



CNG GAS LEAKAGE AND ACCIDENT PREVENTION SYSTEM FOR CNG AUTOMOBILES

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ABSTRACT

The purpose of this project is to develop and install a gas leak detection system for compressed natural gas (CNG) automobiles that is integrated with an OLED display and a solenoid valve to improve safety in CNG-using situations. The system uses an OLED display for real-time monitoring, a microcontroller for data processing and control, a solenoid valve for automated gas shutoff in the event of a leak, and a gas sensor to detect the presence of CNG gas.

Using a gas sensor, the gas detection system continuously checks the surrounding area for concentrations of CNG gas. The system sounds a warning and starts the shutdown process when it detects CNG levels above a predetermined threshold, thereby reducing potential dangers. The OLED display functions as a warning system and a user interface for interacting with the system by giving real-time input on gas levels and system condition. The solenoid valve is set to close by the system in the event of a gas leak, thereby stopping the gas flow and halting additional leaking. This automated reaction improves overall safety by lowering the possibility of an explosion or fire.

This project offers a comprehensive solution for monitoring and reducing the dangers associated with CNG gas leaks, hence improving safety in areas where CNG is utilized. It does this by integrating gas detection with an OLED display and a solenoid valve.

KEYWORDS: Arduino, OLED Display, Solenoid Valve, Buzzer

INTRODUCTION

With the increasing use of Compressed Natural Gas (CNG) as an alternative fuel for vehicles and in industrial applications, ensuring safety measures against potential gas leaks becomes paramount. The integration of advanced detection and control systems can significantly mitigate the risks associated with CNG gas leaks. or usage in industrial processes, home uses, and transportation, compressed natural gas, or CNG, has shown great promise as an alternative fuel. Adoption of CNG offers various benefits, such as reduced emissions, cost-effectiveness, and energy efficiency, as worries about environmental degradation and the depletion of fossil fuels continue to grow.

Methane makes up 80 to 90% of CNG gas. Since the gas is naturally odorless, ethyl mercaptan is added as an odorant prior to the gas being distributed. However, those who are anosmic—that is, have no sense of smell—or have a weak sense of smell could not notice a CNG leak right away, making it impossible for them to act right away. The surrounding region as well as the car in question could be impacted by an explosion caused by this CNG leak. A system that can identify CNG gas leaks and shield people from harm is necessary in such circumstances.

So, considering this problem, we have built a demo system, which is a low-cost model, which would detect CNG gas leakage and automatically shut off the gas supply from the automobiles.

HYPOTHESIS

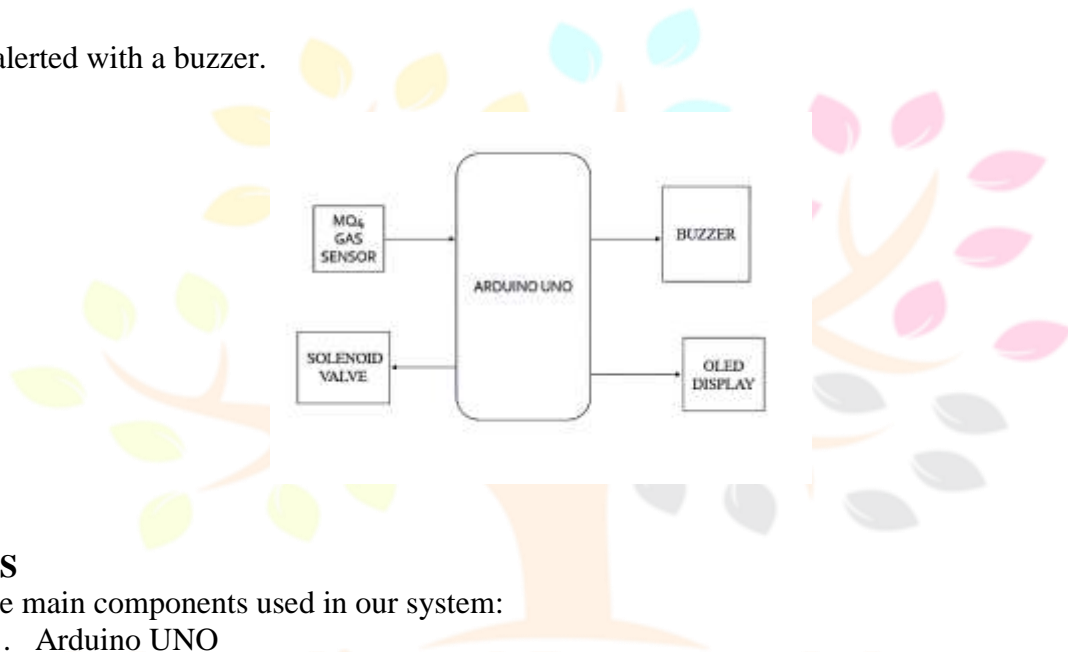
It will be useful to identify CNG leaks and to address any issues that may arise if vehicles are equipped with CNG leakage alert systems.

