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# Design and fabrication of the digital mileage calculator

*Praveen Kumar Sahu*
*sahur365@gmail.com*
*Bhilai Institute of Technology, Raipur, Chhattisgarh*

## ABSTRACT

***Today in this digitized world, if the fuel indicator in the automobiles is also made digital it will help to know the exact amount of fuel available in the fuel tank. The above-furnished fact is considered in my project and I found out a proper solution for indicating the exact availability of fuel in the tank digitally. Here, I am 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). This project mainly concentrates on the indication of fuel level in two-wheeler tanks. Various other features like the distance can be traveled to the corresponding fuel, is added to this arrangement which will explain the clear performance of the vehicle to the corresponding fuel.***

**Keywords:** *Flow sensors, Arduino Uno, Hall sensor, Two-wheeler.*

## 1. INTRODUCTION

Method and apparatus for measuring engine performance with respect to fuel consumption in kilometer per hour are provided. Such performance, in engines either in vehicles, is measured by a digital counting, measuring and calculating system. Fuel flow rate and distance traveled, or elapsed time units are converted respectively to streams of electric pulses which are counted and the ratio there of calculated and the results transmitted to a display. Current and average performance characteristics of an engine are displayed. For example, the current and average kilometers per hour of a motor vehicle are displayed to the operator. Fuel quantity is one of the undetermined factors in two-wheelers. As far as now fuel level in two-wheelers is indicated through the analog gauge. The analog gauge cannot provide an accurate value of the fuel in the tank. It highly affects the driver who is going on long drives. Normally finding fuel station on a highway is difficult. In such cases without knowing the fuel level, it will be difficult for the driver to travel with an assumption about the fuel present inside the tank. Another drawback is that there are possibilities for petrol theft in the petrol bunks which is highly difficult to measure without proper instruments. There is a model proposed to find out the amount of petrol injected into the tank with a digital meter using float sensors but float sensors cannot produce accurate values when there is wobbling. And there is another proposed method that is used to find fuel level in aero planes using a capacitance-level sensor which produces values with high accuracy. The main drawback of capacitance level sensor is its high cost which is not efficient when used in the two-wheeler users. The device has to be cost efficient without compromising on the accuracy of measurement. The sensor fitted has to be chemical resistant, should not vary with physical orientation, independent of shape and size of the tank. Basic methodological errors of liquid level measurement are caused by changes in physical orientation and mechanical forces when the liquid level does not correspond to fuel volume. Additional methodological errors are mainly caused by temperature influence on measured fuel. A fuel consumption measuring apparatus for fuel powered vehicles comprising; a distance traveled sensor the distance traveled sensor produces an electric pulse at regular increments of distance traveled and said fuel flow sensor produces an electric pulse for regular increments of fuel flow. This is having means to measure the fuel consumption in kilometer per hour. Means for periodically restarting the counting means at zero and means to periodically activate the calculating means to provide at intervals, the current fuel consumption rate of said vehicle. For continuously accumulating the distance pulses and the fuel flow pulses and means for activating the calculating means at selected periods to provide the then average fuel consumption of the said vehicle. To depict the calculated fuel consumption per distance rate for said vehicle. The first electric pulses transmitted from the distance traveled sensor and a second pulse shaper for slicing and sharpening the second electric pulses transmitted from the fuel flow sensor; calculating means and means to activate the calculating means; driver means for transmitting the results of the calculation to display and display means to depict said results of fuel consumption rate. Reset the counter means to zero to permit new counts and new calculations to be periodically made to repeatedly update the display.

 

## 2. SENSOR

This idea for design and development of low-cost automatic gasoline flow meters, with the help of readily-available and low-cost flow sensors.

**Pin wheel sensor/Hall-Effect Flow Sensor** Accurate flow measurement is an essential step both in the terms of qualitative and economic points of view. Flow meters have proven excellent devices for measuring gasoline flow, and now it is very easy to build it.


**Fig. Pinwheel Sensor**

**Hardware Hook up connecting** the flow sensor to Arduino requires minimal interconnection. Connect the VCC (Red) and GND (Black) wires of the flow Sensor to the 5v and Gnd of Arduino, and link Pulse Output (Yellow) wire of the water flow sensor to Arduino's digital pin 2. Note that the flow sensor is not a power-hungry type; it draws a maximum of 15-20mA at 5V DC input!

**LED**

LCD (Liquid Crystal Display) screen is an electronic display module and finds a wide range of applications. A 16x2 LCD display is a very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments.

**Battery**

A 12 volt 7Ah battery is used to give supply to Analog fuel gauge, A/D converter along with LED

## 3. METHODOLOGY

It has an important application in the field of automobiles to measure and verify the fuel present in the vehicle with a high degree of precision. The previous techniques use an analogue strip or capacitive Sensor which is either inefficient to measure or too costly to install. In the proposed method, two Flow Sensors are placed linearly, one sensor to measure the amount of fuel entering the tank and another Sensor to measure the amount of fuel leaving the tank to the carburetor. The difference between the above measures gives us the amount of fuel present in the tank and it is stored in the Arduino Uno Microcontroller. It actively keeps the record of the fuel entering the tank and the fuel present in the tank at any given time in the dynamic memory of the Arduino and is displayed using LCD display. If the fuel is low, the system suggests the commuter to refuel as soon as possible. If the fuel gets critically low, the system alarms the commuter to refuel immediately. The system has a solenoid valve which replicates the working of a carburetor of the automobile. This proposed method can identify petrol theft and is useful to people who opt for long rides. This system is designed to cut down the cost and increase the level of accuracy.

