IoT Based Gas Level Detection and Automated Booking System with Smoke Detection

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Abstract **- LPG (Liquefied Petroleum Gas) is a widely used fuel in households and industries, but improper handling can lead to hazards such as gas leakage and fire accidents. To address this issue, this project presents an IoT-based gas level detection and automated booking system with smoke detection. The system continuously monitors the gas level in a cylinder using a load cell and detects any gas leakage using an MQ-6 gas sensor. A smoke sensor is integrated to provide additional safety by detecting fire hazards. When the gas level reaches a predefined threshold, the system automatically initiates a gas cylinder booking process, ensuring timely refills. Additionally, if gas leakage or smoke is detected, an alert notification is sent to the user via an SMS-based alert system, and an alarm is triggered for immediate attention. The entire system is controlled by a microcontroller, which processes sensor data and executes necessary actions. This project enhances safety, convenience, and efficiency by automating gas booking and providing real-time alerts, reducing human intervention and the risk of accidents.**

Keywords: IoT, Gas Level Detection, LCD Module, GSM Module, Weight Sensor

1. INTRODUCTION

The IoT-based Gas Level Detection and Automated Booking System with Smoke Detection The increasing reliance on liquefied petroleum gas (LPG) for domestic and industrial use has highlighted critical challenges in safety and supply management. Gas leaks and explosions remain significant hazards, causing property damage, injuries, and fatalities worldwide. Traditional monitoring methods, which depend on manual checks and static detectors, often fail to provide timely warnings or prevent accidents. These limitations underscore the urgent need for smarter, more reliable solutions to enhance gas safety and management.

Recent advancements in Internet of Things (IoT) technology offer transformative potential for gas monitoring systems. IoT-enabled solutions integrate sensors, wireless connectivity, and cloud computing to enable real-time tracking and automated responses. Prior studies have demonstrated the effectiveness of IoT in detecting gas leaks and monitoring cylinder levels, but gaps remain in fully automating the refill process and integrating comprehensive safety features. Many existing systems also lack user-friendly interfaces or predictive capabilities to optimize gas usage and reduce costs.

This paper presents an IoT-based gas monitoring system that addresses these gaps through three key innovations. First, it combines load cell and MQ-series sensors for accurate gas level detection and leak identification. Second, it automates the booking process via GSM and API integration, eliminating delays in refill requests. Third, it incorporates multi-layered safety protocols, including instant alerts, and exhaust activation.

The Implications of this research extend beyond safety improvements to include economic and operational benefits. By reducing manual intervention, the system cuts costs associated with emergency refills and preventable accidents. Its scalable architecture makes it suitable for diverse settings, from households to industrial facilities. This study contributes to the growing field of smart

energy management, demonstrating how IoT can transform conventional gas systems into efficient, proactive, and user-centric solutions.

2. PROBLEM SOURCE

The safe and efficient management of LPG gas usage faces two major challenges today. First, traditional monitoring methods rely on manual checks, which are often inaccurate and fail to prevent unexpected gas shortages. This leads to frequent disruptions in households and businesses, forcing users to make emergency bookings at higher costs. Second, gas leak detection remains largely reactive – most systems only provide local alarms without automated safety responses or remote alerts, creating dangerous delays in emergency situations. These limitations result in preventable accidents, financial losses, and inefficient gas consumption. So to monitor the LPG Level in the cylinder and getting notified is necessary. So this project is designed for the same. This project also send booking notification to gas agency directly with customer ID and Name of the customer. So the booking for new will be done automatically before completion of existing LPG cylinder. And this project also notifies the user on any gas leakage and fire detection near the cylinder and gives buzzer sound with turning the exhaust fan on.

