.

Corn Grinding Machine Manufacturing Uses Electric Power and Human Power

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Abstract

An inherent problem with maize is the lack of consistency between kernel size and grain size, particularly if one desires the grains or seeds to be of a fine quality. The community service project involved constructing a rudimentary corn-grinding apparatus that operates using both electricity and human power, ensuring functionality even during electrical outages. The procedure commences with the conceptualisation of a maize grinding apparatus, which is subsequently fabricated and subjected to rigorous testing. This includes conducting grinding performance evaluations at varying capacities of 3 kg, 4 kg, and 5 kg of maize, employing both electric and manual power sources. The results of a 60-minute test evaluating the performance of a human-powered maize grinding machine revealed that it achieved a high level of efficiency. The machine was able to grind a maximum of 20 kg of maize into a fine consistency, demonstrating good grinding of the maize granules and seeds. During the performance test of the electric corn grinder, 30 kg of corn were weighed in 60 minutes. The machine's grinding of maize grains and ores was satisfactorily accomplished.

Keywords: Maize kernels or seeds; corn grinder; machine performance evaluation; labor-intensive Human power; electricity power

Abstrak

Permasalahan pada jagung adalah bila diinginkan butiran/biji jagung yang halus, maka membuatnya seringkali tidak sama ukuran bijinya. Pengabdian Masyarakat yang dilakukan ini adalah membuat mesin sederhana untuk penggiling biji jagung dengan menggunakan tenaga listrik dan tenaga manusia jika listrik padam. Metodenya dimulai dengan merancang desain mesin penggiling jagung, kemudian melakukan manufaktur mesin penggiling jagung dan melakukan pengujian-pengujian yaitu uji kinerja penggilingan untuk variasi kapasitas 3kg, 4kg, dan 5kg jagung dengan menggunakan tenaga manual dan tenaga listrik. Hasil yang diperoleh uji kinerja mesin penggiling jagung dengan tenaga manusia untuk waktu 60 menit berat jagung yang tergiling sebanyak 20 kg dengan hasil gilingan butiran/bijih jagung cukup bagus, artinya penggilingan maksimal jagung hasil gilingan menjadi halus. sementara hasil uji kinerja mesin penggiling jagung tenaga listrik dalam waktu 60 menit berat jagung yang tergiling sebanyak 30 kg dengan hasil gilingan butiran/bijih jagung cukup bagus.

Kata kunci: Butiran/biji jagung; mesin penggiling jagung; uji kinerja mesin; tenaga manusia; tenaga listri

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INTRODUCTION

The issue I am facing is that in my hometown, there are numerous maize farmers and breeders who continue to process corn using traditional methods. My objective is to ensure that the residents of this region are able to process corn using a corn grinding machine. As science and technology progress and people's desire for convenience grows, humans need to be more efficient in producing goods and services, focussing on both improving quality and expanding quantity. (Tri Mulyanto & Supriyono, 2019).

Several issues that can be addressed pertain to science and technology, particularly with the motive power of a manufacturing instrument. The adoption of propulsion systems relying on human or animal power was deemed insufficient, prompting the substitution of such systems with more efficient machine power (Nauval et al., 2018). As a result of this modification, the outcomes achieved are superior in both quality and quantity. Provided that these two factors are met, there will be a rise in production and income. The citation (Adriansyah et al., 2014b) The production process has emerged as a crucial facet in the realm of industry. The utilisation of machinery in industrial operations is crucial and indispensable, exerting a significant impact on the advancement and uninterrupted operation of such activities (Yokasing et al., 2019). Notable aspects of the production outcomes of a machine-powered tool include: increased quantity, enhanced quality, accelerated speed, and comparatively improved cleanliness. The concept originated from the idea of creating a maize grinder equipped with a dynamo drive, which harnesses electrical energy (Ansori et al., 2022).

