



DESIGN AND DEVELOPMENT OF WASTE LEAF COLLECTOR AND SHREDDER MACHINE USING SOLAR POWER

Prof. S.A. Bobde *1, Prof. S.R. Bobde*2, Prof. D.N. Dubey*3

*1 Assistant Professor, Department of Mechanical Engineering, DBACER, Nagpur, Maharashtra, India

*2 Assistant Professor, Department of Mechanical Engineering, DBACER, Nagpur, Maharashtra, India

*3 Assistant Professor, Department of Mechanical Engineering, DBACER, Nagpur, Maharashtra, India

ABSTRACT

In India waste leaf are found everywhere in urban area as well as in village which laying on a ground and collected by municipal worker and burn it out causes an air pollution to increase. Which increases the chances of pollution and in some instances affect global warming. To avoid these we can use that's waste leaf to produce compost. The aim of this research was to design and development of Shredder machine Focus on shredding of plant leaves. The purpose of this work is to design and developed a shredder machine which is focusing on chopping of dry leaves this chopped powder to prepare the vermin compost. In shredder the waste leaves are shredded into small pieces and then get collected to the bottom tanks/collecting tanks. The machine is solar powered.

KEYWORDS: Pollution, Solar powered, Shredder, vermin compost, dry leaves.

I. INTRODUCTION

In India agriculture production has biggest share in economy. There are numerous tree leaves drying and falling on ground in farms as well as in urban and village area along the streets. Some of it recycle into the agriculture production as fertilizer while large amount remains unused and, in many instances, pose a disposal problem. The traditional way of burning the waste leaves with fuel is not only the hazardous disposal solution it also wasting useful energy with efficient collection system waste from agricultural production can be utilized as fuel for power and heat production. in some agriculture industries large amount of biomass waste is already concentrated thus there is a need to cater the problem of waste leaves. The proposed machine collect and shreds the leaves and can be used as fertilizer.

II. METHODOLOGY

Design Methodology adopted for developing this machine is as follows :

1. When the shredder machine moves forward by means of the wheels, the brushes connected to the front axle of the wheels rotate.
2. As the brushes rotate, the leaves with the help of sweeper casing goes on the belt conveyer from the ground.

3. When the belt conveyer rotate by means of rollers, the leaves which are on the conveyer belt moves forward and goes in the hopper.

4. After going to hopper the leaves are passing through the shredder and goes in the collecting tank.

5. In the collecting tank, the cutter blades are present which cut the leaves into minute particles which are further used for making fertilizer.

6. The motor on which the cutting blades are mounted is operated by means of solar panel.

III. DESIGN CALCULATIONS

Formula for tension in belt (Tb) & Power required (P) to drive the belt :

D = diameter of roller (m) = 0.02134 m.

N = speed of roller (rpm) = 200rpm.

Type: - PVC Artificial Leather Belt.

Length of Conveyer (L):-550 mm.

Load due to conveyed materials (mm):- 0.1686 kg/m.

Load due to belt (mb):- 0.84 kg/m.

Inclination of the conveyer (θ):- 40 degree.

Vertical height of the conveyer (H):- 0.35m.

Coefficient of friction between PVC roller and belt (f):- 0.30

$T_b = 1.37 * f * L * g * (2 * m_b + mm) * \cos(\alpha) + (H * g * mm)$

Velocity = $\pi D * N / 60$

$$P = T_b * V$$

$$P = 8.312 \text{ Watt}$$

Power required for shredding motor = 2.16 Watt

IV. PROPOSED DESIGN MODEL

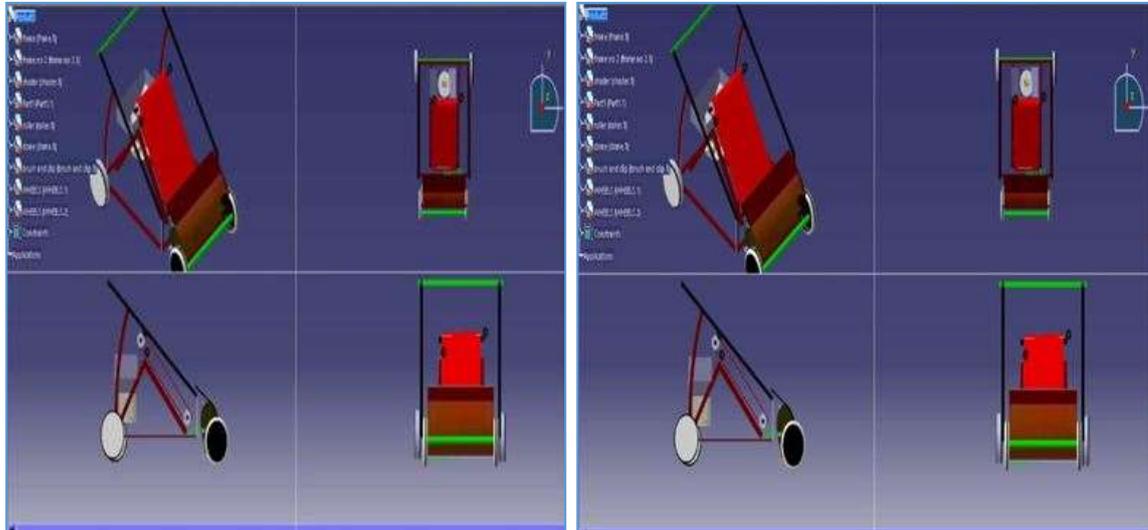


Figure1: 3D view of Shredder Machine.

V. CONCLUSION

A solar powered leaf waste leaf collector and shredder machine is developed . The proposed machine is tested to evaluate the performance of leaves collecting and shredder machine by using different types of techniques. The effect of collecting the leaf and making the useful application without any harm to environment is studied.

On the basis of observations and results the following conclusions are drawn:

1. The movement of the brush is totally depending upon the speed of the front wheels. The collection of leaves is depended upon the surface area on which the machine is moving.
2. The collected leaves moves through the conveyor with in a specific time.
3. The shredder shreds the leaf in the minute particles as per the expected assumption.
4. The battery is charged successfully by the solar panel which supplies power for moving the conveyor and shredder.

VI. REFERENCES

1. Ajinkya S.Hande et al. "Methodology For Design & Fabrication of Portable Organic Waste Chopping Machine To Obtain Compost - A Review" *IJIRST –International Journal for Innovative Research in Science & Technology* Volume 1 | Issue 7 | December 2014 ISSN (online): 2349-6010.
2. Krishna Naik et al. "Design and fabrication of Areca fiber extraction Machine" *International Journal of Emerging Technology and Advanced Engineering* ISSN 2250-2459, ISO 9001:2008 Certified Journal, Volume 4, Issue 7, July 2014.
3. Y. Prashanth et al. "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.

4. 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.
5. Calculation references are from "Dunlop conveyor belt technique design and calculation"