

## Gas Leakage Alarm

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**Abstract:** Safety plays a major role in today's world, we must implement good safety systems in places of work and education. Since some of the gases like carbon monoxides are colorless and odorless, we couldn't find the leakage of gas. This project modifies the modal of existing safety methods in industries and this gas leakage detection can also be used in homes and offices. This project's main objective is to build a microcontroller-based gas detection and alarm system. These gases were sensed by sensors like MQ3, MQ5, and MQ6 these sensors detect the gases like alcohol, ethanol, smoke, natural gas, LPG, and butane gas respectively, this information is transmitted to Arduino UNO, and based on those pieces of information, decisions are made by the microcontroller they are displayed on the LCD every moment of detection in the LCD screen. when the gas exceeds the normal level, the alarm is triggered automatically. This automated detection and alarming system offer a quick response so that we can be safe in case of emergency and critical conditions.

**Keywords** - Arduino UNO, Gas sensors, Buzzer, LCD

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### I. Introduction

The usage of gases leads to various problems in human life as well as animals and the environment. According to WHO (World Health Organisation), gas leakage accidents causes approximately 3.8 million death every year all over the world. Exposure to hazardous gases can cause deadly symptoms to lives since the death rates are also increasing due to gas leakages, therefore, it's been anxiety for people. It is better to prevent it before, in this modern world there are technologies available to overcome this fear. Since some toxic gases are colorless and odorless it is difficult for us to find them in the starting stage. Our main aim of this project is to sense the toxic gases when they start to leak and provide an alarm sound if there is any leakage. MQ sensors for monitoring gas leakage would reduce gas accidents by alerting us.

### II. Literature Survey

[1] A. Mahalingam, r.T. Naayagi, n.E. Mastorakis; They introduced economic gas leakage detector, designed and implemented it. This system ensures continuous monitoring of gas levels.

[2] Prof.M.Amsaveni, A. Anurupa, R.S. Anu Preetha, C. Malarvizhi, M.Gunasekaran; In this paper a GSM module-based control system and leakage detection. They used an MQ6 gas sensor to detect LPG gas which consists of a pre-defined set of instructions.

[3] B.B. Did Paye, Prof.S.K. Nanda; This paper is about an automated unified system of LPG using a microcontroller and GSM module. It is advanced and an innovative approach.

[4] Srinivasan, Leela, Jeya Bharathi, Kritik, Rajasree; In this research paper it is said that the subscriber is alerted through an alarm and displays the status

[5] Hina Ruqsar, Chandana R, Nandini R, Dr.T.P.Surekha; In this paper, it is said that real-time data is available over the internet. Xively IoT platform is used here to provide data of the sensor in real time.

[6] Farahanahun A.S, Oke A.O., and Abolaji B.M.; In 2016 they proposed their gas leakage detector by using an integrated circuit and MQ9.

### III. Block Diagram

The required hardware components of this project are a 9V battery, Gas sensors- MQ3, MQ5, MQ6, Arduino UNO (microcontroller), LCD(Liquid Crystal Display), and buzzer. Whenever gas leaks the leakage is detected by the gas sensors. The gases like alcohol gas, LPG, and smoke are detected by the sensors. The signal is sent to Arduino UNO. The Arduino UNO configures the signal to LCD if the gas levels are high it activates the buzzer to alert and also they are displayed on LCD. The block diagram of Gas leakage alarm is shown in Fig1.

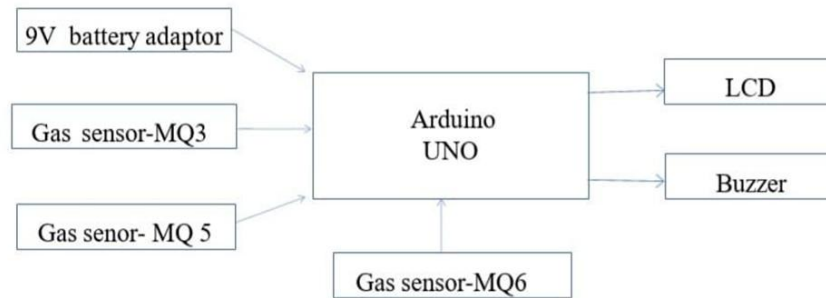


Fig 1. Block diagram

### IV. PROPOSED SYSTEM

This system comprises three gas sensors namely MQ3, MQ5, and MQ6, an Arduino board, an LCD, and a buzzer. The proposed system uses a microcontroller Arduino UNO, which is the main component of this project that performs and controls the whole process of this technique. The signal conditioning of Arduino UNO is completed by sensor output signaling which provides the input to the Arduino. When the sensor output is high it gives 1 otherwise 0. Arduino UNO will receive the sensor output as a digital signal just in case of gas leakage, the sensor output will be 1 if it activates the buzzer as well as “alcohol detected” will be displayed on the LCD. The buzzer alerts people from the workplace, home, and factories just in case of emergency, and a buzzer is connected to give an alert signal. The hardware setup of this proposed system is shown in Fig2.

