Monitoring The Gas cylinder Level and Gas Seepage Detection through IOT

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Abstract – The proposed design system explains about the most common problem experienced in our day- to- day lives that is regarding GAS container going empty. The purpose of the system is, to create awareness about the reducing weight of the gas in the container, and to place a gas order using IOT. A load cell is used for the continuous weight measurement of gas container, which is interfaced with an Arduino Uno (to compare with an ideal value). GSM modem is used to send the SMS to user. When it comes it to security of the system as well as gas container we have an MQ-2 (gas sensor), LM 35 (temperature sensor), which will identify the surrounding environment for any chance of error. Whenever any change is subjected in any of the sensors (load cell, LM35, Mq-2) a siren is triggered.

Index Terms – IoT, Arduino Uno, load cell, LM 35 sensor, MQ-2 sensor, GSM modem.

1. INTRODUCTION

Liquefied petroleum gas is being used for the past decades as industrial fuel and for domestic purpose .It has a wide domestic usage in cooking and for heating. We are put into much difficulty when the cylinder runs out of gas. For several reasons, there may be a delay in providing a gas cylinder, for example, we may notify the service provider at the last moment or there may be a delay in reporting to the gas supplier. Hence it is necessary in the busy world, to detect the decrease in weight of the gas cylinder. The continuous measure is done using the load cell. When a gas container is placed on the load cell it measures the weight and sends an electric pulse to the Arduino Uno microcontroller which will compare the pulse with an ideal value in form of digital (the electric pulse is converted in to equivalent digital value).). If the compared output is less than ideal value, then SMS has been sent to the user about reduction of gas level, buzzer will be ON and the same information is updated in the thing speak application.

Safety is most important for anything which we have in our daily life, especially in the home to prevent the explosion of gases. The discovery of a gas leak in residential buildings has become one of the main problems in recent times. Gas leakage is a most important apprehension for housing and gaseous transportation vehicles. The setting up of a gas leak identifier in unprotected areas is the protective strategies to maintain a strategic distance from the threat of gas leaks. Usually the accident is due to negligence and technical error.

Another purpose of the system is to propose a low-cost automatic alarm system that can detect LPG leaks in various locations. In recent years, the death toll from gas bomb explosions has been steadily increasing. Therefore, it is necessary to systematically detect and prevent LPG leakage. Therefore, as a gas leaks it remains close to the ground. We have an MQ-2(gas sensor), LM 35(temperature sensor), which will detect the surrounding environment for any chance of accident. Whenever any change is subjected in any of the sensors (load cell, LM35, Mq-2) a siren is triggered.

The most reliable concept is the internet of things which is a basic interconnected system providing a basic structure that includes the implementation of hardware components, programming part, different sensors which accumulate the information later which preserve it and further can be accessed remotely. To make or produce a self-ruling more intelligent machine to associate with the outer world, IOT is being utilized which has machine to machine correspondence. IoT solutions not only offers a real time monitoring in every sector but surges to increase in the economic condition of the world by providing better ,easy to use device (IoT connected). From associated homes and urban communities to associated autos and machines to gadgets that track a person's conduct and utilize the information gathered for new sort of administrations.

2. RELATED WORK

2.1.Juvanna [1]

This paper provides gas level monitoring using RFID tag, microcontroller, pressure sensor, and buzzer. This paper uses the pressure as important parameter to detect level of gas present in container .The aim of this project is to intimate the user when the gas container goes empty.

2.2. Zeinab Kamal [2]

This paper presents a technology called Internet of things (IoT). There is connectivity between computers and other physical devices such as vehicles and buildings, embedded with the sensors and network connectivity which enables the reading the data from sensors and actuators that is to be monitored by using the internet.

2.3. Hans-Petter Halvorsen [3]

This paper presents an Arduino its hardware and software based on open source prototyping. It is very easy for the learners to understand the language and easy to debug. Originally Arduino was created as tool for fast prototyping, basically for students without any knowledge in electronics and programming.

2.4. A Mahalingam [4]

This paper provides gas leaks detection which uses a microcontroller, gas sensor and buzzer. When gas leaks are detected by the gas sensor, microcontroller will turn on the buzzer in critical situations.

