International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056
Volume: 04 Issue: 03 | Mar -2017 www.irjet.net p-ISSN: 2395-0072

DESIGN OF SUGARCANE ROOTS REMOVER

Tamilroja.S[1], Janet.A[2], Karthik.V[3], Ramadurai.K[4]

[1] *Lecturer, Department of Mechanical Engineering,*
Parisutham Institute of Technology and Science (PITS), Thanjavur, Tamilnadu, India.
[2, 3 & 4] *Assistant Professor, Department of Mechanical Engineering,*
Parisutham Institute of Technology and Science (PITS), Thanjavur, Tamilnadu, India.

Abstract : In today's competitive world there is a need for faster rate of production of agricultural products. This project aims to design and fabricate small scale sugarcane roots remover machine to reduce farmer's effort and to increase production of agricultural products. Machine consists of petrol engine and different mechanisms are used in this machine. When compare to manual removal of sugarcane roots by farmers, by using this machine, the work can be done at a faster rate and it is economical. The machine is helpful for both whom having small or big farms.

This Machine is an attachment to the tractor. This is used for collecting the roots after the ploughing is done. This machine consists of a winnower, mesh, conveyor, v-belt and a collector. The conveyor used here is of flat belt type. The conveyor transfers the root from winnower to collector where the roots are being stored and the soil is been deposited back by means of a mesh.

Key Words: **Agriculture, Sugarcane root remover, Fabrication, Petrol engine, Mesh, Conveyor.**

1. INTRODUCTION

Agriculture is the backbone of India. In India almost all farmers facing problems of labour shortage. Day by day labour wages are increasing and in the same way demand of agriculture products are also increasing and today's world need faster rate of production of agriculture products. Before giving a solution, we have to think as a user of the product to find, in a very structural way, a solution, because the project will only be useful if the product answers the need. This is why, it's very important to express the need at the beginning of the project. It's about explicating the fundamental exigency which justifies the design of the product. To do this, it's very essential to wonder three questions: To whom (or what) this product will be useful?, On who (or what) it acts?, For what purpose will we design it. A single person (expert), should be able to operate, the cane roots remover in order to remove the sugarcane roots on the field, depositing the soil back.

1.1 Working Principle of sugarcane roots remover

The Working principle of sugarcane roots remover is shown in fig 1.Sugarcane Roots Remover is attached to a prime mover (tractor).The machine is started using a 2-stroke petrol engine and a chain drive is used to transmit power from the engine to the driving system. The winnower moves over the soil as the ploughing is been done. Most of the soil deposit back through the mesh provided in the winnower shown in fig 3. As more soil accumulates, the roots move to the conveyor which is been driven by means of a V-belt.

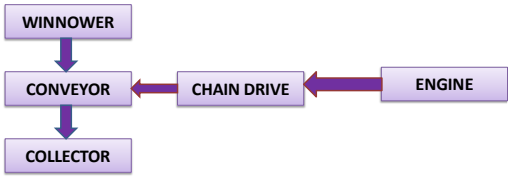

Fig 1: Layout of Sugarcane Roots Remover

The conveyor transfers the root to the collector where the roots are been stored. The heavier soil particles deposit through the mesh provided in the collector.

2. CALCULATIONS

2.1 Design of V-belt

Length of the belt:

$$L = 2C + [\pi/2\ (D+d)] + [(D-d)^2/4C]$$

Substituting the values and solving the equation we get Length of the Belt.

Belt Designation:

Design power $P_d = (F_a * P)/(F_c * F_d)$

Belt speed $S = (\pi * D * n)/60$

Transmitting capacity $KW = (0.79\ S^{-0.09} - (50.8/d_e) - 1.32*10^{-4}S^2)S$

Number of Belts No = Pd/KW

2.2 Conveyor Design

Roller diameter $D = (60*V) / (\pi*N)$

Force on driving pulley $F = \mu Tg\ (m+mB) + gm \sin \alpha$

Belt mass $mB = L*b*t*\rho$

Table -1: Specifications of the components of sugarcane roots remover

Maximum power output	5.2 KW
Speed range	600-1200 rpm
Small- pulley diameter	140 mm
Large pulley diameter	280 mm
No. of belts	1
Length of belt	2800 mm
Roller diameter	160 mm
Roller width	350

These are all the specifications of the components of sugarcane roots remover. Components with these specifications are selected based on the calculations done.

