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IoT- Based Anti-Scam Petrol Pump Automation System

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Abstract*— This project presents a tackles the rampant issue of petrol pump fraud in India, particularly after the Legal Metrology Department's office hours. By utilizing IoT technology, we introduce a solution that ensures fair pricing, prevents scams, and enables 24/7 self-service fuel dispensing. In India, manual price updates at petrol pumps create opportunities for scams, especially during off-hours when oversight is minimal. To combat this, we introduce an IoT- based system with real-time price updates and an Android app for self-service fueling. Prices are centrally updated, promoting transparency and discouraging fraud. Customers can access fuel at any time by scanning a QR code, specifying the quantity, and making a secure wallet payment through the app. This eliminates reliance on station staff, enhancing convenience and trust. Our project's benefits include reduced scams, accurate pricing, and improved customer convenience. Collaboration with petroleum companies is essential for successful implementation, potentially revolutionizing the fuel retail industry in India, particularly during off-hours when fraud risks are higher.

Keywords*— Fuel dispenser, Android Application, Wifi module, Arduino Processing.

I. INTRODUCTION

One of the most significant petrol pump scams in India in recent years involved the manipulation of fuel dispensing units to deliver less fuel than what was actually paid for by customers. This scam was particularly prevalent in some regions and garnered considerable attention due to its widespread impact on consumers. Unscrupulous petrol pump owners or attendants tampered with the fuel dispensing units to deliver less fuel than what was indicated on the meter. This manipulation could involve adjusting the calibration of the dispensing units or using electronic devices to alter the flow rate. Customers, unaware of the manipulation, would pay for a certain quantity of fuel based on the meter reading. However, they would receive less fuel than what they paid for, resulting in financial losses for the consumers. The scam was reported across various states in India, affecting a large number of consumers who frequented petrol pumps involved in the fraudulent practices. Many customers only became aware of the scam when they noticed discrepancies in their fuel consumption or when suspicions were raised due to unusually high fuel expenses. Following complaints from consumers and increased scrutiny from authorities, investigations were launched into suspected petrol pumps. Authorities conducted raids and inspections to identify instances of tampering with fuel dispensing units and other fraudulent activities.

Self-serving 24x7 petrol pumps are a modern innovation in the fuel retailing industry aimed at providing convenience to customers by allowing them to refuel their vehicles at any time of the day or night without the assistance of petrol pump attendants. Self-serving petrol pumps are equipped with automated fuel dispensers that allow customers to select the type and quantity of fuel they require using a digital interface or touchscreen. Customers can choose from various payment options, including cash, credit/debit cards, mobile wallets, or contactless payments. Payment is typically made either at the pump using a card reader or through a payment terminal located nearby. Unlike traditional petrol pumps that have fixed operating hours and require attendance by petrol pump staff, self-serving petrol pumps operate round-the-clock, enabling customers to refuel their vehicles at any time, even during late hours or holidays. Self-serving petrol pumps offer greater convenience and flexibility to customers, especially during emergencies or when traditional petrol pumps are closed. Customers can refuel their vehicles quickly without having to wait for petrol pump attendants or worry about queuing during peak hours.

By eliminating the need for full-time attendance by petrol pump staff, self-serving petrol pumps can reduce operational costs for fuel retailers. This cost-saving advantage can sometimes translate into lower fuel prices for customers. Self-serving petrol pumps are often equipped with advanced safety features such as surveillance cameras, emergency shut-off systems, and adequate lighting to ensure the safety and security of customers, especially during late-night refueling. Self-serving petrol pumps can improve the efficiency of fuel dispensing operations by reducing wait times for customers and streamlining the refueling process. This can lead to faster throughput and increased customer satisfaction. Self-serving petrol pumps may also incorporate environmentally friendly features such as vapor recovery systems or energy-efficient lighting to minimize their environmental impact. Some self-serving petrol pumps may also incorporate environmentally friendly features such as vapor recovery systems or energy-efficient lighting to

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minimize their environmental impact.Self-serving 24x7 petrol pumps offer a convenient, efficient, and flexible refueling option for customers while also providing cost-saving benefits for fuel retailers. As technology continues to advance, we can expect to see further innovations in the design and operation of self-serving petrol pumps to meet the evolving needs of customers and the fuel retailing industry.

