Design of Smart Fuel Tank for Automobiles

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***Abstract*:-** Now-a-days we often come across the situations where we suffer the theft of filling less amount of fuel than required or demanded at the cost of whole of the amount of fuel. To know, how much mileage our vehicle engine gives and to know whether our engine's temperature is under control or not. The "SMART FUEL TANK" will help you monitor all the above events. The fuel tank is smart enough to indicate whether the amount of fuel you demanded to fill in your tank is filled up to the required amount or not. Smart fuel tank is been introduced to combat with these day to day problems of two wheelers. And above all, this system is cost effective and applicable for two wheelers.

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1. Introduction

Customers make complaints regarding less amount of petrol filled in their tank system ex. Improper flow, displaying more units compared to actual amount filled in the tank etc. such complaints are there from customers regarding the fuel in the tank. At the petrol pumps we often come across the situations where we suffer the theft of filling less amount of fuel than required or demanded at the cost of whole of the amount of fuel. Regarding to the complaints of the customers we are designing a smart fuel tank. The fuel tank is smart enough to indicate whether the amount of fuel you demanded to fill in your tank is filled up to the required amount or not and to know the mileage of our vehicle.

To know the amount of fuel and mileage of our vehicle we came to conclusion of designing and implementing smart fuel tank which will be able to show

1) To evaluate and display the amount of fuel poured inside the fuel tank.
2) To evaluate and display mileage of the vehicle instantly to get ensured about the performance of the vehicle.
3) To measure and display the temperature of the engine and prevent overheating and damage of engine parts.

This smart fuel tank will automate the system and will reduce error, also will make the process simpler, cost effective and reliable.
The smart fuel tank which we designed is microcontroller based and for determining parameter values sensors will be used. These sensors are interfaced with microcontroller and suitable code is developed which takes signals from sensors and further process it.

2. System

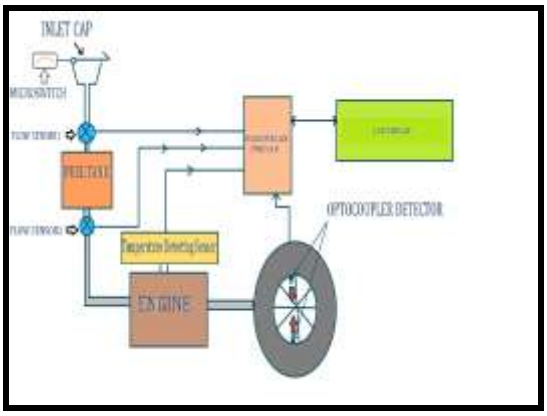

Fig 2.1 System block diagram

System consists of:

1. Micro switch: are switch devices that can open and/or close an electrical circuit at a rapid speed. They take very little pressure or force to operate. Usually these switches are triggered by an external force, either human or by physical object, applied to the actuator. "Snap Action" occurs because of the rapid movement of the spring-assisted moving contacts from one position to another, independent of the actuator speed. Actuator styles available for snap action switches include lever, pushbutton, and roller.

Fig. 2.2 Micro switch

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2. Flow sensor: It is a Hall Effect magnetic sensor whose output is a pulse signal. It consists of a plastic valve body, a water rotor & a Hall Effect sensor. This sensor sits in line with your water line, & uses a pinwheel sensor to measure how much liquid has moved through it. The pinwheel has a little magnet attached, & there's a Hall Effect magnetic sensor on the other side of plastic tube that can measure how many spins the pinwheel has made through the plastic wall.

Fig.2.3 Flow sensor

3. Opto coupler: An Optocoupler, also known as an Opto-isolator or Photo-coupler, is an electronic components that interconnects two separate electrical circuits by means of a light sensitive optical interface. Assume a photo-transistor device as shown. Current from the source signal passes through the input LED which emits an infra-red light whose intensity is proportional to the electrical signal.

This emitted light falls upon the base of the photo-transistor, causing it to switch-ON and conduct in a similar way to a normal bipolar transistor.

The base connection of the photo-transistor can be left open for maximum sensitivity or connected to ground via a suitable external resistor to control the switching sensitivity making it more stable.

