

# Utilization of Waste Plastic Manufacturing of Plastic Bricks-A Research

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**Abstract-** Plastic waste, which is growing day by the day, is becoming an eyesore and polluting the environment, particularly in high mountain settlements where there is no rubbish collection infrastructure. A considerable amount of plastic is taken into tourist trekking destinations, which is then thrown or burned, polluting the ecosystem and air. As a result, these waste plastics must be adequately recycled. To make high strength bricks, low-density polyethylene bags are cleaned and mixed with sand in specific proportions. That have thermal and sound insulation capabilities to minimize construction costs and pollution; this is one of them. one of the most effective strategies to avoid the accumulation of plastic garbage, which is a contaminant that does not degrade. This saves the data in a different way.

As a result of the excess quantity, the cost component decreases. To get desired hues, coloring agents can also be added to the mixture. As a result, in this research, an attempt is made to investigate the qualities of a brick built from plastic trash. The current research focuses on the production and characterization of bricks constructed from waste plastic (LDPE) and fine aggregates. The masonry Produced materials are light in weight, have a smooth surface and fine edges, are free of cracks, have a high crushing strength, and have a low density.

**Keywords-** Plastic waste, Sand, low Density plastic, water absorption.

## I. INTRODUCTION

Low density polyethylene (LDPE) is the most widely used packaging material in the world, and it is used to package a wide range of goods. It's also used to make bottles and containers. They do, however, constitute a significant environmental danger because efficient disposal is a mammoth undertaking. They take a long time to decay. As a result, they are able to block sewers, canals, and waterways They fill landfills quickly because they take a long time to degrade. Bags made of polyethene packaging sheets endanger aquatic life and wildlife by posing a choking hazard if consumed.

Bricks can be made from low density polythene. Bricks are the most basic building materials and must be purchased in large quantities. Because waste polyethylene is reused in the brick manufacturing process, the overall cost of the brick will be decreased. Brick Earth is expensive and mining brick earth causes environmental damage. As a result, utilizing plastic to produce bricks is not only environmentally friendly but also cost-effective. Plastic bricks are not only cost-effective and environmentally beneficial, but they also have a smooth finish, are free of fractures, and have a low water absorption rate.



**1- Present Time Plastic Waste in India-**As our population has grown, our urbanization has increased, and as a result of technical advancements, the number and diversity of solid wastes generated by industrial, agricultural, mining, and domestic activities has increased as well. In the year 2002, the expected global quantity of wastes generated was 12 billion tones, with 11 billion tones being industrial wastes and 1.6 billion tones being municipal solid wastes (MSW). By 2020, over 19 billion tons of solid trash is estimated to be produced yearly. Asia generates 4.4 billion tons of solid waste per year, with MSW accounting for 795 million tonnes of that, with India accounting for 48 (6%) of the total. In India, MSW generation is estimated to exceed 300 million tonnes. MSW generation in India is predicted to surpass 300 million tonnes, requiring 169.6 square kilometers of land for disposal, compared to only 20.2 square kilometres in 1997 for the management of 48 million tonnes. According to research, organic wastes from farms, in addition to city trash, Each year,

agricultural sources provide more than 350 million tonnes. However, it is estimated that 600 million tonnes of coal are produced each year. In India, trash has been created solely from agricultural sources. The amount of trash produced by agricultural sources sugarcane trash, paddy and wheat straw and husk, vegetable waste, food waste, tea, oil production, and wooden mill waste trash, coconut husks, jute fiber, groundnut shells, cotton stalks, and other materials. In the industrial sector, inorganic materials are used.

## II. ADVANTAGE AND DISADVANTAGE OF PLASTIC BRICKS ADVANTAGE

- Higher compressive strength than burned brick.
- It is a process of managing plastic garbage.
- We can lessen the environmental impact of plastic garbage.
- These bricks do not absorb water, allowing us to build a damp-proof structure.
- After disassembling, we can re-melt the bricks and make new ones that can be used.
- For the construction of temporary shelters, sheds, and other similar constructions...
- We can utilize these kinds of bricks as pavers or make pavers out of them.
- Because plastic is non-biodegradable, the bricks have a longer lifespan

**Disadvantage-**These bricks are not fire resistant, if the temperature rises above 40 degrees Celsius, the structure will collapse. The dark or black color of the bricks gives the structure an unappealing aspect. Plastering to the masonry after construction is quite tough.

- Release hazardous gases during the preparation process, which is quite dangerous.
- The production process is extremely hazardous, and safety equipment should be used.
- The production procedure is time-consuming.
- We can only use these bricks for footpath, interior or partition walls because exterior walls are not permitted, are exposed to sunlight, which may cause the brick's strength to deteriorate.

## III. MATERIAL USED

### 3.1-SAND

Sand having specific gravity of 2.56 and fineness modulus of 2.80 is used.

### 3.2-AGGREGATE

Aggregates are coarse particulate rock like material consisting of a collection of particles ranging in size from < mm to > 40 mm. It includes gravel, crushed rock, and sand, and recycled concrete, slag. Aggregate is a granular material, such as sand, gravel, crushed stone, crushed hydraulic-cement concrete, or iron blast-furnace slag, used with a hydraulic cementing medium to produce either concrete or mortar. The aggregate of each type is further sub-divided into many types and classification based on its size. The technique of Sieve Analysis is used for gradation of aggregate for use in concrete and for other applications. Aggregate is called bound material when it is mixed with cement or binding materials and referred to as unbound material when used without cement or binding materials.

