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IoT Based LPG Gas Leakage and Level Detection to Avoid Accidents

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***Abstract*: In general, LPG gas is used in our homes most of the time, and using it has become a basic need for everyone. It is dangerous to breathe in areas where there is a chance of losing our lives because gas leaks have been observed in the past and continue to this day, causing multiple accidents. If the gas leak's level rises, it may explode. Gas leaks must be found and prevented, if necessary, in order to prevent such losses. The only way to detect gas leaks is to continuously monitor the atmosphere, which is only possible artificially. How In an effort to reduce the conditions that lead to gas leaks, our It's also critical to keep an eye on the pressure inside the large gas containers holding dangerous gasses to prevent them from bursting and causing an unexpected gas leak. The system is an Internet of Things (IoT) application running in the cloud that processes sensor data and makes appropriate decisions. This problem has a number of suggested remedies, but none of them have shown to be effective. The goal of this project is to detect leaks and notify individuals, hence reducing the number of gas leak events. The gas sensor MQ2 finds the gas leak coming from the cylinder. The MQ-2 can detect alcohol, smoke, propane, H2, LPG, CH4, and CO. It is connected to the Node MCU (ESP8266), which is configured to deliver the message straight to the user's smartphone via the cloud. For short work suggests a system for detecting leaks in buildings and homes.**

***Keywords*: Arduino Uno, Internet of Things (IoT), Load cell, Gas sensor, Buzzer.**

1. Introduction

Despite the fact that gas has become a vital component of our everyday lives, we frequently observe the widespread usage of gas cylinders in huge, complex companies [2]. Therefore, we have created a mechanism to handle issues that arise from their untimely death or damage brought on by mishaps. The gas level will be continually monitored in this, and the status of any gas leaks will also be checked [1]. If the gas level is dropping, the percentage of gas remaining will be display Additionally, at the same time, any gas leaks will also be reported to the purpose of this project is to detect gas leaks using Internet of Things approaches [5]. The primary goal of this research is to continuously monitor the weight of the cooking gas cylinder while also determining how much gas is used in a given week or month and storing this data to an IoT platform over time [4]. When the weight hits the minimal level, it will appear on a smartphone connected to a Wi-Fi network, alerting the housewife to chain and other family members to examine the entire information or refuel the LPG gas cylinder for routine cooking [5]. In order to prevent mishaps in the kitchen, this system is also intended to detect and sense for liquid petroleum gas (LPG) leaks. If the amount of gas concentration exceeds the usual threshold, the alarm unit will activate immediately [3].

2. Literature Review

Any research ground work is depending on literature investigation. Based on the studies carried out by several researchers and their contribution to research field motivates for future scopes of research. In this chapter review of several research papers by various authors and technical reports has been discussed such as about LPG Gas Leakage & level Detection to Avoid Accidents Using IoT. Tamizharasan V. and Ravichandran (2019)" Gas Level Detection and Automation Booking Using IoT" In this Research paper use by giving the message to their mobile when the LPG level is critically low (below 20%). Automatic Booking the LPG Gas through the auto dialing of gas booking Phone Number and by these we prevent pre-booking and late booking [1]. Prasanta Pratim Bairagi and Dr. L. P. Saikia (2020)" Development of a LPG Monitoring and Automatic Cylinder Booking System Based on Wireless sensor Network ", This project purpose of flexible and reliable way of detecting and leakage of LPG gas monitoring the quantity of LPG available in the cylinder and provides the ability of book the cylinder by automatically sending the booking request via an SMS to the distributer [2]. Boga Vinay and Dr. G. Venkata Hariprasad (2021)," Automatic GAS Leakage Detection and Shut of System", The goal of the project is to develop a system that can identify a gas leak, alert the user via an alarm and status display, and, as a primary safety measure, switch off the gas supply valve. By closing the supply valve, you may stop the gas flow to the stove and avoid a potential fire that could start from someone attempting to light the cooker on fire [3]. Ayesha Siddika and Imam Hossain (2018)," LPG gas leakage monitoring and alert system using Arduino ", the system is built on a microcontroller and includes

