Digital Liquid Level Indicator

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Abstract

Liquid level present in tanks of both general storage and automobiles are to be estimated for the effective usage of the present liquid. The estimation level of present liquid is paramount for the optimum usage of the liquid which is of utmost importance in certain cases. The effective indication of the liquid, the ongoing data-transmission, the enhancement of the signal and the receiving of the subsequent signal in are covered in this paper.

***INDEX** : Liquid level, data-transmission.*

I. INTRODUCTION

In this digitized world, if the indication of liquid levels in automobiles and tanks are also made digital it will help know the exact amount of liquid available in the tank. The above furnished fact is considered in the paper, and a proper solution for indicating the accurate availability of liquid in the tank via our phone at any given place or time within a certain range. This paper focuses on the technology used in order to indicate the exact volume of liquid present in a tank by means of a floating sensor used alongside a transmitter which sends signals to the receiver, which in this case is a mobile-phone. The main advantage is that the user will be notified when the fuel is critically low or in the reserve state hence keeping the person informed and prepared. Here we use floating sensors to accurately read the liquid level. The reading here, is transmitted to the mobile phone which in-turn reads and interprets the received values and produces the necessary output. To avoid tampering of the connection, we provide authentication to the respective user alone. This in turn makes the data not interpretable by any other device keeping the users' data safe. The basic and existing systems as of now are, fuel gauge found in bikes (which does not indicate accurately in volume). Manually opening the lid of the given tank and checking the availability of liquid (which again is inaccurate). Automatic water pumps which indicate one of empty, full or half full which is insufficient for efficient planning. Mileage of vehicles is also an estimate based on an approximation of the remaining fuel.
This project acts as an effort to notify the running out of fuel in bikes' fuel tanks beforehand. At times, we forget to check the fuel level and thereby face problems as a result. The approximate distance travelable is also unknown which is a problem that this app will solve. Overhead tanks with manual pump systems, in cases of power cuts can cause household problems, such as lack of water for daily activities and cooking. Not knowing the accurate level of liquid in the tank hinders the chances of planning with respect to the liquid resource at hand thereby causing unnecessary wastage of resources. Digital Liquid Level Indicator is invented to detect the liquid level in the tank as the input and the percentage of the tank from its full capacity will be displayed on the mobile application along with other information which turns out to be crucial at times. This project in turn aims to keep the owner fully aware of the liquid conditions of the tank at any given time or place.

II. PREVIOUS RESEARCHES

Choudhary Saurabh et. al. [1] studied the framework which demonstrates the fuel level numerically by utilizing LCD. Currently the fuel demonstrating framework in vehicles utilize simple and computerized visuals for indicating surmised fuel level status, not displaying the amount numerically. This framework alluded demonstrates the level of fuel numerically by utilizing LCD. In India, mileage issues have risen to be major issues forcing clients to stall out in obscure zones since they neglect to check their fuel level. This proposed configuration can give an approach to stop

these issues and control the unchecked utilization of the fuel to the client by displaying mileage. This proposed configuration will be useful to control the stream of the fuel in the vehicle, adding to which continuously shows the fuel left and the distance in kilometers it can cover. This is finished by controlling the fuel usage with the assistance of units put in the fuel tank and when the fuel tank gets unfilled a sign is given for the driver that the fuel is void and the vehicle will kill. On the premise of PIC 16F877A advancement of this plan is done and to demonstrate the fuel that is available in the vehicle LCD show is utilized as yield unit.

The system shows the following values:

1. Fuel in Liter 2.Est. Distance 3. KMph (per hour) 4. KMpl (per liter)

LCD shows the Latitude and Longitude value of the users Location, the GPS Antenna monitor the latitude and longitude value of the User Location and these values will be sent to the system com port.

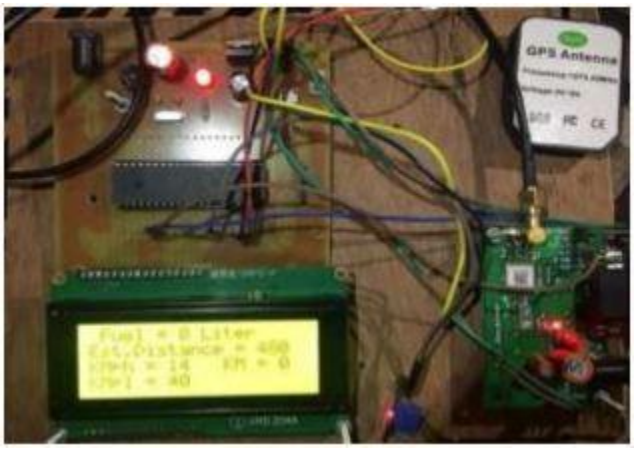

Fig. 1. Digital Fuel Indicator System with Parameter Indication

In this paper they have concluded that the smart digital fuel indicator is an advanced type indicating system. The main advantage of this system is that it can give accurate values of remaining fuel as well as the vehicles running capacity in kms. The time taken for operation is very less. All the equipment's have a long life, are durable & have quality materials. This project is able to show that simple available hardware and technology can be used to construct a robust fuel level monitoring system. It also shows the location of the vehicle to the user by using the latitude and longitude values. The system designed and tested in this project is presented at the low construction cost of the system . Involving mechatronics in such design applications can eventually solve many practical problems with ease, reliability and at a low cost.

