

Design and Fabrication of Pneumatic Sugarcane Bud Chipping Machine

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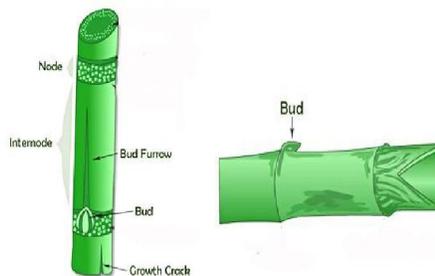
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Abstract: India is an agriculture based country whose 52% population is involved in agriculture. Sugarcane is the raw material for the production of white sugar, jaggery (gur) and khandsari. It is also used chewing and extraction of juice for beverage purpose. About 7.5 percent of the rural population, covering about 45 million sugarcane farmers. In the traditional methods like manual bud cutting with hand knife and bud cutting machine the main limitation is wastage of sugarcane. In this process labour requirement is high and productivity is low. The risk of injury is more. The conventional processes are quite uncomfortable. In pneumatic sugarcane bud chipping machine wastage of sugarcane is avoided by just taking out chips from sugarcane for chipping purposes only one operator is required at a time. In this modern technology productivity is high and more safety is available. Ergonomics is also present so that operator can work for more hour.

Keywords: Pneumatics, Ergonomics

I. INTRODUCTION

The world economy is currently dominated by technologies which rely on fossil energy and this will remain the case for much of the 21st century. Recognition of sugarcane as an important energy crop was recently heightened by the advent of large-scale ethanol production from molasses and directly from cellulose. Sugarcane is one of the most efficient crops in the world in converting solar energy into chemical energy. Sugar cane is the most efficient biofuel feedstock in commercial use today and sugar cane ethanol will contribute to reduce greenhouse gas up to 90% compared to conventional fuels, such as biotechnology (Yadav and Solomon, 2006; Solomon, 2011). Apart from production of sugar and alcohol (biofuel), Sugar industry provides raw material to more than 25 other industrial. The important by products of this industry are acetic acid, butanol, paper, plywood and industrial enzymes (Arecibia, 1998)



There are several methods for sugarcane bud chipping. It is done manually, and also by the use of machines. Manual bud chipping with a hand knife is a common practice. These traditional tools used for bud chipping of sugarcane are unsafe, messy, minimum productive and need skill and training. The risk of injury is also too high. This necessitates the development of an automated sugarcane bud chipping machine. The device, called sugarcane bud chopper, consists of a specially designed blade with a quadrant edge to surgically cut out the buds in a high impact operation, with a clean finish and practically no damage to the cane. "Using this device a person can remove nearly 100 buds in an hour. Handling capacity the machine can also chop the cane into small pieces, is flexible, and can handle various sugarcane sizes and diameters. Machine details The

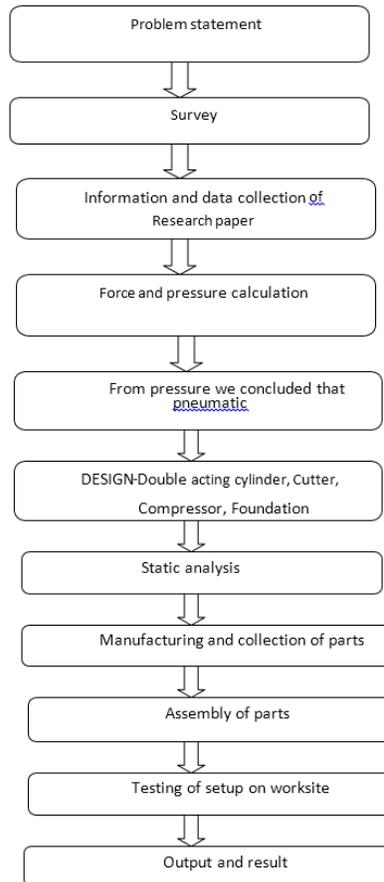


bud chipper consists of a Mounting Frame, the sub-assemblies such as electric motor, worm gearbox, transmitting shaft, chain drive, bearings, and rotor hub and blades arrangements are mounted on the frame.

