LPG Leakage Detection Alert And Auto Exhaust System Using IOT With Global System For Mobile Communication

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Abstract- *This IOT based gas detector connects the device to WIFI which is utilized to set parameters. Because of its small size and portability, it can be installed in hotels, households and industries. This gas detector system uses MQ5 gas sensor and continuously monitor the LPG level in its surrounding. If the level of LPG is within threshold then it gives green signal, if not, it will give red signal and will update it over IOT device. Nowadays commonly used in households, industries and other places as it is very convenient, affordable and ecofriendly and less hazardous than its other alternatives. It has proven to be one of the most reliable and easily controlled fuels. It is supplied to various places in cylinders or pipelines. The additional advantage of the system also involves predicting the working days of the gasoline content. The continuous weight measurement of gas on regular basis is done using a load cell which is interfaced with a Microcontroller. The current status and the booking notifications are notified to the user on their mobile phones via GSM module. The entire framework work towards making the LPG chamber booking system more automatized without any human intercession. Hence, it can leak both as a liquid or as a gas if it is not handled cautiously. Accidents and disasters related to LPG gas leakage are not unheard of. These leakage accidents can cause huge fire and explosion. These accidents are caused usually caused due to negligence and careless handling of the gas. If the gas leakage is not detected in the early stages, then it can lead to a very big disaster, as nowadays we can find the supply of LPG gas in almost every household. So, a lot of people have to face danger in case of such catastrophe.*

I. INTRODUCTION

Today in present era where technological advances are at its zenith, there's not even a single sector which remains untouched by technology. Technology has not only made our lives simpler, but also offers a high level of safety and security wherever required. One of the most significant technologies is IoT (Internet of Things) which makes the way to connect two hardware devices through internet. It is widely used in various sectors like medicine, industries etc, and its Implementation is also expanded in domestic sectors. In our day to day lives, we all use LPG fuel for cooking our daily meals. On account of its flexibility it is used in numerous sectors. Today, booking an LPG cylinder is simply a text message away.

Petroleum companies have introduced the customer-friendly service called as Interactive voice Response technique for their customers. Most of the times in our daily use, users find it difficult to figure out the quantity of LPG left in the cylinder leading to situations where the gas goes empty. This cause inconvenience in its use. In such a state of affairs, associate degree efficient technique to watch the amount of LPG within the cylinder is needed, so the users are tuned in to the LPG level at intervals within the cylinder. Thus, there is a huge demand for an IoT system which is automated in measuring the level of gas and notifying it to the user in order to book the cylinder pre before it gets empty. The Framework of paper proposes a microcontroller- based system that monitor the gas quantity in the container.

The weight of cylinder is measured using load cell sensor which intern works on the principle of piezoelectric sensor.it continuously measures the weight and the send the electric pulse to the microcontroller i.e. Arduino. When system detects the weight of cylinder below particular level, it alerts the user for cylinder booking, and place a refill order in the respective branch. It also provides additional features such as notifying the current status of gasoline present in the container and predicting the working days of the gasoline content. the proposed system uses a Bluetooth Module for the connection of an android device with the system. The main application of this proposed system is to overcome the shortcomings such as delay and pre-booking of the LPG cylinder by the consumers.

Living in this modern age, our life has been included with so many modern technologies and features. Some of them are invented to live a safe and secure life. In this paper, we are talking about a security feature to prevent any kind of

flop from LPG leakage. LPG (Liquefied Petroleum Gas) is a gas made up of flammable hydrocarbon gasses that is used as a cooking and restaurant fuel as well as for transportation. It is a mixture of half butane, 48% propane, and 2% of pentane. It is stored in a metal cylinder and the use of this metal cylinder which contains LPG is growing day by day. Especially in an urban area, it is the main source of cooking fuel. Also, the availability and the low price make it more attractive to the users. But the main point is that a huge number of the users of LPG are not aware of the danger of LPG leakage. Also, they don't have any prior knowledge to prevent this issue. Most accidents occur due to irregular maintenance. It is too sensitive to fire and can result in a huge disaster if it's exposed.

To address this issue, users need a solution and here in this paper, we are going to introduce the solution which is called the IoT-based LPG Gas Leakage Detection and Prevention System. This system is integrated with the network by GSM technology to make SMS alerts during any issue that occurs. Meanwhile, the exhaust fan feature will turn on to remove the air outside to reduce the amount of gas. This system includes two sensors and is MQ6 gas sensor and a YG1006 flame sensor. This is what makes the device capable of detecting fire and gas separately. The structure of the device is made to capable the device to respond fast. And the last thing is that it is affordable for the users to implement in their target area.

