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Experimental Study of Plastic Bricks Using Polyethylene Wastes as Partial Replacement of M-Sand

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***Abstract* – The main aim of this work is to reduce the plastic waste that is raising the present world and to achieve this; a system is designed incorporating a plastic extruder which plays a prominent part in recycling waste plastic into useful products. This work uses waste plastic and converts them into building materials with the help of an extruder, thereby reducing the plastic waste which is a key factor for the environmental pollution. This project reviews one of the sustainable and effective ways of managing plastic waste in urban and rural parts of India in order to minimize their adverse environmental impacts. The paste contained noting more than M-sand, plastic and thermocol. After thorough mixing, the paste was poured into a rectangular mould with standard brick dimensions. The paste took only 20 minutes to settle and harden. Cooling of the set was done by water cooling and after 5 more minutes the brick was extracted from the mould. It had a dark grey texture and increased weight by the initial analysis. Local brick testing methods were conducted such as free fall of the brick and scratch test. In both of those tests, our brick showed increased strength. The brick was subjected to compressive test, water absorption test and efflorescence test. The results showed promise, that the Plastic Composite Brick was efficient than the clay brick and cement brick.**

***Keywords* – M-Sand, plastic composites, Water waste.**

I. INTRODUCTION

The waste plastic will be large in household time. In many countries the compositions of waste is different, that it is affected by the socioeconomic characters, waste management programs and consumption patterns, but generally the level of plastic in the waste composition is high. one of the largest component of plastic waste is polyethylene which is followed by polypropylene. Polyethylene terephthalate and Polystyrene.

The large volume of materials required for construction is potentially a major area for the reuse of waste materials. Recycling the plastics has advantages since it is widely used and has a long service life, which means that the waste is being removed from the waste stream for a long period. Because the amount of clay required to make bricks is large.

The environmental benefits are not only related to the safe disposal of bulk waste, but also to the reduction of environmental impacts that arise due to burning of plastics. Plastics also help to conserve energy at the home Furthermore, the U.S. Department of Energy estimates that use of plastic foam insulation in homes and buildings each year will ultimately save close to 60 million barrels of oil versus other kinds of insulation. The same principles apply in appliances such as refrigerators and air conditioners.

The machine essentially consists of a cutting unit, recycling unit and a mixing unit. The machine parts are made of mild steel, because of its availability and versatile machin ability. The efficiency of the machine was established using plastic wastes, cement and other aggregates. Plastic waste, after chipping into finer granules, was added to cement and aggregates in definite proportion. Then the mixture is allowed to pass through recycling unit to form a mix, and then packed into mold box, before manually rammed and compacted with machine-molded envelope. This process allows the formation of required shape, which is sent for curing to obtain stronger bricks.

II. M-SAND

Manufactured sand is popularly known by several names such as Crushed sand, Rock sand, Green sand, UltraMod Sand, Robo sand, Poabs sand, Barmac sand, Pozzolan sand etc. IS 383-1970 (Reaffirmed 2007) recognizes manufacture sand as ‘Crushed Stone Sand’. Crushed stone sand is produced by crushing boulders.

Manufactured sand is produced by rock-on-rock or rock on metal Vertical Shaft Impactor (VSI) in which the process that produced alluvial deposits is closely simulated.

Particle size reduction and achieving equi-dimensional shape is critical to get desired properties. If rock is crushed in compression lot of inherent properties exhibited by natural river sand are lost. If proper technique of manufacturing is not adopted aggregates are bound to become flaky and elongated. Improvements to sand by way of washing, grading and blending may have to be done before use at the consumer end.

It does content very high silt fine particles (as in case of Filter sand).Presence of other impurities such as coal, bones, shells, mica and silt etc makes it inferior for the use in cement concrete.

The decay of these materials, due to weathering effect, shortens the life of the concrete. Now-a-days, the Government have put ban on lifting sand from River bed. Transportation of sand damages the roads. Removing sand from river bed impact the environment.

