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Design And Development of Sugarcane Bud Chipping Machine

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Abstract: The sugar industries just buys the sugarcane and it is processed in sugarcane processing machine without removing the sugarcane bud which is used for farming of sugarcane. It is probably Destroyed by crushing and other ways. 80% of sugar is produced with sugarcane worldwide. In inter node cutting operation, nodal parts are cut in pieces and bud is taken out from sugarcane for seedling purpose. What we actually intend to do is resolving the mentioned problem by making an automated machine which will be used to remove the bud of the sugarcane and the sugarcane can be used further by the industries for manufacturing sugar and jaggery. The existing(traditional) tools used for bud cutting are not safe, hard and need skills and training for operating. The risk of injury is also high so it is necessary for development of bud cutting machine for sugarcane. The specially Design blades are prototyped using SS(Stainless Steel Material0 attached. It held great promise in multiplication of new cane varieties.

IndexTerms - conventional, economical, Automated, Stainless Steel

I. INTRODUCTION

India is one of the world's largest producers of sugarcane, producing about 300 million tons of sugarcane a year. Sugar production is the second largest agro processing industry in the country, following cotton and textiles. India has more than 566 sugar mills. About four million sugarcane farmers and a large number of agricultural workers are involved in sugarcane farming and subsistence farming, making up 7.5% of the rural workforce. In addition, the industry provides employment for 500,000 skilled and less skilled workers in rural areas. Agriculture is one of the most important sectors of the Indian economy. Agriculture is the only way of life for about two-thirds of Indian workers. The Indian agricultural sector occupies 43% of the Indian subcontinent, and contributes 16.1% of India's GDP. There are a number of crops grown by farmers, sugarcane is one of the most important commercial crops grown in India. There are several ways to cut sugarcane leaves. It is done by hand, and by the use of machinery. Cutting a manual shoot with a hand knife is a common practice. These traditional tools used to grow sugarcane are unsafe, desert, do not produce well and require skill and training. The risk of injury is also very high. This necessitates the development of an automated sugarcane press. This machine, called the cane stalk, contains a specially designed four-sided blade for the operation of the shoots when performing a powerful, clean and harmless cane operation. Sugarcane cultivation research indicates the need for sugarcane seeds grown in sugarcane. By using a sugar cane chipper the buds can be separated. The device includes a hemispheric knife driven by a hand-operated lever. One needs to place the stick on the platform and press the hand lever. After regular beating the cane needs to be rotated 180 degrees on the other side, peeled stalks can be displayed directly in the field or can be planted in kindergartens. The worker can extract an average of 150 to 200 ounces of buds per hour with a chip chipper machine, which will not meet the requirement for kindergarten buds in a short time. Also, the problem arises when the worker needs to work with the bud chipper continuously to remove the buds, which leads to fatigue in his body. This can lead to a decrease in bud discharge at the end of the day. As this is a seasonal activity, finding skilled workers is very difficult. Considering all the factors it is not possible to meet the needs of later kindergarten stalks to be transferred as seed to grow in the field. This approach therefore does not provide an ideal environment for kindergarten development. Automation removes operators from the workspace. The operator of the machine-cutting machine must see the shoot and must concentrate on cutting it at all times. He should put a shoot in the workplace during cutting stroke. Requires one operator per machine. The automatic cane-extracting machine integrates the sensors to detect the sprout, a transport system to stop the sprout in the workplace and has control over the cutting action. Provides flexibility for operators. He can feed on sugarcane that may have 8 to 10 shoots. It even removes all the shoots so he can be free to work with the next machine. This flexibility the user offers the option to work with a large number of devices in the sequence mode. In an automated sugarcane plant, it is possible to use a flexible production system and remove users. It is possible to use upload and download channels. It © 2022 JETIR April 2022, Volume 9, Issue 4 www.jetir.org (ISSN-2349-5162) JETIR2204047 Journal of Emerging Technologies and Innovative Research (JETIR) www.jetir.org a377 can select sugarcane in many areas and supply the transport system. Later with the help of a sensor and the cutter bud is removed leaving the remaining part. This future development requires the right sensor to focus on this task.