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a gas sensor, GSM, display, and buzzer. It is designed for an LPG gas leakage monitoring and warning system that uses an Arduino and a mq135 sensor. The sensor detects gas leaks and sends the information to the microcontroller. On the basis of the information, the microcontroller takes a judgment and displays a warning message on the display. The message is then sent to the user via GSM. An embedded control system may be implemented using an Arduino microcontroller, and it can be easily and quickly modified to match our needs going forward [4]. Zaw Lin Oo And Theist Win Lai (2021)," IoT Based LPG Gas Level Detection and Gas Leakage Accident Prevention with Alert System", The goal of this research is to identify gas leakage and periodically measure the weight of the LPG gas cylinder to know how much gas remains. When a gas leak is detected, the warning signal and alarm sound are activated, as well as an exhaust fan is switched on automatically to reduce the gas concentration. The weight of the LPG is measured using a load sensor, and the sensor's output is coupled to an Arduino and a wifi1010 microcontroller. The user may know the validity of LPG uses daily because the quantity of LPG gas will be published as events then watch then come through in real time using the IoT platform their mobile phone when the LPG level is critically low by utilizing the investigation function via the IoT [5].

3. Existing System

An MQ2 sensor in this system detects LPG gas, which is linked to a buzzer that is attached to an Arduino Uno board. The load cell continuously monitors the gas cylinder's level, and it uses an LCD 16*2 display module to show the gas level. If the gas level is less than10%, the LED will glow up. The IoT module also displays the user's SMS, but it shows the user's gas leakage as a digital (0 and1) and the gas level as an analog (wave form).

The following are the components and specifications that are used in this system.

A. Arduino Uno

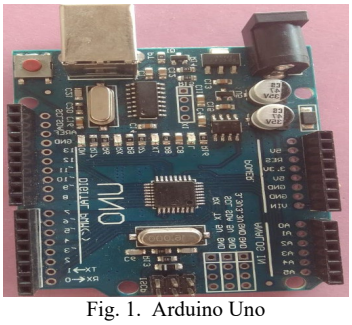

Fig. 1. Arduino Uno

Atmega328P microprocessor is the foundation of the Arduino Uno, an open-source microcontroller board created by Arduino. The board's sets of digital and analog input/output (I/O) pins enable it to be interfaced with circuits and additional expansion boards (keeps), and other circuits. The board is programmable using the Arduino IDE (Integrated Development Environment) and a type B USB cable. It contains six analog I/O pins and fourteen digital I/O pins, six of which are capable of PWM output. It takes voltages between 7 and 20 volts; however, it can be fueled by the USB cord or an additional 9-volt battery.

B. LCD Display

The 16 Pins on the LCD display module are divided into 2 parts for powering the LED 2 parts for powering the LCD display itself self. The 16x2 LCD gets its name from its 16 columns and 2 rows. Numerous combinations are possible, such as 8×1, 8×2, 10×2, 16×1, and so on. However, the 16*2 LCD is the most popular, which is why we are utilizing it.

Fig. 2. LCD display

C. Buzzer

An auditory signaling device, often known as a buzzer or beeper, can be mechanical, electromechanical, or piezoelectric (abbreviated piezo). Buzzers and beepers are commonly used in rail systems, alarm devices, timers, and as a means of verifying human input, such as mouse clicks and keystrokes .and it is an output device that only sounds and alert when the threshold value is satisfied.it is immediately linked to an Arduino uno of the pins, one is attached to the ground pin and the other to the arranging boards digital pin

Fig. 3. Buzzer

D. GAS Sensor

Fig. 4. MQ2 sensor

Typically, a gas sensor has four pins that are directly to Arduino board. two of these pins are used for the power supply and the other connection used to relay, the data that the sense

detect to the Arduino uno. This is a simple, low-cost semiconductor gas sensor module with both analog and digital outputs. This module detects gas using the MQ2 Smoke & Flammable gas sensor. It requires no extra components; simply connect in the VCC and ground pins and you're ready to go. An on-board potentiometer allows you to simply define the threshold value for digital output. Using this module, you can quickly connect the MQ2 Smoke & Combustible Gas Sensor to any microcontroller, Arduino.

E. IoT Module

The term "internet of things" describes the expanding network of real-world objects that have IP addresses and may be connected to the internet. Through the use of embedded technology, the internet of things allows a wide range of devices, including laptops, desktop computers, smartphones, tablets, and smart phones, to connect and communicate with one another and the outside world. The ESP8266 is a low-cost Wi-Fi microprocessor that is made in Shanghai, China by Empress if Systems and includes microcon. Similar chips like as the ESP8285 include an integrated 1 MiB flash memory that enables the creation of single-chip Wi-Fi enabled devices.

The ESP32 series of devices has replaced these microcontroller chips. To add new articles, you must sign in or create an account, which requires auto confirmation.

