IJIRCCE

e-ISSN: 2320-9801 | p-ISSN: 2320-9798

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

Volume 11, Issue 5, May 2023

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 8.379

International Journal of Innovative Research in Computer and Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 |

|| Volume 11, Issue 5, May 2023 ||

| DOI: 10.15680/IJIRCCE.2023.1105345 |

Cow Dung Cake Making Machine Using Electronic Automation

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ABSTRACT: the proposed work "Cow Dung Cake Making Machine Using Electronic Automation" aims to develop an innovative solution to automate the production process of cow dung cakes. Cow dung cakes are widely used in rural areas for cooking and heating purposes. However, the traditional manual method of making these cakes is labor-intensive and time-consuming. To address these challenges, the work introduces an electronic automation system that streamlines the manufacturing process. This increases production capacity and improves the quality of cow dung cakes. The key components of the proposed work include an automated feeding mechanism, a mixing unit, a mold assembly, and a drying mechanism. The automated feeding mechanism ensures a continuous supply of cow dung to the machine, eliminating the need for manual feeding. The mixing unit ensures a uniform composition of the cow dung mixture, enhancing the consistency and quality of the cakes. The mold assembly shapes the cakes efficiently and precisely, optimizing their burning characteristics.

KEYWORDS*:* cow dung cake, renewable energy, automation, feeding mechanism, manufacturing.

I.INTRODUCTION

Today LPG cylinder is used in every house for cooking. The price of LPG cylinder has increased so much that its use is not affordable. So today many people are seen using traditional methods (stove) to prepare food. The fuel required for stove is dung cakes. The process of making dung cakes is very lengthy and unhygienic. Also, cow dung thrown on the roadside imposes a challenge on solid waste management from cow dung polluting the environment causing different diseases.

Cow dung cakes are used as fuel for many purposes such as cooking, heating boilers, chambers, and many other purposes. The main aspect is to automate the cow dung log making process presented in [1]. In [2] expressed Biomass briquettes are a biofuel substitute for coal and charcoal. Biomass briquettes are made from agricultural and forestry waste. Gopalbhai Surtia, Paresh Panchal, Mahesh Patel, Ravikumar RK and Vipin Kumar explained How to make an environment healthy, pollution free and depreciate animal atrocity for this we must make an alternative thing such as it will be non-hazardous to environment so by being this some amount of nature will be pure. Using a cross-sectional analysis, this study analysed that Dung is an available by product of livestock, farmers use them in a various way such as fuel, flooring, plastering of house and it has environmental value [4]. The author presents reports on the investigation into the strength and the durability properties of earth brick stabilized with Cow dung [5]. The design and development of an automated machine for cow dung cake production. The article highlights the improved production capacity and consistent quality achieved through automation, along with the environmental and socioeconomic benefits of utilizing cow dung as a renewable energy source presented in [7].

Key features of Cow Dung Cake Making Machine will include an automated feeding mechanism for cow dung, a mixing unit for uniform composition, a mold assembly for shaping the cakes, and an efficient drying mechanism to accelerate the curing process. These components will be integrated and controlled by an electronic system, ensuring smooth operation and precise control over the manufacturing parameters.In addition to the technical aspects, we will also focus on the environmental and societal benefits of our project. By promoting the utilization of cow dung as a renewable energy source, we aim to contribute to sustainable development and reduce reliance on conventional fuels.

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This work has the potential to empower rural communities by providing an alternative income source through the sale of cow dung cakes, thereby supporting local economies.Through this work, hope to inspire further innovation in the field of renewable energy and encourage the adoption of sustainable practices.

