# GAS LEAKAGE MONITORING AND ALERTING SYSTEM

## PROFESSIONAL READINESS FOR INNOVATION, EMPLOYABILITY AND ENTREPRENEURSHIP

**REPORT**

***Submitted by***

**TEAM ID: PNT2022TMID04616**


**AKSHAYA M 622019106001**

**KASTHURI M 622019106009**

**SARATHAPRIYA C 622019106018**

**SOUNDARYA B 622019106022**


***in partial fulfillment for the award of the degree***

***of***

**BACHELOR OF ENGINEERING**

**IN**

**ELECTRONICS AND COMMUNICATION ENGINEERING**


**PAAVAI COLLEGE OF ENGINEERING**

**NAMAKKAL**


**NOVEMBER 2022**

## ANNA UNIVERSITY CHENNAI 600

## BONAFIDE CERTIFICATE

Certified that this project report "**GAS LEAKAGE MONITORING AND ALERTING SYSTEM "** is the bonafide work of **AKSHAYA M (**622019106001**),KASTHURI M** (622019106009)**, SARATHAPRIYA C** (622019106018)**,SOUNDARYA B** (622019106022) who carried out the project under my supervision.

| | | |
|---|---|---|
| **SIGNATURE** | **SIGNATURE** | **SIGNATURE** |
| **Mr . L. Vasanth** | **Mr .V. Sundharajan** | **Mr .P. Gopinathan** |
| M.E., Ph.D., | M.E., Ph.D., | M.E., |
| Associate Professor | Assistant Proffessor | Assistant Proffessor |
| Department of ECE | Department of ECE | Department of ECE |
| Paavai college of Engineering | Paavai College of Engineering | Paavai College of Engineering |
| Namakkal-637018 | Namakkal- 637018 | Namakkal - 637018 |

## CERTIFICATION OF EVALUATION

**COLLEGE NAME** **Paavai college of engineering**

**BRANCH/SEMESTER** **ECE/VII**

**TEAM ID** **PNT2022TMID041775**

| NAME OF THE STUDENTS AND REGISTER NUMBER | TITLE OF THE PROJECT |
|---|---|
| M.Akshaya (622019106001)<br>M.Kasthuri (622019106009)<br>C.Sarathapriya(622019106018)<br>B.Soundarya(622019106022) | GAS LEAKAGE MONITORING AND ALERTING SYSTEM |

**The report of the project works 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 were evaluated and confirmed to be reports of work done by the above students and then evaluated**

**INTERNAL EVALUATOR** **EXTERNAL EVALUATOR**

# ACKNOWLEDGEMENT

A great deal of time and effort has been spent in completing this project work.Several people have contributed significantly to this work and so this becomes obligatory to record our them.

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CONTENTS

# CHAPTER-1

# INDRODUCTION

The home safety detection system is becoming very crucial for people's protection. Since everyone in the household works every day, it is impossible to check on the household appliances, particularly the LPG gas cylinder, wired circuits, etc. Liquefied petroleum gas (LPG) and natural gas demand has significantly increased during the past three years. LPG and natural gas are recommended to meet this high level of energy demand and to substitute oil or coal due to those fuels' negative environmental effects. Large-scale applications for these gases include industry, heating, home appliances, and motor fuel. The system has a MQ6 gas sensor to monitor this leakage gas. This sensor detects how much leak gas is there in the environment around it. Explosions or being harmed by gas leaks could be avoided in this way.

## 1.1 PROJECT OVERVIEW

The Internet of Things (IOT) is a network of gadgets, automobiles, and home appliances that include the hardware, software, actuators, and networks required for interoperability, cooperation, and information exchange. IOT requires extending the Internet network to a wide range of physically flawed or non-web capable physical devices and ordinary things in addition to more conventional devices like workspaces, workstations, smartphones, and tablets. Remote monitoring and control are possible thanks to these contemporary technologies' ability to connect to the Internet and communicate with one another. The aid of this programme in monitoring hazardous gas emissions benefits the industries. In order to stop the release of gases in various areas, the gas sensors will be integrated to track gas leakage.

## 1.2 PURPOSE

This project aids businesses in keeping an eye on gas emissions that are dangerous. To track gas leaks, the gas sensors will be integrated in a number of locations. The administrators will be contacted and given the location if a gas leak is found in any region. The web application's admin panel allows users to view sensor parameters. The usage of gas detectors includes the detection of combustible, flammable, and toxic gases as well as the loss of oxygen. They can also be used to identify other contaminants or gas leaks. It emits a warning sound in the region where the leak happens and tells users to get out of there.

# CHAPTER -2

# LITERATURE SURVEY

## 2.1 EXISTING PROBLEM

In industries, the current the issue with gas monitoring is that there isn't an effective system for keeping track of gas leaks, and the good systems are expensive and difficult to install. Additionally, the system's cost is considerable, it occasionally causes disasters, there are an unpredictably large number of sensors, and the equipment is improperly positioned.

## 2.2 REFERENCES

### CASE STUDY – I

**TITLE:** Methane Leakage Monitoring Technology For Natural Gas Stations And Its Application

**AUTHOR**: B. Han, Q. Fu, Y. Huang and H. Hou

**YEAR:** 2001

**ABSTRACT:**

Leakage monitoring methods are crucial in natural gas stations for quickly discovering gas leaks and limiting the different losses they generate. Taking into account the drawbacks of the current leakage monitoring technologies used for the natural gas stations, such as the high false alarm rate, poor stability, easy to be interfered by background gas, etc., the Fiber Bragg Grating (FBG) sensing technology is applied to monitor key areas and equipment in natural gas stations that may suffer methane leakage. Monitoring the leaking vibration and methane concentration simultaneously can significantly lower the false alarm rate. Laboratory testing results show that the monitoring method suggested in this work has high reliability, low cost, and is simple to install. It may be widely used to monitor methane leakage in natural gas stations and valve chambers of long-distance and collection pipelines.

**CASE STUDY – II**

**TITLE:** GSM based LPG leakage detection and controlling system.

**AUTHOR**: Prof.M.Amsaveni, A.Anurupa, R.S.Anu Preetha, C.MalarvizhiM.Gunasekaran

**YEAR:** 2015

**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. In this project, after the leakage of gas is detected, the valve is automatically closed, thereby stopping the leakage. Then the electric power supply is also shut down to prevent fire accidents. In particular, gas sensor has been used which has high sensitivity to gases like propane and butane. Gas leakage system consists of GSM module, which alerts the user by sending SMS.

