© 2018 IJSRSET | Volume 4 | Issue 6 | Print ISSN: 2395-1990 | Online ISSN : 2394-4099
Themed Section : Engineering and Technology

Review on Partial Replacement of Cement in Concrete by Untreated Rice Husk Ash

Archana Gharat, Abhilasha Pisat, Nayana Khambalkar, Rima Chande, Prof. Manisha Bambade
Department of Civil, VOGCE, Mumbai University, Aghai, Dist. Thane, Maharashtra, India

ABSTRACT

This paper summarizes the research work on the properties of Rice Husk Ash (RHA) when used as partial replacement for Ordinary Portland Cement (OPC) in concrete. OPC was replaced with RHA by weight at .0%,10%,20%.0% replacement served as the control. Compacting factor test was carried out on fresh concrete while Compressive Strength test was carried out on hardened 150mm concrete cubes after 3,7, and 28 days curing in water. The results revealed that the Compacting factor decreased as the percentage replacement of OPC with RHA increased. The compressive strength of the hardened concrete also decreased with increasing OPC replacement with RHA. It is recommended that further studies be carried out to gather more facts about the suitability of partial replacement of OPC with RHA in concrete.
Keywords: Ordinary Portland Cement, RHA, OPC

I. INTRODUCTION

The need to reduce the high cost of Ordinary Portland Cement in order to provide accommodation for the populace has intensified research into the use of some locally available materials that could be used as partial replacement for Ordinary Portland Cement (OPC) in Civil Engineering and Building Works. Supplementary cementitous materials have been proven to be effective in meeting most of the requirements of durable concrete and blended cements are now used in many parts of the world (Bakar, Putrajaya, and Abdulaziz, 2010).

Various research works have been carried out on the binary blends of Ordinary Portland Cement with difeerent pozzolans in making cement composites (Adewuyi and Ola, 2005; De Sensale, 2006; Saraswathy and Song, 2007; Ettu et al, 2013).

Rice Husk Ash (RHA) which is an agricultural by-product has been reported to be a good pozzolan by numerous researchers. Mehta and Pirth (2000) investigated the use of RHA to reduce temperature in high strength mass concrete and got result showing that RHA is very effective in reducing the temperature of mass concrete compared to OPC concrete. Malhotra and Mehta (2004) later reported that ground RHA with finer particle size than OPC improves concrete properties, including that higher substitution amounts results in lower water absorption values and the addition of RHA causes an increment in the compressive strength. Cordeiro, Filho and Fairbarn (2009) carried out elaborate studies of Brazilian RHA and Rice Straw Ash (RSA) and demonstrated that grinding increases the pozzolanicity of RHA and that high strength of RHA, RSA concrete makes production of blocks with good bearing strength in a rural setting possible. Their study showed that combination of RHA or RSA with lime produces a weak cementitous material which

could however be used to stabilize laterite and improve the bearing strength of the material. Habeeb and Fayyadh (2009) investigated the influence of RHA average particle size on the properties of concrete and found out that at early ages the strength was comparable, while at the age of 28 days, finer RHA exhibited higher strength than the sample with coarser RHA. Rukzon, Chindaprasirt and Mahachai (2009) further studied the effect of grinding on the chemical and physical properties of rice husk ash and the effect of RHA fineness on properties of mortar and found that pozzolans with finer particles had greater pozzolanic reaction.

This research work examined the use of Rice Husk Ash as partial replacement for Ordinary Portland Cement in concrete. It invoved the determination of workability and compressive strength of the concrete at different level of replacement.

II. LITERATURE REVIEW

The literatures regarding the potential uses of rice husk as one of the suitable aggregates for concrete have been reviewed and are presented below.

Mehta and Pirth (2000) investigated the use of RHA (Rice Husk Ash) to reduce temperature in high strength mass concrete and concluded that RHA is very effective in reducing temperature of mass concrete compared to OPC concrete.RHA which is an agricultural by-product has been reported to be a good pozzolanic material by numerous researchers.RHA is obtained after burning of rice husk at a very high temperature.

Malhotra and Mehta (2004) reported that ground RHA with fine particle size than OPC improves concrete properties, including higher substitution amounts in lower water absorption values and the addition of RHA caused an increment in the compressive strength.

Adewuyi and Ola (2005) have carried out research on the binary blends of OPC with different pozzolanic material in making cement composites.

Supplementary cementious materials have been proven to be effective in meeting most of the requirements of durable concrete.

Habeeb and Fayyadh (2009) have investigated the influence of RHA average particle size on properties of concrete and found out that at early ages the strength was comparable,while at the age of 28 days,the finer RHA exhibited higher strength than the sample with coarser RHA.

Lee et al (2005) in their study concluded that some of the waste products like Rice husk which possess pozzoalanic properties and used in the blended cements include fly ash,silica fume,volcanic ash,corn cob ashhence providing good strength properties to concrete.

