

Design and Fabrication of Corn De-Seeding Machine

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ABSTRACT: In India, Maize is one of the most important crops and it has a source of a large number of industrial products besides its use as human food and animal feed. Maize is world's largest resourceful seed crop. The techniques used to separate seed in old days are removing the leaf by hand or by chopping the corn by wooden rod. In this process the kernels were getting damaged and the rate of production was less. Another major problem now a day is that the cost of the machines that are available in the market is high and is not affordable by the farmers. In order to address the above problems, in this project design and fabrication of low cost corn de-seeding machine for de-seeding of corn without any damages has been developed. The concept model of the machine was made by using AutoCAD software and required calculations were made. After freezing the concept, later it was converted into 3D model using CATIA software. The fabrication of the model was done and the test was conducted.

KEYWORDS: Corn de-seeding, Kernels

I. INTRODUCTION

In today's industrial world man's innovative ideas has taken him towards all directions concerning about the production and safety in industrial establishments. Some instruments are of sheer excellence where as others are the result of long research and persistent work, but it is not the amount of time and money spend in the invention of device or the sophistication of it operation is important, but its convenience, utility and operational efficiency that are important in considering the device. De-seeding of corn is the process of removal of its inner layers, leaving only the cob or seed rack of the corn. De-seeding is the process of removing the hulls (or chaff) from beans and other seeds. This is sometimes done using a machine known as a huller. To prepare the seeds to have oils extracted from them, they are cleaned to remove any foreign objects. Next, the seeds have their hulls, or outer coverings, or husk removed.

A huller, husker or de-seeder is an agricultural machine used to automate the process of removing the chaff and the outer husks of grain. Throughout history, there have been numerous techniques to hull rice. In more recent times the processes are mechanized, and the machine is called a huller, or rice huller. These machines are most widely developed and used throughout Asia.

India is presently is in need of technology in the agricultural field the farmers need to do all the segregating processes manually which is a cumbersome task for as for them and also this increases the cost of the final products.

Here is a device which is based on scientific principles of machines it is simple and maintenance free that is produced as result of this project work. The corn de-seeding machine can use in areas like mills etc. this device can cut the grains and separates the cob.

The existing methods of separating the kernels from the cob by hand is time consuming and the cost of the machines available in the market is very high hence a simple and cost effective corn de-seeding machine which is affordable by the farmers has been developed.

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II. LITERATURE REVIEW

1. **Desai Shridhar R et al., [2017]** has carried out the design and development of corn chaff peeling. It has concluded that the peeling machine has been designed, developed and fabricated for reduce the efforts of Indian farmers. The peeling machine was tested in the fabrication shop and later taken to the field. It worked smoothly in the field conditions and gives an output of 60kg/hour. The leaf discharging mechanism is effective and the corn leaf is discharged very easily.
2. **Abhijeet Y. Kedge, et al., [2016]** has presented the review on design of peeling –shelling compact combo machine. It has concluded that many authors have reported the corn sheller and peeling design and also analyzed it for different loading conditions. Now the corn peeling and Sheller machines are separately available, but there is no single unit exists consisting of both the mechanisms.
3. **Oriaku E.C, et al., [2014]** has design and Performance Evaluation of a Corn De-Cobbing and Separating Machine. The following are conclusion drawn from this project ,the average feed rate of the designed machine was found to be 2.06 kg/min. This implies a value of 123.6 kg/hr while average threshing efficiency was obtained as 1.65 kg/min (99 kg/hr). The average threshing efficiency was found to be 78.93 % while the average separation efficiency was 56.06 %.
4. **J.N. Nwakairea et al., [2011]**has designed, Constructed and Performance Analysis of a Maize Thresher for Rural Dweller. It has concluded from this project, it is clear that the machine was designed successfully. The actual throughput capacity of 109.99kg/hr was far better than the human actual throughput capacity which was determined to be 21.1kg/hr.
5. **Onkar kale et al., [2017]** has carried out the Design and Fabrication of Automatic Corn Separator Machine and they have concluded that: 1) The Automatic corn separator machine is portable as well as low cost Indian farmer can purchase it easily 2) Performance of Sheller machine is depend upon mechanical properties of Corn 3) Automatic corn separator machine can be run by manually by handle as well as automatically by motor.

III. OBJECTIVE OF THE WORK

Problem Statement:

1. The existing methods of corn de-husking in agriculture industry consist of breaking the grains by hand or by using large machinery for deseeding.
2. There is a damage of corn which is de seeded using presently available machines.
3. There is a need for an innovative idea or product that is feasible, safe, cost effective and productive for the Indian farmer.