Even though the quality of the material used and components used are of good quality, the cost of the project is not so costly and it can be used and implemented in all vehicles without much increment of cost of the vehicle. This smart fuel indicator is best in its field and will be most widely used and advance system

Mr. Vaibhav N. Ghenand et. al. [2] studied that system is needed because how much fuel left in the tank, is always a point of tension? So before digital world analog meter were invented to keep a check on the fuel. Those meters gives rough estimate of the fuel left in the tank and sometime this rough idea created trouble for the driver. Today everyone is in a race of making as much profit as possible therefore many petrol pumps does not injects the paid fuel. So this project also keeps a track of this theft. This project tells about parameters that indicate the volume of fuel in the tank available for driving the automobile with more precision compared to the existing system. Calculates and verifies that the paid amount of fuel was delivered to the vehicle or not; indicates, in case of any discrepancy and upgrades its status on the basis of real time. In this project it is concluded two Ultrasonic sensors detects the exact quantity of fuel available in fuel tank along with this the gas sensor will detect the quality of fuel being filled in tank. Thus, these two important factors of quality and quantity from customer's point of view are determined. Hence, this project with accurate measurements will help us avoid the major issues of fuel fraud being carried out at fuel stations and it will also help us get the idea about the fuel adulteration.

Elumagandla Surendar et. al. [3] they studied that an advanced digital Fuel meter is the one which shows the level of Fuel in digital format. In their project, they proposed a digital measurement system which constantly displays the different parameters like Fuel quantity and battery health. The heart of the project is the microcontroller which takes necessary decision depending on the sensor feeds and displays the results in the digital format. An analogue type Fuel tank level sensor is interfaced to the analogue-to-digital convertor(ADC), which converts analogue voltage output

from the sensor to the digital form and feed to microcontroller. Then the microcontroller calculates the level depending on the digital value multiplied with the volume of the tank at that level and displays the digital numeric value on the screen. Our digital indicator will indicate the level of Fuel in millilitres. This type of Fuel indicator has not been implemented in any of the two wheelers till now. In this project, we are using many components. The important components used in the project are

[1] Analog To Digital Converter (ADC)
[2] Microcontrollers
[3] Kiel micro vision(software)
[4] Sensors
[5] LCD display with keypad

Their principle of design was actually formed for the good cause of common people. Petrol rates are increasing by the day and it's a rising issue. In the present, most bikes which are available in the market are not having a digital Fuel meter in it. With this the person cannot know how much petrol is present. So if the bike consists of a digital Fuel meter in it, the person will be able to know how much fuel is left in millilitres. So, this concept will be very helpful for common man. Usually, in

the winter season the battery gets depleted. Due to which, the vehicle will not start immediately . So, it's a problem faced by many people. If the vehicle consists of a battery indicator, which shows how much charge is present in it. So, if these two concepts are present in the bike or a car, it will be very useful to everyone.

Construction Phase: a. Tank construction b. Digital Fuel meter construction c. Battery

mechanism Tank Construction:

1. The original petrol tank is used by changing the sensors present in it.
2. The capacity in volume, of the tank is 12 liters.
3. The tank is of a shape which is indefinite.

Digital Fuel meter construction: 1. The Fuel meter is directly put together in the vehicle. 2. The Fuel meter will work accurately with the help of micro controllers ADC. 3. Fuel meter consists of an LCD panel and a fuel level sensor.

Battery Mechanism:

1. The calculation of the rate of time at which electrical energy is being transmitted or expended in an electrical system. The potential difference between the two points in volts is equal to the energy per unit charge (in joules/coulomb) which is required to move the electric charge between the points. Since the electric current ascertains the charge per unit time (in coulombs/second), the electric power p is given by the product of the P=VI (watts)

$P = i2R =$ (watts)

2. Most of all, digital circuits requires a 5.1V regulated voltage. Any sort of fluctuation in the power supply will not be tolerated by the digital circuits. To process clean DC of 5V we require a voltage regulated IC.
3. The stepped down 12V AC output from the transformer or a 12V DC from a battery can be used. This voltage is given to the voltage regulator via a 1N4007 rectifier diode D1, this in turn helps protect the circuit when reverse terminals are connected. The same rectifier diode D1 will convert the 12V AC to DC on connection to the transformer. The converted dc supply will the be filtered using a 100µf capacitor C3 across the cathode of the diode and gnd. The half waved rectified power supply is then given to pin1 of the voltage regulator 7805.

