FUEL MONITORING ON TANKS FOR LEVEL DETECTION AND PURITY CHECK – A SHORT REVIEW

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Abstract
The utilization of vehicles is rapidly increasing now a days and it leads to a huge problem of fuel availability thus giving rise to the petrol pump frauds. The machines at petrol pumps are manipulated in such a way that it shows the amount as entered but the quantity of petrol filled in the customer's tank is lesser than the desired amount. It clearly states that the petrol machines are tempered so that the owner can yield maximum profits. This technique provides huge profits to the owner but at the same time the customers are being cheated. The meters that our vehicles have are analog type and they are not capable of showing the exact value of petrol present in the tank and it is practically not possible for the customer to know the amount of petrol being added. In this project we intend to create a digital display that shows the exact petrol that is being added in the vehicle so that the customer can verify the readings at petrol pumps as well as their tanks. Adding more to this project, it can also calculate the average distance the vehicle can cover in the available amount of fuel.

Key Words : precise volume detection for fuel; digital display, mileage

1. Introduction
In the recent time, everybody is talking about the increased fuel prices but the issue of fuel burglary at petrol pumps remains unaddressed which is equally important, according to officials; attendants at petrol pumps alters fuel by 80ml to 100ml per liter and to execute these things they use different techniques such as distraction, deviation, adulteration in petrol and by placing electronic chips in petrol filling machines to eliminate this plunder we must take count of petrol being filled at customer's side and our system focuses on device along with an mobile application which will do this calculations for consumer. There is no such system which can give exact measurements about petrol added in the tank with such precision. Our proposed technology is based on sensor's and learning algorithms which will give accurate value of petrol being added to the fuel tank with existing fuel and that will monitor at the same time; it will also calculate the average distance the vehicle can cover in the available petrol. The adulteration is checked by the properties of fuel, if its slightly varied then alert is to be passed to the user.

our system will also monitor the condition of engine oil and it will provide alert to the vehicle user if an engine oil needs to be changed in many cases it has been observed that , vehicles owned by private firms or government patrolling vehicles they issues cash vouchers against hand written bills provided by the driver or the person who filled petrol at petrol pumps in company owned vehicles. they may provide false invoice with increased amount in cahoots with attendant at fuel station. to avoid this we are maintaining logs and also providing text message to authorized person about exactly how much fuel is dispensed in the tank and location and information of fuel station where the fuel is bought.

2. Literature Survey
The accuracy of the fuel level is not given the great importance in the past time. The motive behind calculating the fuel level has been to display the information on the dashboard where the customer can see the fuel level present in the tank with a fuel meter. Rather than providing accuracy to the fuel meters, the focus is on mainly two things to improve the display of fuel meter and the meter must indicate when the fuel is below the predefined level. These systems are not capable enough to show the exact value of fuel present in the tank. And these systems cannot help people from being cheated at petrol pumps. Thus, this flaw encourages the frauds at petrol pumps that yield profits of huge amounts. It has become necessary to develop a system that can digitally show the exact amount of fuel that is being added in the fuel tanks. At first, we will summarize the work of existing system with the technology used.

A. In first paper of literature survey the author Petr Petlach[1] focuses on the fuel system in aviation that is based on ultrasonic sensors. Ultrasonic sensors replaced float level sensors and capacitance level sensors in order to obtain high accuracy. The fuel level can be measured when the shape of the tank is regular and known. The precision of ultrasonic sensors forced industries to install aboard the aircraft.
Ultrasonic fuel level detection works on sound energy with coalition of liquid and air. COTS abbreviated as Commercial-off-the-shelf is the merit of the products that are configured at the end by the customer rather than the producer. The availability, economy and ease made us to select ultrasonic sensors over floating level sensors. Ultrasonic sensors can be relied and trusted in obtaining the accurate readings.

Experiments based on ultrasonic gave results under various conditions like temperature changes and vibrations. Equation (1) is for liquids, sound comprises of compressed waves, where, distance of target (d) is identified by product of speed of sound (c) and half of waves time (t).

\[ d = c(T/2) \ldots (1) \]

Equation (2) is equation by Newton-Laplace where twice of speed of sound (c) is gathered by ratio of liquid density (ρ) to elastic bulk modules (k):

\[ c = \sqrt{(k/\rho)} \ldots (2) \]

Experiments were held on cylindrical containers to measure the fuel level. Very vigorous and high extent of ultrasonic energy is needed to measure the level of fuel from the uppermost point of the tank.

New experiments were performed by placing ultrasonic transceivers on the top of tank. These experiments were compared with previous experiments performed on HC-SR04.

A HC-SR04 ultrasonic module consists of an ultrasonic transmitter, some other circuits and a receiver. This module works by emitting ultrasonic signals of 40 KHz, gets the mirror signals and then calculates time. The ultrasonic sensor is capable of measuring the distance between 0.02 to 4 meters. This unit is managed by Arduino.

As it concludes COTS sensor experiments were designed and tested for measuring ultrasonic level between 100 KHz and 300 KHz. To gain more precision and accuracy further experiments are carried out on COTS sensors. The inclination of the tank is considered and experiments are being held to cover this condition.

B. In second paper of literature survey the author Anwar Sadat [2] describes mixing of petrol with kerosene. This technique deals with the light that ushers inside an optical fiber, in which the cover of small length of the cable is removed, thus the fading rays deal with analyte. The light is transformed into current and the current is further transformed into voltage. This method is simple, condensed and mobile.

