

AUTOMATIC CYLINDER BOOK AND LEAKAGE DETECTION SYSTEM

Dr. PRASAD M R

Associate Professor, Department of CSE, Vidyavardhaka College of Engineering, Mysuru.

RAVIRAYAPPA

Assistant Professor, ECE Department, Jain Institute of Technology, Davangere. Email: ravirayappa@jitd.in

RAVIKUMAR K I

Assistant Professor, ECE Department, Jain Institute of Technology, Davangere.

SUPRITH P G

Research Scholar, School of ECE, Reva University, Bangalore.

Dr. KAVITHA K J

Associate Professor, ECE Department, GM Institute of Technology, Davangere.
Email: kavithakj219@gmail.com

Abstract

This paper proposed the system of automatic cylinder book and gas leakage detection system is proposed in this paper. In this system, the LPG leakage is detected through the sensor and information is sent to the user by Short Message Service (SMS) and simultaneously alerts the customer using a GSM module, while activating the alarm and exhaust fan. The additional advantage of the system is that it continuously monitors the level of the LPG present in the cylinder using weight sensor and automatically books the cylinder using a GSM module. The booking status will be sent to user using GSM from the agency side. A Gas sensor is used to detect dangerous gas leaks in the kitchen or near the gas heater. This unit detects 300 to 5000 ppm of Natural Gas. Ideal to detect dangerous gas leaks in the kitchen. Sensor can be easily configured as an alarm unit. The sensor can also sense LPG and Coal Gas. Ideal sensor is used to detect the presence of a dangerous LPG leak in your car or in a service station, storage tank environment. It provides a cost effective and highly accurate system, which not only detect gas leakage but also alert (Beep) and automatic cylinder booking and send an SMS. GSM module is used which alert the user by sending an SMS In order to provide high accuracy gas sensor MQ-6 has been used The intention of the work is to identify the gas leakage, controlling it and also without any human interface gas booking is done.

Keywords: MQ-6, GSM, LPG, Sensor

1. INTRODUCTION

The proposed topic is “Automatic gas leakage detection and cylinder booking system”. A Gas sensor is used to detect dangerous gas leaks in the kitchen or near the gas heater. The proposed topic is “Automatic gas leakage detection and cylinder booking system”.

A Gas sensor is used to detect dangerous gas leaks in the kitchen or near the as heater. The idea of the proposed system presents a LPG gas detection of leakage gas is done by gas sensor which is interfaced with microcontroller. When gas is detected motor will be turn on and it immediately turn off the gas regulator at the same time we inform the user about the gas leakage by sending the SMS, turning on the buzzer and also message displaying on LCD[6].

In auto gas booking we continuously measure the amount of gas which is present in the cylinder. When gas level goes below the set level then message will be send to the gas agency through GSM and confirmation message received by the user from gas agency. So user get cylinder within time.

The intention of the project work is to identify the gas leakage, controlling it and also without any human interface gas booking is done. The idea of the proposed system presents a LPG gas detection of leakage gas is done by gas sensor which is interfaced with microcontroller.

When gas is detected motor will be turn on and it immediately turn off the gas regulator at the same time we inform the user about the gas leakage by sending the SMS, turning on the buzzer and also message displaying on LCD. In auto gas booking we continuously measure the amount of gas which is present in the cylinder.

When gas level goes below the set level then message will be send to the gas agency through GSM and confirmation message received by the user from gas agency. So user get cylinder within time [7]. The intention of the project work is to identify the gas leakage, controlling it and also without any human interface gas booking is done. Some of the work done on such system is as explained below:

“A Wireless Home Safety Gas Leakage Detection System”, IEEE 2011.Luay Friwan, Khaldon Lweesy, AyaBani-Salma, and NourMani [1], have implemented the system that provides a wireless safety device for gas leakage detection. The device is intended for use in household safety where appliances and heaters that use natural gas and liquid petroleum gas (LPG) may be a source of risk.

The system also can be used for other applications in the industry or plants that depend on LPG and natural gas in their operations. This system design consists of two main modules: Detection and transmission module, and the Receiving module. The Detection and transmitting module detects the detection of change of gas concentration using a special sensing circuit built for this purpose.

This module is checks if a change in concentration of gas has exceeded a certain pre-determined threshold. If the sensor is detects a change in gas concentration, it activates and audiovisual alarm and sends a signal to the receiver module.

