INNOVATIVE DESIGN AND SIMULATION OF GAS LEVEL DETECTION SYSTEM IN LIQUEFIED PETROLEUM GAS CYLINDER FOR INDIAN HOUSEHOLD APPLICATION

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Abstract- Liquefied Petroleum Gas (LPG) is essential one for all cooking applications. Probably all of us are in too much problem when the gas cylinder gets emptied during the peak cooking hours. This paper explains to get accurate measurements about the gas available in LPG cylinder by using decreasing pressure level due to consumption of the gas. The paper involves the pressure sensor which is used to calculate the level of the gas left inside the cylinder. The output signal from the pressure sensor is given to the ARDUINO, where the voltage corresponding to the gas pressure is stored. The same signal is displayed in the LED, which is connected to the output port of the controller to show the amount of LPG left in the cylinder.

Keywords- 1-Liquefied Petroleum Gas, 2-Pressure sensor 3-MPX4115, 4-ARDUINO

I. INTRODUCTION

Liquefied petroleum gas has got a wide range of application across the world. It has applications both in domestic usage in cooking and for heating. We were in much difficulty when the cylinder runs out of fuel gas. Hence it is essential in the busy world, to measure the decrease in weight of the gas cylinder. It is made possible by using pressure sensor. Liquefied petroleum gas (LPG) is mixture of propane and butane which also contains a little amount of methane, ethane and other components. LPG has got a wide range of use as a fuel in thermal units of municipal, industrial and agricultural objects and also as a motor fuel. For accurate measurement of LPG parameters, specifically its mass is one of the very important under the LPG storage in cylinders. The density of LPG depends on its temperature and composition. It is not possible to provide highly accurate LPG counting by mass using traditional measurement methods because of absence of data on LPG density. Hence we have to use Pressure sensor. The fact that there exists a big vertical temperature gradient in a LPG cylinder under operation of pump-compressor. So it is not appropriate to consider the LPG density and mass in every layer along the height of a reservoir.

II. ARDUINO

To monitor the Liquefied Petroleum Gas, an efficient and fast working microcontroller is needed. The Arduino is also used to control the working of the gas sensor and its output. The Arduino used in this project is Arduino-R3 and has built in RAM, ROM, Serial Port, Input Output ports, Timers , clock circuit and interrupts. Its special features are it can operate in three modules 1.PWM, 2.capture, 3.compare. The arduino operates at a voltage range of 7 V to 12 V. LED is connected to one of the ports, for displaying the level of gas in cylinder. It is made possible by using pressure sensor. The output of pressure sensor is feed to a analog to digital converter .The ADC converts the analog output of the pressure sensor into digital signal and is the feed into a microcontroller.

The Uno is a microcontroller board based on the ATmega328P. If the sensor sense threshold value then the microcontroller must make an immediate action. The microcontroller is the brain of the system. The operating clock frequency of Arduino is 16 MHz. This arduino has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. timers and 4 input output ports.

III. PRESSURE SENSOR

The basic principle of a pressure sensor is based on the concept of bending of membrane caused by the pressure in a liquid or gas. The membrane used in pressure sensor is a very thin conductive screened layer that follows the bending of the membrane. The pressure sensor used in this project is MPX4115-Integrated silicon pressure transducer for absolute pressure.

IV. SYSTEM OVERVIEW

The block diagram of the proposed system comprises of parts as shown in figure bellow. It consists of Arduino(arduino-r3), pressure sensor(MPX4115), analog-to-digital converter(ADC0804), RF-module(M145026-27), LEDs.

Fig-1: F
V. WORKING PRINCIPLE OF THE SYSTEM:

The pressure sensor MPX4115 will sense the pressure inside the cylinder and will be communicated to the Arduino. Before the output of the pressure sensor is feed to the Arduino, it is given to the ADC0804 analog-to-digital converter. The output of the ADC is then fed to transmitter of the RF module. Here RF module used can transmit 8 bit of data. But if we have used it to transmit 4 bits of data. The receiver receives the 4 bit of data and then the arduino took the immediate response and the LEDs used to indicate the LPG level of the cylindrical valve. The pressure sensor gives the output as an analog signal, which when striking the cylindrical surface produces the electromagnetic wave. This EM wave is sensed by the pressure sensor and it is communicated to the arduino through the RF module. Once the pressure reaches the threshold value the controller sends the message to the arduino.

VI. SIMULATION RESULT

Figure-2 shows the schematic of the pressure detection system. The transducer output is given to the Arduino. The Arduino instruction set is suited to implementation of fast lookup tables in the program space. The threshold value is set in the arduino. When the value of the pressure goes less than or equal to the threshold value the signal will be given to the LED and the LED blinking occurs. Here we have used 4 LEDs which are connected in parallel to represent the level of LPG gas. These lookups take one instruction and two instruction cycles. Optimization is facilitated by the relatively large program space of the arduino and by the design of the instruction set, which allows for embedded constants. Execution time of the arduino can be accurately calculated by multiplying the number of instructions by two cycles; this simplifies design of real-time code.
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CONCLUSION

The development of this pressure detection schematic system gives the information about the change in pressure that occurs in the container, the pressure range of LPG gas inside the cylinder and indicates the user. Continuous measurement of the pressure in the cylinder was done by using a wireless pressure sensor inside the cylinder. The updated level is displayed by the LED-output and the blinking is enabled as the threshold reaches.

REFERENCES