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The Agro Waste Crusher

¹Satyam Gawad, ²Kaustubh Kadam, ³Pritisuravi Hota, ⁴Omkar Jadhav

¹(Department of Mechanical Engineering, Viva Institute of Technology/ Mumbai University, India)

²(Department of Mechanical Engineering, Viva Institute of Technology/ Mumbai University, India)

³(Department of Mechanical Engineering, Viva Institute of Technology/ Mumbai University, India)

⁴(Department of Mechanical Engineering, Viva Institute of Technology/ Mumbai University, India)

Abstract - Agricultural wastes are deposited in a designated spot to decompose in the traditional Agro-waste disposal method, which is the oldest and most traditional sort of waste disposal. The wastes take longer to decompose and damage the environment since they are disposed this way. The agro-waste crusher machine's goal is to reduce agricultural waste and turn it into useable fuel. It cuts down on the amount of people needed to maintain the farm neat. It also contributes to environmental improvement by reducing pollution and disease-causing agro-waste. Shredding, or reducing macro agricultural waste goods into small or micro readily decomposable forms, and then changing these small forms back into macro agricultural waste products, is done with the Agro Waste Shredder machine.

Keywords – Agro-waste, Fuel-cakes, Motor operated, Waste disposal, Waste shredding.

I. INTRODUCTION

This project's purpose was to design and build a Shredder machine that could chop coconut leaves, husks, and other materials. This chopped powder is used to make the compacted cakes. The project started with the collection of data and statistics about the user's lifestyle and current work process. The concept was developed with the user's safety and machine maintenance in mind. Based on the demands of the users and their power, a prototype was constructed.

I. PROBLEM STATEMENT

After examining and investigating previous models, the following difficulties were observed. The following issues have an influence on people's everyday life, resulting in a rise in environmental garbage. As a result, mechanical systems must be designed and built to handle these difficulties.

1. If agricultural waste is not adequately managed, it can become a problem.
2. After the leaves of the coconut tree have dried, they are left to burn or decay.
3. These leaves create a lot of waste due to their big size.
4. Decomposition of such a vast pile of leaves takes a long time.
5. As they disintegrate, these leaves may take up a lot of room.

II. LITERATURE REVIEW

3.1 Ajinkya S. Hande et al, December 2014 [1]

In their research work carried out project on Methodology for Design & Fabrication of Portable Organic Waste Chopping Machine. The organic waste is supplied in a consistent manner through the feeding drum and tray. The chopping drum is then rotated at 1440 rpm by an electric motor via pulleys, causing the waste to be sliced by the impact shear action derived from the shearing blades. Because of the tensile, friction, and impact effects in the chopping process, the cut is also made inside the chopping house. The sliced pieces then flow through the sieve's concave openings and exit the machine. Sieves with various hole sizes can be utilised.

3.2 Kishan Naik et al, July 2014 [2]

They are working on a project that involves the fabrication of an areca fibre extraction equipment. Areca husk fibre is removed in this process. This machine is powered by a three-phase, five-horsepower ac motor that is directly linked to the driving shaft. The driven shaft is enclosed in a casing that is designed to remove only dust

while fibre emerges from a rectangular duct on the casing's lower side. The driving shaft is supported by two bearings, and the blades are modified from the blade design of the coconut husk decorticating machine. The acquired areca fibre was of good quality, with diameters ranging from 0.39 to 0.12mm and lengths ranging from 5 to 6cm. As a result, this equipment will be beneficial to farmers and enterprises in rural areas.

3.3 Y. Prashant et al, April 2014 [3]

They worked on a design and development project for a coconut fibre extraction machine for small-scale coir companies. In this machine, a 14 HP single phase AC motor, heavy duty, is attached at the base, and a smaller pulley at the motor end provides drive via a V-belt to a larger pulley at the driven shaft's other end. As a result, one gear will drive the other gear, and the barrel rotates in the opposite direction at 240 rpm. Coconut husk is fed into the barrels from one end, and the spherical coconut shell is automatically transferred to the other end, where the separated fibre material is gathered in a sack below. Cutting pins have been pressed into an indexed hole on the barrel surface in this concept. Cutting pins help to remove fibre and to give linear motion to coconut shell to exit. Cutting pin indexing angle and distance play the major role to extracting the coconut fibre.

