

# Household Gas Level Monitoring, Automatic Booking and Leakage Detection over IoT

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## Abstract

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 a been added with an RF TX & Rx modules which will give the same information. When it comes it to security of the kit as well as gas container we have an MQ-2(gas sensor), LM35(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.

Index terms: GAS, IoT, GSM, WiFi, Sensor, ARM, Temperature, cylinder, LPG, RF

## INTRODUCTION

This paper is an effective & affirmative way of monitoring the gas quantity in the container, and to intimate as well as to place an refill order in the respective branch office(gas agency), via an message by means of internet through IoT module. The continuous measure is done using the load cell which intern works on the principle of piezo electric sensor, i.e ; when an gas container is placed on the load cell it measures the weight and sends an electric pulse to the microcontroller which will compare the pulse with an ideal value in form of digital (the electric pulse is converted in to equivalent digital value). If the compared output is high then it sends a pulse(high) to the IoT which will update it to the internet but doesn't place an order, but if the compared output is low then it send a pulse(low) to the IoT which will update it to the internet an even place an gas refill order. and for ease of user there is even Radio Frequency(100mtrs) module which has its Tx encoder kit to the main board & its Rx decoder for

an sub board, so the need of providing it with these is that when an gas order is being place it notifies the consumer with an siren alarm.

LPG is comprised of Commercial-Propane and Commercial-Butane having immersed too some sun soaked hydrocarbons. On account of its flexible nature of LPG, It is utilized as a part of numerous necessities, for example, household fuel, mechanical fuel, auto-versatile fuel, light and so on and the interest for LPG is consistently expanding step by step. The condensed oil gas is utilized generally in houses, ventures and in vehicles as fuel on account for its attractive effects which incorporate high calorific esteem, LPG makes less smoke and does not create much problem to the earth. Gaseous petrol is another generally utilized fuel in houses. The two consumes to create clean vitality, however there is a bona fide chance about the spillage. The gases being 5 times heavier than air don't scramble easily and may provoke suffocation when breathed in additionally the spillage gases when touched off may prompt blast. The quantity of passing because

of the blast of gas barrels has been expanding as of late. There is a requirement for a framework to distinguish and furthermore forestall spillage of LPG.

Prior to the improvement of electronic house-hold gas finders in the 1990s, gas nearness was distinguished with an artificially injected paper that changed its shading when presented to the gas. From that point forward, numerous advances and gadgets have been created to identify and screen, and caution the spillage of wide cluster of gases. This day, reserving a LPG barrel is currently only a content SMS away. Oil organizations have propelled the Customer-accommodating administration called as the IVRS (Interactive voice Response) system for their clients.

Our framework gives security from the gas spillage it identifies spillage and makes control move over it. It is useful for us to dodge blast it likewise have arrangement for programmed gas booking.

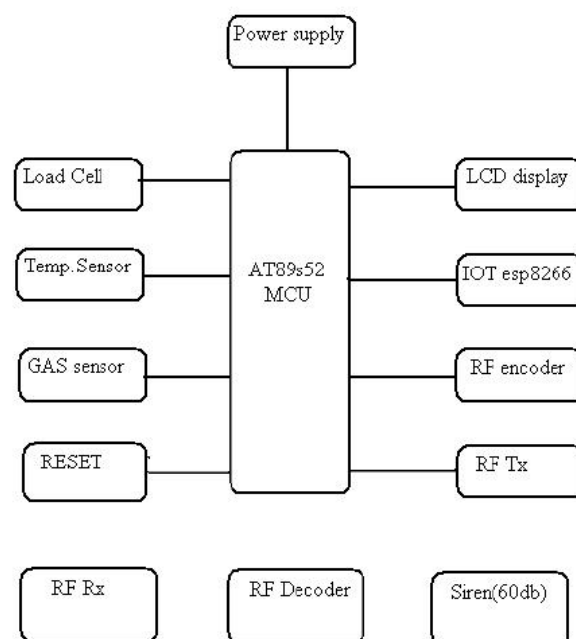
### III. REVIEW OF LITERATURE:

In the year 2011, A. MAHALINGAM, R. T. NAAYAGI, N. E. MASTORAKIS, — Design and Implementation of an Economic Gas Leakage Detector||, This undertaking created framework to identify the gas spillage and giving prompt caution or insinuation to the client.

