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# Solar Operated Riddle Machine

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**Abstract: A solar-powered agricultural sieving system was developed to improve the process of separating different-sized agricultural materials such as grains, seeds. This system aims to make the sieving process more efficient, especially in rural and farming areas where electricity supply is limited. The machine uses solar energy as the primary power source, making it eco-friendly and cost-effective. It helps farmers save time and effort by automating the sieving process and improving output quality. The design includes major components such as a solar panel, battery, motor, and vibrating or rotating sieve mechanism. This project focuses on achieving efficient separation, reducing manual labour, and enhancing productivity in agricultural applications.**

***Keywords:*** *Solar Pannel, Grain.*

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## I. INTRODUCTION

India's agribusiness sector is one of the country's major strengths and has grown steadily over the years. proper post-harvest handling is important to reduce wastage and increase the storage life of food grains. It involves removing unwanted materials such as stones , weed seeds, soil particles,Cleaning the grains in this way improves their quality, makes them safer for storage . To obtain clean and high-quality grains, Grain screening is done and type of impurities to be removed. Sieving machines fitted with sieves of different hole sizes help separate stones, small wood pieces, and other unwanted materials. A sieving machine works by sorting particles according to their mesh size at different levels.To help address energy shortages, the researchers designed a project that uses solar panels as the main power source. The solar-powered sieving machine collects sunlight and converts it into usable energy for operation especially helpful for farmers and small-scale industries and improve a solar-powered sieving machine that can efficiently separate seeds and grains in small-scale production using renewable solar energy.

## II. LITERATURE SURVEY

- Mr. Nachimuthu A.K,(2019)a sieve is an instrument used to separate desired particles from unwanted material by passing the sample through a woven mesh or net, which helps determine the particle size distribution. In their study, the authors concentrated on designing and fabricating the mechanical components of the machine as well as the sieving system itself development of a fully operational and reliable sieve machine.
- In Volume 4, Issue 3 (2018) of IJARIIE (ISSN 2395-4396), the authors describe the use of a slightly inclined rectangular mesh for sieving as a labor-intensive process. simultaneously, which helps reduce the overall time required for preparing concrete and minimizes manual effort
- Mr. Sai Karthik, 2025 (Volume 13, Issue 5 of International Journal of Creative Research Thoughts)Automation has become essential due to labor shortages, strict labor regulations, and the fact that construction and foundry industries are among the most lar-intensive sectors where sand sieving is a critical operation. As a result, larger industries have begun using fully automated sieving machines. However, small-scale foundries and minor contractors cannot afford these advanced technologies, creating the need for more economical and low-cost sieving solutions.
- Heinrich Arnold (November 2001) noted that the relatively long reinvestment cycles of around 15 years innovation in the machine tool industry occurs gradually. However, examining recent history shows that the introduction of digital control technology and computers into machine tools occurred in three distinct waves of technological disruption. Many companies initially underestimated the influence of these new technologies. The article provides an overview of the machine tool industry's evolution since the invention and adoption of numerical controls, analyzing how this innovation

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disrupted the market. The study involved approximately 100 interviews with industry decision-makers and experts who have observed the sector's development over the past forty years. The research highlights the connection between radical technological changes, industry structure, and the competitive environment.

- Atsuko Shimosaka, Shigenori Higashihara, and Jusuke Hidaka conducted a study on the computer simulation of powder sieving to estimate sieving rates using the particle element method demonstrating the accuracy of the simulation. Moreover, the simulation effectively captured the sieving behaviour of cohesive powders. Based on the simulation outcomes, the authors proposed an equation to predict the sieving rate, incorporating three engineering parameters newly defined in this study. The simulation also revealed the relationship between engineering and operating parameters during sieving, such as the vibration amplitude and frequency of the sieving surface.

