Automated Plastic Shredding Dustbin

[1]Mohit Raju, [1]Netto Varghese K, [2] Varadaraj K. R
[1]Student, School of Mechanical Engineering, REVA University, Bengaluru, India.
[2]Associate Professor, School of Mechanical Engineering, REVA University, Bengaluru, India

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 nondegradable 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 Automated 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 and compressing this huge problem.

KEYWORDS – Plastic, Recycling, Shredding Machine, Waste Management

1 Introduction

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, it is ideal to deal with the problem at a smaller scale before it reaches a larger scale.

2 Pollution

Pollution can be defined as the contamination of the natural environment due to the introduction of harmful materials into the environment. Pollution can be in the form of chemical substances or energy such as sound, light or heat. Pollution is not always caused by human factors but it is also caused by naturally occurring contaminants such as volcanic ash. The human factors for pollution are mainly the trash or waste generated by human beings, automobiles and runoff produced by factories and industries etc.

The different major types of pollution can be distinguished as Air pollution, Noise pollution, Light pollution, Littering, Soil contamination, Radioactive contamination, water pollution and Thermal pollution. Pollution has accompanied human civilizations since prehistoric times since man created the first fire. The industrial revolution influenced the burning of coal and wood, and the presence of horses and cattle concentrated in areas acted as the primary source of pollution.

All living things, from one celled microbe to blue whales depend on the natural resources the earth has to offer, especially the supply of air and water. When these resources are corrupted due to pollution all

forms of life on earth are threatened. Pollution is a global problem which should be treated with top level priority. Urban areas are choking due to bad air conditions, rural areas getting toxic with pesticides and other chemicals. Air and water currents carry pollution to all extents of the earth, traces of chemicals have been found on the isolated shores of Antarctica and micro plastics found in the middle of Northern Pacific Ocean, now referred to as the Great Pacific Garbage Patch.

Global warming is another rising issue that the modern world is facing due to the rise in pollution across the globe. Global warming which is the rise of average temperatures at different regions due to changes in the atmospheric conditions as a result or pollution. Changes caused by global warming are irreversible, the melting of glaciers causing seal levels to rise and ocean acidification as the ocean absorbs carbon dioxide from the atmosphere, these changes have devastating results for all living things.

Reducing pollution requires Technology, Environmental, Political and Economic leadership to design develop and execute operations to tackle this problem. Developers must work together towards a common humanitarian goal of protecting the environment for the future.

3 Plastics

Plastic is a term commonly used to describe a wide range of synthetic or semi synthetic material that are used to produce products for a huge and growing range of applications. Wherever we look nowadays we find plastics. We use plastics to make our lives cleaner, easier, safer and more efficient. We find plastics in the house we live in, the vehicles we use, the toys we play, the clothes we wear and much more.

Plastics are materials just like wood, paper or wool and the materials used to produce plastics are naturals products such as cellulose, salts, oils and gasses. Making it the modern choice of material due to its features of malleability or plasticity during manufacturing processes which allows it to be extruded or pressed into various shapes, films, fibers, tubes, bottles and much more, the possibilities are infinite with such a material.

Plastics can be classified based on the chemical structure of the polymer and the side chain compounds it may contain, some of the major classifications of plastics are: Polyesters, silicones, polyurethanes. One important classification of plastics is on the basis of permanence or impermanence. They are divided into Thermoplastic and Thermosetting Polymers.

Thermoplastics when heated do not undergo chemical changes and can be remolded over and over again. Examples of thermoplastics are: Polyethylene (PE), Polypropylene (PP), Polystyrene (PS) and Polyvinyl chloride (PVC).

Thermosetting Polymers take shape only once and stay solid. The chemical reaction taking place is irreversible.

4 Plastic waste crisis

"We made plastic. We depend on it. Now we're drowning in it."

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.

Ocean plastics are estimated to kill thousands, if not millions of marine animals yearly. Several species, including endangered ones are affected and some even visibly harmed by these plastics. Marine species of all sizes from planktons to whales now consume micro plastic bits. These are reasons for some to believe the plastic waste crisis is a looming catastrophe. Micro plastics have been found everywhere in the ocean that people have looked into, from the sediments on the ocean floor to the ice floating in the arctic. Off the islands of Hawaii, it is estimated that 15 percent of the sand on the beaches are actually micro plastics.

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.

5 Plastic recycling in India

Narayan and Priya analyzed plastic waste management and recycling processes in India in the year 2001. A detailed study was conducted in the technology used in the recycling process. From their observations they could make a conclusion that recycling practices in India were different from the rest of the world. There was no use of state-of the-art technology used in the processes, neither were there much development being taken place towards achieving this technology to enhance the recycling process. Majority of the processes involved the use of human labor which exploited the poor and even child labor. The starting point of the process was from the collection and sorting based on color, transparency, hardness, density and opacity of the materials collected. This entire process was done manually. The sorted materials were sent to granulators which employed mechanical technology to perform traditional grinding and extrusion to obtain granules. Most of the units in this process were informal private sectors and carried out the process out in the open or storage shed or backyards of houses. Most of these units were found in slums and shores or lakes and rivers for easy access to waster for washing. There was no clear accounting of material received processed and recycled. Such

activities were termed as backyard recycling.

6 Machines used for plastic recycling:

ND Jadhav

had studied and stated that the machines used for plastic waste recycling and processing were very costly. This could be the reason for most processing plants to not choose technology and instead stick to conventional methods of processing plastic waste. Machines were necessary for the shredding or reducing the plastic into smaller pieces. The aim of these machines was to do this in the most effective manner as cheap possible and without having to use much of manual labor. Which would result in cost reduction of the recycling process.

Dr.M Muthukumaran

proposed design and development of shredder machines with the primary focus to use this shredder for plastic recycling. The key aspects of the design were keeping in mind the users buying capacity and efficiency of the machine. The efficiency depended in the torque of the blades of the shredder. The alignment and tight fit of the blades too played an important role in the overall outcome and consistency of shredded material.

Adepo.S.O.

Talks about the use and construction of the shredding machine as an integral part of the plastic recycling process. The machine should be designed in a way that it will be easy to manufacture with locally available materials. This reduces cost and eases the process of repair and maintenance.

7 MERITS

- Environmental pollution can be reduced and burning of plastic waste will be reduced.
- Recycling minimizes the waste space in the landfills.
- Recycling process to save the earth.
- Our project is not only based on economical ways; it is also useful for the society and is ecofriendly.
- It reduces the labor requirement.

8 APPLICATIONS

- By the application of molding and compression processes, the shredded plastics can be converted into various useful products.
- It can be reused in electronic applications and daily use products.

9 CONCLUSIONS

We conclude that plastic is shredded with the help of plastic shedding machine. We've 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 plastic that is plastic is difficult to decompose. So, we have to recycle the plastic and there are various methods for recycling plastics. After a lot of research, we've come 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

10 REFERENCE

https://shodhganga.inflibnet.ac.in/bitstream/10603/37639/9/09_chapter%202.pdf
https://www.longdom.org/openaccess/development-ofplastic-
bottleshreddingmachine-2252-5211- 1000336.pdf
http://data.conferencewor
ld.in/NIMT/60.pdf
https://www.ijedr.org/papers/IJEDR1604107.pdf
trash-crisis