

## LITERATURE SURVEY

**PROJECT TITLE : Gas Leakage monitoring & Alerting system for Industries**

**TEAM ID : PNT2022TMID05277**

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### **Design and Fabrication of a Carbon Dioxide Gas Leak Detection System for Oil and Gas Facilities**

**Chibuzor Amaobichukwu** (2021) presented design and fabrication of a carbon dioxide gas leak detection system for oil and gas facilities. This is developed because of the reason that high concentration of carbon dioxide can affect the respiratory function and the central nervous system. This prompted the development of this carbon dioxide gas leakage detection system as a safety measure to reduce this risk. This carbon dioxide gas leakage detection is developed with an Arduino microcontroller which is programmed using embedded C++ language and an MQ-135 sensor for a highly accurate and fast response system. The gas leakage detection is not only highly accurate but cheap and portable and can be used for industrial and domestic safety.

### **The Monitoring System of Leakage Accidents in Crude Oil Pipelines and LPG Gas Leakage Detection Using GSM Module**

According to **J Ding** and **J. Wang** and **Q.Pan** (2022) “The monitoring system of leakage accidents in crude oil pipelines” and “LPG Gas leakage detection using GSM module”, LPG is commonly used all over the world which also cause many accidents due to the unknown mistakes of human and gas leakage. For this problem, a reliable safety system is developed using iot which uses four modules. The proposed model sort out into four modules, such as Gas Detection Module (GDM) always detect the gas leakage to avoid unexpected incidents; Location Detection Module (LDM) track the

gas leakage location and pass the value to NM; Notification Module (NM) is responsible for generating the message service to notify the nearest help centre and user; In the case of a gas leak, the Alarm Module (AM) is responsible for activating an emergency alarm. After the setting was established, the model successfully recognized the gas leakages, and a warning was delivered over the Wi-Fi network. The notification was sent to the server to alert the recipient. The warning (Buzzer) is instantly activated to notify others of their presence and avert potential explosion and fire threats. This smart system has several safety advantages critical for detecting gas leaks early and responding to avoid LPG leaks. There will be no risk if the gas supply stops in the pipeline within a specified time.

### **Internet of Things (IOT) Based Gas Leakage Monitoring and Alerting System with MQ-2 Sensor**

**Rohan Chandra Pandey, Manish Verma, Lumesh Kumar Sahu and Saurabh Deshmukh** (2017) demonstrated Internet of things (IOT) based gas leakage monitoring and alerting system with MQ-2 sensor. The main objective of the work is designing microcontroller based toxic gas detecting and alerting system. The hazardous gases like LPG and propane were sensed and displayed and notify each and every second in the LCD display. If these gases exceed the normal level, then an alarm is generated immediately and also an alert message (Email) is sent to the authorized person through the INTERNET and used ARM development board. Operation of IOT based gas leakage and monitoring system was shown by operating the Raspberry pi 3 model attached with embedded system with required input and output gas level with the help of gas sensors. This results in a more efficient in operation because it is connected to a common web page specially built to notify or email the responsible authority automatically so reduces the stress of constant monitoring.

### **Low-Cost Gas Leak Detection and Surveillance System for Single Family Homes**

**Ximena Perez-Palomino, Karina Rosas-Paredes, Jose Esquicha-Tejada** (2022) presented in order to avoid insecurity in Peru they need a low-cost gas

leakage and surveillance system which is implemented using Raspberry Pi3, an Arduino board, SIM 900 module, sensors, actuators, and peripherals which sends email to the respective homemakers in case of insecurity and gas leakage using voice command recognition, Wit.ai and Firebase. Such systems are checked for satisfaction. As the result this system is good alternative to provide greater security to the home. The system is modular and scalable, that is, it allows adding additional sensors, actuators, and peripherals to provide greater characteristics, taking into account electricity consumption so as not to overload the Raspberry Pi or the Arduino board. Detection of small leaks in gas pipelines is an important and persistent problem in the oil and gas industry.