When the current flowing through the LED is interrupted, the infra-red emitted light is cut-off, causing the photo-transistor to cease conducting. The photo-transistor can be used to switch current in the output circuit. The spectral response of the LED and the photo-sensitive device are closely matched being separated by a transparent medium such as glass, plastic or air. Since there is no direct electrical connection between the input and output of an optocoupler, electrical isolation up to 10kV is achieved.

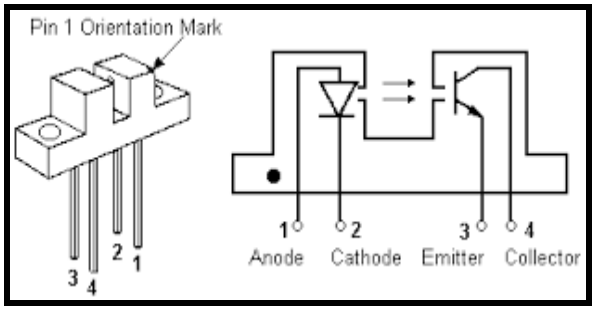

Fig.2.4 Opto coupler

4. LM35: The LM35 ICs are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature.
The LM35 thus has an advantage over linear temperature sensors calibrated in ˚ Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centi-grade scaling.

The LM35 does not require any external calibration or trimming to provide typical accuracies of ±1⁄4˚C at room temperature and ±3⁄4˚C over a full −55 to +150˚C temperature range.

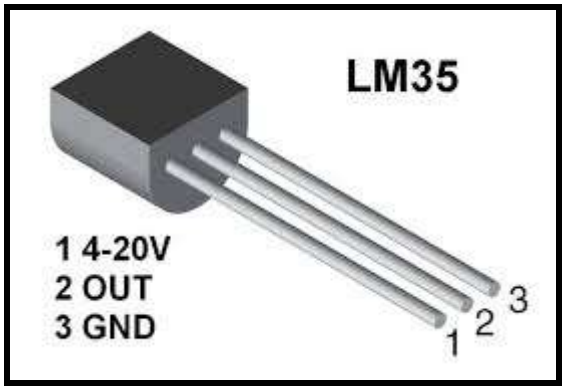

Fig.2.5.LM35

5. Microcontroller ATmega16: The ATmega16 is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega16 achieves throughputs approaching 1 MIPS per MHz allowing the system designed to optimize power consumption versus processing speed.

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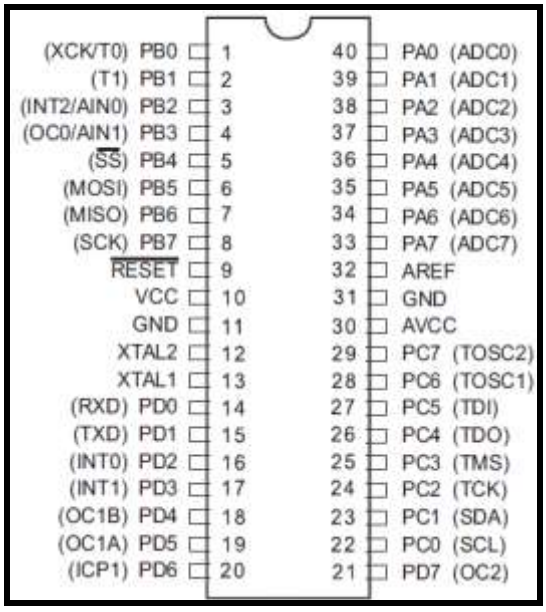

Fig.2.5 Pin Diagram of µC ATmega16

It is the core element of system with following features:

- It is 8 bit microcontroller.
- 16K SRAM.
- 5 MHz clock frequency.

6. Display: In our system we are using liquid crystal display (LCD) which is basically a
16 X 2 LCD display. The display will show the value of all the three parameter i.e. amount of water flowed and amount of dissolved impurities, with start and stop time.

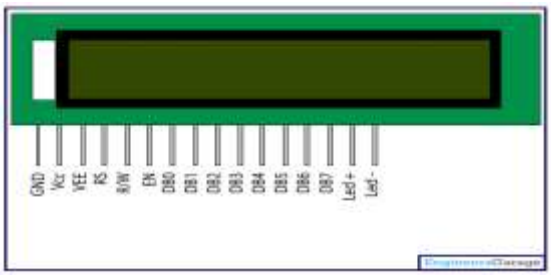

Fig.1.6 Liquid Crystal Display

3. Working

The actual working of the system can be understood by using the flow chart shown further
When the system is fixed to fuel tank it will check the micro switch. If tank cap is open it will enter into petrol inlet routine and if the cap is closed the microcontroller enter into mileage routine.

