

Design of coconut breaking machine with water collecting tank

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ABSTRACT

This research work includes the study of problems that were faced during the cutting of young coconut in commercial purpose. By studying such problem the need of efficient coconut cutting machine was developed. If the developed machine is commercialize the problem of use of coconut water at hotels and restaurants will get benefited. The purpose of this research is to develop, test, and evaluate the young coconut fruit cutting machine. This research work include the description of such a machine which will not only used to cut the coconut but also can be used to drink coconut water at parks and beaches. 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.

1 Introduction

Coconut plays an important role in the economic, social and cultural activities of millions of people in our country. India is a major producer of coconut in the world. Coconut provides food, edible oil, industrial oil and health drink to humanity. Native to the tropics, the palm seems to have found its way across the continents. All parts of coconut tree are useful in one way or other and the crop profoundly influences the socio-economic security of millions of farm families.

Coconut is an important source of vegetable oil used for both edible and industrial applications. Coconuts are harvested from a tree at varying intervals in a year. The frequency differs in different localities. Tender coconuts are picked as and when required. Coconuts become mature in about twelve months after the opening of the inflorescence or flower bunches. The slight reduction in the quantity of copra and oil will be easily compensated by the additional income from the fiber. In order to obtain the copra from the dry coconut, there are number of process to be done.

In fact, the demand for coconut-based products continues to increase both for at domestic market and global market. Various prospective industries from coconut derivatives can still be developed by diversifying the coconut

processing industry both from food and non-food by-products. Among the by-products are oleo chemicals,

desiccated coconut, virgin coconut oil, nata de coco, furniture, fiber, coir, activated charcoal, and so forth. In Indonesia, the development of coconut-based processing industries is initiated by the development of the dried coconut meat or called copra as a raw material for the coconut oil industries. The machine has been designed to overcome a large range of coconut sizes, with equal importance to productivity. The main merits of the proposed machine are it is feasible in terms of economy, time and effort, enhanced safety of the user by eliminating injuries caused primarily due to improper handling of the grater tool. It will be very useful for catering services and hotels for preparing food items. It will be useful in soap producing industries which uses coconut as their prime ingredient. It will have a great role in coconut ice-cream producing industries too.

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 labor 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

2. Literature Survey

1) Yuliati, Hadi Santosa and Ignatius Jaka

Mulyan1. Identification of the needs of the home industry concerning with the current design of coconut shell breaker or tool along with the constraints/problems faced during the operation
2. Design process by technically drawing the coconut shell breaker machine
3. Identification of the materials for designing the machine
4. Design tools as the realization of technical drawings that have been devised previously
5. Measurement and testing the tools to divulge the overall performance of the tool.

2) **Jerry James Jacqwin Joy** The determination of the correct weight which is to be selected so as to be dropped to break is crucial in breaking the coconut. If the weight is less than adequate then the coconut will not be split in half. On the other hand, if the weight is much higher than the required, then it will lead to the coconut pieces being thrown out of the provision provided. Another drawback if the weight is more is that the weight of the machine rises and users will find it difficult to raise the weight. Thus the determination of the weight being required is crucial.

3) **Prof. S. M. Fulmali** , **Prof. A. A. Bhojar** 2 The cutting tools are made up of blades are made up of stainless steel. The blade size is 17 cm in length and the thickness 5 mm. It is provided with threaded bolt to hold that blade in fixed position. In addition to that a drill bit is also provided so that coconut water can drawn with the help of straw. It is also made up of stainless steel. The innovation in such types of new thinking is that, it increase the level of easily work doing by adding the various mechanism and the engineering techniques. In the old cutting process or the work for cutting the coconut is too hard and so more energy is required, to improve the working condition this type of idea is developed.

4) **H. Rajanikanth, Prof. Reddy Naik. J** Experiments were conducted on different size and weight of coconuts to determine the force required for punching and splitting.

It was found that, the force required for splitting varied from 883N to 1962 N with mean value of 1277 N.

5) **Satip Rattanapaskorn and Kiattisak Roonprasan**

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 press on a young coconut sitting on a sharp knife in a vertical plane. The machine consists of 5 main parts: 1) machine frame, 2) cutting base, 3) knife set, 4) pneumatic system, and 5) tanks receiving coconut juice and cut fruits

6) **K. Balachandar** Automation plays a vital role in major things in day to day life. It is not only applicable in automotive industries. The necessary of automation is to reduce the human effort and to save time. Most of the people cut the coconuts manually. But it is more difficult and skilled persons required. A common problem that many people are facing is punching and splitting the coconut

3 Problem Statement

At present the shell breaking is performed manually. Insufficient labor strength, skill full work requirement makes the process tedious and time consuming. There is a chance of accidents during manual process. The labor cost also collectively adds up to the cost of the product. Since we have varieties of de-husking machines, so we are intending to introduce a machine to break coconut shell. Due to manual process, time is consumed, other major disadvantage is the labor 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.

4. Objectives

Traditionally coconut shell is operated manually to get copra out. But it consumes more time and more Physical Exertion of workers, so the main objective is to reduce time consumption and Physical Exertion by introducing a machine to break coconut shell. It should be to operate with less wastage of copra. This machine is reduce the accidents that may happen during deshelling manually. Coconut dehusking and deshelling being

done in villages so that it should not be of electric power consumption type.

