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LPG Leakage Detector by using Arduino UNO with SMS and Sound alert

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ABSTRACT: For the past few years, gas leakage incidents are increasing, according to BFP (Bureau of Fire Protection) has reported nearly 2,400 fire incidents took place in the past 5 years. LPG (Liquefied Petroleum Gas) is highly flammable these are used in heating appliances of vehicles, where LPG consists of both propane(C_3H_8) and butane(C_4H_{10}). The main reason for these incidents is human negligence, for example, no regular checking of gas cylinders, etc. In this project, we can warn the workers and the surrounding people regarding the gas leakage. In this project, we use the materials of an MQ5 Gas sensor, Arduino UNO, 16x2 LCD, Buzzer, Relay, and GSM Module. When LPG gas leakage is sensed by the MQ5 gas sensor the level of leakage is checked in the LCD, if it reaches a certain level, then Arduino UNO will trigger the buzzer to alert the workers inside the factory or Industry. After– the GSM module will send the message to surrounding people near the factory regarding the gas leakage. It will help to decrease the death and injury percentage. At the last, a relay will be triggered where it will be used to turn off the power supply, we need a relay because LPG is highly flammable when the gas interacts with the electricity high explosion will take place and causes the loss of property. Through this project, we can protect the people as well as the property of the factory.

KEYWORDS: LPG Leakage, Monitoring, Security, Gas sensor, GSM Module, Arduino UNO, Relay, Buzzer.

I. INTRODUCTION

LPG is referred to as Liquefied Petroleum Gas. These are extracted from crude oil and natural gas. The main component of LPG is hydrocarbons, the normal components are propane(C_3H_8) and butane(C_4H_{10}). LPG is flammable. LPG is discovered in the year 1912 by Dr Walter Snelling.

LPG became a common issue, so monitoring this issue is important. In this project, we came up with a simple device that can detect gas leakage and alerts the workers and citizen about gas leakage by sending an SMS alert.

In this device when the gas leakage is detected at the MQ5 gas sensor, a 16x2 LCDs the level of leakage. If the leakage is reached a certain point, e.g., 40%, Arduino UNO will trigger the buzzer, alerting the workers inside the factory. Next Arduino will trigger the GSM module, which will send the SMS alert to the citizens which will help to evacuate the leakage area. At last, the relay will be turned ON it will turn OFF the power supply inside the factory. Relay is important because LPG is highly flammable, when LPG gas interacts with current high explosion will take place which produces massive damage to the factory and the environment. With this device, we can reduce the death and injury percentage.

II. ABOUT LPG

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III. INCIDENCES

A. Bhopal Gas tragedy

The Bhopal gas tragedy is also referred to as the Bhopal gas disaster, which took place in the year 1984, 3 December. Which was a nightmare for the Bhopal citizens. Nearly 3,787 victims were dead and nearly 574,366 victims were injured. The gas which was leaked was methyl isocyanate (MIC). MIC is a highly toxic substance. Methyl isocyanate can cause irritate the lungs causing coughing and breathing problems. Due to a lack of technology people are not aware of gas leakage because of that many people are affected by the gas leakage. Workers in the factory are busy controlling gas leakage, they forgot to turn on the alarm.

B. Vizag Gas Leakage

Vizag gas leakage is referred to as the Visakhapatnam gas leak, it was an industrial accident that took place in the year 2020. Which occurred in the LG Polymers chemical plant. The gas leak is speared over a 3kms radius. Nearly 30 victims are dead, and hundreds of victims are injured. It's been nearly 37 years since the Bhopal gas tragedy happened. Still, there is no such technology which will alert the citizens about the gas leakage. Due to covid factories being closed temporarily. After the decrease in covid cases, factories reopened, But workers started the work without checking the machine's condition. Because of the worker's negligence gas leakage took place.

