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Vertical Conveyor Machine for Sugarcane Loading

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Abstract: *Vertical conveyors, also referred to as elevator or lifting conveying systems, serve an essential role in the process of sugarcane harvesting and loading. This type of machine is used to lift the harvested sugarcane from the ground level and transport it to other devices like choppers or transportation means. There have various studies concerning bucket, chain or slat conveyors, and belt systems with emphasis on the issues of material handling, losses, and machine performance. Modern approaches also incorporate the application of automated systems and sensors to avoid blockages and ensure better performance. The purpose of this project is to discuss the design and development of a vertical conveyor for loading sugarcane. The designed machine should help to perform tasks efficiently, reducing the need for manual effort. Moreover, the machine will be able to operate effectively in real working conditions. Such design considerations will be reflected in such features as adjustable conveyor angle, solid structure, and efficient drive mechanism*

Keywords: Sugarcane loading conveyor, vertical conveyor machine, sugarcane handling equipment, agricultural conveyor systems, automated sugarcane loading, sugarcane transportation machinery, and vertical lifting conveyor.

I. INTRODUCTION

India has one of the largest sugar industries globally and, hence, plays a significant part in the Agricultural Economy of India and to maintain our competitiveness we need continuous technological improvements in productivity. For the labor-intensive nature of the manual loading of sugarcane and the fact that there is an ongoing shortage of available labor, this has created an ever-increasing demand for cost-effective, mechanized alternatives. Loading sugarcane can either be done manually or via heavy machinery; however, it can often be quite time-consuming and not suited for small-scale farming operations. Therefore, this project is centered around designing a vertical conveyor-based sugarcane loading system that will lift sugarcane from ground level to vehicles (e.g. trolleys or trucks) using a chain mechanism. The designed machine will have the ability to lift the sugarcane to heights as well as operate efficiently in varying field conditions. The machine aims to reduce manual labor, increase the speed of loading sugarcane and increase safety for the worker in the process of loading sugarcane. The main components are a Mechanically operated conveyor system, chain, sprocket, and strong structure to support these assemblies. The system will improve the flow of material resulting in less damage to the crop providing increased efficiencies across the entire operation. Vertical conveyor systems are used extensively in the material handling industry because of their ability to transport products vertically between various elevations or heights. The continuous movement of materials (Sugar Cane) via these systems will reduce the amount of time lost waiting for discharge, which will in turn, increase overall efficiency of the operations. Design of the system will take selection of suitable materials (e.g., Mild Steel) for the Frame and appropriate components for power transmission will ensure that the system has the necessary durability and strength. Additionally, the

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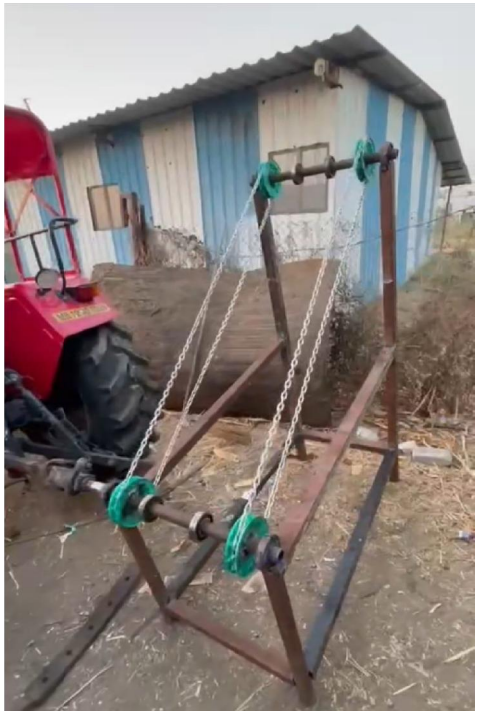
Chain and Sprocket Mechanisms will provide a reliable method of motion and efficient means of transmitting power during lifting operations.



II. COMPONENTS

Link Chian

Fig : 1 Link Chain

Link chains made of steel are strong and long-lasting elements that can perform multiple uses such as lifting, towing and securing the load in an industrial, marine or building environment. Steel chains are made from various materials (stainless steel - grades 304 and 316 - mild steel and/or alloy steel) and come with a high amount of strength, from 20 mm to 150 mm in rod diameter with a good amount of protection from corrosion.

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Hand Wheel (Pulley)

Fig: 2 Hand Wheel (Pulley)

The device known as a "hand wheel" is used to determine the location of a machine's manual control. When combined with either a belt or a chain, it can also be used as a pulley.

Ball Bearing

Fig: 3 Ball Bearing

The NTN Bearing Unit is named for its double-sealed, ball design and is available in many different shapes and sizes for different equipment types. It has a spherical fit between the insert bearing outer diameter and the inner diameter of the bearing housing, allowing for misalignment.

Some NTN products use the exclusive Ball Point Set Screws that provide a firm connection of the bearing unit to a shaft where vibration or impact loads would require that the connection be maintained. Most housing is made from a cast iron material; however, standard is cast iron material and options for other materials such as spheroidal graphite cast iron, structural rolled steel, alloy cast steel including stainless, or resin are available for an additional charge depending on application.

Splined Shaft (PTO)

Fig:4 Splined Shaft (PTO)

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Transmitting power between two components is achieved by using a splined shaft. A splined shaft is a mechanical piece with many grooves (known as splines) that are located on the outside surface of the splined shaft and correspond to the grooves on another mechanical part. The splined shaft's design helps eliminate the possibility of slipping and provides an efficiently transmitting method for transmitting torque between two mechanical parts.

III. WORKING PRINCIPLE

Attach the splined shaft (PTO) of vertical conveyor machine to the PTO gear of tractor. Verify that both are properly attached to each other .Load the sugarcane to the machine. Start the tractor &shaft it to PTO gear. Press the clutch slowly of as it helps to rotate the PTO gear. The rotation of PTO gear helps to rotate the shaft attached to conveyor, then the movement of shaft helps to rotate the hand lever which is attached to chain the all mechanism start moving/rotating with help of shaft rotation. The sugarcane on the chain starts moving upward to fill the trailer.

IV. ACKNOWLEDGMENT

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V. CONCLUSION

In regards to this project I verified that humans are able to endure an increasing number of industrial difficulties, such as in the manufacturing of sugar. In many cases, workers face the risks of lifting and moving heavy loads of sugar cane. These loads are delivered by truck or tractor trailers.. To address this safety concern a new type of device was developed to provide assistance to workers lifting and moving sugar cane onto these transportation vehicles. The new device will give workers a wider range of motion. It has a drive system that allows it to be operated remotely from a fixed point. This application will provide the company very useful and valuable tools to help them reduce labor costs by automating the process of loading sugar cane, resulting in less damage to the crops, and increase production levels. When thinking about using conveyor machines to load sugar cane, there are a lot of possible problems and limitations that need to be thought about. However, because conveyor machines provide significant benefits to sugarcane producers, agricultural services contractors and processors, there is much opportunity for these machines to have a positive impact on the sugarcane industry as it continues to make progress, become more advanced, and become increasingly more successful, while also contributing to greater efficiency, lower costs and improved sustainability.

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