Smart Gas Booking System & Leakage Detection

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ABSTRACT: We all are very busy in our daily life and it is difficult to know the level of LPG gas cylinder. If LPG is going to finish without informing us it can create difficult condition for cooking etc. Our system design can help us to avoid such kind of problem in our daily life. Our design is based on ARM controller, it can track LPG emptiness all the time if LPG is very close to finish or at empty level then it can alert us by sending SMS to LPG Agency for ordering the LPG cylinder. As per current government regulations, intense demand but shortage in production of LPG cylinder, once a new cylinder is booked we need to wait for some days to get it delivered. The other idea of our project is that it continuously monitors the level of the LPG present in the cylinder using load cell. If the gas level reaches below the threshold limit of gas around 2 kg so that the old empty cylinder is replace by new one in time and automatically books the cylinder using a GSM module.

LPG gas leakage detection projects main idea is to implement security system for detecting leakage of gas in the house. Now days there are many cases related to gas leakage which cause innocent people lives and property damage. This system detects the leakage of the LPG and sounds the alarm to alerts the consumer also it send the SMS about the gas leakage. It can also turn off the main power supply.
The presence of dangerous LPG leakage in the gas vehicle (cars, van, auto), companies can be detected using the Ideal Gas Sensor. The system can be simply integrated into a unit that can sound an alarm. This system is very useful to avoid the hazardous.

KEYWORDS: ARM7 controller, Gas sensor MQ6, GSM Module, Load cell, GAS valve, keil micro vision 4.

I. INTRODUCTION

LPG is made up of Commercial Propane and Commercial Butane having saturated as well a sun saturated hydrocarbons. Because of its versatile nature of LPG it is used in many needs such as domestic fuel, industrial fuel, auto-mobile fuel, illumination etc. and the demand for LPG is continuously increasing day by day. The liquefied petroleum gas is used widely in homes, industries and in auto-mobiles as fuel because of its desirable properties which include high calorific value, it creates very less smoke and does not cause much harm to the environment.

Natural gas is another widely used fuel in homes. Both burns to produce clean energy, however there is a serious threat about the leakage. The gases being 5 times heavier than air do not disperse easily and may lead to suffocation when inhaled also the leakage gases when ignited may lead to explosion. The number of deaths due to the explosion of gas cylinders has been increasing in recent years. There is a need for a system to detect and also prevent leakage of LPG.

Before the development of electronic house hold gas detectors in the 1980s and 1990s, 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 SMS away. Petroleum companies have launched the Customer-friendly service called as IVRS (Interactive voice Response) technique for their customers.

Our system provides security from the gas leakage; it detects leakage and takes control action over it. It is helpful for us to avoid explosion it also have provision for automatic gas booking.

II. RELATED WORK

Various methods for gas booking are there in current system. This system shows that there is more time required to deliver LPG after booking. There is no such facility of continuous gas level monitoring system. And also there is no provision for gas leakage detection and control action on gas leakage.We all are very busy in our daily life and it is difficult to know the status of LPG gas cylinder. If LPG is going to finish without informing us it can create very difficult condition for cooking etc. There is no facility for gas leakage detection and control action.

➢ **Current System in Village**
We book gas cylinder when it gets empty by calling gas agency and agency will gives us booking number, with this booking number we got receipt from agency office. Then one has to go in store room for taking cylinder.

➢ **Current System in City**
In current system there is facility of booking gas by calling agency and automatically registered of mobile number and address of owner. So the agency delivers the cylinder on that address. But there is also problem occur if gas will finish within that days then we have to wait for delivery of LPG.

➢ **Smart Gas Booking System**
Our proposed design can help us to avoid such kind of problem in our daily life. Our design is based on ARM controller, it continuously monitor level of the gas. If the gas level is reaches to the threshold level, then automatically SMS send to the agency and cylinder is booked.
It also has provision to detect gas leakage and controlling, the regulator knob is turn off automatically if the gas leakage is takes place.

III. PROPOSED WORK

➢ **BLOCK DIAGRAM DESCRIPTION**
The basic block diagram of the "Smart gas booking, leakage detection and controlling" using ARM controller is shown in below figure. Mainly this block diagram consists of the following essential blocks
1. Power Supply
2. ARM Controller
3. Gas Sensor
4. LCD Display
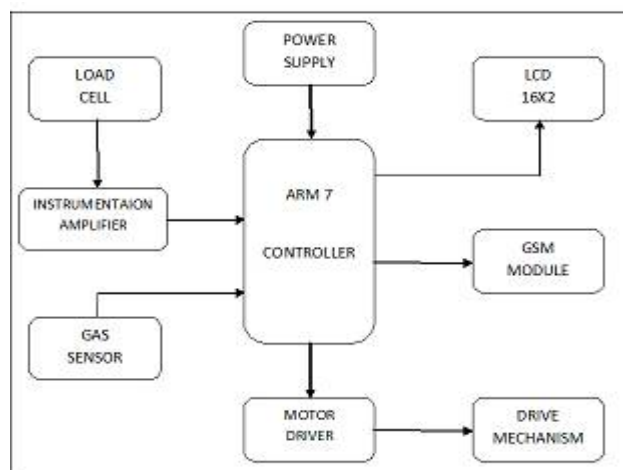5. Load Cell
6. GSM Module
7. DC motor

Fig. 1 Block Diagram

❖ **Power Supply Unit**

Linear regulated power supply, all the electronic circuit needs a dc voltage is derived from the single ac phase main supply. For this purpose we have to use a regulated dc power supply.

