Gas Booking System using VB Software, Microcontroller and Gas Leakage Detection with SMS

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Abstract

The main idea of this paper is to implement automatic Liquefied Petroleum Gas (LPG) booking and security system for detecting leakage of gas by using gas sensor. In this system, the LPG leakage is detected through the sensor and information is sent to the customer by Short Message Service (SMS) and 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 at dealer side along with VB software.

Keywords: Microcontroller, GSM Module, Weight Sensor, Gas Sensor

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I. INTRODUCTION

The Liquefied Petroleum Gas (LPG) was first produced in 1910 by Dr. Walter Snelling, a mixture of gases Commercial Propane and Commercial Butane having saturated as well as unsaturated hydrocarbons. Because of the versatile nature of LPG it is used for many needs such as domestic fuel, industrial fuel, automobile fuel, heating, illumination etc and the demand for LPG is on an exponential raise day by day. The leaked gases when burn may lead to explosion. The number of deaths due to the explosion of gas cylinders has been increasing in recent years. Thus there is a need for a system to detect and also prevent leakage of LPG.

Before the development of electronic household gas detectors in the 1980s and 90s, gas presence was detected with a chemically infused paper that changed its colour when exposed to the gas. Since then, many technologies and devices have been developed to detect, monitor, and alert the leakage of a wide array of gases.

Today, booking an LPG cylinder is now just a text message away. Petroleum companies have launched the customer-friendly service called as IVRS (Interactive voice Response) technique for their customers.

Hence the requirement of an efficient system to measure and display the level of LPG is incapable, which may be used for domestic purposes. Here we used a microcontroller based system where a gas sensor, MQ6 is used to detect dangerous gas leaks. This unit is incorporated into an alarm unit, to sound an alarm or give a visual indication of the LPG leakage. The sensor has good sensitivity combined with a quick response time at low cost. If leakage is detected, message to the person or family member using cellular network called GSM is sent automatically. It also provides a feature to measure weight of LPG cylinder with its value on LCD display. In domestic purpose we have use approximately 400gm gas. A gas quantity of less or equal to 2kg books the cylinder automatically by sending text message to a dealer. Also when cylinder weighs less than or equal to 0.5 Kg, it informs the family members by sending a message to refill the cylinder.

II. THEORY

A. Gas sensor

This is a simple-to-use liquefied petroleum gas (LPG) sensor, suitable for sensing LPG (composed of mostly propane and butane) concentrations in the air. The MQ-6 can detect gas concentrations anywhere from 200 to 10000ppm.

This sensor has a high sensitivity and fast response time. The sensor's output is an analog resistance. The drive circuit is very simple; all you need to do is power the heater coil with 5V, add a load resistance, and connect the output to an ADC.

If concentration level goes above danger level then it turns relay ON which gives interrupt to microcontroller and alternately switches on buzzer an exhaust fan.

Fig. 1: Gas Sensor

B. *Weight Sensor Module*

A cylinder from a distributor to book, we must be aware in advance of amount of gas in the cylinder, and for this purpose the level of gas present in the cylinder has to be monitored continuously.

We have used strain gauge as a weight sensor. The function of strain gage is to give output voltage as per the force/weight applied to it. Sensor converts the applied force into corresponding electrical signal. The output of weight sensor is in analog form.

It is given to a Digitizer board which comes with this weight sensor. Function of Digitizer board is to give digital output which is proportional to analog input received from weight sensor. This digital output is given to microcontroller for further processing. We have used a weight sensor of 40 kg capacity. So 40 kg is the maximum weight that can be applied to this weight sensor.

Fig. 2: Weight Sensor Module

C. *GSM Module*

Gas sensor detects the presence of gas, weight sensor gives the gas level in cylinder, and microcontroller will take corrective or necessary actions. The status of all these happening has to be conveyed to the owner of system or housemates. The technology making it very easy to send and receive messages using GSM module works on simple AT commands which can be implemented by interfacing it to the microcontroller Rx and Tx pins. The GSM module used is SIMCOM 300 which uses SIM memory to store the number of system owner or housemates and distributor or to whoever the messages have to be forwarded. It requires very less memory to send and receive text messages and operates on simple 12 Volt adapter.