Also it'll also be beneficial for-1. To save the lakhs of liters' of coconut water which is literally wasted in temples around the country every year.

2. To convince the temple authorities to provide this water to needy people in hospitals through various NGO's.

5 .Methodology

1)Design Requirement- The design requirement is derived from the needs of the client such as mechanisms, performance of the client such as the mechanisms, performance parameters, reliability, and safety. These elements will derive and control the design and constraints throughout the process. This is to determine the critical process which can cause the accidental injuries and concurrently will provide ideas during designing stage at product level.

2) Conceptual Design – The design concept of total physical shape of the coconut processing apparatus is to be performed. In this process, the entire elements such as design requirements, the customer needs and constraints to be considered in order to satisfy the needs.

3) Preliminary Design-In this stage, the overall system configuration is to be defined, and drawing definition will be developed to provide early project configuration and to assist coordination during the detail design phase.

4) Data Collection- Before developing the detail design phase, a few crucial data were required to obtain which are, (i) dimension of the coconut fruits, and (ii) the force required in order to cut the coconut into halve. The defined dimensions such as, (i) the height of the coconut fruit . (ii) The diameter of the young coconut fruit. The data collection was to provide dimensions and measurement that would allow further construction of the detail design on the product component level.

5) Detail Design –A detail design of each parts of the device at main and sub level to be produced. All the manufacturing drawing such as details drawing, 3D drawings, general assembly drawing, general sectional assembly drawing and exploded drawing to be constructed. For the details drawing on components and

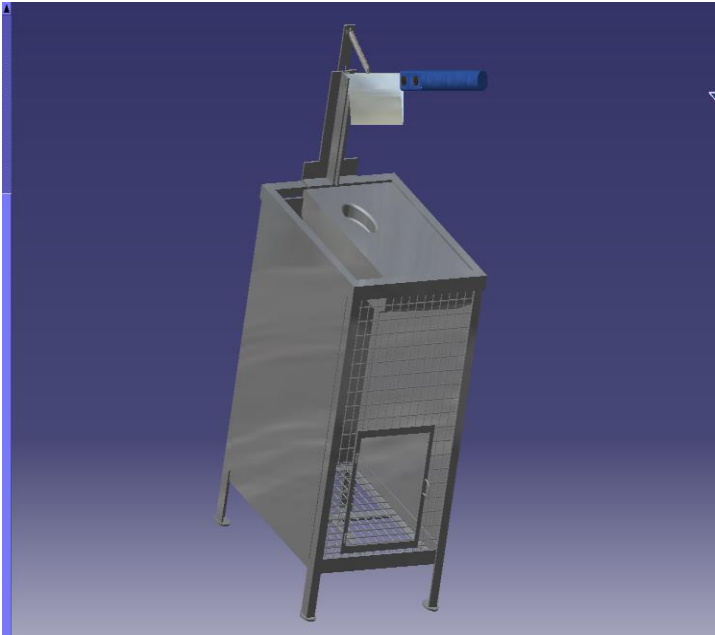
assembly level, 3rd angle orthographic projection to be used.

6) Product Modeling- The 3D modeling software CATIA V5 to be used to model the coconut processing apparatus. All the freehand sketches of the conceptual and the preliminary design to be detailed using this software. The dimensions and form of each component to be assessed and defined based on the engineering design analysis. The product and its sub element would be simulated concurrently during modeling phase. This process was to determine the feasibility of assemblage and the tolerance needed

6 Experimentation and Simulation

Construction-

Following are the components of the machine which will help it to function properly1. Lever alongwith horizontal cutter-It is the main part of the machine which will help us to cut the coconut in 2 halves properly.2. A Spring – To Restrain original position of lever after breaking the coconut.3. Slot 1- To place the coconut
Slot 2- For movement of the lever
4. Tap
5. Water collecting tank
6. A compression spring , to control the movement of the cutter and bring it to the rest position.
7. A clamp to fix the one end of the cutter with nut and bolt
8.A Steel plate with slot to have up and down movement of cutter and another slot to join one end of the spring



2. Startup India

Acknowledgement

We express our sense of gratitude towards our project guide **Prof.S.M.Gaikwad** for his valuable guidance at every step of the study of this project, also his contribution to the resolution of every problem at each stage.

We are overwhelmed to **Prof. S.M.Gaikwad**, Head of the Department, Mechanical Engineering, and all the staff members who extended the preparatory steps of this project. We are very much thankful to respected Principal **Dr. M.S.Gaikwad** for his support.

Finally, we want to thank all of our friends for their support & suggestions. Last but not least we want to express thanks to our family for giving us support and confidence at each stage of this project.

6.1 Experimental Setup

7 Conclusion

The mechanisms used in the machine are very simple so that further future work can be carried out and automation can be planned in the future. A machine of this nature can be used in village level application in developing countries like India. Being India a developing country, the advancement in agriculture sector will help in the national economy for some extent. The cost of the developed machine is very less so that it can be used in temples, small restaurants and shops. This will definitely improve the productivity of coconut in all parts of the country and various new applications can be generated in future.

It reduces the operational cost of the work. Human effort is almost eliminated and also productivity is increased.

The device can be easily assembled and dismantled & Easy to operate with minimum skill level also Product cost is reasonably economical for coconut vendors.

8 Future Work

We can participate in different Government initiatives such as

1. Swatch Bharat campaign.

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