Arm Based Gas Monitoring System

Harshada Navale, Prof. B.V.Pawar

Abstract: - In this paper, our aim is to monitor for liquid petroleum gas (LPG) leakage to avoid fire accidents and hazardous condition providing house safety feature where security has been an important issue today. This system detects and monitor the leakage of LPG using gas sensor and alerts the persons about the gas leakage using the buzzer and by sending the SMS. This system continuously monitors the level of the LPG present in the cylinder When the system detects the LPG concentration in the air exceeds the certain level it immediately alerts the persons by activating an alarm and sending message to the specified mobile phones. The Proposed system uses the GSM to alert the person about gas leakage via SMS .Simultaneously to take the necessary action it automatically switches on the exhaust fan and sprinkler to decrease the gas concentration in the air.

Index Terms: - Gas Sensor, microcontroller, GSM, gas leak detection and prevention

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I. INTRODUCTION

Liquid Petroleum Gas (LPG) is the mixture of propane and butane which is highly flammable chemical. It is odourless gas due to which Ethane-oil is added as powerful odorant, so that leakage can be easily detected [1]. Now a day LPG is one of the alternate fuel used. LPG is also used as fuel in vehicles due to increasing prices of diesel and petrol.LPG was first produced in 1910 by Dr. Walter Snelling. It is the mixture of saturated and unsaturated hydrocarbons. LPG is in versatile nature because of this it is used for many needs such as heating, domestic, industrial and automobile fuel. Day by day demand for LPG is on an exponential raise.LPG is used in many vehicles because of its desirable properties which include high calorific value, which produce the less smoke. Another widely used fuel in the home is the natural gas. Leakage of these gases in the air is the serious problem. The gases being heavier than air do not disperse easily and it may lead to suffocation when inhaled [3]. The gas leakage in the air causes explosion. The natural gas and LPG burn   produce clean energy but there is serious problem about their leakage. In recent years due to explosion of LPG number of deaths has been increased. Some people have low sense of smell this may or may not respond on low concentration of gas leakage. In this case, some high security system become necessary and essential. Present system protects the accidents from gas leakage. Bhopal and Chernobyl gas tragedy was an example of gas leakage tragedy in India and Japan. This was world's worst gas leakage accident. Gas leakage detection is not only important but also stopping leakage is equally essential and necessary [4].Hence we designed the system to detect and also prevent leakage of LPG. Gas leak detection is the process of identifying potentially hazardous gas leaks by sensors. Here we intend to use a microcontroller based system where a gas sensor, MQ6 used to detect different combustible gases at low cost. This sensor has good sensitivity combined with a quick response time. ARM Microcontroller used to alert when the levels of gas detected is beyond safety limit.

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And also microcontroller to take emergency measures including alarm and switching on off the exhaust fan. The alert mechanism in this system includes an buzzer, sprinkler and an SMS sent to the stored numbers by using GSM.

II. SYSTEM ARCHITECTURE

Existing System:
In the system based on wireless sensor network carbon dioxide (CO_2) concentration monitoring system is developed in allusion of gas leakage monitoring requirement for CO_2 capture and storage. The sensors array of CO_2, temperature, humidity, and light intensity are used to collect data and the GPS receiver module is adopted to collect location and data information. The online monitoring Web GIS clients are developed using a PHP programming. But limitation of this system it uses internet for monitoring. Which means it should have 24/7 internet connection. This System only raises an alarm and don't performs any action to prevent or reduce any the damage.

Proposed System:
The proposed system [fig1] is used to monitor the gas leakage detection and prevention of gas leakage. The methodology of the proposed system is mainly divided into the three steps. In the initial step MQ6 gas sensor sense the gas leakage of the system. After that in second step ARM microcontroller receives the signal which has been send by the gas sensor. Then microcontroller sends the activation signal to the external attached devices[1]. In the last step many task operations will be performed like buzzer, sprinkler, exhaust fan and activation of GSM which sends the SMS to the specified numbers.
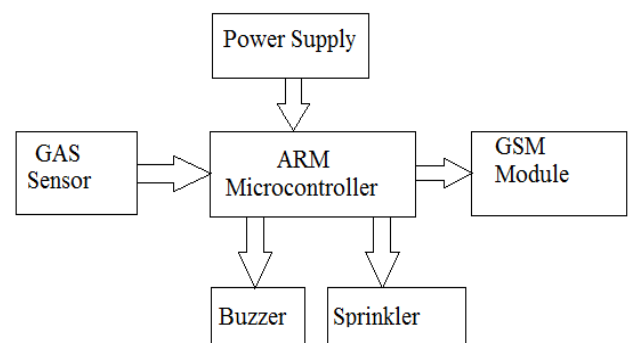


Figure 1. System Block Diagram

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Microcontroller:

Microcontroller is needed to continuously sense the sensor output. Also this is used to store some information which can be used for further processing. So LPC2148 microcontroller is used which is based on 32/16 bit ARM7TDMI-SCPU and this microcontroller is the heart of the system.This microcontroller controls all processes of the system, which consists ofembedded high speed flash memory ranging from 32 kB to 512 kB, a unique accelerator architecture enable 32-bit code execution at the maximum clock rate and 128 bit memory interface [4].Due to its tiny size and low power consumption where miniaturization is a key requirement at that time LPC2148 is ideal for applications such as access control. This is having 8 to 40 kB of on chip static RAM and also 32 to 512 kB of on chip flash program memory. Via on chip boot-loader software it is having facility of In-System/In-Application Programming (ISP/IAP). It is having one or two 10-bit A/D converters provide a total of 6/14analog inputs, with conversion times as low as 2.44 µs per channel. This system has is inbuilt crystal oscillator in range from 1 MHz to 30 MHz and with an external oscillator up to 50 MHz.