**CASE STUDY – III**

**TITLE:** Implementation of Ammonia Gas Leakage Detection & Monitoring System using Internet of Things

**AUTHOR**: J. Vijayalakshmi, G. Puthilibhai and S. R. L. Siddarth.

**YEAR**: 2019

**ABSTRACT:**

The Internet of things is the way we connect various components with internet connectivity and achieve communication. Through an embedded computing system, everything is uniquely identified and can form a world-wide interactive network which performs various functionalities. This paper implements the ammonia gas leakage detection via a monitoring system with the help of ammonia gas sensor (MQ135), using the concept of the Internet of Things. Ammonia Gas sensor (MQ135) sense and detect a large amount of ammonia gas present in the lab, industries, factories, health care, etc, High concentrationof Ammonia results in blindness, lung damage or death. Whenever ammonia gas reaches a threshold level provided in the MQ135 Sensor, the buzzer in the Ammonia Gas Sensor goes

off alerting the officials. The Electrochemical principle on which the system operates. Electrochemical sensors measure the partial pressure of gases under atmospheric conditions. The ambient air is monitored and diffused with the help of a membrane by the liquid electrolyte in the sensor. The system we implement collects data about the various levels of ammonia gas at various times daily and also it is possible to generate graph whenever is needed with the data sensed. The system we propose can be easily made a working model anywhere. The model we propose is much cheaper and efficient as combined with leading IT technology. This paper implements the use of a gas monitoring system in labs to detect the ammonia levels present in the air, processed and notified through the Internet Of Things.

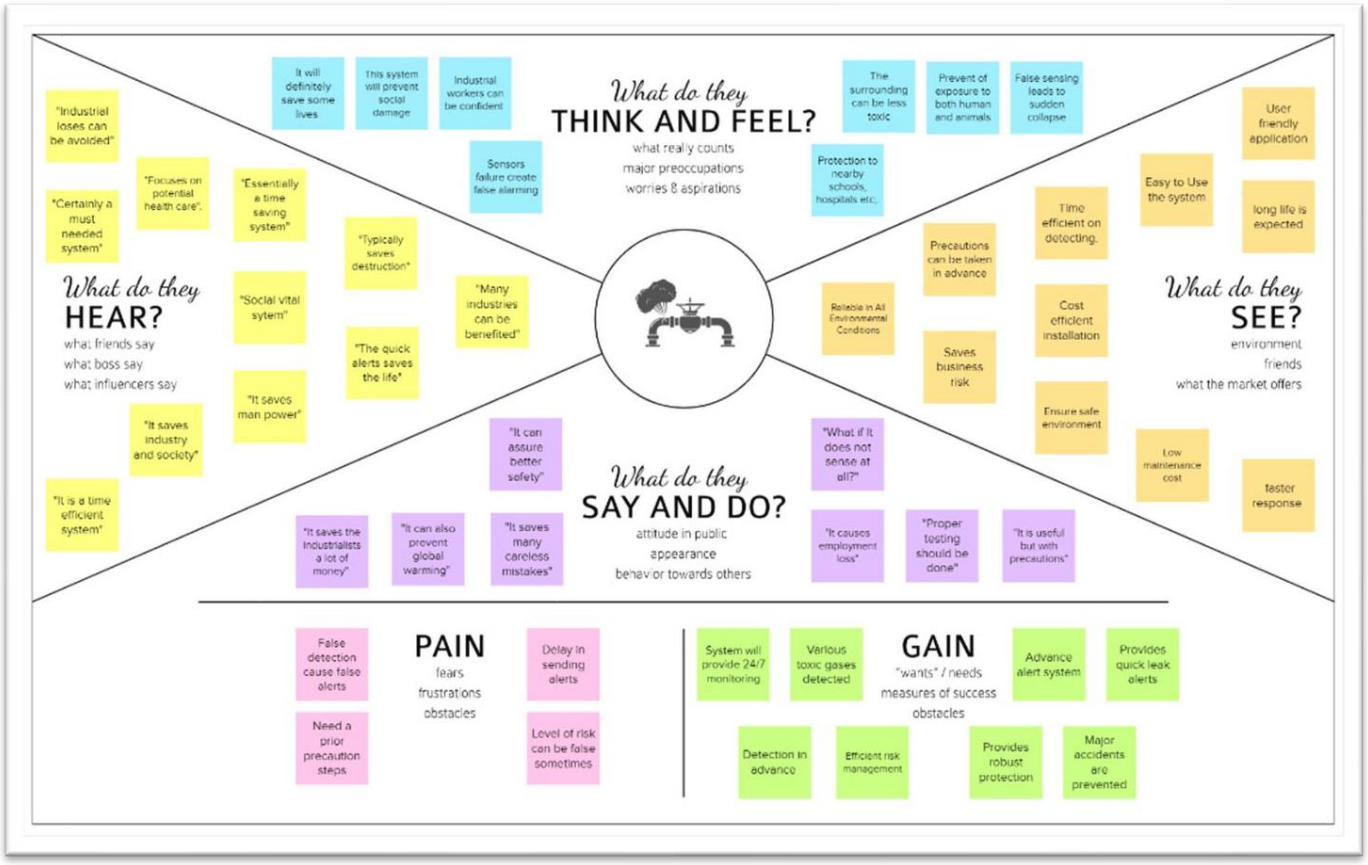
## 2.3 PROBLEM SOLUTION DEFINITION

The industrialists feel uneasy handling the gases since the quantity of sensors is uncertain. Additionally, the expense of the goods and the difficulty of implementing the systems are both significant. Customers occasionally feel let down by this. We develop a system for monitoring gas leakage in the industry and control the leakage, making the installation proposal simple.

