RFID BASED PREPAID CARD FOR PETROL STATION USING WEB SERVER

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Abstract - *This paper explains the system which is capable of automatically deducing the dispensed amount of petrol from user prepaid card (i.e., RFID card) and that deduced amount information and remaining balance of the card is send to the costumers phone using GSM technology and even that deduced amount information is send to the web server using Wi-Fi technology. Here, we are maintaining each costumers petrol dispensed information on the web server which connects all the petrol stations across the country.*

Key Words: **Arduino Mega 2560 Microcontroller, Fuel Dispensing System, GSM Module, Level Sensor, RFID Based Prepaid system, Web Server and Wi-Fi Module.**

1. INTRODUCTION

Now a day everything has been digitized. For example online banking, cash management, tax filling and computerized petrol pump. Considering the computerized petrol pump, a lot of work has been already done in this field. That is some petrol companies provide the smart cards to the customers to access the petrol at the petrol station of their company. But in our system we are using RFID card to access petrol at different petrol stations of different companies petrol across the country and here, we are connecting all these petrol stations using single web server and this web server access is secured by a password which is known only to the petrol companies. On this web server we are maintaining the information of the customers (like petrol dispensed amount and available balance of the card). And even that information is send to the customer mobile phone using GSM module. Here we are providing RFID card to each customer with which customer can access petrol at the petrol stations. Before using this card we have to recharge it like a prepaid card. Whenever we want to fill the tank just we have to place the RFID card near the RFID reader. Then microcontroller reads the data from the RFID reader and performs the action according to the customer. This system also provides the security for the customers for petrol filling at the Petrol stations by avoiding the involvement of human beings, so to avoid the risk of carrying money every time.

2. RELATED WORK

1.1 G.Janani [1]

G.Janani proposed a "Petrol Bunk Automation with Prepaid Card using GSM Identification" system which uses a PIC microcontroller, GSM and RFID technology. This system provides the consumers to know, how much amount of petrol has been filled. It also provides accuracy, saves consumers valuable time and avoids misconceptions and arguments with works at the petrol bunk.

1.2 Priyanka.A.Gaikwad [2]

Priyanka.A.Gaikwad proposed "Automation in Petrol Bunk using RFID and GSM technology" Which uses an Arduino Uno controller, GSM and RFID technology. This system increases the fueling process and it prevents unauthorized fueling by providing RFID card to the customers and it is rechargeable. Here, system equipped with a RFID card reader which reads the available amount in the card.

1.2 Wavekar.Asrar.A [3]

Wavekar.Asrar.A proposed a "RFID Based Automated Petrol Pump" which is capable of automatically deducing the cost of petrol dispensed from user RFID card. This system uses AT89C52 microcontroller and it uses a unique dispensing system which operates with prepaid card using RFID technology. This is unmanned power pump which requires less time to operate and it can be installed anywhere. Here, customer himself can fill the petrol by using RFID card and petrol dispensed amount is automatically deduced from the user RFID card.

HARDWARE REQUIREMENTS

- Arduino Mega 2560 microcontroller.

- Passive RFID card and EM-18 RFID reader.

- Piezo buzzer.

- 4x4 Keypad.

- Liquid crystal display (LCD).

- Fuel dispensing system (consists of SPDT relay switch and pump motor).

- Level sensor (i.e., FC-28 soil moisture sensor).

- SIM 800 GSM module.

- NodeMCU ESP8255 Wi-Fi module.

3. SOFTWARE REQUIREMENTS

- Arduino IDE.
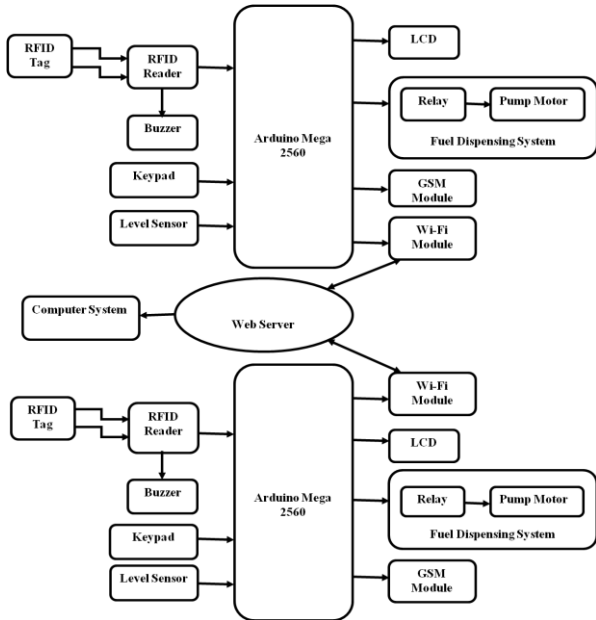
4. PROPOSED DESIGN

Fig -1: Block Diagram

When RFID card or tag comes in the range of RFID reader, the RFID reader reads the ID number of the RFID card and sends to the Arduino Mega 2560 microcontroller. Where we are already stored the ID numbers of the RFID cards in the microcontroller. The microcontroller verifies whether this RFID card is authorized or not. If RFID card is authorized than microcontroller displays RFID card is authorized on the LCD screen, otherwise it displays RFID card is unauthorized and initiates the buzzer.

