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Design and Fabrication of Groundnut Sheller

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Abstract: ***In a developing countries like India groundnuts is grown on small scale, so there is a lack of lack of groundnut sheller machine which are affordable. The average price of peanut is approximately twice the price of pod. There are some groundnut sheller machines are available in market but the cost is not affordable and also they are large in size so they are not suitable for domestic applications they are suitable for mass production like industrial applications. Hence it is essential to design and fabricate a portable groundnut sheller machine for domestic applications. The performance of the machine was evaluated in terms of overall capacity, shelling and material efficiency and mechanical damage. This paper describes about the working, result and conclusion of the groundnut shelling machine.***
Overall, this project involves processes like design, analysis, fabrication and assembling of different components.

I. INTRODUCTION

The process of removal of the skin and bark of the beans is a very time-consuming process and requires labour. Hence machine could fasten this process and reduce labour to one man that would be very advantageous in mass production. The need of this machine is in food processing industry and in agriculture sector for de-shelling of the beans. The bean Sheller will be very efficient for mass production. The objective of this machine is to speed up the process of de-shelling and to reduce the labour work. When the beans are de-shelled manually the bean are pressed at the edge and their shell opens. Same thing happens when we thrash the bean at a hard place it opens up its shell. The same principal is used here in our bean Sheller. The beans are hit by the wooden arms and they cause the bean's skin to rupture and the beans fall in our collect.

II. OBJECTIVES

A. The main and basic objective is to make low-cost groundnut shelling machine.
B. Another thing is that to shell maximum possible groundnut in shortest possible time

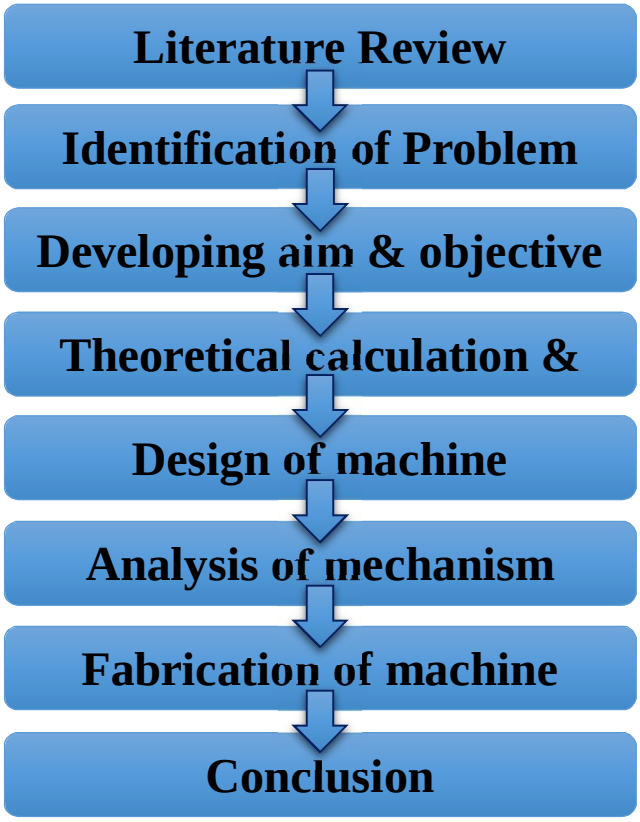
III. LITERATURE SURVEY

Sr no	Name Of Paper/journal	Authors Name	Year of	Findings Of the Paper published
1	A Review on Design and Fabrication of Groundnut Shelling and Separating	Adwal Ravindra1, Ghadge Rohit, Awad Saurav, Prof. Khare G.N	2017	The agriculture is the basic profession of vast of population world-wide. Some modifications can be done in this machine and it will be used over long scale. This machine provides better help to farmers so that they can get proper income of their crop. The scope in agricultural field is tremendous. It will definitely be a vast sector to work on to minimize man power and improve efficiency of operation, decrease cost of operation, decrease efforts.
2	Design and Fabrication of Groundnut Pods and Shell Stripper Machine.	G. Karthik, D. Balashankar	2018	This work presents the design of an electrically powered groundnut pods stripper and shelling machine. It can be used for both domestic and industrial purposes. The advantage to be derived from the use of this machine far outweighs its shortcomings. It was also observed that groundnut with one seed per pod and those with two small seeds in their pods were the ones that came out unshelled or partially shelled