# CHAPTER 3

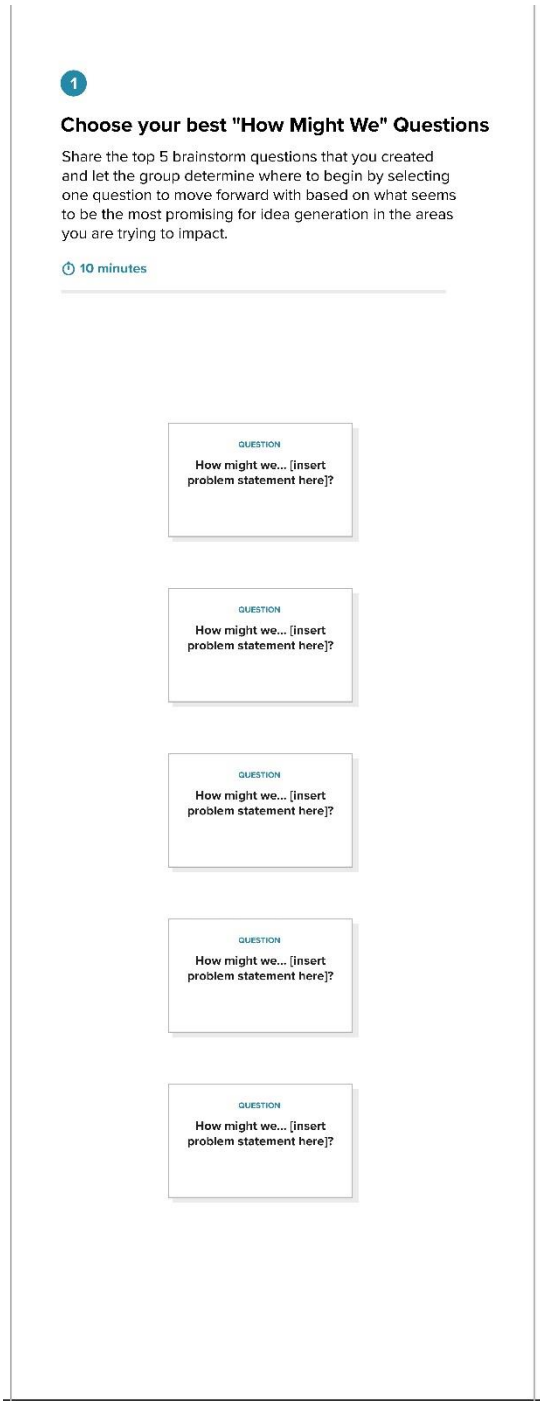
# IDEATION AND PROPOSED SOLUTION

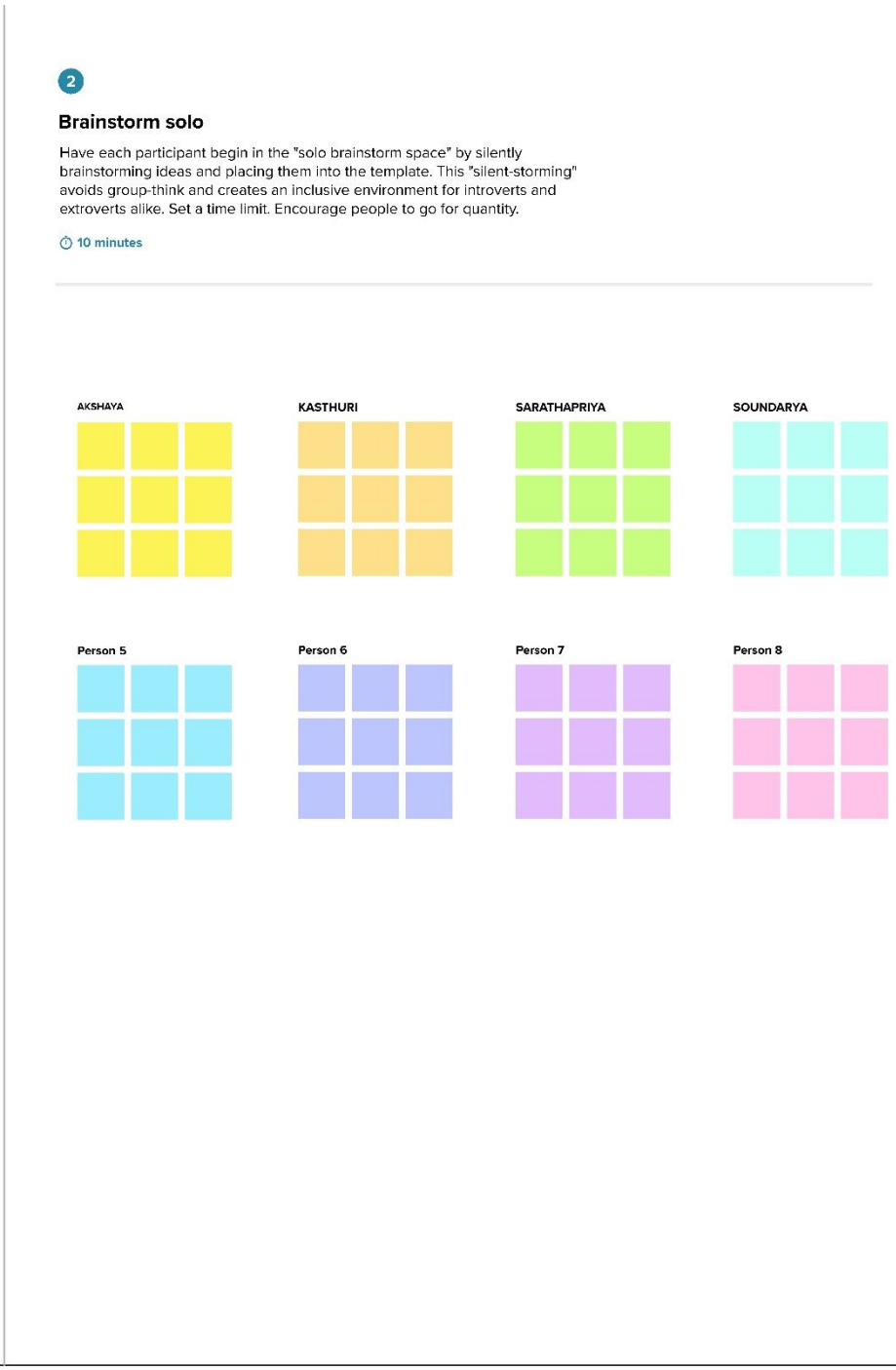
## 3.1 EMPATHY MAP CANVAS



## 3.2 IDEATION AND BRAINSTORMING

### Step-1: Brainstorm, Idea Listing and Grouping



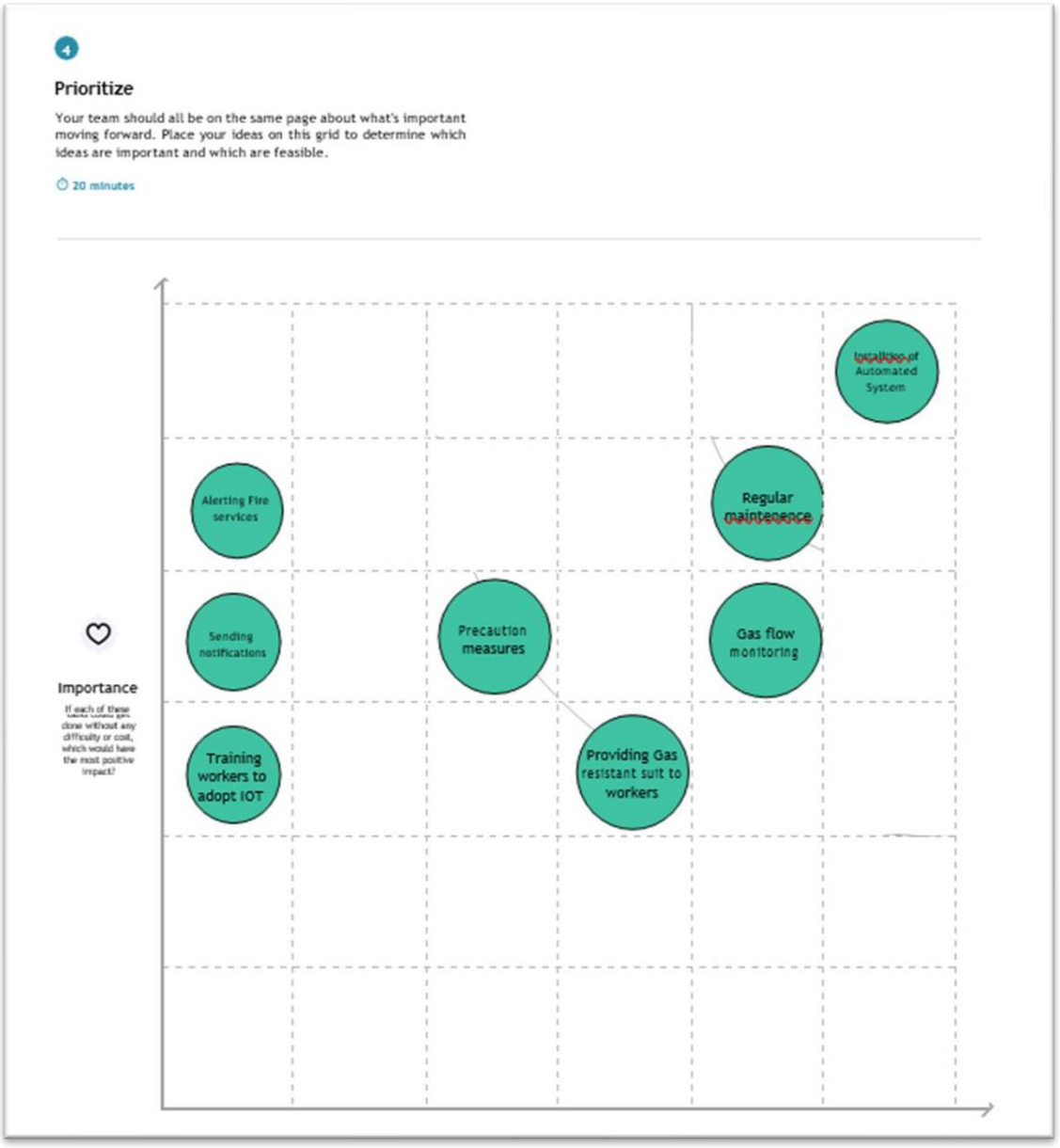



## Group ideas

Take turns sharing your ideas while clustering similar or related notes as you go. Once all sticky notes have been grouped, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you and break it up into smaller sub-groups.

20 minutes

## Step-2: Idea Prioritization



### 3.3 PROPOSED SOLUTION

System for detecting and notifying gas leaks for safety. In many facilities where gas is being manufactured, as well as in several industries, monitoring of gas leakage plays a significant role. This monitoring will prevent numerous accidents caused by gas leaks.

| S. No | PARAMETER | DESCRIPTION |
|---|---|---|
| 1. | Problem Statement | ➢ Emission of harmful gases due to leakages in industries.<br>➢ It is hard for a human to detect gas leakage at early stage.<br>➢ Due to which it may harm surrounding peoples and nearby areas. |
| 2. | Idea/Solution description | ➢ The proposed system that uses the sensor which is capable of detecting hazardous gases like LPG and propane etc.,<br>➢ It immediately sends alerts via message or call.<br>➢ It also sends the location of industry to Disaster Management Team. |
| 3. | Novelty/Uniqueness | ➢ Ability to predict the hazardous gases like LPG and propane<br>➢ User friendly<br>➢ Live alert to the workers |
| 4. | Social Impact / Customer Satisfaction | ➢ Low cost<br>➢ Compact size<br>➢ Easy to use without fear |
| 5. | Business Model (Revenue Model) | ➢ As this product is user friendly, it is advertised in all social media platforms.<br>➢ It is cost effective so it will be engaged in installation in industries. |
| 6. | Scalability of the Solution | ➢ Includes many hazardous gas detections inindustries.<br>➢ The system can be extended in future based on industry requirements and features. |

## 3.4 PROBLEM SOLUTION FIT

## 3.5

**1. CUSTOMER SEGMENTS**

- Large industries where heavy equipment is used in which gas leakage is possible these industries admins are our major customer.
- Sometimes it is hard to identify the area where the leakage occurs.

