Smart LPG Gas Level Monitoring and leakage Detection System using IOT

Prof. V.M. Umale
Department of Electronics and Telecommunication Engineering, Shri Sant Gajanan Maharaj College of Engineering
Shegaon. India

Kalyani Bhagwat
Department of Electronics and Telecommunication Engineering, Shri Sant Gajanan Maharaj College of Engineering Shegaon. India
kalyanibhagwat23033@gmail.com

Sanket Yende
Department of Electronics and Telecommunication Engineering, Shri Sant Gajanan Maharaj College of Engineering Shegaon. India
sanketyende@gmail.com

Bhavesh Shah
Department of Electronics and Telecommunication Engineering, Shri Sant Gajanan Maharaj College of Engineering Shegaon. India
bhavesh2811shah@gmail.com

Namrata Damare
Department of Electronics and Telecommunication Engineering, Shri Sant Gajanan Maharaj College of Engineering Shegaon. India
namratadamare2@gmail.com

Abstract: **LPG is a widely used fuel for cooking. However, it poses some common problems such as running out of gas during peak cooking hours, not knowing the current status of the gas cylinder, and not being able to predict its working days. To reduce the danger, constant vigilance is required. This system detects LPG leakage and sends an alert message to the user. It also detects the gas leakage status and helps customers know if they are being cheated by the gas agency. The system notifies the user of the current status and booking notifications via LORA module on their mobile phones. This is cost-effective. The system works towards making the LPG chamber booking system more automated without any human intervention. It registers your booking through LORA technology by sending an SMS to the distributor company and alerts the user at the same time. This system is helpful for elderly people who live alone and are dependent on others, making them independent and secure from any kitchen hazards.**

Keywords: LPG gas, Loadcell, Arduino, LoRa-module, Atomization.

I.INTRODUCTION:

Now days, LPG is used for many needs such as industrial fuel, automobile fuel, heating and domestic fuel. Mainly LPG is used in homes for cooking purpose. Advantage of using LPG is that it has high calorific value, produces less soot and it is less smoky and mainly does not cause any harmful effect to the environment[1]. As we know that these gases are heavier than air so it doesn't disperse easily and may lead to suffocation when invoked and then may be reason to fire explosion when there is any leakage on ignition.

As the age of person increases, he/she tend to forget basic things like switching off cylinder regulator or the main ignition button, and then gas leakage can be very dangerous. It causes suffocation and explosion due to any spark. Risk of accidents increases day by day as number of LPG consumers increases. This developed system will help such people by switching off regulator immediately on gas detection like fire alarm. As additional advantage, The weight of cylinder is measured using load cell sensor it continuously measures the weight and the send the electric pulse to the microcontroller i.e. Arduino. When system detects the weight of cylinder below particular level, it alerts the user for cylinder booking, and place a refill order in the respective branch. It also provides additional features such as notifying the current status of gasoline present in the container and predicting the working days of the gasoline content[3]. The proposed system uses a LoRa Module for the connection of an android device with the system. The main application of this proposed system is to overcome the shortcomings such as delay and pre-booking of the LPG cylinder by the consumers.

The weight of cylinder is measured using load cell sensor which intern works on the principle of piezoelectric sensor. It continuously measures the weight and the send the electric pulse to the microcontroller i.e. Arduino. When system detects the weight of cylinder below particular level, it alertsthe user for cylinder booking, and place a refill order in the respective branch. It also provides

additional features such as notifying the current status of gasoline present in the container and predicting the working days of the gasoline content. The proposed system uses a LoRa Module for the connection of an android device with the system. The main application of this proposed system is to overcome the shortcomings such as delay and pre-booking of the LPG cylinder by the consumers.

II. LITERATURE SURVEY:

Different techniques were introduced for measuring the amount of gasoline present in the cylinder and scheduling its booking. The system in which, the inbuilt load cell is used to measure the level of the gas inside the cylinder. The output of the load cell was given to the Aurduino Nano controller, where the voltage corresponding to the gas weight was stored. A threshold value was set in the controller. Once the threshold was reached, notification was send on the mobile application through Bluetooth module[1].

In smart LPG gas monitoring and programmed cylinder reservation system we have used Mode MCU, Load cell, HX711 Driver Board, LCD, MQ Gas Sensor to endlessly monitor the heaviness of the cylinder and that will automatically send notification to the gas company agent when it exceeds the minimum threshold value, this helps in delivering cylinder in time. We have also included a safety measure for the user which tracts the gas leakage too [2].

This system will detect leakage of LPG and send an alert message to the user, at the same time it will switch off the mains power supply and a mechanical design attached with it, can switch off regulator too. It ensures safety from any gas leakage accident like suffocation and explosion. As an additional advantage, this system has a weighing sensor which can measure the weight of the cylinder and regularly update user about gas left in the cylinder. This system will also help customers to know whether they are being cheated by gas agency by providing less amount of LPG. [3].