Receiver module acts as a mobile alarm device to allow the mobility within the house premises. This system was tested using LPG and the alarm was activated as a result of change in concentration.

“A Security Alert System Using GSM for Gas Leakage” 2012, Ranjitha .S, Swapna [2], implemented the project whose primary objective is to monitor for LPG gas leakage to avoid fire accidents providing house safety feature where security is an important issue. The system detects the leakage of the LPG using gas sensor and alerts the consumer about the gas leakage by sending message.

This system uses the GSM to alert the person about the gas leakage via message. When the system detects the LPG leakage concentration in the air exceeds the certain level

then it immediately alert the consumer by sending message to specified mobile phone and alert the people at home by activating the alarm which includes the LED, Buzzer and simultaneously display message on LCD display to take the necessary action and switch on the exhaust fan to decrease the LPG gas concentration in the air. "LPG Detection measurement and Booking system", 2012.

Shivalingesh B.M, Pooja R, Mahesh S.R [3] have proposed the system to measure the amount of Gas used and automatic booking. The next section briefly explains the proposed system design used for implementing the automatic cylinder booking and gas leakage detection system based on the survey.

2. DESIGN

The main objective of this proposed system is to detect gas leakage and auto gas booking. An efficient and fast working controller is needed to continuously sense the LPG gas and its level (weight) sensor's output.

Also a fast reply is desired when leakage is found. Along with this a system must possess capacity to store some information which can be used for further processing. The design procedure of the unit is to be carried out in such a way that it has to consume less power and increase the durability of module, as these units are designed as stand-alone units and where there will be no human intervention.

So the PIC microcontroller being low power and low cost microcontroller, is been chosen for the processing purpose in the module and the sensors are chosen in such a way that they are having low operating voltages and hence such sensors are used to measure the gas leakage detection in the cylinder, whereas the load cell is used for booking concept. The proposed block diagram is as shown in figure 1:

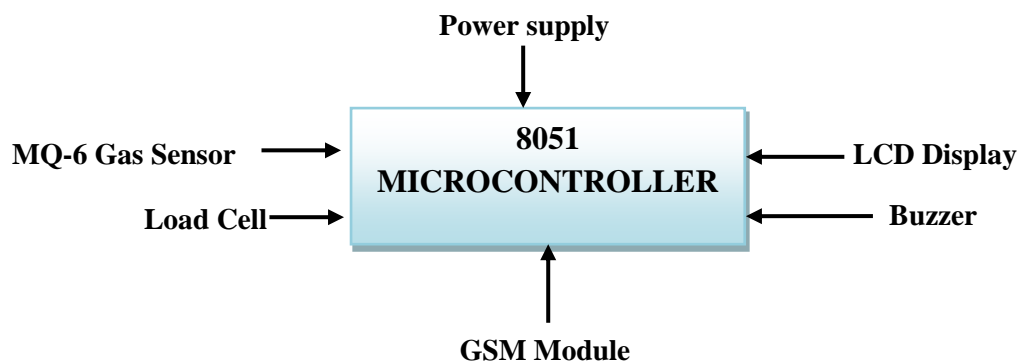


Figure1: Proposed block diagram for Cylinder book and Gas leakage detection system

Gas sensors are available in wide specifications depending on the sensitivity levels, type of gas to be sensed, physical dimensions and numerous other factors [7 & 8]. The figure 2 shows a methane gas sensor MQ-6 gas sensor that can sense gases such as ammonia

which might get produced from methane. When a gas interacts with this sensor, it is first ionized into its Constituents and is then adsorbed by the sensing element.

This adsorption creates a potential difference on the element which is conveyed to the processor unit through output pins in form of current.

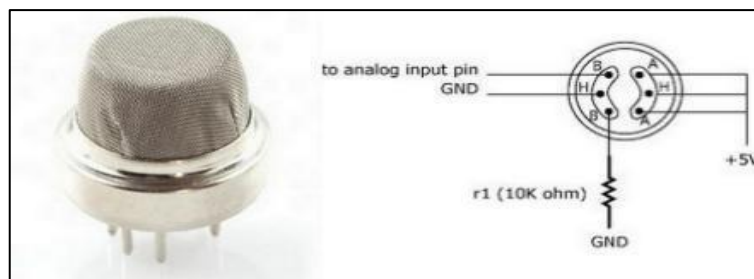


Figure 2: MQ-6 Gas Sensor

The sensor module as shown above consists of a steel exoskeleton under which a sensing element is housed.

