

Embedded Security System using RFID & GSM

Kulkarni Amruta M., Taware Sachin S.

Abstract— The petroleum products are one of the valuable and rare creations of the nature. The proper use and distribution is important task to survive these products. Our system may be the first approach towards security of petroleum products distribution such as petrol, diesel, and kerosene etc. “The simple and proper use of RFID and GSM technologies can provide total security for distribution of petroleum products!” this our proposed design. Simple embedded system and direct PC interface for the system which facilitates the record keeping of the distributed fuel. Also the handy and robust VB program will help to authorized company to control the distribution of fuel whole over the region or country. In our system the control unit and tanker unit are two main parts. The two systems which may far away from each other can easily communicate with each other. The security code in RFID tag provided to the petrol pump get read by the reader and transmission of it to the control unit will helps to company to create the proper database of various petrol pumps distributed over wide area. Also the distribution of the fuel is not possible until control unit provides the proper command to the valve in tanker unit. In short the project we have developed is the basic attachment of all above devices; which will use to provide security to the fuel distribution and helps the data keeping of the distributed fuel. The advancement of the project to large scale can help financially to the industry indirectly. The main purpose of our project satisfies all the needs related to secure distribution of the industrial products.

Index Terms—AT COMMANDS, GSM, GUI, RFID, VB.

I. INTRODUCTION

Fuel is the one of the most essential thing in today's world. We can see number of petrol pumps around us. Our aim is to develop the security system for the petrol distribution tankers of Petroleum Company. The aim of the system is to open or close the tank-valve of the tanker controlling from control cabin. We will use GSM technology for this purpose.

The system will consist of two units; one unit will be placed at tanker which will monitor continuously the fuel level in the tank. The initial original fuel level and current fuel level will be displayed on LCD at front for driver's convenience. Second is the RFID assembly which will read the authentication code of the petrol pump. The amount of fuel poured at particular petrol pump and petrol pump ID will be send to central office through GSM techniques. The visual basic coding will help to control (to check authorized petrol pump, to send valve opening signal) and to keep record of all these things (total fuel delivered, current fuel level, coasting of delivered petrol.).

In short we provide total security while distributing the fuel!

A. Aim of the project

As we are stepping towards the 21st century, man is becoming very careful about security, with no exception for industries. Various petroleum industries are becoming very careful about manufacturing and distribution of their products.

New technology addresses these requirements, providing the foundation to allow cooperative interaction to be developed. Thus the Embedded security system using GSM and RFID techniques is just example of new technology which will be providing the base for security of product distribution and data keeping using electronic control.[2]

As project is PC controlled, the project will be connected to one of the PC port and some programming language (Visual Basic) in order to control the project.

The project is also wireless control so PC is connected to the Control Cabin and other module is connected to main ckt. in tanker unit.[5]

B. Purpose

The purpose of this planning is to establish the scope of the project in terms of the major functions, performance issues and technical constraints. The plan will provide an estimate of the size of the product, the effort required and the duration.

This plan will also consider the risk encountered during the project and the strategies for dealing with them. The plan will also discuss the detailed schedule of various subtasks within the project and also the resources needed to accomplish them.

C. Brief History

In starting day's the petroleum industries were distributing petrol using tankers to respective petrol pumps; which were normally manual distribution and was totally depends on man's loyalty who was doing this job. Now a day's industries are becoming very careful about these things and trying to centrally control all the production and distribution of products.

For the secure distribution of products, industries trying to develop the new advance security system to achieve their goal. However today petrol distribution system is has some disadvantages regarding with stilling of petrol, unauthorized petrol selling by distributor, mixing of impure and improper items in petrol etc.