**3.3-Chemical structure of waste plastic** Ethylene terephthalate is the monomer used to make Poly ethylene terephthalate (PET). It is made up of the ethylene molecule (-CH<sub>2</sub> - CH<sub>2</sub>-), two ester molecules (- COO-), and the terephthalate ring molecule. PET contains only two atomic species: As a result, hydrogen, oxygen, and carbon are present. Only carbon dioxide (CO<sub>2</sub>) and water vapor are produced when PET is burned. aqueous (H<sub>2</sub>O). As a result, even when PET is burned, there is no risk of dangerous gas emissions.

| Content                   | Test Result |
|---------------------------|-------------|
| Specific gravity          | 2.56        |
| Apparent specific gravity | 2.70        |
| Water absorption          | 2.00        |
| Bulk density              | 1.5 Kg/L    |
| Fineness modulus          | 1.796       |

### Physical properties of aggregate

### 3.4-LOW DENSITY POLYETHYLENE

The plastic method produces two greenhouse gases, methane and ethylene, when subjected to ambient solar light. It breaks down more easily over time due to its poor density qualities (branching), resulting in larger surface areas. The supply of glasses shall be of diagonal gases from virgin LDPE, which grow in rate with surface area or time, with rates of 5.8 nmol g<sup>-1</sup>) at the end of a 212-day incubation. 1 d-1, 14.5 nmol g<sup>-1</sup>. In the case of air, When LDPE is incubated, it produces 2 times and 76 times more methane and ethylene in the air than water, respectively. Low density polyethylene (LDPE) is made from waste plastic bags, packaging materials, and plastic bottles with a density of 0.91 to 0.94. The melting point is around 120 degrees centigrade.

**Physical properties of PET**

Compressive/crushing strength is a measure of how strong something is when it is compressed or crushed. The formula for calculating the brick's compressive strength is = (max load taken before N/mm<sup>2</sup> (failure/area of the Brick surface).

|                                  |                        |
|----------------------------------|------------------------|
| Coefficient of thermal expansion | 7x10 <sup>3</sup> / °c |
| Long term service temperature    | 120-170 °c             |
| Melting point                    | 260°c                  |
| Specific gravity                 | 1.3-1.4                |
| Water absorption                 | 0.08- 10 %             |

**IV. METHODOLOGY**

- Plastic waste collection
- Batching
- Plastic crushing
- Burning of plastic
- Mixing
- Moulding
- Drying

**TESTING OF PLASTIC BRICK**

**4.1- Water absorption test**-The bricks are first weighted in a dry state before being immersed in water for 24 hours. They are then removed from the water and wiped clean with a cloth. The percentage difference between dry and wet bricks is then computed. The average weight of the three plastic bricks has been calculated after the weights of the three plastic bricks have been determined.

| Sr. No. | Weight W1 (kg) | Weight W2 (kg) | Water absorption (%) |
|---------|----------------|----------------|----------------------|
| 1       | 3.60           | 3.89           | 4                    |
| 2       | 3.03           | 3.17           | 4.62                 |
| 3       | 2.86           | 2.96           | 5.71                 |

**4.2- Compressive strength test**

The purpose of this test is to determine the compressive strength of brick. It's also known as brick shattering strength. Typically, three brick specimens are taken

to the laboratory for testing and tested one by one. In this test, a brick specimen is placed on a compressive strength testing machine and pressure is applied at a consistent rate until it breaks. The maximum pressure that can be applied is taken into account that the brick is crushed. Each of the three brick specimens is examined individually, and the average result is used to determine the number of bricks.

**Calculation-**

**Compressive strength of bricks = maximum load at failure (N)/average area of bed face (mm<sup>2</sup>)**

| Sr | Aggregate & plastic ratio | Size of brick (LxB) mm | Compressive load in KN | Compressive strength N/mm <sup>2</sup> |
|----|---------------------------|------------------------|------------------------|--|
| 1  | 2:2                       | 190x90x90              | 312.5                  | 18.27                                  |
| 2  | 2:1:5                     | 190x90x90              | 287                    | 16.78                                  |
| 3  | 1.5:2                     | 190x90x90              | 250                    | 14.16                                  |



**V. CONCLUSION**

The following conclusions can be drawn based on the findings:

- Plastic bricks are a very good alternative to traditional earthen bricks.
- Plastic bricks can be used for partition and exterior walls, but not for load bearing walls.
- Because the cost of producing plastic bricks per unit is substantially lower than that of traditional clay bricks, they are less expensive.
- Plastic bricks are also waterproof; thus they can be utilized in underwater buildings.
- Reducing pollution by avoiding the use of plastic.

## VI. FUTURE SCOPE

Plastic bricks give us hope and a way to work on innovative things related to the plastic and to try to invent some new Civil engineering materials which shows some remarkable response in future industry and changes the thoughts of the researchers, users and industries. Such as, in going for

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- Effectively utilize in the road.
- It is use damp proof construction.

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