

DESIGN AND FABRICATION OF COCONUT LEAVES SHREDDER

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Abstract- This paper presents the design and fabrication of coconut leaves shredder to obtain coconut leaves powder to prepare the vermin compost. The conventional agro-waste disposal is a traditional and oldest method of waste disposal in which agriculture wastes are dumped as it is to degrade in a particular place for decomposing. As the wastes are dumped as such, it takes more time to degrade and it causes environmental pollution. The shredder machine aims to reduce the size of agriculture waste which useful for nourishing fertilizer.

A shredder machine mainly consists of cutter, mounted on dual shaft, motor is attached at the base, smaller pulley at the motor end gives drive with the help V-belt to bigger pulley which is connected to gear. One gear will give drive to other gear, and Barrel rotates in opposite direction with the help of these gears. Shaft it rotates at 520 rpm at this time coconut leaves fed into the hopper for high rotational speed of cutter assembly coconut leaves get convert into powder

1. INTRODUCTION:

Agricultural production leaves considerable amounts of agricultural waste. Some of it is recycled into the agricultural production as fertilizer, while large amounts remain unused – and in many instances pose a disposal problem.[1]

It has been realized that large quantity of agricultural wastes remains being unutilized because handling, storage and management related difficulties. The reasons are their low bulk density, large area/volume for storage. The farmers on the field burn most of these wastes after the harvesting of crops. Thus the agricultural waste burning phenomena is being repeated every year. In order to use these wastes for some economical benefits, so the necessary of such machine was felt to utilize all kinds of agricultural waste after shredding, which could be economical and practicable.

II. LITERATURE REVIEW

Agriculture is now one of the most important sectors in the Indian economy. In order to further develop this sector technology has become one of the main components. Typically, dealing with the agriculture sector can entail difficulties relating to a number of factors. Consequently, to overcome such problems, farmers are being encouraged to adopt technology that suits their farm.

PEDAL OPERATED SHREDDER MACHINE

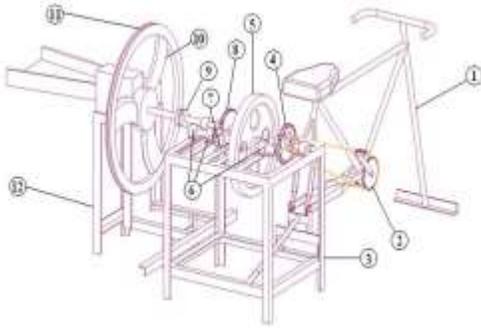


Fig1: Pedal operated shredder machine

A pedal operated shredder machine mainly required two operators one for peddling, another one for feeding purpose. ie is the main disadvantage for this machine. In this concept, the bicycle mechanism for converting and transmitting human energy through paddling to rotational kinetic energy of flywheel is hereby proposed. The energy stored in the flywheel can then use for actual cutting process. This human energy output is in the low range and the processes could be operated intermittently can be considered for utilization.[2]

Hand operated chaff cutter machine



Fig 2: Hand operated chaff cutter machine

The above figure shown is hand operated chaff cutter machine. Chaff cutters are meant for cutting all kinds of dry & green fodder into small pieces for cattle. These chaff cutters can chop the green or dry f Paddy, Grass, Groundnut etc. These machines are also useful for cutting, dry coconut leaves, Dairy Farms, and Jute Industries etc. where chopping is required. The advantages of the product are eco-friendly and maintenance is very easy.[3]

Currently available model



Fig3: Tractor PTO Model

The currently available product for cutting of coconut leaves is as shown in above figure. In the present model the outcome is in the stick form and later it must be crushed to obtain in powder form and the feeding of the coconut leaves in the existing model is of vertical type, which is difficult to feed the coconut leaves. It requires tractor PTO (Power take off shaft) machine cost also very expensive .To overcome from these problems the proposed model is developed.[4]

III.PROBLEM IDENTIFICATION AND CONCEPT DEVELOPMENT

In this project work various shredder concepts are generated and problems regarding the various coconut leaves shredder concepts are identified and selected the best concept using concept screening and concept scoring method for further progress of the project.

Concept A: Pedal Operated Shredder Machine

In this concept

SL.no	Concept-A
1	Blade material is used as MS so cutting rate are less.
2	Efficiency quite less per hour
3	It is not a user friendly
4	Human power required
5	Complicated design
6	Continuous work not possible.
7	Requires more time to cut

Concept B: Hand Operated Chaff Cutter Machine

SL.no	Concept- B
1	Low cutting rate
2	The cutter is made up of hardness steel
3	Weight of the cutter is more
4	Requires more power to cut the coconut leaves
5	There is no safety while working may get chances of accident
6	Transportation is very difficult.

