IOT based automatic fuel pump system Using RFID Technology

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Abstract : The world is moving towards the digitalization and in petrol pump there is still human to human interaction. Our aim is to reduce laborer work and malicious activities happen in petrol pump and automated digitalized mechanism. In our system, we are using RFID card because RFID is a versatile technology which is use in many real time application. RFID 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. 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.

IndexTerms **– RFID, ESP-32, LCD.**

I. 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. Now-a-days the usage of vehicles is increasing day-by-day. The dispensing of fuel to fill all these vehicles at fuel stations leads to a lot of complications. The vehicle driver has to pay cash for this fuel. Sometimes they have to pay more amounts due to lack of small charges. This RFID based petrol pumps can reduce the manpower. These are less time- consuming, require low maintenance cost and should be more reliable. They are easy to operate. We can also prevent misuse of the fuel.

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)

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.

II. LITERATURE SURVEY

1. RFID Based Automated Petrol Pump System, 2020 International Journal of Advanced Research in Computer and Communication Engineering (IJARCCE): In this paper, authors have designed and developed security systems whose access is only for respected authorities. Using a microcontroller, the petrol pump is equipped with a smart card reader/write. At the Petrol Pump, the driver swaps the card and the smart card reader reads the amount in the card and will display it on the LCD. The driver then enters the quantity of petrol that has to be filled using a keypad. The corresponding amount is calculated & deducted from his petro card. The electrical pump is then turned ON according to the entered amount, fills the tank and automatically turns OFF. The practical implementation of the system is done by oil products distribution company, Baghdad at its fuel pump. This technology can be enhanced to implement the same system for milk processing industries while distributing the milk and its products to the market. In day to day life we can see that water distribution in summer is also one of the problems in front of India. So, it is possible to keep control on water distribution in particular area..

2. Computerized Filling Station Management System, 2016 Second International Conference on Science Technology Engineering and Management (ICONSTEM): In this paper, authors have In this project, authors surveyed on RFID technology and advanced cryptographic techniques. In order to maintain the advantage over the existing system the proposed scheme involves ULK kit environment. The overall process in automated filling station consist of the RFID reader placed at the filling station entrance, the gate is opened only when the detected tag id by the RFID reader is valid. The complete filling station is made of ULK kit environment and once the user enters into filling station, he enters the necessary details and confirms for transaction of money using his pin number. Once the pin number is valid the transaction occurs, else alarm sounds if the user provides wrong pin for more than 4tims. A message of amount of fuel obtained by the user, amount debited from the customer's account and there in which the user fills the fuel will be sent to user's registered mobile number using GSM technology for confirmation. All the user's id details and amount credited to filling station account and amount of fuel dispensed will be added to the filling station owner's database.

3. RFID BASED PREPAID CARD FOR PETROL STATION USING WEB SERVER, International Research Journal of Engineering and Technology (IRJET): 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 customers 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.

4. Multipurpose Self -Fuel Dispensing Automated Framework Utilizing RFID Prepaid Cards, 2020 International Research Journal of Engineering and Technology (IRJET): The main aim of the project is to design a system which is capable of automatically deducting the amount of petrol dispensed from user card based on RFID technology. Liquid dispensing systems are quite commonly found in our daily life in different places like offices, Bus stands, Railway stations, Petrol pumps. Here we are going to present modern era petrol dispensing +system which is meant to be operated with prepaid card using RFID technology. The project mainly aims in designing a prepaid card for petrol bunk system and also petrol dispensing system using RFID technology.

5. RFID BASED SELF-SERVICE PETROL STATION, Journal of Emerging Technologies and Innovative Research (JETIR): The main aim of the project is to design an automatic fuel dispensing system using smart cards, which is based on RFID technology. In our daily life we came across with manually operated petrol pumps are preoccupying more time, requires more maintainable cost with lack of consumer facilities. To sort out all these problems we are designing a project which is entitled as RFID based self-service petrol station. In this project authors have introduced a modern technique, which doesn't need man power to maintain petrol bunks. Here we are using smart cards to dispense the fuel automatically. They are also using a fuel level indicator. It indicates the level of petrol in the tank. We are also using fire alarm and smoke sensor.

III. PROPOSED METHODOLOGY

A. Block Diagram :

As shown in the figure 1 below, ESP-32 microcontroller is used. It has in-built ESP8266 Wi-Fi module using which we can directly connect Wi-Fi or internet to the project. The whole system will be operated on 5V DC which will be fed from solar panel. Relay will operate as per customer's requirement to charge fill the fuel in the fuel tank of the vehicle.

