IOT BASED SAFETY ENABLED SMART GAS DETECTOR

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Abstract— **As we all know; industrial security is a key concern in today's world. The number of accidents is rising every day, and we have seen several examples in our daily lives of accidents caused by flammable gases. We frequently hear about home cylinders exploding, which are used for residential purposes, transportation, and a variety of sectors. Many individuals have been seriously hurt and others have died because of explosions in some cases. In addition to being facilitated, the world has become more vulnerable to big blunders and disasters because of new breakthroughs and technology. Similarly, Liquefied In most homes, petroleum gas (LPG) is used in the kitchen and for gas geysers or heaters in the winter. Similarly, companies employ it for a variety of reasons, such as furnaces, boiling, and increasing output at a lower cost**.

This project aims to design an IOT Based Smart Enabled Gas Detector to perform operations such as Gas Detection, LCD Display, blinking of LED, Rotation of DC Fan, Regulation Control, and Quantity Measurement.

Keywords— IOT, Detector system, Arduino Uno, MQ2 Sensor, Regulation control, Quantity Measurement.

1. INTRODUCTION:

The Internet of Things (IoT) is a technology in which embedded devices connected to the Internet, such as software and web-enabled sensors, collect data and store it in the cloud. You can get the data if you want. Only the requested data will be retrieved. All other data is stored in the cloud invisibly. A seamless communication between people, processes, and things is made possible by the capacity to connect commonplace items to the Internet via embedded devices, such as cars, appliances, thermostats, and baby monitors. Operators nearby can be informed of a leak by a gas detector, allowing them to flee the area. Since many gases have the potential to harm biological life, such as people or animals, this kind of equipment is required. Increased atmospheric concentrations of these chemicals will be extremely dangerous.

LPG, alcohol, methane, and other gases can cause this MQ2 gas sensor to react. It can locate hazardous LPG leaks in storage tanks, petrol stations, and vehicles. The sensor also has a quick response time and outstanding sensitivity. The sensor can also pick up on LNG, isobutane, propane, and smoke from cigarettes. When the LPG sensor detects a gas leak from the accumulator, its output diminishes. Like all fossil fuels, this energy source is non-renewable. derived from fossil fuels, including petroleum and gas. LPG gas is generally odourless and is made up primarily of gas and alkanes. [9]

Worldwide, gas leaks cause a large number of fatalities. As a result, there is no need to be concerned about the gas leak being so severe and

out of control that it endangers human life or the environment around it. Additionally, the workers or residents will be informed and made aware of the leak. [5]

Implementing gas leakage detectors in India is crucial for several reasons. First and foremost, it ensures the safety and well-being of individuals and communities. Gas leakages can lead to hazardous situations, causing injuries, fatalities, and property damage. By installing gas leakage detectors, potential leaks can be detected early, allowing for prompt action to mitigate the risks and prevent accidents.[3]

In summary, implementing gas leakage detectors in India is vital for safeguarding human lives, protecting the environment, and promoting sustainable resource management. By proactively detecting and addressing gas leaks, we can mitigate risks, prevent accidents, and contribute to a safer and more sustainable future.

Table 1: The number of accidents and casualties by year

YEAR	2013	2014	2015	2016	2017
Number of accidents	210	187	179	139	185
Number of deaths	3	1	2	0	0
Number of injuries	52	76	60	52	50

The above table shows the number of accidents that occurred between 2013 and 2017 and the resulting casualties.

2. LITERATURE REVIEW:

LPG leaks today are a problem for both manufacturing and homes. If you do not recognize and change 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 authorized person of the leakage will be sent to him. [1]

They offered protection against fire and leakage mishaps. When that occurs, their system SMSs the designated emergency number. [2]

This paper primarily controls the development of a simple gas spill locator at the initial stage and later transforms this uncomplicated device into a most innovative gas identification framework. Propane (C3H8) and butane (C4H10) high affectivity gas sensors have been specifically used. The GSM (Worldwide System for Versatile Communication) module of the gas leakage system sends an SMS as soon as a leak is discovered. [3]

3. Existing SYSTEM:

The Existing system has many back draws with respect to the safety measures. In the existing system, Only the MQ2 sensor, which has a limited range of threshold for sensing gas levels in ppm, is utilised; additional generations of MQ sensors are either not utilised or cannot be added.