## **Gas Leakage with Auto Ventilation and Smart Management System**

AfsanaMim Anika, Ms.NasrinAkter, Md.Niamul Hasan, Jannatul Ferdous Shoma and Abdus Sattar (2021) explored gas leakage with auto ventilation and smart management system using Iot. This is developed due to several issues or accidents that occur in home kitchens mainly in urban areas. Because in urban areas, most of the kitchens are very small and it doesn't contain proper ventilation system. In such case, Spillage of gas increases the risk of fire accident, suffocation or a blast. The proposed method will help to improve the safety and reduce the death toll and reduce the damages that occur to the surrounding environment. There is two important features are auto ventilation and water flow via solenoid valve in the proposed system. The proposed system is exceptionally valuable to forestall fire demise.

## **Leak Detection in Natural Gas Pipelines Using Intelligent Models**

**Oluwatoyin Akinsete** and **Adebayo Oshingbesan** (2017) discovered the industry is beginning to investigate how tools of Machine Learning, Artificial Intelligence, Big Data, etc. can be used to improve current industry processes. Results showed that the Random Forest and Decision Tree models are the most sensitive as they can detect a leak of 0.1% of nominal flow in about 2 hours. The results show that more work can be done to investigate the usefulness of intelligent models in leak detection in natural gas pipelines with more complex architectures. Lastly, since intelligent models are data driven, the application of intelligent models in new pipelines with little or no operational data should also be studied. It is therefore recommended that more research can be done in these areas.

## **Gas Leakage Detector and Monitoring System**

According to **Yekini N.Asafe, Akinade O. Abigael, Oloyede A. Olamide** (2022), the monitoring system is based on a microcontroller that employs a gas sensor as well as a GSM module, an LCD display, and a buzzer. The system was designed for gas leakage monitoring and alerts with SMS via an Arduino microcontroller with a buzzer and an MQ2 gas sensor. This research work had advanced in knowledge as it included an embedded system to alert users via multiple mobile phones for further action to be taken when leakage is detected. The device detects gas leakage using a highly sensitive MQ-2 gas sensor to activate a buzzer that alert people of leakages, and also sent an SMS with the information “Gas Leakage Detected” from the SIM800 GSM Module as a backup to alert the appropriate authority or facility owner of a gas leakage.

## **Probabilistic Multiple Model Neural Network Based Leak Detection System**

**Mohammad Burhan Abdulla and RandaHerzalla** (2015) demonstrated the probabilistic nature of the developed multiple model NN leak detection system gives the decision makers the benefit of analyzing risks associated with their decisions, and correspondingly take more cautious decisions. This is expected to reduce the false alarm rates even further, and therefore reduce the unnecessary shut down events, which leads to a reduction in the associated financial loss.

## **A Secured Model of Iot Based Smart Gas Detection and Automatic Alarm System**

According to **Methila Farzana Woishe, Nila Sultana, Tamanna Zaman Bristy, Nafiza Anjum Khan, MD. Taimur Ahad** (2022), Gas leakage is a serious problem in industrial production, departments, and living quarters. One of the preventive methods to prevent gas accidents is to install gas leakage detection kits in sensitive areas. The gas leak detection and monitoring system is a wireless communication project designed to improve the safety of personnel and machinery in the petrochemical

industry. In industry, excess crude oil is stored in confined spaces. Therefore, the presence of external sources that may cause overheating or fire may cause severe disasters. Even the gas present in the refinery is dangerous. The IoT technology in creating a Gas Leakage Detector and Smart Alerting techniques regarding calling, sending text messages to the involved authority, and an ability to expect risky conditions so that human beings can be made conscious earlier through appearing information analytics at the sensor reading. This is a low-cost, low-power, lightweight, safe, user-friendly, efficient, multi-featured, and simple system for detecting gas. A gas detector will not only provide us with significant information for the health department but it will also lead to a significant increase in our economy because when gas leaks, it not only contaminates the atmosphere but also wastes of gasses will hurt our economy. One of the significant functions of the system in the future is to add a subsystem that can monitor gas waste and gas usage systems. The limitation of this system is that there is no sub-system where wastage of gas and the uses of gas cannot be monitored by using this system. Our model does not work in water.