LCD Description:

Initializing the LCD: Before you may really use the LCD, you must initialize and configure it. This is accomplished by sending a number of initialization instructions to the LCD.The first instruction we send must tell the LCD whether we'll be communicating with it with an 8-bit or 4-bit data bus. We also select a 5x8 dot character font. These two options are selected by sending the command 38h to the LCD as a command. As you will recall from the last section, we mentioned that the RS line must be low if we are sending a command to the LCD.

Fuel gauge: A Fuel level detector (Fuel gauge) is a device inside a car or other vehicles that shows the amount of fuel available. This type of system can be used to measure the amount of fuel or other types of liquids. It typically consists of a sensing or sending units that measures the amount of Fuel actually remaining and a gauge or indicator that transmits this information outside the fuel container. A Fuel gauge can be designed in a number of different ways and many gauges have several flaws that can make the readings comparatively less accurate. The two parts of a Fuel gauge are the sensing or sending unit and the indicator or gauge. A sensing unit is a part of the Fuel gauge found within or connected to the actual Fuel storage container in a vehicle. In a car these days, for example, the sensing unit consists of a float inside the Fuel tank, which is connected to a metal rod that runs through a small electrical circuit. The float raises up or lowers down based on the amount of fuel in the tank.

Relay Driver: Relay is an electro-mechanical switch which can be accessed and controlled by an electronic circuit.

Relay consists of contact points and electromagnetic coils. In most cases, there will be a need of device switches in the electrical appliance which will be on or off depending on the logic produced by an electronic circuit board which runs on few volts of DC. In such scenarios, relays are used which isolate high voltage AC from the DC logic sections. The relay has high quality contact points which can bare more amps of current. The common relay coil is designed for 5-6V of operation voltage. The output pin of the microcontroller is given to the current amplifier through 1K resister.

Procedure:

i. In sense of the mileage of a vehicle, which is affected by some factors which we have considered, we have also used economical, useful, intelligent and quick responding sensors to calculate the effect of the all the factors directly and indirectly.

ii. All the sensors are located at their particular places to perform their operations. Sensors are efficient and quick responding units. The sensors collect all the data in running vehicles and then moves collected information up to the E.C.U. E.C.U. is the controlling unit which commands all the individual sensors and gives them the power to run and forward the collected data to the C.P.U. The E.C.U. is electronic control unit. Then the data moves up to the central processing unit i.e. C.P.U. At this unit the data is computed into the numeric form by means of programming. All the data from the sensors is converted into the form of mileage. All the information is now in coded form which moves towards the modulator. Modulator is the unit to modulate the information and finally the data in display on the digital Fuel indicator in a numeric form.

iii. To maintain the accuracy level the C.P.U. has designed. By providing the clearance in data computation there is 3% to 4% of clearance for sensors errors and immeasurable factors so the information as given by system as near as actual. Thus the modified type intelligent Fuel indicator system operates.

They concluded many facts in their experimental analysis on a two stroke two wheeler vehicle. The project gives us the indication of parameters like Fuel level and battery health. The result shows us two meters which display

1) Fuel level indicator which shows the amount of Fuel present in the petrol tank.
2) Battery level indicator which shows the percentage of charging left over in the battery.
3) A six digit password substituting the key. The ignition will activate, as soon as the password is entered.

From the above results, it is observed that as the digital values of the Fuel are displayed on the LCD, the person can know the accurate level of the Fuel. So that there is no chance of thefts to be done in petrol pumps. The battery indicator helps us to know the amount of charging left over and it helps us mainly in seasons like winter and monsoon, when the battery generally gets discharged. There is a password which substitutes the key. If the wrong password is entered for three times, the master code should be entered and it can be changed also. Therefore, bike thefts can be overcome up to some extent.

They have also concluded that the future scope of this project is to know the amount of impurities present in the total quantity of the fuel. This can be known with the help of sensors which senses the impurity in the fuel. The level of impurity will be shown with the help of digital meter. This idea is taken from the impure milk detector. From that, the amount of water present in the milk can be known. So, using the same principle amount of impurities present in the total fuel can be shown digitally.

Oyndrila Roy et. al. [4] studied that water level indicator may be defined as a system by which we can get the information of water within the reservoir. Water level indicator systems are quite useful to reduce the wastage of water from any reservoir, while filling such reservoir. The wires with colours Blue, Red, Green & Yellow are adjusted to check Level 1, Level 2, Level 3 and Level 4 respectively. Each of these four wires are connected to the amplifier. In this project we have designed the sensor to measure the water up to four different levels. Four segments of insulated conducting wires are used and the naked ends within water are connected with carbon rods. The length of the wire segments are adjusted according to the water levels within the reservoir.

