

# **GAS LEVEL DETECTION AND AUTOMATIC BOOKING USING IOT**

Project Report

Bachelor of Technology

in

**Department of Electronics and Computer Engineering**

By

**T. Hemanth (190050065)**

**G. Deepthi (190050098)**

under the supervision of

**Mr. R.Kartik**

**Asst. Professor**



**Koneru Lakshmaiah Education Foundation**

(Deemed to be University estd., u/s 3 of UGC Act 1956)

Greenfields, Vaddeswaram, Guntur (Dist.), Andhra Pradesh - 522502

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## **ABSTRACT**

Recent trend is the development of Smart homes all around the world. Home automation has become very affordable and many people, industries has started to automate daily routines like light, fans, setting the temperature, etc.,. While LPG is an essential need of every household, its leakage could lead to a disaster. To alert on LPG leakage and prevent any mis-happening there are various products to detect the leakage. Here we have developed an Arduino based LPG gas detector. If gas leakage occurs, this system detects it and makes an alert by showing it on an LCD attached with the circuit. We have used a LPG gas sensor module to detect LPG Gas. This type of equipment is used to detect a gas leak or other emissions and can interface with a control system so a process can be automatically make fan ON. The main objective of this design is to build a Gas leakage detector and monitoring using LPG gas sensor and also connect it with IoT using ESP module for safety and security.

## INTRODUCTION

In present days, the life of the people has become very busy. In day to day life everything is automated then why not the gas cylinder booking automate?

Moreover, most of the people stand in long queues for booking the gas cylinders..

Can't this be avoided? Because of the versatile nature of LPG it is used for many needs such as domestic fuel, industrial fuel, automobile fuel, heating,

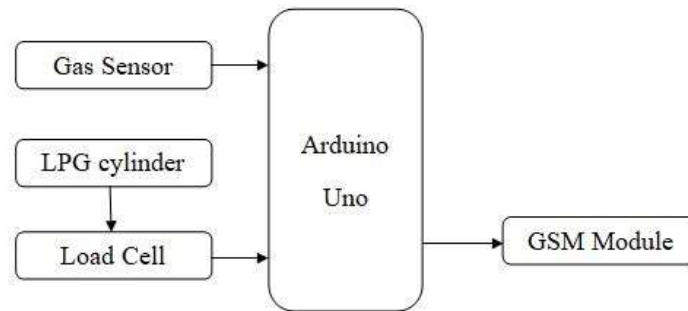
illumination etc and the demand for LPG is on an exponential rise day by day.

Natural gas is another widely used fuel in homes. Both burn to produce clean energy, however there is a serious threat about their leakage. The gases being heavier than air do not disperse easily and may lead to suffocation when inhaled; also the leaked gases when ignited may lead to explosion. The number of deaths due to the explosion of gas cylinders has been increasing in recent years. There is a need for a system to detect and also prevent leakage of LPG.

So, our main objectives to address the above cited problems are

- Keep track of gas usage and its level in cylinder that helps in automatic booking of gas cylinder.
- Avoiding long queues while booking of a gas cylinder.
- Toxic gas detecting and alerting system.

## I. WORKING PRINCIPLE



### A. Description

In human day to day life, the LPG cylinder plays a major role. The main application of the LPG is that it is used in the place of chloroform carbon which causes great damage to the ozone layer. Though it's one in all the foremost normally used fuels, it's associate explosive vary of one.8%–9.5% the volume of gas in the air. It's packed into three classes per the burden of the LPG within the cylinder: social unit, business, and Industrial. The social unit class of the LPG cylinder contains 14.2 kilo LPG within the cylinder. Similarly, the business and Industrial classes of LPG cylinders contain nineteen and thirty-five kilo of LPG severally. With the rising demand for LPG, users have to be compelled to pre-book their LPG cylinder a minimum of a month before the delivery of the new LPG cylinder. Most of the days, users find it difficult to figure out what quantity of LPG has left at intervals the cylinder and this causes tons of bothering to them. In such a state of affairs, associate degree efficient technique to watch the amount of LPG within the cylinder is needed, so the users have tuned in to the LPG level at intervals the cylinder. This paper deals with the detection of the gas leakage and the level of gas in the cylinder and automatic booking of the new LPG cylinder. The sensor used in this has high sensitivity and fast response time. The gas sensor detects other gases including cigarette smoke. When the gas has detected the output of the sensor is sent to the microcontroller and the buzzer is turned on and when the weight measured using the load sensor becomes critically low, the alert is sent to the user and the new LPG cylinder is booked.

