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# AUTOMATIC GAS BOOKING & GAS LEAKAGE DETECTION SYSTEM USING IoT

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**Abstract -** *This paper introduces Automatic Gas Booking and Leakage detection using IoT. Many times it happens that people don't know exactly the status of cylinder and there is a delay in informing gas agency. To avoid such situations, the proposed work focuses on the application of IoT which is used for measuring and displaying the gasoline content present in LPG cylinder used for household purpose. And which in turn will be helpful in automatically booking the new LPG cylinder. The proposed system also detects the gas leakage and provides protection against accidents due to gas leakage. Usually, the capacity of LPG in cylinder cannot be determined, so this system will also display the level of LPG. The level of LPG is measured using load sensor (SEN-10245). The output of the sensor is given to Arduino R3. User is given an alert message to the mobile phone when the gas is critically LOW. By using a GSM module, the information is sent to user via an SMS (short message service). The gas leakage is detected by the gas sensor (MQ6). If there is gas leakage, the proposed system will detect it and alerts the user. Thus, we can prevent the LPG gas burst accident caused due to leakage of gas.*

## 1. INTRODUCTION

The gas leakage detection system. This system is designed to detect LPG gases such as propane and butane, which can be distinctly inflammable in nature.

Today in this present era where technology advances are at its vertex, many devices are available which provides refuge for all mankind. In our day to day lives, we all use cooking fuel that gets leaked due to some or other way and then there is a large possibility of a calamity to occur around.

Most of the days, users find it difficult to figure out what amount of LPG is left in the cylinder and this causes tons of bothering to the user. Because of the busy life, people may forget to notice the empty condition of gas cylinders and this in turn will leads to delayed booking of cylinders. So, to avoid this the proposed system provides a means to continuously monitor the weight of the cylinder and when the level of LPG gas is critically low, then the system sends a message to the user and also the LGP agent to book the cylinder immediately. Apart from automatic booking of gas cylinder, the proposed system also checks for the leakage of gas, which in turn will help to prevent accidents that occurs due to leakage of gas. The several standards have been implemented for

The gas leakage is detected by the gas sensor. This leakage detection gadget detects the fuel leakage and additionally stops the gasoline and a GSM alerts the required person. Then by detecting the gas leakage we can prevent the LPG gas burst accidents at home. The system detects the leakage of LPG gas using MQ-6 gas sensor and alerts the people at home by activating the alarm and also display the same message on LCD to take the necessary action.

Thus using the proposed system booking of LPG cylinders is done automatically within time and thus problems occurring due to delayed booking of gas cylinders is avoided. Also the accidents due to gas leakage is also prevented by using a gas sensor that continuously sense the gas and in case of any leakage, the system will alert the user to take necessary action.

The data sensed by the sensor is pushed onto the 'Thingspeak' cloud platform and graphical representation of the data is displayed on the user interface. This provides a way to analyze the working of "Automatic gas booking and gas leakage detection system".

Using Internet of Things (IoT) concept, this project is implemented in order to provide an automated system for booking gas cylinders whenever required and also preventing gas leakage accidents which in turn serves as a beneficial tool to help LPG consumers.

## 1.1 DESIGN REQUIREMENTS

### A. Hardware

- Arduino Uno
- GAS sensor
- Fire Sensor
- Load cell
- GSM Module
- BUZZER
- LCD Display

### B. Software

- Arduino IDE
- Embedded C Programming.

## 1.2 Block Diagram

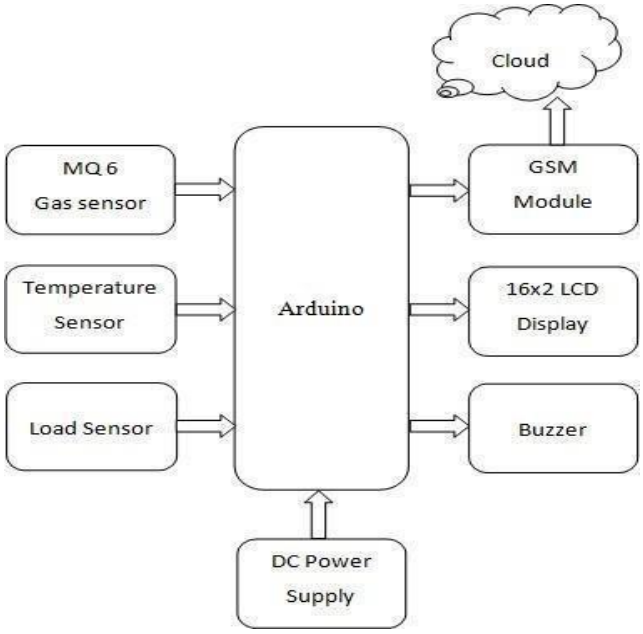


Fig 1.1 Block diagram of system

Fig 1.1 shows the block diagram of Automatic Gas Booking and Gas Level Detection System. The sensor used here has the high sensitivity and fast response time and displaying the weight of the cylinder so that we come to know the exact level of the gasoline in cylinder. The gas sensor detects other gases including cigarette smoke. When the gas is detected, the output of the sensor is send to the microcontroller and the buzzer is turned on and when the weight measured using load sensor becomes critically low, the alert is send to the user which in turn helps the user to automatically book a new LGP cylinder.

**A, Fire Sensor**

The Fire sensor (in fig 1.2) is used for fire detection. There is an ADC convertor, which converts the analog signals received at the sensor end to digital and then transmits them to the micro-controller. The micro-controller is programmed to turn on the buzzer, when the fire is reach a threshold value it will send message to the user. Here Wi-Fi module is used with help of ESP8266. ESP8266 is a chip which is used for connecting micro-controllers to Wi-Fi network.