II. THEORITICAL DETAILS AND ANALYSIS

The customer demanding the fuel from the petroleum industry will first call the industry to convey the requirement. Company will send the fuel via tanker to the petrol pump. Now, our system comes into existence in two parts, one is placed inside the tanker/vehicle and other is placed at the distributing industry itself. One unit which is placed at tanker will monitor continuously the fuel level in the tank. The initial original fuel level and current fuel level will be displayed on LCD at front for driver's convenience. The electronic valve is provided to keep the tanker opening block until it get the opening order from the microcontroller unit. The RFID assembly reads the authentication code of the petrol pump by swapping the reader over the RFID tag pasted at the petrol pump and send it to the control unit to update the database as well as to authenticate the customer who is demanding the petrol.

On the tanker unit side, the RFID system is connected to the microcontroller, level sensor and relay / electronic valve assembly; where the RFID reader will identify the authenticated user ID and send the information about level of fuel and user ID number to the Control cabin section.[7] The borrower just needs to convey the required amount of fuel to be poured to the industrial operator by any communication media.

On the other hand the control cabin consists of another GSM unit which receives the information from tanker unit and interface serially to personal computer so as to edit that data for further work of response. The further action is taken by the software like Visual basic with support of Microsoft access and predefined algorithm. The algorithm is made so as to identify the match between present identity and received code. If the received data gets perfect match with the present data then the control units will response the tanker unit via GSM message in the form *01(amount of fuel).

The interrupt to the microcontroller to activate/deactivate the control valve relay is provided by the SMS by the control cabin's GSM unit using "* 01X" topologies, where the 'X' is amount of fuel. The microcontroller first separate the "*01" and "X", and using the value 'X' it will open the valve. Here '*01' creates interrupt inside the microcontroller.[3] On receiving the interrupt from the control cabin unit, the valve takes action accordingly. The microcontroller continuously sense the fuel level using level sensor and keeps the valve open until it reaches the quantity to be delivered by decrementing the counter. Here the initial fuel level as well as the level of fuel after delivery gets display on the LCD screen. Also, the control unit updates the database by recording the time and date of delivery and whether payment is done or not! Thus our system provides total and central control on petrol distribution using simple RFID and GSM techniques.

III. BLOCK DIAGRAM

A. Tanker Unit

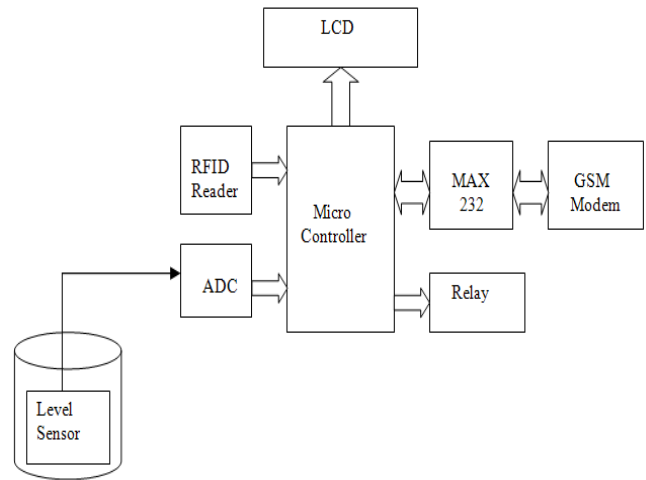


Fig.1 Block Diagram of Tanker Unit

B. Control Cabin Unit

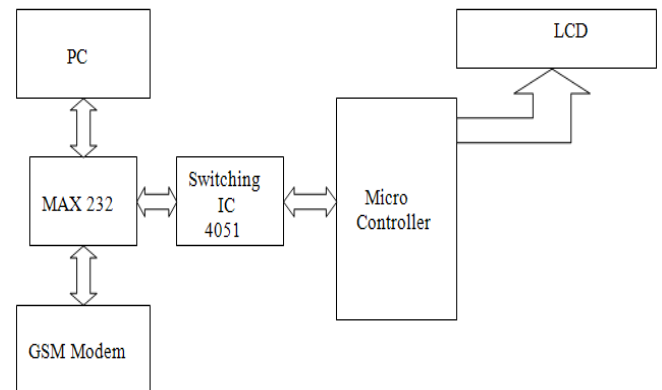


Fig.2 Block Diagram of Control Cabin Unit

IV. EXPLORING WORKING OF THE SYSTEM

For Tanker unit

- 1) Start.
- 2) Check the status of GSM modem using AT commands.[12]
- 3) If connected then go to step 6
- 4) If not connected, display message "GSM not connected!"
- 5) Again follow step 1 to 3.
- 6) Display no. of inbox message.
- 7) Check the status of level sensor.
- 8) Display level of fuel.
- 9) Check status of RFID reader.
- 10) If swap against tag, display corresponding ID.
- 11) Send the ID to central unit.
- 12) Check for response from central unit.