Gas Sensor:

The main function of system is to detect the leakage of LPG gas by using gas sensor. LPG gas consists of propane, methane and also isobutane. Our requirement is to have a gas sensor only to sense the LPG gas and less sensitive to other gases like cooking fumes and cigarettes. Hence MQ6 gas sensor is used which has SnO_2 sensitive material and also lower conductivity in air. This gas sensor is having higher sensitivity to Propane, Butane and LPG, and also has response to Natural gas [3]. This sensor is having simple drive circuit and it is portable gas detector which is having long life and low cost. It requires the 0-5 volt supply which is low as well as safe for gaseous environment. Sensor continuously sense the gas and if concentration level is beyond the set limit, it turns to the relay on which gives interrupt signal to the controller buzzer, sprinkler and exhaust fan turns on.
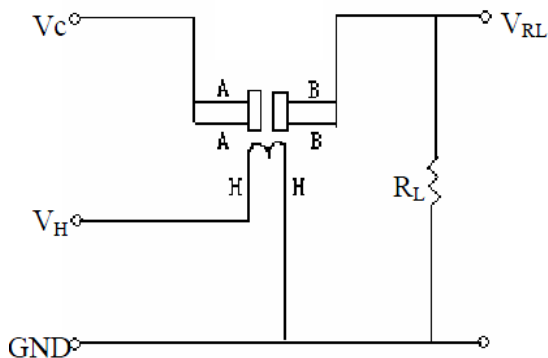
Figure2. Internal Circuit of Gas Sensor

The[Fig 2].is the basic test circuit of the gas sensor. This sensor needs to be put two voltage, heater voltage (VH) and test voltage (VC). VH used to supply certified working temperature to the sensor. VC is used to detect voltage (VRL) on load resistance (RL) which is in series with sensor.

Power of Sensitivity body(Ps):

$$Ps = Vc^2 \times Rs/(Rs + RL)^2$$

Resistance of sensor (Rs):

$$Rs = (Vc/VRL - 1) \times RL$$

GSM Module:

GSM module is used to send the short message about the status of gas leak. By using this, it is very easy to send and receive the message. It works on simple AT commands which can be implemented by interfacing to the controller receiver and transmission pin.GSM uses the combination of Time Division Multiplexing and Frequency Division Multiplexing [3].This requires one sim card with compatible to accept any card. This sim card is used to store the specified person numbers and only to these numbers message will be sent. It requires less memory to send and receive the message [5]. GSM SIM 300/900 works on frequencies 850 MHz, 900 MHz, 1800 MHz and 1900 MHz .It is, easy to use as plug in GSM module and also compact in size. The suitable operating voltage for this module is 5-12 V dc. It is designed along with RS232 convertor circuit. Initially modem is in auto baud mode. Using AT commands baud rate can be configured from 9600-115200 and it has internal TCP/IP protocol stack to enable to connect to internet via GPRS. The modem needs only 3 wires (Tx, Rx, GND) except Power supply to interface with microcontroller. Normal operation temperature is from the range -20 °C to +55 °C.

