Smart e-petrol bunk

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***Abstract*— The current energy stations are driven substantially. This energy pumps are monotonous and bear further force. Erecting fuel station at distant area is expensive, to give excellent installation to the consumers. In the current script, the process of petrol filling is a bit lengthy, consumes time, costly and less secure. To overcome this, we propose an automated petrol pump system for isolated regions. There's no demand for manpower for petrol distribution on this intelligent energy pump. Our petrol pump works with the IOT connectivity, that the head will regulate the energy pump station. Once consumer requires to load gasoline, originally, he checks for pricing online in our designed gate. Also, he'll elect the near stations and pays the petrol amount. He must enter the OTP sent by SMS into the pump's panel. After that pump motor starts to pump fuel. Several components was used in our proposed system.**

Keywords— RFID, Internet of Things (IoT), Smart energy bunk.

I. INTRODUCTION

We seek to transform conventional energy stations using RFID and system robotization technology[1]. The fuel dispensing unit, the output unit and the input unit are controlled by the Arduino Mega 2560Microcontroller. The pump is controlled by the microcontroller unit to run for an exact period, but we still need a worker to collect the measured amount. Ourtechnology is totally computerized, thus maintaining the pump won't require any force. Ease of sale, translucency and safety are guaranteed. Our end is to lower the force and improve the current energy pumps to upgraded version using technology. The RFID card issued to the guests, aids them in allocating the fuel with the automated system for refueling[2]. For convenience of use, the system operator commerce is straightforward. The output unit shows the numbers entered via the keypad, assisting the user in verifying his inputs[3]. The technology is coded to determine theexact volume of petroleum for the quantity entered automatically and to run the pump for the appropriate interval, reducing energy station fraud. The Raspberry Pi module is used as the controller unit in the next generation energy bunk operation for tone- operation, which coordinates with an RFID tag, anelectric motor, a monitor, and a wireless network modem[4]. It can extend multitudinous advantages to consumers. Our proposed system has notable aspects including automatic fuel transmission into the tank without mortal hindrance. It also advances us to the installation to renew the RFID card on the spot. Our system's ability to limit homicide intervention and stopthe unlawful sale of petrol is one of its main benefits[5]. Raspberry Pi module operates as the central regulator unit. The payment is deducted from the RFID card after the sale is complete, and the remaining balance is shown on the screen.

II. PROPOSED SYSTEM

Our system uses affordable RF element, the crucial factor that helps bring reduction and work effectiveness, sans any loss. The exploration proves that RF element gives substantial benefit on operation of liquid natural resources[6]. It provides an effective and efficient system for covering liquid storehouse systems. The conventional energy stations consume time and needs force. Erecting energy stations in all areas, is expensive to give excellent installation to the end users[7]. Robotized energy pump requires lower time and is effective as the client can self-avail the service after the payment is done. The security and automation of fuel distribution is done by microcontroller and GSM technology. It includes a mobile system that is simple to use and a graphical user interface. (GUI). It connects to a rapid gasoline dispenser that the user may access and control. In our method, the user will be given a word to type on the display that the energy station will hand them, aiding the oil corporation in producing user authentication andpreventing the distribution of fuel until

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the word is validated by the database. In brief, we give a safesystem for energy distribution. The improvement of this design can help assiduity financially keywords GSM, LCD, GUI, automation. In our system, a main server has the database of the clients like Name of the client, Card Number, Amount paid, the fuel balance will be subtracted from the card after the petrol purchase.

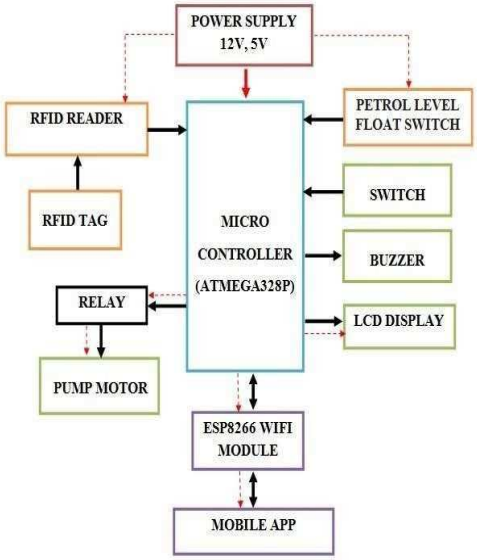


Fig. 1. Block Diagram of Smart E-Petrol System

This block diagram explains the important components of this smart e-Petrol system.

A. Circuit Diagram

The Arduino UNO includes software for interfacing with a computer, other Arduinos. Atmega16U2 acts as a virtual com port for computer programs and routes serial communication over USB. The standard USB COM drivers are used by the 16U2 firmware.

