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Development of Rice Cleaning Machine

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Abstract: *Separating rice from its hull has historically required a lot of work and time, making rice cleaning a labor-intensive and time-consuming operation. The need for more efficient solutions has grown as efficiency demands, particularly in small households and large-scale businesses, have increased.*

The process of cleaning rice frequently fails to fully remove the rice from its hull, resulting in inefficiencies and unsatisfying outcomes despite the effort required. Because of the partial cleaning, users become frustrated and precious resources are squandered. It is evident that a more effective solution is required because this problem continues to exist in both small- and large-scale businesses, where the inability to effectively clean rice reduces production and raises labor costs.

An inventive rice cleaner will be created in order to overcome these obstacles. Uncooked rice may be loaded into the machine with ease thanks to its sturdy body and top-mounted hopper. Dirt, debris, and other pollutants will be separated from the rice by a regulated airflow created by a strong fan inside the cleaning chamber. Waste will be released outdoors, and clean rice will be guided to leave through a specified point. This system is appropriate for both small and large-scale application since it will decrease manual intervention and increase cleaning speed, guaranteeing greater efficiency and more dependable outcomes.

Keywords *– Critical maintenance, environment causes, hygiene*

I.   INTRODUCTION

In order to guarantee the quality and purity of the finished product, rice cleaning machines are crucial pieces of machinery in the rice milling sector. Rice frequently contains a variety of contaminants during harvest, including dirt, stones, husks, and broken grains. These contaminants have an effect on the rice's market worth in addition to its quality.

A rice cleaning machine's main job is to effectively remove these undesirable elements so that the rice is fit for processing and eating. To attain high levels of cleanliness, contemporary rice cleaning machines combine a number of methods, such as screening, air blowing, and gravity separation.

Rice millers may increase the quality of their products, cut waste, and boost overall operational efficiency by investing in cutting-edge rice cleaning technologies. This guarantees adherence to food safety regulations in addition to increasing customer pleasure. In conclusion, rice cleaning equipment is essential to the rice milling process since it improves rice quality and boosts millers' profits.

II.   PROBLEM DEFINITION

2.1 Problem Statement

Rice cleaning methods are slow, labor-intensive, and often ineffective. Manual cleaning and outdated machinery fail to completely remove impurities like dirt, hulls, and other debris from the rice. This results in wasted rice, decreased productivity, and increased labor costs. Users, whether in small households or large-scale operations, often face frustration due to the incomplete cleaning process. As a result, current methods do not meet the growing demand for more efficient and thorough rice cleaning. The need for a faster, more reliable solution is evident. An innovative automated rice cleaning system is required to improve the efficiency, reduce manual labor, and provide better results. Such a system would meet the needs of both small and large-scale operations, ultimately boosting productivity and reducing costs.

