# INTRODUCTION

The Integrated Gas Leak Detection and Alert System is a critical safety project designed to monitor and detect the presence of hazardous gases in industrial, commercial, and residential environments. With the increasing risks associated with gas leaks, which can lead to explosions, fire hazards, or exposure to toxic substances, it is essential to implement a reliable, real-time gas leak detection system. This project aims to develop a comprehensive solution that integrates sensors, communication technologies, and alert mechanisms to ensure the safety of individuals and assets in environments prone to gas hazards.

LPG is a mostly used fuel in the world. It contains in cylinder on highly concentrated state. The cylinder blasts sometimes. A gas cylinder blasts due to many reasons. Gas leakage is the main cause of blast occurrence [1].

 The system typically utilizes advanced gas sensors to detect the presence of various gases such as methane, carbon monoxide, LPG, ammonia, or hydrogen sulphide. Once a gas leak is detected, the system triggers immediate alarms, including visual, audible, and digital notifications.

This project integrates multiple disciplines such as electronics, communication systems, and safety management to create an intelligent solution for gas leak detection, thereby enhancing the overall safety of various environments. The ultimate goal is to minimize the risk of gas-related accidents and ensure the safety of personnel, equipment, and infrastructure.

Here, a project has been proposed to be designed which can detect and prevent gas leakage with an alarming system .MQ-135 is a gas sensor that can detect the gas and there is an Arduino UNO which is the brain of our project. A Global System for Mobile Communication (GSM) module is also used in that system. In 2018 a lowcost gas detection system is proposed [2]. By GSM it will send alert message to the owner of the house and there is also a buzzer for alarming system. Special feature of this project is auto regulator cut off and electricity cut off for to prevent any type of accident related to fire sparkle.

Gas leaks are one of the most dangerous yet often overlooked hazards in both residential and industrial environments. Accidental gas leakage, especially involving highly flammable or toxic gases like LPG, methane, ammonia, or carbon monoxide, can lead to catastrophic consequences including fire, explosions, or serious health complications. Recognizing the need for a smart and timely detection system, this project proposes the development of an Integrated gas leak detection and alert System designed to identify gas leakage at the earliest possible stage and respond with immediate preventive actions.

At the core of this system lies the MQ-135 gas sensor, a reliable and sensitive component capable of detecting a variety of gases. This sensor continuously samples the air and produces an analog signal corresponding to the gas concentration in the environment.

The signal is then processed by an Arduino UNO, which acts as the brain of the system. The Arduino evaluates the sensor data in real-time and checks whether it crosses a predefined safety threshold. If a dangerous gas concentration is detected, the system activates a series of safety responses.

Firstly, a buzzer is triggered to generate an immediate audible alert to warn the occupants of the premises.Simultaneously, the system makes use of a GSM module to send a warning message via SMS to the homeowneror safety personnel. This ensures that the alert reaches the concerned individuals even when they are not on-site,allowing for timely action. What makes this system more robust and safety-focused is the incorporation ofautomatic shut-off mechanisms. A relay circuit connected to the Arduino is used to cut off the gas regulator aswell as the electrical supply in the event of a leak, preventing any further escalation like sparks or ignitions.

The system can optionally be enhanced with IoT features, where data from the sensors can be uploaded to a cloudbased platform. This allows users to remotely monitor gas levels using a smartphone or computer, providing convenience and real-time awareness, especially in large buildings or industrial plants. A user-friendly dashboard interface can be used to display current gas levels, historical data, and allow configuration of alert thresholds based on the environment.

This project not only addresses the immediate need for a safer environment but also showcases the potential of integrating embedded systems, sensor networks, and communication technologies into practical safety applications. With increasing automation and smart home setups, such systems can easily be embedded into existing infrastructure. The combination of hardware-based alert mechanisms and digital communication ensures a multi-layered approach to safety.

The study creates an LPG gas leakage detector. The presence of gas is discovered using MQ135 gas sensors. Automatic notification and warning sent to user's smartphone using Blynk. If leakage occurs, users can access an app on owner's phone [3].

The goal of this project is to create a system for tracking and detecting liquefied petroleum gas leaks. Gas sensor is used to identify gas leaks confined to LPG gas only. For gas detection, a physical alarm alert with a buzzer is

installed, but a non-physical alarm alert with email and notice sent to the user via smartphone has been designed,

the Blynk application is utilized as an IoT platform for monitoring [4].