



# The Smart Gas Leakage Detection with Monitoring and Automatic Safety system

Ms. Shinde Sayali P.<sup>1</sup>, Ms. Dhanashri Jadhav R.<sup>2</sup>, Ms. Amruta Sutar R.<sup>3</sup>

Assistant Professor, Department of Computer Science and Engineering, Dr. Daulatrao Aher College of Engineering, Karad. Shivaji University, Kolhapur-Maharashtra India <sup>1</sup>

Students of Computer science and Engineering Department, Dr. Daulatrao Aher College of Engineering, Karad. Shivaji University, Kolhapur-Maharashtra India <sup>2,3</sup>

**Abstract** – In this paper, we have proposed a Smart Gas Leakage Detection with Monitoring and automatic safety system. Nowadays, people are facing huge side effects due to gas leaks. As a solution, we have developed a gas leakage detection system. This system can help people to avoid the risk of gas leakage. With the increasing demand and consumption of LPG has made it necessary for you to monitor the level of LPG cylinders. So, you can get a little idea about when the gas cylinder will be empty and you can order another gas cylinder before the gas runs out. In today's fast paced world people need to work smart. So, it is now possible to use IOT (Internet of Things), that's why we have used mobile application to turn gas ON/OFF. Through this application we will get notification on our mobile when leak occurs and you will also get an alert through alarm system.

**Keywords** – LPG sensor, Arduino board, sound sensor, LCD display, Buzzer, Solenoid valve, servo motor, load cells

## 1. INTRODUCTION

Gas leakage has become a serious problem and now days it is used in many places like residences, industries and vehicles like Compressed Natural Gas (CNG), buses, cars, etc. It is noticed that due to gas leakage dangerous accidents occurs. The Liquefied Petroleum Gas is an extension of LPG. The LPG is a flammable mixture of hydrocarbon gases. It is a mixture of 48% propane, 50% butane and 2% pentane. Which makes the LPG gas cylinder more dangerous and extremely inflammable gas. With the increasing demand of LPG gas users, most of the time user have to face many dangerous accidents occurs by gas leakage due to inappropriate and unavailable of timely action. In gas leak situations an efficient method to establish a safety system as well as monitor the level of LPG in the cylinder is required, so that the users are aware of the LPG level within the cylinder. The objective of the proposed system is to continuously measure the weight of the cylinder and as soon as it reaches the minimum threshold it will automatically sends notification on android application.

The main aim of this proposed system is to monitor for Liquid Petroleum Gas (LPG) leakage to avoid major fire accidents. The system detects the leakage of the LPG using gas sensor and give notification to the user on android application. and another feature is to ON/OFF gas from android application. The system measures the weight of cylinder by using weight sensor and display it on android application. The proposed system uses Wi Fi module to alert the user about gas leakage via sending notification on android application. A proposed system is an effective combination of features which are LPG leakage detection system, Gas regulation and monitoring, Android based safety system. The proposed system is used to detect gas leakage and also send notification to android application. An android application will help to on/Off the gas from anywhere in home and surrounding. This system also useful to regulate the gas flow.

## 2. LITERATURE REVIEW

[1]. S. M. Zinnuraain et al. The proposed smart gas leakage detection with automatic safety system. With the extremely increased demand and use of LPG, this system would be helpful to monitor the usage of LPG on regular basis and to take safety about any hazards that may occur due to LPG leakage. This system was designed a system that notify the user using IoT through mobile app about the amount of LPG so that appropriate measures can be taken.

[2] Mohd Abid et al. The proposed design system explains about the most common problem experienced in our day- to-day lives that is regarding GAS container going empty. The purpose of the system is, to create awareness about the reducing weight of the gas in the container, and to place a gas order using IOT. A load cell is used for the continuous

weight measurement of gas container, which is interfaced with an Arduino Uno (to compare with an ideal value). GSM modem is used to send the SMS to user.

[3] Suma V et al. The purpose of this paper is to automatically book the new system cylinder while the gas is running out. Sending a notification to a gas agency using WiFi using the Internet of Things approach. In addition, these sensors are used to detect gas leaks at home.

[4] Hitendra Rawat et al The project is to develop home security against intruders, gas leaks and fires. It is not provided to you unless one of the above three cases send you an SMS in an emergency rather than meeting a person while you are out of your home.

[5] Mohammad Monirujjaman Khan The aim of this paper is to propose and discuss a design of a gas leakage detection system that can automatically detect, alert and control gas leakage. This proposed system also includes a warning system for users. The is based on a sensor that easily detects a gas leakage.

[6] Ayesha Siddika et al. The system is based on a microcontroller, which uses gas sensors as well as GSM, displays and buzzer. Designed for alert systems using Ardino Mega with LCG gas leak monitoring and MC135 sensor.

