

**Project Design Phase-I  
Proposed Solution**

Date	19 October 2022
Team ID	PNT2022TMID18930
Project Name	Project - Gas Leakage Monitoring & Alerting System for Industries
Maximum Marks	2 Marks

## **PROPOSED SOLUTION**

There is always a risk of leakage whenever gas is used, threatening human lives and property. Therefore, designing a low-cost gas leakage detector can help in minimizing this risk over a span of several years. There have been several accidents caused by gas leakages in homes and in industries (mainly oil and gas industries). These leakages have led to the loss of several lives and properties through fire outbreaks and explosions.

### **PROBLEM STATEMENT**

- In pipelines gas transfer, gas leakage is inevitable and can cause fatal accidents. The gas leakage up to a certain mass level can be ignored, as it may not cause any major problem. However, it is very important to raise an alarm if it surpasses certain threshold values.
- This problem was mainly identified in oil and gas industry at the connections of gas valves. IoT can be utilized for efficient and easy monitoring of gas leakages in a continuous basis and from any distance. IoT is basically a network of interconnected devices that are embedded with sensors, programming, and network connectivity to collect and exchange data.

### **IDEA / SOLUTION DESCRIPTION**

- This system is an industrial monitoring system design using the Internet of

Things (IoT). The gas sensor (MQ-5) captures the information about the gas levels and posts this into a data cloud. The sensor detects the leakage of gas under various atmospheric conditions. All the components are controlled by an Arduino (UNO-1) which acts as a central processor unit in the setup. As soon as a gas leakage is detected by the sensor, the alarm is raised in the form of a buzzer. This system is also supported by an LCD to display leakage, alert the observer, and activate the exhaust fan in the particular section to evacuate leaked gas.

- The requirement of this gas detection system is not only to monitor the surroundings continuously but also to prevent the gas leakage thus minimizing the chances of fire and damage.

## **NOVELTY / UNIQUENESS**

This system that can detect the presence of natural gases and send alert signals to the users and nearest people about the leakage occurrence, and by showing a dashboard to the operator. The difference between the proposed system and the previous work is that it shows a full screen dashboard in a 24-hour basis, which is connected to Wi-Fi that allows faster information transfer to the dashboard. In another previous work, the GSM is not efficient to be read all the time. It takes time and the reading is done by a mobile and not an industry application. This system allows the user to be able to take immediate actions against the gas leakage. In addition, it makes the gas leakage information available, accessible, and monitored from the DCS room. This system can be used in oil and gas industries and even in kitchen. The requirement of this gas detection system is not only to monitor the surroundings continuously but also to prevent the gas leakage thus minimizing the chances of fire and damage.

## **SOCIAL IMPACT / CUSTOMER SATISFACTION**

There is always a risk of leakage whenever gas is used, threatening human lives and property. Therefore, designing a low-cost gas leakage detector can help in minimizing this risk over a span of several years. This smart device offers several safety benefits that are vital for early gas leakage detection, and response towards preventing gas leakage. With small modifications, the system can also be used for household purposes to prevent house gas leakages. The system provides a real-time notification, allowing immediate implementation of health and safety measures and increasing the available time span to overcome the situation. The same system can be utilized in several other places such as kitchens, oil and gas pipelines, gas storage facilities, etc.

## **BUSINESS MODEL (FINANCIAL BENEFIT)**

Conventional gas measurement and control systems are commonly used to ensure a safe working environment. However, these systems have very high installation costs due to expensive components and further, this cost increases depending on the size of the site, the number of measurement points and the gas types. So, a new low-cost gas leak detection system that has a simple control structure with a single sensor set have been carried out. There are some ways to design a cost-efficient system. This can be achieved by measuring points in the area, where gas leaks are being detected, are combined with pipelines in a single measurement centre. The air samples are taken from the measurement points

through the pipes to the measuring centre with a certain sequence starting from the first point to the last and are measured by a single sensor unit consisting of different gas sensors. Compared to the conventional system, this system detects gas leaks with a delay of about three to nine seconds depending on the distance from the point at which the gas leak occurred to the measurement centre. As a result, the proposed system provides a similar measurement performance at a cost of approximately 75% less than conventional systems.

## **SCALABILITY OF SOLUTION**

This system is designed in such a way that it can withstand most of the harsh environmental conditions. The system's detecting range is also quite high and can detect various gases like  $H_2S$ ,  $CO$ ,  $CH_4$  and  $O_2$ . The system's design and the placement of components in it are in such a way that they are resistant to the hazardous gases.