3.LITERATURE REVIEW

Recent studies have demonstrated the effectiveness of load cells for precise gas level monitoring. The load cell is used everywhere for weighing the products and to get the electrical input to the microcontroller. Load cells are used in several measuring, instruments like laboratory balances platform scales, industrial scales, etc,. Then on in all the weighing projects load cell is being used to calculate the weight of the component using those electrical signals output is fed to microcontroller. MQ-6 gas sensor is one of the types of gas sensors. Specific gas sensor is made for detecting a specific type of gas. For example, MQ-6 is for measuring Propane, Butane, LPG and Smoke. Likewise, for measuring different types of gases different types of sensors are used. The flame sensor is used for detect the fire occurred.

PAPER1: Gas Leakage Detection System for Industrial Plants using IoT:

The most of the industrial fires are caused by gas leaks. These have terrible consequences for the equipment, human life (injuries and deaths), and the environment. Leakage detectors that are now available use on-site alarms to warn individuals nearby. As a result, this idea offers a leakage detector that sends an SMS warning to those who are worried. The presence of dangerous gases, such as LPG, Methane, and Benzene, is detected by this detector. LPG and Methane gases can catch fire, resulting in explosions. If inhaled in high enough concentrations, benzene is a carcinogen that can harm workers' health. As a result, detecting these gases is critical.

PAPER 2: Detection and Location Identification System for Pipeline Gas Leakage:

Every minor task on this globe is automated by the cyberspace of belongings, making our lives easier. The internet of things is now being used for security purposes as well. The main issue today is the discharge of gas from pipelines. The primary mental goal of this research is to identify gas leaks in the pipeline. Again and again, gas detection sensors will be utilized to inspect the pipelines, If there is a leak in the pipeline, it will be detected, and information such as the name of the gas, its pressure rate, and the location of the leak will be sent to mobile phones, laptops, and other IoT devices.

4.PROPOSED SYSTEM

The IoT Based Gas Level Detection and Automated Booking System with smoke detection is designed to overcome problems of traditional methods i.e, Gas cylinder in home for cooking can be empty all of a sudden. This creates lot of problems if there is no extra cylinder at home. And also to prevent accidental leakages at home. The proposed system integrates gas level monitoring system, automatic booking system and gas leakage system to overcome the problems of traditional methods.

The system is composed of following components:

4.1 *Weight Sensor (HX711 & Load Cell)*

Measures the weight of the cylinder for gas level detection. It is a sensor that converts a load or force acting on it into an electrical signal. This electrical signal can be a voltage change, current change depends on the circuitary used. It helps in

tracking the gas level and sending automatic booking request when gas level is less than 200g using GSM.

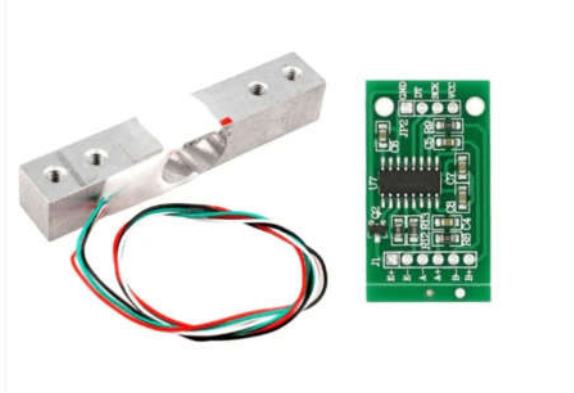

Fig 1 – Load cell

4.2 *MQ-6 Sensor*

Detects any leakage occur at the near of cylinder. MQ-6 Sensor has high sensitivity to propane, methane and butane. This sensor can be used to detect any combustible gases. It is a low cost sensor used for different applications. In this project it is used to detect any LPG Leakage from cylinder and should pass the electrical input to the microcontroller.

