

Design and Fabrication of LPG Drain Gesture

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Abstract - Nowadays there is a shortage of gas cylinders, so we have to book the cylinders before it gets emptied. Many times it happens that because of rush or due to the inadequacy of cylinder, there happens to be a delay in providing the gas cylinder to the customers. The main reason for this delay is that the information is passed to the service provider only after the cylinder gets empty. Most of us face many difficulties when the gas cylinder get emptied during the peak cooking hours. Our project intends to create awareness about the decreasing weight due to consumption of gas. Continuous measurement of weight can be done using a load cell as a measuring device. To monitor the liquefied petroleum gas continuously and effectively a fast working micro-controller is needed. Hence PIC controller is used to controlling the working of the load cell and its output. If the sensor sense threshold weight then the micro-controller it will make an immediate action by alerting the user. In this system, the load cell sensor is used to measure the weight of gas and its output is provided to the PIC controller and the weight will be displayed in the LCD Display, which is connected to the output port of the controller. A threshold weight is set in the controller and once the weight gets decreased below the threshold weight is reached, the micro-controller gives the signal to the buzzer which intimate's the user. To add up a safety in this we are using a leakage sensor at the outlet of the cylinder which is connected to an Arduino system. If the safety system detects leakage it shuts OFF the electrical supply of the house and alarms the user by means of an alarm. This can help in a large-scale prevention of LPG burst accidents and can save human life.

Keywords: Load Cell, PIC Controller, Arduino, LPG Cylinder, Leakage Detection

I. INTRODUCTION

A. Load Cell

Load Cell is a physical element (or) transducer which can translate pressure into an electrical signal. Load cells are used as the heart of weighing machine (or) electronic scales. Thus they are highly accurate providing the user with the required information. These transducers are used because the data can't be obtained or difficult to be recorded from other technologies.

Load cell measures strain which gets converted into force and then to electric energy which is served as a reading of the measured value for the scientists. The strain measurement by load cell helps to maintain the integrity of the object or

measure and under pressure thus protecting the people and also the equipment nearby.

The usage of load cell does not stop with electronic scale but also extends to industrial scales, load testing machines, flow meters, etc. They are basically attached to a support beam (or) structural bearing of an application to which endures pressure and stresses.

Load Cell uses different types of operating principle namely pneumatic load cell, strain gauge load cell and hydraulic load cell.

B. Double Bending Beam Load Cell

Bending beam load cells are often used for a maximum load up to 5 tons. The type of load cell type used for our project is Double Bending beam load cell. It is coupled via rigid elements on the clamping side and also on the load application side. The S-shaped deformation on the load cell provides the strain zones on the surface.



Fig. 1. Double Beam Load Cell

II. COMPONENTS USED

The Main components used are:

- Load Cell
- PIC Controller
- Buzzer
- Battery Supply(6V)
- LCD
- Gas Leakage Sensor
- Arduino Board

III. COMPONENTS DESCRIPTION

A. Pic Controller

Micro-controller is a device, which accommodates large number of the components of a microprocessor system into a single chip. A Micro-controller consists of a CPU, memory space, and all the peripherals needed to make it as a mini computer. It has a

- Inbuilt CPU
- Memory Space (both ROM and RAM)
- Parallel digital Input/output

Micro-controllers also consists of other devices namely:

- A timer module which helps the microcontroller to perform specified tasks for a time period.
- An input and output port which allows the flow of data between the controller and other devices namely a PIC or another microcontroller.
- An ADC allows the microcontroller to accept analog input data for processing.

Micro-controllers are usually:

- Smaller in size
- Reduced Power Consumption
- Minimal Cost

A microcontroller is a stand-alone unit that can function without the requirement of input and output ports or external memory. The CPU core is the central part of the micro-controller. Traditionally micro-controllers are been based on an 8-bit microprocessor unit. But in recent years, they are developed on specifically designed CPU cores (i.e.) PIC microcontrollers which have specially designed CPU cores for better performance.

IV. INTRODUCTION TO PIC

The micro-controller from PIC series is utilized for our work since there is a requirement for continuous monitoring. PIC microcontroller is made up of a complementary metal oxide semiconductor (CMOS) and also the first RISC based micro-controller that uses the separate bus for instruction and another bus for data allowing simultaneous access of both program and data memory. The main advantage of lower power consumption can be availed by the combination of CMOS and RISC micro-controller. This results in tiny chip size with a small pin count and thus it resists the noise when compared to any other fabrication techniques.

