



LPG Detection Using GSM Module

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ABSTRACT: Gas leakage is one of the big problems with industrial sector, residential milieu and gas functioning vehicles like CNG (Compressed Natural Gas) buses, cars etc. One of the contraceptive methods to stop accidents associated with the gas leakage is to install a gas leakage detection device at vulnerable places. The system detects the leakage of the LPG using a gas sensor and uses the GSM to alert the person about the gas leakage via SMS. When the concentration of LPG in air exceeds a certain level, the sensor senses the gas leakage and the output of the sensor goes LOW. The detection is done by the gas sensor, through the microcontroller the LED and buzzer are turned ON simultaneously. An alert is provided to the user, sending an SMS to the programmed mobile number.

KEYWORDS: Liquefied Petroleum Gas, Temperature and gas sensor, PIC Microcontroller, GSM Module.

I. INTRODUCTION

Liquefied Petroleum Gas is constituent of Butane and Propane gases, which are highly inflammable in nature. The LPG is an odorless gas and hence the addition of Ethanethiol allows it to exhibit an odor during its leakage. An ideal gas sensor can be used to sense the leakage of an LPG from vehicles, industries, homes and other residential areas. If there is a leakage of LPG, we can easily identify by its concentration through the gas sensor and by means of rise in temperature. The LPG is widely used for domestic purposes such as boiling, heating and cooking. Some people may have a low sense of smell and in such cases they may not be able to respond for the gas concentration present. Thus, a security based LPG detection system is essential to provide alertness, safety and security from any harmful gas leakage accidents.

The incidents such as Kumbakonam and Bhopal gas tragedy were the examples of the world's worst gas leakage accidents. This leakage detection system detects the gas leakage and also stops the gas supply along with an alarm and a GSM alerts the specified user. The gas sensor we used here, identifies the toxic gases apart from LPG and its voltage goes LOW when there is a leakage of any toxic gas. LOW signal is sent to a microcontroller which in turn sends those signals to the buzzer hence, rising an alarm. After a few milliseconds, the gas leakage message is sent to the user recognized mobile number via GSM module.

II. METHODOLOGY USED

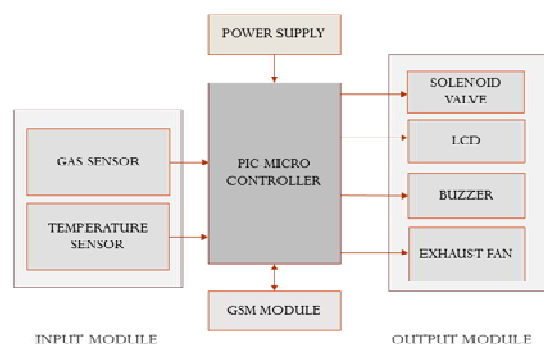


Fig. 1 Block diagram of a microcontroller based LPG detection system using GSM module

The Fig. 1 represents the block diagram of the system. The system consists of three main blocks,

- Input module
- Microcontroller/Processing unit
- Output module

The input module consists of a gas sensor (MQ7) and a temperature sensor (LM35). The gas sensor detects any change in concentration of gases in the air. If there occurs a change in concentration, the voltage of the gas sensor goes LOW. Similarly, if there is any fire or any abnormal temperature activity at the place, its voltage gets LOW. The increase of gas concentration in the air may also lead to a rise in temperature. Hence the LOW voltage is detected by the microcontroller.

MQ-2 Gas Sensor:

MQ-2 is a semiconductor type sensor used to detect the gas leakage. The sensor is made up of a sensitive material tin dioxide (SnO₂). The response of this sensor is low in the clean air. Apart from its sensitivity to propane and butane, it also can sense combustible gases such as methane.



Fig.2: MQ-2 Gas sensor.

The MQ-2 gas sensor has a concentration sensing range from 20 to 2000ppm. It consists of three pins. The two pins are used for a power supply V_{cc} (5V) and ground, the third pin is used for signal transmission.

