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A Review on Design and Fabrication of Groundnut Shelling and Separating Machine

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Abstract - *Groundnut is grown on small scale by farmers in developing countries like India. Lack of groundnut processing machines at affordable cost, especially groundnut Sheller, is a major problem of groundnut production. The groundnut Sheller machines available in the market are large in size and costly and not suitable for domestic purpose. The machine is fabricated by locally sourced materials. The major parts of machine are Hopper, Crushing Chamber, Separating Chamber and Blower. The processes involve in the project are like design, fabrication and assembly of different components.*

Key Words: **Design and fabrication, groundnut shelling, separating machine, locally sourced materials.**

1. INTRODUCTION

Groundnut is the sixth most important oilseed crop in the world. It contains 46-50% oil and 25-28% protein, and is a rich source of dietary fiber, minerals and vitamins. It grows best on soils that are well drained, loosely textured and well supplied with calcium, potassium and phosphorous. Over 100 countries worldwide grow groundnut. The main purpose of this paper is to understand the knowledge of design and fabrication mechanism of portable groundnut Sheller machine. The design is very simple and eco-friendly which uses simple mechanism properties such as shelling system, automatic separating system and crushing chamber etc.

The study of manufacturing was very important for this project. In this project the process of designing the different parts of this shelling and separating machine considering all forces and ergonomic factor for people to use, This project is mainly about generating a new concept of groundnut shell (crush) that would make

easier to transport anywhere and suitable to crush groundnut. After the design has completed, it was transformed to its real product where the design is used for guideline. A simple hand operated groundnut Sheller machine has a semi-cylindrical form closed on both sides. At one end shaft carrying a lever and which is fixed across the centre of the semi cylinder. The major drawback of this machine is labour intensive and consumes lots of time. Output is about 20-30 kg/hour. But the particular design of this project reduces all the causes and improves the efficiency. It consists of the hopper, crushing chamber, separation chamber, blower unit and the frame for support. The crushing chamber and blower unit is powered by electrically which save the time. The machine is also light weight and easy to operate and maintain, the spare parts are also available locally.

2. LITERATURE REVIEW

Shelling is the removal of grains from their pod either by stripping, impact action and rubbing or any combination of these methods [4].The most popular method of groundnut shelling, which is still widely used is the method of crushing or pressing the pods in between the thumb and the first finger to break off the pods and release the seed. This method has low efficiency, it is time consuming, and has high demand of energy [4]. Groundnut shelling machine is a machine used to remove the shell of groundnut so as to obtain the groundnut seeds [3]. There are different machines have been fabricated and used to shell wide variety of groundnut pods [4].These machines are too costly and complex in operation and maintenance [4]. The lowest price of the hand operated groundnut Sheller machine is Rs-11,500/- . Some of these machines have very high shelling capacity. Shelling capacity varies from machine to machine ranging from 5kg-seeds/h to 60kgseeds/h ([1]; [2]). Some hand operated Sheller machines are suitable for domestic application but they only do shelling operation, separation of seeds we have to do manually by using traditional methods such as by using natural wind or by using sieve. A simple hand operated groundnut Sheller has a semi-cylindrical screen closed on both sides. A shaft carrying a lever at one end is fixed across the centre of the semi-cylinder as shown in the Fig.1 (a). On the lever is a pair of plate with shoes or beater bars, having blunts on their undersides. For successful operation of the machine, the operator stands by the side, then holding the operating lever (handle) and swinging it by pushing to and fro to provide shelling action on the shoes assembly [4]. The semi-rotary, action of the shoes shells the pods against the screen but this type of machines cannot do separation of shell and seed.

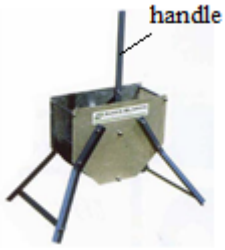
2.1 Classification of Groundnut Sheller Machines

Groundnut Sheller machines are classified based on the following factors

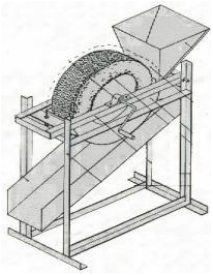
a. Based on the power source ([2], [5])

Based on power source, groundnut Sheller machines are classified in to two types.

- Manually operated (Fig.1)
- Mechanized shelling method (Fig.2)



a. Semi rotary type



b. Rotary type Sheller [7]

Fig.1 Manually operated groundnut Sheller machine

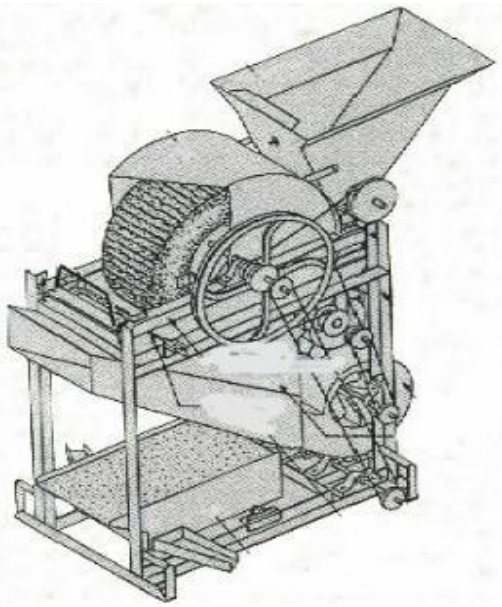


Fig.2 Power operated groundnut Sheller Machine [6]

b. Based on shelling mechanism [5]

Based on Shelling Mechanism, groundnut Sheller machines are classified in to two types.

