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A Minor Project Report

on

GAS LEAKAGE DETECTION AND ALERTING SYSTEM

Submitted in partial fulfilment of requirements for the award of the

Degree of

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ELECTRONICS AND COMMUNICATION ENGINEERING

Under the guidance of

DR.K.SIVANANDAM

Submitted By

N.KUMAR	**(21BEC098)**
R.S.MAHENDRAVARMAN	**(21BEC111)**
S.MALLESH	**(21BEC112)**
S.G.MANIKANDAN	**(21BEC307)**
P.SANTHOSH	**(21BEC311)**

DEPARTMENTOF ELECTRONICS AND COMMUNICATION ENGINEERING

M.KUMARASAMY COLLEGE OF ENGINEERING

(Autonomous)

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BONAFIDE CERTIFICATE

Certified that this project report **"GAS LEAKAGE DETECTION AND ALERTING SYSTEM"**is the bonafide work of **"N.KUMAR (21BEC098), R.S.MAHENDRAVARMAN (21BEC111), S.MALLESH (21BEC112), S.G.MANIKANDAN (21BEC307), P.SANTHOSH (21BEC311)"** who carried out the project work under my supervision in the academic year 2021-2022.

SIGNATURE

Dr.S.PALANIVELRAJAN, M.E., Ph.D.,DLitt(USA)
HEAD OF THE DEPARTMENT
PROFESSOR
Department of Electronics and Communication Engineering,
M.Kumarasamy College of Engineering,
Thalavapalayam, Karur-639113

SIGNATURE

DR.K.SIVANANDAM ME., Ph.D.,
SUPERVISOR,
ASSISTANT PROFESSOR
Department of Electronics and Communication Engineering,
M.Kumarasamy College of Engineering,
Thalavapalayam, Karur-639113

This project report has been submitted for the **18ECP103L-Minor Project I** held at M.Kumarasamy College of Engineering, Karur on **.....**

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- **PSO1**: Applying knowledge in various areas, like Electronics, Communications, Signal processing, VLSI, Embedded systems etc., in the design and implementation of Engineering application.
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MAPPING OF PROJET WITH POs AND PSO

Abstract	**Matching with POs , PSOs**
Keywords	PO5,PO9,PO10,PSO1.

ABSTRACT

Gas leakage is a major issue in the world which is a cause of many human lives and property loss. One of the major causes of gas incidents are improper functioning of alert systems. So, to overcome this we have come up with a better idea of gas leakage alert system. In this paper we will be discussing about gas leakage detection system using NodeMcu and blynk software. Internet of Things (IoT) is the networking of 'things' by which physical things can communicate with the help of sensors, electronics, software, and connectivity. These systems do not require any human interaction. Internet of Things aim towards making life simpler by automating every small task around us. As much is IoT helping in automating tasks, the benefits of IoT can also be extended for enhancing the existing safety standards.Safety plays a major role in today's world and it is necessary that good safety systems are to be implemented in places of education and work. This work modifies the existing safety model installed in industries and this system can also be used in homes and offices. The traditional Gas Leakage Detector Systems though have great precision, fail to acknowledge a few factors in the field of alerting the people about the leakage. Therefore we have used the IoT technology to make a Gas Leakage Detector for society which having Smart Alerting techniques involving sending text message to the concerned authority and an ability performing data analytics on sensor readings.

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CHAPTER 1

INTRODUCTION

Nowadays, the usage of Liquefied Petroleum Gas (LPG) in India is widely used in many fields such as in homes, restaurants, industries (small scale to big scale) and in automobiles as fuels.Sections and sub-sections may be created according to necessity as follows. Leakages may lead to explosion which can lead to many deaths. As the usage of LPG increases in domestic, the accidents occur by these LPG explosion also increases due to lack of continuous inspections and monitoring.

This system uses a mobile app to receive an alerting notification, and reliable in communications between the user and the system.Gas leakage detection and alerting system uses a MQ6 gas sensor to detect the gas leakage. When the gas leakage is detected by the sensor, it sends an analog value to the microcontroller ESP8266. The microcontroller alerts by sending notification and Email**.**

This system uses Wifi to send a notification.So the microcontroller must be connected with wifi in order to send Email and notification. The Internet of Things is an emerging topic of technical, social, and economic significance. Consumer products, durable goods, cars and trucks, industrial and utility components, sensors, and other everyday objects are being combined with Internet connectivity and powerful data analytic capabilities that promise to transform the way we work, live, and play.

