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Smart Fuel Level Indicator System

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Abstract:- In the recent times, we constantly hear about petrol bunk frauds. In countries like India with a lot of vehicles, the consumption of fuel from fuel stations is in very large quantity. Most of the times, consumers are not satisfied with quantity of the fuel given at fuel stations ,because the consumers are provided with less quantity and are cheated. Most of the petrol bunks today have manipulated the pumps such that it displays the amount as entered by the provider but the quantity of fuel that is filled in the customer's fuel tank is much lesser than the displayed value i.e, the pumps are tampered for the benefit of the petrol bunks owner. This results in large profits for the petrol bunks owners but at the same time the customers are cheated. All the vehicles in India consist of analog fuel meters hence it does not show the exact amount of fuel currently in the vehicle and also it is not possible to check the quantity of fuel that is filled in the petrol bunk. So, in Today's world, if the fuel indicator in automobiles is also made digital it will help us to know the exact amount of fuel that is available in the fuel tank. The main objective of our project is to present a proper solution for indicating the exact availability of fuel in the tank digitally. Smart fuel level meter is a micro-controller board which will calibrate the exact amount of fuel flowing into the fuel tank with the help of an ultrasonic sensor. In this project, we mainly focus on creating a digital display that shows exact amount of fuel contained in the vehicles tank.

Various other features like the distance that can be travelled to the corresponding fuel in the fuel tank in kilometers, speed of the vehicle in kilometer per hour, mileage in kilometer per liter is added with this arrangement which will explain the clear performance of the vehicle to the corresponding fuel. This project mainly concentrates on the indication of fuel level in two-wheeler tanks.

I. INTRODUCTION

With the increase of population and usage of vehicle all over the world, fuel necessity has become a huge problem. Moreover in today's world fuel saving has become an important factor. In the digitized world, if the fuel indicator in the vehicles are also made digital it will help to identify the exact amount of fuel that is available in the fuel tank. The above fact is considered for our project and we have found a proper solution for indicating the exact availability of fuel in the fuel tank digitally. Here, we are indicating the amount of fuel in the fuel tank in liters. This value fuel in liters will be in numeric form i.e, in the form of digits (ex: 1.2, 1.3 and 1.4).

This project in the main concentrates about the indication of fuel level in two- wheeler tanks. Various other features like the distance that can be travelled by the vehicle to the corresponding fuel, is added with this arrangement which will help to explain the clear performance of the vehicle to the corresponding fuel in fuel tanks.Mainly this project helps to avoid a lot of problems like fuel bunks at fuel stations, fuel theft and also prevents us from getting into circumstances where we have to push our vehicles due to assumptions of the level of fuel in fuel tanks. Nowadays the fuel indicator system for the two wheeler are made digital but they do not display the exact amount of fuel in the tank i.e. it shows the amount of fuel in terms of bars and not in numbers or digits. So this problem is taken into consideration for our project work of developing the digital (numeric) fuel indicator system for two wheeler which shows exact amount of fuel in terms of Liters(L).

In this project we initially surveyed the existing fuel level indicator systems and fuel tanks of different bikes and scooters. During this survey we examined that the shape of the fuel tanks is different for different vehicles. But due to irregular shape of the tanks there were lot of complexities that rose up for the installation of an electronics kit and level sensors which are used for calibration of fuel amount in the tank. Hence we have taken all the problems into

consideration and prepared a project and found an appropriate solution to it. The fuel level indicator system can be used for any type of fluid and the level is automatically detected and displaying the output on LCD.

II. LITERATURE REVIEW

Till now ,the accuracy of the fuel level measurement in fuel level indicators has not been of great importance. The purpose of measuring the fuel level in the fuel tank has been to present the information on the dashboard with a fuel level meter. Instead of accuracy the two most important factors are to avoid rapid changes in the fuel level displayed and the meter must indicate that the tank is empty when the fuel level is below a predefined level. This system is not capable to provide the exact value of fuel level in the fuel tank. Also such system cannot protect us from getting cheated at petrol pumps as they costs us more for less amount of fuel filled. So it becomes necessary for developing such a system which gives exact (numeric) value of fuel in fuel tank.

