Smart LPG Booking System & Leakage Detection

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ABSTRACT:Now days we all are very busy in our daily life and it is difficult to know the status of LPG gas cylinder. If LPG is going to finish without informing us it can create very difficult condition for cooking etc. Our proposed design can help us to avoid such kind of problem in our daily life .Our design is based on microcontroller, it can track LPG emptiness all the time if LPG is very close to finish or at empty level then it can alert us by sending SMS to owner & it can also transfer message to LPG Agency for ordering the LPG cylinder. In addition it can provide safety also by using sensor it can detect LPG leakage & start alarm.

Keywords: LPG, GSM, SMS, LCD, GAS Sensor MQ-6, Microcontroller

I.INTRODUCTION

LPG is made up of Commercial Propane and Commercial Butane having saturated as well a sun saturate hydrocarbons. Because of its versatile nature of LPG it is used in many needs such as domestic fuel, industrial fuel, auto-mobile fuel, illumination etc. and the demand for LPG is continuously increasing day by day. The liquefied petroleum gas is used widely in homes, industries and in auto-mobiles as fuel because of its desirable properties which include high calorific value, it creates very less smoke and does not cause much harm to the environment .Natural gas is another widely used fuel in homes. Both burns to produce clean energy, however there is a serious threat about the leakage. The gases being 5 times heavier than air do not disperse easily and may lead to suffocation when inhaled also the leakage gases when ignited may lead to explosion. The number of deaths due to the explosion of gas cylinders has been increasing in recent years. There is a need for a system to detect and also prevent leakage of LPG. Our system provides security from the gas leakage; it detects leakage and takes control action over it. It is helpful for us to avoid explosion it also have provision for automatic gas booking.

II.RELATED WORK

Various methods for gas booking are there in current system. This system shows that there is more time required to deliver LPG after booking. There is no such facility of continuous gas level monitoring system. And also there is no provision for gas leakage detection and control action on gas leakage. We all are very busy in our daily life and it is difficult to know the status of LPG gas cylinder. If LPG is going to finish without informing us it can create very difficult condition for cooking etc. There is no facility for gas leakage detection and control action.

Current System in Village

We book gas cylinder when it gets empty by calling gas agency and agency will gives us booking number, with this booking number we got receipt from agency office. Then one has to go in store room for taking cylinder.

Current System in City

In current system there is facility of booking gas by calling agency and automatically registered of mobile number and address of owner. So the agency delivers the cylinder on that address. But there is also problem occur if gas will finish within that days then we have to wait for delivery of LPG.

Smart Gas Booking System

Our proposed design can help us to avoid such kind of problem in our daily life. Our design is based on ARM controller, it continuously monitor level of the gas. If the gas level is reaches to the threshold level, then automatically SMS send to the agency and cylinder is booked.

It also has provision to detect gas leakage and controlling, the regulator knob is turn off automatically if the gas leakage is takes place.

III.PROPOSED SYSTEM

Before the development of electronic house hold gas detectors in the 1980s and 1990s, gas presence was detected with a chemically infused paper that changed its color when exposed to the gas. Since then, many technologies and devices have been developed to detect & monitor, and alert the leakage of a wide array of gases. Today, booking an LPG cylinder is now just a text SMS away. Petroleum companies have launched the Customer-friendly service called as IVRS (Interactive voice Response) technique for their customers. In IVRS system we need to call the agency and book the cylinder when the gas is about to finish. But now days we all are very busy in our daily life and it is difficult to know the status of LPG gas cylinder. If LPG is going to finish without informing us it can create very difficult condition for cooking etc.

