

Fabrication of Semi-Automatic Coconut Coir Twining Machine

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Abstract—India has approximately 21 lakh hectares of its land for coconut plantation. On an average, the country produces 10 thousand coconuts per hectare. Coconut is a fruit used on large scale in south parts of India. Growing them is easy but cleaning them requires great efforts. Coconut consists of a fibrous shell and a hard shell, the fibrous part is known as coir or husk. This coir needs to be separated from the coconut to acquire the main product. Basically it's a skin that is needed to be peeled. This coir is a byproduct of coconut and has many different uses which include packaging, mats manufacture, bedding, etc.^[1]

The objective of this project is to fabricate a machine that could ease the method of peeling a coconut and separate the coconut from its coir. It is a very difficult process and requires a lot of force if done manually by hand. This machine is a semi-automatic coir twining equipment which also ensures safety of user and easily peels the coconut. According to a normal research it costs a farmer min ₹. 5 to decoir a coconut and its not feasible as the coconut itself is sold at a rate of ₹. 15 – ₹. 20. Thus in order to reduce this unnecessary expense this equipment is designed for coconut farmers which can help them to reduce their expenditure on coir removal and also provide ease for this process^[9].

Keywords- coconut, dehusking, coir, cost, time.

I. INTRODUCTION

Coconut (cocosnucifera) is one of the world's most useful and important perennial plants. The coconut fruit is made up of an outer exocarp, a thick fibrous fruit coat known as husk; underneath is the hard protective endocarp or shell. The coconut palm is widely cultivated in the tropics. India is the world's third largest producer of coconuts after the Philippines and Indonesia. Other producers are Thailand, Malaysia, Papua New Guinea and the Pacific Islands. With coconut plantations extending over more than a million hectares, India produces about 5500 million nuts a year. Copra produced in the country is about 0.35 million tons and India accounts for about 50% of the world trade in coir^[4].

1.1 Project Objective

The objective of this project is to ease the process of coconut coir twining by designing a machine which would easily remove the coir and also ensure safety of the user. To reduce the labour cost which in turn increases the final cost of the coconut and is a loss for the farmers. This should also reduce the time required for the cleaning process as manually it takes longer time.

II. PROBLEM DEFINITION

2.1 Problem Statement

After research and gathering information we have realized that a coconut is sold at a cost of Rs. 20 on average^[6]. The farmer has to spend approximately Rs. 5 on cleaning of the coconut. This results in increase market price of the coconut and also the farmer has to spend an unnecessary cost. This also requires large amount of force. Cleaning of the coconut is a difficult task as the shell or coir is fibrous and it does not easily come off the coconut.

III. PROPOSED METHODOLOGY

3.1 Frame

The fabrication of this machine is to manufacture the base frame according to the dimensions. The L- shaped bars are cut into required length and welded at required edges. Dimensions are 500x550x800mm. The small frame welded at bottom part is for the placement of motor. Its dimensions are 400x450x500mm.

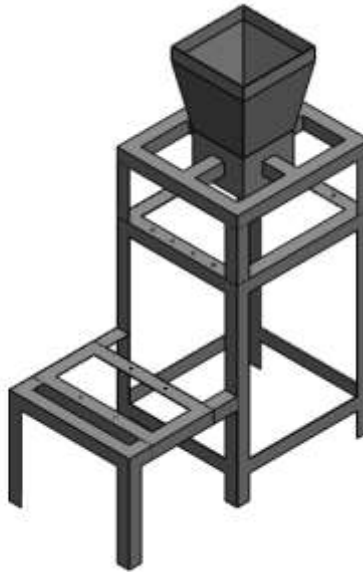


FIGURE 1: Solid model of Frame

3.2 Hopper

The hopper is made from welding sheet metal of thickness of 2mm. The hopper should be made of the size where an average coconut of diameter 10 to 15cm can easily be passed. The length of the coconut should not exceed 230mm. Also an arrangement with the help of spring and hand lever which would be used to open the hopper to drop the coconut on rollers. Whenever the lever is pulled the coconut should fall down on the rollers to get dehusk.

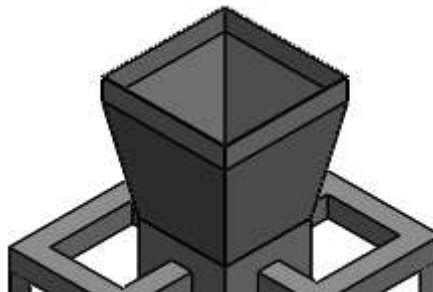


FIGURE 2: Solid model of Hopper

3.3 Spiked rollers

Two cylindrical rollers of diameter 100mm and length 400mm are welded to a 30mm shaft and are closed from both sides. The spikes are welded on the rollers at particular distance and regular intervals. The spikes are cone shaped having 20 mm base dia and a height of 30mm. One cylinder has 5 spikes along the length and second has 4 spikes along the length

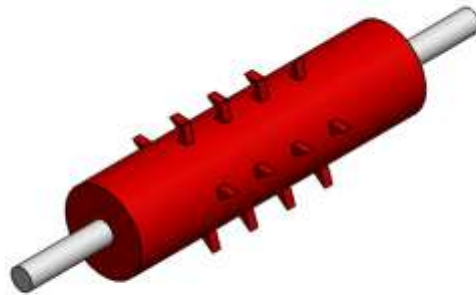


Figure 3: Solid model of Spiked Rollers

3.4 Motor

A single phase AC motor of 1hp capacity is required to run this machine. As the machine is going to be used by farmers it cannot be of 3 – phase supply as the supply is not easily available in the rural areas where these machines can be used. A 3 – phase motor can also be used if the application is for industrial use. The motor should have a speed of 80 – 100RPM for both motors^[5]. We used a geared motor with RPM approximately 100, which was reduces from standard 1440RPM with the help of gear assembly. This was done to increase the Torque Required for dehusking the coconut.

