



**KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY
(KUET)**

Gas Leakage Detector using Arduino and GSM Module with SMS Alert and Sound Alarm

FINAL PROJECT REPORT

Course No. : CSE 3104

Course Name : Peripherals and Interfacing

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- **Project Name :**

Gas Leakage Detector using Arduino and GSM Module with SMS Alert and Sound Alarm.

- **Objectives of the Project :**

The primary thinking of the present project is to provide a good means for safely detecting any malfunction of a pressurized gas system in arduino to prevent accumulation of combustible gases so that damage or explosion due to such an accumulation of gases is prevented. Another object of the present invention is to provide a noble safety means for detecting the leakage of gas into the area of an appliance when the appliance is in a shutdown condition and not in operation. Our another object of the this innovation is to provide a noble gas detection and monitoring system which is economical to manufacture and which may be readily installed in conventional trailers, boats or the like which are normally dependent upon a stored supply of pressurized gas. Typical installation areas being gas banks, gas yards with multi cylinders in storage, user production and utility areas like kitchens. We use MQ5 sensor to detect dangerous LPG cylinder leak in our kitchens. This project can be incorporated to sound an alarm and give prior warning on LCD.

- **Objectives of the Project :**

1. Detect Gas Leakage (like LPG leak, Butane leak, Methane leak) or any such petroleum based gaseous substance that can be detected using MQ5 Sensor.
2. Setup an SMS based Alert Mechanism and send 3 SMS (3 alert messages) to 2 specified mobile numbers (input inside the arduino program)
3. Produce a sound alarm upon gas leak and stop the alarm once gas leak is under control (gas presence in atmosphere is under normal range)
4. Display status in an LCD using a 16×2 LCD module.

- **Required Equipments :**

1. Arduino Uno
2. GSM Module (SIM 900A)
3. MQ5 Gas Sensor
4. 16x2 LCD Display

5. 10K Potentiometer
6. Resistors (560 e, 100 e)
7. Buzzer
8. Transistor (2N2222)
9. Bread Board
10. Connecting Wires

• Circuit Diagram :

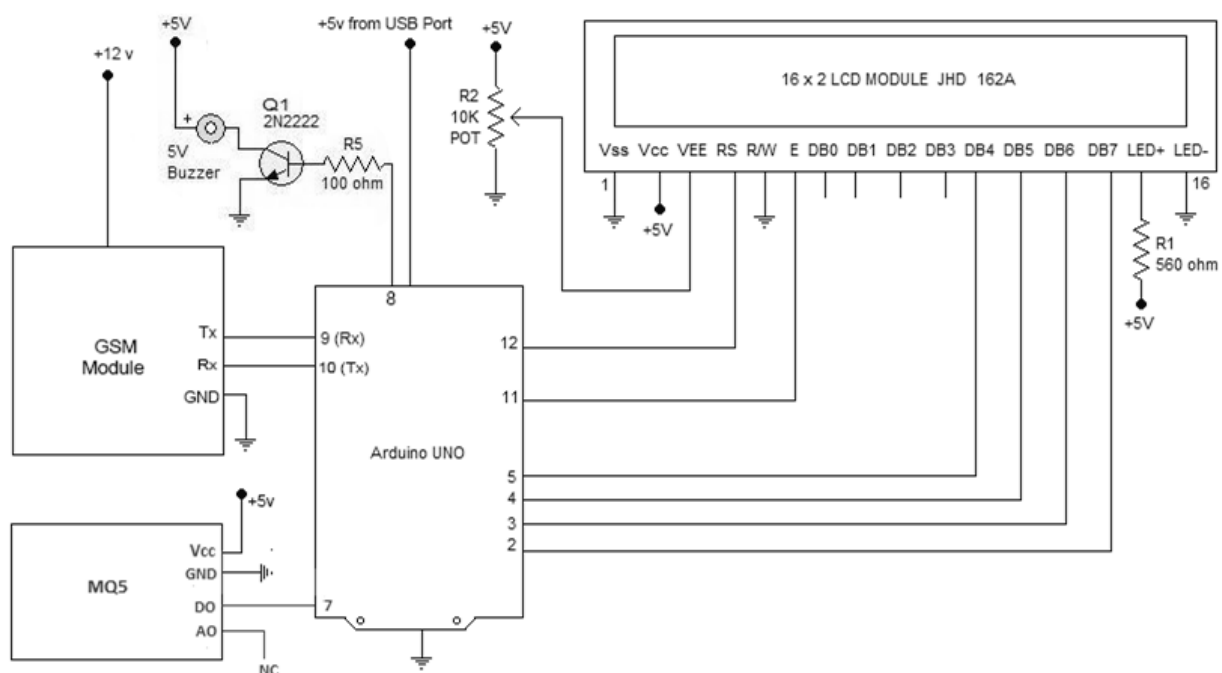


Figure: Gas Leakage Detector using Arduino and GSM Module with SMS Alert and Sound Alarm

• Source Code :

```
#include <SoftwareSerial.h>
#include <LiquidCrystal.h>
LiquidCrystal lcd(12, 11, 5, 4, 3, 2);
SoftwareSerial mySerial(9, 10);

int sensor=7;
int speaker=8;
int gas_value, Gas_alert_val, Gas_shut_val;
```

```

int Gas_Leak_Status;
int sms_count=0;

void setup()
{

pinMode(sensor,INPUT);
pinMode(speaker,OUTPUT);
mySerial.begin(9600);
Serial.begin(9600);
lcd.begin(16,2);
delay(500);
}
void loop()
{
CheckGas();
CheckShutDown();
}

void CheckGas()
{

lcd.setCursor(0,0);
lcd.print("Gas Scan - ON");
Gas_alert_val=ScanGasLevel();
if(Gas_alert_val==LOW)
{
SetAlert();
}}

int ScanGasLevel()
{
gas_value=digitalRead(sensor);
return gas_value; celsius
}

void SetAlert()
{
digitalWrite(speaker,HIGH);
while(sms_count<3)