II. DESIGN OF ANDROID APP

In an era where convenience and efficiency reign supreme, the traditional model of manned petrol pumps is evolving. The emergence of self-servicing petrol pumps brings forth a paradigm shift, empowering consumers to take control of their refueling experience. With the advancement of technology, this transition is further catalyzed by the introduction of dedicated Android applications designed to facilitate the entire process seamlessly. Our Android application aims to revolutionize the way individuals refuel their vehicles by providing a user-friendly, efficient, and secure platform for self-servicing at petrol pumps. Gone are the days of waiting in queues or relying on attendants; with just a few taps on their smartphones, users can initiate and complete the refueling process autonomously. The app ensures secure access to the self-servicing features through robust user authentication mechanisms, safeguarding user data and transactions. A user-friendly interface designed with simplicity in mind allows users to navigate effortlessly, select fuel types, input desired quantities, and initiate fueling with ease. Our application seamlessly integrates with the hardware components of self-servicing pumps, enabling real-time communication and control over the fuel dispensing process. Built-in payment processing capabilities facilitate secure transactions, offering multiple payment options for user convenience, including credit/debit cards, mobile wallets, and contactless payments. Safety remains paramount, with built-in safety features such as emergency stop buttons, automatic shut-off mechanisms, and real-time monitoring to prevent accidents and ensure compliance with safety regulations. Users can access a comprehensive transaction history within the app, providing transparency and accountability for all refueling activities. Users can refuel their vehicles at their convenience, eliminating the need to wait in queues or rely on attendants. The self-servicing model streamlines the refueling process, reducing wait times and enhancing overall efficiency. Users have complete control over the refueling process, from selecting fuel types to monitoring transactions, empowering them with autonomy and freedom. With robust safety measures in place, users can refuel their vehicles confidently, knowing that their safety is prioritized at every step. Kodular is a platform that allows users to create mobile applications without the need for extensive coding knowledge. It operates on a drag-and-drop interface, making it accessible for users with varying levels of technical expertise. Kodular offers a user-friendly interface where users can build their apps by dragging and dropping components onto the design canvas. This simplifies the app development process and reduces the need for writing complex code. Instead of writing code manually, users can create app logic using visual programming blocks. These blocks represent different functions and actions, and users can connect them to define the behavior of their app. Kodular provides a vast library of pre-built components and extensions that users can incorporate into their apps. These components cover various functionalities such as user interface elements, data storage, multimedia handling, connectivity features, and more. Apps created with Kodular can be exported to multiple platforms, including Android, iOS, and even as web apps. This allows developers to reach a broader audience across different devices. Kodular has an active community of users and developers who share knowledge, resources, and support through forums, tutorials, and documentation. This can be valuable for beginners seeking guidance and assistance during the app development process. Kodular allows users to create and integrate custom extensions to extend the functionality of their apps further. This flexibility enables developers to incorporate specific features or integrate with third-party services seamlessly. Kodular operates as a cloud-based platform, allowing users to access their projects from any device with an internet connection. This eliminates the need for local development environments and facilitates collaboration among team members. Kodular follows a freemium pricing model, offering both free and paid plans with varying levels of features and support.

Fig.1. Loading Page

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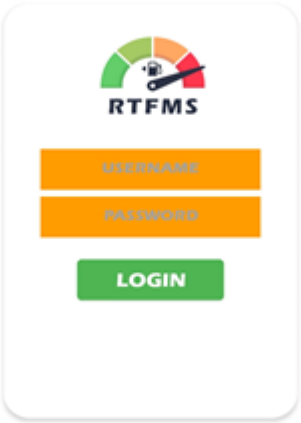

