

LPG Leak Detector using GSM Technology

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Abstract— Now a days the home safety detection system plays the important role for the security of people. Since today's condition all the people from the home goes to work on daily bases, it make impossible to have check on the appliances available at home specially LPG gas cylinder, wired circuits, Etc. whereas in industrial system it also make difficult for the employees to keep the track of every second so to work on this problem, In this paper the system is develop which is able to keep the track on numerous home appliances like LPG gas cylinder, CNG vehicles etc. This system uses MQ6 gas sensing element to discover flammable gas run and we used Arduino microcontroller for controlling the system along with LCD display and GSM Module which send the alert message if the gas leakage will take place. This makes easy for both the commercial as well as domestic sector to keep the track on problem faced on daily bases. This system effectively track the problems arises in day to day life.

Keywords: LPG, MQ6 gas sensor, CNG, GSM

I. INTRODUCTION

Inflammable gases are widely used in industry, heating systems, home appliances and vehicles]. This includes combustible gases like Liquefied Petroleum Gas (LPG), propane, ethane, butane, methane, ethylene etc. also referred to as propane or butane are normally stored in pressurized cylinders in liquid form and vaporize at normal temperatures. A leakage can ignite and cause explosion. Therefore, the leakage detection of gases has gained more interest in recent years especially in fields of safety, industry, environment, and emission control. A conventional gas leakage system uses on-the-spot alarms as a warning to point the leakage. The disadvantage of the conventional leakage system is that it becomes ineffective in the absence of first response team on-site. This may delay the preventive actions causing damage to life and environment. Therefore, there is a need for a system to find the outflow and send the knowledge to the first response team through wireless system. A leakage detection system that initiates a warning SMS will be more effective in the absence of people on-site. Moreover, the leakage wake-up message may be sent to fireside station yet. Gas leakage find or designed with Arduino microcontroller to detect and send information through GSM is presented Alternatively, an MQ6 gas sensor can be used in the detection system to detect several flammable gases creating them ideal for use in a variety of environments. MQ6 gas sensor clearly have many advantages as far as the high-performance systems are concerned wherever smoothing filters are needed to clean the gas sensor data. In this paper, we propose a leakage detection system that uses MQ6 gas sensor to detect the leakage with a alert message using GSM module initiating feature to the first response team. LPG is used to test the system.

II. PROPOSED SYSTEM

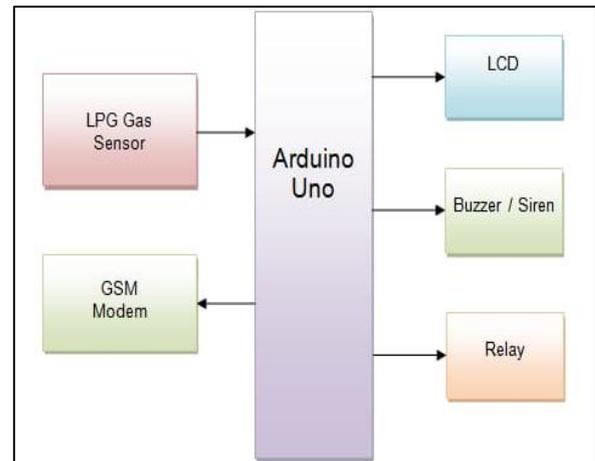


Fig. 1. Block Diagram of LPG gas detector using GSM.

III. WORKING PRINCIPLES

A. LPG Sensor:

LPG Sensor detects the leakage and gives analog output in mV. We feed the mV output signal to Amplifier. Amplifier is nothing but an Instrument Amplifier used to amplify the low signal. To convert that analog output in digital we use here ADC which is directly interfaced with microcontroller. To display the Leakage in PPM we use seven segment displays. One alarm is also provided there to connect any hooter or buzzer. It is used to give alert in case of any high leakage through SMS. So by using this device user able prevent fire accident due to LPG.

B. Warm up Time

The sensor needs 10 minutes of warm up time after first power is applied. After 10 minutes you can take its readings. During warm up time the output analog voltage would go up from 4.5V to 0.5V in variation down gradually. During this warm up time the sensor reading should be ignored.

