Gas Level Detection and Automatic Booking Using IoT

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Abstract - *Gas leakages are a severe problem in residences and other areas where residential gas is utilized. The consumer has no idea of how much gas is being used and how much time left when he or she needs to book a new LPG cylinder. As a result, in this project, we offer an Internet of Things (IoT)-based system that analyses several characteristics of an LPG cylinder and, as a result, keeps the consumer informed via a mobile application. When the gas level is falls below the threshold, an alert message will receive to the user via the buzzer and via the mobile app, and when the LPG level is extremely low, the amount of gas in the cylinder is found using a sensor called a load cell and the rate of gas remaining in the cylinder is updated to the app that is being used by the user (below 20 percent). We prevent pre-booking and late booking by automating the booking of new LPG. When a gas leak is detected, the user is notified via a mobile application and a buzzer. Using GPS, the precise location of the fire accidents will be communicated.*

Key Words: **IOT, LPG gas, MQ2 Gas sensor, NodeMCU**

1.INTRODUCTION

LPG is a regularly utilized fuel with an explosive range of 1.8 percent to 9.5 percent volume of gas in the air. Even though ordinary labor has become smarter, things like gas cylinders in homes have remained the same. It can sometimes lead to an accident. As a result, technology must be used to prevent mishaps. IoT is a fast-growing technology in the industry, and we now have an advanced system for reserving LPG cylinders by IVRS, SMS, or online. Due to the high demand for LPG, customers must pre-book their cylinders. The primary goal of the project is to detect gas leakage of LPG cylinders, which are commonly used in Indian homes, and this project deals with finding the level of gas in the cylinder and sending this information for booking of a new LPG cylinder when the gas level is low, as well as sending an alert to the users using IoT. If a fire occurs, the programmer has the ability to connect with NodeMCU as well as connect to the user's mobile phone and send a notification. The MQ6 LPG gas sensor is utilized for input, as well as sending alert notifications to the user and assisting with automatic LPG booking.

2. LITERATURE SURVEY:

Paper 1: Gas Leakage Detection System for Industrial Plants Using IoT:

The most of the industrial fires are caused by gas leaks. These have terrible consequences for the equipment, human life (injuries and deaths), and the environment. Leakage detectors that are now available use on-site alarms to warn individuals nearby. As a result, this idea offers a leakage detector that sends an SMS warning to those who are worried. The presence of dangerous gases, such as LPG, Methane, and Benzene, is detected by this detector.

LPG and Methane gases can catch fire, resulting in explosions. If inhaled in high enough concentrations, benzene is a carcinogen that can harm workers' health. As a result, detecting these gases is critical.

Paper 2: Detection and Location Identification System for Pipeline Gas Leakage:

Every minor task on this globe is automated by the cyberspace of belongings, making our lives easier. The internet of things is now being used for security purposes as well. The main issue today is the discharge of gas from pipelines. The primary mental goal of this research is to identify gas leaks in the pipeline. Again and again, gas detection sensors will be utilized to inspect the pipelines. If there is a leak in the pipeline, it will be detected, and information such as the name of the gas, its pressure rate, and the location of the leak will be sent to mobile phones, laptops, and other IOT devices. The precise location of the gas leak will be determined via GPS.

Paper 3: Smart Cooking Stove Development:

Energy Harvesting from Heat, Gas Leakage Detection, and IoT Based Notification System This paper discusses the design and implementation of a smart cooking stove with safety features. An energy collection system from cooking heat has also been developed in this research work to improve the efficiency of the traditional cooking stove. This is accomplished by the employment of a heat-absorbing body and a Thermoelectric Cooler (TEC) module. The see beck effect is used to absorb heat and generate power using the TEC module. An IoT server has been used to develop a sensor-based safety feature that may detect gas leaks and warn the user through mobile SMS.

Paper 4: The gas leakage solution for industrial places:

Because gas leakage in industries is unknown, gas sensors are stationed near areas where gas leakage is a possibility. The data from these sensors is subsequently sent to a central

system. The two methods like Fixed instrument and mobile sensing are used. The mobile sensors are positioned near the susceptive sources, and the readings are analyzed there. These readings are subsequently delivered through wireless link to consumers or workers. The downfall is the precision of the localization is less than 5 meters.

Paper 5: Booking, Sensible gas level observance and Gas outpouring detector victimization:

During this time, the gas level in the instrumentation is continuously monitored, and it also informs the various branches where the new LPG cylinder should be placed. The radio frequency module, which comprises of a transmitter and receiver kit, is used to make it easier for the user to operate. The transmitter is a fixed encoder kit on the main board, while the receiver is a fixed decoder kit on the sub board. It also has the advantage of providing the same information, in addition to being simple to use. The temperature sensor is also used to detect flaws that are caused by the surrounding environment. The fundamental disadvantage of this system is that it uses a CPU rather than a controller, and there is no user security.

