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Manufacturing of Paver Block by using Inert Material from Garbage Waste

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***Abstract*—**The most important problem in the world, the especially in India is generation of huge amount of solid waste and it contains large quantity of plastic wastes. Generally the plastic waste requires large duration for degradation. In some places the solid wastes are burned in the dumping yard it again creates air pollution and it will affect the human beings life as well as the environmental conditions. Plastic is very important for current life style due to it's application. Plastic used in many sectors like construction, building materials and etc., It affects the human beings as well as environment, so we are planned to use the solid waste with plastic in the paver block. In this project we have to test on paver block strength compared to normal paver block. The test should be conducted for compressive strength. And resultant comparative strength for these paver blocks will be justified.

***Keywords*—** *plastic waste, solid waste, inert material, paver block.*

I. INTRODUCTION

One of the main problems faced by cities and towns is related to solid waste generation. Current global MSW generation levels are approximately 1.3 billion tons per year, and are expected to increase to approximately 2.2 billion tons per year by 2025. This shows the per capita generation of solid waste is increased 1.2 to 1.42 due to modern life style. Main source of municipal solid wastes are collected from municipal, industry, commercial etc. rapid growth of industrials and population increases increase the plastic usage, which generate large tonnes of MSV. Normally the MSW containing the paper, woods, tin, construction materials and plastics etc., and from that components mostly many materials are recovered the usable and recyclable materials. Also its will be degraded at certain periods, but the only major problem is plastics which is not easily degradable. Plastics take more than one billion year approximately. So the major problem in plastics is degradation. Because of long duration for degradation, we need large size dumping yard [mostly the solid wastes are burned]. Because of the continuous dumping it creates more environmental problems [such environmental problem leads to health problems]. Plastics are used in many sectors due to it's flexibility and it's physical property. Approximately 30% of plastics are used worldwide for packaging applications and the most widely used plastics for packaging are polyethylene, polystyrene (PS). At present the industry is split into organized and unorganized sectors. The organized sector produce quality products whereas unorganized sector is not capable of producing quality products, it produces low quality, cheap products through excessive use of plastic scrap

II. NEED AND OBECTIVES OF THE STUDY

A. Need for the study

1. To know the amount of Municipal Solid Waste generated in our country
2. To reduce the problems caused due to the solid wastes
3. To avoid the environmental and Health effects
4. To identify the best method for plastics disposal.

B. Objectives of the study

1. To protect environment from plastic waste
2. To avoid the issue caused by the disposal of plastic waste like incineration and dumping
3. To reduce pollution over the environment
4. To reduce solid waste used for landfill about 40%.

III. LITERATURE REVIEW

Ahmad K. Jassim (Mar, 2017) investigated on the sustainable solid waste recycling. The common effective character of degradation in commercial polythene carry bags of low density polyethylene was studied over in the period of 4 weeks in shaker under various laboratory conditions. The results show huge possibilities to produce solid waste parts directly from solid inert chips without any additional process like melting and rolling process. The density of cold extruded Al-Zn alloy and copper metal chips reached 95% of the density of parts produced by conventional method. In addition, the hardness of cold extruded chips was equal to 98% of the parts produced by cast and rolled.

B. Mohammed and F. P. Afangide (Dec, 2017) investigation on valorization of polyethylene and plastic bottle wastes as pavement blocks. The possibilities of using very low-density of polyethylene and waste plastic

bottles for the production using interlock pavement blocks was studied. The results show that the duration required for melting waste polyethylene plastic is longer than that for waste plastic bottle. It was also observed that the compressive strength yielded by blocks with higher waste polyethylene plastic was higher than that with higher waste plastic bottle, while a combination of the two materials can also be suitable for production of interlock blocks. The compressive strength on 100% Waste Plastic replacement is 7, 75% Waste replacement is 10, 50% Waste replacement is 14, 25% Waste replacement is 18, 0% Waste replacement is 24.

Ms.S.Parthini, Ms.C.Chella Gifta (Mar, 2016) studied on experimental investigation on cost effective paver block. The main aim of this study is to produce interlocking concrete paver blocks by using manufacturing sand without curing. In this study of development of paver blocks from manufacturing sand the mix design was determined to achieve target strength of M30.The compressive strength test was conducted on paver blocks was found to be 38.6KN.TheTensile splitting strength was conducted on the paver blocks increase in average value from 3.22 N/mm2 to 3.42 N/mm2.