**6. CUSTOMER CONTRAINTS**

- Proper maintenance should be taken at least once in a month and this prevents the customers from taking actions in gas leakage problem.

**5. AVAILABLE SOLUTIONS**

- Usage of sensors to sense gas Leakage.
- Buzzer to indicate the leakage.
- GSM module helps us to get notification when there is a gas leakage.

**2. JOBS-TO-BE-DONE / PROBLEMS**

- Most of GAS explosions are caused by undetected gas leakage in the pre detection condition.
- So that the gas leakage monitoring and alerting systemis needed
- The purpose of the system intodetects the gas leakage neutralize it and prevent explosion.

**9. PROBLEM ROOT CAUSE**

- Some of the faults in the machines, leakage by the machines, people carelessness in workplace and life security.

**7. BEHAVIOUR**

- Network issue is very common as most of the industries are located at the country side. Here contact both the developers and the service providers.
- To determine the gas characteristics and solve the issue, they will locate the leak and identify the warning.

**3. TRIGGERS**

- The trigger varies from the incorrect installation to the use of defective gas cylinders. Employee and organization safety triggers this installation.

**4.EMOTIONS: Before/After**

- Before the action is taken the user feels deceived and cheated.
- After the problem is resolved user feels the sincerity of the developer.

**10. YOUR SOLUTION**

- Low cost IOT based device that can be easily accessed and fixed by people.
- Network strength must be boosted in the device.
- Device can be manufactured in multiple standards based on the environment.

**8. CHANNELS OF BEHAVIOUR**

**ONLINE**

- Sending messages via GSM

**OFFLINE**

- Prevent physical damage to sensor.
- Provide proper network and power supply to sensors.
- Complaint letters.
- Alarm generates high noise which provides warning.

# CHAPTER-4

# REQUIREMENT ANALYSIS

## 4.1 FUNCTIONAL REQUIREMENT

**Functional Requirements:**

Following are the functional requirements of the proposed solution.

| FR No. | Functional Requirement (Epic) | Sub Requirement (Story / Sub-Task) |
|---|---|---|
| FR-1 | User Registration | Registration through Form<br>Online Payment for the service |
| FR-2 | User Access | Access the details using web browser<br>Access the details using mobile application |
| FR-3 | User alert | Gets alert as an SMS message<br>Gets alert alarm in the working area. |

