

Experimental Study on Utilisation of Waste Plastic and Quarry Dust in Paver Block

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ABSTRACT: The Plastic Pavers is prepared by utilizing the waste plastics. Plastic waste which is increasing day by day becomes eyesore and in turn pollutes the environment, especially in Metropolitan areas. A large amount of plastic is being brought into the separation regions are discarded or burned which leads to the contamination of environment and air. Hence, these waste plastics are to be effectively utilized. The waste plastic is heated and added with sand at various percentages to obtain Paver blocks to control pollution and to reduce the overall cost of construction. Hence in this work, an attempt is made to study regard the properties of the Plastic Paver block which is manufactured using plastic wastes. In this present work the Plastic paver are made by adding 45%, 55%, 65% and 75% of plastic waste by weight of sand required to fill mould of pavers.

KEYWORDS: Paver block, Waste Plastic, Quarry dust, Mould, Batching, Mixing, cooling, unmoulding

I. INTRODUCTION

The composition of waste is different in different areas based on the management programs and consumption patterns but the amount of plastic in the overall waste composition is high. The major constituents of plastic waste are **polyethylene and polypropylene**. There are several methods available to recycle and reuse the waste effectively. Since plastic has long service life, they can be recycled effectively. The biggest problem with plastic bags is that they don't readily breakdown in the environment. It takes 20 – 1000 years based on their composition. The average plastic waste produced in India per year is 15432 tones among which 6000 tones remains uncollected. In India the plastic waste is majorly disposed by burning and only less amount of **plastic waste is recycled**.

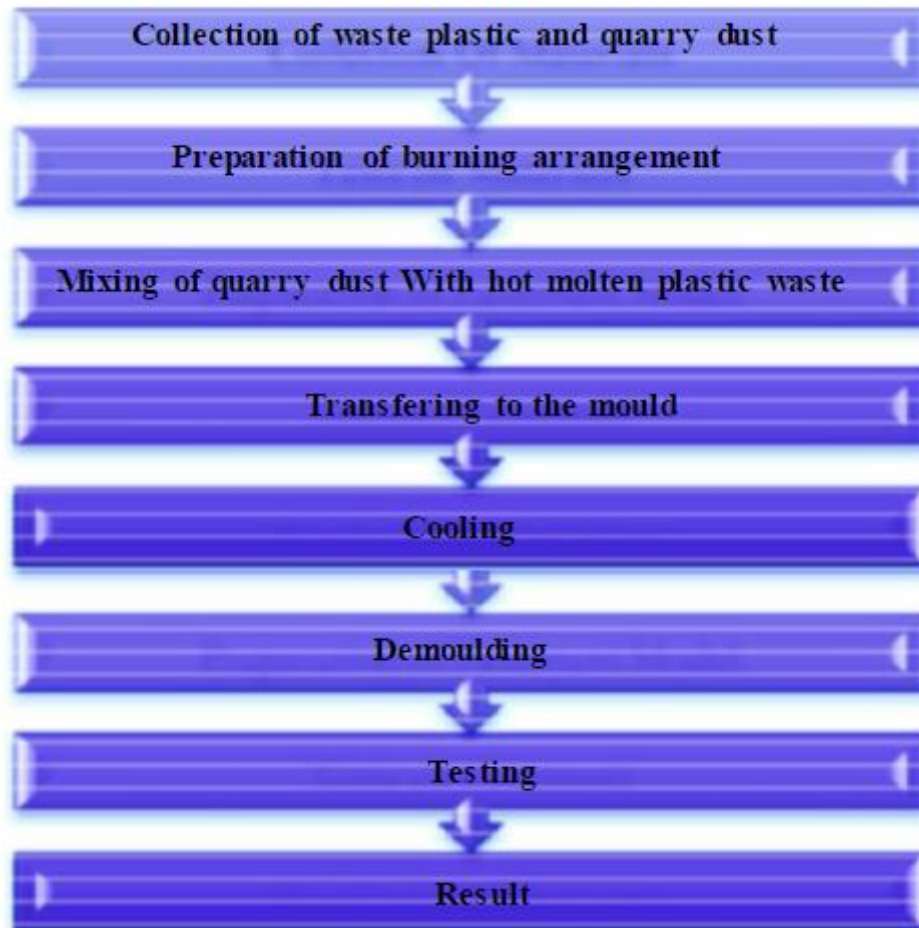
II. OBJECTIVES

The following are the objectives of present study

1. To prepare the plastic paver blocks using waste plastic as a binding material.
2. To study the compressive strength of plastic paver after attaining room temperature.
3. To study the advantages and disadvantage of plastic pavers.

