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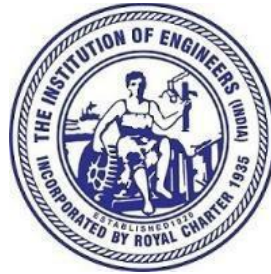
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Review on GFRG Panels in Low Cost Rural Infrastructure Housing

Shrirang D. Borkar¹, Atul S. Verulkar^{*2}, Anshul Limje^{*2}, Chaitanya K. Raut^{*2}, Kunal V. Wankar^{*2},
Nilayam R. Margamwar^{*2}, Sarang K. Wakharkar^{*2}

¹Project Guide, Assistant Professor Civil Engineering Department, DBACER, Nagpur, Maharashtra, India

²Students of Civil Engineering Department, DBACER, Nagpur, Maharashtra, India

ABSTRACT

The main motive of this literature survey is to provide the basic information of GFRG panels in construction of low cost houses. GFRG (Glass Fiber Reinforced Gypsum) is a new building material which is also known as "Rapid wall Building Panel". The main reason for using these panels in construction is to overcome the unavailability of natural resources like river sand, water, gravel, etc. The gypsum is industrial by-product waste. GFRG panels are made up of calcined gypsum plaster and glass fiber. The panel contains cavities that may be filled with concrete and reinforced with steel bars to impart additional strength and provide ductility. It has light weight, high compressive strength, shearing strength, flexural strength, stiffness and ductility. The rapid wall buildings are also resistant to fire, heat, water and corrosion. The paper carried out some of the literature study in different samples of GFRG panel's performance in experimental wise.

Keywords: GFRG, Rapid wall panels, Low Cost.

I. INTRODUCTION

The GFRG panel was originally developed by GFRG Building System Australia and used since 1990 in Australia for mass scale building construction. These panels are manufactured under carefully controlled conditions. The panels are manufactured with the dimensions as 12m x 3m in length x height provided with 124 mm thickness contains cavities which may be unfilled, partially filled or completely filled with concrete and reinforcing steel bars as per the structural requirement.

Experimental studies conducted in Australia, China, and India shows that the GFRG panels suitably filled with plain reinforced concrete possess the substantial strength to act as a load bearing structure as well as shear walls capable of resisting lateral loads due to earthquake and wind.

II. CLASSIFICATION

- 1) Class 1 : Water Resistant Grade
GFRG panel for extended walls, in wet areas and as floor and wall formwork for concrete filling.
- 2) Class 2 : General Grade
GFRG panels for structural application or non-structural application in dry areas.
- 3) Class 3 : Partition Grade
GFRG panel used as non-structural internal partition walls in dry areas.

III. APPLICATION OF GFRG PANELS

GFRG panels are generally used in following ways:

A. As load bearing walls:

Panels with cavities filled with reinforced concrete are suitable for multi-storeyed housing. The cavities

can remain unfilled or suitably filled with non-structural core filling such as insulation, sand, quarry dust, polyurethane or light weight concrete for the single or two storey constructions.

B.As partition walls in multi-storeyed frame buildings.

C.As compound walls/security walls.

D.As horizontal floor slabs/roofs slab with reinforced concrete micro beams and screed (T-beam section).

Typical dimension of a GFRG panel cell

The regular dimension of GFRG panel is 12.0 m x 3.0 m x 0.124 m .

Detailed diagram of GFRG panel cell

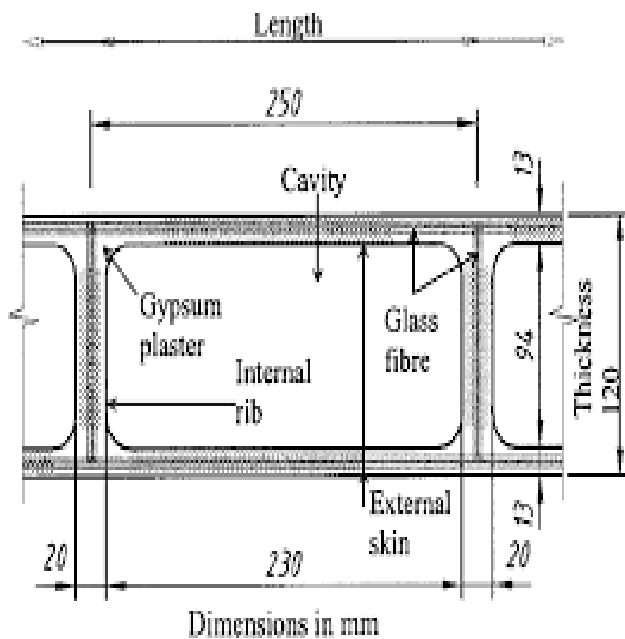


Figure 1. cross section of GFRG panel unit cell

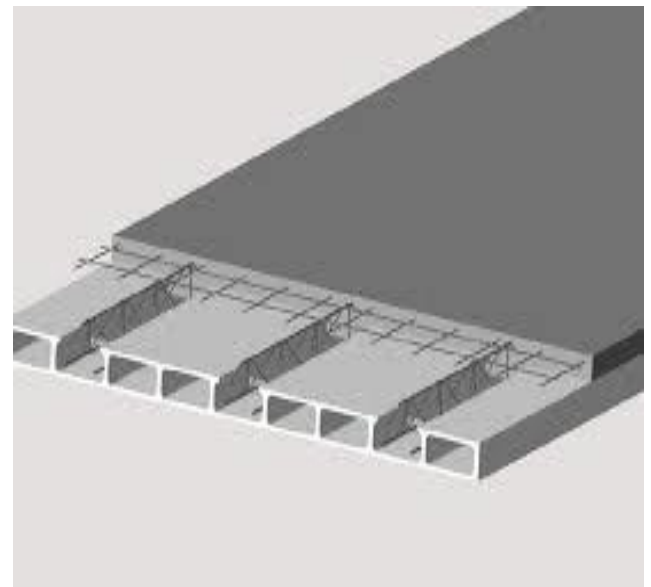


Figure 2. Roof/Floor slab of GFRG panel

Mechanical properties of GFRG panels:

*ISO10140-3:210-Acoustics-laboratory measurements of sound insulation of building elements-part 3: measurement of impact sound insulation

Table 1. Mechanical properties of GFRG panels

Sr no.	Mechanical properties	Nominal value
1	Unit weight	0.433KN/sq.m
2	Modulus of elasticity E	750N/sq. mm
3	Uni-axial compressive strength P	160KN/m (4.77mPa)
4	Uni-axial shear strength T	34-37KN/m
5	Ultimate shear strength V	21.6KN/m
6	Mohr`s hardness	1.6
7	Coefficient of thermal expansion Cm	12 x10 ⁻⁶ mm/°C
8	Water absorption	1.0%:1 hr 3.85%:24 hr
9	Sound transmission class (STC)	4dB
10	Fire resistance:	140/140/140

	Structural adequacy/integrity /insulation	minutes
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Why GFRG is superior to conventional construction?

Gypsum which is a waste product of fertiliser industry is used to make the panels economical and eco-friendly. Glass fibre is used as reinforcing agent which enhances the strength of the panels. Eventually the usage of cement is reduced.

One cement industry alone accounts for 5% increase in CO² emission. By using GFRG panels cement use is reduced and thereby reducing environmental pollution.

In site they are just erected by cranes. Those hollow cavities inside the panels are filled with concrete and steel. Concrete is poured in every third cavity of the panel and other cavities can be filled with waste materials like quarry dust hence it becomes more economical than conventional methods.

GFRG houses are:

- Fire resistant up to 1000 °C
- Earthquake resistant
- Naturally cooler up to 4°C
- Eco-friendly
- Water resistant
- Economical

IV. ADVANTAGES OF GFRG PANELS

- **GREEN TECHNOLOGY:** It makes use of industrial waste gypsum. Does not need any plastering. It consumes much less embodied energy and less carbon footprint.
- **REDUCED BUILT-UP AREA:** Panels being only 124 mm thick, for the same carpet area, the built up area and the building footprint is much less than conventional buildings.

- **VERSATILITY:** Panels can be used not only as walls but also as floors, roofs and staircase.
- **SPEED OF CONSTRUCTION:** Using the system, the construction of a building can be very fast compared to the conventional building.
- **LIGHTNESS OF STRUCTURES:** These panels are very light weight only 43 kg/m². Even after filling some of cavities with concrete, the overall building weight is much less, contributing to significant reduction in design earthquake forces and savings in foundation and overall buildings cost especially in multistoried buildings.

LIMITATION OF USE OF GFRG PANELS

- The shorter span of slab (floor/roof) should be restricted to 5 m.
- Is ideal for if the same floor/roof is replicated for all floors in multistoried structures. For any variations, structural designer needs to be consulted.
- Curved walls or domes should be avoided. In any case it is essential, use masonry/concrete for that particular area.
- The electrical/plumbing drawing should be such that most of the pipes go through the cavities (in order to facilitate minimum cutting of panel).

V. CONCLUSION

GFRG building performs well in terms of least storey displacement, storey drift and base shear when compared to conventional building. The storey displacement and storey drift of both GFRG and conventional buildings are within permissible limits. Static analysis is not sufficient for high rise building and it is necessary to do dynamic analysis.

The building constructed using RW panel comes under Green building categories as after constructing it energy requirement for heat insulation, sound

insulation, humidity and temperature inside is less than conventional building. It is very effective technology to beat the current rising cost of construction. And the most important, this new technology is having potential to provide the low cost shelter to the "Homeless Citizens".

VI. PREVIOUS STUDIES

- **COMPARISON BETWEEN RAPID WALL PANEL CONSTRUCTION OVER CONVENTIONAL CONSTRUCTION WITH RESPECT TO COST AND TIME OF CONSTRUCTION (Kadam Sagar .P , Darade Milind . M) (2016) :**

Rapid wall panel is world`s largest load bearing light weight panels. This method of construction takes a massive leap towards sustainable living creating a positive effect on environment. It is more affordable housing to low income groups. After detailed study and analysis of building it is observed that rapid wall construction saves 67% in construction time and 27% in construction cost compare with conventional building.

- **LOW COST HOUSING BY USING GFRG PANELS (Sk. Subhan Alisha) (2016):**

Experts forecast that a building made of GFRG panels can have a life span of 60 years. The foundation cost comes about 10-15% of the total building. It is suggested to adopt arch foundation in ordinary soil for effecting construction cost up to 40%. The conventional R.C.C. lintels which are costly can be replaced by brick arches for small spans and saves construction cost up to 30-40%.

- **RAPID AFFORDABLE MASS HOUSING USING GLASS FIBER REINFORCED GYPSUM (GFRG) PANELS (Devdas Menon) (2014):**

In order to express this technology, a two storey GFRG demo building was built inside the IIT Madras campus. This building, constructed within a span of 30 days housing a total area of 1981 sq. ft., has 4 flats, two having carpet area of 269 sq. ft. meant for EWS (economically weak section), and the other two with 497 sq. ft. carpet area each

meant for LIG. The saving in cost was almost 35% when compared to conventional construction.

VII. REFERENCES

- [1]. GFRG/Rapid wall building structural design manual, prepared by IIT Madras, published by BMTPC, New Delhi.
- [2]. IS 3809:1979-Fire resistant test of structures
- [3]. Performance appraisal certification PAC's NO. 1008-S/2011 issued to M/s Rashtriya Chemicals and Fertilizers Limited, 'Priyadarshni', Sion, Mumbai.
- [4]. Sk. Subhan Alisha, Sajja. Neeraja, Sk. Akbar, G.Sai Manoj (2016) "Low cost housing by using GFRG panels", International Journal of Scientific Research in science ,Engineering and technology.
- [5]. Mohmad Said MeselhyElsaseed (2016) "Low cost model using GFRG panel" International Journal of Development and Economic Sustainability.
- [6]. Maganti Janardhana, A. Meher Prasad and Devdas Mohan (2004) "studies on the behavior of glass fiber reinforced gypsum wall panels", IIT Madras.

A Review on Experimental Study on Properties of Mortar with Gradation of Sand Particle Sizes

Chetan Khade¹, Aman Jadhav¹, Abhijeet Jumde¹, Rushabh Ramteke¹, Rishabh Padole¹, Himanshu Borkar¹, Mr. Aaquib Ansari²

¹B.E., Department of Civil Engineering, Dr. Babasaheb Ambedkar College of Engineering and Research, Nagpur, Maharashtra, India

²Assistant Professor, Department of Civil Engineering, Dr. Babasaheb Ambedkar College of Engineering and Research, Nagpur, Maharashtra, India

ABSTRACT

Mortar has generally two deficiencies, low durability and low strength. The present trend is toward increasing the durability and strength of mortar to meet the modern construction demand. For that purpose we have done the gradation of sand particles which is used as an aggregate in mortar. A modified mortar of same design mix proportion (1:3) and (1:4) but varying the percentage of different sizes of sand to achieve higher durability and strength. Mortar specimens were tested for compressive strength at age of 7, 14 and 28 days of curing in potable water. The properties are then compared with the controlled mortar mix.

I. INTRODUCTION

Mortar is workable paste used to bind building blocks such as stones, bricks, and concrete masonry units. Mortars are typically made from a mixture of sand, a binders, and water. Mortar mixes include ingredients that give it strength (i.e. cement) and those that promote workability and good bond with the masonry units. Good workability and water retentivity are crucial for maximum bond. A mortar with high cement content is stronger, but it may produce less bond. Contract wise, a mortar having moderate cement content will not be as strong, but it will have better bond strength. The compressive strength of mortar only has a small effect on the bearing strength of the wall, but it adversely affects durability.

II. LITERATURE REVIEW

Cheah Chee Ban, Mahyuddin Ramli[1]:- In this paper the investigation work on Optimization of Mix Proportion of High Performance Mortar for Structural

Applications is carried out. ASTM Type I cement having specific gravity of 3.15 as binder and Type F super plasticizer of sulfonated melamine formaldehyde condensates category was used to maintain the desired level of workability. In first laboratory investigation, a total of 20 batches of mortar mix with cement: Sand ratio of 1: 2.0, 1:2.25, 1:2.5 and 1:2.75 each with water binder ratio varied from 0.40-0.5 with stepped increment of 0.025 was fabricated. In second part of the laboratory investigation, additional 8 batches of mortar mix (Batch 21-28) with cement: Sand ratio of 1:2.25 and 1:2.5 with varying water/binder ratio of 0.35-0.425 at stepped increment of 0.025 were fabricated. To maintain slump of mix at dosage super plasticizer was used within the range of 50-90mm. All mortar mixes were proportioned using absolute volume method as prescribed in ACI Manual of Concrete Practice, Part 1 (American Concrete Institute, 1999). Rheological properties of the mortar mixes were investigated in term of mix slump, besides flow test was performed to

determine flow value of each mix in fresh state. From each batch of mix, a total of 6 numbers of 100x100x100 mm cubes were fabricated. Mortar mix were cured in the mould for 24 h covered completely with polyethene sheeting prior to being remolded and cured in water tank at curing temperature of $20\pm 2^{\circ}\text{C}$ till age of test. After determination of bulk density, compression test is subjected under continuous loading condition. Throughout the test of cube specimens loading rate were maintained constant at 3mm minimum up to failure. The observation is consistent with the fact that the water content of the mix is the main factor affecting workability of concrete whereby increase in water content will result in higher workability of mix. Optimum cement content is achieved at cement: sand ratio of 1:2.25 for water/cement ratio ranging between 0.40 and 0.50 to ensure maximum compressive strength of mortar mix produced. Also, economical use of binder can be achieved with the use of mortar mix with cement: sand ratio of 1: 2.25. Incorporation of super plasticizer in the mortar mix with cement: Sand ratio of 1:2.25 results in higher degree of enhancement in workability as to 1: 2.5. Rate of early strength gain of mortar mix with cement: Sand ratio of 1:2.25 is significantly higher. Incorporation of super plasticizer in mortar mixes resulted in reduction of compressive strength of hardened mortar mix.

L. O. Ettu, F. C. Njoku, J. I. Arimanwa, K. C. Nwachukwu and H.E. Opara[2]:- OPC-RHA composites vary with mix proportion in a similar way as those of normal OPC composites (with 0% RHA). The compressive strength of OPC_RHA cement composites increased with leanness of mix up to some level of leanness after which the strength reduced. On the basis of compressive strength and obvious cost implications, mix proportion of 0.7:1:3:5 would be ideal for OPC-RHA binary blended cement concrete. Similarly, mix proportion of 0.7:1:9 would be ideal for OPC-RHA binary blended cement sandcrete and soilcrete. The 50 days strength values of OPC-RHA blended composites are comparable to those of 100%

OPC composites are comparable to those of 100% OPC composites at OPC replacements with RHA up to 20%. The results seems to suggest that the variation of OPC-RHA cement concrete strength with mix proportion does not depend so much on the ratio of fine aggregate to coarse aggregate as on the proportion of total aggregate. Further studies would be required to determine the most suitable fine to coarse aggregate ratio for OPC-RHA blended cement concrete.

Archana Katroliya, Archana Tiwari[3] :- The work presented in this paper reports an investigation on the behavior of concrete produced from blending cement with RHA and FA. The physical and chemical properties of RHA, FA and OPC were first investigated. The effects of RHA on concrete properties was studied i.e. Compressive strength was studied as the time dependent property.

The result of the study show that the RHA produced from agro waste can be used as partial replacement of ordinary Portland cement in concrete.

From the test result it can be concluded that if approximately 20 % of cement is replaced by equal amount of RHA, there is not any significant depreciation in the compressive strength but it slightly increase. Thus the RHA and FA can be used as partial replacement of cement in the regions where the material is locally available.

Narayan Sambu Potty Kalaikumar Vallyutham M. F. Yusuf A. Anwar M. F. Haron M. N. Alias[4]:- This paper summarizes the research work on the properties of Rice Husk Ash (RHA and MIRHA) Mortars. The parameters of RHA and MIRHA mortar were vary as w/c ratio of 0.50, 0.55, 0.60 and 0.65 taken and 0, 5, 10, 15, 20, 25 and 30% of OPC RHA and MIRHA were taken respectively. 1:3 and 1:4 c/s proportions were used. The Compressive strengths were evaluated at 7, 28 and 60 days using ASTM of sample. The results revealed that when the RHA replacement is increased the compressive strength of most RHA mortars

decreases. It is found due to the grain size of RHA is coarser than the cement, due to which porous surface and more voids inside the mixtures were produced.

Er. S. Thirougnaname, Er. S. Segaran[5]:- Experimental investigation was carried out to study the feasibility of unsieved stone dust (a product obtained from crushing of granite) as fine aggregate in place of river sand in making cement mortar 1:3, 1:4, 1:5, and 1:6, which are the mixes usually adopted in various construction activities. Stone dust obtained from various sources in and around Pondicherry satisfies the requirement as specified in IS standards. More quantity of water is required for unsieved Stone Dust mortar when compared to conventional mortar, irrespective of the mix proportion. Stone Dust mortars are equal or slightly higher strength than reference mortar for different mix proportions, namely for 1:4, 1:5, 1:6 at 100% flow. Hence, it is concluded that stone dust mortars can also be used with confidence in construction.

III. CONCLUSION

Following are the important conclusions made after studying literature review:

1. Optimum cement content is achieved at cement: sand ratio of 1:2.25 for water/cement ratio ranging between 0.40 and 0.50 to ensure maximum compressive strength of mortar mix produced. Also, economical use of binder can be achieved with the use of mortar mix with cement: sand ratio of 1: 2.25.
2. The variation of OPC-RHA cement concrete strength with mix proportion does not depend so much on the ratio of fine aggregate to coarse aggregate as on the proportion of total aggregate.
3. Approximately 20 % of cement is replaced by equal amount of RHA, there is not any significant depreciation in the compressive strength but it slightly increase. Thus the RHA and FA can be used as partial replacement of cement in the regions where the material is locally available

4. The compressive strength of most RHA mortars decreases when the RHA replacement is increased. This is due to the coarser grain size of RHA than the cement which produces porous surface and more voids inside the mixtures.
5. Stone Dust mortars are equal or slightly higher strength than reference mortar for different mix proportions, namely for 1:4, 1:5, 1:6 at 100% flow. Hence, it is concluded that stone dust mortars can also be used with confidence in construction

IV. ACKNOWLEDGEMENT

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V. REFERENCES

- [1]. Cheah Chee Ban, Mahyuddin Ramli "Optimization of Mix Proportion of High Performance Mortar for Structural Applications" American J. of Engineering and Applied Sciences 3 (4):643-649, 2010 ISSN: 1941-7020.
- [2]. L. O. Ettu, F. C. Njoku, J. I. Arimanwa, K. C. Nwachukwu and H.E. Opara "Variation of OPC-Rice Husk Ash Composites Strength with Mix Proportion" International Journal of Scientific & Engineering Research, Volume 4, Issue 9, September-2013 ISSN: 2229-5518.
- [3]. Archana Katroliya, Archana Tiwari "The Effect of Rice Husk and Fly Ash Used as Supplementary Cementing Material on Strength of Mortar and Concrete" International Journal of Research & Technology (IJERT) ISSN: 2278-0181 Vol. 2 Issue 12, December – 2013
- [4]. Narayan Sambu Potty, Kalaikumar Vallyutham M. F. Yusuf A. Anwar M. F. Haron M. N. Alias "Properties of Rice Husk Ash (RHA & MIRHA) Mortars" Research Journal of Applied Sciences,

Engineering & Technology 7(18):3872-3882, 2014
Technology (IJCET), Published: May 10, 2014.

- [5]. Er. S. Thirougnaname, Er. S. Segaran "Use of unsieved stone as fine aggregate in mortar" International Journal of Civil Engineering and Technology (IJCET) ISSN: 0976-6316 Volume 5, Issue 7, July 2014

A Review Paper on strength characteristics of concrete with partially replacement of cement by Rice Husk Ash and Fly Ash

Rushab P. Patil¹, Pritish T. Mallick¹, Raju A. Roy¹, Ashish G. Shende¹, Shubham M. Tembhumne¹, Praful P. Pilare¹,

Prof. Shivani S. Shriram²

¹B.E., Civil Engineering, TGPCET, Nagpur, Maharashtra, India

²Assistant Professor, Student B.E., Civil Engineering, TGPCET, Nagpur, Maharashtra, India

ABSTRACT

Rice husk is one of the waste materials in the rice growing regions. This not only makes the purposeful utilization of agricultural waste but it will also reduce the composition of energy used in the production of cement. Since the agricultural by products such as Rice husk can be partially replaced of cement because of their pozzolanic behavior. Rice husk ash contains as much as 80-85% silica which is highly reactive, depending upon the temperature. Therefore partially replacement of cement by Rice Husk Ash in cement concrete.

Fly ash is comprised of the non-combustible mineral portion of coal. When coal is consumed in the power plant, it is first ground to the fineness of powder. Blown into the power plants boiler, the carbon is consumed, leaving molten particles rich in silica alumina and calcium. The compressive strength is recorded after the 7, 14 and 28 days curing. Then normal concrete cube and RHA, Fly Ash concrete cube test in compressive testing machine, comparing the strength between them.

Keywords: Rice Husk Ash, Fly Ash, Ordinary Portland cement.

I. INTRODUCTION

To reducing the cost of construction of concrete structures by added some waste materials such as Rice Husk Ash, Fly Ash with increasing its compressive strength as compare to the normal concrete (without added RHA and Fly ASH). Rice Husk Ash is obtained from burning of Rice Husk which is the byproduct of rice milling. Rice Husk Ash contains as much as 80-85 % silica which is highly reactive, depends upon the temperatures of the atmosphere. It is considered as a highly pozzolanic materials. Ash is used as like as fine powder because of similar property of cement.

Replacement of cement with Rice Husk Ash leads to decrease in the compressive strength improved the workability and achieved the target strength at 10% replacement for both the grades of concrete. By Ravande Kishore V. Bhikshma P. jeevana Prakash 2011 published by Elsevier Ltd. As the replacement of cement by RHA in concrete increases, the workability of concrete decreases by 27% slump and 9% compaction factor.

Replacement with 25% RHA result in drastic enhancement of the permeability properties of blended concrete compared to that of in ordinary concrete by Seyed Alireza Zareei, Farshad Ameri, Farzan Dorostkar, and Mojtaba Ahmadi Case studies in construction material 7 (2017) 73-81. ISSN:1991-8178

II. LITERATURE REVIEW

Compressive strength of mortar and concrete increase when cement is partially replacement by RHA. Due to active amorphous silica content present in RHA by M.N.N. Khan, M. Jamil, A.B.M.A, Kaish and M.F.M, Zain. This active silica reacts with hydration products of cement and produce secondary C-S-H gel, www.ajbasweb.com

The fine aggregate content is reduced but the coarse aggregate content is deliberately the same, the water is reduced and the density is reduced because of the lower density of fly ash compared with cement by Jagdish Virupakshi Patil, Volume: 04 Issue: 11| Nov-2017 www.irjet.net p-ISSN:

III. PROPERTIES OF RHA AND FLY ASH

RHA is that the highest amorphous silica could be obtained by burning the rice husk at the temp.range of 500-700 0c and the specific surface area up to 150 sq.m per kg. The Specific gravity of rice husk ash is 2.1 and produced after burning of Rice husk (RH) has high reactivity and pozzolanic property. IS 456- 2000 [8], recommends use of RHA in concrete but does not specify quantities.

Fly ash used was obtained Indorama Synthetics India limited, Nagpur, Maharashtra in India. Fly ash is one of the residues generated in the combustion of coal. Fly ash is generally captured from the chimneys of power generation facilities, whereas bottom ash is, as the name suggests, removed from the bottom of the furnace. In the past, fly ash was generally released into the atmosphere via the smoke stack, but pollution control equipment mandated in recent decades now require that it be



Figure 1.1. concrete mixing with RHA and Fly Ash

captured prior to release. But all fly ash includes substantial amounts of silica (silicon dioxide, SiO₂) (both amorphous and crystalline) and lime (calcium oxide, (CaO)). Fly ash is commonly used to supplement Portland cement in concrete production, where it can bring both technological and economic benefits, and is increasingly finding use in synthesis of geopolymers.

IV. MATERIALS

4.1 Cement

Ordinary Portland cement of 53 grade is used in concrete. Cement used has been tested as per IS 10262 and 456-2000.

4.2 Coarse aggregate and Fine aggregate

The maximum size of coarse aggregate should be 20 mm and minimum size should be 10 mm. The coarse aggregate with angular in shape and the rough surface texture is used. The fine aggregates should be used from 4.75 mm to 150 micron.

4.3 Water

Locally available portable water confirming to standard specified in IS 456-2000 is use.

V. METHODOLOGY

1. After completion of data required for the concrete with partially replacement of cement by Rice Husk Ash and Fly Ash then completing the mix design work was done.

2. Replacement of cement by RHA and fly ash as 10%, 15%, 20% in the concrete cubes.
3. Now a days, concrete cubes are under water tank for the curing.
4. All the concrete cubes made by ordinary Portland cement and replacement of cement by RHA and Fly Ash curing is in same water or same water tank.
5. After completion of curing for the 7 days, 14 days, 28 day, cubes are tested on compressive testing machine (CTM).
6. Then to check the characteristics strength of concrete cubes RHA and Fly Ash.
7. Then to comparing the strength between them

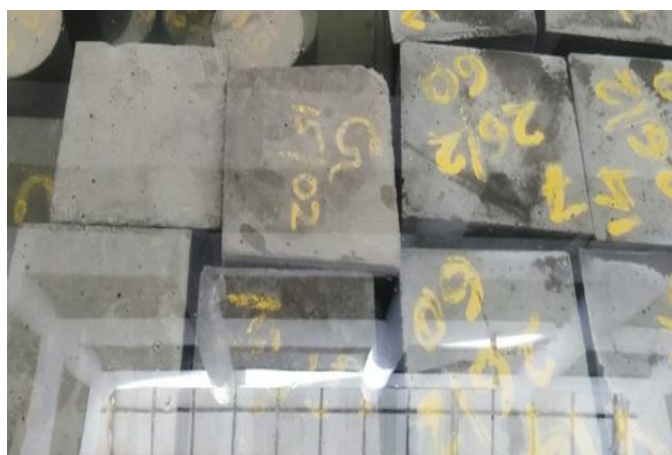


Figure 1.2. Cubes in curing tank



Figure 1.3. Compression testing machine

VI. EXPECTED OUTCOME

1. Reduction of environment pollutants and economy in concrete construction was possible using RHA as partial replacement of cement.
2. RHA mixed concrete develops light weight concrete as compared to normal concrete as its density is less.
3. Combined replacement of Fly Ash and Rice Husk Ash showed higher compressive strength than only replacement of concrete mixes with RHA

VII. REFERENCES

- [1]. SayedAlirezaZareei, Farshad Ameri, FarzanDorostkar, Rice Husk Ash as partially replacement of cement in high strength concrete containing micro silica: Evaluating durability and mechanical properties, Case Studies in Construction Material 7 (2017)
- [2]. Satish H. Sathvane, Vikrant S. Vairagade, Kavita S. Kene, Combine Effect of Rice Husk Ash and Fly Ash on Concrete by 30% cement replacement, chemical, civil and mechanical engineering track of 3rdNirma University International Conference, procedia Engineering 51 (2013) 35-44
- [3]. M.N.N. Khan, M. Jamil, A.B.M.A. Kaish, M.F.M. Zain, An Overview on Manufacturing of Rice Husk Ash as Supplementary Cementitious material, Australian Journal of Basic and Applied Sciences, 8(19)Special 2014, Pages 176-181
- [4]. RAVANDE KISHORE, V. BHIKSHMA, P. JEEVANA PRAKASH, Study on strength characteristics of High Strength Rice Husk Ash Concrete, The Twelfth East Asia-Pacific Conference on Structural Engineering and Construction, Procedia Engineering 14 (2011) 2666-2672
- [5]. Jagdish VirupakshiPatil, Partial Replacement of Cement by Fly ash in Concrete Mix Design Volume: 04 Issue:11 Nov-2017, www.irjet.net p-ISSN: 2395-0072

Comparison Between Wind and Earthquake Resistance Structure

Pande P. G.¹, Rathod H. A.¹, Sahare A. S.¹, Khobragade P.¹, Dalal T.¹, Lanjewar S.B.¹,
Gawali V.¹, Bondre V. A.²

¹Civil Engineering, Department, DBACER, Nagpur, Maharashtra, India

²Assistant Professor, Civil Engineering Department, DBACER, Nagpur, Maharashtra, India

ABSTRACT

It is very essential to consider the effects of lateral loads induced from wind and earthquakes in the design of reinforced concrete structures, especially for high-rise buildings. In some cases effects of earthquake are found to be dominant and more critical than wind effects and in some cases the opposite happens. As per as earthquake force as considered zone factor, height of building and type of sub-soil are relevant in estimation of earthquake force. For wind load base dimensions, height, basic wind speed, terrains category and many more factors include permeability are required for estimation of forces due to wind. By using STADD pro the results presented here are focused on calculation of parameters such as deflection, shear force and bending moment for earthquake and wind load on the different configuration buildings.

Keywords: high-rise buildings; wind pressure; equivalent static loads; zone factor; structural factor; importance factor

I. INTRODUCTION

The focus of this study, in the field of wind and earthquake engineering, is on the comparison of the dynamic behaviour of a multi-story reinforced steel structure building & how they respond to wind and earthquake induced excitations.

All structures especially high rise structures are design for dynamic loads which include loads due to earthquake and wind. Major consideration is given to earthquake loads in earthquake prone areas and that to wind loads in cyclones prone areas. For very tall structure wind is considered as predominant load. Earthquake forces are estimated as per the provision of IS 1893(Part 1):2002 while the wind forces are estimated by IS 875(Part 3):1987. As per the historical wind velocity data India is divided into no. of zones and designed wind velocity is considered according to wind map of India. Class-B Structure and their component such as cladding, glazing, roofing, etc.

having greatest vertical or horizontal dimensions between 20 and 50m.

The focus of this study, in the field of wind and earthquake engineering, is on the comparison of the dynamic behaviour of a multi-story reinforced concrete building and steel structure building & how they respond to wind and earthquake induced excitations.

• Objectives

1. To critically study the codal provisions for Wind and Earthquake Loads.
2. To analyse structural frames with different base dimension and heights for wind and earthquake loads considering provisions of relevant codes
3. To understand development of displacements and forces in selected columns.

II. METHODOLOGY

- Calculation of loads as per Indian Standards.
- Step by Step process of Methodology.
- Analysis using Staad pro on residential building.
- Design using Staad. Pro on residential building.

Calculation of loads as per Indian Standards There are different types of loads acting on the structure

• Dead loads: - All permanent constructions of the structure form the dead loads. The dead load comprises of the weights of walls, partitions floor finishes, false ceilings, false floors and the other permanent constructions in the buildings. The dead load loads is calculated from the dimensions of various members and their unit weights. the unit weights of plain concrete and reinforced concrete made with sand and gravel or crushed natural stone aggregate may be taken respectively.

• Live loads: - Live load is produced by the intended use or occupancy of a building including the weight of movable partitions, distributed and concentrated loads, load due to impact and vibration and dust loads. Imposed loads do not include loads due to wind, seismic activity, snow, and loads imposed due to temperature changes to which the structure will be subjected to, creep and shrinkage of the structure, the differential settlements to which the structure may undergo.

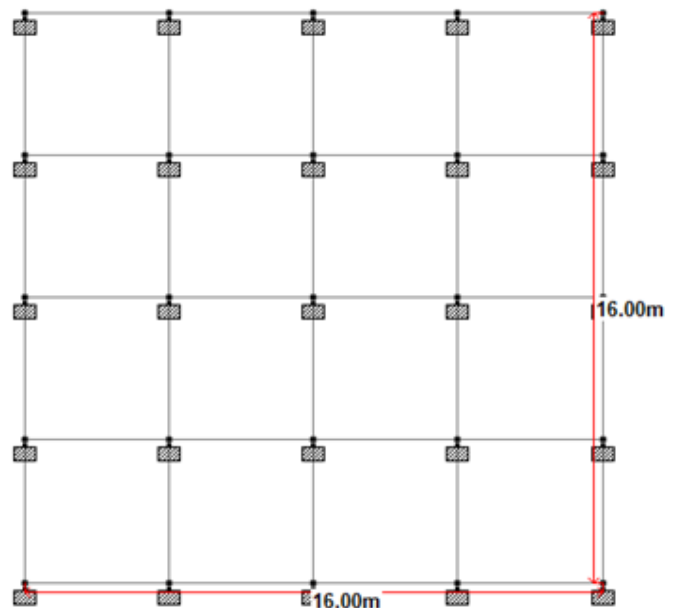
• Wind loads: - Wind is air in the motion relative to the surface of the earth. The primary cause of wind is traced to earth's rotation and differences in the terrestrial radiation. The radiation effects are primarily responsible for the convection either upwards or downwards. The wind generally blows from the horizontal to the ground at high wind speeds. Since vertical components of the atmospheric motion are relatively small, the term 'wind' denotes almost exclusively the horizontal wind, vertical winds are always identified as such. The wind speeds are to be assessed with the aid of anemometers or anemographs which are installed at meteorological observatories at heights generally varying from 10 to 30 meters above the ground.

Project details:-

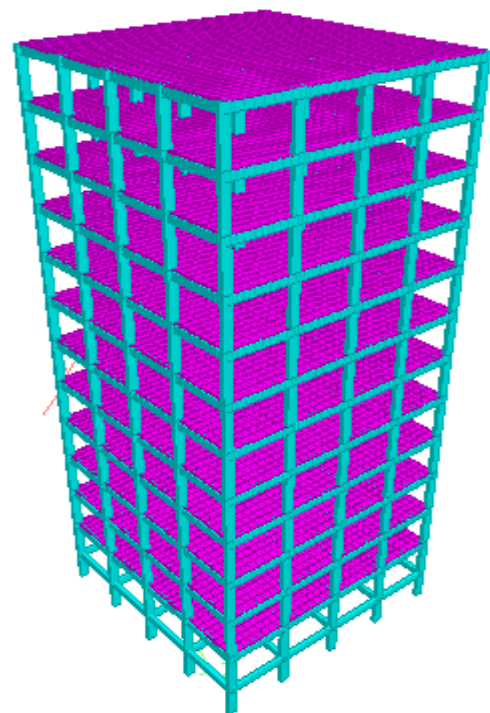
- City :- Nagpur
- Basic wind speed :- 44 m/s
- Permeability :- 5-20%
- Building type :- General
- Size of building :- 16m X 16m X 36m
- Floor :- G+11

III. RESULTS AND DISCUSSION [Page Style]

Modeling of Class-B structure :-



Plan- Base dimensions 16-16



3D View 16-16-36

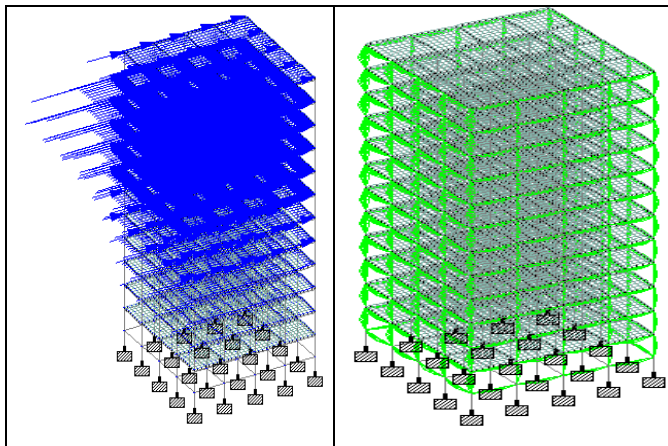


Figure 1. Application of earthquake and wind load on the structures.

Design wind speed and Wind pressure coefficient for Class B structure.

Floor level	V _z = Design wind speed				P _z = Wind pressure coefficient			
	TC 1	TC 2	TC 3	TC 4	TC 1	TC 2	TC 3	TC 4
11	50.3	49.0	46.1	42.5	1.5	1.4	1.2	1.0
8	6	1			2	4	8	8
10	50.0	48.7	45.7	41.72	1.5	1.4	1.2	1.0
7	5	2			1.5	1.4	1.2	1.0
9	49.7	48.4	45.3	40.92	1.4	1.4	1.2	1.0
2					8	1	3	1
8	49.3	47.7	44.6	38.67	1.4	1.3	1.2	0.9
6	6	6			6	7	1.2	0.9
7	48.9	47.0	44	36.43	1.4	1.3	1.1	0.8
4	3	8			4	3	6	0.8
6	48.5	46.4	43.3	34.19	1.4	1.2	1.1	0.7
1	3	2	4		1	9	3	0.7
5	47.8	45.6	42.4	33.44	1.3	1.2	1.0	0.6
8	7	7	2		8	5	8	0.6
4	47.0	44.8	41.3	33.44	1.3	1.2	1.0	0.6
3	8	8	6		3	1	3	0.6
3	46.0	43.8	39.7	33.44	1.2	1.1	0.9	0.6
2	2	2	8		7	5	5	0.6
2	45.3	43.1	38.7	33.44	1.2	1.1	0.9	0.6
3	2	2	2		3	2	0.9	0.6
1	45.3	43.1	38.7	33.44	1.2	1.1	0.9	0.6
2	2	2	2		3	2	0.9	0.6
0	45.3	43.1	38.7	33.44	1.2	1.1	0.9	0.6
3	2	2	2		3	2	0.9	0.6

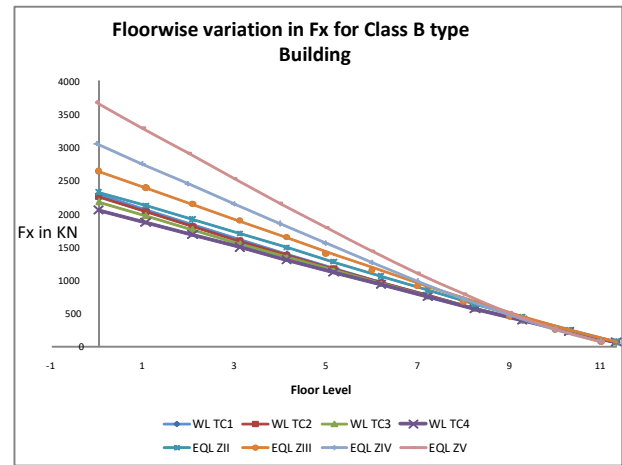


Figure 2. (Variation of Axial force of class B structure with diff Terrain Category and Zones)

- 1) For B class type of structures the difference in axial force developed in column due to EQ and WIND loading is relatively less in case of structure with lower lateral dimensions.
- 2) For the structure having height 36m the axial forces in EQ Zone-II are very close to the forces developed due to wind. However the difference is significantly higher with increase in base dimensions and the EQ forces are found to be predominant in class B type of structure with higher base dimensions.

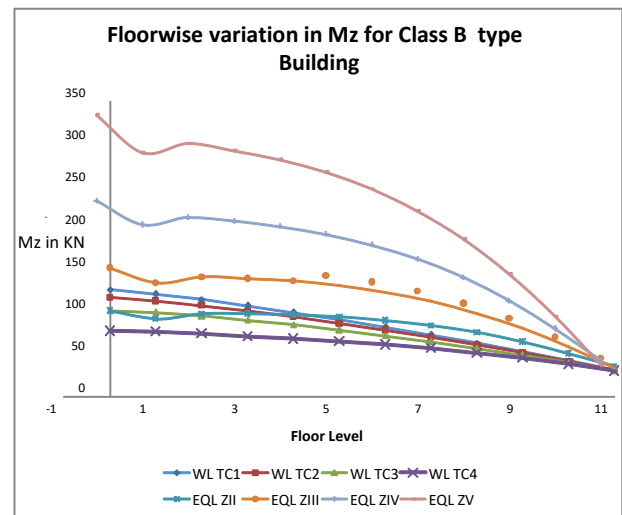


Figure 3. (Variation of Mz of class B structure with diff Terrain category and Zones)

In case of moment in Z direction the M_z due to EQ force is more than that of wind loading.

IV. CONCLUSION

- [1] In case of earthquake the axial force, shear force, torsion, bending moment and displacements developed in the column increase as zone factor increases,
- [2] In case of wind force the axial force, shear force, torsion, bending moment and displacements developed in the columns decrease as terrain category is changed from 1 to 4.
- [3] In case of shear in Z direction for class B If the height of structure increase wind loading in TC 1,2,3 are more than the EQ forces in Zone II.
- [4] In class B type of structure the X-Translation due to wind in terrain categories 1, 2 and 3 is greater than due to earthquake in zone II and III, and X-Translation due to wind in terrain category 4 is greater than due to earthquake in zone II.

V. REFERENCES

- [1]. Dr. Suchita Hirde, Mr. Vinay Magadum, "Severity of Earthquake Forces against Wind Forces for Multistorey RCC Building" Professor, Applied Mechanics Department, Govt. College of Engineering, Karad 415 124, India 2PG Student, Civil-Structures, Govt. College of Engineering, Karad 415 124, India
- [2]. Kosta talaganov, Mihail garevski, Danilo ristic and Vlado micov, "comparative dynamic stability study of a high –rise structure exposed to seismic and wind effects – case" STUDY 13th World Conference on Earthquake Engineering Vancouver, B.C., Canada August 1-6, 2004 Paper No. 778
- [3]. Khaled M. Heiza and Magdy A. Tayel, "Comparative Study of The Effects of Wind and Earthquake Loads on High-rise Buildings" Civil Engineering Department, Faculty of Engineering, Menoufiya University, EGYPT
- [4]. Gana A.J, "Wind effects on structures a case study of buildings in irepodun local government area of kwara state" Civil Engineering Department College of Sciences and Engineering Landmark University, Omu-Aran, Kwara State
- [5]. Xinzhong Chen and Ahsan Kareem, Evaluation of Equivalent Static Wind Loads on Buildings, Assistant Professor of Civil Engineering, Texas Tech University, Texas, USA, xinzhong.chen@ttu.edu, and Professor of Engineering, University of Notre Dame, Indiana, USA, kareem@nd.edu
- [6]. Bimala Pillai, Priyabrata Guha, "Comparison between RCC and steel structure with wind and earthquake effect using Staad pro"
- [7]. Baldev D. Prajapati and D. R. Panchal, "Study of seismic and wind effect on multi storey r.c.c., steel and composite building" M.E. Research Scholar & Assistant Professor, Applied Mechanics & Structural Engg. Deptt., Faculty of Techno. & Engineering, M. S. University of Baroda, Vadodara – 390001, Gujarat, India.
- [8]. P. Mendis, T. Ngo, N. Haritos, A. Hira and B. Samali Wind Loading on Tall Buildings, The University of Melbourne, Australia, and University of Technology Sydney, Australia, J. Cheung Monash University, Australia
- [9]. Umakant Arya, Aslam Hussain and Waseem Khan, "Wind Analysis of Building Frames on Sloping Ground" Rura Engineering Services, M .P , India, Civil, UIT R.G.P.V Bhopal, M.P,India
- [10]. Swati D.Ambadkar and Vipul S. Bawner, "Behaviour of multistoried building under the effect of wind load" Assistant Professor, Department of Civil Engineering, P.R.M.I.T.&R, Badnera, Amravati. Post Graduate Student, Department of Civil Engineering, P.R.M.I.T&R ,Badnera, Amravati
- [11]. D. Boggs and J. Dragovich, "The Nature of Wind Loads and Dynamic Response" IS : 1893 (Part1) : 2002 IS : 875 (Part 3) : 1987

Experimental Investigations on Partial Replacement of Coarse Aggregate by Waste Plastic and Waste Marbles in Concrete

Ashwini Kshirsagar¹, Rutuja Nirwan¹, Asawari Agrelwar¹, Akshay Balpande¹, Pravin Pathak¹, Rohit Gavale¹, Mr. Rakesh Shambharkar²

¹Students of Department of Civil Engineering, DBACER, Wanadongri, Nagpur Maharashtra, India

²Assistant Professor, Department of Civil Engineering, DBACER, Wanadongri, Nagpur Maharashtra, India

ABSTRACT

Plastic waste is big issue in today's environments and which results in public health issues. Now a days public does not have any alternative on any kind of plastic produce so, to overcome this problems, plastic products are used in construction industries due to scarcity of cement, sand, aggregate in future. This review paper includes the partial replacement of waste plastic(20%) as a coarse aggregate and studied the properties of waste plastic in concrete. Large amount of waste has been produced during mining and processing stages by Marble industry. This waste is dumped on to open land which creates a lot of environmental problems. The main objective of this study was utilization of marble waste as a replacement for conventional natural coarse aggregate in concrete. Experimental investigations were carried out to determine the accessibility of use of marble waste as a coarse aggregate in concrete. Conventional natural coarse aggregate was replaced by marble aggregate in different percentages 40% by weight. The average compressive strength of all the concrete mixes containing marble aggregate increased 40% by weight. From the results it was found that, the workability, compressive strength and permeability increased with increase in substitution of marble aggregate.

This paper represents a collection of ideas of various studies done on the use of Waste Plastic and waste marbles Materials in concrete mixes. Conclusions are drawn based upon the respective results of all the mentioned research papers.

Keywords: Environment, Plastic Waste, Natural Fine Aggregate, Compressive Strength Permeability, Waste Marbles.

I. INTRODUCTION

According to Central Pollution Control Board of India, Total plastic waste which is collected and recycled in the country is estimated to be 9,205 tonnes per day. This is a major environmental issue. Plastic waste is a material which is harmful for public health and environment also. Plastic waste is a non biodegradable material. The degraded plastic waste in the form of particle which enters the food chain and it will directly affects the health of human beings, stray animals. So it can be reuse in construction industry. Among the top 20 countries that have dumped the

most plastic waste into the oceans at twelfth position, India is one of the worst performers. It has dumped up to 0.24 million tonnes of plastic into the ocean every year. It is essential to manage this non decomposable waste as soon as possible. One of the methods can be using this waste in structural purposes, for example the use of plastic waste as partial replacement of the constituting materials of concrete mix, which is the current topic of discussion. Keeping in view the disposal issues of plastic waste, its utility in concrete is studied and experimented by various researchers. They have worked on the use of pulverized plastic in

concrete as partial replacement of waste plastic in concrete as partial replacement of coarse aggregate. Testing was conducted on the samples casted by using plastic waste in the laboratory to study the variation of concrete properties from normal concrete. This research paper includes the partial replacement by waste plastic up to 20% by weight and results were studied. Research paper is based on the study which gives the idea of utilizing various Marbles. Approx. 85% of production of marble in India is from Rajasthan state. The marble mining industry has grown up widely in recent past years. Rajasthan has around 4000 marble mines. The industries produce a lot of waste of marble in the form of powder/slurry and pieces of irregular size of stones. large quantity of waste marbles has been generated during the quarrying operations. Wastes is mainly in the form of rock fragments The stones obtained from the quarries are usually dumped in open trenches in the forest area; thereby creating huge amounts of waste. There is absolutely no method of appropriate disposal of waste in the quarrying areas. The waste is dumped on forestland, Roads, riverbeds, & agricultural fields leading to overall environmental degradation. fertility of top soil is reduces. In the present investigation , the generated waste marble was used in concrete as a replacement of conventional coarse aggregate in different percentages 40% by weight. The idea of working concrete mixes was maximum utilization of marble waste which saves the natural resources.

T. Subramani (02)observed that, plastic waste can be disposed by using them as construction materials. Since the plastic waste is not suitable to replace fine aggregate it is used to replace the coarse aggregate. The compressive strength and split tensile strength of concrete containing plastic aggregate is retained more or less in comparison with controlled concrete specimens. However strength noticeably decreased when the plastic content was more than 20%. Has been concluded 20% of plastic waste aggregate can be incorporated as coarse aggregate replacement in concrete without any long term detrimental effects and with acceptable strength development properties.

Promod S. Patil (01).observed that he modified concrete mix, with addition of plastic aggregate replacing conventional aggregate up to certain 20% gives strength with in permissible limit. Modified concrete casted using plastic aggregate as a partial replacement to coarse aggregate shows 10 % it could be satisfy as per IS codes. Density of concrete is reducing after 20% replacement of coarse aggregates in a concrete. **R. Siva Kumar, H. Mohammed Yousuff, M. Haripriya** (03), observed that the coarse replaced with granite waste at 30% in concrete is suitable for construction. **Jay P. Chotaliya, Kuldip B. Makwana, Pratik D. Tank** (04) carried an experimental study on “waste marble chips as coarse aggregate”. They proved that the marble concrete proves more economical at rate of around 7.44% than concrete made with conventional coarse aggregate.

II. MATERIALS

2.1.Cement : The most common cement used is an Ordinary Portland Cement (OPC). The Ordinary Portland Cement of 53 grade confirming to IS 12269 : 2013 It constitutes only about 20 percent of the total volume of concrete mix; it is the active portion of binding medium and is the only scientifically controlled ingredient of concrete.

Table 1. Properties of cement

Sr No	Physical property of cement	Result	Reqd.as per IS:12269:2013
1.	Specific gravity	3.15	3.10 - 3.15
2.	Soundness (Le Chatelier's)	9	10
3.	Initial setting time (hours, min)	35min	30 min. minimum
4.	Final setting time (hours, min)	178 min	600 min. maximum
5.	Compressive strength- 3 days	26.51 N/mm ²	27 N/mm ²
6.	Compressive strength- 7 days	38.49 N/mm ²	37 N/mm ²
7.	Compressive strength- 28 days	52.31 N/mm ²	53N/mm ²

2.2.Coarse aggregate :-The aggregate which is retained over IS Sieve 4.75 mm is termed as coarse aggregate. Locally available coarse aggregate having the maximum size of 20 mm was used in this work. The aggregates were washed to remove dust and dirt and were dried to surface dry condition. The aggregates were tested as per IS: 2386 (Part 4) - 1963 .

Table 2. Properties of coarse aggregate

Sr.no.	Characteristics	Value
1	Colour	Grey
2	Size	20mm
3	Shape	Angular
4	Specific gravity	2.80

2.3.Fine aggregate:-The aggregates most of which pass through 4.75 mm IS sieve are termed as fine aggregates. According to size, the fine aggregate may be described as coarse, medium and fine sands. Depending upon the particle size distribution IS: 383-1970 has divided the fine aggregate into four grading zones (Grade I to IV). The grading zones become progressively finer from grading zone I to IV. In this experimental program, fine aggregate was locally procured and conformed to Indian Standard Specifications IS: 383-1970. The sand was sieved through 4.75 mm sieve to remove any particles greater than 4.75 mm and conforming to grading zone II. It was coarse sand light brown in colour. Sieve analysis and physical properties of fine aggregate are tested as per IS:383-1970 and results are shown in below Table.

Table 3. Properties of Fine Aggregate

Sr.no.	Characteristics	Value
1	Specific gravity	2.65
2	Bulk density(kg/m ³)	1.3
3	Fineness modulus	2.62
4	Water absorption	0.02

2.4.Water : Water is an important ingredient of concrete as it actually participates in the chemical reaction with cement. Since it helps to form the

strength giving cement gel, the quantity and quality of water is required to be looked into very carefully. Water cement ratio used is 0.467 for M25.

2.5.WASTE PLASTIC:

Table 4. Properties of Waste plastic

Sr.no.	Properties	values
1.	Density	930-970(kg/cm ²)
2.	Yield stress	26 (N/mm ²)
3.	Elongation at yield stress	10 %
4.	Tensile modulus of Elasticity	900 (N/mm ²)

2.6.Waste marble

Table 5. Properties of Chemical compositions of marble waste

Sr. No.	Properties	values
1.	Colour	White
2.	Texture	Smooth, glossy
3.	Hardness	3 Mohr's scale
4.	Tensile strength	9.95 (N/mm ²)
5.	Compressive strength	12.45 (N/mm ²)

III. DESIGN MIX METHODOLOGY

A mix M25 grade was designed as per IS 10262:2009 and the same was used to prepare the test samples. The design mix proportion is shown in

Table 6. Properties of Concrete Design Mix Proportion

Sr No	Materials	Grade of Concrete	Average Compressive Strength of Conventional Concrete (N/mm ²)			Average Compressive Strength for variations in		
			7 Days	14 Days	28 Days	7 Days	14 Days	28 Days
1	Waste Marbles	M25	16.2	22.5	24.75	20.66	28.61	31.79
2	Waste Plastic	M25	16.2	22.5	24.75	8.61	11.92	13.24

3.1. Casting of Cubes

(As per IS 516:1959)

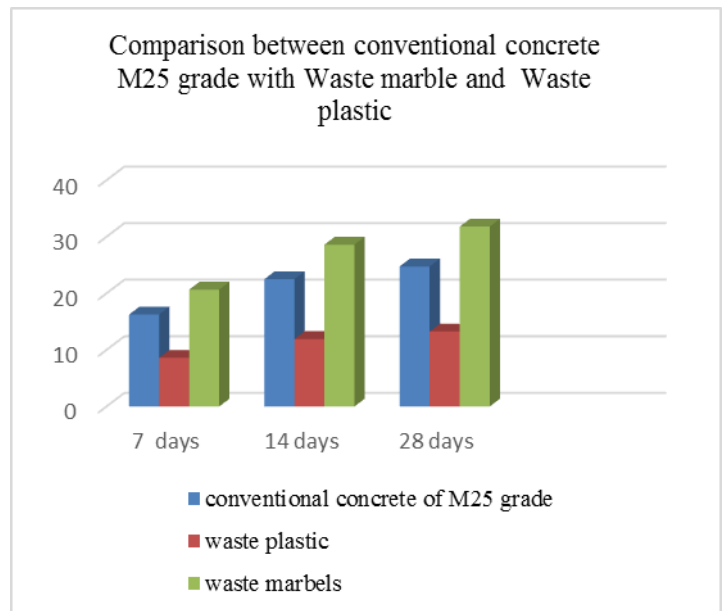
Standard metallic cube moulds (150*150*150 mm) were casted for compressive strength. The specimens were demoulded after 24 hours and subsequently immersed in water for different age of testing. For each age three specimens were tested for the determination of average compressive strength.



Figure 1. Casting of cubes

Table 7. Comparison between Conventional concrete with replacement of coarse aggregate (waste marble and waste plastic)

Sr. no.	Material replacement	Concrete type	Concrete Design Mix Proportion (By Weight)				Replacement %
			W/C Ratio	C (kg)	F.A (kg)	C.A (kg)	
1	Waste plastic	M25	0.467	1	1.5	2.696	20
2	Waste marble	M25	0.467	1	1.5	2.696	40



Graph 1. Comparison between conventional concrete M25 grade with Waste marble and Waste plastic

3.2 Test on Concrete Cubes

3.2.1. Slump Cone Test:

(As per IS: 1199:1959)

The concrete slump test is an empirical test that measures the workability of fresh concrete. More specifically, it measures the consistency of the concrete in that specific batch. This test is performed to check the consistency of freshly made concrete. Consistency is a term very closely related to workability.

Table 8. slump value of various materials

Sr. No.	Materials replacement	% replacement	Slump in mm
1	Waste marble	40	130
2	Waste plastic	20	230

3.2.2. Compression Test

(As per IS 516:1959)

Compression Test was performed on compression testing machine. The load was applied axially without shock till the specimen was crushed. Results of the compressive strength test on concrete with and without varying proportions (50%) of fly ash, (40%) of waste marble, (15%) of silica fume replacement at

the age of 7 days, 14 days and 28 days were noted. The cubes were tested using compression testing machine (CTM). P/A = Compressive stress. Where, P = Load (N) and A = Area (mm^2).

IV. CONCLUSION

1. In this paper the effect of use of waste marble aggregate and waste plastic on properties of concrete were studied and it can be concluded that
2. The workability of all the concrete mix increases with increased percentage of replacement of natural coarse aggregate by waste marble aggregates.
3. Compressive strength of the concrete shows upward trend till 40% waste marble used as coarse aggregate in concrete.
4. The modified concrete mix, with addition of waste plastic aggregate replacing conventional aggregate up to certain 20% gives reduces the strength.
5. By using recycled waste plastic in concrete can reduce the land fill and environmental issues.
6. This type of aggregate replacement is useful where aggregates are in crisis .By this we can conserve natural resource.

V. REFERENCES

- [1]. Promod S. Patil, J.R Mali, Ganesh V. Tapkire, H.R Kumavat, "Innovative Techniques of Waste Plastic Used in Concrete Mixture", Volume: 03 Special/Issue:09/NCETCE-2014/June-2014.
- [2]. T. Subramani, V.K Pugal, "Experimental Study of Plastic Waste As a Coarse Aggregate for Structural Concrete", Volume 4, Issue 5, May 2015.
- [3]. R. Siva Kumar, H. Mohammed Yousuff, M. Haripriya, "An Experimental Study on Partial Replacement for Coarse Aggregate by Granite Waste", ISSN 2348 – 7968.
- [4]. Jay P. Chotaliya, Kuldip B. Makwana, Pratik D. Tank, "Waste Marble Chips As Concrete

Aggregate", 2016), Effect of Waste Plastic as Partial Replacement of Aggregate in Concrete Mixture: A Review.

- [5]. Gaurav Verma¹, Mohd. Afaque Khan², Mr Abhishek Kumar³, Arivalagan. S, "Experimental Investigation on Partial Replacement of Waste Plastic in Concrete International Journal of Engineering Sciences & Research Technology", ISSN: 2277-9655, DOI: 10.5281/zenodo.167190, November, 2016.
- [6]. R. D Shambharkar¹, Aditya Sawarkar² Kunal Rewatkar³, Dolly Wanjari⁴, "Study on Light Weight Characteristics Self Compacting Concrete Using Fine Pumice Powder and Coconut Shell".
- [7]. IS 10262:2009 for Mix Design
- [8]. IS 12269 : 2013 for Cement OPC 53 grade
- [9]. IS: 2386 Part 4– 1963 for Test on Coarse Aggregate
- [10]. IS: 383-1970 for Particle Size Distribution And Test of Fine Aggregate
- [11]. IS 516:1959 for Casting of Cubes and Compression Test
- [12]. IS: 1199:1959 for Slump Cone Test

Review Paper : Testing of Ultrasonic Pulse Velocity on Concrete

Radhika Kherde, Saurabh Bante, Vidhita Gadre, Utkarsha Gajbhiye, Aalhad Pannase,
Atharva Mahore, Tejunsh Bang

Department of Civil Engineering, Dr. Babasaheb Ambedkar College of Engineering and Research, Nagpur,
Maharashtra, India

ABSTRACT

Concrete is most basic material used for any kind of engineering construction. The performance of concrete is been influenced by various factors like water-cement ratio, size of aggregates and its type, the weather conditions, cement type and admixtures. This further results in affecting the compressive strength and the durability of the concrete structure. There are two types of method for determining the strength of concrete; they are destructive and non-destructive method. One of the effective, easiest and less time consuming method of non-destructive in-situ test is Ultrasonic Pulse Velocity. This test determines quality, uniformity, cracks, defects, homogeneity, honey comb voids present in concrete specimens and evaluating dynamic modulus of elasticity. The pulse velocity depends upon the compaction of material, length of the specimen, path length, presence of reinforcement steel, moisture content of concrete, temperature of concrete.

Keywords: Compressive Strength, Dynamic Modulus, Admixtures, Durability, Non-Destructive, Homogeneity, Uniformity, Honey Comb Voids.

I. INTRODUCTION

From the last few decades, the application of Non-destructive test is the field of Civil Engineering has increased and becoming a part of interest in various countries. Concrete is the material used in construction of all structures. Hence, it is mandatory to check the quality and uniformity of the concrete to overcome the failure which may occur in further life of structure. To prevent the deterioration of the structure it is necessary to well maintain it. Application of this non destructive test gives the respective result without spoiling or damaging the specimen. They further can turn out to be an important tool to check the quality.

This non-destructive method is used in number of construction works as it does not affect the workability and appearance. They allow the testing work to be carried out at the original place which helps in frequent monitoring the structure during the life-time. Once the structure is tested then the life span of the structure can be predicted. According to it the maintenance, use, deterioration are worked out. This method helps in determining the various useful properties of the concrete such as its strength, quality, cracks, uniformity, defects, honeycomb voids, homogeneity present in the concrete specimen. Concrete properties mainly depend upon the proportion and quality of the material.

Ultrasonic pulse velocity method generally consists of measuring the time of travelling of an ultrasonic wave

passing through the specimen of concrete. The higher velocity obtained in lesser time when the specimen is good, well compacted whereas when the lower velocity obtained in longer time then it is said to have voids, cracks and other kind of defects in the specimen. The equipment used for this test is Ultrasonic pulse velocity device. The working of the instrument consist of two transducers, they are usually in the form of metallic cylinder heads. One of them is used to transmit ultrasonic pulse wave simultaneously another on receives the wave. They are kept in contact with the surface of the concrete if required greasing is done over the surface to obtain a smooth surface of contact. They are connected by cables to control box where the pulse is generated. The digital display indicates the time taken by the wave to travel between the transmitting and receiving transducers. There are three types of transducers arranged namely direct, semi-direct and indirect transmission.

The benefits and applications of ultrasonic pulse velocity is determining density and elastic properties both of them are related to strength and quality of material. They give out accurate and reliable result regarding the internal properties. Materials homogeneity, defects, presence of voids, and other imperfection in structure are determined by this non-destructive test.

The literature reviews studied are discussed below

Alexandre Lorenzi et.al. 2007 [1]: In there paper they show that it is possible to understand how the variations of tests conditions affect the result of UPV, which can lead into a decrease of errors considering the strength estimation. It also indicates that the UPV tests are sensitive tools to analyse the variations in the homogeneity and the density of concrete. They concluded that it makes possible to contribute to deterioration and structure's quality.

Jason Maximino C. Ongpeng et.al.2017 [2]: In their reference paper they studied regarding detection of damage using UPV for reinforced concrete with corrosion applicable while working on site. It also noted that the multiple cracks propagation going outwards of the diameter of the reinforced steel bars are caused by the corrosion.

Jee Sang Kim et.al.2014 [3]: The UPV as applied on normal concrete can also be used over the geopolymers concrete with same simplicity and conveniently. The progressive damage found in the specimen is reflected in both maximum frequency in frequency domain and pulse velocity in time domain. Also a new equation was derived based on experimental study predicting the compressive strength of geopolymers concrete.

Akash Jain et.al. 2013 [4]: From the experimental study on combined use of non destructive test for assessing compressive strength of concrete they derived the conclusions that the readings of UPV increases with age but the change is very small, it is because the density of the concrete remains same with the increase in age, so UPV alone cannot be used to find the compressive strength. The results obtained of UPV were used to determine the value of compressive strength using correlation curve. It was further observed that there is decrease in UPV readings when the flaws were added in the same mix, this was because due to presence of flaws ultrasonic pulse velocity takes more time to travel.

P. H. Arundas et.al. 2016 [5]: They concluded that from the study on ultrasonic pulse velocity test for the prediction of compressive strength of concrete a mathematical expression was developed using the line of regression. The predicted compressive strength was compared with the actual compressive strength. From the tests it was observed that compression reduces frequency and ultrasonic pulse velocity values, reduction of ultrasonic pulse velocity as an indication

of crack formation, it was found reducing deeply up to the failure.

Grini Abdelouaheb et.al. 2016 [6]: In this experimental study the UPV is used to diagnose the homogeneity of concrete in terms of segregation. It is proved through the tested concrete mixes that the proportion of water is determinant parameter in manifestation of the segregation. Through this study, it was made possible for characterizing segregation of concrete by a non-destructive method easily and speedily. The results observed show the effectiveness of proposed approach.

Tarun Gehlot et.al. 2016 [7]: In this study they worked over the quality of concrete assessment of structural elements, in which they concluded that the poor quality of concrete allows the ingress of oxygen and moisture to the reinforcement bars and due to this corrosion occurs. The pulse velocity test is the ideal method through which uniformity of concrete can be establish for both existing as well as under construction. If presence of large difference in pulse velocity is found than there is strong reason to presume that deteriorated concrete is present. Unlike the other work, this research ended with important and useful charts that require no previous knowledge of the constituents of the tested concrete.

II. CONCLUSION

The basic study of Ultrasonic Pulse Velocity on concrete structures is focusing over the requirement of their quality and durability. Hence, Non-Destructive test aims on understanding the capacities and limitations on tests. The research indicates that testing with UPV is sensitive device towards the determination of homogeneity and density of concrete. Further we conclude that testing with UPV gives quick assessment and relevant results such as estimating the depth of cracks, internal flaws and poor patches formed in concrete specimens.

III. REFERENCES

- [1]. IS 13311 (Part-1)-(1992). Methods of Non-Destructive Testing of Concrete: Part-1: Ultrasonic Pulse Velocity.
- [2]. IS 456:2000 Code of Practice for Plain and Reinforced Concrete.
- [3]. ASNT, "Introduction to Non-Destructive Testing." The American Society for Non-Destructive Testing. <http://www.asnt.org/>, 2006.
- [4]. Lin, Y., Kuo, S-F, Hsiao C., Lai, C-P "Investigation of Pulse Velocity- Strength Relationship of Hardened Concrete" ACI Materials Journal, V. 104, NO. 4, July- Aug 2007, pp.344-350.
- [5]. Tanigawa, Y.; Baba, K.; and Mori, H., "Estimation of Concrete Strength by Combined Nondestructive Testing Method," In-Situ/nondestructive Testing of Concrete, SP-82, V. M. Malhotra, ed., American Concrete Institute, Farmington Hills, Mich., 1984, pp. 57-76.
- [6]. Sturup, V. R.; Vecchio, F. J.; and Caratin, H., "Pulse Velocity as a Measur of Concrete Compressive Strength," In-Situ/nondestructive Testing of Concrete, SP-82, V. M. Malhotra, ed., American Concrete Institute, Farmington Hills, Mich., 1984, pp. 201-227.
- [7]. Iraqi Specification IOS 45-1984.
- [8]. Tarun R. Naik, V. Mohan Malhotra and John S. Popovics, "The Ultrasonic Pulse Velocity Method" in the handbook of Nondestructive Testing of Concrete, Chapter 8, 2004.
- [9]. Breyse, D. (2012). "Nondestructive Testing of Concrete Strength: An historical review and a new perspective by combining NDT methods." Construction and Building Materials, 33, 139-163.
- [10]. Wu, T.T. and Lin, T.F., The stress effect on the ultrasonic pulse velocity variations of concrete under repeated loading, ACI materials Journal, Vol.95, No.5, pp. 519-524(1998)
- [11]. Stauffer, J. D. Woodward, C. B. and whit, K.R.(2005) Nonlinear ultrasonic testing with

resonant and pulse velocity parameters for early damaging concrete, ACI Materials Journal, Vol.102, No.2, pp. 21-28.

- [12]. Chang, H. S. A Study on Ultrasonic Pulse Velocity and Rebound Hardness Method for Structural Concrete with Mixed Fly ash according to the Replacement Ratio of Recycled Aggregate, M. E. Thesis, Hanyang University,(2011), (in Korean).
- [13]. Lee J. H. Strength Characteristics of Geo-Polymer Grout, Journal of the Korean GEO-Environmental Society 13(4), 2012.4, 52-59 (in Korean).
- [14]. Santhanam M. Ultrasonic characterization of damage in concrete. tech science press. 2010;3(2);111-25.
- [15]. Kalyan ST, Kishen CJM. Experimentalevaluation of cracks in concrete by ultrasonic pulse velocity. 2013; 95(1):27-36.
- [16]. A Benouis, N Khaldi and ML Benmalek, Uncertainties of strength concrete estimation by ultrasonic NDT (Admixture effects).

Review on Rooftop Rainwater Harvesting

Rajat R. Kadwe¹, Vishal R. Pimple¹, Sushant S. Kanake¹, Pravin S. Baraskar¹, Samyak S. Naraware¹,
Ankush N. Asati², Shrirang D. Borkar²

¹Civil Engineering Department, DBACER, Nagpur, Maharashtra, India

²Assistant Professor Civil Engineering Department, DBACER, Nagpur, Maharashtra, India

ABSTRACT

Water crisis is serious problem in our country. The rapid urbanization and population explosion have triggered massive demand for quality drinking water than ever before. Water for both irrigation and human consumption, is getting more and more scarce for vast masses of our people and in many regions of the country. Many of the water sources like rivers, ground water streams and lakes are drying up. Rainfall patterns are changing drastically, with the massive deforestation leading both to reduced rainfalls as well as to reduced recharging of underground water. So as an option to fulfil the demand due to unbalanced rainfall having water backup needs, rainwater harvesting system necessary for saving the water and would help in reducing water wastage. The aim of present study is to use rainwater and design the effective plan by which we can collect rain water into a storage for our campus. The rainwater harvesting system will be an alternative source of water at the campus and can be used for Laboratories in Civil and Mechanical Department, Washrooms, as well as for Horticulture and other Purposes. Present paper majorly focuses on Rooftop Rainwater Harvesting (RRWH) of the study area of Dr. Babasaheb Ambedkar College of Engineering & Research (DBACER) Campus, Wanadongri, Nagpur. The expected outcome of this study is the development of Rainwater Harvesting System for the catchment area of campus from Admin Building, CSE Department, Killa Building, Workshop Building and Mechanical Department. This study will fulfil the scarcity of water as our college campus lies within hilly region there is slightly greater demand of water than other areas.

I. INTRODUCTION

Rainwater harvesting is a technology used to collect, convey and store rain water for later use from relatively clean surfaces such as a roof, land surface or rock catchment. RWH is the technique of collecting water from roof, Filtering and storing for further uses. Rainwater Harvesting is a simple technique of catching and holding rainwater where its falls. Either, we can store it in tanks for further use or we can use it to recharge groundwater depending upon the situation. RWH system provides sources of soft, high quality water reduces dependence on well and other

sources and in many contexts are cost effective. RWH system is economically cheaper in construction compared to other sources, i.e. well, canal, dam, diversion, etc.

The number of people who will suffer in future because of the scarcity of water is really alarming by 2050 more than that people would live under condition of high water stress. If we talk about the sufficiency of rain, that it not a big deal to say that its not on time and not

sufficient . Most of industries are depend on it and they also suffer a lot. United Nations environment programme (UNEP) warns water could prove to be a limited factor for a development in a number of reasons in the world. If we talk about India's rain it gets only 90% of its rain fall during the summer monsoon season , which is not sufficient. it last by the month of September after that there is hardly any rain because of this thing India can make use of more than 20% of its stored fresh water resources. Rain Water harvesting has been there practice for more than 3 or 4thousand years. Its an important water source in many areas whether its urban or rural. Its also way of future passport .It is also good option in the areas where good quality fresh surface water or ground water is lacking.Commonly used systems are constructed of three principal components; namely, the catchment area, the collection device, and the conveyance system.

A) Catchment Areas

Rooftop catchments: In the most basic form of this technology, rainwater is collected in simple vessels at the edge of the roof. As the rooftop is the main catchment area, the amount and quality of rainwater collected depends on the area and type of roofing material.

Land surface catchments: Rainwater harvesting using ground or land surface catchment areas is less complex way of collecting rainwater. It involves improving runoff capacity of the land surface through various techniques including collection of runoffs with drain pipes and storage of collected water. Compared to rooftop catchment techniques, ground catchment techniques provide more opportunity for collecting water from a larger surface area. By retaining the flows (including flood flows) of small creeks and streams in small storage reservoirs created by low cost (e.g., earthen) dams, this technology can meet water demands during dry periods. There is a possibility of high rates of water loss due to infiltration into the ground, and, because of the often-marginal quality of

the water collected, this technique is mainly suitable for storing water for agricultural purposes.

B) Collection Devices

Storage tanks: Storage tanks for collecting rainwater harvested using guttering may be either above or below the ground. Precautions required in the use of storage tanks include provision of an adequate enclosure to minimize contamination from human, animal or other environmental contaminants, and a tight cover to prevent algal growth and the breeding of mosquitos. Open containers are not recommended for collecting water for drinking purposes.

C) Conveyance Systems

Conveyance systems are required to transfer the rainwater collected on the rooftops to the storage tanks. This is usually accomplished by making connections to one or more down-pipes connected to the rooftop gutters. When selecting a conveyance system, consideration should be given to the fact that, when it first starts to rain, dirt and debris from the rooftop will be washed into the down-pipe. Thus, the relatively clean water will only be available some time later in the storm. There are several possible choices to selectively collect clean water for the storage tanks.

Advantages:

- Rain water Harvesting is a comparatively clean & totally free source of water.
- Rainwater harvesting is improved for scenery plants & gardens because it is not chlorinated.
- It lowers the water supply cost.
- It can provide an excellent backup source of water for emergencies.
- It is socially acceptable & envivornmentally responsible.
- It can be used to recharge groundwater.
- It minimizes runoff which blocks the storm water drains.

Disadvantages:

- Unpredictable rainfall- Rainfall is hard to predict and sometimes little or no rainfall can limit the supply of rainwater.
- Initial cost- Depending upon the system & technology level. The cost can be recovered in years to come, which again depends on amount of rainfall & sophistication.
- Regular Maintenance- Rainwater Harvesting system requires regular maintenance, this also depends on system, self-cleaning rainwater filters helps to minimize maintenance & keep the water clean.

Study Area



Perimeter ?

746 m

Area

19,390 m²

Figure 1

WHY RAINWATER HARVESTING IN CAMPUS?

- As our college lies in the hilly area, run off of water takes place quickly and hence water does

not percolate as it is used to in the normal landscape.

- The stored water may be used in the laboratories of various departments by giving preliminary treatment.
- It can also be used for cleaning the floors of buildings, gardening purpose.

II. LITERATURE REVIEW

- [1] Project Report on Design of Rainwater Harvesting System Lingaya's University, Faridabad :-

The specialized parts of this paper are water gathering gathered from housetop which is thought to be catchment territories from all lodgings and Institutes departmental working at Lingaya's Institute of Management and Technology, Faridabad Campus. As a matter of first importance, required information are gathered i.e. catchment zones and hydrological precipitation information. Water gathering potential for the inns and workforce flats was ascertained, and the tank limit with appropriate plan is being considered.

- [2] Rain Water Harvesting-A Campus Study, Govt College of Aurangabad: -

The aim of this study is to use rainwater and thus taking close to the concept of nature conservation. In this study, the rain water harvesting system is analysed as a alternative source of water at campus of government college of engineering, Aurangabad in the state of Maharashtra, India. The expected outcome of the study is the development of rainwater harvesting system for catchment area of campus from parking area, workshop area, some of the electronics department area up to hostel. The result analysis shows that the present rain water harvesting system is having the storage 53,96,816 litres/year and construction cost of rs.5 lakhs respectively and is reasonably well in comparison with conventional water sources.

[3] Rooftop Rainwater Harvesting Dahivadi College Campus, Satara.

The main objective of this study is measures three type of surface rainwater harvesting potential in rural area; one is runoff rainwater harvesting potential in hilly area, second is recharge and storage of rainwater harvesting potential in plateau area and third is artificial ground water recharge through rainwater harvesting potential. We also suggest suitable sites of the rainwater harvesting structures with the help of physiography of the area and also estimated rainwater harvesting potential in the region.

III. CONCLUSION

The Present study deals with prospect of improving rain water availability in the DBACER, Nagpur campus by implementing Rain Water Harvesting (RWH) system. The effectiveness of RWH lies in its ability to meet the site requirements and end use preferences. The rain water harvesting is one of the cost effective measure to overcome the problems faced due to water scarcity and it is best option for times to come. The implementation of RWH system can last for many years providing water for Laboratories, Washrooms, Toilets as well as for Horticulture & Gardening purposes in the college campus. In this paper we conclude that RWH in the DBACER Campus is a good potential for rain water conservation and by implementing RWH project in the DBACER Campus runoff water conservation can be made and that can be meet the present water scarcity situation of this location. We propose Roof top Rainwater harvesting technique at DBACER Campus would result in the form of best approach to meet water deficit of this locality.

IV. REFERENCES

- [1]. S.D. Bhatnagar, "Project Report on Design of Rainwater Harvesting System" Lingaya's University, Faridabad (DEC 2017).
- [2]. Abhijeet Keskar, Rushikesh Ambhore, Satish Taji, Sonali Potdar, "Rain Water Harvesting-A Campus Study", Govt College of Aurangabad (2 AUG 2016).
- [3]. C. J. Khilare, S. N. Pawar, D. D. Namdas, V. P. Gaikwad, "Rooftop Rainwater Harvesting" Dahivadi College Campus, Satara SWRDM (2012).
- [4]. Diptikanta Acharya, Shilpika Panda, Niharika Patel, Shubhasmita Prusty, Manoja Das, "A Study on Rain Water Harvesting" at Gandhi Institute of Engineering and Technology Main Campus, Gunupur, Odisha, IJOER, Vol-2 Issue-9 (2016).

Study of Glass Fibre Reinforced Concrete and Aramid Composites

Snehal Sonkusare¹, Harshal Mahalle¹, Pranay Bhujade¹, Nandkishor Nirmalkar¹, Smohit Dhoble¹, Vikas Satpute¹, Ms. Neha Arukia²

¹Student of Civil Engineering Department, DBACER, Nagpur, Maharashtra, India

²Professor of Civil Engineering Department, DBACER, Nagpur, Maharashtra, India

ABSTRACT

Plain concrete has two deficiencies, low tensile strength and low strain at fracture. The present trend in concrete technology is towards increasing the strength and durability of concrete to meet the demand of the modern construction, and for that we add fibres in concrete. Fibres such as steel fibre, glass fibre, synthetic fibre, natural fibre and organic fibre when added in certain percentage in concrete it improves the strain properties as well as crack resistance, ductility, flexural strength and toughness. If we add glass fibre content of 0.33%, 0.67% and 1% in concrete it is observed that percentage increase in flexural strength after 28 days is 7.31 N/mm², 7.59 N/mm², 7.07 N/mm² respectively without reinforcement. The aramid, ones being the most effective, the first organic fibre having high tensile modulus and strength. It has 5-10% higher mechanical properties than other synthetic fibres. Hence, an attempt has made in the present investigation to study the flexural strength of aramid fibre in concrete.

Keywords: Glass Fibres, Aramid Fibres, Eco-Friendly, Flexural Strength, Admixture.

I. INTRODUCTION

Concrete is one of the most widely used construction material in the world. Plain concrete has some deficiencies such as low tensile strength, low post cracking capacity, limited ductility, highly porous, susceptible to chemical and environmental attack. This shortcoming is generally overcome by providing deformed steel bars in concrete. The fibres are a good quality manufactured product that can be reused or used as an admixture to improve some properties of plain concrete. Fibres include steel fibre, glass fibre, aramid fibre, synthetic fibre and natural fibres etc. In recent times glass fibre are also available and which are free from corrosion problems associated with steel fibres. Addition of fibres can increase strength of concrete and also reduce plastic shrinkage and drying shrinkage by arresting the propagations of cracks.

Glass fibre is one of the most versatile building materials that is making the significant contribution to the economics, technology and aesthetic of the construction industry worldwide for over 40 years. Glass fibre has high tensile strength (2-4 GPa), elastic modulus (70-80 GPa) and fire resistance properties thus reducing the loss of damage during fire accidents. GFRP has advantage of being lightweight, high compressive strength and flexural strength.

The aramid ones being the most effective, the first man made organic fibre having high tensile strength, less wear and tear, less abrasive etc. It has 5-10% higher mechanical properties than other synthetic fibre. Aramid has excellent heat and fire resistance therefore it neither melts nor ignites in normal level of oxygen. It is also a light weight material and the aramid fibre will cover Kevlar, Nomex, Technora, Teijinconex, Twaron etc. Aramid fibre has better mechanical properties than steel and glass fibre on

same weight basis. According to the study of synthetic fibres compared to natural organic fibres are eco-friendly, economical and production cost is also low. The aim of the work is to study the engineering properties such as flexural strength of aramid fibre as compared with glass fibres in the concrete for different proportions.

II. MATERIALS

Glass Fibre is a material consisting of numerous extremely fine fibres of glass. Due to the relatively inexpensive cost glass fibres are the most commonly used reinforcement.

Types of Glass: -

- A glass- Soda lime silicate glasses used where the strength, durability and good electrical resistivity of E glass are not required.
- C Glass- Calcium borosilicate glasses used for their chemical stability in corrosive acid environments.
- E Glass- Alumina-calcium-borosilicate glasses with a maximum alkali content of 2 wt% used as general-purpose fibres where strength and high electrical resistivity are required.
- S Glass- Magnesium aluminosilicate glasses used for textile substrates or reinforcement in composite structural application which require high strength, modulus, and stability under extreme temperature and corrosive environments.

The most commonly used glass is E-glass. This is the most popular because of its cost.

Table 1

Fibre Type	Density(g/cm ³)	Modulus GPa
C-glass	2.56	69
D-glass	2.11	55
E-glass	2.54	72
ECR-glass	2.72	80

Properties of Glass Fibers: -

- Incombustibility.
- Corrosion resistance.

- High strength at low densities.
- Good thermal.
- Sound insulation.
- Special electrical properties

Aramid: -

Aramid fibre is a man-made organic polymer (an aromatic polyamide) produced by spinning a solid fibre from a liquid chemical blend. Aramid fibers are a class of heat-resistant and strong synthetic fibers.

Aramid Fibre characteristics

- Aramids share a high degree of orientation with other fibers such as ultra-high-molecular-weight polyethylene, a characteristic that dominates their properties.
- Good resistance to abrasion.
- Good resistance to organic solvents.
- Nonconductive.
- No melting point.

Types of Fibre

Para-Aramid: -

- Kevlar: - Kevlar is a heat-resistant and strong synthetic fibre, related to other aramids such as Nomex and Technora.
- Technora: - Technora is an aramid that is useful for a variety of applications that require high strength or chemical resistance.
- Twaron: - Twaron is a para-aramid. It is a heat-resistant and strong synthetic fibre.
- Heracron: - Have hyper tenacity high heat and chemical resistant, low weight.

Meta-Aramid: -

- Nomex: -Nomex is a flame-resistant meta-aramid.
- Teijinconex: -Teijinconex is a meta-aramid that offers excellent resistance to heat, flame and chemicals.

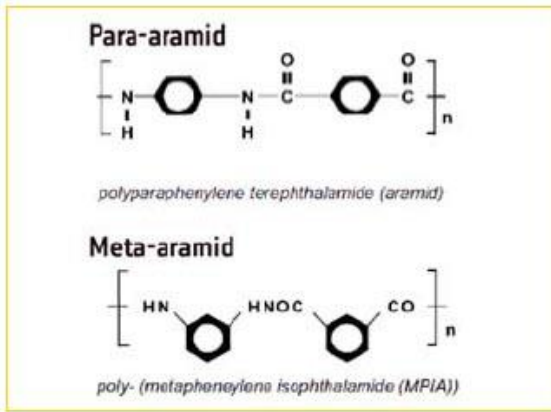


Figure 1

Properties of Aramid Fibre: -

There are many properties of aramid yarns as follows:

- High tensile strength: It has high tensile property rather than steel. This makes them very suitable for weight-sensitive application, such as in the aerospace industry.
- High stiffness: It has high stiffness. When load is applied on its product, then it has less elongation. Therefore, it has high load bearing.
- Low density: It has low density; therefore, it takes less distance and save the space.
- Low creep: The creep of aramid fiber is generally considered to be a logarithmic function of time; creep rate is low when compared with other synthetic fibers such as nylon or polyester and they approach that of steel.
- Stress rupture: When some materials are subjected to permanently applied loads they eventually creep to failure. This phenomenon is generally referred to as stress rupture. Considerable attention has been paid to the stress-rupture behaviour of Kevlar yarns. In all cases it was found that Kevlar yarns would support a large proportion of their nominal short-term ultimate loading for long period of time, but there was considerable variability in the stress rupture life times for any given load level.

Comparison Between Glass fiber And Aramid Fiber

- Tensile Strength.

Table 2

Material	Fibre Strength	Laminated Strength
E Glass	3450	1500
Kevlar	2757	1430

- Density and strength to weight ratio.

Table 3

Materials	Fibre Strength	Laminated Strength	Density of laminate grams/cc	Strength to weight ratio
E Glass	3450	1500	2.66	564
Kevlar	2757	1430	1.44	993

- Modulus of Elasticity

Table 4

Materials	Young modulus
E Glass	30-40
Kevlar	70.5-112.4

Benefits of Aramid Fibre

- Aramid fibre resist elevated temperature therefore for making of protective clotting and fibric used near fire.
- Aramid fiber has non-conductive properties therefore it used like insulator for safety purpose.
- Kevlar has more resistance to fatigue.
- Aramid fibre is a light weight material.

Applications of Aramid Fibre

- Flame resistance clothing, helmets.
- It is used in composite materials.
- It is used in tyres for resisting wear and tear because of their high strength properties.
- It is used for making sporting goods.
- It is used in many civil structure, mechanical structure.

III. CONCLUSION

- The application of glass fibre reinforced concrete has reduced shrinkage, cracking, post cracking capacity and increased durability, tensile strength, flexural strength as compared to plain cement concrete.
- Aramid fiber is great composite material for heat resistance.

IV. REFERENCES

- [1]. Yuji Nakayama et al, bond behaviour between deformed aramid fiber-reinforced plastic reinforcement and concrete The 14th world Conference on Earthquake Engineering October 12-17,2008, Beijing, china.
- [2]. A. Ciferri and I. M. Ward: "Ultra-high modulus polymers";1979, Barking, Applied Science.
- [3]. Blasct v. Fiber textile cu destinatii special si inalt performante. Vol.1, Edit. Tehnopress, lasi, 85(2000).
- [4]. M jassala et al., Aramid fibres-An overview, Indian journal of Fiber & textile Research Vol. 27, September 2002, pp, 290-306.
- [5]. Chio, t.t., Wells, j.e., Moore R.L.and Hmstad. stress rupture behaviour of strands of an organic fibre/epoxy matrix", composite materials: testing and design (3rd conference), astm stp 546, American society of testing and materials. pp. 209-224(1974).

A Review on Transformation of Thermoplastic as an Alternative towards Sustainable Green Building Construction Material

Modak. S. B.*¹, Dr. Bhuyar S. S.², Ms. Madavi S.J.¹, Ms. Kakde S.V.¹, Bhute S.G.¹

¹Department of Civil Engineering, G. H. Rasoni Academy of Engineering and Technology, Nagpur, Maharashtra, India

²R&D Manager, Bajaj Super Pack Company, Nagpur, Maharashtra, India

ABSTRACT

Due to costly recycling technique of waste plastic and its low rate of decomposition, it is become necessary to find alternative sources and technique for consumption of plastic wastes. This paper described manufacturing process, material co-operated for plastic to be used as a construction material. It shows positive results after adding plastic in formation of bricks.

Keywords : Plastic Waste, Polymer, Bricks, Green Building.

I. INTRODUCTION

The amount of plastic waste generation is more rapidly and its proper decomposition process can not found till the days. Resulting produced a hazardous effect to the human health as well as plan an animals. Landfill plastic will remains 500 years and course pollutes the environment and the open burning process of plastic is make air pollution to avoid these all problem recycling of plastic waste will take place.

The plastic are mainly classified in two types such as thermoset and another one is thermoplastic. Thermoset plastic is that type of plastic which a property of unchangeable molecular chains due to tightly bounded molecular chain. Its examples are polyurethane, phenolic and silicone, etc. thermoplastic is that type of plastic which recyclable and it can mould into a another structure. It's examples are polyoxymethylene, polyethylene and polypropylene, etc.

The recycling of plastic waste use in a various things such as bricks, tiles, concrete blocks, bitumen, paver blocks, etc. in these we using plastic waste in a bricks

to built up more strength, more durable and eco friendly to the environment as well as cheapest cost material.

II. MATERIALS AND METHODOLOGY

A Materials

1) **Cement** :- Is an inorganic grey coloured fine powder capable of reaction with water to produced strength giving compound, which set and harden without any appreciable change with regard to its properties in course of time. In this project ordinary Portland cement of 53 grade conforming to IS 456:2000 was used cement is act as a binder when it comes in contact with water, cement has various physical and chemical properties and they are as follows:-

- **Physical Properties of Cement**

Table 1

Sr. No.	Test	Obtained Result	Standards(IS:8112)
1	Initial Setting Time	32 minutes	30 minutes

2	Final Setting Time	580 minutes	600 minutes
3	Fineness	96%	Not less than 90%
4	Specific gravity	3.14	3.10 -3.15
5	Standard consistency	34%	30 -35%

- **Chemical Properties of cement**

Table 2

Sr. No.	Oxide	Present(%)
1	CaO	60-67
2	SiO ₂	17-25
3	Al ₂ O ₃	3.0-8.0
4	Fe ₂ O ₃	0.5-6.0
5	MgO	0.1-4.0
6	Alkalies(K ₂ O,Na ₂ O)	0.4-1.3
7	SO ₃	1.3-3.0

2) **Fly Ash:** - After combustion of pulverized coal the resulting residue in a thermal power plant is known as fly ash. These ash is also called as dry ash or chimney or a hopper ash this will be classified in different grades. The balance 20% of ash gets collected at the bottom of the boiler and referred to as bottom ash. In a manufacturing of a fly ash brick use a grade C. it's physical and chemical properties are as follows:-

- **Physical Properties of Fly Ash**

Table 3

Sr.No.	Tests	Result
1	Specific Gravity	2.67
2	Fineness	84%

- **Chemical Properties of Fly Ash**

Table 4

Sr. No.	Components	Percentage(%)
1	SiO ₂	35-59

2	Fe ₂ O ₃	0.5-2
3	Al ₂ O ₃	20-33
4	CaO	5-16
5	MgO	1-5.5
6	So ₃	0.5-1.5
7	Loss on ignition	1-2

3) **Stone dust:** - In a crusher plants obtain a waste material know as a stone dust. In a construction work stone work use as a raw material every crusher unit produced 15% to 20% stone dust so, it is easily available.

- **Chemical Properties of Stone Dust**

Table 5

Component	Weight
CaO	3.5-40
Al ₂ O ₃	0.5-40
MgO	2.5-25
SiO ₂	1-12
So ₃	0.23-3
Available Alkalis	0-4

- **Index Properties of stone dust**

Table 6

Sr.No.	Property	Value
1	Natural moisture content	9.11
2	Particle size distribution	
	Sand%	97.1
	Silt %	2.9
3	Specific gravity	2.76

4) **Polymer :-** Polymetric materials can be classified as thermoset and thermoplastic. In this project use of a thermoplastic polymer which is soften when heating and hardens in cooling.

III. MANUFACTURING PROCESS

- Collecting a, fly ash containing class c, stone dust, polymer, cement, etc. as per mix design.
- Mix it well in dry condition. After proper mixing add water as per requirement.

- Cement is act as a binder which is comes in contact with water.
- After proper mixing of all the material it place into the mould and provide a pressure upto 70 to 80 ton.
- Due to the pressure it compact well and released the voids.
- After that keep it in normal temperature for drying and alternatively provide a curing for increasing a strength.

IV. LITERATURE SURVEY

1) Use of thermoset in manufacturing of fly ash brick with economic feasibility.

According to C.V. Alkunte, They manufacture a bricks using a thermoset plastic with different percentage such as 5%, 10% & 15%. In result they conclude that the thermoset brick gives a more strength as compare to commercial brick. It also conclude that the brick is weak due to excess amount of thermoset is use. (Above 20%)

2) Manufacturing bricks from sand plastic.

According to Lairenlakpam Billygrahamsingh, They use compact disc (CD) and waste water plastic bottles for manufacturing the bricks .after collection of both type of plastic they cleaned, cutted (small pieces) and heated at 200c and then mixed it with sand and mould .During resulting they observed that this bricks gives a better compressive strength, more durable, ,lower bulk density which helps to reduce dead load of a structure, less porosity help to make it more durable, but its water absorption is less as compare to red brick.

3) Utilisation of waste plastic in manufacturing of bricks and paver blocks.

According to Dinesh S., used of a waste plastic bags, polyethylene bags, red oxide (ferric oxide) and sand for manufacturing of bricks. The plastic would collect, clean and heat up with natural heating process and mix a sand in it. After it moulded and performed a test

on it. In resulting shows that it gives a best result in compression. There is no change in a structural properties of block of bricks up to 180C.

4) Recycling waste thermoplastic for making light weight brick.

According to M.K.Mondal, The present research introduced new process for carporating waste thermoplastic to produced self-compacting light weight a porous fly ash bricks. The results of study clearly indicates viability of the proposition. The findings pave the way towards sustainable recycling of waste plastic and making them alternative materials for construction industry.

V. CONCLUSION

Using of plastic in a manufacturing of a brick it gives a result increasing a compressive strength of a brick with increasing of percentage of plastic. Excessive amount of plastic it decessesiys strength due to loose bond formation between ingredients of brick.

VI. REFERENCES

- [1]. Ahmed K. Jassim., "Recycling of Polyethylene waste to produced plastic cement", 14th global Conferences on sustainable manufacturing, GCSM 3-5 October 2016, Stellenbosch, South Africa.
- [2]. K.PremKumar , M. Gomathi," Production of construction Bricks by Partial Replacement of Waste Plastics",IOSR journal of Mechanical and Civil Engineering (IOSR-JMCE).
- [3]. Mr. N. Thirugnanasambantham, P.Tharun Kumar, R. Sujythra, R. Selvaraman, P. Bharathi," Manufacturing And Testing Of Plastic Sand Bricks",International journal of Science And Engineering Research (IJOSER)
- [4]. Claude Bouterin And Joseph Davidovits,"Geopolymeric Cross-linking (LTGS) And Building Materials",Geopolymer' 88,

Vol.1,pp.79-88; Unofficial English Translation, For information only. Original version in French Titled: Reticulation Geopolymerique (LTGS) etmateriaux de construction.Modified and adapted with the autorisation of CORDI-Geopolymere S.A. in July 2003.

- [5]. A. Rai, "preparation and characterization of lime activated unfired bricks made with industrial wastes," International J. waste resources, vol. 3(1)2013:40-46, A.Raietal.
- [6]. Appukutty P, "Substitution of quarry dust to sand for mortar in brick masonry work," International journal on design and manufacturing technologies, Vol.3, No.1, January 2009.
- [7]. TabinRushad S, "Experimental studies on Lime-Soil fly ash bricks", International journal of civil and structural engineering.
- [8]. NitinGoyal;Manisha., "constructing structures using eco-bricks", International journal of recent trends in Engineering and Research, Vol.2(4),pp. 159-164.
- [9]. Puttaraj M.H; Shanmukha S; NavaneethRai.P.G; and Prathima T.B, "Utilization of waste plastic in manufacturing of plastic-soil bricks" International journal of technology Enhancement and Emerging Engineering Research, Vol.2(4),pp.102-107.
- [10]. Santhakumar A.R; "concrete Technology"Oxford University Press,New Delhi.

Study of Mycelium Bricks

Neha Arukia¹, Veda Shewalkar², Shubham Wath², Sunil Sahare², Samiksha Yerpude², Sachin Surjagade², Gayatri Thakare², Akash Ghugal², Nirantar Borkar²

Department of civil Engineering, Dr. Babasaheb Ambedkar College of Engineering and Research, Nagpur
Maharashtra India

ABSTRACT

The main purpose of the study is to improve the developing material to utilise the power of the nature and is in agreement with its conditions. The utilization of the living design to diminish or invalidate the natural expenses of the structure materials. In the current scenario there is a lot of need of a construction material that is cheap and environment friendly. For this purpose, mycelium bricks are best choice because they are grown, not made. The method use to make the brick is collecting material for growth of mycelium, growing, filling in molds, drying in appropriate conditions, and killing its bacteria in an oven. Mycelium based materials are usually composites, to increase the flexibility by using the selective materials in it. The aim is to produce mycelium material that could be used as insulation. The scope of the mycelium bricks, it gives good compressive strength, varies greatly on its constituents. Future work is planned to improve the thermal performance and increase water resistance of the mycelium bricks by applying oiling and painting.

Keywords : Mycelium Bricks, Thermal Performance.

I. INTRODUCTION

The standard brick had used for building purpose for thousands of years. Bricks were used since 7000 BC. They were discovered in southern Turkey at the site of an ancient settlement around the city of Jericho.

Brick gives more stability to the structure. Besides comfort, a building made of brick also has some advantages such as easy to install. Like advantages there are some disadvantages of standard bricks like standard bricks causes too much pollution at the time of hardening. Hence to save our environment, now a days many researchers are doing work on the mycelium bricks which is one of the environment friendly bricks. Mycelium is a fast growing organism and one of its primary use is to decompose organic compounds. Petroleum products and some pesticides are organic molecules as they are built on a carbon structure, so they can be a potential carbon source for

mycelium. As part of study, will continue with the potential of this material to make a big difference to the material world.

MYCELIUM:

Mycelium is the vegetative part of a fungus or fungus like bacterial colony consisting of a mass of branching thread like hyphae.

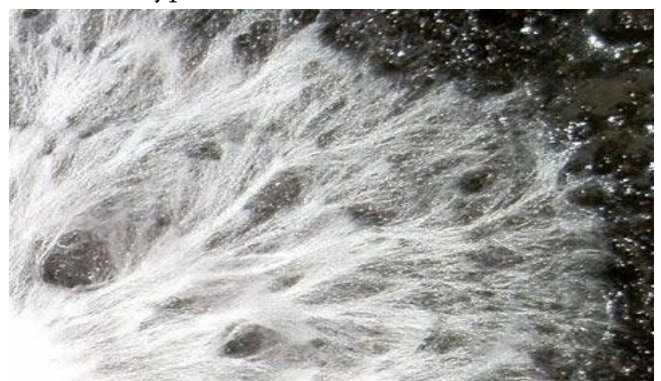


Figure 1. Mycelium

Because of having an active property they can be used in many different areas. The current study is about researching and testing the different substrates and mesh like materials to make mycelium. Here we are using mushroom with a large base (king oyster mushroom) which grow fastly.



Figure 2. king oyster mushroom

Need of mycelium brick:

In the current scenario there is a lot of need of a construction material that is cheap and environment friendly for this purpose mycelium bricks are the best choice because they are grown not made besides of making bricks mycelium can be used in many different thing it can be used to be grow structure frame to replace concrete. Also it can be used to make chairs tables all can be grow from mycelium. It can replace thermocol. And there is many usage of this technique in the future. It is very vast topic to research.

Disadvantages:

- Indoor growing mushrooms.
- Laden with other microbes
- Sterilization
- Long waiting time for mycelium to be colonized.

II. REVIEW

- **Mycelium as a construction material:**



Figure 3. mycelium bricks

1. Sebastian Cox and Ninrla Lvanova :

A British furniture designer Sebastian Cox has teamed up with researcher Ninela Lvanova to investigate the potential of mushroom mycelium in contemporary interior design. He wanted to use this fungal material to create more everyday products. Their series 'mycelium' includes a range of stools and lights series is presented at Somerset house as a part of the London design festival which was held on sept 2017.

2. Danielle Trafe(2015):

Has developed the mushroom table lamp, mushroom flower pots, mushroom hemi pendant are all made of mushroom mycelium.

3. Surf Organics-(2015):

Has developed the surf boards using the mushroom materials.

4. Celine park(2015):

In place of needles the filter made from fungus can be used in pipes. This is the new technique developed Celine in his study. To inhale the vaccine in place of injecting them in the body these pipes are used. She has observed that the fungi can be used as filter as it observes more viruses in it.

5. Lou Corpuz-bosshart(2014):

He developed pavement block using mushroom mycelium. He mixed the mushroom mycelium in the sterilized sawdust for two weeks after it he sent it to green house of university of British Columbia from where the mix is chipped in wood chipper and packed in the mould and left for 5

days after which the blocks were taken out and dried.

6. David Benjamin(2014):

He has developed HI-FI tower soars of 40 feet into the air using mushroom and biodegradable materials it is designed in New York City the HI-FI is built from 10000 living bricks.

7. Philip Ross(2014):

Has developed the leather like structure from the mushroom myco in his own company testing the mushroom as a construction material which is made from the same material to make wooden like black. He has developed small samples of mycelium bricks using mycelium & agricultural waste which is growing in his lab.

8. Eben Bayer(2015):

Has developed mushroom material to provide a natural alternative to traditional plastics & synthetics packaging. Their company evocative has also made the packing of the dell laptop which is also made from mycelium which is replacing standard thermocol packing.



Figure 4. Agricultural waste, Mycelium bag.

Collecting material for growth of mycelium



Growing mycelium



Filling the mould



Drying the product



Killing the bacteria in oven

Figure 5. Step by Step Processes

III. PROCEDURE

1. Sterilize the substrate i.e., the agricultural waste in this case.
2. Take a plastic bag.
3. Add a sterilize agricultural waste and formalin and Fungicide
4. mAdd 2 – 3 Mushrooms seeds in it.
5. Pack the plastic bag and place in a dark place for 3 – 7 days.
6. After 3 – 7 days the Mycelium will start growing.
7. After growth of Mycelium take a brick mould.
8. Add the mix in the brick mould.
9. Pack the mould with Cellophane sheet to make it air tight.
10. Leave the mould in the dark place for 3 – 5 days.

After 5 days the Mycelium should grown.

IV. CONCLUSION

- This paper presents the brief review on mycelium bricks using the root part of mushroom.
- Mycelium composition, utilizes the biological growth rather than expensive energy intensive manufacturing process.
- It constitutes substrate, additives that strongly influence material properties including compressive strength, flexibility and electrical conductivity.
- Temperature and substrate humidity are some of the environmental condition that mostly contribute to the development of the final material.

- Current application of mycelium bricks are restricted to temporary structures.
- eg: - HY-FI tower (12 m).
- But in near future, mycelium brick holds the possibility of being integrally involved in the construction process of building since it is an ecofriendly material.

V. REFERENCES

- [1]. Yangon Xing, Mathew Brewer, Gareth Griffith (2018) growing & testing of mycelium Bricks as building insulation material.environmental science.121 (2018) DOI: 10.1088/1755-1315/121/2/022032.
- [2]. Mitchell Tones, Tien Huynh, Chaitali Dekiwadia, Fugen Daver and Sabu John.Mycelium Composites: a review of engineering characteristics and growth kinetics.Journal of bio.Nano science vol. 11,241-257, 2017.
- [3]. Article- Philip Ross molds fast-growing fungi into mushrooms building bricks that are Stronger than concrete.
- [4]. Literature review-Omid Bafkar (2015) mycelium material new replacement for Thermo statics DOI 1013140/R42/3813.8969.
- [5]. Mariel Dougoud (2018), mycelium infrastructure for impermanent future.
- [6]. Kishan, Rahul Kashyap, Rohan Tyagi, Anshul Jain. Production of mycelium bricks. International journal of innovation science and research technology, volume 3, issue 4, April - 2018.
- [7]. IS Code 1077:1992 for the Compressive strength classification of bricks.
- [8]. IS Code 3495:1992 part 1 to part 4 for Testing of bricks
- [9]. IS Code 5454:1918 for Classification of bricks

A Review : Recycling Waste Lubricating Oil into Fuel

Nikhil Wankhede, Sahil Raut, Shubham Mishra, Sachin Girhepunje, Sudatta Chahande

Department of Mechanical Engineering, Dr. Babasaheb Ambedkar college of Engineering and Research, RTM
Nagpur University, Nagpur, Maharashtra, India

ABSTRACT

This paper gives a brief review about recycling of waste lubricating oil into fuel. Waste lubricant which is generated in day to day life from garage and other service centres which get waste after use then waste lubricating oil effects on environment, and underground and surface waters, since it pollutes the atmospheric air as a result of burning and has harm living organisms. This paper main focus on finding alternative fuel resources and utilizing them to eliminate their negative effects, become of the limitation of petroleum products. According to some studies, it is estimated that crude oil will last only for roughly 80 more years, gaseous fuels for about 150 years, and coal for 230 years. So that various scientists and researchers try to develop new technologies that allow recycling or reusing waste material as an alternative fuels .A pyrolytic process has been carried out to recycle waste unusable lubricating oil into fuel and comparison of this fuel with fresh diesel are discussed.

Keywords: Waste Lubricating Oil, Alternative Fuel, Waste To Fuel, Pyrolytic Process.

I. INTRODUCTION

Waste lubricant oils and bio fuels are two important alternative fuel sources proved to be the best substitutes for existing petro fuels, since waste generated oils represent more than 60% of used lubricant oils. Therefore, waste oils are one of the most abundant pollutant residues that are generated nowadays, reaching the value of 24 million metric tonnes per year [1]. The preferred disposal option in most countries is incineration and combustion for energy recovery, though vacuum distillation and hydro-treatment have been researched to recycle this waste. However, these disposal routes are becoming increasingly impracticable as concerns over environmental pollution, and additional cost, sludge and wastewater disposal are recognized due to the undesirable contaminants present in waste lubricating oil [2]. During lubrication about 20% of the lubricating oil are consumed and the rest 80% are remain as such with some impurities. Thus a huge

quantity of used engine oil is left and wastage from different transport sectors every day [6]. Recycling of used lubricating oil is an intelligent

option for any country, more so for India, as it would conserve our natural resources as well as foreign exchange. Conversion of the waste lubricating into fuel by using pyrolysis technique has positive effects on environment and atmospheric air, and also has economical value [3]. For example, used oil from internal combustion engines generally accumulates a variety of contaminants, which increase the oil's toxicity.

II. METHODS AND MATERIAL

The aim of this study is to obtain fuel from waste lubricating oils by pyrolysis technique [3]. The idea of recycling used lubricating oil was presented in the year of 1930. Initially the used lubricating oils were burnt to produce energy, and later these oils were blended to engine oils after treatment. Due to the

increasing necessity for environmental protection to environmental, the disposal and recycling of waste oils has become very important. The recycling system was consisted of waste oil storage tank and produced fuel storage tank, pump, filter, a reactor, heaters having capacity of heating, mixer, condenser and control unit. It was designed and manufactured in industry to purify waste oil from dust, small carbon soot and metal particulates, and reutilize the waste oil [2]. The recycling of waste lubricating oils can be accomplished by three basic methods, which are Pre-treatment of used engine oil, heating and blending or pyrolytic distillation [5]. Pyrolysis is the thermal decomposition of materials at elevated temperatures in an inert atmosphere. It involves the change of chemical composition and is irreversible. The pyrolysis process is also used to produce ethylene, many forms of carbon, and other chemicals from petroleum, coal, and even wood, to produce coke from coal but in oil refining industry it uses in cracking of larger hydrocarbon into lighter one. The reactor is the most important part of the recycling system, since pyrolytic distillation or thermal treatment of the waste oil is performed in the reactor. It has a cylindrical shape and the size depends upon the capacity of reactor. For 10L capacity size 15 cm in diameter and 20 cm in height. This volume is enough to do all tests, which include characteristics of the fuel, performance and emissions. The reactor was isolated with proper insulation with a thickness of 5 cm to minimize heat loss from the reactor. It includes a mixer and electrical heaters. The mixer was used to mixing the oil and additive to obtain uniform blend and temperature in the oil. The heaters were used to heat the mixture of the purified oil and additive in order to make thermal cracking process more easily.. They can be capable of heating the mixture up to 400°C and more. The pyrolysis of waste oil has been carried out at 400°, to study the effect of temperature on the product quality and quantity. Through electronic control unit heating process was continue which increases the inside lubricating oil temperature unto 400°C. Due to heating vapour generated which

condense through condenser. Continuous bending also required [2]. The vaporized fuel due to heating process was condensed through condenser in which water was used as cooling fluid. The liquid product thus obtained from pyrolysis distillation process further subjected to laboratory test to obtain their properties.

III. RESULTS

Production of fuel from used engine oil with the help of pyrolytic distillation process which further goes to laboratory to check there properties and are given bellow

Table 1. Comparison of fuel obtained from waste lubricant with diesel.

Sr. No.	Properties	Diesel	Fuel
1	Density at 15°C (kg/m ³)	820-845	818
2	Viscosity at 40°C (mm ² /s)	2-4.5	3.49
3	Flash point(°C)	>55	59
4	Fire point(°C)	>50	53
5	Low heating value(kJ/kg)	42.700	42.500

IV. CONCLUSION

From above study it is concluded that when used oil is subjected to high temperature, it undergoes thermal breakdown of hydrocarbon by cracking process. As the temperature increases cracking also increase. At high temperature more conversion rate of waste lubricant into fuel take place. Table 1 shows that comparison between fuel and diesel by their properties hence concluded that conversion of waste lubrication oil can be made into useful fuel through the pyrolysis process. This fuel can be prepared from

waste lubrication oil and use to study the analysis of performance and emission characteristics of the fuel in diesel engines.

V. REFERENCES

- [1]. Manish Chand Sharma and Neelesh Soni, "Production of Alternative Diesel Fuel from Waste Oils and Comparison with Fresh Diesel", M.P. The International Journal of Engineering and Science (IJES), ||Volume||3 ||Issue|| 4||Pages|| 54-58 ||2013|| ISSN (e): 2319 – 1813 ISSN (p): 2319 – 1805.
- [2]. Mohd. Nematullah Nasim¹, M. Sohail Pervez², Ravindra Babu Yarasu³, Namrata V Lotia⁴, "Recycling waste automotive engine oil as alternative fuel for diesel engine", IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) e-ISSN: 2278-1684, p-ISSN: 2320-334X PP 46-50.
- [3]. N. B. Selukar, S. M. Wagh, "Gasoline and Diesel Synthesis from Waste Lubricating Oil: A Kinetic Approach", Amravati and Nagpur. IOSR Journal of Applied Chemistry (IOSR-JAC) ISSN: 2278-5736, PP 22-25.
- [4]. Dr. Venkata Ramesh Mamilla, Dr. Lakshmi Narayana Rao G, "A review: Waste lubricating oil as an alternative fuel blended with diesel", Andhra Pradesh, India. International Journal of Advanced Scientific Research. Volume 1; Issue 1; April 2016; Page No. 01-04.
- [5]. Motshumi J. Diphare, Edison Muzenda, Tsietsi J. Pilusa and Mansoor Mollagee, "A Comparison of Waste Lubricating Oil Treatment Techniques", 2nd International Conference on Environment, Agriculture and Food Sciences (ICEAFS'2013) August 25-26, 2013 Kuala Lumpur (Malaysia).
- [6]. R.A Beg, M. R. I. Sarker, and Md. Riaz Pervez "PRODUCTION OF DIESEL FUEL FROM USED ENGINE OIL", Jadavpur University of India. International Journal of Mechanical & Mechatronics Engineering IJMME-IJENS Vol:10 No:02 1

Omni-Directional Conveyor Platform

Saudagar Salunke, Rushikesh Meshram, Abhishek Mendjoge, Shubham Pardhi, Dharendra Pathak, Ranjit Chauriwar,
Prof. Satish Sonwane

Department of Mechanical Engineering, DBACER, Nagpur, Maharashtra, India

ABSTRACT

In this modern competitive industrial world one can get a step ahead of competitors by selection of appropriate material handling equipment. Material handling process is overhead for the production. A conveyor system is a common technique of mechanical handling equipment that moves material from one location to another location, many kind of conveying system are available and are used according to the various needs of industries. To purpose of this project is to reduce the footprint to move or transfer the product by using Omni-directional conveyor platform. This project help to improve the multi directional movement performed at a single omnidirectional platform, beyond the above improvement the conveyor system is expected to work.

Keywords: Automation, Sortation Systems, Material Handling, Conveyor Platform.

I. INTRODUCTION

The Omni directional platform is capable of both receiving products from any direction and then sorting then in any direction at high rate within a compact footprint. Developed for zone picking (also called pick and pass) operations, the sorter supports diversion of items to manual picking areas then merges batch on to the same conveyor. A single machine can also sort backwards; and position packages in rows and columns. Omnidirectional turner is used to move or rotate the package +90 and -90 degrees left or right. Integrated products can also be alignment. it also helps to reduce footprint compact in size for up to 30% footprint saving. Turing and aligning operations perform combine in one machine.

efficient transportation for a wide variety of materials, which make them very popular in the material handling and packaging industries. They also have popular consumer applications, as they are often found in supermarkets and airports, constituting the final leg of item/ bag delivery to customers. Many kinds of conveying systems are available and are used according to the various needs of different industries. There are chain conveyors (floor and overhead) as well. Chain conveyors consist of enclosed tracks, I-Beam, towline, power & free, and hand pushed trolleys.



II. CONVEYING TECHNOLOGY

A conveyor system is a common piece of mechanical handling equipment that moves materials from one location to another. Conveyors are especially useful in applications involving the transportation of heavy or bulky materials. Conveyor systems allow quick and

Conveyor systems are used widespread across a range of industries due to the numerous benefits they provide.

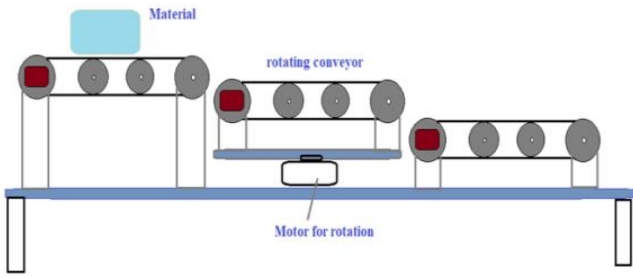


Figure 1. shows the block diagram of omnidirectional conveyor platform

3. Design calculation

A. conveyor belt

Velocity of product conveying $V = 0.013 \text{ m/s}$ (ref. no 2)

Dia. Of drum $D = 0.01 \text{ m}$ (Drum) ... (ref. no 3)

1. Product weight

Product weight = 0.5kg

Length of product = 150mm

Width of product = 80mm

Height of product = 50mm

Total weight of product = 0.5kg

2. Rpm of required motor

Actual torque:

$$\begin{aligned} T &= f \cdot r \\ &= 0.5 \cdot 9.81 \cdot 0.013 \\ &= 0.0637 \text{ Nm} \end{aligned}$$

• rpm calculation:

$$\begin{aligned} v &= 2 \cdot 3.14 \cdot \text{rpm} \cdot d / 2 \\ 0.013 &= 2 \cdot 3.14 \cdot \text{rpm} \cdot 0.013 \\ \text{rpm} &= 9.556 \end{aligned}$$

3. Calculated factors Of conveyor

Velocity of product conveying ' $V = 0.013 \text{ m/s}$

Dia. Of drum ' $D = 0.026 \text{ m}$

Speed of motor $N = 10 \text{ rpm}$

Torque required $T = 10 \text{ kgcm}$

Weight of product. = 0.5kg

Specification of component:

- 1) Motor - dc geared motor
10 rpm
10 kgcm torque
- 2) Power supply- 12 volt 5 amp
- 3) Ball Bearing- 6000zz OD- 26 mm and
ID-10 mm
- 4) Conveyor belt- 100 width and 300 length
- 5) 3/4 Inches MS pipe is used for frame assembly
- 6) MDF sheet - 6mm thick
- 7) Servo motor- metallic gear servo motor mg995

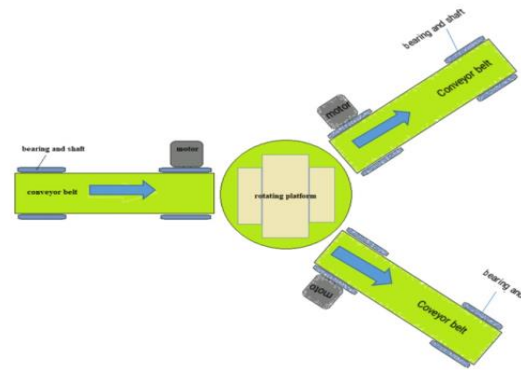


Figure 2

B. component

Components used-

- 1) Conveyor belt
- 2) Ball bearings
- 3) Rollers
- 4) Servo motor
- 5) 2 by 4 feet platform
- 6) 5mm acrylic sheet
- 7) Aluminum sheet
- 8) Cluster wheels
- 9) MS square pipe
- 10) MDF sheet.

Conveyor belt-

A conveyor belt is the carrying medium of a belt conveyor system (often shortened to belt conveyor). A belt conveyor system is one of many types of conveyor systems. A belt conveyor system consists of two or more pulleys (sometimes referred to as drums),

with an endless loop of carrying medium—the conveyor belt—that rotates about them. One or both of the pulleys are powered, moving the belt and the material on the belt forward. The powered pulley is called the drive pulley while the unpowered pulley is called the idler pulley. There are two main industrial classes of belt conveyors; Those in general material handling such as those moving boxes along inside a factory and bulk material handling such as those used to transport large volumes of resources and agricultural materials, such as grain, salt, coal, ore, sand, overburden and more

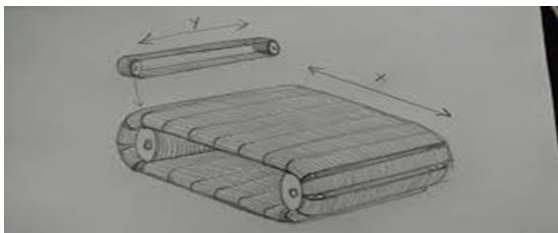


Figure 3

Ball bearing-

A ball bearing is a type of rolling-element bearing that uses balls to maintain the separation between the bearing races.

The purpose of a ball bearing is to reduce rotational friction and support radial and axial loads. It achieves this by using at least three races to contain the balls and transmit the loads through the balls. In most applications, one race is stationary and the other is attached to the rotating assembly (e.g., a hub or shaft). As one of the bearing races rotates it causes the balls to rotate as well. Because the balls are rolling they have a much lower coefficient of friction than if two flat surfaces were sliding against each other.

Ball bearings tend to have lower load capacity for their size than other kinds of rolling-element bearings due to the smaller contact area between the balls and races. However, they can tolerate some misalignment of the inner and outer races.

Bearing size-

ID-10mm

OD-26mm

Bearing Safety Factor. The bearing safety factor, or safety modulus f_s , is the ratio of the basic static load rating C_0 or the equivalent load P on the bearing. When the use conditions are normal operation, a safety factor of 1.0 is typical.

Radial Ball Bearings Basic Dynamic Load Rating, C . The basic dynamic load rating of a bearing with rotating inner ring and stationary outer ring is that load of constant magnitude and size which a sufficiently large group of apparently identical bearings can endure for a basic rating life of one million revolutions.



Figure 4

Rollers-

Rollers are used in conveyor system to provide support for long distance.



Figure 5

Servo motor-

A servomotor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration. It consists of a suitable motor coupled to a sensor for position feedback.



Figure 6

This motor is having a torque of 15 kgcm.

Dc motors-

A DC motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current flow in part of the motor.

DC motors were the first type widely used, since they could be powered from existing direct-current lighting power distribution systems. A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. Small DC motors are used in tools, toys, and appliances. The universal motor can operate on direct current but is a lightweight brushed motor used for portable power tools and appliances. Larger DC motors are used in propulsion of electric vehicles, elevator and hoists, or in drives for steel rolling mills. The advent of power electronics has made replacement of DC motors with AC motors possible in many applications.

A DC motor is a rotary electrical machines. It convert direct current electrical energy into mechanical energy. DC motor has a rotating armature winding and a permanent magnet or static field winding. The speed of DC motor can be controlled using either a variable supply voltage or by changing the strength of current in its field winding. According to soil condition the motor is ON/OFF. It is controlled from our relay boards or Micro controller using DC motor Drivers.

Other types of DC motors require no commutation.

Homopolar motor –

A homopolar motor has a magnetic field along the axis of rotation and an electric current that at some point is not parallel to the magnetic field. The name homopolar refers to the absence of polarity change. Homopolar motors necessarily have a single-turn coil, which limits them to very low voltages. This has restricted the practical application of this type of motor.

Ball bearing motor –

A ball bearing motor is an unusual electric motor that consists of two ball bearing-type bearings, with the inner races mounted on a common conductive shaft, and the outer races connected to a high current, low voltage power supply. An alternative construction fits the outer races inside a metal tube, while the inner races are mounted on a shaft with a non-conductive section (e.g. two sleeves on an insulating rod). This method has the advantage that the tube will act as a flywheel. The direction of rotation is determined by the initial spin which is usually required to get it going.



Figure 7

Electronic circuit-

An electronic circuit is composed of individual electronic components, such as resistors, transistors, capacitors, inductors and diodes, connected by conductive wires or traces through which electric current can flow. To be referred to as electronic, rather than electrical, generally at least one active component must be present. The combination of components and wires allows various simple and complex operations to be performed: signals can be amplified, computations can be performed, and data can be moved from one place to another.

Circuits can be constructed of discrete components connected by individual pieces of wire, but today it is much more common to create interconnections by photolithographic techniques on a laminated substrate (a printed circuit board or PCB) and solder the components to these interconnections to create a finished circuit. In an integrated circuit or IC, the components and interconnections are formed on the same substrate, typically a semiconductor such as silicon or (less commonly) gallium arsenide.

An electronic circuit can usually be categorized as an analog circuit, a digital circuit, or a mixed-signal circuit (a combination of analog circuits and digital circuits).

Breadboards, perfboards, and stripboards are common for testing new designs. They allow the designer to make quick changes to the circuit during development.

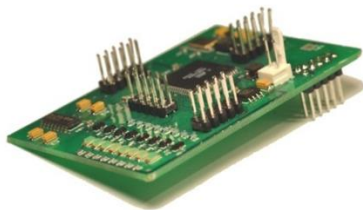


Figure 8

III. OPERATION

The module contains Omni-directional wheels, which are individually and selectively controlled by an electric motor. The special arrangement of the wheels as well as selective control of the drives enables the logistics operator to move and position several objects simultaneously and independently on any track.

The manufacturing product is to be transfer on the conveyor belt that product is to be check by using quality control machines and then machines gives the output that is ok or not means accepted or rejected piece. The Omni-directional conveyor platform is

made of no. of rollers, that are arranged in such a way that they operate any direction to transfer the product as your requirements.

These rollers or wheels rotate continuously forward direction and also oscillate in +90 and -90 left or right as your requirement.

The platform is made of a closed box type at the bottom side, the dc motor is used to rotate the wheel or roller and other motor is used to oscillate the roller assembly to achieve the directional movement. The quality check machine sends the feedback as the product is accepted or rejected ,then the oscillation of rollers depend on the product goes through the direction as required.

That platform helps to the sort the products and move or transfer in any direction (360 degree).

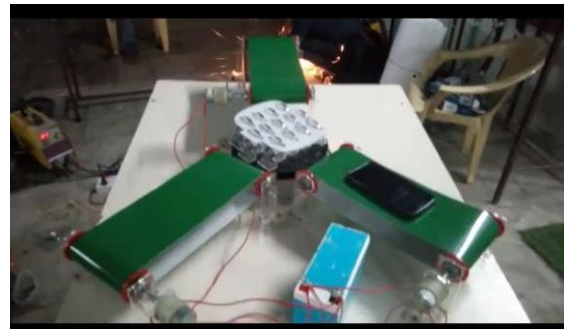


Figure 9. actual system of omnidirectional conveyor platform

IV. CONCLUSION

This product can be fully automated and produced at a lower cost to acceptance will be unimaginable presently there are no competitors for such a kind of product in our market. The system which we developed which can successfully reduce the material handling time on production floor. The system which consist sensor, electric motor, microcontroller makes the system more efficient and its made system fit to use.

V. REFERENCES

- [1]. Prof. Masaki, M., Zhang, L. and Xia, X. (2017). A Comparative Study on the Cost-effective Belt Conveyors for Bulk Material Handling. *Energy Procedia*, 142, pp.2754-2760.
- [2]. Petru, L. and Mazen, G. (2015). PWM Control of a DC Motor Used to Drive a Conveyor Belt. *Procedia Engineering*, 100, pp.299-304.
- [3]. Weyrich, M., Wang, Y., Winkel, J. and Laurowski, M. (2012). High Speed Vision Based Automatic Inspection and Path Planning for Processing Conveyed Objects. *Procedia CIRP*, 3, pp.442-447.
- [4]. Zhao, L. (2011). Typical Failure Analysis and Processing of Belt Conveyor. *Procedia Engineering*, 26, pp.942-946.
- [5]. Gramblicka, S., Kohár, R. and Stopka, M. (2017). Dynamic Analysis of Mechanical Conveyor Drive System. *Procedia Engineering*, 192, pp.259-264.
- [6]. Fedorko, G. and Ivanco, V. (2012). Analysis of Force Ratios in Conveyor Belt of Classic Belt Conveyor. *Procedia Engineering*, 48, pp.123-128.
- [7]. Ellis, D. and Miller, K. (1987). A mathematical analysis of tension shocks in long belt conveyors. *Mathematical Modelling*, 9(8), pp.613-623.
- [8]. Chen, L. (2011). Research on Control Theory of Belt Conveyor. *Applied Mechanics and Materials*, 63-64, pp.209-213.
- [9]. Burditt, A. and Schaphorst, W. (1929). Mechanical Handling of Material in and about the Chemical Plant II—Belt Conveyors. *Industrial & Engineering Chemistry*, 21(7), pp.649-654.
- [10]. Baxter, R. (1985). Conveyors can cure your handling headaches. *Production Engineer*, 64(10), p.18.

Automatic Bar Feeding, Clamping and Cutting Machine

Nikhil Dewalkar*, Pranay Ramteke, Amey Chopde, Vaibhav Rakshit, Mohnish Barade,
Aniket Fating, Prof. Sathish Sonwane

Mechanical Engineering Department, Dr. Babasaheb Ambedkar College of Engineering & Research, Nagpur,
Maharashtra, India

ABSTRACT

Machining the shaft or any shape of rod, first it should be cut to appropriate length & then the machining operation is to be carried out. Nowadays, it is a time consuming task as the process of cutting bar to the required length happens manually. Due to this manual cutting, erroneous marking may result in the job rejection. So, to eliminate this error and also human intervention this project is introduced. The project deals with the concept of automatic bar feeding, clamping and cutting. In this project, an automatic feeding mechanism, clamping mechanism as well as cutting is provided. A microcontroller is used for automation, and to control the various actions which is required for this bar cutting. Basic, view of this project to increase accuracy and reducing the human effort which helps to increase the production rate.

Keywords: Feeding, Automation, Clamping, Bar cutting, Length, Pneumatic system

I. INTRODUCTION

This is an era of automation where, it is defined as replace the manual work into mechanical power in all degrees of automation. It is a full automation where human participation is negligible. A mechanical engineering without design, production and manufacturing is meaningless. The primary concern of this system is to carry out operations that are feeding, clamping and cutting. The sequence of the operations must be precisely timed and maintained. The main work of this project is to cut the rod or pipe with a proper length in number of pieces according to the batch production. The selection of the cutter is based on the type of material which has to be cut. The material preferred in this system is mild steel for the demonstration. Nowadays, almost all the manufacturing process is being automatised in order to deliver the product at faster rate. The system can be maintained and controlled by microcontroller which is attached to the relay circuit. Due to this system, the required time for the cutting is set. Automation in the

modern world is inevitable. Any automatic machine focus on the economical use of man, machine, and material worth the most. The bar feeding and cutting machine works with the help of pneumatic double acting cylinder. The piston cylinder is connected to the moving cutting tool, the machine is portable in size, so easy transportable.

II. PROBLEM IDENTIFICATION

The common problems are facing during cutting are cross cutting of pipes, rods, time management, cutting time etc. The base of the bar cutting operation is not properly fixed such that while cutting, there occurs a crosscutting. The base part is hold by hands such that while cutting the pipe will move rapidly and due to that the cross cutting operation is occurred. If a bar diameter is larger in size, then it is more difficult to cut the bar. It takes more time to perform this operation. Therefore, to reduce human error and to increase production rate, this project is made.

III. LITERATURE REVIEW

The vast review of literature will help to understand concepts, theorems, and different factors affecting the performance of machine.

P.Balashanmugm and G.Balasubramanian [1] pneumatically operated typical pipe cutting machine d.c valve and flow control valve is used for semi-automation. The pipe cutting machine works on pneumatic double acting cylinder. The piston is attached to the movable cutting tool.

Nimbalkar Shripad, Velanje Sagar, Patil Abhay [2] has conducted invention relates to pneumatically operated automatic pipe-cutting machine. The arrangement of the pneumatic valves deployed in this system in accordance to the circuit planned. The choice of cutter is based on the stress calculated. The material favoured in this system is a Mild steel as well as PVC pipe or any other soft material.

ShitalK.Sharma, AshishV.Waghmare, PranitS.Wakhare [3] has provided an alternative to the existing automatic PVC pipe cutting machine, in terms of automating the pipe entry into the cutting apparatus, eliminates power fluctuation and lesser initial investment. The clamping arrangement can be changed according to need of operations which is suitable. The overall system is compact in size, light weight, modular and flexible to be used in small works jobs who need batch production.

IV. METHODOLOGY

Our project "Design and construction of automated bar feeding mechanism" idea taken after refer some literature review paper, generate new idea about configuration, first came design concept, we are develop general frame for make it, perform number of operation such as tool drilling machine, lathe machine, saw, and arc welding are to be required. Such part we assembled on frame like pneumatic

solenoid valve, motor and proximity sensor is situated in front of pipe ,metal rods clamping system because it is sense the pipe and on switch of motor, pipe cutting start after cutting pipe motor will be automatically off and de-clamping pipe, fast cutting operation this process continuously perform.

There are various components that are needed to make the project work such as:-

1. Frame:-This is the base structure of our project where all the components are to be assembled. It also having a base plate and fixed plate on which motor or clamping device is fixed.



Figure 1. Frame

2. Microcontroller: - ATMEGA16 is a 8 bit high performance microcontroller of AVR family with low power consumption. It requires only 5 volt DC supply. It is used only for single task.



Figure 2. Microcontroller

3. Relay Switch :- There are many types of relay, but we are using electromagnetic relay. These relays are

constructed with electrical, mechanical and magnetic components.



Figure 3. Relay switch



Figure 6. Pneumatic cylinder

4. Rollers: - Rollers are used to give the motion to the bar so that it can be easily pushed with less power.



Figure 4. Roller

5. Dc geared motor: - This motor is suitable for high torque and low speed working conditions.



Figure 5. DC geared motor

6. Two stroke pneumatic cylinder: - A pneumatic cylinder is a linear actuator that works with compressed air. The cylinder's main parts are the piston, piston rod, cylinder tube, gasket's, and seals.

7. Pneumatic solenoid valve (5/2):- It is used to direct for stop the flow of compressed air to the appliances. It can also use to actuate a cylinder or air tools.



Figure 7. Pneumatic solenoid valve

Table 1. Components & Its Specification

S.N	Major Components used in the fabrication of project		
	Component	Qty	Specification
1.	Microcontroller (AVRatmega16)	1	Frequency-16Mhz I/P Voltage-5Vdc
2.	Piston cylinder (Double acting)	2	Pressure-13.5bar Bore -25mm Length-125mm

3.	Solenoid valve	1	Voltage-12V dc Pressure- more than 10bar
4.	Cutter	1	Disc dia.-132mm Power-670watts Torque-0.58Nm Speed-2600rpm
5.	Air Compressor	1	Pressure-up to 10bar
6.	Sprocket	3	Out dia-76mm No. of tooth-18 Material-Steel
7.	Geared motor	1	Voltage-12V dc Power-24.67watts Speed-20rpm Torque-11.78Nm

V. WORKING PRINCIPLE

DC Power supply of 12V is given to the machine. The motor runs at 10rpm with high torque rotate the roller by using chain transmission, so that the bar is moving from initial position to the determined position. Proximity sensor is used to detect the work material & to specify the dimension. After that piston cylinder which is used in the pneumatic system clams the rod. The rollers attached to dc geared motor which feeds the bar in forward direction. When the feed rod detects by the proximity sensor then motor stops feeding, it get clamped and cutting operation takes place. A scale of 30cm is used to measure the length of the rod which is to be cut. This process is carried out in a continuous manner.

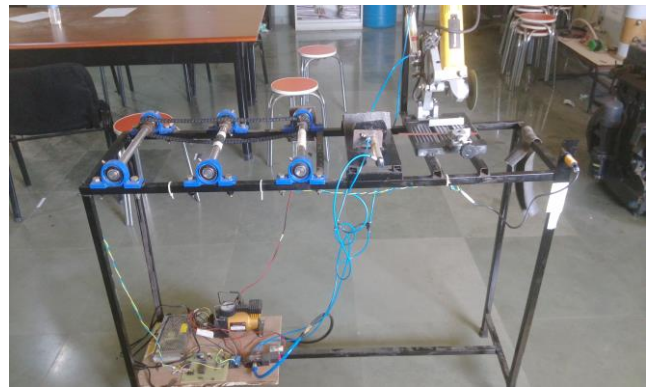


Figure 8. Automatic bar feeding and cutting machine.

VI. CONCLUSION

The design and fabrication of automatic bar feeding and cutting mechanism will be very useful for small scale industries, workshops, etc. we have studied the various automated electronics components such as relays, solenoid valve, microcontrollers, etc. The main aim of this machine is to reduce the human effort, timing for workpiece cutting and neglect the time for measuring the workpiece. This aim is achieved by bringing the automation to the machine. There are some machines which has been already made, but we have introduced some new components and we also have different design which increases the efficiency of work.

VII. FUTURE SCOPE

This project has scope in production industries and mechanical workshops where bar cutting is carried out, since company demands higher production at cheaper cost. Mechanism of bar feeding will help to cut multiple bars at a less time and automation makes it easy.

This automation can surely reduce the loss thereby increasing the productivity by investing small capital and less equipment. This machine can save the wastage of material and we can get the product with high accuracy.

VIII. REFERENCES

- [1]. Design Data Book, PSG Tech, Coimbatore.
- [2]. V.B.Bhandari, A Textbook of Machine Design.
- [3]. R.S.Khurmi and J.K.Gupta, A Textbook of Machine Design, Euresia Publishing House (Pvt.) Ltd., pp.474- 518, 2005.
- [4]. Rushikesh Gadale, Mahendra Pisal, Sanchit Tayade, S.V. Kulkarni, March 2015 "PLC based automatic cutting machine" International journal of Engineering and technical Research ISSN: 2321-0869, Volume No. 3, Issue-3,.Pp.400-470.
- [5]. P.B.Patole, N.V.Gawde, March 2018 "Automatic bar feeding and cutting machine", International journal of advanced Research in Science and Engineering, ISSN: 2311-8354 Volume No. 7 Issue-01.

Productivity Improvement by Minimizing Losses in Paint Line of Sheet Metal Component – A Case Study

Ritik Fulzele^{*1}, Dr. Arun Kedar², Rahul Meshram¹, Mrunal Shambharkar¹, Nikhil Kashiv¹, Shubham Zade¹, Joydev Raj¹

^{*1}Department of Mechanical Engineering, Dr. Babasaheb Ambedkar College of Engineering & Research,
Nagpur, Maharashtra, India

²Faculty of Mechanical Engineering, Dr. Babasaheb Ambedkar College of Engineering & Research, Nagpur,
Maharashtra, India

ABSTRACT

Today's business growth is totally dependent on the productivity and the customer satisfaction through in time delivery and services. This paper reflects the case study conducted at one of the well known sheet metal manufacturing plant AKAR industry which is located in S-70 M.I.D.C. Hingna road Nagpur. The study was carried out in paint line with an aim to reduce the cycle time during operation masking and unmasking the threaded hole of sheet metal component (battery tray) before and after painting process. This study started with observing the operation in paint line, understanding the existing process flow; identify the problem and areas of possible improvements reached. This paper illustrates the Productivity improvement technique formed an integrated platform to help identify the weak areas and improves the lead time for manufacturing process.

Keywords: Sheet Metal Manufacturing Plant, Paint Line, Productivity Improvement Technique, Masking Plug

I. INTRODUCTION

Productivity is the quantitative relation between what we produce and what we use as a resource to produce them, i.e., arithmetic ratio of amount produced (output) to amount of resource (input). Productivity can be expressed as:

$$\text{Productivity} = (\text{Output}/\text{Input})$$

Productivity refers to the efficiency of the production system. It is the concept that guides the management of production system. It is an indicator of how well the factors of production (land, capital and energy) are utilized.

The productivity improvement techniques used to improve the productivity in paint line is work study which is categorized in two types are as below:

- 1) Method study
- 2) Time study

Work study: "Work study is a generic term for those techniques, method study and work measurement or time study which is used in the examination of human work in all its context and which leads systematically to the investigation of all the factors which affects the efficiency and economy of the situation being reviewed, in order to effect improvement."

1) Method study: Method study is the systematic recording and critical examination of existing and proposed ways of doing work, as a means of developing and applying easier and more effective method.

2) Time study: Time study or work measurement is used to determine the time required to complete the operation by skilled worker by using stopwatch.

II. LITERATURE REVIEW

[1] Among the subjects that were most frequently studied by researcher Fredrick w. Taylor [1] developed work study technique in 1880. Work study was the first technique to improve the productivity. Fredrick w. Taylor also developed time study in 1880 which is a part of work study in which he is the first person to use a stopwatch to study and measure work content with his purpose to define “a fair days work.”

[2] Productivity Improvement in Manufacturing Unit Analyzing Production Machine & Facilities by Rajkumar Sharma, prof. Sajid Qureshi and Dr. Vivek Bansod, the main aim of this analysis is to improve layout in manufacturing unit with clear focus on improving productivity. An effort is made to study the entire layout design of production line right from raw material stage until finished product output & redesigned layout after thorough analysis of data in line with software simulation techniques.

[3] Enhancement in Productivity in Sheet Metal Industry through Lean Principles by Gaurav Kumar & S.K. Gupta, the purpose of the research paper is to investigate how to improve productivity and in time delivery as expected plant. This paper illustrated the impact of using lean manufacturing as a tool to identify the weak areas and improves the lead time for manufacturing process which is being used in rim manufacturing of sheet metal industry.

[4] Improving Productivity in a Paint Industry using Industrial Engineering Tools & Techniques by Aakash Jaiswal e.t.al. This paper reflects the study of the implementation of industrial engineering tool in a paint industry.

[5] Increasing Productivity by Reducing Cycle Time in Assembly Line on an Automotive Industry using Work Study Techniques by Ashish Kalra e.t.al. This study was carried out on before paint assembly line with an

aim to reduce the cycle time of different workstation to complete the operation at the assembly line in time.

III. STUDY METHODOLOGY

There are a number of techniques in industrial engineering which are suitable for identify the weak areas and improves the cycle time in sheet metal manufacturing plant. Among these techniques we opted for work study technique which is method study and time study. The study methodology carried out in following ways:

- a) Identify various operations carried out in a paint shop and create original layout of paint shop.
- b) Create flow process chart for pre-treatment process, drying process, painting process and oven.
- c) Collect important data & conduct time study technique to identify the time required for painting process for a particular sheet metal product (battery tray).
- d) Analyze the collected data.
- e) Conduct method study to understand existing method of doing work and identify the areas where cycle time can be reduce, develop faster method of doing the same work.
- f) Conduct trial run for 2 industry visit for new method and collect the data by time study technique and compare the old method to new adopt method.
- g) Recommend the new method to the concern.

IV. CASE STUDY AT COMPANY

The AKAR industry manufacturing the various sheet metal parts like battery tray, battery retainer, tap cover plate, bracket fuel builder, bracket filter mounting commercial for automobile vehicles. This industry fabricates the parts through sheet metal process for leading automobile vehicle manufacturing industries like Mahindra & Mahindra, Ashok Leyland.

A] Problem Statement:

This paper reflects the case study carried out in a paint line particular on a battery tray component shown in figure 1. The industry facing the problem during painting process. There is a time loss during masking and unmasking operation. The organization is using paper masking plug for mask the threaded hole.



Figure 1. Battery tray component

The plugs are made up of sand paper (recycled paper) that are irregular in shape therefore it takes more time for masking and unmasking operation also there are more chances of getting paint stuck inside threaded holes & at the time of mating of nut with bolt it faces difficulty. To avoid this kind of issue Re-tapping process has to be employed. Re-tapping process increases the production cost as well as time.



Figure 2. Paper masking plug

B] Case Study Procedure:

Step 1: Determine all the sub-operation in painting section and create flow process chart.

Table 1

Sr. no.	Sub operation
1.	Masking
2.	Battery tray hanging to hanger
3.	Painting
4.	Unmasking
5.	Painted battery tray to oven trolley

Step 2: Determine the cycle time required for painting operation and calculate normal time for painting operation.

Step 3: Define a new masking plug material which is suitable for wet painting process so that during operation it should give a quality product.

Step 4: Collect all the necessary data about the new existing method by critical examination of existing method

C] Selection of Masking Plug Material & Size:

There are lots of materials for standard masking product, mainly due to the diverse process that are used in finishing process.

The properties of masking plug material should be high temperature resistance, wear resistance, chemical and water resistance and it should be reusable.

We recommend the wooden masking plug shown in figure 3, for protect the threaded hole of battery tray component. The wooden masking plug has properties like it is high temperature resistance at 149 degree Celsius.



Figure 3. Wooden masking plug

D] Cycle time description sheet

Table 2

Sr. no.	Operations	Paper plugs CT (sec)	Wooden plugs CT (sec)
1.	Masking	21	8
2.	Battery tray hanging to hanger	10	12
3.	Painting	129	127
4.	Unmasking	12	5
5.	Painted battery tray to oven trolley	23	26
		195	178

V. RESULT AND CONCLUSION

On the basis of data collected & made the calculations for mask and unmask the threaded portion of sheet metal component (Battery Tray), we found that by the using of wooden masking plug it required less time for masking and unmasking operation are shown in table 3 & table 4

Table 3

Time required (sec)	
Masking by <u>paper</u> masking plug	Unmasking by <u>paper</u> masking plug
21 sec	12 sec

Table 4

Time required (sec)	
Masking by <u>wooden</u> masking plug	Unmasking by <u>wooden</u> masking plug
8 sec	5 sec

VI. REFERENCES

- [1]. Kalra, A. and Sharma, S. (2016), "Increasing productivity by Reducing Cycle Time in Assembly line of an Automotive Industry using work study techniques", International Journal of Engineering research & Technology (IJERT), vol. 5 issue 02
- [2]. Telsang, M.,(1998) , "Industrial Engineering & Production Management" , S. CHAND Publication Pvt. Ltd. 18th reprint 2015.
- [3]. "Time Motion Study in Determination of Time Standard" 3rd Engineering Conference on Advancement in Mechanical and Manufacturing for Sustainable Environment April 14-04-2010, Kuching, Sarawak, Malaysia
- [4]. Biswas, S .,e.t.al (2016) , "Improving productivity using work study technique" ,International Journal Of Research in Engineering and Applied Science (IJREASS) Vol.6 Issue 11 pp 49- 55

Magnetic Abrasive Flow Machining For Super Surface Finishing

Prof. S. A. Bobde, Purushottam Kolhe, Rushikesh Tapre, Niloy Mukherjee, Subodh Thombre, Virendra Kubade,
Abhishek Harode, Shubham Kadu

Department of Mechanical Engineering, RTM Nagpur University, Nagpur, Maharashtra, India

ABSTRACT

Now a days, need of compact and efficient design of any product with good strength has increased. This requires hard materials like carbide and ceramics for achieving better service life. Conventional machining processes when applied to these newer materials are uneconomical, produce poor degree of surface finish and accuracy, and produce some stresses, highly insufficient. It is impossible to achieve good and desired surface finish in compact, complex, intricate shapes, profiles, curved splines etc., where conventional machine tool faces difficulties during machining and consumes much time. It experiences same problem with micro/ nano finishing like small size diameters used in fuel injectors etc. Abrasive flow machining (AFM) is relatively new process among non-conventional machining processes. Low material removal rate happens to be one serious limitation of almost all processes. Magneto abrasive flow machining is a new development in AFM. With the use of uniform magnetic field around the work piece in abrasive flow machining, we can increase the material removal rate as well as the surface finish.

Keywords: Abrasive Slurry, Magnetic Abrasive Flow Machining (MAFM), Material Removal Rate (MRR)

I. INTRODUCTION

Magneto abrasive flow machining (MAFM) is a new technique in machining. These processes can be classified as hybrid machining processes (HMP) – a recent concept in the advancement of non conventional machining. The reasons for developing a hybrid machining process is to make use of combined or mutually enhanced advantages and to avoid or reduce some of the adverse effects the constituent processes produce when they are individually applied. The present paper reports the preliminary results of an on-going research project being conducted with the aim of exploring techniques for improving material removal rate (MRR) in AFM. One such technique uses a magnetic field around the work piece during machining. Magnetic fields introduce such a machining force towards machining in magnetic abrasive finishing (MAF), used for micro machining

and finishing of components, particularly of circular profile.

Magneto Abrasive flow machining (MAFM) is one of the latest non-conventional machining processes, which possesses excellent capabilities for finish-machining of inaccessible regions of a component. It has been successfully employed for deburring, radiusing, and removing recast layers of precision components. High levels of surface finish and sufficiently close tolerances have been achieved for a wide range of components. In MAFM, a semi-solid medium consisting of a polymer-based carrier and abrasives with ferromagnetic particles in a typical proportion is extruded under pressure through or across the surfaces to be machined. The abrasion takes place between surfaces and abrasive results in material removal in form of small chip particles which mix with slurry and work as a tool. A special fixture is

generally required to create restrictive passage or to direct the medium to the desired locations in the work piece. This report discusses the possible improvement in surface roughness and material removal rate by applying a magnetic field around the work piece in AFM. Relationships are developed between the material removal rate and the percentage improvement in surface roughness of steel components when finish-machined by this process.

II. LITERATURE SURVEY

1. Abrasive flow machining: An area seeking for improvement. – Rajendra Baraiya, Vivek Jain, Dheeraj Gupta

Experimental investigations have been carried out by various investigators to investigate the effects of process parameters like extrusion pressure, number of cycles, viscosity, abrasive concentration and grain size on the output responses namely, surface finish and material removal during AFM. Rhoades studied the basic principle of AFM and reported that the depth of cut primarily depends upon abrasive grain size, relative hardness and sharpness and extrusion pressure.

2. MATERIAL REMOVAL MECHANISMS IN ABRASIVE FLOW MACHINING -Szulczynski, Hubert; Uhlmann, Eckart. Institute for Machine Tools and Factory Management, Technical University, Berlin

Normally, the composition of the grinding medium includes the base at 100 weight percent. Specifications concerning abrasive grains are given in weight percentage of the base [3]. 30 % to 80 % of abrasives with rougher grains and 10 % to 30 % of abrasives with finer grains are added to the base.

III. EXPERIMENTAL SETUP

An experimental set-up is designed and fabricated as shown in fig.1. The machine has two actuators. These actuators can hydraulic or pneumatic operated with the use of synchronize circuit. Circuit contains

direction control valve which is push button operated, controls the flow of pressurized fluid and result into desired motion of cylinder piston. Tooling is the vacant chamber is used to store abrasive slurry, and it is made up from nylon material as it is not affected by abrasive particles. This abrasive slurry flows from lower tooling to upper tooling and then vice versa, thus creating a cycle of machining. Fixture is designed in such a way that it is inbuilt in tooling and helps to hold the work piece in right position. Electromagnet is used to provide uniform magnetic field around the specimen by using DC supply and it also facilitates cut off of magnetic flux after machining is carried out.. Electromagnet contains number of poles which are well fitted around the specimen that keeps minimum distance from the centre of flow. Machine structure contains base stand, struts and steel plates that holds whole machine in position.

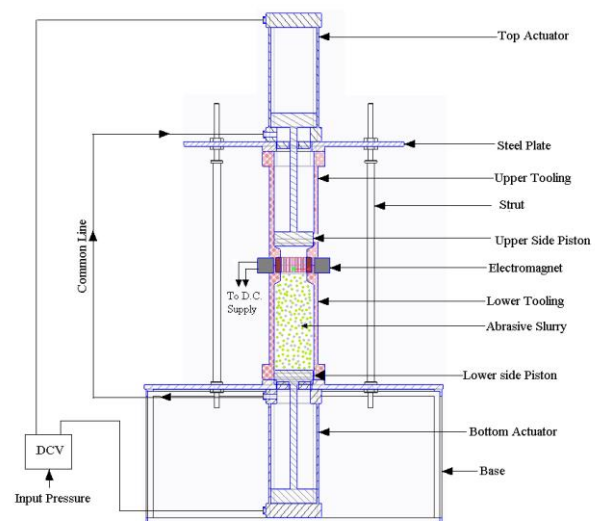


Figure 1

A. Specimen

The work specimen used in this test is a dog clutch contains splines (tooth) on internal surface. Dog clutch is made from alloy steel having specified dimension.

Dimensions: - D_o – 75mm, D_i (mean) – 53.5 mm, L - 26mm.

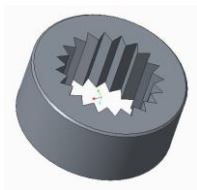


Figure 2

B. Electromagnet

The electromagnet was design and assembled for its location around the work piece. The electromagnet is created by manufacturing core. Core is made from number of silicon steel strip placing one on one called as stamping. Core is design in such a way that it creates number of poles around the work-piece. It consists of 24 poles that are surrounded by coils which contain 108 numbers of turns. Gauge of wire in electromagnetic coil is 28. It is positioned in such a way that it can provide the maximum magnetic field near the entire internal surface of the work piece.

C. Flow Media

Flow media is in state of semi solid fluid. It is mixture abrasive such as aluminium oxide and silicon carbide followed by binding agent like oil, hydrocarbon gel, Silicon based polymer etc., which conforms the fluidity of abrasive slurry. This mixture contain 43 % (by weight) of ferromagnetic material, 42% Al₂O₃ and 15% SiO₂. In ferromagnetic materials we can use iron powder, granules of Fe etc.

IV. PROCESS PARAMETERS

INDEPENDENT PARAMETERS

Table 1

Sr. No.	Process Parameters	Range	Unit
1	Extrusion Pressure	20 - 30	Bar
2	Abrasive carrier concentration	70-30	% by weight
3	Viscosity of Media	490	Pa-s

4	Media flow Rate	618	cm ³ /min
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CONSTANT PARAMETERS

Table 2

Sr. No.	Process Parameters	Range	Unit
1	Abrasive Particle size (mesh size)	60-65	Micron
2	Processing Time	5	Min
3	Temperature of Media	35±2	°C
4	Initial surface roughness	3.04	μ mm

PROCESS RESPONSE

Table 3

Sr. No.	Process Parameters	Range	Unit
1	Surface Finish (improvement)	72.72	%
2	Material Removal	0.2	gm(per cycle)

V. WORKING PRINCIPLE

The abrasive slurry which is in semi solid fluid form flows through work piece. This abrasive particle is force to flow by piston cylinder by applying the pressure. Due to this, velocity of abrasive particle increases by converting potential energy into kinetic energy. When the magnetic field is applied around work piece the ferromagnetic material present in abrasive slurry get struck along with abrasive to the work-piece. Due to pressure of piston it get rubbed on surface of work-piece which results in micro-chipping, causes surface finishing. This process is

carried until desired surface is required. Hence by application of magnetic field the abrasive slurry sticks to the surface and increases MRR in short span of time. After desired result power supply is switched off, magnetic field is vanished hence abrasive left the surface. In this way surface finishing is done.

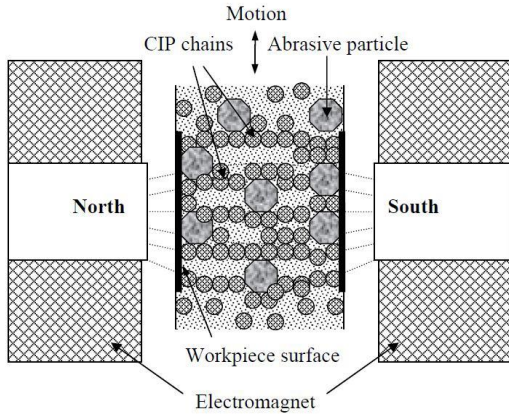


Figure 3

VI. COMPARISONS

Table 4

Parameters	AFM	MAFM
Machining Time (per work piece)	5 min (for 30 Cycle)	3 min (for 30 cycle)
Setup Time	2-3 min	2-3 min
Surface finish (Ra value in μm)	0.05-1.0	3.0-5.0
Material removal Rate	0.008-0.010 mm	0.020-0.030 mm
Productivity	Lower as compare to MAFM	Higher
Accuracy	Higher	Higher

VII. ADVANTAGES

- A. MAFM increases material removal rate and surface finish as compared to AFM.
- B. Its effective on all materials such as hard and high-strength materials like ceramics and carbide.
- C. It produce high degree of surface finish and accuracy and highly efficient over conventional process.

- D. Higher MRR as compare to AFM.
- E. Machining time reduce as compare to AFM and other conventional machining process.

VIII. LIMITATIONS

- A. Abrasive material tends to get embedded if the work material is ductile.
- B. Heat generated by electromagnet may change the property of flow media.
- C. Initial cost of machine is more as compare to AFM.

IX. APPLICATIONS

- A. MAFM in Automotive industry
 - 1) Enhanced uniformity and surface quality of finished components.
 - 2) Increased engine performance.
 - 3) Increased flow velocity and volume.
 - 4) Improved fuel economy and reduced emissions.
 - 5) Extended work piece life by reducing wear and stress surfaces.
- B. MAFM in Aerospace industry
 - 1) Improved surface quality.
 - 2) Enhanced high cycle fatigue strength.
 - 3) Optimized combustion and hydraulics.
 - 4) Increased airflow.
 - 5) Extended component life.
- C. MAFM in Medicine industry
 - 1) Eliminate the surface imperfections where dangerous contaminates can reside.
 - 2) Improved functionality, durability and reliability of medical components.
 - 3) Enhanced uniformity and cleanliness of surfaces.
 - 4) Extended component life.
- D. MAFM in Dies and Moulds industry
 - 1) Reduced production costs.
 - 2) Increased production throughput.

- 3) Enhanced surface uniformity, finish and cleanliness.
- 4) Improved die performance and extend life of dies and mould.

X. CONCLUSION

- A. The magnetic field has been developed around the work piece and removes the material by friction of flow media on the workpiece.
- B. This can help to reduce the manufacturing operation per cycle compared to AFM. This is a continuous process as the combination of magnetic field and flow media interacted towards the work piece and removal of material takes place.
- C. The media flow is in semi viscous form, they do not have any effect on work piece as it passes through continuous motion of flow.

XI. REFERENCES

- [1]. P. D. Kamble, S. P. Untawale, and S. B. Sahare - Use of Magneto Abrasive Flow Machining to Increase MRR and Surface Finish, VSRD-MAP, Vol. 2 (7), 2012, 249-262.
- [2]. Ramandeep Singh and R.S. Walia - Hybrid Magnetic Force Assistant Abrasive Flow Machining Process Study for Optimal Material Removal, International Journal of Applied Engineering Research, ISSN 0973-4562 Vol.7 No.11 (2012).
- [3]. V.K. Jain - Magnetic field assisted abrasive based micro-/ nano-finishing, Journal of Materials Processing Technology 209 (2009), 6022-6038.
- [4]. Sunil Jha and V. K. Jain - Nano-Finishing Techniques, in Department of Mechanical Engineering at Indian Institute of Technology Kanpur - 208016, India.
- [5]. Sandeep Chouhan¹, Sushil Mittal - International Journal of Research in Aeronautical and Mechanical Engineering, International Journal of

Design and Fabrication of Digital Fuel Level Indicator for Two Wheelers

Dr. M. P. Nimkar¹, Abhilesh Kalbande², Hrishikesh Tandulkar², Chetan Chamat², Pranav Kale², Vaibhav Chaudhary²,
Sameer Petkar², Shoyeb Quereshi²

^{*1} Assistant Professor, Mechanical Engineering Department, DBACER, Nagpur, Maharashtra, India

^{*2} Students, Mechanical Engineering Department, DBACER, Nagpur, Maharashtra, India

ABSTRACT

Many Today in this digitized world, if the fuel indicator in the automobiles is also made digital it will help to know the exact amount of fuel available in the fuel tank which may be useful for the user. For the design of digital fuel level indicator the set-up is designed by using sine bar mechanism. The experimental set-up is analyzed for various inclinations of the tank, which will be displayed on LED display for the actual value of amount of actual fuel available in the tank. The experimental set-up is fabricated specifically for two wheeler, the same set-up may be design and fabricated for four wheeler also. The only parameter varied during the experimentation is inclination of tank which is taken as up to 35° measured from ground level. This study presents the effect of inclination of the tank on the amount of fuel available in the tank. This paper mainly focuses to find out a proper solution for indicating the exact availability of fuel in the tank digitally.

Keywords: LED, Float Sensor, Microcontroller, Sine Bar Mechanism, Fuel Tank.

I. INTRODUCTION

Fuel mileage in vehicles refers to the relationship between the distances travelled by an automobile to the amount of fuel consumed. Moreover in today's world fuel saving is also an important factor. For a developing country, where people are more obsessed with mileage, manual mathematical calculations are carried out to know the mileage of a particular vehicle. In conventional fuel mileage calculation method, the results are obtained by two successive refueling of the tank and also by the in vehicle parameters. A fuel level detector (fuel gauge) is a device inside of a two wheeler or other vehicle that measures the amount of fuel still in the vehicle.

This project mainly concentrates about the indication of fuel level in two- wheeler tanks. Various other features like the distance that can be travelled to the corresponding fuel, is added with this arrangement

which will explain the clear performance of the vehicle to the corresponding fuel. This project helps to avoid a lot of problems like fuel bunks at fuel stations, fuel theft and prevents us from getting into situations where we have to push our vehicles due to assumptions of the level of fuel. Nowadays the fuel indicator system for the two wheelers are digital but they do not display the exact amount of fuel which is present in the tank i.e. they show the amount of fuel in terms of bars and not in numbers or digits like Litre or Millilitre. So this problem is taken into consideration for our project work of developing the digital (numeric) fuel indicator system for two wheelers which shows exact amount of fuel in terms of Litres(L) or Millilitres (ml). In this project we first surveyed the existing fuel indicator systems and fuel tanks of different two wheeler.

II. LITERATURE REVIEW

Jaimon Chacko Varghese (1) studied Low Cost Intelligent Real Time Fuel Mileage Indicator for Motorbikes . In this competitive world, everyone strives for greater accuracy than the previously proposed ones. In order to increase the accuracy, we have used ultrasonic sensor and flow sensor to display the results of fuel level indication. The experimental analysis of our project yielded us satisfactory results over the conventional methods.

Deep Gupta, Brajesh Kr. Singh and Kuldeep Panwar(2) presents a study on a Prototyping Model for Fuel Level Detector and Optimizer. There are many sensor based techniques available in the market to measure the liquid level and gives you a close idea of quantity of the liquid, however none can provide you an exact approximation of quantity as in cars by fuel meters what we get an idea of whether tank is full, empty, half full etc.

Sarath T.M, SubhaHencyjose P, Danial Furtado,(3) studied Level Measurement Using Pressure Sensor Issued. The purpose of LED is gives and indicates the current level of position in the fuel tank. Sensor is used to find and trace the fuel level in the fuel tank. This concept is mainly useful to the automobile industries.

S. A. Gandhi, (4) studied Smart Fuel Level Indication System. .Until now the accuracy of the fuel level measurement has not been of great importance. The purpose measuring the fuel level has been to present the information on the dashboard with a fuel level meter. Instead of accuracy the two most important things have been to avoid rapid changes in the fuel level displayed and the meter must indicate that the tank is empty when the fuel level is below a predefined level.

III. METHOD AND MATERIAL

The following components are used in the experimental set – up , the details of which are discussed below:

1. 10 k Potentiometer : 15mm Shaft Pot With Nuts And Washers Pots.
Mounting diameter 16mm Middle terminals(wiper) of pots are connected to middle terminals of float sensor.
Right terminal connected to the ground Left terminal connected to the (arduino) & (arduino)to LED display.



Figure 1. Potentiometer

2. Float sensor
Based on Potentiometer for at the time 1litre =15cm .
Mounting diameter is 32mm .
Signal is transfer form middle terminal of float sensor to the Potentiometer.

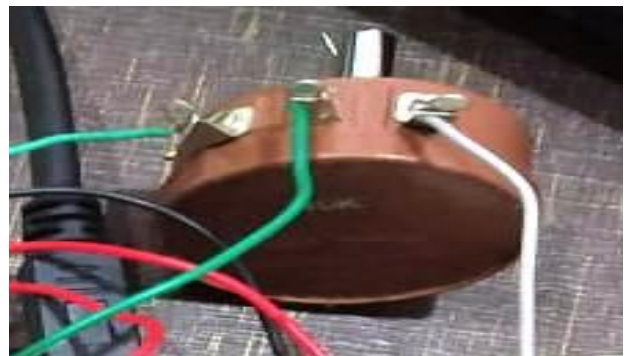


Figure 2. Float sensor

3. LED screen.
Specification for LED 16*2 display



Figure 3. LED screen.

4. Microcontroller:
Used the (arduino) nano kit with avr AT mega 128 microcontroller.
High – performance ,low power consumed .
Fully static operation .
Operating voltage's
4.5V to 5.5V AT mega 128.
Speed grades
0 to 16 MHz AT mega 128.
VCC Digital supply voltage .
GND Ground .

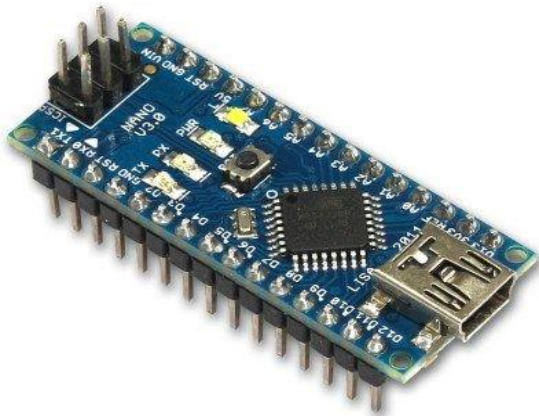


Figure 4. Microcontroller

5. Sine bar mechanism :

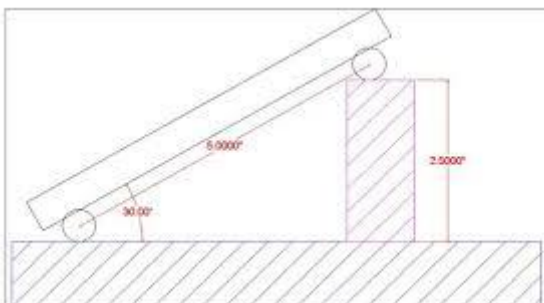


Figure 5. Sine bar mechanism

It is used for check or analyse the actual value shown in the LED display at various angle

IV. RESULTS AND DISCUSSION

The experimental set-up is design and fabricated as per the specification mention above further the experimental set-up is analyse for different inclination of fuel tank and to study its effect on the amount of fuel present in the tank. The LED display is use to show exact amount of fuel in the tank and the distance to be travelled by vehicle. This paper merely present the design and fabrication parts of experimental set-up. Further experimentation can be done for various inclination in later stage.

V. FUTURE ENHANCEMENTS

In future the proposed technique can be improved by adding fuel cells at different places of fuel tank to measure exact fuel levels at different conditions like Banking of road for particular densities at different altitude conditions of vehicle and a buzzer to announce the user about the abnormal conditions like low level, half level and full levels of the fuel tank to refill or warn themselves.

VI. CONCLUSION

This paper is very useful for a common man as it avoids him by getting cheated. This measuring unit should be fixed to the entire vehicle so that we can get an exact quantity of fuel to measure the inflow. Float level sensor is used to measure level of the tanks. This paper presents the study of effect of inclination of tank on the amount of fuel available in the tank.

VII. REFERENCES

- [1]. Aimon Chacko Varghese, Binesh Ellupurayil Balachandran "Low Cost Intelligent Real Time Fuel Mileage Indicator for Motorbikes" (IJITEE), Volume-2, Issue-5, April 2013.

- [2]. Deep Gupta, Brajesh Kr. Singh and Kuldeep Panwar "A Prototyping Model for Fuel Level Detector and Optimizer" page no 226- 229 - African Journal of Basic & Applied Sciences 4 (6): 226-229, 2012 ISSN 2079-2034.
- [3]. Daniel R. McGlynn, "Vehicle Usage Monitoring And Recording System", US Patent 4072850, February 1978.
- [4]. S. Kawamura, "Development of Navigation Control," Toyota Technology, Vol. 34, December 1984.
- [5]. Ti-Ho Wanga, Ming-Chih Lua and Chen-Chien Hsu, 2009. "Liquid-level measurement using a single digital camera", Elsevier, Measurement, 42(4): 604-610
- [6]. A.Avinashkumar¹, U.Singaravelan², "Digital fuel level indicator in two-wheeler along with distance to zero indicator" IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) e-ISSN: 2278-1684,p-ISSN: 2320-334X, Volume 11, Issue 2 Ver. III (Mar- Apr. 2014)
- [7]. Sarath T.M, SubhaHencyjose P, Danial Furtado, " Level Measurement Using Pressure Sensor" Issued .
- [8]. Rahul S.Vaidya " Digital Fuel Level Indicator" Journal Of Information, Knowledge And Research In
- [9]. Mechanical Engineering (ISSN 0975 – 668X| NOV 15 TO OCT 16 | VOLUME – 04, ISSUE – 01)
- [10]. S. A. Gandhi, Smart Fuel Level Indication System , GRD Journals- Global Research and Development Journal for Engineering | Volume 2 | Issue 6 | May 2017 ISSN: 2455-5703.
- [11]. Anirudha Mule¹ , Ujwal Patil², AnilMore³, S.R.Kale⁴ , STUDY OF DIGITAL FUEL METER AND FUEL THEFT DETECTION ,ISBN:978-81-932074-7-5 ,26 –march -2016

Design and Fabrication of Rice Planting Machine by Using Four Bar Link Mechanism

Dr. M.P. Nimkar¹, Mayur Dhande², Utkarsh Wanjari², Shubhash Fating², Sumit Nakade²,
Vipul Dhokane², Shubham Ninawe²

¹Assistant Professor, Mechanical Engineering Department, DBACER, Nagpur, Maharashtra, India

²Students, Mechanical Engineering Department, DBACER, Nagpur, Maharashtra, India

ABSTRACT

India is an agrarian country. About 70% of Indians are dependent on agriculture for their livelihood. India is one of the world's largest producers of rice, accounting for 20% of all world rice production. Rice is usually grown by planting rice paddy in the fields manually with hands. With this method of planting rice paddy, labour cost increases and it is a very time consuming process. These problems can be solved with the help of rice planting machine. This machine reduces labor cost and time to plant rice paddy. This machine has a simple mechanism and it is eco-friendly. This machine requires only one person for its operation. This machine can bring revolution in rice production. So, the main aim of this to design and develop a rice planting machine which will help the farmers to make the whole rice planting process mechanical resulting in reduction of labor, cost and time to a large extend.

Keywords: Agriculture Efficient Machine, Rice Planting Machine, Green Revolution, Paddy Mechanization

I. INTRODUCTION

Mechanical transplanting of paddy seedlings is a solution to the prevailing situation in the India to release the work force and to reduce the cost of paddy production. Farmers are aware of the advantages associated with transplanting of paddy over the broadcasting. But they are unable to practice it for high scarcity of labour. Still the transplanting machines available for the country are imported. Engine driven transplanters are high in cost and the inter-row, intra-row spacing are fixed which are not suitable for the Indian condition. Existing manually operated transplanters are inefficient. The main reason for the poor acceptance was the low capacity of the machine. A simple engine operated transplanter or manually operated transplanter having an average capacity of one hectare per day would be a better solution. . Rice is mainly produced

and consumed in the Asian region. India has the largest area under paddy in the world and ranks second in the production after China. Rice grown in India belongs to the indica. Rice occupies 23.3 per cent of gross cropped area of the country.

The objectives of the study are,

- To develop a two row paddy transplanter.
- To test field performance of the two row paddy transplanter.

II. METHOD AND MATERIAL

The main components of rice planting machine are base wheels, chain drive, gear pair, mechanical arm and paddy support plate.

