

Design and Fabrication of Plastic Shredder Machine

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Abstract : The context of this paperwork is the study of Recycling of plastic waste and design and Fabrication of Shredder Machine. Plastic, since is a non degradable material and is potential to cause bad environmental effects, should be recycled. So our attempt is to design and fabricate a Shredder Machine with maximum optimization of the available resources at minimum cost. This paperwork is divided into two parts where the first part deals with the understanding of the need of plastic recycling and its types and properties and how it can be recycled. The second part sheds light on the design and Fabrication of Shredder Machine and its component details, how to operate it, advantages and limitations of the same. In these, design of Blade and machine frame are modified. For designing purpose AutoCAD 2D and SOLIDWORKS have been used.

IndexTerms – Autocad, Shredder machine, Solidworks

I. INTRODUCTION

Plastic shredder machine is used to crush the plastic material, plastic bottles into small particles for reuse or recycling purpose. Environment is polluted because of plastic which is non bio-

degradable in nature. So aim of the project to decreasing waste plastic by collecting and recycling. It will help us to reduce environmental pollution caused due to plastic.

PLASTIC AND ITS TYPES

- Plastic are biochemically inert and pure plastic are less toxic
- Plastic contains variety of additives
- Plastic is synthetic or semi-synthetic polymer.
- Plastic made up of hydrocarbon molecules
- The two main types of plastic are

1. Thermoplastic
2. Thermosetting Plastic

Thermoplastic –

1. Polypropylene (PP)
2. Poly Vinyl chloride (PVC)
3. Polystyrene (PS)
4. Poly Vinyl Acetate (PVA)
5. Low Density Polyethylene (LDPE)
6. High Density Polyethylene (HDPE)

Thermosetting Plastics -

1. Bakelite
2. Epoxy
3. Melamine
4. Polyester
5. Polyurethane
6. Urea-Formaldehyde

Chemical properties of plastic – Following Table shows melting points for different types of plastic

II. AIM AND OBJECTIVE

- Aim is to recycle the waste plastic to reduce environmental pollution caused by plastic.
- To construct machine with minimum cost of manufacturing and it will produce less vibrations and noise
- To study different elements of shredder machine like frame, shaft, bearings, blade design, flywheel and motor
- To reduce solid plastic waste

III. LITERATURE SURVEY

Dr. Fauzia Siddiqui - The different components designed along the blade are frame/stand, shaft, washers, gears, pulley etc. thus the designing phase is briefly classified as the machine construction, cutting system and the transmission system. The total protect depends upon various parameters such as total knowledge about the system, design of a single blade and its arrangement of the main shaft, reduction in rotation.

Atadius David and Oyejide Oluwaymi Joel - Shredding machine is designed to reduce large solid material objects into a smaller volume, or smaller pieces. Shredding machines are usually used to reduce the size and shape of materials so they can be efficiently used for the purpose intended to. Collected plastics wastes were shredded with the machine and the results obtained reveal that the machine performance is satisfactory.

P.K.Farayibi - Analysis of Plastic recycling machine design for production of thin filament coil. The conceptual design is considered fit for fabrication based on the design analysis and evaluation, using locally available and cheap material.

Dr. Jassim M. Abdulkarim Jaff, Darewan A. Abdulrahman - I includes plastic collection, manual sorting, chipping, washing pelleting. The large particles of plastic need to be broken down into small pieces to reduce storage and transportation space requirement.

Karolina Glogowska, Jakub Rozpedowski - During the shredding process, the following parameter were analysed : electricity consumption, temperature inside the shredding chamber and the temperature of the obtained recyclate. The study indicates the importance of the possibility to shape the workspace of the shredder and the energy relation of the process.

IV. GAP ANALYSIS

1. Blades are manufacture by gas cutting.
2. Forward and reverse switch is provided to motor
3. Washers are used in between blades.
4. 'C' section bars are used to absorb vibrations and load.

V. PROBLEM DEFINITION

1. Nowadays, pollution of environment due to plastic is increased. The plastic can be collected, crushed and then can be melted to use to produce different products. To crush the plastic we used shredder machine to reduce effort.
2. Because of mechanical parts like bearings, blades, motor, shaft continuous lubrication is necessary.
3. In normal cutters plastic is not cutting properly, hence we design blades to cut plastic in small size.

VI. METHODOLOGY

1. To understand the shredder machine, the main or most important part is blade. Blade design is very important part in shredder machine.
2. The design of the blade is done by using autocad and Solidworks 2018.
3. The designing is further classified as different components are designed separately according to load calculations.
4. After designing each component they assembled.
5. This is about CAD modelling.
6. Once Cad modelling is done the next step is material selection for the components.
7. Depending on the prototype we designed the actual manufacturing will start.

