

Gas Leakage Monitoring and Alerting System

-N.K.Vinisha,G.Sushmitha,R.Iswarya,S.Yasmeen

Abstract:-

Safety plays a critical role in today's world and it is vital that certain solutions are implemented in places of work and living. Whether it is electricity or oil and gas, working or living in hazardous conditions demand certain safety protocols.

Liquified Petroleum Gas (LPG) is a type of natural gas liquified under extreme pressure and contained in a metal cylinder. LPG is extremely sensitive to fire and causes a great disaster if exposed to any fire source without precaution.

LPG is more widely available than any other natural gas and is primarily used for cooking. Unfortunately, its broad use makes the event of gas leakage or even a blast standard. Therefore, there is a need to develop a gas leakage detection and monitoring system.

The system will monitor flame and fire through flame sensor. When a fire is detected, the buzzer begins to sound. The system has been tested and it is able to monitor gas wastage, leakage and notify the user. The resulting performance indicated its effectiveness toward saving a significant portion of the wasted gas in domestic.

Introduction:-

The world is moving at a rapid pace. The pandemic is long behind us, and businesses across domains are gearing up to catch up with the two years they lost due to the Coronavirus outbreak. Now is the time to embrace excellence and reduce unnecessary expenses with **scalable IoT solutions** - and this also holds true for the oil and gas domain.

Various commercial companies such as hotels and takeaway joints utilize flammable gasses - for instance, carbon dioxide, LPG, ammonia, and so on - to deliver the best customer service possible. The use of such gasses cannot be denied.

However, they have also brought about a greater risk and threat to human life. With safety a primary concern, businesses dealing with gas must take certain precautions to ensure work is carried out in the most secure manner possible.

Objective :-

The design of a sensor-based automatic gas leakage detector with an alert and control system has been proposed. This is an affordable, less power using, lightweight, portable, safe, user friendly, efficient, multi featured and simple system device for detecting gas. Gas leakage detection will not only provide us with significance in the health department but it will also lead to raise our economy, because when gas leaks it not only contaminates the atmosphere, but also wastage of gases will hurt our economy. The need for ensuring safety in workplaces is expected to be the key driving force for the market over the coming years.

Problem Formulation:-

Gas leakage is nothing but the leak of any gaseous molecule from a stove, or a pipeline, or cylinder etc. This can occur either purposefully or even unintendedly. As we are aware that these kinds of leaks are dangerous to our health, and when it becomes explosive it could cause great danger to the people, home, workplace, industry, and the environment.

Cooking gas connections in India have increased 76 per cent from 140 million in 2014 to 247 million now. However, this has also triggered a rise in the number of accidents with liquefied petroleum gas (LPG, the chemical name for cooking gas) in these years.

List of Components :-

1	Arduino UNO
2	Breadboard
3	LED
4	Gas Sensor
5	LCD 16*2
6	DC motor
7	Rotary potentiometer
8	Buzzer
9	Push Button
10	Resistors(1k ohm, 330 ohm)
11	Jump wires

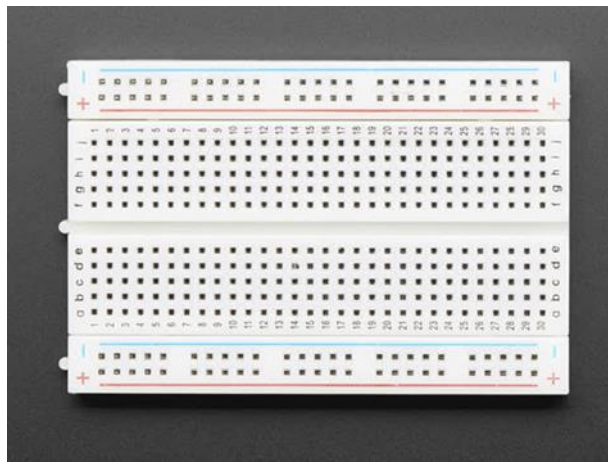
- **ARDUINO UNO :-**



Arduino Uno R3 is one kind of ATmega328P based microcontroller board. It includes the whole thing required to hold up the microcontroller; just attach it to a PC with the help of a USB cable, and give the supply using AC-DC adapter or a battery to get started. The term Uno means “one” in the language of “Italian” and was selected for marking the release of Arduino’s IDE 1.0

software. The R3 Arduino Uno is the 3rd as well as most recent modification of the Arduino Uno. Arduino board and IDE software are the reference versions of Arduino and currently progressed to new releases. The Uno-board is the primary in a sequence of USB-Arduino Board, & the reference model designed for the Arduino platform.

