

# UJJAIN ENGINEERING COLLEGE

## UJJAIN ( M.P.)



### CERTIFICATE

This is to certify that **Pratik Deshabhratar, Ramayan Kapadiya, Sanskar Trivedi, Sanyam Jain** of B.Tech.Third Year, VI Sem, Electronics and Communication Engineering have completed their Minor Project entitled **“LPG Gas Leakage Detector using Arduino with Alarm and Auto Exhaust”** during the year 2022-2023 under our guidance and supervision.

We approve the project for the submission for the partial fulfillment of the requirement for the award of degree of Bachelor degree of Engineering & Communication Engineering.

**Dr. Neha Sharma**  
(Project Guide)

**Prof. Girish kumar Tiwari**  
(Head of ECE Department)

**INTERNAL SIGN**

**EXTERNAL SIGN**

# DECLARATION

We here declared that the work present in the Minor Project entitled “**LPG Gas Leakage Detector using Arduino with Alarm and Auto Exhaust**” submitted in partially fulfillment of the requirement for the award of Bachelor's Degree in Electronics & Communication Engineering has been carried out at Ujjain Engineering College, Ujjain and is an authentic record of our work carried out under the guidance of **Dr. Neha Sharma (Project guide)** Department of Electronic & Communication Engineering, UEC, Ujjain.

## **Name of Candidates:**

Pratik Deshbhratar (0701EC201044)

Ramayan Kapadiya (0701EC201047)

Sanskar Trivedi (0701EC201050)

Sanyam Jain (0701EC201051)

The matter in this project has not been submitted by us for the award of any other degree.

# ACKNOWLEDGMENT

After the completion of Minor Project work, words are not enough to express our feelings about all those who helped us to reach our goal, feeling above all this is our indebtedness to the almighty for providing these moments in our life.

First & foremost we take this opportunity to express our deep regards and heartfelt gratitude of our project guide **Dr. Neha Sharma** of **Electronics & Communication Engineering, UEC, Ujjain** for their inspiring guidance and timely suggestions in carrying out our project successfully. They have also been a constant source of inspiration for us.

We are extremely thankful to **Prof. Girish Kumar Tiwari, Head of the Electronics & Communication Engineering, UEC, Ujjain** for his corporation and motivation during the project. We would also like to thank all the faculties of the department for providing invaluable support and motivation. We are also grateful to our friends and colleagues for their help and cooperation throughout this work.

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Pratik deshbhatar (0701EC201044)

Ramayan kapadiya (0701EC201047)

Sanskar trivedi (0701EC201050)

Sanyam jain (0701EC201051)

# ABSTRACT

The aim of this mini project is to design and develop an LPG gas leakage detection system using an Arduino Uno microcontroller, an MQ-135 gas sensor, a buzzer, and an LCD display to indicate the presence of gas. The proposed system continuously monitors the concentration of LPG gas in the surrounding environment using the MQ-135 gas sensor and activates an alarm and auto exhaust mechanism when the gas concentration exceeds a safe limit. The Arduino Uno microcontroller controls the gas sensor, buzzer, and LCD display, making the system smart and easy to use. The LCD display shows the gas concentration, and the buzzer sounds an alarm to alert the occupants of the building. The exhaust fan is activated automatically to remove the gas, ensuring the safety of the surrounding environment. This mini-project is cost-effective, easy to install, and can be used in homes and commercial areas to prevent accidents due to LPG gas leakage. The proposed system can significantly improve the safety measures in places where LPG gas is used and stored, reducing the risk of fire and explosion accidents.

In addition to the components mentioned above, the proposed system also includes a power supply, which provides the necessary voltage to run the entire circuit. The MQ-135 gas sensor is a low-cost sensor that can detect LPG gas, smoke, and other harmful gases. The sensor sends a signal to the Arduino Uno microcontroller when the gas concentration exceeds a safe limit. The microcontroller then activates the buzzer and the exhaust fan to remove the gas.

Overall, the proposed LPG gas leakage detection system using Arduino Uno, MQ-135 gas sensor, buzzer, LCD display, and auto exhaust mechanism is a practical solution to prevent accidents due to gas leakage. It can significantly improve the safety measures in places where LPG gas is used and stored, reducing the risk of fire and explosion accidents. The system is easy to install, cost-effective, and can be customized to suit specific requirements.

