

LPG/CNG Gas Leakage Detection and Prevention using IoT

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Abstract - Gas leakage is the major critical threat within the automotive industries, also as in residential areas. lately Safety plays important roles in home towards security over the gas leakage. The main goal of this paper is to develop a system for the gas leakage detection and controlling. The gas sensor used for development of this technique is that the combustible gas sensor MQ-2 that utilized in order to detect this of liquefied petroleum gas (LPG). The sensor detects gas concentrations from 200 to 10,000ppm. The output of the sensor is connected to ESP32 Microcontroller. The system is programmed with embedded C, whereas the system evaluates the sensed data. If the sensed data is greater than the threshold value an alert are going to be sent to the user phone and will be controlled via application with help of internet and servo motor are going to be activated in order to turn off the gas regulator valve.

Key Words: ESP32 microcontroller, MQ-2 sensor, Servo motor, regulator valve

1. INTRODUCTION

LPG (Liquefied Petroleum Gas), simply called as propane or butane, is extremely flammable gas that's often used as fuel for cooking purposes. because of the flammable nature of LPG, its leakage can cause damage to life and property.

LPG is additionally used as an alternate fuel in vehicles because of soaring within the prices of petrol and diesel. Some people have low sense of smell, may or might not respond on low concentration of gas leakage. In that case gas leakage security has become an essential and help to protect from gas leakage accidents.

As we all aware of Bhopal gas tragedy was huge example of gas leakage accident in India. This was world's largest gas leakage industrial accident. Gas leakage detection isn't only important but stopping leakage is equally essential. This paper provides a price effective and highly accurate system, which not only detect gas leakage but also alert

it's important to make sure that gas leakage has not occurred in our kitchen. LPG, being heavier than air, doesn't disperse easily and results in suffocation when inhaled. The ignition of leaked gas results leads to

explosion. it's also important to make sure that kitchen has not been caught with fire.

The proposed topic "LPG /CNG gas leakage detection and prevention using IOT" deals with Gas leakage detection If the sensed data is above threshold value signal is sent to ESP32 microcontroller and an alert SMS are going to be sent to the user phone and will be controlled via dynamic web application with help of internet and servo motor are going to be activated in order to turn off the gas regulator valve.

2. RELATED WORK

Mr. Arijit Banik [1] et al, proposed an "Microcontroller Based Low Cost Gas Leakage Detector with SMS Alert". This system focus on Gas leakage is a major problem with industrial sector, residential areas and gas driven vehicles like CNG (Compressed Natural Gas) buses, cars etc. One of the preventive methods to prevent accidents related with the gas leakage is to put in a gas leakage detection device at permeable places. The aim of this project is to develop such a tool which will automatically detect and stop gas leakages in those permeable areas.

T.Soundarya [2] et al, proposed an "C-Leakage: Cylinder LPG Gas Leakage Detection for Home Safety". this technique specialize in Home Fires have taken a growing toll in lives and property in recent years. LPG is flammable and may burn even at a long way from the source of leakage. Most fire accidents are caused due to a poor-quality rubber tube or when the regulator isn't turned off. the availability of gas from the regulator to the burner is on even after the regulator is turned off.

Guru rama gayathri and Yoga ananth [3] et al, proposed an "IoT BASED GAS MONITORING SYSTEM USING ARDUINO". Recent trend is that the developments of Smart homes all around the world. Home automation has become very affordable and much of individuals , industries has began to automate daily routines like light, fans, setting the temperature, etc. A gas detector is also a tool that detects the presence of gases during a neighborhood, often as a region of a security system. This factor leads to a necessity of a gas detection system to be

installed at such accident-prone locations for continuous monitoring of any quite leakage which cannot be detected by the human senses. The proposed system will continuously monitor the environment for any gas leakage.

Ravi Kishore Kodali [4] et al, proposed an “IOT Based industrial plant Safety Gas Leakage Detection System”. this technique specialize in Most of the fire-breakouts in industries are because of gas leaks. These cause dreadful damage to the equipment, human life resulting in injuries, deaths, and environment. Currently available gas leakage detectors alert the people around using on-site alarms. So, this project propose is to gas leakage detector which sends the alert to the concerned people through SMS. This detector senses the presence of harmful gases particularly in surrounding, LPG, Methane and Benzene. LPG and Methane gases ignite easily leading to blasts. Benzene is carcinogen effects the health of workers, if inhaled in higher concentrations. Hence, detection of those gases is important.

