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DESIGN AND DEVELOPMENT OF CORN CHAFF PEELING MACHINE

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Abstract-*since there are more maize peeling techniques in India which are used in our day to day life. The main problems with these techniques are that they are getting more loss in production rate because of using old methods. So now day's farmers are required to use the new techniques to increase the production rate and also reduce the man power. But these machines are not affordable to farmers who are having fewer amounts of farms and which not require these big machines. Many farmers in India not have lot of money to invest for purchasing the machines because of their cost. So most of the farmers are resort to use hand operated method or old methods which gives low profit, more damage of corn seeds from cob, which is very oasis work. Since inventions is going on machines which reduced the work for farmers and also provided the saving of cost. These machines are automatic operated, fuel consumption. So by sing the relation of man machine system which establish the simple mechanical design.*

Key words- *peeling, corn, machine, technique, cob, farmers.* ,

I. INTRDUCTION

In today's growing world man's innovative ideas cross the boundary of the nation in all directions about the safety and production in all industrial sectors. Peeling chaff/Threshing/Shelling/Corn, leaves is the process of removing the leaf from the corn cob. It is the process of separating the leaf from cob before harvesting because the corn seeds are attached to the corn cob which is hard. So if we remove the leaf the corn seeds get easily dry with in less time which provides less time to shelling the corn seeds. Most of the farmers in our nation having less amount of farm so these farmers get more difficulty of labour cost and alien corn peeler cost. Some machines are good for these type of work, but more costly where some are what hazardous methods, but the amount of money and time required for the invention of the device or the performance of its operation quality is very much important, and its utility and operational efficiency that are very much important in making the device.

Corn crop is another world's largest resourceful seed crop. The techniques used in old days are removing the leaf by hand or by chopping the corn by wooden rod. In this process the kernels is get damaged and the rate of production get reduced. Thus, the mission for a satisfactory removing of the leaf of corn is important to the small and even small size farmers in the country. Now a day's a few motorized industries, PTO operated machines have come into market but their prices of the machines are not affordable to the farmers. So the low cost designed machines should be developed for removing the corn leafs, which have been help for farmer to get more production.

II. 1CORN PEELING MACHINE DESIGN AND DEVELOPMENT

Figure 1.Corn Peeling Machine

A) Parts:

This device consists following parts

1. Stand

2. Pulleys
3. Belt
4. Motor
5. Gears
6. Rollers
7. Screwed shaft

B) Selection and design criteria:

General requirement of machine design-

1. High efficiency
2. Minimize the cost
3. Simple in design
4. Easy to operate
5. Safe to operate

C) Design procedure for this product is given below –

1. 1. Find out the problem regarding to the agriculture field.
2. Make a detail statement of the problems.
3. Determine possible mechanisms which are used to give the motion to the product.
4. Select the one best mechanism for the product.
5. Preparing the rough sketch or layout of selected mechanism.
6. Design the each elements selected in mechanism that means find out the forces
7. And stresses acting on it. Also determine the failure criteria for the elements.
8. Select the suitable material for the each element of the product.
9. Determine the standard dimension of elements with proper factor of safety and modify if required.
10. Prepare the actual drawing of each component and assembly of this component with all the specification i.e. material, surface finish, tolerances and machining symbols.

III. Design calculation

A) Design of shaft

When designing our attachment, the following considerations were taken into account

1. The device should be suitable for local manufacturing capabilities.
2. The attachment should employ low-cost materials and manufacturing methods.
3. It should be accessible and affordable by low-income groups, and should fulfill their basic Need for mechanical power
4. It should be simple to manufacture, operate, maintain and repair.
5. It should employ locally available materials and skills. Standard steel pieces such as steel plates, iron rods, angle iron, and flat stock that are locally available should be used. Standard tools used in machine shop such as hack saw, files, punches, taps & dies; medium duty welder; drill press; small lathe and milling machine should be adequate to fabricate the parts needed for the machine.
6. Excessive weight should be avoided, as durability is a prime consideration

The corn load and machine hollow rollers load = 25 kg = 250N

The screwed dimension or diametric radius = 100mm

Total torque on crank = 250 x 50 = 12500N-mm

$P=\frac{2\pi NT}{60}$

Speed required in the range 150 to 300rpm

P = 392 watt

So we have selected 0.5hpmotor.

