Proceedings of National Conference on Technological Developments in Civil and Mechanical Engineering (NCTDCME-18)
SPVP,S.B. Patil College of Engineering, Indapur
JournalNX- A Multidisciplinary Peer Reviewed Journal (ISSN No: 2581-4230)
15th -16th March- 2018

DESIGN AND DEVELOPMENT OF SUGARCANE THRESHER

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Abstract: Sugarcane is the major economic crops in India and it is used as a raw material in sugar manufacturing. Indian agriculture has facing challenges like shortage of agricultural labor, not only in peak working as but also in normal time and the existing harvester was exported and costly.

The aim of this study is to design and analysis a small scale sugarcane harvester machine, as an attachment for tractor. Design was developed using CATIA and analysis can done using ANSYS software. Outcome of this study was developed new harvesting machine which reduce cost, hazardous work of labor and farmer that removes leafs of sugarcane and maximizes productivity. The existing machine was high cost and it cannot use for as an attachment to tractor as compared to new developed machine.

keywords— Sugarcane; Harvester; Tracoter attachment; Desing and Analysis .

1. INTRODUCTION

India is the world's second sugarcane producing country. In the India most of economy is depend on the sugarcane .but to harvest this sugarcane is become very hazardous process for everyone. Most of its need lot of labors. In market there are many machines available to harvest the sugarcane but they are failed in India. So we invent the new thresher machine which is easily implemented in the new upcoming harvester name as "AIIRAVATA". This thresher machine removes the all useless leaves of the sugarcane. At a time nearby 20 to 25 stalks are cleaned by this machine automatically and it doesn't need any man power. So for its atomization and compactness it's easily fits to the new harvester and is an important part.

Chassis frame is the main base of the vehicle on which body is mounted with wheels and machinery. As per the design, marking has been done on each angle. As per the marking, angles are cut by cutting machine and holes are drilled on angles by using drilling machine for fixing saw chain assembly and DC motor. L-angles have been weld as per marking and finally the chassis is fabricated as per the required dimensions. Two wheels are attached to each other through the pipe and connected to the frame for the movement of the harvester in the field. L-angle is weld to pipe to make handle and welded to the chassis for pushing the vehicle in the field. At handle l-shape angle plate is weld to place the solar panel.

L-angle is cut to the required dimension and DC motor is fitted to it; and then it is welded to the front portion of the frame. A shaft from the DC motor is connected to drive sprocket. Guide bar is mounted in front part of the chassis by using nuts and bolts and weld as per the requirement. Proper alignment is made between the drive sprocket and guide bar for the rotation of the saw chain properly. Distance between the guide bar and ground is done as per the requirement. DC motor is connected to the battery through switch and solar panel is connected to the battery for power generation.

1.1 WORKING MECHANISM

In this machine we use the mainly following working mechanism

1. Gear mechanism
2. Pulley mechanism
3. Chain mechanism

In this machine gear mechanism specially used to drive the opposite rollers in the opposite direction here we use the simple spur gear of the 1:10 ratio

Then we use the chain mechanism to drive the adjacent rollers in same direction and same speed. for this e use the chain and its spoke to drive this mechanism and the last but important is the pulley mechanism it is used to drive the machine by the motor with the help of the pulley with the differ diameter of pulley to maximize and minimize the speed . Also here we implement the gearbox to control the entire machine by just one switch. For whole process we use the BLDC motor of 2 HP and it will run by the help of lead acid battery of 48 volt.

Sheet metal is cut by a cutting machine as per the chassis dimensions and it is weld on chassis frame for carrying load on the vehicle.

1.2 PROBLEM STATEMENTS

The main problem starts after harvesting. The no. of leaves are collected in tank. Scrap in abundant amount stored in tank which is not applicable for any purpose. The main aim of our project is to removed all leaves which lies on sugarcane. Scrap free sugarcane is suppling to industry is beneficial for industry. Sugarcane thresher mechanism helps to remove all the leaves and provides sugarcane free from leaves.

1.3 DRAWINGS

Here are some cad drawings of the entire machine part.

