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Gas Level Monitoring and Detection using RFID Technique

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Abstract: Liquified Petroleum gas (LPG) is the common one for all cooking applications. Most of us are prone to much difficulty when the gas cylinder gets emptied during the peak cooking hours. We present this paper in order to create awareness about the decreasing weight due to consumption of the gas and to automatically dial to the gas booking office. Continuous measurement of the weight cannot be done using electronic weight gauges, since it causes fatigue in the springs. Hence we move to contact less detection involving acoustic wave. In this system, the inbuilt pressure sensor in RFID is used to measure the level of the gas inside the cylinder. The output of the pressure sensor is given to the PIC controller, where the voltage corresponding to the gas weight is stored. The same is displayed in the LCD, which is connected to the output port of the controller. A threshold value is set in the controller. Once the threshold level is reached, the voltage value is given to the alarm, which alarms the user. And also it is given to the autodialler.

Keywords: 1-RFID, 2-Pressure sensor, 3-Auto Dialing.

I. INTRODUCTION

Liquified petroleum gas has a world wide application. It has a wide domestic usage in cooking and for heating. We are put into much difficulty when the cylinder runs out of gas. Hence it is necessary in the busy world, to detect the decrease in weight of the gas cylinder. It is made possible by using inbuilt pressure sensor in RFID device. The output is fed to a controller which has input ports, output ports and I/O ports. It is 18 pin IC of package. Its special feature is it operates in three modules 1.capture, 2.compare, 3. PWM. It operates at a voltage range of 3.0V to 5.5V. LCD is connected to one of the ports, for displaying the voltage. Controller is programmed in such a manner that it creates an alarm when the voltage is equal to the threshold value. An auto dialer is enabled for booking the gas cylinder.

II. THEORY

The direct cylinder pressure monitoring system (CPMS) refers to the use of pressure sensor directly mounted on the transport cap of the cylinder. The pressure inside the cylinder is measured continuously by the pressure sensor and the information will be continuously sent to the system using the radio frequency technology[1].

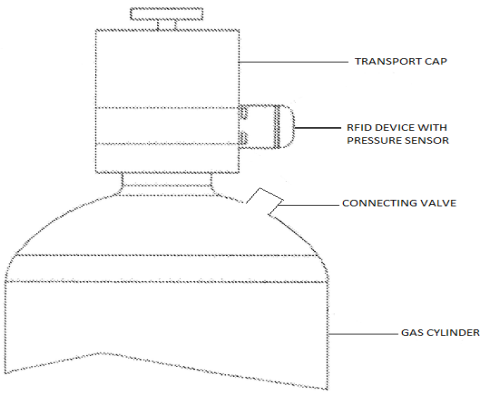

Figure.1.Gas cylinder with RFID Device

In the Fig.1….The cylinder has two outlets, in one of the opening the sensor with the RFID is attached and the another valve is used for connection. The initial level of the pressure is noted and saved in the system and using the LCD We can continuously monitor the level of the pressure inside the cylinder. Previously the pressure of the cylinder is monitored by the method of cylinder knocking system [6]. The another method is presented, which permits the contact less measurement of liquid levels in thin opaque capillaries at high pressures. The method is based on the mass dependence of the flexural resonance frequencies of a finite section of a tube. These resonance frequencies are determined from the complex electrical impedance of a slatted toroid coil exciting a magnet attached to the tube[7].

A. Working Principle of the system:

The pressure inside the cylinder will be sensed by the sensor and it will be communicated to the PIC controller and the LCD using the RFID tag in the cylindrical valve[8].The output of the pressure sensor is analog signal, which when striking the cylindrical surface produces the electromagnetic wave[2]. This EM wave is sensed by the RFID [9]and it is communicated to the controller. Once the pressure reaches the threshold value the controller sends the message to the auto dialler.

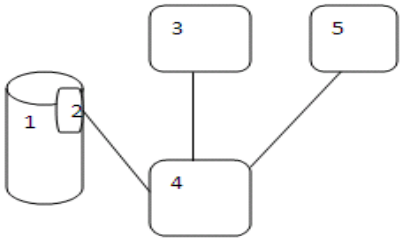

Figure.2 1.Cylinder 2.RFID Tag and pressure sensor 3.LCD Display 4.PIC controller 5.Autodialer

In Fig.3… shows the schematic of the pressure detection system.The output of the transducer is given to the 16F628

PIC Controller. The microcontroller interface is for data logging. The PIC 16F628 is an 8 bit mid-range microcontroller having 1024 words of program memory, 68 bytes of RAM and 64 bytes of long term EEPROM storage. The PIC board that comprises of the LCD connection, RS232 communication, and direct in-circuit program download etc.The 8 bit PIC controller architectural decisions are directed at the maximization of speed-to-cost ratio. The Harvard architecture in which instructions and data come from separate sources simplifies timing and microcircuit design greatly, and this benefits clock speed, price, and power consumption.

