

A REVIEW ON DESIGN AND DEVELOPMENT OF COCONUT DESHELLING MACHINE

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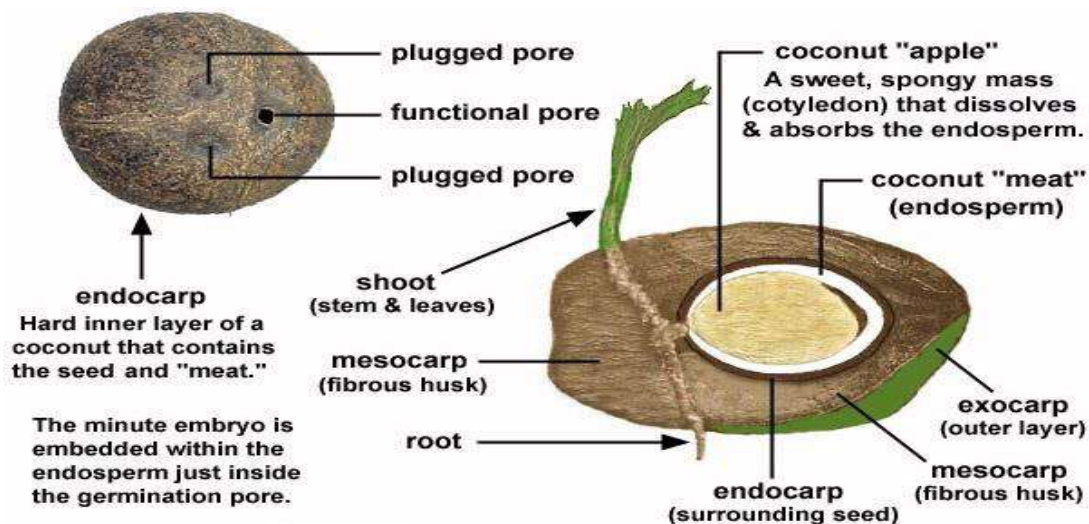
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Abstract: The paper is about fabrication of coconut de-shelling machine. The conventional method used in India, for de-shelling the coconut is labor intensive, unhygienic, time consuming and harmful to human body. To overcome this problem, there is a need to automate the de-shelling process. While automating the process the usefulness of the by-products are to be considered and carefully handled. A coconut de-shelling machine comprising of two cutter mounted on a same shaft with gear drive. Performances test analysis, show that the machine de-shelled the fruits without nut breakage as well as its average de-shelling efficiency is doubled and 300 coconut can de-shell per hour. All materials used in the fabrication of this machine are of standard specification and locally sourced. The estimated cost of producing one unit of the machine is twenty two thousand (Rs.22,000). The objective of project is to design and developed the coconut de-shelling machine and performance of machine which can remove maximum coconut shell at less time.. The construction of machine will be simple in design so that it can be easily manufactured in small workshop. Also the machinery will be of low cost so that an average farmer and small scale vendor can afford to buy it.

INTRODUCTION:

The coconut is one of the main sources of oil products. In order to obtain the oil from the coconut, there are number of process to be done. The processes are coconut plucking, de-husking, breaking shell, drying, de-shelling the kernel from the shell and finally extracting the oil from the kernel. In the above process, the time consuming is the coconut de-shelling, since it is done by using manual labors. Most of the regions use manual de-shelling at present. The coconut is de-shelled by means of using knives, hooks, etc. Due to manual process, time is consumed, other major disadvantage is the labour problem and by using the external devices there may be a chance of accidents takes place. In order to avoid such kind of difficulties we go for the machining process