Fig.1.2 Fire Sensor

**B. Gas sensor**

The methods to sensing gases depend on the change of physical or chemical properties of a given material or property on the presence of the target gas, compared to an ideal environment. Some of the sensing methods use the reaction between the sensing element with the target gas to determine this gas concentration; other methods are based on the comparison of physical properties such as speed velocity and wave propagation between an ideal mean and the one with the gas being sensed. Fig 1.3 shows a gas sensor used to measure gas.

Fig 1.3 gas sensor

**C. Load Cell**

A load cell is a type of transducer, specifically 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 proportionally changes. The most common types of load cell used are hydraulic, pneumatic, and strain gauge.

Fig 1.4 Load Cell

**D. Buzzer**

The fig 1.5, shows a buzzer or beeper which is an audio signaling device, which maybe mechanical, electromechanical. Typical uses of buzzers and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke.

Fig 1.5 Buzzer

### E. LCD

A liquid-crystal display (LCD) in Fig 1.6, is a flat-panel display or other electronically modulated optical device that uses the light-modulating of liquid crystals combined with polarizers. Liquid crystals do not emit light directly, instead using a backlight or reflector to produce images in color or monochrome.

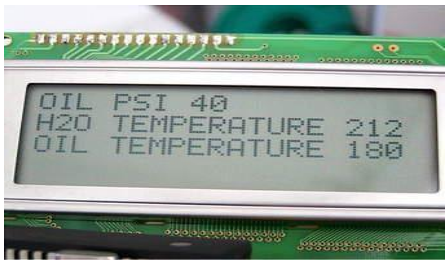


Fig 1.6 LCD

### F. Arduino UNO

The **Arduino Uno** is a microcontroller board based on Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards and other circuits. The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the ARDUINO IDE, via a type B USB cable. It can be powered by the USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts. The Uno differed from all preceding boards by featuring the ATmega328P microcontroller and an ATmega16U2 programmed as a USB-to-serial converter.

Fig 1.7 ARDUINO UNO

## 2. Literature Survey

ın [1], the authors have proposed a system which continuously monitors the leakage of LPG gas and alerts users regarding the gas leakage to avoid major accidents. This system is low cost ans also detects alcohol so it is used as liquor tester. The sensor has excellent sensitivity combined with a quick response time. The disadvantage is, it can be used only as an indicator/alarming device.

In [2], the authors have proposed the air quality monitoring system that allows us to monitor and check the live air quality through IoT. System uses air sensors to sense the presence of harmful gases in the air and transmit data to the microcontroller. The Gas sensor used is highly sensitive to detect the gas leakage. And if particular sensor is damaged then the replacement cost will be high.

In [3], a system that detects the leakage of the LPG using a gas sensor is proposed and this system uses the GSM module to alert the person about the gas leakage via an SMS. But this sytem does not include automatic gas booking module.

In [4], the authors have proposed a system in which the aim is automatically detect, alert and control gas leakage. In this sytem when the hardware system fails the desired output is not generated and hence the corrective action when the gas is leaked will not be taken care.

## 3. Experiment Results

Fig 3.1 LCD showing output of temp, gas level and weight

In Arduino Based LPG gas Monitoring & Automatic Cylinder booking with Alert System MQ-4 gas sensor, LM-35 Temperature sensor, 10 kg load cell ( for prototype) as input devices and Piezoelectric. buzzer, 16x2 LCD display and GSM module used as output devices.

Actually the room temperature is 25°C, but we increased temperature of LM35 upto 53°c. Initially before gas leakage the output of gas sensor is 0 ppm, but when it sense gas the output is 267 ppm.

The Fig 3.1 shows the LCD displaying temperature, gas level in LPG cylinder.

Fig 3.2 Output showing status of LPG cylinder

Figure 3.2 represents SMS messages in user mobile phone which is send by GSM module for different kinds of input reaction in our project. The message "GAS IS LOW RECHARGE SOON" is sent to the user when the LPG gas reaches to minimum threshold level.

In Figure 3.3 we can observe the hardware setup used for the proposed system.

Fig 3.3 Final Design of the Project

Thinkspeak cloud platform is used to push the sensed data onto the cloud using a Wi-FI module and the generated graphs shown in Fig 3.4 helps use to analyze the values obtained in the proposed system.


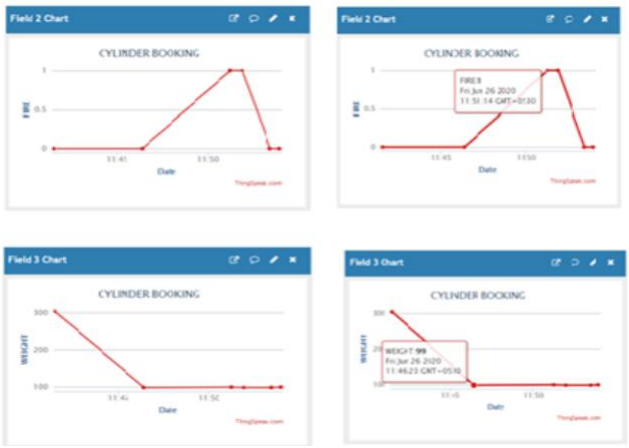


Fig 3.4 Graphs obtained using the sensed data

## 4. Conclusion

To overcome the various problems faced by LPG gas consumers, Automatic Gas Booking and Leakage detection System is developed which completely automates the process of refill the gas cylinder without any human intervention. It also helps the customers to upgrade their safety norms to prevent major accidents associated with gas leakage and protect life and property from such accidents. The primary objective of our project is to measure the gas present in the cylinder. The gas retailer gets the order for a new cylinder and the house owner (consumer) receives the message regarding the status of gas booing. The secondary objective of the proposed system is to prevent damage due to gas accidents by detecting the gas leakage.

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