GAS LEAKAGE MONITORING AND ALERTING SYSTEM FOR INDUSTRIES

NALAIYA THIRAN PROJECT BASED LEARNING

on

HX8001 -PROFESSIONAL READINESS FOR INNOVATION EMPLOYABILITY AND ENTREPRENEURESHIP (PRIEE)

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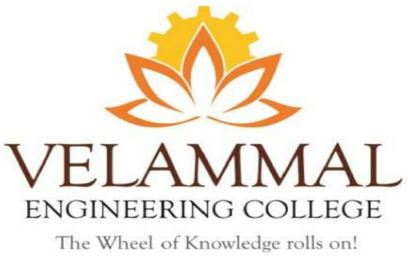
IN

ELECTRONICS AND COMMUNICATION ENGINEERING



VELAMMAL ENGINEERING COLLEGE,CHENNAI-66

(An Autonomous Institution,Affiliated to Anna University, Chennai)

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VELAMMAL ENGINEERING COLLEGE
CHENNAI-66

BONAFIDE CERTIFICATE

Certified that this project report, **"GAS LEAKAGE MONITORING AND ALERTING SYSTEM FOR INDUSTRIES"** is the bonafide work of **"DEEPAK KRISHNA P,VISHAL S R,BHARATH KUMAR and SANTHOSH.S"** who carried out the project work under my supervision and industry mentor.

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The report of the project work submitted by the above students in the partial fulfillment for the award of Bachelor of Engineering Degree in **ELECTRONICS AND COMMUNICATION ENGINEERING** of Anna University, Chennai was evaluated and confirmed to be the report of the work done by the above students and then evaluated.

Submitted for Internal Evaluation held on__/____/2022.

MENTOR **EVALUATOR**

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ABSTRACT

- 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.
- 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.The gas leakage detection system can constantly monitor the gas leak with the help of the sensors.

  ZigBee is used to feed real time sensor data over the cloud. The sensor monitors, detects and raises an alarm whenever a gas leak or fire broke out condition is detected.On cloud, analyze and store the data and communicate wirelessly for further analysis is possible. Anyone can access the leakage data from anywhere using any Internet enabled device like PC, tablet or smart phone and analyze

INTRODUCTION

The Internet of Things is a developing theme of specialized, social, and monetary centrality. Customer items, tough goods, cars and trucks,modern and utility segments,sensors, and other regular articles are being joined with Internet availability and amazing information systematic capacities that guarantee to change the manner in which we work, live, and play. Projections for the effect of IoT on the Internet and economy are amazing, with some foreseeing upwards of 100 billion associated IoT gadgets and a worldwide financial effect of more than $11 trillion by 2025. The Internet of Things (IoT) is an essential theme in innovation industry, strategy, and designing circles. This innovation is encapsulated in a wide range of arranged items, frameworks, and sensors, which exploit headways in processing power, gadgets scaling down, and organize interconnections to offer new capacities. The expansive scale usage of IoT gadgets guarantees to change numerous parts of manner in which we live. For shoppers, new IoT items like Internet-empowered machines, home mechanization parts, and vitality the executive's gadgets are pushing us toward a dream of the "savvy home", offering greater security and vitality effectiveness. IoT frameworks like arranged vehicles,savvy traffic frameworks, and sensors implanted in streets and scaffolds draw us nearer to "brilliant urban areas", which help limit clog and vitality utilization. IoT innovation offers the likelihood to change horticulture, industry, and vitality creation and dissemination by expanding the accessibility of data along the esteem chain of generation utilizing arranged sensors.

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.

