

FUEL LEVEL INDICATOR FOR PETROL BUNK STORAGE TANKS/OIL INDUSTRIES

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Abstract - There is an actual problem in the Petrol bunk storage tank and Oil industries to monitor quantity of fuel remained in the tank. Though there are various methods to monitor the quantity of fuel namely Dipsticks, level sensors, float switch, load cell, analog and digital meters, Dipsticks are widely used and it is a manual work. To overcome this issue, this system is proposed to know the amount of liters present inside the tank with the help of Ultrasonic sensor and GSM to indicate the level in case of full/empty and theft.

Keywords- Peripheral interface controller (PIC), Ultrasonic sensors, Global System for Mobile Communication (GSM), Liquid Crystal Display (LCD).

1. INTRODUCTION

Vanav digital fuel indicator is the first digital fuel level indicating system in India. . The Oil Level Indicator was introduced in need of maintenance gauge the oil level inside large tanks, gearboxes and reservoirs. Oil sensors are used in automotive and industrial applications to gather or send valuable information. They can range from a simple, float-type oil level indicator to a complex, Dipsticks were widely. It is a manual work. Suspend the stick inside the tank, the level is measured approximately. The fuel level cannot be displayed in liters. The mechanical sensor is the widely used sensor. The principle behind magnetic, mechanical and other float level sensors involves the opening or closing of a mechanical switch, either through direct contact with the switch or magnetic operation of a reed. The magnetically actuated float sensors, switching occurs when a permanent magnet sealed inside a float rises or falls to the actuation level. With a mechanically actuated float, switching occurs as a result of the movement of a float against a micro switch. The choice of float material is affected by temperature-induced changes in specific gravity and viscosity such changes directly affect buoyancy.

Using float-style sensors with very high-viscosity oil have a tendency to form sludge and varnish, or heavily contaminated oil. Other sensors are better suited for these applications. Use pneumatic level sensors where hazardous conditions exist, where the electric power use is restricted in applications involving heavy sludge or slurry. Since the compression of a column of air against a diaphragm is used to actuate a switch, no process liquid contacts the sensor's moving parts. These sensors are suitable for highly viscous liquids such as grease.

Basically two types of measurement technique is available that are intrusive and nonintrusive methods. Liquid level is an accurately measured by nonintrusive optical sensing method. Liquid level is measured which is mostly included resistive, capacitive, transducers. But these methods are not suited for fuel measurement. Because they have poor sensitivity, susceptibility and external noises. To overcome the disadvantage, fiber -optic liquid level sensors were introduced. Fiber-optic liquid level sensors having better sensitivity, and also reliable to measure the liquid level. Basic principle of sensor is that light is transmitted to the media and reflected back. In the intrusive method light is transmitted and reflected back to same media .intrusive probe is used to transmit the light to the media. Contact and Contactless are the two methods of Liquid-level. The methods are used to measure liquid level directly by placing a sensor that comes into contact with the liquid.

On the other hand, Contactless methods, such as optical and ultrasound sensing, measure liquid level without having to contact the liquid. Contactless methods are complicated than contact methods. There is lot of sensors available for the fuel Measurement. Instead the fuel meter indicates three states of level which are Half, Full and Empty. Lack of accuracy and performance of the meters. To know the exact amount of fuel, this new system is proposed. Two sensors are used so that the accuracy is achieved. The accurate liters of petrol is been calculated. Instead of dipstick the sensor is used so that the manual work is been decreased and the annual amount for the worker is decreased. The analog indicator system may lead to lack of accuracy, whereas the digital circuit, indicate the correct amount of fuel inside the underground tank. Level measurement devices can detect, indicate and help control liquid or solid levels. Level measurement devices can be classified as direct, or mechanical, measurement and electronic measurement. Level measurement devices can be used for continuous monitoring of fluid level, or point-level monitoring. In point-level monitoring if the fluid level has exceeded a high point, it cause a spill, or if below a low point, it mean the system is close to running on empty.