## **An Intelligent Gas Leak Detection System Using Iot**

**Pankaj B Thote, Mohammad Ashar, Christie Anil Joseph, VishantG.Naik and Priya Bambal** (2021) discovered an intelligent gas leak detection system using Iot. This developed strategy arises from a main reason is that no one can't sense the leakage when it can be discreet at times. At such situations the gas detection system becomes very necessary so as to keep a constant track of the gas level. This system uses sensors along with Node MCU to solve the issue. The key advantage of this intelligent system is that it delivers real-time response and precise leak detection resulting in greater time for better and early prevention.

## **IOT Based LPG Gas Leakage Detector**

**Prof. Pranay Meshram, Nancy Shukla, Stuti Mendhekar, Renuka Gadge, Shivani Kanaskar** (2019) demonstrated IoT Based LPG Gas Leakage Detector

Gas leakage is a major problem in the industrial sector, in residential locations etc. The goal of this paper is to propose a system that can detect, alert and automatically control gas leaks. In particular, a gas sensor has been used which has a high sensitivity to gases such as propane and butane together with LPG. There is an alarm that is triggered once the LPG has been detected. LPG gas leakage is sensed by the MQ5 sensor. As soon as it detects LPG content in air more the threshold value, LED light glows and sound is produced. Also, a SMS is send to user's cell phone and thus notifies the user about the incident if the user is out of the range of sound. The system can be used to avoid fire accident and provide house safety.

## **Internet of Things (IOT) Based Gas Leakage Monitoring and Alerting System with MQ-2 Sensor**

**Rohan Chandra Pandey, Manish Verma, Lumesh Kumar Sahu** (2017) elaborated overall conclusion IOT based toxic gas detector or IOT technology has come a long way since it was conceptualized two decades ago. It has become more efficient, more applicable to today's applications and smarter. The work presented in this project was directed towards pushing IOT technology to the next level. The 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.

## **Design a FEARLESS on Gas Leak**

According to **LindraAuliaRachman, Hasbullah, Universitas MercuBuana, KampusMenteng, Jakarta, Indonesia** (2022) in the process of gas leakage detecting system, most of the gas detector equipment in the field experienced some damage which caused no gas leak to be detected and along with the development of gas detector detection system technology, its function could be upgraded to detect and extinguish fires caused by gas leaks. Taking these aspects into account, the purpose of this research is to design an automatic leak detection and fire extinguishing system called FEARLESS (Fire Suppression and Smart Alert System). The FEARLESS system can draw several conclusions including: It can reduce failures or damage that occur so as to minimize the

occurrence of undetected gas leaks. It can be combined with 2 or more detectors so that it can be implemented in various needs. This application can minimize the occurrence of unknown or undetected malfunctions.

## **Gas Leakage Detection System with Alarming System**

**Muhammad Ahmad Baballe and Mukhtar Ibrahim Bello** (2021) demonstrated gas leakage detection system with alarming system. This device can automatically detect, alarm, and control gas leakage using an exhaust fan to suck the gas away from the premises where there is leakage. The device is intended for use in household safety where appliances and heaters that use natural gas or LPG may be a source of risk. In this, one of the prophylactic means to stop accidents related to this gas leakage is to mount a gas leakage monitoring device in susceptible places. When the MQ-5 sensor senses a gas, it will sound an alarm then the exhaust fan will be activated to suck away the gas present in the environment. But the major disadvantage is that with the help of the exhaust fan, it will be very difficult to have a fire outbreak.

## **Gas Leakage Detection and Smart Alerting System Using Iot**

The researchers **Shital Imade, Priyanka Rajmanes, Aishwarya Gavali, Prof. V. N. Nayakwadi** (2018) demonstrated the IOT technology to make a Gas Leakage Detector for society which having Smart Alerting techniques involving sending text message to the concerned authority and an ability performing data analytics on sensor reading. This will detect the harmful gases in environment and alerting to the society member through alarm and sending notification. This system will be able to detect the gas in environment using the gas sensors. This will prevent from the major harmful problem.

