Gas Leakage Detection and Automatic Gas Booking Alert System using IOT

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Abstract:- 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 alarm. If gas leakage occurs, this system detects it and makes an alert by buzzing the buzzer attached with the circuit. This system is easy to build and anyone who have some knowledge of electronics and programming can build it. We have used a LPG gas sensor module to detect LPG Gas. When LPG gas leakage occurs, it gives a HIGH pulse on its DO pin and Arduino continuously reads its DO pin. When Arduino gets a HIGH pulse from LPG Gas module it shows "LPG Gas Leakage Alert" message on 16x2 LCD and activates buzzer which beeps again and again until the gas detector module doesn't sense the gas in environment. When LPG gas detector module gives LOW pulse to Arduino, then LCD shows "No LPG Gas Leakage" message.

Keywords: IOT,GSM,MQ2 gas sensor, Weight sensor(Load cell),

INTRODUCTION

The main objective of this research is automatic protection from the LPG (Liquefied Petroleum Gas) leakage or reduction of the hazards that can be caused due to unawareness of the user about the gas leakage and also providing an automatic gas booking facility by applying advance communication technology. If there is any gas leakage from storage tank, service station or from the automobile then a buzzer will turn ON and an alert message will be sent to a pre-set mobile number by using GSM (Global System for Mobile communication) technology. Sound from the alarm as well as message in the mobile number will give valuable suggestion to the users so that they can prevent themselves from dangerous effect of LPG gas leakage. Proposed model notifies alert to people before any leakage from the gas cylinder and also automatically books for refilling of gas from the gas booking centre before the cylinder gets empty.

HARDWARE REQUIREMENTS

1. GSM module
2. Arduino UNO
3. MQ2 sensor
4. Weight Sensor(Load cell)
5. LCD Display

SOFTWARE REQUIREMENTS

1. Arduino UNO
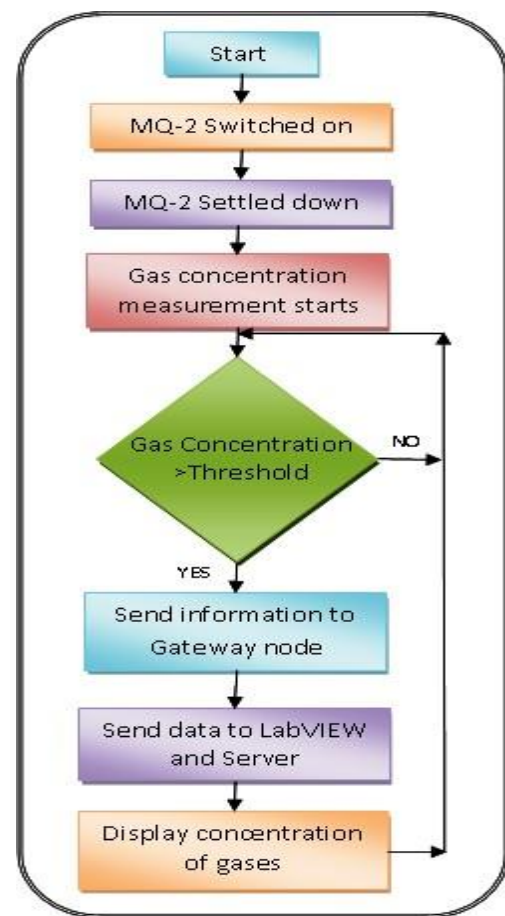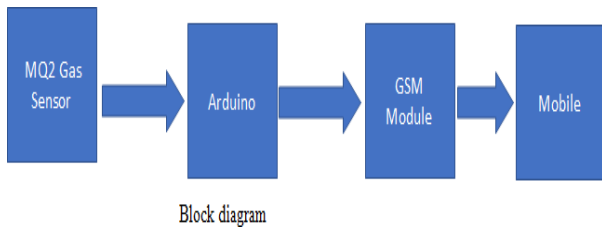
BLOCK DIAGRAM OF THE SYSTEM

Figure. Gas leakage Monitoring system block diagram.

