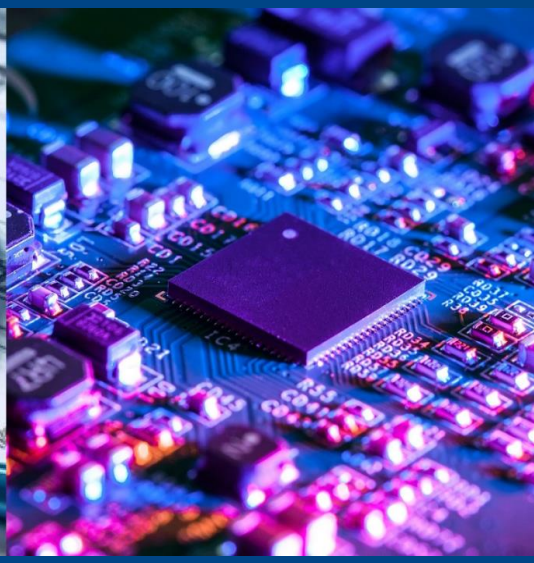
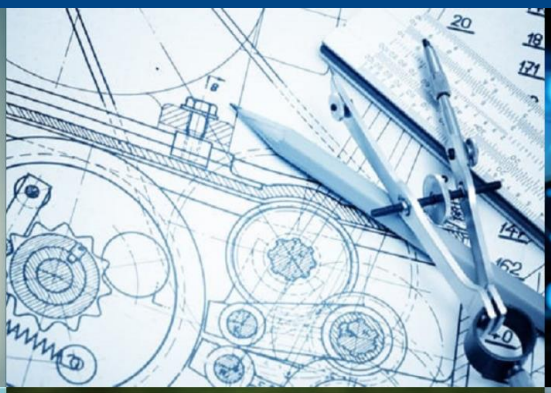
ISSN: 2582-7219

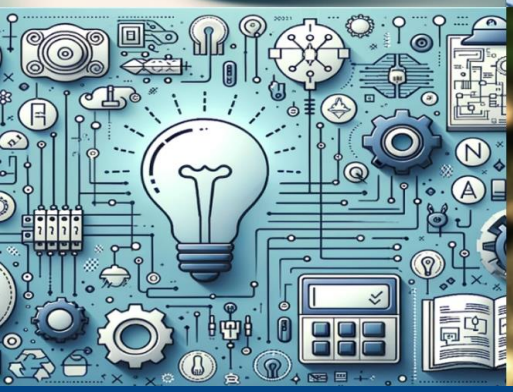




International Journal of Multidisciplinary Research in Science, Engineering and Technology

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)



Impact Factor: 8.206 **Volume 9, Issue 3, March 2026**

© 2026 IJMRSET | Volume 9, Issue 3, March 2026| DOI:10.15680/IJMRSET.2026.0903043

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

IoT - Based AC Gas Leakage Early Prediction System

G. Sivaramkumar [1], Mr. T. Pradeep [2]

Student, Department of Computer Applications, Sri Ramakrishna College \of Arts and Science, Coimbatore, Tamil Nadu, India [1]

Assistant Professor, Department of Computer Applications, Sri Ramakrishna College of Arts & Science, Coimbatore, Tamil Nadu, India [2]

ABSTRACT: Air conditioners are widely used in homes, offices, and industries, but gas leakage is a common problem that can reduce cooling efficiency, increase power consumption, and cause environmental damage. This project presents an AC gas leakage prediction system using an IoT- based simulation model. The system is designed to detect gas leakage at an early stage by continuously monitoring environmental parameters.In this simulation, a gas sensor is used to detect the presence of leaking refrigerant gas. A DHT21 temperature and humidity sensor is used to monitor surrounding temperature variations, which helps in analyzing abnormal changes during leakage conditions. When gas concentration exceeds the predefined safety level, the system activates a buzzer and LED indicator to provide an immediate alert. The measured temperature and gas values are displayed on an LCD display for real-time monitoring.This project focuses on a local simulation-based monitoring system without using any online or cloud platform. The proposed system is simple, cost-effective, and efficient for early detection of AC gas leakage, helping to prevent system damage and ensure safety.

