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Gas Leakage Monitoring and Alert System

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ABSTRACT:

It is a safety system used to detect and monitor the presence of harmful gases like methane, propane, and carbon monoxide. These gases can be dangerous, causing explosions, fires, or poisoning if they leak into the air. The system helps prevent such accidents by identifying leaks early and notifying people about the danger. The system typically works with sensors placed in areas where gas is used or stored. These sensors constantly check the air for the presence of specific gases. If the sensors detect a gas leak above a certain level, the system immediately activates an alarm. The alarm can take various forms, such as a loud sound, flashing lights, or even a message sent to your phone or other devices. Some advanced systems can even automatically turn off gas valves to stop further leakage Gas leakage monitoring systems are commonly used in homes, industries, kitchens, factories, and any places that use gas. They are especially important in places like gas pipelines, chemical plants, and gas storage areas.

Keyword: **Arduino uno, MQ2 Sensor, Power Supply, Buzzer, LCD Display, GSM Module**

1. INTRODUCTION

A Gas Leakage Monitoring and Alert System is a safety tool used to detect harmful gases in the air and alert people if there is a leak. These systems are important in places like factories, homes, and commercial buildings, where dangerous gases such as methane, carbon monoxide, or propane can cause serious harm. The main purpose of the system is to protect people from accidents by notifying them as soon as a gas leak is detected.

The system works by using special sensors that are able to sense the presence of specific gases. These sensors are always on the lookout for dangerous levels of gas in the air. When a leak is detected, the system immediately triggers an alarm to warn people nearby. This could be in the form of a loud noise, a flashing light, or even a message sent to a phone or email.

Gas leaks can happen without warning, and if not detected quickly, they can lead to explosions, fires, or health problems. By having a gas leakage monitoring system in place, businesses and households can avoid these risks. The system helps people act quickly, shutting off gas supply or evacuating the area if necessary.

These systems can be installed in homes, restaurants, factories, and even oil rigs, where gas leaks are a common risk. They help in preventing disasters by ensuring that people are always aware of potential dangers. In addition, many gas leakage monitoring and alert systems are designed to be easy to use and require little maintenance, making them accessible to everyone.

By having a gas leakage monitoring and alert system, people can feel safer knowing that they are protected from the harmful effects of gas leaks.

Objectives

- Detect Gas Leaks Early: To identify harmful gas leaks quickly before they cause damage.

- Alert People: To notify people nearby through alarms or messages when a gas leak occurs.

- Cost Savings: To avoid costly damages and repairs by detecting and stopping gas leaks early.

Scope of study

The scope of study for a Gas Leakage Monitoring and Alert System includes various aspects that ensure safety and efficiency in detecting gas leaks. This study focuses on understanding the different types of gases that need to be monitored, such as methane, carbon monoxide, and propane. It will explore the technology behind the gas sensors that detect these gases accurately and in real-time. The study also looks at the installation of the monitoring system in different environments like homes, industries, and public buildings. It covers the design and configuration of the system to suit specific needs, ensuring that it is reliable and easy to use.

2. LITERATURE REVIEW

A Gas Leakage Detection and Alert System is designed to monitor and detect harmful gas leaks in various environments such as residential, industrial, and commercial settings. These systems utilize advanced sensors to detect gases like methane, carbon monoxide, LPG, and natural gas, which can pose serious safety risks. The system typically comprises gas sensors, a control unit, an alarm system, and, in some cases, integration with wireless networks for remote monitoring.

Gas sensors, such as metal oxide sensors, electrochemical sensors, and infrared sensors, are commonly used in these systems. Metal oxide sensors detect gases by measuring changes in resistance, while electrochemical sensors measure current generated by the gas interaction. Infrared sensors use the principle of gas absorption at specific wavelengths to detect gases.

The gas leakage detection system works by continuously monitoring air quality and detecting the presence of hazardous gases. Once a leak is detected, the control unit processes the data and triggers an alarm, which can be a local audible alert or a visual indicator such as flashing lights. In more advanced systems, the alert may include notifications sent to mobile devices or central monitoring stations.

Some systems are integrated with Internet of Things (IoT) technology, enabling real-time data transmission to remote servers for monitoring and analysis. This feature is particularly useful for large industrial sites where constant supervision is critical. The IoT-based systems provide data that can be used for predictive maintenance, early detection of faults, and better decision-making.

Automatic shutoff valves can be connected to the detection system. These valves close the gas supply once a leak is detected, reducing the risk of further leakage or catastrophic events like explosions. Some systems also include ventilation control, which increases airflow to disperse gas and reduce accumulation.

3. PROPOSED SYSTEM

The proposed Gas Leakage Monitoring and Alert System aims to detect harmful gas leaks and ensure safety. It will use gas sensors such as MQ2 to detect gases like methane, carbon monoxide, and propane. These sensors will continuously monitor gas levels in real-time. When a gas leak is detected, the system will send instant alerts via audible alarms, SMS, to notify people nearby. The system will be connected wirelessly, allowing remote monitoring and control through a cloud-based platform.

System Requirements

The system we want to make is consisting of Arduino, GSM module, Buzzer, LCD. GSM module send the SMS to mobile number, The Arduino will control the signal as well as process the information received from the GSM. These are the following hardware and software requirements, which are needed to run this project successfully.

Hardware Requirements

1) Arduino UNO

2) 16x2 LCD Display

3) 12v dc power supply

4) Buzzer

5) MQ2 Sensor

6) GSM Module

7) GSM Sim

8) Connecting wires.