IV.

This journal explains about the most common problem experienced in our day- to- day lives that is regarding GAS container going empty. We bring this paper to create awareness about the reducing weight of the gas in the container, and to place a gas order using IOT. The gas booking/order is being done with the help IOT and that the continuous weight measurement is done using a load cell which is interfaced with a Microcontroller (to compare with an ideal value). For ease it is even has been added with an RF TX & Rx modules which will give the same information. When it comes to security of the kit as well as gas container we have an MQ-2(gas sensor), LM 35(temperature sensor), which will detect the surrounding environment for any chance of error. When ever any change is subjected in any of the sensors (load cell, LM35, Mq-2) a siren (60db) is triggered[4].

III. PROPOSED SYSTEM:

In order to address the issue, the proposed system is employed. It overcomes the complications of existing system and focuses on providing functionalities like gas leakage detection, detecting gas level and informing user the status of gasoline content and leakage status. The system framework consists of weight measuring Load sensor interfaced with Arduino Uno and the Lora module for connectivity. This embedded processor is used for real time monitoring of the data parameters. The weight measuring load sensor is attached to a mechanically designed movable trolley which holds the cylinder in it. The load sensor attached to the bottom of this plate measures the weight of the cylinder periodically and send the data to HX711 amplifier. The amplifier converts the analog signal to the digital signals and send it to the microcontroller Arduino Uno. The whole working on the framework is accomplished by executing a code inbuild in the microcontroller, it analyses the input readings of load sensor and send the obtained output results of the current status of gasoline content, and the alertness of gas booking once the gas is below its set threshold value .The desired results are notified to the user on their mobile phone via a Lora module. The entire module work towards making the LPG cylinder booking

system more automatized without any human intercession.

Advantages of proposed system:

1. Real-time monitoring of LPG consumed
2. Automatic booking of cylinder when it is going to empty
3. Regular update about weighs of cylinder and LPG
4. Ease of carrying cylinder because of movable trolley system
5. LPG leakage detection and alert notification send on the user mobile.

IV. BLOCK DIAGRAM OF PROPOSED SYSTEM

Figure1.Block Diagram of system

Block diagram gives idea about whole hardware used in this project paper. All the components used in this work have been explained below,

Microcontroller:

We have used ATmega328 series microcontroller. It is a 28 pin IC, having three ports.

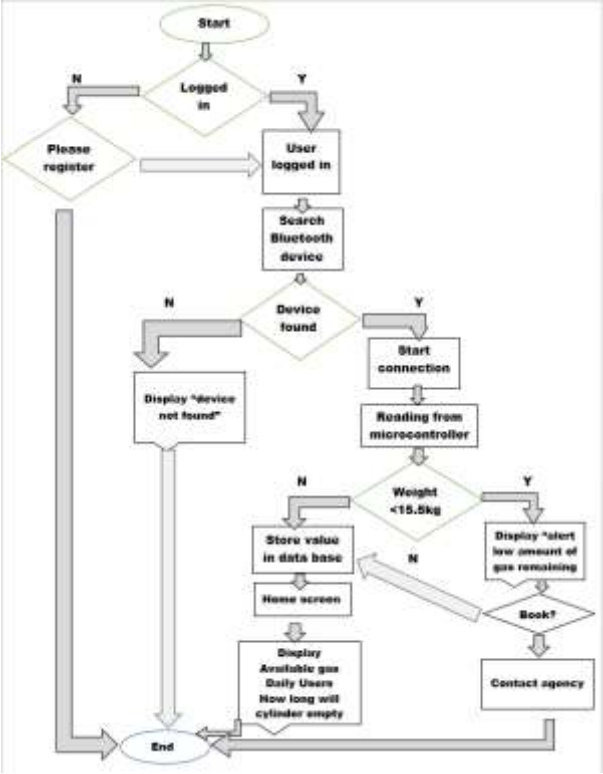


Figure 2. System flow chart

Weighing Sensor:
Weighing sensor is a transducer which converts force applied to it in electrical signal.

LCD Display:
LCD is used to display information about smart trolley functionality. We have used 16*2 LCD display.

1.	Weighing machine
2.	Control Circuit
3.	Display Unit
4.	Mobile Interface
5.	Communication device

Table 1.System architecture

LPG Gas Sensor:
A sensor used to sense gas leakage.MQ-2 is a LPG sensor suitable for sensing LPG concentration in air. MQ-2 sensor can detect LPG concentration anywhere from 200 to 10000ppm.