2. EXISTING SYSTEM

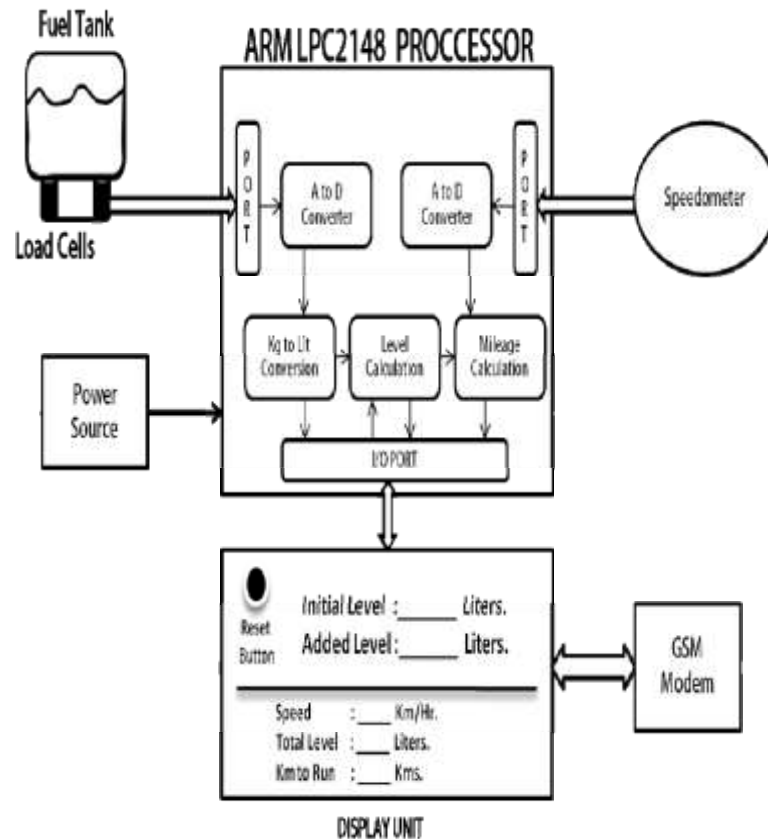


FIGURE 1. EXISTING SYSTEM

Liquid level measurement is necessary for different application such as Petrol bunks, oil industries, automobile industries, etc. There are various type of methods for measuring liquid level from those using capacitive sensors, optical sensors methods, mechanical float to ultrasound methods. The above mentioned types are not in accurate manner. General capacitive liquid-level sensors method measures the electrical capacitance between two electrodes immersed in a liquid and calculate the liquid level from the capacitance value. Optical sensors can measure liquid level without having to contact the liquid by image processing. By using ultrasound sensors, liquid level can be calculated from the range between the sensor and liquid surface. However, these sensors cannot be used for sealed containers and accurate measurement values are not possible, similarly consider same as in the fuel level measurements. The existing system measure the accurate level using load cell and displays with help of digital display. It is capable of transmitting information to vehicle owner through GSM.

Initially the load cell is fixed under the fuel tank with the help of vehicle and the display unit is fixed in the Dash Board. Click the reset button which is present in the display unit, once enter inside the petrol bunk. Then the load cell measures the weight of tank with fuel and sends the value to the Controller LPC2148. This converts the weight value into liters. The output from the controller is displayed in display unit. After that the adding fuel will automatically measured and displayed in unit as added level. This will help us to find the exact amount of fuel added in our vehicle tank at the time of fuel filling in bunk. Simultaneously, Speedometer will interface for measuring the remaining Kilometers to run with remaining fuel. The system reduces fraud/theft in the petrol bunk.

