

Design and Fabrication of Coconut Fiber Removal Machine

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Abstract

Agriculture is the backbone of India. The agriculture field produces lot of products such as rice, sugarcane, turmeric, cereals, coconut, etc. In that coconut is one of the most important product. 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. The coconut is one of the major sources for several agro-based industries. Wide ranges of products obtained from coconut are coconut oil, rope, buttons, chocolates, cookies and several other domestic uses. All parts of coconut tree is useful in one way or other and the crop profoundly influences the socio-economic security of millions of farm families. Now-a-days agricultural field faces the scarcity in workers. Due to shortage of labors, time consumption is more and wages for labours are high. Hence a innovative technique implemented to remove the shell from the dry coconut shell, thereby reducing the manual labour.

Introduction

Coconuts are grown in more than 93 countries of the world, with a total production of 5.4 billion tons per year. An individual coconut fruit is made up of an exocarp, India is the second largest country to grow the coconut palms. 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. All parts of coconut tree is 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. The present study is focused on the various machines which are available for the husking operation of coconut and points out the advantages and disadvantages of each.

1. Objectives Of Project:

Coconut production plays an important role in the national economy of India. Coconuts are known for its versatility as seen in many uses of its different parts. It also has cultural and religious significance in many societies. Copra is the dried meat or kernel of the coconut. 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 reducing the accidents that may happen during deshelling manually.

2. Manually Operated Machines:

A majority of de-husking is carried out manually which goes to show that there are no superior machines developed to handle the coconuts. Coconut de-husking is the most fundamental issue in terms of finding labor and improving productivity. Few machines which are in current practice are described below. It consists of a sharpened edge on which the coconut is placed by applying force. This in turn, cuts and opens the husk of the coconut. It is also dangerous as an in-experienced worker may hurt himself in the process. One traditional method used for coconut dehusking is using a machete. This is done by using human energy.



2. Manual operated machine

Drawback of manual dehusking machine

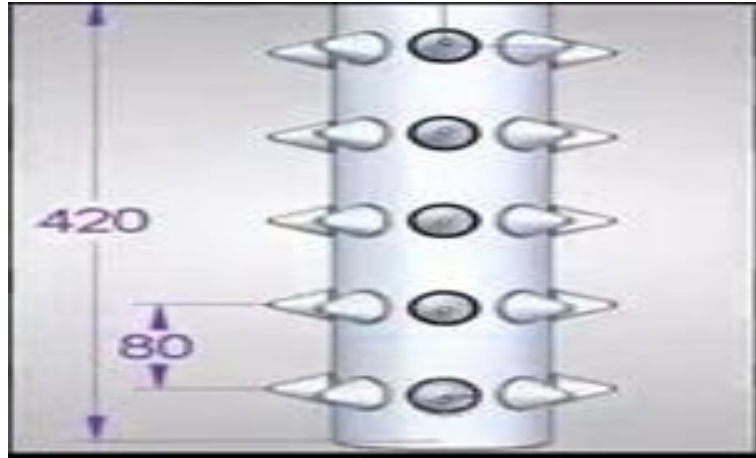
- High labour cost
- Dangerous in work

Components

1.Hollow Shaft With Spines:

The dimensions of cylinders are designed in a manner to obtain effective mesh with coconut husk. The adhesion between fibers in the husk is greater than that between the shell and the husk; hence separation occurs at the husk-shell interface. The thickness of fiber is in the range of 20 to 40mm. The tynes can be attached to cylindrical rollers either by welding or by using fasteners. The power from electric motor is transmitted to the rotating cylinders through pulleys and gears. Power should have less speed and high torque at the rotating cylinders and this is obtained by using a speed reduction gearbox. The gears and pulleys will be arranged in such a way that desired output is obtained by making use of readily available sizes of gears and pulleys, so as to keep the manufacturing cost low. Assumptions used,

