Design and Implementation of Hazardous Gas Leakage Detection system for industrial area

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Abstract— Air pollution acts as the major problem since other type of pollution can be detected visually and by taste, but the toxic air cannot be detected, as it can be colourless, odourless and tasteless. Hence, there is an increasing demand for the environmental pollution control and monitoring systems.This work changes the presently available systems that are set industrial areas and this system can also be used in houses and at work place. The primary aim of the work is to design hazardous gas detecting system using four as sensors. This paper is based on a system, which is used to detect various hazardous gases with the help of Arduino microcontroller. The toxic gases like butane (also known as LPG), methane and carbon monoxide are sensed and displayed on the LCD screen. The concentration of the gasses will be shown in the form of percentage by LCD display.

Index Terms— Hazardous gas, Gas Sensors, Microcontroller (key words)

I. INTRODUCTION (HEADING 1)

With this rise in technology we have not succeeded to take care of our environment in which we live.Thus we have polluted the surrounding, thereby decreasing the quality of the environment we live. Hazardous gases are one that causes health problems, but are also used in industries in large quantities. These gases have to be monitored such that rise in the normal level of them could be detected and suitable safety measures can be taken. But the present systems available are not so handy, are expensive and hard to implement. So an embedded system is designed using ATmega 328 Microcontroller, for the purpose of detection of toxic gas leakage, which in turn neglects the dangers that have adverse effects on human lives.

The toxic gases like carbon monoxide, methane and LPG are mentioned here. The system is reasonable and can be easily implemented in the chemical factories and in localities which is surrounded by the chemical industries or plants. The system also has the provision to provide real-time monitoring of concentration of the gases which is present in the atmosphere. As this method is automatic the information can be given rapidly so that human lives can be saved in time.

In this paper section II gives literature survey on gas leakage detection. Section III discussed about proposed system operation with description of hardware components. Section IV and V gives result discussion and conclusion respectively.

II.SURVEY ON GAS LEAKAGE DETECTION

[1] Ganesh D, 2 Anilet Bala.A 1 "Improvement on Gas Leakage Detection and Location System Based On Wireless Sensor Network" , the paper focuses on the leakage of gas in petrochemical industries.It will locate the leakage point with the help of PIC microcontroller.

[2] "LPG Gas Leakage Detection and Alert System" E. Jebamalar Leavline1 , D. Asir Antony Gnana Singh2 , B. Abinaya3 Here LPG gas leakage system with alarm is designed for household uses.

[3] Falohun A.S, Oke A.O, Abolaji B.M and Oladejo O.E , the paper focuses on, detecting the leakage of the gas and in case of any leakage of gas it provides an alarm to the consumers and in addition it also switch off all the electrical appliances at home.

This system uses MQ-9 sensor to detect the leakage of gas.

III. PRPOSED SYSTEM

The functionality of system is divided into three main steps. In the initial step, the gas leakage is detected by the gas sensor. This detects the gas leakage and gives the signal to the microcontroller. After that in second step the microcontroller receives the signal, which sends by gas sensor. It sends activation signal to other external devices attached such as LCD display .The LCD display will show which gas is actually detected.
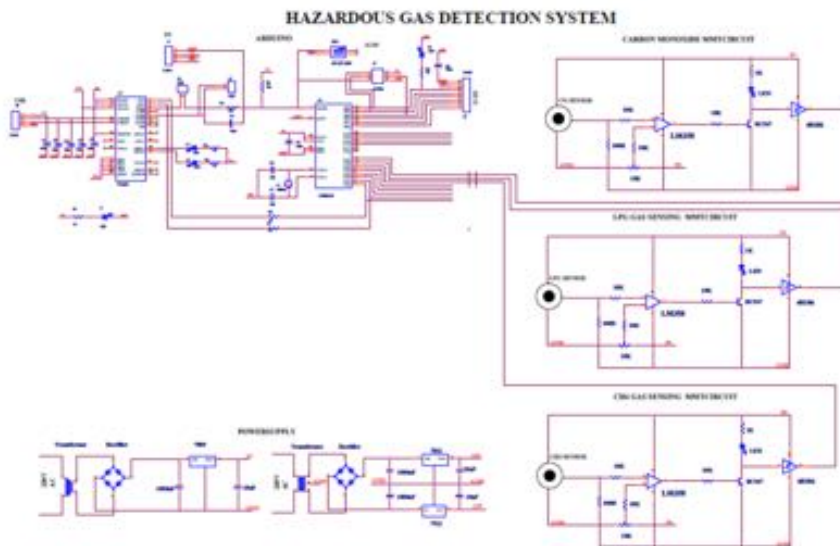
Fig. 1: Circuit Diagram Of the proposed Gas Leakage Detection System

The input which are the toxic gases are sensed through the particular gas sensors. In this system sensors for detecting Methane, LPG and carbon monoxide are used. Then this sensed value is passed to the Programmable Interface Controller. The signals that are sensed are analog in nature and are converted into digital form by the analog to digital convertor which is built inside the PIC.

