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Review RTSRT

LPG Weight Measuring Stand

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Abstract

The LPG Gas Weight Measurement Stand is a novel project designed to precisely measure the remaining weight of liquefied petroleum gas (LPG) in cylinders so that it can be used efficiently and refilled promptly. Traditional methods rely on manual estimation or weighing scales, which can be tedious and inaccurate. The project presents a dedicated weighing stand equipped with a load cell sensor, microcontroller (such as an Arduino or ESP8266), and LCD to indicate real-time weight. The process entails placing the LPG cylinder on the stand, where the load cell measures the weight and sends the reading to the microcontroller. The LPG cylinder is placed directly on the measurement platform, where the load cell senses the force exerted and converts it into an electrical signal. To determine the precise weight of the cylinder, including the amount of gas remaining, the microcontroller processes and calibrates this signal. Users can accurately and conveniently monitor gas levels continuously through the clear display of the processed data on the LCD screen. The system can assess the amount of gas remaining and forecast usage duration based on consumption trends by comparing the current weight with the cylinder's tare weight. The calculated weight is then displayed, allowing users to monitor gas levels accurately. Other features can include Internet of Things (IoT) functionality for remote access via a mobile application, low-gas-level notifications, and consumption analysis through data logging. This product enhances safety, reduces gas wastage, and ensures a constant supply by preventing sudden depletion. It is cost-effective, simple to use, and suitable for both domestic and commercial applications. By integrating smart technology, the LPG Gas Weight Measurement Stand offers a modern solution to an age-old problem, adding convenience and efficiency to LPG usage.

Keywords: LPG monitoring, load cell sensor, weight measurement, IoT-based gas tracking, smart cylinder stand.

INTRODUCTION

The weight measuring stand for LPG aims to solve the common problems associated with using LPG cylinders across household and industrial applications. LPG remains a crucial resource for both cooking and heating; however, consumers frequently face issues, including not knowing the remaining gas levels combined with unpredictable depletion during important moments, along with safety risks from gas leaks. The innovative smart stand project employs advanced sensors and Internet of Things (IoT) technology to provide ongoing weight monitoring of LPG cylinders. High-precision load cell sensors are used by the system to precisely determine the amount of gas remaining in the LPG cylinder and to continuously measure its weight [1–4]. A microcontroller device, such as an Arduino or ESP8266, is used to process the observed data and transform the analog signals into useful digital information.

These readings are displayed in real time through an LCD or mobile interface, making it simple for users to monitor trends in gas usage. To guarantee prompt replenishment and avoid unexpected disruptions, the system sends early warning alerts when the gas level drops below a predetermined

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threshold. The system employs load cells to precisely determine gas levels while alerting users when the gas supply starts to run low. The system includes gas leakage detection capabilities using MQ-2 or MQ-6 sensors, which are designed to sense small leaks [5, 6]. The sensors trigger prompt alerts using buzzers and LED lights or by sending messages directly to the users' mobile devices. Through IoT connectivity, users can seamlessly transfer data to cloud platforms or mobile applications that allow real-time monitoring of gas levels and leakage conditions. This feature enhances safety by providing early alerts while simultaneously offering convenience to users. The system incorporates gas leak detection techniques using MQ-2 or MQ-6 gas sensors, which can detect even minute traces of leaking LPG in addition to weight monitoring.

The sensors instantly trigger safety measures, such as buzzers, LED indications, and automatic smartphone alerts, when they detect leaks. Data can be sent to mobile applications or cloud platforms via IoT connectivity, allowing for remote monitoring and historical data analysis. To further minimize user effort, the device may also automatically schedule cylinders when gas levels drop dangerously low [7, 8]. The LPG weight measurement stand significantly improves safety, efficiency, dependability, and user convenience in both home and commercial applications by fusing intelligent sensing, automation, and networking.