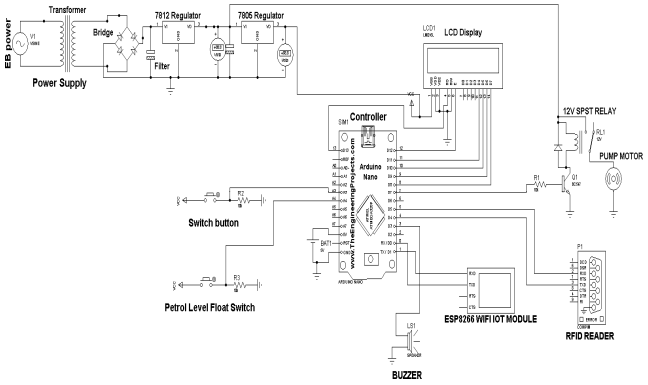


Fig. 2 Circuit Diagram of Proposed System

It incorporates sequential examiner that acknowledges elementary methodology to transmit and receive the data via USB. The circuit illustration of the model is shown in Fig. 2.

III. COMPONENTS OF PROPOSED SYSTEM

A. Voltage Regulators (7805, 7809, 7812)

Voltage regulators execute analogous functions in large-major power-supply methods. They minimize variations in voltage to cover the outfit.

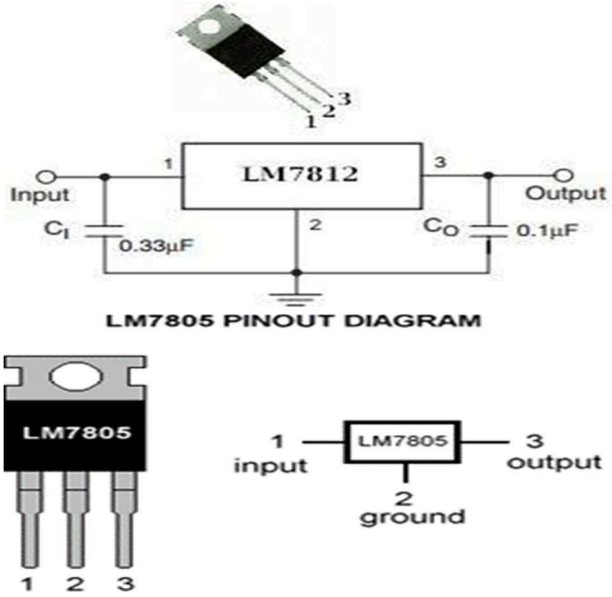


Fig. 3 Pin out diagram of an LM7805, LM7812 regulator

In our system used the induction regulators for controlling purposes. Then we've used three kinds of voltage regulators of lm78XX series videlicet,7809 and 7812.

In power- supply systems the regulators are moreover in substations or on confluent path. Two types of controllers are step regulators, that switches regulate the current force. The pin diagram of the regulator is shown in Fig.3.

B. RFID READER EM18

The RFID reader consists of RFID Tag and Reader. A tag is used to store information about the items, and it's passed to the Reader. The details of the RFID Tag and Reader are discussed below.

1. RFID TAG

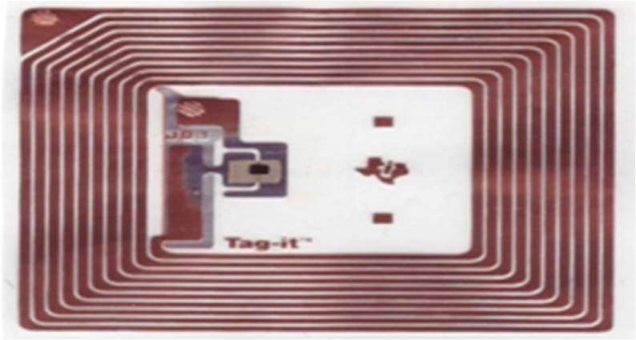


Fig. 4. RFID Tag Inside

The RFID tag incorporates microchip with radio antenna placed on substrate which carries 12 Byte exclusive Recognition number. The internal and external view of RFID card is shown below.