The current system lacks the ability to book a refill when the LPG level is at 10% and does not give the user an SMS notice regarding a gas leak.

4. PROPOSED SYSTEM:

The proposed gas leakage detector is promising since it assures that safety features like gas valve shutdown and SMS alerts to the user are in place. LPG and CNG, or petroleum gas and compressed natural gas, are the most popular cooking fuels. They are also used in a range of vehicles to replace pricey fuels like diesel and gasoline. [7]

These gases are kept in cylinders that are not difficult to rupture. However, leaks can happen through pipes, regulators, or knobs, which could cause accidents like suffocation, uneasiness, or on rare occasions, even a fire or a short circuit. The creation of a system that can identify gas leaks is the primary goal of this research. Upon detection, it will send a warning SMS and turn off the cylinder's gas supply on its own.

The microcontroller, it receives a low signal from the MQ2 Gas sensor which is capable of sensing Gases. The sensor offers a quick response time and great susceptibility.
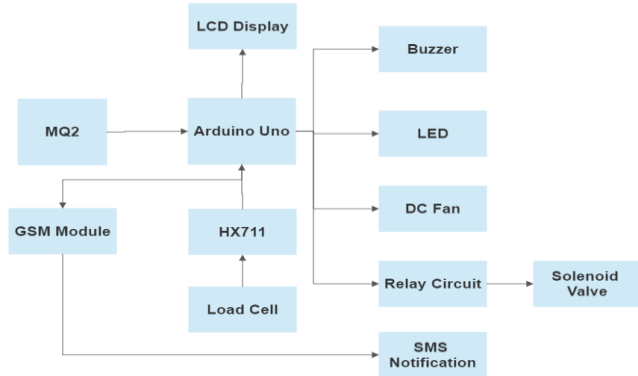

Fig. 1. Architecture of Gas Leakage Detection

The system will display a notification on the LCD with the gas concentration level and the red led glows when the gas level is above the threshold value and the Dc Fan starts to rotate. In addition to this the system is fitted with a relay circuit to control the Solenoid valve for gas flow and a load cell is attached to 19 measure the gas quantity in the LPG (liquid petroleum gas) and alerts the system user with a notification.
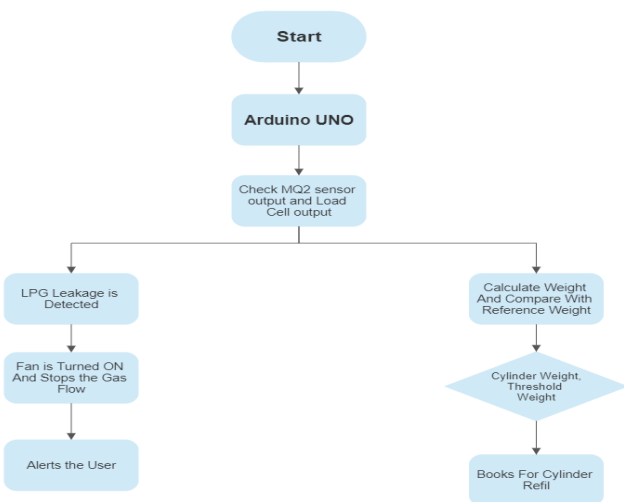
4.1 FLOW CHART:

Fig. 2. Flowchart of the gas leakage detection

The above figure shows the working flow of our system, when the supply power is given to the microcontroller Arduino uno, the system is turned on the MQ-2 sensor detects the leakage of gas in the system whenever there is an leakage detected,

a solenoid valve is attached to the system for the regulation control of 20 the gas and an load cell is also fitted in the system to monitor the measurement of the gasoline present in the LPG. The MQ-2 sensor detects the leakage of the gas the fan is turned on the gas flow is cut-off using the solenoid valve.

The blinking of red LED and the fan is turned on in the system, and the buzzer alarms the user. The solenoid valve plays key important role in the weight measurement of the gas in LPG the user tares the weight in such a way that he species a threshold value for his requirement for booking of automatic refill, the load cell works like a Wheatstone bridge when the resistances in the Wheatstone bridge alters then there will be a voltage induced will be controlled by an amplifier, the gas quantity when kept on the load cell will display the weight of the gas cylinder and send a notification when the gas quantity is below threshold valve set by the User.