II.SYSTEM DESIGN

A. *Hardware architecture*

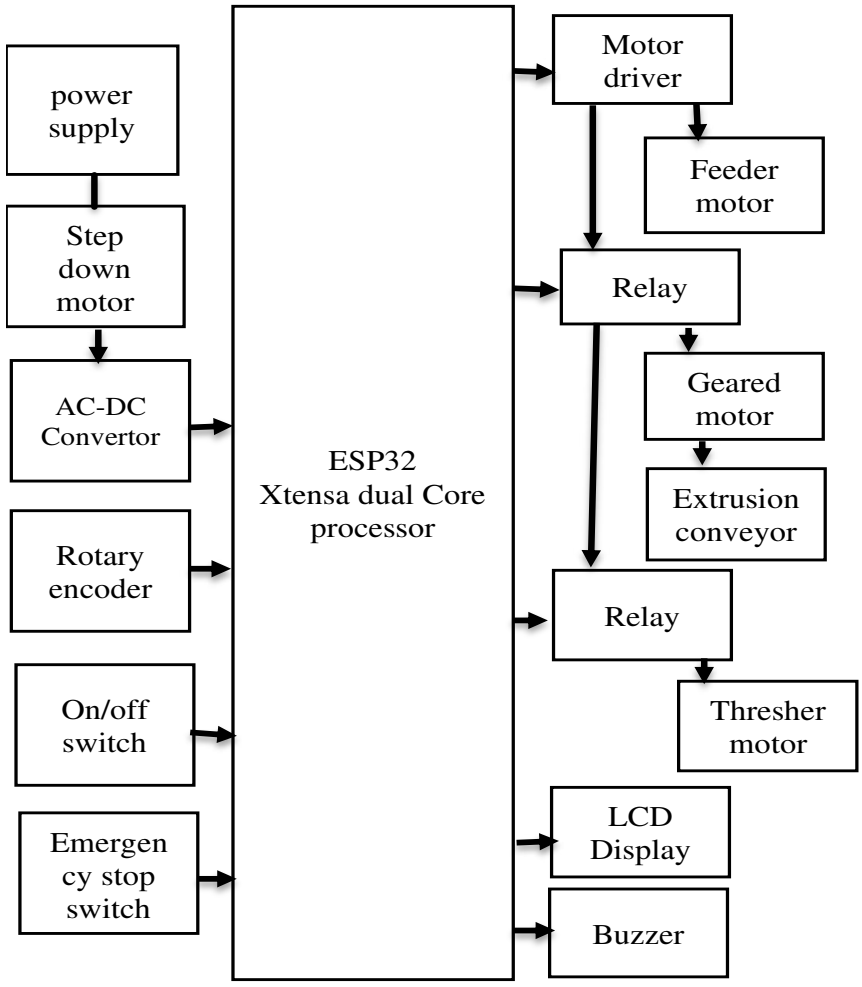

Figure 1: Block diagram of the hardware architecture of a cake making machine.

Figure 1 is for automated cow dung cake making machine. As shown in the block diagram the system is completely powered using Xtensa dual core 32bit processor. The ESP32 Package SOC controller is interfaced to the power supply using step down transformer to convert 230 V to 12 V and then AC-DC voltage converter to further step down the voltage to 3,3 V required for the operation of the system. The rotary encoder interfaced to the ESP32 is used to provide an interactive touch input which is used to provide the input to the system regarding the mixture to be added to cow dung. This helps to employ the custom feed rate depending on the type of mixture to be added. The on off switch is used to start the machine and the emergency switch is used to stop the machine in case of emergency, Once the on switch is pressed, the machine is started, and it simultaneously drives the crusher, feeder and extruder motor via relays and motor drivers. The feeder motor feed rate is adjusted using the motor driver depending on the input entry set by the rotary encoder. The LCD display interface shows the status of the machine. The Python program is deployed on the ESP32 and is used to control the entire system. The system feeds the cow dung and mixture simultaneously preparing cow dung cakes.

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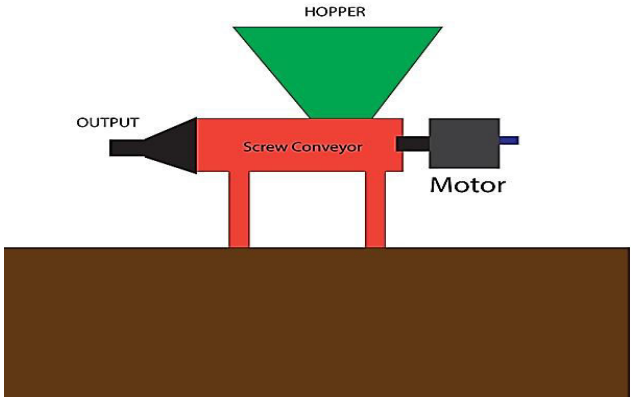

Figure 2: Conceptual Diagram of cow dung making machine system.

