

# Gas Leakage Detection and Automatic Gas Refill

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**Abstract-** Liquid petroleum gas, generally known as LPG, is a common cooking fuel in India. Since these LPG cylinders are used daily, they gradually deplete. When the LPG cylinder is finished, the customer must order a new one from the seller, which could take one or two days to complete. Users have no way to check the level of the LPG cylinders they use every day, and when they suddenly run out, it hurts and makes them angry because it takes so long to get fresh LPG cylinders delivered. The gas supply can be turned ON or OFF using the regulator on the LPG cylinder. Since LPG is a very flammable gas, fire incidents are quite likely to occur. Gas leaks have the potential to start unforeseen fires that seriously harm either persons or property, or even both. The level of LPG within the cylinder is measured by an Internet of Things (IoT)-based Monitoring and Management system, and when the level drops below a predetermined weight, an automatic refilling process is started. Precautionary measures are taken in the event of a gas leak, including turning off the regulator of the cylinder automatically when LPG leakage is detected, sending a message of alert to the user via telegram, turning off the power supply for the nearby appliances, opening the sliding windows, turning on the exhaust, activating a buzzer, and displaying the message on the LCD. Additionally, a sprinkler system will be turned on if there is a fire.

## I. Introduction

The proposed system deals with the automatic booking of the new LPG cylinder as well as the detection of gas leaks, gas levels, and cylinder levels. High sensitivity and quick response times are features of the sensor utilized in this. When a gas is detected, the output of the sensor is communicated to the Arduino Uno microcontroller, which then turns on the security measures. When the load sensor detects a critically low weight, a warning is also given to the user, who then books a new LPG cylinder. The primary purpose of this suggested approach is to address drawbacks such as consumer delays and LPG cylinder pre-ordering, as well as to prevent accidents brought on by LPG cylinder leaking.

## II. Literature Review

Arpitha .T, et al. - [1] has proposed an FPGA – GSM based gas leakage detector with a warning call initiating feature to the first response team is presented. When the breach is discovered, the FPGA starts a warning call using a GSM module. The gas leakage detector prototype has been created and put through successful testing using LPG. In less than a minute, the detector can dial the saved cellphone number to issue a warning call. The suggested leakage detection with call initiation warning system can be expanded to send calls/SMS to many persons and can also be directly connected to the fire station. The cleansing of the sensor data by averaging the gathered data in FPGA may be

part of future development. Additionally, a variety of sensing devices can be connected for a variety of applications, and an FPGA can handle signal processing.

K. Keshamoni, et al. - [2] has proposed system reduces the customer's burden. Nowadays, filling the cylinder is a major issue in our homes. Most of the time, individual's reserve the cylinder without understanding how much gas is still inside. This system will keep track of the amount of gas in the cylinder, and when it falls below the 2 kilograms threshold, it sends an SMS to the user's registered cellphone number. The most crucial and fundamental feature of this system will be to avoid accidents and save lives, which helps to raise safety standards. Any person who utilizes gas in their home will use this program. It offers gas leakage detection from gas cylinders, which is essential for senior people who live alone at home and need to feel secure.

G. Kaveeya, et al. - [3] has proposed the Unified system for LPG in automated way is used in the field of domestic appliances in smarter way. Refilling the cylinder is a major issue in many homes today. The majority of the time, people reserve the cylinder without understanding the precise amount of gas still inside. This system will keep track of the amount of gas in the cylinder and send an SMS to the user on the registered mobile number when the gas level falls below the 2kg threshold. The primary and most crucial function of this system is to avoid accidents and save lives while also assisting in the improvement of safety standards. Anyone who uses gas for home heating will use this application. For the safety of senior people who live alone at home, it offers gas leakage detection from gas cylinders, which will be particularly helpful.

Prof G. Shingan, et al. - [4] has proposed an effective & affirmative way of monitoring the gas quantity in the container, and to intimate as well as to place a refill order in the respective branch office (gas agency), via an message by means of internet through IoT module.

When a gas container is placed on the load cell, it measures the weight and transmits an electric pulse to the microcontroller, which compares the pulse with an ideal value in the form of digital data. This is how the continuous measurement is carried out (the electric pulse is converted in to equivalent digital value). If the compared output is high, it sends a pulse (high) to the IoT, updating it to the internet but not placing an order; however, if the compared output is low, it sends a pulse (low) to the IoT, updating it to the internet and even placing an order for gas refills; additionally, for user convenience, there is even a radio frequency (100 metres) module with its Text encoder kit to the main board and its Rx decoder for a sub

A. Macker, et al.-[5] has proposed a system to gauge the gas display in the cylinder when weight of the barrel is beneath the settled load, this should be possible utilizing the weight sensors. The gas retailer receives the request for a replacement cylinder, the home owner (customer) is informed of the situation, and a secondary goal is to report any malfunctions in the gas adjusting system to prevent LPG damage or explosion. As a result, the framework established will help the LPG Gas Consumers lead happy lives.

