

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

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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.

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