Ravi Kishore Kodali [5] et al, proposed an “IOT Based Automatic LPG Gas Booking and Leakage Detection System”. This paper flash light on LPG gas is the most commonly used Domestic fuel in every household. Booking new gas cylinder manually time consuming. In this fast-growing technology, it's not feasible for an individual to spend time booking manually when this technology is used to do such tasks. So, using IOT gas booking could be done simple. Gas booking can be automated by knowing the status of amount of gas within the cylinder using Load cell, weight sensor.

Nagib Mahfuz [6] et al, proposed an “A Smart Approach of LPG Monitoring and Detection System Using IoT”. Liquefied petroleum gas (LPG) is most generally used everywhere the globe for heating, cooking, vehicle fuel, so many other fueling purposes. LPG may be a highly flammable gas and leakage of LPG occurs major accidents. This paper approaches a sensible technique for monitoring the leakage of LP Gas using IoT. In this research, a smart electronic system is developed for monitoring the presence of LP gas, Natural gas, butane, temperature, humidity, and heat index through a web server.

3. EXISTING SYSTEM

In the existing system, the LPG gas leakage detection in residential area is done manually or by the time of firing it only detects and keeps on alarming to evacuate people

form the high risk, it doesn't close the valve automatically, this could cause fire to be spread all over the area in a very instance of time.

4. PROPOSED SYSTEM

The main objective of the proposed Gas Leakage Detection and Automatic Control System is to provide a solution by designing an automatic system which can detect the leakage of liquefied petroleum gas (LPG) reception and control it by turning off the cylinders regulator knob off. At the same time the SMS alert will be sent to the owner of the house using GSM module.

5. ARCHITECTURE DAIGRAM

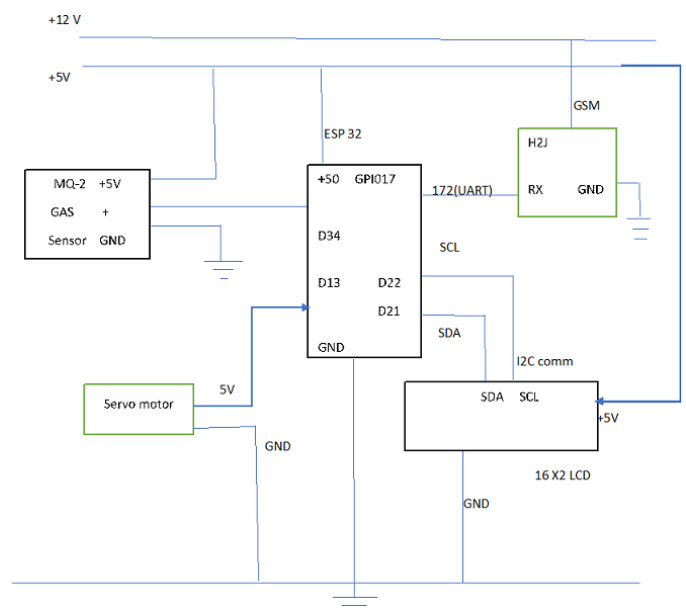


Fig -1: System design

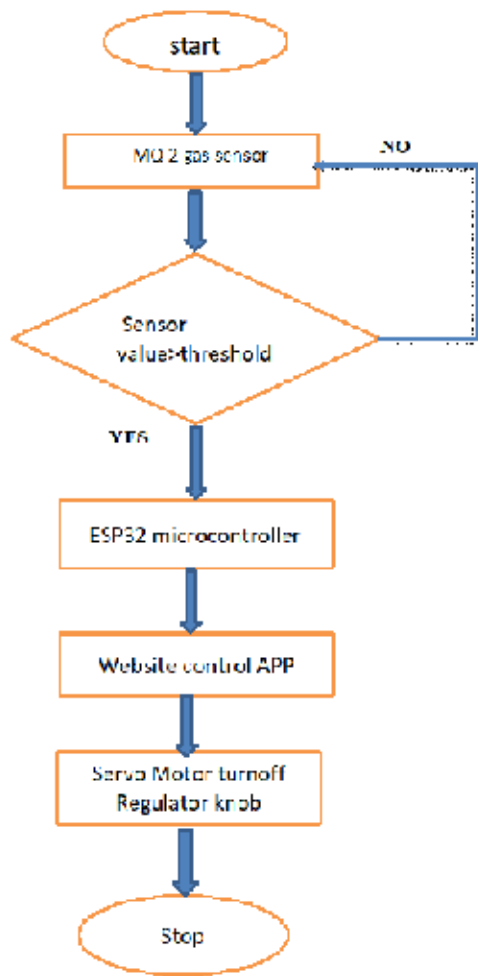


Fig -2: Flow diagram of gas leakage detection system.

