International Journal of Research and Innovation in Engineering Technology ISSN: 2394 – 4854
Volume: 01 Issue: 12 Pages: 13 – 18

IJRIET

FABRICATION OF COCONUT HUSK REMOVER WITH SHELL CUTTER

Nagarajan.N[1], Sundararajan.P.N[2]
[1]Assistant Professor, SVS College of Engineering, Coimbatore
[2]Assistant Professor, SVS College of Engineering, Coimbatore
E-mail-ID: [1]nagu.sajana@gmail.com, [2]sundar.mts@gmail.com

Abstract

This project is to fabricate a coconut husk remover with shell cutter. At present coconut husk is being removed manually, which employs more time and more manpower. This coconut husk remover peels off the coconut husk from coconut fruit to obtain de-husked coconut fruit via pneumatic controlled de-husking device. An operator is required to handle the machine during the de-husking process. It can be used to de-husk both matured coconut and young coconut. This project consists of pneumatic cylinder, solenoid valve, linkages, husk remover and base frame.In this there are two main parts are there. One part is for removing the husk from the coconut and the other is cutting part. In both parts, pneumatic systems are used. The husk is removed with the help of hinge joint which connects to the pneumatic actuator. By connecting these two parts we fabricated as "coconut husk remover with shell cutter".

Keywords: Production of Antimatters, Preservation, Warp Propulsion System.

1. INTRODUCTION

This new proposal claims a new method that gives an easier and safer method to process a coconut which removes the husk and breaks its shell. It is much better than the earlier method by using knives which are harmful to the person and it needs more time. We have put forward this proposal in order to avoid those drawbacks of the earlier methods. By this new method we can remove the husk without producing any stress and also remove the shell in a very safe way. Coconut is the “tree of heaven”, provides many necessities of life including food and shelter. It is mainly cultivated for its nuts; it yields oil, oil cake and fiber. Water from tender coconut is a common refreshing drink and has been used as an excellent isotonic in several tropical countries. It is not only a thirst-quenching liquid, but also a mineral drink, which is beneficial to human health (Poduval et al., 1998). It contains traces of proteins, fats, and minerals like Na, K, Ca, Fe, Cu, P, S, Cl, vitamin C, vitamins of the B group like nicotinic acid, pantothenic acid, riboflavin and biotin. Coconut water contains organic compounds possessing healthy growth promoting properties. It carries nutrients and oxygen to cells, raise the human metabolism, boost human immune system, detoxifies and fight viruses, control diabetes and also aids the human body in fighting against viruses that causes flue (Poduval et al., 1998).

The pneumatic type remover is a mechanical device which is widely used in agricultural works. The pneumatic husk remover for agricultural purposes reduces the time of the man (operator) in removing the husk and also shell removal. The reason for the development and the introduction of the pneumatic husk remover with shell cutter for agricultural purposes is given below. The pneumatic husk remover for agricultural purposes is one of the improved devices.

2. SCOPE OF THE PROJECT

This proposal is a new step to the future, because at this 21st century people are looking for an easier method to do jobs. This proposal is just put forward to reduce the human effort and to save the valuable time. By applying this method lots of time gets saved and more output is obtained. Our proposal is mainly based on the coconut oil refineries, nowadays these refineries are using human labour for processing coconuts. Anyway, they need human to remove the coconut husk and to break the shell.

By the implementing this method the human effort will get reduced. By manual method there are chances of accidents, by using this method the safety problems will be solved. This is a permanent set up, so that saving money is possible. For workers, we have to give daily wages, this machine does not need that, all it needs is a proper care and service, which should be carried out once in a week. This will maintain the efficiency of the machine.

This machine needs less than half a minute to do all process. So the production rate will get increased and also the economic value also gets increased. This machine is not huge, so it needs less space, but we have to keep it in a proper place.

3. NEW PROPOSED DESIGN

The new proposed design if depicted in the below figure with description.

Part – I

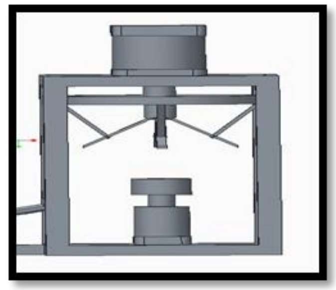

Figure: 1 Husk removing part

This part is needed for removal of husk from the coconut. In this there are two pneumatic actuators. One is placed at the bottom of structure, it's for Holding the coconut and another one is placed on the top of the structure connected with hinge joint for peeling the husk.

