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DESIGN AND FABRICATION OF SOLAR POWERED GROUNDNUT SHELLER MACHINE

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ABSTRACT

Groundnut contains a better importance during this world as an oilseed crop. Seeds contains the rich measure of consumable oil (42-55%) and Protein (26-29%) for us and Fodder for the creatures. Our country is facing the problems within the assembly of groundnuts. Less no. of processing machines to be used is that the key drawback. In market we could find a no. of groundnut shelling machine with larger sizes, higher cost and mostly for non-domestic applications. The machines are best fitted to production. Therefore, it is necessary to style and fabricate the groundnut shelling machine. All the forces, factors and engineering principles are taken into consideration while designing the varied a component of the machine. The specific structure of this undertaking improves the isolating proficiency and limits the mistakes. It contains hopper, crushing chamber, hand operated with handle, Crushing mechanism, frame, pulley, belt, bearings and nut & bolts. The machine is straightforward to require care of and operate.

Keyword: groundnut, crushing chamber, crushing mechanism, solar operated etc

I. INTRODUCTION

The serious issue in groundnut creation in nation like India is that the absence of groundnut preparing machines accessible to ranchers. within the beginning the peanuts were separated from its shells by the workers. The output from this method was very less and will not satisfy the market demand because it was very time-consuming process. This project is principally on the point of remove the barriers while removing the groundnuts with the assistance of alternative energy. The average kernel price is approximately twice the value of pod. Absence of groundnut preparing machines, particularly groundnut Sheller, might be a significant issue of groundnut creation, particularly in our nation India. inside the starting the peanuts were isolated from its shells by the laborers. They just decoct the groundnut by their hands and separate the peanuts from its shell. The output got from this method, was very low and it doesn't fulfill the market demand because it had been very time consuming process. The study of producing was important for this project. during this venture elective vitality I utilized , the strategy for planning the different pieces of this shelling and isolating machine thinking about all powers and ergonomic factor for individuals. to use, This project is principally about generating a replacement concept of groundnut shell (crush) that may make easier to move anywhere and suitable to crush groundnut. After the look has completed, it had been transformed to its real product where the look is employed for guideline. a straightforward hand operated groundnut Sheller machine contains a semi-cylindrical form closed on either side. Toward one side shaft conveying a switch and which is fixed over the focal point of the semi chamber.

II. LITERATURE SURVEY

ShubhamDeshmukh et.al, designed and fabricated the machine with the output shelling rate of 400kg/hr. It has 95.25% of shelling productivity and 91.67% of isolating proficiency. Engine, principle pulley, input shaft, yield shaft, fork, base plate, flywheel, almond couplings are the part of the machines. The materials used for the machine is affordable and simply available. the load of the machine is additionally low and it carries with it the hopper, crushing chamber, separation chamber and also the blower unit. Kulbhushan M. Shejole et.al, designed and fabricated the pedal operated groundnut crusher. it's a manual process where the groundnuts are faraway from shell. The pedal is employed for the movement of the crusher. there'll be no energy consumption and also the cost of production is a smaller amount. it's less maintenance cost. Ashish S. Raghtateet.al , designed and

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fabricated a groundnut sheller machine. it's rock bottom and five experiments were performed with peanuts. Since this machine is formed for tiny businessman or for farmers, therefore the work administered by this machine is a smaller amount. The decocting procedure of groundnut by this machine is more conservative and quicker than manual procedure or different procedures. "GROUNDNUT SHELLER MACHINE" will spare the enormous time, vitality labor and spare money related contribution of the venture, diminishing the cost and time extensively which is that the foundation of the current world economy. TusharWalke et.al, designed and fabricated the groundnut machine which is electrically operated. The working of the machine is power provided to engine it turns the roller. Groundnuts are provided in pulverizing load through container and that they get squashed between Semicircular net and furthermore the roller. Thus, the bottom nuts are faraway from the shell. Ikechukwu Celestine Ugwuoke et.al, designed an electrically powered groundnut shelling machine. The machine was created utilizing materials that were sourced locally. It are often used for both domestic and industrial purposes. The advantage to be derived from the employment of this machine far outweighs its shortcomings. The test outcome indicated that the machine can shell a total of 400kg of groundnut in 60 minutes.