3. PROBLEM STATEMENT

LPG (Liquid Petroleum Gas) is a highly flammable gas made up of a mixture of propane and butane. LPG is used for cooking at home, in restaurants, and in some industrial applications. They have flaws that allow gas to flow out. The gas is an impenetrable substance that can only be recognized through physical study of its odor. Gas leaking can only be recognized if there is a human nearby, and it cannot be identified if there is no human nearby. However, a human with a poor sense of smell may not be able to notice it. As a result, this system will aid in the detection of gas leaks. Furthermore, a gas leak might trigger a fire, which can result in significant injury or death, as well as the destruction of human property. This system was created using the Internet of Things to provide a real-time reaction to the user and the closest fire station.

4. PROPOSED SYSTEM

Gas level sensing and automatic booking are created with a variety of features that are implemented using NodeMCU, and this device will serve as a single system with different applications for LPG consumers. The device keeps track of the gas level load and displays it in the app. It also uses a gas senor to detect gas leaks, and if one is detected, the Buzzer is activated and the user is notified through mobile. This includes the option of ordering a new LPG cylinder if the gas level drops to dangerously low levels. After that, it sends a mobile alert.

Architecture:

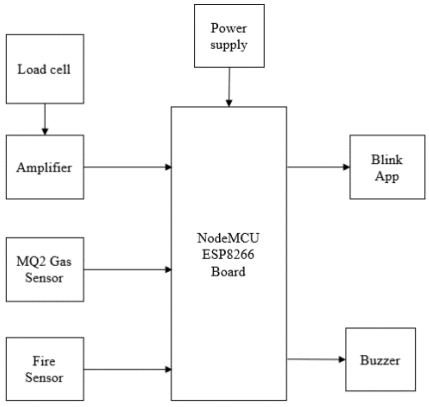

Fig 1. Block Diagram

Hardware Requirements:

- NodeMCU ESP8266 board
- MQ2 gas sensor
- Load cell with HX711 amplifier
- Jumper Wires
- Buzzer
- Power supply 3.3-5 V
- Flame sensor module

Software Requirements:

- Arduino IDE
- Blynk

5. COMPONENTS AND MODULES

5.1 NodeMCU:

NodeMCU is an open-source Internet-of-Things (IoT) platform. It includes application software for the ESP8266 Wi-Fi SoC from Espressif Systems, as well as hardware based on the ESP-12 module. Disregard the word "NodeMCU" refers to the software, not the development kits. The software is based on the eLua project and makes the Espressif Non-OS SDK for ESP8266 and uses the Lua scripting language. The NodeMCU is a combination of an Arduino microcontroller and an ESP8266 module with an integrated Wi-Fi module.

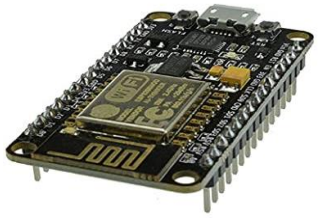

Fig 2. NodeMCU

5.2 Load Cell:

A load cell is a type of transducer that detects force and converts it into an electrical signal. The load cells are employed because they provide precise weight. Most load cells employ a strain gauge to ensure precise measurement. It is utilized to determine the cylinder's weight in this project. The precision is less than 0.1 percent of the total scale. To convert electrical impulses to digital output, the load cell requires a high-resolution ADC converter board, so the HX711 board is used to connect the load cell and the esp8266. The HX711 module has six input pins and four output pins, which are Ground, Vcc, SCK, and DT. We use four of the six input pins, which are E+, E-, O+, and O-.

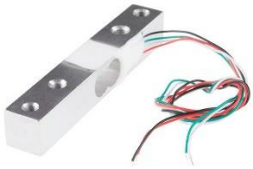

Fig 3. Load Cell

5.3 MQ2 Gas Sensor:

The MQ2 gas sensor is a module that detects gas in the air. There are various different forms of gas, and the gas sensors that the module can identify also differ. The MQ2 gas sensor can detect gases like Methane, Butane, LPG, Smoke, Carbon Monoxide, and other gases. The gas sensor is worked by using an electronic circuit that is delicate to the gas content in the air. Thereby, if gas concentration in the air increases, the output voltage increase, and if the gas concentration in the air decreases, the output voltage decreases.

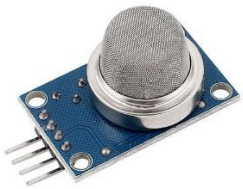

Fig 4. MQ2 Gas Sensor

5.4 Buzzer:

A buzzer is a device that generates tones, alarms, or sounds.