This sensing element is subjected to current through connecting leads. This current is known as heating current through it; the gases coming close to the sensing element get ionized and are absorbed by the sensing element. This changes the resistance of the sensing element which alters the value of the current going out of it.

The top part is a stainless steel mesh which takes care of the following [9 & 10]:

- Filtering out the suspended particles so that only gaseous elements are able to pass to inside of the sensor.
- Protecting the insides of the sensor.
- Exhibits an anti-explosion network that keeps the sensor module intact at high temperatures and gas pressures. In order to manage above listed functions efficiently, the steel mesh is made into two layers. The mesh is bound to rest of the body via a copper plated clamping ring.

The connecting leads of the sensor are thick so that sensor can be connected firmly to the circuit and sufficient amount of heat gets conducted to the inside part. They are casted from copper and have tin plating over them.

Four of the six leads (A, B, C, D) are for signal fetching while two (1, 2) are used to provide sufficient heat to the sensing element. The pins are placed on a Bakelite base which is a good insulator and provides firm gripping to the connecting leads of the sensor [11 & 12].

The top of the sensor is removed off to see the internals parts of the sensor: sensing element and connection wiring. The hexapod structure is constituted by the sensing element and six connecting legs that extend beyond the Bakelite base.

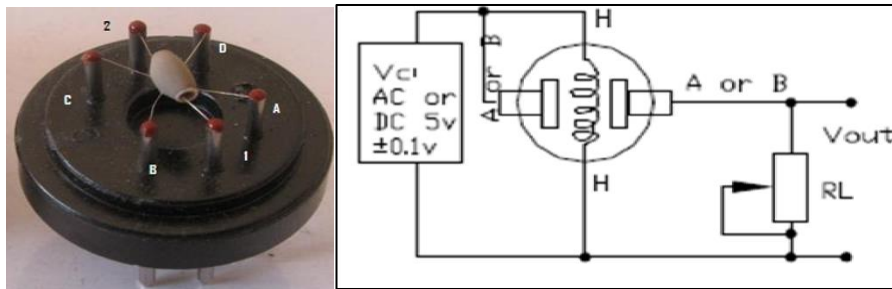


Figure 3: Circuit Diagram of MQ-6 Gas Sensor

The figure 3 shows the hollow sensing element which is made up from Aluminum Oxide based ceramic and has a coating of tin oxide. Using a ceramic substrate increases the heating efficiency and tin oxide, being sensitive towards adsorbing desired gas' components (in this case methane and its products) suffices as sensing coating.

The leads responsible for heating the sensing element are connected through Nickel-Chromium, well known conductive alloy. Leads responsible for output signals are connected using platinum wires which convey small changes in the current that passes through the sensing element.

The platinum wires are connected to the body of the sensing element while Nickel-Chromium Wires pass through its hollow structure. While other wires are attached to the outer body of the element, Nickel-Chromium wires are placed inside the element in a spring shaped. The sensor circuit also shows the ceramic with tin dioxide on the top coating that has good adsorbing property.

Any gas to be monitored has specific temperature at which it ionizes. The task of the sensor is to. Work at the desired temperature so that gas molecules get ionized. Through Nickel-chromium wire, the ceramic region of the sensing element is subjected to heating current.

The heat is radiated by the element in the nearby region where gases interact with it and get ionized. Once, ionized, they are absorbed by the tin dioxide. Adsorbed molecules change the resistance of the tin dioxide layer. This changes the current flowing through the sensing element and is conveyed through the output leads to the unit that controls the working of the sensor. The next section explains the flow of implementation of the system.

