# INTELLIGENT GAS LEVEL MONITOR WITH SMS ALERTS

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**Abstract**-
Gas leakage has been a significant issue in industrial sectors, residential areas, and other locations. To prevent accidents related to gas leaks, one effective measure is to install a gas leakage detection system in susceptible areas. This paper aims to present a design for an automated gas leakage detection system that not only detects and alerts users of gas leaks but also includes a warning mechanism. The system employs a gas sensor capable of promptly identifying gas leaks and sends SMS notifications to users. Additionally, it continuously monitors gas levels, providing audio and visual alerts. The proposed design incorporates both software and hardware elements, resulting in a highly efficient, user-friendly, portable, compact, and cost-effective system.

**Keywords-** Gas detection, monitor, sensor, SMS, alert, GSM, security.

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## I.INTRODUCTION

This system is a crucial component of safety measures, providing the first line of defense against potential gas leakage disasters. It detects gas leaks and activates a circuit to alert people to take necessary precautions. Some leaks are too small to be smelled or involve unscented gases, making this system a vital investment. It identifies dangerous and toxic gas leaks using specific sensors, which emit a sound alert when a leak is detected. Gas leaks can lead to various accidents, causing both material damage and human injuries, with risks such as explosions, fires, and suffocation depending on the gases' properties like toxicity and flammability. In today's world, the safety of residential, industrial, and vehicular environments is paramount, especially concerning potential gas leaks. Gas leakage poses significant risks, including explosions, fires, and toxic exposure, which can lead to substantial property damage, severe injuries, and even loss of life. Traditional methods of detecting gas leaks, such as manual inspections or reliance on the human sense of smell, are often inadequate and can fail to provide timely warnings. To address these challenges, we propose an Intelligent Gas Level Monitor with SMS Alerts, an advanced system designed to enhance safety by providing real-time monitoring and instant notifications. This system utilizes modern technology to detect gas leaks swiftly and accurately, ensuring immediate response to potential hazards.

The Intelligent Gas Level Monitor is equipped with high-sensitivity gas sensors capable of detecting various types of gases such as LPG, methane, and butane. Upon detecting a gas leak, the system not only activates audible and visual alarms but also sends SMS alerts to predefined mobile numbers, ensuring that responsible individuals are promptly informed regardless of their location. This dual alert mechanism maximizes the chances of quick and effective intervention, mitigating the risks associated with gas leaks. Furthermore, the system continuously monitors gas levels and displays the status on an LCD screen, providing real-time data on gas concentration in the environment. The integration of microcontrollers and GSM technology ensures the system's reliability, ease of use, and cost-effectiveness. This paper aims to discuss the design and implementation of the Intelligent Gas Level Monitor with SMS Alerts, highlighting its features, functionality, and potential benefits. By adopting this innovative solution, we can significantly improve safety standards and prevent accidents related to gas leaks in various settings. Due to the increasing number of deaths from gas cylinder explosions in recent years, there is a pressing need for a system that detects gas leaks and provides alerts. An Arduino and IoT-based gas leakage identification system can help determine gas leaks in the environment and send data to an IoT module. The Internet of Things (IoT) enables physical objects to communicate via sensors, electronics, software, and connectivity, requiring no human interaction, which is also true for the IoT-based gas detection system.

## II. RELATED WORK

Gas leakage has emerged as a significant challenge in the industrial sector, residential areas, and gas-operated vehicles such as CNG (Compressed Natural Gas) buses and cars. One effective protective measure is to install detection devices in vulnerable locations. This paper aims to develop a device capable of automatically detecting gas leaks in these areas. The device uses a gas sensor to detect leaks and employs GSM technology to send SMS alerts to notify individuals about the leakage. It is designed to detect gas leaks of substances like LPG, Butane, Methane, or other petroleum-based gases using the MQ-5 Sensor. The system sends three SMS alerts to two specified mobile numbers and produces an alarm sound upon detecting a gas leak, which stops once the leak is controlled. It also displays the status using a 16×2 LCD module. When the LPG concentration in the air exceeds a predetermined level, the gas sensor triggers, causing the microcontroller to activate the LED and buzzer simultaneously. The system then alerts the user by sending an SMS to the specified mobile phone. The sensor's output goes low when the gas concentration in the air exceeds a certain value, which the controller detects, activating the LED and buzzer. The system uses a gas sensor to detect leaks and employs GSM to send SMS alerts about the leakage. When the gas concentration in the air crosses a specified level, the gas sensor triggers, causing the microcontroller to activate the LED and buzzer simultaneously. The system then sends an SMS alert to the specified phone number. The goal is to design and develop an LPG gas leakage monitoring and alert system using Arduino. This system will display the leakage message on a display board and send an alarm notification via SMS to a predefined mobile number. Arduino operates with a 5-volt power supply. Once the system is launched, the sensor will detect gas leakage; if there is no leakage, it will display "Normal Condition Air Cleaning" on the display. If gas leakage is detected, the system will follow three steps:
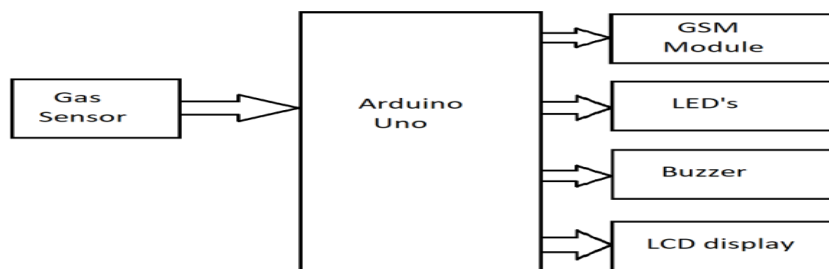
Fig 1. Block Diagram