A. Problem Statement

- The old method of cutting node of sugarcane, i.e., by hand is more time consuming. There are many sugarcane cutting machines are available in market, but they are made by using pneumatic, hydraulic or electrical power. Costs of these machines are also more.
- This cost is not economical for small and medium range farmers. Remaining sugarcane is used for feeding for animals like cows.

B. Objectives

- To avoid wastage of sugarcane. Cost efficient for farmer and small laboratory.
- Avoid use of external power like electric power.
- Avoid use of compressor and electricity used in pneumatic or electric sugarcane machine.
- To reduce the human effort to cut the buds from the sugar cane for sowing purpose.

C. Scope

- This Project work has provided us an excellent opportunity and experience, to use our limited knowledge. We gained a lot of practical knowledge regarding planning, purchasing, computing and machining while doing this project.
- It can be utilized by the small scale farmers as it will be economical for usage and it is one of the essential thing in sugarcane farming.
- Now a days many such machine can be found but they either work on electricity or on fuel, electricity will cause a big loss of money and there is scarcity of fuel.

II. DESIGN:-

Computer-aided design is one of the many tools used by engineers and designers and is used in many ways depending on the profession of the user and the type of software in question. CAD is one part of the whole Digital Product Development (DPD) activity within the Product Lifecycle Management (PLM) processes, and as such is used STES`s RMDSSOE Mechanical Engineering Department, Pune-58 17 together with other tools, which are either integrated modules or stand-alone products, such as:

- Computer-aided engineering (CAE) and Finite element analysis (FEA)
- Computer-aided manufacturing (CAM) including instructions to Computer Numerical Control (CNC) machines
- Photorealistic rendering and Motion Simulation.
- Document management and revision control using Product Data Management (PDM).

CAD is also used for the accurate creation of photo simulations that are often required in the preparation of Environmental Impact Reports, in which computer-aided designs of intended buildings are superimposed into photographs of existing environments to represent what that locale will be like, where the proposed facilities are allowed to be built. Potential blockage of view corridors and shadow studies are also frequently analysed through the use of CAD. CAD has been proven to be useful to engineers as well. Using four properties which are history, features, parameterization, and high-level constraints. The construction history can be used to look back into the model's personal features and work on the single area rather than the whole model. Parameters and constraints can be used to determine the size, shape, and other properties of the different modelling elements. The features in the CAD system can be used for the variety of tools for measurement such as tensile strength, yield strength, electrical or electromagnetic properties. Also, its stress, strain, timing or how the element gets affected in certain temperatures, etc

III. COMPONENTS:-

a) HELICAL COIL SPRING:-

Using all the calculation given below 3D modeling is done using CATIA V5

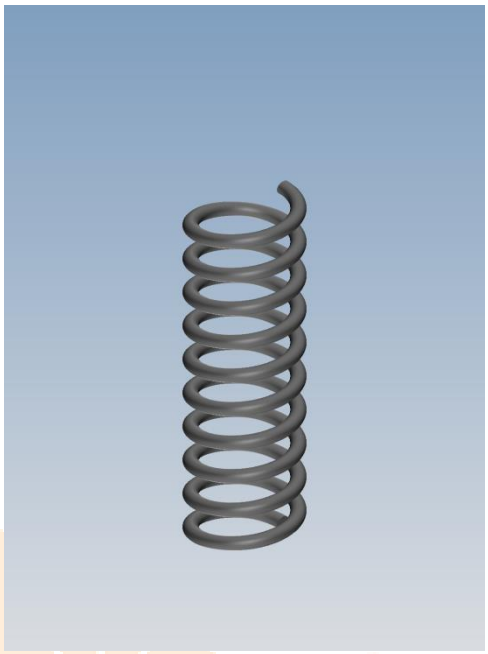

Fig 1: Helical Coil Spring

CALCULATIONS OF HELICAL COIL SPRING :