III. BLOCK DIAGRAM

The block diagram of the smart fuel level indicator system consists of a tank, an ultrasonic sensor, a power supply, an Arduino, an LCD, and a Hall effect sensor.

The proposed system aims in measuring the fuel in the vehicle tank using ultrasonic sensor. The ultrasonic sensor has a better accuracy and and it is easy to calibrate and interface it with an Arduino controller which is used for our project work. The ultrasonic sensor sends ultrasonic waves and reflects it back to the receiver of the ultrasonic sensor. In this way we can find the level of fuel in the fuel tank if we know the time required by the ultrasonic waves to travel. We have used an arduino because it is more reliable than the 8051 controller. In addition to this we have also used Hall Effect sensor which will calculate the mileage of the vehicle. The Hall Effect sensor will count the number of rotations done by the wheel of the vehicle and accordingly it will calculate the mileage of the vehicle.

In this arrangement , the ultrasonic sensor is directly connected to the fuel tank of the vehicle. Accordingly the ultrasonic sensor will find the level of fuel in fuel tank in litres. The Hall Effect sensor is connected to the wheel of the vehicle with the magnet connected on one of the spoke of the vehicle. So it will calculate the number of rotations easily. And the distance covered by the vehicle can be easily calculated by knowing the rotations.

In this arrangement, ultrasonic sensors are connected to the fuel tank of the vehicles whose output is given as input to the Arduino. The output of the Hall effect sensor is also given as input to the Arduino. The power supply is connected to the Arduino. After all the inputs or data are given to the Arduino, the code is executed and the desired outputs like fuel in liters, the distance that can be travelled by vehicle in kilometers, speed in kilometers per hour, and mileage in kilometers per liter is displayed on the LCD.

IV. REQUIREMENTS HARDWARE USED

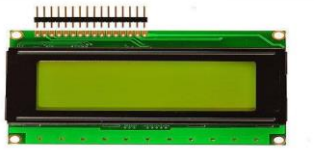
1) ARDUINO RS-328:
Features of Micro-controller ATmega328:

1. Operating Voltage: 5V.
2. Input Voltage (recommended): 7-12V.
3. Input Voltage (limits): 6-20V.
4. Analog Input Pins: 6.
5. DC Current per I/O Pin: 40 mili Ampere.
6. DC Current for 3.3V Pin: 50 mili Ampere.
7. SRAM: 2 KB (ATmega328).
8. Digital I/O Pins: 14 (of which 6 provide PWM output).

2) Ultrasonic Sensors: Ultrasonic sensors are the devices that generates or sense the ultrasound energy. They are divided into three broad categories: transmitters, receivers and transceivers. Ultrasonic sensors works on the principle of echo. The Ultrasonic waves are sent to an object and the reflected waves are received by the sensors.

These sensors are easy to install. Generally, any opening above the tank, such as vent pipe can accommodate these sensors. This means the tank need not to be modified , by drilling holes just for a sensor installation. Also, they need not to be in contact with the fuel during measurement of fuel level. That means it can work effectively even in corrosive environments.

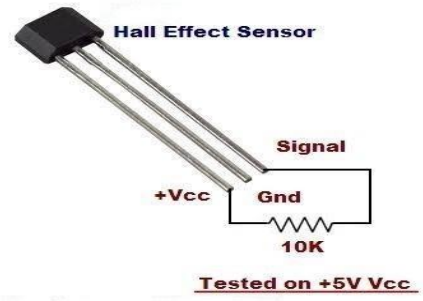
3) LCD Display: It features 20x4 means that 20 characters can be displayed in each of the 4 rows of the 20x4 LCD, thus a total of 80 characters can be displayed at any instance of time. It features 5X8 dots with cursor. It has a built in controller.. It operates on +5V power supply. It posses 1/16 duty cycle.



4) Hall effect sensor: Hall effect sensors is consists of a thin piece of p-type semiconductor material that passes a continuous electric current through itself. When the hall effect sensor is placed within a magnetic field, which is

constructed at right angle to the device, the magnetic flux lines exert a force on the semiconductor material. Generally , a south pole is used to generate a potential difference across the device and the effect of generating measurable voltage by using magnetic field is called Hall effect.

