Recycling Plastic Waste as Pavement/Roof Tiles

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- **Abstract:**

Plastic waste are becoming the scourge of the earth. . Containers, bags, soda and all types of plastics either are burned, they end up in landfills or in our oceans. The aim of the project is to utilise the plastic waste in a smart way to create something useful such as pavement or roof tiles. Tiles made from plastics instead of cement will be more economical and will also help to reduce plastic wastes from the environment.

- **Keywords:** Waste plastic, LDPE ,PET ,Tiles,

- **Introduction:**

The aim of the project is to replace concrete tiles with tiles made from plastics. It will reduce the cost of conventional concrete tiles and at the same will provide an effective recycling solution for our plastic problem. Mostly single use plastics such as polythene bags, water bottles, cups etc. are thrown out and they are not recycled, especially in rural areas of India. These plastics are either burned, which releases harmful gases in the environment or they end up simply as landfills. In order to prevent the pollution caused by plastics wastes we have decided to utilize the plastics into pavement/roof tiles. Waste plastics are collected and shredded. They are melted and mixed with sand and crushed stones.

The molten state of plastic is added with Fine aggregate (sand) at different percentages to obtain high strength blocks that possess good thermal properties and compressive strength

- **Building a Shredder:**

The function of the shredder would be cutting the plastics into small pieces that will be suitable for our use.

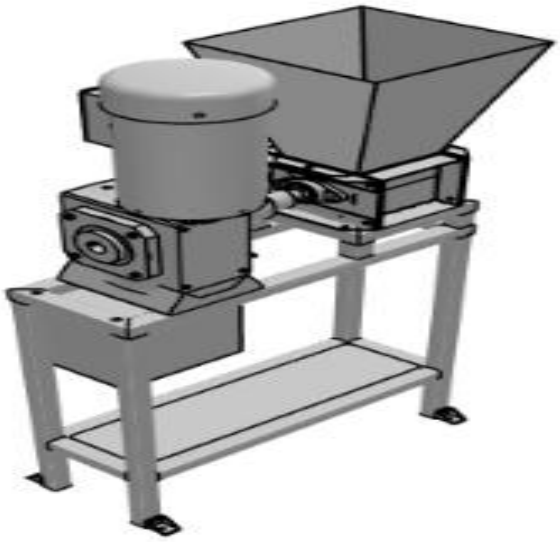
Technical Details

Type	Single Shaft Shreder
Weight	90 Kg
Dimension	280x680x1142 mm
Blade width	5mm, 6mm
Material	Hardox, Mild steel
Voltage	220V
Nominal Power	1.5 kW
Nominal Torque	300 Nm
Output Speed	+/- 70 rpm

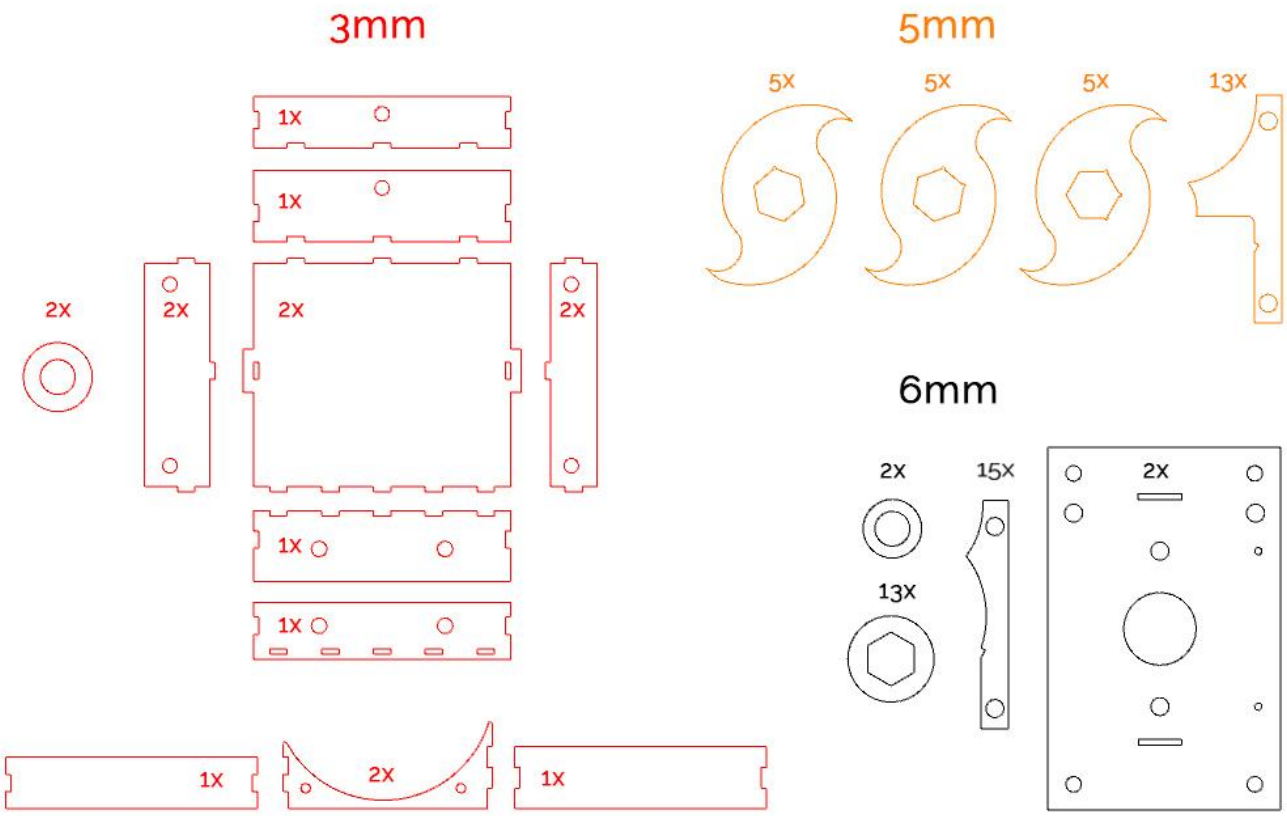
Working Principle:

