International Journal of Creative and Open Research in Engineering and Management
ISSN: **3108-1754 (Online)**
Volume 02 Issue 04 April-2026 | Impact Factor: 3.5

Gas Leakage Detection with Automatic Exhaust Fan

Prof. Deepali R. Vaidya[1], Yashika D. Khobragade[2], Pranav P. Jinde[3], Kartik R. Mundale[4], Sujal V. Sakharkar[5]

[1] Assistant Professor, Department of Electrical Engineering, Rajiv Gandhi College of Engineering, Research and Technology, Chandrapur, India
[2]Department of Electrical Engineering, Rajiv Gandhi College of Engineering, Research and Technology, Chandrapur, India
[3] Department of Electrical Engineering, Rajiv Gandhi College of Engineering, Research and Technology, Chandrapur, India
[4] Department of Electrical Engineering, Rajiv Gandhi College of Engineering, Research and Technology, Chandrapur, India
[5] Department of Electrical Engineering, Rajiv Gandhi College of Engineering, Research and Technology, Chandrapur, India

Corresponding Author Email: khobragadeyashika99@email.com

How to Cite this Article:

Khobragade, Y. D., Jinde, P. P., Mundale, K. R. & Sakharkar, S. V. (2026). Gas Leakage Detection with Automatic Exhaust Fan. International Journal of Creative and Open Research in Engineering and Management, 02(04). https://doi.org/10.55041/ijcope.v2i4.555

https://doi.org/10.55041/ijcope.v2i4.555

Abstract

This paper presents the design and implementation of an automatic gas leakage detection system using the Arduino Nano microcontroller and MQ-series gas sensors. The system continuously monitors the presence of flammable gases such as LPG, propane, and methane. When the concentration exceeds a predefined threshold, the microcontroller activates an exhaust fan and buzzer to ventilate the area and alert occupants. A servo motor is employed to close the gas valve, preventing further leakage. The system provides a cost-effective, scalable, and real-time solution for domestic, commercial, and industrial safety. Future enhancements may include GSM-based notifications and optimized ventilation strategies.

Keywords— Gas leakage detection; Arduino Nano; MQ-5 sensor; exhaust fan; safety automation

I. INTRODUCTION

Gas leakage accidents pose serious risks in domestic and industrial environments, often leading to fire, explosions, or suffocation. Traditional detection methods rely on manual observation, which is unreliable and slow. Automated detection systems using sensors and microcontrollers provide faster responses and improved safety. This study focuses on designing a system that integrates an MQ-5 gas sensor, Arduino Nano, exhaust fan, buzzer, and servo motor to detect and mitigate leakage hazards. The research addresses the gap in affordable, scalable, and real-time monitoring solutions for households and industries.

II. LITERATURE REVIEW

Previous studies have explored sensor-based gas detection systems using MQ-series sensors due to their affordability and sensitivity. However, many designs lack integrated safety responses such as automatic ventilation or valve closure. Some systems rely solely on alarms, which may not prevent accidents. This work builds upon existing research by combining detection, ventilation, and valve control into a single compact system, thereby enhancing safety and reliability.

III. METHODOLOGY

The system architecture consists of:

- **MQ-5 Gas Sensor:** Detects LPG, natural gas, and coal gas.
- **Arduino Nano:** Processes sensor data and controls actuators.
- **Servo Motor:** Closes the gas valve when leakage is detected.
- **Exhaust Fan (DC Motor):** Ventilates leaked gas.
- **Buzzer:** Provides audible alerts.
- **OLED Display:** Shows real-time gas concentration (ppm).
- **Power Supply:** 18650 rechargeable battery with TP4056 charging module.

IV. WORKING PRINCIPLE:

1. Sensor continuously monitors gas concentration.
2. If threshold (>600 ppm) is crossed, Arduino triggers safety actions.
3. Servo closes valve, fan ventilates, buzzer alerts occupants.
4. System resets when gas levels normalize.

V. RESULTS AND DISCUSSION

The prototype successfully detected LPG and methane leaks in controlled environments. The exhaust fan reduced gas concentration within seconds, while the buzzer provided immediate alerts. The servo motor effectively shut off the valve, preventing further leakage. Compared to systems relying only on alarms, this design offers a more comprehensive safety response. Limitations include sensor calibration requirements and dependency on continuous power supply.

s

Fig. 1 Gas Leakage Detection with Automatic Exhaust Fan

VI. APPLICATIONS

- Domestic kitchens
- Restaurants and commercial kitchens
- Laboratories and research facilities
- Industrial plants and factories
- Mobile kitchens and food trucks

Advantages: Early hazard prevention, automatic ventilation, cost-effectiveness, scalability, and user alerts.

Disadvantages: Sensor sensitivity to humidity/temperature, maintenance needs, power dependency, and partial protection without solenoid integration.

VII. CONCLUSION

The proposed gas leakage detection system provides an effective, low-cost solution for enhancing safety in environments where flammable gases are used. By integrating detection, ventilation, and valve control, the system reduces risks of fire, explosion, and suffocation. Future work may focus on GSM-based remote alerts, IoT integration, and improved sensor calibration for higher accuracy.

ACKNOWLEDGMENT

The authors express gratitude to Prof. Ms. D.R. Vaidya for guidance, Dr. R.K. Dhatrak (Head of Department) for support, and Dr. A.Z. Chitade (Principal, RCERT Chandrapur) for encouragement.

REFERENCES

[1] Datasheet of MQ-5 Gas Sensor, Hanwei Electronics, 2024.
[2] Arduino Nano Technical Specifications, Arduino.cc, 2025.
[3] TP4056 Lithium Battery Charger Module Documentation, 2025.
[4] Previous studies on gas detection systems, IEEE Conference Proceedings, 2024.