PROJECT DESIGN & PLANNING

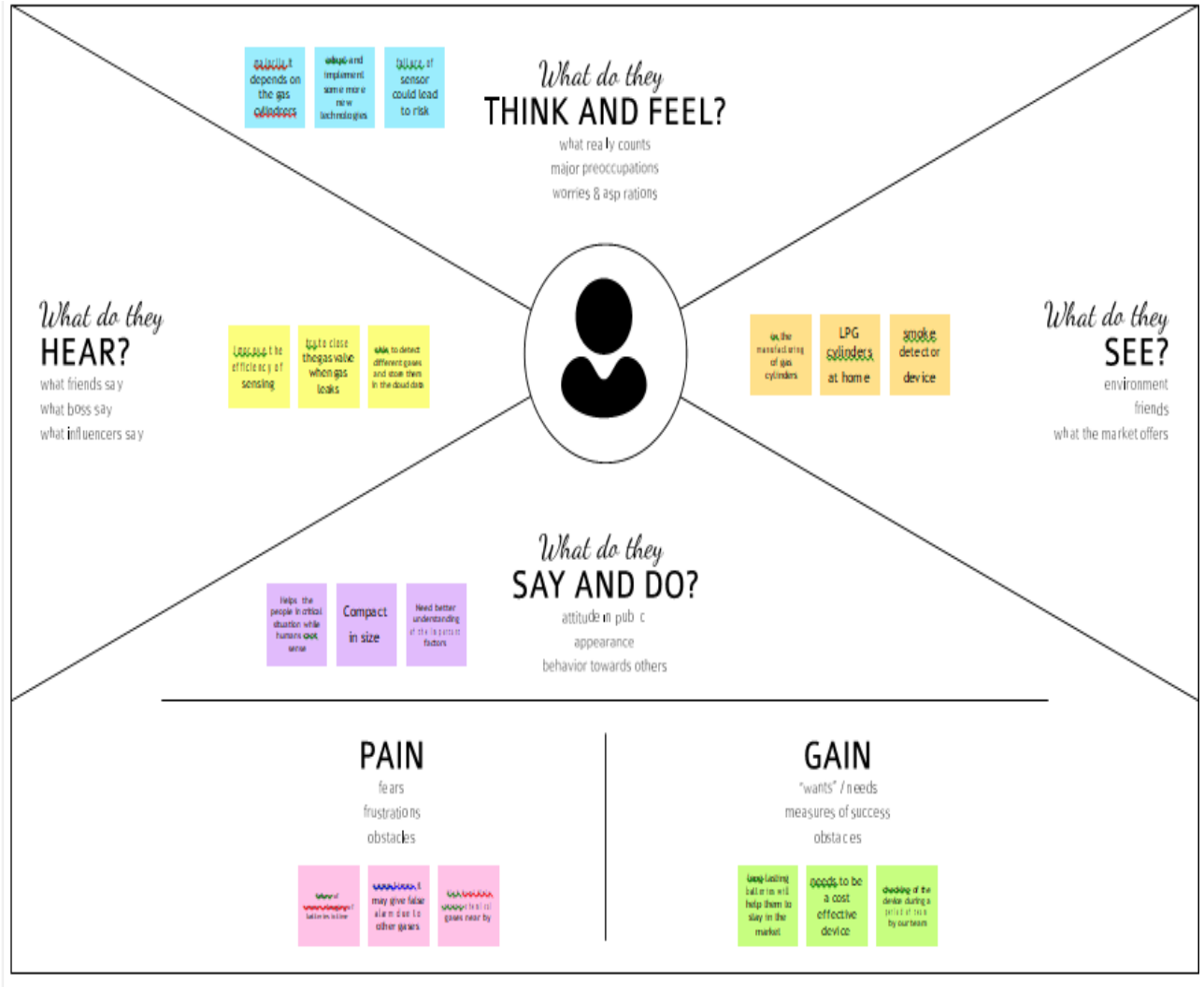
Ideation Phase:

Literature Survey

Sr. No	Paper Title	Author Name	Publication Year	Result
1	Internet of Things (IOT) Based Gas Leakage Monitoring and Alerting System with MQ-2 Sensor	Rohan Chandra Pandey, Manish Verma, Lumesh Kumar Sahu	2017	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.
2	Gas Leakage Detection and Smart Alerting and Prediction Using IoT	Asmita Varma, Prabhakar S, Kayalvizhi Jayavel	2017	The proposed gas leakage detector is promising in the Field of safety.
3	The proposed gas leakage detector is promising in the Field of safety.	Chaitali Bagwe, Vidya Ghadi, Vinayshri Naik, Neha Kunte	2018	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.
4	Internet of Things (IoT) Based Gas Leakage Monitoring and Alerting System with Mq-6 Sensor	Rohan Chandra Pandey, Manish Verma, Lumesh Kumar Sahu, Saurabh Deshmukh	2018	A discussion on how the aims and objectives are met is presented. An overall conclusion IOT based toxic gas detector is it has become more efficient, more applicable to today's applications and smarter.
5	Gas Leakage Detection and Smart Alerting System Using IoT	Shital Imade, Priyanka Rajmanes, Aishwarya Gavali	2018	In this paper we 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

Empathy Map


What do they
THINK AND FEEL?
what really counts
major preoccupations
worries & aspirations
depends on the gas cylinders
and implement some more new technologies
of sensor could lead to risk
What do they
HEAR?
what friends say
what boss say
what influencers say
the efficiency of sensing
to close the gas valve when gas leaks
to detect different gases and store them in the cloud data
What do they
SEE?
environment
friends
what the market offers
the manufacturing of gas cylinders
LPG cylinders at home
smoke detector device
What do they
SAY AND DO?
attitude in public
appearance
behavior towards others
Helps the people in critical situation while humans lack sense
Compact in size
Need better understanding of the important factors
PAIN
fears
frustrations
obstacles
may give false alarm due to other gases
GAIN
"wants" / needs
measures of success
obstacles
long-lasting battery will help them to stay in the market
needs to be a cost effective device
checking of the device during a period of time by our team

PROBLEM STATEMENT

Liquid Petroleum Gas (LPG) is a highly flammable chemical that consists of mixture of propane and butane. LPG is used for cooking at home, restaurant, and certain use for industry. They have certain weaknesses that make the gas leakage occur. The leakage of gases only can be detected by human nearby and if there are no human nearby, it cannot be detected. But sometimes it cannot be detected by human that has a low sense of smell. Thus, this system will help to detect the presence of gas leakage.

- Furthermore, gas leakage can cause fire that will lead to serious injury or death and it also can destroy human properties. This system was developed by using IoT to give real-time response to the user and the nearest fire station.

- LPG gas cylinders are used in our homes for various purposes. Cooking and heating water are a major part of the same.

