

# IOT BASED HOME SAFETY GAS LEAKAGE DETECTION AND AUTOMATIC BOOKING SYSTEM

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**Abstract--** Gas spillages causes a significant issue in family unit, in this way the proposed gas spillage identification and checking framework is created There are numerous strategies accessible for booking a Gas Refill, techniques incorporate web based booking, telephonic booking and so on. It will be difficult situation for the individual who uses LPG gas for cooking reliably. The aim of this paper is to introduce another framework consequently books a cylinder at the point when the gas is going to discharge is by sending a notice to the gas office using Wifi using Internet of Things approach In addition to that sensor is utilized to identify gas spillage at home. On the off chance that the gas spillage is sensed, the gadget continues ahead with ringer caution and showing ready message in LCD show at the same time switch on the fumes fan and turn over the DC engine, is made to kill the gas regulator, PIR sensor additionally put in the home to inform about the human nearness. In the event that no individual, naturally power off simultaneously the notice will be sent to client through versatile by notice calls and SMS. Wifi is one of the most utilized systems over the world. Henceforth, load cell has been utilized to screen the heaviness of the LPG gas consistently. The values are next taken care of to the Arduino microcontroller. By utilization of GSM Module, the data is sent to client by SMS and furthermore programmed booking is finished by dialing the enlisted gas booking number. Consequently, answer warning will be sent to the client about the booking status. This, work this causes the general public to explicitly demonstrate gas spillage and

*furthermore helps the two clients and the office to get the gas booking made consequently utilizing the IOT procedure.*

**Keywords:** *GSM module, gas sensor, PIR sensor, load cell, Arduino Uno, Internet of things.*

## **I. INTRODUCTION**

Internet of things try towards making life less complex what's more, quicker via robotizing the whole little errands related with the life of human. Today, everything is getting keen because of the innovative advancement, for example, of IOT. As IOT is valuable for robotizing the assignments, the upside of IOT can likewise be far reaching for improving the helpful security strategies.

Security plays a significant role while constructing home, buildings, industries as well as towns. The enlarged focus of certain gases in the environment can be exceptionally unsafe, in recent time, everyone needs a facility which reduces time and effort and expect their work to be as easy as possible. One such region where man wants to get the work quicker and simpler is cooking. Most ordinarily LPG is utilized for cooking reason which was presented by Dr.Walter Snelling. It is a amalgamation of propane and butane alongside soaked substance notwithstanding unsaturated hydrocarbon substance. Gas undertakings utilizes SMS, IVRS or Online reserving for the LPG, which is tedious strategies in individuals' day by day life.

However, due to fast nature and high competition, today people look for smarter way of operations than tedious and mechanical as well as manual routine. As such, booking gas has also become one of the tasks where one has tendency to either postpone or forget its booking due to busy schedule and lack of time. Usually in home or industries, most of the disaster happens due to gas leakages, which leads to several accidents and also causes human life. In order to handle such situation, the proposed gas leakage detection and monitoring system is developed and put forth in this paper.

In this layout MQ-6 sensor is used to detect and sense the gas leakage and the temperature sensor is also placed to reduce the false deduction. This proposed system is not only capable of Sensing or detecting the gas leakages as well as alerting the user about the gas leakage by buzzer alarm and also displaying alert message in LCD display simultaneously switch on the exhaust fan and start the stepper motor, external coupling is made to turn off the gas regulator. PIR sensor also placed in the home to notify about the human presence. If no person, automatically power off at the same time the notification

will be sent to user through mobile by warning calls and SMS.

## **II. LITERATURE SURVEY**

T. Machappa, M. Sasikala, and M. V. N. Ambika Prasad exhibited a framework that electrical obstruction increments with increment at intervals the grouping of the gas. The variation of resistance depends on the dopents of the polyaniline, like metal oxides, bimetal oxides (ceramics), etc. conduction, the variation of resistance of the sensing material is either by activity of atmospherically substance on the sensing surface and/or by direct reaction of lattice substance or gap substance with the check gases unit the gas sensing mechanism. throughout this the gas sensing behavior of polyaniline and polyaniline salt composites unit given.

