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Digitalized Flow Quantity and Adulteration Measurement in Petrol

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Abstract **- This project is about designing a digitalized flow quantity and adulteration measuring system used to measure the quantity of fuel filled in the tank along with the adulteration in fuel at the fuel station. The digital meter that is placed at the fuel stations are often found to be faulty and there is always a chance of short-fueling in addition to concern regarding the purity of the fuel . Thus, our project makes a solution for this issue and wakens up the ignorant public. Filling fuel has become a routine for our travelling life so it is an important issue. This device is simple in construction and working and can be easily used by any one. If the fuel is filled in the vehicle's tank before letting into this device the amount of fuel flown and the adulteration percentage can both displayed in the digitizer.**

Key Words: Turbine Flow meter, Arduino , Petrol, Adulteration, Flow Quantity, Petrol station.

1. INTRODUCTION

In this project we are calculating the fuel flown into the tank of the vehicle and also the adulteration percentage. This setup is designed for the purpose of detecting fuel flow and adulteration level as many fuel stations install rigged meters to show variation in the quantity flow. Without knowing this issue, we the public are ignorant and are being cheated every time when we refuel.

The device consists of components like cylindrical cone tipped tank, PVC pipe, turbine flow meter, arduino (UNO), digitizer, temperature sensor , and 9 volt battery. The fuel flows through the device and flown quantity is measured using the turbine flow meter which produces voltage when the turbine is rotated in a magnetic field and the voltage is sent to the Arduino as analog input. The adulteration of the fuel is calculated using the Arduino, temperature sensor and the redwood viscometer apparatus principle. For calculating the fuel quantity and the adulteration level standard formulae are programmed in the Arduino using Arduino IDE.

2. NECESSITY OF DIGITAL FUEL METERING DEVICE

It is essential to fill the fuel in the tank of the automobile for its running. Since it is been consumed regularly there must be no error in its filling quantity and quality. Using this setup before filling the fuel in the tank of the automobile the quantity and quality of the fuel is measured automatically only by allowing it to pass through the setup.

Following are some tricks by which they fraud us:

1) A faulty meter
Some petrol pumps have rigged meters that start ticking even before petrol starts to flow from the hose. A motorist encountered such a meter at a station near Hosur in Tamil Nadu and created a scene at the pump. The manager gave him Rs 500 off.

2) A fuel hose longer than is required
Pumps save on a lot of petrol when they use long pipes. A perfectly good meter will show that a certain amount of petrol has been pumped out, but that amount hasn't reached your tank - some of it is still in the pipe, and it goes back into the pump. Through the day, the number of litres that stations save can be enormous.

3) Sticking fingers firmly in the nozzle of the hose
This reduces the flow speed of the fuel and can save up to a litre at a time for the station.

4) 'Double-checking' the required amount
The attendant asks you how much petrol you want. You say you want petrol worth Rs 1,000. He stops at Rs 200 while configuring the meter, and reconfirms, and 'updates' the value by Rs 800. You might think that you are receiving petrol for Rs 1,000 - but you are only getting petrol for Rs 800, as he has not actually reset the meter. [1]

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3. BLOCK DIAGRAM

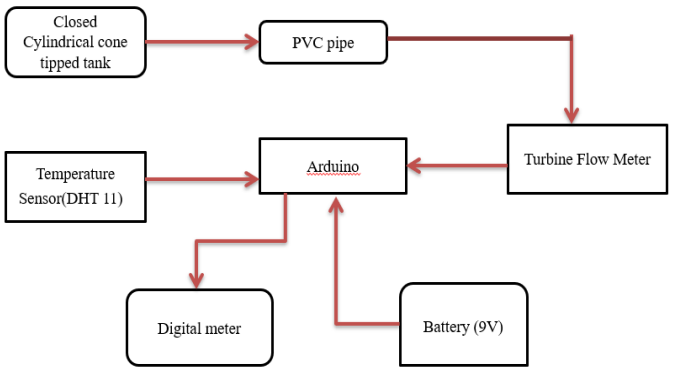

Fig -2. Block Diagram

- **Arduino**: The Arduino UNO is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc
- **Digitalmeter**: A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits.
- **Turbine Flow sensor**: It senses the flow of petrol and sends the signal to the Arduino
- **Battery**: It The nine-volt battery format is commonly available in primary carbon-zinc and alkaline chemistry, in primary lithium iron disulfide, and in rechargeable form in nickel-cadmium, nickel-metal hydride and lithium-ion.
- **Temperature sensor**: DHT11 Temperature & Humidity Sensor features a temperature & humidity sensor complex with a calibrated digital signal output