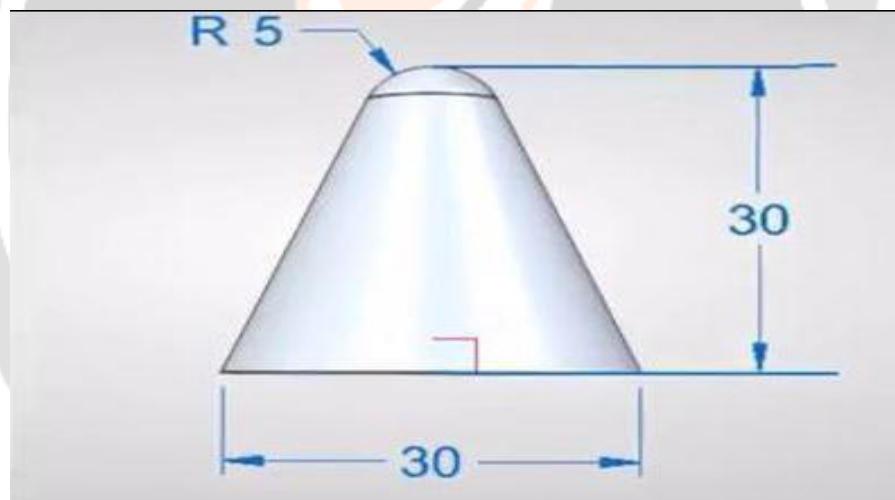
1. Coconut contacts with cylinder at an average angle of 30-degree contact sector .
2. The 1/6th of width of coconut should be inserted into the intermediate space between cylinders. (Approximately 30mm).



1. hollow shaft with spines

2. Cutting Spines:

The adhesion between fibers in the husk is greater than that between the shell and the husk; hence separation occurs at the husk-shell interface. The thickness of fiber is in the range of 20 to 40mm. The dimension of tynes should be so selected that to get effective penetration with coconut. The tynes can be attached to cylindrical rollers either by welding or by using fasteners. The advantage of using fasteners is that the damaged tynes can be easily replaced.



2. cutting spines

3. Gear:

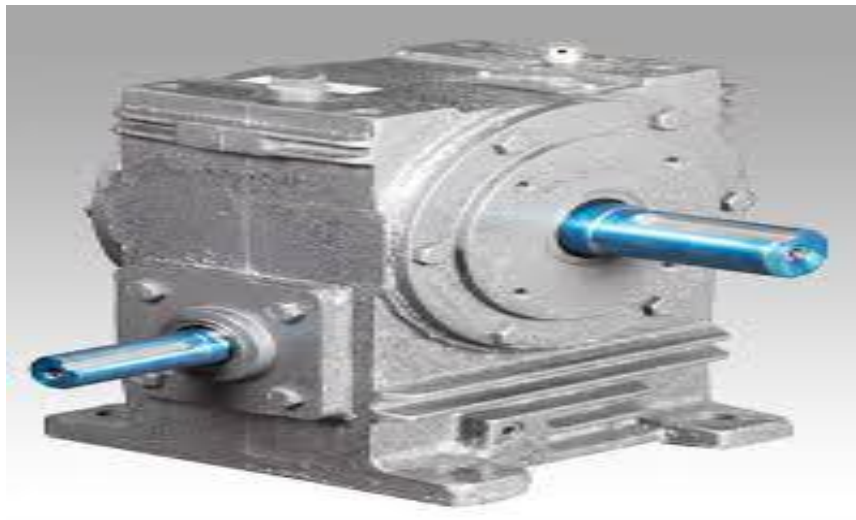
Gears are commonly used to transmit rotational motion between machinery shafts. The spur gears, which are designed to transmit motion and power between parallel shafts, are the most economical gears in the power transmission industry. The most common and easy to produce parallel shaft cylindrical gears. Of a pair of gears, the larger one is called a gear and the smaller one a pinion. Spur gears or straight-cut gears are the simplest type of gear.