III. METHODOLOGY

The process carried out by following steps



The materials used in this working model was the materials which were locally available in that locality. This was the methodology used in the preparation of the working model.

MATERIALS USED:

1. Quarry dust
2. Waste plastic
3. Mould

TESTS CONDUCTED:

TEST ON QUARRY DUST

1. Sieve analysis for quarry dust
2. Specific gravity for quarry dust
3. Bulking for quarry dust

TESTS ON WASTE PLASTIC PAVER BLOCKS

1. Compressive strength test
2. Water absorption test



MANUFACTURING PROCESS OF PAVER BLOCKS

Manufacturing process of paver blocks involved following steps

- Batching
- Preparation of burning arrangement
- Mixing
- Molding & Compacting
- cooling and unmolding

STEP 1: BATCHING

The collected waste plastic bags and plastic water bottle are weighted. And the quarry dust was sieved by using 4.75 mm sieve. The quarry dust and the plastic bags were weighed in various trial mix among which the plastic was taken for burning process.

STEP 2: PREPARATION OF BURNING ARRANGEMENT

The stones are arranged to hold the drum and the fire wood is placed in the gap between the stones and it is ignited. The drum is placed over the above setup and it is heated to remove the moisture present in it.

STEP 3: MIXING

The weighed plastic materials are dropped in the drum. The plastic wastes are heated in the drum of above 1500. As the result of heating the plastic waste melt and quarry dust is added to the plastic when it turns into hot liquid. The sand is added is mixed thoroughly using rod and trowel before it hardens.

STEP 4: MOULDING AND COMPACTING OF WASTE PLASTIC PAVER MOULD

Before placing the mixture into the mould, the sides of the mould are oiled to easy removal of block. This mixture then poured into the mould and they are compacted using tamping rod and surface is finished using trowel.

STEP 5: COOLING

After moulding and compacting the blocks are allowed to cool for 24 hours.

STEP 6: UNMOLDING

After cooling safely removed the block from mould.

TESTS ON WASTE PLASTIC PAVER BLOCKS

Compressive strength test: -

Compression testing is a very common testing method that is used to establish the compressive force or crush resistance of a material. Generally, five specimens of blocks are taken to laboratory for testing and tested one by one. In this test a paver block specimen is put on crushing machine and applied load till it cracks. The ultimate load at which block is crushed is taken into account.

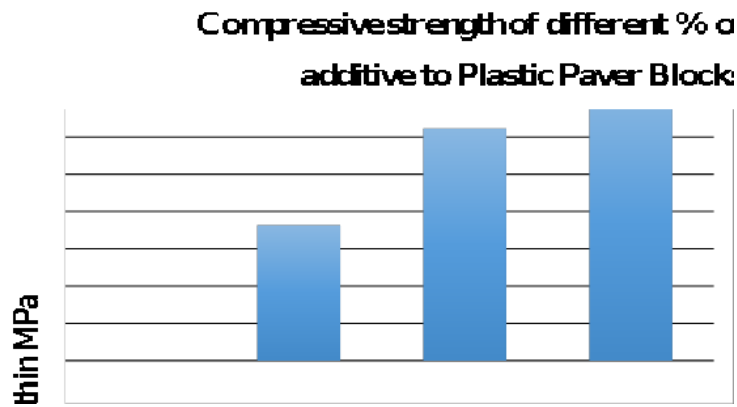
$$\text{Compressive strength} = \frac{\text{Maximum load}}{\text{Area of the specimen}} = P/A$$

Where, P= load value at breakdown of sample N

A= area of the specimen in mm²

Table.4.1: Compressive strength test result

	Sand in kg	Plastic in kg	Compressive strength in mpa
45% of plastic Additive	3.130	1.41	Collapse
55% of plastic Additive	3.130	1.726	7.48
65% of plastic Additive	3.130	2.040	12.78
75% of plastic Additive	3.130	2.350	14.9



Graph.1: Compressive strength of different % of plastic additive to plastic paver blocks

From the graph it is observe that 7.48 MPa is the minimum compressive strength value for 55% of plastic additive and the compressive strength increased to 12.78 MPa for 65% plastic additive and the maximum compressive strength value achieved to 14.9 MPa for 75% plastic additive.