III. METHODOLOGY

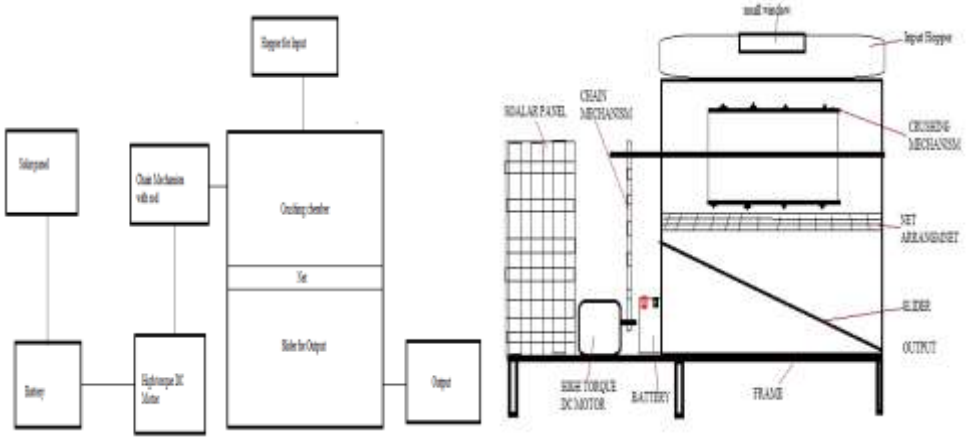

Figure 1: BLOCK DIAGRAM

IV. WORKING

Groundnut is developed for little scope ranchers in creating nations like India. the ordinary part cost is around double the estimation of unit. Absence of groundnut preparing machines, particularly groundnut Sheller, could be a significant issue of groundnut creation, particularly in our nation India. A research-work for design, fabricate, and performance evaluation of a Solar powered groundnut Sheller consisting of feed hopper with a rate control device, shelling unit, separating unit and facility. The exhibition of the machine was assessed as far as throughput limit, shelling productivity, material effectiveness and mechanical harm. Relapse models that would be acclimated express the connection existing between the Sheller execution records, case dampness substance and feed rate were set up. This paper describes about the look of varied components of groundnut Sheller machine. Hence during this design of varied parts are necessary, and style of varied parts thanks to which the look quality of these parts are going to be improved. By and large, this task includes forms like structure, creation and collecting of different segments and so on. The different parts utilized within the machine are: hopper, solar battery, shaft, beater(roller), strainer, hand worked component, pivots, Plummer square, L edge, nut and screw. The dry groundnuts are poured within the container. From the container the groundnuts give way into the devastating load. Smashing chamber comprise of turning mixer and also the stationary sifter. the essential separation between the mixer and sifter is of 10mm. Groundnuts gets shelled after they are connected of the blender and also the sifter. The shelled groundnut blend falls within the isolating load, where the nuts and shells get isolated. Denser nuts, falls therein plate while the lighter shells are

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covered through an outlet. The plate is put underneath the restricting chamber which wavers by the keen bring structure back. The escaped from shells from the secluding chamber are removed when nuts are briefly taken care of within the faltering plate. The groundnuts are accumulated once the plate is full. Diverse pitch distance across hand worked system drive is employed to run the blender, the devastating instrument by dc motor controlled

V. CALCULATIONS

- **Solar Panel Calculation:**

$$I_{pv} = E_i / (V \times H)$$

Ipv, photovoltaic current = total current required to charge the battery from the solar panel

Ei= input energy to the battery

V = system voltage = 12V

H = peak sunshine hour, the average number of hours the solar energy can be captured. H = 5hrs.

Thus

Ipv=4395.06/ (12 x 5)

= 73.25Amperes.

In order to compensate for the losses due to the inefficiency of the solar panel,20% of Ipvis added so that

Ipv= 73.25 + (0.2 x 73.25) = 87.9A.

With a solar panel of the above rating, the peak or open circuit voltage, VP = 12V , 25w.

