

# **Gas Leakage Monitoring and Alerting System for Industries**

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## **Abstract:**

Gas leakage is a major problem with industrial sector, residential premises etc. One of the preventive methods to stop accident associated with the gas leakage is to install a gas leakage detection kit at vulnerable places. The aim of this project is to present such a design that can automatically detect, alert and control gas leakage.

The Internet of things (IoT) is the system of gadgets, vehicles, and home machines that contain hardware, programming, actuators, and network which enables these things to interface, collaborate and trade information. IoT includes broadening Internet network past standard device, for example, work areas, workstations, cell phones and tablets, to any scope of generally stupid or non-web empowered physical device and ordinary articles. Installed with innovation, these gadgets can convey and connect over the Internet, and they can be remotely observed and controlled . The meaning of the Internet of things has advanced because of union of numerous innovations, ongoing examination, AI, ware sensors, and implanted frameworks. Conventional fields of installed frameworks, remote sensor systems, control frameworks computerization (counting home and building mechanization), and others all add to empowering the Internet of things. A gas spill alludes to a hole of petroleum gas or different vaporous item from a pipeline or other regulation into any territory where the gas ought not be available. Since a little hole may steadily develop a hazardous convergence of gas, spills are perilous. Notwithstanding causing flame and blast dangers, holes can slaughter vegetation, including huge trees, and may discharge amazing ozone harming substances to the environment.

## **Objective:**

The layout of a sensor-based automated fuel leakage detector with an alert and control system has been proposed. The equipment for detecting gas is low cost, uses less power, is light-weight, portable, secure, user pleasant, efficient, multi featured and simple machine device for detecting gas leakage.

Gas leakage detection will now not only provide us with significance in the health branch however it will also cause improve our economic system, because while fuel leaks it now not only contaminates the environment, but additionally wastage of gases will harm our economy. The want for making sure protection in places of work is anticipated to be the important thing driving force for the market over the coming years.

## **Problem Formulation:**

Any gaseous molecule that escapes from a stove, pipeline, cylinder, etc. is considered a gas leak. This may happen on purpose or even accidentally. We are all aware that these types of leaks are harmful to human health, and when they explode, they pose a serious threat to everyone's safety as well as that of

The Bhopal Disaster and the Vizag Gas Leak are only a couple of the significant disasters that occurred as a result of gas leaks. As far as industrial accidents go, the Bhopal disaster is considered the worst. From this insecticide plant, over 45 tonnes of methyl isocyanate escaped. Methyl isocyanate is an organic molecule that can be found in insecticides that contain carbamates. The colourless, lethal, and flammable liquid must be kept out of reach of people.

Vizag Styrene that was allowed to escape after being left neglected for a long Time caused a gas leak. This greasy liquid has no colour and can be spread by fumes. Therefore, a detector needs to be built in a way that it can pick up any type of gas, fume, leak, smoke, etc. Despite how harmful and dangerous it may be, the detector may have some parameters attached that could aid in problem prevention.

## Literature survey:

S.No	TITLE	AUTHOR &YEAR	ABOUT THE PAPER	RESULT
1.	Gas Leakage Detection and Smart Alerting System using IOT	Shital Imade, Priyanka Rajmanes, Aishwarya Gavali , Prof. V. N. Nayakwadi-2018	Internet of Things aim towards making life simpler by automating every small task around us. As much is IoT helping in automating tasks, the benefits of IoT can also be extended for enhancing the existing safety standards. Safety, the elementary concern of any project, has not been left untouched by IoT. Gas Leakages in open or closed areas can prove to be dangerous and lethal. The traditional Gas Leakage Detector Systems though have great precision, fail to acknowledge a few factors in the field of alerting the people about the leakage.	We have used the IOT technology to make a Gas Leakage Detector for society which having Smart Alerting techniques involving sending text message to the concerned authority and an ability performing data analytics on sensor. This system will be able to detect the gas in environment using the gas sensors. This will prevent form the major harmful proble
2.	SMS Based Gas Leakage and Fire Detection Alert System to attempt as Firewall against Cybersecurity	Maria Latif, Jazzba Asad, Faiza Nawaz,Noman Mazher	Safety is the foremost aspect in today's world. In this world of technology, people need technology to help them in danger conditions. Gas leakage becomes a severe issue that results in many accidents which lead to mortal and monetary harm. It is need of hour to install the gas leakage detection systems on public places. This paper presents a system design that identifies the leakage of gas and warns the user about the situation by sending SMS on user's phone with the help of GSM.	Smart kitchen by means of IOT was aimed, created and successfully verified in this paper. Through simulation, we appraised the performance of system. This project is simulated using bluemix software. The outcome of the test demonstrates the ability of system to check the leakage of gas in the kitchen and send SMS alert to user's phone when the concentration of gas is above or below the set limit.
3.	Embedded syatem for Hazardous Gas detection and alerting	V.Ramya, B. Palaniappan-2012	Safety plays a major role in today's world and it is necessary that good safety systems are to be implemented in places of education and work. This work modifies the existing safety model installed in industries and this system also be used in homes and offices. The main objective of the work is designing microcontroller based toxic gas detecting and alerting system.. If these gases exceed the normal level then an alarm is generated immediately and also an alert message (SMS) is sent to the authorized person through the GSM.	An embedded system for hazardous gas detection has been implemented The gas sensors and the critical level of the respective gas should be known, and then this system can be implemented for detecting various gases either in domestic area such as places of educational institutions, residential and industrial areas which avoids endangering of human lives.

