PROJECT REPORT

PROJECT NAME	GAS LEAKAGE MONITORING & ALERTING SYSTEM FOR INDUSTRIES
TEAM ID	PNT2022TMID04047
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1. INTRODUCTION

1.1 Project Overview:

In today's world, safety is of the utmost importance, and certain measures must be taken at both work and home to e ensure it. Working or living in a dangerous environment necessitates specific safety measures, whether the subject is electricity or oil and gas. A type of natural gas known as "Liquified Petroleum Gas" (LPG) is compressed under high pressure and stored in a metal cylinder. LPG is extremely vulnerable to fire and can result in catastrophic damage if left unprotected near any fire source. LPG is primarily utilized for cooking and is more readily available than any other natural gas. Sadly, its widespread use makes gas leakage or even a blast a common occurrence. As a result, a system for detecting and monitoring gas leaks is required. Through a flame sensor, the system will keep an eye on fire and flame. The buzzer begins to ring when a fire is detected. Tests have shown that the system can keep track of the wastage of gas and leaks and notify the user. The performance that was produced showed that it was successful in reducing the amount of domestic gas that was wasted.

1.2 Purpose:

Nowadays the home safety detection system plays an important role in the security of people. Since all the people from the home goes to work on a daily bases, it makes it impossible to check on the appliances available at home especially LPG gas cylinder, wired circuits, Etc. In the last three years, there is a tremendous hike in the demand for liquefied petroleum gas (LPG) and natural gas. To meet this access 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 a large scale in industry, as heating, home appliances, and motor fuel. To monitor this gas leak, the system includes an MQ6 gas detector. This sensor detects the amount of leaking gas present in the surrounding atmosphere. In this way, the consequences of an explosion or gas leak can be avoided.

2. LITERATURE SURVEY

2.1 Existing Problem:

The Internet of Things aims towards making life simpler by automating every small task around us. As much as IoT helps in automating tasks, the benefits of IoT can also be extended to 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 people about the leakage. Therefore, we have used IoT technology to make a Gas Leakage Detector for society which has Smart Alerting techniques involving sending a text message to the concerned authority and the ability to perform data analytics on sensor readings. Our main aim is to propose a gas leakage system for a society where each flat has gas leakage detector hardware. This will detect the harmful gases in the environment and alerting to society members through the alarm and sending notifications.

2.2 References:

Prof. M.Amsaveni, A.Anurupa, R.S.Anu Preetha, C.Malarvizhi, M.Gunasekaran; they told in their research paper on "GSM-based LPG leakage detection and controlling system" the leakage of LPG gas is detected by the MQ-6 gas sensor. Its analog output is given to the microcontroller. It consists of a predefined instruction set. Based on this, the exhaust fan is switched on. So, the concentration of gas inside the room gets decreased. Then, the stepper motor is rotated thus closing the knob of the cylinder. Because of this process, the leakage of gas is stopped. The relay is switched to off the power supply of the house. The buzzer produces an alarm to indicate the gas leakage. Then, the user is alerted by SMS through the GSM module. They proposed their methodology that the system takes an automatic control action after the detection of 0.001% of LPG leakage. This automatic control action provides a mechanical handle for closing the valve. We are increasing the security for humans by means of a relay which will shut down the electric power to the house. Also, by using GSM, we are sending an alert message to the users and a buzzer is provided for alerting the neighbors about the leakage.

P.Meenakshi Vidya, S.Abinaya, G.Geetha Rajeswari, N.Guna, "Automatic LPG detection and hazard controlling " published in April 2014 proposed the leakage detection and real-time gas monitoring system. In this system, the gas leakage is detected and controlled by means of the exhaust fan. The level of LPG in the cylinder is also continuously monitored.

Srinivasan, Leela, Jeya bharathi, Kirthik,Rajasree; in this research paper they told about gas leakage detection and control. In this paper, the gas leakage resulting in fatal inferno has become a serious problem in households 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.

Hitendra Rawat, Ashish Kushwah, Khyati Asthana, Akanksha Shivhare, in the year 2014 planned a framework, they gave security issues against hoodlums, spillage, and fire mishaps. In those cases, their framework sends an SMS to the crisis number given to it

B. B. Did paye, Prof. S. K. Nanda; in this paper, they talked about their research on leakage detection and review of "Automated unified system for LPG using microcontroller and GSM module". Their paper proposed an advance and innovative approach for LPG leakage detection, prevention, and automatic booking for a refill. In advance, the system provides the automatic control of the LPG regulator also if leakage is detected the system will automatically turn off the main switch of the power supply. Hence it helps to avoid explosions and blasts.