Our proposed design can help us to avoid such kind of problem in our daily life .Our design is based on microcontroller, it can track LPG emptiness all the time if LPG is very close to finish or at empty level then it can alert us by sending SMS to owner & it can also transfer message to LPG Agency for ordering the LPG cylinder. In addition it can provide safety also by using sensor it can detect LPG leakage & start alarm. This paper points towards some extensions which we would like to add with proposed system. A visual indication is produced by bulb, exhaust fan will help to wipe out leaked gas from the room and a mechanism to turn off main power and gas supplies

LPG gas detection

In LPG gas detection of leakage gas is done by gas sensor which is interfaced with microcontroller. When gas is detected motor will be turn on and it immediately turn off the gas regulator at the same time we inform the user about the gas leakage by sending the SMS, turning on the buzzer and also message displaying on LCD.

Auto gas booking

In auto gas booking we continuously measure the amount of gas which is present in the cylinder. When gas level goes below the set level then message will be send to the gas agency through GSM and confirmation message received by the user from gas agency. So user get cylinder within time.

IV.ALGORITHM

1. Load cell i.e. pressure sensor is used to check the weight of the cylinder and that weight I displayed on lcd
2. If the cylinder weight is below the pre-defined threshold value then automatically send sms to the pre-defined number i.e. to gas agency
3. The threshold value get fix into the microcontroller by programming.
4. GSM modem is used to send and receive the message.
5. Message will be sent from user to gas refill officer and notification will get from the gas refill officer to user.
6. When gas leak is detected by the LPG sensor.
7. LPG sensor will send the signal to the microcontroller and buzzer will turn on through microcontroller and also motor get started to turn off the regulator switch.
8. LCD is used to display the LPG gas leak status i.e. "LPG gas detected" display on LCD when gas leaked.

V.PROPOSED WORK

BLOCK DIAGRAMDESCRIPTION

The basic block diagram of the "Smart gas booking, leakage detection and controlling" using ARM controller is shown in below figure. Mainly this block diagram consists of the following essential blocks
• Microcontrollers.

- LCD with driver.
- Crystal oscillator.
- USART
- Max232
- GSM
- sensors
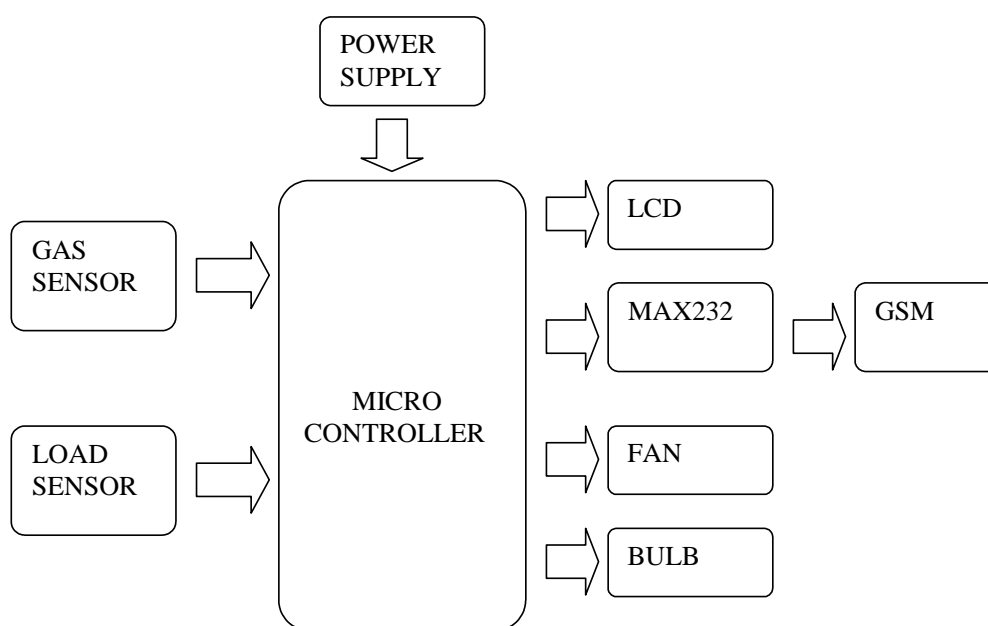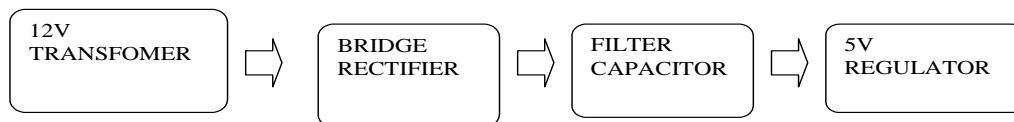- Regulated Power Supply

