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GAS DETECTION AND BOOKING AUTOMATION: IOT-DRIVEN SOLUTIONS FOR ENHANCED SAFETY AND CONVENIENCE

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ABSTRACT - People who reside in homes or other buildings that use natural gas are concerned about gas leaks. The buyer has no idea how much gas they are using or how long it will be until they need to replace their LPG tank. In this study, we describe an Internet of Things (IoT)-enabled system that monitors several LPG cylinder metrics and alerts the user via a mobile app. When the gas level falls below the predetermined limit, the user will receive an alert via the mobile app as well as a loud alarm. When the LPG level in the cylinder is extremely low, a load cell monitor is utilized to determine how much gas is present. When the amount of gas in the cylinder falls below 20%, the user's application receives an update. We do not need to book fresh LPG ahead of time or at the last minute because we employ an automated system. When a gas leak is detected, the user is notified via an audio alarm and a smart phone app. The exact locations of the flames will be made available to the public via GPS.

KEY WORDS: IOT, LPG gas, MQ2 Gas sensor, Node MCU

1. INTRODUCTION

People frequently utilize LPG as a fuel since it can catch fire at concentrations of 1.8% to 9.5% in the air. Even as routine labor becomes more sophisticated, gas cylinders for residences remain unchanged. Sometimes it can lead to an accident. As a result, it is vital to deploy technology to prevent mishaps. The Internet of Things (IoT) has made it much easier to reserve LPG tanks by allowing users to do it online, via SMS, or using IVRS. Due to strong demand, clients must reserve their LPG tanks ahead of time. One of the project's key goals is to detect gas leaks in LPG cylinders, which are often used in Indian homes. It also includes determining how much gas is in the cylinder and communicating that information so that a new LPG cylinder can be reserved when the current one runs out. In addition, the Internet of Things informs people about it. Because the programmer can communicate with Node MCU, it can send an alert to the user's phone if there is a fire. Alarms alert the user to what is going on, the MQ6 LPG gas indicator is useful, and the user can set up automated LPG booking.

2. LITERATURE SURVEY:

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

Gas leaks are the primary cause of most factory fires. This has a significant impact on the environment, human life (resulting in accidents and deaths), and tools. Modern leak monitors activate sirens at the spill site to alert anyone nearby. As a result, this design incorporates a leak detector that sends an SMS to the appropriate recipients. This scanner detects dangerous chemicals such as benzene, methane, and LPG.

Methane and LPG gasses have the potential to cause explosions and burns. Exposure to excessive levels of benzene by breathing can cause cancer and harm one's health. Because of this, it is critical to locate these gasses.

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

All tiny jobs on Earth are now mechanized by digital belongings, simplifying our life. Because of safety concerns, the internet of things has become another reason to use the internet in recent

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years. Currently, the most serious issue is that gas pipes are leaking. This study's main purpose is to find gas leaks in the pipes. The gas detecting equipment will be used repeatedly to check the pipelines. If there is a pipeline leak, the appropriate steps will be taken to locate it and transmit the essential data to phones, PCs, and other Internet of Things devices. This information will include the type of gas, its pressure, and where it may be found. GPS technology will be used to precisely locate the gas leak.

Paper 3: Smart Cooking Stove Development:

The system features the ability to detect gas leaks, generate electricity from heat, and deliver notifications via the Internet of Things. This article examines the design and construction of a high-tech cooking stove with cutting-edge safety features. We developed a technology that captures energy from cooking heat and uses it to improve the performance of standard stoves. A heat-absorbing body and a Thermoelectric Cooler (TEC) module are employed to accomplish this. The See beck effect is used by the TEC module to convert heat energy into electricity. Using an IoT server, a sensor-based safety feature was developed that can detect gas leaks and deliver SMS notifications to users.

Paper 4: The gas leakage solution for industrial places:

Because the amount of gas loss in industrial settings is difficult to estimate, gas sensors are carefully placed near areas where gas leaks could occur. Following that, the sensors relay their data to a centralized server. Sensor technologies that are both permanent and moveable are utilized. The measurements are compared to the locations where the mobile sensors are installed and the sources that are vulnerable. Following that, these metrics are communicated to clients or employees via a wireless network. The spot's precision is less than five meters, which is not excellent.

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

During this period, the instrumentation continuously monitors the gas level and notifies the various departments on the precise placing of the extra LPG cylinder. The transmitter and receiver kit that includes the radio frequency module is designed to be simple to operate. A stationary encoder kit is mounted on the primary board, and a fixed decoder kit is attached to the secondary board. In addition to being user-friendly, it efficiently conveys the same message. Furthermore, environmental flaws are detected using the temperature sensor. The main disadvantages of this technology are that it lacks user authentication and relies on a central processing unit (CPU) rather than a specialized controller.

3. PROBLEM STATEMENT

The gasoline LPG, commonly known as Liquid Petroleum Gas, is relatively easy to ignite. It is composed of butane and propane. LPG is commonly used to cook in restaurants, households, and some sorts of companies. These items contain openings that allow gas to escape. Because the gas is opaque, the only way to determine its identity is through its odor. A gas leak can only be found while people are present; it cannot be found when people are absent. Someone with low olfactory sensitivity, on the other hand, may be unable to detect it. This technique will aid in the detection and localization of gas leaks. A gas leak could also spark a fire, causing catastrophic injury or death and destroying property. The Internet of Things was utilized to develop equipment that instantaneously connects a person to the nearest fire station.