The system reduces the user workload by automatically placing an order for a new cylinder when the gas levels drop below a certain threshold. The LPG weight measuring stand integrates smart technology with practical features to address typical operational problems. The solution demonstrates essential attributes by enhancing both safety and efficiency while boosting usability for domestic and industrial applications [9, 10].

OBJECTIVES

- *Live monitoring:* Weighing the cylinder in real time to estimate the remaining gas.
- *Leakage detection:* Identifying leaks and providing notifications to neutralize potential hazards.
- *Intelligent alerts:* Sending notifications automatically to notify users when refilling is needed.
- *Safety guarantee:* Lessening hazards with advanced warning systems.
- *User friendliness:* Simplifying the management of LPG cylinders with user-friendly features.
- *Convenience for users:* Simplifying LPG level and refill monitoring and making it simpler by automating the process without the need for manual intervention.
- *IoT integration:* Using IoT technology is used to enable remote monitoring and real-time notifications of gas levels and leakage statuses.

METHODOLOGY

Overview of the System

The LPG Gas Weight Measurement Stand is an intelligent system that combines load cells, gas sensors, and IoT technology to track gas levels, sense leaks, and send notifications for safety and convenience purposes. The system uses gas sensors, such as MQ-2 or MQ-6, in addition to weight measurement, to detect even minute signs of LPG leakage in the immediate surroundings. The device lowers the risk of fire threats and ensures user safety by instantly triggering alarms through buzzers, LED indications, or smartphone messages when abnormal gas levels are detected. All data can be sent to a cloud platform or mobile application with IoT connectivity, allowing remote monitoring and real-time changes. This clever integration is appropriate for both residential and business applications because it not only increases operational efficiency but also guarantees a continuous gas supply by alerting customers when refilling is necessary.

System Components

Load Cells

- These sensors weigh the LPG cylinder and determine the level of gas.
- They translate mechanical weight into electrical signals for accurate monitoring.

Gas Sensors (Such as MQ-2 or MQ-6)

- These are sensitive sensors used to detect LPG leaks through gas concentration sensing in the air.
- They are vital to improving safety since they give instantaneous feedback regarding possible leaks.

Microcontroller

- It is an essential element that receives data from load cells and gas sensors.
- It controls system operations and initiates alerts from real-time monitoring.

IoT Module

- Facilitates wireless transmission of data to cloud platforms or mobile apps.
- Gives remote access to gas level and leakage status to the user.

Alert Mechanisms

- Comprises audible buzzers, visual LED displays, and alerts through a mobile app.
- These mechanisms provide users with timely information regarding serious issues.

Power Supply

- Powers the energy required to drive sensors, the microcontroller, and other hardware.
- May be powered with batteries or an external power supply.

Structural Stand

- Constructed from heavy-duty materials to securely support the LPG cylinder.
- The device should be constructed to accommodate the electronic components while maintaining user convenience, as shown in Figure 1.

WORKING PRINCIPLE

Weight Measurement

Load cells placed at the bottom of the stand continuously weigh the cylinder. The sensors detect any weight change, enabling the system to compute the residual volume of LPG in the cylinder.

Leakage Detection

Leakage detection is conducted using gas sensors such as MQ-2 or MQ-6 to determine the existence of LPG in the environment. The sensors used are sufficiently sensitive to detect minor amounts of leaked gas.

Signal Processing

Data from the load cells and gas sensors were received by the microcontroller for processing. The microcontroller serves as the central processor, decoding the data to evaluate the gas level and leakage.

Alert Generation

When the system identifies low gas levels or a gas leak, the microcontroller generates an alert signal. This can be

- Sound alarms through buzzers.
- Visual alerts using LEDs.
- Notifications to the user's mobile phone via an IoT module.

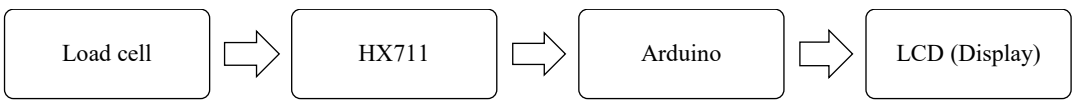

Figure 1. Process.