The conversions is carried out by the ARM processor. There are formula to calculate the exact value of fuel level. Each fuel have density value, depending upon these density value the conversion process is taken place. This density value may vary depending upon the current temperature level. Fuel such as petrol, diesel, gasoline are used for the vehicles in our daily use and calculations are made. Density means thickness of fuel, initially crude oil having higher density from that different fuels are separated by the process and distributed in various applications Hence the petrol and diesel have some set of density value and calculations are made by the formula according to it. The ARM processor process and displays the values on display unit within a second.

Disadvantages of Existing system are it requires continuous electric energy for the production and display of signal .

It also requires an amplification circuit for the generation of display because the signals produced by the gauge itself are of very much low voltage almost in milli volts. It cannot be used highly reactive or corrosive materials because they can damage the gauge. It cannot be used for the measurement of very high pressure if the diaphragm use is made of plastic. The block diagram of the Existing system is shown below in FIGURE 1. The level calculation and the conversion of weight into liters is a tedious process

and needs formula to be calculated. The calculations may vary according to the density of various fluids. An error may occur in case of failure of load cell as it easily affected by external contaminants and dust particles.

Lack of accuracy in case of changes in any physical parameters of the components. Thus the existing system is to find to the accurate level while filling the petrol and to eliminate the fraud of fuel. It is mainly used in speedometers of both four wheeler and two wheeler.

3. PROPOSED SYSTEM

The Concept of the proposed system is to find accuracy of fuel level in the tank and to eliminate the manual work. In proposed system we use two ultrasonic sensors rather than using the load cell in the tank. This will provide us the accuracy toward the petrol inside the petrol tank. Usually the owners will use dipstick to measure the petrol level. By the use of this proposed system the manual work is been reduced. The accuracy of petrol will be shown in liters. The buzzer will indicate when the petrol is full or half or empty. The GSM modem will send the message when the petrol is full or half or empty. The block diagram of proposed system is shown below in FIGURE 2.

Ultrasonic sensors is known as transceivers, which evaluates target by interpreting the echoes from radio or sound waves. The function of ultrasonic sensors is to generate high frequency sound waves and evaluate the echo which is reflected back by the sensor. Sensors calculate the time interval between sending and receiving the echo to determine the distance to an object. To measure tank, the sensor measures the distance to the surface of the fluid/liquid. PIC microcontrollers are electronic circuits that can be programmed to carry out specific task. They can be programmed to be timers or to control a production line and so on.

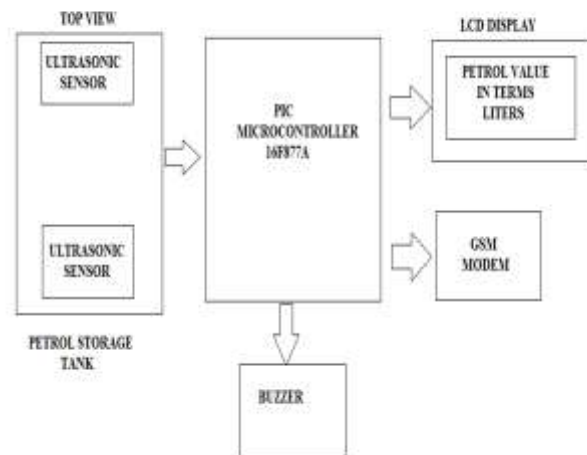


FIGURE 2.PROPOSED SYSTEM

GSM is digital cellular technology used for transmitting mobile voice and data services. It was developed as a digital system using time division multiple access (TDMA) technique for communication purpose. It is used send message to indicate the fuel level. A LCD is used to display the fuel level with the help of PIC microcontroller 16f877a.

A buzzer act as an alarm to be aware of empty or if the fuel becomes full. The working of proposed system placing two Ultrasonic sensors inside the petrol storage tank. By calculating the mean value of both the ultrasonic sensors accuracy is achieved.

PIC microcontroller 16F877A is used and coding can be done according to the tasks using HEX files. With the help of Microprocessor, the value of liters are displayed in LCD. GSM is connected to indicate the level of fuel states.

