FASTAG BASED SMART FUEL DISPENSING SYSTEM

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ABSTRACT

The primary goal of the enterprise is to design a payment device that can automatically deliver petrol for the amount accepted by the consumer. Petrol dispensing systems are most typically found in our daily lives at areas such as offices, bus stops, railway stations, schools, and so on., We will be selling a current generation petrol dispensing device that will be RFID enabled. This work entails creating a prepaid card for a petrol bunk device as well as a petrol payment device using RFID technology. Currently, all petrol stations are run by hand. These manual petrol pumps are time-consuming and demand more manpower. Normally, putting petrol stations in remote areas might be highly expensive in order to provide excellent service to customers. All of these issues are addressed by utilising an unmanned power pump, which requires less time to operate, is effective, and can be deployed anywhere. The customer can use the service, which must be completed using a digital clearing device. FASTag (RFID Tag) is attached to the vehicle's windscreen and allows the purchaser to make toll payments from the account associated with FASTag all at once.

Key words: RFID technology, Petrol dispensing systems, petrol payment device

INTRODUCTION

Shipping fuel to a large number of cars at petrol stations in India has caused a variety of issues. Due to a scarcity of small change on hand with the station operator, the automobile driver must pay for petrol with cash and may be required to pay more than the amount of distributed gas. The RFID-based automatic petrol pump's goal is to eliminate human labour by developing an auto-guiding machine and implementing the operation in a sequential manner. These systems are incredibly dependable and time-saving gadgets [1]. Among the components used in this assignment are a microcontroller, RFID tags, a power source, an LCD display, a motor motive force, and an RFID reader. Petroleum products are one of nature's most beloved and strange innovations.

To ensure the survival of the goods, proper use and distribution are essential. The uncontrolled expansion in the global car population poses an alarming risk to petrol supply [2]. Dispensing fuel at petrol stations to a large number of customers has caused a great deal of

difficulties. Petrol is one of the most significant assets in the international market. Not only is the proper usage of those things vital, but so is the effective use of those products. A fuel station is a facility that sells petrol and lubricants using fuel dispensers that pump fuel into automobiles and calculate the monetary value of the product thus distributed [3]. It is critical. This system contains responsibilities such as displaying the quantity and quantity of petrol, electrical pump riding and turning the petrol pump ON and OFF for this purpose. One significant disadvantage is that there has been an increase in petrol robberies in recent years. To dispense one of the most important petrol assets, such as petroleum, a comfortable machine is required. According to a recent survey, 30ml of every 1000ml is stolen from customers [4].

RF REDER

The EM-18 RFID Reader module operates at a frequency of 125 KHz. This reader is a less expensive option for your RFID-based completely application, and it is widely available. The Reader module includes an on-chip antenna and can be powered by a 5V nominal power supply. When we power up the module and link the module's inbuilt transmit pin to the acquire pin of your microcontroller, they will begin to initialise. Then, set your card in the reading distance, and the card quantity is displayed on the display spot. The module can be programmed to detect supply as well as output [5]. The microcontroller, which serves as the device's main CPU, stores multiple playing card details and compares them to the data provided by the RFID reader.

When both the card's and the microcontroller's information is valid, it sends the manipulate alerts to the relay, causing the motor to start pumping petrol. We proposed three simple RFID smart playing cards in this machine. The first two cards are known and authorised, but the remainder are unknown. When the customer arrives at the bunk to fill up on petrol at the station, he will first swipe the card. If the card is accepted, the RFID card reader will receive the cardboard and proceed to the next stage [6]. This measuring instrument functions in this manner. If the client swipes an unauthorised card, the reader will no longer recognise the card and will display an error message indicating that the card is unauthorised. As a result, the system is completely secure. This system no longer necessitates a high-performance and expensive microcontroller, as well as an ARM collection. It is done out with the aid of a low-cost microcontroller, which indirectly lowers the overall cost of the machine [7].

