

# Automatic LPG Leakage Detector using Arduino (UNO)

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**Abstract:** Gas leakage is a major problem in industries, residential premises and gas powered vehicles. The leakage if not detected may lead to explosion and cause severe damages to life and environment. The conventional leakage detection system uses on-site alarms for warning. The "LPG Gas Leakage Detector Using Arduino" is an innovative safety system designed to detect and respond to the presence of Liquefied Petroleum Gas (LPG) leaks in various environments, including homes, kitchens, and industrial settings. This device leverages Arduino microcontroller technology and gas sensors to provide real-time monitoring and alerts. The system offers an additional layer of protection against the potential hazards and dangers associated with gas leaks.

**Keywords:** Arduino UNO, LCD (Liquid crystal display), LPG(Liquefied petroleum gas), MQ-6 Gas Sensor, Buzzer, LED(Light emitting diode)

## I. INTRODUCTION

A gas leakage detector is a device that helps detect the presence of LPG gas in the air. It's an important safety measure to prevent accidents. Gas leakage leads to various accidents resulting in both material loss and human injuries. The risk of explosion, firing, suffocation are based on their physical properties such toxicity, flammability, etc. The number of deaths due to explosion of gas cylinders has been increasing in recent years.

Gas leakage poses significant safety and environmental risks in both residential and industrial settings. In particular, leaks of Liquefied Petroleum Gas (LPG) can lead to catastrophic accidents and damage to the environment. To address these concerns, the development of efficient gas leakage detection systems is paramount. This research paper presents an innovative approach to LPG gas leakage detection using Arduino, a widely accessible and versatile microcontroller platform. LPG, commonly used for heating, cooking, and fueling vehicles, is highly flammable and can be hazardous when released into the atmosphere. Timely detection and alerting mechanisms are essential to prevent accidents and mitigate potential harm. Traditional gas detectors are often expensive and complex, making them less accessible for individuals and small-scale applications. Arduino, an open-source platform known for its simplicity and affordability, provides an opportunity to design an effective LPG gas leakage detector with wider reach. This research aims to explore the feasibility and reliability of an Arduino-based gas leakage detection system. By leveraging the analog and digital input/output capabilities of Arduino, we will design a system capable of sensing LPG gas levels and triggering alarms when concentrations exceed safe thresholds. The implementation will involve integrating an LPG gas sensor, a buzzer, and an LED indicator, creating a compact, user-friendly device.

Automatic LPG leakage detectors provide a crucial safety measure in environments where LPG is used, such as homes, commercial kitchens, and industrial settings. They offer early detection and prevention of gas leaks, helping to protect lives and property from the potential dangers associated with LPG gas.

**II. BLOCK DIAGRAM**

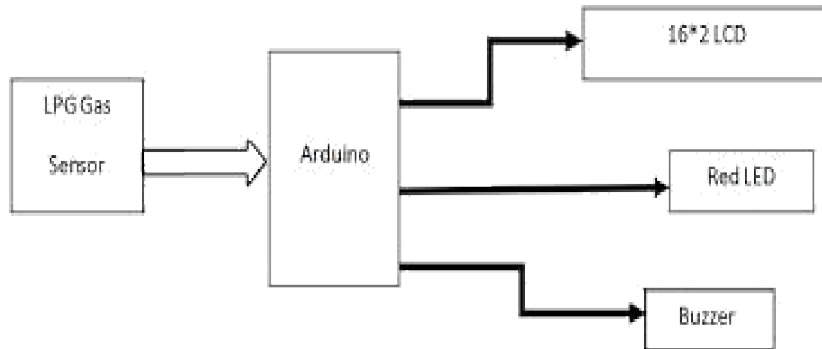


Fig.1.Block diagram of Automatic LPG leakage detector

**III. METHODOLOGY**

**3.1. ARDUINO UNO**

The ARDUINO is a low-power, high-performance CMOS 8-bit Arduino microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel’s high-density nonvolatile memory technology and is compatible with the industry-standard 80C51 instruction set and pinout. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer .By combining a versatile 8-bit CPU within-system programmable Flash on a monolithic chip, the Atmel ARDUINO is a powerful Arduino microcontroller which provides a highly-flexible and cost-effective solution to many embedded control applications. fig. shows the ARDUINO

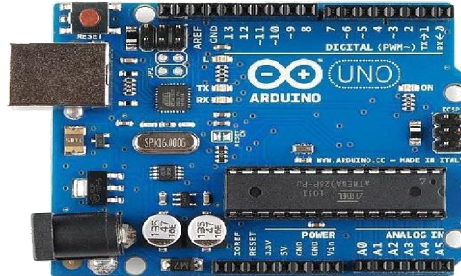


Fig.2.Arduino uno

**3.2. LPG GAS SENSOR MODULE (MQ-6)**

MQ6 Gas sensor is a Metal Oxide Semiconductor (MOS) type Gas Sensor mainly used to detect the LPG and Butane gas concentration in the air either at home or in industry. This sensor contains a sensing element, mainly aluminum-oxide based ceramic, coated with Tin dioxide, enclosed in a stainless-steel mesh. Below figure shows MQ-6 gas sensor.



Fig.3.MQ-6 gas sensor

### 3.3. BUZZER

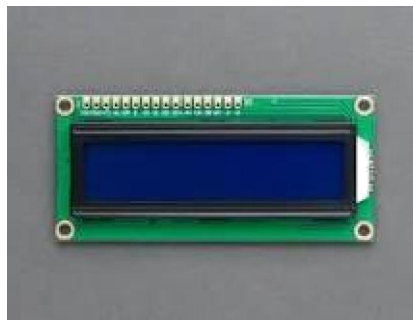
A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric (piezo for short). Typical uses of buzzers and beepers include alarm devices, timers, train and confirmation of user input such as a mouse click or keystroke



**Fig.4.Buzzer**

### 3.4. LCD

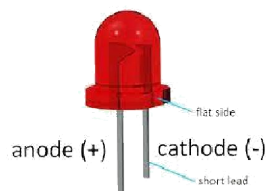
A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix.



