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LPG Leakage Detection System

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Abstract: In this Paper, we propose a LPG based Automated System which is able to sense the Leakage of LPG gas. On Leakage of gas the system will send a message to the owner stating that the gas is leaked and proper precautions must be taken to avoid the LPG leakage. In order to prevent gas leakage a Servo motor is fitted on the regulator button of the cylinder and that Servo motor will be controlled by a Wi-Fi module that will be operated through the Android app. The system is also capable to send an SMS alert to the owner regarding weight of the cylinder so that the user comes to know when it will get empty and can even book a new cylinder through website. Along with the Automatic cylinder booking through URL mentioned in the SMS we also designed feature related to the safety of the user in which it continuously monitor the leakage of LPG gas and alerts the user regarding leakage and can track the monthly usage of the cylinder and can also take measure to consume it.

I. INTRODUCTION

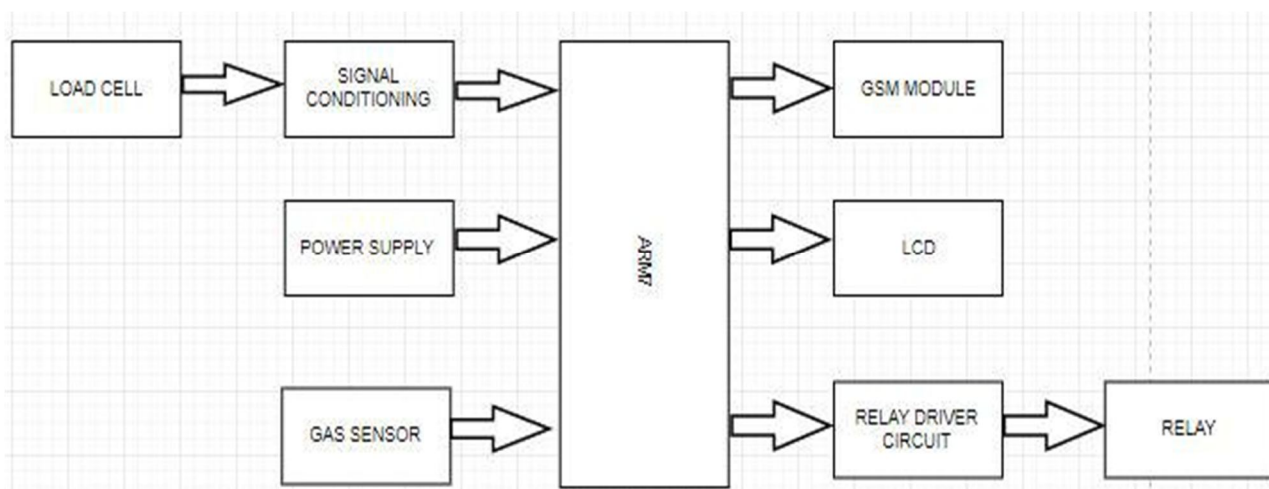
Gas leakage can be very dangerous if proper precaution is not taken at the correct time. The large scale of fire also could contribute to serious injury or death. The Proposed System can alert the user if the LPG Gas gets leaked. The Sensor is capable of detecting LPG leakage. This sensor can also be used to sense other gases like ISO-butane, Propane, CNG and even cigarettes smoke. The output of the sensor goes high as the sensor senses the LPG gas leakage. This is detected by the Arm7 processor. As soon as the Gas leakage is detected in the room the GSM module gets activated and sends an ALERT message to the User using GSM module and exhaust fan is turned ON for throwing the gas out. A weight sensor is used to check the weight of the cylinder and sends ALERT message to the user to refill the cylinder if it fall below 5 of the cylinders total weight and the user can also book the cylinder through website by clicking on the URL provided in the ALERT message to refill the cylinder. We can also keep track of our LPG usage for each month so that we can reduce the wastage of gas and conserve it. We can install this product in homes where the LPG cylinders are used in cooking and other household purpose. Hotel, hospitals, and everywhere this product can be installed. For Prevention, we have fitted a Servo motor on the Regulator button of the cylinder and that Servo motor is controlled by the ESP8266 WI-FI model that will be operated by the Android App. The android app has one button and by clicking on that button it will take the user to the URL. On that URL it has two buttons ON and OFF. By clicking on that ON button the Servo motor will get activated and it will rotate the Regulator button anti-clock wise so that the regulator gets switched off and it stops the flow of LPG to Gas Stove. Once the Leakage is under control and all the LPG Gas is gone out from the room clicking on that OFF button the servo motor will get activated and it will rotate the Regulator button clock wise so that the regulator gets switched on and it resumes the flow of LPG to Gas Stove.

II. PROPOSED SYSTEM

The System is used in the area where highly combustible gases likes CNG, LPG, Methane etc are used. The basic concept behind building this system is to sense the leakage of harmful and combustible gases in order to prevent them from coming to contact with flammable substance causing fire or huge blast. The system we are developing is basically an embedded system with large amount of software codes integrated with some amount of hardware like ARM microprocessor and REES52 which plays a vital role in sensing of combustible gases. The basic functionality and properties of REES52 is that it can sense three types of gases viz. LPG, CNG, Methane in unit of ppm (parts per millions/particles per millions). The Sensor is capable of detecting LPG leakage. This sensor can also be used to sense other gases like ISO-butane, Propane, CNG and even cigarettes smoke. The output of the sensor goes high as the sensor senses the LPG gas leakage. This is detected by the Arm7 processor. As soon as the Gas leakage is detected in the room the GSM module gets activated and sends an ALERT message to the User using GSM module and exhaust fan is turned ON for throwing the gas out. A weight sensor is used to check the weight of the cylinder and sends ALERT message to the user to refill the cylinder if it fall below 5 of the cylinders total weight and the user can also book the cylinder through website by clicking on the URL provided in the ALERT message to refill the cylinder and by clicking on that URL the cylinder will automatically get booked if the user is already registered on that website For prevention of the Gas leakage we have fitted a Servo motor on the

regulator button of the cylinder and that Servo motor will be controlled by a Wi-Fi model that will be operated through the Android app.