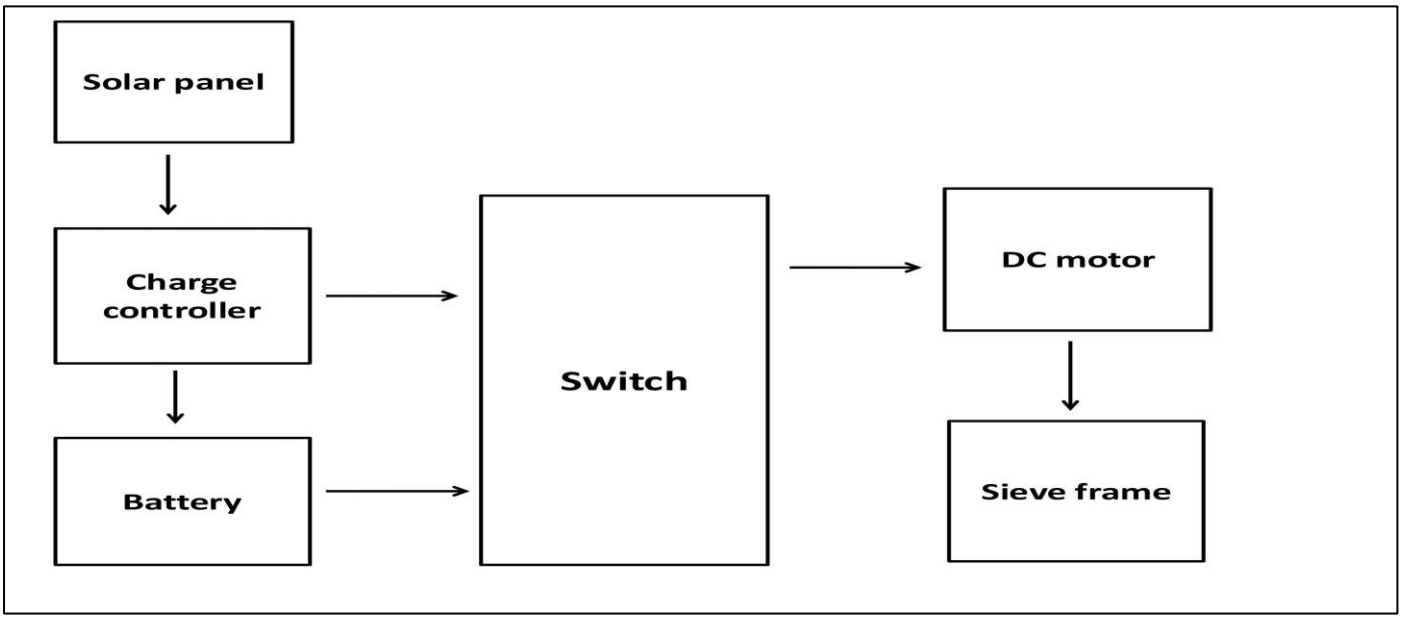


Fig 1 Block Diagram

## III. COMPONENTS

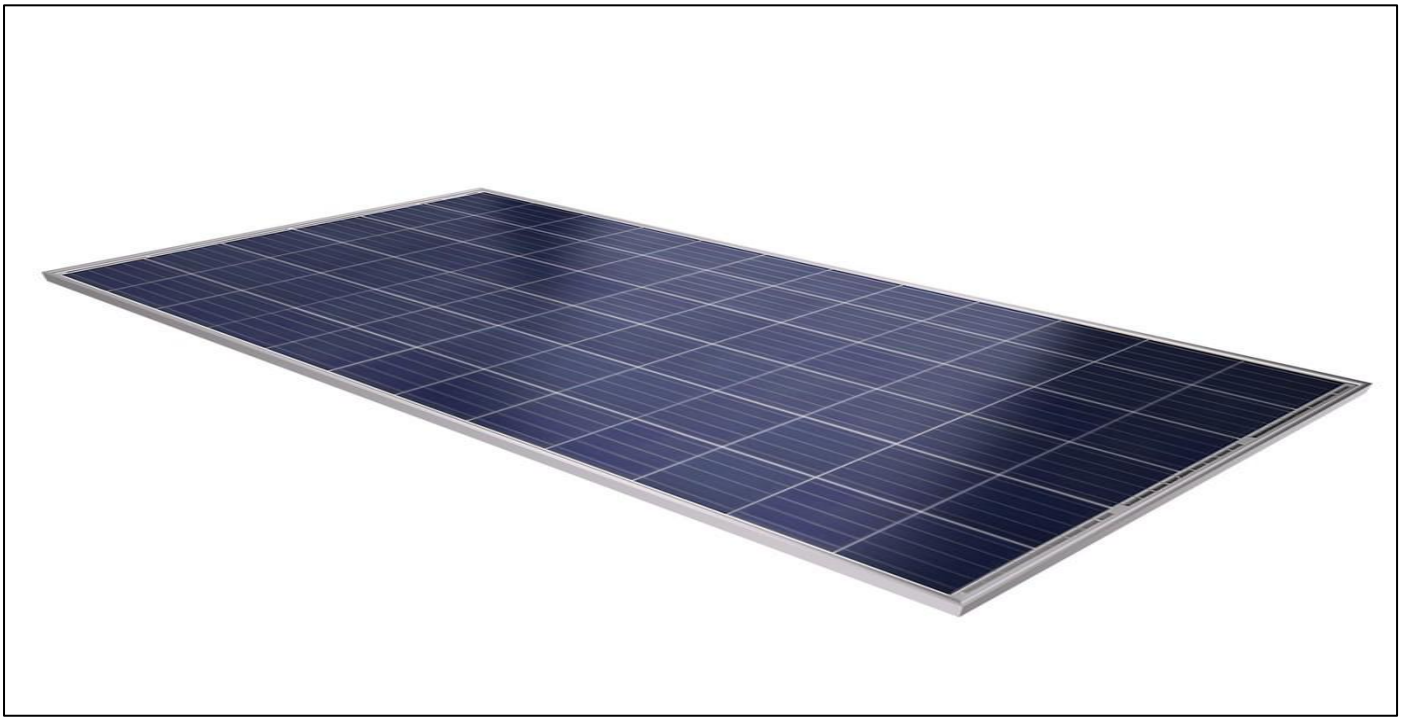

Fig 2 Solar Panel

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It is the heart of the project. It works on the photovoltaic (PV) effect, where sunlight photons strike a semiconductor material (usually silicon). Photons excite electrons in the p-n junction semiconductor layer. Movement of electrons generates direct current (DC). which later drives the wiper motor of the riddle machine.


Fig 3 12V Battery

The 12V rechargeable battery is a key energy storage component in the system. It stores the DC electricity generated by the solar panel and provides a steady and reliable power supply to the wiper motor whenever the riddle machine is in operation.