BASE WHEELS: Wheels are basic yet important part of the whole rice planting mechanism. The power is generated from wheels. As the wheel rotates the power will be transmitted to mechanical arms. The wheels are given guide rods so that wheel can move easily in wet lands. The guide rods are placed such that the holes made by it are actually the place where the paddy seedlings are planted by the mechanical arms.

CHAIN DRIVE: It is used to transmit the power produced by base wheels to the mechanical arms as a result of which it oscillates.

GEAR PAIR: It is used to reverse the rotational direction from anticlockwise to clockwise direction.

MECHANICAL ARM: The mechanical arms are placed parallel to the wheels. The work of the mechanical arms is to grasp the paddy seedlings from the paddy support plate and plant it in the field. The reason to place the mechanical arms parallel to the wheels is that the mechanical arms plant the paddy seedlings in the holes made by the guide rods of the wheel.

PADDY SUPPORT PLATE: The paddy support plate is used to place the paddy seedlings. The main objective of it is to place seedlings such that the seedlings do not fall off while plantation process and the mechanical arms can grasp it easily and the seedlings are not damaged.

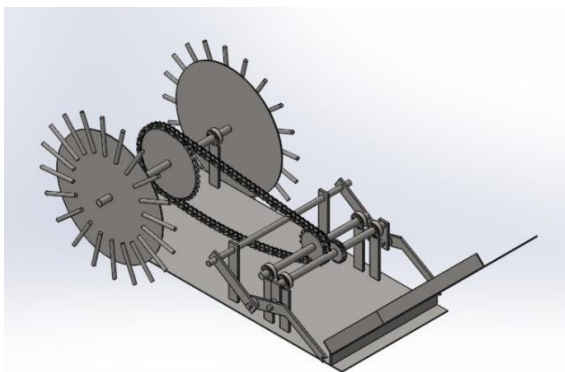


Figure 1. Isometric View of Rice Planting Machine

III. WORKING

In the present experimental set up when the machine is pushed from paddy support plate in the field for operating it, the base wheels rotate in anticlockwise direction. This produces power which is transmitted towards mechanical arms with the help of chain drive. Here, gear pair plays a vital role as it changes the rotational direction from anti-clockwise to clockwise direction. The mechanical arms start oscillating on its axis. While oscillating it grabs the paddy seedlings from paddy support plate and plants it in the field. So, finally rice planting of rice seedlings can be performed



Figure 2. Rice Planting Machine

IV. CALCULATION

Number of teeth of sprocket 1 = 44

Number of teeth of sprocket 2 = 18

Distance between two paddy seedlings in the same column = 300mm Ratio of sprockets = $44/18 = 2.44$

NUMBER OF GUIDE ROD:

Now, When sprocket 2 rotates 360° the rotation of sprocket 1 is upto 162° . Because of sprocket ratio = 2.44

Table 1

Number of cycles	Displacement of Sprocket 1 (Degree)	Displacement of Sprocket 2 (Degree)
Initial Position	0°	0°
1	148°	360°
2	296°	$2(360)=720^\circ$
3	442°	$3(360)=1080^\circ$

4	590°	4(360)=1440°
5	738°	5(360)=1800°
6	886°	6(360)=2160°
7	1032°	7(360)=2520°
8	1180°	8(360)=2880°
9	1328°	9(360)=3240°
10	1476°	10(360)=3600°

A. CALCULATION OF CHAIN LENGTH

Length of chain: $L = L_p * P_d$

Where L_p = The length of continuous chain in multiples of pitches P_d = Pitch diameter

Now to find pitch diameter P_d :

$$a = (30-50)P_d$$

Where a is the center distance and assume it as 55cm

$$55 = 50P_d$$

$$P_d = 1.1$$

Now to find length L_p :

$$L_p = 2a_p + (z_1 + z_2)/2 + (((z_1 - z_2)/(2 * 3.14))^{2 * a_p})$$

Where a_p is the approx. center distance in the multiples of pitches

$$a_p = a / P_d \\ = 60 / 1.1 \quad a_p = 54.54 \text{ cm}$$

Hence,

$$L_p = 2(50) + (44 + 18/2) + (((44 - 18)/(2 * 3.14))^{2 * 50})$$

$$L_p = 131.08 \text{ cm}$$

Length of chain: $L = L_p * P_d$

$$= 131.08 * 1.2 = 144.19 \text{ cm}$$

B. CALCULATION FOR BASE WHEEL

Now, The Highest common factor (H.C.F) of all the above mentioned displacement is 20°.

Therefore,

Number of Guide Rods = Displacement of Sprocket 2 / (H.C.F)

$$= 360° / 20 = 18$$

The above calculation shows the reason regarding the number of guide rods on the base wheel.

Number of Guide Rods = 18

Diameter of Wheel: Number of guide rods = 18

Therefore,

= Number of guide rods/ sprocket ratio

$$= 18 / 2.44 = 7.38 = 8$$

i.e. after every 8th hole a paddy seedling will be transplanted.

Distance between two paddy seedlings in the same column = 350mm, Therefore = 350 / (8-1) = 50mm

Now, by cross multiplication method, 18° = 50mm

$$360° = ? , (360 * 50) / 20 = 900$$

Therefore, Circumference of wheel = 900mm

Diameter of wheel = 900 / 3.14 = 286.62mm

Hence,

The diameter of wheel is taken approximately 288mm.

C. DIMENSION OF TRAY

Tray is used to keep the paddy seedling on the transplanter.

Tray is to carry the seed mat and to direct the plants to planting arm.

Dimension of tray :

Length of sheet metal = 35cm

Breadth of sheet metal = 17.5cm

Thickness of sheet metal = 0.1cm

D. DIMENSION OF SHAFT

Shaft is a revolving rod that transmits motion or power

Here, The one shaft contain fork and another shaft contain four bar linkage and power is given taken by manually and one shaft contain base wheel for movement of the machine.

Shaft dimension : Length of the shaft = 35cm (it is space required between the paddy seedlings)

Diameter of shaft = 2cm (it is optimum diameter for 30cm shaft)

E. DIMENSION OF FOUR BAR

A four bar linkage mechanism was used to get the required measurements. The trajectory of the planting unit depends on

: [1] Point P [2] Length L1, L2, L3 and L4 [3] Delta

L1 = 150mm, L2 = 60mm, L3 = 50mm, L4 = 160mm,

Delta = 101

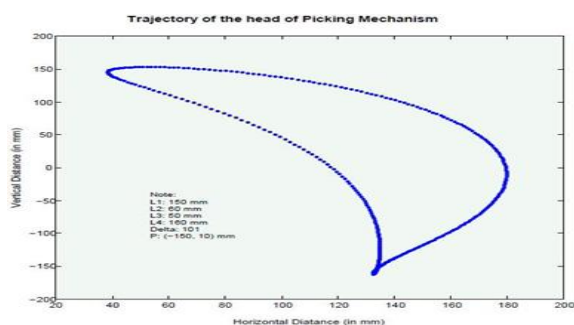


Figure 3. *Optimized length and angle of the Mechanism*

V. RESULTS AND DISCUSSION

Prototype mechanism was evaluated in the field and it worked. There were some points to be redesigned. As the tension is high in the chain, the nylon sprocket gets damaged easily. The sprocket and chain used for the machine were of foot cycle. When machine is operated the sprockets got damaged as bending of teeth takes place. So it is better to use motorcycle chains and sprockets for power transmission.

In this machine, ground wheel supplies the power to operate transplanting arm. Pulling the machine will rotate the ground wheel. Increasing the size and number of guide rods around ground wheels will increase contact area of the ground wheel with the field and make it easy to operate.

The machine has to be pulled for operating it. Ergonomically it is better to push weight rather than to pull. So it is better to turn the handle and the power supplying mechanism to push the machine instead of pulling it.

The machine is used to plant two rows simultaneously. Number of plants per one hill can be increased while altering the tray moving distance and adding engine to power the operation.

Theoretically, when rice planting machine is pushed for 3000mm distance, the number of paddy seedlings

transplanted is 10 in one column. So, totally 20 seedlings get transplanted.



Figure 4. Transplantation of Paddy Seedling

Practically, when rice planting machine was brought into action and pushed upto 3000mm, the total number of seedlings transplanted were 20. The time taken for this was 17 seconds. Total number of paddy seedlings transplanted in one hour is 4200. In one hectare area (Square Farm), approx. 330 columns and approx. 330 rows of paddy seedlings can be transplanted. So, total number of paddy seedlings transplanted in one hectare is approx. 1,10,000. The total time required in transplanting is 26.4 to 27 hours.

The dapog mat was compacted due to high tray angle. Tray angle should be reduced to avoid the problem. Suitable dapog for the machine must have a mud layer 1cm or less thick. Increased thickness of the mud layer increases the power requirement to the planting arm.

Diameter of the ground wheel axle should be increased to have better power supply and stability of the machine. Axle of the sprocket wheel must be constructed using iron to reduce the friction.

VI. CONCLUSIONS AND RECOMMENDATIONS

The rice planting machine has been designed and fabricated satisfactorily. Finally, we can say that it is a user friendly and efficient machine with low production cost. But, there is always a room for improvement. So, the improvements can be done before introducing it to the farmers. The machine is driven by man power but engine can be coupled to enhance the performance. Machine can be developed to transplant several rows simultaneously. The dapog must have thin mud layer for easy removal of seedlings.

VII. REFERENCES

- [1]. Baldev Raj Kamboj, Dharam Bir Yadav, Ashok Yadav, Narender Kumar Goel, Gurjeet Gill, Ram K. Malik, Bhagirath Singh Chauhan, Mechanized Transplanting of Rice (*Oryza Sativa* L. In Nonpuddled And No-till Conditions In The Rice-wheat Cropping System In Haryana, India, American Journal of Plant Sciences, 2013, 4, 2409-2413
- [2]. M. V. Manjunatha, B. G. Masthana Reddy, S. D. Shashidhar And V. R. Joshi, Studies On The Performance Of Self- propelled Rice Transplanter And Its Effect On Crop Yield, Karnataka Journal Of Agricultural Sciences, 22(2): 2009
- [3]. Rajvir Yadav, Mital Patel, S.P. Shukla, S. Pund, Ergonomic Evaluation Of Manually Operated Six-row Paddy Transplanter, International Agricultural Engineering Journal 2007, 16(3-4):147-157
- [4]. Dhanesh D. Patil & Dr. Mangesh R. Phate, Design & Development of Rice Planter Machine, Imperial Journal of Interdisciplinary Research (IJIRVol-2, Issue-8, 2016, 1241-1246.
- [5]. R. S. Khurmi, J. K. Gupta, Simple Mechanisms - Theory of Machines, S.Chand Technical Publishing, 2012 Edition, 94- 116
- [6]. R. K. Jain, Welding, Soldering and Brazing - Production Technology, Khanna Publishers

Design and Fabrication of Bicycle Operated Milking Machine

Prof. Rahul Gorle¹, Abhijeet Shende², Amit Mahure², Abhilash Kukde²,
Yash Fulekar², Akshay Mate², Rohan Mankar²

¹Assistant Professor Department of Mechanical Engineering Dr. Babasaheb Ambedkar College Of Engineering.
And Research, Nagpur, Maharashtra, India

²UG Scholar, Department of Mechanical Engineering, Dr. Babasaheb Ambedkar College Of Engineering. And
Research, Nagpur, Maharashtra, India

ABSTRACT

Modern milking machines extract milk from the dairy cow by applying a vacuum to the teat creating a pressure difference that results in milk flowing from the teat. Vacuum is applied by placing the teat into a cup in which the interior of the cup is subjected to a vacuum. The vacuum must be periodically reduced or removed to provide the teat with a rest period. The rest period is required because the vacuum causes the fluids (blood and other fluids) to accumulate in the teat causing congestion. Modern conventional milking machines attempt to provide this rest period by periodically applying a higher pressure (atmospheric) to the exterior of the cup causing the cup to collapse toward the teat. The typical conventional milking machine will thereby reduce the vacuum level on the teat. The periodic liner action created by the pulsing of higher pressure on the exterior of the liner is provided by a pulsates.

Keywords: Milking, Dairy, Pressure, Vacuum, Pedal, Teat, Pressure DIFFERENCE

I. INTRODUCTION

For milking a cow the required vacuum pressure is approximately -41Kpa. This pressure can be achieved with the help of piston cylinder arrangement. The vacuum is generated inside the kettle by the suction of air with the help of piston moving inside the cylinder actuated with the help of single slider crank chain mechanism. Now a day's increasing busy schedules of human due to lose the maintainability. So we develop a manual Milking machine is driven by Manpower, through a linkage. This machine is useful for human exercise. In this project we use crank chain mechanism which are operated by bicycle through a operating pedal. In market hand operated, battery operated and automatic operated milking machines are available but cost are more, so we want to use

manual operated milking machine for vacuum creation.

The manual milking machines extract milk from the dairy cow by applying a vacuum to the teat creating a pressure difference that results in milk flowing from the teat. Vacuum is applied by placing the teat into a liner in which the interior of the liner is subjected to a vacuum. The vacuum must be periodically reduced or removed to provide the teat with a rest period. The rest period is required because the vacuum causes the fluids (blood and other fluids) to accumulate in the teat causing congestion The main benefit of this system is cost effective over the other available systems with considerable reliability.

Milking is most critical work in dairy farming. When done manually, milking a cow, which yields 15 Litre milk is very tiresome. People who milk 2 or more cows in a day may suffer stiff shoulder and weakness. Milking machines make milking easier. There are different models and various makes of milking machines available in the market. Some milking machines can support 10 to 15 milking clusters simultaneously. Small formers having less than 6 cows cannot afford to buy and use these machines. So we are developing a simple, easy-to-use, low-cost, manually-operated machine for milking dairy cows. The machine consists of a powering unit and teat cluster assembly. A bicycle arrangement enables the user to sit on it and start pedalling. The vacuum generated by pedalling draws milk from the teat and massages the teat by squeezing the rubber liner.

II. METHODS AND MATERIAL

General layout of milking machine



Figure 1. Bicycle Milking machine

Components of milking machine

The basic components of milking machines as given below, it include Milk collection in a bucket placed next to the cow; Pipeline systems in which cows are milked in a cowshed and the milk flows to a central collection tank; Parlour systems in which all the equipment is centralized and cows come to the parlour for milking. Despite the great diversity of milking installations, milking machines work on the same basic principle: milk is collected from the cow by vacuum (suction).

1. Milking Cluster
2. Teat cup
3. Bearing
4. Shaft
5. Bearing
6. Cattle
7. vacuum gauge
8. Pulley

Vacuum Pump

The source of vacuum in a milking machine is a vacuum pump. Its function is to create a partial vacuum in the system by removing air from a confined space (the lines, teat cup liner, and reserve tank).



Figure 2. Vacuum pump

These pumps are normally of the sliding vane type and are driven by electric motor. They require little maintenance and periodic checking of drive belt tension along with topping- up of the oil reservoir is usually sufficient. The pump should have sufficient capacity to be able to maintain a vacuum of 15 inches of mercury through out the milking period. This level of vacuum should be sustained even if a unit is kicked off by a cow or as unit are fitted or removed from the animal. It is generally recommended that the pump be of sufficient size to displace at least 25% more air than is required to operate the milking units and to lift and transport the milk to the cooling and storage area if a pipeline system is used. This additional displacement allows for efficiency as the pump wears with age. Excess capacity is controlled by vacuum regulator.

Teat Cup and Cluster Assembly

Consists of four teat cup assemblies each having a rubber liner and connected to vacuum by rubber tubes and claw. The air admission hole to stabilise the vacuum must be kept clear. The cluster which attaches to the cow, consists of four teat cup assemblies a claw, a long milk tube. Teat cup shells are normally made of stainless steel, Plastics or a combination of plastics and metal are also used. The liner is a flexible rubber sleeve having a mouthpiece, and when assembled in the shell under tension, forms an annular space between the liner and shell. The teat cup assemblies are connected by short to stabilise the vacuum in the teat cups during milking, the claw has a small air admission hole, about 0.8 mm in diameter, which admits approximately 7–8 litres of air/min into the bowl of the claw. This air helps to carry the milk away, preventing flooding and violent vacuum fluctuations. The claw is made of plastics, and usually weighs about 0.25 kg and the total all up weight of a milking cluster is about 0.5 kg. The weight of a milking cluster is important and the correct weight relates to the design of liners. Too little weight gives incomplete milking because of high levels of stripping, too much weight will result in milking units falling off during milking. The bore of the rubber short milk tubes should not be less than 8 mm and the short pulse tubes not less than 5 mm, and the long milk tube should not be less than 12.5 mm. The effective claw bowl volume should not be less than 80 ml.



Figure 3. Teat cup and cluster Assembly

Table 1. Selection of appropriate variant for efficient and gentle milking.

Variants	Selection decisions
Size of teat cup liners	Dia. 19mm, 23mm, 25mm and 27mm
Vacuum level	Ranges from 40-50 kPa
Type and length of stimulation phase	Conventional or European. Time in minutes
Weight of milking cluster	Ranges from 1.5-3.5kg
Milk capacity of claw piece	200 cm ³ or 300 cm ³
Way to attach milking unit	From the side of animal or from the hind legs
Milking with one or two milking cluster per bucket	Requirement of dairy farmer and capacity of machine



Vacuum gauge



Air Hoses



Milking Claw



Milking Bucket

Figure 4. Different parts of mobile bucket milking machine

The following methodology was adopted:

- A herd of 12 buffaloes will be machine milked for full lactation period;
- Suitable sizes of teat cup liners will be determined among the available liners of 19, 23, 25 and 27 mm in diameters;
- Suitable weight of the milking cluster will be determined among the available clusters of 1.8, 2.1 and 2.6kg;
- Milking will be performed two times in a day (Morning and Evening) with even milking gap. The instantaneous increase in milk weight will be measured with time;
- Milking with one and or two clusters per bucket will be performed. Milking will be made on different vacuum levels. The most appropriate vacuum level will be determined;
- Any changes occurring in the teats after milking will be examined; and
- Alternate washing of the machine will be performed with an alkaline rinsing agent in the morning and an acidic rinsing agent in the evening.

III. WORKING

The principle of cycle operated machine milking is to extract milk from the cow by vacuum. The machines are designed to apply a constant vacuum to the end of the teat to suck the milk out and convey it to a suitable container, and to give a periodic squeeze applied externally to the whole of the teat to maintain blood circulation. When operator start cycling the manual force is get applied on the pedal so that the driving sprocket is start rotating. This power is transmitted to the driven sprocket by means of chain drive system. The shaft is connected to the driven sprocket starts rotating; the disc also rotates which is attached at the end of shaft. This rotary motion of disc is converted into reciprocating motion of the vacuum pump through linkages.



Fig 2: Working of Milking machine

This reciprocating motion of vacuum pumps sucks the air present in the storage tank and release into the atmosphere and creates vacuum in the storage tank. Generally the vacuum pressure of 400 mmHg is required and when it obtained the teat cup and cluster assembly is attached to the cow teat. After proper attach of assembly open the cock and due to the negative pressure difference in cows udder and storage tank the milk is extracted and store into storage tank.

IV. CALCULATION

Design of lever

Force acting on lever is determined; the cross section of lever is subjected to bending moment. The cross section at which the bending moment is maximum can be determined by bending moment diagram. The bending moment is maximum at section XX and it is



given by

$$M_b = P \cdot L$$

$$= 490.5 \cdot 150$$

$$= 73557 \text{ N-mm}$$

$$= 73.557 \cdot 10^3 \text{ N-m}$$

The cross section of the lever can be rectangular, for rectangular cross section

$$I = \frac{bd^3}{12}$$

$$\text{and } y = \frac{d}{2}$$

Where

b = distance parallel to the neutral axis

d = distance perpendicular to the neutral axis. Assume dimension d is taken as fourth of b

d=2b or d=4b (empirical relation) d=4*7

d=28 mm

$$I = \frac{bd^3}{12} \quad \text{and} \quad y = \frac{d}{2}$$

$$I = \frac{(7 \times 28^3)}{12} = \frac{28}{2}$$

$$= 12805.33 \text{ mm}^4 \quad = 14 \text{ mm}$$

Using the above proportion, the dimension of the cross section of the lever can be determined by

$$\sigma_b = \frac{M \cdot y}{I}$$

$$= \frac{73575 \times 14}{12805.33}$$

$$= 80.44 \text{ N/mm}^2$$

Design check for safe

Assume factor of safety = 2 (PSG Design data book)

$$\sigma_b = \frac{\sigma_{yt}}{f_{os}}$$

$$= 150 \text{ N/mm}^2$$

As obtained value is less than design value i.e. 80.44

$$\text{N/mm}^2 < 150 \text{ N/mm}^2$$

Hence, design of lever arm is safe.

V. RESULTS AND DISCUSSION

The milk buffaloes of this study in the beginning of the experiment were much nervous and shy due to unfamiliar milker and noise of the machine pump. However, the animals used to machine milking after 4-5 milking. The response of buffaloes to machine milking with different variables is summarized as under:

A. Size of teat cups liners for water buffaloes

The best suited size of teat cup liner for the milked animals was 25mm in diameter among the liners used

(19mm, 23mm, 25mm and 27mm). All test buffaloes with long and short teats could be milked extremely well using this liner. The 25mm dia. liner was used throughout the experiment period.

B. Vacuum level

Different vacuum levels were set for single and double clusters using vacuum control valve. The pulsation ratio and pulsation rate of the pneumatic pulsator was 60:40% and 60 per minute, respectively. The vacuum level 46-48kPa and 44-46kPa gave maximum milk yield (0.807 and 1.086 liters per minute) for single and double clusters, respectively (Table-2).

C. Type and length of stimulation phase

The milk let down was achieved by stimulating teats for two minutes and stripping the first jets into the buffalo's mouth.

D. Weight of milking cluster

The weight of the milking cluster has decisive influence on the milking results. Three different clusters weighing 1.8, 2.1 and 2.6kg were used. The 1.8kg cluster was having light teat cup shell and plastic claw piece. The disadvantage of this cluster was that the liners climbed up the teat contraction, resulting in long milking time and low milk output. The 2.1kg cluster was having light teat cup shells and stainless steel claw piece. This cluster proved to be superior for the smooth and sponge like teats. The 2.6kg cluster had normal teat cup shell and stainless steel claw piece. The problem faced was its adhesion and stretching.

E. Milk capacity of claw piece

The claw piece having volume of 300 cm³ gave the best results.

F. Way to attach milking unit

All the animals were milked from the side of the animals.

G. Milking with one or two milking cluster per bucket

This depends on the requirements of dairy farmer and the capacity of machine. During this experiment the animals were milked using single and double clusters.

for save natural energy source. System gives better performance considering manual milking machine.

Table 1. Selection of appropriate vacuum level using single and double cluster milking.

Nature of milking	Vacuum level (Pressure) (kPa)	Average milk yield per minute (Liters/minute)
Single cluster	42-44	0.71 1
	43-45	0.78 6
	44-46	0.79 2
	46-48	0.80 7
	47-49	0.72 4
Double cluster	41-43	
	41-43	0.72 6
	42-44	0.92 7
	43-45	0.96 4
	44-46	1.08 6
	45-47	0.98 1

VI. CONCLUSION

The equipment is useful for removal of milk by utilizing less energy gives better performance. After making this innovative system, we conclude that this system totally operated on man power. Therefore no requirement of energy means type of system is useful

VII. REFERENCES

- [1]. Design Data Book, PSG Tech, Coimbatore.
- [2]. V.B.Bhandari, A Textbook of Machine Design.
- [3]. "Milking Machine", Binuja Thomas, Scientific Officer, KSCSTE, July 24, 2011.
- [4]. The Milking Machine", Michel A. Watteau, Dairy Research and Development University of Wisconsin-Madison.
- [5]. "Milk Master", Raghava Gowda P., Ksheera Enterprise's.
- [6]. Mein, G.A. "Quantifying the performance of milking units". Proc. Moore park International Conference on Machine Milking and Mastitis". 1997, Cork, Ireland, pp. 15-25.
- [7]. R.S.Khurmi and J.K.Gupta, A Textbook of Machine Design, Euresia Publishing House (Pvt.) Ltd., pp.474- 518, 2005.
- [8]. <http://www.ansci.illinois.edu/static/ansc438/mastitis/milkmachine.htm>

Design and Fabrication Of multipurpose Power Weeder

Saurabh. A. Bobde¹, Aniket D. Kusme², Abhijeet B. Firke², Kapilkumar B. Behune², Kamlesh V. Thombare²,
Vaibhav M. Utane², Pawan M. Sidam²

^{*1}Assistant Professor, Mechanical Engineering Department, DBACER, Nagpur, Maharashtra, India

^{*2}Student, Mechanical Engineering Department, DBACER, Nagpur, Maharashtra, India

ABSTRACT

In India Weed control in crops is major problem. Generally Indian farmer use traditional way for doing fieldwork that is weeding is done by bulls or workers with the help of khurpi. This method is useful but it is very demanding of labour. To overcome this problem we introducing an alternative solution that is “power weeder”. This power weeder will remove grass between two rows and also do the seed sowing operation. We will use rotary adjustment for doing weeding as well as cultivation which is power operated. With the help of this machine we are trying to reduce human efforts with less maintenance cost. Main benefit is reducing labour cost by reducing the number of labours with less time consumption. The same machine is also used for sowing .The approach of this project is to develop the machine to minimize the working cost and also to reduce the time for seed sowing operation by utilizing engine energy to run the machine.

Keywords: Power Weeder, Weeding Efficiency, Seed Sowing, Row Spacing.

I. INTRODUCTION

Weeds are the most rigid and excessive biological constraint to crop production, and it cause viewless damage till the crop is harvested. The compositions of weeds are dependent on soil, climate, cropping and management factors. Valuable share of farmer’s time is wasted for weeding of crops. A weed is unwanted plant which is grow at wrong place at wrong time and which is harmful to crop. It is a plant that emulate with crops for water, nutrients and light. This can reduce crop production. Weeding is an important but equally labour intensive agricultural unit operation. Presently agricultural sector requires chemical free weed control that gives food safety. Consumers require high quality food products and special attention towards food safety. Weed management is as old as agriculture itself, but the methods and concept of controlling weeds have changed over the years. The process of removing unwanted plants in the field

crops is called weeding. The process of removing unwanted plants in the field crops is called weeding... This project aims in the design and fabrication of a machine which is used to remove the weeds and sowing too which makes it multipurpose.

II. PROBLEM IDENTIFICATION

Weed and seed sowing management is one of the tedious operations in vegetable production. Weeds are normally removed with the help of chemicals which can cause harm to the crops too. Power weeders are available but are not multipurpose.

III. LITERATURE REVIEW

Weed control is becoming an expensive operation in crop production .Mechanical weeding is preferred to chemical weeding because weedicide application is generally expensive, hazardous and selective. Besides,

mechanical weeding keeps the soil surface loose by producing soil mulch which results in better aeration and moisture conservation.^[1]

Kepner et al. (1978) claimed that mechanical method of weed control is the best with little or no limitation because of its effectiveness. Wearing is a general phenomenon in power rotary weeder that arises due to friction between soil and parts of machine. Wearing is observed mainly in rotary blades because it cuts the soil and penetrates into the soil. Mass of blades is taken before and after the performance operation.^[2]

Commonly three types of blade geometries are used as blades for weeders and tillers namely, L-shaped blades, C-shaped blades and J-shaped blades. so they are recommended for penetration in hard field and better performance in heavy and wet soils. The J-shaped blades are used for loosening, destroying the soil surface compaction and giving better ventilation to the soil, generally used for tilling hard and wet soils L-shaped blades are the most common widely used for the fields with crop residue, removing weeds.^[3]

A study was undertaken on performance evaluation of wet land weeder for paddy. The main emphasis of the study was the evaluation of wet land weeder i.e. computation of field capacity, field efficiency, weeding index, performance index, plant damage in percent and fuel consumption.^[4]

This research paper presents design modification in multipurpose sowing machine. In this they present that for sowing purpose we import the machinery which are bulk in size having more cost. To prevent this they design multipurpose sowing machine which consists of hopper, seed metering mechanism, ground wheel, power transmission system, seed distributor, and tiller. In this they design model on PRO-E software. the working is very simple as the blade rotates it directly transmit motion to ground wheel which directly connected through main shaft. . When

the ground wheel rotates the main shaft also rotates with the help of power transmission system. The scoops collect the seed from hopper and leave it inside the seed distributor. The tiller is having very good contact with ground.^[5]

Storage device is one of the important device system. And is designed according to weight sustained by the robot as well as the required capacity for planting. This component is stationary to bottom of this tank seed sowing disc is arranged. This disc serves the function of distribution of the seed, as for each complete rotation of the rotating wheel, only one seed fall from the tank. Also number of seed falling from tank varied according to requirements. This disc evenly opens the way to seed hence planting is done smoothly and accurately.^[6]

IV. OBJECTIVES

1. To design and fabrication power weeder for inter row crops whose distance between two rows is 20 inch.
2. To reduce use of harmful pesticides for weed control.
3. Reduce process time.
4. To fabricate a power weeder with sowing capability which will make it a multipurpose machine.

V. DESIGN CONCEPT

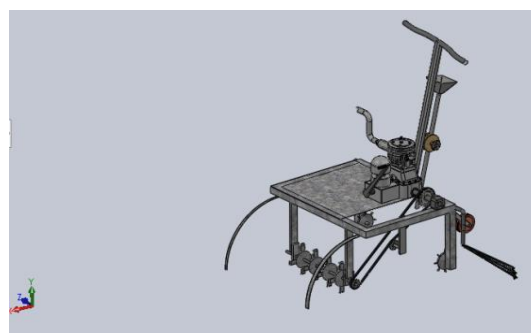


Figure 1

VI. POWER REQUIREMENT

To calculate the power requirement of the weeder, maximum soil resistance is taken as 0.5 kgf/cm². The speed of operation of the weeder is considered as 0.7 ms⁻¹ to 1.0 ms⁻¹. Total width of coverage of cutting blades is in the range of 12 to 30 cm. The depth of operation is considered as 4 to 7 cm, transmission efficiency is 82%.

$$P_d = (SR \times d \times w \times v) / 75 \text{ hp}$$

where,

SR = soil resistance, N/mm²

d = depth of cut, cm

w = effective width of cut, cm

v = speed of operation, ms⁻¹

Hence, power requirement is estimated as

$$P_d = (0.5 \times 8 \times 30 \times 1) / 75 \text{ hp} = 1.6 \text{ hp} = 1.26 \text{ Kw}$$

Total power required

The total power required is estimated as 1.95 hp as follows

where,

P_d = Power required to dig the soil:

η = Transmission efficiency.

Thus, a prime mover of 1.49 kW (2 hp) was required for this weeder.

VII. WORKING

1. Initially start the engine with the help of handle. We used the 2 hp petrol engine.
2. The rotary blades are used for the forward movement of the machine.
3. Chain drive is used to transmit power from engine to rotor shaft.
4. The blades are mounted on the front side of the machine. When blades starts rotating forward motion occurs.
5. Hence weeding is done with less effort and less cost.

6. Hopper containing seeds provides them to seed distribution wheel which drops seed at equal distance as the machine moves forward.
7. Seed distribution wheel is rotated by means of chain drive connected to the rear wheel shaft of weeder.

VIII. CONCLUSION

The main conclusion is as follows:

1. The machine requires one operator for operating the machine.
2. The machine can be used to a minimum 21 inch row spacing.
3. The average depth of operation was 20 mm. effective width of cutting tool is 11 inch.
4. Labour requirement in case of power weeder is least.
5. Overall working of power weeder was satisfactory, trouble free and smooth, there was no breakdown and accidental incident during operation.

IX. REFERENCES

- [1]. International Journal of Research in Advanced Engineering and Technology ISSN: 2455-0876 Volume 2; Issue 5; September 2016;
- [2]. Current Journal of Applied Science and Technology 24(5): 1-7, 2017; Article no.CJAST.37844
- [3]. International Journal of Engineering Trends and Technology (IJETT) – Volume 36 Number 7- June 2016
- [4]. Design and fabrication of seed sowing machine Volume; 04 issue ;09 sep-2017
- [5]. International Journal Of Agriculture Engineering volume 8,issue 1, April 2015,71-74 Journal TAD-80433 (now CPT-70833)
- [6]. Asian Journal of Agricultural Extension, Economics & Sociology 18(3): 1-8, 2017; Article no.AJAEES.34910 ISSN: 2320-7027

Design and Fabrication of Bricks Making Machine from Bio-Degradable Waste using for Horticulture

N P Mungle¹, Shubham Bhakte², Saurabh Patil², Shashank Rodkar², Tushit Ukey², Sahil Sarojkar², Saurabh Jaiswal², Mahakashyap Chauhan²

¹ Assistant Professor Mechanical Engineering DBACER, Nagpur, Maharashtra, India

² Students Mechanical Engineering DBACER, Nagpur, Maharashtra, India

ABSTRACT

This paper reports of design of manual block-making machine; it is a small fraction of a bigger research-study. the various components that make up the final design was done in order to establish the forces, stresses and dimensions. The provision of manure is one the most basic demand of a Farmer all over the World. It is one the most important challenges a farmer faces in his life. The problem of good manure varies from place to place. A good farmer provides, manure to the farm which gives good cultivation. In the developed world the problem is less pronounced, but in the developing nation like Nigeria and India, the problem of farmer is more pronounced. There is about million farmer units' deficit in Nigeria and India. Therefore, the production of high quality and affordable manure is paramount to solving farming problems in developing countries especially in Nigeria and India. Thus, research was about designing and construction of a multipurpose machine that produces high quality manure bricks for low cost farming. That is, for low income communities/earners. The constructed compressive earth brick (CEB)/block making machine can produce on average a total of 300 bricks per day. Thus, the machine is very affordable for small scale enterprise (SSE). Bricks or blocks produced by using this block machine are relatively cheap for those in rural areas and for low income earners.

Keywords: Compressive Earth Bricks, Bricks, Blocks, Bio-degradable waste.

I. INTRODUCTION

It is well known that proper and complete development is one of the most important issues in the world at present days, involves to build our communities in such a way that , we make an impact on the environment through how we survive our lives. In past years, the use of solid waste derived from agricultural products as extender in the manufacture of blended mixture of manure and soil has been the focus of researchers in the agriculture sector.

The Eco-bricks mission is to provide a highly economical solution to a waste problem while helping to curb a destruction of the local environment caused by clay quarries. The bricks are using 75% cow

manure. Eco-bricks claim that process will raise participating farmer income by 53% which will help to raise quality of life.

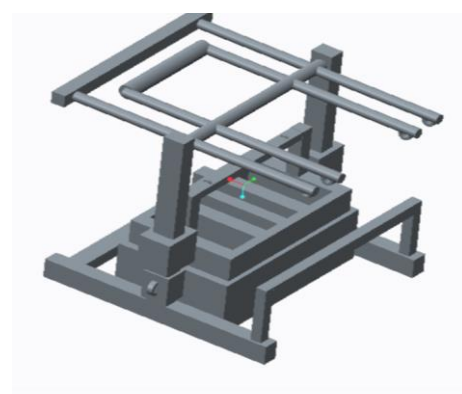


Figure 1. Design Model

II. LITERATURE REVIEW

[1]V.S.R. Pavan Kumar Rayaprolu et. al.(1) Presented result on study of cow dung ash (CDA) as supplementary cementing material in mortar and concrete. They highlighted the significance and necessity of consumption of these waste materials for the manufacturing of sustainable concrete for construction of green buildings in future.

[2]T. Omoniyi, S. Duna, et al.(2). They studied on the topic Compressive Strength Characteristic of Cow dung ash blended cement Concrete. This reports on an investigation into the use of cow dung ash as Supplementary Cementitious Material in concrete. Cement was replaced with cow dung ash up to 30% at 5% interval. Setting times and slump test were carried out on the fresh cement/CDA blended paste and concrete respectively.

[3] Peter Paa-Kofi Yalley, (3)he studied and research on the topic based on Strength and Durability Properties of Cow Dung Stabilized Earth Brick. This research, reports on the investigation into the strength and the durability properties of earth brick stabilized with Cow dung. A local earth was stabilized chemically by Cow dung. A best compressive strength at the dry state and after 15 minutes of immersion in water was obtained with cow dung stabilization at content of 20% by weight of earth. Bricks stabilized with 20% Cow dung contents by weight of earth has a dry and wet compressive strength of 6.64 and 2.27MPa respectively.

III. METHODS AND MATERIAL

Methods

- Pick up dry manure (cow dung , worm compost, sludge) in Pan using a spade and mixing the soil with the addition of water and properly mixing it.

- After mixing the dry manure , farming soil and water together the obtained mixture is then put into moulding blocks for making bricks
- After filling up the blocks the punching press is done over it.
- After punching the manure mixture the punch is unloaded and then the tray is pulled off.
- The wet bricks is then kept in the open air with sunlight and as soon as the bricks get dry it Will form the stiff and easy to break bricks.

IV. EXPERIMENTAL SET-UP



Figure 2. Punching plate



Figure 3. Moulding block



Figure 4. Brick moulding equipment.

V. CHEMICAL COMPOSITION OF MANURE (COW DUNG)

Table 1

Elements	Na	K	Ca	Mg	P	N	Zn
Percentage	.08	.3	1	.48	.84	1.37	286

VI. RESULTS

- ✓ On the basis of results obtained, the compressive strength vary with certain relation with the percentage of manure, soil and water in it, so we conclude that specimen soil 15% is best suitable
- ✓ The optimized mixed proportion is Manure 75% , Soil 15%, water 10% is best suitable to form brick.
- ✓ It is use for easy transportation and it is also use to provide compress and maximum quantity of manure in a sack to the farmer.



Figure 5

VII. CONCLUSION

Manure brick making machine can be produced from locally available mild steel to meet the specifications of imported Brick making machine. The moulded bricks are reasonable strong, hard, easy to break for farming purposes and environmental friendly. Thus, they are suitable for use for Farming , Horticulture and compress the manure waste or biodegradable waste

VIII. REFERENCES

- [1]. VSR.Pawan Kumar Rayaprolu et al, "Incorporation of Cow dung ash to motor and concrete", International Journal of engineering research vol.2 ,issue 3,may-june 20 2,pp-580-585.
- [2]. T. Omoniyi, S. Duna, et al,"study of plastic dust brick made from waste plastic", International Journal of mechanical and production engginering vol 5 issue- 0,oct-20 7.
- [3]. Peter Paa-Kofi Yalley,"use of waste and low energy material for construction" vol 2 oct-2008
- [4]. R.S. Khurmi, "Applied mechanics Strength of Materials", S. Chand & Company Ltd., Ram Nagar, New Delhi 0-055, (2005)
- [5]. R.S. Khurmi and J.K. Gupta, "A textbook of machine design" , Eurasia Publishing House Ltd., Ram Nagar, New Delhi, (2004).
- [6]. Soraj Kumar Panigrahi, Kommula Venkata Parasuram and Clever Ketlogetswe, Design and Development of Low cost Brick making

machine for producing Fly-ash- sand-Cement Bricks.

- [7]. R.Nithiya , Chris Anto . L, K.R. Vinod (2008) , Experimental investigation on bricks by using various waste materials".
- [8]. Ashby, M.F. (2005): Materials Selection in Mechanical Design, 3rd Edition, ELSEVIER Butterworth-Heinemann Publications,
- [9]. Autodesk Inventor, 20 6 (professional edition) Barkanov, E. (200). Introduction To The Finite Element Method, Institute of Materials and Structures, Faculty of Civil Engineering, Riga Technical University.
- [10]. Masonry units Concrete block Association, 2006, February. BS 5628:2005 – Code of practice for the use of masonry
- [11]. Shigley's Mechanical Engineering Design (8th edition), McGraw-Hill's, 054 pp. {ISBN 0-390-76487-6} Burdekin F. M., (2007) Generalizing the safety factor approach, Reliability Engineering and System Safety, pp. 964-973. Crespi, V., Galstyan, A., & Lerman, K.(20) Top–Down vs Bottom–up Methodologies in Multi–Agent System Design

Design and Fabrication of Automatic Braking System Using Obstacle Detecting Sensor : A Review

Manish Balpande, Harsh Choudhari, Pranit Ganar, Vishal Sonune, Akshay Paradkar, Chinmay Balsaraf, Prof V. N. Borikar, Prof. Y. S. Kapnichor

Mechanical Department, Dr. Babasaheb Ambedkar College of Engineering & Research, Nagpur, Maharashtra, India

ABSTRACT

Maximum accidents in vehicles happen because of failure of braking systems. The manual technique of applying brakes is always hazardous as it leads to accidents. Oblivion of the driver, letdown in the connections of braking systems, road situations, the uncontrollable speed of the vehicle and manual process of braking systems are the causes of accidents. It is essential to control brakes automatically through electronics devices to reduce the accident problems. In this research paper we recommend an operational methodology for automatic control of braking method to avoid accidents. This project describes about an electromagnetic braking system which is controlled by sensor and microcontroller. The project is made using sensor and it is controlled by microcontroller. Sensor fixed in front portion of the model. The sensor gets the data from surrounding area through fixed sensors on the model. The sensor sense the obstacle and actuate the electromagnetic brake.

Keywords: Automatic Braking System, Electromagnetic Brakes , Sensors.

I. INTRODUCTION

The most reliable braking system available today are the disc braking system .Electromagnetic Braking System is high-tech braking system use in small & heavy vehicle like car, jeep, truck, busses etc. Electro-magnet braking system is a combination of electro-mechanical Concepts. In this project we minimize the brake fail to avoid the accident. It also reduces the maintenance of our braking system. It is our new idea & new concept those we present in model form.

In driving cars , brake pipe leakages may occurs major accidents because all the liners are not in condition to work properly due to their low oil pressure to expanding the liners. But in our electro-magnetic brake system we performing individual braking system .This method is very protective method for avoiding accident .In case of any individual brake fail

the whole braking system does not fail which is not possible in case of oil braking and air braking system. This is biggest advancement in our project so we implement it in prototype model and explaining our project idea and concept with the help of model.

The major components which are going to be use in our project are disc brake plate, disc liner, braking coil, tension spring, battery(minimum 12 volt), SCR, transformer, led, relay, diode, bridge rectifier, transistor, capacitor .

The objective of the invention is to provide efficient and fail proof reliable braking. In November 1988 layh invented electro magnetic braking system. In our project we are using SCR which was not in Layh's system as additional modified component. Due to SCR we are able to control the braking force in a proportionate manner.

II. METHODS AND MATERIAL

The electromagnetic braking work on the electromagnetic principle. The principle of braking in road vehicle involves the conversion of kinetic energy into thermal energy (heat). Electromagnetic brake work in a relatively cool condition and satisfies all the energy requirement of braking at high speed, completely without the use of friction.

At the initial condition the supply from battery come to SCR but not reaching to electromagnet due to SCR properties. Which in off condition unless and until it recames the gate supply, when we will press the brake pedal or lever, it move the plunger in potentiometer. Which causes the resistance in the circuit are decreases. Which result in get current flow due to the characteristics of SCR as the gate current increases the output SCR also increases in the directly proportional manner. This implies that more press the pedal the more current will flow through the circuit. This is received by electromagnetic field developed. Which causes the iron plate to get attract to each other. Due to SCR, the suddenly braking is prevented, so gradually braking is possible.

As the current is circulated through the coil. It converts the soft iron core in to an electromagnet. The plate attached to the electromagnet also get magnetized which causes the iron plate to attract towards each other as the magnetic force exceed the spring force. The movable plate starts moving toward the fixed plate. Due to this moment liners get in contact with the disc. As the liner and disc comes in contact with each other the frictional force is developed which result in braking action to take place.

In electro-magnetic braking system we used silicon control rectifier (SCR) TYN 612 of (2.5 Amp) in our project we fired the gate pulse of SCR and gives the output of SCR to electro-magnet for performing the brake on disc. This SCR provides high current to our

electro-magnetic attract the iron brake pad onward .this method rotating motion of wheels. In our project we design electro-magnetic coil attach with liner system.

In this braking system, individual braking is used which minimize the failure of braking system. This method is very protective method for avoiding accident. In case of brake fail, other brake works but in oil brake system & air brake system it is not possible. This is biggest advancement in this electromagnetic brake system. so we implement this idea in prototype model and explaining our project ideas and concepts

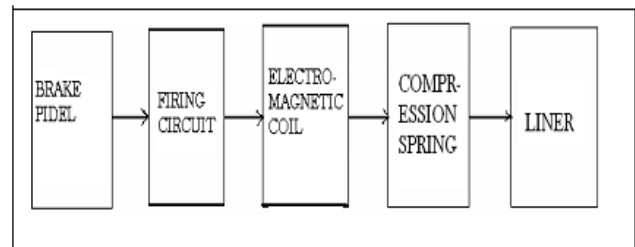


Figure 1

COMPONENTS USED IN ELECTRO- MAGNETIC BRAKE

- **DISC**

The disc brake is a device for slowing or stopping the revolution of the wheel. A brake disc typically made of cast iron or ceramic composites(including carbon, kevlar and silica), is connected to the wheel . To stop the wheel, friction material in the form of brake pads is force mathematically, hydraulically, pneumatically, or electromagnetically against both side of the disc. Friction causes the disc and attach wheel to slow or stop.

Various higher performance brakes have holes drilled through them. This is recognized as cross-drilling and was initially done in the 1960s on racing cars. Brake pads will outgas and under use may create boundary layer of gas between the pad and the disc hurting braking performance. Cross-drilling was created to

deliver the gas someplace to escape. Although modern brake pads seldom suffer from out gassing problems, water residue may build up after a vehicle passes through a puddle and impede braking performance. For this reason, and for heat intemperance purposes, cross drilling is still used on some braking components, but is not favoured for racing or other hard use as the holes are a cause of stress cracks under severe situations.

Discs may also be positioned, where narrow channels are machined into the disc to aid in eliminating dust and gas. Slotting is the preferred method in most racing environments to eliminate gas, water, and de-glaze brake pads. Some discs are together drilled and slotted. Slotted discs are generally not used on standard vehicles because they rapidly wear down brake pads; however, this elimination of material is helpful to race vehicles meanwhile it keeps the pads soft and evades vitrification of their surfaces.

On the road, drilled or slotted discs still have a positive effect in damp conditions because the holes or slots avoid a film of water building up among the disc and the pads. Cross drilled discs will ultimately crack at the holes due to metallic fatigue. Cross-drilled brakes that are factory-made poorly or subjected to high stresses will crack ample faster and further severely.

New technology now permits minor brake systems to be fitted to bicycles, mopeds and nowadays even mountain bikes. The market for mountain bike disc brakes is very huge and has enormous variety, ranging from simple, mechanical (cable) systems, to highly costly and too powerful, and 6-pot hydraulic disc systems, usually used on downhill racing bikes. Improved technology has seen the formation of the first vented discs for usage on mountain bikes. The expelled discs are similar to that seen on cars and have been introduced to help stop heat fade on fast alpine descents. The first use of disc brakes on mountain bikes utilized mechanical braking systems which did

not offer solid braking power, which is why disc brakes were not popular among mountain bikers until hydraulic disc brakes were presented. Most mountain bike brake rotors are made from stainless steel and are very thin. Some use a two-piece floating rotor style and some lightweight rotors are made from aluminium.

Disc brake discs are generally manufactured out of a material entitled grey iron. The SAE keeps a specification for the manufacture of grey iron for various applications. For normal car and light truck applications, the SAE specification is J431 G3000 (superseded to G10). This specification orders the accurate range of hardness, chemical configuration, tensile strength, and other properties necessary for the future use.

Discs are usually broken in one of four methods: warping, scarring, cracking, or excessive rusting. Service shops will sometimes respond to any disc problem by exchanging out the discs totally, this is done mainly where the cost of a new disc may actually be lower than the cost of labour to reappear the original disc. Mechanically this is pointless if the discs have not yet got manufacturers minimum thickness and it is risky to use them, or vane rusting is not simple (ventilated discs only). All leading vehicle manufacturers indorse brake disc skimming (US: rotor turning) as a solution for lateral run-out, vibration issues and brake noises. The milling process is performed in a brake lathe, which eliminates a very thin layer off the disc surface to clean off minor damage and restore uniform thickness. Milling the disc as necessary will make the most of the mileage out of the present discs on the vehicle.

- 1) Warping
- 2) Scarring
- 3) Cracking
- 4) Rusting

- **BRAKE PAD**

The brake pads are intended for high friction with brake pad material rooted in the disc in the process of bedding while wearing consistently. Though it is usually thought that the pad material contacts the metal of the disc to stop the car, the pads work with a very thin layer of their individual material and produce a semi-liquid friction borderline that creates the genuine braking force. Of course, dependent on the properties of the material, disc wear amounts may diverge. The properties that control material wear include trade-offs between performance and permanency.

The brake pads must usually be swapped regularly (depending on pad material), and most are well-found with a method of warning the driver when this needs to take place. Approximately thin piece of soft metal that causes the brakes to squeal when the pads are too thin, while others have a soft metal tab rooted in the pad material that closes an electric circuit and lights a warning light when the brake pad gets thin. Further expensive cars may use an electronic sensor.

While almost all road-going vehicles have only two brake pads per calliper, racing callipers consume up to six pads, with varying frictional properties in a staggered pattern for optimum performance.

Initial brake pads (and linings) contained asbestos. When working on an older car's brakes, care must be taken not to inhale any dust existing on the calliper (or drum). While newer pads can be made of exotic materials like ceramics, Kevlar and other plastics, care to circumvent inhalation of brake dust produced during operation should still be practiced no matter what materials are employed.

- **MAGNETIC COIL**

An electromagnetic coil (or simply a "coil") is made when a conductor (usually a solid copper wire) is coiled around a core or form to generate an inductor or electromagnet. One loop of wire is usually referred to as a turn, and a coil consists of one or more turns.

For use in an electronic circuit, electrical connection terminals called taps are often connected to a coil. Coils are frequently coated with varnish and/or wrapped with insulating tape to provide additional insulation and protected them in place. A completed coil assembly with taps etc. is often called a winding. A transformer is an electromagnetic device that has a primary winding and a secondary winding that transfer's energy from one electrical circuit to another by magnetic coupling without moving parts. The term tickler coil generally refers to a third coil placed in relation to a primary coil and secondary coil A coil tap is a wiring feature establish on some electrical transformers, inductors and coil pickups, all of which are sets of wire coils. The coil tap(s) are points in a wire coil where a conductive patch has been visible (usually on a loop of wire that extends out of the main coil body). As self initiation is larger for larger coil diameter the current in a thick wire tries to flow on the inside. The ideal use of copper is achieved by foils. Sometimes this means that a spiral is a better alternative. Multilayer coils have the difficult of interlayer capacitance, so when multiple coatings are needed the shape needs to be radically changed to a short coil with many layers so that the voltage among consecutive layers is smaller (making them more spirals like).

- **SOFT IRON CORE**

The magnetic core is a key factor in electrical and electromechanical devices such as electromagnets, transformers, and inductors. A magnetic core is a magnetic material with a high magnetic absorptivity, but are usually chosen to be magnetically 'soft', that is, they are made of materials that do not sustain a significant magnetic field when outside field is detached, unlike 'hard' magnetic materials.

The use of a magnetic core can extremely concentrate the strength and rise the effect of magnetic fields produced by electric currents and permanent magnets. The properties of device will rest on crucially on the following factors:

- a. The geometry of the magnetic core.
- b. The amount of air gap in the magnetic circuit.
- c. The properties of the core material
- d. The operating temperature of the core.

III. RESULTS AND DISCUSSION

The general braking system used in today's vehicle of pneumatic or hydraulic. But in hydraulic and pneumatic there is chance of failure by leakage in tube or pipe carrying air or hydraulic fluid. These cause an thousand of accident on roads every year. This causing dead and economical loss .thus we decide to overcome this problem by using electromagnetic principle. Replace hydraulic or pneumatic system by electro magnetic system. In electromagnetic braking system there is less failure as no chance of leakage.

In this project we decide to use general disc brake. Which operate by electromagnetic force to run this system, we use the system consist of electromagnetic coil aligned with the disc brake arrangement circuit control the current flow to the electromagnetic which is control by brake pedal. Electromagnetic arrangement produces the force according to the current it receives. Brake gets applied according current given.

IV. CONCLUSION

The electromagnetic braking system can be implemented in the bike, car, bus, truck etc. It is mostly implemented in the places where braking at high speed is needed. It is also used with the combination of ABS (anti lock braking system). It is definitely overcome the drawback of the hydraulic, pneumatic and mechanical braking system. It is very effective due to its individual braking system. The chances of breakdown are very less compare with other braking systems.

V. ACKNOWLEDGMENT

We would like to thank all those who have directly or indirectly encouraged us to take up this project.

VI. REFERENCES

- [1]. Ganesan. Automobile Engineering. S Chacnd And Company Ltd.
- [2]. Gibbs, G., Jia, H., & Madani, I. (2017). Obstacle Detection With Ultrasonic Sensors And Signal Analysis Metrics. Inair , 28, 173-182.
- [3]. Hermann, D., Galeazzi, R., Anderson, J. C., & Blanke, M. (2015). Smart Sensor Based Obstacle Detection For High Speed Unmanned Surface Vehichle. Ifac , 4 (48), 190-197.
- [4]. Koli, G., Patil, A., Patil, P., & Sokashe, S. (2017). Intelligent Braking System Using Ir Sensor. Ijasre , 03 (2).
- [5]. V.K.Mehta. Basic Electrical Engineering. S Chand & Company Ltd.
- [6]. Vaghela, A., Patel, J., & Vaghela, S. (2016). Obstacle Avoidance Robotic Vehichle Using Ultrasonic Sensors,Android And Bluetooth Orc Obstacle Detection. Irjet , 3 (2), 339-348.
- [7]. Vairavan, V., Kumar, Ajith, S., Ashiff, S. S., & Jose, G. C. (2018). Obstacle Avoidance Vehichle Using Ultrasonic Sensors Arduino Controller. Irjet , 5 (2), 2140-2143.

Design and Fabrication of 360° Flexible Drilling Machine

Harshal Umale, Kunal Pardhi, Nehal Bhivgade, Pranav Meshram, Abhijeet Wanjare,
Sahil Wazade

Bachelor Student, Department of Mechanical Engineering, Dr. Babasaheb Ambedkar College of Engineering & Research Nagpur, Maharashtra, India

ABSTRACT

Nowadays machines are widely controlled by embedded system, for this an effective control of machines are necessary. Our project can easily rotate and drill in any direction, Materials like plastic, wood and light metals can be drilled with this machine. In previous researches there were alignment problems. We can drill holes horizontally, vertically and upside down. This project uses hinges with motor and supporting structure. Our project deals with an interesting manner of drilling system using ATMEGA328 microcontroller and HC-05 Bluetooth serial communication module.

Keywords : Drilling Machine, Automated, Bluetooth Module, Microcontroller

I. INTRODUCTION

Drill machines have been important part of every industry. Drilling holes in parts, sheets & structures is a regular industrial work. Well aligned and perfect drilling needs fixed and strong drills. While drilling, some parts cannot be drilled using fixed drills due to low space between drill bit and drill bed. In such cases we need to use hand drills but hand drills have alignment problems while drilling. So here we propose a 360° flexible drilling machine that can be mounted on table and can be used to drill holes horizontally, vertically. So, this makes it possible for easy drilling even in complicated parts and surfaces.

Drilling Machine Construction

The important parts of a drilling machine are a base, column, drill head and spindle. The base is made of cast iron and may rest on a bench, pedestal or floor depending upon the design. The column is mounted vertically upon the base. It is an accurate machine and the table can be moved up and down on it. The drill spindle, an electric motor and the

Mechanism are meant for driving the spindle at various speeds and are mounted on the top of the column. The power is transmitted from the electric motor to the spindle.

Drilling Machine Working Principle

The working principle of this flexible drilling machine is initially started by connecting wires to 12V battery and then pairing machine with Bluetooth module. Machine consist of four D.C motors for rotating drill bit, chuck and to move connecting arm up and down and to give machine a full 360° rotation.

II. METHODS AND MATERIAL

Our project can easily drill at any direction. Due to this job setting operation is not complicated as well as it reduces the setting time for the operation. It also takes into consideration the most effective method of controlling the drilling machine by bluetooth module. Materials like wood, plastic and light metals drilled with this drilling machine. While drilling the work

piece should be fixed on the work table. As the machine tool exert Vertical pressure to original a hole it loosely called a drill press. The Up/Down and rotating mechanism is available in this Drilling Machine. These arms are made up of mild steel. The parameters in the subgroup is called the degrees of freedom of the joint.

DESIGN CONCEPT



Figure 1

CALCULATIONS

Length of arm 1 = 450 mm

Length of arm 2 = 370 mm

Length of base = 300 mm

Motor 1: - Speed (N) = 500 RPM

$$P = 2\pi NT/60$$

$$60 = (2 * \pi * 500 * T) / 60$$

$$T = 1.45 \text{ N-m}$$

Motor 2,3,4: - Speed = 300 RPM

$$P = 2\pi NT/60$$

$$= (2 * \pi * 300 * T) / 60$$

$$T = 1.90 \text{ N-m}$$

III. CONCLUSION

1. A number of holes can be drilled with this simple unit in 360 degree.
2. It is economical and efficient.
3. It becomes relatively cheap when compared to other units considering its use and cost of project.

IV. REFERENCES

- [1]. Mr. Jay M. Patel, Mr. Akhil P. Nair, Prof. Hiral Chauhan, 3-Directional Flexible Drilling Machine, International Journal for Scientific Research & Development, Vol. 3, January 2015, Pages 1262 – 1264.
- [2]. Praveenkumar, B. S., Niranjan Hugar, Ajithkumar A., DESIGN OF ROD GROOVING MULTISPINDLE DRILLING UNIT, Asian Journal of Science and Technology, Vol.07, March,2016, Pages 2600-2605.
- [3]. Prof. Gadhia Utsav D, Shah Harsh A, Patel Viral A, Patel Kushang P, Amin Harsh J, DESIGN & DEVELOPMENT OF UNIVERSAL PNEUMATIC DRILLING MACHINE: A REVIEW STUDY, International Journal For Technological Research In Engineering, April-2016, Pages 1614 – 1616.
- [4]. N.VENKATESH, G.THULASIMANI, S.NAVEENKUMAR,S.K.MALATHI,S.PALANISAMY, Combined Drilling and Tapping Machine by using Cone Mechanism, International Journal of Scientific & Engineering Research, Volume 7, May-2016 , Pages 11– 15
- [5]. Prof. P.R. Sawant, Mr. R. A.Barawade , DESIGN AND DEVELOPMENT OF SPM-A CASE STUDY IN MULTI DRILLING AND TAPPING MACHINE, International Journal of Advanced Engineering Research and Studies, Vol. 1, January-March, 2012 , Pages 55-57.
- [6]. Mr. Sakate P.R., Mr. Jadhav A.S., Prof. Bamankar P.B., Miss. Jagadale A.A., Miss. Bhosale P.S., A Review on Multi Spindle Drilling Special Purpose Machine with Respect to Productivity, International Journal for Scientific Research & Development, Vol. 3, 2015, Pages 560 – 562.

Experimental Analysis of Solar Panel Cleaning System

Vivek Dhengare, Kunal Gajbhiye, Pankaj Raut, Arshad Sheikh, Abhishek Gaurkhede, Manish Umredkar,

Dr. V. R. Khawale

Mechanical Engineering Department, RTMNU/DBACER, Nagpur, Maharashtra, India

ABSTRACT

The Solar Panels Farms are generally situated in dirt and dust areas which is mostly in case of tropical countries. The performance of solar panels depends on various factors, the power generated by farm can decreased if there is dust and dirt on panels and this is the main factor for reduction in efficiency of PV panels. One can generally assume a reduction of about 40% - 50%, if the panels are not clean properly for 1-2 months. So to overcome this problem and to increase the efficiency of power production cleaning of module on regular basis is necessary. To clean the dust, an automatic cleaning robot is developed, which will clean the panels on regular interval of time. The mechanism is based on control circuit, DC motor to clean the panels. The paper provides you with the idea how the robot will work and its effect on the energy production by solar farms. It will also to help to understand the problem arise due to not cleaning of solar cells.

Keywords: Solar Panels, Energy loss, Design, Cleaning.

I. INTRODUCTION

The robots are alternative method to the conventional methods and they are design so to avoid the wastage of water and to reduce the human effort to clean solar modules, but also labour-intensive, method of sending human workers to hose and wipe down panels manually or use a truck-mounted sprayer to do so., Dirty panels produce less electricity, so to increase the production of electricity cleaning of panels should be must, but the need to use water for cleaning those panels, especially in dry regions, makes even a clean power project less eco-friendly. In certain remote corners, the water digged out from the ground is too brackish for use and also it contains the corroded elements, if not being treated properly, due to this there is increase in production cost of a solar power plant. In dusty areas such as the Middle East and India, solar panels could lose electricity production by 10 % to 35 % over time if they are not washed on regular basis. There is increase in 2-3 % more electricity production than employing humans due to use of such

robots, the challenge of Keeping solar panels dust free will grow as more solar power projects are built worldwide. The cheap labour and plenty of water supply will able to continue for making manual washing the low-cost choice for solar power plant owners. The natural way to clean is air; air flow removes a bulk of the dust while the brushes get rid of the rest. So to avoid the wastage of water, to reduce the human effort and time require cleaning the modules, a robot is developed which will help to clean the module on regular interval of time, and also it will overcome all the problems arise. The robot itself is a solar power charged but it will runs on two 12-volt lead-acid batteries at night. Solar electricity recharges the batteries during the day. The robot will clean the panels to and fro on regular interval of time. After completing its task the robot returns to a docking station and uses the rotational energy to get rid of the dust captured by the microfiber. With about one year of field data of its robots' Hence this paper will help to get an idea and innovative method of cleaning solar panels automatically.

II. METHODS AND MATERIAL

The solar panel was clean by using robotic arm and water sprinkle. The robotic arm consist of two dc motor of 100 rpm and two brushes which is mounted on two shaft of two dc motor which is perpendicular to the panel and other two dc motor of 30rpm arranged in the rack and pinion arrangement helps in moving the robotic arm throughout the panel area for cleaning purpose of the panel the submersible pump place in the water tank that provide water to the sprinkle which is fixed at the head of the panel for wet cleaning of the panel the battery is provided to run the dc motors and the pump.



Figure 1. Front view of solar panel cleaning system

Component specification

Table 1

S.N.	Components	Size(mm)	Quantity
1	Solar panel	666x560	1
2	Robotic arm	572x50	1
3	Brush	Diameter(110), Length(133)	2
4	Rack	765	2

DC motor Specifications:

DC motor 30 rpm

Motor Type : DC with Gear Box, Metal Gears

Base Motor : DC 3000 RPM
 Shaft Type : Center, Circular 6mm Diameter with Internal Hole for coupling, 23 mm shaft length.
 Maximum Torque: ~2.5 Kg-cm at 12V
 RPM : 30 RPM at 12V
 Weight : 145 Gms
 Max Load Current : 250mA at 12V-30RPM
 Power : 770 watt
 Horse Power : 0.0010328 HP
 Dc Motor 100 rpm
 Shaft Type : 6mm shaft diameter, 23mm shaft length.
 Maximum Torque : 1.2 Kgcm
 RPM : 100
 Weight : 125 gm
 Load current : 300 mA at 12v
 Power : 1026.2 Watt
 Power in HP : 0.0018659

III. RESULTS AND DISCUSSION

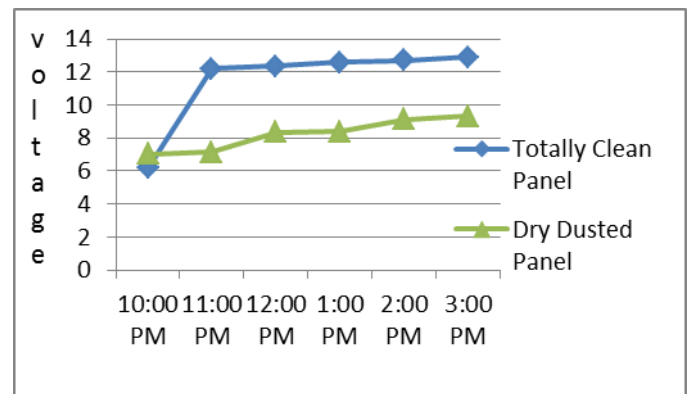


Figure 2. Voltage vs Time For dusted and Non-dusted solar panel

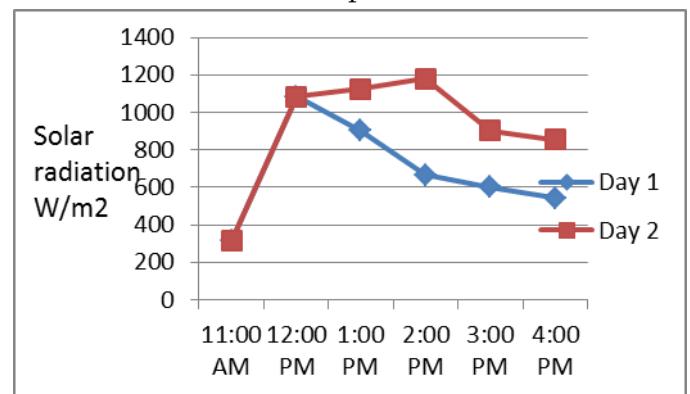


Figure 3. Graph of Time vs Solar Radiation Intensity

V. REFERENCES

Panel efficiency

Date 5 march 2019

Timing between 1-2 PM

Panel output

For totally clean panel = 21.05 volts

For dry dusted panel = 19.28 volts

Hence

Efficiency of panel = $(21.05 - 19.28) / 21.05 * 100$
= 8.40 %

Hence the efficiency loss due to dusted panel is 8.40%

- [1]. "Robotic Device for Cleaning Photovoltaic Panel Arrays" by mark Anderson, Ashton Grandy, Jeremy Hastie, Andrew Sweezey, Richard Ranky, Constantinous Mavroidis
- [2]. "Development of an automatic robotic cleaning system for photovoltaic plants", by Nawaf Albaqawi and Alireza Gheitasi, Waikato Institute of Technology, New Zealand, 2014.

A. The Following are the Result Obtained after Analysing the Robot

- 1) Single robot for single row (row length doesn't matters)
- 2) Brush length can be adjusted according to panel width.
- 3) Robot self charged from battery.
- 4) Designed to run fully autonomous (No human is required)

B. There are some Benefits also which are stated as follows

- 1) Improvement in performance of solar
- 2) system
- 3) Reduce cost of operations of solar plants
- 4) Extend lifetime of solar panels
- 5) Make solar power plants greener.

IV. CONCLUSION

1. In that project we are saving time and money.
2. In future it can reduce the weight and can made compact design of the system with the help of new technology.
3. Due to use of robot cleaning mechanism the efficiency of PV panel increases.
4. There is no labour requirement for cleaning.
5. This project is used for both wet cleaning and dry cleaning process.

Solar Powered Air Compressor for Domestic Purpose

Prof. Sailesh Dhomne, Utkarsh R. Dhakate, Shivam Thambhake, Saurabh A. Wankhede, Shubham S. Nimkande,
Durgesh Kurekar

Mechanical Engineering, Rashtrasant Tukdoji Maharaj Nagpur University/Dr. Babasaheb Ambedkar College of
Engineering, Nagpur, Maharashtra, India

ABSTRACT

Conservation of energy and improvement of efficiency has always been the major area of concern for the engineering this days. The conventional air compressor have high power consumption factor. Such air compressor is even bulky and can't be afforded by individual. Such compressor has industrial application but can't be used for domestic purpose. By this study we are trying to make a air compressor which use renewable source of energy and the compact size of air compressor makes it useful for domestic purpose.

Keywords: Conservation, Efficiency, Compressor, Renewable, Domestic.

I. INTRODUCTION

According to the first law of thermodynamics, "energy can neither be created nor be destroyed; it can only be converted from one form of energy into another form of energy". Solar panel used for running the air compressor works on the same principle, solar radiation would be absorbed by solar panel and would convert it into another form i.e. electrical energy. Such electrical energy would power the air compressor. The electrical energy generated from this panel would be stored in battery.

High rpm would lead in more liter per minute output. Solar panel used was of 100 watt which is sufficient for charging the battery in a good time. The panel was connected to a switch mode power supply, then battery. The entire setup runs with a power consumption of 48 watt.

II. METHODS AND MATERIAL

Designing a compressor which had a compact size was important. Hence we have designed such compressor using a aluminum alloy which is light in weight and easy to machine for smooth internal finish. Using a light weight motor with high rpm has been used further the speed has been enhanced by using gear arrangement between motor and compressor.



Figure 1

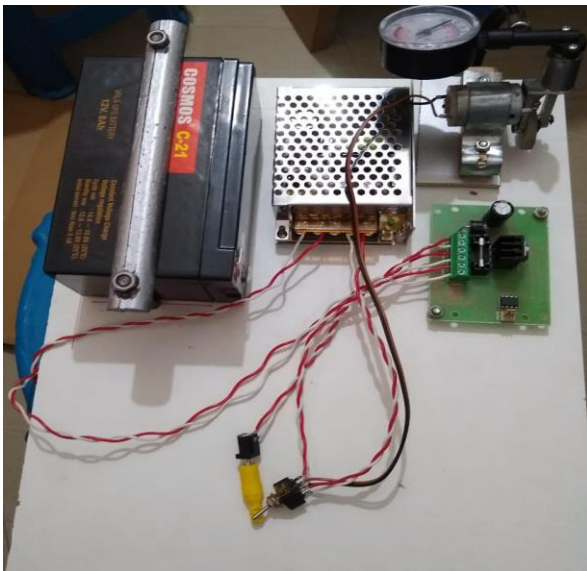


Figure 2

Piston Pin
 $d_o = 0.04 \times 30$
 $= 1.2 \text{ mm}$
 $\approx 1.5 \text{ to } 2 \text{ mm}$ (according to availability)
 Displacement-
 $= \pi/4 \times D^2 \times N \times L \times n$. ($N=250 \text{ Rpm}$, $n=1$)
 $= 6185010.537 \text{ mm}^3/\text{min}$
 $= 6.18 \text{ l/min}$.
 Time required filling up of tyre
 $= 10/6.18$
 $= 1.6 \text{ min/per tyre}$.
 Practical time taken = 3 min/per tyre

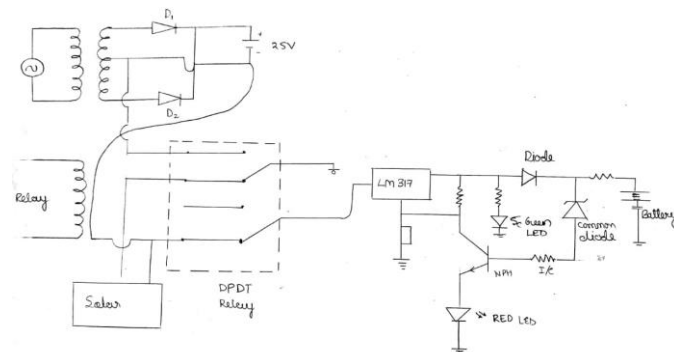


Figure 3

Calculations for compressor:-

Sut of material from pg 44(db).

Material- Aluminum Alloy

SAE No 39 Ni 2mg 1.5 sut= 253

Taking FOS=2

$$\sigma_t = sut = 253 = 126 \text{ N/mm}^2$$

$D = 30 \text{ mm}$ (inner diameter of cylinder)

$C = \text{re boring allowance} = 0.8$

The thickness of cylinder-

$$T = p_{max} \times D + c / 2\sigma_c$$

$$P_{max} = 1.10 \text{ N/mm}^2 \text{ (160psi)}$$

$$(1.1 \times 30 / 2 \times 126) + 0.8$$

$$\approx 1 \text{ mm}$$

Take stroke = 1.15D

$$= 34.5 \text{ mm}$$

$$\approx 35 \text{ mm}$$

Swept volume-

$$V_s = \pi/4 \times D^2 \times L = 0.0243$$

III. RESULTS AND DISCUSSION

The solar compressor designed by us has a efficiency of 6 litres/min and 0.0243m³ swept volume. The current rating for the compressor has been rated as 4 ampere and battery rating has 12 volts.

As the power rating is less than the industrial power compressor hence this compressor can be used by every individual. This compressor can be installed along the road side and hence air station can be installed as similar to petrol station. As this compressor doesn't need large power supply this can be used at any remote places by using solar panel. As this setup has a less fabrication cost the entire setup can be purchased.

A. Title and Author Details

VARGHESE has examined the effect of low tire pressure in vehicle. According to him low tire pressure can result in high fuel consumption and poor handling of vehicle. His system is designed to regulate the pressure in each tire without compromising the safety and driving comfort. Now days CO₂ emission is a major environmental issue. Fuel consumption is directly associated with the tyre inflated pressure and .hence more the fuel consumption more the CO₂ emission. According to a survey released in 2001 by the Department of Transportation's NHTSA a reduction in

fuel economy of 3.3% mile per gallon was recorded for a decrease of 0.55 bar in tyre pressure. [1]

Nader Jalili and **Prakash Venkataraman** studied the possibility of using nitrogen in tire inflation to improve safety and performance of vehicle. During low inflation pressure in tire the contact patch area between the tire and road increases as a result more rolling resistance is experienced by the tire lower tire pressure causes irregular wear and tear of tire. According to him using nitrogen in passenger car can improve driving safety and also improve tire life and fuel economy. His study concludes that nitrogen can maintain the tire pressure 74% better than shop air and hence produces 70% less rolling resistance than air inflated tire. [2]

Loya Chandreshkumar ,**Joshi Pranav** ,**Chaudhri Hemraj** ,**Prof. Gaytri Bokade** has designed tyre pressure monitoring system with fuel leak detection .Their TPMS doesn't requires a pressure sensor as it has an observer coded in software. An under inflated tire can cause higher friction in tire and road which decreases fuel economy and tire life. They have studied that an under inflated tire can reduction in tyre life fuel economy 305 and 3% respectively. Research has concluded that for better tyre life the tyre pressure should be maintained near STD value.[3]

T.J.S. Anand, **M.Warikh** study presents that air pressure in the car tyre falls from 10 to 20 kPa per month in which this is equal of adding a 70 kg person into the car. The facts suggest that, tyres with proper inflation pressure save their life up to 20% which sums nine months additional to its life span. It can also save fuel from 4% to 10%, improving braking efficiency up to 20%, makes the steering system easy and enables self steer. Inflating optimum tyre pressure can save tyres from overheating, explosion; nonetheless it can cushion motoring and cut maintenance cost. The desired tyre pressure values need not be noted by the consumer. This device is not only restricted to be used with kiosk for speedy

inflation, but also it can also be used along with industrial air compressor or other air pressure resources. This device is designated Automatic Tyre Pressure Controller (ATPC). ATPC was discovered to be very promising in giving the preset pressure values with the minimum error of less than 1% with subject to dynamic loading and fatigue cyclic test. The test assures that the entire operating system can function up to seven years without any major variation in pre-set values.[4]

Sadda Mahendra1, **N. Amara Nageswara Rao2** analysed the effect of tyre over force and inflation pressure on the rolling loss and fuel utilisation is studied. The sidewalls of the tyre contract and relax over and over, nearing to 500 times per minute at highway speeds. And, the tread deforms from a circular to a flat shape and back to circular again there being certain practical factors that can abate flex and heat. Inflation pressure has effects as follows; underinflated tyres lose their shape at a faster pace, develop high heat, and hampers fuel economy. Perfectly inflated tyres conserve fuel by mitigating rolling resistance. The stresses developed are lesser than the yield strength of rubber even when the tyre is overloaded. The rolling loss will be increased for overloading and in turn will elevate the fuel consumption rate. A possible solution for controlling fuel consumption by varying tyre operating load/pressure conditions is given. Incrementing tyre pressure is a feasible and cost effective method of fully or partially nullifying for increased rolling resistance. Some fuel conservation can be accomplished by this method.[5]

Prof. P.M. Borade, **Gopinath Keskar**, **Yash Girme**, **Digambar Ghevade**, **Akshay Shelke**.

Explained the basic workings of a CTI system study, the different aspects in which CTI systems give benefits are analysed and the cost benefit of installing a CTI system is studied. The system which possesses sensors feed the information to a display panel which can be handled manually. The electronic unit keeps in hand all the information. The source of air is obtained

from the vehicles' air braking system and pneumatic systems. Hence it aids re-inflation of the tyres to optimum pressure conditions. The transportability requirements in the former Soviet Union and Warsaw pact countries were highly consuming due to poor roadways and highway quality. As a result, a major step was taken by these countries to develop systems to enhance mobility, which included primary suspensions and central tyre inflation systems (Kaczmarek, 1984). Kaczmarek (1984) believed that "One of the most effective and well proven systems that have been adapted to wheeled tactical vehicles to improve the overall vehicle mobility is CTI". [6]

Sagar Adakmol, Tushar Shende, Dikshit Poriya, Sanjot Fotedar, Prof. S.P.Shinde.

Studied to develop a self-inflating tire system. It ensures that tires are properly inflated at all times. The design of project is successfully tested and installed with the help of centralized compressor. This innovation leads to provide fuel savings of 1-4% and increase tyre life by up to 10%. The system uses reciprocating compressor to get the air from atmosphere & to compress it to a required pressure. It is perfect for inflators, cars and bikes. When the pressure drops below required level, the sensors sense the change in pressure and start compressor to recover the pressure drop inside the tyre. It does not require any special attention from driver side after the system being installed. It eliminates the need of checking tyre pressure manually, thus saving time and labor.[7]

Ambarish G. Mohapatra. develop the automobile Tire Pressure Monitoring System (TPMS) helps the driver to be alert about the change in tire pressure. The pressure sensor was made using a self temperature regaining diaphragm type strain gauge. It was designed to measure maximum tyre pressure of 2.5kg/cm² or 35.55psi. The system was continuously transmitting the tire pressure value to a central receiver. The output of central receiver system is displayed on the LCD receiver. Whenever the

pressure will go above 2.5kg/cm² and below 2.2kg/cm², the feedback was displayed on the LCD display and additional warning sounds using buzzer. Various output sensors with different input pressure are noted at room temperature. Same as further an elevated temperature to determine different static character of sensors. By using different pressure levels and analysing the sensors output, different sensors characteristics were studied. To maximize the life of transmitted battery and minimize the consumption of power, the pressure data successfully transmitted.[8]

T Pletts. Studied the workings of a CTI system. This technology offers perks such as saving in road maintenances cost and mobility improvement, but it also reduces the two main components. A CTI system permits a vehicle operator to optimize tyre and vehicle performance by varying inflation pressures in response to changing operating conditions (load, road and vehicle speed) while the vehicle is moving (Foltz and Elliot, 1996). It is largely recognized that the installation of a CTI system results in increased traction, improved vehicle mobility and utilization, higher off-highway travel speeds, improved driver comfort, reduced road surface damage, reduced fuel consumption and extended tyre life (USDA,1993). Central tyre inflation systems have many advantageous benefits in the transportation industry. These benefits include, improved vehicle mobility due to the increase in traction when tyre pressures are lowered, improved ride quality and cargo safety due to the reduction in vehicle vibrations when the correct tyre pressure is used for a particular road condition, reduced road maintenance because sediment production is limited and lowered road construction costs, increased fuel efficiency and a massive increase in the life of vehicle tyres. All these benefits contribute to a considerable cost saving in the overall operation of a transportation vehicle. [9]

P.Y. Andoh, F. Davis, Y.A.K. Fiagbe, T. Alhassan presents the effect the tyre pressures of vehicles on

fuel consumption and ways to optimize running cost due to tyre pressure. The effects of tyre pressure on vehicle performance are the main issues to look after and cannot be overlooked as research shows that it has effect on tyre wear, fuel consumption, and rolling resistance. Required tyre pressures are generally recommended by vehicle manufacturer and going by the manufacturer recommendation will result in the optimum performance by the vehicle. The results of the research shows that less than 10% of vehicle have their tyre pressure as that recommended, the remaining more than 90% had tyre pressures deviated. Therefore we can infer that performances of other 90% are optimum and may be consuming more fuel. Hence the developed model can be used to anticipate the consumption of fuel consumed by a vehicle on hilly roads.[10]

Julien Brondex studied on constantly and automatically adapting the tire pressure to the driving conditions that a car encounters is an ambitious task. However it is probably an innovation that could contribute to more environmentally friendly road vehicles when one knows the impact of tire pressure on fuel consumption. It is almost impossible to get a reliable estimation by simulations alone of the extent to which such a system will allow to reduce and save fuel. This is because of the fact that the correlation between tire pressure, rolling resistance and fuel consumption is not fully understood. Therefore, the only way to quantify the benefit of the adaptive tire pressure is to make a prototype and to perform measurements. That was the purpose of the project and this is why all the components selected are listed in Appendix C with their reference number and manufacturer. [11]

Mrs. O. Hema Latha, Mr. S. Irfan Sadaq, Mr. Md. Abdul Raheem Junaidi present the work to prove solar photo voltaic is used to generate the power to run the air compressor used for inflating tyres. A solar powered air compressor does exactly as a regular compressor, but it's powered by the sun. Air

compressors are often used to inflate tyres, power drills used by oil and gas companies because there is no power available, solar powered air compressors make powering these inflation system and drills very easy. The radiations in the form of energy received from sun is collected by the solar photovoltaic cell, the energy is stored and collected in battery and, from battery it is brought to the compressor if the compressor is DC motor operated. The voltage regulator or charge controller, microcontroller are used to control the fluctuation in the voltage. From batteries using inverter the energy is converted for AC motors air compressor or in many cases SMPSs are also used. Once the battery is charged the energy is transferred to air compressor and it starts working. The purpose for the research work had been successfully performed and it had been noted that the actual operation of an Air compressor can be performed using solar panel voltage which is used to drive the air compressor effectively without any external supply that will eliminate the usage of using non conventional source of energy. [12]

Anirudh Addala & Srinivasu Gangada aims to examine the performance of a car which takes air as the working medium. Air car is currently being developed which is still in progress and is under R&D stage all over the world. Reviews and feedbacks on the availability and the impact of the fossil fuels in the present and future generations led us to design a vehicle which runs by renewable energy sources. The technology of compressed air vehicles is turned out to not new, in fact, it has been around for years. Compressed air technology allows engines/ motors that are both non-polluting and economical. After months of research and development, the compressed air car is brought into existence. Unlike electric or hydrogen powered vehicles, compressed air car is not expensive. [13]

Priyadi, M. Pujiantara, and M. H. Purnomo focuses on the work done on the size of tank required to store the potential energy of the compressed air that provides

the mechanical power needed by DC generator that supplies a fixed power DC load for 12 hours. The design of the rest of system (upstream of the storage tank) will be discussed in future reports. In the paper they discuss about an application of small scale CAES to replace chemical battery storage in solar home systems (SHS). SHS is a government electrification project for non powered rural areas where it is difficult to use power source other than solar power. The project is set up by distributing small solar photovoltaic (PV) systems with capacity to cover even the minimal electrical power requirements needed for lighting in areas like rural communities. More research of the efficiency related to the regulator setting show that, if it is possible to use a boost converter with a wider input voltage range. More work is required to evaluate the components upstream of the storage tank and to complete this assessment of the possibility of this system replacing conventional SHS arrangements. [14]

Harendra Kumar Yadav, Vijay Kumar and Vinay Kumar Yadav, pivot their study on the multifarious use and necessity of solar energy in India. Country like India is very unbalanced in electricity production. Production is less when compared to consumption. Requirement consumption is around 5000 trillion kWh per year. There is prolific amount of solar radiation incident over India ranging from 1200-2300 kWh per square meter. The government of India is trying to improve the solar energy consumption and launched Jawaharlal Nehru National Solar Mission (JNNSM) on 31st March 2013. Solar power is very great option in country like India to increase power production. This is also very good for our environment protection and our economic development. Solar energy is unlimited source of energy, and our country also provide suitable climate for this energy, but we need some better ideas and source to increase efficiency and decrease production cost [63,64,66]. [15]

For many decades, utilizing the energy from the sun has always had great potential but large scale utilization has faced many bottlenecks. Amongst the many bottle necks are cost of Technology, energy storage, distribution of solar power and daily/seasonal variability of solar resource. R.S. **Anand, M.K. Das, S.S.K. Iyer, S. K. Mishra, P.S. Sensarma, A. Singh** address these challenges under three broad research themes of solar energy capture, distribution, and also the storage.

We are proposing to use multicrystalline Si solar cells, amorphous silicon solar cells, and 2D-concentrators using micro morph Ge/GaAs/GaInP Solar Cell Technology. This will also encourage the entrepreneurs of our country to invest more in solar energy technologies. The projects are serving as test platforms for large scale solar energy utilization technologies, providing more energy source. These projects are making their way in the academic institutions in long-term solar energy research, development, and pedagogical teaching activities. The project have increased the awareness of green technologies amongst the public.[16]

IV. CONCLUSION

After reading and analyzing the data collected from various papers we can conclude that a proper tyre pressure is necessary for optimum fuel consumption and less wear tear of tyre. Such solar powered air compressor can be used for refilling tyre and air station can be created along road or also can be used for household purpose.

V. REFERENCES

- [1]. ALEXANDER VARGHESE,"Influence of Tyre Inflation Pressure on Fuel Consumption, Vehicle Handling and Ride Quality Simulation and Modelling".2013.

- [2]. Loya Chandreshkumar, Joshi Pranav, et al. / International Journal of Engineering Research and Applications (IJERA) ISSN: 2248-9622 www.ijera.com Vol. 3, Issue 3, May-Jun 2013, pp.345-348.
- [3]. Nader Jalili, Ph.D., Prakash Venkataraman, "TIRE NITROGEN FILLING SYSTEM, A FINAL REPORT TO: Industrial Technologies Sector of Ingersoll Rand Corporation."
- [4]. T.J.S. Anand, M. Warikh. "Engineering of Tire Pressure Controlling device: An Invention Towards Successful Product Development Sivarao", International Journal of Basic & Applied Sciences IJBAS Vol: 9 No: 9-261-1952091 IJBAS-IJENS @ International Journals of Engineering and Sciences IJENS.
- [5]. Sadda. Mahendra¹, N. Amara Nageswara Rao². "Effect of Tyre Overload and Inflation Pressure on Rolling Loss (resistance) and Fuel Consumption of Automobile Cars" ISSN (e): International Journal of Computational Engineering Research (IJCER) 2250 – 3005 Vol, 04, Issue-10, October– 2014, pp36-42.
- [6]. Prof. P.M. Borade, Gopinath Keskar, et al. "CENTRAL TIRE INFLATION SYSTEM". ISSN: 2455-2631 June 2017 IJS DR | Volume 2, Issue 6 IJS DR1706005 International Journal of Scientific Development and Research (IJS DR) www.ijsdr.org 66 CENTRAL TYRE INFLATION SYSTEM .
- [7]. Sagar Adakmol, Tushar Shende, et al. "Central tire inflation system" IJSRD-International Journal for Scientific Research & Development| Vol. 4, Issue 03, 2016 | ISSN (online): 2321-0613
- [8]. Ambarish G. Mohapatra. "Design and Implementation of diaphragm Type Pressure Sensor in a Direct Tire Pressure Monitoring System (TPMS) for Automotive Safety Applications". International Journal of Engineering Science and Technology (IJEST). Vol. 3, No. 8, August 2011
- [9]. T Pletts. "A LITERATURE OVERVIEW OF CENTRAL TYRE INFLATION SYSTEMS", School of Bioresarches Engineering and Environmental Hydrology University of KwaZulu-Natal Pietermaritzburg, July 2006 .
- [10]. P.Y. Andoh, F. Davis, Y.A.K. Fiagbe, et al. "Tyre Pressure Model For Predicting fuel Consumption of Vehicles On Ghana Roads". INTERNATIONAL JOURNAL OF SCIENTIFIC & TECHNOLOGY RESEARCH VOLUME 2, ISSUE 9, SEPTEMBER 2013 ISSN 2277-8616 120 IJSTR 2013
- [11]. Julien Brondex. Design of a prototype of an adaptive tire pressure system.
- [12]. Mrs. O.Hema Latha, Mr. S.Irfan Sadaq et al. "Solar Based Air Compressor for Inflating Tyres", IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) e-ISSN: 2278-1684, p-ISSN: 2320-334X, Volume 11, Issue 5 Ver. IV (Sep- Oct. 2014), PP 29-33 29
- [13]. Anirudh Addala & Srinivasu Gangada, "Fabrication and Testing of Compressed Air Car Viswanadha Institute of Technology and Management", Global Journal of Researches in Engineering Mechanical and Mechanics Engineering Volume 13 Issue 1 Version 1.0 Year 2013 Type: Double Blind Peer Reviewed International Research Journal Publisher: Global Journals Inc. (USA) Online ISSN: 2249-4596 Print ISSN: 0975-5861.
- [14]. A. Priyadi, M. Pujiantara, and M. H., "Sizing Compressed-Air Energy Storage Tanks for Solar Home Systems.", Conference Paper • June 2015 DOI:10.1109/CIVEMSA.2015.7158620
- [15]. Science, Engineering and Technology (IARJSET) National Conference (NCREE-2015) IMS Engineering College, Ghaziabad Vol. 2, Special Issue 1, May 2015, page 63.[
- [16]. R.S. Anand, M.K. Das, et al. "SOLAR ENERGY RESEARCH ENCLAVE ", submitted to Indian Institute of Technology Kanpur, August 2009.

Experimental Analysis of Domestic Refrigerator by Using Spiral Shape Condenser

Chaitanya Rokde¹, Mayur Ade¹, Mayur Burade¹, Ayaz Sheikh¹, PrafulSomkuwar¹,
 Sashant Sawarkar¹, Prof. AsmitaPatil², Prof. P. A. Hatwalne²

¹BE, Mechanical Engineering Department, Dr. Babasaheb Ambedkar College of Engineering & Research
 Nagpur, Maharashtra, India

²Professor Mechanical Engineering Dept., Dr. Babasaheb Ambedkar College of Engineering & Research Nagpur,
 Maharashtra, India

ABSTRACT

Most of the household refrigerators work on the vapor compression refrigeration system which are holding high coefficient of performance. The research article elaborates work about COP enhancement of domestic refrigerator by making alternative arrangement for condenser. The maximum utilization of thermal energy is achieved by proper utilization of Heat Exchangers, and selection of temperature gradient. The purpose of paper is to compare the COP of refrigerator by using spiral shaped condenser and the refrigerant R-134a with commercial refrigerator. It was observed that the COP of VCRS noticeably increased by using spiral type condenser with enhance rate of Heat Transfer through Heat Exchanger.

Keywords: Condenser, COP, Refrigeration, Heat Rejection.

I. INTRODUCTION

Most of the domestic and commercial refrigerators are operates on 'Vapor-Compression' cycle and run for normal COP value which holds the scope of improvement with alteration made in components assembled in system. Energy recovery is the prime requirement today to optimize energy consumption. The maximum utilization of thermal energy is achieved by properly designed Heat Exchangers, and selection of temperature program. Figure 1 shows the schematic diagram of components for typical vapor-compression refrigeration system. Basic components of refrigeration system as shown in the below Fig., they are compressor, Condenser, Expansion valve, evaporator.

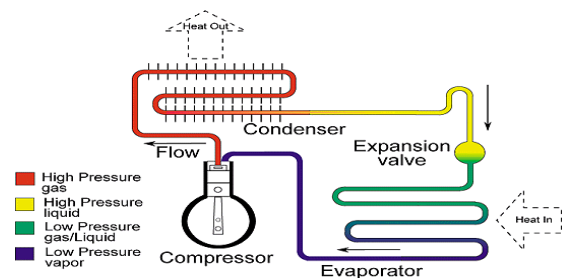


Figure 1

Refrigerant effect is obtained at the evaporator, low pressure liquid refrigerant flows in the coils of evaporator and absorbs heat from product; the refrigerant vaporizes and leaves for compressor. From Figure, the vapour is compressed at constant entropy and exit compressor as a vapour which holding very high temperature. The liquid refrigerant goes through expansion valve/Throttle valve, where its pressure decreases abruptly, causing flash evaporation and auto-refrigeration of less than half of the liquid. The resulting refrigerant vapour returns back to the

compressor inlet to complete the thermodynamic cycle and so on. This report work elaborates the heat exchanger i.e. condenser. Which is mainly classified based on the shape of the coils, type of flow of refrigerant. Condenser is a device or unit used to condense a substance from its gaseous to its liquid state, by cooling it. Lots of modifications and exploration has been done on refrigeration system in order to improve the efficiency and ease of getting cooling effect. P.G. Lohote et al. [1] contributed by using spiral condenser to raise COP of refrigerator to the value that was never before. The Experimental work centric about performance study of spiral shaped condenser used in refrigerator holding 165 liters' capacity. B. Santosh Kumar et al. [2] performed the experimental investigation of vapor compression refrigeration system with spiral shaped condenser. Experiment was done on kelvinator refrigerator of 165 liters and hermetic compressor is used. Bilal A. Qureshi et al. [3] studied experimental observation on the impact of fouling on the condenser of a vapor compression refrigeration system. An experimental study of condenser fouling factor on some performance characteristics and properties of a simple vapor compression system is presented. It can be concluded that due to fouling heat transfer rate of condenser was decreases.

II. EXPERIMENTAL WORK

The condenser is one of most important component of Vapor compression refrigeration system which contributes lot in the overall system performance. As function of Condenser is dissipating the heat absorbed by refrigerant during the process of evaporation and compression. The refrigerant COP is the function of its operating temperature, the current work undertakes modification of condenser geometry and thus through effective temperature regulation maintained, system COP would be high. The project work is centric about, installation of spiral and micro channel shape base condenser to the refrigerator holding 165 Liters capacity.

The specification of the spiral shaped condenser and the coil diameter is shown below:-

Condenser coil diameter (Copper):- 6.35 mm

Length of Condenser Coil (Copper) :- 8.5 m

No. of Turns :- 7 Turns

Refrigerant Type:- R-134a

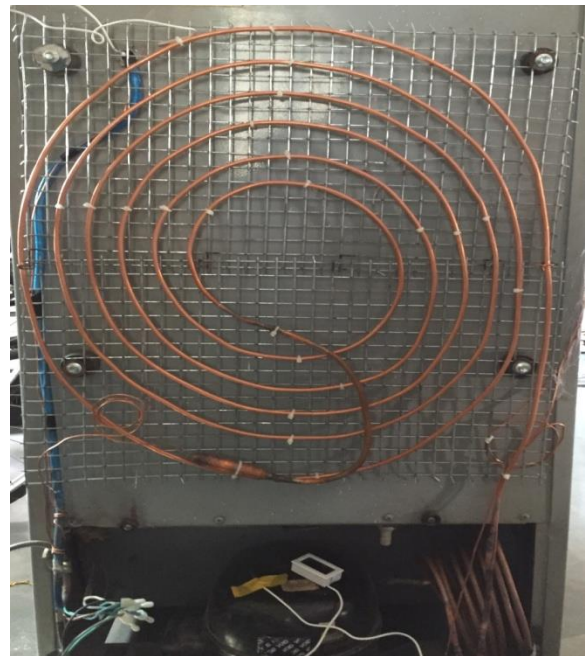


Figure 2. Actual picture of experimental setup

III. PROPOSED METHDOLOGY

To increase the COP of the refrigeration system many changes can be done in the design of condenser and evaporator. As we increase the effectiveness of the condenser, ultimately COP of the system increases. Effectiveness of the condenser can be increased by many methods some of them are, Geometry of the condenser coil, Increase the surface Area, thermal Conductivity of the tube material, Fin spacing After literature survey we felt that there is chance to increase the effectiveness of the condenser considering the geometry of the condenser tube.

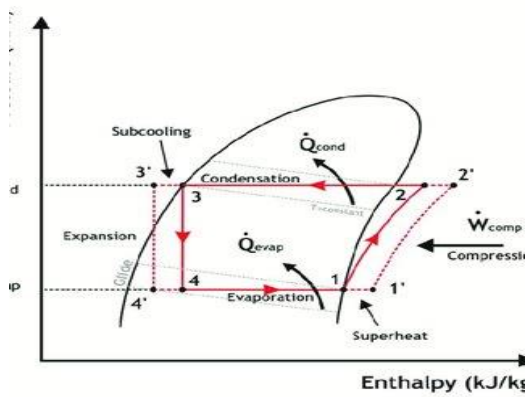


Figure 3

IV. EXPERIMENTAL PROCEDURE

The following procedure is intended to build an experimental set up for Vapor compression refrigeration system

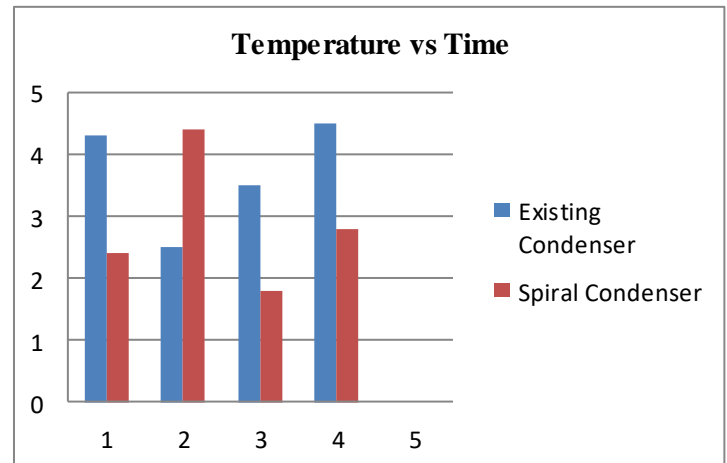
- Domestic refrigerator working on Vapor compression cycle with holding capacity (165 Liter) is used for study.
- Pressure and temperature sensors are fixed at the point of compressor entry and exit too.
- Conventional condenser replaced by Spiral shaped condenser coil.
- R-134a refrigerant is charged in to VCR system
- Switch ON the refrigerator system and observations are noted from Pressure gauge and temperature indicators for respective temperature readings.
- The performance of the existing system, with Spiral condenser is investigated with respect to set of observations.
- COP is investigated with the help of P-H chart
- The results are tabulated for Existing, Spiral condenser based system
- The Compression of spiral shaped Condenser VCRS is done with respect to commercial VCRS.

V. CALCULATION AND RESULT

Existing Calculation-

- COP (Copper) = 3.57

- Heat Rejection in Condenser = 206 KJ/Kg
- Theoretical Power Consumption of Compressor = 0.978 KW
- Heat Transfer Rate = 18.7 KW
- $COP = (h_1 - h_4) / (h_2 - h_1)$
- $h_1 = h_g @ T_1$
- $S_1 = S_2$
- $h_2 = h_g @ pr. conden + C_p [T_{sup} - T_{sat @ pr. conden}]$
- $h_3 = h_f @ T_3$
- $h_4 = h_f @ T_4$



Gharp 1

VI. CONCLUSION

The current work is centric about performance study of spiral shaped condenser used in refrigerator holding 165 liters' capacity. The data obtained from experimental set up used in analyzing performance of spiral shaped condenser used as a part of vapor compression system. With introduction made for spiral shape condensers. COP value found increased by 5.06 % over the conventional refrigeration system

- With the help of our arrangement heat loss increases via conduction-convection-conduction-radiation.

With this setup we are increasing COP of refrigerator with little increasing power consumption.

VII. REFERENCES

- [1]. P.G. Lohote, Dr. K. P. Kolhe Enhancement of COP by Using Spiral and Microchannel Condenser instead of conventional Condenser of VCR System Volume 3, Issue 7 JETIR (ISSN-2349-5162).
- [2]. B Santosh Kumar
Dr.A.RajireddyC.RamanjaneyuluN.Jaya Krishna
Experimental Investigation of Vapour Compression Re-frigaation System with Spiral Shaped Condenser Volume 2, Is-sue 02/2015 ISSN 2349-3860
- [3]. Bilal A. Qureshi, Syed M. Zubair The impact of fouling on the condenser of a vapor compression refrigeration system: An ex-perimental observation interational journal of refrigeration38 (2014)260-266
- [4]. Kays WM, London AL. Compact heat exchangers. New-York: McGraw-Hill, 1984.
- [5]. Eckert, E.R.G.; Goldstein, R.J.; Ibele, W.E.; Patankar, S.V.; Simon, T.W.; Strykowski, P.J.; Tamma, K.K.; Kuehn, T.H.; Bar-Cohen, A.; Heberlein, J.V.R.; (Sep 1997), Heat transfer--a review of 1994 literature, International Journal of Heat and Mass Transfer 40-16, 3729-3804.
- [6]. Performance enhancement of a household refrigerator by addition of latent heat storage International Journal of Refrigeration, Volume 31, Issue 5, August
- [7]. By James R. lines .ly Coiled Heat Exchangers offer Advantages GRAHAM MANUFACTURING CO. INC.

A Review on Lorry Unloading System

Dr. Nischal P. Mungle, Prof. Smitesh R. Bobde, Amit Kawade, Akhil Nikhare, Akash Jaisingpure, Abhisar Narkhede, Sarang Nagpure, Girish Jerpoth

Department of Mechanical Engineering, Dr. Babasaheb Ambedkar college of Engineering & Research Nagpur, Maharashtra, India

ABSTRACT

The main aim of this paper is to study of unloading system and their various components and find effects on various parameters. As we found for unloading the cement, grain bags, humans have been used which is a slow process of unloading of the bags. Due to which ideal time of trucks increases. So to fulfil requirement we have to make such system which will eventually reduce the ideal time of lorry and faster unloading takes place rather than traditional unloading in which human workers are used or waiting for workers which requires a lot of time. And, finally we are going to design the system which can easily unload heavy bags. In this system an overall design of the lorry unloading mechanism has been carried out. The dimensions of the main components have been determined for a load capacity of 50kg (490.33 N) having rope fall. Various dimensions for cross section of various shapes for unloading have been found. In this project we tried our best to design, fabricate and to make working model of lorry unloading system.

Keywords: Hoist, Actuator, wire rope, Cranes, Unloading.

I. INTRODUCTION

In our system, we will be using I section, wire rope, actuators, gear arrangement, DC motor, rope drum, DBT remote control, etc. Our system is a load lifting device that is provided with wire rope drum. It can be used to raise and lower the load of the semi finished or fully finished components or raw materials. We studied a system that is rigidly fixed to the ground or mounted on the rear side of vehicles. The system is operated by a operator with skilled technic. It is mostly employed for lifting or lowering heavier parts and moving from one place to another. The system needs to have more convenient apparatus to produce high lifting torque and gives better mechanical benefits to move the load that cannot done by worker. The system is mainly used in loading and unloading of goods in warehouse. It can also be seen in industry like automobile and manufacturing were assembly of heavy components are required. It is available various

ways or forms – all are made or chosen according to specific purpose or use. The size of cranes varies from the smallest jib cranes being employed in workshops, to the largest tower cranes being employed in tall building constructions. Mini-cranes can also be utilized in tall building constructions for facilitating in doing construction works on reaching some tight locations.

II. LITERATURE REVIEW

Work Design and Analysis of a lorry unloading System

The system of loading and unloading of component in industry or warehouse is been a major issue and need to improve. This give fatigue to the labour and health issue which lead to give an idea for improving a mechanism for loading and unloading system. In this there is a fixed system with static load to move the component. So we make an improvement in the system on the design and fabrication for mobile floor crane equipment with various facilities and feature to

issue a failure due to static load. In this system we have improve to bear a maximum load of 50Kg. the system consists of an actuator, era motor, wire rope , clamping device etc .The fabrication process involved selection of material, Design, cutting welding and Assembly. Arc welding is used for joining of two metals parts. This system is very useful for loading and unloading purpose and also improves efficiency and consume less time and cost.

A. N. Rudenko [1]:

In this book “Material Handling Equipment” divided into three parts.

In first part explains general information of material handling equipment and also mansions its application in industry, role in production. Enumerates the main types of material handling equipment. In second part, description of parts of hoisting machinery such as chains, ropes, pulleys, drums, braking gears, drives, hoisting, and lifting mechanisms of cranes. Various types of crane are also the subjects for practical designing wok. Design model and theory are given in their application to general-purpose machines. Special types of crane are not mansion in this book.

In third part, gives a brief description of elevators (lifts).

B. Yuantal Crane [2]:

M/S, Yuantal crane had introduced working principal of Electric overhead travelling crane. The motor is linked to the drum through gearbox. The wire rope winds in the drum and it connected through the pulley block and lifting appliance. Motor provides motion of positive and negative direction to drum according to that rolls or releases wire rope so that the sling and hoisting realizes lifting movement.

C. Indian Standard (807-2006) [3]:

This standard describes the design of structural portion for cranes, hoists, specifics permissible stresses and other details of design. In order to ensure the economy in design in reliability in the operation of this system. To deal with the subject conventionally,

cranes have been broadly classified into eight categories based on their nature of duty and number of hours in service per year. It is producers or manufactures responsibility to ensure the correct classification of the required cranes.

D. Indian Standard (3177-1999) [4]:

Indian standards are broader in concept and give a standard principle in a generalized form because of uniformity of a product or services. This standard covers the mechanical and electrical drives of the cranes. The components of crane are made with dimensions or design in accordance with the help of Indian standard as prescribed.

IS 3177-1999 covers all selection criteria of components in EOT crane such as lifting hooks, shafts, wire rope, rope drum, flanges, sheaves, bearings, gear boxes, couplings, fasteners, motor, etc which are required to make this system possible.

E. ElectroMech FZE [5]:

M/S ElectroMech had introduced a new design as “Double decked arrangement of trolley mechanism” in single failure proof EOT crane. They developed a single failure proof EOT crane by using two independent rope drums. Both the rope drums are driven by separate gearboxes and motors. Both the wire ropes revving are taken on alternate pulleys to maintain equilibrium of load in case of failure of one rope system or single mechanism. The hooks used are of duel design with dual attaching points thereby if one attachment falls, the other load path continues to support the load without excessive drop or swing.

G. Ranjendra Parmanik [6]:

Ranjendra parmanik in a post “Design of hoist arrangement of EOT crane(2008), he has discussed about the history of crane, various types of crane, application, the design of the hoist of EOT crane is done by algebraic calculations and a model design of the various parts of EOT crane

H. Dr. Frank Jauch [7]:

Dr. Frank Jauch in a post "Care, use and maintenance of wire ropes on cranes", he has discussed about drum. There are two types of drum he discussed: single layer drum & multi-layer drum. Both are used based on lifting capacity of an object. He has also discussed about crane ropes.

I. Michael G. Kay [8]:

Material handling (MH) involves "short-distance movement that usually takes place within the confines of a building such as a plant or a warehouse and between a building and a transportation agency." It can be used to create "time and place utility" through the handling, storage, and control of material, as distinct from manufacturing (i.e., fabrication and assembly operations) which creates "form utility" by changing the shape, form, and makeup of material.

It is often said that Material Handling only adds to the cost of a product, it does not add to the value of a product. Although Material Handling does not provide a product with form utility, the time and place utility provided by Material Handling can add real value to a product, i.e., the value of a product can increase after Material Handling has taken place.

J. Wire Rope

When a large amount of power is to be transmitted over along distance from one pulley to another then wire rope is widely used in elevators, mine hoist, conveyors hauling devices and suspension bridges. The wire ropes run on a grooved pulley but they rest on the bottom of the grooves and are not wedged between the slides of the grooved. The ratio of driving tension for the rope drive may be obtained in similar way as v-belt which gives as the advantages like lighter in weight, silent operation. The wire rope can withstand shock loads, more reliable and durable. It does not fail suddenly which gives us high efficiency and provide low cost. withstand shock loads, more reliable and durable. It does not fail suddenly which gives us high efficiency and provide low cost.

III. CONCLUSION

1. From the above survey we also recognised that in industries for unloading bags small unloading systems are used outside the vehicle and near to warehouses.
2. Small unloading cranes like Jib cranes, hoists, etc are used for lifting purpose or to move the heavy loaded parts from one place to another.
3. As per the study, we found that some of the traditional system used in unloading lorries has rigid construction, consisting of various hydraulics and pneumatics systems inbuilt in the vehicles which utilizes more space, increases the cost as well as maintenance of the system.
4. As per our survey we found that in small lorry, retail shops does not have such facilities. For unloading purpose human workers are used for unloading cement, grain bags like material. At such places there is unavailability of workers to unload the vehicle. Hence, the ideal time of the vehicle and driver is increased which causes the decrease in productivity of the vehicle.

So, focusing on retail shops and small lorries where productivity of the vehicle is considerably low due to lack of manpower. Therefore, we have targeted this particular problem to be resolved and optimum solution that can be operated by driver only is taken into consideration.

IV. RESULT

The proposed system will be flexible for small vehicles which are used to transport the bags from warehouse to retail shops such vehicle includes TATA 407, TATA 307, Pick-up vans, etc. There will be no need of extra labour to unload the vehicle. The driver itself will be capable of operating the proposed lorry unloading system.

The proposed lorry unloading system may reduce the human fatigue caused due to unloading of heavy bags.

It will also increase the productivity of the vehicle, as it can be used any time on any lorry with minimum time as compared with traditional unloading systems.

Evaporative Cooling Methods : A Review

Himanshu Mankar, Niraj Pawde, Suraj Pawde, Abhishek Sawant, Khushal Nasre, Ganesh Mohadikar

Mechanical Engineering Department, Dr. Babasaheb Ambedkar College of Engineering and Research, Nagpur,
Maharashtra, India

ABSTRACT

Now days due to energy crisis and harmful effect to environment, there is more and more urgent need of energy saving in air conditioning and water cooling demands in mainly consideration of all the free cooling techniques. Among them evaporative cooling is well known technique from long time which gives good results and wide number of applications in residential, commercial, agricultural, and institutional buildings to industrial applications like as spot cooling in power plants, foundries, etc. This papers aims to review the recent development concerning evaporative cooling technologies that could potentially provide sufficient cooling effort, reduce environmental impact and lower energy consumption. The authors have reviewed various journal papers and suggested different schemes of classification. The review covers working principle, performance of evaporative cooling technology and also studied direct, indirect and direct-indirect cooling system. The study focusing on investigating the method of cooling, benefits in terms of power consumption, cost saving and various environmental aspects, In addition, certain gap areas are identified that would help researchers in future research.

Keywords: Evaporative Cooling, Energy Consumption, Method of Cooling, Environmental Aspects.

I. INTRODUCTION

Evaporative cooling has been in use for many decades in India for cooling water and for providing thermal comfort in hot and dry regions. Evaporative air conditioning systems offer an attractive alternative to the conventional summer air conditioning systems in places, which are hot and dry. Evaporative air conditioning systems also find applications in hot industrial environments where the use of conventional air conditioning systems becomes prohibitively expensive. In addition, evaporative cooling systems are more environmentally friendly as they consume less energy and their performance improves as air temperature increases and humidity decreases. As it is relatively cheap and requires less energy than other forms of cooling thus it has a prime importance in summer season and hot condition.

II. METHODS AND MATERIAL

A. DIRECT EVAPORATIVE COOLING (OPEN CIRCUIT)

Direct Evaporative cooling introduce water directly into the supply air stream (usually with a spray or some sort of wetted media). As the water absorbs heat from the air, it evaporates and cools the air. In direct evaporative cooling the dry bulb temperature is lowered but the wet bulb temperature remains unchanged. In operation a blower pulls the air through permeable water –soaked pad. As the air passes through the pad, it is filtered, cooled and humidified [6]. A recirculation pump keeps the media (pads of woven fiber or corrugated paper) wet, while air flows through the pads. To ensure that the entire media get wet, more water is wet, more water is usually pumped and can be evaporated and excess water drains from the bottom into a sump. An

automatic refill system replace the evaporated water the efficiency of direct cooling depends on the pad media. A good quality rigid cellulose pad can provide up to 90% saturation efficiency while the loose aspen wood fiber pads shall result in 50 to 60 % contact efficiencies.

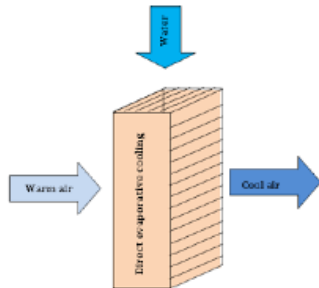


Fig 1: Direct evaporative cooling (DEC)

Figure 1. Direct Evaporative Cooler

B. INDIRECT EVAPORATIVE COOLING (CLOSED CIRCUIT)

Indirect evaporative cooling lowers the temperature of air via some type of heat exchanger arrangement, in which a secondary airstream is cooled by water and which in turn cools the primary airstream. The cooled air never comes in direct contact with water or environment. In indirect evaporative cooling system both the dry bulb and wet bulb temperatures are reduced. Indirect evaporative coolers do not add humidity to the air, but cost more than direct coolers and operate at a lower efficiency.

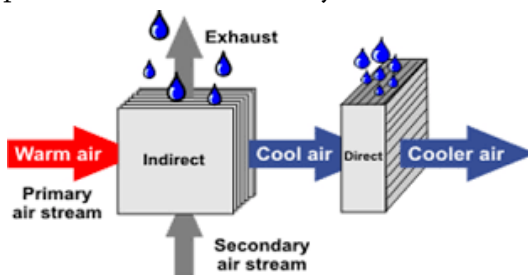


Figure 2. Indirect Evaporative Cooling

C. COMBINED EVAPORATIVE COOLING

This type of evaporative coolers combine indirect with direct evaporative cooling. This is accomplished by passing air inside a heat exchanger that is cooled by evaporation on the outside. In the second stage, the pre-cooled air passes through a water-soaked pad and picks up humidity as it cools. Because the air supply to

the second stage evaporator is pre-cooled, less humidity is added to the air, whose affinity for moisture is directly related to temperature. The two-stage evaporative cooling provides air that is cooler than either a direct or indirect single-stage system can provide individually. In many cases, these two-stage systems provide better comfort than a compressor-based system, because they maintain a more favorable indoor humidity range.

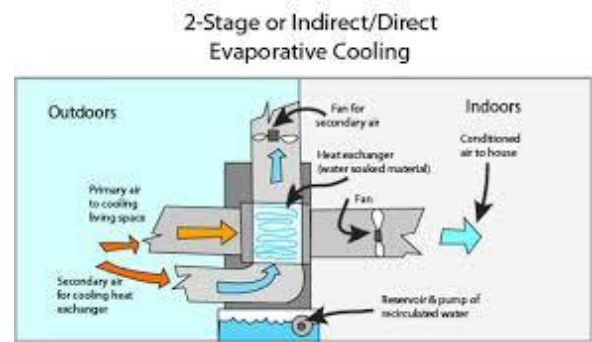


Figure 3. Combined Evaporative Cooling

D. ACTIVE DIRECT EVAPORATIVE COOLING

The active direct evaporative coolers are electricity-driven systems, however, it use a fraction of power for air and water circulation. So, it is considered much less energy intensive than other traditional cooling technologies, with energy saving up to 30% . A typical direct evaporative cooler comprises of evaporative media (wet able and porous Pads), fan blows air through the wetted medium, water tank, recirculation pump and water distribution system, as illustrated schematically in Fig 1. The direct evaporative cooling is an adiabatic cooling process, i.e. the total enthalpy of the air is constant throughout the process, as shown in Figure. The water absorbs the sensible heat from the supply air and evaporates causing the air temperature decreases and its humidity to increase . Theoretically, the supply air could be cooled to 100% effectiveness, but in such process a wet-bulb effectiveness of 70 % - 80 % only is achievable because of short contact time between the two fluids, insufficient wet ability of the pads. Eventually the system would not be able to cool down the incoming air lower than its wet-bulb temperature. The wet-bulb

effectiveness could reach range between 70-95% in most current commercial processes.

E. PASSIVE DIRECT EVAPORATIVE COOLING

Passive cooling techniques use natural phenomena, energies, and heat sinks for cooling buildings without the use of mechanical apparatus consume electrical energy. However, small fans and pumps could be required. Passive DEC is depends on the climate which means the techniques applied for hot and humid regions are different from those for hot and dry areas. This technology is able to reduce indoor air temperature by about 9 °C.

III. RESULTS AND DISCUSSION

Various cooling technology been studied here but a lot more can be developed to increase cooling efficiency. Combined evaporative method is most efficient but also being on high cost its losses its economy. Direct method is mostly used in many country as it the cheapest method with less maintenance. All these methods order can be developed to provide cooling at zero energy cost, no harmful effect to environment and also having low initial cost.

IV. CONCLUSION

As using the water for the evaporation purpose, which leads to decrease the temperature of the air also containing the most economically environmental effective system. In this review paper of evaporating cooling technology, methods are studied for the commercial and comfort purposes. Indirect evaporative coolers has shown higher values of effectiveness and more economically operated in the terms of energy consumption saving, particularly the M-Cycle, which is based on dew point IEC system. However the combined system of direct and indirect cooling system have similar performance or even the higher but their system consist of higher initial cost and the major problems like noise & vibrations,

pressure loss and friction loss. Recent work on experimentations and the Methodologies suggested by the author have shown the considerable potential towards enhancing the performance and cooling capacity of the system for building cooling.

V. REFERENCES

- [1]. Jain D. Development and testing of two-stage evaporative cooler. *Building and Environment*, 2007; 42: 2549–2554: doi:10.1016/j.buildenv.2006.07.034
- [2]. Watt J R., *Evaporative cooling handbook*, 2nd edition. Chapman and Halt, New York 1986.
- [3]. Suvarna V. Mehere, Krunal P. Mudafale, Dr. Sunil V. Prayagi, *Review of Direct Evaporative Cooling System With Its Applications*.
- [4]. Aftab Ahmad, Shafiqur Rehman, Luai M. Al-Hadhrami (2013) Performance evaluation of an indirect evaporative cooler under controlled environmental conditions, *Energy and Buildings*, vol. 62, pp. 278–285
- [5]. Xuan Y.M., Xiao F., Niu X.F., Huang X., Wang S.W —Research and application of evaporative cooling in China: A review (I) — *Research in Renewable and Sustainable Energy Reviews*, 16, 3535–3546, 2012.

Soil-Interaction of Multistorey R. C. C. Frames

Mayank Banwale¹, G. B. Bhaskar²

¹M-tech Student, Structural Engineering, G. H Raisoni Academy of Engineering and Technology, Nagpur, Maharashtra, India

²Assistant Professor, Structural Engineering, G. H Raisoni Academy of Engineering and Technology, Nagpur, Maharashtra, India

ABSTRACT

Comprehensive experimental and analytical studies have been carried out to understand the behavior of existing frame buildings constructed before the introduction of seismic design codes in 1970's. Different aspects of the response have been investigated and inherent weaknesses have been pointed out. This usually has been done assuming a fixed-base structure while ignoring the flexibility of soil and foundation. In this thesis, the interaction between the super-structure and sub-structure (SSI) is investigated by modelling the soil as simple as possible to capture the overall response of the system. As new analytical hysteresis rules and more advanced tools of analysis have been developed in recent years, the linear response of a structure which can be representative of a broad range of existing or newly designed structures, is investigated while allowing for flexibility of the soil-foundation system and SSI effects. The use of flexible base in the analysis can lead to reduction in the structural response and damage consequences in joints and infills. The results of this study suggest that the compliance of simply modelled soil for typical building structures have in average beneficial effects in terms of structural demand especially for stiff structures.

Keywords: Soil Structure Interaction, Linear Analysis, Shear Wall, Soft Soil.

I. INTRODUCTION

A common design practice for dynamic loading assumes the building to be fixed at their bases. In reality the supporting soil medium allows movement to some extent due to its property to deform. This may decrease the overall stiffness of the structural system and hence may increase the natural periods of the system, such influence of partial fixity of structures at foundation level due to soil flexibility intern alters the response. On the other hand, the extent of fixity offered by soil at the base of the structure depends on the load transferred from the structure to the soil as the same decides the type and size of foundation to be provided. Such an interdependent behavior of soil and structure regulating the overall response is referred to as soil structure interaction. This effect of soil

flexibility is to be accounted through consideration of springs of specified stiffness. Thus the change in natural period due to effect of soil structure interaction may be an important issue from the viewpoint of design considerations. Also it is usual practice to treat the brick infill as a non-structural element and therefore all the lateral loads are assumed to be resisted by the frame, but performance of buildings in the recent earthquakes (e g:1985 Mexico City earthquake, 2001 Bhuj earthquake) clearly illustrates that the presence of infill wall has significant structural implication. Therefore, the structural contribution of infill wall cannot simply be neglected particularly in regions of moderate and high seismicity where the frame infill interaction may cause substantial increase in both stiffness and

strength. A review of analysis and design provisions related to masonry infill RC frames in seismic design codes of different countries show that only a few codes have considered the effect of infill in analysis and design of masonry in filled RC frames. On the other hand, the stiffness and strength of in filled frames with openings are not taken care of by most of the codes. Hence the behavior of in filled frames with opening needs to be studied extensively in order to develop a rational approach or guidelines for design. In the last three decades, the effect of SSI on earthquake response of structures has attracted an intensive interest among researchers and engineers. Most of these researches focus on theoretical analysis, while less has been done on the experimental study. The interaction among the structure, foundation and soil medium below the foundation alter the actual behaviour of the structure considerably as obtained by the consideration of the structure alone. Flexibility of soil medium below foundation decreases the overall stiffness of the building frames resulting in an increase in the natural period of the system.

II. MODELLING AND ANALYSIS

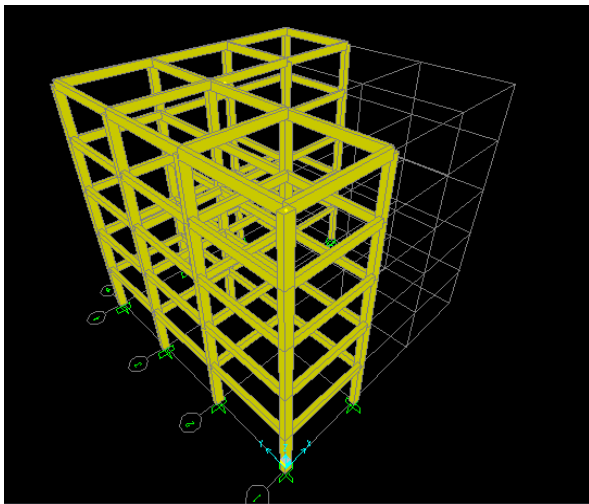
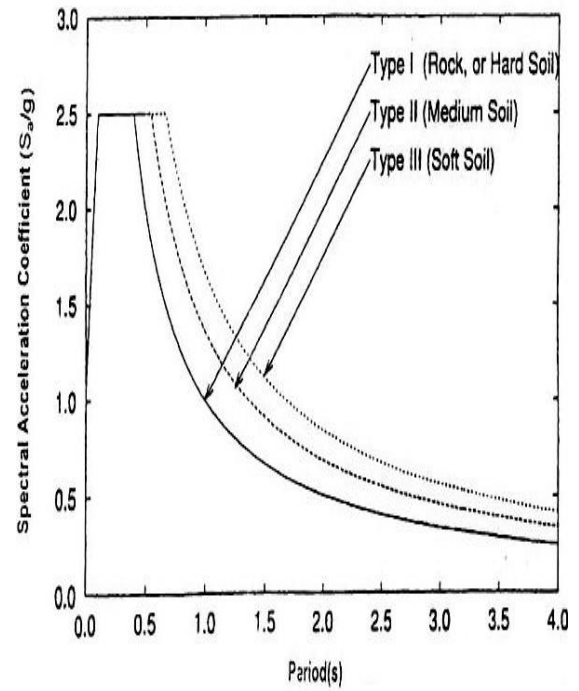
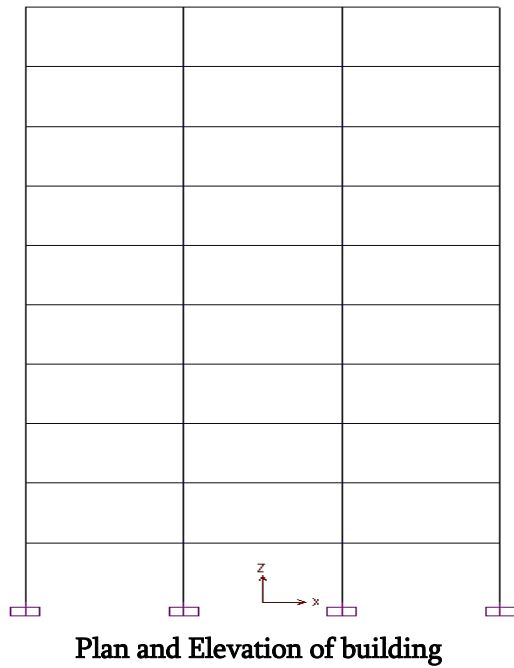
Idealization of Structure

To study the dynamic behavior of building structure while considering the effect of soil structure interaction, building frame is modeled as 3D space frame using standard two noded frame element with two longitudinal degrees of freedom and one rotational degree of freedom at each node. At the interface of infill and frame, the infill element and the frame element are given same nodes. The idealized form of a typical 3 bay x 3 bay 10 storey building frame with infill wall modeled as represented schematically in figure the present study also considers bare frame to see how correctly the influence of soil structure interaction on dynamic behavior can be predicted. This may give an idea about the error, which one should liable to commit if this popular but grossly inaccurate approach is invoked. A 3 bay x 3 bay building frames with 10

storey's on isolated footing have been considered. The height of each storey is taken as 3.6 m and the longitudinal and transverse dimensions of 3 bays x 3 bay building is taken as 6 m for central bay and 6 m for the two side bays. For all the buildings the dimensions of reinforced concrete column are taken as 600 x 600 mm and for beam it is 200 x 600 mm. Similarly thickness for roof and floor is taken as 150 mm and their corresponding dead load is directly applied on the beam. The brick infill with thickness 150 mm. All the above dimensions were arrived on the basis of the design following the respective Indian code for design of reinforced concrete structure. However, these design data are believed to be practicable and hence, do not affect the generality of the conclusion. Irregularity scenario has been performed. The results of non-linear static pushover analysis obtained in the form of capacity curve for considered irregularity in the model in longitudinal and transverse direction are shown in Fig. 4 and Fig. 5 respectively. The response reduction factor (R) is calculated from the formulations given in Lakhade et al. (2017) for collapse prevention level. The formulation adopted for determining response reduction factor of the considered models is given by equation (1) (Lakhade et al. 2017).

$$R = R_S R_\mu \quad \dots\dots(1)$$

As mentioned in IS 1893(1):2016, value of R for considered model is taken as 5. But the value of R obtained for model is 5.77 (i. e. , greater than 5) in



irregularity scenario has been performed.

Response spectra for rock and soil sites for 5% damping (IS1893)

III. RESULTS AND DISCUSSION

Linear Static Analysis

The plan layout and elevation of G+10 storey building is shown in fig. The building is deliberately kept symmetric

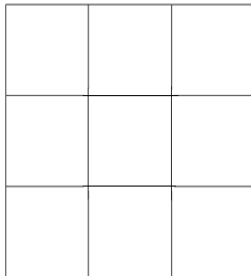
in plan along both orthogonal directions. The building considered is assumed to be located in Seismic Zone II.

Data

- 1) Live Load = 3.5 kN/m² at typical floor, 1.5 kN/m² at terrace
- 2) Floor finish = 1 kN/m²
- 3) Terrace finish = 1 kN/m²
- 4) Location = Nagpur city
- 5) Earthquake load = As per IS-1893(Part-1)-2002
- 6) Storey height = 3.6 m
- 7) Walls = 0.15 m thick
- 8) Column size = 0.6 X 0.6 m
- 9) Beams = 0.2 X 0.6 m
- 10) Slab thickness = 0.15 m

- 11) Density of concrete = 25 kN/m³
- 12) Density of brick = 20 kN/m³
- 13) Seismic zone = II

Bare frame (Soft soil)



The results of non-linear static pushover analysis obtained in the form of capacity curve for considered

irregularity in the model in longitudinal and transverse direction are shown in Fig. 4 and Fig. 5 respectively. The response reduction factor (R) is calculated from the formulations given in Lakhade et al. (2017) for collapse prevention level. The formulation adopted for determining response reduction factor of the considered models is given by equation (1) (Lakhade et al. 2017).

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Table 1

Case No.	Storey	Max Reaction In KN	Max. Displacement of top storey In mm	Frequency In Cyc/sec.	Period In Sec	Base shear In KN
SB2'a (Without SSI)	G+10	5758	40	0.75	1.3	436
				0.84	1.1	
				0.84	1.1	
SB2'b (With SSI)	G+10	5248	50	0.60	1.6	412
				0.64	1.5	
				0.62	1.59	
SB2'b' (With SSI)	G+10	4558	74	0.4	2.4	291
				0.4	2.4	
				0.53	1.8	

IV. CONCLUSION

In the present study, the effect of soil structure interaction on the dynamic characteristics of structure has been studied. Some of the conclusions that can be drawn from the observations made above are,

1. The study shows that consideration of different parameter such as soil structure interaction, and location of walls influences time period, displacement and base shear of building frame considerably. Hence

it is important to consider to all these parameters in the analysis of structures.

2. Shear walls located in the central part of the multistoried building gives lesser displacement and more

V. REFERENCES

[1]. Badry P. and Satyam N. (2016). "Seismic soil structure interaction analysis for asymmetrical buildings supported on piled raft for the 2015

Nepal earthquake”, *Journal of Asian Earth Sciences*, Accepted Manuscript.

- [2]. Eser M. , Aydemir C. , and Ekiz I. (2011). Effects of Soil Structure Interaction on Strength Reduction Factors”, *Procedia Engineering*, 14, 1696–1704.
- [3]. Esteban S. , Fernando L. C. , Arezou M. F. R. (2013). “Inelastic dynamic soil–structure interaction effects on moment-resisting frame buildings”, *Engineering Structures*, 51, 166–177.
- [4]. François S. , Galvín P. , Museros P, Lombaert G. and Degrande G. (2014). “Dynamic soil–structure interaction analysis of a telescope at the Javalambre Astrophysical Observatory”, *Soil Dynamics and Earthquake Engineering*, 65, 165–180.

Seismic Performance Assessment of Irregular RC Building

Mohammad Aslam Faqueer Mohammad^{*1}, G. B. Bhaskar²

¹M-Tech Student, Structural Engineering, G.H Raison Academy of Engineering and Technology, Nagpur,
Maharashtra, India

²Assistant Professor, Structural Engineering, G.H Raison Academy of Engineering and Technology, Nagpur,
Maharashtra, India

ABSTRACT

Damage to irregular structures caused by asymmetry in plan has been observed during many major and minor earthquakes during the past. The non-coincident center of mass and stiffness in a structure generate plan asymmetry which causes torsional vibration resulting in severe damage to structural components in the more laterally flexible regions of the structure. Modelling plays a very important role in design and analysis of structures. In the present study, a typical irregular plan of building with 5-storey is considered and is assumed to be located on medium soil condition and seismic zone V. The building is analyzed by using response spectrum analysis and designed as special moment resisting frame as per the specifications of Indian Standard. Further, the performance of building is assessed using Non-linear static procedure i.e. static pushover analysis as per ASCE-41. In addition to this the response reduction factor (R) of considered model is also evaluated. It is concluded that, for irregular buildings considering response reduction factor R same as that provided in Indian seismic code is inappropriate and the value should be less than 5.

Keywords: Asymmetric building, Response Spectrum Method, Non-linear Static analysis, Response Reduction factor.

I. INTRODUCTION

So far irregularity has been studied by many researchers and important recommendations has also been laid in the Indian codes, so as to avoid the major devastation during seismic actions. Different types of irregularity seen practically

- a. Vertical stiffness irregularity
- b. Mass irregularity
- c. Vertical geometric irregularity
- d. In plane discontinuity
- e. Out of plane offsets
- f. Discontinuity in capacity (weak storey)
- g. Torsional sensitivity

This causes obstruction in the flow of forces and stress concentration increases in the critical areas. Torsional forces occurs as CM and CR (Centre of mass and rigidity) do not lie at same points. The torsional stresses are quite dangerous, causing complete failure of the structure. Static method i.e seismic coefficient method mentioned in IS 1893: 2016 Part I may not be useful as it is based on regular distribution of stiffness and mass in a structure, and hence it becomes less accurate. Figure 1 shows different plan irregularity arrangements which are observed, which are proved to be dangerous, Indian codes on earthquake resistant design laid some stringent clauses for the design of irregular buildings.

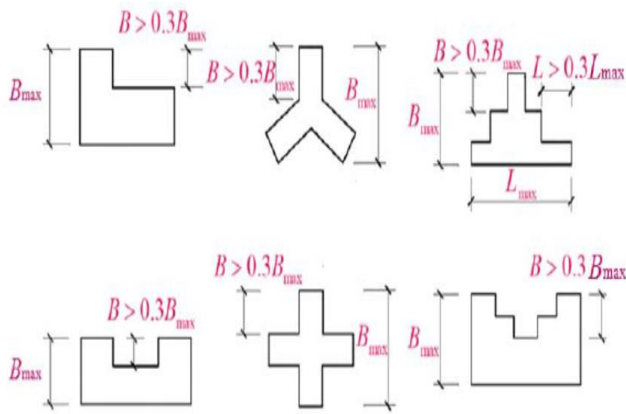


Figure 1. Plan irregularity in buildings, (google search)

Shelke and ansari, 2007 considered the irregularities of the structure namely mass, stiffness and vertical geometric irregularity. It was observed that the structure with mass irregularity experience large base shear than regular structures. Stiffness irregularity structures experience large storey drifts, further, darshale and Shelke, 2016 studied the to control the effect of irregularity by using base isolation. Base isolation reduced the lateral displacement, shear forces, bending moments, base shear, storey acceleration, interstorey drift as compared to the conventional fixed base structure. Which shows the effectiveness of base isolation and concluded that base isolation is very effective seismic response control device.

Sheikh and Shinde, 2016, studied about the seismic analysis by considering mass irregularities given in the specific codes and investigated the proportional distribution of lateral forces evolved through seismic action in each storey level due to changes in mass of frame on vertically irregular frame. Bhosale, et al. (2016) examined the seismic performance of buildings with irregular distribution of mass, stiffness, and strength along the height may be significantly different from that of regular buildings. Stepped and setback buildings under the category of vertical geometric irregularity needs to be investigated in detail to validate the special design requirements recommended by design codes. Further, Mohod, 2015, examined the effect of shape and the plan of the

structural building on the response of seismic analysis. Buildings with irregular geometry respond differently against seismic action. It has been observed from the research that simple plan and configuration must be adopted at the planning stage to minimize the effect of earthquake. Mahesh and Rao, 2014, presented a paper in which a G+11 multistorey building with regular and irregular configuration had been considered for earthquake and wind loads using ETABS and STAAD PRO V8i. Different response like the storey drift, displacement, base shear were plotted and the inference was that when both regular and irregular configurations were compared, the storey drift and the base shear value were found to be more for regular configuration. Athanassiadou C.J. (2008) addressed multistorey reinforced concrete (R/C) frame buildings, irregular in elevation. Two ten-storey two-dimensional plane frames with two and four large setbacks in the upper floors respectively, as well as a third one, regular in elevation, have been designed to the provisions of the 2004 Eurocode 8 (EC8) for the high (DCH) and medium (DCM) ductility classes, and the same peak ground acceleration (PGA) and material characteristics. As expected, DCM frames are found to be stronger and less ductile than the corresponding DCH ones. The overstrength of the irregular frames is found to be similar to that of the regular ones, while DCH frames are found to dispose higher overstrength than DCM ones. Sarkar (2010) studied about how to deal with the vertical irregularities in stepped building. Stepped building frames, with vertical geometric irregularity, are now increasingly encountered in modern urban construction.

From the study of literature, it has been concluded that irregularity is detrimental for the structures during earthquake, hence preventive measure need to be considered while designing structures and irregularity must be avoided.

II. MODELLING AND ANALYSIS

• Selection of plan of the building

In order to thoroughly analyze the building with plan irregularity, various shaped building having different plan shapes will be undertaken. From the literature thorough idea regarding plan irregularity has been studied and L Shaped building is considered with irregularity of more than 50%. The plan area of the considered 5 storey building is 15 x 15 m with 3 m of storey height. The sizes of each component of the building is decided by designing the building for gravity and earthquake loading. Figure 2 and 3 shows the plan and elevation of the building. Preliminary sizes of the frame members have been considered based on the deflection criteria given as per Indian standard IS 456-2000 and IS 13920-2016. Response spectrum analysis of structure has been performed as per IS 1893 part 1 (2016). Building is assumed to be situated on medium soil in seismic zone V, having zone factor 0.36. Structure is subjected to gravity loads as per the clauses mentioned in Indian standards (IS 456, IS 875 part I and II). In the proposed structure slab thickness and wall thickness is assumed equal to 100 mm and 230 mm (outer) and 115 mm (internal) respectively. Structural modelling, analysis and design have been performed in SAP 2000 version 14.2.4. Detailed mathematical model has been prepared to represent the distribution of structural geometry of elements and loading in plan as well as in elevation.

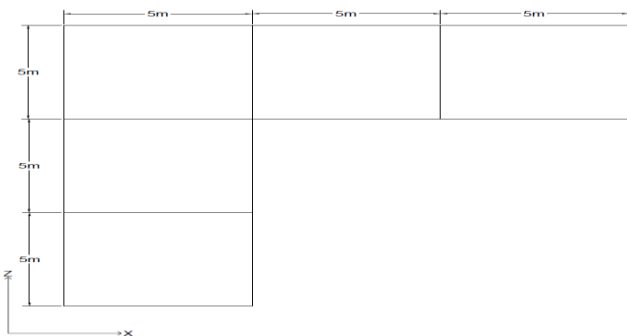


Figure 2. Plan of the building

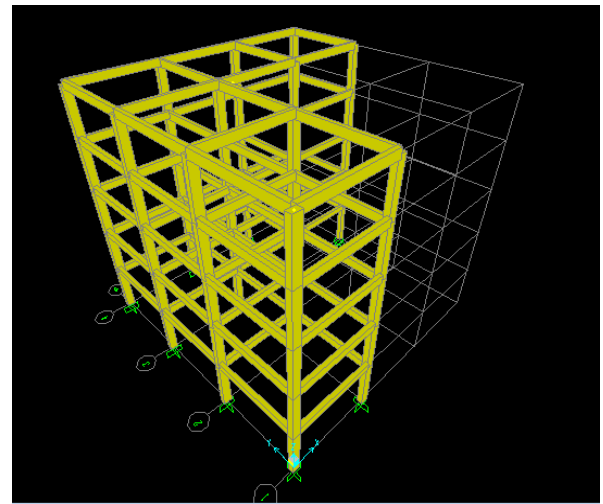


Figure 3. 3D view of the building

Thickness of slab at all floor level and roof level have been assumed to be same and modeled as rigid diaphragm. Archetype building has been analyzed by using response spectrum analysis and designed as special moment resisting frame as per the specifications IS 456:2000 and IS 13920:2016 code. The beams have been assigned with moment (M3) hinges and columns with coupled axial moment (P-M2-M3) hinges at the two ends. To access the performance of building nonlinear static analysis i.e. static pushover analysis have been performed.

III. RESULTS AND DISCUSSION

Pushover analysis is performed for the considered model under study. The different pushover curves in terms of base shear and roof displacement in longitudinal as well as transverse directions has been obtained. Capacity curves of building model are linear initially, after certain point it start deviating from linearity to non-linearity. Non-linearity comes in picture due to inelastic action start takes place in structural elements. All curves are approximated by means of bi-linearization method as per FEMA 356. The nonlinear performance of structure depends on stiffness, strength and ductility of structure. The approximate estimation of aforementioned parameters can be found from the capacity curve result of building obtained from nonlinear static pushover

analysis. Pushover analysis also give insight of weak links present in the structure or highlight the region of inadequate capacity. In the present case the comparative study of change in over strength, storey displacement, yield and ultimate base shear capacity of structure due to irregularity scenario has been performed.

The results of non-linear static pushover analysis obtained in the form of capacity curve for considered irregularity in the model in longitudinal and transverse direction are shown in Fig. 4 and Fig. 5 respectively.

The response reduction factor (R) is calculated from the formulations given in Lakhade et al. (2017) for collapse prevention level. The formulation adopted for determining response reduction factor of the considered models is given by equation (1) (Lakhade et al. 2017).

$$R = R_S R_\mu \dots\dots(1)$$

As mentioned in IS 1893(1):2016, value of R for considered model is taken as 5. But the value of R obtained for model is 5.77 (i.e., greater than 5) in longitudinal direction whereas in transverse direction, R is less than 5. This shows that for irregular buildings considering response reduction factor R same as that of R equals to 5 is inappropriate and the value should be less than 5.

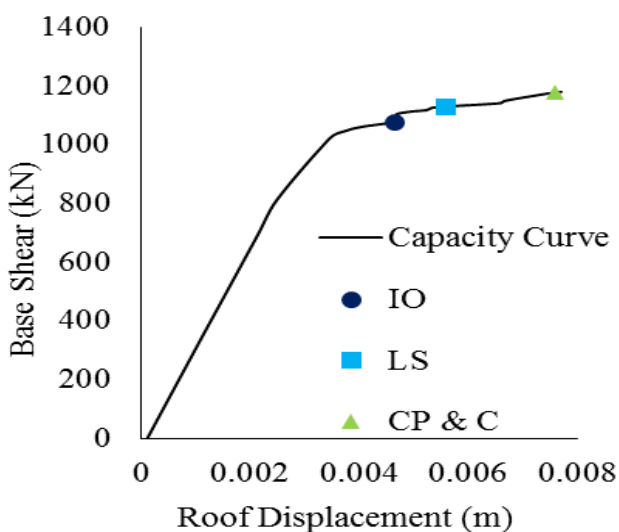


Figure 4. Capacity curve in longitudinal direction

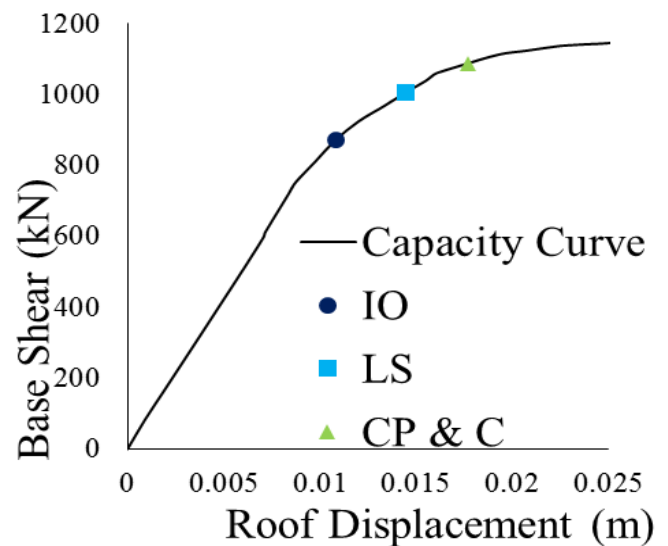


Figure 4. Capacity curve in transverse direction

Table 1. Capacity curves results

Direction	X	Y
Initial stiffness	300411	92222
Ductility	2.22	1.75
Overstrength	2.1	2.13
Response reduction factor (R)	5.77	4.147

IV. CONCLUSION

Irregularity imparts torsional forces, since CG and CM doesn't coincides with each other. The stress concentration increases at severe locations and hence complete failure of the structure is possible. Hence, stringent clauses have been recommended regarding the design of irregular structures for earthquake. Indian codes prohibits the use of such structures in earthquake prone areas. In the present L-shaped building is considered and the performance is evaluated based on non-linear static pushover analysis. Following conclusions have been made

1. Response reduction factor is found to be more than 5 in X-direction and less than 5 in Y-direction.
2. Pushover curves gives the capacity of the building.
3. For the considered model, ductility is less in Y-direction as compare to X-direction.

V. REFERENCES

- [1]. Shelke, R. N., and Ansari, U. S. (2017). Seismic Analysis of Vertically Irregular RC Building Frames." *International Journal of Civil Engineering and Technology*, 8(1), 155-169.
- [2]. Darshale, S. D., and Shelke, N. L. (2016). "Seismic Response Control of Vertically Irregular R.C.C. Structure using Base Isolation." *International Journal of Engineering Research*, 5(2), 683-689.
- [3]. Bhosale, A. S., Davis R., and Sarkar, P. (2017). "Vertical Irregularity of Buildings: Regularity Index versus Seismic Risk." *ASCE. Journal of Risk and Uncertainty in Engineering Systems, Part A: Civil Engineering*, 189-195.
- [4]. Mohod, M. V. (2015). "Effect of Shape and Plan Configuration on Seismic Response of Structure." *International Journal of Scientific & Technology Research*, 4, 84-88.
- [5]. Kumar, C. R., Narayan, K. B., Prashanth, M. H., Manjunatha, H. B., & Reddy, D. V. (2015). "Seismic Performance Evaluation of RC Buildings with Vertical Irregularity. *Indian Society of Earthquake Technology*".
- [6]. Athanassiadou, C. J. (2007). "Seismic Performance of R/C Plane Frames Irregular in Elevation." *Engineering Structures*, 30, 1250-1261.
- [7]. Mahesh, M. S., & Rao, M. D. B. P. (2014). Comparison of analysis and design of regular and irregular configuration of multi-Story building in various seismic zones and various types of soils using ETABS and STAAD. *Journal of Mechanical and Civil Engineering (IOSR-JMCE)*, 11, 490-495.
- [8]. Sarkar, P., Meher, P., and Menon, D. (2010). "Vertical Geometric Irregularity in Stepped Building Frames." *Journal of Engineering Structures*, 32, 2175-2182.

Rain Water Harvesting Zonation of Nagpur City

Shashank Pal, Shubham Funde, Sanket Thombare, Aditya Supsande, Nirali Wahane, Anchal Sukdheve

Department of Civil Department, GHRAET, Nagpur, Maharashtra, India

ABSTRACT

As per the study done by authors the world population increases, the demand increases for quality drinking water. Surface and groundwater resources are being utilized faster than they can be recharged. Rainwater harvesting is an old practice that is being adopted by many nations as a viable decentralized water source. This paper reviews the methods, design of rainwater harvesting systems, and its impacts adopted in all parts of the world.

Keywords: Construction Management, Risk Analysis, Bridge Construction, Construction Planning, Resource Utilization.

I. INTRODUCTION

Rain water harvesting is one of the most effective methods of water management and water conservation. It is the term used to indicate the collection and storage of rain water used for human, animals and plant needs.

Artificial recharge to ground water is a process by which the ground water reservoir is augmented at a rate exceeding that under natural conditions of replenishment. The collected water is stored and pumped in a separate pipe distribution. This is a very useful method for a developing country like India in reducing the cost and the demand of treated water and also economizing the treatment plants operation, maintenance and distribution costs.

As per the Ministry of Urban Development and Poverty Alleviation, Govt. of India has made modifications to the building bye laws that requires Water Harvesting through storing of water runoff including rain water in all new buildings on plots of 100 sq. meters and above will be mandatory.

II. METHODS AND MATERIAL

The project work is divided into **3 Phase:**

Phase 1:

- The selected site was divided into 1 Sq.km area of grid on the map with the help of AutoCAD software and the Google earth software
- The junctions of the grids were noted and numbered.
- Then the water levels in the well were taken with the help of tape on or near the noted junctions.
- The location of the well of which the water level was taken was noted with the help of Google earth app.
- The exact location or the exact coordinates were marked with the help of GPS.
- The obtained readings were compared and the fluctuations in the water levels of the different areas of the city were found.

Phase 2:

- The points or the location on which the water level was taken in the 1st phase will be taken again.

- The readings of the water levels obtained will be compared with the readings of 1st phase.
- This will give us the water level fluctuation in the specific period of time.

Phase 3:

- The points or the location on which the water level was taken in the 1st phase and 2nd phase will be taken again.
- The readings of the water levels obtained will be compared with the readings of 1st phase and 2nd phase.
- This will give us the water level fluctuation in the specific period of time.
- The overall Fluctuation of Water level in the Nagpur city in the whole year will be obtained.

III. RESULTS AND DISCUSSION [Page Style]

- The water levels of the various areas were taken and the 1st phase and the 2nd phase of the project is done.
- The following are the readings of the water levels obtained in 1st phase and 2nd phase:

Tabel 1

Grid no.	Depth Phase 1.	Depth Phase2.	X latitude	Y longitude	Z altitude
161	0.95	3.2	295081	2335771	327
162	1.6	3.5	296013	2335821	311
160	4.6	11.2	293861	2336288	329
163	1.3	3.8	296971	2335976	324
164	0.9	2.1	297799	2335993	299
165	2.7	5.8	298934	2335963	290
179	1.8	5.9	298835	2335019	311
185	2.16	4.9	304973	2334978	263
150	1.2	5.2	299243	2337251	313
134	1.52	2.36	298336	2337934	282
133	2.8	4.5	298015	2337848	317

166	1.1	5.4	297841	2339043	468
66	1.08	3.5	300965	2342011	298
65	0.7	2.8	300097	2342569	338
61	1.3	5.1	296279	2341870	314
82	0.7	4.6	297445	2340701	325
147	1.35	2.8	296002	2337068	345
148	2.02	4.6	299339	2336907	285
163	1.3	3.2	296971	2335976	324
177	1.3	3.1	297012	2334989	321
178	1.7	3.5	298034	2335043	318
150	1.25	5.2	290672	2337093	319
210	1.02	5.2	305023	2333026	307
199	1.75	5.8	305027	2336907	233
200	1.85	4.9	305974	2333959	288
186	2.1	6.3	305963	2335030	297
182	2	4.3	302192	2335106	315
168	1.15	3.1	302094	2336075	306
184	2.45	4.1	303982	2334989	310
198	1.8	5.2	304013	2334041	311
197	2.6	6.3	303063	2334004	301
177	0.9	4.1	298682	2339113	288
100	1.7	5.5	299159	2339773	294
99	2.4	4.6	298144	2339786	315
116	2.12	6.3	298035	2339094	334
98	0.7	4.5	296835	2339895	328
218	8.3	12.8	305000	2332004	308
26	1.9	4.2	299016	2344019	306
27	2.1	6.5	299908	2344064	285
17	1.2	5.8	299951	2344931	291
179	1.5	4.9	298923	2335081	341
180	4.25	8.2	299765	2335260	310
194	4.4	7.9	299921	2333837	309
166	1.8	5.4	299974	2335892	302
181	1.35	5.1	360843	2335055	283
195	dry	Dry	300680	2331581	280
176	1.2	4.1	295410	2334964	305
175	1.15	10.1	294872	2335132	315
174	1.3	9.7	293985	2334866	318
191	3.05	7.9	297954	2334052	306
207	7.8	12.8	298977	2332900	312
208	1.9	5.3	300185	2332765	290

143	3.7	7.1	297901	2342875	325
25	2.3	5.4	297735	2343592	309

IV. CONCLUSION

RWH is a gradual process, we can not suddenly increase the ground water table after constructing recharge structures, by constructing any type of recharge structure, and we can give our contribution in aquifer recharge. This will help to rejuvenate the depleting ground water resources. Also help to save the little amount of rain water which used to drain away from many years. The methodology used in helped to examine the ground water level of various areas of the city.

V. REFERENCES

- [1]. Rainwater Harvesting (Rwh) - A Review, "J. R. Julius, Dr. R. Angeline Prabhavathy, Dr. G. Ravikumar" International Journal Of Innovative Research & Development-May, 2013 Vol 2 Issue
- [2]. Rooftop Rain Water Harvesting for Groundwater Recharge in an Educational Complex, "Dr. Arun Kumar Dwivedi, Virendra B. Patil & Amol B. Karankal" Global Journal of Researches in Engineering Civil And Structural Engineering Volume 13 Issue 1 Version 1.0 Year 2013
- [3]. Application of Rain Water Harvesting Scheme in Shimla Region," Rajiv Ganguly*, Bansal A, Mishra M and Kumar A" Ganguly et al., Hydrol Current Res 2014

A Review on Designing of Dam And De-silting

Jayjit Shelke¹, Pranay Dhopte¹, Sagar Talegaonkar¹, Dhanshree Gilbile¹, Miss. Radhika Kherde²

¹Student, Civil Engineering Department, Dr. Babasaheb Ambedkar College of Engineering and Research, Nagpur, Rashtrasant Tukdoji Maharaj University, Nagpur, Maharashtra, India

²Department of Civil Engineering, Dr. Babasaheb Ambedkar College of Engineering and Research, Nagpur, Rashtrasant Tukdoji Maharaj University, Nagpur, Maharashtra, India

ABSTRACT

This paper presents a survey report of design of dam with de-silting. Siltation is most often caused by soil and sediment spill. Due to silting capacity of live storage of reservoir decreases rapidly as well as silt also effects on the durability of structure of dam and the usual method of river flow diversion involves construction of tunnel and cofferdams. The cost of diversion work could be as high as 10-20% of total dam construction cost. The cost of diversion works depends on factors such as the tunnel dimension and intended tunnelling support measures during and after excavation. The quality of the rock through which the tunnel should be excavated and dimension of the upstream and downstream cofferdams. The optimum diameter and the total diversion cost are directly related to the river flood discharge. According to report of hydro power plant in India, there are various renewable resources like sun, wind, water, ocean and tidal. The power generation using hydro resources offers sustainable zero energy input cost, zero greenhouse gases emission, low operation and maintenance cost. These are currently near 17% of the world total power generation is based on hydro resources and its share to renewable power generation is 70%. All the systematic process which are discussed in paper.

Keywords: sedimentation causes and effect de-silting for dams, diversion tunnel and hydro power plant

I. INTRODUCTION

Dams are said to be an important source of water supply and high importance for various other reasons. As the sediments accumulate in the reservoir, so the dam gradually loses its ability to store water for the purposes for which it was built means storage capacity of reservoir is reduced. Generally, reservoirs are built in river for water supply, power generation, discharge regulation and flood control. The reservoir capacity can be divided into three portions such as dead storage volume, live storage volume and the flood control storage volume. Construction of dam may take up to 10 or more years. In this period, the river has to be diverted in order to create a dry environment for the

construction of dam. The usual method of river flow diversion involves construction of tunnel and cofferdam. The tunnel is excavated in either of the abutment to divert the entire river flow, both its normal and flood discharge around the site the cofferdam are water tight structure usually embankment, construction of upstream and downstream of site to isolate the area that has to be kept dry. The entrance is located at upper side of the upstream cofferdam and discharge into the river in lower side of downstream cofferdam.

In hydro power plant the water is utilized to move the turbine which is turned and runs the electricity generators. About 26% of energy is contributed by

hydro power to India. According to 2010 census of India planning commission, nearly 28.8% of India are below poverty line. In many villages household have no access to electricity. Basically the potential energy of the water storage in the dam gets converted into the kinetic energy of the moving water in the penstock. The kinetic energy get converted into electric energy with help of turbine and generator combination. A 30% supply of water is fulfils with the help of hydro power plant.

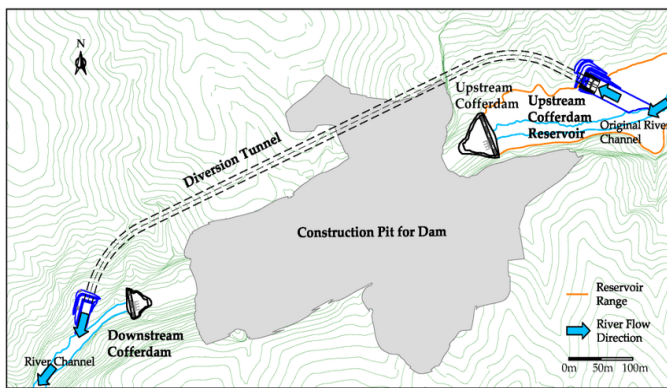


Figure 1. tunnel with coffer dam.

The literature reviews studied are discussed below:

(Saeed Sedighzadeh, Abbas Mansoori, Mohammad Reza Pirestani and Davoud Sedighzadeh)[1]: In their paper they show that the basic assumptions employed in this study to attain the necessary guides in the selecting optimum tunnel and cofferdam in dam diversion works. Tunnel excavation includes surveying, drilling (and blasting in the drill and blast method), mucking, drainage, ventilation and lighting. Immediately after excavation of each longitudinal segment of the tunnel, support measures for the exposed area of the tunnel are required in various degrees. To provide for better stability, more durable surface and smoother flow conduit, the water carrying tunnels are often lined with formed reinforced concrete. The cost of civil works is related to specifications of the project such as the locality and topography, availability of the required materials and equipment, quality of the soil and the rock, the execution methods adopted by the contractor, and un-

anticipated situations regarding water, weather and ground, among other factors.

(Mr. Pratik Ghorpade, Mr. Anand Chavan, Ms. Harsada kadam, Mr. Sanjay Patil)[2]: In their reference paper they studied that de-silting is an artificial technique mainly used for the management of silting of reservoir. By using de-silting artifices decrease the volume of dead storage and increase the live storage of reservoir with improving storage capacity of dam. Also improve life of dam structure with management of sediment and silting in reservoir. Generally, reservoirs are built in rivers for water supply, power generation, discharge regulation and flood control. The reservoir capacity can be divided into three portions, the dead storage, the active or live storage volume and the flood control storage volume. In this method mainly considered the horizontal hydraulic pressure and gravitational force present on the silt.

(Roshni Bhoi, Dr. S.M. Ali)[3]: In this experimental study the main source of hydroelectricity is the water which is readily available in India. Water power can be used in various forms. The most important way is the hydroelectric dam, where water stored is responsible for the turbine rotation and thereby capture the energy which is used to run the generator. These are classified according to the power generation capacity.

- Large hydro power: >100 MW
- Medium hydro power: 30-100 MW
- Small hydro power: 1-30 MW

These are generally used to feed a small community or rural industry where grid is not available. The water is stored behind the dam. The reservoir is located very high as the height of the reservoir decides the force of water flowing to the turbine. Depending on the load demand the water is allowed into the turbine. The water flows through the turbine through the penstock which are designed to transport water from intake to turbine without any cavitation problem. The height of water at the water reservoir and amount of water into the penstock determine the total power.

generation by a hydro plant. The water strikes the blade of the turbine and the potential and kinetic energy of water is converted to the rotational energy which drives the blades of the turbine. This rotating shaft produce alternating current in the coils of the generator the production of the magnetic field which is further converted to the electrical energy by electro magnetic field mechanism. Thus, hydroelectric power plant produce electricity from the energy of water.

(Bidasaria M)[4]: In this study they work on Indira Sagar Project in M.P., a multipurpose project, a 92 m high dam on Narmada river was required to be constructed but during off monsoon period flow of 300 cumecs of river Narmada was to be diverted so that dam can be constructed. For this, it was necessary to construct a 24 m high coffer dam to divert the off monsoon flow through a diversion tunnel from left abutment. This coffer dam was to be founded on a complex geological strata.

(R.Ajalloeian, A.R.Samadi Soofi, and M.Salavati)[5]: In this paper they introduce that from the study. In recent year, following the increasing need to create space underground with larger scale and in greater depth in poor areas, identifying more and more of the earth is evident. In relation to construction of dam, geological survey is the most important parts of studies which can be useful and valuable information about the design of underground space offer. Dam are considered as one of the most important civil structure.

(Neena Isaac, T.I.Eldho0)[6]: In there paper they shows that the storage capacity of hydro power reservoirs is lost due to the sediment depositipon. Removing the sediment deposition hydraulically by drawdown flushing is one of the most effective methos of restoring the storage capacity. For the hydraulic model studies, a 1:100 scale geometrically similar model was constructed.

(H.Chanson, Patricks James)[7] : The authors have documented several case studies illustrating reservoir failures causes by siltation and catchment erosion. The failure cases are use to introduce students to the complexity of the reservoir management and sedimentation. The main lesson is the importance of designing a reservoir as a complete system, including hydrology, soil conservation practice, sediment transport principles and hence the siltation process.

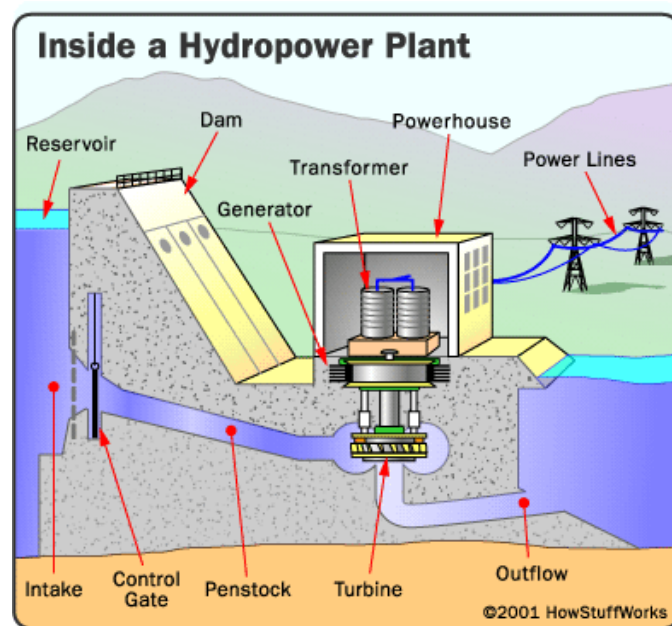


Figure 2. hydropower plant.

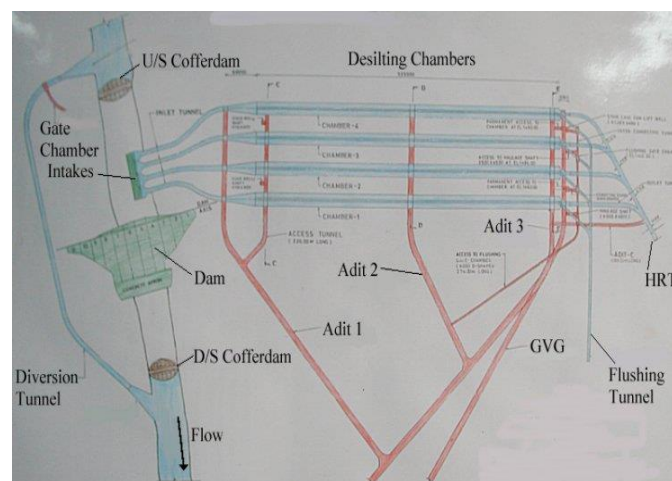


Figure 3. De-silting

II. DISCUSSION

All paragraphs must be indented. All paragraphs must

The entire document should be in Times New Roman or Times font. Type 3 fonts must not be used. Other font types may be used if needed for special purposes.

III. CONCLUSION

Although a conclusion may review the main points of the paper, do not replicate the abstract as the conclusion. A conclusion might elaborate on the importance of the work or suggest applications and extensions. Authors are strongly encouraged not to call out multiple figures or tables in the conclusion—these should be referenced in the body of the paper.

IV. REFERENCES

- [1]. Mama and Okafor, (2015) “siltation in reservoirs” Department of Civil Engineering, Faculty of Engineering, University of Nigeria.
- [2]. Radhika Kherde, faculty of civil engineering department, DBACER, Nagpur university.
- [3]. Leo C and van Rijn, (2001) “Sedimentation of sand and mud in reservoirs in rivers”
- [4]. Jing-San Hwang, “Mitigation of reservoir sedimentation” water resources management, Taiwan Provincial Water Conservancy Bureau, Taichung, Taiwan.
- [5]. Ahmed M.J. - Assessment of Geological and Technical inputs for optimization of Designs of Indira Sagar Project, M.P.India. M. Krishnamoorthy, G.C. Vyas, Rajeev Sachedeva – Civil design aspects of Indira Sagar Project. Tripathi D.C. Amitabh Sharan, - Shearzone treatment : A case study of Indira Sagar Project on Narmada River, M.P.India.
- [6]. Rajan A. T., 2000. Power Sector Reform in Orissa: an ex-post analysis of the causal factors, Energy Policy, 28: 657-669.
- [7]. MoEF (Ministry of Environment and Forests) 1980. Forest (Conservation) Act, 1980 with Amendments Made in 1988.
- [8]. MoP (Ministry of Power), 2008. Hydro Power Policy 2008. (New Delhi: Ministry of Power, Government of India).
- [9]. MoP (Ministry of Power), 1998. Policy on Hydro Power Development. (New Delhi: Ministry of Power, Government of India).
- [10]. MoRD (Ministry of Rural Development), 2007. The National Rehabilitation and Resettlement Policy, 2007. (New Delhi: Department of Land resources, Land reforms Division, Government of India).
- [11]. Nandimath O. V., 2009. Oxford handbook of environmental decision making in India: An EIA model, New Delhi: Oxford University Press.
- [12]. Sectoral Overview Report on Hydropower Development in India, AHEC, IIT Roorkee, February 2007.
- [13]. P. Saxena and Arun Kumar, “Small hydropower development in India”, special publication 25 years of Renewable Energy in India, MNRE, New Delhi, 2007
- [14]. Central Electricity Authority, Hydro Development Plan for 12th Five Year Plan, New Delhi, Sept 2008

A Review on Municipal Solid Waste in the Nagpur City

Vaibhav Rajurkar, Faizan Isani, Ajay Rathod, Rahul Itankar

Civil Engineering, Dr. Babasaheb Ambedkar College of Engineering and Research, Rashtrasant Tukdoji Maharaj University, Nagpur, Maharashtra, India

ABSTRACT

Municipal Solid waste management is one of the major environmental problem all over the world. Solid Waste Management which is already a mammoth task in developing country like India is going to be more complicated with the increase in urbanization, changing lifestyles and increase in consumerism. Urbanization is now becoming a global phenomenon, but its consequence are more pronounced in developing countries. Improper Management of Municipal solid waste causes hazards to surrounding people. Various study reveal that about 90% of MSW is disposed of, in open dumps and landfill, which create problem to public health and to ecosystem. Composition of waste varies with different factors like living standards, climatic conditions, socio- economic factors, etc. The focus of the present paper is to investigate the quantity, quality and its management in the Nagpur City. The present paper evaluates the current practices prevalent in Nagpur to deal with this solid waste and problems associated with it. The study is concluded with a few fruitful suggestions which may be beneficial for the disposal of MSW.

Keywords : Municipal Solid Waste, Management, Urbanisation.

I. INTRODUCTION

to Municipal solid waste was not a problem in ancient days but now a days where cities are growing at faster rate and one thing is common that we can find huge number of heaps of garbage all over the cities. Huge volume of waste is generated and management of solid waste is major challenge. These solid waste generated needs to be collected, transported and shall be disposed off properly before creating adverse impacts on environment. Gradually the different systems were involved and a scientific method which was developed by using 3Rs which is reduce, recycle, reuse. Reduce the waste stream is the most important significant of all the options to manage waste. If waste is not generated then we do not have to invent ways to dispose off. Reuse is the next desirable option in this, material can be used again and again for same purpose. Recycling is the next step in priority it includes the collection of used reused items.

Composting is the best way to dispose of the solid waste in a proper way, there are lots of composting techniques which are Indore method, Bangalore method, vermin-composting, landfill etc. Composting is a technique which creates “wealth from waste”. After composting the solid is used as fertilizers which are very beneficial for crops yield. “Cleanliness is godliness” is the mantra of Mahatma Gandhiji, Father of nation. To fulfill the Mahatma Gandhi’s dream Shri Narendra Modi himself started the cleanliness drive. Clean India, Green India which is kwon as “Swatch Bharat Abhiyan”.

As we look into the world scenario developing countries generate more solid waste compared to developed countries. The various problems that are found in developing are population continues to grow, Waste per capita is rising as economies development, Migration from rural cities to urban areas continues, Number and size of cities increases, Globalization

results in industrial and hazardous waste generation shifting to developing countries, Political interference also hampers smooth running of local authorities in developing countries, Vulnerability of pollution of surface and groundwater is high because local authorities rarely considered it in developing countries, In terms of MSW disposal, land filling remains the most popular choice with waste management authorities in developing countries, Recycling in developing countries tends to be practiced on a community or on a for-profit basis. Solid waste management is not restricted to person, group, area, concerned list or non-exclusive, non-rivalled and essential, the responsibility for providing the service lies within the public domain being of local nature it is entrusted to local authorities.

Nagpur also known as ‘Orange City’ is spread across an area of 217 sq.km with population of 2.5 million (Census 2011). The city is located at the geographical centre of India. Nagpur is the Third Largest city in the state of Maharashtra after Mumbai and Pune and the largest in Central India.

Nagpur is also being developed as a Smart City under the Government of India Smart City programme. Nagpur is the geographical centre of the country and is the major trade centre in the region and is well connected. Nagpur Municipal Corporation (NMC) spreads over an area of 227.38 sq. km with a total population of 24.06 lakh (more than 3 million currently) according to the census of 2011.[2] Nagpur city makes up 4.73% of the total urban population of the state. The city is now among the fastest growing cities in India and is rapidly emerging as commercial, retailing and logistic hub.[1] Nagpur Municipal Corporation (NMC) is currently generating an average of 1100-1200 TPD of waste, with an average per capita generation of 444 grams per person per day. NMC has been a progressive urban local body and has taken some measures for improvement of waste management in the city; however, there is still a need for a lot of focus and considerable improvement. For

the effective management of waste, the city has been divided into 10 zones. Door-to-door waste collection is practiced in all wards, except outer city areas. NMC has privatised collection and transportation of the solid waste and awarded the contract to Kanak Resources Management Limited (KRML) in December 2007. KRML is responsible for the doorto-door collection of waste and transportation of waste to the dumpsite at Bhandewadi.

Approximately 255 vehicles of various types are deployed by KRML for the transportation of waste, along with handcarts, small tricycles and tipper trucks for primary collection from the households.[1]

II. CASE STUDY OF NAGPUR CITY

Nagpur is situated in the eastern part of Maharashtra. The coordinates of the city lie between 78°30" to 79°30"E and 20°30" to 21°45"N,[1]. The average altitude is 310.5 m above mean sea level. Nagpur is in the exact centre of the Indian peninsula. The city has the Zero Mile Stone locating the geographical centre of India, which was used by the British to measure all distances within the Indian subcontinent. Nagpur is well connected with the major urban centres across India.

