Load Cell Based Fuel Theft Detection System

Akshey Sharma, Pankaj Sharma, Divyanshi Bhardwaj, Deeksha Mishra, Ankita Soni

Department of Electronics & Communication, Moradabad Institute of Technology, Moradabad, India

E-mail: aksheys15@gmail.com, pankaj354518@yahoo.com, mishrasdeeksha29@gmail.com, ankita345v@gmail.com, divyanshibhardwaj007@gmail.com

Abstract

In this project we focuses on creating a universal digital display of the exact amount of fuel contained in the vehicles tank and also helps in cross checking the quantity of fuel filled at the vehicle fuel tank even if the vehicle is off at the time of filing of fuel by measuring the weight of the fuel. Here, we are indicating the amount of fuel in the tank in liters. This value in liters will be in numerical digits. As we say the device is universal so can easily be installed in any two wheeler automobile.

Keywords: Microcontroller, load cell, load cell amplifier, LCD, GPS module

INTRODUCTION

In the recent times we are constantly hearing about petrol filling station frauds. Most of the petrol filling station today has manipulated the pumps such that it displays the amount as entered but the quantity of fuel filled in the customer's tank is much lesser than the displayed value, i.e., the pumps are manipulated for the benefit of the petrol pump owner. This results in huge profits for the petrol bunks but at the same time the customers are cheated. All the vehicles in India consist digital blinking meters hence, it is not possible to precisely know the amount of fuel currently in the vehicle and also it is not possible to cross check the quantity of fuel filled in the vehicle tank.

This project focuses on creating a universal digital display of the exact amount of fuel contained in the fuel tank and helps in cross checking the quantity of fuel filled in the fuel tank of vehicle if the vehicle is off at the time of filling of fuel by measuring its weight. Basically, we are indicating the amount of fuel in the tank in liters. This value in liters will be in numerical digits (ex: 1.2, 1.3, 1.4 liters). Since, the device is universal, so can be easily installed in any two wheeler automobiles [1].

This project mainly concentrates about the indication of fuel level in two-wheeler tanks. Various other features like the distance that can be travelled by the corresponding fuel are added with this arrangement which will explain the clear performance of the vehicle to the corresponding fuel. In addition, for the vehicle security purpose we are installing a GPS system for continuous tracking of the vehicle position [2].

PROPOSED SOLUTION

This project focuses on creating a device which can help to actively display the exact amount of fuel and track the position of the vehicle in real time. It involves the making of the system to provide an indicator which is reliable, easy to read, also works when the vehicle is off at the time of filling and of dependable/compatible overall design. The system comprises of Fuel tank, Load Cell, Load Cell, Battery, Microcontroller with LCD display which are interfaced to give the output in highly accurate digital value [3, 4]. This can be seen in the block diagram given below where the connection of each part is explained.
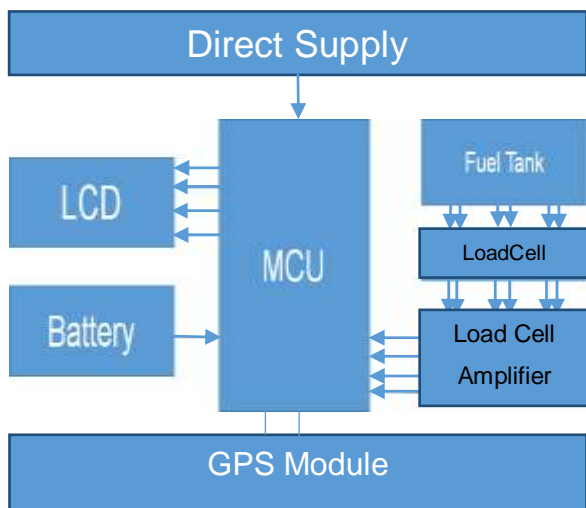

Fig. 1: Block Diagram of Proposed Idea Block Diagram.

Our procedure can be described accurately in the following block diagram:

1)   We intended to measure the total weight of the fuel tank.

2)   Eliminate the weight of the empty fuel tank (which we already take in account).

3)   Convert the weight into liters.

4)   Than display the finally possessed readings on the LCD screen.

5)   It also controls the GPS module to track the position of our vehicle.

COMPONENT

A short description of our parts used in this project is as follows:

Load Cell
The heart of any weighing system is the load cell. We have used load cell because load cells are highly accurate transducers which provides the user with information not generally obtained by other technology due to commercial factors. Load cell are of various types and even in these types there are major variations. We are using strain gauge load cell here. The sensing element is designed in such a way that it develops a strain, directly proportional to the load applied. The force applied can be identified
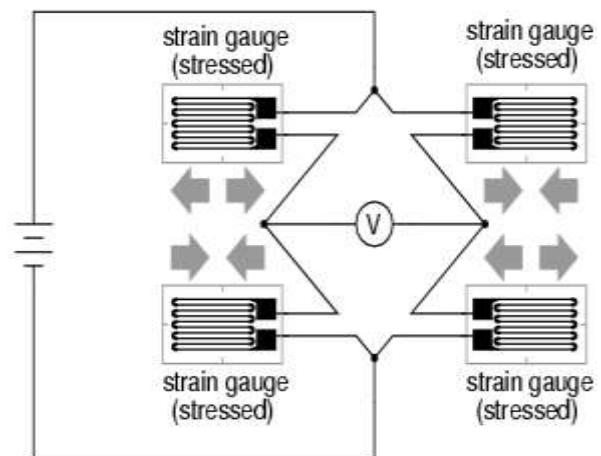

Fig. 2: Full Bridge Strain Gauge Circuit.

in terms of resistance change. The strain gauges, usually four or a multiple of four, are connected into a Wheatstone bridge configuration in order to convert the very small change in resistance into a usable electrical signal.