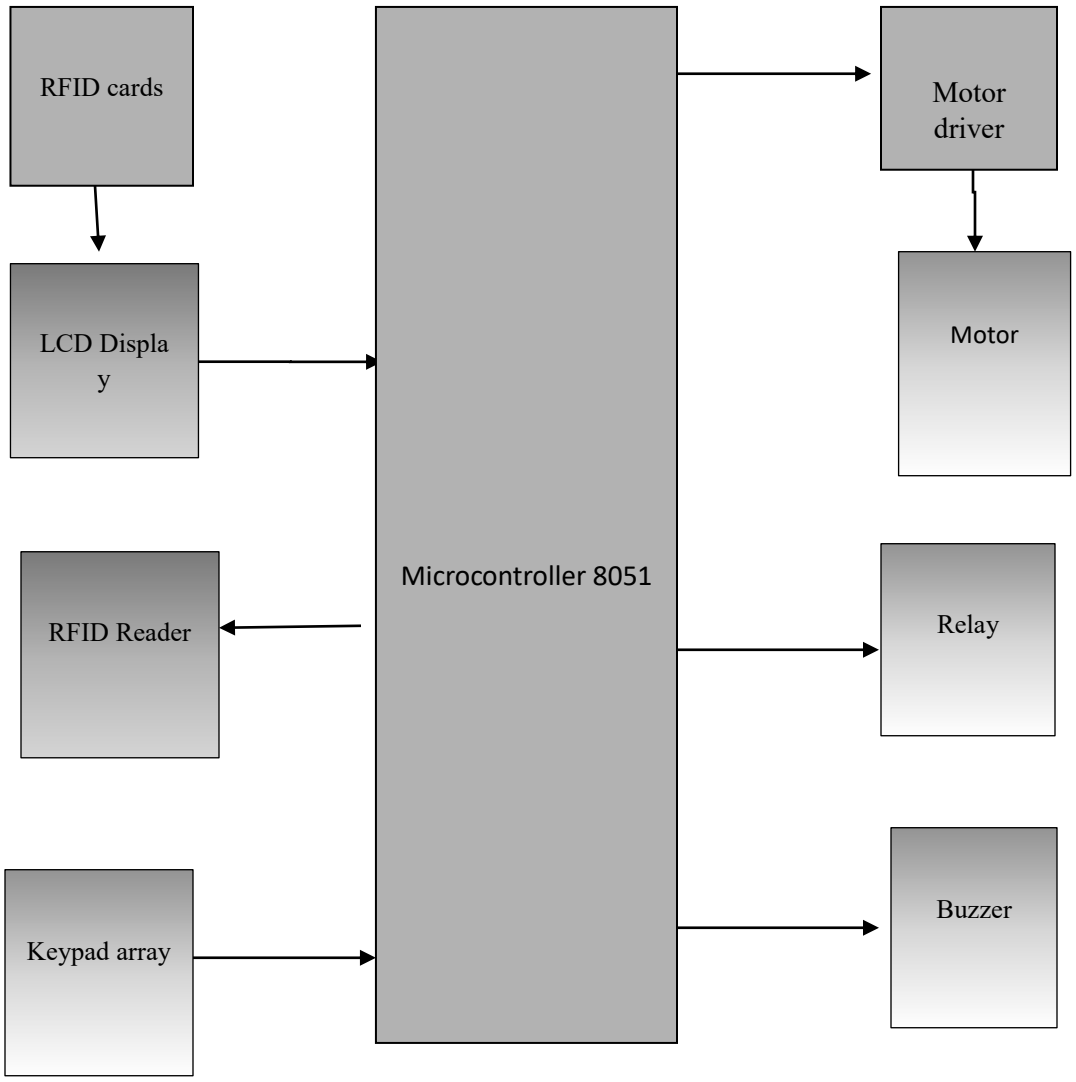


Fig. Block Diagram

CONSTRUCTION AND WORKING

In this proposed design, we created an automated petrol station by combining RFID with the Adriano Uno. The suggested version is divided into two sections: analogue and digital. The analogue component provides time, quantity, and amount measurement for the scanned product in dealing, while the virtual elements work for the suction and pump (SUMP) unit [8]. The version shown here only works for particular amounts of money entered by the user. The statistics for each amount are supplied into a separate RFID tag, and the account is saved in their individual frequencies in an RFID Reader. RFID operates at a precise frequency of electromagnetic waves ranging from 125 KHz to 2.4GHz. When the frequency matches the scanned tag, the reader scans the quantity intended with the aid of the consumer and activates the Adriano Uno to compute time and money for the supplied amount. The Adriano Uno alerts the motor, and the distribution occurs as a result. The gadget has five relay switches, four of which

allow the user to enter a four-digit number and one relay which is used to turn on and off the DC motor. The SUMP unit absorbs the preferred petrol and pumps it into the field tank [9].