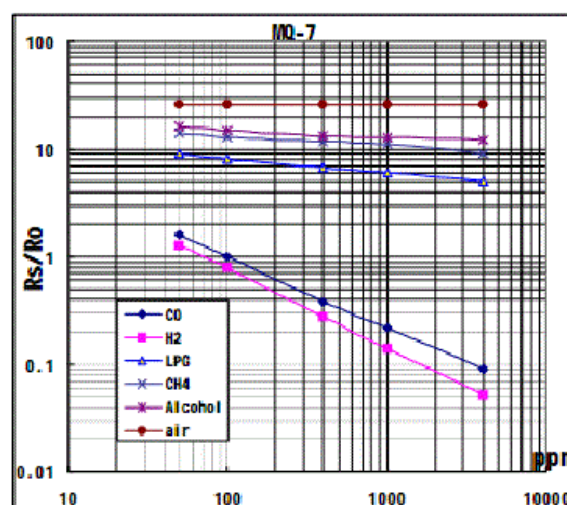


Fig.3: Typical sensitivity characteristics of MQ-7 for several gases.

The signal transmission pin is the one which sends the signal to the micro controller if there is any increase in the concentration of gases in the air.

LM-35 TEMPERATURE SENSOR:

LM35 is a temperature sensor used here to detect any change in temperature in any residential area. The sensor has an operating temperature range from -55°C to 150°C . The sensor has a scaling factor of $0.01\text{V}/^{\circ}\text{C}$.



Fig.4: LM35 Temperature sensor.

The output is proportional to the temperature. The sensor has three pins. The first one is a supply voltage V_{cc} and possess voltage value of 5V. The second pin is an output voltage pin, it generates a voltage of around -1V to 6V. The third pin is used as a ground here.

PIC MICROCONTROLLER:

PIC16F877A microcontroller is a device with 5 ports and an EEPROM of 256 bytes. The device is based on universal receiver and transmitter concept (USART). The PIC microcontroller has a high performance CPU. All the instructions are based on a single cycle, whereas the program branches are based on a double cycle. There are totally 40 pins. It has an operating speed of 200MHz of clock input and an instruction cycle of 200nS.

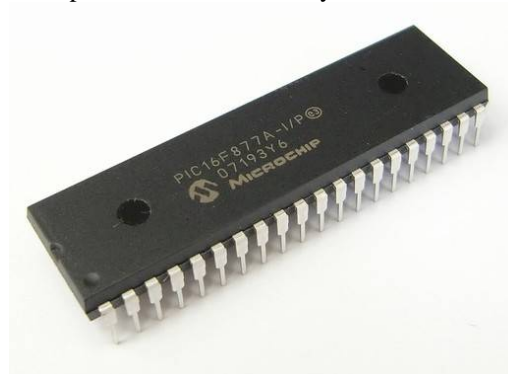


Fig.5: PIC16F877A Microcontroller.

The maximum operating frequency range is 20MHz, with a flash program memory of 8KB. The device also has 2 serial communication ports and a single parallel communication port along with a 10 bit A/D module. It operates on a 5V DC supply for serial programming along with the programmable code protection. The chip operates on a power supply voltage of 2 to 5.5V. It has an ability to reprogram for around 100,000 times.

GSM MODULE:

Global System for Mobile communications modem is a highly flexible switch and a play quad band SIM900A. The modem can be used for direct and an easy integration to RS232 applications. The modem can be connected to a microcontroller through MAX232. The modem is used in this security system to send and receive SMS from and to the recognized user. The module can accept any GSM network operator SIM card along with its unique phone number. The status of the device can be indicated by LED.



Fig.6: GSM modem.

The modem has a transmission rate of 22.8Kbps with an operating frequency of 890 to 915MHz. The modem can send SMS to a recognized user as soon as there is a leakage of gas or any rise in temperature.

III. CONCLUSION

The system is proposed to protect ourselves from any gas leakage in cars, industries, homes, hospitals, etc. Also to safeguard ourselves from gas leakage in heating gas fired appliances like boilers, domestic water heaters. It can be used in large industries which use gas as their production. It also provides safety from gas leakage in cooking gas fired appliances like ovens, stoves etc.

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