Sugarcane plays a major role in the economy of sugarcane growing areas and, hence, improving sugarcane production will greatly help in economic prosperity of the farmers and other stakeholders associated with sugarcane cultivation. There has been tremendous awareness in the area of developing “Sugar Complexes” focusing on economic and sustainable utilization of sugar industry by- products. In India, many sugar units have transformed themselves into Sugar-Agro industrial Complexes, producing a variety of chemicals and utility products from sugarcane. Sucrose content is the highly desirable trait in sugarcane as the world wide demand for cost-effective bio-fuels is increasing. Sugarcane’ high efficiency in fixing CO₂ into carbohydrates for conversion into biofuel has a wakened the world’s interest in the crop.

The Indian sugar industry is second largest industry in the country. Generates surplus exportable power through cogeneration there by playing a major catalytic role in the socioeconomic transformation of rural population. It encompasses 599 operating sugar mills, 309 distilleries, 180 co-generation, numerous paper and pulp plants(Solomon 2011b). There will be high demand for sugarcane as a source as a source of biofuel; power and sugar which is going to contribute national economy in a greater way.

In India, for conventional system of sugarcane cultivation, about 6-8 tones seed cane is used as planting material, which comprises of about 32,000 stalk pieces having 2-3 buds. Cane cuttings with one, two or three buds known as sets are used as seed. This large mass of planting material poses a great problem in transport, handling and storage of seed cane and undergoes rapid deterioration thus reducing the viability of buds and subsequently their sprouting. One alternative to reduce the mass and improve the quality of seed cane would be to plant excised axillary buds of cane stalk, popularly known as bud chips. These bud chips are less bulky, easily transportable and more economical seed material. The bud chip technology holds great promise in rapid multiplication of new cane varieties. The left- over cane can be well utilized for preparing juice or sugar or jiggery.



II. METHODOLOGY

This chapter will cover the details explanation of methodology that is being used to make this project complete and working well. Many methodology or findings from this field mainly generated into journal for others to take advantages and improve as upcoming studies. The method is use to achieve the objective of the project that will accomplish a perfect result. In order to evaluate this project, the methodology based on System Development Life Cycle (SDLC), generally three major step, which is planning, implementing and analysis.

III. OBJECTIVE

- The main objective of this project is to perform job holding and cutting operations effectively with high human safety by incorporating a machine with the pneumatic power.
- This project is cost effective for small scale farmers.
- Nowadays almost all the manufacturing process is being automized in order to deliver the products at a faster rate. To achieve mass production, the automation of the predefined tasks is necessary and is made mandatory in the current operating conditions of the industries.
- Sugarcane bud chipping machine used to extract bud for fresh development of bud as a new plant.
- It provides an ideal cut in one single punch which makes this process free from potential loss of time, money and seeds.
- In that context it helps to give better 'ergonomics' to the operator.
- To avoid the wastage of sugarcane during 'sowing'.

IV. PROBLEM STATEMENT

1. The wastage of sugarcane during sowing of bud by conventional method. Lower productivity, having Less safety, high man power required in conventional method. Conventional method of planting sugarcane causes to chip the complete sugarcane into several fragments with buds present at its nodes.

This damages the sugarcane completely and leads to causing loss in the farmer's hands since they are unable to sell their cultivated sugarcanes to the industries such as sugar factories and other industries that use sugarcane as their source of raw material. Tones of sugarcanes are chipped into fragments to utilize the necessary cane buds and the chipped ones rather than used for planting are then sold to the markets at very cheaper rates.

2. It has been observed in rural areas most of the people cut the sugarcane buds manually. This consumes a lot of sugar cane and time to cut the buds. In order to identify this cause we have designed and fabricated the sugar cane bud chipping machine which works on electricity. It reduces about 70% of seeding cost. And get more yield The machine reduces tremendous labour and produces more number of buds in less time. This machine can be easily lifted as it is light in weight. It will prove one of the good ideas for the farmer.

V. CONCLUSION

The project carried out by us made an impressive task in the field of small scale industries related to agricultural activities. After comparing different conventional methods of sugarcane bud chipping we conclude that, pneumatically operated sugarcane bud chipping machine is better to extract buds for fresh development of bud as a new plant. By applying this process we can save the excess loss of time, money and sugarcane. It gives the better ergonomics to the operator and avoids the wastage of sugarcane which is occurred in conventional methods.

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