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Design and Fabrication of Wet Grinder with Extra Roller

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ABSTRACT:

Many conventional methods have been proposed to date, but the proposed model creeps in a new set of innovative notions for wet grinders incorporating technical stuff into existence. The proposed model quenches the intention to digitalize the hand-operated traditional methods available for wet grinders. Grinding is labor-intensive and manpower-oriented work. This is a real-time consumer problem like high usage of electricity and high Time regulation. The proposed model is designed with an extra two roller stones to break the grains. This model helps reduce the high electricity usage and time regulation users can use this technology quickly and easily. The main goal of this wet grinder control is to reduce the tiny metal pieces mixes with grinding flour.

Keywords: Motor, Roller, Collecting Tank, Belt, and Pulley.

1. INTRODUCTION

A Wet Grinder is a tool for abrasive cutting of arduous material or a food preparation appliance used in Indian cookery for grinding food grains to supply a paste or batter. Wet Grinder for abrasive cutting uses fluid for lubrication or cooling, whereas one for food preparation uses water to mix with ground grain to supply batter.

Our project is a household appliance and it can also be used for Industrial purposes. In the regular wet grinder, we made an extra roller mill. The mill consists of a grain collecting tank, roller, gearbox, and exhaust. The mill is constructed above the grinder and it will run by the gear and pulleys.

2. COMPONENTS:

The main components used in our project are as follows:

2.1 Motor
2.2 Grinding wheel
2.3 Drum
2.4 Gears
2.5 Switch
2.6 Belt and Pulley
2.7 Roller Mill

2.1 MOTOR

The motor used in our standard grinder is a SinglePhases Induction Motor, which works on both DC and AC. The motor is wound with copper wire to produce a magnetic effect on the rotor. The rotor in turn revolves at a high speed. The exact RPM depends on the capacity and power used by the grinder Motor.

A single-phase induction motor is similar to the three-phase squirrel cage induction motor except there is single phase two windings (instead of one three-phase winding in 3-phase motors) mounted on the stator and the cage winding rotor is placed inside the stator which freely rotates with the help of mounted bearings on the motor shaft. Single-phase AC supply is given to the stator winding (main winding). The alternating current flowing through the stator winding produces magnetic flux. This flux is known as the main flux. Now we assume that the rotor is rotating and is placed in a magnetic field produced by the stator winding. According to Faraday's law, the current start flowing in the rotor circuit it is a close path. This current is known as rotor current.

Due to the rotor current, the flux is produced around the rotor winding. This flux is known as rotor flux. There are two fluxes**;** the main flux which is produced by the stator and the second is the rotor flux which is produced by the rotor. Interaction between the main flux and rotor flux, the torque produced in the rotor and it starts rotating.

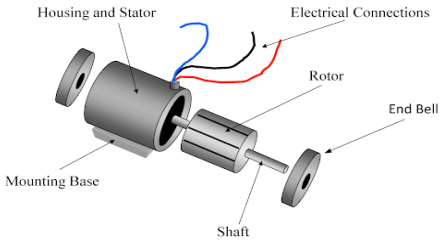


Figure 2.1

2.2 GRINDING WHEEL

A grinding wheel is a wheel used for grinding. Grinding wheels are composed of abrasive compounds and are used for various grinding (abrasive cutting) and abrasive machining operations. Such wheels are used in grinding machines.
The wheels are generally made with composite material. This consistsofparticle aggregate pressed and bonded together by a cementing matrix (called the bond in grinding wheel terminology) to form a solid, circular shape. Various profiles and cross-sections are available depending on the intended usage of the wheel. They may also be made from a solid steel or aluminum disc with particles bonded to the surface. Today most grinding wheels are artificial composites made with artificial aggregates, but the history of grinding wheels began with natural composite stones, such as those used for millstones.

Figure 2.2

2.3 DRUM

Grinding Drum plays a major role in our project for preparing flour. The drum is made up of stainless steel. The grinding wheel is placed inside Drum. The Process that takes place in the drum is to convert the rice into flour and it is done by the grinding wheel. This circular steel acts as a barrier while the roller grinds the rice.