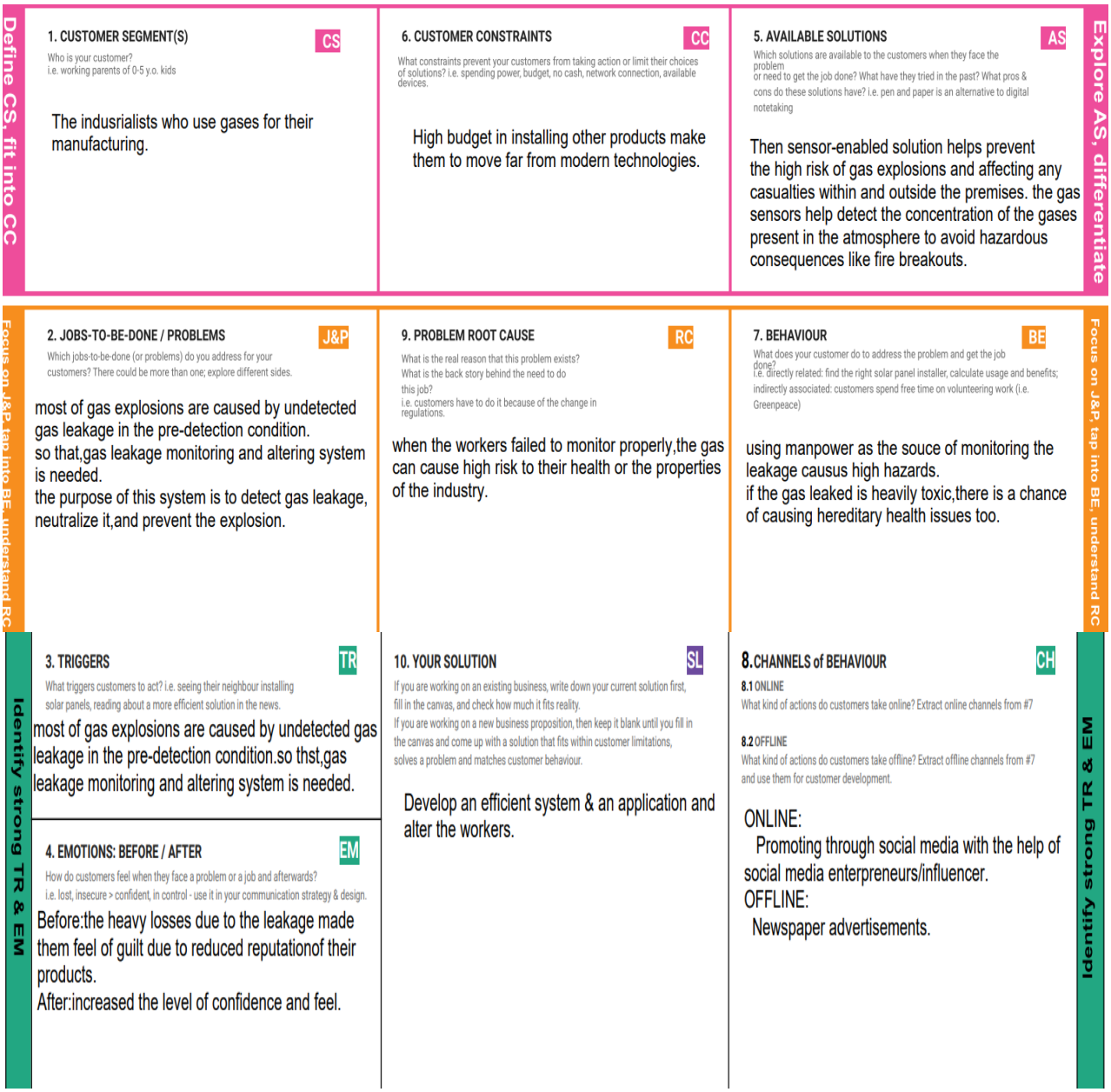
- Hence it would not be wrong to say that it is an integral part of our life. However, there have been cases in the past about accidents due to gas leakage.The basic objective of the project is to provide a security system to prevent a caused due to the leakage of gas.

Proposed Solution:

