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Overview on Manufacturing of Tiles from Plastic Waste

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Abstract: ***Plastic waste is a non-biodegradable waste which cannot decompose and this creates water, land pollution and air pollution. Also, while we burn the plastic waste in Dumping Ground, the percentage of plastic waste is increasing rapidly. It is estimated that the plastic waste will double after a decade as we use hundred grades of plastic in our daily life. We can recycle, reuse the plastic waste. As a civil engineer we have to innovate something new related to this, which is a boon for civil engineering. So, here we try to do something innovative as reuse of plastic waste for the production of floor tiles. The present investigation at manufacturing Floor tiles using waste plastic in different properties with Fly ash, without use of cement and comparing it with the normal cement tiles. To evaluate different physical and mechanical properties, tests like water absorption test, transverse resistance, resistance of impact and abrasion resistance tests were carried out as per IS specifications on the plastic tile and these test results were compared with normal cement tiles. The results obtained have shown better result compared to normal tile. As per this study it can considered to use plastic waste as a binding material instead of cement in manufacture of floor tiles. However, we generally use two to three types of polymers to make tiles," Paras explains. High-density polyethene (HDPE), Polypropylene (PP), and sometimes Low-density Polyethylene (LDPE). "We mix 15 per cent of fillers while recycling the plastics, to make it more tensile and durable.***

Keywords: Floor tiles, LDPE, PP, Fly ash, Waste plastic Introduction

I. INTRODUCTION

Waste is defined as any material that is not useful and does not represent any economic value to its owner. Depending on the physical state of waste, wastes are categorized into solid, liquid and gaseous. Solid Wastes are categorized into municipal wastes, hazardous wastes, medical wastes, and radioactive wastes. Note that, gaseous waste that is held in a closed container falls into the category of solid waste for disposal purposes. However, this study will be focused on biodegradable and photodegradable materials to decompose the waste, along with sufficient moisture and nutrients to sustain microbial action. Thus, the deeper these plastics are buried in the landfill, the less likely they are to decompose. Therefore, it is reasonable to say that that the market for plastic recycling Managing solid waste generally involves planning, financing, construction and operation of facilities for the collection, transportation, recycling and final disposition of the waste. Plastic is defined as synthetic or semi-synthetic materials which are polymeric and are composed of large molecules of organic substances known as monomers. The increasing plastic waste causes a lot of threat to the environment and even repeated recycling pose a potential danger. This waste plastic can be reused to make tiles that can be used in floorings for houses, terraces and bathroom.

A. Scope of the Work

1) Establishing the industries.
2) Increasing their strength by adding other material.
3) Recycling the plastic and using as a construction material.
4) Protection of environment.

B. Application of Plastic Tiles

1) For parking floors.
2) For Footpath way.
3) In Bathroom.
4) In Gardens for good aesthetic view**.**

II. OBJECTIVE

The current examination targets producing Floor Tiles utilizing waste plastic in various extents with sand, without utilization of concrete and contrasting it and the ordinary concrete tiles.

A. To foster a proficient route and to adequately use the waste plastics.
B. To limit and reuse age of waste plastic on the land and water to keep away from land and water debasement and resulting contamination danger.

C. To deliver financially savvy materials which a typical individual can bear without any problem.

III. METHODOLOGY

It is important to only use the right kind of plastic, Plastic bags, Naan water bags, Plastic film.This kind of plastic is called Low Density Polyethylene (LDPE). Make sure you only use this kind of plastic – using the wrong sort of plastic could be dangerous to your health.

You will need:

- Overalls, gloves, masks, covered shoes/boots
- 1 melting barrel (an oil drum cut in half, with 50cm legs)
- Stirring equipment (metal reinforcing rods with a metal paddle welded to the end)
- Firewood
- Construction sand
- Tile mould (no more than 4cm deep)
- Used engine oil
- Metal table
- Trowel, mould press

A. Sort

Make sure your plastic waste is mainly clean. Remove all materials that are not LDPE (including other plastics). If you're not sure if something is LDPE, leave it out.

B. Melt

Put the metal drum with firewood underneath and gently heat it, add the plastic waste. It will reduce down. Make sure the fire does not get too hot. You will end up melting it down to a large ball of melted plastic.