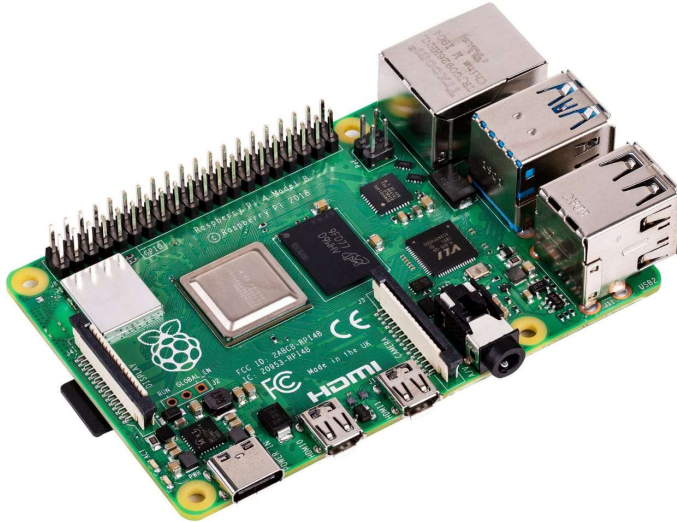
4.	Dangerous Gas Detection using an Integrated Circuit and MQ-9	Falohun A.S, Oke A.O., Abolaji B.M., Oladejo O.E.-2016	Natural gas is an odourless one which consists of compounds made of two elements: carbon and hydrogen called hydrocarbons. Sometimes, due to an accident or if the valve is not properly closed, the gas leaks. This system is aimed at detecting the leakage and sounding an alert so that occupants in the building can maintain optimal ventilation and turn off all electrical appliances or evacuate the vicinity until a redress is made.	The gas detector system implemented met certain favourable conditions such as low cost, vast application, design economy, availability of components (locally sourced) and research materials, efficiency, compatibility, portability and also durability
5.	Design and Simulation of Gas and Fire Detector and Alarm system with Water sprinkle	R.O.Okeke, M.Ehikhamenle-2017	This work is to design and implement a Fire and Gas Detection System with water sprinkler using SMS Feedback. This system makes use of a microcontroller along with sensing circuit which will detect gas leakage and fire and with the help of an alarm system the system gives alert about fire or gas leakage and with the installation of a GSM modem SMS can be sent to notify the user if there is fire or gas leakage and if the fire occurs the water sprinkler sprinkles water on the affected area to reduce the effect of the fire. A Liquid Crystal Display (LCD) displays the status of the system	A fire and gas hazard control has been designed, implemented and found working. This system has solved the problem caused by gas leakage in our surrounding which lead to fire outbreak that has caused the death of its victims. This system has been designed to carry out the detection and notify the presence of a Liquefied Petroleum Gas (LPG) in our surroundings. It also detect and notify the presence of fire in the environment then fight the fire outbreak itself using fire extinguisher and the water sprinkling system. The construction was made such that maintenance and repairs are done easily incase the system breaks down or if a fault occurs.

