

Mini Rice Processing Unit

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Abstract – This research-based application work proposes the integration of principles from the discipline of mechatronics in the field of Agriculture. Rice is a plant that grows widely in tropical and subtropical regions like India as it requires abundant rain and sunshine to grow and also requires low cost labor as it is labor intensive to cultivate. Therefore, there is a need for a low cost, high efficiency rice processing unit. Commercial milling systems mill the paddy in stages, and hence are called multi-stage or multi-pass rice mills. It is supposed to separate rice grain from the paddy, then separate the chaff from these grains and then separate the actual grains from the chaff and paddy and stones, etc. The objective of commercial rice milling is to reduce mechanical stresses and heat build-up in the grain, thereby minimizing grain breakage and producing uniformly polished grain. Compared to village-level systems, the commercial milling system is a more sophisticated system configured to maximize the process of producing well-milled, whole grains. Our project is a small scale rice plant which would be affordable to most farmers.

Key Words: Agriculture, Rice, Rice Milling, Affordable, Sophisticated, Paddy, Small scale.

1. INTRODUCTION

Rice is the largest agricultural product in India and India is one of the largest producers of rice accounting for 20% of all world rice production. As far as we know the harvesting of rice is done in a traditional way which is self-sufficient. But the post harvesting processes to be done on the rice in a traditional way is not efficient. As per the FICCI's survey the overall employment of labour for agricultural purposes has a 30.57 million net reduction in 2013-14. The Average reduction in agricultural workforce is 20.77% and as per the survey done by us the average per day wages demanded by a labour for agricultural work is Rs. 150- Rs. 300, which is too expensive for a farmer. As there are industries in rural areas the labour now-a-days are attracted towards jobs in these industries. Rice agriculture is profitable but processing of these rice crops after harvesting in the traditional way is not very efficient and profitable. So the farmers, due to lack of labour and the traditional method not being very effective, have to give these rice crops to the milling plant for further processing. Traditional areas of rice plantations are the

states of Kerala, Karnataka, Tamil Nadu, Andhra Pradesh and also Goa, Orissa, West Bengal, Puducherry, Gujrat, Maharashtra. There has been no significant advancement in the section of post harvesting processes of rice grains until the rice or grain processing machine came to existence, but this news was of no importance because availability of such machines was very less, as it is very less the cost was very high. As for now these machines are available sufficiently but are still expensive for a small scale farmer.

The paddy comprises 20% rice hull or husk, 11% bran layers, and 69% starchy endosperm. The rice is obtained after hulling/ dehusking of paddy in a rice mill. Paddy in its raw form cannot be consumed by human beings. It needs to be suitably processed for obtaining rice. Rice milling is the process which helps in removal of hulls and bran from paddy grains to produce polished rice. Rice milling is the process of removal of husk and bran layer from the paddy to produce a whole white rice kernel. The rice should be free from impurities and should contain a minimum number of broken grains.

We are developing a Modular Rice Processing Unit which will be affordable and can be as efficient as an Industrial Rice Processing Mill. Our Rice Processing Unit will also be smart unlike traditional Rice Mill.

2. Problem Statement

Overall objective of our project is to develop a product which will ensure production of edible rice free of husk, stones and other foreign material and by which help farmers to make more profit while spending less on labour and also saving their time. Currently, there is a huge reduction in labour for agricultural processes and if available the wages are very high. Since rice will most likely remain the basic food of the ever increasing world population, efforts have to be made to increase its production by developing a low cost milling machine.

As per our survey which we did in Dahanu the labour wages has gone up to Rs. 150 to Rs. 300/Day and also that the Labours are well attracted towards big manufacturing industries rather than farms. As there is less availability of labour for processing of the grain crops, the farmers have to approach large scale industries or to be specific commercial

processing mills. These large scale industries are set up near farms due to which they occupy fertile land /agricultural land, which would have rather been used by the farmers to do farming. The farmers have to transport their grains to the processing plants for processing. So, they have to bear the transportation charges. After the processing of the rice crop they also have to bring these grains back to the farm. It would be great if we bring the plant near the farmers rather than frequently transporting the grains to the processing plants. The aim of our project is to eliminate those large scale post harvesting grain processing plants to save the farmers money, time and labour. By doing a survey we shortlisted above points which state lack of labour, inappropriate use of space and considering farmers economical condition. So we have tried to develop a processing unit which would be able to meet their needs.