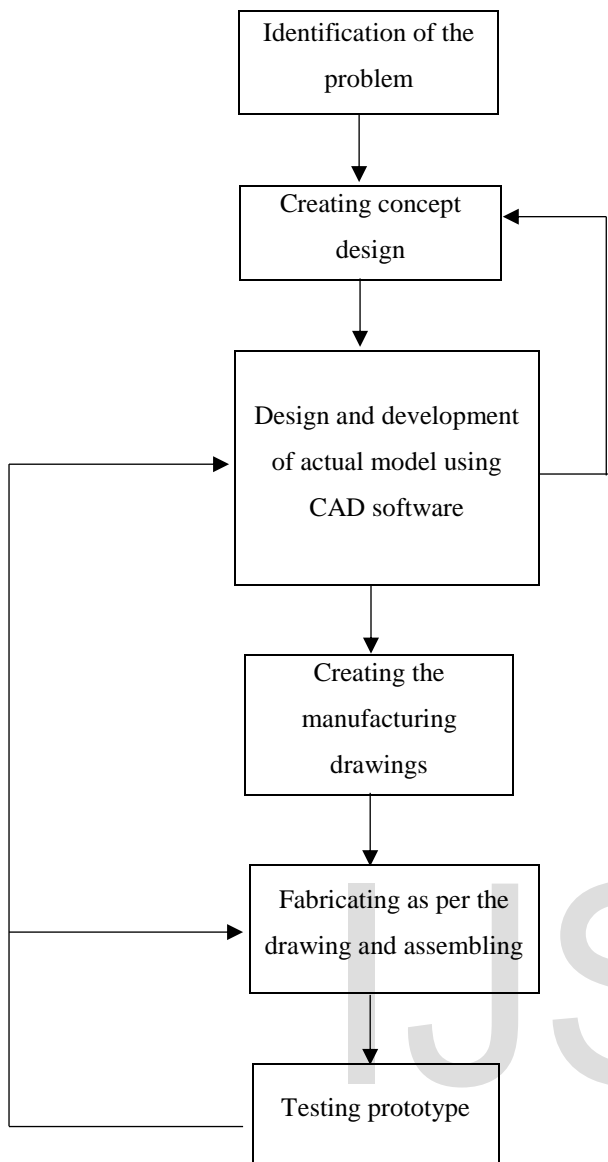
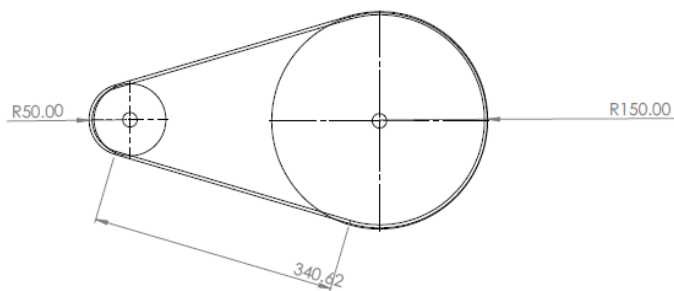
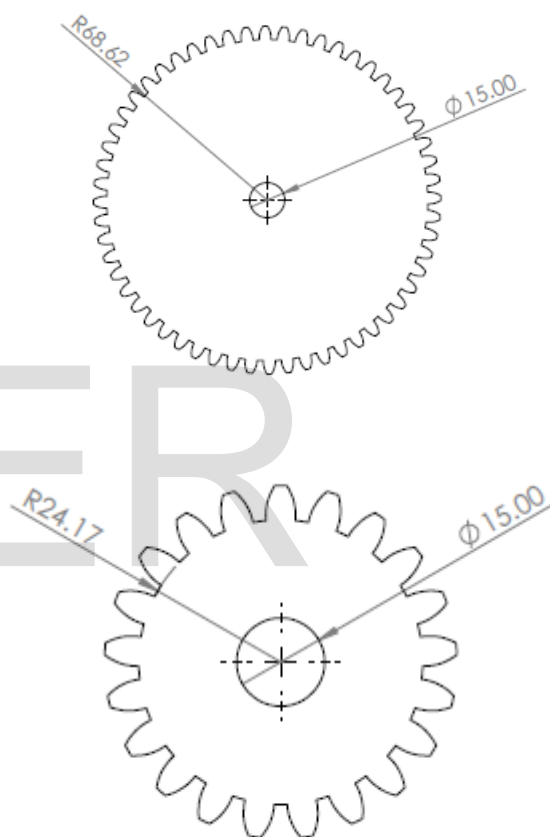


