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LPG Gas Leakage Detector

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Abstract: Liquefied Petroleum Gas (LPG) is extensively used in urban areas as a clean fuel source, but gas leakage can be a serious safety issue in homes, businesses, and vehicles. To prevent accidents related to gas leakage, a gas leakage detection system can be installed at vulnerable locations. This sensor based automated system is built to identify or detect uncertainties and notify them to users in case of gas leakage. The system includes an alerting system for users to ensure they are aware of any potential danger. To decrease concentration of gas in air exhaust fan is included in system. To take necessary step relay module is present to switch off the electronic devices. Overall, the proposed system aims to increase safety and prevent accidents caused by gas leakage.
Keywords: buzzer, exhaust fan, liquefied petroleum gas, MQ-6 sensor, relay module.

I. INTRODUCTION

Gas leaks are a serious problem that can lead to dangerous accidents in many environments including homes, businesses and vehicles. Liquefied petroleum gas (LPG) is commonly used as fuel due to its desirable properties of high calorific value, low emission of smoke and low environmental impact.

However, LPG is highly flammable and can cause explosions and fires if released. These accidents can cause property damage, loss of life and even death.

Gas leaks can occur due to poor quality cylinders, outdated valves, worn regulators and ignorance of the rules for handling gas cylinders. Odorants are added to LPG to detect leaks some of them are ethanethiol, thiophene and mercaptan. Some individuals with olfactory impairments might not rely on this defense mechanism. Gas leak detectors are therefore necessary to shield individuals from the possibility of gas leakage. Methods for detecting gas leaks have been the subject of several research papers [1].

A low-cost, sophisticated sensor-based gas leak detection, warning, and control system is suggested in this article. The system is easy to manage, efficient, compact and economical. The integration of sound and visual form can warn users of gas leaks and cut off power supply to prevent accidents.

The suggested system's primary function is LPG detection. A message will be sent to the registered mobile number when a tiny amount of LPG is brought close to the MQ6 sensor. The created system will benefit the client because gas leaks and booking issues are now issues that LPG gas customers face.

They can raise their safety standards and prevent a major disaster. It also aids in the prevention of mishaps that appear to occur to people and their property. The primary aim of the proposed system is to notify the user when a gas leak is discovered using a gas sensor, in order to prevent injury or an outburst. As a result, the proposed solution makes living a happy life easier for LPG gas customers [2].

Today's way of life has made safety a major issue. LPG and CNG, or petroleum gas and compressed natural gas, are the most often used cooking fuels in homes and businesses, as well as in a range of vehicles to replace costlier fuels such as diesel and gasoline. These gases are housed in cylinders that are easily broken. However, leaks can occur through pipes, regulators, or knobs, resulting in disasters such as suffocation or discomfort, as well as the occurrence of a fire or short circuit. The major purpose of this assignment is to advance a system for detecting gas leaks. On detection a signal will be sent to turn of the electronic devices [3].

LPG (Liquefied petroleum gas) has characteristic of burning smokeless in air and is odorless. As the gas is heavier as compared to air will not disappear easily and may lead to suffocation if inhaled. To take requisite action, buttons on the exhaust fan to decrease the concentration of gas in surrounding atmosphere. The gas leakage detection is method of detecting hazardous gas leaks using sensors. Specified mobile number will get notified using GSM module. Propane and butane present in LPG are highly flammable chemicals [4]. Gas sensors are presently used in a variety of sectors throughout the world, including instrumentation, safety, and health. A gas sensor is used in this investigation to accomplish the same thing. The sensor is widely used to detect gas leaks in a wide range of surrounding applications.

II. METHODOLOGY

Now gas sensors are globally used in instrumentation, health and safety industries. In the same way, gas sensors are used in this paper. The sensor used will continuously monitor gas leaks in wide range for different surrounding application.
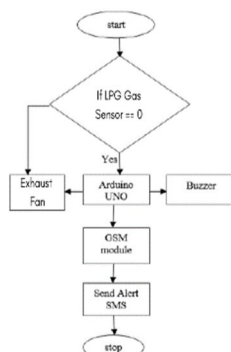
In the incident of an LPG gas leakage, the functioning of electrical devices can lead to a crucial safety hazard and increase the risk of mishaps. The system is designed to immediately detect the presence of gas leakage and automatically interrupt the room's power supply while simultaneously activating the exhaust fan to decrease the concentration of LPG gas in the surrounding air. MQ6 gas sensor detects the presence of gas and sends an analog signal to the microcontroller. The Arduino Uno has a built-in analog-to-digital converter (ADC) that can convert analog signals to digital signals with 10 bits resolution. The microcontroller processes the digital signal and sends an instruction to the GSM module to send an SMS alert to the user's mobile phone. It provides real-time notifications to the user, even when the user is away from the location where the gas leak is detected. This allows the user to take appropriate action on time, such as shutting off the gas supply or look for assistance from a professional gas technician.
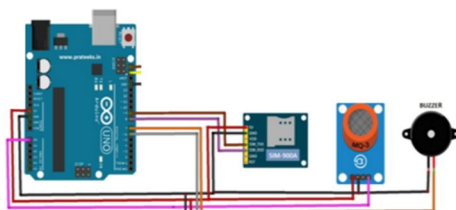

Fig 1: Circuit Diagram

III. SYSTEM SPECIFICATION

A. *Software Requirement*
1) *Arduino IDE*

Arduino IDE is an open source and an official software mostly used for compiling and authoring code into Modules of Arduino. The individual without any prior technical expertise may get started learning as code compilation is so simple in Arduino IDE. Operating systems such as Windows, MAC, Linux can conveniently access it. This software operates on Java Platform, which contain build-in functions and commands essential for modifying, debugging and compiling the code.

