

Design and Fabrication of Areca Nut Dehusking and Slicing Machine

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Abstract - Areca nut is a medicinal crop, commonly grown in Southeast-Asian countries and India is one of the largest producer of areca nut. The production of Areca nut in India is about 3.3 lakh tonnes a year. Areca nut as a medicinal plant helps treating mental and eye disorders like schizophrenia and glaucoma respectively and it is also used as recreational drug to enhance central nervous system. Considering the growing demand in the current world, there is a need of improving the pace of productivity and processing of the areca nut. Generally the processing of the nut is carried out in the country side. Due to high availability of the labour in these conditions makes processing of the nut cost effective, since the processing is done manually, the productivity of the nut is considerably low i.e. around 3kg/hr. To improve the productivity range, a research is carried out to develop a machine which could perform all the chores comfortably with less labour. The processing machine comprises of conveying assembly, de-husking assembly, and a seed slicing assembly. The machine is designed to be simple, compact, and easy for installation, with improvement in effective production, decreased labour intensity and safer production. Before fabricating the machine, the parts are modelled evaluated and assembled using SOLID EDGE V19 software.

keywords - Areca nut, Dehusking, Slicing Process, Solid Edge.

I. INTRODUCTION

Agriculture serves to be the backbone of Indian economy. More than 50% of the population depends on it for the income. It is important to educate and enhance safe, efficient and cost effective production. Acknowledging the above, production rate and safe environment for producing areca nut in India is too low.

Areca nut is a seed from an Areca palm, commonly known as betel nut, it. It is mostly cultivated in tropical countries like India, Philippines, Bangladesh, Ceylon, Malaya and Japan. India ranks first in both, area of cultivation (58%) and production (53%) of Areca nut [1]. Keeping its medical significance, areca nut also takes an importance in in the social, cultural functions, religious and economic life of people in India. This Areca nut has uses in Ayurveda and Veterinary medicines.

Betel nut is usually used for chewing and due to the presence of alkaloid, arecoline, it also finds its importance in Ayurveda and Chinese medical practices.

The production of areca nut has extensively increased in this decade due to demands in various sectors. Areca is not a ready product and it is naturally found in the form of covered husk. The nut is de-husked, sliced into pieces, boiled in water and then sun dried. The process of peeling the shell is called as husking and husking involves manually removing the shell by using a sharp knife or by hand, the production rate is around 3kg/hr. considering the current demand, the production rate is quite low. Hence it is necessary to develop a machine which could improve the production rate by several folds.

The present work emphasizes on developing Areca nut Dehusking and slicing machine composed of a conveying assembly, de-husking assembly, and a seed slicing assembly [2]. The conveying assembly comprises a chain conveyer and an electric motor. Bucket shaped structure are attached on the chain in column mode to lift the areca nut from the hopper to the de-husking assembly [3].

The seed slicing assembly is composed of HSS slicing tool, electric motor, and seed pushing assembly. Wherein the seed pushing assembly pushes the seed pushing rods to move in the direction of reciprocating mode. The seed cutters are arranged on the shaft which is driven by the electric motor. Parts of the machine are modelled and evaluated using SOLID EDGE software.

A decent attempt is made to develop a machine which could improve the rate of production as per the current demands.

PROBLEM DEFINITION

The conventional method of de-husking and cutting of Areca nut is a physical and labor intensive process, in which a single cutter is used to cut the nut into bits, this method of manually cutting the Areca nut is carried out from ages and is still carried out in most of the households in villages. The traditional method involves lot of time and man force.

This project "Design and Fabrication of De-Husking and Slicing Machine for Areca Nut" will be contribution to the villagers to produce areca nut much efficiently in less time and in increased mass [4].

Since the machine is performs efficiently and economical in production, it can be recommended for use. Further, the machine will also reduce human labour, labour cost with evenly cut good quality nut [5].

II. OBJECTIVES

The objective of the project is to develop a machine for husking and slicing of Areca nuts.

- The machine to be developed which can efficiently and economically work as husking and slicing machine.
- The machine should increase productivity rate significantly compared to manual Dehusking and slicing method.
- The machine should be able to accommodate different sizes of Areca nut.
- The machine must be easy to operate, eliminating the need of skilled labour.
- The machine should be able to improve safer production system.