Objectives:

1. To manufacture a machine which helps the indian farmers who are the backone of national economy.
2. To make a complete device which reduce the human effort and cost of the machine
3. To make a device this is suitable for small scale industries.
4. Simple machine construction and better features.
5. Developing a machine which de seed grains of the corn in less time
6. To make it affordable to the common farmer.
7. To make it compact in size.
8. To make it portable.
9. To avoid damage of corn.

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IV. DESIGN AND FABRICATION OF MACHINE COMPONENTS

COMPONENTS	DIMENSION (mm)
Main frame	780×295
Sub frame	470×215
Main Shaft (dia)	75
Main Shaft (length)	310
Drive pulley	45
Driven pulley	60
Pulley to pulley	565
Belt	V-type
Bearing	Ball bearing

1. **Main Frame:** Main frame is having length of 780mm, width 295mm, and height of 670mm at front at rear side.
2. **Electric Motor:** An electric motor is used for achieving high speed. Motor with uni-direction with 0.5 HP capacity. Motor rotates at a speed of 1500-1800 rpm.
3. **Main Shaft:** Shaft of length 310mm and diameter 75mm is used. An ellipse angled rod is welded on the circumference of the shaft.
4. **Pulley:** In this machine we have used 2 v-belt pulleys made of aluminium alloy for better stability and power transmission. Driver pulley of 45mm diameter and driven pulley of 60mm diameter.
5. **Ball bearings:** For smooth and easy rotation, ball bearing is fixed at the both the ends of the shaft. Ball bearings can accommodate radial and axial loads. It can be used to transmit large power.
6. **Corn Guider:** It is a specially designed part used in this machine, which acts as de-seeder. It is having a length of 450mm, teethes are provided at the end to de-seed the corn. The teeth's having gap of 20mm in between them. Corn Guide Structure is made up of gauge sheet of 1.3mm. The corn is feed through this guide structure and inside rotation shaft is rotating; it chopped out the corn seed from corn.
7. **Cob and Kernel outlets:** Cob outlet is provided at the front side of the machine whereas the outlet for Kernels separated is provided at one side of the machine. Both outlets are welded to the main head.

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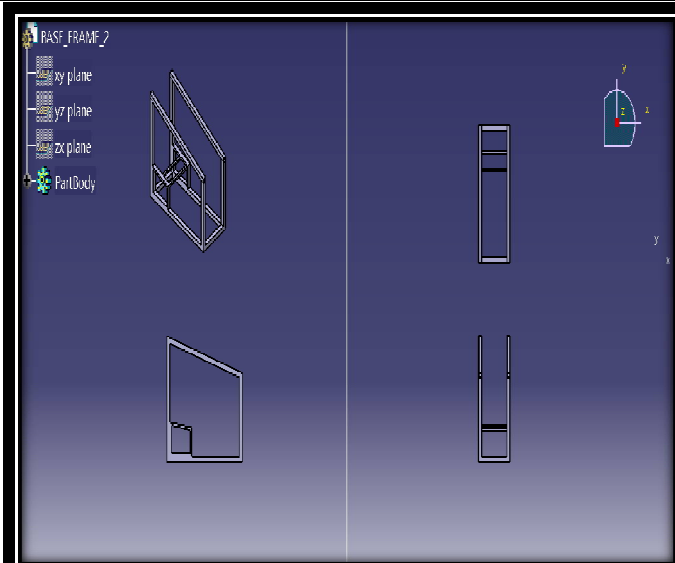
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Figure 1 :Design and Fabrication of Components