[7] M. Abdul Hannan et al. This project focuses on issues such as for the working householder that are very busy at their workplace, which will minimise their time at home, and for people who have a low sense of smell especially old folks. The objective of this project is to develop a cost-effective system based on Arduino microcontroller, which can detect domestic LPG leakage with some awareness action.

[8] Dr. Chetana Tukkoji et al. The project focuses on working households who are very busy in their workplace, which will reduce their time at home and especially those who will smell less. The project aims to develop an effective-based system based on the Arduino microcontroller, which can detect domestic LPG leaks through some awareness action.

[9] M Athish Subramanian et al. The main idea of this paper is to review the material on IoT based gas detection system and to ensure the safety of people and the environment.

### 3. SMART GAS DETECTION WITH MONITORING AND AUTOMATIC SAFETY SYSTEM

The proposed smart gas leakage detection with automatic safety system comprises of two sensors, Solenoid valve, Arduino board, PCB, LCD display, Load cell and Mobile app.

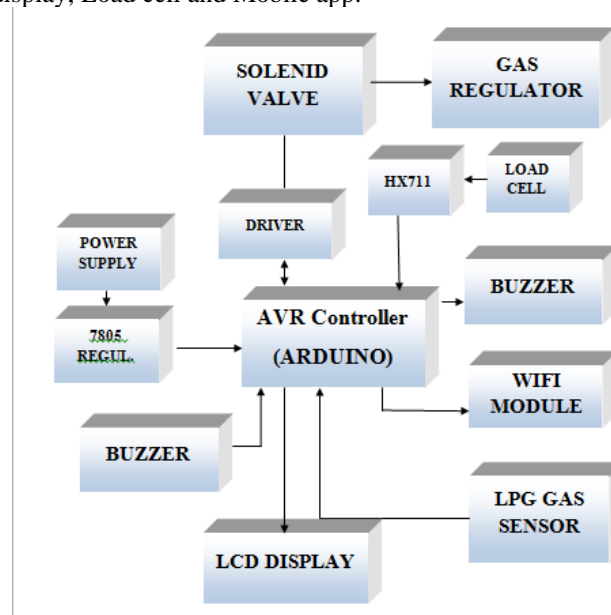


Fig 1. Block diagram of proposed system

#### 1. LPG sensor:

- Liquefied Petroleum Gas (LPG) sensor is easy to use. This sensor is able to sense LPG mixtures in the air.

- The LPG Gas sensor can detect Gas concentrations anywhere from 200 to 10000 ppm in the environment.
- Applications of this sensor are Gas leak detection system, fire/safety detection system.

**2 Sound Sensor:**

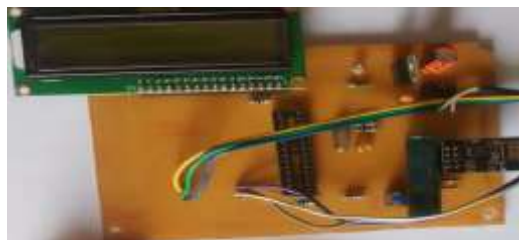
- The sound sensor is one type of module is used to notice the sound.
- Generally, this module is used to detect the intensity of sound
- Applications of this module mainly include switch, security as well as monitoring

**3 Solenoid Valve:**

- Solenoid valves are electromechanically operated valves.
- Solenoid valves are regularly used to control the flow of elements in fluidics.
- The main goal of solenoid valve is to shut off, release, dose, distribute or mix fluids.
- Solenoid valve offer fast and safe switching, high reliability, long service life, low control power and compact design.

**4 Arduino Board:**

- To program the microcontroller on this board you need to install a software on your computer, called the Arduino IDE
- Arduino boards are able to read inputs like light on sensor, a finger on button and turn it into an output like activating a motor, turning on LED, etc.
- In our project, we used registers, capacitors, diodes, transistors to build arduino board.
- All Arduino boards are completely open-source empowering users to build them independently and eventually adapt them to their particular needs.

**5 PCB:**

- Printed circuit Board is used to mechanically support and electrically connect electronic components using conductive pathways, tracks or signal traces etched from copper sheet laminated on to non-conductive substrate.



## 6 LCD Display:

- A Liquid Crystal Display (LCD) is a flat panel display or other electronically modulated optical device that uses light modulating properties of liquid crystals combine with polarizers.
- LCD shows the notifications of leakage of gas, weight of LPG and ON/OFF the gas.



## 7 Load cell:

- A load cell is a force transducer. It converts a force such as tension, compression, pressure, or torque into an electrical signal that can be measured and standardized.
- As the force applied to the load cell increases, the electrical signal changes proportionally.



## 4. SYSTEM MODULES

Proposed work suggests that to ensure LPG leakage detection. Our project has four modules which are LPG leakage detection, LPG weight monitoring.

