

Automated Unified Trolley System for LPG Leakage Detection with Safety Measures and Refill Booking

Shraddha Suresh Tanksale¹, Prof. A.S. Mali² and Dr. B.T. Salokhe³

¹M.E. Student, Department of Electronics Engineering, Tatyasaheb Kore Institute of Engineering & Technology, Warananagar, INDIA

²Assistant Professor, Department of Electronics Engineering, Tatyasaheb Kore Institute of Engineering & Technology, Warananagar, INDIA

³Professor, Department of Electronics Engineering, Tatyasaheb Kore Institute of Engineering & Technology, Warananagar, INDIA

¹Corresponding Author: shraddhakulkarni2404@gmail.com

ABSTRACT

The aim of this paper is to design Automated Unified Trolley System for LPG leakage detection with safety measures and Refill booking. This system will detect leakage of LPG and implement security against gas leak such as it will switch off the main power supply. It also switch on the exhaust fan automatically to decrease the gas concentration in air. This system will also help customer to regular update about weight of cylinder. So they are being not cheated by gas agency by providing less amount of gas. Also it is helpful to know about the status of gas. If gas in the cylinder is about threshold value, the system will immediately register gas booking through GSM technology by sending SMS to the distributor company and also send an alert to user at same time. By implementing this, the LPG provider can reduce the delivery delay time and helps to improve customer support service in transparent manner.

Keywords— LPG Automated booking system, Leakage detection, GSM, PIC Controller

[2].The gases being heavier than air, do not disperse easily and may lead to suffocation when inhaled, also when gas leaks into the air may lead to explosion [3]. Due to the explosion of LPG gas the number of deaths has been increased in recent years.

To avoid this developed system will help by switching off regulator as well as main supply immediately on gas detection. It also switches on the exhaust fan automatically to decrease the gas concentration in air. Consumers are mostly frustrated with quantity of LPG in the cylinder do not meet the promised quantity during delivery [4]

In fact, most of the time people's handover old cylinder to the delivery men without knowing the exact quantity of the gas left in it. LPG weighing machine is used to overcome this problem. It will monitor and display the quantity of gas level in the cylinder, when gas level reaches below the threshold limit of around 2kg it sends SMS alert to the user as well as gas refill agency. Hence, the consumer can be aware of the emptiness without handing over a cylinder with few quantity of LPG left behind.

So as additional advantage, this system will monitor weight of cylinder regularly and update information on LCD display. Further it can automatically register booking to Distributor Company when cylinder is going to be empty.

An automated LPG system can help the consumers in overcoming the various issue and can be an alternative to the existing IVRS LPG booking system. In this system, the consumer has to dial a toll free or non-free number in order to register a booking service. In this case, there are

I. INTRODUCTION

LPG first produced in 1910 by Dr.Walter Snelling is mixture of Commercial Propane and Commercial Butane having saturated and unsaturated hydrocarbons [1]. As LPG is versatile in nature it is used for many needs such as domestic fuel, industrial fuel, automatic fuel, heating, illumination etc. In most of our homes no safety measures are taken against LPG cylinder. This is a very dangerous approach and needs to be changed. An explosion results in a pressure wave and a large fireball

high chances where the consumer may forget to book for his next cycle. So to avoid this cylinder booking is done through a message sending process by the system when the weight of the cylinder is at its threshold. Threshold can be set by consumer simultaneously system will sent alert message to distributor company and user mobile number.

II. EXISTING METHODOLOGY

In all existing methods, different gas sensing technologies are used. However most of the accidents happen because of our negligence to not switch off the regulator. The detection of gases and its monitoring has already been done. However no control action is being taken.

LPG gas comes in metal cylinder and therefore one cannot keep the track of the quantity of the consumption of the fuel. As a result sometimes in fact often it happens that one does not comes to know whether how much amount of fuel is remaining. So that booking for a new refill cylinder could be done before the gas in the container gets empty and the user gets deprived of the fuel till new refill is at doorstep.

