

# Gas Leakage Monitoring & Alerting System for Industries

<b>PROJECT NAME</b>	GAS LEAKAGE AND MONITORING &ALERTING SYSTEM FOR INDUSTRIES
<b>TEAM ID</b>	PNT2022TMID09820
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<b>BRANCH</b>	ELECTRONICS AND COMMUNICATION ENGINEERING

## ABSTRACT

liquefied petroleum gas (LPG), also called LP gas, any of several liquid mixtures of the volatile hydrocarbons propene, propane, butene, and butane. A typical commercial mixture may also contain ethane and ethylene, as well as a volatile mercaptan, an odorant added as a safety precaution. The presence of hazardous LPG gas leakage in a domestic, work place, also, stored gases container gas which exhibits ideal characteristic is use. For that sake, an alarm unit is used to vibrate an alarm which is buzzer. Buzzer gives an audible sign of the presence of LPG volume. The sensors are widely used to detect essence of propane, iso-butane, LPG and even smoke. The sensor has an advantage to combine a sensitivity response time. If the LPG sensor senses gas leak from work place or home, sensor output goes to active low [logic-0]condition. Arduino UNO is used in the project; low signals are overlooked by the Arduino and gas leakage is been noticed by the Arduino. The Arduino UNO turns on the LCD and buzzer. It even turns on the GSM modem after that, it continues to send messages SMS to mobile number specifically mentioned in the program of the source code for alerting danger to the people. The system has been tested and it is able to monitor gas wastage, leakage and send a SMS to the user. The resulting performance indicated its effectiveness toward saving a significant portion of the wasted gas in domestic

## INTRODUCTION

LPG consists of mixture of gases like propane and butane. These gases can catch fire easily. LPG is used as propellant, fuel and as a refrigerant. When a leak occurs, the leaked gases may lead to explosion. The number of deaths occurring due to explosion of gas cylinders has increased. So the leakage should be controlled to protect people from danger. Bhopal gas tragedy is an example for accidents due to gas leakage. Gas leakage detection is not only important but controlling the leakage is also important.

Liquid petroleum gas is generally used in houses and industries. In homes, LPG is used mainly for cooking purpose. This energy source is primarily composed of propane and butane which are highly flammable chemical compounds. LPG leaks can happen, though rarely, inside a home, commercial premises or in gas powered vehicles. Leakage of this gas can be dangerous as it enhances the risk of explosion. An odorant such as ethanethiol is added to LPG, so that leaks can be detected easily by most people. However, some people who have a reduced sense of smell may not be able to rely upon this inherent safety mechanism. In such cases, a gas leakage detector becomes vital and helps to protect people from the dangers of gas leakage. Now a days the home safety detection system plays the important role for the security of people. Since all the people from the home goes to work on daily bases it makes impossible to check on the appliances available at home specially LPG gas cylinder, wired circuits, Etc. Since last three years there is a tremendous hike in the demands of liquefied petroleum gas (LPG) and natural gas.

To meet this excess amount of demand for energy and replace oil or coal due to their environmental disadvantage, LPG and natural gas are preferred. These gases are mostly used on large scale in industry, heating, home appliances and motor fuel. So as to track this leakage gas, the system includes MQ6 gas sensor. This sensor senses the amount of leak gas present in the surrounding atmosphere. Through this, explosion or getting affected by the leakage of gas could be avoided.

## **OBJECTIVE:**

The design of a sensor-based automatic gasleakage detector with an alert and control system has been proposed. This is an affordable, less power using, lightweight, portable, safe, user friendly, efficient, multi featured and simple system device for detecting gas. Gas leakage detection will not only provide us with significance in the health department but it will also lead to raise our economy, because when gas leaks it not only contaminates the atmosphere, but also wastage of gases will hurt our economy. The need for ensuring safety in workplaces is expected to be the key driving force for the market over the coming years.

## **PROBLEM FORMULATION:**

Gas leakage is nothing but the leak of any gaseous molecule from a stove, or a pipeline, or cylinder etc. This can occur either purposefully or even unintendedly. As we are aware that these kinds of leaks are dangerous to our health, and when it becomes explosive it could cause great danger to the people, home, workplace, industry and the environment.