3.spur gear

4. Gear Box:

A **transmission** is a machine in a power transmission system, which provides controlled application of the power. Often the term transmission refers simply to the **gearbox** that uses gears and gear trains to provide speed and torque conversions from a rotating power source to another device. The most common use is in motor vehicles, where the transmission adapts the output of the internal combustion engine to the drive wheels. The transmission reduces the higher engine speed to the slower wheel speed, increasing torque in the process. Transmissions are also used on pedal bicycles, fixed machines, and where different rotational speeds and torques are adapted.



4. gear box

5. Belt Drive:

A **belt** is a loop of flexible material used to link two or more rotating shafts mechanically, most often parallel. Belts may be used as a source of motion, to transmit power efficiently or to track relative movement. For high-power requirements, two or more **V-belts** can be joined side-by-side in an arrangement called a multi-V, running on matching multi-groove sheaves. When an endless belt does not fit the need, jointed and link V-belts may be employed. Most models offer the same power and speed ratings as equivalently-sized endless belts and do not require special pulleys to operate. This is known as a multiple-V-belt drive. V-belts solved the slippage and alignment problem. It is now the basic belt for power transmission. They provide the best combination of traction, speed of movement, load of the bearings, and long service life. V-belts trump flat belts with their small center distances and high reduction ratios. The preferred center distance is larger than the largest pulley diameter, but less than three times the sum of both pulleys. V-belts need larger pulleys for their thicker cross-section than flat belts.



5.v belt

6. Bearing Blocks:

A ball bearing is a type of rolling-element bearing that uses balls to maintain the separation between the bearing races. The purpose of a ball bearing is to reduce rotational friction and support radial and axial loads. It achieves this by using at least two races to contain the balls and transmit the loads through the balls. In most applications, one race is stationary and the other is attached to the rotating assembly (e.g., a hub or shaft). As one of the bearing races rotates it causes the balls to rotate as well. Because the balls are rolling they have a much lower coefficient of friction than if two flat surfaces were sliding against each other. Ball bearings tend to have lower load capacity for their size than other kinds of rolling-element bearings due to the smaller contact area between the balls and races. However, they can tolerate some misalignment of the inner and outer races.

The bearings are pressed smoothly to fit into the shafts because if hammered the bearing may develop cracks. Bearing is made up of steel material and bearing cap is mild steel. Ball and roller bearings are used widely in instruments and machines in order to minimize friction and power loss.



6.bearing block

7. Electric Motors:

An electric motor is an electrical machine that converts electrical energy into mechanical energy. The reverse of this is the conversion of mechanical energy into electrical energy and is done by an electric generator, which has much in common with a motor. Most electric motors operate through the interaction between an electric motor's magnetic field and winding currents to generate force.

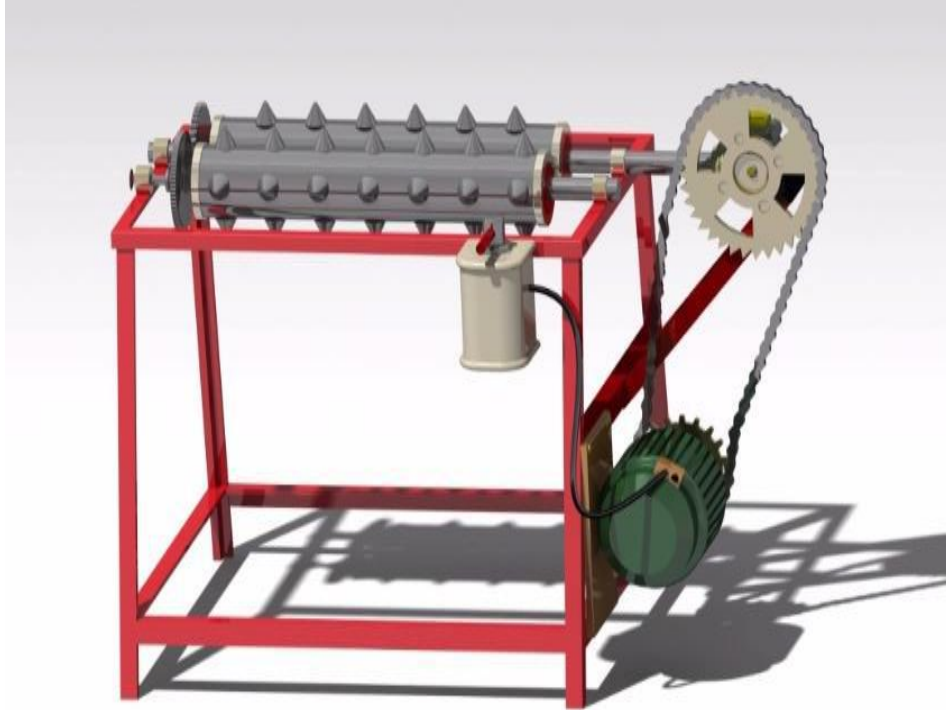
In certain applications, such as in regenerative braking with traction motors in the transportation industry, electric motors can also be used in reverse as generators to convert mechanical energy into electric power. Electric motors can be powered by direct current (DC) sources, such as from batteries, motor vehicles or rectifiers, or by alternating current (AC) sources, such as from the power grid, inverters or generators. Small motors may be found in electric watches. The largest of electric motors are used for ship propulsion, pipeline compression and pumped-storage applications with ratings reaching 100 megawatts.