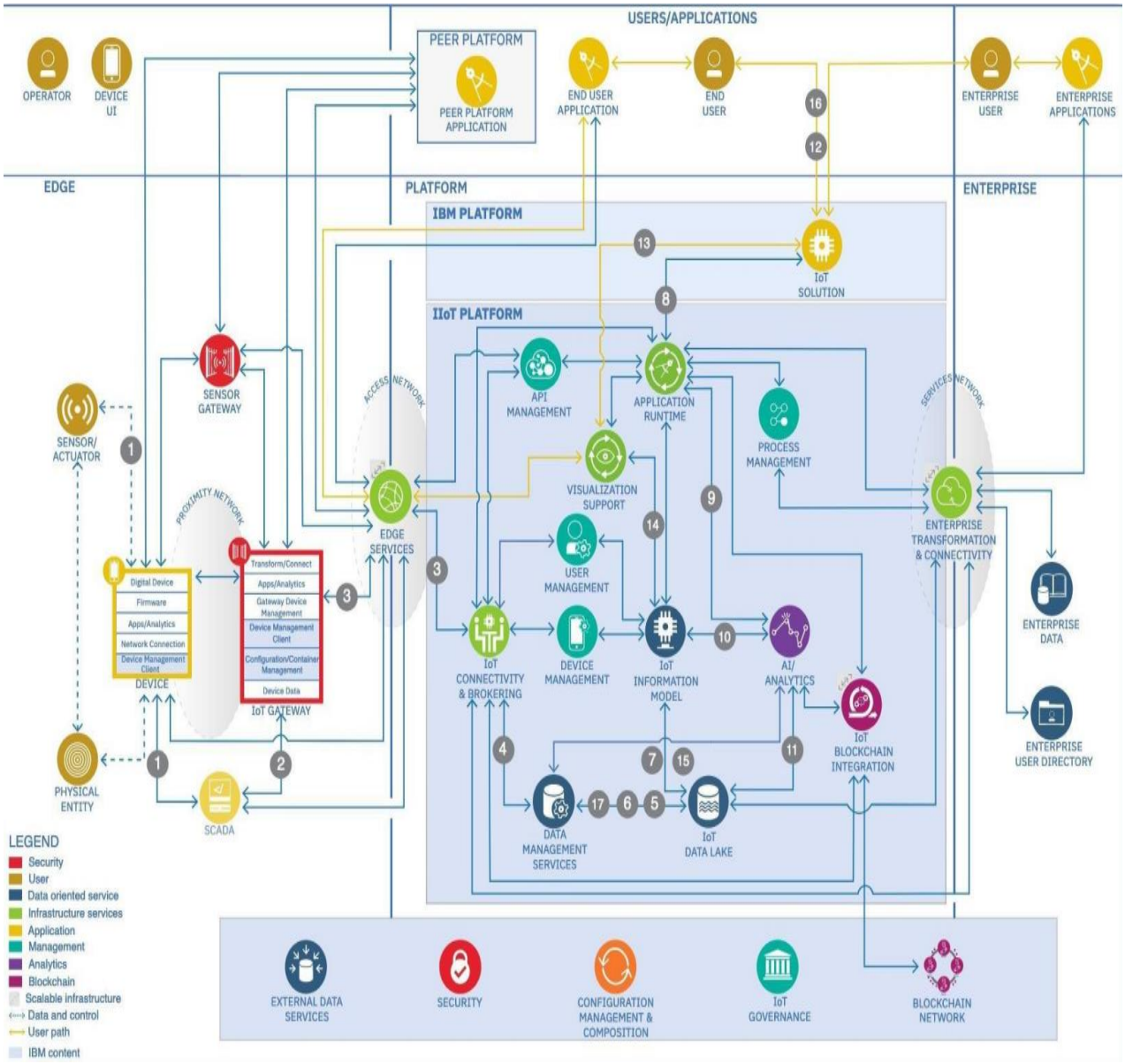
S.N No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Liquid Petroleum Gas (LPG) is a highly flammable chemical that consists of mixture of propane and butane. LPG is used for cooking at home, restaurant, and certain use for industry. They have certain weaknesses that make the gas leakage occur. The leakage of gases only can be detected by human nearby and if there are no human nearby, it cannot be detected. But sometimes it cannot be detected by human that has a low sense of smell.Furthermore, gas leakage can cause fire that will lead to serious injury or death and it also can destroy human properties.
2.	Idea / Solution description	• When the gas leakage is detected it will alert the user by alarm/buzzer • It can send the sms to the user also • We can also make the exhaust fan on while during the gas leakage • Detection of the gas leakage is important and halting leakage is important equally.
3.	Novelty / Uniqueness	• instant detection of gas leakage send sms to the concerned user • easy to access and operate

4.	Social Impact / Customer Satisfaction	• Cost efficient • Easy to access and operate • Easy installation and detect the gas leakage fastly • Prevent fires and explosions
5.	Business Model (Revenue Model)	• This project is mainly for Industries so we can visit to the industries and explain them about the benefits of our
6.	Scalability of the Solution	• Our end to end wireless gas monitoring system uses wireless sensors to detect the presence of toxic gases . The solution can hence be scaled up for flexible functionality and offer great extendibility for multi-purpose usage. • We can also upgraded it in future like making exhaust fan on while gas is detected (or) like making automatically close the valve of gas cylinder when the gas is start to leak

