

# Wireless Sensor Network Based on Gas Leakage Detection

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**Abstract**— There have been many incidents such as explosions and fires due to gas leaks. Such occurrences can have dangerous effects if the leak is not detected early. The wireless detection network-based gas leak detection system is a project that can detect the gas leak in the environment and send data to the cloud via the MCU node. The Internet of Things (IoT) is the network of "things" that physical thing can communicate through sensors, electronics, software, and connectivity. These systems do not require human interaction and the same happens with the IOT based gas detection system, it does not require human attention. The WSN-based gas leak detection system detects the gas using a gas sensor. The gas sensor interface to the MCU node is implemented in this project. The signal from this sensor is sent to the node microcontroller (ESP8266). The microcontroller is connected to a cloud and a buzzer. WSN based leak detection is implemented using an ESP8266 chip. This is a Wi-Fi module used to connect microcontrollers to the Wi-Fi network, make TCP / IP connections, and send data. The data collected by these sensors is sent to the cloud. The MCU node then sends the data to a cloud. Once the gas leak is detected, the buzzer will be turned on and the result will be displayed in the cloud. The prerequisite for this GLP project for gas leak detection and intelligent warning is that the WLAN module is connected to a WLAN hotspot or access point.

**Keywords:** LPG, Sensor, Arduino, IOT, Home Safety

## I. INTRODUCTION

The Liquefied Petroleum Gas (LPG) has no colour and no smell. The LPG gas liquefies under moderate pressure and vaporize upon discharge of pressure. Therefore, the LPG is stored in liquid form (concentrated). In general, LPG obtained from sanitized crude oil, in this way, it is under pressure form and also from natural gas or crude oil streams. The LPG can be odorized by adding an appropriate odour for the prevention of explosive attacks. The most important property of LPG is that, it is heavier than air.

As concentration of LPG increases, it creates hazards to human health. The LPG can be used as a fuel for many sectors, viz. domestic, industrial, cooking processes etc. LPG is also used as a fuel for vehicles. Due to the flammable behaviour of LPG gas, out of harm's way handlings of LPG must be useful in the domestic and industrial situations. Its liquid form is very harmful for the skin. Therefore, to avoid the hazards from this, monitoring and detecting of LPG leakage is carried out through this project

There are still many cases of LPG explosion that happen in the society. Despite, the number of it is not as many as formerly when the first LPG is applied in massive. However, it frequently causes forest fire. Forest fires may cause some relevant losses towards residential structures, infrastructures, industrial facilities, farms, and vegetation, and they are a relevant threat to human life [1]. Almost all of the explosion happen caused by the undetected leakage.

In the beginning, LPG has no scent. So it will make LPG hard to detect. Be aware of that, Pertamina added mercaptans gas to make it has a unique and nose piercing smell [2]. Then the LPG will be easier to detect. But sometimes the leakage occurs when there is nobody home. If that happens, gas will spread widely with no warning. This is so risky and the explosion will happen in anytime. The leakage can occur with some factors. In some cases, it happens because of incorrect regulator installation [3], the tube rubber is worn out, brittle hose, the tube is already obsolete [3], and many others. In addition, BSN present the comprehensive data about under standard gas stove. They are 20 percent of the regulator, 50 percent of the gas stove, 66 percent of valve tube, and 100 percent of hose that out of standard[3].

From all that factors, most of it occurs around the tube mouth and the hose. Because in the tube mouth, gas can slip in and out easily. But, the leakage can also occur around the connection.

## II. LITERATURE SURVEY

A. Mahalingam, T. Naayagin. E. Mastorakis; they introduce design and implementation of an economic gas leakage detector. They gave the formulation of many problems in previous gas leakage detectors. They told that several standards have been formulated for the design of a gas leakage detection system such as IEEE, BS 5730. This system ensures a continuous monitoring of the gas levels. If the gas level increases above the normal threshold level of 400 ppm butane (LPG), the system starts to issue early warning alarms at 100ms interval, which implies low level gas leakage. If the leakage level increases to 575 ppm of butane (LPG), the system activates high severity audio alarms at 50 ms intervals warning the occupants to run to safety.

P. Meenakshi Vidya, S.Abinaya, G.Geetha Rajeshwari, N.Guna, "Automatic LPG detection and hazard controlling" published in April 2014 published in April 2014 proposed the leakage detection and real time gas monitoring system. In this system, the gas leakage is detected and controlled by means of exhaust fan. The level of LPG in cylinder is also continuously monitored. [2]

Pal-Stefan Murvaya, Ioan Sileaa, 2008, they told in their survey on gas leak detection and localization techniques various ways to detect the gas leakage. They introduce some old or new technique to detect the gas. The proposed techniques in their paper are nontechnical methods, hardware-based methods which include acoustic methods, optical methods and active methods.

