UTILIZATION OF WASTE PLASTIC IN MANUFACTURING OF PAVER BLOCKS

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Abstract: Plastic waste which is increasing day by day becomes eyesore and in turn pollutes the environment, especially in high mountain villages where no garbage collection system exists. A large amount of plastic is being brought into the tourist trekking regions are discarded or burned which leads to the contamination of environment and air. Hence, these waste plastics are to be effectively utilized. High-density polyethylene (HDPE) and polyethylene (PE) bags are cleaned and added with sand and aggregate at various percentages to obtain high strength block that possess thermal and sound insulation properties to control pollution and to reduce the overall cost of construction, this is one of the best ways to avoid the accumulation of plastic waste which is an on-degradable pollutant. This alternatively saves the quantity of sand that has to be taken away from the precious river beds/mines. The plastic waste is naturally available in surplus quantity and hence the cost factor comes down. Also Coloring agents can be added to the mixture to attain desired shades. Hence in this project, an attempt is made to study regard the properties of the block which is manufactured using plastic wastes .Disposal of large quantity of plastic bottle has emerged as an important environmental challenge, and its recycling is facing a big problem due to non-degradable nature. Due to plastic does not decompose biologically, the amount of plastic waste in our surroundings is steadily increasing. The proposed plastic mould which is made up by adding plastic waste in crush form in plastic moulds may help to reuse the plastic waste as one of the additives material of sand and fine coarse aggregate, and to help the disposal problem of plastic waste. The properties of plastic mould which contain varying percentages of plastic were tested for compressive strength, water absorption and efflorescence. It shows that an appreciable improvement in the performance of moulds can be achieved by introducing crush type of plastic waste into plastic moulds. In view of utilization of plastic waste material for developing sustainable construction material, the present paper reviews plastic waste materials in different compositions of ratios (0.5, 1.0, 1.5, 2.0, and 2.5) that were added to the raw material to develop plastic moulds. The compression strength of the mould is reviewed and recommendations are suggested as the outcome of the study.

Key Words: **Plastic, Sand, Coarse Aggregate, Compressive strength.**

I. INTRODUCTION

Plastic paver block paving is versatile, aesthetically attractive, functional, and cost effective and requires little or no maintenance if correctly manufactured and laid. Most concrete block paving constructed in India also has performed satisfactorily but two main areas of concern are occasional failure due to excessive surface wear, and variability in the strength of block.

Natural resources are depleting worldwide at the same time the generated wastes from the industry and residential area are increasing substantially. The sustainable development for construction involves the use of Nonconventional and innovative materials, and recycling of waste materials in order to compensate the lack of natural resources and to find alternative ways conserving the environment.

Currently about 56lakh tonnes of plastic waste dumped in India in a year. The dumped waste pollutes the surrounding environment. As the result it affects both human beings and animals in direct and indirect ways. Hence it necessary to dispose the plastic waste properly as per the regulations provided by our government.

In many countries the compositions of waste is different, that it is affected by the socioeconomic characters, waste management programs and consumption patterns, but generally the level of plastic in the waste composition is high.one of the largest component of plastic waste is polyethylene which is followed by polypropylene.

Plastics also help to conserve energy at the home Furthermore, the U.S. Department of Energy estimates that use of plastic foam insulation in homes and buildings each year will ultimately save close to 60 million barrels of oil versus other kinds of insulation. The same principles apply in appliances such as refrigerators and air conditioners.

Recycling the plastics has advantages since it is widely used and has a long service life, which means that the waste is being removed from the waste stream for a long period. Because the amount of clay required to make bricks is large, the environmental benefits are not only related to the safe disposal of bulk waste, but also to the reduction of environmental impacts that arise due to burning of plastics.

The replacement of plastic waste for cement provides potential environmental as well as economic benefits. With the view to investigate the behavior of waste plastic in manufacturing of plastic paver block from the solid waste a critical review of literature was taken up. An attempt was made to reuse the waste plastic with an aim not to lose the strength far from original Paver blocks. The physical and mechanical properties of materials used in Plastic Paver block were investigated. For the test 10 cubes were cast for measuring Compressive strength.

ADVANTGES

- The utilization of waste plastic in productions 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, river sand and coarse aggregate have shown better result.
- It also shows good heat resistance.
- It can be used in non-traffic and light traffic road.
- The cost of construction will be reduced and also helps to avoid the general disposal technique of waste plastics.
- By using plastics in pavements blocks, reduces the weight up to 15%.

OBJECTIVES

The experimental work was carried out to overcome the problem of disposal of waste plastic and also to minimize hazards caused by waste plastic on the environment.

The objectives are:

- The use of wastage plastic in paver blocks is aimed at reducing aggregate contents and leading to better economy and durability.
- It will also help in safe guarding the environment effects and contributes towards the solution for safe disposal of wastage plastic.
- As compressive and durability are the most significant properties for concrete paver blocks, the same have been studied for various concrete mixes with varying percentages of material.

By keeping the above objectives in mind the aims of present work is to check, the suitability and utilization of waste plastic as a replacement to cement in paver blocks.