2.2 Objective

Develop an automated rice cleaning machine that overcomes the inefficiencies of traditional cleaning methods. The machine will automate the cleaning process, reducing the time and manual labor involved. A controlled airflow system will be used to effectively separate rice from impurities such as dirt, hulls, and other debris, ensuring a thorough clean. It will be designed to meet the needs of both small households and large-scale operations, offering versatility and scalability. By reducing rice wastage and minimizing the need for additional labor, productivity will be improved, and operational costs will be lowered. The machine will provide consistent, high-quality cleaning results. Ultimately, it will improve efficiency, enhance user experience, and make rice cleaning more cost-effective for users.
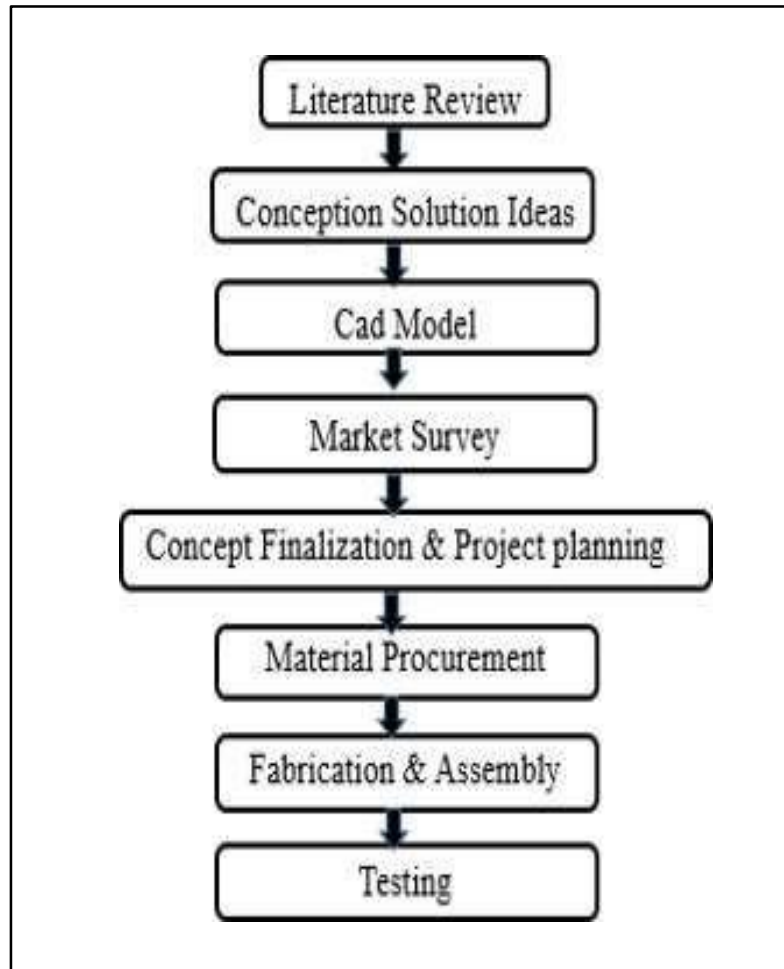
III. METHODOLOGY

Fig 1. Flowchart for proposed methodology

3.1 Market survey

The purpose of the rice cleaning machine market survey is to determine the needs and preferences of industry users. In order to learn more about the latest developments and difficulties in rice cleaning, it focuses on a range of participants, such as farmers, rice producers, mills, distributors, and specialists. The survey will examine the equipment that consumers currently use, the characteristics that they value most, and their financial constraints.

Our investigation revealed that the cost of the parts required for rice washers can differ greatly. A 500 RPM exhaust fan, for example, can cost anywhere between Rs. 1,000 and Rs. 1,400. While wires cost about Rs. 200, a channel might cost anywhere from Rs. 500 to Rs. 700. Furthermore, a cylinder costs between Rs. 600 and Rs. 800. Planning and budgeting for the development of the rice cleaning machine require an understanding of these expenses.

3.2 CAD Model

The system was designed and modelled using Solid Works software. It consists of a exhaust fan, wire, cylinder and base. The study frame serves as the main body, providing structural support and stability
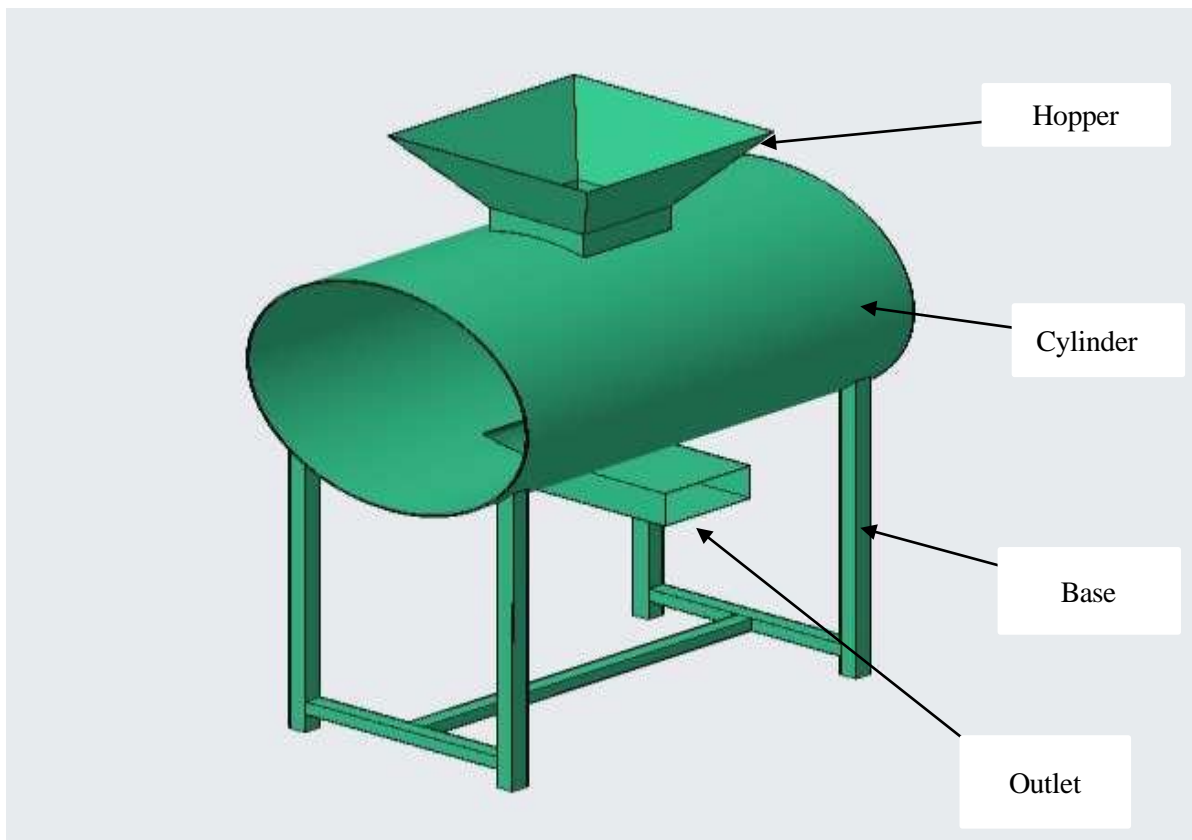