Later in 2013, few individuals built up the outline proposed for home security. This framework identifies the spillage of the LPG and cautions the purchaser about the break by bell. This task was produced utilizing micro-controller ARM form 7 processor and re-enacted utilizing Keil programming.

In the year 2014, HitendraRawat , Ashish Kushwah, Khyati Asthana, AkankshaShivhare, planned a framework, They gave security issues against hoodlums, spillage and fire mishaps. In those cases their framework sends SMS to the crisis number gave to it.

### SYSTEM ARCHITECTURE



**Figure 4.1** block diagram of system Architecture.

The above block diagram shows the outlay of the entire paper which has been discussed above the hardware requirements are quite limited & easily available as well as less feasible. The gas container is placed on the Load Cell and it constantly keeps on sending the electric pulses to the microcontroller to compare it with the ideal value. We already know the use of Temp. sensor & gas sensors and their respective roles which is to maintain the Boards & gas container security, they are also connected with the MC and an trigger pulse is sent if any gas/ fire is occurred, to the IoT apart from the RF module. The other block is the sub board which consists of the RF decoder & RF Rx which are helpful in the triggering of the Siren alarm by sensing the signal sent from the RF Tx. the reset switch(pulse) is used to reset the microcontroller & the devices connected to it. the LCD display is used to display the status of the gas container and as well as to report if any accident is to occur. The IoT is the main component which play the major role for updating of the status of the entire kit.

### INTERNET OF THINGS

ESP8266EX (ESP- Espressif Systems Smart platform; EXrevised version) offers a complete and self-contained WiFi networking resolution, it can be used to host the application or to offload wireless networking functions from another application to the processor. ESP8266EX hosts the application it picks up directly from an external flash; it has integrated cache to improve the performance of the system in such applications. Alternately, serving as a WiFi adapter, wireless internet access can be added to any micro controller-based design with simple connectivity (SPI/SDIO or I2C/UART interface). it integrates the antenna switch, RF module, power amplifier, low noise receive amplifier, filters, power management modules, and the entire solution, including front-end module, is designed to occupy minimal PCB area. ESP8266EX also integrates an enhanced version of Tensilica's L106 Diamond series 32-bit processor, with on-chip SRAM, besides the WiFi modem properties. ESP8266EX is often integrated with external sensors and other application specific devices through its GPIOs, so as it can be made to work as an entirely individual system even if required. Thus the IoT module has the main phrase in the paper.

## HARDWARE SPECIFICATIONS

### Brief Intro to AT89S52 Microcontroller

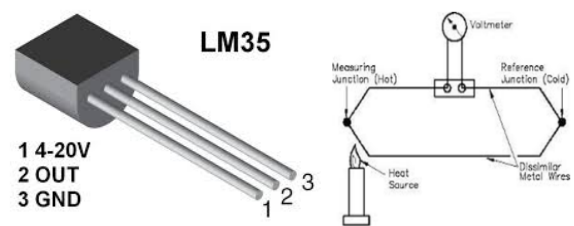
The **AT89S52** comes from the popular 8051 family of Atmel Microcontrollers. It is an 8-bit CMOS microcontroller with 8K as Flash memory and 256 bytes of RAM. Since it is similar to the trust worthy 8051 architecture these microcontrollers are as per industry standard. It has 32 I/O pins comprising of three 16-bit timers, external interrupts, full-duplex serial port, on-chip oscillator and clock circuitry. The Microcontroller also has Operating mode, Idle Mode and Power down mode which makes it suitable for battery operated applications. Few considerable drawback of the microcontroller is that it does not have in-built ADC and does not support SPI or I2C protocols. However you can utilise external modules for the same.