III. BLOCK DIAGRAM



A. Arm7 Lpc2148

The LPC2148 Microprocessors are based on a 16-bit/32-bit ARM7TDMI-S CPU with real-time emulation and embedded trace support, that combine the Micro-processor with embedded high-speed flash memory ranging from 32kB to 512kB. A 128-bit wide memory inter-face and a unique accelerator architecture enable 32-bit code execution at the maximum clock rate. For critical code size applications, the alternative 16-bit Thumb mode reduces code by more than 30 percent with minimal performance penalty

B. Features

- 1) 16-bit/32-bit ARM7TDMI-S Microprocessor in a tiny LQFP64 package. 8 kB to 40 kB of on-chip static RAM and 32kB to 512kB of on-chip flash memory.
- 2) 128-bit wide interface/accelerator enables high-speed 60 MHz operation.
- 3) In-System Programming/In-Application Programming (ISP/IAP) via on-chip boot loader software.
- 4) Single flash sector or full chip erase in 400 ms and programming of 256 B in 1 ms.
- 5) Embedded ICE RT and Embedded Trace interfaces real-time debugging with the on-chip Real Monitor software and high-speed tracing of instruction execution.USB 2.0 Full-speed compliant device controller with 2kB of endpoint RAM.
- 6) In addition, the LPC2148 provides 8kB of on-chip RAM accessible to USB by DMA.
- 7) Single 10-bit DAC provides variable Analog output (LPC2148 only).
- 8) Two 32-bit timers/external event counters (with four capture and four compare channels each), PWM unit (six outputs) and watchdog.
- 9) Low power Real-Time Clock (RTC) with independent power and 32 kHz clock input.

C. Weight Sensor

It is used to measure the weight of cylinder and it has a capacity of 40kg. The function is to give output voltage as per force/weight applied to it. It is basically a device that measures strain and then converts force into electric energy which serves as measurement for scientists and workers.



Figure 1: Weight Sensor (Load cell)

D. Gas Sensor

Gas sensor is used to check the leakage of the system. Here we have used REES52 gas sensor. It has the sensitivity to sense LPG Gas as well as natural gas. The REES52 sensor having the detecting concentration scope 200-10000ppm.

If the gas is detected then sensor gives output +5v. If the gas is not detected then sensor gives output 0v.

E. LCD Display

Liquid crystal display (LCD display) is used for continuously monitoring the Leakage and the weight of the LPG Gas cylinder. Here we have used 16x2 alphanumeric displays. It is used to display the gas leakage and it is display the message as "LPG Detected". It is also used to show the weight of the gas cylinder and it display the message like "Weight = %".

F. GSM Module

The GSM module is used for communication between system and user. In this project, if the gas is leaked it will send the message to the user telling that the gas is leaked. SMS is send to the owner of gas cylinder. We have used SIM900 GSM modem.

G. Exhaust Fan

The LPG is pushed out into the environment using an exhaust fan which reduces the concentration of LPG near the leakage area.

IV. IMPLEMENTATION

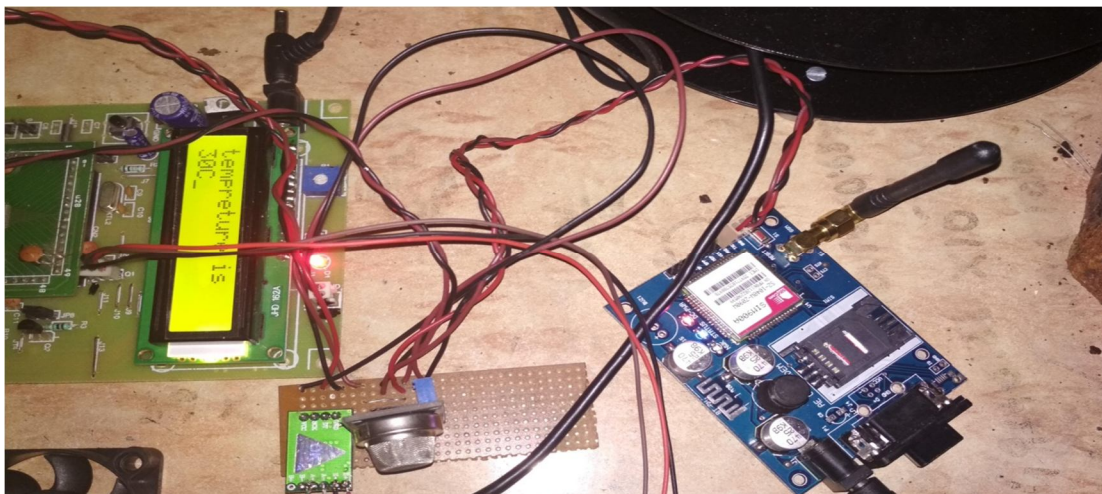


Figure 2 : LPG Detection



V. CONCLUSION

Our Proposed System can detect the gas leakage in the atmosphere and it alerts the user by sending an message to the user using GSM module. Weight Sensor is used to calculate the amount of the gas left in the cylinder and proper precautions can be taken to consume the wastage of the LPG gas and it can even book a cylinder for the user using a URL provided in the alert message which will automatically redirect it to booking website.

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