

DEVELOPMENT OF COCONUT TRIMMING MACHINE USING PEDAL POWER

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ABSTRACT: The project was initiated to design a young coconut trimming machine for vendors. The main aim of the project is to make easily available of the machine for vendors which will be simple operated by pedaling the cycle. Since the electrical energy is not available all the time for street vendors or it is impossible to carry battery with them all the time as it is heavy. This trimming machine may provide boon to the local vendors. Moreover while transporting a large amount of young coconuts, the weight and volume may be the sight of consideration therefore this machine will also aim at making the coconut lighter and will also occupy less space hence makes the product more attractive

Keywords- Bicycle chain, Pedal power, Sprocket, Trimming mechanisms.

INTRODUCTION

Traditional areas of coconut cultivation in India are the states of Kerala, Tamil Nadu, Karnataka, Puducherry, Andhra Pradesh, Goa, Maharashtra, Odisha, West-Bengal and, Gujarat and the islands of Lakshadweep and Andaman and Nicobar. The Coconut Development Board of Government of India surveyed in 2014-15 that the four southern states combined account for near about 90% of the total production in the country: Tamil Nadu (33.84%), Karnataka (25.15%), Kerala (23.96%), and Andhra Pradesh (7.16%). Other states, such as Goa, Maharashtra, Odisha, West Bengal, and those in the northeast. Tripura Assam account for the remaining productions. Tamil Nadu leads all other states, though Kerala has the largest number of coconut trees, in terms of production per hectare. In Tamil Nadu, Coimbatore and Tirupur regions top the production list. In Goa, the coconut tree has been again classified by the government of India as a palm (like a grass), enabling farmers and land developers to clear land with lesser restrictions. With this, it will no more be considered as a tree and no permission will be required by the forest department before cutting a coconut tree.

In major coconut producing countries, several products and their sub-products are processed for export. In many countries, despite the numerous benefits derived, the coconut is under threat due to factors such as conversion of farms to oil palm, urbanization and vagaries of market particularly the volatility of its various products. The young coconut fruit can be marketed at two stages of development, mature and immature. At the immature stage, the fruits contain mostly water and a little jelly like meat. The edible part of the coconut fruit (coconut meat and water) is the endosperm tissue. The clear juice inside can be consumed as a refreshing drink. The coconut water contains the same major electrolytes as those in human body fluids (Fife 2007). It has long been the most popular beverage consumed in the tropics. Currently, the trimming process is done manually which requires skilled labor and extremely hazardous. The operators need to shear the husk off the green fruit with a long sharp knife. The inner white husk is then converted to finely shaped conical shaped top with a slightly tapered cylindrical body and a flat base. In addition to that, the fruit should be at least 6 months old and the trimming process should allow at least 1 cm thickness of husk left on the stem end of the fruit over the soft eye. After trimming, the fruit are dipped into sodium metabisulfite solution to prevent surface browning. The concentration of sodium metabisulfite should not be over 5% and the dipping time should not exceed 5 min to ensure that the edible portion of the fruit is safe for consumption. The shortage of skilled labor and the high production cost has created an urgent need for mechanical trimming machines. In fact, many traders have showed interest and desire to have machinery that is capable of trimming the young coconut fruit into an attractive shape similar to that practiced by skilled labor.

Therefore, this study was particularly focused on vertical trimming mechanism hence creating a better and safer way to trim young coconut fruit. The aim of the present study was to overcome the limitation of young coconut manual trimming process and to carry out the process in a more ergonomic way.

LITERATURE SURVEY

The pedal operated green coconut trimming machine for vendor is working on simple sprocket chain drive mechanism. The mechanism is used to trimming the green coconut in attractive way in order to reduce its weight for transportation. By preparing the project the pedal power is converted into rotational energy which rotate the trimming machine, shaft. Thus, the green coconut can trim without any external energy thus the machine is energy efficient. Since this machine uses no fuel this is very cheap and easily use. The surveying of the literature regarding the ecosystem are listed below.

