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LPG Gas Leakage Detector Using Blynk Application

Siti Sunaidah Sukma Bt Subri[1], Rosniza Bt Ramli[2], Norkiah Bt Mat Zaki[3]
[1,2,3] Jabatan Kejuruteraan Elektrik / Politeknik Kuching Sarawak, Malaysia.

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Abstract: *Liquefied Petroleum Gas (LPG) known as "cylinder gas" is one source of energy used for cooking, heating and etc.. LPG gas consist propane and butane gas. Although its characteristic is odorless in natural state but it is a flammable gas that can cause fire incident to occurs. Conventionally, the gas leakage can be easily be detecting through their smells because it consists a mixture of an Ethyl Mercaptan odorant. Thus, the paper develops LPG gas leakage detector with Blynk IOT-based. MQ2 gas sensor are used in detecting the present of gas. Notification warning automatically sent through user smartphone using Blynk app through their mobile phone if leaking occurs. The detector is tested in two condition state which are in airtight room with no air flow or fan and open room with window open. The time taken for detector to react and message receives in term of distance with the flame variation. Then,the analysis was made based on their condition state.*

Key Word*: Liquefied Petroleum Gas (LPG), Blynk Application, Internet of Thing(IOT), Gas Leakage.*

I. INTRODUCTION

Over the past years with the growing of technology, there are many research and system has been developed in monitoring and detecting gas leakage. Liquefied Petroleum Gas [LPG] is commonly type of gas used as heating fuel in industrial and household as cooking gas. This gas has been selected due to its availability, affordability and environmentally friendly as it consists of mixture propane and butane. This combination of gas is odorless which is difficult to be detected if gas leaking occurs. Hence, an Ethyl Mercaptan as a powerful odorant is added to the mixture of gas to detect the gas leakage via the sense of smell andit is easily detected by the people[1]. There are several causes that can contribute to this problem such as improper fitting of regulators which the sealing gap between the mouth of the gas cylinder valve is not perfectly fit[2,3]. This regulator can cause gas form a large gas cloud that will fall to ground as it characteristic is heavier than air. Then lead to the explosion when it near the ignition source. Other factor that can contributes to the leaking gas are inferior quality of tube sealing rings, quality of gas cylinders, and tear gas hose due to animals such as mice[3]. Thus, regular monitoring dan checking are important in checking the condition of the gas container to reduce the probability of fire incident.

With the growth in the number of people using this LPG fuel as cooking source, it is important to present some of the necessary safety measures to prevent fires. These LPG gas leakages have increased from 0.72% to 10.74% of all kitchen accidents[4]. Therefore, it is compulsory to have a detector in detecting gas leakage. Conventionally, a wired sensor network is used in monitoring gas leaking which need high costing to implement and user failed get to be inform if the gas leaking occur[5]. In order to overcome the limitation of the conventional method, an IOT are implement as notification system. This paper provides system which not only detect gas leakage but also notification warning message will be automatically sending through user smart phone through Blynk application. Advantage these detector project not only low in costing but at the same time help to alert the user whenever the user location with the help of internet access. To provide high accuracy gas sensor MQ-2 has been used. The paper has been organized as II. System Structure and Operation III. Result and Analysis and IV. Conclusion.

II.SYSTEM STRUCTURE AND OPERATION

The overview functionality of project can be shown in block diagram as below Fig. 1.

The method mainly focuses on monitoring and detecting gas leakage using NodeMCU as a controller. For gas detection, MQ-2 gassensor is use in detecting gas leaking. The threshold limit value is set to 180. If the amount of gas leaking detected above the threshold limit value, the buzzer, led and exhaust fan will automatically operate. At the same time, the user will get a notification warning message via IOT Blnyk application as alert system through their smartphone even though they are outside house or premise areas.