SYSTEM ANALYSIS

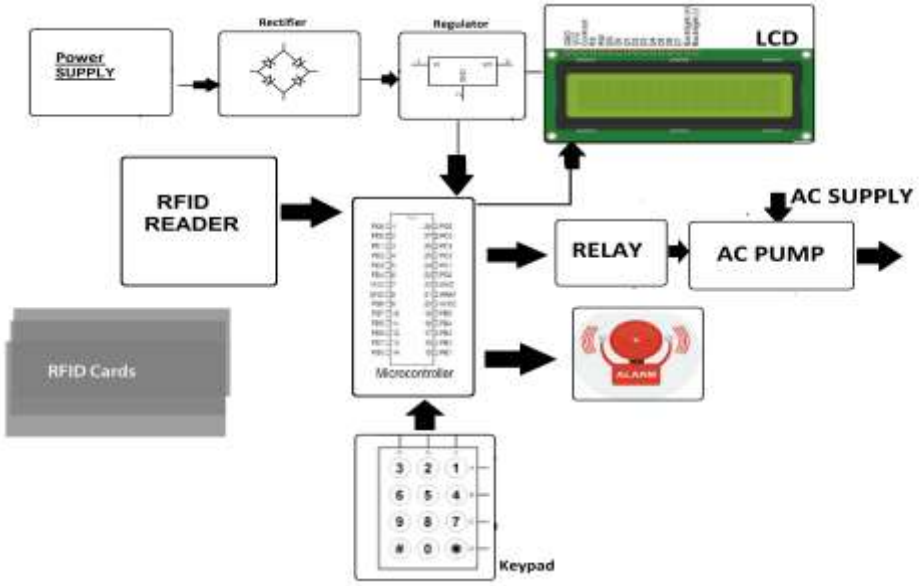
Everything is now digital. Almost all fuel pumps in modern systems feature a controlling device to execute activities such as dealing with the electric pump, driving the display, measuring the glide, and therefore turning off the electrical pump. However, someone must collect the funds, and there is always the chance of human error [10]. We're using RFID cards to obtain petrol at exclusive petrol stations of various petrol organisations across the country and right here in this planned petrol pump automation system. We simply place the RFID card near the RFID scanner whenever we wish to fill the tank from the petrol dispenser. The microcontroller then reads the information from the RFID reader and executes the action based on the needs of the customer. This virtual gas pump gadget also provides clients with security when filling up at petrol stations by avoiding the involvement of humans, which reduces the risk of carrying cash on every occasion [11]. This fuel pump gadget is made up of an Atmega328 microcontroller, an RFID module, an LCD display, a keypad, an ac pump, and an alarm. When the RFID reader reads the cardboard, it prompts us for a three-digit password; if we enter the wrong password more than twice, an alarm is triggered. When the correct password is put into the device, the system prompts for the quantity and suggests the balance amount. On getting into the amount, the motor starts off evolved and petrol receive crammed within the petrol tank from the gasoline dispenser.

RFID TECHNOLOGY

This device employs RFID technology, and each user may have a Prepaid RFID card. It is rechargeable at all times. RFID tags with unique verification codes are embedded in these cards. RFID readers read the virtual data embedded in radio frequency tags. When a consumer approaches the RFID reader, it captures the digital data and sends the matching sign to the microcontroller [12]. The microcontroller compares the collected data to saved information from many cards. If the corresponding in form is seen, the amount entered by the individual is deducted from that account.

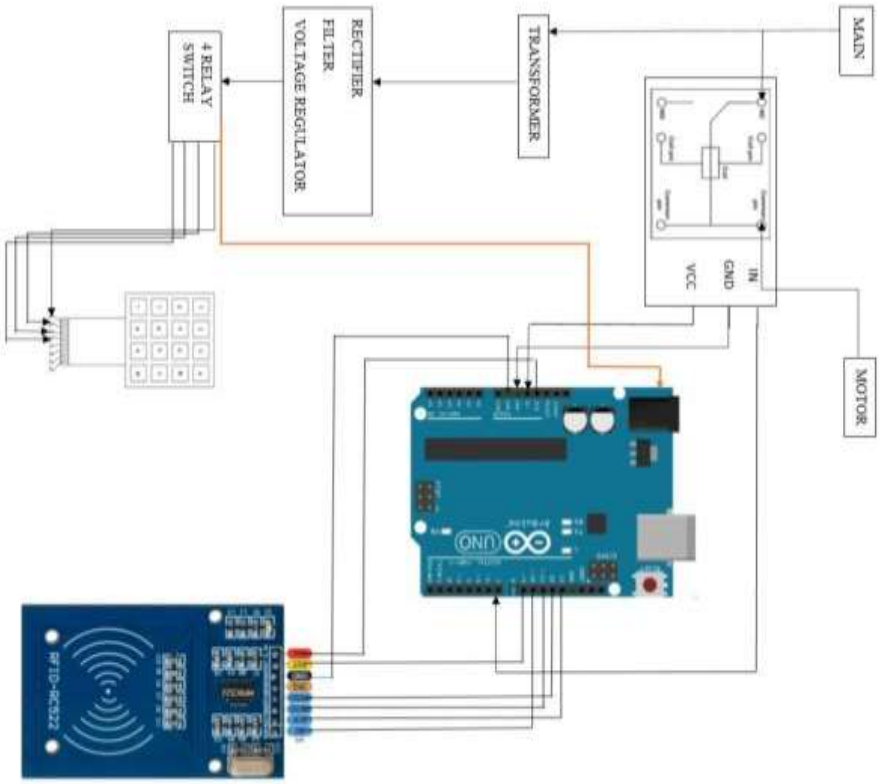
The microcontroller engages the relay driver for that specific duration of time, and the preferred specified petrol is dispensed into the tank. In either case, the consumer receives petrol for the amount debited from the consumer's pay as you go card. When the customer arrives at the petrol station to fill up, he will first swipe the card. RFID card reader accepts cardboard if it is permitted. After inputting the correct numbers/digits, the PF-card balance will be verified; if the card has sufficient funds for the number of litres, they are opting for, gasoline will be pumped and the amount will be debited from the card; this will be charged based on current petrol prices. The customer will then be advised of how much balance he/she has after fuelling, which will be displayed on the LCD screen and sent as a message to the customer's registered cell number through GSM [13]. After transmitting the message to the customer, the