Therefore, we have used the technology to make a Gas Leakage Detector for society which having Smart Alerting techniques involving sending text message to the concerned authority and an ability performing data analytics on sensor readings. Our main aim is to proposing the gas leakage system for society where each flat have gas leakage detector hardware. This will detect the harmful gases in environment and alerting to the society member through alarm and sending notification.

Advantages :

- Get real-time alerts about the gaseous presence in the atmosphere
- Prevent fire hazards and explosions
- Supervise gas concentration levels
- Ensure worker's health
- Real-time updates about leakages
- Cost-effective installation
- Get immediate gas leak alerts

Applications :

- ✓ Residential (LPG gas detector for home)
- ✓ Commercial
- ✓ Industrial

II. LITERATURE REVIEW

In past years many smart gas detectors have been proposed to detect leakage of LPG efficiently.

- Some programmed the system such way that it sends a text message to notify the user Or to shut off the gas line automatically
- Some even used GSM and Wireless monitoring system
- This paper discusses about the real time observation of gas concentration in the surrounding and avoiding any future accidents.

Shamsudin et al (2021). Proposed IoT-based LPG Leakage Detector System with Safety Alert Mechanism. They used components Like ESP Wi-Fi MODULE (ESP8266), MQ-2, ATMega328(Arduino UNO), Load cell, Blynk mobile application, As a result, the technique and goal of this work is to create a gas leak detecting gadget that uses IoT and has many ways to alert users to the presence of a gas leak. The circuit's principle is based on a gas sensor that can detect gas leakage in percentages and parts per million (ppm).

Shobha et al (2021). proposed Internet of Things based Hazardous Gas leakage Detection System in this paper they used, MQ2 Gas Sensor, Arduino Uno, Gas Detection, Ethernet Shield, the Proposed IoT Based if hazardous gas leakage noticing system that list and groups As a result, whether it is a gas leak has occurred in the pipe is determined by the content of the feedback as positive or negative. It can be used to identify fires in houses, guest houses, health facilities, factories, and other public places. The 'IoT-based Hazardous Gas Leakage Detection System' is used in this paper to prevent fires and take preventative measures against fires.

Srikanth Sai et al (2020). Designed IoT Based LPG Leakage Detection and Booking System with Customer SMS Alert In this paper they used MQ2 Gas Sensor, Load Cell, AWS server, GSM Modem This system detects a fuel leak automatically and sends a text message to the user. If the user is busy and does not respond in a timely manner, the system reserves the characteristics of LPG gasoline and replaces the reservation data on the server robotically using the AWS server.

Manichandana et al. (2022). Presented their work on GAS leakage detection and inspection of leakage spots in GAS pipes in this system They provided several models that utilized the SCADA I/F model This model was introduced on GAS leakage detection and inspection of leakage spots in GAS pipes in this system. They provided several models that utilized the SCADA I/F model. In less than three seconds, the technology can deliver correct data from the GAS pipeline to a dedicated simulation. This module, which communicates with SCADA, collects dynamic parameters every 30 seconds. Simulation Model This model uses numerical-based approaches to simulate transient flow using reliable data. Prospective variables are offered in that system in order to obtain the average temperature and systole pressure.

Shilpa et al (2020). Proposed LPG Gas Measurement Detection using GPS They used components like Load cell, Arduino, Signal amplifier, LPG, MQ6 sensor, GPS, and Signal amplifier. This device keeps track of the gas cylinder's level. If the threshold level falls below 2kgs, the user will receive an alert SMS, and the leakage level will be determined.

Rameswari et al (2021). presented. Smart gas assistant for a perfect kitchen. In this paper, they used Wi-Fi, GSM Module, Arduino, Online Tool, Mobile Application, Internet of Things. This system calculates the amount of LPG in the cylinder It will book itself. the cylinder depending on the registration number in addition, an alert message was sent also, inform the customer about the amount of gas in the cylinder.

Jebamalar et al (2021) designed LPG Gas Leakage Detection and Alert System. In this paper, they used Voltage Regulator IC 7805, Resistor, MQ2, Gas sensor, Liquid petroleum gas. This paper discussed a system for detecting and alerting LPG leaks. When LPG leakage is detected, this device activates an LED and a buzzer to inform people. This technique is both simple and efficient.

