Gas Leakage Monitoring and Alerting System

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ABSTRACT

Liquefied Petroleum Gas (LPG) is widely used for heating, cooking, automotive fuel, and a variety of other applications around the world. Liquefied Petroleum Gas is highly flammable. There had been many serious accidents, such as explosions and fires involving leakage of liquefied gas. If a leak is not noticed early enough, such accidents can have dangerous consequences. The problems of gas leakage and cylinder availability are faced daily. LPG is a flammable gas that is used to power heating appliances. The risk of structural fire, asphyxiation, or explosion is increased if this gas escapes. This problem can be solved by developing an effective means of detecting gas leaks. The user will be alerted as soon as a gas leak is detected. This project also deals with the percentage of gas remaining in the cylinder, which is determined by a sensor known as a load cell, and the percentage of gas remaining in the cylinder is constantly updated. When a gas leak is detected, the buzzer makes sound. The main goal of this project is to create a gas leak detection and monitoring system based on the Internet of Things (IoT). With the use of a gas sensor and a load sensor, this system will be able to monitor gas leakage and gas level. This data is transmitted to the user via the Internet of Things.

INTRODUCTION

IoT refers to the network of physical objects or “things” that communicate with each other with the help of **IoT sensors**, modules, software, and other technologies and exchange data with other devices and systems over the internet.

IoT applications range from sophisticated **industrial tools** to ordinary household objects. As of today, there are more than seven billion connected IoT devices worldwide, and the number is expected to grow by 22 billion by 2025. There is no surprise that IoT has become one of the most critical technologies to be conceived in the 21st century in the past few years. Who would have thought about switching on the fan using a smartphone - while sitting at opposite ends of the house?

Connecting everyday objects such as cars, baby monitors, thermostats, and kitchen appliances to the internet through embedded devices makes seamless communication possible between things, processes, and people!

Safety plays a critical role in today’s world and it is vital that certain solutions are implemented in places of work and living. Whether it is electricity or oil and gas, working or living in hazardous conditions demand certain safety protocols.

Liquified Petroleum Gas (LPG) is a type of natural gas liquified under extreme pressure and contained in a metal cylinder. LPG is extremely sensitive to fire and causes a great disaster if exposed to any fire source without precaution. LPG is more widely available than any other natural gas and is primarily used for cooking. Unfortunately, its broad use makes the event of gas leakage or even a blast standard. Therefore, there is a need to develop a gas leakage detection and monitoring system.

The solution could detect gas leakage, send an alert to the end-user via an SMS or a buzzer, and feature an exhaust fan that gets activated once the gas or fire is detected. The fan aims to push the

air outside. In another scenario, we could use a load cell sensor to monitor the weight of the LPG gas cylinder regularly and feed the values to the microcontroller.

Suppose the gas in the cylinder indicates a value where the remaining percentage level falls below the threshold level set for gas. In that case, the gas cylinder company should be notified immediately to refill the cylinder or replace it. The sensor is also handy for monitoring gas usage over a period.

LITERATURE SURVEY

The world is moving at a rapid pace. The pandemic is long behind us, and businesses across domains are gearing up to catch up with the two years they lost due to the Coronavirus outbreak. Now is the time to embrace excellence and reduce unnecessary expenses with **scalable IoT solutions** - and this also holds true for the oil and gas domain.

Various commercial companies such as hotels and takeaway joints utilize flammable gasses - for instance, carbon dioxide, LPG, ammonia, and so on - to deliver the best customer service possible. The use of such gasses cannot be denied. However, they have also brought about a greater risk and threat to human life. With safety a primary concern, businesses dealing with gas have to take certain precautions to ensure work is carried out in the most secure manner possible.

That is where a gas detection system is necessary at accident-prone locations, including households, to continuously monitor any kind of leakage - regardless of the human senses - and send an alert to the end-user. The gasses are toxic in nature, resulting in human unconsciousness and even death if consumed in larger quantities. Moreover, gaseous blasts are another disaster that everyone - working in a factory or at home - would want to avoid at all costs!

Using an Ethernet shield module and **Android application**, the IoT device informs the end-user about the environmental conditions, such as the temperature of the location and gas level. The gas detection system monitors the surroundings continuously and prevents further gas leakage.

The IoT-powered gas leakage detection utilizes an MQ6 sensor for the same. It detects the malfunctioning of the pressurized gas system to prevent the accumulation of gasses so that the explosion does not happen.

The system is divided into three modules:

- Firstly, the MQ6 gas sensors detect gas leakage.
- Secondly, the signals are sent to the ARM through the IoT sensors. Post this, an activation ping gets sent to the devices connected externally with the help of a microcontroller.
- Lastly, various functions by devices such as exhaust fan, buzzer, and sprinkler are performed, further activating the GSM module.

The GSM module and the ARM-based microcontroller use gas detection for communicating amongst devices. In addition, Arduino, a low-cost microcontroller, is engineered in such a way it receives the input data from the sensors. For ensuring regular communication between Arduino and the smartphone, Bluetooth is required.

The said system can be deployed in **homes, hotels, factory units, LPG cylinder storage areas**, and so on. The main advantage of this IoT and Arduino-based application is that it can determine the leakage and send the data over to a site. It can be monitored, and preventive measures can be taken

to avoid any disaster. Suppose corrective steps are taken promptly after it is reported over the IoT devices. In that case, that can help save the loss of lives, alleviate any mishaps from happening, and cut down on business expenses.

CONCLUSION:

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 work has presented solutions to several problems and issues that have not been addressed in previous work. The IoT gas leakage detection system is a boon as it saves lives, keeps the expenses in check, and helps businesses conduct their operations in compliance with the law. The system alerts notifications to the end-user - who responds accordingly with the help of connected devices such as a smartphone on the go. The developed IOT based gas leakage and monitoring accurately measure the leakage of gas and alert user. The sensor has been integrated with IoT framework which has efficiently been used to measure and monitor the gas leakage in real time. It can successfully detect temperature and humidity which can be used for further safety measures.