Specifications of Polyethylene Wastes

Type : Hooked end
Breadth : 3 mm
Length : 12mm
Aspect ratio : 1:4
Appearance : Clear, Bright,
Application : Industrial floors, Tunnel short Crete
Density : 7850 kg/m2
Abbreviation : PE
Melting point : 115 to 135 degree Celsius

III. MATERIALS

The Materials used in thus experimental investigation are

- **M-sand**
  Zone-II of IS 383-1970, Specific Gravity -2.76.
- **Polyethylene Wastes**
  A Polyethylene waste with necessary size is received from tricky.
- **Water**
  Locally available potable water obtained from source of college campus bore well is used for mixing and curing of bricks for normal conditions confirming to the requirements of water for curing as per IS:456-2000.

IV. METHODOLOGY

M-sand with necessary amount and 5-20 % of Polyethylene wastes are mixed. The water is mixed with water cement ratio 0.5.The mixed amount of M-sand and Polyethylene wastes are molded in the Brick mould with standard size of mould. Curing and testing of Bricks compressive and water absorption test is conducted. The compressive strength and water absorption level is found out.

V. RESULT AND DISCUSSION

1. Compressive Strength test

Table.1. Compressive Strength test

No. of Days	Percentage of Polyethylene Wastes Added (%)		
	5 %	10 %	15 %
	Compressive Strength on Cube (N/mm^2)		
7 days	7.8	8.4	8.9
14 days	9.2	9.7	9.9
28 days	12.6	13.1	13.8

Maximum Compressive Strength = 13.8 N/mm^2 (15% of PE wastes)

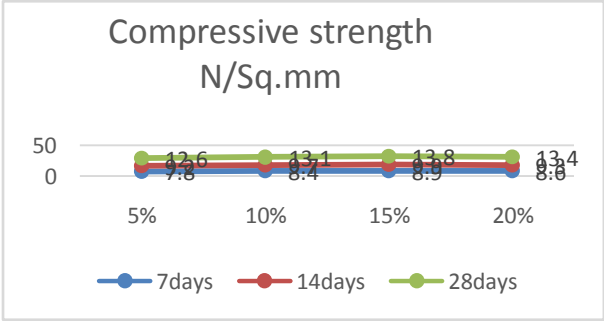

Fig.1 Compressive strength comparison.

2. Water Absorption Test

Table.2 Water Absorption Test

Sl. No.	Percentage Composition		Weight of Brick (Kg)		Water Absorption W (%)
	M-sand (%)	PE wastes (%)	Before Curing	After Curing	
1	95	5	1385	1498	8.15
2	90	10	1410	1512	7.23
3	85	15	1421	1515	6.62
4	80	20	1408	1509	7.17

Minimum Water Absorption = 6.62 % (Polyethylene Content 15%)

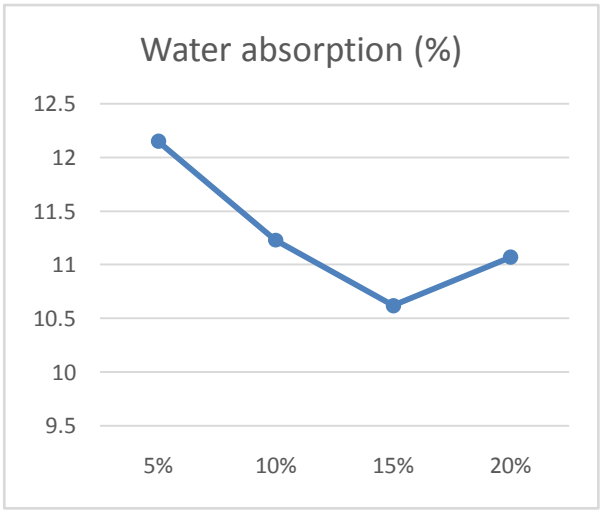

Fig. 2. Water Absorption value as Graph.

V.CONCLUSION

In M-sand with partially replacing the polyethylene wastes as 5 %,10 %, 15 %, 20 % respectively. The maximum compressive strength of the brick is achieved by adding 15 % of the plastic wastes.From these tests the brick using Polyethylene wastes as partial replacement of M-sand is very strong and stiffness.The Maximum Compressive Strength of the Brick Specimen is 13.8 N/sq.mm.The Minimum Water Absorption of the Brick Specimen is 6.62 %.When the Percentage of Polyethylene is increases 15 %, the Strength will reduced and increasing the Moisture Content. So the Optimum Percentage of the Polyethylene Wastes in M-sand is 15%.

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