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Development, Fabrication and Application of Plastic Recycling Machine

Er.Niteen S.Mali[1], Mr.Sagar Salunkhe[2],Mr.Suraj Jadhav[3] ,Mr.Girish Waradkar[4],Mr.Jaykumar Teli[5]

[1]Lecturer In MechanicalDepartment, Dr.D.Y.Patil Polytechnic, Kolhapur.
[2]Mechanical Department, Dr.D.Y.PatilPolytechnic ,Kolhapur.
[3]MechanicalDepartment, Dr.D.Y.Patil Polytechnic, Kolhapur.
[4]MechanicalDepartment, Dr.D.Y.Patil Polytechnic, Kolhapur.
[5]MechanicalDepartment, Dr.D.Y.Patil Polytechnic ,Kolhapur.

Abstract –Plastics are inexpensive, lightweight and durable materials, which can readily bemoulded into a variety of products that find use in a wide range of applications. However,current levels of their usage and disposal generate several environmental problems. They are affecting not only human life but also wildlife. Plastics items like sheets, bottles, bags may block the water systems. Looking at this issue there is need to recycle the plastic, which in turn will reduce the production rate of it and saves the earth, human and wild life. In our research we have developed the plastic recycling machine. This machine recycles the used plastics and we have made various plastic blocks.

***Key Words*:**Plastic, Recycling, Shredding, Injection Moulding

1.INTRODUCTION

Plastics are wide range of synthetic or semi-synthetic organic compounds that are malleable and so can be molded into solid objects. In developed economies, plastic is used in packaging and roughly the same in buildings in applications such as piping, plumbing or vinyl siding. Other uses include automobiles industry, furniture, and toys as well as used in much domestic useful equipment. In the developing world, the applications of plastic may differ—42% of India's consumption is used in packaging Worldwide, about 50 kg of plastic is produced annually per person, with production doubling every ten years.There are two types of plastics used in world. Thermoplastics are the plastics that, when heated, do not undergo chemical change in their composition and so can be molded again and again. Thermoset can melt and take shape only once: after they have solidified, they stay solid. Plastic – the most wide spread material in use is synthetic or semi-synthetic polymerized product(1).Shopping bags made of Plastic are widely used for transporting a range of small consumer goods, and in all regions, plastic bottles are for conveying drinking water .As well as plastic is used for disposing of human and other domestic wastes (2). It is estimated that each year 500 billion to 1 trillionplastic bags are used worldwide. It means that around one million plastic bags being used every minute globally, which is shows us the use and how much we are dependent on use of plastic in our day to day activities. Main issue is not in the use of plastics, but is actually dismal of plastic is major issue.Study shows that around75% of plastic is not recyclable. One can see good opportunity in recycling of plastc business, but is it possible easily (3).Reusing plastic bottles has an environmental advantage after proper cleaning the bottles in their original post-consumer form rather thanto melt and process the plastic, which saves the costs and saves landfill space. (4)Plastic carrier bag waste is may affect in flooding and mosquitobreeding, also they can blocks drainage and waterway. This pollution can have harmful effects on the land and rivers by affecting wildlife and habitat, but also on human health. Wide use of plastic

results in chemical pollution in several ways, which affects the environment.

2.0 Problem Definition

Plastic waste has a negative economic impact as well as become much of it could be repurpose and reuse. As plastic production is set to be double in next 20 years and that plastic takes long years to decompose. Now a days the plastic bottles, supporting frames etc. are normally used after use these plastics are disposed of they take lot of space and as it is this increases pollution.It is essential to address the problem as soon as possiblePlastics crushed can be melted and can be used to produce different kind of product but it is an extremely laborious work. Hence we need a simple machine which will reduce the human efforts.

3.0 Selection of material, and Fabrication of Machine component

. Mainly machine is divided into three parts to carry out the plastic recycling.

1. Crushing of plastic
2. Melting of plastic crush
3. Injection Molding in useful shape.

We have used the following components in our machine. Their dimensions (sizes) and numbers are calculated after design of individual components. Those are as follows.

TableNo1. Mechanical Component

COMPONENTS	QUANTITY
Sprocket	2
Chain	1
Key	2
Solid shaft	1
Hollow shaft	1
Bearing	2
Forward reverse switch	1
Plywood	2
Nut & bolts	30
Can	1
Steel cutting wheel	1
Foam sheet	1

Table No.2 Electronic Component

COMPONENTS	QUANTITY
PID Controller	2
SSR	2
Thermocouple type J	2
Band heater	3
Power cord	5m
3 core wire	10m
Gear motor	1

4.0 Process of used Plastics

4.1. **Shredding Process: It is the process of crushing the plastics. And is carried out as explained below.**

1. Gather the sorted plastic you want to shred : For shredding the plastic we have gather plastics which are in various colours and different types. It is very useful for finishing and melting the plastics.
2. Separate in colours: It is very necessary to separate plastic component with various colours. This process will be beneficial to create one colour product and we can make it in various colours also.
3. Check if the mesh is installed with the right hole size: Mesh is in various sizes of holes This mesh gives various sizes of pieces of plastic that we inserted in shredder. If mesh is not fitted properly number of plastic pieces are not cut in one shape. There will be problem in melting.
4. Turn on the machine: After doing all above process , we have to turn on the machine for further step.
5. Put in the plastic and wait: After turning on the machine, the plastic we have selected put into the machine for shredding and wait for cut it into number of pieces.
6. Store the shredded plastic: Now ,the mesh has given proper pieces as shown in Fig.No.1 and 2. that we want. Then these pieces should gather or store into bucket.
7. Clean the machine: Now shredding is over. In shredding process there are many small pieces of plastic which are remained in the mesh. So there is need of cleaning the machine.