```

```

{
  SendTextMessage();
}
Gas_Leak_Status=1;
lcd.setCursor(0,1);
lcd.print("Gas Alert! SMS Sent!");
}

```

```

void CheckShutDown()

```

```

{
  if(Gas_Leak_Status==1)
  {

```

```

    Gas_shut_val=ScanGasLevel();
    if(Gas_shut_val==HIGH)
    {

```

```

        lcd.setCursor(0,1);
        lcd.print("No Gas Leaking");
        digitalWrite(speaker,LOW);
        sms_count=0;
        Gas_Leak_Status=0;
    }}}}

```

```

void SendTextMessage()

```

```

{
  mySerial.println("AT+CMGF=1");
  delay(1000);
  mySerial.println("AT+CMGS=\"+880.....\"\\r");
  delay(1000);
  mySerial.println("Gas Leaking
  delay(200);
  mySerial.println((char)26);
  delay(1000);
  mySerial.println("AT+CMGS=\"+880.....\"\\r");
  delay(1000);
  mySerial.println("Gas Leaking!");
  delay(200);
  mySerial.println((char)26);
  delay(1000);
}

```

```
sms_count++;  
}
```

- **Functionality :**

1. When we develop critical systems like Gas Leakage Detector or similar systems like Fire Alarm System, we need to monitor the sensor parameters continuously(24×7). So our system must monitor “gas leak” continuously. This is achieved by scanning the sensor output (digital out of MQ5) continuously inside the ScanGasLevel() subroutine. If you look into the program, the main function loop() has only two subroutines – CheckGas() and CheckShutDown() – which are called repeatedly. CheckGas() – is a subroutine which scans sensor output continuously and take actions if there occurs a ‘gas leak’ at any point of time. CheckShutDown() – is a subroutine to monitor the shut down process and check if status of room is back to normal conditions (no gas leaking).
2. CheckGas() – is the function which monitors occurrence of a gas leak 24×7. This function fetches the gas level measured by MQ35 (by reading digital out of MQ35 using digitalRead() command) and stores it to the variable Gas_alert_val for comparison. If there is no ‘gas leak’ – the sensor out will be HIGH. If there occurs a ‘gas leak’ at any point of time, the sensor out will immediately change to LOW status. The statement *if(Gas_alert_val==LOW)* checks this and if a gas leak occurs, then an inner subroutine SetAlert() will be invoked.
3. SetAlert() is the function that controls number of SMS alerts sent to each mobile number loaded in the program. The number of SMS alerts sent can be altered by changing the stopping condition of while loop. The stopping condition *sms_count< 3* – means 3 SMS alerts will be sent to each mobile number. The function to send SMS (using AT Commands) – SendTextMessage() will be called 3 times if SMS alert count is 3. This function SendTextMessage() will be invoked as many times as the number SMS alerts set in the program. In addition to sending SMS alerts, this subroutine also controls the sound alarm. The alarm is invoked using command *digitalWrite(speaker,HIGH)* – which will activate the speaker connected at pin 8 of arduino.
4. We have limited the number of SMS alerts using the stopping condition. Once a gas leak occurs and the set number of SMS alerts has been sent, the system will not send any more SMS! The system assumes that its job is over by sending SMS. Humans has to come and shut down the gas leak problem. After sending alerts, the system will start monitoring Shut Down process. Once the gas leak has been eliminated, system will automatically reactivate its SMS alert settings by resetting the sms_count variable back to zero.
5. CheckShutDown() – is the function which monitors if gas leak was shut down. We need to entertain this function only if a ‘gas leak’ has occurred. To limit the entry to the statements inside this routine, we

have introduced a variable Gas_Leak Status. This variable value will be set to value 1 when a gas leak occurs (check the statement inside SetAlert()). The statements inside CheckShutDown() will be executed only if the value of Gas_Leak Status==1. (If there was no gas leak occurred, we don't need to waste time executing ShutDown checking statements). We consider the 'gas leak' has been eliminated once room temperature is back to normal. So if our variable Gas_shut_val falls back to HIGH status, we consider gas leak has been eliminated and surroundings are safe.

6. The subroutine has statement to stop the gas leakage alarm (refer statement – digitalWrite(speaker,LOW) – which cuts the supply to pin 8 of arduino and stops the sound alarm) which will be executed when gas leak is eliminated completely (as the status of Gas_shut_val == HIGH). We start our Gas Leakage monitoring again with SMS Alerts active! (We reset the Gas_Leak_Status variable and sms_count variable back to zero – which are essential variable conditions for monitoring gas leak again and to send alert sms if gas leak repeats.

- **Features :**

1. High sensitivity LPG, iso-butane, propane
2. Small sensitivity to alcohol, smoke
3. Fast response
4. Wide detection range
5. Stable performance and long life
6. Simple drive circuit

- **Advantages :**

1. It is used in homes for LPG leakages
2. The sensor has excellent sensitivity combined with a quick response time.
3. Maintenance cost is very less.

- **Disadvantages :**

1. It works only when a 5V power supply is given.
2. Its sensitivity depends on Humidity and temperature.