

To Study And Modify The Bagasse Bale Breaker System

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ABSTRACT

The aim of this work was to study and modifies the the bagasse bale breaking machine which is used for cutting of bagasse, as a function of its moisture content, angle of the blade edge and cutting speed. The basic objective of Bale breaking machine is to brake the bale of bagasse in proper way i.e. into a fine pieces and then supply this bagasse matter to furnace through the conveyor belt. Low angle of the blade edge and low moisture content are, in this order, the most factors in determining a low specific cutting energy and a low peak cutting force respectively. The good cutting conditions are achieved for an angle of blade edge of 20.8° and a moisture content of 10% .Use of belt drive instead of gear drive improves the working capacity of machine. The results of this work could contribute to the optimal design of bagasse bale breaking system.

Keywords: Sugarcane bagasse, Bagasse bale, cutting energy, Bale breaker.

I. INTRODUCTION

Bagasse bale breaker machine is a device which helps in the breaking of bale which is made from sugarcane waste called as bagasse. The basic objective of bale breaking machine is to brake the bale of bagasse in proper way i.e. into a fine pieces and then supply this bagasse matter to furnace through the conveyor belt. Different aspects of bagasse breaking machine which will be helpful for the agriculture industry to move towards mechanization. Generally it is observed that in sugar industry when juice is extracted from sugarcane after that the remaining material which is fibrous residue called as bagasse generally get wasted. This waste cannot use for any purpose in other industries but in sugar industry this waste cannot throw out. By removing the moisture content from fibrous residue it compressed with the help of baling machine. The outcome product is rectangular form which is known as bale. The bale which is used in sugar industry for the generation of steam in boiler act as fuel. This bale is beaked in bagasse bale breaking machine then this braked bale is used into the combustion chamber. But actual problem is that the bagasse is not completely burned due to the uneven braking of the

bale. It causes incomplete combustion of bale. Because of incomplete combustion various hazardous exhaust gases are produced such that CO , CO_2 , NO_x . This causes serious problems to human beings and also making pollution in the environment. There are various problems in Bagasse bale breaking machine:

1. Uneven breaking of bagasse bale.
2. Jamming of rotors frequently due to threads.
3. Increased load reduces bearing life.

The cutting procedure is one of the most important steps for biomass preparation prior to densification. This stage helps to normalize the raw material and therefore facilitate handling, feeding, and filling in the briquetting equipment. Now a days, for by product industry, a better knowledge of material behaviour during cutting is needed for economical and productive reason. From an engineering viewpoint, few papers on biomass cutting procedure have been published, especially with respect to sugarcane biomass. Habib et al. categorized the different parameters affecting the performance of the cutting procedure. They

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Showed that the main parameter of the cutting tool is the knife-edge angle, and that of the biomass is the moisture content, whereas, for the operation machine situation, the main parameter is the cutting speed. The scope of this work was to assess the suitability of the cutting process for sugarcane bagasse. The variable explored included the moisture content, the angle of the blade edge and the cutting speed. Specific cutting energy and peak cutting force are both important parameters describing the cutting process. The energy consumed in shearing a unit area of biomass is called the specific cutting energy.

II. LITERATURE REVIEW

Sugarcane is the principle cash crops grown all over the world. Huge quantities of cane bagasse produced during sugarcane production. Bagasse has been used to produce energy by direct combustion. Bailing sugarcane bagasse is of very low quantity due to its low nitrogen and high fibre content hence it has poor digestibility (**Khan et al., 1992**). It can be used as low cost sources of roughage with applying some processing technique. (**Reddy et al., 1993**) One of these processing techniques is to preserve it as a silage treated with urea. This may partially contribute in solving the problem of green feed shortage during summer season.

(**Singh et al., 1999**) Revealed that, calculation of urea above 1% to sugarcane bagasse during instilling process produced a silage having NH_3N as a percentage of total nitrogen, more than 85% at all studied level of urea addition due to buffering effect of urea.

(**Habib et al., 2002**) Categorized the different parameters affecting performance of cutting process into four predominant groups namely Cutting tool, Plant, Machine and a mixed group. They showed that the main parameters of cutting tool are knife edge angle and that of the plant material is moisture content that's why the working performance main parameters is reduces.

(**Arif 1999**) mentioned that the mechanical treatment of residue for size reduction which can be accomplished by cutting or grinding. He also added that the cut length of residue is depend on speed of rotor.

(**Metwally et al. 1995**) Investigated that the effect of moisture content on the performance of different mechanical methods for cutting .They concluded that by decreasing the moisture content cutting efficiency increases, which means there is decreasing of power requirements.

(**Kepner et al., 1982**) He stated that cutting energy was inversely proportional to the length of the cuts for short cuts.