This monitoring system can also be improved by using Bluetooth instead of GSM to transmit client alarm signals, supporting another running application. A portable robot that can identify between different gas focuses can be built for industrial usage. The expansion of the load cell can also be used as a weight sensor that measures the amount of gas in the barrel and furthermore detects high weight gas in the chamber pipe, sending alert signals through SMS and LCD displays.

Ravi. H, et al.-[6] has discussed the different methods used for identifying the leakages and drawbacks of the proposed system that provide precautions in the form of alert signals or indications whenever there is a leakage. Also, they have proposed a method that can automatically close the valve of the gas

regulator using a mechanical automated valve closing adopter.

M. Santiputri, et al. - [7] has proposed that the Gas Leak Detection device can provide information about dangerous conditions such as gas leaks and the presence of fire so that it can be quickly detected by homeowners. The NodeMCU-based gadget is constructed, and a Firebase connector is used to link it to an Android-based smartphone. The gas leak detecting gadget has the ability to notify consumers via texts, alarms, or Android bars. It is good to display notifications on Android-based smart phones so that users or homeowners can learn about gas leaks right away.

Suma V, et al. - [8] in this paper has thus put forth a new proposed system which is microcontroller based application of gas booking and gas detection systems using IOT. The sensor employed in this model can sense and detect gas leaks. The user also receives notifications about the amount of gas left in the cylinder and is given the option to pre-order a new cylinder without any difficulty. For added benefits, this gadget can be readily connected into an alert system or a visual indicator of the LPG awareness. This suggested system may be helpful in the hospitality and retail industries, among others. The major goal of this effort is to make gas booking and gas leak detection safe and simple in order to prevent disasters that can happen as a result of carelessness.

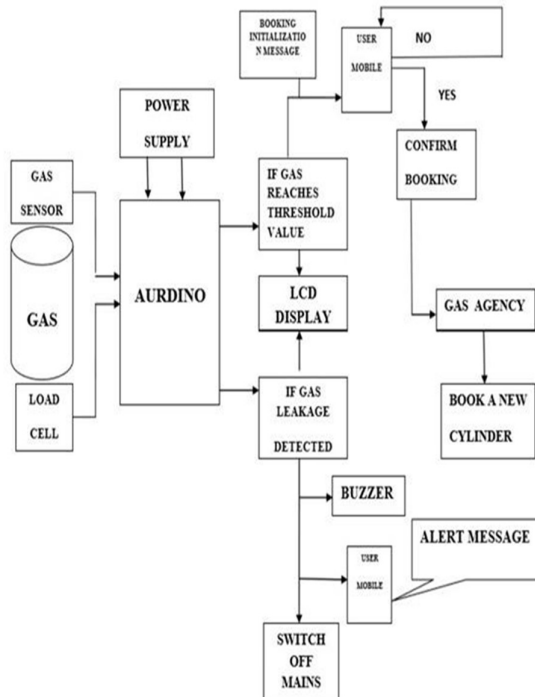
S. Shrestha, et al. - [9] has proposed system, Gas Sensor (MQ2 Sensor), Load Cell and Fire Sensor is interfaced to the microcontroller ATMEGA328. These sensors act as input to the system. The system receives input from these sensors. The GSM module can connect to the Internet using a mobile data network when it is interfaced. Gas leaks are found with gas sensors. The user is alerted as soon as a gas leak is found so that he or she can close the gas valve. A load cell continuously measures the weight of the gas in the cylinder, and when it falls below a predetermined threshold, a notification is sent to the booking agency and the home owner to reserve a gas cylinder. Fire is detected by a fire sensor, and when a fire is found, a buzzer begins to beep to notify the user of the emergency in their home. All of these sensors' responses can be seen on the LCD

display. The APR33A3 voice module is connected to the GSM Module and used to record alert voice messages. When a user answers the call, the recorded voice is played. AT instructions are used by the GSM Module to send SMS and phone calls.

R K Kodali, et al. - [10] has proposed system is designed and successfully implemented. The load cell senses the cylinder's weight and transmits that information to NodeMcu, which uses its Wi-Fi ESP8266 to transfer the data to the cloud at Ubiquiti. When the weight is less than the shown value, an indicator becomes red, and an email is sent to the agency for gas reservations. The gas concentration is continually measured by the MQ2 sensor. The concentration of LPG gas increases when there is a leak, and this is seen on ubidots. An alarm message is provided to the user and the indicator turns red if the concentration rises above 400 ppm. It is possible to enhance this system to automatically shut off the gas valve. This method can be used with a robot to detect gas leaks. In order to detect both the pressure in the cylinder pipe and the amount of gas in the cylinder, a pressure sensor can alternatively be used in place of a load cell.

### III. Proposed System

The proposed model's fundamental structure and operation are shown in figure 1 below. The suggested model's primary function is the detection of gas leaks. If there is a gas leak in an LPG cylinder, it will be found by an Arduino board-interfaced sensor. We send an SMS to the user when a gas leak is discovered to let them know. In response, a buzzer will activate to create a warning and an LCD will display a leakage message. A relay linked to it will turn off the mains, cutting off power to the house to prevent any fire hazards.