The benefits in the false way of mixing kerosene in the petrol are discussed in this paper. Purity of the petrol must be checked, as it affects the working of your vehicle and other appliances that work on petrol.

Fiber optic sensors are more beneficial than other non-optical sensors. They provide remarkable characteristics such as compact in size, lightweight and adding more, they does not need current at the point of sensing.

Petrol is usually mixed with kerosene as kerosene is economical and easily available. Adulteration of fuel leads to air pollution and several respiratory problems. Kerosene easily gets mixed with petrol without any change in chemical properties. There are different methods available for detecting adulteration in petrol like odor based method, filter test, ultrasonic testing etc.

The method explained in this paper is claimed to be more simple, compact and mobile in comparison to the available methods. An LED is fixed at one of the end that provides electromagnetic radiation from where absorption is to be calculated. The light emitted is acknowledged at the other end of the fiber and transformed into current using photo-diode.

It concludes that adulteration detection of the petrol with kerosene is determined. This paper explains the electronic technique to check the discussed problem. This technique can be used in monitoring the purity of petrol and diesel.

C. In third paper of literature survey the author K. Burak Dalci & Kayhan Gulez [3] describe that neural network is profitably used in a large number of areas such as pre detection of machine failures, control, etc. Feed-forward neural networks are normally instructed a back-propagation training algorithm first filed by Rumelhart, Hinton and Williams in 1986. This is the effectual use after the 1980s. Advantages of high-speed computing technology, NNs are more practical, easy to update and execute to distributed intelligence or associative memory properties of the network. With the network at first untrained, i.e., with randomly selected weights output signal mode will be fully mismatched than the required output mode for the given input mode. Actual output mode is balanced with the desired output mode, and weights are tuned by organized back-propagation training algorithm till the matching pattern occurs, i.e., the pattern delusion become acceptably small and the imposing edge of NNs is the ability of resolving highly nonlinear and complex problems and processing inaccuracies and noise data efficiency. In addition to the application of fuel levels, volume tanks are also units modeled by units. The model tank according to the size (that changes over time) the resulting tank is stored into the training phase of neural networks. Then, for any changes available structure and system training data is sensed and the necessary action is taken by the user. The input value for NNs are three dimensioned (in units for X, Y and Z) and Time (t: depending on date or year sensitive analysis and results) and output values Is bad sectors (B.S.) related to the dimensions and time.
In fourth paper of literature survey the author J. A. Goundar [4] describe that mechatronics design solutions has been solving practical problems for a generation of strategic business field in power station at Cawaira, substation Fiji electricity authority (FEA). Observing system development, design and automatic evaluation measuring and managing fuel levels of fuel were done at this substation, the supply tank was designed and the demonstration uses a physical model. The system is developed by using the pressure sensor, microcontroller, composed of an electromagnet valves and liquid pumps. In pressure sensor measurement, the pressure present inside the column is merged in the tank; it is then adjusted to the display level. The system is designed to read real-time data to calculate fuel level in the tank as well as programmed with critical events. In the event of such an event triggers an alarm of maximum safety limit due to low fuel in the tank and leakage of fuel lines. The system is being tested for measurement using manufactured models and systems and the results are verified by the measurements that are taken manually. The system is comparatively cheap and easy to develop, install and control. In addition to observing the fuel level, the system can be well suited to a variety of other measurements as well.

3. Proposed System

According to the current scenario, fuel gauge are use to detect fuel level and to display on fuel meter. It does not measure accurate amount of availability of fuel. There should be a precise way to display fuel availability. The frauds are become easy to do by using electronic chips in petrol filling machines and thus resulting in serious frauds. To overcome this problem we are going to compare incoming count of petrol to the consumer’s vehicle. Also, it has been observed that people often forget to change their engine oil, which results in degradation of engine performance.

In the proposed system, Printed Circuit Board is used in this system connected micro-controller. PCB is connects with fuel level detection module, adulteration testing module and oil quality check module, also the GPS and GSM kit installed to PCB. PCB connects Bluetooth to access the network with android application. The calculation phase works on android application to display precise information to user. The device notifies owner of current status through SMS alerts.

4. System Modules

- Fuel level Detection
- Adulteration testing
- Oil quality check
- Notification
- Logs storage

A. Fuel level Detection

The main purpose of this project is to calculate and measure the fuel level that is present in the fuel tank using an ultrasonic sensor that is meant for this purpose. Ultrasonic sensor transmits and receives the waves, based on which the level is detected.

B. Adulteration testing

The purpose of this module is to detect any adulteration in the petrol that is added to the tank. Generally kerosene is mixed with petrol to increase the quantity of the petrol.

C. Oil quality check

Oil quality module’s work is to identify the quality of engine oil by passing the IR rays through it. The quality of oil is decided by the density of the reflected ways that are received by the sensor.

D. Notification

This module is responsible for sending alerts to the user through a mobile application. Notifications and updates are sent to the user through this module.

E. Logs storage

All the databases and entries of fuel are stored in the cloud which can be fetched whenever the user demands for the logs with the help of an application.

5. Conclusion

There are many devices that promise to give the exact results and some of them fail but, we will develop a system that will be more precise when it comes to result and also it will be more interactive to the users unlike other systems. We offer comparatively more features in a single system that can detect level, notify you and can do variety of other measurements.

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