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Groundnut Shelling Machine

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ABSTRACT :

The majority of land in India is used for agriculture, which yields goods and semi-finished products. Another semi-finished agricultural product is groundnut. In underdeveloped nations like India, farmers cultivate groundnuts on a small scale. The average cost of karnal is around double that of what was paid. One of the main issues with groundnut production, particularly in India, is the lack of equipment for processing them, particularly groundnut shellers. Initially, the workers removed the peanuts from their shells. They just use their hands to decoct the groundnut and extract the peanuts from the shell. Due to the lengthy process, the production produced by this approach is extremely low and does not meet market demand.

a study to design, build, and test the operation of a groundnut sheller that includes a shelling unit, separating unit, power system, and a feed hopper with a flow rat e control mechanism. Mechanical damage, shelling efficiency, material efficiency, and throughput capacity were used to assess the machine's performance. That might be utilized to convey the relationship that was established between the feed rate, pod moisture content, and Sheller performance indices. the creation and design of the groundnutSheller machine's several parts.

Therefore, it is vital to create a variety of parts for this, and doing so will increase the design quality of those parts.

All things considered, this project entails procedures like component assembly, manufacture, and design.Keeping this in mind, we believe that we ought to create a machine with a higher production capacity and that the machine obtains operated on 1400rpm electric motor instead of manual work.

1. INTRODUCTION

Portuguese traders brought the groundnut (Arachis Hypogea) to West Africa in the 16th century, bringing it from Latin America (Brazil). According to Komolafe et al. (1985) and Hommons (1994), its genuine origins date back to 350 BC.
The largest and most significant member of the Leguminosae, it belongs to the papilionaceous family of plants (Shankar Appa, Robert, and Virginia, 20 03).
In Africa's tropical regions, this crop is thought to have enormous potential for use as food and an industrial product (Milner, 1973).It is utilized to gene rate income to promote rural development in several parts of Nigeria, including Kano, Sokoto, Kaduna, Bauchi, and Borno States.
Shelling and separation are two crucial steps in the groundnut production process.
The process of removing a groundnut seed from its pod by impact action, compression, shearing, or a combination of these techniques is known as shell ing. The two main categories of shelling operations are mechanical and traditional methods.
Traditional methods of shelling include animal trampling, stick beating, and manual pod pressing.Podpressing is predominantly used in Nigeria and is i nefficient, energy-intensive, time-consuming, labor-intensive, and exhausting.
Over the years, a number of shelling machines based on various approaches have been produced.
These include, to name a few, powered rubber groundnut shellers, baby groundnut shellers, and hand-operated groundnut shellers.
These devices are quite expensive due to custom taxes, making them unaffordable for small-scale farmers and producers.
identified a few of the three groundnut types' physical characteristics. RMP-9, RMP-12, and ICGV-SM-93523 were the materials used. Weight, bulk density, moisture content, and other physical attributes were taken into account.
Analysis was done using an Anova at a 0.5 probability level.
created and built a machine for shelling and sorting groundnuts. The machine's 400 kg/h shelling capacity, 78% shelling efficiency, and 17.25% material damage are all achieved with a 1 horsepower motor. We looked locally for the materials.
The pods were crushed by the machine using spikes.
intended to replace the current design by crushing the pod with an angry shaft. Additionally, to use locally accessible materials to increase the shelling capacity at a low cost. The machine is then assessed according to the percentage of material and shelling efficiency.
The majority of India's land is utilized for agriculture, which yields goods and semi-finished items. Another semi-finished agricultural product is groundnut. Small-scale farmers in developing nations like India grow groundnuts. On average, kernels cost around twice as much as pods. One of the

main issues with groundnut production, particularly in India, is the lack of equipment for processing them, particularly groundnut shellers. Initially, the workers removed the peanuts from their shells. They just use their hands to decoct the groundnut and extract the peanuts from the shell. Given how time-consuming the procedure was, the method's production was extremely low and did not meet market demand. Regression models were developed that may be used to express the link between feed rate, pod moisture content, and Sheller performance metrics. The design and construction of several groundnut sheller machine components are covered in this work. Because of this, it is required to design a number of pieces, and the design quality of those parts will be improved as a result.