BLOCK DIAGRAM DESCRIPTION:

As shown in the schematic diagram below, it contains Arduino board, LPG GAS Sensor Module, buzzer and LED. Arduino controls the whole process of this system like reading LPG Gas sensor module output, sending message to User's Mobile and activating buzzer. We can set sensitivity of this sensor module by inbuilt potentiometer placed on it.

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Block diagram

GLOBAL SYSTEM FOR MOBILE (GSM)

Worldwide System for Mobile Communications (GSM) is the world's most prevalent standard for portable communication frameworks. The GSM Association assesses that 80% of the worldwide portable market utilizes the standard. GSM is utilized by over 1.5 billion individuals crosswise over in excess of 212 nations and domains. This pervasiveness implies that endorsers can utilize their telephones all through the world, empowered by global wandering game plans between portable system administrators. GSM contrasts from its antecedent advances in that both flagging and discourse channels are computerized, and in this manner GSM is viewed as a second era (2G) cell phone framework. This likewise encourages the wide-spread usage of information correspondence applications into the framework.

The GSM standard has been favourable position to the two purchasers, who may profit by the capacity to meander and switch bearers without supplanting telephones, and furthermore to arrange administrators, who can pick gear from numerous GSM hardware sellers. GSM likewise spearheaded minimal effort execution of the short message administration (SMS), additionally called content informing, which has since been bolstered on other cell phone guidelines too.

SUBSCRIBER IDENTITY MODULE (SIM):

An endorser character module (SIM) on a removable SIM card safely stores the administration supporter key (IMSI) used to distinguish an endorser on versatile communication gadgets, (for example, cell phones and PCs). The SIM is a little shrewd card which contains both programming and data. It gives the real character to the endorser. Amid beginning enrolment all the applicable endorser information are embedded into the SIM card and the movement is known as personalization. A cell phone can't make or get any calls aside from crisis calls without a SIM. Each SIM card is enlisted in a specific GSM network(HPLMN), and can be perceived by another system just if the HPLMN have understanding between themselves to help the endorser, i.e., the supporter has meandering office.

GAS SENSOR(MQ2)

Grove - Gas Sensor (MQ2) detects combustible gasses and smoke. The Grove -Gas Sensor (MQ2) module is useful for gas leakage detection (in home and industry). It can detect combustible gas and smoke. The output voltage from the Gas sensor increases when the concentration of gas.

MQ2 gas sensor can be used to detect the presence of LPG, Propane and Hydrogen, also could be used to detect Methane and other combustible steam, it is low cost and suitable for different application. Sensor is sensitive to flammable gas and smoke. Smoke sensor is given 5 Volt to power it. Smoke sensor indicate smoke by the voltage that it output more smoke more output. A potentiometer is provided to adjust the sensitivity. Sn02 is the sensor used which is of low conductivity when the air is clean. But when smoke exist sensor provides an Analog resistive output based on concentration of smoke. The circuit has a heater. Power is given to heater by VCC and GND from power supply. The circuit has a variable resistor. The resistance across the pin depends on the smoke in air in the sensor. The resistance will be lowered if the content is more. And voltage is increased between the sensor and load resistor.

Working/ measuring principle of Gas sensor
The MQ2 has an electrochemical sensor, which changes its resistance for different concentrations of varied gasses. The sensor is connected in series with a variable resistor to form a voltage divider circuit , and the variable resistor is used to change sensitivity. When one of the above gaseous elements comes in contact with the sensor after heating, the sensor's resistance change. The change in the resistance changes the voltage across the sensor, and this voltage can be read by a microcontroller. The voltage value can be used to find the resistance of the sensor by knowing the reference voltage and the other resistor's resistance. The sensor has different sensitivity for different types of gasses.

SPECIFICATIONS
➢ Power Supply: 4.5V to 5V DC
➢ High sensitivity to Propane, Smoke, LPG and Butane
➢ Wide range high sensitivity to Combustible gases
➢ Long life and low cost
➢ Analog and Digital output available
➢ Onboard visual indicator (LED) for indicating alarm
➢ Compact design and easily mountable
➢ Simple 4 PIN header interface
➢ Supply voltage =5v

WEIGHT SENSOR (LOAD CELL)

A barrel from a wholesaler to book, we should know ahead of time of measure of gas in the chamber, and for this reason the dimension of gas present in the chamber must be observed persistently. We have utilized strain measure as a weight sensor. The capacity of strain gage is to give yield voltage according to the power/weight connected to it. Sensor changes over the

connected power into comparing electrical flag. The yield of weight sensor is in simple structure. It is given to a Digitizer board which accompanies this weight sensor. Capacity of Digitizer board is to give advanced yield which is corresponding to simple information gotten from weight sensor. This advanced yield is given to microcontroller for further handling.