In hinge joint there are five linkages used for de-husking the coconut. These are operated with the help of pneumatic actuators. The actuations are controlled by the 5/2 DC solenoid valve. After the de-husking process the coconut shell is taken to the next stage.

Part – II

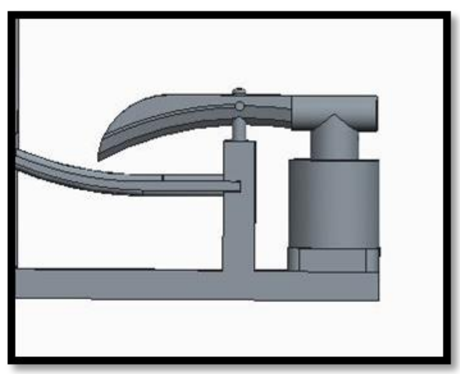

Figure: 2 Coconut Cutter with pneumatic actuator

This part is used for cutting the coconut shell. Here one pneumatic actuator is being used. For cutting operation the knife is attached to the pneumatic actuator. When the pneumatic actuator is actuated, the knife comes down with high force, breaking the coconut into two.

Characteristics	Dimension (mm)
Height(H)	179.7+_5.3
Diameter(D)	160.2+_5.6
Shell height(h)	99.3_+ 4.2
Shell diameter(d)	105.3+_6
Vertical height b/w shell & stem (b1)	45.4+_5.2
Vertical distance b/w shell & fruit base	32.7+_2.5

Table: 1 Coconut specifications

S.No	Weight of coconut (kg)	Force required for cutting(N)
1	2.5	579
2	1.75	491
3	2	476
4	1.5	456

Table: 2 Force required for cutting

8. DESIGN CALCULATIONS

Design calculation for pneumatic cylinder (100 x100)

Mini pressure applied in the cylinder (p) = 3 kgf/cm^2

Diameter of the cylinder (D) = 50 mm

Stroke length = 100 mm

Area of cylinder (A) = $\pi/4*(D^2)$

= $0.785*(0.100^2)$

= $7.85x10^{-3}$ m^2

Force exerted in the piston (F):

Pressure * applied area of cylinder Force

$(2.94x\ 10^5)(1.96\ x10^{-3})$

288.68 N

For lifting one kg weight, the force required is given by,

Force = m x a

1 x9.81

Force = 9.81 N

And the pressure required for one pneumatic cylinder to lift I kg is given by,

Pressure, P = Force/ Area

= 9.81 /7.85x10^{-3}
= 1249.68 N/m2

Pressure = 0.012496 bar

Maximum load in the cylinder,

Pressure*area

1249.68 x 7.85 x10^{-3}

Maximum load in the cylinder = 9.80 N

Total load in the cylinder = m x a

9.80 x 9.81

Total load on the cylinder = 96.13 kg

Design calculation for pneumatic cylinder (50 x100)

Mini pressure applied in the cylinder:

p= 1.5 kg f/cm^2 = 1.47 x 10^5 n/m^2

Diameter of the cylinder (D) = 50 mm

Stroke length = 100 mm

Area of cylinder (A) = (3.14/4*(D^2))

= (.785x(.050^2)

= 1.96 x10^{-3} m^2

Force exerted on the piston:

F = Pressure applied * Area of cylinder

Force (F) =(1.47 x 10^5 n/m^2) * (1.96 x$10^{-3}$$m^2$)

F = 288.68 N

For lifting one kg weight, the force required is given by,

Force = m x a = 1 x9.81 = 9.81 N

And the pressure required for one pneumatic cylinder to lift I kg is given by,

Pressure,(P) = Force/ Area

= 9.81 /1.96 x10^{-3}

= 4998.72N/m2

Pressure,(P) = 0.0499872bar

Maximum load in the cylinder = Pressure*Area

= 4998.72 x 1.96 x10^{-3}

Maximum load on the cylinder = 9.79 N

Total load in the cylinder = m x a

= 9.79 x 9.81

Total load on the cylinder = 96.03 kg

Design calculation for pneumatic cylinder (32 x100)

Mini pressure applied in the cylinder (p)

p= 2x10^5N/m^2

Diameter of the cylinder (D = 32 mm

Stroke length = 100 mm

Area of cylinder (A) = (3.14/4*(D^2))