If RFID card is authorized than microcontroller gives the access to the customer to enter the amount of the petrol using keypad and it is displayed on the LCD screen. Then microcontroller checks whether the available balance of the RFID card is more than the entered amount. If it is more than microcontroller turns ON the pump motor through relay switch for a particular time period and then pump motor automatically turns OFF. After completion of petrol filling process, the information of the petrol dispensed amount and remaining balance of the RFID card is send to the costumer mobile phone using GSM module (i.e., SIM800) and also sends to the web server using Wi-Fi module (i.e., NodeMCU ESP8266). In web server we are maintaining the petrol dispensed amount of the costumers and this web server access is secured by a password and that password is only known to the petrol companies.

Suppose if available balance is less than the entered amount than microcontroller tells the customer to recharge the RFID card. Here, RFID card works as a prepaid card and it is recharged at the petrol station itself. Also here, we are

using Level sensor to sense the level of the fuel in the tank and the buzzer is activated, if the fuel level is low.
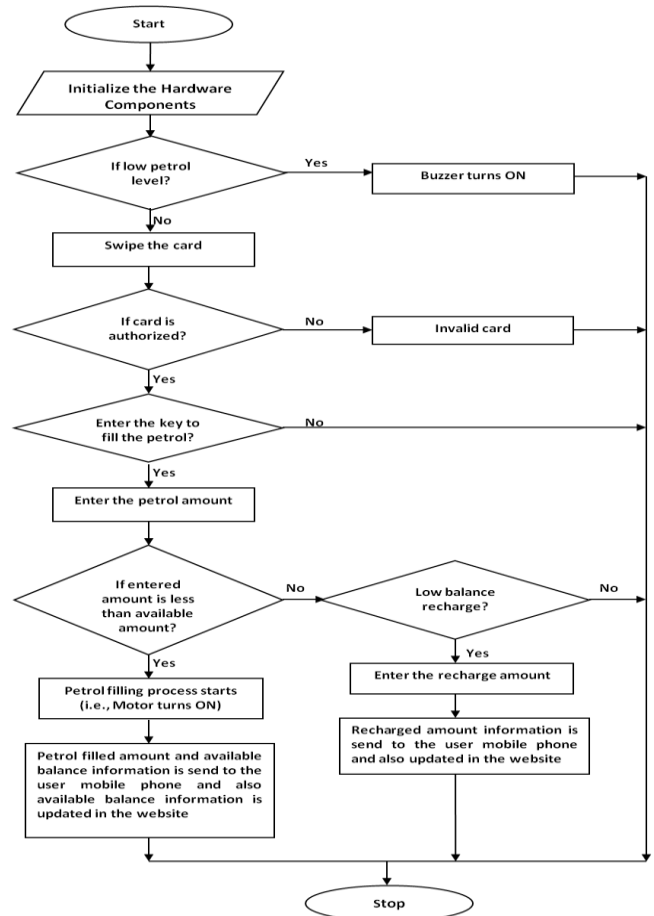
5. SYSTEM FLOW CHART

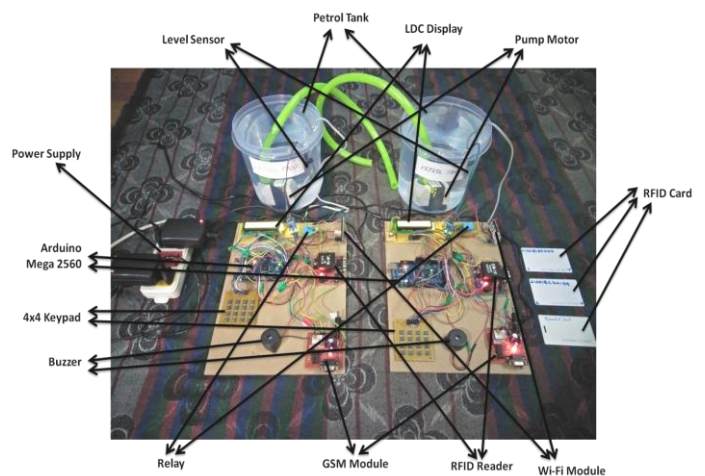**Fig -2**: System flow chart

6. EXPERIMENTAL SETUP

Fig -3: Experimental Setup

7. RESULTS

The result of the complete system is given below with step by step process:

Step 1: Turn ON the power supply. The controller first checks the petrol level in the tank, if petrol level is low than buzzer is initiated and display Low petrol level on the LCD. Otherwise buzzer is OFF as shown in figure 4.

