



ARDUINO BASED AUTOMATIC GAS LEAKAGE DETECTION SYSTEM

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ABSTRACT

The creation of Smart houses worldwide is a recent trend. Numerous individuals and businesses have begun automating regular tasks like turning on lights and fans and adjusting the thermostat. The main goal of the project is to construct a gas leakage detector using an LPG gas sensor. This device will continuously track the amount of LPG gas in the air and, for added safety and security, link to the Internet of Things using an ESP module. This device can be implemented in LPG gas storage spaces in hotels and residences. The primary controller is an Arduino. The project's end product is utilised to alert the user and identify gas leaks from cylinders. Accidental explosions can occur in the home frequently and may be brought on by gas leaks or the storage of explosives like propane. People have adapted to using the LPG (Liquid Petroleum Gas) delivery system for cooking in the modern world. Numerous events will occur nearby while the LPG system is in use that could result in human fatalities. Gas leakage hazards are hazardous and may become unmanageable if prompt action is not taken. This document provides the detection of LPG cylinder leaking in certain places, such as the kitchen, and alerts the user regarding leakage in an effort to stop this from happening, whether intentionally or accidentally.

KEYWORDS-arduino, Gasleakage Detection, Gas sensor

1.INTRODUCTION

Due to its high temperature, low smoke, soot, and environmental impact, liquefied oil gas (LPG) is a flammable hydrocarbon mixture that is utilised for a wide range of purposes, including as fuel for homes, dormitories, industries, cars, and other vehicles. Even if it is far from the source of the leak, LPG might catch fire due to its high flame retardancy. Chemical molecules of propane and butane, which burn extremely efficiently, make up the majority of the energy source. The gases have a high flammability. LPG is primarily used in homes for cooking.

LPG leaks today are a problem for both manufacturing and residential use. If you do not recognise and make changes soon away, it is quite dangerous to your life. Our project's goal is to provide a solution by shutting off the gas supply as soon as a leak is noticed in addition to sounding the alarm. Additionally, a notification informing the authorised person of the leakage will be sent to him[1]. The work by Sanjay dos et al.,[2] primarily deals with the development of a basic gas spill locator at the initial stage and then transforming this easy device into a cutting-edge gas identification system. Propane (C₃H₈) and butane gas sensors have been specifically used because of their great affectivity (C₄H₁₀). The GSM (Worldwide System for Versatile Communication) module of the gas leak detection system sends an SMS as soon as a leak is discovered. Keywords: Arduino, LCD, LPG, MQ-6 Gas Sensor, Stepper. C.tukkoji et al.,[3] offered a novel method for discovering Arduino-based microcontrollers that allow LPG discharge. We must exercise some caution in order to find the discharge in order to warn on Liquefied Rock Oil Gas (LPG) leakage and avert any

unpleasant incident. If there is a gas leak, an Arduino-based LPG gas detection alert can be constructed. The LPG detector MQ 6 is an accurate LPG sensing tool that measures signal strength. The non-inheritable electrical signal is successfully quantized using a cost-effective Arduino-based signal processing technique. Based on square measure, the severity of the LPG leakage is divided into three categories: LOW, MEDIUM, and HIGH.

The main goal of the work by A.Munnaza et al.,[4] is to use gas sensors and the Spartan 6 FPGA process to detect gas leakage in any industry. To lower the cost of maintaining servers, prevent data loss, and facilitate access from various internet-connected devices (computer, tablet, and mobile phone) simultaneously and anywhere in the world, it is crucial to set up a cloud-based monitoring system. Any electronic device in a home can be controlled via the Internet of Things (IoT). The design of an industrial monitoring system using the Internet of Things is presented in this study (IoT). Information from the gas sensor (MQ-5) is uploaded to a data cloud. Under the majority of atmospheric circumstances, the sensor can identify gas leaks. An Arduino (UNO-1) that serves as the setup's main processor controls all of the components. The alert is triggered in the form of a buzzer as soon as the sensor detects a gas leak. An LCD that supports this alert shows the leak's location.[5].