Fig. 2. Login Page

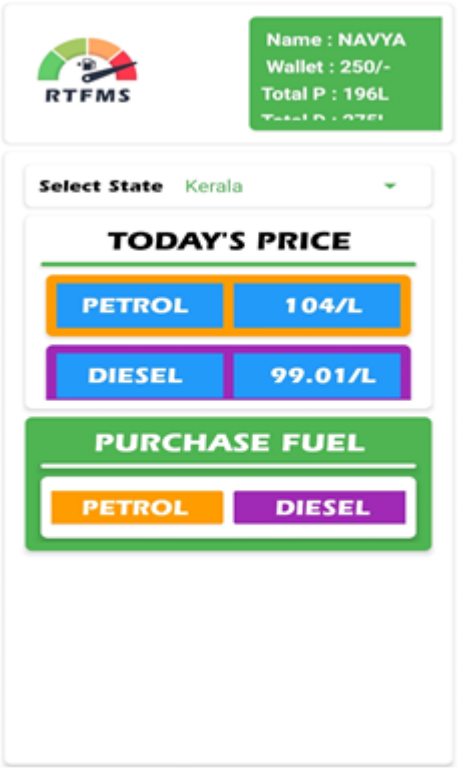

Fig.3. Main Page

while opening this rtfms app , login page will open. Enter the login id and password. A main page

will open , select your state where you want the petrol and diesel. Now we can see the price of

petrol and diesel of that state. Then scan the QR code and pay the money .

III. METHODOLOGY

The methodology involves the meticulous design and construction of a comprehensive solution to manage fuel dispensing, pricing, and customer interactions, we introduce an Integrated Fuel Management System. [2] This system incorporates IoT technology to create smart fuel dispenser machines, an IoT server for centralized price management, and an Android application for seamless customer management. By synchronizing communication between these components, we aim to streamline operations, enhance efficiency, and improve the overall fueling experience. We design and develop fuel dispenser machines equipped with IoT sensors and connectivity capabilities. Features include real-time monitoring of fuel levels, automatic shut-off mechanisms, and tamper-proof design to prevent unauthorized access. AN IoT server is implemented to centralize fuel price management and distribution. The server receives updates on fuel prices from authorized sources and disseminates this information to all connected dispenser machines in real-time. A custom Android application is developed for fuel station operators to manage dispenser machines and monitor fueling transactions. [1] Operators can remotely control dispenser settings, view transaction history, and receive notifications/alerts for any irregularities [3]. Communication between dispenser machines, the IoT server, and the Android app is synchronized for seamless operation. Dispenser machines regularly update fuel levels and status to the server, while the server sends pricing information to all machines simultaneously. The Android app interacts with both the server and dispenser machines to facilitate user management and monitoring. Customers use the Android app to locate nearby fuel stations, check fuel prices, and initiate fueling. The app provides real-time updates on available fuel types, prices, and transaction history. Upon arrival at the fuel station, customers use the app to authorize the fueling process, monitor dispensing, and receive digital receipts.

1. Microcontroller (Controller): Arduino or similar microcontroller to control the operation of the fuel dispenser machine and handle communication with other components.
2. Motor Driver: Motor driver module to control the fuel motor pump responsible for dispensing fuel.
3. LED Indicator: LEDs to indicate the status of the fuel dispenser machine, such as power on/off, fuel availability, and transaction completion.
4. LCD Display: LCD display module to provide visual feedback to users, including fuel type selection, quantity input, and transaction details.
5. Fuel Motor Pump: Fuel motor pump to dispense the selected type and quantity of fuel.
6. Dispenser Button: Push-button switches or capacitive touch buttons to allow users to initiate the fueling process and make selections.
7. Liquid Flow Sensor: Liquid flow sensor to measure

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the flow rate of fuel and ensure accurate dispensing.