C. Using the Sensor

The sensor needs 5V to operate, Give regulated +5V DC supply, the sensor will take around 180mA supply. The sensor will heat a little bit since it has internal heater that heats the sensing element.

IV. HARDWARE DESCRIPTION

A. Microcontroller



Fig. 2: Microcontroller

ATmega-328 is basically an Advanced Virtual RISC (AVR) micro-controller. It supports the data up to eight (8) bits. ATmega-328 has 32KB internal built-in memory. This micro-controller has a lot of other characteristics. You should also have a look at Introduction to PIC16F877a (it's a PIC Microcontroller) and then compare functions of these two Microcontrollers.

ATmega328 has 1KB Electrically Erasable Programmable Read Only Memory (EEPROM). This property shows if the electric supply supplied to the micro-controller is removed, even then it can store the data and can provide results after providing it with the electric supply. Moreover, ATmega-328 has 2KB Static Random Access Memory (SRAM). Other characteristics will be explained later. ATmega328 has several different features which make it the most popular device in today's market. These features consist of advanced RISC architecture, good performance, low power consumption, real timer counter having separate oscillator, 6 PWM pins, programmable Serial USART, programming lock for software security, throughput up to 20 MIPS etc. ATmega-328 is mostly used in Arduino. The further details about ATmega328 will be given later in this section.

B. MQ6 Gas sensor

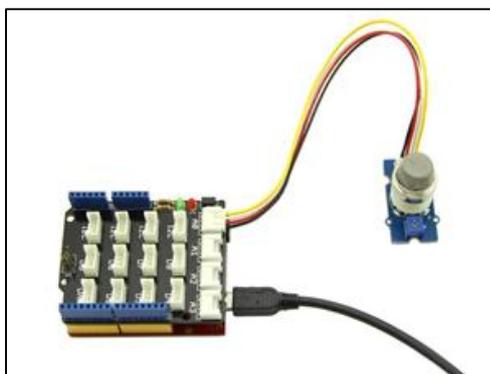


Fig. 3: gas detector

Sensitive material of MQ-5 gas sensor is SnO₂, which with lower conductivity in clean air. When the target combustible gas exist, The sensors conductivity is more higher along with

the gas concentration rising. Please use simple electrocircuit, convert change of conductivity to correspond output signal of gas concentration.

MQ-5 gas sensor has high sensitivity to Methane, Propane and Butane, and could be used to detect both Methane and Propane. The sensor could be used to detect different combustible gas especially Methane, it is with low cost and suitable for different application

C. Liquid Crystal Display (LCD)



Fig. 4: LCD display

An LCD consists of two glass panels, with the liquid crystal material sandwiched in between them. The inner surface of the glass plates are coated with transparent electrodes which define the character, symbols or patterns to be displayed. Polymeric layers are present in between the electrodes and the liquid crystal, which makes the liquid crystal molecules to maintain a defined orientation angle. One each polarizer are pasted outside the two glass panels.

When sufficient voltage is applied to the electrodes, the liquid crystal molecules would be aligned in a specific direction. The light rays passing through the LCD would be rotated by the polarizer, which would result in activating / highlighting the desired characters.

The LCD's are lightweight with only a few millimeters thickness. Since the LCD's consume less power, they are compatible with low power electronic circuits, and can be powered for long durations. The LCD's don't generate light and so light is needed to read the display. By using backlighting, reading is possible in the dark. The LCD's have long life and a wide operating temperature range. Changing the display size or the layout size is relatively simple which makes the LCD's more customer friendly.

D. GSM Modem



Fig. 5: GSM Modem

GSM module is used to establish communication between a computer and a GSM system. Global System for Mobile communication (GSM) is an architecture used for mobile communication in most of the countries. Global Packet Radio Service (GPRS) is an extension of GSM that enables higher data transmission rate. GSM/GPRS module consists of a GSM/GPRS modem assembled together with power supply

circuit and communication interfaces (like RS-232, USB, etc) for computer. The MODEM is the soul of such modules.