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# Introduction

The LPG (Liquefied Petroleum Gas) gas leakage detector is a mini project that uses an Arduino Uno microcontroller, an MQ-135 gas sensor, a buzzer, an LCD screen, and an auto exhaust to detect the presence of LPG gas in the air. The system has been designed to detect the gas leakage and alert the user by sounding an alarm and displaying the gas level on the LCD screen. The auto exhaust system will also turn on automatically to exhaust the gas and prevent any potential hazards. This project is highly useful in homes and industries where LPG gas is used as a fuel for cooking or other purposes, as it ensures the safety of the occupants and prevents any potential mishaps due to gas leakage. This project is a great example of the application of microcontroller-based systems in real-world scenarios and provides an opportunity for students and hobbyists to learn about electronics and programming.

LPG gas leakage can pose a serious threat to the safety of the occupants, as it is highly flammable and can cause explosions or fire hazards. Therefore, it is important to have a system in place that can detect the presence of LPG gas in the air and alert the user before any potential hazard can occur.

The LPG gas leakage detector project is a simple and effective solution that can help in preventing such incidents. The MQ-135 gas sensor is used to detect the presence of LPG gas in the air. It is a low-cost gas sensor that can detect a wide range of gases, including LPG, propane, and methane.

The buzzer and LCD screen are used to alert the user in case of a gas leakage. The buzzer sounds an alarm, and the LCD screen displays the gas level, allowing the user to take necessary precautions. Additionally, an auto exhaust system is integrated into the project, which turns on automatically to exhaust the gas and prevent any potential hazards.

The LPG gas leakage detector project is an excellent example of the practical application of electronics and programming in real-world scenarios.

1.

## Proposed Methodology

The proposed methodology for the LPG gas leakage detector mini project using Arduino Uno, MQ 135 gas sensor, buzzer, LCD to display gas detection, with alarm and auto-exhaust can be outlined as follows:

1. **Hardware Assembly:** First, assemble the hardware components, including the Arduino Uno board, MQ 135 gas sensor, buzzer, and LCD 16\*2 display. Connect the components according to their specifications and ensure that the connections are secure.
2. **Programming:** Next, write the code to program the Arduino Uno board. The code should include instructions for reading data from the MQ 135 gas sensor, displaying the gas levels on the LCD 16\*2 display, triggering the alarm when gas levels exceed a certain threshold, and turning on the exhaust fan when gas levels reach a dangerous level.
3. **Testing:** After programming the Arduino Uno board, test the project to ensure that it is working correctly. Test the gas sensor by exposing it to LPG gas and verify that it detects the gas and triggers the alarm and auto-exhaust mechanisms.
4. **Calibration:** The MQ 135 gas sensor may require calibration to provide accurate readings. Calibrate the gas sensor using a known concentration of LPG gas to ensure accurate detection.
5. **Final Assembly:** Once the project is successfully tested and calibrated, finalize the assembly by mounting the components in a suitable enclosure.
6. **Final Testing:** Test the complete system again to ensure that all components are functioning correctly and that the gas sensor is calibrated correctly

2.



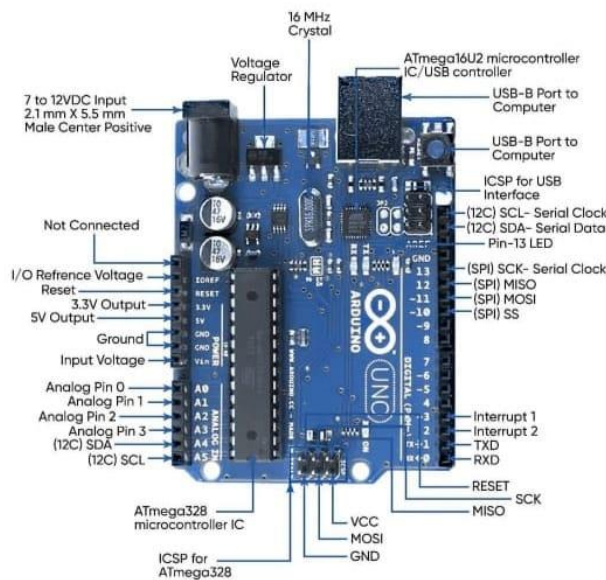
7. Deployment: Finally, deploy the LPG gas leakage detector system in the desired location, such as homes or industries, to provide reliable and cost-effective gas detection and safety solutions.