Concept C: Tractor PTO Model Shredder

SL.no	Concept-C
1	Complicated design
2	It requires tractor
3	Very expensive
4	Maintainace of machine is very difficult
5	Wear and tear of blades occurs frequently
6	It requires more power
7	Wight of the machine is more

Concept D: Proposed Model

SL.no	Concept-D
1	Cutters tip are made up of tungsten carbide hence cutting rate are high.
2	Cutters having six teeth so it requires

	less time
3	Motor used single phase motor
4	Only one operator is sufficient
5	Cost of machine is less
6	Simple in design
7	Requires less power about 2 hp.
8	For safety concern protecting shield cover on belt and pulley.

Rate the concepts

A relative score of “better than” (+), “same as” (0), “Worse than” (-) is to be place in each cell of the matrix to represent how each concept in comparison to the reference concept relative to the particular criterion.

Ratings:- “better than” (+), “same as” (0), “Worse than” (-)

Rank the concepts

Table 1 . Pugh’s Chart

<u>Selection criteria</u>	<u>Concept A</u> 	<u>Concept B</u> 	<u>Concept C</u> 	<u>Concept D</u> 
Function	+	+	-	+
Cutting rate	+	+	+	+
Safety	-	+	-	-
Reliability	0	-	0	+
Cost	+	-	+	+
SUM +’S	3	3	2	4
SUM 0’S	1	0	1	0
SUM -’S	1	2	2	1
Net score	2	1	0	4
Rank	2	3	4	1

After rating all the concepts, summation of the “better than”, “same as”, “Worse than” scores and enters the sum for each category in the lower rows of the matrix. A net score is calculated by subtracting the number of “Worse than” ratings from “better than” ratings. In general, the concept with more ratings will be ranked higher and the outcome of this step is that concept “D” is ranked as “1”. So concept D is selected for the development process.

Objectives of Proposed concept:

To overcome the limitations of existing system the proposed concept minimizes certain limitations as mentioned below.

- 1 To perform different difficult jobs in the field of agriculture easily and effectively by using the new machinery.
- 2 It requires only one operator ultimately reduces the man power.
- 3 For safety concern it is user friendly.
- 4 To achieving higher rate of output in lesser time.
- 5 To reduce the adverse effects on the environment, and to use ethically justifiable production methods.

IV.PROPOSED CONCEPT:

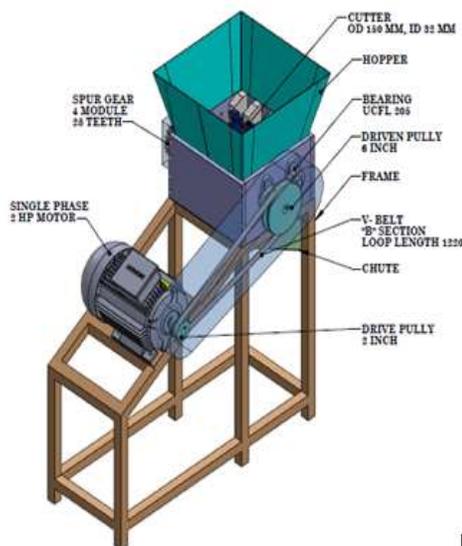


Fig4: Coconut leaves shredder.

Methodology:

The main aim of the project is to produce the small pieces of coconut leaves further it convert into manure fertilizer that will be useful for crops. The machine consists of dual shaft, Hoper, Spur gear, Frame , motor and cutter, Belt and pulley. The machine will be fabricated using mild steel frame and cutting tip of cutter made up of tungsten carbide. The machine runs in 1-phase 2hp power supply.

In this machine, the coconut dry leaves are fed, into the machine vertically through hopper. The motor is rotated at certain speed 1440 rpm. But maintain the speed ratio about 1: 3 so driven shaft rotated at 520 rpm Cutter are mounted on shaft one shaft driven by belt and pulley another shaft driven by spur gear both shaft rotated in opposite direction. Due to the high rotational force, the coconut leaves get chopped and get into powder.

