Manufacturing and Testing of Plastic Tiles

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Abstract- *The environmental decontamination and land pollution can be reduced by making best from waste. An alternative is provided for flooring or roofing tiles that consume nonrenewable resources, or produce negative environmental impact. In this research project three samples of tiles having 10 mm thickness were made. Waste Plastic from industries and epoxy resin along with hardener were mixed and tiles were casted. Then these tiles are tested in laboratory*

Keywords- Polypropylene, MEKP, Epoxy resin, Frictional coefficient.

I. INTRODUCTION

To keep the environment clean and healthy. The plastic waste should be removing as early as possible. So, in our we mainly concentrate on using this wastage of plastic as raw material for the production of tiles.

If waste plastic is burned, poisonous gases, smell and hazardous material are generated so, in this experiment we are using waste plastic material for the production of tiles. Solid waste plastic is crushed and converted into small and small particles of any appropriate color. This plastic is mixed with binding agent and this homogenous mix is put into Mould to set and get good tiles. Due to increase in requirement of tiles, there is shortage of stones, marbles, and increase in soil erosion. So, the hunt for alternative tile comes to end at the innovation of this “plastic tiles”. The processes of manufacturing of plastic tile required less time and are easy to handle. The waste plastic used is 950 gm. per tile. Epoxy resin 150 gm. per /tile was added as binder, and then mixed with 65 gm. per/ tile of hardener. All this casting was done at normal temperature of 250 C. The tile was tested for abrasion, flexure and frictional coefficient test.

Possibility of using plastic waste as a binding material instead of cement in the manufacturing of flooring tiles have been worked out by the researchers in the past. Such tiles have low porosity hence it makes tiles impervious. Tiles are also made from a mixture of PVC, CPVC, PVDC. The tiles made from recycled plastic have higher flexural resistance and lower specific weight than ceramic tiles.

Plastic tiles are rarely seemed in India, but this concept is used in China Now-a-days. They are using this type of tiles practically. The tiles which are produced by this wastage of plastic have better performance and strength as compared to ordinary tiles. Also it has more advantages discussed in the project further.

He result of this high consumption is nothing unless reducing the initial resources and increasing the landfill. In recent times, human from the one hand is always seeking broader sources with lower price and from the other hand is following the way to get rid of the wastes. The waste today can be produced wherever humans footprints be existed, and remind him that they have not chosen the appropriate method for exploitation of the nature. This paper introduces the development and low cost housing in India. At the present time, the possibility of utilizing the renewable resources such as solar, geothermal has been provided for us more than before, and development of the renewable and alternative energies is making progress. Plastic have become an essential part of our day to day life since their introduction over hundred years ago. The only way to reduce hazards of plastic reduce and reuse.

RESEARCH OBJECTIVES

1. To study the properties of plastic.
2. To use wastage of plastic material in manufacturing of plastic tile.
3. To know the limited proportion of plastic waste in addition to MEKP & Epoxy resin for getting proper strength..
4. Promoting recycling of plastic polymers as a substitute for virgin plastic.
5. To compare the experimented results with the ceramic tiles details and perform the economic analysis.

MOULD FOR PLASTIC TILES:

Mild steel was selected for fabrication of Mould. It has following advantages over aluminum

1. It is economical as compared to aluminum.
2. It has better tensile strength.
3. Also, it provides better impact resistance to Mould.

4. It is weld able.
5. Having less than 2% carbon it will magnetize well and is relatively inexpensive.
6. It must be painted or otherwise sealed to prevent it from rusting.
7. Most everyday items made of steel have some milder steel content. Anything from cookware, motorcycle frames through to motor car chassis, use this metal in their construction.

Mould having a standard size 300 mm * 300mm * 15mm.

Figure 1 Mould for casting of plastic tiles

II. MATERIALS

This project works deals with experimental program for making of plastic waste tiles. Materials uses in this tile are waste plastic crush material, MEKP and Epoxy resin. It is observing that all the materials satisfy the relevant provisions of IS code practice.

a. Crushed Material:- Crushed solid plastic material having size 1 mm to 3 mm approximately Properties:

1. Very much amount of crushed material available.
2. It is hard as well as in crystal form.
3. It is produced from waste solid product.
4. It is available at low cost.

Figure 2 : Waste crushed solid plastic material

b. MEKP [METHYL ETHYL KETONE PEROXIDE]

MEKP hardener which is used to reduce the setting time of chemical reaction. It is used to improve the strength of material. Methyl ethyl ketone peroxide (MEKP) is organic peroxide, a high explosive similar to acetone peroxide.

c.Epoxy Resin (GLUE)

Epoxy resins are low molecular weight pre-polymers or higher molecular weight polymers which normally contain at least two epoxide groups. The epoxide group is also sometimes referred to as a glycidasl or oxidase group.
More amount of this chemical was required for the project.

III. PROCEDURE OF CASTING TILE

1. Clean a mould properly and laid the thin plastic paper over the mould.
2. Take a crushed plastic material required for tiles by weight.
3. Take chemical methyl ethyl ketone peroxide (MEKP), epoxy resin by weight.
4. Mix properly crushed material and methyl ethyl ketone peroxide (hardener) and epoxy resin (binder) with hand glows.
5. Place this well mix in mould and placed properly in mould.
6. Apply the load for compression by using hand compaction.
7. Then, keep the mould in normal room temperature for 24 hours.
8. After 24 hours removes the tile from mould carefully.