KEYWORDS: AC Gas Leakage, IoT System, Gas Sensor, DHT21 Sensor, Temperature Monitoring, Buzzer Alert, LCD Display, LED Indicator, Simulation Model, Safety System

I. INTRODUCTION

Air conditioners are commonly used in homes, offices, hospitals, and industries to maintain a comfortable temperature. Most air conditioning systems use refrigerant gas for cooling. If there is a gas leakage, it can reduce cooling performance, increase electricity consumption, damage the AC unit, and also affect the environment. In some cases, gas leakage may create health and safety risks.Early detection of AC gas leakage is very important to avoid major damage and costly repairs. Traditional methods of detecting leakage are manual and may not identify the problem at the right time. To overcome this issue, an IoT-based monitoring system can be used to continuously check gas levels and temperature conditions.This project presents a simulation-based AC gas leakage prediction system using sensors such as a gas sensor and DHT21 temperature sensor. The system monitors environmental conditions and provides alerts using a buzzer and LED when leakage is detected. The real- time values are displayed on an LCD screen. This system is designed as a simple, low- cost, and effective safety solution without using any online or cloud platform.

However, gas leakage is one of the most common problems in AC systems. Leakage may occur due to corrosion, improper installation, damaged pipes, or poor maintenance. When refrigerant gas leaks, the cooling efficiency of the AC reduces significantly. This leads to higher electricity consumption, poor performance, and increased operational costs. Continuous leakage can also damage the compressor and other internal components of the air conditioner.Traditional methods of detecting gas leakage involve manual inspection by technicians. These methods are time- consuming and may not identify small leaks at an early stage. To solve this problem, modern monitoring systems using sensors and embedded technology can be implemented. Internet of Things (IoT) based systems allow continuous monitoring of environmental parameters and provide automatic alerts when abnormal conditions are detected.In addition to performance issues, gas leakage can also create environmental and safety concerns. Some refrigerant gases contribute to global warming and ozone layer depletion. In enclosed spaces, gas leakage may also cause breathing discomfort or other health-related problems.

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

II. OBJECTIVE

The main objective of this project is to design and develop a simulation-based AC gas leakage prediction system using IoT technology. The system aims to detect refrigerant gas leakage at an early stage in order to prevent major damage to the air conditioning unit. By continuously monitoring the gas concentration levels, the system helps in identifying abnormal conditions quickly and accurately.Another important objective of this project is to monitor environmental parameters such as temperature and humidity using the DHT21 sensor. Temperature variation can indicate improper functioning of the AC system, especially during gas leakage conditions. By analyzing temperature data along with gas sensor readings, the system improves the reliability and accuracy of leakage prediction.

Another objective is to develop a cost- effective and easy-to-implement solution. The project is designed as a simulation model without using any online or cloud platform, making it simple and suitable for small-scale applications. The system focuses on offline monitoring, reducing complexity while maintaining efficiency.

III. EXISTING SYSTEM

In the existing system, detection of AC gas leakage is mostly done manually. When the air conditioner does not cool properly, technicians inspect the system to identify the problem. They check the gas pressure using specialized tools and equipment. This method requires human involvement and technical knowledge. Small leakages may not be detected at an early stage, which can lead to serious damage over time.In many cases, users come to know about gas leakage only after noticing poor cooling performance or an unusual increase in electricity consumption. By that time, a significant amount of refrigerant gas may have already leaked. This not only reduces the efficiency of the AC unit but also increases maintenance costs. Manual inspection is time-consuming and may not provide continuous monitoring of the system.Some advanced systems use electronic leak detectors, but they are expensive and mainly used by professional service technicians. These devices are not permanently installed inside the AC system for continuous monitoring. They are used only during maintenance or repair work. Therefore, there is no real-time monitoring or automatic alert system in most conventional setups.

In the existing approach, there is also a lack of automatic safety alerts. If gas leakage occurs in a closed environment, users may not immediately recognize the issue. This can lead to safety risks and environmental problems. Refrigerant gases contribute to global warming and ozone depletion when released into the atmosphere.

IV. METHODOLOGY

The methodology of this project is based on designing and implementing a simulation- based AC gas leakage prediction system using IoT components. The system is developed to continuously monitor gas concentration and temperature levels in order to identify leakage conditions at an early stage. The overall working process includes sensing, data processing, displaying results, and providing alerts.

First, the gas sensor is used to detect the presence and concentration of refrigerant gas in the surrounding environment. The sensor continuously monitors the air near the AC unit. When gas leakage occurs, the sensor senses the increased gas concentration and sends the data to the microcontroller. A predefined threshold value is set in the program. If the gas level exceeds this limit, the system identifies it as a leakage

condition.At the same time, the DHT21 temperature and humidity sensor is used to measure environmental temperature and humidity. Temperature variation plays an important role in detecting abnormal AC operation. During gas leakage, cooling efficiency decreases, which may cause temperature changes. By analyzing both gas concentration and temperature data, the system improves detection accuracy.The microcontroller acts as the central processing unit of the system. It receives input from the gas sensor and DHT21 sensor, processes the data, and makes decisions based on programmed conditions. The real-time values of gas concentration and temperature are displayed on an LCD display. This allows users to monitor system conditions easily.When the gas concentration exceeds the set threshold value, the microcontroller activates the buzzer and LED indicator. The buzzer provides an audible alert, while the LED gives a visual indication of leakage. This immediate alert mechanism ensures that users can take necessary action quickly to prevent further damage.The entire system is developed as a simulation model without using any online or cloud platform. All monitoring and alert operations are performed locally within the system. This makes the project