Proposed Solution Fit



Solution Architecture



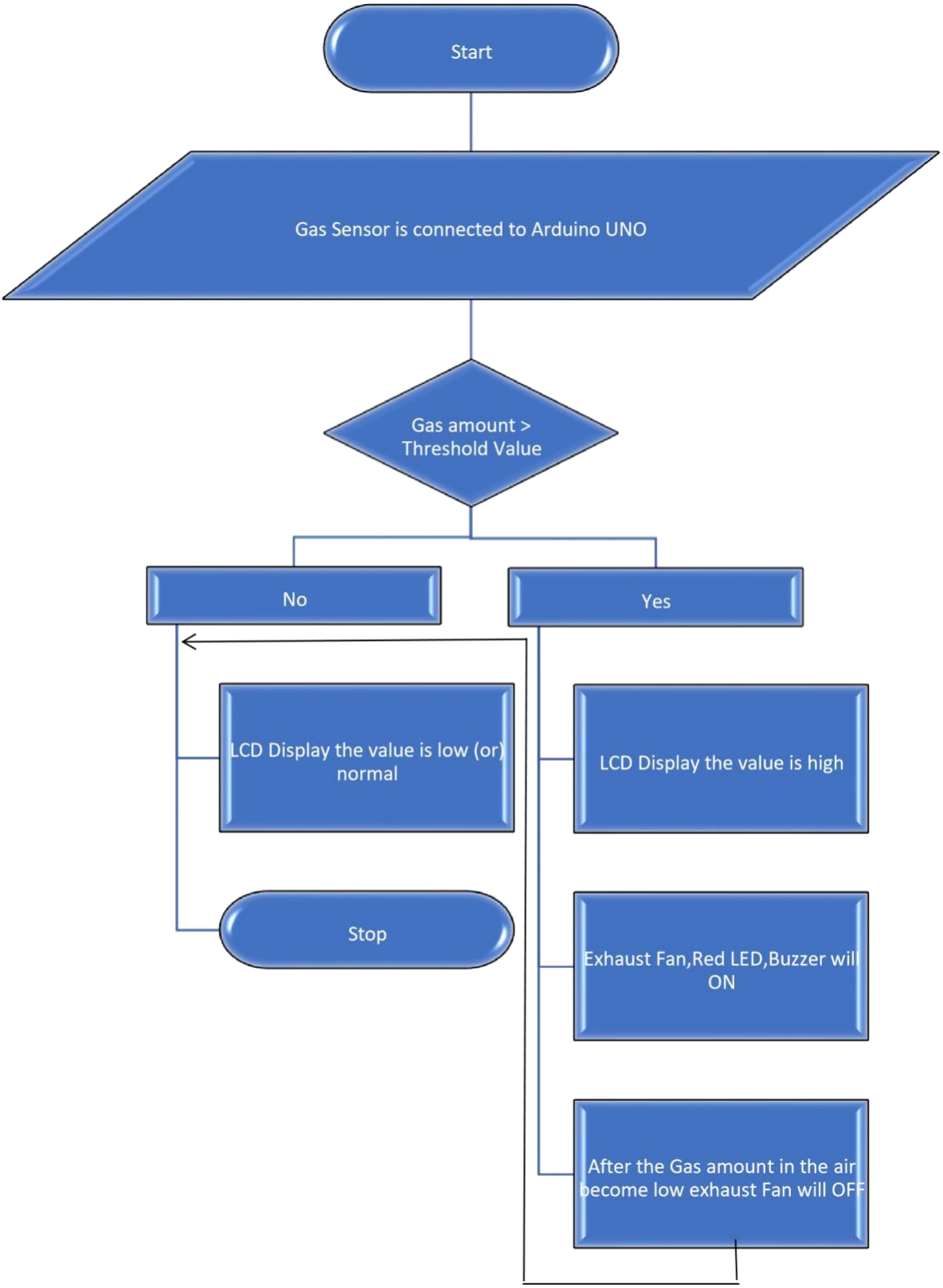
Project Design Phase II

Customer Journey Map

	Stage 1	Stage 2	Stage 3
OBJECTIVES	Write a goal or activity	Gas leakage detection systems protect personnel and the environment from potentially hazords exposure to gases	The system comprises of sensors for detecting gas leak interfaced to microcontroller that will give an alert to user whenever there is a gas leakage,display warning information by using liquid.
NEEDS	Write a need you want to meet	Fire hazard prevention	Harmful gas detection
FEELINGS	Write a emotion you expect the customer to have	Happy about this solution	Embrassed on the solution and promoted the good words towords this project.
BARRIERS	Write a potential challenge to your objective	Higher officials	Commercial companies