Few of the major incidents that took place due to gas leakage include the Bhopal Disaster and the Vizag Gasleak. The Bhopal disaster is known to be the worst industrial accident ever. Approximately 45 tons of Methyl Isocyanate was leaked from this insecticide plant. Methyl Isocyanate is an organic compound and a chemical that could come from the carbamate pesticides.

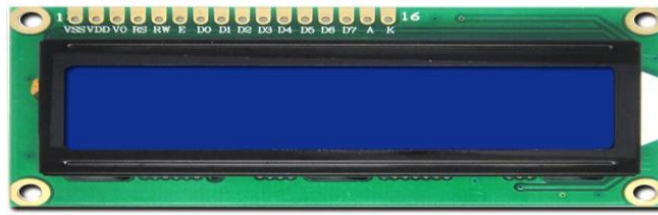
This colorless, poisonous and flammable liquid is something that human beings have to be away from. Vizag Gas leak was a resultant of the escape of styrene that were unattended for a long period.

This colorless oily liquid can spread in fumes. So, a detector must be made in such a way that could detect any kind of gas, fume, leak, smoke etc. However harmful and dangerous it can be, the detector could be attached with certain parameters that could help to prevent the issue.

## LIST OF COMPONENTS:

S.NO	NAME OF THE COMPONENT	QUANTITY
1	LCD 16 *2	1
2	Arduino Uno R3	1
3	1 k ohm Resister	4
4	Peizo	1
5	Gas Sensor	1
6	Red LED	1
7	Green LED	1
8	4.7 k ohm Resister	1
9	250 k ohm Potentiometer	1

## **LCD 16\*2:**



16×2 LCD is one kind of electronic device used to display the message and data. The term LCD full form is Liquid Crystal Display. The display is named 16×2 LCD because it has 16 Columns and 2 Rows. it can be displayed (16×2=32) 32 characters in total and each character will be made of 5×8 Pixel Dots. These displays are mainly based on multi-segment light emitting diodes. There are a lot of combinations of display available in the market like 8×1, 8×2, 10×2, 16×1, etc. but the 16×2 LCD is widely used. These LCD modules are low cost, and programmer-friendly, therefore, is used in various DIY circuits, devices, and embedded projects.

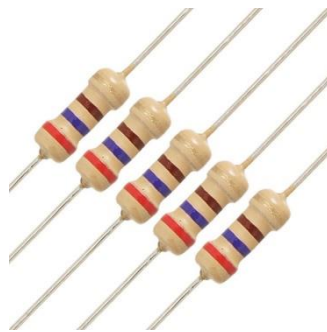
## **ARDUINO UNO R3:**



Arduino Uno R3 is one kind of ATmega328P based microcontroller board. It includes the whole thing required to hold up the microcontroller; just attach it to a PC with the help of a USB cable, and give the supply using AC-DC adapter or a battery to get started. The term Uno means “one” in the language of “Italian” and

was selected for marking the release of Arduino's IDE 1.0 software. The R3 Arduino Uno is the 3rd as well as most recent modification of the Arduino Uno. Arduino board and IDE software are the reference versions of Arduino and currently progressed to new releases. The Uno-board is the primary in a sequence of USB-Arduino Board, & the reference model designed for the Arduino platform.

## **RESISTER:**



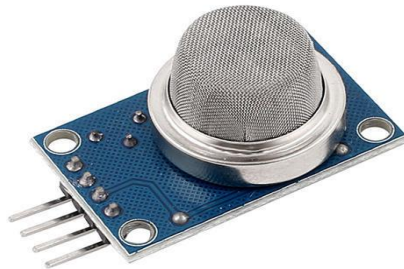
The resistive element in carbon composition resistors is made from a mixture of finely powdered carbon and an insulating material, usually ceramic. A resin holds the mixture together. The resistance is determined by the ratio of the fill material (the powdered ceramic) to the carbon. A passive electrical component with two terminals that are used for either limiting or regulating the flow of electric current in electrical circuits.

## **PIEZO:**



A piezo is a device that generates a voltage when force is applied or becomes deformed when voltage is supplied. They are based on the principle of electromechanical energy conversion and primarily measure force, as well as other quantities such as pressure, acceleration, temperature, and strain by converting the acquired data to an electrical charge.