2. LITERATURE REVIEW

Grain shelling is the process of removing grains from their pods by rubbing, impact action, stripping, or any combination of these techniques.The most common groundnut shelling technique, which is still in use today, involves crushing or pushing the pods between the thum and the first finger to break them off and release them.This approach requires a lot of energy, is time-consuming, and is inefficient. A groundnut shelling machine is a device that removes the groundnut's shell in order to extract the seeds. A wide range of groundnut pods can be shelled using various equipment that have been constructed. These devices are too expensive and require too much upkeep and operation. The hand-operated groundnut sheller machine is the least expensive, costing Rs. 2,500. The shelling capacity of some of these devices is really great. Machine-to-machine variations in shelling capacity range from 5 kg/h to 60 kg/h. Some hand driven Sheller machines are ideal for home application but they just do shelling operation, separation of seeds we have todomanuallybyusingtraditionalmethodssuchasbyusingnaturalwindorby using . The semi-cylindrical screen of a basic hand-operated groundnut sheller is closed on both sides. As seen in the illustration, a shaft with a lever at one end is placed across the middle of these semi-cylinders.A pair of plates with beaterbars or shoes and blunts on the undersides are on the lever. The semi-rotary action of the shoes shells the pods against the screen, but this kind of machine cannot do that. To ensure the machine works properly, the operator must stand by the side, grasp the operating lever (handle), and swing it by pushing to and fro to provide shelling action on the shoe's assembly.

PROBLEMIDENTIFICATION

The workers sorted the peanuts from their shells. They just use their hands to decoct the groundnut and extract the peanuts from the shell. Due to the lengthy process, the production obtained from this technology was extremely low and could not meet market demand.
The worker also found the work to be dull.
The conventional technique for separating groundnuts from nuts involves placing the peanuts in a cotton bag and using a rolling pin to roll them over. We still had to pick the peanuts out because they did not come completely loose, but this method did a nice job of cracking the shells (removing the sor e fingers issue). This method of shelling a ground nut is unreliable because it cracks the ground nut and causes nuts to mingle with the shell. The introduction explains that the conventional approach to groundnut separation is insufficient.
Because of this manual procedure, several significant issues are identified, and some ideas or concepts are generated to address these issues.Accordingt ogeneratedideasdeciding
objectiveofproject.The following are the primary issues that former employees and small business owners are dealing with: 1) The base process is now operated manually (pedaloperated) 2)Nuts&husk(outercoveringofgroundnut)ismixedaftercrushing(shellingoperation).
3)Lowproductivity&timeconsuming.

Purpose of Shelling Machine

Toreducecost. Toreduceinvestmentcostonmachine. to boost revenue. Save time.

PROBLEM DEFINATION

The goal is to create a low-cost groundnut shelling equipment that would enable farmers to sell shelled groundnuts rather than unshelled ones. Taking into account the aforementioned issues, create a machine that will solve the majority of the issues with the manually shelling machines that were previously in use. This will lessen the need for human labor, increase productivity, and increase the former's profit. This is the groundnut sheller machine model.
Concept A.
The goal of introducing inexpensive automation was to address issues with the existing manual, traditional method.
The idea behind the endeavor is to (1) determine the key process factors by observing the manual procedures. (2) Quantify the crucial approach.
(3) A system that had complete control over the process. (4) The automated forming area. (5)Low-costautomatedsystem.
(6) Improved machine design and fabrication, since this is crucial in rural areas.Taking into account the aforementioned considerations, we designed a semi-automated machine to replace manual processes.

B. OBJECTIVE

This project's primary goal is to surpass the conventional approach. (1) To lessen waste from crushed or cracked groundnuts.
(2)Toincreasetheefficiency. (3) To lessen the time and effort required to shell the groundnut. (4) To create a low-
cost device that farmers can employ to transform their semi-finished groundnuts (shell groundnuts) into finished groundnuts.
(5) It fulfills the hamlet residents' desire to make more money.

