ENVIROFLOW MONITORING SYSTEM OF GASIFIER

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Abstract. In rural areas with abundant agricultural residues like rice husks, traditional energy production often relies on non-renewable resources, leading to environmental concerns and energy insecurity. The gasifier app is a mobile tool designed to help users efficiently manage biomass gasifier machines by providing calculations for fuel consumption, operational time, and rice production based on the power level (50kW to 500kW) and the input of rice husk or operating hours. A key feature allows users to log and track their daily gasifier usage, helping them monitor fuel consumption, operational hours, and rice production over time, thereby simplifying gasifier operation and promoting efficient resource management.

Keywords: biomass gasifier, fuel consumption, operational time calculation, power level(kW), rice production estimation, usage tracking, daily log, user-friendly interface

INTRODUCTION

Many communities, especially in rural areas, struggle with energy production despite having abundant agricultural residues like rice husks. Traditional energy methods often rely on non-renewable resources, leading to environmental degradation and energy insecurity. As the demand for sustainable energy solutions grows, efficient systems for converting biomass into clean energy are essential. However, the complexity of gasification technology and the variability of biomass feedstocks can make it challenging for non-experts to operate. This highlights the need for a user-friendly gasifier system that guides users through the process, ensuring optimal energy production while minimizing environmental impact.

PROBLEM

Rice mill operators face challenges like inefficient resource management, difficulty calculating operational time, predicting rice production, and relying on manual record-keeping, leading to resource wastage and human errors. The gasifier app addresses these issues by accurately calculating the required rice husk and fuel for different gasifier power levels, predicting operational time, and estimating rice production. It also enables users to maintain digital records of their daily usage, eliminating error-prone manual logs. By automating these processes, the app enhances efficiency, reduces waste, and provides real-time data, helping operators optimize energy consumption and agricultural output in a competitive environment.

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APPROACH

The gasifier app, developed with Dart and Flutter, offers an efficient solution for managing gasification processes using an SQLite database for local data storage. Users can select a power level (50kW to 500kW) and input the amount of rice husk available, which automatically calculates operational time and fuel consumption. The app also tracks rice husk and fuel usage over time and includes a rice production calculator based on the selected rice type and operational time.

Intuitive navigation features, such as a menu drawer and navigation bar, provide access to key functionalities like machine and rice calculations, resource storage, and data visualizations. Users can also explore educational content to optimize resource usage.

The system flowchart illustrates the user journey from the splash screen to the Home Screen, the primary navigation hub. The app includes dedicated screens for machine calculations, rice calculations, and resource management, along with a History Usage section for tracking past data. All user interactions and data are stored in the Gasifier Database, ensuring efficient management of profiles and calculations. The app also includes back button handling for improved navigation, creating a comprehensive, user-friendly experience for gasification management.