3. Scope

Our product will not only help to increase the profit of the farmer but also ease the post harvesting processing of the grains at a very low cost or investment. Setting up a rice mill will allow farmers to engage in value addition & more profits. Rice bran is a byproduct obtained during the rice milling process, which is a very good source of edible oil. Rice is in great demand both in household consumption and also in Hotels, restaurants, canteens, etc.

4. Working

Processes involved in our proposed system chronologically are:-

Threshing – In this process the rice grains are separated from the crop by the means of threshing.

In this process the paddy is held against a thresher which is a cylinder with v-shaped protrusions. These protrusions when hit the paddy separate the rice grains from the paddy.

Sifting – Sifting Process is used for separation of paddy/chaff (loosened) and other impurities like stone, mud-balls, etc from rice grain. It's a vibrating platform which is perforated.

Milling/Grater – In this process the chaff from the rice grains are removed from it to get white rice with the help of a metal shaft with screw-like structure on half of it and straight lines on half of it. This shaft when rotated inside a metal sheet with small protrusions on the inside causes friction and the chaff is removed due to this friction. The screw-like protrusions allow the grains to move forward.

5. Development of research

Researching for a solution to the problem stated, we found that rice processing plants have various components.

In order to make our project effective we had to use all the

basic components required to get the end result we are hoping for, short of some components like polishing and grading.

While designing the thresher, the main part which was to be researched was the part which actually threshes the rice grain from the paddy. After research the threshing part was designed with long V- Shaped elongations, same as the thresher we also had to research about all the other components such as the Sifting machine, Milling Machine all of which was done in months.

After which we started designing the components and overall project. While designing we considered all the information we got from the research from long V-Shaped elongations to Metal shaft and protrusion patterns on it.

Designing the overall layout of the project required trial and error method where all the components had to be placed in such a manner that least amount of space was wasted.

6. Objective

The objective of our project are: -

1. Advancement in processing of the rice grain crop.
2. Reducing work and labour cost for farmers.
3. Saving land space for agriculture.
4. Help farmers make more profit.
5. To apply what we have learned throughout our B.E program into this project as much as we can.

7. Proposed System

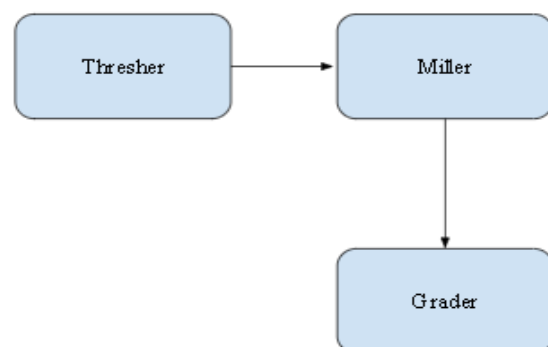


Fig. 1 Block diagram of Proposed system

7.1. Control System and Implementation

Our project has a Thresher in the start of the processing unit where the farmer will supposedly feed the crop in the system. After this the grains and the crops are separated from each other. The crops and grains go through the hopper to the machine where the chaff is removed (Huller) from the grain. At the end there is a sifter which separates the chaff, paddy and other impurities away from the rice grains and we get the finished grains.

8. Components of the System required:

Manufacturing processes implemented:

Different manufacturing processes are involved in the fabrication of the Mini Rice Processing Unit. The machine consists of so many components which must be put together appropriately that their interaction with one another would produce the desired output. Some of the processes include: cutting, drilling.

Materials:

In the design and fabrication of a rice milling machine, it is very important to carefully select the material and method. This is to ensure that the final product meets its specification and work as intended. In the selection of suitable material that will satisfy this design and product requirement, it is necessary to look at many aspects so that the components and assembly are fabricated within the resources available. The materials and components employed are listed below.

8.1 Hardware parts:

1. Polyvinyl chloride pipes (Milling Machine)
2. Plywood
3. High speed, High Starting Torque Motor
4. Rechargeable lead-acid battery
5. Stainless Steel Rod
6. Stainless Steel Pipe
7. Tin Sheet
8. Sifting net.

9. Conclusion and Results

Our project is a reliable plant which can process the paddy grains after harvesting them very easily and can make the process of processing the rice after harvesting very easy on both workforce and Money. Our plant eliminates large scale rice mills which use up agricultural land which could have rather been used for farming. This plant can make the farmers use his/her time in other businesses such as Poultry, Horticulture, etc.

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