- **BREADBOARD :-**



A breadboard is a widely used tool to design and test circuit. You do not need to solder wires and components to make a circuit while using a bread board. It is easier to mount components & reuse them. Since, components are not soldered you can change your circuit design at any point without any hassle. It consist of an array of conductive metal clips encased in a box made of white ABS plastic, where each clip is insulated with another clips. There are a number of holes on the plastic box, arranged in a particular fashion. A typical bread board layout consists of two types of region also called strips. Bus strips and socket strips. Bus strips are usually used to provide power supply to the circuit. It consists of two columns, one for power voltage and other for ground. Socket strips are used to hold most of the components in a circuit. Generally it consists of two sections each with 5 rows and 64 columns. Every column is electrically connected from inside.

- **LED :-**



LED (Light Emitting Diode) is an optoelectronic device which works on the principle of electro-luminance. Electro-luminance is the property of the material to convert electrical energy into light energy and later it radiates this light energy. In the same way, the semiconductor in LED emits light under the influence of electric field. The symbol of LED is formed by merging the symbol of P-N Junction diode and outward arrows. These outward arrows symbolise the light radiated by the light emitting diode.

- **GAS SENSOR :-**



A gas sensor is a device which detects the presence or concentration of gases in the atmosphere. Based on the concentration of the gas the sensor produces a corresponding potential difference by changing the resistance of the material inside the sensor, which can be measured as output voltage. Based on this voltage value the type and concentration of the gas can be estimate.

- **LCD 16*2 :-**



16×2 LCD is one kind of electronic device used to display the message and data. The term LCD full form is Liquid Crystal Display. The display is named 16×2 LCD because it has 16 Columns and 2 Rows. it can be displayed (16×2=32) 32 characters in total and each character will be made of 5×8 Pixel Dots. These displays are mainly based on multi-segment lightemitting diodes. There are a lot of combinations of display available in the market like 8×1, 8×2, 10×2, 16×1, etc. but the 16×2 LCD is widely used. These LCD modules are low cost, and programmer-friendly, therefore, is used in various DIY circuits, devices, and embedded projects.

- **DC MOTOR:-**



DC motor is an electrical machine that converts electrical energy into mechanical energy. In a DC motor, the input electrical energy is the direct current which is transformed into the mechanical rotation.

- **ROTARY POTENTIOMETERS:-**



The rotary type potentiometers are used mainly for obtaining adjustable supply voltage to a part of electronic circuits and electrical circuits. The volume controller of a radio transistor is a popular example of a rotary potentiometer where the rotary knob of the potentiometer controls the supply to the amplifier.

This type of potentiometer has two terminal contacts between which a uniform resistance is placed in a semi-circular pattern. The device also has a middle terminal which is connected to the resistance through a sliding contact attached with a rotary knob. By rotating the knob one can move the sliding contact on the semi-circular resistance.

- **BUZZER:-**



A buzzer or beeper is an audio signaling device,[1] which may be mechanical, electromechanical, or piezoelectric (piezo for short). Typical uses of buzzers and beepers include alarm devices, timers, train and confirmation of user input such as a mouse click or keystroke.

- **PUSH BUTTON:-**



A **push-button** (also spelled **pushbutton**) or simply **button** is a simple switch mechanism to control some aspect of a machine or a process. Buttons are typically made out of hard material, usually plastic or metal.

- **RESISTOR:-**



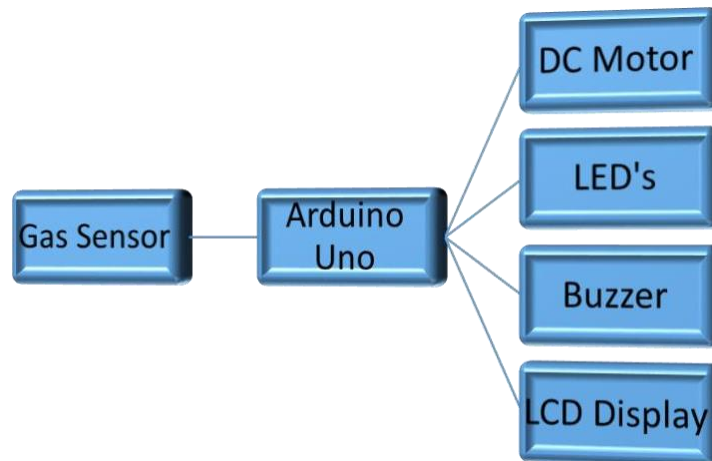
A resistor is a passive two-terminal electrical component that implements electrical resistance as a circuit element.