The Arduino Hall effect sensor code can be used to detect a magnet and counts the number of times it detects it.



5) Flow sensor: A flow sensor is an electronic device that measures or regulates the flow rate of liquids and gases with pipes and tubes. They are generally connected to guages to render their measurements but can also be connected to computers and digital interfaces.

Flow sensors are able to detect leaks, blockages , pipe bursts and any changes in liquid concentration due to contamination or pollution. Flow sensor can detect the amount of fuel flow having 0.3 to 6 liter per minute flow rate.

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6) Power Supply: The Arduino board can operate on an external voltage supply of 6 to 20 volts. If it supplied with voltage less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If used more than 12V supply , the voltage regulator may overheat and it may damage the Arduino board. The recommended range is between 7 to 12 volts.

V. WORKING

- In this system, the Arduino RS-328 controller is used. This controller is extremely helpful to utilize, and the coding or programming of this controller is additionally simpler.
- Here we also use the hall effect and ultrasonic sensors
- The ultrasonic sensor and flow sensor is installed in the fuel tank to sense the level of petrol.
- The hall effect sensor is used to count the rotation of the wheel.
- The Arduino sends a trigger to the ultrasonic sensor at a regular interval of time which in turn makes the transmitter emit an ultrasonic pulse. This pulse hits the surface, reflects, and returns. The receiver on the sensor picks up this pulse and reports it to the microcontroller.
- The Arduino keeps the track of the time it takes for the above process to complete and then calculates the distance using a formula.
- Distance travelled bu the wave = (T x Speed of wave) / 2
- Where, T = time taken by the wave to transmit and reflect.
- The whole term is divided by 2 because Time is the combination of time required for come and go of wave.
- The distance calculated using ultrasonic sensors is then sent to the Arduino which has to be calibrated to obtain the level of fuel in liters.
- In addition to this, the hall effect sensor is used. It is connected to the wheel of the vehicle with the magnet on one of the spokes of the vehicle.
- So it will easily calculate the number of rotations and the distance covered can be easily calculated by knowing the rotations.
- The distance travelled can be calculated using the formula:
- Distance travelled = (circumference x number of rotations).
- After calculating the distance travelled, we can find the mileage using the formula:
- Mileage = (distance travelled / Quantity of fuel consumed)
- The quantity of fuel consumed is calculated by the flow sensor connected at the outlet of the tank.
- After receiving the value of the quantity of fuel that remains in the tank, we get the estimated distance that can be covered by the vehicle with the corresponding fuel to remain in the tank with the same formula of mileage:
- Estimated distance = mileage x Quantity of fuel remaining in the tank
- All these entities are calculated by the Arduino using the inputs coming from ultrasonic sensors, flow sensors and hall effect sensors which is then displayed on the LCD.

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VI. RESULT

The proposed system displays the following parameters on the LCD:

1. Fuel in the tank in Liters.
2. Est. Distance that can be covered corresponding to the fuel in the fuel tank.
3. Speed of vehicle in Kilometer Per Hour.
4. Mileage of vehicle in Kilometer per liters.

Fig: Digital Fuel Indicator System With Parameter Indication

VII. CONCLUSION

The smart digital fuel level indicator system is a very advance type indicating system. The main advantage of this system is that it gives accurate value of remaining fuel as well as the vehicle running capacity in kilometers. The accuracy level of the system is estimated to be up to 70% to 75% because advance type C.P.U is preferred and used in this project. The operation time taken by the system is very less i.e, in micro seconds. All the equipment's used have long life, durability & are quality material.

This project is able to show that with simple available hardware and technology we can construct a robust fuel level monitoring system. The system designed and tested in this project is presented at the low construction cost. Even though the quality of material used and components used are of good quality, the cost of the project is not reasonable and it can be used and implemented in all vehicles without much increase of cost of the vehicle.

This smart fuel indicator is best in its field and will be most widely used advance system in future.

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