

GAS LEVEL DETECTION AND MONITORING USING LOAD CELL

S.Durga devi¹, D.Muthu porcia², R.S.Santha kumari³, R.Sandhiya⁴, R.Devirathna⁵

¹Faculty,Department of EIE,Sri Sairam Engineering College,Chennai-44.

²⁻⁵Student, Department of EIE,Sri Sairam Engineering College,Chennai-44.

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. This paper is presented 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 it is proposed to design to contact less detection involving acoustic wave. In this system, the load cell is used to measure the level of the gas inside the cylinder. This project made the detection of decreasing weight by using pressure sensor. The level of the cylinder will be messaged to the user's mobile in kg. The pressure can be measured by euler's Bernoulli theorem. Continuous measurement was done using GSM module gas leakage is detected by special sensor.

KEYWORDS GSM module,load cell, Amplifier ,Arduino.

I INTRODUCTION

Liquified petroleum gas has a world wide application. It has a wide domestic usage in cooking and for heating. There is a difficult situation when

the cylinder runs out of gas. Hence it is necessary in the busy world, to monitor the level of the gas in a cylinder. It is made possible by using load cell. The output is fed to a user's mobile by using the GSM module which has input ports, output ports and I/O ports. It operates at a voltage range of 3.0V to 5.5V. The 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. Also when there is a gas leak from the cylinder, the sensor detects it and alarms the user.

II. PROPOSED SYSTEM

A.BLOCK DIAGRAM

Fig 1. Shows the block diagram of proposed system

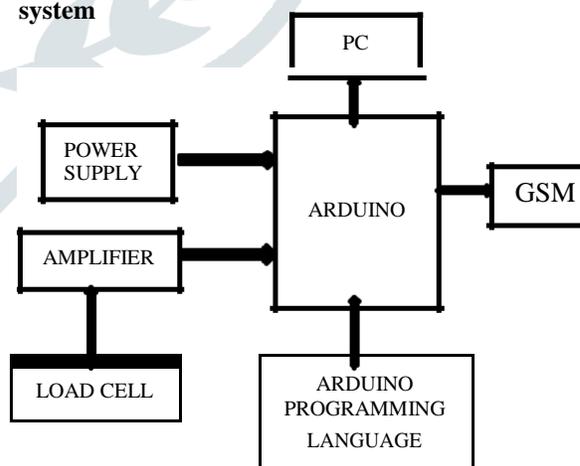


Fig.1 Block digram of proposed system

B. Description of the block diagram:

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 load cell and the information will be continuously sent to the system using GSM module. From the GSM module, the signal is transferred to Arduino and due to the program and the sim connected to GSM module it will send message to the user's mobile indicating the level of cylinder. The initial level of the pressure is measured and saved in the system and it is being displayed using the LCD. So that it can be continuously monitored

III IMPLEMENTATION OF THE PROPOSED SYSTEM

A. LIQUIFIED PETROLEUM GAS COMPOSITION:

LPG is the combination of commercial propane and butane having both saturated and unsaturated hydrocarbons. LPG has only a very faint smell, and consequently, it is necessary to add some odourant so that any escaping gas can easily be detected. Ethyl Mercaptan is normally used as stenching agent for this purpose. The amount to be added should be sufficient to allow detection in atmosphere 1/5 of lower limit of flammability or odour level 2 as per IS: 4576. LPG has an explosive range of 1.8% to 9.5% volume of gas in air. This is considerably narrower than other common gaseous fuels. This gives an indication of hazard of LPG vapour accumulated in low lying area in the eventuality of the leakage or spillage. Hence the gas leakage must necessarily have to be detected in order to avoid severe damage to

lives. The gas detection agent Ethyl Mercaptan's presence is detected by this special arrangement. The method of detection shall be Electrochemical Cell with a proven service life in harsh locations. The electrochemical cell shall be plug-in style and shall include an integral intelligent digital interface that provides for seamless interchangeability between Intelligent Transmitter Modules. The Intelligent Transmitter Module shall be a universal design that adapts to any sensor type or range whose change shall be implementable directly through the user interface. The sensor design shall incorporate an internal intrinsically safe barrier circuit which eliminates the requirement for a flame arrestor and allows for direct sample contact with the sensing element. 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.

