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Automated LPG cylinder consumption monitoring and safety system

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ABSTRACT

There is a quick improvement in innovation that affecting human life in a few viewpoints because of fast advancement in various fields however we despite everything need to receive that innovation with the end goal that we can make human life progressively simpler to live. At present we are having a framework Advance LPG cylinder booking through IVRS or online which is generally hard for the uneducated individuals to book the LPG cylinder ahead of time. Another Serious issue LPG cylinder clients confronting is "They don't know precisely the status of LPG gas fruition" makes considerably more postponement in booking the cylinder which is awkward the greater part of the occasions. This paper proposes a framework that will make the whole LPG cylinder booking strategy computerized without human intercession. This framework persistently quantifies the heaviness of the cylinder and once it arrives at least edge it will consequently send a message to the approved LPG Operator so they can convey the LPG cylinder in time. Alongside the Mechanized chamber booking, we additionally planned elements identified with the wellbeing of the client in which it persistently screens the spillage of LPG gas and alarms the client in regards to spillage to stay away from significant mishaps which costs human lives for the most part. Keywords: Arduino Uno, Temperature sensor, GSM Modem, Gas Sensor, Load Cell.

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1. INTRODUCTION

There are approximate 30Crore LPG clients in our nation. The primary target of our task is to consistently quantifies the heaviness of the cylinder by a load cell and when the heaviness of the cylinder goes beneath the set worth it sends a message to the gas organization for the booking and another message to the service center. It likewise diminishes human endeavors additionally became simple for the uneducated individual. At the point when the temperature of the room goes above 50C, it turns ON the buzzer and makes a sound. The fundamental

reason for our venture is to maintain a strategic distance from mishaps because of spillage of LPG as wellbeing is a significant part. This framework is additionally recognizing LPG gases, for example, butane and propane. The scope of the MQ2 sensor is from 200-10000 ppm. At the point when the degree of butane goes over 600 ppm which is considered as risky for humans, the framework communicates something specific "LPG spillage is distinguished in your kitchen" to the proprietor.

2. LITERATURE REVIEW

In 2011, A.MAHALINGAM, R.T.NAAYAGI,1, N. E. MASTORAKIS, designed the system the leakage of gas is detected by the system and alerts the user by the immediate alarm. Later in the year 2014, the new design came which was introduced by Hitendra Rawat, Ashish Kushwah, Khyati Asthana, Akanksha Shivhare, this project was designed for security issues from thieves, leakage and fire explosion in these cases the system sends the SMS to the emergency number given to it. A savvy, automatic Liquefied Petroleum Gas (LPG) booking, spillage area, and ceaseless gas checking system are proposed in this paper. In this system, the LPG spillage is recognized through the sensor and information is sent to the customer by Short Message Administration (SMS) and simultaneously alerts the customer using a GSM module, while starting the alarm and exhaust fan. The extra favored point of view of the system is that it interminably screens the degree of the LPG present in the chamber using a weight sensor and normally books the barrel using a GSM module. In the proposed framework we have planned "Automated LPG cylinder consumption monitoring and safety system" These reports centers around the recognition of economic fuels like oil, fluid oil gas, alcohol.etc., and alert the encompassing individuals about the spillage through SMS. It likewise faculties encompassing temperature, so no fire mishaps happen. The one increasingly significant component is programmed chamber booking by seeing the present use of LPG gas in our everyday life. This task asserts the topping off of LPG by making an impression on the administration community When LPG gas weight scopes to the greatest limit

esteem. This undertaking gives an alarm message by humming the signal and through SMS to the householders when gas spillage is distinguished.

3. PROBLEM DEFINITION

Gas leaks can happen from flawed gas machines or pipework. Gaseous petrol and LPG are nonpoisonous, yet both can prompt flames and explosives. By actualizing this undertaking, It gives security to individuals by detecting the spillage of gas. Individuals save their time by utilizing a programmed gas booking framework.

4. METHODOLOGY

The first and the foremost step in the working procedure starts with the calibration process. In this process, known weight is placed on the load cell and is calibrated accordingly (depending on application) upon placing the weight on the load cell. The transducer of the load cell generates electric pulses of a few mv ranges, as the signal obtained is of poor strength which needs to be amplified. Therefore, HX711 is used; this module amplifies low electric pulses obtained from load cell to its corresponding digital signal. This obtained signal is given as an input to Arduino, which processes this information and the respective real-time weight is extracted using the code in the program. The obtained real-time weight (which is an output of Arduino) is fed as input to GSM nodule. When the level of LPG measured in real-time using load cell drops down below threshold LPG level an automatic onetime message is generated and sent by the gsm module to the authorized LPG service provider in which an appeal to Rebook a fresh cylinder is done and also a confirmation message is sent by the service provider to the customer. The MQ2 is an electrochemical sensor, its resistance varies with varying different concentrations of gases. It consists of a variable resistor which is connected in series with the sensor which forms voltage divider circuit.