## 4.2 NON-FUNCTIONAL REQUIREMENTS

**Non-Functional Requirements:**

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

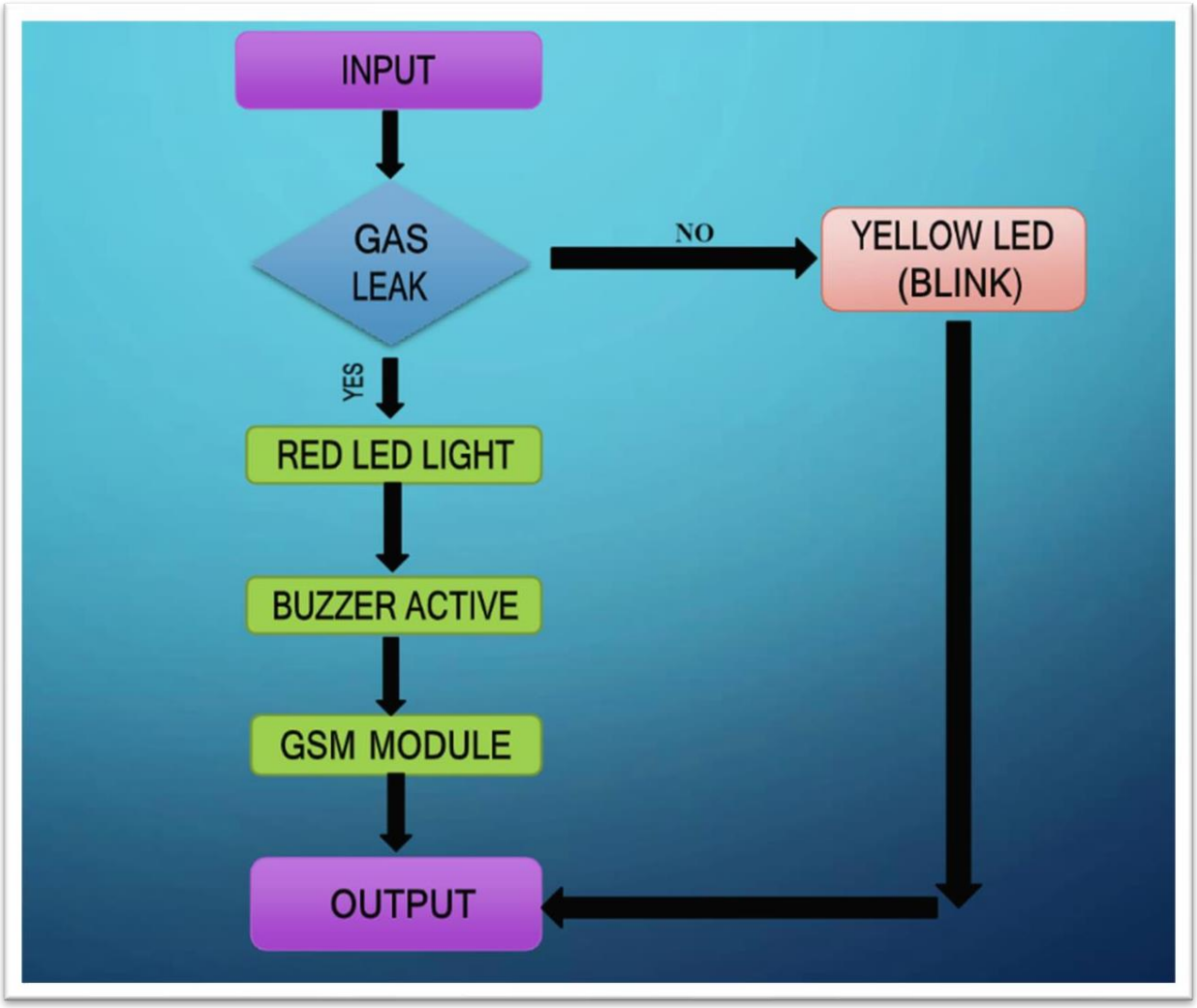
| NFR No. | Non-Functional Requirement | Description |
|---|---|---|
| NFR-1 | Usability | The device must be usable by the customer anywhere |
| NFR-2 | Security | Data from the sensors are stored securely and away from other data |
| NFR-3 | Reliability | Data can be retrieved anytime and no data is discarded without customer knowledge |
| NFR-4 | Performance | No performance delay in case of large number of data or more parameters |
| NFR-5 | Availability | The device doesn't fail even under harsh conditions. Device continues to send parameters, even after an alert situation. |
| NFR-6 | Scalability | Device must be capable of measuring conditions even in a larger industry |

# CHAPTER-5

# PROJECT DESIGN

## 5.1 DATA FLOW DIAGRAM

The monitoring and detection of gas leaks is shown in the data flow diagram. Here, information from an IOT device is gathered regarding the temperature and gas sensors, and the information is then analyzed. A warning is issued and the necessary actions are taken if the alert action calls for it.



## 5.2 SOLUTION AND TECHNOLOGY ARCHITECTURE

The monitoring and detection of gas leaks is shown in this technical diagram. In this case, data is gathered from temperature and gas sensors and connected to IBM Watson (cloud). The outcome of the data from the cloud flows through Node Red, which is connected to the cloud.

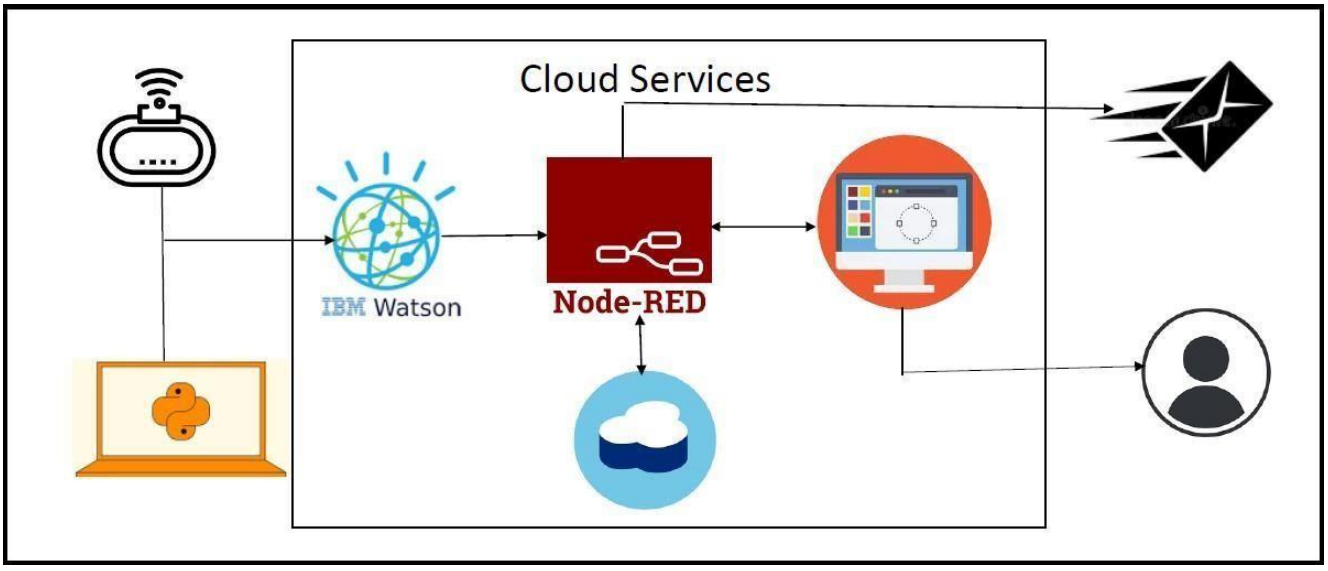



**TABLE-1: COMPONENTS & TECHNOLOGIES**

| S. No | Component | Description | Technology |
|---|---|---|---|
| 1. | User Interface | Web UI | HTML, CSS, JavaScript |
| 2. | Application Logic-1 | Logic for a process in the application | Python |
| 3. | Application Logic-2 | Logic for a process in the application | IBM Watson STT service |
| 4. | Application Logic-3 | Logic for a process in the application | IBM Watson Assistant |
| 5. | Database | Data Type | MySQL, NoSQL, etc. |
| 6. | Cloud Database | Database Service on Cloud | IBM Cloudant. |
| 7. | File Storage | File storage requirements | IBM Block Storage |
| 8. | External API-1 | Purpose of External API used in the application | IBM Weather API |

| | | | |
|---|---|---|---|
| 9. | External API-2 | Purpose of External API used in the application | Aadhar API |
| 10. | Machine Learning Model | Purpose of Machine Learning Model | Object Recognition Model |
| 11. | Infrastructure (Server / Cloud) | Application Deployment on Local System / CloudLocal Server Configuration:<br>Cloud Server Configuration: | Cloud Foundry |