V. ADVANTAGE

- 1) Simple analog output
- 2) High sensitivity to LPG, iso-butane, propane
- 3) Small sensitivity to alcohol, smoke
- 4) Fast response
- 5) Wide detection range
- 6) Stable performance and long life

VI. APPLICATION

- 1) A Gas leakage detector (Domestic)
- 2) Combustible gas detector (Industrial)
- 3) Gas detector (Portable)
- 4) Homes
- 5) Factories
- 6) LPG storage
- 7) Gas cars
- 8) Hotels

VII. FLOW CHART

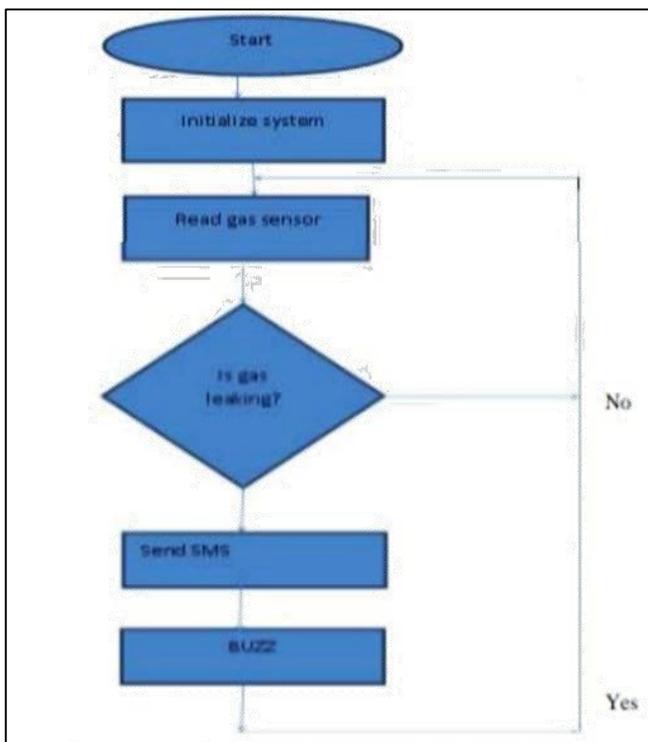


Fig. 6: Gas Leakage and Alarm System Flow Chart

VIII. RESULTS

The designed system prevents gas leakage inside homes as well as outside homes. The system detects the LPG gas concentration in the air if it exceeds a safety level and then responds by using GSM to send sms to the consumer. The LED and Buzzer are activated to alert the consumer in case of gas leakage and the system displays the message on LCD display.



IX. CONCLUSION

We have tested our system both hardware and software in our lab. We have successfully completed it. It is working properly according to our project ideas.

LPG Gas Leakage is a major problem in many industries and households. We have designed such a system which can detect Gas Leakages effectively using a gas sensor and alert people either by using GSM to send a message to their mobile phones or by activating the LED, Buzzer. Hence our Project will definitely prove to be a boon for households and industries in preventing future gas leakages.

Finally, we conclude in recent households, the use of LPG is taking a big roll, from the use of cylinder up to the use of petroleum pipelines. The biggest trouble in using this kind of technology is security problem, and our project will strike it out for households and industries. Although the market price is quite high of this device, yet we have tried to limit this high price within. The leak detecting techniques are categorized into various ways for gas pipelines. Some techniques have been improved since their invention and some new ones were designed resulting in advancement of sensor manufacturing and computing power. Leak detection techniques in each category hold some advantages and disadvantages. For example, all external detection technique is done from outside of the pipelines. It not only detects the leakage but the leakage location also. But the detection of this leakage location is very long. Mathematical model based detection of the pipe shows good results at high flow rates while for low flow rates a mass balance based detection system would be more suitable. Hybrid systems take the advantage of the real-time detection capability of a software based method. The high localization accuracy of a hardware based technique, along with other specific advantages is supposed to be the future trend in gas leak detection. Between these ample varieties of commercial solutions available is ultimately an action that has to be taken after evaluating the needs of the system in which gas leak detection is required.

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