LPG GAS LEAKAGE DETECTION SYSTEM USING NODE MCU AND BLYNK APPLICATION

Kaushalya Thopate, Anway Deshpande, Muhib Momin, Sachin Chaware, Deep Gadappa, Kaushik Najare
Vishwakarma Institute of Technology Pune, India

Abstract —

A framework for managing gas spills has been developed in order to safeguard lives, uphold social commitments, and take into account the dangers associated with impacts and injuries brought on by gas leaks in homes, vehicles, and places of business. A framework that enables us to not only warn the concerned party but also contain any gas spillage is acquired by using already-installed frameworks and integrating Internet of things (IoT) into it. A framework has been proposed in the study that makes use of modern electronics and technology to lessen the likelihood of accidents and guarantee security.

I. INTRODUCTION

One of the most well-known cooking fuels utilised in India is liquefied petroleum gas (LPG). In addition to being inexpensive and easily accessible, LPG is the ideal fuel for cocking purposes. Given the increase in the number of people using LPGfuel, it is crucial to provide some security measures that must be represented in order to live a life without accidents. The significant accidents happened when LPG was being used. While using LPG gas in India, there will be gas leaks. We can also observe leaks coming from old or worn-out gas pipes or tubes, which could cause them to rupture and cause a significant gas leak. LPG has a low odour because it is a combustible gas, as is known odourless LPG gas, which makes it easier to detect leaks.[1]

Ethanethiol is also blended with up and down stairtways is almost challenging.

From making up 0.72% of all kitchen mishaps to 10.74% of all kitchen accidents, LPG gas leakages have increased. The LPG part, which weighsbetween 4 and 7 kg, is more secure when the burner is placed next to it than it is elsewhere because of the use of elastic pipes, which run the danger of developing leaks that could lead to gas spills.[2]

A specially created computer programme is utilised to locate the area where a leak has occurred. This programme will function offline and be used to send emails to the designated user.[4] In order to trigger the entire system, an LPG gas detector is employed to detect gas leaks as quickly aspossible. After that, an email will be sent to the designated user, which will glow the hazard warning lights, activate the horn, and display amessage on the LCD screen. The employed machinery will provide the greatest results withmore benefits, and it may be improved in the future for any further uses, such as cutting off the main power supply and also being utilised to send SMS to the user. This is evident in high-tech residences and hotels where people don't want any hazards to occur around them.[5]

II. LITERATURE REVIEW

We looked into a smart home care system thatkeeps an eye on senior citizens' security. It notifies medical staff through email if any aberrant health rate vitals are found. This home care system also has cameras to catch intruders and sensors to recognize fires. People suffering from short-term memory loss receive messages from the system about daily tasks.[6]

The system consists of two main parts: the first determines if the vapor pressure exceeds a set limit, and the second determines whether the gas concentration is below a set limit.

To locate the community is alerted when gas leaks occur in domestic settings such as residences, hotels, schools and other domestic venues. Globally, businesses including instrumentation, safety, and health now employ gas sensors. This study performs the same task using a gassensor. Numerous adjacent applications commonlyemploy the sensor to identify gas leaks. The device also continuously displays the quantity of leakage on an LCD screen. [7]

The gas sensor outputs an analogue value that may be transformed to a digital signal using the analogue to digital converter integrated into the Node MCU. The gas sensor measures the concentration of gas in ppm. Based on the same digital measurement, it enables the user to set the low, medium, and dangerous levels of leakage. This is possible because of the smart phones and internet that we are widely using.[9]

This study performs the same task using a gas sensor. Numerous nearby applications frequently use the sensor to identify gas leaks. The device also continuously displays the quantity of leakage on an LCD screen. The gas sensor outputs an analogue value that may be transformed to a digital signal using the analogue to digital converter integratedinto the Node MCU. The gas sensor measures the concentration of gas in ppm. Based on the same digital measurement, it enables the user to set the low, medium, and dangerous levels of leakage. Due to our widespread use of smart phones and the internet, this is possible. [8]

The proposed project is an Android app for LPG leak detection and notification that provides users with an easy way to monitor the gas's level in cylinders. To alert the community when gas leaks are discovered in domestic sites such residences, hotels, schools and other domestic settings.Globally, businesses including instrumentation, safety, and health now employ gas sensors.