The Internet of Things (IoT) is an important topic in technology industry, policy, and engineering circles. This technology is embodied in a wide spectrum of networked products, systems, and sensors, which take advantage of advancements in computing power, electronics miniaturization, and network interconnections to offer new capabilities. The large-scale implementation of IoT devices promises to transform many aspects of the way we live. For consumers, new IoT products like Internet-enabled appliances, home automation components, and energy management devices are moving us toward a vision of the “smart home’’, offering more security and energy efficiency.

IoT systems like networked vehicles, intelligent traffic systems, and sensors embedded in roads and bridges move us closer to the idea of “smart cities’’, which help minimize

congestion and energy consumption. IoT technology offers the possibility to transform agriculture, industry, and energy production and distribution by increasing the availability of information along the value chain of production using networked sensors.

There are different ways of detecting gas leakage in which there has been existing LPG detector which only sound out an alarm when there is leakage and there is still improvement that could be made to the existing ones, in which a microcontroller activate the alarm and send a message through Email to the appropriate personnel. The crux of the paper is to create a device that can detect LPG leakage as part of a safety measure and automatically send an Email to the appropriate personnel and will activate an alarm immediately after gas leakage is detected in other to prevent wastage of the gas and also explosion which could lead to damaging of properties and other calamities.

CHAPTER 2

LITERATURE REVIEW

Liquid Petroleum Gas Detection:

Liquid Petroleum gas is a flammable mixture of hydrocarbon gases used as fuel in heating appliances, cooking equipment, and specifically as a vehicle fuel (it is often referred to as autogas). It is an odorless gas due to ethyl mercaptan is added as an odorant to be easily detected when leakage occurs for safety precaution. LPG is made by refining petroleum or wet natural gas and is almost entirely derived from fossil fuels sources being manufactured during the refining of crude oil as theory emerged from the natural state. It was classified as a hazardous material because of its explosive potentials when under pressure, due to this hazardous property leading to fire explosion. The gas detection process was made by the chemically infused paper that change its color when it's been exposed to gas before the development of the electronics gas detector. The electronics leakage detector was an active approach to initial fault detection in other to achieve the utmost safety of humanity and properties as a whole they introduced an android base automatic gas detection).different approaches have been used alongside several research in the detection of leakage and were also implemented alongside some incident toward some decades. The existing leakage detection is optical sensor method, cable sensor, negative pressure, vapor sampling, signal processing, mass volume, and pressure point analysis, in which have been implemented using a different framework. Some groups of researchers have classified the technology as two fitting categories, which are software and hardware method but research continues and to technical nature research effort which led them to three group methods.

Classification of Leakages Detection:

There are different classes of leakage detection which have been used to monitor the leakage, several criteria are classified into their classification, some of which are critical principles and abilities needed from humans. The detection is classified into three, which are automated detection, manual detection, and semi-automated detection. Automated Detection involves monitoring of detecting leakage without the help of the operator, once the detector device is installed and been connected to the display of the personnel in charge and can be automatically shut down from the display unit. (SCADA); Manual Detection - These are methods in which

the device can only be operated by humans. Like thermal imager or light detection and ranging (Lidar) devices; Semi-automated detection – solutions that necessitate a certain amount of input or assistance in carrying out certain tasks (e.g. statistical or digital signal processing methods) (Batzias et al., 2011). The technology used in leakages detection can be classified into two categories which are, Direct method and the Indirect method The direct method is making use of a handheld detector by the patrol team along the pipeline and in the aspect of the very long pipeline, the airplane mounted optical imaging device is used along the pipeline for measuring gas emanation for fast result.

Embedded Real-Time System:

For Gas Leakage Detection A domestic applications in residential buildings for an Embedded real-time system for gas leakage detection in which sensor nodes are installed in various households and communicate with a single central node. An alarm is triggered in the event of gas leakage. The concerned personnel is identified and alerted via text messages using the assigned MAC address of the RF module in each sensor unit. The use of exhaust fans is a commonly proposed solution for gas-related accidents, however, this system is only capable of mitigating a possible disaster and not completely averting it, since this approach reduces the risk by expelling gas leakage instead of shutting down the supply.

Wireless modularization of gas safety devices:

Smart home gas safety management system based on wireless modularization of gas safety devices was designed to allow safety in the homes in other to reduce damages. The system is based on the commercially available intelligent Micom meters, which have enhanced standard gas meters with a built-in microcontroller and a cutoff valve. The system is primarily concerned with detecting fire breakouts, and the existing gas meter has been upgraded to communicate with an external smoke and CO detecting sensor, as well as fire extinguishing modules, which are used to extinguish the fire when the temperature exceeds the threshold. The requirement for an existing Micom meter to construct the enhanced gas and fire safety method is a disadvantage of this system, as it lacks independent application, developed a gas leakage detection and location system based on wireless sensor networks. They used wireless sensor

networks to detect gas leakages and ensure product safety in the petrochemical industry. The system emphasizes the importance of developing centralized location software by collecting data from wireless RF sensors in order to precisely pinpoint the location of gas leakage and aid in the response time reduction In spite of the absence of remote monitoring and automatic shutoff, the study emphasizes the importance of inter-node communication in developing a dependable leakage detection system.