4.2. Comparison of Existing System with Proposed System

S.No	Parameter	Existing System	Proposed System
1	Sensor	Only the MQ2 sensor, which has a limited range of threshold for sensing gas levels in ppm, is utilised; additional generations of MQ sensors are either not utilised or cannot be added.[10]	Any MQ sensor can be utilised, and it can apply a customizable threshold range for gas sensing in ppm, from MQ2 through MQ5/6 and MQ9 gas sensors.

2	Additional components	In the system they used load cell and LM35 temperature sensor instead of exhaust fan.	When a gas sensor detects a gas leak, the exhaust fan turns on automatically, closing the valve when the gas is present in the room where the system is applied. The exhaust fan can be used simultaneously with the valve.
3	Data Storage	No additional data storage for gas leak	It has a data storage for every gas leak per use or when leak is detected in the cloud storage
4	Cost	cost bit costly around 10k to 12k	low cost around 7k to 8k

5. IMPLEMENTATION OF GAS LEAKAGE DECTOR:

An ESP8266 chip is used in the implementation of an IoT-based intelligent (LPG) leakage detection project. The MQ2 gas sensor has provided data to the Arduino, which will take action if a leak has been found. The output about the gas level will be shown on an IOT-based display, which will show the percentage of gas level as per the established value. When a leak is found, the stepper motor is alerted to turn on the valve at the same time as a buzzer is turned on until the user shuts it off.

These defenses consist of chemical sensors for CO and propane gas and electrical signal conditioning circuits. Electrical circuits can be analog or digital, and chemical sensors can be built using semiconductor materials. In the past, accidental fires and cylinder ruptures have caused economic turmoil. This circuit turns on the warning system in the event that smoke or gas leaks are discovered. The Arduino and MQ smoke/gas sensors are used most frequently in the circuit to find smoke and gas leaks. [3]

A. Arduino

An Arduino is a circuit board with numerous components, including microcontroller chips. Beginners may utilise it with ease.
It can be utilised to operate motors, lighting, cameras, or even to construct a straightforward robot. By using a connector cable to connect the Arduino board to the laptop, the programme can be readily implemented.
When it receives information from the sensing device, it is widely used in this system to shut off the gas supply and alert the neighbour by turning on the alarm and exhaust fan. Even sending the owner SMS messages with photographs of the actions is possible.

B. LCD
Liquid crystal display 16x2 is referred to as LCD. It was used in this system to interact with an Arduino board and show the output of the leakage. A leak will be indicated, and an Arduino can be used to control it. Either gas is leaking, or There isn't a leak.

C. MQ2 Sensor

Gases (Iso gas, butane) in concentrations of 200–1000 ppppm can be detected using this detector.

Avoid the commotion of alcohol, smoking, etc. Once gas is detected by the detector, it compares with the internal comparator to supply the Arduino with the output of digital logic information. Vi pins are present on the encased MQ-2, of which four are used for fetching signals and the remaining two for supplying heating current.

D. ESP8266 WIFI module

The ESP8266 is a cheap wifi module with an integrated MCU and tcp/ip stack. It runs in soft access point mode. There are only two input and output pins on it. The MCU transmits the programme to the GPIO board. This wifi module is used to transmit data to websites and can also receive data from websites. It can be utilised by connecting it to an Arduino board or directly to a computer using a USB wire.

5.1 METHODOLOGY:

A network of physical objects that can communicate with one another thanks to sensors, electronics, software, and connections is known as the Internet of Things (IOT). The same is true for gas detection devices powered by the Internet of Things (IoT), which do not require human input. LPG leak detection based on IOT and Arduino. An LPG gas sensor is used by the system to identify LPG gas.

Implemented is an LPG gas sensor interface for Arduino. The Arduino microcontroller will receive the signal from this sensor in this project. The IOT module (ESP8266) is linked to the microcontroller, along with the LCD and buzzer. The ESP8266 chip is used in the implementation of the IOT LPG leak detecting project.

To connect a microcontroller to a Wi-Fi network, create a TCP/IP connection, and send data, a Wi-Fi module is used. These sensors provide the data they have collected to the IOT. The data is subsequently sent to the website by the IOT module. A bell and the message "Leak detected"

are displayed on the LCD as soon as a gas leak is discovered.

This LPG gas leak detection and smart alert project needs the Wi-Fi module to be linked to a Wi-Fi hotspot or zone as a need. The Arduino microcontroller will receive the signal from this sensor in this project.