**TABLE-2: APPLICATION CHARACTERISTICS**

| **S. No** | **Characteristics** | **Description** | **Technology** |
|---|---|---|---|
| 1. | Open-Source Frameworks | The open-source frameworks used | Mozilla Firefox |
| 2. | Security Implementations | The usage of firewalls, security and access controls, etc. | IBM cloud Encryptions |
| 3. | Scalable Architecture | The scalability of architecture (3 – tier, Micro-services) | IBM cloud architecture |
| 4. | Availability | Application accessibility (e.g., use of load balancers, distributed servers etc.) | Web applications are even accessible to industrial employees |
| 5. | Performance | Take into account the application's performance when designing it (requests per second, cache usage, CDN usage, etc.). | The online application may be used by employees at any time because of its excellent efficiency. |

## 5.3 USER STORIES

| User Type | Functional Requirement (Epic) | User Story Number | User Story/Task | Acceptance Criteria | Priority | Release |
|---|---|---|---|---|---|---|
| Customer (Mobile User) | Registration | USN-1 | User Can enter into the web application | I can access my account /Dashboard | High | Sprint-1 |
| | | USN-2 | User can register their credentials like email id and password | I can receive confirmation email & click confirm | High | Sprint-1 |
| | Login | USN-3 | User can log into the application by entering email &Password | I can login to my account | High | Sprint-1 |
| | Dashboard | USN-4 | User can view the temperature | I can view the data given by the device | High | Sprint-2 |
| | | USN-5 | User can view the level of gas | I can view the data given by the device | High | Sprint-2 |
| Customer (Web User) | Usage | USN-1 | User can view the web page and get the information | I can view the data given by the device | High | Sprint-3 |
| Customer | Working | USN-1 | User act according to the alert given by the device | I can get the data work according to it | High | Sprint-3 |
| | | USN-2 | User turns ON the exhaust fan/sprinkler when the leakage occurs | I can get the data work according to it | High | Sprint-4 |
| Customer Care Executive | Action | USN-1 | user solve the problems when someone faxes any usage issues | I can solve the issues when someone fails to understand the procedure | High | Sprint-4 |
| Administrator | Administration | USN-1 | User Stores every information | I can store the gained information | High | Sprint-4 |

## CHAPTER-6

## 6.1 SPRINT PLANNING AND ESTIMATION

**Project Tracker:**

| Sprint | Total Story Points | Duration | Sprint StartDate | Sprint End Date (Planned) | Story Points Completed (as on Planned EndDate) | Sprint Release Date (Actual ) |
|---|---|---|---|---|---|---|
| Sprint-1 | 20 | 6 Days | 24 Oct 2022 | 29 Oct 2022 | 20 | 29 Oct 2022 |
| Sprint-2 | 20 | 6 Days | 31 Oct 2022 | 05 Nov 2022 | 20 | 05 Nov2022 |
| Sprint-3 | 20 | 6 Days | 07 Nov 2022 | 12 Nov 2022 | 20 | 12 Nov 2022 |
| Sprint-4 | 20 | 6 Days | 14 Nov 2022 | 19 Nov 2022 | 20 | 19 Nov 2022 |

**Velocity: Sprint – I to 4**

Sprint duration = 6 days Velocity of the team = 20 points

$$\text{average velocity (AV)} = \frac{\text{Velocity}}{\text{Sprint duration}}$$

$$AV = 20/6 = 3.34$$

Average Velocity = 3.34

| Sprint | Functional Requirement (EPIC) | User Story Number | User Story/Task | Story Points | Priority | Team Members |
|---|---|---|---|---|---|---|
| Sprint-1 | IDE | USN-1 | Installing all the software's which is required like python IDE | 2 | High | Akshaya.M<br>Kasthuri.M<br>Sarathapriya.C<br>Soundarya.B |
| Sprint-1 | Checking the simulation with condition | USN-1 | Simulating the circuits and experimenting | 2 | High | Akshaya.M<br>Kasthuri.M<br>Sarathapriya.C<br>Soundarya.B |
| Sprint-2 | Software | USN-2 | -IBM Watson iot<br>-Node Red Integration | 2 | High | Akshaya.M<br>Kasthuri.M<br>Sarathapriya.C<br>Soundarya.B |
| Sprint-2 | Software | USN-2 | Test the device and workflow | 2 | High | Akshaya.M<br>Kasthuri.M<br>Sarathapriya.C<br>Soundarya.B |

| | | | | | | |
|---|---|---|---|---|---|---|
| Sprint-3 | Application Development | USN-3 | using MIT App Inventor Create an app | 2 | High | Akshaya.M<br>Kasthuri.M<br>Sarathapriya.C<br>Soundarya.B |
| Sprint-3 | Testing | USN-3 | Testing the Application | 2 | High | Akshaya.M<br>Kasthuri.M<br>Sarathapriya.C<br>Soundarya.B |
| Sprint-4 | Web UI | USN-4 | User interface with the software | 2 | High | Akshaya.M<br>Kasthuri.M<br>Sarathapriya.C<br>Soundarya.B |

## 6.2 PRINT DELIVERY SCHEDULE

| Sprint | Functional Requirement (Epic) | User Story/Task | Story Points | Priority | Team Members |
|---|---|---|---|---|---|
| Sprint -1 | Resource initialization | create and initialize accounts in various public APIs like Open/Weather Map API | 1 | Low | Akshaya.M<br>Kasthuri.M<br>Sarathapriya.C<br>Soundarya.B |
| Sprint-1 | Local Server /Software to cloud | Write a python program that outputs results given the inputs like weather and location | 1 | Medium | Akshaya.M<br>Kasthuri.M<br>Sarathapriya.C<br>Soundarya.B |
| Sprint-2 | Push the server/software to cloud | Push the code from sprint 1 to cloud as it can be accessed from anywhere | 2 | Medium | Akshaya.M<br>Kasthuri.M<br>Sarathapriya.C<br>Soundarya.B |
| Sprint-3 | Hardware initialization | Integrate the hardware to be able to access the cloud and provide inputs to the same | 2 | High | Akshaya.M<br>Kasthuri.M<br>Sarathapriya.C<br>Soundarya.B |
| Sprint-4 | UI/UX Optimization &Debugging | Optimize all the short coming and provide user experience | 2 | Low | Akshaya.M<br>Kasthuri.M<br>Sarathapriya.C<br>Soundarya.B |

