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Bricks Made Out of Plastic

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ABSTRACT

Plastics are key resources in the circular economy and recycling after the end of useful life with economic value creation and minimal damage to the environment is the key to their sustainable management. Studies in a large stream of research have explored impregnating waste plastics in concrete and reported encouraging results with multiple benefits. The present study makes a critical review of some of these findings and gleans some common useful trends in the properties reported in these studies. The study also presents results of experimental work on bricks made of non-recyclable waste thermoplastic granules constituting 0 to 20% by weight, with 4kg of fly ash, cement, and sand making up the remainder. The bricks were cured under water for 28 days and baked at a temperature ranging from 90oC to 110oC for 2 hours. The key characteristics of these bricks are found to be lightweight, porous, have low thermal conductivity, and have appreciable mechanical strengths. Though such bricks hold promise, no similar study appears to have been reported so far. Unlike other processes of making porous bricks, which usually involve incineration to burn combustible materials to form pores with the implication of high carbon emission, the proposed process is non-destructive in that the bricks are merely baked at a low temperature, sufficient to melt the waste plastic that gets diffused within the body of the bricks. The compressive strength after the addition of waste plastic is the same as normal brick strength. And also reduce the water absorption capacity of brick is reduced compared with nominal brick. Efflorescence values were low than the normal brick. The bricks are likely to add energy efficiency in buildings and help create economic value for manufacturers, thereby, encouraging the ecosystem of plastic waste management involving all actors in the value chain.

INTRODUCTION

Plastic waste which is one of the most hazardous substances in the environment is increasing the risk of global warming, and tackling this plastic waste are getting more difficult day by day. Hence, these waste plastics are to be effectively utilized. Low-density polyethylene bags are cleaned and added with sand at percentages to obtain stronger bricks that possess the overall cost of construction; this is one of the best ways to avoid the accumulation of plastic waste which is an on-degradable pollutant. Plastic waste is naturally available in surplus quantity and hence the cost factor comes down. Hence in this thesis, an attempt is made to study the properties of the brick manufactured using plastic waste. The present work deals with the manufacturing and analysis of bricks made with waste plastic (LDPE) and fine aggregates. The bricks produced are lightweight, low in cost, and also more durable than normal clay bricks and have high crushing strength and very low water absorption. The bricks are manufactured by heating waste plastic to a temperature range of 120 to 150 degrees centigrade Andmixing sand into the molten plastic.

REVIEW OF LITERATURE

The increase in the popularity of using environmentally friendly, low cost and lightweight construction materials in the building industry has brought about the need to investigate how this can be achieved by benefiting the environment as well as maintaining the material requirements affirmed in the standards. Brick is one of the most accommodating masonry units as a building material due to its 35 Wahid et al.,2015 properties. Attempts have been made to incorporate waste in the production of bricks such as the use of paper processing residues, cigarette butts, fly ash, textile effluent treatment plant (ETP) sludge, polystyrene foam, plastic fiber, straw, polystyrene fabric, cotton waste, dried sludge collected from an industrial wastewater treatment plant, rice husk ash, granulated blast furnace slag, rubber, craft pulp production residue, limestone dust and wood sawdust, processed waste tea, petroleum effluent treatment plant sludge, welding flux slag, and waste paper pulp [6]. In [3], it describes the use of various types of waste materials in different proportions and adopted different methods to produce bricks. Different tests were conducted on produced bricks to evaluate their properties following the various available standards. Compressive strength and water absorption are two common parameters considered by most researchers as required by various standards. It is noted that although many of the studied bricks made from waste materials meet the various standard requirements and several patents have been approved, so far commercial production and application of bricks from waste materials is still very limited. The limited production and application of bricks from waste materials are also related to the absence of relevant standards and the slow acceptance by industry and the public. Standardization plays an important role in disseminating knowledge, exploiting research results, and reducing time to market for innovations. Recently, [5] mentioned that there are various research works have been done to find out the safe and environment-friendly disposal of plastics. India generates 56 lakh tons of plastic waste annually, whereas Delhi accounts for a staggering 689.5 tons a day. Approximately, 60% of total plastic waste is collected and recycled in the country per day, and remain is uncollected and littered. Besides that, concrete all over the globe has been utilized for the required infrastructure. Both materials'consumptionis increasing day by day in their respective field. The inclusion of waste plastic in concrete by replacing or adding concrete ingredients is one of the appropriate ways to dispose of it. In terms of cost, a cost comparison of available walling materials in the Makurdi metropolis showed that the use of bricks made from 45% sand and 5% cement resulted in a saving of 30%-47% when compared with the use of sand concrete blocks. While the use of fired clay bricks resulted in a savings of 19% per square meter of wall. The study, therefore, recommends the use of laterite bricks in Makurdi and other locations due to its more economical and environmentally friendly than fired clay bricks.The global market for waste plastic in the manufacturing of brick is experiencing substantial growth and is expected to continue to grow rapidly in the next few years. Plastic is one of the most widely used materials for applications like packaging and manufacturing of various products. According to UNEP, the total plastic waste generated globally is around 300 million which accounts for 18% of the total waste generate annually**.** Only 9% of all the plastic waste ever produced has been recycled, 12% has been incinerated, while the rest 79% has accumulated in various landfills and natural water bodies. Global research over the last few years has proved that waste plastic can be effectively used in the manufacturing of bricks, which is a key driver in the growth of the market for waste plastic in the manufacturing of bricks throughout the forecast period.