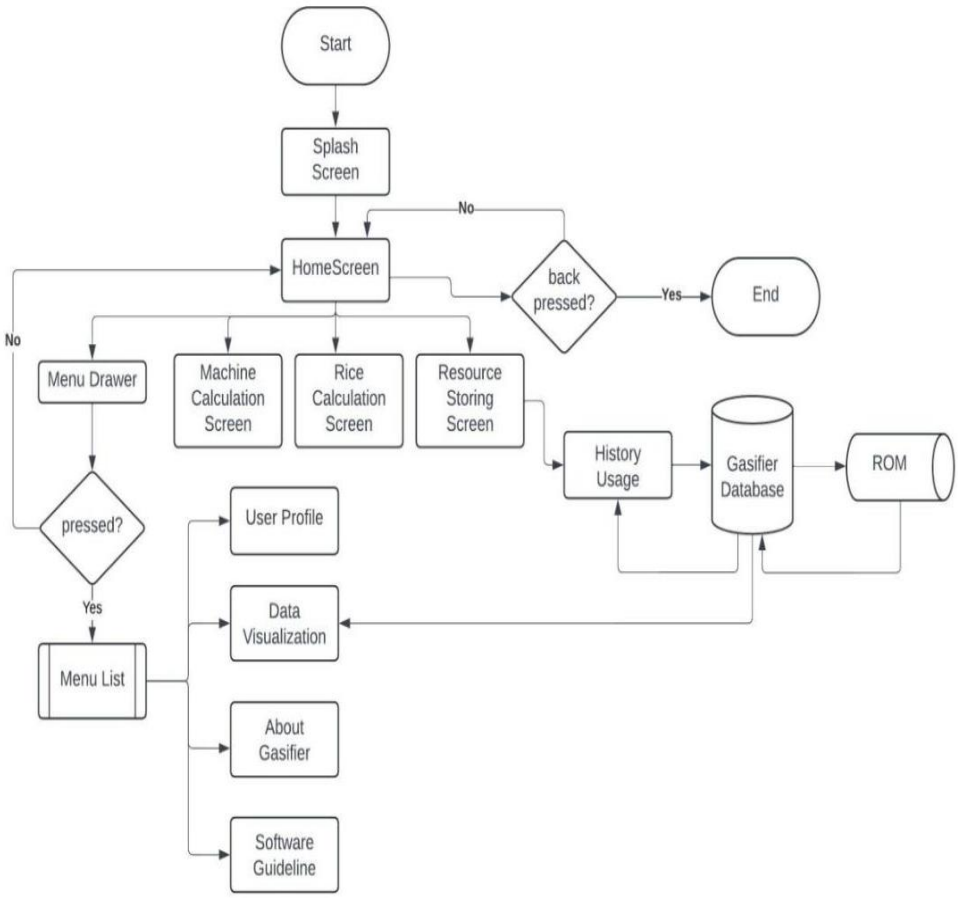

Figure 1: System Flow Diagram

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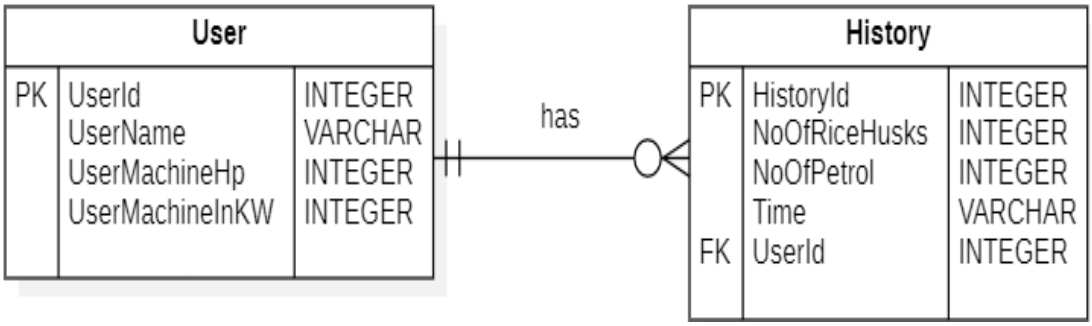

Figure 2: Entity Relationship Diagram

Figure 2 illustrates the ER diagram for the gasifier app.It includes two main tables: **User** and **History**. The **User** table stores unique identifiers (UserId), along with attributes such as the horsepower (UserMachineHp) and power rating in kilowatts (UserMachineInKW) of the user's gasifier machine. The **History** table tracks operational data, including the amount of rice husks and petrol used, and a timestamp for each record. Each record in the **History** table is linked to a specific user through the UserId foreign key, establishing a one-to-many relationship where one user can have multiple history records. This structure enables comprehensive tracking of usage data associated with individual users, facilitating detailed monitoring and analysis of gasifier performance.

RESULTS

The result of using the gasifier app is improved efficiency and productivity for rice mill operators, as it enables precise calculation of resource requirements, including the optimal amount of rice husk and fuel for various gasifier power levels, reducing wastage and ensuring peak efficiency. By accurately predicting operational time and rice production output, the app helps operators plan their work schedules and production targets more effectively. The digital record-keeping feature allows for easier tracking of daily gasifier usage, fuel consumption, and rice production, eliminating manual errors.