3. WORKING PRINCIPLE

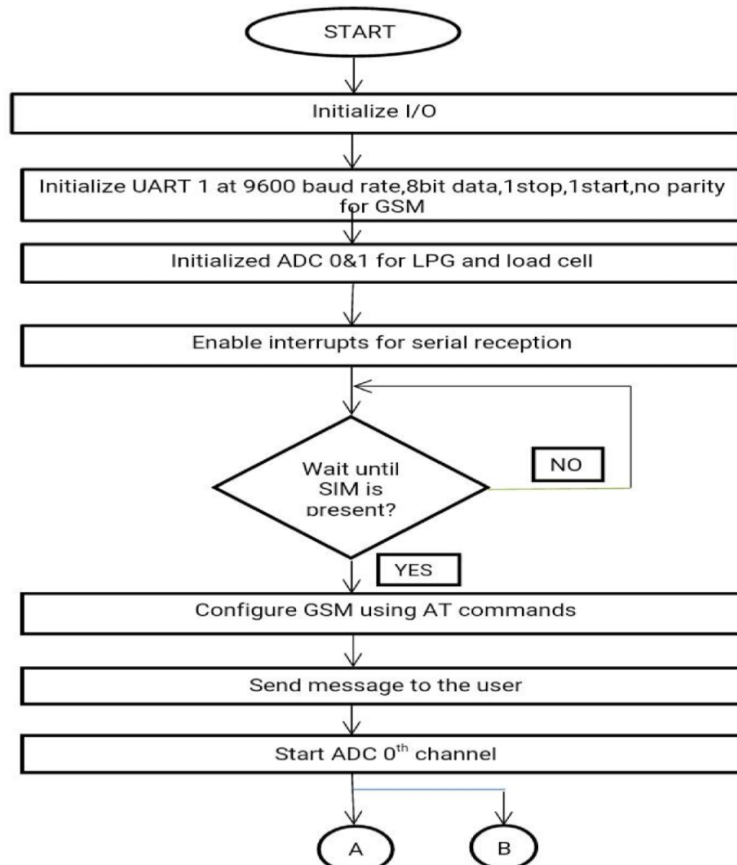
The system process starts by the process of transmitting by power on the system as shown figure 4. Initialization block present in the system initializes the UART1 at 9600 baud rate, 8 bit data and no parity for GSM, Initializes ADC 0th&1st channel for LPG sensor & load. It also enable the interrupts for serial reception check whether SIM is present or not for data Trans reception.

After confirmation of the SIM, next will configure the GSM using AT commands and send the message to the user. If not configured, then step back to previous step. Start ADC 0th channel for gas sensor and it will wait for 250 samples conversion done. If it is not done, back to previous step. If the conversion is done than read the results come out of their conversion.

Then the system will check whether given result is greater than threshold or not .if the result is greater than threshold at that time to turn on the alarm and Fan. Then the system will send a message to the user. If not stop ADC 0th channel and start ADC 1st channel for load. Then system will wait the 500samples conversion is done. If it is not done the 500 samples of conversion go to previous step.

The conversion is done. Read appropriate results and check the load is lesser than threshold .if the load is less than threshold value send message to the consumers and issue auto booking message to agency.

Figure 4: Flowchart of working principle of proposed system (Customer Side)