Table 1. Detail Of Secondary Storage Points In NMC Area

ZONE NO.	NAME OF THE ZONE	TOTAL NO. OF SECON DARY POINTS	DETAIL OF TRANSFER STATION
1	Laxmi Nagar	20	Sita Nagar (Temporary) Rahate Colony (Temporary)
2	Dharampeth	19	Ambajhari T- Point (Temporary)

3	Hanuman Nagar	14	Budhwari Bazaar, Sakkardara (Permanent)
4	Dhantoli	30	Ganesh Peth (Temporary)
5	Neharu Nagar	12	Tajbag Maidan (Temporary)
6	Gandhibagh	15	Sokhta Bhawan (Temporary)
7	Satranjipura	16	
8	Lakadgang	10	Gangabai Ghat (Temporary)
9	Ashi Nagar	13	Gangabai Ghat (Temporary)
10	Mangalwari	21	Chaoni Chowk (Temporary)

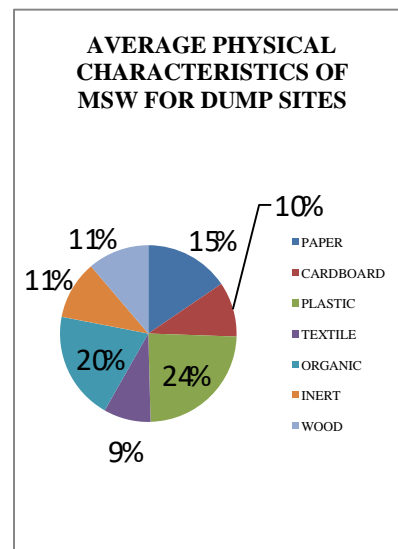


Figure 2. Characteristics Of Waste

Table 2. Legislation And Laws

Sr. No.	Rules	Year
1.	The Hazardous Waste (Management, Handling and Tran boundary movement)	1989
2	Biomedical Waste Handling Rules	1998
3.	Municipal Solid Waste (Management and Handling) Rules	2000
4.	The Batteries (Management and Handling) Rules	2001
5.	National Urban Sanitation Policy	2008
7.	Plastic Waste (Management and Handling) Rules	2011
8.	E-waste Rules	2011
9.	Swacch Bharat mission	2014

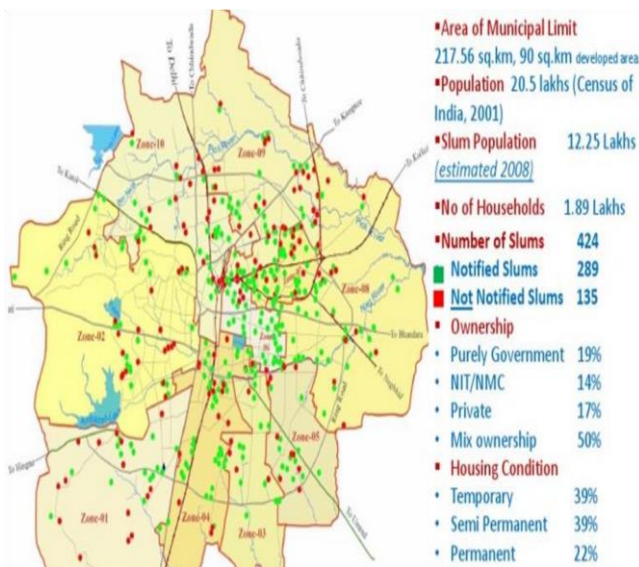


Figure 1. Slum Location Map For Nagpur City

Currently, there is no working waste treatment facility in Nagpur. Waste collected from various parts of the city is dumped at Bhandewadi dumpsite, which is approx. 10 km from the city centre.

III. DISSCUSSION

In the olden times, the method of disposal was incineration because the quantity of waste disposal was very less, but now as urbanization, migration, privatization, industrialization come into power, the generation of waste has tremendously increased. Due to increase in the quantity of waste generation new methods like land filling, composting, were adopted.

The new method in Nagpur city includes privatisation of waste collection and transportation services, which involves the collection of waste from doorsteps and transportation to the dumpsite. NMC has privatised collection and transportation of the solid waste and awarded the contract to Kanak Resources Management Limited (KRML) in December 2007.

KRML is responsible for the doorto-door collection of waste and transportation of waste to the dumpsite at Bhandewadi. In the year 2008, Nagpur city came up with the concept of a binfree city and eliminated more than 80% of primary collection points/ community bins from the city. There is still scope for improvement in the collection and transportation system, including improvements in logistic management, optimal utilisation of vehicles, increasing coverage of outer city areas, and bringing efficiency to segregation practices.

However , as per the Municipal Solid Wastes (Management and Handling) Rules, 2000, the landfill site should be large enough to last for 20-25 years and should be away from habitation clusters, forest areas, water bodies, monuments, national parks, wetlands and places of important cultural, historical or religious interest.

But the present site are having habitats of humans in the range of 500km,band famous temple of Nagpur Baps Shri Swaminarayan Temple is about 3.4 km from bhandewadi, though the temple is at an adequate distance but as the amount of untreated waste in the site is increasing tremendously, various problems like air pollution. Various nearby hospitals suggested that the amount of patients suffering from bronchitis, asthma, skin problems are increasing rapidly. Also, two major fires had engulfed the municipal waste emitting poisonous gases and making it difficult for residents nearby, which means that frequent fires have been reported from the site due to unscientific disposal of waste at bhandewadi.

After studying all the aspects and scenarios of waste disposal of Nagpur city, the above methods were not satisfactory and apt under various situations.

Therefore, we suggest some solutions that can be undertaken.

Rather that dumping all the waste at one particular site which is very close to human habitation, we suggest some other engineered dumping sites which follow the rules of Municipal Solid Wastes (Management and Handling), 2000. The first one is the vacant revenue department land near Mandwa village in MIDC Butibori 36 kms from the city, Around 250-300 acre of area can be used and the land is even bigger than the present site at Bhandewadi and can be used for more than 30 years. The other sites that can be used are mining site at Kuhi-Dongargaon on Umred Road. Also a site which is 20 km away from the present site of Nagpur can be used. Bellari in Kalmeshwar tehsil and Titur in Kuhi tehsil can also be used.



Figure 3. Map of Bhandewadi and nearby mines sites.

IV. CONCLUSION

With an exponentially increasing population, it is even more important to be considerate about how well individuals take care of the planet. Land is limited, resources are limited, and the health of the planet can only be heard to a limited extent. As more and more waste is generated yearly, it is evident that this increasing trend is unacceptable in the long run. Landfills and recycling can only temporarily mitigate the immediate consequences of this large waste production. However, if the problem of municipal solid waste is to be truly addressed, the root of the issue must be looked at first. If less waste is generated in the first place, the challenge of finding environmentally feasible ways of disposing of waste will be much easier.

V. REFERENCES

- [1]. The urban Nexus, "Solid Waste Management For Nagpur Feasibility Study".
- [2]. Census 2011, Provisional Population Totals, India, Census 2011, Registrar general of India.
- [3]. Martin Schaub and Jeremie Bertrand, "Waste Management in Nagpur, India".

A Review on Cracks and Patches on Road

Jayjit Shelke¹, Reshama Pardhi¹, Snehal Lokhande¹, Pranay Dhopte², Miss. Radhika Kherde¹

¹Student, Civil Engineering, Dr. Babasaheb Ambedkar College of Engineering and Research, Nagpur.

Rashtrasant Tukdoji Maharaj University, Nagpur, Maharashtra, India

²Department of Civil Engineering, Dr. Babasaheb Ambedkar College of Engineering and Research, Nagpur,

Rashtrasant Tukdoji Maharaj University, Nagpur, Maharashtra, India

ABSTRACT

This paper presents a report of cracks and patches are same type of road surface distresses whose assessment is essential in India. At present, distress data collection is increasingly being automated by using various imaging system. This is expensive, time consuming and slows down the road maintenance management. A robust method of automated detection and assessment of cracks and patches from real life video clips of Indian highway is proposed. The local authority road networks commonly comprise roads of various functional characteristics and a variety of construction types. We are investigate about the use of digital technique to obtain field data to increase safety and reduce labour requirements using a semi automated distress collection and measurement system and also in the robust method cracks and patches are detected and quantified automatically using various image processing technique supported by heuristically derived decision logic. The algorithm automatically detects cracks and patches after the adjustment of the optical distortion. Moreover, the technique products an automatic classification and rating to create different categories. Patches have always been a problem for highway maintenance agencies because their repair is costly and time consuming.

Keywords: Automated Distress Assessment, Image Analysis, Distress, Automated Survey

I. INTRODUCTION

An area of pavement where part of the original pavement has been replaced or covered with new material to repair the existing pavement is called as patches. In a road maintenances management system the assessment of road surface distress is one of the important tasks for developing repair and maintenance strategies. Patches and cracks are some type of road surface distress whose assessment is essential in India (March 2004). The correct patching techniques prolong the life of the pavement and prevent further degradation which can lead to an accelerated rate of decay of the pavement. Potholes are an annoyance and a danger to the public and their patching consumes time from state department of

transportation and local department of public work agencies that could be spent elsewhere therefore correctly patching potholes. The time is extremely important to reduced long term cost associated with repeated patching. All flexible pavement require patching at sometime during their service life. Patching material are one of the larger material cost. A high quality patch is one of the most cost effective means of utilizing available resources because of surface patching patching should be perform to a standard commensurate with resource availability and the objective of retaining a smooth ride as long as possible potholes. Cracks and patches are some type of road surface distresses whose assessment is essential in India. In the current field practice road distress data assessment is reported to be done through distress data

collection and processing of the collected raw data. At present distress data collection is increasingly being automated by using various imaging systems. The collected raw video clips for distress assessment is still predominantly being done manually this is expensive, time consuming and slows down the road maintenance management. In these paper a robust method for automated detection and assessment of potholes cracks and patches are detected and quantified automatically using various image processing techniques supported by heuristically derived decision logic.

The information extracted using the proposed method can be used for determining maintenance levels of Indian road and taking further appropriate actions for repair and rehabilitation.



Figure 1. Patch work of road

The literature reviews studied are discussed below:

(Siksha Swaroopa Kar, Dr. P.K.Jain) [1]: In there paper they study the repair of cracks and patches in Many a times, potholes are repaired by non scientific antiquated techniques and non-standard materials. It is often seen on roads that potholes are filled in haste by debris/soil, which is usually washed away with the first rain. It leads to a pavement that cannot be repaired and can be made functional only by reconstruction. Therefore, scientific approach involving utilization of standard materials and

techniques is essential for long lasting repairs of potholes and patches.

(Lokeshwor Huidrom, Lalit Kumar Das, S.K.Sud) [2]:

The objective of this study is to develop a robust method which has the capability to detect and measure potholes, cracks and patches accurately from real life video frames of Indian highways having bituminous surfaces. With regard to this objective, the present study started with the personal experience of the occurrence of various forms of potholes, cracks and patches on Indian highways. The distinctive visual characteristic of these distresses such brightness, shape, size and location are further investigated to build a heuristically derived decision logic for their accurate identification and classification. Further, real life video clips of Indian highways at different places are captured using two existing camera based imaging systems and they are segmented automatically into two different types of frames category (frames with distress and frames without distress) using a fast video segmentation algorithm called DFS algorithm. Then, database of frames with distress is processed with the proposed algorithm called CDDMC algorithm for automated detection and measurement of potholes, cracks and patches in one pass.

(Sebastiano Battiato, Filippo Stanco, Salvatore Cafiso, Alessandro Di Graziano) [3] :

In there paper they introduce In the road management process, an evaluation of road pavement conditions is one of the most important aspects required to guarantee adequate functional standards and a suitable maintenance programme. An awareness of pavement conditions is necessary in order to be able to programme short, medium and long-term maintenance works within a systematic management system (Pavement Management System, PMS) which permits available resources to be optimised,2 guaranteeing that functional standards and preestablished safety standards are always met.6 The importance of road network management supported by the

implementation of a PMS is a concept that is currently accepted by nearly all those countries which invest resources, not so much into the building of new roads, as into research to maintain existing pavements in good condition.⁸ However, many local authorities are worrying slow in implementing decision support systems for an optimised road network management also because there is often a lack of information regarding the managed network due to its extent and the high cost of surveying its condition.

(**Matthew Sainz**) [4] : In there paper they shows the summary of potholes. The pothles are typically caused by traffic stresses, poor underlying support, the presence of moisture, and freeze-thaw cycles. Asphalt pavement maintenance can be categorized as preventive maintenance, corrective maintenance, or emergency maintenance. Preventive maintenance is used to extend the life of a pavement before catastrophic distresses occur. Corrective, or reactive maintenance, is performed after “a deficiency occurs in the pavement, such as loss of friction, moderate to severe rutting, or extensive cracking” takes place (Johnson and Snopl 2000). Emergency maintenance is performed after a serious or dangerous failure has happened to the asphalt pavement, such as a blowout or large pothole. The four most commonly used techniques for pothole patching are throw-and-go, throw and-roll, semi-permanent, and spray-injection and the costs associated with each type of pothole patching can be broken into materials, labor and equipment. Patching can take place during the spring period, when the base material is soft and wet and there are few, if any, freeze-thaw cycles expected, or during the winter period, when potholes are typically formed and the temperatures are low, the base material is frozen, and additional moisture and freeze-thaw cycles are expected. (Wilson and Romine 1994). Because of the better weather conditions and reduced stresses, patches applied in the spring have a much longer life expectancy.

(**Dax Patel, Prof.(Dr.) P.J.Gundaliya, Dr. Prakash Mehta**) [5] : In there paper they introduce that the India has the second largest road network in the world spanning about 4.69 million km comprising different categories of roads. Only half of the total road network is paved and of the paved roads, 90% of them are bituminous pavements. Pavement design is the process of developing the most economical combination of pavement layers to suit the soil foundation and the cumulative traffic to be carried during the design life. Pavement design consists of mainly two parts: (i) Design of the material mixture, to be used in each pavement component layer; (ii) design of pavement structure (design of thickness and type of different component layers). The main factors to be considered in the pavement design are: traffic; climate, road geometry; and position, soil and drainage. Highway pavement is deteriorating fast due to lack of timely maintenance Thus, timely maintenance of the highway pavement is essential. Road maintenance is one of the important components of the entire road system. Right maintenance treatment is to be given to the right place at the right time. A flexible pavement failure is defined by formation of pot holes, ruts, cracks, localized depressions, settlements, etc

II. DISCUSSION

All paragraphs must be indented. All paragraphs must The entire document should be in Times New Roman or Times font. Type 3 fonts must not be used. Other font types may be used if needed for special purposes.



Figure 2. patch work of road

III. CONCLUSION

Although a conclusion may review the main points of the paper, do not replicate the abstract as the conclusion. A conclusion might elaborate on the importance of the work or suggest applications and extensions. Authors are strongly encouraged not to call out multiple figures or tables in the conclusion—these should be referenced in the body of the paper.

IV. REFERENCES

- [1]. Atkins, Harold. N., 1983, ' Highway Materials, Soil and Concrete " Second Edition. Pub Reston Publishing Company, Inc., Virginia.
- [2]. Berlin, M. and E. Hunt "Asphalt Concrete Patching Material Evaluation" Oregon DOT Report No. OR-RD-01-19, June 2001.
- [3]. Flaherty, C.A., 1988, "Highway Engineering" Volume 2, Third Edition. Published in Great Britain.
- [4]. IRC:82-1982 "Maintenance of Bituminous Surfacing of Highways" Indian Road Congress
- [5]. MORTH (2004). Guidelines for Maintenance Management of Primary, Secondary, and Urban Roads (pp.3). New Delhi: Indian Road Congress.
- [6]. TRBE (2004). NCHRP Synthesis 334. Automated pavement distress collection techniques, Washington: Transportation Research Board. Bennett, C.R., Chamorro, A., Chen, C., Sominiac, H.D., & Flintsch, G.W. (2007). Data collection for road management (version 2.0). East Asia Pacific Transport Unit, Washington: The World Bank.
- [7]. Chan, S. et al. (2011). "Pavement Preservation: A Solution for Sustainability." Transportation Research Record: Journal of the Transportation Research Board, No. 2235, 2235(1), 36-42.
- [8]. Johnson, A., and Snopl, P. (2000). Best Practices Handbook on Asphalt Pavement Maintenance, University of Minnesota, Minneapolis, Minnesota.
- [9]. New Mexico Department of Transportation. (2007). Pavement Maintenance Manual, Santa Fe, New Mexico.

Smart Village Using IoT

Prince Juneja, Ajay Dhanwade, Mrunal Pathak, Darshani Kalbande, Dhawal Bhakta, Abhijeet Vighne

Department of Computer Technology Engineering, Rajiv Gandhi College of Engineering and Research, Nagpur,
Maharashtra, India

ABSTRACT

The main objective of this project is to develop an automation irrigation system using an node MCU board with Internet being remotely controlled by any Android OS smart phone. So that agricultural lands are irrigates automatically without physical present of farmer. As technology is advancing so irrigations are also getting smarter. Modern irrigation pumps are gradually shifting from conventional switches to centralized control system, involving remote controlled switches. Presently conventional pump switches located in different parts of the agriculture land are makes it difficult for the user to go near them to operate and physically present on those areas. Even more it becomes more difficult for the elderly or physically handicapped people to do so. Remote controlled irrigation automation system provides a most modern solution with smart phones for those persons who want to do agriculture without physically present on the space. In order to achieve this, a IOT(internet of things) module is interfaced to the node MCU board at the receiver end while on the transmitter end, a GUI application on the cell phone sends ON/OFF commands to the receiver where loads are connected . By touching the specified location on the GUI, the loads can be turned ON/OFF remotely through this technology. The loads are operated by IOT board through relay module. Along with this we use a soil sensor. Which detect whether soil is dry or wet. When soil condition is dry soil sensor give command to IOT module to start the pump. When soil becomes wet it gives command to stop the water pump. It works in accordance with the soil condition. This project is complete smart project for advanced irrigation. An automated irrigation system for efficient water management and intruder detection system has been proposed. Soil Parameters like soil moisture, pH, Humidity are measured and the Pressure sensor and the sensed values are displayed in LCD. The intruder detection system is done with the help of PIR sensor where the birds are repelled from entering into the field. The GSM module has been used to establish a communication link between the farmer and the field. The current field status will be intimated to the farmer through SMS and also updated in the webpage. The farmer can access the server about the field condition anytime, anywhere thereby reducing the man power and time.

I. INTRODUCTION

Internet of Things represents a general concept for the ability of network devices to sense and collect data from the world around us, and then share that data across the Internet where it can be processed and utilized for various interesting purpose. Internet of Things is very quickly becoming a reality. We can see the proof of it around us. Our devices are getting

smarter each day from smart phones to smart TV to smart car to smart kitchen. Everything is now getting connected to internet. Internet of Things describes a network of physical objects that connect to each other through the internet. Objects, or 'things' can transfer information wirelessly without requiring human interaction. A 'things' can be any objects that can be assigned an IP address and provided with the ability to transfer data over a network.

A thing, in the internet of things, can be a person with a heart monitor implant, a farm animal with a biochip transponder, an automobile that has built in sensors to alert the driver when tire pressure is low or any other natural or manmade object that can be assigned an IP address and provided with the ability to transfer data over a network. These devices collect useful data over a network. These devices collect useful data with the help of various existing technologies and then autonomously flow the data between other devices. Current market examples include smart thermostat systems and washer/dryers that utilizes Wi-Fi for remote monitoring.

Internet of Things or IoT is an architecture that comprises specialized hardware boards, Software systems, web APIs, protocols which together creates a seamless environment which allows smart embedded devices to be connected to internet such that sensory data can be accessed and control system can be triggered over internet. Also devices could be connected to internet using various means like Wi-Fi, Ethernet and so on. Furthermore devices may not needed to be connected to internet independently

1.1 Aim and Objectives

The objectives of the project is to design a smart drip irrigation system to water plants with the use of devices like raspberry pi, Arduino microcontrollers. Arduino is used to control the system wirelessly while C/C++ programming language is used for automation purpose. This system also contributes an efficient and fairly cheap automation irrigation system. System once installed has no maintenance cost and is easy to use. Environment parameters monitoring system based on wireless communication technology has been developed to control remotely, which realizes the measurement of temperature, rain fall, soil parameters.

1.2 Existing Methodology

The system can be represented using algorithms and algorithms are designed using flowcharts

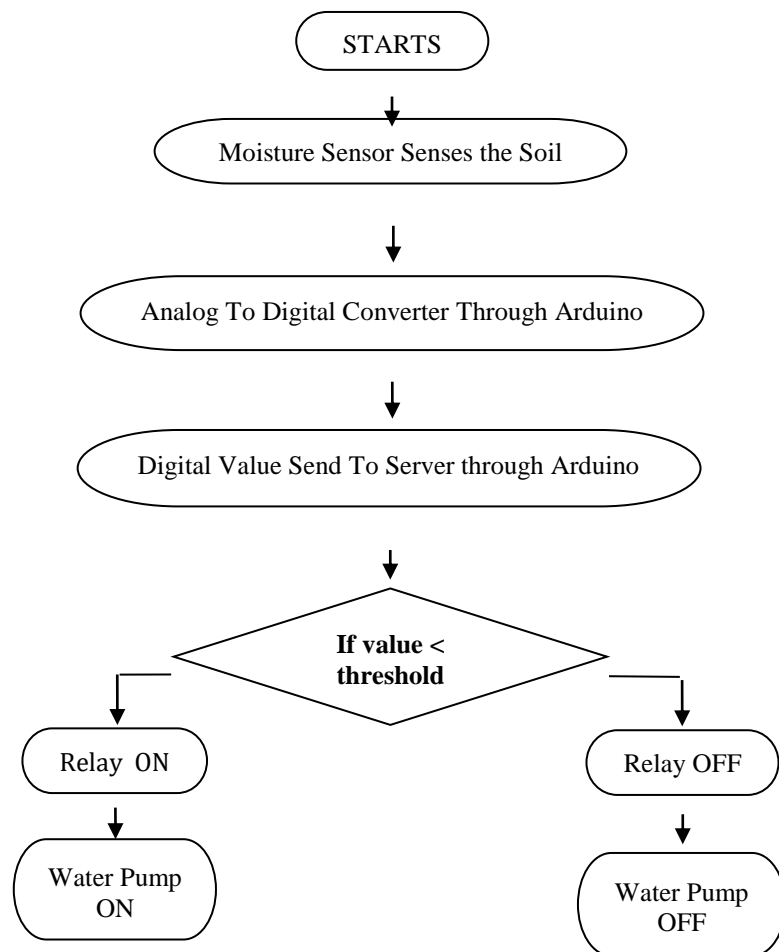


Figure 1. Flowchart of the system

The logics of the algorithm help to identify whether there is need of water to plant. Further, logics and decision making conditions help soil moisture condition of the soil and it always maintain moisture and also the user gets the status of the motor on the mobile. First the moisture sensor senses the soil. The output of the moisture is in the analog form. The ADC of the Arduino converts the output of the moisture sensor into digital form. The digital value is then send to the through RF module which decides whether to soil is wet or dry and according to that water the plant. If the soil is dry, Raspberry pi actuates the relay and water pump starts which leads to water to flow. If the soil is wet, turns the relay of as a result water pump is off and water flow stop.

II. PROPOSED SYSTEM

An IoT based irrigation system is for efficient agriculture management system which enables farmers to contend with challenges they face. There are many application in IoT, which addresses the major problem like soil moisture detection, water conservation management, crop growth monitoring, etc. This project enables better and smarter irrigation through temperature, humidity and other sensors networked to communicate with the user. For farmers and growers, Internet of Things has provided extremely productive ways to cultivate soil with the use of cheap, easy to install sensors and an abundance of insightful data they offer.

SOIL MOISTURE: Soil moisture is the water that is held in the spaces between soil particles. The root zone soil moisture is the water that is available to the plants, which is generally considered to be in the upper 200 cm of soil, moisture is fundamental importance to many hydrological, biological and biogeochemical process. The proposed system include soil moisture measurement as the main module. Irrigation to the field and acknowledgement to the user are done based on the water content in the soil.

ELECTRICAL CONDUCTIVITY OF SOIL: Electrical conductivity(EC) is a measurement of the dissolved material in an aqueous solution, which relates to the ability of the material to conduct electric current through it. EC is measured in units called Seiments per unit area. Higher the dissolved material in the soil, higher the EC will be in it.

Similar to EC, pH of the soil measure the acidity of soil based on hydrogen ion concentration in it. The pH of the soil ranges on a logarithmic scale from 1-14, where pH 1-6 are acidic, pH 7 is neutral, pH 8-14 are basic. The optimum pH range for most of the plants is between 5.5-7. Based on the pH value the soil nutrient level can be defined.

TEMPERATURE: Temperature is another parameter that is measured in this project. This value helps in

conservation of water used for irrigation. Even though the soil moisture is less, if the temperature is not too high then the irrigation to the crop can be limited. This is because many plants can withstand low moisture conditions when the temperature is moderate.

CONTROLLING UNIT: Arduino is an open source electronics platform based on easy to use hardware and software. Arduino boards are able to read inputs light on a sensor, a finger on a button, or a twitter message and turn it into an output activating a motor, turning on an LED, publishing something online. The board can be activated by sending a set of instruction to the microcontroller on the board. The Arduino programming language, and the Arduino software, based on processing must be used for implementation.

The moisture and temperature sensed by the sensor are processed in the arduino microcontroller. When the values are beyond the threshold value, then the controller does the defined job.

MOISTURE SENSOR: Soil moisture sensor measure the volumetric water content in soil. Since the direct gravimetric measurement of free soil moisture requires removing, drying, and weighting of a sample, soil moisture sensor measures the volumetric water content indirectly by using by some other property of the soil, such as electric resistance, dielectric constant, or interaction with neutrons, as a proxy for the moisture content. The relation between the measured property and the soil moisture must be calibrated and may vary depending on environment factor such as soil type, temperature, or electric conductivity.

Reflecting microwave radiation is affected by the soil moisture and is affected by the soil moisture and is used for remote sensing in hydrology and agriculture. Portable probe instruments can be used by farmers or gardeners.

TEMPERATURE SENSOR: The LM35 series are precision integrated circuit temperature devices with an output voltage linearly proportional to the centigrade temperature. The LM35 device has an advantage over linear temperature sensors calibrated in Kelvin, as the user is not required to subtract a large constant voltage from the output to obtain convenient centigrade scaling. The LM35 device does not require any external calibration or trimming to provide typical accuracies of $\frac{1}{4}$ C at room temperature and $\frac{3}{4}$ C over a full -55 C to 150 C temperature range. Lower cost is assured by trimming and calibration at the water level. The low output impedance, linear output, and precise inherent calibration of the LM35 device makes interfacing to readout or control circuitry especially easy. The device is used with single power supplies, or with plus and minus supplies. As the LM35 device draws only 60 uA from the supply, it has very low self heating of less than 0.1 C in still air.

GSM SIM 900 MODEM: The GSM standard has given birth to wireless services like General Packet Radio Service (GPRS) and Enhanced Data For GSM Evolution (EDGE). Its end users were the first to take advantage for an inexpensive implementation of SMS, which is more popularly known as texting, GSM phones may be identified by the presence of a Subscriber Identity module (SIM). This tiny object, which is about as wide as a finger, is a removable smart card that contains a user's subscription information, as well as some contact entries. This SIM card allows a user to switch from one GSM phone to another. One service that has grown enormously is the short message service. Developed as part of the GSM specification, it has been incorporated into other cellular technologies. It can be thought of as being similar to the paging service but it is far more comprehensive allowing bi-directional messaging, store and forward delivery, and it also allows alphanumeric messages of a reasonable length. This service has become particularly popular, initially with the young as it provided a simple, low fixed cost.

This project effectively uses the short message service provided by GSM to acknowledge the user about the field and crop condition.

III. CONCLUSION

The moisture sensors and temperature sensor measure the moisture level (water content) and temperature of the different plants. If the moisture level is found to be below the desired level, the moisture sensor sends the signal to the Arduino board which triggers the Water Pump to turn ON and supply the water to respective plant. The system may be further extended for outdoor utilization

This project presents the design of an IoT based automatic irrigation system. The proposed system can reduce the efforts of farmers and provides high yield. It also conserves water for irrigation by locating the sensor at the right position above the soil level. This work have shown the plants can still sustain at low moisture level when the temperature is moderate.

The main goal of the project is to transform the manual irrigation system to the Automatic irrigation by using the Internet of Things (IoT). The machine can be operated through remote location so the farmer does not have to spend time in his field for irrigation in farm.

IV. REFERENCES

- [1]. Joaquin Gutierrez, Alejandra Nieto- Garibay, "A real time implementation of a GSM based automated irrigation control system using drip irrigation methodology". IEEE, 2013.vol 5 n0 01 January 13.
- [2]. Veena Divyak, Ayush Akouri, "A real time implementation of GSM based automated irrigation control system using drip irrigation methodology", 2013. Volume 4 Issue 5, May 2013.
- [3]. S.R.N. Reddy, "Design of remote monitoring and control system". IEEE, vol 1, Issue 10, 2013

- [4]. I. Bennis, H. Fouchal, O. Zytoune, D. Aboutajdine, "Drip Irrigation System using Wireless Sensor Networks" Proceedings of the Federated Conference on Computer Science and Information Systems, ACSIS, Vol. 5, 2015.
- [5]. G. Nisha , J.Megala, Velammal institute a/technology, Chennai,India, "Wireless sensor network based automated irrigation and crop field monitoring system", 2014 Sixth International Conference on Advanced Computing (ICoAC) 978-1-4 799-81595114/\$31.00©20 14 IEEE
- [6]. Zhiyong Lai, Yongli Dai, "An Irrigation Control System Based On An FPGA" 2012 Second International Conference on Instrumentation & Measurement, Computer, Communication and Control.
- [7]. Mahir Dursun and Semih Ozden, "A wireless application of drip irrigation automation supported by soil moisture sensors" Scientific Research and Essays Vol. 6(7), pp. 1573-1582, 4 April, 2011
- [8]. Sensor Based Automatic Irrigation System and Soil pH Detection using Image Processing. Sanjay Kumawat¹, Mayur Bhamare², Apurva Nagare³, Ashwini Kapadnis⁴ Dept. of Computer Engineering, Late. G. N. Sapkal College of Engineering, Nashik, Maharashtra, India.
- [9]. MICROCONTROLLER BASED AUTOMATIC PLANT IRRIGATION SYSTEM Bishnu Deo Kumar¹, Prachi Srivastava², Reetika Agrawal³, Vanya Tiwari⁴ ¹Asst. Prof., Department of Instrumentation and Control Engg., Galgotias College of Engg. & Tech., Uttar Pradesh, India ²34UG Student, Department of Instrumentation and Control Engg., Galgotias College of Engg. & Tech., Uttar Pradesh,
- [10]. Automatic irrigation system for smart city using PLC and SCADA Gaddipathi Bharathi*¹, Chippada Gnana Prasunamba.

Efficient Multi-Keyword Search in Encrypted and Distributed Cloud Storage

Darshana Khadse , Harshada Gote , Mayuri Pardhi , Nikita Bhakre , Nikita Thag , Ms.Nutan Sonawane

Department of Computer Technology Engineering, Rajiv Gandhi College of Engineering and Research, Nagpur, Maharashtra, India

ABSTRACT

In Information Networks, owners can store their records over disseminated different servers. It urging customers to store and access their data in and from various servers by settling down wherever and on any device. It is an endeavoring task to give capable seek after on passed on what's more give the insurance on owner's reports. The present system gives one possible methodology that is security guaranteeing requesting (PPI). In this structure, records are floated over various private servers which are with everything considered obliged by cloud/open server. Right when customer needs a few records, they question to open cloud, which by then reestablishes the dapper once-over that is private server once-over to customers. Resulting to getting list, customer can glance through the reports on unequivocal private server yet in this system, records are confirmed in plain substance structure on private server that is assurance is undermined. Regardless, proposed structure improves this present system to make it reasonably secure and accommodating. First reports are confirmed in encoded structure on the private servers and after that utilization Key Distribution Center (KDC) for allowing unscrambling of data get from private server, at client side. The proposed structure what's more completes TF-IDF, which gives the masterminding of results to customers.

Keywords: Information Network, Encryption, Inner Product Similarity, Single Keyword Search, Multi-Keyword Search, Ranking.

I. INTRODUCTION

The concept of project is to provide an efficient search in distributed cloud network and also provide privacy to data for which we are using PPI technique, in which data is stored in multiple server . Indexing is done of all the server. The index of particular server is maintained there only. Here independent monitoring server is introduced .Hence efficiency is improved because of one server and data privacy is provided because request is not reaching the main server. To maintain user privacy KDC is used. Advance encryption standard is used for encryption and TF-IDF is used for ranking

II. LITERATURE REVIEW

Rising information frameworks [1] give accommodating seek after on passed on reports. Security ensuring reports or PPI presents a response for guarding their owner's assurance. The understudied issue is security certification inside watching multi-catchphrase record look by using PPI. Terms and verbalizations get got contrasts their semantic repercussions. In this the maker appears, the main work of e-PPI for preparing the dispersed report look close by quantitatively withdrawn attestation ensuring.

In paper [2] makers proposed an ensured cushioned multi-watchword orchestrated look for over the cloud data which is in encoded structure. This framework licenses explicit catchphrases as an interest parameter

and returns the related results to shared structure is basic. Security is related by scrambling the patient records using symmetric Encryption other than called as private-key cryptography which is used to encode and unscramble the message for consistency in security. A sender sends encoded data (figure substance) and gatherer uses the most ideal approach to manage direct unscramble the data by using this encryption procedure.

In paper [3] makers proposed a novel ordinary character strike that parts existing PPIs and developed an identity mixing custom against the device in e-PPI. With no trusted in distant likewise as trust connection between providers, the proposed e-PPI building tradition is the begun. By using nonexclusive MPC a system that is secure multi-party computation and streamlined the execution to a reasonable estimation by constraining the exorbitant MPC part, the PPI improvement specially wrapped up.

In paper [4] creator prescribed that the structure is useful to emergency offices comparably as patients to share their flourishing records in a pariah server. This is beneficial for getting to their records from wherever in view of shared structure. Security of shared framework is central. Security is associated by scrambling the patient records utilizing symmetric Encryption in like course called as private-key cryptography which is utilized to encode and loosen up the message for consistency in security. A sender sends encoded information (figure substance) and recipient utilizes the best way to deal with oversee unscramble the information by utilizing this encryption procedure.

In paper [5] producers proposed SS-PPI, a novel security saving record reflection, which, related of dissipated access control-kept up look customs, gives hypothetically ensured affirmation of substance protection. Separated and existing recommendations (e.g., flipping confirmation saving index[2]), our answer features with a development of irrefutable

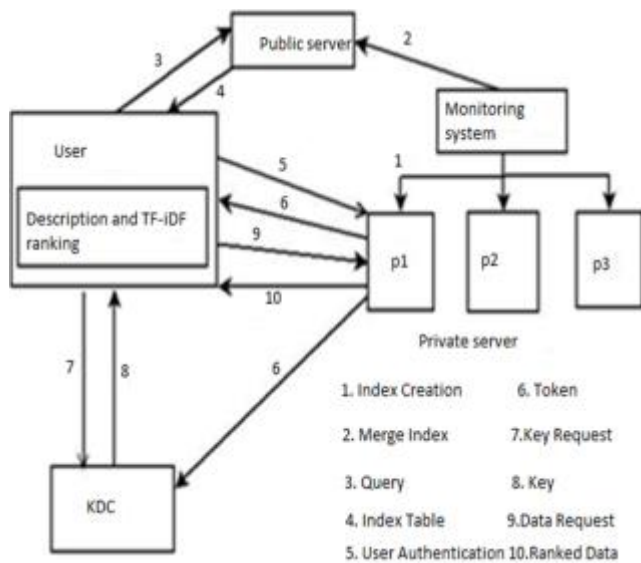
highlights: (an) it joins find the opportunity to control game-plans in the protection ensuring record, which improves both intrigue ability and strike quality; (b) it utilizes an energetic report headway convention by techniques for a novel utilization of the produce sharing course of action in a completely streamed way (without confided in outsider), requiring just suffering (generally two) round of correspondence; (c) it gives data theoretic security against charming enemies amidst summary improvement correspondingly as demand replying. We direct both formal examination and test assessment of SS-PPI and display that it beats the best level strategies like both security attestation and execution reasonability.

III. PROPOSED WORK

Structure is including open cloud server, diverse private servers and unmistakable customers. The owners accounts are store on private servers in stream way. The records are confirmed in encoded structure. AES figuring is used for data encryption. Each private server made its record report of data. Checking structure accumulates all records and setting them. This mixed record is then checked at open cloud. In the long run, if client needs some report from server, it delivers a demand to open cloud. In returns, open cloud gives the mixed record got from checking structure. After a short time from this last affiliation document, client having the once-over of private server at which request related data is confirmed. By then to get to the data at server, client sends the check request with customer name and bewilder word.

Private server checks this nuances store in its database. After viable check, private server makes the token and sends it to client and Key Distribution Center (KDC). Coming to fruition to getting this token, customer request's to KDC for key. KDC demand this token with its token which is starting at now getting from private server. After confirmation, KDC gives encryption key to the client. By then client send data request to private server in returns server gives all

organizing mixed records. Using key client can unscramble the data. Finally apply the TF-IDF organizing check, to get all results in orchestrating procedure.



IV. CONCLUSION

The happening to circulated figuring, data owners are impelled to redistribute their marvelous data the board systems from adjacent goals to business open cloud for mind boggling flexibility and money related assets. Protection and data security of delicate data must be mixed before re-appropriating, which obsoletes ordinary data utilize reliant on plaintext watchword search. Considering the immense number of data customers and reports in cloud, it is basic for the request organization to allow multi-catchphrase question and give result closeness situating to meet the convincing data recuperation need.

V. REFERENCES

[1]. Yuzhe Tang and Ling Liu, Fellow, IEEE, "Privacy-Preserving Multi-Keyword Search in Information Networks," IEEE Transactions On Knowledge And Data Engineering, Volume 27, Issue 9, 2015

[2]. Ning Cao, Cong Wang, Ming Li, Kui Ren, and Wenjing Lou, "Privacy-Preserving Multi-

keyword Ranked Search over Encrypted Cloud Data" , Proc. IEEE Infocom, Volume 3, Issue 8, 2014

[3]. Yuzhe Tang , Ling Liu , Arun Iyengar , Kisung Lee, Qi Zhang, " E-PPI: Locator Service in Information Networks with Personalized Privacy Preservation" , IEEE Transactions On Knowledge And Data Engineering, Volume 7, Issue 6, 2015

[4]. K.S.Sureh, Mrs. SaritaChowdary, T. Balachary. " A Cloud Based System for Patient Health Records Using Symmetric Encryption" ,International Journal of Advanced Research in Computer Science and Software Engineering, Volume 3, Issue 11, 2013.

[5]. Yuzhe Tang, Ting Wang, Ling Liu, Shicong Meng, and Balaji Palanisamy. "Privacy-Preserving Indexing for eHealth Information Networks" , ACM CIKM'11, Volume 2, Issue4, 2011.

A Review on Wireless Sensor Networks for Optimal Energy Utilization

Apeksha Adulkar¹, Ayushi Evaney¹, Deeplaxmi Babde¹, Shwetal Warhade¹, Preeti Karmore²

¹UG Student, Department of Computer Science Engineering, Dr. Babasaheb Ambedkar College of Engineering and Research, Nagpur, Maharashtra, India

²Assistant Professor, Department of Computer Science Engineering, Dr. Babasaheb Ambedkar College of Engineering and Research, Nagpur, Maharashtra, India

ABSTRACT

Wireless sensor networks contain a far-reaching number of appropriated sensor contraptions, which are related and created through multi-hop guiding. To make use of the optimal lifetime in Wireless Sensor Networks (WSNs) the ways for information move are picked in a way that the aggregate vitality used along the way is limited. To help high versatility and better information aggregation, sensor nodes are consistently gathered into disjoint, non-covering subsets called clusters. Clusters make progressive WSNs which join proficient usage of restricted assets of sensor nodes and subsequently expands organize lifetime. The objective of this paper is to demonstrate a bleeding edge audit on clustering calculations announced in the writing of WSNs. This paper presents different vitality proficient clustering calculations in WSNs.

Keywords: Clustering, Load balancing, Fault Tolerance, Latency, Data Aggregation, LEACH, PEGASIS, TEEN, HEED

I. INTRODUCTION

Remote Sensor Network (WSN) is a future mechanical assembly, which has a wide extent of bearing, including structure protection and present day recognizing. This kind of framework, as a general rule contains endless that join them to outline a framework. The most fundamental idea for a remote sensor sort out is control usage. Notwithstanding the way that the employments of WSN are to an incredible degree rich and appealing, the WSN won't be grasped in by far most of these applications if batteries are to be changed dependably. As such, when the sensor center is organized, control usage must be restricted. There are different systems that can be used to decrease the ordinary supply current of the radio, and in this way the power usage.

Absence of ideal vitality use is one of the most prominent confinements of the remote sensor hubs.

Various experts are working in vitality powerful sensor hubs, progression of vitality capable framework tradition and topology. Power is eaten up by a sensor center to identify getting ready and to transmit data. Data transmission is the most vitality exhausting exercises. Introduction of bunching approach in the WSN data transmission will lessen the vitality usage.

Grouping has wound up being a viable technique that constructs the framework lifetime by dropping the vitality utilization and gives the imperative versatility. To achieve high versatility and extended vitality profitability and to redesign the framework lifetime the experts have significantly gotten the arrangement of molding bunches.

For example circumstances arrange for the collection of sensor hubs in gigantic scale remote sensor. In a general sense, a bunching plan chooses a ton of hub that can give the base station a spine

interface. The types of hubs discussed in these parts are termed bunch heads, and as part hubs are implied whatever remains of the hubs of the framework. The part hubs sporadically transmit their data to the group leaders who have a spot in this bunching plan, transforming it into the commitment of the group head to add up to this data and transmit it to the base station. Somehow this transmission could either be fast via many heads of the group. This arrangement, over the long haul, makes two measuring systems in which the larger sum of the group head hubs is set up and the part hubs transform into a smaller pecking request, thus reducing the quantity of bundles given off. An additional heap of a group head center has to recognize messages from its bunch of people, all out, convey the accumulated message to the accompanying jump to the sink and deliver the collected messages that other group head hubs have started. It is essential to regroup the framework as often as possible in order to modify the store Ideal utilization of bunching is constantly vitality compelling if the group heads are legitimately arranged along these lines the circumstance of group head transforms into key criteria in bunching for achieving vitality efficiency. In the grouping plan, bunch head hubs are browsed through one of the transmitted sensor in a homogeneous environment.

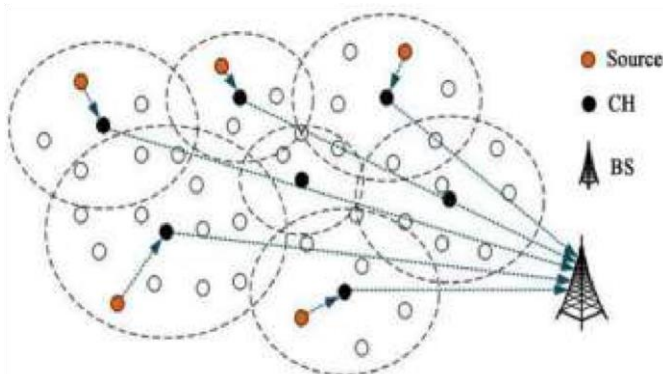


Figure 1. Basic Architecture for Wireless Sensor Network Correspondence area and partitioning of base stations are genuine stresses that must be considered when performing grouping of remote sensors. The correspondence between the bunch head

and the base station is another key piece of grouping if this is not fast enough to require multi hop coordination to make the bunch head accessible. What's more, moreover, the bunch head should not to be exhausted unnecessarily which may some way or another or another lead to silly loss of vitality of group head hubs.

II. LITERATURE REVIEW

The use of essentialness in WSN is one of the most fundamental issues. With regard to the ability to imperatively plan, hierarchical conventions are accepted as the best. They limit the use of imperative uncommonly in a get-together and spread the data by using a grouping technique. Different leveled planning conventions reduce the use of essentialness by confining hubs into groups. A middle with the Goliath dealing with force is selected as a group head in each bunch, which connotes the data sent by the fuelled sensor hubs. There are inspections around bunch - based management conventions for remote sensor structure. In [5] Authors demonstrated the tradition of LEACH (Low Energy Adaptive Clustering Hierarchy) by selecting the CHs in rounds for group - based structure WSNs, a generally known and impeccable bunching estimate. Drain is a powerful flexible standard vitality grouping figure that structures hubs packs depending on the hailing quality and uses these bunch heads as SINK changes. Since data exchange to the base station engulfs more vitality, with the transmission, all the sensor hubs knock off some people's socks inside a bunch replacement. This prompts balanced vitality use everything being equivalent and starting now and into the foreseeable future an undeniably widened lifetime of the framework. A predefined regard, P (the perfect dimension of group heads in the framework), is set before beginning this computation. Drain works in a couple of rounds where each round has two stages, the setup sort out and the reliable stage. Amidst the setup organize, each center points lifts whether to wrap up a group head or not. Each center point selects a sporadic

number p in the range of 0 and 1, which is basically the chance to select as a group head. If the probability p isn't actually a point of confinement $T(n)$ for center n , center n will transform into a group head for the current round r .

$$T(n) = \begin{cases} p & \text{If } n \in G \\ 0 & \text{Otherwise} \end{cases} \quad \overline{1 - p * (r \bmod \frac{1}{p})}$$

The sensor hubs can begin to identify and transmit information to the bunch heads in the middle of the steady stage. The bunch also manages all data from their group's sensor hubs and sends data to the base station. The framework enters another round of picking the bunch heads after an unequivocal length of time spent on the suffering stage. The resolute stage's length is longer than the setup organizes scope with an express extreme objective of limiting the overhead. Drain gives an improved lead to correspondence in WSNs thinking about self – affiliation techniques. Adaptability is moreover supported by LEACH, newer hubs need to be synchronized with the current round.

In view of how the predefined P is a dimension of the total number of sensor hubs, center point frustrations may result in fewer group heads to be picked than those to be searched.

Examine a single LEACH round; a stochastic cluster-head selection will not induce the least use of vitality in the midst of a given sensor hubs game plan's suffering stage of data trading. Take an example; a section of group heads can be arranged near the edges of the framework, or some neighboring hubs can advance to become bunch heads. Some sensor hubs are further away from a group head in these cases. In any case, considering around two changes somewhere, in the later round a choice of extraordinary group heads can understand a terrible affirmation of bunch heads. With regard to the use of vitality, for a stochastic

calculation a deterministic estimate of the choice of bunch head can be used. Distinguishing what remains of vitality in the condition of the farthest point may pose another problem.

The group – head edge will end up being exorbitantly low as whatever remains of the hubs have a low vitality level after different rounds. With sufficient vitality, some group heads will not be able to transfer data to the base station. Despite the route that there are still hubs open with sufficient vitality to play this errand, the framework cannot work remarkably. Melding a factor that increases the edge for any center that has not been a group head for a specific number of rounds can further enhance the edge condition. Because of the higher edge, the likelihood of this center point changing into a bunch head develops.

Power – proficient collection in sensor data structures (PEGASIS), which is a change over LEACH, was proposed in [6] creators. It's chain – based custom where hubs need to talk and exchange visits with BS to their closest neighbors. To discover the closest neighbor, every inside of the framework uses flag quality. The PEGASIS chain connects hubs closest to each other that shape the BS course. Any midpoint in the chain will send the collected data to the BS and the hubs stuck the tight spot will send to the BS. Nevertheless, PEGASIS suspicions may not usually be justifiable.

- PEGASIS expects each sensor center to be able to converse clearly with the BS. Sensor hubs use multi – hop correspondence in utilitarian cases to achieve the BS.
- This believes that all hubs on the territory of the other center point of the system will maintain a whole database; anyway the method by which the center point region is gotten isn't depicted.
- All sensor hubs are thought to have a comparative vitality dimension and are most likely to pass on in the meantime.

Irrespective of the way in which colossal sensors are settled or stationary as recognized in PEGASIS, a few sensors can be allowed to move and influence as far as possible along these lines.

Here in [7], the makers proposed a dynamic bunching uniquely aimed at adaptable structures in which hubs respond to unexpected and stupid changes in the condition known as TEEN in a short time. Hard Threshold (HT) and Soft Threshold (ST) Bunch plan and information trade are done as in the past what many would consider conceivable considerations close by different characteristics. The hubs reliably perceive these traits and what is more the earth. The center switches on its transmitter and sends the recognized information unmistakably when it finds within point that the clear trademark has achieved HT.

In the center point, the perceived look is moored in an inner factor SV. In the current group time parcel, the next time that the present estimate of the apparent quality is higher than HT and the present estimate of the recognized trademark contrasts from SV by a total like or higher than the ST will undoubtedly be transmitted within point. Using HT and ST in the framework will decrease the transmission ratio and thereby decrease the general dispersal of centrality within the framework. This game plan is time-friendly - acknowledging basic application information.

This paper [8] Adaptive Periodic Threshold - Sensitive Energy Efficient Sensor Network (APTEEN) plot is a progression to TEEN and is intended both to sporadically send chance and to respond to key conditions. Then again, APTEEN cements the bit of proactive and responsive frameworks and transmits information in customizable time intervals whilst, irrespective of that, it reacts to abrupt changes in mark

considerations. APTEEN depends on a framework of interest that licenses three kinds of intrigue: on - time recorded and tenacious that can be used to some extent as a mutt structure. The CH selection framework depends on the LEACH - C dash systems CHs specify the four parameters in APTEEN: attributes, thresholds, timing, and count time.

All hubs in APTEEN always feel nature, but it is precisely when the quality of information seen is at or clearer than HT that information is transmitted. With regard to a center point, the information must be viewed and transmitted again if it is not transmitted in day and age with respect to the number time. In APTEEN, each CH aggregates the information within its group from the part hubs and transmits the information gathered to the BS. The custom sees that the information obtained from part hubs is enough to take a gander at ; this reduces an epic proportion of the bounty of the information to be sent to the BS. In addition, the cream framework is appreciated by a sensible TDMA game plan by selecting transmission space for all hubs in a bunch. Furthermore, APTEEN offers a lot of adaptability by allowing customers to fix the CT between time and edge considerations for centrality use can be restricted by changing the CT and what is more the most expelled point considerations.

Here in [9], a scattered, randomized grouping for WSNs was proposed by makers. This framework is unambiguously allocated to single - level bunching and paralyzed grouping in two stages. Each sensor center point accounts for itself in the single - level bunching as a CH with probability p within its correspondence run to the neighboring center point. The names of these CHs are voluntary CHs. Each and every hubs inside k bounces a CH level will receive this revelation either by mapping correspondence or by sending it Compulsory CHs are not hubs that are neither CH nor have a group spot. If by any chance that the announcement will

not reach a center within a pre - set time between time t that is figured in light of the term for a group to accomplish an inside point that is k bounces away, within point will change into a compulsory CH expecting that it is not within k ricochets of all CHs volunteers. The second step, named dazed grouping, gathers h bunch advancement estimates. The count guarantees CHs and base station h - influence engineer. The CHs closest to the base station are experiencing trouble as they travel as exchanges for various CHs.

Paper [10] the Hybrid, Energy - Efficient and Distributed (HEED) bunching strategy for unrehearsed sensor systems is another recognizable vitality fit center point grouping estimate. The notice made by [21] would be a spread grouping custom that has been proposed as follows:

- Extending the future system by spreading the use of vitality.
- Completion of the grouping framework within predictable cycles;
- Reduced overhead control (to be immediate in the number of hubs),
- Incredible production - scattered bunch heads and decreased groups.

Notice that in setting a cross type of two bunching parameters group heads are occasionally picked: The central parameter is whatever remains of the criticality of each center point of the sensor and the discretionary parameter is the cost of correspondence intra - bunch as a Neighbor region or group thickness area. The focal parameter is used to select a covered group heads game plan probabilistically while using the associate parameter to break ties.

The get - together frame at each center point of the sensor requires a few rounds. Each round is long enough to receive messages from any neighbor within the expanding bunch. As with LEACH, there is predefined a secured rate of bunch heads in

the structure, C_{prob} . The C_{prob} parameter starts to induce the key bunch head presentations late and has no incite sway on the last group structure. In HEED, each sensor center point sets the likelihood that CH_{prob} will change into a group head as it looks for Where $E_{residual}$ is the evaluated current holding up vitality in this sensor center point and E_{max} is the most amazing meaning (identifying with a fully charged battery), which is conventionally indistinct for homogeneous sensor hubs. The consideration of CH_{prob} must be more fundamental than a p_{min} base edge. A group head could either be a short bunch — head if its CH_{prob} is < 1 or a last group — head if its CH_{prob} is 1.

Each sensor center that has never been noticed by the CH lifts a relative center point with the corresponding CH_{prob} in the midst of each round of HEED. The starting late selected CH is added to the current strategy of the group heads. It sends a declaration message as a restrictive CH or a last CH if a sensor center point is bowed up by a social affair CH. With the most unessential expense from this CH system, an inside taking a gander at the CH list picks the group head. By then, each inside point copies its CH_{prob} and goes to the stage that follows. If an inside point executes the adjacent HEED to lift itself to undoubtedly turn up a CH or join a get - together, it is verbalized as a last CH. At a pending cycle, a brief CH center point may change into a general center point if it is alerted from a less critical CH expenditure. Keep in mind that at remarkable bunching between times the center point could be lifted as a CH in case it has high meaning with less expense. Since the WSNs are recognized as a static frame where focus points to pass out of the blue, the inside point set near each center point does not change every once in a while. Before long HEED ought not to be seriously propelling core interest. The dispersal of HEED's favorable position utilization increases the value of the huge number of center concentrations within the framework. By sending and suffering messages,

hubs in the same path thus animate their neighboring sets in multi - skip compose all over. The HEED framework extemporizes the models throughout their lifetime over LEACH as it carelessly picks CH (and starts now and into the not - so - distant bunch sizes), which prompts a few core interests to go early. The last CH chosen here will be specially trained in the framework and the correspondence experience will be maintained.

In [11] makers proposed the first unequal bunching model to change the use of centrality, called Unequal Clustering Size (UCS). The field of the sensor is isolated into two concentrated circles called layers and each layer has a number of similar size groups. The size and conditions of the two - layer groups are obvious. Tradition perceives that the BS is created in internal motivation that drives the structure and that the district of CHs is settled "priori" that are symmetrically sorted out in concentrated circles around the BS. To control the use of criticality within the group, each CH should be set at the bunch driving center motivation. CHs are planted in the structure deterministically and are recognized as super hubs that are substantially more expensive than part hubs. The group level can be moved by isolating the first of the essential layer around the BS, thus almost changing the hubs ratio in an unambiguous bunch. By selecting the nearest CH to BS, each CH transmits information to BS.

The UCS has ascended from LEACH two affinities. The UCS, however, can maintain uniform use of vitality among CHs. It can be simplified by fluctuating the hubs ratio of the standard correspondence stack in each group. Correspondingly, custom impacts two layered frameworks to model, and two - way between unambiguous group strategies, resulting in shorter basic transmission expels disengaged and LEACH, diminishing the entire use of vitality significantly.

In [12] makers proposed the stream adjusted controlling (FBR) tradition for multi-bounce

bunched WSNs. The custom endeavors to satisfy both power viability and growth guarding. The custom joins four stages: bunching, multi - ricochet upgrading of the spine, streaming balanced transmission and re - routing. At the beginning of covering sensor degrees, the couple of hubs are assembled into one bunch. Manage spine improvement; the use of CHs and BS accumulates a novel paralyzed spine. The balanced arrangement of the stream distributes the traded information from the sensors to the BS over various courses to attempt to use the power of the sensors. Unambiguously when the CH was short on vitality, the CH drops out of the spine and the topology of the framework is reconfigured in the rerouting stage in such places. In order to evaluate the achievement of the FBR tradition, the two assessments called the lifetime framework and the lifetime of development are considered. The increase works out as a planned display that FBR yields both the longest lifetime as well as a better enlargement guarantee.

Here in [13] makers proposed CBRP brainstorm for which the framework is grouped using a few parameters and then a spread across the tree to send the base station accumulated information. CBRP development is spent on two stages, such as managing cluster head selection and organizing tree time planning. The CH affirmation depends on the Cluster Head Selection Value (CHSV) in the selection arrangement for CH, the best look center for CHSV will change and be placed in the group head. In controlling the tree time orchestra, in view of the parent selection value (PSV), one by one group head selects the center point of their parent sensor. The controlling tree will then be made and the transmission will take place. The division and remaining hugeness of hubs and selects is considered by CBRP to be immaculate CHs that can spare moreover notable vitality in hubs. Starter does not show surprisingly that CBRP corresponds to the

use of centrality among CHs and is thus spared in the framework more prominent vitality.

In [14] makers introduced an Energy Efficient Clustering Scheme (EECS) to collect applications for periodic information. The structure is divided into various groups in EECS and uses single - influence correspondence between the CH and the BS. In EECS, a CH hopeful scans the ability for a given round to lift CH. Each hopeful CH demonstrates to neighboring competitors their left vitality. On the off chance that a given center does not locate an inside point with significantly increasingly additional importance, it's turning into a CH. EECS extends LEACH through shocking survey of social gatherings in group setting separate from the BS. The cost of correspondence intra - group is reduced by selecting the nearest CH.

Custom is proposed for WSNs in [15] Power - Efficient and Adaptive Clustering Hierarchy (PEACH) to extend the lifetime of the structure by decreasing the use of criticality. The hubs in the framework could see the origin and purpose of information parcels becoming distant features of correspondence. In PEACH, for example, the groups are fused without additional overhead transmission, see, and state, join and book messages. PEACH is a masterminding probabilistic estimation and provides a versatile staggered grouping. On the other hand, under unexpected conditions; it is also incredibly capable and versatile with the present grouping traditions.

PEACH might fit both vigilant and missing WSNs as for a zone. Unequivocally an application, the region information of within point isn't recognized. PEACH custom territory unaware may be used in such applications. The space - conscious PEACH works when, for example, a GPS - like device on sensor hubs is accessible to the detention instrument.

III. CONCLUSIONS

In later years, authorities were drawn to remote sensor arrangements in both sharp and mechanical spaces. An endeavoring attempt is the strategy of influencing, solid, and versatile control traditions for WSNs. Clearly, grouping computations can fit WSN's goals and troubles all around. Similarly; it is certainly noted here that basic undertakings were made to keep an eye out for the frameworks to plot to induce and viable bundling of traditional WSN arrangements as of late. This paper has inspected the state of-claim to fame of different bunching estimations in remote sensor arranges close to LEACH and other fundamental traditions composed in the association of WSNs till today. Every effort has been made to give completion and right forefront audit on importance gainful bunching estimations as applicable to WSNs.

IV. REFERENCES

- [1]. W.B. Heinzelman, A.P. Chandrakasan and H. Balakrishnan, "Application specific protocol architecture for wireless microsensor networks", IEEE Transactions on Wireless Communications, vol.1, no.4, Oct 2002, pp.660-670.
- [2]. S. Lindsey and C.S. Raghavendra, "PEGASIS:Power efficient gathering in sensor information system", in Proc. of IEEE Aerospace conference, vol.3, March 2002, pp.1125-1130.
- [3]. S. Banerjee and S. Khuller, "A clustering scheme for hierarchical control in multihop wireless networks", in Proc. of 20th Annual Joint Conference of the IEEE Computer & Communications Societies (INFOCOM'01), vol.2, April 2001, pp.1028-1037.
- [4]. S. Banbyopadhyay and E.J. Coyle, "An energy efficient hierarchical clustering algorithm for wireless sensor networks", Twenty-Second Annual Joint Conference of the IEEE Computer and Communications IEEE Societies (INFOCOM 2003), vol.3, April 2003, pp.1713-

1723. [5] W. Heinzelman, A. Chandrakasan and H. Balakrishnan, "Energy efficient Communication Protocol for Wireless Micro-sensor Networks", Proceedings of the 33rd Annual Hawaii International Conference on System Sciences, 2000.
- [5]. S. Lindsey and C.S. Raghavendra, "PEGASIS: Power efficient gathering in sensor information system", in Proc. of IEEE Aerospace conference, vol.3, March 2002, pp.1125-1130.
- [6]. A. Manjeshwar and D.P. Agrawal, "TEEN: A Routing Protocol for Enhanced Efficiency in Wireless Sensor Networks", Proceedings of the 15th International Parallel & Distributed Processing Symposium, IEEE Computer Society, April 2000, pp. 2009-2015.
- [7]. A. Manjeshwar and D. P. Agarwal, "APTEEN: A hybrid protocol for efficient routing and comprehensive information retrieval in wireless sensor networks," in Proceedings of the 2nd International Workshop on Parallel and Distributed Computing Issues in Wireless Networks and Mobile computing, FL, USA, April 2002, pp.195-202. [9] S. Banbyopadhyay and E.J. Coyle, "An energy efficient hierarchical clustering algorithm for wireless sensor networks", Twenty-Second Annual Joint Conference of the IEEE Computer and Communications IEEE Societies (INFOCOM 2003), vol.3, April 2003, pp.1713-1723.
- [8]. O. Younis and S. Fahmy, "HEED: A Hybrid, Energy- Efficient, Distributed Clustering Approach for Ad Hoc Sensor Networks", IEEE Transactions on Mobile Computing, vol.3, no. 4, Oct 2004, pp.366-379.
- [9]. S. Soro and W.B. Heinzelman, "Prolonging the lifetime of wireless sensor networks via unequal clustering," in Proceedings of 19th IEEE International Parallel and Distributed Processing Symposium, April 2005.
- [10]. Y. Tao, Y. Zhang and Y. Ji, "Flow-balanced routing for multi-hop clustered wireless sensor networks," Ad Hoc Networks, vol.11, no.1, January 2013, pp. 541-554.
- [11]. B. Zarei, M. Zeynali and V.M. Nezhad, "Novel Cluster Based Routing Protocol in Wireless Sensor Networks", IJCSI International Journal of Computer Science, vol.7, no.4, 2010.
- [13]. M. Ye, C. Li, G. Chen and J. Wu, "An energy efficient clustering scheme in wireless sensor networks," Ad Hoc and Sensor Wireless Networks, vol. 3, April 2006, pp.99- 119.
- [14]. Y. Sangho, H. Junyoung, C. Yookun and J. Hong, "PEACH: Powerefficient and adaptive clustering hierarchy protocol for wireless sensor networks," Computer Communications, vol. 30, no.14-15, October 2007, pp. 2842-2852.
- [15]. A.U. Khattak, G.A. Shah and M. Ahsan, "Two-tier cluster based routing protocol for wireless sensor networks," in Proceedings of IEEE/IFIP 8th International Conference on Embedded and Ubiquitous Computing (EUC), Hong Kong, December 2010, pp. 410-415.
- [16]. N. Gautam and J.Y. Pyun, "Distance aware intelligent clustering protocol for wireless sensor networks," IEEE Journal of Communications and Networks, vol.12, no.2, April 2010, pp. 122-129.

Question Answering System on the Basis of Crowd Sourcing

Bhavika Hirapure, Neha Burghate, Pooja Mendhe, Shweta Giri, Mr. D.S. Gawande

Department of Computer Science and Engineering DBACER Nagpur, India

ABSTRACT

These days, individuals utilize the web to discover the appropriate response, for the most part network question replying (CQA) destinations utilized for finding the arrangement. However, social media is becoming more popular, that's why people are ignoring the Community question answering site (CQA). Therefore, we are creating a website which is "Question answering system on the basis of CrowdSourcing". This project aims to find and develop the solution or overcome the unanswered question issue. By using crowdsourcing platform the task could easily be done by humans.

Keywords: Crowdsourcing, Knowledgesharing, Qasystem

I. INTRODUCTION

Search engines, social media and network creates complications but CQA will provide the most relevant answer. CrowdSourcing is the act of getting ideas, information from a group of people. Similar to a "suggestion box". QA system is developed to overcome the problem of unanswered question. The aim of this project is to combine human thinking and knowledge sharing for limited community.

II. RELATED WORK

They make a task work publicly supporting framework association in a private situation. They utilized PCSS and four quality control strategies which are preprocessing sifting, constant genuine - time separating, post-handling sifting, and conjecture preparing sifting, and assess the PCSS by utilizing it to gather information [1].

They utilized Crowder approach skim slant and utilizing a few highlights they create programming work, for example, required systems, installment, title

and diagram depiction, post information and accommodation due date, and so forth [2].

They proposed QA framework question recognizable proof plan question acknowledgment ((EAT) ID) and looking through the learning base insight root word (KB) to discover the appropriate response revealing the dissolvable to the characterized inquiry [3].

They concentrated on "Wh-Question" and after that present a scientific model precedent dependent on numerical examination to distinguish the inevitable Why-Questions answers [4].

III. METHODOLOGY

In this project, we have to overcome the problem of existing QA on the basis of crowd sourcing with limited community concept and give permission to only authorized user to answer the question. Unauthorized user are able to only read or access knowledge from the QA system. The purpose of this model is to provide knowledge sharing and question answering based on crowdsourcing for the authorized user and find best solution of the question.

First of all starting the QA system, there is login option for both guest users and private users. Private users is nothing but registered user and Guest user is anyone who can ask their question to the QA system. Guest user and private user ask the question to the QA system. The question is stored in the database, after that administrator analyse that question if the question is invalid then it's send message to the users else question is valid then it is forwarded to the next process (to the crowd workers). Crowd workers then give the answers according to the question. All answers stored in the database, after that administrator analyse that answer on the basis of rating and review. Amongst all the answers given, one having the highest rating has given the priority at the topmost of the answers. And rest of the answers arranged accordingly on the basis of rating. Thus we get lot of answers and knowledge related to our question.

of crowdsourcing platform we combine the human concept, share knowledge and give best solution to the user.

V. REFERENCES

- [1]. Mohammad Javad Kargar, Abbas Oveissi, "An OpModelFor Question Answering Systems Based On Crowdsourcing".
- [2]. Masayuki Ashikawa, Takahiro Kawamura and Akihiko Ohsuga, "Deployment of Private Crowdsourcing System with Quality Control Methods", 2015 IEEE/WIC/ACM International Conference on Web Intelligence and Intelligent Agent Technology.
- [3]. Hasangi Kahaduwa, Dilshan Pathirana, Pathum Liyana Arachchi, Vishma Dias, Surangika Ranathunga, Upali Kohomban, "Question Answering System for the Travel Domain", 2017 Moratuwa Engineering Research Conference (MERCon).

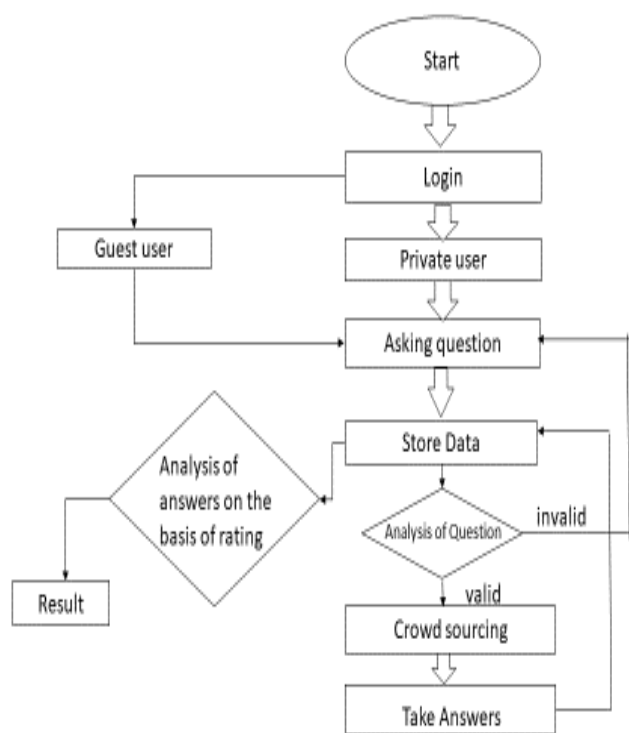


Figure 1. Work flow diagram of QA System

IV. CONCLUSION AND FUTURE SCOPE

This project attempts to overcome the challenges which are faced in existing work, by using the concept

Rooftop Solar Panel Cleaning System Using Internet of Things (IoT)

Abhiraj Dumanwar, Aditya Ghangare, Akash Mithe, Shubham Parashar, Dr. N.V Chaudhari

Department of Computer Science and Engineering DBACER, Nagpur, India

ABSTRACT

In general, solar panels are installed in dusty areas. Because of excessive dust accumulation and bird droppings the power generation efficiency of solar panel is affected. Cleaning the solar panel manually is tedious and cumbersome. In this paper we propose a programmable system to clean solar panel using water and wiper. The project is implemented using Internet of Things (IOT) technology. The system will be controlled by the Microcontroller and various sensors. The system can be controlled by using android device. The system notifies the user about the various operations performed through text message. The system may be converted to portable so that it can be used in various locations.

Keywords : SPV Panel, Motors, Microcontroller, IOT, Sensors

I. INTRODUCTION

The sun is a very good energy source, so there is plenty of solar energy available in nature. If whole solar energy could be made available for utilization, supplying the world's energy demand would be more sufficient. However, due to atmospheric conditions, this is not possible. Solar energy can be converted via solar panel into more usable forms of energy. Renewable energy, in particular solar energy, which provides electricity without causing any impact on gas emissions, is of wide interest.

Many alternatives have considered the photovoltaic method of extracting electricity from solar power. It promises to meet the ever-increasing energy demand. Due to weather conditions, the efficiency of the solar panel is limited, so parameters like dust, moisture and temperature are extremely important. In this respect, the efficiency study of the solar panel was carried out with and without dust accumulation. The project includes a dust cleaning system design and implementation.

The main aim of the project is to provide an automated cleaning mechanism for dust from the solar panel. Many factors affect the efficiency of Photovoltaic (PV) power, such as snow, high temperatures, pollen, dust and dirt. The main factor affecting the efficiency of a PV panel is dust, which, depending on the environment, can reduce its efficiency by up to 50 percent. Cleaning has traditionally been done manually. Manual cleaning has disadvantages such as accident and panel damage, movement problems, poor maintenance, etc. The automatic dust cleaning system of solar panels has resolved the problems of conventional cleaning and also creates effective cleaning and prevents inconsistencies in efficiency due to the deposition of dust. Studies conducted to assess the efficiency of the solar panel for one day, one week and one month of dust collected on it. The efficiency of the solar panel was also calculated one day, one week and one month after cleaning the surface. And finally, it is proven that the efficiency of the solar panel increases significantly by comparing both efficiencies. The developed model improves the performance of the solar panel.

II. METHODOLOGY

Dust deposition on the solar panel can reduce the level of performance of the solar panel and reduce the productivity of solar cells and, if the panel is not cleaned, the efficiency is approximately 50 percent over 6 months. This leads to significant annual monetary losses. We proposed a cleaning mechanism in this paper to clean the accumulated dust on the solar panel. This proposed system is completely automatic and does not require any human intervention, but the system can be initiated / triggered via the android device if the automatic system sometimes does not respond. Regardless of their size, the system can be attached to any solar panel. The system operates via the microcontroller fixed to the frame and moves using stepper motors with wheels. The power is supplied to the entire system via batteries or solar panels. The cleaning wiper is triggered by the initiation of the water spray mechanism as soon as the dust sensor detects dust. No dust notifications about the cleaning operation are sent to the user after the dust sensor senses.

The methodology involves the following steps

1. Details on the effect of accumulation of dust on the solar panel on the efficiency of power generation.
2. Designing an automatic cleaning system model.
3. To keep the cost minimum and produce an efficient system, select the microcontroller, sensors, water nozzles and other components for the system.
4. Design of an effective communication system for communication between user and microcontroller.

III. ANALYSIS OF DUST ON PANEL

The accumulation of dust on the solar panel surface reduces radiation to the filament and causes voltage and power loss. Dust not only reduces radiation in the solar cell, but also changes the reliance on the

incidence angle of solar radiation. Research shows that the daily energy loss caused by dust deposited on the surface of the PV module is around 4.4% over a year. Daily energy losses can be higher than 20% during longer period of time without rain. Moreover, the loss of radiation is not perpetual during the day and immensely depends on the angle of sunlight and the ratio of attenuation to direct radiation. The loss of solar output is symmetrical at noon when studied according to position of the sun, where the minimum value is reached. Different pollutants were tested for the performance of the PV module. Depending on the amount and sort of contaminant accumulated, a decrease in the voltage and output power of the PV module is observed when particles of dust are stashed in the Solar module. In addition, there is a greater reduction in the temperature of the PV module. The PV modules are clean and cool, as well as efficient system performance. The generation of electricity in the solar panel is calculated scientifically with dust and without dust with different load resistance.

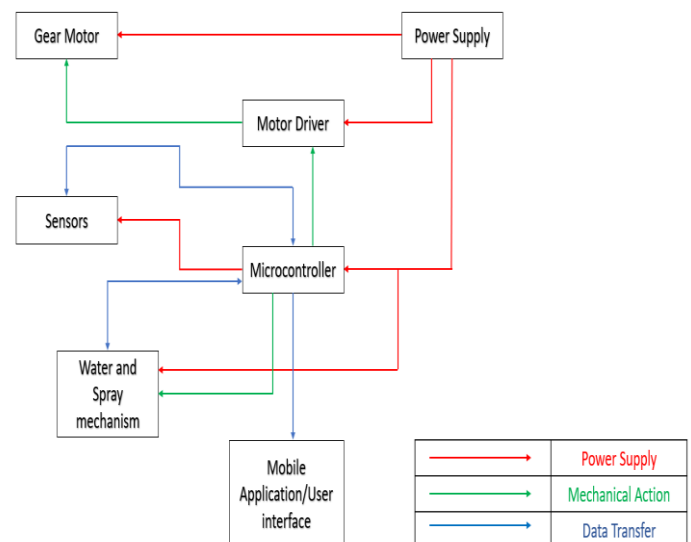


Figure 1. Flow Diagram of Cleaning System.

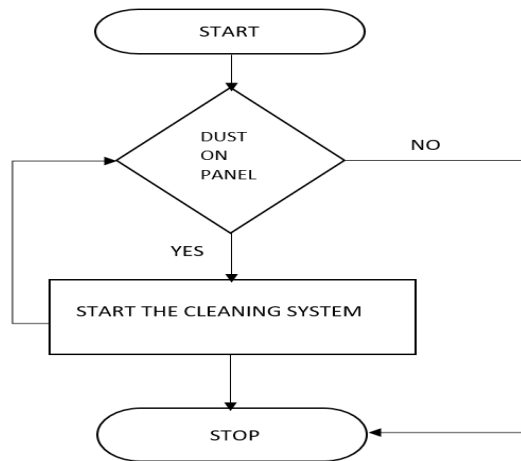


Figure 2. Automated Solar panel cleaning Algorithm.

This project consists of 4 modules

1. Sensor module
2. Motor module
3. Cleaning module
4. User Interface

1. Sensor Module

The dust sensor detects dust on the solar panel. If there is dust on the sensor, it generates a voltage and threshold and if the threshold is more than a specific predefined value then the system will be automatically triggered.

The microcontroller on the basis of data, communicates with the other modules to initiate cleaning or not.

2. Motor Module

The motor module deals with the movement of the cleaning device. When dust is accumulated on the panel, the dust sensor generates the threshold and triggers the microcontroller, which then initiates the motor driver to activate the cleaning device.

3. Cleaning Module

The cleaning module deals with the cleaning of the panel. As the motor driver gets initiated, the microcontroller then asks the wiper to start the clean operation and also activates the spray mechanism. The

cleaning operation is performed till the dust sensor gives a negative value.

4. User Interface

The user interface enables the communication between the user and the device. The device sends text messages to the user through GSM module to tell him about every operation that is being performed. Also, in this module the user can initiate to clean his solar panel own through the mobile application.

IV. WORKDONE

There are various types of solar panels are available in the market and the most used solar panels types are:

- Monocrystalline Solar Panels (Mono-SI)
- Polycrystalline Solar Panels (Poly-SI)
- Thin-Film Solar Cells (TFSC)

Mono-SI and Poly-SI are the solar panels which are mostly used in residential usage, Mono-SI is 12% to 16% more efficient as compared to Poly-SI.

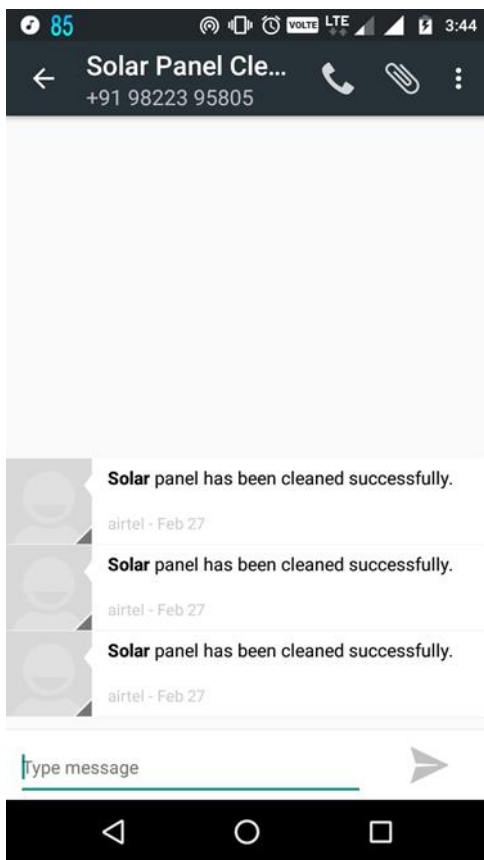
Mechanical department has designed a model of actual panel cleaning system with the fabrication of the cleaning arm which consists of 4 gear motors installed over it two of them are of 100 revolutions per minute (RPM) and other two are of 30 revolutions per minute (RPM) respectively. 30 revolutions per minute (RPM) motors are installed on the either edges of the solar panels which will driven over the tracks on the panel. Arm has two 100 revolutions per minute (RPM) motors in the middle which will clean the panel. Water sprays are installed on the upper edge of the solar panel which will spray the water over it when the pump is been triggered.

Now, as far as the computer science & engineering department concerned is responsible for making the whole system to be programable. So, Internet of Things (IoT) technology is being implemented. The brain of the whole cleaning system is NodeMCU and Arduino which are called as the Microcontroller.

These microcontrollers are connected to the ultrasonic sensor, GSM module, dust sensor, water pump & the cleaning arm motors.

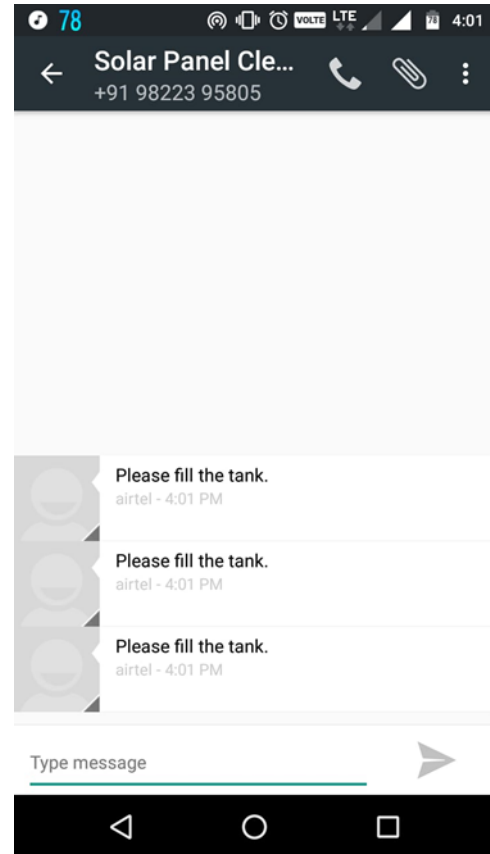
Steps of cleaning process:

- User can trigger the cleaning process by their own mobile phone just by clicking on the “ON” button.
- As, the process starts the water pump will spray the water over the panel and the cleaning arm will move in forward direction for particular time which can be a variable time according to the panel length.
- After few second’s forward movement of the cleaning arm, the arm will come backwards up to its original position and at that time the water pump will stop the water spray, and the user will get the message on their mobile phone that the cleaning process has been successfully done.



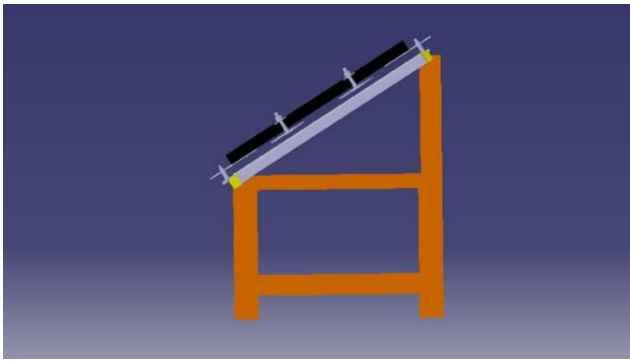
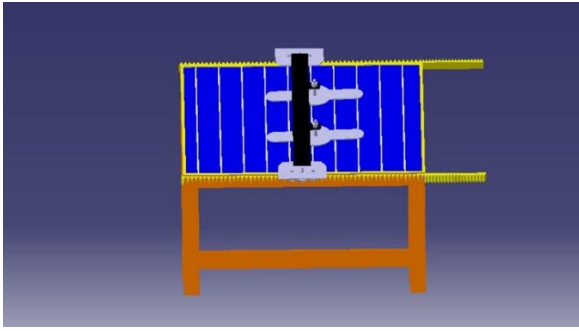
- The ultrasonic sensor is being installed in the water tank which will inform the user about the

status of the water in the tank. If the distance of the water is more than 15cm then the sensor will trigger the message on the user’s mobile phone, “please fill the tank” and the system will not get triggered until the water is filled in the tank.



- The dust sensor is connected to the arduino, dust sensor detects the dust which passes through it and generates a threshold and voltage when ever dust goes through it.
- It gives a specific threshold when the value is more than a predefined value the microcontroller will trigger the whole cleaning system.

V. DESIGN REPRESENTATION OF ACTUAL MODULE



The above-mentioned sketches are the representation of the actual module which consists of the 2 gear motors which will move over the solar panel, Tracks are installed on both the edges of the solar panel so that the mechanical cleaning arm can move along the panel for cleaning. The motors situated in the middle of the mechanical arms are of 100 revolutions per minute (RPM) which will move 360 degrees and the motors which are driving the arm are of 30 revolutions per minute (RPM). 12 Volts battery is used as the main source of power supply for whole module to be processed, the battery which is being used is rechargeable battery which gets recharged by the solar panel itself. Water tank consists of the water pump which sprays the water over the surface of the solar panel.

VI. RESULTS

The system is being successfully triggered programmably as well as manually and each module is performing their respective work efficiently and user is getting the proper response from the system as desired.

VII. APPLICATION

In the 21st century, the use of non-conventional energy resources for electricity generation increased. More and more people install solar panels on their home's roofs to generate electricity. However, when dust is accumulated on the solar panel, the flow rate is reduced and less electricity is produced. Therefore, cleaning the panel as soon as the dust is accumulated is very important for the correct power generation. But it is a very tedious task to clean the panel, requiring human effort and time that most people do not have. The elderly cannot clean the panel even regularly. The solar panel cleaning device therefore helps the user solve all the problems mentioned above. It automatically cleans the panel using a dust sensor, cleaners and communicates with the microcontroller. The device also allows you to communicate so that the user can also start cleaning whenever the user wants.

VIII. ADVANTAGES

1. System has to be installed only once.
2. Low operation and maintenance costs.
3. Easily replaceable components.
4. Easy installation.
5. Low production cost.
6. Highly safe cleaning system with no threat to humans.
7. Easy to operate and maintain.
8. No heavy machinery is required.
9. Working of system is very easy.

IX. DISADVANTAGES

1. Microcontroller may get damaged due to irregular voltage supply.
2. Wiper needs to be changed when worn out.

X. LIMITATION

1. The actual dust sensor which works with the 100% efficiency doesn't exist.

2. The periodic cleaning is not possible because the microcontroller is limited in terms of the memory and microcontrollers works on the microsecond measures so the hours values in terms of microseconds is way more higher which is not possible to implant in the microcontroller.
- [6]. "Dry Brush Assembly and Method of Operating Dry Brush Assembly for Cleaning Solar Panel Modules", Eddie Bug, Perrysburg, Oh (Us), US 2016/0015164 A1.
- [7]. "Automatic Solar Panel Cleaning System", Manju B 1, Abdul Bari 1 and Pavan C M 2, UG Student1 and Assistant professor2, Department of Mechanical Engineering, G Madegowda Institute of Technology, Bharathinagar, Mandya, INDIA, DOI: 10.31695/IJASRE.2018.32778

XI. CONCLUSION

Existing automated cleaning systems focus primarily on large solar power plants and are not generally useful for installation on smaller solar panels on dwelling roofs. This means that only a smaller solar panel must be installed for those with space constraints, which is why this project offers these smaller solar panels a huge advantage. The system can be installed on the top of the roof for solar panels.

XII. REFERENCES

- [1]. "Microcontroller Based Automatic Cleaning of Solar Panel", S. B. Halbhavi, S. G. Kulkarni, Dr. D. B. Kulkarni, Department of Electrical & Electronics Engineering, Gogte Institute of Technology, Belgaum Karnataka, India, ISSN: 2278-621X.
- [2]. "Solar Panel Cleaning System", Mr. Ashish Saini, Abhishek Nahar, Amit Yadav, Arnim, Dhruvash Singh Shekhawat, Mr. Ankit Vijayvargiya, Department Of Electrical Engineering Swami Keshvanand Institute Of Technology Management & Gramothan, Ramnagar, Jagatpura, Jaipur (Raj.), ISSN: 2454-1362.
- [3]. Automated Self-Cleaning Solar Panel, Yousaf Abdul Salam, Terry Green and Yann Tyng Lin.
- [4]. "The Effect of Soiling on Photovoltaic Systems ", Located in Arid Climates, Adrienne Kimber, Sunpower Corporation, 2954 San Pablo Ave. Berkeley, Ca 94702 USA.
- [5]. "Solar Tracker Cleaning System and Method", Moshe Meller, Tel Aviv (Il); Eran Meller, Tel Aviv (Il), US 9,455,665 B1.

Image Fusion for Scene Classification using Machine Learning

Chaitali Swan¹, Dr N. V. Chaudhari²

¹Student, Department of Computer Science and Engineering DBACER Nagpur, India

²HOD, Department of Computer Science and Engineering DBACER Nagpur, India

ABSTRACT

Image fusion is the mechanism of gathering all important information. It is not only reduce data but also more appropriate and understandable for human and machine. Scene classification is widely used in day to day lifecycle. Their importance is increasing gradually. Scene classification is a classification which classify the image according to their area of importance. In this paper, Image is segmented, features of image are extracted and information is stored in database about image. Lastly, image is classified by machine learning and output comes in the text format. We use machine learning based support vector machine for classification which is more accurate than KNN classifier. The main aim of this study is to improve the accuracy and to reduce the delay of computation for the system.

Keywords: Scene classification, machine learning, support vector machine (SVM), KNN classifier, machine learning based SVM.

I. INTRODUCTION

Scene classification is classify the scene into various parts for object recognition. Various image are stored in database. Input scene goes from three method such as segmentation, feature extraction, scene classification. Segmentation divides the image by applying Gaussian filter for smoothed the image. After that feature extraction extract the colour pixel and edge pixel that shows sharpening of pixel then apply KNN classifier for matching the both images and resulted output. Lastly, apply machine learning for comparing accuracy of both classifier.

Support vector machine (SVM) that classify the image in two class. There are different type of image feature for that only two classes is not sufficient for that we use machine learning SVM. The machine learning SVM classify the image in five classes. That five class shows the one of the best feature from all.

Scene image classification is an important problems for applications of computer vision such as robotics,

image search, geo-localization, etc. It is also a challenging problem, e.g. for scene object recognition aren't appropriate. This is because scenes include both a holistic component, the gist of the scene, and an object based component. Furthermore, the object vocabulary is usually open-ended and it does not suffice to recognize objects, as most scenes are collections of objects in characteristic spatial layouts. There is also a need to model relationships between objects.

Our problem formulation will be to identify datasets for classification. Extraction of features from those datasets in order to completely define the image. Finally use a machine learning based classifier to classify the image into a particular scene type.

II. LITERATURE REVIEW

"Image understanding - a brief review of scene classification and recognition", Vineeta Singh, Deeptha Girish, and Anca Ralescu MAICS 2017.[18]

conclude that Scene recognition performs better when low level features are used. Local features help override the effects of occluded objects, low lighting conditions. These features can be successfully mapped into semantic image descriptors.

“Scene classification with semantic fisher vectors”, Mandar Dixit, Si Chen, Dashan Gao, Nikhil Rasiwasia, and Nuno Vasconcelos. In *CVPR*, pages 2974–2983, 2015.[6] proposed that an effective approach to summarize them with a Fisher vector, which is non-trivial. The semantic FV provides a better classification architecture than an FV of low-level features or a even fine-tuned classifier.

“Deep Scene Image Classification with the MFAFVNet”, Yunsheng Li Mandar Dixit Nuno Vasconcelos University of California, San Diego La Jolla, CA 92093 2017 IEEE International Conference on Computer Vision. The new architecture is based on a MFA-FV layer that implements a statistically correct version of the MFA-FV, through a combination of network computations and regularization. When compared to previous neural implementations of Fisher vectors, the MFAFVNet relies on a more powerful statistical model and a more accurate implementation. The MFAFVNet achieves state of the art performance on scene classification.

“Scene Classification in Images”, B V V Sri Raj Dutt Pulkit Agrawal Sushoban Nayak A tree classification approach very high accuracy at each and every step, else cumulation of errors at each levels and their further percolation can affect the overall accuracy of the classifier badly.

“Remote Sensing Image Scene Classification: Benchmark and State of the Art”, By Gong Cheng, Junwei Han, Senior Member, IEEE, and Xiaoqiang Lu, Senior Member, IEEE. first presented a comprehensive review of the recent progress in the field of remote sensing image scene classification, including benchmark data sets and state-of-the-art

methods. Authors evaluated a number of representative state-of-the-art methods including deep-learning-based methods for the task of scene classification using the proposed data set and reported the results as a useful performance baseline for future research.

III. CONCLUSION

Scene classification is more accurate with the machine learning. The output is error free and machine identified scene give output correctly and it is easily understandable. Delay time for the computation in machine learning is minimum than KNN. Machine learning shows the best feature output. After comparison with KNN, classifier machine learning is the best one classifier.

IV. REFERENCES

- [1]. Yunsheng Li Mandar Dixit Nuno Vasconcelos University of California, San Diego La Jolla, CA 92093 “Deep Scene Image Classification with the MFAFVNet” 2017 IEEE International Conference on Computer Vision.
- [2]. Relja Arandjelovic, Petr Gronat, Akihiko Torii, Tomas Pajdla, and Josef Sivic. Netvlad: CNN architecture for weakly supervised place recognition. In *ICCV*, pages 5297–5307, 2016.
- [3]. Mircea Cimpoi, Subhransu Maji, and Andrea Vedaldi. Deep filter banks for texture recognition and segmentation. In *CVPR*, pages 3828–3836, 2015.
- [4]. Navneet Dalal and Bill Triggs. Histograms of oriented gradients for human detection. In *CVPR*, volume 1, pages 886– 893. IEEE, 2005.
- [5]. J. Deng, W. Dong, R. Socher, L.-J. Li, K. Li, and L. Fei-Fei. ImageNet: A Large-Scale Hierarchical Image Database. In *CVPR09*, 2009.
- [6]. Mandar Dixit, Si Chen, Dashan Gao, Nikhil Rasiwasia, and Nuno Vasconcelos. Scene classification with semantic fisher vectors. In *CVPR*, pages 2974–2983, 2015.

- [7]. Mandar D Dixit and Nuno Vasconcelos. Object based scene representations using fisher scores of local subspace projections. In NIPS, pages 2811–2819, 2016.
- [8]. Yang Gao, Oscar Beijbom, Ning Zhang, and Trevor Darrell. Compact bilinear pooling. In CVPR, pages 317–326, 2016.
- [9]. Zoubin Ghahramani, Geoffrey E Hinton, et al. The em algorithm for mixtures of factor analyzers. Technical report, Technical Report CRG-TR-96-1, University of Toronto, 1996.
- [10]. Remote Sensing Image Scene Classification: Benchmark and State of the Art By Gong Cheng, Junwei Han, Senior Member, IEEE, and Xiaoqiang Lu, Senior Member, IEEE.
- [11]. Ross Girshick, Jeff Donahue, Trevor Darrell, and Jitendr Malik. Rich feature hierarchies for accurate object detection and semantic segmentation. In CVPR, 2014.
- [12]. Yunchao Gong, Liwei Wang, Ruiqi Guo, and Svetlana Lazebnik. Multi-scale orderless pooling of deep Convolutional activation features. In ECCV, pages 392–407 Springer, 2014.
- [13]. Aude Oliva and Antonio Torralba. Modeling the shape of the scene: A holistic representation of the spatial envelope IJCV, 42(3):145–175, 2001.
- [14]. Florent Perronnin, Jorge Sanchez, and Thomas Mensink, Improving the fisher kernel for large-scale image classification. In ECCV, pages 143–156. Springer, 2010.
- [15]. Scene Classification in Images B V V Sri Raj Dutt Pulkit Agrawal Sushoban Nayak
- [16]. Jorge Sanchez, Florent Perronnin, Thomas Mensink, and Jakob Verbeek. Image classification with the fisher vector: Theory and practice. IJCV, 105(3):222–245, 2013.
- [17]. Karen Simonyan and Andrew Zisserman. Very deep convolutional networks for large-scale image recognition. arXiv preprint arXiv:1409.1556, 2014.
- [18]. Image understanding - a brief review of scene classification and recognition Vineeta Singh, Deeptha Girish, and Anca Ralescu MAICS 2017

Sharing Hard Disk Data Over WIFI Network

Prof. Sneha Sahare¹, Pravina Kshirsagar², Prajjwal Tripathi², Sanket Gabhane², Naresh Hans²

¹Assistant Professor, Computer Science & Engineering Department, DBACER, Nagpur, Maharashtra, India

²Computer Science & Engineering Department, Nagpur University, DBACER, Nagpur, Maharashtra, India

ABSTRACT

In a current situation, we cannot access the hard disk data directly through mobile. We must require a computer or laptop as a mediator. In the existing method, mobile cannot read the files of a hard disk because mobile support exFAT file format and hard disk contain NTFS file format. In this proposed system we are going to connect and mount a portable hard disk to the mobile and read the files from a hard disk through the Storage Access Framework with the help of a mounting script. The Storage Access Framework is nothing but an interface of our application which makes it simple for a user to browse and manipulate data.

Keywords: Hard Disk, NTFS (New Technology File System), FAT (File Allocation Table), Mounting.

I. INTRODUCTION

Android is a Google - designed mobile operating system. It is based on a modified Linux kernel version and other open source software and is primarily designed for mobile touchscreen devices like smartphones and tablets. Most of the mobile is now running an android - based operating system. These Android devices operating system support Fat12 (File Allocation Table), 16,32, Ext3(Third Extended File System), Ext4 or exFAT (Extended File Allocation Table) file system. The file is stored in one or more clusters that are not necessarily next to each other when you write a new file to a hard disk, they may be rather widespread over the disk.

For High-capacity storage media such as HDDs which is NTFS (New Technology File System) type disks partitioned is not supported in an Android operating system. NTFS is the file system used by the Windows operating system to store and retrieve files on a hard disk. NTFS is the Windows equivalent of the File Allocation Table of Windows 95 (FAT) and the High Performance File System. However, in terms of

performance, extensibility, NTFS offers a number of improvements over FAT and HPFS.

In this proposed system we are going to connect a portable hard disk to the mobile and read the files from a hard disk through the Storage Access Framework. The Storage Access Framework is nothing but an interface of our application which makes it simple for a user to browse and manipulate data, as well as open documents, images, and other files across all preferred storage. Once we read the data from the hard disk, we can easily manipulate the data and we can also transfer our data via a wireless medium. We are developing an android application, here application will work as a mediator which can share data from one portable hard disk to another portable hard disk.

II. METHODOLOGY

Computer stores data on a piece of media (such as a disk or CD - ROM) in specific, structured file formats. In order to properly interpret its data, the computer must be able to read the format on this media if the

computer does not recognize the format, errors are returned. Forcing your computer to work with corrupted or unrecognized formats will also cause your computer to write data incorrectly, rendering all the files stored on the media unrecoverable.

The storage device of NTFS file format cannot be easily mounted by an Android operating system that is why we cannot access NTFS file format. In this mounting script, there are certain stages after achieving those stages we can mount NTFS Storage device through which we can access NTFS file system. Mounting ensures that the media format is recognized by a computer if a computer is unable to recognize that format, the device cannot be mounted. When the media is mounted successfully, the computer incorporates the file system of the media into a local file system and creates a mount point through which you can access an external device, a locally available link.

Following are certain stages of mounting module

1. Parsing raw data stream of memory location.
2. Detect partition table.
3. Parse the partition table.
4. Parse the NTFS partition.
5. Generate the file directory and tree structure.

There are two different ways to store data on the drive for MBR (Master Boot Record) and GPT (GUID partition table) partition. This information includes where the divisions begin and start, so your operating system knows which sectors are bootable for each partition. Therefore, you must select MBR or GPT before creating a partition on the drive.

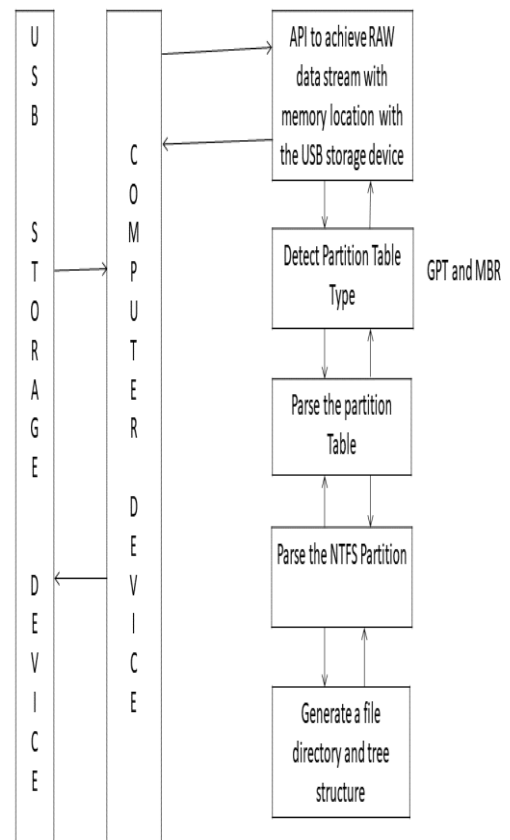


Figure 1. Mounting Stages

III. WORKFLOW

Flowchart shows the diagrammatical representation of our system. The initial stage of our project is to establish a connection between hard disk to mobile through OTG cable (On The Go). In this proposed system we are going to connect and mount a portable hard disk to the mobile and read the files from a hard disk through the Storage Access Framework with the help of a mounting script. Once the mount process is done system can access the data. The Storage Access Framework is nothing but an interface of our application which makes it simple for a user to browse and manipulate data. Now user is able to perform read and manipulate operation on data

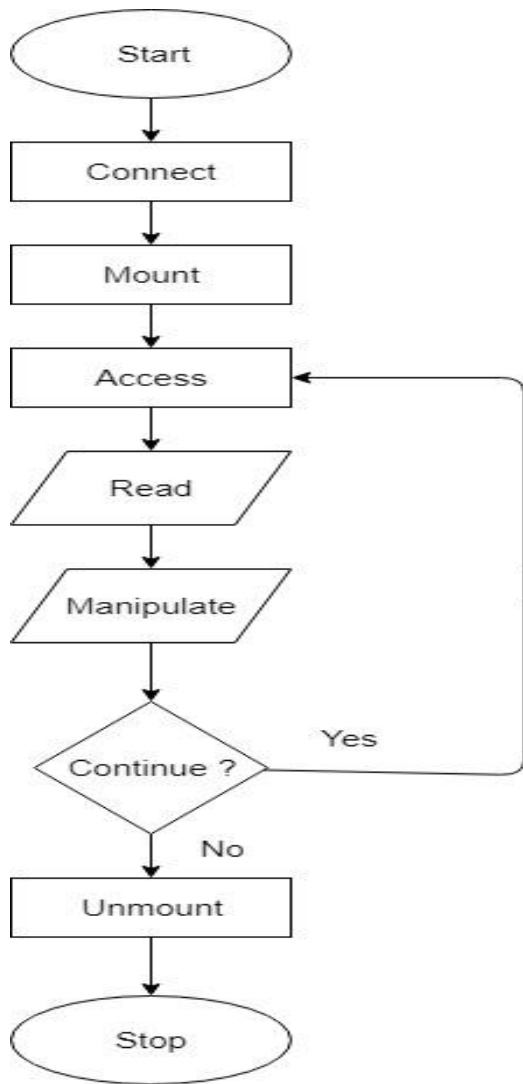


Figure 2. Project Flow

IV. SCREENSHOT

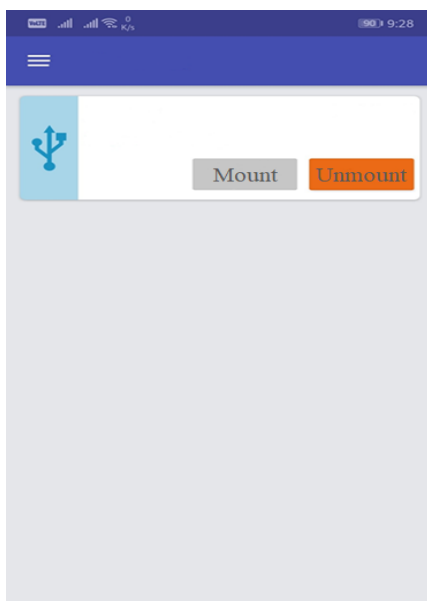


Figure 3

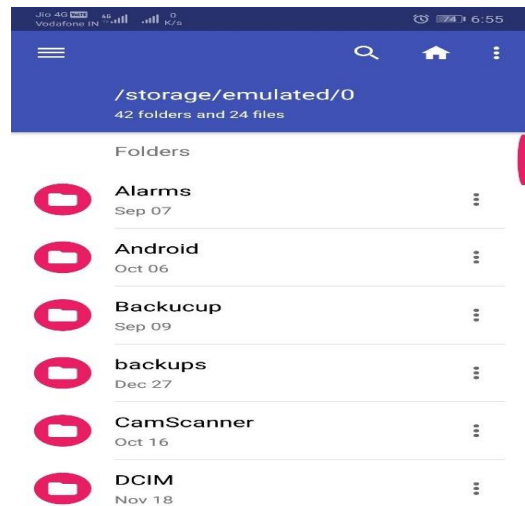


Figure 4

V. APPLICATION

When Microsoft started to release Windows NT operating system, NTFS File System came to light. New Technology file system has been a major improvement over FAT file system to store and retrieve data on a hard drive.

- Get access to external hard disk without using pc or laptop.
- Providing storage access framework. (interface)
- We can easily manipulate the data of hard disk.
- We can share our data between hard disk without carrying laptop.
- Mount popular file systems – Microsoft exFAT/NTFS.

VI. REFERENCES

- [1]. G. Qinquan, C. En and Z. Kai, "Analysis and Implementation of NTFS File System Based on Computer Forensics," Education Technology and Computer Science, International Workshop on (ETCS), Wuhan, Hubei, China, 2010, pp. 325-328.
- [2]. GREENAWALT, P. Modeling power management for hard disks. In Proceedings of the Symposium on Modeling and Simulation of Computer Telecommunication Systems (1994).

- [3]. RUEMMLER, C., AND WILKES, J. An Introduction to Disk Drive Modeling. IEEE Computer 27, 3 (March 1994), 17-29.
- [4]. "NTFS Master File Table (MFT)". Ntfs.com. Retrieved 22 September 2018.
- [5]. "New Capabilities and Features of the NTFS 3.1 File System". Microsoft. 1 December 2007.

Analysis of Fake Ranking on Social Media : Twitter

Nikhita Indurkar¹, Pranali Lotkar¹, Reshma Maske¹, Omkar Amin¹, Rohit Fukte¹, Prof. Ashwin Shinde²

¹Student, Department of Computer Science and Engineering, DBACER, RTMNU, Nagpur, Maharashtra, India

²Professor, Department of Computer Science and Engineering, DBACER, RTMNU, Nagpur, Maharashtra, India

ABSTRACT

The main aim of this project is to study of fake ranking on social media. We use it for find credibility on any social media platform. Now-a-days, we can see that everyone shared information but every information is not real. Some fake information are also spread increasingly on social media. The spreading of this fake information should be stop by using our system. We semi-supervised rank on any social media post and find the score according their credibility. We have done survey on mechanism like analyzing the online data, data abstraction, data classification. Such techniques help to ensuring the integrity of the information. By using our system no fake information spread on social media.

Keywords: Trustworthiness, Status, analysis, User-experience, Feature-ranking, Twitter.

I. INTRODUCTION

Online social media are interactive computer mediated technology that facilitated the creation and sharing of information, ideas, interaction and other forms of expressions via virtual communities and networks. The variety of standalone and built in social media services currently available introduces challenges of definition. Network form through social media change the way groups of people interact and communicate.

Twitter is a social network that allows users to send and receive short messages. While some social networking services use different templates. Twitter is fairly simple to use. Twitter users can follow what other people post. People all over the world talk about all kind of topics.

As a social media made growing possible to transfer near-real-time information in very cost effective way. Number of user around the globe experiencing of such platform so that it make possible for user to obtain

news and information regarding their topic and interest. This leads to the development of technique that can verify information obtained from platform which has become a challenging and necessary task.

We are including various modules information gathering, design of GUI, characterizing and exercising the suggested menus, implementation of proposed system, score generation, classification. We are using two algorithms in

Our projects LDRI (Language Detection Review Analysis) and Word Segmentation. We are going to create dataset for likes and comment for analysis. We are going to distinguish between credible and non-credible contents about post. It provide supervision on social media content and it will trace Malicious users also. Basically it will help to stop rumors on social media. To access information credibility on social media platform for preventing fake or malicious information. To observe user comment in credible and non-credible.

II. RELATED WORK

Majed Alrubain and his team used devise algorithm for accessing fake ranking and the studied realize credibility score using radar graph and comparison regarding their topic of interest. Other researchers have gone to certain limit extend to create system to assess fake ranking finding in real time. Such including systems are TweetCred and TwitterTrails there has been large amount of research focus on topics of high impact events such as earthquake, floods and political environment. The major task is to find credibility online social media.

There are the challenges related to study credibility on social media are as following:-

1. The difficulties of social media and web in recognising resources for used in studying and accessing credibility.
2. Large amount of data in various structure that make it difficult to obtain necessary information to find credibility of users.
3. Malicious activities for example, In tweeter malicious users purchase personal information make a fake amount and post tweet with same meaning with different words.
4. The process of evaluating solutions has a challenging task to maintain it in system, given that most researchers are limited in terms of the extent to which they can test their work (Twitter and other OSN limitations).[1]

Aditi Gupta and her team made work on Twitter to find the credibility. They work on TweetCred and Ranking on the social media. Quality and truthfulness of information was find by using TweetCred. In ranking the likes and comment count added over it. During this period, the credibility score is large number of tweets was computed, allowing us to evaluate and manage in TweetCred terms of its response time, effectiveness and usability. Every real-

time information mange under TweetCred system. To the best of our knowledge, this is the first research work to develop on a real-time based system for finding credibility on Twitter, and to evaluate it on a user base. [2]

Response Time: They analyzed the response time of the site that is loading time called burdening time from the moment when its request is send to our system. The moment which is the resulting score is returned by the server to the credibility extension. The response time of this server can be find by using API server which is used to find credibility of Twitter.

User Feedback: Many of people credibility score has request served by TweetCred, we received the feedback from them. When providing feedback users had the option of either agree and disagree with our score.

User Comments: TweetCred system was valued by large number of user for its originality and simple to use. Users also wanted to know that our backend functionality run for finding credibility.

Rahul Bora and his team have made a survey on information retrieval which is available on OSN, on analyze available data. They divide their process into three steps, first is that Collect an information in the form of data from OSN using API, next step is used different algorithm to analyze the information and then check the authencity for related files and data information on the OSN and analyse the recently presented data.[3]

Data collection: By this methods based on crawling it is fast and uniformed algorithm. It solve the problem of Big data.

Data Classification: It basically work on data mining application like clustering. It consist of various algorithm used for classification purpose.

Data Analysis and visualization: Social network analysis showed interconnection between social sites. It consisting of nodes and tires. These networks are representing in a social network diagram, where nodes are represent in points. The tires represent interconnection between the one by one information such as networking sites or media platform or other platforms. These platforms provides the huge sources of information for social network which they are used to analysis purpose.

III. CONCLUSION

We are conclude that we survey on different types of algorithms and techniques which are used to find credibility on social media platform. We will improving credibility of data from than previous techniques where thousands of people around the globe post their images, videos every day and hence it to find credibility to ensuring that the forwarding and uploading information is valid or not. So that our technique can find its credibility in more reliable time.

IV. REFERENCES

- [1]. Majed Alrubaian, Student Member, Muhammad Al-Qurishi, Student Member, Mohammad Mehedi Hassan, Member and AtifAlamri, Member, IEEE.
- [2]. Real-time credibility assessment of content on twitter Aditi Gupta, Ponnurangamkumaranguru, Caros Castillo, Patrick Meier International Conference on social Informatics, 228-243, 2014.
- [3]. Rahul Bora BMSCE, Rahul Kumar, Utkarsh Dev, Satyam Shankar Prasad, ijarcsm.com, Bengaluru, India.

Implementation of Data Mining Techniques for Soil Quality Analysis

Abha Natu¹, Neha Titarmare¹, Rupal Lokare¹, Shreya Bagde¹, Prof. Mitali Ingle²

¹BE Student, Department of Computer Science & Engineering, Dr. Babasaheb Ambedkar College of Engineering and Research, Nagpur, Maharashtra, India

²Assistant Professor, Department of Computer Science & Engineering, Dr. Babasaheb Ambedkar College of Engineering and Research, Nagpur, Maharashtra, India

ABSTRACT

Data Mining is a method which centers on expansive data sets to remove data for expectation and disclosure of concealed patterns. Data Mining is appropriate for different zones like human services, protection, showcasing, retail, correspondence, agriculture. At first, this information extraction was figured and assessed physically utilizing measurable systems. Along these lines, semi-automated data mining systems rose due to the progression in the innovation. Such headway was additionally as a capacity which expands the requests of examination. In such case, semi-mechanized systems have turned out to be wasteful. Consequently, robotized data mining systems were acquainted with blend information productively. A study of the accessible writing on data mining and pattern recognition for soil data mining is displayed in this paper. Data mining in Agricultural soil datasets is a generally novel research field. Proficient strategies can be produced and customized for explaining complex soil datasets utilizing data mining.

Keywords : J48 Classifier, Naïve Bayes Classifier.

I. INTRODUCTION

In current days, data mining is utilized in various fields. Presently multi day's data mining idea and strategies used to determine the agriculture issues. In this paper, it has been discussed about how data mining procedures are connected in the agriculture field. All around, every day the prerequisite of nourishment is raising; henceforth the horticultural researchers, ranchers, government, and scientists are tedious to put additional endeavor and utilize various systems in agriculture for development underway. As an impact, the data produced in the field of horticultural data upgraded step by step.

Data mining can be utilized for anticipating the future patterns of rural procedures. Mining programs comprises different sets that are created and utilized by business endeavors and biomedical specialists.

These strategies are very much arranged towards their particular learning area.

The utilization of standard measurable investigation methods is both tedious and costly. Productive procedures are created and customized for illuminating soil data sets utilizing data mining techniques to enhance viability and precision of the Classification of huge data sets [1].

Soil testing is the examination to choose supplement substance, synthesis and diverse characteristics. Tests are commonly performed to evaluate fruitfulness and show does not have that ought to be relieved [2]. The earth testing research centers are equipped with reasonable specific arrangement on a few bits of soil testing, including testing procedures and plans of manure proposals [4]. It urges agriculturists to pick the dimension of manure.

II. METHODOLOGY

Over the years numerous algorithms were made to extricate learning from expansive arrangements of data. There are a few unique procedures to approach this issue: order, affiliation rule, bunching, and so on. Grouping methods are intended for arranging obscure examples utilizing data given by a lot of characterized tests.

This set is commonly recommended to as a readiness set, in light of the way that, when in doubt, it is used to set up the gathering framework how to play out its request. The task for undertaking can be viewed as an organized system where each occasion has a spot with a class, which is showed up by the estimation of a noteworthy target trademark or fundamentally the class attributes. Game-plan plans with data mining utilize a mix of calculations and the specific figuring utilized can affect the manner by which records are depicted. This work discusses K-Nearest Neighbor and Naive Bayes calculations.

K-Nearest Neighbor [4] does not have any learning stage, in light of the way that each time a social occasion is performed it utilizes an arranging set. The presumption behind the closest neighbor calculation is that a relative depiction is made by comparable models. The relative recognized models utilized for designating out a depiction to a dull point of reference are outlined by the parameter K.

Navie Bayes [5] classifier recognize that the vicinity (or nonappearance) of a specific section of a class is confined to the closeness (or nonattendance) of some other part. Subordinate upon the positive idea of the likelihood show up, Naive Bayes classifiers can be organized feasibly in a controlled getting the hang of setting. Gullible Bayes work much better in different confounding conditions. In this examination, the dialog center on the job of information mining in setting of soil examination in the field of horticulture.

There is have to change enormous measure of information that are accessible in lab and agribusiness college into data. This can be conceivable with information mining.

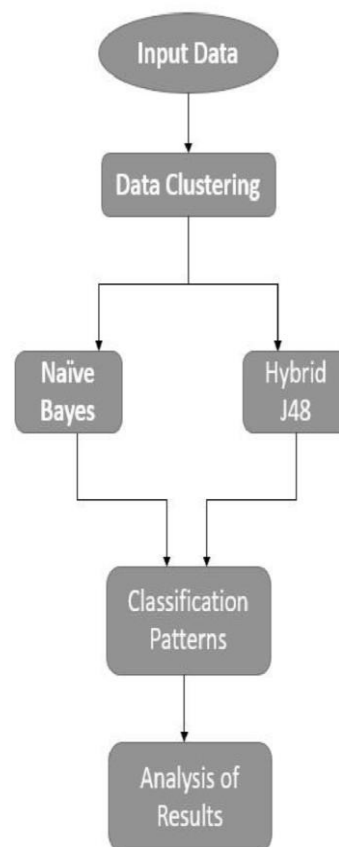


Figure 1. System Architecture

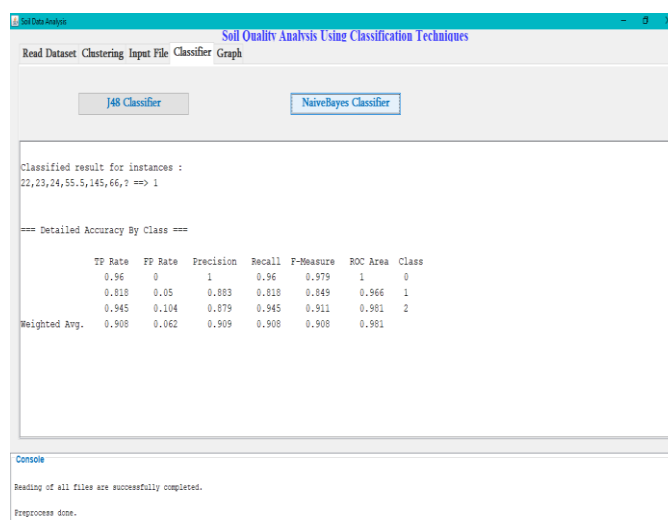


Figure 2

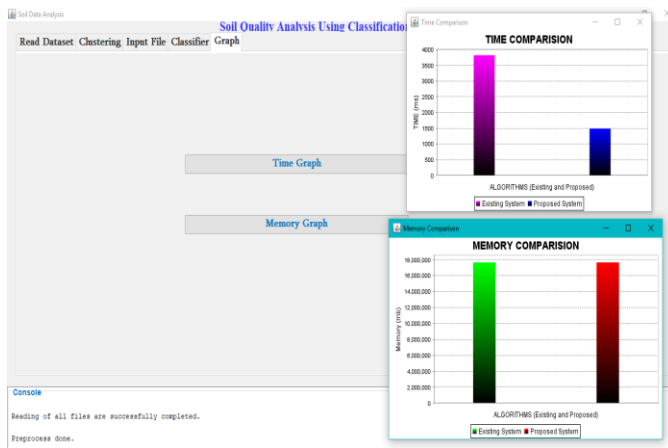


Figure 3

5) We are using 2 classifiers J48 classifier and Naive Bayes classifier. In this we are going to compare the values based on these classifiers. And select the most appropriate value which is given by Naive Bayes classifier.

Values are divided into 3 classes:

0- neutral

1 - Fertile

2- Non fertile.

These classes will help in defining the fertility of soil

6) The last module is Graph, in which Time comparison and memory comparison is done based on the values which we get from earlier modules. On basis of this final result is evaluated.

III. CONCLUSION

Horticulture is the most extraordinary basic region especially in the advancing country like India. Usage of information advancement in cultivating can change the circumstance of basic leadership and originators can yield better. This survey inspected the activity of information mining in farming. As agribusiness is a dirt based industry, it is highly unlikely that required production increments the real harvests can be accomplished without guaranteeing that plants have a satisfactory and adjusted supply of supplements. The paper additionally proposes another technique for

which utilizes a half and half J48 classifier for investigation and foreseeing the dirt conduct.

IV. REFERENCES

- [1]. Mrs. N. Hemaageetha 1 , Dr. G.M. Nasira Analysis of Soil condition Based on pH value Using Classification Techniques Nov.-Dec. 2016
- [2]. S.S.Baskar L.Arockiam S.Charles "Applying Data Mining Techniques on Soil Fertility Prediction" International Journal of Computer Applications Technology and Research Volume 2– Issue 6, 660 - 662, 2013
- [3]. Ravindra M, V. Lokesha, Prasanna Kumara, Alok Ranjan "Study and Analysis of Decision Tree Based Irrigation Methods in Agriculture System" International Journal of Emerging Technology and Advanced Engineering ISSN 2250-2459, ISO 9001:2008 Certified Journal, Volume 2, Issue 12, December 2012
- [4]. D Ramesh, B Vishnu Vardhan "Region Specific Crop Yield Analysis: A Data Mining Approach" UACEE International Journal of Advances in Computer Science and its Applications – IJCSIA Volume 3 : Issue 2 [ISSN 2250 – 3765] 05 June 2013
- [5]. S. Veenadhari, Dr. Bharat Mishra, Dr.CD Singh "Soybean Productivity Modeling using Decision Tree Algorithms" International Journal of Computer Applications (0975 – 8887) Volume 27– No.7, August 2011

A Survey on Image Retrieval Techniques for Capturing User Intention

Ms. Pooja S. Junonkar, Mr. Nitin N. Janhwe

Computer Science and Engineering, Chandrapur, Maharashtra, India

ABSTRACT

Web search engines are been used in large scale for image retrieval. Largely used web-search engines (like Google, Bing, etc) mostly rely various based image search. User enters a query in this search engines and gets images as result. This provides us with random and noisy results as outcome. This search does not provide user's intent result. User has to go through all the obtained images and select the required image suitable to user's intent. This increases complexities of users. To overcome these complexities many of the different image techniques are researched. In this paper, we present a novel internet image search approach. This paper contains various image retrieval techniques that may prove profitable for capturing user's intension. Some techniques are textual- based, some are color-based, and some are shape-based, while some may be combination of above. Some techniques search images offline, while some searches online. But the intension of all the techniques is to capture user's intention. In the further context, we discussed various techniques of image search for effective image retrieval technique.

Keywords : Query image, Search Engines, Image Retrieval, Algorithms, Re-Ranking, User Intention, Image Search.

I. INTRODUCTION

We are familiar with many search engines (e.g.; Google image search, Bing image search, I Like image search) which are used in large scale for commercial use. Many of the search engines still works on the textual based image extraction technique. User enters a query keyword related to their intent image and gets bulk of image as output. Some of the images from this bulk are related, while some are unambiguous. In short, keywords provides users intent in short. To remove this unambiguousness, many research techniques are introduced. Semantic gap between the image tags are removed in order to recover intent gap. Blogs are created to separate negative images and positive images. Large amount of user's metadata is collected from social media sites related to query. Visual feature extraction of query image and database image is obtained and most matched featured images are displayed. Various re-ranking techniques to arrange the images according to query. Feature

extraction of a part from query image and comparison with features of database images. With visual feature extraction, keyword expansion is done to obtain effective matched images. Extraction on the basis of color features are obtained and then re-ranked for resultant images.

This are the various technique, surveyed in this paper. These techniques tried to capture user intention in very efficient and less effort pattern. These techniques tried to remove the complexities that are suffered by the user while searching for intent image from database images. The detailed discussion of each technique is as below:

II. LITERATURE SURVEY

A. Clustering Algorithm [9]

A cluster is a collection of data points that are similar to one another within the same cluster and dissimilar to data points in other clusters. Clustering method is used for unsupervised classification, where data points

of same group are clustered together. Cluster analysis itself is not one specific algorithms but the general task to be solved. It can be achieved by various algorithms that differ significantly in their notion of what constitutes a cluster and how to efficiently find them. Popular notions of clusters include groups with small distances among the cluster members, dense areas of the data space, intervals or particular statistical distribution. The goal of clustering is to remove the semantic gaps between the images.

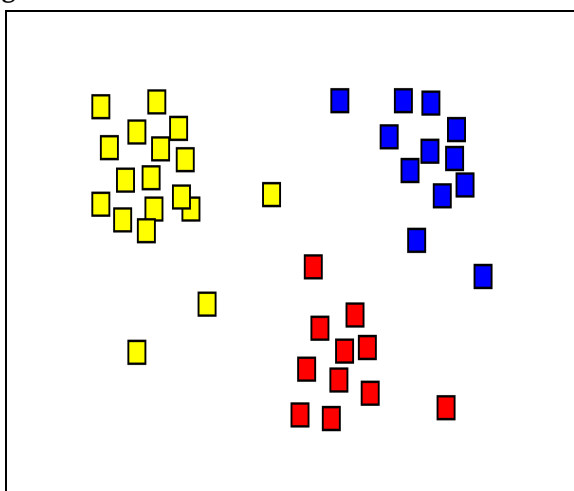


Figure 1. The result of a cluster analysis shown as the coloring of the squares into three clusters.

B. Partitional clustering [9]

Partitional clustering aims at partitioning a group of data points into disjoint clusters optimizing a specific criterion. When the number of data points is large, a brute force enumeration of all possible combinations would be computationally expensive. Instead, heuristic methods are applied to find the optimal partitioning. The most popular criterion function used for partitional clustering is the sum of squared error function given by ;

$$E = \sum_{i=1}^k \sum_{x \in C_i} (x - m_i)^2 \quad (1)$$

where k is the number of clusters, C_i is the i th cluster, x is a data point and m_i is the centroid of the i th cluster.

C. Hierarchical Clustering (Connectivity-based Clustering) [9]

Hierarchical clustering groups data over a variety of scales by creating a cluster tree or dendrogram. The tree is not a single set of clusters, but rather a multilevel hierarchy, where clusters at one level are joined as clusters at the next level. This allows you to decide the level or scale of clustering that is most appropriate for your application. The Statistics and Machine Learning Toolbox function `cluster` data supports clustering and performs all of the necessary steps. It incorporates the `pdist`, `linkage` and `cluster` functions, which you can use separately for more detailed analysis. The `dendrogram` function plots the cluster tree. To perform hierarchical cluster analysis on a data set using Statistics and Machine Learning Toolbox functions, follow this procedure:

- Find the similarity or dissimilarity between every pair of objects in the data set. In this step, we calculate the distance between objects using the `pdist` function. The `pdist` function supports many different ways to compute this measurement.
- Group the objects into a binary, hierarchical cluster tree. In this step, we link pairs of objects that are in close proximity using the `linkage` function. The `linkage` function uses the distance information generated in step 1 to determine the proximity of objects to each other. As objects are paired into binary clusters, the newly formed clusters are grouped into larger clusters until a hierarchical tree is formed.
- Determine where to cut the hierarchical tree into clusters. In this step, we use the `cluster` function to prune branches off the bottom of the hierarchical tree, and assign all the objects below each cut to a single cluster. This creates a partition of the `sdata`. The `cluster` function can create these clusters by detecting natural groupings in the hierarchical tree or by cutting off the hierarchical tree at an arbitrary point.

D. Density clustering [9]

It is based on connecting points within certain distance thresholds. However, it only connects points that satisfy a density criterion, in the original variant defined as a minimum number of other objects within this radius. A cluster consists of all density-connected

objects plus all objects that are within these objects' range. Another interesting property of DBSCAN is that its complexity is fairly low - it requires a linear number of range queries on the database - and that it will discover essentially the same results.

OPTICS is a generalization of DBSCAN that removes the need to choose an appropriate value for the range and produces a hierarchical result related to that of linkage clustering.

E. Grid-based Clustering using AMR approach [10]

The grid-based methods have the fastest processing time that typically depends on the size of the grid instead of the data objects. These methods use a single uniform grid mesh to partition the entire problem domain into cells and the data objects located within a cell are represented by the cell using a set of statistical attributes from the objects. Clustering is, then, performed on the grid cells, instead of the database itself. Since the size of the grid is usually much less than the number of the data objects, the processing speed can be significantly improved.

Adaptive Mesh Refinement (AMR) is a type of multiscale algorithm that achieves high resolution in localized regions of dynamic, multidimensional numerical simulations. Instead of using a single resolution mesh grid, the AMR clustering algorithm first adaptively creates different resolution grids based on the regional density and these grids comprise a hierarchy tree that represents the problem domain as nested structured grids of increasing resolution. Secondly, the algorithm considers each leaf as the center of an individual cluster and recursively assigns the membership for the data objects located in the parent nodes until the root node is reached.

F. Clustering by 'means' approach [9]

It comes under partitional clustering. Two common methods are involved in it. These include k-means method and k-medoids method. In k-means method, each cluster has a centroid which represents the cluster. Centroid is nothing but the mean of all the data points in the cluster. In k-medoids method, each cluster is represented by the data point closest to the centroid of the cluster. The process starts by GARG method of contribution of data points given by

$$\text{dispersion}(C_i) = \frac{1}{n} \sum_{x \in C_i} (x - m_i)^2 \quad (2)$$

$$\text{contribution}(x, C_i) = \text{dispersion}(C_i - [x]) - \text{dispersion}(C_i) \quad (3)$$

It clearly states that, if a data point is negative, it has an adverse effect on the cluster. And positive points are grouped together. This tells us that negative points are treated separately than positive points.

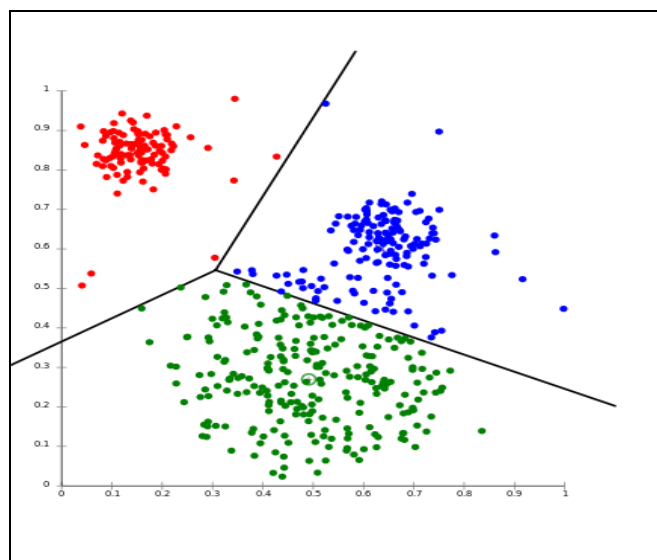


Figure 2. K-means separates data which assumes equal-sized

G. Mining Click logs approach [4]

Search engines generate millions of image results for a query. This provides a dataset that bridges the semantic and intent gaps. But the large-scale clicked data does not provide means to build linkage among visual content, semantics, and search intents. In this approach, a dataset named Clickture is introduced. This dataset contains a triad

$$\text{Clickture} = \{(K, Q, C)\} \quad (4)$$

This triad means that the image K was clicked C times in the search result query Q in one year. This approach also removes duplications by attaching a unique key to each image K in the dataset. This key is a hash code generated from the URL of the image. Hence, the similarity between the images can be removed. Through users' click action during image search, a user often clicks one or more images that are relevant to the query, thus mostly the query Q in the triad is relevant linked to the image K.

In general, the bigger the click count C is, the higher probability that the corresponding query is relevant to the image. For convenience, we call Q a “clicked query” of Image K , and K a “clicked image” of query Q , and call (K, Q) a “clicked image-query pair”, and the triad (K, Q, C) as “click data”. We also call “clicked queries” of an image as “labels” of the image.

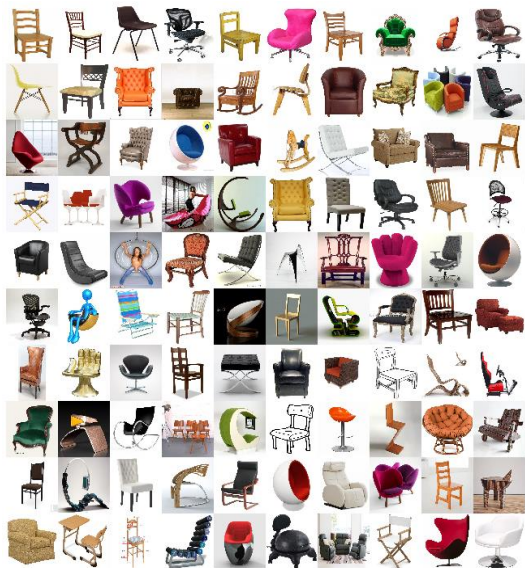


Figure 3. Example of Clickage for the query ‘chair’. Top ranked images are obtained[4].

H. Ranking based Tensor Factorization model [2]

Conventional image search caused more problems as textual based description need more specification. This thing is not possible every time, because an image cannot be described fully in words. Hence, conventional image search shows more unambiguous results. Hence, Personalized image search came into existence. Personalization fall under two categorizes. The first is collaborative filtering which takes opinion of many users to uses new items of similar class. Users are asked to rate the items based on some criteria. The system counts the rating of each items and bring the high rating items to top. The second is profile-based filtering which users the users profile to target the interest of the users about the items of some criteria. The ranking based model mainly work on second category of personalize search. This model performs the basic search as per the user’s interest related to query and annotate the images. Then it maps the user preferences and query into a specific space. Finally, the images are re-ranked according to user’s preferences.

The working model is as follows;

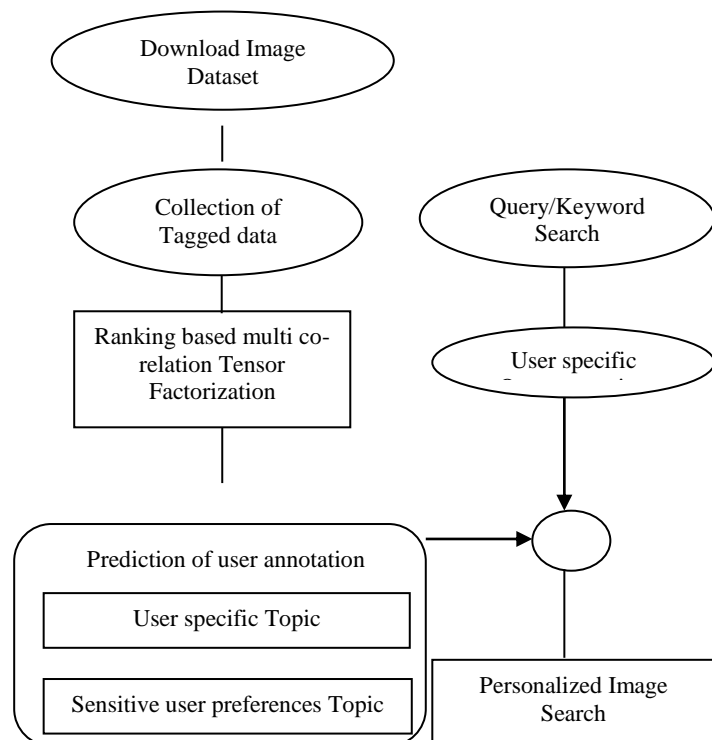


Figure 4. Working model for RMTF approach[2].

I. iLike approach [3]

This approaches combines both the textual as well as visual features of CBIR technique. Directly moving toward the process of working, this approach firstly collects all the relevant images from the Web server. Internet spider program is used for collecting images. This images are collected depending upon the textual features. Then analysis of all the extracted images are done and feature extraction of each image is performed. The feature of colour and texture is used Features of each retrieved images are collected and are stored in database. Then compared with the feature of query image. Distance between the query image and all the retrieved images are calculated. After calculating, the images with minimum distance are indexed first followed by remaining images and are outputted to users.

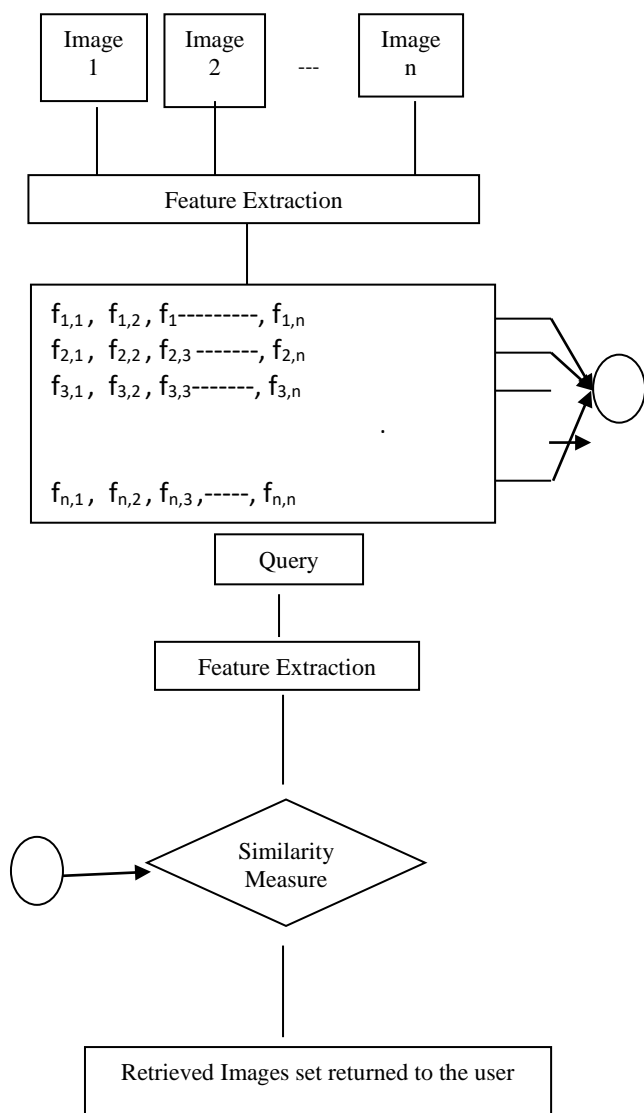


Figure 5. Relevance Retrieve System[3].

J. Bag-based Image re-ranking approach [5]

Clustering means grouping similar images together and compare or matching among the clusters instead of individual images. This will reduce the concerned time complexity to a great extent. So, cluster of similar images containing most of the relevant images is called positive bags and the bag containing least relevant images related to query is labelled as negative bags. This way of clustering is called as bag-based re-ranking.

The task of the following bag formation is removal of irrelevant images and re-ranking the remainder. Iterative application of bag formation algorithm using weak bag annotation technique yields bag more precise to the entered query.

K. Re-ranking sets of Picture by Exploiting Consistency (ReSPEC) approach [7]

The purpose of content based image retrieval is that whenever a user gives a query image, it retrieves the images that are mostly related to the content. ReSPEC is composed of two main methods. Firstly, based on the user query image (keyword) the image search engine (Google, Yahoo,...etc) retrieves the images then, clusters the results based on extracted image features, and returns the cluster that is inferred to be the most relevant to the search query. Secondly, ranks the results that are most relevant to the user query images.

- Segmentation of Image
In image segmentation each images collected from the image search engine has been broken into regions of resemblance, with the intuition that each of these regions is a separate object in the image by using a graph based approach.
- Selection of Feature
In order to obtain a measure of how similar image blobs are to one another, good features are needed to represent the blobs. Color histograms in HSV color space used to represent the image features. To form a feature vector for each blob, histograms are built for the H, S and V channels, with 15 bins each, and then concatenated together to form a 45 dimensional feature vector.
- Mean Shift Clustering in Feature Space
The next step in the system is to cluster the blobs, according to their extracted features with the hope that the object of interest will form the largest cluster. Since some of the blobs will represent garbage, it is difficult to predict the number of clusters that are present.
- Re - ranking of Images
After obtaining the “significant” cluster in feature space, the mean is computed. The rest of the images are then resorted based on the distance of their blobs to this mean. Since each image could potentially contain more than one blob, the closest blob in each image is used.

L. Active Re-ranking [5]

It is the reranking with user-intention. Figure below depicts the flow of active reranking technique. It involves active sample selection in which user labels

the images as relevant or irrelevant. The images obtained in third module are the user labelled relevant images. This step is followed by dimension reduction which localizes visual features.

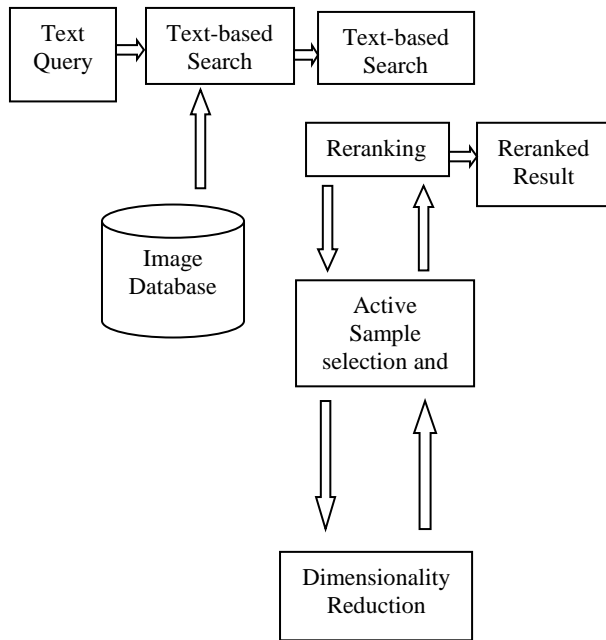


Figure 6. Working model of Active reranking[5].

M. Circular Re-ranking [5]

In this technique of reranking, images are made to reranked again and again. Images obtained by text query search is made to reranked. The result of first reranking is stored and given as input to next reranking step. This process is made to continue until the final re ranking. This mutual exchange of information across multi[le modalities for improving search performance.

III. CONCLUSION

On the basis of reviewed from this survey of available image retrieval and re-ranking techniques is that the text-based image retrieval is not sufficient for obtaining precise image for a given query. Most of the techniques used only visual features and tries to capture user's intention. These methods do not compete but can complement each other.

The domain of image harvesting, retrieval and re-ranking offers a vast scope for exploration as well as innovation. This survey will prove to be beneficial to gain overview of the work done in this field.

IV. REFERENCES

- [1]. "IntentSearch: Capturing User Intention for One-Click Internet Image Search" Xiaou Tang, Fellow, IEEE, Ke Liu, Jingyu Cui, Student Member, IEEE, Fang Wen, Member, IEEE, and Xiaogang Wang, Member, IEEE, VOL. 34, NO. 7, JULY 2012.
- [2]. "Personalized Image Search from Photo Sharing Websites Using Ranking Based Tensor Factorization Model (RMTF)", Poonam Bhusari* Rashmi Gupta Amit Sinahal, Volume 3, Issue 8, August 2013
- [3]. "A New Trend Content-Based Image Retrieval Technique used in Real Time Application" , Ms.Sayali.S.Pawar Prof.R.S.Chaure, Volume 4, Issue 6, June 2014
- [4]. "Clickage: Towards Bridging Semantic and Intent Gaps via Mining Click Logs of Search Engines" , Xian-Sheng Hua, Linjun Yang, Jingdong Wang, Jing Wang Ming Ye, Kuansan Wang, Yong Rui, Jin Li, Vol 3, Copyright 2013, Oct 2013
- [5]. "Image Retrieval and Re-Ranking technique" , Mayuri Joshi,Revati Deshmukh,Kalashree Hemke,Ashwini Bhadke,Rakhi Wajhi,Vol.5,No.2,April 2014
- [6]. " Extended Image Features for User Intention Refined Image Search", S.Sunitha* A.RamaSatish, Volume 4, Issue 2, February 2014
- [7]. Internet Image Search Based On User Intention, Raviraj Kasture,Dr. A.M.Dixit, Volume 2, Issue 6, June 2014
- [8]. "Survey On Novel Techniques for Effective Image Search Based On Users Intention", S. Aarif Ahamed1, B. A. Vishnupriya1, V. Venkateshwaradev, Vol. 2 Issue 4, April - 2013
- [9]. "Contribution-Based Clustering Algorithm for Content-Based Image Retrieval", Harikrishna Narasimhan, Purushothaman Ramraj, Volume 4, Issue 6, August 2014
- [10]. A Grid-based Clustering Algorithm using Adaptive Mesh Refinement Wei-keng Liao Ying Liu Alok Choudhary ,July 2014.

R - Help

Prof. Preeti Karmore¹, Kanchan Mathankar², Aniket Kalaskar², Akansha Bhusari², Shital Singhandhupe², Rupali Shelki²

¹Assistant Professor, Department of Computer Science & Engineering, Dr. Babasaheb Ambedkar College of Engineering and Research, Nagpur, Maharashtra, India

²BE Students, Department of Computer Science & Engineering, Dr. Babasaheb Ambedkar College of Engineering and Research, Nagpur, Maharashtra, India

ABSTRACT

R-Help registers a complaint with minimum inputs and issues unique ID. It relays the complaint online to relevant officials for immediate action. It allows passengers to lodge complaints through mobile application and enables them to check real time feedback on the status of redressal of their complaint. There are some existing applications for the registration purpose but with some drawbacks. The proposed system tries to overcome them. Slow registration of FIR in Accidents and assault cases is one of the biggest problems of the existing system. Often the victims are told by the hospital authorities that the treatment would not be started unless an FIR has been registered. The slow registration of FIR leads to loss of precious time and other issues. We have proposed to develop a system which provides an easily accessible android mobile application. The complaints would be registered over the application. The complainant would be filling up the FIR form, he would be providing the proofs and details related to the complainant on the application. The user can upload images, and details as records. These details would then be received by the Railway Police Force (RPF). They will verify the details of the complainant and carry out further proceedings of the case. There is an option of updating the status complaint for the user as well as the RPF. Thus the entire process would be carried out online, without much manual intervention.

Keywords: FIR, Complaint, Two Way Updation, RPF.

I. INTRODUCTION

Railways are one of the most important transportation system in India. Now-a-days large number of crimes, missing complaints, robberies as well as accidents are happened. So, for this type of complaints, users required a platform where they can register their complaints. The complaints are of various types, it may be missing of persons, valuable things, luggage, robbery complaints or it may be accidental cases. For registering the complaints user have to go into RPF (Railway Police Force) station manually but it takes much time for registration of complaints.

There are online FIR registration systems available in the form of railway websites, railway helpline web portals, and android mobile applications. This systems are very useful in instant registration from anywhere without going to RPF station manually.

In India previously the user had no other option than lodging the complaints manually by going to nearby Railway police stations, and this process used to take longer time to solve or investigate the particular case and less chances of getting results too. Later on the ministry of railways takes initiative to launch

applications regarding railways, But these applications have some drawbacks due to which these applications fails to fulfill user requirements.

R-HELP is an online FIR Registration and Reporting in Railway System which is accessed by Public, Railway Police Force (RPF) and Government Railway Police (GRP), which covers the cons of existing systems.

II. LITERATURE SURVEY

In [1] Authors has proposed a system that contained all the information related to the police officers. There were various departments like traffic, narcotics and anti-trafficking and all the officers and their names and all the necessary details were in the database.

In [2] Ministry of Railways developed a website called as IRCTC. It is one of the busy website and by offering the same services on the Yatra platform, they achieved two objectives. Yatra was able to now offer a complete portfolio of travel options to its customers from flights, hotels, holiday packages, car rentals to train reservations. Secondly it gave customers a more seamless customer experience on its website, thus encouraging them to use the Yatra platform for train reservations.

In [3] Railway Minister Suresh Prabhu launched an application which is Rail SAARTHI (Synergized advanced application rail travel help and information) which was developed by CRIS (Centre for Railway Information System) in the rail budget 2016-17. It is a single window interface for Indian railways which provides safety for women, complaint facility and suggestion. And other use of the application is that One can also book air ticket through the app and give feedback.

In [4] Railway Minister Shri Piyush Goyal launched an android application Rail Madad. The application is used as desired assistance during travel through railways.

In [5] authors Archana Iyer, Prachi Kathale, Sagar Gathoo, Nikhil Surpam proposes an E-Police System, in which the FIR is registered and track through Android application. this system provides an easily accessible android application which forms the front end and web portal for the police department. The complaints are registered over the application. By allowing citizens to lodge their complaints directly, this system circumvents police officers who are often reluctant to register FIRs, particularly in kidnapping and ransom cases.

In [6] Authors Dr. Ayesha Butalia, Nilofar M. Shaikh, Avez Quadari, Roshan Undirwade, Nahid Pathan proposed an E-POLICE SYSTEM based on android application which is made for people and for the police to get complete electronic data framework to them so as to complete the work faster.

In [7] Authors Prof. Anindita Khade, Sanket Yerigeri, Kaustubh Sonde, Shivaganesh Pillai creates a system where the user can register an FIR in an emergency situations and police department can take immediate actions on it.

III. IMPLEMENTATION

Our Application provides an FIR login system where after login into system user get an interface where he can register complaint, check Complaints and can check status of their complaints. This system also provides an emergency option to user for emergency purposes.

Basic modules of the system :

1. USER :

User is the one who will lodge or register the Complaint, for this user need to download or install the application in their device to access it. Once installation is done, the user need to login onto the application. And can take advantages of features present on application.

a) Local User :

In this Application, Local User need to fill all the details and data for registering the complaint which includes name, train name, date, complaint type and images if needed.

1. Reserved User :

In this application, Reserved user have to fill PNR number and remaining details of user such as incident date and complaint type and other data such as images if needed.

2. RPF (Railway Police Force) :

RPF is the authority who will take actions on the complaints registered by the user. RPF have to login into application where they are able to see the complaints and status updated by user and vice-versa. RPF are able to update the complaints in two sections, solved and unsolved respectively.

3. GRP (Government Railway Police):

GRP is main authority who will only check all the solved and unsolved case reports send by RPF and accordingly do the following investigation.

4. Two Way Updation :

In this system user as well as RPF has the options to update their status in case they want to add some information regarding to their case.

5. Complaint Status :

Users can check their current status updated by RPF and RPF can also check status from users side.

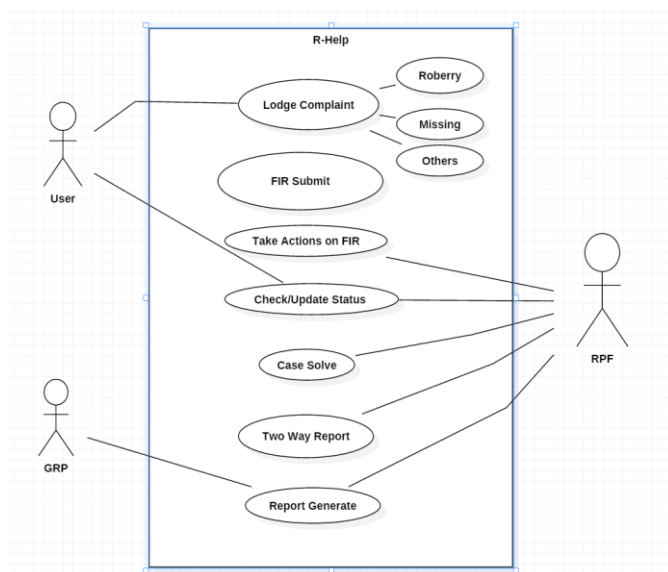


Figure 1. Use case diagram for proposed system

IV. REFERENCES

- [1]. Prof. Ramesh Gavva and Prasarla Shanthan, "E-Cops," October 4, 2011.
- [2]. Ministry of Railways, "IRCTC (Indian Railway Catering and Tourism Corporation Limited)",27 September 1999.
- [3]. CRIS (Centre for Railway Information System), "Rail SAARTHI", 2016-17.
- [4]. Shri Piyush Goyal launches "Rail Madad" .
- [5]. Archana Iyer, Prachi Kathale, Sagar Gathoo, Nikhil Surpam,"E-Police System", Department of Information Technology, YCCE, Wanadongri, Nagpur, India, International Reasearch Journal of Engineering and Mobile Technology (IRJET), Vol.03 Issue.02, February- 2016.
- [6]. Dr.Ayesha Butalia, Nilofar M. Shaikh , Avez Quadari , Roshan Undirwade , Nahid Pathan "E-Police System" Department of Computer Engineering, PGMCOE, Wagholi, Pune, Maharashtra, India, International Journal of Innovative and Emerging Research in Engineering e-ISSN: 2394 – 3343 online at Volume 4, Issue 6, 2017.
- [7]. Prof. Anindita Khade, Sanket Yerigeri, Kaustubh Sonde, Shivaganesh Pillai —Online FIR Registration and SOS System, Computer Engineering SIES Graduate School of Technology, Navi Mumbai, India. International Journal Of Engineering And Computer Science ISSN:2319-7242 (IJECS), Vol.05 Issue.04, April- 2016.
- [8]. Muhammad Baqer Mollah, Sikder Sunbeam Islam, Md. Arnan Ullah, "Proposed E-Police System for Enhancement of E-Government Services of Bangladesh", IEEE/OSAI/APR International Conference on Informatics, Electronics and Vision. .

A Review on Smart Ignition System in Automobile Industries

Shailesh Dhomne¹, Pratik Bulkunde², Sourabh Lohakare², Ajit Ukey², Snehal Gajbiye², Shubham Deolekar²,
Nilesh Shambarkar²

¹ Assistant Professor, Mechanical Engineering Department, RTMNU, DBACER, Nagpur, Maharashtra, India

² Mechanical Engineering Department, RTMNU, DBACER, Nagpur, Maharashtra, India

ABSTRACT

Normally available locks in the two wheeled vehicle do not provide any security to vehicle owner, traditional locking system used keys to lock or unlock the vehicle and these locks are well known to thieves and they can be easily broken by them, if a person having the keys of locking system then that person have the authority to lock or unlock the vehicle, the locking system doesn't know about the person is authorised or not. If the keys are lost or stolen then the owner will unable to unlock the system. About 8.1% of accident caused by teenagers (the person don't having appropriate license) and 6.4% of the accident is happens by drunk and drive cases. Statistics says that only 20% of stolen vehicles can be recovered in India. Thus there is a need for more security options to be available for the two wheeled vehicle which is unique and must be different from the traditional key locks. Biometrics system can be used as a good and effective security option along with alcohol detector and GPS system. An important and very reliable human identification method is fingerprint identification. As fingerprint of every person is unique thus it can be used in various security options. In this study a review on various lacking system in the two & four wheeled vehicles is presented. The till date work in this direction is analysed and further possible development may be analysed.

Keywords: Fingerprint Module, Ignition System, GPS Module, Alcohol Detector, Micro Controller.

I. INTRODUCTION

Because of increasing number of theft cases of the two wheelers there is a need to enhance the security level of the two wheeled vehicle. Traditional and commonly used key locks available in the bikes are well known to the thieves and thus it can be easily unlocked by the professional thieves. With the help of master key it becomes very easy to unlock or broke the lock of the vehicle by the thieves. The owner of the vehicle have to handle those keys carefully that those keys shouldn't be steal or loss. Nowadays the road accident caused by teenagers is getting increases day by day, the children of the owner have those keys and they used to drive their vehicle without

appropriate training and license. The statistics shows that the 8.1% of road accidents are caused by teenagers or the person who don't have license. The numbers of the drunk & drive cases are also big there are 6.4% of road accidents are caused by driving the vehicle by driver whose consume the over limit alcohol. As the number of stolen vehicles are also getting increasing and there are only 20 % of the vehicles can recovered from the stolen vehicles and the cases of eve teasing and girl kidnapping are also raised in todays world so we need some system that can trace the location of our vehicle accurately on our mobile phone.

This creates the demand of such type of lock which is new and provides an additional security level. The new and modern lock must be unique in itself i.e. it must be only unlocked by special and specific key. This type of feature is available in the biometrics locks i.e. the lock which can only be locked and unlocked by the human body features. Biometrics can include: face recognition, voice recognition, fingerprint recognition, eye (iris) recognition. Of all these type of special biometric recognition techniques the fingerprint recognition is the most widely used because fingerprint of every person on the earth is unique and can provide good reliability. Also the implementation of the fingerprint recognition system is easy and cheap than the other ones. Thus fingerprint recognition locking system can provide better reliability than the traditional locks and also is cheaper and easy than the other biometric locking system.

Thus here we are proposing a model which utilizes the concepts of fingerprint recognition with GPS and alcohol detector in the two wheeled vehicle to enhance the security level of the vehicle.

II. LITERATURE REVIEW

Anna Richardson discuss the use of RFID in immobilizer, then the security of different car types. The majority of the paper is on five attacks that can be used on key fobs and immobilizers. First, is the radio jamming attack where the attacker sends garbage data at the same frequency as the key fob to block the users signal from reaching the car. The result is that the car owner isn't able to lock or unlock the car. Next, the RollJam Wireless Attack. Here the RollJam device similarly blocks the key fob signal from reaching the car, but it also records it. The owner then presses the lock/unlock button again and this code is also stored by the RollJam, but the first code is released and the car locks/unlocks. The attack is then able to use the second code to gain access to the car at will. The third attack is the relay attack which carries the key fob

signal over a greater distance such that the attacker can unlock and start the car. The next attack is an attack on the Megamos Crypto transponder. Here, the attack is able to figure out the code needed to unlock and start the car through weaknesses in the cryptography. Last, an attacker can attack the keypad on the driver's code using a long sequence detailed below which must include the password into the vehicle. (2)

Aurelien Francillon, Boris Danev et al., demonstrate relay attacks on Passive Keyless Entry and Start (PKES) systems used in modern cars, build two efficient and inexpensive attack realizations, wired and wireless physical-layer relays, that allow the attacker to enter and start a car by relaying messages between the car and the smart key. Relays are completely independent of the modulation, protocol, or presence of strong authentication and encryption. Relaying the signal in one direction only (from the car to the key) is sufficient to perform the attack while the true distance between the key and car remains large (tested up to 50 meters, non line-of-sight), also show that, with setup the smart key can be excited from up to 8 meters. This removes the need for the attacker to get close to the key in order to establish the relay, analyze and discuss critical system characteristics. Given the generality of the relay attack and the number of evaluated systems, it is likely that all PKES systems based on similar designs are also vulnerable to the same attack. Finally, immediate mitigation measures that minimize the risk of relay attacks as well as recent solutions that may prevent relay attacks while preserving the convenience of use, for which PKES systems were initially introduced. (3)

Tobias Glocker, Timo Mantere et al., describes the possible attacks against a Remote Keyless System and introduces a secure protocol as well as a lightweight Symmetric Encryption Algorithm for a Remote Keyless Entry System applicable in vehicles(33)

Ayush Jain, Ajay Goswami et al., National Journal of Advanced Research, Volume 3; Issue 1; January 2017; Page No. 39-41 a finger print based car ignition system with a view of reducing car theft and to ward off unauthorized users. Nobody can ignite the vehicle except authorized by the designed system already captures its fingerprints pattern features through enrolment into the system. This is achieved with the use of fingerprint module, PIC18F4620 microcontroller and Liquid Crystal Display (LCD) module. More so, after testing of the overall designed project, the results obtained were satisfactory. Hence, the approach adopted in this study can be applied to various systems and fields such as banks, attendance system management in school, hotels, homes and so on. (4)

Harshit Khulbe, Himanshu Bhatt et al., International Journal on Emerging Technologies, a helmet integrated system with bike ignition which could ensure the use of helmet by the user. Furthermore, to enhance the security use the specific feature of human i.e. unique fingerprint. So, identifying a person through fingerprint and implementing it for security will help a lot. The rising demand of security in two wheelers and the issues of lost keys could be resolved by this system. (11)

Prof. Rahil Khan, Sajid Ahmed et al., IJESC, Volume 7; Issue No.3: Car Ignition System using fingerprint scanning as part of the car security system, it to protect the car from unauthorized access. In order to ignite the engine, the user is required to scan their fingerprint at the fingerprint sensor. The system will process the fingerprint image and compare it with the fingerprint stored in the database. If the fingerprint matches, a signal will be sent by the microcontroller to ignite the car engine. However, if the user has an unrecognizable fingerprint problem, this system will provide an alternative way to start the car, by entering a password. This system also allows the owner to enroll new users into the database or delete the existing user as well as changing the password. use of

finger print recognition to start or ignite the motorcycle against the use of conventional methods of key locks. Related work include enhancing the security of the bikes by adding different types of locks and alarming unit to alert owner of the bike in case of danger. (28)

Karthikeyan.a, Sowndharya.j., International Journal Of Computational Engineering Research a fingerprint module to read once identity to start the equipment. For this use a microcontroller to enable the ignition system if the matching between scanned data and the already existing data is correct. Comparison is done inside the fingerprint module itself and its output is given to microcontroller. Result is displayed in a LCD display whether the user is authorised or not. The sensor used is FIM 3030 by NITGEN. Microcontroller used is AT89c52. AT89c52 is a low power, high power CMOS 8 bit microcontroller. It consists of 32 I/O lines. The other main components are the decoder and the latch. The decoder used is DM74LS138 where as the latch used is 74HC373. (18)

Roopam Arora, Kapil Kumar, International Journal of Computer Engineering and Applications, Volume IX, Issue X, Oct. 15] Biometrics' authentication is used in computer science as a form of identification and access control. The special type of a sensor is used to read the fingerprint of a person and matches the data by comparing it with the authorized fingerprint image, which is stored in the database. If the match is found then the vehicles will be started. Digital image processing algorithms is employed to identify whether the incoming fingerprint image is genuine or forgery. (31)

JOHN GEORGE.A, RAJAGOPAL.N et al., ADVANCES in NATURAL and APPLIED SCIENCES, 2017 February 11: pages 133-135 finger print keypad recognition to start or ignite the vehicle against the use of conventional methods of key locks. Related work include enhancing the security of the vehicles

by adding different types of locks and alarming unit to alert owner of the vehicle in case of danger. (15)

Pritpal Singh, Tanjot Sethi et al., International Journal of Materials, Mechanics and Manufacturing, Vol. 3; 4, November 2015 A smart anti-theft system that uses GPS and GSM system to prevent theft and to determine the exact location of vehicle. The system contains GPS module, GSM modem, Infrared sensors, DTMF decoder IC MT8870DE, 8051 microcontroller, relay switch, vibration sensor, paint spray and high voltage mesh. GPS system track the current location of vehicle, there are two types of tracking used one is online tracking and other is offline tracking. GSM system is also installed in the vehicle for sending the information to the owner of the vehicle because GPS system can only receive the vehicle location information from satellites. In case of accident this system automatically sends the message for help to ones relatives. The preventive measures like engine ignition cutoff, fuel supply cutoff, electric shock system (installed on steering wheel) and paint spray system are installed in the vehicle which is controlled using user or owner GSM mobile. The owner can lock or unlock his/her vehicle with the help of SMS. This complete system is designed taking in consideration the low range vehicles to provide them extreme security. (27)

Bhumi Bhatt, Purvi Kalani et al., International Journal Of Engineering And Computer Science, Volume 4, Issue 6 June 2015, Page No. 12508-12511 the wireless technology effectively for the automotive environments by using the GSM Modem used in sending sms in case of theft intimation. whenever a person trying to steal the vehicle, at that time sends an interrupt to a programmable microcontroller of 8051 family that stores owner's number upon a miss call for the first time. When someone tries to steal the car then microcontroller gets an interrupt and orders GSM Modem to send the sms, the owner receives a SMS that his car is being stolen then the owner sends back the SMS to the GSM modem to 'STOP', while the

vehicle will be stopped. The control instruction is given to the microcontroller through interface, the output from which activates a relay driver to trip the relay that disconnects the ignition of the automobile resulting in stopping the vehicle. (6)

Prashantkumar R. , Sagar V. C. et al., International Journal of Engineering Sciences & Emerging Technologies, Volume 6, Issue 3, Dec. 2013 A security system various new features are included in addition to the engine immobilizer and alarm. Few of the important features supported by system are alerting owner by SMS about the theft attempt, allowing user to control the system remotely by SMS, tracking the location of vehicle using GPS technology, Remote Keyless System, servo motor operated locking system (handle lock, fuel lock and rear wheel lock) and side stand indicator. Redundancy is maintained to make the system reliable even in the worst case scenario, designed to be compatible with almost all the brands of vehicle. (26)

S. Philomina, M. Sundararajan., Journal of Chemical and Pharmaceutical Sciences, This framework incorporates a GSM modem and GPS which controls the ignition arrangement of a vehicle by method for a Voice call and can likewise find the vehicle on the off chance that it get lost. The vehicle can be begun or halted by a voice call from an enlisted versatile number and we can likewise find the vehicle by utilizing GPS. Embracing this innovation it will be exceptionally valuable to people to control of vehicles and can likewise find the vehicle on the off chance that it get lost. A communicating device like mobile phone is likewise joined with the Arduino, which thusly, associated with the motor. In light of the signs got by the portable, one can control the ignition. (32)

Achint Agarwala, Amit Saxenaa et al., International Journal of Innovative and Emerging Research in Engineering, Volume 4, Issue 4, 2017 an intelligent system which does not allow the rider to start the ignition of the vehicle if he is not wearing a helmet or

is not sober. The system requires firstly to authenticate the rider from the preloaded fingerprints from the database of the microcontrollers also making it compulsory for the rider to wear the helmet as per the government guidelines. The system consist of alcohol sensor. Microcontroller ATmega328 is used for the performing the efficient working of system. RF module performing the communication part along with the help of IR sensor. (1)

Ms. Khyati Varma, Ms. Sneha Jainwar et al., International Journal of Advanced Research in Computer and Communication Engineering, Vol. 5, Issue 8, August 2016 the system is designed in such a way that the vehicle will not start unless the rider wears a helmet and passes the alcohol test, thereby also solving the problem of drunken driving. The helmet has an additional feature of accident indication and reporting through GPS – GSM technology which sends message to the hospitals and family members at the time of accident. This project is designed for people's safety and is in the best interest of the society. (23)

Kiran Rana Gill, Joel Sachin, International Journal for Innovative Research in Science & Technology, Volume 2, Issue 12, May 2016 the ignition of vehicle using fingerprint sensor and liquid crystal display, they were generating the same results along with same proficiency and accuracy in it by reducing its cost factor, so that it is easily affordable by customers and we can widely spread and implement the security in different domains. This approach would be fruitful to users who want to possess valid and authenticated entry. (19)

P.J.Bharani , B.Gopinath et al., Advanced Engineering Forum, Trans Tech Publications, Switzerland, Vols. 6-7 fingerprints for train ignition along with the conventional method of using keys. The fingerprint recognition software enables fingerprints of valid users of the train to be enrolled in a database. The developed prototype serves as an impetus to drive

future research, geared towards developing a more robust and embedded real-time fingerprint based ignition systems in trains along with ZigBee communication. (25)

Mr. Amit Hatekar, Harsh Babani et al., Int. Journal of Engineering Research and Application, Vol. 7, Issue 5, (Part -2) May 2017, pp.31-34 The system is SMS-based and uses biometric technology to revolutionize the standards of security. It uses a GSM Modem to send an SMS to the authorized person in case of an intrusion. The project is realized by interfacing a fingerprint sensor with a 89c51 microcontroller and a GSM Module. As the system uses GSM technology, it provides ubiquitous access to the system for security. (22)

B. Dimple , M. Veda Chary et al., IOSR Journal of Electronics and Communication Engineering, Volume 10, Issue 1, Ver. 1 (Jan - Feb. 2015), PP 45-48 smart card capable of storing the fingerprint of particular person. While issuing the license, the specific person's fingerprint is to be stored in the card. Vehicles such as cars should have a card reader capable of reading the particular license. The same automobile should have the facility of fingerprint reader device. A person, who wishes to drive the vehicle, should insert the smartcard in the vehicle and then swipe his/her finger. If the fingerprint matches with the fingerprint stored in the smart card then it goes for alcohol detection and seatbelt checking. After passing all authentications, the vehicle will be ignited. The vehicle will not be ignited, if any one of the authentications fails and will not proceed the next step. This increases the security of vehicles and also ensures safe driving by preventing accidents. The prototype of the ignition system is used by the Master controller.(5)

R.M.Vithlani, Sagar Shingala et al., International Journal of Electronics and Communication Engineering and Technology (IJCET), Volume 7,

Issue 5, September-October 2016, pp. 28–37 biometric solution with very low cost hardware and using open source hardware and software tool plus does it our self-installation. (29)

Kuljinder Singh, Maninder Kaur, International Journal of Science and Research (IJSR), the finger print image quality based on an adaptive fingerprint enhancement method that is based on contextual filtering. The term adaptive implies that parameters of the method are automatically adjusted based on the input fingerprint image. Once the finger print image is enhanced at the required level, the pores are extracted based on segmentation of the finger print image by eliminating the finger print area above a threshold limit. The pores location and then interdistances are computed and stored in a data base. Further, the minutiae are extracted and again their location and inter-distances are computed and stored in a data base. Same procedure is repeated for the query image and standard deviation is computed between the inter-distance of the query image and data base images. The finger print information based on pores and minutiae are fused together in order to get the matching score. (20)

Hussaini Habibu, Adamu Murtala Zungeru et al., IISTE, Control Theory and Informatics, Vol.4, No.8, 2014 a biometric (fingerprint based) access control system was developed with added versatility: remotely Adding/Removing users and monitoring the system's operation via a GSM Phone. The administrator phone sends SMS commands to the system to put it in the desired operating modes (as security situations arise) and to add/remove users of the premise; thus, the system can work both independently and as dictated by the administrator. The main components are a Fingerprint Module, a GSM/GPRS modem, the door & its control circuitry, and an AT89C52 microcontroller. The microcontroller polls the SMS received by the GSM modem, interprets it to puts the system in the desired mode, sends appropriate SCAN/DELETE/ADD command to the fingerprint scanner, opens/closes the

door at each access request by any user (registered or not) based on the present system mode and command it receives from the scanner. The microcontroller's code is written in ASSEMBLY language using KEIL MICRO-VISION3 emulator/debugger. At completion, the system quite responded in the four set modes: it adds/deletes user fingerprints appropriately, shuts-off when instructed, opens/closes the door when a registered fingerprint is recognized, displays messages appropriately on the LCD screen and receives/sends the appropriate SMS to the Administrator's phone. (12)

Z. Brijet, B. Santhoshkumar et al., Journal of Chemical and Pharmaceutical Sciences, Fingerprint sensor data reading obtained in the AT mega 328 which is analysed with the pre-assigned data. Identifying the person as the car owner or an authorized fingerprint user who can take control of the car, the engine ignition system starts. If it is an intruder, engine never starts. Improvement: Other security systems can be hacked, whereas in this case fingerprint is being used as the key which is unique for each person and therefore gives improved security. (38)

Tobias Glocker, Timo Mantere et al., the possible attacks against a Remote Keyless System and introduces a secure protocol as well as a lightweight Symmetric Encryption Algorithm for a Remote Keyless Entry System applicable in vehicles. (34)

Younhee Gil, Dosung Ahn et al., 32nd Applied Imagery Pattern Recognition Workshop, additional three fingerprint images are used in enrollment phase of fingerprint verification system. their experiments using FVC 2002 databases show that the enrollment using multiple impressions improves the performance of the whole fingerprint verification system. (37)

I.V.N.S Aditya, Y. Radha Krishna Murthy et al., International Journal of Computer Applications, Volume 13. 6, January 2011 The two devices, retinal scanner and thumb scanner can be used as one alternate to another. If one method is failed, the user

can be authenticated by using another method. The failure of the device or failure of particular component in the device can be indicated to the user by using LEDs. (13)

D.Narendar Singh, K.Tejaswi et al., International Journal of Latest Trends in Engineering and Technology (IJLTET), face recognition, using the Principle Component Analysis (PCA) algorithm. According to the comparison result (authentic or not), ARM processor triggers certain actions. If the result is not authentic means ARM produces the signal to block the car access (i.e. Produce the interrupt signal to car engine to stop its action) and inform the car owner about the unauthorized access via Multimedia Message Services (MMS) with the help of GSM/GPRS modem. Also it can be extends to send the current location of the vehicle using the GPS modem as a Short Message Services (SMS). (09)

YIGANG ZHANG, QIONG LI et al., Int. Conf. on Electronics, Hardware, Wireless and Optical Communications, Madrid, Spain, February 15-17, 2006, pp172-175 the Fingerprint Vault scheme is used to ensure the security of the fingerprint template. By taking advantage of the Fingerprint Vault scheme, which is developed based on Jules and Sudan's Fuzzy Vault scheme, our system does not store the user's fingerprint template in the IC card, but a secret "locked" by his fingerprint. Only the user who owns the matching fingerprint can retrieve successfully and therefore validate his identity. It is computational infeasible for the attacker to obtain the user's fingerprint template from the data stored in the IC card. Comparing with the normal biometrics based access control system, our system can provide higher security. The overall design idea, the implementations of hardware and software of the system. (35)

Nima Karimian, Zimu Guo et al., a noiseaware biometric quantization framework capable of generating unique, reliable keys with reduced enrollment time and denoising costs. The proposed

noise-aware approach is compared to previous approach for multiple biometric modalities, including popular ones (fingerprint and iris) and emerging cardiovascular ones (ECG and PPG). The results show that ECG provides the best tradeoff between reliability, key length, entropy, and cost. In the second and third case studies, demonstrate how reliability, denoising costs, and enrollment times can be simultaneously improved by modeling subject intra-variations for ECG. (24)

D. Maio, D. Maltoni et al., the organization of FVC2002 and to capture the attention of a significantly higher number of academic and commercial organizations (33 algorithms were submitted). The FVC2002 database, the test protocol and the main differences between FVC2000 and FVC2002. The algorithm performance evaluation will be presented at the 16th ICPR. (8)

J.L. Wayman , A.K. Jain et al., the main activities of the FVC2004 organization and provides a first overview of the evaluation. Results will be further elaborated and officially presented at the International Conference on Biometric Authentication (Hong Kong) on July 2004. (14)

Rajesh Kumar Jakkar, Roop Pahuja, American Journal of Traffic and Transportation Engineering, design, development and live-performance test of the prototype of drink and drive situation detection and alert cum vehicle control system to minimize road mishaps and enhance public safety on road. It also analyses the response of breath –alcohol semiconductor sensor with respect to variation in distance from source which is critical part of system design. Based upon the recent smart gas sensing and integration of satellite and cellular wireless communication technologies, the proposed device quickly senses the drunken state of the driver during start-up/driving by estimating the equivalent breath alcohol concentration level corresponding to the legally permissible state's threshold blood alcohol

concentration level. On detection of such situation, on-vehicle siren/audio alarm is activated to warn the persons on road and vehicle control system is triggered to lock ignition or stop the fuel inflow to the vehicle. Additionally, 'alert SMS' indicating drunk driver location, tracked by onboard GPS receiver, along with vehicle number is communicated remotely to authorized (family members, traffic police) mobile user using GSM cellular network to take appropriate action thereafter. The live experiment results highlighted the successful working performance of the device in-housed at the steering wheel of the vehicle with the drunk driver. (30)

Lennox M. Mwaringa and Theophilus Biketi, Annual Conference on Sustainable Research and Innovation, 4 - 6 May 2016 The first layer of protection in the system is a fingerprint recognition, from which the doors and drive implements are opened. The fingerprint matching is done by utilizing the minutiae based fingerprint recognition scheme. The second layer consists of a Dual Tone Multi Frequency (DTMF) module which uses mobile phone to effect control over a long distance, just in case thieves break the glass and get access to the vehicle. The vehicle can be turned on by a start button upon verification by the system. No mechanical keys are used in this system. When finger ID entered is not correct, or a wrong DTMF password is entered will result in vehicle getting immobilized by keeping the door door locked, cutting the fuel supply and switching off the ignition power, an alarm will turned on to alert people in the vicinity of the vehicle. The different layers of protection defined are controlled by an AVR based controller acting as the central node. The whole system was tested using a test set up by mimicking the vehicle door, whereas fingerprint and DTMF data was received from the system. Output signals from the microcontroller proved that the functionality of the anti-theft system in good working condition. (21)

Yolanda D. Austria, Luisito L. Lacatan et al., International Journal of Computing Sciences

Research,1st International Conference on Redesigning, Re-engineering Academic Direction for Global Competitiveness, The prevention of crashing of the system,the Face Recognition System for authentication of engine ignition acceptance test#1 should have an indicator to know if the program is executed successfully. Also, in order to achieve receiving the exact location of the motorcycle, the GPS and GSM for location and anti-theft notification acceptance test#1 should have an antenna in order for the GPS to receive the coordinates from the satellites much more accurate than that of without antenna. Lastly, in order to achieve the error prevention in receiving text messages of the GSM module, the Engine Ignition by Passcode and GSM acceptance test#1 should always delete received messages to clear the allotted memory storage for messages. (34)

Bindu Nagendra, B Bhargavi et al., International Journal of Engineering Research & Technology (IJERT), Volume 6, Issue 13 Fingerprint sensor captures the fingerprint images, matches the uniqueness of each print read by the sensor and compares it to the one stored in its module or local system database. A vehicle tracking system that works using GPS and GSM technology, which would be the cheapest source of vehicle tracking and it would work as anti-theft system. It is an embedded system which is used for tracking and positioning of any vehicle by using Global Positioning System (GPS) and Global system for mobile communication (GSM).(7)

D.Sarathkumar, C.K Sathish Kumar et al., International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering] Vol. 5, Issue 4, April 2016 in driving test a candidate applied for license have to drive over a closed loop path in front of the authorities. The candidate has to drive over the path without any support over the land surface and if he fails to do he will be disqualified. For that, the authorities watch candidate manually. A lab view system with sensor has been developed for watching the candidate for

getting license by using lab view. By using this, the candidate who fails to keep their foot in the vehicle by differential output from the sensor can be monitored. Then it was processed by the microcontroller to the lab view with the help of laptop or PC and number of count detection while a person entering for license test was authenticated by using finger print sensor. So that they will automatically select or reject by the system.(10)

Kanchan Gurule, Jyotsna Nikam et al., International Journal for Scientific Research & Development, Vol. 6, Issue 01, 2018 nobody can ignite the vehicle except authorized by the designed system already captures its fingerprints pattern features through enrolment into the system. This is achieved with the use of fingerprint module, AVR microcontroller and Liquid Crystal Display (LCD) module. More so, after testing of the overall designed project, the results obtained were satisfactory. Hence, the approach adopted in this study can be applied to various systems and fields such as banks, attendance system management in school, hotels, and homes so on. (17)

Joseph E. Harter, Kokomo a starting system for an engine of an automotive vehicle having an ignition system includes a fingerprint sensor that generates a fingerprint signal. A memory has a plurality of authorized fingerprint signals stored therein. A switch is used to generate a start signal. A controller is coupled to the ignition system, the fingerprint sensor, the memory, and switch. The controller compares the fingerprint signal with the authorized fingerprint signal stored in the memory and enables the ignition system in response to the start signal and the fingerprint signal being substantially equal to an authorized fingerprint signal. (16)

III. COMPARISON OF EXISTED MODEL

Sr no	Advantages	Dis advantages
1	<ul style="list-style-type: none"> Fingerprint module used as an additional security feature in the vehicle. System was efficiently differentiating between the authentic and the fake user. 	Option of adding/deleting user from the memory is not given
2	Proposed good system to authenticate the user with the fingerprint recognition	Unsuccessful to implement
3	Various features are added in the bike that efficiently enhances the security. Like locating the bike, sms alert, immobilizing unit.	Features added act only as alarming units but does not prevent from theft.
4	Provides both biometric identification and alerting unit in the vehicle.	Designed for cars not for the bikes.