This corn kernel crushing machine is also very useful for chicken farmers to reduce maintenance costs for livestock, because the price of chicken seeds is currently soaring quite high so chicken farmers use corn kernels as an alternative ingredient for mixing chicken feed (Agustinus, 2014). Whole corn kernels are intended for chickens over 1 month old, while corn kernels that are smaller in size after going through the splitting process are intended for chickens under 1 month old. (Teknikmesin, 2015).
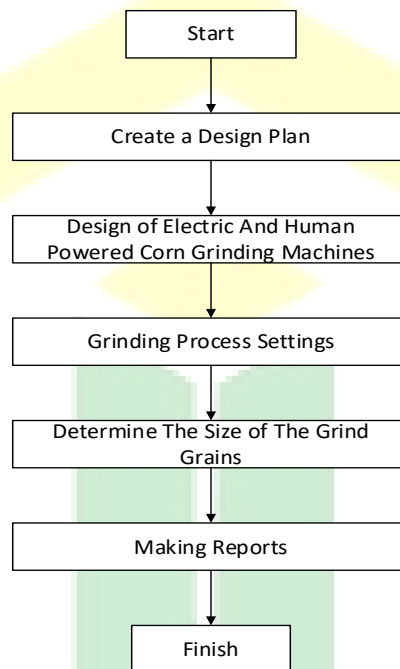
Corn is a source of carbohydrates so it has economic value and is included in the important commodity category because it is in second place after rice. Corn is also one of the food products in Indonesia (Fahmi Hasahari & Danny SAM, 2017). Increased corn production can be influenced by several factors, namely superior natural resources, availability of agricultural land, and the Indonesian climate which is suitable for developing corn cultivation (Adriansyah et al., 2014a). so that not only corn is obtained during harvest, but corn plant by-products also increase, such as leaves, stems and corn cobs (Napitupulu, 2021).

As a result of the very large corn production, it is necessary to carry out appropriate post-harvest handling, so it requires tools that are in accordance with the principles that work effectively and efficiently (Dyah & Alwi, 2023). If it is not balanced with good post-harvest handling when corn productivity increases, there is a possibility that seed damage due to improper handling can reach 12-15% of the total production (Hadijah, 2010.

The comparison between corn grinders is that they can be used with human/manual power and can also be used with electric power. The objectives of this research are: to obtain a corn grinding machine manufacturing system, determine a manual and automatic control system, design/obtain a corn grinding machine design to obtain adjustable grinding results.

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METHOD

Before designing a maize grinding machine, it is imperative to ascertain the specific goals and objectives that the machine should fulfill. Will this equipment be utilized for industrial applications or solely for domestic use? In addition, it is important to take into account parameters such as the intended production capacity, the desired level of fineness, and the necessary power requirements. Subsequently, it is vital to gather data about the existing maize grinding machines available in the market. One can do this task by gathering relevant literature on maize grinding machines, conducting online research, or consulting specialists in the relevant subject. This will provide you with an understanding of the typical components present in maize grinding machines, as well as the operational principle of the machine.

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                  │   Create a Design Plan  │
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                  │ Design of Electric And Human │
                  │ Powered Corn Grinding Machines │
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                  │ Grinding Process Settings │
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Prior to designing a maize grinding machine, it is essential to ascertain the machine's goals and objectives. Will this equipment be utilized for industrial applications or solely for domestic use? In addition, it is necessary to take into account aspects such as the intended production capacity, the desired level of fineness, and the required power needs. Subsequently, it is necessary to gather data regarding the existing maize grinding machines available in the market. One can do this task by gathering relevant literature on maize grinding machines, conducting online research, or consulting with specialists in the relevant field. This will provide you with an understanding of the typical components present in maize grinding machines, as well as the operational principle of the machine.

Using the data you have gathered, you can proceed to develop a maize grinding apparatus that aligns with the predetermined requirements and specifications. One can accomplish this task by utilizing mechanical design software, such as AutoCAD or SolidWorks. An alternative approach is to create a hand-drawn illustration to visually represent the design of the equipment you are constructing.

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Once you have completed the design of the maize grinding machine, the next step is to model or test the machine. One way to accomplish this is by creating a basic prototype of a maize grinding machine and thereafter conducting tests to determine if machine functions as intended.
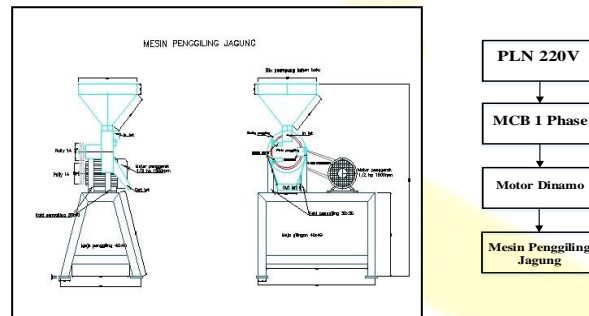
This electric motor driven corn kernel crushing machine is designed using fairly simple materials at an affordable price. In this corn kernel grinding machine, the author made a final project that designed all parts of the tool and its components.