Water absorption test:

In this test, blocks are weighed in dry condition and let them immersed in fresh water for 24 hours. After 24 hours of immersion, those are taken out from water and wipe out with cloth. Then, block is weighed in wet condition. The difference between weights is the water absorbed by block. The percentage of water absorption is then calculated.

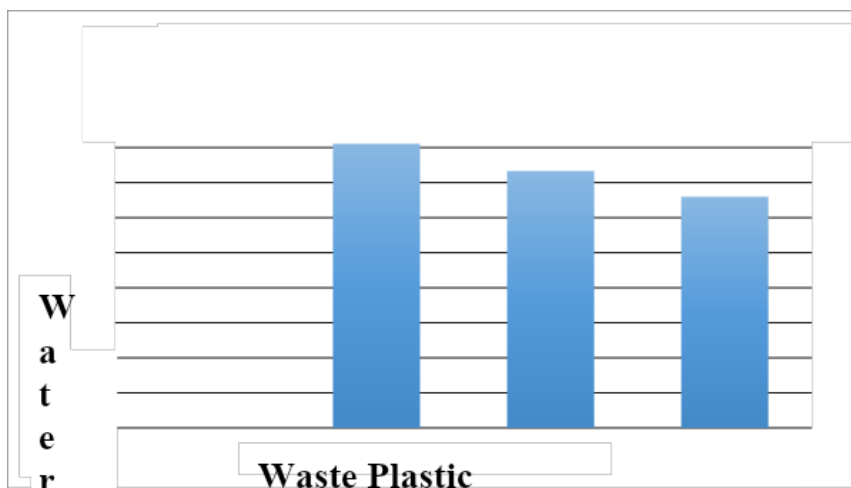
$$\text{Water absorption} = \{ [W2 - W1] / W1 \} \times 100$$

Where, W1= Weight of dry block (kg)

W2 = Weight of wet block (kg)

Table.4.2.Water absorption test result

particulars	45% of plastic additive	55% of plastic additive	65% of plastic Additive	75% of plastic Additive
Dry weight (kg)	3.80	3.70	3.41	3.03
Wet weight (kg)	3.9	3.76	3.46	3.07
Water absorption in %	2.63	1.62	1.46	1.32



Graph.2: Water absorption of different % plastic additive to plastic paver blocks

From the graph it is observed that the maximum water absorption value 2.63% for 45% plastic additive and the minimum water absorption value 1.32% for 75% of plastic additive.

IV. CONCLUSION

1. From the above results it can be concluded that, the addition of 65% waste plastic is required to get desired shape of paver Block and 75% of waste plastic is required to get the compressive strength of 15MPa.
2. The utilization of waste plastic in production of paver block has productive way of disposal of plastic waste.
3. Though the compressive strength is low when compared to the concrete paver block.

REFERENCES

1. **Mall R., Shrama S., Patel R. D.**, “Studies of the Properties of Paver Block using Fly Ash”, International Journal for Scientific Research & Development, ISSN (online): 2321-0613, Volume 2 Issue 10, 2014, 59-65 11
2. **Nanda Radhikesh P., Das Amiya K., Moharana.N.C.**, “Stone crusher dust as a fine aggregate in Concrete for paving blocks”, International Journal of Civil and Structural Engineering, ISSN
3. **Navya G., J., V Rao J. V.**, “Influences of polyester fiber on concrete paver blocks”, IOSR Journal of Mechanical and Civil Engineering, e-ISSN: 2278-1684, p-ISSN: 2320-334X, Volume 11, Issue 4, Jul- Aug. 2014, 70-75 6 – 4399, Volume 1, No 3, 2010, 631-638.
4. **PATEL D. N., PITRODA J. R.** “Techno Economical Development of Low-Cost Interlocking Paverblock by Partially Replacement of Portland Pozzolana Cement With used Foundry Sand Waste”, Journal of International Academic Research for Multidisciplinary, Impact Factor 1.393, ISSN: 23205083, Volume 2, Issue 4, M
5. **Raja O.**, “Manufactured Sand Can be Used as Fine Aggregate in Concrete Paver Block”, International Journal of Engineering Research-Online, ISSN: 2321-7758, Vol.2, Issue.6, 2014, 168–172.