Fig. 1: Block Diagram

Fig. 2: Regulated Power Supply

5.1. Microcontroller

The major heart of this project is microcontroller; a microcontroller (sometimes abbreviated μC, uC or MCU) is a small computer on a single integrated circuit containing a processor core, memory, and programmable input/output peripherals etc. However, compare to others microcontroller is fast and very ease to program in C language because of huge support can gain from the manufacturer for programming.

5.2. LCD Module

Liquid Crystal Displays are materials which combine the properties of both liquids and Crystals. Rather than having a melting point, they having a temperature range within which the molecules are almost as mobile as they would in a liquid, but are grouped together in an ordered form similar to a crystal. An LCD consists of two glass panels, with the liquid crystal material sandwiched in between them. The inner surface of the glass plate is coated with transparent electrodes, which define the character, symbols or patterns to be displayed. Polymeric layers present in between the electrodes and the liquid crystal, which makes the crystal molecules maintain a defined Orientation angle.

5.3. MAX232 (Voltage Level Converter)

The MAX232 is an IC that converts signals from an RS-232 serial port to signals suitable for use in TTL compatible digital logic circuits. The MAX232 is a dual driver/receiver and typically converts the RX, TX, CTS and RTS signals. The drivers provide RS-232 voltage level outputs (approx. ± 7.5 V) from a single + 5 V supply via on-chip charge pumps and external capacitors. The receivers reduce RS-232 inputs (which may be as high as ± 25 V), to standard 5 V TTL levels.

5.4. Crystal Oscillator

A **crystal oscillator** is an electronic oscillator circuit that uses the mechanical resonance of a vibrating crystal of piezoelectric material to create an electrical signal with a very precise frequency.
This frequency is commonly used to keep track of time, to provide a stable clock signal for microcontrollers. The most common type of piezoelectric resonator used is the quartz crystal, so oscillator circuits incorporating them became known as crystal oscillators.

5.5. Reset Function

Reset is used for putting the microcontroller into a 'known' condition. That practically means that microcontroller can behave rather inaccurately under certain undesirable conditions. In order to continue its proper functioning it has to be reset, meaning all registers would be placed in a starting position. Reset is not only used when microcontroller doesn't behave the way we want it to, but can also be used when trying out a device as an interrupt in program execution, or to get a microcontroller ready when loading a program.

5.6. GSM

Global system for communications, originally group special mobile, is a standard set developed by the European telecommunications standards institute (etsi) to describe protocols for second generation (2g) digital cellular networks used by mobile phones. it became the de facto global standard for mobile communications with over 80% market share. GSM is a cellular network, which means that cell phones connect to it by searching for cells in the immediate vicinity. There are five different cell sizes in a GSM network—macro, micro, pico, femto, and umbrella cells. The coverage area of each cell varies according to the implementation environment.

5.7. Load Cell

A **load cell** is a transducer that is used to convert a force into an electrical signal. The various types of load cells that exist include Hydraulic load cells, Pneumatic load cells and Strain gauge load cells.

5.8 Gas Sensor

They are used in gas leakage detecting equipment's in family and industry, are suitable for detecting of LPG, natural gas, town gas, avoid the noise of alcohol and cooking fumes and cigarette smoke.