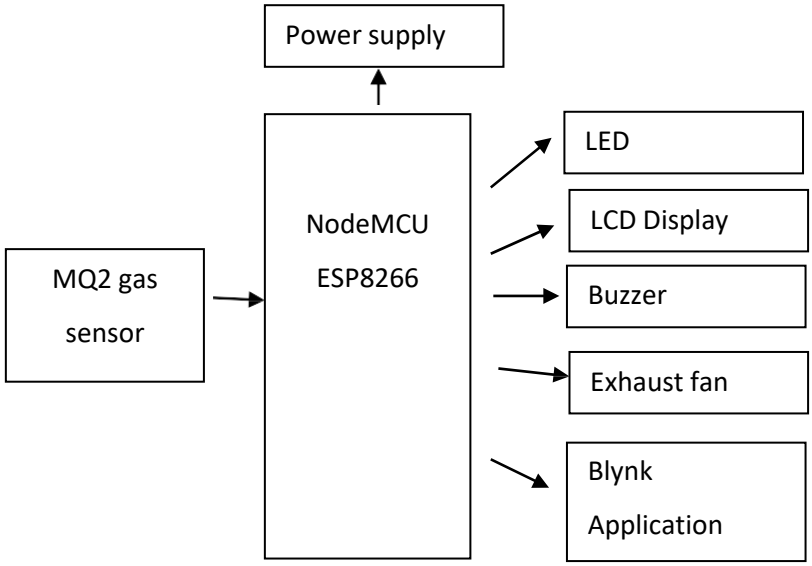

Fig. 1 block diagram of gas leakage detector

To meet the requirement, the NodeMCU controller has been use because it comprises a Wi-Fi interface to connect smartphone of the user and detector. The LCD display 16x2 are used to display the reading of the gas value in all time. This systemis so flexible and can be monitored easily. The connection of gas leakage detector system is shown in Fig. 2 below.

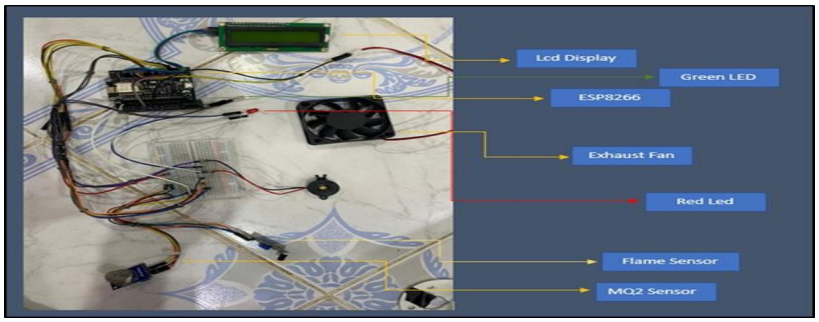

Fig. 2 Gas leakage detection system

The components used to build a system are as follow:

A. Node MCU ESP8266

Fig. 3 Node MCU ESP8266

ESP8266 Integrates 802.11b/g/n HT40 Wi-Fi transceiver, so it can not only connect to a Wi-Fi network and interact with the Internet, but it can also set up a network of its own, allowing other devices to connect directly to it. This makes the ESP8266 NodeMCU even more versatile.

B. LCD display

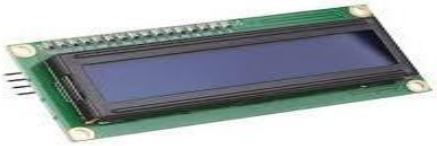

Fig. 4 LCD display

An LCD is an electronic display module that uses liquid crystal to produce a visible image. The 16×2 LCD display is a considerably basic module commonly used in DIYs and circuits. The 16×2 translates a display 16 characters per line in 2 such lines. In this LCD each character is displayed in a 5×7 pixel matrix.

C. Buzzer

Fig. 5 Buzzer

The buzzer consists of an outside case with two pins to attach it to power and ground. When current is applied to the buzzer it causes the ceramic disk to contract or expand. The changing current can cause the surrounding disc to vibrate.