- **Determination of Crushing Power to Break the Pod-** Considering a single spike, the torque required to drive the system may be obtained from the following expression:

$$T = n_a \times n_s \times F \times r \quad (1)$$

Where, n_a = number of active anchor at a time = 5

n_s = number of spike per anchor = 7

F = force per spike required to break the groundnut pod

r = distance from the axis of rotation to the point of action of the force = 0.11m a n s n F r

The average force required to break the groundnut pod is 2N. From equation (1), we get

$$T = 5 \times 7 \times 2 \times 0.11 = 7.7 Nm$$

The power required in breaking the pods in the shelling chamber may be obtained from

$$P = T \times \omega_2 = T \times \left(\frac{\pi \times N_2}{30} \right) \quad (2)$$

Where, N_2 = speed of rotation of the driven shaft = 240rpm 2 N

From equation (2), we get

$$P = 7.7 \times \left(\frac{\pi \times 240}{30} \right) = 193.52\ W$$

- **Determination of Spike Diameter -** The loading on each spike is taken to be that of a concentrated intermediate load on a cantilever. Hence the deflection on it is

$$y = \frac{F \times a^4}{8 \times E \times I} (a - 3 \times l) = \frac{64 \times F \times a^4}{8 \times E \times \pi \times d^4} (a - 3 \times l) \quad (3)$$

From equation (3), we get

$$d = \sqrt[4]{\frac{8 \times F \times a^4}{E \times \pi \times y} (a - 3 \times l)} \quad (4)$$

Where, d = spike diameter

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y = deflection = -5×10^{-10} m

E = modulus of elasticity = 200×10^{9} N/m^2

a = radius of the spike = 0.01

l = length of the spike = 0.02m

$$d = \sqrt[4]{\frac{8 \times 2 \times 0.01^{4}}{200 \times 10^{9} \times \pi \times (-5 \times 10^{-10})}(0.01 - 3 \times 0.02)} = 2.99\,m$$

A diameter of 4mm was selected for use.

- **Determination of shaft diameter-** For a solid shaft having little or no axial loading, the shaft diameter may be determined from the following ASME code equation [7]:

$$D^3 = \frac{16}{\pi \tau_{max}}\sqrt{(k_b M_b)^2 + (k_t M_t)^2} \quad (5)$$

Where, D = Shaft diameter

τ_{max} = Permissible shear stress

M_b = Maximum value of bending moment

M_t = Maximum value of twisting moment

k_b = Combined shock and fatigue factor applied to bending moment

k_t = Combined shock and fatigue factor applied to twisting moment

The maximum permissible shear stress may be taken as 42 MPa for shafts with allowance for keyways.
For suddenly applied load, and . From equation (5),

we get k_b =0 .2 and k_t = 5 .1

From equation (19), we get

$$D = \sqrt[3]{\frac{16}{\pi \times 42 \times 10^{6}}\sqrt{(2.0 \times 4.74)^2 + (1.5 \times 7.7)^2}} = 12.19\,mm$$

A standard size of 25mm was selected.

- **Calculations for sample of groundnut**

1) Decorticating efficiency = (Qs/Qt)x100

= (1.184/2) x100

= 59.2%

2) Material efficiency = (Qu/Qu+Qd)x100

= (1.074/1.074+0.110)x100

=90.70 %

3) Mechanical damage = (Qd/Qu+Qd)x100

= (0.110/1.074+0.110)x100

= 9.29 %

4) Throughput capacity = (Qs/Tm)

= (1.184/147) x100

= 48.32 %

The hand operated groundnut decorticator is ready for decorticating of groundnut. The above results show that our machine can decorticate 59.1 % groundnut with 9.29 % damage. The hand operated groundnut decorticator machine capacity is 48.32 kg per hour.

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VI. CONCLUSION

In view of it's inferred that, the manual hand worked groundnut decorticator machine is best decision to utilize rancher instead of engine worked. The machine is hand operated in order that there's no energy consumption which wills helps to scale back the value of productions. This machine also saves time and manpower. If we last continuous work we got the next output in very short time. The procedure of this technique is extremely simple, so there's no skill labour required to work a machine.

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