In this paper the sensors are used to detect LPG gas leakage. An MQ2 semiconductor sensor is used. Sensitive material of the MQ-2 gas sensor is SnO₂, which has lower conductivity in clean air. When the target combustible gas exists, the sensor conductivity increases with the rising gas concentration. The MQ2 gas sensor has a high sensitivity to Propane, Butane and LPG, and response to the Natural gas. The sensor can be used to detect different combustible gasses, especially Methane; it's affordable and is suitable for various applications. The MQ-2 can detect gas concentrations anywhere from 200 to 10,000 ppm. The sensor's output is an analog resistance. Figure shows the block diagram of the gas leakage detection and control system.

At first, the microcontroller send signal to the GSM module and if the GSM module is connected properly with the microcontroller, it sends an acknowledgement signal back to the microcontroller. Then if there is any gas leakage in

the detected by the gas sensor unit using MQ-2 gas sensor. After the sensor unit detects the gas leakage, a sign is shipped to the ADC unit of the microcontroller which then sends activation signal to other external devices connected to it such as regulator attached with servo motor, GSM module and LCD display.

6. EXPERIMENTAL RESULTS

This system is based on the ESP32 Microcontroller and MQ-2 gas sensor. When the sensor detects gas within the atmosphere, it'll give digital output 1 and if gas in not detected the sensor will give digital output 0. ESP32 will receive the sensor output as digital input. If the sensor output is high, then the SERVOMOTOR will start rotating along with the LCD that will show that "Gas detected: Yes". If the sensor output is low then servo motor will not be turn, and the LCD will show that "Gas detected: No". Whenever the gas leakage value reaches the threshold value automatically the gas regulator vale is going to close and the value is displayed in LCD, SMS is sent to the user mobile. Along with this we can control the gas regulator automatically as well as manually through web page



Fig -3: Prototype model of proposed system.

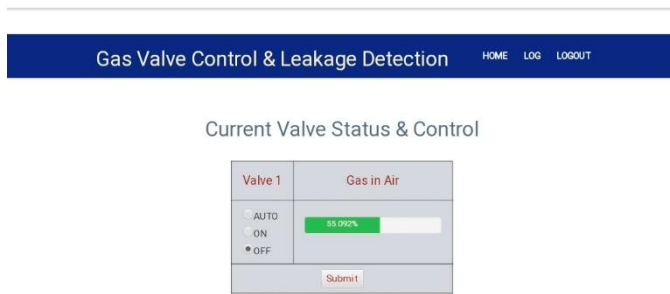


Fig -4: Web interface for controlling gas leakage

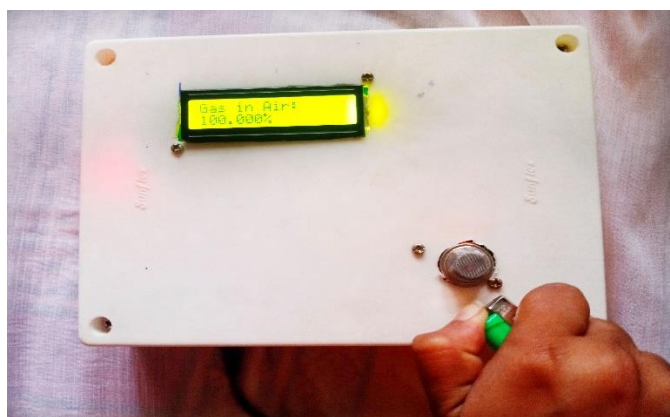


Fig -5: LCD display gas in air.

2 6:27 PM

CAUTION!!!
Gas Leakage Detected
Gas in Air: 100.000%

2 8:07 PM

CAUTION!!!
Gas Leakage Detected
Gas in Air: 100.000%

Fig -6: SMS notification to authenticated user.

7. CONCLUSIONS

Gas leakage is the major critical threat within the automotive industries, also as in residential areas. lately Safety plays important roles in home towards security

over the gas leakage. The design of a sensor-based automatic gas leakage detector with an alert and system has been proposed and discussed this paper. This is a low-cost, low power, lightweight, portable, safe, user friendly, efficient, multi featured and easy system device can detect the leakage of liquefied petroleum gas (LPG) reception and control it by turning off the cylinder knob. At the same time the SMS alert will be sent to the owner of the house using GSM module.

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