

# LPG Gas Detection System with Auto Cut-Off Regulator

Prof. M.D. Patil<sup>1</sup>, Munjal Sumit Naganath<sup>2</sup>, Shinde Atharv Maruti<sup>3</sup>, Sayyad Azad Firoj<sup>4</sup>

<sup>1</sup>Assoc Assistant Professor Savitribai Phule Pune University S.B. Patil Collage of Engineering

<sup>2,3,4</sup>Department Of Electrical Engineering Savitribai Phule Pune University

**Abstract-** The LPG Gas Detection System with Auto Cut-Off Regulator using Servo Motor is designed to improve safety by detecting LPG gas leakage and taking automatic preventive action. LPG is widely used in homes, hotels, restaurants, laboratories, and industries because of its efficiency and convenience. However, leakage of LPG gas can lead to dangerous situations such as fire accidents, explosions, suffocation, and property damage. To overcome these problems, the proposed system uses an MQ-6 gas sensor to continuously monitor the surrounding environment for LPG leakage. The sensor sends signals to the Arduino UNO microcontroller whenever the gas concentration exceeds the predefined safety limit. The microcontroller then activates a buzzer and warning indicator to alert nearby users about the leakage condition. This quick alert system helps people take immediate safety precautions and avoid hazardous situations. The system operates automatically with fast response time and minimum human intervention. Therefore, it provides a reliable and effective solution for improving LPG gas safety. In addition to gas detection and warning generation, the proposed system also provides an automatic gas cut-off mechanism using a servo motor. The servo motor is connected to the LPG regulator knob and is controlled by the Arduino UNO microcontroller. When gas leakage is detected, the servo motor automatically rotates the regulator knob in the OFF direction to stop the gas supply and prevent further leakage. The system also uses relay modules to disconnect electrical appliances and activate an exhaust fan to remove leaked gas from the surrounding area, reducing the chances of fire and explosion. The proposed system is cost-effective, compact, and easy to install in domestic as well as industrial environments.

**Keywords:** LPG Gas Detection, MQ-6 Gas Sensor, Arduino UNO, Servo Motor, Auto Cut-Off Regulator. Gas Leakage Detection, Buzzer Alert System, Relay Module, Exhaust Fan Control, Safety System.

## I. INTRODUCTION

Liquefied Petroleum Gas (LPG) is widely used in homes, hotels, industries, and laboratories because it is efficient, economical, and easy to use. LPG mainly consists of propane and butane gases, which are highly flammable in nature. Although LPG provides many advantages, leakage of gas can create serious dangers such as fire accidents, explosions, and health problems. Many accidents occur due to unattended gas leakage, damaged pipelines, or improper handling of gas cylinders and regulators. Therefore, it is very important to develop a reliable system that can quickly detect gas leakage and take immediate preventive action. An automatic LPG gas detection and protection system can help improve safety and reduce risks in daily life.

The LPG Gas Detection System with Auto Cut-Off Regulator using Servo Motor is designed to provide

automatic safety during gas leakage conditions. The system uses an MQ-series gas sensor to continuously monitor the surrounding air for the presence of LPG gas. When the gas level exceeds the predefined safety limit, the sensor sends a signal to the microcontroller for further action. The microcontroller then activates a buzzer and warning indicator to alert nearby people about the leakage. At the same time, a servo motor is used to rotate the gas regulator knob automatically and stop the gas supply. This automatic cut-off mechanism helps prevent further leakage and reduces the possibility of accidents.

## OBJECTIVE

1. To detect LPG gas leakage using an MQ-series gas sensor.
2. To provide an automatic safety system for preventing gas leakage accidents.

3. To alert users through a buzzer and warning indicator during gas leakage.
4. To automatically cut off the gas supply using a servo motor-operated regulator.
5. To reduce the risk of fire, explosion, and health hazards caused by LPG leakage.
6. To design a low-cost, reliable, and easy-to-use gas safety system.
7. 7. To minimize human intervention during emergency situations.
8. To improve safety in homes, hotels, laboratories, and industrial areas using LPG cylinders.