6.	IOT Based Smart Gas Leakage Detection and Alerting System	Rohan K H-2021	Gas leakage are causing massive explosions in places throughout the world. The conventionally available gas leakage detectors only have the provision to alarm the user who is physically present at the spot . Hence, to overcome this limitation, this project implements a model which sends an email to the user in case there is a leakage. This model detects the leakage of Liquid Petroleum Gas & Benzene. LPG is highly inflammable and results in blasts. Benzene when inhaled in higher concentrations affects the health of workers in industries since it is carcinogenic. Hence, this cost-effective project uses MQ 6 and MQ 135 sensors for detecting the aforementioned gases using Arduino -UNO ,Wifi Module ESP8266 and Thingspeak cloud..	Implementing this system is found out to be more efficient than the previously existing system. And with the introduction of Arduino-UNO the whole project cost was also reduced and human safety level was also increased. Practical applications of the proposed system- Used in industries to detect the leakage of toxic gases. Used in hotels to detect smoking by customers. Used to check the quality/purity of air in offices. Used to check concentration of gases in mines. Used in detecting fire.
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## COMPONENTS REQUIRED:

S.No.	Name of the Component	Quantity
1.	Raspberry pi	1
2.	Breadboard	1
3.	LED	2
4.	Resistor	5
5.	Piezo	1
6.	Gas Sensor	1

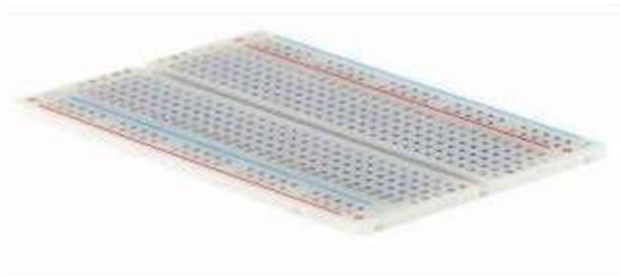
## Raspberry pi:



Raspberry Pi

Raspberry Pi is defined as a minicomputer the size of a credit card that is interoperable with any input and output hardware device like a monitor, a television, a mouse, or a keyboard – effectively converting the set-up into a full-fledged PC at a low cost.

## Breadboard :-



Breadboard

A breadboard is a common tool for circuit design and testing. Using a bread board eliminates the necessity for soldering wires and components together to form a circuit. Component mounting and reuse are simpler. Components are not soldered together, allowing for easy circuit design changes at any time. It consists of a collection of metallic clips that are both conductive and insulated from one another, all contained in a box made of white ABS plastic. The plastic box has numerous holes that are organised in a specific way. Two different regions, sometimes known as strips, make up a traditional bread board pattern. Bus strips are frequently employed to supply the circuit with electricity. It has two

columns: one for ground and the other for power voltage. The majority of the components in a circuit are held in place by socket strips. It typically has two portions, each with five rows and 64 columns. Each column has an internal electrical connection.

### LED :-



**LED**

An optoelectronic LED (Light Emitting Diode) operates on the electro-luminescence principle. The ability of a substance to transform electrical energy into light energy and then emit that light energy is known as electro-luminescence. The semiconductor in an LED operates similarly, emitting light when an electric field is present. The P-N Junction diode and outward arrow symbols are combined to create the LED symbol. These arrows pointing outward stand in for the light that the LED emits.

### Resistor:-

A passive electrical device that has two terminals and is employed in electrical circuits to limit or regulate the flow of current.



**Resistor**

## **Piezo :-**

A piezo is a device that deforms when electricity is applied or produces a voltage when force is applied.



Piezo buzzer

## **Gas Sensor :-**

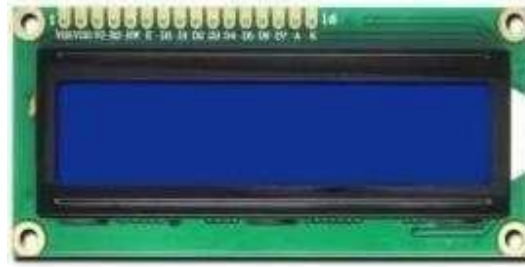


Gas sens

A device that detects the presence or concentration of gases in the atmosphere is called a gas sensor. By altering the resistance of the material inside the sensor, the sensor generates a corresponding potential difference based on the gas concentration, which may be recorded as output voltage. The type and concentration of the gas can be inferred from this voltage value.