AWARENESS	Write how to create awareness	Online ads and social media	Television ads
SERVICE	Write what at all services are provided	Provide waranty	Help desk/chat

Data Flow Diagram



Functional Requirements

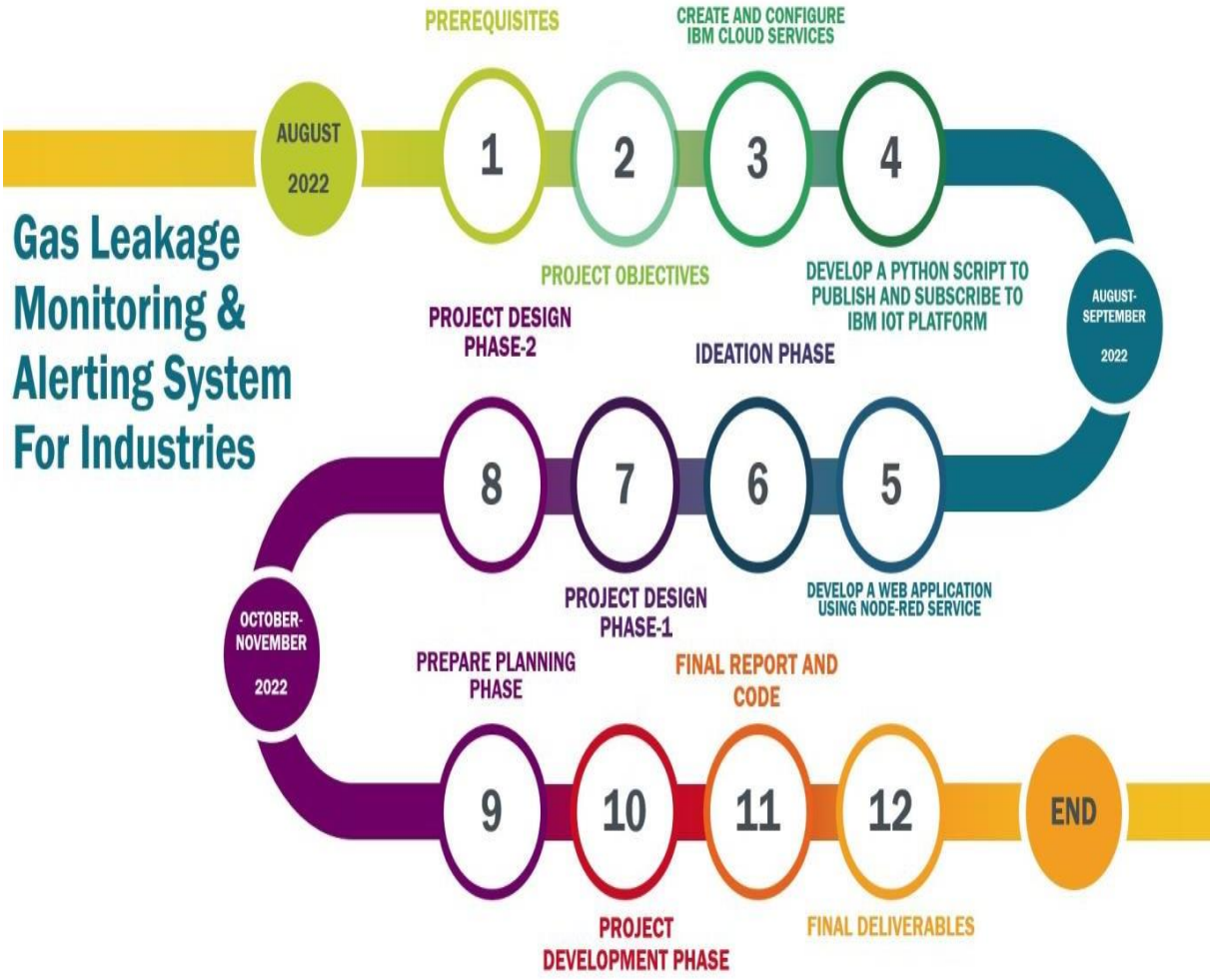
Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	Monitoring	Level of gas is monitored using sensor and if there is any leakage, alert can be sent through messages and with a buzzer sound.
FR-2	User Reception	The data like the level of gas can be send through messages
FR-3	User Understanding	The user can monitor the level of gas with the help of the data. If there is an increase in gas level then the alert will be given by message or buzzer sound.
FR-4	User Performance	When the user gets notified, they could take precaution steps like turning the gas off, turn on the exhaust fan/sprinkler and avoid serious accidents.