III. DESIGN OF SYSTM

The designed system for Automated Unified Trolley System for LPG leakage detection with safety measures and Refill booking using PIC 16F877a has various applications such as LPG detection and Prevention methods and automatic gas booking system.

System and structure

The block diagram shows main blocks that can be used to develop a system. PIC 16Fxxx series microcontroller having five ports and eight channels may be used to process and control whole system [5]. It consists of I/O ports, 3 timers, ROM, RAM, Flash memory and inbuilt ADC. PIC channel 10 bit inbuilt ADC which convert the analog value into 10 bit digital data. Microcontroller 16F877A has 40 pins, 32 pins for parallel port. The series of PIC16 consists of five ports such as Port A, Port B, Port C, Port D & Port E.

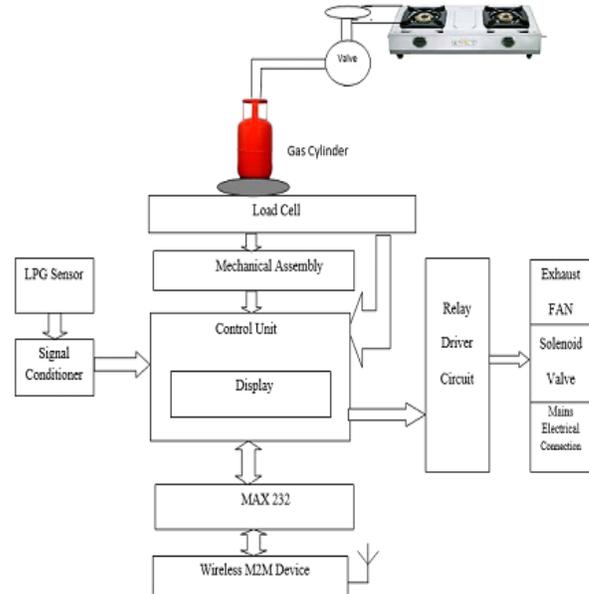


Fig.1 Block diagram of System

MQ-6 is sensor used to sense gas leakage; it is suitable for sensing LPG concentration in air [6]. When sensor detects gas leak the output of sensor given to the signal conditioning circuit for manipulating the analog output to the meet the requirement of controller.

LPG sensor module is used to detect any gas leakage and it is interfaced to the PIC microcontroller using the digital port pin and if there is gas leakage detected, the output signal from the LPG sensor module changes and it is sensed by the PIC microcontroller to display it on LCD as well as give SMS alert to user through GSM module. The protection circuit consists of solenoid valve, exhaust fan and energy meter.

The solenoid valve drive unit controls the opening and closing of the solenoid valve which controls the flow of gas from the supply to the point where the gas is being used. The solenoid valve drive receives signal from the control unit and the carries out the appropriate action [7].

If there is a gas leakage, then the household ac power supply can be disconnected using a relay.

The protection circuit has exhaust fan which does not provide spark so it is safe. A drive circuit is designed to activate the exhaust fan using relay. When concentration of gas exceeds the safety level then controller switch on the exhaust fan by which gases sent out.

Weighing sensor is transducer which converts force applied to it into in electrical signals. Load is used to measure the weight of gas cylinder through weighing sensor [1]. The change in output of the load cell can be measure in the form of voltages which is analog. That analog output will be given to analog to digital converter. In automatic Gas booking system, LCD continuously monitors the weight of the gas in cylinder and displays it

on seven segment display. When the weight of the gas is less than or equal to 2 Kg, a logic high pulse is fed to a port pin of PIC microcontroller. As this pin goes high, PIC microcontroller will send a booking message to distributor. At the same time, the message will be displayed on LCD.

Wireless M2M device like GSM SIM 800/300/900 can be used to modify user in emergencies and for booking purpose [8]. GSM stands for Global System for Mobile communication with the help of this module user gets alerted through message on gas leakage detection and cylinder gets automatically booked to agency when it is going to empty.