Koli Nishikant, Aiwale Nachiket, Inamdar Avadhut, Abhishek Sanger (Jun, 2016) studied on experimental investigation on Manufacturing of Concrete Paving Block by Using Waste Glass Material. The Properties of concrete mixed with waste glass as partial usage of Fine aggregate amounts in the range of 15%, 30% and 45% were investigated. The M30 grade concrete and compressive test conducted on paving block for15% glass replaced is 34.12, 30% glass replaced is 35.27, 45% glass replaced is 33.11. the 30% replacement give maximum strength.

IV. MATERIALS

For manufacturing paver block the following materials are used:

1. Plastic
2. Inerts

A. PLASTIC

The plastic which was highly present in the municipal solid waste were segregated separately. Then the plastic was rushed. Though the plastic cannot be decay it can also be used for the manufacturing of paver block.

Table1. properties of plastics

S.No	PROPERTY	TYPES OF PLASTIC WASTE		
		PE	PP	PVC
1	DENSITY (Kg/m^3)	915	946	1380
2	SPECIFIC GRAVITY	0.91	0.9	1.2
3	MELTING POINT	105º TO 115º	85º TO 145º	105º TO 115º

B. INERTS

The municipal solid waste has to be sieved through 18 mm sieve. So that the 18 mm size aggregates present in the municipal solid waste was retained. This aggregate would consist of various stone and glass. The transition temperature for glass is 573℃ and coefficient of thermal expansion for 100-300ºC is 9 ppm/K and density for 20℃ is $2.52g/cm^3$.

Table2. Time taken to degenerate

Type	Approximate time
Vegetable manner	1 week
Paper	10-30 days
Cotton cloth	2-5 months
Wood	10-15 year
Aluminium	100-500 years
Plastic bags	Un defined

V. METHODOLOGY

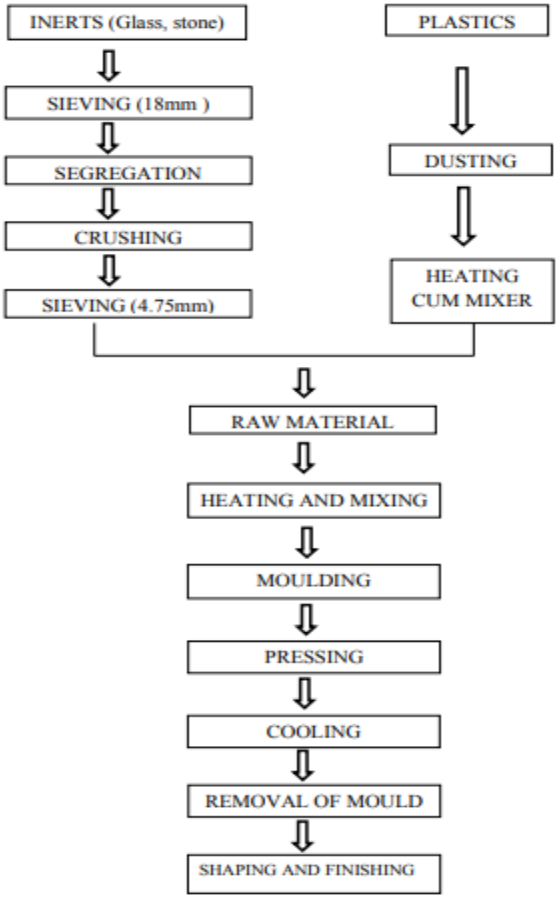

Fig 1. Methodology

The stpes of manufacture of cement concrete paver blocks involves the following steps:

A. PROPORTIONING

A nominal concrete mix ratio of 1:2:4 (cement: sand: stone chips) by the volume of cement may be used for the manufacturing of cement concrete paver blocks. The water -cement ratio of 0.62. The cement concrete mix should not

be more than the ratio of 1:6 by volume of cement to aggregates before mixing. The Fineness modules of using combined aggregates should be in the range of 3.6 to 4.0.

Fig 2. Segregation

Table- III: properties of plastics

s.no	Trial name	% of plastic	% of inert
1	Trail1	40%	60%
2	Trail 2	60%	40%
3	Trail 3	70%	30%

B. MIXING

All the raw materials for paver block manufacturing's are placed in a concrete rotary mixer and the mixer is rotated in the duration of 15 minutes. The prepared mixing of materials are discharged from the mixer and then consumed in the next 30 minutes.