III. METHODOLOGY




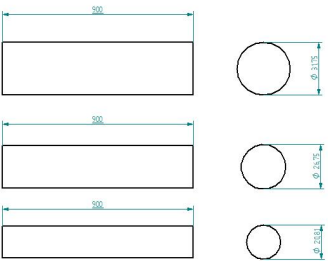





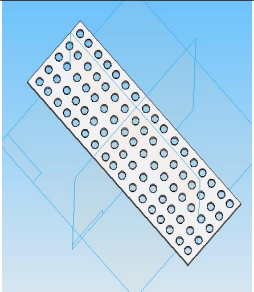
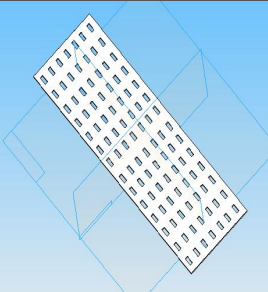
The method used in the study was carried out with three stages.

Firstly, investigating the problem on ground, by consulting Areca nut farmer in order to obtain information regarding the problem of processing it manually [6].

Secondly, designing the Areca nut de-husking and slicing machine according to the needs and demands of the farmer.

Thirdly, evaluating the performance of betel nut machine considering suggested parameters by the farmer. And assessing whether the problem has been resolved by the designed machine.

IV. DEVELOPMENT OF DE-HUSKING AND SLICING MACHINE FOR ARECA NUT

		
<p align="center">Motor</p>	<p align="center">Dehusking Wheel</p>	
		
<p align="center">Shaft</p>	<p align="center">Belt Drives</p>	<p align="center">Chain Conveyor</p>
		
<p align="center">Bearings</p>	<p align="center">Hoppers</p>	<p align="center">Slicing Blade</p>
		
<p align="center">Filters Fig 1. Parts</p>		

Electric Motor -An electric motor is used to drive both De husking and slicing chamber of the machine. Motor is the driving force for operation of the machine, hence care should be taken while selecting the capacity and power of the motor. Motor chosen for the process should be specific towards the load. For carrying out a minimal process, a motor power should be of 0.5

HP for slicing machine and for Dehusking machine motor should be of 2 HP. Minimum speed, a motor should operate at is 1400 rpm at 240 V. for minimal effective production.

De-Husking wheel - This is the special wheel made up of aluminium alloy and it is used to De-husk the areca nut by mounting special blade on the wheel as shown in Figure 1.

Shaft - Shaft is used to transmit power to Dehusking wheel, slicing blade and different mechanisms in the machine. In this machine, three different of diameter shaft are used i.e. 1.25 inch, 1 inch and 0.75 inch of length 900 mm.

Belt drives - Belt drives are used to transmit power from motor to the required shaft of any distance and to reduce the motor speed to required slow speed using different size pulleys as shown in figure 1.

Chain conveyor - Chain conveyor is used to move areca nut from the hopper to the Dehusking chamber using the buckets which are mounted in the chain conveyor.

Bearings - Bearing is a machine element that constrains relative motion to only the desired motion, and reduces friction between moving parts. The design of the bearing may, for example, provide for free linear movement of the moving part or for free rotation around a fixed axis. In this machine 2 hole and 4 hole hose bearings are used as shown in figure.

Hoppers - Hoppers are used to store the areca nut from the hopper areca nut passed to the slicing chamber through the chain conveyor.

Slicing blades - These are the special blades using slice the areca nut into the small pieces.

Filters - Filters are used to filter the completely dehusked and partially dehusked areca nuts as shown in figure.

Mostly tools and parts are made up of Mild steel, HSS, Aluminum alloy, Fe etc.

Mild Steel: Mild steel is used to make the supporting base and casing. The base and casing should be made up of hard material.

High Speed Steel: HSS is subset of tool steel, commonly in tool bits and cutting tools. The HSS material is used here for slicing blades.

Aluminium Alloy: It is used to manufacture the de-husking wheel, which is light weighted and high temperature observable.

V. WORKING PRINCIPLE

This work is entirely a design oriented project. Taking into consideration that the Areca nut has to be de-husked and sliced into small pieces and serve the purpose of mass production. The cutting blades are arranged in a particular fashion so that the Areca nut sliced into small pieces [7]. The Areca nut is fed into the hopper.