OBJECTIVES

- To detect CNG leakage using MQ-4 sensor To automatically shutoff gas supply using solenoid valve
- An alert is indicated by the buzzer and OLED display

METHODOLOGY

- The procedures used to put the CNG leakage alert system into place are as follows:
- The MQ-4 gas sensor will identify CNG leaks and notify the Arduino Uno about them.
- After processing the gas sensor's input signal, the Arduino will send a response signal to the relay.
- To stop the gas supply, the solenoid will close and the relay will turn on.
- The ppm and threshold values of the gas present around the gas sensor will be shown on the OLED display.
- The user is alerted with a buzzer.



COMPONENTS

Following are the main components used in our system:

1. Arduino UNO
2. Solenoid Valve
3. MQ-4 Gas Sensor
4. OLED Display

1.Arduino UNO:



One type of microcontroller board based on the ATmega328 is the Arduino Uno; the word "uno" is Italian for "one." The name Arduino Uno refers to the forthcoming Arduino Uno Board 1.0 microcontroller board. Digital I/O pins (14), an analog I/P pin (six), a ceramic resonator (A16 MHz), a USB port, a RST button, and an ICSP header are all present on this board. By connecting this board to the computer, all of these can assist the microcontroller in doing further operations. An AC to DC adapter or a USB cable can be used to power this board; a battery can also be used.

2.Solenoid Valve



An electromagnetic actuator, or solenoid, plus a valve body make up a solenoid valve, an on/off electromechanically actuated valve. The valve actuator that opens and closes the valve is the solenoid-plunger assembly. This actuator can be configured so that the plunger motion is limited to opening or closing. A solenoid cannot restrict flow since there is no intermediate or in-between position. The pressure-containing components in contact with the process fluid make up the valve body.

3.MQ-4 Gas Sensor



The MQ4 methane gas sensor is widely used in industries such as CNG gas and methane (CH₄) to detect gas leaks at home. Potentiometers can be used to alter the sensitivity of this gas sensor because of its quick response time and high sensitivity. This analog output sensor from the MQ sensor family is used in a manner akin to that of a compressed natural gas (CNG) sensor.