Iruansi et al (2019). presents their work. Design and Development of Kitchen Gas Leakage Detection and Automatic Gas Shutoff System in their project they used a buzzer, gas sensor, microcontroller, gas leakage detection, and solenoid valve. The purpose of the research is to develop a system that can detect gas leaks and warn the subscriber via an alert and a status monitor, as well as the ability to shut it down off the gas supply valve as a primary safety measure.

III. PROBLEM STATEMENT AND MARKET NEEDS

Gas leakages are a common problem in homes and industries. If not detected and corrected at the right time, it can cause lost of lives and properties. Potentially deadly liquefied petroleum gas is also very dangerous to life.

TARGET SPECIFICATIONS

After the study of the problem statement and the market needs. The following parameters of the system is to be designed.

1. Reliable
2. Low cost
3. Quick response
4. Durability
5. Compact process

Research and Development

An Arduino UNO serving as a microcontroller is in charge of managing the entire system. The key benefits of adopting this controller over others include faster processing rates and the capacity to manage numerous inputs and outputs simultaneously without sacrificing output accuracy and precision.

This Arduino UNO has sufficient processing power to handle the data from the RFID receiver. Processing the signal from the RFID tag that the receiver receives is the processor's primary function. Arduino Uno processes these input signals and activates the corresponding relays, which in turn causes the processor to produce the output signals.

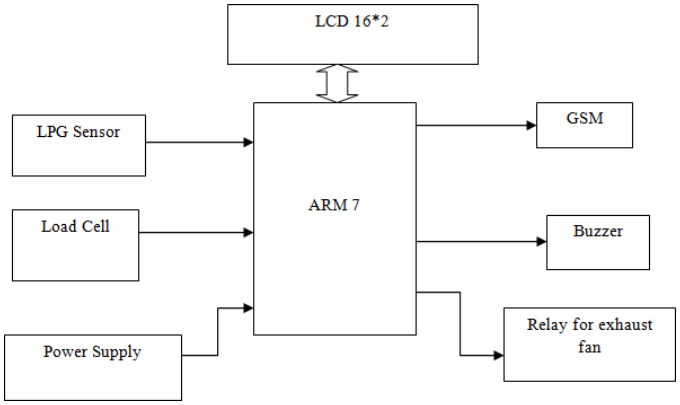
This particular board can also be connected to a computer for simple implementation or change of the code that serves as the processor's "brain" and regulates operations. To examine an analogue or graphical representation of both inputs, the device can communicate with the computer using special software.

IV. HARDWARE IMPLEMENTATION

Components of the system:

1. Arduino UNO
2. GSM
3. Relay
4. Buzzer
5. Gas Sensor
6. Fan
7. Strip Light
8. Driver
9. LCD
10. Transformer

Block Diagram



Arduino UNO:

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing. Over the years Arduino has been the brain of thousands of projects, from everyday objects to complex scientific instruments. A worldwide community of makers - students, hobbyists, artists, programmers, and professionals - has gathered around this open-source platform, their contributions have added up to an incredible amount of accessible knowledge that can be of great help to novices and experts alike.

Arduino was born at the Ivrea Interaction Design Institute as an easy tool for fast prototyping, aimed at students without a background in electronics and programming. As soon as it reached a wider community, the Arduino board started changing to adapt to new needs and challenges, differentiating its offer from simple 8-bit boards to products for IoT applications, wearable, 3D printing, and embedded environments. All Arduino boards are completely open-source, empowering users to build them independently and eventually adapt them to their particular needs. The software, too, is open-source, and it is growing through the contributions of users worldwide.

Gas Sensor:

We have the gas sensor for the gases from various sources. It can give output if the gas leakage occurs. We can pick up the output from the gas sensor and process it and we can either control or do any other activities. We can also make an alarm or any other indications by arranging the circuits which are designed by us. The following figure shows the circuitry which gives an output signal and LED indication when the gas is sensed by the gas sensor. Here the sensor is biased by 5v dc input. And Inverting input of the operational amplifier LM 741. And the LM741 op – amp is used as a comparator.As we know the function of the comparator, the output of the comparator is given to the base of the transistor Q1. Here the transistor (BC547) used as a switch. because of this, the current flow in the output and through the LED controlled by the output of op – amp.The power LED indicates the whether the power is ON or OFF.

GSM:

We have the gas sensor for the gases from various sources. It can give output if the gas leakage occurs. We can pick up the output from the gas sensor and process it and we can either control or do any other activities. We can also make an alarm or any other indications by arranging the circuits which are designed by us.

