EFFECTIVE USE OF WASTE PLASTIC AS MANUFACTURING OF PAVER BLOCK

S.DINESH[2], K.MOHAMED SHALMAN PARISHEE[3], J.SRIRAM[4], M.MOHAMED BASHITH[5]

R.JAYASANKAR[1]

[2,3,4,5] FINAL YEAR CIVIL ENGINEERING

[1]HEAD OF DEPARTMENT FOR CIVIL ENGINEERING

A.V.C COLLEGE OF ENGINEERING

MANNAMPANDAL

MAYILADUTHURAI-609001

Email: dineshsambath@gmail.com , salmanparishee@rediffmail.com

ABSTRACT

Day by day our environment is polluted by large amount of plastic wastes. However there are several plastic waste recycled & reused, They are not done effectively. In order to prevent the environment pollution caused by plastic waste, We decided to utilize it effectively in the manufacturing of paver blocks. Large amount of plastic wastes have been collected from several places such as tourist and public places etc., High density polyethylene bags are collected, cleaned and used as a replacement for cement in the manufacturing of Paver Blocks. The molten state of plastic is added with Fine aggregate (sand) at different percentages to obtain high strength Paver Blocks that possess good thermal properties and compressive strength. The plastic waste is available in large quantity and hence the cost factor comes down. Different shades can be obtained by mixing coloring agents such as red oxide. Hence in this thesis an attempt is made to study regard the properties of Paver blocks which is manufactured using plastic waste.

Keywords : Waste Plastics, River Sand, Paver blocks

INTRODUCTION

The composition of waste is different in different areas based on the socioeconomic characters, waste management programs and consumption patterns but the amount of plastic in the overall waste composition is high. The major constituents of plastic waste is 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 tonnes among which 6000 tonnes remains uncollected. In India the plastic waste are majorly disposed by burning and only less amount of plastic waste is recycled

MATERIAL USED

1. Waste plastics

By definition the plastics can be made to different shapes when they are heated in closest environment it exists in the different forms such as cups, furniture's, basins, plastic bags, food and drinking containers, and they are become waste material. Accumulation of such wastes can result into hazardous effects to both human and plant life. Therefore, need for proper disposal, and, if possible, use of these wastes in their recycled forms, occurs. This can be done through process of plastic management. Waste management in respect to plastic can be done by recycling. If they are not recycled then they will become big pollutant to the environment as they not decompose easily and also not allow the water to percolate in to the soil and they are also poisonous.

Fig.1 Waste plastics

TABLE 1 PHYSICAL PROPERTIES OF HDPE

SI.NO	PHYSICAL PROPERTIES	VALUES
1	Tensile Strength	0.2-.4 N/mm^2
2	Max. Continued use temperature	65ºC (149ºF)
3	Thermal Coefficient of Expansion	(100-200) x 10^{-6}
4	Melting Point	126ºC (259ºF)
5	Density	0.941-0.965 g/cm^3

2. River sand

Sand is naturally occurring granular material which is composed of mineral particles and finely divided material. The composition of sand varies depending on the local rock conditions and sources, but the most constituent of sand in Inland continental settings and non-tropical coastal region is silica dioxide (Sio2) in the form of quartz. The second commonly used sand is the calcium carbonate, for example aragonite, which has mostly been created, over the past half billion years, by various forms of life, like coral and shellfish. Sand are now used in all the construction process.

Fig.2 River Sand

3. Red Oxide(ferric oxide)

Iron (III) oxide or ferric oxide is the inorganic
compound with the formula Fe2O3. It is one of the three main oxides of iron, the other two being iron (II) oxide (FeO), which is rare, and iron (II, III) oxide (Fe3O4), which also occurs naturally as the mineral magnetite. As the mineral known as hematite, Fe2O3 is the main source of iron for the steel industry. Fe2O3 is ferromagnetic, dark red, and readily attacked by acids. Iron (III) oxide is often called rust, and to some extent this label is useful, because rust shares several properties and has a similar composition. To a chemist, rust is considered an ill-defined material, described as hydrated ferric oxide.

Fig 3: Red oxide

Iron(III) oxide which can be used as a pigment in the name of “pigment brown 6”,"pigment brown 7","pigment red 101”. for example, pigment brown and the pigment red are used in food and drug administration and also in cosmetics The properties of red oxide is to make colouring to the paver blocks. They are red, odourless and their density is 5.26 g/cm3. their melting point is also at 2851 degrees Fahrenheit.

CONTROL MIX DESIGN

In order to find the plastic soil blocks that they possess high compressive strength with various mix proportions are made and they are tested using compressive testing machine. The mix proportion were in the ratio of (1:2,
1:3, 1:4, 1:5, 1:6)

These are the ratio which represent the plastic, river sand respectively.

In first step we should collect the waste plastic bags and the polyethylene bags are sorted out and remaining are disposed safely.
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 stones and firewood.

The stones are arranged to hold the drum and the firewood 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. 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. 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, Red oxide is added (less than 10% of the total weight) to impart dark red colour.

TEST PROCEDURES

To know the quality of plastic sand paver blocks following tests can be performed. In these tests some are performed in laboratory and the rest are on field.

1. Compressive 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 pressure till it breaks. The ultimate pressure at which block is crushed is taken into account. All five paver block specimens are tested one by one and average result is taken as paver block's compressive strength.

The plastic sand paver blocks of different ratios are tested one by one and in this the high compression.

Fig 4: Compressive strength for plastic sand paver blocks

TABLE 2: Compressive strength of Plastic sand paver`

SI NO	TYPE OF PAVER BLOCK	VALUE
1	Plastic Sand blocks(without hydraulic press)	1 N/mm^2
2	Plastic Sand blocks(with hydraulic press)	5 N/mm^2

2. Water absorption test

In this test, paver 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 paver block is weighed in wet condition. the difference between weights is the water absorbed by the paver block. the percentage of water absorption is then calculated.

The less water absorbed by the paver block the greater its quality. Good quality paver block doesn't absorb more than 5% of its own weight.

Water absorption of test specimen = 2.2 %

As per IS 15658:2006 water absorption percentage within 5%, the result of specimen is 2.2% hence it is satisfied.

3. Fire resistance test

The Plastic is highly susceptible to fire but in case of Plastic sand Paver blocks the presence of sand imparts insulation. There is no change in the structural properties of block up to 180ºC above which visible cracks are

seen and the blocks deteriorate with increase in temperature.

4. Hardness test

In this test a scratch is made on block surface with steel rod (any hard material can be used) which was difficult to imply the blocks were hard. This shows the brick possess high quality.

CONCLUSION

Living organisms, particularly marine animals, can also be affected through entanglement, direct ingestion of **plastic waste**, or through exposure to chemicals within **plastics** that cause interruptions in biological functions

The Plastic Sand Paver Blocks 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 flue gases into synthetic oil etc.,

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