This is based on commercial purpose used all over the areas. Used in vehicles like lorry, government bus etc., It can be implemented for the theft detection in vehicles and bunks. The proposed system replaces the Load cell with Ultrasonic sensors for better accuracy and performance. The PIC microcontroller PIC16f877a is one of the most useful microcontrollers in the industry. This controller is very convenient to use, the coding or programming of is also easier. One of the main advantage, it can be write-erase as many times as possible because it use FLASH memory technology. It has 40 pins and there are 33 pins for input and output. It consist of two 8 bit and one 16 bit timer. Capture and compare modules, serial ports, parallel ports and five input/output ports are present.

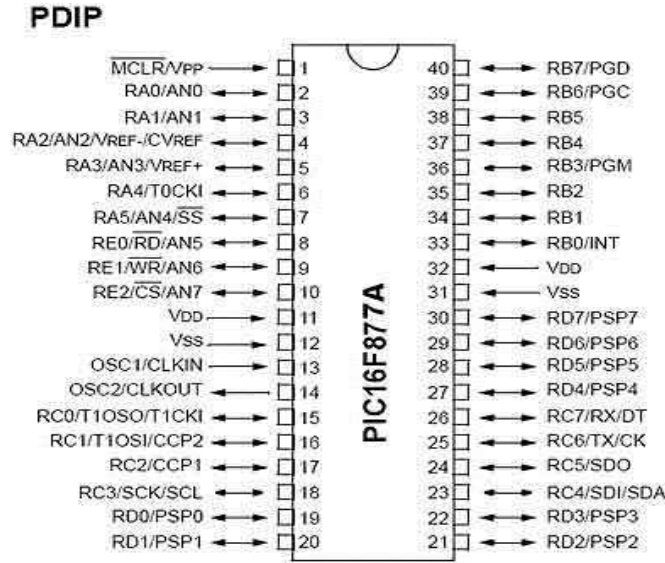


FIGURE 3. PIN DIAGRAM OF PIC 16F877A

4. SOFTWARE IMPLEMENTATION

Software implementation is done by Proteus 8 software using PIC microcontroller 16f877a. The coding for PIC microcontroller is designed using HEX files. The output is displayed in the LCD display in terms of liters.

Indication of petrol capacity –EMPTY

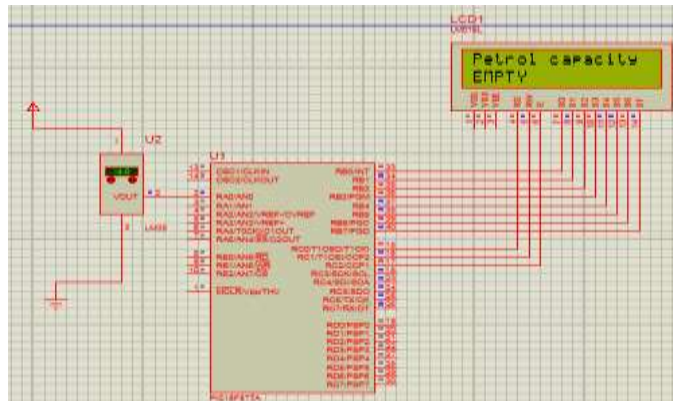


FIGURE 4. SIMULATION OUTPUT FOR EMPTY

This simulation output is indicating that the petrol capacity as empty. The LCD display will display the unit as empty when potentiometer is varied .