Motor power = 5 watt

Motor speed = 1440 rpm

Motor supply 230 V single phase

T = Max Torque generated to rotating Crank

б = 145 N/ mm2 considering factor of safety = 4

As per Design data book shaft material is selected Carbon steel C40

$C40 \Rightarrow Sut = 580\ N/mm^2 \quad Yield = 435\ N/mm^2$

σ = 145 N/mm2

As per ASME code
0.3 X Yield strength N/mm2
0.18 X ultimate strength N/mm2} whichever is smaller
0.3 x 330 = 99 N/mm2 …….(a)
0.18 x 580 = 104 N/mm2 ……..(b)
From equation (a) & (b)
Allowable stress value will be 99 N/mm2
If key ways will provide to shaft then
τ = 99 x 0.75 = 74.25 N/mm2
WE know that

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

Where T = 12500N-mm
By using above equation drive shaft dia d = 9.33mm …….A

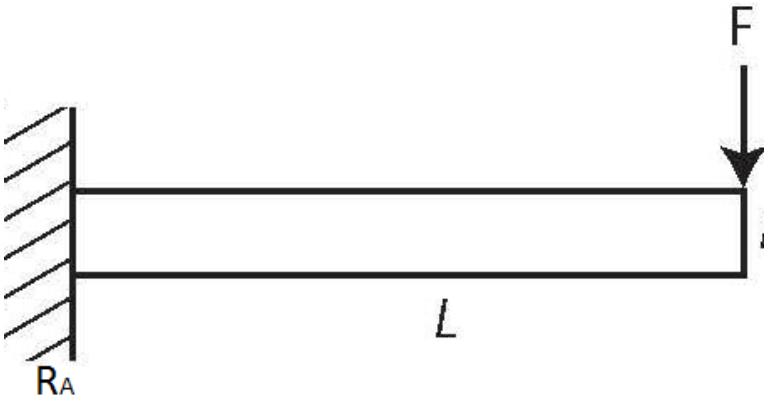

Figure 2.Drive shaft loading condition.

P = 1000 N

$$\sum F_Y = 0$$

RA = 1000
Calculation of bending moment at loading point P,
BM at M = 1000 x 50 = 50000N-mm
We know,

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

б = 145 N/ mm2 considering factor of safety = 4
By using above equation drive shaft dia d = 15.49mm ……..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

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

For design data book
Equivalent bending moment

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

Te = 116297 N-mm
Me = 83148 N-mm
WE KNOW WE KNOW

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

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

ζ = 73 < 74 N/mm2 and

ϭ = 105 < 145 N/mm2
By using above equation 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.

B) Selection of bearing :-

$$\frac{F_a}{F_r} = 0 \leq e$$

So, x=1 AND y=0
Equivalent dynamic load

$$P = XF_r + YF_q$$

P = RB = 1000 N
Life in hrs. = 10000 hrs.

$$L = \frac{60nL_h}{10^6}$$

L = 36 millions of rev
Dynamic load capacity

$$L = \left(\frac{C}{P}\right)^{\emptyset}$$

a = 3 for ball bearing.

From SKF bearing catalogue we have selected the bearing static capacity for shaft dia 20mm = Co = 2.32 KN
From above equation = C = 360 N

So calculated dynamic capacity C < bearing catalogue dynamic capacity C = 4.32KN
Hence from catalogue bearing selected = 61204

IV. FABRICATION

1. Square bar:
   Material= mild steel
   Operation=cutting, welding and drilling.
2. Shaft (hollow):
   Material=mild steel
   Operation=cutting
3. Metal plate:
   Material=mild steel
   Operation=cutting, welding
4. Pulleys:
   Material=casting
   Operation=fitting
5. Bearing:
   Material=grey casting
   Operation=fitting

V. ADVANTAGES AND DISADVANTAGES OF PAYBACK METHOD
VI.

A) Advantages:
1. An investment project with a short payback period promises the quick inflow of cash. It is therefore, a useful capital budgeting method for cash poor firms.
2. A project with short payback period can improve the liquidity position of the business quickly. The payback period is important for the firms for which liquidity is very important.
3. An investment with short payback period makes the funds available soon to invest in another project.
4. A short payback period reduces the risk of loss caused by changing economic conditions and other unavoidable reasons.
5. Payback period is very easy to compute.

B) Disadvantages:
1. 1The payback method does not take into account the time value of money.
2. It does not consider the useful life of the assets and inflow of cash after payback period.

C) Application
Thismachineis used
1) Used in agriculture sector
2) Used in the mills
3)It is helpful to the small scale farmers.

VII. FUTURE SCOPE OF THE PROJECT

The real challenge to execute the design and fabrication problems along with the cost constraint related to small scale farmers. The machine has a great scope in the agricultural industry, and easy for use for unskilled labors, the cost is moderated and simple design. By using this machine pay back cost in less period of time.
By using a part delving system provide a same size of corn to the hopper with the help of special arrangement of the conveyor system.

VIII. CONCLUSION

The peeling machine has been designed, developed and fabricated for reduce the efforts of Indian farmers. The peeling machine was tested in the fabrication shop and later taken to the field. It worked smoothly in the field conditions and gives an output of 60kg/hour. The leaf discharging mechanism is effective and the corn leaf is discharged very easily. For commercial purposes one can improve the efficiency of the machine by increasing the size of the machine. By applying multiple head increases the production rate.

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