Gunduz and Ugur (2004) in their study concluded that the greatest advantages of light weight concrete are its low density,allowing for construction on the ground with only moderate bearing capacity,the use of less reinforcement, the ability to construct taller structures,greater economy in lifting and use of more thermally efficient material.The unit weight of rice husk concrete can be lowered by either using porous materials, therefore lightweight aggregates instead of ordinary ones,introducing air into mortar or removing the fine fraction of aggregate and then by partially compacting the concrete.In all cases,the main goal is to introduce voids into aggregates and mortar or between mortar or aggregate.

Khedari et al (2001) have studied the characteristic properties of various light weight aggregates like pumice,coal slag, flying ash,rice husk,straw,saw dust,cork granules,wheat husk,coconut fiber and coconut shell used in partial replacement for concrete production.

The organic waste used in light weight concrete is mainly of plant origin.They concluded that by using plant waste that is abundantly found in rural areas, it may be possible to construct cheaper and good quality agricultural constructions.

Sari and Pasamehmetoglu (2004) have concluded that rice husk.

III. SPECIFICATIONS

1. Rice Husk Ash (RHA)

The Rice Husk used was obtained from Ile Ife, Nigeria. After collection, the Rice Husk was burnt under guided or enclosed place to limit the amount of ash that will be blown off.. The ash was ground to the required level of fineness and sieved through 600 μm sieve in order to remove any impurity and larger size particles.

2. Coarse Aggregate

The granite used for this research work was 12mm size. It was sourced from a quarry in Igbajo in Nigeria

3. Fine Aggregate

The sand used for this research work was sourced from Iree, Osun state, Nigeria. The impurities were removed and it conformed to the requirements of BS 882 (1992).

4. Cement

The cement used was Ordinary Portland Cement. It was sourced from Iree, Osun State, Nigeria and it conformed to the requirements of BS EN 197-1: 2000.

5. Water

The water used for the study was obtained from a free flowing stream. The water was clean and free from any visible impurities. It conformed to BS EN 1008:2002 requirements.

4. Concrete Mix Design

The concrete used in this research work was made using Binder, Sand and Gravel. The concrete mix proportion was 1:2:4 by weight.

5. Casting of samples

Cubic specimens of concrete with size 150 x 150 x 150 mm were cast for determination of all measurements. Six mixes were prepared using different percentages of 0, 5, 10, 15, 20 and 25 RHA. The concrete was mixed, placed and compacted in three layers. The samples were demoulded after 24 hours and kept in a curing tank for 7, 14 and 28 days as required. The Compacting Factor apparatus was also used to determine the compacting factor values of the fresh concrete in accordance with BS 1881: Part 103 (1983)

6. ADVANTAGES

1. Improves compressive strength , flexural strengths and split strength.
2. RHA mixed concrete shows better bond strength as compared to OPC concrete.
3. Permeability of concrete decreases chloride diffusion and chloride permeation reduces (30%) replacement.
4. RHA makes a role to increased resistance to chemical.

7. USES

1. RHA can be used in the 2 distinct ways
2. To create HPC-RHA can be added to cement to Increase high strength concrete.
3. To create Green Concrete –RHA can be used as an substitute to reduce amount of concrete with higher strength .

8. DISADVANTAGES

1. Suitable incinerator/furnace as well as grinding method is required for burning grinding rice husk in order to obtain good quality ash.
2. Strength of concrete is reduced for larger (beyond 30%) replacement

IV. CONCLUSION

Rice husk ash is one of the most active research areas that encompass a number of disciplines including civil

engineering and construction materials.Rice husk ash is an agricultural waste product which is produced in large quantities globally every year and due to the difficulty involved in its disposal,RHA is becoming an environmental hazard in rice producing countries.
India alone produces around 120 million tons of paddy per year,giving around 24 million tons rice husk per year and 6 million tons of rice husk ash per year.As rice husk is piling up everyday,there is a pressure on rice industries to find asolution for its disposal.It is most essential to develop eco-friendly concrete from RHA.

RHA can be used in concrete to improve its strength and other durability factors.From the review of above literatures from the various researchers,it can be well concluded that RHA can be used as cement in lightweight structural concrete preparation. Sustainable utilization would preserve conventional materials for future.To opt for green construction, RHA is a right choice,as it doesn't produce environmental pollution and accelerates speed of construction.

V. REFERENCES

[1]. Bakar, B.H.A., Putrajaya, R.C. and Abdulaziz H. (2010). Malaysian Saw dust ash – Improving the Durability and Corrosion resistance of concrete: Pre-review. Concrete Research Letters, 1(1): 6-13, March 2010.

[2]. British Standard Institution (1983). Methods for Determination of Compacting Factor, BS 1881, Part 103, British Standard Institution, London.

[3]. British Standard Institution (1983). Methods for Determination of Compressive Strength of concrete cubes BS 1881, Part 116, British Standard Institution, London.

[4]. British Standard Institution (1992). Specifications for aggregates from natural sources for concrete, BS 882, Part 2, British Standard Institution, London.

[5]. British Standard Institution (2000). Specification for Portland cement, BS EN 197-1, British Standard Institution. London