

Fabrication of Corn Peeling and Cutter Machine

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Abstract: There are lots of maize threshing techniques which are used in farm for remove grain. The main problems with these machines are not affordable to farmers who are having less acreage farms and which they do not require these big threshing machines. Many farmers in India are not affordable to use these machines because of their cost. So as man machine system can be established these machine provides simple mechanical design. The existing machines of corn de-seeding in agriculture industry consist of separation of grains only. But for making the paste of the corn another machine is required, which is not affordable for the farmer. So in this concept by keeping these things in mind we design the new concept which consists of three operations like seed separation, seed paste and cob crushing in a single assembly. In this concept there is no need of any extra attachment. By using large machinery for deseeding, which are not effective for a developing economy like India where farmers have little money for investment. Hence there is a need for an innovative idea or product that is feasible, safe, cost effective and productive for the Indian farmer.

Keywords: Thrushing, Shelters, Dehusking, Harvesting, Threshers.

1. Introduction

In India, Corn is one of the most important crop and it has a source of a large number of industrial products besides its use as human food and animal feed. Every part of Corn has economic value as the grain, leaves, main crop stalk, tassel and cob can all be used to produce a large variety of food and non-food products. After harvesting with sickle and plucking of cob manually, de-husking of cob is done by hand to remove its outer sheath and further grain is obtained by shelling the cob traditionally, i.e. by beating the de-husked cobs with sticks or with fingers or sickle, etc. To overcome this problem of removing its outer sheath and de-husking the cobs this machine was developed. The machine basically comprises of separate shelling chamber, threshing chamber, collecting tray and motor (IHP). The arrangement of these parts is connected by belt and pulley mechanism. In India, most of the farmers shell corn by mainly three methods namely shelling cob grain by hand; hand operated corn Sheller and beating by stick method were carried for removing corn kernel from the cob. For removal of corn shells and to deseeding of the cobs with minimum damage to

the cobs.



2. Literature Review

- Anant J Ghadi and Arun Kum, et al., [July 2015]: A research-work for design, fabricate, and performance evaluation of a Corn Sheller consisting of feed hopper, shelling unit, separating unit and power system. Regression models that could be used to express the relationship existing between the Sheller performance indices, pod moisture content and feed rate were establish. This paper describes about the design of various components of Corn Sheller machine. Hence in this design of various parts are necessary, and design of various parts due to which the design quality of those parts will be improved.

- J.N. Nwakaire B.O. Ugwuishiwu C.J. Ohagwu, [2016]: The processing of agricultural product into quality forms not only prolongs the Useful life of these products but also increases the net profit farmers make from such products. In this work, emphasis was placed on demand led design which Involved understanding the need of the farmer and designing an appropriate system that meets that need. The objectives of the work were to design, construct, and evaluate a low cost maize Sheller for rural farmers in Nigeria. The methods used involved the collection of farmer's opinion on their Sheller needs, selecting appropriate materials, and utilization of theories of failure that enable the determination of allowable shear stress on the bearing supports.

- Kedar Patil Shamuvuel Pandit Gajendra Pol Sunil Kadam Avdhut Jadhav, [2016]: In India, Corn is one of the most important crop and it has a source of a large number of industrial products besides its use as human food and animal feed. Every part of Corn has economic value as the grain, leaves, main crop stalk, tassel and cob can all be used to produce a large variety of food and non-food products. After harvesting with sickle and plucking of cob manually, dehusking of cob is

done by hand to remove its outer sheath and further grain is obtained by shelling the cob traditionally, i.e. by beating the dehusked cobs with sticks or with fingers or sickle, etc

- Praveen Kiran Mali, [2015]: The Threshing Machine has been proposed for designed, developed and fabricated keeping in mind the constraints and requirements of the Indian farmers. Self-reliance is the major drive of development and vibrant economy. This proposed machine has been designed to be fabricated with the use of locally available materials. The machine is simple, less bulky and the ergonomic considerations in the design would allow for its comfortable use in a sitting posture for it can easily be operated by either male or female. The development made in these machines provides safety from accidents and makes good use for its portability.

- Girish Karikatti et al., [2018]: The development of any existing technology requires an exploration regarding its history. In different ages human always tried to develop new methods, new technology for the up gradation of living style. Through the exhaustive literature survey and study it is found that the maize was extensively used worldwide. In developing world, maize threshing is done by various PTO operated machines, but in rural areas the farmers who lack in financial condition cannot afford this machine .so they use various hectic process which leads to monotonous work.

3. Objective of the Work

A. Problem Formulation

The de-seeding machine should have designed, developed and fabricated keeping in mind the constraints and requirements of the Indian farmers as a corn is one of favorite type of food amongst the people, specially Maharashtra region.

- No. of machines & equipment's are available which are costly & consumes more time for the deseeding of corn.
- Corn paste can be used for making various dishes, such features can also design while fabrication of machines.
- Cob powder can also be used as fodder for cattle's in villages which is good gradients.
- Machine can be design technically which will saves the time, money & employment can be generated as a micro, small enterprise as a bakery product.

B. Aims and Objectives

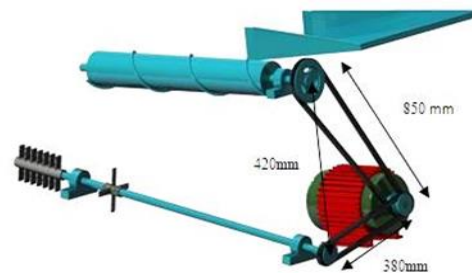
- To save the time for de- seeding of corn.
- To generate an employment for farmers leads to establish small enterprise.
- To increase the production rate compares to conventional machines.
- To save the overall production cost.