Pal-Stefan Murvaya, Ioan Sileaa, 2008, they told in their survey on gas leak detection and localization techniques various ways to detect gas leakage. They introduce some old or new techniques to detect the gas. The proposed techniques in this paper are nontechnical methods and hardware-based methods which include acoustic methods, optical methods, and active methods. In their survey they told a wide variety of leak-detecting techniques is available for gas pipelines.

2.3 Problem Statement Definition:
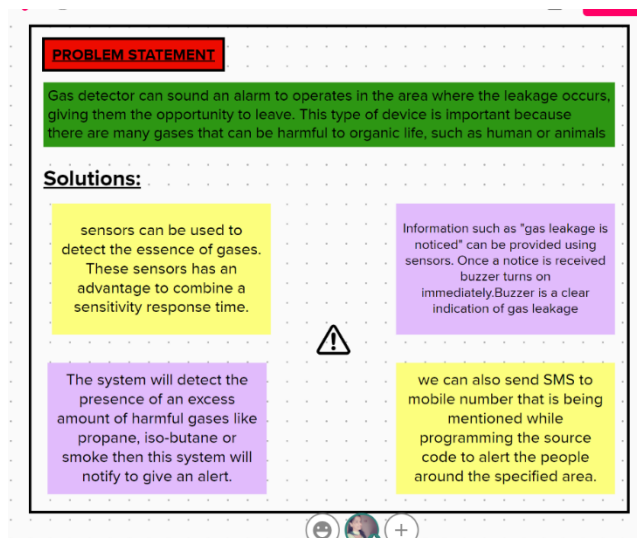
3. IDEATION & PROPOSED SOLUTION:

3.1 Empathy Map Canvas:
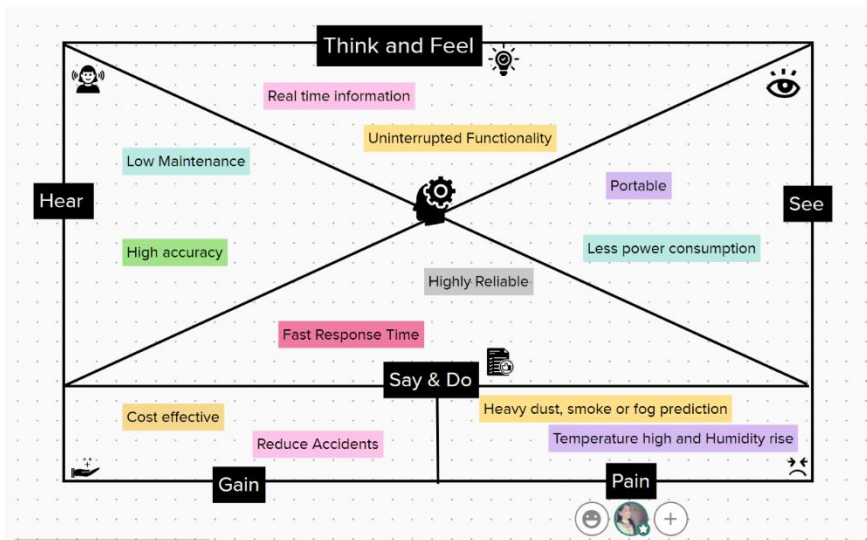
3.2 Ideation & Brainstorming:

3.3 Proposed Solution:

Proposed Solution Template:-

S.NO	PARAMETER	DESCRIPTION
1.	Problem Statement (Problem to be solved)	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.
2.	Idea/Solution Description	IOT and Arduino based leakage detection system senses the gas with the help of an gas sensor. Data sensed by these sensors is sent to the IOT. The IOT module then sends the data over to a website. The buzzer is turned ON once the gas leakage is detected. At this time, LCD Display shows a message as "Leakage detected".

3.	Novelty of the project	Although, there are many solutions for this problem but they have some disadvantages. Some of the solutions only detects some particular gases and some others only detect those gases and alert small distance only. This can be rectified by alerting large area and detect more gases. The fire and rescue services department can be notified by sending the alert message to them.
4.	Social Impact	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. Our solution will prevent great losses like Bhopal Gas Tragedy.
5.	BusinessModel(Revenue Model)	The main objective of our project is to save lives. So we can establish this project as a product and visit the industries and make them aware of this project.
6.	Scalability of the solution	We can use our project as a basic model and we can develop our project in a large scale and establish some new ideas in the future. We can upgrade our project with some more features in the future.

3.4 Problem Solution fit:

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	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 in environment 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 to avoid accidents.