2.5. Abhishek gupta [5]

This paper provides the gas leakage detection using gas sensor, IC 555, transistor, LED and buzzer. Whenever a gas leak is detected by gas sensor, IC 555 will turn on the transistor which in turn on the buzzer and intimates to the user and LED will starts to glow.

3. PROPOSED MODELLING

As seen from diagram all the sensors load cell, MQ-2 gas sensor, temperature LM35 sensor , GSM modem are interfaced to Arduino Uno. Arduino Uno, load cell, MQ-2 gas sensor, temperature LM35 sensor, LCD and buzzer consumes 5V.And GSM consumes 12V. Two separate adapters 5V and 12V has been used to power the overall proposed design. The normal data values of the three sensors are stored already in the arduino program which means a threshold voltage is set in the arduino program.

The gas container is placed on the Load Cell .The load cell has a strain gauge, which deforms when pressure is applied. It constantly keeps on sending the electric pulses to the Arduino to compare it with the ideal value. When the compared output is less than ideal value, a sms is sent to user through GSM modem, buzzer will be ON and it is updated to the thing speak IoT application.

The projected system uses a gas sensor which detects the leaks of LPG which then intimate about the leakage as critical situation via SMS, buzzer is triggered and updated to the thing speak application. LM35 Temperature Sensor produces the analog values. When this sensor comes in contact with heat, it converts this high temperature into a voltage. When the temperature exceeds more than room temperature, then system will update this information to the thing speak application and alerts the user about the increase in temperature via SMS, and the system activates the siren. The data value is simultaneously sent to the node microcontroller which is a wifi module. The values are also displayed on the LCD display (16x2).The corresponding values are also updated in the thing speak application.
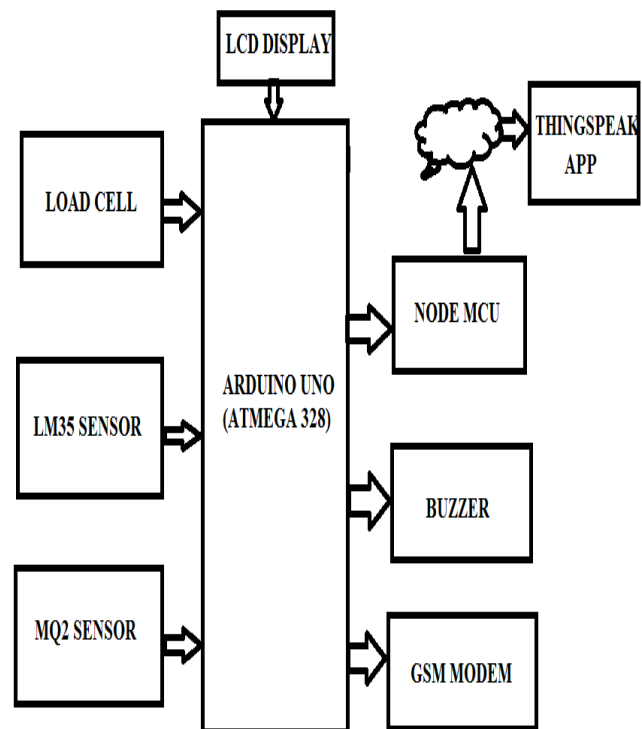

Figure 1 Block diagram of proposed design system

Working and features of proposed system is explained below

1. Arduino: Arduino Uno which includes a microcontroller that is ATMega328, with clock generating path providing crystal frequency 16MHz. It has dual input/output port so that we can attach the pin either input or output, as other microcontroller have single input port and the output port. Microcontroller basically operates at 5V to 3.3V voltage. First AC 230V voltage is step down through transformer to 12V DC, then it is regulated with 7805 or other type of regulator to obtain 5V, 3.3V. Arduino consist of in-built 5V and 3.3V power supply port so we don't need all components which has been used by other controller. Arduino include Rx and Tx port for fast serial communication like other microcontroller. We are using 5V and 12V adapter which has inbuilt RPS circuit, 5V is connected to external power jack of Arduino, load cell, gas sensor, temperature sensor, LCD display and 12V is given to gsm modem.

2. Load Cell: The load cell has a strain gauge, which deforms when pressure is applied. The strain gauge then generates an electrical signal when it is deformed because its effective resistance changes when it is deformed. The HX711 module amplifies the low electrical output of the load cell and introduces or applies this amplified and digitized signal to Arduino to gain weight.HX711 acts as bridge between the load cell and Arduino.

