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LPG leakage detector with buzzer indication **using Microcontroller**

Under the Guidance of

Dr. VERGIN RAJA SAROBIN M

Team Members:-

Nikhil Teotia 21MCA1024

Joy Bhattacharjee 21MCA1015

Lakshay 21MCA1056

Nikhil Sarogi 21MCA1080

Alin Paul 21MCA1054

Vinayak Singh 21MCA1064

Abstract

Liquefied Petroleum Gas (LPG) is a main source of fuel, especially in urban areas because it is clean compared to firewood and charcoal. Gas leakage is a major problem in the industrial sector, residential premises, etc. Nowadays, home security has become a major issue because of increasing gas leakage. Gas leakage is a source of great anxiety with ateliers, residential areas and vehicles like Compressed Natural Gas (CNG), buses, and cars which are run on gas power. One of the preventive methods to stop accidents associated with the gas leakage is to install a gas leakage detection kit at vulnerable places. The aim of our project is to propose and discuss a design of a gas leakage detection system that can automatically detect, alert and control gas leakage. This proposed system also includes an alerting system for the users. The system is based on a sensor that easily detects a gas leakage.

Introduction

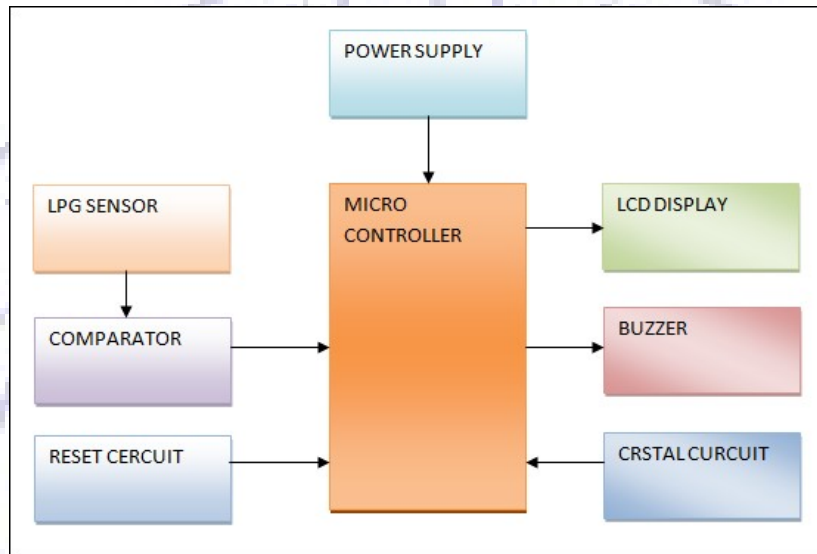
Gas leakage is a serious problem and nowadays it is observed in many places like residences, industries, and vehicles like Compressed Natural Gas (CNG), buses, cars, etc. It is noticed that due to gas leakage, dangerous accidents occur. The Liquefied petroleum gas (LPG), or propane, is a flammable mixture of hydrocarbon gases used as fuel in many applications like homes, hostels, industries, automobiles, and vehicles because of its desirable properties which include high calorific value, less smoke, less soot, and meager harm to the environment. Liquid petroleum gas (LPG) is highly inflammable and can burn even at some distance from the source of leakage. This energy source is primarily composed of propane and butane which are highly flammable chemical compounds. These gases can catch fire easily. In homes, LPG is used mainly for cooking purposes. When a leak occurs, the leaked gases may lead to an explosion. Gas leakage leads to various accidents resulting in both material loss and human injuries. Home fires have been occurring frequently and the threat to human lives and properties has been growing in recent years. The risks of explosion, fire, suffocation are based on their physical properties such toxicity, flammability, etc. The number of deaths due to the explosion of gas cylinders has been increasing in recent years. The Bhopal gas tragedy is an example of accidents due to gas leakage.