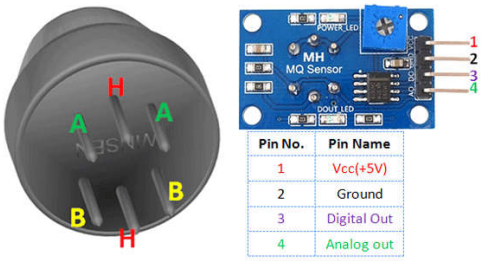

Fig 2 – MQ-6 Sensor

4.3 *Flame Sensor*

Flame sensor module (KY-026 sensor) that includes a flame sensor (IR receiver), resister, capacitor, potentiometer, and LM393 comparator. With this sensor we can detect infrared light with a wavelength between 600 and 900 nanometers. The light detected in the form of infrared light is converted into current changes by the far-infrared flame probe. This used for detecting any fire accident near the cylinder.

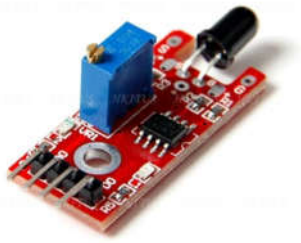

Fig 3 – Flame Sensor

4.4 *GSM A7670C Module*

GSM (Global System for Mobile communication) is used for sending SMS to user when the gas level is below 200g and also send booking request to gas agency with customer ID and Name of the user. And also used to send alert to the user when gas leakage / fire is detected.\

Fig 4 – GSM A7670C Module

4.5 *LCD Display*

It is used to display the real-time gas level and gas concentration near the cylinder.

Fig 5 – LCD Display

4.6 *Arduino UNO*

Arduino UNO acts as the central processing unit for the system. Receives data from sensors and processes it to trigger actions. (e.g. updating LCD, Sending alerts).

