INTRODUCTION TO ELECTRICAL ENGINEERING [19AIE104]

S1 B.TECH CSE (AIE)

**GAS DETECTION SYSTEM USING ARDUINO**

A Project Report

*Submitted b*y

ROLL NUMBER NAME

AM.EN.U4AIE21106 ADVAITH PR

AM.EN.U4AIE21141 MAHADEV SUNIL

AM.EN.U4AIE21145 NANDANA AJOY

AM.EN.U4AIE21155 S ANAND

AM.EN.U4AIE21159 SHREYA PULLURI

**

AMRITA SCHOOL OF ENGINEERING

AMRITA VISHWA VIDYAPEETHAM

AMRITAPURI 690 525

January 2022

**ABSTRACT**

Gas detection systems are critical for monitoring and detecting hazardous inert gases and ensuring safety, air quality, or analysing the environment throughout many different industries. These types of equipment are used to detect gas leakage or other emissions and can interface with a control system so that a process can be automatically shut down. It can also be used to monitor and detect gas leakage and alert the operators in the area where the leak is occurring, giving them the opportunity to move away from the leak. These types of devices are important because there are many gases that possess a threat to living organisms.

The scope of this project is to design and develop a low-cost electronic circuit which can detect the presence of LPG.

The proposed system is based around MQ2 Gas Sensor Module which converts the Gas concentration into electrical signals. The voltage that the sensor outputs, change according to the gas level that exists in the atmosphere. The sensor outputs a voltage that is proportional to the concentration of gas. An Arduino based microcontroller platform will be used for sensor data processing and to take necessary control actions. A signal conditioning circuit will be designed for interfacing the MQ2 Gas sensor with the Arduino platform board.

This circuit contains an Arduino UNO R3, Gas Sensor, 4 LED’s, four 1 Kilo ohm resistors and one 4.7 Kilo ohm resistor.

**TABLE OF CONTENTS**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | | | |  |
| 1 | INTRODUCTION | | | 4 |
| 2 | | COMPONENTS REQUIRED. | 5 | |
| 3 | | CIRCUIT DIAGRAM | 6 | |
| 4 | | WORKING OF THE SYSTEM | 7 | |
| 5 | | CODE | 8 | |
| 6 | RESULTS AND ANALYSIS | | | 10 |
| 7 | CONCLUSION | | | 11 |
| 8 | REFERENCES | | | 11 |
|  |  | | |  |

**INTRODUCTION**

LPG is the abbreviation or short form for liquefied petroleum gas. Like all fossil fuels, it is a non-renewable source of energy. It is extracted from crude oil and natural gas. The main composition of LPG are hydrocarbons containing three or four carbon atoms. The normal components of LPG thus, are propane and butane. Small concentrations of other hydrocarbons may also be present. LPG vapours are highly inflammable and heavier than air so utmost precaution should be taken during storage so that any leakage will not sink to the ground.

The objective of this project is to detect leakage of LPG and to prevent any severe calamities. Gas sensors are nowadays being used in wide range of applications like in the field of safety, health, instrumentation etc.

This project allows the user to set the low, medium and high level concentration of leakage based on the analogue signals. The intensity values are compared with three predetermined thresholds and based on that it classifies it into four different classes of concentration of leakage.

**COMPONENTS REQUIRED**

1. Arduino Uno R3

A picture containing graphical user interface

Description automatically generated

2. 4.7 Kilo Ohm resistor – x1



3. 1 Kilo Ohm resistor – x3



4. Gas Sensor

A picture containing kitchenware

Description automatically generated

5. LEDs – green, yellow, orange and red

A picture containing seat

Description automatically generated

6. Breadboard

Calendar

Description automatically generated

7. Connecting Wires

**CIRCUIT DIAGRAM**

**Diagram, schematic

Description automatically generated**

**Diagram

Description automatically generated**

**A close-up of a circuit board

Description automatically generated with medium confidence**

**WORKING OF THE SYSTEM**

The basic working principle of the gas sensor is that output voltage pin of the sensor varies according to the gas concentration in its proximity. This voltage variation is signal conditioned and is applied to the ADC input pin (analogue to digital converter) of the microcontroller in the Arduino board. An embedded software running in the Arduino board, reads the ADC registers and maps it to the various threshold levels set against the different gas concentrations. Based on the gas concentration detected, the Arduino board drives the digital output pin which is wired to the led circuit on the breadboard.

* There a four LEDs in total in the system; green, yellow, orange and red.
* The green LED is connected to DC input supply voltage and will always be ON once powered up. This can be used to check whether the device is switched on or not.
* The other three LEDs are used to indicate the level of Gas concentration in the atmosphere. With the increase in concentration of the gas, the LEDs will start turning ON one by one starting with yellow, orange and finally red.
* When the concentration value of the gas is registered in the gas sensor as greater than or equal to 400, the yellow LED is turned on. Similarly, when the concentration value of the gas is registered in the gas sensor as greater than or equal to 500, the orange LED is turned on. When the concentration value of the gas is registered in the gas sensor as greater than or equal to 700, the red LED is turned on.
* When the red LED is turned on, it implies that the surroundings are no longer safe due to extremely high concentration of LPG.

The LEDs and the Gas sensor used in the system is powered from the DC supply on the Arduino board.

**CODE**

// GAS Sensor

//Only Green - Safe

//Yellow - Alert

//Orange - Danger

//Red - Area Contaminated

int const PIN\_GAS=A3;

int LED\_G=3;

int LED\_Y=4;

int LED\_O=5;

int LED\_R=6;

void setup()

{

pinMode(LED\_G,OUTPUT);

pinMode(LED\_Y,OUTPUT);

pinMode(LED\_O,OUTPUT);

pinMode(LED\_R,OUTPUT);

Serial.begin(9600);

}

void loop()

{

int value=analogRead(PIN\_GAS);

digitalWrite(LED\_G, HIGH);

digitalWrite(LED\_Y, value >= 400 ? HIGH : LOW);

digitalWrite(LED\_O, value >= 500 ? HIGH : LOW);

digitalWrite(LED\_R, value >= 700 ? HIGH : LOW);

delay(250);

}

**RESULT AND ANALYSIS**

The Gas detection system has been simulated and tested in Tinker CAD simulation environment setup and following results has been observed.

* Gas detection system successfully detected LPG leakage.
* Only Green LED (Power ON LED) has been glowing, when the circuit is powered ON and no gas concentration is present
* The yellow LED glows when there is low concentration of LPG in the area surrounding the gas detection system.
* The orange LED glows when there is medium concentration of LPG.
* Red LED glows when there is a very high concentration of LPG.

**CONCLUSION**

The sensor employed is capable to monitor, identify and alert us about the leakage. This device may be easily placed into an alert device or an LPG display indicator for extra advantages. It is a low cost but extremely efficient device for detecting gas leakage and may play a key role in avoiding any sort of explosion due to the leakage.

The major aim of this effort is to maintain safety and to make it simpler to reserve gases and detect leaks to prevent tragedies caused by carelessness.

**REFERENCES**

<https://www.tinkercad.com/things/1yrv2QEbgEG-gas-sensor/editel?sharecode=8Kss3iG-XyhjpFqTxckIJDF6kt1XyEd9A4L3Mq6dc1Q>

<https://www.brightonk12.com>

<http://www.mouser.com/>

<http://www.hwsensor.com/>