Sugarcane Lifter Mechanism by using Chain Conveyor

Darshan Kothawade[1] Bhavesh Nijai[2] Akshada Gunjal[3] Shrikant Nehe[4] Prof. P M Karandikar[5]
[1,2,3,4]B.E. Student [5]Assistant Professor
[1,2,3,4,5]Department of Mechanical Engineering
[1,2,3,4,5]PREC, Loni, SPPU, India

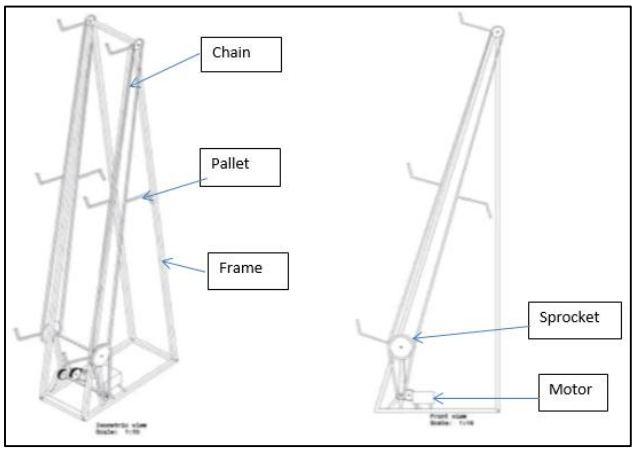
Abstract— This research paper deals with design and development of small scale sugarcane lifting machine to reduce farmer's effort and to increase production of agricultural products of sugarcane at the lower cost which can be affordable to Indian farmers or a group of farmers. In India, farmers are facing problems of labour shortage. Therefore, there is a need of mechanization in the Indian agricultural sector as the agriculture sector is still dependent on labour & hence it is labour intensive. The need for mechanization is increased by the scarcity of workers on account of urbanization and the consequent rise in labour costs. Also, speed is the major factor in the faster rate of production which helps to improve the quality of agriculture products like sugarcane. Sugarcane lifting or loading by a machine has a more capacity to lift the sugarcane faster compared to the manual one. Hence, need of using sugarcane lifter in India is necessary for faster rate of production of sugarcane products as well as harvesters take less time to cut the cane and cuts cane in smaller parts so that it becomes easy to transport with larger amount of quantity in one trolley.

Key words: Sprocket, Chain, Frame, Shaft, Bearing, Motor

I. INTRODUCTION

In the research paper, the following technical solution to the above technical problem: the rack has a top sprocket shaft 1, with the lower portion of the chain wheel shaft 1 and the same vertical plane of the drive shaft , drive shaft and two chains ends are equipped with a sprocket; a chassis and a lower support bar parallel with the drive shaft and the telescoping rod connected to the frame activity, power machine is mounted on the connecting rod and the support bracket telescopic rod ; rack projecting lower portion of the crossbar is connected with the axle of the wheel move. When we look at the world scenario, it is found that the fields of sugarcane are extremely huge compared to the Indian farms and hence they use machines for harvesting instead of labours as it is not possible by the labours to harvest the farm quickly. Therefore, labours for harvesting are very rare case. Therefore it is seen that machines especially for sugarcane lifting have been built & used and they have worked out to be quite successful. There have been attempts made to make use of these lifters in India, however, the attempts turned out to be unfavourable to the small size farms and also land quality of our farms. Hence, till today also very few sugarcane lifters are used for helping in the process even though a need is arising due to scarcity of labourers and an increase in demand for a faster and more profitable output of farmers. The purpose of this research is to design and analyze the strength of sugarcane loader structure based on engineering. The sugarcane loader was designed by the computer aided design. The knowledge is gained from design and development of sugarcane loader structure based on engineering which can be transferred to the entrepreneur for sugarcane loader proceeding. For the strength analysis they considered the range of load of canes to be 10kg to 20kg.

