Digital Fuel Level Indicator for Motor Bikes using Arduino Microcontroller

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Abstract-

The precision is always being whole heartedly welcomed by the people all over the world. It has an important application in the field of automobiles to measure and verify the fuel present in the vehicle with high degree of precision. The previous techniques use analog 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 carburettor. 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 carburettor 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.

Keywords— *Flow sensors, Carburettor, Analog strip, capacitive sensor.*

I. INTRODUCTION

Fuel quantity is one of the undetermined factors in two wheelers. As far as now fuel level in two wheelers are indicated through analog gauge. Analog gauge cannot provide accurate value of the fuel in the tank. It highly affects the driver who is going on a long drives. Normally finding fuel station in a highway is difficult. During such cases withoutknowing 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 aeroplanes using 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 liquid level does not correspond to fuel volume. Additional methodological errors are mainly caused by temperature influence on measured fuel.

II. HALL EFFECT WATER FLOW SENSOR

The Hall Effect Water Flow sensor sits in line with your water line and contains a pinwheel sensor to measure how much liquid has moved through it. There's an integrated magnetic Hall Effect sensor that outputs an electrical pulse with every revolution. The Hall Effect sensor is sealed from the water pipe and allows the sensor to stay safe and dry.

The sensor comes with three wires: red (5-24VDC power), black (ground) and yellow (Hall Effect pulse output). By counting the pulses from the output of the sensor, you can easily calculate water flow.

Each pulse is approximately 2.25 millilitres.

pipe, **V** is average velocity of the flow and **A** is the cross-sectional area of the pipe (viscosity, density and the friction of the liquid in contact with the pipe also influence the flow rate of water).

Pulse frequency (Hz) = 7.5Q, Q is flow rate in L/m

The pulse signal is a simple square wave so it is quite easy to log and convert into litres per minute using the following formula.
Pulse frequency (Hz) / 7.5 = flow rate in L/min.

Features

Model	YF-S201
Sensor Type	Hall effect
Working Voltage	5 to 18V DC (min tested working voltage 4.5V)
Max current draw	15mA @ 5V
Output Type	5V TTL
Working Flow Rate	1 to 30 Litres/Minute
Working Temperature range	-25 to +80℃
Working Humidity Range	35%-80% RH
Accuracy	±10%
Maximum water pressure	2.0 MPa
Output duty cycle	50% +-10%
Output rise time	0.04us
Output fall time	0.18us
Flow rate pulse characteristics	Frequency (Hz) = 7.5 * Flow rate (L/min)
Pulses per Litre	450
Durability	Minimum 300,000 cycles

Connection details

Red wire	+5V
Black wire	GND
Yellow wire	PWM output

Calculation/ Formula

Flow rate can be determined inferentially by different techniques like change in velocity or kinetic energy. Here we have determined flow rate by 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 **Q = V x A**, where **Q** is flow rate/total flow of water through the

Flow Rate (L/H) = (Pulse frequency x 60 min) / 7.5Q

In other words:

Sensor Frequency (Hz) = 7.5 * Q (Litres/min)

Litres = Q * time elapsed (seconds) / 60 (secs/min)

Litres = (Freq(Pulses/sec)/7.5)*time elapsed(secs)/60

Litres = Pulses / (7.5 * 60)

III. SENSOR CHARACTERISTICS

Arduino programming language (based on Wiring) is used to do send a set of instructions to the microcontroller on the board. VCC (Red) and GND (Black) wires of the water flow Sensor are connected to the 5v and GND of Arduino, and link Pulse Output (Yellow) wire of the water flow sensor is connected to Arduino's digital pin 2. It draws a maximum of 15-20mA at 5V DC input. The experimental readings are noted down and plotted between Litres/hour and Frequency in Herts.

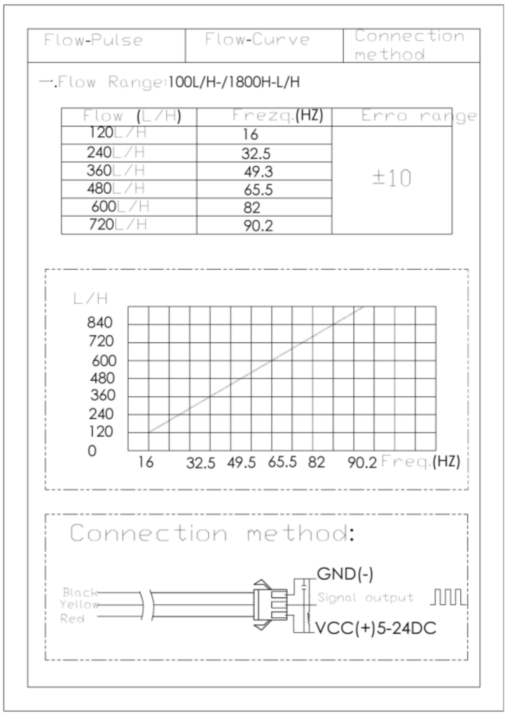

Fig. 1 sensor characteristics

IV. PROPOSED SOLUTION

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 carburettor. 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 carburettor 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.