Now the electrical signals generated by the Load cell are in a few million volts, so these weak signals need to be amplified. If we directly connect this load cell to Arduino, load cell produces a weak signals which are not identified by Arduino. Therefore, now HX711 load cell module enters the screen.

HX711 load cell module with HX711 chip, which is a 24-bit high-precision A/D converter (analog-digital converter).There are two analog input channels on the HX711 and we can get a maximum of 128 gain by programming these channels. The HX711 module amplifies the low electrical output of the load cell and introduces or applies this amplified and digitized signal to Arduino to gain weight.HX711 acts as bridge between the load cell and Arduino.

3. MQ 2 Sensor: Sensor used to sense gas leakage. The MQ 2 sensor is basically Liquid petroleum gas (LPG), which consists of propane and butane. So when the gas leak is sensed by the sensor, it will send a high pulse to the arduino, which will be updated to the thing speak application, send an SMS to user about the gas leak condition and even a buzzer is heard and therefore the problem can be sorted and solved. The basic element in this sensor is made up of the Tin dioxide which is having it's chemically formulae as Sno2.

4. LM 35 Sensor: LM35 Temperature Sensor produces the analog values. When this sensor comes in contact with heat, it converts this high temperature into a voltage. This voltage is then processed to give actual temperature value in degree Celsius. It has three pins as shown which are connected to Arduino.

LM35 Temperature Sensor produces the analog values. When this sensor comes in contact with heat, it converts this high temperature into a voltage; this voltage is then processed to give actual temperature value in degree Celsius.

5. LCD Display: LCD screen (LED) of 16X2 characters working on + 5 volts supply. The display unit is used to provide user information. Here 16*2 represents sixteen columns and two rows. It will display all information such as weight display, gas leakage detection message and also display message sent to the agency or user.

6. GSM Modem: A text message is sent to the consumers when the gas present in the container reaches its threshold level. Users get alarms through this GSM whenever gas leak is detected, also when temperature is high. Users get alarms through this GSM whenever gas leak is detected, also when temperature is high. It need very little amount of memory to send and receive text messages.

7. Buzzer: This device provides a beep of sound and acts as alarm system for many applications. This device consumes very less power around 5V.Piezo buzzer is used in this project to know whenever gas present in the container is reduced, high temperature is detected and gas leakage is detected then Piezo buzzer will make sound.

8. Node microcontroller: Node MCU is a microcontroller which is associated with IOT server through web. MCU will get the ON OFF bundles from server and changes apparatuses regard to server flag.

ESP8266 currently stands the most utilized wifi module when comes in a scenario of commercial business sector. Apart from that it has several advantages of ESP8266 has emerged like balancing circuit and unbalancing circuit in the modulation. It basically consumes least power as well as provides most efficient security in the overall comparative wifi module.

9. Thing Speak: Thing Speak is a platform that offers a variety of services designed to build IoT applications. It provides real-time data collection capabilities, graphically visualize collected data and create applications that work with Web services, social networks and other application programming interfaces.

The applications provided by Thing Speak make it easier for us to integrate with Web services, social networks and other APIs. IoT service is one of the important key elements of an IoT system .One of the application platforms offering a wide variety of features along with the IOT service id Thing Speak. The core of Thing Speak is a channel which can be used for saving and processing data collected from the 'things'.

4. RESULTS AND DISCUSSIONS

The graph shows the updation in the internet for any change in the LPG gas level, there are only two levels that is either 0 (low) levels or 1(high) level. The gas is considered as low if the 0 level is appeared, else it is high if the level 1 is appeared.
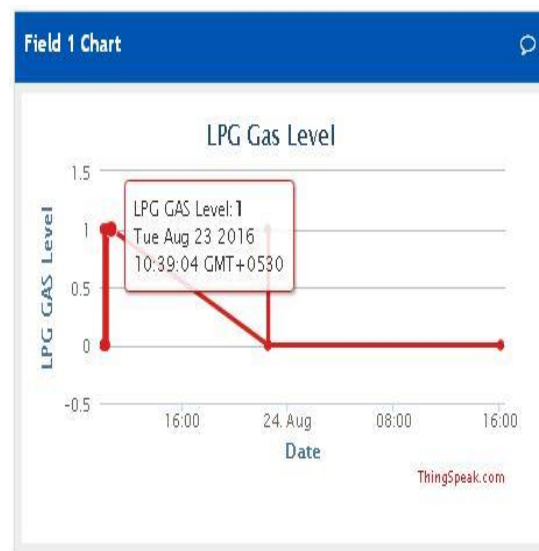