J. Trop. Agric. and, S. Yahya [1] The project was initiated to design and develop a prototype of young coconut shaping machine. The main purpose of the design was to trim most of the outer husk (green husk) to create an attractive looking trimmed coconut (hexagonal shape) which could easily be cut open. The prototype machine was based on lathe trimming mechanism which consisted of a pair of blades and bottom up holder to clamp the young coconut. During operation, the young coconut was placed vertically at the holder and clamped before the body and shoulder trimming took place. When the fruit rotated, the operator manually adjusted the trimming blades to trim the body and shoulder part of the fruit. The rotational speed used for trimming the fruits can be adjusted accordingly. The prototype machine could trim 95 newly harvested fruits per hour when the rotational speed was set at 400 rpm.

Rakshith K K [2] Pedal power is the transfer of energy from a human source through the use of a foot pedal and Gear system. This technology is most commonly used for transportation and has been used to propel bicycles for over a hundred year. Pedal operated machine is human

operated and totally eco-friendly. It can be used to save electricity and also helps to get physical exercise when implemented in urban areas. In this project, we fabricated such a washing machine with both washing and rinsing mechanism.

Krishnamurthy M, Rakesh N [3] Due to the lack of electric power or the absence of machine itself in many developing countries it is not possible to machine wash clothes. Washing clothes by hand leaves one breathless and takes an awful amount of time. A coconut trimming machine is a machine designed to wash laundry. Generally, these machines are generally operated by electric power but pedal operated machine is human operated and totally eco-friendly. It can be used to save electricity and also get physical exercise when implemented in urban areas. In this project, we fabricated such a coconut trimming machine with both washing and rinsing mechanism.

DESIGN PARAMETERS

1. CUTTING MECHANISMS

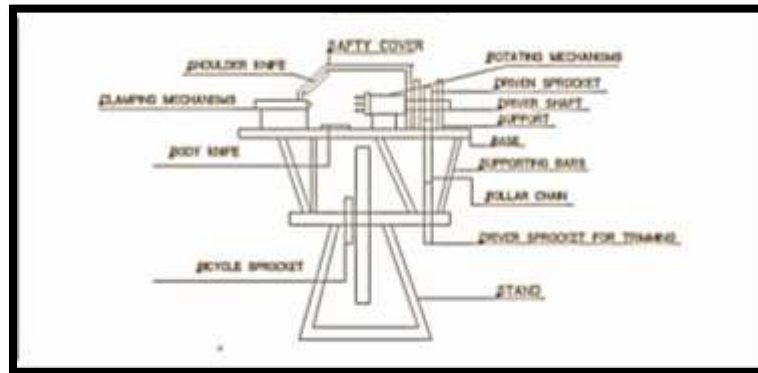


Figure 1: Design of cutting mechanisms

The young coconut trimming machine comprises a main frame, bottom-up fruit holder, a shoulder trimming knife and a body trimming knife. Figure illustrates the main parts of the machine and its clamping components. The machine was driven by bicycle with chain and sprocket mechanisms. In the design, the human expended for an average weight man of 70kg (1501b) at a cycling speed range of 16km/h – 24km/h or 233 r.p.m was used and after the analysis the efficiency and human power required to drive the shaft was calculated to be 56% and 1.02hp respectively. However, a range of 100 – 300 rpm was normally applied for trimming the fruits. In this case, 300 rpm is considered to be a general speed for trimming young coconuts. Basically, the longer the fruits being stored, the higher the rotational speed. The design concept was to trim the horizontally rotating fruit by using an inclined sharp knife at different angles to get the desired contour for the body and shoulder of the fruit. The cutting edge angles of shoulder and body blades ranged between 52 – 56° and 74 – 76° respectively. The most suitable angles of the feeding knives were determined according to the appearance and defect rate of the final trimmed fruit. A single operator was required to perform the trimming operation.

