

A Survey on Various Methodologies used to Detect Gas Leakage and Automatic Booking System

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Abstract - The most widely used fuel in India is LPG as it burns completely when compared to other alternatives hence used for cooking purpose. In recent years, most fire accidents are caused due to the improper use of LPG or carelessness which leads to serious injuries caused by gas leakage and explosion. This project focuses on automatic protection from the LPG leakage or reduction of the hazards that can be caused due to unawareness of the user about the gas leakage and also providing an automatic gas booking facility by applying advanced communication technology by monitoring the level of LPG using load cell, MQ-6 gas sensor, and Arduino UNO R3. Our system detects smoke and also controls the exhaust fan automatically and in case of fire accidents, the fire brigade will get a notification immediately. This system activates the indicators even if a small amount of LPG is detected near the gas sensor. Also when the level of gas falls below some predefined value it automatically alerts the user and sends a message to the gas agency for booking a refill, it also detects smoke and controls the exhaust fan. This system detects fire during fire accidents and reports to the concerned authorities through an alert message. This system is cost-effective and reliable when compared to other systems.

Key Words: MQ-6 gas sensor, Arduino UNO R3, GSM(Global System for Mobile communication) module, LCD(Liquid Crystal Display), LPG(Liquified Petroleum Gas).

1. INTRODUCTION

LPG plays a major role in our day to day life as there are various ways to use LPG like cooking, vehicle fuel, etc. Since the gas is stored in compressed form in a steel cylinder there

is a lot of chances that the cylinder may burst due to gas leakage or even cause fire accidents. Gas leakage is a major problem with the industrial sector, residential area and gas-powered vehicles like buses, cars, etc. which may lead to dangerous situations if ignored as LPG is highly inflammable even a small electric spark or a flame is enough to cause a fire when the LPG is mixed with the air due to gas leakage. One of the preventive methods to stop such accidents is to install a gas leakage detection kit at vulnerable places. Sometimes the users find it difficult to book a refill because they are not aware of the remaining amount of LPG in the cylinder as they forget the date of installation of the cylinder due to their busy lives and end up booking the cylinder either too early or too late. One of the main drawbacks of the current system is safety. The aim of this project is to present such a design that can automatically detect gas leakage in vulnerable areas and prevent dangerous situations. This system continuously monitors the level of the LPG in the cylinder using load cell which is connected to the Arduino UNO R3 which in turn displays the level of the remaining gas in the cylinder through a LCD module and also books a refill if the level reaches below the threshold value after alerting the user about the status of the gas in the cylinder. The MQ-6 gas sensor is used to detect any gas leakage, when there is a leakage and the amount of the propane and butane(LPG components) are more than the threshold value then it alerts the user about the gas leakage through buzzer, and message, also it turns off the main power supply of the house and the main supply of the gas in order to prevent explosion and fire accidents. Apart from leakage detection our system also detects smoke and automatically turns on the exhaust fan and In case of fire accidents, the system detects fire and reports to the fire brigade through an alert message.

2. LITERATURE SURVEY

This paper[1] suggests a good way to control the system using ATmega328 microcontroller, load cell, and MQ-6 gas sensor to monitor the levels of LPG through the load cell and display the levels continuously and to book a refill automatically when the gas level reaches below the threshold value. The gas sensor detects the gas leakage and alerts the user through a buzzer and turns off the gas supply by turning off the regulator knob.

This paper[2] uses the MQ-6 gas sensor, AT89C51 microcontroller, stepper motor, LCD display module, and GSM module to build the gas leakage detection system. The gas leakage is detected by the MQ-6 gas sensor and it sends the signal to the microcontroller with the help of ADC, the microcontroller receives the signal and activates the buzzer and displays the message on the LCD display and also drives the stepper motor to turn off the regulator knob.

This paper[3] uses ARM microcontroller, MQ-6 gas sensor, solenoid valve, weight cell, buzzer, LCD display, and GSM module to build the control system. The gas sensor detects the gas leakage and sends a signal to the ARM microcontroller which then turns on the exhaust fan and turns off the regulator valve using a solenoid and then turns off the main power supply. This system also monitors the gas level using weight cell and displays the gas level in the LCD display and if the gas level reaches below 2kg i.e. the set threshold value then the system automatically books the refill for the gas from the agency.

This paper[4] uses a sensor, signal conditioning circuit, Analog to Digital converter (ADC), FPGA and a GSM module to build the gas detection system. The MQ-6 gas sensor detects the gas leakage and sends the information to the FPGA which then compares the received information with the threshold value and if the received data is greater than the threshold value then the leakage is detected and then a warning call is sent to the user through the GSM module.

This system[5] uses ARM microcontroller, MQ-5 gas sensor, stepper motor, Weight sensor, and GSM module. The gas sensor detects the gas leakage and the information is sent to ARM microcontroller which then activates the stepper motor to turn off the regulator knob. The weight of the cylinder is monitored by the load cell and is displayed in the LCD module when the weight of the cylinder reaches below the threshold value the microcontroller automatically books a refill through the GSM module.

3. GAPS IN LITERATURE

The main disadvantage of these systems [1] & [2] is they just turn off the gas regulator knob during the gas leak but not the power supply which may lead to fire accidents and explosion.

The main disadvantage of this system [3] is it turns on the exhaust fan during the gas leak which may lead to fire

accidents and explosion, and the ARM microcontroller is very costly when compared to Arduino UNO.

The main disadvantage of this system [4] is it uses FPGA board which is very costly when compared to Arduino UNO. The disadvantage of this system [5] is it uses MQ-5 sensor instead of the MQ-6 sensor and the ARM microcontroller is costly when compared to Arduino UNO.

4. CONCLUSION

The above-mentioned reviews give various methods used to detect the LPG level and automatic LPG gas booking system for conserving LPG. Although various systems are suggested they are either expensive or inefficient. Hence our motive is to design a cost-effective and reliable LPG control system which monitors the level of LPG and gas leakage detection and automatic refill booking system.

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