CHAPTER 3

HARDWARE USED

MICRCONTROLLER (ESP 8266-12E) NODE MCU:

Node MCU is an open source IoT platform. It is a microcontroller development board with wifi capability. It uses an ESP8266 microcontroller chip. Its operating voltage is 5v dc supply. It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. The term "Node MCU" by default refers to the firmware rather than the dev kits. The firmware uses the Lua scripting language. It is based on the eLua project, and built on the Espressif Non-OS SDK for ESP8266.The ESP8266 module enables microcontrollers to connect to 2.4 GHz Wi-Fi.

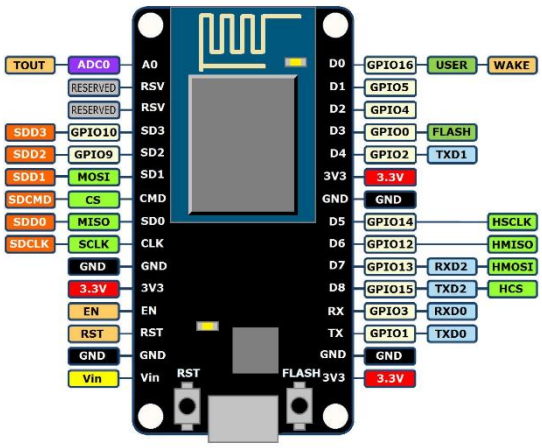

Fig No:3.1 MICRCONTROLLER (ESP 8266-12E) NODE MCU

MQ6 GAS SENSOR:

The MQ6 gas sensor is a sensor that has a fast response to LPG (Liquid Petroleum Gas), is stable and durable and can be used in a simple drive circuit. MQ-6 gas sensors are commonly used in equipment to detect gas leaks in household and industrial activities, which are suitable for detecting LPG, iso-butane, propane.