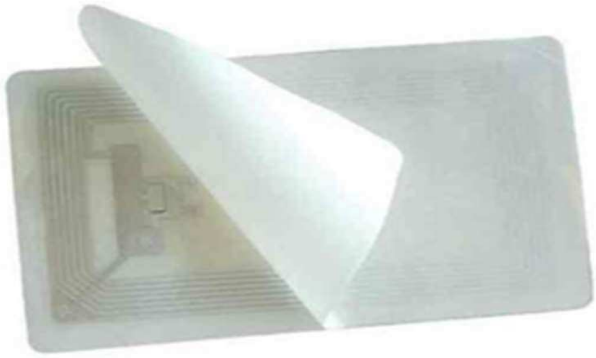


Fig. 5. RFID Tag

2. RFID READER:

We use RFID tag to read exclusive IDs. When RFID tag reaches the RFID reader's range, it displays exclusive ID and serially communicates with microcontroller or PC. A transmitter and antenna are placed to the RFID reader.It is in a fixed location.

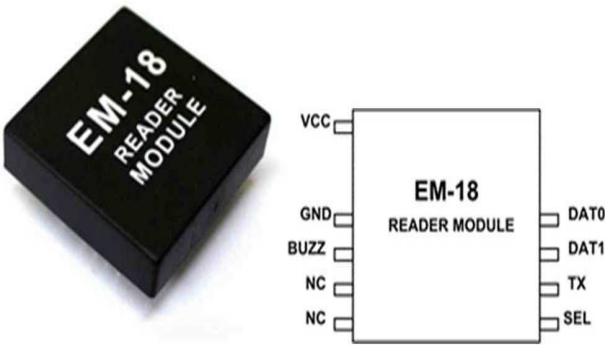


Fig. 6. EM18 RFID Reader Module

The EM18 RFID reader reads tags of frequency of 125 kHz which is represented in above Fig.6. Further, it serially transfers exclusive ID to personal computer on the appropriate ports. The EM18 RFID reader displays data from RFID tags that stores ID of 12 bytes.

The EM18 RFID reader does not need direct sight path. It contains a short recognition limit, which is measured in centimeters. When we move the RFID tag close to the reader, it displays the data from the tag and immediately transfers a 12-byte exclusive ID through serial port.

2.1 ACTIVE RFID SYSTEM

Active RFID tags own transmitter and energy. It typically exhibits an interpreted limit up to MHz.

2.2 PASSIVE RFID SYSTEM

Passive RFID tag lacks source instead energy signals from the RFID reader antenna. It has limited read range to 1m and operate in both low (125 KHz) and high frequency (13 MHz) ranges.

Inductive coupling occurs when an RFID reader produces magnetic field and RFID tag traverses the magnetic field, and responds from the RFID tags identified by the RFID reader. It is utilized for short-distance applications since the magnetic field declines significantly with distance.

Capacitive coupling, in which the reader releases electromagnetic waves and when those waves collide with RFID tags, the RFID tag reflects a signal holding ID information. The ESP8266 Module is shown below.

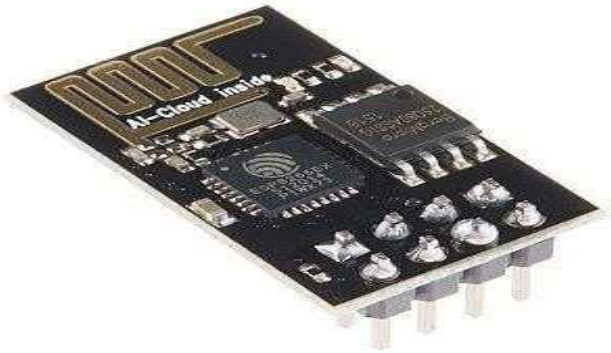


Fig. 7 ESP8266 Module

The ESP8266 component operates at 3.3V. The Arduino Uno supplies 5V then it won't operate well and cause damage. It never responds when linked directly to the Arduino. So, a voltage dividerthat converts the 5V into 3.3V is done. It is achievedby placing three resistors in series. This module shown in Fig.7. The TX & RX pinof the ESP8266 is linked to pin 9 & 10 of Arduino via resistors. We require 2.4 Giga Hertz Wi-Fi along with input-output ports used in general, Analog to Digital converter, Communication ports, etc.

IV. METHODOLOGY

The methodology of this smart e-petrol system has discussed in this chapter. The petrol is filled based on the information sensed by the RFID. Then the relay turns on the dispenser. Information such as the amount of petrol filled and the balance amount inthe card is displayed after it is recharged. The card is inserted to the card reader, the Sensor output level is notified if the RFIDis valid.

Fig.8. represents the flowchart of proposed system.