The single-shaft shredder consists of a movable cutter disc and a stationary cutter to complete the function of shredding materials. The cutter head is composed of a base shaft and a plurality of square-shaped movable cutter blocks

Model



Shredder Disks



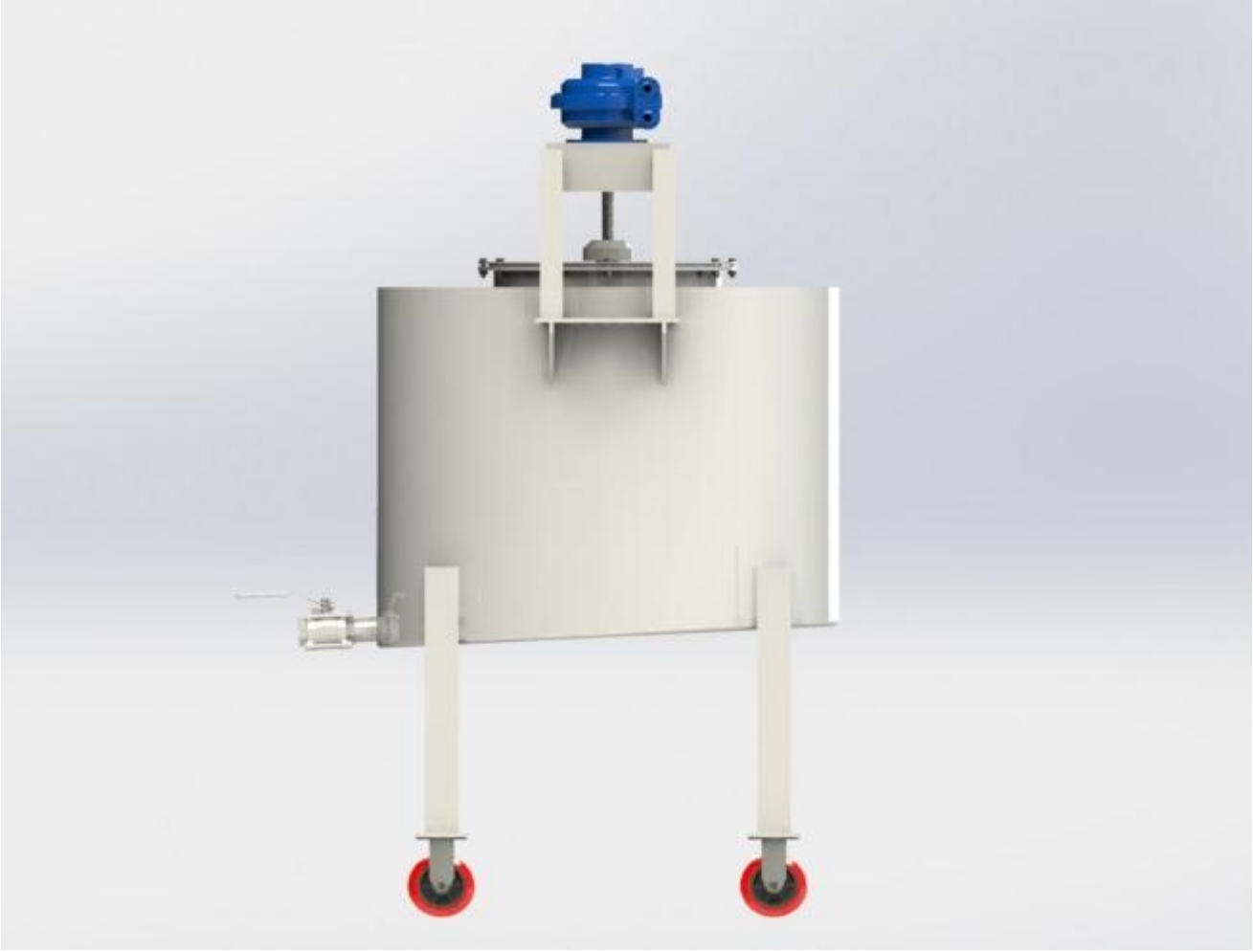
- **Building a Mixing/Heating Chamber**

The next step is to build Chamber where we'll put the shredded plastic along with a mixture of Sand, crushed stones etc. The chamber will be heated at an temperature around 150 degree(C) to melt the plastic. An agitator will be added to properly mix the substances.

Plastic, here will act as an binding agent with functions similar to cement.

The chamber will be connected to a faucet which will pour the hot mixture into the desired moulds by the action of gravity.

Model



- **Properties of the Materials**

Polyethylene (PET)

Polyethylene terephthalate or PET are commonly used in manufacturing of single use soda/ water bottles. It is one of the most commonly used single use plastic. The basic property are:

SL No.	Particulars	Value
1.	Melting Point	250 ◦ C
2.	Thermal coefficient of expansion	0.15 to 0.24 $Wm^{-1}K^{-1}$
3.	Density	1.3g/cm3 (20◦ C)

Low Density Polyethylene (LDPE)

LDPE plastics will mostly includes plastic bags of approx 50 microns. LDPE is indicated by resin number 4. The basic property are:

SL No.	Particulars	Value
1.	Melting Point	120 ◦ C
2.	Thermal coefficient of expansion	100-200 $x10^{-6}$ $Wm^{-1}K^{-1}$
3.	Density	0.91-0.94 g/cm3 (20◦ C)

Sand