3.4 S.Nithyananth et al, March 2014 [4]

They created a garbage shredding machine design. The waste shredder machine is similar to a ploughing attachment in that it is an attachment. A tractor with a power take-off shaft can be used to operate the shredder (PTO). The tractor's power – 35 HP and up – is transferred to the shredder unit. One fixed blade and five circular blades make up the Assembly. The shredded organic waste will be in small bits so that the farmer can use it to manufacture vermin compost.

3.5 P.B. Khope et al, 2013 [5]

Proposed an experimental set-up for determining an empirical relationship for a chaff cutter powered by a human-powered flywheel motor. This equipment was used to slice the fodder into small pieces so that the animals could easily consume it. The bicycle mechanism for converting and transmitting human energy through paddling to rotating kinetic energy of the flywheel is proposed in the human powered flywheel motor concept. The flywheel's stored energy can be utilised in the cutting process. The flywheel shaft attained a speed of 350 RPM with a gear ratio of 1:2 after the driver paddled for 1 minute. After one minute, the paddling was stopped and the set-up was checked for free running. The flywheel shaft came to rest after 25 minutes. It proved that the alignment of bearing and other parts of the experimental set-up was satisfactory.

III. OBJECTIVES

1. Getting rid of garbage, such as dried coconut leaves and other agricultural debris
2. Design and build a mechanical shredder machine
3. Producing pellets or cakes from shredded agricultural waste. (Phase 1)
4. Phase 2- making eco-friendly plates out of shredded material powder which may be used to serve or store meals. If broken or not in use these plates can be burnt later.

IV. METHODOLOGY

A brief research was conducted for the production and construction of The Agro Waste Shredder machine in order to relieve numerous challenges experienced by consumers in the desired field, in order to solve the problems described in the previous chapter.

5.1 Design of The Agro Waste Shredder machine:

A hopper, angular blades, perforated blade covering, pulley, belt, piston cylinder assembly, heating coil, and other components make up the Agro Waste Shredder Machine. The Agro Waste Shredder is divided into two stages. The first procedure is assembling a piston cylinder to compress the powder into a cake-like structure or pellets. The moulding mechanism in the second phase compresses and moulds the powdered dust into usable items.

5.2 Project Manufacturing Steps:

1. Market Survey and Research: Before beginning the actual manufacture of the project, we conducted a market assessment for various materials and components that were required. This survey has nine different components, such as blade material, sheet metal, and so on. Also mentioned were the motor specs to be utilised in the shredding operation.

2. Selection of Material: We had a rough concept of the materials and components needed for the project based on the research we had done. Materials for various components were chosen during the production selection process. To begin, we chose square metal tubes for the shredder machine's frame since they can endure the shredder's weight and vibrations. Sheet metal was chosen as the second option for the shredder's cover. Following

that, the primary selection of blade and pulley material was completed. We chose OEM material for the Pulley, and Carbon Steel for the Blades based on a number of factors.

3. Manufacturing Process: The welding of the shredder machine's frame and the shredder machine's Phase 2 attachment were both part of the production process. Welding of sheet metals for the hopper and the shredder's exterior covering material is also required. Also included are the welding and attachment of blades to the shaft.

4. Assembly and Installation: All of the components will be brought together for the final assembly and installation procedure of the finished shredding machine, as well as further testing and trials, once all of the selection, manufacturing, and other essential operations have been completed.

5.3 Shredder components:

1. Angular Blades: The key component of the Agricultural waste shredder is the angular blades, which shred the agro waste given by the user. These angular blades are formed like a 'L' and are attached to the shaft by brackets. These blades shred the waste and transform it into a powdery substance. These blades will be made out of forged EN8 material.

2. Perforated Blade covering: The perforated blade covering serves two purposes. First and foremost, to keep the blades from injuring the user in the event of an uneven surface. Second, to ensure that the material fed into the machine is properly shredded. MS will be the material utilised to make the perforated blade covering.

3. Shaft and brackets: The hollow shaft is manufactured of Mild Steel and has a diameter of 35mm and a thickness of 10mm. The bracket is likewise welded to the shaft with a thickness of 5mm.