The names of the gases which have been sensed are then displayed on the LCD and the concentration in percentage will be displayed on LCD according to the conditions present in programming.

Sensors used in the prescribed system explained below

MQ-2 Sensor: This is an ideal sensor, which used for the detection of the harmful LPG leakages at homes or in a work place, storage equipments as well as in vehicles in which the fuel used is LPG. This section is very easy to incorporate into a circuit with alarms, to start an alarm tone or even to show a visual view of the concentration of the gas. This sensor provides a good sensitivity along with with the good response time. Whenever input gas is present, the conductivity of the sensor is higher and the concentration rises.

MQ-2 gas sensor contain *Bakelite material* senses the toxic gases but give accurate values for LPG. It can also sense the natural gas available. It is Economical and handy.

MQ – 4 Sensor:MQ -4 sensors are used in systems with gas leakages detecting devices at small and in bigger levels. It is also able to detect CH4, Natural gas. They have fast response. They have stable and long life. They consist of simple drive circuit.

Arduino Microcontroller: Arduino is a source with open electronics prototyping platform based on flexible, easy-to-use hardware and software.Arduino is capable to sense the environment by getting an input signal from a different sensor and can accordingly control different operations.

The Arduino programming language is used to the program the microcontroller on the arduino board and it also uses the Arduino development environment. Here this Arduino gets the sensed information from gas sensor. An Arduino board consists of an AtMega microcontroller which is of 8-bits along with complementary components inorder to perform programming and its incorporation into the other circuits. A boot loader is used to preprogramme an Arduino microcontroller so that the programs to be uploaded on the on-chip flash memory is simplified to a great level in comparision with other devices that uses an external programmer.

LCD Display: The LCD (Liquid Crystal Display) screen is an electronic module which is used for displaying information. It has a large number of applications in day to day life. A 16*2 LCD display which is the common module is extremely used in various electronic circuits and devices. Mostly the LCD modules are preferred in comparison with the seven segments and the different other multi segments. This is because that the LCD is economical and can easily be programmed. It has no bounding of displaying special and custom characters, animations and a lot more. The meaning of 16x2 LCD is that it can display 16 characters per line and there are 2 such lines. Here each character is displayed in 5x7 pixel matrix size.

II. RESULT & DISCUSSION

The prototype of proposed detection system has tested by sensing a small amount of LPG, Methane and carbon monoxide gas near to the sensor.