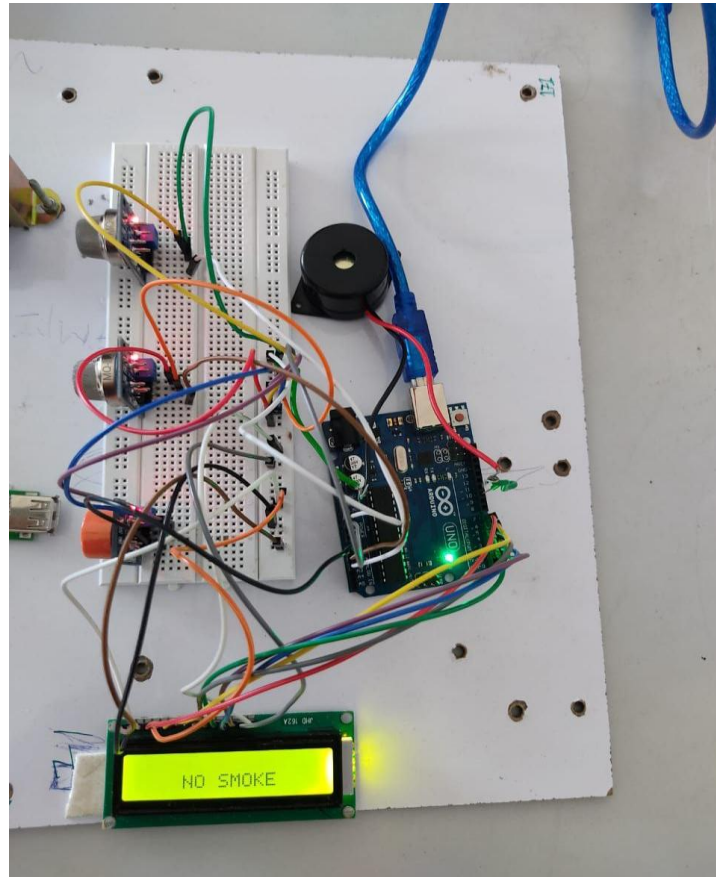


Fig 2. Hardware Setup

## V. HARDWARE IMPLEMENTATION

### A. Gas sensor-MQ3

The gas sensor MQ3 is a semiconductor type sensor and is highly sensitive to alcohol, detection ranges from 25 ppm to 500 ppm. It provides an analog output resistance based on the concentration of the alcohol when alcohol gas exists MQ3 senses it, and the conductivity increases, and as the conductivity is higher the gas concentration rises. Measurements can be taken as soon as possible as it has a fast response time. Vapors of alcohol can be simply squeezed into the sensor to check it's working. MQ3 is a heater-driven sensor to measure accurately the sensor needs to be fully warmed up. The sensor can measure the concentration of 0.04mg/L to 4mg/L. It can operate from -10 to 50 degrees C. It consumes 150mA to 50V.

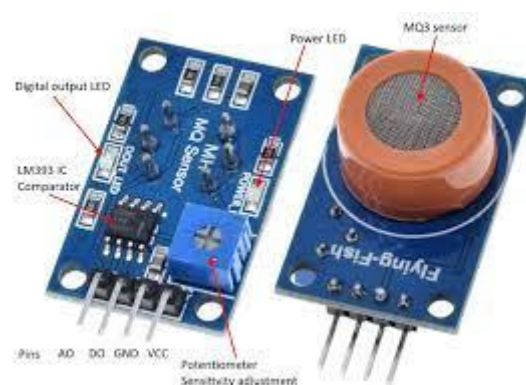


Fig 3. MQ3 sensor

### B. Gas sensor-MQ5

MQ5 sensor's detection ranges from 300 ppm to 10000 ppm It is useful for gas leakage detection in homes and works place and places of education its sensitivity can be adjusted by a potentiometer. MQ5 has a sensitive filament of tin dioxide formed in it. In the clean air, the filament in it has lower conductivity when there are combustible gases like LPG surrounding it the filament's conductivity raises resulting in the change in

resistance that shows the gas concentration. It can detect methane and propane at the same time. Especially it is used to detect flammable gases like LPG. It is cost efficient and also has many applications.