Sand is simply small very particles of what used to be rock - worn down to very small particles by any of a variety of natural causes - typically water or wind erosion. As such, depending on the nature of the rock, the sand can have a variety of chemical compositions as rocks have an almost infinite number of chemical compositions. That said, the most common sand composition is primarily quartz based, so SiO2 is a dominant constituent - the same stuff most glass is made from.

- **Procedure**
  - ❖ Collection of waste plastics (plastic bags, wrappers, water bottles etc)
  - ❖ Feeding them plastics into the shredder.
  - ❖ Collection of shredded plastics
  - ❖ Pouring the plastics along with sand and crushed rocks in the heating/mixing chamber
  - ❖ At approx 150^0 C the plastic would melt.
  - ❖ Dyes may be added to obtain desired colours.
  - ❖ The hot molten plastic /sand mixture are then poured into desired moulds and pressed in order to remove internal pores.
  - ❖ The moulds are allowed to dry for some time and then the finished blocks are removed from the moulds.
  - ❖ The pavement/roof tiles are ready to use.

- **Conclusion**

The following conclusions were drawn:

- ❖ The utilization of waste plastic in production of pavement /roof tiles has productive way of disposal of plastic waste.
- ❖ The cost of paver block is reduced when compared to that of concrete pavement/roof tiles

- **Reference**

[1]. Utilization of Waste Plastic in Manufacturing of Plastic–Sand Tiles Mrs. Manasi V.Ghamande, Mr. Pranay P. Gangele, Mr. Viraj P. Desale , Mr. Ajinkya M. Nande , Mr. Atharva A. Kulkarni , Miss. Sharayu S. Thosar , Miss. Shreya
[2]. Reuse of Plastic Waste in Paver Blocks by B. Shanmugavalli.
[3]. Manufacturing of Plastone using Plastic and Quarry Dust by M. Brindha , C. Yusvanth Raj , I. Syed Nivas , S. Sheik Suliman