Gas level detection and automatic booking are designed with various features that are implemented using Arduino and this device will be a single system with multiple applications for LPG consumers. The device monitors the load if the gas level and displays it within the alphanumeric display incessantly. It also detects the gas leakage by gas sensor. This includes an additional feature of booking a new LPG cylinder when the gas level becomes critically low. Then it sends an alert to the registered mobile number by an SMS with the help of the GSM module and the alert database is displayed in the system monitor



There are two flow charts for gas leakage detection and automatic gas booking which explain the methodology of the operation as follows:

## **METHODOLOGY:**

### **GAS LEAKAGE DETECTION**

In this model, gas spillage recognition has been given a most elevated need. MQ6 set in the region of the gas chamber. In the appearance of spillage, the obstruction of the sensor diminishes expanding its conductivity. Relating beat is sustained to microcontroller and at the same time switches on the ringer and fumes fan which we can reset by a manual reset switch. Additionally a rationale high heartbeat (+5 V) is given as a hinder to INT0 stick of Microcontroller. Microcontroller communicates something specific "EMERGENCY ALERT: LPG gas spillage found in your home" to required mailid by means of GSM module and a similar will be shown on LCD.

### **AUTOMATIC GAS BOOKING**

In programmed Gas booking framework, L6D ceaselessly screens the heaviness of the gas in chamber and shows it on seven section show. At the point when the heaviness of the gas is  $\leq 150$  ml, a rationale high heartbeat is encouraged to a port stick of microcontroller. As this stick goes high, microcontroller will send booking message to wholesaler of organization, "REG\_yyyyyyy\_12345". In the meantime, the message will be given to the mail id.

**IOT Based Industrial Plant Safety Gas Leakage Detection System.** Most of the fire-breakouts in industries are due to gas leaks. These cause dreadful damage to the equipment, human life leading to injuries, deaths, and environment. Currently available leakage detectors warn the people around using on-site alarms. So, this project proposes a leakage detector which sends the warning to the concerned people through SMS. This detector senses the presence of harmful gases particularly, LPG, Methane and Benzene. LPG and Methane gases catch fire easily resulting in blasts. Benzene is carcinogen affecting the health of workers, if inhaled in higher concentrations. Hence, detection of these gases is essential.

**Pipeline Gas Leakage Detection And Location Identification System.** Every diminutive task in this planetary is machine-controlled by cyberspace of belongings which makes our life easier. Now internet of things is used for safety purpose also. Nowadays outflow of gas in pipeline is the major difficulty. The chief mental object of this project is to detect the leakage of gases in the pipeline. Pipeline will be monitored with in an regular intervals using gas detection sensors. If there is any leakage in the pipeline then it will be detected and information such as name of the gas, pressure rate of the gas and its location where there is leakage of gases will be passed to the mobile phone, laptops, etc using IOT. The accurate location for the gas leakage will be detected using the GPS.



Scan Gas & Display in LCD After activation, the device will continuously scan gas and show the result in the LCD display. If there is no gas, then the display will show - 'No Gas Leaking'. If there is any gas found, the display will show - 'Gas leaking'. □ Detection of Gas: If there is presence of any gas the display shows 'Gas Alert'. □ When the sensor finds any gas leakage in room or where the device is installed, it immediately activates the Exhaust fan. □ Stop Alert & Reset: If the gas sensor cannot find any gas leakage, then it shows that there is no gas leaking and keeps on scanning for gas. when gas level becomes low it makes automatic booking to the registered refilling centre. Gas leak detection is the process of identifying potentially hazardous gas leaks by sensors. These sensors usually employ an audible alarm to alert people when a dangerous gas has been detected. Exposure to toxic gases can also occur in operations such as painting, fumigation, fuel filling, construction, excavation of contaminated soils, landfill operations, entering confined spaces, etc. Common sensors include combustion, photoionization detectors, ultrasonic sensors, electrochemical gas sensors, and semiconductor sensors. More recently, infrared imaging sensors have come in use. All of these sensors are used for a wide range of applications and can be found in industrial plants, refineries, pharmaceutical manufacturing, fumigation facilities, paper pulp mills, aircraft and shipbuilding facilities, hazmat operations, waste-water treatment facilities, vehicles, indoor air quality testing and homes.