4. PROPOSED SYSTEM

NodeMCU is utilized for a variety of purposes, including monitoring gas levels and facilitating automated bookings. This tool will be a unified system for LPG users that may be utilized for a variety of purposes. The gadget monitors the gas level load and displays it on the app. It also includes a gas indicator for detecting leaks. Every time a leak is discovered, the buzzer sounds and the person is promptly notified on their phone. This includes the option to request a new LPG

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tank when the gas supply becomes dangerously low. After then, it sends a message to your phone.

Architecture:

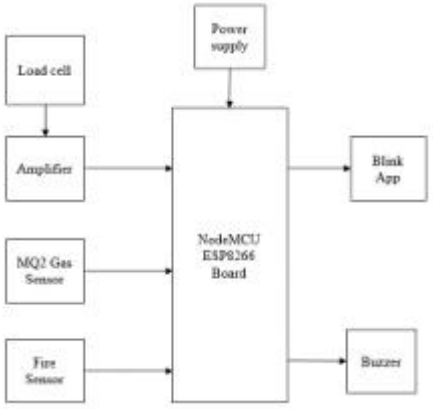

Fig1. Block Diagram

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

Node MCU:

This is an open-source tool for the Internet of Things. The ESP-12 module is at the heart of the offering, which also includes application software for Espress if Systems' ESP8266 Wi-Fi System on a Chip (SoC). Don't pay attention to the term "NodeMCU"; it refers to hardware development kits, not software. It was developed using the computer language Lua and is based on the e Lua project. You may now acquire the Espress if Non-OS SDK for ESP8266. The NodeMCU is made up of an Arduino microprocessor and an ESP8266 module that includes a Wi-Fi module.

Fig 2.NodeMCU

Load Cell:

A load cell is a sensor that detects and converts force into an electrical signal. Load cells are used to accurately and quickly measure weight. Strain gauges are commonly used in load cells to ensure that measurements are correct. A mathematical method is utilized in this project to determine how much the cylinder weighs. It is off by less than 0.1% of the total spread. The HX711 board connects the load cell to the esp8266, which is a critical step in connecting the load cell to a high-resolution ADC converter board. This link allows you to convert electrical impulses into digital output. The HX711 module has six input and four output pins. The output pins are ground, Vcc, SCK, and DT. We use E+, E-, O+, and O- among the six input pins.

Fig3. Load Cell

MQ2 Gas Sensor:

The MQ2 gas sensor gadget allows you to detect and identify gases in the air. The module can detect several types of gases, and the gas monitors it employs can also vary. Smoke, carbon monoxide, butane, methane, and other gases can be detected by the MQ2 gas monitor. The gas monitor is powered by an electrical circuit that varies according to the amount of gas in the air. As a result, as the concentration of gases in the air increases, so does the output voltage; conversely, as the concentration of gases decreases, the output voltage falls.

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Fig 4.MQ2 Gas Sensor

Buzzer:

Buzzers are electronic devices that produce alarms, tones, and noises.

Flame sensor:

This flame sensor module is composed of several components, including an infrared (IR) detector, a resistor, a capacitor, a potentiometer, and an LM393 comparator. This sensor can detect infrared light at frequencies ranging from 600 to 900 nanometers. The far-infrared flame probe detects infrared light, which is converted into changes in electric current. Change the sensitivity by using the system's built-in resistor.

Fig5. Fire Sensor

6. EXPERIMENTAL RESULTS

The load cell measures the weight of the gas cylinder, while the gas sensor identifies any gas leakage. The gas agency is contacted when the gas level falls below a predetermined threshold in order to activate reservations.

Fig 6.Arduino IDE

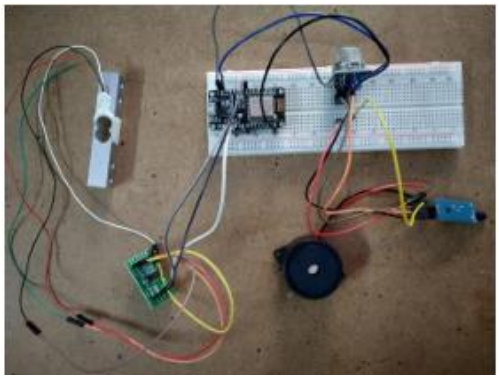

Fig 7.Hardware Setup

Fig 8.Blynk Application

Fig 9.Gas Alert

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Fig 10.Fire Alert

7. CONCLUSION

A concept for a substantial development in home technology is being considered for this project. This solution will greatly simplify the process of reserving or monitoring LPG cylinders by eliminating the need for human intervention. A lot of time and work will be saved. Additionally, it would safeguard individuals' safety by preventing occurrences caused by gas leakage. This gas leak monitor stands out for its easy-to-use operation and remarkable capacity to detect LPG gas leaks. This item is reasonably priced, user-friendly, and of great quality. The construction project was completed to a suitable level. Finally, the Internet of Things helps customers order LPG tanks more efficiently. This device allows users to verify the amount of gas in their vehicles, eliminating the need to pre-order cylinders and endure lengthy wait times. If the proposed method works as intended, it might also be used in the mining business. Gas sensors can detect dangerous gas leaks and sound an alert to clear the vicinity of people in an emergency.

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