Fig -4: Low petrol level in the tank

Step 2: Swipe the RFID card as shown in figure 5.

Fig -5: Swipe the RFID card

Step 3: If RFID card is authorized, then controller fetches the user available amount data from the website as shown in figure 6 and display on the LCD as shown in figure 7. Otherwise it display Invalid card as shown in figure 9.

Fig -6: Controller fetching the user available amount data from the website

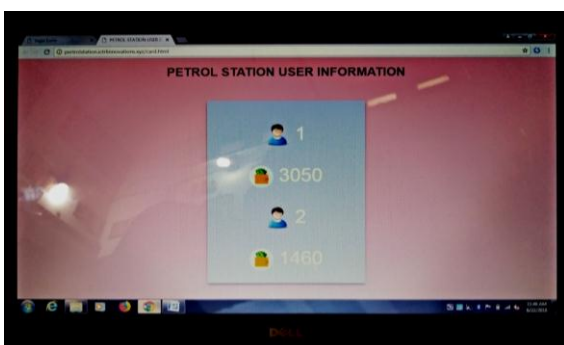**Fig -7:** After fetching the data, user available amount is displayed on LCD

Fig -8: User available amount data in the Website

Fig -9: Invalid RFID Card

Step 4: The controller ask the user to press the key to fill the petrol or to cancel the action as shown in figure 10.

Fig -10: Controller asking the user to press the key to fill the petrol or to cancel the action

Step 5: If user press the key to fill the petrol, then controller ask the user to enter the amount of the petrol as shown in figure 11.

Fig -11: Controller asking the user to enter the amount of the petrol

Step 6: If entered amount is less than the available amount, then petrol filling process starts (i.e., Motor turns ON) as shown in figure 12. Otherwise controller say to recharge as shown in figure 13 and if user press the recharge button then controller ask the user to enter the rechargeable amount as shown in figure 14.

Fig -12: Petrol filling process started

Fig -13: If entered amount is more than the available amount, then controller tells user to recharge

Fig -14: If recharge button is pressed, then controller ask the user to enter the recharge amount

Step 7: After filling the petrol, the petrol filled amount and available balance information is send to the user mobile phone as shown in figure 15. And available balance is updated in the website as shown in figure 16.

Fig -15: Petrol filled amount and available balance information is send to the user mobile phone
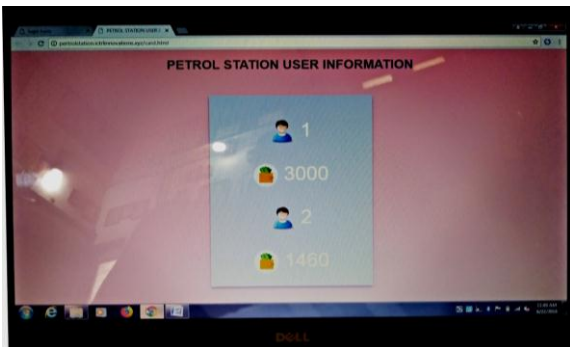

Fig -16: Available balance of the user is updated in the website

If amount is recharged, then that recharged amount information is send to the user mobile phone as shown in figure 17 and also updated in the website as shown in figure 18.

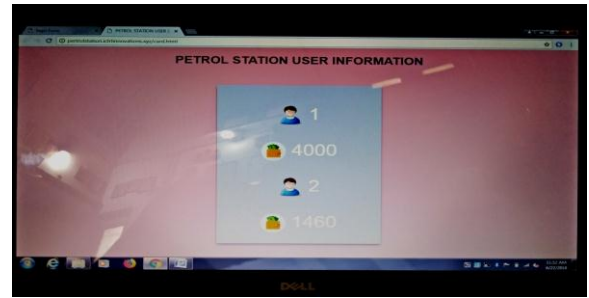**Fig -17:** Recharged amount information is send to the user mobile phone

Fig -18: Recharged amount of the user is updated in the website

8.   ADVANTAGES

1. Man power is reduced due to automated self-service.

2. Due to use of RFID technology robbery of the fuel is prevented.

3. Accuracy in the amount of petrol filling.

4. Benefit to the petrol companies by maintaining the data of the costumers as well as the petrol consumption.

9.   CONCLUSION

This system connects all the petrol stations of different companies on a single Web server and this web server access is protected by a password and this password is only known to the petrol companies. On this web server we are maintaining the dispensed petrol information and available balance of the costumers. And even this information is send to the costumer's mobile phone.

This system provides the feature of prepaid card recharge facility and it also provides the authority to costumers to access the petrol in all the petrol stations across the country through a single RFID card. Another importance of this system is to give the security to the costumers instead of carrying the money every time.

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