Indication of petrol capacity –100L

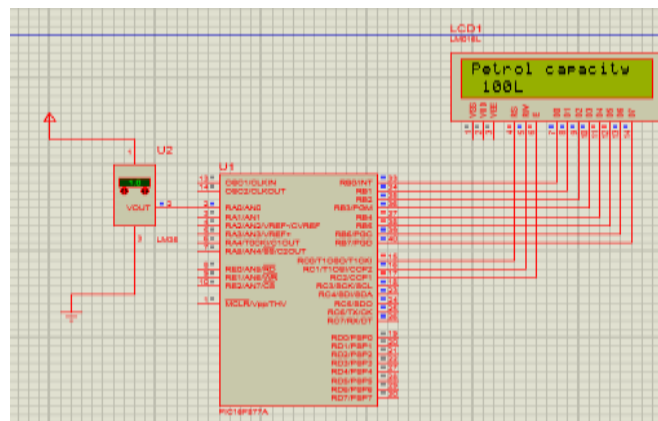


FIGURE 5. OUTPUT FOR 100L

This simulation output is indicating that the petrol capacity as 100L. The LCD display will display the unit as 100L when potentiometer is varied.

Indication of petrol capacity –900L

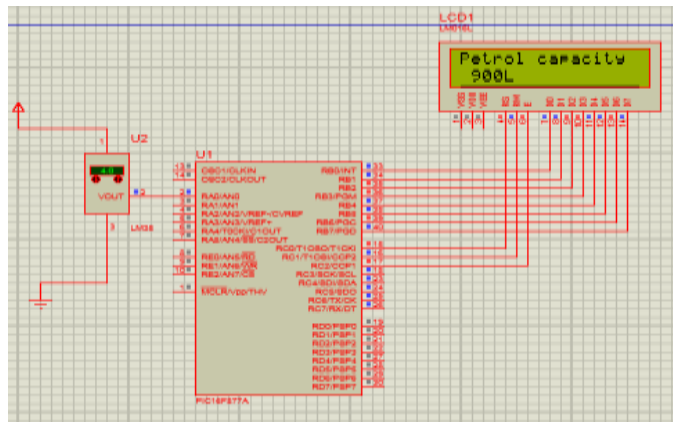


FIGURE 6. OUTPUT FOR 900L

This simulation output is indicating that the petrol capacity as 900L. The LCD display will display the unit as empty when potentiometer is varied.

Indication of petrol capacity –FULL

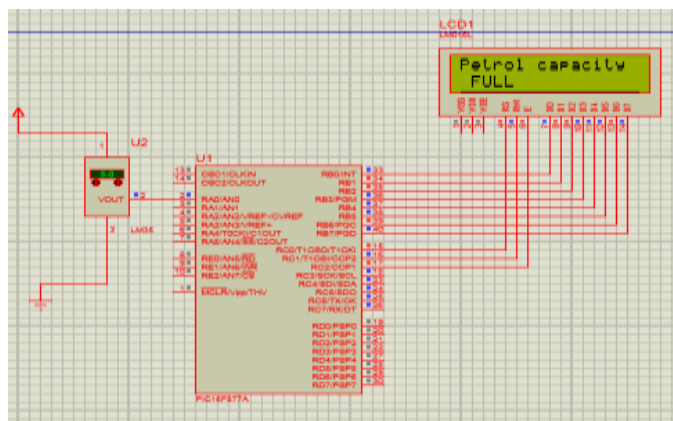


FIGURE 7. OUTPUT FOR FULL STATE

This simulation output is indicating that the petrol capacity as FULL. The LCD display will display the unit as FULL when potentiometer is varied.

5. CONCLUSION

Thus the Proposed system of fuel measurement using Ultrasonic sensor with PIC Microcontroller 16f877a is efficient and easy to use. It overcomes the disadvantages of other analog and digital meters. It can be implemented in Oil industries and Petrol bunk storage tanks to know the exact amount of fuel. The amount of liters will be displayed in the LCD. A buzzer to indicate the level is full or empty and an SMS alert to indicate the fuel level details and theft. It eliminates the manual work and achieve accuracy. This is based on commercial purpose used all over the areas. Used in vehicles like lorry, government bus etc., It can be implemented for the theft detection in vehicles and bunks.

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