In summary, this proposed methodology covers the steps required to assemble, program, test, calibrate, and deploy the LPG gas leakage detector mini project using Arduino Uno, MQ 135 gas sensor, buzzer, LCD 16\*2 display, and auto-exhaust mechanisms.

# Hardware Used

The hardware components used in the LPG gas leakage detector mini project using Arduino Uno, MQ 135 gas sensor, buzzer, LCD to display gas detection, with alarm and auto exhaust are as follows:

1. **Arduino Uno Board:** The Arduino Uno board is a microcontroller board that provides the brains of the project. It controls the gas sensor, buzzer, and LCD display, and processes the data from the sensor to determine the gas levels.



**Fig1:-Arduino Uno Board**

2. **MQ 135 Gas Sensor:** The MQ 135 gas sensor is a popular gas sensor that detects a wide range of gases, including LPG gas.



**Fig 2:-MQ 135 Gas Sensor**

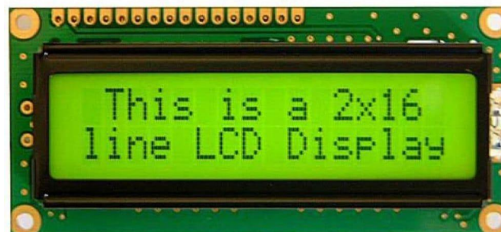
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3. Buzzer: The buzzer is used to provide an audible alarm when gas levels exceed a certain threshold.



**Fig 3:-Buzzer**

4. LCD 16\*2 Display: The LCD display is used to display the gas levels and system status, providing a user-friendly interface.



**Fig 4:- LCD 16\*2 Display**

5. Auto-Exhaust Mechanism: The auto-exhaust mechanism consists of an exhaust fan that is turned on automatically when gas levels exceed a dangerous level, removing the gas from the surrounding environment.

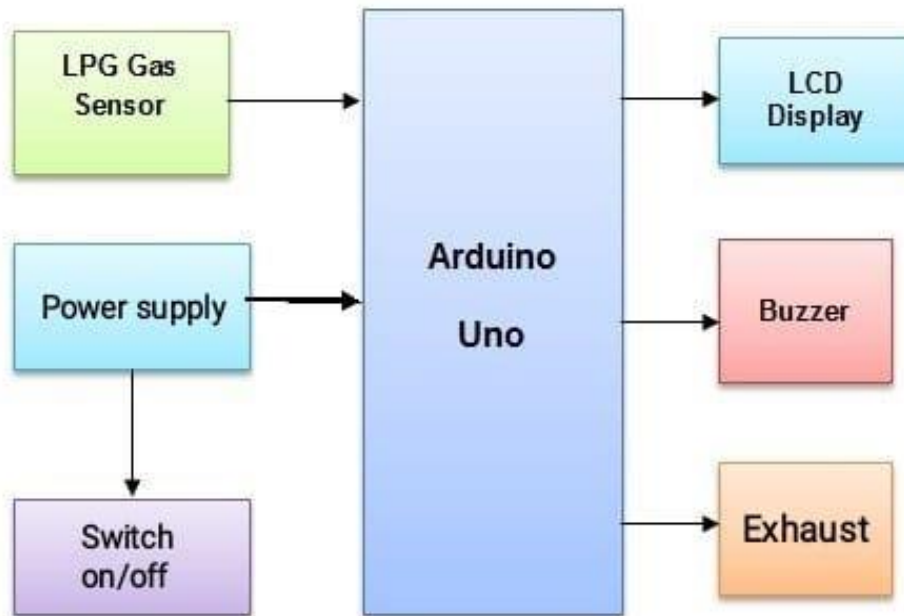


**Fig 5:-Exhaust Fan**

Overall, these hardware components provide a cost-effective and reliable solution for detecting LPG gas leakage and providing an alarm and auto-exhaust mechanism to prevent potential hazards caused by gas leakage.

5.

## Circuit / Block Diagram



**Fig 6:-Block diagram of LPG Gas Leakage Detector**

## **Working of Circuit Diagram**

The circuit diagram of the LPG gas leakage detector consists of the MQ 135 gas sensor, LCD display, alarm, relay module, and exhaust fan, all connected to the Arduino Uno microcontroller board. The MQ 135 gas sensor is connected to the A0 pin of the Arduino Uno, while the LCD display, alarm, and relay module are connected to digital pins on the board. The exhaust fan is connected to the normally open (NO) pin of the relay module which is then connected to a power source.