motor pump starts and begins to fuel the vehicle via the pipe or gun connected to the pump when the motor reaches the quantity of litres specified by the customer.



PROPOSED Diagram of RFID Based Automated Petrol Pump System

CIRCUIT DIAGRAM OF PROPOSED SYSTEM



Circuit Diagram of Proposed System

MODULE DISCRIPTION

3.1. MICROCONTROLLER

The 8051 is one of the first and most widely used microcontrollers, often known as the MCS-51. It was delivered by Intel in the year 1981. It began as an N-type steel-oxide-semiconductor (NMOS)-based microcontroller, but later iterations were mostly based on complementary metal-oxide-semiconductor (CMOS) technology.

3.2. RELAY

A relay is a type of electrical transfer. It is made up of a set of input terminals for a single or a couple of manage signals and a set of running contact terminals. The switch may also include any number of contacts in a couple of contact documents, including make contacts, wreck contacts, or combinations of the two. It operates on the electromagnetic principle. When the relay's circuit detects the fault contemporary, the electromagnetic field that generates the transient magnetic discipline is activated. This magnetic field moves the relay armature, allowing it to open or close connections [14].

3.3 .RFID MODULE

RFID can be active (powered), passive (unpowered), or semi-passive (battery-assisted). RFID tags are classified into three types based on the frequency at which they transmit data: low frequency (LF), high frequency (HF), and extremely-high frequency (UHF). In general, the lower the frequency of the RFID machine, the shorter the examination range and the slower the data read cost [15].

3.4 .RFID CARDS

It is scanned using a specific frequency specific to the character RFID tag, which contains data that can be communicated using the same frequency as the RFID reader. An RFID card has a slim design (81x54x1 mm), similar to a driver's licence or identification card, and can be stored in the user's pockets. An RFID tag, on the other hand, is smaller and thicker (about 20x20x5 mm), yet it can be stored within the consumer's keying. Finally, an RFID adhesive label has a medium dimension (50x50) and is thin and bendy.

3.5 .SEVEN-SEGMENT LED

A seven-section LED is a digital display module that is specifically designed to display numerical data. Light-emitting diodes (LEDs) arranged in the shape of numbers provide a clearly visible display. They are also known as "seven-segment shows" or "seven-segment

signs." A LCD display's thing ratio is the proportionate dating of its width in comparison to its peak [16].

3.6 .ARDUINO UNO R3

The Adriano Uno R3 is a microcontroller board that is built around a detachable, dual-inline package deal (DIP) ATmega328 AVR microprocessor. It features 20 digital I/O pins (six of which can be used as PWM outputs and six as analogue inputs). It may be programmed using the simple-to-use Adriano computer software.

3.7 .LCD DISPLAY

LCD (Liquid Crystal Display) is a form of flat panel display that operates primarily with liquid crystals. They create images by painting using liquid crystals. The liquid crystals are integrated in the display, and they may be illuminated by some type of backlight. The genuine liquid crystal display is composed of multiple layers, as well as a polarised filter and electrodes.