## **GAS SENSOR:**



A gas sensor is a device which detects the presence or concentration of gases in the atmosphere. Based on the concentration of the gas the sensor produces a corresponding potential difference by changing the resistance of the material inside the sensor, which can be measured as output voltage. Based on this voltage value the type and concentration of the gas can be estimated.

## **LED:**





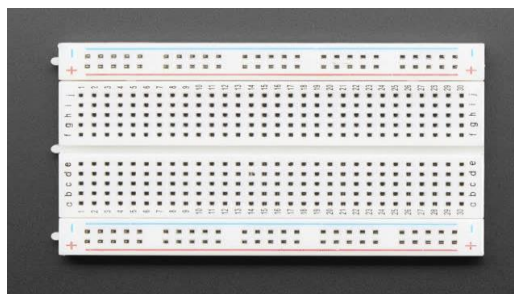
LED (Light Emitting Diode) is an optoelectronic device which works on the principle of electro-luminance. Electro-luminance is the property of the material to convert electrical energy into light energy and later it radiates this light energy. In the same way, the semiconductor in LED emits light under the influence of electric field. The symbol of LED is formed by merging the symbol of P-N Junction diode and outward arrows. These outward arrows symbolise the light radiated by the light emitting diode.

### **POTENTIO METER:**



A potentiometer is an instrument for measuring voltage or 'potential difference' by comparison of an unknown voltage with a known reference voltage. If a sensitive indicating instrument is used, very little current is drawn from the source of the unknown voltage.

### **BREAD BOARD:**



A breadboard is a widely used tool to design and test circuit. You do not need to solder wires and components to make a circuit while using a bread board. It is easier to mount components & reuse them. Since, components are not soldered you can change your circuit design at any point without any hassle. It consist of an array of conductive metal clips encased in a box made of white ABS plastic, where each clip is insulated with another clips. There are a number of holes on the plastic box, arranged in a particular fashion. A typical bread board layout consists of two types of region also called strips. Bus strips and socket strips. Bus strips are usually used to provide power supply to the circuit. It consists of two columns, one for power voltage and otherfor ground. Socketstrips are used to hold most of the components in a circuit. Generally it consists of two sections each with 5 rows and 64 columns. Every column is electrically connected from inside.