A GSM modem is a specialized type of modem which accepts a SIM card, and operates like a mobile phone. GSM modem looks just like a mobile phone. When a GSM modem is connected to a PC, this allows the PC to use the GSM modem to communicate over the mobile network. These GSM modems are used for sending and receiving SMS and MMS messages.

Fig. 3: GSM Module

III. FUTURE SCOPE

A voice feedback system can be included in GSM based LPG weight and LPG leakage detection system. User will get intimation through pre-recorded voice messages like the weight of gas Cylinder is XYZ kg.

IV. METHODOLOGY

There are two flow charts for gas leakage detection and automatic gas booking which explain the methodology of the operation as follows:

A. Gas Leakage Detection

In this prototype, gas leakage detection has been given a highest priority. MQ6 placed in the vicinity of the gas cylinder. In the advent of leakage, the resistance of the sensor decreases increasing its conductivity. Corresponding pulse is fed to microcontroller and simultaneously switches on the buzzer and exhaust fan which we can reset by a manual reset switch. Also a logic high pulse (+5 V) is given as an interrupt to INT0 pin of Microcontroller. Microcontroller sends a message "EMERGENCY ALERT: LPG gas leakage found in your home" to required cell numbers via GSM module and the same will be displayed on LCD.
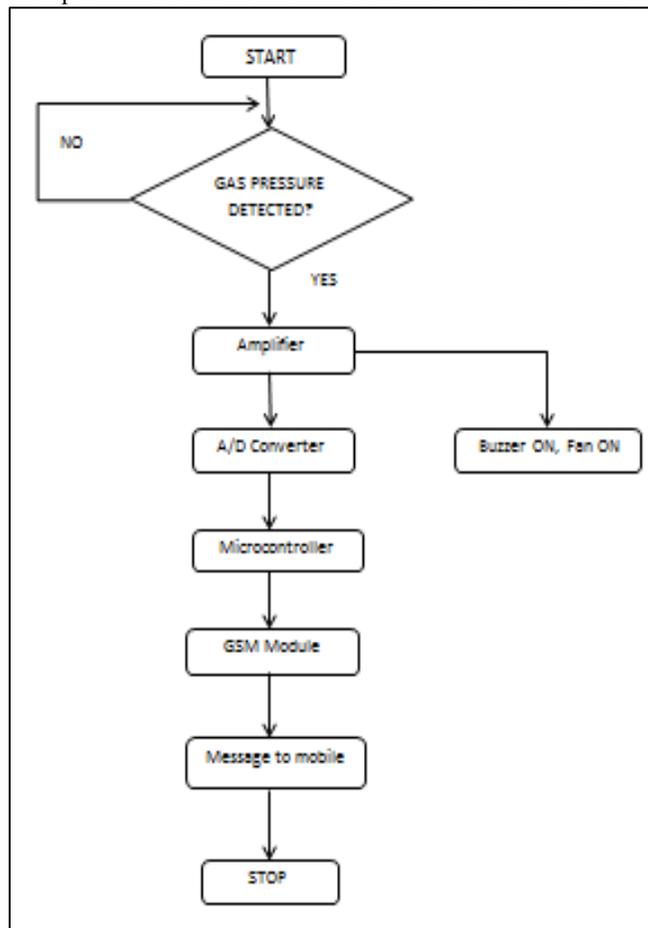
Fig. 4: Flow Chart