II. WORKING DIAGRAM



III. DESIGN SPECIFICATION

P = Load of sugarcane
T = Max Torque generated due to sprocket wheel. = 7500 N-mm
$R_A = R_B$ = Support reactions.
As per Design data book shaft material is selected Carbon steel C40

C40=> S_{ut}= 580N/mm^2
Yield=>S_{yt}=435N/mm^2 [5]

σ = 145 N/mm2
As per ASME code
{0.3 X Yield strength N/mm^2
0.18 X ultimate strength N/mm^2 }whichever is smaller
0.3 x 330 = 99 N/mm^2 (a)
0.18 x 580 = 104 N/mm^2 (b)
From equation (a) & (b)
Allowable stress value will be 99 N/mm^2
If key ways will provide to shaft then
τ = 99 x 0.75 = 74.25 N/mm^2
Max torsional moment equation is given by

we know,

$$T_e = \frac{\pi}{16} d^3 \tau$$

Where T = 7500 N-mm
By using above equation drive shaft diameter d = 8.02 mm ……(A)
We know that,
Max bending moment equation is given by

we know,

$$M = \frac{\pi}{32} d^3 \sigma$$

All rights reserved by www.ijsrd.com

P = 150 N
The sprocket diameter D = 100mm

$$\sum F_Y = 0$$

As per load condition and farm condition the total load on wheel is considered
RA =150N
The distance we have considered as per component fitment
L = 100 mm
Calculation of bending moment at loading point P,
BM at M = 150 x 100 = 15000 N-mm

we know,

$$M = \frac{\pi}{32} d^3 \sigma$$

Ϭ = 145 N/ mm2 considering factor of safety = 2
By using above equation drive shaft diameter d = 12.85mm (B)
From equation A and B we have selected the diameter of shaft = 20mm considering extra jerk and for safe design.
According to maximum shear stress theory
Equivalent Torque :-

$$T_e = \sqrt{(K_b M_A)^2 + (K_t T)^2}$$

From design data book service factor K_b & K_t = 1.
Equivalent bending moment

$$Me = \frac{1}{2}\left[M + \sqrt{(K_b M_A)^2 + (K_t T)^2}\right] \quad [5]$$

T_e = 16770 N-mm
M_e = 23385N-mm

we know,

$$T_e = \frac{\pi}{16} d^3 \tau$$

we know,

$$M = \frac{\pi}{32} d^3 \sigma$$

$\dot{\zeta}$ = 10.67 < 74 N/mm^2 and
Ϭ = 93.25< 145 N/mm^2

We have checked the allowable shear stress and allowable bending stress and it is seen that the both values are within limit hence design is safe.

IV. ADVANTAGES

- Low fabrication cost.
- Reduces labour and overall cost
- Easy Construction.
- Economical One.
- Can be built up to various capacities easily.
- Low maintenance cost.
- Less time consuming

V. CONCLUSION

The paper introduces a new mechanism for opening and closing of gate using Power Screw. It has advantages of being operated without manual interference, high load carrying capacity, high speed, long life. The gate is simple in construction and easy to manufacture. Use of remote control is eliminated and opening and closing of the gate is totally automatic.

REFERENCES

A. Research Papers:

[1] K.Meetan,P.Karin, T.Luckanawat. "Design and simulation of sugarcane loader structure",Journal of research and application in Mechanical engineering,Vol.5, No.1, 30-41 (2017)
[2] 2. Mr. Santosh Kumar Bawage, Ajinkya Mane,Akshay Indore. "Design and development of mini sugarcane lifter",IJARIIE-ISSN(O)-2395-4396 Vol. 4 Issue March, (2018)
[3] Jagtap M. D., Pawar P. M.,Gaikwad B. D. "Study of roller conveyer chain strip under tensile loading",IJMER Vol. 4 Issue 5 (2014) .
[4] Santosh Kunnur, K. K. Ganganallimath,(2013)"design of sugarcane lifter mechanism by force analysis" Vol-25,No.2, International Journal Of Research And Application In Mechanical Engineering.

B. Reference Books:

[5] R.S.Khurmi, J.K.Gupta, "Machine design pub-Eurasia publishing house pvt.ltd"
[6] V.B. Bhandari Design of Machine Element 3rd Edition. Tata McGraw-Hill (2010).

All rights reserved by *www.ijsrd.com*