- **JUMPER WIRES:-**



Jumper wires are electrical wires with connector pins at each end. They are used to connect two points in a circuit without soldering.

Block Diagram:-



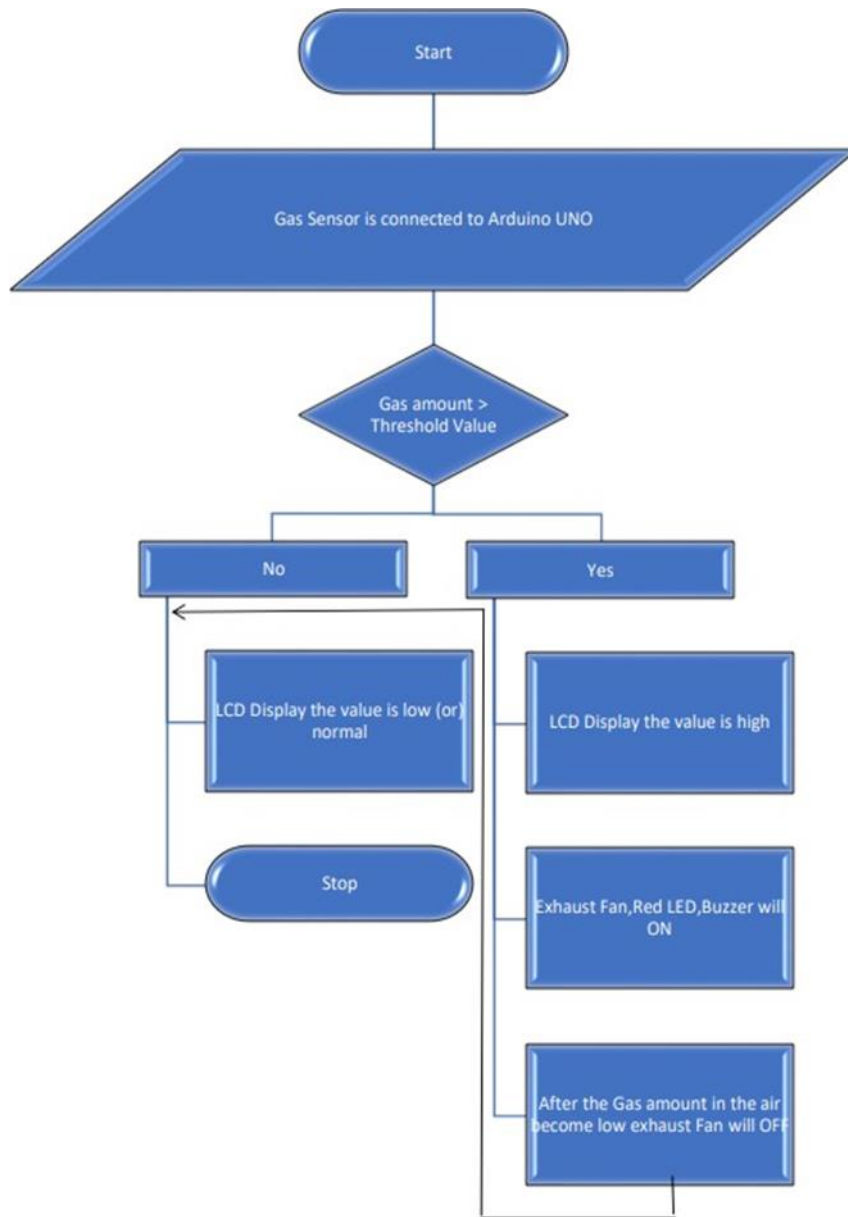
Proposed method :-

In this project our central component is Arduino UNO. Arduino will make decision when the gas amount is more than the threshold value, an automatic fan will ON and deduct the extra gas from the room or kitchen.