5.9. Relay

A relay is an electrically operated switch. Many relays use an electromagnet to operate a switching mechanism mechanically, but other operating principles are also used. Relays are used where it is necessary to control a circuit by a low-power signal (with complete electrical isolation between control and controlled circuits), or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits, repeating the signal coming in from one circuit and re-transmitting it to another. Relays were used extensively in telephone exchanges and early computers to perform logical operations.

5.10. Power Supply

A power supply is a device that supplies electric power to an electrical load. The term is most commonly applied to electric power converters that convert one form of electrical energy to another, though it may also refer to devices that convert another form of energy (mechanical, chemical, solar) to electrical energy. A regulated power supply is one that controls the output voltage or current to a specific value; the controlled value is held nearly constant despite variations in either load current or the voltage supplied by the power supply's energy source.

5.11. Step down Transformers

 Step down transformers are designed to reduce electrical voltage. Their primary voltage is greater than their secondary voltage. This kind of transformer "steps down" the voltage applied to it. For instance, a step down transformer is needed to use an 110v product in a country with a 220v supply. Step down transformers convert electrical voltage from one level or phase configuration usually down to a lower level. They can include features for electrical isolation, power distribution, and control and instrumentation applications. Step down transformers typically rely on the principle of magnetic induction between coils to convert voltage and/or current levels.

5.12. Rectifier

A rectifier is an electrical device that converts alternating (AC), which periodically reverses direction, to direct current (DC), which flows in only one direction. The process is known as rectification. Physically, rectifiers take a number of forms, including tube diodes, mercury-arc valves, copper and selenium oxide rectifiers, semiconductor diodes, silicon-controlled rectifiers and other silicon-based semiconductor switches. Historically, even synchronous electromechanical switches and motors have been used. Early radio receivers, called crystal radios, used a "cat's whisker" of fine wire pressing on a crystal of galena (lead sulphide) to serve as a point-contact rectifier or "crystal detector". Rectifiers have many uses, but are often found serving as components of DC power supplies and high-voltage direct current power transmission systems. Rectification may serve in roles other than to generate direct current for use as a source of power. As noted, detectors of radio signals serve as rectifiers. In gas heating systems flame rectification is used to detect presence of flame.

5.13. Filters

Electronic filters are analog circuits which perform signal processing functions, specifically to remove unwanted frequency components from the signal, to enhance wanted ones, or both. The most common types of electronic filters are linear filters, regardless of other aspects of their design.

5.14. Regulator

A regulator is a device which has the function of maintaining a designated characteristic. It performs the activity of managing or maintaining a range of values in a machine. The measurable property of a device is managed closely by specified conditions or an advance set value; or it can be a variable according to a predetermined arrangement scheme. It can be used generally to connote any set of various controls or devices for regulating or controlling items or objects.

ADVANTAGES

1. It insures the security from the gas leakage and hazards.
2. It is very less time consuming and cylinder replace in time.
3. Easy implementation.

DISADVANTAGES

1. Gas sensor should be high enough sensitive to detect gas leakage.
2. If we can use another sensor then cost will be high.
3. It should be real time.

APPLICATIONS

This system can be used in different parking area like
1. House hold purpose
2. Gas agency

3. Chemical factory
4. Companies
5. Hospitals etc.

VI.RESULT AND DISCUSSION

Fig. 3: Gas booking

In this way we implement our system. It is help in gas booking automatically when gas level (i.e. 2 kg) reaches to the threshold level SMS will be send to the agency i.e. "REGISTER THIS NUMBER". It also continuously displays the level of the gas in the cylinder.

Fig.4: Gas Leakage Detected

It is also useful in gas leakage detection and alert by SMS to the owner. It will turn off the solenoid pressure valve automatically. SMS "GAS DETECTED" is send to the owner mobile number. It will avoid dangerous explosion and save human life. It is very fast in response.

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VII.CONCLUSION

By implementing this project we help the people to save their time by providing automatic gas booking. 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.

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