IV. CONCLUSION

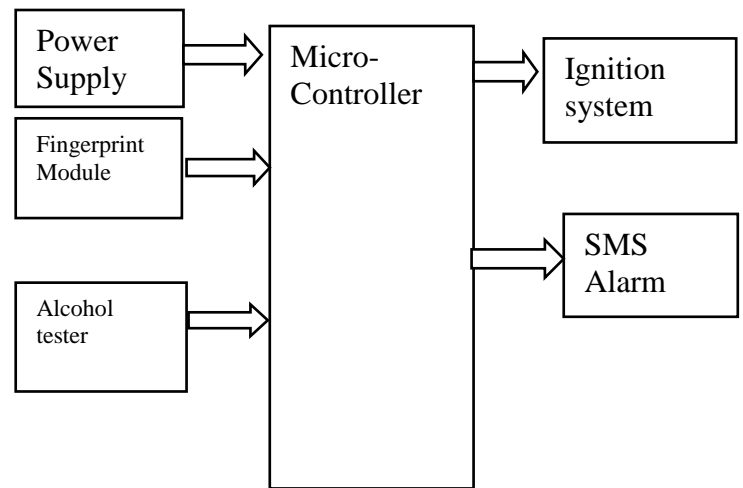
Basically, skin of human fingertips consists of ridges and valleys and they mixing together form the distinctive patterns and these patterns are called fingerprints. From different researches it has been observed that no two persons have the same fingerprints, so they are unique for each individual. Because of the above mentioned characteristic, fingerprints are very popular for biometrics applications. Fingerprints have remarkable permanency and uniqueness throughout the time. From observations we conclude that the fingerprints

offer more secure and reliable personal identification than passwords, id-cards or key can provide.

The GSM modem provides information to the user on his request. The owner can access the position of the vehicle at any instant The GPS receiver on the kit will locate the latitude and longitude of the vehicle using the satellite service. Our project deals with the design & development of a theft control system for vehicle as well as protect the life of rider.

Drunk driving is one of the very serious national and global road safety problem. Though driving under the drunken condition is illegal and punishable in almost every country, even then many persons/ young children, break the rules and feel excited to drink and drive. Presently, to prohibit drunk driving on road and minimize road mishaps is a major road safety challenge, where the recent technological developments have great role to play. We the design, development and in-vehicle testing of the proposed drunk driver detection and altering system (DDAS).

The descriptive statistics from Table 4.1 showed that the values were normally distributed about their mean and variance. This indicated that aggregate stock prices on the KSE and the macroeconomic factors, inflation rate, oil prices, exchange rate, and interest rate are all not too much sensitive to periodic changes and speculation. To interpret, this study found that an individual investor could not earn higher rate of profit from the KSE. Additionally, individual investors and corporations could not earn higher profits and interest rates from the economy and foreign companies could not earn considerably higher returns in terms of exchange rate. The investor could only earn a normal profit from KSE.



From the block diagram we can see that with the help of fingerprint module and alcohol tester input is provided to the microcontroller and on the basis of the input received from the devices microcontroller drives the output devices i.e., ignition system of the bike and the alarm. Scanning checking of the fingerprint is done with the help of the fingerprint module and the on the basis of the output of the module microcontroller drive the ignition system of bike. Only authorized person(s) record is stored in the module. If the driver consumes the alcohol beverages within the limit then the match condition occur ignition system of the bike is turn on otherwise sms alarm is received on cell phone.

V. REFERENCES

- [1]. Achint Agarwala, Amit Saxenaa et al., "fingerprint based smart system" [International Journal of Innovative and Emerging Research in Engineering] Volume 4, Issue 4, 2017.
- [2]. Anna Richardson "Security of vehicle key fobs and immobilizers".
- [3]. Aurelien Francillon, Boris Danev et al., "Relay attack on passive keyless entry and start system in modern cars".
- [4]. Ayush Jain, Ajay Goswami et al., "Design and development of fingerprint based vehicle starting system", National Journal of Advanced

- Research, Volume 3; Issue 1; January 2017; Page No. 39-41.
- [5]. B. Dimple, M. Veda Chary et al., "a smart wireless ignition system for vehicle security", IOSR Journal of Electronics and Communication Engineering, Volume 10, Issue 1, Ver. 1 (Jan - Feb. 2015), PP 45-48.
- [6]. Bhumi Bhatt, Purvi Kalani et al., "Smart vehicle security system using GPS & GSM", International Journal Of Engineering And Computer Science, Volume 4, Issue 6 June 2015, Page No. 12508-12511.
- [7]. Bindu Nagendra, B Bhargavi et al., "Smart Vehicle Security System Using GSM & GPS", International Journal of Engineering Research & Technology (IJERT), Volume 6, Issue 13
- [8]. D. Maio, D. Maltoni et al., "Second and Third Fingerprint Verification competition".
- [9]. D.Narendar Singh, K.Tejaswi et al., "Real time vehicle theft identity and control system based on arm 9", International Journal of Latest Trends in Engineering and Technology (IJLTET).
- [10]. D.Sarathkumar, C.K Sathish Kumar et al., "Automatic Two Wheeler Driving Licence System by Using Labview", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol. 5, Issue 4, April 2016.
- [11]. Harshit Khulbe, Himanshu Bhatt et al., "Helmet integrated bike with fingerprint ignition system", International Journal on Emerging Technologies.
- [12]. Hussaini Habibu, Adamu Murtala Zungeru et al., "Design of a GSM-Based Biometric Access Control System", IISTE, Control Theory and Informatics] Vol.4, No.8, 2014.
- [13]. I.V.N.S Aditya, Y. Radha Krishna Murthy et al., "Alternate method for the failure of antitheft device used in motor vehicles", International Journal of Computer Applications, Volume 13. 6, January 2011.
- [14]. J.L. Wayman, A.K. Jain et al.
- [15]. JOHN GEORGE.A, RAJAGOPAL.N et al. "Ignition based on fingerprint and keypad recognition", ADVANCES in NATURAL and APPLIED SCIENCES, 2017 February 11: pages 133-135.
- [16]. Joseph E. Harter, Kokomo.
- [17]. Kanchan Gurule, Jyotsna Nikam et al., "Finger Print Based Car Ignition System", International Journal for Scientific Research & Development, Vol. 6, Issue 01, 2018.
- [18]. Karthikeyan.a, Sowndharya.j, "Fingerprint based ignition system", International Journal Of Computational Engineering Research.
- [19]. Kiran Rana Gill,Joel Sachin, "Vehicle ignition using fingerprint sensor", International Journal for Innovative Research in Science & Technology, Volume 2,Issue 12, May 2016.
- [20]. Kuljinder Singh, Maninder Kaur, "Scanner based Fingerprint Matching system for Security Applications", International Journal of Science and Research (IJSR).
- [21]. Lennox M. Mwaringa and Theophilus Biketi, "Finger print based automotive security lock system", Annual Conference on Sustainable Research and Innovation, 4 - 6 May 2016.
- [22]. Mr. Amit Hatekar, Harsh Babani et al., Int. Journal of Engineering Research and Application, Vol. 7, Issue 5, (Part -2) May 2017, pp.31-34.
- [23]. Ms. Khyati Varma1, Ms. Sneha Jainwar et al., "Helmet based vehicle's auto ignition alcohol detection and accident indication reporting system", International Journal of Advanced Research in Computer and Communication Engineering, Vol. 5, Issue 8, August 2016.
- [24]. Nima Karimian, Zimu Guo et al., "Secure and reliable biometric access control for resource constrained system and IoT".
- [25]. P.J.Bharani , B.Gopinath et al., Advanced Engineering Forum, Trans Tech Publications, Switzerland, Vols. 6-7 .
- [26]. Prashantkumar R., Sagar V. C. et al., "Two wheeler vehicle security system", International

- Journal of Engineering Sciences & Emerging Technologies, Volume 6, Issue 3, Dec. 2013.
- [27]. Pritpal Singh, Tanjot Sethi et al., "A smart anti-theft system for vehicle security "International Journal of Materials, Mechanics and Manufacturing, Vol. 3; 4, November 2015.
- [28]. Prof. Rahil Khan, Sajid Ahmed et al., "Biometric scanning based on vehicle ignition system" , IJESC, Volume 7; Issue No.3.
- [29]. R.M.Vithlani, Sagar Shingala et al., International Journal of Electronics and Communication Engineering and Technology (IJECEET), Volume 7, Issue 5, September-October 2016, pp. 28-37
- [30]. Rajesh Kumar Jakkar, Roop Pahuja, "Drunk-driver detection and alert system(DDDAS)for smart vehicle", American Journal of Traffic and Transportation Engineering.
- [31]. Roopam Arora, Kapil Kumar "Start up engine using fingerprinting" [International Journal of Computer Engineering and Applications, Volume IX, Issue X, Oct. 15].
- [32]. S. Philomina, M. Sundararajan, "GSM based vehicle ignition system", Journal of Chemical and Pharmaceutical Sciences.
- [33]. Tobias Glocker, Timo Mantere et al., "a protocol for a secure remote keyless entry system applicable in vehicle using symmetric -key cryptography".
- [34]. Tobias Glocker, Timo Mantere et al., "a protocol for a secure remote keyless entry system applicable in vehicle using symmetric -key cryptography".
- [35]. YIGANG ZHANG , QIONG LI et al., "The design of fingerprint vault based IC card access control system", Int. Conf. on Electronics, Hardware, Wireless and Optical Communications, Madrid, Spain, February 15-17, 2006, pp172-175.
- [36]. Yolanda D. Austria, Luisito L. Lacatan et al. "Face Recognition for Motorcycle Engine Ignition with Messaging System", International Journal of Computing Sciences Research, 1st International Conference on Redesigning, Re-engineering Academic Direction for Global Competitiveness.
- [37]. Younhee Gil, Dosung Ahn et al. "Access control system with high level security using fingerprint", 32nd Applied Imagery Pattern Recognition Workshop.
- [38]. Z. Brijet, B. Santhoshkumar et al., "Vehicle Anti-Theft System Using Fingerprint Recognition Technique", Journal of Chemical and Pharmaceutical Sciences.
- [39]. Shailesh Dhomne and Pratik Bulkunde. 2002. International Journal of Scientific Research in Science, Engineering and Technology.

Experimental Study on Partial Replacement of Coarse Aggregate by Crown Caps

Neha S. Rathod¹, Isha K. Tekade², Anirudha D. Deshmukh³, Hemant Chandangir⁴, Nikhil Upare⁵

Prof. Amruta A. Yadav⁶

¹⁻⁶Civil Engineering Department, Yeshwantrao Chavan, College of Engineering Nagpur, Maharashtra, India

⁷Assistant Professor, Civil Engineering Department, Yeshwantrao Chavan, College of Engineering Nagpur, Maharashtra, India

ABSTRACT

As we all know cement concrete is widely and commonly used in construction industry. All the materials required to make the concrete are extracted from the environment. The environmental resources are need to be used in control to protect the environment. There is excess amount of industrial waste that needs to be treated so that it won't cause any harm to the surrounding human race and the other environmental elements. Here we are trying to deal with the large amount of metal waste generated in the form of soft drink bottle caps. These caps are hard to biodegrade therefore these can be recycled or reused. The experiment initiated with 10% replacement of coarse aggregate with waste bottle caps. The size of bottle caps is 2.5cm (diameter) and 3mm projections. M30 grade mix is used with 0.42 water cement ratio. The mechanical properties are tested by carrying out the compression test, flexural test and split tensile test.

Keywords : Waste Bottle Caps, Compression Test, Flexural Test, Split Tensile

I. INTRODUCTION

We need the special attention towards the metal and plastic waste generated from the industry as these are not biodegradable which leads the saturation of these materials on the earth for a very long period. Concrete is most used man-made material as construction is a vital part of the development of the country or the facilities provided for the living. Using the bottle caps is one of the way to utilize it in the concrete production. The caps are lighter in weight than the stone metal. The metal caps are collected and partial replacement of coarse aggregate is

carried out and the experimental results are studied in order to compare the mechanical properties of this concrete with the regular concrete. The tests namely compression, flexural and split tensile test are carried out on different specimens. For compression test; cube of 150x150x150 mm, for Split tensile test; cylinder 150mm diameter and 300mm height and for flexural test; beam 100x100x500 mm are tested. The test results are taken for 7 days, 14 days and 28 days.

II. MATERIALS

Cement- Cement is a binding medium in the concrete production. Ordinary Portland cement of grade 53 is used conforming to IS 12269-1987. Initial setting time is 30 min. And final setting time is 600 min. The specific gravity of cement is 3.15.

Coarse Aggregate- Locally available aggregates are used. The size of aggregates used is 10-20mm . 0.5% water absorption The impact value and crushing value is 7.49% and 24.40% respectively. Specific gravity is 2.67, and fineness modulus is 7.2 and all are under limits and were tested in accordance to Indian Standard specifications IS: 383-1970.

Fine aggregates- Locally available sand confirming to zone II with specific gravity 2.65 and .25% water absorption was used. The testing of sand was done as per Indian Standard Specification IS: 383-1970. The size of the aggregate lesser than 4.75 mm is considered as Fine aggregate.

Water- Water is used for mixing, curing purpose should be clean, potable, fresh and free from any bacteria and desire matter confirming to IS 3025-1964 is used for mixing. water is a key ingredient in the manufacture of concrete.

Waste bottle caps- Crown caps of soft drinks and other beverages are collected and cut into half as shown in the fig.(1)



Fig. 1 - Crown caps cut half

III. METHODOLOGY

In this experiment M30 grade with nominal mix as per IS 10262-2009 is used. The concrete mix proportion (cement: fine aggregate: coarse aggregate) is 1: 0.75: 1.5 by volume and a water cement ratio of 0.43. The amount of materials in the mix is given below.

Detail mix proportion

Cement	Fine aggregate	Coarse aggregate
338 kg/m ³	686 kg/m ³	1082 kg/m ³

IV. EXPERIMENTAL PREPARATIONS

Total 18 cubes, 12 cylinders and 12 beams were casted. Metal caps were partially replaced with coarse aggregates in concrete in 2 different percentages 0% and 10%. For each percent of metal cap addition, 3 cubes, 2 cylinders and 2 beams were casted. Final strength of cubes, cylinders and beams were tested after 7, 14 and 28 days of curing.

All the three tests were carried out on universal testing machine

Compression test-Compression testing machine was used for testing the compressive strength of cubes [150 X 150 X 150] mm,

Split tensile test-split tensile strength of cylinders [Ø 150 mm, height 300 mm]

Flexural test-flexural strength test on beams of size [100X 100 X 500 mm]

V. REVIEW

This study is intended to find the effective ways to reutilize the waste Aluminium caps, which can be reused as a useful raw material (Coarse aggregate) for the preparation of the concrete. Possibly the compressive strength of the concrete increases when coarse aggregate is partially replaced by the metal caps. Also the concrete obtained is of lightweight.

VI. ACKNOWLEDGMENT

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VII. REFERENCES

- [1]. IS: 8112-1989. Specifications for 43 grades Portland cement, Bureau of Indian Standards, New Delhi, India.
- [2]. IS: 383-1970. Specifications for coarse and fine aggregates from natural sources for concrete, Bureau of Indian Standards, New Delhi, India.
- [3]. IS: 10262-2009. Recommended guidelines for concrete mix design, Bureau of Indian Standards, New Delhi, India.
- [4]. IS 456-2000, Indian standard plain and reinforced concrete-code of practice, 4th revision, and 1st reprint Sep-2000.
- [5]. Concrete technology, M.S.Shetty, S.Chand publishing
- [6]. Darshan N1, Rajani V Akki 2, Sharath B P “Experimental Study on the Hardened Properties of Concrete by Using Soft Drink Bottle Caps as Partial Replacement for Coarse Aggregates”
- [7]. Mr.SaiGopiKamepalli, Ms.MisbahBashir, Mr.S.Ganesh “ Experimental study of replacement of coarse aggregates with aluminium caps”
- [8]. A. Ishaya I. M. Oyemogum A. Arinze “Properties of Concrete Produced with Waste Bottle Caps (WBC) as partial replacement of concrete as a partial replacement

Design and Analyze the performance of Mechanical Rebar Coupler in the concrete structure Alternative to Lap Splices

Ajinkya Bhandekar¹, Ankit Thorat¹, Ashutosh Dohale¹, Sneha Nandeshwar¹, Manish Rathod¹,
Shivang Singh¹, Prof. Shalaka Sharma²

¹U.G. Scholar, Civil Engineering Department, G.H.R.A.E.T Nagpur, Maharashtra, India

²Assistant Professor, Civil Engineering Department, G.H.R.A.E.T Nagpur, Maharashtra, India

ABSTRACT

In construction practices, the buildings of concrete structure have focused on the use of steel reinforcement for transfer of tension and shear forces. In general construction purposes two types of steel are used including the mild and deformed steel bars. The mild steel bars which are used in reinforced cement concrete works are plain in surface and round in cross-section. Lap splicing is the conventional method of connecting steel reinforcement bars. Lapping is the method in that reinforcement bar is connected with each other. Purpose of lapping is to give continuity of reinforced structure like beam, column, slab etc. The splicing of bars by lapping may also have various imperfections such as that the low quality weld, inadequate length of lap and increase in the construction cost. But the lapping may also reduce the time and increase the structural reliability of the concrete structure. The practice of the use of coupler in the construction industry may overcome the problems of the construction time and simplify the design and construction of reinforced concrete and reduce the amount of reinforcement required. The present paper is to analyze the design and the performance of the coupler in the concrete structure. Couplers not only provide strength to joints but also prove as an economic mean for connections of two bars. The objective of this research study is that to investigate the new design of the coupler which reduces the consumption of reinforcement steel and construction time in concrete structure.

Keywords: Couplers, Splice, Lapping.

I. INTRODUCTION

In the versatile Civil Engineering industry reinforced concrete is widely used. The increasing use of cast in – situ reinforced concrete leads to development of new technologies. It helps to increase the quality of structure and reduces time consumption of construction works. In the reinforced concrete structures, some reinforcing bars must be spliced. Lapped joints are always an appropriate method of connecting reinforcement bars. There are three basic ways to splice the bars that are the Lap splices, mechanical connections and welded splices. Of the three lap splicing is the common and least expensive.

We cannot avoid lapping as the bars come in standard lengths of 18m-12m. Steel reinforcing bars of larger diameter required about 15% more steel than that used in single steel. Continuing research, more demanding designs in the concrete structure development of hybrid concrete/steel designs have made the designers to consider an alternative to the lap splicing. The length of a bar required may be longer than the stock length of steel, or the bar maybe too long to be shipped conveniently. The use of mechanical couplers for connecting reinforcing bars is a promising technology, is continuing to develop in terms of the types of couplers available and their

performance. The supply of couplers is becoming a global business and because of the diversity in the design codes, construction practices and specifications, standardization of the specification and testing of coupler performance has been slow. The types of couplers available can be conveniently categorized on the basis of joint is made between the coupler and the reinforcing steel. More and more engineers are specifying that mechanical reinforcement connections over the lap splicing. Their research has said that the mechanical connections afford reliability and consistency that can't be found with the lap splicing. In the reinforced concrete structure, some reinforcing bars must be spliced so that the force from one bar to the joining bar is transferred. So, in the field of construction various couplers are used. Couplers can simplify the design and construction of reinforced concrete and reduce the amount of reinforcement required. However lap splices cannot be used for bars having diameter greater than 36mm, so the bars having diameter greater than 36mm may be welded or coupled by using reinforcement couplers. Whereas welding requires skilled workmanship and continuous power supply. Therefore to overcome the above disadvantages and complexity of welded and spliced connection the rebar couplers are preferred for connection.

The Indian construction industry has felt the immediate need, and is encouraging the builders to use mechanical couplers for use in many major infrastructure and multistoried construction projects. The supply of couplers is becoming a global business and because of diversity in design codes, construction practices and specifications, standardization of specification and testing of coupler performance has been slow. The type of couplers available can be conveniently categorized on basis of joint made between the coupler and reinforcing steel. Couplers not only provide strength to joints but also proves to economic means of connections of two bars. In either case, rebar installers end up with two or more pieces of steel that must be spliced together. Designed for the

use with worldwide grades of rebar, they develop the full tension splice strength requirement per numerous design standards.

With all coupler systems, the joint is made either in fabricators work or on construction site. Therefore there is a requirement for control of both the coupler manufacturing operation, and also the production of splice itself, which will normally require some end preparation of the bar.

II. STUDY AND METHODOLOGY

The study was divided into different parts as structural analysis, specifications and manufacturing, estimation and comparison made between mechanical and lap splices. Their performance was analyzed on the basis of ultimate tensile capacity and percentage elongation.

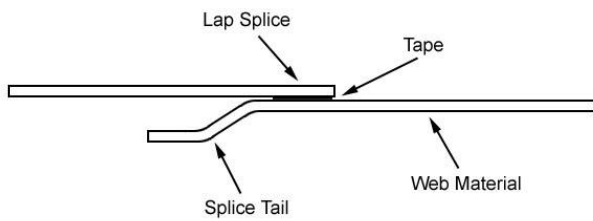
A. Structural analysis

- i. The development length and bond stress can be determined from IS 456: 2000.
- ii. IS 4694:1968 States the information about basic dimensions for square threads.
- iii. IS 7008:1988 States the information about isometric trapezoidal screw threads.
- iv. Tensile Strength- The tensile strength of the mechanical splice should not be less than 690 N/mm².
- v. Percentage Elongation - The minimum percentage elongation at maximum force should be minimum 3% before the failure of test piece.

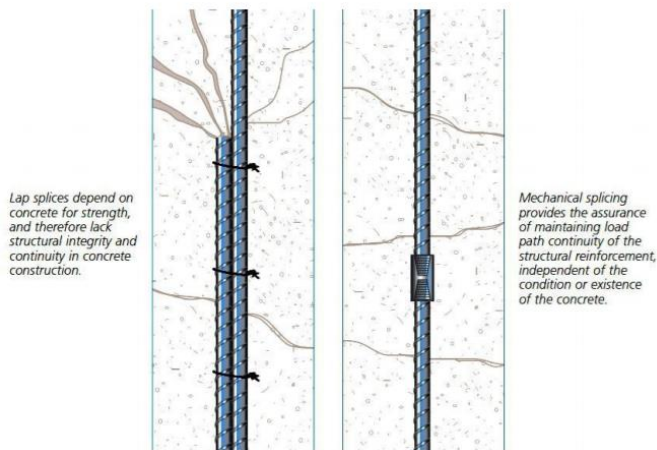
B. Specifications and manufacturing

According to the specifications required various materials and their alloys can be used for preparing the couplers. Generally the couplers are manufactured from mild steel. The manufacturing of couplers includes various steps such as cutting, boring, threading, tapping and finishing. Couplers are manufactured on Metal Lathe machine.

Lap Splice



Congestion of Bars



Lap considered	D	50	50	50	50
Lap length	M	0.8	1	1.25	1.6
Weight of overlapping lap	Kg	1.26	2.47	4.82	10.11
Total bar consumed per floor	M	4.8	5	5.25	5.6
No. of lap in 12 m rebar	No.	2	2	2	2
Actual consumption of bar	M	9.6	10	10.5	11.2
Wastage scrap in length	M	2.4	2	1.5	0.8
Wastage in Kg	Kg	3.769	4.938	5.787	5.057
Wastage as scrap in 12 meters in Rs.	Rs.	188.47	246.91	289.35	252.84

C. Economic Survey

The conventional lap splicing methods require more time and steel. Hence there is wastage of money and also more wastage of reinforcement bars as scrap. We can avoid this by giving alternative to conventional lap splicing by mechanical splicing. For that purpose economic survey is much more needed.

Table 1. Economy Survey for Various bars diameters.

Description	Units	Quantities			
		16	20	25	32
Rebar diameter	MM	16	20	25	32
Length of rebar	M	12	12	12	12
Weight of rebar per meter.	Kg/M	1.571	2.469	3.858	6.321
Cost of steel	Rs	50	50	50	50
Rebar length as per floor	M	4	4	4	4

III. TEST RESULTS

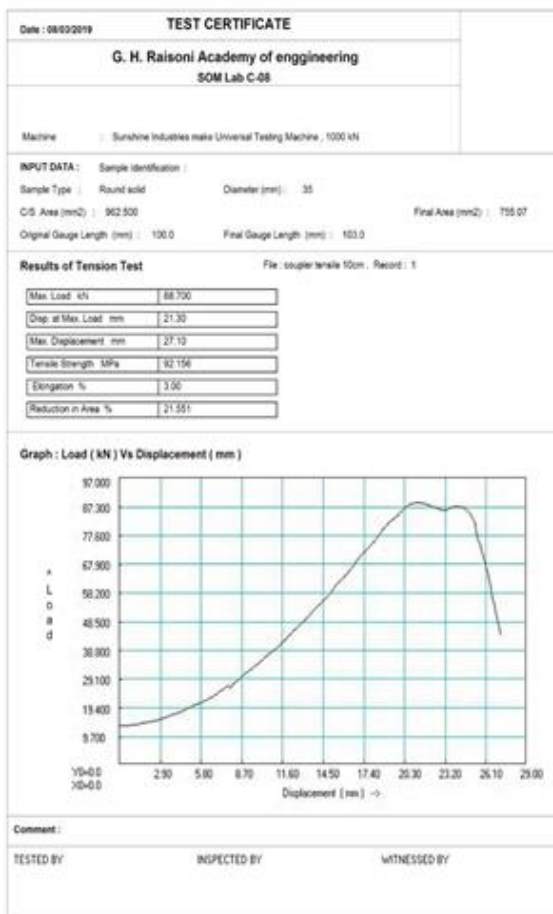
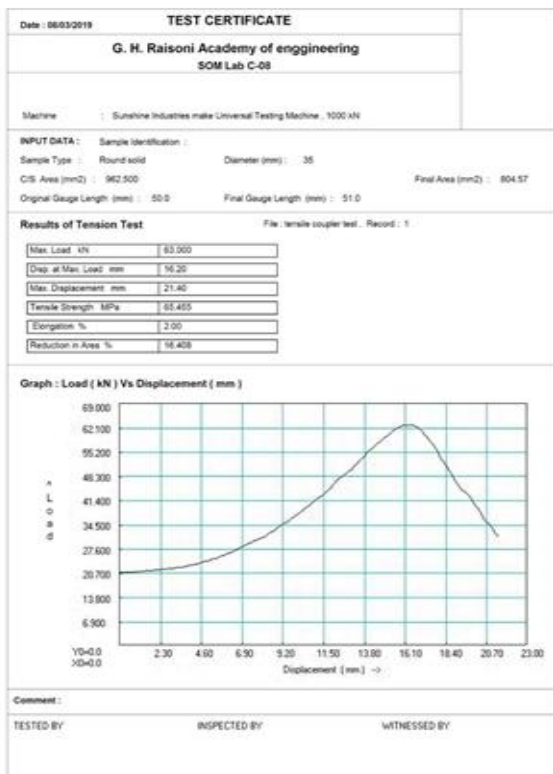
The Tensile test was carried on 5cm and 10cm diameter bar on the Universal Testing Machine where the strength of the coupler of 35mm diameter was checked respectively. The 5cm diameter bar strength is found out to be 65.455N/mm² and for 10cm diameter bar strength was found out to be 92.156 N/mm². Whereas, the tensile strength of the coupler is said to be more than 500N/mm² for the proper strength, therefore the test specimen failed as it has not given the expected result. It resulted in the failure of the test because of the use of the mild steel which is commonly used in the coupler. So therefore according to our research the better material such that EN8D, Fe500, Fe550D would result in giving the appropriate strength to the coupler.

IV. CONCLUSION

The use of mechanical splices as an alternative to lapping of reinforcement is a viable one in many situations. Couplers having high carbon contents have high strength and in addition with greater thickness are more sustainable and effective. The test was done to design and analyze the new coupler in the concrete structure. The use of better material such that EN8D, Fe500, Fe550D will result in the proper strength of the coupler, the use of mild steel resulted in the failure of test and couldn't attain the appropriate strength. The proper physical and chemical properties will result in the better material which will ultimately result in appropriate strength of the coupler. This will also result in the increase of the reliability and reduce both consumption of reinforcing steel and construction time. The mechanical coupler has significant improvement in loading capacity and ductility better than the conventional splicing methods independent of the concrete conditions. The conclusion from the various test and survey is as stated Tensile Test- Mechanical splice gives high performance than conventional lap splice; Mechanical splice strength is generally 125-150% more than conventional lapping strength.

V. REFERENCES

- [1]. H. G. Sreenath, "Mechanical Couplers for Splicing Steel Reinforcements in Concrete Structures". ICI Journal, Vol.14, Oct-Dec, 2013 No.3.
- [2]. M. K. Hurd, " Mechanical vs. lap splicing", Concrete Construction Article, Publication #C980683, Copyright© 1998.
- [3]. Vidmantas Jokūbaitis, Linas Juknevičius, "Influence of reinforcement couplers on the cracking of reinforced concrete members". May 19-21, 2010, Vilnius, Lithuania, the 10th International Conference.



- [4]. Singh R. , Himanshu S. K. , Bhalla N., Reinforcement Couplers As An Alternative To Lap Splices: A Case Study". International Journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181 Vol.2 Issue 2 Feb-2013.
- [5]. Sanjivkumar N. Harinkhede,et.al,” Investigation of New Techniques in Mechanical Rebar Coupler as an Alternative to Lap Splices”, Imperial Journal of Interdisciplinary Research (IJIR) Vol-2, Issue-6, 2016 ISSN: 2454-1362. Pp.1039-1041.
- [6]. Vistasp M. Karbhari “Long term performance of epoxy bonded rebar couplers". Research Implementation Report Aug-31, 2006. University Of California, San Diego.
- [7]. Dac Phuong NGUYEN, Hiroshi Mutsuyoshi, “Influence of quality of mechanical splices on behavior of reinforced concrete members”,Research Report of Department of Civil and Environmental Engineering, Saitama Univ., Vol.41, 2015.
- [8]. IS 16172: 2014, Reinforcement Couplers for Mechanical Splices of Bars in Concrete — Specification.
- [9]. IS code 456 (2000): Code of Practice is an Indian Standard code of practice for general structural use of plain and reinforced concrete.
- [10]. IS 13920 (1993): Ductile detailing of reinforced concrete structures subjected to seismic forces – code of practice.

Reuse of Grey Water for Flushing Purpose

Chandrashekhar Chauragade¹, Pawan Shimpi¹, Mohd.Safwan¹, Md. Ali Khan¹,
Shubham Rathod¹, Aniket Soge¹, Prof. Laxmikant Vairagade²

¹U.G. Student, Civil Engineering Department, G.H.R.A.E.T Nagpur, Maharashtra, India

²Assistant Professor, Civil Engineering Department, G.H.R.A.E.T Nagpur, Maharashtra, India

ABSTRACT

Grey water is the wastewater that is being discharged from a house, excluding black water (toilet water). This includes water from showers, bathtubs, sinks, kitchen, dishwashers, laundry tubs, and washing machines. It generally contains traces of soap, shampoo and toothpaste, food scraps, cooking oils, detergents and hair in minor quantities. Grey water makes up the largest proportion of the total wastewater flow from household in terms of volume. Typically, 50-80% of the household wastewater is grey water. If a composting toilet is also used, then 100% of the household wastewater is grey water. Studies in different countries have estimated that the usable domestic grey water resource could amount up to 35% of the total domestic demand. Non-domestic establishments such as swimming pools, restaurants, hotels, schools, and other public buildings produce clean grey water. This grey water can be collected before it goes to the septic tank or the municipal wastewater system, and may be reused to irrigate plants after providing a simple treatment. With a little additional treatment, this water can also be used for toilet flushing and other applications. Some safeguards are required.

Keywords: Grey Water, Toilet Flush, Sand Filter, Onsite Reuse, Gravity Flow System

I. INTRODUCTION

Grey water is the wastewater that is being discharged from a house, excluding black water (toilet water). This includes water from showers, bathtubs, sinks, kitchen, dishwashers, laundry tubs, and washing machines. It generally contains traces of soap, shampoo and toothpaste, food scraps, cooking oils, detergents and hair in minor quantities. Grey water makes up the largest proportion of the total wastewater flow from household in terms of volume. Typically, 50-80% of the household wastewater is grey water. If a composting toilet is also used, then 100% of the household wastewater is grey water. Studies in different countries have estimated that the usable domestic grey water resource could amount up to 35% of the total domestic demand. Non-domestic establishments such as swimming pools, restaurants,

hotels, schools, and other public buildings produce clean grey water. This grey water can be collected before it goes to the septic tank or the municipal wastewater system, and may be reused to irrigate plants after providing a simple treatment. With a little additional treatment, this water can also be used for toilet flushing and other applications. Of course, some safeguards are required. The risks to the human and plant health should be minimized. In certain cases, no treatment may be required. The Ministry of Environment and Forests norms for environment clearance to construction projects is 100% treatment of grey water by collecting grey and black water in separate pipelines and reusing it for irrigation or flushing. But there are no recommendations for separating household grey water in India. The knowledge of the state of the art technologies adopted in grey waste water management in households in

other countries can help in utilizing the reuse potential of it. Sometimes kitchen water and laundry water are not included in grey water due to the presence of oil and greases in kitchen water and surfactants in laundry water which may decrease the efficiency of the various physical and biological treatment techniques.

II. METHODOLOGY

The greywater is recyclable and with proper treatment can be put to reuse in toilet flushing. The data collection and processing water use – includes greywater from flushing and face/ hand washing, mopping, utensils washing etc. is done on the basis of actual consumption. The treatment unit is made potable and thus the units adopted in this project is such that it could be accommodated in small space provided for the entire unit. The equalization tank and sand filtration method is adopted here with various locally available materials such as sand of various sizes, gravel of different sizes, charcoal, brick pieces and sponge. Parallel pipeline networks are made to collect the greywater and direct it to the treatment unit where it enters the equalization tank prior to sand filtration. Parallel pipeline networks are provided to check that the waste water is being sent to the treatment plant during the maintenance period of the greywater recycling system. The outlet and the inlet of the system are provided with check valves so as to direct it to the next floor inlet or outlet in case of overflows. The effluents are made to flow through gravity to the immediate lower floor toilet flush through well connected pipe network. It is to be noted that no additional or extra energy is needed as input in any stage for the operation of this treatment unit.

III. RESULTS AND CONCLUSION

For India's future generations to be ensured of a reliable water supply, sustainable management practices must be implemented to preserve the nation's declining groundwater resources. The present

study reviews and suggests the concept of using greywater in various possible fields and thus, making fresh water demand with in control. The use of grey water in India is in the stage of infancy. In India, this greywater system may be very effective in the school /college campuses especially those with residential facilities. The method experimentally assures to be effective water conservatory method cutting off the fresh water usage up to 10 to 30%. It also reduces load on the treatment plant and saves the energy used for such large scale treatments. The experimental trials were conducted in the laboratory with different materials and varying depths and the most efficient method was adopted. The comparison of the parameters of the untreated and the treated water is as shown in the table. This is also a reliable and sustainable method made handy and thus can be easily adopted in any floor of the building.

The method also is the solution for the water crisis which is one of the major crisis in present day and in future in India. Proper maintenance and improved public awareness can make this decentralized system more effective and convenient by reducing transportation cost and pressure on centralized recycling systems. Therefore, a novel wastewater treatment and reuse strategy has been proposed which suggests the separate treatment of greywater. Greywater can be treated by onsite treatment processes unlike black water which can be treated as centralized system. This treatment system can be implemented at household or cluster level so that recycling system needs to be robust and simple to operate.

Table 1

Test	Observation before passing filtration unit	Observation after passing filtration unit	Permissible Limit
pH	6.9	6.7	6.5-8.5
Total Hardness	323	451	600 mg/l
Alkalinity	1068	616	600 mg/l
Colour	10	<1.0	10 CFU
Odour	Disagreeable	Agreeable	Agreeable
Turbidity	102	3	5 NTU
BOD ₅	72	30	2-50 mg/l
TSS	1200	700	1-1000 mg/l
Total Phosphorous	Absent	Absent	Absent
Chloride	404	390	500 mg/l
Sulphate	300	150	400 mg/l

From this analysis it can be concluded that seasonal fluctuation is a great problem in utilizing demand management, rain water and storm water harvesting as alternative supply options of water resources. For this reason using these alternative options is not always reliable. In contrast, grey water recycling is more reliable source in order to manage the rising demand of water. Reliability reduces water demand throughout the year and also reduces volumes of waste water to be treated are the major advantages of grey water recycling process. Thus the greywater is purified in site and reused for toilet flushing and in turn contributes in decreasing the water demand to a certain extent in the present water scarce scenario.

IV. SCOPE OF FUTURE WORK

This treatment unit being handy can be adopted in any kind of building and can be specially designed depending on the location, water demand and disposal method and the quality of greywater generated in the building. This method serves the best in the multi-storey residential buildings where lots of greywater generates in site. In such locations this treat unit can effectively treat the waste water avoiding extra load on the septic plants and conserving water at the same time. This method can also be developed as a separate unit of treatment for kitchen wastes alone by necessary additions in the filter media depending on the quality of the kitchen waste water generated in the building. Based on the type of the building for which the unit is being adopted, the treatment unit can be effectively designed as per the water quality of the greywater generated there.

V. REFERENCES

- [1]. A-Boal, D. Christov, Lechte, P. and Shipton, R. 1995."Installation and Evaluation of domestic Greywater Reuse Systems: Exacutive Summary" Department of Civil and Building Engineering, Victoria University of Technology. Victoria, Australia : VictoriaUniversity of Technology, 1995. Technical Memorandum.
- [2]. Amoozegar, Aziz. 1998. "Impact of Wastewater qaulity on the long-term acceptance rate of soils for on-site wastewater disposal systems" Soil Science Department, North Carolina State University. Raleigh, North Carolina, Water Resources Research Institute, 1998. Study. .
- [3]. Ayers, R.S. and Westcot, D.W. 1989 "Water Quality for Agriculture. Food and Agriculture Organization" Rome : United Nations, 1989. Guidance. .
- [4]. Birks, R and Hills, S. 2007 "Characterisation of Indicator Organisms and Pathogens in Domestic Greywater for Recycling" Thames Water Research

and Development. Environmental Monitoring and Assessment (2007) 129, 2007

- [5]. Casanova, Lisa M., Gerba, Charles P. and Karpiscak, Martin. 2000 "Chemical and Microbial Characterization of Household Graywater. Departement of Soil", Water and Environmental Science, Offices of Arid Land Studies, University of Arizona. Tuscon, AZ : University of Arizona, 2000

A Review of Development of Black Cotton Soil Brick from Biodegradable Waste Material

R. R. Jichkar¹, Subhash Patel², Preeti randai², Ankita Meshram², Sushma Jibhenkar², Pradeep Goyal², Saurabh Naik²,
Vedant Raipure²

*¹Assistant Professor, Department of Civil Engineering, Dr Babasaheb Ambedkar College of Engineering And Research, Nagpur, Maharashtra, India

²Student, Department of Civil Engineering, Dr Babasaheb Ambedkar College of Engineering And Research, Nagpur, Maharashtra, India

ABSTRACT

Over the past few decades, civil engineers are putting continuous efforts towards converting wastes to useful building construction material. An experimental investigation has been carried out to study the feasibility of producing bricks from locally available black cotton soil with biodegradable waste material such as sugar cane husk, saw dust, rice husk, coconut husk. This paper reviews recycling various waste materials in bricks production. This study describes the use of bio-degradable waste in the manufacturing of brick as an alternative resource rather than the conventional one. The effect of this waste on the properties of bricks will be reviewed and recommendations for future research as out comings of this review will be given. This reviewed approach on bricks made from waste is useful to provide potential and sustainable solution.

Keywords: Black Cotton Soil, Bricks, Rice Husk, Sugarcane Husk, Saw Dust, Coconut Husk.

I. INTRODUCTION

Brick is defined as an artificial material obtained by moulding clay in rectangular block of uniform size that are dried and burnt at high temperature to form a dense and compact product. The main ingredients of brick are clay, sand lime, fly ash etc. According to IS 2212 (1991) standard size of brick is 19 cm x 9 cm x 9 cm. India produces over 60 million clay brick annually resulting in strong impact on soil erosion and unprocessed emission. As per the press information bureau, every year with an average annual growth of 4% (PIB 2016), India generates 62 million tonnes of waste (waste containing both recyclable as well as non-recyclable waste). The generated waste can be divided into three major categories i.e. organic (biodegradable waste), dry (recyclable waste) and biomedical (sanitary waste). Biodegradable waste includes organic matter in waste.

Biodegradable waste materials can be divided into carbon dioxide, simple organic molecules by micro-organisms and other living things by composting and other similar process. On the other hand, the black cotton soil is very retentive of moisture. Its great swelling property makes it almost impossible to work with it in rainy season. Whereas in the hot season, the moisture content present in the soil evaporates and the soil shrinks and it develops deep cracks, (10 to 15 cm wide and up to a meter deep). Hence it is a difficult task to make bricks from BCS.

Therefore, this review is carried out to find the sustainable use of this biodegradable waste material for making eco-friendly bricks in order to increase its construction properties and to reduce the waste producing in India to some extent.

DEVELOPMENT OF BRICK FROM BIODEGRADABLE WASTE MATERIAL

Lusia Barbieri, fernanda Andreola et al. (2013) developed bricks by using different agriculture biomass waste like sawdust, cherry seeds, grape seeds, and sugar cane ash. The agriculture biomass waste added in brick is not more than 10% weight of clay. These bricks are compared with industrial red brick. It is found that the biomass waste contains organic substance that provides support in heating process. Grapes and cherries seeds act as a pour forming agents that are added as 5% of the weight of the bricks. Weight loss (WL %), Water absorption (WA %), MOR and heating values are measured for the bricks. It was found that MOR value is 21-23 mpa with weight loss 7-10%. Sugar cane ash shows slightly less shrinkage than the standard one and MOR value is around 28%. Addition of biomass waste up to 5% weight of brick results in increase of water absorption and decrease in mechanical properties.

Laxmikant Yadu, Rajesh Kumar Tripathi et al. (2011) used fly ash and rice husk ash to stabilize black cotton soil. Laboratory test which were conducted on black cotton soil including fly ash and rice husk ash were Atterburg's limits, specific gravity, CBR, UCS (unconfined compressive strength) and characteristics were determined according to Bureau of Indian Standard (BIS). Addition of fly ash results in decrease of OMC and decrease in MDD and addition of rice husk ash results in increase in OMC and decrease in MDD. The optimum amount of fly ash and rice husk ash was found to be 12% and 9% on the basis of CBR and UCS test.

Mohammad Shahid Arshad & Dr. P .Y. Pawale , (2014) worked on formation of bricks prepared from natural waste material which comprises of orange peels and coconut waste. Clay is used as a binding material for natural waste and paper mill waste. From this study they found that coconut waste is most efficient than orange peel and paper mill waste. Coconut waste can be easily handled and utilised for making light weight

bricks. In case of coconut waste, the shorter fibre gives better result as compared to longer fibre and up to 60 percent of the clay can be substituted by natural waste material for making bricks.

Apurva Kulkarni, Samruddha Raje, Mamta Rajgor, (2013) used bagasse ash and lime as a replacement for fly ash brick. The bricks of size (230×100×75) mm were made with different proportions compressive test was conducted on brick. The load is applied axially at a uniform rate of 14 N/mm² and crushing load is noted. In result it was found that compressive strength of Bagasse ash as compared to the fly ash was more, it also solved the disposal problems. The compressive strength is obtained at 10% replacement of fly ash as bagasse ash.

Rahul R. Jichkar, Kunal R. Pokale, and Yogesh R. Borkar, (Aug 2015) for making bricks have used combination of black cotton soil and brick dust. They have varied the proportion of brick dust as 10%, 20%, 30%. They have performed the test for checking moisture content, Swelling index and unconfined compressive strength. They came to a conclusion that moisture content reduces after 7 days and 28 days. Swelling index of black cotton soil decreases brick dust up to certain limit & strength carrying capacity of sample bricks is increased.

Rushikesh Mirzapure, Gaurav Waghmare et al. (January 2016) used black cotton soil as a raw material for the bricks and also some other admixtures to alter the proportion of black cotton soil. Materials used are Black cotton soil, Rice husk, Salt. Tests performed were compressive strength test, water absorption test. Author came to a conclusion that good quality of bricks can be manufactured by using admixture, such as lime, salt, rice husk, coal, etc.

Mangesh V. Madurwar, Sachin A. Mandavgane et al., (2014) used bio-fuel by product, sugarcane bagasse ash (SBA) to manufacture brick and quarry dust as replacement of lime. The characteristics SBA is found

out by using X-ray fluorescence (XRF), thermogravimetric analysis (TGA), X-ray diffraction and scanning electron microscopy (SEM). This test confirms that SBA is a cementitious material and it is stable till 650°C. SEM shows fine pore surface characteristic physical properties of quarry dust is determined by laboratory test. The SAB-QD-L bricks were compared with commercially available brick, and it was observed that it was light weighted, energy efficient and compressive strength met the requirement of IS 1077:1992.

(Panchal Darshan, Vivek Patel, et al (2014) made bricks by using adhesive materials, black cotton soil, rice husk and salt with different combinations. The size of brick was 190mm×90mm×70mm and various tests which were conducted on bricks were compressive strength as per IS3495 water absorption test as per IS 3495(part 3) size, shape, colour, soundness, structure test. In result it was found that compressive strength is 60% more than normal brick, water absorption is 20%, it is less than normal brick and volumetric change is in the range of 3mm to 6mm. This brick provided an economical solution where black cotton soil is available.

(Abdul El 2004) did his research on incorporation. From his research he found that sewage sludge from sewage treatment plants can be regarded as an interesting raw material for fabrication of clay bricks. As per the study about 10% to 40% weight can be utilized for advancement of normal clay. As per physical & chemical properties, bricks with more than 30% sludge addition are not recommended for use, since they are brittle & get easily broken even when handled gently. Sludge bricks may not be suitable as facing bricks due to their poor surface texture & finishing unless plaster is applied. Due to these reasons sludge aimed clay bricks are normally not exposed to view.

(Badr El Din Ezzal, Hegazy, Hanan Ahmed 2012) Investigated the complete substitution of brick clay by

sludge incorporated with some of the agricultural and industrial waste such as rice husk ash and silica fume. Three proportions of sludge to silica fume to SF to RHA were tried which were (50:25:25), (50:25:25), (25:25:50) respectively. It was fired at 900°C, 1000°C, 1100°C and 1200°C. They found the best results with the proportion of 50% of sludge, 25% SF and 25% RHA were the optimum material proportion to produce brick from waste sludge incorporated with SF and RHA. They concluded that WTP sludge can be successfully used in brick manufacturing incorporated with agricultural and industrial waste materials, which contain high silica content, such as RHA & SF. The results are limited to the study conditions such as mixing proportion, firing temperature and manufacturing method used in study.

(Kuldeep Singh Chouhan, Prof Rajesh Jain 2015) worked to improve stability of black cotton soil by using fly ash to get the maximum strength and used the same content of fly ash with sugar cane fibre 1.5cm which gave decreased behaviour of expansion of black cotton soil. The CBR value is found in between 1.19 to 5.65 & unconfined compression ratio from 9.66 to 1.43 kg/cm². It was found that the optimum moisture content (OMC) decreases with the increase in % of fly ash and dry density is increased with increase in % of fly ash.

(Ushma Gwale and Prof Y.P Joshi 2018) This research was carried out to analyse the strength of black cotton soil using coconut fibre black cotton soil which was mixed with coir fibre in range of 0.5% and 2.5%. During which they observed the properties like change in optimum moisture content & Maximum dry density of black cotton soil due to addition of coir, changes in UCS result due to addition of coir fibre & find the optimum fibre content, & change in free swelling characteristics of black cotton soil with an addition of coir fibre was observed. As a result of their research they found that it is eco-friendly waste material & easily used. At the end they concluded that

the use of coconut is found to be effective & eco-friendly method of stabilizing the weak sub-grade soil.

(Prashantha T.R, Dr.Anupam Mittal 2017) used coir as an addition with black cotton soil in different percentage (0.2%, 0.3%, 0.4%, and 0.5%). Various tests that were conducted on the specimen included CBR, Unconfined compressive strength (UCS), free swell test, plastic and liquid limit test . It was found that soil density decreases when compacted fibre content increases, cohesion increases and it reaches its peak at 0.4% which is optimum fibre content. When core fibre increases to more than 0.4% it results into reduction in cohesion. Almost 40% reduction is found in black cotton soil.

(C.C. Ikeagwuoni 2016) used Saw dust, Ash and Lime to improve the compressibility characteristic of the black cotton soil. Test which was conducted are atterburg's limit, specific gravity, particle size distribution. Sawdust was used as 0 to 20% by weight of soil, and lime as 4% by weight of soil. A significant improvement in the compressibility characteristic was found when a combination of 16% SDA and 4% weight of black cotton soil were added to it. The specific gravity is improved from 2.34 to 2.37. Liquid limit decreases 84.2% to 40.6%. Plastic limit is increase from 28 to 33%. Overall plastic limit was down from 56.2 to 7.3%. Free swell is decreases from 79 to 25.2%.

II. DISCUSSION

From the paper studied, it was found that different materials impacts on different properties of bricks. It was observed from different research conducted on the bricks manufactured from waste bricks properties like physical & mechanical properties can be improved by adding different waste material in brick composition as well as swelling and drying properties of black cotton soil can be overcome.

According to Lusia Barbieri, fernanda Andreola etc. (2013) Addition of biomass waste up to 5% weight of

brick results in decrease in weight and increase in porosity or increase in water absorption and decrease in mechanical properties. Laxmikant Yadu, Rajesh Kumar Tripathi, (2011) found from their research that Addition of fly ash result in decrease of OMC and decrease in MDD for addition of rice husk ash result in increase in OMC and decrease in MDD. According to (Mohammad shahid Arshad and Dr.P.Y.pawale, (2014)) up to 60% of the clay can be reduced by natural waste material (orange peels & coconut waste) for making bricks. Vaidya Dipesh (2014) concluded from his research that water absorption of the brick made from the black cotton soil with the various admixtures is about 20% less than water absorption of the normal brick.

According to (Rushikesh Mirzapure, Gaurav Waghmare, Shrikant Rathod, etc (January 2016) good quality of bricks of BCS, can be manufacture by using admixture, such as lime, salt, rice husk, coal, etc. According to (Panchal Darshan, Vivek Patel, Rona Vishesh, Sukhadia Hardik, Vaidya Dipesh, 2014) Bricks made by using adhesive materials, black cotton soil, rice husk and salt with different combinations possesses compressive strength of 60%, water absorption is 20% more than normal brick. (Kuldeep Singh Chouhan, Prof Rajesh Jain 2015) found that the optimum moisture content (OMC) decreases with increase in % of fly ash and dry density increases with increase in % of fly ash in bricks. (Ushma Gwale, Prof Y.P Joshi 2017) As a result of their research they found that coconut fibre eco-friendly waste material & easily used. The optimum moisture content decrease 12-08 maximum dry density is 1.55%. At the end they conclude that the use of coconuts fibre is found to be effective & eco-friendly method of stabilizing the weak sub-grade soil.

Whatever study we have done yet from that, we can say that biodegradable waste material can be also used as an ingredient in brick making of good quality of bricks possessing good bricks qualities can be expected.

III. CONCLUSION

Different papers based on black cotton soil brick manufacturing & use of bio-degradable waste for the same has been reviewed. There effect change in properties, reuse as an ingredient in brick making are reviewed. It was found that different materials provides & enhance properties of bricks in different manner & hence they can be used to overcome the swelling & drying property of Black cotton soil. Hence rice husk, coconut husk, sugar cane husk & fine saw dust are selected & experimental study will be done on brick made by adding these bio degradable waste materials.

IV. REFERENCES

- [1]. Lusía Barbieri, Fernanda Andreola , Isabella Lancellotti. "Management of Agricultural Biomass Wastes: Priliminary Study On Characterization And Valorisation In Clay Matrix Bricks", Journal Of Waste Management ELSEVIER, 33,(2013),2307-2315.
- [2]. Laxmikant Yadu Rajesh Kumar Tripathi Dharamveer Singh, 2014, "Comparison of Fly Ash and Rice Husk Ash Stabilized Black Cotton Soil", International Journal of Earth Sciences and Engineering, ISSN 0974-5904.
- [3]. Mohammad Shahid Arshad, Dr. P.Y. Pawade, 2014. "Reuse of Natural Waste Material for Making Light Weight Bricks", International Journal of Scientific & Technology Research, Volume 3, ISSN 2277-8616.
- [4]. Apurva Kulkarni, samrudhha raje, Mamta rajgor 2013, "Baggase ash as an effective replacement in fly ash brick",International journal of engineering trends and technology, ISSN: 2231-5381.
- [5]. Kunal R. Pokale, Yogesh R . Borkar, R.R. Jichkar ,2015, "Experimental Investigation for Stabilization of Black Cotton Soil By using waste material - Brick Dust", International Research Journal of Engineering and Technology (IRJET).
- [6]. Rushikesh Mirzapure; Gaurav Waghmare et al.; 2016, "Comparison between Black Cotton Soil Brick and Normal Brick by using Admixture", International Journal of Research, ISSN: 2348-6848 Vol-3,
- [7]. Mangesh V. madurwar, sachin A. mandavgane et al., 2014, "Use of sugarcane baggase ash as a brick material", current science, volume 107, no.6 ,2680 71314.
- [8]. Panchal Darshan, Patel Vivek,Rana Vireshet a.l.et al.,2014, "Comparison of bricks made from black cotton soil with various admixtures to normal bricks" International journal for innovative research in science and technology, ISSN:2349-6010 .
- [9]. Abdul G. Liew , Azni Idis, Calvin ,H.K. wong et al.,2004, "Incorporation of sewage sludge in clay brick and its characterization" , Journal of waste management and research 22:226-233.
- [10]. Badr EI din Eazzal Hegazy ,Hanan ahmad fouad et al., 2012, "Incorporation of water sludge , silica fume and rice husk ash in brick making", Journal of advances in environmental research, i:83-96.
- [11]. Kuldeep Singh Chauhan , Prof. Rajesh Jain et al. 2015, "Effect of fly ash and fibre on engineering property of black cotton soil", International journal for innovation research in science and technology , ISSN:2349-6010.
- [12]. Ushma Gwale , Prof.Y.P.Joshi, , et al.2018, " A Study On Black Cotton Soil To Enhance CBR Value Of Soil Sub –Grade Using coconut coir Fibre For Rural Roads", International journal of technical innovation in modern engineering and science, e-ISSN:2455-2585.
- [13]. Prashantha T.R; Dr.Anupam Mittal, 2017, "Change in the properties of black cotton soil due to addition of coir fibre", International journal of Engineering and technology , Management and applied science; ISSN: 2349-4476.
- [14]. Prashantha T.R. , Dr.Anupam Mittal,"Compressibility characteristics of black cotton soil admixed with sawdust ash and lime", nigerian journal of technology,ISSN:0331-8443

An Experimental and Numerical Investigation of Mechanically Stabilized Earth Wall

Ashwini V. Thakre¹, Harshlata K. Lokhande¹, Neha R. Thawre¹, Rakhi P. Thool¹, Shraddha P. Dongre¹, Shubhangi S. Karangale¹, Pankajkumar A. Yadav²

¹Student, Department of Civil Engineering, GHRAET, Nagpur, Maharashtra, India

²Assistant Professor, Department of Civil Engineering, GHRAET, Nagpur, Maharashtra, India

ABSTRACT

Mechanically stabilized earth wall is geosynthetic reinforced technique, it has been widely used in civil engineering practice over the last two decades. Now a days, MSE wall has become a substitute solution to conventional retaining wall based on economy and easy construction. To ensure the safety of such structure intense analysis would require by experimental and numerical approach.

Keywords: Plaxis-2D, RE Wall, Geogride,

I. INTRODUCTION

Mechanically stabilized earth wall is geosynthetic reinforced technique, it has been widely used in civil engineering practice over the last two decades. Now a days, MSE wall has become a substitute solution to conventional retaining wall based on economy and easy construction. To ensure the safety of such structure intense analysis would required by experimental and numerical approach. The heavy soil mass is supported by retaining walls in various fields of civil engineering such as hydraulics and irrigation structures, highways, railways, tunnels, mining etc. and evaluation of lateral earth pressure is key factor to design retaining wall. The retaining walls are often classified in terms of their heavy mass and flexibility. Nowadays, 4 geosynthetic-reinforced soil technique Mechanically stabilized earth(MSE) is a method of reinforcing earthen materials so that they can support their own weight.

The wall constructed using the MSE method rely on reinforcing elements such as metal bars, welded wire mats, geosynthetics, or other anchorage systems to

improve the mechanical properties of the soil mass (FHWA, 1995). MSE walls are typically constructed using four structural components:

1. geogrid reinforcement
2. wall facing
3. retained backfill

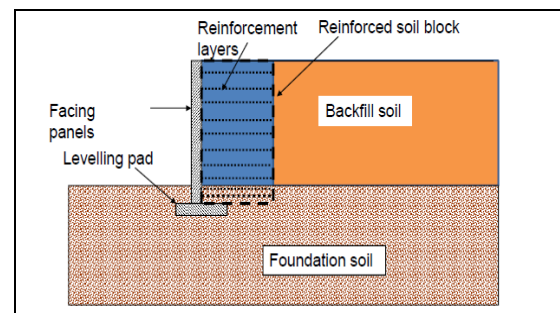


Figure 1. Component Parts of MSE Wall

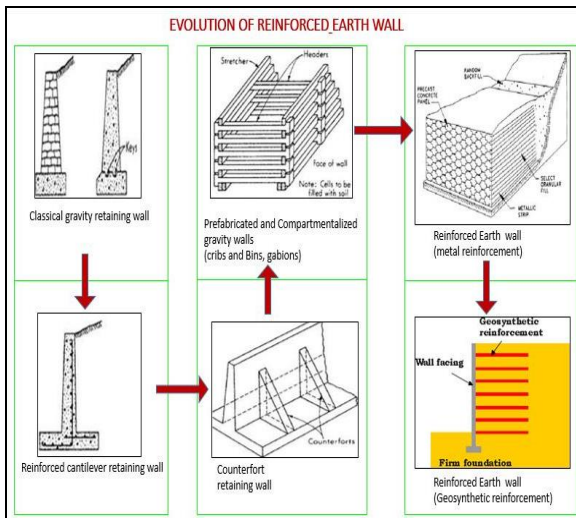


Figure 2. Evolution Of Reinforced Earth Wall



Figure 3. Failure Of Retaining Wall

II. LITRETURE REVIEW

Chalermyanont, T. and Benson, C.H (2005)– A two phase approach was used to develop a reliability based design (RBD) method for external stability of MSE wall. Three modes of failure were considered: sliding, overturning and bearing capacity. External stability was assessed by treating the reinforced soil as a rigid mass using the same procedures employed for conventional gravity type wall systems. The probability of external failure is similar to inherent probability of failure reported by other investigators for similar geotechnical structures.

Federal Highway Administration (FHWA), 2001- Mechanically stabilized earth (MSE) walls, also called reinforced soil walls, are commonly used structures for retaining the earth under bridges, highways, railroads, water front ports, and various other types of infrastructure. These walls are constructed from the bottom up by placing alternating layers of soil and reinforcement. The reinforcement could be a relatively extensible product such as ageogrid or geotextile or a more rigid product such as steel ribbed strips. The reinforced soil is usually engineered granular material and the facing of these walls is typically inclined at greater than 70 degrees.

SadokBenmebarek (2016)- Back-to-back mechanically stabilized earth walls (BBMSEWs) are encountered in bridge approaches, ramp ways, rockfall protection systems, earth dams, levees and noise barriers. However, available design guidelines for BBMSEWs are limited and not applicable to numerical modeling when back-to-back walls interact with each other. The objective of this paper is to investigate, using PLAXIS code, the effects of the reduction in the distance between BBMSEW, the reinforcement length, the quality of backfill material and the connection of reinforcements in the middle, when the back-to-back walls are close. The results indicate that each of the BBMSEWs behaves independently if the width of the embankment between mechanically stabilized earth walls is greater than that of the active zone. This is in good agreement with the result of FHWA design guideline. However, the results show that the FHWA design guideline underestimates the lateral earth pressure when back-to-back walls interact with each other. Moreover, for closer BBMSEWs, FHWA design guideline strongly overestimates the maximum tensile force in the reinforcement. The investigation of the quality of backfill material shows that the minor increase in embankment cohesion can lead to significant reductions in both the lateral earth pressure and the maximum tensile force in geosynthetic. When the distance between the two earth walls is close to zero, the connection of

reinforcement between back-to-back walls significantly improves the factor of safety.

III. METHODOLOGY

3.1 Numerical modeling:-

- Modeling of RE wall in Plaxis 2D
- Plastic analysis
- Determination of outward movement of wall
- Stress in backfill
- Stress in Geogrid.

Experimental testing :-

- Modeling of RE wall in Laboratory (scale model)
- Determination of outward movement of wall
- Validation of outward movement

Table 1. Properties of backfill material

Property	Values	IS- Codes
Unit weight (kN/m ³)	15.02	IS :2770 (Part 14) – 1984
Specific gravity (G)	2.64	IS :2770 (Part 3/ Sec1) – 1980
Coefficient of uniformity, Cu	1.91	S :2770 (Part 4) – 1983
Coefficient of curvature, Cc	1.24	IS :2770 (Part 4) – 1984
D10	0.24	IS :2770 (Part 4) – 1985
D30	0.37	IS :2770 (Part 4) – 1985
D60	0.46	IS :2770 (Part 4) – 1985

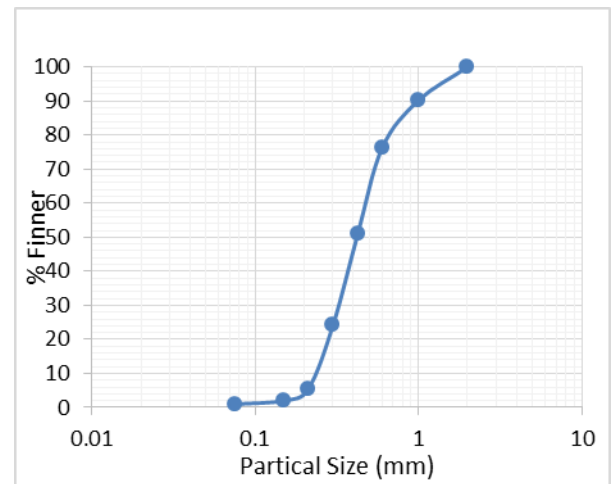


Figure 4. Particle size Distribution curve

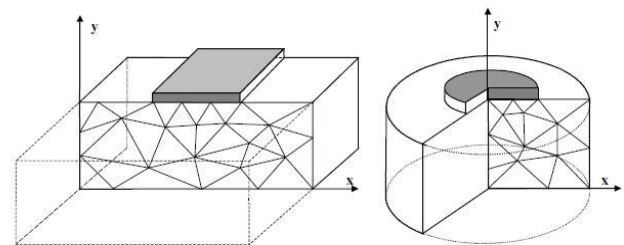
3.2 Analysis by Plaxis 2D

Plaxis is finite element software developed at the Technical University of Delft for Dutch Government. Initially, it was intended to analyze the soft soil river embankments of the lowlands of Holland. Soon after, the company Plaxis BV was invented, and the program was extended to cover a broader range of geotechnical issues. The Plaxis program started at Delft University of Technology in early 1970's when Peter Vermeer started to do a program of research on finite element analysis on the design and construction of Eastern re scope

Problem

Height of RE wall = 6m

Unit wt = 16.32, Fi of backfill = 35, Czi = 5, E= 30000, poisons = 0.3, Rinter = 0.7, thikness of plate = 0.35
Geogrid EA = 1500, foundation is soil (linear elastic)



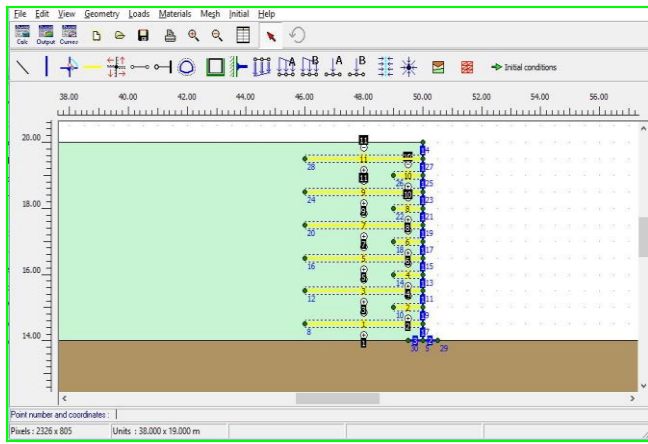


Figure 5. Geometric model of RE wall

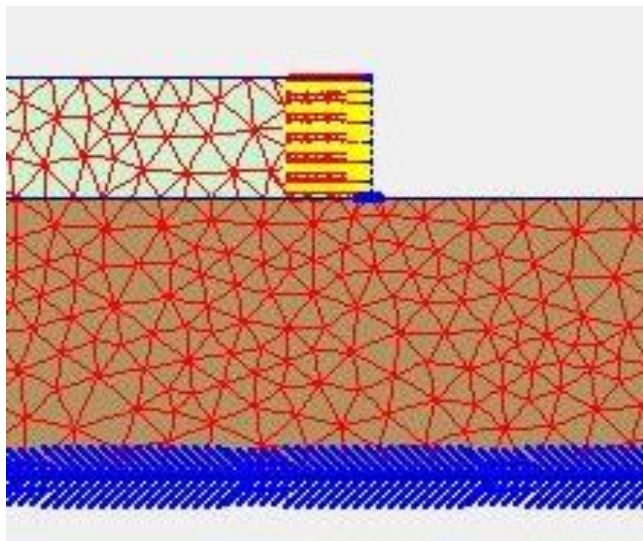


Figure 6. Mesh of model

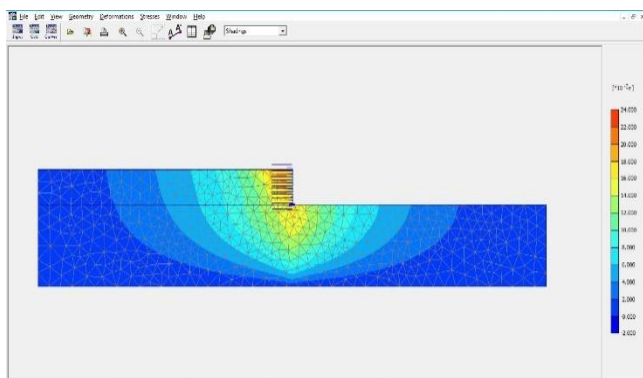


Figure 7. Deformed model

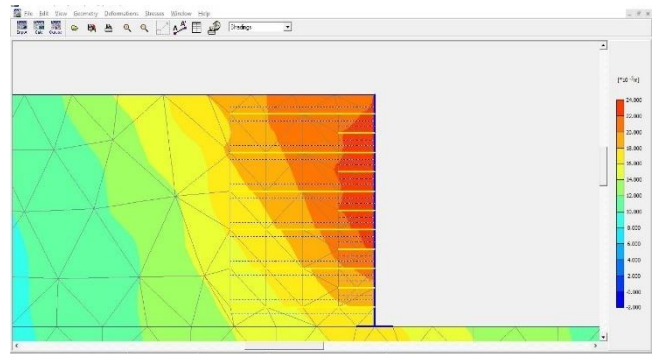


Figure 8. Maximum deformation at top of wall

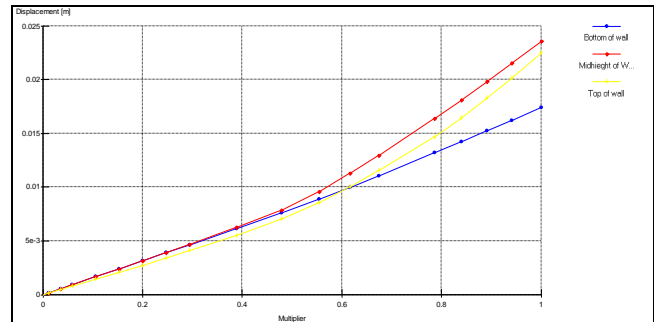


Figure 9. Deflection at different points on wall

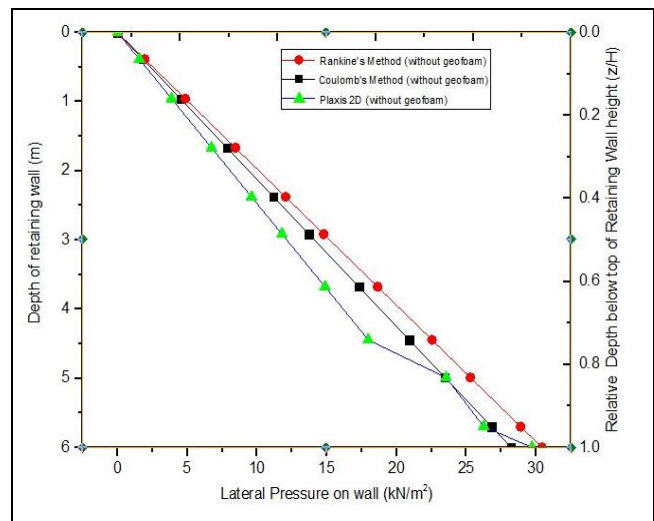


Figure 10. Pressure on wall

IV. CONCLUSION

The RE wall is easy to construct and provide economical retaining structure in civil engineering used as retaining wall, bridge abutment, Earth slope Protection. Numerical Analysis shows, the wall deflect 25mm at 0.65 times height of wall from bottom which should be taken into account while construction of such wall. Outward bulging is major

problem encountered in reinforced earth wall, this numerical analysis shows the same.

V. REFERENCES

- [1]. Yadav, Pankajkumar. (2018). ANALYTICAL AND EXPERIMENTAL ANALYSIS OF RETAINING WALL IN STATIC AND SEISMIC CONDITIONS: A REVIEW.
- [2]. Yadav, Pankajkumar & Singh, Dhananjay & P Dahale, P & H Padade, A. (2018). Analysis of retaining wall in static and seismic condition with inclusion of geofom using Plaxis 2D.
- [3]. Rouili Ahmed “Effect of Construction Sequences on the Behaviour of aBackfilled Retaining Wall” IACSIT International Journal of Engineering and Technology, Vol. 4, No. 6, December 2012 .

Evaluation of Self Healing Porous Asphalt for Road Construction

Mr. Ankit Nandeshwar¹, Mr. Ashish Yetre¹, Mr. Dhiraj Bhople¹, Ms. Kajol Lade¹, Mr. Parth Dhole¹,

Mr. Sahil Vidhwani¹, Prof. Mrunalini Takarkhede²

¹Student, Department of Civil Engineering, GHRAET, Nagpur, Maharashtra, India

²Assistant Professor, Department of Civil Engineering, GHRAET, Nagpur, Maharashtra, India

ABSTRACT

This paper summarizes the main results of experimental research on the induction healing of porous asphalt with steel wool fibres. Self healing Technology is new field within material engineering and is changing the way of material behave. The aging of asphalt under weather and traffic associated with the formation of micro cracks on surface layer of pavement by adding a conductive material in asphalt production, such as steel fibres, the possibilities arises of heating up the mortar of the asphalt by an induction device. A short “ heat shot” through the steel fibre causes melting of bituminous binder and because of that, hairline or micro cracks on the pavement surface are close or healed. The asphalt mixture will reset and start a new life. This technique also can be used as additional way of storm water management. The past few studies suggested that, porous asphalt pavement intended to be used for parking lots, storm water management, peak flow reduction & noise reduction. Study includes sample making of various proportion of asphalt, aggregates & steel fibre.

Keywords: Ravelling, Induction Heating, Porous Asphalt, Noise Reduction.

I. INTRODUCTION

Porous asphalt shows excellent performance in both noise reduction and water drainage. Although porous asphalt has these great qualities, its service life is much shorter (sometimes only half) compared to dense graded asphalt roads. Ravelling, which is the loss of aggregate particles from the surface layer, is the main damage mechanism of porous asphalt surface wearing courses. In this research, an induction healing approach (namely, activating the healing process of asphalt concrete through induction heating) was developed to enhance the durability of the porous asphalt roads. Steel fibers are added to a porous asphalt mixture to make it electrically conductive and suitable for induction heating. When micro cracks are expected to occur in the asphalt mastic of the pavement, the temperature of the mastic can be increased locally by induction heating of the steel

fibers so that porous asphalt concrete can repair itself and close the cracks through the high temperature healing of the bitumen (diffusion and flow). The closure of micro cracks will prevent the formation of macro cracks. In such a way, ravelling can be avoided or delayed in the end. To make asphalt mastic and porous asphalt concrete electrically conductive and suitable for induction heating, steel wool fibers were incorporated into them. The electrical conductivity and induction heating speed of asphalt mastic and porous asphalt concrete were first studied in this research. Asphalt mastic and porous asphalt concrete with steel fibers can be heated with induction energy. There is an optimal volume content of steel fiber in asphalt mastic or porous asphalt concrete to obtain the highest induction heating speed. However, porous asphalt concrete does not need to be fully conductive for induction heating. Every single steel wool is a heating unit. Nonconductive samples with steel fiber

can still be heated with induction heating, but at a low heating speed. The diameter, length and content of steel wool fiber are important for the conductivity and heating speed of asphalt concrete matrix. It is proven that induction heating does not cause extra ageing to bitumen. The steel wool was optimized to obtain the best particle loss resistance in porous asphalt concrete. 8% steel wool was considered as the optimal content. The healing potential of porous asphalt concrete with steel wool fibre was also evaluated in this research with beam sample. The optimal induction heating temperature is 85 °C for porous asphalt concrete to obtain the best healing rate. These are some objectives

- 1) To make self healing porous asphalt to be used for road construction.
- 2) Increase drainage properties of pavement.
- 3) To prevent raveling of top pavement.
- 4) Reduction in generation of micro cracks.
- 5) To minimize the maintenance cost and increase the life span of roads

II. MATERIAL & SAMPLE PREPRATION

The raw materials used in this research to make mastic beams are bitumen, aggregates & steel fibre.

A. BITUMEN

The bitumen used of penetration grade bitumen of 70/100. The crushed sand has an average density of 2.67 g/cm³. The bitumen was obtained from Indian oil corporation limited (IOCL) and the properties of bitumen are

Table 1

Binder grade	Penetration	Softening point	Specific gravity
70/100	89d mm	45.8 °C	1.03 g/cm ³

B. COARSE AGGREGATE

Aggregate used for preparation of mastic beam are passing through 12.5mm and retained on 10mm IS sieve. The specific gravity of aggregates are 2.67.

C. STEEL FIBER

Steel fibre are brought from market and no treatment was needed for steel fiber. The size of steel wool should be 1mm and should be mixed in pieces of more than 100. The steel wool fibre used for making mastic beam & its properties are:

Table 2

Length of fibre	Diameter	Tensile strength	Density	Material type
30-60mm	0.45 to 1.00mm	750-1300Mpa	7.9g/cm ³	Low carbon drawn round wire

The beams, were sawn from porous asphalt slabs. The dimension of these beams is 400 mm × 50 mm × 50 mm. The beams will be used to determine the healing effect of different percentage of steel wool fibre with asphalt mix.

PREPRATION OF MASTIC BEAM

The procedure for making mastic beam:

1. Select of mould size 400mm*50mm*50mm
2. Select the aggregates passed through 12.5mm & retained on 10mm IS sieve.
3. Heat the aggregates to remove the water content of aggregate and make it surface dry.
4. The bitumen required is obtained from 4.5% of total weight of aggregates. Heat the bitumen and pour the required bitumen into the mixing bowl.
5. Add the required steel fibre. The steel wool is added in different proportions such as 4%, 8% & 12% of the volume of bitumen. Add the required steel fibre.
6. Mixed bitumen & steel fibre in the mixing bowl then add the heated aggregates into the mixing bowl and mixed it thoroughly.

7. Blend the mixture at high speed until the steel fibres are dispersed quite well (for 15 minutes).
8. After mixing, the mould are casted by filling the mixed into the moulds and compacted.

III. RESULT & DSCRIPTION

A. Test description

Healing of asphalt mastic beams was characterized by testing the fracture resistance recovery of beam samples after fracture. The test procedure is first, two mastic beams were frozen at $-20\text{ }^{\circ}\text{C}$ and broken in three point bending test (as shown in Figure 1). This temperature was chosen to avoid permanent deformation and to create a brittle fracture in the sample. Then, both pieces were put together in the same mould where they were originally made and induction-heated for few minutes. Finally, the samples were frozen to $-20\text{ }^{\circ}\text{C}$ and broken again by means of three point bending test. This process was repeated until the beams did not resist any more loads.

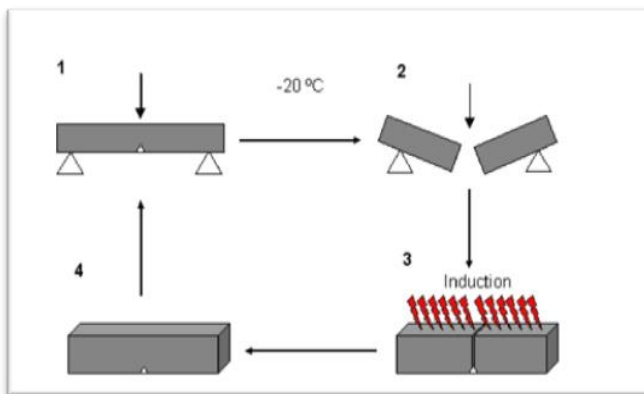


Figure 1. Three Point Bending Test

B. Test result

To study how induction heating influences the healing rate of the fractured beams, the fractured beams were induction-heated to different temperatures ($30\text{-}50\text{-}70\text{-}85\text{-}100\text{ }^{\circ}\text{C}$), respectively, and then the corresponding fracture resistance of the heated beams was tested after cooling.

The evolution of the bending strength of asphalt mastic samples through successive damage-healing

cycles. This process was repeated until the accumulated damage in the material was too high to continue the healing process. The strength recovery of the samples after the first healing is about 85% of the original value. In the successive cycles, it becomes stable at about 70% of the original value. The strength recovery is not complete for two reasons. The crack represents a weak point and the sample suffers some kind of structural damage due to the induction heating.

It could be seen that cracks disappeared because of the flow of bitumen during the induction heating process. It could also be observed that the volume of the mastic increased through the cycles, maybe because the heating was excessive and the air voids in the mixture suffered an expansion.

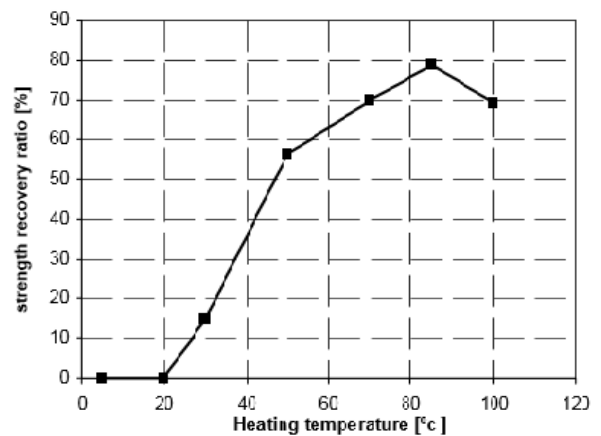


Figure 2. Strength recovery ratios with different induction heating temperatures.

IV. CONCLUSION

The general conclusions with regards to the main goals are as follows

1. Adding steel (wool) fiber to porous asphalt concrete makes it electrically conductive. The electrical resistance of porous asphalt concrete depends on the content, diameter and length of steel fiber. There is an optimal content of steel fiber for porous asphalt concrete to obtain the highest conductivity. Addition of more steel fibers does not increase the conductivity

anymore. Excess steel fibers can make the mixture difficult to mix.

2. Addition of a moderate amount of steel fiber can increase the ravelling resistance and indirect tensile strength of porous asphalt concrete. steel wool fiber proved to be the most efficient to increase the particle loss (ravelling) resistance and strength of porous asphalt concrete. The optimal content of this type steel wool is 8% (by volume of bitumen) to obtain the lowest particle loss value or highest indirect tensile strength. Adding 8% steel wool fibre to porous asphalt concrete increases its resilient stiffness and decreases its temperature dependency, increases its fatigue resistance and water sensitivity.

3. The healing capacity of asphalt mastic and porous asphalt concrete is increased by induction heating. The completely fractured asphalt mastic beams and porous asphalt concrete beams with steel wool cannot heal themselves at low temperatures; but they can be healed many times due to induction heating. The stiffness of fatigue damaged porous asphalt concrete beams recovered more and faster when induction heating is applied on the samples. The fatigue life of porous asphalt concrete beams with steel wool is significantly extended after induction heating. The optimal heating temperature is 85 °C. Induction heating can be repeated when cracks appear again. Through multiple times induction heating, the fatigue life of a porous asphalt beam can be strongly increased. Induction heating also significantly increases the healing capacity and speed of aged porous asphalt beams. Induction heating should not be applied too early or too late during the service life of pavement.

4. The durability of porous asphalt concrete roads will be improved with induction heating because of the improvements in the healing capacity and in the fatigue resistance.

5. The induction healing capacity of porous asphalt concrete beams was evaluated in bending test on

elastic foundation. The fractured beams cannot heal themselves at low temperatures. With induction heating, the beams can be healed up to 78.8%. The optimal heating temperature is 85 °C. Further heating causes swelling and drainage problems of the binder, which offset the benefits of induction heating. Reheating doesn't decrease the healing ratio of the sample, which means that heating can be repeated when cracks appear again.

V. RECOMMENDATION

1. Optimization of steel fiber (wool) - The diameter and length of steel fiber are very important factors affecting the electrical conductivity and induction heating speed of porous asphalt concrete incorporating steel fibre. Addition of steel fiber should not reduce the air voids content of the mixture, which is very important for the noise reduction, spray and splash functions of a porous asphalt layer.

2. Optimization of mixing technology - To shorten mixing time and save energy consumed in dispersing steel fiber into porous asphalt mixture, the mixing technology needs to be optimized. It is recommended that steel wool is first mixed with bitumen.

3. Optimization of induction generator - To enhance the induction speed, the induction generator should be optimized by changing its frequency and the shape/size of the coil. The porous asphalt trial section should be heated very quickly and locally in the mortar to close the cracks inside without heating the stones. A surface temperature of 85 °C in the mortar is recommended

4. Modeling of induction healing in porous asphalt concrete - To fully understand the mechanisms involved in induction healing and to predict the induction heating time needed to obtain a full healing recovery of porous asphalt concrete, modeling work can be of great help.

VI. REFERENCES

- [1]. Amir Tabakovic and Erik Schlanger "Self-Healing Technology for Asphalt Pavement."2015
- [2]. Quantao Liu , Erik Schangen , Martin F.C. Van de Ven, "Predicting the performance of the induction healing porous asphalt test section". RILEM 2012
- [3]. Miss Gauri R. Mahajan, Dr.Y.P.Joshi, Prof.S.S.Goliya, "Technologies for Self Healing of Asphalt Pavements 2017".
- [4]. Gerbert van Bochove, R&D, Heijmans B.V., Rosmalen,Netherlands, "Extending the Service Life by Induction Heating of asphalt" 2016
- [5]. Gomze, A L, Gomze, L N, "Rheo-Mechanical Model For Self Healing Asphalt 2017
- [6]. Performance Test of porous Asphalt Mix – A Review by K. A. Masri And A. k. Arshad
- [7]. Ten Year Experience a porous Asphalt in Belgium G Van and C.Moraux ,Transportation research record 1265.
- [8]. Self healing methods used in asphalt used in asphalt mixtures, erkut yalcin, jose norambuena-contreras,alvaro garcia.
- [9]. Influence of the microwave heating time on the self-healing properties of asphalt mixtures- jose norambuena-contreras.
- [10]. Influence of steel wool fiber on mechanical, thermal & healing properties , Alvaro Garcia, Moises Bueno.

A Review Paper on Self-Healing of Concrete by Using Bacteria, *Bacillus Subtilis*

Akshita V. Hadke, Mrunal L. Kumbhare, Naina U. Mate, Poonam G. Shambharkar, Saloni K. Hadke, Supriya B. Daf, Sanjay K. Bhadke

Department of Civil Engineering, Tulsiramji Gaikwad Patil College of Engineering and Technology, Nagpur, Maharashtra, India

ABSTRACT

A Self-Healing Material is described as a material that is capable of repairing itself back to the original state. Self-Healing Concrete is a product that will biologically produce Limestone to heal cracks that appear on the surface of concrete. When a concrete structure is damaged and water seeps through the cracks that appear in the concrete, the spores of the bacteria gets germinated, thus the concrete will be healed. *Bacillus Subtilis*: - *Bacillus Subtilis* is also known as Hay Bacillus. It is a Gram Positive, Catalase Positive Bacterium, found in soil. It is in rod shaped and can form a tough, protective endospore, allowing it to tolerate extreme environmental condition. The concentration of the Bacteria is 30 gm. and 60 gm. added while mixing the concrete. The Compressive strength, Flexural strength, durability of concrete will be recorded after 7, 14, and 28 days and also curing will be recorded for conventional cube of size 150 x 150 x 150 mm.

Keywords: *Bacillus Subtilis*, Ordinary Portland Cement.

I. INTRODUCTION

Concrete is the most commonly used building material, but it has few limitations. It is strong durable, locally available and versatile. Concrete is very good material to resist the compressive load to a limit but if the load applied on the concrete is more than their limit of resisting load, it causes the strength reduction of concrete by producing the cracks in the concrete and the treatment of the cracks is very expensive. Tiny cracks formed on the surface of the concrete make the whole structure vulnerable due to seepage of water into the concrete, promoting less durability of concrete. Self Healing concrete can solve the problem of durability of concrete structures. [1], Self Healing concrete is one that senses the cracks formation and reacts to heal itself without human interference. The cracks are formed on the surface of concrete due to many reasons like shrinkage, inadequate water for hydration. Self-Healing concrete is a concrete that will biologically produce Limestone to heal cracks that

appear on the surface of concrete structures. However when a concrete structure is damaged and water starts to seep through the cracks that appears in the concrete, the spores of the bacteria germinate on contact with the water and nutrients. Having being activated, the limestone solidifies on the crack surface, there by sealing it up. The consumption of oxygen during the bacterial conversion, has an additional advantage. [2], *Bacillus Subtilis*, also known as hay bacillus or grass bacillus. It is a gram positive, catalase positive bacterium, found in soil. It is in rod shaped and can form a tough, protective endospore, allowing it to tolerate extreme environmental condition.

II. METHODS AND MATERIALS

Cement

Ordinary Portland cement of 53 grade is used in concrete. Cement used has been tested as per IS 10262 and 456-2000.

Crushed sand

Crushed sand having specific gravity of 2.65 and confirming to IS-383 II is used.

Course aggregate

The maximum size of coarse aggregate should be 20 mm and minimum size should be 10 mm. The coarse aggregate with angular in shape and the rough surface texture is used.

Bacteria

The bacteria of Bacillus subtilis were obtained from, Florken sciences, Nashik.

Water

Locally available portable water confirming to standard specified in IS 456-2000 is use.

M25 grade of concrete mix design as per IS code 10262 (2009) given below in table no 1

Table 1. M25 grade of concrete mix design

Materials	Quantity	Average specific gravity	Water absorption %
Cement	478.95kg	3.15	-
Sand	794.49kg	2.65	1.0 %
20mm aggregate	1011.17kg	2.67	0.5 %
Water	191.58kg	-	-
Bacteria	30gm & 60gm	-	-

METHODS:

Slump test: The concrete slump test is an imperial test that measure workability of fresh concrete. The slump cone test indicates the behaviour of a compacted concrete cone under the action of gravitational forces. The test was carried out with a Moulds called a slump cone. The decrease in height of concrete to that of moulds is noted with scale which is found to be 75mm for conventional cubes and 45mm for bacterial cubes.

Compressive studies: M25 concrete design mix was made as per I.S 10262:2009. Cubes of size 150mm X 150mm X150mm were casted with and without adding bacteria. Dosage of 30 gm and 60 gm bacteria were added in 2nd mix design. Cubes will be then tested for compressive strength at 7,14 and 28 days.

III. RESULTS AND DISCUSSION

Expected Outcome

Introducing the bacteria into the concrete makes it very beneficial it improves the property of the concrete which is more than the conventional concrete. Bacteria repair the cracks in concrete by producing the calcium carbonate crystal which block the cracks and repair it. The concentration of the Bacteria is 30 gm. and 60 gm. added while mixing the concrete. The Compressive strength and durability of concrete will be recorded after 7, 14, and 28 days and also curing will be recorded for conventional cube of size 150 x 150 x 150 mm. By introducing Concrete using the bacteria in concrete, the layer of Limestone will be formed on the surface on concrete cubes when the cracks are formed. This research has shown that the development of self healing concrete is Eco friendly and it also increases the service time, durability and reduces the maintenance cost.

IV. REFERENCES

- [1]. Ramakrishnan V, Ramesh KP, and Bang SS. South Dokata School of Mines and Technology, USA, Bacterial Concrete, Proceedings of SPIE, Vol. 4234 pp. 168-176, Smart Materials.
- [2]. Ramchandra SK, Ramakrishnan V, Bang SS. South Dokata School of Mines and Technology, USA Remediation of concrete using Micro-organisms ACI Materials journal, 98(2001) 3-9.
- [3]. Bouzoubaa N, Zhang MH, Malhotra VM. Mechanical properties and durability of

concrete made with HVFA blended cements using a coarse FA. *Cement and Concrete Research*. 31(2001)1393-1402.

- [4]. J.L.Day, V. Ramakrishnan, S.S. Bang, Microbiologically induced sealant for concrete crack remediation, 16th Engineering Mechanics Conference, 16-18 July 2003, Seattle, Washington.
- [5]. J. Dick, W. De Windt, B. De Graef, H. Saveyn, P. Van der Meeren, N. De Belie, W. Verstraete, Bio-deposition of a calcium carbonate layer on degraded limestone by *Bacillus* species, *Biodegradation* V7 (4) (2006) 357-367.
- [6]. Salmabanu Luhar, Suthar Gourav, Research Scholar, Malaviya National Institute of Technology, Jaipur UG Student, Civil Engineering Department, Jaipur, have published review paper on self healing concrete.
- [7]. Henk M. Jonkers, Delft University of Technology, Faculty of Civil Engineering and Geosciences, Micolab.

A Review: Experimental Study on Compacted Soil Using Ultrasonic Pulse Velocity Test

Radhika Kherde, Atharva Mahore, Aalhad Pannase, Tejunsh Bang, Saurabh Bante, Utkarsha Gajbhiye, Vidhita Gadre

Department of Civil Engineering, Dr. Babasaheb Ambedkar College of Engineering and Research, Nagpur, Maharashtra, India

ABSTRACT

Soil testing is very important to determine the load bearing capacity and strength of the soil. While soil testing we calculate the index properties such as water content, specific gravity, bulk density, dry density, consistency limit etc. And other geotechnical properties like compressive strength and shear strength. The specimens were prepared for the laboratory test by using proctor compaction method. The proctor mould of (100 mm dia.) and (125 mm length) is used. By using direct transmission method the wave velocity of each compacted specimen is measured. In this study the tests were conducted for investigating the use of Ultrasonic Pulse Velocity (UPV) over 16 samples of compacted clayey soil from Wanadongri region. Determining the index properties using the old methods and comparing it with the UPV results. Finally the calibration curve is plotted using the observations such as water content vs. velocity, dry density vs. velocity, bulk density vs. velocity, compressive strength vs. velocity. The curve shows that which of them is more efficient.

Keywords: Water Content, Bulk Density, Dry Density, Compressive Strength, Ultrasonic Pulse Velocity Test, Wave Velocity, Consistency Limit.

I. INTRODUCTION

Whether constructing a commercial building or residential building it all starts with the foundation. Since entire structure is hold by the foundation. Hence soil investigation is an important parameter which plays a crucial role that will allow planning of foundation work properly and accurately. So that soil testing is prime importance to determine index properties and engineering properties.

There are various methods adopted for soil testing. Some tests are performed in laboratory and some are in the field. These tests are simply divided into two parts destructive and non-destructive tests. For ex. In-situ density is determined by sand replacement method, core cutter method, rubber balloon method which is destructive tests. Non-destructive methods most commonly include nuclear density test, electrical

resistivity and cone penetration tests. In this research non-destructive test is taken into account as it is easy, lightweight, less time consuming and give quick results.

Different soil types will require different type of foundation. Depending on the properties of soil what should be the type of foundation to be used and the depth of the same should be decided. For selection of materials, design, and quality control purposes compaction characteristics of soil are required. Compaction characteristics of soil are evaluated by analysing the relationship between water content and dry density of soil. To determine the variation of dry density and water content proctor compaction tests are generally adopted in the laboratory. However soil contains water and water sometimes causes troubles in

construction of foundation, this can be known by studying the soil conditions.

Ultrasonic testing can present a sophisticated and fast approach for determining characteristics of compacted clayey soils. The testing program consisted of measuring pulse wave velocity on compacted soil using the direct transmission method. Ultrasonic pulse velocity method is used to assess the quality of concrete, metals, asphalt, etc. In this test, by measuring the velocity of an ultrasonic pulse waves passing through a compacted soil sample the strength and quality of compacted sample is assessed. The waves pass through the sample and the time taken is recorded. High velocity rate indicates good quality and continuity of the material, while slow velocity rate may indicate sample with cracks or voids.

This non-destructive method can be used as an alternative to existing methods to analyse laboratory or field compacted soils as well as physical and engineering properties of soils by geotechnical researchers.

The brief review of various soils testing by different researchers is discussed below:

Nitesh Ashok Bhange (2018): In this study the conclusion drawn are the relation between velocity and water content are established as an identical relation to that of a typical compaction characteristic curve of proctor. The relation obtains between velocity and density for the sample tested. The empirical equation in this research for predicting density, water content, compressive strength are found to be encouraging.

T. Senthilmurugan (2005): In this work the conclusion were obtained irrespective of the soil type, compaction method and energy of compaction, the relation obtained between velocity and water content was established as an identical relation to that of a typical compaction characteristic curve of proctor.

The peak velocity and maximum densities were within $\pm 1\%$ water content for the tested samples of two types. It was observed that the pulse velocity increases with compaction energy and decreases with plasticity. The linear relation were obtained between density and velocity.

Leslie (1950): Leslie investigates the relation between water content and velocity in silty clay and stated that maximum velocity occurs at maximum density and optimum moisture content (OMC).

Desislava Z. Slavova (2010): In this study slightly higher wave velocities were observed for samples of higher dry unit weight. As the smaller compaction mould could be use for the compacted sample in place of the larger mould but the care and experience is needed to match the target values over a given compaction curve. Lower wave velocities are observed at higher moisture content. Hence the velocity shows the strongest correlation with variations in moisture content.

Ferreira and Camarini (2001): Ferreira and camarini investigated the feasibility of assessing the strength of stabilized soil through pulse velocity.

Nazli Yesiller (2000): The conclusions were made as ultrasonic testing can be use effectively for determining the compaction characteristics of soil in the laboratory as well as in the field. Through transmission these tests can be conducted in laboratory, where as surface transmission could be used over the field for determining velocity of compacted clayey soil. Hence this method can be use as an alternative for existing field method. However, field verification is required for completing the development of the method.

Hardin and Richart (1963): In their work on Ottawa sand reported certain concepts of wave propagation in dry, partially saturated and saturated sand.

Sheeran (1967): Among the investigators Sheeran made an extensive study on soils of three types in which velocities of p-waves were determined, compacted by kneading and impact methods. It was observed that maximum dry densities and peak velocities occurred within $\pm 0.5\%$ water content for laboratory compacted soils.

Sologyan (1990): Reported a similar study taking into account the micro-structural properties of soils. The given information was relevant to agricultural operations. It was suggested that ultrasonic testing was used effectively to determine density, water content, and micro-structural properties of soils.

Wang et al (1991): The study by Wang et al brought out the effect of static compaction pressure on the variation of ultrasonic pulse velocity with water content.

McIntire (1991): Stated that in a three-phase system such as compacted soil, transmission of waves occurs through all of the phases. Generally the velocities in solids are higher than velocities in liquids, which are higher than velocities in gases.

II. RESULTS AND DISCUSSION

The calibration curve will be plotted using the observations. By using the compaction curve the relationship between dry density and water content of soil is demonstrated. Comparing the observations and calculations of conventional testing methods with the ultrasonic pulse velocity by using graph. The curve will show that which of them is more efficient. Compaction properties of field soils are compared with the compaction properties of soils determined in the laboratory to verify the effectiveness of construction procedures.

Plotting of the following comparison graph:

Water content vs. Velocity

Dry density vs. Velocity

Bulk density vs. Velocity

Compressive strength vs. velocity

III. CONCLUSION

The basic objective of using ultrasonic pulse velocity test on compacted clayey soil is to discover improvements in existing practice and procedures that will enable planning and conducting soil tests with less time consuming, more effectively and quicker results can be obtain. Further as non-destructive test (UPV) is adopted, it provides excellent balance between quality control, safety and cost-effectiveness. Hence the study allows alternatives for existing field methods.

IV. REFERENCES

- [1]. IS 2720 (part 5) 1985, plastic limit test and liquid limit test.
- [2]. IS 2720 (part 2) 1973, plastic limit test.
- [3]. IS 2720 (part 10) 1999, unconfined compressive strength.
- [4]. IS 13311 (part 1) 1992 non-destructive testing (Ultrasonic pulse velocity).
- [5]. Leslie, J.R. (1950) "Pulse Techniques Applied to Dynamic Testing", ASTM, 50, 1314-1323.
- [6]. Hardin, B.O., Richart, F.E. (1963). "Elastic Waves Velocities in Granular Soils." J. Soils Mech. and Found Engg., ASCE, 89(1) 33-65.
- [7]. Yesiller, N., Gokhanlnci and Carol Miller .J. (2000). "Ultrasonic testing for compacted Clayey Soils".Advances in Unsaturated Geotechnics 54-68.
- [8]. Sheeran, D.E., Baker, W.H. and Krizek. R. J. (1997)."Experimental Study of Pulse Velocities in Compacted Soils". Highway record No.177, Highway Research Board,226-238.
- [9]. Sologyan A.I., (1990). "Survey of Methods and Means for Determining Soil Density in the Fields". Soviet J. Non-destructive testing Plenum Publishing Corp. 25(7), 480-486.
- [10]. "Soil mechanics and foundations" B.C Punmia.
- [11]. en.m.wikipedia.org/wiki/Ultrasonic pulse velocity test.

Design and Fabrication of Two Slope Solar Still Water Distillation

Kalyani Sengar¹, Yash Thote², Saurabh Ghate³, Ashish Lanjewar⁴, Rahul Chandrawanshi⁵, Aniket Dongre⁶

¹Assistant Professor, Department of Mechanical Engineering, G H Rasoni Academy of Engineering and Technology, Nagpur, Maharashtra, India

^{2,3,4,5,6}Department of Mechanical Engineering, G H Rasoni Academy of Engineering and Technology, Nagpur, Maharashtra, India

ABSTRACT

Performance of a single basin two slope solar still has been studied theoretically and experimentally. A single basin does two slope solar still of 450mm x 600 mm basin area is fabricated from an acrylic sheet of 3.5 mm. The condensing glass covers of 4 mm thickness with 30° tilt angle are used. In the present work, an attempt has been made to investigate the effect of the various parameters on the productivity of solar still like water depth, wind velocity, solar radiation, etc. The overall production of the still was higher during March, April, August, November and December and it is around 4 liters/day. The average production of the still was 2.1 liters/day/m². The hourly temperature has been recorded for water, basin liner, and glass surfaces. It is seen that the production rate increases with increase in wind velocity and cooling of glass covers.

Keywords : Solar Still, Theoretical Analysis, Experimental Analysis, Transmittance Variations, Year Round Performance.

I. INTRODUCTION

Drinking water is still a big problem in most arid and remote areas. About 97 % of water available earth are brackish or saline and 2 % of water available in the form glaciers. Thus, only 1% of the earth, water are potable i.e. drinkable. Single basin solar still is a valuable solution for this problem. This type of still is capable of producing clean potable water from available brackish or wastewater throughout the year. Single slope still is suitable at higher latitude place, while at lower places two slope still is preferred. However, the transmittance of the cover depends on many parameters like incidence angle, cover plate material and its thickness. Correlation has been obtained to estimate the transmittance of the given glass at any place, time, inclination, and orientation.

Commercially available window glass was used as cover plate and its thickness was chosen as 4 mm to withstand the self-weight and thermal stresses. The inclination has been 30° for maximum productivity. The global and diffused solar irradiances on horizontal plane and on the cover plate surfaces were estimated using radiation model. In this work, using the experimental and theoretical data the year round performance of the still for the year 2019 has been estimated for local place, Nagpur (21.14580 N, 79.080 E)

II. Estimation of solar Irradiance

As recommended by ASHRAE [20], hourly global irradiance (I), hourly direct irradiance (I_b) and hourly diffuse irradiance (I_d) on the horizontal surface on a clear day are calculated, using the following equations.

$$I = I_b + I_d \quad (1)$$

$$I_b = B \sin \alpha \exp [-C/ \sin \alpha] \quad (2)$$

$$I_d = D I_{bn} \quad (3)$$

where B, C and D are ASHRAE constants.

The angle between the sun rays and the horizontal plane (i.e. sun elevation angle α) and the angle between the sun rays and the vertical plane (i.e., the AOI θ) can be calculated using the relation [21]

$$\sin \alpha = \cos \phi \cos \delta \cos \omega + \sin \phi \sin \delta = \cos \theta \quad (4)$$

where $\phi = 21^{\circ}14'$ is the latitude of the G H Raisoni Academy of Engg. & Technology, Nagpur, India; the sun declination (δ) is the angle between the sun's rays and the plane of the Earth's equator which varies with season for one year; the hour angle (ω) of the place is the angle through which the earth would turn to bring the meridian of the place directly under the sun. The sun elevation angle (α) and AOI (θ) are complementary angles.

III. THEORETICAL ANALYSIS

The theoretical analysis of the still is done using the new model proposed by Kalidasa Murugavel et al. [8]. The total energy available for utilization by the still for given instant is the total

irradiance transmitted (Q_t) through the covers for given time and it is given by,

$$Q_t = Q_{tN} + Q_{tS} \quad (10)$$

where Q_{tN} ($= \tau_N A_{gN} I_N$) and Q_{tS} ($= \tau_S A_{gS} I_S$) are the irradiances transmitted through the north and south covers, τ_N and τ_S are transmittances of the glass covers, A_{gN} and A_{gS} are cover areas and I_N and I_S are incidence irradiances on the covers.

Since, the basin and water temperatures, production rate of the still and instantaneous efficiency vary with time, a numerical approach was used for their calculations. For still – theoretical, the irradiance was calculated using the radiation model for every 10 seconds. The heat transfer coefficients were calculated using the initial values of water and glass temperatures,

solar still parameters and other climatic conditions at 6 AM.

IV. EXPERIMENTAL SETUP AND PROCEDURE

A single basin double slope solar still (here simply referred to as "still-solar") was fabricated with mild steel plate as shown in fig. 1. The overall size of the basin is 450mm x 600 mm x 0.25 m. The bottom of the still was leveled with 5 cm thick concrete to minimize heat loss through the basin and to spread the water uniformly. The concrete surface was black painted to improve the irradiance absorption capacity. The top is covered with two glasses of thickness 4 mm inclined at 30° on both sides supported by wooden frame. The outer surfaces are covered with insulating glass wool and thermocole layers. The condensed water is collected in the V-shaped drainage provided below the glass lower edge on both sides of the still. The condensate collected is continuously drained through flexible hose and stored in a measuring jar. A hole in the basin side wall allows to insert the thermocouples for the measurement of the basin water, still and condensate temperature. Four thermocouples were placed in the basin at different locations. Two thermocouples are placed in the each side of the drain to measure the condensate temperature. The hole is closed with insulating material to avoid the heat and vapour loss. Another hole is provided for water inlet. Through this hole, water tube from piezometer is inserted to supply raw water continuously to the basin from storage tank through control valves which regulates the flow, to keep the mass of water in the basin always constant.

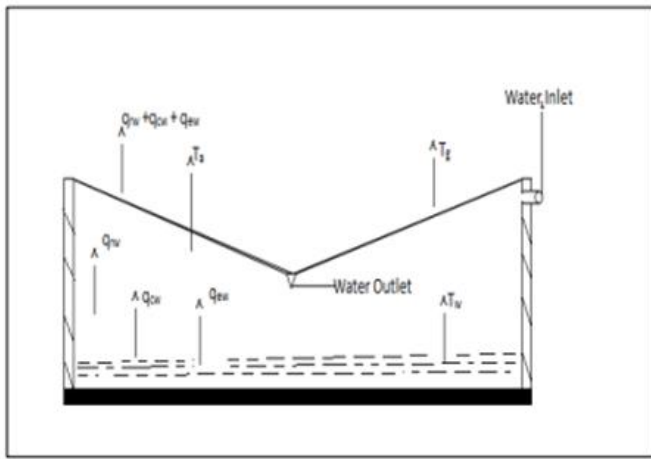


Figure 1. Single basin two slopes experimental still

The raw water was supplied using measuring tube. The total and diffused irradiance horizontal, inclined plane facing south and north were measured using a calibrated photovoltaic type sun meter. In this meter, the pv panel can be set at any inclination and orientation to measure the irradiance. This sun meter is calibrated frequently using the standard pyranometer available in our energy laboratory. The diffused irradiance on inclined surfaces was measured by blocking the direct irradiance on the photovoltaic surface. The wind velocity was measured with electronic digital anemometer.

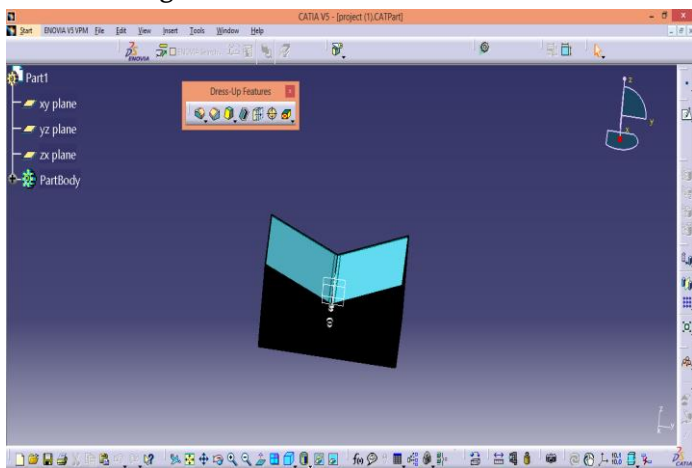


Figure 2. Cad Model Single basin two slopes experimental still

The maximum possible error occurred in any instrument is equal to the ratio between its least count and minimum value of the output measured.

The experiments were conducted at the open terrace of the Department of Mechanical Engineering during March 2019. Experiments were carried out for different depths from 0.5 cm to 6 cm. The observations were taken for 24 hours starting from 6 AM, corresponding to the predicted data of the section above. The global and diffused irradiances on horizontal and irradiances on inclined planes, the temperatures of the atmosphere, condensate and basin water, and the masses of raw water supplied and condensate collected were recorded every 30 minutes.

V. RESULTS AND DISCUSSIONS

Figures 2 show the estimated year round variation of global solar irradiance. The north facing cover receives more global irradiance during March to May, while south facing cover receives more irradiance during October to March. In September, both covers receive the same amount of irradiance. During November, December, January and February, the south facing cover receives the irradiance close to normal during noon period with steep variation in incidence.

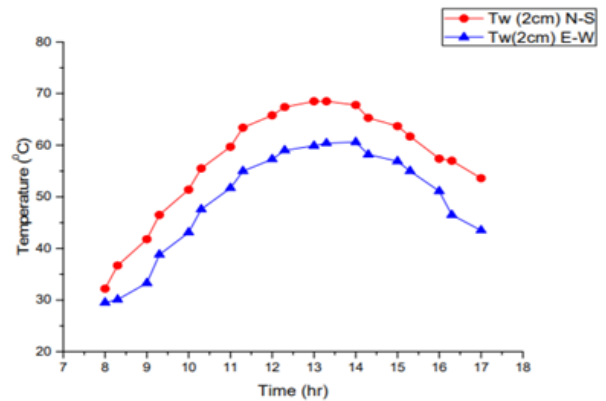


Figure 2(a) : Hourly temperature variation of basin water for East-West and North-South orientation

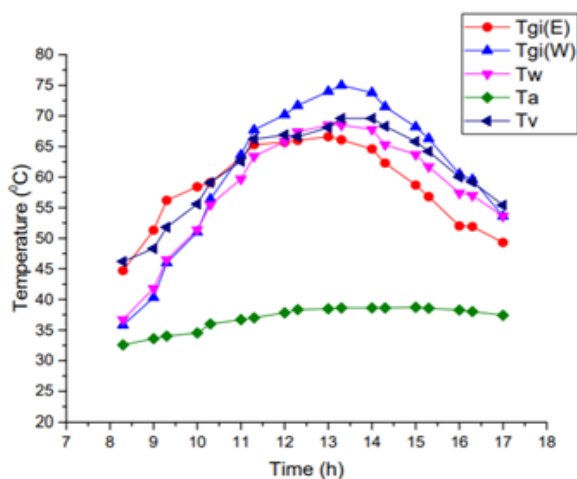


Figure 2 (b) : Hourly temperatures variation of solar still for 2 cm water depth

The comparison of theoretical and actual water temperatures is shown in fig. 3. At higher depth, the deviations between the theoretical and actual values are less. At lower depth, the deviation is higher. In the higher water temperature range, the deviations between the theoretical and actual values are higher. At higher water temperature, the water vapour proportion is high in the still air. This effect is not considered in the theoretical analysis. This is the reason for higher deviation between the theoretical and actual values. However, the variation pattern is similar for theoretical and experimental values.

The comparison between the theoretical and actual production rate for the depths of 6 cm and 0.5 cm. The theoretical [8] model over predicts the production. At lower depth, the water temperature is high. At higher water temperature, the proportion of water vapour in the still air is high and this effect is not included in the theoretical model. This is the reason for higher deviation between theoretical and actual production rates at lower depth of 0.5 cm. During this region, the production rate is inversely proportional to the water – glass temperature difference. Hence another thermal model is required to predict the production rate accurately using the estimated temperatures.

VI. CONCLUSION

In the design of single basin two slope solar still is fabricated and tested. The production rate variations for different months have been studied as a function of local time. A V-type basin solar still has been fabricated and tested. The efficiency of the still has been calculated as 28% and the distillate output collected as 4L/m²/day. The still is expected to work 10 years with nominal maintenance and the production cost per liter is calculated as Rs 0.32/-. The cost effective design is expected to provide the rural communities an efficient way to convert the brackish water into potable water. Producing fresh water by a solar still with its simplicity would be one of the best solutions to supply fresh water to villages and rural regions. In November and March the variations are steeper. Similarly the time for maximum production rate is also different for different months. This is due to variations in irradiance incidence on the covers, atmospheric temperature and wind velocity. The overall production is higher in March, April, August, November and December.

VII. REFERENCES

- [1]. Kalidasa Murugavel, K., Chockalingam, KN.K.S.K., Srithar, K., Progresses in improving the effectiveness of the single basin passive solar still, *Desalination* 220 (2008), pp. 677–686.
- [2]. Malik, M.A.S., Tiwar, G.N., Kumar, A., Sodha, M.S., *Solar Distillation*, Pergamon press, UK, 1982.
- [3]. Singh, H.N., Tiwari, G.N., Monthly performance of passive and active solar stills for different Indian climatic conditions, *Desalination* 168 (2004), pp. 145-150.
- [4]. Velmurugan, V., Senthil kumaran, S., Niranjana prabhu, V., Srithar, K., Productivity enhancement of stepped solar Still – Performance analysis, *Thermal Science* 12 (2008), 3, pp. 153-163.

- [5]. Feilizadeh, M., Soltanieh, M., Jafarpur, K., Karimi Estahbanati, M.R., A new radiation model for a single-slope solar still, *Desalination* 262 (2010), pp. 166–173.
- [6]. Madhlopa, A., Johnstone, C.M., Computation of solar radiation distribution in a solar still with internal and external reflectors, *Solar Energy* 85 (2011), pp. 217–233.
- [7]. Arjunan, T.V., Aybar, H.S., Nedunchezian, N., Effect of sponge liner on the internal heat transfer coefficients in a simple solar still, *Desalination and Water Treatment* 29 (2011), pp. 271-284.
- [8]. Kalidasa Murugavel, K., Sivakumar, S., Riaz Ahamed, J., Chockalingam, Kn.K.S.K., Srithar, K., Single basin double slope solar still with minimum basin depth and energy storing materials, *Applied Energy* 87 (2010), pp. 514–523.
- [9]. Eduardo Rubio, Fernández, J.L., Porta-Gándara, M.A., Modeling thermal asymmetries in double slope solar stills, *Renewable Energy* 29 (2004), pp. 895-906.
- [10]. Kalidasa Murugavel, K., Srithar, K., Performance study on basin type double slope solar still with different wick materials and minimum mass of water, *Renewable Energy* 36 (2011), pp. 612-620.
- [11]. Hiroshi Tanaka, A theoretical analysis of basin type solar still with flat plate external bottom reflector, *Desalination* (2011) article in press.
- [12]. Kalidasa Murugavel, K., Chockalingam, KN.K.S.K., Srithar, K., Experimental analysis on variation of transmittance of different thickness window glasses at different solar insolation conditions, 3rd BSME-ASME International Conference on Thermal Engineering, Dhaka, Bangladesh, 2006.
- [13]. Kabeel, A.E., El-Agouz, S.A., Review of researches and developments on solar stills, *Desalination* 276 (2011), pp. 1–12.
- [14]. Singh A.K., Tiwari, G.N., Long-term comparative study of solar-distiller systems, *Energy* 18 (1993), pp. 1161-1169.
- [15]. El-Sebaili, A.A., Aboul-Enein, S., Ramadan, M.R.I., El-Bialy, E., Year-round performance of a modified single-basin solar still with mica plate as a suspended absorber, *Energy* 25 (2000), pp. 35–49.
- [16]. Al-Hinai, H., Al-Nassri, M.S., Jubran, B.A., Parametric investigation of a double-effect solar still in comparison with a single-effect solar still, *Desalination* 150 (2002), pp. 75-83.
- [17]. Mousa Abu-Arabi, Yousef Zurigat, Year-round comparative study of three types of solar desalination units, *Desalination* 172 (2005), pp. 137-143.
- [18]. Abdul Jabbar N. Khalifa, Hussein A. Ibrahim, Experimental study on the effect of internal and external reflectors on the performance of basin type solar stills at various seasons, *Desalination and Water Treatment* 27 (2011), pp. 313-318.
- [19]. Anil Kr.Tiwari, Tiwari, G.N., Effect of the condensing cover's slope on internal heat and mass transfer in distillation: an indoor simulation, *Desalination* 180 (2005), pp. 73-88.
- [20]. American Society of Heating, Refrigeration and Air-conditioning Engineers, ASHRAE Handbook of Fundamentals, Atlanta, 1985.
- [21]. John A. Duffie, William A. Beckman, *Solar engineering of thermal processes*, 3rd Edition, John Wiley and Sons, New York. 2006.
- [22]. Parishwad, G.V., Bhardwaj, R.K., Nema, V.K., Estimation of hourly solar radiation for India, *Renewable Energy* 12 (1997), pp. 303-313.
- [23]. Liu, B.Y.H., Jordan, R.C., The interrelationship and characteristic distribution of direct, diffuse and total solar radiation, *Solar Energy* 4 (1960), pp. 1-19.
- [24]. Klein, S.A., Calculation of monthly average isolation on tilted surfaces, *Solar Energy* 23 (1977), pp. 526-541.
- [25]. Anna Mani, *Hand Book of Solar Radiation Data for India*, Allied publishers Private Limited, India, 1980.

Creative Construction Using Waste and Residual Materials in Cement Bricks

Ms. Snehal K. Kamble¹, Pallavi S. Chakole¹, Jyoti B. Chouhan²

¹Department of Civil Engineering, Yeshwantrao Chavan College of Engineering, Nagpur, Maharashtra, India

²Department of Civil Engineering, Shri Ramdeobaba College of Engineering, Nagpur, Maharashtra, India

ABSTRACT

In this paper the attempts are made to find out the possibility of using pond ash and stone crusher dust and compare with burnt clay bricks. A large part of the cement is replaced by pond ash and stone crusher dust used as an additive in different compositions and the bricks are made as per the conventional standard codes of practice at a brick manufacturing plant. The properties then analysed are compared with those of conventional brick.

Keywords: Pond Ash, Stone Crusher Dust, Bricks, Cement, Clay, Mix Design, Standard Proctor Test, Water Absorption, Casting, Curing, Compressive Strength Test, Economy, Environment, Sustainability.

I. INTRODUCTION

In thermal power plants, coal is burnt to heat the water in order to generate steam, which is in turn used to run the turbines. Pond ash is the waste material produced from the boilers and is also known more commonly as wet fly ash because it is obtained from the wet disposal of fly ash. The generation of this pond ash poses as an environmental threat and utilizing it constructively is an innovative step in engineering research and management. Pond ash utilization in building materials have many advantages like cost effectiveness, environmental friendly, increases in strength and also conservation of natural resources and materials [1].

All standard components used in the formation of these bricks are: (1) Pond Ash, (2) Stone Crusher Dust, and (3) Cement. The study aims at complete generation of an unconventional brick from the physical and chemical testing of raw materials to the casting of bricks and compressive strength test. The objective of the project is to reuse waste and residual materials to reduce cost of construction and

environmental pollution without compromising with the required characteristics of the subject.

II. METHODS AND MATERIAL

Pond Ash

The pond ash was obtained from thermal power plant and the physical and chemical composition was studied in laboratory. The material was found to be safe for use as construction material and standard tests were performed as per Indian Standard codes of practice.

Table 1. Physical Properties of Pond Ash

S.N.	Proprties	Pond Ash
1.	Lime Reactivity of Pond Ash	0.66
2.	Specific Gravity	2.16
3.	Bulk Density in Loose State	824 kg/m ³
4.	Bulk Density in Compacted State	990 kg/m ³
5.	Atterberg's Limits Liquid Limit Percentage	47.3

6.	Grain size distribution	
	Sand%	72
	Silt%	28
	Clay%	NIL
7.	IS Classification	SP-SM

Stone Crusher Dust

The crusher dust is created at quarrying or construction sites and is generally regarded as a pollutant. But with proper processing and utilization, it can effectively alter the properties of the pond ash brick. The crusher dust features gray or brown and the size is perfectly fine. In most situations, these products are used as the cement aggregate to form a specific texture. The dust could be used to make other products. In summary, in the construction industry, the crusher dust plays an important role. The dust comes from the stones and it retains the stones' benefits. For example, the dust is produced with high resistance to heat and the natural stones mean no harm to the environment. Thereby, compared with the chemicals, the dust would not pollute the environment over time.

Cement

The cement used was tested for all physical and chemical characteristics as per Indian Standard Code of Practice and used in minimum amount in the brick mix design.

Water

The water used for mixing and curing should be clean and free from injurious quantities of alkalis, acid, oils, salts, sugar, organic materials, vegetable growth and other substances that may be deleterious to the brick. The pH value should not be less than 6.

STANDARD TESTS

The detailed tests performed in the project are as follows:

Standard Proctor Test (Light) on Pond Ash

This test was performed in accordance with IS 2720-Part 7 (1980). 3 Kg of pond ash was taken and the

water is added to it with the help of graduated cylinder at 2% increments by weight of pond ash. The mould with base plate attached is weighed to the nearest 1 gm. The extension collar is to be attached with the mould. Then the moist mix in the mould is compacted in three equal layers, each layer being given 25 blows from the 2.6 Kg rammer dropped from a height of 310 mm. The extension is removed and the compacted soil is levelled off carefully to the top of the mould by means of a straight edge. Then the mould and mix is weighed to the nearest 1 gm. The mix is removed from the mould and a representative soil sample is obtained water content determination. The test helps determine the optimum moisture content of mix, maximum dry density and water absorption of the pond ash.

Mix Design

The required raw materials like fly ash, pond ash, lime, gypsum and sand have to be mixed as per the ratio in pan mixer. These mixed materials are conveyed to the brick mould through the conveyor. After processing, as per required size of bricks were casted and taken in pallet truck for curing purpose. At early stages, bricks were cured by normal water curing and then by sprinkling of water.

Compressive Strength Test on Brick

This test was performed in accordance with IS 3495-Part 1 (1992). Unevenness observed in the bed faces of bricks is removed to provide two smooth and parallel faces by grinding. It is immersed in water at room temperature for 24 hours. The specimen is then removed and any surplus moisture is drained out at room temperature. The frog and all voids in the bed face are filled with cement mortar. It is stored under the damp jute bags for 24 hours followed by immersion in clean water for 3 days. The specimen is placed with flat faces horizontal, and mortar filled face facing upwards between two 3 ply plywood sheets each of 3 mm thickness and carefully centered between plates of testing machine. Load is applied axially at a uniform rate of 14 N/mm² per minute till

failure occurs. The maximum load at failure is noted down. The load at failure is considered the maximum load at which the specimen fails to produce any further increase in the indicator reading on the testing machine. The test helps determine compressive strength of cement bricks.

PROCEDURE

The experimentation is done to study the effect of pond ash in clay-pond ash burnt bricks. The clay is replaced with pond ash. The pond ash is mixed with the local clay, which is being used for making the bricks [2]. The mixtures of clay and the pond ash with different percentage by weight are prepared. These mixtures are mixed thoroughly by adding the appropriate amount of water, are used to make the clay-pond ash bricks. The prepared bricks are then air dried in an open atmosphere for 4 - 5 days. Thereafter, these bricks are fired in a central portion in a traditional way as practiced. All the bricks are taken out from the Kiln as per usual procedure, cooled and thereafter transported to the material testing laboratory. The flow chart of the process is given in the Figure-1.

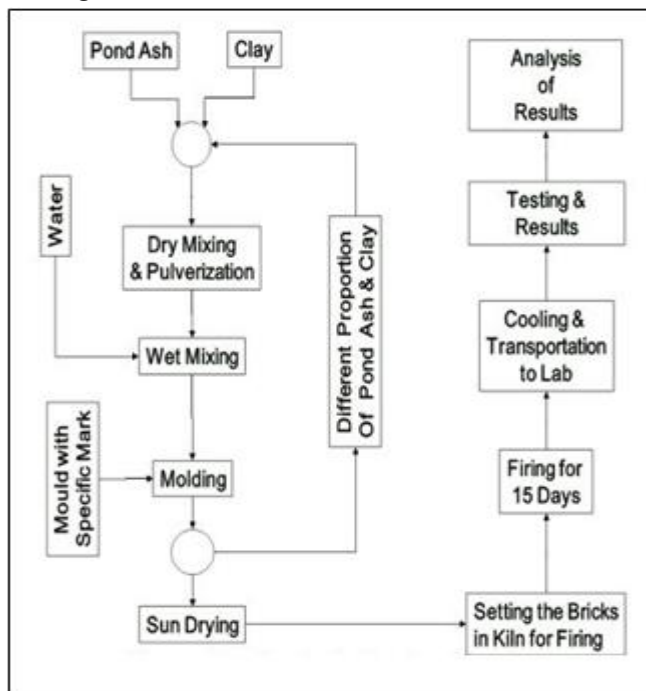


Figure 1. Flow Chart showing Experimental Procedure.

III. RESULTS AND DISCUSSION

The results from the tests conducted on pond ash bricks are finally compared with the results obtained for conventional burnt clay bricks. The cost of the production of both bricks is also compared. The project work was found to be-

- Safe in design
- Adequate in strength
- Durable
- Economic
- Environmentally friendly

Additionally, the project creatively uses materials such as pond ash and stone crusher dust which might otherwise have to be discarded, thus reducing cost of generation of newer raw materials for basic construction units.

IV. CONCLUSION

Although a conclusion may review the main points of the paper, do not replicate the abstract as the conclusion. A conclusion might elaborate on the importance of the work or suggest applications and extensions. Authors are strongly encouraged not to call out multiple figures or tables in the conclusion these should be referenced in the body of the paper.

V. REFERENCES

- [1]. K.Vidhya, Dr.S.Kandasamy, U.Sanjana Malaimagal, S.R.Karthikeyan, G. Sathick Basha, H. Tariq Junaid, "Experimental Studies on Pond Ash Brick," International Journal of Engineering Research and Development, Volume 6, Issue 5 (March 2013), PP. 06-11.
- [2]. Prashant G. Sonawane, Dr. Arun Kumar Dwivedi, "Technical Properties of Pond Ash - Clay Fired Bricks – An Experimental Study", American Journal of Engineering Research (AJER), Volume-02, Issue-09, pp-110-117.

- [3]. Prasenjit Ghosh and Sudha Goel, "Physical and Chemical Characterization of Pond Ash", International Journal of Environmental Research and Development, Volume 4, Number 2 (2014), pp. 129-134.
- [4]. Arumugam K, Ilangovan R, James Manohar D, "A study on characterization and use of Pond Ash as fine aggregate in Concrete", International Journal Of Civil And Structural Engineering Volume 2, No 2, 2011.
- [5]. Radhikesh P. Nanda, Amiya K. Das, Moharana.N.C, "Stone crusher dust as a fine aggregate in Concrete for paving blocks", International Journal Of Civil And Structural Engineering Volume 1, No 3, 2010.
- [6]. Dr. A.D. Pofale, Syed Raziuddin Quadri, "Effective Utilization of Crusher Dust in Concrete Using Portland Pozzolana Cement", International Journal of Scientific and Research Publications, Volume 3, Issue 8, August 2013.
- [7]. IS 2720-7 - 1980 - Methods of test for soils, Part 7: Determination of water content-dry density relation using light compaction.
- [8]. IS 3495-1 (1992): Methods of tests of burnt clay building bricks: Part 1 Determination of compressive strength.

Comparison between Destructive and Non Destructive Test on Concrete Incorporated with Fly Ash

Kunal Kharbade , Yash Jadhao , Shrikant Chaure , Ankush Ghormode , Pritam Mohinkar , Prashil Bankar

YCCE, Nagpur, Maharashtra, India

ABSTRACT

Concrete has been the prime ingredient of any RC structure for ages. There have been many advancements in types of structures but concrete cannot be neglected but ingredients such as fly ash can be used in some amounts as a replacement for cement without making any adverse effect on the structure. Simultaneously it is also necessary to check the quality of materials used. The quality of concrete can be checked by destructive as well as non-destructive methods. This paper discussed each of these methods in detail and compares them with each other giving out advantages of one over the other.

I. INTRODUCTION

Concrete is a composite material composed of water, coarse granular material (the fine and coarse aggregate or filler) embedded in a hard matrix of material (the cement or binder) that fills the space among the aggregate particles and glues them together. Concrete is widely used for making architectural structures, foundations, brick or block walls, pavements, bridges or overpasses, highways, runways, parking structures, dams, pools/reservoirs, pipes, footings for gates, fences and poles and even boats. Concrete is used in large quantities almost everywhere mankind has a need for infrastructure. The amount of concrete used worldwide, ton for ton, is twice that of steel, wood, plastics, and aluminum combined. Concrete's use in the modern world is exceeded only by that of naturally occurring water. Concrete is also the basis of a large commercial industry. Fly ash utilization in concrete production is already a common practice in many of the metro cities. Reduce cost of concrete production and reduce waste from power plant have become the main reasons for its utilization. Fly ash is a byproduct from burning pulverized coal in electric power generating plants. Cement contains lime. Some of this lime becomes free and available during the

hydration process. When fly ash is present with free lime, it reacts chemically to form additional cementitious materials, improving many of the properties of the concrete.

II. LITERATURE REVIEW

Kumavat et al., (2017) carried out an experimental study on combined methods of NDT in concrete and evaluation of core specimen from existing buildings. Ultra-pulse velocity, rebound hammer and core tests were performed on the specimens according to IS standards and combining the two methods. Regression analysis was carried out and correlation coefficients were given. Charts were plotted between rebound numbers, UPV against compressive strength of the core specimen. The comparison showed that use of combined methods gives higher accuracy on estimation of concrete compressive strength. The results obtained gave correlation coefficient of 0.003 and 0.355 for rebound value and UPV value. A higher correlation coefficient of 0.441 was obtained when two methods were combined.

Lopez et al., (2016) experimentally studied about the concrete compressive strength estimation by NDT.

The main aim was to produce a correlation between results of surface hardness, UPV and compressive strength of structural concrete in bleachers of soccer stadium in Parana, Brazil. Concrete structure used in the study was 26 years old and had some severe deformities i.e. segregation, corrosion and cracks. Mapping reinforcement was performed and UPV test was done. 26 specimens of concrete were collected from the bleachers and rebar mapping was done for the defect of corrosion in the pillars. Correlation curves between NDT results were plotted. The results showed that stronger the concrete, higher shall be its surface index as well as its wave propagation velocity. Results also showed a good correlation between both surface hardness test and UPV test.

Bhosale and Salunkhe (2016) experimentally found the relation between destructive and nondestructive tests on concrete. Different concrete mixes of M20, M25, and M30 were used and a slab of 2000*1000*200 mm was casted for each grade and cores were extracted from the slab. Cylinders of size 100*200 mm, Cubes of size 150*150*150mm and cubes of 150*150*150mm with inserted bar of size 16mm were casted. Casted cubes after 28 days were tested to obtain compressive strength using CTM. Rebound hammer test was performed and average of 12 readings were taken. Regression analysis was done and various correlations were achieved which are given as following:

Relation between compressive strength of cylinders

(f cyl) and cores (F cor)

$$F \text{ cor} = -0.034 f \text{ cyl}^2 + 2.586 f \text{ cyl} - 19.25$$

Relation between rebound strength of cylinders(R cyl) and cores(R cor)

$$R \text{ cor} = -0.020 R \text{ cyl}^2 + 2.15 R \text{ cyl} - 16.75$$

Relation between rebound ultra-pulse velocity of cylinders (U cyl) and cores (U cor)

$$U \text{ cor} = 1.373 U \text{ cyl}^2 + 12.18 U \text{ cyl} - 22.95$$

Relation between rebound strength(R cor) and UPV strength of cores (f cor)

$$R \text{ cor} = -0.050 f \text{ cor}^2 + 3.987 f \text{ cor} - 31.16$$

Relation between UPV (U cor) and compressive strength (f cor) of cores

$$U \text{ cor} = -0.003 f \text{ cor}^2 + 0.18 f \text{ cor} + 1.410$$

Relation between rebound strength and UPV of cores

$$U \text{ cor} = -0.002 R \text{ cor}^2 + 0.166 R \text{ cor} + 1.671$$

Relation between rebound strength and compressive strength of cylinders

$$R \text{ cyl} = -0.037 f \text{ cyl}^2 + 2.712 f \text{ cyl} - 19.85$$

Relation between UPV and compressive strength of cylinders

$$U \text{ cyl} = 0.0222 f \text{ cyl} + 3.64$$

Relation between rebound strength and UPV

$$U \text{ cyl} = 0.001 R \text{ cyl}^2 - 0.052 R \text{ cyl} + 4.355$$

Mulik et al., (2015) performed a series of nondestructive tests to investigate the mechanical properties of concrete employed in laboratory specimens and buildings. SONReb (combined testing method) was adopted for the experimental study. 60 concrete specimens of size (150mm*150mm*150mm) were prepared to obtain a strength of 15 MPa, 20 MPa, 25 MPa, 30 MPa, 35 MPa, and 40 MPa and the specimens were cured for 28 days after which rebound hammer test, ultra-pulse velocity test, and compression test was performed on them. The results showed that SONReb method of combined testing provided a reliable assessment for determining concrete compressive strength and a correlation coefficient of 0.789 and 0.672 was achieved for rebound number values and ultra-pulse velocity. A higher correlation coefficient of 0.867 was achieved using SONReb and combined methods were predicted to be more reliable in determining the compressive strength.

Konapure and Richardrobin (2015) experimentally studied M20 and M25 grade of concrete and mix proportion of 1:2.9:3.02 and 1.98:3.88 and obtained a relationship between rebound hammer testing and destructive testing. 174 cubes were casted and 6

rebound no readings were obtained on each cube, at different locations of the specimen. The cubes were given a load of 7N/mm² in CTM. The results showed that the percentage difference of compressive strength for NDT and DT was low for laboratory specimens and rebound hammer test gave more realistic results in early age of concrete. Three curves were plotted between rebound number and destructive strength testing and out of the three curves, the average curve gave the most reliable results to destructive values.

Patil et al., (2015) experimentally investigated on the comparative study of effect of curing on strength of concrete using DT and NDT methods. 27 cubes of M25 grade were casted and allowed to be cured for 7, 14 and 28 days and rebound hammer test and compressive strength test was performed on 9 cubes of 7, 14 and 28 days respectively. The results showed that rebound number increased as the compressive strength increased and vice-versa. For 28 days of curing decrease in percentage strength was less as compared to 7 days percentage decrease in strength and average error in measuring compressive strength for 7, 14 and 28 days by rebound hammer and CTM was found out to be 20.01%, 1.37% and 0.99% respectively. Results also showed that compressive strength or rebound number could be produced if only one of the values was known.

Damodar and Gupta (2014) experimentally investigated to develop an ideal curve equation that could predict the value of concrete's compressive strength .OPC, PPC and PSC cements were used in

the experimental work.18 cubes of 1st batch of M20, M25, and M30 grade were cast and subjected to normal curing. 3 cubes from every mix were tested for compressive strength at 1 and 3 days respectively and result of average of 3 cubes was taken. Similar cubes for PSC and PPC were cast and tested. 2nd batch of M20, M25 and M30 grade were cast. 18 cubes were subjected to normal curing while as 18 cubes were subjected to accelerated curing. Results obtained from the experiment showed that OPC gained strength of 80% in the 1st day of accelerated curing while as PSC and PPC only gained 50% strength in the 1st day and these results could be used in future for prediction of early strength of concrete. Results also showed that an ideal curve equation could be obtained and used in computing the compressive strength of concrete. The gain in compressive strength is given in the following equation

$$Y = (ab)^x$$

Where y represents compressive strength, a represents factor comprising parameters of various design mixes, b represents coefficient of no of days the system has been subjected to curing and x represents no of days the cubes which are subjected to curing.

Table 1: Compressive strength comparison of Mix M20 (Damodar and Gupta, 2014)

Mix Grade	1 day	3 days	7 days	28 days
Mn20-OPC	4.00	9.39	19.55	23.48
Ma20-OPC	19.25	18.17	19.55	23.48
Ma20-PPC	12.74	10.22	16.74	22.88

Ma20-PSC	11.7	11.48	19.92	24.44
Where n-normal curing, a-accelerated curing				

Table 2. Compressive Strength Comparison of Mix M25 (Damodar and Gupta, 2014)

Mix Grade	1 day	3 days	7 days	28 days
Mn20-OPC	5.17	11.78	24.07	28.74
Mn20-OPC	22.96	22.37	24.07	28.74
Ma20-PPC	13.48	11.18	17.33	23.70
Ma20-PSC	12.66	12.10	19.25	25.33

Where n-normal curing, a-accelerated curing

Table 3. Compressive Strength Comparison of Mix M30 (Damodar and Gupta, 2014)

Mix Grade	1 day	3 days	7 days	28 days
Mn20-OPC	5.53	12.93	24.74	30.74
Mn20-OPC	24.88	23.77	24.74	30.74
Ma20-PPC	17.18	14.44	22.96	31.70
Ma20-PSC	14.29	13.03	22.41	28.29

Where n-normal curing, a-accelerated curing

Samson et al., (2014) investigated about the correlation between nondestructive and destructive testing of compressive strength of concrete. Concrete cubes of size (100x100x100mm) were cast using M20, M30, and M35 grade concrete and were cured for 7, 14 and 28 days. Preliminary tests were performed on materials. Total of 90 cubes were produced and rebound hammer test was performed. 10 readings for rebound hammer compressive strength on each specimen were taken. Various tables for rebound

number and compressive strength were drawn and correlations were listed out. Regression analysis was carried out and results showed high rebound number in high compressive strength. Correlation coefficients of regression models ranged between 92.1%- 97.9% which showed an excellent relation between rebound

number and compressive strength. Results also showed that if only rebound number was known, the compressive strength of concrete could be easily predicted.

Table 4. Relationship between compressive strength and Rebound number after 7 days curing (Samson et al., 2014)

Grade	Slope(m)	Intercept(c)	Standard Deviation(s)	R ² (%)	Significance
M20	1.19	-3.73	0.328	91.6	yes
M30	1.08	-2.85	0.354	92.1	yes
M35	0.778	2.83	0.384	92.6	yes

Table 5. Relationship between compressive strength and Rebound number after 14days curing (Samson et al., 2014)

Grade	Slope(m)	Intercept(c)	Standard Deviation(s)	R ² (%)	Significance
M20	0.834	1.55	0.268	94.5	yes
M30	0.644	5.49	0.251	97.9	yes
M35	0.503	8.73	0.433	97.1	yes

Table 6. Relationship between compressive strength and Rebound number after 28days curing (Samson et al., 2014)

Grade	Slope(m)	Intercept(c)	Standard deviation	R ² (%)	Significance
M20	0.649	4.91	0.456	97.1	yes
M30	0.728	-0.380	0.497	96.6	yes
M35	0.609	7.18	0.761	92.1	yes

Reddy (2014) carried out an experimental investigation to find out concrete's strength by various NDT methods and compressive testing. Various cubes of concrete with replacement of fly ash (10%, 20% and 30%) of M15, M20, M25, M30, and M40 mixes were designed and tested for compressive strength at 7,

24, 28, 56, and 90 days. A comparative study was made for all the mixes using (UPV, rebound number and compressive strength) and curves were plotted. Results showed that pulse velocity and rebound number increased with age of concrete. Recycled aggregate concrete also showed 30% less strength than

plain concrete and fly ash concrete showed 75% less strength than plain concrete as well.

Akash Jain et al., (2013) developed a method of combined use of both UPV and RH tests for assessing the strength of concrete with great accuracy. The concrete mix design for M20, M30, M40, and M50 was done using IS 456:2000 and IS 10262:1982 and a total of 288 cubes were casted. The samples were tested for ultra-pulse velocity and rebound number followed by Indian standards (IS 13311 part (2) 1992). Relationship graphs were plotted between age of OPC/PPC and rebound number and between age of OPC/PPC and UPV. A relationship curve was also plotted between ultra-pulse velocity, rebound number and compressive strength. The results derived from the experiments showed that UPV readings increased with age but the change was very small and it alone could not be used for finding out the compressive strength. The readings of rebound number also showed an increase with age and the approximate value could be directly determined by using rebound number only. Results also showed that if correlation was developed between

rebound number and pulse velocity, more accurate results could be predicted and achieved.

Hannachi and Nacer (2012) investigated the application of the combined method of UPV and RH tests for evaluation of compressive strength. UPV and RH tests were calibrated with mechanical tests done on cylindrical specimens. The tests were used to determine quality of concrete using regression analysis modes. Equations were obtained by statistical analysis to analyze concrete's compressive strength on site. Correlation charts were plotted and regression equations were listed. The results showed that using more than one NDT provided a better correlation and lead to more reliable strength evaluation of concrete's strength. The results also showed that combined methods appeared more appropriate on conditions of on-site measurements as they were very fast, convenient and cost efficient.

Table 7. Regression equations for Cylindrical Specimens (Hannachi and Nacer, 2012)

Rebound hammer method	$f_c = -0.7708N + 54.6389$	$R^2 = 0.3983$
Ultra-pulse velocity method	$f_c = -0.0162V + 97.54095$	$R^2 = 0.5213$
Combined method	$f_c = 0.5752V - 0.0261N + 121.2976$	$R^2 = 0.5452$

Table 8. Regression equations for Cores (Hannachi and Nacer, 2012)

Rebound hammer method	$f_c = 0.3218N + 5.3290$	$R^2 = 0.0864$
Ultra-pulse velocity method	$f_c = 0.0088V - 20.2771$	$R^2 = 0.0901$
Combined method	$f_c = 0.0993V + 14.5356N - 0.0037V - 371.4$	$R^2 = 0.1251$

Shang et al., (2012) experimentally found the strength of concrete using NDT methods. All the samples were made from locally available materials and were conformed to Chinese standard (GB 175-2007). Five sets of M20, M25, M30, M40 and M50 mixes were prepared and each containing 21 concrete cube specimens of the size (150x150x150mm). Rebound hammer test was performed on the specimens and 16

readings were taken for each specimen. Regression analysis was done and curves were drawn for rebound hammer method. Results showed that rebound hammer was found reliable in predicting early strength of concrete. Thus, it was concluded that, the regression model for strength evaluation could be safely used for the prediction of concrete strength in all types of concrete engineering investigations

Table 9 Rebound Curve for Concrete measurement and error (Shang *et al.*, 2012)

Regress Model	Function Expression	Correlative coefficient	Mean Relative Error (%)	Relative standard error
Exponential function 1	$f_{Cu} = 6.004665e^{(0.47xRm - 0.017x dm)}$	0.824	12.43	15.33
Exponential function 2	$f_{Cu} = 278.28xe^{(-77.23/Rm + 0.009/dm)}$	0.850	11.88	14.7
Logarithm function	$f_{Cu} = 235.71 + 75.30 \ln(Rm) - 0.53812x \ln(dm)$	0.868	11.21	16.88
Power function	$f_{Cu} = 0.028x Rm^{1.9629} x dm^{0.0155}$	0.850	11.17	14.05
Power exponential function	$f_{Cu} = 6.00468x 1.0486^{Rm} x e^{-0.0177x dm}$	0.824	12.43	15.33
Complex exponential function	$f_{Cu} = 0.032509x Rm^{1.941} x 10^{-0.00789x dm}$	0.852	11.04	13.75

Rohit et al., (2012) experimentally investigated the flexural strength of plain and fiber reinforced high volume fly ash concrete (HVFAC) by destructive and non-destructive techniques. Experiments were conducted on M25, M30 and M35 mixes and poly carboxylate based super plasticizer was used. Compaction factor test and flexural strength tests were performed as destructive tests and UPV was performed as nondestructive test. Charts and graphs were plotted and the

results showed that pulse velocity decreased with increase in the fiber content up to 3.2%. and polyester fiber showed significant gain beyond 28 days. The gain in the %age of fly ash exhibited a reduction in the percentage gain at different age of concrete. Regression yield analysis was carried out and following equations for prediction of flexural strength at 28 days for different samples were summed up as follows:

Table10. Equations for prediction of flexural strength for UPV at 28 days (Rohit *et al.*, 2012)

Fiber/ Fly ash	50%	55%	60%
0%	fb= 0.0040-14.33	fb= 0.0040-13.34	fb=0.0020-6.183
0.15%	fb= 0.0080-14.80	fb= 0.0050-16.16	fb= 0.0010-2.130
0.25%	fb= 0.0030-9.162	fb= 0.0030-9.265	fb= 0.0020-5.425

Shariati et al., (2010) assessed the strength of RC structures through UPV and rebound hammer tests and a correlation between DT and NDT tests was established. Main members of an existing building including a column, beam and slab were tested by NDT. Regression analysis was done and calibration curves were drawn. Correlation between predicted and actual compressive strength of concrete was interpreted by plotting average rebound no/ultrasonic pulse velocity against compressive strength of each member. Results obtained from the experimental study showed that regression model achieved from the combination of two NDT methods was more precise as compared to the individual methods. Results also showed that rebound number method was more effective in forecasting the compressive strength of concrete than the UPV test method.

Aydin and Saribiyik (2010) carried out experimental investigation to develop a relationship and correlation between rebound hammer test (NDT) and compression test (DT). Cube specimens of size 15*15*15 cm and a no of core samples from different RC structures were tested. Rebound hammer test and compressive test was performed on the specimens. The curves were drawn and the best fit correction factors for concrete compressive strength were obtained through processing the correlation among the datasets. The results drawn from the investigation showed that use of rebound hammer test on existing buildings was not found suitable for evaluation of strength in old concrete. Results also showed that rebound hammer tests could be used alone as a reliable means to estimate the strength of concrete specimens if the needed calibrations were done.

Table 11. Regression outputs for 28 and 90 days' concrete specimens (Aydin and Saribiyik, 2010)

28 days concrete specimens	$y = 11.61 A - 52.033$	$R^2 = 0.856$
90 days concrete specimens	$y = 16.674 A - 238.31$	$R^2 = 0.9449$

III. CONCLUSION

From the overview of various experimental studies and investigations following conclusions were made:

- The comparative study showed that pulse velocity and rebound number increased with age of concrete and with increase of compressive strength.
- Compressive strength or rebound number could be produced if only one of the values was known to us.
- Results concluded that percentage difference between compressive strength by nondestructive and destructive testing was found out to be low for laboratory specimens.

- Rebound hammer was proved to be the most simple and quick method of obtaining the compressive strength of concrete specimens.
- The use of more than one non-destructive method would provide a better correlation, leading to predictable means of evaluation of strength in concrete.
- Combined methods (ultra-pulse velocity and rebound hammer) were predicted to be more reliable in determination of compressive strength of various concrete specimens.

IV. REFERENCES

- [1]. Jain A.,Kathuria A.,Kumar A.,Verma Y.,Krishna M.,(2013),"Combined use of Non-destructive

- Tests for Assessments of strength of Concrete in Structure", Elsevier, Volume 54, pp. 241-251.
- [2]. Aydin F., Saribiyik M., (2010), "Correlation between Schmidt Hammer and destructive Compressive testing for Concretes in existing buildings, Scientific Research and Essays, Volume 5, pp. 1644-1648.
- [3]. Bhosale N., Salunkhe P., (2016), "To Establish Relation between Destructive and Non-Destructive Tests on Concrete", International Journal of Engineering Research and General Science, Volume 4, Issue 2.
- [4]. Carina A., (1994), "NDT of Concrete-History and Challenges", American Concrete Institute.
- [5]. Supe J., Gupta M., (2014), "Predictive Model of Compressive Strength for Concrete situ", International Journal of Structural and Civil Engineering Research, Volume 3.
- [6]. Konapure G., Richard Robin J., (2015), "Relationship between Non-Destructive Testing of Rebound Hammer and Destructive Testing", International Journal of Current Engineering and Technology, Volume 5.
- [7]. Kumavat R., Patel V., Tapkire G., Patil R., (2017), "Utilization of Combined NDT in the Concrete Strength Evaluation of Concrete Specimen from existing building", International Journal of Innovative Research In Science, Engineering and Technology, Volume 6, Issue 1
- [8]. Lambert, (2013), "Cement and Concrete-History and Development", American Concrete Institute, Volume 5.
- [9]. Lopez Y., Vannali L., Jose V., (2016), "Concrete Compressive Strength Estimation by Means of Non-destructive Testing: A Case Study", Open Journal of Civil Engineering, Volume 6.
- [10]. Mulik V., Minal R., Deep S., Vijay D., Vishal S., Shweta P., (2015), "The use of Combined Non-destructive Testing in the Concrete Strength Assessment from Laboratory Specimens and Existing Buildings". International Journal of Current Engineering and Scientific Research, Volume 2, Issue 5.
- [11]. Nacer M., Hannachi S., (2012), "Application of the Combined Method for evaluating the Compressive Strength of Concrete in situ" Open Journal of Civil Engineering, Volume 2, pp. 16-21.
- [12]. Patil H., Khairnar D., Thube R., (2015), "Comparative study of effect of Curing on Compressive strength of Concrete by using NDT & DT", International Journal of Science and Advance Research in Technology, Volume 1, Issue 6.
- [13]. Reddy K., (2014), "Assessment of strength of Concrete by Non-Destructive Testing Techniques", International Journal of Engineering and Management Research, Volume 4, Issue 3, pp. 248-256.
- [14]. Rohit K., Patel I. Modhera C., (2012), "Comparative Study on Flexural Strength of Plain and Fiber reinforced HVFA Concrete by Destructive and Non-destructive Techniques", International Journal of Engineering and Science, Volume 1, Issue 2, pp. 42-48.
- [15]. Samson D., Omoniyi, Moses T., (2014), "Correlation between Non-destructive Testing and Destructive Testing of Concrete", International Journal of Engineering Science Invention, Volume 3, Issue 9, pp. 12-17.
- [16]. Shang H., Ting Y., Yang L., (2012), "Experimental Study on the Compressive Strength of Big Mobility Concrete with Non-destructive Testing Method", Advances in Material Science and Engineering, Volume 2.
- [17]. Shariati M., Hafizah N., Mehdi H., Shafigh P., Sinaei H., (2011), "Assessing the strength of reinforced concrete structures through UPV and Schmidt Rebound Hammer tests", Scientific Research and Essays, Volume 6, pp. 213-220.

Design of Economical Beam Section Replacing Light Weight Material Below Neutral Axis

Ankur V. Gedam, Md. Rashid S. Sheikh, Yaminee J. Khandale, Prerna A. Madewar, Kalyani A. Ramteke, Rekha R.

Lihare

UG Scholar, Department of Civil Engineering, TGPCET, Nagpur, Maharashtra, India

ABSTRACT

This Study carried out on brick-filled reinforced concrete beams. The concrete just above neutral axis is less stressed where as the concrete below the neutral axis serves as a shear transmitting media. In RC beams less stressed concrete below neutral axis can be replaced by some light weight and low cost materials like light weight concrete, bricks etc. In this study partially utilized concrete of RC beam has been replaced by bricks, It will reduce the weight of the structure and also achieve the economy. Brick filled reinforced concrete beams acts like composite beams. We use method of initial functions for the analysis of brick filled RC composite beams Reinforced brickwork is also an alternative to reduce the use of concrete. The behavior of reinforced brick beams is similar to that of reinforced concrete beams. But in this type of structures large depth of sections obstructs the head room requirements. In such a situation RC beam is one of the alternatives, however, in RC beams strength of concrete lying near the neutral axis is not fully utilized. The concrete just above neutral axis is less stressed where as the concrete below the neutral axis serves as a shear transmitting media. Looking to the limitations of reinforced brick beams and RC beams, the concept of brick filled RC beams has been developed. Partially utilized concrete of RC beam has been replaced by bricks. In this way the economy of reinforced brick beams and strength of RC beams are tried to be combine in brick filled beams. The bond between brick and concrete layers at the brick concrete interface should essentially be very good. It should be ensured that no slip will occur between the two layers.

Keywords: R Bricks, RC Beams, Concrete, Composite Beam, Light Weight Concrete.

I. INTRODUCTION

General

Reinforced concrete is being used in most of construction activities. In recent days the problem faced by the construction industry is acute shortage of raw materials. Researchers have been investigating many alternative materials to suite the Indian scenario. Rice husk, saw dust, light weight aggregates, copper slag, fly ash, are some of the materials experimented. In the beams the concrete below the neutral axis does not take any tension .Hence the replacement of this concrete can reduce the materials used for

construction that physical conditions are verified for in filled beam .brick filled RC composite beams.

A newly developed lightweight reinforced concrete (LSRC) section has been experimentally investigated section can be used either as beams or slabs .The section is made up of a reinforced concrete with lightweight block infill. LSRC developed LSRC members are suitable for large span construction due to the weight saving benefits and ease of construction. Sustainability means meeting the needs of the present generation without compromising the ability of future generations to meet their needs .Sustainability can be

achieved by reducing, reusing and recycling the waste. It also means moving towards green technologies and reduces emission of CO₂. Production of cement is also one of the main causes of man-made carbon dioxide emissions. Reduction of greenhouse gases and environmental pollution is great concerned for all of us. So the authors have to reduce the use of cement from concrete structure make concrete more sustainable and environment friendly. This can be done by replacing cement in concrete with larger amounts of supplementary cementing materials, or by replacing less stressed or unutilized concrete by other low cost and environment friendly materials like alternative aggregates, bricks etc

SCOPE OF PROJECT

As the day-by-day the use of cement is increase so that the section becomes costly. And production of cement contribute large amount of carbon dioxide in the air causes air pollution .so attempt is done to reduce the use of concrete so that cement also gets reduce and the section gets economical. And the concrete is replaced by lightweight materials.

Objectives Of Work

1. TO study the behavior of in filled concrete beams
2. To reduce the quantity of concrete required for section
3. To reduce the cost of the section
4. To reduce the dead weight of section
5. Sustainability can be achieved by replacing the partially used concrete

II. METHODS AND MATERIAL

LIGHT WEIGHT MATERIAL THAT WE USED BRICKS

Bricks remain one of the most important building materials in the country. Brick making is a traditional industry in India It has directly or indirectly caused a series of environmental and health problems. At a global level, environmental pollution from brick-

making operations contributes to the phenomena of global warming and climate change.



Photo 1. Bricks of Perfect Shape

Table 1. Specification of bricks

Parameters	Clay Bricks
Block Density (kg/m ³)	1900
Compressive Strength (kg/cm ²)	30
Thermal conductivity (W/m.k)	0.184
Water Absorption (%)	20%
Drying Shrinkage (mm/m)	No Shrinkage



Photo 2. Cage of conventional beam section



Photo 3. Cage of brick in filled beams section



Photo 4. Compaction of beams



Photo 6. Compaction of cubes

CELLULAR LIGHT WEIGHT CONCRETE BLOCKS (clc)

Light weight foamed concrete has become more popular in recent years owing to the tremendous advantages it offers over the conventional concrete. Modern technology and a better understanding of the concrete have also helped much in the promotion and use of light weight foamed concrete



Photo 7. Cellular Lightweight Concrete blocks

Advantages of c/c blocks

1. It has excellent compressive strength in excess of regular clay bricks/solid blocks, guarantees min. compressive strength of 3N/mm^2 .
2. Bending strength is 15 to 20% of compressive strength
3. CLC bricks density is 750kg/m^3 which reduces dead load structures.
4. Huge saving in foundation and structure savings upto 30% on beam costs.
5. Good earthquake resistance properties.
6. Easy handling / faster construction.
7. Huge saving of lab our
8. It offers highest thermal insulation making cool summers and warm winters.
9. Reduced air conditioning expenses.
10. It is fire resistant.

Technical Specifications

Table 2. Specification of cellular lightweight blocks

Particulars	Units	Sizes
Size	MM	760x200
Thickness	MM	200
Compressive Strength	N/MM^2	<3
Water Absorption	%	12-15%
Normal Dry Density	Kg/M^3	750
Thermal Conductivity	$\text{W/m}^0\text{k}$	0.16
Sound Absorption	Db	Upto 42
Fire Resistance	Hrs	4*
Thermal Resistance	$\text{M2-}^0\text{k/w}$	0.46
Heat Transmission Coefficient U	$\text{W/m}^2\text{-}^0\text{k}$	2.13

Lightweight materials Replacement Zone

The replacement zone in reinforced concrete beam, where concrete below neutral axis may be replaced by bricks was obtained with the help of stress block, used for limit state design of RC beams.

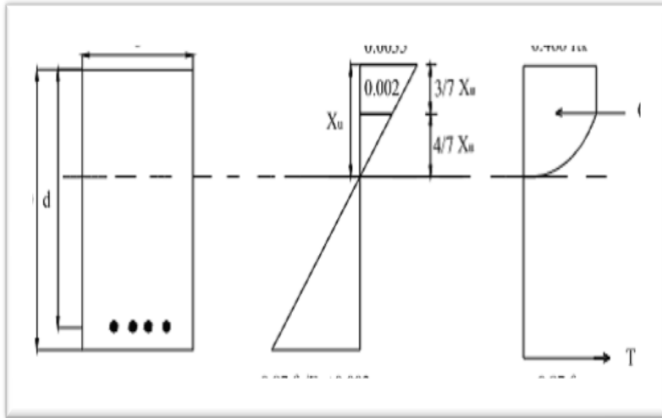


Figure 1. Stress Block Parameters for RC beams

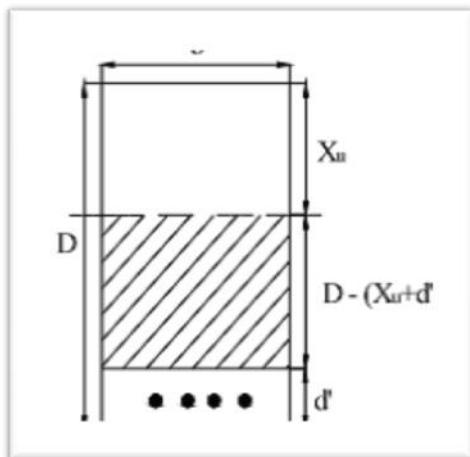


Figure 2. Brick replacement zone in RC beams

By equating total tension to total compression, $X_u = (0.87 f_y A_{st}) / (0.36 f_{ck} b)$ as per IS 456 2000 $d' = (2 \times \text{cover} + \text{diameter of bar})$ d' is the thickness of concrete layer available to maintain bond between steel and concrete. It is assumed the provision of thickness of concrete not less than the cover provided on each side of the tension reinforcement will satisfy the bond requirement.

Brick replacement zone = $D - (X_u + d')$

TESTS ON MATERIALS

All the ingredients used for preparation of the concrete, are thoroughly tested for their quality and physical properties in a well equipped laboratory attached to the plant for conformity to relevant Indian Standard Codes. The moisture probe determines the water content in the sand and aggregates. This accordingly helps in fixing the proportion of water to be added for the preparation of the mix. The sand being used is passed through the mechanized sieving system, before feeding for mixing.

Trial mixes are carried out and tested to ensure that each and every batch of concrete coming out of the plant meets the parameters of client's requirements. The sand being used is passed through the mechanized sieving system, before feeding for mixing.

Cement

Initial and final setting time of cement

For finding out initial setting time, and soundness of cement, and strength a parameter known as standard consistency has to be used. The standard consistency of a cement paste is define as that consistency which will permit a vicat plunger having 10mm diameter and 50mm length to penetrate to a depth of 33-35mm from the top of the mould.

Procedure

1. Unless otherwise specified this test shall be conducted at a temperature of $27 \pm 2^\circ\text{C}$ and $65 \pm 5\%$ of relative humidity of the Laboratory.
2. Prepare a paste of 300 grams of cement with 0.85 times the water required to a give a paste of standard consistency IS: 4031 (Part 4) 1988.
3. The time of gauging in any case shall not be less than 3 minutes not more than 5 minutes and the gauging shall be completed before any sign of setting occurs.
4. Count the time of gauging from the time of adding water to the dry cement until commencing to fill the mould

5. Fill the vicat mould with this paste making it level with the top of the mould.
6. Slightly shake the mould to expel the air.
7. In filling the mould the operator hands and the blade the gauging trowel shall only be used.

Initial Setting Time

1. Immediately place the test block with the non-porous resting plate, under the rod bearing the initial setting needle.
2. Lower the needle and quickly release allowing it to penetrate in to the mould.
3. In the beginning the needle will completely pierce the mould
4. Repeat this procedure until the needle fails to pierce the mould for $5 + 0.5\text{mm}$.
5. Record the period elapsed between the time of adding water to the cement to the time when needle fails to pierce the mould by $5 + 0.5\text{mm}$ as the initial setting time.

Final Setting Time

1. Replace the needle of the vicat apparatus by the needle with an annular ring
2. Lower the needle and quickly release.
3. Repeat the process until the annular ring makes an impression on the mould.
4. Record the period elapsed between the time of adding water to the cement to the time when the annular ring fails to make the impression on the mould as the final setting time.

Precaution

The time of gauging in any case shall not be less than 3 minutes not more than 5minutes.

III. LITERATURE REVIEW

Introduction

Theoretical and experimental work done and some of the experimental studies performed in this field are presented in following papers.

