

## Design and Fabrication of Organic Waste Shredding Machine

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**Abstract:** Organic composting forms the backbone & basic necessity of a poor farmer. The traditional methods are not sufficient & satisfactory for chopping the crop residues. Whereas buying the chemical fertilizer is not possible for every farmer due to its high cost and also food waste contains high calorific and nutritive values. In all the cities and places, organic waste is dumped or disposed in landfill or discarded, which causes the public health hazards and diseases like malaria, cholera, typhoid. Inadequate management of wastes like uncontrolled dumping bears several adverse consequences. Shredding machine is used for shredding and converting macro organic waste products into small or micro easily decomposable form, which can be used as organic manure. Organic waste shredder designed should perfect to shred all kinds of waste products. The organic waste shredded will be in small pieces to enable the farmer to make use of it as feed for manure or organic manure and biogas feed. This shredder can be operated with a motor.

**Keywords-** Biogas feed, Environment pollution free, Motor, Macro organic waste, Organic manure, shredding machine.

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### I. Introduction

Organic waste, or green waste, is organic material such as food, garden, agriculture and lawn clippings. It can also include animal and plant based material and degradable carbon such as paper, cardboard and timber. Burying organic waste in landfill is a big problem. Hence first we have to know the necessity/reasons for solid waste management.

Food waste is the organic material having the high calorific and nutritive values to microbes, that's why efficiency of methane production can be increased. In all the cities and places, organic waste is dumped or disposed in landfill or discarded, which causes the public health hazards and diseases like malaria, cholera, typhoid. Inadequate management of wastes like uncontrolled dumping bears several adverse consequences. It is not only polluting ground water and surface through leachate but also promotes the breeding of flies, mosquitoes, rats and other disease bearing vectors. Also, it produces unpleasant odor and methane which is a major greenhouse gas contributing to global warming.

Agriculture is the major occupation in many parts of the world and producing a range of waste waters requiring a variety of treatment technologies and management practices. The basic occupation of 70% of the population in India is majorly dependent on Agriculture. A variety of crops are cultivated in India. But after harvesting them the crops wastages are either burnt out or thrown as waste without taking into consideration of their nutritive value. With the increase in the population our aim is not only to stabilize agriculture production but also to increase it further in sustainable manner. Excessive use of agro-chemicals like pesticides and fertilizers over years may affect the soil health and lead to declining of crop yields and quality of the products. Hence, a natural balance needs to be maintained at all costs for existence of life and property. The obvious choice would be judicious use of agro-chemicals and more and more use of naturally occurring materials in farming systems. Agriculture waste, which includes both natural and non-natural wastes. 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 waste are dumped, it takes more time to degrade and it causes environmental pollution.

Hence the shredder machine is used for shredding i.e. converting of macro agriculture waste and food waste into small easily decomposable form, which can be used as organic manure. The small size waste will decompose faster than the large or macro size waste. This decomposed waste can be used for the crops and this leads to improving in the growth and quality of the crops and also improving the soil chemical properties such as supply and retention of soil nutrients, and promotes chemical reactions.

## II. Literature Review

2.1 P.B.Khope et al., Proposed the Design of experimental set-up for establishing empirical relationship for chaff cutter energized by human powered flywheel motor. This machine used to chop the forage into small pieces for easy consumption by the animals. In the human powered flywheel motor concept, the bicycle mechanism for converting and transmitting human energy through padding to rotational kinetic energy of flywheel is hereby proposed. The energy stored in the flywheel can be used for actual cutting process.



**Fig 2.1** Human powered fly wheel motor

2.2 Ajinkya s. Hande et al., in their research work carried out project on Methodology for Design and Fabrication of Portable Organic waste chopping Machine. Organic waste is fed uniformly through feeding drum and tray. Then the shaft rotated at 1440 rpm through electric motor by means of pulleys makes the chopping drum to cut the waste by the effect of impact shear obtained from the shearing blades. Then the cut pieces pass through the concave holes of the sieve & come out of the machine.



**Fig 2.2** Portable organic waste chopping machine

2.3 Mohamad Khatib Iqbal, proposed “Development of coconut leaves cutter ”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 Vbelt 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.

2.4 S Nithyananth et al., they are developed a Design of waste shredder machine. The waste shredder machine is an attachment as like a ploughing attachment. Shredder can be operated with Tractor- power take off shaft. The power from the Tractor is transmitted to the assembly. The assembly consists of one fixed blade and five circular blades. The organic matter shredded will be in small pieces to enable the farmer to make use to prepare for vermin compost.

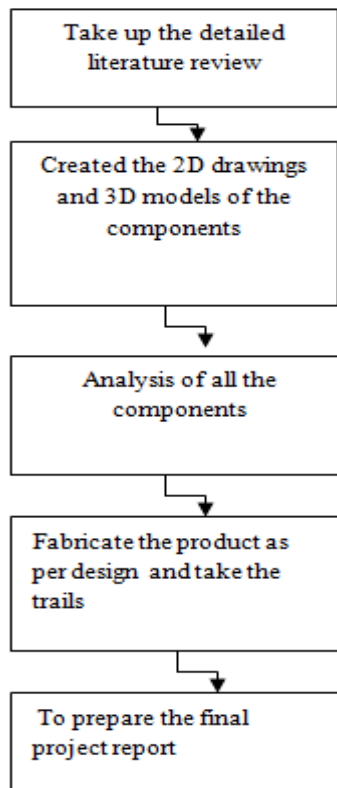


Fig 2.3 Tractor powered

2.5 After studying the Literature of various existing Shredding machine and we observed that the Labour is widely used for Chopping of agriculture waste and difficult to disposal of food waste. Some of the machines are operate by manually it takes the human effort and also using motors . The motors gives motion using V-belt and pulleys, hence chances of slip and safety has to be considered. To overcome these difficulties, We design the machine operated by Electric motor. In this, the motor is directly meshed with the driven gear with help of driver gear mounted on the motor shaft. Hence we obtain more Torque.

