

# PROJECT REPORT

## Gas Leakage Monitoring and Alerting System

Team ID : PNT2022TMID29894

( Department of Electronics and Communication Engineering )



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## Abstract :-

Gas leakages are one of the major reasons behind fires and blast accidents. Here we propose an automated gas detection and accident avoider system. The system automatically detects gas leakages. If the leakage is detected system automatically starts exhaust fans. One exhaust is used to suck the gas out of the room. While another fan is used to pull in fresh air from outside at the same time sending out an alert message to turn off the gas supply. The system efficiently avoids the chances of any fires or blasts which could have been caused due to gas leakage.

## Objective :-

The design of a sensor-based automatic gas leakage 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.

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. Arduino UNO R3 1
2. Breadboard 1
3. LED 2
4. Resistor 5
5. Piezo 1
6. Gas Sensor 1
7. LCD 16\*2 1

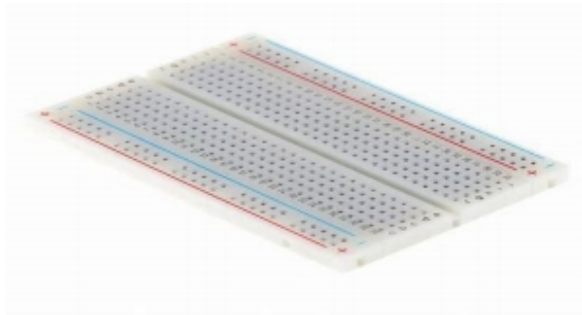
### Arduino UNO R3 :-



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.

## Breadboard :-



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 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 other for ground. Socket strips 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.

## LED :-



LED (Light Emitting Diode) is an optoelectronic device which works on the principle of electro-luminescence. Electro-luminescence 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.

## Resistor :-



A passive electrical component with two terminals that are used for either limiting or regulating the flow of electric current in electrical circuits.

### Piezo :-



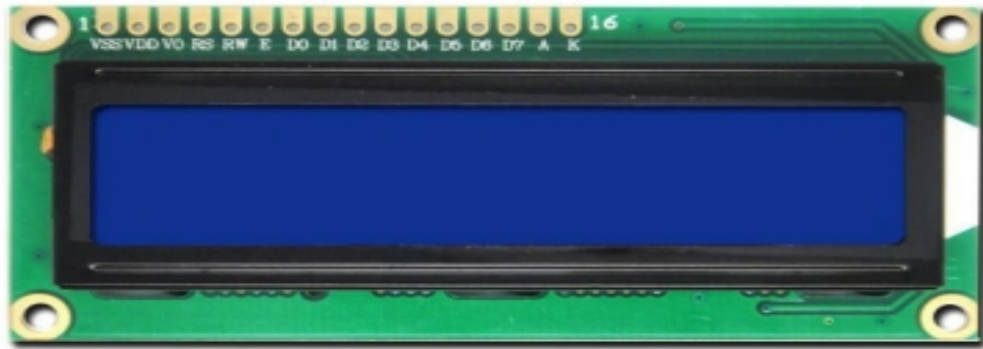
A piezo is a device that generates a voltage when force is applied or becomes deformed when voltage is supplied.