4.2 Non-Functional requirements:

<u>Non-Functional Requirements:</u>

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

NFR NO.	Non-Functional	Requirement Description
NFR-1	Usability	It updates the data regularly as well as protects the workers.
NFR-2	Security	As a result of emergency alert, we can be able to protect both the humans and properties. Precaution steps could be taken.
NFR-3	Reliability	Can be able to provide accurate values. It might have a capacity to recognize the smoke accurately and does not give a false
NFR-4	Performance	Sprinklers and exhaust fans are used in case of emergency
NFR-5	Availability	It can be used everyday, it includes day and nights.
NFR-6	Scalability	Sensors can be replaced every time it fails

5. PROJECT DESIGN

5.1 Data Flow Diagrams:

FLOWCHART-GAS LEAKAGE DETECTION AND ALERTING SYSTEM
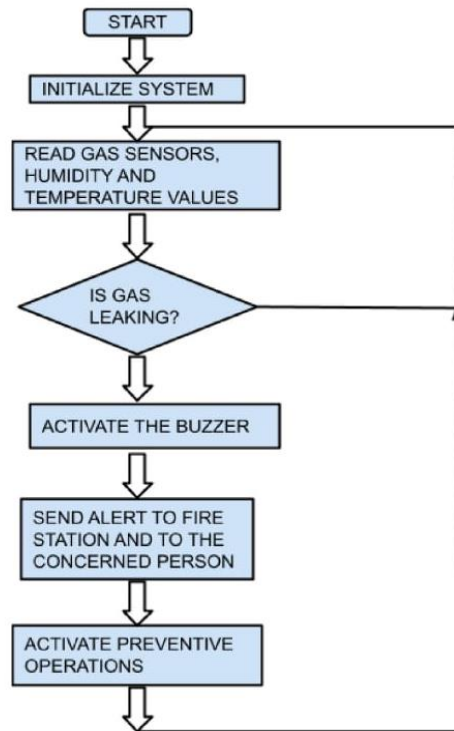
5.2 Solution & Technical Architecture:

TECHNICAL ARCHITECTURE:

6. PROJECT PLANNING & SCHEDULING

6.1 Sprint Planning & Estimation:

- ☐ SPRINT PLAN
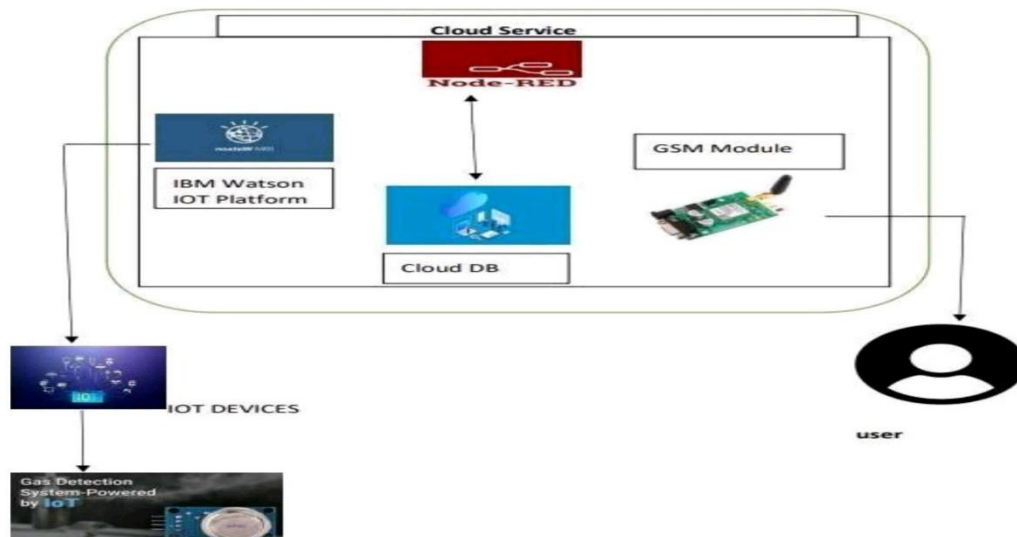- • ANALYZE THE PROBLEM
- • PREPARE An ABSTRACT, PROBLEM STATEMENT
- • LIST A REQUIRED OBJECT NEEDED
- • CREATE A PROGRAM CODE AND RUN IT
- • MAKE A PROTOTYPE TO IMPLEMENT
- • TEST WITH THE CREATED CODE AND CHECK THE DESIGNED PROTOTYPE