Moreover, the app promotes a more organized approach to resource management, allowing operators to quickly access historical data for better decision-making. With real-time data at their fingertips, users can adjust operations based on immediate needs and optimize resource allocation. This adaptability not only enhances operational efficiency but also contributes to a more sustainable approach to energy production. Additionally, the app's user-friendly interface ensures that operators can easily navigate its features, further reducing the learning curve. Ultimately, the app leads to better resource management, increased transparency, and optimized energy usage, resulting in higher productivity and reduced operational costs. It enables operators to make data-driven decisions to enhance energy efficiency and agricultural output.

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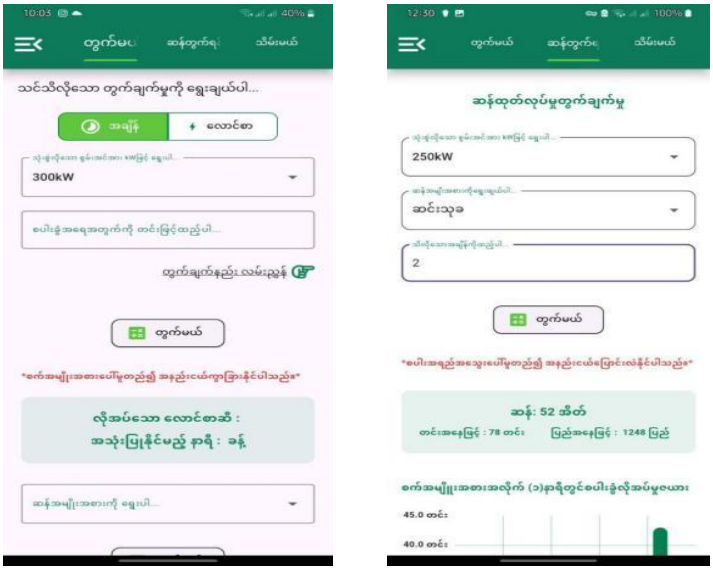

Figure 3: Calculation Screens of the Gasifier App

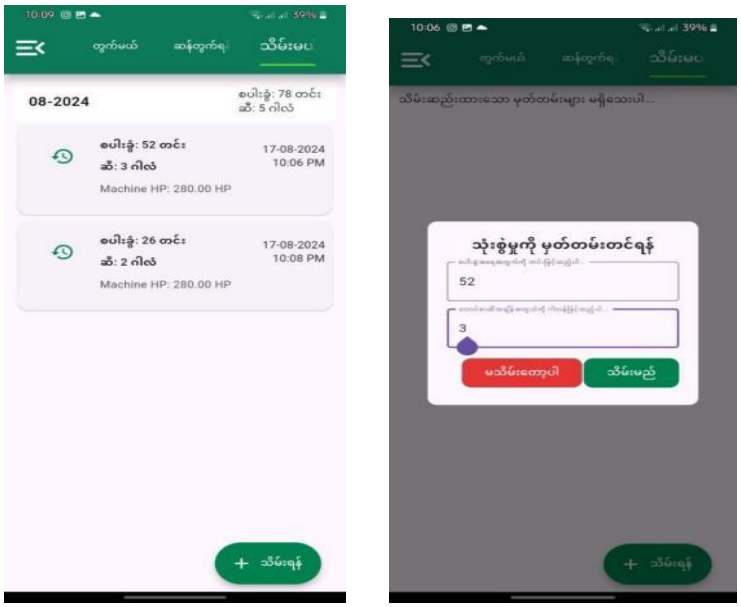

Figure 4: Resource Usage Storing Screens of the Gasifier App

CONCLUSION

As the need for renewable energy sources grows, the gasifier mobile app provides a vital tool for optimizing the conversion of rice husks into clean energy. Designed with a user-friendly interface, the system simplifies the process of calculating key operational parameters and managing data. Its intuitive design enhances user experience by making navigation straightforward and decision-making accurate. This project offers significant benefits, including precise operational settings, efficient data management, and effective biomass utilization. By facilitating efficient energy production and supporting sustainable practices, the

system reduces the complexity of gasifier operations, proving to be a valuable asset for users seeking to maximize clean energy from biomass.

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