Srinivasan, Leela, Jeyabharathi, Kirthik, Rajasree; in this research paper they told about gas leakage detection and control. In this paper, the gas leakage resulting into fatal inferno has become a serious problem in household and other areas where household gas is handled and used. It alerts the subscriber through the alarm and the status display besides

turning off the gas supply valve as a primary safety measure. [4]

Hina Ruqsar, Chandana R , Nandini R , Dr. T P Surekha , have proposed a system that along with monitoring and detection of gas leakage, real time data is made available through real time feed over internet They have used Xively IOT platform to provide real time sensor data over the internet. [6]

### III. CONCEPTUAL DIAGRAM

#### A. Node MCU

Node MCU is an open source LUA based firmware developed for ESP8266 WiFi chip. By exploring functionality with ESP8266 chip, Node MCU firmware comes with ESP8266 Development board/kit i.e. Node MCU Development board. Since Node MCU is open source platform, their hardware design is open for edit/modify/build. Node MCU Dev Kit/board consist of ESP8266 WiFi enabled chip. The ESP8266 is a low-cost Wi-Fi chip developed by Espressif Systems with TCP/IP protocol. For more information about ESP8266, you can refer ESP8266 WiFi Module. There is Version2 (V2) available for Node MCU Dev Kit i.e. Node MCU Development Board v1.0 (Version2), which usually comes in black colored PCB.

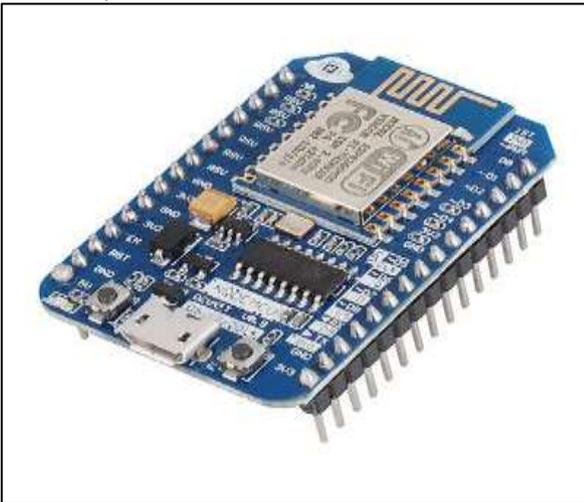


Fig. 3: Node MCU Development Board/kit v0.9 (Version1)

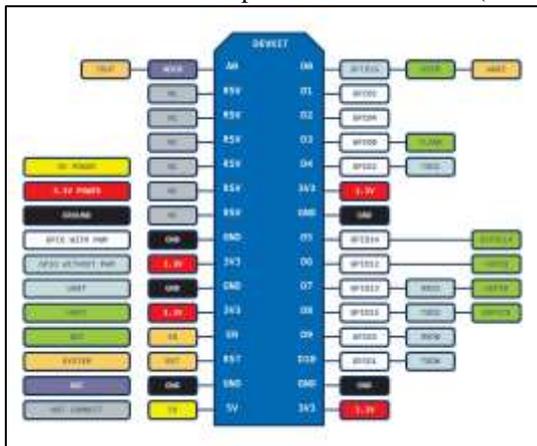


Fig. 4: Pin diagram of Node MCU

#### B. MQ-6 Sensor-

LPG Gas Sensor Module is designed to detect the presence of a dangerous LPG leak in your Home, car or in a service station, storage tank environment by interfacing with Microcontroller without ADC Channels and programming. In this version of LPG Gas sensor module two pots are included, one for trigger level setting and the other for setting sensitivity of the sensor. It allows to determine when a preset LPG gas level has been reached or exceeded. The module uses MQ-6 sensor to sense LPG leak. The MQ-6 can detect gas concentrations anywhere from 200 to 10000 ppm.



Fig. 5: MQ-6 sensor

The best location to fix Gas Sensor Module is near the Gas Cylinder or near the pipeline in case of piped gas connection. In case of LPG, when Gas leakage occurs , the gas will settle down near the floor because LPG is heavier than the air. So for best results it would be advisable to fit Gas Sensor Module nearly 1m above the floor.

### IV. CONCLUSION

For the first stage project presentation the literature survey of different approaches to detect the LPG gas detection has been studied. The PCB required for the proposed system has been designed using dip trace software and printed on copper clad. In next stage, the software part of the system will be developed and tested.

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