### 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.

## 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



# Project Design & Planning :-

- Ideation Phase :-

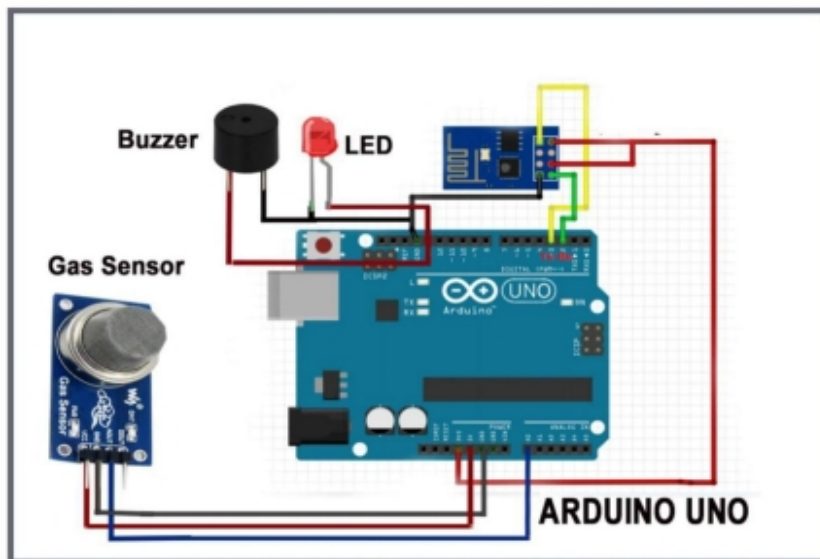
- literature survey :-

TITLE	AUTHOR	OBJECTIVES
Internet of Things (IOT) Based Gas Leakage Monitoring and Alerting System with MQ-2 Sensor(2017)	RohanChandraPandey,Manish Verma, Lumesh Kumar Sahu	This paper choice of using a real time gas leakage monitoring and Sensing the output levels of gas has been clearly observed by the help of this system.
Gas Leakage Detection and Smart Alerting and Prediction Using IoT(2017)	Asmita Varma, Prabhakar S, Kayalvizhi Jayavel	The proposed gas leakage detector is promising in the Field of safety.
IOT Based Gas Leakage Detection System with Database Logging, Prediction and Smart ,Alerting(2018)	Chaitali Bagwe, Vidya Ghadi, Vinayshri Naik, Neha Kunte	The system provides constant monitoring and detection of gas leakage along with storage of data in database for predictions and analysis. The IOT components used helps in making the system much more cost effective in comparison with traditional Gas detector systems.

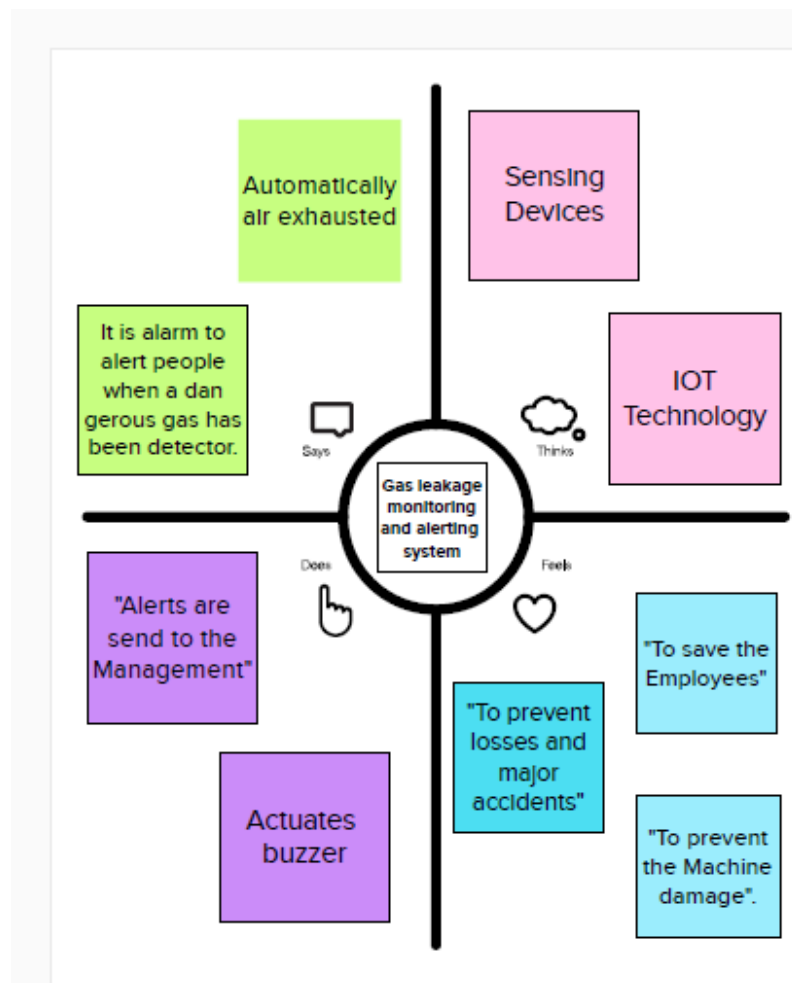
- **Ideation :-**

System consists of gas detector sensors, Arduino board, ESP8266 and Cloud server. One Society authority person can register the all flat member user to our system. Society admin can add the details of per flat user such as user name, mobile number, per user