Tools and materials:
1. Welding machine and hammer
2. Hand grinder and drill
3. Angled ruler and meter
4. Angle iron and stainless plate
5. Welding electrodes and iron paint
6. Used cans and markers
7. Bolts and nuts

Corn grinding machine components:
1. Motorcycle dynamo
2. Fanbelt
3. Switch
4. Container tube/hopper
5. Cover tube
6. Engine Mount
7. Lever/crank

The process of working on a corn grinding machine powered by electricity and human power is as follows: Making a container for corn to be ground, making knives and sieves as tools for breaking and filtering corn, making covers for knives and sieves, making stands/tables for corn grinding machines, and the last one by painting the corn grinding machine.

RESULTS AND DISCUSSION

The disadvantage of this tool is that if there is an overload in the corn storage tube, the tool can work slowly or stop so we need to monitor the tool so that it doesn't overfill the corn storage tube that will be ground.
Human Powered Corn Grinding Machine Data Table.

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Table 1 Human Powered Corn Grinding Machine

No	Time	Weight of ground corn
1	15 minute	5 Kg
2	30 minute	10 Kg
3	45 minute	15 Kg
4	60 minute	20 Kg

Corn Grinding Machine Data Table Electric power.

No	Time	The weight of milled corn
1	10 minute	5 Kg
2	20 minute	10 Kg
3	30 minute	15 Kg
4	40 minute	20 Kg
5	50 minute	25 Kg
6	60minute	30 Kg

The aforementioned performance tests encompass evaluations of both electric power and human power. Each test was conducted twice, once utilizing electric/automatic power and once utilizing human/manual power. The experiment was conducted using three distinct size variables. The first variable utilized 3 kilograms of maize, the second variable utilized 4 kilograms of maize, and the third variable utilized 5 kilograms of maize for 60 minutes. Based on the first performance, utilizing human energy, the process of milling maize consumed 20 kg of maize for 60 minutes. Subsequently, utilizing electric or automatic power, the corn milling process consumed 30 kg of maize over 60 minutes, as indicated by the outcomes of the second performance. Upkeep and Maintenance. Furnish details regarding the regular maintenance necessary to preserve machine performance. Ensure that operators possess a comprehensive understanding of the correct procedures for utilising, sanitizing, and upkeeping the machine. When discussing maize grinding machines, it is crucial to consider many elements such as local requirements, production size, and relevant safety regulations. Every talk should be tailored to the specific situation in which the equipment is being used. Ensure strict adherence to safety protocols when designing, fabricating, and operating maize grinding machinery. If you lack expertise in machine construction, it is advisable to seek guidance from a technical specialist or mechanical engineer to guarantee the machine's safety and functionality. Efficiency: Corn grinding machines can greatly increase the efficiency of corn processing. Consistency: The machine can produce corn grinds of consistent size, important for some industrial applications. Time and Labor: Automated grinding processes can save time and human labor

CONCLUSIONS AND SUGGESTIONS

Conclusion

1. Corn grinding machines have an important role in increasing production efficiency in the corn processing industry.

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2. Demand for electric and human-powered corn grinding machines may be high because corn is an important commodity with a variety of applications.

3. The use of advanced technology in manufacturing electric and human powered corn grinding machines can improve the quality and efficiency of the grinding process.

Suggestion

1. Advanced Research and Development: Invest in research and development to improve the efficiency, reliability and durability of corn grinding machines.

2. Raw Material Quality: Make sure to use high quality raw materials in machine manufacturing to avoid quality problems and damage.

3. User Training: Provide adequate training to machine users to ensure safe and efficient use.

4. Maintenance and After-Sales Service: Offer good maintenance service and technical support to customers to extend machine life and ensure customer satisfaction.

5. Market Development: Explore new market opportunities and develop effective marketing strategies to increase market penetration of corn grinding machines.

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