2.4 ROLLER MILL

A roller mill is a grinding system/mechanism used to grind or crush various materials, such as grain, ore, gravel, plastic, and others. They use cylindrical rollers, either in opposing pairs or against flat plates. Roller grain mills are an alternative to traditional millstone arrangements in gristmills.
Itconsists of:

- Two cylindrical rollers placed parallel to each other
- The collecting tanks
- Inlet and outlet

The grains of rice are fed into the collecting tank through the inlet. The grains are fed into the roller system where the grains are crushed by the two rollers. The sizes of the particles can be adjusted by adjusting the gap between the two rollers, feed rate, and speed differential between the rollers. The crushed rice is then outputted through the outlet. The working principle of the roller mill is stress (which is applied by the rotating rollers) and attrition in the milling of solids in suspensions, pastes or ointments, and some solid materials.

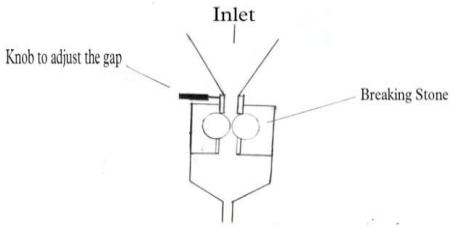


Figure 2.4

3.0 LITERATURE REVIEW:

- **KS Mateo, et.al.,** A finishing diet containing dry-rolled corn, soybean meal, and alfalfa hay was fed as the control diet Two hundred forty Angus crossbred steers were used to determine the influence of feeding various quantities of wet and dry grains. Carcasses of steers fed DGS had greater ($P < 0.05$) fat thickness (1.47 vs. 1.28 cm), greater ($P < 0.05$) USDA yield grades (3.23 vs. 2.94), and smaller ($P < 0.05$) percentage of yield grades 1 and 2 (41.1 vs. 60.4%)than carcasses of steers fed the control diet.

- **DR B Sargunam, et.al.,** The proposed model quenches the intention to digitalize the hand-operated traditional methods available for wet grinders. Grinding is labor-intensive and manpower-oriented work. This is a real-time consumer electronic problem. This model helps reduce the work burden of the user, and any unskilled user can easily use this technology. The main goal of this smart wet grinder control is to improve the efficiency of grinding with continuous monitoring and extend it to the field of commercial electronics.

- **N RoopcgandChowdary, et, al.,** The individual usage of two products for dry and wet grinding increases the cost of the product and occupies more floor space. The gain of popularity of multi-functional products in the market has been rising, the customers are shifting from existing products to multi-functional products to save money and floor space in the kitchen to know the requirement of customers the data collection is done using questionnaires.

- **John Charles Hall, et.al.,** only includes razor grinders and spring knife grinders. The Union and Soho wheels are both first-class wheels. This model helps to reduce the work burden of the user and any skill-less user can make use of this technology easily. Pasting behavior rice flour milled by three grinders method namely dry, semi-dry and wet grinding

- **LakkanaRuekkasaem, et.al.,** This study is aimed at finding appropriate levels of machine setup for small-sized rice milling machines to improve rice milling efficiency. The study investigated three factors of machine setup that would lead to the smallest percentage of broken rice grains size of hopper feed, gap adjuster, and outlet regulator. At the end of the study, optimal parameters for the design were found.

- **OlufemiBaideleBusari, et.al.,** The rice milling machine consists of a feeding unit, milling unit, cleaning unit, separating unit, delivery unit, and frame. It is powered by a 3hp electric motor. The process involves the interaction of machine and seed for the release of grains through blown air from the impeller. The performance parameters include the percentage of broken rice, milling efficiency of paddy varieties, wholeness, and machine efficiency.

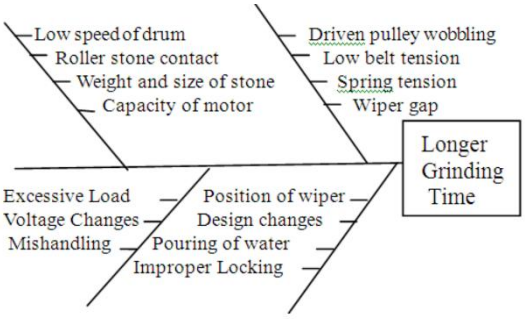
- **Vasudeva Singh, et.al.,** A colloid mill was comparatively evaluated with domestic wet grinding systems, namely a mixer grinder and a stone grinder. The comparison was carried out with raw rice, parboiled rice, and black gram. The wet grinding method and dry grinding method were carried out. The finer the particle size the greater the starch damage. The colloid mill appears to be suitable for industrial usage.