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3	Groundnut Peeling Shelling Machine	A. Mani1 P. Manish Kumar, Krishna Karthick	2021	The main importance of this project is as this machine is battery operated it can be directly transported to the groundnut farms and can be operated without an external electric supply which is not available at most of the farms. Proper evaluation of the design will be performed and created something even better instead of simply manually operated operations. Finally, we conclude that atomizing machines is a better option to use farmer instead of manually operated. The demands atomize shelling machine of farmers & other customers will be also considered while designing.
4	Design & Fabrication of Groundnut Sheller Machine	Tushar Walke1, Praful Gadge, Ganesh Gohate, Ritesh Banpurkar	2017	The cost of the machine is less and if the farmer buys this machine, farmer can recover the invested money back. By using this machine problem of the labour crises can be reduced. Comparing with manual harvesting only one labour is required. It makes the process faster hence reduces most of the shelling time and labour cost. This machine is helpful for both small and big farms.
5	Design and Fabrication of Pedal Operated Groundnut Decorticator Machine	Kulbhushan M. Shejole1, Nitin B. Borkar, Abhijit M. Bobade	2017	Based on it is concluded that, the pedal operated groundnut decorticator machine is better option to use farmer instead of hand operated. The machine is pedal operated so that there is no energy consumption which wills helps to reduce the cost of productions. This machine also saves time and manpower. If we go on continuous work, we got a higher output in very short time. The operating procedure of this system is very simple, so there is no skill labour required to operate a machine.

IV. DESIGN METHODOLOGY



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V. RESULTS AND CALCULATION

The sample of a readings are recorded. Five tests are conducted each of them consists of one Kg of groundnuts. Each of test conducted at a same speed. Approximately 72% groundnuts are shelled. The shelled groundnuts are collected in a drawer among with some small size pods. In shelled groundnuts damaged and undamaged peanuts are separated for calculating efficiencies.

Sr. No.	Total wt. of groundnut in Kg. (Qt)	Wt. of shelled groundnut in Kg (Qs)	Wt. of undamaged groundnut in Kg (Qu)	Wt. of damaged groundnut in Kg (Qd)	Time for shelling operation in seconds (Tm)
1	1	0.75	0.55	0.195	30
2	1	0.74	0.56	0.175	30
3	1	0.7	0.51	0.187	30
4	1	0.72	0.54	0.179	30
5	1	0.73	0.54	0.186	30
Total	5	3.61	2.66	0.922	150
Average	1	0.722	0.532	0.184	30

Shelling Efficiency(%) = $\frac{Qs}{Qt} x100 = \frac{0.722}{1} x100 =$ 72.2%

Material Efficiency(%) = $\frac{Qu}{(Qu+Qd)} x100 = \frac{0.532}{(0.532+0.184)} x100 =$ 74%

Mechanical Damage(%) = $\frac{Qd}{(Qu+Qd)} x100 = \frac{0.184}{(0.532+0.184)} x100 =$ 25.07%

Overall Capacity(Kg/h) = $\frac{Qs}{Tm} = \frac{0.722}{0.0083} =$ 87Kg/h

DESIGN MODEL



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VI. CONCLUTION

A. Reduction in Size

The overall size of the unit fabricated is smaller than the one which are commercially available in the market. The dimensions this of the machine are 1117.6x762 mm (44" x 30"). Upon calculating the area occupied by the machine it comes out as 851611.2mm^2. The dimensions of the machine available in the market is about 1150x762 mm. The machine can be made even more compact by reducing the free space in the body and drum. However, reduction in the free space will make the maintenance and cleaning of the machine harder. Also adding of the accessories like a gear box, shaker or blower and changing the mesh (drum net) will be harder.

B. Reduction in Weight

The project is light in weight as it is built from wood. Using high quality steel would have increased the weight as well as the cost of the machine. Also the mechanism which includes the drum and the planks are made from wood which not only reduces the weight, but it also reduced the direct forced and centrifugal forced acting on the shaft which also helps in the reduction of vibrations.

C. Reduction in Cost

The overall cost of the fabricated project is around Rs. 13000 whereas the average cost of the machines available in the market ranges from Rs. 15,000 to Rs. 50,000. The lower power motor, the wooden body and drum are some of the factors which help in major cost cutting of the overall cost of the project both in terms of material cost and machining cost.

D. Power Saving

The motor used in the project is a 0.5 hp (0.37 KW) 1440 rpm motor whereas most of the machines in the market uses around 1.1 to 2.2KW. It reduces the power consumption. The motor is able to drive the mechanism as it is light in weight. Also higher power motors are costly and bulky that is it adds in more weight to the machine. Using a higher RPM motor would lead to the mechanism rotating at much higher RPM producing un-necessary sound and vibration.

VII. FUTURE SCOPE

The groundnut sheller can be modified with various attachments and changes in the components to increase the efficiency and for maximum output conveniently. These changes would increase the cost of the machine but also increasing the efficiency and can avail new featuresto the machine A few of the attachments/modifications are as follows:

A. Blower

A process for removing the skins from the bean comprises:
Loading the beans in the de-shelling chamber
Rotating the de-shelling chamber and the arms inside on the shaft that will hit the beans and the beans will fall down and if some of the skins fall down, it will get collected in the draw.
To avoid the skins of the beans to get collected in the drawer a blower should be installed so that the peeled skins of the beans are blown away and would be expelled from the rear side ofthe machine.