## **Gas Leakage Detection and Alert System**

**E. Jebamalar Leavline, D. Asir Antony Gnana Singh, B. Abinaya and H. Deepika** (2017) demonstrated LPG gas leakage detection and alert system. Liquid petroleum gas (LPG) is highly inflammable and can burn even at some distance from the source of leakage. Most fire accidents are caused because of a poor-quality rubber tube or the regulator is not turned off when not in use. Therefore, developing the gas leakage alert

system is very essential. Hence, this paper presents a gas leakage alert system to detect the gas leakage and to alarm the people onboard. LPG leakage detection is essential to prevent accidents and to save human lives. This paper presented LPG leakage detection and alert system. This system triggers LED and buzzer to alert people when LPG leakage is detected. This system is very simple yet reliable.

## **Iot Based Industrial Plant Safety Gas Leakage Detection System**

**Ravi Kishore Kodali, RNV Greeshma, Kusuma Priya Nimmanapalli, Yatish Krishna Yogi Borra** (2018) demonstrated IOT based industrial plant safety gas leakage detection system. Most of the fire-breakouts in industries are due to gas leaks. These cause dreadful damage to the equipment, human life leading to injuries, deaths, and environment. Currently available leakage detectors warn the people around using on-site alarms. So, this project proposes a leakage detector which sends the warning to the concerned people through SMS. The Sensing System detects the leakage and Alerting system sends a warning message through IFTTT. A prototype of the gas leakage detection system has been developed and successfully tested with Methane, LPG and Benzene. The warning message is successfully sent to the mobile number with very less delay.

## **Analysis of Iot Based Smart Gas Leakage Detector and Notification System**

**Shanmukapriya Amuthan and Mohd Shahril Izuan Mohd Zin** (2021) explained about the analysis of iot based smart gas leakage detector and notification system. This design proposes the a low-cost device that enables users to communicate with home liquefied petroleum gas (LPG) through the Arduino Blynk program. In this there is a Wi-Fi module with simple user interface which is used instead of many number of switches which is the major issues in other methods. It accomplishes the three project goals of designing a smart gas leak tracker using a suitable microcontroller, building an intelligent gas leakage detector, and analyzing gas concentration data to determine the optimal threshold value for gas leakage detection.

## **Sensor-Based Gas Leakage Detector System**



**Mohammad Monirujjaman Khan** (2020) demonstrated Sensor-based gas leakage detector system. This is because, Liquefied Petroleum Gas (LPG) is a main source of fuel, especially in urban areas because it is clean compared to firewood and charcoal. Gas leakage is a major problem in the industrial sector, residential premises, etc. Nowadays, home security has become a major issue because of increasing gas leakage. The aim of this paper is to propose and discuss a design of a gas leakage detection system that can automatically detect, alert and control gas leakage. The design of a sensor-based automatic gas leakage detector with an alert and control system has been proposed and discussed in this paper. The proposed system will cost only USD 10 which is easily affordable even for poor people.

## **LPG Leakage Detection Using Gas Sensor (Mq-6)**

According to **N Evalina** and **H.A. Azis** (2022), the main objective of the project is to build a gas LPG leakage detector using an LPG gas sensor and microcontroller. It developed a security system by providing an early Warning System to give a sign if there is a smell of gas around Home. The presence of gas leakage signals on the sensors to work, the MQ-6 is the gas Sensor used to detect leakage gas LPG. This MQ-6 sensor test is performed by measuring the sensor output with the Atmega8 microcontroller when the LPG gas is detected and then writes it on the LCD screen. This MQ-6 sensor test is done by measuring the sensor output with the ATmega8 microcontroller when the LPG gas leakage is detected and the gas level is 2000 ppm, it will be automatically written on the LCD screen and the buzzer will sound. However, when the gas levels are reduced to less than 2000 ppm, it will automatically disappear on the LCD and the buzzer will stop sounding. This test was conducted to determine the contribution of the MQ-6 sensor.