Outer diameter of the spring D0= 48mm
As per design data book for cold drawn wire steel wire diameterd=6mm,
Inner diameter ofspring,
Di = 48-12 = 36 mm
Calculating the load bearing capacity of spring For any service life,
Spring index C= Do/d = 48/6 =8
C = 8
Then Wahl factor of spring, K= (4C-1)/(4C-4)+0.615/C
For C =8 K= 1.18
Nowto Find load holding by spring P,
P = 618:47N
Thus spring hold the load of 708.54 N remaining load is absorbed by magnet.
Deflection ofspring (δ) can calculate by,
δ =(8PD3N)=(Gd4)
δ = 56:04mm

Spring rate = P= 11N-mm
Springstiffness=K=11N-mm
Number ofturns = N = 17
Asspring has square and ground ends number of Inactive turns=2
Total number of turn, N = 17
Free length of spring,
Lf = solid length + deflection + axial gap
=55+56+0.15(56)
=55+56+0.15(56)
Lf = 120mm:
Pitch of spring = Lf=N
Pitch of spring=13.33mm

b) PEDAL:-

Using all the calculation given below 3D modeling is done using CATIA V5

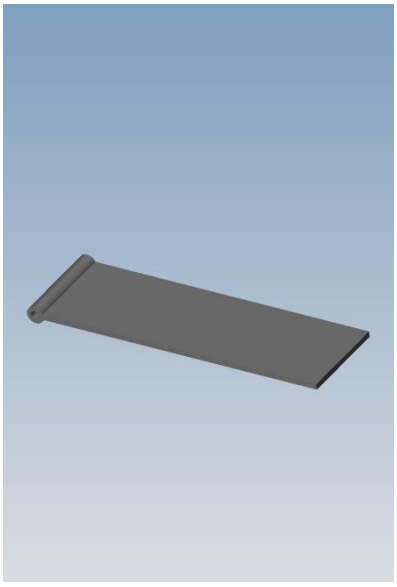

Fig 2: Pedal

CALCULATION OF PEDAL :

Mass to be applied on pedal: 60kg
Force applied: 60x9.81=588.6N
Dimensions of pedal: Length (l)=500 mm
Width (w)=230 mm , Height (h) = 5 mm

M= w x 1 x 1/8= 588.6 *500*500/8= 18,393,750 Nmm

Y=2.5

Ixx = (1/12) (b)(h^3) = (1/12) x (b) x (h x h x h)
Ixx=5.28033x107mm^4
Iyy= 5208.33mm^4

σb= M × y/I= 18393750*2.5/5280.33*107= 81.38MPa

c) ELECTRICAL SERVO MOTOR:

Fig 3: Electrical Servo Motor

CALCULATIONS OF SERVO MOTOR :

Consider weight applied to cut the sugarcane=3kg
So the force applied is equal to =3x9.81N
F= 29.43N
Hence,
the torque required = 29.43x 600 = 17658 N-mm=17.65N-m
So we have selected the motor according the torque requirement.

d) Table:

Fig 4: Table

e) Support Member:

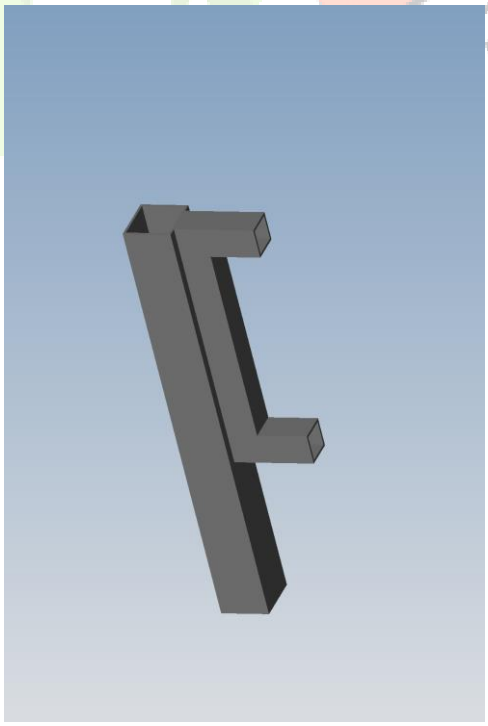

Fig 5: Support Member

f) Central Rod:

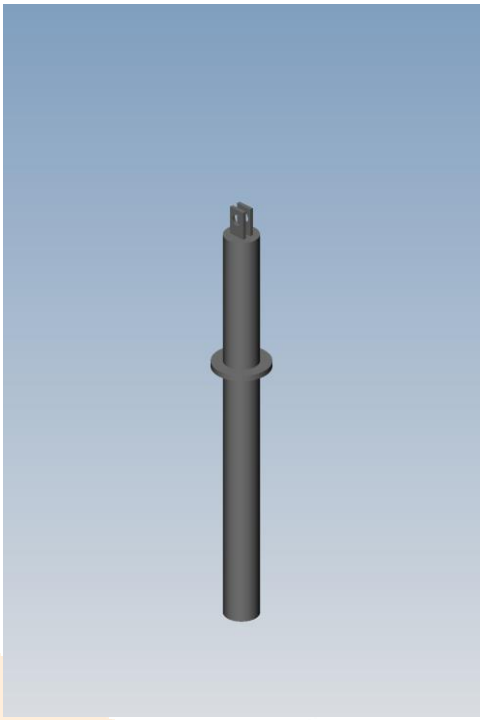

Fig 6 : Central Rod

f) Assembly:

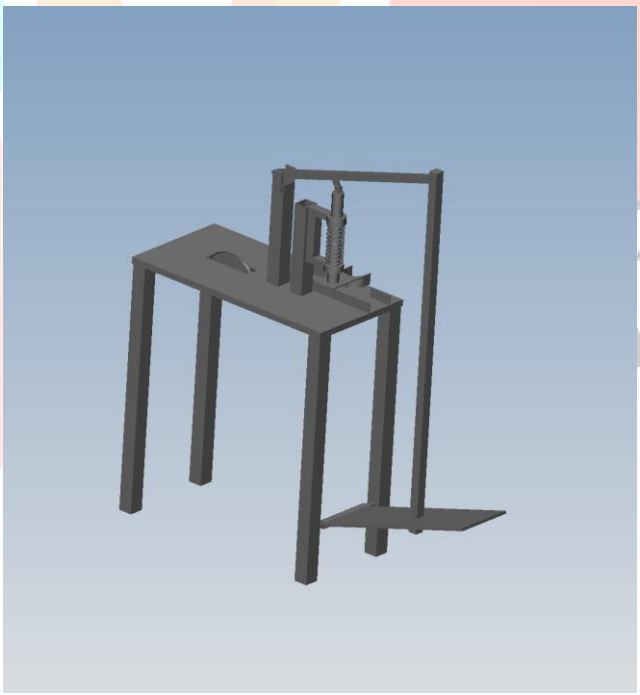

Fig 7 : Assembly

- 1 Horse Power =745.7 watts of electrical power so in theory a 5HP motor operating at 100% efficiency will consume about 3.728kW of power. In one hour, any will use 3728.5 kilowatt-hours. Of course, no motor is 100% efficiency, so the motor will actually consume somewhat more power than this.
- Any pneumatic motor cost around 50000-90000 which is not cost friendly for farmers and the cost for manufacturing is also added in it.
- The Sugarcane wastage made by our project will be near about 0 as compare to other electrical and manual sugarcane bud cutters.
- As our project is farmer friendly there is no need of power we require human effort for it.

IV. CONCLUSION :-

We have successfully Designed 3D CAD model using Catia. We have completed spring calculations and motor calculations for the same. We have calculated the torque required for the motor. We have designed an economical, easy to use, less complicated, time saving machine for the farmers for sugarcane bud chipping without cutting the whole sugarcane.

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