III. OBJECTIVE

- 1) Design the bagasse bale breaker system with different alternatives.
- 2) To design modified system.
- 3) Manufacturing and assembly.
- 4) Testing of new part and component.

IV. MODIFICATION WORK

The modified bale breaker is works on the principal of belt drive. The Belt is used in the system is open v-belt. The

whole system is placed in casing, the casing Is made up of mild steel. When motor starts it transmits the power to driving pulley through shaft and then belt transmit power. Since they are located near the neutral axis of the cross section of the belt, the stresses due to bending of the belt around the pulley are almost negligible. The layer of the rubber located above the load carrying cords is subjected to tension and is called tension layer , similarly the layer of rubber below the central cord is subjected to compression and is called compression layer. Due to this rotor is rotated in inward direction. While rotating of rotor bagasse bale imparted on it by labor. It get compressed due to rotation of the rotor and plate and finally broken in suitable size.

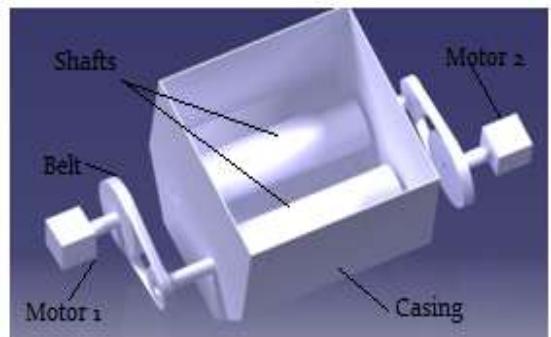


Fig: Modified bagasse bale breaker system

- **Teeth Modification:**



1. New Teeth



2. Old Teeth

We have modified the shape of teeth for the breaking the bagasse bale into small particles. we can see in fig (2) and (1) the previous teeth system and modified teeth system respectively. Previous teeth system cannot break the bale in small pieces as stresses are more on it. Previous teeth's are convex in shape at the tip due to which some times breaking of teeth's occurs. The energy and force required for cutting may vary depending on raw material moisture content (bagasse) and the blade geometry and the speed of cutting process. Double edge knife teeth's are best suitable for shearing action of bagasse bale. So teeth with modification in its tip shape making knife edged can do same work with precision. results in braking of bale in small pieces.

- **Maintenance Plate**

Bagasse bales are tied with the help of threads ,this threads are getting wound on teeth's after the braking of bale. It reduces the cutting efficiency of the teeth's. Hence to remove this threads from teeth's one small window is provided on casing wall on the front side. This window is closed with the help of plate is called as maintenance plate.

- Inclined Plate**

Two plates are welded at the bottom at an some angle for directing the small pieces of bagasse to fall on the conveyor.

- Modification of casing**

Old Bagasse bale breaker is small in height due to its small height, particles of bagasse are getting spread in near by area which causes breathing problem, Hence to overcome this barrier height of breaker is increased and top side is closes 60%.



V. RESULTS

1. Modified the design of bagasse bale breaker consisting of belt drive, teeth modification and reduced centre distance and maintenance plate that's why the bale brakes into small pieces as shown in figure.



Fig: Unbroken bagasse by old machine



Fig: Broken bagasse by modified machine

2. Belt Drive: Due to belt drive it reduces the capital cost of bagasse bale breaker and gives smooth running and it is free from noise and lubrication. 3. Teeth modification and reduced centre distance:- modified teeth profile and reduced centre distance which breaks the bale into fine pieces as compare to conventional bagasse bale breaker machine. 4. Casing shape:- due to open shape of the casing bagasse spreads in atmosphere and they causes breathing problems to workers but in case of modified casing reduced the problem of bagasse spreading due to aesthetic shape of casing. It gives more safety as compare to conventional bagasse bale breaker

SCOPE:

Due to uneven breakage of bale it causes incomplete combustion of bagasse in boiler. Therefore we are adding new improved arrangement of various parts such that two motor with belt drive and rotor mechanism with inward direction and inclined plates. It produces small particles than previous so it effects on complete combustion of bagasse hence it increases overall efficiency. Production rate of bale breaking is high due to this there is saving of time and money. So considering these points related to breaking of bagasse bale an attempt is made to design and fabricate such equipment's which will able to perform the operation more efficiently and also will results in low cost. Decreases the operational cost by using new mechanism.

- Work reliability under different working conditions.
- Decrease the cost of machine.
- Machine can be operated in small sugar industry.
- Making such a machine which can be able to perform exact operation.

VI. CONCLUSION

By studying and modifying the old bagasse bale breaker, we observe that, modified bagasse bale breaker breaks the bale into small pieces as compared to conventional bagasse bale breaker. Because of this complete combustion of bagasse in furnace is possible and hence efficiency of plant increases.

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