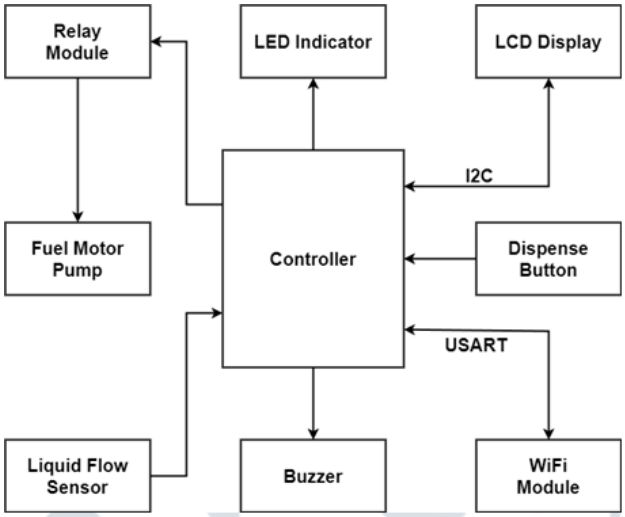
8. Buzzer: Buzzer or piezo speaker to provide audible feedback to users, such as confirmation beeps or error alerts.
9. WiFi Module: WiFi module (such as ESP8266 or ESP32) to enable wireless communication with the IoT server and Android app.

IV. WORKING PRINCIPLE

IoT- Based Price Setting Mechanism: [2] An IoT server is utilized to manage fuel prices centrally. This server receives updates on fuel prices from authorized sources, such as regulatory bodies or fuel suppliers, and disseminates this information to all connected dispenser units. Updating Price Within Few Seconds: The IoT server updates fuel prices within seconds of receiving new pricing information. This ensures that fuel prices are always up-to-date and reflect changes in market conditions or regulatory requirements promptly. Custom Made Android Application: The Android application provides users with a user-friendly interface to interact with the fuel dispenser system. Users can use the app to locate nearby self-servicing pumps, check real-time fuel prices, initiate fueling by scanning QR code, and receive digital receipts for transactions. Non-Manipulatable Dispenser Unit: The dispenser unit is designed with tamper-proof mechanisms and sensors to prevent dispense quantity manipulation. Any attempt to tamper with the unit triggers alarms and alerts the system.

Monitoring Dispensing Quantity and Pricing: Liquid flow sensors installed in the dispenser units continuously monitor dispensed quantity to ensure accuracy. Any discrepancies between dispensed and requested quantities are flagged and reported. The Android application also displays real-time pricing information sourced from the IoT server, ensuring transparency and enabling customers to make informed decisions. Fully Automated Self-Servicing Pumps: The dispenser units are equipped with automation features that allow customers to refuel their vehicles independently. Customers can use the custom-made Android application to select the fuel type, specify the quantity, and initiate the fueling process without the need for attendants. The fuel dispenser system provides a comprehensive solution to address fuel scams in Indian petrol pumps. It ensures accurate dispense quantity, transparent pricing, and seamless operation, even outside regular working hours, enhancing customer trust and confidence in the fueling process.

V. BLOCK DIAGRAM



VI. RESULT

The final implementation of this comprehensive solution is a significant reduction in fuel scams, enhanced transparency and accountability, improved operational efficiency, and a more convenient and secure fueling experience for customers at Indian petrol pumps. This solution not only addresses the challenges posed by fuel scams but also sets a new standard for integrity and reliability in the fuel industry.

VII. CONCLUSION

The implementation of self-serving petrol pumps with anti-scam measures represents a significant step forward in the fuel retailing industry. By offering 24x7 access and reducing reliance on manual assistance, these pumps enhance convenience for customers while also improving operational efficiency and reducing costs for fuel retailers. The incorporation of anti-scam measures such as automated fuel dispensing, integrated payment systems, surveillance cameras, and tamper-proof technologies helps to safeguard against fraudulent activities such as under-dispensing, adulteration, or card skimming. These measures not only protect consumers from financial losses but also promote trust and transparency in the fuel retailing process. Furthermore, self-serving petrol pumps contribute to enhanced safety and security through features like emergency shut-off systems and adequate lighting, ensuring a secure refueling experience, especially during late hours. As the demand for convenience and efficiency in fuel retailing continues to grow, the adoption of self-serving petrol pumps with robust anti-scam measures is poised to become increasingly prevalent. However, it is essential for fuel retailers and regulatory authorities to remain vigilant and continuously innovate to stay ahead of emerging threats and ensure the integrity of the fuel retailing ecosystem. Overall, self-serving petrol pumps equipped with anti-scam measures represent a win-win solution that benefits both consumers

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and fuel retailers, fostering a more reliable, efficient, and trustworthy refueling experience for all stakeholders involved.

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