



**PROJECT TITLE : COMPREHENSIVE SMOKE DETECTION  
SYSTEM FOR GAS PROCESSING FACILITIES (2024-2025 )**

**B.E., ELECTRONICS AND COMMUNICATION ENGINEERING**

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# **COMPREHENSIVE SMOKE DETECTION SYSTEM FOR GAS PROCESSING FACILITIES**

## **ABSTRACT**

In gas processing facilities, the presence of highly flammable and toxic gases is inherent to the system. These gases cannot be eliminated, but their detection and early warning are crucial to prevent catastrophic accidents. A reliable fire and gas detection system (FGS) is essential to mitigate risks. This project report outlines the design, development, and deployment of a comprehensive smoke detection system for gas processing facilities.

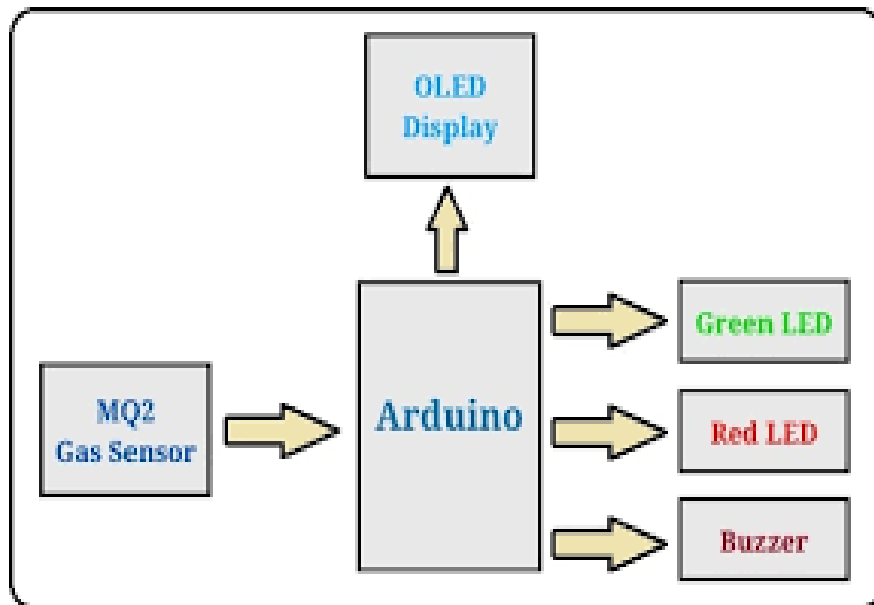
## **INTRODUCTION**

Gas processing plants handle hazardous materials, including toxic and flammable gases and liquids. To prevent accidents resulting from these hazardous atmospheres, an early detection system is necessary. The fire and gas detection system (FGS) plays a critical role in identifying toxic gas leaks and flammable fluid releases promptly. Designing an effective FGS involves considering various factors related to plant operations, equipment, raw materials, and environmental conditions.

## **DESCRIPTION**

So basically this project is useful when you are planning to secure your place from any type of gas leakage. When the smoke is detected by the MQ-6 gas sensor in smoke detector using Arduino then the green LED will go on otherwise red LED will glow. To make this project more interesting and user friendly we attach a 16×2 LCD module to it and an alarm sytem with it. We can see the real time status of the working of the gas sensor in this LCD screen.

## BLOCK DIAGRAM:



## WORKING PROCESS:

Overview of how the smoke detection alarm system operates

- The smoke sensor detects smoke particles in the air.
- When the smoke is detected, the sensor sends a signal to the Arduino uno.
- The Arduino process the signal and triggers the alarm (buzzer)to sound.
- Simultaneously, an LED indicator lights up to visually alert users.

