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A Literature Review on Design of Mini Rice Milling Machine

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ABSTRACT

Rice mill is important step in post production of rice, past studies had proven that supply of rice can be increased by additional conversion of paddy to rice through use of modern paddy processing techniques. Aim of this project will be to provide an alternative solution to farmers in form of a portable rice mill machine and decrease dependency on rice mill industries and own a feasible solution for rice milling and own the byproduct obtained from milling process such as bran and husk. A pair to leather roller will be used to remove the husk and mini huller mill will be used for whitening of rice. In this study, we will use conventional method as well as CAD model for designing a portable rice mill machine. Then analysis of design will be performed comparing to study and existing models. After final analysis, when result is found to be safe, design will be finalized.

Keywords : Milling, Whitening Chamber, Roller Chamber

I. INTRODUCTION

India is the second biggest rice producing country in the world after China. It contributes about 20 percent of the world output of rice. Paddy being the major cereal crop of India covers an area of more than 42.8 million hectares, the largest under any single crop (FAO, 1995). It has been stated by the Department of Agriculture, Government of India that in 1985-86 production of paddy was of the order of 96 million tones which was increased to 115 million tons in 1995-96 and is expected to increase to 130 million tons by year 2000. It is grown in almost all the provinces of the country but more than 86 percent of the total production accounts for the States of Andhra Pradesh, West Bengal, Tamil Nadu, Uttar Pradesh, Bihar, Orissa, Madhya Pradesh, Punjab and Assam. Rice production, processing and marketing constitute the biggest industry in the country. Indian rice milling industry is the oldest and largest agro-based industry. The annual production of paddy was estimated at over 521 million tones, mostly in developing countries and the amount is rising at an average rate of 3 percent per annum (FAO, 1995). It was, however, the serious food crisis in the early sixties which highlighted the need for a proper policy towards the industry. This led to joint study of the industry by the Government of India and the Ford Foundation of India. The study pointed out that the overall supply of rice could be augmented

substantially with additional yield obtained through modernization of the existing rice processing techniques. A number of studies were also undertaken and came out with the same findings. For cleaning the paddy farmer has to transport paddy to the private rice mill in their area. Rice mill is important step in post production of rice, past studies had proven that supply of rice can be increased by additional conversion of paddy to rice through use of modern paddy processing techniques.

Thus objective of our project is to design machine that will use effective techniques for

(a) Husk removing of paddy

(b) Machine drying/ parboiling of paddy (to add strength)

(c) Milling and polishing

(d) Storing and packing

Problem Statement

Indian rice mills are the oldest agro based industries. The paddy cleaning process in a private rice mill is some time a long and costly process for farmers as they have to wait for their turn which some time lead to exploitation of the farmers. Existing huller mills have 60-68% recovery of rice from paddy and 10-25% loss where as modern mill have 68-72% recovery and 5-7% loss. 10% of paddy/rice is loss in transport, storage and processing. Hence advance and handy portable rice mill will reduce the loss.

II. Research Methodology

In present study, we will study the different model and research on mini rice mill and accumulate data required to design a effective steps for rice milling in a small machine then a CAD model will be generated considering the requirements and which will complain according to our milling process. Design will be analyzed according to study and feasible design will be finalized.

A. Data Accumulation

Requirements

- Matched Power 3 HP (2.2-3 kw) 1.5-2.2 kw
- Operation manual feeding and motor drive manual feeding and motor drive
- Material Metallic steel (MS) Metallic steel (MS)
- Weight Approx 65 kg with motor
- Power source 3 HP single phase electric motor Voltage 220±10 V Frequency 50 Hz Overall dimensions (mm) 1250×530×1125 Rotor speed (r/min) 1400-1600 5500 Rotor diameter (mm) 40 210
- Rice sieve (mm) Size 166 *72 Thickness: 1.2

B. Problems

After studying the components of the rice milling machine and parameters related to rice milling, the causes of high rice breakage percentage were found to be as follows.

- Machine - Knob spacing adjustment, inadequate maintenance.
- Method - Paddy rice flow rate, motor revolution speed.
- People -Inadequate knowledge and skills on machine usage.
- Raw Materials - Paddy rice moisture, rice strain, paddy rice storage.