3. SYSTEM DESIGN

ConsistsofapplicationoftechnicalinformationDevelop a country for the creation of new or modified machinery or mechanisms that are as economical an d efficient as possible. It must be adopted here.
The entire design process has been divided into two sections, primarily the space need arrangement of different components on the main frame system a nd the numerous physical restrictions.
Machine interaction, the number of working environment positions, the likelihood of failure, the safety measures in place, the ease of maintenance, the potential for improvement, the machine's wish from a pound level, the machine's total weight, and many other factors.
A mechanical design lists and stores the components according to how they were purchased, specifically: 1. Design of parts 2.Partstobepurchased Design components are completed, and the distinctions that are obtained are to the next highest dimension that is easily accessible in the market.
As a result, the assembly is amplified as servicing work. There are specifications for the different tolerances on the works.
The charts are then sent to several catalogs, and it is stated that anyone can buy them with the given details.

SYSTEMDESIGN

We primarily focused on the following parameters when designing the system. SystemselectionBasedPhysicalConstraints
It needs to be verified if it will be used in a small-scale or large-scale company. In our situation, either a small or major industry is supposed to use it. It must be extremely small in order to accommodate the major system's mechanical design, which must be directly modified. Controlling the physical parameters is the design's responsibility.
that the differences in mechanical design can be properly attributed to that.Arrangementsofvariouscomponents
Given the space constraints, they ought to be arranged so that service and removal are simple.
Every available space is used in the arrangement of the components.
Componentsof system
As previously said, the system should be small enough to fit in a regular room.Everything should be packed tightly. The needed high weight is provided by a compact system design. One of the machine's key characteristics is how well it applies psychological concepts and how friendly it is to the operator.
Chances of failure
One of the most crucial requirements for any design is the owner's losses in the event of failure.
When designing mechanical systems, a high safety factor reduces the likelihood of failure. Moreover.
Servicingfacility
The components should be arranged to facilitate simple maintenance. It is easy to disassemble parts, especially those that need regular maintenance.The scope of future work and the framework for future enhancements should be specified.

Heightormachinefromground
The machine's height should be adjusted for the operator's convenience and comfort to prevent fatigue while operating. In addition to being level, the machine should have sufficient ground clearance to be mounted on a table.
Weightofmachine
The overall weight is determined by the material choice as well as the component measurements.In the event of a catastrophic breakdown, a heavier machine is more difficult to transfer because of its increased weight.

MECHANICALDESIGN

Because it depends on a proper design understanding of the problem, the mechanical design step is crucial.
Preliminary feelings may be detected here, and wear analysis should be sufficient.
He needs to determine how much force is being applied to the machine's components.
This stress may be categorized as follows: 1. Direct shear stress resulting from axial load 2.Shearstressdueto.
Using the design equation, these forces are quite precisely determined.
He can guess them based on similar conditions if he does not have enough knowledge. The functional needs will be nearly met by this.
One must always err on the side of caution.
Another significant stress in the design of machine elements' working dimensions is the choice of safety criteria to identify working or design stress. Nets and service needs are the adjustments that must be made to the value in accordance with the theoretical stress form. The loading situation, product shape, environmental circumstances, and desired material attributes should all be taken into consideration when choosing a material. It should be possible to reduce the use of improper lubricating techniques.In design of mechanical systems
The components are listed and kept in two categories according to how they were purchased. 1. Design components 2.Partstobepurchased These are the next highest dimensions that can be easily cabled for design pieces. Both the postproduction and the assembly feel moist. The trio's actions on the project are exceptional.
In order for anyone to purr the pursuit store with specified specifications, the part must be bought in accordance with feed numerous catalogues and sta ndards.

InstructionalObjectives:

At the conclusion, the pupils: Applications for springs Nomenclatureofatypicalhelicalspring The helical spring's stresses Deflectionofahelicalspring Mechanical springs are used in a variety of machine kinds.