Figure 2 shows the block diagram of cow dung cake making machine system. It consists of hopper, screw conveyor, motors etc. The illustrative diagram above shows the working principle of the proposed work. As shown in the illustrative diagram the proposed system consists of development of cow dung log making machine. The system can convert cow dung to cow dung cakes and can be used for eco-friendly way of generating the wood for most of the purposes without actual cutting down the trees. As shown in the illustrative diagram the system consists of a hopper where the mixture of the cow dung with other additives will be loaded. The screw conveyor is fabricated at the bottom of the hopper which will take the material from the hopper and extrude it through the extrusion end with uniform extrusion and mixing of the cow dung and the other mixture. The Output cow dung cakes will be delivered from the other end of the conveyor which can then be dried and used as a replacement of wood for majority of the applications.

B. Software architecture

Figure 3 shows the flow chart of the system. As shown in the flow chart, the system consists of the on/off switch. The first activity in the project flow is to read the on off switch. Once the on off switch is read the program will process if the switch is on. If the switch is on, the controller will command the activation relay to activate the screw conveyor. The screw conveyor then starts extruding the cow dung logs from the machine. Then the next activity is to read the mixer know. The mixer knob will read the position of the potentiometer and activate the mixing conveyor. The mixing conveyor will then start mixing the additives in the machine. Finally, the cutting blade is activated which will cut the extruded cow dung and the cycle repeats or stops.

Start: The flowchart begins with the start symbol.
Read ON/OFF Switch: The machine reads the status of the ON/OFF switch to determine if it is in the ON position.
Switch On?: The flowchart branches into two paths based on the status of the ON/OFF switch. If the switch is in the ON position, the machine continues to the next step. If the switch is in the OFF position, the flowchart ends.
Start the Machine: The machine is started, and the flowchart proceeds to the next step.
Turn on Relay: The machine activates a relay, which controls the power supply to various components.
Activate Screw Conveyor: The screw conveyor, responsible for feeding the cow dung mixture, is activated to start the material flow.
Read Mixer Knob: The machine reads the position of the mixer knob to determine the desired speed of the motor.
Adjust Speed of Motor: The motor speed is adjusted based on the position of the mixer knob. This step allows for controlling the intensity of mixing.
Activate Cutting Mechanism: The cutting mechanism, responsible for shaping the cow dung mixture into cakes, is activated.
Stop: The flowchart ends, indicating the completion of the process.

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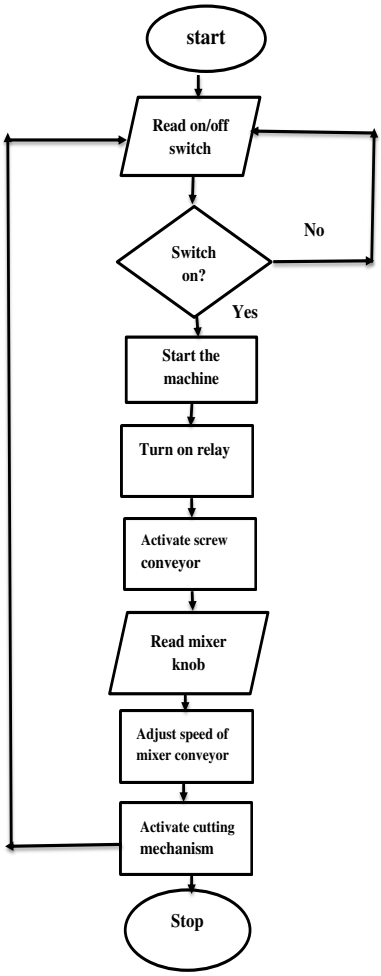

Figure 3: Flow chart of working of machine.

III.RESULT AND DISCUSSION

The implementation of a cow dung cake making machine using electronic automation offers several advantages. Firstly, it significantly improves the efficiency and productivity of the cow dung cake production process. With automated systems for material handling, mixing, shaping, the machine can operate continuously, reducing the need for manual labor and increasing the output.

Electronic automation enables precise control over various parameters such as mixing ratios and shaping techniques. This results in consistent and high-quality cow dung cakes with uniform composition and optimal moisture content.

The electronic controls unit offers flexibility in adjusting production settings and parameters. This allows for customization according to specific requirements, such as different cake sizes or the inclusion of additives for enhanced combustion properties. Additionally, the incorporation of safety features ensures the well-being of operators and prevents accidents. Emergency stop buttons offer immediate response capabilities in case of any unforeseen circumstances or malfunctions, promoting a safe working environment.

