Plastic Waste As A Constituent In Manufacturing Of Interlocking Brick

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Abstract- *The decline in the availability of skilled in the construction industry led to a need for a brick that could overcome the problems of poor workmanship. This led to the development of plastic bricks. Plastic bricks is another type of brick which can be made from the plastic waste. This bricks are the solution of the pollution from the waste plastic. This bricks are easy to make and the pollution from the brick kilns can also be stopped using these bricks as there is no requirement further for the brick kilns. This brick have more strength than normal bricks and having light weight which can give further benefits to sustainable structures.*

Keywords- Plastic Bricks, Sustainable structure, Waste Plastic.

I. INTRODUCTION

Plastic is one of the daily increasing useful as well as a hazardous material. At the time of need, plastic is found to be very useful but after its use, it is simply thrown away, creating all kinds of hazards. Plastic is non-biodegradable that remains as a hazardous material for more than centuries. The quantity of plastic waste in Municipal Solid Waste (MSW) is expanding rapidly. It is estimated that the rate of expansion is double for every 10 years. This is due to rapid growth of population, urbanization, developmental activities and changes in life style which leading widespread littering on the landscape. They are non-biodegradable and also researchers have found that the plastic materials can remain on earth for 4500 years without degradation In India approximately 40 million tons of the municipal solid waste is generated annually, with evaluated increasing at a rate of 1.5 to 2% every year. Hence, these waste plastics are to be effectively utilized. Today, it is impossible for any vital sector to work efficiently without usage of plastic starting from agriculture to industries. Thus, we cannot ban the use of plastic but the reuse of plastic waste in building constructions, industries are considered to be the most practicable applications. Plastic sand brick possesses more advantages which includes cost efficiency, resource efficiency, reduction in emission of greenhouse gases, etc., Plastic soil brick is also known as "Eco-Bricks" made of plastic waste which is otherwise harmful to all living organisms can be used for construction purposes. It increases the compressive strength when compared to fly ash bricks. By use of plastic soil bricks, the water absorption presence of alkalis was highly reduced. Owing to numerous advantages further research would improve quality and durability of plastic sand bricks.

II. PRESENT SCENARIO OF WASTE GENERATION IN INDIA

Growth of population has increased our urbanization as a result rising standard of living due to technological innovations have contributed to an increase both in the quantity and variety of solid wastes generated by industrial, agricultural activities, mining and domestic. Globally the estimated quantity of wastes generation was 12 billion tones in the year 2002 of which 11 billion tones were industrial wastes and 1.6 billion tones were municipal solid wastes (MSW). About 19 billion tons of solid wastes are expected to be generated annually by the year 2020. Annually, Asia alone generates 4.4 billion tons of solid wastes and MSW comprise 795 million tons of which about 48 (6%) MT are generated in India. MSW generation in India, is expected to reach 300 Million tones and land requirement for disposal of this waste would be 169.6 km2 as against which only 20.2 km2 were occupied in 1997 for management of 48 Million tones. As it is studied that apart from municipal wastes, the organic wastes from agricultural sources alone contribute more than 350 million tons per year. However, it is reported that about 600 million tons of wastes have been generated in India from agricultural sources alone. The Quantity of wastes generated from agricultural sources are sugarcane baggage, paddy and wheat straw and husk, wastes of vegetables, food products, tea, oil production, wooden mill waste, coconut husk, jute fiber, groundnut shell, cotton stalk etc. In the industrial sector inorganic solid waste could are coal combustion residues, bauxite red mud, tailings from aluminum, iron, copper and zinc primary extraction processes. Generation of all these inorganic industrial wastes in India is estimated to be 290 million Tons per annum. In India, 4.5 million tons of hazardous wastes are being generated annually during different industrial process like electroplating, various metal

extraction processes, galvanizing, refinery, petrochemical industries, pharmaceutical and pesticide industries.

III. MATERIALS USED

3.1 SAND

Common river sand having specific gravity of 2.56 and fineness modulus of 2.805 is used.