## II. PROPOSED SYSTEM

A Gas Leakage Detection system is designed with SMS and buzzer alert using GSM module, buzzer and Arduino as major components. Sim800 GSM Module, buzzer and MQ2 Gas Sensor are interfaced with Arduino where gas sensor serves as input and GSM module and buzzer are the outputs. The 16x2 LCD displays the gas level value throughout the working of the system. The alert system consisting of GSM module, LED and buzzer is triggered when smoke or gas leakage is detected. The circuit uses the MQ2 Smoke/Gas sensor and Arduino as microcontroller to detect and smoke and gas leak. MQ2 Gas sensor requires 5V DC power supply and draws around 800mW of current. The gases that can be detected by MQ2 gas sensor are LPG, Smoke, Hydrogen, Propane, Methane, Alcohol and Carbon Monoxide in terms of its concentrations. The MQ2 sensor signal is monitored by the microcontroller and sends the signal to GSM module to send messages as "Gas Leakage" to a mobile number hardcoded prior. Whenever there is excess gas concentration in the environment the buzzer makes a sound and red led is on. During safe environment condition green led is on. This system can be used as a safety measure device in households or in industries. A signal from the microcontroller will be sent to the display to show a gas leakage message. Step 2: The signal from the buzzer will sound when the first step is completed. Step 3: Finally, a GSM module will send a notification message about the gas leak to one or multiple specified phone numbers.

The circuit connections include an Arduino, buzzer, LEDs, LCD, and GSM module. The Arduino functions as the microcontroller, while the GSM module sends SMS status updates. LEDs and buzzers act as indicators. The MQ2 sensor detects the gas concentration in the environment and sends this data to the Arduino. A threshold value is set in the program, and if the gas concentration exceeds this threshold, an SMS alert is sent to a specified mobile number, and the buzzer and LED are activated. This alerts nearby individuals, prompting them to take measures to reduce the gas concentration. All activities are displayed on the LCD screen. If the gas level is normal, this is indicated on the LCD, and no SMS is sent. The GSM module uses AT commands to send SMS messages to the designated mobile number.
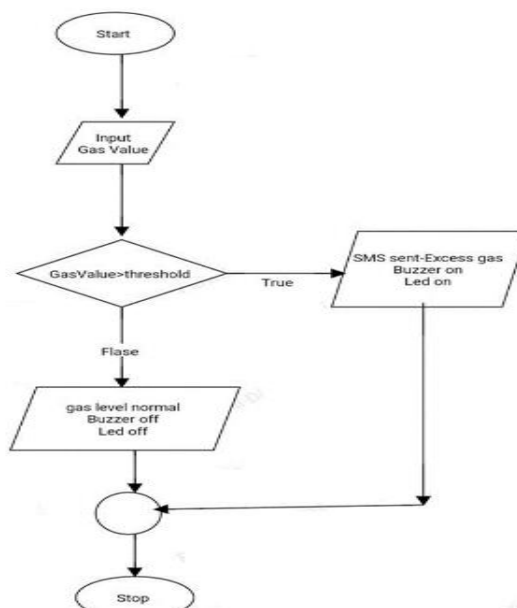
**III Hardware and Software Description**