GEOMETRIC 2D SOLID WORKS MODELLING

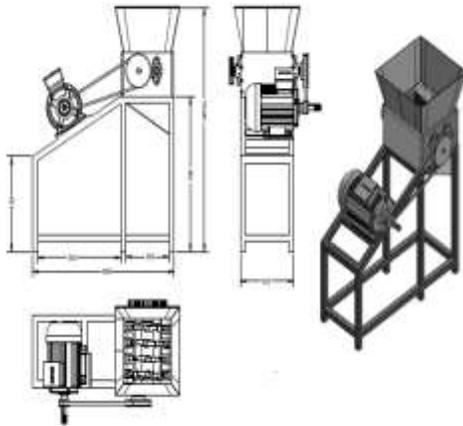


Fig 5: Proposed 2D Model

V.COMPONENTS TO BE USED FOR PROPOSED CONCEPT

PARTS	QUANTITY	MATERIALS	DESCRIPTION
Structural Frame	1	M.S	Tube=40×40 mm Thickness=2.5mm Length 86mm Breadth 320 mm Height 1030 mm
Cutter	8	Tungsten carbide and mild steel	OD 150 mm ID 32 mm Thickness=25mm 6 teeth
Motor	1	Electrical AC	Single-Phase 2hP 1440rpm
Spur gear	2	MS	OD=120mm ID=25 mm Module=4 No of Teeth=28 Thickness=25mm
Hopper	1	G.I Sheet	Length 300mm Breadth 200mm Thickness 3mm
Collecting vessel	1	G.I Sheet	Thickness 3mm Length 200 mm
Belt B-1340	1	Synthetic rubber	B1340 Length 1256 mm Thickness 11mm
Small pulley	1	Cast iron	B Section Ø 65 mm
Larger pulley	1	Cast iron	B Section Ø 150mm
Bearing	4	Cast iron	UCFL 205 D1 ID 25mm
Shaft	2	M.S	OD 32mm Length 420mm

VI. Developed Model



Fig.6: Developed model

Working principle

Working principle gives us the functionality of the proposed model. The developed model, acts as an electro mechanical which reduces the human effort as well as human intervention by utilizing the electrical motor for the cutting of leaves. The process is very much simplified as compared to the earlier processes.

The machine is first connected to the 1-phase power supply and started. Later, the dry coconut leaves are fed into the hopper. As the coconut leaves move towards the cutters assembly, this assembly rotates at the speed of 520 rpm, the coconut leaves get chopped and collected on the other side of the machine.

Advantages

- 1 This machine reduces the agro-waste and, keep the farm neat and clean
- 2 Reduces the environmental pollution
- 3 It is easily convert solid waste into small pieces.
- 4 The output of powder is good for vermin-compost and, it is a good bio fertilizer for crops.

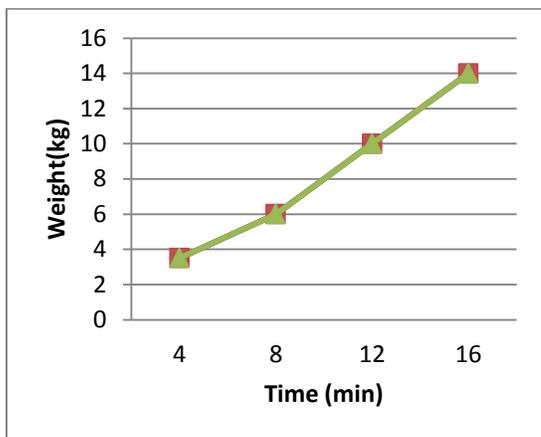
Application

- 1 The waste shredder machine can be applied not only in mass level but also small level agricultural field.

It can be used in forest industry

VII. Result

Length of leaves is five feet and number of leaves is Four



The above graph shows Time V/s kilogram. The graph clearly shows that the amount of pieces collected with respect to time. In this test 5 feet length and 4 coconut leaves are taken. The test is conducted for 4 different times. For which results are obtained, how much amount of powder collected and graph is plotted.

Conclusion

The proposed model is simple, efficient, requires less time and cost effective when compared to the existing model. In the proposed model the coconut leaves waste are shredded into machine, which is enclosed with the motor and blades made up of tungsten carbide and mild steel to obtain the outcome as small pieces about 30mm to 50 mm.

After the successful deployment of the proposed Coconut leaves cutter, the outcome of the project work is in the form of powder and further it will be used as manure fertilizer. For the different lengths

REFERENCES:

- [1] S.Nithyananth “ Design of Waste Shredder Machine” Libin Samuel et al Int. Journal of Engineering Research and Applications ISSN : 2248-9622, Vol. 4, Issue 3(Version 1), March 2014, pp.487-491
- [2]P.B.Khope and J.P.Modak“Design of experimental set-up for establishing empirical relationship for chaff cutter energized by human powered flywheel motor”Journal of Agricultural Technology 2013 Vol. 9(4): 779-791
- [3]Ajinkya S. Hande “ Methodlogy For Design and Fabrication of portable organic Waste chopping Machine To obtain comopost – A Review. Volume 1 |Issue 7 | December 2014 ISSN (online): 2349-6010 IJIRST –International Journal for Innovative Research in Science & Technology| of coconut leaves, results have been obtained and graph is plotted.
- [4] Mohamad khatib iqbal “Development of coconut leaves cutter” Vol. 3, No. 12. (June 2014) Key: citeulike:13215244.”
- [5] Y Prashanth, C Gopinath, “Design and Development of coconut fiber Extraction Machine” Department of Design, M. S. Ramaiah School of Advanced Studies, Bangalore - 560 058 Volume 13, Issue 1, April 2014
- [6]P.B.Khope, J.P.Modak“Establishing empirical relationship to predict the chaff cutting phenomenon energized by human powered flywheel motor (hpfm)”IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS) e-ISSN: 2319-2380, p-ISSN: 2319-2372. Volume 3, Issue 2 (May. - Jun. 2013), pp 35-39