C. CAD Modeling of Mini Rice Milling Machine

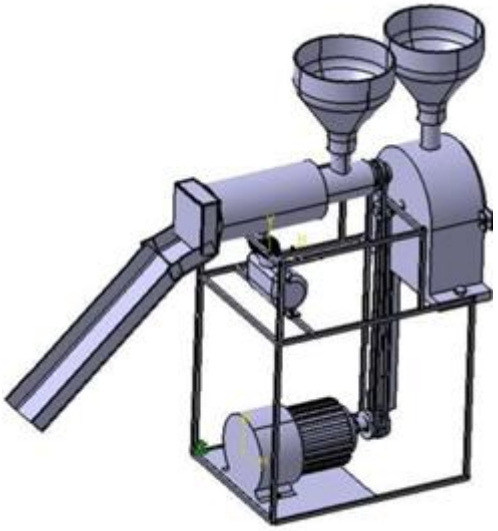

Figure1: 3D CAD model of mini rice milling machine

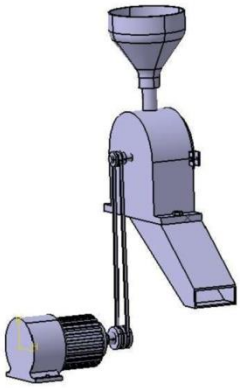

Figure2: Lather roller housing

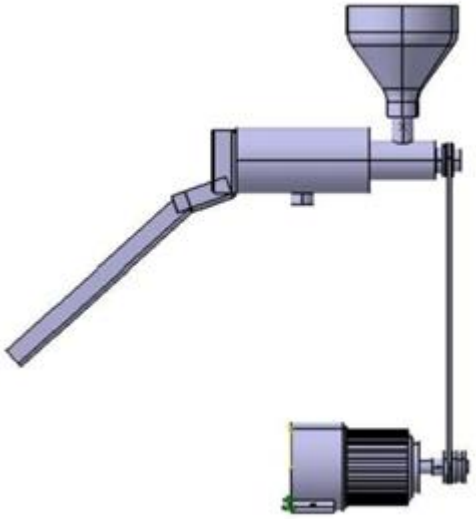

Figure3: Rice whitening chamber

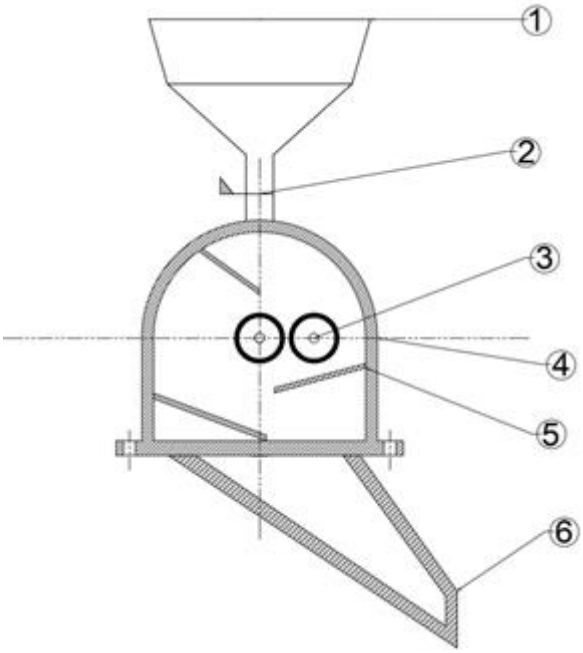

Figure 4: 2D cut section of roller chamber

TABLE 1
LABELING FOR FIGURE 4

Sr No	Components Name
1.	Hopper
2.	Feed adjuster plate
3.	Leather roller
4.	Roller chamber
5.	Direction plate
6.	Rice discharge tray

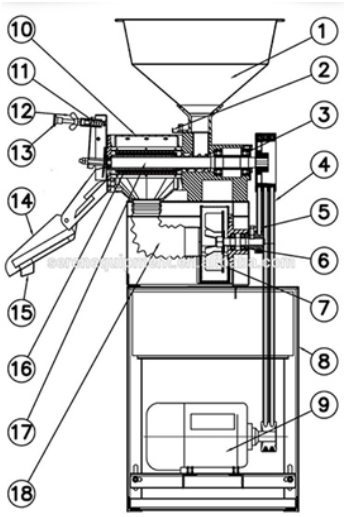

Figure 5: 2D cut section of whitening chamber

TABLE 2
LABELING FOR FIGURE 5

Sr.no	Component Name
1.	hopper
2.	Feed adjuster
3.	bearing
4.	Belt drive
5.	Belt drive
6.	Blower bearing
7.	Blower
8.	Frame
9.	Motor
10.	Barel
11.	Spring
12.	Screw nut
13.	Handle
14.	Discharge rice tray
15.	Discharge tray
16.	Rice sleve
17.	Shaft
18.	Flexible tube

III. CONCLUSION

This study included study of different research on mini rice milling machine. By this study we were able to make feasible design for a mini rice milling machine which comprises of two steps of rice/ paddy processing first was a chamber of lather roller for husk removal and second step was a rice whitening chamber with help of helix shaft rotating inside a milling sheet. The results revealed that the optimum parameters were: size of hopper feed at 12 cm2, gap adjuster at 5 mm, and outlet regulator at 5 cm. The limitation of this study was in the cleanup of milling sheet that could affect milling performance leading to the bias in the experiment. Hence the design was found to be safe.

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