LCD 16\*2 :-

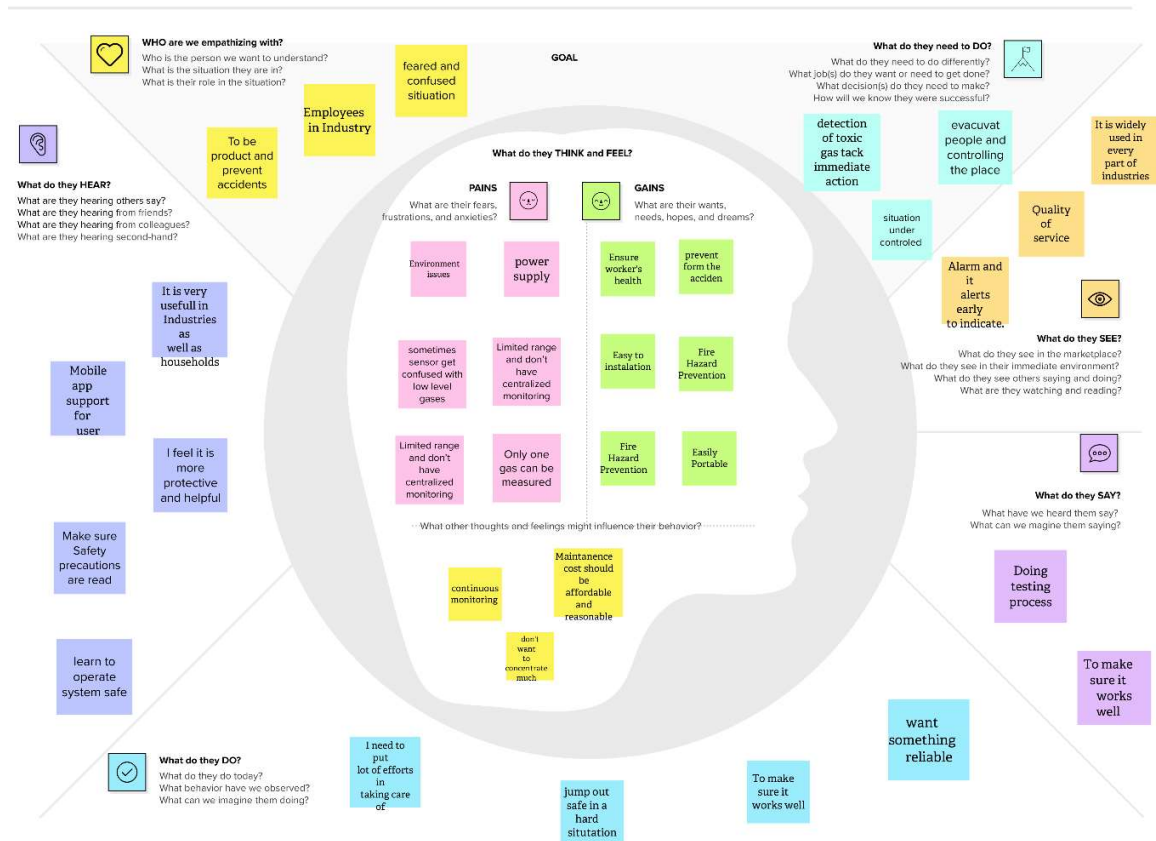


One type of electronic gadget utilised to display the message and data is a 162 LCD. Liquid Crystal Display is the term's full name. Because it has 16 Columns and 2 Rows, the display is known as a 162 LCD. It can display a total of  $(16 + 2) = 32$  characters, each of which is composed of  $5 \times 8$  pixels. The basic technology behind these displays is multi-segment light emitting diodes. There are several different display configurations on the market, including 81, 82, 102, 161, and others, but the 162 LCD is the most popular. Since these LCD modules are inexpensive and easy to programme, they are frequently utilised in DIY embedded applications.