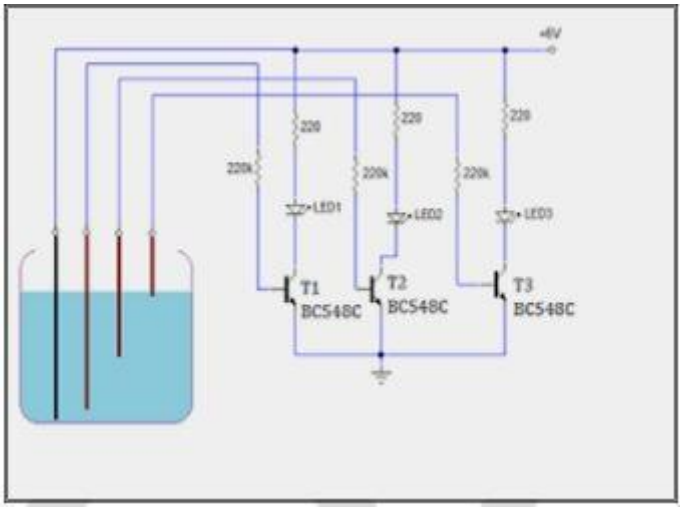

Fig. 2. Circuit digram of Water Level Indicator.

This circuit consists of 4 sensing probes which are dipped in water to sense the level of water. The probe A is connected as common to other three, which should be at the bottom most part of the water tank, also it acts as a reference level. The probes B, C,and D are set as minimum, middle and maximum level respectively. The circuit is assembled on a general PCB and encloses it in a casing and mounts it inside home with the indicator LED's pointing out of the box. A short length three, 18 SWG copper wires can be used as sensing probes and for common sensor Probe A, a bare copper wire can be used.

When water in the tank touches the probe A and B simultaneously, a small current flows from A to B through the water and to the base of transistor T1 via a 220KΩ resistor. As a result, the transistor conducts causing the LED1 to glow and immediatly the pump will start functioning and the buzzer starts sounding. Similarly, when the water touches sensor C, LED2 glows and indicates that the tank is half filled and the pump still works and it gives the information about the level of water in the tank. Finally, when the water touches sensor D, LED3 glows and indicates the tank is completely filled and immediately the pump stops functioning and the buzzer connected will stop. Input Voltage: 6-volt power supply is required.

Transistor: BC548C is general purpose silicon, NPN, bipolar
junction transistor. It is used for amplification and switching purposes. The current gain may vary between 110 and 800. The maximum DCcurrent gain is 800.

Water Sensors: 18 SWG copper wires can be used as sensing probes that can be placed in the water tank. As the current required passing through the wire is in nano amps. But if required, the carbon rods at the end of wires can also be used. These carbon rods should be thoroughly washed.

LM7805: This is a 5V regulator used to power up the entire circuit.

Buzzer: Any 6 V buzzer will work here. Automatic Water Level Controller can be used in Hotels, Homes, Factories, Apartments, Commercial Complexes, Drainages and so on. Automatic water level controllers will automatically START the pump set as soon as the water level falls below the predefined level (usually 1/2 tank) and will SWITCH OFF the pump set as soon as tank is full. It can be used to predict flood Liquid level indicator in the huge containers in companies.

This can not only be used for water tanks but also used for oil level and chemical level in labs. To design this system, we used transistors as platforms along with local materials of low cost. We tried to design a system in such a way that its components will be able to prevent the wastage of water. The whole system operates automatically. So it does not require any expert to operate it. It is not expensive either. This design has scope for future research and development due to its vast capabilities.

III. CONCLUSION

This project has given knowledge and experience in coding, designing, testing and implementation. It has also helped in putting into practice, various software engineering principles, algorithms, data structures and file structure principles, like integrity and consistency of data

This project will help to analyze the appropriate amount of liquids in either automobile tanks or personal usage tanks thereby saving the usage of fuel, water or any other liquid.

By putting into use this project, an individual can analyze the appropriate amount of liquids in either automobile tanks or personal usage tanks thereby saving the usage of fuel, water or any other liquid. The project is helpful to the environment as it saves precious liquids by regulating its usage. It saves money by predicting the exact amount of liquid and also saves a lot of time by informing us in prior the exact amount of liquid that remains.

This project on a whole is beneficial, as it is useful in day to day life. It solves the major problem of water wastage thereby ending water crisis and also another major problem of fuel depletion solved by limiting the use of fuel based on requirement.

Thus, we conclude by saying that our project on a whole is environmental friendly and helps in planning for effective usage of liquids.

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