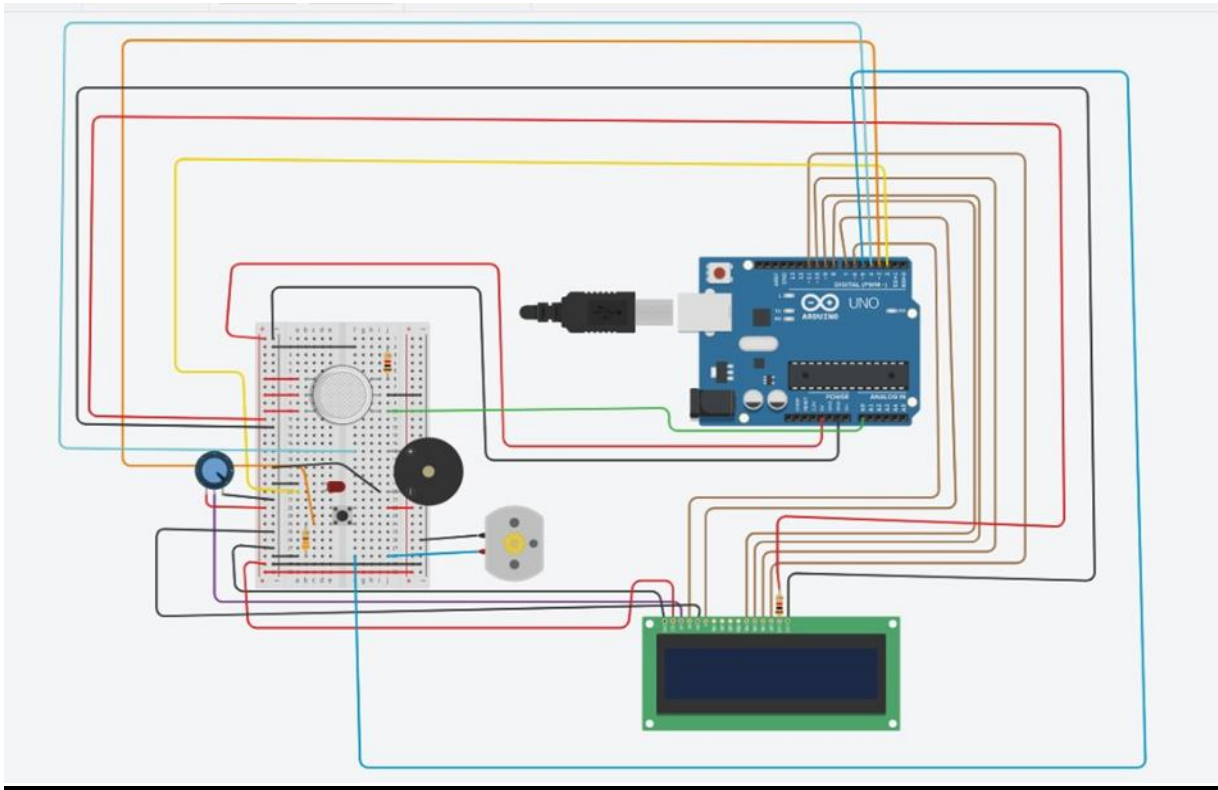
Here, we have a gas sensor that will connect with the Arduino. The gas sensor will read the gas amount from the air. Then we must set a gas threshold value. When the gas value of the air of our home or kitchen is more than the threshold value. The exhaust fan will automatically ON. After eliminating the gas amount from the air, the exhaust fan will automatically OFF.

Arduino UNO is the main unit of the system which performs the following tasks. A signal conditioning of the Arduino UNO is done by output signal of the sensor, provided input to Arduino. The detection results displayed on LCD. Indicates the people of danger in work place, factory, home. Buzzer activity with Beep sound is made.

