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UTILIZATION OF WASTE PLASTIC IN MANUFACTURINGOF PLASTIC BRICK

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ABSTRACT: *Plastic waste, which is growing 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 proportion 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 savesthe 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 thesis, 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 masonryProduced 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; it usually takes more than ten decades. 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.

Figure 1: Plastic brick

II. PRESENT TIME PLASTIC WASTE GENERATION IN INDIA

As our population has grown, our urbanisation 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 tonnes of solid trash are estimated to be produced yearly. Asia generates 4.4 billion tonnes 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 kilometres 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 fibre, groundnut shells, cotton stalks, and other materials In the industrial sector, inorganic materials are used.

ADVANTAGE OF PLASTIC BRICK:

- The brick has a higher compressive strength than burned brick.
- It is a method 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.
- Suitable for use in the coldest climates with severe rain and snowfall.
- It is possible to use lower-skilled labour. The bricks will be laid**.**

DISADVANTAGE OF PLASTIC BRICK:

Because these bricks are not fire resistant, if the temperature rises above 50 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. MATERIALS USED

(A) SAND

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

(B) AGGREGATE

Aggregates are coarse particulate rock like material consisting of a collection of particles ranging in size from < 2.0 mm to > 50 mm. It includes gravel, crushed rock, sand, recycled concrete,
slag, and synthetic aggregate. 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. Types of aggregates include Coarse aggregate and fine aggregate. 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. In this project use aggregate size of 1 to 2 inch.

(C) 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_2 - CH_2-), 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_2) and water vapor are produced when PET is burned. aqueous (H_2O). As a result, even when PET is burned, there is no risk of dangerous gas emissions. However, inthis case, only PET melting was required.

TABLE 1: PHYSICAL CHARACTERISTICS OF FINE AGGREGATE

Content	Test result
Specific gravity	2.56
Apparent specific gravity	2.70
Water absorption	2.00
Bulk density	1.5 kg/L
Fineness modulus	2.796

(D) LOW DENSITY POLYETHYLINE:

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-1) at the end of a 212-day incubation.1 d-1,
14.5 nmol g-1 d-1 ethylene, 3.9 nmol g-1 d1 ethane, and 9.7 nmol g-1 d-1 propylene 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 115 degrees centigrade, and the density is g/cm3.

PHYSICAL PROPERTIES OF PET:

Coefficient of thermal expansion	$7x10^3$ / ^{0}c
Long term service temperature	115-170 ^{0}c
Melting point	260^0c
Specific gravity	1.3-1.4
Water absorption	0.07- 10 %

Table 2: Physical properties of PET

METHODOLOGY:

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

TESTING OF PLASTIC BRICK:

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 determine.

Serial no.	Weight W1 (kg)	Weight W2 (kg)	Water absorption in (%)
1	3.60	3.89	4
2	3.03	3.17	4.62
3	2.80	2.96	5.71

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 consistentrate until it breaks. The maximum pressure that can be applied It 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.
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/mm2 (failure/area of the Brick surface).

Figure: Compressive strength test

Calculation:

$$\text{Compressive strength of bricks} = \frac{\text{maximum load at failure (N)}}{\text{average area of bed face (mm2)}}$$

Serial no.	Aggregate & plastic ratio	Size of brick(l*b) mm	Compressive load in KN	Compressive strength in N/mm^2
1	2:2	190x90x90	312.5	18.27
2	2:1:5	190x90x90	287	16.78
3	1.5:2	190x90x90	250	14.16

IV. FIGURES AND TABLES

Figure 4.1: Waste plastic

Figure 4.2: Melting.

V. CONCLUSION

The following conclusions can be drawn based on the findings:

- Plastic brick is 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 claybricks, 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.

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:

- Plastic bricks use in the parks for making bench, running trucks and waterfall in the park.
- Effectively utilize in the road.
- Plastic bricks use in the parks for making bench, running trucks and waterfall in the park.
- Effectively utilize in the road.
- It is use damp proof construction.

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