The goal of the work[6] is to offer a design for an automatic warning system that can locate and stop liquefied petroleum gas leaks in a variety of locations. As soon as the gas leak exceeds setpoint1, this system calls the user and sounds a buzzer alarm to notify the neighbours. The gas pipe

valves are closed by the servo motor. This gadget guarantees safety and guards against explosions and suffocation brought on by gas leaks. Arduino Uno is used to implement this project, and Arduino IDE and proteus software are used to simulate it.

Massive explosions are being caused by gas leaks all across the world. The only user who can be alerted by conventional gas leakage detectors is the one who is physically present at the scene. In order to get over this restriction, this project creates a model that notifies the user via email if there is a leak. This model can identify benzene and liquid petroleum gas leaks. The IFTTT web service is used by the prototype of this approach to send an email to the concerned party. At the location of a leak, an LED is also utilised as a visual alarm[7].

The sensor is frequently used to find gas leaks for a variety of nearby applications. On an LCD display, the device also continuously shows the leaking amount. The gas sensor detects the concentration of gas in ppm and outputs analog value which can be converted to a digital signal using inbuilt Analog to Digital Convertor of Node MCU.

II. PROPOSED SYSTEM

The suggested project is an Android application for LPG leak detection and alert, giving users a simple way to keep track of the gas's level in cylinders. to find gas leaks in houses, hotels, schools, and other household settings while sending out an alert to those around. Globally, gas sensors are now used in industries like instrumentation, safety, and health. This paper uses a gas sensor to do the same. Fig.1, shows block diagram of proposed system

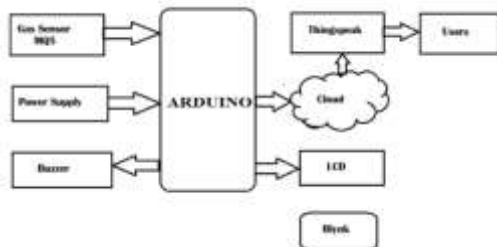


Fig.1. Block Diagram

III. SYSTEM DESCRIPTION

a. *Arduino IDE*: Open source software called Arduino IDE is mostly used for authoring and compiling code into Arduino Modules. Because it is an official Arduino programme, code compilation is so simple that even the average individual with no prior technical expertise may get started learning. It is conveniently accessible for operating systems like MAC, Windows, and Linux and operates on the Java Platform, which has built-in functions and commands that are essential for debugging, modifying, and compiling the code in the environment.

b. *Thing Speak*: An IOT analytics platform is called ThingSpeak. It allowed us to watch realtime cloud data. Data can be sent to Thingspeak from our gadget. There are two different kinds of API keys. API Read and API Write. Write API Key –It is 16 digit code that allows an application to write data to a channel. Read API Key – It is 16-digit code that

allows an application to read the data stored in a channel. ThingSpeak provides instant visualizations of data posted by your devices to ThingSpeak. ThingSpeak is often used for prototyping and proof of concept IoT systems that require analytics.

c. *BLYNK Framework*: With the help of the new platform BLYNK, you can easily create user interfaces for managing and controlling your hardware projects from iOS and Android mobile devices. You can design a project dashboard after downloading the BLYNK app and placing buttons, sliders, graphs, and other widgets on the screen.

d. *Node MCU*: The open-source Node MCU development board and firmware are designed specifically for Internet of Things applications. The ESP8266 Wi-Fi module is a gadget that connects to the Arduino board and adds Wi-Fi functionality that functions similarly to a Wi-Fi shield. With AT command set, it functions. This module can be coupled with the sensor and other applications through its GPIOs thanks to its powerful on-board processing and storage capabilities. ESP8266 Wi-Fi module for cloud data archiving. The Micro USB port and VIN pin can be used to power the Node MCU (External Supply Pin). It supports the UART, SPI, and I2C interfaces. After processing it, the output signal is then provided. It has a Wi-Fi module built right into it. Fig2..., shows node MCU