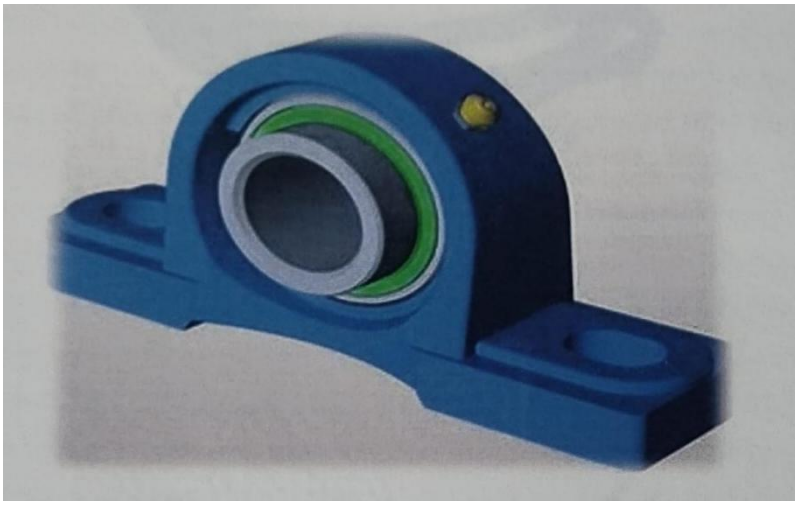
SelectionoftheGroundnutShellingMachine

This machine was constructed by assembling a number of parts. These components include the shelling chamber, fan, hopper, chaff outlet, seed discharge outlet, and frame.

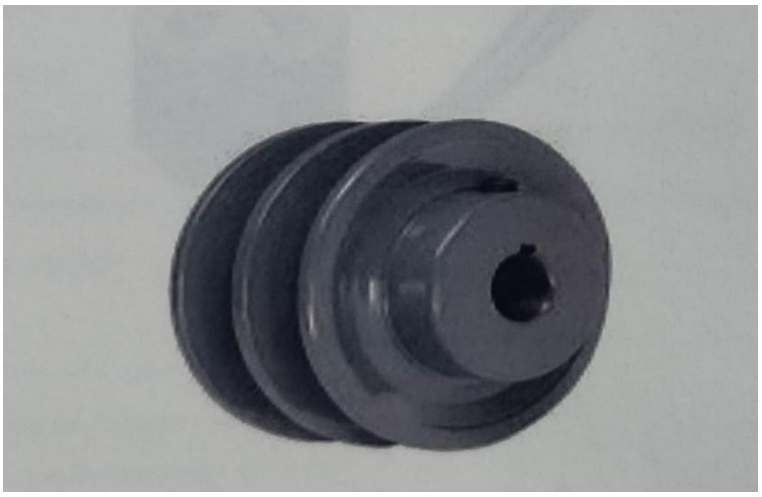
1.Frame It contains the prime mover (electric motor), hopper, shelling, and separating unit.
It must have high welding qualities and be able to sustain loads and pressures as the machine's primary support.
Thus, angle bars made of mild steel were employed. 2.Hopper
Before and during the shelling process, it stores the groundnut that has not yet been shelled.
It needs to be strong, resistant to corrosion, and able to bear vibration loads and pressures. As a result, the material is 2 mm thick mild steel sheet.
3.ShellingChamber It contains the shelling drum and the auger. Inside of it, the shelling process is carried out.
It must therefore have good weldability, corrosion resistance, and the capacity to bear loads and strains. The pitch of the shelling drum is its diameter.
The drum's active length is 500 mm. Thus, mild steel with a thickness of 2 mm was chosen. 4.SeedDischargeOutlet
This outlet is used to collect the shelled groundnut seed. Gravity causes the seeds to drop from the shelling chamber onto the tray.
It needs to be strong and resistant to impact loads. Thus, mild steel with a thickness of 2 mm was utilized.

