

# IoT Based LPG Leakage Detection – Result Based

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## ABSTRACT

*Liquefied Petroleum Gas (LPG) is being used for heating in a wide range of domestic, industry and automobile applications. There has been a serious safety concern relating to LPG leakage in the environment. Exposure to LPG would cause explosion and affect the well-being of the people in the nearby area if it is not carefully monitored. An Electronic Nose (e-nose) system is used to monitor the gas and trigger an alarm as well as control the leakage within the environment. The environment is monitored by using wireless e-nose known as node, which is installed inside the environment. The node consists of two LPG gas sensors as well as a temperature sensor. The acquired data is sent wirelessly to the base node through Wi-Fi communication protocol. The acquired data is analyzed by the base node to automatically determine the gas concentration in the environment and leakages. The system used an alarm and an indication lamp to alert the staff within the plant if gas leakage is detected. It will also automatically activate the water sprinkler system and exhaust fan which will reduce the gas concentration. Initial result shows that the system can detect the leakage when the gas concentration exceeds the pre-set value. This indicates that the system could be used to monitor the gas leakage in the environment.*

*Keywords: LPG sensor, IOT, Home Safety, cloud computing, ESP32.*

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## I. INTRODUCTION

The Proposed system manages to detect LPG gas leakage and send notification to the user. The additional features are smoke and fire detection, automatic LPG booking by measure the weight of cylinder using load cell and internet of things. Gas leakages results a serious problem in household and other areas where household gas is used, therefore the proposed gas leakage detection and monitoring system is developed. There are many methods available for booking a Gas Refill, methods include online booking, telephonic booking etc. It will be difficult situation for the one who uses LPG gas for cooking regularly. The aim of this paper is to present a new system automatically books a cylinder when the gas is about to empty is by sending a notification to the gas agency using WiFi using Internet of Things approach. In addition to that sensor is used to detect gas leakage at home. If the gas leakage is sensed automatically, it will send SMS to the user.

## II. LITERATURE REVIEW

The LPG cylinder needs to be refurbishing after a certain period of time in service. The refurbish processing plant plays an important role in gathering the used cylinders to resupply the gas manufacturer. Gas leakage incident may happen during the refurbish process which can cause explosion. This is due to sub-standard cylinder, old valve, worn out regulator and lack of awareness using gas cylinder [1]. The explosion may cause harmful effects to human such as injuries or fatalities or property damage. The leakage can cause cold burns to the skin and as an Asphyxiant. It also causes irritated respiratory tract, nose and eyes [1]. Since the gas is odourless, an odorant such as Ethyl Mercaptan (C<sub>2</sub>H<sub>6</sub>S) is added for ease detection.

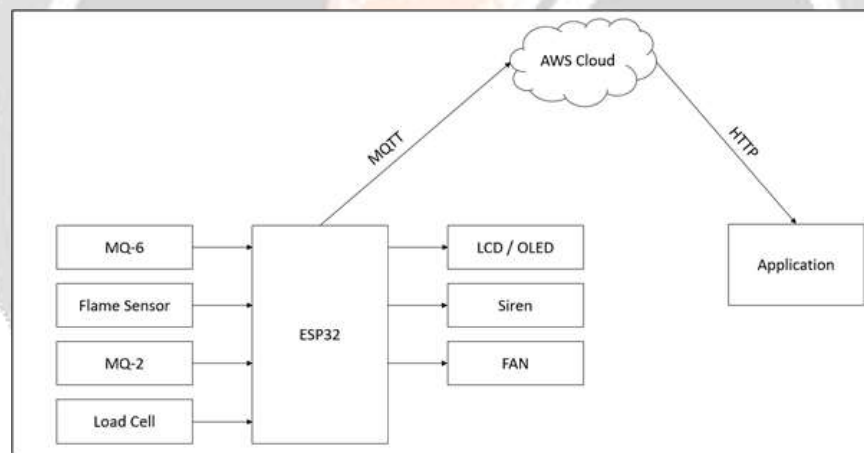
With the increasing demand of LP gas users, most of the time user must face many dangerous accidents occurs by gas leakage due to inappropriate and unavailable of timely action. In such a situation an efficient method to establish a safety system as well as monitor the level of LPG in the cylinder is required, so that the users are aware of the LPG level within the cylinder. They can take the initiative to stop the leakage and can take necessary steps to in booking a new cylinder. In this era, where everything is powered by electricity, a small spark in the premises during LPG

leakage is more than enough to cause an explosion. So, it is highly necessary that the users are aware of the necessary precautions to be taken during an LPG leakage [1], [2].

A large amount of research has been going based on LPG gas leakage detection and protection system. In the era of technology development brings an efficient and effective technology. Johnson-Williams Instruments founded the first gas detection technology in the year 1928 by developing a company. The owners of J-W instruments were Dr. Oliver Johnston and Phil Williams. J-W Instruments the first electronics company for gas detection in Silicon Valley. More than 40 year they were successful as, the company made a huge impact in gas detections. They were successful to make the instruments more portable and user friendly and were able to make first combination instrument that could detect both combustible gases/vapors as well as oxygen. In the 1980s and 1990s, before the development of electronic household, by detectors of carbon monoxide presence of carbon monoxide was detected with a chemically infused paper that turned brown when exposed to the gas [3]. Since then, many electronic technologies and devices have been developed to detect, monitor, and alert the leak of a wide array of gases under instantaneously. The above research and talks with eminent engineers from various industries laid the foundation for gathering information about the proposed system.