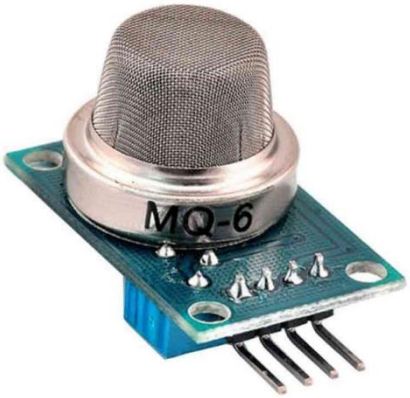

Fig No:3.2 MQ6 GAS SENSOR

CHAPTER 4

EXPERIMENT PROCESS

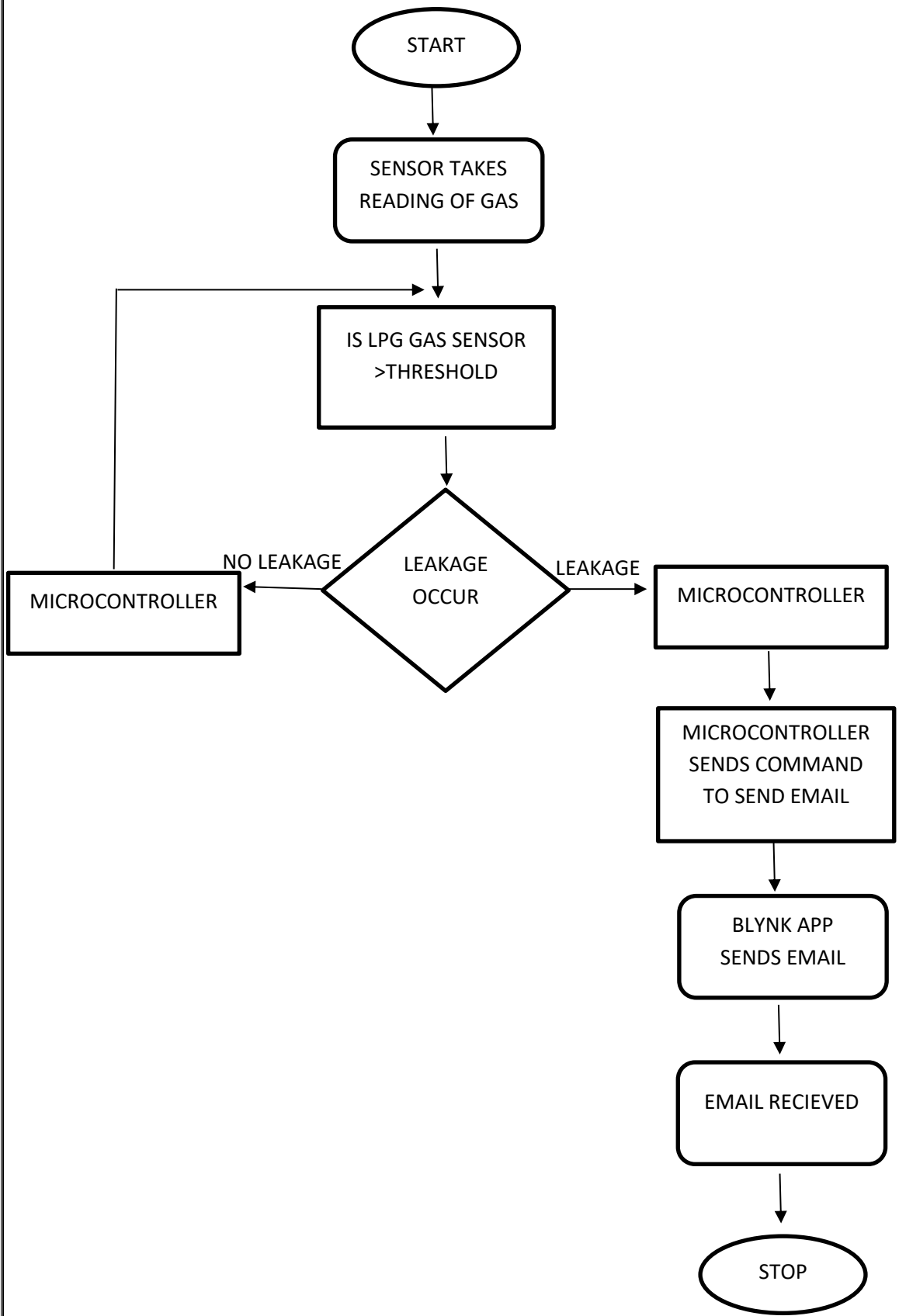

Table No: 4.1 Workflow

CHAPTER 5

COMPONENT DESIGN

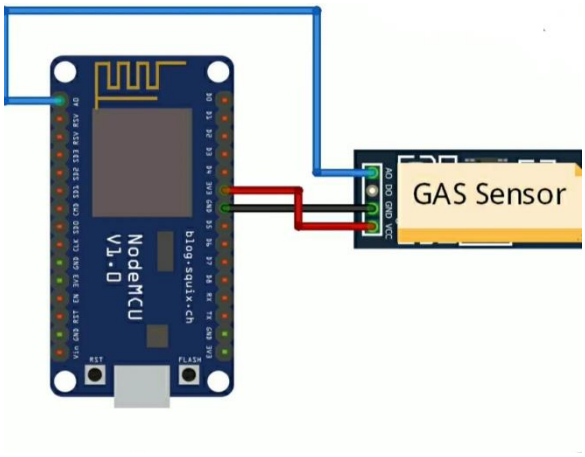

Fig No: 5.1 CIRCUIT DIAGRAM

The circuit diagram is connection of the v_0 pin is connected to vin on node MCU, GND is connected to the Gnd pin and A0 pin is connected to the analog input of the NODEMCU. When the MQ6 Gas sensor detects the gas leakage above the threshold value, it sends input to the microcontroller NODEMCU.

The NODEMCU which is connected to wifi, Sends an alerting message to the registered email through Blynk App.