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## ● Empathy Map :-



## Project Design Phase I :-

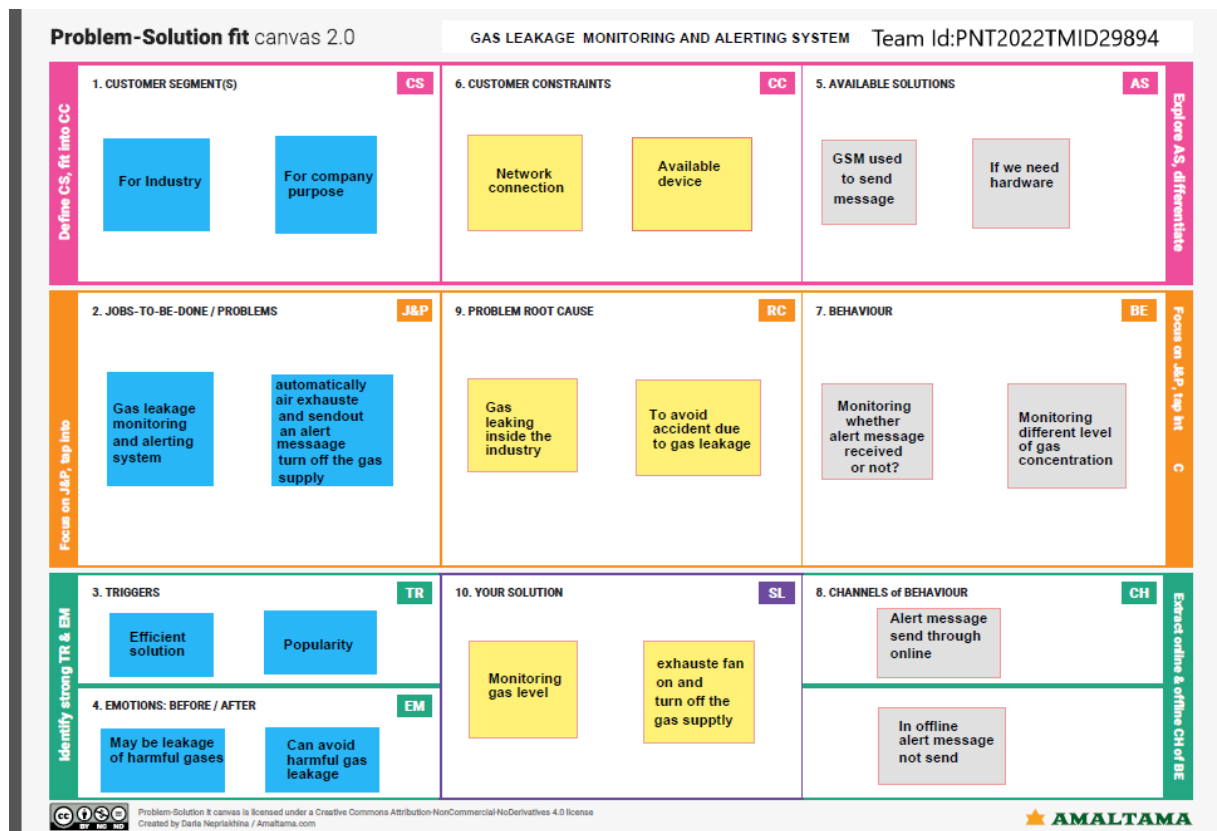
### ● Proposed Solution :-

#### Proposed Solution Template:

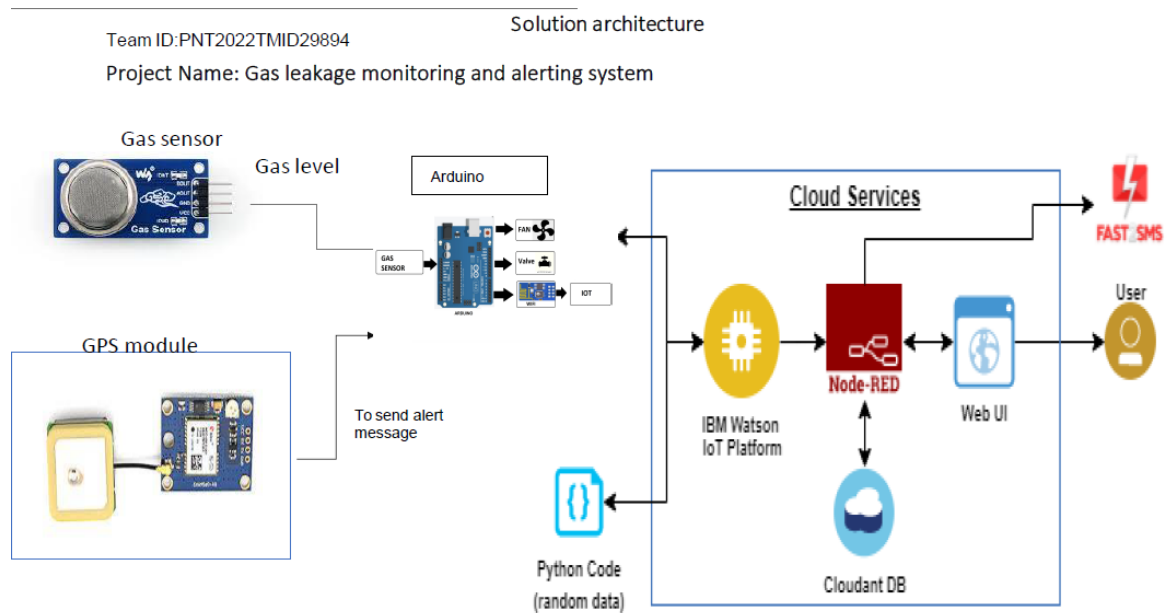
Project team shall fill the following information in proposed solution template.

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Gas leakage monitoring and alerting System.
2.	Idea / Solution description	This project helps the industries in monitoring The emission of harmful gases.If the leakage is detected system automatically starts exhaust to fan it is used to suck the gas out of the room Another fan is used to pull in fresh air from outside at the same time sending out an alert message to turn of the gas supply.
3.	Novelty / Uniqueness	The work is automatically air exhauste and sending out an alert message to turn off the Gas supply.

