

An experimental study on the utilization of plastic waste for the manufacturing of bricks

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Abstract - Plastic is very hazardous in today's world. This is the most dangerous problem that humanity faces nowadays. When it burned it releases toxic gases like furans, dioxins, and mercury. The plastic, which is lower than 75 m, causes serious issues for human beings as well as the ecosystem. This experiment was performed on the manufacturing of bricks using plastic waste. The brick is manufactured by the process of melting it with river sand at 110°–130°C. In this experiment, we have used different types of sand to plastic ratios. The different types of plastic percentages we used in this experiment were 30%, 35%, 40%, 45%, and 50%, respectively, with the river sand. The tests that were performed on these bricks were compression tests, absorption tests, and other tests that were performed on normal bricks. These bricks are light in weight and economical in budget as we are using plastic waste.

Key Words: plastic waste, water absorption, compressive strength, hardness, efflorescence.

1. INTRODUCTION

Plastic has been most used that plastic pollution has become one in every of the environmental problems of the planet and also to blame for the global climate change. The utilization of plastic in our day-to-day life, like polyethylene bags, food packets, disposal materials, etc. it's impacted the environment, our health and wellbeing. We've got all contributed to the present problem, and now it's our responsibility to figure towards it to cut back and ultimately End Plastic Pollution. The employment of plastic is additionally a serious issue everywhere the planet. Every day, thousands of loads of pollutants are discarded into the air by natural events and human actions. Way more damaging are the substances discharged into the atmosphere by human actions. Most plastics are highly proof against the natural processes of degradation. As a result, it takes an extended period of your time to degrade the plastic. It's resulted within the enormous presence of plastic pollution within the environment and, at the identical time, affected human health adversely. it's estimated that plastic waste constitutes approximately 10% of the full municipal waste worldwide which 80% of all plastic found within the world's oceans originates from land-based sources.

1.1 Material Required For Manufacturing of Plastic Brick

Plastic waste such as Polyethene, Plastic bottles (Pet), Plastic with other composite materials, Engine oil, River sand (4.75mm)

2. SCOPE OF THIS EXPERIMENT

To generate plastic waste in an efficient manner and to use it effectively. To reduce the consumption of natural resources such as clay for the manufacturing of bricks. It takes less time for manufacturing as compared to normal brick. To produce the most cost-effective material and also offer an alternate option to the customer. To minimize the amount of plastic waste being recycled.

3. MATERIALS & METHODOLOGY

3.1. Materials

3.1.1. Plastic waste

Plastic that is used afterwards and downcycled in the environment becomes waste.

Fig-1 Plastic waste



Plastic waste is the accumulation in the environment of synthetic plastic products to the point that they create problems for wildlife and their habitats as well as for Human populations.

Table-1 Composition of plastic

Plastic type	Amount
Low density polyethylene	23%
High density polyethylene	19%
Polypropylene	14%
Poly vinyl chloride	6%
Polystyrene	9%
Polyethylene terephthalate	10%
Others	19%

3.1.2 River sand

This sand is naturally obtained on the bank side of the river. River sand has a small amount of clay, silt, and other organic impurities present in it. Its grain size is generally that of 4.75 mm coarse fine sand.

Fig-2 Collecting of river sand



3.2 Methodology

3.2.1 Collection of materials

In this experiment firstly, we have to collect the plastic waste material from different sites in the waste area.

Fig-3 Collection of plastic waste



3.2.2 Batching

The material that we collected contains some impurities like soil, water, and other waste. We have to separate it from this kind of waste and keep it dry and weighted as per our requirements.

Fig-4 Weighted batching



3.2.3 Melting

After collection and batching of material the plastic waste were to be put for melting process at (110⁰-130⁰C) be in the liquid form after all the waste plastic were full in liquid state then we have to use the sand in it and in the mould we have to use engine oil so that it not stick it with the mould.

Fig- 5 Melting of plastic waste



3.2.4 Moulding

Immediately after the mixing process, we should pour the mix into the mould. Because immediately after mixing, the mix starts cooling and it hardens, the quicker the mix should be poured into the mould and compacted. The size of the mould which we have used is 190mm X 90mm X 90mm, which is the standard modular size of the bricks.

Fig- 6 tamping of brick



3.2.5 Curing

Because the bricks cool and harden at room temperature immediately after molding, no curing process is required. The brick itself leaves the mould after 30 minutes, and it automatically cools down after 1 hour to 1.5 hours.

Fig -7 curing of plastic brick



4. RESULTS & DISCUSSION

4.1 Discussion

4.1.1 Qualities of good bricks

The good brick that used in the construction it possess these characteristic

4.1.1.1 Soundness

A good brick should give a clear, metallic sound when it strike with another brick.

4.1.1.2 Hardness

A good brick should be so hard that our finger nails should not be able to make any impact its surface when scratched.

4.1.1.3 Porosity

A good brick should not absorb more than 15 percent of its dry weight of water when kept immersed for 24 hours.

4.2 Results

4.2.1 Different composition with plastic wastes

SR.NO	COMPOSITION (SAND:PLASTIC)	SAND	PLASTIC WASTE
1.	3200gm of sample (70:30)	2240gm	960gm
2.	3200gm of sample (65:35)	2080gm	1120gm
3.	3200gm of sample (60:40)	1920gm	1280gm
4.	3200gm of sample (55:45)	1760gm	1440gm
5.	3200gm of sample (50:50)	1600gm	1600gm
6.	3200gm of sample (45:65)	1440gm	1760gm
7.	3200gm of sample (40:60)	1280gm	1920gm

4.2.2 Compression test

SR. NO	COMPOSITION (SAND:PLASTIC)		APPLIED LOAD	COMPRESSION TEST(N/mm ²)
1.	SAMPLE 1 (60:40)	1	205kn	8.87
2.	SAMPLE 2 (55:45)	2	210kn	9.09
3.	SAMPLE 3 (50:50)	3	215kn	9.30
4.	SAMPLE 4 (45:55)	4	220kn	9.45
5.	SAMPLE 5 (40:60)	5	215kn	9.30
6.	SAMPLE 6 (45:65)	6	205kn	8.87

Fig-8 Compression test on brick



4.2.3 Absorption test

SR.NO	COMPOSITION	WATER ABSORPTION TEST AFTER 24 HR
1.	SAMPLE 1	3.12%
2.	SAMPLE 2	3.02%
3.	SAMPLE 3	3.45%
4.	RED BRICK	7%

Fig-9 Before absorption



Fig-10 after absorption



4.2.4 Impact test

In this test, we have to take a brick and drop it from a 1 meter height. A good quality bricks should not break. If the bricks are broken, that means the impact value is low and it should be rejected.



Fig-11 Before impact test



Fig-12 after impact test

5. CONCLUSION

Plastic brick is found to be more strength as compare to 3rd class brick The setting time of plastic is low if we compare to normal brick Plastic waste is utilize in a good way Plastic waste brick is additionally accustomed reduce the environmental pollution It reduce the usage of clay in making of bricks Water absorption of plastic waste brick is low as compared to normal brick Plastic brick give an alternate option to the people We conclude that the plastic brick is helpful for the development industry as compare to fly ash and 3rd class clay brick



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