II. MIX DESIGN

Design Mix Ratios

Trials	Ratios	Weight in Kg		
		Plastic	Fine Aggregates	Coarse Aggregates
1	0.5 : 1.0 : 0.5	0.299	1.064	0.532
2	1.0 : 1.5 : 0.5	0.399	1.064	0.354
3	1.5 : 2.0 : 0.5	0.449	1.064	0.266
4	2.0 : 2.5 : 0.5	0.479	1.064	0.212
5	2.5 : 3.0 : 0.5	0.499	1.064	0.177

Table 1. Design mix ratios

III. METHODOLOGY

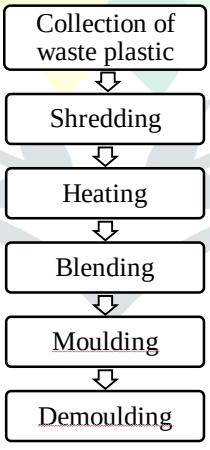


Fig 1 Flow Diagram

The collected waste plastic are cut into a small pieces this process is known as shredding. After shredding, take plastic in a fixed proportion (according to mix calculation) and heated in a pan until it starts melting. While melting add fine aggregate and coarse aggregate in a fixed proportions and stir well until it mix uniformly. It forms a mixture

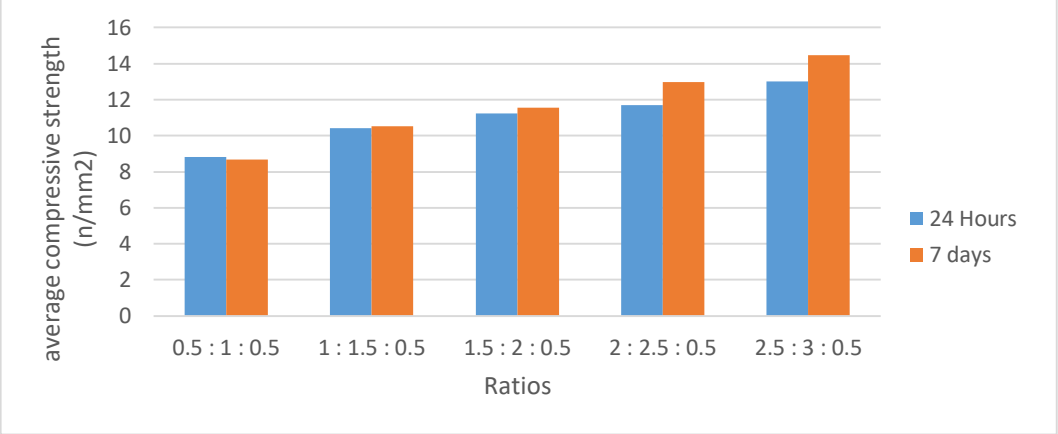
The formed mixture was poured to a mould, make sure that the mould was cleaned and greased or oiled before pouring. While pouring tamp with metal road to avoid air gaps. The mould should be placed on a metal plate. Allow the hot mixture in the mould to set for a few minutes, repeatedly shaking the mould to loosen the edges. Keep trying to lift the mould. The paving blocks should be released from the moulds and place with temperature of 27^{o}c for 2hours.

IV. RESULT

COMPRESSIVE STRENGTH

Trial. No	Ratios	Load (P) KN		Area (A) mm^2	Compressive strength (F=P/A) N/mm^2		Average Compressive Strength	
		24hrs	7 days		1 day	7 days	1 day	7 days
1	0.5 : 1 : 0.5	150	150	17200	8.72	8.72	8.835	8.66
		154	148	17200	8.95	8.60		
2	1 : 1.5 : 0.5	180	180	17200	10.46	10.46	10.4	10.52
		178	182	17200	10.34	10.58		
3	1.5 : 2 : 0.5	190	200	17200	11.04	11.62	11.22	11.56
		196	198	17200	11.39	11.51		
4	2 : 2.5 : 0.5	200	220	17200	11.62	12.79	11.68	25.93
		202	226	17200	11.74	13.14		
5	2.5 : 3 : 0.5	220	250	17200	12.79	14.53	13.02	14.46
		228	254	17200	13.25	14.76		

Table 2. COMPRESSIVE STRENGTH



GRAPH 1. COMPRESSIVE STRENGTH

IV. CONCLUSION

- The cost of construction will be reduced and also helps to avoid the general disposal technique of waste plastics namely incineration which have certain burden on ecology.
- The compressive strength of modified pavement block is more than conventional block.it can be used in Non-traffic and light traffic road
- Removal of waste products thus abolishing the land requirement problem for dumping plastic, Reduction in the emission of greenhouse gases by the conversion of flue gases into synthetic oil etc.,
- By using the plastics in pavement block, reduces the weight up to 15%, paver block made using plastic waste, Fine aggregate, coarse aggregate have shown better result, it also shows good heat resistance.
- There is no deposition of salts on the surface of blocks hence it is not affected by effloresces.
- Waste plastic, which is available everywhere, may be put to an effective use in manufacturing of paver blocks.
- It is observe that, compressive strength will be increased with the increase of plastic content, but as per our results we recommend the ratio of 1.5 : 2 : 0.5 with the comparison of conventional blocks.

Lastly, strongly conclude that the use of recycled plastics in pavement block is the best option for the disposal of plastic and ultimately reduces plastic pollution in the environment.

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