- Reciprocating
- Rotary

3. SCHEMATIC REPRESENTATION

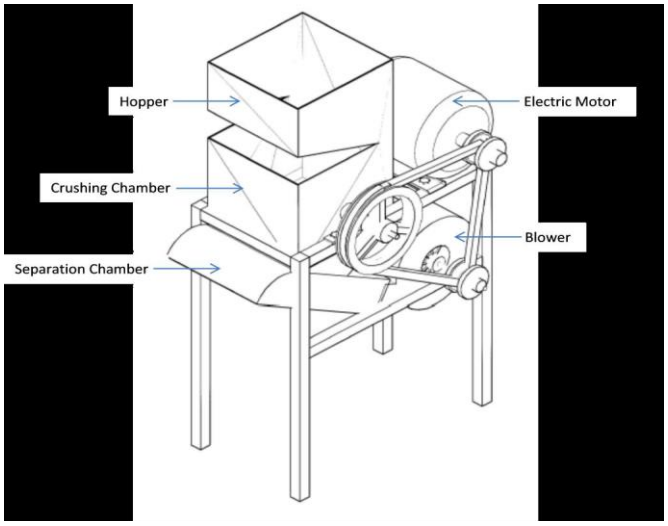


Fig.3 Proposed model of Groundnut shelling and separating machine

4. OBJECTIVE

- The main and basic objective is to make low cost groundnut shelling and separating machine.
- The machined shell maximum possible groundnut in shortest possible time.
- The machine should not damage the peanuts in according to earn profit.
- The cost of a machine should be affordable to the farmers.
- The space required by the machine should be less. It should be kept within the land.
- The machine should not have high weight. It should be easily move anywhere.

5. COMPONENTS AND SPECIFICATIONS

- Frame
- Electric motor
- Roller
- V-Belt
- Pulley
- Hopper
- Fan
- Semicircular Net

5.1Frame:

The frame is used to support all the components. Material of frame is cast iron and height up to 1m.

Fig .4 Frame

5.2 ELECTRIC MOTOR:

This motor is used to rotate the roller by using belt and pulley.

Output = 230 volt
Current =3.5 amps
Power =0.37kw/0.5 HP

Fig.5 Electric motor

5.3 Roller:

Roller is made up of hollow cylinder of 1ft dia. and 1ft length with the rods welded on its periphery. The material of roller is cast iron.

Fig.6 Roller

5.4 V-Belt:

V-Belt is used to transmit rotary motion of shaft of motor to the shaft of roller. Material of the belt is rubber or polymer for strength and reinforcement.

Fig.7 V-Belt

5.5 PULLEY:

Pulley is used to transmit the torque of motor to the roller. One pulley is directly mounted over the motor shaft and another pulley mounted on the shaft of roller. And both the pulleys are connected with the help of V-belt. Pulley Dia. =75mm.

Fig.8 Pulley

5.6 Hopper:

Hopper contains groundnuts before and during shelling process. It is use to continuous supply of the groundnut to the crushing unit.

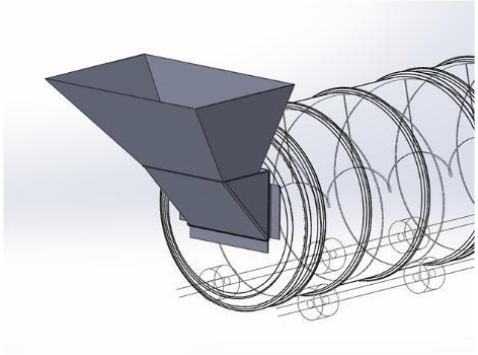


Fig.9 Hopper

5.7 Fan

Fan is mounted on the shaft of the motor just in front of pulley at some distance. This fan separates the shell and the peanuts.

Fig.10 Fan

5.8 Semicircular Net

This semicircular net is fitted beside the roller at very small distance so that shell of groundnut should be easily cracked and peanuts remain uncracked.

Fig.11 Semicircular Net

6. FUTURE SCOPE

1. The agriculture is the basic profession of vast of population world-wide .Some modifications can be done in this machine and it will be used over long scale.

2. This machine provides better help to farmers so that they can get proper income of their crop. The scope in agricultural field is tremendous.

3. It will definitely be a vast sector to work on to minimise man power and improve efficiency of operation, decrease cost of operation, decrease efforts.

4. Use of solar energy instead of electrical energy to operate machine

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