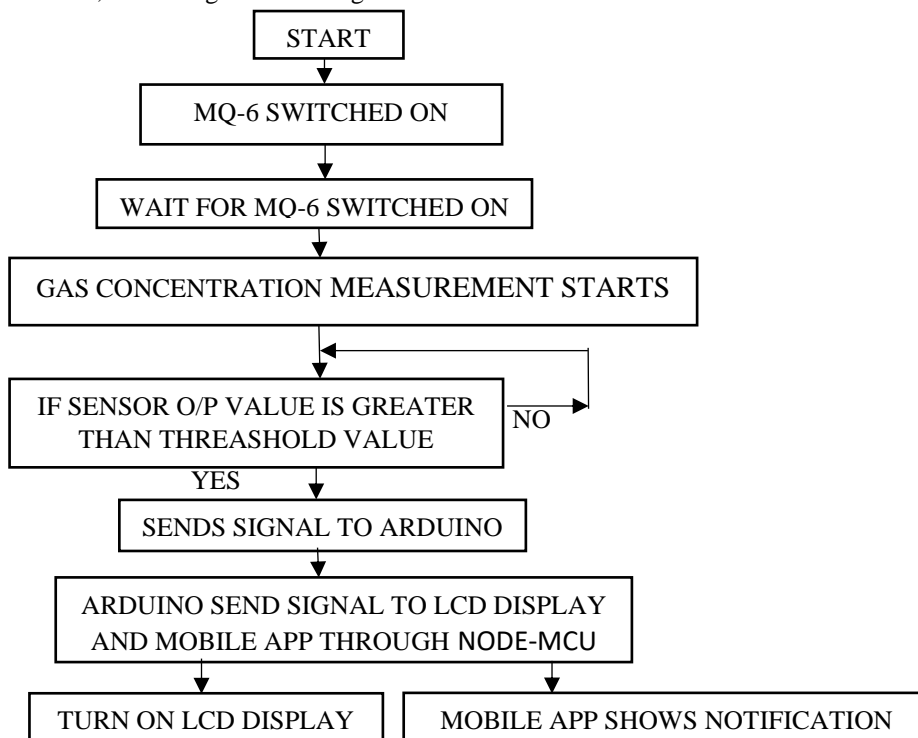


Fig. 2 Flowchart of LPG leakage detection.

### 1. LPG Leakage Detection

A representation of the gas leak detection function in the proposed system is shown in the flowchart diagram 2. For the purpose of detecting gas leaks, the gas sensor used in this system is MQ-6. The outer membrane of this sensor is composed of SnO<sub>2</sub> (Tin Dioxide). It is an electro-chemical sensor so it reacts with propane and the butane gas and the product of chemical value are converted to the corresponding electrical voltage. This electrical voltage is then sent to Arduino and after amplification, a notification is sent to the 16\*2 LCD display and displayed on the mobile app.

### 2. LPG Weight Monitoring System

A representation of the function of the LPG monitoring system in the proposed system is shown in the flowchart diagram. 3

To monitor LPG, strain gauge load cell CZL-601 is used. This load cell generates the output according to the change in resistance in the load cell, which is instead amplified by the instrumentation amplifier and then sent to Arduino. Arduino processes the information and converts the corresponding output ASCII code which is displayed on the LCD screen as well as in the mobile app.

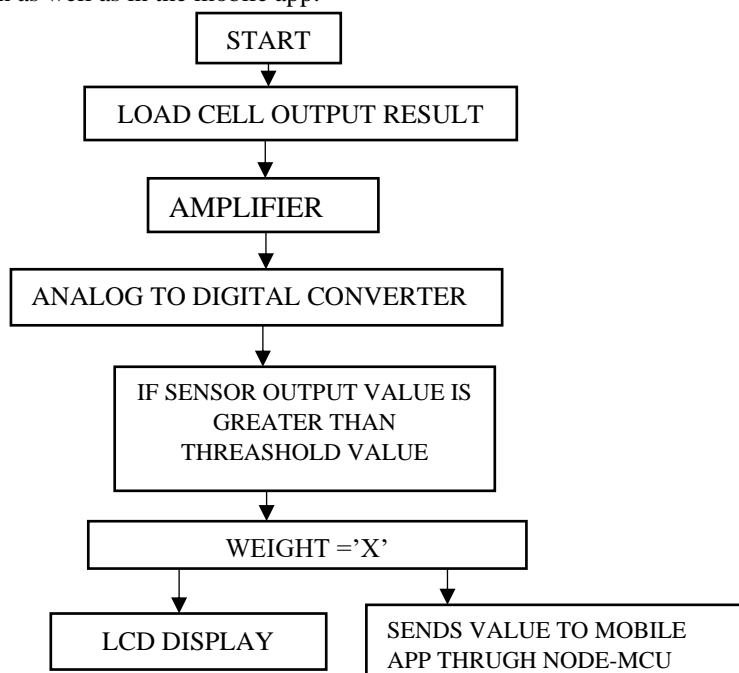


Fig. 3 LPG monitoring system

### 3. LPG Safety System

The functionality of the LPG safety process in the proposed system is represented in the flowchart diagram. 4 A protection valve is used between the LPG supply line to prevent the leaking gas from spreading around. In this proposed system solenoid valves are used to prevent the spread of gas. It is an electromechanically driven valve; The actuator is connected by a valve as an electric current. It is controlled by a mobile app. When the shutdown button is pressed from the app, it turns on through the actuator, creating a magnetic field that excites the actuator and close the valve. Thus, it provides protection from the spreading air.