Fig 4. MQ5 sensor

**C. Gas sensor-MQ6**

MQ6 gas sensors detect gases like butane and isobutane and smoke its detection ranges from 200 ppm to 10000 ppm this sensor has a fast response time and also high sensitivity. The drive circuit is very simple.



Fig 5. MQ6 sensor

**D. Arduino UNO**

Arduino is an open-source microcontroller and in this project, it is used to interface with gas sensors-MQ3, MQ5, MQ6, buzzer, and LCD. It is low cost and flexible to use.



Fig 6. Arduino UNO

**E. LCD Display**

LCD stands for Liquid Crystal Display in which alphanumeric characters and symbols are displayed. In this project, LCD is used to display the alert of gas leakage. If there is any kind of leakage then it is displayed as gas leakage else it represents no gas leakage.

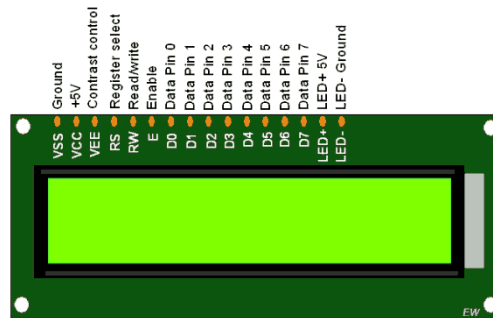


Fig 7. LCD

**F. Buzzer**

A buzzer is an audio signaling device. The function of the buzzer is to convert a signal from audio to sound. In this project, the work of the buzzer is to indicate to us with a beep sound whenever the gas leakage occurs.



Fig 8. Buzzer

**VI. SOFTWARE IMPLEMENTATION**

software implementation is done as the flow chart given below, if the gas leakage is present it returns to yes and proceeds with the following functions like activating the gas sensor and turning on the LCD and buzzer, if it returns no it again starts from first for the three sensors one by one with a gap of 3 seconds. The flowchart of software implementation is shown in Fig 9.

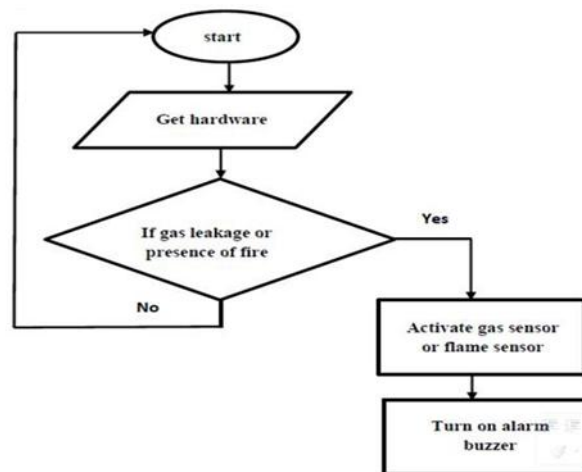


Fig 9. flowchart of software implementation

### **VII. Working**

This system uses alcohol, LPG, and smoke sensors like MQ3, MQ5, and MQ6 which are accustomed to sense particular gases. A potentiometer is employed to manage the sensitivity of the gas. whenever alcohol leakage occurs it gives a high pulse on its pin and the Arduino reads them. If the Arduino gets a high pulse from any of the MQ3 sensors then it displays the message on LCD 'Alcohol leakage' with the beep sound in the buzzer when there's no leakage it indicates 'no alcohol leakage' without any buzzer sound similarly with MQ5 when the smoke is detected by the sensor it indicates 'smoke alert' else it'll indicate 'no smoke'. In MQ6 when the LPG gas is present it indicates 'LPG leakage' else 'no LPG leakage'. These three indications are done one by one on the LCD every three seconds. The sensors are semiconductive type and require a supply voltage of 5V.

### **VIII. Result**

When Arduino UNO is connected with the gas sensors the indications are shown within the LCD and when there's gas leakage it is indicated within the LCD, therefore, the buzzer is alarmed in cases of emergency helping us know the leakage of colorless and odorless gases.

### **IX. Conclusion**

A sensor-based gas leakage alarm is explained in this paper with an alert system. Gas leakage results in several accidents nowadays, it sometimes ends up in injuries to humans and materials losses, to avoid this kind of situation this technique of gas leakage alarm is implemented so that we will get an alert whenever there is an issue in leakage of gases, to prevent human lives and to avoid materialistic losses.

### **Future Scope**

IoT has major scope within the leakage of gas and another major scope is that it can automatically shut down the device when the device has gas leakage, some apps or web can be developed to observe and monitor the gas leakage from far distances its useful for people far away from house or industries. This technique is flexible to varied gas sensors and relays based on the applications. Gas sensors will be replaced or added according to the applications.

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