Literature Review

W.Godwin Jesudhasan, Dr. G. Hemalatha(2014). The Experimental investigation criteria to replace the portion below the neutral axis of the beam with Expanded polystyrene sheet (EPS). Expanded polystyrene sheet is a waste material obtained from the packing industries. It has good flexibility property. Normally in beams failure occurs by Bending, but by embedding EPS sheet in concrete, shear cracks only occur while loading. While considering weight criteria EPS embedded beam weighs lesser compared to conventional beam.(1)

Jain Joy, Rajesh Rajeev(2014) .The objective of the investigation is to develop a Reinforced Concrete Beam with hollow neutral axis which may replace the position of reinforced concrete beam in near future. However, in RC beams strength of concrete lying in and near the neutral axis is not fully utilized. So this un-utilized concrete is removed by replacing with any light-weight material. The material incorporated in the concrete beam is PVC pipe, which occupy the concrete volume in the neutral axis, where the compression and tension is zero thereby making the beam hollow. The properties of PVC is not been used since it is used only as a filler material in concrete. Specimens of solid RC beams and Hollow RC beams are cast and tested for four point flexure. Then the results are compared and the effects are studied. The self weight of this developed RC beams are expected to be reduced with the decrease in concrete volume hence proving the beams to be economical. (2)

Patel Rakesh, Dubey S.K., Pathak K.K(2013). Observed that when the concrete below neutral axis is replaced by light weight materials such as bricks, clc blocks, Wooden blocks etc. so as to make the section economic. The strength of the light infill material is similar to the normal sections. Brick replacement zone is obtained with the help of stress block, used for limit state design of RC beams. Method of initial functions is used for the analysis of reinforced concrete brick filled composite beams. The method of initial function

(MIF) is an analytical method of elasticity theory. Moreover, by saving concrete we save cement which also reduces the green house gases emissions. In this way sustainability can be achieved.(3)

S. B. Kandekar¹, P. D. Dhake , M. R. Wakchaure(2013). A beam is a one dimensional (normally horizontal) flexural member which provides support to the slab and vertical walls. In a normal beam (simply supported) two zones generally arise, viz. compression zone at top and tension zone at bottom. As concrete is weak in tension, steel is introduced in the tension zone to take the tension, but as strength of concrete is ignored in tension zone with respect to compression zone. So logically no concrete is required in tension side. But this concrete needs to be provided on tension side to act as strain transferring media to steel and maybe called as 'sacrificial concrete'. If this concrete has no tension more than strain transferring, then why to go for same grade of concrete which is used in upper zone? This is basic question which led to the idea of concrete grade reduction in tension zone for RCC beams to reduce construction cost.(4)

Deepak Gowda. ,Dr. H. B. Balakrishna,(2012) carried out experimenting it on brick-filled reinforced concrete beams.. In RC beams less stressed concrete below neutral axis can be replaced by some light weight and low cost materials like light weight concrete, bricks etc. In this study partially utilized concrete of RC beam has been replaced by some light weight and low cost materials like light weight concrete by bricks. This will reduce the weight of the structure. Brick filled reinforced concrete beams acts like composite beams. Behaviour of reinforced concrete brick-filled beams is similar to that of reinforced concrete beams. Presence of bricks in the low stressed zone has not caused significant reduction in strength of reinforced concrete beams. It has been observed that the replacement of concrete by bricks in reinforced concrete beams does not require any extra labour time. Economy and reduction of weight in

beams depends on the percentage replacement of concrete by bricks.(5)

Arivalagan Soundararajan¹, Kandasamy Shanmugasundaram (2010). This paper presents an experimental study of normal mix, fly ash, quarry waste and low strength concrete (brick-bat lime concrete) contribution to the ultimate moment capacity of square steel hollow sections. Fifteen simply supported beam specimens of 1200-mm long steel hollow sections filled with normal mix, fly ash, quarry waste and low strength concrete and identical dimensions of hollow sections were experimented. Extensive measurements of such material properties, strain and deflection were carried out. Theoretical studies of ultimate moment capacity of a beam specimen were also calculated in this study for comparison's sake. These experimental investigation results showed that normal mix, fly ash, quarry waste and low-strength concrete enhance the moment carrying capacity of steel hollow sections. Furthermore, in these studies it can be found that normal mix, fly ash and quarry waste concrete can be used in composite construction to increase the flexural capacity of steel hollow sections.(6)

M.R. Esfahania (2007) Presented the flexural behaviour of reinforced concrete beams strength and using Carbon Fibre Reinforced Polymers (CFRP) sheets. The effect of reinforcing bar ratio on the flexural strength of the strengthened beams is examined. Twelve concrete beam specimens with dimensions of 150 mm width, 200 mm height, and 2000 mm length were casted and tested. Beam sections with three different reinforcing ratios, were used as longitudinal tensile reinforcement in specimens. Nine specimens were strengthened in flexure by CFRP sheets. The other three specimens were considered as control specimens. The width, length and number of layers of CFRP sheets varied in different specimens. The flexural strength and stiffness of the strengthened beams increased compared to the control specimens.(7)

Al-Khaiat and Haque 1998The use of lightweight concrete in the construction industry has been gaining popularity in the past few decades. Although there have been many works done on the structural performance of lightweight aggregate concrete, these are mostly confined to naturally occurring aggregates, manufactured aggregates and aggregates from industrial by-products. If OPS concrete can be used for structural applications, it would not only be beneficial towards the environment, but also be advantageous for low-income families as this concrete can be used for the construction of low cost houses, especially in the vicinity of oil palm plantations. For structural applications, the flexural behaviour of OPS concrete beams has to be closely scrutinised and clearly established. Therefore, this paper presents the results of an experimental investigation on the flexural behaviour of reinforced OPS concrete beams. The beams were loaded incrementally until failure and their strength, cracking, deformation and ductility behaviour were examined.(8)

Hunaiti (1997) conducted a study on the strength of composite sections with foamed and lightweight aggregate concrete. In this research, test specimens of square steel hollow sections and square sections filled with foamed and lightweight concrete were used to investigate the contribution of these concretes to the strength of cross-sections of composite members. There are few studies covering steel hollow beams filled with normal concrete and lightweight concretes. Some studies considered only the lightweight concrete (lightweight aggregates were produced from a wide variety of raw materials including clay, shale, slate pumice and perlite) and foamed concrete filled steel hollows. From this study find moment carrying capacity of the filled section.(9)

Govindan, P. and Santhakumar, A. R. (1984) Experimental study of brick filled reinforced concrete beam is done and it is observed that saving of 30% concrete is achieved The experimental programme is conducted on the beams with light weight brick core

with ferrocement form. It is observed that beams achieved higher ultimate load when welded wire mesh is used in ferrocement forms.(10)

Remark

By taking a review of papers mentioned above we conclude that the concrete below neutral axis is less effective in taking tension. So by using the materials which are light weight and having some tensile strength and less shrinkage we can replace the concrete below neutral axis. By this the use of concrete is less in half the section and the section become economical.

IV. RESULTS AND DISCUSSION

We cast number of specimen for various test and their results are listed below.

Compressive strength of M30 grade of concrete

Table 3. Compressive strength of M30 grade cubes

Sr.no	Specimen (Cubes)	Compressive Strength(N/mm ²)	Mean strength(N/mm ²)
1	7 Days	14.3	
2	7 Days	15.7	14.63
3	7 Days	13.9	

Costs of Beam Sections

Table 4. Cost Comparison A

Sr.No	Material	Quantity (For 1 Beam in KG)	Rate (Rs per Kg)	Amount (Rs)
1	Cement	9.17	7	64.19
2	Sand	23.24	1.13	26.26
3	Coarse aggregate	28.41	0.37	10.51
Total cost for one beam				100.96
Total cost for two beam				201.92

4.3 Weight of Beam Sections

Table 5. Weight of beams sections

Sr. No	Description	Weight in KN	Weight in Kg
1	Conventional	0.756	77.06
2	Brick infilled beam	0.735	74.92
3	CLC block infilled beam	0.639	65.13

2. For Brick Infill Beam

Table 6. Cost Comparison B

Sr.n o	Material	Quantity (For 1 Beam in KG)	Rate (Rs per Kg)	Amount (Rs)
1	Cement	5.04	7	35.28
2	Sand	12.78	1.13	14.44
3	Coarse aggregate	15.62	0.37	5.77
4	Brick	3	5	15
Total cost for one beam				70.49
Total cost for four beam				115.49

Remark : The cost of conventional beam is greater than cost of infilled beams . So it is beneficial to use the infilled in practice.

V. CONCLUSION

Based on the results obtained in this study the following conclusions were drawn

1. Behaviour of reinforced concrete infilled beams is similar to that of reinforced concrete beams.
2. Presence of lightweight material in the low stressed zone has not caused significant reduction in strength of reinforced concrete beams. It has been observed that the replacement of concrete by

lightweight material in reinforced concrete beams does not require any extra labour or time.

3. Economy and reduction of weight in beams depends on the percentage replacement of concrete by lightweight materials.
4. The shear strength of infilled beam is more than design shear strength.
5. The ultimate moment carrying capacity of infilled than design ultimate moment.
6. The infilled material can sustain more deflection.
7. The cost of in filled beams is less than conventional beams .So it can be practically used.
8. The weight of the structure is reduced due to lightweight material. So the overall weight of the structure is reduced.

Limitation

1. Method consumed a little bit more time than conventional method.
2. As rcc is the composite material, the bond between steel and concrete is not much effective as in normal section.

Future Scope of Project

1. This type of beams is used in bridge girders as their dimensions are very large we can use it for more area below neutral axis.
2. This can be used in the heavy precast members.

VI. REFERENCES

- [1]. W.Godwin Jesudhasan, Dr. G. Hemalatha, "Experimental Investigation on Beams
- [2]. Partial Replacement Below The Neutral Axis",Research gate,vol.no.5 April 2014.,567-898.
- [3]. Jain Joy,Rajesh Rajeev,"Effect of Reinforced Concrete Beam with Hollow Neutral Axis",IJSRD - International Journal for Scientific Research & Development| Vol.2,Issue 10,2014 | ISSN (online): 2321-0613.
- [4]. Patel Rakesh,Dubey S.K,Pathak K.K,"Brick Filled Reinforced Concrete Composite Beams"

- ,International Journal of Advanced Engineering Technology E-ISSN 0976-3945.(2013).
- [5]. S.B.Kandekar,P.D.Dhake ,M.R.Wakchaure,"Concrete Grade Variation InTension And Compression Zones Of Rcc Beams",International Journal of Innovative Research in Science,Engineering and Technology Vol.2,Issue 8,August 2013.
- [6]. Deepak Gowda.,Dr.H.B.Balakrishna," Experimental Study On Flexural Behavior Of Reinforced Concrete Beams By Replacing Copper Slag As Fine Aggregate",International Journal of Civil and Structural Engineering Research Vol.2,Issue 1,pp: (97-103),Month: April 2012.
- [7]. Arivalagan Soundararajan1,Kandasamy Shanmugasundaram,"Flexural Behaviour Of Concrete-Filled Steel Hollow Sections Beams",14:2,107-114.(2010).
- [8]. Gupta M.and Pandey A.K.,"Experimental studies on brick masonry in compression",Indian Concrete Journal,Vol.86 (1),pp.43-50,(2012).
- [9]. Arulselvan S.,K.Subramanian,Pillai P.E.B.and Santhakumar A.R.,"RC In filled frame- RC plane frame interactions for seismic resistance",Journal of Applied sciences Vol.7(7) pp.942-959,(2007).
- [10]. A,"Permanent ferrocement forms: A viable alternative for construction of concrete beams",30th Conference on our world in concrete & structures,Singapore,(2005).
- [11]. Dubey S.K.,"Analysis of homogeneous orthotropic deep beams".Journal of Structural Engineering,Vol.32(2),pp.109-166,(2005).Ezzat H.F,Mohamed N.A.,Yousry B.S.and Ahmed
- [12]. Dubey S.K.,"Analysis of composite laminated deep beams".Proceedings of the third International Conference on "Advances in Composites",ADCOMP,Bangalore,pp.30-39,(2000).
- [13]. Choubey U.B.and Gupta U,"structural response of brick-filled reinforced concrete beams",Proceedings of fourth International seminar on Structural masonry for developing Countries,Madras,pp.226-233,(1992).
- [14]. Govindan,P.and Santhakumar A.R.,"Composite action of reinforced cement concrete beams with plain masonry infills",Proceedings of International Symposium on Reinforced and Prestressed Masonry,Edinburgh,(1984). Iyengar K.T.S Raja,and P.V.Raman," Free vibration of rectangular beams of arbitrary depth",ActaMechanica,Vol.32 (1),pp.249-259,(1979).
- [15]. "BRICK FILLED REINFORCED CONCRETE COMPOSITE BEAMS" Patel Rakesh,Dubey S.K,Pathak K.K.

Design of R. C. C Overhead Water Tank

Roshan Y. Gawarle, Palash A. Wagh, Himani Dakare, Naina Dokare, Shankumar Kummari, Dhanashree Sawarbandhe
Civil Engineering Department, Tulsiramji Gaikwad-Patil College of Engineering & Technology, Mohgaon,
Nagpur, Maharashtra, India

ABSTRACT

The water tank is used to store water to tide over the daily requirements. Water tanks can be of different capacity depending upon the demand requirement of a municipal corporation. Water which covers about 71% of the earth surface. This paper gives an overall designing procedure of an Overhead Circular tank using LIMIT STATE METHOD from IS-3370:2009. The crack width was also checked by a limit state of serviceability IS-3370: 2009. It was observed that in case of limit state design cost required is less. Obviously, the circular water tank is more economical compared to the square tank. This paper gives, the theory behind the design of a liquid retaining structure, Elevated circular water tank with a domed roof, circular wall, top ring beam, flat base slab, and bottom beam are design with limit state method.

Keywords: Economical Design, IS-3370:2009, Limit State Method, IS-456:2000, Circular Overhead Tank

I. INTRODUCTION

In the construction of concrete structure for the storage of water and other liquids the imperviousness of concrete is most essential. Storage reservoirs and overhead tank are used to store water. This project gives in brief, the theory behind the design of liquid retaining structure, circular water tank with rigid base using limit state method. This report includes analyze and design circular water tank with rigid base.

Elevated water tanks are one of the most important lifeline structures in earthquake prone regions. In major cities and also in rural areas elevated water tanks forms an integral part of water supply scheme. This study presents the evaluation of seismic forces acting on elevated water tank e.g. circular water tank with frame staging affected by different parameters viz., seismic intensity, different wind speeds. Indian Standards for the design of liquid retaining structures have been recently revised in the year 2009. The earlier version allowed the design of water retaining structures by Working Stress Method only, But the

revision of the code allows the Working stress method as well as Limit State method for designing RCC water tanks. Elevated tanks are supported on staging which may consist of masonry walls, R.C.C. tower or R.C.C. columns braced together. The walls are subjected to water pressure. The base has to carry the load of water and tank load. The staging has to carry load of water and tank. The staging is also designed for wind forces.

II. AIMS & OBJECTIVES

- To study the various forces acting on a water tank. Understanding the most important factors that plays role in designing of a water tank.
- To study the guidelines of design of water tank according to IS code and checking the design.
- To know about the design philosophies of water tank design.
- Preparing a water tank design which is economical and safe, providing proper steel reinforcement in concrete and studying its safety according to various codes.

III. MATERIAL & METHOD USE IN DESIGN

- We know that water is essential for every living thing and ground source of water are not easily available so water is stored in various type tank so for designing of tank required better serviceability.
- Dynamic analysis of liquid containing tank is a complex problem involving fluid-structure interaction.
- Concrete mix weaker than M-20 is not used because of higher grade lesser porosity of concrete.
- Minimum quantity of cement in concrete shall be not less than 30 KN/m³
- Coefficient of expansion due to temperature = $11 \times 10^{-6} / ^\circ\text{C}$
- Coefficient of shrinkage may be taken = 450×10^{-6} for initial and 200×10^{-6} for drying
- Minimum cover to all reinforcement should be 20 mm or the diameter of main bar whichever is greater.
- An overhead liquid retaining structure is design using LIMIT STATE METHOD
- Avoiding the cracking in the tank and to prevent the leakage and the component of tank can be design using LIMIT STATE METHOD (example:- column, bracing, circular wall etc.). Code using IS: 3370-PART 2-2009
- IS: 456:2000

A. Design requirement of Concrete Structures

In water retaining structures a dense impermeable concrete is required therefore, proportion of fine and coarse aggregates to cement should be such as to give high quality concrete. Concrete mix weaker than M20 is not used. The minimum quantity of cement in the concrete mix shall be not less than 300 kg/m³. The design of the concrete mix shall be such that the resultant concrete is sufficiently impervious. Efficient compaction preferably by vibration is essential. The permeability of the thoroughly compacted concrete is

dependent on water cement ratio. Increase in water cement ratio increases permeability, while concrete with low water cement ratio is difficult to compact. Other causes of leakage in concrete are defects such as segregation and honey combing. All joints should be made water tight as these are potential sources of leakage. The design and construction of container for storage of liquid have been covered by IS 3370 (Parts 1 to 4), and this standard lays down the principles of design of staging for elevated liquid tanks. All requirements of IS 456, IS 3370 (Part 1), IS 3370 (Part 2) and IS 1893 Part 2 in so far as they apply, shall be deemed to form part of this standard except where otherwise laid down in this standard. Design report containing basis of design, method of structural analysis, detailed computation of loads, structural analysis, design calculations with sizes of members and reinforcement.

B. Design With Member Analysis

In the membrane analysis the member are assumed to act independent of the others.

Hence individually all components of the structure are designed.

The design of membrane analysis is carried as follows,

Consider, M30 concrete

HYSD Fe 415 bars

Intensity of wind pressure = 1200N/m²

Thickness of dome = 100mm

Bearing capacity = 180 KN/m²

Let the diameter of cylindrical portion D = 15.91 m

R = 7.95, h = height of cylindrical

Rise $h_1 = 1.98$ m

Required volume = 1900 m³

h = 9.54 m

Allowing for free board; h = 0.3 m For top dome, the radius R_1 ;

By property of circle $R_1 = 15.82$ m

DESIGN OF TOP DOME

$R_1 = 15.82$ m

Let thickness $t_1 = 100 \text{ mm} = 0.1\text{m}$
 Semi central angle(θ)= 30.18° Taking Live load = 1.5 KN/m^2
 Taking Dead load= 0.1×25
 Pressure on top of dome $p = 0.1 \times 25000 + 1500$
 $P = 4000\text{N/m}^2$ Meridional thrust at edge
 $T_1 = W \times R / 1 + \cos\theta$
 $T_1 = 33.94\text{KN}$
 Meridional stress = $M.T/b.t = 33.94 \times 10^3 / 1000 \times 100$
 $\sigma = 0.34 < 5\text{N/mm}^2$ (safe), since stresses are within safe limit, provide nominal reinforcement @ 0.3%
 $A_{st} = 300\text{mm}^2$
 Provide $8\text{mm}\varnothing$ steel bars at spacing 160mm
 Both circumferentially & meridionally

Design of Ring Beam

Calculation for hoop tension in ring beam
 Hoop tension = [meridional thrust] $\cos\theta \times D/2$
 $\tau = 33.94 \times \cos[30.18] \times 15.19/2$
 $\tau = 233.39 \text{ KN}$
 Calculation for area of main reinforcement
 $A_{st} = 233.39 \times 10^3 / 150$
 $A_{st} = 1555.93 \text{ mm}^2$
 Provide 4nos of steel bar [two at top and two at bottom]
 $\varnothing = 25\text{mm}$
 Provide 4bars
 $A_{st} = 1963.49\text{mm}^2$
 Calculation for size of ring beam
 Hoop Tension $/b^2 + (m-1) \times A_{st}$. provided
 $1.2 = 233.39 \times 10^3 / b^2 + (13.33-1) \times 1963.49$
 $b = 300\text{mm}$ provide ring beam of size $300 \times 300\text{mm}$ & $8 \text{ mm } \varnothing$ stirrups at 200mm c/c

Design of circular wall

$T = 30H + 50$
 $T = 400\text{mm}$
 Calculation for maximum hoop tension
 $H^2/D.T = 9.84^2 / 15.91 \times 0.345$
 Hoop tension = 17.64
 maximum hoop tension coefficient from table
 0.68 at $0.7H$
 maximum hoop tension = coefficient $\times w.h \times D/2$
 Hoop tension = $0.68 \times 10 \times 7.84 \times 15.91/2$

Hoop tension = 532.285 KN
 Calculation for maximum B.M
 $H^2/D.T = 17.64$
 Maximum B.M coefficient from table (10) IS3370
 Coefficient = -0.0079
 Maximum B.M = Coefficient $\times W \times H^3$
 $B.M = 0.0079 \times 10 \times 9.84^3$
 $B.M = 75.26 \text{ KN.m}$
 $B.M = 75.26 \times 10^6 \text{ N.mm}$

Check for hoop tension
 A_{st} for hoop tension = Hoop tension/
 $\tau = 532.28 \times 10^3 / 150$
 $A_{st} = 3548.53\text{mm}^2$
 $\tau = \text{Hoop tension} / b.T + (M-1)A_{st}$
 $\tau = 532.28 \times 10^3 / 1000 \times 400 + (13.33-1) \times 3348.53$
 $\tau = 1.36 \text{ N/mm}^2 > 1.2 \text{ N/mm}^2$ (hence unsafe)
 $\tau = 1.19 > 1.2 \text{ N/mm}^2$ (hence safe)
 Check for thickness of wall from B.M criteria
 Neutral axis constant (k) = $1/1 +$
 $k = 1/1 + 150/13033 \times 7$
 lever constant (j) = $1 - k/3$
 $j = 1 - 0.38/3$
 $j = 0.87$
 $j = 7 \times 0.38 \times 0.81/2$
 $j = 1.16$

$B.M = Q.b.t^2$
 $75.26 \times 10^6 = 1.16 \times 1000 \times t^2$
 $t = 254.71 < t$
 $t = 254.71 < 360\text{mm}$ (hence ok)

This provide $T = 400$
 $T = 360\text{mm}$
 Design of Reinforcement (A_{st})
 To Find Minimum R/F for $T=400\text{mm}$
 Using IS 456:2000
 $Y = 0.17\%$, Interpolation
 $A_{st\text{min}} = 0.17\% . b.T$
 $A_{st\text{min}} = 680\text{mm}^2$
 To Find A_{st} For Hoop Tension (i.e. ring reinforcement)
 $A_{st} = \text{Hoop Tension} / \sigma_{st} = 532.28 \times 10^3 / 150$
 $A_{st} = 3548.53\text{mm}^2 > A_{st\text{min}}$
 Provide hoop tension on both face of tank
 Hence, A_{st} for each face = 1774.25mm^2
 Let us provide 12mm ring bars

Spacing = 60mm

Thus provide 12mm ring @50mm c/c on each face

To Find A_{st} For B.M (i.e. vertical steel bar for cantilever

At Inner Face $A_{st} = B.M / \sigma_{st} \cdot j \times t$

$$A_{st} = 75.26 \times 10^6 / 150 \times 0.8 \times 360 = 1601.95 \text{mm}^2$$

Provide this steel at inner face only using 12mm of vertical steel bars 70mm c/c

Thus provide 12mm \varnothing vertical steel bar @30mm c/c

At outer face, distribution reinforcement

$$A_{st} = A_{st \text{ min}} = 680/2 = 340 \text{mm}^2 \text{ Spacing} = 100 \text{mm}$$

Tank Floor Slab

Tank floor slab in circular and fixed at the periphery to the circular ring beam

Load on the circular slab = W

W = (weight of water) + (self weight of slab assume as 400mm thickness)

$$W = (10 \times 9.84) + (0.4 \times 25)$$

$$W = 98.4 + 10$$

$$W = 108.4 \text{ KN/m}^2$$

Max. radial and circumferential moment

Positive moment at centre of span is M_{rp}

$$M_{rp} = (3/16 W \cdot r^2) = 1284.59 \text{ KN.M}$$

-tive moment at support

$$M_m = (W \cdot r^2 / 16) = (108.4 \times 7.95^2 / 8) = 856.39 \text{ KN.M}$$

Circumferential moment is given by the relation

$$M_c = (W \cdot r^2 / 16) = 108.4 \times 7.95^2 / 16 = 428.19 \text{ KN.M}$$

Effective depth of slab is given by d

$$\text{Depth} = \frac{\sqrt{M}}{Qb} = \frac{\sqrt{1284590000}}{1.009 \times 1000} = 1128.33 \text{mm}$$

Adopt depth = 1150mm

Reinforcement in circular slab

$$A_{st} \text{ (centre of span)} = [1284.59 \times 10^6 / 190 \times 0.89 \times 1150]$$

$$A_{st} = 6605.76 \text{mm}^2$$

$$A_{st} \text{ (support)} = [856.39 \times 10^6 / 150 \times 0.89 \times 1150]$$

$$A_{st} = 5578.18 \text{mm}^2$$

$$A_{st} \text{ (circumferential moment)} = 428.19 \times 10^6 / 150 \times 0.88 \times 270$$

$$A_{st} = 12014.31 \text{mm}^2$$

Provide 25mm \varnothing bars at 70mm c/c, length 4m from support at top radially & circumferentially.

Bottom beam

Total load on bottom beam

Weight of water = 1000KN

$$\text{Load from dome} = 2\pi R \cdot r \cdot w = 399.86 \text{KN}$$

$$\text{Weight of top ring beam} = 0.30 \times 0.40 \times 25 \times \pi \times 16.31 = 512.63 \text{KN}$$

$$\text{Weight of cylindrical wall} = \pi \times 16.31 \times 0.4 \times 9.54 \times 25 = 4888.24 \text{K}$$

$$\text{Weight of floor slab} = \pi \times 7.35 \times 0.4 \times 25 = 249.76 \text{KN}$$

$$\text{Weight of bottom beam} = 0.4 \times 0.6 \times \pi \times 16.31 \times 25 = 768.60 \text{KN}$$

Total vertical load = 7819.15KN

$$= W/\pi \cdot D = 7819.15/\pi \times 16.31$$

$$= 152.60 \text{KN/M}$$

Moment and shear force in beam

+ve B.M of support = 0.00148W.B

$$= 920 \text{kN.M}$$

Live B.M of centre of support = 0.0075W.R

$$= 466.21 \text{kN.M}$$

Torsion moment = 0.0015WR

$$= 93.24 \text{kN.M}$$

Shear force at support = v

$$v = \text{total load} / 2 \times \text{no. of column}$$

$$v = 7358 / 2 \times 21$$

$$v = 186.17 \text{KN}$$

Shear force at section of maximum tension is given by

$$V = [175.19 - 143.60 \times 7.95 \times \pi \times 12.79 / 180]$$

$$= 83.37 \text{KN}$$

Design of support section

Bending moment (M) = 920KN.M

Shear force (V) = 83.31 KN.M

$$\text{Effective depth} = \sqrt{\frac{M}{\phi}} = 1159.75 \text{mm}$$

Adopt (d) = 1200mm

Overall depth = 1250mm

$$A_{st} = \frac{920 \times 10^6}{150 \times 0.88 \times 1200} = 5808 \text{mm}^2$$

Provide 8mm bar of 32mm \varnothing

$$A_{st} = 6434 \text{mm}^2$$

Spacing at 120mm

$$\tau = \left(\frac{v}{b \cdot d}\right) = \frac{186.17 \times 10^3}{600 \times 1200} = 0.25 \frac{N}{\text{mm}^2}$$

$$\left(\frac{100A_{st}}{b.d}\right) = \left(\frac{1000 \times 6434}{600 \times 1200}\right) = 0.89$$

From table no.23 IS 456:2000

$$\tau_v = \tau_e$$

provide minimum shear reinforcement

$$\frac{A_{sv}}{b_{sv}} \geq \frac{0.4}{0.87 f_y}$$

provide minimum shear reinforcement

$$\frac{A_{sv}}{600} \geq 1.10 \times 10^{-3}$$

$$0.3 \geq 1.10$$

Design of centre at span section

Bending moment (M) = 466.21KN.m

$$A_{st} = \left(\frac{466.21 \times 10^8}{190 \times 0.89 \times 1200}\right) = 2297.50 \text{mm}^2$$

Minimum quantity of steel is obtained

$$A_{st} = \left(\frac{0.85 b.d}{f_y}\right) = \left(\frac{0.85 \times 600 \times 1200}{415}\right)$$

$$A_{st} = 1474.70 \text{mm}^2$$

Provide 3 bar of 32 mm Ø (Ast = 2412.74mm²)

Design of section subjected to maximum tension and shear

Torsion moment (T) = 93.24 KN.M

Shear force (V) = 83.37 KN.M

Bending moment (M) = 0

Overall depth (D) = 1250mm

Width of section (b) = 600mm

$$M_s = T \left(\frac{1 + \left(\frac{D}{b}\right)}{1.7}\right) = 93.24 \left(1 + \left(\frac{1250}{600}\right)\right) = 96.32 \text{KN.M}$$

Me = (M + Ms) = (0+96.32) = 96.32KN.M

$$A_{st} = \left(\frac{96.32 \times 10^6}{190 \times 0.890 \times 1200}\right) = 474.67 \text{mm}^2$$

But minimum reinforcement is 1474.70mm²

Provide 3 bar of 32mm Ø

Ve=V+1.6 (T/b)

Ve=332.01KN

τ=0.46

As per Ast =0.20= 0.20<0.46

Hence shear reinforcement are required use 12mm two legged stirrups with side cover of 25mm &50mm at top and bottom

Supporting Tower

Loads on Column

total load from ring beam=7819.15KN

total load on each column=7819.15/21 =372.34KN

self weight of column= 0.28×25×30=210KN

taking dia. of column=600mm²

area =0.28m

self weight of braces=4×0.30×0.450×25×7.95=107.33KN

total axial load on each column = tank empty=619.67-1000/21

$$=229.21 \text{KN}$$

tank full condition= on each column=372.34+14+107.33

$$=619.67 \text{KN}$$

Size of bracing = (0.30×0.45)

Wind force

Intensity of wind pressure = 1.5 $\frac{\text{KN}}{\text{m}^2}$

Reduction coefficient for circular shape = 0.7

Wind force on top of dome and cylindrical wall

(including bottom ring beam)

$$= 0.7 \times 1.5 \times 11.74 \times 16.71$$

$$= 205.98 \text{KN}$$

Wind force in column = 21×0.6×30×1.8

$$= 680.4 \text{KN}$$

Wind force on braces = (4×16×0.45×1.5) = 43.2 KN

Total horizontal wind force = (205.98+378+43.2) = 627.18 KN

Assuming contra flexure point at mid height of column and fixity at the base

The moment at the base of column is obtained

M = (0.5×625.18×4.4) =1379.78 KN.M

M₁= moment at the base of column due to wind load

$$M_1 = (205.98 \times 31.74) + (378 \times 21) + (43.2 \times 21)$$

$$M_1 = 15383 \text{KN.M}$$

V = Reaction developed at base of exterior column

$$M_1 = \sum M + \frac{v}{r_1} \sum r^2$$

$$r_1 = 7.95 \cos 30^\circ = 6.88 \text{m}$$

$$r_2 = 4.4 \times (6.88) = 208.27$$

$$15383 = 1379.78 + \left(\frac{v}{6.88}\right) \times 208.27$$

$$V = 462.58 \text{KN}$$

Total load on column at base is obtained as

$$P = (619.67 + 462.58) = 1082.25 \text{KN}$$

Moment in each column at base is

$$M = 1379.78/21 = 65.70 \text{KN.M}$$

$$\text{Eccentricity} = e = (M/P) = \left(\frac{65.70 \times 10^6}{1082.25 \times 10^3}\right)$$

$e = 60.70 \text{ mm}$

Since, eccentricity is small direct stresses are predominant using 6 bars of 25mmØ equally spaced on all face

$$A_{sc} = (6 \times 490.87) = 2945.24 \text{ mm}^2$$

$$A_c = (282743.34 - 2945.24) + (1.5 \times 20 \times 2945.24)$$

$$A_c = 368155.3 \text{ mm}^2$$

$$I_e = \left(\frac{\pi}{64} \times d^4\right) + (2 \times 1.5 \times 20 \times 3 \times 490.87 \times 150^2)$$

$$I_e = 1.988 \times 10^9 \text{ mm}^4$$

$$\text{Direct compressive stress} = \sigma_{cc} = \left(\frac{1082.25 \times 10^3}{368155.3}\right) = 2.94 \text{ N/mm}^2$$

$$\text{Bending stress} = \sigma_{cb} = \left(\frac{65.70 \times 10^6 \times 200}{1.988 \times 10^9}\right) = 6.60 \text{ N/mm}^2$$

Permissible stress in concrete is increased by 33.33 percent while considering wind effects

$$\text{Hence, } \left(\frac{\sigma_{cc}}{\sigma_{cc}} + \frac{\sigma_{cb}}{\sigma_{cb}}\right) < 1$$

Condition is not safe

Increase diameter by 100 mm

Adopt 700mm diameter of column and 10mmØ ties at 200mm.

DESIGN OF BRACING

Moment in base = (2 × moment in column × sec30°)

$$= (2 \times 65.70 \times 1.15)$$

$$= 151.11 \text{ KN. m}$$

Section of brace = d (0.30 × 0.45)

$$b = 350 \text{ mm}$$

$$d = 400 \text{ mm}$$

Moment of resistance of section is given by

$$M_1 = (0.897 \times 300 \times 450^2) / 10^6$$

$$M_1 = 54.07 \text{ KN. M}$$

Balance moment = $M_2 = (M - M_1)$

$$= (151.11 - 54.07) = 97.04 \text{ KN. M}$$

$$A_{st1} = \left(\frac{54.07 \times 10^6}{230 \times 0.90 \times 400}\right) = 653.01 \text{ mm}^2$$

$$A_{st2} = \left(\frac{97.04 \times 10^6}{230 \times 0.9 \times 350}\right) = 1339.40 \text{ mm}^2$$

$$A_{st} = (653.01 + 1339.40) = 1992.41 \text{ mm}^2$$

Provide 6 bar of 22mmØ ($A_{st} = 2280.8 \text{ mm}^2$)

Length of brace = (2 × 7.95 × sin30) = 7.95m

Maximum shear force is brace

$$= \left(\frac{151.11}{0.5 \times 7.95}\right) = \left(\frac{\text{moment in brace}}{\frac{1}{2} \text{ length of brace}}\right) = 38 \text{ KN}$$

$$= \left(\frac{100 A_{st}}{b.d}\right) = \left(\frac{100 \times 2280.8}{350 \times 400}\right) = 1.6$$

From table 23 of IS: 456, $t_c = 0.43 \text{ N/mm}^2$

Since, $t_c < t_v$, Provide nominal shear reinforcement using 8mm diameter 2 legged stirrups.

IV. CONCLUSION

Storage of water in the form of tanks for drinking and washing purposes, swimming pools for exercise and enjoyment, and sewage sedimentation tanks are gaining increasing importance in the present day life. For small capacities we go for rectangular water tanks while for bigger capacities we provide circular water tanks. Design of water tank is a very tedious method. Particularly design of under ground water tank involves lots of mathematical formulae and calculation. It is also time consuming. Hence program gives a solution to the above problems. There is a little difference between the design values of program to that of manual calculation. The program gives the least value for the design. Hence designer should not provide less than the values we get from the program. In case of theoretical calculation designer initially add some extra values to the obtained values to be in safer side.

V. REFERENCES

- [1]. Asati Ankush N., KaduMahendra S. (2014), "Seismic investigation of RC elevated water tank for different types of staging patterns"
- [2]. Bhandari M, Singh Karan Deep (2014), "Comparative study of design of water tank"
- [3]. Bhandari M, Singh Karan Deep (2014), "Economic design of water tank of different shapes"
- [4]. Dixit B Patel. Patel. Chirag. N. (2016), "A review on overhead water tank staging considering Fluid-Structure-Soil Interaction"

- [5]. Dona Rose K J, Sreekumar M, Anumod A S (2015), "A study of overhead water tanks subjected to dynamic loads"
- [6]. Kagdelwar Bhagyashree Prakash, Patil A. V.(2016), "Economic design of RC elevated water tanks by using IS 3370 and its revision is 3370 (2009)"
- [7]. J. Yogeshwarana, C.Pavithra,(2015), "Behaviour of an elevated RC tank subjected to various earthquake responses"
- [8]. Young-MyungYang, Ji-Hoon Kim, Heung-SeokSeo, Kangwon Lee, Ihn-Soo Yoon (2006),"Development of the world's largest above-ground full containment storage tank"
- [9]. Munshi J.A. and Sherman W.C., ' Reinforced concrete tanks'pg.101-108, Feb2004, Concrete International Journal.
- [10]. Ashok K. Jain, 'Reinforced concrete Limit State Design', pg.196-197, pg.671-677, Nem Chand & Bros., Roorkee 247 667,India.

Experimental Investigation On Industrial Waste Material For Green Concrete

Tushal Chavhan, Anshuman Sagar, Rambhu Kumar, Sumit Gaure, Devsharan Sahu

Civil Engineering, Nagpur University, GHRAET, Nagpur, Maharashtra, India

ABSTRACT

The raw materials of concrete consist of cement, sand and crushed aggregates. Partial replacement of these raw materials by waste products may decrease the cost, reduce the energy consumption and also reduce the environment pollution. Wastes can be used to produce new products or can be used as admixtures so that natural sources are used more efficiently and the environment is protected from waste deposits. Fly ash can be used as filler materials and helps to reduce the total voids content in concrete and metakaoline can be used as admixtures/additive in concrete. The use of steel dust in concrete is desirable of benefits such as useful disposal of a byproduct, reducing of river sand consumption and increased strength. However, the use of steel dust leads to a reduction in the workability of concrete. In this project the flyash, metakaoline and steel dust waste are utilized as a replacement with cement and fine aggregate in concrete mix, the size of the concrete cube is 150mm×150mm×150mm and they were tested with different mix proportions of 0%, 10%, 20%, for flyash, metakaoline and 30%, 40% for steel dust In this study, the main constituents of the concrete cube are Ordinary Portland Cement, Fine aggregate and the replaced material. However, This paper deals with the idea of finding suitable proportions of steel dust, flyash and metakaoline that could be related in attaining the target strength of concrete. Experiments were conducted to find the compressive strength of concrete for M25 grade, with OPC 43 grade of OPC cement. Based on the test results, can be conclude that combine use of steel dust and fly ash and metakaoline can be shown improved or decrease the strength in concrete and also preserve the environment.

Keywords: Flyash, Metakaoline, Steel Dust, Partial Replacement

I. INTRODUCTION

GREEN concrete has nothing to do with color, It is a concept of using eco-friendly materials in concrete, to make the system more sustainable. Green concrete is very Often and also cheap to produce, because for example, waste products are used as a partial substitute for cement, charges .India there is large quantity of industrial waste generated , so it is very difficult to disposed off all these waste for land fill and incineration due to lack of space available and it is harmful for environment. Since the utilization of these waste becomes very necessary. So we are trying to utilize these waste products as a partially

replacement of cement and fine aggregate in concrete. Today construction cost is very high with using routine material like cement, fine aggregate and coarse aggregate. This study includes use of different waste material as a partial replacement of cement and fine aggregate. It is a concept of using eco-friendly materials in concrete, to make the system more sustainable. In India, large amount of fly-ash and steel dust is generated in thermal power plants and steel plant respectively with an imperative blow on environmental and living organism. The use of fly-ash, metakaoline and steel dust in concrete can reduce the consumption of natural resources and also diminishes the effect of pollutant in environment. In recent

studies, many researchers found that the use of additional cementitious materials like fly-ash, metkaoline and steel dust in concrete is economical and reliable. India is 2nd largest cement market country in the world after china, both in production and consumption. As of FY17, a total of 575 operational cement plants in the country has Capacity of 460 MTPA as of December 2017. This process is responsible for 5 to 8 percent of all carbon dioxide (CO₂) emissions worldwide.

II. OBJECTIVE

In this project objective is to study the influence of partial replacement of fly-ash, metkaoline and steel dust in concrete subjected to different curing environments. In India, large amount of fly-ash, steel dust is generated in thermal power plants and steel plant with an imperative blow on environmental and living organism. The use of fly-ash and steel dust in concrete can reduce the consumption of natural resources and also diminishes the effect of pollutant in environment. The problem arising from continuous technological and industrial development is the disposal of waste material, the utilization of waste material in concrete, not only can reduce the cost of construction, but also proves to be a safest method of its disposal. To reduce the CO₂ emission in cement plant, reduce cost of the construction material and also reduce waste disposal problems of industries and wastes material and which are turned into a valuable by products and reduce the environmental pollution. This project deals with the idea of finding suitable proportions of steel slag, flyash and metakaoline that could be related in attaining the target strength of concrete.

III. LITERATURE SURVEY

Fattuhi and Hugle (1987) In his presentation stated that different cement pastes and concrete mixes were prepared using ordinary Portland cement and subjected to sulphuric acid attack. The main parameters investigated included w/c ratio (and

cement content) and age of the cementitious materials. 102 mm cubes were immersed in a channel containing an approximately 2% solution of continuously flowing sulphuric acid. The changes in weight with time for each cube were determined continuously up to a maximum exposure period of 50 days. The results indicated that the deterioration of the cubes for this high acid concentration decreased with a decrease in the cement content. The effect of age was slightly more significant for cement paste than for concrete cubes.

Fareed Ahmed Memon et al (2010) in this study concrete cube are made with OPC (Ordinary Portland Cement) and with different configurations of fly-ash by replacing cement and fine aggregate. To achieve the aim of this study, total 81 concrete cubes were cast. Among 81 cubes, 9 cubes were made with normal concrete, 36 cubes were made by replacing 25, 50, 75 and 100% of fine aggregate with fly-ash and 36 cubes were made by replacing 10, 25, 50 and 75% of cement with fly ash. The cubes were 6"X6" in crosssection, and the mix design was aimed for 5000 psi. After proper curing of all 82 cubes, they were tested at 3, 7 and 28 days curing age. The cubes were tested in Forney Universal Testing Machine. The compressive strength of concrete cubes made by replacing 100% fine aggregate by fly-ash was higher than the concrete cubes made with OPC at all 3, 7 and 28 days curing ages. On the other hand, the compressive strength of concrete cubes made by replacing 50 and 75% of cement by fly-ash were quite lower than the concrete cubes made with OPC at all curing ages.

Alvin Harison et al (2014) conducted a peculiar study on the utilization of materials which can fulfill the expectations of the construction industry in different areas. In this study cement has been replaced by fly-ash accordingly in the range of 0%,10%,20%,30%,40%,50%,60%by weight of cement for M-25 mix with 0.46 water cement ratio. Concrete mixtures were produced, tested and compared in terms of compressive strength. It was observed that

20% of replacement of Portland pozzolana cement (PPC) by fly-ash strength is increased marginally (1.9% to 3.2%) at 28 days and 56 days respectively. It was observed that upto 30% replacement of PPC by fly-ash strength is almost equal to the referral concrete after 56 days. PPC gained strength after 56 days curing because of slow hydration process.

Jian Tong Ding (2002) investigated the MK or SF on the workability, strength, shrinkage and resistance to chloride penetration of concrete were investigated and compared in this study. For the given mixture proportions, MK offers better workability than does SF. As the replacement level was increased, the strength of the MK – modified concrete increased at all ages. The increase in the strength was similar to that of the SF – modified concrete. The incorporation of the both MK and SF in concrete can reduce the free drying shrinkage and restrained shrinkage cracking width. The initial cracking appeared earlier in the SF- and MK- in concrete can reduce the chloride diffusion rate significantly, with the SF concrete performing somewhat better.

Patil (2012) studied the compressive strength of concrete increases with increase in HRM content up to 7.5%. Thereafter there is slight decline in strength for 10%, 12% and 15% due excess amount of HRM which reduces the w/b ratio and delay pozzolanic activity. The higher strength in case of 7.5% addition is due to sufficient amount of HRM available to react with calcium hydroxide which accelerates hydration of cement and forms C-S-H gel. The 7.5% addition of high reactivity metakaolin in cement is the optimum percentage enhancing the compressive strength at 28 days by 7.73% when compared with the control mix specimen. The 7.5% addition of high reactivity metakaolin in cement is enhanced the resistance to chloride attack. The compressive strength of concrete incorporated with 7.5% HRM is reduced only by 3.85% as compared with the reduction of strength of control mix specimen is by 4.88%. The 7.5% addition of high reactivity metakaolin in cement is also

enhanced the resistance to sulfate attack. The compressive strength of concrete incorporated with 7.5% HRM is reduced only by 6.01% as compared with the reduction of strength of control mix specimen by 9.29%. The present study deals with the compressive strength, split tensile strength and flexural strength for cement replacement by metakaolin based concrete.

R.Srinivasan, K.Sathiya & M. Palanisamy reported on "Experimental investigations in developing low cost concrete from paper industry waste". Over 300 million tons of industrial wastes are being produced per annum by chemical and agricultural process in India. These materials pose problems of disposal and health hazards. The wastes like phosphor gypsum and red mud contain obnoxious impurities which adversely affect the strength and other properties of building materials based on them.

A Balwaik & SP Raut reported on "Utilization of waste paper pulp by partial replacement of cement in concrete". The use of paper-mill pulp in concrete formulations was investigated as an alternative to landfill disposal. The cement has been replaced by waste paper sludge accordingly in the range of 5% to 20% by weight for M-20 and M-30 mix. By using adequate amount of the waste paper pulp and water, concrete mixtures were produced and compared in terms of slump and strength with the conventional concrete.

IV. CONCLUSIONS FROM LITERATURE

In concrete cement can be replaced with 10% to 20% Flyash with maximum increase in strength beyond starts decreases. 10% to 20% cement replacement by Metakaolin is superior to all other mixes. The increase in Metakaolin content improves the compressive strength and split tensile strength up to 10% to 20% cement replacement. Compressive strength and workability increased with increase in steel slag content. Fine aggregate with 30% to 40% replacement

showed better mechanical properties in the hardened state. Compressive strength increased upto 30% of replacement with steel dust, and then decreased at all ages.

V. METHODOLOGY

Experimental program and Mix Proportions

Concrete mix design for the mix design procedure given in IS: 10262 were followed with minor modification for M25 grade for a target mean strength of 31.6 MPa. Taking into considerations, the minimum requirements for cement, fine aggregate and coarse aggregate content in kg/m^3 of concrete for M25 is 438 kg/m^3 , 812 kg/m^3 and 1033 kg/m^3 respectively. In the present experimental investigation on fly-ash, metakaoline and steel dust has been used as a partial replacement of cement and fine aggregate as an additional ingredient in concrete mixes. The effect of adding different percentages of fly-ash (10%-20% of cement), metkaoline (10%-20% of cement) and steel dust (30%-40% of fine aggregate) has additional material to concrete mixes on their compressive strength were studied.

Casting of Cube

The standard size of cube is 150 mm. Cubes of 150 mm size are suitable for concrete having a nominal maximum aggregate size 10mm to 20 mm. After the sample has been remixed, immediately fill the cube moulds and compact the concrete, either by hand or by vibration. Any air trapped in the concrete will reduce the strength of the cube. Hence, the cubes must be fully compacted. However, care must also be taken not to over compact the concrete as this may cause segregation of the aggregates and cement paste in the mix. This may also reduce the final compressive strength. Immediately after making the cubes they should be marked clearly. This can be done by writing the details of the cube in ink on a small piece of paper and placing on top of the concrete until it is demoulded.

Curing

The minimum period for curing concrete to attain maximum strength is 28 Days. The period for curing is 7 days, 28 days and 45 days. From the above graph, it is clear that concrete attains 50% of its design strength when it cured for 3-7 Days. 75% of Compressive strength achieved in 14 days and 90% of strength by 28 days as time goes on the strength increase gradually. Early strength of concrete is more important, and it is responsible for the ultimate strength of concrete. We should do proper curing as per the environment condition, type of member, etc. Maintaining the proper temperature also plays an important role in concrete as mentioned, it should not be cooler than 5deg C. It is recommended to keep concrete moist for 28 days. Nowadays Due to lack of time, the curing can be achieved by following modern techniques in 14-20 Days. But it is always recommended to keep concrete moist for at least 14 days. As per **IS 456 – 2000** concrete should not be cured less than 7 days for OPC

Testing

Compressive Strength Test a digital compressive testing machine is used for determine the compressive strength of hardened concrete as per the requirements of IS 516-1959 using standard 150mm cubes. The test was conducted on 150mm x 150mm x 150mm cube specimen at 7, 28, and 45 days. The sample cubes were placed in the testing machine. Loading were applied on the sample until the sample fails, where the reading started to decline. The test was repeated conducted on another two more cubes and the value was taken as the average.

VI. MATERIALS USED

Flyash

Fly ash is one of the residues generated in the combustion of coal. Fly ash is generally captured from the chimneys of coal-fired power plants, and is one of two types of ash that jointly are known as coal ash; the other, bottom ash, is removed from the bottom of coal furnaces. Depending upon the source and makeup of the coal being burned, the components of fly ash vary considerably, but all fly ash includes substantial amounts of silicon dioxide (SiO₂) (both amorphous and crystalline) and calcium oxide (CaO), both being endemic ingredients in many coal bearing rock strata. About 43 percent is recycled and often used to supplement Portland cement in concrete production.

Chemical Properties of cement and Fly Ash

Table 1

Properties	Cement	Flyash
Ca O	63	12.9
Si O ₂	34	44.5
Al ₂ O ₃	5.5	21.1
SO ₃	1.92	7.87
Na ₂ O	-	6.25
K ₂ O	0.48	0.8
Specific gravity	3.15	2.1-3.0



Figure 2. Flyash

Metakaoline

Meta kaolin is not a by-product. It is obtained by the calcinations of pure or refined Kaolinite clay at a temperature between 6500 C and 8500 C, followed by



Figure 1. compressive testing machine

Workability test by Slump test Concrete slump test or slump cone test is to determine the workability or consistency of concrete mix prepared at the laboratory or the construction site during the progress of the work. Concrete slump test is carried out from batch to batch to check the uniform quality of concrete during construction. The slump test is the most simple workability test for concrete, involves low cost and provides immediate results. Due to this fact, it has been widely used for workability tests since 1922.

Experimental Analysis

To study and compare the behavior of concrete using flyash, metakaoline and steel dust as partially replacement of cement and fine aggregate experimental investigations as mentioned were carried out on concrete samples for their strength and properties. The concrete samples were cast with mix 1:1.85:2.35. The tests were carried out after 7, 28, 45 days of the casting of concrete specimen. Summary of the test result for concrete mixes with partially replacement of fine aggregate using steel dust and the partially replacement of cement with flyash and metakaoline as recorded.

grinding to achieve a fineness of 700-900 m²/kg. It is a high quality pozzolonic material, which is blended with cement in order to improve the durability of concrete. When used in concrete it will fill the void space between cement particles resulting in a more impermeable concrete. Meta kaolin, is a relatively new material in the concrete industry, is effective in increasing strength, reducing sulphate attack and improving air-void network. resulting in an increased strength and reduced porosity and therefore improved durability.

Chemical Properties of Cement and Metakaolin

Table 2

Properties	Cement %	Metakaolin %
Silica (SiO ₂)	34	54.3
Alumina Al ₂ O ₃	5.5	38.3
Calcium oxide CaO	63	0.39
Ferric oxide Calcium oxide (Fe ₂ O ₃)	4.4	4.28
Magnesium oxide (MgO)	1.26	0.08
Potassium oxide (K ₂ O)	0.48	0.50
Sulphuric anhydride (SO ₄)	1.92	0.22
Specific gravity	3.15	2.5



Figure 2. Metakaoline

Steel Dust

Slag is a partially vitreous by-product of the process of smelting ore, which separates the desired metal fraction from the unwanted mass. slag is usually a mixture of metal oxides and silicon dioxide. Ground granulated slag is often used in concrete in

combination with Portland cement as part of blended cement. Ground granulated slag reacts with water to produce cementitious properties. Concrete containing ground granulated slag develops strength over a longer period, leading to reduced permeability and better durability. Since the unit volume of Portland cement is reduced, this concrete is less vulnerable to alkali-silica and sulphate attack.

Chemical Properties of cement and Steel dust

Table 3

Properties	Cement	Steel dust
Al ₂ O ₃	5.5	21.4
CaO	63	0.32
Fe ₂ O ₃	4.4	64.35
MgO	1.26	0.17
SiO ₂	34	13.21
MnO	-	0.06
Specific gravity	3.15	2.68



Figure 3. steel dust

Cement

Ordinary Portland Cement (43 grade) conforming to IS IS 8112 : 2013 was used for the experimental work. Laboratory tests were conducted on cement to determine specific gravity, fineness, standard consistency, initial setting time, final setting time and compressive strength. In this work 10%-20% of cement was replaced by fly ash and metakaoline. Specific gravity of cement was 3.15.

Fine Aggregate

Tests were done according to IS 2386 (part 3):1963. M sand passing through 4.75mm sieve conforming to zone II as per IS 383:1970 was used for the experiment.

The properties of fine aggregate are, Specific gravity 2.61 and Fineness modulus 2.97.

Coarse Aggregate

Coarse aggregate used in this study were 20mm nominal size, and were tested as per the Indian Standard Specifications IS 383:1970. Its physical properties and sieve analysis results are shown in Table 3.5 and 3.6 respectively. The particle size distribution curve in Figure 3.4 shows that the coarse aggregate belongs to the standard zone.

VII. EXPERIMENTAL INVESTIGATION

In the present experimental investigation on fly-ash, metakaoline and steel dust has been used as a partial replacement of cement and fine aggregate as an additional ingredient in concrete mixes. The effect of adding different percentages of fly-as (10%-20%), metkaoline (10%-20%) and steel dust (30%-40%) has additional material to concrete mixes on their compressive strength were studied.

VIII. TEST RESULTS & DISCUSSION

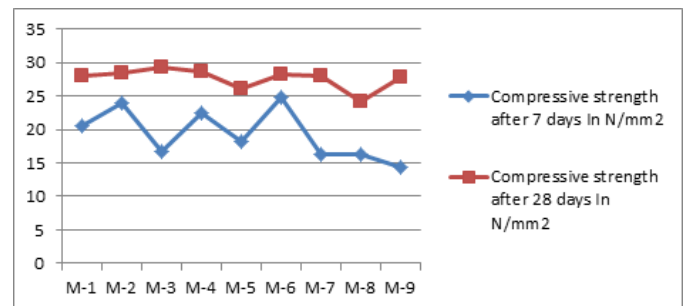
The test was conducted on 150mm x 150mm x 150mm cube specimen at 7, 28, and 45 days. The sample cubes were placed in the testing machine. Loading were applied on the sample until the sample fails, where the reading started to decline. The test was repeated conducted on another two more cubes and the value was taken as the average. (IS:516-1959)

The mix proportion design and compressive test result after 7 and 28 days are presented in Table.

Mix design-1. (flyash + steel powder)

Mix design	replace OPC Cement with		FA replaced with steel dust	Compressive strength after 7 days in N/mm2	Compressive strength after 28 days in N/mm2
	Flyash	Metakaoline			
M-1	-	-	-	20.55	28.11

M-2	-	-	30	24.00	28.44
M-3	-	-	40	16.66	29.33
M-4	10	-	-	22.44	28.66
M-5	20	-	-	18.11	26.11
M-6	10	-	30	24.88	28.22
M-7	10	-	40	16.22	28.11
M-8	20	-	30	16.33	24.22
M-9	20	-	40	14.44	27.72

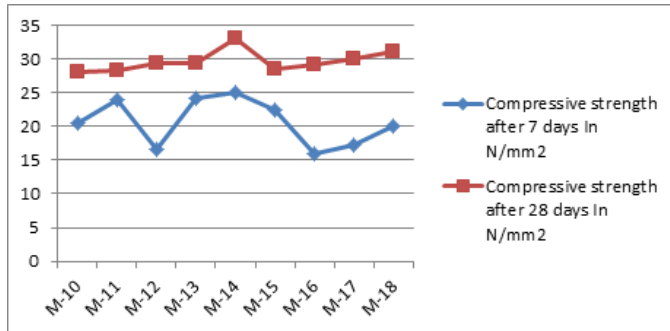


Graph. 1.0 Compressive strength results of Fly-ash and steel dust in concrete

Mix design-2. (metakaoline + steel powder)

Mix design	OPC replaced with		FA replaced with steel dust	Compressive strength after 7 days in N/mm2	Compressive strength after 28 days in N/mm2
	Flyash	Metakaoline			
M-10	-	-	-	20.55	28.11
M-11	-	-	30	24.00	28.44
M-12	-	-	40	16.66	29.33
M-13	-	10	-	24.22	29.33
M-14	-	20	-	25.11	33.11
M-15	-	10	30	22.55	28.55
M-16	-	10	40	16.00	29.30

M-17	-	20	30	17.22	30.11
M-18	-	20	40	20.00	31.22

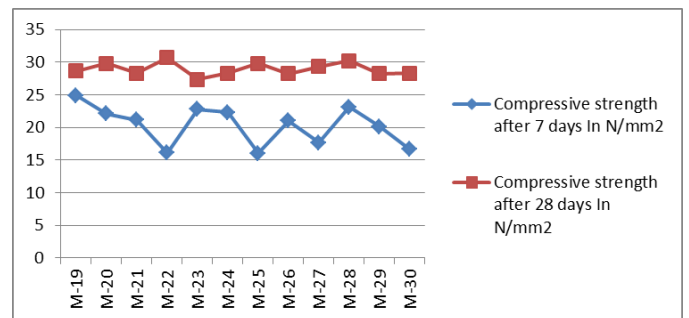


Graph. 2.0. Compressive strength results of metakaoline and steel dust in concrete

Mix design-3. (flyash + metakaoline + steel powder)

Mix design	OPC replaced with		FA replaced with steel dust	Compressive strength after 7 days in N/mm²	Compressive strength after 28 days in N/mm²
	Flyash	Metakaoline			
M-19	10	10	-	24.88	28.66
M-20	20	20	-	22.11	29.77
M-21	10	20	-	21.11	28.31
M-22	20	10	-	16.11	30.66
M-23	10	10	30	22.77	27.33
M-24	10	10	40	22.33	28.33
M-25	20	20	30	16.00	29.77
M-26	20	20	40	20.98	28.22
M-27	20	10	30	17.66	29.33

27					
M-28	10	20	40	23.11	30.22
M-29	10	20	30	20.11	28.22
M-30	20	10	40	16.66	28.33



Graph. 3.0. Compressive strength results of Fly-ash, metakaoline and steel dust in concrete

IX. CONCLUSIONS

1. The compressive strengths of concrete (with 0%, 10% and 20%, weight replacement of cement with Flyash and 0%, 30% and 40% weight replacement of fine aggregate with steel dust) cured in water for 7, 28 days indicate that at 10% replacement of flyash and 40% replacement of steel dust there is increase in strength and beyond that the strengths decreased, also the combined mix of flyash 10% of cement and steel dust 40% of fine aggregate increase in compressive strength beyond that the strengths decreased
2. The compressive strengths of concrete (with 0%, 10% and 20%, weight replacement of cement with metakaoline and 0%, 30% and 40% weight replacement of fine aggregate with steel dust) cured in water for 7, 28 days indicate that at 20% replacement of metakaoline and 40% replacement of steel dust there is increase in strength and beyond that the strengths decreased, also the combined mix of metakaoline 20% of cement and steel dust 40% of fine aggregate increase in compressive strength beyond that the strengths decreased
3. Fine aggregate with 40% replacement with steel dust showed better mechanical properties in the

hardened state. Compressive strength increased upto 40% of replacement with steel dust, and then decreased at all ages. The combined mix of flyash 10% of cement, metakaoline 10% of cement and steel dust 40% of fine aggregate increase in compressive strength at 28th day

X. REFERENCES

- [1]. A.H.L.Swaroop, K.Venkateswararao, and Prof P Kodandaramarao (2013), Durability Studies On Concrete With Fly Ash & Ggbs, International Journal of Engineering Research and Applications (IJERA), Vol. 3, Issue 4, pp.285-289.
- [2]. Alvin Harison, Vikas Srivastava and Arpan Herbert (2014), Effect of Fly Ash on Compressive Strength of Portland Pozzolona Cement Concrete, Journal of Academia and Industrial Research (JAIR), Vol 2, Issue 8, pp 476-479.
- [3]. Sabir B.B, Wild S, Bai J, "Metakaolin and calcined clay as pozzolans for concrete :a review" Cement and concrete composite 23 ,(2001),pp.441-454.
- [4]. Jian-Tong Ding and Zongjin Li "Effects of Metakaolin and Silica Fume on Properties of Concrete" ACI Materials Journal/July-August 2002,pp.393-398
- [5]. Badogiannis E, Papadakis V.G., Chaniotakis E, Tsivilis S, "Exploitation of poor Greek kaolins: Strength development of metakaolin concrete and evaluation by means of k-value" Cement and Concrete Research 34 (2004),pp.1035-1041.
- [6]. S.Tanveer Hussain, K.V.S Gopala Krishna Sastry " Study of strength properties of concrete by using micro silica and nano silica" in IJRET, eISSN: 2319-1163 | pISSN: 2321-7308, Vol-3, Issue: 10, Oct-2014.
- [7]. Mohammad Panjehpour, Abang Abdullah, Abang Ali, Ramazan Demirboga "A review for characterization of silica fume and its effects on concrete properties ".
- [8]. Aman Jatale, Kartikey Tiwari, Sahil Khandelwal (2013) - "Effects on Compressive Strength When Cement is Partially Replaced by Fly Ash" IOSR Journal of Mechanical and Civil Engineering, e-ISSN 2278-1684, Vol. 5, pp 34-43. [
- [9]. Justice J.M, Kennison L.H, Mohr B.J., Beckwith S.L, McCormick L.E, Wiggins B., Zhang Z.Z, and Kurtis K.E, "Comparison of Two Metakaolins and a Silica Fume Used as Supplementary Cementitious Materials" SP-228(Volume1&2) Seventh International Symposium on Utilization of High-Strength/HighPerformance Concrete, June(2005),SP228.
- [10]. P.S.Kothai and Dr.R.Malathy (2014), Utilization of Steel Slag in Concrete as a Partial Replacement Material for Fine Aggregates, International Journal of Innovative Research in ScienceEngineering and Technology, Vol 3, Issue 4, pp 11585-11592.
- [11]. Parvati V. K and Prakash K.B (2013), Feasibility Study of Fly Ash as a Replacement for Fine Aggregate in Concrete and its Behaviour under Sustained Elevated Temperature, International Journal Of Scientific & Engineering Research, Vol 4, Issue 5, pp 87-90.

A Review on Fuzzy Keyword Matching for Search Through Encrypted Data in Cloud Computing

Anushree Charde, Revati Khodke, Utkarsha Thakare, Tejas Gandole, Saurabh Dhale

Computer engineering, Bapurao Deshmukh College of Engineering, Wardha, Maharashtra, India

ABSTRACT

Cloud computing is now days booming data store for users. Users intend to store data on the cloud so as to reduce the burden on the system and saving their capital investment towards the management of data. As there is millions of users' uses cloud storage data has to be stored in secured or an encrypted form before outsourcing to the cloud. Because cloud computing allows a user to store and retrieve the data from anywhere and on any type of the device according to the users need. This transformation or manipulation of data at cloud gives rise to several security issues as data is going to be accessed by the user on the internet. In general sense the user may often misspell the keywords while searching for a particular file. In our solution to this, we are using N-gram algorithm to quantify keywords similarity and develop two advanced techniques such as based-trie traverse searching scheme. The paper reviews the concept of fuzzy keyword search over encrypted data using cloud computing and the algorithms and mechanisms utilized for it.

Keywords: Cloud Computing, Fuzzy Keyword Search, Encryption Technique

I. INTRODUCTION

Day by day we are utilizing the digital documents and stepping up into the big data era, terabytes of data is getting produced worldwide per day. Users, business analysts and other entities that use systems are getting attracted by cloud computing for its vast and scalable storage or computing resources, low cost and the payment policy which charges as per your storage goes.

Variety of users can access and share information stored in the cloud independent of locations. The outsourced data may contain very sensitive information such as e-mails, company financial data, government documents, Personal Health Care records, facebook photos and business documents [9]. The cloud storage facility have various privacy issues so, cloud clients tends to encrypt the data before outsourcing it to the cloud. This encryption of data

obviates the searching based data utility [4] and hence the need of various mechanisms and algorithms to search over encrypted data appears.

Moreover, in Cloud Computing, data owners may share their outsourced data with a large number of users. The individual users might want to only retrieve certain specific data files they are interested in during a given session. One of the most popular ways is to selectively retrieve files through keyword-based search instead of retrieving all the encrypted files back which is completely impractical in cloud computing scenarios. Such keyword-based search technique allows users to selectively retrieve files of interest and has been widely applied in plaintext search scenarios, such as Google search [11].

By integrating the trapdoors of keywords within the index information, effective keyword search can be realized while both file content and keyword privacy

are well-preserved. Although allowing for performing searches effectively and securely, the existing searchable encryption methods do not suit for cloud computing scenario since they support only *exact* keyword search.

For any effective practical searching utilization of the key idea, a user should be allowed to search using the fuzzy keywords i.e. the user supposed to type the misspelled words as keywords to search for the particular file on stored on the cloud.

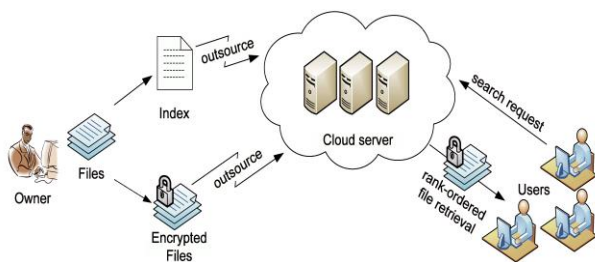


Figure 1. Architecture of fuzzy keyword search [7]

Although a client has mistaken to type the keyword but system should present it with the correctly spelled name of the files which are closest to match with the keywords that has been typed by the user in search. In this paper we focus on fuzzy keyword a matching technique which is supposed to be a non-trivial part in searching through encrypted cloud data.

The rest of paper is organized as follows: Section II presents Literature review that describes some necessary background for the techniques used in this paper. Section III introduces the proposed system and the algorithms that are going to be the part of our proposed system. Finally Section IV concludes the paper.

II. LITERATURE REVIEW

we have gone through the various mechanisms and techniques imposed by some authors. We come up with several techniques that we can apply to do our work better. Here is some related information that can be applied to the system described above,

Wen-Chung Kuo et al. [1] proposed that cloud computing is a trending data storage house in the networking industry. Storing data in the cloud can raise the storage overhead and reduce the costing of both hardware and software for the users. However, the clients cannot trust the cloud storage in the sense of security and privacy. So, there is a need of encryption of data before outsourcing to the cloud, There are some encryption techniques that supports exact keyword search. This paper provides the fuzzy keyword searching techniques for encrypted data.

Fang Zheng Li et al. [2] this paper elaborates the various techniques for searching the fuzzy words encountered by the users. The top-k algorithm has been employed in this paper for searching the results of the precision queries. Experiment results show that average precision and average recall are good enough to correspond to actual situation when query sets are come from normal school fuzzy sets.

Dr. Nanendra Shekokar et al. [3] proposed that With the increased rate of growth and adaptation of cloud computing, daily, more and more sensitive information is being centralized onto the cloud. For the protection of valuable proprietary information, the data using keywords but these techniques account for only exact keyword search. This makes paper we focus on secure storage using Advance Encryption Standards (AES) and information retrieval by performing fuzzy keyword search on this encrypted data. The AES is used to encrypt the files that are going to be outsourced .In the proposed solution, we exploit edit distance to quantify keywords similarity and develop an efficient technique for constructing fuzzy keyword sets, which focus on reducing the storage and representation overheads.

M A Manazir Ahsan et al. [4] proposed that, user like business entities, researchers are getting attracted towards the cloud storage. Though, cloud provides scalable data storage utility most users are not comfortable to store data on the cloud for security

purpose. However, existing schemes suffer either from efficient handling of multi-letter errors or cannot distinguish anagrams. In this paper, we propose a scheme for fuzzy keyword search on encrypted data concentrating on fuzzy word matching among dictionary words. Our proposed scheme constructs a transformed keyword (monogram set) based on each letter and its position in the word, which enables to find out original word from its typo secured with maximum similarity metric. As a similarity metric, we have chosen a modified version of Jaccard similarity which ensures maximum similarity for the closest word possibly the original one. Our experiment also suggests the applicability of our scheme.

Jing Chen et al. [5] in this paper that motivated by privacy preservation requirements for outsourced data, keyword searches over encrypted cloud data have become a hot topic. Compared to single-keyword exact searches, multi-keyword fuzzy search schemes attract more attention because of their improvements in search accuracy, typing mistakes, and user experience in general. However, existing multi-keyword fuzzy search solutions are not sufficiently efficient when the file set in the cloud is large. In this framework, a novel two-stage index structure is exploited to ensure that search time is independent of file set size. The multi-keyword fuzzy search function is achieved through a delicate design based on the Gram Counting Order, the Bloom filter, and the Locality-Sensitive Hashing index.

III. PROPOSED WORK

Implementation of fuzzy keyword search :

consider a scenario where a private enterprise would like to centralize its data. Files are encrypted using AES and outsourced to cloud storage. At the same time the information is stored in a FILE INDEX: 1. File ID. 2. Keywords 3. File Name. We derive out fuzzy keyword sets from this FILE INDEX using N-GRAM algorithm and JACCARD coefficient to calculate the keywords similarity. To avoid enumerating all fuzzy

keywords, and thus reducing the search space, we eliminate keywords with JACCARD coefficient smaller than our threshold value. Search results are ranked according to our proposed weighted ranking function. These fuzzy keywords sets are associated with their respective file identification. On the fuzzy keyword sets generated, the trap-door function is applied. The keyword trapdoors and file ID's are now outsourced to cloud storage.

GRAM – BASED TECHNIQUE:

Another efficient technique for constructing fuzzy set is based on grams. The gram of a string is a **substring** that can be used as a signature for efficient approximate search. While gram has been widely used for constructing inverted list for approximate string search, we use gram for the matching purpose. We propose to utilize the fact that any primitive edit operation will affect at most one specific character of the keyword, leaving all the remaining characters untouched. In other words, the relative order of the remaining characters after the primitive operations is always kept the same as it is before the operations.

For example, the gram-based fuzzy set SCASTLE, 1 for keyword CASTLE can be constructed as {CASTLE, CSTLE, CATLE, CASLE, CASTE, CASTL, ASTLE}.

ADVANCE ENCRYPTION STANDARD

AES is an encryption algorithm used for encryption of files that are going to be outsourced. The 4x4 matrix of bytes made from 128-bit input block is referred to as the state array. Before any round-based processing for encryption can begin, input state is XORed with the first four words of the schedule. The importance of fuzzy search has received attention in the realisation of plaintext searching for information retrieval. This problem was addressed by allowing user to search relevant information based on approximate string matching. It seems possible for one to directly apply these string matching algorithms to the context of searchable encryption by computing

the trapdoors on a character base within alphabets. However, this simple construction suffers from dictionary and statistical attacks due to lack of privacy-preserving encryption methods. Among the searchable encryption techniques, most of those works are focused on efficiency improvement and formalization of security definitions. Searchable encryption's first construction was proposed by Song et al, in which each word in the document is encrypted independently under a special two-layer encryption construction. Goh proposed views Bloom filters for constructing the indexes for data files to achieve more efficient search Chang et al And Curtmola et al both proposed similar approaches, in which a single encrypted hash table index is built for the whole of file collection. In this, each entry consists of the trap-door of a keyword and an encrypted set of file identifiers whose corresponding data files contain the keyword. A complementary approach was presented by Bonehet alas public-key based searchable encryption scheme

JACCARD ALGORITHM

this paper proposed the similarity measurement method between words by deploying Jaccard Coefficient. Technically, we developed a measure of similarity Jaccard with Prolog programming language to compare similarity between sets of data. Furthermore, the performance of this proposed similarity measurement method was accomplished by employing precision, recall, and F-measure. Precisely, the test results demonstrated the awareness of advantage and disadvantages of the measurement which were adapted and applied to a search for meaning by using Jaccard similarity coefficient. A measure of similarity of the search words. The determination of the association between two words with Jaccard coefficient. Jaccard index is a name often used for comparing similarity, dissimilarity, and distance of the data set.

N-GRAMS ALGORITHM

N-Grams is a word prediction algorithm using probabilistic methods to predict next word after observing N-1 words. Therefore, computing the probability of the next word is closely related to computing the probability of a sequence of words.

Simple (Unsmoothed) N-grams

The simplest probabilistic model for word prediction can be assigning equal probability to each word. So suppose that there are N words in a language, then the probability of any word following another word would be $1/N$. However, this approach ignores the fact that some words are more frequent than the others in languages.

An improvement to the model above would be assigning the probability of a word w_i following the word w_{i-1} is the probability of the word w_i itself. For example, word "the" occurs 7% in Brown corpus, and "rabbit" occurs at a frequency of $1/10.000$. Then, for any word, the probability of the next word being "the" is %7. However, this ignores that in some contexts, occurrence of the "rabbit" after a word is much more probable than occurrence of "the". For instance, "rabbit" following the word "white" seems much more logical than the word "the" following "white".

IV. CONCLUSION

The paper studies the various searching techniques for the encrypted cloud data. The paper gives information about the limitations of previously available searching techniques that are suitable for searching plaintext data and not to the cloud scenarios. The techniques that we have studied like N-gram, Jaccard, AES are efficient and yet privacy preserving as well as easy to implement.

We have presented the various security and data utilization issues in cloud storage related to available searching techniques.

The various issues that has been overcome are keyword privacy, index privacy, query privacy, fine search, scalability, index Security, efficiency.

V. REFERENCES

- [1]. Wen-Chung kuo, I-Hsien Liu, Yu-Hsin Lin, Jung-ShianLi,Chuan-Gang Li,"a secure multi-keyword fuzzy search with polynomial function for encrypted data in cloud computation", in 3rd international conference on computer and communication system 2018.
- [2]. FangZheng Li, Da Yong Luo,DongXie, "Fuzzy queries of numerical attributes for keyword-based search over relational databases", in IEEE 978-1-4244-4738-1/9/\$25.00 in 2009.
- [3]. Dr. NarendraShekokar, KunjitaSampat, ChandaniChandawall, Jahnavi Shah, "Implementation of Fuzzy Keyword Search Over Encrypted Data in Cloud Computing", International Conference on Advance Computing Technologies and Application 2015.
- [4]. MA Manazir Ahsan, MusaratSabilah, Ainuddin Wahid Bin Abdul Wahab, Mohad Yamani Idna Bin Idris,"An Efficient Fuzzy Keyword Matching Technique for searching through Encrypted Cloud Data", in IEEE 978-1-5090-6255-3/17/\$31.00 in 2017
- [5]. Jing Chen,Kun He, Lan Deng, QuanYuan,Ruiying Du, Jie Wu, "ElimFS: A Chieving Efficient, Leakage-Resilient And Multi-Keyword Fuzzy Search On Encrypted Cloud Data",in IEEE 2017.
- [6]. Seo-Young Noh, AmolJaikar, "NOVEL:NO-VOWEL Technique To Search Fuzzy Keyword",in 2017 IEEE 18TH International Conference On Mobile Data Management.
- [7]. QianWang,JunLi,Cong Wang, NingCao, KuiRen and Wenjing Lou, "Fuzzy Keyword Search Over Encrypted Data in Cloud Computing", in Mini-Conference IEEE INFOCOM 2010.
- [8]. Sonal Rahul Jandade,Jyoti N. Nandimath, "Survey on Keyword Search in Encrypted Data With Privacy Presentation", in International Journal Of Science and Research in 2016.
- [9]. KalyaniSonawane, Rahul Dagade,"A Survey On Multi-Keyword Ranked Search Over Encrypted Cloud Data Owners", in International Journal Of Computer Application(0975-8887)Volume 162-No 11 March 2017.
- [10]. QanqunXu, Hong Shen, YingPengSang, HuiGian, " Privacy-Preserving Ranked Fuzzy Keyword Search Over Encrypted Cloud Data", in 2013 International Conference On Parallel And Distributed Computing Application And Technologies.
- [11]. Google, "Briteney Spears Spelling Correction,"Referenced online at <http://www.google.com/jobs/briteney.html>,june 2009

Accident Detection using GSM , GPS module and Solar Cell

Manjiri N. Pise, Nikita D. Tembhe, Kalyani A. Salodkar, Vishal B. Wandile, Vrushabh D. Gaurkar
Computer Engineering Department, Nagpur University, Wardha, Maharashtra, India

ABSTRACT

In today's era, particularly within the young generation the craze to ride bike is increasing. The middle class family prefers to buy two wheeler over a four wheeler because of their low price. That's why the number of two wheelers on the road is increasing. Currently accidents are most important problem which is faced by a rider. Sometimes riders have to loss their lives because of no one at the place where accident occurs to inform to the family members and ambulance. To overcome this problem we built a helmet. A smart helmet could be a special plan that makes bike driving safer than before. This is often enforced victimization GSM and GPS technology. The operating of this sensible helmet is extremely easy, vibration sensors are placed in numerous places of helmet wherever the chance of touching is a lot of that is connected to microcontroller board. Thus once the rider crashes and therefore the helmet hit the bottom, these sensors sense and offers to the microcontroller board, then controller extract GPS information victimization the GPS module that's interfaced thereto. Once the information exceeds minimum stress limit then GSM module mechanically sends message to motorcar or relations.

Keywords: Helmet, sensors, GPS, GSM, Microcontroller, Arduino

I. INTRODUCTION

It is a well-known fact that young generation prefers bikes and motorcycle over four wheelers. A survey indicates that more than 70% of the riders avoid wearing helmet without any specific reason.

The idea of developing this work comes from our social responsibility towards society. In many accidents that occur around us, there is a huge loss of life [1]. In keeping with a survey of Asian country, there are around "7500" folks die on roads annually that occur because of bike accidents. There are varied reasons for accidents like not having adequate ability to drive, defective 2 wheelers, rash driving, "drinking and driving", etc. Nearly 1/2 cut folks die because of lack of treatment in correct time. There might reasons for this like late arrival of motorcar, nobody at the place wherever accident happens. Therefore, it's vital

that there ought to be a facility to attenuate the when effects of those accidents.

A thought of finding some solution to resolve this problem come up with this idea of giving information about accident as soon as possible and in time ! After all time matters a lot.

The idea of this work is to give information about the rider wearing the helmet or not, whether the rider drunken or not and also, he met with an accident it gives an information about location where he is met with an accident through GSM module to mobile numbers family members, so I have chosen GSM technology to give the information by sending SMS, using GSM module which has SIM card slot to place the SIM and send SMS. Sending SMS alone can't help the driver, if we send and an 2 SMS saying that accident had occurred where the ambulance will

come without knowing the location of the accident. So to trace out the location where exactly accident occur using GPS module, and gives to microcontroller, then it sends the SMS which contains the latitude and longitude of an area to family members mobile numbers For this we use GPS module to extract the location of the accident, the GPS data will contain the latitude and longitude values using which we can find the accurate position of the accident place.

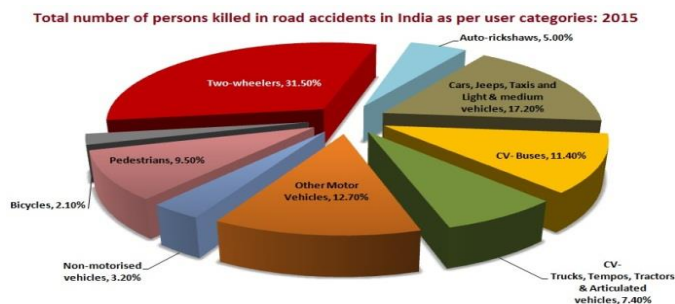


Figure 1. Percentage of accident due to different transportation mode (2015)

A. Objective

1. Force the riders to wear their helmets. As per the law and to maximize the survivability of the rider in case of an accident, wearing helmet is must. If the rider isn't wearing his helmet, he should not be able to start his two wheeler.
2. Detect accidents reliably by removing false positives. The threshold for acceleration change to be classified as an accident should be suitable. Too high a threshold would discard the accidents and too low a threshold would lead to false positives.
3. Report accidents to authorities and to the assigned emergency contact. The notification should also have the location of the accident so that help can be sent immediately.
4. Consolidate and plot the accidents on a map to prevent future accidents by identifying accident hot-spots. This is done with the help of Google maps.
5. Sending SMS from GSM module to mobile phone.

II. PROPOSED SYSTEM

At the time of accident, the method to intimate and locating the place of the victim could be a bit troublesome task that's to be discovered. The credentials of the victim square measure unknown that is tedious throughout crucial moments for the individuals at the accidental spot. the most motive of the project is to style AN IOT detection and coverage system. The distinctive feature of the system is to find the victim and report the accident with the relevant info to ambulances and his involved individuals to produce a fast medical care to the victim. A Microcontroller chip is employed and a novel code is programmed during this module to attain this practicality. Vibration sensors square measure interfaced with the Microcontroller chip that senses the vibration frequency of the accident. A most stress limit of the vibration threshold is programmed within the module. The GPS module is connected to the Microcontroller and everyone this square measure embedded within the helmet. The GPS module is useful for the relations and therefore the friends, to trace the victim's location. Figure 2.1 describes the data flow of the system.

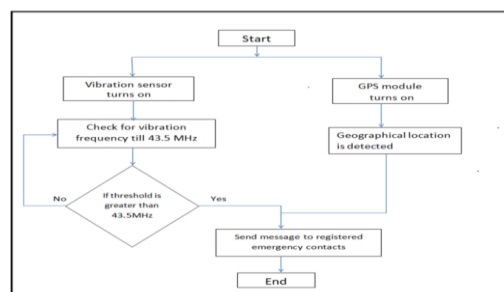


Figure 2. Data Flow Diagram

A. Proposed Architecture

The report describes the epitome of a wise helmet that aims to observe and report accidents occurring in 2 wheelers. Microcontroller interfaced with measuring instrument and GSM module and cloud service infrastructures square measure utilized to attain the ultimate objectives of notification and coverage. The helmet is developed in a way to detect an accident in two wheelers and send the geographical co-ordinates of the accident to the emergency authorities and the emergency contacts of the victim. A 6-axis

accelerometer is mounted on the helmet which continuously monitors the acceleration levels of the helmet. When an accident is detected due to inconsistent acceleration levels and exceeds the threshold, it gathers the GPS co-ordinates from the GPS module and sends a message to the emergency authorities' web server which then sends an emergency message to the assigned emergency contact of the victim.

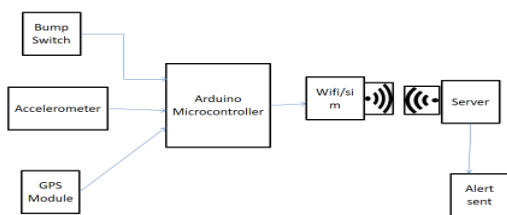


Figure 3. Architecture of System

B. Technical Studies

Hardware Requirements

- Microcontroller
- Vibration Sensor
- Alcohol Sensor
- GSM Module
- GPS Module
- Solar Cell

Software Requirements

- Programming in “C” using keil software.
- RIDE Compiler
- Microcontroller 1.2 Software

Table 1. Components

Sr. No.	Component	Quantity	Rating
1.	Microcontroller	1	
2.	Pressure Sensor	1	
3.	Vibration Sensor	1	
4.	Alcohol Sensor	1	
5.	Temperature sensor	1	
6.	GSM module	1	900 MHz
7.	GPS module	1	2.4GHz

8.	RF Transmitter	1	47 MHz
9.	Solar cell	1	6 volt
10.	LCD Display	1	
11.	LED	1	

I) Microcontroller

This is the core of the device, an inexpensive and simply offered and programmable Arduino NANO clone, with Atmega 328. It provides restricted process capability, however it's enough for our purpose. It's little, and compact, that is a crucial issue as a result of the complete hardware must be fitted within a helmet. When the device is started for the first time, the application prompts to calibrate the helmet. Upon calibrating, the calibrated values of the accelerometer are stored in the microcontroller's ROM. This is used to calculate the 'tilt' of the helmet while riding the motorbike. The microcontroller performs other operations as shown in the flowcharts later in this section.



Figure 4. Microcontroller chip

II) GPS Module

The Global Positioning System (GPS) may be a satellite-based navigation system that is employed to sight the placement wherever the accidents are going to be taken place. It detects the line of longitude and Latitude values of specific place and sends it to GSM module. It works all told weather. It additionally helps to see different units like speed, distance, time, etc. There are three pins of GPS module that is employed during this project. Receiver pin of GPS is connected to the transmitter pin of GSM module and Transmitter pin of GPS is connected to the receiver pin of GSM module and third pin is connected to Vcc.



Figure 5. GPS MODEM available in local market

III) GSM Technology

GSM (Global System for Mobile communication) may be a digital mobile telephone system that's wide utilized in Europe and different elements of the planet. GSM uses a variation of your time division multiple access (TDMA) and that the foremost wide used of the 3 digital wireless telephone technologies (TDMA, GSM and CDMA). GSM abbreviates as international System for Mobile communication. It's accustomed establish association between a laptop and GSM system. It includes customary interfaces like RS232, USB, etc.



Figure 6. GSM MODEM available in local market

IV) Gas Sensor (MQ3)

This detector is employed to sight alcohol content in biker's breath. It runs on voltage offer of 2-3.3V. It needs heater voltage with operative temperature of -10 to seventy degrees C. Its heater consumption is a smaller amount than 750mW. Its dimensions are sixteen.8mm in diameter and nine.3mm tall while not pins. It's a high sensitivity and quick interval.

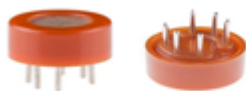


Figure 7. MQ3 Sensor

V) Vibration Sensor

This detector buffers an electricity electrical device. Because the electrical device is displaced from the mechanical neutral axis, bending creates strain inside the electricity part and generates voltages. The Vibration detector Detector is meant for the safety apply once Vibration detector Alarm acknowledges movement or vibration, it sends a symbol to either board Developed a replacement form of Omni-directional high sensitivity Security Vibration Detector with Omni-directional detection.

VI) Solar Cell

A photovoltaic cell, or solar cell, is associate device that converts the energy of sunshine directly into electricity by the electrical phenomenon result, that may be a physical and natural phenomenon. it's a variety of sensing element, outlined as a tool whose electrical characteristics, like current, voltage, or resistance, vary once exposed to lightweight. Individual photovoltaic cell devices is combined to make modules, otherwise called star panels. In basic terms one junction element photovoltaic cell will manufacture a most open-circuit voltage of roughly zero.5 to 0.6 volts.

III. IMPLEMENTATION



Figure 8. Vibration sensor

Here we connect the Arduinowith a vibration sensor. For that we install a vibration sensor with aArduino. Arduino coded with Arduino Software. After we note down the observations of vibration sensor. Up to the range of vibration is from 0 to 1023. The lowest range is 0 and highest range is 1023.

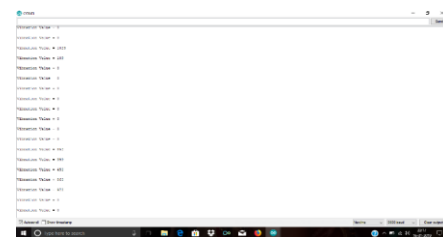


Figure 9. Reading of Vibration sensor

IV. CONCLUSION

As the final a part of this project, we'd wish to say that- "Without correct action at correct time, danger a

waits North American nation with a much bigger face". We have a tendency to should act on time once an individual is abraded. We have a tendency to should watch out of person the method it means that it's meant. Otherwise, a valuable life should be lost we'd like to grasp however precious lives of individuals are and what importance first-aid carries in saving this precious lives. The proposed work offers a solution to this problem by introducing accident detection and reporting system aiming to save at least half the lives that are lost due to bike accidents In future, this method may well be enforced for lock protection and for different safety functions. It may even be enforced to manage the speed of the vehicle and to forestall the rider from over dashing by passing the data to the rider's family. The early detection and reporting will account to the responsibility of saving many lives.

V. REFERENCES

- [1]. RashmiVashisth, Sanchit Gupta, Aditya Jain, Sarthak Gupta, Sahil, PrashantRana (2017), "Implementation and Analysis of Smart Helmet", 4th IEEE International Conference on Signal Processing, Computing and Control, Vol. No. 7
- [2]. MohdKhairulAfiqMohdRasli, Nina KorlinaMadzhi, Juliana Johari (2013), "Smart Helmet with Sensors for Accident Prevention", International Conference on Electrical, Electronics and System Engineering, Vol. No. 8
- [3]. Prof.Prem Kumar M. , Rajesh Bagrecha, "An IoT based Smart Helmet for Accident Detection and Notification ", International Digital Library Of Science &Research(IDL) Volume 1 Issue 7, July 2017.
- [4]. Prof.Chitte P.P. , Mr SalunkeAkshay S. , Mr ThoratAniruddha N., "Smart Helmet & Intelligent Bike System ", International Research Journal Of Engineering and Technology(IRJET) Volume 3 Issue 5, May 2016.
- [5]. Prof.Manjesh N, Sudarshan Raj, "Smart Helmet using GSM & GPS Technology for Accident Detection and Reporting System" , International Journal of Electrical and Electronics Research Volume 2 Issue 4, December 2014.
- [6]. A. Ajay, V. Vishnu, V. Vishwant, "Accidental Identification and Navigation System in Helmet", International Conference on Nextgen Electronics Technology, Volume 3 Issue 3, 2017.
- [7]. ShohebShabbeer, MerinMeleet, "Smart Helmet for Accident Detection and Notification", International Conference on Computational Systems and Information Technology for Sustainable Solution, 2017.
- [8]. SayanTapadar, Shinjine Ray, Robin Karlose, "Accident and Alcohol Detection in Bluetooth Enable Smart Helmet for Bike", International Conference on Computing and Network Communication, Volume 4, 2015.
- [9]. Anshu Singh Gautam, Gulshan Kumar Dubey, Mayank Mishra and MohitaPrabhat, "Smart Helmet System". Journal of Emerging Technologies and Innovative Research, Vol. 2 (4), 1165-1168, 2015.
- [10]. Jennifer William, KaustubhPadwal, Nexon Samuel, AkshayBawkar and SmitaRukhande, "Intelligent Helmet", International Journal of Scientific and Engineering Research, 591-594, 2016.
- [11]. Srikrishnan, SenthilKumarand, K. and Ravi, S., "Cloud Incorporated Smart Helmet Integrated with Two-wheeler Communication Setup", International Journal of Computer Technology and Applications, Vol.9 (4), 2025-2035, 2016.

A Literature Survey on Automatic Attendance System for BDCE using Face Detection

Jaiveer H. Thakur, Amol J. Wasekar, Mayuri A. Tijare, Renuka P. Sherje, Yamini B. Falke

Computer Engineering, Bapurao Deshmukh College of Engineering, Wardha, Maharashtra, India

ABSTRACT

Understudy record by and large contains individual data about specific individual alongside photo. To distinguish any understudy, we need some recognizable proof in regards to individual. By and large the quality and goals of the recorded picture sections is poor and hard to identify a face. To solve such issue, we are creating a computer program. Recognizable proof should be possible from numerous points of view like unique finger impression, eyes, DNA and so forth. One of the applications is face identification. The programmed participation the board will supplant the manual technique, which takes a ton of tedious and hard to keep up. There are many biometric processes, in that face recognition is the best method. In this paper we will portray the participation without human obstruction. In this strategy the camera is settled in the classroom and it will catch the picture, the appearances are identified and after that it is perceived with the database and finally the attendance is marked.

Keywords : Face Detection and Recognition, Open CV, Principal Component Analysis (PCA)

I. INTRODUCTION

Maintenance of student's attendance is the most difficult task in various institutions. Every institution has its own method of taking attendance such as using attendance sheet or by using some other biometric methods. But these methods consume a lot of time. Mostly attendance is taken with the help of attendance sheet given to the faculty members. This consumes a lot of work and time. We do not know whether the authenticated student will be responding or not due to interference of noise or lack of concentration. Calculation of attendance is another major task which may cause manual errors. Exceptions may occur, the participation sheet may end up lost or stolen by a portion of the understudies. To overcome such troubles we are in need of an automated attendance management system.

Face recognition has many advantages compared to that of the other biometric methods. Some other biometric methods follows certain restrictions i.e. there should be some voluntary action involved that object should stand straight in front of the camera or should press their finger on touchpad to give the biometric whereas in our technique there is no action involved because the camera takes the picture far away and with the help of these we easily recognize the faces. Face detection involves detecting candidate regions in an image that are possible faces. Next step, Face recognition involves identifying the student by comparing the detected face with the stored images and then classifies or recognizes his/her identity. Even though there are no standard algorithms for face recognition of faces there some classification technique for face recognition like Principal Component Analysis, Linear Discriminant Analysis, Support Vector Machine, etc. In final step ones the

student is recognized, his/her attendance is mark in excel sheet.

There are few disadvantages to overcome with the help of automatic attendance management which does not consume time and the date is not lost until we erase the data. This method is most efficient in this day.

II. SYSTEM ARCHITECTURE

Our proposed “automatic attendance using face detection” is comprised of numerous operational modules which are essential for the key operations in the system. Each module holds a specific functionality regarding the database and the datasets consisting of images and excel sheets which are processed into the system architecture. The system have the following operational flow and it is shown by the figure given below.

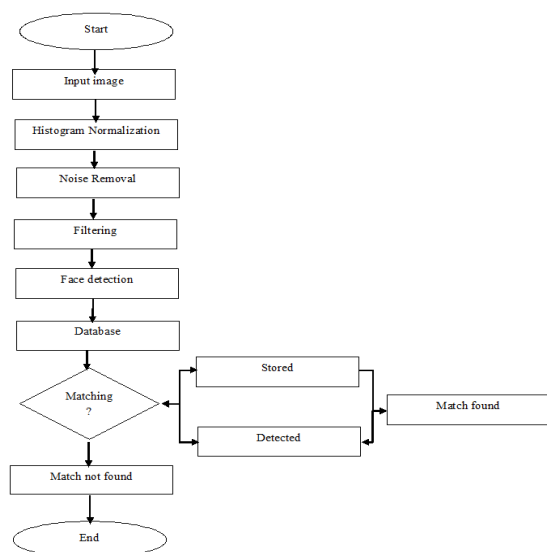


Figure 1. Flow diagram of the proposed analysis system

The flow diagram above represents the various modules in which the data is being processed at the time of operation.

III. LITERATURE REVIEW

Maintenance of student’s attendance is the most difficult task in various educational institutions.

Attendance can be maintained by using various types of techniques. Kawaguchi [1] proposed a lecture attendance system with a new method called continuous monitoring, with the student's attendance marked automatically by the camera which captures the photo of a student in the class. These techniques can consume a lot of work & time.

V. Shelu and A.Dika, [2] proposed a real-time computer vision algorithm in automatic attendance management system. The system uses a non-intrusive camera that can capture images in the classroom and compares the extracted face from the captured image with the database inside the system. This system also uses a machine learning algorithm which is usually used in computer vision. In addition, Haar classifier is used to train the images from the camera. The face captured by the camera then converted to greyscale and the image is put to subtraction process. The image then stored on the server to be processed later.

N. Kar,.[3] proposed an automated attendance management system using facial recognition technology that used the principal component analysis. This system uses two libraries which are OpenCV, a computer vision library, and FLTK (light toolkit). Both libraries help the development of the system, for example, OpenCV supports algorithm and FLTK is used to design the interface. In this system, there are two processes, namely, request matching and adding a new face to the database. In request matching, the first step is opening the camera and capturing the photo, then the face is extracted from the image. The next step is recognizing the face with the training data and projecting the extracted face onto the principal component analysis. The final step is displaying the face that closely matched the acquired image. The Haar cascade method then performed to the image to find the object in the image in different window size. The next step is storing the image into the database, then learning the face, and followed with an application of principal component analysis algorithm. The final step is storing the information inside the

face XML file. The system is focused on the algorithm to improve the face detection from acquired images or videos.

The proposed system uses Recognition technique. Photometric Recognition system is a technique which overcomes the above limitations of the previous methods. Photometric technique which is an Arithmetical strategy, can serves us discovering image processing which is also referred to digital processing. This system proposes a batch of pictures prepared & are underscored dependent on the improvement of the pictorial data for human collaboration. Thus, the single pictures are compared to the selected image from the database. The images acquired can be treated as two dimensional or three dimensional. Hence image processing is more popular in the today's generation. This is because of its availability of computer, graphics software, large memory size, its supports for surveillance and security purpose etc. We can come to the conclusion that this is the foremost & supreme technique which can erect & multiply the automated attendance management system. The various system proposed by the authors.

An Author proposed that a lecture a lecture attendance system with a new method called continuous monitoring, with the student's attendance marked automatically by the camera which captures the photo of a student in the class. The system has a simple architecture with only using two cameras installed on the wall of the class. The first camera is the capturing camera used to capture the student image in the class and the second camera is sensor camera used to capture the student image in the class and the capturing camera will snap the student image. The system then compares the picture taking from the capturing camera and images in the database. This process is done repeatedly to complete the attendance marking process.

An Author proposed a smart attendance marking system that combines two different algorithms, principal component analysis, and artificial neural

network. The study is able to solve the problem or learn from the input data and the expected value. This system also uses back propagation algorithm combined with mathematical function. The result shows that the system is able to recognize the faces in various environments.

An Author proposed a system which implements automatic attendance using facial recognition. The system can extract the object in the face such as the nose or mouth by using MATLAB with principal component analysis (PCA). The system designed to resolve issues of attendance marking system such as the time-consuming issue. Hence automatic attendance can be applied using facial recognition and using MATLAB software integrated with facial recognition technique.

An Author proposed an automated attendance management system using facial recognition technology that used the principal component analysis. This system uses two libraries which are OpenCV, a computer vision library, and FLTK (light toolkit). Both libraries helps the development of the system, for example, OpenCV supports algorithm and FLTK is used to design the interface. In this system, there are two processes, namely, request matching and adding a new face to the database. In request matching, the first step is opening the camera and capturing the photo, and then the face is extracted from the image. The next step is recognizing the face with the training data and projecting the extracted face onto the principal component analysis. The final step is displaying the face that closely matched the acquired image. Meanwhile, adding a new face to the database process is started with capturing the photo, and then the face is extracted from the image. The Haar cascade method then performed to the image to find the object in the image in different window size. The next step is storing the image into the database, then learning the face, and followed with an application of principal component analysis algorithm. The final step is storing the information inside the face XML file.

The system is focused on the algorithm to improve the face detection from acquired images or videos.

IV. OBJECTIVES

This task is expected to distinguish an individual utilizing the pictures recently taken. The identification will be done according to the previous images of different persons.

The objectives of this project are given below:

1. Detection of unique face images amidst the other natural components such as walls, backgrounds etc.
2. Extraction of unique characteristic features of a face useful for face recognition.
3. Detection of faces amongst other face characters such as beard, spectacles etc.
4. Effective recognition of unique faces in a crowd (individual recognition in the crowd).
5. Automated update in the database without human intervention.

V. CONCLUSION

This paper reviews the attendance management system based on facial recognition for BDCE. It replaces the traditional method of attendance management with an automated system which is fast, efficient, cost and time saving and the attendance is taken more accurately. This method requires only simple hardware and software for installation. One difficult task in this system is face recognition; PCA gives better performance of facial recognition by analysing facial features, region of interest and comparing with the database faces. The techniques used are trustworthy, attainable and safe enough for use.

We have gone through some algorithms as a necessity so which we used to detect the images and also to rise the outcomes of the system. The focus in future work is improving the accuracy of the system by

incorporating principal component analysis with convolution neural network. The objective is to obtain good generalization abilities for the education system. Hence this system is expected to give desired results. Also the efficiency could be improved by integrating other techniques within future.

Although a conclusion may review the main points of the paper, do not replicate the abstract as the conclusion. A conclusion might elaborate on the importance of the work or suggest applications and extensions. Authors are strongly encouraged not to call out multiple figures or tables in the conclusion—these should be referenced in the body of the paper.

VI. REFERENCES

- [1]. Y. Kawaguchi, "Face Recognition-based Lecture Attendance System," The 3rd AEARU., no. October 2005.
- [2]. V. Shehu and A. Dika, "Using real-time computer vision algorithms in automatic attendance management systems," Information Technology Interfaces (ITI), 2010 32nd International Conference on, pp. 397–402, 2010.
- [3]. N. Kar, M. K. Debbarma, A. Saha, and D. R. Pal, "Study of Implementing Automated Attendance System Using Face Recognition Technique," International Journal of Computer and Communication Engineering, vol. 1, no. 2, pp. 100–103, 2012.
- [4]. J. Joseph and K. P. Zacharia, "Automatic Attendance Management System Using Face Recognition," International Journal of Science and Research (IJSR), vol. 2, no. 11, pp. 327–330, 2013.
- [5]. J. Kanti and A. Papola, "Smart Attendance using Face Recognition with Percentage Analyzer," vol. 3, no. 6, pp. 7321–7324, 2014.
- [6]. N. Kar, M. K. Debbarma, A. Saha, and D. R. Pal, "Study of Implementing Automated Attendance System Using Face Recognition Technique," International Journal of Computer and Communication Engineering, vol. 1, no. 2, pp. 100–103, 2012.

Smart Security Using Raspberry pi, Camera module and OpenCV

Shubham S. Bansod, Gaurija Dakhole, Sandhya Kewat, Puja Nehare, Puja Nehare

Department of Computer Engineering, R.T.M.N.U., Wardha Maharashtra, Maharashtra, India

ABSTRACT

The proposed system can be extended to be used for different properties and facilities such as banks and offices. Human emotions can be understood by text, vocal, verbal and facial expressions. In this project we use the raspberry pi3 microcontroller for the processing and the raspberry pi camera is use to capture the images of person and stored it in database. If the image of person matches with database then the door will be open. The implementation recognition at real-time on raspberry pi 3 and average accuracy above 85% is achieved at real-time. In this project the algorithm use in used is Eigen face detection algorithm for the face detection and the open CV algorithm for the face detection and recognition purpose. The main application of this project is to provide security to the very confidential and more secure areas. To provided remote monitor and control for the home appliances. The propose system can be extended to be used for different properties and facilities. It provided maximum safety to the academic and business field.

Keywords: Raspberry pi 3, Raspberry pi camera, smart home, door system, image processing, OPENCV, python, home automation security

I. INTRODUCTION

Nowadays technology plays an important essential role in our daily life in which different types of interests are taking advantages by this technology. Nowadays, smart phones and computers have significantly contributed to our daily life where many adjustments and computations are being completing such types of technologies. Security of homes has become one of the most concerning issues are facing many of the people. By the expanded duration of time to leaving the home due to any work, study and other duties, our homes are being more unsecured, vulnerable for several threats specially being burgled. Most from the threats for this there are different cases where securing or the monitoring the house is very difficult, critical such as the presence of elderly individual or kids. For the home security system or so-called Home OS because it has been proposed in order to provide most secure arrangements. Such concept

tells about to turn our home into a smart in which different types of tasks especially the monitoring can be performed by the remotely. Monitoring and controlling some of the tasks inside the house have the ability to provide better maximum safety.

Home automation system is a application that connect to different types of electronic devices for the monitoring and controlling the all home appliances. This home automation system is a area that caught several attentions by the both academic and business fields. The earliest effort of home security system was relied on wired home networks however, due to the appropriate planning and construction works required to offer a wired home, such effort tend to be insufficient.

II. METHODOLOGY

In this proposed smart digital door system, the setup works in two communication modes one is Raspberry Pi and another is email modes, Raspberry Pi is a small computer board working on the Linux operating system which connects to a computer monitor, keyboard and mouse. Raspberry Pi can be used to electronic appliances and programming network circuits, it can also be use as a personal computer and Apache Web server, MySQL, can be installed in the board.

The input is placed for the control module is keypad screen of the user or new visitor. The control module is then start its camera PI and capture image then send the file to the database by help of Email. The result data sends to user includes the access to the door for the user at the door by using LED (red and green). It also includes message alarm on door and also sending live feeds to the owner and notifications to the owner about the user when authorized person he/she enters and leave the house.

The control module controls the camera pi, keypad and communication between server and all the important running processes are done by this control module. The control module Raspberry Pi is the central units of the door lock system where all process cycle is done. The control module is the server for verify the user id and the microcontroller. Camera is connected to Raspberry Pi 3 for surveillance purposes. All the operations are done by the control module which includes sending SMS and image to the Email of the owner, check that the guest is authorize to enter the house and the image.

III. PRIOR APPROACH

In this project with a minicomputer Raspberry pi 3 different input and output is interfaced. In info area there is calling ringer, PIR sensor & wireless camera.

In processing section a minicomputer raspberry pi 3 is used. Raspberry pi3 is equipped with wifi dongle. And on the output terminal there are Lcd, magnetic door lock, emailing services. A calling ringer is set on entryway so that on the off chance that somebody visits the client the individual will press the chime and the ringer will produce a flag to Raspberry Pi 3 indicating presence of a person. There is also another way of sensing human and that is passive infra red human motion detection sensor. If any thief tries to break into the house PIR sensor will identify the motion of that human and will transmit an alarm to Raspberry Pi 3. Most important input device is the wireless camera. It is used to see image stream and also whenever a person comes it takes a snapshot of that person and transmit it to Raspberry Pi 3. Raspberry Pi 3 process these inputs like whenever it gets a calling bell as input it transmits a signal to wireless camera to capture an image of the visitor. Inside the time it gets the image it create a Tweet alarming the client that somebody has arrived in front of entryway. After receiving the image Raspberry Pi 3 sends a mail to user attaching the picture. User can control the magnetic lock through email. In the event that client needs to allow the guest get to he can turn on the lock and on the off chance that he needs to dismiss access in any capacity whatsoever client can demonstrate the reason to LCD tweeting a text for visitor.



Figure 1. Data-set of Authentic face of a person

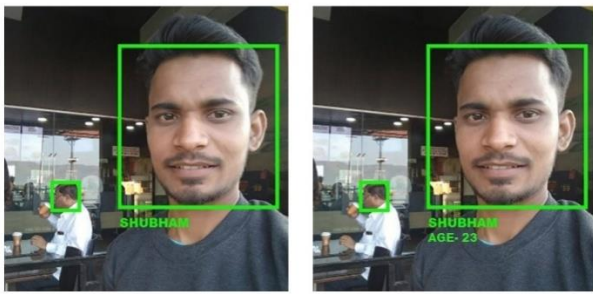


Figure 2. Face Detection Using Open CV

IV. OUR APPROACH

In this proposed work, the brief description of proposed system followed by the operation of the Raspberry Pi 3 module in our design, the screen keypad door lock and the Camera Pi module has been added. This smart digital door lock is a system to monitor and control some home devices. This smart digital door lock system works over internet network by using Raspberry Pi 3. The structure of system consists of the three phases input, processing and output. In this input phase aims to input the key for a newcomer and if the key is valid or the image of that person is matching with the image in the database, the door is opened, otherwise the door is not opened and a photo is taken and then it sent to the owner of the house by e-mail system and then if the owner of the house permitted to allow him to enter, the key and the image of that person is stored in the database. By this the person is granted permission to enter at any time by the authentication of the password in the database or by his image.

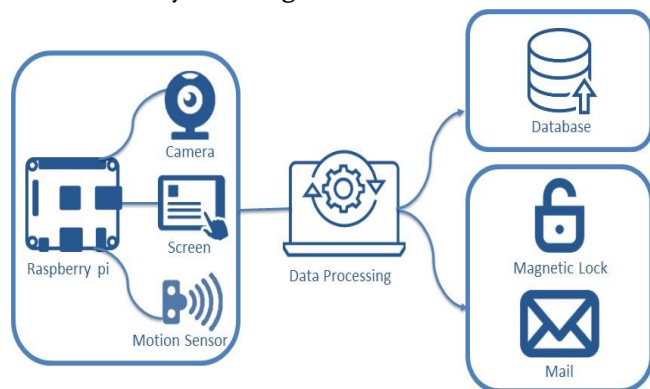


Figure 3. Existing Mechanisms for your paper

V. CONCLUSION

The project design and implemented a security system based on the Raspberry Pi. The aspects of the system are: motion using a motion sensor, video capturing using a Raspberry Pi Camera and sending out an alert through e-mail. It did not however achieved the option of image processing in the Raspberry Pi because of system constraints i.e. processor speed.

The framework can be utilized in a few spots like banks, emergency clinics, labs and other advanced mechanized frameworks, which drastically diminish the peril of unapproved section, proof can be given to" the security department if any robbery issue occurs.

VI. REFERENCES

- [1]. Naser Abbas Hussein, Inas A1. Mansoori, "Smart Door System For Home Security using Raspberry pi3", International Conference on Computer and Application, 2017.
- [2]. Nareshkumar R.M., Apoorva Kamat, Dnyaneshvari Shinde, "Smart door security control system using raspberry pi", International Journal innovations and advancement in computer science,2017.
- [3]. A. Lee, D. Tyroler, H.-J. Chen, and H. Yuk, "Home automation system ,security control system using raspberry pi", International Journal innovations and advancement in computer science,2017.
- [4]. Suchitra, Suja P, Shikha Tripathi, "Real-time emotion recognition from facial images using raspberry pi II", 3rd international conference on signal processing and integrated networks (SPIN), 2016.
- [5]. Ishita Gupta, Varsha Patil, Chaitali Kadam, Shreya Dumbre, "Face detection and recognition using raspberry pi", IEEE International WIE Conference on electrical and computer engineering, 2016.

- [6]. S.Chitnis, N. Deshpande, and A. Shaligram, "An investigative study for smart home security: Issues, challenges and countermeasures, " *Wirel. Sens. Netw*, vol. 8, pp. 61-68, 2016.
- [7]. Y. Jiang, S. Liu, X. Yang, and L. Liao, "Application of fishface algorithm to face recognition system," in *Conference Anthology*, IEEE, 2013, pp. 1- 4
- [8]. Y. T. Park, P. Sthapit and J.-Y. Pyun, "Smart digital door lock for the home automation," in *TENCON 2009-2009 IEEE Region 10 Conference*, 2009, pp. 1-6.
- [9]. I.-K. Hwang and J.-W. Baek, "Wireless access monitoring and control system based on digital door lock," *IEEE Transactions on Consumer Electronics*, vol. 53, 2007.

An E-Commerce Website for Vatsol Company

Akshay Supare, Ankita Gawhane, Pragati Meghare, Pooja Dekate, Preeti Borkar, Tejaswini Warghane

Information Technology, Bapurao Deshmukh College of Engineering, Sevagram, Maharashtra, India

ABSTRACT

In this paper, it's about the E-commerce website. Online shopping is an easy and comfortable way of shopping from a large range of products which is beneficial to the customers. There are innumerable advantages of online shopping. Customers can save a lot of time which they normally need to physically go to the retail shop i.e. outside home and buy the products that customers want. In this website all the demand of the customer is fulfilled. The company named Vatsol company provide the product to the customers with the quality and reasonable cost. This website is divided into various modules firstly the registration module which is used to register the person. Admin which has a authority to update the website as possible or as the requirement of the customers. The product browse and the product search module allow the customers to access the website. The shipping and billing module which is used for the payment. Finally this study attempts to examine that how the shopping will influence the customers online shopping attitude.

Keywords: Website, Customers, Shopping, Quality of Product, E-Commerce, Reasonable Cost, Payment

I. INTRODUCTION

Shopping online gradually becomes a kind of fashion with the prevalence of Internet and e-commerce website. At the same time, as the development and the increasing integration of network and information technology and various websites, many traditional media contents tend to digital methods.

So, this website is all about the chemical and pesticides products which is used to prevent the termites. Termites are the winged insect (such as an ant or termite) of a kind having winged and wingless forms. To avoid the occurrences of these insects the "Vatsol Company" made the three chemical products. The product name is as follows

1. "Wud-safe" Anti-termite Wood primer
2. Termi-ban" Anti-termite Wood primer
3. "Fungi-ban" Anti-Fungal/Anti Wet-Rot Wood primer.

This is the Sponsor type project which the organisation named as "Vatsol Company". The company developed the three products as named before. These three products are used to avoid termites. To make that company digitalized this website came to an existence. These products contain the cost comparatively less than other products and beneficial to the customers. This company works on the Anti-Termite product. Termite Treatment and good building methods can't completely prevent a termite infestation. So the Anti-Termite products are used. Vatsol industries introduce preproduct "wud-safe" anti-termite wood primer, "termi-ban" anti-termite building protector, "fungi-ban" anti-fulgal/anti wet-rot wood primer. This product protects all types of wood, Bamboo, wood borers, building structures etc.

Their website makes life more comfortable and advanced for the users. One such website that we are discussing here in the report is for the Vatsol

Company. This website mainly aims to minimize the difficulty of the company as well as the customers and for the more publicity of the organisation.

Following aspects are included in this Website:

- This project is a software interface between Customers and the organisation.
- This increase the publicity of the company.
- The person should have to login if not then have to register first.
- For making digital this website comes to existence.

II. LITERATURE SURVEY

E-commerce is the most vast and popular business sector. It is an online buying and selling process so its needs are as simple as the business means.. This application make life more comfortable and advanced for the users. One such Web-application that we are discussing here in the report. This application mainly aims to popularized the organisation named as "Vatsol Company" which is based on the chemical product marketing.

Authors propose in this paper that the outlines different aspects of developing an ecommerce website and the optimum solution to the challenges involved in developing one. It consists of the planning process, which starts with determining the use case, domain modeling and architectural pattern of the web application.. [1]

Authors have attempted to create an application which will help Customer to Avoid the Alates in there owner home. While purchasing the product the person have to register himself/ herself. The customer can easily access the website. [2]

The customer save a lot of time, while purchasing from the outside home. While doing the online shopping they don't need to exaggerate in the surrounding. The customer has many methods to purchase online weather it will from online payment

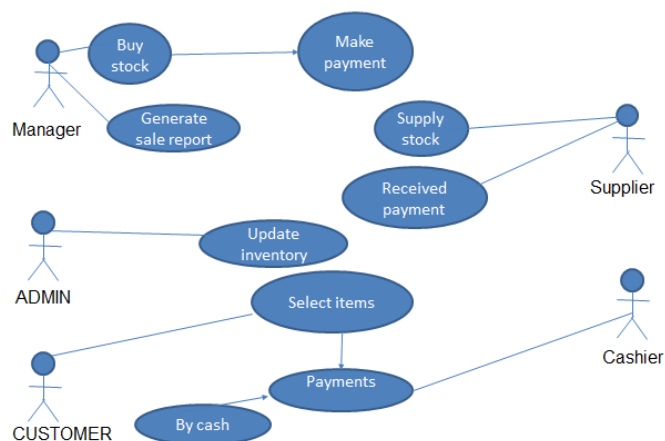
or cash in delivery. Finally, the advantages of this system are summarized. [3]

Author suggests the correlation between the utility and the quality of the product. Website can fulfil the demand of the customers. The price of the product is comparatively less than other products. It is found that the customer attitude, delivery speed, and the product quality factors. [4]

Buyers and sellers can get together through online shopping so that the services can get more and more convenient business. It introduced the online payment, order generating which make the business Digitalized. In this paper the online website has basically completed all the required features, and the customers can conveniently shop the products. [5]

III. SYSTEM ARCHITECTURE

As shown in fig. our proposed Website for the "Vatsol Company" and its architecture and its flow is given below.



This UML diagram is designed for better interaction between the customer and the Admin or the manager of that organization.

- This software very gracefully handle the requirement of the customers and their demand.

- These website is is useful which can be access from the anywhere and anytime, while sitting in their home town also.

This website enables the customers to get the information of the various products, their quality and the Vatsol company.

IV. ADVANTAGES OF E-COMMERCE WEBSITE

E-Commerce Website is very useful now-a-days in the current situation. People will know whole about the product which the company is use to sell out.

They will also know the proper information about the Company or the Organization.

- You get variety of the products.
- Comparison of the Company product with the other product available in the Website.
- The better quality of the product is published.
- Online payment can be done.
- Person can market in one roof, while sitting on sofa
- Knowledge of the product will specify perfectly.

V. CONCLUSION

This Website gives proper and accurate information of the products as well as their prices etc. The customer can also check the compatibility of the Vatsol Company products and other products. It also shows the effectiveness and quality of the product.

Thus these Website fulfil all the requirements of the customer's weather it will related to the cost or quality of the products.

COMPARISON TABLE OF "VATSOL COMPANY" PRODUCTS WITH THE OTHER PRODUCT

Table 1

Sr.No	Wud-safe/Termi-ban/Fungi-ban	Other Products (Terminator)
1.	No Pesticides Chemical. Repels termite/insects Thus 'Non-violent' methods	Mostly contain toxic pesticides. Kill all coming in contact with it.
2.	No fumes, no smell hence called environment friendly product.	While manufacturing and using, also after applying these evaporate and emit toxic fumes with very strong smell.
3.	Has fire retardant properties	No fire retardant product
4.	Cost of "Wud-safe/Termi-ban/Fungi-ban" Rs.200/liter for bigger packing to Rs 100/liter for smaller packing	Cost for Terminator and other product approx. Rs.300/Liter
5.	Effective for borers also.	No use for borers
6.	If use as per Instruction for "Wud-safe/Termi-ban/Fungi-ban" give life time guaranty for wood against termites/fungi and Termi-ban gives 10 years guarantee.Conditions apply.	Minimal and Non-Effective guaranty.

VI. REFERENCES

- [1]. S. E. Ullah, T. Alauddin and H. U. Zaman, "Developing an E-commerce website," 2016 International Conference on Microelectronics, Computing and Communications (MicroCom), Durgapur, 2016, pp. 1-4.
- [2]. A. Kumar and A. B. M. Shawkat, "i-SHOP: A Model for Smart Shopping," 2016 3rd Asia-Pacific World Congress on Computer Science and Engineering (APWC on CSE), Nadi, 2016, pp. 139-143.doi: 10.1109/APWC-on-CSE.2016.032
- [3]. A. Parashar and E. Gupta, "ANN based ranking algorithm for products on E-Commerce website," 2017 Third International Conference on Advances in Electrical, Electronics, Information, Communication and Bio-Informatics (AEEICB), Chennai, 2017, pp. 362-366.

- [4]. H. Wang and J. Yang, "Research and application of web development based on ASP.NET 2.0+Ajax," 2008 3rd IEEE Conference on Industrial Electronics and Applications, Singapore, 2008, pp. 857-860.
- [5]. G. Lan-juan, L. Quan and J. Xue-mei, "The Design and Implementation of the Online Shopping System for Digital Arts," 2010 Ninth International Symposium on Distributed Computing and Applications to Business, Engineering and Science, Hong Kong, 2010, pp. 414-416.
- [6]. Y. Li and R. Xiao, "A Relational Model Based Semantic Network Knowledge Representation Technology and Its Application," 2014 International Conference on Identification, Information and Knowledge in the Internet of Things, Beijing, 2014, pp. 100-106
- [7]. P. Wadhwa and M. P. S. Bhatia, "Social Networks analysis: Trends, techniques and future prospects," Fourth International Conference on Advances in Recent Technologies in Communication and Computing (ARTCom2012), Bangalore, India, 2012, pp. 1-6.
- [8]. Jiuru Zhao, Xinguang Li and Xia Li, "The text mining model building of open questionnaire based on LSA," 2016 IEEE Advanced Information Management, Communicates, Electronic and Automation Control Conference (IMCEC), Xi'an, 2016, pp. 435-438.
- [9]. Mohammad Daoud S.K. Naqvi Asad Ahmad "Opinion Observer: Recommendation System on E-Commerce Website" International Journal of Computer Applications (0975-8887) vol. 105 November 2014.
- [10]. Yong Soo Kim "Recommender system based on product taxonomy in E-commerce site" Journal of information science and engineering vol. 29 pp. 63-78 2013.
- [11]. N. Verma and J. Singh, "Improved Web Mining for E-commerce Website Restructuring," 2015 IEEE International Conference on Computational Intelligence & Communication Technology, Ghaziabad, 2015, pp. 155-160.
- [12]. F. Sun and L. Zhou, "Study of Authentication Mechanism of E-evidence in the E-commerce Litigation," 2012 International Conference on Management of e-Commerce

E-Reparar Online Service Portal

Ankit Mate, Saket Shahare, Saurabh Maske, Rajat Pakhale, Kushal Ghorse, Bhuwaneshwari Deshmukh

Department of Computer Technology Engineering, Rajiv Gandhi College of Engineering & Research, Nagpur,
Maharashtra, India

ABSTRACT

Today's world is of internet, everything is available on internet and easy to use and is time saving too. Most of our task for which we have to stand in a queue for hours say for example to pay electricity bill, telephone bills, water bills but with the help of internet it becomes so easy, we can pay any kind of bill by just by one tap. Same goes for online shopping of cloths, groceries, furniture. Considering the need of today's world E-Reparar developed which is an e-commerce website engaged in electronic and electrical appliances repair and service of new and old products. Providing an door to door step service to customer which in turn save time and efforts of customer. In this customer gets a door step technical assistance for their product with one tap request with minimal charges. The key idea behind this project is to provide door step services to customer to save there time and efforts. Our main motive behind this project is to boost up the local service market. It is an online service based portal in which we provide door step services to customer. Services regarding to repairing of defective electronics & electrical gadgets and products. It is a bridge from which customer can connect to entire market of service provider. Bad/faulty gadget/appliances can lead to numerous problems ranging from frequent power outages, house fires, etc. Fixing it on your own can be fatal. Gadget/appliances repairs need to be done by expert technicians as an improper work may put lives and property at risk. Our service provider are highly skilled and take full safety measures while performing a job. Thus this project present the platform for the people that significantly reduces the wastage of time and make convenient for people to repair gadgets at doorstep. Consequently, it also manages the database which is useful for checking the status of the various fields in future.

Keywords: E-Reparar, E-commerce, repair, Appliances.

I. INTRODUCTION

We are always surrounded by electronic appliances and we always use them in our day to day life and our most of the work are completely depend upon them for example computer, laptops, mobile phone, printer and we cannot imagine our life without them.

What if any of them is not working and all your work gets stuck and we do not have enough time to go to repairing shop and get our device repaired. So to make it easier E-reparar is introduced to deal with all of customers concern E-reparar is basically an online

electrical appliances repairing portal where customer register their complainant about their product and get repaired by our certified service provider at their door step.

This reduces customers time and energy to search for best service man to repair their product. In almost every home there are horde of appliances that practically remain in use throughout the day to provide us the comfort and easiness of life that we deserve.

We are really grateful to these appliances which are necessity of every home. And if you are grateful to such appliances then you must care for them too. The breakdown of electrical domestic devices is inevitable as machines after long run tend to break down.

At times they break down early due to misuse or over use. The electrical appliances like mixer/ grinder, Geysers, water heater, fan, Iron, computer, laptop, mobile etc. are widely used in almost every house hold. These electrical appliances do need periodic servicing, maintenance and repair actively.

We are not only providing electronic appliance services but we also focusing on automobiles and industrial automation. Though there are a number of authorized repair & servicing centers, provided by the authorized dealers network but still there is wide spread need of the repair & servicing centers to cater the need of repair and servicing activity for these appliances specially in semi urban and rural areas.

We provide online platform to the customer, customer can easily connect with us by registering complaint on our website or application. Customer having the option of to choose the service provider from their own cities.

1.1 Aim and Objectives

The objectives of the project is to design a smart drip irrigation system to water plants with the use of devices like raspberry pi, Arduino microcontrollers. Arduino is used to control the system wirelessly while C/C++ programming language is used for automation purpose. This system also contributes an efficient and fairly cheap automation irrigation system. System once installed has no maintenance cost and is easy to use. Environment parameters monitoring system based on wireless communication technology has been developed to control remotely, which realizes the measurement of temperature, rain fall, soil parameters.

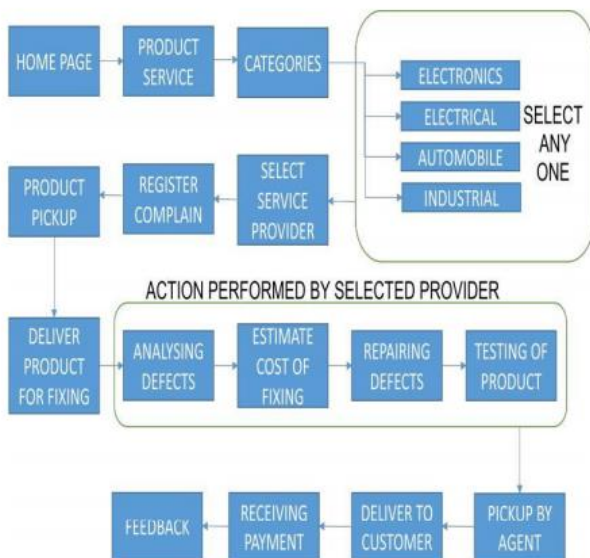
1.2 Existing Methodology

HOME TRIANGLE It is similar to our project and it is most famous e-service provider but their implementation is different they are not connecting local service provider to the customer they provide their own service agent and service is in limited area. MR. RIGHT It is similar to our project but their implementation is different they are not connecting local service provider to the customer they provide their own service agent and service is in limited area but it is not user friendly and customer reviews are very bad about their service. HOUSEJOY.COM It is similar but it does not provide that much products services to customer and limited area services, bad user interface.

II. PROPOSED SYSTEM

The system scenario will elaborate the actual step by step flow of process I.e. from first when user visit to the web site up to the final feedback all the aspects have been shown in the figure 2. Flow Diagram. Homepage is the very first page when user enter into the website. This is the page where all the main functional attributes were present at the top web page. From this icon we can access the particular attribute directly from the homepage. After login user can see actual services available in there are and can avail them according to their need and which are trusted to them and near around them.

After the selection of service provider user may register their complaint to the selected service provide. After successful registration of complaint registration our executive will be present with in a 24 hour to pick up and examine.



We are providing platform to the customer which provides doorstep services to the customer, services related to the repairing of different products and gadgets (automobile, electrical, electronics, industrial automation and etc.). Customer can easily connect with us they can simply visit to our website and register complaint.

Firstly, user visit to our website then select area then select category which kind of products he/she wants to repair then select service provider as per their choice provide details of address and one of our service agent will visit to customer site and pick up the product and deliver to the selected service provider and later the service provider analysis the defects in the products then decide estimate cost to repair or fixing the problem then he forward estimate cost to admin then admin forward estimate cost to the specified customer then customer decide he wants to execute further steps such repairing of products and fixing of product.

After performing all the operation by the service provider one of our expertise analysis the refurbished product and our agent will pick up the product from services provider and deliver to the customer then our agent will give the running demo of refurbished product to customer after all the confirmation of

customer. Payment made by customer sand receive by our agent. We are providing extended warranty on refurbished product the customer can rate and review the selected shop. Customer reviews can be taken as feedback.

III. CONCLUSION

Based on above work carried out following conclusion are presented. Provides platform for the people that significantly reduces the wastage of time and make convenient for people to repair gadgets at doorstep. Consequently, it also manages the database which is useful for checking the status of the various fields in future. It will probably boost the local market places and leads to increase in their services as before.

The paper has summarized all the benefits of E-repairer which is going to help society by providing its services in future. It is also going to help the local service provider to boost their market providing and online platform to their services. Service Providers can easily register their services whit minimal cost and can maximize their revenue.

Today almost everyone is on internet, so it is also going to help people to get their gadgets repaired just by registering a complaint and sit back. Consequently, it also manages the database which is useful for checking the status of the various fields in future

Our project is a mediator between customer and the service provider it will help local service provider to boost up their business service provider can get door step customer and customer will get door step services.

IV. REFERENCES

- [1]. Y-N Shen and F "AN APPROACH FOR ONLINE REPAIR AND YIELD ENHANCEMENT OF VLSVWSI REDUNDANT MEMORIES", Lombardi Texas A&M University

Department of Computer Science College Station.

- [2]. Dr. Mahavir P.Nakel, Dr. Sameer Naval, "Study Of Impact And Dependency Of Electronic Gadgets on Health & Life Style of Student - A Comparative Study Among Youth Population in MGM Campus, Aurangabad", Volume 6 Issue 5, May 2017, Paper ID:ART20173757.
- [3]. E.W.T. Ngai ,285 West port Road USA Available Online 11 July 2005,"A review for mobile commerce research and applications".
- [4]. Omer,"ElectronicCommerceResearchandApplications".Volume27, January–February 2018, Pages 152-162.
- [5]. Brain j. Corbitt , "Trust and e-commerce: A study of consumers perception". Volume 2 Issue 5.
- [6]. Francisco J. Martinez, "Consumer engagement in an online brand community". Volume 23, May-June 2017.
- [7]. Vikash Saadan, "Repair and servicing of domestic electrical application". Electrical Division MSME-Development Institute Ministry of MSME, Govt. Of India.

Study the Possibilities of using Waste Foundry Sand in Concrete as a Fine Aggregate

Sonali P. Deshpande, Rani P. Kose, Rushikesh Y. Kharabe, Rajan A. Raskondawar, Rishabh S. Gedam,

Mo. Iklakh Mo. Isril Shekh, Snehal S. Bobade

Department of Civil Engineering, TGPCET, Nagpur, Maharashtra, India

ABSTRACT

Now a day the worldwide consumption of sand as a fine aggregate in concrete production is very high. Developing countries have encountered some strain in the supply of natural sand in order to meet the increasing need of the infrastructural development in recent year, to overcome the stress and demand of river sand, researchers and practitioners in the construction industry have identified some alternative. One of them is foundry sand, it is a high quality silica and with uniform physical characteristics and by-product of ferrous and non-ferrous metal casting industry. It is provided that foundry sand used as fine aggregate will enhance the strength of concrete to a greater extend. The foundry industry in Nagpur produces waste foundry sand that ends up in landfill sites. The utilization of waste foundry sand will benefit the industry, as raw material and energy are conserved, while costs of disposal are lowered. In this study, the physical, chemical and mechanical properties of three waste foundry sand from Nagpur were analyzed. The samples were investigated with a view to determine their conformity with applicable engineering criteria when used as a replacement, to various extents, of the fine aggregate. The main properties investigated included physical properties (sp. Gravity, fineness modulus, unit weight, absorption, moisture content, clay lumps and friable particle, material finer than 75mm.) and the chemical properties X-ray fluorescence (XRF), X- ray diffraction (XRD). However, the chemical test result showed the composition of these sands to be comparable with results from other investigations, from IS 383 : 2016 and suitable for use as a fine aggregate replacement in concrete.

Keywords: Chemical Properties, Physical Properties, Waste Foundry Sand (WFS), Concrete, Construction Material, Waste Recycling

I. INTRODUCTION

A foundry produces metal casting by pouring molten metal into a performed mould to end the resulting harden cast. The metal cast include iron steel from the ferrous family and Aluminium, copper, brass and bronze from non-ferrous family. WFS is high quality silica sand with uniform physical characteristics. It is a by- products of ferrous and nonferrous metal casting industry Where sand has been used for centuries as a molding material because of its thermal

conductivity. Foundries successfully recycle and reuse the send many times. When the sand can no longer be reused in the foundry it is removed from the foundry and this term as WFS.[4]

Classification of foundry sand depends upon the type of binder system used in metal casting. Two types of binder systems are generally, used and on the basis of that foundry sands are categorised as: clay-bonded sand (Green Sand) and chemically bonded sand. The most common casting process used in foundry

industry is the sand cast system. Virtually all sand cast mould for ferrous castings are of the Green Sand type. Clay- bonded (Green) Sand is composed of naturally occurring materials, which and blended together such as high- quality silica sand (85 - 95%) bentonite clay (4 -10%) as a Binder, a carbonaceous additive (2 - 10%) to improve the casting surface finish and Water (2 - 5%). It is black in colour due to carbon content.[1], [3]

Green Sand is the most commonly used moulding media by foundries. Silica sand is the bulk medium that resists high temperatures while the casting of clay binds the sand together. The water adds plasticity. The carbonaceous additives prevent the "burn-on" or fusing of sand onto the casting surface. Green sand also contains trace Chemicals such as Mgo, K₂O and Tio₂.

Chemically bonded sand is used both in core making where high strength is necessary to withstand the heat of molten metal, and in mould making. These systems involve the use of one or more organic binders in conjunction with catalysts and different hardening or setting procedures. Chemically bonded sand consists of 93-99% silica and 1- 3% chemical binder. Chemically bonded Sands are generally light in color and in texture than clay-bonded sand.[8]

The foundry industry estimates that approximately 100 million tonnes of sand is used in production annually of that 6-10 million tonnes are discarded annually and are available to recycle into other products and are used in The Other industries. The automotive industries and its parts are the major generator of foundry sand. (about 95 % of estimated used foundry sand).[6]

II. METHODS AND MATERIAL

1) A. Materials

Waste foundry sand (WFS) consist of primarily of uniformly sized high quality silica sand or lake sand that is bonded to form molds for ferrous and non-ferrous metal casting. It is a by by-products of ferrous and nonferrous metal casting industry Where sand has been used for centuries as a molding material because of its thermal conductivity. Foundries successfully recycle and reuse the send many times. When the sand can no longer be reused in the foundry it is removed from the foundry and this term as WFS. [4]

In the casting process molding sands are recycled and reused multiple times. Eventually however the recycled sand degrades to the joint that it can no longer be reused in the casting process when it is not possible to further reuse in the foundry it is removed from the foundry and termed as WFS.

WFS samples were collected from three foundry sites in Nagpur. These comprised two clay-bonded systems (green sand) which were collected from the Jaiswal Neco Industry, Ekta Casting Industry and Shree Steel Industry (respectively referred to as samples WFS01, WFS02 and WFS03). The samples collected had a mass of approximately 10 kg each.

2) A.a. Methods

The methods used for evaluation of physical and chemical properties of WFS are discussed in this section.

A.a.i Physical Properties

Seven methods for the evaluation of physical properties were used as follows:

1. Mmoisture Content: The moisture content of soil in an important parameter affecting its behavior. Moisture content is a ratio expressed as a percentage of the weight of water in a given soil solid particles under the specified testing

condition.

2. Specific Gravity : The specific gravity of a soil is the ratio of weight in air of weight in air of a given volume of soil particle at a stated temperature to the weight of an equal volume of distilled water under the same condition.
3. Fineness modulus : Fineness modulus of sand is an index number which represents the mean size of the particles in sand. It is calculated by performing sieve analysis with standard sieves. The cumulative percentage retained on each sieve is added and subtracted by 100 gives the value of fineness modulus.
4. Clay lump test : Clay lump is a traditional form of construction, using earth with a high clay content, straw, animal dung, chalk/flint etc.
5. Water absorption : This test is a rapid procedure for field determining the percentage of free or surface moisture in sand, and for determining the percentage of water absorption for sand of less than saturated surface dry condition.
6. Unit weight : Unit weight for a soil is a property of a soil which is used to solve the problems related to the earthwork. Unit weight is also known by the name specific weight.
7. Material finer than 75micron : This test method covers determination of the amount of material finer than 75micron.

A.a.ii. Chemical properties

Two methods for the evaluation of chemical properties were used as follows:

1.X-ray Fluorescence (XRF) : XRF is a non-destructive analytical technique used to determine the elemental composition of materials. XRF analyzers determine the chemistry of a sample by measuring the fluorescent X- ray emitted from a sample when it is excited by a primary X-ray source. Each of the elements present in a sample produces a set of characteristic fluorescent X- rays that is unique for that specific element. XRF analyzers are available in handheld models designed to provide

instant elemental analysis for immediate feedback in the field, or in lab-based systems designed to provide qualitative and quantitative analysis for process and quality control. Both types of XRF equipment are used in applications as diverse as cement manufacturing, metallurgy, mining, petroleum, polymers, paints and chemicals, forensics investigations, and environmental analysis.

2. X-ray diffraction (XRD) : XRD is a versatile and nondestructive analytical technique that reveals detailed structural and chemical information about the crystallography of materials. XRD looks at a crystalline material's characteristic X-ray scattering, or diffraction pattern, which reveals the material's atomic structure. Qualitative analysis is possible by comparing the XRD pattern of an unknown material with a library of known patterns. XRD's many applications include:

- 3.
1. Identification of single or multiple phases in an unknown sample
2. Quantification of known phases of a mixture
3. Amorphous content evaluation
4. Crystallography – solving crystal structure
5. Non ambient analysis – crystal structure changes with temperature, pressure or gas phase
6. Surface and thin film analysis
7. Texture analysis

III. RESULT AND DISCUSSION

Expected Outcome

- From the different literature review, we found that waste foundry sand can be effectively used in concrete as a fine aggregate up to a different certain percentage with different mix grade of concrete.
- Waste foundry sand can be effectively replace as a fine aggregate upto 15-20%.
- With waste foundry sand we can use the fly ash, coal bottom ash or admixture in concrete to

improve its properties of concrete.

- But the researchers found that the properties of waste foundry sand is varying on the basis of metal custard, because foundry sand is used for both ferrous and nonferrous materials. Due to these its chemical properties are varying and it directly affects on the concrete.
- Also we see some limitations of using foundry sand. Foundry sand is black in color, in some concrete this may cause the finished concrete to have a grayish/black tint, which may not be desirable. Foundry sand reduced workability of concrete.
- Hence, before using it in the concrete it is to be checked the feasibility by physical, chemical and Mechanical properties of waste foundry sand from different industries. There are some process to improve the properties of foundry sand use in concrete.

IV. REFERENCES

- [1]. Yucel Guney, Yasin Dursun Sari, Mubsin Yalcin, Ahmat Tuncan, Senayi Donmer, "Re-usage of WFS in high strength concrete" Waste management: Volume 30 issue 8-9 August-September 2010, page 1705-1713
- [2]. Sayeed Javed, "Use of WFS in highway construction" Joint transportation research program, final report publication FHWA/LN/JHRP-94/02 15 june 2016
- [3]. Rafat Siddique, Anita Rajor, G. Kaur, "Influence of fungus on properties of concrete made with WFS" Journal of materials in civil 2012, Volume 25, issues 4 april 2013
- [4]. Yogesh Aggarwal, Rafat Siddique, "Microstructure and properties of concrete using WFS as a partial replacement of aggregate" Construction and building material-2014 Volume 54,15 march 2014, page 210-223
- [5]. Saveria Monosi, Daniel Sani, Francesca Tittarelli, "Use of sand in cement mortar and concrete production" The open waste management 2010, Volume 11, Publish 8 july 2010
- [6]. Rafat Siddiquea,*, Gurdeep Kaurb, Anita Rajorb Waste foundry sand and its leachate characteristics Resources, Conservation and Recycling 25 January 2010
- [7]. Dushyant R. Bhimani, Jayeshkumar Pitrode, Jaydevbhai J. Bhavsar, "Study of foundry sand: opportunities for sustainable and economical concrete" Global research analysis India 1 january 2013
- [8]. Y. Guney, Y. D. Sari, M. Yalcin, A. Tuncan, S. Donmer, "Re-usage of WFS in high strength concrete" Waste management: Volume 30 issue 8-9 August- September 2010, page 1705-1713
- [9]. Rafat Siddique, G. Singh, "The effect of foundry sand as a partial replacement of fine aggregate on compressive strength of concrete" Construction and building material : volume 26 Issue 1 january 2012 page 416-422
- [10]. Naik TR, Kraus RN, Chun YM, Ramme WB, Singh SS, "Use of high volume fly ash, bottom ash and WFS in manufacturing of precast moulding concrete product" Properties of field manufactured cast-concrete products utilizing recycled materials, J Mater civil engg 2003, 15(4):400-7
- [11]. Khatib JM, Ellis DJ, "The properties of concrete containing foundry sand as a partial replacement of natural sand" Mechanical preperities of concrete containing foundry sand, ACI spl publ. 2001 (SP-200): 733-48
- [12]. R. Alonso-Santurde , A. Andrés , J.R. Viguri , M. Raimondo , G. Guarini , C. Zanelli , M. Dondi, "Technological behaviour and recycling potential of spent foundry sands in clay bricks" Journal of Environmental Management 92 (2011) 994e1002
- [13]. Recep Bakis, Hakan Koyuncu, Ayhan Demirbas, "An investigation of waste foundry sand in asphalt concrete mixtures" Waste Manage Res 2006: 24: 269– 274

- [14]. H. Merve Basar, Nuran Deveci Aksoy, "The effect of waste foundry sand (WFS) as partial replacement of sand on the mechanical, leaching and micro-structural characteristics of ready-mixed concrete" *Construction and Building Materials* 35 (2012) 508–515
- [15]. Elizabeth A. Dayton, Shane D. Whitacre, Robert S. Dungan, Nicholas T. Basta, "Characterization of physical and chemical properties of spent foundry sands pertinent to beneficial use in manufactured soils" Received: 20 May 2009
- [16]. An Deng, Paul J. Tikalsky, "Geotechnical and leaching properties of flowable fill incorporating waste foundry sand" *Waste Management* 28 (2008) 2161–2170
- [17]. Robert S. Dungan, Ursula Kukierb, Brad Lee, "Blending foundry sands with soil: Effect on dehydrogenase activity" *Science of the Total Environment* 357 (2006) 221– 230
- [18]. Patrick Iloh, George Fanourakis, Aurobindo Ogra, "Evaluation of Physical and Chemical Properties of South African Waste Foundry Sand (WFS) for Concrete Use" Received: 5 December 2018; Accepted: 22 December 2018; Published: 2 January 2019
- [19]. Yucel Guney, Ahmet H. Aydilek b, M. Melih Demirkan, "Geoenvironmental behavior of foundry sand amended mixtures for highway subbases" *Waste Management* 26 (2006) 932–945
- [20]. Mariusz Holtzer, Artur Bobrowski, Sylwia Z ymankowska-Kumon, "Temperature influence on structural changes of foundry bentonites" *Journal of Molecular Structure* 1004 (2011) 102–108
- [21]. Rafat Siddiquea, Gurpreet Singhb, "Utilization of waste foundry sand (WFS) in concrete manufacturing" *Resources, Conservation and Recycling* 55 (2011) 885– 892
- [22]. Robert S. Dungan, Nikki H. Dees "The characterization of total and leachable metals in foundry molding sands" *Journal of Environmental Management* 90 (2009) 539e548
- [23]. Francesca Tittarelli, "Waste foundry sand" Research Unit INSTM, Ancona, Italy, Institute of Atmospheric Sciences and Climate, National Research Council (ISAC-CNR), Bologna, Italy
- [24]. Rafat Siddique, "Utilization of industrial by-products in concrete" *Procedia Engineering* 95 (2014) 335 – 347
- [25]. J. M. Khatib, S. Baig, A Bougara, C Booth, "Foundry Sand Utilisation in Concrete" *Production researchgate Article* • January 2012

A Review : Study the Possibilities of using Coal Bottom Ash in Concrete as a Cement

Prerna R. Pimpalghare, Neha A. Walke, Shubham S. Hadke, Shashikant P. Wakalkar, Vaibhav G. Gondane, Avikant D.

Uikey

Department of Civil Engineering, TGPCET, Nagpur, Maharashtra, India

ABSTRACT

The Coal Bottom Ash is obtained from the Thermal Power Plant. In India about 35 million tons of Coal Bottom Ash is produced the study was to investigate their use in concrete to replace cement with coal bottom ash as a waste with a main focus on the properties such that Physical and Chemical. In Physical such as specific gravity, particle size analysis, moisture content, bulk density. In chemical property content the XRF test and SEM test also included. This test value compare with IS Code 3812[Pulverized Fuel Ash – Specification]. The value match the XRF and SEM test with IS code 3812, then the possibilities of using Coal Bottom Ash in concrete as a Cement.

I. INTRODUCTION

The ash is obtained from the thermal power station. In India about 190 to 200 million tons of coal ash as waste which is comprises of bottom ash and fly ash. Large quantity (35 million tons) of coal bottom ash is produced by thermal power plants in india. The present method of disposal of coal bottom ash on open land is the main cause of an environment hazard for the surrounding community. As utilization of coal bottom ash can help in alleviating environmental problems, Hence the aim of this research study was to investigate their use in concrete to replace cement with bottom ash as a waste. Bottom ash is part of the non-combustible residue of combustion in a furnace or incinerator. In an industrial context, it has traditionally referred to coal combustion and comprises traces of combustibles embedded in forming clinkers and sticking to hot side walls of a coal-burning furnace

during its operation. The portion of the ash that escapes up the chimney or stack is, however, referred to as fly ash. The clinkers fall by themselves into the bottom hopper of a coal-burning furnace and are cooled. The above portion of the ash is referred to as bottom ash too. Additionally, modern municipal waste incinerators try in reducing the production of dioxins by incinerating at 850 to 950 (degrees Celsius) for at least two seconds forming bottom ash as byproduct. Bottom ash also makes a useful construction material. In Indian coal combustion products association estimates the use of bottom ash in the construction industry at 46% and the use of fly ash at 43%. Bottom ash applications include filler material for structural applications and embankments, aggregate in road bases, sub – bases, pavement, and lightweight concrete products, as feed stock in the production of cement. The chemical makeup of fly and bottom ash varies significantly and is dependent on the source and composition of the coal being burned . This can include a wide variety of toxic substances from trace amounts to percent levels. In order to protect the

environment or the quality and safety of any products it is added to, the composition of the ash product needs to be accurately analyzed before it can be recycled or disposed .

II. METHODS AND MATERIAL

Materials:

We have collected the Coal Bottom Ash from different power plant

- 1) Khaperkheda Thermal Power Plant
- 2) Koradi Thermal Power Plant
- 3) Butibori Relience Power Plant



Figure 1. Coal Bottom Ash of Butibori Relience Power Plant



Figure 2. Coal Bottom Ash of Khaperkheda Power Plant



Figure 1. Coal Bottom Ash of Koradi Power Plant

Methods:

1) **Sieve analysis:** Take adequate quantity of the representative sample and thoroughly break up the lump by means of a rubber pestle in mortar but not breaking the individual grains. Then dry in air or sun. In wet weather, use sample maintained at 70°C weight the sample and record its weight correct to 0.1% of the weight of the sample. Separate the sample by sieving into two parts,

1. **Retaining on 75 μ sieve**

2. **Passing through 4.75mm sieve.**

Here analysis is done for the fraction above 2mm only. Record the weight of fraction retained 0.2mm sieve accurate to 0.1% of its total weight.

Separate the various fractions by successive sieving through sieve of 100mm, 63mm, 20mm, 6.3mm, 4.75mm and 2mm. while sieving, agitate the sieves so that the material rolls in irregular motion.

Record the weight of material retained on each sieve correct to the 0.1% of its total weight. Then calculate the percentage of each fraction of the weight of total sample taken initially analysis.

2) **Moisture Content:** Clean and dry container with lid or dish . Weight accurately and determine the weight of the empty container provided along with lids. Let it be W1.

- 1) Take about 20 to 25 gm. Of the given weight of coal bottom ash in a container and determine the weight again. Let it be W2.
- 2) Keeps the containing the wet coal bottom ash in an oven. Set at 105°C The drying should be done

in constant weight. The container should be open, but the lid also be kept along with container.

- 3) After complete drying, cool it in desiccators to room temperature and weight let it be W3.

4) Specific Gravity:

- 1) Sieve the dry field sample through 4.75mm sieve. Oven dry the soil to constant weight at 105°C to 110°C and cool it I desiccators. Record the weight of empty pycnometer used (W1).
- 2) Weight the pycnometer with oven dry soil (W2).
- 3) Fill Kerosene to half full level in the pycnometer and mix the thoroughly with glass rod. Add more kerosene and stir it. Replace the screw top and fill the pycnometer flush with hole in the conical cap. Dry the pycnometer from outside, and find the weight(W3).
- 4) Empty the pycnometer, clean it thoroughly and fill it with distilled water, to hole of the conical cap and find the weight(W1).
- 5) Repeat above steps for the two more determination of specific gravity.
- 5) **Bulk Density:** Sieve about 40g of the material through 250. Micron IS sieve on to a tared glazed paper and weigh it accurately. Slip the powder gently and smoothly into the measuring cylinder which should be held at 45° to the vertical, without knocking or squeezing. Assemble the apparatus With the thumb and four fingers of one hand, gently grasp the upper part of the cylinder, and within one second lift it about 25 mm and let it drop. Note the volume after dropping it once. Continue lifting and dropping until 50 complete drops have been given to the cylinder. During this operation give a gentle turn of about 10° in the clockwise direction to the cylinder after every two drops. As soon as 50 drops are completed, raise the cylinder to eye level and read the volume of the material.

- 6) **Loss on Ignition:** Heat 1.00g of the sample for 15 minutes in a weighed and covered platinum

crucible (a porcelain crucible may also be used) of 20 to 25 ml capacity by placing it in a muffle furnace at temperature between 900° and 1000°C; cool and weigh. Check the loss in weight by a secong heating for 5 minutes and re-weigh.

7) XRF Test:

Table 1. Comparison between Cement and CBA (Butibori Reliance Power Plant)

Chemical Composition	Cement	CBA
SiO ₂ +Al ₂ O ₃ +Fe ₂ O ₃	70	58.72
SiO ₂ (min)	35	56.32
MgO (max)	5	0.38
Na ₂ O (max)	1.5	0.053
K ₂ O (maX)	0.83	0.060
CaO	63.72	7.3
LOI	5	1.02

Table 2. Comparison between Cement and CBA (Khaperkheda Power Plant)

Chemical Composition	Cement	CBA
SiO ₂ +Al ₂ O ₃ +Fe ₂ O ₃	70	69.54
SiO ₂ (min)	35	67.42
MgO (max)	5	0.29
Na ₂ O (max)	1.5	0.034
K ₂ O (max)	0.83	0.060
CaO	63.72	7.3
LOI	5	7.33

Table 3. Comparison between Cement and CBA (Koradi Power Plant)

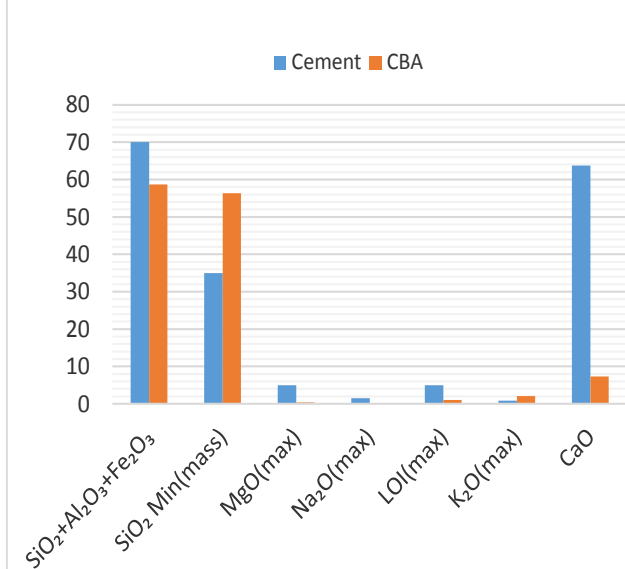
Chemical Composition	Cement	CBA
SiO ₂ +Al ₂ O ₃ +Fe ₂ O ₃	70	60.75
SiO ₂ (min)	35	58.96
MgO (max)	5	0.10
Na ₂ O (max)	1.5	0.060
K ₂ O (maX)	0.83	0.060

CaO	63.72	7.3
LOI	5	16.23

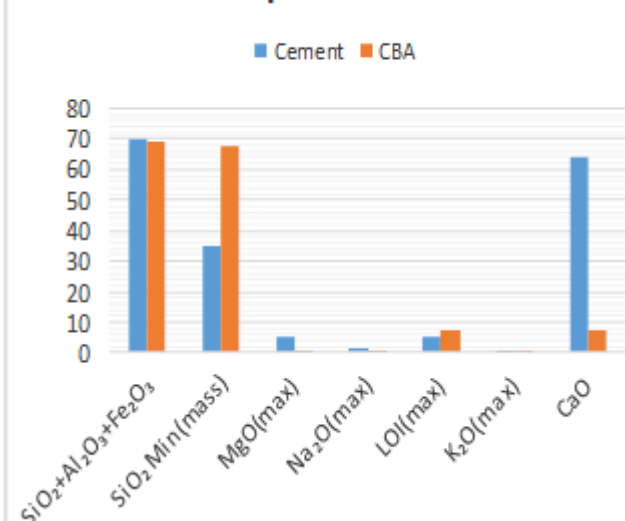
III. RESULTS AND DISCUSSION

Comparison of cement and Coal Bottom Ash

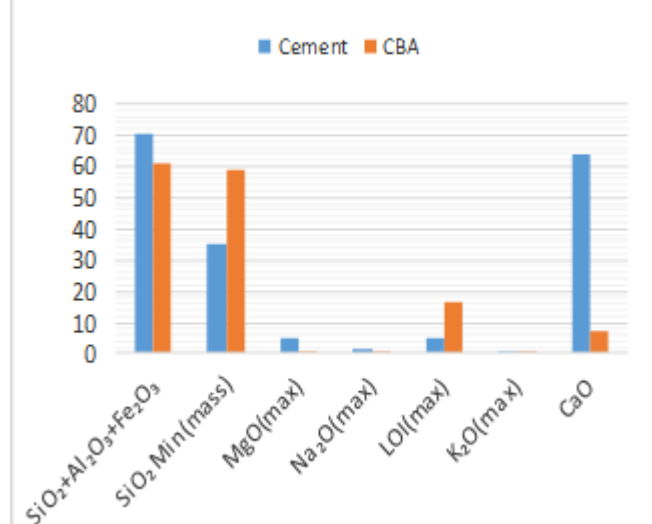
CBA of Butibori Reliance Power Plant



CBA of Khaperkheda Power Plant



CBA of Koradi Power Plant



IV. CONCLUSION

This paper was prepared by reviewing the different on thermal Power Plant grinding time of CBA. From the review, the properties of Cement is compare with CBA were improved by decreasing the particle size of CBA. Furthermore, SEM analysis shows that the particle size of the CBA and scanning the p.article of CBA Generally, pozzolanic reaction of CBA was directly related to its fineness. The SEM result will be positive as possible . From the literature review, by increasing the fineness of CBA. Then the conclusion is Positive as possibilities using the Coal Bottom Ash as a Cement.

V. REFERENCES

- [1]. Diana Bajarea *, Girts Bumanisb, Liga Upeniecec, "Coal Combustion Bottom Ash as Microfiller with Pozzolanic Properties for Traditional Concrete," 11th International Conference on Modern Building Materials, Structures and Techniques, MBMST 2013. Institute of Materials and Structures, Faculty of Civil Engineering, Riga Technical University, Kalku st. 1, LV-1658 Riga, Latvia.
- [2]. Vikas R Nadig1, Sanjith J2 , Ranjith A3, Kiran B M4. 2002. International Journal of Scientific Research in Science, Engineering and Technology. (Nov 2002), ISSN NO: 2320-334X, DOI: 10.9790/1684-1226148151.

Analysis of Laterally Loaded Pile by Experimental Approach

Mr. Aditya Rathi, Ms. Ankita Parimal, Mr. Tushar Dagwar, Mr. Lokesh Wankhade,
Mr. Akash Kamble, Mr. Rounak Gadpalliwar, Mr. Pankajkumar Yadav, Mr. Chaitanya Halmare

Civil Engineering Department, G.H. Rasoni Academy of engineering and technology, Nagpur, Maharashtra,
India

ABSTRACT

This paper study the lateral behavior pile. The pile foundation commonly used to support load that are sufficiently heavy and laterally loaded structure. The laterally loaded pile shows initially linear deflection forwarded by curvilinear behavior. The pile is tested for sand soil and the properties of sand is evaluated in laboratory. In this work, we are performing test on circular cast iron pile deeply embedded in sand. The load versus deflection graph has forward period upto many periods to get trend of failure.

Keywords: Pile Foundation, Sand, Dial Gauge, Load, Sieve Analysis.

I. INTRODUCTION

Generally, high vertical loads and small lateral loads are carried by pile foundation. Pile foundation is provided where soil bearing capacity is low and loads are high. Vertical piles are provided for sustaining the high axial loads and small lateral loads. Lateral loads play vital role in offshore structures and it can be 30% of the vertical load, whereas in case of onshore structures it is around 10-15%. It can be applied by wind, waves or both in offshore structures. In case of onshore structures lateral load can be applied by means of earth pressure in retaining wall, traffic loading on a bridge pier etc. During floods high lateral loads are applied by means of trees, soil and other material flowing through water. In such case where lateral loads increases batter piles are preferred because of their high resistance towards lateral loads. So while designing the foundation for these types of structures the effect of lateral loads should never be under estimated. Small scale model tests are generally preferred because full scale model test turns out to be costly and time taking. However, in small scale model test number of parameters can vary according to the

researcher's requirement. The objective of this study is to compare the efficacy of the vertical piles with batter piles. The "p-y" method is one of the most popular and widely used approaches for understanding the behavior of laterally loaded piles. This is a subgrade reaction technique, where p is the mobilized soil resistance and y is the deflection of the pile. The p-y method for sands was developed by Reese, Cox and Koop (1974). The p-y approach has been used by various researchers in different soils i.e. sands (Reese et al., 1974; Wessel ink et al., 1988), silts (e.g., Reese and Van Impe, 2001) and clays (e.g., Matlock, 1970; Reese and Welch, 1975). Most of the studies were performed under monotonic lateral loads. Initially the method was proposed for single piles but later it has also been used for the pile groups using the p- multiplier concept. The software used for the study is LPILE which works on the principal of finite difference method. The program use p-y curve method for solving laterally loaded pile problems

II. METHODS AND MATERIAL

Model tests were conducted in the laboratory to determine the pile behavior under lateral loading condition. The results of the tests were then compared with the results of PLAXIS software. The piles were properly scaled out so that its behavior can be used on the field. Tests were conducted on single piles in sand.

Sand

Locally available sand was used as a foundation for the tests. The intrinsic properties of used sand are reported in Table. The sand bed was prepared using rainfall technique. The falling height of the sand from the container was kept constant throughout the experiment. The average dry density of the sand was 16.5 kN/m^3 . The interface was developed between the pile material and sand, so the angle was calculated using direct shear test. The sand was classified as poorly graded sand (SP) according to unified soil classification system (USCS).

Model Pile

The piles were modeled using scaling laws proposed by Wood et al (2002). The scaling factor for the pile was 1/16. Mild steel piles having an outer diameter 20 mm and internal diameter 18 mm were used. The piles with different slenderness ratios were adopted i.e. 18, 28, and 38 to understand the behavior of short, intermediate and long piles at a relative density of 60%. The bottom of the pile section was made conical (60 angle) which helps in smooth driving of piles and also prevents entering of sand into the pile.

Pile Caps

Pile caps were also made up of the same material as used for piles i.e. mild steel. Since, the tests were not only conducted on vertical piles, the pile caps were also fabricated with different angles such as 15, 25, and 35. The pile caps having size of $90 \times 90 \times 35 \text{ mm}$ and weight 7.45 N were placed and the piles were then inserted.

Model Tank

The tank was first modeled according to the piles and pile caps and then fabricated accordingly. The maximum length of the pile was 760 mm and Outer diameter 20 mm. According to (Matlock and Rao) to avoid the boundary effect minimum distance from the periphery of the pile to the tank should be 8 to 10 times the diameter of the pile for lateral loads. So, the size of the tank was kept as $1.1 \times 1.1 \times 1 \text{ m}$ and was made of mild steel sheet of thickness 2 mm. Lateral load arrangement was provided on the tank.

Test setup and loading arrangement

Static lateral load tests were conducted on vertical and batter piles using the test setup as shown in figure 1. Dead loads were used for applying static lateral loads on the piles. Static lateral load was applied by means of GI wire, one end of which is connected to the pile cap and other end goes from pulley to the loading frame. Weights were added and displacement of the pile was measured using Dial gauge. The applied load was measured using the load cell.

Filling of tank and Pile Installation

Rainfall technique was used for filling of the tank. Sand was poured in tank from a height of 450 mm and was kept constant for all tests. Sand was filled in layers of 50 mm and was leveled after each layer. Initially sand was poured up to a depth of 300 mm from the bottom of tank. The relative density for each test was kept 60%. A marginal variation of 2% in the density was observed. The density of the sand was checked by placing cylindrical containers of known volume at different places in the tank. Pile was inserted in the pile cap and was placed in position where load can be applied. Same technique was used for filling the remaining portion of a tank. The top 50 mm of the pile was kept above the sand bed so that the wire remains horizontal while applying load.

III. RESULTS AND DISCUSSION

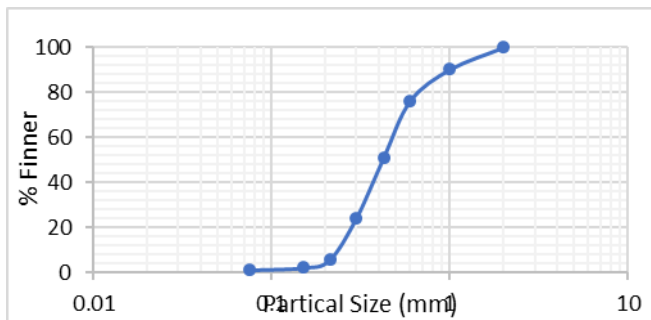
The various test were conducted on the sand that we had used.

The index property of Sand Indian Standard

Table 1

Property	Values
Unit weight (kN/m ³) min	15.02
Specific gravity (G)	2.64
Coefficient of uniformity, Cu	1.91
Coefficient of curvature, Cc	1.24
D10	0.24
D30	0.37
D60	0.46

Sieve Analysis results



Results of pile testing against lateral load

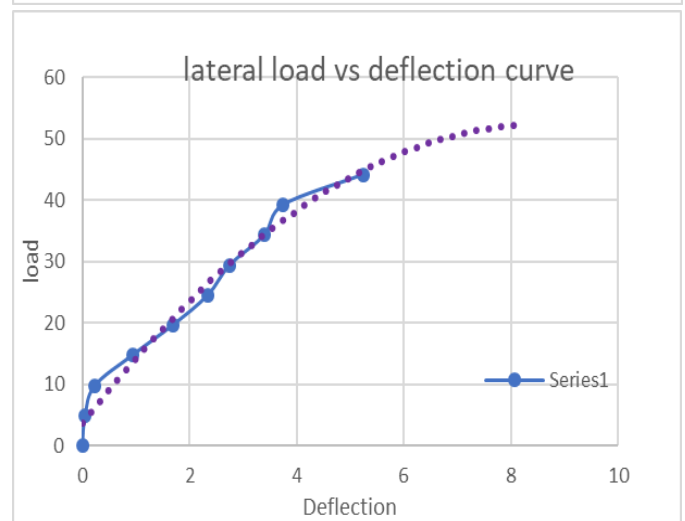
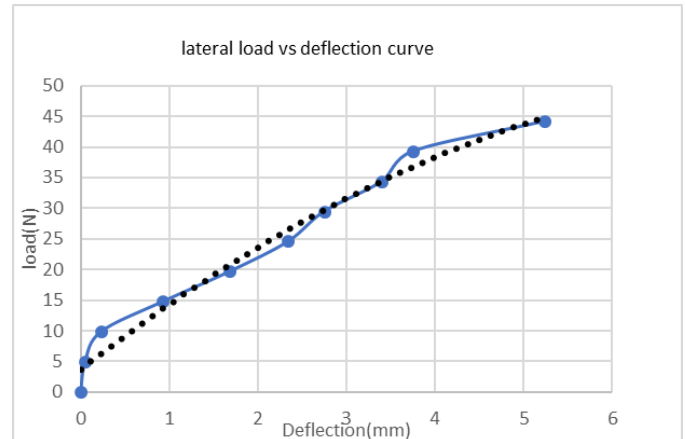
Pile Diameter - 25cm

Pile Length - 60cm

Table 2

Sr. No.	Load (kg)	Load (N)	Deflection (Division on gauge)	Deflection (mm)
1	0	0	0	0
2	0.5	4.90	0	0
3	1	9.81	23	0.23
4	1.5	14.75	92	0.93

5	2.0	19.62	168	1.68
6	2.5	24.52	234	2.34
7	3.0	29.43	275	2.75
8	3.5	34.335	340	3.4
9	4.0	39.24	375	3.75
10	4.5	44.145	524	5.24



IV. CONCLUSION

The laterally loaded pile shows the load versus lateral deflection straightforward nature. The initial linear portion of graph is followed by non linear behavior. The slope of load versus deflection reduces as load increase this behavior will help to find out lateral load carrying capacity of pile.

V. REFERENCES

[1]. Settlement of axially loaded piles entirely embedded in rock – analytical and experimental

- study (Hisham T. Eid and Khaldoun Bani-Hani), Geomechanics and Geoengineering: An International Journal, Vol. 7, No. 2, June 2012, 139–148.
- [2]. Numerical Study and Comparison of the Settlement Behaviours of Axially Loaded Piles using Different Material Models (S. Gowthaman, M.C.M. Nasvi and S. Krishnya), ENGINEER - Vol. L, No. 02, pp. [01-10], 2017 © The Institution of Engineers, Sri Lanka ENGINEER - Vol. L, No. 02,
- [3]. Modeling the Behavior of Axially and Laterally Loaded Pile with a Contact Model (Zakia Khelifi), Electronic journal of Geotechnical Engineering (EJGE) Vol. 16 [2011], Bund. N.
- [4]. NUMERICAL MODELING OF SINGLE PILE IN A TWO-LAYERED SOIL (WATTAMWAR MAYUR KISHANRAO and ARUN PRASAD), International Journal of Mechanical And Production Engineering, ISSN: 2320-2092
- [5]. Performance of Axially Loaded Single Pile Embedded in Cohesive Soil with Cavities (Ali A. Al-Jazaairry, Tahsin T. Sabbagh), World Academy of Science, Engineering and Technology International Journal of Environmental, Chemical, Ecological, Geological and Geophysical Engineering Vol:11, No:7, 2017
- [6]. FAISAL I. SHALABI & TALAT A. BADER International Journal of Civil Engineering (IJCE) ISSN(P): 2278-9987; ISSN(E): 2278-9995 Vol. 3, Issue 1, Jan 2014
- [7]. Bipin K. Gupta Dipanjan Basu Indian Geotechnical Conference 2017 GeoNEst 14-16 December 2017, IIT Guwahati, India
- [8]. S. R. Pathak, R. S. Dalvi, et.al. (2010) “Earthquake Induced Liquefaction Using Shake Table Test” International Conferences on Recent Advances in Geotechnical Earthquake Engineering and Soil Dynamics.
- [9]. Ravi Kant Mittal, M.K. Gupta (2004) “Liquefaction behavior of sand during

vibrations”.13th World Conference on Earthquake Engineering Paper No 1419 pp 1-7.

A Review of Construction Management and Risks

Sumit Paik, Apeksha Janbandhu, Shubham Khastagir, Yogesh Dhage, Ankita Dhabarde

Department of Civil Engineering Department, GHRAET, Nagpur, Maharashtra, India

ABSTRACT

Development of extension ventures were started in unpredictable and dynamic issues bringing about conditions of high vulnerability and hazard, which were intensified by requesting many obliges. The general technique was to ponder depends to a great extent on the review poll which will be gathered from different scaffold. A second supposition practice from autonomous specialists and councils that centers around the quality part of the tasks can be presented in the arrangement of foundation transport ventures. In this content there is examine of various literature on construction management and risks.

Keywords: Construction Management, Risk Analysis, Bridge Construction, Construction Planning, Resource Utilization.

I. INTRODUCTION

Development the executives has been the subject of significant research, particularly in the course of the most recent two decades with the improvement of a wide assortment of imaginative administration methods of insight, approaches, what's more, methods, for example, constant improvement, without a moment to spare; enhancements altogether quality administration idea, and quality confirmation models; and mechanization that has brought about minor enhancements in construction. Risk is the capability of picking up or losing something of value. Values, for example, physical wellbeing, economic wellbeing or financial wealth can be picked up or lost when making hazard coming about because of a given move or inaction. Outcomes of uncertainty and its introduction in a task is chance. In a task setting, it is the opportunity of something happening that will have an impact upon objectives. Construction ventures are unpredictable and are usually considered the most mind boggling undertaking in any industry. The development business encounters great difficulty in adapting to the expanding intricacy of its

significant tasks. Hazard the executives gives an organized method for evaluating and delaying with future vulnerability.

1.1 RISK FACTOR

The idea of hazard is multi-dimensional. With regards to development industry, the likelihood that an unmistakable factor negative to the general task happens is constantly present. An absence of consistency identified with the results of arranging circumstance and the related vulnerability of assessed results prompts the outcome that outcomes either can be superior to expected or can be more regrettable. It incorporates harm to people and property (such as flame, storm, water, breakdown, subsidence, vibration, and so on.) Contract conditions frequently make it a legally binding commit to take out protection spread against these dangers. The second class is 'basic hazard'. This incorporates outside variables for example, harm because of war, atomic contamination and supersonic blasts, government arrangement on assessments, work, wellbeing Or other laws malevolent harm and modern debate. Such occurrences are all the subject of statutory risk and no

protection spread is typically accessible or required. The third classification, frequently alluded to as 'theoretical hazard', is something, which can be distributed ahead of time as chosen by the gatherings to the agreement. This may incorporate misfortunes in time what's more, cash, which result from startling ground conditions, incredibly unfavorable climate, unforeseeable deficiencies of work or materials and other comparative issues outside the ability to control of the contractual worker. There are likewise dangers of misfortunes of time and cash due to: postponements and question (ownership of site, late supply of data, wasteful execution of work, and so forth.) poor heading, supervision or correspondence; delays in installment and postponement in settling debate. There are different sorts of hazard and the hazard the board manages their convenient recognizable proof, evaluation and legitimate dealing.

1.2 RISK ANALYSIS

Instruments that can robotize frequently bolster the utilization of a hazard examination strategy. The fundamental job of the apparatuses is to permit for looking, assembling and dealing with the fundamental information for the different venture stages. Different procedures use distinctive sorts of information and data gathered from a wide scope of sources utilizing diverse apparatuses, for example, insights, assessments, studies, documentations and master decisions. Task chance investigate systems can be grouped into two principle classifications, in particular subjective and quantitative methods.

1.3 BRIDGE CONSTRUCTION

An extension is a structure worked to traverse physical hindrances without shutting the route underneath, for example, an assortment of water, valley, or street, to provide entry over the hindrance. There are a wide range of plans that each fill a specific need and apply to various circumstances. Plans of extensions fluctuate contingent upon the capacity of the scaffold, the nature of the territory where the extension is built and tied down, the material used to

make it, and the reserves accessible to construct it. Extension development is an unpredictable and methodical work and there are assortments of dangers all the time amid the entire period of extension development from development readiness to development fruition. Amid the development period of an extension, a lot of work is high over the ground; therefore, the development of scaffolds has higher hazard contrasted and the other designing development. The event of hazard mishaps in the period of scaffold development will prompt incredible misfortunes to the owner and development undertakings, if the development danger of the scaffold has not given more consideration. The hazard mishaps will have unfriendly impact on the ordinary extension development and it might intrude on the scaffold development. For the vast scaffold, the venture of which is so enormous, the innovation is very complex and the development time frame is excessively long. At the point when the mishap of the vast extension in development stage happens, the property harm and individual damage is more genuine than the common scaffold. In this manner, the hazard the board of substantial scaffolds in development stage has extraordinary essentialness to keep the event of development mishaps of expansive spans.

1.4 SCHEDULING OF BRIDGE CONSTRUCTION PROJECTS

Wu et al. [1] introduced scheduling of construction projects as an allocation of resources of workers, machines and materials in a time-efficient way. Moreover, baseline schedule is proposed as an important step that the contractor has to realistically estimate the duration of a project. The importance of this step is such that project owners can evaluate the feasibility of contractors based on that and also successful completion of the project is attributed to this step [2]. The differences between design, productivity of resources, availability of resources, scheduling techniques are the effective factors to make repetitive activities unique in the point of view of durations. In other words, their durations are rarely

identical in each unit since those factors contribute to activity and resource schedules, and definition of the repetitive activities' characteristics. Consequently, characteristics of repetitive activities are what creates the need for sophisticated scheduling techniques and tools to schedule projects under precedence and resource constraints [3]. Further, construction project scheduling is almost experience-based. In other words, human knowledge plays an important role in project scheduling. In this point of view, previous researchers tried to capture human knowledge to create a powerful system to deal with scheduling issues. Which they only have been able to represent the expertise in the form of a set of data and rules on the computer [4].