B. Automatic Pouch Packing

This machine can be attached to the Bean Sheller and the beans could be packed and sealed directly which will increase the productivity and the time will be saved. This machine should be installed just before the unloading drawer where the beans would fall after passing the mesh. The beans would be packed and sealed in plastic bags and can be sent straight for sales in the market or it can even be frozen to increase its life.

C. Solar Driven Motor

Motor installed on the machine could be driven by solar panels increasing the efficiency much and would eliminate the wastage of electricity but these installments could be expensive causing high initial costs. The solar panels would be installed and would set onthe open field which would simply generate electricity giving power to the motor.

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D. Replaceable Mesh

The mesh of the de-shelling chamber and the sliding mesh provided in the machine should be made replaceable so that different kinds of beans and nuts can be loaded. This would increase make the machine more flexible and would be used for many other beans,nuts, etc.

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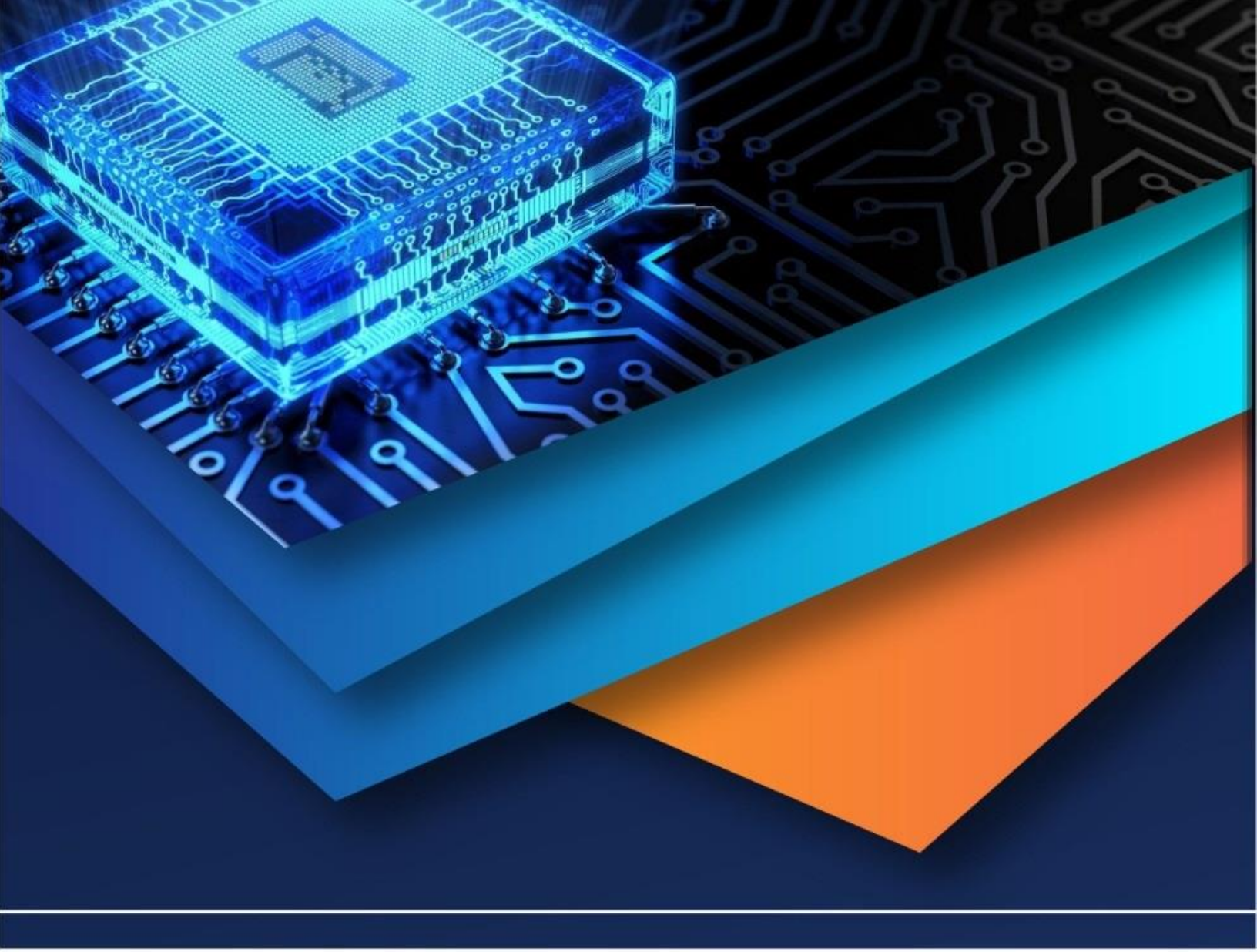
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