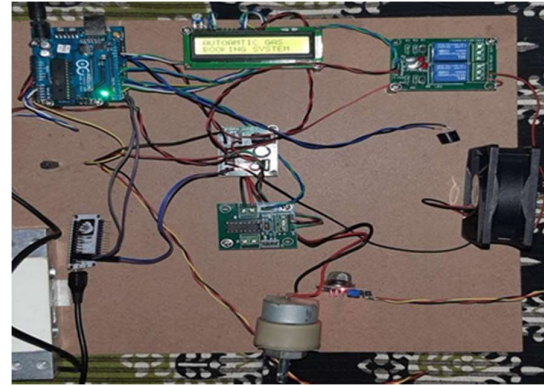


**Figure 1. System Architecture of proposed model**

Making an automatic reservation for a cylinder refill is another feature of the model. In the automatic gas refill booking system, we use a load cell sensor to continuously check the amount of gas in the LPG cylinder. The user will receive a notification via SMS that the gas level has reached the minimum level and requests confirmation for scheduling an LPG cylinder refill when the gas level falls below the preset level or threshold level. An SMS to the gas agency to schedule a refill will be automatically issued once the user confirms the booking. The confirmation SMS will be issued the following day if the user rejects the replenishment. The cycle repeats until the refill booking have been registered in the gas agency.

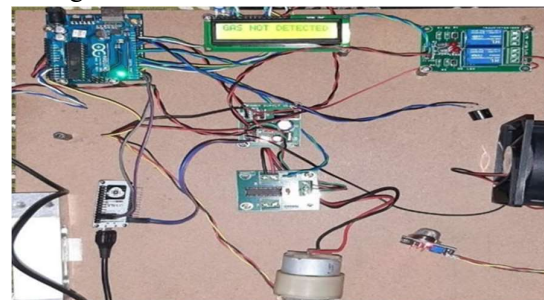
#### IV. Results

The below figure 2 is obtained as soon as the model is turned on.



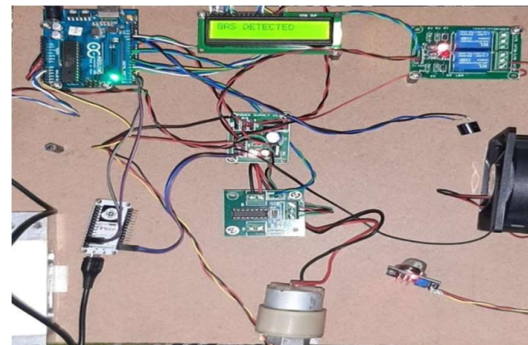
**Figure 2. Starting Message**

The below figure 3 shows there is no gas leakage



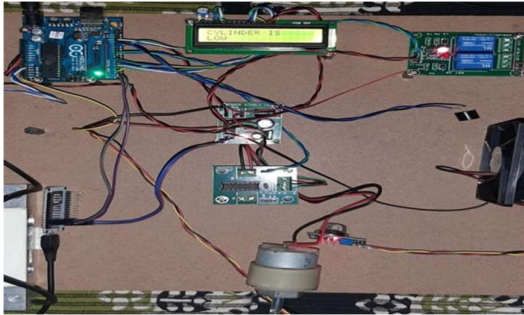
**Figure 3: Gas Leakage Not Detected**

The below figure 4 shows there is some gas leakage.



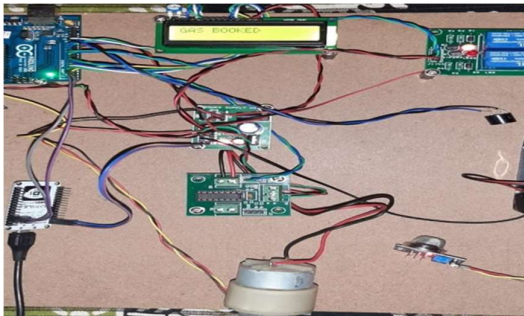
**Figure 4. Gas Leakage Detection**

The below figure 5 shows the level of LPG in the cylinder.



**Figure 5. LPG level**

The below figure 6 shows that a refill has been booked



**Figure 6. Gas Booked**

## V. Conclusion

The proposal put forth in this paper is for users of residential gas cylinders to be able to see how much gas is left in their cylinders and to make ordering a new cylinder simple. Additionally, the system gives gas cylinders to LPG suppliers so they can maintain an appropriate stock of cylinders. Additionally, the suggested system sends warnings to the user whenever there is a significant amount of gas leaking surrounding the system in an effort to prevent accidents. The system can also be integrated with businesses, lodging establishments, and other establishments so that it can be used for safety and monitoring needs. Consequently, gas leakage monitoring can be done using the affordable system. As a result, the inexpensive device may be used to monitor gas leaks and is crucial in preventing explosions caused by leaks.

## VI. Future Work

This monitoring system can be improved further by sending alert messages to users over Bluetooth rather than GSM, which offers a different real-time application. Mobile robots that can detect various gas concentrations can be designed for industrial use. A load cell addition can be used as a pressure sensor that measures the amount of gas in the cylinder as well as high pressure gas in the cylinder pipe, alerting users via SMS and LCD displays.

## VII. References

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