1.5 RESOURCE ALLOCATION IN BRIDGE CONSTRUCTION PROJECTS

Traditional scheduling methods such as CPM and graphical methods like Line-Of-Balance (LOB) cannot consider dynamic and resource-driven features of construction activities [3]. It seems that mathematical methods have been successful to model behaviours of shared resources through dynamic programming but in comparison to resource-driven simulation, they cannot be so effective. In addition, some of resource-driven simulations such as STROBOSCOPE use a conditioning node (e.g. Fork node) within shared resources allocation processes which offer a great advantage in the modeling of construction activities by considering their dynamic and resource-driven feature. The way of assigning shared resources between construction activities has an important role in successfully management of continuous repetitive projects [3]. CPM, LOB and Repetitive Scheduling Method (RSM) methods assume that activities require only one resource each and resource availability constraints are modeled by using precedence constraints. In these methods, a resource serves only one activity which is called a "dedicated resource" while in reality, activities may share the same resources. Where, resources and activities are called shared resources and resource-sharing activities

respectively. However, precedence constraints approaches have failed to present resource availability constraints for shared resources [3].

1.6 SIMULATION IN BRIDGE CONSTRUCTION PROJECTS

Kim [19] described simulation as a building and investigation process for a computerised model of a system which captures various time measures such as real time, expanded and compressed time to improve the behaviour of a process or system. Simulation is able to model any system with any set of conditions in a more practical way since it runs the computerised model of a system rather than finding analytical solution. This potential of simulation makes it more advantageous than traditional scheduling methods like CPM and PERT. In other words, the considered system does not need to be analytically managed. Moreover, fewer assumptions are required when simulation is used to schedule construction projects. In the simulation approach, individual activities, interdependencies among them and resource availability are taken into account. This capability makes simulation suitable for detailed investigation of construction schedules [7]. Although simulations have been successful their implementations have not drawn as much attention in bridge construction processes. Few examples of studies that have applied simulation within the bridge construction domain include works done by Ailland et al. [5], AbouRizk and Dozzi [8], [9], [10] and [11]. In their work, AbouRizk and Dozzi [8] used CYCLONE to facilitate dispute resolution in The 31st International Symposium on Automation and Robotics in Construction and Mining (ISARC 2014) bridge jacking operations. Huang and Halpin [9] simulated the construction operations in a cable-stayed bridge in Washington by using DISCO simulation software. Chan et al. [10] used SDESA to simulate field processes for a pre-cast bridge, resulting in optimal solutions to the pre-cast segment inventory problems. Others like Marzouk [5] utilized simulation model like STROBOSCOPE as a simulation engine which was coded by Visual basic 6.0 to develop a

special purpose simulation model to assist in the planning of bridge deck construction. This simulation engine considers uncertainties and the interaction amongst resources used for the construction works. Marzouk et al [5] had modelled the 15th May Bridge located in Cairo, Egypt which was constructed using an incremental launching technique. Marzouk et al [5] examined the results of the developed model and illustrate its capabilities in modeling two construction methods; single form, and multiple form. A sensitivity analysis was performed in their study to evaluate the performance of the system under different combination of resources. The study eventually enabled planners to estimate duration and production rate in each combination within those different methods of bridge construction and also provided them more understandable results to study the impact of assigned resources when estimating project duration.

II. METHODOLOGY

There has been a generous collection of writing regarding the matter of execution and execution estimation in the order of development the board. In perspective on the extensive writing regarding the matter of execution, this examination incorporates the latest writing regarding the matter distributed in best positioned development the board diaries to recognize the viewpoints and highlights of execution examined in various settings. All together to acquire the latest research in the field, the audit time allotment was restricted to a multi year time frame (1999-2008) of distribution. To guarantee higher scholastic principles, peer-assessed articles distributed in six noteworthy development the executives diaries are included while dark writing has been rejected. They are examined and grouped through organized meta-investigation system develops.

III. LITERATURE REVIEW

3.1 CONSTRUCTION PROJECT MANAGEMENT

It has been contended that generation the executives in development depends on inadequate hypothesis, which prompts included expenses and the decrease of generally speaking execution (Koskela, 1992; Ballard and Howell, 1998; Ballard, 2000; Koskela, 2000; Koskela and Howell, 2002). Koskela and Howell (2002) fight that present development venture conveyance rehearses neglect to give a strong premise to improvement and are insufficient when ventures are mind boggling, dubious and brisk. They refer to the straightforwardness and deficiency of two hidden hypotheses, 'the executives as arranging' and the 'indoor regulator display' of control, whose inadequacies are abridged under three headings:-

- 1) the implausible job of arranging and poor transient arranging.
- 2) unsystematic administration of execution and
- 3) a limited perspective on control as estimating and making restorative move, instead of as a procedure of learning. Similar creators condemn the customary development arranging and control framework, as depicted in the PMBOK manage (2004), for the deficiency of its basic speculations and the ineffectualness of its systems (Koskela and Howell, 2002; Howell and Koskela, 2004).

3.2 RISK MANAGEMENT

The dangers which were recognized in two different ways for better basic leadership. Utilizing the work separate structure the dimension of hazard was resolved. Through polls study they gathered essential information. With the assistance of the meeting to generate new ideas survey was readied. Primavera programming was utilized to break down the hazard. They examined that monetary dangers and development hazard were most affected hazard in Indian development industry. the distinctive strategy of hazard recognizable proof methods in the development industry. The development business was particular into mechanical development, framework

and overwhelming development. The examination helped out through polls overview inside the development business. Hazard noteworthy list technique, they had examined the gathered information. A three-point rating scale was picked to separate the dangers. At long last, it was recognized the current utilized strategies for hazard evaluations were Brainstorming, agenda, flowchart, Delphi technique, Risk huge file strategy. Every technique for hazard evaluation has their restriction consequently it was seen that chance appraisal could be coordinated into new methodology that helps basic leadership

IV. RESEARCH CONTRIBUTION

The harmonization of cost ideas, classifications and the elucidation of critical terms can be seen as a stage forward that will smooth the advancement of recognizing the variables influencing the development costs that could at last clarify the cost heightening and contrasts among the Swedish locales. The commitment of this piece of the exploration is additionally to offer a comprehension of the conduct of contractual workers in explicit financial circumstances by mulling over the long-run relationship. It finds out that if temporary workers/subcontractors show crafty conduct amid the financial blast, the outcome will be an expanded higher development cost. The investigation can likewise advance the present comprehension of the administration structure of Swedish development firms and how they could impact development costs. We endeavor to use exchange cost hypothesis while investigating development segment structures, which ought to be viewed as an initial phase in attempting to comprehend changes in the division from a proficiency point of view. The commitments are one of a kind as in neither the conduct connection between customer furthermore, contractual worker nor basic examination of firms has been completely explored. The third theory of the second paper strengthens what numerous scholastics and experts as of now called attention to, which is the requirement for expanded challenge and progressively outside provider support

in the part so as to facilitate the expansion in development costs. As the reaction from the review recommends, nature of foundation ventures has not diminished after the exchange of value affirmation from customer to contractual worker. Be that as it may, the high number of respondents that demonstrated quality is equivalent to before the exchange raises a worry of absence of quality improvement. Smyth (2010) battles that so as to accomplish constant improvement that infers consistency, learning must be exchanged crosswise over undertakings and inserted as a capacity or capability. The lack of gifted and experienced specialists in the open customer association may have undermined information exchange openings and consequently added to the apparent absence of value improvement in open development ventures. A venture director's choices with respect to quality details and models amid the development period of ventures can likewise impact persistent improvement objectives if venture administrators much of the time resort to a satisfactory quality dimension that isn't ideal so as to maintain a strategic distance from or on the other hand limit clashes with temporary workers or the disappointment of ranking directors. The longing to build the utilization of other acquirement strategies, for example, PPP is by all accounts pie in the sky thinking right now, when it is deciphered as lessening the need an open customer with a profoundly gifted and able workforce that can not just arrangement with the specialized parts of development extends but on the other hand are prepared to deal with the stray pieces of long haul contracts from lawful and money related angles.

V. CONCLUSION

Managing tedious, dubious, and dynamic highlights of development extends inside planning strategies have been wellsprings of worry in the development space. To accomplish precision and/effective the board of development ventures, at that point organizers need to actualize better demonstrating strategies. As to

incapability of conventional arranging strategies, venture organizers would need to look for incorporated methodologies utilizing new advancements in development the executives. Taking into account that there have been less examinations related to execution of reproduction in this space the current investigation along these lines discovers its handiness. The investigation speaks to an imaginative comprehensive investigation inside the NZ development part that would manage complexities engaged with development ventures the executives and help improve tasks' conveyance. The general positioning of hazard factors for the seven classes were investigated, the mean esteem running from 1 to 2.5 as considered as the most basic factors in the scaffold ventures. the main ten positioning of hazard factors were as pursues: Delay amid development process, Lack of coordination, Safety gear for laborers, numerous alterations on configuration are made amid execution, Unavailability of land and option to proceed that confines access to the site, Casting and relieving time is more Inexperience when evaluating tenders, Unrealistic expense gauge and calendars, the proprietor lingers behind in paying the contractual workers and Low dimension of capacity of temporary worker.

VI. REFERENCES

- [1]. Wu, I., et al., Bridge construction schedule generation with pattern-based construction methods and constraint-based simulation. *Advanced engineering informatics*, 2010.24(4):p.379 -388.
- [2]. Kim, J., An investigation of activating duration input modelling by duration variance ratio for simulation-based construction scheduling, 2007.
- [3]. Srisuwanrat, C.,the sequence step algorithm:A stimulation -based scheduling algorithm for repetitive projects with probabilistic activity durations , 2009,ProQuest, UMI Dissertations Publishing.
- [4]. Wu, I.,et al . A pattern-based approach for facilitating schedule generation and cost analysis in bridge construction projects.in Proc. Of 26th CIB-W78 conference on managing IT in construction 2009.
- [5]. Marzouk, M., H.Z. EI-Dein, and M. EI- Said, Application of computer simulation to construction of incremental launching bridges. *Journal of Civil Engineering and Management*, 2007.13 (1):p. 27 – 36.
- [6]. Ailland,K.,H., J. Bargstadt, and S.Hollermann.Construction process in simulation in bridge building based on significant day-to-day data.In proceedings of the Winter Simulation Conference. 2010.Winter Simulation Conference.
- [7]. Serman , J.,D.,System dynamics modelling for project management.Unpulished manuscript,Cambridge,MA, 1992.
- [8]. AbouRizk, S.M. and S.P.Dozzi,Appilation of computer simulation in resolving construction dispute. *Journal of construction engineering and management*,1993.119(2):p. 355-373.
- [9]. Huang,R.,A.M.Grigoriadis,and D.W.Halpil. Simulation of cable-stayed bridges using DISCO.in Proc.,1994 Winter Simulation Conference, IEEE,Piscetaway,N.J.1994.
- [10]. Chan,W.H.and M.Lu. Logistics and operation simulations in precast viaduct construction:case study.in Proceedings of 2005 ASCE Internation Conference on Computing in Civil Engineering. 2005.
- [11]. Marzouk,M.,H.Said, and M. EI-Said ,Special-Purpose Simulation Model For Balance Cantilever Bridges. *Journal Of Bridge Engineering*, 2008.13(2): p. 122- 131.

E-Cart Shopping System

Shraddha Kathane, Apurva Boratne, Rashmi Mangrulkar, Shivani Mahajan, Shubham Bawane, Moahammad Mujib
Informaton Technology, Bapurao Deshmukh College of engineering, Sewagram (Wardha), Maharashtra, India

ABSTRACT

In this paper we survey such a shopping system that can be very helpful for the customer and that can also save the time of the customer and make their shopping easy. In this system customer scans the QR Code of the products and add product into the cart. Bill is a generated automatically which saves the time waiting in a queue. In this paper, we focus on a cart in which products put into a shopping cart and the product automatically read and the bill is generated on the monitor of cart which is transfer to the billing counter via online domain. As a result customers don't have to hold up in long lines at checkout. This system brings new innovation than existing shopping system. The main purpose of this paper is to provide centralized and automated billing system using QR code. Along with the automatic billing some special features incorporated are budget setting and Product recommendation based on the special offers and discount along with product details with an anti – theft mechanism. We uses new term in this paper that is Market Basket Analysis.

Keywords: Cart, QR Code, Billing System, Security, Market Basket Analysis, Barcode, Smart Shopping

I. INTRODUCTION

Human beings are always demanding to develop technology which will support and fulfill their basic needs with an easier and faster way. At present, many super market uses the traditional shopping method, they buy the product, add into the cart and then goes to the billing counter. In billing counter the scans the barcode of products and make the bills. This shopping mode can make the customer tired and can waste much more time of the customer by waiting in the queue in the billing counter. So to make the shopping easy for the customer we introduce the E-cart system for shopping using wireless sensor networks.

In this paper we develop such a shopping system that can be very helpful for the customer and that can also save the time of the customer and make their shopping easy. In this system customer scans the QR Code of the products and add product into the cart. Also bill is generated automatically which saves the

time waiting in a queue. In this paper, we center around a shopping framework. Smart Shelves that are additionally furnished with QR Code pursuers can screen all provided things and send thing notification to the server At the point when things or products wind up sold out, the server can tell representatives to restock. It ends up being basic for the store to do stock administration as all things can be normally scrutinized and adequately logged. We consider security and protection issues identified with systems as no past research has handled it. When a customer enter in the supermarket he/she had to scan the QR code on the carts monitor and after login successful he/she gets a message that his/her cart is ready for shopping. The customer can be able to view their previous shopping lists in the screen or he /she can create the new shopping list.

In our paper we introduce a new concept which is Market Basket Analysis. It help to reduce the product searching time.

E.g. if a customer buy a milk, in a screen the product associated with the milk is to be shown such as bread and biscuits and the variety of these shown products will also be display. It will easy for the customer to find the product and it shows the shelves where that product are kept. If the new product is introduce in the store it shows the advertisement of that product.

This paper adds to the headway in the current shopping system which can acquire another advancement the field of shopping centers. The main purpose of this paper is to provide centralized and automated billing system using QR code. Along with the automatic billing some special features incorporated are budget setting and Product recommendation based on the special offers and discount along with product details.

II. METHODS

First and foremost customer will download the android application on his cell phone .After this if customer does not have an account or ID for shopping purpose he will register for account after this the customer gets the unique ID that is QR code generate on his cell phone. Or else if customer has account then he/she is ready to shop.

A customer enters into the shopping mall on entering, customer first picks up a his/her shopping cart which has a Monitor on it an also a camera is introduce in the cart for scanning QR Code on each product. The bill of the buy products from the carts monitors to the billing counter is transfer through online process. So by this there is no need to rescan the product at the billing section. All the items in the mall will be equipped with QR Code tags. When person puts an item in the cart, its code will be detected by `camera

also each item is added to the cart billing is done at the cart itself.

Simultaneously all details are displayed on carts monitor. And also if we want to remove some inserted item then we press the delete key and remove a particular item. 8 item's cost gets subtracted from total bill and item removal message is displayed on cart screen. Screen of cart also show the way where the product is store in arrange on shelves at mall. At the billing Counter the total bill data will be transferred to PC LCD is used as main output device for the customers; it displays the details of items, price and total bill etc. to indicate the activity made by customer.

MARKET BASKET ANALYSIS:

In our paper we introduce a new concept which is Market Basket Analysis. It help to reduce the product searching time. The related product is displayed according to category of product. Various category are mention at admin warehouse according to this product are shown.

E.g. if a customer buy a milk, in a screen the product associated with the milk is to be shown such as bread and biscuits and the variety of these shown products will also be display. It will easy for the customer to find the product and it shows the shelves where that product are kept. If the new product is introduce in the store it shows the advertisement of that product.

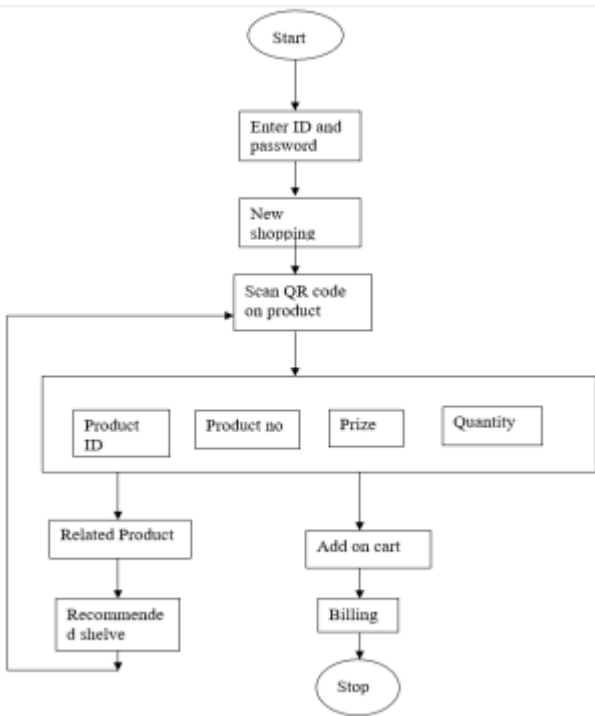
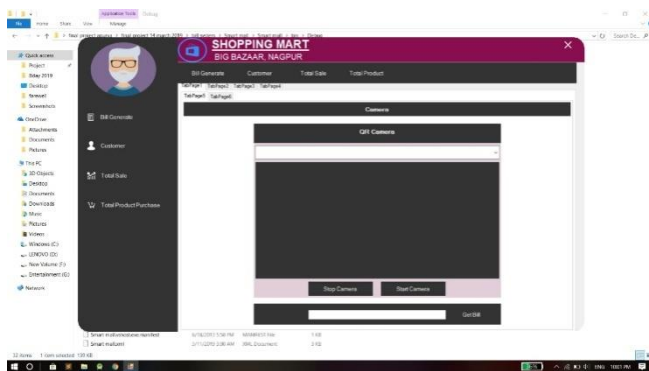


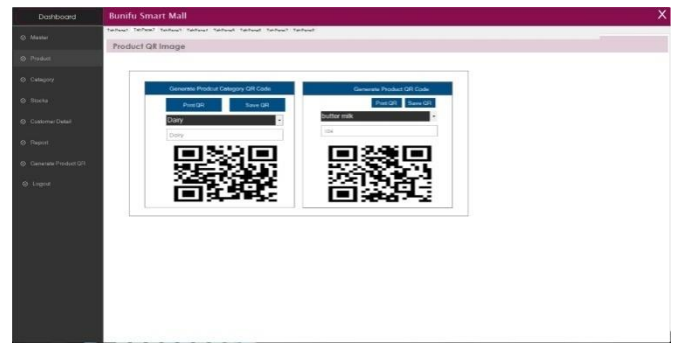
Figure 1. Flow Diagram of Shopping System

III. RESULTS AND DISCUSSION



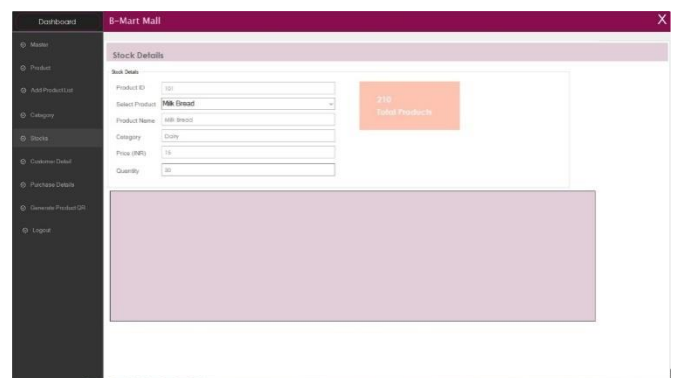
SCR 1. Billing Centre GUI

After adding the product into the cart we went to the billing section, In billing centre, the QR code from the phone is again scanned and then the bill is generated. The Generated bill is to be paid by the customer by cash and then the SMS of the bill is send to the registered mobile number.



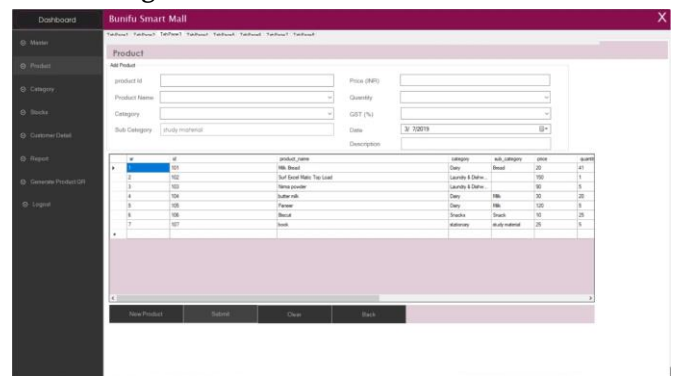
SCR 2. Generating QR Code for product

In this we generated QR code for the product and for the Category of the product that we print and paste on the product.



SCR 3. Show the stock details in warehouse

In this it shows the how many no of stock is available in warehouse and when the stock is not in stock it gives the notification to the admin



SCR 4. Adding new product in warehouse

In this we add the new product which is arrived in the mall administrator have to add the details like gst details, quantity, price, etc

IV. CONCLUSION

In this paper, we propose a secure smart shopping system utilizing QR code technology. This is the first time that QR code is employed in enhancing shopping and billing experiences and also Market basket Analysis are examined with regards to a keen shopping framework. We detail the structure of a total framework and construct a model to test its capacities. We structure a protected correspondence convention and present security examination and execution assessments. We trust that future stores will be secured with QR code and GSM technology and our exploration is a spearheading one in the advancement of a shopping framework. Our future research will focus on improving the current system, for example movement of cart is automated is also implemented in future. Also the misplace product detection from shelves.

V. REFERENCES

- [1]. R. Li, T. Song, N. Capurso, J. Yu, J. Couture and X. Cheng, "IoT Applications on Secure Smart Shopping System," In IEEE Internet of Things Journal, vol. 4, no. 6, pp. 1945-1954, Dec. 2017.
- [2]. Prof. P.C. Warule, Gavhane Pratiksha, Ghorpade Rutuja, Joshi Prasad, "RFID, ZigBee and GSM Based Automatic Billing Trolley For Shopping Mall" International Journal of Research in Advent Technology, Vol.6, No.3, March 2018.
- [3]. Kumar, A. Gupta, S. Balamurugan, S. Balaji and R. Marimuthu, "Smart Shopping Cart," 2017 International conference on Microelectronic Devices, Circuits and Systems (ICMDCS), Vellore, 2017, pp. 1-4.
- [4]. Hsin-Han Chiang, Wan-Ting You, Shu-Hsuan Lin, Wei-Chih Shih, Yu-Te Liao, Jin-Shyan Lee, and Yen-Lin Chen "Development of Smart Shopping Carts with Customer-Oriented kb Service" in International Conference on System Science and Engineering (ICSSE) National Chi Nan University, Taiwan, 2016, pp 1-3.
- [5]. Yewatkar, F. Amanda, R. Singh, A. Bandal et al., "Smart cart with automatic billing, Product information, product recommendation using rfid & zigbee with anti-theft," Procedia Computer Science, vol. 79, pp. 793–800, 2016.
- [6]. P. Chandrasekar and T. Sangeetha, "Smart shopping cart with automatic billing system through rfid and zigbee", in Information Communication and Embedded Systems, 2014 International Conference on. IEEE, 2014, pp. 1–4
- [7]. S. Amendola, R. Lodato, S. Manzari, C. Occhiuzzi, and G. Marrocco, "Rfid technology For IoT-based personal healthcare in smart spaces", IEEE Internet of things journal, vol. 1, no. 2, pp. 144–152, 2014.
- [8]. R. M. Bani-Hani, Y. A. Wahsheh and M. B. Al-Sarhan, "Secure QR code system," 2014 10th International Conference on Innovations in Information Technology (IIT), Al Ain, 2014, pp. 1-6.
- [9]. R. Kumar, K. Gopalakrishna, and K. Ramesha, "Intelligent shopping cart", International Journal of Engineering Science Technology, vol. 2, no. 4, pp. 499–507, 2013.
- [10]. S. Gupta, A. Kaur, A. Garg, A. Verma, A. Bansal, and A. Singh, " Arduino based smart cart", International Journal of Advanced Research in Computer Engineering & Technology, vol. 2, no. 12, 2013.
- [11]. D. Klabjan and J. Pei, "In-store one-to-one marketing ", Journal of Retailing and Consumer Services, vol. 18, no. 1, pp. 64–73, 2011.
- [12]. Khan, S. U. Khan, R. Zaheer, and S. Khan, "Future internet: the internet of things Architecture, possible applications and key challenges", in Frontiers of Information Technology (FIT), 2012 10th International Conference on. IEEE, 2012, pp. 257–260.
- [13]. L. Tan and N. Wang, "Future internet: The internet of things", in 2010 3rd International Conference on Advanced Computer Engineering, vol. 5. IEEE, 2010, pp. V5–376. E. Welbourne, L. Battle, G. Cole, K. Gould, K. Rector, S. Raymer, M. Balazinska and G. Borriello, "Building the internet of things using rfid: the rfid ecosystem experience", IEEE Internet Computing, vol. 13, no. 3, pp. 48–55, 2009.

Advancement and Automation in Pulverizer Machine to Increase its Production Rate

Amit Gavhad¹, Rohan Nikhare², Sanket Rao², Raj Kumar², Suryaprakash Daheriya², Umesh Gumgaonkar²

¹Assistant Professor, Mechanical Engineering Department., GHRAET, Nagpur, Maharashtra, India

²Mechanical Engineering Department., GHRAET, Nagpur, Maharashtra, India

ABSTRACT

This paper presents the modified design of a blade made up of EN-8 Carbon Steel used to further reduce the size of the granular aluminum foil material of more and above grade size of 90. This research is done on the logical approach based on the study done on the pulverizer machine when it is in running condition and also to study the design of blade so as to achieve higher production rate in the ongoing process at the NPM Industry and to do the advancement in the blade design to achieve higher production rate. This paper also presents the upgraded design and analysis of the blade and various remedial solutions for its advancement that has increased its production rate.

Keywords: Pulverizer Machine, EN8 Carbon Steel

I. INTRODUCTION

A pulverizer or grinder is a mechanical device for the grinding of many different types of materials. So as to reduce the size of a particular material up to a certain desired size or to grind it further till the requirement. This additional resources that assist you in writing a professional technical paper.

Operating principle of Pulverizer

The pulverizer consists of an encased rotor carrying swing hammers, whizzer classifier for fineness regulation and pressure gradient creator mounted on a solid shaft. Raw material to be pulverized enters the crushing chamber through the hopper or the automatic rotary feeder. The impact of the hammers on the feed material against the liner plates reduces it into fine powder. The ground material is carried towards the whizzer classifier for classification and the oversize particles are rejected by the classifier and returned to the crushing chamber for further grinding. The classified material is then conveyed into the cyclone for collection and bagging. A dust collector is

provided in the system for ensuring dust less operation and for no loss of ground powder.

Typical application of Pulverizers

The techno wings impact pulverizers are used for a wide range of application e.g. Agricultural, chemicals, carbon and graphite, coal, coke, coconut shell and wood saw dust, clay, dye stuff and pigments, detergents, ferro-alloys fertilizers, fillers, food products, herbs and spices, insecticides and pesticides, katha, marine feeds, minerals, plastics, pharmaceuticals, resins.



Figure 1. Pulverizer Machine

II. METHODS AND MATERIAL

Factors affecting the production in pulverizer due to blade design.

The width of the blade is of 2.5 inches due to which the grinding of the aluminum foil doesn't takes place as per the desired requirement of the industry.

Rotation of the blade that is currently 35 rpm which is to be increased so as material can be grinded at a faster cutting rate and can also increase the production rate of the grinded short sized powder form aluminum.

Thickness of the blade affects the cutting of aluminum foil that is greater that the Grade size 10. The thickness of the blade is small therefore the material grinding doesn't place as per the requirement.

Faster and improper mannered pouring of the raw material into the hopper of the machine that is the pouring of material is done at higher rate as compare to the slower cutting rate of the grinder blade.

Material used to make the blade EN8 carbon steel is a common medium carbon and medium tensile steel, with improved strength over mild steel, through-

hardening medium carbon steel. EN8 carbon steel is also readily machinable in any condition.

EN8 steels are generally used in the as supplied untreated condition. But EN8 steels can be further surface-hardened by induction processes, producing components with enhanced wear resistance. Steel EN8 materials in its heat treated forms possesses good homogenous metallurgical structures, giving consistent machining properties

1. EN8 Steel is Steel Grade in BS 970 1955 Specification

EN8 steel grade belongs to the standard of BS 970-1955, which is a standard for wrought steel for mechanical and allied engineering purpose. In BS 970 standards, there are some other common steel grades, like EN9, EN19, EN24, EN36 etc. And the most equivalent is grade 080M40 steel in BS 970-1991.

2. EN8 Carbon Steel is Available in Following Shape:
We could supply EN8 steel in bright round bar in drawn/turned condition or round hot rolled, hexagon, square, steel flats and plate.

EN8 Steel Round Bar: 8mm-1600mm

EN8 Steel Cold Drawn Bar: 5mm-70mm

EN8 Carbon Steel Flat & Plate: 10-1500mm x 200-3000mm

Sizes of other shapes are available, please send emails to us for specific checking.

3. EN8 Carbon Steel Grade Equivalents

Other steel grades in ASTM, DIN, JIS standards are similar and equivalent to EN8 steel, as follows:

BS 970-1991:080M40

AISI/ASTM A29:1038, 1040, 1045

DIN Werkstoff No.: 1.0511, 1.1186, 1.1189

BS & DIN European: C40, CK40, C45, CK45

JIS G4051: S40C, S45C

4. EN8 Carbon Steel Properties

4.1 Carbon Steel EN8 Chemical Composition

Standard Grade	C	Mn	P	S	Si
BS 970 EN8/080M40	0.36-0.44	0.60-1.00	0.05	0.005	0.10-0.40

4.2 EN8 Medium Carbon Steel Mechanical Properties and Hardness

Heat Treatment	Tensile Strength Rm	Yield Strength Rm	Rp0.2	Amin 5.65√So	Impact		Hardness
	MPa	MPa			Izob	KCV	
N	550	280	—	16	15	16	152/207
	510	245	—	17	—	—	146/197
Q	625/775	385	355	16	25	28	179/229
R	700/850	465	450	16	25	28	201/255

5. Forging of Carbon Steel Grade EN8/080M40

Preheat the EN8 steel carefully, then raise temperature to 1050°C for forging. Do not forge below 850°C. After forging cool en8 steel slowly, preferably in a furnace.

6. Heat Treatment of EN8 Carbon Steel

EN8 steel is usually supplied untreated but also be able to be supplied to order in the normalized or finally heat treated, which is adequate for a wide range of applications.

Tempering – Carbon steel EN8 or 080m40 can be tempered at a heat of between 550°C to 660°C (1022°F-1220°F), heating for about 1 hour for every inch of thickness, then cool in oil or water.

Normalising of EN8 bright mild steel takes place at 830-860°C (1526°F-1580°F) then it is cooled in air.

Quenching: in oil or water after heating to this temperature will harden the steel.

7. Applications of EN8 Carbon Steel

EN8 steel material is suitable for the all general engineering applications requiring a higher strength than mild steel such as:

general-purpose axles
shafts,
gears,
bolts and studs.
spindles,
automotive and general engineering components,
Other general engineering parts etc.

We supply steel grade EN8 to some customers in middle east like UAE, Europe countries like UK and also in Africa like south Africa. We will have some EN8 carbon steel promotion at the end of almost every month. Just send emails with detailed requests for EN8 carbon steels price.



Figure 2. EN8 Carbon Steel

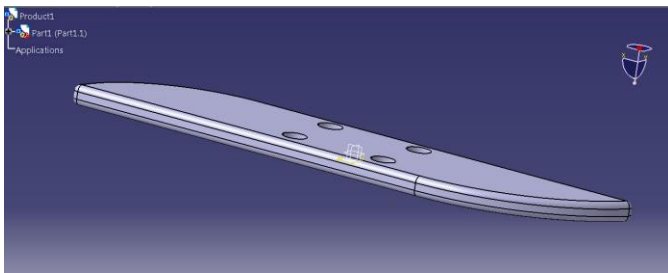
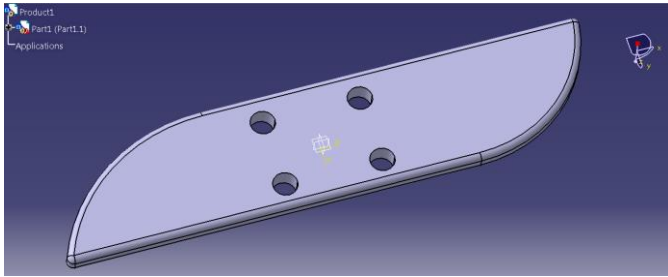
Designing of the modified blade Mainly the modification is done in the two desired factors that has completely changed the aspects of the blade design which are as followed:

The main modification in the design of the blade is done by increasing the width of the blade to 4 inches. The previous blade was of the width 2 inches and the modified blade is increased with the 2 inch width and the total width of the blade is now 4 inches and the length of the blade is 18 inches.

The thickness of the blade is also increased, firstly the blade thickness was of 10-12 mm and now the thickness is increased up to 18-20 mm.

The designing of the blade is done in the CATIA V5 software.

Designing of the modified blade in the CATIA V5 Software



Solutions

The product quality up to the industrial requirement can be achieved by increasing the width of the blade that actually results in cutting of more amount of material. Firstly the blade was of 2 inches which doesn't allows the material to grind as per the industry requirement that is the output to be received is in the grinded powdered form therefore as per the desired requirement if the width is increased then the more amount of material can be cut down that is the aluminum foil of grade 9-12 can be easily cut down as the width will be increased. The main benefit for this width size blade is that the product quality that is achieved from this blade marks up to the industry requirement and grinded material received is of needed grade size.

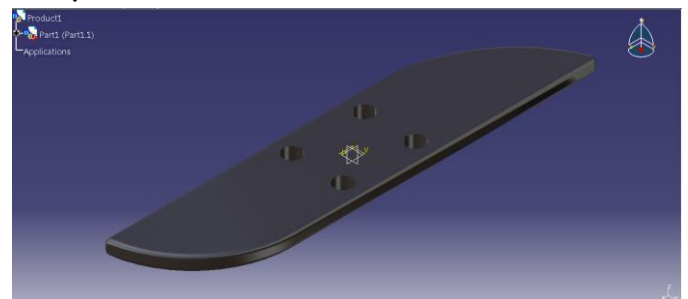
The rpm of the blade is needed to be increased that is firstly the blade use to run at 35rpm and after testing it at higher speed the rpm of the machine is further increased by 40-45 rpm and now the blade runs at the speed of 75-80 rpm which cuts and grinds the material in the desired size needed and the product that is to be

achieved in the thick powdered form is now being achieved in that particular thick powdered form.

The thickness of the blade is now changed to 20 mm from the previous thickness of old blade that was of 10-12 mm, the old blade was not able to grind the material due to the grade size of the aluminum that is of grade size 9-12 which is tough for the 10-12 mm blade to grind that much hard material so the grinding doesn't use to takes place as per the requirement and now after the thickness is changed to 20mm, the grinded material achieved from the modified blade is of good quality and the desired grade size that is required in the industry.

The manner of pouring of the material has also been changed now that is the material being poured is now poured in a desired amount of material which grinds the material uniformly.

EN8 Material applied to the blade to do the further Analysis on it



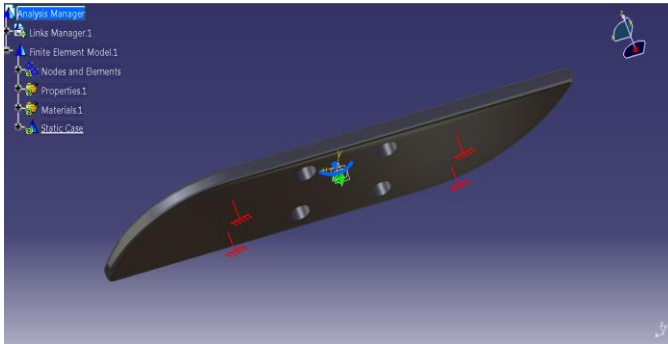
Analysis of the blade

The analysis is done on the blade by applying the pressure of 100N/m². That is mainly the material is poured into the machine with the help of hopper which doesn't applies any amount of pressure on the blade. That is so low amount of force or the pressure is applied on the blade when it is in rotation. Therefore the following analysis is done just by applying a low pressure of 100N/m² on the blade.

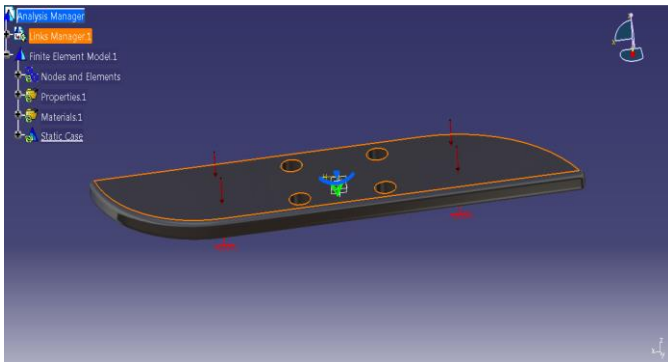
The analysis is carried out in three ways that is:
Von-Misses Stress Analysis

Displacement Analysis

Further are the analysis carried out on the CATIA software.

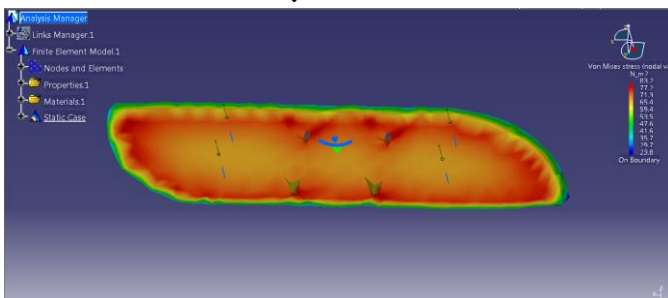


The clamps have been mounted on the base as the material comes down into the machine from the hopper so the pressure and the force that is mainly applied at the top of the blade.



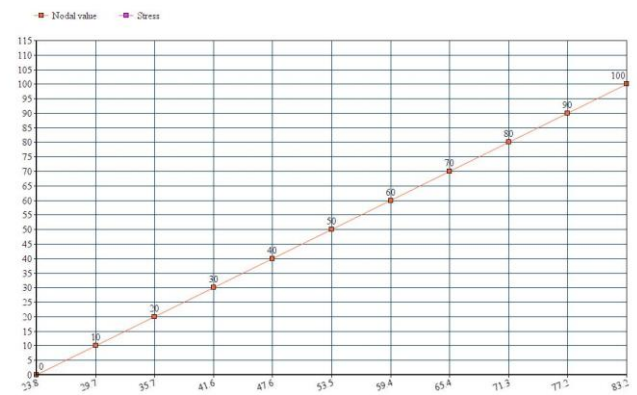
The pressure points have been applied to the top of the blade as compared to the alignment of the clamps mounted at the base of the blade. That is the pressure of 100 N/m² is being applied on the blade and then the computation is done so as to achieve the further analysis of the desired part.

Von-Misses Stress Analysis

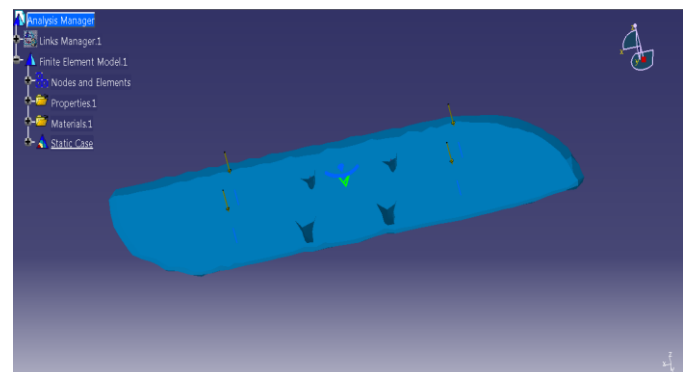


The von Misses stress is used to predict yielding of materials under complex loading from the results of uniaxial tensile tests. The von Misses stress satisfies the property where two stress states with equal distortion energy have an equal von Misses stress.

The various changes can be seen in the part body as the various color represents where the exact amount of pressure is been exerted. That is the dark blue color shows where the pressure exerted is less and the red color shows which is highly affected by the pressure exertion on the part body.



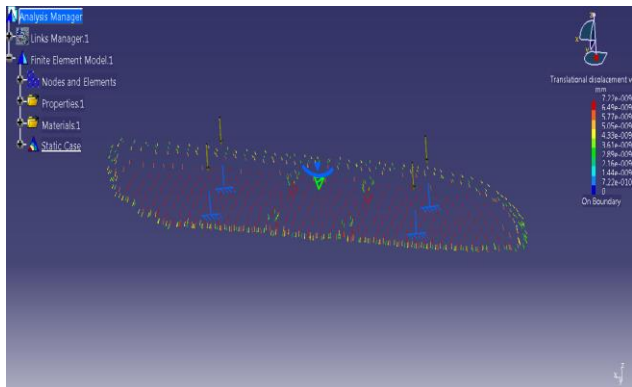
Graph made from the obtained result of nodal values by applying gradual stress of 100N/m².



Deformation Analysis

Deformation analysis shows a analyzed image of the blade while applying the pressure of 100N/m². In actual practice the blade will not get deformed but it will definitely reduce its sharpness from the corners from where the material grinding takes place.

Translation Displacement Analysis



III. CONCLUSION

The modified blade has been implemented at the industry in actual practice and the production rate at the industry by this blade results in increase of production of the thick powdered aluminum by 500 kg of grinded material by one machine in one single shift firstly the production was so low and the company was facing a major issue with it which is positively solved and the positive results have been achieved from the modified design. The implementation has been done by the industry as they saw a positive outcome in this modified design.

Review Paper on Microgrid System

Ninad Kamble, Pratik Nandanwar, Pratik Yadav, Samir Upare, Manoj Choudhari

Electrical Engineering Department, DBACER, Nagpur, Maharashtra, India

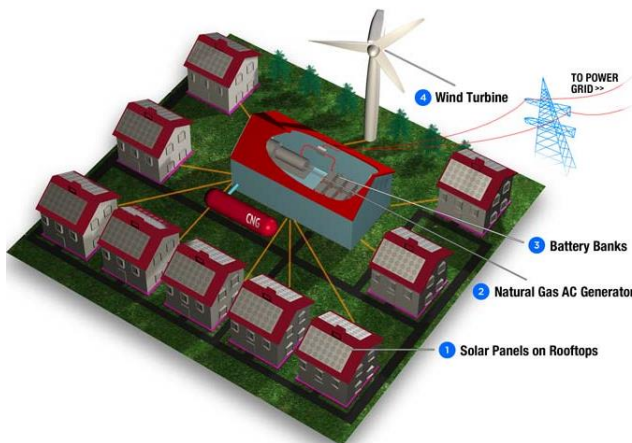
ABSTRACT

The concept of integration of distributed energy resources for formation of micro grid will be most significant in near future. The latest research and development in the field of micro grid as a promising power system through a comprehensive literature review is presented in this paper. It shows a broad overview on the worldwide research trend on micro grid which is most significant topic at present. This literature survey reveals that integration of distributed energy resources, operation, control, power quality issues and stability of micro grid system should be explored to implement micro grid success- fully in real power scenario. Microgrids are electricity distribution systems containing loads and distributed energy resources, (such as distributed generators, storage devices, or controllable loads) that can be operated in a controlled, coordinated way either while connected to the main power network or while is landed.

Keywords: DER, Integration DG RER RESs , Micro Grid Control, Micro Grid Protection & Micro Grid Stability

I. INTRODUCTION

A Microgrid refers to distributed energy resources and loads that can be operated in a controlled, coordinated way; they can be connected to the main power grid, operate in “islanded” mode or be completely off-grid.



MICROGRID

Figure 1. Distributed Power Supply System In Microgrid

Microgrids are low- or medium-voltage grids located at or near the consumption sites. They can generate power from both renewable and conventional sources and although they are mainly electrical systems, they can also incorporate a thermal energy component, such as combinedheat and power. Microgrids are increasingly being equipped with energy storage systems, as batteries become more cost competitive. The system is controlled through a microgrid controller incorporating demand-response so that demand can be matched to available supply in the safest and most optimized manner. A flywheel or battery-based grid stabilizing system can be included to offer real and reactive power support.

The concept of a microgrid is not new: the earliest electricity networks were essentially microgrids before they were joined into regional and national grids. What is new is their changing and expanding role, in the face of rising power demands, the falling cost of renewable sources, and the increasing need for

supply resilience and autonomy – both on- and off-grid.

II. BASIC STRUCTURE OF MICROGRID

1) Storage in Microgrid:

Microgrid can have storage as backup while operating in stand-alone mode of operation. When there is renewable source of power, excess power from renewable (after the load demand is fulfilled), can be stored in batteries. This can then be used as backup when needed.

From a brief introduction of components of microgrid, a visualization of microgrid can be viewed as following figure:

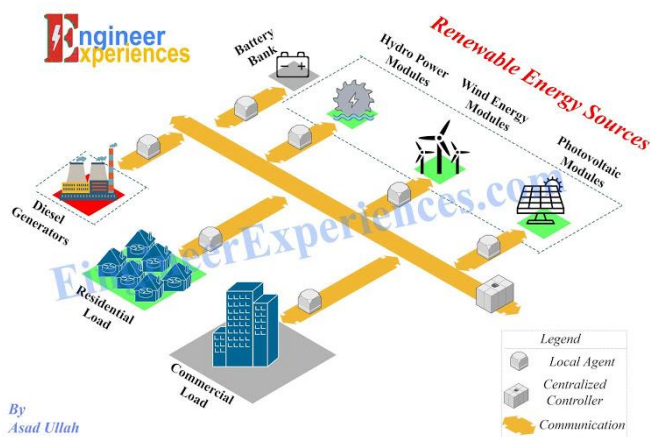


Figure 2. Basic Structure Of Microgrid

This figure has multiple load centers (commercial and residential) and multiple type of generation (conventional and non-conventional). The microgrid has distributed sources and local controllers also whole microgrid is monitored by centralized control unit. There is also a battery bank for storage of excess renewable power.

This is stand-alone operation of a microgrid.

2) Mode of Operation of Microgrid:

Microgrid can work with the main power supply from the utility to feed the load and provide power to the main grid when it has excess power. It can work as island of load units and generation when other parts

of whole power system is under maintenance or have bug in it. Control unit is also responsible of successful connection and disconnection of microgrid from main grid. and operation must not be disturbed by this.

Basic Structure and Elements in Microgrid:

As stated in start that microgrid is home for a lot of components according to requirements of stakeholders (consumer, investor, market). All components join together to form structure of microgrid. From the definition, we can conclude that basic elements in microgrid are:

- Distributed Generating units
- Load Centers
- Distribution network
- Control Unit(s)
- Electric Power Storage (optional)

The distributed generation units could be conventional, non-conventional (renewable or alternate sources) or combination of both. Main objective of these generating units is to meet the demand of local load centers. Load centers can also have own generation, partially dependent to the supply or total demand is fulfilled by the generating units through distribution network.

3) Control in Microgrid:

Control unit is one of major component of microgrid. The flow of power from generation to the load centers should be monitored, controlled and managed properly. Even before, the generation of electric power must have controller to maintain power quality (voltage, frequency and sin wave within limit).

4) **Synchronization and control** of single type of generation in microgrid is relatively easy and less complex. And this can be controlled by single central controller. But microgrid can have multiple type of generation (by its nature) at single place to feed the single load center. So, the control of such diverse type of generation becomes very complex and Control in Microgrid:

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TYPES OF MICROGRID:

Community Microgrids can serve a few up to thousands of customers and support the penetration of local energy (electricity, heating, and cooling).[8] In a community microgrid, some houses may have some renewable sources that can supply their demand as well as that of their neighbors within the same community.

1.Community Microgrid

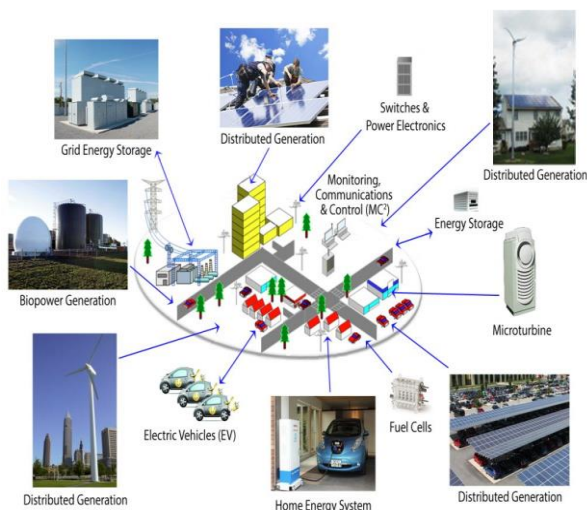


Figure 3. Community Microgrid

Community Microgrids can serve a few up to thousands of customers and support the penetration of

local energy (electricity, heating, and cooling).[8] In a community microgrid, some houses may have some renewable sources that can supply their demand as well as that of their neighbors within the same community. The community microgrid may also have a centralized or several distributed energy storages. Such microgrids can be in the form of an ac and dc microgrid coupled together through a bi-directional power electronic converter.

2.Remote Off-grid Microgrids

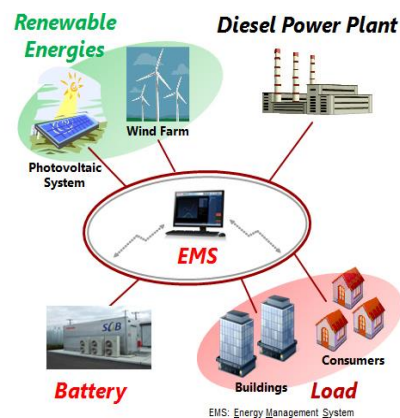


Figure 4. Remote Off-Grid Microgrid

These microgrids never connect to the Macrogrid and instead operate in an island mode at all times because of economic issues or geographical position. Typically, an "off-grid" microgrid is built in areas that are far distant from any transmission and distribution infrastructure and, therefore, have no connection to the utility grid.[6][10] Studies have demonstrated that operating a remote area or islands' off-grid microgrids, that are dominated by renewable sources, will reduce the levelized cost of electricity production over the life of such microgrid projects.[

Large remote areas may be supplied by several independent microgrids, each with a different owner (operator). Although such microgrids are traditionally designed to be energy self-sufficient, intermittent renewable sources and their unexpected and sharp variations can cause unexpected power shortfall or excessive generation in those microgrids.

3. Commercial and Industrial (C&I) Microgrids.



Figure 5. Commercial And Industrial Microgrid

These types of microgrids are maturing quickly in North America and Asia Pacific; however, the lack of well-known standards for these types of microgrids limits them globally. Main reasons for the installation of an industrial microgrid are power supply security and its reliability. There are many manufacturing processes in which an interruption of the power supply may cause high revenue losses and long start-up time.[6][10] Industrial microgrids can be designed to supply circular-economy (near-)zero-emission industrial processes, and can integrate combined heat and power (CHP) generation, being fed by both renewable sources and waste processing; energy storage can be additionally used to optimize the operations of these sub-systems.

Challenges

Microgrids, and integration of DER units in general, introduce a number of operational challenges that

need to be addressed in the design of control and protection systems in order to ensure that the present levels of reliability are not significantly affected and the potential benefits of Distributed Generation (DG) units are fully harnessed. Some of these challenges arise from invalid assumptions typically applied to conventional distribution systems, while others are the result of stability issues formerly observed only at a transmission system level.

- Bidirectional power flows: The presence of distributed generation (DG) units in the network at low voltage levels can cause reverse power flows that may lead to complications in protection coordination, undesirable power flow patterns, fault current distribution, and voltage control.
- Stability issues: Interaction of control system of DG units may create local oscillations, requiring a thorough small-disturbance stability analysis. Moreover, transition activities between the grid-connected and islanding (stand-alone) modes of operation in a microgrid can create transient stability. Recent studies have shown that direct-current (DC) microgrid interface can result in significantly simpler control structure, more energy efficient distribution and higher current carrying capacity for the same line ratings.
- Modeling: Many characteristic in traditional scheme such as prevalence of three-phase balanced conditions, primarily inductive transmission lines, and constant-power loads are not necessarily hold valid for microgrids, and consequently models need to be revised.
- Uncertainty: The operation of microgrids contain very much uncertainty in which the economical and reliable operation of microgrids rely on. Load profile and weather forecast are two of them that make this coordination becomes more challenging in isolated microgrids, where the critical demand-supply balance and typically higher component failure rates require solving a strongly coupled

problem over an extended horizon. This uncertainty is higher than those in bulk power systems, due to the reduced number of loads and highly correlated variations of available energy resources (limited averaging effect).

Microgrid protection and coordination issues:

Short circuit fault is frequent in power system and the same is harmful for the power system components, consumer's equipments as well as personnel too. As per traditional philosophy of existing power system protection, microgrids are to be protected from large amount of short circuit currents, excessively high or low voltage due to abnormal conditions occurring on the utility grid side fault or fault in the microgrid itself. To provide proper protection and to avoid damages of microgrid and customer's equipments; protective relays are to be installed to detect the abnormal conditions and to initiate circuit breakers to isolate the fault. Since proper action is required within a few fundamental cycles, decisions are generally made autonomously based upon local information like magnitudes of abnormal voltage, current etc. . In utility grid, the synchronous generators are inherently capable of withstanding large fault current which is sensed by the relays and interrupted by the circuit breakers. So cost of the power system protective devices like circuit breakers, transformers, current limiting reactors are increased due to direct interaction with that severe fault current. Another important point in this context discussed in, is the fast limitation of fault current which is a unique capacity of power electronics based interfacing of DGs that can further provide a great benefit due to reduction in rating, as well as cost of the expensive current carrying equipments and current interrupting circuit breakers. Also the fast response characteristic of the solid state power electronic interfaced relays can provide good protection coordination among all related protective devices in the microgrid system.

Stability analysis of microgrid :

The stability of a microgrid, which is interconnection of several distributed energy resources, is its ability to return to normal or stable operation after having been subjected to some form of disturbance. Conversely, instability means a condition denoting loss of synchronism or falling out of normal operation. Stability considerations have been recognized as an essential feature of microgrid planning. For proper working of microgrid, the stability problems are to be taken care of considering the steady state, dynamic and transient condition. The study of steady state stability mainly concerned with computing maximum limit of DER loading while maintaining synchronism, however, if the loading is increased gradually . In a microgrid, dynamic instability more often occurs than the steady state one due to sudden fluctuation of load leading to the system oscillation which is required to be died out completely within a short period. Oscillations persisting for a long period may be a serious threat to the interconnection of DERs. Therefore, study of dynamic stability of a microgrid is essential.

Advantages of microgrid:

- Ability to disconnect from utility grid during disturbance and operate independently
- It reduces demand on utility grid thus prevents grid failure
- We can use both electricity and heat energy so that over all efficiency increases
- have much smaller financial commitments.
- use renewable resources hence are more environmentally friendly with lower carbon footprints.
- require fewer technical skills to operate and rely more on automation.

Disadvantages of microgrid:

- Voltage ,frequency and power quality should be at acceptable limits
- Requires battery tanks to store which requires space and maintenance

- Resynchronization to utility grid is difficult
- Protection is difficult

III. REFERENCES

- [1]. "A Survey of Techniques for Designing and Managing Micro grids", IEEE PES GM 2015
- [2]. "Features and Benefits - Microgrids". www.districtenergy.org. Retrieved 2018-06-28.
- [3]. "DOE Micro grid Workshop Report" (PDF).
- [4]. Hatziargyriou, Nikos (2014). Micro grids Architectures and Control. John Wiley and Sons Ltd. p. 4. ISBN 978-1-118-72068-4.
- [5]. Jump up toga b c d Ernie Hayden. "Introduction to Micro grids" (PDF). Retrieved 20 June 2016.
- [6]. Sale, M.; Sea, Y.; Mandy, Y.; Bandager, W.; Mohamed, A. (October 2016). "Design and implementation of CCNY DC micro grid tested". 2016 IEEE Industry Applications Society Annual Meeting: 1–7. Doi: 10.1109/IAS.2016.7731870. ISBN 978-1-4799-8397-1.
- [7]. Thomson, Greg (2018). "The Sonoma Community Micro grid Initiative" (PDF). Clean Coalition.
- [8]. R. H. Lasseter and P. Piagi. MicroGrid: A Conceptual Solution. Power Electronics Specialists Conference, IEEE 35th Annual, 2004.vv
- [9]. US Department of Energy Electricity Distribution Programme, "Advanced distribution technologies and operating concepts-MicroGrids", Online]. Available: <http://www.electricdistribution.ctc.com/MicroGrids.htm>.
- [10]. S. Morozumi, "Micro-grid demonstration projects in Japan", IEEE Power Conversion Conference, pp.635-642, April, 2007. an overview", System of Systems Engineering, IEEE International Conference, pp.1-8, April, 2007.

Design and Implementation of Dual Converter by Using Microcontroller with DC Motor as Load

Bhagyashri Patil, Nikit Koche, Gaurav Sahu, Karishma Gajbhiye, Prof. Shivpal R. Verma

Dr. Babasaheb Ambedkar College of Engineering and Research Wanadongri, Hingna Road, Nagpur, Maharashtra, India

ABSTRACT

Use of microcontroller-based system has given flexibility for implementation of closed loop operation, to get variable speed of DC motor irrespective of supply fluctuation and load variation by incrementing or decrementing firing angle for dual convertor. In dual converters with non-circulating current, only one converter operates at a time and another converter is temporarily blocked from conducting by withdrawing firing pulses to the thyristors. Since only one converter operates at a time no reactors are required between the converters. The paper includes details on design of regulated power supply and zero crossing detectors to detect zero crossing instant of A.C. input to converters to determine firing angle, control circuit is designed to read some input parameters.

Keywords: Microcontroller, DC Motor, Silicon Controlled Rectifiers, MOSFET

I. INTRODUCTION

The rapid growth in science and technology offers several advantages of using integrated circuits, microprocessors, microcontrollers, embedded chips, etc., in designing electrical and electronics projects and circuits by reducing their size, cost, and complexity. Using these embedded chips and microcontrollers is increasing due to its simplicity and benefits. The microcontrollers can be programmed to perform various tasks based on requirement of the circuit operation. Thus, simply by changing program instructions various tasks can be performed by a single circuit without changing any hardware circuitry of the project. Thus, the application of microcontroller in science and technology is increasing rapidly. Power electronic applications have become very common in modern commercial and industrial environments particularly in applications of AC-DC conversions. Electrical system is mostly AC in nature. But the traditional DC drives are still in operation, due to ease

of speed control requiring forward and reverse operation.

To achieve this effective control on speed and direction of chosen DC drive and AC-DC conversion, a simple controllable dual converter is used in this work. Dual converters consist of two converters or bridges. Left bridge acts as a forward converter and other (right) acts as reverse converter. Single-phase full converters allow only two-quadrant operations. If two fully-controlled converters are connected back-to-back, then a four-quadrant operation is possible and such types of converters are called dual converters as shown in Figure-1. They are used in high power variable speed drives. Conventional dual converter is built by employing two full bridge converters as shown in Figure-1. One of them is used to allow the current of motor to flow only in one direction whilst the other is used for reverse direction. Hence two bridge converters are required to perform four-quadrant operations. A Dual-Converter is a converter

which can handle a load with all four combinations of voltage polarity and current direction. The positive current converter is operated for positive current to load. The negative current converter is operated for negative load current.

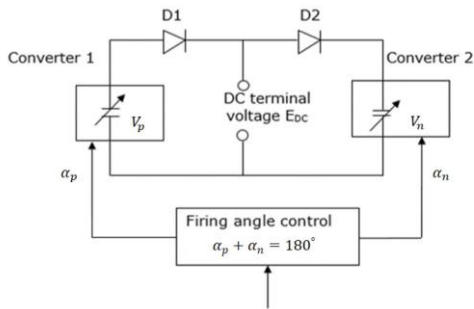


Figure 1. Block diagram of dual converter

There are two modes of dual converter.

- (1) Non-circulating current mode.
- (2) Circulating current mode.

A. Non-circulating Current Mode

In this mode, complex controlling unit is needed to trigger the thyristor. When a positive converter is triggered the negative converter is blocked temporarily. So, that time interval (10 to 20 ms) is needed between the two converter's triggering pulses. Based on the triggering the load current may be continuous or discontinuous in nature. The circuit diagram of non-circulating current mode dual converter is shown in the Figure 2

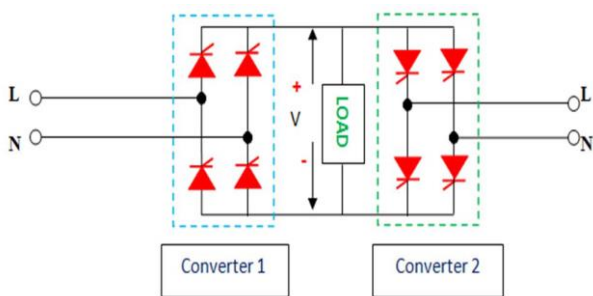


Figure 2. Circuit diagram for Non-circulating current mode.

B. Circulating Current Mode

Both the converters are always in conduction. Due to this a large amount of circulating current flow present in the circuit. To limit the over flow of the circulating

current reactors are used as shown in the Fig. 3. To operate the converters 1 and 2 concurrently firing angles should be maintained in such a way that, $\alpha_p + \alpha_n = 180^\circ$. The main advantage of this mode is its faster response. The cost and size of the reactor reasonably quite large in higher power level. Circulating current increases the power losses. So, the power factor (pf) and efficiency (η) are low. The inductance value chosen such a way that the circulating current is 30% of full load current.

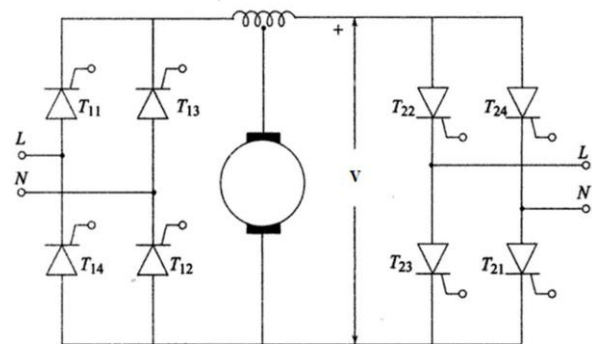


Figure 3. Dual converter in circulating Mode

MICROCONTROLLER BASED TRIGGERING CIRCUIT

Thyristors or Silicon Controlled Rectifiers (SCRs) are widely used as a switching device in the medium and large power levels starting from few kilowatts to several mega watts at voltage levels of few hundred to several kilo volt levels. Bipolar Junction Transistors (BJTs) and Metal Oxide Semiconductor Field Effect Transistors (MOSFETs) although have very fast switching characteristics compared to SCRs, their uses are limited to medium power levels at few hundred volts. Insulated Gate Bipolar Transistors (IGBTs) are switching devices which have positive points over the MOSFETs and thyristors. However, their higher cost and inability to work at very high voltages makes SCR a better choice even today, so far as line commutated converters are concerned. Because of advances in the switching technology the analog trigger circuits are replaced by digital trigger circuits. The circuit like converter, cycloconverter, rectifier and inverter make use of thyristor as an elementary unit. There are three

terminal thyristors having additional terminal gate, along with anode and cathode; is employed to trigger the thyristor at a precise angle, known as firing mechanism. It is observed that in analog triggering circuit, trigger circuit is too complex with many components; which may lead to debugging difficulties, uneven spacing of the adjacent trigger pulses and shifting phase inaccuracies. Hence digital trigger mechanisms designed which overcomes the limitations of analog trigger circuit. Simple, reliable gate drives for interfacing logic to power devices enhanced the control of large amounts of power. Recently, advances in microcontroller technology have led to self-contained systems capable of performing much more than mere computation. Peripheral tasks so necessary to high speed, real time control can now be incorporated with a microprocessor onto a single controller chip. These include high speed data collection, analog-to-digital data conversion, timing (including sampling rates), multiplexing, and high speed output of digital data. Microcontrollers perform such high speed control functions plus microprocessor computation at reasonable cost and as an easily interfaced to a larger control system. This paper describes the design and development of microcontroller based firing angle control, using Arduino microcontroller. The microcontroller is used as the firing controller. This IC chip takes input from a variable resistor, convert it to digital data, calculate delay time and trigger thyristors accordingly. The firing angle is adjustable from zero to 180°.

II. HARDWARE

A. zero-crossing detector and the power supply

The main sections of the circuit are a rectifier, regulated power supply and zero-crossing detector. Figure.3 shows the supply waveform, zero-crossing circuit and synchronised output waveform. The 230V AC mains is stepped down by transformer to deliver the secondary output of 9V, 500 mA. The transformer output is rectified by a full-wave centre tapped rectifier comprising diodes and then regulated by IC

7805. Capacitors are used for bypassing the ripples present in the regulated 5V power supply. LED acts as the power-on indicator and resistor limits the current through LED.

B. Switch

Switches are used to increase and decrease the triggering angle. In this microcontroller based triggering circuit two switches are used, one for increasing and decreasing the triggering angle and other for direction control i.e, forward and reverse.

C. Isolation circuit

Transformers not only provide higher or lower voltage differences between their primary and secondary windings, but they also provide “electrical isolation” between the higher voltages on the primary side and the lower voltage on the secondary side. In other words, transformers isolate the primary input voltage from the secondary output voltage using electromagnetic coupling by means of a magnetic flux circulating within the iron laminated core. But we can also provide electrical isolation between an input source and an output load using just light by using a very common and valuable electronic component called an opto-coupler. Pulse transformer can also be used for isolation. An optocoupler, also known as an opto-isolator or photo-coupler, is an electronic component that interconnects two separate electrical circuits by means of a light sensitive optical interface. To protect the triggering circuit from high voltage converter circuit isolation is necessary. So opto-coupler is used here to isolate the triggering circuit from the converter circuit.

III. CONCLUSION

This paper discussed the detailed study of DC machine speed control using dual converter in both the direction (forward and reverse) and in both the mode of operation (generating and motoring). Dual converters are used for four-quadrant operation of DC drive. In circulating mode of operation there is no

need of dead time. So the speed reversal is very quick and smooth. The results of circulating current mode of operation in open loop control is shown in MATLAB simulation Relationship between motor speed and firing pulses generated by Arduino microcontroller was also found to be Linear.

IV. REFERENCES

- [1]. Seenivasan Raghupathi, R Ratheesh, K. Subramanian, P. Mahalakshmi Matlab Simulation on Dual Converter with Separately Excited DC Motor as a Load ,978-1-5090-5682-8 /17/\$31.00 ©2017 IEEE.(Base Paper)
- [2]. Ruchita Namdeo, C.S.Sharma, Rajnee Bala Minz, “Analysis of speed for separately excited dc motor using all types of single phase and three phase rectifiers”, International journal of Engineering Research and technology (IJERT), Vol. 3, Issue 9, Sep-2014.
- [3]. Dr.P.S.Bimbhra, Power Electronics, 3rd Edition, Khanna publications, 2004, pp.228-235.
- [4]. M D Singh, K B Khanchandani, Power Electronics, 2nd Edition, McGraw Hill Education (India) pvt. Ltd., 2007, pp.412-432.
- [5]. Giannis Tzortzis, Alexandros Amargianos, Savvas Piperidis, “Development of a compact regenerative braking system for electric vehicles”, IEEE- Mediterranean Conference on control and Automation (MED) - spain, 23rd Conference, June-2015.
- [6]. B.L.Theraja, A.K.Theraja, A text book of electrical technology, Vol. 2, 23rd edition, S. Chand & Company Ltd, 2004, pp.1070-1071.
- [7]. Jayakishan H.Moradiya, Prof. Niraj B.Danidhariya, “Design and simulation of close loop speed control of dc drives by using dual converter”, International Journal of Advance Engineering and Research Develpement (IJAERD), Volume 1, Issue 3, April-2014.
- [8]. A Comparative Analysis of Firing Angle Based Speed Control Scheme of DC Motor by Sarita Shastri, Pawan Pandey, IJERA ISSN: 2248-9622.
- [9]. Tirtharaj Sen, Pijush Kanti Bhattacharjee, Member, IACSIT, Manjima Bhattacharya “Design and Implementation of firing circuit for single phase” Converter International Journal of Computer and Electrical Engineering, Vol. 3, No. 3, June 2011.

Wheelchair Using Automatic Gesture Control

Aparna Ramteke, Ashwini Maski, Vaibhavi Mutkure, Swapnil Yende, Prof. P. A. Shewane

Electrical Department, RTMNU/DBACER, Nagpur, Maharashtra, India

ABSTRACT

This project developed a wheelchair control which is useful to the physically disabled person with his hand movement or his hand gesture recognition using acceleration technology. Tremendous leaps have been made in the field of wheelchair technology. However, even these significant advances haven't been able to help quadriplegics navigate wheelchair unassisted. It is wheelchair which can be controlled by simple hand gesture. It employs a sensor which control the wheelchair hand gesture made by the user and interrupt the motion intended by user and moves accordingly. In acceleration we have acceleration sensor. When we change the direction, the sensor register values are given to microcontroller. Depending on the direction of the acceleration, microcontroller controls the wheelchair like LEFT, RIGHT, FRONT and BACK. The aim of the paper is to implement wheelchair direction control with hand gesture reorganization.

Keywords: Micro-Electromechanical Systems (MEMS), Wheelchair.

I. INTRODUCTION

The aim of this project is to use wheelchair automatically for moving forward, backward, Left & Right. The overall framework of this project is to restore automatic to severely Disabled people by helping them use independently a power wheelchair. A wheelchair is an electric wheelchair fitted with acceleration sensors, obstacle sensor and computer to help less able drivers achieve some independent mobility. By just tilting acceleration sensor wheelchair can be moved in four directions. The obstacle sensor can help the rider control the by and avoiding objects until he or she is able to handle the job.

The amount of work that the rider chooses to do and how much control is taken by the chair is decided by the rider and his or her care. Obstacle in the way can also determined by wheelchair and wheelchair will stop automatically. The wheelchair can also integrate with HAND movements and computers; the pilot can

use the same control to drives the wheelchair and operate another assistive device, so handicap person who cannot make use of his hands can drive chair by HAND movement.

Taking advantages of technological evolution, in order to increase the quality of life for handicap people and facilitate their integration into the working world. In order to guide a wheelchair various situation can be distinguished. If the user is capable of controlling his HANDS, the ideal solution is the use of a sensor.

Our project handicap wheelchair basically works on the principle of acceleration sensors whose output is analog varies according to acceleration applied to it, by applying simple formula we calculate the amount of tilt & output of tilt will decide to move in which direction.

II. WORKING

Our project handicap wheelchair basically works on the principle of acceleration, one acceleration sensor,

provides to axes, acceleration sensor whose output is analog, varies according to acceleration applied to it, by applying simple formula we calculate the amount of tilt and output of tilt will decide to move in which direction. Sensor gives X axis and y axis output independently which is hand to ADC and then microcontroller and depending on pulse width it decide to move or not. On chair obstacle sensors will be installed. Total 4 sensors will be installed for detection of wall/obstacle in the forward, backward, left and right direction.

Movement of hand, the motor moves in any of the 4 direction's (i.e. forward, backward, left, right) when person tilt his hand in forward direction above 20 degree angle chair will move in forward direction. If person tilt his hand in. Backward direction above 20 degree angle chair will move in backward direction. If person tilt his hand in left direction above 20 degree angle chair will move in left direction.

If person tilt his hand in right direction above 20 degree angle chair will move in right direction. If person tilt his hand at 45 degree forward priority will be given to forward direction.

Depending on the width of pulse width modulation, microcontroller will generate a count value. So, depending on the value of the count it will give the proper signal to the motor to move in corresponding direction.

WORKING OF WHEELS

1. We obtained four combination from acceleration sensor which we used to drive a motor in four direction.
2. From acceleration sensor we found analogue output which got converted into digital at the output of 12 bit ADC which is followed by microcontroller.

3. The program burned into Ic is running successfully to accept input from all ports and provide various combination at output port.

Table 1

Direction	Motor1	Motor2
Forward	Forward	Forward
Backward	Backward	Backward
Left	Backward	Forward
Right	Forward	Backward

III. CIRCUIT DIAGRAM

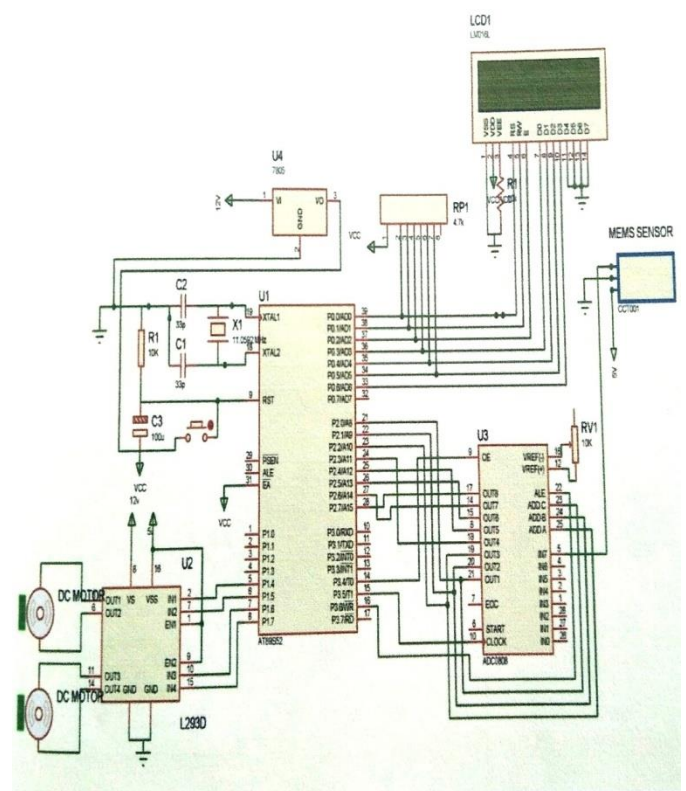


Figure 1

CIRCUIT DIAGRAM OF RF MODULE

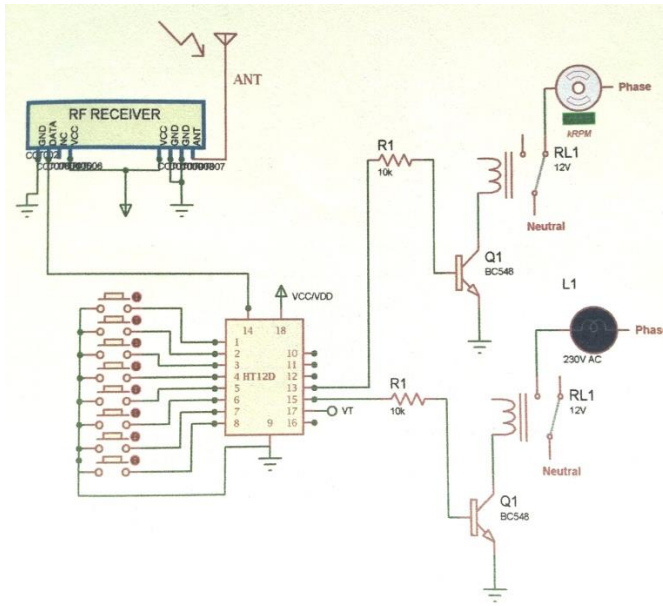


Figure 2

IV. BLOCK DIAGRAM

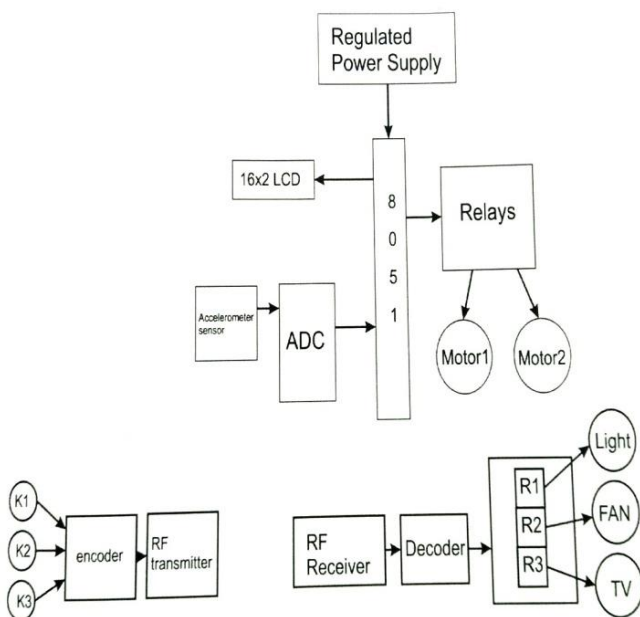


Figure 3

V. ACCELEROMETER

An Accelerometer Is a device that measures proper acceleration. Measure by an accelerometer is not

necessarily the coordinate acceleration(Rate of change of velocity). Accelerometer multiple application in industry and science. Accelerometers are used in tablet, computers and digital cameras so that images on screen are always displayed upright.

Single and multi access model of accelerometer are available to detect magnitude and direction of the proper acceleration(G-Force), as a vector quantity, and can be used to sense orientation(because direction of weight changes), coordinate acceleration(so long as it produce G-Force or a change in force), vibration, shock and falling in a resistive medium(a case were the proper acceleration changes since it starts at zero, then increases). Micro machined accelerometer are increasingly present in portable electronics devices and video game controllers, to detect the position of device or provide for game input.

Pairs of accelerometers extended over a region of space can be used to detect differences(gradients) in the proper acceleration of frames of references associated with those points. These devices are called gravity gradiometers, as they measures gradients in the gravitational field. Such pairs of accelerometers in theory may also be able to detect gravitational waves.

VI. DC MOTOR

A variety of electric motors provide power to robots making them move with various programmed motion. The direct current(DC) motor is one of the first machine devised to convert electric power into mechanical power. Permanent magnet(PM) direct current converts electrical energy into mechanical energy through the interaction of two magnetic fields. One field is produced by a permanent magnet assembly. The other field is produced by an electric current flowing in the motor windings. These two fields result in a torque which tends to rotate the rotor. As the rotor turns, the current in the windings is commutated to produce a continuous torque output permanent magnet(PM) motors are probably the most

commonly used DC motors, but there are also some other type of DC motors(types which used coils to make the permanent magnetic field also). DC motors operate from direct current power source moment of the magnetic field is achieved by switching current between coils within the motor. This action is called “Commutation”.

VII. MICROCONTROLLER

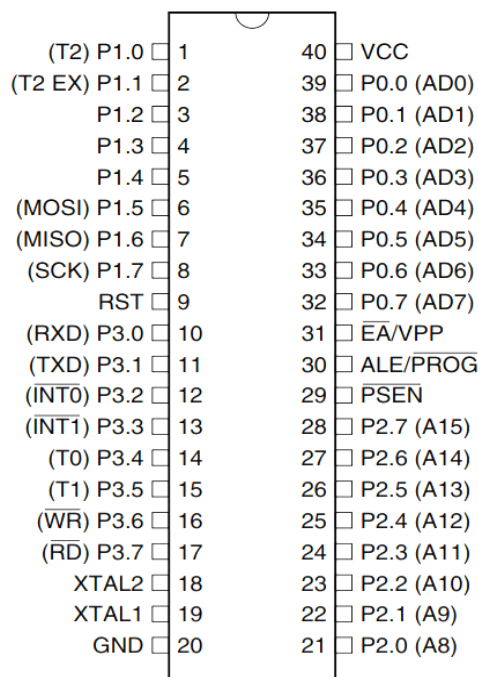


Figure 4

The microcontroller is the heart of this project. The microcontroller is the 40 pin IC which can be programmed. The microcontroller which we are using in this project is AT 89S52.

The AT89S52 is designed with static logic for operation down to zero frequency and support to software selectable power saving modes. The Idle mode stop the CPU while allowing the RAM, timer/counter, port and interrupt system to continue functioning. The power-down mode save the save the RAM contents but freezes the oscillator disabling all other chip function until the next hardware reset.

VIII. APPLICATION

- Hospitals
- Health care centers
- Old age home
- Communication
- Automatic gaming toys
- Control of mechanical systems
- Sport

IX. ADVANTAGES

- Increase mobility, for disable people who can not use their arms to power a manual wheelchair.
- Increase maneuverability, power wheelchair use caster that swivel a full 180 degree to provide more maneuverability, especially in small areas, according to the electric wheelchair centre.
- Increase physical support, a power wheelchair can have the option to allow for ore physical support.
- Increase disabled people ability to live independently to enjoy the same choice, control and freedom as any other citizen at home, at work and as member of the community.
- Improving the life chances of disabled people.

X. CONCLUSION

This paper will provide the solution to the controlling mechanism of automatic wheelchair by propagating the signal using by hand gesture of the physically challenged people. The different gestures will considered as the signal and it will control the wheelchair as per the signal request send by the transceiver. The MEMS sensor is used to propagate the signal properly to the transceivers as per the response of the user.

XI. REFERENCES

- [1]. Prof. Vishal V. Pande, "Hand Gesture Based Wheelchair Movement Control for Disabled

- Person Using MEMS" et al Int. Journal of Engineering Research and Applications Vol. 4, Issue 4(Version 4), April 2014, pp.152-158
- [2]. Amundson JS, Amundson SG,"A joystick controlled wheelchair",*Biomed Sci Instrum* .1991; 27:131-3.
- [3]. Javajji Veeraiah, P.V.N Aravind Syam, N.Naga Durga, K.Ravi Kanth, G.Vasudha , "accelerometer based gesture recognition for wheel chair direction control using zigbee protocol", *International Journal of Technological Exploration and Learning (IJTEL)* Volume 2, Issue 2, April 2013.
- [4]. Richard C.Simpson,"Smart Wheelchairs: A Literature Review", *Journal of Rehabilitation Research and Development*, Volume 42, Number 4, Pages423-436, August 2005.
- [5]. Rajesh Kannan Megalingam, Ramesh Nammily Nair, Sai Manoj Prakhya," Automated Voice based Home navigation system for the Elderly and the Physically Challenged", *proc.ICACT2011*P.603-08 Feb 2011.
- [6]. Zhang fang Hu, Lin li, Yuan Luo, Yi Zhang 4 Xing Wei, A Novel Intelligent Wheelchair Control Approach based on Head gesture recognition, international conference on computer application and system modeling(ICCASM), 2010.
- [7]. Dicianno, Brad E and Sibenaller, Sara and Kimmich, Claire and Cooper, Rory A and Pyo, Jay (2009)Joystick use for virtual power wheelchair driving in individuals with tremor: pilot study.*Development*, 46 (2). pp. 269-75. ISSN 1938-132
- [8]. Pei Jia, Huosheng H Hu, Tao Lu Kui Yuan, Head gesture recognition for hands - free control of an intelligent wheelchair.
- [9]. S. Fioretti, T. Leo, and S. Longhi , A Navigation System for Increasing the Autonomy and the Security of Powered Wheelchairs,*IEEE Transactions On Rehabilitation Engineering*, Vol. 8, No. 4, December 2000.
- [10]. ShilpaGulati, Benjamin Kuipers2008. "High Performance Control for Graceful Motion of an Intelligent Wheelchair". *Proceedings of the IEEE International Conference on Robotics and Automation (ICRA)*
- [11]. Ren C. Luo, Tse Min Chen, Chi – Yang Hu, and Zu, Adaptive Intelligent Assistance Control of Electrical Wheelchairs by Grey - Fuzzy Decision-Making Algorithm, *Proceedings of the 1999 IEEE International Conference on Robotics & Automation Detroit, Michigan May 1999.*
- [12]. Asebrandt, Susanne iwarsson and Agnetasta, "Older People,s Use of Powered Wheelchairs for Activity And Participation, Taylor and Francis health Sciences.

Solar Operated Portable Water Purifier

Sandhya Kude, Nikita Mauje, Snehal Dongre, Pallavi Pantawane

Department of Electrical Engineering, RTMNU / DBACER Nagpur, Maharashtra, India

ABSTRACT

In this paper we are making solar operated portable water purifier. The basic principle behind this project is Ion exchanger resin, silver ceramic filter and UV steriliser. Solar radiation from sun is collected by solar panel. Then these collected radiation stored in battery in the form of DC. This DC source convert into AC by inverter connected to the purification unit through electromagnetic relay. Purification unit consist of suction pump and water tank. The microcontroller 8051 keeps watch on water level in the water tank and prevent it from overflow. From this process we obtained purified fresh water in the water tank.

Keywords: Microcontroller 8051, UV sterilizer, Ion Exchange Resin, Silver Ceramic Filter, Solar Panel, Solar Energy, Battery, Inverter.

I. INTRODUCTION

Water is a necessity of human along with food and air. Fresh water resources usually available are river, lake and underground water reservoirs. About 71% of earth is covered with water. Despite of all of that 96.5% of total earth's water found in oceans which is not drinkable .Less than 1% of fresh water is in river, lakes and the atmosphere which is drinkable. The distribution of fresh water is becoming an increasingly important issue in many areas of the world. The availability of fresh water in many areas of the country is brackish, saline or impure. The establishment of human habitat in these areas strongly depend on how such water can be made available. There are many methods available for purifying the drinking water such as chlorination of wells, chlorine tablet, and pot, slow and rapid sand filter.

To study the process of purification of water we are making a water purifier which works on solar energy which is excessive in nature and cheap. The sunlight is one of the several forms of heat energy that can be used to power that process. In case of power failure,

this purifier will continue to work on supply from the grid. Here we use microcontroller 8051 to check the water level and prevent it from overflow. This purifier can be use in remote areas and rural areas where there is no electricity. And also it can be use in places affected by natural calamities. It provides pollution free operation.

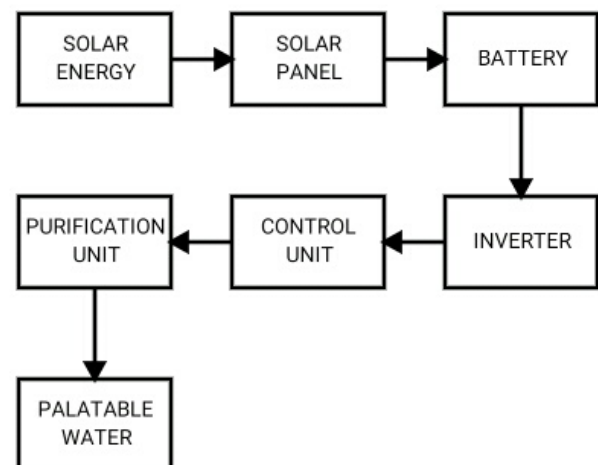


Figure 1. Block Diagram of Solar Operated Water Purifier

II. MATERIALS

A. Electrical Energy

Electrical energy is the greatest invention in history because it opened up to a entire new world. Without power, the world would never be able to innovate.

Electrical energy to this day is the most important innovation because it serves as the base line for all invention to.

Electrical energy occupies the top grade in the energy grade system. It finds uncountable uses in home, industry, agriculture and even in transport.

The annual per capita consumption of electrical energy in few countries is

Table 1

USA	14240 kWh
Canada	18400 kWh
Japan	8460 kWh
UK	675 kWh
USSR	6420 kWh
India	664.8 kWh

From above table it is shown that per capita consumption in India is laughably low as compared to that in developed country.

The reason behind this installation of transmission lines in remote areas, rural areas and the cost of electricity. Considering this reasons we have switch another source of energy.

There are many methods available for producing electricity, among that only few are greater generation of electricity.

It can be obtained from natural sources like

- Tidal Energy
- Wind Energy
- Solar Energy

Out of these sources of energy solar energy is widely used for generation of electricity.

Here we replace electricity with solar energy because for generation of electricity lots of water is used from many years. In these process most of the water is waste. To save this water and reduce the cost of electricity we have used solar energy.

Solar energy captured energy from the sunlight. It reduces the electricity bills. And have low maintenance cost.

B. Solar Energy

Here we replace electricity with solar energy, because for generation of electricity lots of water is used from many years. To save this water and reduce the cost of electricity we have used solar energy.

Solar panel captured energy from the sunlight.

It is present in larger quantity in nature. It is essential to used as the solar panel can installed anywhere like home, industry, agriculture. There are few advantages of solar energy over electricity.

It reduces the electricity bills. And have low maintenance cost and easy to use.

C. Solar panel

The solar panel is firstly introduced by the "EDEMAND BACGERAL" in 1839 at Age of 19. The solar panel are made up of semiconductor that is pure silicon.

Types of Solar Panels

The different types of solar panel are as follows;

1. Crystalline Silicon
 - a) Mono crystalline solar panel
 - b) Poly crystalline solar panel
2. String Ribbon Solar Cells
3. Thin Film Solar Panel
4. Building Integrated Photo voltaic

Table 2

Types	Efficiency	Life time
1. Crystalline Mono crystalline Polycrystalline	19-22% 14-16%	30-35 year 25-30 year
2. String Ribbon Solar Cells	7-8 %	-
3.Thin Film Solar Panel	10- 12 %	-
4.Building Integrated Photo voltaic	14- 16%	-

Mostly we use the mono crystalline Solar Panel because; it has high efficiency i.e. 19-22% to consume the Energy.

The Mono crystalline solar panel is made up of from pure silicon i.e. it is 90-99% of pure. Therefore its life time is also more than others solar panels. The life time of mono crystalline solar panel is 30-35 years. It is also used in winter season because, it has high efficiency.

The range of solar panel is depending on the amount of energy we use for purification unit.

E.g. For finding the rating of solar panel we use the simple formula,

Suppose the rating of battery is 150AH

Then,

$$150 \times 2 = 300W$$

Then, we use the rating of 300W for solar panel.

To charge the battery of 150AH out of 15%

Then,

$$15 \div 100 \times 1500AH = 22.5A$$

15% electric current is sufficient to charge the battery. Therefore, the 300W of solar panel is sufficient to charge the battery of 150AH.

D. Control Unit

The control unit consists of sensors, microcontroller 8051 and algorithm. Basically this microcontroller 8051 is used to sense the water level in tank. This system monitors the water level of the tank and automatically switches on the system whenever the tank is empty.

Sensors:

A device which detects physical property and records indicates, or otherwise response to it is called as sensors. We use water level sensor here. Level sensor is used to detect the level of substance that can flow. Level measurement can be done inside the container. Such measurement can be used to determine the amount of material within a closed container.

Microcontroller 8051:

8051 microcontroller is designed by Intel in 1981. It is an 8-bit microcontroller. It is built with 40 pins DIP (dual inline package), 4kb of ROM storage and 128 bytes of RAM storage, 2-16 bit timers. It consists of are four parallel 8-bit ports, which are programmable as well as addressable as per the requirement. An on-chip crystal oscillator is integrated in the microcontroller having crystal frequency of 12 MHz.

A Microcontroller has all the necessary components which a microprocessor possesses and invariably it poses ROM, RAM, Serial Port, timers, interrupts Input Output ports, and clock circuit. The microcontroller always focus on the chip facility and it is more prominent in the case of serial ports, analog-to-digital converters, timers, counters, read only memory, parallel input, interrupt control, random access memory and output ports. The concept of the 8051 microcontroller arises from here and here we will discuss in depth about the various aspects, uses, programming and other features of the 8051 microcontroller.

E. Purification Unit

Stage 1- Ion exchange resin:

High calcium and magnesium percentage decreases which present in hard water. The supply ability is 1000 Cubic Meter/Cubic Meters per Month. It uses in the desalination of potable water. The purity is 100%

Stage 2 – Silver ceramic filter:

Bacteria protozoa and microbial cysts are removed. However, filter is typically not effective against viruses since they are small enough to pass through the clean side of filter. Silver helps to kill or incapacitated bacteria and prevent the growth of mould and algae in the body of the filter. The supply ability is 10000 Piece/Pieces per Month thermocouple protection tube. It contains 99% of Alumina. The temperature is 1700 C

Stage 3- UV Sterilizer:

It will kill all the biological impurities inside the water. The use is to control the infection by stopping the spread of microorganisms. The supply ability is 20000 Set/Sets per Month Top aqua UV sterilizer. The input voltage required is 110/220V 50Hz. The UV sterilizer working pressure is 8 bars.

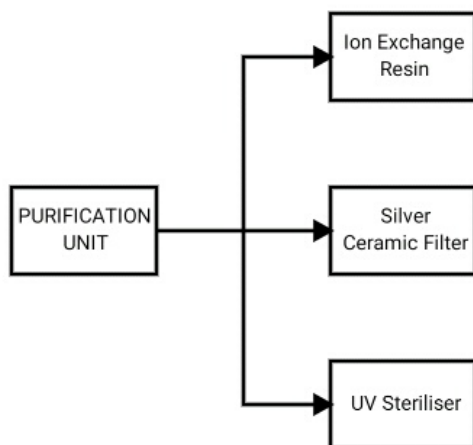


Figure 2. Purification Unit



Figure 3. Hardware Kit of Water Purification System

III. CONCLUSION

Solar energy is used for purification of water. Pure and safe drinking water is the basic need of all the living beings. The contaminated water is the major problem of health hazards, to overcome this we can use the purifier which is solar operated as well as portable. Hence we end with the smart approach to get the drinking water with the optimum use of the renewable energy.

IV. REFERENCES

- [1]. Nimal, R.J.G.R., Hussain, J.H., Effect of deep cryogenic treatment on EN24 steel, International Journal of Pure and applied mathematics, V-116, I-17 Special Issue, PP-113-116, 2017
- [2]. Parameswari, D., Khannaa, V., Deploying lampport clocks and linked lists, International Journal of pharmacy and technology , V-8, I-3, PP-17039-17044, 2016
- [3]. Kaipia, T., Salonen, P., Lassila, J., Partanen, J., 2007, "Application of low voltage DC distribution system –A Techno-Economical study" Proceeding CRIED 2007
- [4]. Paajanen, P., Kaipia, T., Partanen, J., 2009 "DC supply of low voltage electrical appliances in residential buildings "proceeding CIRED 2009.

Hybrid Power Generation System Using Wind Energy and Solar Energy

Ashlesha Yelure, Chaitali Mhaske, Laxmi Rokade, Nikita Raut, Pradnya Sahare

Department of Electrical Engineering, Dr. Babasaheb Ambedkar Collage of Engineering & Research, Nagpur,
Maharashtra, India

ABSTRACT

Renewable energy is the energy produced from sources that do not deplete or can be replenished within human life such as solar, wind, tidal, geothermal etc. Renewable energy accounts for 2% of world's electricity. Nowadays electricity is most needed facility for the human being. All conventional resources are depleting day by day, so we have to shift from conventional to non-conventional resource. We can give uninterrupted power by using hybrid energy system. In this paper hybrid combination of two energy source i.e. wind and solar. Basically this system involves integration of two energy system. Solar panels are used for converting solar energy & wind turbines for converting wind energy into electricity. This paper deals with generation of electricity by combining two non-conventional sources which leads to generate electricity which affordable cost without disturbing nature balance.

Keywords: Electricity, Hybrid, Solar, Power, Wind

I. INTRODUCTION

Electricity is most needed for our day to day life. There are two ways of electricity generation either by conventional or non-conventional energy resources like coal, diesel, nuclear, etc. the main drawback of these sources is that they produce waste like ash, nuclear which also damages the nature.

The non-conventional energy source should be good alternative for the same. These. There are many non-conventional energy source such as geothermal, wind, solar, etc.

Solar and wind energy are available in all condition. They have been deemed clean, inexhaustible, unlimited and environment friendly. Such characteristics has attracted the energy sector to use renewable energy source on larger scale. However, all renewable energy sources have drawbacks too.

Wind and solar source is dependent on unpredictable factors such as weather and climatic condition. To overcome this drawback we can use two energy resources. This brings us to the hybrid solar. Solar, wind, power plant concept. Hybrid energy system have proven to be advantageous for decreasing the environment.

II. SOLAR ENERGY

Solar energy is the energy which gets by the radiation of the sun. it is renewable, inexhaustible & environment pollution free and affordable in cost. Solar charged battery system provide power supply for complete 24 hrs a day irrespective of bad weather. It has greater efficiency and only need initial investment.

III. WIND ENERGY

Wind is natural phenomenon related to the movement of air masses caused primarily by differential solar heating of earth's surface. The wind

turbines captures the winds kinetic energy in a rotor consisting of two or more blades mechanically coupled to an electrical generator the wind energy needs less cost for generation of electricity. It needs high initial cost, except it is reliable, has less emission and maintenance cost is also less.

IV. HYBRID ENERGY SYSTEM

Hybrid energy system is the combination of two energy sources for giving power to load in other word, it is defined as “Energy system which is fabricated or designed to extract power by using two energy sources. It has good reliability, efficiency, less emission & lower cost. The various hybrid are wind-solar, solar-diesel, wind-hydro. In this proposed system, solar & wind is used for generating power. Hybrid energy generation is more important because wind do nit flow continuously & sun radiation is only present approx 8 to 10 hrs a day. So for continuous power, it is important to hybridise the solar & wind power with storage batteries.

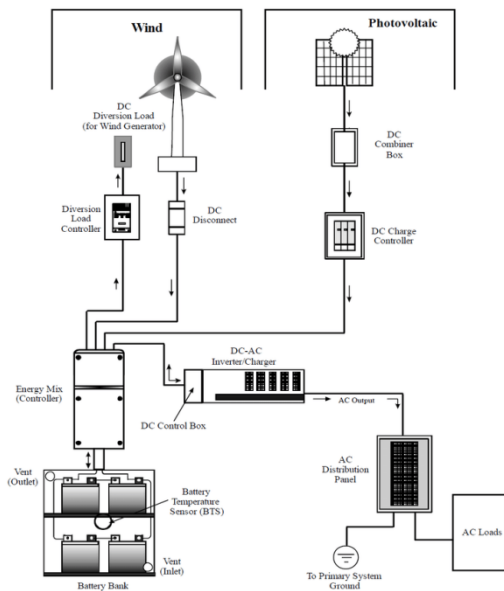


Figure 1: Schematic diagram of Hybrid (Renewable) Solar – Wind Power Source

❖ DESIGN OF HYBRID ENERGY SYSTEM

For designing of hybrid energy, we need to find data as follows

a. Data requirement for solar system

1. Annual mean daily duration of sunshine hours.
2. Daily solar radiation horizontal (kwh/m²/day)

b. Data requirement for wind system

1. Mean annual hourly wind speed (m/sec)
2. Wind power that can be generated from wind turbine.

The above fig. shows block diagram of hybrid power generation system using wind & solar power. It consist of following components.

1. Solar panel
2. Wind turbine
3. Charge Controller
4. Batteries
5. Inverter

1. Solar panel:- solar/pv panel are used to connect the renewable power coming from sun into electrical energy. The principle working solar panel is with semiconductor i.e. PN junction diode. When junction absorbs light, energy absorbed photon is transferred to electron-proton system of material creating charge carriers which get separated at junction. These charge carries field is circulate potential electricly connected in series parallel combination to generate required current & voltage.

2. Wind Turbine:- It is a mechanical system which generates electrical energy from renewable energy source. It extracts energy from wind by rotation of blades. Basically wind turbine has two types, one is vertical & another is horizontal. The wind speed does not remains same. The power generated from wind is not continuous, its fluctuating to obtain non-fluctuating power, we have to store in battery & then provide it to the load.

3. Charge controller:- Charge controller has basic function that it control the source which is to be active or inactive. It simultaneously charge battery and also gives power to the load. The controller has

over-charge protection. Short-circuit protection, pole confusion protection and automatic dump-load function. It also the function is that it should vary the power as per the load demand can fulfill. And when power is not generating it should extract power from battery and give it to the load.

4. Batteries:- Batteries are used in order to store electricity that is produced from wind energy. The capacity of battery may vary depending on the size of wind turbine or solar power plant. Battery should be having low maintenance & charge leakage should also be low. Multiple batteries can be connected in series & parallel to increase or decrease the capacity of battery, depending upon capacity of battery, depending upon o/p from hybrid system.

5. Inverter:- As we know most of the electrical appliances require Ac voltage, so first Dc output of batteries will be converted into AC voltage with the help of an Inverter. We have to choose greater rating inverter than desired rating, it must be having over voltage protection, reverse polarity & short circuit protection, the input voltage output voltage & frequency and overall power handling depends on the design of the specific device or the chemistry.

V. FORMULAS

The total power generated by this system may be given as the addition of the power generated by the solar PV panel and power generated by the wind turbine.

Mathematically it can be represented as,

$$P_T = N_w * P_w + N_s * P_s$$

Where,

P_T is the total power generated

P_w is the power generated by wind turbines

P_s is the power generated by solar panels

N_w is the no of wind turbine

N_s is the no of solar panels used

A. Calculations for wind energy

The power generated by wind energy is given by,

Power=(density of air*swept area*velocity cubed)/2

$$P_w = \frac{1}{2} \cdot \rho(A_w)(V)^3$$

Where,

P is power in watts (W)

ρ is the air density in kilograms per cubic meter(kg/m^3)

A_w is the swept area by air in square meters (m^2)

V is the wind speed in meters per second(m/s)

B. Calculations for solar energy

To determine the size of PV modules, the required energy consumptions must be estimated.

Therefore, the power is calculated as

$$P_s = I_{ns}(t) * A_s * Eff(pv)$$

Where,

$I_{ns}(t)$ = isolation at time t (kg/m^2)

A_s = area of single PV panel (m^2)

Eff_{pv} = overall efficiency of the PV panels and dc/dc converters.

Overall efficiency is given by,

$$Eff(pv) = H * PR$$

Where,

H= Annual average solar radiation on tilted panels.

PR= Performance ratio, coefficient for losses

C=cost

The total cost of the solar-wind hybrid energy system is depend upon the total no of wind turbine used and total no of solar panels used. Therefore the total cost is given as follows

Total cost=(No. of wind turbine*cost of single wind turbine)+(No. of solar panels*cost of single solar panel)+(No. of batteries used in battery bank* cost of single battery)

$$C_T = (N_w * C_{WT}) + (N_s * C_{SP}) + (N_B * C_B)$$

Where,

C_T is the total cost in Rs

C_{WT} is the cost of single wind turbine in Rs

C_{SP} is the cost of single Battery in Rs

C_B is the cost of single Battery in Rs

N_w is the number of wind turbine used

N_s is the number of solar panels used

N_B is the number of Batteries used in Battery Bank.

Applications:-

- Islanded System (Remote Areas)
- Hybrid vehicle (Fuel less)
- Distributed power generations
- Transmission & communication tower

Advantages:-

- Best for Remote area System(RAPS)
- Can be used for 24 hrs power generation
- Operational in all weather
- Green, Environment Friendly
- Higher output power
- Efficiency improvement

VI. CONCLUSION

Hybrid power generation system is good and effective solution for power generation than conventional energy resources. It has greater efficiency. It can provide to remote places where government is unable to reach. So that the power can be utilize where it is generated so that it will reduce the transmission losses and cost. Cost reduction can be done by increasing the production of equipment. People should be motivated to use the non conventional energy resources. It is highly safe for the environment as it doesn't produce any emission and harmful waste product like conventional energy resources. It is cost effective solution for generation. It only need initial investment and affordable solution for electricity generation.

VII. REFERENCES

- [1]. Swapneel Kaurav, Prof. P. Yadav, "Hybrid power system using wind energy and solar energy", International journal of Innovative Reasearch of science, Engineering and Technology (IJIRSET), vol. 5, Issue 1, January 2016.
- [2]. Ashish S. Ingole, Prof. Bhushan S. Rakhade, "Hybrid power generation system using wind energy and solar energy", International journal of scientific & Research Publication, Vol. 5, Issue 3 march 2015.
- [3]. Bharat Raj singh, Bal Krishna Dubey, "Solar wind Hybrid power generation system," IRJET Vol. 5, Issue 01 Jan 2018.
- [4]. Mr. Sthita Prajna Mishra, Dr. S. M. Ali, Ms. Prajnasmitha Mohapatra, Ms. Arjyadhra Pradhan, "A Hybrid System (Solar & wind) energy fir remote areas", IJERD Vol. 4, Issue 8 Nov 2012.

Coin Based Universal Mobile Battery Charger

Akanksha S. Waghmare, Purva V. Joshi, Yogita R. Gaydhane, Swati S. Wattamwar

Electrical Engineering Department, DBACER, Nagpur, Maharashtra, India

ABSTRACT

The coin-based mobile battery charger developed in this paper is providing a unique service to the rural public where grid power is not available for partial/full daytime and source of revenue for site providers. The coin-based mobile battery charger can be quickly and easily installed outside any business premises. The mobile phone market is a vast industry and has spread into rural areas as a essential means of communication. While the urban population buy the pre owned mobile phones that require charging frequently. Many times battery becomes flat in the middle of conversation particularly at inconvenient times when access to a standard charger isn't possible. The coin based mobile battery charger is designed to solve this problem. A microcontroller is programmed for all the controlling application. The source for charging is obtained from direct power grid and solar energy in case of non availability of grid power.

Keywords : Solar panel, mobile battery, microcontroller, LCD Display, Mobile Phone

I. INTRODUCTION

The growth of mobile phone market is phenomenal in recent years and the need for charging the mobile battery is required anytime and anywhere. In many developing countries the grid power is not available for few hours to several hours on daily basis especially in semi urban and rural population use more sophisticated mobiles with good power batteries lasting for few days, the rural population buy the pre owned mobile phones that require charging frequently even two or three times a day. In the event of unpredictable grid power and availability of abundant solar power a coin based mobile battery charger is designed and developed in this paper.

This device is like a vending machine for mobile for mobile battery charging at kiosks and the user has to plug the phone into one of the adaptor and insert a coin for charging at a constant current for a definite duration. The solar power application to battery charging has been studied in the past. Solar chargers

convert light energy into DC current for a range of voltage that can be used for chargers convert the battery. They are generally portable but can also be firmly mounted. In this design of coin based mobile battery charger fixed solar panel of size 635*550*38mm, 37WP is used to charge the battery up to maximum 2.0 amps in bright sun light. In this paper, the design and developed of a coin based mobile battery charger based on main power and solar power is discussed and this is primarily for rural areas where the mobiles are basic needs for communication and the main power is not available all the time. The motivation for this research came from the published papers.

II. BLOCK DIAGRAM

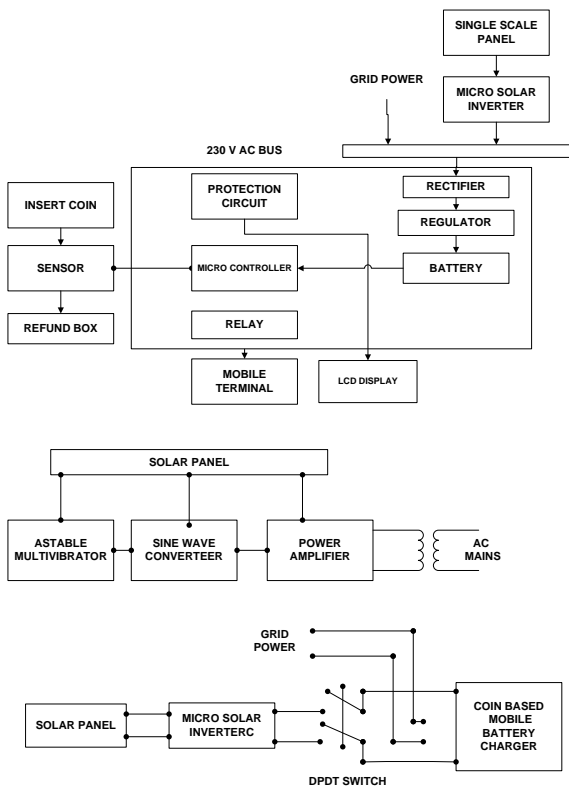


Figure 1. Block diagram

The mobile battery charger starts charging a mobile connected to it when a coin is inserted at the coin insertion slot at the input stage. The type of coin and the size will be displayed at the LCD display for the user so as to ensure correct coin insertion. Any other coin, if inserted in the slot will be returned to refund box. A sensor attached to the coin insertion slot accepts the coin into the battery charging unit and start charging the mobile battery for a specific period controlled by the software of the microcontroller. The sensor is an IR sensor. The resistance of the sensor decreases when IR (infrared) light falls on it. A good sensor will have zero resistance in presence of light and a very large resistance in absence of light. When the coin obstructs the IR light falling on a sensor, it sends a pulse to the control unit authorizing the start of charging the mobile battery connected to the device. Two IR sensors are used for positive authentication of the charging process.

2.1 CONTROLLER

This section acts according to the input signal from the sensor circuit. Coin accepted or rejected is based on the diameter of the coin. This invokes microcontroller along with LCD interface displays the selection of mobile option if particular mobile is selected for charging the corresponding routine is activated and charge the mobile for a particular duration of time. When the routine completes, it indicates charge complete message through LCD display. Similarly the same procedure is followed for charging more than four different mobiles simultaneously. The simple routine is indicated through flowchart as shown in the Figure.

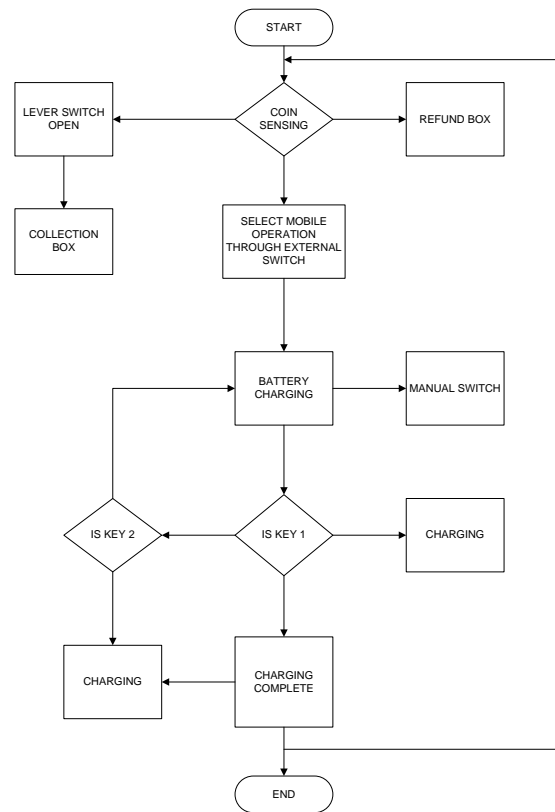


Figure 3. flowchart

2.2 LCD DISPLAY

The LCD displays all the information to the customer as and when required. When the mobile battery is connected, it displays "Insert Coin". While charging it displays "Charging" and at the end of charging cycle it displays "Charge completed". For charging

continuously the coin has to be inserted when the display shows “Charge Completed”.

2.3 POWER SUPPLY

The input to the circuit is applied from the regulated power supply. The AC input i.e. 230V from the mains supply is step down by the transformer to 12V and is fed to a rectifier. The output obtained from the rectifier is a pulsating DC voltage. So in order to get a pure DC voltage, the output voltage from the rectifier is fed to a filter to remove any AC components present even after rectification. Now, this voltage is given to a voltage regulator to obtain a pure constant dc voltage.

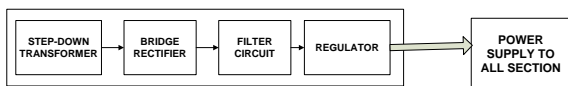


Figure 3. Power supply Module

2.4 TRANSFORMER

Usually, DC voltages are required to operate various electronic equipment and these voltages are 5V, 9V or 12V. But these voltages cannot be obtained directly. Thus the AC input available at the mains supply i.e., 230V is to be brought down to the required voltage level. This is done by a transformer. Thus, a step down transformer is employed to decrease the voltage to a required level.

2.5 RELAY

A relay is a switch. This is an electromagnet switch in which it is operate as a mechanically and also other operating principles are also used, such as Solid-state relays. It can be used to control a circuit by a separate low-power signal, or must be controlled by one signal.

2.6 RECTIFIER

The output from the transformer is fed to the rectifier. It converts AC into pulsating DC. The rectifier may be a half wave or a full wave rectifier. In this project, a bridge rectifier is used because of its merits like good stability and full wave rectification.

2.7 MICROCONTROLLER AT89S52

The AT89S52 is a low voltage, high performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable flash memory. The AT89S52 provides the following standard features: 8K bytes of flash, 256 bytes of RAM, 32 I/O lines, Watchdog timer, two data pointer, three 16-bit timer/counter, a six-vector two level interrupt architecture, a full duplex serial port, on chip oscillator, and clock circuitry, fast programming time.

2.8 SOLAR PANEL

A solar panel is a collection of solar cells. Solar panel is a packaged interconnected assembly of solar cells, known as photovoltaic cells. Solar panels use light energy (photons) from the sun to generate electricity through the photovoltaic effect.

2.9 RECHARGABLE BATTERY

A rechargeable battery or storage battery is a group of one or more electrochemical cells. They are known as secondary cells because their electrochemical reaction is electrically reversible.

2.10 IR SENSOR

An infrared sensor is an electronic instrument which is used to sense certain characteristic of its surroundings by either emitting and/or detecting infrared radiation. Infrared sensors are also capable of measuring the heat being emitted by an object and detecting motion.

III. APPLICATION

- ✓ Public places
- ✓ Trains
- ✓ Function halls

IV. ADVANTAGES

- ✓ Low power consumption
- ✓ Less expensive
- ✓ Reduced man power
- ✓ Simple and hand efficient

- ✓ More useful save Energy from Sun

V. FUTURE SCOPE

This project is very useful to people who are all using mobile phone without charging condition in public places.

VI. CONCLUSION

In this paper, a novel method of charging mobile batteries of different manufactures using solar power has been designed and developed for rural and remote areas where the grid power is not available all the time. The mobile communication has become a necessity even in rural areas and this device is useful for charging mobile batteries as these mobile battery chargers can be installed in kiosks at various places the convenience of mobile users.

VII. REFERENCES

- [1]. Mr. Patil K.N., Mr. Sagar Patil, Mr. Harshavardhan Kamble, Mr. Kshitijkumar Sawant, "Mobile Battery Charger on Coin Insertion", IRJET-VOLUME 04-ISSUE 01-JAN-2017, e-ISSN: 2395-0056, p-ISSN: 2395-0072.
- [2]. A. H. Tirmare, V.V. Khandare, P. S. Mali, "SOLAR ENERGY BASED MOBILE CHARGER", International Journal of Research in Engineering, IT & Social Sciences ISSN 2250-0588, Impact Factor: 5.850, Volume 5, Issue 6, June 2015 Website: www.indusedu.org
- [3]. Aparna D. Pawar, "Coin Based Solar Mobile Charger", International Journal of Engineering and Technical Research (IJETR) ISSN: 2321-0869, Volume-3, Issue-5, May 2015
- [4]. Prof. R. J. Sapkal, Snehal N. Shinde, Madhuri B. Sathe, Roshani M. Waghmare, "Automatic Gadget Charger using Matlab and Solar Panel", SSRG International Journal of Electronics and Communication Engineering (SSRG – IJECE) – Volume 4 Issue 5 – May 2017.
- [5]. Raju R. Khawse, Sachine S. Shikare, Pradip Suryanwanshi, Prof. A.A. Trikolikar, "Coin Based Mobile Charger Using Solar Panel, RFID", International Journal of Advanced Research in Computer Engineering & Technology (IJARCET) Volume 4 Issue 3, March 2015.
- [6]. Satyendra Kumar Gupta, Anurag Agrawal, "SOLAR PORTABLE CHARGER FOR MOBILE PHONE DEVICES USING THE SOLAR ENERGY AS A SOURCE OF ELECTRIC POWER", International Advanced Research Journal in Science, Engineering and Technology (IARJSET) National Conference on Renewable Energy and Environment (NCREE-2015) IMS Engineering College, Ghaziabad Vol. 2, Issue 1, April 2015.
- [7]. Ekta Gupta, Manas Singhal, Akash Verma, Arshad Khan, Osheen, Swati Singh, "Coin Based Solar Mobile Charger", International Journal on Recent and Innovation Trends in Computing and Communication, Volume: 4 Issue: 4, ISSN: 2321-8169, 151 – 153.
- [8]. Tummala Geetha, Vajjarapu Lavanya, "Coin Based Universal Mobile Charger using Solar Energy", International Journal of VLSI System Design and communication System", ISSN 2322-0929, Vol.04, Issue.10, October-2016, Pages:1102-1106.
- [9]. Rinu Jose, Priya Patel, Kamini Upadhyay, Jignesh Prajapati, "Mobile Charging Using Coin Insertion", 2nd International Conference on Current Research Trends in Engineering and Technology, IJSRSET | Volume 4 | Issue 5 | Print ISSN: 2395-1990 | Online ISSN : 2394-4099, Themed Section: Engineering and Technology.
- [10]. G. Priyanka, S. Anisha, P. Padma Shri, "Coin Based Mobile Charger", priyanka@mepcoeng.ac.in, sani97keerthi@gmail.com, padmashrisabeen@gmail.com, International Journal of Pure and Applied Mathematics, Volume 119 No. 12 2018, 13695-13701, ISSN:

1314-3395 (on-line version), url:
<http://www.ijpam.eu>, Special Issue.

- [11]. Rohini Thawal, Suvarna Sarade, Manasi Vaidya, Prof. V.S. karambelkar, "Coin Based Mobile Charger Using Solar System", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, (An ISO 3297: 2007 Certified Organization), Vol. 5, Issue 3, March 2016, ISSN (Print) : 2320 – 3765, ISSN (Online): 2278 – 8875.

Reduction of Harmonics in NE555 IC based Inverter Circuit by Using Passive Filters

Dr. Shilpa Kalambe, Omkar Khadsang, Shubham Bhomle, Yash Balpande

Electrical Engineering Department, RTMNU, DBACER, NAGPUR, Maharashtra, India

ABSTRACT

Solar energy consumption in the power system shows diverse impacts on power system. Voltage profile improvement, minimization of the losses, congestion management, reliability improvement are the positive aspects of its implementation whereas it also reflects some adverse impacts like harmonics insertion due to extensive use of power electronics devices such as rectifiers inverters, thyristors transistors. In this Work we visited the solar integrated substation. To study all these impacts on power system and prepared a prototype of the solar system with power conditioning unit using passive filters to mitigate harmonics.

Keywords: Power Quality, Inverter, NE555 timer IC, Harmonics, Passive Filter.

I. INTRODUCTION

The rapid revolution of renewable generation stimulated the need for efficient, cheap and robust inverters that would interface them to the grid without compromising the quality of supply for the grid [1]. For fast work and quick response output we are selecting electronics equipment because of their switching property make them better. But there is a lack of power electronics equipment that they generate harmonics. These harmonics are amenable for input voltage and current distortion at the point of integration to the grid. Because of harmonics present in the system distorted power caused to damage the equipment, so harmonics can be considered as harmful gateways which harm the entire power system [2].

Improvement of semiconductor technology has elongated the power electronics field due the availability of power devices such as Field Effect Transistor (FET), Insulated Gate Bipolar Transistors (IGBT) and Gate Turn off Thyristors (GTO's) that

have high power rating and good switching characteristics. These devices are mostly used in power converter circuit. The output current and voltage of converters are generally concerned with low order harmonics. Harmonics are inexpedient component in the sinusoidal waveform of the ac power supply. Harmonics occur as integral multiples of the fundamental frequency i.e. 3rd, 5th, 7th, etc. It affects the power quality as well as efficiency.

This paper give an overall system of converting DC to AC solar inverter using 555 timer IC and passive power filter applications.

II. PROPOSED TOPOLOGY

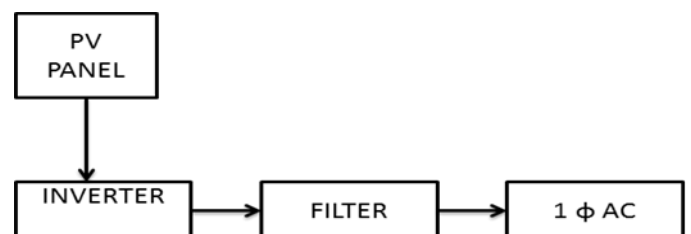


Figure 1. block diagram of the proposed Topology

III. PV PANELS

In this PV panel the photon will absorb the light illumination and cells stored in this will result the migration of conduction band to valance band, that is the holes in the layer will be absorbed by the n type electrons this result in the layer to store energy and the load is connected across it which is connected to the voltage regulator or inverter type load The main functions of the PV cell are:

- To convert the solar energy to direct current Electrical energy.
- Regulate the electrical energy output.
- Feed the electrical energy in to an external load circuit to perform and store the electrical energy in a battery subsystem for later use.

In our prototype we used polycrystalline 6W PV panel

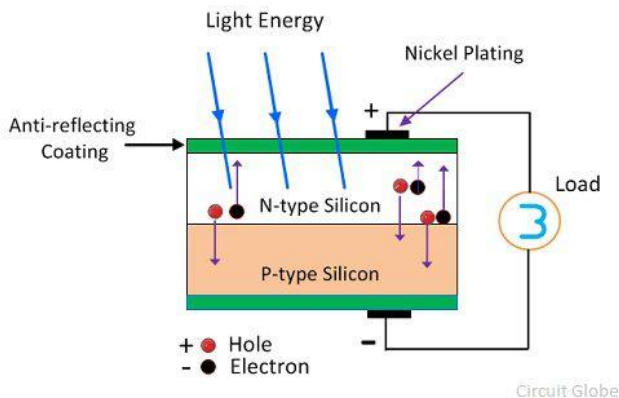


Figure 2. PV Cell

IV. 555 TIMER IC

The main objective of this paper is to produce sinusoidal waveform using multivibrator ICs. The application has been understood using NE555 timer IC which is fit for both mono-stable and astable applications. Similar others ICs the on-off time of this IC is also reliant on external capacitor. The capacitor takes finite period of time to charge and discharge

through resistor which can be determined using R and C values using expressions. $t=R*C$

One of the most common operational modes of this IC is its use as astable multivibrator for fluctuating duty cycle generation. Astable multivibrator is arrangement of bistable multivibrator to switch conditions periodically. Bistable is connected with RC network in feedback loop to control the RC time constant in this mode, it simply acts as an oscillator generating a continuous waveform of rectangular on-off pulses alternating between two voltage levels.

4.1.ASTABLE MULTIVIBRATOR:-

Astable multivibrator has automatic built in triggering which switches if continuously between its two unstable states both set and reset. Astable multivibrator also known as free running multivibrator the astable circuit consist of two switching transistors across coupled feedback network time delay capacitors.

Astable oscillator produce a continuous square waveform its output. the basic circuit's astable multivibrator operates as common emitter amplifier with 100% positive feedback. Astable Multivibrator can produce two very slot of square wave output waveform.

NE 555 IC based inverter circuit with configuration of giving a 50HZ ,9V output. Voltage is 12V DC input voltage. Supply can be from any renewable energy generator, resistor R1,R2 and capacitor C1andC2. The resistor and capacitor will be designed as followings:

Frequency

$$F = \frac{1.44}{(R_1+2R_2)*C}$$

$$F=50 \text{ Hz};$$

$$\%Duty \text{ Cycle} = \frac{(R_1+R_2)}{(R_1+2R_2)}$$

$$\text{Let } C=0.01\mu\text{F};$$

Using Equations (1) and (2);

To find the values of R_1 and R_2 to design the 555 timer circuit.

T_c =charging

Time= $0.693(R_1+R_2)*C$,

T_d =Discharging time $0.693R_2*C$

Let consider as duty cycle is %

Frequency=50Hz, $C=0.01\mu f$

Equation (1):

$$(R_1+2R_2)*C=0.03 \dots\dots\dots (3)$$

Equation (2):

$$0.50=(R_1+R_2)/(R_1+2R_2);$$

$$R_2=0.03$$

$$R_1 \dots\dots\dots (4)$$

Equation (4) in (3):

$$R_1=10 \text{ k } \Omega \dots\dots\dots (5)$$

Equation (5) in (4);

$$R_2=139 \text{ k } \Omega$$

The output from NPN and PNP transistor pair is in square wave which also contain harmonics and wave form will be distorted after simplification by the transistors, the proposed low pass filter configuration for 50HZ frequency .The harmonics are reduced and the output waveform is in the proper sinusoidal shape in the oscilloscope.

V. OVERVIEW OF HARMONICS

Harmonics are undesirable component in the sinusoidal waveform of the ac power supply. Harmonics occur as integral multiple of fundamental frequency. It is therefore necessary that harmonics in any power system be monitored.

The harmonics can arise in following ways:

1. Through the application of non-sinusoidal driving voltage to a circuit containing non-linear impedance.
2. Harmonics are created by electronics equipment. The short pulses cause distorted current waveform.

Harmonics can rectify by using suitable method such as filters. Using a mathematical technique known as Fast Fourier Transform, the distorted ac waveform can be resolved into its component waveform. The basic theory according to Fourier theorem, periodic non-sinusoidal or complex voltage or current waveforms can be represented by the sum of a series of multiple frequency terms of varying phases and magnitudes. Figure 1 and Figure 2 represents a pure sinusoidal wave before impact of harmonics and distorted wave after it affected by harmonic.

Types of Harmonics Sources

There are two types of harmonic sources:

1. Current-Source Type of Harmonic Sources
2. Voltage-Source Type of Harmonic Sources

1. Current-Source Type of Harmonic Sources:

Current harmonics are caused by nonlinear loads when a non-linear load, such as rectifier and inverter are connected to the system, it draw a current that is not necessarily sinusoidal. The current wave form can become quite complex, depending on type of load and its interaction with other component of the system. Current waveform becomes, as described through Fourier series analysis. This types of harmonics is generated in nonlinear loads. Examples of nonlinear loads include transistor and a non-ideal transformer. Nonlinear loads create disturbance in the fundamental harmonics which produces all type of harmonics.

2. Voltage-Source Type of Harmonic Sources:

Voltage harmonics are mostly causes by current harmonics. The voltage provided by the voltage source will be distorted by current harmonics due to source impedance. If the source impedance of the voltage source is small, current harmonics will causes only small voltage harmonics. It is typically the case that voltage harmonics are indeed small compare to current harmonics. The average real power contributed by current harmonics is equal to 0. However, if higher harmonics of voltage are consider

then current harmonics do make a contribution to the real power transferred to the load.

5.1 Behaviour of Harmonic

Harmonic behavior is defined by the Bullard laws of harmonics:

- Harmonic amplitudes are proportional to the area of distortion.
- The harmonic signature is the result of the angle where the sinusoid impact the distortion as predicted by the Bullard harmonic solution.
- Even harmonics don't appear in the symmetrical distortion because they cancel each other out.
- Square waves, triangle waves and all other kinds of waveforms obey these laws and their harmonic behavior can be predicted with simple mathematical formulas [8].

Harmonics are caused by steady state distortions to current and voltage waves and repeat every cycle. They are different from transient distortions such as spikes, dips and impulses .

5.2 Harmonic Detection Methods

There are different algorithms for harmonic detection which lead the accuracy, speed, the filter stability, easy and inexpensive implementation, etc.

Table 2. Harmonic Detection Methods

Harmonic Detection Method			
Frequency Domain		Time Domain	
Discrete transform	Fourier	Synchronous fundamental "dq-frame"	
Fast transform	Fourier	Synchronous	individual harmonic "dq-frame"
Recursive Fourier transform	discrete	Generalized	integrators & variants

VI. PASSIVE FILTER

Passive filter are the oldest type of electronic filter, as they are quite simple, having resistor, capacitor and inductor and they do not depend on any type of external type of source.[2] The inductor will block high frequency signal but offer increasing impedance and conduct low frequency signals. The capacitors are going to do just the opposite. Passive filter are not restricted by the bandwidth limitations of op-amps.

Types of passive filter:-

There are several types of passive filter, here are some common passive filters.

- Band pass filter
- Power line filter
- SAW filter
- Signal filter

The passive filters are used in order to protect the power system by restricting the harmonic current to enter the power system by providing a low impedance path. Passive filter are the combination of series and shunt.

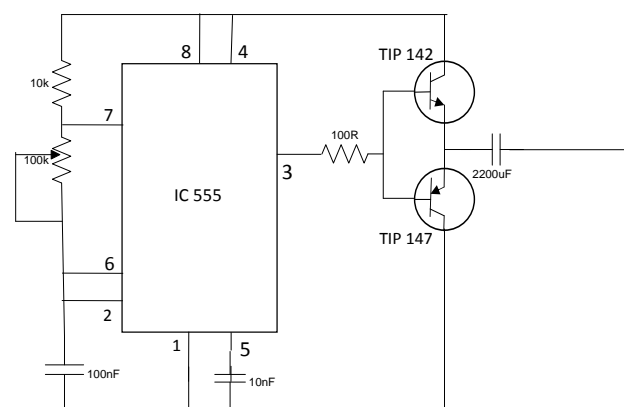


Figure 3. Inverter circuit diagram with 555 Timer

Here we used combination of resistor(R) and capacitor(C) Low pass filter for low power.

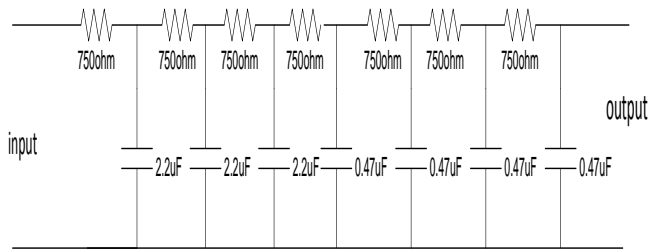


Figure 4. RC filter

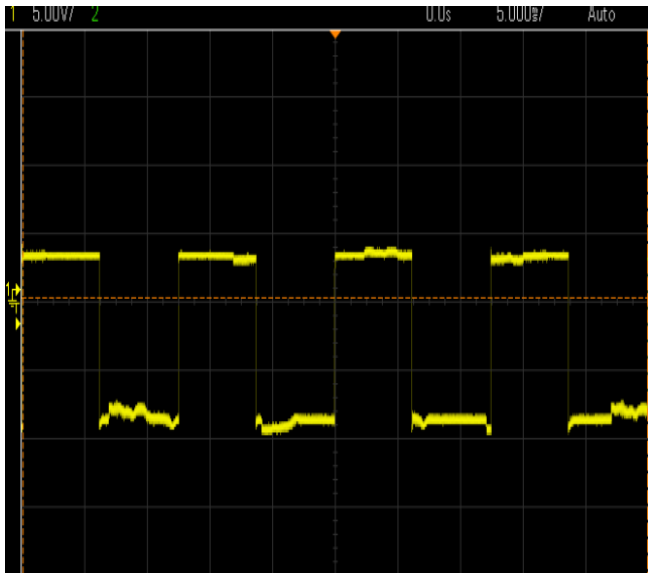


Figure 5. wave form of inverter circuit with

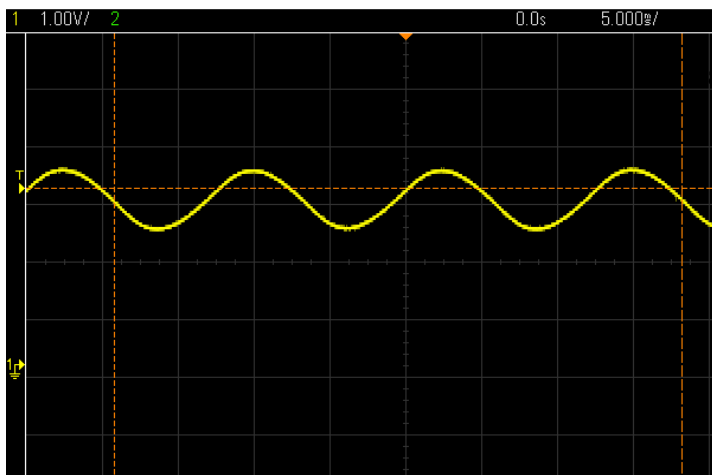


Figure 6. wave form of inverter circuit with RC filter

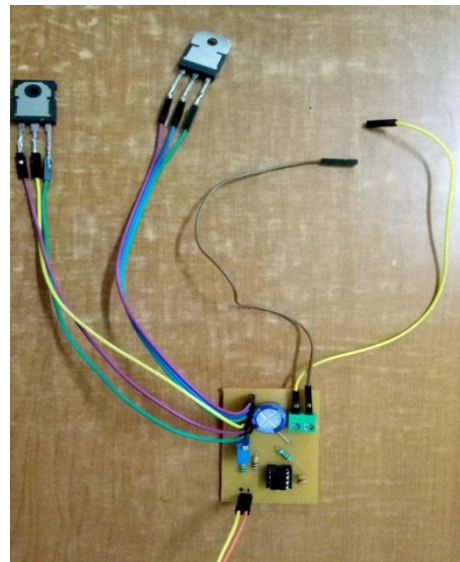


Figure 7. Prototype of inverter circuit without filter

VII. CONCLUSION

The result show has been done in the field of pure sine wave inverter but to obtain a waveform with reduced number of harmonics along with high efficiency which is easy to implement, cost proficient and reliable for low power application which is cheap to realize.

We plan extend this work in future work and present a better solution

VIII. REFERENCES

- [1]. Konstantinos G. Georgakas, Panagis N. VoVo'sannd Nicholas A. VoVo's, "Harmonic reduction method for a Single-phase dc-ac converter without output filter". DOI 10.1109/TPEL.2013.2286918,IEEE Transaction on Power Electronics.
- [2]. Rajesh Wari, Ashish Bagwari,"Voltage harmonic Reduction using passive filter shunt passive-active Filter for non-linear load, IEEE DOI0.1109/CSNT.2017.25
- [3]. Zeeshan Shahid, Sheroz Khan, AHM Zahirul Alam and Musse Muhamod Ahmed LM555 Timer-Based Inverter Low Power Pure Sinusoidal AC Output Department of ECE,

Kulliyah of Engineering, International Islamic University Malaysia, Kuala Lumpur, Malaysia.

- [4]. A.P Narmadha¹ Easwaran² Gopi Hitesh³ Karthikeyan⁴ Design of Single Phase Sine Wave Inverter using Multivibrator IC Department of EEE, BIT Campus, Anna University, Trichy, India. 2-4UG Scholar, Department of EEE, BIT Campus, Anna University, Trichy, India.
- [5]. Sandeep Phogat, "Analysis of Single Phase SPWM Inverter", International Journal of Science and Research (IJSR), Vol. 3, Issue 8, August 2014.
- [6]. Sridhar Dandin, Dr. Aswini Kumari, "Highly Efficient Pure Sine-Wave Inverter for Photovoltaic Applications with MPPT Technique", International Journal of Engineering Research and Technology (IJRET), Vol. 3, Issue 5, May 2014.

Solar Wind Hybrid Energy System

Divya Motghare¹, Surbhi Wagde¹, Aniket Kosare¹, Bhupesh Katekhaye¹, A.A. Dutta²

¹Electrical Engineering Department, DBACER, Nagpur, Maharashtra, India

²Assistant Professor, Electrical Engineering Department, DBACER, Nagpur, Maharashtra, India

ABSTRACT

As the developing technology has made humans to depend on energy. So as the energy crisis begins and electricity is for most essential need for domestic as well as industrial work. In modern technology all the non-renewable sources are depleting. So now we have to shift from non-renewable to renewable sources. So we need to develop renewable sources of energy in more amounts for this development. Therefore the combination of solar and wind energy hybrid can be the solution to many problems we common people, as well as the industrial workers face. We need a hybrid energy system of wind and solar energy. Solar and wind energy extract their energies from the nature and generate electricity. The main purpose of this paper is to generate energy without damaging the nature, pollution etc. This way generation of more electricity will lead to the economical development and the prices will become affordable for common people.

Keywords: Solar Energy, Wind Energy, Hybrid Power System, Generation.

I. INTRODUCTION

We require electricity for operating almost all the appliances we use in our day to day life. Energy has been playing important role in human and economic development and world peace. Electrical energy demand increases in word so to fulfill demand we have to generate electrical energy.

The biggest disadvantage with the usage of conventional resources is that their usage causes pollution due to the production of various pollutants like ash in case of a coal power plant, smoke in case of diesel power plant, radioactive material in case of nuclear power plant. So we need to find some other methods to produce electricity. There are two ways of electricity generation either by renewable or non-renewable energy sources. Since, all the non-renewable sources are depleting so we need to develop renewable sources. The new sources should be reliable, pollution free and economical.

Renewable energy i.e., energy generated from solar, wind, biomass and hydropower could increase diversity of energy supplies and offer us clean energy beyond all doubt. The energy generated from solar and wind is much less than the production by fossil fuels, however, electricity generation by utilizing PV cells and wind turbine increased rapidly.

Solar energy has drawback that it could not produce electrical energy in rainy and cloudy season so we need to overcome this drawback we can use two energy resources so that any one of source fails other source will keep generating the electricity. And in good weather condition we can use both sources combine.

Solar Energy

Solar energy is that energy which we get from the sun in form of radiation. Solar energy is present on

earth continuously and in abundant manner. It does not produce any gas that means it do not cause any kind of pollution, it is inexhaustible. It is available free of cost. It has low maintenance cost. Only problem with solar system it cannot produce energy in bad weather conditions. But in a country like India where sun shines for almost 300 days in a year, it is therefore a convenient mode of electricity production. Meager amount of investment is involved in setting up a solar power plant and also it is quite easy to maintain and has greater efficiency than other energy sources. The efficiency of the system is also quite good. Long life span and less emission of pollutants are its major advantages.

Wind Energy

Wind energy is the energy which is extracted from wind. For extraction we use wind mill. It is renewable energy sources. The wind energy needs less cost for generation of electricity. Maintenance cost is also less for wind energy system. Wind energy is present almost 24 hours of the day. It has less emission. Initial cost is also less of the system. Generation of electricity from wind is depend upon the speed of wind flowing. The major disadvantages of using independent renewable energy resources are that unavailability of power for all time. For overcoming this we use solar and wind energy together. So that any one source of power fails other will take care of the generation. In this proposed system we can use both sources combine. Another way is that we can use any one source and keep another source as a stand by unit. This will leads to continuity of generation. This will make system reliable. The main disadvantages of this system are that it needs high initial cost. Except that it is reliable, it has less emission. Maintenance cost is less. Life span of this system is more. Efficiency is more. A main advantage of this system is that it gives continuous power supply.

II. DESIGN OF HYBRID ENERGY SYSTEM

For design of the hybrid energy system we need to find the data as follows

A. Data required for Solar System:

1. Annual mean daily duration of Sunshine hours
2. Daily Solar Radiation horizontal (KWH/m²/day)

B. Data required for Wind System:

1. Mean Annual Hourly Wind Speed (m/sec)
2. Wind Power that can be generated from the wind turbine

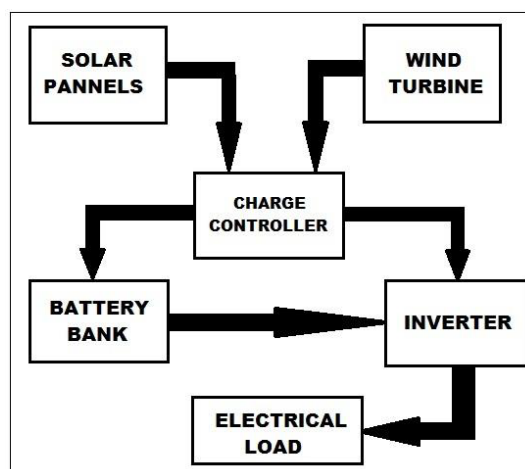


Figure 1. Block diagram of Hybrid energy generation system

Above figure shows the block diagram of the hybrid power generation system using wind and solar power. This block diagram includes following blocks.

- i. Solar panel
- ii. Wind turbine
- iii. Charge controller
- iv. Battery bank
- v. Inverter

i. Solar panel

Solar panel is use to convert solar radiation to the electrical energy. The physical of PV cell is very similar to that of the classical diode with a PN junction formed by semiconductor material. When the junction absorbs light, the energy of absorbed photon is transferred to the electron-proton system of the material, creating charge carriers that are

separated at the junction. The charge carriers in the junction region create a potential gradient, get accelerated under the electric field, and circulate as current through an external circuit. Solar array or panel is a group of a several modules electrically connected in series parallel combination to generate the required current and voltage. Solar panels are the medium to convert solar power into the electrical power.

ii. Wind turbine

Wind turbine is that system which extracts energy from wind by rotation of the blades of the wind turbine. Basically wind turbine has two types one is vertical and another is horizontal. As the wind speed increases power generation is also increases. The power generated from wind is not continuous its fluctuating. For obtain the non-fluctuating power we have to store in battery and then provide it to the load.

iii. Charge controller

Charge controller has basic function is that it control the source which is to be active or inactive. It simultaneously charge battery and also gives power to the load. The controller has over-charge protection, short-circuit protection, pole confusion protection and automatic dump-load function. It also the function is that it should vary the power as per the load demand. It add the both the power so that the load demand can fulfill. And when power is not generating it should extract power from battery and give it to the load.

iv. Battery Bank

We have to choose battery bank size per the load requirement so that it should fulfill the requirement of load for calculating the battery bank size we need to find following data

1. Find total daily use in watt-hour (Wh).
2. Find total back up time of the battery

For increase in battery bank size we need to connect cell in series so that we can get the larger battery bank size.

v. Inverter

We have to choose greater rating inverter than the desired rating .The pure sign wave inverter is recommended in other to prolong the lifespan of the inverter. Inverter is need to convert DC power into AC power. As our load working on the AC supply so we need to convert DC power. The input voltage Output voltage and frequency, and overall power handling depends on the design of the specific device or the circuitry. The inverter does not produce any power. The power is provided by the DC source.

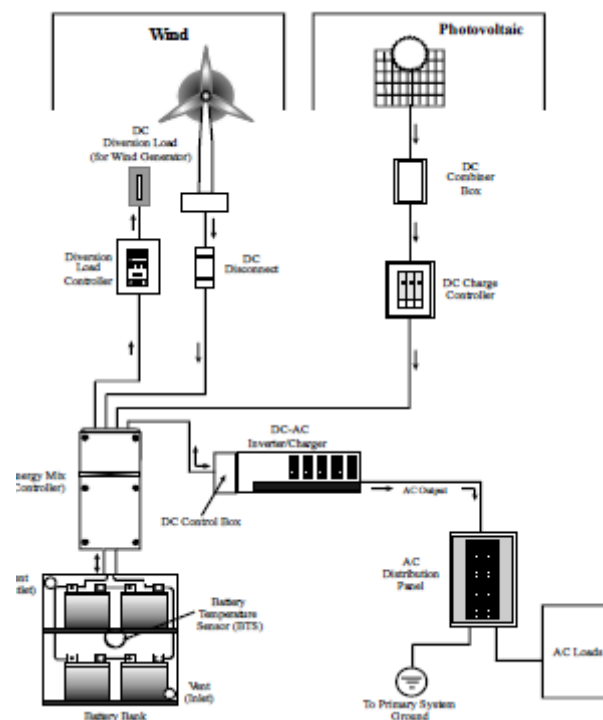


Figure 2. Schematic diagram of hybrid solar wind power system

III. SPECIAL ISSUES WIND TURBINES AND PV CELLS

As the wind does not blow all the time nor does the sun shine all the time, solar and wind power alone are poor power sources. Hybridizing solar and wind power source together with storage batteries to cover

the periods of time without sun or wind provides a realistic form of power generation. This variable feature of wind turbine power generation is different from conventional fossil fuel, nuclear or hydro-based power generation. Wind energy has become the least expensive renewable energy technology in existence and has peaked the interest of scientists and educators the world over.

Photovoltaic or PV cells, known commonly as solar cells, convert the energy from sunlight into DC electricity. PVs offer added advantages over other renewable energy sources in that they give off no noise and require practically no maintenance. PV cells are a familiar element of the scientific calculator owned by many students. Their operating principles and governing relationships are unfortunately not as pedagogically simple as that of wind turbines. However, they operate as using the same semiconductor principles that govern diodes and transistors and the explanation of their functioning is straightforward and helps to make more intuitive many of the principles covered in semiconductor electronics classes.

Most industrial uses of electricity require AC power. Wind turbines and PV cells provide DC power. A semiconductor-based device known as a power inverter is used to convert the DC power to AC power. This device has a relatively simple operation that is a vivid illustration of many topics traditionally covered in power electronics classes.

5. Basic Components of Solar Power

The major components include P.V modules, battery and inverter. The most efficient way to determine the capacities of these components is to estimate the load to be supplied. The size of the battery bank required will depend on the storage required, the maximum discharge rate, and the minimum temperature at which the batteries will be used [4]. When designing a solar power system, all of these factors are to be taken into consideration when battery size is to be chosen.

Lead-acid batteries are the most common in P.V systems because their initial cost is lower and also they are readily available nearly everywhere in the world.

Deep cycle batteries are designed to be repeatedly discharged as much as 80 percent of their capacity and so they are a good choice for power systems. Figure 2 is a schematic diagram of a typical Photovoltaic System.

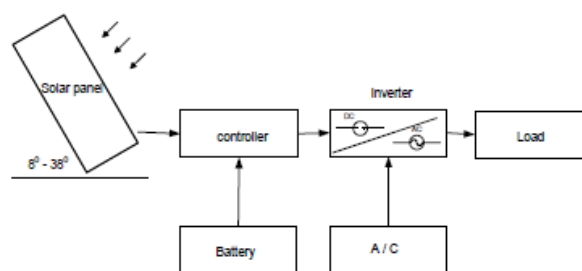


Figure 3. Photovoltaic System

IV. CONCLUSION

Obviously, a complete hybrid power system of this nature may be too expensive and too labour intensive for many Industrial Technology Departments. However, many of the same benefits could be gleaned from having some subset of the system, for example a PV panel, batteries, and an inverter or even just a PV panel and a DC motor. The enhancement to instruction, especially in making electrical power measurement more physical, intuitive, and real world are substantial and the cost and labour involved in some adoptions of the ideas in this paper to a smaller scale setup are responsible.

The use of solar and wind hybrid power generation is an especially vivid and relevant choice for students for electrical Technology as these are power sources of technological, political, and economic importance of the country. Hybrid combination of wind power, solar power, geothermal power, power from incineration of solid waste, and many other technologies could also be considered depending on local interest and

resources. The key elements of this test bed concept present in the paper are two or more renewable power sources can be connected to a power grid with complex electrical interactions.

V. REFERENCES

- [1]. JB.V.Subrahmanyam, P.K. Sahoo and M. Reddy "Local PV-Wind Hybrid Systems Development for Supplying Electricity to Industry", Mediamira Science Publisher, October 22, 2011.
- [2]. Ashish S. Ingole, Prof. Bhushan S. Rakhonde "Hybrid Power Generation System Using Wind Energy and Solar Energy", IJSRP, Volume 5, Issue 3, March 2015.
- [3]. A. Adejumodi, S.G. Oyagbinrin, F.G. Akinboro, M.B. Olajida "Hybrid Solar and Wind Power: An Essential for Information Communication Technology Infrastructure and People in Rural Communities", JRRAS 9(1), October 2011.
- [4]. Bharat Raj Singh, Bal Krishna Dubey "Solar Wind Power Generation System", IRJET, volume 5: issue 1: 01 January 2018.
- [5]. N.shivaramakrishna, Ch. Kasi Ramakrishna Reddy "Hybrid Power Generation combination solar-wind power and modified solar panel", IJETT-volume41: issue 5-May 13.
- [6]. Ugur FESLI, Raif BAYIR, Mahmut Ozer "Design and Implimentation of a Domestic Solar-Wind Hybrid Energy System.
- [7]. Pritesh P. Shirsath, Anant Pise, Ajit Shinde " Solar-Wind Hybrid Energy Generation System", IJERGS,volume 4, Issue 2,March-April 2016.
- [8]. K Bhoopati, Dr.G.Girdhar, M.C.Lavanya, Prasun Kumar DAS "Wind-Solar Hybrid Energy Production Analysis Report", SRRA & Resources Assessment, National Institute of Wind Energy, September 2016.

Net Metering in Grid Connected Solar PV System

Nisha R. Molke, Sujata T. Pawade, Sumit A. Pawade, Sandesh B. Fulzele, Pranay D. Kalamkar

Department of EE, Dr. Babasaheb Ambedkar College of Engineering and Research, Wanadongari, Nagpur,
Maharashtra, India

ABSTRACT

In India, power demand is increasing day by day. To fulfill this demand we are using renewable energy source i.e. solar, as it is available abundant in nature. But at night time, for reliability of supply we are using storage batteries, and ultimately this increases the cost of system. So, here we are using net metering mechanism. It is a billing mechanism. If the solar generates surplus amount of power then that has to be supplied to grid and exported power must recorded. In this paper the bidirectional net meter in grid connected solar PV system is proposed that keeps record of electricity imported from grid and electricity exported to grid.

Keywords : Net Meter, Solar Energy, Solar PV System.

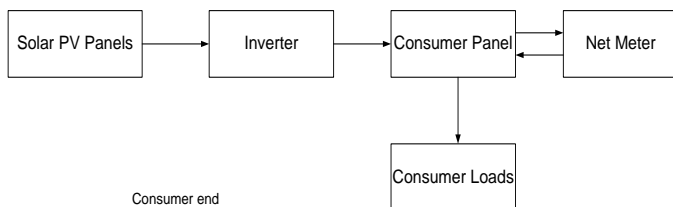
I. INTRODUCTION

Renewable power generation has become an ultimatum in recent years. In recent times many energy experts, scientists, engineers and activists actively promote a 100% renewable energy vision. The recent reports suggest that, we have already used almost 2/3 of our carbon budget and at the current projected rate; this entire budget will be used by the year 2040. So it is essential that we move rapidly towards a renewable energy [1]. The renewable energy which is abundantly available in nature is solar energy. Solar energy is pollution free and causes no greenhouse gases to be emitted after installation. It reduced dependence on foreign oil and fossil fuel. Solar panels last over 30 years so no maintenance is required. Access power can be sold back to the power company if grid intertied. Solar Photo Voltaic systems which convert sunlight into electricity are usually installed on the existing roof-top space of buildings to meet the minimum load requirement India is facing a major growth in the photovoltaic sector. The Indian

government has set a motivated target of achieving 20 GW of grid-connected and 2 GW of off-grid PV capacity by 2022[2]. Net metering is a billing mechanism which allows small consumers who generate some or all of their own electricity to use that electricity anytime, instead of when it is generated.

II. BASIC NET METERING SYSTEM

Fig 1 outlines the net metering concept. The system mainly consists of five modules- solar PV modules/panels for converting sunlight into dc supply, inverter for converting DC to AC so that it can be used at home or supplied to grid or both, home, bidirectional meter and grid. Storage system like battery can also be included in the system. Energy flow between solar panel, inverter and home is unidirectional while it is bidirectional between home, meter and grid.



The power seen from grid terminal is as in (1) subjected to the constraint according to (2). The tariff rate in general is expressed as (3). [3]. The meter balance is also calculated on the basis of constraints as in (4). The payback period is calculated through as in (5).

$$P_{grid} = P_{used} - P_{gen} \quad (1)$$

$$P_{gen} \leq P_{gemin} \quad (2)$$

$$T_{total} = T_f + T_{wc} + T_{ec} + T_{ra} \quad (3)$$

$$N_b = P_b - T_{total} \quad \text{If } P_{grid} > 0$$

$$N_b = P_b - T_{total} \quad \text{If } P_{grid} < 0 \quad (4)$$

$$N_b = P_b \quad \text{If } P_{grid} = 0$$

$$T_{payback} = \frac{C_{solar} - C_{incen}}{C_{saving} * 364.25} \quad (5)$$

III. IMPLEMENTATION OF NET METERING

The first net meter has been installed in the premises of Verdean industries Limited, located in Adhere(Mumbai) by "Tata Power Company". In march, the civic body had installed 25KW solar metering at its Vatic Nagar Word Office and Majiwada, Manmade, it will also introduce this new power generation technique at Umbra and Anandibai Joshi hospital in Vartak Nagar to meet its energy requirements.

Many utilities are permitting to residential PV plant to be connected to grid by implementing a net metering system. The net metering system allows home owner to sell excess energy being produce by the PV plant back to the utility as the same rate at which the home owner purchases it from the utility [4].

IV. ALGORITHM FOR NET METERING

Algorithm explains the working of net meter in calculating the net power exchange between the utility and consumer. The algorithm takes the values from solar meter and bidirectional meter. The values are used to calculate the solar power PPV and utility power Putility. [5]

- 1: Measure the values of I_{pv} and V_{pv} to calculate PV power $P_{pv} = V_i * I_i * \cos\phi$, where I is any time instant
- 2: Measure the values of $V_{utility}$ and $I_{utility}$ to calculate utility power $P_{utility} = V_{utility} * I_{utility} * \cos\phi$, where k is any time instant.
- 3: Said the load of the building as $P_{Load} = 2KW$.
- 4: **if** $P_{pv} > P_{Load}$ **then** the supply is sent back to the grid and net meter displays 'reverse'
- 5: **else** $P_{pv} \leq P_{Load}$ The supply is received from the utility grid and net meter displays 'forward'
- 6: **end if**
- 7: check the above condition after 30sec. The net units power as calculated as :

$$P_{net} = P_{pv} - P_{utility}$$

V. Net Metering Benefits

1. The system is easy and inexpensive. It enables people to get real value for the energy they produce, without having to installed a second meter on an expensive battery storage system.
2. To allows homeowners and businesses to produce energy, which takes some of the pressure off the grid, especially during period of peak consumption.
3. Each home can potentially power two or three other homes. If enough home in a neighborhood use renewable energy and net metering, the neighborhood could potentially become self-reliant.
4. It encourages consumers to play an active role in alternative energy production, which both

protects the environment and helps preserve natural energy resources.

5. Homes that use net metering tend to be more aware of, and therefore more conscientious about their energy consumption.
6. It saves utility companies money on meter installation, reading and billing cost.

VI. REFERENCES

- [1]. K. Maharaja, P. PradeepBalaji, S. Sangeetha, M. Elakkiya “Development of Bidirectional Net Meter in Grid Connected Solar PV System for Domestic Consumers” 978-1-4673-9925-8/16/\$31.00 ©2016 IEEE.
- [2]. M.Sahanaasree, S.Arunkumar, K. KalidasaMurugavel “Feasibility Study for the Net Metering Implementation in Residential Solar PV Installations across Tamil Nadu” 2014 international conference on computation of power, energy, information and communication (ICCPETC), 978-1-4 799-3826-1114/\$31.00©2014 IEEE.
- [3]. SohamDuttaDebomitaGhosh, Member IEEE Dusmanta Kumar Mohanta, Senior Member IEEE “Optimum Solar Panel Rating for Net Energy Metering Environment” International Conference on Electrical, Electronics, and Optimization Techniques (ICEEOT) – 2016.978-1-4673-9939-5/16/\$31.00 ©2016 IEEE
- [4]. MohdRizwanSirajuddinShaikh , Santosh B. Waghmare , Suvarna Shankar Labade , PoojaVittalFuke, Anil Tekale “A Review Paper on Electricity Generation from Solar Energy” International Journal for Research in Applied Science & Engineering Technology (IJRASET) ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor:6.887 Volume 5 Issue IX, September 2017
- [5]. Mukesh Singh “A Technical Review on Solar-Net metering”.

Checking the various parameters of FRC (Fibre Reinforcement Concrete) using the Steel and Glass Fibres

Abdul Kadir Shekh, Mohan Kumar Yadav, Himanshu Kamble, Kuldip Barsagade, Neha Kukare, Pritesh Ramteke

Civil Engineering Department, TGPOCET, Nagpur, Maharashtra, India

ABSTRACT

Concrete is eco-friendly in our modern world in all developing and developed country. It plays very vital role in construction world it is locally available material and adding steel fibre and glass fibre in concrete it increase the strength and durability of concrete. Glass fibre increase the smoothness and provide crack free of concrete. As we know that concrete is brittle material when load is applied on it get cracked so to protect from it random distributed of steel fibre are placed to overcome the brittle of concrete and provide more strength and durability. This paper represent the effect of fibres and study the strength of reinforced concrete of M30 grade with 2% of steel and glass fibre which shows the enhanced properties compare to normal.

Keywords : Fibre Reinforced Concrete, Glass Fibre, Steel Fibre, Compressive Strength, Split Tensile Strength.

I. INTRODUCTION

As we know that the concrete is manmade and most widely used material globally for construction in many developing and developed countries in related to construction. It has several desirable properties like high compressive strength, stiffness and durability under normal usual environmental factors while at same time concrete found to be brittle and weak in tension. Fibre Reinforcement Concrete (FRC) combine the high compressive strength properties of cement mortars with significantly increased impact, flexural and tensile strength imparted by the fibre reinforcement. If fibre is not used in concrete there may be chances of development of cracks due to drying shrinkage, plastic shrinkage and other reason of chances in volume of concrete.

In this experimental investigation Portland Pozzolana Cement (PPC – 53 grade), Carbon Steel Fibre and Glass fibre are used. Fibre Reinforcement Concrete is a composite material essentially consisting of conventional concrete or mortar reinforced by

randomly oriented, short continuous and discrete fibres of specific geometry. It is a parts of reinforcing material usually described by aspect ratio. Aspect ratio is specified by volume fraction. Fibres are added to improve the strength parameters of the concrete as reinforcement effective to improve the flexural strength and compressive strength of concrete. In ancient years, researchers have realized the benefits of combining fibres, in terms of obtaining synergy and improving the response of composite material. Little progress was made in the development of this material till 1963, when Ramauldi J.P. and Batson G.B. published their classical paper on the subject. In the early 1970's FRC has been in prevent construction.

II. METHODS AND MATERIAL

The main theme of this experiment investigation is to determine the strength parameters such as compressive strength, split tensile strength of concrete and design to meet the requirements of M₃₀

grade of concrete mix with steel fibre of 2% by volume of concrete and alkalis resistance glass fibre of 2% by weight of cement.

1. In first stage, properties of various materials used in mix are studied.
2. In second stage mix design is carried out preparation of the mold.
3. Examine the strength characteristics (compressive strength and split tensile strength) of concrete modified with addition of steel and glass fiber of 2%.
4. Compare the effect of various type of fibers for efficient performance intersects of strength, workability and durability.
5. Final step is about comparing results.

Compressive Strength

Compressive strength test is the strength of concrete is usually defined and determined by the crushing strength of 150mm×150mm×150mm of an age of 7,14 and 28 days. According IS 516-1959. The steel fibres and glass fibres included at the rate of 2%. This solid is provided in the mould and altered legitimately so, as not to have any voids. Following 24 hours these moulds are evacuated and test examples are placed in water for curing. Load at the disappointment isolated by zone of example gives the compressive quality of cement.

Compressive Strength (Mpa) = Failure load/Cross Sectional Area.



Fig – 2.1 Compressive strength test

Split Tensile Strength

To locate the split elasticity the barrels were placed in the moulds of measurements 200mm length and 150mm diameter across with M30 grade of concrete. Set of the test example by adding glass fibre by including the glass fibre at the rate of 2% were additionally included while passing the barrels the compaction is done utilizing the table vibrator. Finally the top layer of the example is completely labelled and very much wrapped up from time of casting 24 hours the barrels were demolded and were kept for curing in curing time for 28 days. After 28 days curing is done these examples have been tried in pressure testing machine. The split rigidity is figured as takes after

$$\text{Split tensile strength (Mpa)} = \frac{2p}{\pi Dl}$$

p = Failure Load

D = Diameter of cylinder

l = length of cylinder.



Fig – 2.2 Split tensile strength test

III. RESULTS AND DISCUSSION

TABLE-1. Compressive strength

Sn	Mix Proportion (ratio)	Fibres	Workability	Area of 3 – cubes			
				Slump (mm)	Compressive strength (Mpa)		
					7 days	14 days	28 days
1.	1:1.7:2.08	No	75	17.0	21.3	35.7	
2.	1:1.7:2.08	Glass	70	13.3	22.8	35.5	
3.	1:1.7:2.08	Steel	72	20.0	26.5	42.5	

The above Table-1 and Table-2 shows the compare between Normal specimen, Glass fibre and Steel fibre. As per test we get later result by using 2% of steel fibre and glass fibre comparing to normal specimen. Here, in this paper the test has been done for 7-days, 14-days and 28-days curing.

TABLE – 2. Tensile strength

Sn	Mix Proportion (ratio)	Fibres	Workability	Area and Diameter of Cylinder			
				Slump (mm)	Tensile strength (Mpa)		
					7 days	14 days	28 days
1.	1:1.7:2.08	No	75	1.54	1.8	3.2	
2.	1:1.7:2.08	Glass	70	1.1	2.0	4.5	
3.	1:1.7:2.08	Steel	72	2.3	3.4	5.5	

IV. CONCLUSION

The main theme of this experiment is study to quantity of the effect of the additional of Glass fibre, Steel fibre and Normal specimen by examine physical and mechanical properties of including compressive strength and split tensile strength. We get high strength of steel fibre as compare to normal specimen. The highest compressive strength is 42.5 Mpa and the highest split is 5.5 Mpa and Similarly, using Glass fibre, we didn't get highest strength but we got the smooth surface of concrete and fineness of concrete etc. thus we increase the properties of concrete by using 2% of steel fibre and Glass fibre and get better result comparing to normal specimen in 28 days.

V. REFERENCES

- [1]. Alan J. Brookes, "Cladding of Building"
- [2]. Arnon Bentur and Sidney Mindess, "Fibre Reinforced Cementations Composites", Second Edition 2007, Chapter 8, (pp278).
- [3]. Sikder, P.K, Gupta, S and Kumar, S. (2004), "Application of Fiber as Secondary Reinforcement in Concrete", NSW & CW, December. [5] MoRTH Specification for Road and Bridge Works (2001), Fourth Revision.
- [4]. Application and properties of fibre coccrete Author :- Amit Rai and Dr.Y.P Joshi [2]. Compressive

- [5]. Behavior Of Steel Fibre Reinforced Concrete
Author :- R.D.Neves and J.C.O. Fernandes de Almedia
- [6]. Eng. Pshtiwan N. Shakor, and Prof. S. S. Pimplikar (2011) "Glass Fibre Reinforced Concrete Use in Construction", International Journal of Technology and Engineering System (IJTES), Jan –March 2011- Vol.2.No.2.
- [7]. Shrikanth Harle "Glass Fiber Reinforced Concrete & Its Properties" International Journal of Engineering Sciences & Research Technology Harle, 3(1), January 2014. [2] Amit Rai, Dr. Y.P Joshi "Applications and Properties of Fiber Reinforced Concrete" International Journal of Engineering Research and Applications Volume 4, Issue 5 (Version 1), May 2014.
- [9]. Dr. P. Perumal and Dr. J. Maheswaran, "Behavioural study on the effect of AR-Glass Fibre reinforced concrete", NBW & CW October 2006, (pp 174-180).
- [10]. Upendra Varma and A.D. Kumar (2013), "Glass Fibre Reinforced Concrete", International Journal of Engineering Research and Applications, Vol. 3, Issue 5, pp.1914-1918.

A Review on Design and Fabrication of Power Cultivator

Pratik Dhage¹, Shrikant Waghmare², Pratik Gaikwad², Sachin Warhade², Tushar Wakhare²,
Shubham Kawalkar², Suraj Karankar²

¹ Assistance Professor of Mechanical Engineering Department, G.H. Rasoni Academy of Engineering and Technology, Nagpur, Maharashtra, India

² Mechanical Engineering Department, G.H. Rasoni Academy of Engineering and Technology, Nagpur, Maharashtra, India

ABSTRACT

As that now a day's using conventional farming method for cultivating the land which is so time taking and costly too, so we develop a new method to do it. In India all the equipments were used for cultivation purpose are expensive that in result unable to buy by every farmer and also to reduce the use of ox pair; hence to overcome this problem we design and fabricate this method. The practical application of this model was performed and we achieve our target to design and fabricate of power cultivator. This paper can directly discuss the working about our design and fabrication and presents the result of study per acre consumption of fuel.

Keywords: Power Cultivator, Engine, Soil, Land, Technology

I. INTRODUCTION

Power cultivator is designed mainly for cultivating in small farms area and in hill farming. The adoption of power cultivators by the farmers for carrying out farming operations is low when compared to tractors. The concept of power cultivator came to the world in the year 1920. The first country to use power cultivator on large scale was Japan. The first successful model of power cultivator was designed in the year 1947. During the year 1950 to 1965 the production of power cultivator increased rapidly. Power cultivator was introduced in India during 1963. Power cultivator is a walking type tractor. The operator trails behind the power cultivator, holding the two handles of cultivator in his hands. Power cultivator is also called as a single axle walking type tractor, though a seat is provided in some designs. Now-a-days some models of power cultivator have an optional riding facility. Power cultivators have been especially designed and developed for use on small or medium farms where four wheel tractors are not easily available.

Now-a-days some models of power cultivator have an optional riding facility. This design and fabrication of power cultivator is for small land and where the tractor is not possible for cultivation which is expensive method. In this paper we discuss about the design and consumption of fuel per acre of power cultivator. The operator trails behind the power cultivator, holding the two handles of cultivator in his hands. Power cultivator is also called as a single axle walking type tractor, though a seat is provided in some designs.

II. LITERATURE SURVEY

Studies shows that Subrata Kr. Mandal, Atanu Maity (from 15th National Conference on Machines and Mechanisms a research paper Development and Performance Evaluation of a Light Weight Power Tiller) conducted trials the average Effective field capacity was 0.2 and 0.25 ha/day. The average fuel consumption Was 1.0 and 1.2 l/h. The field capacity found to be 0.1 ha/day (10 hrs.). During the field

studies conducted in different soil conditions Sirahi and Panwar have found that the existing weight of about 200 kg of the IRRI model.

III. OPERATION

The operation of a power cultivator involves walking with the Cultivator machine on a farming land continuously for up to the needs to cultivate. During peak seasons of seedbed preparation, farmers operate power cultivator s even for more than 8h a day. The operator has to guide/control the forward movement of the machine by actuating hand clutches provided on each handle or sometimes by pushing/pulling the handles towards sides. The operator sometimes lifts the rear portion of the machine to take sharp turns at the headlands. The main clutch is a lever on the handle. The lever can be shifted to on or off position while operating in the field. When the lever is shifted to on position, the power from the engine is transmitted through the main clutch to the various parts of the power cultivator. When the lever is shifted to off position the power from the engine is cut-off from the rest of the transmission.



Fig. ENGINE

IV. COMPONENTS OF POWER CULTIVATOR

A power cultivator consists of the following main parts:

- (1) Engine
- (2) Transmission gears
- (3) Brakes Rotary
- (4) Pedestal Bearing or Pillow block bearing.



Fig. V shaped Cultivator



Fig. Wheel

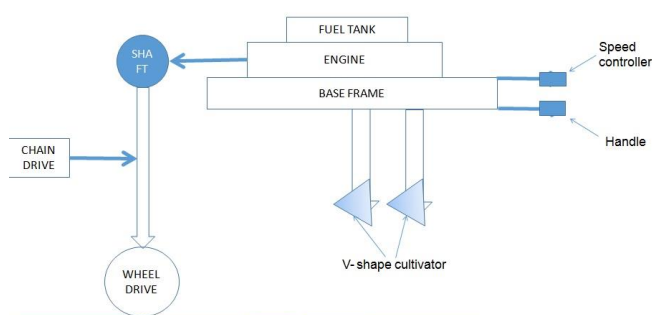


Fig. Base Frame

All the power cultivator components are fitted with diesel engine. The makes like Kubota, Mitsubishi, Usha and Sarachi have used diesel engine in India.

V. POWER TRANSMISSION IN A POWER CULTIVATOR

For operation of power cultivator, the power is obtained from the IC Engine, fitted on the power cultivator. The engine power goes to the main clutch with the help of belt or chain. From main clutch, the power is divided in two routes, one goes to transmission gears, steering clutch and then to the wheel. The other component goes to the tilling clutch and then to the tilling attachment. The main components for transmission of power are given below:



V-belt is usually used to transmit power from the engine to the main clutch, because V-belt has very high efficiency and it works as a shock absorber also. The power cultivator remains an essential mode of power for farming operations, especially in land preparations. The Machine saves time and improves the land productivity. Wetland tillage in rice land cultivation is the main operation for which this machine is employed.

Belt Drive – It may be used as source of motion to transmit power efficiently track relative movement. Belts are looped over pulley and may have twist between the pulleys, and the shafts need not be parallel.

Type – V-Belt

Big pulley – 356mm

Small pulley – 78mm

Chain Drive – It is a way of transmitting mechanical power from one place to another. It used to convey power to the wheel of a vehicle particle.

VI. SYSTEM SPECIFICATION

Specifications of lightweight power cultivator used for performance evaluation

S. No. Particulars

1. Engine: Make Usha
2. Engine: Model UL5000SS
3. Engine: Power 5HP, 2600 RPM
4. Engine: 4 Stroke
5. Fuel tank capacity Diesel - 5lit
6. Lubrication – Central lubrication combined oil mist & splash
7. Weight of the Engine - 46 kg
8. Starting Method – Handle
9. Drive to Rotary unit Chain and sprocket, centrally
10. Overall Dimension 1510 x 730 x 910 (l x w x h)
11. Outer diameter of Rotary unit 300 mm
12. Depth of cut 100-150 mm (adjustable)
13. Total weight 120 kg

VII. CALCULATIONS

Data :

- Engine speed = **2600 rpm**
- Wheel diameter = 14”
= 14*25.4
= 355.6 mm
= **0.3556 m**

- Radius wheel :-
 $R = 0.3556/2$
= **0.1778 m**

•

$$X = \frac{\pi * D * N}{60}$$

$$= \frac{\pi * 0.3556 * 2600}{60}$$

$$= 48.40$$

= 50 rpm

Wheel RPM is 50.