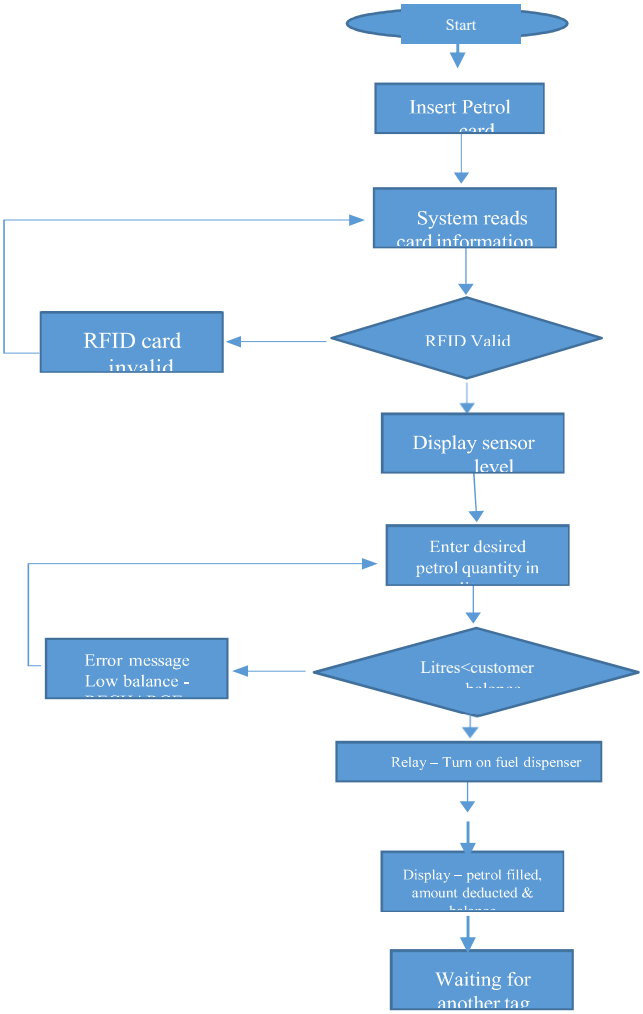


Fig.8 Methodology of Proposed System

This system is upgraded from the regular fuel working system. Enter the quantity of petrol. The system checks the value entered and if the value of petrol is less than the card balance, it will provide you with the petrol or else the system will give as the information about recharge.

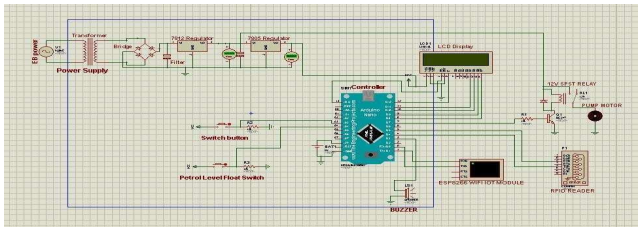


Fig. 9 Simulation of proposed system

Once the fuel is filled, the system turns off the fuel dispenser and displaysthe quantity of fuel filled, amount (Rs.) of fuel, the balance in your card is shown in LCD. Finally, the system is waiting for other Tag.

V. RESULTS AND DISCUSSION

Proteus Professional is user-accessible software used in automated model. It is utilized by programmed design engineers, professionals to develop illustrations and layouts for industrial PCB and shown below.

The simulation model is shown in Fig.6 which uses a petrol- level float switch, pump motor, buzzer, RFID reader, LCD display and Arduino UNO controller. The controller will give the signal to pump motor once the process verification is completed. The quantity of fuel which present in pump station is displayed by receiving the signal from the petrol level float switch through controller.

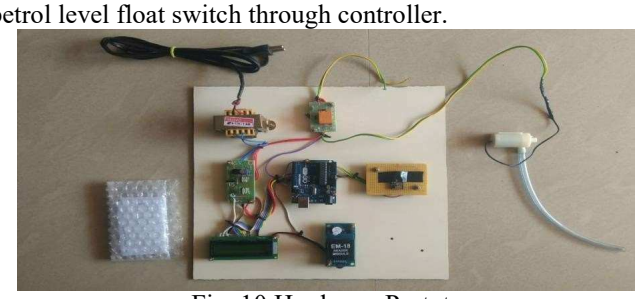


Fig. 10 Hardware Prototype

The hardware circuit is shown in Fig. 10. The flow meter is used to gauge the level of fuel intake. The amount of fuel going in a pipeline/time(unit) is measured in a volumetric manner. So that, it is easy to measure exactly the amount of fuel flowing out of the pump and the fuel flowing out of the nozzle. It includes the sensor and microcontroller to do the process. The proposed system consists of RFID Tag and Reader, sensors, relays, pump motor, and a controller. This controller as like as our ATM card. To control the speed of the pump, piston-based pumps are preferred in order to reach the dynamics fuel displacement system with fuel pressure regulator is also used. The gear-type pumps are used in stable fuel displacement.