- 13) If response is present, go to step 15.
- 14) If response is not present, repeat step 11 to 14.
- 15) Values received in the form “*01X” (here X is numerical value.)s
- 16) Separate the received value in the form “*01” and “X”.
- 17) Open the valve relay.
- 18) Decrement the counter for X value.
- 19) If X-- = 0 then go to step 20, else repeat 18 and 19.
- 20) Close the valve relay.
- 21) Again go to step 2 and repeat up to step 21.
- 22) Stop.

VB Front end GUI

Some samples of VB front end forms to indicate user database and transaction of fuel are as shown in fig.4, 5 &6.[4]

For Control Unit

1. Start
2. Firstly customer will convey the RFID provided to him and then the quantity of fuel required.
3. Keep the records of the customer in the forms provided in the sequence such as name, location, ID and amount required.
4. Take information from tanker unit.
5. Receive user ID and other data from GSM
6. Match the received id with present id.
7. If match, send the message to the tanker unit using “*01X” format and update the database by the date, time of delivery and payment
8. If match not found, send message “Unauthorized user!” to tanker unit Block the valve opening using “*00X” format
9. Again follow step 4 to 8.
10. Stop

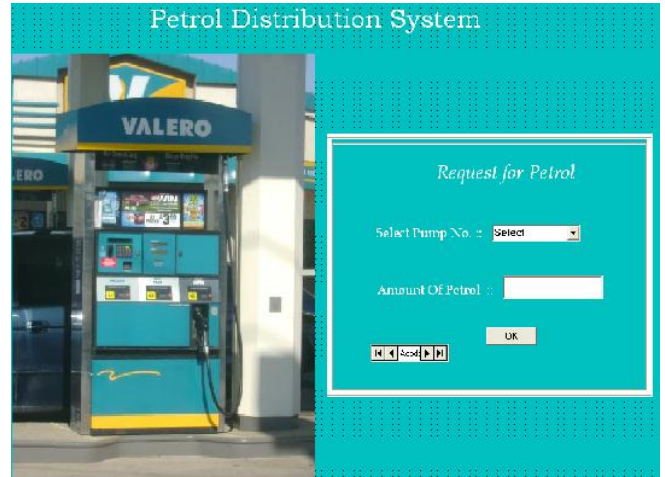


Fig.4 Form for request of petrol

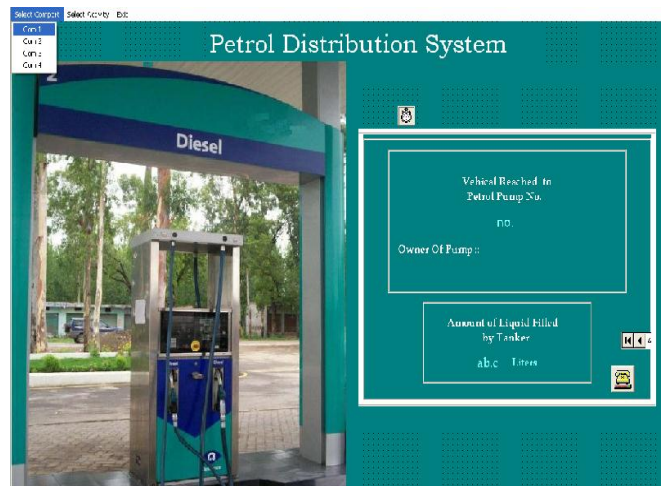


Fig.5 Form to indicate Id of matched user.