2 POWER SUPPLY CUTTING

MECHANISMS

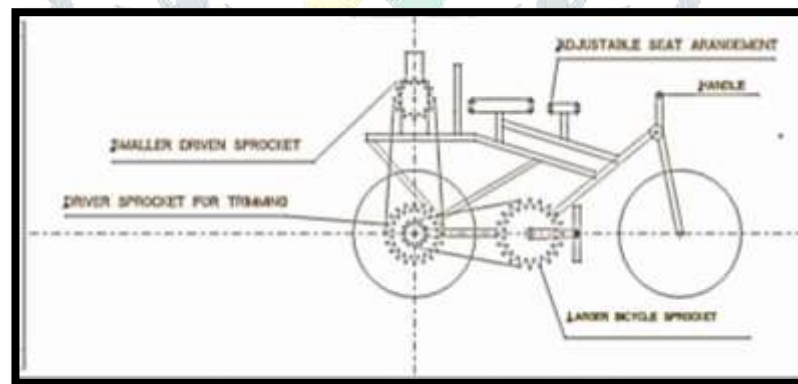


Figure 2: Design power supply to trimming mechanisms

Pedal power is the transfer of energy from a human source through the use of a foot pedal and Gear system. This technology is most commonly used for transportation and has been used to propel bicycles for over a hundred years. In the design, the human expended for an average age man of 70kg (1501b) at a cycling speed range of 16km/h – 24km/h or 233 r.p.m was used and after the analysis the efficiency and human power required to drive the shaft was calculated to be 56% and 1.02hp respectively. The machine is pedal operated and it is supply by the input power by the peddling of the bicycle chain and sprocket drive, the power is then transmitted from sprocket wheel to the rear end i.e. smaller sprocket with the use of chain and sprocket drive. The small sprocket which is acting as a driven for bicycle chain and sprocket drive, the same sprocket will act as the driver for the further green coconut trimming mechanism. Thus, the driven sprocket of the chain and sprocket mechanism of bicycle will drive the driver sprocket for the green coconut trimming mechanism.

WORKING PRINCIPLE

As the name suggest, the main aim of the green coconut trimming machine is to remove the outer green husk of the young coconut so that it can be converted into light weight for easy transportation and for extracting water from it by coconut venders. The machine is pedal operated and it is supply by the input power by the peddling of the bicycle chain and sprocket drive, the power is then transmitted from sprocket wheel to the rear end i.e. smaller sprocket with the use of chain and sprocket drive. The small sprocket which is acting as a driven for bicycle chain and sprocket drive, the same sprocket will act as the driver for the further green coconut trimming mechanism. Thus, the driven sprocket of the chain and sprocket mechanism of bicycle will drive the driver sprocket for the green coconut trimming mechanism. Due to this chain and sprocket arrangement in the machine the rpm and speed will get multiplied and the same will be transfer to green coconut trimming mechanism shaft by another chain and sprocket arrangement. The power from chain and sprocket of the bicycle is transfer to the machine shaft of the coconut trimming machine further on which coconut clamping mechanisms is mounted. The green coconut clamping mechanisms is a device which used to clamped the coconut with the help of four number of screw arranged in circular pattern to hold the coconut tightly. From the top of the coconut clammer there is spring loaded bar which is used support the coconut from top which allow to rotated the green coconut axially and trimmed it easily. Then the coconut is placed in clammer, rotates axially and the blades are arranged according to the desired angle and place to trim the coconut easily and in very attractive shape. After all this trimming process, the base of the coconut is cut by using base cutting knife arrangement.

ADVANTAGES

- As the machine is pedal operated, it requires less efforts to trim the coconut.
- Machine is fully manually operated using bicycle chain sprocket mechanism.
- The machine is portable it can be setup anywhere.
- As the machine does not require electric power supply, this machine is eco-friendly.

CONCLUSION

The machine must be easy to build and inexpensive if it will be adopted into the community. We recognized this need and designed the machine from the start with low cost in mind. The machine will only contain parts that are readily available in rural areas. For all machine components it uses bicycle parts. The pedal-powered coconut trimming machine is quite different from the community's current method of trimming coconuts; the community may be reluctant to try the new machine. To encourage the adoption of the coconut trimming machine, we will run multiple trials with local coconut vendors so we can adjust the design to meet their needs. We will run the trial periods with groups like the coconut vendor's cooperative who are already familiar with pedal powered machines; they have already proved they are willing to try new technologies. We achieved what we desired i.e. to build a manually driven pedal powered low cost coconut trimming machine using locally available materials and performing necessary function of trimming the coconut with ease. The coconut trimming machine can be used by the urban coconut vendors to workout and exercises. If the production of this coconut trimming machine is done at commercial scale then the total production cost of the machine can be reduced to 40% of estimated cost.

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