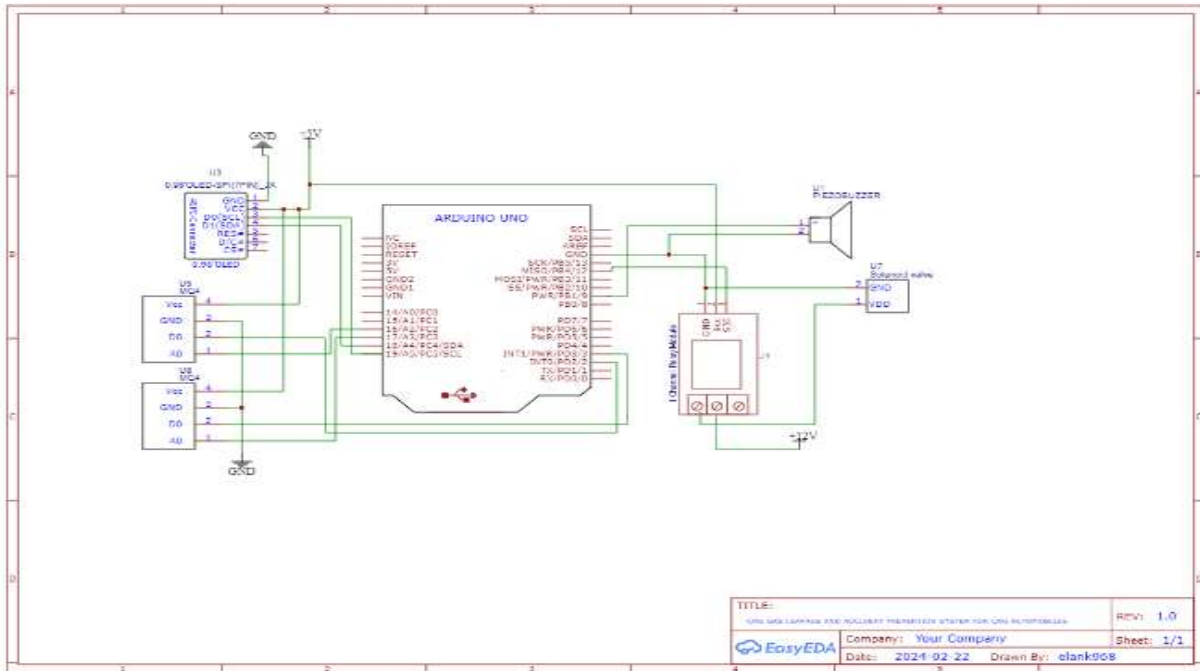
4.OLED Display



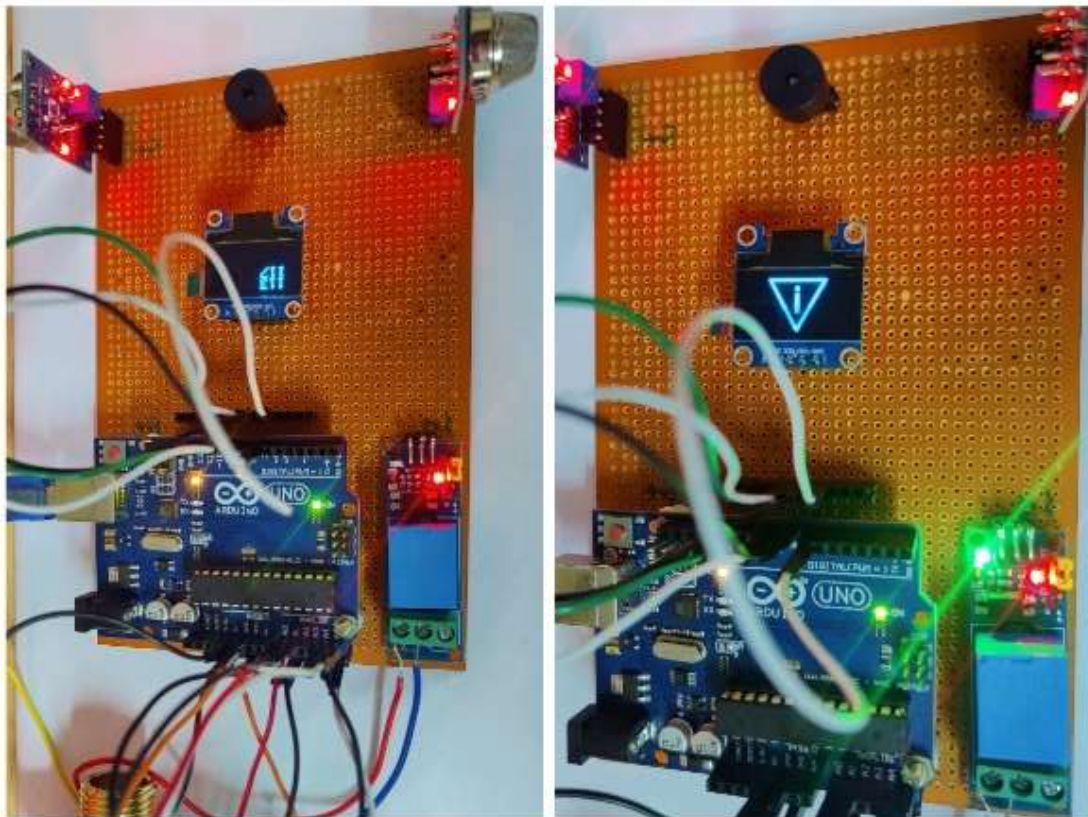
Organic light-emitting diodes, or OLEDs, are created by sandwiching a number of organic thin films in between two conductors. When electrical current is applied, a bright light is released. OLED displays are more efficient and thinner than LCD displays since they are emissive displays rather than requiring a white backlight.

In addition to being energy-efficient and thin, OLED screens offer the highest quality images available and can be made transparent, flexible, foldable, rollable, and even stretchy in the future. The future of display technology is OLEDs.

CIRCUIT DIAGRAM



WORKING DEMO



When the gas sensor is triggered, the buzzer activates, a caution symbol appears on the OLED display, and the relay is turned on.

CONCLUSION

Following system testing, we've found that the MQ-4 gas sensor is used by the CNG leakage system to detect CNG gas. The Arduino UNO microcontroller will receive the input signal after the CNG gas sensor has been detected. The relay will then receive a signal from the Arduino UNO, and it will activate a solenoid valve to cut off the gas supply. We may therefore draw the conclusion that this system will promptly detect any CNG leaks and address any ensuing issues.

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