Figure 3 : Casting Of Tiles at VPSCET, Lonavala. Survey laboratory. STUDENTS OF BE (CIVIL)

PROPORTION OF CONSTITUENTS

- Crushed Plastic Material
- MEKP
- Epoxy Resin

PROPORTION FOR FIRST TILE:-

- 1:2:12 (Hardner:Epoxy Resin:Plastic Material)

PROPORTION FOR SECOND TILE:-

- 1:2:15 (Hardner:Epoxy Resin:Plastic Material)

This tile consists of 70% solid crushed wastage plastic materials and 30% material (epoxy resin glue and hardener) are used.

There are 2 types of plastics:

1. Thermo softening
2. Thermosetting.

From which we've used the thermosetting plastic. For the binding purpose, we've used the thermosetting resin.

The epoxy glue was taken in one pan for the mixing purpose. After this, wastage crushed material and epoxy hardener were added in the pan. Further, MEKP were also added in appropriate quantity in the pan.

Before pouring the material into the mould, the mould was made leak-proof, by coating it with rubber. To make the mould stick-proof, the silicon spray was used as anti-sticking agent. After this, the mixture was made homogeneous with the help of stirrer. After pouring the material into the mould, some jerk was given to the mould, so as to remove the air bubbles if any.

One more precaution was taken that, the mould was kept undisturbed throughout the process, because, if it would have disturbed, then the thickness of tiles also varies. After this, the mould was kept in the sunlight for one hour for setting of plastic.

IV. TETING ON TILES AND RESULTS

RESULT OF FLEXURE TEST:-

Figure 4 : Flexure test carried out at VPSCET, LONAVALA, TOM laboratory

OBSERVATION:-

Table no. 1 : Observation table of flexure test.

Sr. No.	Proportion of Tiles	Break Load (w) (N)	Flexure Strength (N/mm2)	Deflection (mm)
1.	1:2:12	$17.5* 10^3$	151.91	22
2.	1:2:15	$19.23* 10^3$	106.83	19

CALCULATION

F= (3WL) / (2bt2)
= (3*19.23*103*250) / (2*300*152)
= 106.83 N/mm2

RESULT OF ABRASION TEST ON PLASTIC TILES:-

Fig. 6 : Abrasion test carried out on plastic tiles at VPSCET, LONAVALA, TOM laboratory.

OBSERVATION:-

Size of specimen: 65 mm x 65 mm x 15 mm
Original area of specimen: 4225 mm2
Original volume of specimen: 63375 mm3
Table no. 2 Observation table of abrasion test

Sr. No.	Proportion of tiles	Volume (mm^3)	T1 (mm)	T2 (mm)	T3 (mm)	W1 (gm)	W2 (gm)	W3 (gm)
1.	1:2:12	50700	12.47	12.01	0.46	54	52	2
2.	1:2:15	63375	15.85	15.52	0.33	54	53	1

CALCULATION

Average loss of thickness T3= (T1-T2)=15.85-15.52= 0.33mm
Result:- Average wear i.e. loss of thickness is T3= 0.0.33 mm
Similarly the loss of thickness is calculated for other proportion.

RESULT OF FRICTIONAL COEFFICIENT ON PLASTIC TILES:-
OBSERVATION

The different material uses for the frictional coefficient test were to tooth paste, matchbox and stone. We will find the angle of repose,

Table No.4 Calculation of frictional coefficient to plastic tiles

Material	Angle of Repose (Degree)	Weight of Material (Kg)	Frictional Coefficient (n/kg)
Matchbox	350	0.0004	0.70
Stone	390	0.122	0.809
Toothpaste	260	0.112	0.48

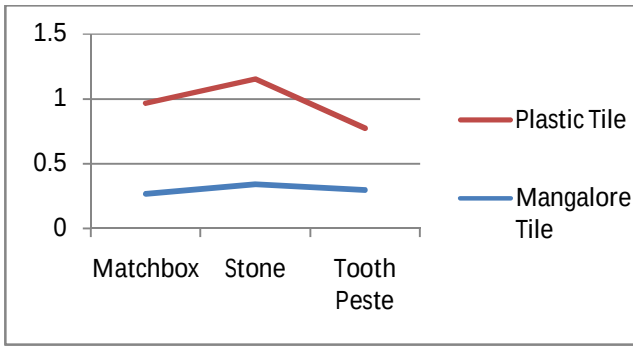

Fig.7 A graph of material against frictional coefficient

Table No. 3 Comparison between Ceramic tiles and plastic tiles

Sr. No	**Test**	**Strength Of Tiles**	
		Plastic Tiles	**Ceramic Tiles**
1.	Flexural Strength Test	106.83 N/mm2	2.24 N/mm2
2.	Abrasion Resistance Test	0.33 mm	1.32 mm
3.	Frictional Coefficient Test	0.663 N/kg	0.30 N/kg
4.	Water Absorption Test	0 kg	0 kg
5.	Cost	80 Rs.	55 Rs.

Table No. 4 Comparison between ordinary tiles and plastic tiles

Sr. No.	Property	Ordinary Tiles	Plastic Tiles
1.	Aesthetic view	Good	Better
2.	Water Absorption	Less	No Absorption
3.	Visual Abrasion Resistance	More	Less
4.	Chemical Resistance	Yes	No
5.	Frizz/Thaw Resistance	-	-
6.	Coefficient Of Friction	More	Less
7.	Thermal Shock Resistance	More	Less
8.	Water Curing	Less	More
9.	Thickness	Less	More
10.	Bond Strength	More	Less
11.	Breaking Strength Floor Tiles	Less	High
12.	Weight	More	Light

V. CONCLUSION

The plastic tiles are more durable then the ceramic tiles with respect to various perspective as retaining result. Locking towards the flexural capacity of the tiles, those can be use under heavy load. The area of heavy load can be garages, workshop parking etc. The less wear and tear will be seen in this plastic tiles. Only thing the cost of tiles slightly more than

ceramic tiles but these can be over seen with the other property.

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