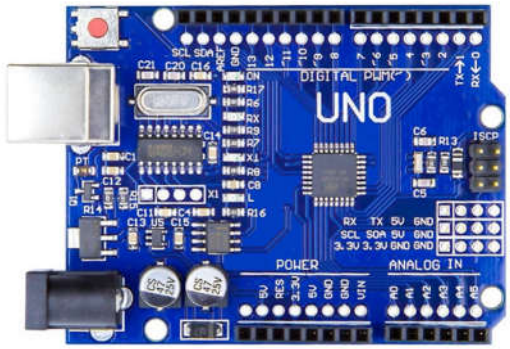

Fig 6 – Arduino UNO

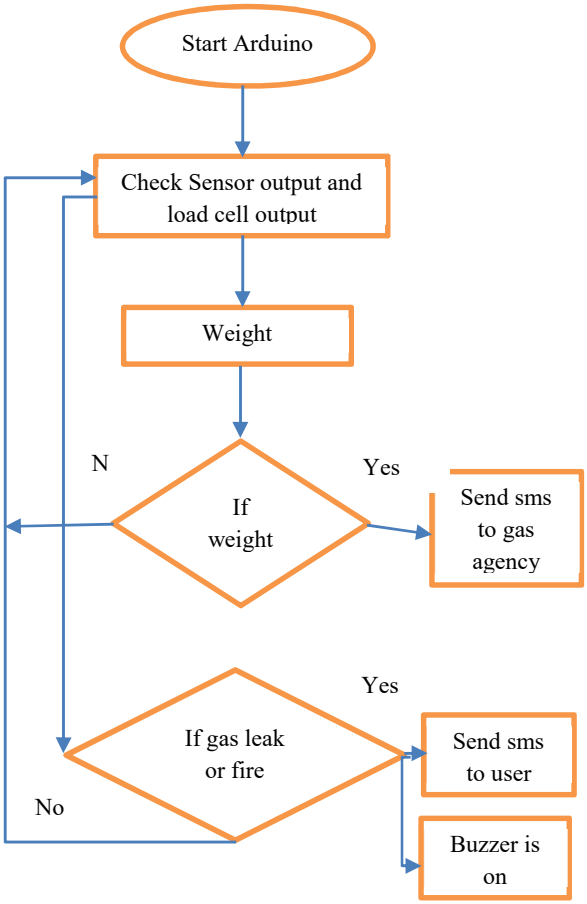

Fig 6 - Flow Diagram of Proposed work

In gas level detection and automated booking system with smoke detection, load cell regularly checks the weight of the LPG in the cylinder and sends information about the weight to Arduino UNO. Everytime the new input arrives the microcontroller will process the input and checks the conditions given in the code. And also the weight will display on the LCD Display. If the weight of the LPG in the cylinder is less than 200g then microcontroller will send at commands to GSM to communicate with user and the gas agency for booking request of new cylinder. If any leakage is detected then GSM sends SMS alert to the user and exhaust fan is turned on. If flame sensor detects any fire then GSM will communicate with user and sends alert to the user and turns the buzzer for local alert.

5. EXPERIMENTAL SETUP

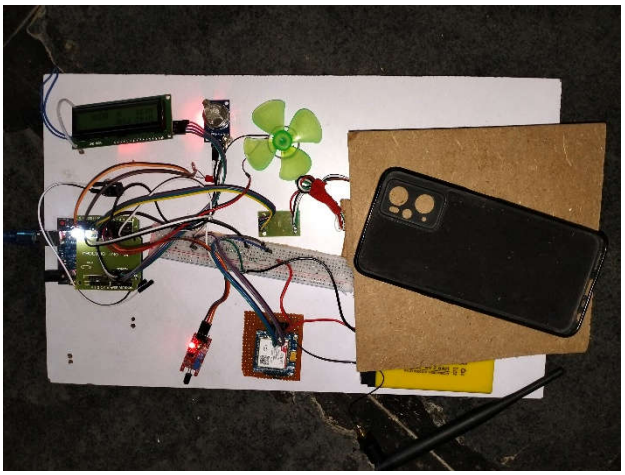

Figure 7 – Experimental setup

The above picture shows the components used in the proposed project. The module at right is load cell and is used for measuring weight of cylinder. The module at centre of left is Arduino UNO. The module at centre of bottom is GSM Module. The module at the top left in the picture is LCD Display used to show the weight of the gas level.

6. RESULTS

User gets sms when the gas level is less than 200g and Leakage is detected.

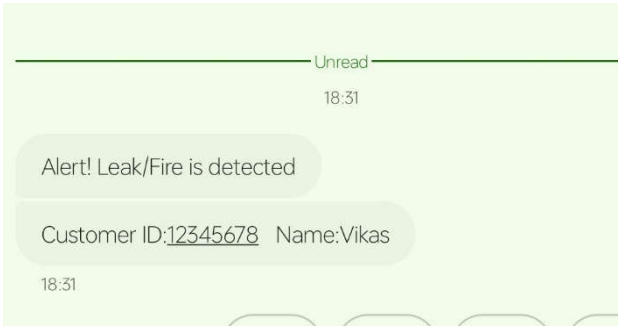

Fig 8 – SMS sent by GSM Module when gas level is less than 200g

7. CONCLUSION AND FUTURE SCOPE

This project successfully developed an IoT-based gas monitoring system that integrates load cell measurements, MQ-6 gas sensing, and flame detection to create a comprehensive safety and automation solution. The system achieved high accuracy in gas level tracking , reliable leak detection, and instant emergency responses through user alerts. By combining these features with automated GSM-based booking functionality, the project addresses critical gaps in existing gas management systems, offering households a cost-effective way to prevent accidents, optimize gas usage, and eliminate manual refill hassles.

Future enhancements could focus on integrating AI-driven predictive analytics to forecast gas depletion patterns and optimize refill schedules. Expanding the system with solar power support, multi-cylinder management for commercial use, and voice assistant compatibility would increase its versatility and sustainability. Additional research should explore blockchain-based secure transactions for bookings and partnerships with gas suppliers for seamless API integration. The system's architecture also allows for adaptation to other pressurized gas applications, potentially revolutionizing safety standards in industrial and medical gas supply chains. These advancements would further position the technology as a comprehensive solution for smart energy management in evolving IoT ecosystems.

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