Fabien Chraim, Yusuf Bugra Erol, Kris Pister had explained the gas leakage solution for industrial places. Since the leakage of gas in the industries are unknown, the gas sensors are kept around the places where the gas leakage is possible. The information from these sensors are then send to the single system. The two techniques used are fixed instrumentation and mobile sensing. The mobile sensors are placed in the suspective sources and the readings are evaluated in that spot. These readings are then transmitted to the users or workers through wireless connection. But the main drawback is that the localization accuracy is under 5m.

L.P.Deshmukh, T.H.Mujawar, M.S.Kasbe, S.S.Mule, J.Akhtar and N.N.Maldar provides the abstract design so as to watch the outpouring of LPG within the atmosphere. The Lab view programming environment is developed to connect large area. The leakage level of a gas concentration is done using the Lab view GUI. The nodes and network are configured in this program. The measurements which is taken by the sensor nodes through the coordinator node using USB and ZigBee interface are also captured in this program. When the system detects the gas leakage, it sends a SMS alert to the user and also it activates the alarm. The gas flow emission is also controlled by using the solenoid valve. The output of the system is supervised using the personal computer or laptop.

Kumar Keshamoni and Sabbani Hemanth planned the sensible Gas Level observance, Booking and Gas outpouring Detector victimization IoT. During this the gas amount within the instrumentation is ceaselessly monitored and it additionally intimates the various branch so as to position the new LPG cylinder. The Radio frequency module is used in order to make the user to use it easily and this module consists of the transmitter and receiver kit. The transmitter is an encoder kit which is fixed in the main board and the receiver is a decoder kit which is fixed in the sub board. In addition to easy usage, it also

have the advantage that it gives the same information. The temperature sensor is also used in order to detect the errors which occurs due to the surrounding environment. The main drawback in this system is that the use of processor instead of the controller and moreover there is no security for the user.

### III. PROPOSED SYSTEM

In this proposed system, the gas leakage is detected by gas sensor MQ6 which is interfaced by arduino and automatic booking is designed and this device will be a single system with multiple applications for LPG consumers. If the gas leakage is detected by LPG gas sensor the device gets on with buzzer alarm and displaying alert message in LCD display simultaneously switch on the exhaust fan and start the DC motor, external coupling is made to turn off the gas regulator and the temperature sensor is also placed to reduce the false deduction at the same time PIR sensor also placed in the home to notify about the human presence. If no person, automatically power off at the same time the notification will be sent to user through mobile by warning calls and SMS or Email. For automatic booking, Load cell which is also known as pressure sensor is used to detect the weight of the gas and the weight will be displayed through LCD. If the weight of the cylinder is below the threshold level automatically the new cylinder will be booked and the delivery information sendback to the consumer through GSM module.