## ● Proposed Solution Fit :-



## ● Solution Architecture :-

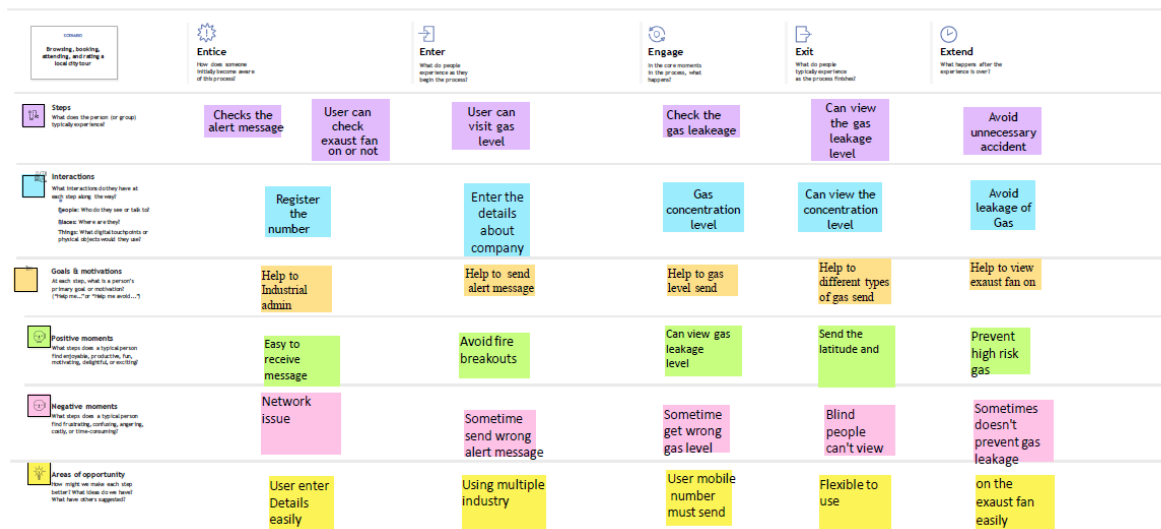


## Project Design Phase II :-

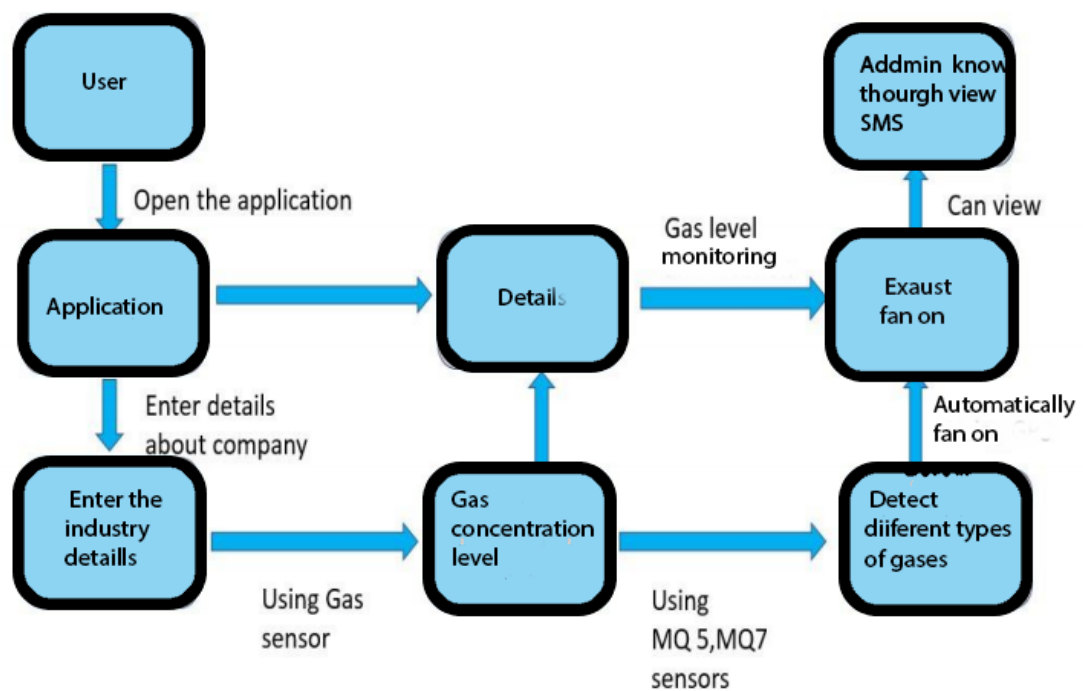
### ● Customer Journey Map :-

#### Customer journey map-Gas leakage monitoring and alerting system

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- Data Flow Diagram :.





## ● Functional Requirements :-

### Functional Requirements:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User message	message through mobile message through Gmail message through LinkedIN
FR-2	User Confirmation	Confirmation via Email Confirmation via alert message
FR-3	Gas leakage exhaust fan will be on	User receive an alert message and exhaust will be on automatically
FR-4	Gas concentration level	Gas leakage level can view Gas sensor needed for gas leakage level

**Non-functional Requirements:**

Following are the non-functional requirements of the proposed solution.

FR No.	Non-Functional Requirement	Description
NFR-1	Usability	Easy to use and simple exhaust fan ON Efficiency is good.
NFR-2	Security	alert message is highly secure. Software is protected by un authorized access.
NFR-3	Reliability	High reliability to work with alert message Application runs accurately.
NFR-4	Performance	Gas concentration level updated immediatly
NFR-5	Availability	24*7 can monitoring the gas level Available widely.
NFR-6	Scalability	This services available for Unlimited user High scalability.

## Project Planning :-

- Milestone and Activity List :-

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### Milestone Activity Plan.