Overall, the cow dung cake making machine using electronic automation streamlines the production process, improves product quality, and enhances safety. It offers a cost-effective and sustainable solution for harnessing the potential of cow dung as a renewable energy source while minimizing manual labor and maximizing efficiency.

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Figure 4: Hopper for feeding cow dung.

Figure 4 shows the hopper for feeding cow dung. This is the hopper for feeding the cow dung. The hopper holds the feed and then feeds it to the compression conveyor which will extrude the cow dung through the extrusion cone making the cow dung cakes**.**

Figure 5: Secondary conveyor used to add additives.

Figure 5 shows the secondary conveyor. This secondary conveyor for additives addition which will be used to add the additives in the cow dung cake making machine. This part was responsible for compressing the formulated feeds before it was extruded in the die plate. The motor speed is adjusted based on the position of the mixer knob. This step allows for controlling the intensity of mixing. The shafting to allow them to freely rotate once the shaft rotated also.

Figure 6: Gear train.

Figure 6 shows the gear train. The gear train with 35-Watt pmdc motor is used to drive the secondary conveyor.

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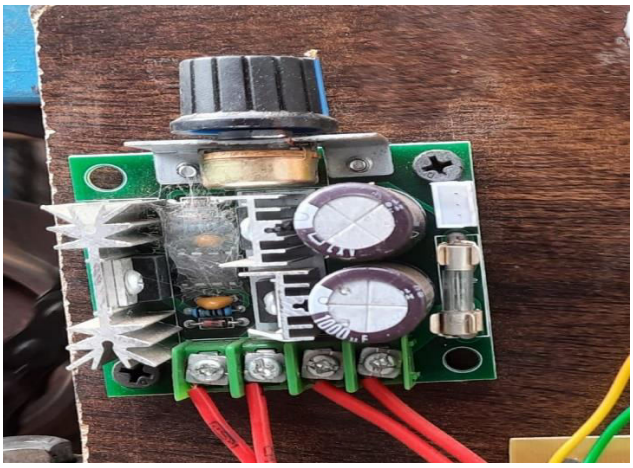

Figure 7: PWM speed controller

Figure 7 shows the PWM speed controller. The PWM Speed controller is attached for controlling the speed of the secondary conveyor which adds the additives int the cow dung log.

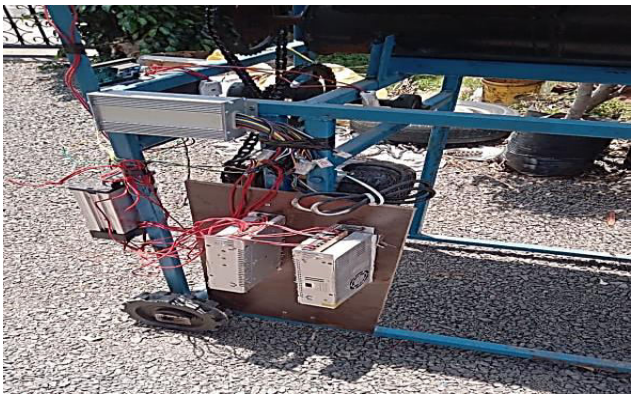

Figure 8: Electronic components

Figure 8 shows the electronics components. The system is completely powered using Xtensa dual core 32bit processor. The ESP32 Package SOC controller is interfaced to the power supply using step down transformer to convert 230 V to 12 V and then AC-DC voltage converter to further step down the voltage to 3,3 V required for the operation of the system. The rotary encoder interfaced to the ESP32 is used to provide an interactive touch input which is used to provide the input to the system regarding the mixture to be added to cow dung. This helps to employ the custom feed rate depending on the type of mixture to be added. The on off switch is used to start the machine and the emergency switch is used to stop the machine in case of emergency, Once the on switch is pressed, the machine is started, and it simultaneously drives the crusher, feeder and extruder motor via relays and motor drivers.

Figure 9: Result of extrusion

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The Above figure 9 shows the results of extrusion. The extrusion from the primary conveyor is then passed to the cutting mechanism to cut the output extrusion. The cutting mechanism, responsible for shaping the cow dung mixture into cakes, is activated.

Figure 10: Hardware structure

While burning cow dung alone can release a significant amount of smoke and pollutants, adding certain additives can potentially improve its combustion efficiency and reduce emissions. Adding different additives, such as regular waste, peanut shells, or cashew nut shells, can potentially affect the burning process and the resulting outcomes. Let's discuss each additive separately.

