

## Gas Cylinder Leakage Detection, Weight Checking & Automatic Cylinder Booking System over IOT

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### Abstract

LPG Cylinder is the most commonly used domestic fuel in daily human life, not only in hotels and homes for cooking but also in several industrial sectors. By this, the demand for LPG usage is increasing rapidly. Meanwhile, this high usage of LPG sometimes leads to gas leakage, which may cause a dangerous explosion. There have been many mishaps due to the detonation of LPG cylinders, and in some of the occurrences, it is due to the laxity of gas leakage. To overcome this, our designed system can help monitor and detect gas leakage. To detect the gas in LPG, an MQ-6 sensor is used, and for any gas leakage that arises, the sensor detects it by making an alert with a buzzer that can help people, and an alert message is sent to the registered mobile number of the user. Another major problem faced by the users of LPG Cylinders is the in-opportune fatigue of gas cylinders. This proposed system will automate the entire LPG cylinder booking course of action without human mediation. This apparatus continuously monitors the weight of the cylinder. Once it reaches the slightest doorstep value, it will automatically send a message to the permitted LPG Agent so that they can dispatch the LPG cylinder in time. This will eventually help the consumer know when to restore the cylinder.

### 1. Introduction

The nation has approximately 30 crores of LPG users, mostly 40% of the population. LPG is one of the clean fuels for domestic household purposes as well as industrial purposes also. With the usage of LPG, some accidents may occur in the home, so technology is needed to prevent those accidents. Most of the accidents are due to the explosion of LPG cylinders. But, sometimes, a very small quantity of gas leakage is unnoticed, leading to a further major accident. It is very vicious when an LPG gas leakage occurs in any domiciliary usage, chemical industry, or other applications. So, this project is mainly focused on monitoring the leakage of Liquid Petroleum Gas (LPG) to avoid major fire accidents and also providing safety precautions where security has been an important issue and automatic cylinder booking without human involvement. This project uses an MQ-6 sensor to detect leakage. When the system points out that LPG congregation in the air reaches the described level, then alerts the end user by sending an SMS to the o inscribed mobile phone number and notifying the people at home by activating the alarm through a buzzer concurrently and also displaying the same message on LCD to take

the necessary action like to turn on the exhaust fan and opening the windows to decrease the gas concentration in the air. This system is also designed to measure the weight of the cylinder continuously. Once it reaches the minimum threshold, it will automatically register your LPG Cylinder booking through GSM machinery by sending SMS to the retailer company and an alert to the user simultaneously. This will eventually help the consumer know when to restore the cylinder

### 2. Problem statement

To investigate Gas leakage and alarming to alert the citizens about leakage who are situated locally and remotely located through this system. Examinations by oil organizations found that most LPG customers are ignorant of the security checks of gas cylinders. Another reason is an unauthorized filling of LPG cylinders likewise causes misadventures. There is a need for an agenda to detect and avoid leakage of LPG.

- To detect the leakage of the LPG system
- To alert the people about the gas leakage by sending messages through Email, text messages, and

alarming the buzzer.

- To alert the gas agency about gas exhaustion and book a new cylinder.

### 3. Materials Used and Design

#### Arduino UNO board

The Arduino Uno is a non-proprietary embedded controller board based on the Microchip ATmega328P microcontroller and evolved by Arduino. cc and was originally emancipated in 2010. The board has digital and analog input/output pins that may be affiliated with several augmented boards and other circuits.



#### MQ-6 Gas Sensor

MQ-6 gas sensor is a highly sensitive gas sensor to detect petroleum-based gases like LPG and other combustible steam Propane and Hydrogen. It also could be used to detect Methane. It is low-cost and suitable for different applications but less sensitive to Alcohol and Carbon dioxide. This elementary sensor can be crowned in the kitchen to give a caution alarm if there is a discharge of LPG.