There are various projects based on sensors. And this is a low cost Microcontroller based project. Microcontroller based LPG gas leakage system using MQ6 (LPG Gas) sensor with Buzzer indication has applications in various areas including Industrial application, domestic application. This system is very useful in hotels, home, car, LPG agencies. This system has advance safety standard and most important this helps prevent accident occurred because of fire. It is also useful in protecting human life, wealth and property.

MQ6 (LPG Gas) sensor is used to detect LPG leakage this sensor has quick response time it responding very short period of time. Output of MQ6 sensor is given to Comparator. And output of comparator IC is given to microcontroller 89s51. Liquid crystal display – LCD display shows a message when MQ6 crosses threshold level. And also a Buzzer is turned on to give Alert

indication. We have provided a potentiometer which is used to vary the threshold level of comparator which decides the threshold level of leakage condition.

Architecture



BLOCK DIAGRAM DESCRIPTION:-

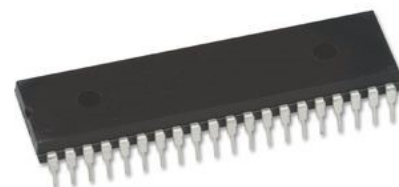
1) LPG gas sensor:-

LPG sensor is the sensor that measures the amount of gas in the surrounding environment. It gives voltage output. The output is in the form of analog voltage. This output varies from 0 to 5 volts.

2) MICRO-CONTROLLER (8051):-

It is the major part of the system. The 8051 has one serial port that receives and transmits data. Transmission and reception can take place simultaneously. The four communication modes possible with 8051 present the system designer and programmer with opportunities to conduct very sophisticated data communication network. It is the heart of the system which controls all the inputs and the controlling action to be taken at the output. Microcontroller used here is the AT89S51.

Figure: Photograph of an 89s51 microcontroller



3) LCD DISPLAY:-

Liquid Crystal Display which is commonly known as LCD is an Alphanumeric Display it means that it can display Alphabets, Numbers as well as special symbols thus LCD is a user friendly Display device which can be used for displaying various messages unlike seven segment display which can display only numbers and some of the alphabets. The only disadvantage of LCD over seven segment is that seven segment is robust display and be visualized from a longer distance as compared to LCD. Here we have used 16 x 2 Alphanumeric Display which means on this display we can display two lines with maximum of 16 characters in one line.

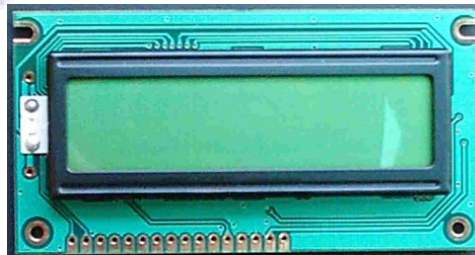


Figure: Photograph of A typical 16 by 2 alphanumeric LCD display

4) Comparator:

The output voltage of LPG sensor is in analog form. And the 89s51 microcontroller cannot read analog voltage. That's why we have used comparator in our project. The output voltage from sensor and voltage divider is given to the comparator. This comparator compares the voltage from sensor and gives output to the microcontroller.

5) Buzzer:

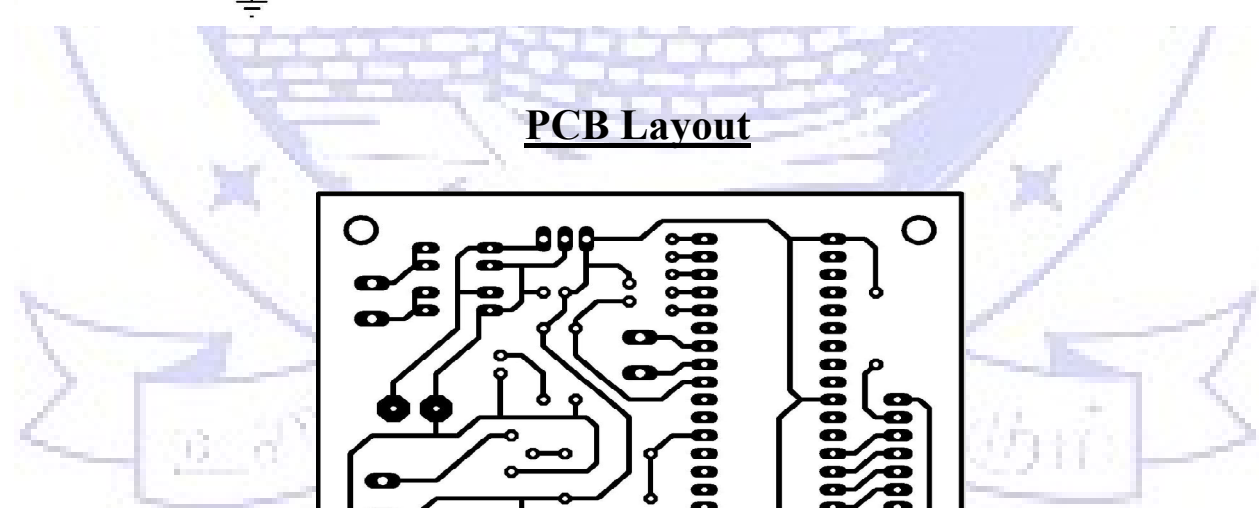
We have used a piezoelectric buzzer in our project. It is used for alert indication. The buzzer will be turned on when sensor value goes above the desired value.

Implementation

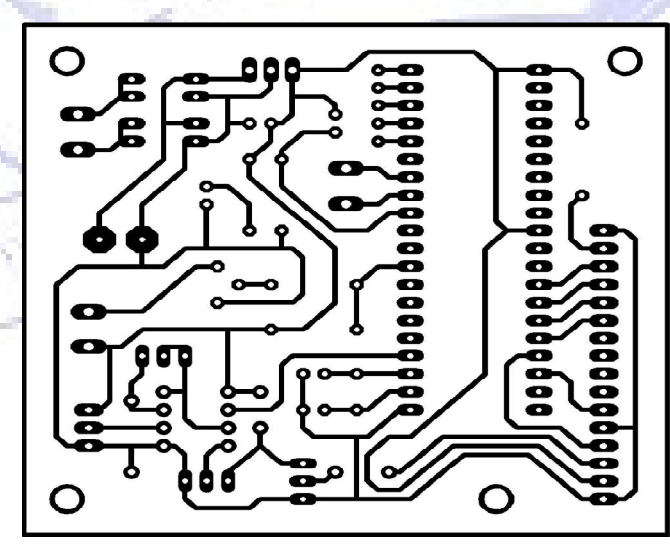
In this project, semiconductor sensors are used to detect LPG gas. An MQ6 semiconductor sensor is used. Sensitive material of the MQ-6 gas sensor is SnO_2 , which has lower conductivity in clean air. When the target combustible gas exists, the sensor conductivity increases along with the rising gas concentration. The MQ6 gas sensor has a high sensitivity to Propane, Butane and LPG, and response to Natural gas. The sensor could be used to detect different combustible gasses, especially Methane; it has a low-cost and is suitable for different applications. The MQ-6 can detect gas concentrations anywhere from 200 to 10,000ppm. The sensor's output is an analog resistance.

