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AUTOMATIC PLASTIC SHREDDING DUSTBIN

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Abstract: Waste management is a problem our modern world has been facing for a long time now with no clear and definite solution in sight. Plastics are one of the major worries of this waste management crisis due to its abundance and non-degradable nature. Presently the processing of plastic waste happens only at a large-scale industry level. Like the solution to many problems we've come across, is to deal with the problem at a smaller scale before it reaches a larger scale. The Automatic Plastic Shredding Dustbin is a device that will be able to perform the initial steps of plastic waste management right at the source of the waste production. The shredding mechanism is similar tothe mechanism used at industries scaled down to a highly compact version. Which will be used to shred commercial and single use plastics produced at events, offices or even at homes? There by shredding and compressing this huge problem.

Keywords – Plastic, Recycling, Shredding Machine, Waste Management

I. INTRODUCTION

Plastic pollution has become one of the most pressing environmental issues, as rapidly increasing production of disposable plastic products overwhelms theworld's ability to deal with them. Plastic pollution is most visible in developing Asian and African nations, where garbage collection systems are often inefficientor nonexistent. But the developed world, especially in countries with low recycling rates, also has trouble properly collecting discarded plastics. Plastic trash has become so ubiquitous it has prompted efforts to write a global treaty negotiated by the United Nations.

The miracle material that made modern life possible is now choking us. The source of plastic waste ending up in the oceans is not something anyone can pin point. Rough estimates have approximated 14 million tons of plastic waste each year end up in our oceans. Most of it are from careless dumping on land and rivers that get blown or washed into the oceans. As the rate of degradation of these plastics are unclear it is expected to remain for around 400 years.

The growth and applications of plastic production has outrun the waste management processes. This is why we see the oceans, landfills and even public places under assault by plastic wastes. The use of plastics is the kind of increase that would break any system that is not prepared for it. The introduction of a throwaway living and dependency on single use plastic for many applications have boosted this problem into scales we cannot measure. The accumulated, unprocessed and uncollected plastic waste is a train wreck in the making fueled by the ever- growing use of single use plastics.

From our initial observation and research on plastic waste management and why this crisis has arisen, we have realized that the problem starts at the very first stepof waste management, the collection and segregation. Plastic as a waste is not a problem when it is collected and processed by recycling or other means. But it is a problem when it is not collected. Commercially available plastic wastes are not collected in the right manner either because,

- There are no available Dustbins.
- Refusal to collect the waste by authorities as it is not segregated.

- Available Dustbins are filled / not cleared.
- Lack of awareness of the harmful effects of littering.
- Lack of knowledge that plastics can be collected and recycled.
- Impatience to find a Dustbin nearby.

Like the solution to many problems we've come across, is to deal with the problem at a smaller scale before it reaches a larger scale. The Automatic Plastic Shredding Dustbin is a device that will be able to perform the initial steps of plastic waste management right at the source of the waste production. The shredding mechanism is similar to the mechanism used at industries scaled down to a highly compact version. Which will be used to shred commercial and single use plastics produced at events, offices or even at homes. There by shredding andcompressing this huge problem.

II. LITERATURE SURVEY

Narayan Priya (2001): Analysed Plastic waste management in India, its recycling process and technology used in it and reported that the kind of recycling practiced in India is quite different from what is practiced in the rest of the world, in that state-of the- art technologies are not employed here. The starting point is the sorting of plasticwaste. This is done on the basis of colour, transparency, hardness, density and opacity of the scrap. The sorted waste is then sent to the granulators. The technology employed is mechanical with the traditional grinding and extrusion toobtain granules. The final stage is reprocessing. The reprocessing sector can be divided into the granulators and the converters. The converters use these to make plastic products.

Adepo, S. O. (2017): Proposes the design and construction of a plastic shredding machine which is an integral part of plastic recycling process. The machine is designed using locally available raw materials which make it cheap and easy to maintain and repair.

ND Jadhav (2018): Proposes the available machines used to recycle plastic waste are very costly. A cutting machine is designed to reduce large plastic material objects into a smaller volume or small pieces. Aim is to process the plastic waste as cheap as possible by cutting where it is made for reducing of labor work which results in cost reduction.