Use the below template to create product backlog and sprint schedule

Milestone	Function (Epic)	Milestone Story Number	Story / Task
Milestone -1	Data Collection	M1	Collecting the data about Gas leakage detection process.
Milestone-2	Gas detection	M2	Detecting the Gas leakage in the industry using gas sensor.
Milestone-3	Gas leakage level	M3	Detecting different gas level when gas leaking.
Milestone-4	Exhaust fan on	M4	If the leakage detected system automatically starts exhaust fan
Milestone-4	Exhaust fan on	M4	If the leakage detected system automatically starts exhaust fan
Milestone-5	Alert message	M5	Creating message using Node red.
Milestone-6	Testing	M6	Testing the gas leakage as per user Requirement.
Milestone-7	Final result and documentation	M7	Final document deliver as per template.

- Sprint Delivery Plan :-

SPRINT PLAN	Identify the Problem	1
	Prepare a Abstract, Problem Statement	2
	List a required object needed	3
	Create a Code and Run it	4
	Make a Prototype	5
	Test with the created code and check the designed prototype is	6
	Solution for the Problem is Found!!	7

## Project Development Phase :-

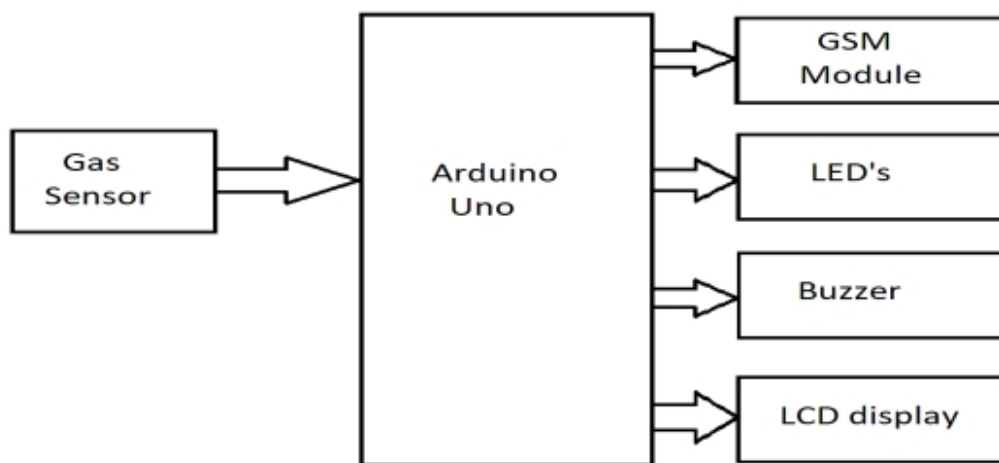
```
#include <LiquidCrystal.h>
LiquidCrystal lcd(6, 7, 8, 9, 10, 11);
float gasPin = A0;
float gasLevel;
int ledPin = 2;
int buttonPin = 3;
int buzzPin = 4;
int buttonState;
int fan = 5;
void setup(){
  pinMode(ledPin, OUTPUT);
  pinMode(buttonPin, INPUT);
  pinMode(gasPin,INPUT);
  pinMode(fan,OUTPUT);
  Serial.begin(9600);
  lcd.begin(16, 2);
  lcd.setCursor(0,0);
  lcd.print(" Welcome");
  lcd.setCursor(0,2);
  lcd.print(" Youtube");
  delay(500);
  lcd.clear();
}
void loop(){
  // Read the value from gas sensor and button
  gasLevel = analogRead(gasPin);
  buttonState = digitalRead(buttonPin);
  // call the function for gas detection and button work
  gasDetected(gasLevel);
  buzzer(gasLevel);
  exhaustFanOn(buttonState);
}
// Gas Leakage Detection & Automatic Alarm and Fan ON
void gasDetected(float gasLevel){
  if(gasLevel >= 300){
    digitalWrite(buzzPin,HIGH);
    digitalWrite(ledPin,HIGH);
    digitalWrite(fan,HIGH);
    lcd.setCursor(0,0);
    lcd.print("GAS:");
    lcd.print(gasLevel);
    lcd.setCursor(0,2);
    lcd.print("FAN ON");
    delay(1000);
    lcd.clear();
  }else{
```

```

digitalWrite(ledPin,LOW);
digitalWrite(buzzPin,LOW);
digitalWrite(fan,LOW);
lcd.setCursor(0,0);
lcd.print("GAS:");
lcd.print(gasLevel);
lcd.setCursor(0,2);
lcd.print("FAN OFF");
delay(1000);
lcd.clear();
}
}
//BUZZER
void buzzer(float gasLevel){
if(gasLevel>=300)
{
for(int i=0; i<=30; i=i+10)
{
tone(4,i);
delay(400);
noTone(4);
delay(400);
}
}
}
// Manually Exhaust FAN ON
void exhaustFanOn(int buttonState){
if(buttonState == HIGH){
digitalWrite(fan,HIGH);
lcd.setCursor(0,0);
lcd.print("Button State:");
lcd.print(buttonState);
lcd.setCursor(0,2);
lcd.print("FAN ON");
delay(10000);
lcd.clear();
}
}
}