The LPG gas leakage detector is a simple but effective device that uses an Arduino Uno microcontroller board, MQ 135 gas sensor, LCD display, alarm, and exhaust fan to detect the presence of LPG gas and alert the user if the gas concentration exceeds a certain threshold. The device is easy to build and can be used in homes, offices, and other enclosed spaces to improve safety and prevent accidents.

# Software Used

## 1.Arduino IDE for code compilation.

Arduino IDE is used ,it is an open-source electronics platform based on easy-to-use hardware and software. It consists of a physical programmable circuit board (often referred to as a microcontroller) and an Integrated Development Environment (IDE) that runs on a computer, which is used to write and upload code to the microcontroller.

## 2.Proteus for simulation

Proteus is a powerful software tool used for simulation, design, and debugging of electronic circuits. It is widely used by electronic engineers and hobbyists to design and test electronic circuits before they are physically built. Proteus can simulate both analog and digital circuits, and can also simulate microcontroller-based systems.

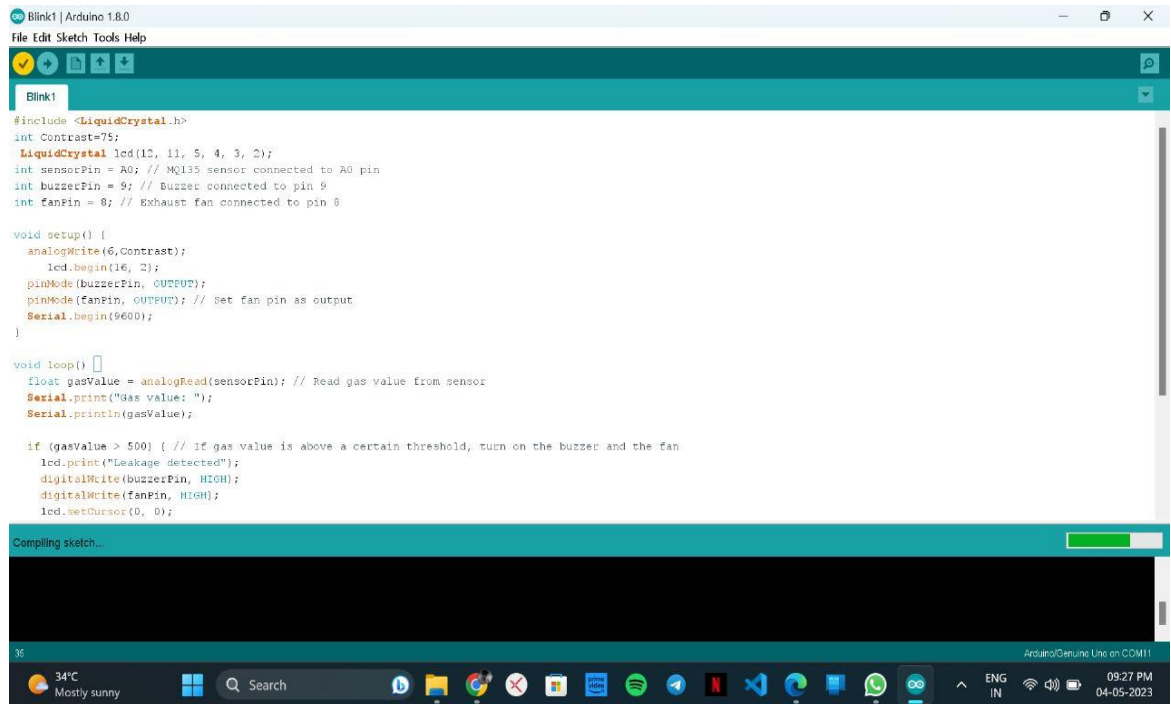
One of the key features of Proteus is its ability to perform mixed-mode simulation, which allows analog and digital components to be simulated together in the same circuit. This makes it a very useful tool for designing complex systems that incorporate both analog and digital components.

Proteus also includes a comprehensive library of components, including microcontrollers, sensors, actuators, and other electronic components. This allows users to quickly design and test circuits using pre-built components rather than having to create them from scratch.

In addition to circuit simulation, Proteus also includes a PCB layout editor, which allows users to design and prototype their circuits on a physical board. This can save time and money in the design process by allowing users to test their circuit designs before they are sent off for fabrication.