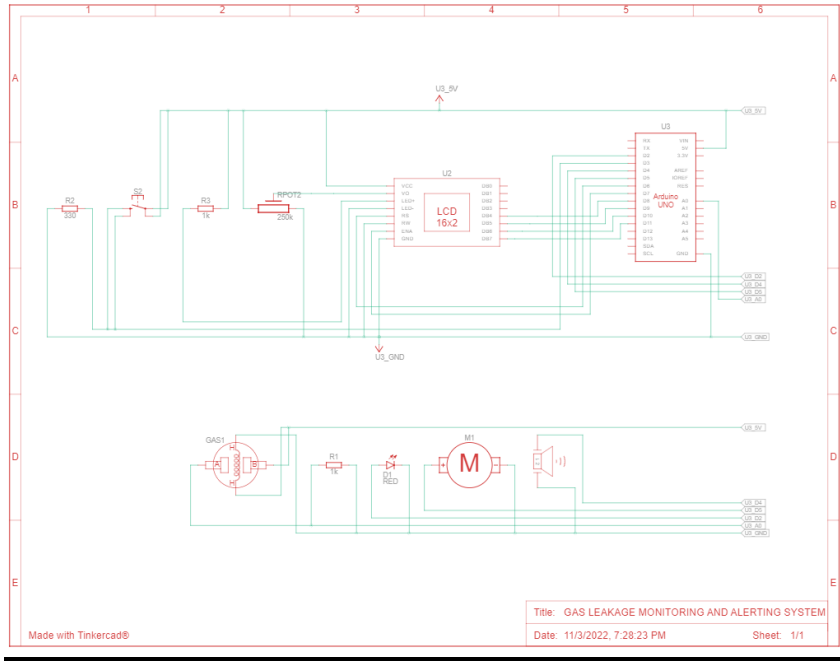
FLOW GRAPH:-



Circuit Diagram :-



SCHEMATIC DIAGRAM:-



CODE :-

```
#include <LiquidCrystal.h>
LiquidCrystal lcd(6, 7, 8, 9, 10, 11);
float gasPin = A0;
float gasLevel;
int ledPin = 2;
int buttonPin = 3;
int buzzPin = 4;
int buttonState;
int fan = 5;

void setup(){
  pinMode(ledPin, OUTPUT);
  pinMode(buttonPin, INPUT);
  pinMode(gasPin, INPUT);
  pinMode(fan, OUTPUT);
  Serial.begin(9600);
  lcd.begin(16, 2);
  lcd.setCursor(0,0);
  lcd.print(" Welcome");
  lcd.setCursor(0,2);
  lcd.print("GAS LEAKAGE SYSTEM");
  delay(500);
  lcd.clear();
}

void loop(){
  // Read the value from gas sensor and button
  gasLevel = analogRead(gasPin);
  buttonState = digitalRead(buttonPin);
  // call the function for gas detection and button work
  gasDetected(gasLevel);
  buzzer(gasLevel);
  exhaustFanOn(buttonState);
}
// Gas Leakage Detection & Automatic Alarm and Fan ON
void gasDetected(float gasLevel){
  if(gasLevel >= 300){
    digitalWrite(buzzPin, HIGH);
    digitalWrite(ledPin, HIGH);
    digitalWrite(fan, HIGH);
  }
}
```

```

    lcd.setCursor(0,0);
    lcd.print("GAS:");
    lcd.print(gasLevel);
    lcd.setCursor(0,2);
    lcd.print("FAN ON");
    delay(1000);
    lcd.clear();
}else{
    digitalWrite(ledPin,LOW);
    digitalWrite(buzzPin,LOW);
    digitalWrite(fan,LOW);
    lcd.setCursor(0,0);
    lcd.print("GAS:");
    lcd.print(gasLevel);
    lcd.setCursor(0,2);
    lcd.print("FAN OFF");
    delay(1000);
    lcd.clear();
}
}
//BUZZER
void buzzer(float gasLevel){
if(gasLevel>=300)
{
    for(int i=0; i<=30; i=i+10)
    {
        tone(4,i);
        delay(400);
        noTone(4);
        delay(400);
    }
}
}
// Manually Exhaust FAN ON
void exhaustFanOn(int buttonState){
    if(buttonState == HIGH){
        digitalWrite(fan,HIGH);
        lcd.setCursor(0,0);
        lcd.print("Button State:");
        lcd.print(buttonState);
        lcd.setCursor(0,2);
        lcd.print("FAN ON");
        delay(10000);
        lcd.clear();
    }
}
}

```

TINKERCAD LINK:-

https://www.tinkercad.com/things/fGvVek7OI3p-ibm-final-project/editel?sharecode=iGapHQfMmO_xV402duIgs56cyEezHI88xpORIGxviqc

LINK:-

https://drive.google.com/file/d/1iQ351A_5vi5RaYbCFBmZhbWGPafNdfRO/view?usp=drivesdk

Solution Statement :-

This project mainly focuses on the detection of gas leakage and providing security when the user is around or away from home. The use wireless technology for providing security against gas leakage to users hence cost effective and more adaptable. The system comprises of sensors for detecting gas leak interfaced to microcontroller that will give an alert to user whenever there is a gas leakage, display warning information by using Liquid Crystal Display (LCD). This will enable the user to take precaution of explosion disaster which may result on Liquefied Petroleum Gas (LPG) cookers like loss of properties, injury or even death. GLDS provides ideal solution to gas leakage problems faced by home owners in daily life.

Conclusion :-

After this project performance, can conclude that detection of the LPG gas leakage is incredible in the project system. Applicable usefully in the industrial and domestic purpose. In danger situations we can save the life by using this system. A sensor node senses gas like CO₂, oxygen, propane. The estimated range of transmission and consumption of power is obtained. The simple procedures and Arduino UNO Micro controller area used to build the sensor.