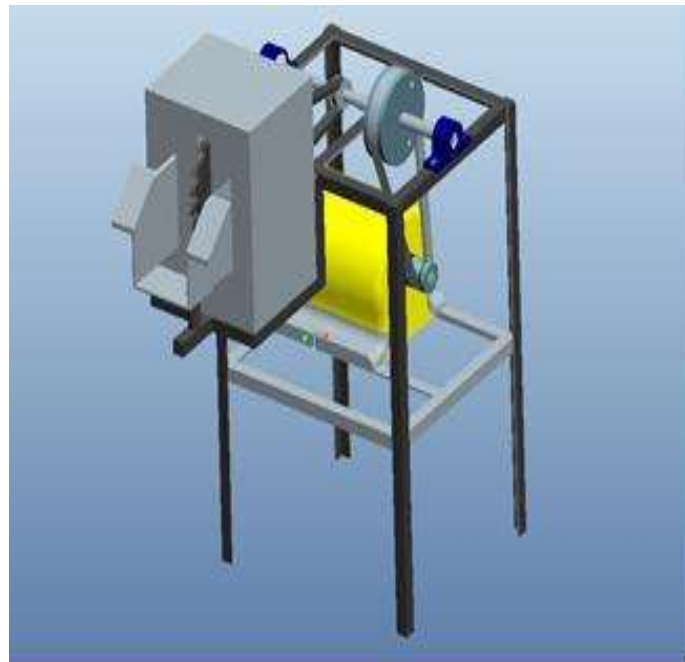


REVIEW OF DIFFERENT TYPE OF COCONUT DESHELLING MACHINE:

A) Mr. Ketan K. Tonpe Int. Journal of Engineering Research and Applications
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The major components of the developed coconut de-shelling machine shown in Figure 3 are frame, Cross cutter, conveying unit, driven and driver pulleys, rubber belt and motor and bearing housing .The frame is the main supporting structure upon which other components of this machine were mounted. The frame is a welded structure construction from 50x50x5 mm angle iron with dimensions of 650 mm length, 740 mm width and 1000 mm height. The de-shelling unit comprises of two shaft one is intermediate shaft and other is cutter shaft. Intermediate shaft is a mild steel rod of 25mm diameter and 610 mm long and also mounted cutter shaft 25 mm diameter and 250 mm long supported at both ends by ball bearing. A 1 H.P (0.745 motor, which is attached to the base of stand transmits power from motor shaft to intermediate shaft No. 1 through single groove pulley P1 (2.5") and pulley P2 (11") which are attached to motor shaft, intermediate shaft respectively and is connected by V-belt drive 680

Motor shaft is rotated at 1440 RPM and intermediate shaft is rotated at 388 RPM. In intermediate shaft located the pulley P3 (2.5") which transmitted the power to cutter shaft at which rotate speed 388 RPM, Since coconut shell contain low strength, hence it requires low speed for cutting, The de-shelling rod attached to frame structure which is near to disc cutter. The coconut eye of the coconut fruit and locate it to the de-shelling rod, without touching the disc cutter and rotate smoothly to de-shelled the coconut.



B) T.Vidhan Singh and R. Udhaya kumar [1] this literature gives a view to develop a power operated coconut de-shelling machine was designed and developed. The capacity of the machine is 200 nuts or 400 cups per batch. The loading and unloading is done manually. The optimum average moisture content for the maximum de-shelling efficiency (92%) was 35% (d.b). The optimum rotating speed of the de-shelling machine was 10 rpm and the time taken for de-shelling was four minutes per batch. The time saved by using the de-shelling machine was four times as compared to the manual method.

C) Satip Rattanapaskorn and Kiattisak Roonprasang [2] the author has analyzed the feasibility of an design and development of semi-automatic cutting machine for young coconuts. The purpose of this research is to design, fabricate, test, and evaluate the prototype of a semi-automatic young coconut fruit cutting machine. The design concept is that fruit cutting is accomplished by pneumatic press on a young coconut sitting on a sharp knife in a vertical plane. In operation, a young

coconut is placed on the cutting base and the pneumatic control is switched on. The coconut is automatically moved to the ressing unit and cut in half by a knife set. The coconut juice flows down to the tank while the cut fruits are separated and moved into the other tank. The machine is found to operate safely without damage to the fruits. The machine capacity is 480 fruits/hr with the total operating cost of about 2.63 USD/1000 fruits.

