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“REUSE OF WASTE PLASTIC AND PVC IN PAVER BLOCK”

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ABSTRACT

Global production of plastics is increasing every year (300 million metric tonnes in every year) and the amount of plastic litter that is finding its way into the environment and into the oceans is also increasing, especially in the areas of the world where waste management practices are not keeping up with the rapid development.

Plastic waste is one such resource, a major component of solid waste which is abundantly available and disposed of without proper treatment. There has been an exponential growth in municipal plastic waste disposal especially in urban areas which deteriorates the beauty of the landscape. Plastic was found to be an effective binder for using in paver block (for non-traffic). This efficient method helps the pavements to resist higher temperature and reducing rainwater infiltration. These paver block have shown improved compression and abrasion values and reduced water seepage. It consists of waste plastic (used as a binder) and fine aggregate which is mixed together & laid down in mould layers then compacted.

Keyword: Solid waste, Plastic, Paver blocks, PVC.

I. INTRODUCTION

Plastic pollution is the accumulation of plastic objects and particles (e.g.: plastic bottle and much more) in the Earth's environment that adversely affects wildlife, wildlife creature, and humans. Plastics that act. as pollutants are categorized into micro-, or macro debris, based on size. Plastics are inexpensive and durable, and as a result levels of plastic production by humans are high. However, the chemical structure of most plastics renders them resistant to many natural processes of degradation and as a result they are slow to degrade. Together, these two factors have led to a high prominence of plastic pollution in the environment.

Plastic pollution can afflict land, waterways and oceans. It is Estimated that 1.1 to 8.8 million metric tons of plastic waste enters the ocean from coastal communities each year. Living organisms, particularly marine animals, can be harmed either by mechanical effects, such as entanglement in plastic objects, problems related to ingestion of plastic waste, or through exposure to chemicals within plastics that interfere with their physiology. Effects on humans include disruption of various hormonal mechanisms.

II. METHODOLOGY

2.1 Procedure of making plastic paver block

Step 1:- In first step we should collect the waste plastic bags and the polyethylene bags are sorted out and remaining are disposed safely.

step 2:- Next the collected waste bags are cleaned with water and dried to remove the water present in it after this the plastics are burned out by using gas cylinder. The stones are arranged to hold the pan and the gas cylinder is placed in the ground and it is ignited. The pan is placed over the above setup and it is heated to remove the moisture present in it. Then the plastic bags are added to the drum one by one and the river sand is added to the plastic when it turns into hot liquid.



Fig. 1 Melting waste plastic.

Step 3:- The sand is added is mixed thoroughly using rod and trowel before it hardens. The mixture has a very short setting hence mixing process must not consume more time on the other hand the process should be complete. In case of Paver blocks.

Step 4:- These mixtures is then poured in to the paver mould and they are compacted using steel rod and surface is finished using trowel. Before placing the mixture into the mould, the sides of the mould are oiled to easy removal of paver block.



Fig. 2 Hexagonal waste plastic paver block.

2.2 Procedure of making PVC paver block

Step 1:- Collection of PVC plastic material from plastic waste disposal.

It is known as polyvinyl chloride. It is third most widely produced synthetic plastic polymer. PVC is used as plastic waste brought from the surrounding area for this project PVC is one of the most commonly used thermoplastic polymers in the world. It is naturally white and very brittle. PVC plastic crush are used in the experiments.

Step 2:- Mould:

The metal moulds having hexagonal shape are used for casting PVC paving block. They were made in such a manner as to facilitate the removal of the moulded specimen without any damage. The size of mould is 200mm x 200mm x 60 mm and the volume of one mould is 0.0024m^3 .

Step 3:- Weighing:-

The proportion or materials are taken by weight or by volume. The procedure will adapted was by weighing of the material as it is more accurate in comparison with volumetric method

Step 4:- Mixing:

After weighing all the ingredients which are to be used are taken for hand mixing process. At first, cement and sand with 20% PVC crush was mixed uniformly.

Step 5:- Compaction:

Compacting of concrete was done after placing the mixed concrete in the paver mould. The compaction work is carried out with vibrating machine. The concrete was filled in three layers. The vibrator is used to remove voids. The concrete should be properly compacted to remove the water and air voids and confirms that the concrete becomes denser, as it improves strength of concrete.

Step 6:-Curing:

The casted PVC mortar was allowed for drying for 24 hours in normal atmospheric temperature. After that, the concrete is demoulded and the blocks are cured with water to permit complete moisturize. After curing the blocks are dried in natural atmosphere for 7, 14 and 28 days.

III. RESULT & DISCUSSION

3.1 Water Absorption Test :-

water-absorption test A test to determine the moisture content of soil as a percentage of its dry weight. The sample is weighed, dried in an oven, then reweighed under standard conditions. It is calculated as the moisture content, which is equal to: (weight of the container with wet soil minus the weight of the container with dry soil) divided by (weight of the container with dry soil minus the weight of the container), then multiplied by 100 to express it as a percentage.

$$W_2 - W_1 / W_1 \times 100$$

W_1 :- Weight of oven dry sample.

W_2 :- Weight of saturated sample.

