DESIGN AND FABRICATION OF AUTOMATIC ARECANUT PROCESSING UNIT

PROJECT REFERENCE NO.:41S_BE_1514

COLLEGE : ST JOSEPH ENGINEERING COLLEGE
BRANCH : DEPARTMENT OF MECHANICAL ENGINEERING
GUIDE : Mr. YATHISH KUMAR K
          Mr. SAMPATH KUMAR
STUDENTS : Mr. ROYSTON SHAWN LOUIS
           Mr. DANISH D’SOUZA
           Mr. SHELTON FLOYD PETER TORAS
           Mr. EMIL B VARGHESE

Keywords:
Arecanut processing unit, arecanut de-husker, arecanut boiler, arecanut dryer.

Introduction
In recent years, labour scarcity has emerged as one of the foremost challenges in farming. One crop that has been most affected by this is arecanut. Arecanut production is the largest in India according to FAO statistics and according to this, in 2013, Indian production of arecanut counts for 49.74% of the total world production. In India, Karnataka has the highest production percentage of 62.69%. However, in recent years harvesting and processing of arecanut becomes more difficult for farmers as it involves physical exertion, younger generations of labour are losing interest, with potentially harsh implication for arecanut cultivation.

Arecanut more commonly known as Betel Nut is a very important commercial crop in India. It takes approximately five years for an arecanut palm to mature and bear fruit. Each areca palm is harvested once a year. The cultivation of arecanut can be traced back to Vedic periods. Arecanut was even used in Ayurvedic and Ethane veterinary medicines. It is commercially available in dried, cured, and fresh forms. While fresh, the husk is green and the nut inside is so soft once mature, the palm can provide nuts annually for up to fifty years.

This project work emphasizes on developing an arecanut processing unit. The machine is able to peel the arecanut, cut it in to two halves, boil and dry it to desired hardness in a single pass for two different grades. The design and fabrication of arecanut processing unit was based on arecanut available in the areas of Malenadu. In this work, a safe, reliable and efficient arecanut processing machine is designed and fabricated.

Objectives:
The objectives of this project are as follows
- To process raw arecanut using the mechatronic system i.e. arduino UNO.
- By implementing automation reducing the human effort and labour problem.
- To reduce the processing time and to increase the quality.
- To run the machine using 24V DC power supply that eliminates problems regarding power failure and low voltage.

Methodology
Phase 1:
- Literature survey focused on dehusking system of arecanut processing unit.
- Literature survey focused on boiling and drying systems of arecanut processing unit.

Phase 2:
- Design of dehusking system.
• Fabrication of dehusking system.
• Assembling of all the parts of dehusking system.

**Phase 3:**
• Design of boiling and drying system.
• Fabrication of boiling and drying system.
• Assembling of all the parts of boiling and drying system.

**Phase 5:**
• Design and fabrication of transfer mechanism.
• Final testing.

**Working**
• All the four parts of the whole unit i.e. De-husker, Boiler, Dryer, and sorter are constructed separately and then assembled in one frame.
• Each part is connected through belts and conveyors.
• The main parts of the de-husker are the two plungers which are actuated pneumatically which crushes the nut and dehusks it. The hopper sends the nut to the arecanut dehusker. The diameter of the hopper is to make sure that only one arecanut falls at a time.
• Once this is done the de-husking part is complete and the seeds of the arecanut are sent to the cutting unit using conveyor belt.
• The arecanut is held in the holder and a blade is used to cut the arecanut into two halves.
• The arecanut is sent to the container by tilting the arecanut holder. In this step, here the nut is boiled using steam generated in a boiler. Once the nuts are boiled they are extracted from the boiler without the water and fed to the hopper.
• This hopper sends the nuts to the dryer for drying. There are three conveyors for equal distribution of all the nuts. At a time through the hopper one line of arecanut falls onto the conveyor, this is moving, thus filling all the arecanuts.
• Here we use hot air gun and suction fans to dry the arecanuts.

**Results and Conclusions**
The design and fabrication of the arecanut processing unit was based on the areas of Malanadu. The major problem in these regions is voltage. The maximum voltage around that area is 120V. The existing de-husking machines need a lot more power than that is available in these areas. This is a major problem and that is why most of these cultivators prefer traditional methods.

To solve this major problem, our processing unit has been designed and fabricated in such a way that the whole unit will be powered by a 24V DC Battery. Thus, this processing unit can be used in rural areas where there isn’t much power output.

This unit has been designed and fabricated for 12 kg of raw arecanut. The estimate that we got was around 8 hours for the process. This means 12 kg of raw arecanut was de-husked, cut into two, boiled and dried in 6 hours. De-husking and cutting of the nut is done automatically and sequentially. This showed better quality of arecanuts, with fewer human errors, less damage, and very low time consumption. This unit eliminates the risk of labour injury involved in the traditional manual peeling process.

**Future Scope:**
An attempt is made to design and fabricate an entire arecanut processing unit. This unit involves de-husking, boiling, drying and sorting of arecanut seeds. This unit can do all the different processes required for the processing of an arecanut seed in one go. This saves a lot of time and manual labour for the cultivator.

However, there is a scope for further improvements.
• A de-buncher can also be added as another part of the assembly unit, so all the processes can be done in one system.
• This design can be incorporated and developed for processing unit for higher weight of arecanuts.
• For better drying and less energy consumption solar flat plate collector can also be used.
• A sorter can be added to sort different grades of arecanut.