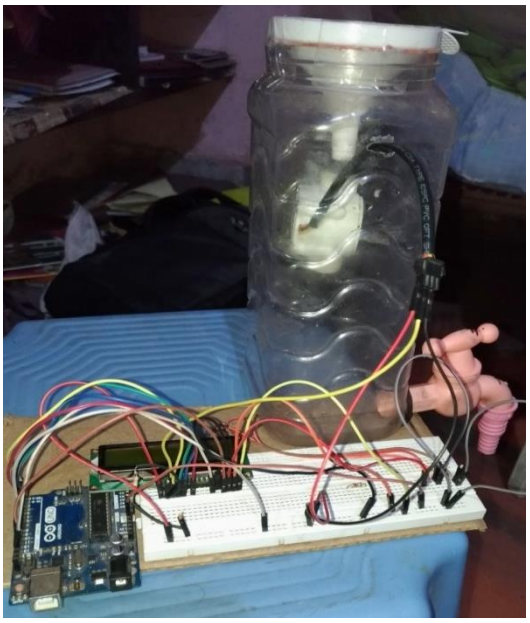

**Fig. The prototype set up without bike**

 

## 4. CALCULATION/ FORMULA

Flow rate can be determined inferentially by different techniques like a change in velocity or kinetic energy. Here we have determined flow rate by a change in velocity of water. Velocity depends on the pressure that forces the through pipelines. As the pipe's cross-sectional area is known and remains constant, the average velocity is an indication of the flow rate. The basis relationship for determining the liquid's flow rate in such cases is

$$\mathbf{Q = V \times A},$$

Where **Q** is flow rate/total flow of water through the amount of fuel leaving the tank to the carburetor.
The sensor which measures the incoming fuel is fitted in the mouth of the petrol tank and the sensor measuring the outgoing fuel from the tank is fitted near the carburetor of the motorbike. The difference between the above measures gives us the amount of fuel present in the tank and it is stored in the Arduino Uno microcontroller.

Flow Rate (L/H) = (Pulse frequency x 60 min) / 7.5Q
In other words:
Sensor Frequency (Hz) = 7.5 * Q (Liters/min)
Liters = Q * time elapsed (seconds) / 60 (secs/min)
Liters = (Freq(Pulses/sec)/7.5)*time elapsed(secs)/60
Litters = Pulses / (7.5 * 60)\

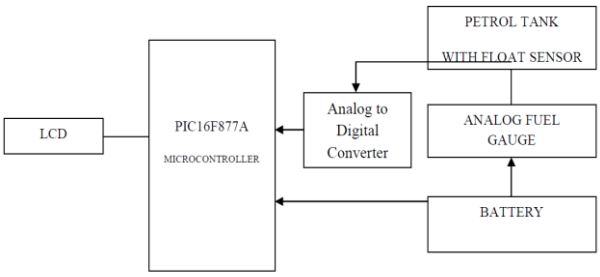


**Fig. block diagram**

## 5. CONCLUSION

The implementation of the system was very smooth, easy and very effective at a very low cost compared to all other techniques. The results were stored in Arduino to keep track of the efficiency. The accuracy of this system is close to 90% - 95%. The readings are unaffected by physical orientations and chemical changes of the liquid.

The A/D converter with LCD was fitted with the Analog fuel gauge of the two-wheeler and the result was successfully obtained. The A/D converter shows the amount of fuel in fuel tank in exact liters (EX: 1.3, 1.4, 1.5 ). The A/D converter shows the exact fuel in liters only when the fuel in the fuel tank is more than 1 liter. The accuracy level is upto95 – 98% because the error was around ± 0.2 liters, because the fuel in the fuel tank was measured on the basis of float level in the tank and we didn't use any other sensors. It displays the exact liters on plane roads and shows error value on slope surfaces.

## 6. FUTURE SCOPE

Future scope of this project is very huge if we talk about heavy bikes, racing bikes or any bike but especially focus on bikes which have GPS on them can calculate the distance we set. So whenever where we want to go we can set our destination, and the GPS calculated the distance and we can see all things including petrol pumps so from the digital mileage calculator now you know the mileage of your bike and with the help of GPS, you know the distance. So now you can easily calculate how much fuel you need to reach that distance, and through GPS we can set an Indicator which indicates petrol pumps where you can feel the tank. It will be the new revolution for bikes. Things like that didn't build till now and this is whole engineering work.

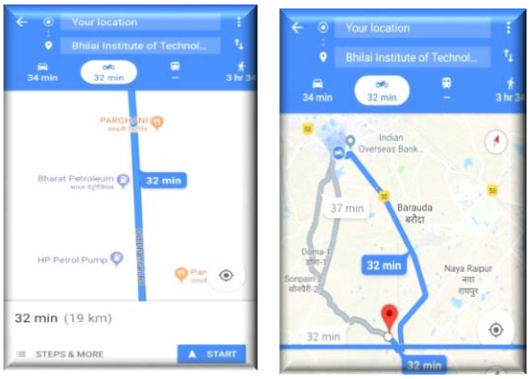


**Fig. GPS**

 


**Fig. Display**

In the above diagram, I set a distance from my location to my collage location that around 32 km and we have fuel in the tank which we can go 28.35km and in the map there is a petrol pump which is around 20 km away and the display starts displaying to feel the tank on that petrol pump.

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