**Figure 6.1 AT89S52 Microcontroller**

### LM 35 (temp. sensor)

It works on the basis of voltage. And now for the sensors, if any fire is to be happened then the temperature sensor will sense an high change (positive change) in temperature and will send an pulse to microcontroller which intern will send an update to the internet trough IoT, and as well it will trigger an siren alarm in the RF Rx kit (sub board).



**Figure 6.2(a) LM35 gas sensor (b) working model of LM35**

### MQ-2 (Gas Sensor)

The touchy material utilized as a part of MQ-2 gas sensor is thin oxide ( $\text{SnO}_2$ ), which has bring down conductivity in a perfect air medium. At the point when the objective LPG spill is identified, the sensor's conductivity rises and increments proportionately as the degree of gas spillage increments. The identification scope of MQ-2 gas sensor is 300-5000ppm"[4]" and has quick reaction time and is a low controlled gadget (5V). This sensor has diverse protection esteem in various focus.

## GAS SENSOR CALIBRATION

The Calibration of MQ-2 gas sensor was done in a gas chamber utilizing a standard restorative syringe. The gas focus in ppm was differed and relating

yield voltages were noted. The voltage ranges for LPG gas fixation comparing to different levels were estimated

MQ 2 sensor is basically an LPG(liquefied petroleum gas) which is composed of propane & butane, so when an gas leakage is sensed by the sensor it will send an high pulse to the Mc which will update it in the IoT, and even an buzzer is heard in the RF Rx kit. and the problem can be sorted & solved. Thus the overall components & sensors play role in the paper as explained above.



**Figure 6.3** MQ2 temperature sensors

#### Weight Sensor (LOAD CELL)

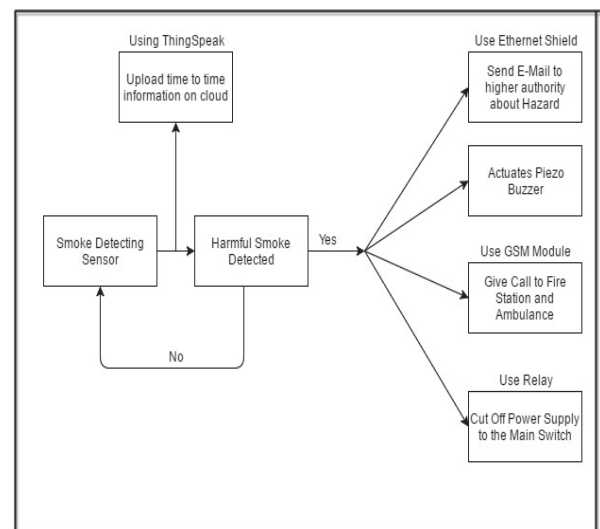
To book a cylinder from a merchant (Agency), we should know about measure of gas in the chamber, and for this reason the level of gas show in the cylinder must be observed persistently. The heap cell having required measuring limit with regards to household cylinder is utilized and for alignment reason the weight sensor module is used alongside the heap cell. Here we utilize a binocular load cell to quantify the heaviness of cylinder. It has two closures settled and free end. The weight i.e. cylinder is set at free end. Amid an estimation, weight follows up on the heap cell's metal spring component and causes flexible twisting. This strain which can either be certain or negative is changed over into an electrical flag by a strain check introduced on the spring component. The (compulsory) fundamental segments, i.e. spring component and strain measure are supplemented with extra components (lodging, fixing components) securing the strain check components. The strain check yield is protection

which is associated at four arms of Wheatstone's scaffold which gives a solitary yield voltage is changed over to advanced and utilized for advance investigation. The whetstones connect gives the four yield voltages i.e. excitation positive and negative and flag positive and negative. These signs are given to PIC Micro-controller. The heap cell circuit is as appeared in the figure 3.



**Figure 6.4** weight cell

#### VII. Gas Leakage Detection Processing Steps



**Figure 7.1** Gas Leakage detection processing steps

Now when the sensor will be exposed to the gases that MQ-2 can detect then the sensor readings could be compared with the threshold value for detecting leakages.