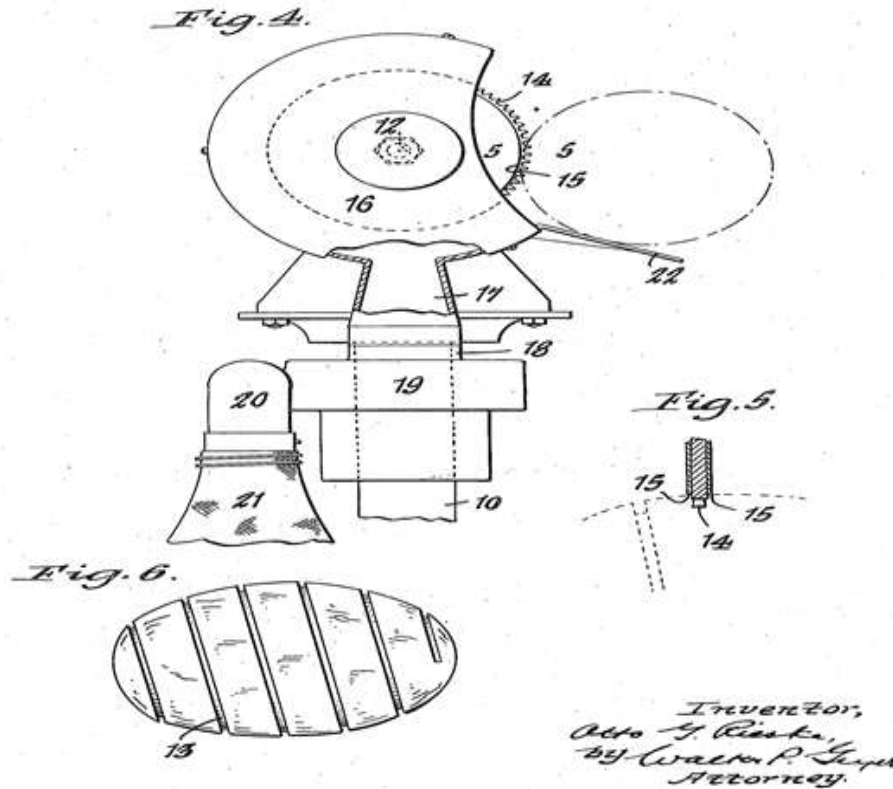


Figure 4. Prototype of the semi-automatic young coconut fruit cutting machine: 1) machine frame; 2) cutting base; 3) knife set; 4) pneumatic system; 5) tank

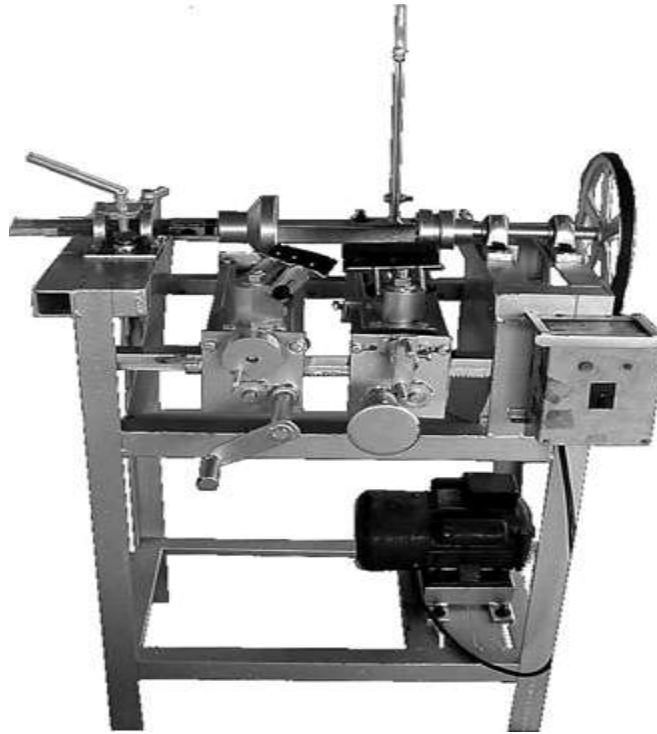
D) Abubakar Mohammed and Abdulkadir B. Hassan [10] This literature gives a view to design the motorized and manually operated groundnut sheller was developed. The sheller when operated electrically with 10kg of groundnut sample performed at 78% and 85% for shelling and cleaning efficiency respectively, with a mechanical damage of 1.1%. It has a throughput capacity of 345.4kg/h. the manually operated sheller has 5kg of groundnut sample and performed at 65% shelling efficiency with mechanical damage of 2.8% and a throughput capacity of 118.9kg/h. with this performance, efficient shelling has been achieved. The shelling machine if made available to small and medium scale farmers, more groundnuts will be produced with less drudgery in less time. The Sheller was design based on the physical and mechanical properties of groundnut and therefore shell only groundnut.