We have utilized a weight sensor of 40 kg limit. So 40 kg is the greatest weight that can be connected to this weight sensor.

METHODOLOGY

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

GAS LEAKAGE DETECTION

In this model, gas spillage recognition has been given a most elevated need. MQ2 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 cell numbers 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 $<=2$ Kg, a rationale high heartbeat is encouraged to a port stick of microcontroller. As this stick goes high, microcontroller will send a booking message to wholesaler of organization, "REG_AMARGAS_12345". In the meantime, the message will be shown on LCD as "Need a new Gas Cylinder". At the point when the heaviness of the gas goes beneath 0.5 kg another rationale high heartbeat is encouraged to another port of microcontroller through a hand-off circuit as talked about in truth table. As this port stick goes high, microcontroller will communicate something specific as "Gas staying just 0.5 Kg. Promptly Refill your Cylinder" through a GSM module to cell numbers required individuals and the message "Barrel Empty, Please Refill" is shown on the LCD show.
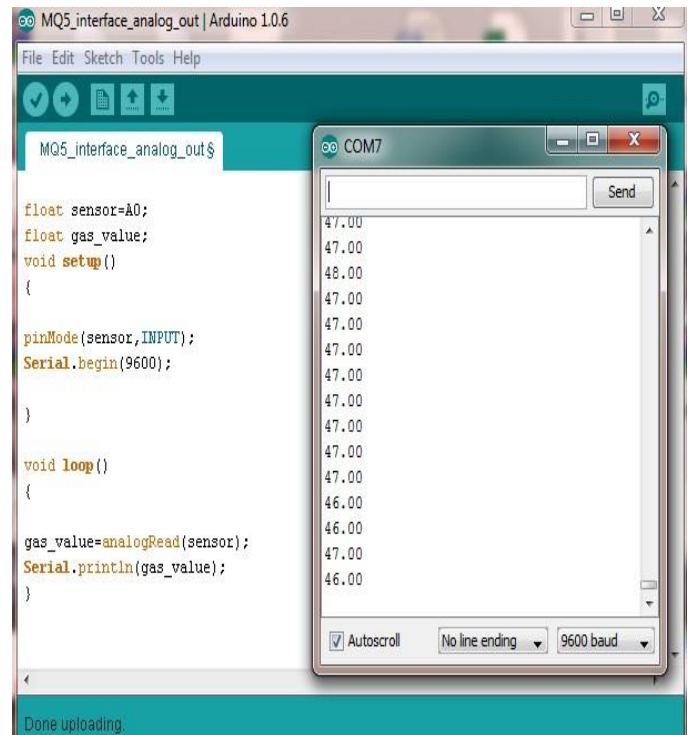
RESULTS

Figure. Circuit Diagram of overall system output.

Figure. Load cell measurement

DESCRIPTION OF THE CIRCUIT DIAGRAM
OPERATION OF CIRCUIT

The working of any advanced system is mainly dependent on the microcontroller which controls the entire functioning of the device. In this case the Arduino Uno microcontroller acts like a conditional switch. It performs two set of action depending upon the condition present. It triggers the buzzer and the LCD to display the message "Gas Leak" when the leakage of the gas is detected by the sensor. The other action is to display the message on LCD "No Gas Leak" when the leakage of the gas is not detected by the sensor. If the sensor detects the presence the gas in the vicinity the GSM module will send "Gas Leak" message to the relevant contacts. If no gas is detected by the sensor in the vicinity then the GSM module will not send any messages. GSM module is included in this device to make the stakeholders aware about the leakage of gas taking place at their house in their absence so that necessary actions can be

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implemented immediately to prevent an accident. The working of the Simple Gas Leak detector can be summarized in the figure

CONCLUSION

The main advantage of this simple gas leak detector is its simplicity and its ability to warn its stakeholders 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 audio – 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 stakeholders 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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