PIC (16F877)

There are different types of memories which are offered by Various microcontrollers. Some of the memories which are often used are EEPROM, EPROM, FLASH, etc. In these types the newly developed memory is FLASH. This technology is preferred to be used in PIC16F877. It has advantage of data

retainment when the power is switched off and also Easier Programming and Erasing.

A. Pic Start Plus Programmer`

The PIC start plus development system which is based upon microchip technology facilitates the product development engineer with a highly flexible low-cost microcontroller design toolset for all microchip PIC micro devices. It also gives the product developer the ability to program the micro-controller using software. The complete architecture of PIC 16F877 is shown below.

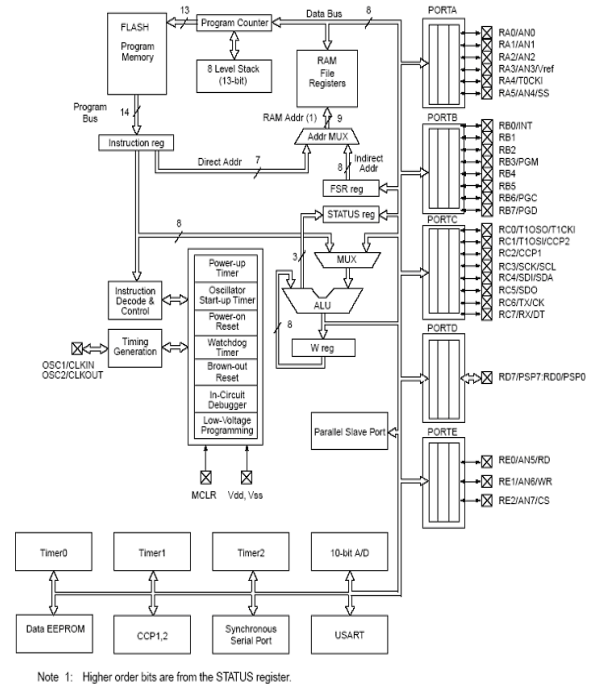


Fig. 2. Architecture of PIC 16F877

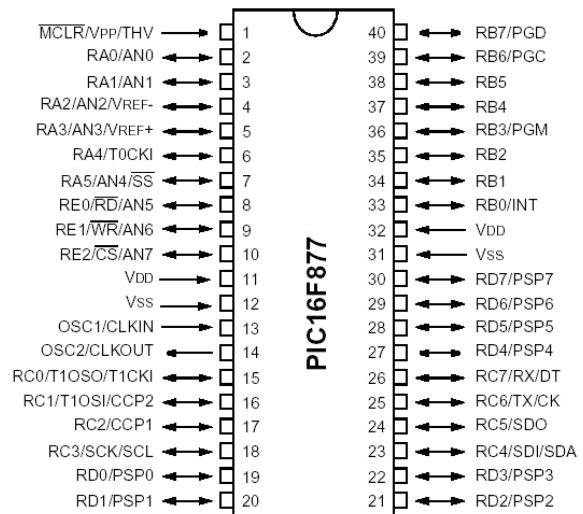


Fig. 3. Pin Configuration of PIC 16F877

B. Battery

A battery consists of one or more voltaic cells, whose primary function is to produce electrical energy by the conversion of chemical energy. The two half cells connected in series by means of conductive electrolyte, each cell has a positive terminal, and a negative terminal. They are immersed in a solid or liquid electrolyte as they do not touch each other. Here the conductor is the electrolyte connects the half-cells. It contains the ions which reacts with the chemicals of the electrodes. Thus Chemical energy is converted into electrical energy by chemical reactions that transfer the charge between the electrode and the electrolyte at the point of their interface. These transfer of charges is called as faradaic reaction and are responsible for current flow through the cell. If the transfer of charge occurs at an Electrode and an electrolyte interface, it is called as non-faradaic reaction. The lead-acid cell of regular car batteries "run down" when sitting unused due to Non-faradaic reactions.



Fig. 4. Battery

C. Buzzer

A buzzer or beeper is a signaling device, which has various applications in automobiles, household things like a microwave oven and is usually electronic. It inheres a number of switches and sensors which are connected to a control unit that determines when to sound a warning sign either in a continuous or intermittent way of buzzing or by means of a beeping sound. These devices are based on an electromechanical system which is similar as an electric bell.