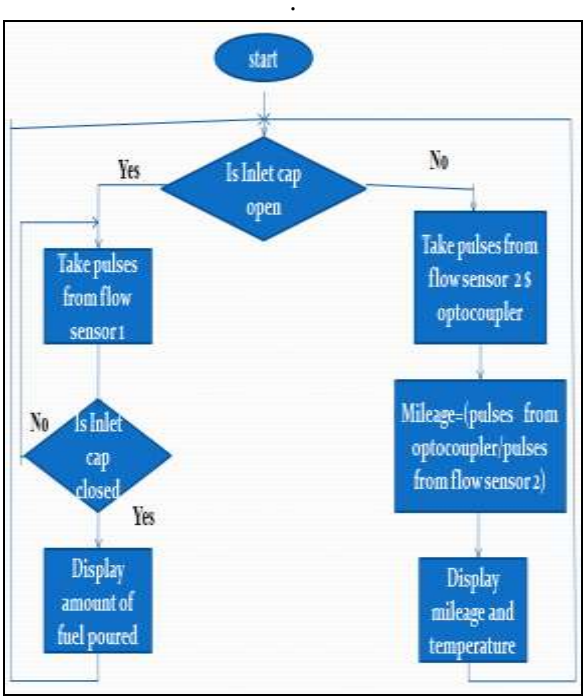

Fig.3.1 Flow Chart

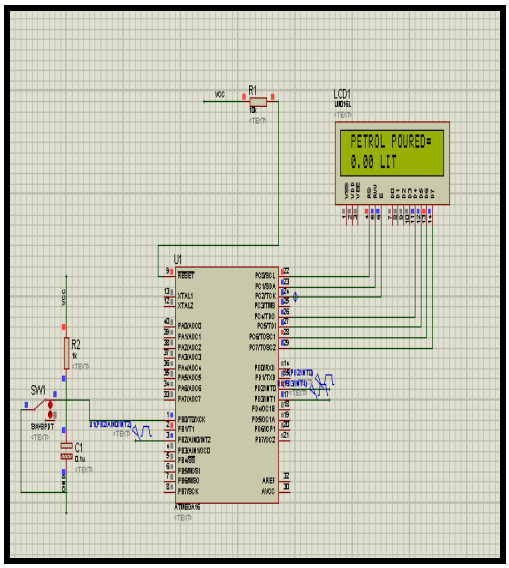

Fig.3.2 Circuit Diagram Results

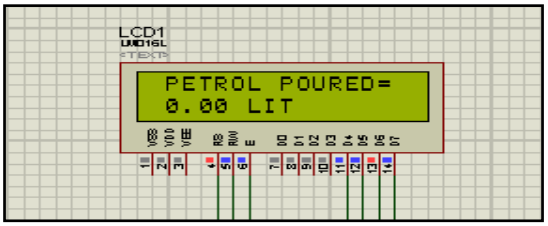

Fig.4.1 Display Showing Petrol Poured

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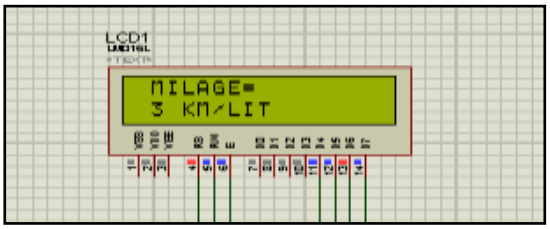

Fig.4.1 Display Showing Milage

The output of the project will be displayed on LCD which will show the following events:

1] The quantity of fuel filled.
2] The mileage of the engine.
3] The temperature of the engine

Conclusion

By designing this data logger we will be able to keep a log of parameter values according to date and time of water supply system on weekly basis.

This log can be used to study and analyze the overall performance of water supply system. This log will be useful to Water Dept to take necessary steps to improve water supply system and thus will increase the service providing capability, also help in maintaining trust amongst its customers.

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