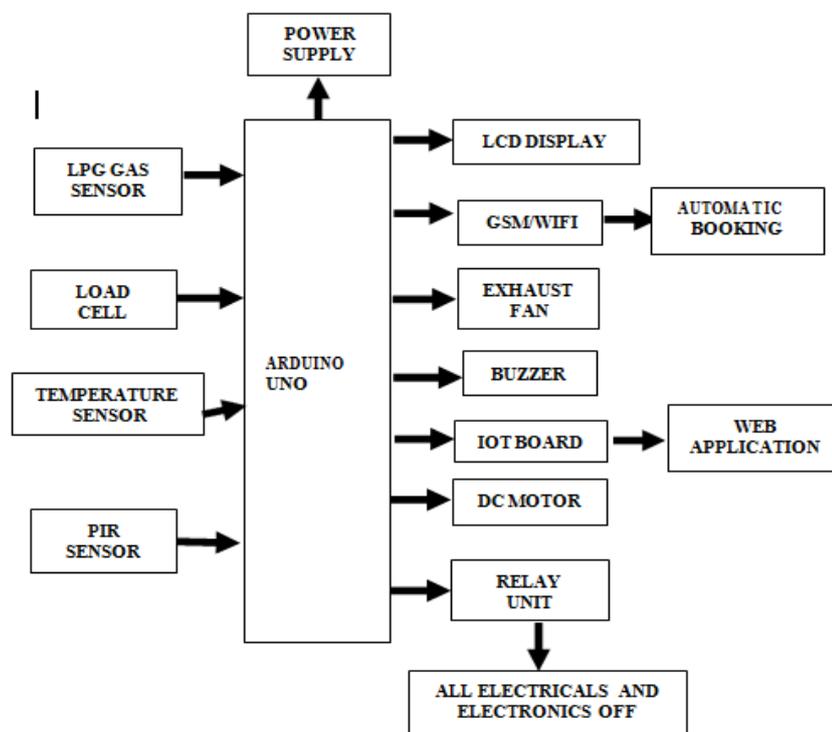


Figure 1 Gas leakage detection and automatic booking system

## **DESCRIPTION:**

### ***GAS SENSOR***

Gas Sensor (MQ-6) module is useful for gas leakage detecting. The sensitivity can be adjusted by the potentiometer. Sensitive material of MQ-6 gas sensing element is SnO<sub>2</sub>, that with lower physical phenomenon in clean air. The physical phenomenon of the sensing element is high once the flammable gas is detected. The resistance of the sensor is changed when the gaseous element comes in contact with the sensor. This change causes the change in voltage. This voltage change can be read in the microcontroller. There are different sensitivity values for various gaseous element. In this system the gas sensor is used to detect the gas leakage, if it senses the positive signal send to the arduino.



Figure 2 Gas sensor

### **LOAD CELL**

A Load cell which is also known as pressure sensor is used to detect the weight of the gas. The load cells are used to provide the accurate weight. Strain gauge is used in most of the load cells for the accurate measurement. The driving voltage if the load is about 5 to 10V. The accuracy rate is less than 0.1% of the full scale. In this proposed system it is used to calculate the weight of the cylinder and also given the reference weight if it reaches below send the signal which is interfaced with Arduino.



Figure 3 Load cell

### **TEMPERATURE SENSOR**

A temperature sensor is a device, typically, a thermocouple or RTD, that gives temperature measurement through an electrical signal. A thermocouple (T/C) is has two dissimilar metals that generate electrical voltage in directly proportion to changes in temperature. An RTD (Resistance Temperature Detector) is a variable resistor that will change its resistance in proportion to change in temperature in nearly linear manner. In this system it used to avoid the false detection.



Figure 4 Temperature sensor

### **PIR SENSOR**

PIR sensor is a passive infrared sensor is an electronic sensor that measures infrared (IR) light radiating from objects in its field of view. This sensor is used for motion detectors. In this proposed system this sensor is used to detect about the human presence in the home. In this system gas leakage is detected at that time PIR sensor is sensed, if no person automatically shut down the power.



Figure 5 PIR sensor

### **ARDUINO**

The Arduino Uno board may be a microcontroller supported the ATmega328. There are 14 digital input/output pins. Among this, six pins square wave used as PWM outputs, a sixteen megacycle ceramic resonator, an ICSP header, a USB association, six analog inputs, an influence jack and a button that contains all the desired support required for microcontroller. This can be then connected to a laptop with a USB cable or with a AC- to-

DC adapter or battery to urge started. FTDI USB-to-serial driver chip don't seem to be employed in them and it's totally different from all different boards. it's featured by the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial device. In this system all the sensor readings given to this board to do the further process.



Figure 6 Arduino UNO

### LCD DISPLAY

LCD (liquid crystal display) contains two interfaces on upper and lower side of the module. the 16x2 LCD display has the height and width size of 80.0 x 36.0 mm and containing VA size of 66.0 x 16.0 mm and thickness is 13.2 mm. its operating power supply ranges from +5.0 V or +3.0 V. In this system LCD is used to display the alert message i.e “LPG leakage detected” is displayed when the leak is detected by sensor and also LCD is used to display the weight of the cylinder.