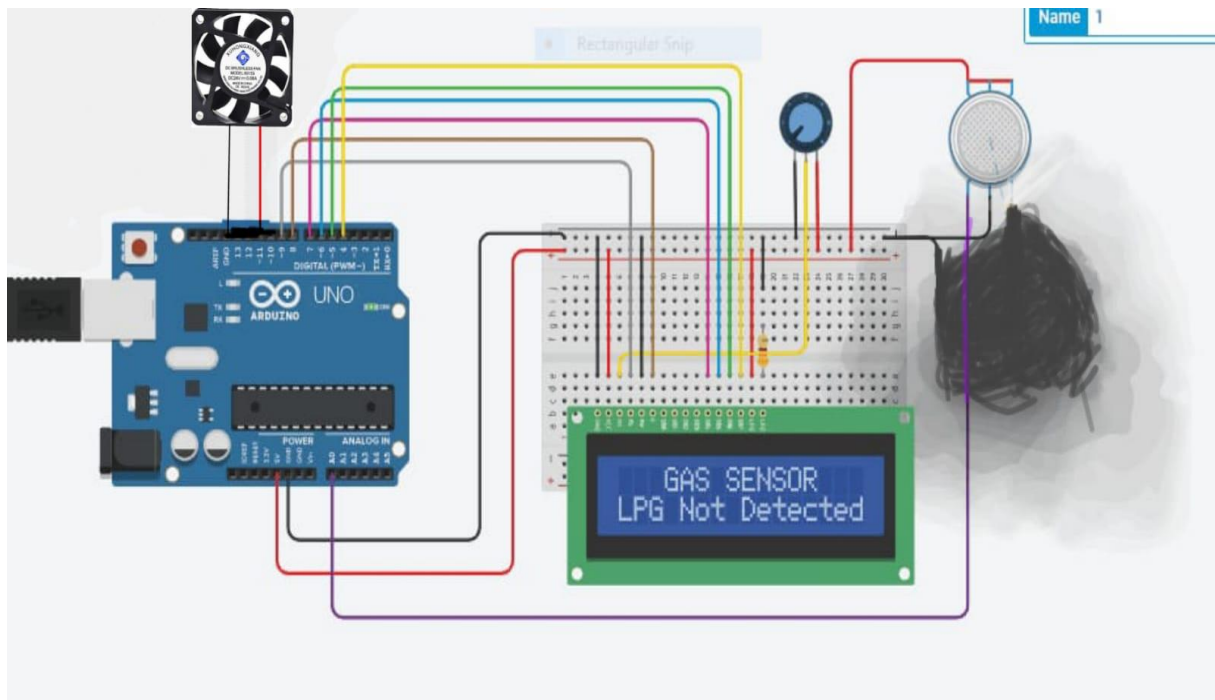
Overall, Proteus is a powerful and versatile tool for electronic circuit design and simulation, and is widely used in the electronics industry and by hobbyists alike.

# Software Designing Layout



**Fig 7:-software designing layout**

# PCB Designing Layout



**Fig 8:- PCB Design Layout**



## Working

The working of the LPG gas leakage detector using Arduino Uno, MQ 135 gas sensor, buzzer, LCD to display gas detection, with alarm and auto exhaust can be described as follows:

1. Power up the Arduino Uno board by connecting it to a power source using a USB cable.
2. Connect the MQ 135 gas sensor to the analog input pin of the Arduino Uno board.
3. Connect the buzzer to the digital output pin of the Arduino Uno board.
4. Connect the LCD 16\*2 display to the Arduino Uno board using the appropriate pins.
5. Upload the program code to the Arduino Uno board using the Arduino IDE.
6. Place the gas sensor in the environment being monitored, preferably near the LPG gas source.
7. Calibrate the gas sensor using a known concentration of LPG gas to ensure accurate detection.
8. Once calibrated, the gas sensor will detect any LPG gas leakage in the environment.
9. The gas sensor will provide an analog output that is proportional to the gas concentration.
10. The Arduino Uno board will process the analog output from the gas sensor and display the gas levels on the LCD 16\*2 display.

11.

11. If the gas levels exceed a certain threshold, the buzzer will be triggered, providing an audible alarm to alert users about the gas leak.
12. If the gas levels continue to increase and reach a dangerous level, the auto-exhaust mechanism will turn on the exhaust fan automatically, removing the gas from the surrounding environment.
13. After the gas levels have decreased and the gas leak has been resolved, the system can be reset by turning off the alarm and exhaust fan.