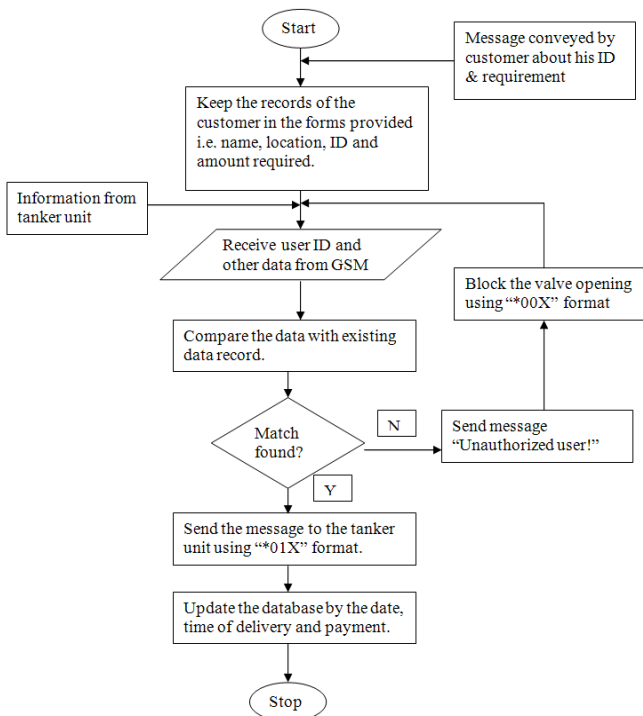


Fig.3 Work flow of system working

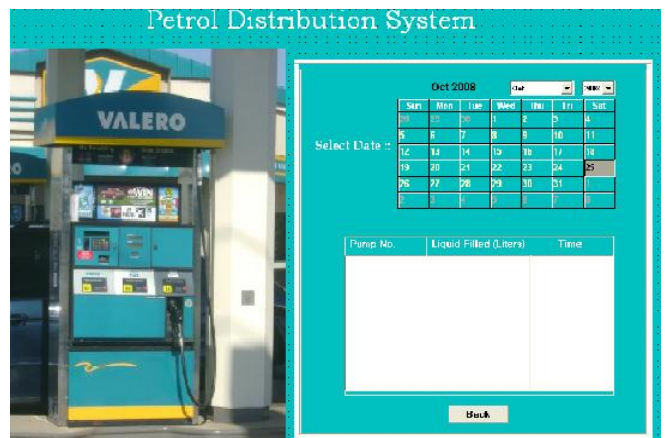


Fig.6 Form for date wise database search.

V. INTERFACING

Basic requirements for interfacing:

- 1) Power supply 12V, 5V. [1]
- 2) GSM module with active SIM.
- 3) DB9 connector for GSM and PC connection with our system.
- 4) RFID reader with standard reading format.
- 5) Passive tags for user identification.
- 6) PC with OS Windows 98/XP/Windows NT.
- 7) Visual Studio Ver.6.0.
- 8) Microsoft office pack with Microsoft access.
- 9) Resistive /RF level sensor.
- 10) Confirmation Display with suitable resolution.

VI. ADVANTAGES AND LIMITATIONS

A. Advantages

1. This system has simple components and simple construction of them on circuit.
2. It is possible to implement this system on small board space also.
3. GSM system used in our project provides quick data communication over long distance also.
4. RFID system helps us to provide the maximum security to authenticate the user at minimum cost.
5. It requires very less power supply i.e. from 5V to 12 V only, which is easily available.
6. Also as it provides the central control on petrol distribution, thus there is no question of stilling or to change the record of distributed fuel.
7. Easy to handle for distributor since only amount of fuel which is to be poured need to type on keypad and remaining work takes place automatically.

B. Limitations

This system may suffer at remote area where there is problem with GSM range. Also the attack from hackers may create problem but using high standard of encryption and availing GSM transceiver widely, one may overcome these limitations.