## II. LITERATURE SURVEY

Various research works and safety systems have been developed to detect LPG gas leakage and prevent accidents in domestic and industrial environments. Many researchers have used MQ-series gas sensors because of their high sensitivity, low cost, and easy interfacing with microcontrollers. These sensors are capable of detecting LPG leakage at an early stage and providing warning signals to users. Earlier systems mainly focused on gas detection and alarm generation using buzzers and LEDs, but they required manual action to stop the gas supply. Due to this limitation, advanced systems with automatic cut-off mechanisms were introduced to improve safety and reduce human intervention.. Several studies proposed the use of microcontrollers such as Arduino, PIC, and Node MCU for controlling the gas detection process and activating emergency actions. Researchers have also integrated GSM modules and IoT technology to send alert messages to users during leakage conditions.

## III. METHODOLOGY

The methodology of the LPG Gas Detection System with Auto Cut-Off Regulator using Servo Motor begins with continuous monitoring of the surrounding environment using an MQ-series gas sensor. The sensor detects the presence and concentration of LPG gas in the air and sends the detected signal to the microcontroller. The microcontroller continuously compares the gas level with a predefined safety threshold value. Under normal conditions, the system remains in monitoring

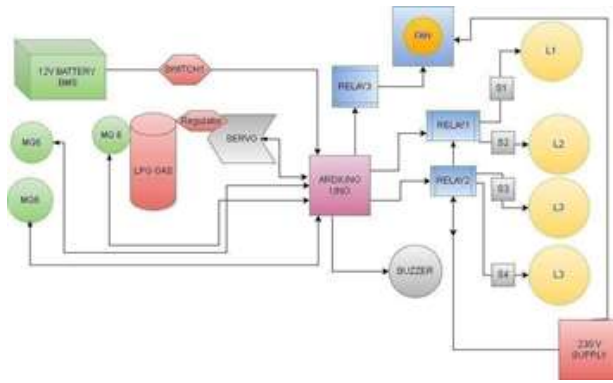
mode without activating any alert or control mechanism.

When the gas concentration exceeds the safe limit, the microcontroller identifies it as a leakage condition and immediately activates a buzzer and warning indicator to alert users. Simultaneously, the microcontroller sends a control signal to the servo motor connected to the LPG regulator knob. The servo motor rotates the regulator in the OFF direction to automatically stop the gas supply and prevent further leakage. After the gas level returns to a safe condition, the system can be reset manually or automatically for normal operation. This methodology provides quick detection, automatic protection, and improved safety against LPG gas leakage accidents.

The methodology also includes the use of relay modules for controlling additional safety devices during gas leakage conditions. When leakage is detected, the Arduino UNO activates the relays to disconnect electrical appliances and power supply lines to prevent spark generation. At the same time, the exhaust fan is automatically switched ON to remove leaked gas from the surrounding environment. This additional safety mechanism helps reduce the chances of fire accidents and explosions caused by LPG gas accumulation.

The entire system is designed to work automatically with continuous real-time monitoring and quick response. The combination of gas sensors, microcontroller, servo motor, relays, and alert systems improves the overall efficiency and reliability of the project. The methodology ensures minimal human intervention during emergencies and provides better protection for homes, hotels, laboratories, and industries. Thus, the proposed methodology offers a smart, cost-effective, and efficient approach for LPG gas leakage detection and safety control.

## BLOCK DAIGRAM



#### IV. RESULT AND DISCUSSION

The result of the LPG Gas Detection System with Auto Cut-Off Regulator using Servo Motor shows that the system successfully detects LPG gas leakage using the MQ-6 gas sensor. During testing, the sensor continuously monitored the surrounding environment and accurately detected the presence of LPG gas when the concentration exceeded the predefined safety limit. Once leakage was detected, the Arduino UNO microcontroller immediately activated the buzzer and warning LED to alert users about the dangerous condition. The system responded quickly and provided reliable leakage detection performance.