Overall, this working of the LPG gas leakage detector mini project using Arduino Uno, MQ 135 gas sensor, buzzer, LCD to display gas detection, with alarm and auto exhaust provides a reliable and cost-effective solution to detect LPG gas leakage and prevent potential hazards caused by gas leakage. It is a user-friendly and effective system for monitoring gas levels and alerting users about gas leaks while automatically removing gas from the surrounding environment, ensuring safety and peace of mind.

# Programming

```
#include <LiquidCrystal.h>
int Contrast=75;
LiquidCrystal lcd(12, 11, 5, 4, 3, 2);
int sensorPin = A0; // MQ135 sensor connected to A0 pin
int buzzerPin = 9; // Buzzer connected to pin 9
int fanPin = 8; // Exhaust fan connected to pin 8
void setup() {   analogWrite(6,Contrast);
                 lcd.begin(16, 2);
                 pinMode(buzzerPin, OUTPUT);
                 pinMode(fanPin, OUTPUT); // Set fan pin as output
                 Serial.begin(9600);}

void loop() {
    float gasValue = analogRead(sensorPin);
    // Read gas value from sensor
    Serial.print("Gas value: ");
    Serial.println(gasValue);      }

    if (gasValue > 500) {
        // If gas value is above a certain threshold, turn on the
        buzzer and the fan
        lcd.print("Leakage detected");
        digitalWrite(buzzerPin, HIGH);
        digitalWrite(fanPin, HIGH);
        lcd.setCursor(0, 0);
    } else{
        digitalWrite(buzzerPin, LOW);
        digitalWrite(fanPin, LOW); // Turn off the fan if gas
        value is below the threshold
        lcd.setCursor(0, 0);
        lcd.print("No Leakage detected");}
        delay(1000); //Wait for 1 second before taking another
        reading      }
```

## Merit's And Demerit's

**Merits** of LPG gas leakage detector using Arduino Uno, MQ 135 gas sensor, buzzer, LCD to display gas is detected, with alarm and auto exhaust:

1. **Early Detection:** The system can detect gas leaks early, allowing users to take prompt action to prevent potential hazards caused by gas leakage.
2. **Cost-Effective:** The system is cost-effective and can be easily assembled using readily available components, making it an affordable solution for households and small businesses.
3. **User-Friendly:** The LCD 16\*2 display provides a user-friendly interface for monitoring gas levels, and the audible alarm and auto-exhaust mechanisms make the system easy to use and operate.
4. **Low Maintenance:** The system is low maintenance and does not require frequent maintenance or calibration, reducing the overall maintenance cost and effort.
5. **Customizable:** The system can be customized to meet specific requirements, such as adjusting the threshold for triggering the alarm or auto-exhaust mechanism.

**Demerits** of LPG gas leakage detector using Arduino Uno, MQ 135 gas sensor, buzzer, LCD to display gas is detected, with alarm and auto exhaust:

1. **Limited Range:** The system has a limited range of detection, and users must place the gas sensor in close proximity to the gas source to ensure accurate detection.

2. False Alarms: The system may trigger false alarms in certain situations, such as when using other types of gas or when the gas levels are within the normal range.
3. Limited Exhaust Capacity: The exhaust fan may have limited capacity, and users may need to install additional exhaust fans to ensure effective removal of gas from the surrounding environment.
4. Power Supply: The system relies on a power source, such as a USB cable, and may require a backup power supply to ensure continuous operation during power outages.

Overall, the LPG gas leakage detector using Arduino Uno, MQ 135 gas sensor, buzzer, LCD to display gas is detected, with alarm and auto exhaust is an effective and affordable solution for detecting LPG gas leaks and preventing potential hazards caused by gas leakage. While it has some limitations and potential drawbacks, the benefits and merits of the system outweigh the demerits, making it a viable option for households and small businesses.

# Application

The LPG gas leakage detector using Arduino Uno, MQ 135 gas sensor, buzzer, LCD to display gas is detected, with alarm and auto exhaust has numerous applications in various settings, including:

1. Residential: The system can be used in households to detect gas leaks from cooking gas cylinders and prevent potential hazards caused by gas leakage.
2. Commercial: The system can be used in commercial settings, such as restaurants and food processing plants, to detect gas leaks from LPG gas cylinders and prevent potential hazards caused by gas leakage.
3. Industrial: The system can be used in industrial settings, such as factories and chemical plants, to detect gas leaks from gas pipelines and prevent potential hazards caused by gas leakage.
4. Transportation: The system can be used in transportation settings, such as in vehicles that use LPG gas as a fuel, to detect gas leaks and prevent potential hazards caused by gas leakage.
5. Laboratory: The system can be used in laboratories to detect gas leaks from gas cylinders and prevent potential hazards caused by gas leakage.

