PERFORMANCE OF PLASTIC BRICKS ABOUT POROSITY, FIRE RESISTANCE, STRENGTH, COST AND BONDING ABILITY

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ABSTRACT

The increasing environmental concerns and the need for sustainable construction materials have led to the exploration of innovative alternatives to traditional building materials. Plastic bricks, derived from recycled plastic waste, are emerging as a promising solution to address both environmental issues and the demand for cost-effective construction materials. This project aims to comprehensively evaluate the performance of plastic bricks in terms of porosity, fire resistance, strength, cost, and bonding ability.

The plastic waste is the hazardous problem in today's world. This is most dangerous problem in front of humanity. The most hazardous type of wastes are HDPE and PTE and the plastic below 50micron is also causing a serious problem. This plastic mixed in the soil, it directly effects on fertility of the soil. Nowadays, the large amount of plastic is deposited into sea. This plastic wastes gives hazardous effect on the aquatic life and quality of seawater also polluted by this plastic. So, we try to finding efficient way to solve this problem of plastic waste. So, we added these plastic wastes into the bricks and create the bricks by using plastic wastes. It is most economical solution present in the construction industry and it is also economical and environment friendly solution of the plastic wastes.

I. INTRODUCTION

The construction industry is a significant contributor to environmental degradation. Plastic waste, a major environmental concern, has the potential to be transformed into a valuable resource through innovative applications such as plastic bricks. The fundamentals of brick manufacturing have not changed over time. However, technological advancements have made contemporary brick plants substantially more efficient and have improved the overall quality of the products. A more complete knowledge of raw materials and their properties, better control of firing, improved kiln designs and more advanced mechanization have all contributed to advancing the brick industry.

Plastic is the very hazardous material and very difficult to decompose it is main problem in the world. Use of plastic is high in our daily life such as polythene bags, disposals, furniture’s, packing food packets and other accessories. Plastic is varying in large and various types according to their chemical composition. So, to separation of plastic wastes and mainly big problem in front of us. Brick is the one of the most common masonry units used as a building material. Building material like brick, concrete block is popularly used in construction and these materials are expensive and find it difficult to afford easily. A large demand has been placed on building material. Industries especially in the last decade owing to the increasing population which causes a chronic shortage of building material alternative. May contribute in the exhaustion of the natural. Plastic is a non-biodegradable waste material. Plastic waste in increasing due to increasing population, urbanization and development. Many people throughout plastic after using it is not decomposed easily and effect the growth of plant. From that plastic we are trying to reduce the ratio of plastic by creating a brick.

II. METHODOLOGY

- Steps of the plastic brick
  1. Collect the plastic waste, plastic should be dry. Collect only plastic water bottle and plastic bags.

Plastic water bottle and plastic bags are in huge amount as domestic as well as commercial waste. The domestic waste is readily available at each house hold. Our group should collect 100 plastic water bottles and 100 plastic bags from hotels, house hold, etc.
2. Cut plastic bottles and bags into small pieces.
   Clean and wash all the bottles and bags with water. Cut bottles and bags using cutter and scissor into appropriate small pieces. Prepare the mold using iron. By using iron sheet metal prepare two mounds of size 23cm X 11cm X 8cm in workshop.

3. Melt all plastic collected.
   Place pieces of plastic in a steel bowl and place it in the furnace at predetermined temperature till melting point of plastic. Pour the melted plastic into the prepared mold. Take out the brick from mold when the temperature of brick comes down at room temperature.

4. Test compressive strength of plastic brick using compression testing machine.
   In this test, the cubical brick specimen is placed in the compression strength testing machine. After placing it we will apply the load on the brick without any shock. The load will be increased at a rate of 140kg/cm2 min continuously till the specimen’s resistance to increasing load breaks down and it cannot withstand any greater load further. Recording the maximum load applied to the brick specimen and the appearance and type of failure is also noted along with any unusual features.