4. Experimental setup

A. Construction

The construction of the corn de-seeding machine is simple in

operation which is made up of Mild Steel angles bars and plates in order to resist the whole load of the machine. The bars are welded together to make a stand where the motor is mounted or rested. The motor is attached with the pulley where the motion from the motor is transmitted with the help of belt to the shellar shaft and the cutter shaft as a result the shaft and cutter mounted on it rotates. Corn is fed manually through the hopper at the top and as a result corn grains are separated from the cob which can be easily de-seeded. Also the separated seeds are cuts in to small pieces to make the paste of it. The cob after deseeding of seed from corn it enters in to the cob cutter section where it broken in to the small pieces. The seed cutter is made up of HSS plates strips. The strips having sharp edges. The strips are welded to the bush. The bush is fix on the shaft. The cob crusher blades are made up of HSS. Crusher having two types of blades i.e. moving blades and stable blades. Both blades having the same material.



B. Mechanism

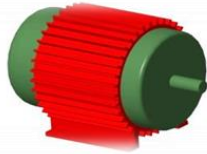
The mechanism is simple as like thrasher. The roller having shellar line which acts shear force on seeds. Impact of force is very high due to high speed rotation. It causes removal of seeds from cob. These separated cobs are send to cob crusher and separated seeds are allows inside the cutter casing. Both operations carried out with each other. At the top of shellar drum there is one adjuster mechanism which adjusts the size of casing according to the size of cob. There is different slot are provided on the adjuster casing to adjust the size of sheller casing.

5. Design and Machine Components

A. Components:

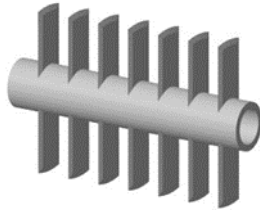
1) Motor

The motor used for operation is single phase A.C. double capacitor synchronous motor which having a capacity of 2 Watt. It rotates at the speed of 1440 rpm, which fulfills the speed required for all operations. Single phase motors are the most familiar of all electric motors. It is true that single phase motors are less efficient substitute for three phase motor but three phase powers is normally not available except in large commercial and industrial establishments. Single phase induction motors are usually two poles or four poles, rated at 1HP or less, while slower and larger motor can be manufactured for special purpose. The synchronous motor runs at a constant speed regardless of the load on the motor.



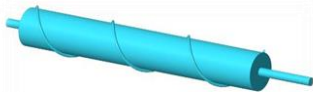
2) Cob crusher

The cob crusher is made up of HSS strips. The cob crusher consists of stable and movable cutter. The movable cutter is mounted on shaft with the help of bush. This cutter having a sharp edge which cut the cob into small pieces. The stable cutter is welded to the cutter casing and it also having a sharp edge. The cutters are arranged so one after another like stable movable. The speed required to cut the cob is 870 rpm.



3) De-seeding drum

The Sheller drum is the hollow cylindrical drum, which is mounted in the shaft. On the outer side of the drum there is a spiral ring is attached which perform the actual shelling operation.



4) Power transmission

The power is transmitted from motor to the different cutters with the help of belt drive. The different size pulleys are used to drive the different cutters.

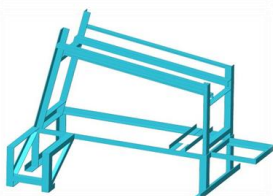


5) Sheller casing adjuster

The Sheller casing adjuster is the important component of the machine. It consists of the adjusting lever which hold in the slots provided on the device as per the size of cob. The adjuster consists of the spring assembly which maintains the casing distance as per the size of the cob.

6) Frame

The frame is fabricated by joining the L-shaped rod with the help of arc welding.



7) Cob Cutter Hopper

The cob Cutter is fabricated from HSS Strips, some cutters are movable and some stable which are welded to the cob hopper.



B. Actual Fabricated Model

we used double capacitor synchronized motor to run the overall assembly. The motion from motor to shaft is transmitted with the help of belt drive through pulley mounted on the shaft. The motor having capacity of 1 H.P. The cob cutter and seed cutter both are mounted on the same shaft. The seed cutter is protected by casing. The cob cutter having two types of cutter stable and movable. The stable Cutter is welded to the hob casing.

C. Machine Components Specification

Table 1
Machine Component Specification

S. No.	Components	Specification
1	Diameter of Cutter Shaft	25mm
2	Diameter of Sheller Shaft	25 mm
3	Diameter of Motor Pulley	90mm
4	Diameter of Cutter Pulley	74mm
5	Length of Cutter Shaft	1030 mm
6	Length of Sheller Drum Shaft	920 mm
7	Speed of Motor	1440 rpm
8	Speed of Cutter Shaft	1750 rpm
9	Speed of Sheller Drum Shaft	720 rpm

6. Result

The result obtained from the machine is as shown in the following table:

Table 2
Result

No. of pieces	Time for deseeding	Time for cutting	Time for cob crushing	Threshing Rate
4	3 sec	2 sec	2 sec	332 kg/hr

7. Conclusion

The de-seeding machine has been established to reduce the efforts of the farmer and grains are separate with minimum cost. The de-seeding machine was tested in the machine shop and later taken to the field. It worked in the tested conditions and gives an output of 332 Kg/hour. It also performs the additional operations which makes it multipurpose very effectively. Additionally, the de-seeder is a multi-functional machine that can de-seed various types of food item such as rice, chilly powering, potato past, corn de-husking etc. This can be done by changing the drum and teeth.

References

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