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A Review on Development of Chaff Cutter Blades for Better Productivity

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ABSTRACT

A chaff cutter is used to cut the chaff ,sugarcane also stem so that there will be better animal digestion. Due to this the chaff is cut into very small pieces. This chaff and hay plays a very important role in agriculture production. In this paper we have to improve the blade life by using different materials, different bevel angles and different blade thickness and blade edge thickness. In this paper we used mild steel, high carbon steel, and high speed steel blades. In this paper our main aim is to increase the productivity. We can do stress analysis by ANSYS software and also by UTM.

Keywords-blade, stress analysis, blade edge thickness

1.INTRODUCTION

A Chaff cutter is mechanical device used to cut the straw or hay into small pieces a good way to blend it together and fed to cattle. This improves animal digestion and forestalls animal from rejecting any a part of their meals. As in step with these days's state of affairs the populace of buffalos and farm animals is notably extended. So to growth the productivity and decrease the physical effort required for running the device the motorized machineries came into lifestyles it's far great for dairy farmers. Presently fodder slicing machines are electric pushed as well as hand operated or engine pushed.

The diverse sorts of fodder may be processed on this device are forage grass, inexperienced grass, dry corn straw, and wheat stalk. The final merchandise may be used to feed livestock, goats, deer, and horses. It can also system cotton stalk, bark, small branches, they can also be used to generate strength, and to make paper. Chaff cutters have developed gradually from the primary machines into commercial popular machines that may be driven at numerous speeds with the intention to gain numerous lengths of cuts of chaff with recognize to animal choice type. New chaff cutter machines includes portable tractor driven chaff cutter - in which chaff cutter may be in the discipline and cargo trolleys.

The present green fodder cutting machine features a single, only rod-shaped cut green fodder, green fodder cannot cut block. Whether peasant family, tribunal or farms and sales markets are in urgent need of a new, practical, functional and greener fodder cutter. The population of cattle in India in 1987 was 274 million. For such kind of population traditional human

powered fodder cutting machines were used, but due to this the efforts for running the machine was physically demanding. So to increase the productivity and reduce the physical effort required for running the machine the motorized machineries came into existence.

II.LITERATURE SURVEY

Nilesh Sankpal et al [1] worked on modification of chaff cutter machine. They develop the machine gradually from basic machine into standard machine which can be electric driven. They develop this machine for achieving various length of cut of chaff as per the preference. They modified this machine for compactness and for achieving blockage of grass.

Sanjay Patil et al [2] present a research on design and modification of chaff cutting machine. They modify the design of chaff cutter so that it allows the farmer to not only cut the sugarcane in a form which can be used as a fodder for animals but can also gring various feeding materials like dry corn straw, grass, soyabene, wheat stalk. Due to this there is reduction in human work and increse in fodder production. They use different types of blades for obtaining different types of chaff for animals.

Anna Sarak et al [3] doing some modification in chaff cutting machine. This modified chaff cutting machine allows farmers to cut various feeding materials such as sugarcane top, grass, wheat stalk. Here they replace the electric motor by spring mechanism so less efforts are required for this and also spring is available easily. Zero percent fossilefuel is there. It is worked by manual efforts also. It cuts the fodder uniformly. It is durable, long lasting and low maintenance required.

Mr.P.B.Patil et al [4] develop a chaff cutting machine. They searched that while eating, animals waste more chaff. There is up to 40-50% of Chaff is wasted by them. It is very big loss. To stop this wastage of Chaff some farmers also use the conventional method of cutting the Chaff. Some of them use machine like chaff cutter.

This type of Chaff is very much essential for faster growth of goats and ships. It can also be used for animal like horse also. So it is very much essential to manufacture a machine to cut the wet Chaff also. It should be cut in size of up to 3-4 inches in length. Machine should not make slurry and wastage of that Chaff.

P. B. Khope, J. P. Modak [5] addresses the development and performance of a Human Powered Flywheel Motor (HPFM) operated forge cutter. This set-up is used to cut crop residues like maize stovers, sorghum stovers in dry condition. This cut stovers can be fed to cattle directly.

K. S. Zakiuddin, J. P. Modak [6] stated that a chaff cutter is a mechanical device used to cut the straw or hay into small pieces so as to mix it together with other forage Chaff and fed to horses and cattle. This improves the animal's digestion and prevents animals from rejecting any part of their food.

Dinesh Mohan et al [7] has represented paper on study of safety features in fodder cutting machine. An epidemiological study done in north India showed that all age groups sus-tain fodder-cutter injuries while operating the machine. They presented paper on safety procedures for running the fodder cutting machines.

Prof.J.G.Shinde, Prof.S.V.Pandit [8] develop a chaff cutter in a simple construction. They design the machine such that it will require minimum space. As the motor is placed inside the machine stand not outside the machine, the space is considerably saved. To increase the productivity and reduce the physical effort required for running the machine the motorized machineries came into existence it is best for dairy farmers. Presently fodder cutting machines are electric driven as well as hand operated or

engine driven.

ChinmayBandiwadekar et al [9] designed a special purposed small scale machine for small scale farmers who have requirement to feed their cattle on daily basis in small to medium basis. They explained in this paper that, the machine has small dimensions compared to traditional 'kadbakutti' machine, the energy required for our machine is less & works on single phase, the moving parts of the machine are completely covered so operation of ma-chine is safe. Due to new cutting technology the wear and tear of the blades is negligible on the other hand conventional machine requires frequent sharpening of blades. The cost would also be less once it is mass produced.

P.B.Khope, J.P.Modak [10] gives output of their research that, the application of human powered flywheel motoras an energy source for rural generation of electrical energy for rural applications along with computer aided analysis of battery charging process.