The servo motor connected to the LPG regulator successfully rotated the regulator knob in the OFF direction and stopped the gas supply automatically during leakage conditions. The relay modules also operated properly by disconnecting electrical appliances and activating the exhaust fan to remove leaked gas from the surrounding area. These actions helped reduce the risk of fire accidents, explosions, and spark generation. The integration of multiple safety features improved the overall efficiency and effectiveness of the system during emergency situations.

The discussion of the project shows that the proposed system is cost-effective, reliable, and suitable for both domestic and industrial applications. The system minimizes human intervention and provides automatic protection against LPG-related hazards. Although the system depends on continuous power supply and requires periodic sensor maintenance, its performance is

highly effective for real-time gas monitoring and accident prevention. Thus, the developed system provides a smart and efficient solution for enhancing LPG gas safety and protecting human life and property.

#### ADVANTAGES

1. Early Gas Detection: Detects LPG leakage quickly using the MQ-6 sensor.
2. Automatic Gas Cut-Off: Automatically stops the LPG gas supply during leakage to prevent accidents.
3. Improved Safety: Helps prevent fire accidents and explosions.
4. Instant Alert System: Buzzer and LED provide immediate warning alerts.
5. Low Cost and Reliable: Easy to install and suitable for homes and industries.

#### DISADVANTAGES

1. Power Dependency: The system requires continuous power supply for proper operation.
2. Sensor Maintenance: MQ-6 sensor needs regular cleaning and calibration for accurate detection.
3. False Alarms: Smoke or other gases may sometimes trigger incorrect alerts.
4. Servo Motor Limitation: Servo motor may not work properly if the regulator is too tight.
5. Limited Gas Detection: The system is mainly designed for LPG gas detection only.

#### APPLICATION

1. Domestic Kitchens: Used in homes to detect LPG leakage and improve kitchen safety.
2. Hotels and Restaurants: Helps prevent gas-related accidents in commercial cooking areas.
3. Industrial Applications: Used in industries where LPG cylinders and gas pipelines are commonly used.
4. Laboratories: Provides safety in laboratories using LPG gas for experiments and testing.
5. Gas Storage Areas: Used in LPG storage and distribution centers for continuous gas leakage monitoring.

## V. CONCLUSION

The LPG Gas Detection System with Auto Cut-Off Regulator using Servo Motor is an effective and reliable safety system for detecting LPG gas leakage. The MQ-6 gas sensor continuously monitors the surrounding environment and detects leakage at an early stage. When gas leakage is detected, the system immediately activates a buzzer and warning indicator to alert users. At the same time, the servo motor automatically turns OFF the gas regulator to stop further gas leakage. The relay modules also help in disconnecting electrical appliances and activating the exhaust fan for additional safety. The system reduces the risk of fire accidents, explosions, and health hazards caused by LPG leakage. It operates automatically with quick response time and minimum human intervention. The proposed system is cost-effective, compact, and easy to install in homes, hotels, laboratories, and industries. Although regular maintenance and power supply are required, the system provides efficient and reliable performance. Thus, the project offers a smart and practical solution for improving LPG gas safety and protecting human life and property.

## REFERENCES

1. J. Patel, R. Sharma, and P. Deshmukh, "Automatic LPG Gas Leakage Detection and Alert System using Arduino," 2018.
2. S. Mehta and T. Verma, "IoT Based Gas Leakage Detection and Prevention System," 2019.
3. K. Kumar and A. Reddy, "Microcontroller- Based Gas Leakage Detection with Automatic Shut Off Mechanism," 2020.
4. M. Khan and D. Shaikh, "Smart Gas Safety System using Arduino and Wireless Alerts," 2021.
5. R. Ghosh and N. Roy, "Design and Implementation of an LPG Leakage Monitoring and Control System," 2022.
6. M. R. Pawar and S. N. Mali, "LPG Leakage Detection System with Automatic Gas Regulator Cut-Off," 2016.
7. K. A. Patil and P. R. Sonawane, "IoT-Based LPG Gas Detection System with Automatic Power Supply Cut-Off," 2018.
8. Singh and R. Kumar, "Gas Leakage Detection and Smart Alert System using GSM," 2020.
9. P. Joshi and V. Kulkarni, "Arduino Based LPG Monitoring and Safety System," 2019.