Figure 7 LCD Display

### GSM module

GSM could be a mobile communication modem; it's stands for world system for mobile communication (GSM). GSM is employed for transmission mobile voice and knowledge services. They're operated at the 850MHz, 900MHz, 1800MHz and 1900MHz frequency bands that is an open and digital cellular technology. standing indicator can flashes unceasingly whenever the decision arrives otherwise it's left ON. Network junction rectifier can blink each second that indicates that the GSM module isn't connected to the

mobile network. The LED blink continuously for every 3 seconds, when the connection is established and in off state when the connections aren't established. In this system it is used to send the message or calls to the user and also the added contacts such as fire station, ambulance number. whatever the number we have stored it able to send the intimation to avoid the accident and the new cylinder is automatically booked, if we store the gas agency number and the SMS messages on user mobile phone, send by this module. The message "CYLINDER BOOKING MESSAGE IS SENT TO GAS AGENCY" is sent to the user when the LPG gas reaches to minimum threshold level. So the user comes to know Cylinder booking is done.



Figure 8 GSM module

### **EXHAUST FAN**

Exhaust fan is used to pull excess moisture and unwanted odours out of a particular room or area. In this system it is placed when the gas leakage is detected by sensors it gets on by relay unit it runs by battery it is used to pull the gas out and also protect from harmful gas leakage.

### **BUZZER**

A buzzer is an audio signaling device which is capable of controlling microcontrollers IO directly, with the working voltage of 5V. In this system buzzer alarm is placed, when the gas is leaked it gives an audio sound to intimate about the gas leakage. By this we can able to be alert before accidents.



Figure 9 BUZZER

## IOT BOARD

IOT is an environment in which objects, or people are provided with unique identifiers and the ability to transfer data over a network without requiring human-to- human or human to computer interaction. An IOT is microcontroller unit (MCU) or development board is a prototyping solution that have low-power processors which support various programming environments, collect sensor data and transfer it to an cloud-based server. In this system IOT board is used to send the notification to the user by message when the gas is leaked. The sensor readings and the weight of the LPG is interfaced with arduino board and transferred to the cloud via IOT.

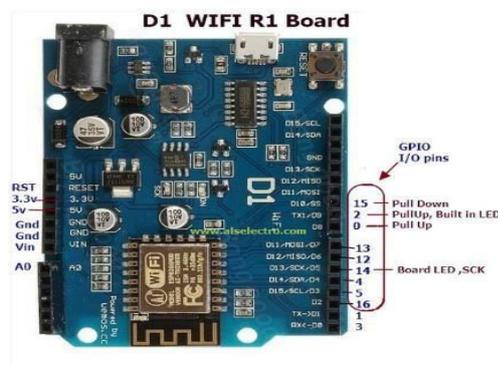


Figure 10 IOT Board

## DC MOTOR

The rule of DC motor is the making of pivoting magnet inside the portable piece of the engine, rotor. Engine shows settled magnet and rotor demonstrates a turning magnet. The power for the stator electromagnet is provided by particular DC source. The relative point between these magnets is kept up almost 90 degrees. At the point when a gas spill happens this checking framework detects the break by methods for a sensor and the esteem is given to the arduino. The estimation of lower and larger amount of spillage is given regarding paired arrangement. At that point the guidance is given to the engine to close the handle. If the gas spillage is happens it turn off the Gas regulator. At that point after this controlling measure, the spillage message is sent to the client and fire station.



Figure 11 DC Motor

## **RELAY UNIT**

A relay is an electrical switch which is used to control all other electronic devices by using electromagnetic mechanical toggle. In this system relay is interfaced with arduino board if the gas is leaked without the human presence, relay will shut down all the electricals in the house and also another relay is placed to turn on the exhaust fan. Relay unit is mainly used to turn on or off the electricals.

## **WEB APPLICATION**

The web application consists of login page where the user can login using username and password. After successful login the user can view the weight of the cylinder, booking details and the delivery information and also the call records made for the gas agency. The user can get the notification from the server through IOT transferred from arduino when the gas leakage happens, if they have the active login.

## **IV. METHODOLOGY**

**Step1:** Gas leakage detection through sensors which is interfaced through arduino. Regular input for any form of gas leakage is checked through an MQ-6 gas sensor. If there is any change in the environment, i.e. presence of LPG gases (at least 7% presence) then a positive signal is sent to the arduino microcontroller.