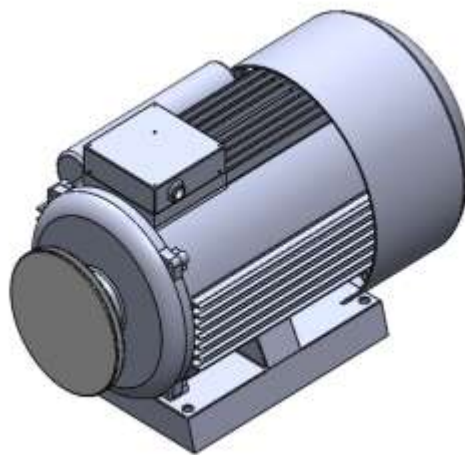


FIGURE 4: Solid model of Motor

3.5 Gears, Pulleys, Belt and Bearings

For transmission of power, requirement of two spur gears, two pulleys and four pedestal bearings is necessary. The machine runs on the proper arrangement of these parts. A belt of proper length is attached to the pulley of dia 70mm from the motor. The rollers are attached to a 250mm pulley which is connected to the motor with a belt. This provides the drive to the rollers. The gears are in mesh the drive is provided to the large gear and the smaller gear is driven by meshing. Thus a speed difference is created between these two rollers^[3]. Pedestal bearings are fixed on the frame which supports the shaft that extends from the cylindrical rollers.

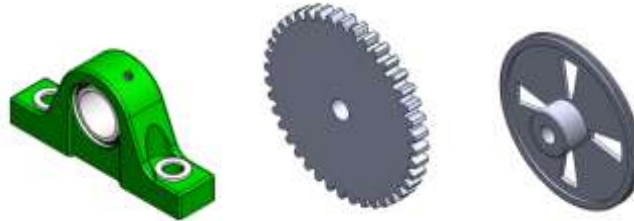


FIGURE 5: Solid model of Bearing, Gear and Pulley.

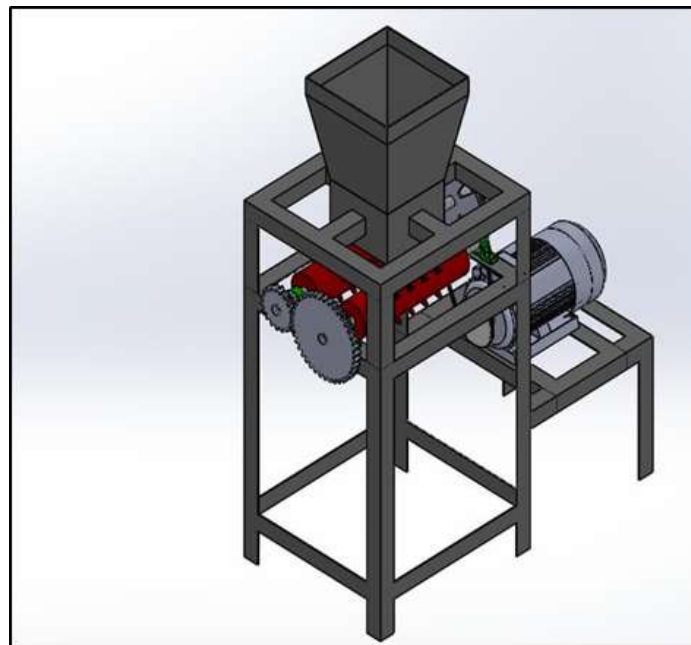


FIGURE 6: Solid model of Coconut coir twinning machine

IV. WORKING

The power produced by the prime mover is transmitted to the system through a series of belts and pulleys. The power transmitted into the lower roller was transmitted to the upper roller through a belt drive connection. The fixed rollers has spikes designed to penetrate into the husk and pull it apart. At first the coconut are feeded in the hopper setup. Then the coconut inline drops between the spiked rollers from the hopper. Power produced by prime mover is then used to peel off the coir with the rotating spiked rollers. The rollers keep on removing maximum amount of coir as much as possible. Further operator press the pedal and the finished dry coconut is thrown out and collected in a box while the waste simply drops down in trash bag.

V. CONCLUSION

The literature represented in this study describes the need of this product as we have estimated that the coir twinning process is a hectic if done manually with using tradition tools. Although even if automatic machines are considered they are also expensive and cannot be afforded by small scale farmers. In this study, we also anticipated that the user gets injured while using the manual equipments and also it is a tiring process^[2]. This semi – automatic coir twinner helps to ease the process and also reduces the fatigue on user ensuring his/her safety. The machine is at a low cost initially so can be easily afforded by small scale farmers as well as larger scale coconut cultivators. The machine is simple in design and construction and does not require special planning. Thus carrying out stepwise procedure the machine can be completed successfully^{[7],[8]}.

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