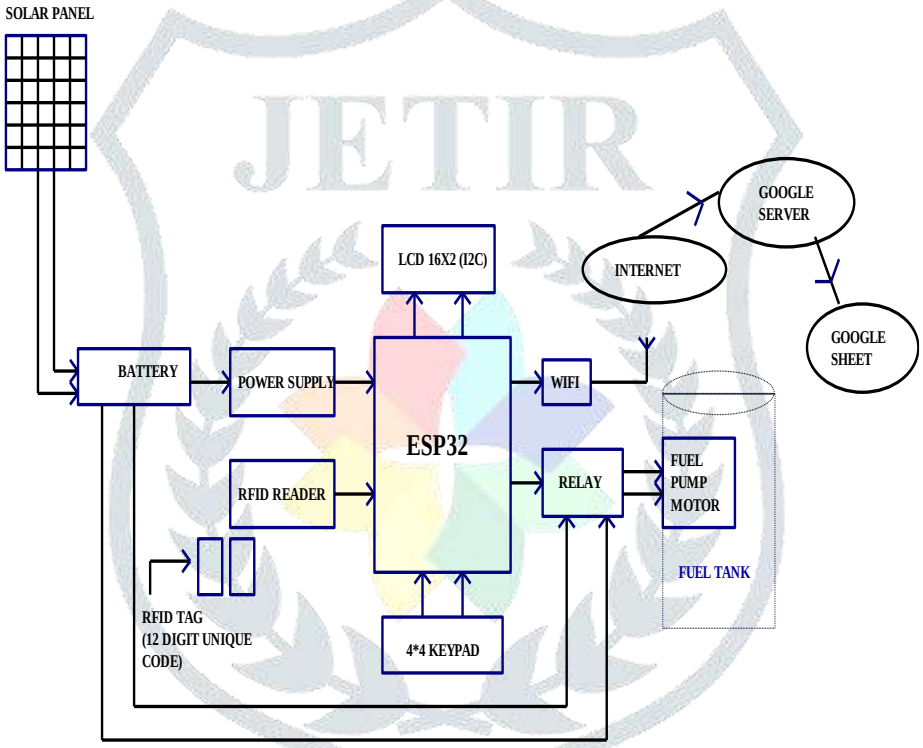

Fig.1. Block Diagram

B. Methodology:

The prototype of Fuel station is proposed such that it uses the renewable energy (Solar Energy). With the help of Solar panel, energy will be stored into the battery.

Here we are providing RFID card to each customer with which customer can access petrol at the charging stations. Before using this card, we have to recharge it like a prepaid card. Whenever we want to fuel the vehicle, just we have to enter required amount and 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 fueling the vehicle by avoiding the involvement of human beings, so to avoid the risk of carrying money every time and fuel the vehicle tank whenever required. All the data is display on LCD and saved in Google sheet according to the customer name, date and amount.

C. Hardware requirements:

1) ESP – 32
2) Solar Panel
3) Battery
4) RFID Reader
5) RFID Tags
6) LCD
7) Relay

D. Software requiremenets:

1) Proteus – For simulation of power supply.
2) OrCAD – For block diagram drawing

3) Arduino IDE- For programming in ESP-32.
4) Altium- for circuit diagram and PCB making.

IV. RESULTS AND DISCUSSIONS

A. Software side:

Proteus design Suite by Lab enter Electronics, leading EDA software including schematic capture, advanced simulation, PCB auto routing, MCAD integration. Power supply design is prepared in Proteus and various signals are captured prior to actual system development. As our project requires 5V DC supply, we have designed power simulation for the same. This can be done very effectively using Proteus. Following Figure 2 and Figure 3 shows the simulation done and running simulation as well.

Fig.2.Power Supply Simulation (Before Running)

Fig.3. Power Simulation (After Running)

In figure 3 shows that the full wave rectification can be obtained a pulsating DC average value is shown on the voltmeter. The reservoir capacitor gives the smoothing effect to the waveforms.

B. Hardware side:

(1) Hardware model :