Jizhan Liu, Zhiguo Li, Pingping Li, and Hanping Mao [11] designed a laser stem cutting device for harvesting robot. In this paper a laser stem-cutting device for fruit harvesting robot was designed, which includes a laser generation and control unit and an actuating mechanism. a laser stem-cutting device for fruit harvesting robot was designed, which includes a laser generation and control unit and an actuating mechanism. A 30W high-power fiber-coupled laser diode is selected, and it is supplied with a lithium battery whose gradually-dropped voltage is turned to constant-current by a constant-current supply circuit. In the protection/control circuit, two-step slow start of the laser diode is achieved by a RC delay circuit and a delay relay circuit. To cut stems off, the focusing lens installed on the end-effector of harvesting robot and connected with the laser by a fiber is driven by a Maxon mini DC motor through a bearing structure. Experiments indicate that this device works well and effectively.

III.NOTEWORTHY CONTRIBUTION IN THE PREVIOUS WORK

Fig No.1:Chaff Cutter

In the previous work (Nilesh Sankpal, Vaibhav Powar et al.) , a chaff cutter is modified to improve the productivity. The machine require minimum space. Double sharpening blades are used. Powder scoating casing is provided for safety. Fodder cutting rate is 300kg/hr. There is an arrangement of forward and reverse rotation of blades.

In the previous work (Anna sarak, Aniket Shinde et al.) the different types of blades are used, to obtain different types of chaff for animals. Also the in the previous work, an electric motor is replaced by spring mechanism and they required less effort for that because spring is available easily. So in that work, they use zero fossil fuel. The machine has ability to cutting grass 144kg/hr.

In the previous work (Mr.P.B.Patil, Mr.P.V.Mali et al.), the chaff cutter machine is modified for its compactness and for avoiding blockage of grass. In this for 50 N-m torque they select 2HP motor. In this there is an arrangement of gear, belt & pulley, and bearings. So the chaff cutter has less noise and less weight due to gears and due to compactness. In this work double sharpening blades are used.

In the proposed work , for increasing the productivity and reduction in physical effort, some motorized machines are existing. These machines are electric driven as well as hand operated or engine driven. As the motor is placed inside the machine stand not outside the machine, the space is considerably saved. To increase the productivity and reduce the physical effort required forrunning the machine the motorized machineries came into existence it is best for dairy farmers.

In the previous work (Jayant P Modak, zakiuddin syedkazi), there is human energized chaff cutter. Their concept is average work rate of man working continuously equal to 0.13 HP. The flywheel is used as a power source and manpower is required to energize the flywheel. And when energy is stored in flywheel then it is supplied through clutch and gearing unit to the shaft.

In the proposed work (Dinesh Mohan, Adarshkumar et al.) , a chaff cutter is developed to avoid serious injuries to hands of both adults and children in the village of north India. In adults injury occure during feeding side. They are doing some inventions in their work to avoid injuries. In that work they use warning roller, blade safety guard, gear cover, flywheel locking pin, finger guard.

In the previous work(Chinmay Bandiwadekar, Ajinkya Kambale et al.) a new machine is designed for small farmers who have small to medium basis daily requirement to feed the cattle. This machine works on single phase and energy required for the machine is less. They covered all the moving parts so it is safe to use. In their work the wear and tear of blades is negligible.

IV.PROPOSED METHODOLOGY

Chaff cutter is a hay or straw cutting machine which is used in uniform chopping of the fodder for livestock or raw material to agro industries. The various types of fodder can be processed in this machine are forage grass, green grass, dry corn straw, and wheat stalk. The final products can be used to feed cattle, goats, deer, and horses.

Research is confined at studying the following parameters and finding out optimum effective solution for them.

Fig No.2:Straight Rectangular Chaff Cutter Blade

Fig No.3: Chaff Cutter Blades

To achieve the above-mentioned objectives, the following methodology is preferable for the proposed work:

1) The objective of the work is to increase the productivity of chaff cutting machine. We have to improve the life of blades of chaff cutter.
2) We will use blades of different types & different materials like medium carbon steel, high carbon steel, high speed steel.
3) We will use different blade bevel angles like 0 degree, 15 degree, 25 degree, 35 degree and 45 degree.

4) We will Calculate the stresses in blade on Universal testing machine by compression test.
5) We will use straight rectangular blades of different thickness like 2mm, 3mm, 4 mm
6) Also we will finding the stress analysis of blades using ANSYS software.
7) We will compare the stress values of blades by using different material ,different blade angles, and different blade .
8) We will take a test on chaff cutter by using different blade material and different types of stem.
9) Like stress we can find some other parameters like time required to cut the chaff, energy required to cut the chaff.

V. EXPECTED OUTCOME OF THE PROPOSED WORK.

By using different types of blades we can obtain different types of chaff for animal. By our proposed work we can cut the sugarcane waste so that it can be utilized as a fodder for animal as well as grind various feeding materials such as dry corn straw, grass, soyabean, wheat stalk, with ease and thus reducing the manual work of farmer and increases the fodder production. Chaff can be easily cut in a least time.
As we will using blade of different materials, so we can calculate stresses in blades .So by our proposed work & by stress analysis we can do performance optimization of chaff cutter.

VI.CONCLUSION

We can cut sugarcane, stems and chaff with dia(10-30mm) so that there will be better animal digestion . As we are using different materials like mild steel, high carbon steel and high speed steel.Stress value for these materials are different. So by using different materials and bevel angles we will conclude the better angle and material for chaff cutter blades. Also we will see that which blade material wear fast. Also we will conclude that the time required for different blade is different.

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