### III. Methodology

#### 3.1 Process Which We Carried Out For Development of Product



#### 3.2 Opration

In this Shredding machine, the Organic waste like Agriculture waste, Kitchen Debris, cooked foods etc are fed into the machine vertically through hopper on to the cutters. Cutters are mounted on shaft supported by bearings which is mounted on the machine frame. One shaft driven by motor and another shaft driven by spur gear both shaft rotated in opposite direction. The motor is rotated at certain speed 1440 rpm and with it coupled with gear box to reduce the speed and to increase the torque.

When the crop or waste come in contact with the rotating cutters or blades then the shearing action takes place. Due this shearing action, the large size waste converted into small micro size. This small size wastage will decompose faster than the macro size. The clearance between the rotating blades depends upon the size of the organic waste used for chopping. The chopped organic waste comes out of the machine and undergoes decomposition.

Before operation



Fig 3.21 Collecting of Tree waste



Fig 3.22 Collecting of food wastage

After operation



Fig3.23 Tree wastages in Powder form



Fig 3.24 Food wastages in Powder form

#### IV. Design Of Blade Or Cutter

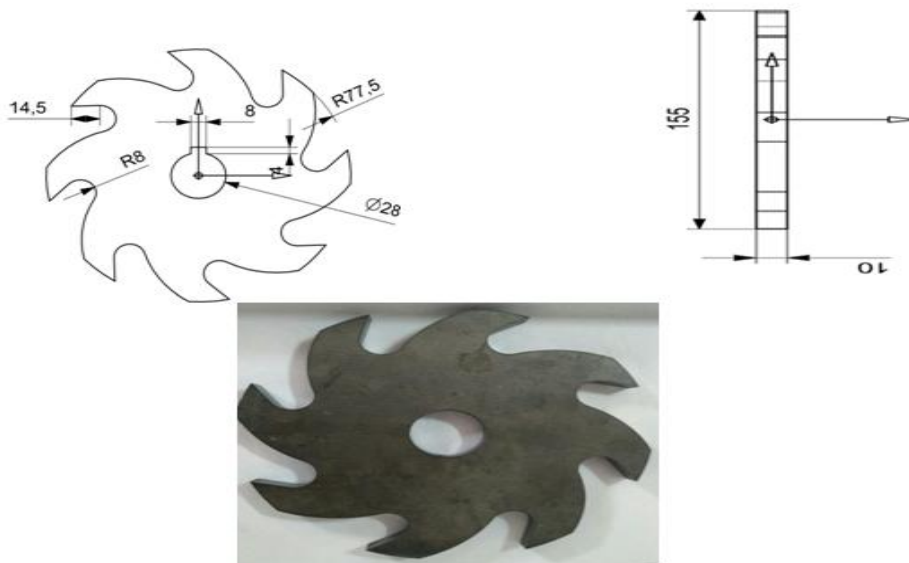


Fig 4.1 fabrication blade



## V. Material Specifications

SI No	Description	Materials
1.	Cutter and Bushes	High carbon steel
2.	Shaft	Carbon(C11) grade
3.	Electric Motor with planetary gear box	2 HP 3 Phase, output rpm 96
4.	Structural Frame	Mild steel
5.	Base plate and supports	Mild steel
6.	Hopper and collecting vessel	Mild steel sheet
7.	Bearings	UCP 204
8.	Gears	EN 8

## VI. Final Model

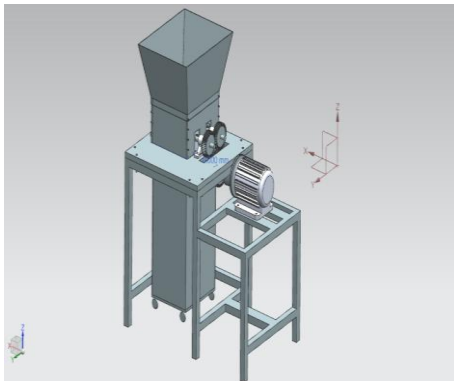


Fig 6.1 CATIA model



Fig 6.2 Fabrication model

## VII. Conclusion

After the preparation of the model, we conclude that atomise machine is better option to shred the organic waste instead of using manual operated shredder. In this we designed the machine by considering the various factors into consideration. The machine is made for small businessman, therefore the work carried out by these machine is less.

The following are the important points drawn from our work

- Machine cost is less compared to other shredder machine.
- Blades can be easily removable.
- Easy to assemble and disassemble.
- Highly skilled labours are not required.

## VIII. Future Scope

1. By increasing the cutting speed the efficiency can be increased. By using more number of blades the output efficiency & productivity can be increased.
2. The machine can be made movable in the floor by providing wheels of tire to it which can move more freely without any problem on the floor.
3. By increasing the size of the cutting chamber more amount of crop residue can be continuously feed in the machine cutting chamber. Thus ultimately a movable bigger size, weight, more productive & well efficient machine can be added to the future scope.

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