E) T. Roshni , J. Jippu, C. S. Ratheesh, and J. Sachin [3] The author has analyzed the feasibility of an power operated coconut punch-cum-splitter was developed for extracting coconut water and coconut meat. The nut of the screw rod was rotated with an electric motor and the drive was transmitted with a belt and pulley system. The tender coconut was placed on the top of the screw rod in natural rest position and was raised to press against either the punch or the blade fixed above the screw rod. The average energy requirement for punching and splitting of the selected range were found to be 11.74 kJ and 12.13 kJ. An electric motor assisted apparatus was developed to punch and split open the tender coconuts. The force required for punching and splitting was found with a mean value of 712 N and 1277 N, respectively.

Dec. 14, 1948. O. G. RIESKE 2,456,446
 COCONUT FEELING MACHINE HAVING ROTARY RADIAL
 CUTTER BLADES WITH FAN PORTIONS 2 Sheets-Sheet 2
 Filed July 27, 1944



F) A sample of optimally-matured coconuts selected at ran-dom by competent growers was divided into four groups, each containing 33 fruit, for post-harvest storage times of 0, 3, 6 and 9 days. Storage was under normal room condi-tions (ambient temperature = 28.7 LC, humidity = 67.2%). Before the trimming test, 30 coconuts in each group were subjected to a compression test. Each fruit was compressed by a 6.4 mm diameter plunger at a loading rate of 25 mm/ min. The fruit was mounted on an Instron (Model 5569, USA) universal testing machine and compressed until rup-ture occurred. The same test was done at two opposite points on the equatorial line of the fruit. The other three fruit were measured for moisture content according to ASAE standard No. ASAE S358.2DEC93 (1994). Perfor-mance of the machine and physical properties of the fruit were then evaluated. A compressive force and fruit defor-mation about 30% of rupture point were used to calculate the modulus of elasticity.



J) Bhaskar and V. K. Singh [4] this article focuses on an approach based on the aim of present investigations is to evaluate the physical property-water absorptions and mechanical property-compressive properties. Coconut particle reinforced composites were fabricated by reinforcing shell particle (size between 200-800 μ m) by wt% of 20, 25, 30 & 35 into epoxy matrix. Composites plates were made by casting in open mould. That is possible with very low cost and easy way. Experimental results showed that water absorption increases with the increase of wt% of particle but compressive properties increases upto 30wt% of particle approaches to actual compressive strength of epoxy

RESEARCH GAP:

The coconut is one of the main sources of oil products. In order to obtain the oil from the coconut, there are number of process to be done. The processes are coconut plucking, de-husking, breaking shell, drying, de-shelling the kernel from the shell and finally extracting the oil from the kernel. In the above process, the time consuming is the coconut de-shelling, since it is done by using manual labors. Most of the regions use manual de-shelling at present. The coconut is de-shelled by means of using knives, hooks, etc. Due to manual process, time is consumed, other major disadvantage is the labour problem and by using the external devices there may be a chance of accidents takes place. In order to avoid such kind of difficulties we go for the machining process.