Fig 3. mixing

C. COMPACTING

In this experimental investigation use the vibrating table for compacting concrete purpose. The municipal solid wastes were sieved through the 18mm sieve. The solid particles were retained. In this retained material the inert material like glass, various stones were segregated. The mixed materials were heated in a container at 350℃. The consequent stirring should be done while heating. After some time the plastic wastes gets melted and then the coated with other concrete material and tends to form a slurry formation.

D. CURING

After the compaction process the mould was removed and kept sun and open air for reduce crack formation on concrete surface purpose. This process duration is 24hrs. The curing period for the paver block is similar to the conventional concrete mix. The curing process time the same room temperature was maintained. The curing tank water removed and refilled in particular period of time to maintain the quality of the curing water. Mostly the curing water is free from salts.

Fig 4. Moulding

E. DRYING

After curing period, the blocks are dried in natural wind and sent to side for use. The concrete paver blocks gain strength in the interval of the first 3 days of curing period and maximum achieved in strengths are attained in the first 10 to 15 days of curing period. A block drying period of 7 to 15 days was generally completed and the drying shrinkage after which they can be used.

Fig 5. Drying

VI. TESTING OF PAVER BLOCK

The compressive strength values of the standard concrete paver block and the alternative materials (plastic and inert) paver block within top 20mm layer thickness were analyzed. It is observed that the compressive strength of plastic paver block is content compared to standard concrete paver block at 28 days. It is observed that at 0.4% of maximum strength was attained. The increment in compressive strength at 0.4% content is 7.81% at the age of 24 Hours.

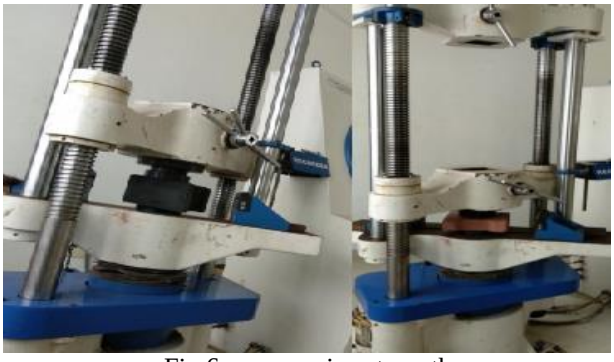

Fig 6.compressive strength

Dimensions of the paver block:
Length = 200mm,

breadth=160mm,

height =80mm

(standard mould size was used for testing purpose)

Table- IV: compressive strength

s.no	trial	Area (mm^2)	Load (KN)	Compressive strength (N/mm^2)
1	conventional	32000	284	8.875
2	Trail 1 (40%P+60%I)	32000	260	8.125
3	Trail 2 (60%P+40%I)	32000	330	10.310
4	Trail 3 (70%P+30%I)	32000	200	6.250

The following bar chart based on above table

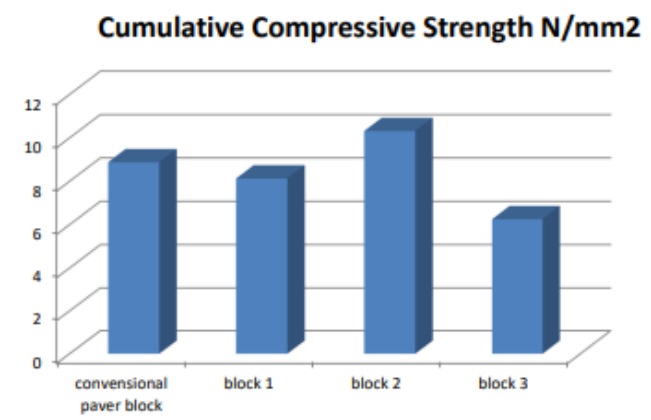

Fig 6. Compressive strength

VII. CONCLUSION

The following conclusions were obtained from the experimental investigation and various literature studies

1. The utilization of waste plastic in production of paver block has productive way of disposal of plastic waste.
2. It also shows good heat resistance.
3. This project can be used in non-traffic and light traffic road.
4. By this method we can be used to reduce the solid waste in municipality and also it is used to reduce 40% of landfill.
5. Among the above three block, block 2 achieved the highest strength of 10.31 N/mm^2. It attained full strength in 24 hours. Though the compressive strength is slightly high when compared to the concrete paver block it can be used in gardens, pedestrian path and cycle way etc.
6. It is ecofriendly.

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