Table No 1. Waste Plastic paver block water absorption test

Sample	Weight of dry sample (gm)(W_1)	Weight of saturated sample (gm)(W_2)	% Water absorption
1	3747	3799	1.38
2	3815	4054	6.26
3	3378	3630	7.46

Table No 2 Waste PVC paver block water absorption test

Sample	Weight of dry sample (gm)(W_1)	Weight of saturated sample (gm)(W_2)	% Water absorption
1	3658	3876	5.95
2	3779	4.012	6.16
3	3478	3720	6.95

3.2 Compressive Test

This is done to know the compressive strength of the and paver blocks. This is also called crushing strength of and paver blocks. Generally three specimens of Paver block are taken to laboratory for testing and tested one by one. In this test a and paver block specimen is put on crushing machine and applied pressure till it. The ultimate pressure at which is crushed is taken into account. All three paver block specimens are tested one by one and average result is taken paver block compressive /crushing strength. The plastic sand /PVC sand and paver blocks of 4:1 ratios are tested one by one and in this the high compression is found and comparison made between the plastic and PVC paver block.



Fig. 3 Compressive strength test .

Table No 3. Compressive strength test result of plastic paver block.

Sample	Days	Applied load (KN)	Compressive strength
1	7	40	11.76
2	14	50	14.70
3	28	70	19.11

Table 4. Compressive strength test result of PVC paver block.

Sample	Days	Applied load (KN)	Compressive strength
1	7	30	8.823
2	14	45	11.42
3	28	60	17.14

Table 5. standard compressive test result of standard concrete paver block of M30 grade.

Sample	Days	Compressive strength
1	7	20
2	14	28
3	28	30

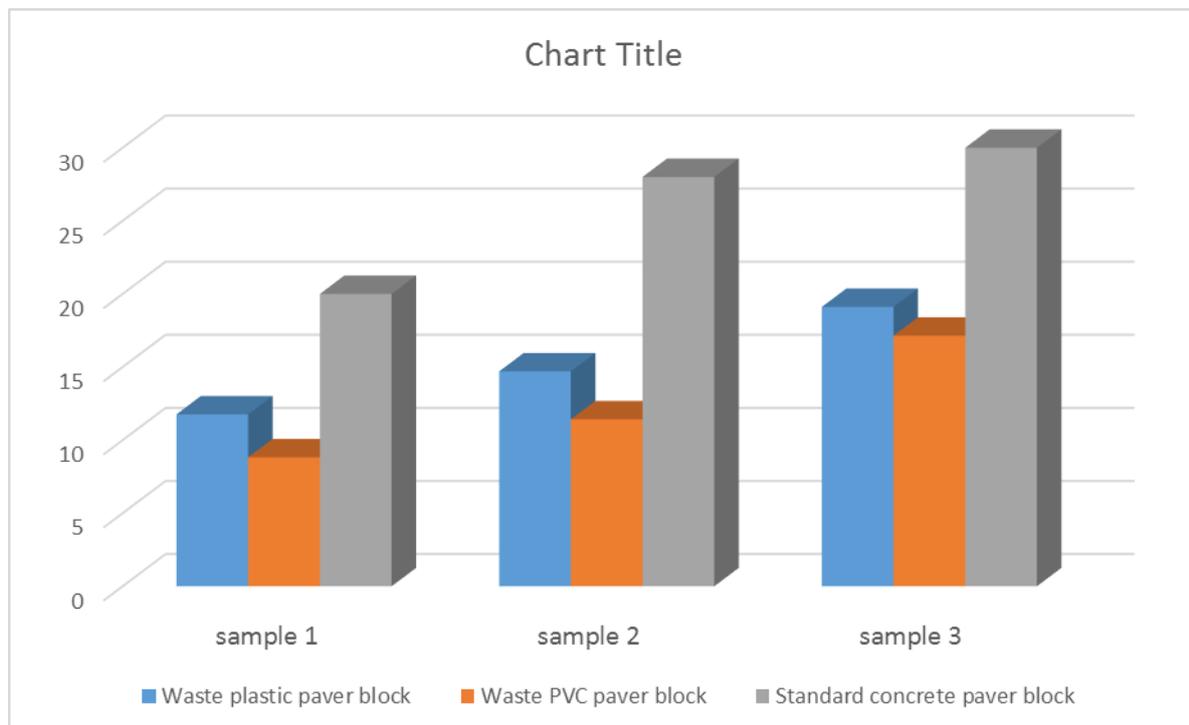


Fig 4 Compressive strength between waste plastic and waste PVC paver block

IV. CONCLUSION

The Plastic sand bricks possess more advantages which include Cost efficiency, Removal of waste products thus abolishing the land requirement problem for dumping plastic, Reduction in the emission of greenhouse gases by the conversion of gases into synthetic oil etc. This method is suitable for the countries which has the difficult to dispose/recycle the plastic waste. The natural resources consumed for the manufacturing of Plastic sand. Bricks and Paver blocks are very much less when compared to its counterparts. The manufacturing cost could be reduced further by replacing the river sand with fly ash/quarry dust or other waste products. Cause to the numerous advantages further research would improve the quality and durability of plastic sand bricks and paver blocks.

The utilization of waste plastic in production of paver block has productive way of disposal of plastic waste. The cost of paver block is reduced when compared to that of concrete paver block. Paver block made using plastic waste, quarry dust, coarse aggregate and ceramic waste have shown better result. It also shows good heat resistance.

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Though the compressive strength is low when compared to the concrete paver block it can be used in gardens, pedestrian path and cycle way etc. It can be used in Non-traffic and light traffic road. The concrete consists of cement, fine aggregate, coarse aggregate and water. The PVC powder is replaced for in 1:4. Out of these, 25% of PVC by weight of sand is the optimum content which does not affect the properties of concrete.

From the above observation, it is possible to use the plastic up to 25% by weight of fine aggregate. The plastic in concrete reduces the unit weight of concrete.

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