

DESIGN OF INNOVATIVE WASTE PLASTICS DISPOSAL MACHINEH Rajarajasozhan¹, V Nirmal kannan², M.Mohamed Abdul Hafeez³, R.G.Hari⁴^{1,4} Final year student, V.S.B.Engineering College, Karur^{2,3} Professor, V.S.B.Engineering College, Karur

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Abstract

Polymer is one of the most common used materials in the world today, but they cause serious environmental pollution and exhaustion of landfill space. Recycling is the method to keep the plastic alive. For this to happen, in this project my idea is the waste plastics will be shred into small bits making it ready for transportation and further process. The shred polymers are compressed and mold by using compressing oven. We will get compact sized usable compound. Therefore, it becomes a necessity to control the littering of polymers around our area and to save our environment from these waste polymers.

Keywords: Waste Polymer, Exhaustion of landfill space, Litter, shred, Transportation, Compressed, Compressing Oven, Useful polymer.

1.Introduction:

Plastics were invented by Leo Hendrik Baekeland in 1907. Plastic becomes more popular materials in industry and its household uses have increased abruptly. It has led to increases in the quantity of polymer wastes of several types being produced in our society. Most of these wastages are non-biodegradable and this cannot be broken down by microbial action. Most plastics are polythene, polystyrene, high density polyethylene wastes are usually thrown in people walkplaces, public drains, roads and open places to public view in most parts of the country. These process leads to littering of plastic wastages in and around our area(locality). If we go to combustion aid for burning the plastics and this liberates high toxic content gases. It pollutes the air and causes several respiratory problems for human beings.

Waste plastic shredding machine that reduces used plastic bottles, cabbage bags to smaller particle sizes to enhance its portability, easiness and readiness for use into another new product. The main principle of this machine was got from the Egypt ancient tradition method of using scissors to cut materials into reduced form and scratching used by cats when digging or tearing. These two olden methods were applied in the design of the machine by fabricating cutting blades to cut the waste plastic while some of the cutting blades have sharp curved edges to drawn the plastic into the cutting blades teeth. The waste plastic shredder machine consists of the feeding unit, the shredding unit, the power unit and the machine frame, compressing heating oven unit. The machine can be powered by electric motor of 12 Hp. These shredded particles are poured into the compressing oven for further operation. The magical operation of shred particles is turned into useful compact sized material.

1.1 Objective:

- It is proposal to plan design and fabricate the polymer disposal machine by using shredding and compressing oven.
- To solve the problem which is created by polymers.
- To reduce the littering of polymers.
- To reduce transportation cost and space for dumping.
- It creates new revolution on polymer recycling method.
- To reduce the time consumption in recycling process.

Waste plastic into compact sized usable plastic materials.

2. Types of plastic and its usages

2.1 Polyethylene Terephthalate

This type of recycled plastic is tough, has excellent clarity, is strong and has barrier to moisture and gas. It is used in the manufacture of water, soft drinks, peanut butter and salad dressing bottles and jars.

2.2 High Density Polyethylene

This recycled plastic is known for its excellent stiffness, resistance to moisture, strength, versatility, toughness and reduced permeability to gas. It is used in the manufacture of water, juice and milk bottles. It is also used to make retail and trash bags for households and business people.

2.3 Polyvinyl Chloride

Abbreviated as PVC, polyvinyl chloride has a number of applications. It is versatile, can be bended easily, it is tough and strong. This recycled plastic is commonly used in the manufacture of juice bottles, PVC piping and cling films.

2.4 Low Density Polyethylene

This is the most common type of recycled plastic. It has exceptional ease of processing; it is strong, flexible, tough, and resistant to moisture and it's easy to seal. This plastic is usually used in making frozen food bags, flexible container lids, freezable bottles just to mention but a few.

3. Problem identification

- Burning of plastics in the open air, leads to environmental pollution due to the release of poisonous chemicals.
- The polluted air is inhaled by humans and animals **affect** their **health** and can cause **respiratory** problems.
- There are **8.3 billion** tons of plastic in the world. A study published in this week's issue of Science Advances estimates the total amount of plastic ever produced throughout the world to be **8,300 million** metric tons.

- Chemicals in **plastic** which give them their rigidity or flexibility (flame retardants, bisphenols, phthalates and other **harmful** chemicals) are oily poisons that repel water and stick to petroleum-based objects like **plastic** debris. **So**, the toxic chemicals that leach out of **plastics** can accumulate on other **plastics** 450 years.

Different kinds of plastic can degrade at different times, but the average time for a plastic bottle to completely degrade is at least **450 years**. It can even take some bottles **1000 years** to biodegrade! That's a long time for even the smallest bottle

4. Need of plastic recycling

4.1 Provision of a Sustainable Source of Raw Materials

Recycling plastics provides a sustainable source of raw materials to the manufacturing industry. Once the plastics are recycled, they are sent to manufacturing industries to be redesigned and converted into new shapes and used in different appliances.

4.2 Reduces Environmental Problems

Since plastics are non-biodegradable, they pose a high risk to the people and the environment as a whole. They can block sewer lines, drainages and other waterways leading to blockages and unwanted pileups. When plastics are eliminated through recycling, the environment looks clean and inhabitable.