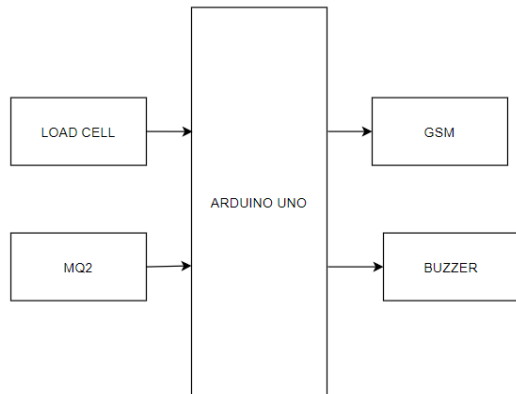


Fig. 1: Block diagram

5. IMPLIMENTATION

5.1 Algorithm

- Step 1:** Start.
- Step 2:** Initialize Load cell and GSM.
- Step 3:** Check load cell and MQ2 sensor output.
- Step 4:** Calculate the weight with the reference value and check the Mq2 sensor.
- Step 5:** If the weight is below threshold value go to step 7. If there is gas leakage then go to step 8.
- Step 6:** If the weight is above the threshold value go to the step 4. If there is no gas leakage then go to step3.
- Step 7:** send an SMS to the registered mobile number.
- Step 8:** Activate the buzzer.
- Step 9:** Stop.

Step 10: Check for the train departure by the sensors. If the train sensed go to next step. Otherwise repeat Step 9.

Step 11: Open the gate.

Step 12: Go to STEP 3.

Step 13: Stop

5.2 Flowchart

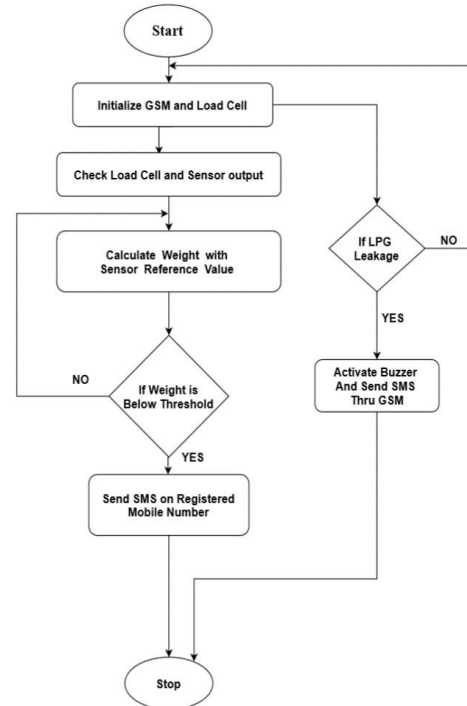


Fig. 2: Flow chart

5.3 Circuit Diagram

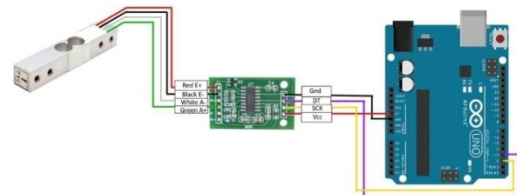


Fig. 3: Load cell interfacing with the Arduino uno

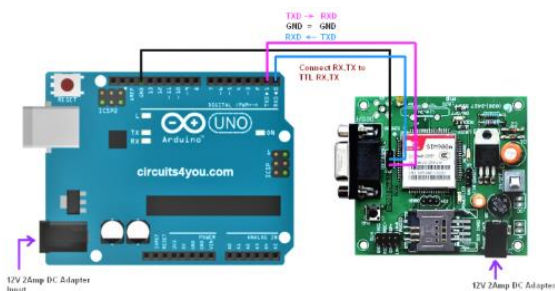


Fig. 4: GSM SIM 900A interfacing with Arduino Uno

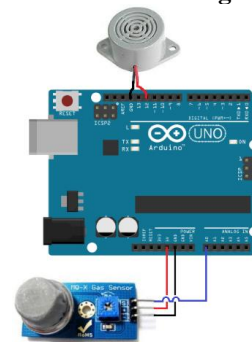


Fig. 5:MQ2 sensor with the Arduino Uno

6. HARDWARE AND SOFTWARE DESCRIPTION

6.1 Hardware

6.1.1 Gas sensor: This is compact liquefied petroleum gas (LPG) sensor, makes easier for sensing LPG (which is composed of propane and butane gas). This MQ-6 sensor can identify gas concentrations in ppm (ranging from 200 to 10000ppm). This sensor features high sensitivity and fast reaction time. The sensor's output is an analog resistance. The heater coil is powered with 5V, add a load resistance, and connect the output to an ADC. If concentration level goes above danger level then it turns relay ON which provides an interrupt to the microcontroller and alternately switches on buzzer an exhaust fan.