Sometimes we face following problems in crushing, we overcome them as follows,

1. Sometimes the blades don't grab the plastic. Try pushing the plastic towards the blades with the tool provided. Never attempt to do that with your hands.
2. If plastic resistance exceeds the maximum torque of the motor, the machine will stop. Basically, there is too much plastic to be cut and the motor can't make it. Switch off the machine and remove some of the clogged plastic.

Fig.1 Crush of Plastic Bottles

Fig.1 Crush of Solid Plastic

The Crusher amchine is as shown in fig.no.03.

Fig.No.3 Crushing Machine

4.2 Melting and Injection Molding:

The injection Molding Machine as shown in Fig 4, is used to melt the crush and also to fill the mold.

How to operate the injection

1. Turn the machine on and set the temperature to 20° more than the desired temperature. Make sure the lever is completely at its lowest position.
2. Wait for at least 20 minutes.
3. Turn the temperature down and fill the barrel with the desired plastic.
4. Wait another 15 minutes for the plastic to melt, the first batch of plastic is more to rinse the machine and to get rid of plastics from previous sessions.
5. Press the first batch of plastic out of the machine.
6. The machine is now ready for production.

Process

1. The machine is now warm and ready to produce.
2. Fill the barrel with the desired plastic.
3. Press the lever in the barrel.
4. Pull the lever up every 5 to 10 minutes and add more plastic.
5. Wait for 10 minutes or more.
6. Unscrew the brass screw at the bottom.
7. Screw in the mould (be quick or plastic will start to flow out!).
8. Once the mould is secured to the machine pull the lever down as far as possible, don´t be scared to give it a lot of pressure, it can easily hold a 100kg.
9. Unscrew the mould from the machine.
10. Pull the lever up.
11. Screw the brass screw in place.
12. Fill the machine for a new product.
13. Let the mould cool.
14. Open the mould once it is cooled down.

Fig.No.4Injection Molding Machine

5. Result

5.1 From used plastic we have manufactured the paver blocks of various sizes as shown in Fig.5. Such blocks can be used for constructing building because such boxes are durable and water proof.Also in future using recycled plastic we can make panels of doors and windows.

5.2 Also from used plastic we have manufacturedglass lids as shown in Fig No.6, which can be used in every office or home to close the mouth of the glass. Available lids in market are expensive. If we made lids from recycling plastic. That might be cheap and colorful. It lids can be produced in various colors.

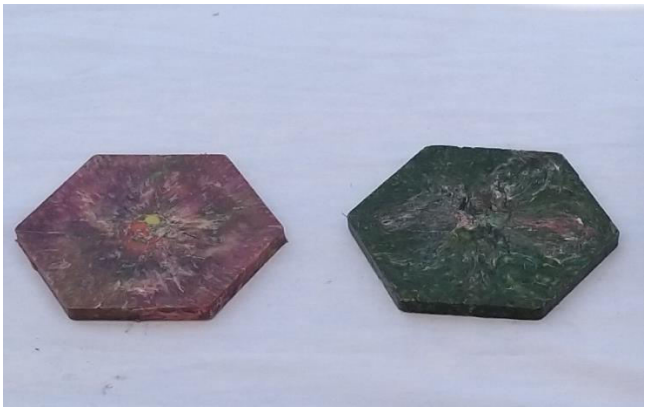

Fig No.5 Paver Blocks

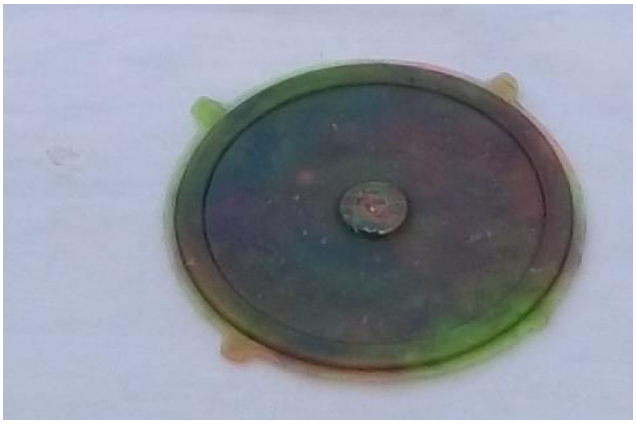

Fig.No.6 Glass Lids

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