We looked into a smart home care system that keeps an eye on senior citizens' security. It notifies medical staff through email if any aberrant health rate vitals are found. This home care system also hascameras to catch intruders and sensors to recognise fires. People suffering from short-term memory loss receive notifications from the system about dailytasks.[9]

In this paper author has given different causes of leakage of combustible gases. Author has given a reference to H. Huang & which proposed a technique to design a AVR microcontroller based combustible and Hazardous gas detecting and alerting system. This system did not react on time because of any medium but this system can be installed in to vulnerable places.

LPG is a common cooking fuel in Indonesia and many other nations due to its affordability and ability to produce green energy. This paper describes the implementation and design of a systemfor gas leak detection. The project's main goal is to use a micro-controller and LPG gas sensor to create a gas leakage detector. By offering an early Warning System to provide a sign if there is a gas smell around the home, it established a security system.[10]

III. METHODOLOGY

IoT (Internet of Things)-based LPG leak detection can increase safety by offering real-time monitoring of LPG levels and warning users incase of a leak. Here are some procedures for developing an IoT-based LPG gas leak detection system:

Install a gas sensor that can identify LPG: Install a gas sensor that can identify LPG. TheMQ-6, MQ-5, and MQ-2 sensors are only a few of the various gas sensor types that can be employed. These sensors are capable of detecting various airborne quantities of LPG gas.

Sensor to microcontroller connection: Connect a microcontroller, such as an Arduino, Raspberry Pi, or an ESP8266, to the gas sensor. In order to establish whether there is a gas leak, the microcontroller will gather data from the sensor and process it.

Establish Internet Connection: Use an Ethernet or Wi-Fi shield to connect the microcontroller to the internet. The microcontroller will be able to do this and send data to the cloud for storage and analysis.

Create a Cloud-Based Application: Create a cloud-based application utilising a platform like Google Cloud IoT, AWS IoT, or Azure IoT. Data from the microcontroller will be received by the programme, which will then process it to find a gas leak. If there is a gas leak, it will also notify people by email, SMS, or push notifications.

System Validation and Testing: To make surethe system is operating properly, test it. By releasing a little amount of LPG gas close to the sensor, you can simulate a gas leak and see if the system notices it and issues an alert.

Upkeep and calibration: To ensure the accuracy and dependability of the gas sensor, regularly calibrate and maintain it. To maintain precise detection, you might need to frequently change the sensor.

By identifying gas leaks early and notifying users of them, an IoT-based LPG gas leak detection system can help to increase user safety. WhereLPG gas is used as a fuel source, such as in homes,commercial kitchens and industrial settings, it can be especially helpful.

Sensor Calculations

MQ 2	$\log ppm = \log(\frac{R_s}{R_0})$	R^2
LPG	$LPG \log ppm = -2.1116 \log\left(\frac{R_s}{R_0}\right) + 2.7624$	0.9994

IV. BLOCK DIAGRAM

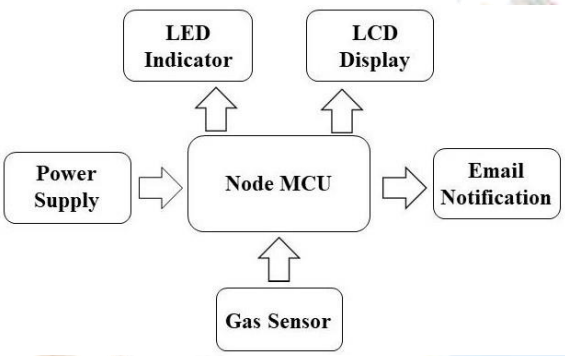

Fig IV.I. Block Diagram

A. Node MCU: Another open-source IoT board is NodeMCU. It includes firmware that will work with the ESP8266 Wi-Fi SoC and equipmentthat depends on the ESP-12 module. The term "NodeMCU" is frequently used to refer to firmware that has been hostile to unit improvement. The Lua scripting language will be utilised by this firmware.

B. LPG Gas Sensor: The MQ2 is an LPG gas detection sensor that will be used to find gases more quickly once they have leaked. Therefore, it was primarily employed to detect gas leaks from gas cylinders or other gas sources. It will be used for a variety of industrial applications, and this sensor can find gases including LNG, LPG, propane, and iso-butane.

C. Power Supply: Every electronic device requires power from a primary source using any means, such as a higher stage down converter that can convert 230V AC input into a 0-12V or 500mA supply. In order to supply the 5V voltage to the electronic boards whose output will be used to power the micro controller circuits, a full-wave connect rectifier that is pursued by several capacitor channels will be used.