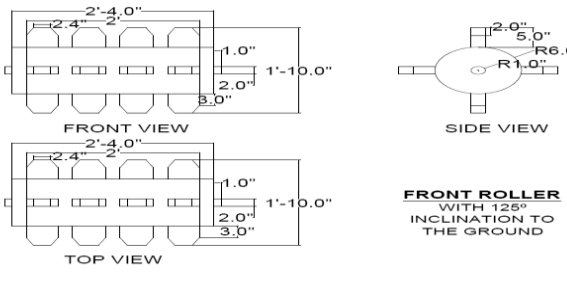

Fig1. Roller cad design

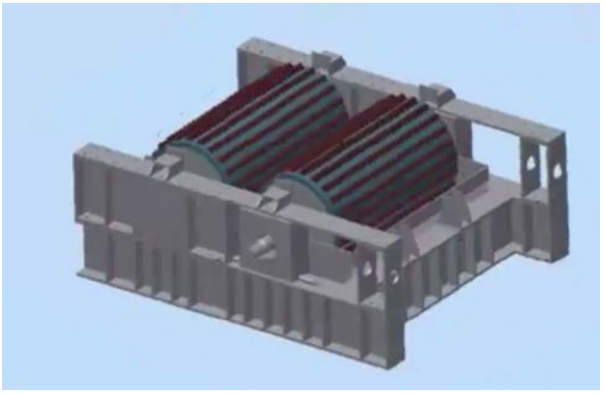

Fig. 2 assembly animation design

2. MATERAL SELECTION

Material required for various parts as per requirements of part are given below:

Sr. no.	Part name	Material
1	Front roller	MS round pipe& plate
2	Cane divider	Ms sheet and round pipe
3	Rotary cutter	MS plate and non corrosive coating
4	Thresher roller	MS pipe & rough polish paper
5	Vertical reciprocating cutter	Ms plate with non corrosive coating
6	Chain conveyor	Easily available in market
7	V shape outlet	MS sheet

Now I will give the no. of set required as well as the required motor and their horse power and the type of motor & battery.

SR	PART NAME	SET NO.	REQUIRED MOTOR	H.P OF MOTOR
1	Rotor	2	2	1 / 2
2	Cane divider	4	2	1
3	Rotary cutter	4	2	1
4	Grabber roller	4	2	1
5	Thresher roller	8	2	1
6	Vertical cutter	2	2	1 / 2
7	Chain conveyor	2	2	2

In case of noise reduction and the long lasting purpose as well as the low maintenance purpose we need the BLDC motor with their controller to adjust its RPM.

As per the weight reduction and the long lasting purpose we need the LI-ION battery with insulating casing.

3. ADVANTAGES AND DISADVANTAGES

3.1 ADVANTAGES

These are main advantage of our thresher machine that after harvesting no anyone leaves found on sugarcane. All scrap is processed and make it useful as biodegradable waste or organic compost.

1] Reduce all labor work.
2] Reduce hazardous process.
3] Cost is lowered.
4] Easily implement in new harvester.
5] Need less space and fast working.
6] Full automated, at a time clean the 20 to 25 sugarcane.
7] Easily controlled by switches.

3.2 DISADVANTAGES

1] Maintenance cost is high.
2] Shortage of skilled labor.

4. CONCLUSION

This machine is very helpful for any sugarcane farmer as well as the sugar mills. It is very portable machine. In low cost its very effective and fast working processed machine. This machine is helps to reduce all the hazardous work of the labor and full automation lead the machine quality. Maintained and cost is very less than the other leaf removal processes. The various experiments were performed by the researchers for minimizing the force required for the cutting of sugarcane for the harvesters which helps to increase the rate of harvesting. The changes made in cutting angle, type of blade like serrated or normal blade, angle of blade affect the quality of the cut of cane.

There are two attachments which are attached to the tractor and then from taking power from PTO, it works as sugarcane harvester. The harvester is easy to operate & assemble as there is no need of skilled worker. The maintenance & operating cost of harvester is much lesser as it is used as an attachment for a tractor & takes the power from tractor only. Design of harvester is smaller and hence it can be used for smaller as well as larger area farms easily.

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