Properties of the sand

Particulars	Result
Specific Gravity	2.56
Apparent sp. gravity	2.7
Water Absorption	1.98
Bulk Density	1.397 Kg/L

3.2 Waste plastic

We are using Low Density Polyethylene Waste Plastic (LDPE) in this project because the High-Density Polyethylene Plastic become powder when heated or melted. But the LDPE plastic become liquid when heated and in atmospheric temperature it again hardens and act like a binding material in manufacturing of sandl bricks Low-density polyethylene (LDPE) is a thermoplastic made from the monomer ethylene. It was the first grade of polyethylene, produced in 1933 by Imperial Chemical Industries (ICI) using a high-pressure process via free radical polymerization. Its manufacture employs the same method today. The EPA estimates 5.7% of LDPE is recycled. Despite competition from more modern polymers, LDPE continues to be an important plastic grade. In 2013 the worldwide LDPE market reached a volume of about US$33 billion.

According to UN estimates, every year the world uses 500 billion plastic bags while half of the plastic used is of single use or in disposable items such as grocery bags, cutlery and straws. Each year, at least eight million tonnes of plastic end up in the oceans, the equivalent of a full garbage trucks every minute.

IV. METHODOLOGY

Collection of Material
Melting
Mixing
Moulding
Curing

4.1 Collection of Material

The plastic material should be collected from the factories waste and hospital waste and industries waste and also food packages and plastic bottles this will come under the LDPE plastic type.

4.2 Melting

Since we are using LDPE plastic as binding material in manufacturing of bricks it needs melting of plastic. we melted plastic in a pan by using fire & wood. The melting point of plastic is 120˚C -180˚C.

Figure1- Melting

4.3 Mixing

Mixing of materials is essential for the production of uniform and strength for brick. The mixing has to be ensuring that the mass becomes homogeneous, uniform in color and consistency. Then these plastic liquids thoroughly mixed by using trowel before it hardens. The mixture has very short setting bags are turned to molten state; the river sand is added to it. The sand added is mixed time. Hence mixing process should not consume more time.

4.4 Moulding

After completion of proper mixing we place mix into required mould. In these projects we use the normal brick sizes (19x15x8 cm). After 2 days remove the brick from the mould and then done curing.

Figure2- Moulding

4.5 Curing

The test specimens after moulding were allowed to dry for a period of 24 hours. The specimens were kept in curing tank and allowed to cure for a period of 28 days.

V. TESTING

5.1Compressive Strength Test:

This test is done to know the compressive strength of brick. It is also called the crushing strength of brick. Generally, 3 specimens of bricks are taken to laboratory for the testing and tested one by one. In this test, a brick specimen is put on compressive strength is put on Compressive Strength testing machine and applied pressure at a constant arte till it breaks. The ultimate pressure at which brick is crushed is taken into account. All three brick specimens are tested one by one and average result is taken as bricks compressive/crushing strength. The Compressive Strength of the brick is calculated by the formula = (max load taken before failure/ Area of the Brick surface) N/mm2.

5.2 Water Absorption Test:

In this the bricks first weighted in dry condition and they are immersed in water for 24 hours. After that they are taken out from water and they are wiping out with cloth. Then the difference between the dry and wet bricks percentage are calculated. They weight of the three plastic bricks has been taken and then the average weight of the bricks is calculated.

Figure3- Water Absorption

VI. RESULT

6.1 COMPRESSIVE STRENGTH

Samples	Load taken by specimen	Compressive Strength
Specimen-1	165 KN	7.02 N/mm²
Specimen-2	190 KN	8.08 N/mm²
Specimen-3	220 KN	9.36 N/mm²
Average	191.6 KN	8.12 N/mm²

6.2 Water Absorption Test

No brick should absorb water more than 20% of its dry weight when kept immersed in water for 24 hours. Plastic soil bricks do not absorb water hence water absorption of plastic soil bricks is 0%.

VII. CONCLUSION

Plastic soil brick possesses more advantages which includes cost efficiency, resource efficiency, etc., Plastic soil brick is also known as “Eco-Bricks” made of plastic waste which is otherwise harmful to all living organisms can be used for construction purposes. It increases the compressive strength when compared to burnt bricks. By use of plastic soil bricks, the water absorption presence of alkalis was highly reduced.

This method is suitable for the countries which has the difficult to dispose /recycle the plastic waste. The natural resources consumed for the manufacturing of Plastic soil bricks are very much less when compared to its counterparts. Owing to numerous advantages further research would improve quality and durability of plastic soil bricks.

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