VII. APPLICATIONS AND FUTURE SCOPE

- 1) In petroleum products distribution our system looks for the control on product thefts which is the most serious problem for the manufacturing industries.
- 2) It is also possible to implement the same system for milk processing industries while distributing the milk and its products to the market.
- 3) 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.
- 4) The agricultural products like vegetables as well as processed fruits and its sub products may be securely distributed to the market using the same system we proposed.

5) Also it is possible to keep record of the distributed products to the market; which is commercially most important for the industries.

VIII. PRACTICAL RESULTS

Party A has requested for the 50 liter of petrol, the database in VB forms at the Party B get recorded. Swap the RFID tag against reader, keeping the position of the level sensor at the highest possible position, the RFID number and level of fuel get displayed.

Now Party B got the SMS which includes RFID number of Party A. After some delay, the form shows the auto update of database in VB w.r.t ID, name, location, date, time and amount of fuel and it send the message back to the Party A in form “*01X” e.g. “*0150”. As soon as the message received at the Party A, the relay get opened and the display start to show the decreasing fuel level since valve decreases its position. As the valve reaches the position by pouring the particular fuel, it will get automatically turn OFF.

IX. CONCLUSION

In the world of electronics it is important to develop the new technology to make secure the distribution of fuel and keeping record of the same fuel with authorization of user. Our project is one idea which can change the face of today’s manual system of distribution and data keeping. The total central access of all these activities provide the correct approach toward security and economical need of the industries since industry itself can control distribution as well as keep the record of the same fuel from thousands of miles seated in office. Also there is no option for the petrol pump or distributor to issue the fuel illegally that is total faithfulness of both the sides will get maintained. In short, this project probably can be implemented for the use of other tasks other than petrol distribution, on large scale to achieve various goals of industries.

REFERENCES

- [1]. Frensel- communication electronics principles and applications- (3rd edition)- Tata Mc Graw Hill- -tenth print 2007-page no:505 to 506 (for RFID)
- [2]. Ronald.J.Tocc- Digital system (6th edition) - page no. 744 to 776.(for microcontroller interfacing)
- [3]. Kenneth.J.Ayala-The 8051 microcontroller architecture, programing and application (2nd edition) - 1997.(for microcontroller, LCD, ADC, MAX232 and assembly language reference)
- [4]. Patrik Naughton,Herbert schild -The complete reference of Java (3rd edition)- april 2000 (for JAVA basics)
- [5]. www.wireless.com/security.htm
- [6]. www.alldatasheets.com.
- [7]. www.google.com/datasheets/special_features_RFID (for RFID).
- [8].http://instruct1.cit.cornell.edu/Courses/ee476/FinalProjects/s2006/cjr_37/Website/index.htm. “Proximity Security System” By: Craig Ross (cjr37) and Ricardo Goto (rhg22).December 4, 2007
- [9].<http://www.electronics-project-design.com/Electronics-Project-Design-blog.html> (for PCB)
- [10].[http://en.wikipedia.org/wiki/Relay_\(disambiguation\)](http://en.wikipedia.org/wiki/Relay_(disambiguation)) (for RELAY)
- [11].http://www.ozeki.hu/index.phtml?ow_page_number=455&page_name=sms_Introduction (for GSM)
- [12].http://www.developershome.com/sms/sms_tutorial.asp?page=smsIntro2 (for GSM AT commands)
- [13]. http://en.wikipedia.org/wiki/Level_sensor



ISSN 2249-6343

International Journal of Computer Technology and Electronics Engineering (IJCTEE)
Volume 2, Issue 1

AUTHOR'S BIOGRAPHY

Prof. Kulkarni Amruta M. working as a lecturer in dept.of E&TC at Sir Vishveswaraiya Institute of Technology, Chincholi (Nasik) doing his PG in Embedded and VLSI and working on the research entitled Embedded E-documentation

Prof. Taware Sachin S. working as a lecturer in dept.of E&TC at Pravara Rural Engineering College, Loni doing his PG in Embedded and VLSI and working on the research entitled Embedded E-documentation and Magnetic Resonance Cavity.