D. MQ2 gas sensor

Fig. 6 MQ2 gas sensor

MQ2 gas sensor is an electronic sensor use for sensing the concentration of gases in the air such as LPG, propane, methane, hydrogen, alcohol, smoke and carbon monoxide. MQ2 gas sensor is also known as chemiresistor. It contains a sensing material whose resistance changes when it encounters the gas.

E. Exhaust Fan

Fig. 7 Exhaust fan

The exhaust fan helps to removes the airborne cooking byproducts from the air in your kitchen. These byproducts can include grease, rogue spices, fumes, smoke, steam, and heat.

F. Blynk Application

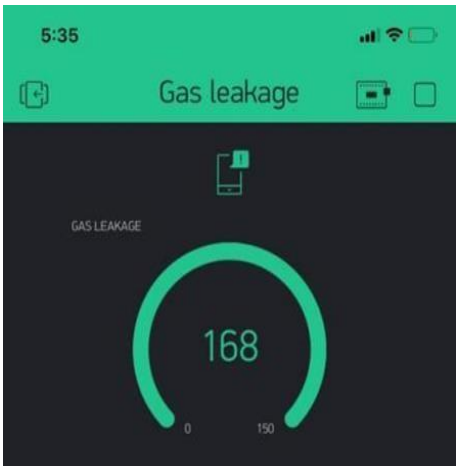

Fig. 8 Interfaced Blynk Application

Blynk application is a new platform that allows to quickly build interfaces for controlling and monitoring hardware projects from iOS and Android device. For this project the blynk app is use to give notification on the user's phone.

III.RESULT AND ANALYSIS

The gas leakage detector system is designed to fulfilled the below requirement. The system must meet the following requirementas to be say it acceptable.

No	Gas Sensor	Buzzer	LED	LCD Display	Fan	Blynk Notification Status
1.	More than 180	On	On	Gas Detect	On	Gas Detect
2.	Less than 180	Off	Off	Good Condition	Off	Normal

Table 9 Summary of test condition

The detector is experimentally test in two condition areas which are open area with open window and airtight area without any fan or aircons in order to test the efficiency and intense gas be detected by the system. The system is tested in 5 range of distance with the present of flame. The time taken for detector to react as buzzer ringing is detected and amount of gas are recorded in table below.

No.	Distance (cm)	Time taken detector react (sec)	Gas level	Blynk notification status
1.	0	0	215	Gas Detect
2.	2	5	215	Gas Detect
3.	4	7	185	Gas Detect
4.	6	9	183	Gas Detect
5.	8	15	181	Gas Detect

Table 10 Result testing in airtight area

No.	Distance (cm)	Time taken Detector React (sec)	Gas Level	Blynk notification status
1.	0	0	210	Gas Detect
2.	2	4	180	Gas Detect
3.	4	7	180	Gas Detect
4.	6	More than 15	150	No Detect
5.	8	More than 15	80	No Detect

Table 11 Result testing in open area

Table 10 and table 11 show the result testing in airtight area and open area. Based on both results obtain, it can be summarized as the sensitivity of detector to detect the gas reduced as distance detector been placed are far from the flame as it takes a longer period to react. The factor that causes the efficiency of detector be drop are wind flow. As can see from table 11, it can be deduced that the gas release is carried away as the wind blows hard enough and thus efficiencies of detector decreased. Compared to the airtight area, the detector still can be detected the present of gas leak with the same distance because there are no air or wind flowas the window closed. Second factor that contribute to result was the width area as the time taken for the detector be react with small area is faster than a bigger width area. Therefore, the number of sensors use with width area should be taken into consideration when designing a system. This can increase the efficiency and accuracy of the detector to detect the present of gas.

IV.CONCLUSION

In a nutshell, gas leakage can contribute to higher accident be happen if exposed to high temperature or flame. Thus, this gas leakage detector with Blynk application is suitable and recommended to be installed in the premise or house. It can help in detecting leaking gas and automatically notify the user through phone whether user in premise area or outside premise area. If gas leaking happen, user can directly contact for the assistance.

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