F. LED Display

When the gas sensor detects an LPG gas leak, it sends a signal to the Arduino UNO, causing the LED to illuminate as an indicator of a leak. The LED gives a visible indicator of a gas leak, allowing the user to detect the presence of gas even in low-light settings.

Fig. 5. LED display

4. Proposed of System

The current technology simply detects gas and gas level and alerts users to gas leaks; however, it only sends alerts to the individual whose mobile phone is registered. Therefore, the objective of this IOT project is to identify leaks and alert people in order to lower the frequency of gas leak incidents. The gas leak emanating from the cylinder is detected by the gas sensor MQ2. The MQ2 can identify LPG, H2, propane, smoke, and alcohol. Our research proposes a system for detecting leaks in households and companies with the goal of mitigating the factors that result in gas leaks. Monitoring the pressure inside the sizable gas canisters containing hazardous gases is also essential to preventing them from exploding and resulting in an unplanned gas leak. The system is a cloud-based Internet of Things program that analyses sensor data and makes the necessary judgments. Many solutions have been proposed for this issue, but none of them have proven to be successful. This IOT project aims to identify leaks and alert people in order to lower the frequency of gas leak incidents. The gas leak emanating from the cylinder is detected by the gas sensor MQ2. The MQ-2 can identify H2, LPG, CH4, propane, smoke, and alcohol. The MQ2 can identify LPG, H2, propane, smoke, and alcohol. It is linked to the Node MCU (ESP8266), which is set up to send the message over the cloud directly to the user's smartphone. Additionally, a buzzer is wired to the circuit for prompt response. warning to the residents of the house, allowing us to turn off the cylinder and stop an explosion.

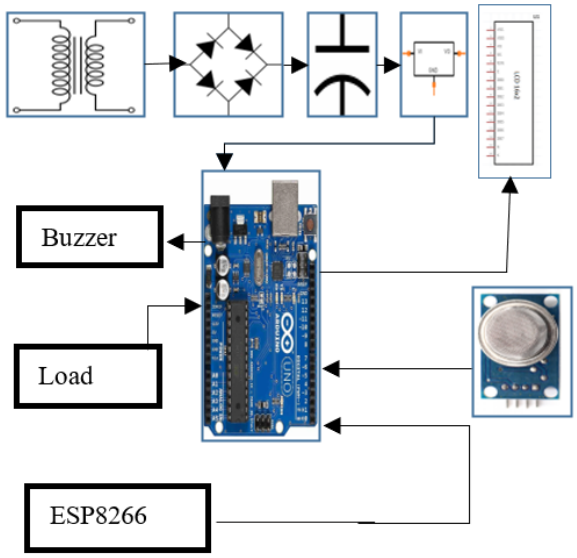

Fig. 6. Block diagram of IoT based LPG gas leakage & level detection to avoid accidents

A. Advantages

- It can be help in saving the losses of lives and property.
- Accident reduces due to automatic leakage detection.
- Alert to fill gas that's why emergency case not occurred.
- Provide safety against accident.
- Get immediate gas leak alerts.
- Real time update about leakage.

B. Disadvantages

- Internet connection is necessary to wireless monitoring

C. Future scope

- The data gathered by the mobile application is useful to the industrial sector and is utilized in data analysis.
- The system becomes a home computerization project when other sensors, such as temperature and pressure sensors, are combined.
- An additional option for the project could be the display.

D. Working Operation

In this system gas sensor is used to detect the gas leakage. In

this system we used Arduino controller board to control whole system, whenever gas sensor detects the gas then buzzer will be on. load cell is used to measure weight of gas tank whenever weight of gas tank will be remained 10% of full gas tank then indicator shows the indicator to book a new gas tank. The MQ-2 can detect alcohol, smoke, propane, H2, LPG, CH4, and CO. It is connected to the Node MCU (ESP8266), which is configured to deliver the message straight to the user's smartphone via the cloud. For short work suggests a system for detecting leaks in buildings and homes.

5. Conclusion

This project can be applied in a variety of fields and industries because it is a very cost effective and offers a high level of security against gas leak. additionally, the gas level is monitor using a load cell to let customer known how much gas is left in the cylinder tanks and it is display on an LCD and an IoT enable mobile device. The initiative we are working on will benefit both home LPG usage in modern homes is becoming increasingly problematic. Starting with the usage of cylinders and ending with pipelines for petroleum. Security poses the greatest risk while utilizing this technology. Additionally, the initiative we are working on will benefit both homes and industries greatly.

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