D. LCD Display: The visual marker is a 16x2LCD (Liquid Crystal Display) display. This LCD display is being used for its cost-effectiveness and straightforward programmability. It displays a variety of messages, such as gas spills, the availability of renting a room, and so forth. Additionally, it displays the actions taken by the microcontroller.

V. CIRCUIT DIAGRAM

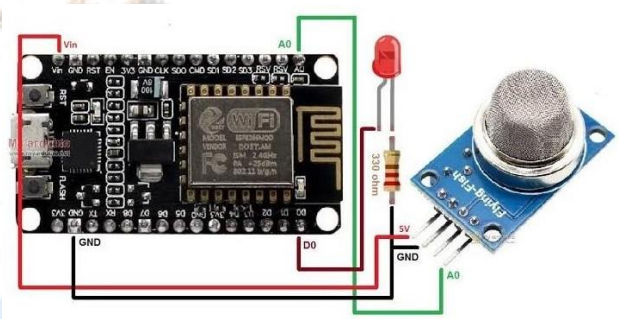

Fig V.I. Circuit Diagram

VI. OUTPUT

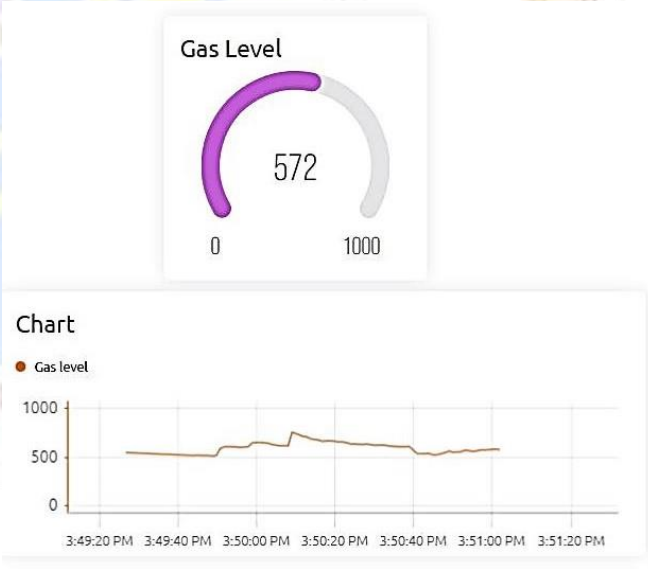

Fig VI.I. Graph

VII. CONCLUSION

A lighter is used to gather gas that has leaked surrounding the gas sensor, and if the sensorvalue exceeds the limit value, the small scale controller will perform the activities that are particular to that scale:

The controller handle quickly to halt further leakage. The transfer will cut off the main power source after 2-4 seconds. The LCD displays a message to warn customers and those nearby as the ringer begins to signal. The Wi-Fi module will use the cloud to send clients SMS and email.

The main latitude offered by this simple gas spill indicator is its simplicity and ability to alert partners to the presence of LPG gas spills. This framework's sound-visual cautioning frameworks contribute to its favorable position. This locator is well-executed, not at all challenging to use, and moreover a cheap item. Another benefit of this device is that gas leaks can still occur even if no one is home at the time.This can be used to lessen mishaps brought onby hazardous gas leaks, and then it will be put touse to use a relay to switch off the main power supply. The use of MQ-6 gas leakage will be guaranteed.

VIII. FUTURE SCOPE

Given the highlights provided, this system can be made more effective by incorporating fewer and more fundamentally smaller data sources, such as

1. Temperature: To monitor the chamber's temperature in accordance with nature and programme the framework to respond as necessary.

2. This architecture benefits from IOT for messaging and informing, but by integrating Android and GSM for messaging and informing, it may be made enormous.

3. Sensors: The expansion of applicable and future new innovation-based sensors as well as their continuous and profitable integration would significantly increase the framework's credibility.