C. Mix

When the plastic has melted, it may start burning slightly. This is fine, but do not let it get so hot that it burns strongly. Add sand until you have the required mixture. You may find it easier to remove the plastic into another container to mix.

D. Mould

Quickly remove the mixture and put it into the mould with the trowel. The mixture is very hot so be careful and wear gloves. Press the mixture in so there are no air gaps.

E. Set

Remove the mould and leave – it should harden in around 2 hours. Experiment with different amounts of sand and LDPE plastic.

F. Market

These plastic floor tiles sell for D30 each (concrete tiles cost D40). These set quicker and are waterproof. Make samples and show them to potential buyers.

IV. EXPERIMENTATION

For checking the properties of LDPE made tiles following test were done on the component:

A. Compression Test

Compression test was conducted as per the ASTM D 695-2015 Standard. For this, the standard specimen size is 12.7 x 12.7 x 25.4mm. The specimen is placed between compressive plates parallel to the surface. The specimen is then compressed at a uniform rate. The maximum load is recorded along with stress-strain data. An extensometer attached to the front of the fixture is used to determine modulus. Compressive strength and modulus are two useful calculations in this test. They are calculated using the following equations.

$$Compressive\ strength = maximum\ compressive\ load\ minimum\ cross-sectional\ area$$

Equipment used in this test are:

- Instron universal tester

- Extensometer

V. RESULTS AND DISCUSSION

The density of the LDPE tile was observed to be 843 kg/mm3 . For conventional tiles, it is near to 2400. So, the tiles can be used in various applications where we require weight reduction. In the LDPE made tile, the total weight reduction was observed to be 57.7322% as compared to the conventional bathroom tile having the same dimension. The compressive strength of 17.26 MPa was observed. According to IS 15622:2006, a minimum of 1500 N breaking force is required to pass the test. The manufactured LDPE component showed 2175.6 N breaking force. So, these tiles can be used in places where there is no high weight bearing requirement. Burning rate was observed to be 52mm/min which was lesser than the standard 100mm/min required to pass the test. The coefficient of friction was experimentally calculated to be 0.5 for test specimen which was equivalent to the commercially available bathroom tile of 0.512 which opens up new avenues for further research and improvement of the coefficient of friction to make antiskid tiles. This makes tiles we manufactured using LDPE usable for normal day to day applications avoiding any slippage.

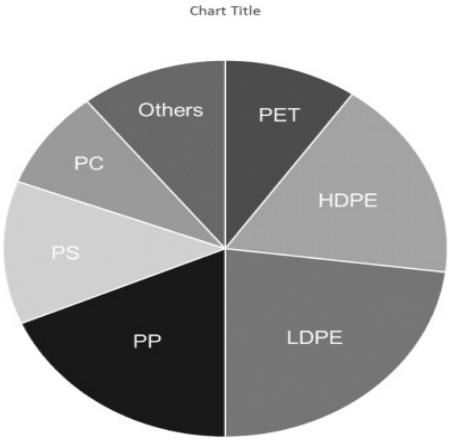

Fig. 5. Composition of plastic wastes (data from Association of Plastic Manufacturers in Europe, 2004).

VI. CONCLUSIONS

Waste plastic, which is available everywhere, may be put to an effective use in tile. Plastic for production of floor tiles can help reduce the environmental pollution, thereby making the environment clean and healthy. Water absorption of plastic tile is zero percent. With reference to the literature and this study, plastic waste can be used as a binding agent instead of cement in the manufacture of tiles, in the pavement construction etc.A completely recycled product was manufactured at a very cheap price. The material is unbreakable as against ceramic tile. The static friction factor is better than the available product making it suitable for antifriction tile fittings. Manufactured tiles have good machinability in cutting and finishing. Manufactured tile floats on water, making it suitable for marine applications like rafts, floats.