IV. LITERATURE SURVEY

Ramya k C, Nivetha M (2021) developed in this project is, this device is mainly used in households. When the gas leakage is detected at the gas sensor it will send the SMS alert to the house owner about the gas leakage and it will alert by buzzer too. The main drawback is that the SMS will be sent to the owner of the house about the gas leakage not to the other person rather than the owner. If the owner of the house is out of a station where the signals cannot reach it will become a big problem. [1]

Priya, R. Vishnu, and G. Kowsalya (2021) In this paper used Arduino UNO, MQ 2 gas sensor, and PIR sensor. A gas sensor is used to detect the gas leakage and a PIR sensor is used to detect the presence of the human. If there is no human detected in the kitchen over a while, then the microcontroller will turn on the buzzer and automatically turn off the valve of the gas cylinder. [2]

M Athish Subramanian and Naveen Selvam (2020) developed this project, LPG gas leakage is converted from PPM (Parts Per Million) to volts from the Arduino IDE software and the result will be sent to the user when it reaches a threshold limit. [3]

Hasibuan, Muhammad Siddik and Iswandi Idris (2019) developed this project when gas is detected at MQ 2 gas sensor, then the GSM module will send the SMS alert to the person of house owner about the gas leakage. Besides of SMS system emits the sound that is created from the buzzer. [4]

Zinnuraain (2019) In this paper used node MCU, IoT (Internet of things) and mobile app. Users can be notified about the level of gas in the cylinder through the mobile app the and mobile app will give safety precautions when there is gas leakage in the house. [5]

Imam Hossain and Siddika (2018) developed this device, when there is an LPG gas leakage GSM module will send the command to the microcontroller to stop the supply. The main disadvantage of the project is that workers inside the factory/industry or people outside the factory/industry are not aware of gas leakage. It will become a huge problem for the workers as well as residents around the factory/industry. [6]

Shiyana and Mrs R Deepa (2017) developed this device, when hazardous gases like CO, CO2, LPG, etc. are detected at the gas sensor, the GSM module will send the information regarding the gas leakage to the person. The main disadvantage of this project is, that when the gas leakage is detected at the gas sensor it will send the SMS alert to the particular person, it won't alert the other people inside and outside the factory. It will become a more dangerous issue for the workers and the people[7]

V. PROPOSED METHODOLOGIES

When LPG gas leakage is sensed by the MQ5 gas sensor the level of leakage is checked in the LCD, if it reaches a certain level, then Arduino UNO will trigger the buzzer to alert the workers inside the factory or Industry. After– the GSM module will send the message to surrounding people near the factory regarding the gas leakage. It will help to decrease the death and injury percentage. At the last, a relay will be triggered where it will be used to turn off the power supply, we need a relay because LPG is highly flammable when the gas interacts with the electricity high explosion will take place and causes the loss of property.
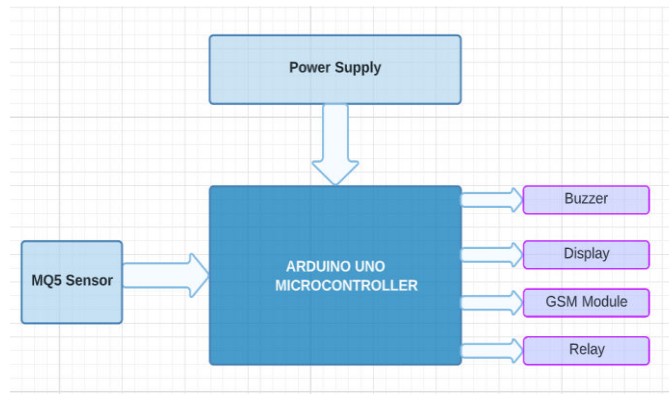

Fig 1. The proposed methodology of the block diagram

From the above block diagram, the MQ5 gas sensor and power supply are the inputs to the Arduino UNO microcontroller. Buzzer, LCD, GSM module and relay are the output of the Arduino UNO microcontroller.
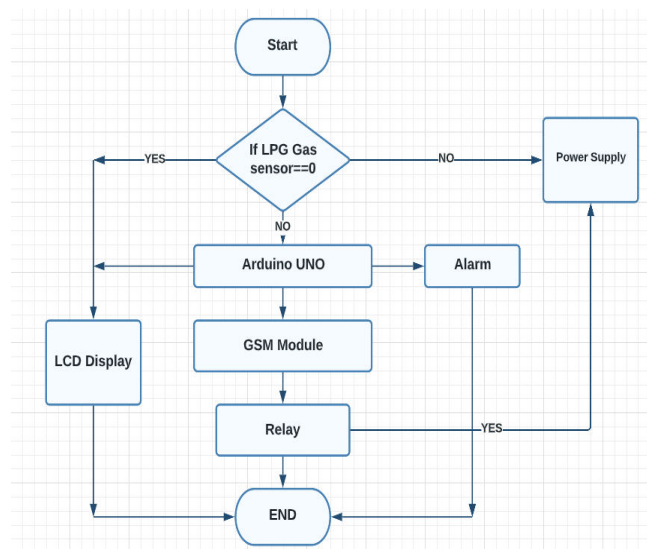