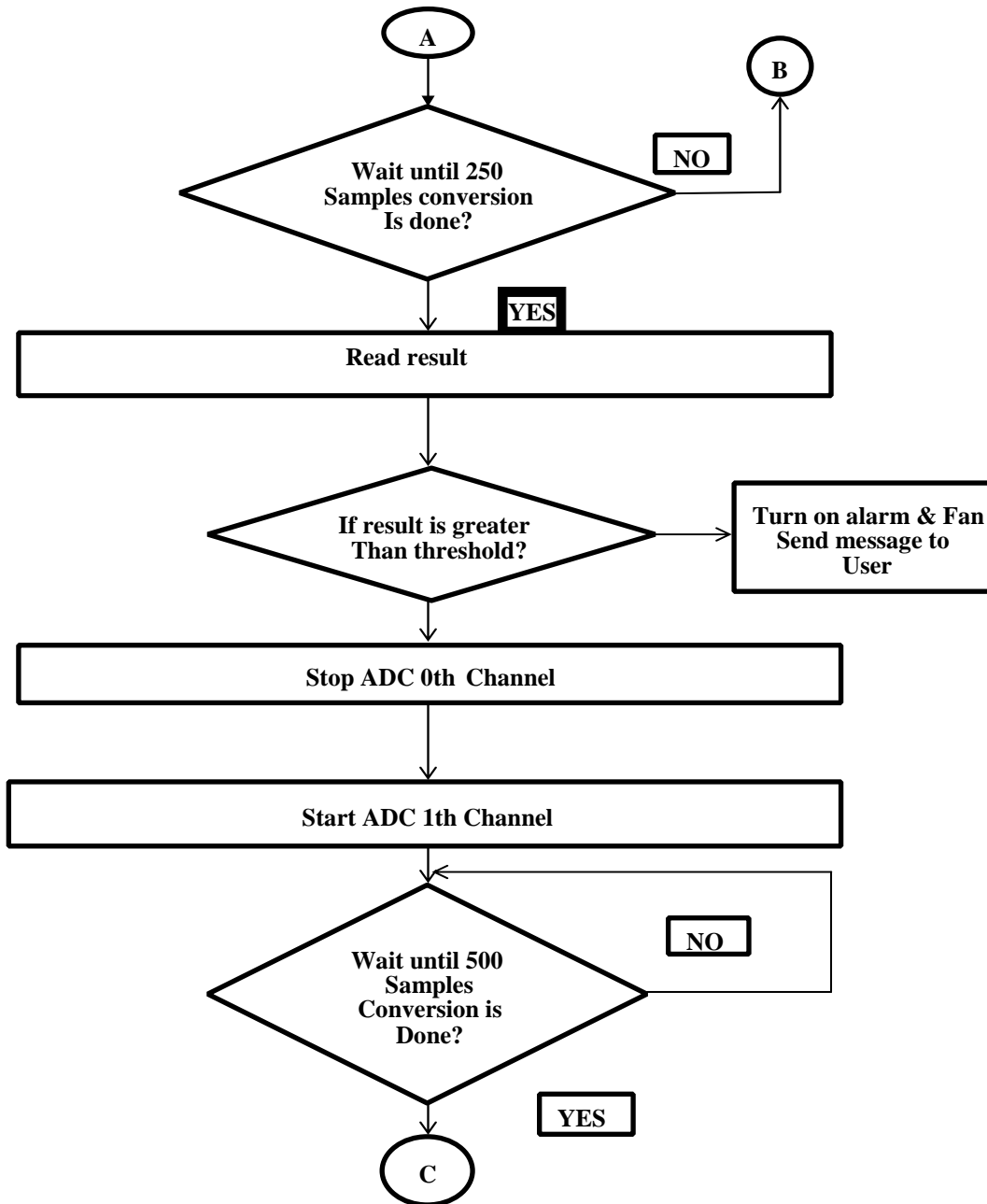


Figure 4: Flowchart of working principle of proposed system (Customer Side) (Contd.)

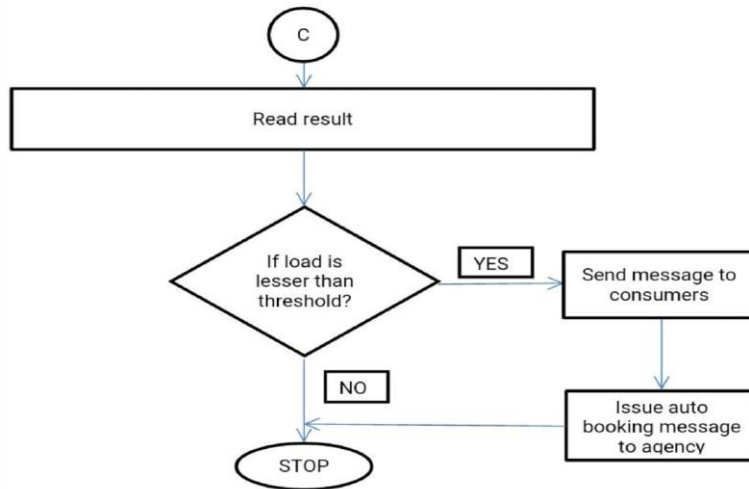
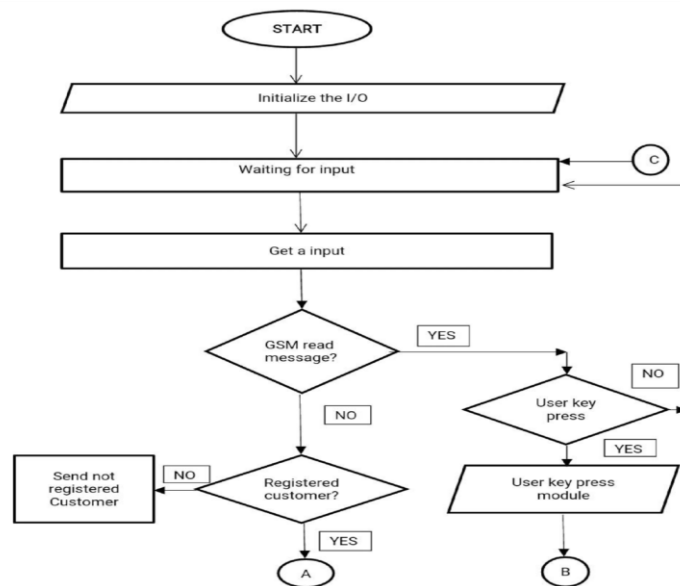


Figure 4: Flowchart of working principle of proposed system (Customer Side) (Contd.)