# CHAPTER-7

# CODING AND SOLUTIONING

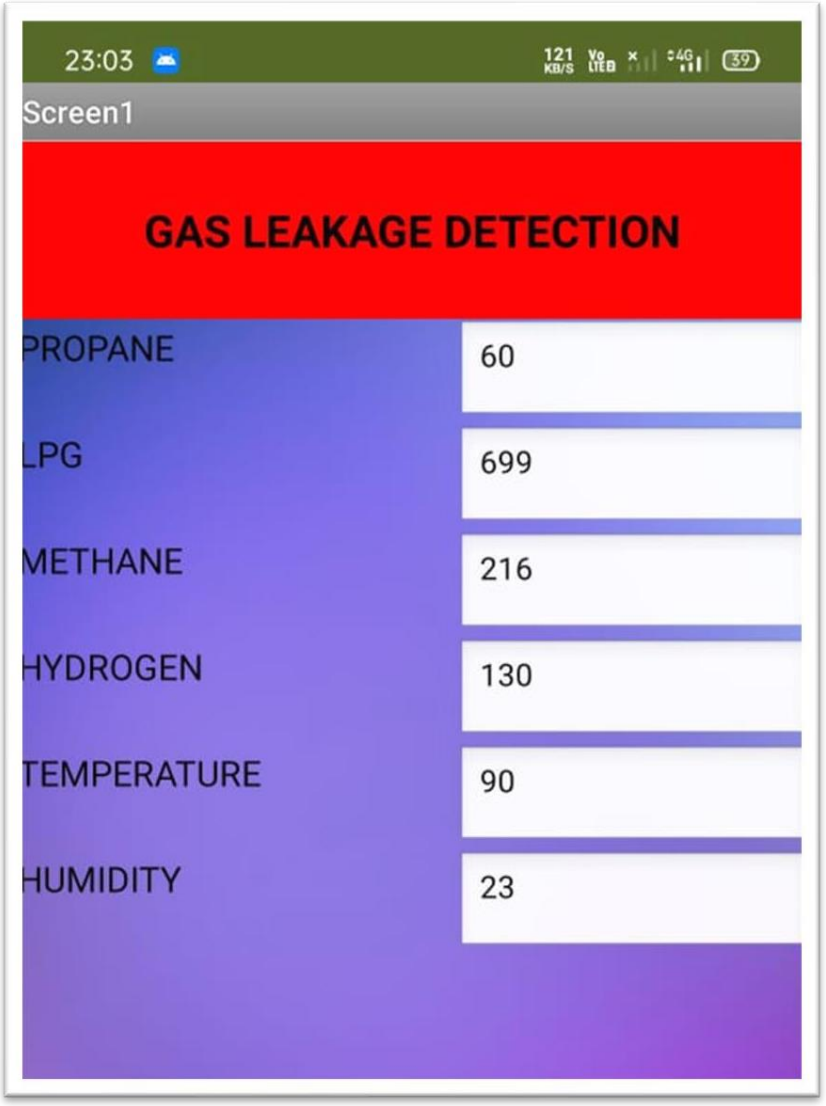
## 7.1 FEATURE CODE

```
import time
import sys
import ibmiotf.application
import ibmiotf.device
import random
#Provide your IBM Watson Device Credentials
organization = "kz2her"
deviceType = "NODE"
deviceId = "4222"
authMethod = "token"
authToken = " j5RIM+NYy8Uv6+!s4q"
# Initialize GPIO
try:
deviceOptions = {"org": organization, "type": deviceType, "id":
deviceId, "auth-method": authMethod, "auth-token": authToken}
deviceCli = ibmiotf.device.Client(deviceOptions)
#.....
except Exception as e:
print("Caught exception connecting device: %s" % str(e))
sys.exit()
# Connect and send a datapoint "hello" with value "world" into the cloud asan event of
type "greeting" 10 times
deviceCli.connect()
while True:
#Get Sensor Data from DHT11
```

```
Propane = random.randint(0, 500);

Carbon_Monoxide = random.randint(0, 500);

LPG= random.randint(0, 1000);

Methane = random.randint(0, 500);

Hydrogen= random.randint(0, 500);

Temperature=random.randint(0,100 );

Humidity=random.randint(0,100 );

data = { "temp" : Temperature, "Humid": Humidity,"Propane": Propane,

"Carbon_Monoxide": Carbon_Monoxide,

"LPG": LPG,

"Methane": Methane,

"Hydrogen":Hydrogen }

#print data

def myOnPublishCallback():

print ("Published Temperature = %s C" % Temperature, "Humidity = %s%%" %
Humidity,"Propane = %s ppm" % Propane, "LPG = %s ppm" % LPG,"Methane = %s
ppm" % Methane,"Hydrogen = %s ppm" % Hydrogen,"Carbon monoxide = %s ppm" %
Carbon_Monoxide , "to IBM Watson")

if (Propane or Carbon_Monoxide or LPG or Methane or Hydrogen)>150:

print("GAS LEAKAGE FOUND")

else:

print("NO LEAKAGE")

success = deviceCli.publishEvent("IoTSensor", "json", data,
qos=0,on_publish=myOnPublishCallback)

if not success:

print("Not connected to IoTF")

time.sleep(10)

deviceCli.commandCallback = myCommandCallback

# Disconnect the device and application from the cloud

deviceCli.disconnect()
```

## 7.2 FEATURE:

We have developed the application in MIT app inventer which can monitor the temperature, humidity and type of gas leakage.