## **Hardware/Software Required**

- MQ6 LPG Gas Sensor
- Mechanical platform with Load cell
- Sim 900 gsm module and usb2 to serial RS232
- Raspberry Pi
- MicroSD Memory Card
- Comfast wireless adapter
- Hdmi cable
- 6 in 1 electric soldering kit
- Digital multimeter

n The Raspberry Pi 3 Model B is the third generation Raspberry Pi. This powerful credit-card sized single board computer can be used for many applications and supersedes the original Raspberry Pi Model B+ and Raspberry Pi 2 Model B. Whilst maintaining the popular board format the Raspberry Pi 3 Model B brings you a more powerful processor, 10x faster than the first generation Raspberry Pi. Additionally it adds wireless LAN & Bluetooth connectivity making it the ideal solution for powerful connected designs.



Pin#	NAME		NAME	Pin#
01	3.3v DC Power		DC Power 5v	02
03	GPIO02 (SDA1 , I <sup>2</sup> C)		DC Power 5v	04
05	GPIO03 (SCL1 , I <sup>2</sup> C)		Ground	06
07	GPIO04 (GPIO_GCLK)		(TXD0) GPIO14	08
09	Ground		(RXD0) GPIO15	10
11	GPIO17 (GPIO_GEN0)		(GPIO_GEN1) GPIO18	12
13	GPIO27 (GPIO_GEN2)		Ground	14
15	GPIO22 (GPIO_GEN3)		(GPIO_GEN4) GPIO23	16
17	3.3v DC Power		(GPIO_GEN5) GPIO24	18
19	GPIO10 (SPI_MOSI)		Ground	20
21	GPIO09 (SPI_MISO)		(GPIO_GEN6) GPIO25	22
23	GPIO11 (SPI_CLK)		(SPI_CE0_N) GPIO08	24
25	Ground		(SPI_CE1_N) GPIO07	26
27	ID_SD (I <sup>2</sup> C ID EEPROM)		(I <sup>2</sup> C ID EEPROM) ID_SC	28
29	GPIO05		Ground	30
31	GPIO06		GPIO12	32
33	GPIO13		Ground	34
35	GPIO19		GPIO16	36
37	GPIO26		GPIO20	38
39	Ground		GPIO21	40

Figure 3.2 Pin details of Raspberry-pi

## B. MQ6 LPG Gas Sensor

The MQ6 (LPG Gas Sensor) is a simple-to-use liquefied petroleum gas (LPG) sensor. It can be used in gas leakage detecting equipment in consumer and industry applications, this sensor is suitable for detecting LPG, iso-butane, propane, LNG. Avoid the noise of alcohol, cooking fumes and cigarette smoke. It make detection by method of cycle high and low temperature, and detect CO when low temperature (heated by 1.5V). The sensors conductivity is more higher along with the gas concentration rising. When high temperature (heated by 5.0V), it cleans the other gases adsorbed under low temperature.



# Mechanical platform with Load cell

**RS** Before strain gage-based load cells became the method of choice for industrial weighing applications, mechanical lever scales were widely used. Mechanical scales can weigh everything from pills to railroad cars and can do so accurately and reliably if they are properly calibrated and maintained. The method of operation can involve either the use of a weight balancing mechanism or the detection of the force developed by mechanical levers. The earliest, pre-strain gage force sensors included hydraulic and pneumatic designs. In 1843, English physicist Sir Charles Wheatstone devised a bridge circuit that could measure electrical resistances. The Wheatstone bridge circuit is ideal for measuring the resistance changes that occur in strain gages. Although the first bonded resistance wire strain gage was developed in the 1940s, it was not until modern electronics caught up that the new technology became technically and economically feasible. Since that time, however, strain gages have proliferated both as mechanical scale components and in stand-alone load cells.

## Load Cell Operating Principles

Load cell designs can be distinguished according to the type of output signal generated (pneumatic, hydraulic, electric) or according to the way they detect weight (bending, shear, compression, tension, etc.)