In summary, the LPG gas leakage detector using Arduino Uno, MQ 135 gas sensor, buzzer, LCD to display gas is detected, with alarm and auto exhaust has versatile applications in various settings where LPG gas is used, helping to detect gas leaks and prevent potential hazards caused by gas leakage.

## Conclusion

In conclusion, the LPG gas leakage detector using Arduino Uno, MQ 135 gas sensor, buzzer, LCD to display gas is detected, with alarm and auto exhaust is a simple and effective solution to detect LPG gas leaks and prevent potential hazards caused by gas leakage. It is cost-effective, easy to use, and customizable to meet specific requirements. The system has various applications in residential, commercial, industrial, transportation, and laboratory settings, making it a versatile solution to monitor gas levels and ensure the safety of individuals and the environment. Although the system has some limitations, its benefits and merits outweigh the demerits, making it a viable option for households, small businesses, and industries.

Furthermore, the LPG gas leakage detector using Arduino Uno, MQ 135 gas sensor, buzzer, LCD to display gas is detected, with alarm and auto exhaust is an excellent example of how technology can be used to improve safety and prevent potential hazards. With the increasing use of LPG gas in various settings, it is essential to have a reliable system in place that can detect gas leaks and alert individuals before any damage is done. The project demonstrates the effectiveness of using Arduino-based systems to design and develop simple and effective solutions for common problems. In addition, the project provides a good platform for learning about Arduino programming and sensor interfacing, making it an excellent educational tool for students and hobbyists interested in electronics and programming. Overall, the LPG gas leakage detector using Arduino Uno, MQ 135 gas sensor, buzzer, LCD to display gas is detected, with alarm and auto exhaust is a valuable project that has the potential to save lives and prevent damage caused by gas leaks.

## Future Scope

The mini project "LPG gas leakage detection using Arduino Uno, MQ135 gas sensor, buzzer, LCD to display gas is detected, with alarm and auto exhaust" has a wide scope in the future, especially in terms of enhancing safety and reducing environmental pollution.

Here are some potential future scopes for the project:

1. **Integration with home automation systems:** The project can be further developed to integrate with home automation systems. For example, when gas leakage is detected, the system can automatically shut off the gas supply and turn on the exhaust fan, which can be controlled by a home automation system.
2. **Remote monitoring:** The system can be connected to the internet, allowing remote monitoring and control. This feature can be helpful in monitoring the gas leakage when the homeowner is away from home.
3. **Advanced sensors:** Advanced gas sensors, such as carbon monoxide (CO) and smoke sensors, can be integrated into the system to detect other harmful gases and smoke.
4. **Mobile application:** The project can be developed to include a mobile application that can provide real-time gas leakage alerts and control the exhaust fan and gas supply.
5. **Machine learning:** Machine learning algorithms can be used to analyze the sensor data and predict potential gas leakages. This can help in preventing gas leakages and enhancing safety.
6. **Industrial application:** The project can be scaled up for industrial applications, such as in factories, where gas leakage can be a severe safety hazard



## Reference

Here is a reference for your mini-project on "LPG gas leakage detector using Arduino Uno, MQ 135 gas sensor, buzzer, LCD to display gas is detected, with alarm and auto exhaust":

- "Smart Sensors and Systems: Innovations for Medical, Environmental, and IoT Applications, 2nd edition" by Dr. Subhas Chandra Mukhopadhyay and Dr. Antonio Luque Estepa (published in 2021)
- "Principles of Electronic Instrumentation and Measurement, 4th edition" by Dr. S. K. Bhattacharya (published 2020 )
- Exploring Arduino: Tools and Techniques for Engineering Wizardry" by Jeremy Blum. Edition: 2nd.
- "Beginning Sensor Networks with Arduino and Raspberry Pi" by Charles Bell. Edition: 1st.
- "Arduino Projects: The Complete Beginner's Guide to Learning Arduino" by Tim Warren. Edition: 1st.
- "Gas Sensors: Design and Performance" by Ghenadii Korotcenkov. Edition: 1st.
- "Introduction to Sensors for Ranging and Imaging" by Graham Brooker. Edition: 1st.