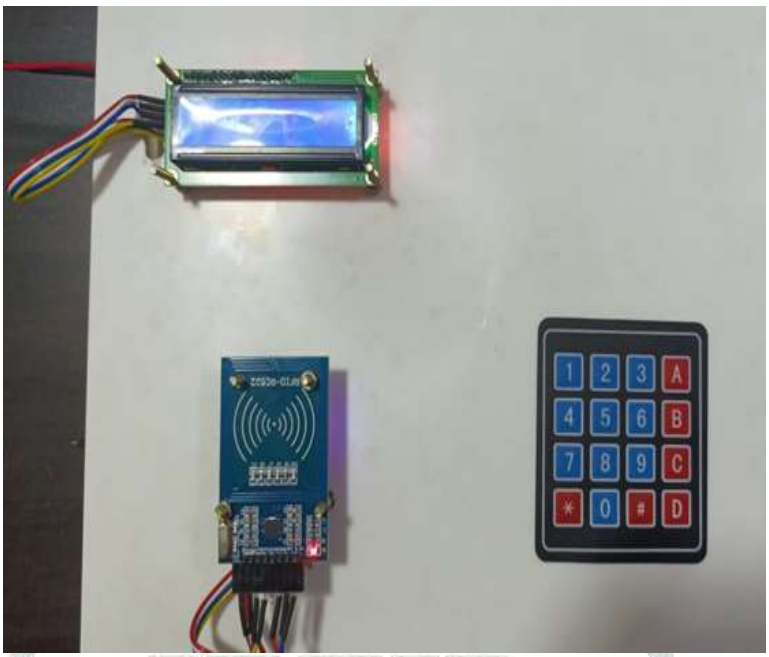

Fig.4. Hardware Model

(2) RFID Processing: In figure 5 shows the whole processing of RFID, from pin entering to updating google sheet process.

Fig.5. RFID Processing

(3) Google Sheet: Lastly, google sheet automatically will update with respective to its date, time, customer name, amount and total balance.

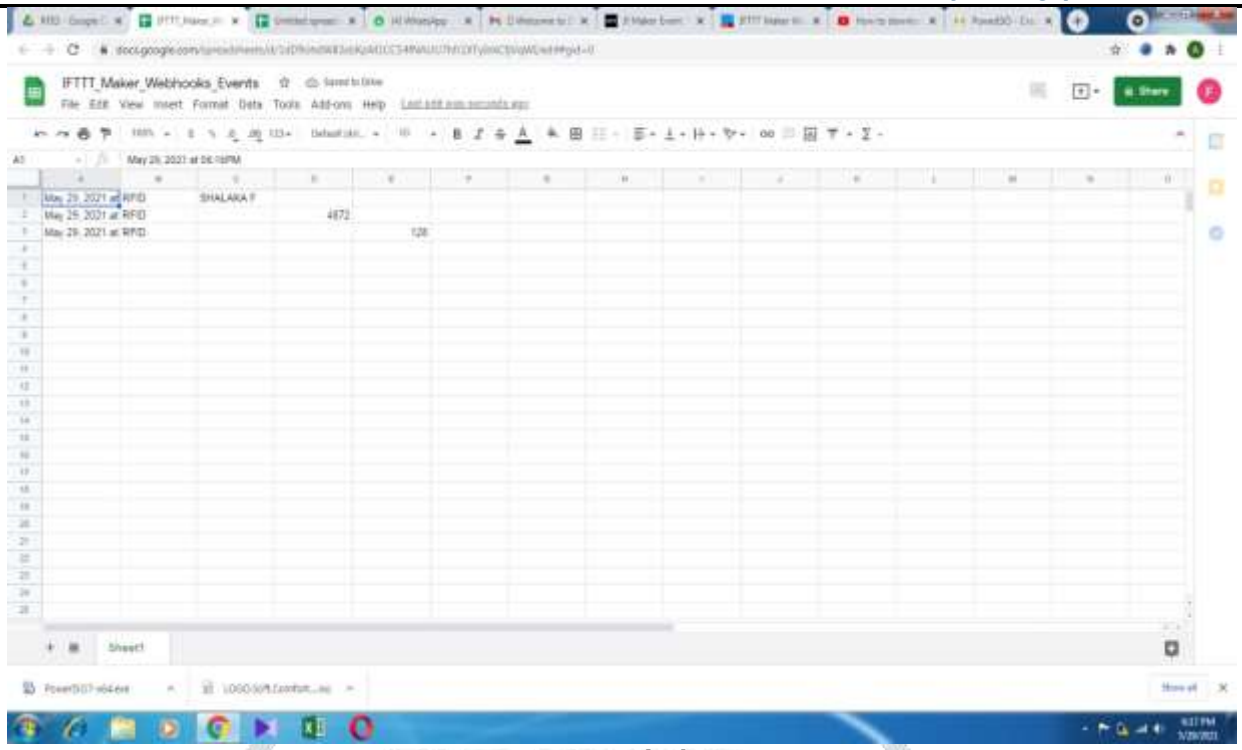

Fig.6. Google sheet

V. CONCLUSION

The prototype of fuel station with renewable energy source is successfully implemented. The project shows how we can have the accounting facility for fuel station with Google sheets. The usage of microcontroller with RFID module helps the accounting process for smoother operation. The take away part of the project is microcontroller programming, power supply design and the PCB design. Hence using the regular components, the prototype of fuel station is implemented through this project.

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