MODELSANDDRAWING

PillowBlockBearing

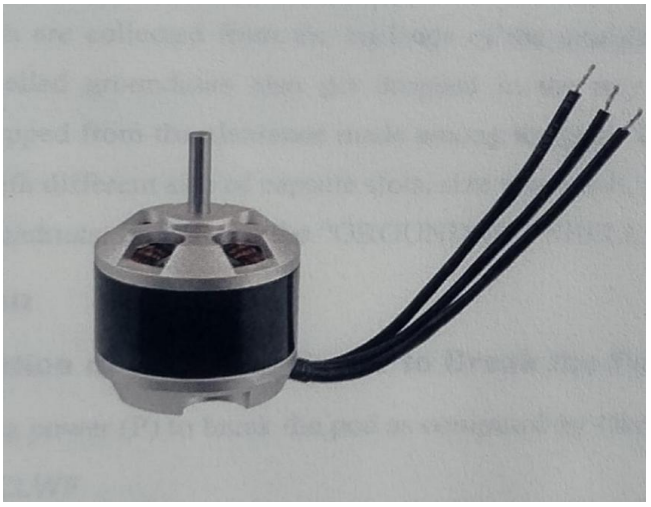


Pulley



V-Belt

Motor



WORKINGPRINCIPLE

Shearing, lowering, and separating actions are how the groundnut sheller works. First, the machine receives its inputs—the groundnut—through the hopper. Then the semicircular net and the roll shaft come into touch with the groundnuts. While the roll shaft rotates, the semicircular net remains stationary. This is where the shearing motion occurs when the groundnut touches these two components. The groundnuts become shelled and split into two pieces as a result of shearing motion, or crushing. For example, in the peanut and groundnut shell. There is space between the roll shaft and the net. The size of the groundnuts that need to be decocted determines the amount of clearance that is allowed. Once the groundnut has been shelled, the peanut and its shell are dropped downward from the semicircular net, and a fan applies centrifugal force on the peanut and groundnut shell. The peanuts fell and gathered in the separator as a result of the increased weight. However, because they are lighter, the groundnut shells are flung outside the machine and gathered from the machine's back. Seven to ten percent of the unshelled groundnuts are also dropped into the tray from the shelling chamber. This peanut falls from the space created between the grill. For groundnuts of varied sizes, the three types of thenets can be utilized with capsule slots of varying sizes. The "GROUNDNUT SHELLER" functions in this manner.

6. BENEFITS, CONSIDERATIONS, AND USE ADVANTAGES

AdvantagesofPeanutShellingMachine Low energy usage, excellent efficiency, and low cost.
It can completely shell peanuts, separate the shells and karnals pulley, and nearly preserve the kernel. The shelling rate can be less than 95%, and the br eaking rate is equivalent to or greater than 5%. DISADVANTAGES The semi-cylindrical form of a basic hand-

operated groundnut sheller machine is closed on both sides. A shaft with a lever at one end that is fastened across the semi-cylinder's center. This machine's main flaw is how labor-intensive and time-consuming it is. About 20–30 kilograms are produced every hour. APPLICATIONS 1. Take groundnuts out of their shell. 2. Disentangle the peas from the peel. 3.Separatedifferenttypesofnutsfromitspeels.

6. FUTURESCOPE

The scope of the work is. Future scope and ease of understanding are important.
Details about what is being supplied as part of the project should also be included.
With enough market share, the groundnut sheller would provide a significant increase in shelling efficiency. In the poor world's groundnut-producing regions, the majority of shelling is done by hand. Women typically perform this kind of work.
One example is the inexpensive groundnut sheller.
In the end, it might greatly cut down on the amount of time farmers and rural women spend processing groundnuts, freeing them time for other activities. The machines that will provide their owners with increased output in the future are listed below. (1) The size of shelled nuts varies.
The size of the nuts affects the price per kilogram. The Sheller machine's nuts outlet is where the grading system for nuts can be attached.
(2) To ensure a steady and proportionate flow of ground nuts, an automated flow control system based on an electric sensor can be installed at the bottom end of the hopper. (3) Soil adhered to shells and sank into the ground nuts during shelling.
It is possible to attach a soil removal system (grading system) to remove soil particles.
(4) We can better manage the dust if we give the layout at the shell exit. (5) We can better manage the dust if we give the layout at the shell exit.
The "GROUNDNUT SHELLER" can be powered by a bull in place of an electric motor or by 0.5 horsepower with the same output if the gear train or chain drive is connected.
When the sheller was operated electrically, the roasted groundnut sample's shelling efficiency was 66%, whereas when it was operated manually, the shelling efficiency was 55%.