VIII. FIELD PERFORMANCE EVALUATION:

The lightweight power Cultivator was evaluated over an area of under sandy Loam soil for seedbed preparation. The 0.404 hector in 1hr with 1 lit diesel for cultivating land.



IX. ACKNOWLEDGEMENT

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of our parents and enthusiastic friends for their encouragement and moral support for this effort.

X. CONCLUSION

The power cultivator is capable of primary and secondary tillage operations and is most suitable for operations in hilly regions, wet conditions and for small holdings. Given the right set of implements and attachments, the power cultivator is capable of performing most of the field operations in the intensive cultivation. The light weight of power cultivator is a favorable factor for working in wet and dry land conditions. External attachments can be made on the cultivator depending upon the nature of work. So, the cultivator can be used as a multi-purpose machine.

The main advantage of this technology is that any farmer in India can easily handle this mini cultivator. For increasing the traction and torque we have reduces speed in three different stages as,

- By using V-belt drive
- By using two different chain sprocket mechanism

The 0.404 hector in 1hr with 1 lit diesel for cultivating land.

XI. REFERENCES

- [1]. A Hendriadi, V.M. Salokhe, Improvement of a power Cultivator cage wheel for use in swampy peat soils, Agricultural, Aquatic Systems and Engineering Program, Asian Institute of Technology.
- [2]. Showkat Rasool, Hifjur Raheman, Suitability of rubber track as traction device for power Cultivators, Department of agricultural & Food engineering, IIT Kharagpur, India.
- [3]. D.A. Mada, Sunday Mahai, "The Role of Agricultural Mechanization in the Economic Development for Small Scale Farms in Adamawa State", The International Journal of Engineering

and Science (IJES) Volume 2 Issue 11 Pages 91-96 2013 ISSN (e): 2319 2319 – 1805

- [4]. Md. AqibNaque, Akhtar Ali Rizvi, Amogh v. Tijare, Prof. A. B. Tupkar Design, Development and Fabrication of Soil Cultivator and Weeder Mechanical Engg. Dept. P. C. E. Nagpur, Maharashtra, India (IJIET) Vol. 2 Issue 2 April 2013

Design and Development of Hexacopter for Spray Painting

Praharsh Singh¹, Rushabh Meshram¹, Shubham Jambhule¹, Vaibhav Hage¹, Wakif Raza¹, Yogesh Sawant¹, Mr. Mohsin I A R Sheikh²

¹Department of Mechanical Engineering GHRAET, Nagpur, India

²Assistant Professor Department of Mechanical Engineering GHRAET, Nagpur, India

ABSTRACT

In this 21st century technology increases day by day, UAV (Unmanned Aerial Vehicle) is one of those. The UAV has different application like inspection and monitoring, surveying and mapping, pesticides sprayer, and painting. The UAV's are designed as per its application. It may be a quadcopter, hexacopter, octacopter or any other multicopter. The Hexacopter painting sprayer pump is an equipment or a device which is used for painting at higher altitude by using the principle of its lifting capacity. Motors are connected to the propellers which convert the rotary motion of the propeller into upward thrust which lifts the hexacopter. The hexacopter consists of six high speed motors that generate which utilize battery power for its working. The blades are connected to the DC motor. Rotation of blades produces thrust which helps in lifting the Hexacopter and moves up and down, to and fro. We used a spraying pump for spraying colours. The proper handling of the remote will decide how to paint the Building. The application of the painting Hexacopter is to reach at a certain height where human can't reach and paint the wall efficiently.

Keywords : UAV, Battery, BLDC Motor, Propeller

I. INTRODUCTION

In the past years the size and price of electronic components got reduced but its specification increases. And because of this any cheap and lightweight drone can be built. These UAV's can be fitted with sensors and other equipment to perform multitask work. The UAV's are also known as Remotely Piloted Vehicles (RPVs) and it can be controlled through radio frequencies. In these days the UAV's are controlled by iPhone and Tablets through Global Positioning System. As per the numbers of motors or propellers the name of multicopter is decided. Each motor requires single propeller and vice-versa.

II. COMPONENTS OF HEXACOPTER

- 1- **Motors** – It should be exact same in size as well as in weight also. The specification of each motor should be also same for perfect lifting.
- 2- **Frame**- The material used for frame is fibre because of its strength frame design is done according to the tread belt size as per space availability and clearance for reduction of friction.
- 3- **ESC's** - The Electronic Speed Controller. It is a circuit which controls and regulates the speed of a motor. Speed is controlled on the basis of motor whether it is Brushed DC motor OR Brushless DC motor. For Brushed DC motor it depends upon the voltage Varying and for Brushless DC motor it depends upon the timing of pulses of current delivered to the winding.

- 4- **Transmitter and Receiver** – It is another important part of Hexacopter. Transmitter which we hold in our hands and operate and receiver is placed in the Hexacopter which accepts the radio signals and move as per the given command.
- 5- **Propellers** – The propellers which are used in Hexacopter are made of Carbon Fiber, Hard and light in weight.
- 6- **Battery** – It provide power supply to the motores

III. OBJECTIVES

The main Aim of the project is to reduce the problems that we faced while painting a building on the basis of its cost and quality. The objectives are :-

- To eliminate human life risk while painting at high altitude.
- To increase the accuracy of painting.
- To reduce excess wastage of paints
- To reduce the labour cost by using the hexacopter.

IV. RESULT

Total calculated Axial Thrust is 4.28 Kg.



Figure 1

V. REFERENCES

- [1]. S. Bhandari, S. Pathak, R. Poudel "A report on Design and Development of Hexa-copter (KU-copter)"
- [2]. Dupuis, M & Gibbons, J. (2008). Design optimization of quadcopter capable of autonomous flight. Worcester polytechnic Institute. Retrieved August 8, 2014
- [3]. DiGesare, A. Design Optimization of a Quad-Rotor Capable of Autonomous Flight. Worcester Polytechnic Institute.
- [4]. Fogelberg, J. 2013. Navigation and Autonomous Control of a Hexa-copter in Indoor Environments. Lund University.
- [5]. "Development of Unmanned Aerial Vehicle (UAV) Ornithopter with Wireless Radio Control"
- [6]. "Design and Development of Hexa-copter for Environmental Research"
- [7]. "Design, Implementation, and Testing of a UAV Quadcopter"
- [8]. "Wireless Communications with Unmanned Aerial Vehicles: Opportunities and Challenges"
- [9]. Resarch papper on Design & Fabrication Of Remote Operated 3-Axis Spray Painting "Prof. Dinesh B. Shinde".
- [10]. Research papper on Quadcopter based fertilizer and pesticide spraying system "Prof. N. Gandhiraj"

Characterization of Jatropha Oil, An Alternative Fuel

Dhananjay G. Pardhi, Shailendra G. Gajbhiye, Prashant M. Khanorkar

Mechanical Engineering Department, Government Polytechnic Gadchiroli, Maharashtra, India

ABSTRACT

There has been greater awareness on biodiesel in developing countries in the recent time and significant activities have picked up for its production especially with a view to boost the rural economy. Biodiesel, a promising substitute as an alternative fuel for diesel has gained significant attention due to the predicted shortness of conventional fuels and environmental concern. The utilization of liquid fuels such as biodiesel produced from Jatropha oil by trans-esterification process represents one of the most promising options for the use of conventional fossil fuels. The Jatropha oil is converted into Jatropha oil methyl ester known as biodiesel prepared in the presence of homogeneous acid catalyst. The physical properties such as Calorific value, density, flash point, kinematic viscosity, Cloud point and Pour point were studied out for Jatropha oil methyl ester. The same characteristics study was also carried out for the diesel fuel for obtaining the base line data for analysis. The study reveals that the values of properties obtained from the study of Jatropha methyl ester is closely matched with the values of conventional diesel and can be used in the existing diesel engine without any modification.

I. INTRODUCTION

As civilization is growing, transport becomes essential part of life. The biggest problem is the growing population & depletion of fossil fuel. About 100 years ago, the major source of energy shifted from recent solar to fossil fuel (hydrocarbons). Technology has generally led to a greater use of hydrocarbon fuels, making civilization vulnerable to decrease in supply. This necessitates the search for alternative of oil as energy source.

Biodiesel is an alternative fuel for diesel engine. The esters of vegetable oils and animal fats are known collectively as biodiesel. It is a domestic, renewable fuel for diesel engine derived from natural oil like Jatropha oil. Biodiesel has an energy content of about 12% less than petroleum-based diesel fuel on a mass basis. It has a higher molecular weight, viscosity, density, and flash point than diesel fuel. Jatropha

curcas is unusual among tree crops is a renewable non-edible plant. From jatropha seeds jatropha oil can be extracted which have similar properties as diesel but some properties such as kinematic viscosity, solidifying point, flashpoint and ignition point is very high in jatropha oil. By some chemical reactions, jatropha oil can be converted into biodiesel. Jatropha oil can also be used directly by blending with diesel. Practically high viscosity of vegetable oil (30-200 centistokes) as compared to that of diesel. (5.8-6.4 centistokes) leads to unfavorable pumping; inefficient mixing of fuel with air contributes to incomplete combustion, high flash point results in increase carbon deposit Formation and inferior cooking. Due to these problems, vegetable oil needs to be modified to bring the combustion related properties closer to those of diesel oil. The fuel modification is mainly aim at reducing the viscosity and increasing the volatility.

One of the most promising processes to convert vegetable oil into methyl ester is the trans-esterification, in which alcohol reacts with triglycerides of fatty acids (vegetable oil) in the presence of catalyst. Jatropha vegetable oil is one of the prime non edible sources available in India. The vegetable oil used for biodiesel production might contain free fatty acids which will enhance saponification reaction as side reaction during the trans-esterification process. Vegetable oil has the characteristics compatible with the CI engine systems. Vegetable oils are also miscible with diesel fuel in any proportion and can be used as extenders. India highly depends on import of petroleum crude and nearly two third of its requirement is met through imports. Moreover the gases emitted by petrol, diesel driven vehicles have an adverse effect on the environment and human health. Jatropha oil has potential as an alternative energy source. This will enable our country to become independent in the fuel sector by promoting and adopting biofuel as an alternative to petroleum fuels. The oil extracted from jatropha seeds can be used as a substitute for kerosene without any further processing. This is more economical compared to kerosene crude oil, which are used for electrification. It is found from researches that the neat jatropha oil can be used run engines in mini-vans for rural transportation ,haulage trucks, farm tractors and other agricultural machinery, but may requires little modification. Show the alternative society has to choose from, altogether with the advantages and disadvantages of each of them.

Source of Jatropha oil:-

The plant that is generally cultivated for the purpose of extracting jatropha oil is Jatropha curcas. Owing to the toxicity of jatropha seeds, they are not used by humans. The major goal of jatropha cultivation therefore is performed for the sake of extracting jatropha oil. Oil that is produced from the seeds of Jatropha plant that grows in all the common and marginal lands is called as jatropha oil. The main goal of cultivating jatropha all over the world is to extract

oil from the seeds which is used as an alternative energy source. Jatropha oil extraction methods have also gained the same importance like jatropha cultivation. Since the oil extracted from jatropha seeds is the primary source for bio-fuel, the process of extraction methods have also become significant.

The oil extracted from the seeds is processed to prepare high quality bio-fuel an alternative source that can be used in diesel car. While the residue that remains after extracting oil is also processed and used a biomass feedstock to produce electricity and is also used as a fertilizer. Jatropha oil is non edible and is also poisonous. Jatropha has to be made with two process to get a better yield of 92% otherwise a yield of less the 85% only will be got. Analysis of Jatropha curcas seed shows the following chemical compositions

Moisture	: 6.20%
Protein	: 18.00%
Fat	: 38.00%
Carbohydrates	: 17.00%
Fibre	: 15.50%
Ash	: 5.30%

The oil contain is 50-60% in the seed. The oil contains 21% saturated fatty acid and 79% unsaturated fatty acid. These are some of the chemical element in the seed, cursine, which is poisonous and render the oil not appropriate for human consumption.

As an energy source:-

Oil from jatropha curcas: There are number of variety of jatropha. Best among these are jatropha curcas. Jatropha oil is an important product from the plant for meeting the cooking and lighting needs of the rural population, boiler fuel for industrial purpose or as a viable substitute for Diesel. About one- third of the energy in the fruit of jatropha can be extracted as oil that has a similar energy value to Diesel fuel. Jatropha oil can be used directly in Diesel engines added to Diesel fuel as an extender or trans esterified to a bio-diesel fuel. There are some technical problems to use

jatropha oil directly in Diesel engines that have yet to be completely overcome. Moreover, the cost of producing jatropha oil as a Diesel substitute is currently higher than the cost of Diesel itself. It is significant to point out that, the non edible vegetable oil of jatropha curcas has the requisite potential providing a promising and commercially viable alternative to diesel oil since it has desirable physical chemical and performance characteristics comparable to diesel. Cars could be run with jatropha oil without requiring much change in design. Jatropha oil expelled from seeds and filtered through filter press can replace kerosene or oil lamp.

Jatropha oil can be used as liquid fuel for lighting and cooking. It will also be used in big Diesel engine based electricity generating sets, pump sets, heavy farm machinery, where the viscosity of oil is not an issue. The seeds of jatropha contain (50% by weight) viscous oil which can be used for manufacture of candles and soap, in the cosmetic industry, for cooking and lighting by itself or as a Diesel /paraffin substitute or extender.

Other products of Jatropha curcas:

The jatropha oil can be used for soap production and cosmetics production in rural areas. The oil is a strong purgative, widely used as an antiseptic for cough, skin diseases and as a pain reliever from rheumatism. Jatropha oil has been used commercially as a raw material for soap manufacture for decades, both by large and small industrial producers.

When jatropha seeds are crushed, the resulting jatropha oil can be processed to produce a high quality biodiesel that can be used in a standard diesel car, while the residue (press cake) can also be processed and used as biomass feedstock to power electricity plants or used as fertilizer (it contains nitrogen, phosphorous and potassium).

Yield of Jatropha oil:-

It is often considered that a more effective extraction technique would yield greater quantities of oil. This is partly inaccurate, since an effective extraction method would only yield the optimum quantity and not more than that. The optimum oil content in jatropha plant varies between species and genetic variants.

Climatic and soil condition generally affects the yield of the oil as well. However, improper processing technique such as prolonged exposure of the harvested seeds to direct sunlight can impair the oil yield considerably. The maximum oil content that has been reported in jatropha seeds has been close to 50-60%. However, the accepted average is 40%, and the fraction that can be extracted is taken to be around 91%.

Below are some of the methods that are usually followed to extract the oils from jatropha seeds.

Oil Presses: -

Oil presses method is used to extract the oil using simple mechanical devices. It is also done manually. The most commonly used oil presses method is the Bielenberg ram press method. Bielenberg ram press method is a simple traditional method that uses simple devices to extract the oils. With the help of this method 3 liters of oil can be obtained with 12 kg of seeds.

OilExpellers:-

Oil expeller's method is also use for jatropha oil extraction. The most commonly used method is the Sayari oil expeller method. This method is also called as Sundhara oil expeller. Komet oil expellers are also used. These sayari oil expellers was developed in Nepal and is a diesel operated one. Now it is developed in Tanzania and Zimbabwe mainly for the production jatropha oil. Heavy oil expellers are made of heavy cast iron and the light ones are made up of iron sheets. Electricity driven models are also available. Komet oil expeller is a single oil expeller

machine that is used not only to extract the jatropha oil as well for the preparation of the oil cakes.

Traditional Methods:-Traditional methods are used in the rural and developing areas for extracting the oils. Traditional methods are simple and the oil is extracted by hand using simple equipment.

Hot oil extraction:-

The process of extracting the oil at high pressure is called as hot oil extraction method. Since jatropha oil can regulate the operating temperature it is extracted using the hot oil extraction method.

Then the cold oil extraction method it is easy to extract the oil from the hot oil extraction since the oil flows more easily due to higher viscosity. And the press cake that remains after extracting the oil also have less oil content which might be 3 to 7 % approximately. These two reasons make the oil press method very interesting. During the oil extraction method many stuffing of the seeds are converted into gum like substances and some non organic substances. These are unwanted products and so they have to be refined.

Modern Concepts:-

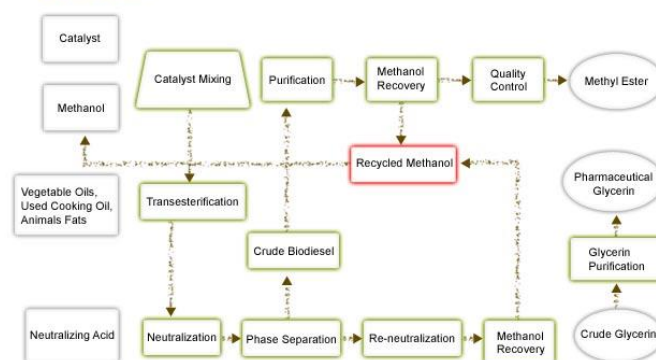
Modern methods are followed to extract more oils from the jatropha seeds. In these modern concepts chemical methods like aqueous enzymatic treatment is used. The maximum yield by following this modern method is said to be about 74/5. The main idea in researching the modern concepts is to extract a greater percentage of oil from the jatropha seeds

Jatropha Biodiesel Process:-

Trans-esterification is the process of converting the oil produced from vegetables into biodiesel. The process is less complex and it is quite easy. Trans-esterification is a chemical based production of biodiesel from jatropha oil. In this process a complex fatty acids like triglyceride molecule is taken and it is neutralized.

The glycerin is removed and an alcohol ester is created. This process is completed when methanol is mixed with sodium hydroxide. This result in the production of sodium methoxide which is then mixed with oil produced from the jatropha seeds. When the mixture settles glycerin is left at the bottom and the biodiesel (methyl esters) remains on the top. This methyl ester is washed and then filtered

Jatropha BioDiesel Extraction



Trans-esterification Biodiesel Process

Raw materials required

- Jatropha oil
- Methanol
- Potassium hydroxide
- Isopropyl alcohol
- Distilled water
- Phenolphthalein solution
- Vinegar
- Water

Manufacturing Process

First jatropha oil is filtered to remove the solid particles present in it. Then it is heated to remove the water contents if any present in it. Biodiesel is now been used as a diesel engine in number of agencies. The results are said to be comparable with petroleum in all the areas like power, efficiency, climbing, hauling etc. To determine the amount of catalyst that is required for catalyst. The accurate amount of potassium hydroxide is mixed with methanol till the methanol completely dissolves to get potassium methoxide. In the winter season additional jatropha

oil is heated and is mixed with the potassium methoxide. The mixture is allowed to settle. In this process glycerin settles at the bottom and the biodiesel at the top. The glycerin is then removed and the biodiesel is washed and dried. The biodiesel that is obtained is then checked for quality

Note: In this process when methanol and potassium hydroxide to produce potassium methoxide which when mixed with oil produces strong polar bond. This breaks the fatty acids into glycerin and biodiesel (esters).

Biodiesel Characterization:-

The specific gravity reduces after trans-esterification, viscosity from 57 to 4.73 centistokes, which is

acceptable as per ASTM norms for biodiesel. Flash point and fire point are important temperatures specified for safety during transport, storage and handling. The flash point and fire point of biodiesel was found to be 128°C and 136°C respectively. Flash point of jatropha oil decreases after trans-esterification, which shows that its volatile characteristics had improved and it is also safe to handle.

Higher density means more mass of fuel per unit volume for vegetable compared to diesel oil. The higher mass of fuel would give higher energy available for work output per unit volume. Higher viscosity is a major problem in using vegetable oil as fuel for diesel engines.

Table 1. The properties, Diesel, Jatropha Oil and biodiesel

Property	Diesel	Jatropha oil	Biodiesel
Flash Point °C	65	214	128
Fire point °C	78	256	136
Pour Point °C	-6	6	-2
Cloud Point °C	5	11	8
Viscosity at 40°C	2.86	36.92	4.82
Viscosity Index	98	181	154
Specific Gravity (29°C)	0.792	0.944	0.84
Refractive Index at 40°C	1.32	1.61	1.46
Calorific Value (MJ/kg)	44.34	39.76	42.80

II. CONCLUSION

In the current investigation, it has confirmed that jatropha oil may be used as resource to obtain biodiesel. The viscosity of jatropha oil reduces substantially after trans-esterification and is comparable to diesel. Biodiesel characteristics like density, viscosity, flash point, cloud point and pour point are comparable to diesel. Biodiesel is a viable substitute for petroleum based diesel fuel. Its

advantages are improved lubricity, higher cetane number, cleaner emission (except for NOx), reduced global warming, and enhanced rural development. Jatropha oil has potential as an alternative energy source. This will enable our country to become independent in the fuel sector by promoting and adopting biofuel as an alternative to petroleum fuels.

III. REFERENCES

- [1]. Ofori-Boateng Cynthia, Feasibility of Jatropha oil for Biodiesel: Economic Analysis, World Renewable energy Congress 2011 Sweden.
- [2]. Kazi Mostafiejur Rehaman, Biodisel from Jatropha oil as an alternative fuel for Diesel engine, International journal of Mechanical & Mechatronics IJMME-IJENS.
- [3]. S. Antony Raja, Biodisel production from Jatropha oil & its characterization, Research Journal of Chemical Science Vol. 1(1) April (2011)
- [4]. S. Antony Raja, Biodiesel production from Jatropha oil & its charecterisation, Research Journal of Chemical Science Vol. 1(1) April (2011)

Experimental Investigation on Low Grade Cement by Using Waste Products

Mithun P. Rathod, Akash M. Waghmare, Kunal K. Thool, Shekhar M. Chavhan, Vaibhav J. Pawar, Aniket T. Alegaonkar

Department of Civil Engineering, GHRAET, Nagpur, Maharashtra, India

ABSTRACT

Demand and consumption of cement is increasing day by day which has led researchers and scientists to search for locally available alternate binders that can replace cement partially and are ecofriendly and contribute towards waste management. In this research cementitious materials such as hydrated lime, fly ash, sugarcane bagasse ash, sewage sludge ash, and ceramic waste are used as replacement to reduce costs and environmental pollution associated with the production of cement. OPC 53 grade cement is used in the study. In this research study the (OPC) cement has been replaced by hydrated lime, fly ash, sugarcane bagasse ash, sewage sludge ash, and ceramic waste accordingly in the range of 0%, 45%, 50%, 55% & 60% by weight. The effect of replacement of cement by above waste products is tested and compared in terms of compressive strength to the conventional mortar. Mortar was proportioned in 1:5 cement sand ratio. The compressive strength test was conducted on the masonry mortar cubes. The compressive strength of mortars was measured at 7 and 28 days. As a result, the compressive strength achieved up to 50% replacing cement with above waste products.

Keywords: Waste Products, OPC, Eco-Friendly, Low Grade Cement, Cementitious Material, Mortar

I. INTRODUCTION

In the field of construction cement plays vital role. Without cement, mortar and concrete cant possible because cement is used as binder. Manufacturing Process of cement are one of the major industry. Nowadays in building construction high grade cement were used for every stage but in some units high grade cement is not require such as plastering and brickwork. We are aware that a lot of damage is done to environment in the manufacture of cement. It involves lot of carbon emission associated with other chemicals. The researches has shown that every 1 ton of cement manufacture releases half ton of carbon dioxide, so there is an immediate need to control the usage of cement.

On the hand materials wastes such as Sugarcane Bagasse Ash, Sewage sludge ash, Ceramic waste, are

difficult to dispose which in return is environmental Hazard. The use of this waste material in replacement of cement not only reduces the environmental pollution but also enhances the properties of cement and also reduces the cost.

In addition to its negative environmental impact cement is also one of the most expensive materials when compared to the other constituents of concrete.

The raw materials for the cement production like lime are also being exploited in large amount which may result in running out of them, as it is predicted to happen in some places of the world.

II. LITERATURE REVIEW

2.1 Amarnath Yerramala

1. Compressive strength increased with curing age for all fly ash replacements. Irrespective of fly ash percentage the compressive strength decreased at early age when compared to reference mortar. However, at later curing age mortars made with 5%, 10% and 15% showed higher strength than reference mortar.

2. Similar to concrete the maximum efficiency was at 10% for mortars. However, the efficiency factor was higher for fly ash mortars than fly ash concretes up to nearly 20%, further increase in fly ash percentage reduced efficiency factor for fly ash mortars than fly ash concretes in terms of strength.

2.2 Mao-Chieh Chi

Sugar cane bagasse ash (SCBA), a by-product of sugar and alcohol production, is one of the potential pozzolanic materials that can be blended with Portland cement. In this study, SCBA with particle sizes $<45 \mu\text{m}$ was used to replace type 1 Ordinary Portland cement with various dosages (10 %, 20 %, and 30 %) by weight of binder. The water/cementitious material (w/cm) and sand/binder ratios were kept at constants of 0.55 and 2.75, respectively. Composites were mixed, and effects of SCBA on properties were investigated by conducting flow test, water absorption test, initial surface absorption test, drying shrinkage test, compressive strength test, rapid chloride penetration test (RCPT), thermal gravimetric analysis (TGA), and scanning electron microscopy (SEM). Experimental results show that the flow spread of fresh mortars would decrease with an increase of SCBA replacement. The specimens with 10 % SCBA have the superior performance on compressive strength, drying shrinkage, water absorption, initial surface absorption, and chloride ion penetration, TGA, and SEM at the age of 56 days. It indicates that 10 % cement

replacement of SCBA may be considered as the optimum limit.

The flow spread of fresh mortars would decrease with the increase of bagasse ash replacement. The specimens with 10 % bagasse ash as a Portland cement replacement have the superior performance on compressive strength, drying shrinkage, water absorption, initial surface absorption, and chloride ion penetration at the age of 56 days.

2.3 Wong Yih Kang

The aim of this research is to study the partial replacement of cement with sewage sludge ash, SSA in mortar through experimental works. The experimental works were carried out to assess the feasibility of utilizing SSA as a construction material. An attempt has been made to replace 10% and 15% of the mass of cement with 600°C and 800°C incinerated SSA into the mortar. The result of the compressive strength test shows that the mortar with 10% replacement of 800°C burnt SSA increase in compressive strength up to 1.14% and 5.06% at the ages of 28 days and 90 days, respectively. The total porosity of the mortar also decreases up to 7.05% after the replacement of 10% 800°C burnt SSA after 90 days. The XRD and XRF tests show that the major components in sewage sludge are SiO_2 , Al_2O_3 and Fe_2O_3 .

2.4 Amitkumar D. Raval, Dr.Indrajit N. Patel, Prof. Jayeshkumar Pitroda

In this research study the (OPC) cement has been replaced by ceramic waste powder accordingly in the range of 0%, 10%, 20%, 30% 40%, & 50% by weight of M-20 grade concrete. Concrete mixtures were produced, tested and compared in terms of compressive strength to the conventional concrete. These tests were carried out to evaluate the mechanical properties for 7, 14 and 28 days. As a result, the compressive strength achieved up to 30% replacing cement with ceramic waste. This research work is concerned with the experimental

investigation on strength of concrete and optimum percentage of the partial replacement by replacing cement via 0%, 10%, 20%, 30%, 40% and 50% of ceramic waste.

The Compressive Strength of M20 grade concrete increases when the replacement of Cement with Ceramic Powder up to 30% replaces by weight of Cement and further replacement of Cement with Ceramic Powder decreases the Compressive Strength.

III. METHODOLOGY

3.1 Materials

3.1.1 Fly ash

Fly ash is one of the most common pozzolan and is being used quite extensively. The utilization of fly ash in cement has increased rapidly as it contains high siliceous and aluminous compounds. Apart from different concretes, mortar also has its intended uses in construction field. Mortar has been used for centuries as a means of adhering bricks or concrete blocks to one another. Further, cement mortar continues to be used in many different types of constructions like plastering and quick repairs. Although it is possible to obtain advantages of using fly ash in mortar. In this fly ash was collected from khaparkheda thermal power plant.

Table 1. Chemical Properties of Fly Ash

Chemical Components	Cement	Fly Ash
SiO ₂	21.8	58.3
Al ₂ O ₃	6.6	31.7
Fe ₂ O ₃	4.1	5.9
CaO	60.1	2.0
MgO	2.1	0.1
Na ₂ O	0.4	0.8
K ₂ O	0.4	0.8
SO ₃	2.2	0.2
Loss Of Ignition	2.4	0.3

3.1.2 Sugarcane Bagasse Ash

Bagasse is a by-product from sugar industries which is burnt to generate power required for different activities in the factory. The burning of bagasse leaves bagasse ash as a waste, which has a pozzolanic property that would potentially be used as a cement replacement material. It has been known that the worldwide total production of sugarcane is over 1500 million tons. In this research bagasse ash was obtained from Vainganga sugar power limited Devhala. Physical and chemical properties of the bagasse ash are mentioned in Table.

Table 2. Chemical Properties of Sugercane Bagasse Ash

Chemical Components	Sugercane Bagasse Ash
SiO ₂	87.40
Al ₂ O ₃	3.6
Fe ₂ O ₃	4.95
CaO	2.56
MgO	0.69
Na ₂ O	0.15
K ₂ O	0.47
SO ₃	0.11
Loss Of Ignition	8.25

3.1.3 Sewage Sludge Ash (SSA)

The disposal of sewage sludge is a challenging issue in India. India produces nearly 960 million tonnes of sewage sludge annually from 316 sewage treatment plants (2016-17). Most of this sludge is disposed of through land filling, and incineration. Although incineration results in optimum volume reduction and stabilization for sewage Sludge. Different methods of SSA disposal have different degrees of environmental impact and cost effectiveness. Therefore, there is an urgent need to develop alternative methods of SSA disposal. The sewage sludge was collected from sewage treatment plant bhandewadi.

Table 3. Chemical Properties of Sewage sludge Ash

Chemical Components	Sewage sludge ash
SiO ₂	48
Al ₂ O ₃	13.7
Fe ₂ O ₃	6.2
CaO	3.6
MgO	1.9
Na ₂ O	1.0
K ₂ O	2.1
SO ₃	1.7

3.1.4 Ceramic Waste

Indian ceramic production is 100 Milliontonne per year. In the ceramic industry, about 15%-30% waste material generated from the total production. This waste is not recycled in any form at present. However, the ceramic waste is durable, hard and highly resistant to biological, chemical, and physical degradation forces. The Ceramic industries are dumping the powder in any nearby pit or vacant spaces. This leads to serious environmental and dust pollution and occupation of a vast area of land, especially after the powder dries up so it is necessary to dispose the Ceramic waste quickly and use in the construction industry. Ceramic waste was obtained from Padma industries Nagpur.

Table 4. Chemical Properties of Ceramic Waste

Chemical Components	Ceramic Waste
SiO ₂	63.29
Al ₂ O ₃	18.29
Fe ₂ O ₃	4.32
CaO	4.46
MgO	0.72
Na ₂ O	0.75
K ₂ O	2.18
SO ₃	0.10
Loss Of Ignition	1.61

3.1.5 Cement (OPC)

In this experimental work Ordinary Portland cement (Grade 53) conforming to IS 12269-1987 in all trial

mixes is used. The physical properties of the cement obtained on conducting appropriate tests conforming to process laid down in IS: 269/4831 has been performed. The results are mentioned in table 1 shown below

Table 5

Property of cement	Value
Fineness of cement(m ² /kg)	320
Specific gravity	3.15
Grade	53 grade OPC
Standard consistency	35%
Initial setting time	90 mins
Final setting time	265 mins
Compressive strength	61.00 N/mm ²

3.1.6 Fine Aggregate

In this study stone dust passing through 4.75 mm sieve conforming to Zone II as per IS: 383-1970 is used as fine aggregate. The fine aggregate is free from clay, silt and organic impurities.

Table 6

Physical test	Fine aggregate
Specific gravity	2.59
Fineness modulus	2.36
Bulk density (kg/m ³)	1.58

3.1.7 Water

Water is an important ingredient of Mortar as it actually participates in the chemical reaction with cement. Since it helps to form the strength giving cement gel, the quantity and quality of water are required to be looked into very carefully. Fresh potable drinking water of Ph value (6.5- 7.2) free from organic impurities is being used which is available in college campus.

3.2 Mix Proportions of mortar

In order to investigate strength properties of hydrated lime, fly ash, sugarcane bagasse ash, sewage sludge ash, and ceramic waste mortars, sixteen mixes were employed. Reference mix (M1 to M16). All the mixes was made with cement to fine aggregate ratio of 1:5.

Water to cementitious ratio of 25% was adopted for all the mixes.

3.3 Experimental Methodology

The evaluation of above waste for use as a replacement of cement material begins with the mortar testing. Mortar contains cement, water, fine aggregate. With the control mortar, i.e. 0%, 45%, 50%, 55% & 60% of the cement is replaced with hydrated lime, fly ash, sugarcane bagasse ash, sewage sludge ash, and ceramic waste, the data from the above

waste is compared with data from a standard mortar without above waste. Three cube samples were cast on the mould of size 50x50x50 mm for each 1:5 mortar mix with partial replacement of cement with a w/c ratio as 0.25 were also cast. After about 24hr the specimens were de-moulded and water curing with gunny bags was continued till the respective specimens were tested after 7 and 28 days for compressive strength test.

Table 7

MIX PROPORTIONS(IN PERCENTAGE)							
SR. NO	MIX	CEMENT (C)	HYDRATED LIME (L)	FLY ASH (10% OF C+L)	CERAMIC WASTE (10% OF C+L)	SUGARCANE BAGASSE ASH (10% OF C+L)	SEWGE SLUDGE ASH (10% OF C+L)
1	M1	0.55	0.45	10	0	0	0
2	M2	0.55	0.45	0	10	0	0
3	M3	0.55	0.45	0	0	10	0
4	M4	0.55	0.45	0	0	0	10
5	M5	0.55	0.45	10	10	0	0
6	M6	0.55	0.45	10	0	10	0
7	M7	0.55	0.45	10	0	0	10
8	M8	0.55	0.45	0	10	10	0
9	M9	0.55	0.45	0	10	0	10
10	M10	0.55	0.45	0	0	10	10
11	M11	0.55	0.45	10	10	10	0
12	M12	0.55	0.45	10	10	0	10
13	M13	0.55	0.45	0	10	10	10
14	M14	0.55	0.45	10	0	10	10
15	M15	0.55	0.45	10	10	10	10
16	M16	0.55	0.45	0	0	0	0

Table 8

MIX PROPORTIONS (BY WEIGHT)								
SR. NO	MIX	CEMENT	HYDRATED LIME	FLY ASH (10% OF C+L)	CERAMIC WASTE (10% OF C+L)	SUGARCANE BAGASSE ASH (10% OF C+L)	SEWGE SLUDGE ASH (10% OF C+L)	TOTAL WEIGHT (IN GM)
1	M1	250	200	50	0	0	0	500
1	M2	250	200	0	50	0	0	500
3	M3	250	200	0	0	50	0	500
4	M4	250	200	0	0	0	50	500
5	M5	230	190	10	10	0	0	500
6	M6	230	190	10	0	10	0	500
7	M7	230	190	10	0	0	10	500
8	M8	230	190	0	10	10	0	500
9	M9	230	190	0	10	0	10	500
10	M10	230	190	0	0	10	10	500
11	M11	210	170	10	10	10	0	500
12	M12	210	170	10	10	0	10	500
13	M13	210	170	0	10	10	10	500
14	M14	210	170	10	0	10	10	500
15	M15	200	160	35	35	35	35	500
16	M16	275	225	0	0	0	0	500

IV. RESULT AND DISCUSSION

Compressive strength tests were performed on Universal testing machine using cube samples. Three samples per batch were tested with the average strength values reported in this paper. The comparative studies were made on their characteristics for mortar mix ratio of 1:5 with partial replacement of cement with waste products as 0%, 45%, 50%, 55% and 60%. The Strength was calculated by deviding area from the load taken by the cube in N/MM².

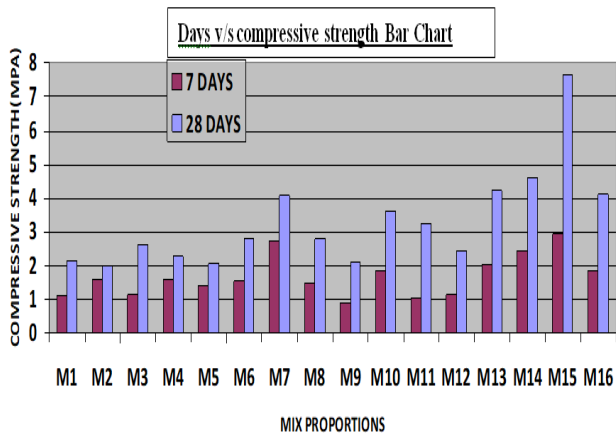
The compressive strength developments of all mix proportioned mortars are presented in Table no. 9 It can be seen from the table that, the strength increased with curing age for M15 replacement with cement. The trend in the figure shows that the increase in strength was 14% & 35% for curing ages of 7 and 28 days respectively for reference mortar with respect to seven days of curing. As the waste products percentage increased, the strength rate increased with curing period. The strength of M15 was 2.94 mpa at 7

days and it increased 2.5 times at the age of 28 days i. e. 7.61 mpa.

Table 9. Compressive Strength Of Cubes (50x50x50mm) At 7 & 28 Days

MIX	COMPRESSIVE STRENGTH (N/MM ²)	
	7 DAYS	28 DAYS
M1	1.1	2.14
M2	1.6	2.0
M3	1.15	2.62
M4	1.6	2.27
M5	1.44	2.08
M6	1.54	2.79
M7	2.75	4.1
M8	1.5	2.8
M9	0.9	2.1
M10	1.86	3.62
M11	1.06	3.27

M12	1.15	2.45
M13	2.04	4.24
M14	2.45	4.62
M15	2.94	7.61
M16	1.86	4.13



V. CONCLUSIONS

Based on experimental investigations concerning the compressive strength of mortar, the following observations are made:

- The Compressive Strength of mortar increases when the replacement of Cement with hydrated lime, fly ash, sugarcane bagasse ash, sewage sludge ash, and ceramic waste up to 60% replaces by weight of Cement and further replacement of Cement with above wastes decreases the Compressive Strength.
- Mortar on 60% replacement of Cement with above wastes, Compressive Strength obtained is 7.61 N/mm² and vice-versa the cost of the cement is reduced up to 28% and hence it becomes more economical for construction of partition wall and plastering work than the standard mortar. It becomes technically and economically feasible and viable.

- Utilization of waste products and its application are used for the development of the construction industry.
- It is the possible alternative solution of safe disposal of waste products.

IV. REFERENCES

- ASTM C 125, Standard Terminology Relating to Concrete and Concrete Aggregate, 1994 Annual Book of ASTM Standards
- Ahmed, Y.H., and Buenfeld, N.R. (1997). An investigation of ground granulated blast furnace slag as a toxic waste solidification/ stabilization reagent. *Environ. Eng. Sci.* 14, 113.
- Al Sayed, M.H., Madany, I.M., and Buali, A.R.M. (1995). Use of sewage sludge ash in asphaltic paving mixes in hot regions. *Constr. Build. Mater.* 9, 19.
- Habeeb, G.A. and H.B. Mahmud, 2010, "Study on properties of Rice Husk Ash and Its Use as Cement Replacement Material.", *Material Research*, 13(2): 185-190
- M.Vijaya Sekhar Reddy, I.V.Ramana Reddy, "Studies on durability characteristics Of high performance concrete" *International journal of advanced scientific and technical research*, issue 2 volume 6, december 2012 ISS 2249-9954.

A Review on Technique of Growing Vegetables Without Soil - Hydroponics

Mr. M. Khalid Bhurani, Mr. Anmol Itada, Mr. Musab Siddiqui, Mr. Kartikkeya Jaiswal, Mr. Aatish Pandey,
Mr. Shubham Bagde

Civil Engineering Department, G. H. Rasoni Academy of Engineering and Technology, Nagpur, Maharashtra, India

ABSTRACT

Soil-based agriculture is facing some major challenges with the growth of civilization everywhere the globe, like decrease per capita land availability, except this, thanks to speedy urbanization and industrial enterprise as threats from global climate change and its connected adverse result, the land cultivation is going to face difficult threats, beneath such circumstances, within the close to future it becomes involved to feed the complete population using commercial farming system. Naturally, soil-less culture is changing into additional relevant within the gift situation, to cope-up with these challenges. —Soilless Culture || is that the growing of plants that imitate soil- base husbandry by victimization several varieties of growing media as for instance inorganic substance, organic substance and artificial substrates. Soilless culture is that the quickest growing sector of agriculture, and it may be impetus to food production within the future. The business is anticipated to grow exponentially conjointly in future, as conditions of soil growing changing into troublesome. the applying of a soilless culture system victimizing artificial substrates would lead to economical and effective use of water and fertilizers and minimize the employment of chemicals for gash and sickness management. Plants grown in soil less culture has shown superior quality, high yield, speedy harvest, and high nutrient content. however just in case of developing countries there's a scarcity of its customary acquaintance and poor dissemination of its available technologies. For popularization of soilless culture at international level, it's terribly imperative to produce scientific proved technology to gardeners and build mass awareness in potential areas at international level.

Keywords: Aeroponics, Hydroponics, Nutriculture, Open Field Agriculture, Soil-Less Culture

I. INTRODUCTION

Soil is the foremost accessible growing medium for plants. It provides anchorage, nutrients, air, water, etc. for fortunate plant growth. However, soils do cause serious limitations for plant growth too, at times. Additionally, typical crop growing in soil (Open Field Agriculture) is somewhat troublesome because it involves massive area, heap of labor and enormous volume of water. Moreover, some places like metropolitan areas, soil isn't available for crop growing in some areas, we discover deficiency of fertile cultivable land due to their unfavorable

geographical or geographics conditions. Of late, another significant issue full-fledged since is that the issue to rent labour for typical open field agriculture. Beneath such circumstances, soil-less culture is introduced with success.

Soil-less culture refers to the techniques of Hydroponics 'and Aeroponics'. The term 'Hydroponics' was derived from the Greek words 'hydro' suggests that water and 'ponos' suggests that labour. It's a way of growing plants using mineral nutrient solutions, without soil. Terrestrial plants could also be fully grown with their roots within the mineral nutrient answer solely or in Associate in

nursing inert medium, like perlite, gravel, or nonconductor. Singh and Singh (2012) additionally opined that hydroponic is that technique of growing plants in soil-less condition with their roots immersed in nutrient. this technique helps to face the challenges of global climate change and additionally helps in production system management for economical utilization of natural resources and mitigating deficiency disease. Aeroponics 'is another technique, a lot of or less like hydroponics with solely distinction that beneath aeroponics plants are fully grown with fine drops (a mist or aerosol) of nutrient solution. Interest in implementing of nutriculture developed in 1925 once the green house business expressed interest in its use. In 1929, Dr. William F. Gericke of the University of CA succeeded in growing tomato vines of 7.5 m height in nutrient solutions. He named this new production system —hydroponics. In India, hydroponics was introduced in year 1946 by W. J. Shalto Duglas and he established a laboratory in Kalimpong, West Bengal. He has additionally written a book named as "Hydroponics- the Bengal System". in a while throughout Nineteen Sixties and 70s, commercial hydroponics farms were developed in , Arizona, Belgium, California, Denmark, German, Holland, Iran, Italy, Japan, Russia and different countries. Throughout Nineteen Eighties, several machine-controlled and computerized agriculture farms were established round the world.

II. DIFFERENT AVAILABLE TECHNIQUES FOR SOIL-LESS CULTURE

Large numbers of hydroponic/soil-less culture techniques are available. However, following factors are considered in selecting a technique:

1. Expected quality of the produce – colour, appearance, free from pesticides, etc.

We can classify the techniques as follows:

2.1 Techniques of hydroponics

It is also known as Liquid Hydroponics_ method. Plants grown in solution culture have their roots suspended directly in a nutrient solution. It can further be classified into-

- i) Circulating methods (closed system)/ Continuous flow solution culture
 - a) Nutrient film technique (NFT)
 - b) Deep flow technique (DFT)



a)



b)

Fig 1. Different circulating methods (a) Nutrient film technique, (b) Deep flow technique [4]

Nutrient film technique (NFT)

NFT was developed within the middle Twenties in China by Dr. Alan Zhang Junior. In this system, the depth of the recirculating stream ought to be terribly shallow, very little flow of water, therefore the name 'nutrient film'. This ensures that the thick root mat, that develops within the bottom of the channel, has associate side, which is moist within the air. after this,

associate rich supply of oxygen is provided to the roots of the plants.



A properly designed NFT system is predicated on exploitation the correct channel slope, the correct flow, and therefore the right channel length. The plant roots are exposed to adequate supply of water, gas and nutrients. In earlier production systems, there was a conflict between the availability of those necessities, since excessive or deficient amounts of one ends up in an imbalance of one or both of the others. NFT, due to its style, provides a system whereby all 3 necessities for healthy plant growth may be met at constant time, providing the easy thought of NFT is often remembered and practiced. The results of these benefits is that higher yields of high-quality turn out are obtained over associate extended amount of cropping culture systems can provide a consistent nutrient environment for roots.

Sources of nutrient elements

Table -4: Sources of nutrient elements with their characteristics

Source	Element	Characteristics
Potassium nitrate KNO_3	N, K	Very soluble salt
Potassium phosphate monobasic KH_2PO_4	P, K	Corrects phosphorus Deficiency
Magnesium sulfate $MgSO_4$	S, Mg	Cheap, highly soluble, pure salt
Iron chelate	Fe Cit	Best sources of Iron
Boric acid H_3BO_3	B	Best source of Boron
Calcium nitrate $Ca(NO_3)_2$	N, Ca	Very soluble salt

The frequency and volume of the nutrient solution applied depends on the type of substrate used (volume and monitoring of the system in necessary. Two aspects of physical – chemical characteristics), the crop (species and stage of development), the size of the container, the crop and irrigation systems used and the prevailing climatic conditions. Plants should be fed daily. The best time to administer the nutrient solution is between 6:00 and 8:00 am, though water requirements will vary considerably throughout the day, and from one day to another. The solution should be applied to the roots, trying to avoid wetting the leaves to prevent damage and the appearance of diseases. Under no circumstances should plants be allowed to suffer from water stress, as this will affect their final yields. It is generally recommended that you apply only water to the plants once a week, in order to flush away any excess salts that have remained. Use double the amount of water normally applied, but without adding nutrients. Between 20% and 50% of the solution should be drained-off to prevent the accumulation of the toxicions and an excessive increases of electrical conductivity in the root area. The excess DESIRABLE pH RANGE OF NUTRIENT

SOLUTIONS

In hydroponic systems, pH is constantly changing as the plant grows. Changes in pH of less than 0.1 unit are not significant. Thus pH control is a necessity in hydroponic solutions. The pH range of 5.5 to 6.5 is optimal for the availability of nutrients from most nutrient solutions for most species, but species differ significantly and several can grow well outside of this range.

CONTROL OF CONTAMINANTS

Maintenance of sterile root-zone environment is essential to have good plant vigour under soil-less culture. It is extremely difficult to achieve and critical to minimize population of plant pathogens in the root zone. Commonly encountered disease in hydroponic solution is wilt, caused by Fusarium and Verticillium.

Species of Pythium and Phytophthora destroys all but the main roots. No effective fungicides are there which can be safely used in hydroponics. Only Metalaxyl has been found highly effective for control of Pythium on vegetable crops, but it is not registered for the use. Heat treatment of nutrient solution has also been found effective in keeping the root-zone free of pathogens.

Hydroponic averages compared with ordinary soil yields

Sources of nutrient elements are

Name of crop	Hydroponic equivalent per acre	Agricultural average per acre
Wheat	5,000 lb.	600 lb.
Oats	3,000 lb.	850 lb.
Rice	12,000 lb.	750-900 lb.
Maize	8,000 lb.	1,500 lb.
Soybean	1,500 lb.	600 lb.
Potato	70 tons	8 tons lb.
Beet root	20,000 lb.	9,000 lb.
Cabbage	18,000 lb.	13,000 lb.
Peas	14,000 lb.	2,000 lb.
Tomato	180 tonnes	5-10 tonnes
Cauliflower	30,000 lb.	10-15,000 lb.
French bean	42,000 lb. of pods for eating	-
Lettuce	21,000 lb.	9,000 lb.
Lady_s finger	19,000 lb.	5-8,000 lb.
Cucumber	28,000 lb.	7,000 lb.

III. CONCLUSION

The industry is expected to grow exponentially also in future, as conditions of soil growing is becoming difficult. Specially, in a country like India , where urban concrete conglomerate is growing each day , there is no option but adopting soil-less culture to help improve the yield and quality of the produce so that we can ensure food security of our country.

IV. REFERENCES

- [1]. Ellis, N.K., Jensen, M., Larsen, J. and Oebker, N., NutricultureSystems— GrowingPlantsWithoutSoil . Station Bulletin No. 44. Purdue University, Lafayette, Indiana.(1974)
- [2]. Beibel,J.P.,—Hydroponics- TheScienceofGrowing Crops Without Soil . Florida Department of Agric. Bull. p. 180,(1960.)
- [3]. Butler,J.D.andOebker,N.F.,—Hydroponicsasa Hobby— Growing Plants Without Soil . Circular844.
- [4]. Maharana, L. and Koul, D.N..The emergence of Hydroponics.Yojana (June).55 : 39-40.(2011)
- [5]. Singh,S.andSingh,B.S..—Hydroponics- Atechnique for cultivation of vegetables and medicinal plants . In. Proceedings of 4th Global conference on —Horticulture for Food, Nutrition and Livelihood Options Bhubaneshwar, Odisha, India. p.220. (2012)
- [6]. De Kreij C; Voogt W; Baas R (1999). Nutrient solutions and water quality for soilless cultures. Research Station for Floriculture and Glasshouse Vegetables (PBG), Naaldwijk, The Netherlands, Brochure 196
- [7]. Raviv M; Krasnovsky A; Medina S; Reuveni R(1998). Assessment of various control strategies for recirculation of greenhouse effluents under semi-arid conditions.Journal of Horticultural Science and Biotechnology, 73(4), 485–491 [8]. Savvas D (2002). Nutrient solution recycling in hydroponics. In: HydroponicProduction of Vegetables and Ornamentals (Savvas D; Passam H C, eds), pp 299–343.
- [8]. Embryo Publications, Athens, Greece
- [9]. Silberbush M; Ben-Asher J (2001). Simulation study of nutrient uptake by plants from soilless cultures as affected by salinity buildup and transpiration. Plant and Soil, 233, 59–69

- [10]. Sonneveld C (2000). Effects of salinity on substrate grown vegetables and ornamentals in greenhouse horticulture. PhD Thesis, University of Wageningen, The Netherlands
- [11]. Van Os E A; Gieling Th H; Ruijs M N A (2002). Equipment for hydroponic installations. In: Hydroponic Production of Vegetables and Ornamentals (Savvas D; Passam H C, eds), pp 103–141. Embryo Publications, Athens, Greece

Design and Fabrication of Solar Panels Cleaning System : A Review

Rahul K. Parihar, Rahul K. Kalnake, Rakesh H. Dongre, Roshan D. Raut, Vipin P. Ramteke,
Vivek S. Karanjekar, Vaibhav V. Patankar

Department of Mechanical Engineering, G. H. Raisoni Academic Collage of Engineering, Nagpur, Maharashtra,
India

ABSTRACT

The aim of this paper is to give an innovative concept to handle energy demand around the world is increasing rapidly for many applications. Solar energy is abundant in nature and is proving its existence for many applications like street lighting, house hold appliances, water heating, agricultural and industrial purpose. One of the ways to harness solar energy is done by using solar panels. Limitation of solar energy is its efficiency for any application due to the factors like dust, humidity, temperature etc. Electrical parameters of solar panel are sensitive to accumulated dust density and will affect the transmittance of the solar panel thereby reduce its efficiency. In order to overcome this problem, it is necessary to clean the solar panels regularly. One of the method is to increase the efficiency of solar panel is by removing the dust accumulated on solar panel. Cleaning of solar panels is difficult task. The normal way to clean the solar panels is washing them manually but it is not reliable and economical. In this regard a work is taken up to design and implement the automatic dust cleaning mechanism for solar panel. This mechanism is based on control circuit, DC motor; microfiber (bristles) to clean the panels. The paper provides you with the idea how the mechanism will work and its effect on the energy production by solar farms. It will also to help to understand the problem arise due to not cleaning of solar cells.

Keywords : Solar Panels, Energy loss, Mechanism, Automatic Dust Cleaning, Microcontroller.

I. INTRODUCTION

The sun emits energy at an extremely large rate hence there is abundant availability of solar energy in the nature. If all solar energy could be converted into usable forms, it would be more enough to supply the world's energy demand. However, this is not possible because of conditions in the atmosphere such as effect of clouds and temperature. Solar energy can be converted to more usable energy forms through solar panel. There is unprecedented interest in renewable energy, particularly solar energy, which provides electricity without giving rise to any carbon dioxide emission. Of the many alternatives, photovoltaic method of extracting power from solar energy have been considered has promising toward meeting the

continuously increasing demand of energy . The efficiency of solar panel is limited due natural conditions so it is very much essential to take care of parameters like dust, humidity and temperature. In this regard the work has been taken up to study the efficiency of solar panel with and without dust collected on it. The developed project includes design and to implementation of microcontroller based dust cleaning system. The main aim of the project is provide automatic dust cleaning mechanism for solar panel.

1.1. CLEANING METHODS FOR PV PANEL'S

1.1.1. Natural removal of dust

The natural powers are employed to remove the dusts, such as wind power, gravitation and the scour of the rainwater. The effect of this method is not very well. It is seen that the solar cell array can be turned to vertical or oblique position to remove the dusts easily when early morning, late evening, night and a rainy day. However, the rotation of the large solar cell array is very difficult.

1.1.2. Mechanical removal of dust

The mechanical methods remove the dusts by brushing, blowing, Vibrating and ultrasonic driving. The brushing methods clean the solar cell with something like the broom or brush that were driven by the machine was designed just like windscreen-wiper. However, firstly, because of the small size and the strong adhesively of the dusts, the cleaning method is inefficient. Secondly, the abominable working environment of the solar cell makes the maintenance of the machine difficult. Then, due to the large area of the solar cell array, the cleaning machine is powerful. Lastly, the surfaces of the solar cell maybe were damaged by the brush when wiping. The blowing method cleaning the solar cell with wind power is an effective cleaning one except the low efficiency, high energy-consumption and the unsatisfactory maintainability of the blower.

1.1.3. Electrostatic removal of dust

If there are a high potential on the surface of the solar panels, the charged and uncharged dusts will be attract to the panels because of the electrostatic forces. Then, the dust particles will be charged by the solar panels finally, so they have the same electric charge and the electrostatic forces between them are repulsion. At last, the dust particles will float away the solar panels. However, this strategy cannot be used in PV system, because of the effecting of the rain on earth

1.2. Comparison between different Solar PV cleaning Techniques

Cleaning System	Advantage	Disadvantage
Fuzzy Logic Control based Cleaning System	<ul style="list-style-type: none"> • Automatic cleaning system • Robust design 	<ul style="list-style-type: none"> • High Cost
Heliostats Cleaning Team Oriented Robot (HECTOR)	<ul style="list-style-type: none"> • Extreme and thorough cleaning • No external power supply required 	<ul style="list-style-type: none"> • Robots require charging separately
Solar Brush	<ul style="list-style-type: none"> • It is wirelessly controlled • Automated robot 	<ul style="list-style-type: none"> • Heavy load on the surface of panels • Human attention is required • Slow performance
Automatic Solar Panel Cleaning System	<ul style="list-style-type: none"> • Cleans dust efficiently 	<ul style="list-style-type: none"> • Human interference required
Electrostatic Charge System for Cleaning	<ul style="list-style-type: none"> • No water required • No heavy gears required 	<ul style="list-style-type: none"> • Requires to be charged

1.3 Manufacturing and Installation

We have to clean solar panel by dry cleaning process, for that we are using nylon brush of soft bristles so that it should not affect the transparency of solar panel in long term use. Now this brush will rotate at high speed for throwing of the dust from the panel. The rotating motion for brush is given to it by motor

mounted beside it, the motor is of high rpm and low torque, so for balancing that chain sprocket is provided between them. This whole assembly is mounted on the frame; the pedestal bearing is used for mounting rollers.

The frame with this assembly is mounted on four rollers; all four rollers are having individual motors of high torque and low rpm. Below frame four idle rollers are also given for travelling smoothly on solar panel frame. We have used timer circuit in our machine by which we can set how many times a day our machine will clean the solar panels. Our circuit is having only three press buttons one will start the machine and other two will increase and decrease the time in seconds, which will be shown in display. On both the ends of the machine limit switch is mounted which will stop the machine as it will go on the one end of the solar panel row.

II. LITRATIRE SURVEY

In this paper you will find the idea of how the system will help you to clean the solar panels without the help of human & water, thus saving the water usage. To do so various different kinds of research paper has been reviewed so that the concept should be clear and the manufacturing of system should be easy. The need to clean the solar panels on regular basis is necessary because accumulation of dust on panels is necessary either manual or by automatic. With reference to this paper we have developed a new and easy technique to clean the panels reduces the intensity of incident rays, thus reducing its production efficiency. So periodic cleaning of panels.

Various different methods are there for cleaning of panels like human using brush, spraying of water. But with the use of such techniques we are wasting water as well as we are investing huge amount in cleaning. Cleaning is done everywhere. They have design a robot which is human operated & thus it cannot work

all the time as the panels should be cleaned after specific interval of time. Hence there should be some automation done for better scope.

This paper has given a better idea of making the mechanism. They have composed of a cleaning head that moves on panels while the robot's auxiliary equipment for power & water supply is connected via umbilical, located on an adjacent support vehicle. The cleaning head is driven vertically by Cables & horizontally by a pair of motorized drive trolleys which rides along the bottom & top edges of array panels. The drive and cleaning system needs to ensure the longevity of device. So design of new system is necessary so that there will not be any complex in use and it will be fully automatic.

Cleaning the solar panels is normally by washing which is very tedious & cumbersome, at the same time its expensive too. The design of auto cleaning robot will have flexibility in order to fix on different sizes of flat solar panels. In accordance with dimensions of flat plate, the robot consists of rollers that will be driven by DC motors through belt system. The movements of rollers will be controlled by microcontroller. In this they have used the external power for driving motor. It helps to reduce the labor requirement.

III. CONCLUSION

Dust accumulation on PV panels can significantly reduce their power output. While the Geographic region is solar-energy rich, the desert conditions are quite dusty threatening the PV systems power generation potential. The robotic system proposed by me with the help of company is a simple way to tackle this challenge effectively. Although promising results will be obtained. Here we are going to set a new benchmark by using latest technology and replacing the conventional methods of cleaning the solar panels. We are saving water, time and money. In general the technique used by other method explain above total cost of solar panel maintenance goes around 5% of total plant cost annually but cleaning done by robot

reduced it by 2%. The mechanism of this kind can clean the solar farm as and when require very easily without man power thus saving the cost and waste age of water. Further we can add very interesting features in our system like de-ionized water cleaning; camera for inspection and climate based cleaning. The major advantage of this robot is that we can inspect the farm without going on actual site. Also in future we can reduce the weight and can made compact design of the system with the help of booming technology. Also now a day there is increase in use of solar system in industries as well as at homes, thus giving a bright future scope for this system.

IV. REFERENCES

- [1]. "Robotic Device for Cleaning Photovoltaic Panel Arrays" by mark Anderson, Ashton Grandy, Jeremy Hastie, Andrew Sweezey, Richard Ranky, Constantinos Mavroidis
- [2]. "Development of an automatic robotic cleaning system for photovoltaic plants", by Nawaf Albaqawi and Alireza Gheitasi, Waikato Institite of Tecgnology New Zealand, 2014
- [3]. "Microcontroller Based Automatic Cleaning of Solar Panels" by S.B. Halbhavi, G. Kulkarni, Dr. D. B. Kulkarni, IJLTET Vol. 5 Issues 4th July,2015, ISN: 2278-621X
- [4]. "Effects of Dust on Performance of PV Panels" by Shaharin A. Sulaiman, Haizatul H. Hussain, NikSiti H. NikLeh, and Mohd S. I. Razali
- [5]. Gradual Reduction of energy production of pv plants through continuous soiling. Prof. Dr. H.ss Haberlin and Ch. Renken. University of Applied Science Bern. University of Technology and Architecture Burgdor
- [6]. Salim, F. Huraib, and N. Eugenio, " PV power-study of system options and optimization," in Proceedings of the 8th European PV Solar, Energy Conference, Florence, Italy, 1988.
- [7]. R. H. Hamid, F. El-Hussainy, M.M. Beheary, K. M. Abdel-Moneim, Energy Conversion and Management, 47, 3192 (2006).
- [8]. OSC Energy Inc., SolarWash, 7 Nov. 2008, <http://www.ocsenergy.com>
- [9]. Denholm P, Drury E, Margolis R, Mehos M. Solar energy: the largest energy resource. In: Sioshansi FP, editor. Generating electricity in a carbon-constrained world.

A Survey on Design and Development of Workplace Monitoring System for Laboratories

Ankit Rathod, Saurabh Wase, Purushottam Bawne, Sandip Shende, Shubham Bargaiya

Department of Computer Science and Engineering, S.B. Jain Institute of Technology, Management and Research, Nagpur, Maharashtra, India

ABSTRACT

More effort has focused on integrating instructional technologies into classrooms than has focused on assessing the impact of these technologies on teaching and learning performance. To evaluate whether computer technology is beneficial to the teaching and learning process requires that we first develop a system to understand what students in a classroom do when there are computers in front of them. We identify the requirements for such a system and then describe a prototype system that uses off-the-shelf spyware as its main component. We report findings from a pilot study we conducted in a computer-equipped composition classroom. Our results show that while the monitoring system captured the necessary data, the use of an off-the-shelf tool did not completely satisfy all of our system requirements. Additional customization work on keystroke recording and password protection is necessary to effectively monitor real-time student in-class activities.

Keywords : Personal Digital Assistant

I. INTRODUCTION

Classrooms equipped with computers and Internet access are becoming increasingly common. Smartboards, Personal Digital Assistants (PDAs), and networked computers are being used in lecture presentations, for note taking, and in stimulating collaboration. New computer and network technologies introduced into the classroom are altering both teaching and learning experiences. With the goal of creating advanced classroom environments, more educators use computer-equipped classrooms or assume that students will bring their own computing devices to class. While much effort has focused on introducing computer technologies into classrooms, not enough effort has been spent on assessing the impact of having computers in classrooms. One important first question to ask is whether these

technologies help instructors teach more effectively and whether the technology helps students in their learning process. An equally important second question is whether there are any detrimental impacts of so much technology use. There are certainly different approaches to evaluate the impacts and answer these questions. Traditional studies involve surveys, self-report questionnaires, classroom observation, and retention testing. However, these studies are prone to subjectivity and do not measure the real-time cognitive interaction between students and computers during a classroom lecture. This fact motivates us to design a classroom monitoring system and apply it in real classes to evaluate the in-depth impacts of computer-equipped classrooms. We believe that the analysis of data collected by such a system will provide better insight into the true impacts of classroom technologies. this system will give a huge

satisfaction to customer as well as reduces headache of corporation and citizens.

II. OBJECTIVES

- To trace and record the purpose and time of usage of machine by student.
- To remove log book record completely.
- Monitoring the workplace activities with the system and on the system using cameras.
- To trace the lab utilization and generate report of lab.

III. LITERRATURE SURVEY

- The student data will stored in a database where it will be view and manage by the administrator, also another attributes added like news updates and view student feedback again system will be monitor.
- A system to understand what students in a classroom do when there are computers in front of them. We identify the requirements for such a system and then describe a prototype system that uses off-the-shelf spyware as its main component.
- The application makes use socket programming for communication between the teacher's computer and all the students' computers.
- It meets the individual needs of the experiment teaching well by integrating the mobile teaching mode and the network teaching mode. At the same time experiment processes can be monitored in C-LIMS via the workflow mechanism.
- N. Wenliang, H. Xi, L. Zheyang and et ai, "An Open Laboratory supervision and management System Based on Fingerprints Recognition", 2009 Second International Symposium on Computational Intelligence and Design, 2009, pp:510-512 .
- The application makes use socket programming for communication between the teacher's computer and all the students' computers.

IV. PROPOSED WORK

The main objective of the Project on Laboratory Management System is to manage and record the details from Student and View. It manages all the information about Student, Complete Information, View, Student.

This project mainly focuses on recording the purpose and time of usage of machine and Detection of unwanted activities of student on the system. After deploying this project administrator will be able to keep track on activities done by students on the system. We plan to develop this project in below mentioned modules.

The Desktop app will contain following modules:

Module 1: Student need to login with the provided id/ roll no., password and purpose work to use to system. This module allows student to enter their purpose work as well as new tasks or other details provided by ADMIN.

Module 2: Admin creates all authenticated logins with respective password to enter this module for student. Admin helps to authenticate the report of lab and cameras also handle adding the new students.

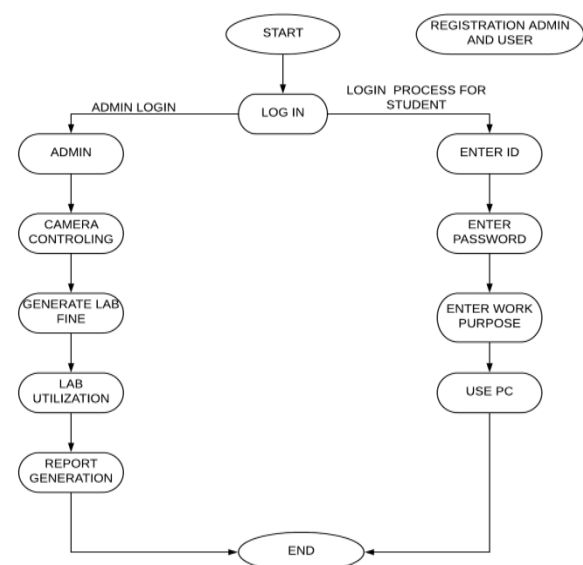


Fig 4.1 Flowchart

A. Flow of the system

In the first module will be to firstly add the students in the database in which the data is being matched with the database and the students details is being inserted into the system and hence using this module . The new guest can also be able to inserted by the admin module in which the data will be made available.

Now the second module comes into picture when the system boots up the app gets autostarted during the boot time and thus accordingly a fullscreen window is being displayed which will be used to enter the credentials to login the system hence now the data once verified he will be logged into the system and made the availability to get the monitoring and camera proctor of the system .

The timer as soon as the student logs into the system then the users data is being monitored whatsoever he/she does in the system and the whole information is being updated into the databases.

B. Functional Modules

There are only 2 modules being implemented here:

1) Developing the admin module to make student module operational:

On coming to the admin we first need to make the student entry point and so we build the database for the students , admin and the reports ,guests . After making the database first add admins then the students and then finally the guests. Since we have to make a report we need first to record and monitor the students and guest that persist on the system.

2) The Student module to operate the system:

Now the student or guest have to now enetr the credentials in the system on the window and as soon

as the credentials gets matched then the student monitoring and proctoring starts its login time and date are updated in the database and using these data we are able to generate reports of the data in the admin module.

V. CONCLUSION

The Workplace Monitoring system application that will be able to proctor the activities of the student right after they are logged in the system.

This will make the admin know each and every activity of the student and a report of his/her login and logout and what he/she did on system will be generated and sent to the admin.

Application will also be able to proctor the lab using camera system installed in the laboratory.

Analysis and Design of Long Concrete Silo Having Different Height and Diameter under Earthquake Effect

Anurag Ravindra Warade¹, Dr. Tushar G. Shende²

¹M-Tech (SE), Department of Civil Engineering, GHRAET, Nagpur, Maharashtra, India

²Associate Professor, Department of Civil Engineering, GHRAET, Nagpur, Maharashtra, India

ABSTRACT

Structures used for storing bulk solids are called bins, bunkers, silos, or tanks. There is no generally accepted definition for these terms, shallow structures containing coal, crushed stone, gravel, and similar materials are called bins or bunkers and tall structures containing materials such as grain, cement and wheat are usually called silos. Elevated silos generally consist of a conical roof, a cylindrical shell and a conical hopper and they could be elevated and supported by frames or reinforced concrete columns. Circular silos (both steel and reinforced concrete) are used to store material in various industries like cement plants (clinkers), power plants (raw coal), oil and gas industry (sulfur pellets) etc. Elevated steel and reinforced concrete circular silo for storage show performance in earthquake reinforced concrete silo stability increases by using shear wall but loss of steel silo in earthquake stability increases using steel panel on opposite side Displacement of structure decreases in case of shear wall panel and stiffness increases.

Keywords : Circular Concrete Silos, Analysis, Conventional Design and Finite Element, Shell Design of silo.

I. INTRODUCTION

Concrete silos are constructed from small precast concrete blocks with ridged grooves along each edge that lock them together into a high strength shell. Much of concrete's strength comes from its high incompressibility, so the silo is held together by steel/concrete hoops encircling the tower and compressing the staves into a tight ring. The vertical stacks are held together by intermeshing of the ends of the staves by a short distance around the perimeter of each layer, and hoops which are tightened directly across the stave edges.

The static pressure of the material inside the silo pressing outward on the staves increases towards the bottom of the silo, so the hoops can be spaced wide apart near the top but become progressively more

closely spaced towards the bottom to prevent seams from opening.

Conventional methods of analysis of silos can deal well with axisymmetric loading due to gravity and stored materials. A silo, being an elevated structure, may be subjected to tremendous lateral loads due to wind and earthquake. The conventional methods cannot incorporate the effect of lateral loads in the design procedure effectively. Meridional and hoop forces developed.

Prediction of various stress resultants at critical locations by approximate conventional methods may not always be acceptable. Besides, traditional approach of analysis can not predict any type of moments at all. Despite all such approximations the conventional method of analysis has been used with considerable success in the past. Conservative design

approach combined with high factor of safety can be attributed to such success. With the advancement of the versatile and powerful techniques of finite elements it has now become easy to determine more accurately all the design forces at any section of a circular silo

ENTIONAL METHOD OF SILO DESIGN

Manual design worked out of silos of specific dimension to know exact design requirement of silo for static and dynamic load condition. Model of silo has made by using STAAD software and carried out its result for static analysis and dynamic analysis Model was made by using M-25 grade concrete to circular shell. And thickness of shell is 150 mm Analysis carried out after removing each column one by one. Janssen's theory used for for pressure calculations After analysis, Area of steel calculated from result of horizontal pressure, direct tension in hopper as well as cylinder.

II. STAAD MODEL AND ANALYSIS

Model of the silo has made in STAAD. There are wind and earthquake factor applied to the model of silo and designed it for sever load cases to get maximum size of section of reinforce concrete member. Wind pressure and

Earthquake forces are assigned by referring basic parameters to check the percentage of steel for static load condition, model analyse and design for static load condition.

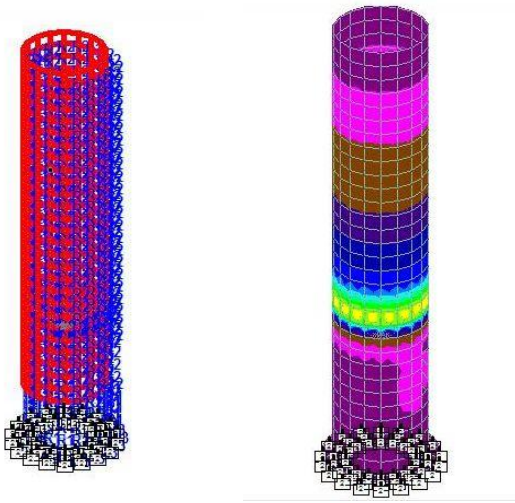
Considering Janssens theory for present,			
$p_v =$	$\frac{wR}{\mu'n}$	$(1 - \exp(-\frac{\mu'nh}{R}))$)
$p_h =$	$\frac{wR}{\mu'}$	$(1 - \exp(-\frac{\mu'nh}{R}))$)
$n =$	$\frac{(1-\sin\phi)}{(1+\sin\phi)}$	=	$\frac{(1-\sin 25)}{(1+\sin 25)}$
		=	0.406

Diameter	6 m
height	20 m
Density of material stored	8 kN/m ³
coeff. Of friction b/w wall and	0.444
ratio of hor to ver pressure	0.406
Angle of repose	25 °
Grade of Concrete	20
Grade of steel	415
depth of hopper below silo	2.5 m
dia of hopper opening	1 m

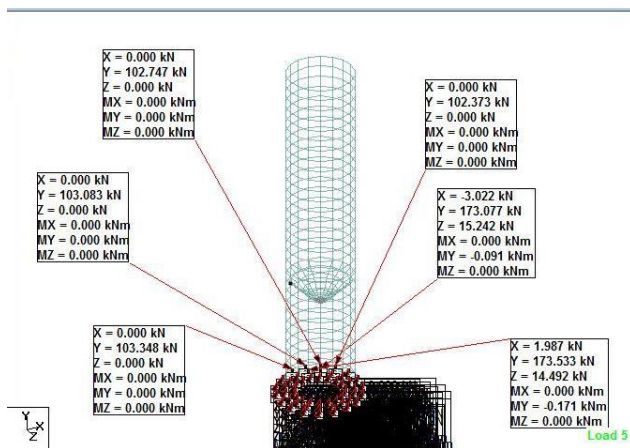
	h	p_h	P_v
-1	1	3.059	1.358
-2	2	5.773	2.563
-3	3	8.178	3.631
-4	4	10.312	4.579
-5	5	12.204	5.419
-6	6	13.882	6.164
-7	7	15.370	6.824
-8	8	16.690	7.410
-9	9	17.860	7.930
-10	10	18.898	8.391
-11	11	19.818	8.799
-12	12	20.634	9.161
-13	13	21.358	9.483
-14	14	21.999	9.768
-15	15	22.568	10.020
-16	16	23.073	10.244
-17	17	23.521	10.443
-18	18	23.918	10.619
-19	19	24.270	10.776
-20	20	24.582	10.914

To verify result of software, Silo has designed for static load condition and it is compared with manual static design of silo.

Basic data and geometry of silo is same as it is considered in manual design. Fig Showing the geometry of silo.



Thickness of wall is 150mm. 8 m high silo supported with 4 column designed for fill condition. Pressure of wheat is considered to calculate pressure on wall of silo



From above manual calculation it is found that wall of silos required 2.81 % of steel on wall to resist pressure due to grain.

After analysing the model in STAAD with same load intensity, it is come to know that wall required 2.7 % steel to resist pressure due to grain. It is almost equal to 2.81 %.

STAAD redistribute the moments and give the optimum solution of the structural element. There for there is difference of 0.11% in between manual calculation and software analysis. Maximum Shear

force in hopper element = 22 kN/m² And moment in hopper element is zero or negligible.

Area of steel required in hopper panel is 5 cm² It is equal to 500 mm² which is very near to area required of reinforcement calculated manually.

Hence, from this analysis it can conclude that manual analysis and software analysis is same so we can analyse and study the model for dynamic analysis by using STAADs software.

III. ANALYSIS OF SILO FOR WIND AND EARTHQUAKE

Load combination used for earthquake analysis and wind analysis. As per IS 1893 – 2002 and IS 875-1987 (part 3 & part 5)

- 1) 1.5(DL+LL)
- 2) 1.2(DL+LL+EL)
- 3) 1.5(DL+EL)
- 4) 0.9DL* 1.5EL
- 5) 1.2(DL+LL+WL)
- 6) 1.5(DL+WL)
- 7) 0.9DL* 1.5WL

Where,

DL = Dead Load

LL = Live Load

&

EL = Earth Load

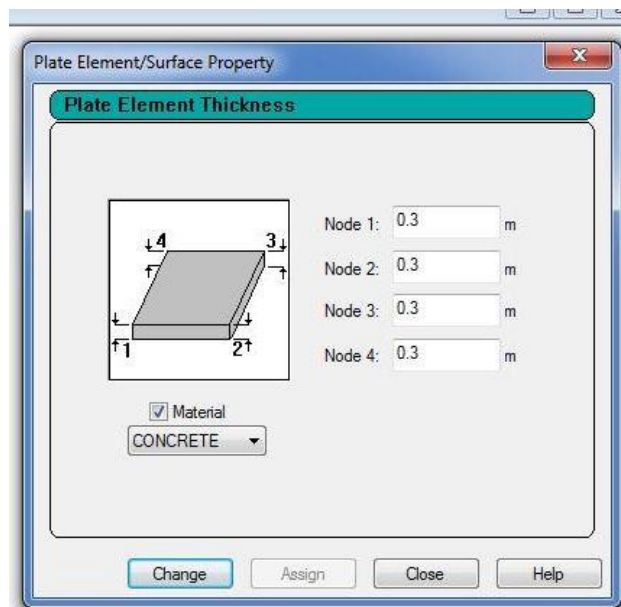
WL = Wind load

It can be seen that axial force in very negligible in upper columns after removing column 1 at ground floor. It transferred the additional load in adjoining

column. If column designed as per ductile design code, it could resist the additional load up to certain extent.

	h	vertical load	lumped VL
-1	1	2.464	0.6160
-2	2	4.928	1.2320
-3	3	7.392	1.8479
-4	4	9.856	2.4639
-5	5	12.320	3.0799
-6	6	14.783	3.6959
-7	7	17.247	4.3118
-8	8	19.711	4.9278
-9	9	22.175	5.5438
-10	10	24.639	6.1598
-11	11	27.103	6.7758
-12	12	29.567	7.3917
-13	13	32.031	8.0077
-14	14	34.495	8.6237
-15	15	36.959	9.2397
-16	16	39.423	9.8557
-17	17	41.887	10.4716
-18	18	44.350	11.0876
-19	19	46.814	11.7036
-20	20	49.278	12.3196
-20.5	20.5	50.510	12.6276
-21	21	51.742	12.9355
-21.5	21.5	52.974	13.2435
-22	22	54.206	13.5515
-22.5	22.5	55.438	13.8595

Note that these shell element internal forces are forces per unit length acting on the midsurface of the shell element. STAADS only reports the value of these forces at the shell element corner points.



Stresses for all load combination has been analysed and silo found critical in wind load case.

Maximum percentage of steel required for dynamic analysis is 3.5 % where it was 2.81% for static analysis.

In common silo design based on ACI 313 (1997) wall pressures from earthquake effects are not taken into account and the system is reduced to a cantilever beam with several point masses being situated on top of each other to calculate appropriate additional static horizontal loads, 80 percent of actual mass of stored material should be considered as effective mass for calculating masses. But Eurocode 8 part 4 (2003) considers additional horizontal pressures resulting from earthquake effects with simple relations.

Few images are displayed below which showing the failure of silos due to earthquake and wind forces. It is essential to consider wind and earthquake effect on silo.

IV. CONCLUSION

This research is carried out to check the behaviour of silos in earthquake and wind load condition. A typical model of silo taken for analysis and checked for static as well as dynamic design. For software data validation, Manual analysis is done for static

analysis and checked its result with static analysis of software. Both result are same which give the idea about perfectness of software for analysis and design.

Earthquake and wind load combination taken by referring relevant IS codes such as IS 1893 and IS 456, IS 875. From the analysis it is conclude that stresses on silo is more while applying the earthquake load and wind load as compare to stresses due to static load.

To resist additional stresses during earthquake and high wind, silo shall design for additional earthquake and wind forces. Many silos fail due to lack of earthquake design as shown in above images. This analysis and design is carried out on concrete cylindrical silo. It can be check for concrete rectangular silo and steel silos too.

V. REFERENCES

- [1]. "Parametric Study On Dynamic Response Of Silo" by Anand Adi , Hemant L. Sonawadekar, International Journal of Engineering Research & Technology (IJERT) Vol. 2 Issue 7, July - 2013, ISSN: 2278-0181
- [2]. Design forces and moments in circular silos based on finite element analysis by Md. Alauddin and Sohrabuddin Ahmad, Journal of civil engineering division, the institution of Engineers, Bangladesh, Vol. CE23 No . 1. 1995
- [3]. Sivabala. P, Elangovan. G, Kameshwari. B, "Effect of shear wall panels on the dynamic response of a silo "International Journal of Civil and Structural Engineering Volume 1, No 4, 2011.
- [4]. Adem Dogangun, Zeki Karaca, Ahmet Durmus and Halil Sezen (2009), Cause of Damage and Failures in Silo Structures, Journal of Performance of Constructed Facilities, Vol.23, No. 2, pp (65-71).
- [5]. Alnabuddin L.V. & Sohrbuddin Ahmad, (1995), Design Forces and Moments in Circular Silos Based on Finite Element Package, Journal of the Civil Engineering division, The Institution of Engineers, Bangladesh, Vol CE23, pp. (59-88).
- [6]. Bradely M S, Berrey R.G. and Farnis R.J.(2007), Methods for design of Hoppers, Silos, Bunkers & Bins for reliable gravity Flow for Pharmaceutical, Food, Mineral and Other applications, The Wolfson Centre of Bulk solids Handling Technology, University of Greenwich,UK, pp (213-220).

Seismic Performance of RC Structures for Various Zones Considering Different Classes of Building

Anup Diwakar Malekar¹, D. P. Telang², Laxmikant N. Vairagade³

¹M-Tech Student (SE), Department of Civil Engineering, GHRAET, Nagpur, Maharashtra, India

² Assistant Professor, Department of Civil Engineering, GHRAET, Nagpur, Maharashtra, India

³Assistant Professor, Department of Civil Engineering, GHRAET, Nagpur, Maharashtra, India

ABSTRACT

The behavior of a building throughout earthquakes depends critically on its overall form, size and type of building. Earthquake resistant of buildings depends upon providing the building with strength, stiffness and spring less deformation capability that area unit nice enough to face up to a given level of earthquake generated force. This is typically accomplished through the choice of associate degree applicable building configuration and also the careful particularization of structural members. Configuration is essential to smart seismic performance of the buildings. The necessary aspects moving seismic configuration of buildings area unit overall geometry, structural systems, and load paths. The building slenderness ratio and the building core size are the key drivers for the efficient structural design. This paper focuses on the result of each Vertical aspect ratio (H/B ratio i.e. Slenderness Ratio) and Horizontal or set up ratio (L/B ratio), wherever H is that the total Height of the building frame, B is the Base width and L is the Length of the building frame with completely different set up Configurations on the seismic Analysis of high-rise Regular R.C.C. Buildings. The check structures area unit unbroken regular in elevation and in set up. Here, height and also the base dimension of the buildings area unit varied consistent with the side Ratios. The values of side Ratios area unit thus appointed that it provides completely different configurations for Low, Medium and High-rise building models.

Keywords : RC Structure, Vertical Aspect Ratio, Slenderness Ratio, Aspect Ratio

I. INTRODUCTION

All structures especially high-rise structures are design for dynamic loads which include loads due to earthquake and wind. Major consideration is given to earthquake loads in earthquake prone areas and that to wind loads in cyclones prone areas. For very tall structure wind is considered as predominant load. Relevant standards and specifications, analysis procedure clearly indicates significant variations in calculation of wind and earthquake forces on structures. As per as earthquake force as considered zone factor, height of building and type of subsoil are

relevant in estimation of earthquake force. For wind load base dimensions, height, basic wind speed, terrains category and many more factors include permeability are required for estimation of forces due to wind. Structures are designed for the effect of earthquake forces and wind forces in addition to gravity load.

Earthquake forces are estimated as per the provision of IS 1893(Part 1):2002 while the wind forces are estimated by IS 875(Part 3):1987. As per the historical wind velocity data India is divided into no. of zones and designed wind velocity is considered according to

wind map of India. While the country is divided into four different seismic zone as per geological features and seismic history as per provision of IS 1893(Part 1):2002. Earthquake and maximum wind cannot be considered simultaneously thus it is required to have both wind analysis and seismic analysis of structure. To understand the dynamic effect due to wind the complex formulations is adopted in IS: 875(Part-III). The IS 875(Part 3):1987 as categorized building into three different classes depending upon their size as per clause 5.3.2.2:

Class-A: Structure and their component such as cladding, glazing, roofing, etc. having greatest vertical or horizontal dimensions less than 20m.

Class-B: Structure and their component such as cladding, glazing, roofing, etc. having greatest vertical or horizontal dimensions between 20 and 50m.

Class-C: Structure and their component such as cladding, glazing, roofing, etc. having greatest vertical or horizontal dimensions greater than 50m.

This indicates that the largest dimension plays major role in estimating wind forces on structures. Overlooking other dimensions and various tables given in IS 875 (Part 3):1987 and give coefficients according to classes. However, earthquake force gives significance to height of structure as the time period of structure is linked to height of structure. Looking at the complexity arising due to significant variation in the consideration of building dimensions a need is realized in estimating wind and earthquake forces on typical A, B, C Class structures and investigate the performance of the structures against earthquake loads.

II. METHODS AND MATERIAL

In the present study, I.S. Code (1893:2002) based Dynamic Analysis (Response Spectrum Analysis) is performed. This study includes comparative study of behaviour of Low, Medium, High-Rise R.C.C. building frames considering different geometrical plan configurations based on different aspect ratios under earthquake forces. Following steps of methods of analysis are adopted in this study:

Step-1: Selection of different models having different building geometry, No. of bays for Horizontal Aspect Ratio and No. of storeys for Slenderness Ratio.

Step-2: Selection of seismic zone.

Step-3: Formation of load combination.

Step-4: Modelling of building frames using Staad Pro software.

Step-5: Analyses each models considering each load combinations for (No of Model Cases) by Seismic Analysis.

Step-6: Comparative study of results in terms of Base shear, Storey overturning moments, Storey drift, Storey displacement and Modal period of vibration.

M-25 grade of concrete and Fe-415 grade of reinforcing steel are used for all the frame models used in this study. Elastic material properties of these materials are taken as per Indian Standard IS 456 (2000). The short-term modulus of elasticity (E_c) of concrete is taken as: $E_c=5000\sqrt{F_{ck}}$

III. RESULTS AND DISCUSSION

For calculation of forces, moments and displacement consider two important load cases for the analysis for corner column.

1.5(DL+EQ-X) – for earthquake analysis.

1.5(DL+EQ-z) – for earthquake analysis.

A. Analysis results

Axial force for Aspect Ratio 1 & 2 of structure with varying base dimensions for Class – A structure

TABLE 1 : Axial force for central column 16-16-18 m structure for earthquake load

Sr. No	Maximum Axial force central column due to earthquake load			
	16 X 16 X 18 = Aspect Ratio 1			
	Zone III (Z)	Zone III (X)	Zone IV (Z)	Zone IV (X)
1	441.091	441.891	441.091	441.891
2	884.415	884.415	884.415	884.415
3	1324.962	1324.962	1324.962	1324.962

4	1764.927	1764.927	1764.927	1764.927	4	56.621	40.085	74.087	52.334
5	2203.913	2203.913	2203.913	2203.913	5	74.672	54.224	97.745	70.862
6	2639.927	2639.927	2639.927	2639.927	6	88.993	65.628	116.518	85.811
					7	97.589	73.057	127.79	95.556

TABLE 2: Axial force for central column 08-16-18 m structure for earthquake load

Sr. No	Maximum Axial force central column due to earthquake load			
	08 X 16 X 18 = Aspect Ratio 2			
	Zone III (Z)	Zone III (X)	Zone IV (Z)	Zone IV (X)
1	428.550	428.550	428.550	428.550
2	843.417	843.417	843.417	843.417
3	1263.007	1263.007	1263.007	1263.007
4	1686.417	1686.417	1686.417	1686.417
5	2115.219	2115.219	2115.219	2115.219
6	2552.075	2552.075	2552.075	2552.075

Displacement for Aspect Ratio 1 & 2 of structure with varying base dimensions for Class – A structure

TABLE 3: Displacement for central column 16-16-18 m & 08-16-18 m structure for earthquake load

Sr. No	Maximum Displacement (mm) of central column due to earthquake load			
	16 X 16 X 18 = Aspect Ratio 1			
	Zone III (Z)	Zone III (X)	Zone IV (Z)	Zone IV (X)
1	0	0	0	0
2	18.841	10.215	28.131	15.082
3	43.287	25.679	64.74	38.197
4	67.138	41.291	100.479	61.564
5	88.628	55.406	132.693	82.709
6	105.698	66.631	158.29	99.536
7	115.944	73.636	173.658	110.045
08 X 16 X 18 = Aspect Ratio 2				
	Zone III (Z)	Zone III (X)	Zone IV (Z)	Zone IV (X)
1	0	0	0	0
2	15.928	9.553	20.793	12.368
3	36.544	24.614	47.786	32.073

Bending Moment for Aspect Ratio 1 & 2 of structure with varying base dimensions for Class – A structure

TABLE 4: Bending Moment for central column 16-16-18 m & 08-16-18 m structure for earthquake load

Sr. No	Maximum Bending Moment central column due to earthquake load			
	16 X 16 X 18 = Aspect Ratio 1			
	Zone III (Z)	Zone III (X)	Zone IV (Z)	Zone IV (X)
1	94.054	89.587	141.081	134.381
2	160.548	159.834	240.821	239.751
3	203.931	210.297	305.896	315.445
4	227.092	239.288	340.638	358.931
5	237.202	258.081	355.803	387.121
6	247.858	297.783	371.786	446.674
08 X 16 X 18 = Aspect Ratio 2				
	Zone III (Z)	Zone III (X)	Zone IV (Z)	Zone IV (X)
1	78.959	85.296	103.546	111.856
2	134.666	155.491	176.598	203.908
3	171.216	208.441	224.53	273.347
4	191.017	239.263	250.496	313.766
5	199.863	262.385	262.097	344.088
6	209.002	278.431	274.082	365.13

Shear Force for Aspect Ratio 1 & 2 of structure with varying base dimensions for Class – A structure

TABLE 5: Shear Force for central column 16-16-18 m & 08-16-18 m structure for earthquake load

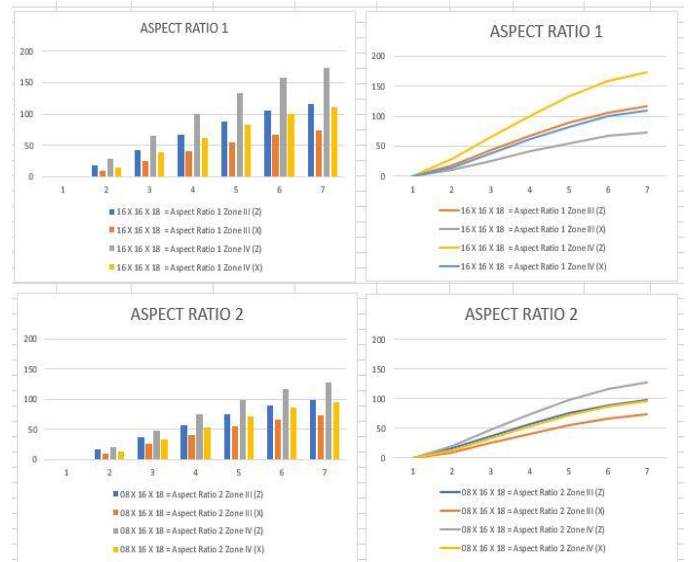
Sr. No	Maximum Shear Force central column due to earthquake load			
	16 X 16 X 18 = Aspect Ratio 1			
	Zone III (Z)	Zone III (X)	Zone IV (Z)	Zone IV (X)
1	0	0	0	0
2	15.928	9.553	20.793	12.368
3	36.544	24.614	47.786	32.073

Sr. No	Maximum Shear Force central column due to earthquake load				Zone III (Z)	Zone III (X)	Zone IV (Z)	Zone IV (X)	
	16 X 16 X 18 = Aspect Ratio 1				1	15.305	13.074	19.214	16.288
					2	24.853	20.374	30.874	25.001
	Zone III (Z)	Zone III (X)	Zone IV (Z)	Zone IV (X)	3	31.987	26.439	39.358	32.083
1	68.744	75.377	103.116	113.066	4	37.005	30.612	45.06	36.676
2	111.139	117.924	166.708	176.886	5	40.75	35.092	49.048	41.629
3	138.441	147.185	207.661	220.778	6	44.881	39.288	53.558	46.224
4	152.55	161.996	228.825	242.993					
5	157.381	166.221	236.071	249.331					
6	148.454	153.999	222.681	230.998					

B. Graphs

Graphs for Displacement with diff Zones factor for Aspect Ratio 1 & 2 of structure with varying base dimensions for Class – A structure

Sr. No	Maximum Shear Force central column due to earthquake load			
	08 X 16 X 18 = Aspect Ratio 2			
	Zone III (Z)	Zone III (X)	Zone IV (Z)	Zone IV (X)
1	57.704	71.444	75.672	93.691
2	93.229	113.735	122.26	149.15
3	116.254	144.273	152.454	190.155
4	125.185	145.003	168.307	211.003
5	128.343	160.901	173.922	218.892
6	132.624	166.916	164.165	189.198

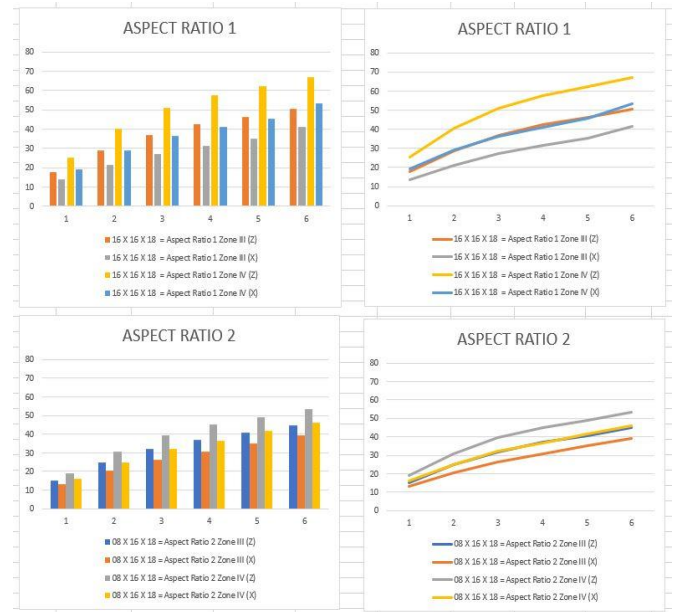
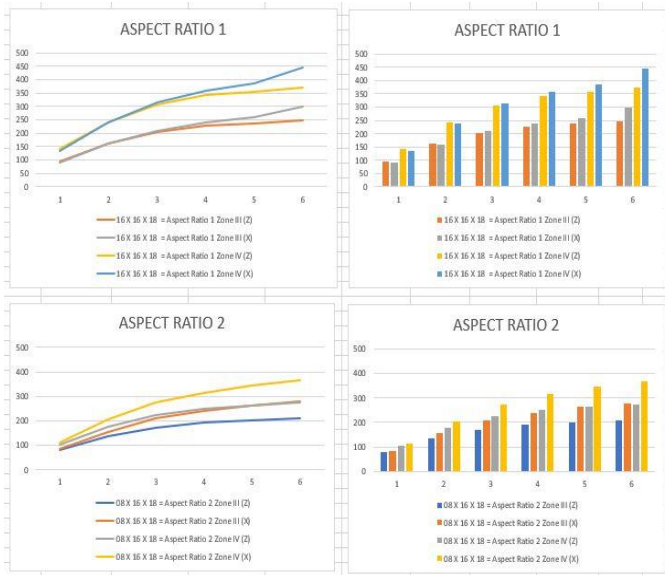


Compressive Stresses for Aspect Ratio 1 & 2 of structure with varying base dimensions for Class – A structure

TABLE 6: Compressive Stresses for central column 16-16-18 m & 08-16-18 m structure for earthquake load

Sr. No	Maximum Compressive Stresses (N/mm ²) central column due to earthquake load			
	16 X 16 X 18 = Aspect Ratio 1			
	Zone III (Z)	Zone III (X)	Zone IV (Z)	Zone IV (X)
1	17.797	13.763	25.275	19.225
2	28.839	21.305	40.364	29.063
3	36.912	27.228	51.005	36.478
4	42.401	31.396	57.772	41.264
5	46.32	35.339	62.133	45.662
6	50.647	41.422	67.171	53.333
	08 X 16 X 18 = Aspect Ratio 2			

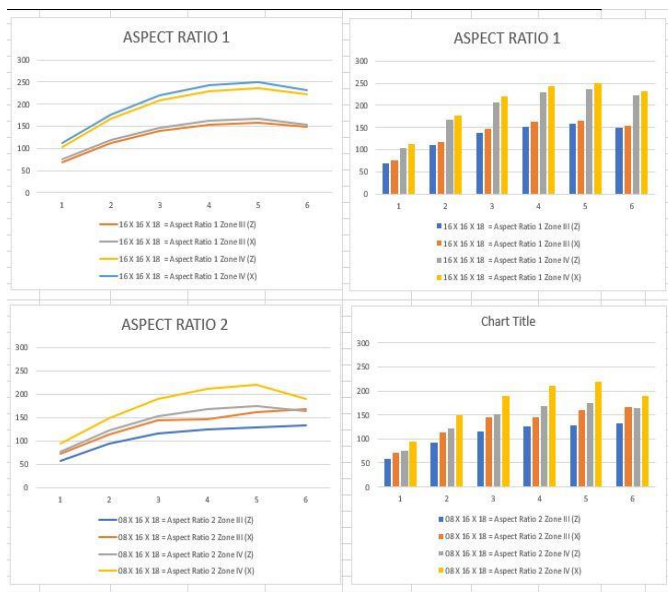
Graphs for Bending moment with diff Zones factor for Aspect Ratio 1 & 2 of structure with varying base dimensions for Class – A structure



Graphs for Shear Force with diff Zones factor for Aspect Ratio 1 & 2 of structure with varying base dimensions for Class – A structure

IV. CONCLUSION

1. In case of Seismic force the shear force, bending moment, compressive stresses and displacements developed in the columns increase as seismic zone is changed from III to IV for same Aspect ratio.
2. In case of Seismic force the axial force developed in the columns remains same as seismic zone is changed from III to IV for same Aspect ratio.
3. In case of Seismic force the axial force, shear force, bending moment, compressive stresses and displacements developed in the columns decrease as seismic zone is changed from III to IV as the Aspect ratio changed from 1 to 2.
4. In case of Seismic force the axial force developed in the columns decreases as the seismic zone is changed from III to IV as the Aspect ratio changed from 1 to 2.
5. In case of Different Class of building i.e, as the height of building increases the difference in axial force developed in the columns decreases as the seismic zone is changed from III to IV as the Aspect ratio changed from 1 to 2.



Graphs for Compressive Stresses with diff Zones factor for Aspect Ratio 1 & 2 of structure with varying base dimensions for Class – A structure

6. Earthquake forces are dependent on height as well as base dimensions, they increase with the increase in height as well as base dimensions.

7. In case of earthquake if the height of structure is increased the shear force at top floor is found lesser than floor immediately below.

8. For the same Aspect ration the shear force remains the same for different zone i.e III & IV in both the direction i.e X & Z.

9. The orientation of column plays a very important role when we consider the earthquake forces as we conclude that from the results that bending moment, compressive stresses and displacements decreases for the same aspect ratio in the same earthquake zone.

10. The orientation of column plays a very important role when we consider the earthquake forces as we conclude that from the results that shear force increases for the same aspect ratio in the same earthquake zone.

11 As the aspect ratio increase the building become more critical as the height of building increases.

12 The tall building should have small aspect ratio i.e sides of the building should be nearly equal in size, which will make it less critical.

V. REFERENCES

- [1] Dr. K. R. C. Reddy, Sandip A. Tupat, "The effect of zone factors on wind and earthquake loads of high-rise structures" Department of Civil Engineering, Kavikulguru Institute of Technology and Science. Ramtek-441106, Dist. Nagpur, India'
- [2] Dr. Suchita Hirde, Mr. Vinay Magadam, "Severity of Earthquake Forces against Wind Forces for Multistorey RCC Building" Professor, Applied Mechanics Department, Govt. College of Engineering, Karad 415 124, India 2PG Student, Civil-Structures, Govt. College of Engineering, Karad 415 124, India
- [3] Kostatalaganov, Mihailgarevski, Daniloristic and Vladimicov, "comparative dynamic stability study of a high -rise structure exposed to seismic and wind effects - case" STUDY 13th World Conference on Earthquake Engineering Vancouver, B.C., Canada August 1-6, 2004 Paper No. 778
- [4] Prof_Arya, "Steps for safe design and construction of Multistorey reinforced concrete buildings" Fundamentals_for_seismic_design_of_RCC_buildings.
- [5] Azlan Adnan and Suhana Suradi, "Comparison on the effect of earthquake and wind loads on the Performance of reinforced concrete buildings" Structural Earthquake Engineering Research, D04, Structure and Material Laboratory, Faculty of Civil Engineering-Universiti Teknologi Malaysia lazlan_fka_utm@yahoo.com, 2sueana80@yahoo.com
- [6] Khaled M. Heiza and Magdy A. Tayel, "Comparative Study of The Effects of Wind and Earthquake Loads on High-rise Buildings" Civil Engineering Department, Faculty of Engineering, Menoufiya University, EGYPT
- [7] Anupam Rajmani and Prof Priyabrata Guha, "Analysis of wind & earthquake load for different shapes of high rise building" Narula Institute of Technology, 81, Nilgunj Road, Agarpara, Kolkata, West Bengal
- [8] Syed Rehan and S.H. Mahure, "Study of Seismic and Wind Effect on Multi Storey R.C.C. Steel and Composite Building" Final Year Student (M.E. Structure) Professor & HOD Department Of Civil Engineering, Babasaheb Naik College of Engineering Pusad Dist Yavatmal Maharashtra.
- [9] Dat Duthinh and Emil Simi, "Safety of Structures in Strong Winds and Earthquakes: Multihazard Considerations" Journal of structural engineering © asce / march 2010

- [10] SanhikKarMajumder and Prof. PriyabrataGuha, Comparison Between Wind And Seismic Load On Different Types Of Structures, M.Tech (Structural Engineering) Narula Institute of Technology, Agarpara, Kol-109, W.B., India
- [11] Nicola Storgaard, "Earthquakes and their effects on buildings" Constructing Architect, 7th semester
- [12] Hany J. Farran "Wind & Earthquake Response in Very Long Span Cable Stayed and Suspension Bridges"
- [13] Gana A.J, "Wind effects on structures [a case study of buildings in irepodun local government area of kwara state]" Civil Engineering Department College of Sciences and Engineering Landmark University, Omu-Aran, Kwara State
- [14] AbdurRahman, SaiadaFuadi Fancy and ShamimAra Bobby, "Analysis of drift due to wind loads and earthquake loads on tall structures by programming language c"
- [15] Xinzhong Chen and Ahsan Kareem, Evaluation of Equivalent Static Wind Loads on Buildings, Assistant Professor of Civil Engineering, Texas Tech University, Texas, USA, xinzhong.chen@ttu.edu, and Professor of Engineering, University of Notre Dame, Indiana, USA, kareem@nd.edu
- [16] Bimala Pillai, PriyabrataGuha, "Comparison between RCC and steel structure with wind and earthquake effect using Staad pro"
- [17] Baldev D. Prajapati and D. R. Panchal, "Study of seismic and wind effect on multi storey r.c.c., steel and composite building" M.E. Research Scholar & Assistant Professor, Applied Mechanics & Structural Engg. Deptt., Faculty of Techno. & Engineering, M. S. University of Baroda, Vadodara - 390001, Gujarat, India.
- [18] B. Dean Kumar and B.L.P. Swami, "Wind effects on tall building frames influence of dynamic parameters" Department of Civil Engineering, JNTU College of Engineering, Hyderabad-500085, India, and Department of Civil Engineering, Vasavi College of Engineering, Ibrahim Bagh-500031, India
- [19] P. Mendis, T. Ngo, N. Haritos, A. Hira and B. Samali Wind Loading on Tall Buildings, The University of Melbourne, Australia, and University of Technology Sydney, Australia, J. Cheung Monash University, Australia
- [20] By Jonathan P. Stewart, Gregory L. Fenves, and Raymond B. Seed, "Seismic soil-structure interaction in buildings. I: analytical methods" 3 Members, ASCE
- [21] Umakant Arya, Aslam Hussain and Waseem Khan, "Wind Analysis of Building Frames on Sloping Ground" Rura Engineering Services, M.P., India, Civil, UIT R.G.P.V Bhopal, M.P, India
- [22] Hossein Moravej, Mahdi Hatami, Reza Naghshbandi and Yaser Mousavi Siamakani, "Wind load analysis of buildings in hill-shape zone" Faculty of Civil Engineering, Universiti Teknologi Malaysia
- [23] Swati D. Ambadkar and Vipul S. Bawner, "Behaviour of multistoried building under the effect of wind load" Assistant Professor, Department of Civil Engineering, P.R.M.I.T.&R, Badnera, Amravati. Post Graduate Student, Department of Civil Engineering, P.R.M.I.T.&R, Badnera, Amravati
- [24] Ryan Merrick and Girma Bitsuamlak, "Shape effects on the wind-induced response of high-rise buildings" Technical Coordinator, RWDI Inc., Guelph, Ontario, Canada, email: Ryan.Merrick@rwdi.com and Assistant professor, Department of Civil and Environmental Engineering/International Hurricane Research Center, Florida International University, Miami, Florida, 33174, email: bitsuamg@fiu.edu
- [25] D. Boggs and J. Dragovich, "The Nature of Wind Loads and Dynamic Response"
- [26] IS : 1893 (Part 1) : 2002 - "Criteria for Earthquake resistant design of structures"

Performance Based Analysis of Low-Rise Open Ground Storey Building

Abhishek T. Takalkhede¹, Dr. Tushar G. Shende², Laxmikant N. Vairagade³

¹M-Tech (SE), Department of Civil Engineering, GHRAET, Nagpur, Maharashtra, India

²Associate Professor, Department of Civil Engineering, GHRAET, Nagpur, Maharashtra, India

³Assistant Professor, Department of Civil Engineering, GHRAET, Nagpur, Maharashtra, India

ABSTRACT

Many Urban multistoried building in India today have open storey as an unavoidable features. This is primarily being adopted to accommodate parking or lobbies in open storey, such features are highly undesirable in building built in seismically active areas, and this has been verified in numerous experience of strong shaking during past earthquake. Though multistoried building with open (soft) ground floor is inherently vulnerable to collapse due to earthquake load, their construction is still widespread developing nation like India. Open storey at different levels of the structure for out-weighs the warning against such building from engineering community. In this paper we are concentrating on finding the best place for soft stories which is use for parking space and offices in high-rise building. Soft storey is one of the main reasons for building damage during an earthquake and has been mentioned in all investigation report. Soft storey due to increase storey height is well known subject. Infill are usually not considered as a part of load bearing system. This study investigates the soft storey behavior due to increase in storey height, of infill's at ground floor storey by means of linear static and nonlinear static analysis for midrise reinforced concrete building displacement capacity at immediate occupancy, life safety and collapse prevision, performance level and storey drift demands. Soft storey behavior due to change in infill's amount is evaluated in view of the displacement capacities, drift demand and structural behavior.

Keywords : Pushover Analysis, Open Ground Storey, Infill Wall, Seismic Analysis, Compression Member.

I. INTRODUCTION

Due to increasing population since the past few years car parking space for residential apartments in populated cities is a matter of major concern. Hence the trend has been to utilize the ground storey of the building itself for parking. These types of buildings having no infill masonry walls in ground storey, but infilled in all upper storeys, are called Open Ground Storey (OGS) buildings. There is significant advantage of these category of buildings functionally but from a seismic performance point of view such buildings are considered to have increased vulnerability Due to the

presence of infill walls in the entire upper storey except for the ground storey makes the upper storeys much stiffer than the open ground storey. Thus, the upper storeys move almost together as a single block, and most of the horizontal displacement of the building occurs in the soft ground storey itself. In other words, this type of buildings sway back and forth like inverted pendulum during earthquake shaking, and hence the columns in the ground storey columns and beams are heavily stressed.

Therefore, it is required that the ground storey columns must have sufficient strength and adequate

ductility. The vulnerability of this type of building is attributed to the sudden lowering of lateral stiffness and strength in ground storey, compared to upper storeys with infill walls.



Fig.1 - Open ground Storey of the building

The OGS framed building behaves differently as compared to a bare framed building (without any infill) or a fully infilled framed building under lateral load. A bare frame is much less stiff than a fully infilled frame. When this frame is fully infilled, truss action is introduced. A fully infilled frame shows less inter-storey drift, although it attracts higher base shear (due to increased stiffness). A fully infilled frame Inclusion of stiffness and strength of infill walls in the OGS building frame decreases the fundamental time period compared to a bare frame. Dya et. al, 2015, investigated the severity of OGS with increase in height of soft story building. Pushover analysis is carried out by considering vertical irregularity in the stiffness. Wibowo et. al, 2015, carried out an experimental analysis to investigate the precast soft storey building and concluded that it had considerable displacement capacity as compare to traditional construction. Jennings et. al, 2014, presented retrofitting strategy for soft storey wood frame building. It consist of energy dissipating device and shape memory alloy for recent ring capability. Rai, 2013 presented a design procedure and analytical evaluation of two strengthening techniques to improve the seismic performance of the existing non-ductile RC frames with soft-story at the ground story

level. Kirac N. et al., 2011 studied the seismic behavior of weak storey. It is observed that negative effects of this irregularity can be reduced by some precautions during the construction stage. Sarkar P. et al., 2010 proposed a new method of quantifying irregularity in such building frames, accounting for dynamic characteristics (mass and stiffness). The proposed 'regularity index' provides a basis for assessing the degree of irregularities in a stepped building frame. Wibowo A. et al. (2010) reported a unique experimental field test study that provides insight into the push-over load deflection and collapse behavior of a soft storey building. Four field tests were undertaken to investigate the actual lateral force deflection behavior of the soft storey columns. Interestingly, the tests indicated that the soft storey columns possessed significant displacement capacity despite significant strength degradation. Athanassiadou C.J. (2008) addressed multistory reinforced concrete (R/C) frame buildings, irregular in elevation. Two ten-storey two-dimensional plane frames with two and four large setbacks in the upper floors respectively, as well as a third one, regular in elevation, have been designed to the provisions of the 2004 Euro code 8 (EC8) for the high (DCH) and medium (DCM) ductility classes, and the same peak ground acceleration (PGA) and material characteristics. The over strength of the irregular frames is found to be similar to that of the regular ones. Pushover analysis seems to underestimate the response quantities in the upper floors of the irregular frames. The conclusion from above literature review is that open ground storey is vulnerable for seismic excitation, so the present study is based on the seismic evaluation of OGS buildings and the reason why they are adopted by the designers in spite of the fact that they are more vulnerable during earthquake. To study linear analyses of the building model considering various cases and critically evaluate the linear analysis results to compare the building responses with and without considering infill.

II. METHODS AND MATERIAL

To study the Seismic behavior of building structure while considering the effect of open ground storey, building frame is modeled as 3D space frame using standard two noded frame element with two longitudinal degrees of freedom and one rotational degree of freedom at each node. At the interface of infill and frame, the infill element and the frame element are given same nodes.

The idealized form of a typical 5 bay x 2 bay 4 storey building frame with infill wall modeled as represented schematically in Fig. 1 the present study also considers bare frame to see how correctly the influence of open ground storey on Seismic behavior can be predicted.

A 5 bay x 2 bay building frames with 4 storeys on isolated footing have been considered. The height of each storey is taken as 3.1 m. Thickness for roof and floor is taken as 120 mm and their corresponding dead load is directly applied on the beam. The brick infill with thickness 230 mm. slab thickness is 120 mm. All the above dimensions were arrived on the basis of the design following the respective Indian code for design of reinforced concrete structure. However, these design data are believed to be practicable and hence, do not affect the generality of the conclusion. Table 1 and 2 shows the sectional properties of the beam and column and material properties.

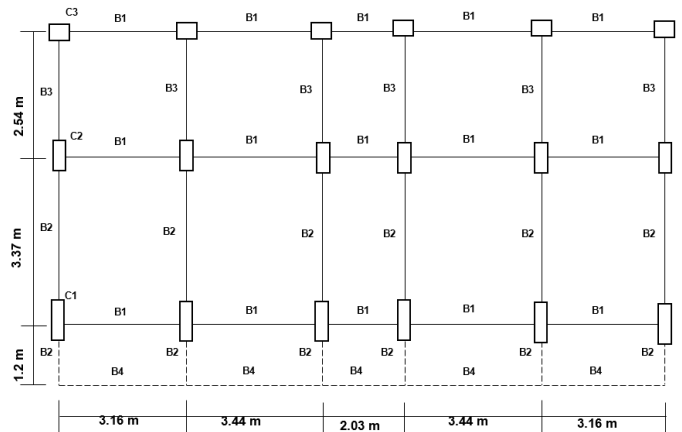
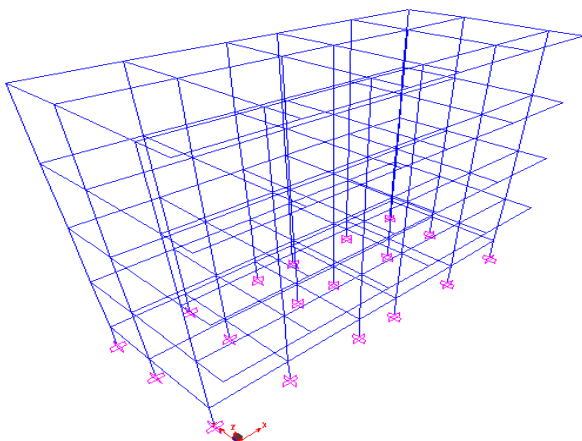


Fig.2 - 3D view and Elevation of building considered

Table 1 - Sectional Properties

Columns	Size (mm)	Beams	Size (mm)
C1	230 x 450	B1	230 x 350
C2	230 x 400	B2	230 x 400
C3	230 x 350	B3	230 x 300
		B4	200 x 400

Table 2 - Properties of material

Materials	Modulus of elasticity (kN/m ²)	Poisson's ratio
Concrete M25	25 x 10 ⁶	0.2
Masonry	4.5 x 10 ⁶	0.19

III. RESULTS AND INTERPRETATION

Initially the displacement of the building in X and Y direction is performed with and without infill wall. It has been observed that zone factors highly influences the performance of OGS building which can be seen with the help of graphical representation as shown in fig. 3. With the introduction of infills the stiffness increases and hence the displacement of the building in various zones decreases.

Pushover analysis is carried out for building models. First pushover analysis is done for the gravity loads (DL+LL) incrementally under load control. The lateral

pushover analysis (PUSH-X) is followed after the gravity pushover, under displacement control. The building is pushed in lateral directions until the formation of collapse mechanism. The capacity curve (base shear versus roof displacement) is obtained in X-direction and presented in Fig. These figures clearly show that global stiffness of an open ground storey building hardly changes even if the stiffness of the infill walls is ignored. If there is no considerable change in the stiffness elastic base shear demand for the building will also not change considerably if the stiffness of the infill walls is ignored. The variation of pushover curves in X-directions is in agreement with the linear analysis results presented in the previous section with regard to the variation of elastic base shear demand for building models. Fig. 4 shows the hinge formation of the building after pushover analysis.

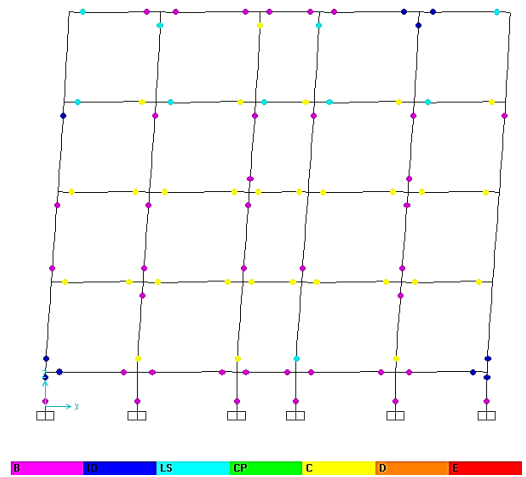


Fig. 4 - Hinge pattern of the building

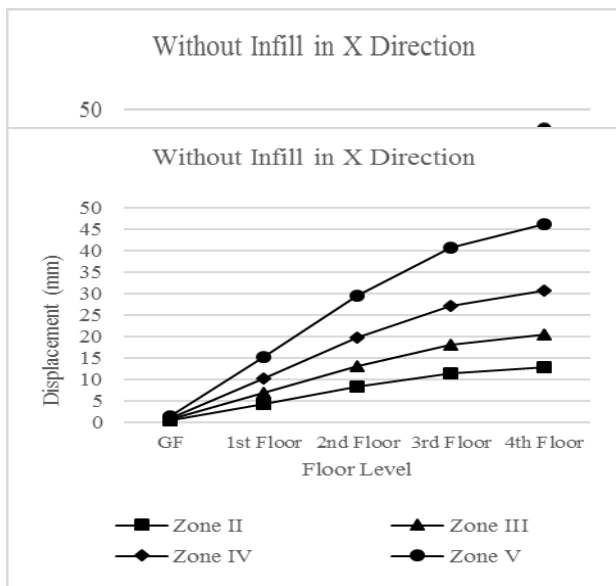
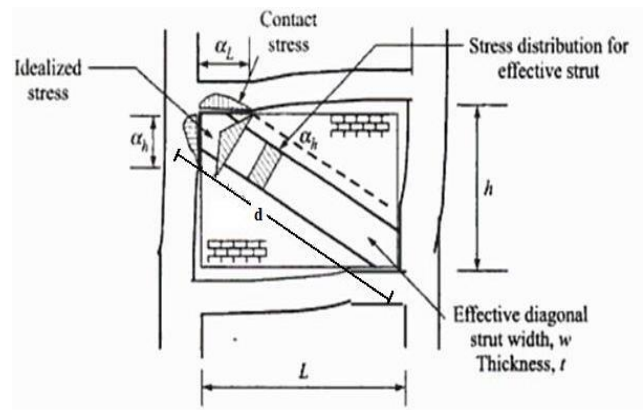
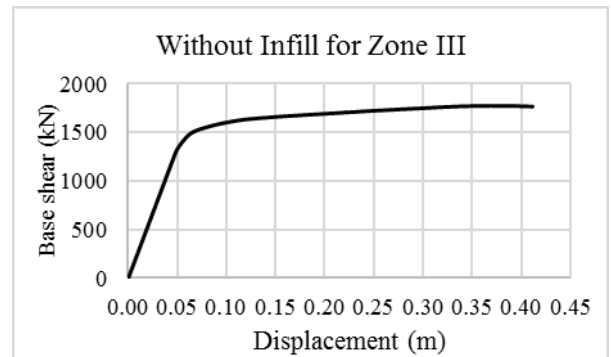


Fig. 3 - Displacement comparison with and without infill



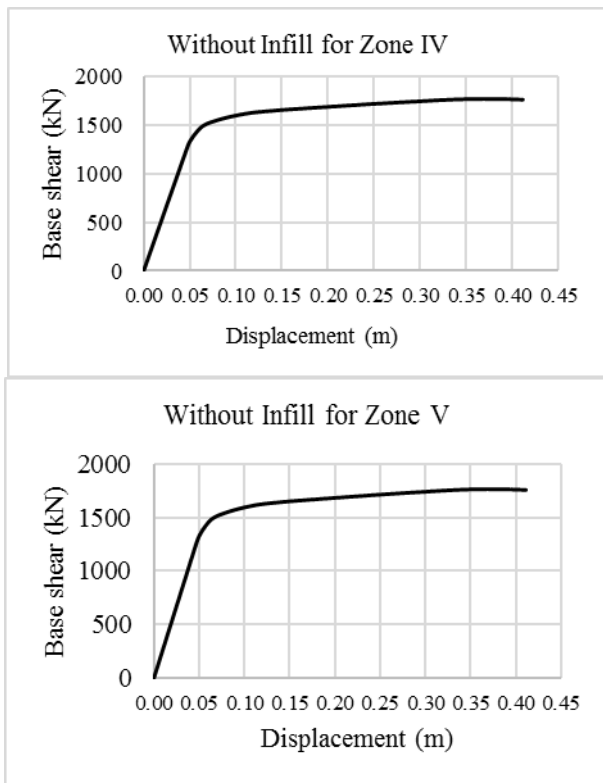


Fig.5 - Pushover Curve without infills for different zones

Pushover analysis with Infills

In the case of an infill wall located in a lateral load resisting frame the stiffness and strength contribution of the infill are considered by modeling the infill as an equivalent compression strut. Infill parameters (effective width, elastic modulus and strength) are calculated using the method recommended by Smith [5]. The length of the strut is given by the diagonal distance d of the panel (Figur1c) and its thickness is given by the thickness of the infill wall. The estimation of width w of the strut is given below. The initial elastic modulus of the strut Ei is equated to Em the elastic modulus of masonry. As per UBC (1997), Em is given as $750fm$, where fm is the compressive stress of masonry in Map. The effective width was found to depend on the relative stiffness of the infill to the frame, the magnitude of the diagonal load and the aspect ratio of the unfilled panel.

The relative stiffness of the infill to the frame is expressed in terms of a parameter

$$\lambda = \sqrt[4]{\frac{E_i t \sin 2\theta}{4 E_c I_c h'}}$$

Here, Ei is initial elastic modulus of the infill material, E is elastic modulus of the concrete in column, h' is height of column between centerlines of beams, h' is clear height of infill wall, Ic is moment of inertia of each column, l is length of beam between centerlines of columns, t is thickness of infill wall, and $\theta = \tan^{-1}(h/l)$ is the slope of the infill diagonal to the horizontal.

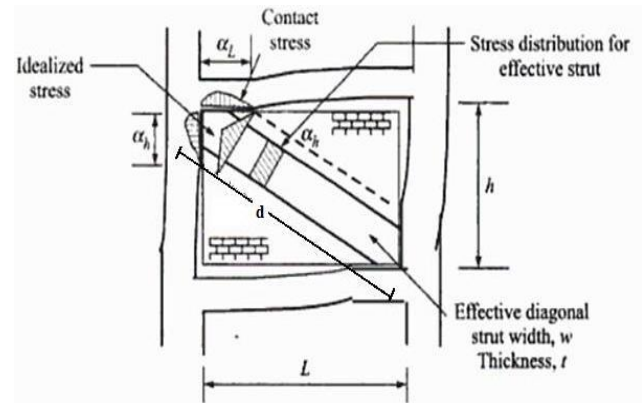
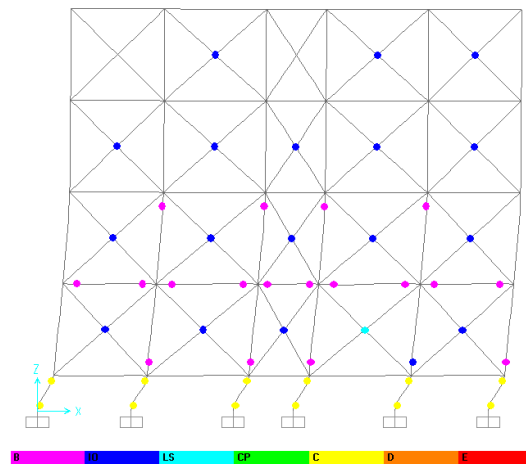


Fig. 6 - Equivalent diagonal strut



IV. CONCLUSION

Open ground storey is detrimental during base excitation, as stiffness at the bottom storey reduces and the hinge formation occurs directly on the bottom storey column which leads to global failure of the structure. The infill walls at the suitable location on the ground may avoid the complete collapse of the structure. The modeling of infill as a diagonal strut is

best suited to simulate the stiffness of the infill walls. The responses are found to increase with the zones

V. REFERENCES

- [1] Dya A. F. C. and Oretaa A. W. C. (2015). "Seismic vulnerability assessment of soft story irregular buildings using pushover analysis", *Procedia Engineering*, 125, 925 – 932.
- [2] Wibowo A., Wilson J. L., Lam N. TK and E. F Gad (2015). "Collapse behaviour assessment of precast soft storey building", *Procedia Engineering*, 125, 1036 – 1042.
- [3] Jennings E., Lindt J. W., Ziaei E., Mochizuki G., Pang W. and Shao X. (2014). "Retrofit of a soft-story woodframe building using SMA devices with full-scale hybrid test verification", *Engineering Structures*, 80, 469–485.
- [4] Sahoo D. R. and Rai D. C. (2013). "Design and evaluation of seismic strengthening techniques for reinforced concrete frames with soft ground story", *Engineering Structures*, 56, 1933–1944.
- [5] Kirac N., Dogan M. and Ozbasaran H. (2011). "Failure of weak-storey during earthquakes", *Engineering Failure Analysis*, 18, 572–581.
- [6] Hejazi F., Jilani S., Noorzaei J., Chieng C. Y., Jaafar M. S. and Abang Ali A. A. (2011). "Effect of Soft Story on Structural Response of High Rise Buildings", *Materials Science and Engineering*, 17, 1 – 13.
- [7] Sarkar P., Prasad A. M., Menon D. (2010). "Vertical geometric irregularity in stepped building frames", *Engineering Structures*, 32, 2175 – 2182.
- [8] Wibowo A., Wilson J. L., Lam N. TK and E. F Gad (2010). "Collapse modelling analysis of a precast soft storey building in Australia", *Engineering Structures* 32, 1925 – 1936.
- [9] Athanassiadou C.J. (2008). "Seismic performance of R/C plane frames irregular in elevation", *Engineering Structures*, 30, 1250–1261.
- [10] Lee H. S. and Ko D.W. (2007). "Seismic response characteristics of high-rise RC wall buildings having different irregularities in lower stories", *Engineering Structures*, 29, 3149–3167.
- [11] Yoshimura M. (1997). "Nonlinear Analysis of a Reinforced Concrete Building with a Soft First Story Collapsed by the 1995 Hyogoken-Nanbu Earthquake", *Cement and Concrete Composites* 19, 213-221.

An Investigation on Bacterial Concrete

Shreya Gadhave, Pritam Dandekar, Harshal Pawankar, Atul Kurzekar

Civil Engineering Department, Yashwantrao Chavan College of Engineering, Nagpur, Maharashtra, India

ABSTRACT

Cracking in concrete is the main concern throughout the structures because it causes loss of strength with time. Hence a special type of environmental free solution is to be made for maintenance purpose. Therefore a bacterial concrete is prepared. However, the drawback of this material is that it easily cracks due to its low tensile strength, & due to temperature expansion, contraction, whereas the creep & shrinkage also produce cracks. While bigger cracks deteriorate structural integrity, also hair-line cracks may result in durability problem. In this study we will discuss about the self-healing process of concrete is process by which the cracks obtained in the body of concrete get repaired by itself or it required some external help to complete self healing activity. The bacterial species called *Bacillus subtilis* for increasing the strength of concrete and decreasing the porosity at 28 Days. Though these species are eco-friendly and does not cause any harm to human and use for improving the resistance of concrete when exposed to alkaline, sulfate and freeze-thaw environments. This paper mainly comprises of activation of bacteria and focuses on strength of bacteria concrete with normal concrete and also filling of cracks.

Keywords: Bacterial Concrete, *Bacillus Subtilis*, Self Healing, Compressive Strength.

I. INTRODUCTION

Cracks often occur in concrete because of low compressive strength and flexural strength after application of load on a structure. Water or aggressive material may seek in the concrete through cracks. Inspecting and then repairing these cracks are time consuming and costly. So we have come up with a new concept of crack healing concrete by releasing healing agents inside the concrete when cracks appear. Ghosh et.al. investigated seven different bacterial concentration of shewanella species (10^{-10} - 10^7 cells/ml) and obtained optimal bacterial concentration to be 10^5 cells/ml with corresponding 25% increase in compressive strength. In these research paper, We have discussed an environmental friendly self-healing concrete technique.

In previous research carried out, *Bacillus sphauricus* bacteria were used to precipitate calcium carbonate. In this, the bacterial cell get coated with a layer of calcium carbonate the aim of our research work is to use CaCO_3 precipitated by the *Bacillus subtilis* to heal the crack in concrete.

Cracks often occur in concrete because of the low tensile strength of this material. Rapid crack healing is necessary since it is easier for aggressive substances to ingress into concrete through cracks than through the concrete matrix. It is known that it is costly to inspect, monitored repair cracks. Moreover, some of the repair methods currently used is not so sustainable [Neville 1996].

Therefore, it would be desirable if concrete cracks could be healed autonomously by releasing healing agents inside the matrix when cracks appear. In this

study, an eco-friendly and self-healing crack repair technique is explored. Previous research has shown that *Bacillus sphaericus* bacteria are able to precipitate calcium carbonate (CaCO_3) on their cell constituents and in their micro-environment by conversion of urea ($\text{CO}(\text{NH}_2)_2$) into ammonium (NH_4^+) and carbonate (CO_3^{2-}). The bacteria locally increases the pH and promotes the precipitation of calcium carbonate in a calcium rich environment. Through this process, the bacterial cell is coated with a layer of calcium carbonate. The aim of our study is to use this bio-precipitated CaCO_3 to heal cracks in concrete. A calculation showed that precipitation of CaCO_3 is not enough to fill wide concrete cracks completely. So its solution is to restrict the wide expansion of the crack i.e. by using *Bacillus subtilis* to heal cracks in concrete.

1.1 Advantages

Microbial concrete in crack remediation:- Specimens were filled with bacteria, nutrients & sand. Significant increase in compressive strength & stiffness values as compared to those without cells was demonstrated. Better resistance towards freeze-thaw attack reduction:-Application of microbial calcite may help in resistance towards freeze-thaw reduction due to bacterial chemical process and also it can reduce the permeability than freezing process decreased.

Reduction in permeability of concrete:-Effect of microbial concrete on penetration properties was studied by different researchers. Permeability can be investigated due to surface treatment result in an increased resistance towards carbonation and chloride ingress. Carbonation is related to the nature and connectivity of the porous giving rise to higher carbonation depths.

Reduction in corrosion of reinforced concrete: Application of microbial calcite may help in sealing the path ingress and improve the life of reinforced concrete structure.

1.2 Objectives

Primary objective of Bacterial Concrete is healing of developed cracks. Secondary or long term objective is to check the self healing ability of concrete. Comparing the Compressive Strength of Bacterial Concrete with Normal Concrete.

II. METHODS AND MATERIAL

2.1. Activation of Bacteria

2.1.1. For Nutrient Broth

Initially pro-biotics like Curd, Sporolac and Soil were used as sample for testing. Nutrient Broth was taken as per proportion in the conical flask with air tight cotton plug was placed in autoclave at 120°C for 15psi. The surrounding was made free from microbes by spreading spirit and lighting candles in the working area in sterile condition. Further the dilution process was carried out in the same sterile condition. Conical Flask were kept in incubator at 37°C for 24-48hrs.



Figure 1. Sterilised chamber

2.1.2. For Nutrient Agar

Autoclave suspension at 120°C at 15psi for sterilizing medium and melting agar. Pour Molten agar into petri dish under sterile condition. Add 2-3 drops of pro-biotics like Curd, Sporolac and Soil were used as sample for testing. Petri dish were kept in incubator at 37°C for 24hrs.

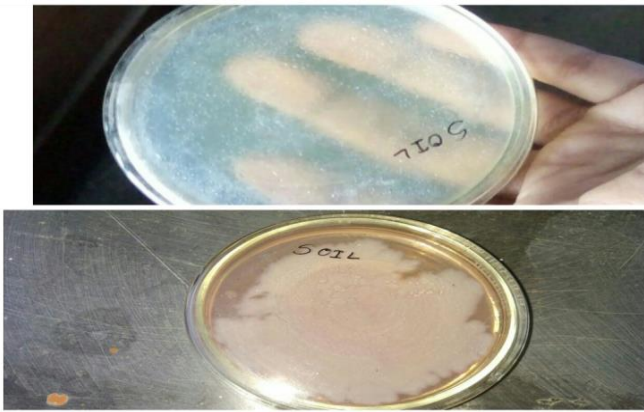


Figure 2. Activated bacteria in nutrient agar



Figure 4. Bacterial solution in conical flask

2.2. Mix and proportion

2.2.1. For Normal Concrete

Mix Proportion for grade M30

Cement :Fine Aggregate :Coarse Aggregate :Water

1 : 1.6 : 2.9 : 0.46

2.2.2. For Bacterial Concrete

Mix proportion is same as normal concrete. The 17% water quantity is replaced by bacterial culture solution.

3.0 RESULTS AND DISCUSSION

3.1. Microscopic Result

The activation of bacterial concrete was done successfully as it emits green colour in chromophore agar and appears pink colour in microscope shown in figure 3

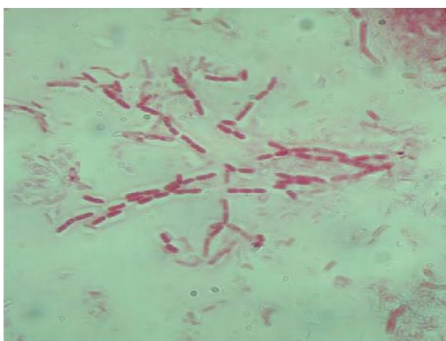


Figure 3. Microscopic view

3.2. After Activation

The cloudy appearance has also been observed in the culture which shows the presence of Bacillus subtilis in the nutrient broth shown in fig.4.

3.3. The results of compressive strength

3.3.1. For 7days:-

Table 1. Compressive Strength of 7 days

Type of concrete	Cube 1	Cube 2	Cube 3	Average (KN/m ²)
Normal concrete (KN/m ²)	18.5	18	17.8	18.1
Bacterial concrete (KN/m ²)	22	23.11	24.08	23.06

3.3.2. For 14 days:-

Table 2. Compressive Strength of 14 days

Type of concrete	Cube 1	Cube 2	Cube 3	Average (KN/m ²)
Normal concrete (KN/m ²)	24	25.33	24.8	24.71
Bacterial concrete (KN/m ²)	32	31.48	29.2	30.89

3.3.2. For 28 days:-

Table 3. Compressive strength of 28 days

Type of concrete	Cube 1	Cube 2	Cube 3	Average (KN/m ²)
Normal concrete (KN/m ²)	31.11	30.45	29.77	30.44

Bacterial concrete (KN/m ²)	34.22	35.1	33.56	34.29
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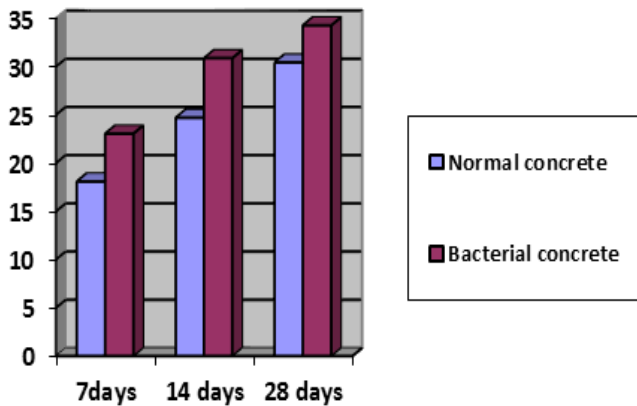


Figure 5. Graphical representation of compressive strength

From above result we can conclude that the Compressive strength of Bacterial Concrete have been increased by 26% as compared to Normal Concrete.

III. CONCLUSION

The Self healing is done by Bacteria by precipitating calcite in cracks in concrete. The activation of bacteria was also done successfully. The species of *Bacillus Subtilis* was extracted from soil sample. The compressive strength of Bacterial Concrete was successively increased as compared to Normal Concrete.

IV. REFERENCES

[1]. De Muynck, W., Cox, K., De Belie, N., and Verstraete, W. (2008) Bacterial carbonate precipitation as an alternative surface treatment for concrete. *Constr Build Mater* 22: 875-885.

[2]. De Muynck, W., De Belie, N., and Verstraete, W.(2010) Microbial carbonate precipitation in construction material: A review. *Ecol Eng* 36:118-361

[3]. Van Tittelboom, K., De Belie, N., De Muynck, W.,and Verstraete, W (2010) Use of bacteria to repair cracks in concrete. *Cement Concrete Res* 40: 157166.

[4]. Jonkers, H.M. (2007) Self healing concrete: a biological approach. In *Self healing materials - An alternative approach to 20 centuries of materials science* (ed. S. van der Zwaag), pp. 195–204. Springer, the Netherlands.

[5]. Jonkers, H.M., and Schlangen, E. (2008) Development of a bacteria-based self healing concrete. In *Tailor made concrete structures - new solutions for our society*. Proc. Int. FIB symposium (ed. J. C. Walraven & D. Stoelhorst), pp. 425-430. Amsterdam, the Netherlands.

[6]. Jonkers, H.M., Thijssen, A., Muyzer, G., Copuroglu, O., and Schlangen, E. (2010) Application of bacteria as self-healing agent for the development of sustainable concrete. *Ecological Engineering* 36(2): 230-235

[7]. Neville, A.M. (1996) *Properties of concrete* (4th edition). Pearson Higher Education, Prentice Hall, New Jersey.

[8]. Neville, A.M. (2002) Autogenous healing - A concrete miracle? *Concrete Int* 24(11):76-82

[9]. Edvardsen, C. (1999) Water permeability and autogenous healing of cracks in concrete. *ACI Materials Journal* 96(4): 448-454.

[10]. Reinhardt, H.W., and Jooss, M. (2003) Permeability and selfhealing of cracked concrete as a function of temperature and crack width. *Cement and Concrete Res* 33:981985.

[11]. Li, V.C., and Yang, E. (2007) Self healing in concrete materials. In *Self healing materials - An alternative approach to 20 centuries of materials science* (ed. S. van der Zwaag), pp. 161– 194. Springer, the Netherlands.

[12]. Polystyrene mould. 2011 (accessed June 3, 2016 URL: <http://www.impacttest.co.uk/products/5289-3gang-prism-mould-polystyrene/>).

- [13]. Ftirsystem.2014(accessedJune7,2016)
URL:<http://www.labindiaanalytical.com/ftir.html>.
- [14]. Hobart mixer. 2011 (accessed June 3, 2016)
URL:<http://www.webstaurantstore.com/hobartlegacy-hl400-1-40-qtcommercial-planetary-floor-mixer-with-standard-accessories-240v-3phase-1-1-2hp/425HL4001STD.html>.
- [15]. Damian Arnold. Self healing concrete.INGENIA, 46, 2014.
- [16]. Andrew R. Barron. Chemical composition ofPortland cement. 2010.

Smart Controlling System

Arpit Dhok, Ritesh Ranjan, Vaibhav Pajai, Suraj Askar, Shashi Ranjan, Rutvik Choudhary, Abhishek Dhumal

Department of Electrical Engineering, YCCE, Nagpur, Maharashtra, India

ABSTRACT

Nowdays internet has been connecting people and making life simpler by providing all kinds of information with the click of a button. And advancement to that is IOT (internet of things) which will enable physical objects used in day to day life to connect to the internet and exchange data. In this paper a smart controlling system based on internet of things is developed. Which allows the user to automate all the connected devices and appliances. And integrate them to provide seamless control over its useful aspect. The designed system not only monitors the sensor data, but also actuates a process according to the requirement. For example adjustment of bulb brightness according to according to the surrounding.

Keywords : Arduino uno, ESP8266, Server, Load, Internet of things.

I. INTRODUCTION

Automation has become one of the eminently attractive areas that play an important role in day to day life. This controlling automation have various applications such as: Lighting control system, Appliance control and integration, Security, Leak and smoke detection, automation for the elderly and disabled etc.

This technology has endless possibilities and infinite applications. Everyday devices are made smart and intuitive and by enabling them to share data intelligently they can be used to improve peoples' lives. It can be used to provide better personal safety, monitor health, save time and make better use of our natural resources. IOT has made a huge impact in the way people live, work and communicate.

The emergence of new technologies and smart devices had made peoples' lives very comfortable and convenient. With the increasing demand for a high

standard of living, Smart home, which is one of the most popular applications of IoT is grabbing the spotlight on a global level.

In the proposed architecture we have tried to develop a smart controlling system that can perform similar operations to the existing products at significantly low cost. The system uses Wifi technology which is in built feature of a smart phone and provides a better wireless communication medium. An web page is developed to control the appliances and transmit the data over network.

II. EXISTING SYSTEM

Literature related to the research topic has been reviewed for last twenty years in order to find out work carried out by various researchers. There are many systems for remote monitoring and control designed as commercial products or experimental research platforms. It is noticed that most of the

research carried out belongs to the following categories

- 1) Internet based Monitoring using Servers, GPRS modems, etc. with different approaches.
- 2) GSM-SMS protocols using GSM module individually or in combination with Internet Technologies.
- 3) Wireless Monitoring using Bluetooth, Wi-Fi, Zigbee and RF.

III. PROBLEM IDENTIFICATION

WIRING CONNECTIONS: Connection of the devices is set through wires which reduces the speed in data transfer and also if there is any cut in the wires, it is difficult to identify for a longer connection.

SLOW COMMUNICATION: transfer of data is very slow in process and it takes time for performing any action.

CONNECTIVITY LIMITATIONS: connectivity methods like Bluetooth, radio frequency and zig-bee has a bit short range for the connection to be enabled.

SLOW PROCESS: only a single board is used in connecting all the devices which makes it slower in terms of processing the data and also only one process could run at a time.

IV. PROPOSED MODEL

a) The proposed system is based on the interconnection between Wi-Fi modules in which the client wifi modules will be connected to the station wifi module which will be giving commands through the smart phone which is connected to the same as an external device, will have priority in giving instructions and extracting work over them, works in master-slave principle.

b) There will not be any relay connections between the devices which helps in reducing the time required in data transfer and losing of data.

c) There will be a continuous monitoring of data that is being transferred and also generating a log out of it.

d) webpage is being developed for a user friendly interaction between the user and the devices.

e) The whole system is wireless, so there won't be any loss in data at maximum and also there won't be any problem due to wiring.

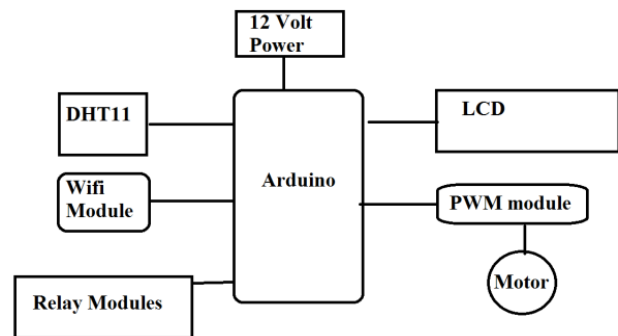


Figure 1. Architecture of proposed system

V. IMPLEMENTATION SETUP

This model implementation require following components :-

1)Arduino Nano-

The Arduino Nano is a small, complete, and breadboard-friendly board based on the ATmega328P (Arduino Nano 3.x). It has more or less the same functionality of the Arduino Duemilanove, but in a different package. It lacks only a DC power jack, and works with a Mini-B USB cable instead of a standard one.

2)DHT11-

The component is 4-pin single row pin package. The single-wire serial interfa cemakes system . Integration quick and easy. DHT11's power supply is 3-5.5V DC. 1 capacitor valued up to 100nF can be added between VDD and GND for power filtering.

3)Wifi Module(ESP8266)-

ESP8266 is a self contained SoC with integrated TCP/IP stack which helps any microcontroller having UART to access a wifi network. It can act as both WiFi access point as well as a WiFi client. It is pre-programmed with AT commands, so we can easily

access and configure it using a microcontroller.ESP8266 runs on 3.3V

4) PWM Module -

Is a technique of reducing the typical power delivered by associate electrical signal, by effectively chopping it up into separate elements.

5) LCD 16*2 -

16x2 LCD is named so because; it has 16 Columns and 2 Rows.Here LCD is use to show the temperature, humidity and switching configuration(0,1)

6) Relay (JQC-3FC(T73))- 5 volt working voltage, COM , NO, NC connection.

Max switching current-10 amp

Operating time <=10ms.

Rated load – 10A 250VAC/5V DC

Dielectric strength >= 1000 VAC

Generally Available in already install on pcb.

7)LDR

It is basically a photocell that works on the principle of photoconductivity. The passive element is largely a resistance whose resistance worth decreases once the intensity of light-weight decreases.

i.)Design and implementation of the Temperature Control device, Light intensity control device and Access point device with the use of Wi-Fi module for interconnection. PWM technique is use for speed control of motor.

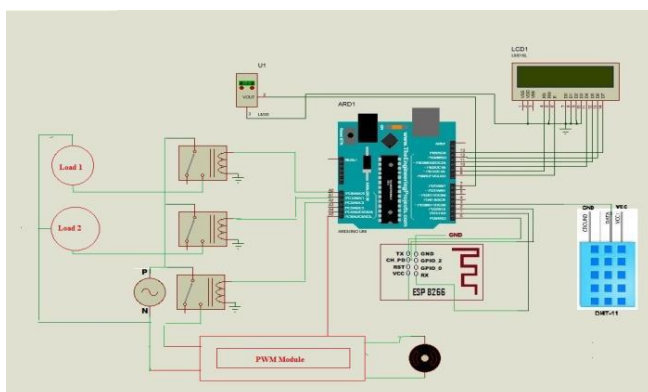


Figure 2. Circuit Diagram

ii. AT commands are use in the Wi-Fi module ESP8266 and modify it as an access point for one Device.

iii. For the rest of the Device, modifying the module ESP8266 as node for both transferring and Receiving the data.

iv. Developing a webpage that is suitable for the android device which will be able to control the Devices by connecting it to the access point Device and giving away the command for the operation to be performed.

Explanation

In the hardware implementation of the system, we are using ESP8266 as the main microcontroller coupled with Arduino. ESP8266 comes 128k bytes memory and 4MB of storage. Relays act as a medium between the microcontroller and appliances for their automation. The code is long but easy to understand . First of all will initialize the software u art with the digital pins 3 & 2 of Arduino for the communication purpose with ESP8266. After that we are going to initialize pins to which are connect to relays as output pins. Then we configure ESP8266 in the access point mode .

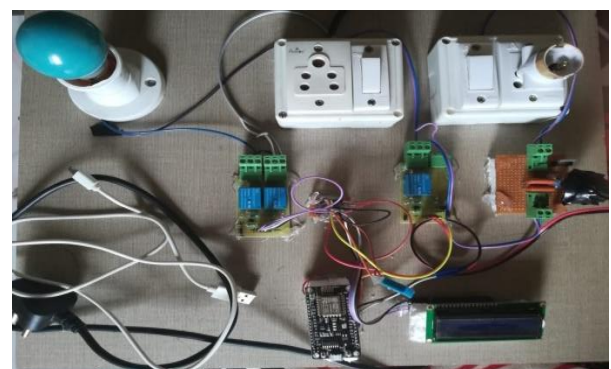


Figure 3. Experimental setup

Arduino + ESP8266 is programmed as a web server such that we can control those relays through a web browser. The appliances are turned ON and OFF.



Figure 4 : GUI in android devices to control esp8266

VI. CONCLUSION

This system will bring more convenience and comfort to people's life. The android-based smart home application communicates with the Wi-Fi module ESP8266 which acts as an access point. Using webpage user could control and monitor the smart home environment. Arduino provides an economic and efficient platform to implement the smart home automation system. This system can be used to communicate with many numbers of users. It lowers the wastage of electricity ,consumes less time, also it helps the old aged and disabled people in doing the basic domestic works on their own.

VII. REFERENCES

- [1]. Sirsath N. S, Dhole P. S, Mohire N. P, Naik S. C & Ratnaparkhi N.S Department of Computer Engineering, 44, Vidyanagari, Parvati, Pune-411009, India University of Pune, "Home Automation using Cloud Network and Mobile Devices"
- [2]. Deepali Javale, Mohd. Mohsin, Shreerang Nandanwar "Home Automation and Security System Using Android ADK" in International Journal of Electronics Communication and

Computer Technology (IJECCCT) Volume 3 Issue 2 (March 2013)

- [3]. Charith Perera, Student Member, IEEE, Arkady Zaslavsky, Member, IEEE, Peter Christen, and Dimitrios Georgakopoulos, Member, IEEE "Context Aware Computing for The Internet of Things: A Survey". IEEE COMMUNICATIONS SURVEYS & TUTORIAL
- [4]. Charith Perera_y, Arkady Zaslavskyy, Peter Christen_ and Dimitrios Georgakopoulosy Research School of Computer Science, The Australian National University, Canberra, ACT 0200, Australia yCSIRO ICT Center, Canberra, ACT 2601, Australia " CA4IOT: Context Awareness for Internet of Things"
- [5]. Bill N. Schilit, Norman Adams, and Roy Want, "Context-Aware Computing Applications"
- [6]. Jayavardhana Gubbi, ,Rajkumar Buyya, Slaven Marusic,a Marimuthu Palaniswamia, "Internet of Things (IoT): A Vision, Architectural Elements, and Future Directions"

Android Based PC Controller

Prof. Preetee K. Karmore

Assistant Professor, Department of Computer Science and Engineering, Dr. Babasaheb Ambedkar College of Engineering and Research, Nagpur, Maharashtra, India

ABSTRACT

Conventionally, the computer system has a monitor, CPU, keyboard, and mouse. For performing some activity on the computer such as typing a word document, opening some file or doing any operation on a computer, we need to sit in front of a computer with hardware devices such as keyboard and mouse. Also, if we are giving any presentation in the conference and if the presenter standing at some place away from keyboard and mouse and wants to open some other file then he has to come in front and then open other file using a mouse. Moreover, sitting in front of a computer for hours, one suffers from eye problems as well as other health issues. So, to overcome these problems an android app is developed. . Using this app user can control the PC within the Wi-Fi range. Wi-Fi connection is required between computer and android device so that user can access the computer remotely instead of sitting beside it.

Keywords : Wireless keyboard, Wireless mouse, WIFI Connection, Android device

I. INTRODUCTION

There exist several situations where we want to wirelessly and comfortably operate a computer, where the computer screen is projected onto a big screen through a projector or big-screen television, such as classrooms, conference/meeting rooms, mobile, workgroup project environments and modern office environments, and even living rooms. Several specifically designed devices are available in the market for the purpose of operating computers remotely and wirelessly. Wireless keyboard, uses either Bluetooth or wireless USB mini-receiver plugged into the USB port of computer for the communication between the keyboard and the computer. Some wireless keyboards have a touchpad for controlling the mouse cursor. Wireless presentation controller, allows user to operate his/her computer remotely for presentation through Bluetooth connection.

However, all those devices have certain drawbacks. Wireless keyboard has limited flexibility and is not convenient for a presenter to carry it around in the room during the presentation. Presenters usually like to walk around while presenting. Carrying a wireless keyboard is definitely not convenient. Wireless presentation controller does have good mobility. However, most of such devices do not allow user to have full operation on the computer, such as running a program, moving or closing an application window, etc. Even it has a small touchpad for moving mouse cursor, however it is very difficult for the presenter to use it to move the mouse cursor while he/she is walking around. The widely used and very popular smart devices, such as iPads, smart phones, PDAs, and smart game controllers, can be the excellent alternatives as computer remote controllers if we develop appropriate apps for them. This motivated to develop an app for most popular mobile OS android to control action on PC.

The traditional computer system has a wired keyboard and mouse. It becomes difficult to access the system remotely. So to overcome this problem we have designed an android app that allows to control the PC remotely within the Wi-Fi range by providing virtual mouse, keyboard. It also provide function to send and receive data from phone and laptop, to transfer android files to desktop and vice versa, to play media player on laptop and to view gallery controlled by android and to implement live screen.

I. Implementation details

Proposed work is divided into three parts-

1. Android(Client Side): Android part of proposed work has been developed in Android Studio.
2. Desktop(Server Side): Desktop part of proposed work has been developed in Netbeans.
3. Libraries: Library (jar file) used by both android as well as desktop part. It has been developed in Netbeans.

Libraries: Library (jar file) used by both android as well as desktop part. It has been developed in Netbeans.

TCP two way handshaking has been used for establishing a connection. As TCP provides connection oriented, reliable and secured service and provides acknowledgement of delivered packets. First client port send a request to the server port for connection. Server port receives request from client means server is in listening mode and the flag means that the connection is opened. Connection is identified by 4 values IP of your host, port of your host, IP of the remote host, port of the remote host. At this moment, where the 3 way handshake is done, the first program gets the client socket from the server socket is returned. As soon as you get connected to the remote program, the remote program gets the client socket just like your local program through which all communication is done.

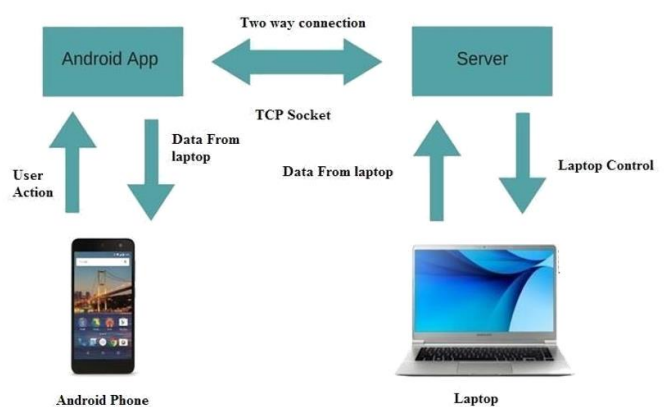


Fig 1 : Working Model of Wireless Controller using Android

1. How to Connect

- A. Start hotspot on phone and connect your laptop via Wi-Fi.
- B. Open the desktop app on your laptop.
- C. Open Android app and enter connection details provided by desktop app to connect.

2. App Dependencies

- A. User must have JRE 8 installed
- B. Only Android mobiles are supported
- C. Working Wi-Fi/hotspot is necessary

II. MODULES

1. Server side

Firstly, connect laptop to a common network through hotspot. Run the desktop application. After running the desktop application IP address and port number will be generated which will be used to establish connection between android mobile and desktop. The IP address is generated dynamically by using Dynamic Host Configuration Protocol (DHCP). The port number is basically defined as 3000 port number and if the port number 3000 is not available then it will go on incrementing the port number till it finds the free port. We have incremented the port and not decremented because the port number 0-1024 are used for standard services such as HTTP. For this we have first opened the server socket. While implementing a server we also need to create a socket

object from the ServerSocket in order to listen for and accept connections from clients(android phone).

2. Client side

For establishing the connection we need to use the protocol such as TCP or UDP. In proposed work we have used TCP. TCP is a connection-oriented protocol. In order to do communication over the TCP protocol, a connection must first be established between the pair of sockets. While one of the sockets listens for a connection request (server), the other asks for a connection (client). Once two sockets have been connected, they can be used to transmit data in both (or either one of the) directions. First, we have open a socket.

3. Touchpad and Keyboard

Touchpad and Keyboard will perform their normal task. For implementing the virtual mouse and QWERTY keyboard we have used Robot class in JAVA. Robot class contain methods such as mousePress(), mouseRelease(), doubleClick(), mouseMove(), keyPress(), keyRelease().

4. File Transfer

We can share the file on mobile to laptop. The file will be stored in C:\Users\Admin\RemoteControlPC For implementing this we have created a receiveFile function which has file name, file size and the object of the ouputInputStream class. Object of the outputInputStream class because the file is to transferred from client to server .i.e. server is in listening mode. It first fetch the home directory using the function getHomeDirectoryPath() which returns the path of the file which is to be transferred from mobile to laptop. The file is transferred in the form of packets using TCP. The file is saved at the above specified path.

5. File Download

We can download the files from the host computer to our android mobile. For implementing this we have created a sendFile function which has path and the object of the outputStream class. Path is the location where the file is to stored and Object of the DataOutput Stream class because the file is to transferred from server to client. Then it sends the size of the file first and then file is transferred in the form of packets using TCP.

6. Image Viewer

We can view the images of our mobile on the laptop. For implemeting this we have used Image View node that is used for painting images loaded with Image class. We have created a showImage method which has name and path as a parameter.

7. Media Player

The mobile songs can be played on laptop. It will shown the list of item of your mobile phone. You can send the file by clicking on it.Music control which shows the progree of song and same with that we provide the functionality for volume, increasing and decreasing as per user requirement and providing one pause button for pause the song and resume the song.

8. Power

Power provides many options such as shut down, restart, suspend and sleep. For implementing this we have used exec() method of JAVA Runtime class. Firstly, we get the name of the operating system by using the getProperty() function of JAVA. This function returns the name of the OS.

9. Live Screen

The monitor screen can be seen in android phone. It shows the running screen in android phone. We can access and perform any operation by just using android phone. For implementing this we have used the Robot class in Java. Robot class has method such as createScreenCapture which creates an image containing pixel read from the screen. In simple

words, this function returns the screenshot of every instance. This screenshot is send in the form of packets using TCP. In this way we get the live screen. For adjusting it to the size of mobile window we have used the `getScreenSize()` of the Toolkit class in Java.

III. RESULT AND DISCUSSION

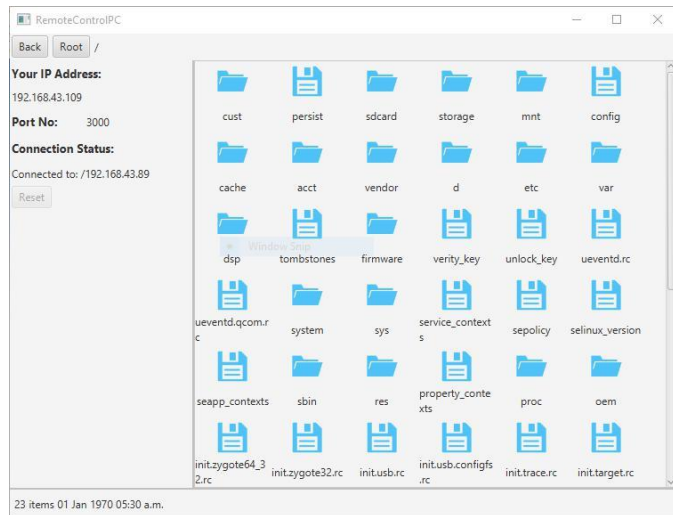


Fig 4.1 Server Side Running on Desktop

The figure 4.1 shows the server side window running on the desktop which will show the IP address of the PC and the port number. This IP address and port number will be used for establishing the connection between the android phone and the desktop.

The fig 4.2. shows the Connect screen on android. Here, we have to enter the IP address and the port number generated by the PC. After entering the correct IP address and the port number the connection will be established between the PC and the android mobile.

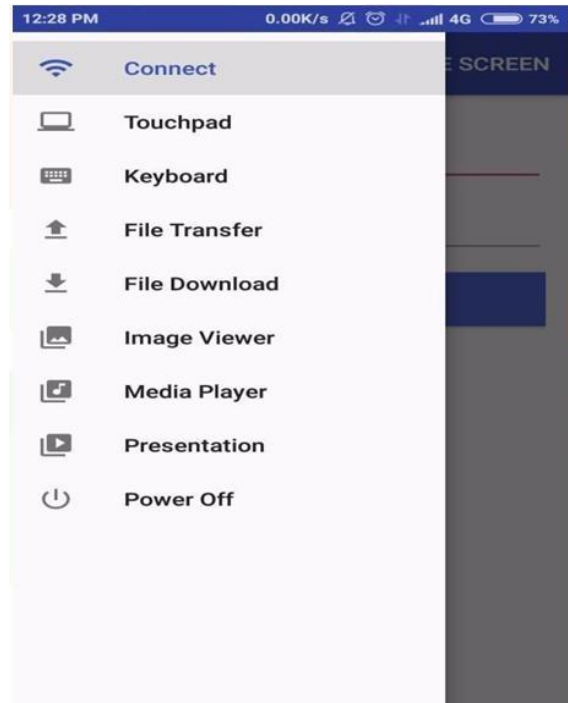


Fig 4.3. Navigation(Android)

The figure 4.3 shows the list of various options provided in app.

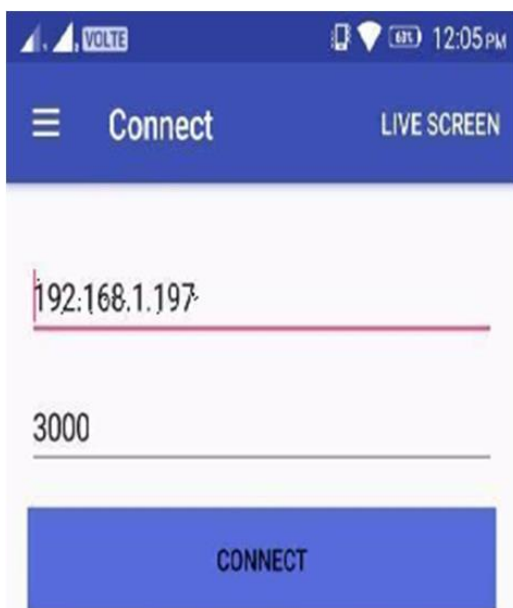


Fig 4.2. Connect Screen On android

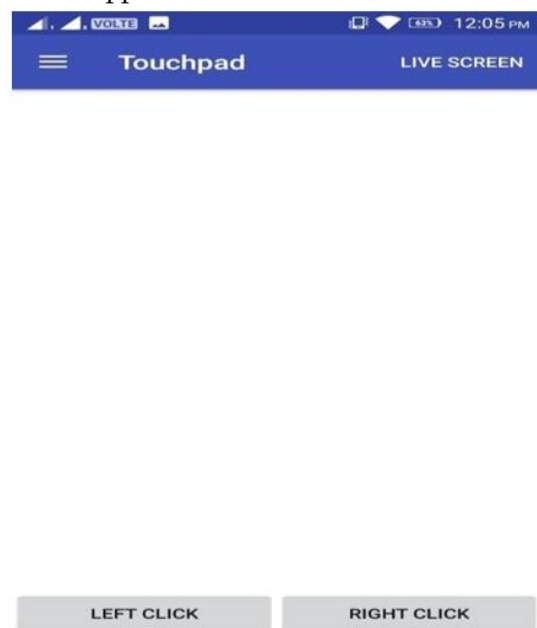


Fig 4.4. touchpad to control mouse

Touchpad acts like virtual mouse. the cursor will be moved by dragging the fingers on the screen. the double click is implemented as two left clicks.



Fig 4.5. Keyboard Screen

The fig 4.5 is of virtual keyword which contains the QWERTY keyboard and buttons such as Control, Alter, Tab etc.

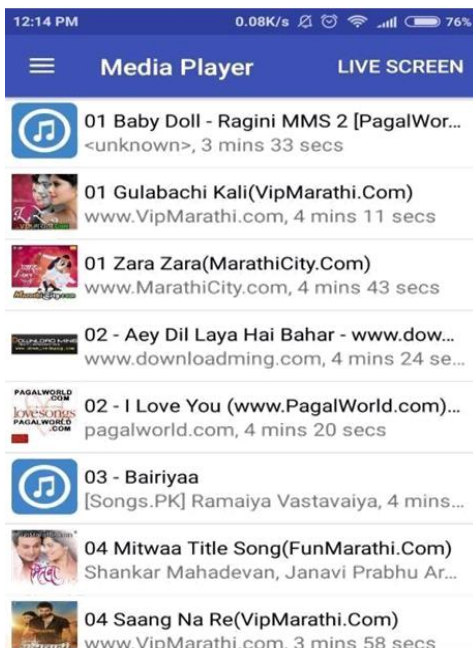


Fig 4.6. Media Player Screen

Interacting mobile phone and laptop, when you want to paly the music, it shows the list of music of your phone .By just clicking on it, it directly sends that song to the server (laptop) and play that particular music.

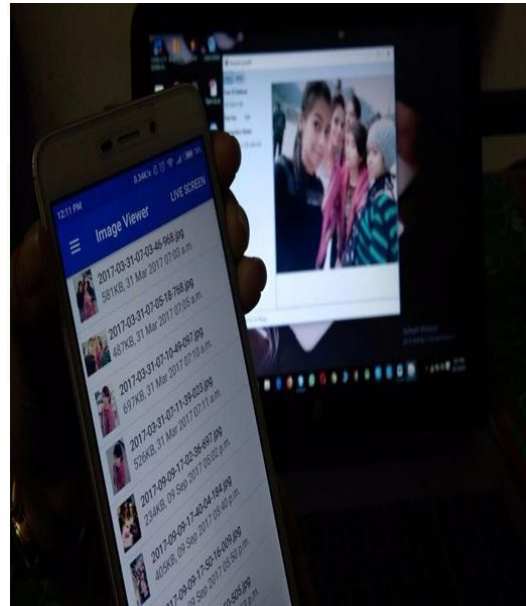


Fig 4.7. Image Viewer Screen

Using the Image Viewer, the user will be able to see the images which are in mobile on the laptop.

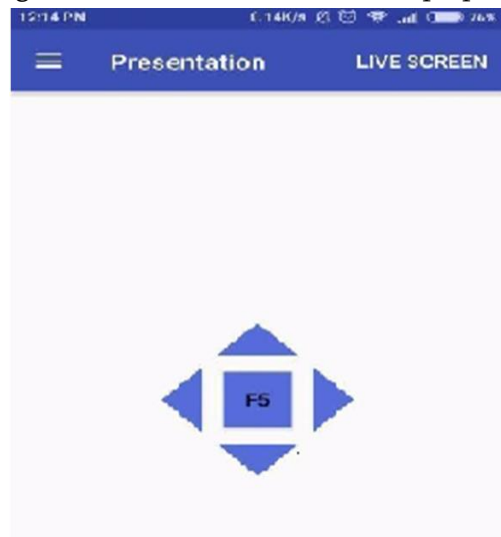


Fig 4.8. Presentation Control

Using Presentation control, the user can move slides using the arrow keys provides and F5 is for slide show.

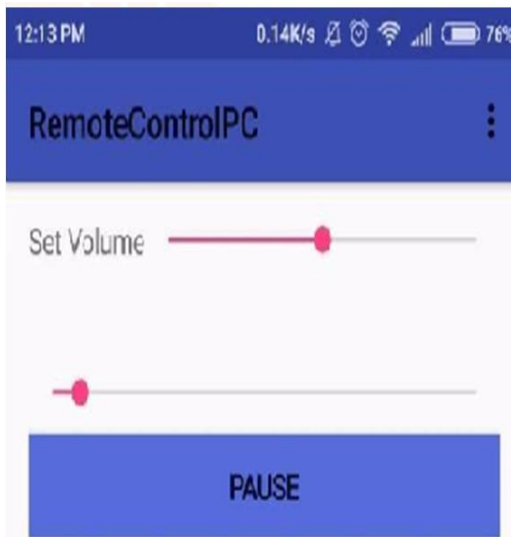


Fig 4.9. Music control screen

With the media player you can see music control screen, where it provides set volume, which is used to increase or decrease the volume, next is progress of song, and the third is pause button to stop the song or we can resume the song from the same button.

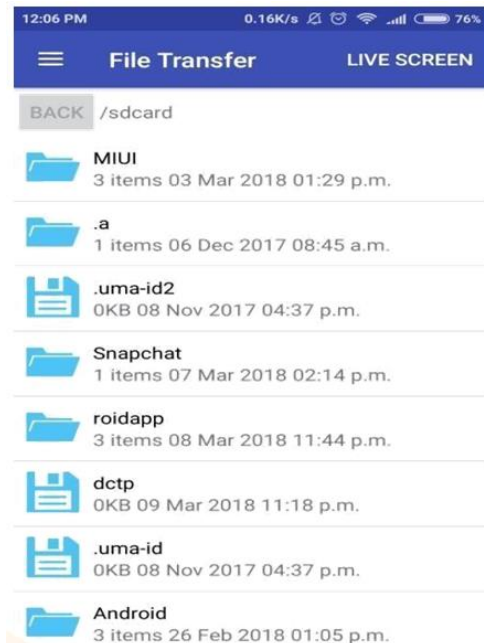


Fig 4.10. File Transfer Screen

Using File Transfer, the user can transfer the files from mobile to PC.

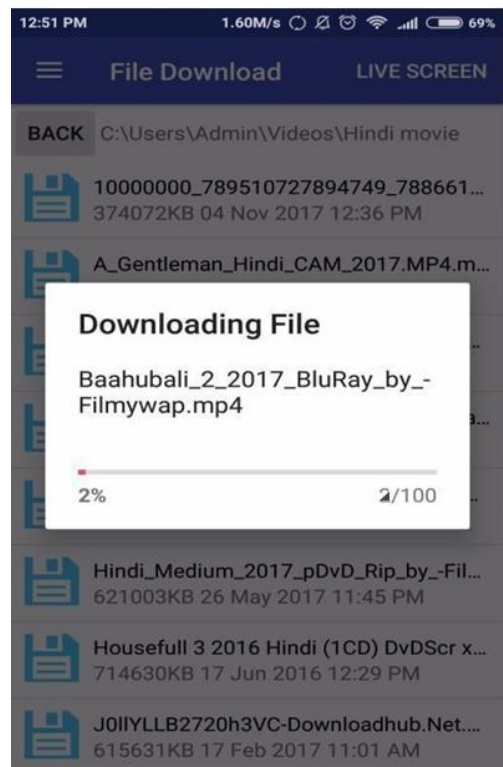


Fig 4.11. File download screen

Using File Download, The User Can Download The Files From PC Onto Android Mobile. User Can Download The File Of Any Format.

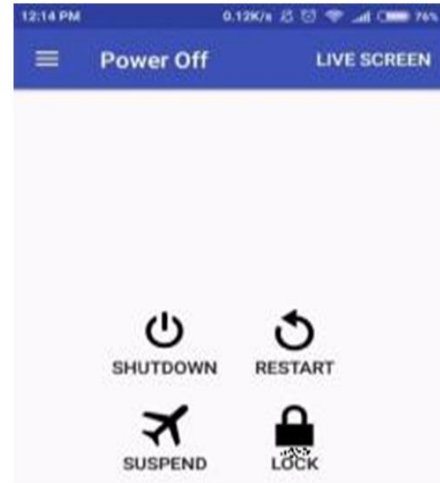


Fig 4.12. Power off Screen

Power off screen contains control such as Shutdown clicking on which will shut down the PC. Similarly, Restart, suspend and lock options are provided.