MQ-4, MQ-2 and MQ-7 gas sensor detects Methane, LPG and carbon monoxide gas respectively. The signal from the different sensors are sends to the microcontroller After that microcontroller send an active signal to other externally connected devices. As a result, LCD display will show the names of detected gasses. In addition, the percentage of respective gas will be displayed on LCD. This testing has done at three different medium. Observations for the entire three medium indicated in the table given
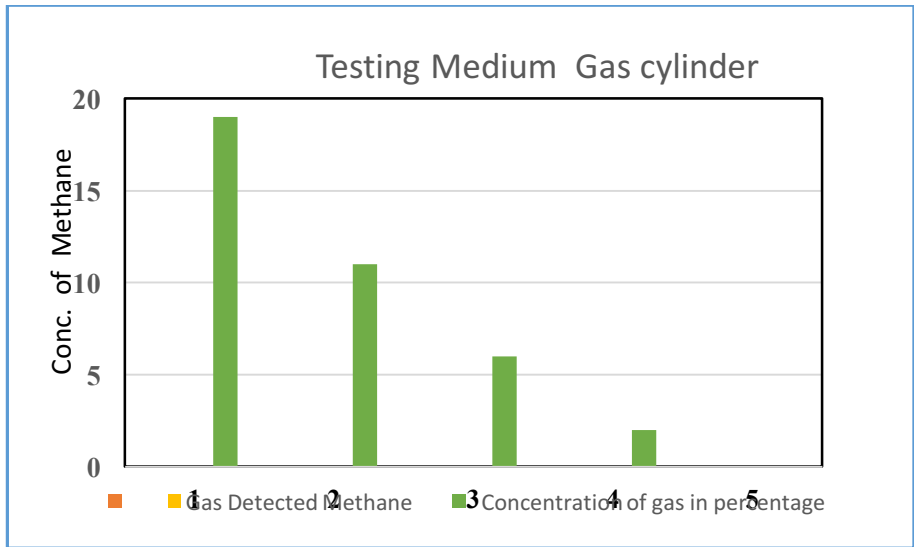
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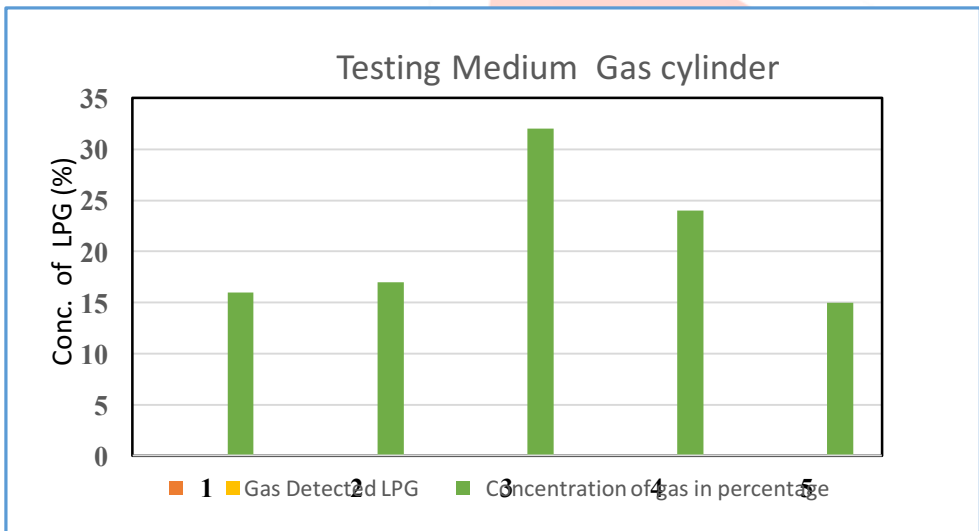Fig. 2: Analysis for detecting methane gas

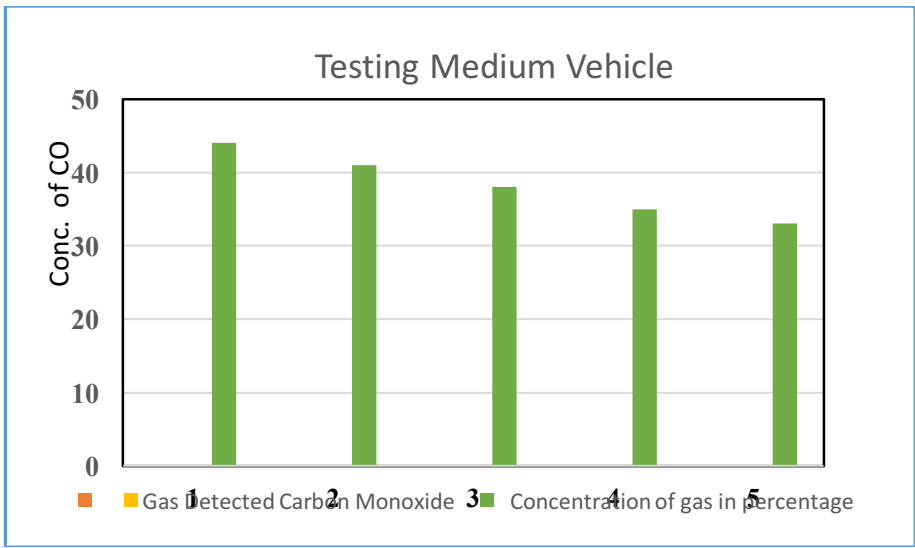Fig. 3: Analysis for detecting concentration of LPG

Fig. 4: Analysis for detecting concentration of Carbon monoxide

III. CONCLUSIONS

Hazardous gas detection device, which uses an embedded system, has been implemented in this paper.In this system we have describe a new approach for gas leakage detection system at a low concentration.The leakage is detected with the help of MQ-4, MQ-2and MQ-7 gas sensors. Sensor sends a signal to microcontroller. In the next step microcontroller sends an active signal to other externally connected devices. A quick response rate is provided by this system. With the help of this system, the critical situations can be solved quickly over the manual methods, which require large amount of time. For the industry application, number of sensors has to be increased in the system.

IV. ACKNOWLEDGEMENT

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