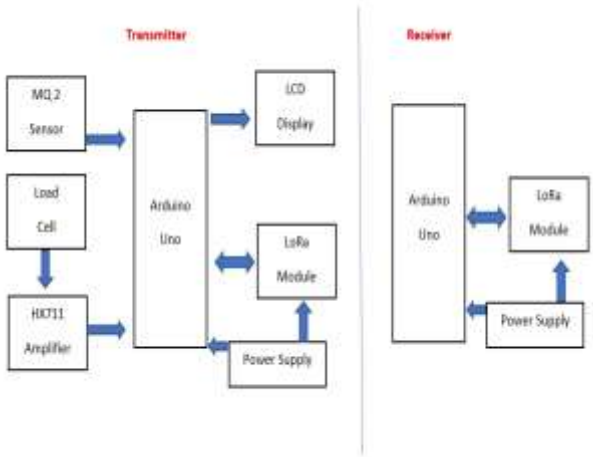
LoRa Module: Lora module is used to communication wirelessly. This wireless communication is based on spread spectrum modulation techniques accomplished using radio frequency between transmitter and receiver and the range of this module is greater than 10 km.

HX711 amplifier: It is an 24 bit-ADC chip with preamplifier included. It is a 16 pin chip.

V. METHODOLOGY (FLOW CHART)

- User Interface Flow-Chart:

VI.SYSTEM ARCHITECTURE:



The multipurpose smart LPG trolley is incredibly simple to install and functions just like a standard LPG trolley. The user only needs to bring a smart trolley and set a cylinder on it for it to begin updating and performing other tasks.

Three modules make up the created system:
Weighing machine:
The weight of an LPG cylinder is measured using a special weighing machine. It employs a load cell, a weighing sensor with a maximum capacity of 40 kg, which is positioned between the upper base (for the cylinder) and lower base Figure 3 (wheels attached). Figure 3 depicts a designed moving tram.

Figure 1.

A. Control circuitry:

The sensors in the control circuitry are numerous. It will Figure 4. control circuit with microcontroller manage every aspect of the system's operation. On the detection of gas leakage, microcontroller receives the signal from gas leakage sensor, it will send the the signal to buzzer , secondly it will send the notification on the user mobile through blynk application. Microcontroller is used to perform all these functions, which activates all the modules on required situation. All of these tasks are carried out by a microcontroller, which also activates each module as needed.

B. Mobile Interface

Mobile Application : A mobile application is created that serves as a conduit between the user and the microcontroller. Through this mobile application, the user is shown and informed of the required outputs and outcomes. To connect the LoRa module, the user must first sign up for this programme. The graphical representation of the daily gas usage shows a user-friendly interface. When a user receives an alert about cylinder booking, a pop-up message asking for booking.

VII.RESULT AND CALCULATIONS

The LPG leakage is detected by MQ-2 sensor, according the distance of sensor from regulator the voltage value of the output of sensor is varied. The safe status or unsafe status, which may be displayed on the LCD display and audible via the buzzer, can be determined from the results of tests that have been performed. The sensor voltage test is performed to establish the functioning voltage of the sensor both in standby and during a gas leak. The microcontroller is programmed as necessary for this test, and it then displays the sensor output on the LCD[2]. Table 4.1 is below this and shows the test results.

Voltage Sensor (volt)	Display on the LCD
0.24	“No Gas Leakage”
1.73	“No Gas Leakage”
2.18	“No Gas Leakage”
2.33	“ Gas Leakage”
3.38	“ Gas Leakage”

Table 2. Sensor output displayed on LCD.

The load cell determined the cylinder's weight, and in accordance with that weight, an alarm message appeared on the LCD and a notification is sent to the user's mobile app.

Sr No	Weight Cylinder	Levels	Result
1.	Below 15.5 kg	Level 0	Display massage Cylinder is empty
2.	16.3 kg	Level 1	Display alert massage
3.	20.3 kg	Level 2	Display alert massage

Table 3. Result displayed on LCD.

We have used Arduino Uno, Load cell, HX711 Driver Board, LCD, and MQ Gas Sensor[6] in smart LPG gas monitoring and programmed cylinder reservation system to continuously monitor the heaviness of the cylinder and that will automatically send notification to the gas company agent when it exceeds the minimum threshold value[7],

which helps in delivering cylinder on time. Additionally, we have a user safety precaution that also detects gas leaks.

VIII. FUTURE SCOPE:

1) Voice feedback system can be included in detection system. This will notify the user through pre-recorded voice messages about the weight of cylinder.

2) The app can be linked with the online database and instead of Bluetooth module, wi-fi module can be used to transfer the daily recorded readings to the online database, this will help identifying the daily uses trends.

IX. CONCLUSION:

The method that was suggested looked at many factors relating to the technology employed for gas level sensing. It began with an explanation of the problems encountered and the difficulty brought on when an LPG cylinder runs out while being used for cooking. The results of the survey showed that while the various technologies were expensive, they had the same mindset. Designing a straightforward and workable strategy to address the issue was crucial. The cost-effective gas level detection system that was suggested and successfully implemented as a result of the use of IOT also
provides a method for determining the current quantity of gas left in the cylinder and forecasting the working days.
By using this technique, any inconveniences caused by
cylinder booking delays are avoided.

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