

Design and Fabrication of Waste Plastic Recycling Machine

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Abstract - To solve the problem of indestructible waste plastic by recycling this hazardous polymer into useful product i.e. tiles so that we can get rid of the malicious material and obtain sustainable balance between the generation and destruction of waste plastic materials, which is able to provide safe environment for humans along with various species of the Earth by making a more economical, user friendly and easy to transport plastic recycling machine. Firstly the machine in 3D software will be designed and then based on the calculated load that the machine will be subjected to, the analysis will be done and the material of the machine will be decided. Further this the fabrication of the machine will be done on the basis of the analysis done. In this machine, shredded plastic is put through the hopper into heating chamber. Inside the heating chamber, plastic is heated up to its melting temperature and then by lever arrangement which followed by press to final fabrication of the tiles. It will be beneficiary to the society and the small scale industrialists as the products made from it will be available at a cheaper cost. Fabrication of the machine so that the waste plastic can be recycled at a much cheaper cost with the use of more economical and compact injection-molding machine.

Key Words: Plastic Recycling Machine, Injection Molding Machine, molding machine, waste recycling machine, plastic, landfill avoidance.

1. INTRODUCTION

Waste plastic has become a huge problem for the world and disposal of it presents numerous challenges in front of us. Out of the huge amount of waste plastic generated only 9.1% of the plastic is recycled, rest all is just thrown away in ocean posing problems to the marine life. The paper deals with the recycling of the waste plastic and converting it to some useful products such as tiles, beams, decorative products by the use of more economical and less power consuming machine which is better than conventional machines available in market thus reducing the cost of the products manufactured. It involves the collecting, sorting, shredding and melting of the plastic and thus producing the products using the different types of the products.

1.1 Collecting

The actual collection of plastic can happen in a number of ways depending on the cultural and economic context of your country as well as the partners you decide to work with.

Some examples are, collection from the surrounding area, from local shops or manufacturers, local waste pickers or from the local waste stream.

1.2 Sorting

Sorting is done manually by checking the SPI code. Once the unsorted plastic comes in the workspace you should separate it in the relevant sorting bags (labelled with appropriate SPI code). Check each product for the small code (it can be numbers or letters in the triangular recycling sign), this is usually very small and can be difficult to find. Usually, it is embossed in the plastic itself at the bottom/inside of the product or printed on the label. Once you spot what plastic type the product is you can drop it in the appropriate sorting bag with the same SPI code.

1.3 Shredding

In this stage, the sorted plastic is shredded using the shredder machine. The size of the machine may vary from purpose to purpose, depending on the amount of the plastic to be shredded. The size of the granules or the shredded plastic depends on the sleeve that is used in the shredder.

1.4 Washing

Plastic needs to be clean before undergoing recycling processes. Dust, dirt and impurities will cause problems to Plastic machines and processes. Dirty plastic can result in extra maintenance, breakdowns, problematic productions and low-quality products.

1.5 Storing

The washed plastic is stored in the different labeled containers so that it can be easily identified and used when needed.

2. MECHANISM USED

It uses the lever and the plunger arrangement to transfer the force applied by the human on the lever to the plunger via the connecting rod that connects the lever and the plunger.

3. WORKING PRINCIPLE

The working principle of the injection-molding machine is similar to the syringe used for injection. It uses the thrust of the plunger to inject the melted plastic into the closed cavity,

and then obtains the process of the product after curing and setting.

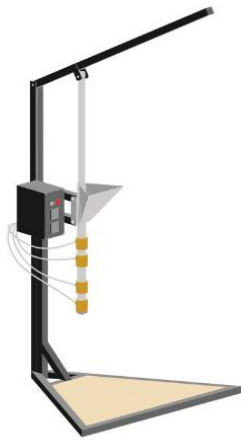


Fig -1: CAD model of the injection molding machine

4. COMPONENT USED

1. Barrel
2. Heating Element
3. Temperature sensing element
4. Hopper
5. Supporting structure
6. Mold
7. Plunger
8. Lever

4.1 Barrel

The barrel used for the machine is of rectangular shaped hollow aluminum bar. On the outer surface of the barrel the heating elements are mounted to provide the efficient heating of the plastic.



Fig -2: Barrel

4.2 Heating Element

The heating element used is of soldering iron rods. Many different types of heating elements can be used such as band heater, etc. depending upon the shape of the barrel used.



Fig -3: Heating Element

4.3 Mold

The molds used are designed as per the required product. In this paper, we have used hexagonal molds for the tiles, which are made of aluminum sheets.



Fig -4: Mold

5. MATERIAL SELECTION

In the context of product design, the main goal of material selection is to minimize cost while meeting product performance goals. Systematic selection of the best material (Table 1) for a given application begins with properties and costs of candidate materials.

Table -1: Material of components

COMPONENETS	MATERIAL
Barrel	Aluminum bar
Lever	Aluminum bar
Plunger	Aluminum bar
Base	Ply wood
Connecting rod	Aluminum bar

6. PROCESS INVOLVED IN FABRICATION

6.1 Cutting of the parts

Hand grinder is a simple and cheap way to cut the aluminum bars with a greater ease. It involves the use of rotating cutting blades, which are rotated with the help of a powerful motor, which is powered by electrical source.

6.2 Assembly of the parts

Nuts and bolts are the cheapest way to assemble the parts made of aluminum. It provides the leverage to disassemble the machine when desired easily.

6.3 Insulation of the outer surface

Silicones provides the best insulation properties at a cheaper rate for the machines dealing with high temperature.



Fig -5: Plastic recycling machine

7. FUTURE PROSPECTS

In the future the size of the machine will be reduced to more compact size, the emission of the gases due to the melting of the plastic will be controlled by the use of Carboxen absorption tubes and the size of the products prepared from the machine will be increased.

8. CONCLUSION

This study describes the use of plastic recycling machine to deal with the increasing problems that are being faced by the world due to the increase in the quantity of the waste plastic that is being accumulated thus posing hazardous situations to the human as well as to the animal life. This paper provides the useful and easy method to convert these waste

plastic into useful products such as tiles, beams, etc. which can be used in the constructional work thus decreasing the burden over the conventional and natural materials on the same time dealing with the waste plastic reduction.

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BIOGRAPHIES



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