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Modified Rotavator for Cutting Sugarcane Trunk

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Abstract: **-** *Nowadays there are many types of rotavators available in the market but the cost of these rotavators is very high and it is not possible to purchase all farmers. So made the new rotavator for cutting of sugarcane trunk. But the different types of rotavators available in the market have some drawbacks covered in the new rotavator. The main thing of this new rotavator is to cut the sugarcane trunk at the ground level which does not happen in the other rotavator and the other rotavator cut the trunk below the ground level. Now for illuminating this drawback we made this new rotavator. Quality control is used to evaluate processes and products and is a powerful tool for reducing variability. The objective of this study was to evaluate the quality of green sugarcane cutting for mechanized harvest, using statistical quality control tools. Cutting height and damage to ratoon stalks caused by different blade and disc combinations of the base cutter mechanism were used as indicators of quality.*

Keyword: **-** Power Take off shaft, Bevel Gear, Rotating M S Blade, etc.

I. Introduction

Sugarcane is the most important agro-industrial crop next to cotton which is being cultivated on around 4.86 million hectares area in India. The country produced about324 million tons of cane at a national average of about 67 tons ha in the year 2010- 11(Directorate of Economics and Statistics, Department of Agriculture and Cooperation). Sugarcane remains in the field for almost a year and right from land preparation to harvesting the crop there is heavy demand for labor and machinery throughout its crop cycle. Sugarcane accounts for 60-70 percent of the cost of sugarcane production and thus has a vital role to make the sugar industry a commercially valuable venture. (Singh et al.2011).

Sugarcane is one crop in which there has been little mechanization in India, all farm operations from planting to harvesting are labor dependent. In a true sense. If we look at the prevailing degree of mechanization, it is observed that so-called mechanization is confined to cauterization, only in general, and the use of land preparation equipment, mainly cultivator and harrow in particular. (Sharma et al. 2007). This is one of the reasons for the higher cost of cultivation of this crop and lower yield. Sugarcane production is labor-intensive requiring about 3300 man-hrs. In the present context of globalization, ways and means have to be further evolved to produce more sugar per unit area, time, and input to keep pace with the population growth while preserving the soil and water resources. For this purpose, it has been experienced that the use of modern machinery is inevitable.

The use of machinery helps in labour-saving, ensures timeliness of operation, reduces drudgery, helps in improving the quality of work, reduces the cost of operation, and ensures effective utilization of resources. In the case of the sugarcane crop although machinery has been developed, however, the adoption of these implements and machinery has not been up to the desired level. Thus, there is a considerable mechanization gap, especially in the area of sugarcane planting, intercultural, harvesting, and ratoon management.

II. Sequence of Operation

Basic Components of Modified Rotavator

1. Inlet – Power from Tractor.
2. PTO Shaft for power transmission.
3. PTO Shaft to the bevel gear.
4. Bevel Gear transmit power to the 90^0.
5. Cutter Blade to the output shaft of bevel gear.
6. Rotate the blade after Power taking from shaft.

7. Output is to cut the trunk.

III. Literature Review

Subrata Kr. Mandal and Basudeb Bhattacharya" Design and Development of rotavator blade: Interrogation of CAD method 2013". Blades interact with soil in a different way than normal plots which are subjected to impact and high friction which creates non-uniform forces and unbalancing which results in the wearing of the blade. Therefore, it is necessary that design and dilates (development) a suitable model that will enhance self-life. This paper deals with the design and development of rotavator blades through the interrogation of the computer-aided design (CAD) method. Gopal U. Shinde and Shyam R. Kajale" Design optimization in rotary tillage tool system components by CEA 2012." The design optimization of rotary tillage tool by the application of computer-aided engineering (CEA)- Techniques based on finite element method and simulation method is done by using CAD-Analysis software for the structural analysis.

The different tillage tool parts of rotary tillage tools are geometrically constrained by the preparation of solid model, meshing, and simulation done with actual field performance rating parameters along with boundary conditions. Rahul Davis "Optimization of surface roughness in wet turning operation of EN 24 steel 2012". The present an experimental study is concerned with the cutting parameter optimization (spindle speed, depth of cut, feed rate) in wet turning EN 24 steels (0.4%C) with hardness 40+2 HRC. In the present work, turning operations were carried out on EN 24 steel by carbide P-30 cutting tool in wet conditions, and the combination of the optimal levels of the parameters were obtained.