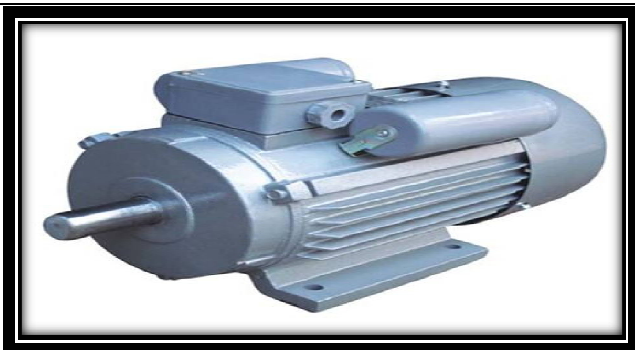
3D Model of Main Frame



Fabricated Model of Main Frame



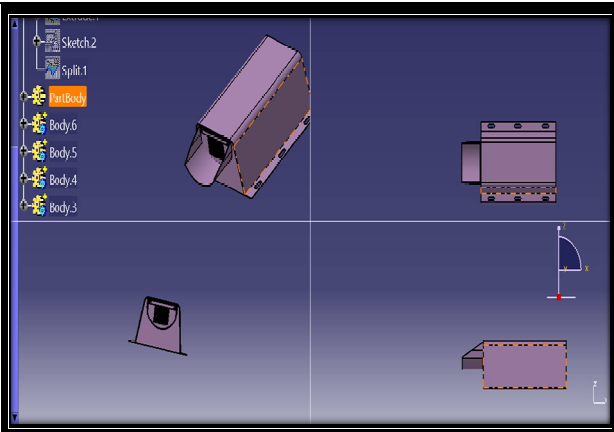
Electric Motor



V-Belt



3D Model of Main Head



Fabricated Main Head



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<p>3D Model of Main Shaft with helical rod on the surface</p> 	<p>Fabricated Main shaft with Helical Rod on the surface</p> 
<p>Pulley</p> 	<p>Bearing</p> 
<p>3D Model of Corn guider</p> 	<p>Fabricated Corn guider</p> 

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Cob and Kernel outlets



Final Assembled Model



Table 2: Material used for the components and operations carried out

SL No.	PARTS	MATERIAL	OPERATION
1	Main Frame	Mild steel	Cutting, welding, drilling
2	Main Shaft	Mild steel	Planning
3	Electric Motor plate	Mild steel	Marking, cutting, welding
4	Base support	Mild steel	Marking and cutting
5	Bearing support	Mild steel	Marking and cutting
6	Pulley	Aluminium	Fitting
7	Bearing	Grey cast iron	Fitting

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V. WORKING PRINCIPLE

The electric motor provides the primary motion required to run the machine. The motion and torque are transmitted to the main shaft via pulleys, v-belt and bearing; a rod of 4mm diameter has been welded along its circumference from one end to other end. The main shaft with welded rod on its surface is rotated in a clockwise direction with the help of the motor. The maize collected in the hopper are introduced into the machine through the inlet. The maize comes in contact with the rotating main shaft inside the corn guider barrel. The Maize is subjected to the continuous impact force and rotatory motion due to the welded helical rod on the surface of the rotating shaft, the Kernels gets separated or deseeded from the cob. A straight rod is welded near the front end of the corn guider which helps in the de-seeding as well as guiding the cob towards the cob outlet. Since the Corn guider or barrel is designed as a tapered section, the maize moves along the length of the barrel in the forward direction until it reaches the cob outlet spout. The cob comes out of the outlet provided for it near the front end of the machine whereas the kernels will come out through the outlet provided for it at the bottom of the machine.

VI. RESULTS AND DISCUSSION

The test result was found to be efficient. To deseed one piece of corn the time taken by the machine was found to be 2.5sec. Later the test was conducted by taking 10 pieces of corn and the time taken to deseed 10 pieces was found to be 25sec. The weight of corn of 10pieces of corn was later measured and it was found to be 1.8kg. Therefore the time taken to deseed 1.8 kg of corn is 25sec without any damages. Going by the test results we can say that about 1440 pieces that is 260 kg of corn per hour can be deseeded effectively and completely without any damages. Therefore the efficiency of the model was found to be 100%.

The only drawback of the model is that the some amounts of kernels were discharging out of the machine through the outlet provided for discharge of empty cob (waste). From the test conducted the amount of deseeded corn (kernels) coming out through the actual outlet provided for that is found to be 1.271 kg from 1.8kg of the total weight. The amount of corn (kernels) coming out from the outlet provided for the empty cob is found to be 0.259kg which is almost negligible.

	Time	Weight
1	25 Sec	1 Hour
2	1.8Kg	260Kg



Fig 2: Dry Corn for Deseeding



Fig 3: Kernels de-seeded



Fig 4: Cob after de-seeding

VII. CONCLUSION

The corn de-seeding machine has been designed, developed and fabricated for reduce the efforts of Indian farmers during de-seeding. The cost of the machine is around Rupees 13000/-. This machine was tested in the work shop and the de-seeding capacity of the machine per hour is found to be 260Kg. The kernels where separated from the cob

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completely without any damages and the efficiency of de-seeding was found to be 100%. Discharging mechanism is effective and the corn seed is discharged very easily. For commercial purposes one can improve the efficiency of the machine by increasing the size of the machine, by using high speed motor and by providing multiple heads.

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