Block Diagram

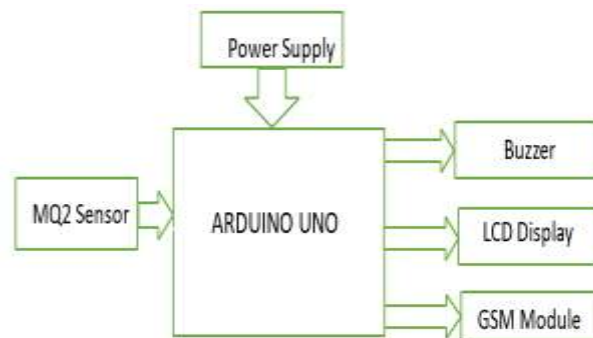**Fig**. **Block Diagram proposed system**

Figure 1: Block Diagram of Gas Leakage Monitoring and Alert System using Arduino.

Initially, the Arduino uno send signal to the GSM module and if the GSM module is connected properly with the Arduino uno it sends an acknowledgement signal back to the Arduino uno. Then if there is any gas leakage then it is detected by the gas sensor unit using MQ-2sensor. After the sensor unit detects the gas leakage, a signal is sent to the Arduino uno unit. which then sends activation signal to other external devices connected to it such as buzzer, GSM module and LCD display**.**

A.   Arduino Uno

Fig. Arduino Uno

The gas sensor detects gas leakage and sends an analog signal to Arduino. It reads the analog signal, processes the data, and determines if the gas concentration exceeds a predetermined threshold. If the threshold is exceeded, Arduino sends an alert signal to the GSM module. The GSM module sends an alert message to a cloud-based platform or mobile SMS. The buzzer produces an audible alert, and the LED indicators display a visual alert.

B.   MQ2 Sensor

Fig. MQ2 Sensor

MQ-2 gas sensor detects gas leakage and sends analog signal to Arduino. It reads analog signal, processes data, and determines if gas concentration exceeds a predetermined threshold. If threshold is exceeded, Arduino sends alert signals to buzzer and Buzzer will indicate.

C.   GSM Module

Fig. GSM Module

In this system, a GSM module acts as the communication hub, allowing the system to send immediate alerts, typically in the form of SMS messages, to a pre-defined mobile number when a gas leak is detected, effectively notifying the user about the gas is leaked and enabling them to take necessary actions regardless of their location. The MQ2 Sensor senses the gas leakage then it will monitor by the arduino and sends the signal to GSM module to send messages as "Gas Leakage" to a mobile number written in code.

D.   LCD Display

Fig. LCD Display

When the gas leakage goes high it turns ON the LED to indicate and makes an alarm with the help of buzzer. In this system we used 16×2 LCD display for this problem. An LCD displays the gas leakage result, such as "Gas leakage"

E.   Buzzer

Fig. Buzzer

MQ-2 sensor detects gas leakage and sends analog output to Arduino board. It reads analog output, processes data, and determines, When the gas is leaking the buzzer gives a beeping sound that indicates the fire is detected.

4. CONCLUSION

The gas leakage monitoring and alert system is an essential safety tool designed to detect harmful gas leaks in real-time. By using sensors, the system can detect various types of gases and send immediate alerts to users or authorities when dangerous levels are detected. This helps prevent potential accidents, explosions, or health hazards. The system is highly efficient in industrial, residential, and commercial settings, ensuring a safer environment. It improves response times by notifying individuals instantly through alarms, mobile notifications, or automated control systems. Additionally, it enhances overall security by continuously monitoring the gas levels, reducing the chances of human error.

5. FLOW CHART
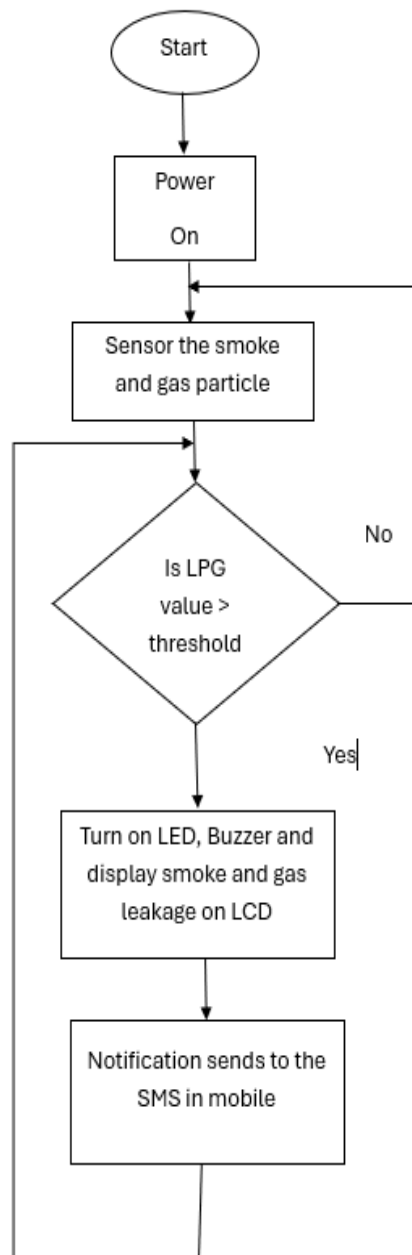
6. ADVANTAGES

1. Early Detection

2. Cost Savings

3. Environmental Protection

4. Remote Monitoring and Alerts

5. Low Maintenance

7. APPLICATION

1. Restaurants and Cafes

2. Homes

3. Industrial Applications

4. Gas Stations

5. Public Transportation

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