IV. Construction

The power is taking from the tractor by using the PTO shaft and it is transmitted to the bevel gear through the propeller shaft connected between PTO and bevel gear. At another end of bevel gear another one small connecting rod is connected between cutter rotating blade. Power takes of shaft and power transmitting shaft are connected by using the universal joint. When power is transmitted to this shaft is get rotate and giving this power to the bevel gear and this bevel gear transmits power in 90^0 to the rotating cutting blade. By using this mechanism, we cut the sugarcane trunk after the harvesting of sugarcane to reduce human effort and reduce labor cost and also it is time saving.

V. Methodology

Step 1:

The function of the cutting blade is to cut the sugar cane trunk easily. It is made up of MS steel because it is having high strength and it resists wear. It is able to with stand high cutting speed and also at low speed. The blade having additional cutting slots for heat dissipation to avoid heating of blade. The cutting ability of this blade is good than other blades used in rotavators.

Step 2:

Transmission shafts are used to transmit power between the source and the machine absorbing power; e.g., Counter shafts and line shafts. The alloy material used for ordinary shafts is mild steel. When high strength is required, Shafts steel such as nickel, nickel-chromium, or chromium-vanadium steel is using are generally formed.

Step 3:

Universal joint linked together, allowing the transmission of torque and/or rotary motion. It also allows for the transmission of power between two points that are not in line with each other. Universal joints come in a wide variety of shapes, sizes, and configurations to accommodate the infinite number of applications they can go into. You should always consult a professional before selecting a universal joint.

Step 4:

Bevel gears are gears where the axes of the two shafts intersect and the tooth-bearing faces of the gears themselves are conically shaped. Bevel gears are most often mounted on shafts that are 90 degrees apart but can be designed to work at other angles as well. The pitch surface of bevel gears is a cone.

Step 5:
Hypoid bevel gears are similar to spiral bevels but the pitch surfaces are hyperbolic and not conical. Pinion can be offset above, or below, the gear Centre, thus allowing larger pinion diameter, longer life, and smoother mesh, with additional ratios. In a limiting case of making the "bevel" surface parallel with the axis of rotation, this configuration resembles a worm drive. Hypoid gears were widely used in automobile rear axles...

Step 6: Due to those arrangements the force for rotating the output shaft is less required in the firm rotary motion and will be resolved into 90 hence the required force is to be less of its original magnitude. By using this mechanism, we cut the sugarcane trunk after the harvesting of sugarcane.

Experimental Setup

VI. Conclusion

From this project we recognize that we can easily cut the sugarcane trunk with the help of a modified rotavator and we can reduce human effort with the help of this modified new rotavator. We conclude that we can provide an economically better and more useful rotavator for the market. We can conclude that we can provide a rotavator with many advantages with minimum investment. From this project, we can reduce or minimize the cost and extra labouring costs also reduce human efforts.

REFERENCES

[1] Automobile Engineering Book

[2] Design of Machine Element (Khurmi)

[3] Study Of Torsional Response on the Rotor shaft of a Rotavator Under Transient Load Conditions' by Vignesh, Dr. Muruganandhan. R, Dasairi. N, Nagarjun. M, IJIRSET volume4, special Issue, 4 April 2015.

[4] Computer-Aided Design and Analysis of Rotavator Blade' by Prasad D. Tupkari, Dr.P.K. Sharma, Prof. Amit Singh, IJATES Volume 2, Issue No.05, May 2014.

[5] Design Modification and Structural Analysis of Rotavator Blade by Using Hyper Works 12.0' by C. Manivelprabhu, Dr. N. Sangeetha, T. Ramganesh, 2015 India Altair Conference.

[6] Design Modification and Analysis of Rotavator Blade' by Jeevarathinam. A Velmurugan. C, IOSR Journal of Mechanical and Civil Engineering (IOSRJMCE) e-ISSN: 2278-1684, p-ISSN: 2320-334X PP 43-50 2.