B. *Hardware Needed*
1) *Arduino UNO*

One of the standard board of Arduino is Arduino UNO. Here UNO stands for 'one' as per Italian language. The first release was made under the name of Arduino as UNO.

Also, it was the first USB board launched by Arduino. It is considered as one of the powerful board and is used in various projects. ATmega328P microcontroller is utilized in Arduino UNO. We compared this board with other existing board like Arduino Mega board, etc and it is easier to use. This board includes analog and digital Input or Output pins, circuits and shields. This board include 14 digital pins, a power jack 6 analog pin inputs, a USB connector and an In- Circuit Serial Programming (ICSP) header. It is programmed based on Integrated Development Environment (IDE) which can run on both offline and online platforms.

Fig 2: Arduino UNO

2) MQ-6 Sensor

The MQ-6 gas sensor is a small module that is used to detect the presence of various gases in the air, including LPG (liquefied petroleum gas) and propane. The sensor works by measuring the resistance changes in a tin dioxide (SnO_2) sensing element, which is heated by a small heating element inside the sensor. When gas molecules come in contact with the sensing element, the resistance of the element changes, and this change is utilized to detect the presence and concentration of the gas. The MQ-6 sensor has a quick response time and great sensitivity. Because of these attributes it is used in broad range of applications, including gas leakage detection, industrial gas detection, and even in portable gas detectors. However, it should be noted that the sensor can also be affected by other gases, such as alcohol and smoke, which can lead to false readings if not properly calibrated.

To use an MQ-6 gas sensor, it is usually connected to a microcontroller or other circuitry that can read changes in the sensing element's resistance and convert it into a useful signal. Sensor modules typically have 4 pins: VCC, GND, DOUT, and AOUT. VCC and GND are used to power the sensor, and DOUT and AOUT provide digital and analog output signals respectively. The sensitivity and response time of the sensor can be adjusted using a variable resistor on the module.

Fig 3: MQ-6 gas sensor

3) Relay 5V

Relay functions as switch and is one kind of electro-mechanical component. Contact switches can be closed or opened by energizing relay coil by DC. Generally a 5V relay module with single channel contains a coil, and two contacts such as normally closed (NC) and normally opened (NO). Since a 5V relay module is an automatic switch and controls large current with low current signals, it is frequently utilised in automatic control circuits. Relay signal input voltage can range from 0V to 5V.

Fig 4: Relay 5V

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4) GSM Module

Global system for mobile communication is a miniature cellular modem used for GPRS transmission, sending and receiving SMS and for making voice calls. The data is compressed and digitalized by GSM, further transmit it over the channel along with two other streams of user data. Own time interval. It operates in the frequency range of 900 MHz or 1800-MHz. It supports voice calls along with SMS transmission and data rates of up to 9.6 kbps. It contains a GSM modem and other essential components including a microcontroller, memory and power supply to facilitate communication over cellular networks.
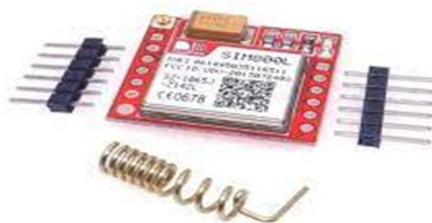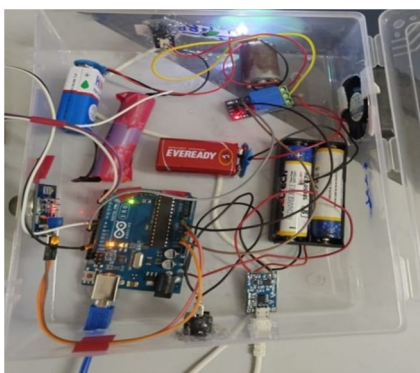

Fig 5: GSM Module

Fig 6: Practical model

IV. RESULT AND DISCUSSION

The ultimate goal of the project is to build a finished LPG gas leakage detector. The project's sensor is connected to a Arduino uno, which keeps an eye on any gas leaks. The GSM module sends a notification to user if any LPG gas leakage is detected and release the gas from home using exhaust fan. The inclusion of both GSM module and relay module can further improve security.

V. CONCLUSION

A practical and cost-effective solution of gas leakage designed and implemented successfully. The project shall detect the leaked LPG gas within the detection radius of 10 to 30 cm{that is it shall be placed relatively closed with the cylinder} with this project as product, the people who use it shall feel safe and comfortable. The prototype's ability to alert users by sending the proper audio-visual warning signals is confirmed by test results.

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