**Step2:** The positive signal from the gas detection which would make the alarm ring and alert message in LCD display “LPG leakage detected” displayed when the leak is detected by sensor simultaneously switch on the exhaust fan.

**Step 3:** The DC motor is placed to turn off the gas regulator the temperature sensor is also placed to reduce the false deduction and the signal would also send message to the user through server.

**Step 4:** While the alarm is switched on, another signal is sent to check human presence. This is done by a PIR sensor. This PIR sensor sends a constant detection of the

surrounding. The timer present would backtrack to 5 minutes. If still there is no human detection, there would be signal sent to the Arduino.

**Step 5:** The signal from the Arduino if found negative after 5 minutes, then a signal would be sent to turn off the main power. The power switched off using relay unit which would be attached on the arduino microcontroller.

**Step 6:** Load cell which is also known as pressure sensor is used to detect the weight of the gas and the weight will be displayed through LCD display.

**Step 7:** If the weight of the cylinder is below the threshold level automatically the new cylinder will be booked and the delivery information send back to the consumer through GSM module.

**Step 8:** The results from the sensors are transferred from the arduino board to the server via IOT board. The user is viewed in the web application. where the user can login using username and password. By this application user can view the weight of the cylinder, booking details and the delivery information and also the call records made for the gas agency and also get the notification if the gas leakage is detected by sensors.

## V. ADVANTAGES

- Our system helps customers to upgrade their safety and protect life and property from reputed accidents.
- We can able to observe the amount of the gas and also the gas leak.
- By this system, the users can be aware of their gas level and it also avoids the prior and delay booking of the cylinder.
- The system is much more efficient and also the sensor used in the system MQ-6, is in constant detection of any change in the environment. Immediate action is taken if there is an accidental leakage insuring 100% safety.
- The proposed system helps the LPG gas customers to lead a pleasant life.

## VI. RESULT

The proposed system is developed to detect and monitor the LPG ,when a small amount of LPG is brought near the MQ6 sensor, it display the message in LCD i.e “GAS

LEAKAGE” at the time of leakage of the gas and the system monitors the LPG level and displays the message “HIGH or LOW”. As in recent times, the problems that are faced by the LPG gas customer is gas leakages and booking issues, the developed system will be helpful to the customer. It helps them to upgrade their safety norms and aids to prevent the major disaster. It also helps in protecting life and property from apparent accidents. The primary aim of this proposed system is therefore to detect the gas leakage which is detected through gas sensor and user should be notified to prevent injury or outburst. The secondary aim is to detect the weight of the gas remaining in the cylinder which can be done through weight sensor and book the cylinder automatically and the message “CYLINDER BOOKING MESSAGE IS SENT TO GAS AGENCY” is sent to the user when the LPG gas reaches to minimum threshold level. So the user comes to know Cylinder booking is done.

## **VII. CONCLUSION**

Internet of Things has gained its wide popularity in recent days due to its various streams of applications which has paved way for smooth, safe and easier mode of living style for human beings. One such area of applications includes gas booking and gas leakage detection for both domestic and commercial purposes. Though, several techniques is existing for the same, yet gas leakage detection is one major concern and a challenge always. The new proposed system which is microcontroller based application of gas booking and gas detection systems using IOT. The sensor used in this model can sense and detect the leakage of the gas and the user gets notification regarding gas leakage and can also monitor the cylinder weight it can be taken to pre-book the new cylinder automatically. This proposed system can be useful in marketing sectors like hotels, shop etc. The main intention of this work is to ensure safe and easier way of gas booking and gas leakage detection to avoid disasters that may occur due to negligence.

## **VIII. FUTURE SCOPE**

Voice feedback system can be included in GSM based LPG weight and LPG leakage detection system. User will get intimation through pre-recorded voice messages like the weight of gas Cylinder is ABC kg. In future, some other wireless technology can be used to sense gasses and can be helpful for control of gas leakage. A robot has been utilized in trading human for taking care of different errands in a risky and perilous working environment where human life may in danger. A portable gas detecting robot can be built to detect the spillage of gas through pipelines as the robot can proceed onward a track which is arranged along the length of pipeline.

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