The process of dissecting a complicated subject into manageable chunks in order to better comprehend it is called analysis.
Based on the ideas discussed in the first chapter's literature study, we examined the effectiveness of motorized Sheller machines in this chapter.
In the analysis, we compare the parameters that are related to machine efficiency and provide an idea of the kind of machine that is most suited for high productivity at low production costs.
This chapter also covers the machine's payback period, which determines how long it will take to recoup the cost of the unit.
The sheller machine comparison with another based primary machine is explained by the following points:
(1) It was discovered that the average efficiency for JH and WB grades was 75.75% and 72.97%, respectively.
The average efficiency was 74.36% overall. (2) Winnowing and shelling have maximum efficiencies of 79.5% and 80%, respectively.
(3) The optimal shelling efficiency of 96, 77.8, and 62% was achieved by the forward-facing impeller with eight slots.
A moisture level of 5.3% (d.b.) resulted in shelling and winnowing efficiencies of 96 and 87.3%, respectively, for the eight-slot forward-facing impeller, 86.6 and 85.3% for the radial impeller, and 85 and 83.7% for the backward-facing impeller.
(4) The average shelling efficiency for the groundnut cultivars ICGV-SM-93523, Samnut 10-Rmp 12, and Samnut 10-Rmp 9 was determined to be 90.2, 91.9, and 85.7%, respectively.
The machine's maximum shelling effectiveness (91.9%) was seen when shelling groundnuts of the Samnut 10-Rmp-12 variety.
Additionally, the three groundnut cultivars' average shelling efficiency of 89.0%

CONCLUSION

In place of only manually conducted procedures, a proper evaluation of the design will be carried out and something even better will be created. Finally, we come to the conclusion that using an atomize machine rather than a manually operated one is a better option for farmers. When designing the equipment, the needs of the farmer and other clients will also be taken into account.
The Sheller was built with the intention of evaluating the machine's suitability for usage by farmers.Fiveexperimentswereperformedwithpeanuts. The work that this machine does is less because it is designed for farmers or small business owners.
The purchase of a larger groundnut decorator requires a significant amount of resources, and decorating groundnuts on-site also costs more. These "Groundnut Sheller" are incredibly inexpensive in contrast.
The "GROUNDNUT SHELLER MACHINE" has been chosen as the subject of our study.
For the decocting process, the "GROUNDNUT SHELLER MACHINE" is the perfect piece of equipment.
As the project is being completed, our thoughts and ideas are being developed toward the equipment's technologies and mechanisms. Additionally, we envisioned that this "GROUNDNUT SHELLER MACHINE" would be the most important piece of equipment for the expansion and advancement of cottage sector enterprises in the future. Similarly, this is cost-effective and perfect for cottage sector projects when it comes to decocting groundnuts.
The "GROUNDNUT SHELLER MACHINE" can be used in a small industry, or it can even be used by a former.This machine decocts groundnuts more quickly and affordably than a manual procedure or any other method.Thus, upon completion of this project, we conclude that the "GROUNDNUT SHELLER MACHINE" will significantly reduce the project's cost and time, which is its foundation, by saving a great deal of time, energy, manpower, and financial input.

TESTINGANDRESULTS

The selection of the sample is based on the study conducted in the preceding chapter. The sample is delivered from the market (mandi).To get rid of moisture, it is sun-dried for a day. The groundnut in the sample has been unshelled, and some soil has stuck to the shell. Based on the previous chapter's discussion of the experimental setup and operating principle of the testing machine, we decided to conduct research and test one sample five times. Following reading, the mean reading is determined by adding up all of the sample readings. We can calculate the Sheller machine's result with the use of this mean reading. The sample reading is displayed in the accompanying table, which corresponds to the experimental machine setup that was demonstrated in the previous chapter.

The weight of the sample, the weight of the shelled nuts, and the amount of time needed to shell the groundnut are among the factors included in the testing table.

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PHOTOGALLERY

InternalMechanism

Side View

FrontView

TopView