The PIC instruction set is suited to implementation of fast lookup tables in the program space. Threshold value is set in the controller. When the value is less than or equal to the threshold value the signal will be given to the alarm and the auto dialer. Such lookups take one instruction and two instruction cycles. Many functions can be modeled in this way. Optimization is facilitated by the relatively large program space of the PIC (e.g. 4096 x 14-bit words on the 16F690) and by the design of the instruction set, which allows for embedded constants. Execution time can be accurately estimated by multiplying the number of instructions by two cycles; this simplifies design of real-time code.

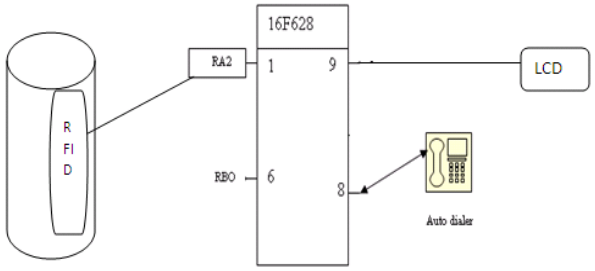

Figure.3.Schematic of the pressure detection system

Similarly, interrupt latency is constant at three instruction cycles. External interrupts have to be synchronized with the four clock instruction cycle, otherwise there can be a one instruction cycle jitter. Internal interrupts are already synchronized. The constant interrupt latency allows PICs to achieve interrupt driven low jitter timing sequences. The Threshold value will be stored permanently in the EEPROM .once the incoming value from the microphone is equals or greater than the threshold the signal will be given to the alarm and also the auto dialer circuit which is connected with the PIC.

An autodialler, or automatic calling unit is an electronic device that can automatically dial telephone numbers to communicate between any two points in the telephone, mobile phone and pager networks. Once the call has been established (through the telephone exchange) the autodialer will announce verbal messages[3] .The Fig.4… circuit consists of a small PIC microcontroller, assembly program, and a few other parts to detect a switch closure from an open door, window, or manual push button and then dial the cell phone number, and transmit steady tone to indicate the source of the call. The circuit uses the pulse dialing system to interrupt the line connection a number of times to indicate each digit. Pulse dialing (the oldest form of dialing) works by actually disconnecting or "hanging up" the phone line a number of times to indicate each digit. For example, the digit "5" would be dialed by disconnecting and reconnecting the line 5 times in short intervals of about 100mS. There is about a 1 second pause (with the line connected) between each digit. The timing is not critical and was able to dial 411 and connect to the local information service just using a momentary push button switch in series with the phone line.
2.2.Circuit Operation:

In operation, the switch closure is detected on pin 7 of the processor which activates the reed relay and takes the line off-hook for 3 seconds to establish the dial tone. The processor then dials the number by opening and closing the relay a number of times for each digit. When dialing is complete, the processor waits 3 seconds and then transmits a steady tone of about 300Hz for 30 seconds through the modem transformer. The call is then terminated and the processor waits for the switch to open before resetting.

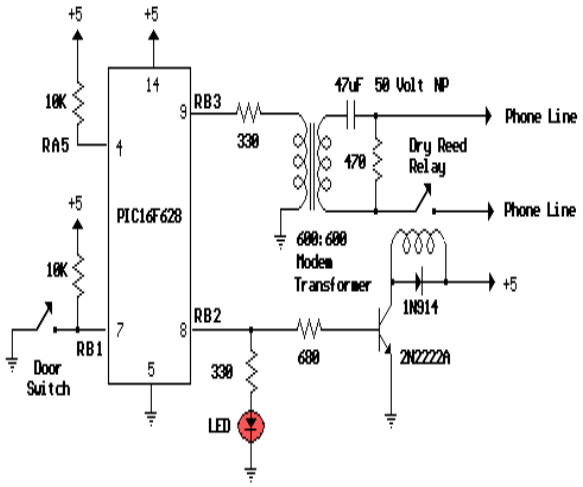

Figure.4.Automatic Dialer Circuit

III. RELATED WORK

The pressure can also be measured by applying the Euler Bernolli Theorem, where the gas cylinder is knocked using a hammer and the acoustic vibration is related to the pressure inside the cylinder [4]. By knocking on the surface of the tank, the frequency of the sound generating from the vibration of the wall of the tank can be used to estimate the quantity of the gas. when a hammer was used to knock the cylinder surface the triggered transverse vibration can be regarded as mechanical vibration which is similar to that of Bernoulli-Euler beam partially loaded with a distributed mass[5]. Euler-Bernolli theorem is used as the calculation model for estimating vibrating frequencies of a cylindrical tube. By released gas out of tank step by step the natural sound frequencies of the gas tank with different weights can be measured.

IV. CONCLUSION

The development of the pressure detection schematic gives the information about the change in pressure of the container, the pressure range of gas inside the cylinder and alarms the user. Continuous measurement was done by using a wireless pressure sensor inside the cylinder. The updated value is displayed and the alarm is enabled as the threshold reaches.

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