2.3 Bending Analysis of Winnower

A bending moment is the reaction induced in a structural element when an external force or moment applied to the element causing the element to bend.

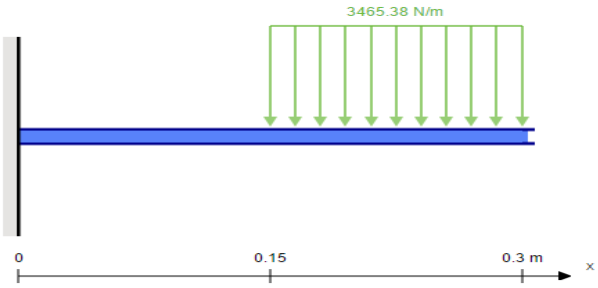

Fig -2: Bending Analysis of Winnower

Basic schematic of bending analysis of the winnower is shown in Fig 2. Winnower is considered as a cantilever beam with a UDL of 3465.38 N/m acting a length of 0.15 m from the origin.

Bending Analysis of Winnower

Area A= l*b

m= ρ A

w=mg

$$\frac{M}{I}=\frac{\sigma}{y}$$

I = bt3/12 b=2t y= t/2

2.4 3-D Modeling

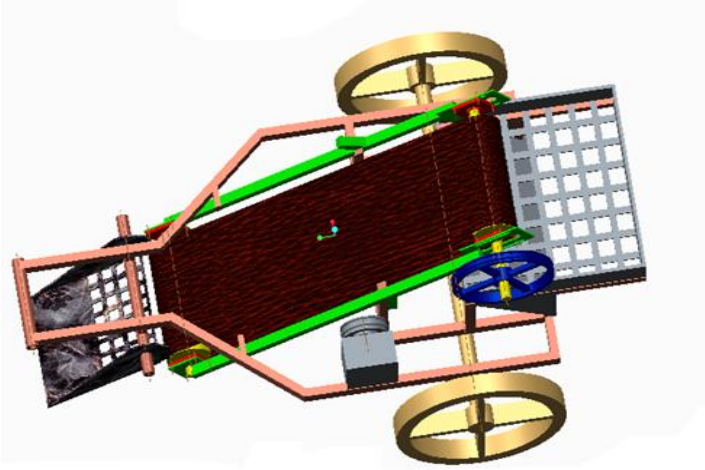

Fig -3: 3D Modeling of Sugarcane Roots Remover

3-D modeling is the process of developing a mathematical representation of any three dimensional surface of an object via specialized software. The isometric view (3-D model) of the sugarcane roots remover is shown in Fig 3.

3. CONCLUSIONS

Any idea when kept in the mind is not so good, hence innovation must be led out of the box to create a powerful change. Positive thinking will overcome the challenges faced. It is with tremendous joy and feeling I put forth that the thoughts were applied and the prototype was made. The initial problem statement of fabricating a project to remove sugarcane roots was a mammoth task. But wheels started rolling weeks earlier and with careful planning and scheduling, the task was accomplished. Our project has fulfilled the need of removing the sugarcane roots before starting a new cultivation. We can look forward to the day when we can see our project in the Agricultural farms of India.

REFERENCES

1. Bansal R K, "Strength of Materials", Lakshmi publications.
2. Battie-Laclau, P.B.; Laclau, J.P. 2009. Growth of the whole root system for a plant crop of sugarcane under rainfed and irrigated environments in Brazil. Field Crops Research 114: 351-360.
3. Costa, M.C.G.; Mazza, J.A.; Vitti, G.C.; Jorge, L.A.C. 2007. Root distribution, plant nutritional status, and stalk and sugar yield in two genotypes of sugarcane in distinct soils. Revista Brasileira de Ciência do Solo 31: 1503-1514. (in Portuguese, with abstract in English).
4. Md. Jalaludeen S, "Design oftransmission Systems", Anuradha Publications, 1998.
5. Prabhu TJ, "Design of Transmission Elements", Mani Offset, 2000.
6. Smith, D.M.; Inman-Bamber, N.G.; Thornburn, P.J. 2005. Growth and function of the sugarcane root system. Field Crops Research 92: 163-189.
7. Taylor, H.M.; Klepper, B. 1978. Role of rooting characteristics. Advances in Agronomy 30: 99-128.