VII. FUTURE WORK

Plastic sand bricks give us hope and a way to work on innovative things related to the plastic and to try to invent some new civil engineering materials which shows some remarkable response in future industry and changes the thoughts of the researchers, users and industries. Such as, in going for plastic sand wall in framed structures as a partition wall, plastic sand benches in the parks, plastic sand tracks for running and jogging in place of concrete or stone tracks. Recycled plastics are used in new building and construction applications every day. Recycled plastics can be blended with virgin plastic (plastic that has not been processed before) to reduce cost without sacrificing performance. The use of PW for construction applications creates a pathway to use these wastes for long term applications compared to short term ones such as recycling into new products which will end up as waste within a short period of time. The possible use of PW as binder, aggregates and fibres makes it a viable replacement for all components in cementitious composites, with somewhat acceptable detrimental effects on the performance of the resulting composite. The use of PW for various construction application will lead to various revenue generation

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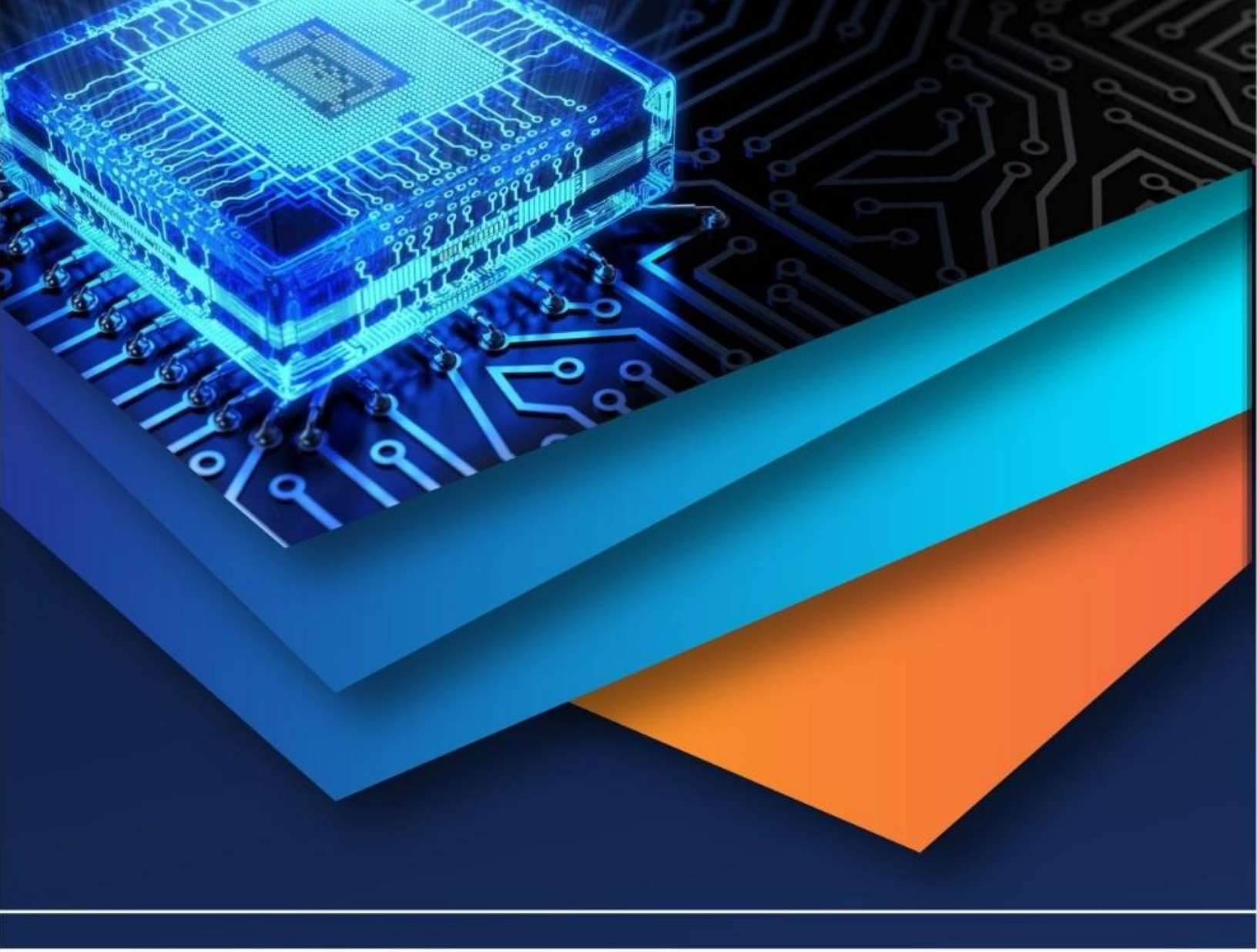

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