IV. HARDWARE IMPLEMENTATION

The Hardware implementation of system can be divided into two parts,

1) Designing LPG detection and Prevention Circuit



Fig.2 LPG detection and Prevention Unit

2) Designing Automatic Gas booking system



Fig.3 Automatic Gas Booking Unit

The connection has made up between the PIC microcontroller, sensor circuits, relays connected with energy meter, solenoid valve and exhaust fan. The DC

power supply is provided to microcontroller. The 12 V DC supply provided to GSM module.

This project is developed and tested with respect to actual parameters of LPG. Such as Detection of LPG leakage and implementation of security against gas leak. Automatically turn off the valve to avoid the Gas flow. Automatically turn on the Exhaust fan to release the gas Switch off mains power supply Regular update about weight of cylinder Automatic Booking of cylinder when it is going to empty.

V. SOFTWARE IMPLEMENTATION

The overall system flow chart is for Gas Leakage detection as well as gas booking system. LPG sensor module is used to detect any gas leakage through MQ-6 sensor and it is interfaced to the PIC microcontroller using the digital port pin and if there is gas leakage detected, the output signal from the LPG sensor module changes and it is sensed by the PIC microcontroller to display it on LCD as well as give SMS alert to user through GSM module. The protection circuit consists of solenoid valve, exhaust fan and energy meter.

In automatic Gas booking system, LCD continuously monitors the weight of the gas in cylinder and displays it on seven segment display. When the weight of the gas is less than or equal to 2 Kg, a logic high pulse is fed to a port pin of PIC microcontroller. As this pin goes high, PIC microcontroller will send a booking message to distributor. At the same time, the message will be displayed on LCD.

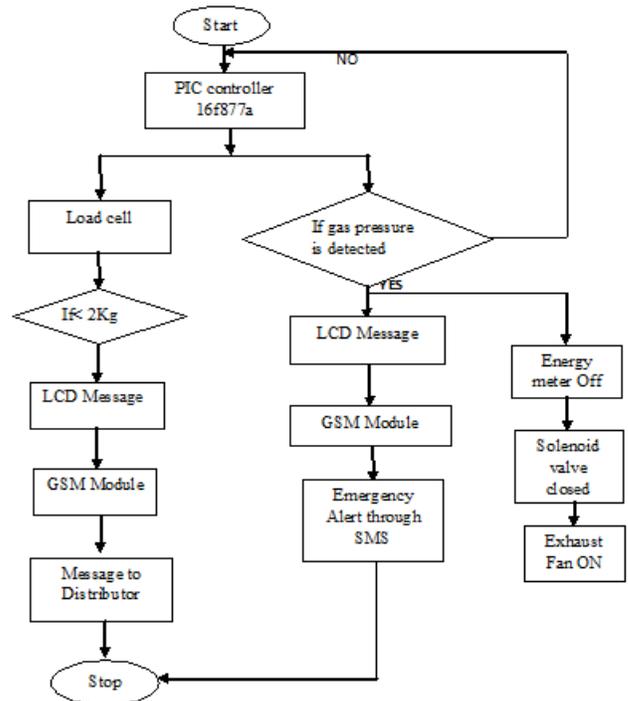


Fig. 4 Overall Flow chart Process

VI. RESULT ANALYSIS

This project is developed and tested with respect to actual parameters of LPG. Such as Detection of LPG leakage and implementation of security against gas leak. Automatically turn off the valve to avoid the Gas flow. Automatically turn on the Exhaust fan to release the gas Switch off mains power supply Regular update about weight of cylinder Automatic Booking of cylinder when it is going to empty.

1) Detection of LPG leakage and implementation of security against gas leak



Fig.5 Detection of LPG leakage

2) LPG Detection on LCD



Fig.6 LPG Detection on LCD

3) Gas Leakage SMS on Mobile

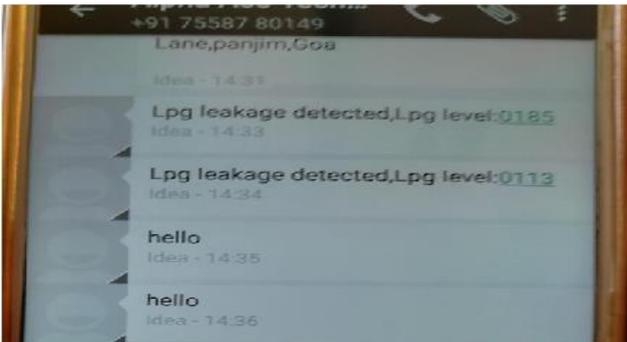


Fig.7 Gas Leakage SMS on Mobile

4) Turn On the Exhaust Fan



Fig.8 Turn on the Exhaust Fan

5) Automatically turn off the valve and switch off the main power supply



Fig.9 Automatically turns off the valve and switch off the main power supply

6) Weight is below threshold shown by LCD:



Fig.10 Weight is below threshold shown by LCD

7) Message to the Distributor

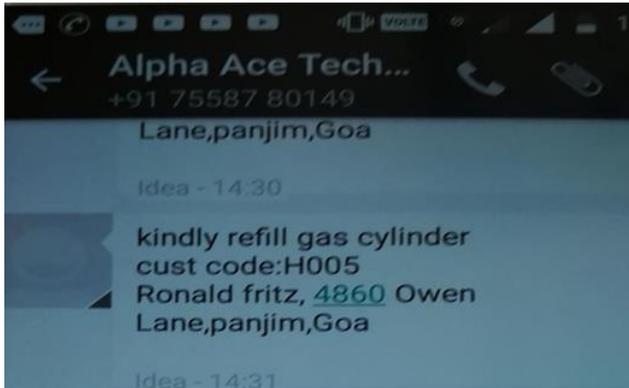


Fig.11 Message to the Distributor

8) Overall System



Fig.12 Overall System

VII. CONCLUSION

This project is fully automated so the human attention is not required. The trolley can detect LPG leakage and after leakage detection user is alerted through SMS on his mobile. For safety, this device will also switch off mains power supply on leakage detection.

In advance, this system can also switch off regulator on gas detection which will stop further leakage of gas. Along with gas leakage detection, this system has a fully automated approach to book gas cylinder to Distributor Company. Display unit of system will update you regularly about LPG consumed daily and also amount of LPG left in gas cylinder. The system developed here is much efficient as home security tool and having affordable cost as compared to gas detectors commercially available in the market.

REFERENCES

- [1] B. D. Jolhe, P. A. Potdukhe, & N. S. Gawai. (2013). Automatic LPG booking leakage detection and real time gas measurement monitoring system. *International Journal of Engineering Research & Technology*, 2(4), 1192-1195.
- [2] Ankur Bachchan, Kajal Bhasharkar, Mohammad Zaki Gundagi, & Vinish Bhan. (2016). Design of smart LPG regulator using internet-of-things. *International Journal of Engineering Technology, Management and Applied Sciences*, 4(2), 166-169.
- [3] Rajitha and T. Swapna. (2012). Security alert system using GSM for gas leakage. *International Journal of VLSI and Embedded Systems*, 3(4), 173-175.
- [4] Abhishek Kumar Sahu, P Bhaskar, Rahul Kumar Sharma, SK Inzamam Ul Haque, Sudhir Kumar, & Richa Shrivastava. (2017). Gas monitoring using GSM. *International Journal for Research in Applied Science & Engineering Technology*, 5(5), 1320-1323.
- [5] Pal-Stefan Murvay & Ioan Silea. (2012). A survey on gas leak detection and localization techniques. *Journal of Loss Prevention in the Process Industries*, 25(6), 966-973.
- [6] K.Padma Priya, M.Surekha, R.Preethi, T.Devika, & N.Dhivya. (2014). Smart gas cylinder using embedded system. *International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering*, 2(2), 958-962.
- [7] Shaikh Nizamuddin M, Hanmante Sachin A, & Hazique Husain. (2017). Smart gas leakage detection & registration. *International Journal of Electrical and Electronics Engineers*, 9(1), 1126-1130.
- [8] Abid Khan, Neju K. Prince, Shailendra Kumar Dewangan, & Praveen Singh Rathore. (2014). GSM based automatic LPG ordering system with leakage alert. *International Journal of Research in Engineering and Technology*, 3(12), 40-42.