The primary components used in the project include an Arduino, MQ2 gas sensor, GSM module, buzzer, LCD, and LEDs. The Arduino is powered by a 9V external battery, while the GSM module is powered by an adapter. The GSM Arduino Uno

module, a SIM 800A type, features a transmitter, receiver, and SIM card slot. The 16x2 LCD displays all program activities. The buzzer and LEDs serve as indicators, activating when the gas level exceeds the set threshold.
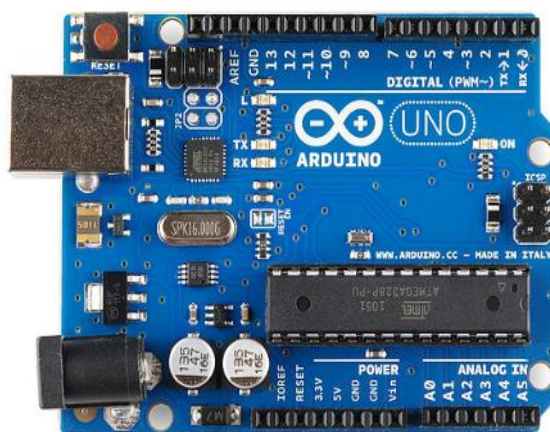


The Arduino UNO is arguably the most popular model among Arduino boards. It is equipped with an Atmega328 processor running at 16MHz, offering 32KB of program memory, 1KB of EEPROM, and 2KB of RAM. The UNO features 14 digital I/O pins, 6 analog inputs, and supports both 5V and 3.3V power rails. Its pin header arrangement is becoming a standard for

development boards, ensuring compatibility with most shields available on the market. The UNO includes a power jack for external wall wart power and a VIN option for battery connection. Measuring 69mm x 54mm, the compact size of the UNO makes it suitable for a wide range of projects, and its four screw holes allow for secure mounting.

**iii. Gas Sensor**



**Fig 3.** Gas Sensor

iv. A gas sensor is a device that detects the presence or concentration of gases in the atmosphere. It generates a corresponding potential difference by altering the resistance of its internal material based on the gas

concentration, which can be measured as an output voltage. This voltage value allows for the estimation of both the type and concentration of the gas.

**v. GSM Module**



**Fig 4.** GSM Module

A GSM module or a GPRS module is a chip or circuit that willbe used to establish communication between a mobile device or no SMS is sent. A computing machine and a GSM or GPRS system. The modem (modulator-demodulator) is a critical part here. GSM GPRS Modules are one of the commonly used communication modules in embedded systems. A GSM GPRS Module is used to enable communication between a microcontroller (or a microprocessor) and the GSM / GPSR Network.

**Software**

The programming is done using the Arduino IDE software, which is installed and run on a computer. The MQ2 sensor detects the gas concentration in the surrounding environment and sends this data to the Arduino microcontroller. The program includes a threshold value, and if the gas concentration exceeds this threshold, an SMS alert is sent, the buzzer and LED are activated, and AT commands are issued to the GSM module to send the SMS. All activities are displayed on the LCD. If the gas level is normal, this is also indicated on the LCD. The complete program flowchart is shown below.

**RESULTS AND DISCUSSIONS**

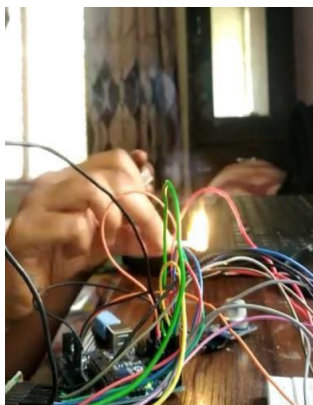This system is made to work in hazardous places where human life is at risk. It identifies the gas concentration in the
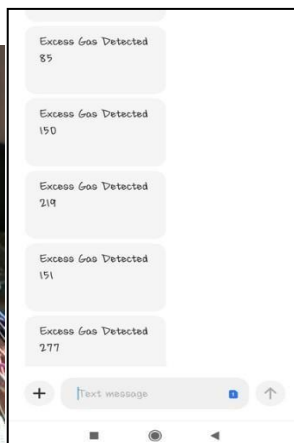


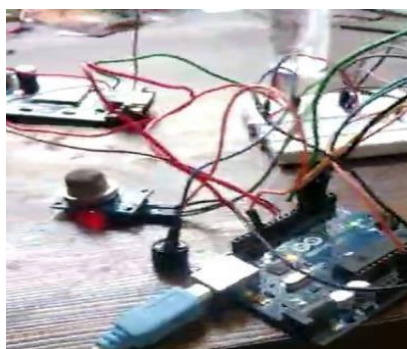**Fig 6.** Fire Introduced       **Fig 7.** SMS sent on phone



**Fig 8.** Circuit connection

## III. CONCLUSION

After successfully integrating the software and hardware components of the gas leakage detection system, we found that it effectively alerts users through continuous SMS notifications, a buzzer alarm, and a red LED light in the event of a gas leak, without requiring a human operator. The system can detect even the slightest gas concentrations in the environment, with a quick response time that promptly notifies the user to take necessary actions. Additionally, the gas levels can be continuously monitored, with a green LED indicating normal, safe conditions. This system is suitable for installation in small-scale industries such as kitchens, hostel cafeterias, and other areas, helping to reduce accidents caused by gas leaks in both household and commercial settings.

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