The results of the proposed system are displayed and the data oncustomers and petrol consumption is stored in Blynk an IOT platform. The output results are shown as Manimithra has pumped 10 Litre petrol with the cost o Rs.920. Once the process is completed the system waits for another response to scan the new Tag. If the consumer missed the RFID, they can block the card.

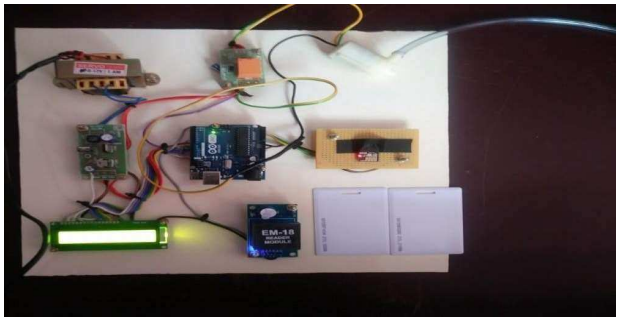


Fig. 11 Execution Output

The output is shown in Fig. 11 after the execution is done.



Fig. 12 Blynk Output

The above-mentioned Fig.12 shows the Blynk output of the proposed system.

VI. CONCLUSION

The advantage of our product is accessible easily by the consumers. Since it is accessible through smartphones, it eases the consumers work. RFID technology ensures security and provides user with unique evidence of identity. This system's maintenance is easy. This application reduces time and effort than traditional energy stations. The primary objective of our model is renew regular petrol pump by lowering labor and to enable smart payment. It is an understandable linguistic to fulfil the operator's needs. Towards the upgradation to smart payments fraudulent in fuel stations is minimized. Potential advancements can be installing the system with a bill copier, density checker, and touchscreen display to give a smart user interface.

REFERENCES

[1] Gjanani , Petrol Bunk Automation with Prepaid Card using GSM Identification Volume 06 Issue 02, February 2018 ISSN: 232(URASET) 9653.M. Young. The Technical Writer's Handbook. Mill Valley, CA- University Science, 1989.

[2] Krishnasamy, R., Aathi, R., Jayapalan, B., Karthikeyen, K., & Nowfal, M. (2019). Automatic fuel monitoring system. Int. J. Recent Technol. Eng, 8, 348-352.

[3] Tamilarasu, P., Kumaresan, V., Gunasekar, T., Logeswaran, T., & Suresh, M. (2019). Design of an Automated Smart Vehicle Fueling System. International Journal of Recent Technology and Engineering (IJRTE), ISSN, 2277-3878 .

[4] Sheth, S., Patel, K. H., & Patel, H. (2016). Design of automatic fuel filling system using a mechatronics approach. In CAD/CAM, Robotics and Factories of the Future: Proceedings of the 28th International Conference on CARs & FoF 2016 (pp. 785-795). Springer India.

[5] Ali, B. A., Mihalca, V. O., & Cătălin, Ț. R. (2018). Automatic fuel tank monitoring, tracking & theft detection system. In MATEC Web of Conferences (Vol. 184, p. 02011). EDP Sciences.

[6] Tandon, A., Jharwal, T., Sharma, V., Sharma, V., & Sharma, Y. K. RFID Based Automation Of Petrol Pump.

[7] Rao, S. S., & Prasad, V. S. (2017, June). Centralized automation of petrol bunk management and safety using RFID and GSM technology. In 2017 International Conference on Intelligent Computing and Control (I2C2) (pp. 1-5). IEEE.

[8] Maithili, P., & Ramya, A. M. (2020, November). Design of automatic driving license system using of RF transmitter in two wheeler. In AIP Conference Proceedings (Vol. 2270, No. 1, p 14. AIP Publishing LLC.

[9] Bolla, D. R., Jijesh, J. J., Palle, S. S., & Penna, M. (2020, November). An IoT based smart e-fuel stations using ESP-32. In 2020 International conference on recent trends on electronics, information, communication & technology (RTEICT) (pp. 333-336). IEEE.

[10] Venugopal, C., & Thangavel, B. (2022). Automatic Vehicle Fueling System using PLC Controlled Robotic Arm. F1000Research, 11(1006), 1006.

[11] Pranitha, B. (2022). RFID Based Unmanned Petrol Pump.

[12] Naveen, B., Rashmitha, B. K., Parthasarathi, K. S., Sandhya, B. C., & Lohith, S. (2019, May). IoT based petrol bunk management for self-operation using RFID and raspberry PI. In Proceedings of the Second International Conference on Emerging Trends in Science & Technologies For Engineering Systems (ICETSE-2019).