CHAPTER 6
SOFTWARE DESIGN

The Hardware was coded in C language. The platform used for uploading the code to the Microcontroller NODEMCU is Arduino IDE.The code used in this project is shown as follows.

```
#define BLYNK_TEMPLATE_ID "TMPLqSAJG7KF"

#define BLYNK_DEVICE_NAME "GAS LEAKAGE"

#define BLYNK_AUTH_TOKEN "lpl0p1B3TP-CcawE-vdnH1QAsLyvrkLU"

#define BLYNK_PRINT Serial
#include <ESP8266WiFi.h>
#include <BlynkSimpleEsp8266.h>


char auth[] = BLYNK_AUTH_TOKEN;

char ssid[] = "shanmugam";  // wifi name
char pass[] = "sh299201";  // wifi password
int smokeA0 = A0;
int data = 0;
int sensorThres = 100;


BlynkTimer timer;

void sendSensor(){

 int data = analogRead(smokeA0);
 Blynk.virtualWrite(V0, data);
  Serial.print("Pin A0: ");
  Serial.println(data);


  if(data > 20){
    Blynk.email("test@gmail.com", "Alert", "Gas Leakage Detected!");
```

```
    Blynk.logEvent("gas_alert","Gas Leakage Detected");
  }
}

void setup(){
  pinMode(smokeA0, INPUT);
   Serial.begin(115200);
  Blynk.begin(auth, ssid, pass);
  timer.setInterval(2500L, sendSensor);
}

void loop(){
  Blynk.run();
  timer.run();}
```

CHAPTER 7
PROJECT METHODOLOGY

7.1. EXISTING METHOD

- This system is based on the Arduino UNO R3 and MQ-6 gas sensor. When the sensor detects gas in the atmosphere, it will give digital output 1 and if gas in not detected the sensor will give digital output 0.

- Arduino will receive the sensor output as digital input. If the sensor output is high, then the buzzer will start tuning along with the LCD that will show that “Gas detected: Yes”.

- If the sensor output is low then buzzer will not be tuning, and the LCD will show that “Gas detected: No”.

- The following Shows the block diagram of existing model.

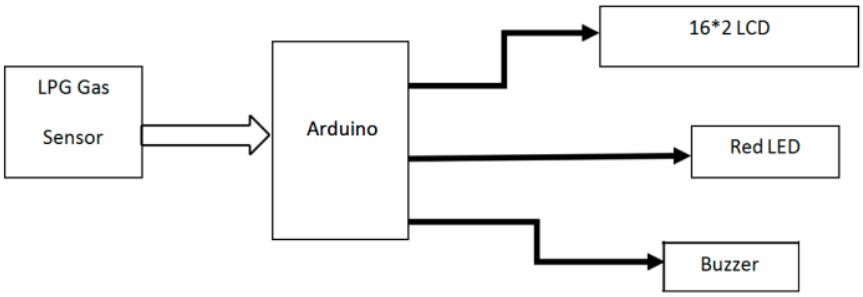

Fig No: 7.1 Existing System Block diagram

7.2. PROPOSED METHOD

- The design of the proposed method is based on NODEMCU ESP8266, MQ6 Gas sensor, an LED.
- The gas sensor detects the gas leakage and sends the analog input to the NODEMCU ESP8266.
- We can use NODEMCU ESP8266 to send notification to mobile.

CHAPTER 8

CONCLUSION

This work presents the design and implementation of gas leakage detection system. Various works on gas leakages detection system was reviewed and presented. I was discovered that some of the existent research don't takes in to considerations the cost effectiveness for the purpose of implementation of gas leakages detection at individual/domestic uses, and not easy to be further modified. Internet of Things is a new revolution of the Internet & it is a key research topic for researcher in embedded, computer science & information technology area due to its very diverse area of application & heterogeneous mixture of various communications and embedded technology in its architecture. In our modern scenario the usage of LPG has increased in a greater manner. As a result of this,the damages caused by the leakage of gas is increasing day by day. So as to eradicate this problems we are introducing highly advanced system known as Internet Of Things(IOT) .This research work had advanced in knowledge as it included an embedded system to alert users via multiple mobile phones for further action to be taken when leakage is detected. The device detects gas leakage using a MQ6 Gas sensor and sends it to the microcontroller and the microcontroller sends an email to mail account registered in the Blynk application.It would provide protection from the hazards of gas leakage and explotion due to that leakage.

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GAS LEAKAGE DETECTION AND ALERTING SYSTEM

Dr.K.sivanandam [1], R.S.Mahendravarman [2], N.Kumar [3], S.Mallesh[4], P.Santhosh[5],S.G.Manikandan[6]
Assistant professor[1],UG student [2,3,4,5,6]
[1]Department of Electronics and Communication Engineering,
M.Kumarasamy College of Engineering, Karur

ABSTRACT

Nowadays the usage of Gas is essential in every household and industries for functioning of that particular house or organisation. There are many hazards caused due to the leakage of the gas. This paper focusses on reducing that hazard by the usage of the microcontroller nodemcu.Gas leakage detection and alerting system uses a MQ6 gas sensor to detect the gas leakage. When the gas leakage is detected by the sensor, it sends an analog value to the microcontroller ESP8266. The microcontroller alerts by sending notification and Email.

Keywords:ESP, Microcontroller, Gas Leakage