## PROGRAMMING LOGIC:

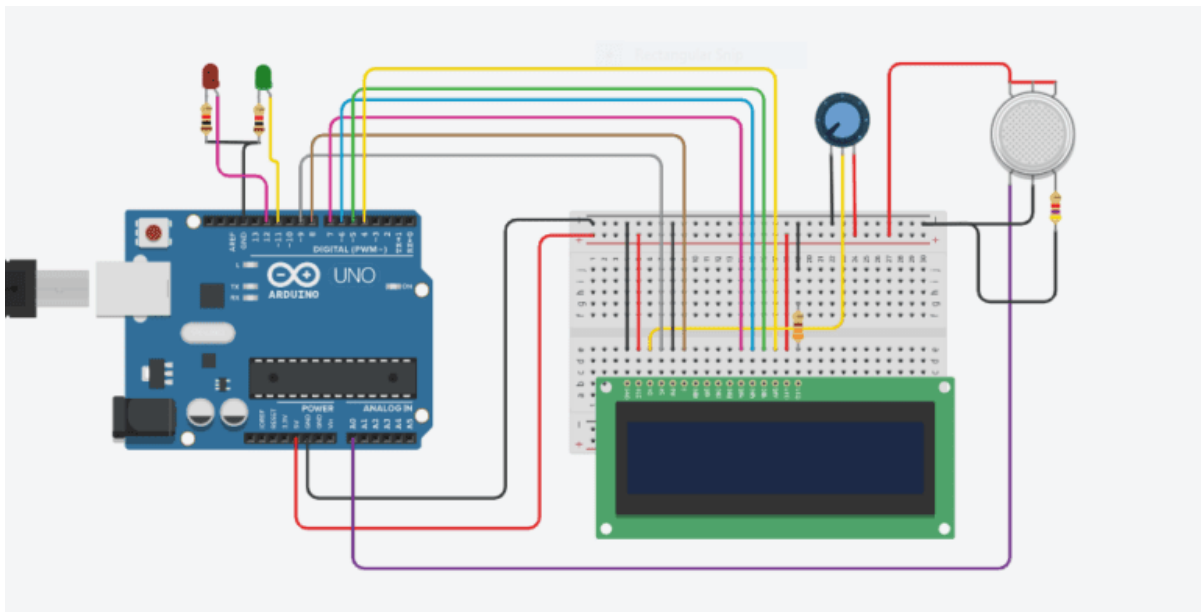
- Description of the Arduino sketch (code) used to program the system:
- Initialization of pins and variables
- Setting up the sensor and defining threshold values or smoke detection.
- Implementing the main loop to continuously monitor the sensor readings.
- Triggering the alarm and LED indicator when smoke is detected.

## COMPONENTS OF THE FGS:

The FGS comprises several components:

- ✓ Arduino UNO
- ✓ MQ-2 gas sensor
- ✓ 16×2 LCD module
- ✓ 10K potentiometer
- ✓ Red and green LEDs
- ✓ 220 ohms resistors
- ✓ Jumper wires and a breadboard
- ✓ USB cable for uploading the code

## CIRCUIT DIAGRAM:



## **CODE FOR MQ-2 GAS DETECTOR:**

```
#include "LiquidCrystal.h"

LiquidCrystal lcd(9,8,7,6,5,4);

int SMOKE_VAL=0;

void setup ()
{
  Pinmode(A0, INPUT);
  Serial.begin(9600);
  Lcd.begin(16,2);
  pinMode(11,OUTPUT);
  pinMode(12,OUTPUT);

  lcd.setCursor(0,0);
  lcd.print(" SMOKE  SENSOR");
}

Void loop()
{
  SMOKE_VAL=analogRead(A0);
  Serial.println(SMOKE_VAL);
  If (SMOKE_VAL>500)
  {
    Lcd.setCursor(0,1);
    lcd.print("SMOKE DETECTED");
    digitalWrite(11,HIGH);
    digitalWrite(12,LOW);
  }
  Else
  {
```

```
Lcd.setCursor(0,1);  
Lcd.print( "SMOKE NOT DETECTED");  
digitalWrite(11,LOW);  
digitalWrite(12,HIGH);  
}  
Delay(10);  
}
```

## **GAS DETECTOR:**

Three types of gas detectors serve for detecting loss of containment:

- **Flammable Gas Detector:** Detects the presence of flammable gases.
- **Hydrogen Gas Detector:** Specifically detects hydrogen gas leaks.
- **Toxic Gas Detector:** Identifies toxic gas releases.