**Hydraulic load cells** are force -balance devices, measuring weight as a change in pressure of the internal filling fluid. In a rolling diaphragm type hydraulic load cell, a load or force acting on a loading head is transferred to a piston that in turn compresses a filling fluid confined within an elastomeric diaphragm chamber. As force increases, the pressure of the hydraulic fluid rises. This pressure can be locally indicated or transmitted for remote indication or control



## **Sim 900 gsm module and usb2 to serial RS232**

SIM900A Modem is built with Dual Band GSM/GPRS based SIM900A modem from SIMCOM. It works on frequencies 900/ 1800 MHz. SIM900A can search these two bands automatically. The frequency bands can also be set by AT Commands. The baud rate is configurable from 1200-115200 through AT command. The GSM/GPRS Modem is having internal TCP/IP stack to enable you to connect with internet via GPRS.

SIM900A is an ultra compact and reliable wireless module. This is a complete GSM/GPRS module in a SMT type and designed with a very powerful single-chip processor integrating AMR926EJ-S core, allowing you to benefit from small dimensions and cost-effective solutions.



## MicroSD Memory Card

**Secure Digital**, officially abbreviated as **SD**, is a [proprietary non-volatile memory card](#) format developed by the [SD Association \(SDA\)](#) for use in portable devices.

The standard was introduced in August 1999 by joint efforts between [SanDisk](#), [Panasonic](#) (Matsushita) and [Toshiba](#) as an improvement over [MultiMediaCards \(MMCs\)](#),<sup>[1]</sup> and has become the industry standard. The three companies formed SD-3C, LLC, a company that licenses and enforces intellectual property rights associated with SD memory cards and SD host and ancillary products.<sup>[2]</sup>

The companies also formed the SD Association (SDA), a non-profit organization, in January 2000 to promote and create SD Card standards.<sup>[3]</sup> SDA today has about 1,000 member companies. The SDA uses several [trademarked logos](#) owned and licensed by SD-3C to enforce compliance with its specifications and assure users of compatibility.<sup>[4]</sup>



## Comfast Wirelesadapter

A **wireless repeater** (also called **wireless range extender** or **wifi extender**) is a device that takes an existing signal from a [wireless router](#) or [wireless access point](#) and rebroadcasts it to create a second network. When two or more hosts have to be connected with one another over the [IEEE 802.11](#) protocol and the distance is too long for a direct connection to be established, a wireless repeater is used to bridge the gap. It can be a specialized stand-alone [computer networking device](#). Also, some [wireless network interface controllers](#) ..





## HDMI Cable

**High-Definition Multimedia Interface (HDMI)** is

a [proprietary](#) audio/video [interface](#) for transmitting [uncompressed video](#) data and compressed or uncompressed [digital audio](#) data from an HDMI-compliant source device, such as a [display controller](#), to a compatible [computer monitor](#), [video projector](#), [digital television](#), or [digital audio](#) device.<sup>[3]</sup> HDMI is a digital replacement for [analog video](#) standards.

HDMI implements the [EIA/CEA-861](#) standards, which define video formats and waveforms, transport of compressed and uncompressed [LPCM](#) audio, auxiliary data, and implementations of the [VESA EDID](#).<sup>[4][5]</sup>:p. III



## 6 in 1 electric soldering kit

A **soldering iron** is a [hand tool](#) used in [soldering](#). It supplies heat to melt [solder](#) so that it can flow into the joint between two workpieces.

A soldering iron is composed of a heated metal tip and an insulated handle. Heating is often achieved electrically, by passing an electric current (supplied through an electrical cord or battery cables) through a resistive [heating element](#). Cordless irons can be heated by combustion of gas stored in a small tank, often using a [catalytic heater](#) rather than a flame.



## Digital multimeter

Digital multimeter is **a test equipment which offers several electronic measurement task in one tool**. It is also known as the voltmeter or Ohm meter or Volt Ohm meter. The standard and basic measurements performed by multimeter are the measurements of amps, volts, and ohms.



## **Raspbian pi os installation**

- Downloaded image file of OS
- Make the bootable copy of OS on MicroSD card.
- setting of username , password

## **Conclusion And Future scope**

The main advantage of this simple gas leak detector is its simplicity and its ability to warn its users about the leakage of the LPG gas. The future aspects of this detector include the gsm module and a tripper circuit which increases the efficiency of the system and provides more safety to the users. The other advantage of this system includes its visual warning systems. This detector is implemented successfully and is easy to use and also a low cost product. Another advantage of this device is that even though if no one is there in the house and then gas leaks occurs, GSM module is there to send immediate messages to the users regarding the gas leak and thus it lowers the intensity of accidents. GSM module in this device ensures better safety regarding the gas leaks

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