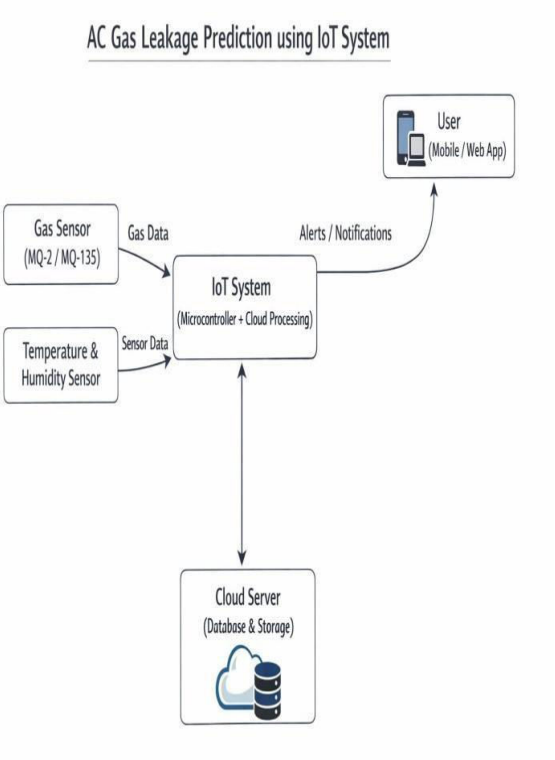
ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

simple, cost-effective, and suitable for offline applications.Overall, the methodology focuses on continuous monitoring, early detection, and instant alert generation using sensor-based technology to enhance AC system safety and performance.

V. RESULT AND DISCUSSION



The developed AC gas leakage prediction system was tested under simulation conditions to evaluate its performance and accuracy. The gas sensor successfully detected variations in gas concentration levels when leakage conditions were simulated. The sensor readings were continuously monitored and displayed on the LCD screen along with temperature and humidity values from the DHT21 sensor.During normal operating conditions, the gas sensor showed values within the safe threshold range, and the buzzer and LED remained inactive. The LCD display clearly showed normal temperature and gas readings. When gas leakage was simulated by increasing the gas concentration value beyond the predefined threshold, the system responded immediately. The microcontroller detected the abnormal condition and activated both the buzzer and LED indicator as an alert mechanism. The DHT21 sensor also recorded slight temperature variations during leakage simulation. These changes helped in understanding the relationship between gas leakage and cooling efficiency. By combining gas sensor data and temperature readings, the system improved reliability in identifying abnormal conditions.The response time of the system was observed to be quick and efficient. The alert was generated immediately after the threshold value was crossed. The LCD display provided clear real-time information, making it easy for users to understand the system status.

VI. CONCLUSION

In this project, a simulation-based AC gas leakage prediction system using IoT technology was successfully designed and implemented. The system effectively monitors gas concentration and temperature using a gas sensor and DHT21 sensor. By continuously analyzing sensor data, the system is able to detect abnormal gas levels at an early stage.

When the gas concentration exceeds the predefined threshold value, the system immediately activates a buzzer and LED indicator to provide both audible and visual alerts. The LCD display shows real-time values, allowing users to

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

easily monitor system conditions. This quick response mechanism helps in preventing major damage to the air conditioning unit and ensures user safety.The project demonstrates that an offline IoT-based monitoring system can be simple, cost-effective, and efficientwithoutusing any online or cloud platform. Early detection of gas leakage reduces maintenance costs, improves energy efficiency, and minimizes environmental impact.Overall, the proposed system provides a reliable solution for AC gas leakage prediction and highlights the importance of sensor-based smart monitoring systems in modern applications. With further improvements and real-time implementation, this system can be widely used in residential and industrial environment.

REFERENCES

1. Bahga, A., & Madisetti, V. (2014).
2. Internet of Things: A Hands-On Approach.
3. Banzi, M. (2011). Getting Started with Arduino.
4. Doggen, J. (2011). Arduino: A Technical Reference.
5. Raj, P. (2017). The Internet of Things: Enabling Technologies, Platforms, and Use Cases.
6. de Silva, C. W. (2007). Sensors and Actuators: Engineering System Instrumentatio

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH

IN SCIENCE, ENGINEERING AND TECHNOLOGY

| Mobile No: +91-6381907438 | Whatsapp: +91-6381907438 | ijmrset@gmail.com |

www.ijmrset.com