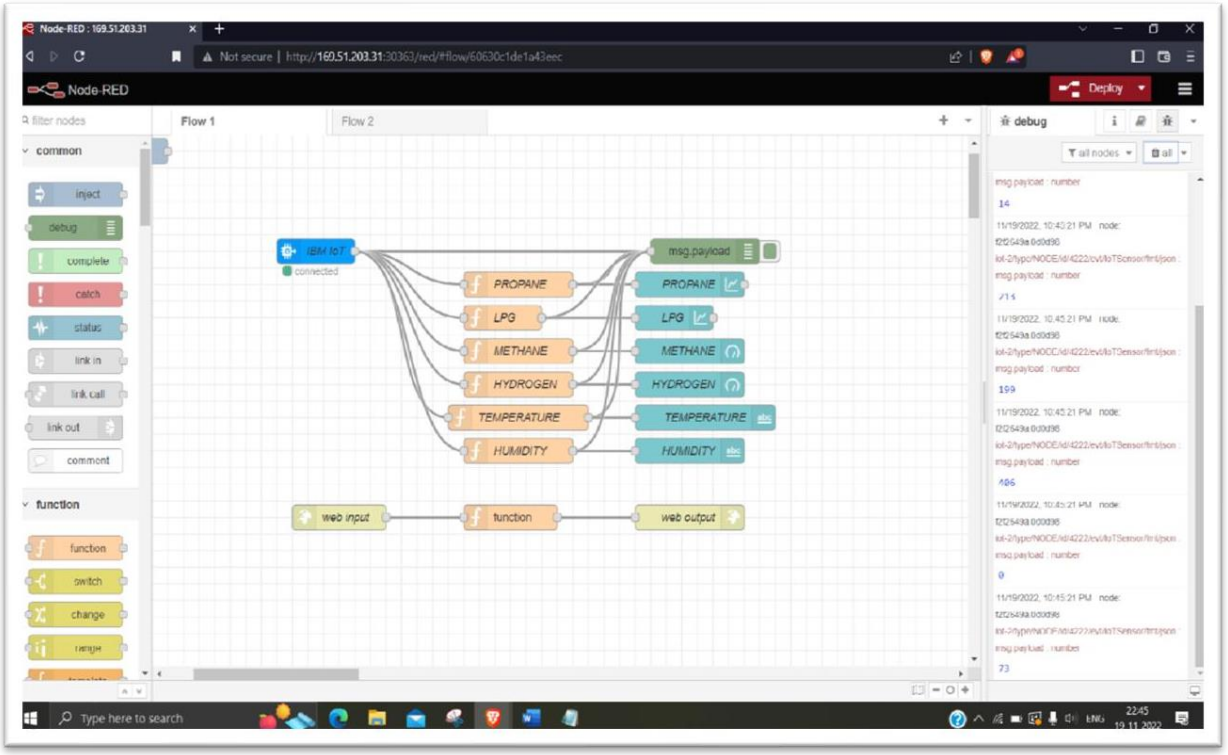


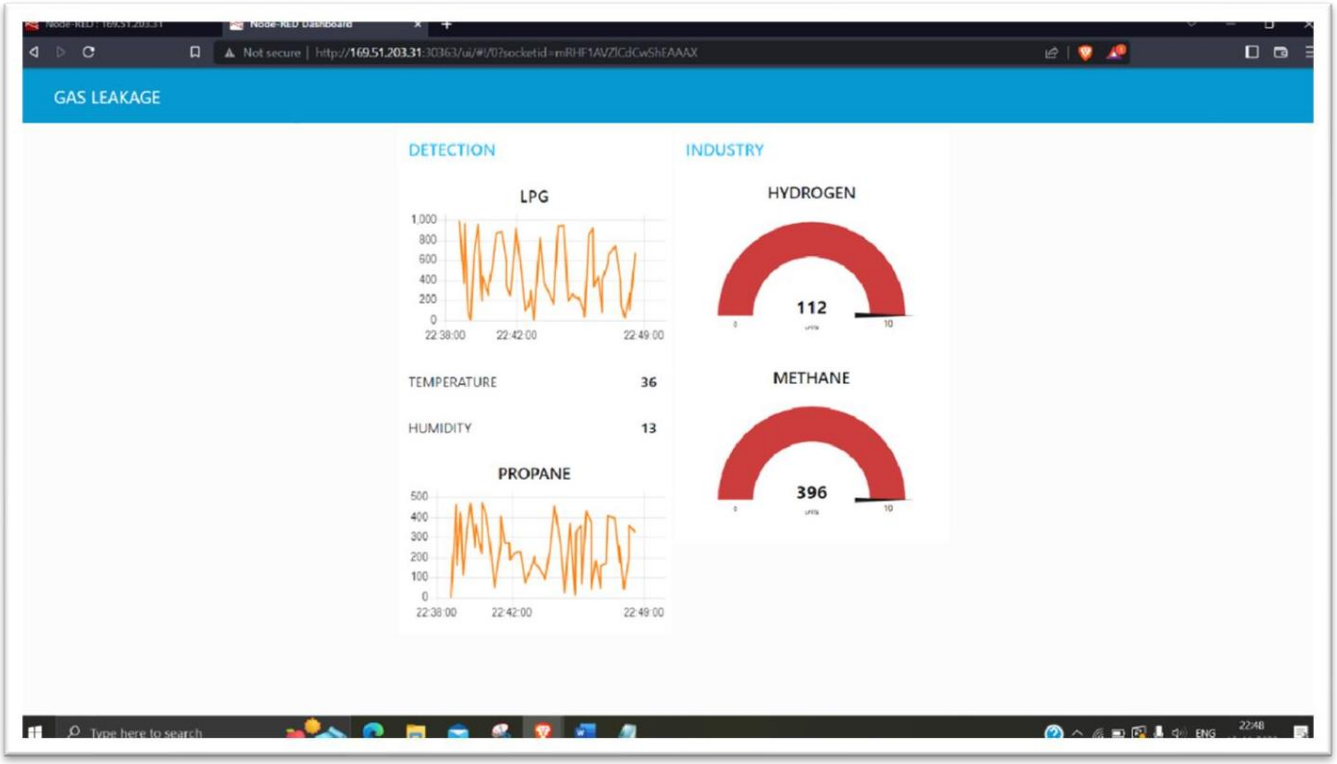
# CHAPTER-8

# RESULT

## 8.1 PERFORMANCE METRICS

Below image represents the result of node red dash board




Not secure | http://169.51.203.31:30363/ui/#!/0?socketid=mRHF1AVZlCdGwShEAAAX
GAS LEAKAGE
DETECTION
LPG
1,000
800
600
400
200
0
22:38:00
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TEMPERATURE
36
HUMIDITY
13
PROPANE
500
400
300
200
100
0
22:38:00
22:42:00
22:49:00
INDUSTRY
HYDROGEN
112
0
10
METHANE
396
0
10
Type here to search
ENG
22:48

# CHAPTER – 9

# ADVANTAGES AND DISADVANTAGES

## ADVANTAGES

- ✓ For locating gas leaks in industrial environments, this project is helpful.
- ✓ More effective equipment and components.
- ✓ Dependable and low-power utilisation.
- ✓ Another purpose for it is to locate LPG gas leaks inside the house.

## DISADVANTAGES

- ✓ Gas cylinders are stored in a variety of locations; therefore, it is impossible to pinpoint the specific position of the leak.
- ✓ Its sensitivity is influenced by both temperature and relative humidity.
- ✓ Without the Internet, setup cannot work and perform.
- ✓ It's difficult to install the setup.

# CHAPTER 10

# CONCLUSION

Gas leakage causes serious mishaps that cause property damage and injuries to people. Gas leaks are caused by inadequate maintenance of the machinery and a lack of public knowledge. Therefore, it is crucial to identify gas leaks in order to stop accidents and save lives. This study described a method for detecting and alerting LPG leaks. When a gas leak is detected, this system sends out a warning and activates a buzzer to warn people. This technique is simple but dependable.

# CHAPTER-11

# FURTURE SCOPE

A. Extended System Features

The surrounding air's temperature and humidity have an impact on how gases behave. A gas may not be flammable at low temperatures at a certain concentration, but it may be explosive at high temperatures. The inclusion of a temperature and humidity sensor will be quite beneficial for this reason.

B. Applying Big Data Analytics to the sensor readings

On the sensor readings, analytics might be run. The results of the sensors' readings could be used to forecast potential accident scenarios. Algorithms could be developed that could anticipate such circumstances rather than immediately alarming when the concentrations have reached high levels. The system's accuracy would be improved by combining the results from the temperature and humidity sensors with the readings from the gas sensor. The number of false alarms raised will drop to extremely low percentages.

C. Dedicated System Application

For the system, a specific mobile application might be created. The app would have the following features:

1. Being able to quickly and easily learn the house's degrees of attentiveness.

2. Because it is a safety equipment, it must be meticulously calibrated and maintained. The app can ensure that notifications are sent as reminders to periodically get the system reviewed.

# CHAPTER – 12

# APPENDIX

## 12.1 GITHUB LINK

**https://github.com/IBM-EPBL/IBM-Project-36498-1660295577**