Fig 4. CAD Model

3.3 Fabrication & Assembly

The design of the rice cleaning machine will be turned into a functional product through a number of crucial processes. First, materials that are long-lasting and functional will be carefully chosen. For easy loading, the hopper will be built of plastic or stainless steel, while the body frame will be made of sturdy metals like mild or stainless steel to withstand rust. In order to efficiently separate the rice from the hulls, the cleaning chamber will use metal mesh to let air pass through. To guarantee effective airflow, the fan will be made of lightweight materials. The first step in the manufacturing process will be to precisely cut the materials, then shape and finish them for assembly.

Building a strong frame and fastening the hopper and cleaning chamber will be the first steps in the assembly process once all the parts are prepared. After that, the fan and all required electrical components, such as wiring and controls, will be installed. Following assembly, the machine will go through a rigorous testing process to make sure it functions well and cleans rice correctly. Any flaws will be checked to make sure it satisfies safety and performance requirements. The machine may be painted or coated for increased durability, and final changes may be made in response to test findings. The preparation of thorough paperwork, such as maintenance manuals and user guides, will guarantee that the rice cleaning machine is set for market launch.

3.4 Testing

To make sure the rice cleaning machine is effective and meets user needs, evaluation is a crucial first step. Functional testing is the first step in the process, during which every component of the machine is examined to make sure it functions as intended. This include evaluating the fan's airflow, making sure the hopper can easily load rice, and running a test batch of rice to make sure it efficiently eliminates dirt and hulls. Performance testing then assesses the machine's cleaning efficiency in comparison to conventional techniques, checks the cleaned rice for any remaining hulls, and tracks energy consumption while in use to make sure it is energy-efficient.

IV. CONCLUSION

The issues with conventional techniques, which are frequently tedious and annoying, will be resolved by the rice cleaning machine. It will save time and effort by removing the challenge of fully separating rice from its shell. With the help of this machine, the procedure will be simpler and more effective, yielding better outcomes with less work. It will be more user-friendly and less physically taxing thanks to its sturdy design and top-mounted hopper for effortless loading. After being loaded, a strong fan will generate airflow that eliminates dirt and debris, guaranteeing that only clean rice is produced and pushing waste outside to reduce manual effort. Convenience will be emphasized in the design, requiring little human labor so that users can concentrate on other duties while the machine cleans. The machine will satisfy the increasing need for rapid rice processing and is appropriate for both small households and larger companies. Anyone looking for a quicker and more efficient way to clean rice can benefit from the increased productivity and hassle-free experience that comes with simplifying a laborious chore, which will eventually increase cooking happiness.

Acknowledgements

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