Fig.3., NODE MCU

e. *MQ 5 Gas Sensor*: The Gas Sensor (MQ5) module is helpful for detecting gas leaks (in home and industry). It works well for finding H₂, LPG, CH₄, CO, and alcohol. Measurements may be made as soon as feasible thanks to its high sensitivity and quick reaction time. The potentiometer can be used to modify the sensor's sensitivity. The following describes how the MQ-5 gas sensor functions: The sensor has a SnO₂ sensitive filament. In the presence of clean air, this filament tends to have lower electrical conductivity. When a combustible gas such as LPG is introduced, the filament's conductivity rises, and the amount of change in its conductance/resistance can be used to indicate the equivalent gas concentration. Higher temperatures, if there is also a resistive heating element, tend to make this effect more noticeable. SnO₂ is sensitive to other flammable gases as well, but it is particularly susceptible to methane, butane, and propane. One of the most crucial tools for detecting poisonous gases, the gas sensor offers a crucial way to track the concentration and environmental data of gas in order to ensure the safety of production.



Fig.4.Gas Sensor

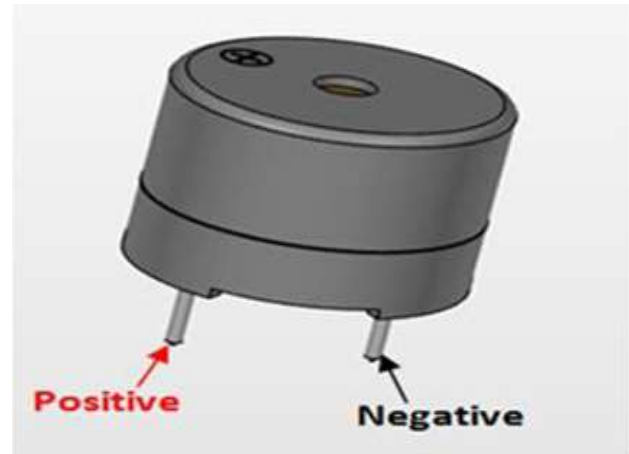


Fig.6.,Buzzer

f. LCD: Liquid crystal display is referred to as LCD. It is a particular type of electronic display module used in a wide array of circuits and devices, including mobile phones, calculators, computers, TVs, and other electronics. These displays are mostly preferred for seven segments and multi-segment light-emitting diodes. The main advantages of adopting this module are its low cost, ease of programming, animations, and unlimited ability to display bespoke characters, unique animations, etc.



Fig.5.LCD Display

g. Buzzer: Buzzers are electric sound-producing instruments. They fall under the categories of Piezo buzzer and magnetic buzzer, and are often driven by DC voltage. They have various designs and functions, and as a result, they may produce a variety of sounds. A buzzer or beeper is a mechanical, electromechanical, or piezoelectric audio signalling device (piezo for short). Buzzers and beepers are frequently used as alarm clocks, timers, and to validate human input such as a mouse click or keyboard.

III.IMPLEMENTATON

The hardware prototype of the proposed system has been shown in Fig.7.

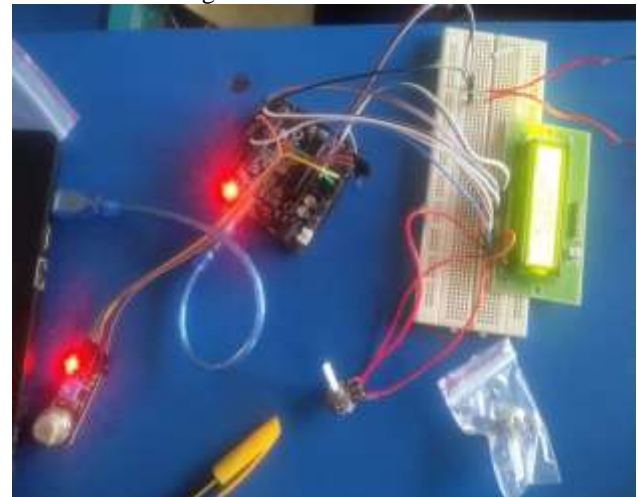


Fig.7.Hardware Prototype

IV.RESULTS

The project's ultimate goal is to create a finished gas leakage detection system. With the development of internet usage in homes, the inclusion of the internet of things can further improve security. The Node MCU continuously monitors the gas leakage using the sensor utilised in this project. The mobile application sends the user a notification if there are any changes to the sensor values. The mobile application's data are updated from the Blynk server. Thingspeak, an IoT software platform, is interfaced with the node MCU. The software's primary function is to send consumers an online alert message. LPG gas in the atmosphere is measured using a MQ5 gas sensor.