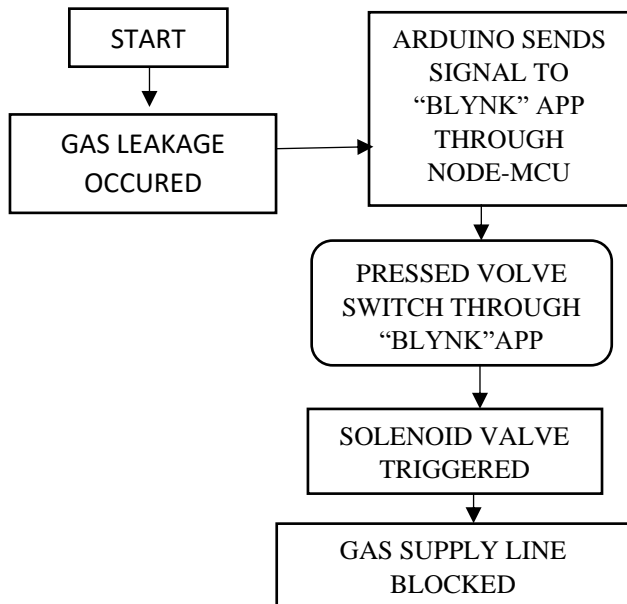


Fig 4 LPG safety system.



Fig 5 Experimental setup

## 5. RESULT ANALYSIS

A model of the proposed system was implemented to prevent accidents due to gas leakage as well as to monitor the gas level of LPG cylinders. Sample and demonstration of the proposed system are shown in fig. 5.

The prototype system in Fig. 5 shows an LPG leak detection when a small amount of LPG is brought near the MQ-2 gas sensor, it reacts with its wisdom range and sends an output signal to Arduino and Arduino sends the signal to the LCD display on the mobile app. It also shows the carbon-monoxide and smoke levels detected by the gas sensor. In the fig. 6, the system prototype monitors the gas level of the LPG cylinder and displays the weight of the cylinder on the LCD display as well as on the “BLYNK” mobile app.

No	Distance	Gas level detected	Percentage of gas detected
1	1-1.5m	200- 457ppm	2-4%
2	0.5-1m	237-1027ppm	2-10%
3	0-0.5m	459-7102ppm2	4-70%

Table 1. Result analysis of LPG Leakage.





Fig 6 LCD display used in system



Fig 7. Connection setup

## SNAPSHOT-



On the LCD screen “W = 0.00 kg” shows the amount of LPG remaining in the cylinder which is the SI unit. In this demonstration a water bottle is used instead of a gas cylinder as it is a microscopic device. Load cell under the bottle which cannot weigh more than 10 kg. It has been successfully calibrated so that it shows the actual weight of the bottle. It also confirms the amount of LPG remaining in the cylinder and also shows that, if any leakage occurs, the solenoid valve will close which can be operated from the mobile app.

In previous documents in this regard, they have recently developed a system that can be operated by GSM and it can only measure how much LPG is left on the booking system the cylinder, but our system can not only measure but also take the initiative for the accident moment. Can take security.

## 6. ACKNOWLEDGMENT

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## 7. CONCLUSION

The proposed Smart Gas Leakage Detection with Monitoring and Automatic Safety System is mainly aimed for household purpose, where the user can be notified of the amount of LPG remaining in the cylinder so that necessary steps or actions can be taken to pre-book a new cylinder. Also, the proposed system notifies the user about any LPG Leakage to take preventive action to avoid an explosion by sending data with the help of Wi Fi communication system or Wi Fi module and with automatic safety system. The proposed system can also be used in hotels, hospitals in case of LPG leakage.

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## BIOGRAPHIES



**Prof Sayali Shinde** is working as assistant Professor at **AGTIS Dr Daulatrao Aher College of Engineering Karad** with 5 years of experience teaching undergraduate engineering students Her area of interest are big data and data analytics, information security, data mining Ms. Sayali P. Shinde



**Ms. Dhanashri R. Jadhav**, Student, CSE Department, At AGTI's DACOE



**Ms. Amruta R. Sutar**, Student, CSE Department, At AGTI's DACOE