Load Cell Amplifier
The load cell is the main element of our project but the voltage generated by the load cell is very small; generally in millivolts or microvolts; which is much difficult to detect by the microcontroller. So, we use a load cell amplifier to maintain a detectable amount of voltage for microcontroller. This amplified voltage work as the primary input or better say as raw reading for the micro controller [5].
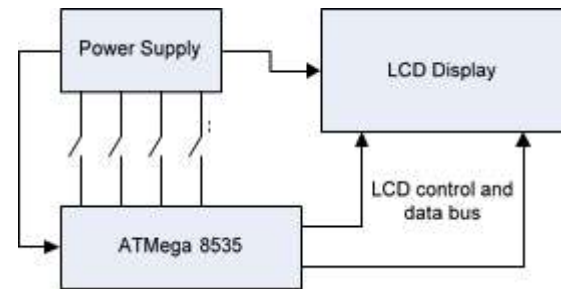
Microcontroller
The overall processing is done here in the microcontroller. The microcontroller does here multiple works such as:
 1) Taking raw input.
 2) Process it according to our need.
 3) Interface with the LCD.
 4) Maintain the initial zero (eliminate the weight of empty fuel tank) condition for exact calculation.
 5) Also choose between the power supplies.
 6) Perform other additional tasks.

LCD
The full name of LCD is Liquid Crystal Display. As the name implies it is use to display the information which is processed by our microcontroller and sent to it [6, 7].

Fig. 3: Interfacing of LCD with Microcontroller.

GPS Module
The Global Positioning System Module or simply GPS module is used for tracking the position of vehicle in case of any miss happening [8].

Secondary Battery
The secondary supply is used when the vehicle is off or unignited, which helps us to tally the amount of fuel filled at petrol pumps the same time [9].

CONCLUSION

This project may be developed as a universal fuel meter due to its principle of weight in kilograms to liters conversion to a précised value. As in this project are taking the average from multiple inputs that is from the various sensorsthat we are using at the bottom of our vehicle's fuel tank and then the input is fed to the microcontroller giving a high accuracy weight output which is further is used to take high accuracy output in liters. Hence the accuracy of the value in liters gets increased to an optimum value using our device. This project will serve for other purposes. Another major advantage of this device would be GPS tracking of a vehicle in cases of vehicle theft so that we

could easily track the location of the respective vehicle and trace vehicle location.

FUTURE SCOPE

We can implement it in four wheelers also. With the evaluation of technology the design of this device allow its size to be reduced. So, we can adjust the system in more complex vehicles and provide some more space for other parts and designing.

REFERENCES

1. Udayavalli, M. Omamageswari. Embedded system based intelligent digital fuel gauge. *IPASJ International Journal of Electronics & Communication (IIJEC)*. 2014; 2(12).

2. A. Avinashkumar, U. Singaravelan, T. V. Premkumar, K. Gnanaprakash. Digital fuel level indicator in two-wheeler along with distance to zero indicator. *IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE)*. 2014; 11(2): 80–84p.

3. Awadhesh Kumar, Sandip Kumar Singh. Digital fuel indicator in two wheelers. *International Journal for Scientific Research & Development*. 2015; 2(12).

4. V. S. Chavan, R. Askhedkar, S. B. Sanap. Analysis of anti vibration mounts for vibration isolation in diesel engine generator set. *International Journal of Engineering Research and Applications (IJERA)*. 2013; 3(3): 1423–1428p.

5. Wilmar Hernandez. Improving the response of a load cell by using optimal filtering. *Sensors*. 2006.

6. Pooja Soni, Kapil Suchdeo. Exploring the serial capabilities for 16X2 LCD interface. *International Journal of Emerging Technology and Advanced Engineering*. 2012; 2(11).

7. Mr. Khalid I. Saad, Ms. Nusrat Afrin, Mr. Rajib Mikail. Design and implementation of a microcontroller based LCD screen digital stop watch. *International Journal of Electrical, Computer, Energetic, Electronic and Communication Engineering*. 2011; 5(2).

8. Pankaj Verma, J.S Bhatia. Design and development of GPS-GSM based tracking system with google map based monitoring. *International Journal of Computer Science, Engineering and Applications (IJCSEA)*. 2013; 3(3).

9. Ruchi Selot, Arun Kumar. A review of automatic switching by using PLC system. *International Journal of Digital Application & Contemporary Research*. 2015; 4(3).