III. DESIGN OF PROPOSEDSYSTEM

The present system deals with the detection and prevention of the gas leakage as shown in [Fig3]. The gas sensor and arm microcontroller are used. Hence the gas sensor continuously sense the concentration of LPG gas. If concentration of gas is within set limit i.e. less than the fixed threshold value, then it keeps on checking periodically the concentration of gas in air. If concentration of the gas in air is beyond the set level then, it turns on the relay and gives the interrupt signal to the microcontroller to turns on the buzzer, sprinkler etc. and to the GSM module. This transmission is done by using RS232. Then this module sends the SMS to the specified numbers which are fixed into the system.
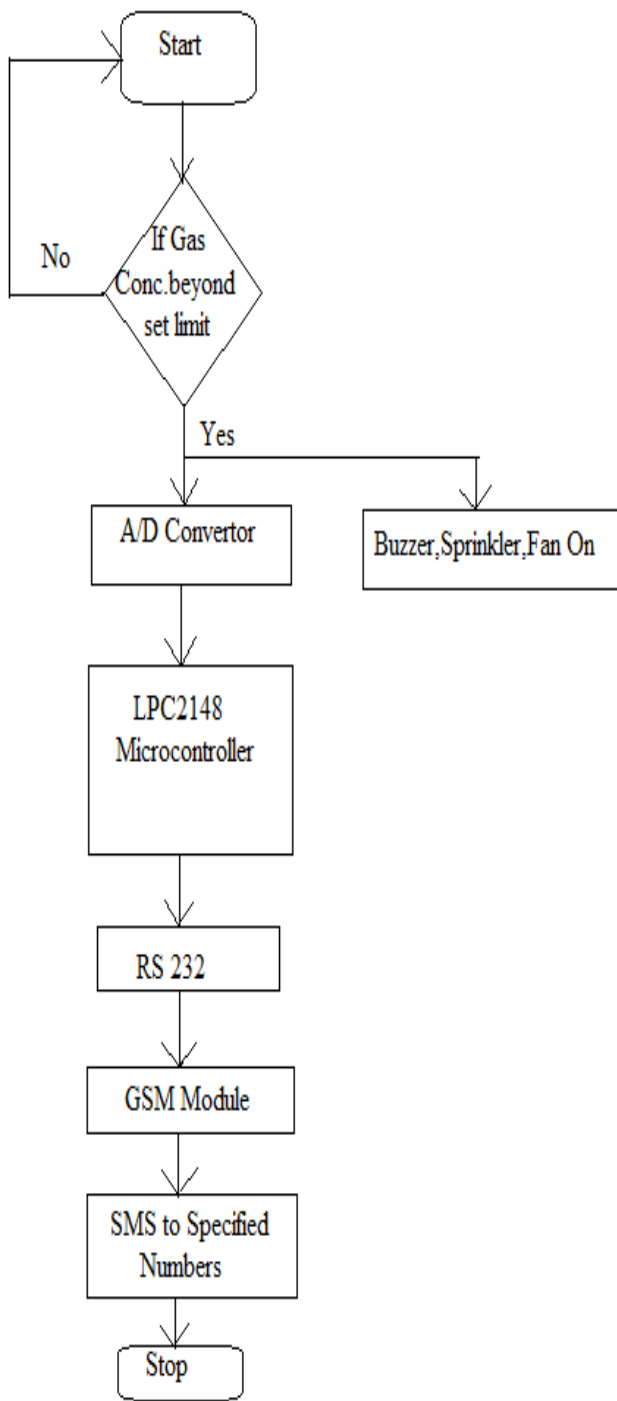
Figure 4. Simulation Output

Figure 3. Flowchart of gas monitoring

IV.RESULT

The system is developed and tested on simulation. The system simulation is done by using the [Fig4] Proteus software 8.0.and it is tested on simulation data. It is observed that, the system works very good for set threshold and give the output audio visual signal.
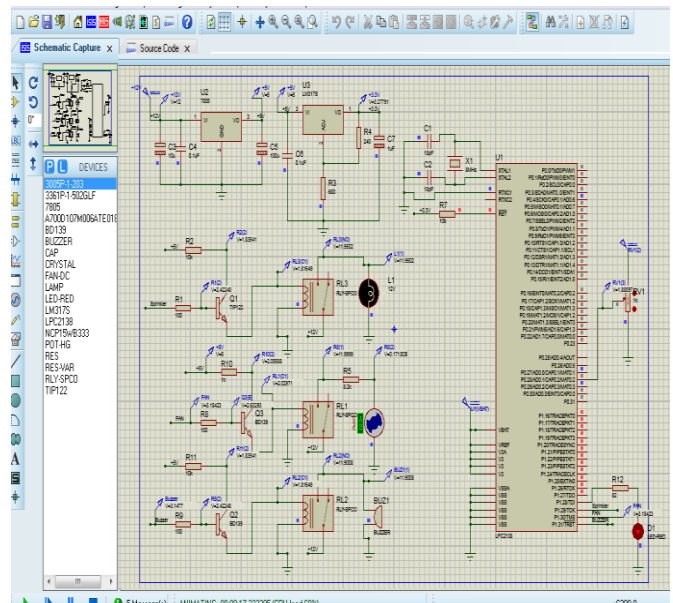
V. CONCLUSION

The proposed new approach to monitor and detect the leakage of LPG gas is simulated a developed which detects the leakage of gas in the air and if it exceeds safety level then it activates the buzzer and sends the SMS to the specified numbers by using GSM. Using this user gets alert in the hazardous and abnormal condition to take the necessary action. We can avoid the accidents caused by gas leakage with the help of this system.

VI. REFERENCES

[1]. LPG Leakage Monitoring and Multilevel Alerting System Selvapriya C*1, SathyaPrabha S2, Abdulrahim M3, Aarthi K C4 in November, 2013

[2]. A Security Alert System Using GSM For GAS Leakage

[3]. S.RAJITHA1 ,T.SWAPNA2 Electronics and Communication Engineering, AP, India in September-October 2012

[4]. Automatic LPG Booking, Leakage Detection And Real Time Gas Measurement Monitoring System B. D. Jolhe, P. A. Potdukhe, N. S. Gawai in April 2013

[5]. Online Monitoring of Green House Gas Leakage inIndustries Angel College of Engineering and Technology, Tirupur, Tamil Nadu, India. In Dec-Jan, 2014

[6]. Development of Movable Gas Tanker Leakage Detection Using Embedded System Mr.S.B.Patil, Dr.A.J.Patil Dec 2012.