The MQ2 gas sensor uses 800mW of power and runs on 5V DC. It has a 200–10,000 ppm detection range for LPG, smoke, alcohol, propane, hydrogen, methane, and carbon monoxide.
MQ2 Gas detection sensor have a T90 of 15, 17 or even 30 seconds. Because of this, some gas detector manufacturers use a general T90 of 30 seconds overall.

Whenever gases are found in the environment, receive immediate notifications. Prevent fires and explosions by Keeping an eye on gas concentration levels. Accurately measure the oxygen level, use data analytics to make smarter judgements, and get up-to-date leak information all in one place.

6. CONCLUSION

The Internet of Things has recently gained widespread recognition. We are grateful for its many applications, which have made it possible for people to live comfortably, healthily, and simply. The suggested gas leak detector in the field of security appears promising.
Making this model was always intended to usher in a revolution in safety, reducing and ultimately eliminating any potential risk brought on by the emission of poisonous and hazardous gases. One of these application areas is the monitoring of gas reservations and leaks for both household and commercial purposes. There are many ways, but one of the biggest problems has been figuring out where gas leaks are. As a result, this work provided a revolutionary microcontroller-based technique for gas reservations and gas detectors.

Despite the fact that numerous studies on gas leakage detection have been conducted independently, we have suggested a unified

method with regard to safety precautions. Our smart detector has safety features enabled. Additionally, our intelligent detector will sound an alarm and turn off the gas flow from the cylinder. Our technology monitors the gasoline and immediately notifies and schedules refills. The IoT-based system that we have suggested in this paper will allow users to monitor the stove remotely and avoid any unintentional incidents.

7. REFERENCES

[1] Gas Leakage Detection Based on Arduino And Alarm Sound, Rhonnel S. Paculanan, Israel Carino, International Journal of Innovative Technology and Exploring Engineering (IJITEE) Vol 8, April 2019.

[2]. Hitendra Rawat, Ashish Kushwah, Khyati Asthana and Akanksha Shivhare.

[3] Sanjoy Das, Sahana S, Soujanya K Swathi M C, "Gas leakage detection and prevention using IoT": International Journal of Scientific Research % Engineering Trends. Vol 6, Issue 3, May-June 2020, ISSN (online): 2395-566X.

[4]. D. Surie, O. Laguionie, T. Pederson, ―"Wireless sensor networking of everyday objects in a smart home environment‖, Proceedings of the International Conference on Intelligent Sensors", Sensor Networks and Information Processing- ISSNIP- 2008, pp. 189 – 194.

[5] Dr. Chetana Tukkoji, Mr. Sanjeev Kumar, "Review paper on- LPG Gas leakage detection using IOT": IJEAST –International Journal of Engineering Applied Science & Technology, Volume 4, Issue 12, April 2020 IJEAST (online): 603-609.

[6] F. Salvadori et al., "Monitoring in industrial systems using wireless sensor network with dynamic power management," IEEE Trans.

[7]. Ankit Sood, Babalu Sonkar, Atul Ranjan, Mr. Ameer Faisal, "Microcontroller Based LPG Gas Leakage Detector Using GSM Module", International Journal of Electrical and Electronics Research, Volume 3, Issue2, April-June 2015.

[7]J. Tsado, O. Imoru, S.O. Olayemi, "Design and construction of a GSM based gas leak Alert system"‖, IEEE Transaction, IRJEEE Vol. 1(1), pp. 002-006, September, 2014.

Instrum. Meas., vol. 58, no. 9, pp. 3104–3111, Sep. 2009.

[8] D. Surie, O. Laguionie, and T. Pederson, "Wireless sensor networking of everyday objects in a smart home environment," in Proc. Int. Conf. Intell. Sensors, Sensor Netw. Inf. Process, pp. 189–194, 2008.

[9] Mr.A.Subbarayudu , M.Pavithra, M.Sushmitha A survey based on "Automated LPG Gas Monitoring, Booking & Leakage Detector for Home Safety",2018

[10] Prof. Parag Naik, Pranay Dhopte, Rajat Wanode, Roheet Kantode, Saurabh Nagre,. Gas Sensor Using Arduino UNO and MQ2 Sensor. ISSN (Online) 2278-1021 ISSN (Print) 2319-5940 International Journal of Advanced Research in Computer and Communication Engineering ISO 3297:2007 Certified Vol. 7, Issue 3, March 2018.