6.2 Sprint Delivery Schedule

SPRINT DELIVERY PLAN

STEP 1	STEP 2	STEP 3	STEP 4	STEP 5	STEP 6
First step is to identify the problem	Prepare the abstract for the problem statement	Learn the required software and gain knowledge	Write the code for the problem and execute it	Test created code and design prototype	Eventually a solution is found to solve the problem
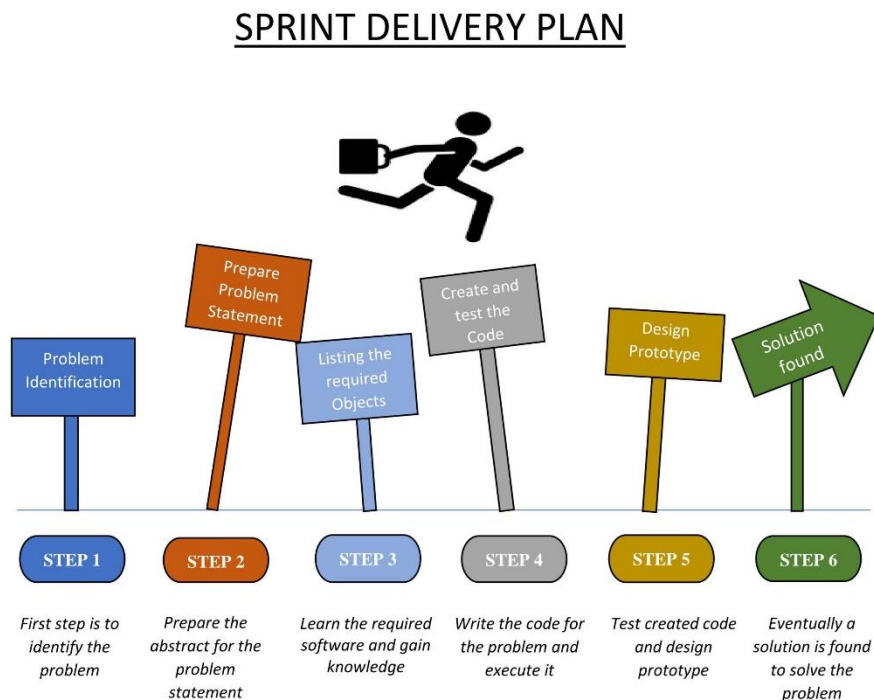
- • Sprint 1
- • Sprint 2
- • Sprint 3
- • Sprint 4

We are Developing the code in this Schedule.

7. Schematic Diagram of project & Components:

7.1 Circuit Diagram:

7.2 Components:

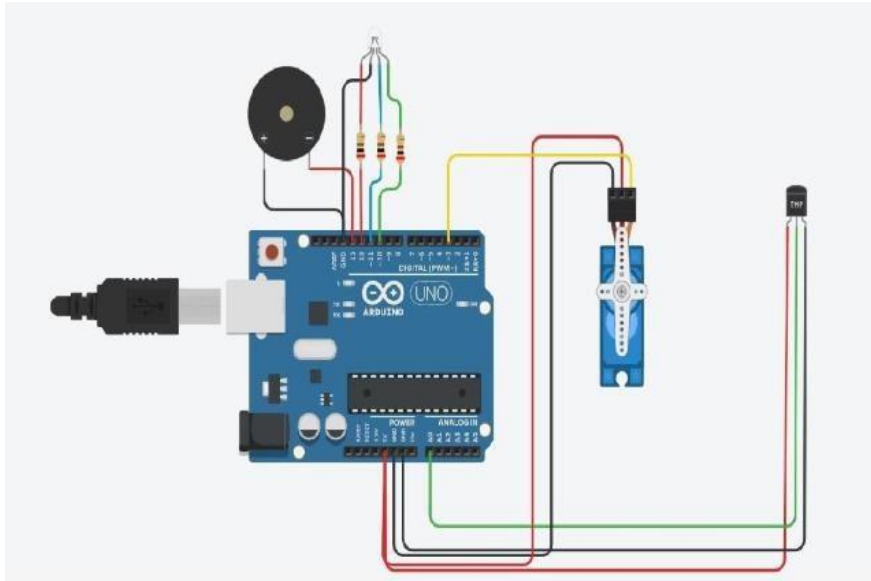The design of a sensor-based automatic gas leakage detector with an alert and control system. The components are

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 (16x2)	1

8. CONCLUSION:

After this project performance can conclude that the detection of the LPG gas leakage is incredible in the project system. Applicable usefully for industrial and domestic purposes. In dangerous situations, we can save the life by using this system. An alert is indicated by the GSM module. A sensor node senses gas like CO2, oxygen, and 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.

9. FUTURE SCOPE:

We propose to build the system using an MQ6 gas detection sensor and interface it with an Aurdino Uno microcontroller along with an LCD Display. Our system uses the gas sensor to detect any gas leakages. The gas sensor sends out a signal to the microcontroller as soon as it encounters a gas leakage. The microcontroller processes this signal and a message is displayed on the LCD to alert the user.

10. APPENDIX:

```
#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);
  }
```

}GitHub & Project Demo Link: https://github.com/IBM-EPBL/IBM-Project-22090-1659803580