**Fig.5 .LCD**

### 3.5. LED

LED stands for light emitting diode. LED lighting products produce light up to 90% more efficiently than incandescent light bulbs. How do they work? An electrical current passes through a microchip, which illuminates the tiny light sources we call LEDs and the result is visible light.



**Fig. 6. LED**

### 3.6. JUMPER WIRES (connecting wires)

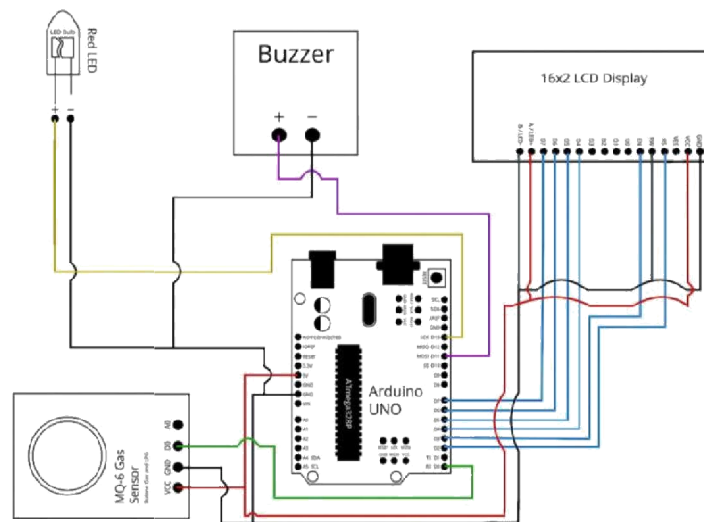
A jumper wire is an electric wire that connects remote electric circuits used for printed circuit boards. By attaching a jumper wire on the circuit, it can be short-circuited and short-cut (jump) to the electric circuit.



**Fig.7. Jumper wires**

**IV. CIRCUIT DIAGRAM AND DISCRPTION**

The circuit diagram for Automatic LPG leakage detector using ARDUINO is given below.

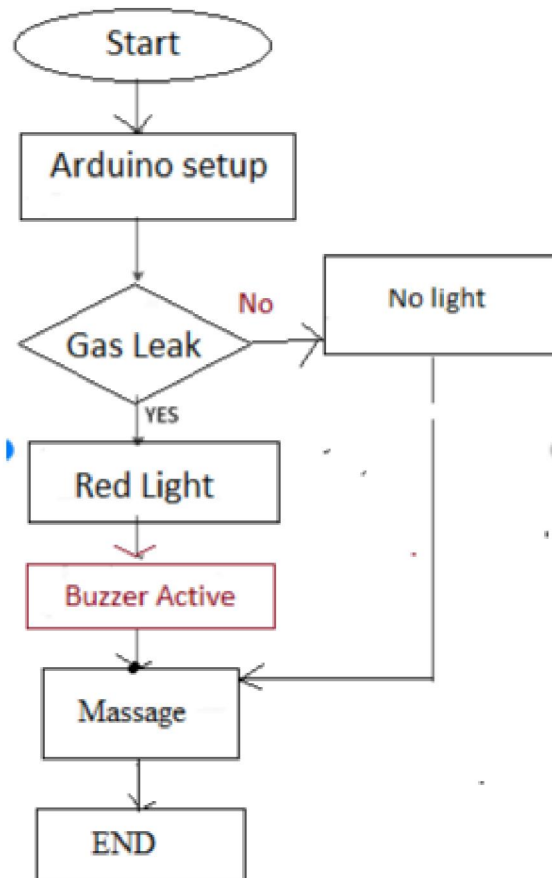


**Fig.8. circuit diagram of Automatic LPG leakage detector using Arduino uno**

As shown in the schematic diagram above, it contains Arduino board, LPG GAS Sensor Module, buzzer and 16x2 LCD module. Arduino controls the whole process of this system like reading LPG Gas sensor module output, sending message to LCD and activating buzzer and LED.

LPG gas sensor module's D0 pin is directly connected to pin D0 of Arduino and Vcc and GND are connected to 5V and GND of arduino. **LPG gas sensor module consist a MQ-6 sensor which detects LPG gas.** This MQ-6 sensor has a heater inside which needs some heater supply to heat up and it may takes up to 15 minute to get ready for detecting LPG gas. And a comparator circuit is used for converting Analog output of MQ-6 in digital. A 16x2 LCD is connected with arduinoin

**V. FLOW CHART**



**VI. ADVANTAGES**

- It is used in house as LPG leakage detection.
- It also detects alcohol so it is used as liquor tester.
- Cost efficient.
- Less complex circuit.
- No environmental effect or no effect of physical conditions

**VII. FUTURE SCOPE**

There is a lot of scope in the IOT based gas Leakage Detection system as it can be used for various sectors that can be any Commercial area, buildings, hotels, hospitals. The Infrared Sensor and MQ6 Gas Sensor is helpful to prevent fire.

**VIII. CONCLUSION**

We can conclude that LPG leakage detection is essential to prevent accidents and to save human lives. This paper presents LPG leakage detection and alert system. This system triggers LED and buzzer to alert people when LPG leakage is detected. This system is very simple yet reliable. The automatic LPG leakage detector using Arduino is a project that utilizes Arduino microcontroller to detect and alert the presence of LPG This paper provides an automated and efficient way to ensure safety by promptly detecting and alerting about potential gas leaks.

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