WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Gas Leakage Detection using IOT

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ABSTRACT—

The IOT based gas leakage detection system using Arduino UNO aims to enhance safety by detecting harmful gas leaks in real-time and providing immediate alerts. The system integrates gas sensor, such as the MQ series, with a Arduino UNO micro controller, which connects to the Arduino UNO via buzzer, exhaust fan . When the sensor detects the presence of gases like LPG, methane, or carbon monoxide beyond a set threshold, the Arduino UNO triggers an alarm and sends notifications to user. This system can be applied in homes, industrial settings, or any environment where gas leaks pose a risk, offering a reliable and efficient solution for early detection and prevention of gas-related accidents. The IOT based gas leakage detection system using Arduino UNO is designed to provide continuous monitoring and early detection of gas leaks, ensuring safety in residential, industrial, or commercial environments. The system employs a combination of gas sensor to detect the presence of hazardous gases like LPG, methane. The Arduino UNO processes the sensor data and, upon detecting a gas concentration above a predetermined threshold, activates an alarm system and sends real-time notifications to users via buzzer, exhaust fan & LED. Additionally, the system can be integrated with cloud-based IOT platforms. The ultimate goal of this system is to minimize the risk of gas-related accidents, allowing for quick responses and timely intervention. This approach enhances safety while reducing human error and response time, offering a scalable and efficient solution for both home and industrial safety applications.

Keywords— Arduino UNO, Gas sensor, buzzer, Exhaust fan

Introduction

Gas leaks are a significant safety hazard in both residential and industrial environments. Whether it's natural gas, propane, or toxic gases, undetected leaks can lead to fires, explosions, health risks, and environmental damage. In response to this pressing issue, the integration of the Internet of Things (IOT) into gas leakage detection systems offers a modern, reliable solution for real-time monitoring and rapid response. IOT enabled gas leakage detection systems use a network of interconnected sensors that can continuously monitor gas levels in the air. These sensors detect the presence of specific gases like LPG, methane gases and communicate with a central system that can trigger alarms, notify users, or even activate safety mechanisms like shutting off gas supply. The advantage of IOT is its ability to provide remote monitoring and automated responses, ensuring that gas leaks are detected and addressed promptly, even in hard-to-reach or hazardous areas. This project aims to design and implement a Gas Leakage Detection System based on IOT technology. The system will consist of gas sensors connected to a cloud platform or a local server for continuous monitoring, data analysis, and alerting. By leveraging IOT's capabilities for real-time data collection and automatic actions, this system provides a scalable, cost-effective, and efficient solution for ensuring safety in environments where gas leaks are a concern. Through this project, we seek to demonstrate how IOT can enhance safety protocols, reduce human error, and improve operational efficiency in managing gas leak risks. The system will not only serve as a proactive safety tool but also contribute to the overall sustainability by minimizing environmental harm caused by unchecked gas leakes.

Literature survey

IOT-Based Gas Leak Detection System by A. G. Bournias, V. V. C. Vasilanko.

The goal of this project is to design and implement a reliable, real-time IoT-based gas leak Detection system that can monitor hazardous gas levels, provide instant alerts, and Automatically trigger safety measures in case of a gas leak. This system is particularly useful In both residential and industrial environments where gas leakages can lead to dangerous Explosions, fires, or poisoning. Using a network of interconnected sensors, cloud platforms, and automated responses, the system aims to enhance safety by providing continuous Monitoring and rapid response to gas leak incidents.

Gas leaks are a significant safety risk, especially in homes, factories, oil & gas plants, and laboratories where toxic or flammable gases are present. Traditional methods of gas leak detection, such as manual inspections or local alarms, have limitations in terms of responsiveness, scalability, and real-time monitoring. There is a pressing need for an automated, scalable solution that can detect gas leaks in real-time, send alerts to users or emergency services, and trigger safety systems.

S. K. Gupta, R. P. Jadhav, P. K. Sahoo

The IOT based Gas Leakage Detection System developed by S. K. Gupta, R. P. Jadhav, and P. K. Sahoo aims to mitigate the dangers associated with hazardous gas leaks by leveraging Internet of Things (IOT) technology. The system is designed to monitor the presence of flammable or toxic gases in both residential and industrial settings, providing real-time data collection, analysis, and alerting. Gas leaks, if undetected, pose significant risks such as explosions, fires, and health hazards. Traditional methods for detecting gas leaks are often manual or localized, meaning they lack the immediacy and scalability needed in many modern environments. By using gas sensors, wireless communication, and cloud-based monitoring, this IOT based system offers an automated, reliable, and scalable solution for detecting gas leaks.

Lohani, A., & Khatri, P. (2020). Smart gas leakage detection and monitoring system using IoT.

This paper presents the design and implementation of a smart gas leakage detection and monitoring system using Internet of Things (IOT) technology. The system aims to enhance safety by detecting hazardous gas leaks, such as LPG or methane, in residential or industrial environments. It uses sensors to monitor gas levels in real time and triggers immediate alerts via buzzer, SMS, or mobile app notifications when a leak is detected. The IOT based approach allows for remote monitoring, offering users access to gas status through a web or mobile interface. The system is designed to be cost-effective, user-friendly, and scalable, making it suitable for widespread deployment. The authors also discuss the use of micro controllers like Arduino and sensor like MQ series gas sensor, along with cloud services for data logging and notification. Overall, the paper highlights the potential of IOT to create smarter and safer environments by reducing the risk of gas-related accidents through proactive monitoring and instant communication. is becoming most difficult to take the reading of energy meter from each home. As number of houses increases, it may be possible but it takes lot of manpower. The customers are unaware of electricity usage, which results in huge bills. Electricity theft is common in some rural areas which results in both operational and economic loss. To avoid these problems, our Prepaid Energy Meter plays a key role. This proposed project makes consumers happy because they can monitor their usage through the internet. In this proposed model, an automated system by Node MCU and Arduino is implemented. SMS is sent to recharge the
meter. Since IoT is being used, it can monitor the status of the energy through the Internet. The recharge can also be done through the Internet. If there is an insufficient balance, then the power supply connection is simply disconnected from the house. The automated alerts are also sent in the form of messages to the end user's mobile phone according to the balance present in the system. With this proposal labor requirements, electricity theft, and billing errors are reduced.

Methodology

- **System Design:** Design the circuit by integrating the gas sensor with Arduino UNO. Add buzzer, LED”s and exhaust fan to the system.
- **Gas Sensor Calibration:** Calibrate the MQ sensor to detect a threshold gas concentration of 100 ppm. Set threshold values in code.
- **IOT Integration:** Connect the Arduino UNO to a buzzer and exhaust fan. Program it to send data to an IOT platform. Set triggers for alerts via buzzer, exhaust fan and LED .
- **Alert Mechanism:** If gas level exceeds the threshold: Activate buzzer, exhaust fan and LED. Send real-time notify to the user with the help of buzzer and exhaust fan.
- **Testing & Deployment:** Test the system under controlled conditions. Fine-tune sensor sensitivity and alert thresholds. Deploy in kitchen, lab, or industrial area for real-time monitoring.

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