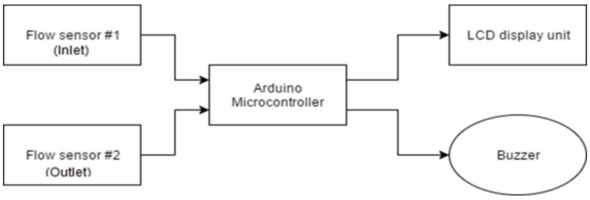

Fig. 2 Basic Unit

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.

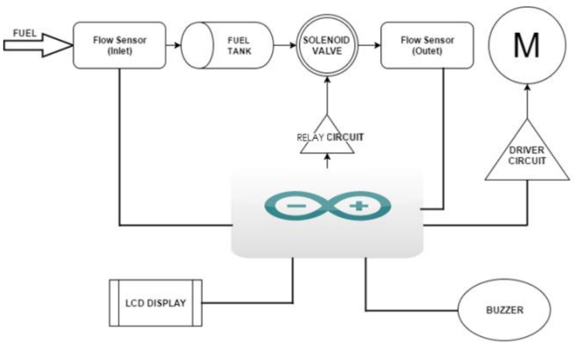

Fig.3 Prototype Model

In fig. 3, the solenoid valve acts as a carburettor of the motorbike to control the flow of the fuel and the motor works as an engine.

V. EXPERIMENTAL DATAS AND RESULT

A prototype of the proposed model was designed and implemented under various conditions with different permutations and combination to obtain the complete working of the system.

When the Fuel was Zero, The system displayed, Fuel is Zero with a periodic buzzer. When the fuel started to pour in, only the fuel crossed the minimum reserve level, the Buzzer got switched off while the LCD displaying the exact amount of fuel entering in the tank.

When the fuel started to leave the tank to the carburettor, the amount of fuel was measured and calculated the exact amount of fuel present in the tank in the LCD display. This method is very simple to execute and has a higher accuracy in measurement.

[3] Deep Gupta, Brajesh Kr. Singh and KuldeepPanwar "A Prototyping Model for Fuel Level Detector and Optimizer" page no 226229 - African Journal of Basic & Applied Sciences 4 (6): 226-229, 2012 ISSN 2079-2034.

[4] JaimonChacko Varghese, BineshEllupurayilBalachandran "Low Cost Intelligent Real Time Fuel Mileage Indicator for Motorbikes" (IJITEE), Volume-2, Issue-5, April 2013.

Flow sensor A (Inlet)(ml)	Flow sensor B(Outlet) (ml)	Fuel Level (ml)	LCD Display (ml)	Solenoid valve	Motor	Buzzer
0	0	0	0	OFF	OFF	HIGH
33	0	33	33	OFF	OFF	HIGH
108	0	108	108	OFF	OFF	LOW
259	0	259	259	OFF	OFF	LOW
324	0	324	324	OFF	OFF	LOW
500	0	500	500	OFF	OFF	LOW
500	5	495	495	ON	ON	LOW
500	16	484	484	ON	ON	LOW
500	27	473	473	ON	ON	LOW
500	52	448	448	ON	ON	LOW
500	84	416	416	ON	ON	LOW
500	134	366	366	ON	ON	LOW
500	227	273	273	ON	ON	LOW
500	305	195	195	ON	ON	LOW
500	422	88	88	ON	ON	LOW
500	490	10	10	ON	ON	HIGH

VI. 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 95% - 98%. The readings are unaffected by physical orientations and chemical changes of the liquid.

VII. REFERENCES

[1] 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), Volume 11, Issue 2 Ver. III, PP 80-84, 2014.

[2] Arduino UNO &Genuino UNO [online]. ©2016 [cired2014-06-01].URL: <https://www.arduino.cc/en/Main/ArduinoBoardUno>

[7] NitinJade ,PranjalShrimali , Asvin Patel , Sagar Gupta," Modified Type Intelligent Digital Fuel Indicator System ", IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE), PP 20-23,2014.

[8]PetrPetlach and Michal Dub, "Possibilities of COTS Ultrasonic Fuel Quantity Measurement ", Digital Avionics Systems Conference (DASC), 2016 IEEE/AIAA 35th, 2016.

[5] Kunal D. Dhande, Sarang R. gogilwar, SagarYele and Ass. Prof.VivekGandhewar, Fuel level measurement techniques: A systematic survey. International Journal of Research in AdventTechnology.
[6] Mrs.Udayavalli.V. ,Mrs.M.Omamageswari, Embedded system based intelligent digital fuel Gauge. IPASJ International Journal of Electronics and Communication (IIJEC), 2, March-April 2014.
[9] R. Martinek, Sensors in industrial applications (in Czech). Prague: BEN, 2004.
[10] Rahul Gogawale, SumitSonawane, Om Swami, Prof. S.S. Nikam, "Petrol Level Detection Using Ultrasonic Sensor ", International Engineering Research Journal (IERJ) Volume 2 Issue 2 Page 848-850, 2016.
[11] S. Dado, L. Bejcek and A. Platil, Flow and level measurement (in Czech). Prague: BEN, 2005.
[12] S. Soloman, Sensors handbook, 2nd ed.. New York: McGraw-Hill, 2010.