5.4 Shredder Phase-1: The material is collected after shredding for further processing. In Phase 1, the gathered material is sent to the pellet production process. The material is gathered initially when transferring a mechanism so that a large amount may be carried utilising flaps beneath the blades. To avoid material waste, these flaps are adjusted in line with the pellet-making machinery. Inside the pellet-making machinery, the piston cylinder assembly is installed. To prevent particles from entering beneath the piston and fouling it, the piston head is maintained a bit longer than usual. When the shredded material comes in this assembly, the piston pushes or crushes it. The compressed material is then discharged from the pellet forming assembly through the other end of the piston. Thus the desired product is produced

5.5 Shredder Phase-2: The assembly is installed on the metal frame in Phase 2. The material is received by the pressing mechanism. For press operation, the pressing mechanism has a lead screw and a side handle. The shredded material is kept beneath the press for pressing, and the press is used to press the material. Once the product has been pressed into the desired form, it is dried using the heating coil placed beneath the press table. The presence of moisture in the shredded material needs the material's drying. The moisture in the substance is caused by the additional binders in the material for binding the shredded material.

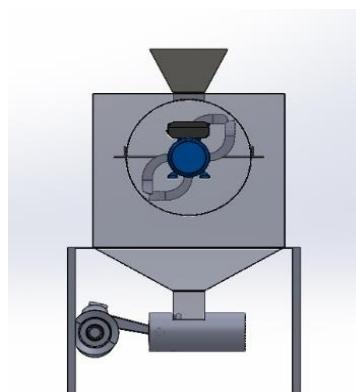


Fig 5.1

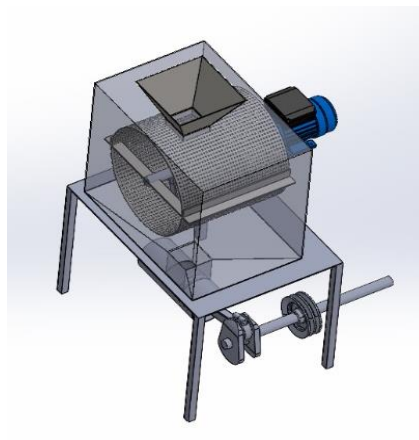


Fig 5.2

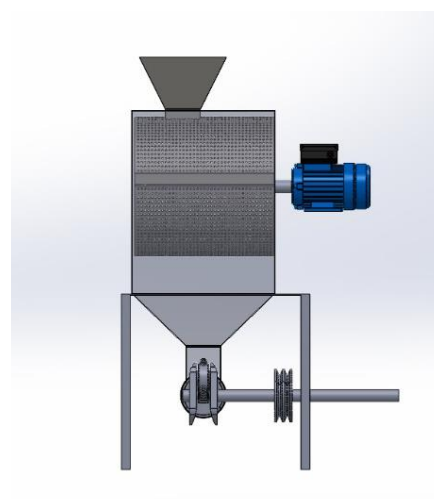


Fig 5.3

Table 5.1

Sr. No	Description	Specification
1	Name	The Agro Waste Shredder
2	Mechanism	Pulley and Belt
3	Target customers	Farmers
4	Shredder Process	Motor operated
5	Material	Mild Steel
6	Safety	Perforated blade covering
7	Cost	20000/-
8	Life of Product	5 to 6 years
9	Motor Specification	4HP, 3phase AC Induction motor, 3000rpm
10	Weight	Approx. 100kg

Table 5.2

Part	Cost
Phase - 1	
Motor	5000/-
Blade	2500/-
Pulley	500/-
Shaft	1000/-
Piston and Sleeve Design	3000/-
Crank and connecting mechanism	2000/-
Hardware material	1500/-
Fabrication	2000/-
Other expenses	500/-
Phase – 2	
Screw	1000/-
Frame	1000/-
Die	2000/-
Heating coil	500/-

V. CONCLUSION

Most of us will benefit from the Agro Waste Shredder Machine since it will help us clean up the agro waste around us, therefore keeping the environment clean and freeing up more space by immediately removing waste material. This machine is very simple to operate, thus it may be used by anybody with no special skills or abilities. The machine's output also serves as a source of fuel for burning and plates for serving and storing food and other stuff. This machine will be accessible at a reasonable price, allowing everybody to own one.

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