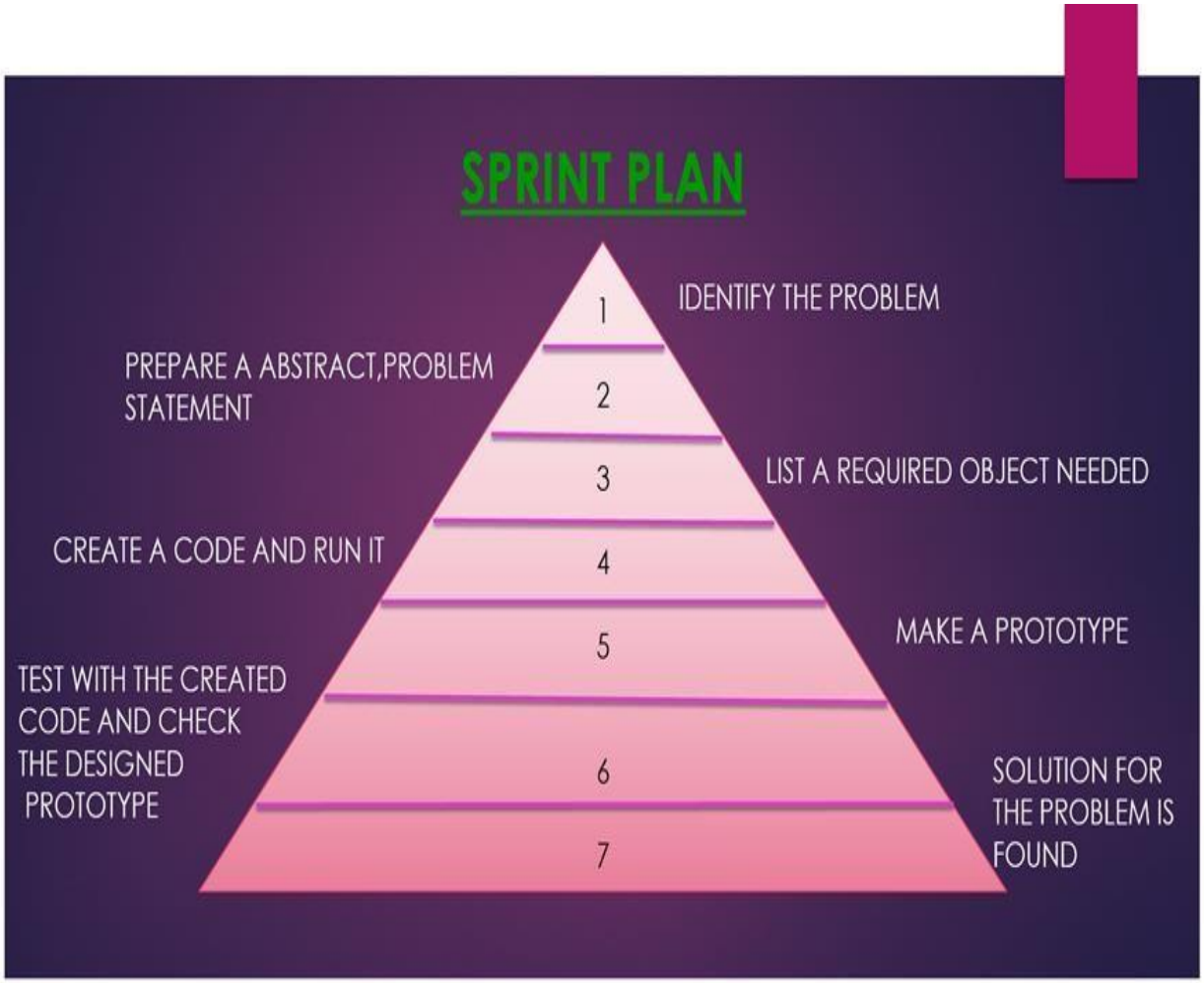
Technology Architecture

Project Planning

Milestone and Activity List



Sprint Delivery Plan



PROJECT DEVELOPMENT PHASE

Sprint-1

```
#include <LiquidCrystal.h>

LiquidCrystal lcd(5,6,8,9,10,11);

int redled = 2;
int greenled = 3;
int buzzer = 4;
int sensor = A0;
int sensorThresh = 400;
void setup()
{
pinMode(redled, OUTPUT);
pinMode(greenled,OUTPUT);
pinMode(buzzer,OUTPUT);
pinMode(sensor,INPUT);
Serial.begin(9600);
lcd.begin(16,2);
}
void loop()
{
  int analogValue = analogRead(sensor);
  Serial.print(analogValue);
  if(analogValue>sensorThresh)
  {
    digitalWrite(redled,1);
    digitalWrite(greenled,0);
```

```
  tone(buzzer,1000,10000);
  lcd.clear();
  lcd.setCursor(0,1);
  lcd.print("ALERT");
  delay(1000);
  lcd.clear();
  lcd.setCursor(0,1);
  lcd.print("EVACUATE");
  delay(1000);
 }
 else
 {
  digitalWrite(greenled,1);
  digitalWrite(redled,0);
  noTone(buzzer);
  lcd.clear();
  lcd.setCursor(0,0);
  lcd.print("SAFE");
  delay(1000);
  lcd.clear();
  lcd.setCursor(0,1);
  lcd.print("ALL CLEAR");
  delay(1000);
 }

}
```

Sprint-2

```
#include <LiquidCrystal.h>
LiquidCrystal lcd(5,6,8,9,10,11);
      int redled = 2;
        int greenled = 3;
        int buzzer = 4;
        int sensor = A0;
        int sensorThresh = 400;
        void setup()
        {
        pinMode(redled, OUTPUT);
        pinMode(greenled,OUTPUT);
        pinMode(buzzer,OUTPUT);
        pinMode(sensor,INPUT);
        Serial.begin(9600);
        lcd.begin(16,2);
        }
        void loop()
        {
          int analogValue = analogRead(sensor);
          Serial.print(analogValue);
          if(analogValue>sensorThresh)
          {
            digitalWrite(redled,1);
            digitalWrite(greenled,0);
```

```
  tone(buzzer,1000,10000);
  lcd.clear();
  lcd.setCursor(0,1);
  lcd.print("ALERT");
  delay(1000);
  lcd.clear();
  lcd.setCursor(0,1);
  lcd.print("EVACUATE");
  delay(1000);
 }
else
{
  digitalWrite(greenled,1);
  digitalWrite(redled,0);
  noTone(buzzer);
  lcd.clear();
  lcd.setCursor(0,0);
  lcd.print("SAFE");
  delay(1000);
  lcd.clear();
  lcd.setCursor(0,1);
  lcd.print("ALL CLEAR");
  delay(1000);
 }
```

Sprint-3

```
#include <LiquidCrystal.h>
LiquidCrystal lcd(5,6,8,9,10,11);
int redled = 2;
int greenled = 3;
int buzzer = 4;
int sensor = A0;
int sensorThresh = 400;

void setup()
{
pinMode(redled, OUTPUT);
pinMode(greenled,OUTPUT);
pinMode(buzzer,OUTPUT);
pinMode(sensor,INPUT);
Serial.begin(9600);
lcd.begin(16,2);
}

void loop()
{
  int analogValue = analogRead(sensor);
  Serial.print(analogValue);
  if(analogValue>sensorThresh)
```

```
{
  digitalWrite(redled,HIGH);
  digitalWrite(greenled,LOW);
  tone(buzzer,1000,10000);
  lcd.clear();
  lcd.setCursor(0,1);
  lcd.print("ALERT");
  delay(1000);
  lcd.clear();
  lcd.setCursor(0,1);
  lcd.print("EVACUATE");
  delay(1000);
}
else
{
  digitalWrite(greenled,HIGH);
  digitalWrite(redled,LOW);
  noTone(buzzer);
  lcd.clear();
  lcd.setCursor(0,0);
  lcd.print("SAFE");
  delay(1000);
  lcd.clear();
  lcd.setCursor(0,1);
  lcd.print("ALL CLEAR");
```

```
    delay(1000);
  }


}
```