References

1. Abraham K., "Soft computing techniques which are used for rotary turning tool monitoring-literature review," *International Journal of Engineering and Technology(UAE),* vol. 7, no. 1, p. 48 to:: 51, 2018.
2. Ankit Sood, "Microcontroller Based LPG Gas Leakage Detector Using GSM Module," *International Journal of Electrical and Electronics Research,* vol. 3, no. 2, p. 264 to 269, 2015.
3. Arun Raj, "LPG Gas Monitoring System," *International Journal of Innovative Technology and Research,* vol. 3, no. 2, p. 1957 to 1960., 2015.
4. Baji S.K., "Application of multiple signal classification algorithm on GPS TEC for earthquakes," *Indian Journalof Science and Technology,* vol. 9, no. 17, 2016.
5. Bhavani K.V.L., "Wideband CPW fed monopole fractal antenna with defected ground structure," *Journal of Engineering and Applied Sciences,* vol. 11, no. 11, pp. 2446 - 2454, 2016.
6. C.Selvapriya, "LPG Leakage Monitoring and Multilevel Alerting System," *International Journal of Engineering Sciences & Research Technology,* vol. 2, no. 11, p. Pg – 3287 to 3290, 2013.
7. Venkata Ratnam D., "Ionospheric forecasting model using fuzzy logic-based gradient descent method," *Geodesy and Geodynamics,* vol. 8, no. 5, pp. 305-310, 2017.
8. Sridhar M., "Ionospheric scintillation forecasting model based on NN-PSO technique," *Astrophysics and Space Science,* vol. 362, no. 9, 2017.
9. Sreenivasa Rao D., "Microstrip parasitic strip loaded reconfigurable monopole antenna," *ARPN Journal of Engineering andApplied Sciences,* vol. 11, no. 19, pp. 11589 - 11594, 2016.
10. Salman M.N., "Baseline wander removal in cardiac signals using Variable Step Size Adaptive Noise Cancellers," *Proceedings of the 2016 IEEE International Conference on Wireless Communications, Signal Processing and Networking, Wisp NET 2016* , pp. 1529 - 1533, 2016.
11. S.Sharma, "Classification of gases using Dynamic Response of Thick Flim Gas Sensor Array," in *IEEE Conference on Sensors Journal,* 2013.
12. Rama Krishna T.V., "Microstrip line fed leaky wave antenna with shorting visa for wideband systems," *International Journal of Electrical and Computer Engineering,* vol. 6, no. 4, pp. 1725 - 1731, 2016.

    Rajalakshmi A., "Vehicular Pollution and Status Monitoring Using RFID," *International Journal of Advanced Research in Science, Engineering and Technology,* vol. 2, no. 4, pp. 580-586, 2015.

13. Prof.Pankaj C.Warule, "LPG Detection, Metering and Control System Using Microcontroller," *IJARIIE*, vol. 2, no. 2, p. 648 to 652, 2016.

14. S. M. Pragathi B., "Controlling of PV-STATCOM for increasing power transmission based on VHDL signal generation," *International Journal of Engineering and Technology(UAE)* , vol. 7, no. 2, p. 52 to:: 55 , 2018.

15. Naik K.K., "Design of Conformal Antenna with Slots on Path and CSRR on Ground Plane for ISM Band Applications," *Wireless Personal Communications*, vol. 103, no. 4, p. 3025 to::3039, 2018.

16. Madhav B.T.P., "Circularly polarized slotted aperture antenna with coplanar waveguide fed for broadband applications," *Journal of Engineering Science and Technology*, vol. 11, no. 2, pp. 267 - 277, 2016.

17. Kishore P.V.V., "Optical Flow Hand Tracking and Active Contour Hand Shape Features for Continuous Sign Language Recognition with Artificial Neural Networks," *Proceedings - 6th International Advanced Computing Conference*, pp. 346 - 351, 2016.

18. Kilaru A., "Rain rate intensity model for communication link design across the Indian region," *Journal of Atmospheric and Solar-Terrestrial Physics*, vol. 145, pp. 136 - 142, 2016.

19. Karthick S, "Reconfigurable FIR Filter with Radix-4 Array Multiplier," *Journal of Theoretical and Applied Information Technology*, vol. 57, pp. 326-336, 2013.

20. V. S. &. P. E. Karthick S, "Low Power Systolic Array Based Digital Filter for DSP Applications," *Scientific World Journal*, pp. 1-6, 2015.

21. Kalyan S.S.S., "Hybrid beam steering of Ka-band array-fed reflector antenna for satellite communication links," *International Journal of Simulation: Systems, Science and Technology*, 2018.

22. Harsha P.B.S., "Implementation of Advanced Carrier Tracking Algorithm Using Adaptive- Extended Kalman Filter for GNSS Receivers," *IEEE Geoscience andRemote Sensing Letters*, vol. 13, no. 9, pp. pp: 1280 - 1284, 2016.

23. Gundu R.P., "TOA-based source localization using ML estimation," *Journal of Advanced Research in Dynamical and Control Systems*, vol. 10, no. 10, p. 1146 to:: 1155, 2018.

24. Chandrasekhar Rao J., "CPW-fed compact ultra-wideband MIMO antenna for portable devices," *Indian Journal of Science and Technology*, vol. 9, no. 17, 2016.