This system is based on the Micro-Controller (8051) and MQ-6 gas sensor. When the sensor detects gas in the atmosphere, it will give digital output 1 and if gas is not detected the sensor

and usually illuminates a light on the appreciate button or comes on in the form of a continuous or intermittent buzzing or beeping



PCB Layout



Component List

	ICs	
Sr no	Component Name	Quantity
1	89S51	1
2	IC Base 40 Pin	1
3	LM358	1
4	IC Base 8 pin	1
	Capacitors	
Sr no	Component Name	Quantity
1	102	2
2	103	2
3	1000microF	1
4	100microF	2
5	10microF	1
6	33pF	2
7	4.7microF	2
	Miscellaneous	
Sr no	Component Name	Quantity
1	Crystal 11.0592 MHz	1
2	1N4007	5
3	7805	1
4	7812	1
5		
6	BC547	1
7		
8	LCD	1
9	LED	5
10	PBT2	1
11	PBT3	1
12	Relay	1

13	Transformer	1
14		
	Resistor	
Sr no	Component Name	Quantity
1	100E	6
2	10k	4
3	15k	2
4	1k	2
5	27k	2
6	2k2	4
7	3k3	1
8	4k7	3
9	POT1 5k	1
10	POT2 10k	2
11	PULLUP	1
	Connector	
Sr no	Component Name	Quantity
1	02 Pin	4
2	03 Pin	2
3	16 Pin	1
4	ISP 06Pin	1

Result & Analysis

The Proteus Design Suite is a proprietary software tool suite used primarily for electronic design automation. The software is used mainly by electronic design engineers and technicians to create schematics and electronic prints for manufacturing printed circuit boards. Figure shows the circuit diagram that was designed using Proteus libraries. This system is based on Micro-Controller (8051) and MQ-6 gas sensor. When the sensor detects gas in atmosphere, it will give a digital output of 1 and if gas is not detected the sensor will give a digital output of 0. Micro-Controller will take the sensor output as the digital input. If sensor output is high, then the buzzer will start tuning and the LCD will show that “Gas detected: Yes”. If sensor output is low then the

buzzer will not be tuning, LCD will show that “Gas detected: No”. The detector incorporates a MQ-6 sensor (with gas detection range of 300–10,000 ppm) as the LPG gas sensor, LCD for displaying gas concentration, a buzzer as an alarm and a number of LEDs to indicate the gas leakage status. The microcontroller senses the presence of a gas when the voltages signal from the MQ-6 sensor goes beyond a certain level and gives an audiovisual alarm

If the system detects the level of gas in the air that exceeds the safety level it will activate the alarm which includes the buzzer to alert the users at home of the abnormal condition and to take any necessary action. The most tell-tale sign of a leak is the smell of gas in the home. However, in the case of a carbon monoxide leak, there are also particular physical symptoms you may suffer from if there is a leak. The output result of this paper is that the leakage will be detected and stopped within 2s after the leakage starts. This system can even detect the level of gas leakage. This is an efficient method for automatically detecting and controlling the gas leakage. Moreover, the fire accidents are also prevented by switching off the power supply. The idea for gas detection and control can be implemented at a large scale for various industries. This system can be installed in a kitchen, at a hostel cafeteria, and any other areas. This can be helpful in reducing accidents caused by gas leakage in household as well as in any similar commercial set up. In our country there are 180 million people, and due to its low cost this product is affordable and will prevent many accidents and save many properties and human lives.

Conclusion

With the knowledge of new techniques in ‘Electronics’ we are able to make our life more comfortable. One such application of electronics is used in “LPG leakage detector with buzzer indication using Microcontroller” The approach we followed and which is explained in this project report is novel and has achieved the target of "LPG leakage detector with buzzer indication using Microcontroller" satisfying user needs and requirements.

The development of this project has shown how much hard work goes into the creation of a system. “LPG leakage detector with buzzer indication using Microcontroller” was a project based on microcontroller, due to which hardware requirement is reduced. Embarking of this project has helped us in developing a team spirit, patience and time management necessary for today's technical professionals.

Hence we can conclude that the required goals and objectives of our project have been achieved.

This project has built in us confidence that any problem can be solved with sheer determination, hard work and optimism. We feel that our product serves something good to this world and we

like to present it before this prosperous world. By doing this project, we were better able to understand the various facets of doing an embedded system project which is emerging as one of the most 'in demand' technologies right now.

References

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