Figure 4.1 LPG Gas Level

The graph shows the status of gas sensor which senses for any chance of gas leakage near & around the gas container, the sensor continuously keeps on sensing, if any change is observed then it is updated in the internet. If the level is at 1 then there is a gas leakage from the container.

Figure 4.2 Gas Leakage Level

The below graph shows the status of temperature sensor which measures the temperature near gas container to avoid any slight chance of the fire accident. If the level is at 1 then there is fire near the gas container, else it is quite normal near it.
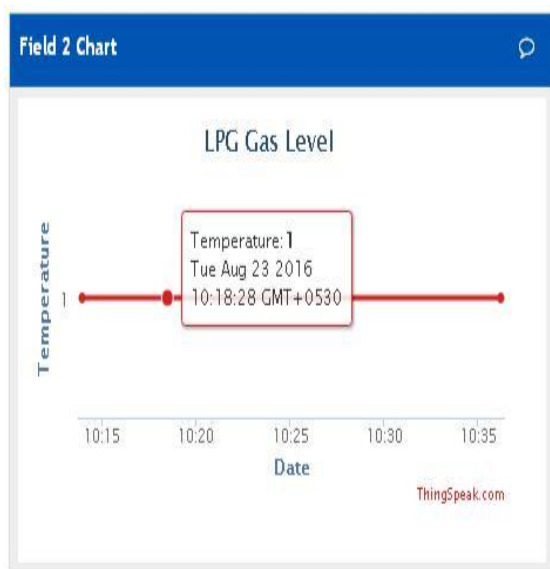

Figure 4.3 Temperature Level

The below diagram shows the SMS sent to the user about leakage of gas, reduction in the gas level and high change in temperature.
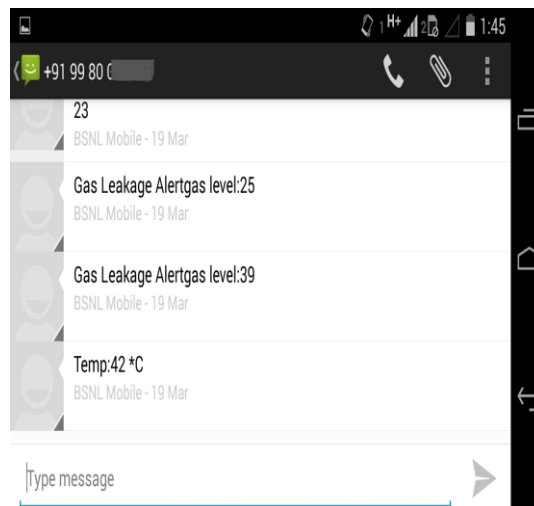

Figure 4.4 Showing received sms when gas leakage

5. CONCLUSION

In this work I have tried to overcome the above challenges through IoT based gas level monitoring system which is portable, user friendly, less expensive and can be implemented easily in a very small space. Outcome determines the proposed system provide better and immediate response. It not only helps in making the work easier but also plays a major role in the security / avoidance of accidents to the user and helps in leading an easy life. By implementing this project we help the people to save their time. It can provide the security to people by sensing the leakage of gas. It is very useful for domestic purpose as well as for the industrial purposes. This can further be improved by embedding the sensors, Arduino and other parts in a very easy take away portable device and we can use a water sprinkler and fire extinguisher when high temperature is detected as a control mechanism.

REFERENCES

[1] A I. Juvanna1, N. Meenakshi2 ISSN 2320–088X (2015)
[2] Zeinab Kamal ,Elmustafa sayed (2014)
[3] HansPetterHalvorsen (2014)
[4] A. MAHALINGAM, R. NAAYAGI ISBN 978-1-61804-074-9
[5] Abhishek gupta ISSN 2250-3153(2017)