At the distribution side, first initialize all the parameters and waiting for input from user side, than it receives the message from user module and distribution side of GSM read the message and check whether message is comes from registered customer or not. If it is not it will sent a unregistered customer message to user. If a registered customer the distribution side sent a gas booking message to user. On other side user key press module used for entering the date and time than also used for registering customer ID and mobile number .In the user key press module is also used for deleting the customer ID and mobile number as shown in figure 5.

Figure 5: Flowchart of working principle of proposed system (Distributor Side)



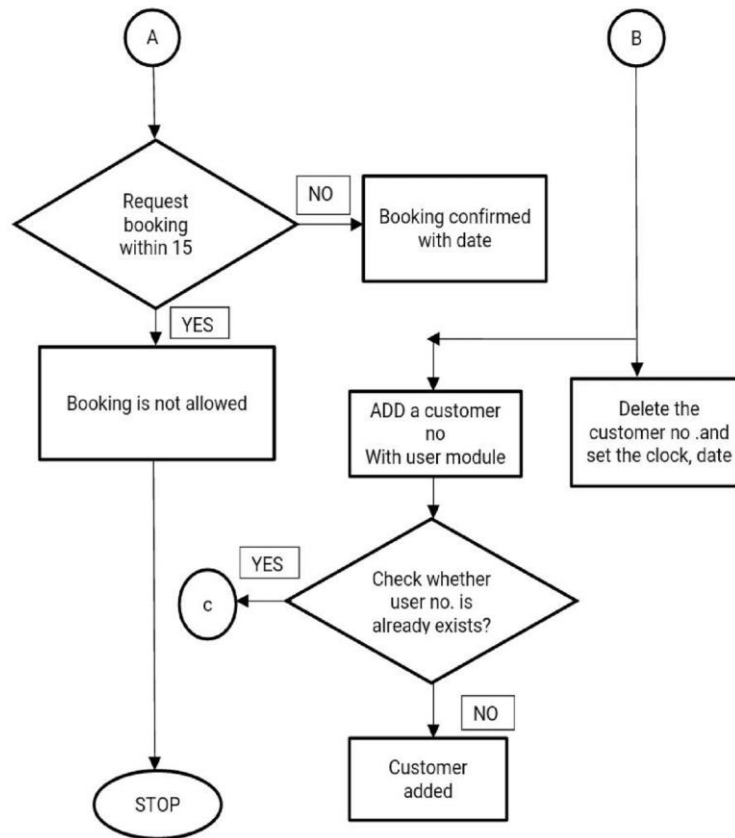


Figure 5: Flowchart of working principle of proposed system (Distributor Side) (Contd.)

4. RESULT AND CONCLUSION

Conclusion

This proposed topic is Automatic gas leakage detection and cylinder booking system. A Gas sensor is used to detect dangerous gas leaks in the kitchen or near the gas heater. Ideal to detect dangerous gas leaks in the kitchen. Sensor can be easily configured as an alarm unit. The sensor can also sense LPG and Coal Gas as well as Ideal sensor for use to detect the presence of a dangerous LPG leak in your car or in a service station storage tank environment. This unit can be easily incorporated into an alarm unit, to sound an alarm or give a visual indication of the LPG concentration. The sensor has excellent sensitivity combined with a quick response time. When GAS leakage is detected and is messaged to the authorized person using cellular network called GSM. It provides a cost effective and highly accurate system, which not only detect gas leakage but also alert (Beep) and automatic cylinder booking and send an SMS.GSM module is used which alert the user by sending an SMS In order to provide high accuracy gas sensor MQ6 has been used The intention of the project work is to identify the gas leakage, controlling it and also without any human interface gas booking is done.

Future Enhancement

The solution provided can be further enhanced by displaying in the LCD unit how much amount of gas is leaked. We can also incorporate the location detection feature for the gas leakage area for which area the gas leakage is occurred and automatically send a message to nearest fire station.

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