III.METHODOLOGY & MATERIALS:

Design Concept: The Automated plastic shredding dustbin is equipped with a shredder and an electric motor with gear, which are mounted on a vibration free frame and is covered with a casing as shown in the assembly view of the machine in Figure 1. The shredding subpart, is made up of the hopper and a single shredding shafts rotating against the fixed cutting blades, which are equipped with knife edgerings for cutting of PET/HDPE plastic materials loaded into the hopper into smaller pieces called flakes. It is noteworthy that the shredder shaft is driven byan electric motor with the aid of a shaft coupling (connector) as shown below:

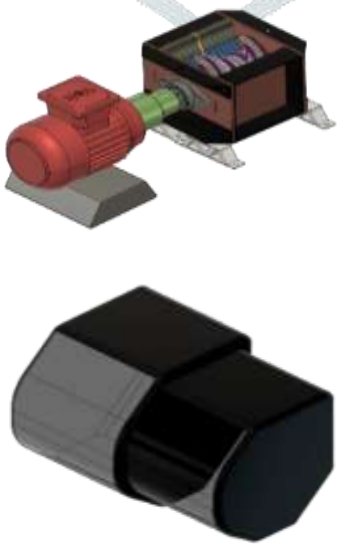

Fig 1-3D view of shredder and casing

Design Consideration:

The followings were considered during the design of the plastic recyclingmachine

Fig 2: Motor in connection with shredder

MATERIAL SELECTION

The selection of materials and component parts for the fabrication of the plasticShredding machine was based on the following considerations which include:

- Availability of raw material for fabrication
- Simplicity in designing and operation
- Low cost of production
- Ease to maintenance
- Physical and mechanical properties.

BASE AND SUPPORT

The base and support to withstand the heavy motor and accompanythe entire equipment setup required in-depth selection of right materials and heights. In order to carry this out, a beam of simplyfixed supports was considered to design the entire base and through this calculation, a wooden made table was fabricated to fulfil thecurrent equipment requirements.

Fig 3: wooden box used for base

$$For\ vertical\ Equilibrium\ F_y = 0 - - - - - - - - > R_A + R_B - W = 0 R_A + R_B = WWp - R_B L = 0$$

$$From above equation, R_A + \frac{Wp}{L} = W R_A = \frac{Wq}{L}$$

VI. MODEL AND WORKING PRINCIPLE

Shredding is a process of reducing the size of plastic wastes into the small size thereby reducing the space it occupies and is easy to use it for various applications. The plastic wastes are collected from different sources ranging froma small bakery to institutions to corporate sectors. Since there are various typesof plastics, we're primarily focusing on PET and HDPE plastics as these aremore commonly used, Once the power supply unit is turned on, the machine blades are rotating at regular intervals. When a person inserts the plastic wastes (PET bottles) into the hopper of the shredder machine, these are shredded by the shredding machine blades in a various size based on the size of blade configurations. The size of output wastes can be also determined and modified by the adjustment of an extra component called sieve. Once the wastes are shredded into pellets/flakes, theyare cleaned and treated with chemicals and additives. These waste shredded plastics are reused to form different products by various operations such as compression, molding etc.

Fig:4 Cutting Blades

VII. APPLICATIONS

- By the application of mold and compression processes, the shredded plasticscan be converted into various useful products.
- It can be reused in electronic applications and daily use products.
- It can be used in small scale industries and small time companies for quickplastic reduction

Colleges, Schools and smaller households can use this equipment to dispose ofharmful plastics immediately

Fig:5 Products made out of recycled plastic

VIII. CONCLUSION

It is concluded that plastic is shredded with the help of Plastic Shredding machine. It is designed this product for domestic as well as commercial purpose. Plastic is an essential part of our day to day life, but there is a big disadvantage of plasticthat is it is difficult to decompose. So,it is to recycle the plastic and there arevarious methods for recycling plastics. After a lot of research, it came to a conclusion that shredding is one of the most efficient ways to recycle and reduce plastic waste and hence we adopted the process in our design.

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