When a leak is discovered, the apps' gas indicator level rises to a specific value. The system verifies the MQ5 sensor value if the value is higher than the threshold value. The alarm is ON if there is a gas leak. The Node MCU also interfaced with a buzzer and LCD. If there is a gas leak, the alarm system turns on and an LCD screen shows how much gas is leaking. So that everyone in the area is informed of any problems and may take rapid action when they arise,

numerous users, including the neighbourhood, can be interfaced.

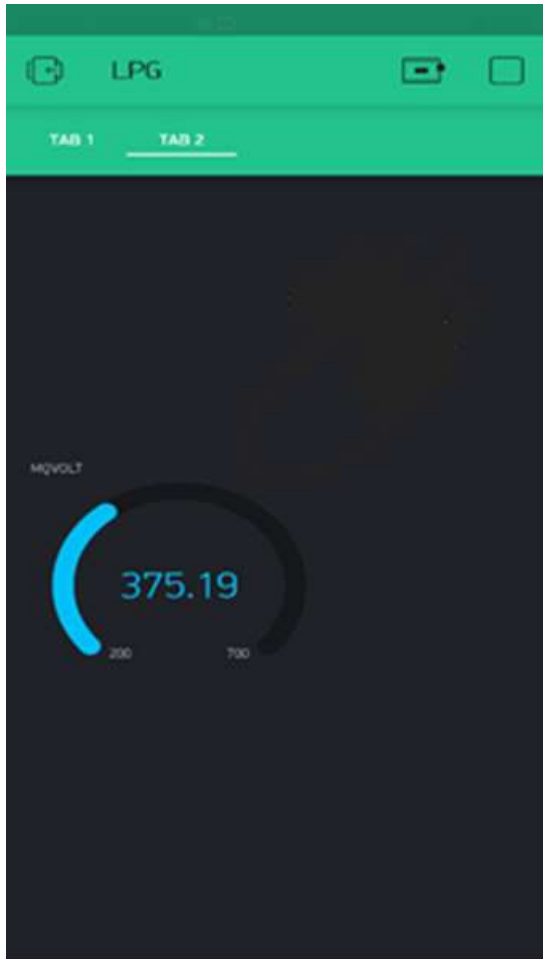


Fig.8.,Gas Leakage Indicator

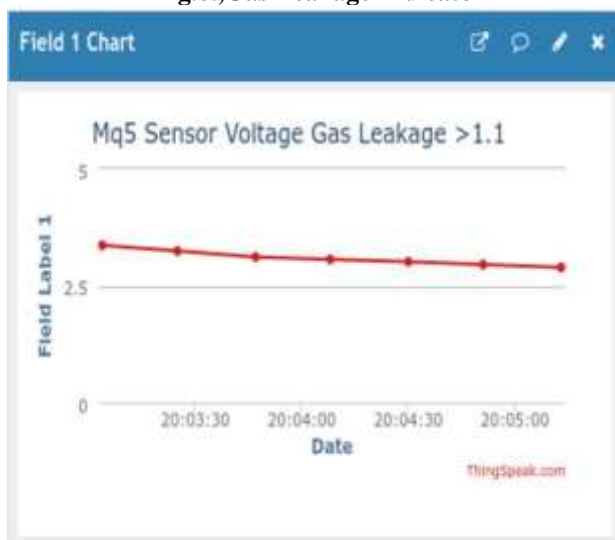


Fig.9.Gas Leakage detected by sensor

proposed technology is more affordable than the market's currently available detectors. It can assist us in preventing mishaps from all angles. In order to avoid accidents and preserve lives, it is crucial to identify LPG leaks. We talked about the techniques for finding leaks, which can help save many lives. With the help of this technology, the user has access to real-time data at all times.

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V.CONCLUSION

Gas leaks cause serious mishaps that cause property damage and human injuries. Poor equipment maintenance and a lack of public awareness are the main causes of gas leaks. It is a cost-effective device that may be put in LPG gas storage rooms in hotels and apartments, among other places. The