Gas meter is a common instrument used by gas cylinder refurbishes plant to monitor the leakage during production. Trained human panel is also used to determine the strength of an odour concentration by smelling the air samples. But human panel cannot be exposed to hazardous gas for long periods of time or at high concentration. Thus, the need for LPG leakage monitoring system is vital to monitor the safety in the plant environment in real time.

### III. PROPOSED ARCHITECTURE



**Figure 1 System Architecture**

Each one of the above mentioned three phases of implementation of Smart Freight Box is explained in detail below -

In this proposed system, the gas leakage is detected by MQ-6 sensor, which is interfaced with ESP32, when the gas leakage is detected through the MQ-6 sensor the Fan gets on and lights gets off with buzzer alarm and displaying alert message in LCD display, at the same time the notification will be sent to user through mobile which is connected via WiFi. Further, working of this proposed system is as below.

- Load cell which is also known as weight sensor is used to detect the weight of the gas and the result will be displayed through LCD display.
- If the weight of the cylinder is below the threshold level, the booking confirmation message will be sent to user.
- The threshold range will be embedded and usually developed using Programming.
- Message will be sent from user to LPG agency and gets a return notification of when the LPG is delivered.

- However, as another segment of this system, it also detects leakage of gas in LPG models through sensors. LPG gas sensor will generate the signal to the controller and automatically shut down the main power supply. LCD is used to display the alert message i.e “LPG leakage detected” displayed when the leak is detected by sensor.

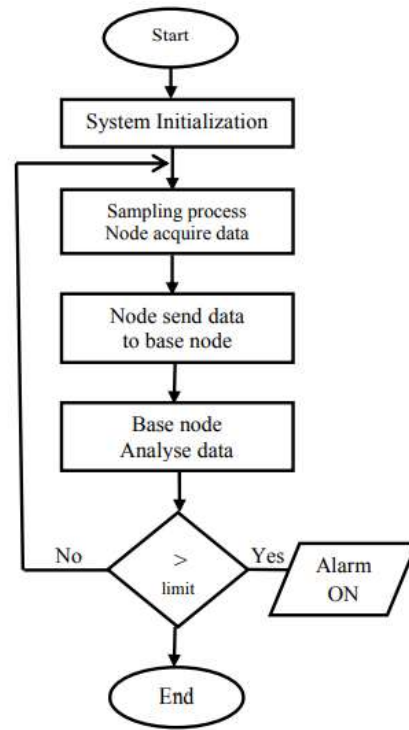


Figure 2 - Flow chart

#### IV. RESULT

The Wi-Fi e-nose (node) had been successfully developed and able to produce the sensors profile as shown by Fig. The sensors responses consist of transient and steady state response. Feature selection technique was used to extract 100 steady state sensor responses in sampling rate based on sensor data sheet. There were no variations in the sensors responses which indicated that the developed instrument is functioning accordingly.

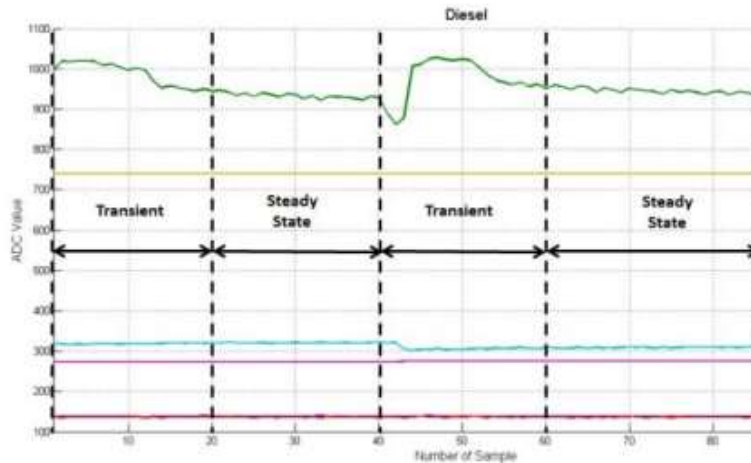


Figure 3 - Result

## V. CONCLUSION

Internet of Things has gained its wide popularity in recent days due to its various streams of applications which has paved way for smooth, safe, and easier mode of living style for human beings. One such area of applications includes gas booking and gas leakage detection for both domestic and commercial purposes. Though, several techniques are existing for the same, yet gas leakage detection is one major concern and a challenge always.

This system thus put forth a new proposed system which is micro-controller-based application of gas booking and gas detection systems using IOT. The sensor used in this model can sense and detect the leakage of the gas, and the user gets notification regarding to remaining percentage of gas in the cylinder as well certain action can be taken to pre-book the new cylinder without any barrier. This unit can be easily integrated into an alarm unit, or a visual indication of the LPG awareness for further benefits. This proposed system can be useful in marketing sectors like hotels, shop etc. The main intention of this work is to ensure safe and easier way of gas booking and gas leakage detection to avoid disasters that may occur due to negligence.

## VI. REFERENCES

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