The buzzer is actuated when the readings exceed the threshold value.

An email about the details containing the concentration levels of gases is sent to the concerned authority (Lab In charge, Technical Department). In order to send the email an internet

connection is required which is provided by the Ethernet Shield.

This feature is totally modifiable depending upon the need of the user. The e-mail could be sent every hour, every 24 hours or whatever is desired. It requires only a simple manipulation of code.

A call is made to the concerned authority (Lab In charge, Fire Station, and Ambulance). GSM Module is used for making a call as well as sending text message. Just like the email feature, this is also modifiable according to the user needs as to when and what message should be sent and who all should be the recipients.

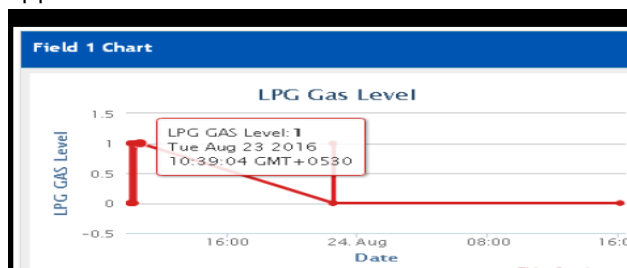
If the sensor readings are about to reach the lower explosion limit (LEL), the relay cuts off the power supply to the main switch.

The sensor readings that were uploaded to cloud (Step 3) can be used for data analytics. The average reading of 24 hours can be calculated, every day since the day of deployment. The comparison of these average readings will help in increasing the precision of the system and help it in understanding the behaviour of the environment in which it is deployed.

## RESULTS

### Gas level Monitoring

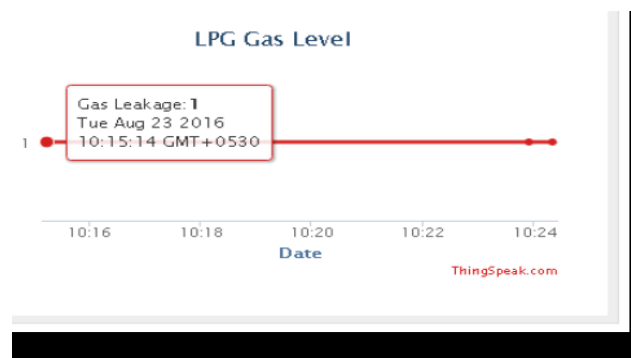
The below graph shows the updation in the internet through IoT for any change in the LPG gas level, there are only two levels that is either 0(low) level or 1(high) level. The gas is considered as low if the 0 level is appeared, else it is high if the level 1 is appeared.



**Figure 10.1** Gas level Monitoring

### Gas Leakage Alert

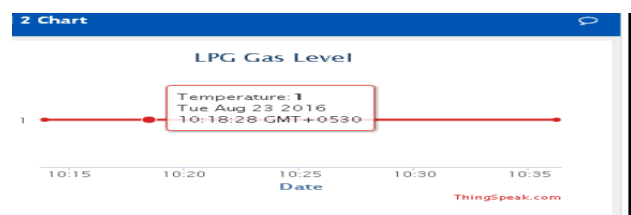
The below graph shows the status of the gas sensor which senses for any chance of gas leakage near & around the gas container, the sensor continuously keeps on sensing, if any change is observed then it is updated in the internet using IoT. If the level is at 1 then there is an gas leakage from the container.



**Figure 10.2** Gas Leakage Alert

### Temperature Alert

The graph below is the measure of the status of, the temperature sensor which measures the temperature near the gas container, to avoid any slight chance of the fire accident. If the level is at 1 then there is fire near the gas container, else it is quite normal near it.



**Figure 10.3** Temperature Alert

## COLCLUSION

Hence, from the above discussion we can conclude that the paper (Automatic Gas Booking using IoT & RF) is absolutely ethical for the application of the users who consume(use) gas in their daily life. It not only helps in making the work easier but also plays a major role in the security / avoidance of accidents to the user and helps in leading a easy life.

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