

Design and Development of Groundnut Pod Separating Machine.

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Abstract: Our project is mainly focused on the design and Development of a groundnut pod separating machine electrically powered by a 1hp motor. In the beginning the Groundnut pods were separated from its crop by the workers. The output got from this method, was very low and it does not fulfil the market demand because it was very time consuming process.

Our project mainly consists of robotic arm and spiked rotating drum. Robotic arm will pluck out the groundnut crop and feed it on the spiked rotating drum. Spikes on rotating drum will separate the pods from ground crop. There are big Groundnut Harvesters available in market, but farmers having small farm area can't afford that harvesters. Our machine is small, lightweight, and low in cost. Farmers having small farm area can afford and use our machine.

Keywords: Design and Development, Groundnut Separator, light Weight, Low Cost, Robotic Arm, Rotating Spiked Drum.

I. Introduction

Groundnut is very important as per as the oil seed is concerned, Groundnut is the sixth most important oilseed crop in the world. It contains 48-50% oil and 26-28% protein, and is a rich source of dietary fiber, minerals and vitamins. Developing countries constitute 97% of the global area and 94% of the global production of this crop. The production of groundnut is concentrated in Asia and Africa (56% and 40% of the global area and 68% and 25% of the global production, respectively).

Among the many fast growing cash crops, groundnut is always sought after by small farmers. Among the many fast growing cash crops, groundnut is always sought after by small farmers. But the major hardship in growing this crop is harvesting. It is a laborious and time consuming process. The fields need to be made wet the previous day with scant irrigation, so that the soil becomes loose and the plants along with the pods can be pulled out easily from the soil. Once plucked, the pods need to be stripped from the shell. Stripping the pods is a traditional practice done either by removing the pods manually or hitting the bunches with the help of rods.

Both these methods are quite difficult and damage the hands and fingers. There is no guarantee that all pods can be removed from the shell. Manually about 20-30 women are required for stripping an acre of groundnut pods.

The cylindrical type machine is closed on all the sides except for three opening, one on the top and other two at bottom. The uprooted plant with the pod is fed through the opening at the top where a spiked cylinder is fitted and through the opening at bottom the broken pods are collected. The fine dust and other particles are thrown out through third outlet.

II. Problem Definition

In traditional method time required is too much.

The efforts in traditional method are more.

Higher cost of labor.

Low efficiency.

Profit earned by farmer is less.

III. Problem solution/aim of our project

The aim of project is to design & develop a low-cost groundnut harvester which will help farmer to reduce time required to separate groundnuts.

To reduce human efforts.

To increase efficiency and get more profit.

To reduce high requirement of labors.

IV. Components Used in Machine

a. Cylinder with spikes on it:

Stripping is done by holding the pod portion of a bunch over the spiked cylinder. The vines along with the groundnuts are held over the spiked cylinder and the pods get removed. The vines are not fed into the machine. After pod removal, the bunch is dried and used as fodder for animals. It saves 60 per cent of labor and pod separation time, which ultimately reduces the cost of cultivation. Though there are several models of groundnut pod stripper available in various research institutes, this machine is compact and can be transported easily.

b. Robotic Arm

3 DOF robotic arm is used in this machine. Pick and place robotic arm is used with gripper. Robotic arm is used to pluck out groundnut crop and feed it on rotating drum. Rotating drum will separate the groundnut pod from crop. Injuries to workers during feeding crop can be eliminated using robotic arm. We can restrict robotic arm up to specific locations.

Components used in gripper are as follows;

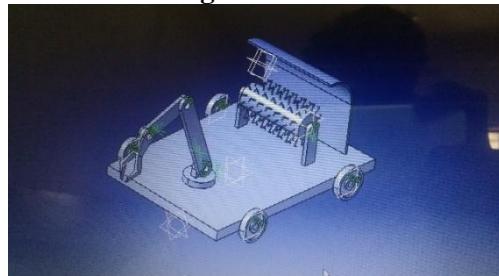
c. Spur Gear

The arrangement of *two parallel* and coplanar shafts is done by the spur gears. These gears can be fitted externally and internally as well. The spur gear will rotate in the same way in the internal gearing, and it revolves in the opposite way in the external gearing. It is used in the clocks, gear box, and lathe back gear.

d. Worm and Worm Wheel

It can integrate shafts that are perpendicular to each other. Here, the driver is worm and driven is worm wheel. The advantage of using worm and worm wheel is that it can transmit high power and efficiency along with the reduced velocity ratio. Some of the applications are wind shield wiper, index head, and steering gear box.

V. Diagram and tables



3D MODEL

COMPONENT	SPECIFICATION
Motor	1 HP Electric Motor.
Chassis	1 meter by 2 meter.
Battery	100 V, 30 A hrs. for 3 hrs.
Spur gear	5 cm Diameter.
Arm	1.5 meter.
Gripper	1 feet-16 rpm of gear motor.
Rotating brush	1440 rpm with bars.
Rotating Drum	240 rpm.
Worm gear	Metal gear.

Table of Components and Specifications

VI. Working

Spur and the worm gears will be attached on the gripper. Motor will rotate clockwise and anti-clockwise for open and close moment of the gripper. Here battery is used to supply power to the switches working as controller for the machine. The arm and gripper will work through the command sent from the switches called mechanical switches. The arm will move up and down. The gripper will open and close.

Robotic Arm will pluck out the Groundnut crop and fed it on the spiked rotating drum from the root side of crop. Spikes on rotating drum will remove the pods from groundnut crop. The separated pods are stores at the bottom of casing.

VII. Conclusion

Our groundnut separator machine will help to improve the threshing efficiency of small farmers where electricity is not available. It will also help to reduce both threshing cost and threshing time. Requirement of more number of workers will be eliminated as only two workers can carry out the complete threshing operation. The project objectives originally are to build a groundnut pod separator and cleaner using engineering principles to process groundnut. This machine can be used to collect medicine plants from environment where humans cannot go. Handicap person can increase his productivity or efficiency using this machine.

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