Alarm description

5Volt Passive beeper

1. The Arduino output pin drives this small sound module.
2. A single pulse of current will make it click, and continuous pulses will cause an output of tone, and the frequency can be controlled.

3. Many different sounds can be made which can be selected from the Arduino TONE library. It is not a full-range speaker.

D. LCD Display (Liquid Crystal Display)

LCD (Liquid Crystal Display) screen has large applications, and it is an electronic display module. The very primary module is used in various devices and circuits is 16x2 LCD. These modules are used for the reason of LCDs being economical, easily programmable, have no limitation of displaying.

A 16x2 LCD is capable of displaying 16 characters in a line and for two lines. Command and Data are the two registers of an LCD. Each character shown in a LCD is of 5x7 pixel matrix.

The command instructions given to the LCD are stored in the command register. The directions are given to LCD to perform the predefined task like starting the display, clearing the screen, setting the cursor position, controlling display, etc. The Data Register stores the output which has to be displayed. The data is the ASCII value of the character to be displayed on the LCD.

E. Gas Leakage Sensor

LPG is a mixture of Butane and Propane. These two gases are odorless and in order to smell their leakage Ethyl Mercaptan is added. Here we use an MQ-6 Gas leakage sensor which is highly sensitive towards LPG and it's resistance changes when the concentration of the LPG changes.

Specifications of MQ-6:

- Analog output voltage: 0~5V.
- Higher sensitivity to propane, butane, LPG, etc.
- Highly reliable which provides faster response.
- Working voltage: 5V.



Fig. 5. Mq-6 gas leakage sensor

F. Arduino Board

Arduino UNO is one of the robust board of the Arduino family. It is a ATmega328P based microcontroller board based and has 14 digital input/output pins, 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer

with a USB cable or power it with an AC-to-DC adapter or battery to get started.



Fig. 6. Arduino Board

IV. BLOCK DIAGRAM

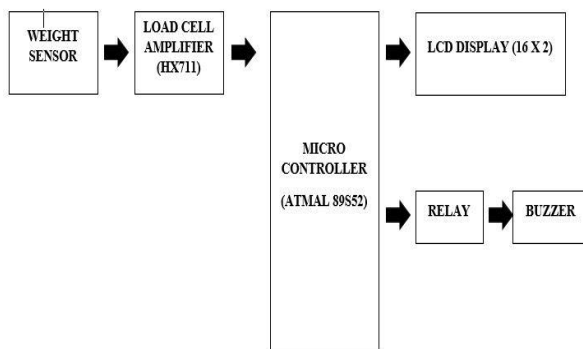


Fig.7. Block Diagram for Micro Controller ATMEL 89S52

V. WORKING PRINCIPLE

The working principle is as follows:

- The load (cylinder) is kept on the frame (i.e.) above the load cell.
- The deformation in the load cell which is the strain is converted into an electrical signal by the load cell.
- The output of the load cell is given to the Load cell amplifier (HX711) for amplifying the load cell reading.
- Then the electric signal is passed into the micro-controller (Atmel 89S52).

- When the value reaches the minimum threshold value, the micro-controller gives the alert to the buzzer.
- The output of the micro-controller is given to the input of the relay.
- The relay breaks the large electric current and supplies only the required current to the buzzer and buzzer beeps when the threshold is obtained.
- Another output of the micro-controller is given to the LCD Display for weight display.

VI. FABRICATED DESIGN

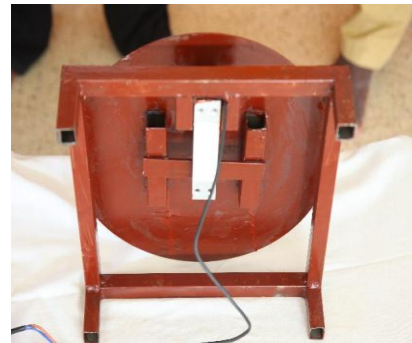


Fig. 8. Fabricated Design

VII. CONCLUSION

Thus, our project "LPG DRAIN GESTURE" is used to find the volume of gas drained, and also it helps to alert the user for prior booking to the service provider, thereby avoiding the difficulty of gas emptiness during peak cooking hours. It also adds up with the safety feature by using an Arduino system into for turning OFF the electrical supply during LPG leakage.

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