B. Automatic Gas Booking

In automatic Gas booking system, L6D continuously monitors the weight of the gas in cylinder and displays it on seven segment display. When the weight of the gas is <=2 Kg, a logic high pulse is fed to a port pin of microcontroller. As this pin goes high, microcontroller will send a booking message to distributor of format, "REG_AMARGAS_12345". At the same time, the message will be displayed on LCD as "Booking Cylinder". When the weight of the gas goes below 0.5 kg another logic high pulse is fed to another port of microcontroller through a relay circuit as discussed in truth table. As this port pin goes high, microcontroller will send a message as "Gas remaining only 0.5 Kg. Immediately Refill your Cylinder" through a GSM module to cell numbers required members and the message "Cylinder Empty, Please Refill" is displayed on the LCD display.
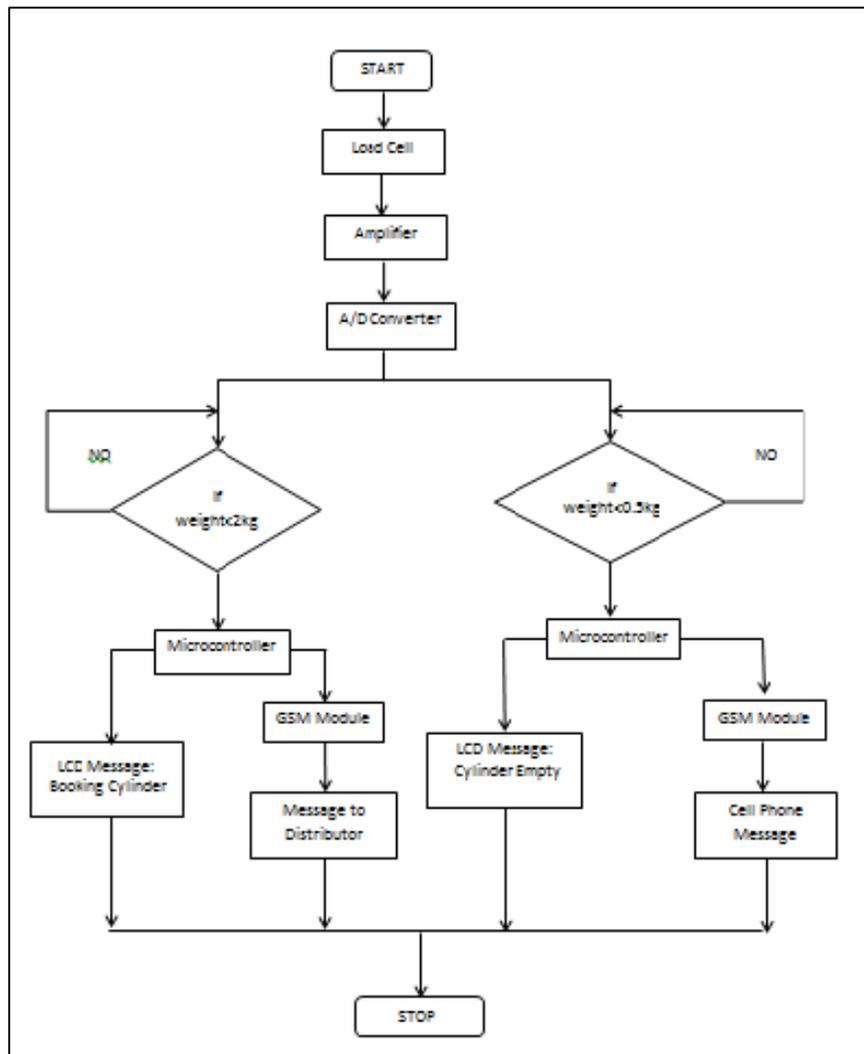
Fig. 5: Flow Chart

1) Software Implementation
- The software part programming through Microcontroller. It is easy to write code in Keil software and burn the IC.C and C++ language are used for programming.
- VB software is used at distributer's side which consist of all information of user.

2) Hardware Implementation
- Weight sensor.
- Gas sensor.
- GSM module.
- LCD display

V. CONCLUSION

A time consuming, security purpose and cost-effective gas leakage detection system was proposed, designed and successfully implemented. Along with gas leakage detection, this system gives a fully automated approach towards the gas booking. Continuous weight measurement of the gas and its display on LCD makes it an efficient home security system and also can be used in industries and other places to detect gas leaks. The cost involved in developing the system is significantly low and is much less than the cost of gas detectors commercially available in the market and the automatic booking is time consuming is part of project.

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