6.1.2 Weight Sensor Module: To book a cylinder from a distributor, we must remember the amount of gas left within the cylinder, and for this purpose the extent of gas present within the cylinder has got to be monitored continuously. We have used strain gage as a weight sensor. The function of the strain gauge is to offer output voltage as per the force/weight applied to it. This Sensor converts the force applied on it into its equivalent electrical signal. The output obtained from Loadcell is in analog form. This output obtained is further processed using HX711(ADC), its corresponding digital weights are received. The function of Digitizer board (here hx711 serves as digitizer board) is to offer digital output, which is a digital version of the analog output form of loadcell. This output will be in the digital format which is further processed by a microcontroller with all sets of required logical instructions. We have used a maximum of 40 kg weighable loadcell to demonstrate our idea. So, 40 kg is the maximum weight which will be applied to the present weight sensor.

6.1.3 GSM module: The gas sensor detects the gas presence, a weight sensor is used in extracting the level of LPG present inside the cylinder, and the microcontroller will take corrective or necessary actions. The status of all these happening has to be conveyed to the Authorised LPG booking customer care or distributor. The technology makes it very easy to send and receive messages using the GSM module works on simple AT commands which may be implemented by interfacing it to the microcontroller Rx and Tx pins. The GSM module used is SIMCOM 900 which uses SIM memory to store the number of Authorised LPG booking customer care or distributor or to whomever, the messages have to be forwarded. This module operates on a simple 12 Volt adapter and very less memory space is used up in sending SMS alerts by the module. A GSM modem is a specialized type of modem that accepts a SIM card and operates like a mobile phone. GSM modem looks just like a mobile phone. When a GSM modem is connected to a PC, this allows the PC to use the GSM modem to communicate over the mobile network. These GSM modems are used for sending and receiving SMS and MMS messages.

6.1.4 Buzzer: Buzzer is used to point that gas leakage has occurred and also indicate that the whole cylinder is empty.

6.1.5 HX711: HX711 is an ADC chip with a preamplifier included. The chip is used mainly in applications involving Weight Estimations. The output of the load cell obtained will be in millivolts. These outputs are difficult to handle directly by controllers, so we will use HX711 IC which takes these voltage signals and supply standard digital values which may be employed by a microcontroller. The chip is designed to handle these low voltages. To measure

weight using load cell we usually need-regulated power source, output amplifier (noise reduced), ADC converter. All three features need three separate circuits and components adding to cost and complexity. So we will use the HX711 IC which has all the above features simply removing complex circuitry.

6.2 Software

6.2.1 Arduino Tool v1.8.4: Arduino may be a prototype platform (open-source) supported easy-to-use hardware and software.

Arduino consists of a Programmable board, that can be programmed depending on applications with the help of a ready-made software called Arduino IDE (Integrated Development Environment), which is employed to write down and upload the pc code to the physical board. Arduino boards are ready to read analog or digital input signals from different sensors and switch it into an output like activating a motor, turning LED on/off, hook up with the cloud, and lots of other actions.

- (a) It is easily available for operating systems like MAC, Windows, Linux, and runs on the Java Platform that comes with inbuilt functions and commands that play a vital role in debugging, editing, and compiling the code in the environment. Arduino IDE is open-source software that's mainly used for writing and compiling the code into the Arduino Module.
- (b) The Arduino software making code compilation too easy that even a standard person with no prior technical knowledge can get their feet wet with the training process.
- (c) It is easily available for operating systems like MAC, Windows, Linux, and runs on the Java Platform that comes with inbuilt functions and commands that play a vital role in debugging, editing, and compiling the code in the environment.
- (d) A range of Arduino modules available including Arduino Uno, Arduino Mega, Arduino Leonardo, Arduino Micro, and many more.
- (e) Each of them contains a microcontroller on the board that is actually programmed and accepts the information in the form of code.
- (f) the most code, also referred to as a sketch, created on the IDE platform will ultimately generate a Hex File which is then transferred and uploaded within the controller on the board.
- (g) The IDE environment mainly contains two basic parts: Editor and Compiler where the former is used for writing the required code and later is used for compiling and uploading the code into the given Arduino Module.
- (h) This environment supports both C and C++ languages

7. APPLICATIONS

- (a) Gas leakage detected by the gas sensor to control these leakage motor gets started and turn off the gas regulator.
- (b) The load cell is continuously measuring the weight of the gas cylinder. When the gas level goes below the set level, the message is sent to the gas agency for booking purposes.

8. RESULT AND ANALYSIS

In this project, we have created a device that can automatically measure the gas and when the gas is below the given mark, generates an SMS n is sent to the customer and the gas agent hence booking a cylinder without human interface. This device also functions as a safety unit by making an alarm sound in case of any harmful incident such as faulty devices and gas

leakage. Hence it provides a complete function of the gas cylinder without human interference.

9. CONCLUSION

We made our device which completely automates the process of refill booking without human intervention. Our device also helps the customers to upgrade their safety. The main objective of our project is to measure the gas present in the cylinder when the weight of the cylinder is below the given point, this can be done using the weight sensors. The gas retailer gets a booking request message for a new cylinder and the consumer receives the message regarding the status. The next objective is to detect any malfunctioning in the gas cylinder hence protecting from fire accidents.

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