FORMULATION OF THE PROBLEM

1. Needs more research before implications.

2. Needs more capital at first for R&D and Starting a business.
3. Some harmful plastics which are non-removal can cause problems.
4. Myths about how that plastic bricks can be flammable.
5. Competition from established traditional brick manufacturers. Some flying conspiracies about plastic bricks being highly flammable and other things put negative thoughts about our product among the people.
6. People traditionally prefer clay bricks over plastic bricks.

METHODOLOGY OF THE STUDY

Brick-making process

The different percentages of HDPE powder were mixed with PLC andwater. The percentages ofpowder and PLC were taken on a weight basis but the water was taken on a volume basis. The quantity of water increased with the increasing HDPE percentage, because, plastics are hydrophobic and less compact,It was done to get a homogenous concrete to cast on the smallmold. It was kept for 24 hours in the mold until dried. After drying, theDW of all the samples was taken to determine density before curing.Afterward, samples were put in water for 7 days more to study their CSand TS strength. Again, after 7 days the samples were taken out from thewater and dried to test their properties. In the second step, the samplewas kept in the water again for 28 days to study their properties [68].

The shape of the products

Usually, the shape of the brick was fixed as a square block. Thesquare block of forma was prepared previously and it was a fixed shape.The format was made up of tin. The mold was kept inside the forma andthe brick was prepared like the forma.

Density measurement

Density (mass of a unit volume of materials) is expressed as grams per cubic centimeter. Mathematically it is premeditated as the total massdivided by volume.

GENERAL QUESTIONS

1. What are the raw materials used to make a plastic brick?

Theraw materials used in the making of a plastic brick are recycled plastic, sand, and quarry dust.

2. Are plastic bricks better than clay bricks?

Plastic bricks are better than clay bricks because it is supposedly more durable and cheaper than clay bricks by approximately 10% and not to forget are efficient and eco-friendly.

3. Are plastic bricks flammable?

Although, the conductivity of plastic bricks is lower than thatof clay bricks. A properly packed eco brick is almost impossible to light on fire. Engineers test material flammability by holding it to an exposed flame.

RESEARCH DESIGN

Plastic bottles

+

Polythene bags

Quarry

+

dustSand

The shredded plastic is mixed with sand and subjected to extreme heat, producing a sludge that is molded into different-sized blocks. The result is a paver that is anywhere between two and seven times stronger than concrete, half the weight, and as much as 15 percent cheaper. Plastic is fibrous in nature, and the unique production process prevents air pockets from forming within the bricks. This results in greater compression strength than conventional paving stones that crack under heavy force or prolonged weather exposure.

Strengths:

Our product helps to reduce plastic pollution all over the Globe. Raw material cost is very low. More durable than traditional bricks and more cost-efficient.

Weakness:

Needs more research before implications. Needs more capital atfirst for R&D and Starting a business. Some harmful plastics which are non-removal can cause problems.

Opportunities:

Recycling plastic is appreciated in the market. Transformation towards recycled products helps our product to enter the market. With help of making in India and plastic free will help our product to achieve sales in the market.

Threats:

Competition from established traditional brick manufacturers. Some flying conspiracies about plastic bricks being highly flammable and other things put negative thoughts about our product among the people.

CONCLUSION

The results showed that the production of plastic bricks by usinghigh-density polyethylene could be used as an alternative to soil brick.Production of plastic bricks could reduce the huge quantities of plasticwaste in the environment which ultimately saves our soil and aquaticenvironment and improves the physical environment. This type ofplastic usage leads to attaining an eco-friendly environment. In

addition,this alternative use of plastic material helps to produce green building materials in the construction sector. The use of plastic with cement inbrick reduces the use of soil from the agriculture field as well as reducespressure on the environment to attain sustainable development. Thepresent results showed that plastic bricks containing up to 35% of HDPEcould be used as the standard brick in the construction sector

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