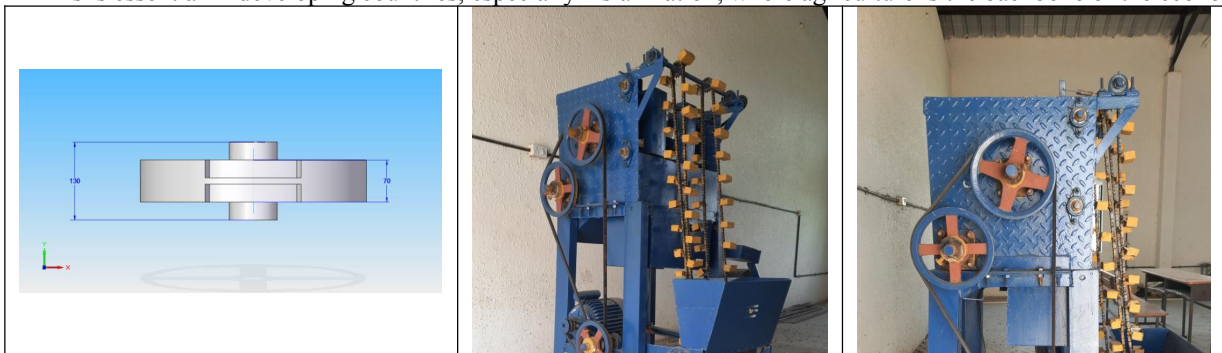
From the hopper it areca nuts are lifted to the de-husking chamber, in that chamber of shell of Areca nut is removed and filtered. The filtered and de-husked nuts are passed into the slicing chamber, where the Areca nut is sliced into the small sizes under the action of rotating blades [8]. A picture of ready machine is shown in Figure 2.

Some of the positives of the machine are, it reduces the time taken for Dehusking and slicing, reduces amount of labour and labour cost, no need of highly skilled operator to operate, increased productivity rate and enhances mass production. Finally, machine needs very less maintenance. Hence it can be summed up as, Areca nut slicing and Dehusking machine is totally suitable for agriculture and industrial purposes.

VI. CONCLUSION

The paper was aimed at not just to extend the applying of advanced technology among the sector of agriculture. The main propose of the technical paper is to guarantee some positive outcomes concerning day today challenges in agriculture sector [9].

- It also encourages the use of technology to increase the productivity in agriculture.
- The areca nut De husking machine is in evolution stage. The machine is compact in design.
- The cost of the machine is more effective compare to other machines.
- The machine can be operated by unskilled labour.
- This machine has two live shafts to remove the husk and to slice the nut. It could help a large number of farmers to overcome their various De husking and slicing problems.
- Projects like this encourage people to take up cultivation of full time and half time jobs.
- This is essential in developing countries, especially Asian nation, where agriculture is the backbone of the economy.



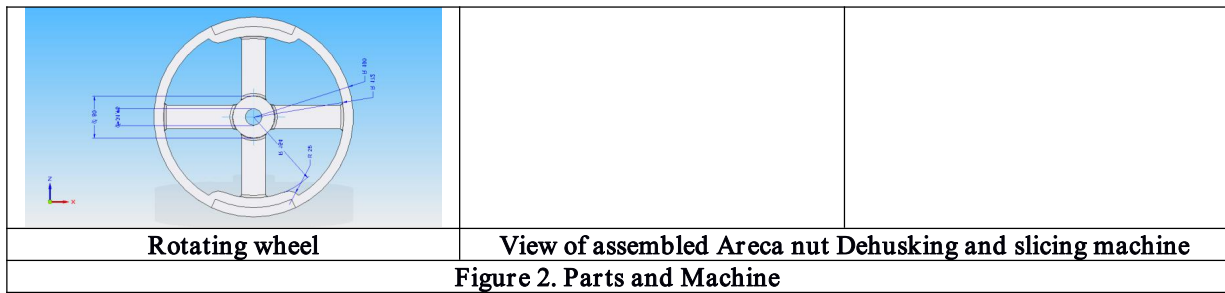


Figure 2. Parts and Machine

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