Design and Fabrication of Solar Operated Waste Leaf Collector and Shredder Machine

Prof. Sandeep Lutade[1], Nikhil Lichade[2], Neetin Ingole[3], Adarsh Pantawane[4], Akshay Shahu[5], Yash Dhanvijay[6], Kunal Pande[7]

[1]*Assistant Professor Department of Mechanical Engineering, Dr. Babasaheb Ambedkar College of Engineering and Research, Nagpur, Maharashtra*

[2,3,4,5,6,7] *UG students, Department of Mechanical Engineering, Dr. Babasaheb Ambedkar College of Engineering and Research, Nagpur, Maharashtra*

***Abstract*- All over India waste leaf laying a ground is collected by municipal worker and burn it out causes an air pollution to increase. Attributable to air pollution it's also contributed to increase global warming so to avoid these we can use that's waste leaf to produce compost.**

A manually operated mechanical waste collector and shredder apparatus comprising a wheel frame suitable to retain a trash wntaine theorem. A height adjustable axle mounted rotary brush is mounted forwardly of the frame and is rotated by action of ground contacting wheels through a suitable drive mechanism when the machine is move.

The rotary brush sweeps into an upcoming positioned conveyer which is adopted to carry forward to the waste leaf to the hopper and thereby to the shredder. In shredder the waste leaves are shredded into small pieces and then get collected to the bottom tanks/collecting tanks.

***Index terms*- Global Warming, Trash Wntaine Theorem, Drive Mechanism**

I.INTRODUCTION

Agricultural production gives considerable amount of agriculture waste. Some of it recycle into the agriculture production as fertilizer while large amount remains unused and, in many instances, pose a disposal problem. Uncontrolled burning in the 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.

II.LIETERATURE REVIEW AND METHODOLOGY

1 Ajinkya s. Hande et al, in their research work carried out project on Methodology For Design & 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. The cut is also made inside the chopping house due to the effect of tensile, friction, and impact effect in chopping process. Then the cut pieces pass through the concave holes of the sieve & come out of the machine. The sieves of different sized holes can be used.

2 Kishan Naik et al, they are focused project on Fabrication of areca fibre extraction machine. This is basically removing fibre from areca husk. This machine consists of 3 phase 5 hp ac motor which is directly coupled to drive shaft. The driven shaft is enclosed in a casing which is designed in such a way that only dust is removed and fibre comes out of rectangular duct at lower side of casing. The driven shaft is supported by two bearings and has blades which are designed by modifying the blade design of coconut husk decorticating machine. The areca fibre obtained was of good quality with diameter varying from 0.39 ± 0.12mm and length varying from 5-6cm. Thus this machine will be helpful for rural entrepreneurs and farmers.

3 Y. Prashant et al, they carried out a project on Design and Develop a Coconut fibre extraction machine for small scale coir industries. In this machine ¼ HP Single phase AC motor, heavy duty, is attached at the base, smaller pulley at the motor end gives drive with the help V-belt to bigger pulley at the other end of the driven shaft gear are connected, hence one gear will give drive to other gear, so barrel rotates in opposite direction at speed of 240 rpm. Coconut husk is fed from one end in between barrels and round coconut shell is moved automatically towards other end and separated fibre material is collected in sack below. In this concept cutting pins has been press fitted on indexed hole on barrel surface. Cutting pins helps to remove fibre and to give linear motion to coconut shell to exit. Cutting pin indexing angle and distance plays the major role to extracting the coconut fibre.

4 S.Nithyananth et al, they are developed a Design of waste shredder machine. The waste shredder machine is an attachment as like a plugging attachment. Shredder can be operated with a Tractor – power take off shaft (PTO).The Power from the Tractor – 35 HP and above - is transmitted to the shredder 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.

III. METHODOLOGY

WORKING:

When the shredder machine moves forward by means of the wheels, the brushes connected to the front axle of the wheels rotate.

1 As the brushes rotate, the leaves with the help of sweeper casing goes on the belt conveyer from the ground.
2 When the belt conveyer rotate by means of rollers, the leaves which are on the conveyer belt moves forward and goes in the hopper.
3 After going to hopper the leaves are passing through the shredder and goes in the collecting tank.
4 In the collecting tank, the cutter blades are present which cut the leaves into minute particles which are further used for making fertilizer.
5 The motor on which the cutting blades are mounted is operated by means of solar panel.

IV. DESIGN AND CALCULATION

Formula for tension in belt (T_b) & 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 Conveyor (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 conveyor (θ):- 40 degree.
Vertical height of the conveyor (H):- 0.35m.
Coefficient of friction between PVC roller and belt (f) :- 0.30

T_b=1.37*f*L*g*(2*mb+mm)*cos(α)+(H*g*mm)
Velocity= π D*N/60
P = T_b*V
P =8.312 Watt
Power required for shredding motor = 2.16 Watt

V. CONCLUSION

A small unit of leaf collecting machine was developed. The 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 shedder shreds the leaf in the minute particles as per the expected assumption.
4 The battery is charged successfully by the solar panels which supply power for moving the conveyor and shredder.

REFRENCES

[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] All formulae are taken from "Dunlop conveyor belt technique design and calculation"