= (.785x.032^2)

= 8.0384 x $10^{-4}$$m^2$

Force exerted on the piston (F):

Pressures applied * Area of cylinder

Force = (2 x 10^5) x(8.03 x 10^{-4})

Force = 160.68 N

For lifting one kg weight, the force required is given by,

Force = m x a = 1 x 9.81

Force = 9.81N

And the pressure required for one pneumatic cylinder to lift I kg given by,

Pressure, P = Force/ Area = 9.81 /8.03 x10^{-4}

Pressure, P = 12203.92 N/m2

Pressure = 0.1220392 bar

Maximum load in the cylinder = Pressure x area

= 160.68 N

Total load in the cylinder = m x a

= 160.68 x9.81

= 1576.27 kg

9. COST ESTIMATION

Material Cost

Mild steel (squire pipe) = 1,200

MS Solid rod = 300

Pneumatic Actuator (100*100) = 3,620

Pneumatic Actuator (50*100) = 2,450

Pneumatic Actuator (32*100) = 1,650

5/2 DC Solenoid Valve (3 Nos) = 3*500

= 1,500

Knife = 220

Flexible hose (PU) 8 Meter	= 8*26
	= 208
Total	**Rs.11,148/=**

Labour Cost

Drilling	= 300
Welding	= 3,000
Bending	= 200
Grinding	= 300
Painting	= 300
Logistics	= 1,200
Total	**Rs.5,300/=**

Overhead Charges

The overhead charges are calculated by "manufacturing cost"

Manufacturing Cost = Material Cost + Labour Cost

11,148+5,300

Rs.16,448/=

Overhead Charges:

20% of the manufacturing cost

(16448)*(.20)

Rs.3,289/=

Total Cost

Material Cost + Labour Cost + Overhead Charges

11,148 + 5,300 + 3289

19,737

Total cost for this project: Rs.19,737/=

10. CONCLUSION

The semi-automatic coconut husk remover with shell cutter is an advanced method which removes the husk and cuts the shell in an easy way of operation. This will reduce the human effort and avoid chances for accidents of the manual method of operation. It reduces the operational cost of the work, comparing to the manual method, the proposal is a very effective and advantageous method. This machine is mainly based on the coconut oil factories where it will increase the rate of production and also saves more valuable time. This project describes the designing of a machine which is able to two operations; one followed by another, which shows that it is a multi stage process machine includes the complicated work by manually. The manual method includes the peeling of the husk it is a very difficult process and it would take more time for a less skilled person. And the cutting, we have to be more careful while doing the cutting manually. In order to solve these problems the coconut husk remover with shell cutter is a better option to be considered.

References

[1] Harach. C, Jarimopas. B (1995). Young coconut peeling machine. Kasetsart University Journal (Natural Science), 29, 393–403 (inThai).

[2] Jarimopas. B, Kuson. P (2007). A young coconut fruit opening machine. Biosystems Engineering, 98(2), 185–191.

[3] Ruttanadat N (2007). Development of a young coconut fruit trimming machine. Journal of Food Engineering, 79, 752–757.

[4] Jarimopas. B, Pechsamai. A (2002). Design and development of young coconut peeling machine. Thai Agricultural Research Journal, 20(2), 91–110 (in Thai).

[5] Gulyaev A. , Physical Metallurgy, 5th Edn. , Mir publishers, Moscow, 1980, p – 173.

[6] Rao P. N. , Manufacturing Technology, 2nd Edn. , Tata McGraw Hill Publisher, New Delhi, 2003, p – 28, 13 – 20.

[7] Rodrigo, A. A. M., K. Matias, C. S. Rita, V. O. Pedro and A. Lucio 2007. Ultrasound-assisted treatment of coconut water samples for potentiometric stripping determination of Zinc. *Journal of Brazilian Chemical Society*, 18(2), 93-98.

[8] Santoso. U., K. Kubo, T. Ota, T. Tadokoro and A. Mackawa 1996. Nutrient composition of kopyor coconuts. *Food Chemistry*, 57(2), 299-304.

[9] Shamsudeen, K. P., J. Anitha and J. Jippu 1999. KAU tender coconut cutter. *Indian Coconut Journal*, 30(6).

[10] Evaluation of coconut cultivars for tender nut waters for West Bengal. *Indian Coconut Journal*, 29(1), 3-4 Pummer, S., P. Heil, W. Maleck and G. Petroianu 2001.