5.5 Flame sensor:

Flame sensor module that includes a flame sensor (IR receiver), resister, capacitor, potentiometer, and LM393 comparator. With this sensor we can detect infrared light with a wavelength between 600 and 900 nanometers. The light detected in the form of infrared light is converted into current changes by the far-infrared flame probe. The inbuilt resistor is used to alter sensitivity.

Fig 5. Fire Sensor

6. EXPERIMENTAL RESULTS

Gas leakage is detected by the gas sensor and Load cell will measure the weight of the gas cylinder. When gas level goes below the certain level, message will send to the gas agency for booking purpose.

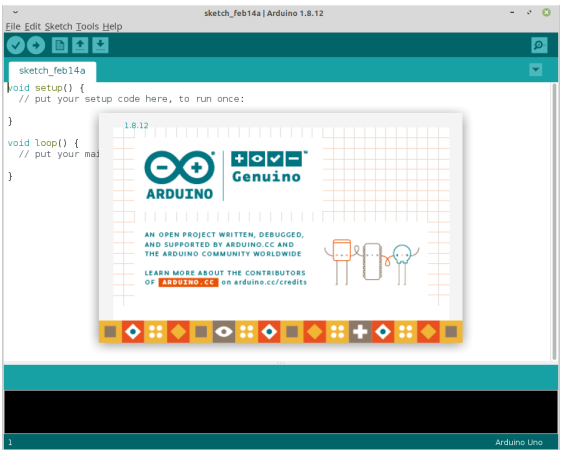

Fig 6. Arduino IDE

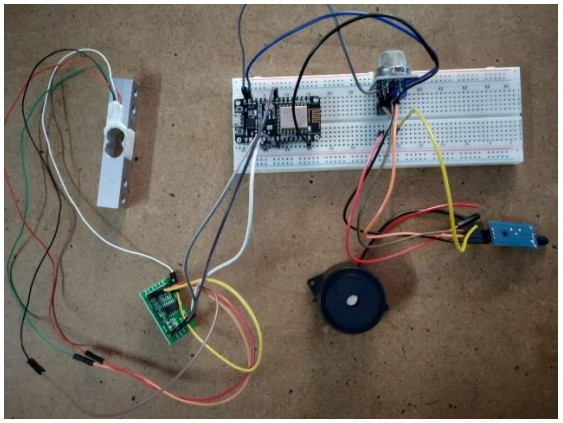

Fig 7. Hardware Setup

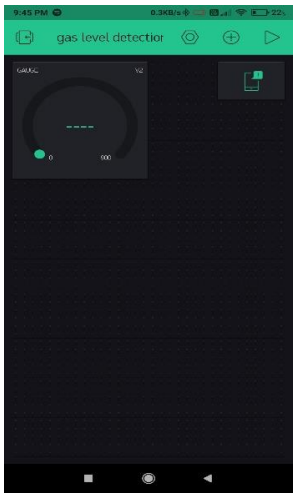

Fig 8. Blynk Application

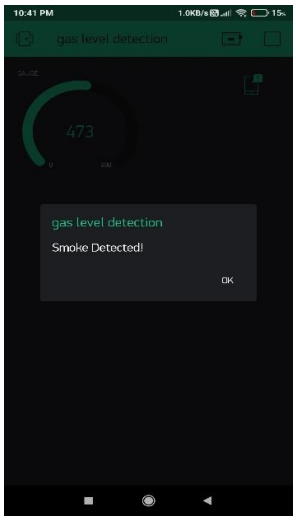

Fig 9. Gas Alert

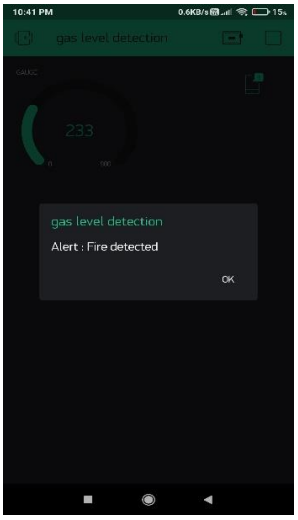

Fig 10. Fire Alert

7. CONCLUSION

The proposed notion in this project would be another step toward home automation. This method would significantly reduce human intervention in the booking or monitoring of LPG cylinders, saving a significant amount of time or haste in the process. It will also safeguard human safety by preventing gas leakage-related mishaps. The main benefit of this simple gas leak detector is its ease of use and capacity to warn consumers when LPG gas is leaking. This detector has been successfully built and is simple to use as well as a low-cost product. Finally, the consumer can book a new LPG cylinder using the Internet of Things. Users may keep track of their gas levels with this technology, which also eliminates the need for prior and delayed cylinder booking. When successfully implemented, the proposed system can also be utilized in mines, where gas sensors will detect harmful gas leaks and transmit a warning for personnel to evacuate in an emergency.

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