```

## Proposed method :-

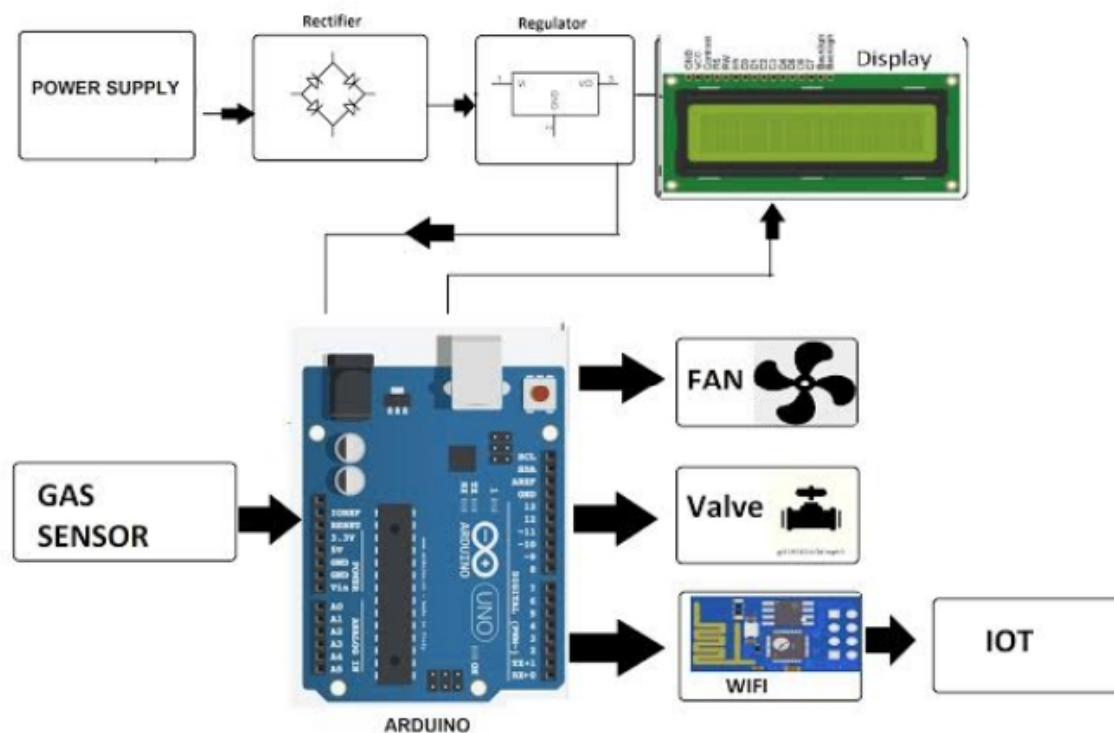


Arduino UNO (Atmega-328) is the main unit of the system which performs the following tasks. A signal conditioning of the Arduino UNO is done by output signal of the sensor, provided input to Arduino. The detection results displayed on LCD. Indicates the people of danger in work place, factory, home. Buzzer activity with beep(siren) sound is made. Also send alert SMS to the in charge of the plant whose number is saved in SIM card by using GSM modem. The SMS received depends upon the leak of gas in the detection area of the sensor.

## 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 data is 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.

## Circuit Diagram :-



*Refer Link :* [Circuit design Gas Leakage Monitoring and Alerting System | Tinkercad](#)



## Conclusion :-

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 gas like 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 area used to build the sensor.

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