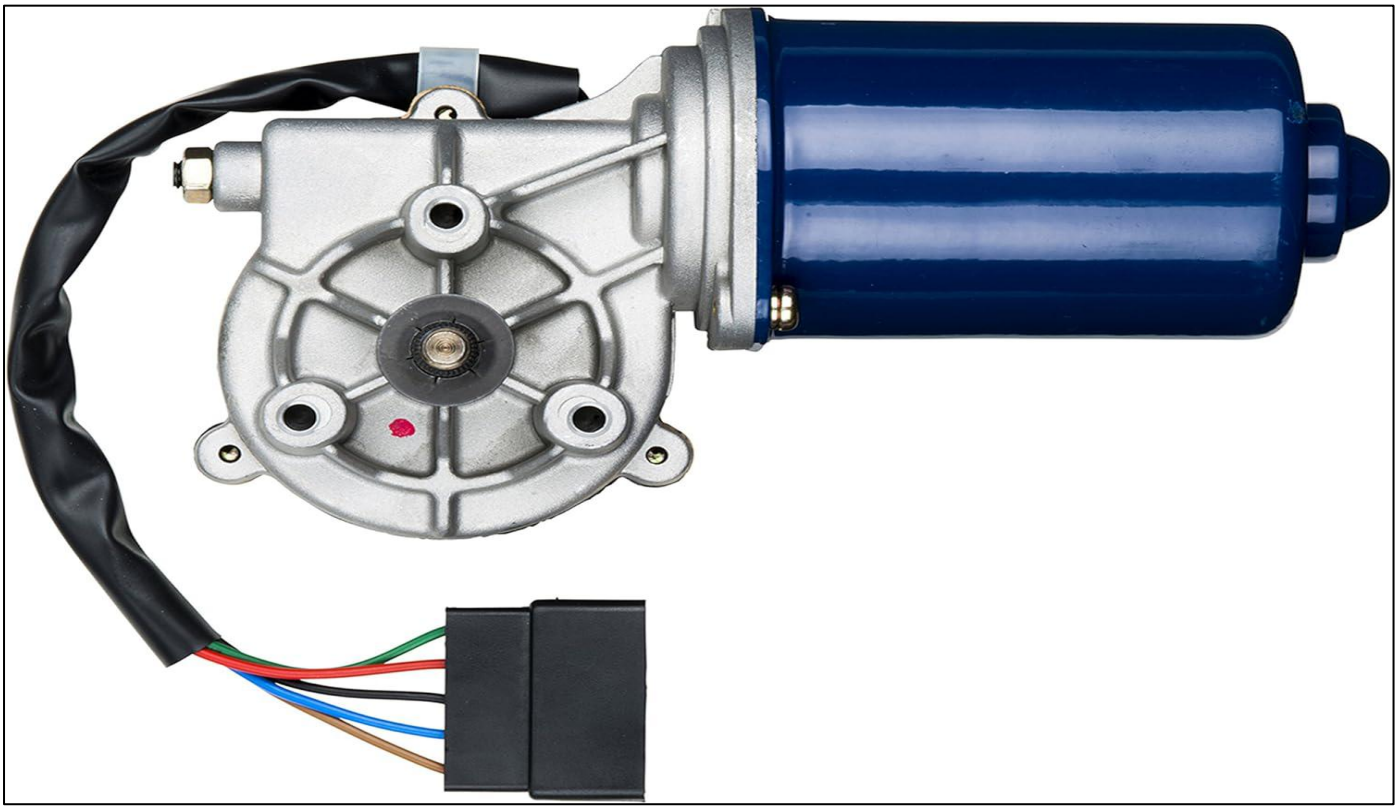

Fig 4 Wiper Motor

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A wiper motor is a specialized DC motor designed to provide the mechanical power needed to operate windshield wipers in automobiles output, durability. It can run on a 12V DC battery, making it compatible with solar-based and battery-powered systems

Description: A DC wiper motor (commonly used in automobiles) that provides oscillatory motion.

- Operating Voltage: 12V DC
- Power Rating: 30W – 60W
- Speed: 30 – 60 RPM (low-speed torque motor)
- Torque: High torque
- Weight: ~1 to 2 kg


Fig 5 Switch

Role in the system: Acts as a control unit, allowing the farmer to start or stop the riddle machine easily. It is one of the simplest yet most important components in electrical and electronic systems. By controlling the ON/OFF state, it allows the user to operate devices like motors, lights, fans, and other loads safely.

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Fig 6 Riddle Mechanism (Sieve/Frame)

A riddle mechanism, also called a sieve or frame, is the mechanical part of the riddle machine that performs the separation of unwanted materials such as stones, debris, and larger particles from soil or seeds. It works on the principle of size-based separation, where particles smaller than the mesh holes pass through, while larger particles remain on top