1. **Regular waste:** Adding regular waste materials, such as dry leaves, paper, or cardboard, to cow dung cakes can improve their combustion efficiency. The waste acts as additional fuel, increasing the overall heat output and prolonging the burning time.
2. **Peanut shells:** Incorporating peanut shells into cow dung cakes can enhance their burning performance. Peanut shells are rich in carbon and lignin, which are combustible components. When burned, they contribute to the overall heat output and duration of the fire. Peanut shells tend to burn steadily and produce a moderate flame.
3. **Cashew nut shells:** Cashew nut shells can also serve as effective additives to cow dung cakes. Similar to peanut shells, cashew nut shells contain carbon and lignin, making them suitable for fuel. Burning cow dung cakes with cashew nut shells can result in a sustained and prolonged fire, generating substantial heat.

Sr.no.	Type of additives	Combustion time	Time required for burning to ash
1.	Regular waste	10 min	4 min
2.	Cashew nutshell	7 min	5 min
3.	Peanut shell	14 min	6 min

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IV. CONCLUSION AND FUTURE WORK

Mechanical, electrical, and control system ideas were used to successfully create the automatic cow dung log maker. To create cow dung cakes, this machine operates semiautomatically. The production rate of cow dung cakes has increased with the use of this machine while using less machine runtime. The number of workers needed to produce cow dung cakes has decreased. A significant amount of agricultural waste is produced in India and poses environmental risks. However, if managed carefully, these wastes might be a superior option for briquetting. Therefore, using agricultural waste to make briquettes can be economically viable, sustainable, and environmentally friendly for an agricultural nation like India that produces enormous amounts of agricultural waste each year.

In conclusion, the project on the cow dung cake making machine using electronic automation has successfully achieved its objectives of designing and developing an automated system for cow dung cake production. The use of electronic automation in the process has led to several significant benefits.

The machine has demonstrated increased efficiency, allowing for faster and consistent production of cow dung cakes compared to manual methods. This has resulted in labor savings, as the machine reduces the need for extensive manual labor and streamlines the production process. Automation ensures precise control over parameters such as mixing speed, shaping, and drying, leading to improved product consistency and quality.

Furthermore, the automation of the cow dung cake making process has enhanced safety by reducing physical strain on workers and incorporating safety features. The machine has also optimized the utilization of resources, minimized waste, and promoted sustainable resource management.

The proposed works outcomes highlight the economic viability of cow dung cake production, as the automated machine provides opportunities for income generation and sustainable livelihoods, particularly in rural communities. Additionally, the use of cow dung cakes as a renewable and eco-friendly fuel source contributes to environmental sustainability.

In conclusion, the cow dung cake making machine using electronic automation offers a practical and efficient solution for the production of cow dung cakes. The project's achievements contribute to promoting sustainable energy practices, improving livelihoods, and supporting rural development. Further research and development in this area can lead to broader implementation and adoption of this technology, benefiting both communities and the environment.

1. Increased efficiency and productivity: Electronic automation can significantly enhance the efficiency and productivity of the cow dung cake making process. Automation can help streamline various steps, such as mixing, shaping, and drying, leading to higher output and reduced labor requirements.
2. Quality control and standardization: Automation allows for better control over the production process, ensuring consistent quality and standardized cow dung cakes.
3. Integration with renewable energy systems: Cow dung cake production can be integrated with renewable energy systems, such as biogas plants or biomass power generation.
4. Research and development: Automation opens up opportunities for further research and development in cow dung utilization. It allows for experimentation with different additives, processing techniques, and alternative uses for cow dung cakes, such as fertilizer production or material for construction.
5. Market potential: The demand for sustainable and environmentally friendly products is growing globally. Cow dung cakes can cater to this demand, especially in areas with limited access to traditional fuel sources. An automated machine that produces high-quality cow dung cakes can have a significant market potential in both rural and urban areas.

Overall, a project involving a cow dung cake making machine using electronic automation offers numerous opportunities for innovation, sustainability, and market growth. It combines traditional practices with modern technology, addressing energy needs, environmental concerns, and socio-economic development.

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| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 |

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INNO SPACE
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Impact Factor: 8.379

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ISSN INTERNATIONAL STANDARD SERIAL NUMBER INDIA

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