Fig 2. The proposed methodology for Flow chart

The flow chart begins with the start, if there is no gas leakage detected at the gas sensor it will display on the 16 x 2 LCD and continue the power supply. When there is any gas leakage is detected at the gas sensor, the MQ5 gas sensor will send the data to the Arduino UNO, after that 16 x 2 LCD will display the level of gas leakage. If the gas leakage is reached the 40% then Arduino UNO will trigger the alarm which will alert the workers inside the factories/Industries after that Arduino UNO will trigger the GSM module which will send the SMS alert to the surrounding citizens, who are living near to the factory/industry. After that Arduino UNO will trigger the relay to shut down the power supply inside the factory/industry. By using a relay we can protect the factory from the explosion. By this, we can decrease the death and injury rate.
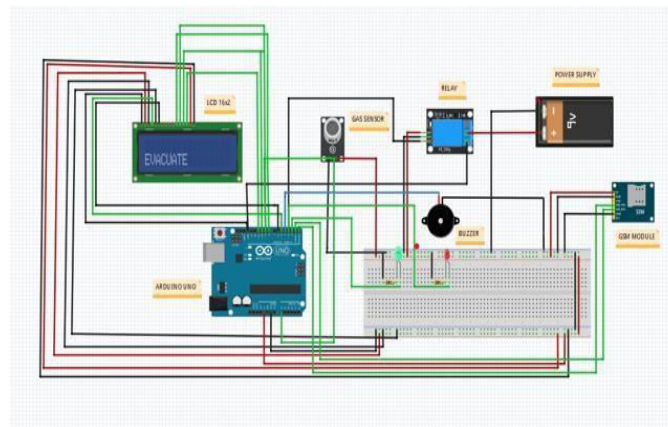

Fig 3. The proposed methodology of Circuit   Diagram

In the circuit diagram, we used a 16 x 2 LCD display, Arduino UNO microcontroller, buzzer, relay, MQ5 gas sensor, and GSM module.

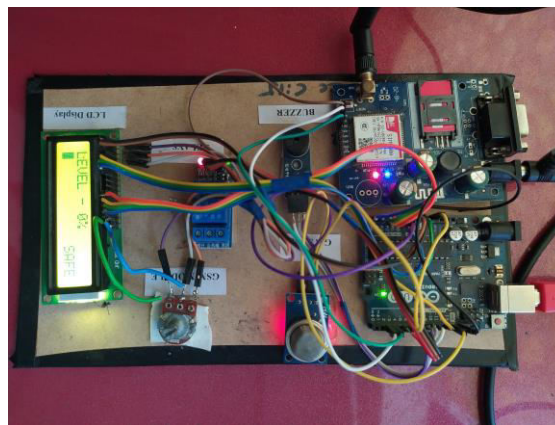## VI.   OBSERVATION AND RESULT

Fig 4. Circuit kit

When there is no gas leakage detected at the gas sensor

Fig 5: When there is no gas leakage

When the gas leakage is detected at the gas sensor, but the gas leakage is below the threshold value

Fig 6: Gas leakage below threshold level

When the gas leakage is reaches the threshold value

Fig 7: When gas leakage reaches the threshold level

After the gas leakage reaches the threshold value. SMS alert will be sent to the citizens near the factory.
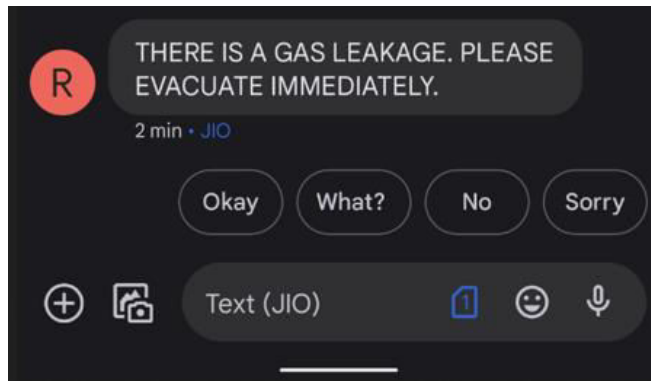