5. Determine melting temperature of plastic brick by Fire test.
   The standard used for the test is. The plastic alone is readily susceptible if not flammable to elevated temperatures and in case of fire, the sand and plastic mixture may withstand temperatures that plastics alone usually cannot. It has been observed that the structural integrity of the bricks holds very well up to 180oC. In this test we will first heat and maintain the brick at the standard testing temperature in the furnace and then we will do the compressive strength test to check whether the properties change or not.

6. Determine Water absorption capacity of plastic brick by impressing in water for 24 hours.
   This test at first the bricks are weighed in total dry conditions. Then they will be allowed to be dipped in fresh water for about 24 hours in a container. The bricks are taken out of the water after 24 hours and are wiped with a cloth. The wet brick is weighed using a weighing machine. For the calculation of water absorption, the difference between wet brick and dry brick is done. The difference is the amount of water absorbed by the brick. After that the percentage of water absorption is calculated using the data. Water absorption of bricks talks about the bonding of bricks with mortar. Although other factors such as grooves and design on bricks also improve the bonding. For sand bricks which have less water absorptivity leaner mortar layer is used for bonding bricks and mortar. Greater quality bricks absorb less amount of water. For a good quality brick, the water absorption should be less than 20% of its own weight.

III. RESULTS AND DISCUSSION

1. Compression Strength test
   In this test, the cubical brick specimen is placed in the compression strength testing machine. After placing it we will apply the load on the brick without any shock. The load will be increased at a rate of 140kg/cm2 min continuously till the specimen’s resistance to increasing load breaks down and it cannot withstand any greater load further. Recording the maximum load applied to the brick specimen and the appearance and type of failure is also noted along with any unusual features.

   COMPRESSIVE STRENGTH= MAXIMUM LOAD APPLIED SPECIMEN AREA COMPRESSIVE STRENGTH = F/A

   Where,
   F - Maximum load applied (KN)
   A – Specimen Area (mm2)

2. Water Absorption Test:
   In this test at first the bricks are weighed in total dry conditions. Then they will be allowed to be dipped in fresh water for about 24 hours in a container. The bricks are taken out of the water after 24 hours and are wiped with a cloth. The wet brick is weighed using a weighing machine. For the calculation of water absorption, the difference between wet brick and dry brick is done. The difference is the amount of water absorbed by the brick. After that the percentage of water absorption is calculated using the data. Water absorption of bricks talks about the bonding of bricks with mortar. Although other factors such as grooves and design on bricks also
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\text{Water absorption} = \left\{ \frac{\text{Weight of wet brick} - \text{Weight of dry brick}}{\text{Weight of dry brick}} \right\} \times 100
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\text{Weight of wet brick} = 2.997 \text{ kg} \\
\text{Weight of dry brick} = 2.958 \text{ kg} \\
\text{Water absorption in \%} = 1.318 \%
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3. Fire Resistance Test:
The standard used for the test is BIS 3809 1979. The plastic alone is readily susceptible if not flammable to elevated temperatures and in case of fire, the sand and plastic mixture may withstand temperatures that plastics alone usually cannot.

It has been observed that the structural integrity of the bricks holds very well up to 180°C. In this test we will first heat and maintain the brick at the standard testing temperature in the furnace and then we will do the compressive strength test to check whether the properties change or not.

IV. CONCLUSION

The following conclusions could be drawn from the present investigation.

The proposed project presented above intends to resolve in reducing the plastic waste disposal problem as it utilizes the waste even in its finest form and converts that useless material into a useful construction material. Extruder machine plays a prominent role in the conversion of waste plastic into its melted form. Also, extruder does not possess any threats to the environment and hence can be used without any restriction. It also helps in reducing the usage of natural resources which are utilized during the manufacturing of burnt bricks, also it reduces the pollution which is generated from kiln during brick manufacturing. The final end product can be used as brick, which is having a higher strength than conventional brick. Also, the water absorption capacity is higher in comparison to conventional brick with a lower weight. Its uses are not restricted as only brick; it can even be utilized as a building block by increasing the dimension of the mould. Also, it reduces the use of wire used for fencing. Floor tiles, sleepers, etc. can also be produced from it. This brick also turns out to be economical than conventional brick, by reducing the cost of incinerators for burning purpose and landfills.

V. REFERENCES


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