4. COMPONENTS

The functioning of entire device depends upon the four important parts. They are:

1) *Turbine flow meter*

Fig -3. Turbine flow meter [3]

The turbine flow meter is used for volumetric total flow and/or flow rate measurement and has a relatively simple working principle. As fluid flows through the turbine meter, it impinges upon turbine blades that are free to rotate about an axis along the center line of the turbine housing. Turbine meters are simple to operate and maintain, and in service worldwide as a reliable, cost-effective method for achieving accurate flow measurement. Turbine flow meters are designed to maximize throughout and minimize pressure drop, maintain high flow rates over an extended flow range and offer pulse output that is linear to the flow rate.

2) Arduino (UNO)

The Arduino UNO is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 Digital pins, 6 Analog pins, and programmable with the Arduino IDE (Integrated Development Environment) via a type B USB cable. It can be powered by a USB cable or by an external 9 volt battery, though it accepts voltages between 7 and 20 volts.

3) Power supply

The nine-volt battery, or 9-volt battery, is a common size of battery that was introduced for the early transistor radios. It has a rectangular prism shape with rounded edges and a polarized snap connector at the top. This type is commonly used in walkie-talkies, clocks and smoke detectors.

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5. WORKING

The setup is placed over the fuel tank of the vehicle by opening the cap and letting the other end of the setup to be inside the tank opening. Initially the fuel from the fuel dispenser is flown out into the closed cylindrical cone tipped tank where the fuel is segregated temporarily and once the funnel is full the fuel flows evenly through the tube.

The tube possesses turbine flow meter which calculates the velocity of fuel flown into the tank. These pulse signals which are measured by the meter is sent to the arduino and this data is again sent to digitizer for display after calculating the fuel flown quantity.

Second part of the system is to calculate the kinematic viscosity of the fuel by which the adulteration percentage is known. If the fuel is adulterated, the kinematic viscosity of the fuel decreases. The kinematic viscosity of pure fuel is compared with the test fuel to calculate the adulteration level. Kinematic viscosity of the fuel can be calculated by using the redwood viscometer apparatus principle.

In this experiment the temperature, density and time taken for flow is needed to calculate the kinematic viscosity. The temperature and time is sent to the arduino as inputs. The arduino sends the digital signal to digital meter for display. The power supply is given to all these components using a 12V battery.

6. ADVANTAGES

- The setup is small and mobilized.
- Handling of the setup is easy.
- No maintenance is required.
- Just by placing on the fuel tank the readings can measured.
- No reading error occurs due to usage of digital meter

7. DISADVANTAGES

- Bulky design of unit, can be overcome by modifications.
- Careful handlimg of electronic parts must be ensured.
- Setup is little heavier due to mild steel used in tank.

8. FUTURE SCOPE

- By using advanced technology the electronics parts size of the setup will be minimized.
- By advanced fabrication techniques in the device, the setup can be coupled and integrated in the respective automobile.
- In future we can use it in all types of vehicle.
- In future we can use an

9. ACTUAL DEVICE TO BE FITTED ON THE FUEL TANK OF THE AUTOMOBILE

Fig -4. Petrol Adulteration and Quantity measuring Device

10. CONCLUSION

Thus the setup is fabricated according to the design calculation and tested. Initially 1 litre of diesel is made to flow through the setup. The diesel made to flow is of high purity and perfect kinematic viscosity. Thus the digital meter displays the values of the flow quantity as 1 litre , the temperature of the pure diesel , its kinematic viscosity, density and whether the fuel flown is adulterated or not. Thus the result shown for the pure diesel is not adulterated.

Secondly a 200 milli litre of kerosene is mixed with the pure diesel is again made to flow into the setup.The digital meter displays the flow quantity as 1.2 litres and reveals that the fuel is adulterated due to the drop in kinematic viscosity level when compared to the pure diesel.The values displayed in the digital meter is atmost accurate with the units. Thus the setup is fabricated and tested successfully with the results.

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