Fig: SMS alert to the citizens

VII. CONCLUSION

Gases are highly toxic; they will affect humans as well as animals. By alerting them about gas leakage by SMS alert or buzzer (sound) alert. Through this project, we can alert the citizens and the workers inside the factory will help them to evacuate the affected area immediately. By these gases, humans and animals can suffer various diseases like breathing problems, Lungs related diseases, burning of the eyes, headaches, etc. This project is developed to enhance man and machine safety in factories and industries. Using this device will make sure another Bhopal tragedy and Vizag LG polymer incidents won't happen again.
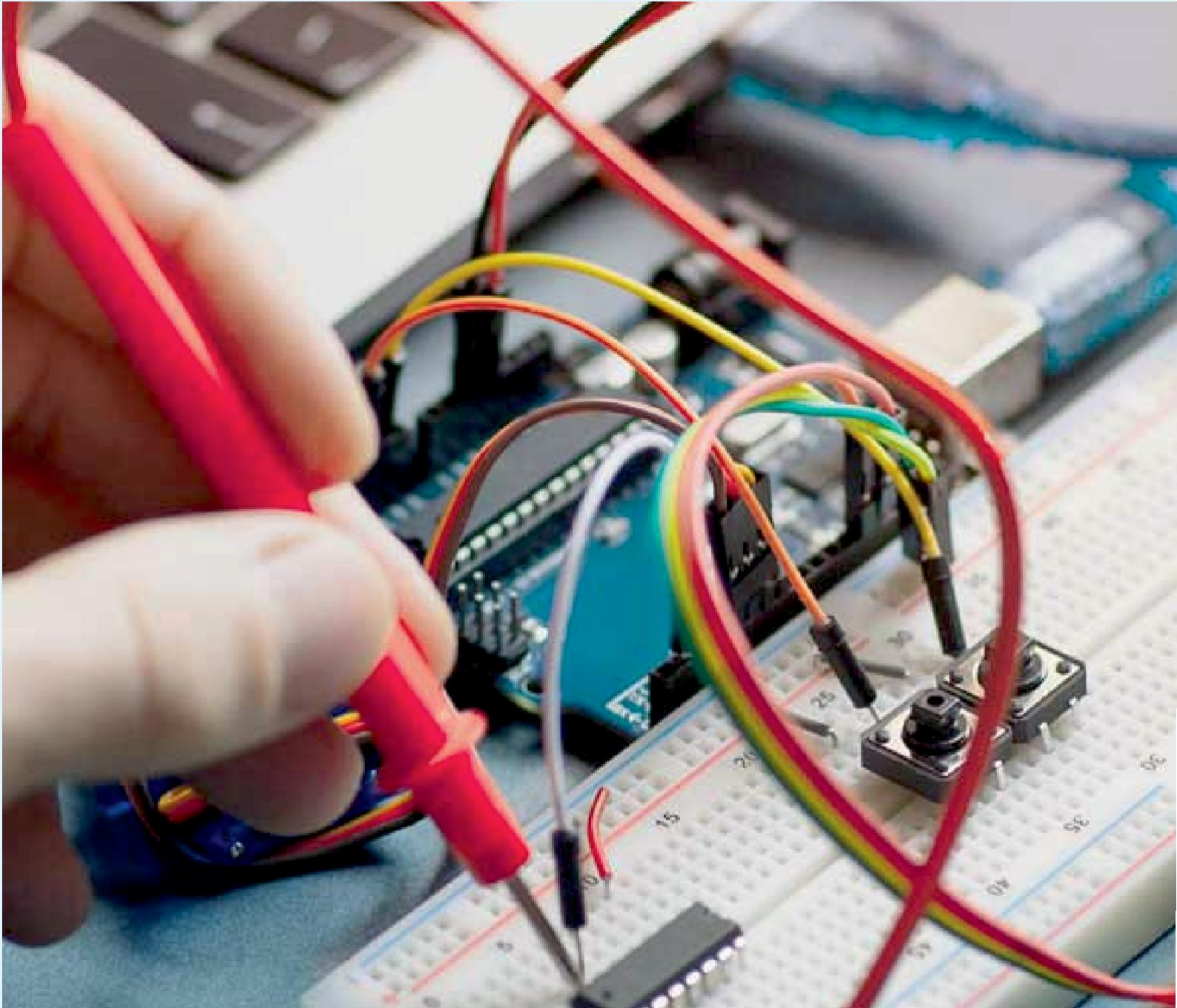
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