B. WORKING PRINCIPLE OF THE SYSTEM:

The working model is presented in Fig.2



Fig.2 Working Model

The pressure inside the cylinder will be sensed by the sensor and it will be communicated to the GSM module. The output of the pressure sensor is analog signal, which is converted into digital signal by amplifier. This weight is sensed by the load cell and it pressure reaches the threshold value the controller sends the message to the autodialer. Cylinder .he 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. 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. It is proposed by I.Juvanna et al, 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. 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 autodialer 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 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. The detailed photo of the hardware implementation is shown in Fig.3

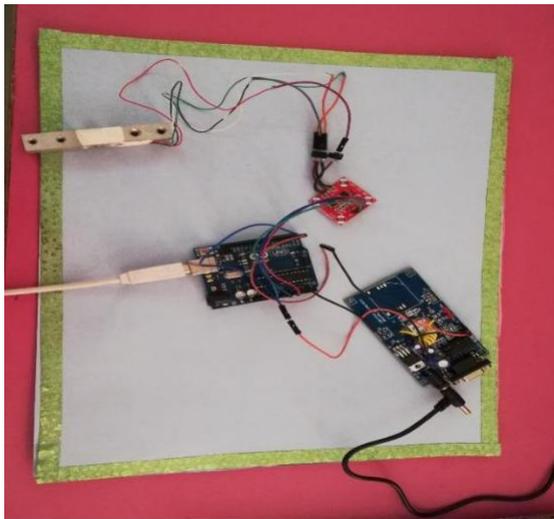


Fig.3 photo of the hardware implementation

IV RELATED WORK:

The pressure can also be measured by applying the Euler Bernoulli Theorem, where the gas cylinder is knocked using a hammer and the acoustic vibration is related to the pressure inside the cylinder. 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. Euler-Bernoulli 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.

V. CONCLUSION:

The development of the pressure detection schematic gives the information about the change in weight and pressure of the container, the weight range of gas inside the cylinder and alarms the user. Continuous

measurement was done by using a load cell. The updated value is displayed as message in the user's mobile. The gas leakage if any is detected by the specific sensor and alarms the user.

REFERENCES:

- [1] M. Amabili, "Free vibration of partially filled horizontal cylindrical shells", *Journals of sound and vibration*, vol.191, no.5, pp.757-780, 1996.
- [2] D. Donlagic, M. Završnik and Dali Donlagic, "Low frequency acoustic resonance level detector with neural network classification". *Sensors and Actuators A* vol.55 (1996), pp. 99–106.
- [3] Denis.A.Olchanski, sergey A.Levykh, "Multipurpose Control system for Control Algorithms Research".
- [4] K.T.Chan, T.P.Leung and W.O.Wrong, "Free vibration of simply supported beam partially loaded with distributed mass", *Journals of sound and vibration*, vol.285, no.4-5, pp.1039-1048, 2005.
- [5] k.shannon, X.Li, Z.Wang and J.D.N cheeke, "Mode conversion and path of acoustic in a partially filled with liquid", *Journal of sound and vibration*, vol.195, no.3, pp.303-307, 1999.
- [6] P.B.Goncalves and N.R.S.S. Ramos, "Free vibration analysis of cylindrical tanks partially filled with liquid", *Journal of Sound and Vibration*, vol.195, no.3, pp 429-444, 1996.
- [7] I.Juvanna et al, *International Journal of Computer Science and Mobile Computing*, Vol.3 Issue.2, February- 2014, pg. 591-595 © 2014, IJCSMC
- [8] M.A.Jacobs, R.Breeuwer, M.F.Kemmereand J.T.F.Keurentjes, "Contact less liquid detection in a partially filled tube by resonance". *Journal of sound and vibration*, vol.191, no. 5, pp.755-780, 1996.
- [9] K.T.Chan, J.Z.Zhang and W.O.Wrong, "Free vibration of simply supported beam partially loaded with distributed mass", *Journals of sound and vibration*, vol.285, no.4-5, pp.1039-1048, 2005.