IoT Integration

The IoT module of the system facilitates the real-time transmission of data to a cloud platform or mobile application. Users can remotely track gas levels, receive alerts, and even automate the booking of a new cylinder when the gas level is extremely low.

User Interaction

Using a mobile application or user interface, users can conveniently view the system data, alerts, and cylinder-related operations.

RESULTS AND DISCUSSIONS

Presentation of the Results

The designed system includes add-ons for gas leakage detection and LPG cylinder weight detection through an embedded system and Blynk software. The test results indicate that the system identifies gas leakage with high accuracy, effectiveness, and reliability. The role of the MQ-2 gas sensor is important because it identifies the gas leak and alerts the alarm system, which in turn automatically sends an SMS to the user. In addition, the load cell continually detects and indicates the weight of the cylinders so that users can monitor the moment when the cylinders must be replaced. Blynk provides real-time monitoring of the status of the cylinder; thus, the information is readily available. Of greater significance is that with GSM technology, users are guaranteed to be updated via SMS even without an active Internet connection.

Interpretation and Analysis of the Results

The proposed system achieved high levels of improvement over the traditional methods of gas leakage identification and LPG cylinder tracking. One of the biggest advantages is its capability to identify gas leaks effectively and efficiently with high accuracy, thereby reducing the chances of accidents and increasing user safety. The system provides real-time feedback regarding the cylinder status to allow users to determine the best time to replace it. It is simple to use and easy to design, making it perfect for household and business use. Although it has its merits, the system also has some demerits. For instance, it relies on Internet access to operate optimally, which is challenging in areas with poor connectivity. Second, the cost of implementation might not be economical for small consumers. Finally, regular maintenance must be performed to achieve maximum efficiency in the long term.

Discussion of the Implications of the Results and How They Relate to the Objectives and Research Question

The developed system has diverse applications in real life. In domestic and commercial environments, it can detect gas leakage and weigh LPG cylinders effectively, which contributes to the safety of customers and minimizes the risk of accidents. In an industrial environment, the system is invaluable for identifying gas leaks and ensuring worker safety. It can also be applied to installed gas distribution systems to maximize safety and operating efficiency. The results address the research questions and desired objectives, confirming the efficacy of the system for gas leak detection and LPG weight monitoring. Its simplicity makes it suitable for most applications, such as homes, companies, and industries.

ADVANTAGES

- *Enhancement of safety:* By checking the gas quantity and leakage, the incidence of accidents from gas exhaustion or undetected leaks is reduced.
- *Cost savings:* Saves costs in the long run by reducing LPG wastage and ensuring timely refills.
- *Automation:* Advanced systems can automate the process of booking fresh cylinders into a user-friendly and seamless process.
- *Commercial applications:* Ideal for commercial cooking and industries where multiple cylinders must be managed efficiently.

CONCLUSIONS

The end of the LPG weight measuring stand project reflects the importance of improving safety, convenience, and efficiency when using LPG. Through precise measurement of the gas level and leak detection, the system provides a safe environment for home and industrial use. Its ability to be used with IoT and smart technologies ensures remote monitoring, timely notifications, and auto-cylinder booking, making it an easy-to-use and technology-driven solution. The project's capacity to deliver real-time data and prompt alerts is one of its major achievements. When gas levels drop below a predetermined threshold, users are alerted, enabling them to schedule refills ahead of time and prevent unplanned disruptions during production or culinary procedures. Furthermore, remote monitoring via cloud platforms or mobile applications is made possible by integrating IoT and smart connectivity. This feature greatly improves convenience and user control by enabling users to obtain gas status information at any time and from any location.

By minimizing manual labor and guaranteeing a continuous supply, the automated cylinder booking option further streamlines the procedure. In addition, the project enhances sustainability through the minimization of gas wastage and the efficiency of use. Generally speaking, this project can transform the way LPG is managed by providing users with useful advantages without compromising safety and the environment.

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