4.3 Reduces Landfill Problems

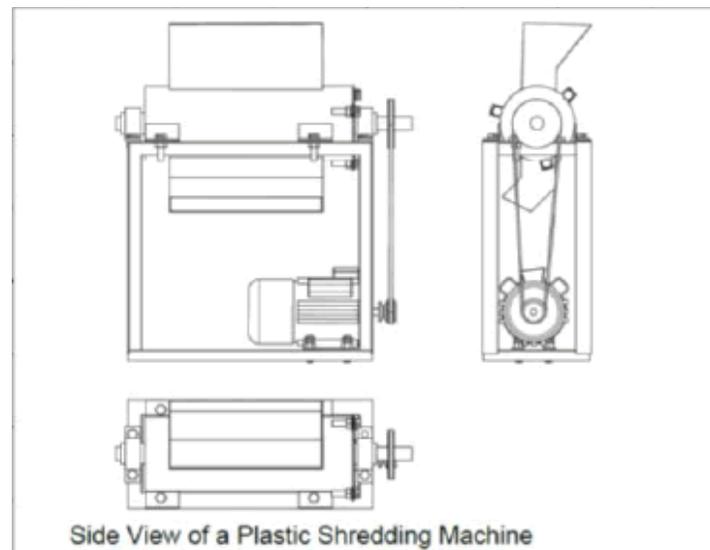
Recycling plastics minimizes the amount of plastic being taken to the ever diminishing landfill sites. Most countries have designated areas specifically meant for burying plastics. When they are recycled, these sites will receive little plastic garbage. The remaining areas can be used for other purposes instead of dumping plastics that do not rot. These areas can be used for agriculture or for human settlement. It should be understood that human population is growing each day and land is becoming a problem. Instead of misusing the land for garbage disposal it can be used for settlement and other important economic activities.

4.4 Consumes Less Energy

Recycling of materials including plastics requires less energy as compared to making the plastic from scratch. This saves energy and that energy can be diverted to other important things in the economy. It is therefore important to encourage plastic recycling in the manufacturing industry as it will save the economy billions of money. The process of manufacturing plastic using natural raw materials is expensive and time consuming compared to the recycling process.

4.5 Encourages a Sustainable Lifestyle among People

Individuals who have ventured into plastic collection and recycling business will experience improved lifestyles as they will get their daily income from the business. This will in the long run improve the economy and boost the living standards of the people. So do not just sit there doing nothing, embrace plastic recycling activities and improve your economic standards.



5 Methodology:

5.1 Phase 1: Collection of polymer content

Collection of polymers around our circumference which are scattered in our location. Separate the polymer on basis of polymer number#. Mainly we concentrate on High density polyethylene, low density polyethylene, polyethylene terephthalate($C_{10}H_8O_4$) polystyrene($(C_8H_8)_n$) compound, others.

5.2 Phase 2: Fabrication polymer disposal system

To control the littering of polymer around our area, we fabricate this polymer disposal machine by using shredding and compressing oven. As a preliminary step shredding machine shred the polymers which are feed into the hopper shaft cutter made of mm mild steel having 7 serrated teeth welded 1.8mm apart. The cylinder equally has some cutter with sharp edges to shred the waste polymers.

In a second step, shred polymers are fall into the compressing oven. The compressor compresses the shredded polymers with sufficient pressure. The oven mounted at the bottom of the compressing oven which is used to mold the polymer into compact size. This process would

not create any pollution and easy to handle. The modified polymers are further used for many applications

6. Step by step procedure:

6.1 Collection

Plastics are available in many forms that is plastic containers, jars, bottles, plastic bags, plastic covers, big industrial plastics and some other also. Due to their quality of being able to use easy and its fine nature tends to move towards a people attraction. Some business people have put forward as volunteer into plastic collecting business for a purpose of gain income. So, there are lots of plastic collection centre available. Tons and tons of scrap plastic are collected and sent to a collecting yard where they are then packed and transported to plastic processing plants. Sadly, not all countries have the capacity to recycle plastic. Only, developed countries can actually have this facility to recycle plastics. This shows, plastic wastes are still a major problem in the world.

6.2 Sorting

The real recycling process of plastic starts with arranging of the varying plastic items by their color and resin formation. This process is actually processed to ensure all contaminants are eliminated. There are specially designed machines that help in arranging of the plastics based on their resin formation. Therefore, the recycling sorts the plastic by symbol at the bottom level.

6.3 Shredding

After sorting the plastics, the next very big step is into cut the plastics in small pieces. The plastic containers and bottles are dumped into ground and cut into tiny pieces. The heavier and lighter plastic flakes are separated using a specially designed machine. The separation process helps in achieving that the different plastics are not put together in the final product. These are used to make different items.

6.4 compressing

The shred plastics are compressed by using forging and squeezing methods. At the bottom, heating plate is around the compressing oven. The process of compressing and surface melting act simultaneously.

7. Solution:

Melting of plastic leads to heavier air pollution and causes respiratory problems to human beings. Instead of melting, polymers are compressed and mold the surface of plastic material to obtain useful product.

8. Problem faced:

Melting of plastic at atmospheric level leads to increase in volume of the shred particles. Pouring of different polymers leads to increases in shred time and efficiency of the machine will be reduced. Temperature maintenance is very important while molding process. High

temperature leads to plastic melted and pollution will be created. Constant pressure should be regulated properly.

9. Conclusion:

The plastic waste recycling machine will create great impact on society in plastic reduction process. It produces 25-30 kg of shredded plastic as output per hour. The result obtained from this machine is to reduce the littering of polymers and reduce the transportation cost and space for dumping. It creates new revolution on polymer recycling method.

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