- **Nestor C Camello, et.al.,** The main objective is to design and construct a prototype of a rice huller with a rice grinder. It can efficiently husk and bran the rice using the principle of friction resulting from the rotating motion of the steel roll. A vacuum fan is also installed to remove the remaining light husk from the rice huller. The rice is then fed into the grinder from the rice huller. The grinder uses a three-rolling stone system to grind the rice**.** The speed of the grinder and the feed rate of the rice are manually controlled**.**

- **S.ChehrehChelgani, et.al.,** Water scarcity dictates limiting the use of water in ore processing plants particularly in arid regions. Dry grinding consumes higher energy and produces wider particle size distributions compared with wet grinding Moreover, dry ground samples in the pulp phase correlate with higher Eh and dissolved oxygen concentration. This review thoroughly assesses various approaches for flotation separation of different minerals, which have been drily ground, and provides perspectives for further future investigations.

4.0 PROBLEM STATEMENT

In the regular wet grinder, the time taken for the process completion is higher and it leads to the overuse of electric current**.** Therefore, people prefer to use Instant grinder mills. But there is a major defect during the use of the Instant grinder. In the instant grinder, metal plates are used for the grinding process. Due to the constant grinding process of the plates, the metal plates undergo erosion which causes minute metal particles to get mixed with the food material causing drastic changes in the physical and chemical composition of the food material. This would cause major health issues for the consumers



5.0 DESIGN:

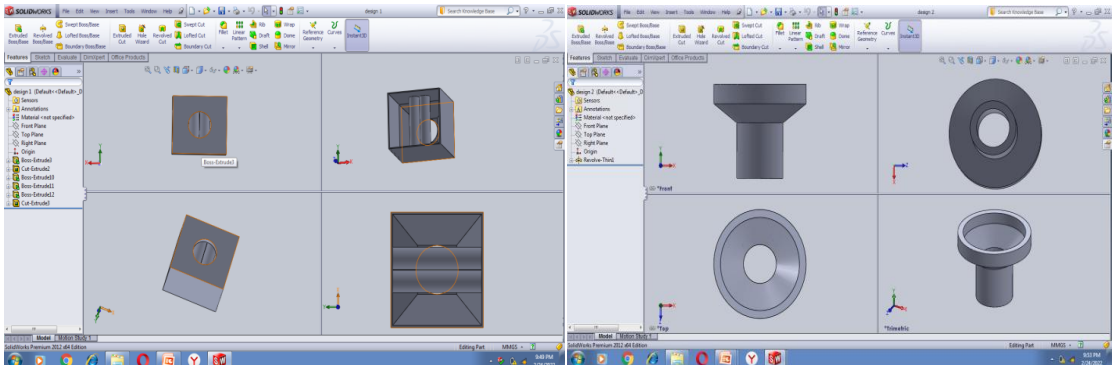


Figure 5.0

6.0 EXPERIMENTAL SETUP:

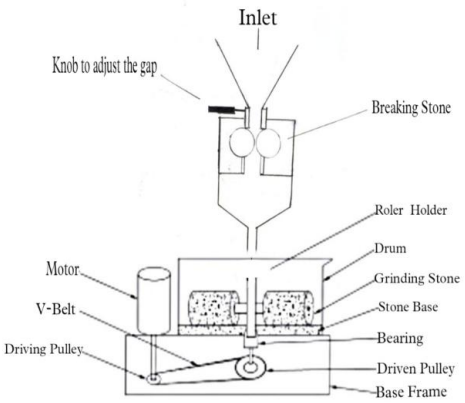


Figure 6.0

In the regular wet grinder, the process of breaking the rice is simple. When we pour the rice into the wet grinder drum the motor runs the drum in rotational motion in return the roller which is placed perpendicular to the drum will rotate in the axis of rotation. Then the rolling grinder will grind the rice and make the batter with help of water. In this process, we added the extra rolling mill. The purpose of the roller mill used is to break the rice before we pour the rice into the grinder. This will break the rice into two or more grains. The process will reduce the time consumption of the grinder and reduce the overhead of the motor.

7.0 RESULT AND DISCUSSION

The comparative study between a normal wet grinder and our proposed wet grinder has been studied and it has been found that the time taken to complete the process is less and the particle size of the batter produced is finer in our proposed wet grinder with an extra roller. It also eliminates any possibility of metal poisoning of the food material due to the erosion of metal plates, unlike instant wet grinders. This helps in ensuring the safety and of health the consumers.

Figure 7.0

8.0 CONCLUSION

The problem of using instant wet grinders (metal plates) can be rectified by using the fabrication of a wet grinder with an extra roller design. Minimal time consumption is better than the conventional grinding process by using an inlet and outlet valve. It is observed that the proposed design provides the desired outcome with reasonable cost and overall helps in the good hygiene of people without human intervention.

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