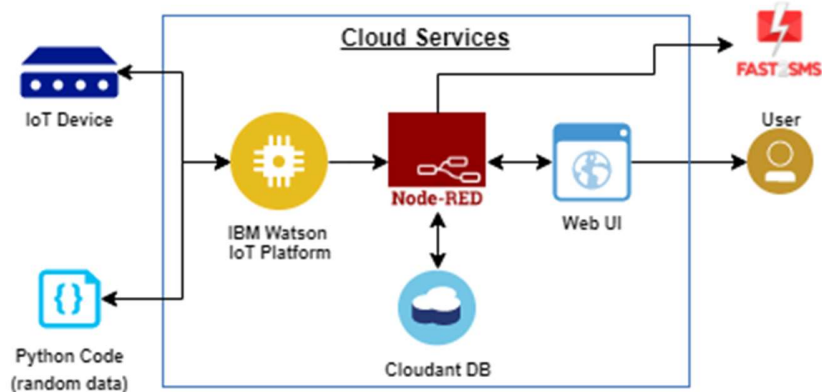
**Solution Statement :**

The system might be viewed as a modest attempt to link up the principal gas detection techniques now in use with a mobile platform coupled with IoT platforms. One metre around the rover, the gases are detected, and the sensor output data is continually sent to the nearby server. Stray gases are also detected because of the sensors' subpar precision, which introduces some inaccuracy into their results, particularly in the case of methane. Additionally, the storage and availability of hazardous gases like hydrogen sulphide makes it difficult to test the integrated gear. The complexity of system maintenance and material selection for the system in the event of corrosive gases is decreased because the system runs outside the pipeline. The technology can only be utilised as a major indicator of leakage inside a plant at this point.

## Empathy map:



## Diagram:



## **Conclusion :-**

We can infer from the project's performance that the system's detection of LPG gas leakage is remarkable. Useful for both residential and commercial purposes. We can use this technique to save lives in dangerous situations. The GSM module indicates an alert. Propane, CO<sub>2</sub>, and other gases are detected by a sensor node. Power usage and transmission range estimates are made. The sensor was constructed using straightforward techniques and an Arduino UNO Micro controller.

## **Future scope:**

Major cities of India are pushing Smart Home application, gas monitoring system is a part of Smart Home application. Enhancing Industrial Safety using IoT. IoT turns drone into gas detection sensor. Another major future scope could be including a Automatic Shut-off device which will turn off the gas supply whenever it will detect any gas leakage. This system can be implemented in Industries, Hotels and wherever the LPG cylinders are used. This system can be used in industries involving applications such as Furnace, Boilers, Gas welding, Gas cutting, Steel Plants, Metallurgical industries, Food processing Industries, Glass Industries, Plastic industries, Pharmaceuticals, Aerosol manufacturing. As hospitals require to provide maximum possible safety to patients, this system can be used to keep track of all the cylinders used in it. Some of the cylinders used are Oxygen cylinder, Carbon dioxide cylinder, Nitrous oxide cylinder. As many students are naïve the risk of causing accidents is high. Hence, our system can also be used in schools, colleges. Many colleges have well established labs including chemistry lab and pharmaceutical labs where gas burners are used. Plenty of medical equipment requires gas cylinders.

## **References:**

1. Shital Imade, Priyanka Rajmanes, Aishwarya Gavali , Prof. V. N. Nayakwadi-2018 “Gas Leakage Detection and Smart Alerting System using IOT”.
2. Maria Latif, Jazzba Asad, Faiza Nawaz, Noman Mazher “SMS Based Gas Leakage and Fire Detection Alert System to attempt as Firewall against Cybersecurity”.
3. Rohan K H-2021 “ IOT Based Smart Gas Leakage Detection and Alerting System”

## Python Code:

```
#IBM Watson IOT Platform

#pip install wiotp-sdk

import wiotp.sdk.device
import time
import random

myConfig = {
    "identity": {
        "orgId": "yy65z9",
        "typeId": "NodeMCU",
        "deviceId": "12345"
    },
    "auth": {
        "token": "12345678"
    }
}

def myCommandCallback(cmd):
    print("Message received from IBM IoT Platform: %s" % cmd.data['command'])
    m=cmd.data['command']

client = wiotp.sdk.device.DeviceClient(config=myConfig, logHandlers=None)
client.connect()

while True:
    methane=random.randint(1000,4000)
    if methane<2000:
```

```
        st="no leakage of methane"
    else:
        st="danger"
    temp=random.randint(-20,50)
    humidity=random.randint(0,100)
    myData={"lvl":methane,"stat":st,"temperature":temp,"humidity":humidity}
    client.publishEvent(eventId="status", msgFormat="json", data=myData, qos=0,
onPublish=None)
    print("Published data Successfully: %s", myData)
    client.commandCallback = myCommandCallback
    time.sleep(2)
    client.disconnect()
```