#### Buzzer

The buzzer is an audio device. The major use of buzzers embraces distressing for any hazard. In this project, we have utilized a vital buzzer. The principal motive for using a buzzer in this project is to unnerve the people for any leakage, if there is any.



#### LCD Display

We have also imparted Liquid Crystal Display (LCD) to this set-up. We have used 16\*2 alphanumeric displays. LCD shows the actual weight of the gas, and at the same time, it shows various status messages like “Sending SMS,” “SMS sent,” “Gas has reached 20% value,” or “Gas has reached 5% value”. All these messages are displayed on the LCD so that the person handling this project can go through these messages. The LCD is convenient for trial objectives as well.



#### GSM Module

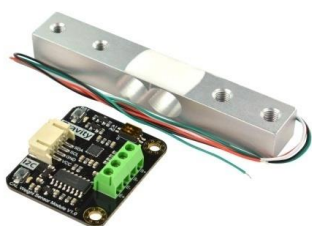
A GSM modem or GSM module is a device that maneuvers GSM mobile telephone mechanization to provide a cellular data link to a meshwork. GSM modems are operated in mobile telephones and other appliances that liaise with mobile telephone networks. They utilize SIMs to recognize their gadget to the network.



#### Weight Sensor Module

The amount of gas contained in the cylinder must be monitored continuously. Because to book a cylinder

from an LPG Agency, we should know how much gas is inside the cylinder. L6d weight sensor module is equipped in the system with the load cell having the required weighing ability for domestic cylinders. The load cell relents a transfer circuit that propounds two logical pulses (for  $\leq 10$  kg and  $\leq 0.5$  kg), which are correspondingly associated with micro-controller port pins to identify the gas level. Thus, the weight changes will be displayed on the LCD.



## 4. Architecture

The following figure shows the basic building structure of our proposed system.

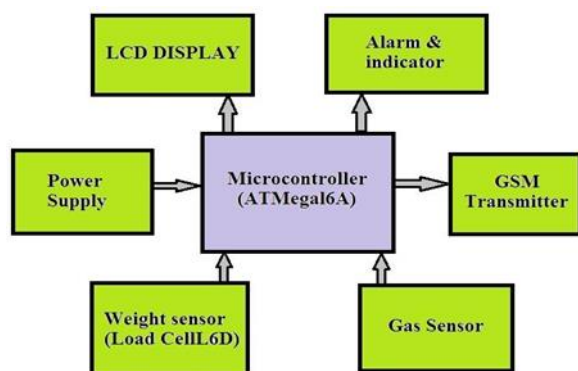


Fig-1: Architecture of Proposed System

## 5. Working

The work of this project is classified into two modules. The first module discusses the working of

the gas leakage system. While in the second module, the working of the load cell is explained.

### (i) Gas Leakage Detection

LPG leakage detection has been given the most elevated need in this model. This system will be installed in such a position that there will be no inconvenience in detecting gas leakage. The preferred location will be near the gas stove. If the MQ-6 sensor detects any accumulation of gas in the adjoining environs, it will sense it and send a signal to Arduino Board. The module will process the signal and activate the buzzer depending on the strength of the signal received. Also, the Arduino communicates something specific, "EMERGENCY ALERT: LPG gas leakage found in your home," to required cell numbers employing a GSM module, and a similar will be shown on LCD