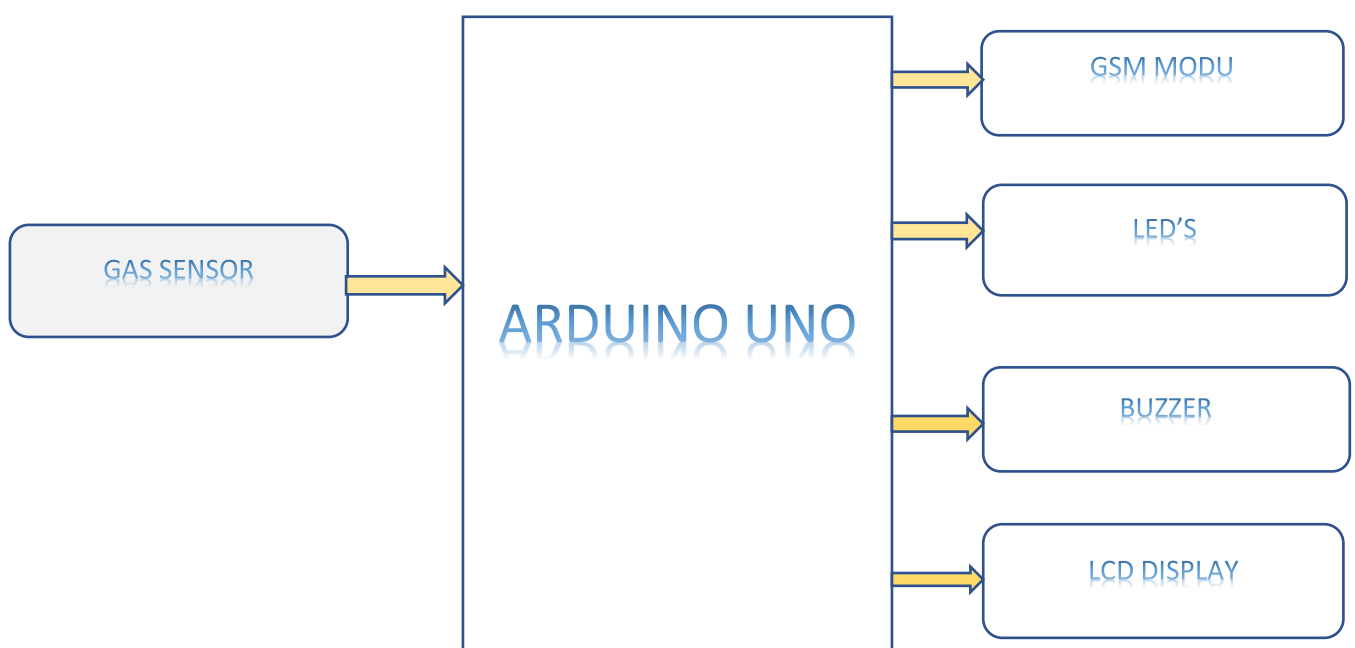
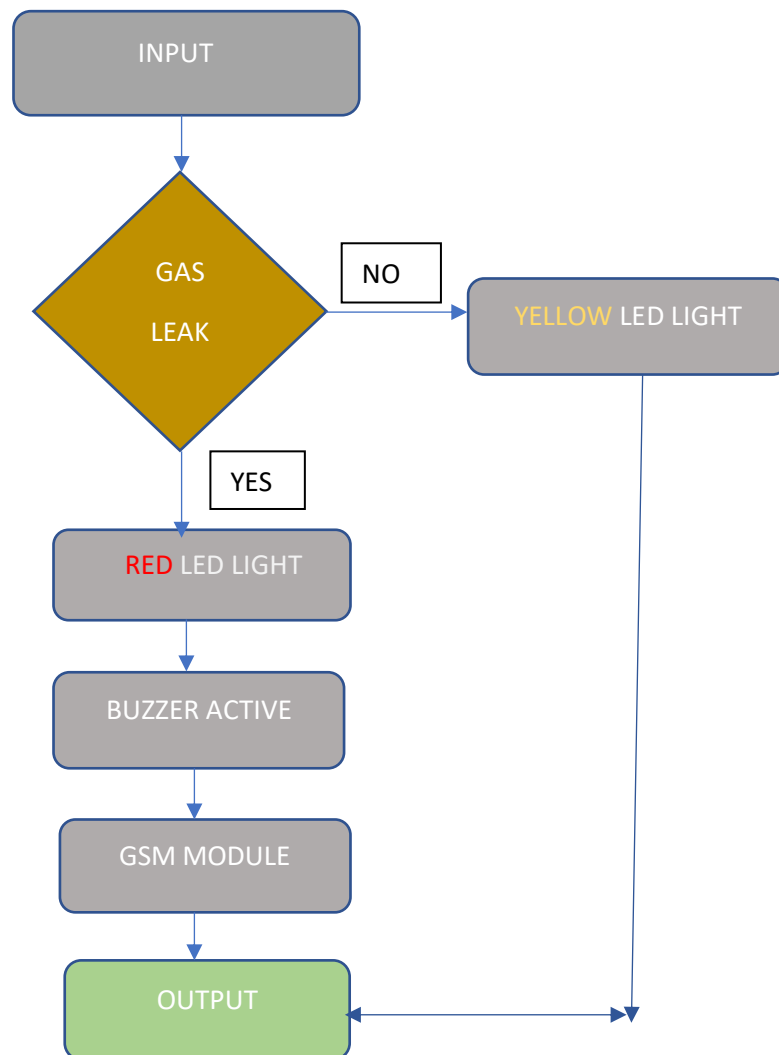
## **PROPOSED METHOD:**

The proposed system takes an automatic control action after the detection of 0.001% of LPG leakage. Arduino UNO is the main unit of the system which performs the following tasks.