Electric motors may be classified by electric power source type, internal construction, application, type of motion output, and so on. Electric motors are used to produce linear or rotary force (torque), and should be distinguished from devices such as magnetic solenoids and loudspeakers that convert electricity into motion but do not generate usable mechanical powers, which are respectively referred to as actuators and transducers.



7. Electric motor

Working Diagram:



Working Principle:

In this project, The two rollers containing a series of sharp edges with a continuous rolling action. These two rollers will be connected to shaft rotated by an electrical motor with required power through speed reduction units. Roller 1 will act as dehusker and Roller 2 will act as guiding roller.

Roller 1 rotates in counter clockwise direction while roller 2 rotates in clockwise direction. The spines are machined according to the dimensions on the lathe and then welded on the roller surface. Speed reduction unit consists of gears which are selected based on the rpm. Also the direction of both rollers has to be opposite to each other which can be done with the help of idler gear.

An electric motor of required power is to be selected based on the shearing force of husk, The motor used is of single phase, 1HP. The motor shaft is coupled to the gearbox which drives the system. The pressing plate is used to press the coconut downwards during the process. So that the coconut does not run out of the roller while removing the husk . The removed husk is collected in a tray which is fixed just below the rollers.

Advantages:

1. Skilled labor is not required.
2. Easy operation
3. It can be transported easily from one place to another place
4. Maintenance is easy.
5. Investment is low
6. Dismantling and assembling is simple.

Application:

1. Industrial canteens
2. Agriculture purposes
3. Hair oil refinery industries
4. Coir and Fuel industries
5. Gunny bag industries
6. Health benefits

Conclusions:

The project carried out by us made an impressive task in the field of agricultural. It is very useful to the farmers for motorized husk remover. Easy to assemble. Easy Maintenance. About the market, this model is compact with good range of productivity with low cost and safety. This project will reduce the cost involved in the concern. Project has been designed to perform the entire requirement task at the shortest time available. Power operated dehusking tool can help any unskilled operator to get his work done with ease. The dehusker is completely safe to operate. For example 32 coconut husk/hour removed in manual operated machines, In our projects 110 coconut husk /hour are removed. Operator cost of manual is Rs.250/hour, In our projects consumed overall cost is 175/hour. The saving amount is an 75/hour.

Results:

| Particulars | Traditional way of breaking | Machine |
|------------------------|---|----------|
| Quantity per hour | 32 | 110 |
| Time taken per coconut | 1.50 sec | 32.5 sec |
| Risk factors | High | Less |
| Health injuries | Injuries in hands and other parts of the body | Less |
| Ease of use | Difficult | Easy |
| Effort required | Very high | Less |

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