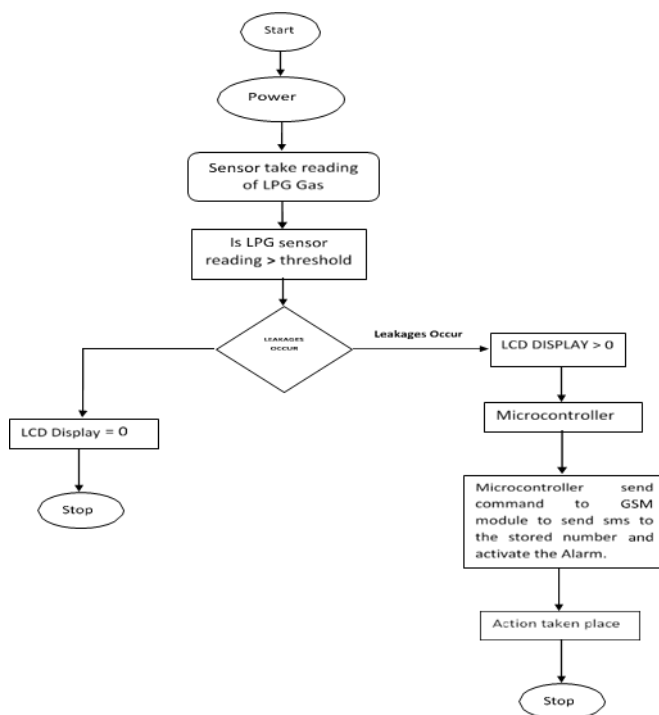
### (ii) Automatic Gas Booking System

The automatic Gas booking system continuously monitors the weight of the gas in the cylinder and displays it on a 16X2 LCD. The Weight sensor gives the output in analog form. Then the load cell is calibrated and displays the LCD readings. If the weight of the LPG in the cylinder is less than 5kg, the message is displayed on the LCD stating the low weight of the cylinder and sends an SMS to the LPG Distributor to book a new cylinder through the SM module. Also, if the weight of the gas goes below 0.5 kg, the microcontroller will send an alert message through a GSM module to the cell numbers of the consumer. Also, an alert message is displayed on the LCD screen to refill the cylinder.

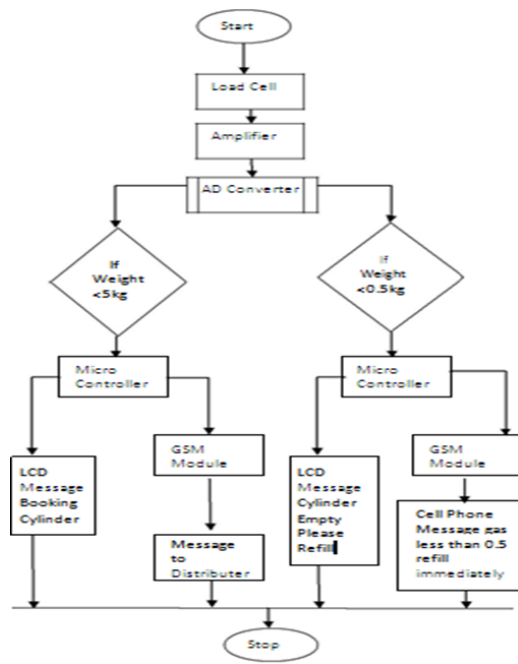
## 6. Flow of the work

(i) The following flowchart shows how the Gas Leakage Detection System works.





**Figure 2:** Flowchart of Gas Leakage Detection System



**Figure 3:** Flowchart of Automatic Gas Booking System

## 7. Result

With this Proposed system,

- The user is alerted if the LPG leakage exceeds the threshold value and is displayed on the 16x2 LCD.

- The user will also be alerted when the MQ-6 sensor detects the fire.
- Also, this system prototype continuously monitors the LPG level of the cylinder and books the cylinder automatically by sending an SMS to LPG Agency.

## 8. Conclusion

The major motive here is to bring forth safety to the users of LPG (Liquefied Petroleum Gas) in various sectors like cooking, automobiles, industries, etc. A budget-friendly gas leakage detection system was put forward, mapped out, and successfully executed in this paper. It uses an MQ-6 sensor and load cell to monitor the LPG being used completely to prevent accidents caused by carelessness or misuse of LPG. In addition to gas leakage detection, this system gives an entirely mechanized approach to gas booking. The cost incriminated in developing the system is outstandingly low and is much less than the cost of gas detectors economically obtainable in the market.

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