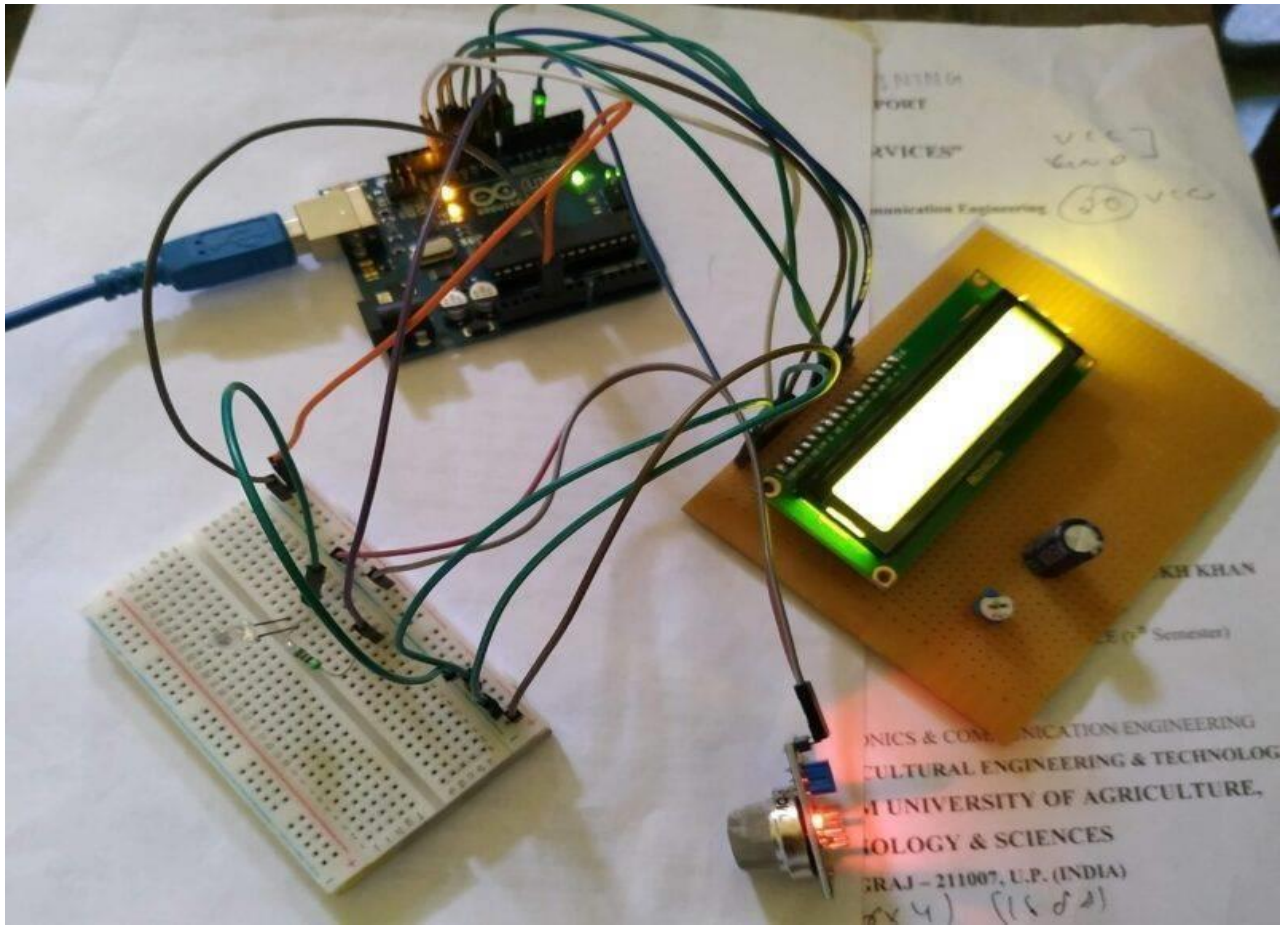
## **DESIGN CONSIDERATIONS**

When designing an FGS for gas processing facilities, consider the following factors:

- **Plant Operation:** Understand the specific processes and operations within the facility.
- **Equipment Used:** Different equipment may require tailored detection solutions.
- **Raw Materials:** The type of gases and liquids being processed affects detector selection.
- **Wind Direction:** Wind patterns influence gas dispersion and detector placement.



## OUTPUT:



## ADVANTAGES:

- Automatic emergency services
- Smart smoke detectors work best as part of a connected home system.
- quick response.
- Reduce loss.

## APPLICATIONS:

- Residential buildings.
- Commercial buildings.
- Industrial facilities
- Healthcare facilities.
- Education institutions
- Transportation systems.
- Data centers

## **CONCLUSION**

A well-designed smoke detection system is crucial for gas processing facilities. By integrating gas, we can enhance safety. It is imperative for ensuring the safety and security of prevent accidents, and protect personal and the environment. Through the integration of advanced sensors, real-time monitoring capabilities, and automated alert systems, such a system can effectively mitigate the risks associated with smoke and fire incidents. By prioritizing proactive measures and investing in state-of-the-art technology, gas processing facilities can significantly enhance their emergency response protocols and minimize the potential for catastrophic events.