Fig 1. Block Diagram of Methodology

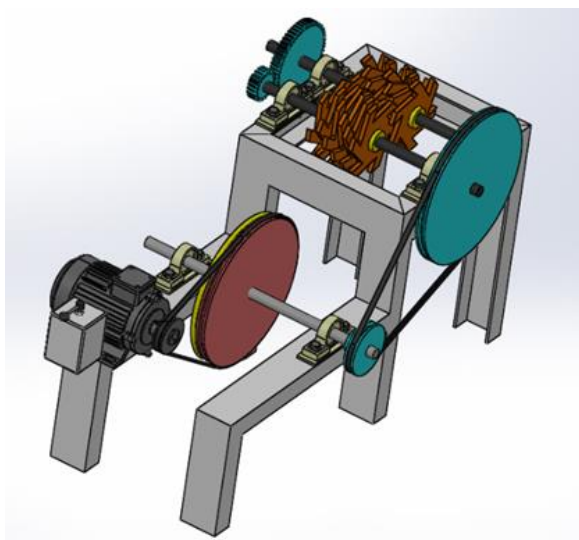
1. Pulley and Belt



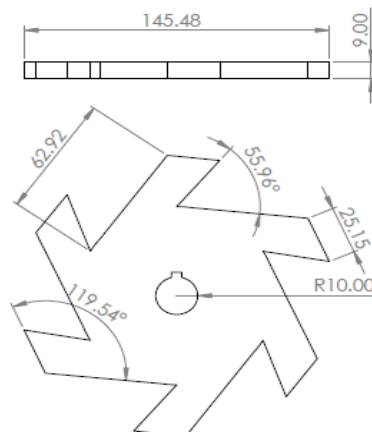
2. Gears



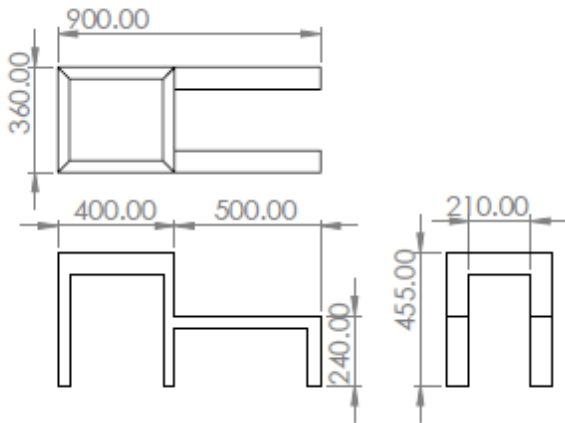
VII. MACHINE COMPONENTS CONSTRUCTION, ASSEMBLY AND LOAD CALCULATIONS



3. Cutter Blade



4. Frame



VIII. FEASIBILITY AND COST ESTIMATION

Cost estimation is nothing but how much cost is required for each component. This includes material cost, machining cost.

- Material cost – It includes total amount to collect raw materials.
- Machining cost – It includes cost of machining.

IX. CONCLUSION

In this project we conclude that many parameters are dependant on each other to manufacture the shredder machine which is able to cut the plastic in small sizes. The designing of the machine which is successfully carried out using Solidworks 2018. Before starting the actual fabrication, load calculations are made to get positive result. Also, we need to set the proper gear ratio. We select 'C' section bars to reduce vibration. Finally, the machine is manufactured with low cost, less noise and less vibrations.

X. RESULT

We select the materials according to load calculations. The problem like plastic stuck in blades we eliminated by selecting proper gear ratio, increasing torque and selecting proper motor. The major and important part of shredder machine is blade design which affect the cut size of pieces is successfully designed.

XI. REFERENCES

- [1] Mulla Irfana Falyyaj, Bhosale Jaydeep, "Design and development of plastic shredding machine". Volume 4, Issue 10, October 2017.
- [2] Olalekan Hammed, "Development of polythene chipping machine for recycling purposes". Volume 6, Issue 7, July 2015.
- [3] Atadious David and Oyejide Oluwayomi Joel, "Design and construction of plastic shredder machine for recycling and management of plastic wastes".
- [4] Kamesh B.Vaidya, Mayank N.Kosurkar, "Recycling of Thermoplastic to reduce solid plastic waste", Volume 3, Issue 2 2017.
- [5] P.K.Farayibi, "Finite Element Analysis of Plastic recycling machine design for production of thin filament coil", Volume 36, No 2 April 2017.
- [6] Dr. Jassim M. Abdulkarim Jaff, Darewan A. Abdulrahman, "Design and Fabrication Recycling of plastic system", Volume 7, Issue 5, May 2016.
- [7] Karolina Glogowska, Jakub Rozpedowski, "Examination of Shredding Procees Parameter and the properties of Recyclate", Volume 10, No 29, March 2016.
- [8] Mr. Ankit B. Raut, Mr. Vinayak D. Wagh, "Design and Fabrication of Paper Shredder machine", Volume 6, Issue 4 April 2018.
- [9] Dr. Fauzia Siddiqui, "Design and Fabrication of Paper shredder machine", Volume 8, Issue 3 2017.
- Akinfiresoye Waleola, OJ Olukunle and DJ Adelabu, "Development of waste plastic sherdding machine", 2017.
- [10] Mulla Irfan Faiyyaj, Mete Rushabh Pradip, "Design and development of plastic shredding machine". Volume 4, Issue 10, October 2017.
- [11] Juraj Beniak, Juraj Ondru²ka, Viliam faľko, "Design Process of energy effective shredding machine for Biomass treatment", Volume 52, No 5, 2012.
- [12] Sara Escudero, "Design of a Shredder attachment for a waste compactor", 201