Sprint-4

```
#include <LiquidCrystal.h>
LiquidCrystal lcd(5,6,8,9,10,11);
int redled = 2;
int greenled = 3;
int buzzer = 4;
int sensor = A0;
int sensorThresh = 400;

void setup()
{
pinMode(redled, OUTPUT);
pinMode(greenled,OUTPUT);
pinMode(buzzer,OUTPUT);
pinMode(sensor,INPUT);
Serial.begin(9600);
lcd.begin(16,2);
}

void loop()
{
  int analogValue = analogRead(sensor);
  Serial.print(analogValue);
  if(analogValue>sensorThresh)
```

```
{
  digitalWrite(redled,HIGH);
  digitalWrite(greenled,LOW);
  tone(buzzer,1000,10000);
  lcd.clear();
  lcd.setCursor(0,1);
  lcd.print("ALERT");
  delay(1000);
  lcd.clear();
  lcd.setCursor(0,1);
  lcd.print("EVACUATE");
  delay(1000);
}
else
{
  digitalWrite(greenled,HIGH);
  digitalWrite(redled,LOW);
  noTone(buzzer);
  lcd.clear();
  lcd.setCursor(0,0);
  lcd.print("SAFE");
  delay(1000);
  lcd.clear();
  lcd.setCursor(0,1);
  lcd.print("ALL CLEAR");
```

```
    delay(1000);
  }


}
```

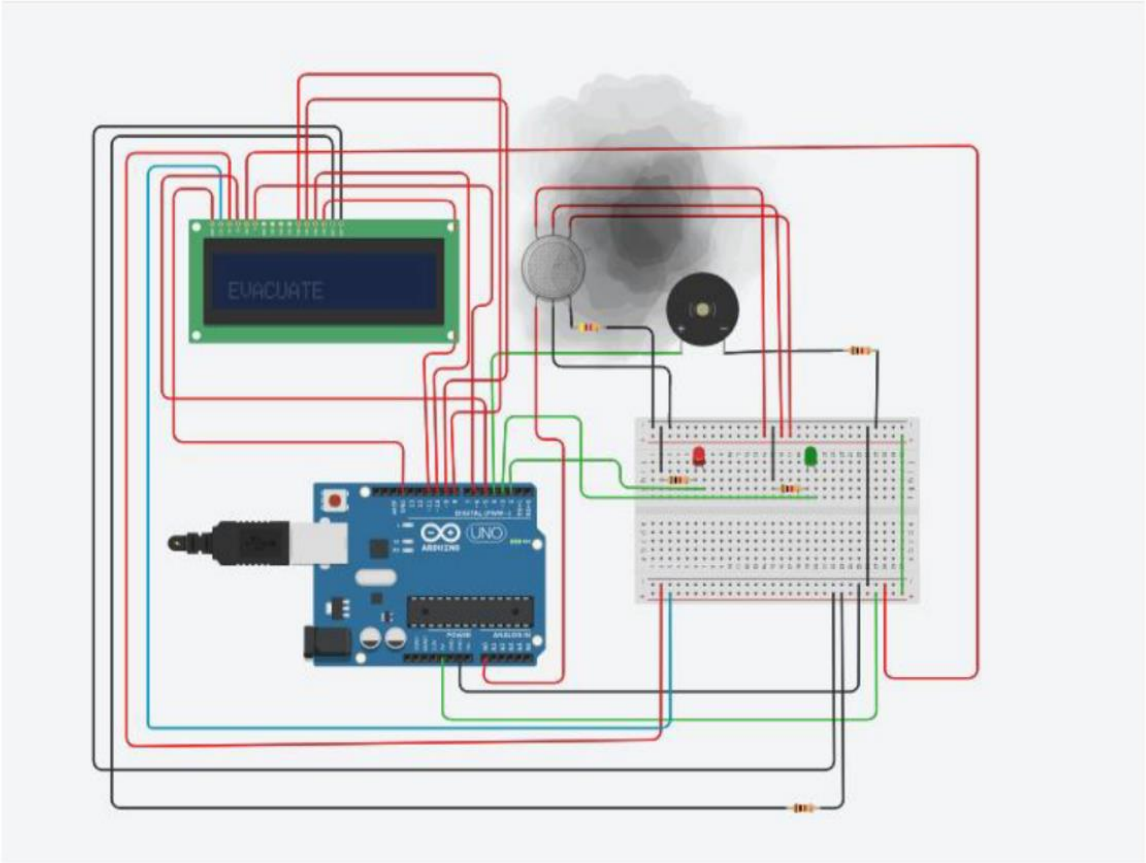
CODE AND SOLUTION

```
#include <LiquidCrystal.h>
LiquidCrystal lcd(5,6,8,9,10,11);

int redled = 2;
int greenled = 3;
int buzzer = 4;
int sensor = A0;
int sensorThresh = 400;

void setup()
{
pinMode(redled, OUTPUT);
pinMode(greenled,OUTPUT);
pinMode(buzzer,OUTPUT);
pinMode(sensor,INPUT);
Serial.begin(9600);
lcd.begin(16,2);
}

void loop()
{
  int analogValue = analogRead(sensor);
  Serial.print(analogValue);
```

```
if(analogValue>sensorThresh)
{
  digitalWrite(redled,HIGH);
  digitalWrite(greenled,LOW);
  tone(buzzer,1000,10000);
  lcd.clear();
  lcd.setCursor(0,1);
  lcd.print("ALERT");
  delay(1000);
  lcd.clear();
  lcd.setCursor(0,1);
  lcd.print("EVACUATE");
  delay(1000);
}
else
{
  digitalWrite(greenled,HIGH);
  digitalWrite(redled,LOW);
  noTone(buzzer);
  lcd.clear();
  lcd.setCursor(0,0);
  lcd.print("SAFE");
  delay(1000);
  lcd.clear();
  lcd.setCursor(0,1);
```

```
    lcd.print("ALL CLEAR");
    delay(1000);
  }

}
```

RESULT



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 CO2, 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.