The following figure shows the circuitry which gives an output signal and LED indication when the gas is sensed by the gas sensor. Here the sensor is biased by 5v dc input. And Inverting input of the operational amplifier LM 741. And the LM741 op – amp is used as a comparator.As we know the function of the comparator, the output of the comparator is given to the base of the transistor Q1. Here the transistor (BC547) used as a switch. because of this, the current flow in the output and through the LED controlled by the output of op – amp.The power LED indicates the whether the power is ON or OFF

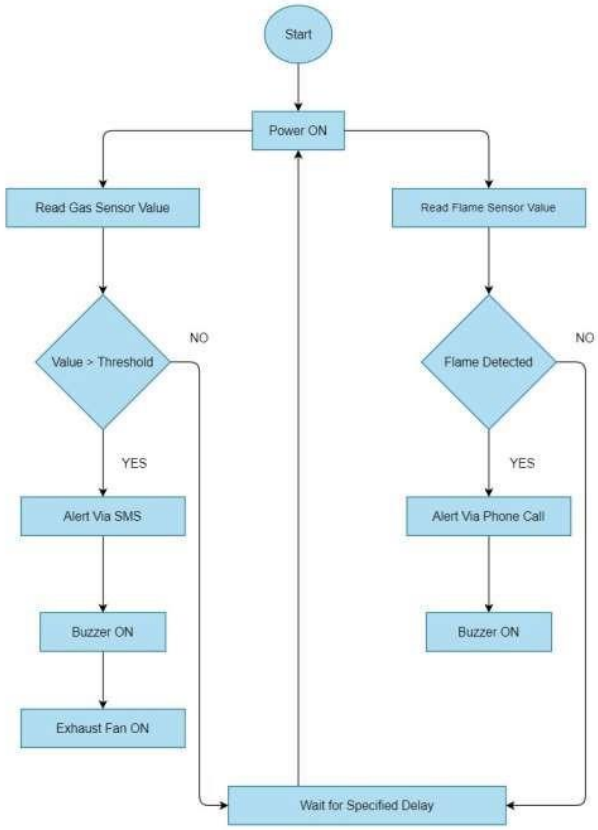
Buzzer:

A **buzzer** or **beeper** is a signaling device, usually electronic, typically used in automobiles, household appliances such as a microwave oven, or game shows. It most commonly consists of a number of switches or sensors connected to a control unit that determines if and which button was pushed or a preset time has lapsed, and usually illuminates a light on the appropriate button or control panel, and sounds a warning in the form of a continuous or intermittent buzzing or beeping sound. Initially this device was based on an electromechanical system which was identical to an electric bell without the metal gong (which makes the ringing noise).

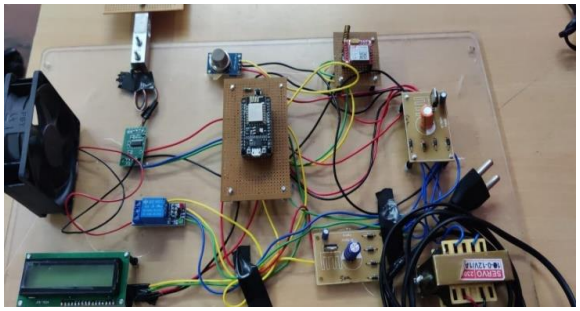
Often these units were anchored to a wall or ceiling and used the ceiling or wall as a sounding board. Another implementation with some AC-connected devices was to

implement a circuit to make the AC current into a noise loud enough to drive a loudspeaker and hook this circuit up to a cheap 8-ohm speaker. Nowadays, it is more popular to use a ceramic-based piezoelectric sounder like a Son alert which makes a high-pitched tone. Usually these were hooked up to "driver" circuits which varied the pitch of the sound or pulsed the sound on and off.

V. FLOWCHART



Working Explanation:



The Arduino microcontroller will read LPG gas through an LPG gas sensor. If it detects a gas leak, the red LED will light up, the buzzer will activate, then the system will send a notification message stating that there has been an LPG gas leak.

VI. FUTURE SCOPE

Another major future scope could be including a Automatic Shut-off device which will turn off the gas supply whenever it will detect any gas leakage. This system can be implemented in Industries, Hotels and wherever the LPG cylinders are used.

V. CONCLUSION

Gas leakage leads to severe accidents resulting in material losses and human injuries. Gas leakage occurs mainly due to poor maintenance of equipments and inadequate awareness of the people. Hence, LPG leakage detection is essential to prevent accidents and to save human lives.

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