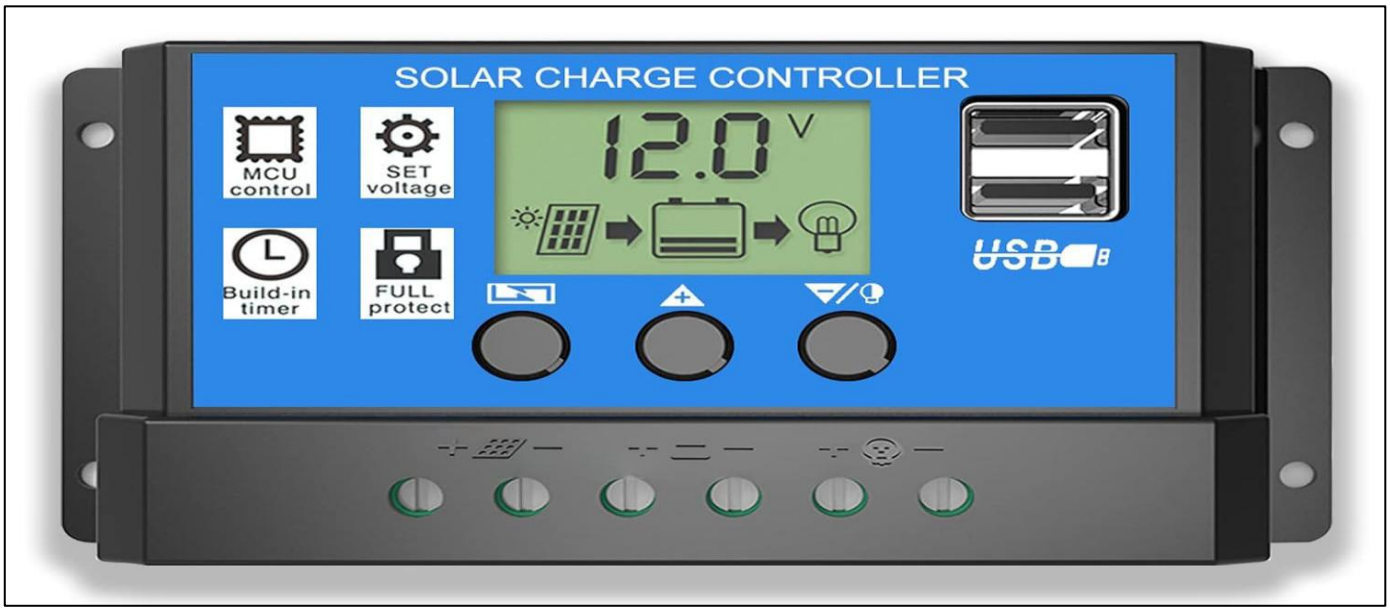


Fig 7 Charge Controller

A charge controller is an electrical device that regulates the voltage and current sent to a battery, protecting it from damage by preventing overcharging and over-discharging. It acts as a regulator between a power source, like solar panels, and a battery, ensuring the battery receives the correct amount of power for safe and efficient charging and extending its lifespan

## IV. METHODOLOGY

The solar panel captures sunlight and converts it into electrical energy. The generated DC power is directed to the 12V battery, the panel charges the battery continuously, ensuring sufficient energy for evening or cloudy-day operation.

When the switch is turned ON, the motor starts rotating. A linkage mechanism connects the motor arm to the sieve, converting(back-and-forth) motion. This causes the riddle/sieve to vibrate, allowing materials placed on it to move gradually across the surface.

Soil, sand, or seed mixtures are poured onto the riddle mechanism. Larger unwanted materials such as stones, sticks, or debris remain on top of the sieve and are separated. This process ensures that seeds or soil are cleaned and prepared for agricultural use.

## V. ADVANTAGES

- *Eco-Friendly:*
  Uses renewable solar energy, reducing carbon footprint.
- *Portable:*
  No need for wired power, making it perfect for outdoor use.
- *Low Maintenance:*
  Solar panels are durable and require minimal maintenance.

- *Cost-Effective:*
  Saves energy costs, as solar power is free.

## VI. APPLICATIONS

- Separation of Stones from Soil: Removes stones, pebbles, and debris from soil, providing clean soil for farming.
- Cleaning of Seeds/Grains: Cleans seeds/grains by separating dust, soil particles, and small debris, improving quality for storage.

## VII. CONCLUSION

The solar-powered riddle machine is a simple, eco-friendly, and cost-effective solution for small-scale farmers. By utilizing solar energy, it ensures sustainable operation without dependency on grid electricity or fossil fuels. The wiper motor-driven riddle mechanism effectively separates stones, debris, and unwanted particles from soil and seeds, thereby improving agricultural productivity and reducing manual effort.

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