3.8 .POWER SUPPLY

A battery is a device that stores electric power in the form of chemical strength. When necessary, the power is released as electric power for DC consumers such as lighting and starter automobiles. A battery is made up of many galvanic cells, each with a voltage of two volts. Fortunately, you can utilise a vehicle battery as a power bank to charge your electronics.

3.9 .PUMP MOTOR

We simply place the RFID card near the RFID scanner whenever we wish to fill the tank from the petrol dispenser. The microcontroller then reads the information from the RFID reader and executes the action based on the needs of the customer. The pump motor, on the other hand, is an electrical induction device that transfers electrical power into mechanical strength.

3.10 .LED

LED is an abbreviation for light emitting diode. LED lighting products provide light up to 90% more efficiently than incandescent light bulbs. How do they make their paintings? An electrical current passes across a microchip, illuminating the small light resources known as LEDs, and the end result is visible light. The semiconductor fabric is first created in a high-stress, high-temperature chamber where components (gallium, arsenic, and phosphor) are purified, combined, and melted into a focused solution.

IMPLIMENTATION

Every customer will be given a PF-card known as a petrol fuelling card, which he or she must swipe at the petrol filling stations as they enter. A PF-card reader will be installed at the fuelling factor to allow customers to view initializations through LCD and GSM units. If all of the stages appear to be followed correctly, the consumer will be able to perceive that the machine is in operation mode. Even the device displays a message on the LCD that says "Sorry. "Please Move Next" appears on the LCD panel. The customer is then ready to swipe the PF-card. Now the customer may be asked to provide his Picard password. The password pass examination will now be completed right here; if he/she enters the incorrect password, a notification stating "WRONG PASSWORD" will be displayed on the LCD. The customer must then re-enter the correct password that he possesses; if the password entered is accurate, the device will go to the next step, and the LCD will display the message "ENTER THE LITRES IN NUMBER". After entering the precise numbers/digits, the PF-card amount stability may be examined to see if the card has enough money to cover a wide range of litres. They are opting for petrol to be pumped and the quantity to be debited from the cardboard, which might be paid based on current petrol costs. The client will then be aware of how much balance he/she has after fuelling, which will be displayed on the LCD display screen and sent as a message to the customer's registered cell number through GSM. After delivering the message to the buyer, the motor pump starts and begins to develop to petrol the automobile via the pipe or gun connected to the pump. As the motor reaches the number of litres entered by the buyer, the pump that is linked to the motor automatically receives off, and the petrol/diesel flows through the pipe. When the stability of the PF-card is low or does not reach the acceptable quantity that was entered for the variety of litres, the LCD displays the message "LOW BALANCE, PLEASE RECHARGE CARD," and it also sends a message to a cell phone, since we use GSM technology. When a consumer recharges his card, he receives a notice on his phone stating his "RECHARGE IS SUCCESSFUL." This device also has volume functions such as a smoke sensor, a level sensor, and a buzzer alarm. As it detects smoke, this smoke sensor will assist us in locating any hearth activities or mishaps. If there is any smoke, this smoke sensor will sound the buzzer and send a message to the provider centre saying "SMOKE IS DETECTED." In this project, we used an ARM-7 controller, 2*sixteen LCDs, a keypad, and an RFID reader.

CONCLUSION

This article is intended for security systems that are only accessible to trusted authorities. A microprocessor is used to build a smart card reader/writer within the petrol pump. At the petrol station, the driver exchanges the card, and the smart card reader reads the amount on the card and displays it on the LCD. When an RFID tag is placed in front of an RFID reader, the reader reads the card and calculates the amount of money on the card. If there are enough funds on the card, the petrol will be filled based on the number of taps. For example, one litter of petrol will be spilt if we tap the fuel dispenser once, and two litters of petrol will be poured if we

press twice**.** You will receive an SMS with the total money deducted and the number of litters consumed. Our electrical system was faultless. All of the functions in our plan could be carried out. Connecting the microcontroller to the hardware components was the most difficult portion of this project. We feel that this electronic system is highly marketable because it is simple to use, inexpensive due to minimal power consumption, and exceedingly dependable. This project has the potential to establish a secure system. Filling up automobiles with petrol at petrol stations using a Smart Card-based Accessing System. RFID devices dispense the exact amount of fuel requested by the user. The efficiency is maintained in this manner. Furthermore, because everything is automated, labour strain is decreased. Furthermore, because only authorised users can enter and exit the system, this system is more secure than current ones. To improve the efficiency of this system, higher-quality RFID cards must be manufactured. As a result, our project's design and simulation phases are accomplished in the first phase. In the second phase, we want to work on our project's hardware design and put what we've talked about thus far into action.

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