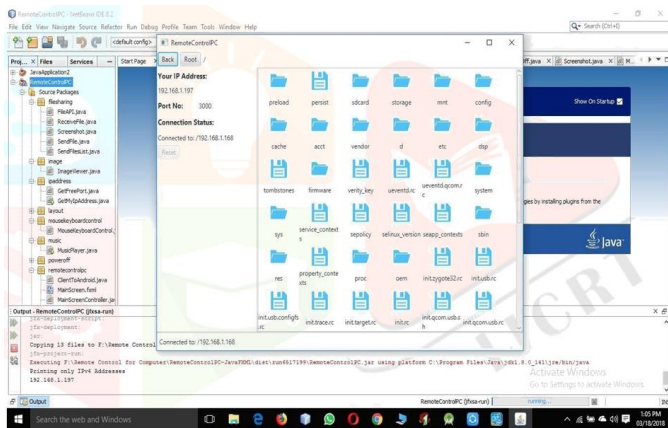


Fig 4.13. Live Screen

Live screen is used to bring the server screen to the mobile for that we are using GetScreenCapture(). It uses the scaling factor for managing the image screen to small screen. By using the live screen we can directly use the file, folders and perform the operation directly.

IV. CONCLUSION

This report describes how to turn smart devices, more specifically smartphones, into computer remote controllers. As we know our traditional computer system are not easy to handle. If we want do any work on computer then, we need to carry the hardware all time. But using this app we provide the functionality where user can easily handle the system from remote place and can perform several operation by connecting to Wi-Fi without any barrier. It provide flexibility to control the PC remotely through this app. For that we have provided the touchpad which is a replacement of mouse and control the pointer . QWERTY keyboard is provided. File transfer and file downloading the file from android phone and laptop respectively. Using media player we can directly send the music file to the system and the music is played on the system. Along with that we have provided presentation and poweroff, where presentation handles the presentation and poweroff for shut down, suspend, lock and restart functions are provided. And the main advantage is that using this app, we can bring running screen to our android phone using

GetScreenCapture() function. So, with the help of live screen we can directly see all the files and folders directly on our phone and can easily handle.

V. REFERENCES

- [1]. Suhashini Chaurasia, "Implementation of Remote Desktop Utility Using TeamViewer", IOSR Journal of Computer Engineering(IOSR-JCE), 2016.
- [2]. Dejan Chandra Gope, Md. Shafiqul Islam, "Interaction with Large Screen Display using Fingertip & Virtual Touch Screen", 1st International Conference on Computer & Information Engineering, 26-27 November, 2015
- [3]. Onkar Mule, Nihal Shaikh, Pratik Shinde, Amit Wagaskar, Prof. Sneha Ramteke, "Remote Access of Android Smart Phone", International Journal of Computer Science and Information Technologies, Vol. 7 (2) , 2016.
- [4]. Seung-Ju Jang, "Implementation of Remote Control and Management System in the Windows OS", IJCSNS, vol.12 No. 8, August 2012.
- [5]. Alexander Henzen, Percy Nohama, "Adaptable Virtual Keyboard and Mouse for People", IJCTT, July 2014.
- [6]. C.R. Dikovita#1, D.P. Abeysooriya, "Interaction with Large Screen Display using Fingertip & Virtual Touch Screen", 1st International Conference on Computer & Information Engineering, 26-27 November, 2015
- [7]. Miss. Mukta N. Patil, Mr. Sameer S. Joshi, Mr. S. M. Bagle, "Controlling PC Through mobile phone", International Journal of Engineering Sciences& Research Technology, April, 2015
- [8]. Mahesh Deshmukh, Damini Jawale, Shruti Joshi, Prof. P. S. Kulkarni, "Android Based Wireless PC Controller", International Journal of Computer Science and Information Technologies, Vol. 6 (1),2015.

- [9]. Alifiya Bhanpurawala , Dhananjay Kalbande , Aishwarya Venkatesh, Subhashree Chowdhury , “Screen Sharing Application for Mobile Phones”, International Conference on Technologies for Sustainable Development, February 2015.
- [10]. Jeel J Patel, “IP-Based Connection Between Mobile Phones”, International Conference on Computer Communication and Informatics (ICCCI -2014), Jan. 03 – 05, 2014.

IOT Based Garbage Monitoring System

Himanshu Gupta¹, Amit Chaturkar¹, Abhay Bagde¹, Hritik Raj¹, Ankur Hemane¹, Prof. Prerana Deshmukh²

¹BE Scholar, Department of Computer Technology, Priyadarshini College of Engineering, Nagpur, Maharashtra, India

²Assistant Professor, Department of Computer Technology, Priyadarshini College of Engineering, Nagpur, Maharashtra, India

ABSTRACT

Today, one of the difficulties of most urban communities and towns are going up against is the decrease in state of cleanness of nature with respect to the garbage the board. This happens because of the fumble of the garbage collection. This bungle makes the spread of garbage in network which thus makes undesirable condition in the quick zone. It likewise invigorates a few genuine illnesses among the general population in nearness and debases the magnificence of the territory. To maintain a strategic distance from fumble of the garbage and to improve the cleanness of the general public, Garbage observing framework is planned. In the proposed framework, the dimension of the garbage is identified with the assistance of ultrasonic sensor and sent to the approved office for garbage collection through GSM framework. Speaker utilizes PIR sensor to distinguish the movement of the general population going to the garbage canister with waste while the container is at full status and square adding of any more garbage to the receptacle through illuminating them. The GSM and the fringe sensors utilized are interfaced through the Arduino microcontroller. A GUI is likewise created to screen the ideal data identified with the garbage bins for various chose areas. Contingent upon the got messages through the GSM at control room it is shown on LCD and the approved individual advise the drivers to gather the garbage on schedule. This will competently screen the garbage collection to make nature shrewd, perfect and safe.

Keywords : Internet of Things, Smart Garbage Monitoring, Smart City, Microcontroller

I. INTRODUCTION

By 2030, right around two-third of the total population will live in urban areas. This reality requires the advancement of manageable answers for urban life, overseeing waste is a key issue for the wellbeing.

Proficient and vitality sparing waste administration, lessening CO₂, air contamination and vehicle exhaust emanations—these are only a couple of models for the requests of future urban areas. In perspectives on that, the effective utilize and mindful treatment of assets

become increasingly imperative. Successfully overseeing waste is imperative in created nations. Squander the executives may swallow upto half of a city's financial plan, yet just serve a little piece of the populace.

Here and there, upto 60% of waste isn't being gathered, it is regularly basically consumed by the roadside. It can contaminate drinking water, it can spread malady to individuals living adjacent. Indeed, even with incredible course enhancement, the laborer should in any case physically go to the dustbin to check squander levels. Along these lines, trucks

regularly visit holders that needn't bother with purging, which squanders both time and fuel.

Squander the executives avoids mischief to human wellbeing and nature by lessening the volume and perilous character of private and mechanical waste.

The brilliant, sensor based dustbin will pass judgment on the dimension of waste in it and send the message straightforwardly to the metropolitan company. It can detect all the sort of waste material it is possible that it is as strong or fluid. As indicated by the filled dimension of the dustbin, the vehicles from the metropolitan enterprise will pick the most brief way with the assistance of the cloud server, which will spare their time. It accentuates on "Advanced INDIA". The framework is straightforward. In the event that there is any issue with any gear later on, that part is effectively replaceable with new one immediately.

Things (Embedded gadgets) which are associated with Internet and in some cases these gadgets can be controlled from the web is called as Internet of Things. In our framework, the Smart residue bins are associated with the web to get the ongoing data of the savvy dustbins. An appropriate waste administration framework is required to keep the city spotless and sterile. There are numerous dustbins arranged over the city or the Campus (Educational Institutions, Companies, and Hospitals etc.). These dustbins are associated with small scale controller, Ultrasonic Sensors and GSM modules where the Ultrasonic sensor will recognize the dimension of the dustbin and will send the signs to miniaturized scale controller. The information got will be broke down and prepared and appropriately the dustbin level can be discovered on week by week premise. K-implies bunching Algorithm will give the investigation to make sense of on which days the dustbin is been filled more. This exercises can be followed out through the Android Application. Approved work force will have the Android Application which will demonstrate the

present dimension of dustbin. This will help in routinely observing the present status of dustbin and clean the dustbins at right occasions so pointless awful stench will be decreased.

whole world, which causes in absence of wellbeing mindfulness out in the open and results in individuals putting less cash in projects identified with the waste administration in the public eye. This makes colossal issues over individuals' wellbeing everywhere throughout the world. Legitimate administration of waste materials urban and provincial zones is imperative to keep up sterile and solid living condition to live. The Government of India has been battling from numerous years to discover a cost proficient and successful approach to deal with the nation's expanding measure of garbage. Dominant part of contaminations are spread due to microorganisms and infections in unhygienic and dirtied condition. The innovation sources are required for defending the earth at present. Dominant part of nature in general society and local locations are being contaminated with the waste materials out in the open, private and modern zones. The IoT based garbage checking framework is a creative framework which will keep the earth and urban communities clean. This framework screens the garbage bins all through the city and advises about the dimension of garbage gathered in the garbage bins to an individual in the regulatory division. For number of times we have seen that the dustbins are being overflowed with the waste materials and the worry individual don't have any data about it inside the time, because of which unsanitary conditions are framed in the surroundings condition and living zone.

II. MOTIVATION AND BACKGROUND

In the previous history, since the human populace thickness and dimensions of misuse of characteristic assets were less, the measure of strong waste created was noteworthy. Be that as it may, the expansion in the populace in this day and age has expanded the

garbage. To keep nature spotless and solid, there is a necessity of legitimate garbage transfer. Inappropriate garbage transfer raises contamination, medical problems, different dangers and in result it influences nature. Contamination extremely influences the developing and populated urban communities as it contains contaminants which result in flimsiness, issue and uneasiness to the biological system. Numbness and absence of neatness are ruining nature. The correct waste expulsion and the executives are incredibly viable to improve the wellbeing and prosperity of the city's populace.

The primary objective of this paper is to take a shot at natural issues because of ill-advised waste transfer and unravel them for better wellbeing and cleanliness of the general population. The proposed framework fits into the classification of IoT connected to outer and open situations and it satisfies the accompanying essential prerequisites of IoT administrations:

- Unwavering quality: Communication is crucial in IoT for administration provisioning, connected to the outside and open condition. Dependable and solid correspondence is required arranged by completing correspondence between gadgets as this sort of IoT has an extensive administration space. Consequently, the receptacle utilized in the proposed framework associated with one another, in light of a remote work arranges (WMN), giving dependability.
- Portability: IOT gadgets might be required to move in the external environment. The proposed framework works with a battery rather than the changeless power source, bringing about an extraordinary dimension of versatility. The versatility of the framework is secured with a power-based power supply.
- Administration Continuity: Data communications and administrations ought to be directed flawlessly whenever and any area in IoT with an extensive administration space. Bins are

situated at the customary space of separation to guarantee the administration progression.

- Client Convenience: The presentation of IoT has improved client comfort. For client facilitate, the proposed framework lessens the method postpone the time of the existing garbage gathering frameworks, which empowers clients to set free their garbage without a long pause and auspicious end of filled bins.
- Vitality Efficiency: IoT connected to outer and open conditions depends on a dependable on the framework and requires versatility, causing a lot of vitality utilization. To take care of this issue, the sensors work utilizing vitality proficient procedures, expanding their battery lifetimes.

III. LITERATURE REVIEW

The garbage the officials in urban networks must be effectively and profitably completed. The distinctive suggestions were progressed and some of them adequately realized. Nevertheless, it can't be considered as an incredible one. Along these lines, a diagram was done among different recommendation and this survey paper consolidates examine among different procedures for Waste Collection System reliant on IoT.

The paper [9] proposed to squander collection structure relies upon waste measurement data from trashcans in a metropolitan domain. The data accumulated by sensors is sent over the Internet to a server where it is secured and took care of. The maker assembled data is then used for checking and improving the consistent decision of trashcans to be accumulated, figuring the courses in like way. Reliably, the pros get them as of late decided courses in their course contraptions. The key component of this system is that it is proposed to pick up in actuality and to settle on decisions on the consistently waste dimension status just as on future state gauge, traffic stop up balanced cost-capability limits, and other

affecting elements that from the prior individuals can't foresee.

Another system [10], there are distinctive dustbins arranged all through the city or the Campus. These dustbins are outfitted effortlessly embedded device which helps in following the element of the garbage bins and a stand-out ID will be obliged every dustbin in the city so it is definitely not hard to perceive which garbage compartment is full. The endeavor module is disengaged into two segments Transmitter region and beneficiary section. Here in the transmitter section, we are using 8051 microcontrollers, RF Transmitter and sensors these are added to the dustbin. Where the sensor is used to recognize the measurement in the dustbin whether the dustbin is full or void.

Another methodology [11] is that when the garbage accomplishes the edge level ultrasonic sensor will trigger the GSM modem which will always alert the required master until the garbage in the dustbin is squashed. At the point when the dustbin is squashed, people can reuse the dustbin. At standard between times, dustbin will be squashed. In this methodology, the GSM 900A modem is used to send the messages.

Another methodology for garbage the officials is exhibited [12] as seeks after. A dustbin is interfaced with microcontroller based system having IR remote structures close by central system showing the current status of garbage, on convenient web program with HTML page by Wi-Fi. Thus the status will be revived on to the HTML page.

In paper [13] Infrared sensor (IR sensor) is used which is a multipurpose sensor, which can perceive the component of garbage. IR sensor creates the light, which is vague to stripped eye yet the electronic fragments can recognize it.

In Paper [14] System screens the garbage bins and teaches about the component of garbage assembled in

the garbage bins by methods for a page. For this the system uses ultrasonic sensors put over the bins to recognize the garbage level and difference it and the garbage bins significance. The system makes use of AVR family microcontroller, LCD screen, Wi-Fi modem for sending data and a flag.

In paper [15] ensures the cleaning of dustbins soon when the garbage level accomplishes its generally extraordinary. In his organization system IOT as the working in the field for masterminded radio-repeat recognizing evidence (RFID), following the collection vehicle, Dustbin watching and other creating distinguishing headways.

IV. PROPOSED METHODOLOGY

In this framework, dustbins are organized at level 1 of a building made under savvy city activity. It will gather the misfortune through keen pipe framework set in the building. The perceptive dustbins are interfaced with the web through GSM to get the present status. Two sensors are settled and no more lifted inspiration driving the dustbin to keep up a key partition from wrong dimension estimation and are interfaced with the microcontroller.

To distinguish awful stench a gas sensor is set at the base of the dustbin and is adjacent to interfaced with the controller to remember it off the waste filled in the dustbin. The two sensors send the signs to the controller. Arduino accumulates information gotten by the gatherer and trade nearby page through the Ethernet shield.

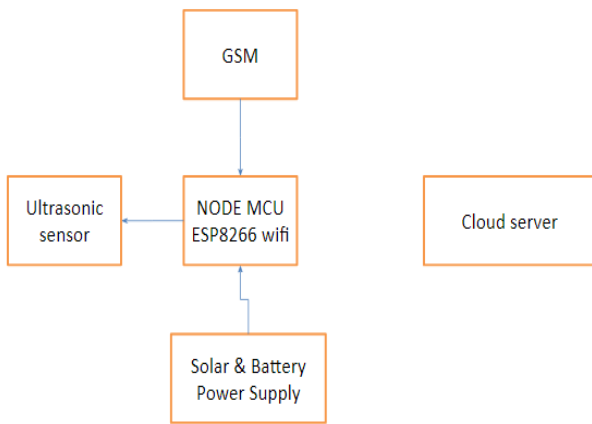


Figure 1. System Architecture

The ultrasonic sensor is utilized to check the dimension status of a dustbin so as to pick whether it is full or passed greatest limit esteem. Dynamic status of dustbin is appeared on the site using relationship through the Ethernet shield. Checking the page will help the waste collection office with following for the correct area and proportion of the junk. The waste vehicles would then have the ability to debilitate the garbage from a specific domain.

The farthest point of GSM module is to establish a connection on the waste social event division when it gets full. The garbage bins put at level 1 of the structures can be effectively emptied utilizing engines to pivot it by 180° while the gatherer truck is at an area under dimension 1 (ground level).

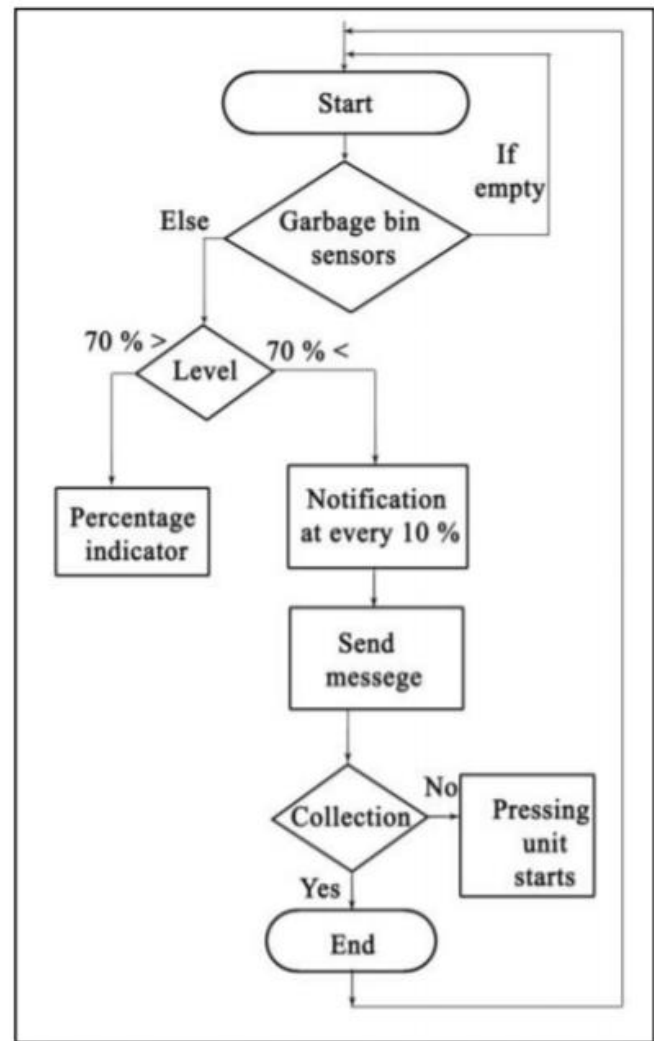


Figure 2. Flowchart

This System monitors the garbage bin and informs the level of garbage bins collection how many garbage in the garbage bin. The system uses ultrasonic sensor placed over the bins to detect the garbage level and compare it with the garbage depth. If garbage level is 70% or less than 70% then it is ok. However, if garbage level is above 70% their Arduino gives information above bin level to server ESP8266 01 module. A Server is used to store data and shows of all dustbins level on the web page. GSM used to send the text message to the mobile. Text message contains information about garbage level and location of a particular bin.

V. CONCLUSION

The principal objective is to keep up the dimension of tidiness in the city and structure a domain which is better for the living. By utilizing this framework we

can always check the dimension of the garbage in the dustbins which are put in different pieces of the city. On the off chance that a specific dustbin has achieved the greatest dimension, at that point, the workers can be educated and they can promptly take certain activities to purge it at the earliest opportunity. The representatives can check the status of these bins whenever on their cell phones. This can end up being an extremely helpful framework whenever utilized appropriately.

The framework can be utilized as a benchmark by the general population who are happy to make one stride further for expanding the neatness in their regarded regions. The ultrasonic sensor is being utilized in this framework to check the dimension of garbage in the dustbins however in future different sorts of sensors can be utilized with the ultrasonic sensor to get progressively exact yield and to take this framework to another dimension. Presently this framework can be utilized in specific territories yet when it demonstrates its believability it tends to be utilized in all the enormous regions. As this framework additionally diminishes manual work certain progressions should be possible in the framework to take it to another dimension and make it progressively valuable for the representatives and individuals who are utilizing it. In the future, a group can be made which will be in control for taking care of and keeping up this framework and furthermore to deal with its systems for upkeeps.

VI. REFERENCES

- [1] Melo, Alexander Bento, et al. "Optimization of Garbage Collection Using Genetic Algorithm." Mobile Ad Hoc and Sensor Systems (MASS), 2017 IEEE 14th International Conference on. IEEE, 2017.
- [2] C. A. Mucelin, "LIXO E IMPACTOS AMBIENTAIS PERCEPTÍVEIS NO ECOSSISTEMA URBANO Garbage and perceptible environmental impacts in urban ecosystem," vol. 20, no. 1, pp. 111–124, 2008.
- [3] R. Fujdiak, P. Masek, P. Mlynek, J. Misurec, and E. Olshannikova, "Using Genetic Algorithm for Advanced Municipal Waste Collection in Smart City," 2016.
- [4] M. N. K. Boulos and N. M. Al-shorbaji, "On the Internet of Things , smart cities and the WHO Healthy Cities," pp. 1–6, 2014.
- [5] Jain, Aaditya, and Ranu Bagherwal. "Design and implementation of a smart solid waste monitoring and collection system based on Internet of Things." Computing, Communication and Networking Technologies (ICCCNT), 2017 8th International Conference on. IEEE, 2017.
- [6] Mirchandani, Sahil, et al. "IoT enabled dustbins." Big Data, IoT and Data Science, 2017 International Conference on. IEEE, 2017.
- [7] Modak P, Jiemian Y, Hogyuan Yu, Mohanty CR 2010 Municipal solid waste management turning waste into resources in Shanghai manual: a guide for sustainable urban development in 21st century, pp. 1-36
- [8] Kumar JS, Subbaiah KV, Rao PVVP. 2014 Municipal solid waste management in India. Austr J. Eng. Res. 2, 1-8 (DOI: 10.7603/s40632-014-0001-4)
- [9] Jose M. Gutierrez, Smart Waste Collection System Based on Location Intelligence. Procedia Computer Science 61 (2015) 120 – 127..
- [10] Parkash, Prabu, IoT Based Waste Management for Smart City. IJECS Vol. 4, Issue 02 February 2016.
- [11] Monika K, Smart Dustbin-An Efficient Garbage Monitoring System. IJECS Volume 6 Issue No. 06 June 2016.
- [12] S.S. Navghane, IoT Based Garbage, and Waste Collection Bin. IJARECE Volume 5, Issue 5, May 2016.

- [14] Meghana KC, Dr. K R Nataraj IOT Based Intelligent Bin for Smart Cities. IJRITCC May 2016.
- [15] Abdul Atif Khan, Study Of Smart City Using Internet Of Things. Ijritcc March 2016.
- [16] Vishesh Kumar Kurrel, Smart Garbage Collection Bin Overflows Indicator using the Internet of Things. Volume 3, Issue 05 May 2016.
- [17] J. Q. Li, D. Borenstein, P. B. Mirchandani, "Truck Scheduling for Solid Waste Collection in the City of Porto Alegre, Brazil", Omega, Elsevier, 2008, vol. 36, pp. 1133-1149.
- [18] P. T. R. Ramos, M. I. Gomes, and A. P. B. Pova, "Assessing and improving Management Practices when Planning Packaging Waste Collection Systems", Resources Conservation and recycling, Elsevier, 2014, vol. 85, pp. 116-129.
- [19] A. Stellingwerff, "Dynamic Waste Collection: Assessing the Usage of Dynamic Routing Methodologies", Master Thesis, Industrial Engineering & Management, University of Twente, Twente Milieu, 2011.

Car Data Decipher

¹Prof. Tejal Irkhede, ²Rohit Kashayp, ²Nikhil Kumar, ²Vivek Ranjan, ²Manish Kumar

¹Assistant Professor, Department of Computer Technology, Priyadarshini College of Engineering, Nagpur, Maharashtra, India

²BE Scholar, Department of Computer Technology, Priyadarshini College of Engineering, Nagpur, Maharashtra, India

ABSTRACT

The primary reason for this paper is to build up a model of the Accident discovery framework utilizing black box. In case of mishap, if any damage happened to the vehicle driver or travelers so perhaps there will be the loss of lives because of deferral in restorative help. This model can be structured with the least number of circuits. The framework can add to building more secure vehicles, improving the treatment of accident unfortunate casualties, helping insurance organizations with their vehicle crash examinations and upgrading street status so as to diminish the passing rate. This venture goes for finding the event of any mishap and revealing the location of mishap to the recently coded number with the goal that prompt help can be given by emergency vehicle or the relative earned. GPS which is a navigational framework utilizing a system of satellites circling the earth.

Keywords: Car Accidents, Road Safety, Public Health, Black Box, Event Data Recorder

I. INTRODUCTION

Presently a-days, there is extreme interest for autos, on account of this traffic control winds up wild and it prompts street mishaps. If there should be an occurrence of mishap, long reaction time to go to the injured individual may prompt an increment number of death. In writing a few papers examines mishap identification and vehicle following. In [2], an inventive remote disclosure using MEMS accelerometer and GPS following structure is utilized for discovery of accident. The system can recognize kind of incident (immediate and nonlinear fall) from accelerometer sign using limit computation, remove in the wake of crushing of GPS ground speed and cruiser. After the disaster is recognized, short ready data (alert back rub and position of setback) is sent by methods for GSM framework. The structure is attempted in genuine 850 applications using bicycles.

The test results exhibit that it can recognize direct fall, non-straight fall and ostensible ride with no bogus caution, remote discovery utilizing MEMS accelerometer and GPS following for unintentional checking of the vehicle. The impediment of the system proposed in [2] is a mishap location for just bikes and revealing just utilizing GPS with no black box. The paper [3] titled "The 3-organize AcuTrac, Motorcycle Tracking System", Elite security supplies outline work is constrained to bike on the grounds that a bikes setbacks could have a few cases which can't thoroughly use for four wheeler mishap identification. The constraints of the above structure are making utilization of the capacity of the GPS framework just as a zone sensor to influence an extremely decent spread strategy to recognize disasters. Various gadgets are accessible for occurrence recognition by researchers. The genuine episode location techniques wound up by deciding realtime

focused on vehicles and examination to help expectation focused on the vehicle. This particular identification approach is known while Traffic-episode recognition calculation controlled by nonparametric relapse in [3].

The system in [4] spares the message just as report with crossing point utilizing metadata library. An incident discovery technique in street [5], utilize CCTV which frequently observe the development of auto-follow. Anyway, this strategy screens the fundamental focused on guests move that is fitted with a lot of circle openings inside it is execution. Because of the escape clauses inside going before is powerful a couple of spics and span robotized occurrence recognition just as credit revealing methodologies wound up advanced. The majority of these gadgets are generally significantly centered expected for some wheeler autos. This particular robotized location just as credit announcing approach began working with GPS UNIT just as GSM mechanical expertise. Anyway, these sort of wound up specifically built expected for cars. The real robotized episode discovery approach which frequently utilizes air case sensor just as the accelerometer to help analyze a mishap wound upset forward by M. Chuan-Zhietal [6][10]. Later gadgets that have been advanced from this begun working with GPS unit innovation proposed for occurrence recognition alongside expected for deciding the setting in regards to episode. The framework arranged by Jerath just as Jung Lee utilizes GPS unit innovation to help watch out for speed with the auto just as a microcontroller to help analyze speed with the auto planned for continuous minor seconds [7][8]. Brisk braking will maybe result in a bogus valuable while speed huge distinction could be the essential angle viewed as proposed for distinguishing occurrence. A large portion of these strategies wound up made explicitly expected for certain wheelers [9].

The vast majority of these gadgets isn't utilized in two or three wheelers while they are most likely not

fruitful. Subsequently, gadgets wound up intended for both the cars. This is a stage for crisis salvage which will work ideally so as to decrease the brilliant time of landing of rescuers if there should be an occurrence of street mishaps when each microsecond tallies. Our paper expects to show an innovation consequently recognizing the mishap and an equipment GPS beacon dependent on GSM/GPS innovation illuminating at the event of a mishap with adequate subtleties like careful area and time at which mishap occurred and alongside that the voice was recorded for two or three minutes when the mishap occurs. This paper builds up a correspondence between the control station and the unit introduced in vehicles. Vehicles will have GPS/GSM empowered following modules and will be followed progressively utilizing cell systems. The product inserted in the microcontroller will control the different activities of the gadget by checking waveform from the vibration sensor. If there should arise an occurrence of the mishap the gadget will send an alarm message alongside area information from the GPS module to control station utilizing GSM organize. It is an extensive and powerful answer for the poor salvage reaction if there should be an occurrence of mishap. The mishap detailing can naturally discover an auto collision, scan for the spot and after that send the fundamental data to the salvage organization covering topographical directions and the time and conditions in which a car crash occurred. At the server end, a control capacity will remove applicable information and store it in a database, to which mishap data from models will be surveyed progressively. Our framework joins propelled equipment plan and refined control innovation into a reduced, solid package. The proposed strategy fundamentally abbreviate the reaction time of the mishap.

II. RELATED WORK

A. How Black Boxes Work

Event data recorders are not actually black boxes but tiny microcomputer chip sets. In most vehicles, they

are part of the airbag control module, and originally were included to ensure airbags deployed when they were supposed to.

Over the years, as electronics got cheaper, smaller and smarter, event data recorders became capable of doing more than simply monitoring airbags. Automakers realized the devices could be used to provide information about the seriousness of an accident, and if a car was being operated properly when a crash occurred. Based on a separate NHTSA regulation passed in 2012, if a vehicle today does have an event data recorder, it must track 15 specific data points, including speed, steering, braking, acceleration, seatbelt use, and, in the event of a crash, force of impact and whether airbags deployed.

Depending on the automaker and car model, an event data recorder may capture many more functions, though car companies are not required to disclose exactly what those are. The language many use to explain black boxes in owner's manuals also is purposely general to cover technology updates and to save space.

Put everything the devices do in an owner's guide and "instead of one paragraph, you'd have potentially another 20 or 30 pages. That really wouldn't be realistic," says Richard Ruth, a black box equipment trainer, expert witness and consultant who worked at Ford Motor Co. for 33 years, including a stint evaluating event data recorders and other safety equipment. "It's not going to change whether or not you're going to buy the car."

Most event data recorders are programmed to record data in a continuous loop, writing over information again and again until a vehicle is in a front-end collision or other crash. When an accident occurs, the device automatically saves up to 5 seconds of data from immediately before, during and after an incident.

Today, practically every major automaker selling cars in the United States builds event data recorders into new vehicles. The exceptions are Volkswagen (which auto industry watchers say is preparing for the NHTSA regulation to kick in), Ferrari and Maserati. Traffic accident analysis consultant Harris Technical Services maintains a list of car makes and models from 1994-2014 with event data recorders.

The NHTSA rule, which the agency has been working on for years, was supposed to take effect September 1, 2014. However, auto industry insiders say the agency is still reviewing more than 1,000 comments it received about the proposed regulation, making that implementation date unrealistic. A NHTSA representative declined to comment on the delay.

B. Getting Black Box Data

Black box data is difficult and expensive to get to, and interpreting it takes special training. Extracting the data after an accident involves using a data-retrieval tool kit that consists of hardware, software and a cable that plugs into a car's on board diagnostics port. That is the same port mechanics use to identify engine problems and insurance companies tap as the basis for use-based insurance policies. Crash data retrieval tool kits are not cheap, running \$2,000-\$10,000 and up, not including training costs.

It follows that since drivers own their cars or trucks, they own data the vehicles generate, including black box data. But because it's so difficult and costly to extract, it's virtually impossible for average car owners to do it on their own — assuming that they even want to.

Who else can access the information is a point of contention. Automakers would like the right to access the information for numerous reasons including safety, to make sure systems work the way they should and to check for defects. Other parties that want a black box's car crash data can include police and other law enforcement agencies that are investigating an

accident, insurance companies looking into a claim, lawyers representing parties in car-crash lawsuits and accident reconstruction consultants working for any of the above.

In states with no black box laws on the books, "state troopers could get the data without a subpoena if there was a fatality," says Tom Kowalick, a self-taught black box expert who chairs an event data recorder standards working group that's part of the Institute of Electrical and Electronics Engineers. Kowalick also wrote some of the black box information on the NHTSA Web site. "If they want to grab it, there's nobody saying they can't."

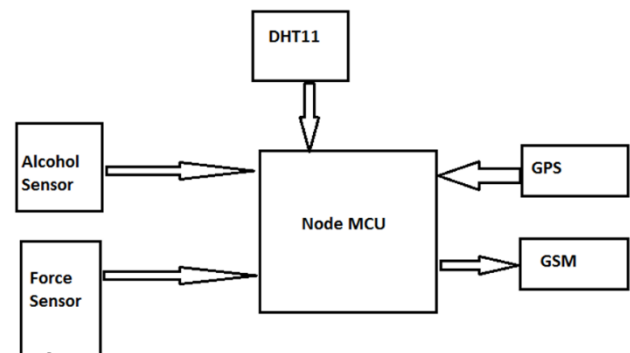
To rectify that situation, 15 states have passed EDR regulation over the past decade. Under the theory that car owners have privacy rights, many of the state laws require automakers to notify new-car buyers that vehicles contain black boxes, such as in the owner's manual. State laws also spell out the conditions under which police or other parties can obtain EDR information without an owner's consent, such as with a court order; for dispatching emergency personnel; diagnosing, servicing or repairing the vehicle; or probable cause in an accident. The National Council of State Legislatures maintains an updated list of state EDR laws.

Black boxes have become a battleground in states such as California, where earlier this year, insurance companies and automakers lined up on opposite sides of a black box data protection bill that would have required automakers to let car owners block or opt out of recording vehicle information. The bill didn't make it out of the state Senate Transportation Committee after heavyweights including the Alliance of Automobile Manufacturers opposed it.

Earlier in 2014, two U.S. senators introduced a bipartisan bill that would provide some of the same protections on a national level. The Driver Privacy Act explicitly states that a black box's data can't be

retrieved by anyone other than vehicle owners without their consent and protects any personally identifiable information. By April 2014, the bill had collected 23 co-sponsors and been approved by the Senate Commerce Committee. As of July 2014, however, no further action had been taken.

III. METHODOLOGY



In this proposed work, a novel technique for mishap recognition framework used to follow the vehicle utilizing GSM and GPS innovation. In this framework, we utilized temperature sensor, liquor sensor, speed sensor, microcontroller, LCD and GPS module GSM module at whatever point the vehicle will begin, as of now the whole sensor will be in dynamic mode and afterward begin to peruse the parameter in along these lines, the whole sensor will screen the vehicle execution. Since the control unit gets every one of the information from the sensor and then demonstrate all the parameter esteem on LCD at once. In this framework, the core of the proposed framework is a microcontroller. The whole fringe sensor associated with the microcontroller. Preferably, framework will peruse the distinctive parameters like temperature, speed, liquor rate present in the vehicle and persistently show on LCD. In this framework, we likewise embed memory card which is associated with the microcontroller of the system, will spare the information of each parameter. At the point when the mishap happened, at that point, the specific area of this occurrence will follow by utilizing GPS innovation. On identifying mishap this framework will get the present area to facilitate from GPS module. The GSM

module will send the alarm message to the injured individual relatives to predefine contact number in the meantime memory card should store the resend information which could be recouped at administration station for helping insurance agencies with their vehicle crash examination. at administration focus, memory card will be associated with PC to peruse every one of the information put away in it.

IV. CONCLUSION

The main purpose of our project is to develop a prototype of black box for vehicle diagnosis that can be installed into any vehicle .This prototype can be designed with minimum number of circuits. This can contribute to construct safer vehicles, can monitor the driving skills of the driver, improving treatment for crash victims, helping insurance companies with their vehicle crash investigations, and enhancing road status in order to decrease the death rate.

V. REFERENCES

- [1] Accidental Deaths & Suicides in India, 1970 to 2013 published by the National Crime Records Bureau, Ministry of Home Affairs, Government of India, New Delhi.
- [2] Wireless Black Box using MEMS Accelerometer and GPS Tracking for Accidental Monitoring of Vehicles, 978-1-4577-2177- 9/12\$25 (c) 2012 IEEE.
- [3] "The 3-stage acuTrac Motorcycle Tracking System", Elite security supplies, <http://www.gpsfast.com>.
- [4] "Traffic-incident detection-algorithm based on nonparametric regression", S. M. Tang and H. J. Gao, IEEE Transactions on Intelligent Transportation Systems, vol. 6, 2005, pp. 38-42.
- [5] Yong-Kul Ki ,Jin-Woo Kim and Doo-Kwon Baik," A Traffic Accident Detection Model using Metadata Registry ",Conference on Software Engineering Research, Management and Applications, 2006 ppno: 0-7695-2656-X.
- [6] "Providing Accident Detection in Vehicular Networks Through OBD-II Devices and Android-based Smartphones" Juan Carlos Cano, Jorge Zaldivar, Carlos T. Calafate, Pietro Manzoni in 5th IEEE Workshop On User Mobility and Vehicular Networks 2011 pp no : 978-1-61284-928-7.
- [7] "Method of Freeway Incident Detection Using wireless Positioning," H. Ru-fu, L. Chuan-zhi, Y.E. Hong-wu, in Proceedings of the IEEE International Conference on Automation and Logistics, 2008, pp. 2801 -2804.
- [8] "GPS-free terrain-based vehicle tracking on road networks," Jerath, K.; Brennan, S.N., American Control Conference (ACC), 2012, pp.307, 311, 27-29 June 2012
- [9] "An accident detection system on highway through CCTV with calogero-mosersystem, Jung Lee Conference on Communications (APCC), 2012 18th Asia-Pacific pp.no: 978-1-4673-4726-6.
- [10] Jog, S.R., Sutaone, M.S, Badawe, V.V., "Ruggedisation methodologies for GPS based Vehicle Tracking System," (ICECT), 2011 3rd International Conference on , vol.2, no., pp.214,218, 8-10 April 2011.
- [11] Baker, J., and Fricke, L., Process of Traffic Accident Reconstruction. Traffic Accident Reconstruction (L. Fricke, ed.), Evanston, IL, Northwestern University Traffic Institute. (2010).
- [12] Van Kirk, D. J. Vehicular Accident Investigation and Reconstruction. CRC press. USA. pp.15-19. (2001).

Review Paper on Experimental Investigation on Use of Tire Rubber in Concrete

¹Utkarsh Meshram, ²Tushar G. Shende, ³Gita Bhaskar

¹M.Tech Student, Department of Civil Engineering, G. H. Rasoni Academy of Engineering and Technology, Nagpur, India

²Associate Professor, Department of Civil Engineering, G. H. Rasoni Academy of Engineering and Technology, Nagpur, India

³Assistant Professor, Department of Civil Engineering, G. H. Rasoni Academy of Engineering and Technology, Nagpur, India

ABSTRACT

Today's construction industry is growing rapidly at its own pace, new materials are being explored and are being used along with conventional material. The conventional material basically include cement, sand aggregate and water which form a homogenous mix called concrete. It is one of the most popular construction materials. Due to this fact, the construction industry is always trying to increase its uses and applications and improving its properties, while reducing cost. In general, concrete has low tensile strength, low ductility, and low energy absorption. Efforts been made by various researchers all over the world to recycle or reuse the used non-biodegradable material in construction industry such as fly ash, rice husk, plastic bottles and shredded rubber. In the present paper, efforts have been made to modify the property of concrete by using waste tyre rubber. The proportion of the ingredients such as cement, sand and aggregate is partially replaced by the use of tyre rubber of suitable sizes. It is found that with the use of tyre rubber, there is no increase in compressive strength but flexural strength and resilience of concrete is enhanced. Such concrete may be used in the construction of load bearing structures and road construction.

Keywords : Tyre Rubber, Concrete, Compressive Strength, Flexural Strength.

I. INTRODUCTION

It is estimated that more than 250 million scrap-tires weighing more than 3 million tons are produced in the India each year, this quantity is in addition to the more than 300 million scrap-tires that are stockpiled already. Those stockpiles represent a severe fire risk due to lightning, combustion, or just plain carelessness. They also pose other health hazards including diseases due to rodent and mosquito infestation and pollution to land, water, and air. Most landfills are refusing to take anymore tires due to the fact that they are harmful to the environment and are not biodegradable. New means of disposal or recycling must

be used. Aside from tire derived fuel, the most promising use of recycled tires is in engineering applications. A tire is a composite of complex elastomer formulations, fibers and steel/fiber cord. Rubber is the principal element of tire, making up about 85% of the tire where both synthetic and natural rubbers may be used. Natural rubber is an elastic hydrocarbon polymer which occurs as a milky colloidal secretion in the sap of several varieties of plants. Rubber can also be produced synthetically, as a thermoset polymeric material in which individual monomer chains are chemically linked by covalent bonds during polymerization.

Today's construction industry is growing rapidly at its own pace, new materials are being explored and are being used along with conventional material. The conventional material basically include cement, sand aggregate and water which form a homogenous mix called concrete. It is one of the most popular construction materials. Due to this fact, the construction industry is always trying to increase its uses and applications and improving its properties, while reducing cost. In general, concrete has low tensile strength, low ductility, and low energy absorption. Concrete also tends to shrink and crack during the hardening and curing process. These limitations are constantly being tested with hopes of improvement by the introduction of new admixtures and aggregates used in the mix. One such method may be the introduction of rubber to the concrete mix. It is a perfect way to modify the properties of concrete and recycle rubber tires at the same time. Though, number of researchers have used many recycled products so as to manufacture the concrete without affecting the original strength and also enhancing the property of conventional concrete. Decades ago, Metropolitan city like Bangalore constructed roads by using plastic as a waste material and used it along with concrete. Fly ash, pulverised rice husk and other industrial wastes are various materials where researchers successfully proved that the use of such material enhance the property of the concrete, along with that issue of pollution can be avoided. Figure 1 shows the stockpiled tyre rubber on site and small chips of such tyre rubber.

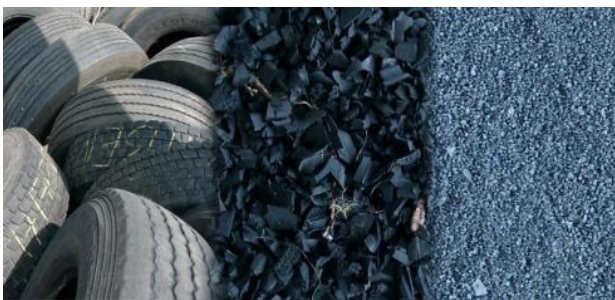


Fig. 1 Stockpiled tyre

Rubber in tyre acts as a gripping source between two surfaces and enhance the shock resisting capacity in vehicles and conveyor belts in industries. Same phenomenon is found to be observed in the concrete, when cement, sand and aggregate is partially replaced by shredded tyre in pieces.

II. LITERATURE REVIEW:

The performance of concrete that contains rubber aggregate made from used tyres has been studied since the early 1990s. Waste-Tyre rubber is one of the most significant environmental hazards worldwide. Because of the increase in auto mobile production, there is a need to properly dispose the vast amounts of used rubber tyres. Available sites for waste disposals are rapidly depleting. The increasing amount of waste tyres worldwide makes the disposition of tyres a relevant problem to be solved. Efforts are being made to discover the prospective use of waste-tyre rubber in construction technology. Some of the prominent literature reviews being studied so far are as follows.

Eshmaiel Ganjian, Morteza Khorami and Ali Akbar Maghsoudi (2009)

They carried out extensive research on the performance of concrete mixtures considering, 5%, 7.5% and 10% of discarded tyre rubber as aggregate and cement replacements was investigated. Two sets of concrete specimens were made. In the first set, different percentages by weight of chipped rubber were replaced for coarse aggregates and in the second set scrap-tyre powder was replaced for cement. Selected standard durability and mechanical test were performed and the results were analysed. The mechanical tests included compressive strength, tensile strength, flexural strength and modulus of elasticity. The durability tests included permeability and water absorption. The results showed that with up to 5% replacement, in each set, no major changes on concrete characteristics would occur, however, with further increase in replacement ratios considerable changes were observed.

N Segre and Joekes (2000) carried an extensive experimental analysis on the surface modification of powdered tire rubber to increase its adhesion to cement paste. The particles were surface-treated with NaOH saturated aqueous solutions for 20 min. Scanning electron microscopy, water absorption, density, flexural strength, compressive strength, abrasion resistance, modulus of elasticity and fracture energy measurements were performed using test specimens (water/cement ratio=0.36) containing 10% of as-received or 10% of NaOH-treated rubber. The results of fracture energy and flexural and compressive strength show that the addition of rubber particles improves the toughness and reduces the porosity of the specimens. Electron microscopic examination show that the NaOH surface treatment enhances the rubber–matrix adhesion. The use of thus treated tire rubber particles, as addition, instead of a coarse aggregate, in cement-based materials is promising for applications such as driveways or in road construction.

Raghavan, et.al (2011) carried out an investigation to determine workability and mechanical properties of mortar containing shredded automobile and truck tyres. Two different shapes of rubber particles were used as constituents of mortar: (1) granules about 2 mm in diameter, and (2) shreds having two sizes which were, nominally, 5.5 mm×1.2 mm and 10.8 mm×1.8 mm (length×diameter). The geometry of the rubber particles influenced the fracture behaviour of rubber-containing mortar. The addition of rubber led to a decrease in flexural strength and plastic shrinkage cracking of mortar. The crack width and crack length due to plastic shrinkage were reduced for mortar containing the 10.8×1.8 mm rubber shreds compared with a mortar without shreds. The rheological properties of the mortar containing rubber shreds were comparable to those of a mortar without rubber and yielded lower plastic viscosity than a mortar containing 25.4 mm×15 µm (length×diameter) polypropylene fibres. The alkaline stability of rubber in mortar was also evaluated by immersing rubber

shreds in NaOH and Ca(OH)₂ solutions for 4 mon and the results showed that there is less than 20% change in stress and strain value. They suggested that automobile and truck tyres can be recycled by shredding and incorporating them into mortar and probably concrete for certain infrastructural application.

Sang S, Hajirasouliha I and pilakoutas K (2011) investigated the potential of incorporating recycled rubber tyre chips into Ordinary Portland Cement (OPC) concrete. Workability, strength and durability properties of concrete incorporating rubber tyre chips as a partial replacement for the coarse aggregate in the concrete is presented in paper. Plain rubber aggregate and rubber aggregate coated with cement paste were used. The results showed that concrete incorporating rubber aggregate has lower workability and unit weight and exhibited a notable reduction in compressive strength. However, the rubberised concrete did not exhibit a typical failure mode of plain concrete and a beneficial effect on flexural strength was observed.

Bignozzi M and Sandrolini, F. (2006) investigated rubberised self-compacting concrete was prepared containing different amounts of untreated tyre waste and their mechanical and microstructural behaviour are investigated and discussed in this paper. The fresh and hardened properties of such materials are compared with those of a typical reference formulation of self-compacting concrete. A comparison of the obtained compressive strengths with literature data confirms that self-compacting technology helps binding rubber phases.

Azevedo F, Pacheco T, Jesus C, Barroso, J and Camoes A. (2012)

They carried out study on fly ash and metakaolin by replacing partial cement. The durability performance was assessed by means of capillary water absorption and resistance to sulphuric acid attack. The results show the existence of a synergetic effect between fly

ash and metakaolin that minimizes the strength loss associated to the use of rubber waste. Results also show that it is possible to use rubber waste up to 15% and still maintain a high resistance to acid attack. The mixes with 45% fly ash and 15% metakaolin show a much higher resistance to sulphuric acid attack than the reference mix independently of the rubber waste content.

Aiello M, Leuzzi G, Centonze A and Maffezodi A. (2009) contributed on the use of granulated rubber and steel fibres recovered from waste tyres in concrete. In particular, the concrete obtained by adding recycled steel fibres evidenced a satisfactory improvement of the fragile matrix, mostly in terms of toughness and post-cracking behaviour. As a consequence recycled steel fibres reinforced concrete appears a promising material for both structural and non-structural applications. In the present paper results obtained by the experimental work performed up to now are reported. In order to evaluate the concrete-fibres bond characteristics and to determine the critical fibre length, pull-out tests were initially carried out. Furthermore compressive strength of concrete was evaluated for different volume ratios of added RSF and flexural tests were performed to analyze the post-cracking behaviour of RSFRC. For comparison purposes, samples reinforced with industrial steel fibres (ISF) were also considered. Satisfactory results were obtained regarding the bond between recycled steel fibres and concrete; on the other hand compressive strength of concrete seems unaffected by the presence of fibres despite their irregular geometric properties. Finally, flexural tests furnished in some cases results comparable to those obtained when using ISF as concerns the post-cracking behaviour.

Bravo M, Brito J (2012) understood the problems associated with dumping of used tyres, which ultimately led to the development of various uses for this industrial waste. The performance of concrete that contains rubber aggregate made from used tyres has been studied since the early 1990s. Past research

has dealt mainly with the mechanical characteristics of this type of concrete. This research assessed the performance of CTA in terms of durability. Tests for shrinkage, water absorption by immersion and capillarity, carbonation and chlorides penetration resistance were performed. Concrete mixes were produced in which 5%, 10% and 15% of the volume of natural aggregate (NA) were replaced by aggregate derived from used tyres (TA). The fine and coarse aggregate were replaced both separately and simultaneously. This research also examined the influence of the rubber grinding process. Some concrete mixes were therefore made with mechanically ground aggregate and others with aggregate produced by cryogenic technology.

Snelson D, Kinuthia, J, Davies P, Chang S (2009) carried out an investigation to establish the physical, mechanical and chemical characteristics unprocessed pulverised fuel ash waste tyres from a former landfill site, determined the suitability of the fly ash and/or tyres in road construction (embankment and pavement) and also in concrete to be used in the construction of the proposed highway. This paper reports on concrete-based construction using various levels of fly ash as partial replacement for Portland cement (PC), and shredded waste tyres (chips 15–20 mm) as aggregate replacement were subjected to unconfined compressive strength tests to establish performance, hence, optimising mix designs. Strength development up to 180 days for the concrete made with PC–PFA blends as binders (PC–PFA concrete), with and without aggregate replacement with tyre chips, is reported. It has been concluded that the above concrete do not have sufficient early strength, but it tends to improve at the age of longer curing. The lower earlier strength shows that such concrete may not be used for low to medium strength applications such as blinding, low-strength foundations, crash barriers, noise reduction barriers, cycle paths, footpaths and material for pipe bedding.

Meddah A, Beddar M and Bali A (2014). Carried out an extensive study which aims to experimentally investigate the possibility of using shredded rubber tire in concrete. The rubber particles are added to mixes as a partial replacement by volume of some parts of natural crushed aggregates. Unit weight, mechanical properties, modulus of elasticity and porosity are evaluated and compared according to the rubber content in the concrete mix. The effects of compaction energy and roughness of rubber surfaces are also studied. The results obtained showed that the inclusion of rubber particles in concrete mixes will change their characteristics in fresh state as well as hardened state. Even though the mechanical properties decrease when rubber content in the mix is increasing, it should be noted that it is possible to use rubber particles in low traffic pavements project. In the other hand, rubber particles may improve some desired technical characteristics such as; porosity, ductility and cracking resistance performance. Further they concluded that In addition to that, it may be more environmentally efficient to use rubber aggregates in concrete, because this helps to remove some parts of these wastes and protect the environment. The performance of such mix with shredded rubber additions can be improved by modifying the roughness of rubber particle surfaces, when the optimal rubber content depends on technical requirements and the destination of project.

III. 4. CONCLUSION:

Tremendous research and investigation on the use of waste tyre rubber in an concrete by replacing cement, sand, aggregate is a field of interest for many researchers. From the study of literature review, it has been concluded that optimal use and proper roughness of rubber influences the mechanical properties of concrete. Such concrete may not be used for important construction work where loading is very high. It finds its application in the use of light loading construction such as roads where there is light traffic or in foundation where much strength is not required,

which ultimately helps in waste management thus controlling the hazardous damage from stockpiled tyre rubber.

IV. REFERENCES

- [1]. Eshmaiel Ganjian, Morteza Khorami and Ali Akbar Maghsoudi (2009). "Scrap Tyre rubber replacement for aggregate and filler in concrete". *Construction and Building Materials*. Vol. 23(5), pp. 1828-1836.
- [2]. N Segre and Joekes (2000). "Use of tire rubber particles as addition to cement paste" *Cement and Concrete Research* Vol. 30(9), pp. 1421-1425.
- [3]. N Raghavan, H Huynh and C Ferraris, (1998). "Workability, Mechanical properties and chemical stability of a recycled tyre rubber-filled cementitious composite". *Journal of Material Science*, Vol. 33(7), pp. 1745-1752.
- [4]. Sang S, Hajirasouliha I and pilakoutas K (2011). "Strength and Deformability of waste tyre rubber filled reinforced concrete columns" *Construction and Building Materials*, Vol. 25(1), pp. 218-226.
- [5]. Bignozzi M and Sandrolini, F. (2006). "Tyre rubber waste recycling in self-compacting concrete". *Cement and Concrete Research*, Vol. 36(4), pp. 735-739.
- [6]. Azevedo F, Pacheco T, Jesus C, Barroso, J and Camoes A. (2012). "Properties and durability of HPC with tyre rubber wastes". *Construction and Building Materials*, Vol 34, pp 186-191.
- [7]. Aiello M, Leuzzi G, Centonze A and Maffezodi A. (2009). "Use of steel fibres recovered from waste tyres as reinforcement in concrete: Pull-out behaviour, compressive and flexural strength. *Waste Management*, Vol 29(6), pp 1960-1970.
- [8]. Bravo M, Brito J (2012). "Concrete made with used tyre aggregate: durability-related performance". *Journal of Cleaner Production*, Vol 25, pp. 42-50.
- [9]. Snelson D, Kinuthia, J, Davies P, Chang S (2009). "Sustainable Construction: Composite use of Tyres and Ash in Concrete" *Waste Management*, Vol, 29(1), pp. 360-367.

Numerical Approach to Investigate the Settlement in RCC Road Using Plaxis 2D and Its Remedial Measures

Ashwin S Meshram¹, Shubham R Mohabey¹, Vaibhav Mahore¹, Pankaj Kumar Yadav², Amod Gurjar²

¹Department of Civil Engineering, GHRAET, Nagpur, Maharashtra, India

²Assistant Professor, Department of Civil Engineering, GHRAET, Nagpur, Maharashtra, India

ABSTRACT

In present scenario, the Indian Ministry Road Transport and Highways has been relentlessly promoting sustainable development to achieve both economic growth and a good living environment for future generations. Given that the provision of infrastructure and buildings is indispensable to support local economic development, the construction industry will increasingly play a vital role in shaping a sustainable environment for the residents of India, especially Nagpur. However, the construction industry has long been confronted with its adverse impacts on the environment by generating many waste materials and consuming substantial quantities of natural resources. Moreover, the lack of natural resources has resulted in a strong dependency on importing natural aggregates from overseas. Thus, there is an urgency regarding the divergence of waste materials away from the Landfill area and to source alternative materials to replace natural aggregates. As an important component of the sustainable development trend, the use of recycled waste materials in construction applications is a method to enhance resource efficiency. To realize the beneficial use of C & D material, an in-depth study was conducted to evaluate its use in road construction using PLAXIS 2D. This software accomplishes to analyse the effect of cyclic loading on construction and demolished waste underneath the rigid pavement in static, dynamic and applying geogrid as well. This dissertation report paraphrases the inclusion of sub base material as C&D waste beneath the rigid pavement to dwindle the settlement of it. The static and dynamic analysis of rigid pavement incorporating geogrid has been studied to find the effect over it with the help of PLAXIS 2D. Several models have been analysed in PLAXIS 2D with various loading from IRC 58:2002 and IRC Class AA Loading. The temperature check is also studied for the existing ongoing Roads in Nagpur Region. The result from study shows that the stresses developed at higher temperature

Keywords: PLAXIS 2D, RCC Pavement, Geogride, C & D waste

I. INTRODUCTION

Latterly, road pavements, valuing the environmental perspective and seeking to terminate all long term impacts (economic, social, environmental, or other) of this type of investments, the great magnitude for the economic development of the Country. The sustainable development concept has been subjected to various construe. The term “sustainability” at the present time is applied now a days commonly to

almost every facet of life, in the reference of human sustainability on Earth, it is being increasingly used, giving special focus about the causes of global warming and climate change in atmosphere. ‘Brundtland Report’ states that the development “meets the needs of the present without compromising With the ability of future generations for meeting their own needs”. Conservation of the rapidly diminishing natural resources and

preservation of the environment are to be the nucleus of sustainable development. On environment there is consequent effect of any activity, viz., and road pavement construction. A structure consisting of superimposed layers of processed material layed above the natural soil sub-grade is the road pavement, and its primary function is to distribute the applied load by vehicles on it to the subgrade.

The pavement structure should be provided with the properties like adequate skid resistance, acceptable

Riding quality of surface, favourable light reflecting characteristics, and low noise pollution. The ultimate aim is to ensure that the transmitted stresses due to Wheel load are sufficiently reduced, so that they will not exceed bearing capacity of the subgrade.

The flexible pavement consists of layers with highest quality materials near surface and its suitability depends upon the aggregate interlock, particle friction and cohesion. The bituminous pavement is example of flexible pavement. The examples of rigid type of pavements are the concrete pavements, these are made with the help of Portland cement, they have high modulus of elasticity because of its rigidity, and tends to distribute the applied load over the wide spread area of the soil beneath it.

Until last two decades, landfill was considered as the low cost and efficient method of C&D waste management in Nagpur. But land filling is considered to be undesirable due to environmental and ecosystem hazards. Most of the landfills are now days are at the end of completing their full capacity due to construction of basement oriented buildings.

Now a days the existing bitumen roads are being replaced by RCC pavements because the lifespan of the road is more than and periodical maintenance

cost is very low. The major problem faced during the replacement of RCC road are such as settlement, cracks, corner stresses, undulation, traction force, etc. therefore a vast analysis would be required for such RCC road.



Figure 1

1. Defects in RCC road:-

cracks, settelemts, undulations, cornerstress. The above problems occur due to many reasons such as improper design ,heavy load etc.



Figure 2



Figure 3



Figure 4



Figure 5

II. LITRETURE REVIEW

Auxi Barbudo et al. reviewed that Construction and Demolition Waste is a priority waste stream in the European Union. Currently, the production of CDW in Spain is around 20 million tons (430 kg/habitant year). The Waste Framework Directive requires Member States to recycle 70% of CDW before 2020. Recycled aggregates (RA) which are obtained from the CDW conveniently treated in recycling plants, can be used in civil engineering and building works. The recycling rate in Spain is approximately 40%, very far from recycling rates in other countries such as the Netherlands, Denmark and Germany that exceed the recycling rate of 80%. This work is extracted from "Catalogue of pavements with recycled CDW aggregates (CRA)", redacted with the aim of promoting the use of recycled materials in roads in the framework of a sustainable perspective and immersed in the future policies of the European Union.

Kamal H. Khayat, Seyedhamed Sadati reviewed that the research is to evaluate the feasibility of using high-volume recycled materials for concrete production in rigid pavement. The goal was to replace 50% of the solids with recycled materials and industrial by-products. The performance of concrete mixtures made with different fine and coarse recycled concrete aggregate (RCA) contents and binder types was investigated. Both single-layer rigid pavement and two-lift concrete pavement (2LCP) were considered. The investigation highlighted in this report evaluates the feasibility of developing concrete mixtures with high volume of recycled materials for the construction of sustainable rigid pavement. The goal of the project is to replace 50% of the cement and virgin aggregate with SCMs and RCA.

Dr. Pandu Kurre et al. reviewed that Several Instances That Pavement Performance Is Greatly Affected By The Usage Of Poor Quality Of Soil Subgrade Which Causes Severe Damage And Distress. With The Growing Tendency To Utilize Marginal Soils, There Arises The Need To Understand The Fundamental Behavior Of The Materials In Order To Make Suitable Amendments In Design Parameters, Especially In The Subgrade Construction Of Pavements. This Paper Presents The Shear Strength Behavior Of Geotextile Reinforced Marginal Soil Without And With Cement Modification And Compares Its Performance With That Of Conventional Soil Subgrade (Gravel). The Study Revealed That The Cement Modified Marginal Soil Has Become Non-Plastic With Its Performance Close To That Of Gravel Subgrade.

III. METHODOLOGY

Material Testing

Construction and demolition waste:- Construction and demolition waste is generated from construction industries/structures; whenever the structure is demolished C&D waste is generated. It consist of concrete, steel, tiles, wood, bricks, plastic, etc. the composition of the C&D waste depends upon its

structure. It is said that there is no adequate or satisfactory data for accessing to the amount of waste material generated in Nagpur.

This is because there is no separate regulatory framework for handling the C&D waste management within the city, as it is considered in the solid waste management. Due to which it is getting difficult to access the information of to handle the construction and demolition waste material. As a report prepared by ministry of environmental and forest in 2008 determining that 0.35 million tons per day of waste material is generated in the country. On these basis 200 million tons MSW is produced annually.



Figure 6
Table 1

Sr. no.	Components of C &D waste	(%) TIFAC
1.	Soil/ sand/ aggregate	36.0
2.	Bitumen	2.0
3.	Steel	5.0
4.	Concrete	23.0
5.	Wood	2.0
6.	Others	1.0

Particle size Distribution

Sieve analysis test is performed to know the different size of particle present during the test. This is

commonly used in civil engineering to assess the particle size distribution curve of a granular material by allowing the material to pass through a series of sieves of progressively smaller mesh size and weighing the amount of material that is stopped by each sieve as a fraction of the whole mass

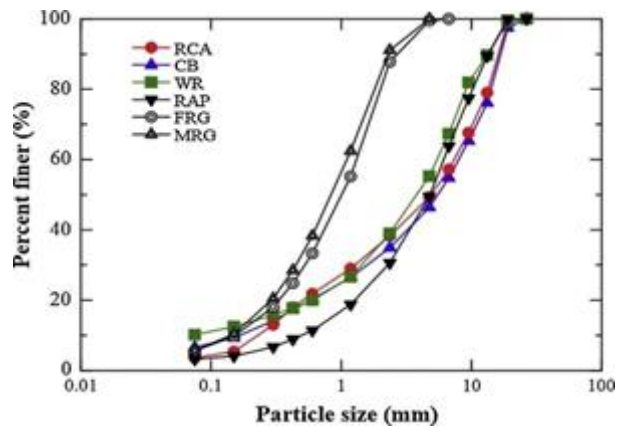


Figure 7

Direct Shear Test

A direct shear device measuring 60 mm x 60 mm x 60 mm depth was used for testing of the C & D waste. In the direct shear tests, the upper half is fixed to the frame of the apparatus. Whereas the bottom half can be moved relative to the top half with the assistance of an actuator controlled by an electric motor, thus shearing the soil specimen along the horizontal failure plane. In this study, a rigid steel plate was used as the loading plate, which applied 1.1 kPa itself to the test sample. The direct shear test device is capable of applying a vertical and shear force of up to 100 kN. The normal force applied on the rigid plate and shear force exerted during shearing were measured with the help of two load cells. The data were collected with a computerized data acquisition system.

The samples used for the direct shear tests were prepared by adding the corresponding optimum moisture contents to the dry materials and thoroughly mixing the material. The samples were then compacted in the shear box in three layers to the maximum dry density achieved from modified compaction test. The compaction process was carried out by using a small vibratory compactor.

Before the compaction of samples in the shear box, the upper and lower boxes of the shear box were assembled by keeping the two alignment pins in place to ensure that the upper and lower halves are aligned properly. The total weight of material to be filled in the shear box is computed based on volume of the shear box and the maximum dry density of the material obtained from compaction tests.

Unconfined Compression test

Unconfined Compression Strength (UCS) test is one of the most common and simplest tests that can be carried out utilizing minimum laboratory facilities. It is commonly used as a key design index parameter for estimating the stiffness of pavement material used in mechanistic pavement design methods. This test includes the application of an axial vertical load through loading platens, using strain-control or stress-control conditions, to a cylindrical sample of laterally unconfined soil. The unconfined compressive strength (UCS) is defined as the maximum unit stress obtained from monotonic load testing. In this investigation, the UCS tests were undertaken on the C&D waste samples after the samples were taken from demolished materials with the core cutter sampler. The UCS specimens were prepared as a split mould of 50 mm diameter and 100 mm in height.

2.4	1.456	2.4	1.5232	2.4	1.456
2.7	1.621	2.7	1.688	2.7	1.621
3	1.7123	3	1.67	3	1.7423
3.3	1.5654	3.3	1.5654	3.3	1.55213
3.6	1.37444	3.6	1.37444	3.6	1.37444
3.9	1.07731	3.9	1.07731	3.9	1.07731
4.2	0.93524	4.2	0.93524	4.2	0.821
4.5	0.78787	4.5	0.6741	4.5	0.71



Figure 8

Table 2

SAMPLE 1		SAMPLE 2		SAMPLE 3	
0	0	0	0	0	0
0.15	0.05	0.15	0.035	0.15	0.015
0.3	0.08869	0.3	0.078	0.3	0.0684
0.6	0.3455	0.6	0.3455	0.6	0.3455
0.9	0.58629	0.9	0.521	0.9	0.5111
1.2	0.8745	1.2	0.8745	1.2	0.8745
1.5	1.121	1.5	1.00121	1.5	1.1
1.8	1.213	1.8	1.2232	1.8	1.213
2.1	1.32	2.1	1.411	2.1	1.32

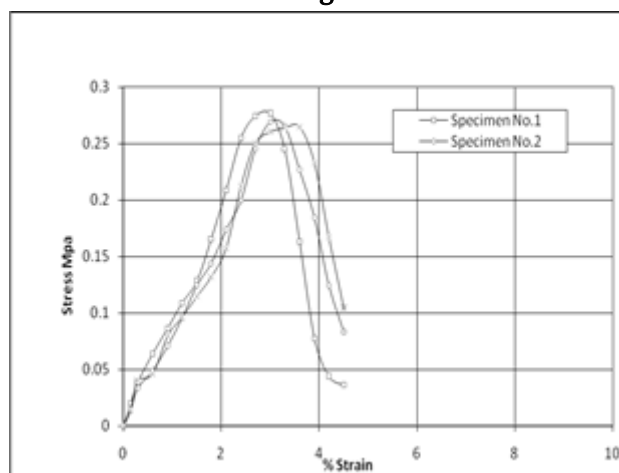


Figure 9

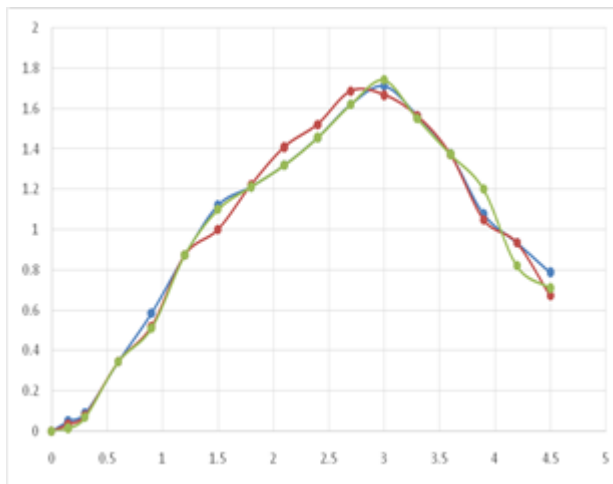


Figure 10

Properties of Material

Table 2

Sr. no.	Soil	Sub-base	C&D
C	12	0	0
Ø	26	41	43
E	30000 kPa	30000 kPa	30000 kPa
Poisson's Ratio	0.3	0.4	0.5

Analysis by Plaxis 2D

Plaxis is finite element software developed at the Technical University of Delft for Dutch Government. Initially, it was intended to analyze the soft soil river embankments of the lowlands of Holland. Soon after, the company Plaxis BV was invented, and the program was extended to cover a broader range of geotechnical issues. The Plaxis program started at Delft University of Technology in early 1970's when Peter Vermeer started to do a program of research on finite element analysis on the design and construction of Eastern Scheldt Storm-Barrier in Netherland.

Initial finite element code was developed to calculate the elastic-plastic plane using six-nodded triangular elements. In the year 1982 Rene DeBorst under the supervision of Pieter Vermeer, performed his master's program related topic on the analysis of cone

penetration test in clay. The study of axisymmetric led to the existence of Plaxis. The study was on six-nodded triangles in the element. This 15 – noded triangle was developed thus increasing the number of nodes in the element. The usage of 15-noded triangle is the simplest element for any analysis in axisymmetric.

Then the experts De Borst and Vermeer implement the 15-noded triangle in Plaxis thus solving the problem of cone penetrometer. The development of Plaxis proceeds with the problem to solve the soil structure interaction effects. This led to the study on beam element by Klaas Bakker under the supervision of Pieter Vermeer. The outcome of the experiment using beam element was applicable to flexible retaining wall and later application to the analysis of flexible footings and rafts.

Baker's work formulated the implementation of 5-noded beam element in Plaxis (Bakker et al (1990), Bakker et al (1991)). The 5- noded beam element is compatible to the 15-noded triangular elements (has 5 nodes). Baker's work was novel for the invention of hybrid method introducing the displacement of degree-of –freedom to the element behaviour. The lack of degree of freedom has made solution to reduce the number of variables thus simplified the element.

Analysis without C&D waste in the subbase:-

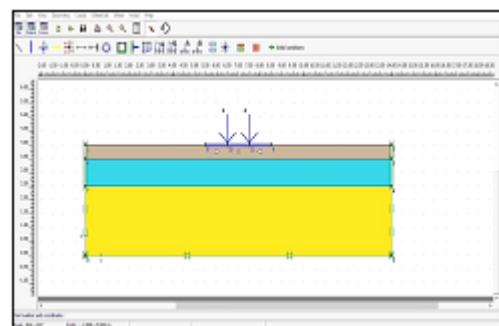


Figure 11. Numerical modeling

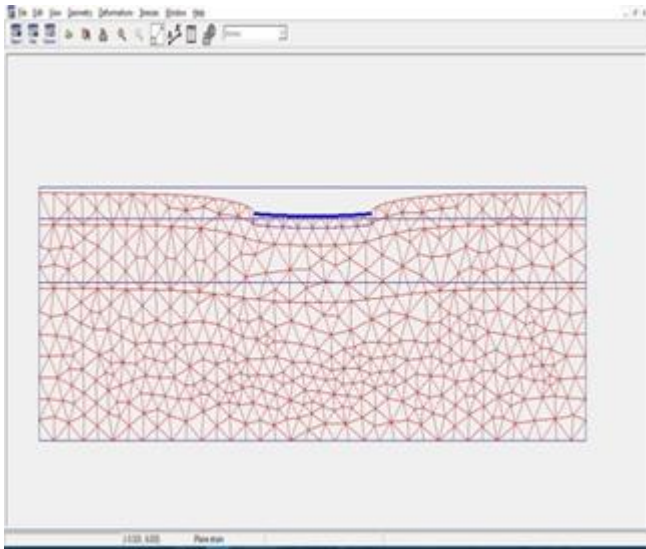


Figure 12. Mesh generations

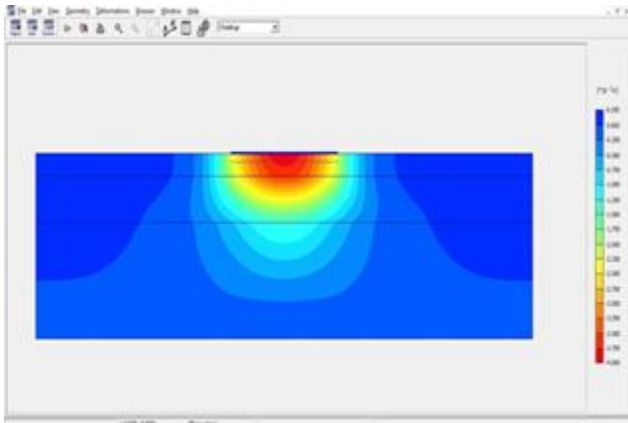


Figure 13. Vertical displacement of sub base 353.16 kN
Max deformation = 4.00 mm
C&D with Geogride

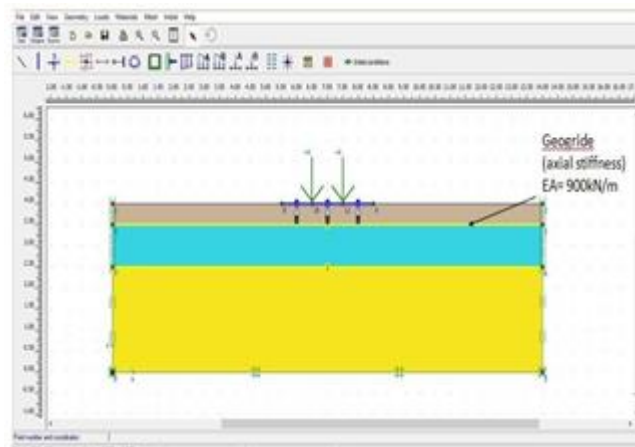


Figure 14. Application of Geogrid of axial stiffness of 900 kN/m for tandem loading of 353.16kN.

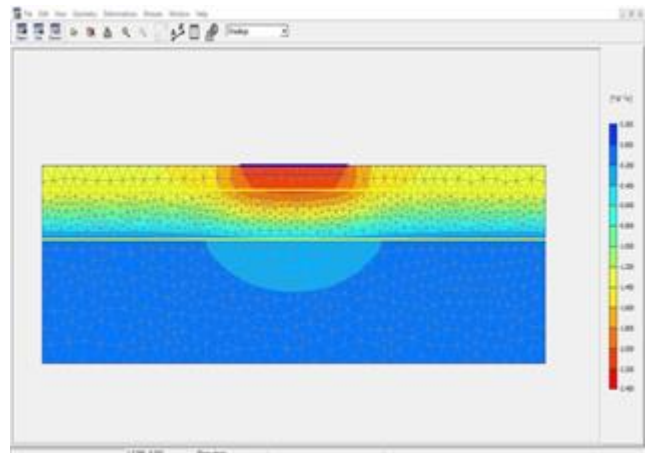


Figure 15. Settlement of 2.4 mm occurs with impact loading of 353.16 kN of Tandem loading

IV. RESULT AND DISCUSSION

As we can see that the using C&D in the sub base the amount of settlement is very much less so this will increase the life of pavement.

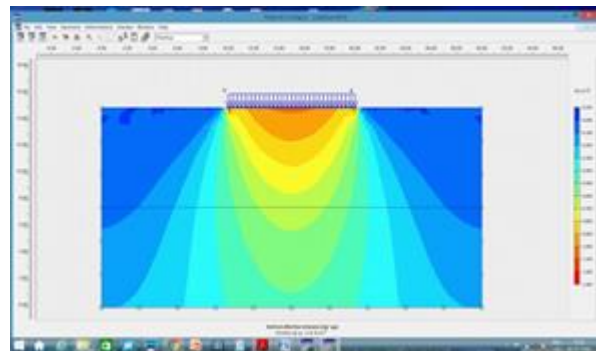


Figure 16. Vertical displacement of sub-base with using geogrid and C&D waste combined.

V. CONCLUSION

Concrete aggregate or demolished waste can be used as base and sub-base materials, in place of crushed stone aggregate for supporting a concrete pavement system. The compaction of recycled concrete aggregate is the same as that of crushed stone aggregate and gravel. The stability and the shear resistance of recycled concrete aggregate in dry conditions are higher than those of gravel and equal to or better than those of crushed stone aggregate.

Breakage of aggregate particles increases in severity from gravel to recycled concrete aggregate.

A comprehensive laboratory evaluation of the physical and shear strength characteristics of six C&D materials was undertaken using results from gradation, UCS, DST tests. The physical and shear strength characteristics of the recycled C&D materials were compared with the requirements for typical quarry materials. The shear strength parameters were subsequently analyzed and discussed. The following conclusions can be drawn on the physical properties and shear strength responses of the C & D materials.

The recycled C & D materials are classified as well-graded materials and are found to have the potential to be used in pavement base/sub base applications. Water absorption and surface roughness are found to control the compaction curves of the recycled C&D materials.

Numerical modeling of the demolished waste under rigid pavement is done by using PLAXIS 2D. After intensive modeling it is clear that the settlement in RCC slab is under permissible limit. For axle load it is found 2.1 mm and after impact load the deformation is 4.1 mm. numerical.

The use of geotextile in RCC road to wrap the demolished waste at the interfaces, deformation in slab gets reduced and which is found 2.4 mm. The existing RCC slab in Nagpur found safe for 35 cm thick, at temperature differential of 21 °C, according to IRC 58:2002 and IRC 58:2011.

5.1 Future scope

Road construction is a sector where measures need to be taken in order to reduce the energy demand and environmental impact, and, in particular, to reduce the use of raw materials cost-effectively. The APSE project aims to contribute to sustainable development by adhering to relevant EU policies and reducing the environmental impact associated with the construction of roads. It aims to this by proving technologies that facilitate asphalt recycling, use of

waste and novel greener binders, all integrated appropriately into optimal and eco-innovative designs of asphalt pavements, and thereby increasing their commercial viability. Based on the research conducted, it can be concluded that potential measures with sound sustainability credentials, including alternative binders and a wide use of recycled materials (including reclaimed asphalt and recycled materials derived from construction and demolition waste), can be adopted for widespread application in the right situations.

VI. REFERENCES

- [1]. Milind V. Mohod 1*, Dr. K.N.Kadam 2, "A Comparative Study on Rigid and Flexible Pavement: A Review", IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) e-ISSN: 2278-1684,p- ISSN: 2320-334X, Volume 13, Issue 3 Ver. VII (May- Jun. 2016), PP 84-88.
- [2]. Rafaela Cardoso, Rui Vasco Silva, Jorge de Brito, Ravindra Dhir, "Use of recycled aggregates from construction and demolition waste in geotechnical applications: A literature review", Waste Management xxx (2015) xxx – xxx, journal homepage: www.elsevier.com/locate/wasma.
- [3]. Taesoon Park1, "Application of Construction and Building Debris as Base and Subbase Materials in Rigid Pavement", 10.1061/~ASCE!0733- 947X~2003!129:5~558!
- [4]. Javier Tavira , José Ramón Jiménez , Jesús Ayuso, María José Sierrac, Enrique Fernández Ledesma, "Functional and structural parameters of a paved road section constructed with mixed recycled aggregates from non-selected construction and demolition waste with excavation soil", Construction and Building Materials 164 (2018) 57 – 69, journal homepage: www.elsevier.com/locate/conbuildma.
- [5]. Arul Arulrajah, Mahdi M. Disfani, Suksun Horpibulsuk, Cherdasak Suksiripattanapong, Nutthachai Prongmanee, "Physical properties and shear strength responses of recycled

- construction and demolition materials in unbound pavement base/sub- base applications", *Construction and Building Materials* 58 (2014) 245 – 257, journal homepage: www.elsevier.com/locate/conbuildma.
- [6]. Tabassom Afshar, Mahdi M Disfani, Arul Arulrajah, Guillermo A Narsilio, Sacha Emam, "Impact of particle shape on breakage of recycled construction and demolition aggregates", *Powder Technology* 308 (2017) 1-12, journal homepage: www.elsevier.com/locate/powte
- [7]. Seyedhamed Sadati, Kamal H. Khayat, "Field performance of concrete pavement incorporating recycled concrete aggregate", *Construction and Building Materials* 126 (2016) 691–700, journal homepage: www.elsevier.com/locate/conbuildma
- [8]. U.S. Army Corps of Engineers, 2003, *Use of Geogrids in Pavement Construction*, ETL 1110-1-189.
- [9]. Giroud, J.P., and L. Noiray, 1981, "Geotextiles-Reinforced Unpaved Road Design," *Journal of Geotechnical Engineering*, Vol. 107, No. 9, pages 1233-1253, ASCE.

Experimental Investigations on Partial Replacement of Cement with Fly Ash, Silica Fume and Partial Replacement of Sand with Quarry Sand in Concrete

Rakesh Shambharkar¹, Rutuja Nirwan², Asawari Agrelwar², Akshay Balpande², Pravin Pathak², Rohit Gavale²,
Ashwini Kshirsagar²

¹Assistant Professor, Department of Civil Engineering, DBACER, Wanadongri, Nagpur, Maharashtra, India

²Students of Department of Civil Engineering, DBACER, Wanadongri, Nagpur, Maharashtra, India

ABSTRACT

Fly ash is the waste generated by industries which is responsible for causing environmental as well as health problems due to dumping and disposal. This research describes the accessibility of using the thermal industry waste in concrete production as partial replacement of cement. By formulation of concrete with the use of fly ash as a supplementary cementitious material was tested as an alternative to conventional concrete. The fly ash has been replaced 50% by weight of cement for M30 mix. Concrete mixtures were produced, tested and compared in terms of compressive and with the conventional concrete. These tests were carried out to determine the mechanical properties for the tests for compressive strength at 7 days, 14 days and 28 days taken at room temperature. Quarry dust is used to reduce the demand of natural sand by using quarry waste. By partially replacing the quarry sand with the natural sand, the effect of strength and workability of concrete has been studied. This paper reports the experimental study and investigated the partial replacement of natural sand with quarry dust. It has been found that the partial replacement of quarry dust with natural sand has a significant effect to enhance the compressive strength. Quarry dust has been replaced 40% with the natural sand. Silica fume has major impact on industries. It is an experimental study to determine the nature of silica fume and its impact on the properties of conventional concrete. By partially replacing the cement with silica fume, the strength parameters of concrete have been studied. Silica fume has been replaced by 15% of cement, by weight for cube. By partially replacing cement with Silica fume, investigation has been carried out and its effect on the important parameters of concrete such as strength and workability has been studied. It has been found that partial replacement with silica fume has a significant effect in the compressive strength of cubes. We are investigating the potential of using fly ash, quarry sand and silica fumes its effect on the strength and workability of concrete. Attempts for improving the properties of concrete with respect to strength and durability.

Keywords: Concrete, Sand, cement, Fly Ash, silica fumes, quarry dust (QD), Compressive Strength, supplementary cementitious materials, Ordinary Portland cement (OPC), Partial replacement, slump cone test, thermal industry waste.

I. INTRODUCTION

Presence of waste materials in the environment can directly cause environmental problem, So the reuse of

waste material is necessary. The Waste can be used to produce new products so that natural resources are used more efficiently and effectively. The industrial wastes which are dumped in the nearby land through

which the natural fertility of the soil is spoiled. Fly ash is the finely divided mineral residue resulting from the combustion of ground or thermal power plant e.g. Koradi plant . The utilization of waste materials in cement and concrete industry reduces the environmental problems of power plants and decreases electricity generation costs. Cement with fly ash reduces the permeability of concrete. fly ash contributes in a various ways like durability and strength and also increases the setting time of concrete. The pozzolanic reaction removing the excessive calcium hydroxide, which can be produced by the cement reaction. In the present experimental investigation, the fly ash has been used to study the effect on compressive strength on M25 grade of concrete. Some of the countries are facing various problems in the supply of natural sand . the expertise of the construction industry is investigating the other alternative in order to reduce the demand of natural sand . Now a days the natural river sand has become scarce and very costly. Hence we are forced to think of alternative materials .A quarry is a type of open pit mine in which dimension stone, rock , construction aggregate, riprap, sand, gravels or slate is excavated from ground . The quarry dust may be used in the place of natural river sand fully or partially. Another alternative is by using quarry waste to replace the use of natural sand . Natural sand in many parts of the country is not graded properly and has excessive silt . On the other hand, quarry dust does not contain silt or organic impurities and can be produce to meet desired gradation and fineness as per requirement. Consequently quarry sand improves the strength of concrete. A comparatively good strength is expected when quarry sand is replaced partially or fully with or without concrete admixtures. The particles which are passing through 4.75mm sieve are called as quarry dust. Silica fume is an ultrafine powder collected as a by-product of the silicon and ferrosilicon alloy production.. it is also known as micro silica, non-crystalline polymorph of silicon dioxide. It's particles size less than 1 micron and with an average diameter of about 0.1 microns, The use of silica fume as a

pozzolana in proper quantity taken in percent can enhance various properties in conventional concrete such as cohesiveness, strength, permeability and durability. Silica fume concrete is appropriate in places where low permeability and high abrasion resistance are of great importance. It is also appropriate in such places where very high cohesive mixes are required to avoid segregation and bleeding. The main objective of this study is to find the impact of partial replacement of Silica fume with cement on the strength characteristics of concrete. 15 percent of replacement has been considered for partially replacing cement with silica fume. M25 concrete grade is designed with replacement of silica fume .

Ghutke & Bhandari (01)examine the Influence of silica fume on concrete. Results showed that the silica fume is a good replacement of cement. The rate of strength gain in silica fume concrete is high. Workability of concrete decreases as increase with% of silica fume. The optimum value of compressive strength can be achieved in 10%replacement of silica fume. As strength of 15%replacement of cement by silica fume is more than normal concrete. The optimum silica fume replacement percentage varies from 10 % to 15 %replacement level.

Alok (02) write A Research Paper on Partial Replacement of Cement in M-30 Concrete from Silica Fume and Fly Ash. Replacement levels of OPC by Silica Fume were 0%, 2.5%, 5%and 7.5%where replacement levels of Ordinary Portland cement by Fly Ash were 0%, 5%, 10% and 15% by weight. 1% super-plasticizer was used in all the test specimens for better workability at lower water cement ratio and to identify the sharp effects of Silica Fume and Fly Ash on the properties of concrete. Water-cement ratio was kept 0.43 in all cases.43.1 N/mm² was the maximum compressive strength which was obtained at replacement level of 7.5% by weight of SF and 20% by weight of FA with cement.6.47 N/mm² was the maximum flexural strength which was obtained at replacement level of 7.5% by weight of SF and20% by

weight of FA with cement. 2.573 N/mm² was the maximum split tensile strength which was obtained at replacement level of 7.5% by weight of SF and 20% by weight of FA with cement.

Sasikumar & Tamilvanan (03) Performed an Experimental Investigation on Properties of Silica Fumes as a Partial Replacement of Cement main parameter investigated in this study is M30 grade concrete with partial replacement of cement by silica fume 0%, 25%, 30%, 40% and 50%. The normal consistency increases about 40% when silica fume percentage increases from 0% to 25%. The optimum 7 and 28-day compressive strength has been obtained in the 25 % silica fume replacement level. Also, the split tensile strength is high when using 25% silica fume replacement for cement.

Amarkhail (04) observed Effects of Silica Fume on Properties of High-Strength Concrete. He found that up to 10% cement may be replaced by silica fume without harming the concrete workability. Concrete containing 10% silica fume replacement achieved the highest compressive strength followed by 15% silica fume replacement with a small difference. Concrete with 15% silica fume content achieved the highest flexural strength. 10% and 15% silica fume content as replacement of cement were found to be the optimum amount for significantly enhancement of compressive strength and flexural strength respectively.

Abdullah Anwar et al (05) their studies tell that Fly ash is rich in cementitious industrial wastes and has great potential to replace Portland cement. Their studies tell that 28 days compressive strength of Mix can be achieved with a replacement of 30% of fly ash with the cement. When the percentage of replacement is increased the water/ binder ratio gets reduced, thereby, increasing the compressive strength.

Marthong and T.P. Agrawal(06) studied about compressive strength, durability and shrinkage of concrete and their Test results shows that, inclusion of

fly ash generally improves the concrete properties up to certain percentage of replacement in all grades of OPC.

Samaresh Pan (07) founded that replacements of cement by fly ash have resulted in considerable variation in the properties of fresh concrete. Incorporation of fly ash in concrete increased the cohesiveness of the mix, prevented segregation and resulted in reduced bleeding. Fly ash concretes have been found to be amiable to compaction than the control mixes. Higher percentages of fly ash can cause a change in color of the mix.

Alvin Harison et al (08) conducted a peculiar study on the utilization of materials which can fulfill the expectations of the construction industry in different areas. In this study cement has been replaced by fly-ash accordingly in the range of 0%, 10%, 20%, 30%, 40%, 50%, 60% by weight of cement for M-25 mix with 0.46 water cement ratio. Concrete mixtures were produced, tested and compared in terms of compressive strength. It was observed that 20% of replacement of Portland pozzolana cement (PPC) by fly-ash strength is increased marginally (1.9% to 3.2%) at 28 days and 56 days respectively. It was observed that upto 30% replacement of PPC by fly-ash strength is almost equal to the referral concrete after 56 days. PPC gained strength after 56 days curing because of slow hydration process.

G.Balamurugan*, Dr.P.Perumal (09) founded that Concrete acquires maximum increase in compressive strength at 50% sand replacement by quarry sand The percentage of increase in strength with respect to control concrete is 24.04 & 6.10 in M20 and M25 respectively.

Chitlange and Pajgade (10) It is observed that there is consistent increase in the strength of plain concrete when natural sand is fully replaced by quarry dust.

Nanda et al. (11).The investigation proposes that the stone dust can be replaced up to 50% without any

effect on mechanical and physical properties and the economical saving will be 56%.

Chandana Sukesh (2013) in his study published in the International Journal of Innovative Technology and Exploring Engineering, says that ideal percentage of the replacement of sand with quarry dust is 55 percent to 75 percent in case of compressive strength.

II. MATERIALS

2.1. Cement: The most common cement used is an Ordinary Portland Cement (OPC). The Ordinary Portland Cement of 53 grade conforming to IS 12269: 2013 It constitutes only about 20 percent of the total volume of concrete mix; it is the active portion of binding medium and is the only scientifically controlled ingredient of concrete.

Table 1. properties of cement

Sr.no	Physical property of cement	Result	Requirements as per IS: 12269:2013
1.	Specific gravity	3.15	3.10 - 3.15
2.	Soundness (Le Chatelier's)	9.5	10
3.	Initial setting time (hours, min)	35min	30 min. minimum
4.	Final setting time (hours, min)	178 min	600 min. maximum
5.	Compressive strength- 3 days	26.51 N/mm ²	27 N/mm ²
6.	Compressive strength- 7 days	38.49 N/mm ²	37 N/mm ²
7.	Compressive strength- 28 days	52.31 N/mm ²	53N/mm ²

2.2. Coarse aggregate: -The aggregate which is retained over IS Sieve 4.75 mm is termed as coarse aggregate. Locally available coarse aggregate having the maximum size of 20 mm was used in this work. The

aggregates were washed to remove dust and dirt and were dried to surface dry condition. The aggregates were tested as per IS: 2386 (Part 4) - 1963.

Table 2. properties of coarse aggregate

Sr.no.	Characteristics	Value
1	Color	Grey
2	Size	20mm
3	Shape	Angular
4	Specific gravity	2.80

2.3. Fine aggregate: -

The aggregates most of which pass through 4.75 mm IS sieve are termed as fine aggregates. According to size, the fine aggregate may be described as coarse, medium and fine sands. Depending upon the particle size distribution IS: 383-1970 has divided the fine aggregate into four grading zones (Grade I to IV). The grading zones become progressively finer from grading zone I to IV. In this experimental program, fine aggregate was locally procured and conformed to Indian Standard Specifications IS: 383-1970. The sand was sieved through 4.75 mm sieve to remove any particles greater than 4.75 mm and conforming to grading zone II. It was coarse sand light brown in color. Sieve analysis and physical properties of fine aggregate are tested as per IS:383-1970 and results are shown in below Table.

Table 3. properties of fine aggregate

Sr.no.	Characteristics	value
1	Specific gravity	2.65
2	Bulk density(kg/m ³)	1.3
3	Fineness modulus	2.62
4	Water absorption	0.02

2.4. Water

Water is an important ingredient of concrete as it actually participates in the chemical reaction with cement. Since it helps to form the strength giving cement gel, the quantity and quality of water is required to be looked into very carefully. Water cement ratio used is 0.467 for M25.

2.5. Fly ash:

Table 4. properties of fly ash

Sr. No	properties	value
1.	Specific Gravity	1.90-2.55
2.	Specific surface (m ² /kg)	392
3.	Bulk density(gm/cm ³)	0.994
4.	color	Whitish grey

2.6. Silica fume:

Table 5. properties of silica fumes

Sr. No.	Physical property of Silica fume	result
1.	Specific gravity	2.2
2.	Bulk density(kg/m ³)	130-430
3.	Particle size(μm)	<1
4.	Fineness(m ² /kg)	15000-30000

2.7. Quarry sand:

Table 6. properties of quarry sand

Sr.no	Properties	values
1.	Specific of gravity	2.57
2.	Fineness modulus	2.41
3.	Density	1.85gm/cc
4.	Void ratio	0.42

III. DESIGN MIX METHODOLOGY

A mix M25 grade was designed as per IS10262:2009 and the same was used to prepare the test samples. The design mix proportion is shown in table

Table 7. Concrete Design Mix Proportion

Sr No	Material replacement	Concrete type	Concrete Design Mix Proportion (By Weight)				Replacement %
			W/C Ratio	C (kg)	FA (kg)	C.A (kg)	
1	Fly	M30	0.5	1	1.3	3.2	50

	ash				5	0	
2	Quarry sand	M25	0.467	1	1.5	2.696	40
3	Silica fumes	M25	0.467	1	1.5	2.696	15

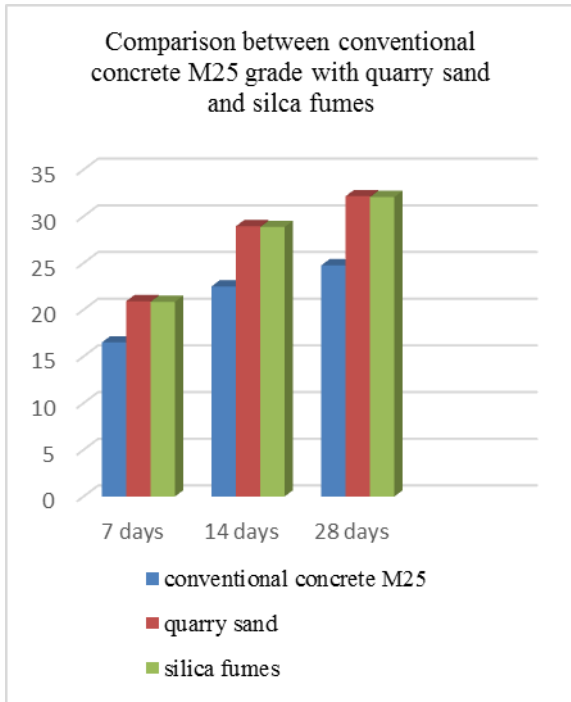
3.1. Casting of Cubes

(As per IS 516:1959)

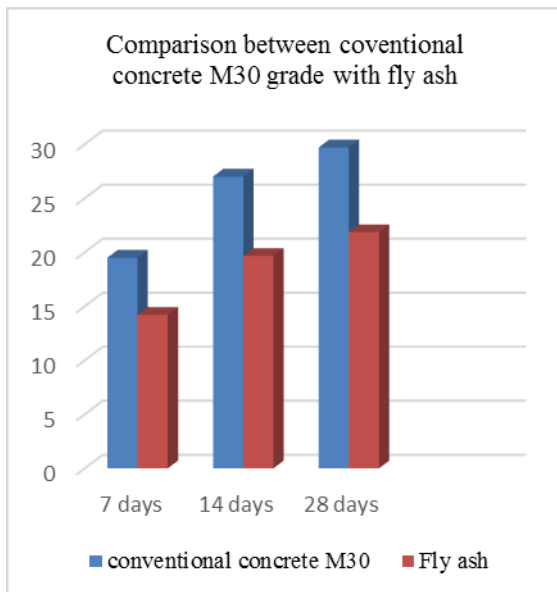
Standard metallic cube moulds (150*150*150 mm) were casted for compressive strength the specimens were demolded after 24 hours and subsequently immersed in water for different age of testing. For each age three specimens were tested for the determination of average compressive and strength.

Table 8. Comparison between conventional concrete M25 & M30 grade with quarry sand silica fumes and fly ash.

Sr. No	Materials	Grade	Average compressive strength for Conventional Concrete (N/mm ²)			Compressive strength for variations		
			7 day	14 day	28 day	7 day	14 day	28 day
1.	Fly ash	M30	19.5	27	29.7	14.21	19.66	21.85
2.	Quarry sand	M25	16.25	22.5	24.75	20.91	28.94	32.16
3.	Silica fume	M25	16.25	22.5	24.75	20.85	28.863	32.07



Graph 1. Comparison between conventional concrete M25 grade with quarry sand and silica fumes



Graph 2. Comparison between conventional concrete M30 grade with fly ash

3.2 Test on Concrete Cubes

3.2.1. Slump Cone Test:

The concrete slump test is an empirical test that measures the workability of fresh concrete. More specifically, it measures the consistency of the

concrete in that specific batch. This test is performed to check the consistency of freshly made concrete. Consistency is a term very closely related to workability.

Table 9. slump of materials.

Sr no.	Materials	% Replacing	Slump in mm
1	Fly ash	50	150
2	Quarry sand	40	130
3	Silica fume	15	110

3.2.2. Compression Test

Test was performed on compression testing machine As per IS: 1199:1959. The load was applied axially without shock till the specimen was crushed. Results of the compressive strength test on concrete with and without varying proportions (50%) of fly ash, (40%) of waste marble, (15%) of silica fume replacement at the age of 7days, 14 days and 28 days were noted. The cubes were tested using compression testing machine (CTM). $P/A = \text{Compressive stress}$. Where, $P = \text{Load (N)}$ and $A = \text{Area (mm}^2\text{)}$.

IV. CONCLUSION

Based on limited experimental investigation concerning the compressive & Non-Destructive test, the following conclusions are drawn:

- Compressive strength reduces when cement replaced fly ash at higher percentage (50%).
- Use of fly ash in concrete can save the coal & thermal industry disposal costs and produce a 'greener' concrete for construction.
- Concrete acquires maximum increase in compressive strength at 40% sand replacement by quarry sand.
- According to the value of compressive strength collected, the value is high and it show that quarry dust suitable to use as sand replacement. All the value of compressive strength surpasses the minimum value of compressive strength for normal concrete. So, quarry dust can apply as

sand replacement in concrete mix for M25 Grade in construction industry.

- The optimum strength of cube is gain at 15% replacement for all 7, 14 and 28 days respectively.
- The above conclusion gives clear picture that fly ash can be innovative supplementary cementitious Construction Material but it tends to decrease the compressive strength at high percent (50%) as well as quarry dust can be utilized in concrete mixtures as a good substitute for natural river sand with higher strength at 40% replacement and silica fumes can be used as a partial replacement of cement with 15% replacement.

V. REFERENCES

- [1]. Ghutke, V. S. & Bhandari, P.S. 2014), "Influence of Silica Fume on Concrete", IOSR, Journal of Mechanical and Civil Engineering, 44-47.
- [2]. Kumar, A., Jain, S., Gupta, S., Sonaram & Merawat, S. 2015), "A Research Paper on Partial Replacement of Cement in M-30 Concrete from Silica Fume and Fly Ash", SSRG International Journal of Civil Engineering, 35), 40-45.
- [3]. Sasikumar, A. 2016), "Experimental Investigation on Properties of Silica Fumes as a Partial Replacement of Cement. International Journal of Innovative Research in Science", 5 3), 4392-4395.
- [4]. Amarkhail, N. 2015), "Effects of Silica Fume on Properties of High-Strength Concrete", International Journal of Technical Research and Applications, 13-19.
- [5]. Abdullah Anwar, Sabih Ahmad, Syed Aqeel Ahmad, Juned Ahmad and Syed Mohd. Ashraf Husain, "Investigating the Compressive Strength of Concrete by Partial Replacement of Cement with High Volume Fly Ash", 2015.
- [6]. C. Marthong and T. P. Agrawal, "Effect of Fly Ash Additive on Concrete Properties", 2012.
- [7]. Samaresh Pan, "Effect Of Fly Ash As A Cement Replacement Material On The Characteristics Of Concrete", 2012.
- [8]. Alvin Harison, Vikas Srivastava and Arpan Her bent 2014- "Effect of Fly-ash on Compressive Strength of Portland Pozzolana Cement Concrete", Journal of Academia and Industrial Research, Vol. 2, ISSN:2278-5213.
- [9]. G.Balamurugan*, Dr.P.Perumal "Use of Quarry Dust to Replace Sand in Concrete – An Experimental Study", International Journal of Scientific and Research Publications, Volume 3, Issue 12, December 2013, 1 ISSN 2250-3153.
- [10]. M. R. Chitlange and P. S. Pajgade, "Strength Appraisal of Artificial Sand as Fine Aggregate in SFRC," ARPN Journal of Engineering and Applied Sciences, vol. 5, no. 10, pp. 34–38, 2010.
- [11]. R. P. Nanda, A. K. Das, and N. Moharana, "Stone Crusher Dust as A Fine Aggregate in Concrete For Paving Blocks," International Journal of Civil and Structural Engineering, vol. 1, no. 3, p. 613, 2010.
- [12]. R. D Shambharkar¹, Aditya Sawarkar² Kunal Rewatkar³, Dolly Wanjari⁴, "Study on Light weight Characteristics Self Compacting Concrete using Fine Pumice Powder and Coconut Shell"
- [13]. IS 10262:2009 for Mix Design
- [14]. IS 12269 : 2013 for cement OPC 53 grade
- [15]. IS: 2386 Part 4– 1963 for Test on Coarse Aggregate.
- [16]. IS: 383-1970 for particle size distribution and test of Fine Aggregate
- [17]. IS 516:1959 for Casting of Cubes and Compression Test
- [18]. IS: 1199:1959 for Slump Cone Test

Comparison of Strength Between Conventional Paver Block and Fly Ash Paver Block

Chandahas Rawale¹, Rushi Katta¹, Pratiksha Bhute¹, Kanchan Kueya¹, Prachita Dahikar¹, Nikita Khadse¹,
Prof. Laxmikant Vairagade²

¹U.G. Student, Civil Engineering Department, G.H.R.A.E.T Nagpur, Maharashtra, India

²Assistant Professor, Civil Engineering Department, G.H.R.A.E.T Nagpur, Maharashtra, India

ABSTRACT

Now a days we will conclude cement replace by fly ash and adding gypsum and super plasticizer with various percentages in the construction of concrete block pavement. As we know dumping of fly ash is the biggest issue now days in India in due to fly ash environmental pollution and human hazard increasing day by days. The aim this research is make economic and environmental friendly paver block, and solve the disposal problem fly ash.

Keywords: Concrete, Dust, Fly Ash, Super Plasticizer, Hardener, Compressive Strength

I. INTRODUCTION

Paver Block: Block paving also known as brick paving is a commonly used decorative method of creating a pavement or hard standing. The main benefit of bricks over other materials is that individual bricks can later be lifted up and replaced. A concrete brick has to be allowed to set. There are two basic types of paving blocks – concrete and clay. Concrete Paving Blocks: Concrete blocks are mass manufactured to standard sizes. This makes them interchangeable. Typical concrete paving blocks have one smooth face and one rough, although some paving blocks so come with reversible surfaces (can be used both sides). The performance characteristics of concrete paving blocks make it suitable for the heaviest duty applications, able to support substantial loads and resist shearing and braking forces. These blocks come in different colors. The colors typically come from metallic oxides. However, these colours tend to fade over a period of time, so it is helpful to exercise caution while selecting them. Concrete

paving blocks are the most preferred choice for laying of pavements, driveways, etc.

Clay Paving Blocks: Clay paving blocks (also called as bricks or cobbles) are generally available as typical, rectangular bricks, although custom shapes can be made for specific projects. Unlike the concrete paving blocks, both the surfaces of most clay blocks are fully useable and interchangeable. Clay bricks do not use any dyes to impart colour; they come in natural colour. Consequently, the colour of these blocks does not usually fade with time. Clay paving blocks are more difficult to cut than their concrete counterpart. The paving blocks are most suitable for walls or pillars.

Materials utilize: Cement: As per availability of cement in market we have use 43 grade OPC as per IS code. Material Admixture :Mineral admixture are used to replace the OPC with various percentage to find strength of concrete blocks. The fly ash can be used in different following quantities. Aggregate: For casting of paver block we have use 6mm to 10mm aggregate

Table 1

Sr. No.	Size of Aggregate	IS recommended Code
1	6 mm	IS 383
2	10 mm	IS 383

- Dust:** Sand is replaced from dust. Dust is nothing but aggregate. The IS Code for dust is HS 7105. It has same properties like sand and hence it can be used as substitute.
- Admixture:** Admixture which is used in construction of concrete block pavement should be conforming to IS 9103, it is not affecting the property of concrete block pavement.
- Water:** The water used in production of paving block should be potable and having minimum PH value of 7 to 8 as per IS 456. The water cement ratio is 0.45.

Results

- Comparison of compressive strength

Table 2

Sr. No.	Conventional block	Fly Ash block
	7 days(N/mm ²)	7 days(N/mm ²)
1	50.83	47.22(50% fly ash)
2	49.20	Fail (100% fly ash)

II. CONCLUSION

From experimental results we conclude that compressive strength of both conventional as well as fly ash blocks are similar. Therefore fly ash paver blocks can replace conventional blocks.

III. SCOPE OF THE FUTURE

Fly ash is cheaply and readily available. Fly ash as produced on large scale it leads to attain economy.

IV. REFERENCES

- [1]. Radhikesh P Nanda, Amiya k Das, Maharana N.C., "Stone crusher dust as a fine aggregate in concrete", International Journal of Civil & Structural Engineering, volume 1, No 3, 2017.
- [2]. Ms. Deshmukh Anuja A, Mr. Nikam Rohit S, Gite Asha., " Utilization of Basalt fiber", International Conference on recent trends in civil Engineering, Science & management,(ICCSM-17) ISBN-978-93-86171.
- [3]. Koli Nishikant, Aiwale Nachiket, Inamdar, Abishek Sangar., "Manufacturing of concrete paving block by using waste glass material", International Journal of Scientific and Research Publications, Volume 6, Issue 6, June 2016 61.
- [4]. Dinesh W. Gawatre, Akshay S Ghaytadhkar, Nikhil N Gage Sumit D bhar shubham.S.Deare., "To improve Mechanical properties of concrete paver block", IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE).
- [5]. Kewal,Sanjay K Sharma and Himmi Gupta., "Development of paver block by using foundry sand based geopolymer concrete", Author(s) 2015 the Article is published with open access at www
- [6]. Surta Rai Nurliana Panjaitan., "Influence of Lime Addition Compressive Strength Against Increasing Paving Block", Department of Civil Engineering, Institute Technology Medan, Indonesia.
- [7]. Chethan Kumar N.T., "Hypo sludge paver blocks., ",Assistant professor, civil engineering department, PACE Mangalore , Karnataka(India).
- [8]. Tung-chai Ling., Hasanan Md Nor., "Granulated waste tyres in concrete paving block",

- Department of Geotechnics and Transportation, University Teknologi Malaysia, Malaysia, Skudai, 81300, Malaysia.
- [9]. Patel V. V., Dr. Pitroda J. R., Prof. Bhavsar J. J., "A Critical literature review on gain full utilization of industrial waste in rubber mould paver block", International Journal of emerging technologies application in engineering technology and sciences. 0974-3588 | JAN 2016 | Volume 9 : Issue 1.
- [10]. R. C. Yeole., Dr. M. B. Varma., "Comparison of Mix Designs of Paver Blocks using Waste Rounded Steel Aggregates and Rubber Pad", International Journal of Emerging Technology and Advanced Engineering Website: www.ijetae.com (ISSN 2250-2459, ISO 9001:2008 Certified Journal, Volume 4, Issue.
- [11]. Shyam Prakash Koganti., Kommineni Hemanthraja Satish Sajja., "Replacement of Fine Aggregate by using Recyclable Materials in Paving Blocks", IOP Conf. Series: Materials Science and Engineering 225 (2017) 012157 doi:10.1088/1757-899X/225/1/012157.
- [12]. B.A.V .Ram kumar ,J Venkateshwar Rao., "Effect of Inclusion Of Glass Fiber and GGBS in concrete Paver block", IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) e-ISSN:2278-1684,p-ISSN: 2320-334X, Volume 12, Issue 5 Ver. III (Sep. - Oct. 2015).
- [13]. Shivkumar Hallale, Shinde swapnil &Vikas Londhe., " Recycled Plastic and Coconut Fiber Used in Concrete Paver Block", UG scholar Assistant professor Department of Civil Engineering Sethu Institute of Technology, Madurai, Tamilnadu, India.
- [14]. Ritesh Mall , Saurabh Dubey&Sharda Sharma., " Study the properties of paver blocks by using material like fly ash ", M.Tech Structural Engineering Department of Civil Engineering Madan mohan malviya University of Technology,Gorakhpur (U.P) India.
- [15]. S. Ismail And Z.Yaacob., " Properties of Bricks Produce with Recycled fine Aggregate ", World Academy of Science, Engineering and Technology 43 2010..chitkara.edu.in/publication

Basic Requirements of Anaerobic Digestion- A Review

Bhagat, M. S.¹, Jamgade P. B.², Rathod R. B.², Tarale, P. G.², Sontakke A.G², Pakmode A.R²,
Chaudhari D.P²

¹Associate Professor, Department of Civil Engineering, DBACER, Nagpur, Maharashtra, India

²B.E. Student, Department of Civil Engineering, DBACER, Nagpur, Maharashtra, India

ABSTRACT

The reduction of CO₂ emissions, large demand of fossil fuels and environmental issues are the reasons for studies to develop new technologies to obtain energy from biomass. More attention is being directed toward biological production of biogas using Anaerobic Digestion Processes. Biogas generating technology is a favourable dual purpose technology at present. Biogas typically refers to an odourless gas produced by Anaerobic Digestion (AD) of biomass using microorganisms. It has an approximate composition of 50-70% Methane (a combustible gas), 30-50% Carbon dioxide and other trace gases. Among other applications, the gas can be used for heating, cooking and electricity generation. Biogas production from anaerobic digestion is a promising technology for sustainable energy development.

Keywords: Biomass, Anaerobic Digestion, Sustainable

I. INTRODUCTION

With rapid urbanization, the quantities of municipal solid waste, an important by-product of an urban lifestyle, is increasing at a rate faster than urbanization itself [1]. The proper management strategy is necessary to avoid the pollution caused by the Municipal Waste (MW). MSW contains compostable organic matter (fruit and vegetable peels, food waste), recyclables (paper, plastic, glass, metals, etc.), toxic substances (paints, pesticides, used batteries, medicines), and soiled waste (blood stained cotton, sanitary napkins, disposable syringes). Solid Waste Management (SWM) is an organized process of storage, collection, transportation, processing and disposal of solid refuse residuals in an engineered sanitary landfill. It is an integrated process comprising

Several collection methods, varied transportation equipments, storage, recovery mechanisms for recyclable material, reduction of waste volume and

quantity by methods such as composting, waste-to-power and disposal in a designated engineered sanitary. The frequently used procedure to control the MW pollution is recycling and converting the MW to organic amendments. Biogas can be used in place of fossil fuel derived energy and it is clean and renewable [2]. Global warming is the main problem of our country caused by emission of CO₂ due to combustion of fossil fuel. Different biomass are used for anaerobic digestion that includes; waste water, sewage sludge, food waste, fruits and vegetables waste, municipal solid waste, etc. Biogas production has multiple benefits like energy production, waste minimization, land filling reduction, reduction of pollution levels, bio-fertilizer from digestate, pure chemicals, and creation of green jobs. Anaerobic digestion (AD) is the most common method for sludge stabilization. Moreover, this digestion process using various anaerobic bacteria produces biogas including methane that can be an alternative source of energy. AD has been successfully used for sludge treatments of

various kinds for example sewage sludge [3]. Waste activated sludge [4] and cow manure [5]. However, very few studies have applied AD for paper sludge (PS treatment) [6]. However, very few studies have applied AD for PS treatment. Lin et al [7].

Rapid growth of population and uncontrolled and unmonitored urbanization has created serious problems of energy requirement and solid waste disposal. Vegetable market wastes contribute to a great amount of pollution; hence, there has been a strong need for appropriate vegetable waste management systems [7]. Vegetable wastes that comprise of high fraction of putrescibles organic matter cause serious environmental and health risks. It is known that organic waste materials such as vegetables contain adequate quantity of nutrients essential for the growth and metabolism of anaerobic bacteria in biogas production [8]. India produces 150 million tonnes of fruits and vegetables and generates 50 million tonnes of wastes per annum, Therefore it become necessary to develop appropriate waste treatment technology for vegetable wastes to minimize green house gas emission [9]. The process of digestion and production of biogas depends on the composition of feedstock and the fermentation products of the vegetable wastes. The main objective of this study is to employ anaerobic digestion process as a sustainable technology for digesting the vegetable wastes, produced in large amounts during harvesting, handling, transportation, storage, marketing and processing, and to provide the renewable source of energy as well as to reduce the potential green house gas emission [10]. The specific objectives are (i) to optimize the methane gas evolution from the vegetable waste. (ii) To get an understanding of the anaerobic digestion of the vegetable wastes under ambient temperature conditions by conducting a lab scale study and hence to investigate the biogas yield and the kinetics of anaerobic digestion of vegetable waste fed.

The techniques used for the conversion of organic materials to biogas have been in existence for many years. Methane generation has been applied to meeting the energy needs in rural areas. In England, India, Taiwan, for example, methane generating units as well as plants using cow manure and municipal waste have been in operation for years. In United States there has been considerable interest in the process of anaerobic digestion as an approach to generating a safe clear fuel as well as source of fertilizer [5,6].

II. ANAEROBIC DIGESTION

Anaerobic digestion (AD) is a process in which microorganisms break down biodegradable material in the absence of oxygen. Anaerobic digestion can be used to treat various organic wastes and recover bio-energy in the form of biogas, which contains mainly CH₄ and CO₂. Methane could be a source of renewable energy producing electricity in combined heat and power plants.

III. PHASES OF ANAEROBIC DIGESTION

- 1) Hydrolysis:** Hydrolysis is a reaction with water. Acid and base can be used to accelerate the reaction. It is a process where complex organic molecules (cellulose, proteins and fats) are broken down into simple sugars, amino acids and fatty acids by an enzyme called hydrolase.
- 2) Acidogenesis:** The monomers formed in the hydrolytic phase are taken up by acidogenic bacteria to be further degraded into short chain organic acids, alcohols, hydrogen and CO₂.
- 3) Acetogenesis:** In the stage acitogenic micro-organism further break down the hydrogen and CO₂ gas to produce mainly acetic acid and organic acid and alcohols which are subsequently converted into acetate. The acetate serves as a substrate for methane-

forming bacteria, which grows in a synergetic relationship with methane forming bacteria.

4) Methanogenesis: In the final stage, bacteria known as methanogen, convert the acetic acid into methane, CO₂ and water under strict anaerobic conditions. A nutrient rich by-product, known as the digestate, is formed during this process. As explained, in the fourth and final stage of the anaerobic digestion, methane is formed by methanogenic bacteria, either by breaking down the acids to methane and CO₂ or by reducing CO₂ with hydrogen.

IV. FACTORS AFFECTING YIELD AND PRODUCTION OF BIO-GAS

1) Temperature: Temperature is one of the critical parameters in biogas production. Failure to properly control the reaction temperature may lead to decrease in process efficiency and indirectly affect the rate of reaction, the solubility of heavy metals and carbon dioxide as well as buffering. There are three temperature ranges in the anaerobic digestion which are: 1) Psychrophilic : 0-15 °C ,2) Mesophilic 15-45 °C, 3) Thermophilic : 45-65 °C .The operation in the mesophilic range is more stable and requires a smaller energy expense. The temperature between 350C to 370 C is considered suitable for the production of methane.

2) PH (Acidity or alkanity): Biogas production is greatly influenced by pH of digester contents. It is essentially a measure of acidity and alkalinity of a solution. A pH value of 7 is regarded as neutral, less than 7 as acidic and greater than 7 as alkaline. A too acidic or too alkaline environ-ment is viewed as detrimental for bacterial activity. A pH between 7 and 8.5 is optimum range for increased gas yield. Sometimes, it becomes necessary to bring the pH value to a desired range which can be done by introducing additives.

3) Loading rate: Loading rate normally expressed as amount of waste materials fed per unit volume of digester capacity is an important parameter that affects gas yield. Pretreatment of feed was identified as one of the contributing factor for increasing the biogas yield. If the loading rate is too high, pH of the digester content tends to fall due to its becoming acidic, results in inability of micro-organisms to biodegrade all feed materials.

4) Salinity: The effect of salinity on biogas yield have negative impact on gas output. The final biogas generation might be strongly inhibited, rather than hydrolysis, VFA formation and acetate production, due to salinity.

5) Carbon nitrogen ratio: For the efficient gas generation it is necessary to maintain C/N ratio within desired range. Organic solid wastes mostly comprised of protein, starch and fat. In anaerobic conditions, nitrogen is an essential nutrient for microorganisms to grow and multiply in number. It is very important to maintain nitrogen concentration throughout the process so that it will not cause disturbance to the process the microorganism consumed. The most optimal C/N ratios in a methane generation process were in the range of 20 - 30. It also has been stated that carbon is about 25 to 30 times faster than nitrogen because they uses carbon as the source of energy while Nitrogen used for building cell structure. For the improvement of C/N ratio, Co-digestion of mixtures is employed.

6) Hydraulic Retention Time (HRT): HRT is defined as the average time spent by the input slurry inside the digester before it comes out. HRT is chosen so as to achieve at least 70-80 per cent digestion. HRT varies between 20 to 120 days depending upon the design and operating temperature of the digester. HRT for digesters operating in countries of tropical region like India is usually taken as 40-50 days. In countries of colder climates like China, digesters are designed for HRT of about 100 days.

7) Moisture content: This should be about 90% of the weight of the total contents. With too much water the rate of production per unit volume in the pit will fall, preventing optimum use of the digester. If the water content is too low, acetic acid will accumulate, inhibiting the fermentation process and hence production and also thick scum will be formed on the surface. The water content differs according to the raw material used for fermentation. Nature of organic materials, materials rich in cellulose and semi-cellulose with sufficient proteaceous substance produce more gas.

8) Agitation (Stirring): the purpose of mixing and stirring inside the digester is to blend the fresh material with the dig estate and thus inoculate the fresh material with microbes. Such mixing avoids temperature gradients within the digester and also prevents scum formation. Scum can result in blockage of the gas pipe or potentially lead to a foaming over the digester. Mixing greatly helps to ensure intimate contact between micro-organisms which leads to improved fermentation efficiency and biogas yield.

9) Microbial Activity: There are several factors and class of materials which act as inhibitor to bacterial activity during anaerobic fermentation. When these chemicals and factors reach certain level, bacterial activity almost stops thereby severely affecting gas yield. For example, when volatile acid concentration reaches a value of 200 ppm, or ammoniacal nitrogen concentration exceeds a value of 1500 ppm, microbial activity is greatly retarded. A retarded microbial activity ultimately results in low quality gas with low methane content in relation to other constituents.

10) Inoculum: Cow dung slurry was used as a source of inoculum since rumen of cow contains anaerobic microbial population. The cow dung slurry was prepared by mixing water in 1:5 proportions and sieved to remove coarse particles. The cow dung slurry and the FW slurry were mixed in 1:1

proportion and the mix was poured in the reactor. The nitrogen gas was sparged through the reactor to remove the oxygen toxicity to anaerobes. The total solids (TS) concentration of the mix was 9000ml/L with volatile fraction of 86%. The reactor content was mixed thoroughly by 100% recirculation from the outlet (top) to the inlet (bottom) of the reactor with the help of the slurry pump.

V. APPLICATIONS AND SCOPE OF BIOGAS:

Biogas can be used as a replacement for natural gas in vehicle fuel. If compressed it can replace natural gas for use in vehicles. Biogas can be used for electricity production. Residues left from biogas are a valuable fertilizer especially at the place where soil quality has become degraded through over-intensive farming.

VI. CONCLUSION AND DISCUSSIONS

It is recognised that biodegradable waste can be feedstock to produce useful energy, leading to waste minimisation at the same time. Among various treatment methods, anaerobic digestion to produce biogas from organic waste is a proven environment friendly route for waste treatment and energy recovery. It can drastically reduce the depletion of natural resources. Physical and chemical characteristics of the organic wastes are important for designing and operating digesters as they affect the biogas production and process stability during anaerobic digestion. The design and performance of anaerobic digestion processes are affected by many factors. Some of them are related to feedstock characteristics, reactor design and operation conditions hence with better equipment, adjustment of conditions and if the feedstock is digested properly, more reasonable results can be obtained. Insulation of the digester gives good biogas yield as compared to non-insulated one. According to studies, Continuous fed digesters results in good quality of methane. Hence biogas production by means of anaerobic

digestion has become an established and proven technology for management of waste.

VII. REFERENCES

- [1]. A. Apte, V. Cheernam, M. Kamat, S. Kamat, P. Kashikar, and H. Jeswani, "Potential of Using Kitchen Waste in a Biogas Plant", *International Journal of Environmental Science and Development*, Vol. 4, No. 4, August 2013.
- [2]. Budiyo, I. N. Widiya, S. Johari, Sunarso (2010), "The Kinetic of Biogas Production Rate from Cattle Manure in Batch Mode." *International Journal of Chemical and Biomolecular Engineering*, 3, 39-44.
- [3]. Y. Cao, A. Pawlowski, 2012. "Sewage sludge-to-energy approaches based on anaerobic digestion and pyrolysis: Brief overview and energy efficiency assessment. *Renewable and Sustainable Energy Reviews*", Vol. 16 (3), pp.1657-1665
- [4]. D. Bolzonella, L. Innocenti, F. Cecchi. 2002. "Biological nutrient removal wastewater treatments and sewage sludge anaerobic mesophilic digestion performances." *WatSciTechnol*, Vol. 46(10), pp.199-208
- [5]. E. Maranon, L. Castrillon, G. Quiroga, Y. Fernandez-Nava, L. Gomez, M. Garcia. 2012. "Co-digestion of cattle manure with food waste and sludge to increase biogas production." *Waste Management*, Vol. 32
- [6]. S. Kumar, S. A. Gaikwad, A. K. Shekdar, P. K. Kshirsagar, R. N. Singh. (2004). "Estimation method for national methane emission from solid waste landfills." *Atmospheric Environment*. 38: 3481-3487
- [7]. B. Velmurugan and R. Alwar "Anaerobic Digestion of Vegetable Wastes for Biogas Production in a Fed-Batch Reactor" *Int. J. Emerg. Sci.*, 1(3), 478-486, September 2011 ISSN: 2222-4254
- [8]. Y. S. Bodkhe and A. N. Vaidya. "Complete recycle bioreactor for anaerobic digestion of organic substrates: Food waste" *Research Journal of Chemistry and Environment* Vol.16 (2) June (2012)
- [9]. S. L. Bong, K. Byungchul, C. In. "Anaerobic Treatment of Food Waste Leachate for Biogas Production Using a Novel Digestion System" *Environ. Eng. Res.* 2012 March, 17(1) : 41-46 ISSN 1226-1025
- [10]. S. V. Dhanalakshmi and R. A. Ramanujam. S "Biogas Generation in a Vegetable Waste Anaerobic Digester: An Analytical Approach" *Research Journal of Recent Sciences* Vol. 1(3), 41-47, March (2012) ISSN 2277-2502

A Review : On Base Isolation Techniques

P. A. Deotale¹, R. S. Naranje², N. V. Dhakde³, R. J. Meshram⁴, P. V. Lakadey⁵, P. S. Amborkar⁶, R. D. Yadav⁷

¹Assistant Professor, Department of Civil Engineering, RTMNU/DBACER, Nagpur, Maharashtra, India

²³⁴⁵⁶⁷Department of Civil Engineering, RTMNU/DBACER, Nagpur, Maharashtra, India

ABSTRACT

An earthquake represents one of natural hazards human society has to face, often without any kind of warnings. An earthquake can cause many damages or losses to the structure due to seismic forces, which can cause the settlement and displacement of the structure or buildings to protect the structure from the displacement of isolator. An isolator is the system which separates the substructure and superstructure of the building which can be of various types. Isolation must be chosen depending upon its results, materials and its outputs and considering all the aspects. There are different types of isolationsystem, in this paper it gives basic information about the base isolation system and it also describes suitability and application. The building is to be designed on SAP2000 software. The main aim of this paper is to determine the base shear of building and providing a suitable isolation.

Keywords: Earthquake Engineering, Base Isolation System, Lateral Displacement, SAP2000

I. INTRODUCTION

An Earthquake is the result of the sudden release of energy in the Earth's crust created seismic waves that cause vibrations; the ground may develop cracks, fissures, and settlements. Shaking and ground rupture are the main effects, resulting mainly in more or less damage to building and other rigid structures. The potential risk of loss of life adds a very serious dimension to seismic design putting structural engineers a moral responsibility.

The main objective of earthquake resistant design is to make such buildings that can resist the effect of ground movement and would not collapse during the strong earthquake. Recently, many new systems have been developed to either reduce the earthquake forces acting on the structure or to absorb a portion of seismic energy.

Base isolation is one of the most widely researched, implemented and accepted seismic protection. The structures performance during an earthquake depends on the type and characteristics on the base isolation. It needs proper modelling to study the isolations nonlinear behaviour. A typical LRB's force displacement relationship is nonlinear. The simple friction isolator consists of a large surface deformation. Therefore, it is good to introduce any recovery mechanism for better performance of friction sliding bearings. For example, a restoration mechanism is provided by the mid and outer rubber cores in resilient friction bearings (R-FBI).

A brief review of some papers is given in this article to understand the difference between the fixed base responses and the isolated base structure, to determine the effectiveness of the different isolators and to study the properties of the isolator in details.

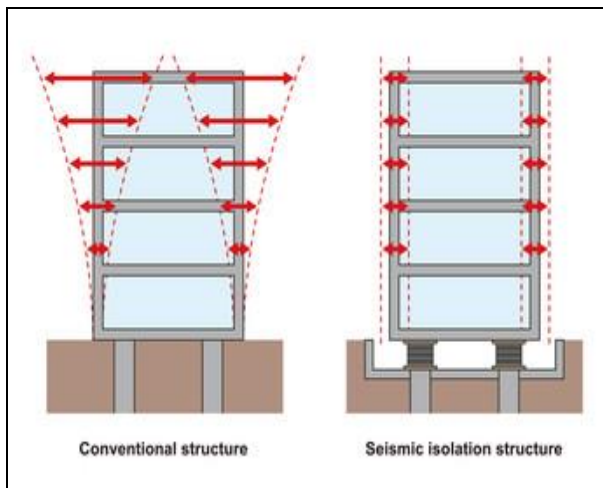


Fig. (i) Figure shows the seismic behaviour of the building with and without base isolation

II. LITERATURE REVIEW

The brief review of various base isolated buildings by different researchers is discussed below:

H.W.Shenton[1], discuss the relative results of a fixed and isolated structure have been compared and analyzed. The Concrete Fix Base Structure was designed by referring California Association of Structural Agencies (SEAOC). The base isolated response was compared to a fixed base response. The base shear varied according to the SEAOC recommendation.

Three different types of time History, post-earthquake record were selected to perform nonlinear dynamic analysis for fixed base and isolated base structure.

Results were compared to SEAOC's 25 percent and 50 percent of the Specified Lateral Force. Building performance was checked for different lateral forces.

N. Torunbalci and G. Ozpalarlar[2], studied and compared six storey building with five different seismic protection alternative with fixed based building. In this analysis, total base shear forces, storey shear forces, maximum absolute acceleration and relative storey are compared and result are discussed.

The result was on the basis of natural period. The natural period of fixed base building was 0.58 sec,

which was further increased to 2 sec by using base isolators. When storey shear, relative drift and acceleration values are examined after application of seismic protection alternatives, the results were similar to zone which is out of resonance range of earthquake. Results were found adequate and safe from earthquake.

Dia Eddin Nassani, Mustafa Wassef Abdulmajeed[3], have studied advanced seismic resistance methods, and the effect of this system on the seismic response on the structures. To verify the effect of base isolation system two different buildings are taken into account, one with base isolated and other with fixed base. Both buildings were compared with the help of SAP2000. The base shear in x direction in base isolated condition was 3557 KN and for fixed base condition it was 13940 KN. Result were similar in condition of y direction. The drift ratio for base isolated condition was 0.0007 while that for fixed base was 0.003. Comparing result it was found that base isolation system reduces the base shear force & storey drift as compared to fixed base.

Sameer S. Shaikh, P.B. Mrunal.[4], discuss the base isolation at different levels in building. They made up three storey building without base isolation and with base isolation at the different levels of the building, because they found that if the isolators are fixing to above floors, acceleration are decreasing hence there is less failure occurs to above floors as compared to isolators at footing. So they used laminate rubber bearing as a isolators in building. Because LBR is made up of alternating layers of rubber and steel. They study both building under the time history motion because time history is the best way to represent the earthquake actions. After performing time history analysis it is found that when base isolators are shifting at plinth level and first floor level acceleration was reduced.

R. B. Ghodke, Dr. S. V. Admane[5], studied the effect of the earthquake study may lead to horizontal

components of the earthquake movement that mainly damage the structure rather than the vertical component and may also face major economic losses. Base isolation is an effective system for reducing damage to buildings caused by the earthquake.

Observations are made on the SAP2000 software study of 5 storied buildings with base isolation and without base isolation. The building plan area is 12 m x 10 m with each typical storey having height of 3.0 m. The building is analysed and designed using SAP2000 software. Two different observations are being made. Two different observations are being made. One design with a fixed base and the other with a base isolation system; and two results are compared, and with base isolation and without base isolation there is a very huge and remarkable difference. Building displacement with fixed base is more than building with base isolation.

A. Swetha, Dr. H. Sudarsana Rao[6], studied dynamic analysis of the G+4 storey building. The dynamic analysis was done using a new beta mark method. Records of the values of the EI Centro Earthquake were taken to accelerate ground motion. Static analysis was performed and comparison was made for peak lateral force, shear force and displacement of each force. The design was done in accordance with IS 1893 (part 1): 2002. The comparison was made and interferences were drawn to the effectiveness of ground storey and week buildings due to the critical effect of an earthquake.

Sekar and Kadappan[7], carried out experimental work on base isolated bearing and rigid base reinforced concrete building were compared with the effects of the soil, earthquake zone and normal and sloping soil. He took a multi-storey RC building with a normal and sloping ground surface for this study and designed it with and without an isolator. Various storey height ranges from 1 to 10 were taken with different seismic zones and the building's plan was rectangular with a size of 12x16 m and a seismic zone. The linear dynamic analysis was carried out using the

response spectrum method. The different results were obtained with the different terrain and zone conditions. As with the introduction of the isolator, the basic natural time of the structure increases but reduces the base shear. Building drift also increases in the storey. Since the results were changed due to different terrain conditions, the base isolator makes the building as a rigid building with a longer period of time.

Sushma. G. Sawadatkhar, Mandar. M. Joshi[8], studied an earthquake represents one of the natural hazards human society has to face, often without any kind of warnings. It involves a severe, shaking of the earth below out feet affecting all systems and structures standing on it. The need to minimize earthquake damage is important. This leads to use of seismic base isolation strategy on a large scale in several earthquake prone developed countries. The base isolation works by decoupling of building or structure between the substructure and superstructure. It is the flexible layer between foundation and superstructure. There are different types of base isolators and materials used for base isolators which give basic information in this paper. The different types of base isolators are lead rubber bearings, high density rubber bearings and friction pendulum system. Out of which it is found most effective and most widely used is lead rubber bearing which has many advantages as compared to others. The various materials used for lead rubber bearings are rubber, lead, and steel. In lead rubber bearings there are alternate layers of rubber and steel. Lead rubber bearings are found to be most effective in every aspect on the seismic prone structures. It is applicable to low to medium of buildings. It protects from horizontal movements and gives better vertical stiffness to the structures as compared to others.

H. R. Tavakoli F. Naghaviand A. R. Goltabar[9], studied dynamic responses of multistorey base-isolated and fixed base buildings are investigated in near and far reaching ground movements. The lead

rubber insulation bearing (LBR) is used in the examination. First, the mechanical properties of the LRB insulation system are calculated. The seismic analysis of the building is performed using a non linear time history method for two dimensional reinforced concrete building frames. For analytical purposes, three far field records and three near fault ground motions records from the same components are selected at different stations and performed on frames. The analytical results for isolated and fixed base frames are compared in low and low ground movements. The results of the analysis are examined as the drift of the storey, acceleration of each storey, base shear and displacement of the base.

A. Sai Greeshma, M. S. Anantha venkatesh[10], studied and discussed the base control of high rise building using fixed isolators. The aim of the study was to determine the effectiveness of base isolators under the vibrations. For these purpose they studied building structure of different storey levels i.e.10 storey, 20 storey, 30 storey buildings are analysed with fixed base and isolated base. Then the seismic response of analysed building, both fixed base and base isolated under 2001 Bhuj earthquake by using passive base isolators was studied. The reduction in lateral response was measured by comparing the storey displacement, storey shear, storey over turning moment of both building. It has been observed that maximum storey displacement was decreased about 40%, maximum storey shear and base shear was decreased about 50%, maximum moment and base moment was decreased of about 50% by providing base isolators.

III. CONCLUSION

The conclusion on the above study can be noted that, when the comparison between the non-isolated and with isolated building is done, then the isolation technique is more effective. Application of base isolation is an extraordinary and widely used technique which can be used to save innumerable

lives and money spend destruction made by earthquakes. Also this paper can be concluded that the, time period can be increase with the application of different base isolation as compared to fixed base system.

IV. REFERENCES

- [1]. Constantinou and Tadjbakhsh, "Optimum characteristic of isolated structures", Journal of Structural Engineering, ASCE, May 1985, Vol. 111, (pp. 2733-2750).
- [2]. Makris and Constantinou, Himanshu S. Deoskar, "Studies on seismic isolation of buildings", Journal of Structural Engineering, ASCE, June 1991, Vol. 117, (pp. 27080).
- [3]. Kelly J.M. Naeim, "Design of seismic isolated structures" , Journal of Earthquake Engineering & Structural Dynamics, 1999, ISSN 2075-5309 Nueva York
- [4]. Heaton T.H., Hall J.F. ald D.J , Halling M.W."Response of high-rise and base-isolated buildings to a hypothetical Mw 7.0 blind thrust earthquake", Science 267(5195), 206–211 (1995).
- [5]. Pourzeynali.s, Zarif.M, "Multi-objective optimization of seismically isolated high-rise building structures using genetic algorithms", Elsevier, Journal of Sound and Vibration 311(2008) 1141–1160.
- [6]. Swathirani.K.S , Muralidhara.G.B , Santoshkumar.N.B, "Eatrquake Response Of Reinforced Cocrete Multi Storey With Based Isolation", International Journal of Research in Engineering and Technology Volume: 04 Issue: 10,pg 158-167,2015.
- [7]. Sekar and PL Kadappan, "Seismic analysis of multi-storey buildings resting on normal and sloping grounds in different seismic zones with and without base isolator" , I-manager's Journal on Structural Engineering, Vol. 4 l No. 1,(2015).
- [8]. Farzad Hatami, Hamed Nademi, Mohammad Rahaie, "Effects of Soil-Structure Interaction on the Seismic Response of Base Isolated in High-

- Rise Buildings”, International Journal of Structural and Civil Engineering Research Vol. 4, No. 3, (2015).
- [9]. A.Swetha, Dr. H. Sudarsana Rao, “Non-linear analysis of multistorey g + 4 building by time history method using newmark’s linear and average acceleration method”, international journal of engineering sciences & research technology, issn: 2277-9655, (2015).
- [10]. Shu-lu Wang, Hong-bai Bai & Ghun-hong Lu, “The Research Progress and Application Expectation of Metal Rubber Vibration Isolator”, International Conference on Materials, Environmental and Biological Engineering, (2015)
- [11]. A. B. M. Saiful Islam, Mohammed Jameel and Mohd Zamin Jumaat, “Seismic isolation in buildings to be a practical reality: Behavior of structure and installation technique”, Journal of Engineering and Technology Research Vol. 3(4), pp. 99-117, April 2011.
- [12]. Donato Cancellara, Fabio De Angelis, “Assessment and dynamic nonlinear analysis of different base isolation systems for a multi-storey RC building irregular in plan” , ELSEVIER, Computers and Structures, (2016).
- [13]. Fabio Mazza n, Daniela Pucci, “Static vulnerability of an existing r.c. structure and seismic retrofitting by CFRP and base-isolation: A case study”, ELSEVIER, Soil Dynamics and Earthquake Engineering, (2016).
- [14]. Jared Weisman and Gordon P. Warn, “Stability of Elastomeric and Lead-Rubber Seismic Isolation Bearings”, Journal of structural engineering, ASCE, February 2012, Vol. 138, (pp. 215-223).
- [15]. Jia Gaofeng and Shi Zhiferi, “A new seismic isolation system and its feasibility study”, Earthquake engineering and engineering vibration, SPRINGER, March 2010, Vol. 9, (pp. 75- 82).
- [16]. S.D.Darshale and N.L.Shelke, “seismic Response Control of R.C.C. Structure using Base Isolation”, International Journal of research in Engineering science and Technology, vol.2, No.1, (2016).
- [17]. Sayani Prayag J, Ryan Keri L. “Comparative evaluation of base-isolated and fixed-base buildings using a comprehensive response index”, J Structural Engg 2009; 135(6):698–707.
- [18]. Erduran E, Dao ND, Ryan KL. “Comparative response assessment of minimally compliant low-rise conventional and base-isolated steel frames”, Earthquake Eng Struct Dyn 2011;40(10):1123–41.
- [19]. Furukawa T, Ito M, Izawa K, et al. “System identification of base isolated building using seismic response data”, Eng. Mech-ASCE, 2005, 131: 268–275.

Time History Analysis of Multi-Storey Building Equipped With Steel Bracing

¹Rahul D. Sapkale, ²Rakesh D. Shambharkar

¹ Assistant Professor, Department of Civil Engineering, G. H. Raisoni Academy of Engineering & Technology, Nagpur, Maharashtra, India

² Assistant Professor, Civil Engineering Department, DBACER, Nagpur, Maharashtra, India.

ABSTRACT

Steel bracing has proven to be one of the most effective systems in resisting lateral loads. Although its use to upgrade the lateral load capacity of existing Reinforced Concrete (RC) frames has been the subject of numerous studies, guidelines for its use in newly constructed RC frames still need to be developed. In this paper the study reveals that seismic performance of moment resisting RC frames with different patterns of bracing system. The three different types of bracings were used i.e. X - bracing system, V - bracing system and Inverted V - bracing system. This arrangement helped in reducing the structural response (i.e. displacement, interstorey drift) of the designed building structure. An (G+6) storey building was modelled and designed as per the code provisions of IS-1893:2002. And linear analysis is been carried out. The analysis was conducted with a view of accessing the seismic elastic performance of the building structure.

Keywords : Braced Frame, Linear Analysis, Storey Displacement, Storey Drift, Unbraced Frame

I. INTRODUCTION

This document is a template. An electronic copy can be Braced steel frames are commonly used to resist lateral loads. Their design guidelines are readily available [1]. The use of bracing to upgrade the seismic capacity of existing RC frames has been the subject of several research investigations over the past three decades. Two bracing systems are typically considered: external bracing and internal bracing. In order to strengthen concrete structures against lateral and seismic loading, the designers generally tend to lighten the total weight of structures, as well as strengthening them with shear walls, steel or concrete jackets or fibre reinforced polymer layers, external pre-stressing, and other popular means of bracings.

The logical arrangement of steel bracings in plan and levels has a great influence on the response and on the lateral displacement of structures. In the case of braces with high slenderness ratios and while they are in tension, the system may experience excessive horizontal or vertical deformations before failure of the joints. On the other hand if the bracing members are in compression, lateral deflection may easily occur; and regarding the possibility of occurrence of plastic deformations, the structures' hysteresis curves become unstable. Bracings with medium slenderness ratios have a brittle behaviour, and thus, when in compression, would not provide enough stiffness to contribute against lateral loads [2].

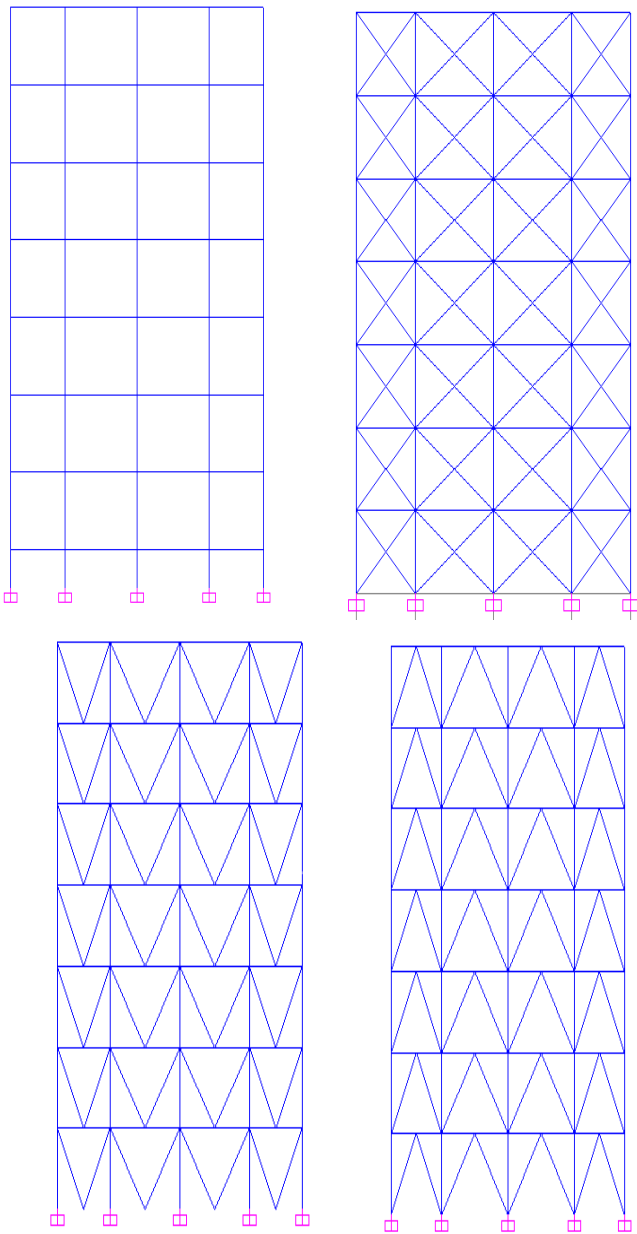


Figure 1 :- Unbraced and different types of Braced Modal

The aim of this research is to evaluate the performance and strengthening of RC frame structures with bracing members. At first, different type of bracing members is studied by considering a variety of models having different geometrical properties and characteristics. In the second stage, two RC frame structures unbraced and braced are designed and analysed. Then using the results obtained from analysis suitable frame with less displacement, Drift, etc. result is selected for the structure.

II. DESCRIPTION OF BRACING SYSTEM

Braced frames are a very common form of construction, being economic to construct and simple to analyse. Economy comes from the inexpensive, nominally pinned connections between beams and columns. Bracing, which provides stability and resists lateral loads, may be from diagonal steel members or, from a concrete 'core'. In braced construction, beams and columns are designed under vertical load only, assuming the bracing system carries all lateral loads. A Braced Frame is a structural system which is designed primarily to resist wind and earthquake forces. Members in a braced frame are designed to work in tension and compression, similar to a truss. Braced frames are almost always composed of steel members. Following fig. 2 show the different types of bracing system use to braced the structure.

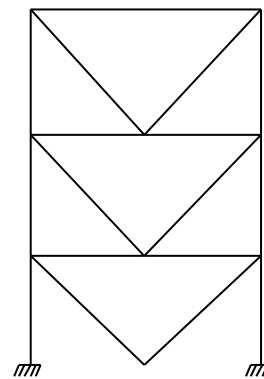
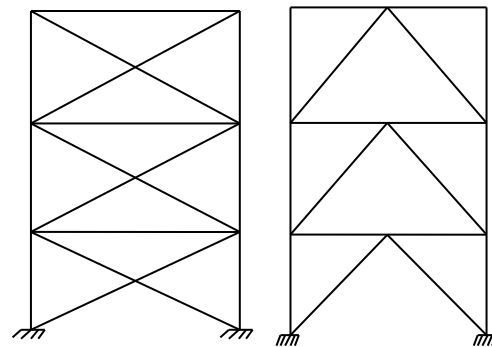


Figure 2 :- Different types of bracing

III. LINEAR ANALYSIS

Once the structural model has been selected, it is possible to perform analysis to determine the seismically induced forces in the structure. There are different methods of analysis which provide different degrees of accuracy. The analysis process can be categorized on the basis of three factors

- a) Type of external load applied
- b) Behaviour of structure/structural element
- c) Type of structural model selected

The analysis can be further classified as under linear static analysis, linear dynamic analysis

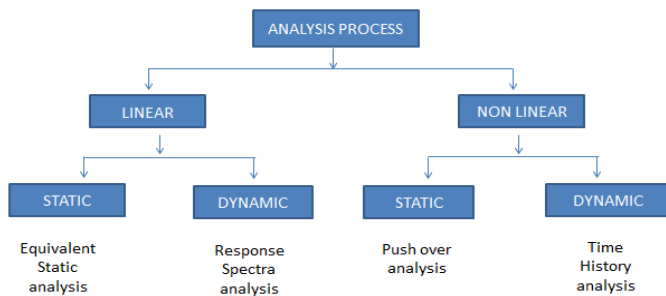


Figure 3 :- Different Types of Analysis

3.1 Linear Analysis:

Linear static analysis or equivalent static analysis can only be used for regular structures with limited height. Linear dynamic analysis can be performed in two ways: either by the mode superposition method or the response spectrum and elastic time history method. This analysis will produce the effect of higher modes of vibration and the actual distribution of forces in the elastic range in a better way. They represent an improvement over linear static analysis. The significant difference between linear static and dynamic analysis is the level of force and their distribution along the height of the structure.

- a) Linear equivalent static analysis
- b) Linear dynamic analysis

3.1.1 Linear equivalent static analysis:

This approach defines a series of forces acting on a building to represent the effect of earthquake ground motion, typically defined by a seismic design response spectrum. It assumes that the building responds in its fundamental mode. For this to be true, the building must be low-rise and must not twist significantly when the ground moves. The response is read from a design response spectrum, given the natural frequency of the building (either calculated or defined by the building code). The applicability of this method is extended in many building codes by applying a factor to account for higher buildings with some higher modes, and for low levels of twisting. To account for the effect due to "yielding" of the structure, many codes apply modification factors that reduce the design forces (force reduction factor).

3.1.2 Linear Dynamic analysis:

This approach permits multiple modes of response of a building to be taken into account (in the frequency domain). This is required in many building codes for all except for every simple or very complex structure. The response of a structure can be defined as a combination of many special shapes (modes) that in a vibrating string correspond to the "harmonics". Computer analysis can be used to determine these modes of a structure. For each mode, a response is read from the design spectrum, based on the modal frequency and the modal mass, and they are then combined to provide an estimate of the total response of the structure. In this, we have to calculate the magnitude of forces in all directions, i.e. X, Y & Z, and then see the effect on the building. Combination methods include the following

- Absolute – peak values are added together
- Square root of the sum of the squares (SRSS)
- Complete quadratic combination (CQC)-a method that is an improvement on SRSS for closely spaced modes.

IV. PROPERTIES OF BRACING MEMBER

- 1). Section = ISMC 75
- 2). Weight per Metre = 6.8 kg
- 3). Sectional area = 8067 cm²
- 4). Depth of section 75 mm
- 5). Width of Flange = 40 mm
- 6). Thickness of flange = 7.3 mm
- 7). Thickness of web = 4.4 mm
- 8). Maximum Size of flange Rivet = 12 mm

V. DESCRIPTION OF THE INVESTIGATED STRUCTURES

The heading of the References section must not be numbered. Considering residential building for 14m x 11m plan building with 3x3m, 4x3m, and 4x4m grid having rectangular columns and beams. The entire rectangular columns are oriented such that longer side parallel to the global 'Y' direction and shorter side parallel to 'X' direction. The height of the column in global 'Z' direction is considered 3m for each floor. The size of Column and Beam are selected to satisfy codal provision in shape and Column and Beam are shown in Table no. 4.1. Building consists of 230mm Brick Masonry in external side and 115mm Thick Masonry in inner side and 230mm Thick Masonry for Top Parapet Wall.

Investigated structure is constructed of RCC frame with M20 grade of concrete and Fe415 grade of steel with fixed support condition at the foundation level. RCC frame Structure modelled and designed as per the code provisions of IS-1893:2002, IS-456:2000 and IS-13920:2002

The data assumed for the problem to be analysing in SAP 2000 are as follows:

- 1). Building = (G+6) Storey
- 2). Slab thickness = 100 mm
- 3). Live Load = 3 KN/m²
- 4). Floor Finish = 1 KN/m²
- 5). Software Used = SAP 2000
- 6). Method of Analysis = linear Analysis

TABLE 1 :- PROPERTIES OF SECTIONS

Columns	Size (mm)	Beams	Size (mm)
C1	230 X 500	B1	230 X 300
C2	230 X 450	B2	230 X 400
C3	230 X 400	-----	-----

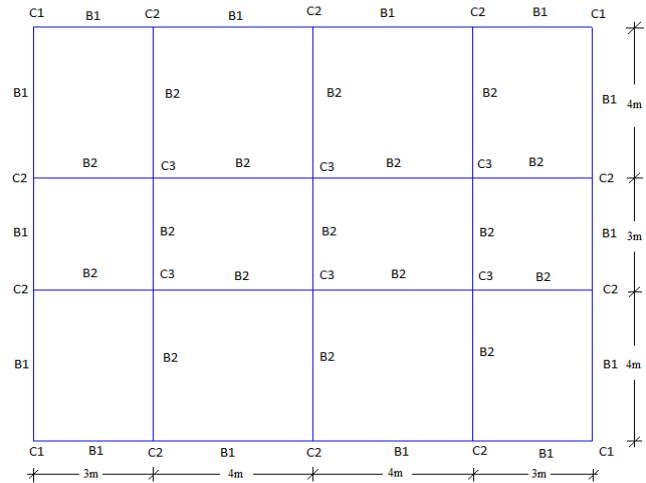


Figure 4 :- Plan of building

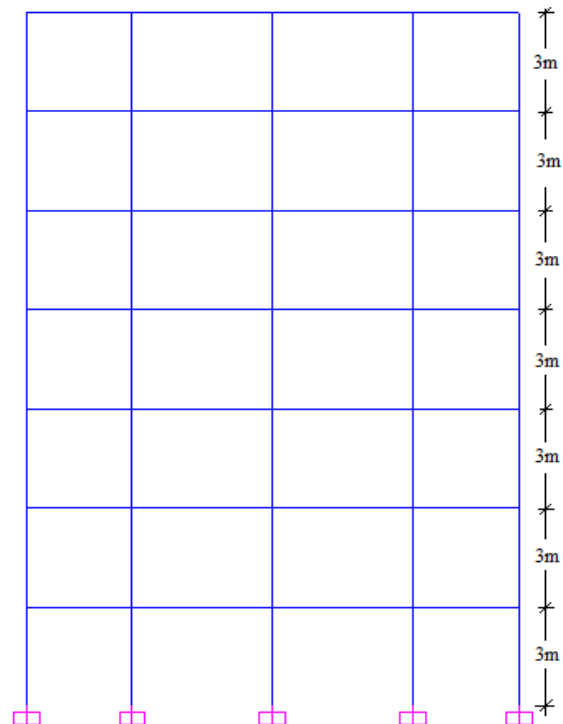


Figure 5 :- Elevation of building

VI. RESULTS AND DISCUSSION

VII. CONCLUSION

As the analytical study is based on the reduction of the seismic energy through the structural RC Frames, unbraced frame system is used to correlates the values with the bracing system, were found out using SAP 2000.

Following figure no. 6 to 10 are showing the displacement and Drift comparison of unbraced and different braced system for linear analysis with help of graph. On X-axis in the graph indicates the displacement, Drift, Shear Force & Bending Moment in millimeters respectively while Y-axis indicates the floor level of the structure. To differentiate the bracing system from each other different colour of line with marking over it is be used.

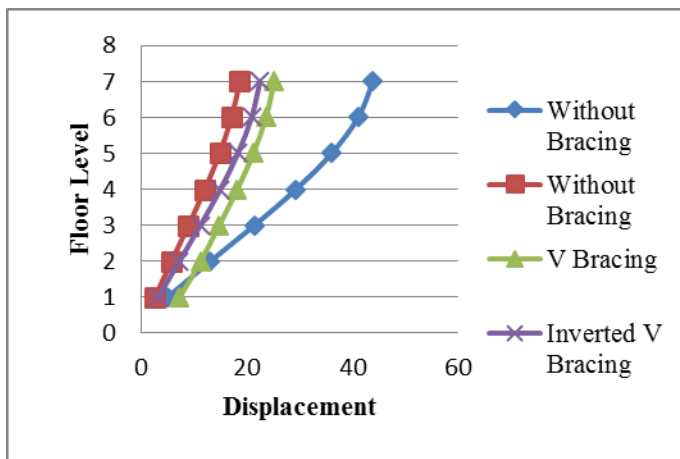


Figure 6 :- Displacement Graph

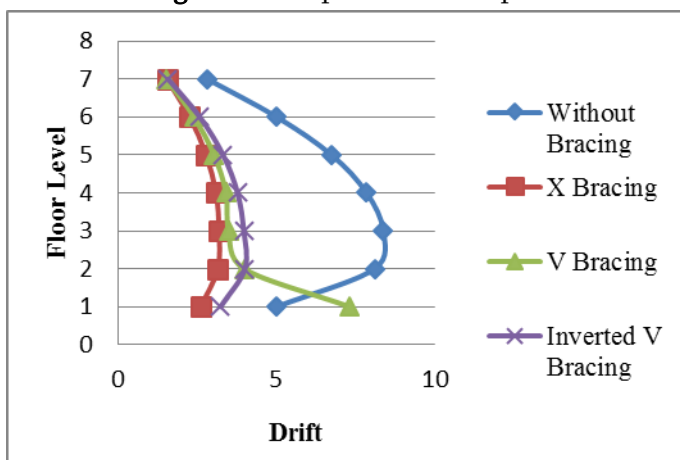


Figure 7 :- Drift Graph

Two frames unbraced and a different braced frame with steel bracing, were designed and analysed using SAP 2000 software to see the behaviour of frames. The conclusions drawn based on the analysis is that a braced RC frame minimizes the displacement, drift, Forces & Moments of the structure during the seismic activity as compare to that of without braced frame. Comparing results of three types of bracing system i.e. X bracing system, V bracing system and Inverted V bracing system with unbraced frame in all type X bracing system show more promising result it reduces displacement and drift of storey more than any of bracing system.

VIII. REFERENCES

- [1]. M.A. Youssef, H. Ghaffarzadeh, M. Nehdi (2007) "Seismic performance of RC frames with concentric internal steel bracing" *Engineering structure* 29, 1561-1568
- [2]. A.R. Rahai, M.M. Alinia (2008) "Performance evaluation and strengthening of concrete structures with composite bracing members" *Construction and Building Material* 22, 2100-2110
- [3]. Marco Valentea (2013) "Seismic Protection of R/C Structures by a New Dissipative Bracing System" *Procedia Engineering* 54, 785-794
- [4]. Ravi S. Navrange (2015) "Optimization of Damper Location Format in the RC Building Frames" *Journal of Control, Robotics, and Mechatronic Systems*, Vol. 1 (1), 33-37, Structural Engineering Dept., TGPCET, Nagpur, India
- [5]. Richard Sause, James M. Ricles, David Roke, Choung-Yeol Seo, and Kyung-Sik Lee (2006) "Design of self-centering steel concentrically-braced" 4th International Conference on Earthquake Engineering Taipei, Taiwan, Paper no. 122

- [6]. L. Di Sarno, A.S. Elnashai (2009) “Bracing systems for seismic retrofitting of steel frames” *Journal of Constructional Steel Research* 65, 452–465
- [7]. H. Moghaddam, I. Hajirasouliha, A. Doostan (2005) “Optimum seismic design of concentrically braced steel frames” *Journal of Constructional Steel Research* 61, 151-166
- [8]. A. Caruso-Juliano, A. Gallagher, T.E. Morrison, C.A. Rogers (2014) “Seismic performance of single-storey steel concentrically braced frame structures constructed in the 1960s” *Canadian Journal of Civil Engineering* 41(7), 579-593
- [9]. Adil Emre Ozel, Esra Mete Guneyisi (2011) “Effects of eccentric steel bracing systems on seismic fragility curves of mid-rise R/C buildings” *Structural Safety* 33, 82-95
- [10]. E. F. Gad, K. Watson, L. Pham, L. McGrath (2008) “Lateral bracing in steel framed residential structures” *Australasian Structural Engineering Conference (ASEC)* 26-27, Melbourne, Australia
- [11]. IS 1893 (Part 1), “Bureau of Indian Standards”, New Delhi, India, (2002).
- [12]. IS 13920, “Bureau of Indian Standards”, New Delhi, India, (1993).

Design and Analysis of a Residential Building Integrated with Green Building Concept - Literature Review

Vikas Hulde*1

*1M.Tech Scholar, G.H.R.A.E.T, R.T.M.N.U, Nagpur, Maharashtra, India

ABSTRACT

"The essential goal of this work is to the accentuation on basic plan of a structure (G+1) utilizing green idea with the goal that the structure stays solid all through its lifetime and fit enough to give a shed amid winter and summer."

Keywords: Energy, Green Building, Eco- friendly Housing.

I. INTRODUCTION

present senior energy utilization has expanded a ton. The expansion in energy utilization is because of the expansion in the quantity of structure that is being built nowadays. The material that is utilized to manufacture a general structure now days for the most part comprises of non-sustainable materials which are neither durable nor Energy Efficient. These are wellbeing dangerous and less eco-accommodating as well. To the extent the financial analyst is the worry, however these material gives the low starting expense for making a structure yet prompts high energy utilization costs and a high support cost which brings about expanding the general expense of the structure. In this paper, we will watch the impact of a portion of the segment of the green structure like the rooftop, glass and so forth and its various types which is utilized to develop the green structures. And furthermore we will discover how much degree this green glass decreases the general power utilization of the structure when contrasted with ordinary glass by utilizing reenactment process(Using ECO-Nirman entire structure execution instrument programming) and at last get the upside of this Green house part over typical segment.

II. LITERATURE REVIEW

1. Arijit Sinha 1 , Rakesh Gupta 1 , Andreja Kutnar DRVNA INDUSTRIJA 64 (1) 45-53 (2013)

Worldwide manageability objectives have prompted the improvement of the green structure development. The Green Building Program, originating from the development, has had exceptional accomplishment as it gives a quantifiable measurement to individuals' endeavors towards maintainable improvement. Manageable improvement and green structures are regularly utilized conversely. Albeit, manageable improvement and green structures are connected, they are not the equivalent.

This paper gives a review of how green structure identifies with supportable improvement rehearses. Maintainability additionally administers choices concerning building materials. A complete clarification of what comprises a green structure material is talked about and how sustainable material like wood admission in the choosing criteria. There are many green structure rating frameworks set up. US Green Building Council managed Leadership in Energy and Environment Design (LEED) is the

worldwide market pioneer in the rating frameworks. LEED is an excellent and stupendous exertion in moving towards supportable improvement by changing over the fabricated condition green. Be that as it may, it has certain traps and difficulties. A portion of these difficulties are as for arrangements on material se-lection and execution checking. The materials utilized in an undertaking are considered at a typical beginning stage and no thought is given to the existence cycle execution of the material. Proclamations concerning supportability require approval, and Life Cycle Analysis (LCA) is a device that can give such legitimacy. This paper exhibits how useful it tends to be, when included, in the greater plan of green structure rating frameworks and presents an inte-ground plan idea for green structures.

2. Hemant Kumar 1 and Vaishali Sahu 2 Department of Civil & Environmental Engineering, ITM University, Gurgaon, Haryana, India Civil Engineering and Urban Planning: An International Journal(CiVEJ) Vol.2,No.2, June 2015

The green structure idea is winding up increasingly more mainstream nowadays in light of the fact that these are considered as condition neighborly structure. The legislature is making fitting strides in usage of green structure ideas by giving increment in Floor territory proportion. They are making activity arrangement on environmental change on manageable natural surroundings by proposing savvy city ideas. Further notwithstanding that BEE is putting their exertion on apparatus naming system which helps in examination and leeway of substantial development ventures. A few corporate associations, organizations and development organizations are currently rehearsing green structure idea in the development. There are many green structure rating frameworks set up. GRIHA (Green Rating for Integrated Habitat Assessment) and LEED (Leadership in Energy and Environment Design) was created in light of this need. The GRIHA is considered as Indian National Rating System which have been concluded in the wake of consolidating different alterations proposed by a gathering of modelers and specialists. US Green

Building Council directed (LEED) as the main green structure rating framework which is positioned first among different frameworks. LEED is contributing intensely in changing over the constructed condition towards feasible advancement. The structures which go under GRIHA are those which are having land region more than 2,500 Sqm. (with the exception of mechanical buildings). These structures can experience this confirmation program. The GRIHA doesn't cover structures having region under 2500 sqm so the present investigation centers around giving a rating framework to little private structures. By receiving this rating framework an ever increasing number of structures might be secured for supportable improvement. It gives a lift to close-by environment.

3. M. Samer (Cairo University, Faculty of Agriculture, Department of Agricultural Engineering, El-Gammaa Street, 12613 Giza, Egypt) Agric Eng Int: CIGR Journal Vol. 15, No.2

The "Green Building" is an interdisciplinary topic, where the green structure idea incorporates a large number of components, segments and strategies which wander to a few subtopics that entwined to shape the green structure idea. For the most part, the green structure is viewed as a natural segment, as the green structure materials are made from nearby eco-sources, for example ecologically inviting materials, which are then used to make an eco-development subject to an eco-plan that gives a solid environment based on the social and compositional legacy in development while guaranteeing protection of common assets. This guarantees dismantling the structure segments and materials, after a decided structure lifetime, to ecologically well disposed materials that can be either re-utilized or reused. Amid their lifecycle, the green structures limit the utilization of assets (energy and water); decrease the hurtful effect on the nature, and give better indoor condition. Green structures manage the cost of an abnormal state of ecological, financial, and building execution.

These incorporate energy proficiency and preservation, improved indoor air quality, asset and material effectiveness, and inhabitant's wellbeing and efficiency. This investigation centers around characterizing green structures and explaining their collaboration with the earth, energy, and indoor air quality and ventilation. Besides, the present examination researches the green structure materials (for example biocement, eco-bond and green solid), green plans, green rooftops, and green advancements. Furthermore, the present investigation features the green structures rating frameworks, the financial matters of green structures, and the difficulties that face the execution. In the end, the interdependency between the green structures and agribusiness has been examined.

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4. Devarshi Tathaga, Dr.Ramesh D. Dod IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) e-ISSN: 2278-1684,p-ISSN: 2320-334X, Volume 12, Issue 2 Ver. II (Mar - Apr. 2015), PP 01-09

Change in atmosphere, brought about by the arrival of nursery impact causing gases (principally carbon dioxide) into the air, has been perceived as one of the best dangers of the 21st century. Offer of the worldwide energy utilization in India and China has additionally been on the ascent because of overwhelming industrialization, urbanization, populace blast, and concentrated development of IT. Structures are the prime energy purchasers in present day urban communities bookkeeping upto 40 to 45% energy utilization. Their utilization can be to a great extent kept through improving effectiveness, which is a compelling way to decrease ozone depleting substance discharges and moderate down consumption of petroleum products. There is an overwhelming (over half) sparing potential in the structure area and in this way it is considered as a potential division to address the difficulties of worldwide energy request and environmental change. Alongside the appearance of energy productive measures, increasingly successful methods are expected to prompt or propel more prominent endeavors, particularly to the signatories of the Kyoto Protocol. This specialized paper features the significance of reasonable development, talks about job of energy proficiency in green structures in Indian

setting to decrease the energy utilization and natural corruption through Green House Gas discharge (GHG). Likewise it indicates out the advantages of green development just as the motivating forces from govt. what's more, city bodies for GRIHA ensured green structure.

2. 5. Avinash Shivajirao Pawar, Solapur University, Solapur, India Journal of Engineering Research and Studies E-ISSN0976-7916

The Kyoto convention binded the created nations to diminish the ozone depleting substance emanations in any event by 5% by 2008– 2012 so as to handle a dangerous atmospheric deviation and environmental change. A portion of the proportions of the legislatures to accomplish this objective are to advance new structures development and to retrofit existing structures while fulfilling low energy criteria. This implies improving energy proficiency of structures and energy frameworks, creating feasible structure ideas and advancing sustainable power sources. "Green" or "feasible" structures utilize key assets like energy, water, materials, and land more productively than structures that are simply worked to code. With progressively common light and better air quality, green structures ordinarily add to improved representative and understudy wellbeing, solace, and efficiency. A green structure drains the regular assets to the base amid its development and task.

The point of a green structure configuration is to limit the interest on non-sustainable assets, expand the use proficiency of these assets, when being used, and augment the reuse, reusing, and use of inexhaustible assets. It boosts the utilization of proficient structure materials and development rehearses; streamlines the utilization of on location sources and sinks by bi-climatic building rehearses; utilizes least energy to control itself; utilizes productive gear to meet its lighting, cooling, and different needs; augments the utilization of inexhaustible wellsprings of energy; utilizes effective waste and water the board rehearses; and gives agreeable and clean indoor working conditions. In aggregate, the accompanying parts of

the structure configuration are investigated in a coordinated path in a green structure.

3. J.T. Kevern, AM.ASCE, ASCE Journal of Professional Practice in Engineering Education and Practice Special Edition on Sustainability Education in Civil and Environmental Engineering

This paper examines a structure to join maintainable plan/thinking as another Civil Engineering course and encounters from the pilot advertising. Imperative zones are plot to help all designers in understanding maintainability in setting with conventional building standards. Green structure rating frameworks were used to present the ideas of manageability in structures and foundation, featured by introductions from green structure experts. By giving a superior comprehension of supportability through instruction, Civil Engineers can give proactive answers for a developing worldwide framework.

III. OBJECTIVES FROM THE PAPERS

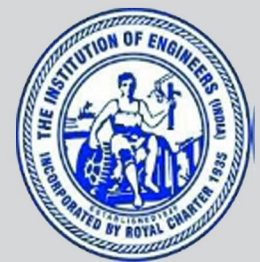
Targets:

1. To examination the plan method for green structure.
2. To applying gravity loads and diverse load combinations according to Indian code arrangement.
3. To plan of Residential building (G+1) for an alternate instance of load combination
4. To Modify the structure and diminish the expense and make it condition neighbourly. must be indented. All paragraphs must be justified, i.e. both left-justified and right-justified.

IV. REFERENCES

- [1]. G.R.K.D. Satya Prasad "Performance optimization of a Rooftop Hybridized Solar PV-AC grid assisted power system for peak load

- management” published in International Journal of Engineering Research and Applications, ISSN: 2248-9622, vol-2, Issue No-3, May-june 2012
- [2]. G.R.K.D. Satya Prasad “Design Of Standalone hybrid Biomass & PV system of an off grid house in a remote area” in International Journal of Engineering Research and Application, vol-3, issue-6, Nov-Dec 2013 , pp-433 - 437
- [3]. G.R.K.D. Satya Prasad “Energy and Comfort Management in Energy Efficient Buildings Using RETSCREEN Software-A Case Study Analysis” in International Journal of Engineering Research and Application ISSN: 2248-9622, Vol. 3, Issue 6, Nov-Dec 2013, pp.378-381
- [4]. <http://www.epa.gov/greenbuilding/pubs/about.html>.
- [5]. Yan Ji and Stellios Plainiotis (2006): Design for Sustainability. Beijing: China Architecture and Building Press. ISBN7112083907.
- [6]. Hopkins, R. 2002. A Natural Way of Building. (<http://transitionculture.org/articles/anaturalwayofbuilding2002/>) Transition Culture. Retrieved:20070330.
- [7]. Allen & Iano, 2008[Allen, E, & Iano, J. (2008). Fundamentals of building construction: materials and methods. Hoboken, New Jersey: John Wiley & Sons Inc.
- [8]. U.S. Environmental Protection Agency. (October 28, 2010). Green Building Home. Retrieved November 28, 2009
- [9]. Unnikrishna Pillai and Devdas Menon, “Reinforced Concrete Design”, Tata +McGraw-Hill publishing company limited.
- [10]. N.Krishna Raju, “Advanced Reinforced concrete design”, CBS publishers & distributors, Delhi
- [11]. SP:16-1980 “Design aids Reinforced Concrete” to IS:456-1978, Bureau of Indian Standards, New Delhi.
- [12]. Bribian, I.Z.; Capilla, A.V.; Uson, A.A., 2011: Life cycle assessment of building materials: Comparative analysis of energy and environmental impacts and evaluation of the eco-efficiency improvement potential. Build Environ 46: 1133-1140, 11. <http://dx.doi.org/10.1016/j.buildenv.2010.12.002>.
- [13]. Buchanan, A.H., 2006: Can Timber Buildings Help Reduce Global CO2 Emissions? Proceedings, World Conference on Timber Engineering. Portland, Oregon, USA.
- [14]. Buchanan, A.H., 2010: Energy and CO2 advantages of wood for sustainable buildings. Proceedings, World Conference on Timber Engineering. Riva-del-Garda, Italy.
- [15]. IS – 456:2000. Bureau Of Indian Standards Code Of Practice For Plain And Reinforced Concrete.
- [16]. ETABS Non Linear Version 9.2.0,
- [17]. www.csiberkeley.com
- [18]. www.Bentley.com/STAAD



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