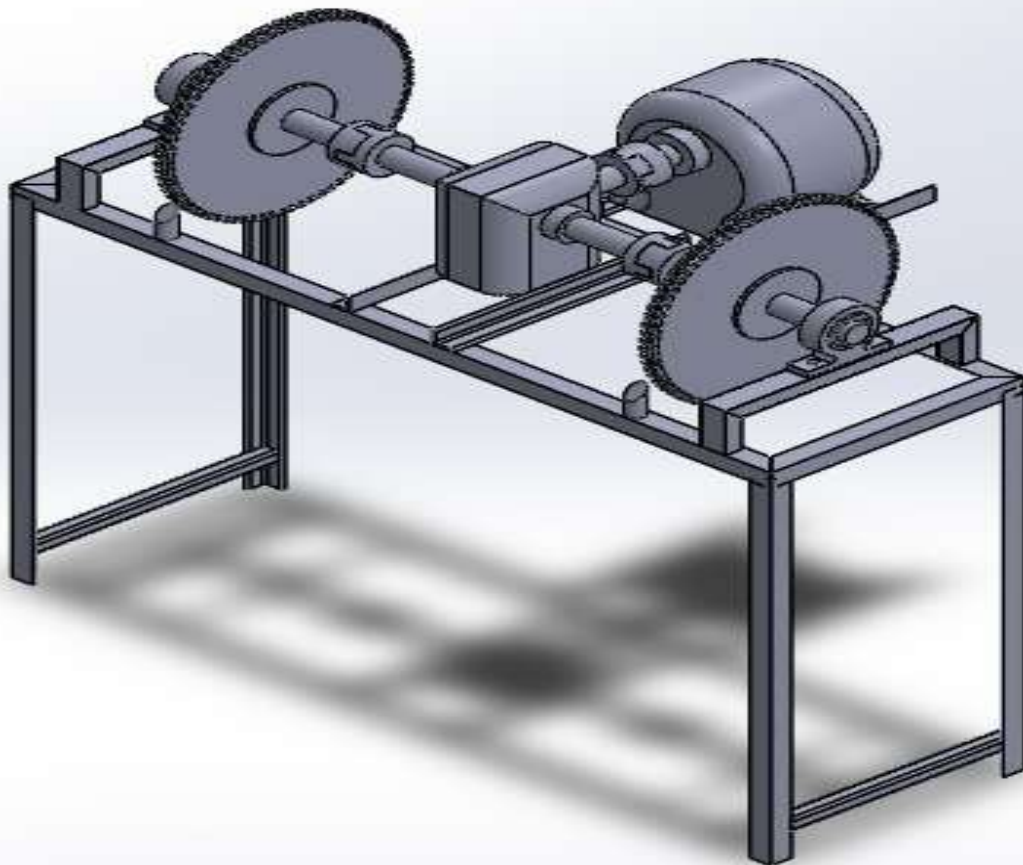
- Traditional coconut de-shelling process is time consuming.
- These are laborious, time consuming, cost intensive and Involve various processing activity.
- In local methods hygienic conditions are not maintained.
- Sometimes manual coconut de-shelling is harmful to human body

CONCLUSIONS:

A power operated coconut deshelling machine was designed and developed. Coconut deshelling machine which deshelled coconuts without nut breakage and machine is easy to operate and perform with an average deshelling efficiency and capacity of 90% and 195 nuts per hour. Introduction of this machine eliminates the problem of extracted shell length distortion associated with the use of some risks involved in the use of cut and hold the coconut de-shelling.

Coconut is considered as a healthy food and hence there is a high demand for shifting the market towards value added products such as coconut milk, coconut cream, coconut vinegar, etc as mentioned above. Apart from the above products, other uses includes that coconut shell, leaf, husk, etc is used as fuel in many rural areas and in industries for boiler operations. A variety of handicraft product can be made from wood, shell, husk, etc which increase revenue of small scale industries. Value addition also minimizes the waste and reduces the environmental degradation. To achieve large-scale commercial use, the products must be produced, packaged and delivered to market in a form that meets the consumer requirements. Coconut has great culinary, medicinal, cosmetic and industrial application; therefore, all the efforts should be made to promote the value added products of coconut through national and global level. Also, the research and development should be directed to explore new technologies for the development of coconut industries.

CAD MODEL OF COCONUT DESHELLING MACHINE



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