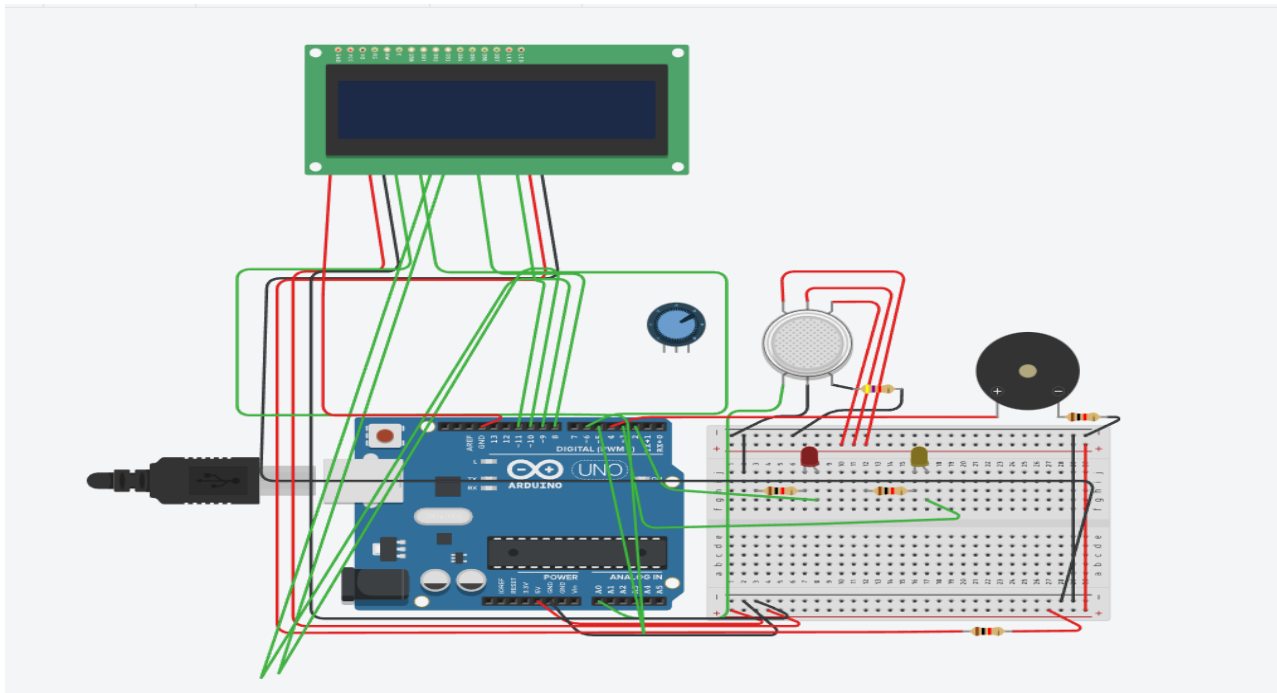
A signal conditioning of the Arduino UNO is done by output signal of the sensor, provided input to Arduino. The detection results displayed on LCD. Indicates the people of danger in work place, factory, home. Buzzer activity with beep(siren) sound is made. Also send alert SMS to the in charge of the plant whose number issaved in SIM card by using GSM modem. The SMS received depends upon the leak of gas in the detection area of the sensor.

By using a GSM module, we are sending an alert message i.e SMS (Short messaging services) to warn the users about the LPG leakage and a buzzer is provided for alerting the neighbors in case of the absence of the users about the LPG leakage. The aim of this system is to reduce the probability of explosion due to gas leakage.

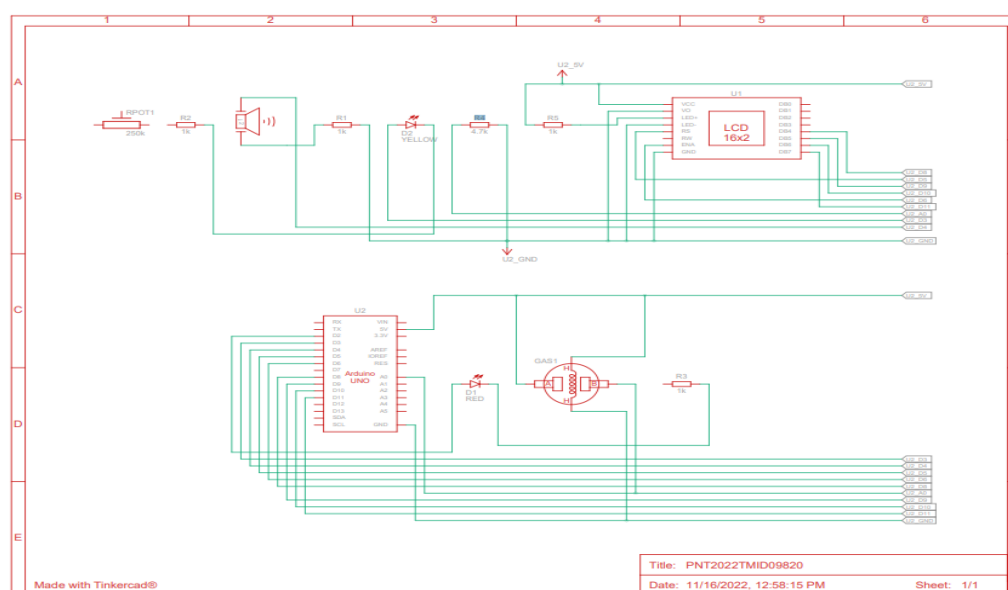
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### CIRCUIT DIAGRAM:



**SCHEMATIC VIEW:**



## **LITERATURE SURVEY:**

**Hina Ruqsar, Chandana R , Nandini R , Dr. T P Surekha ,** have proposed a system that along with monitoring and detection of gas leakage, real time data is made available through real time feed over internet They have used Xively IOT platform to provide real time sensor data over the internet.

**Falohun A.S., Oke A.O., and Abolaji B.M. 2016,** in this paper they proposed their dangerous gas detection using an integrated circuit and MQ-9. In this basically, they used an embedded design which includes typical input and output devices include switches, relays, solenoids, LEDs, small or custom LCD displays, radio frequency devices, and sensors for data such as temperature, humidity, light level etc. Embedded systems usually have no keyboard, screen, disks, printers, or other recognizable I/O devices of a personal computer, and may lack human interaction device. The amount and type of detectors and the type of fire alarm system that one chooses for property protection will depend on the owner's property protection goals, the value of the property and there requirements of the owner's insurance company. Generally, heat detection will be used in all areas that are not considered high value. Here again, one of the most common mistakes in fire alarm generally, heat detection will be used in all areas that are not considered high value. Here again, one of the most common mistakes in fire alarm system application is to provide partial protection of a building and expect high performance from the installed systems of any kind. System application is to provide partial protection of a building and expect high performance from the installed systems of any kind.

**Asmita Varma, PrabhakarS, Kayalvizhi Jayavel 2017,** have proposed a system that along with gas leakage detector is promising in the field of safety. The Topic of this paper is Gas leakage detection and smart alerting and prediction using IoT

**Srinivasan, Leela,Jeyabharath, Kirthik,Rajasree,** in this research paper they told about gas leakage detection and control. In this paper, the gas leakage resulting into fatal inferno has become a serious problem in house hold and other areas where household gas is handled and used. It alerts the subscriber through the alarm and the status display besides turning off the gas supply valve as a primary safety measure.

**Shital Imade, Priyanka Rajmanes, Aishwarya Gavali 2018**, in this paper they proposed to use IOT technology for enhancing the existing safety standards. While making this prototype has been to bring a revolution in the field of safety against the leakage of harmful and toxic gases

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## **SOLUTION STATEMENT:**

The system can be taken as a small attempt in connecting the existing primary gas detection methods to a mobile platform integrated with IoT platforms. The gases are sensed in an area of 1m radius of the rover and the sensor output datas are continuously transferred to the local server. The accuracy of sensors are not upto the mark thus stray gases are also detected which creates an amount of error in the outputs of the sensors, especially in case of methane. Further the availability and storage of toxic gases like hydrogen sulphide also creates problems for testing the assembled hardware. As the system operates outside the pipeline, the complication of system maintenance and material selection of the system in case of corrosive gases is reduced. Thus the system at this stage can only be used as a primary indicator of leakage inside a plant.

## **CONCLUSION:**

Gas leakage leads to severe accidents resulting in material losses and Human Injuries. Gas Leakage occurs mainly due to poor maintenance of equipment sans inadequate awareness of the people. Hence the Gas leakage is essential to prevent accidents and to save lives of human. After this project performance, can conclude that detection of the LPG gas leakage is incredible in the project system. Applicable usefully in the industrial and domestic purpose. In danger situations we are able to save the life by using this system. An alert is indicated by the GSM module. A sensor node senses gaslike CO<sub>2</sub>, oxygen, propane. The estimated range of transmission and consumption of power is obtained. The simple procedures and Arduino UNO Micro controller are used to build the sensor. This system triggers LED and Buzzer to alert people when LPG leakage is detected. This system is very simple, useful and reliable.

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