❖ **ARM Controller**

ARM (Advance RISC Machine) is an 16 bit/32 bit ARM7TDMI-S CPU with real-time emulation and embedded trace support, that combine the ARM controller high speed flash memory ranging from 32 KB to 512 KB. A128-bit wide memory interface and unique accelerator architecture enable 32-bit code execution at the maximum clock rate. For critical code size applications, the alternative 16-bit Thumb mode reduces code by more than 30\%\ with minimal performance penalty. It is small in size and low power consumption, LPC2148 is ideal for applications where miniaturization is a key requirement, such as access control and point-of-sale. Serial communications interfaces ranging from a USB 2.0 Full-speed device, multiple UARTs, SPI, SSP to I2C-bus and on-chip SRAM of 8 kB up to 40 kB, make these devices very well suited for communication gateways and protocol converters, soft modems, voice recognition and low end imaging, providing both large buffer size and high processing power. Various 32-bit timers, single or dual 10-bit ADC(s), 10-bit DAC, PWM channels and 45 fast GPIO lines with up to nine edge or level sensitive external interrupt pins make these microcontrollers suitable for industrial control and medical systems.

❖ **Gas Sensor Circuit**

A gas sensor is a device which is used to sense gas leakage of its surroundings. MQ-6 is used for gas leakage detection MQ sensor composed by micro AL200 ceramic tube, Tin Dioxide (SnO2) sensitive layer, measuring electrode and heater are fixed in to crust made by plastic and stainless steel. The heater provides necessary work condition for work of sensitive components. The envelope MQ-6 has 6 pins, 4 of them are used to fetch signals, and other 2 are used for providing heating current.

Here MQ-6 sensor works on basics of combustion process, and output is given in variable voltage form, so, when gas is leakage voltage of output pin of MQ-6 is increased and we use IC2 (OPAMP LM324) as a comparator for compare gas leakage with respect to normal condition.

❖ **LCD Display**

Interfacing between ARM 7 controller and the LCD is required for displaying the status of LPG cylinder. The LCD is set to 16x2 display. Depending on the status of LPG cylinder, the LCD displays the quantity of gas remain in the cylinder and also displays the leakage of the gas if leakage occurs. The data from the ARM 7 controller is communicated using upper 4 bits of one-of the ports and the data pins of the LCD is connected to data pins D4, D5, D6, D7 of the LCD. The LCD is enabled by using Enable (E) pin. R/W pin is used to Reading and writingdata to the LCD.

❖ **GSM Module**

GSM Modem can use any GSM network operator SIM card and act just like a mobile phone with its own unique phone number.We use this modem because it has the advantage, it can use its RS232 port to communicate and develop embedded applications. Applications like logging, remote control,SMS Control and data transfer can be developed easily. The modem can either be connected to PC serial port directly or to any controller. It can be used to send and receive SMS or make/receive voice calls. It is also used to connect to internet viaGPRS mode and do many applications for data logging and control. In GPRS mode you can also connect to any remote FTP server and upload files for data logging. This GSM modem is a highly flexible plug and play quad band GSM modem for direct and easy integration to RS232 applications. Supports features like Voice, SMS, Data/Fax, GPRS and integrated TCP/IP stack.

❖ **ADVANTAGES**
1. It insures the security from the gas leakage and hazards.
2. It is very less time consuming and cylinder replace in time.
3. Easy implementation.
4. It is fully automated system; errors due to human are control.

❖ **DISADVANTAGES**
1. Gas sensor should be high enough sensitive to detect gas leakage.

2. If we can use another sensor then cost will be high.
3. It should be real time.

❖ **APPLICATIONS**

This system can be used in different parking area like

1. House hold purpose
2. Gas agency
3. Chemical factory
4. Companies
5. Hospitals etc.

➤ **FUTURE WORK**

1. We can turn off the room power supply when gas leak.
2. System can be battery operated.
3. We can drive the regulator by dc motor.

IV. PRAPOSED ALGORITHEM

1. Start
2. Initialize all input and output ports.
3. Initialize LCD display, GAS sensor, GSM module.
4. Display the level of Gas on LCD.
5. If the level of gas is 2 kg then send SMS to the agency.
6. If gas leakage takes place then sound the alarm and send SMS to the customer.
7. Then turn off the main gas valve.
8. Go to step 4.

V. RESULT AND DISCUSSION

Fig. Gas booking

In this way we implement our system. It is help in gas booking automatically when gas level (i.e. 2 kg) reaches to the threshold level SMS will be send to the agency i.e. "REGISTER THIS NUMBER". It also continuously displays the level of the gas in the cylinder.

Fig. 2 Gas Leakage Detected

It is also useful in gas leakage detection and alert by SMS to the owneras shown in fig.2. It will turn off the solenoid pressure valve automatically. SMS "GAS DETECTED" is send to the owner mobile number. It will avoid dangerous explosion and save human life. It is very fast in response.

VI. CONCLUSION

The automatic gas booking system was proposed, designed and successfully implemented in this paper for human simplicity and gas leakage detection is useful in home safety and industrial applications. This system detects the leakage of the gas and alerts the owner about the leakage of gas by SMS, while activating the alarm. The system continuously monitor the weight of the gas cylinder 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. This project is implemented using the ARM controller and simulated using the Keil software. 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.

VII.   ACKNOWLEDGMENT

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