International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 08 Issue: 10 | Oct 2021 www.irjet.net p-ISSN: 2395-0072

DEVELOPMENT OF FUEL MEASURING DEVICE FOR AUTOMOBILES THROUGH AXIAL TURBINE FLOWMETER

Sanket P. Deore[1]

[1]*B.E., Dept. of Mechanical Engineering, MVP's KBT College of Engineering, Nashik, Maharashtra (India)*

Abstract - *India, a country having population more than 1.2 billion and counting is the only country in the world showing drastic changes every coming day. The Power requirement in our country is also in a huge quantity. As India comes in list of developing countries the major source of power generation is nonrenewable source which includes thermal power plants extra also due to overpopulation in the country which includes majority of people belonging to working class or middle-class production of two wheelers and four wheelers in mass quantity and thus brings India rank in world's top 3 automobile production sector. Due to continuous demand of automobile in the country the fuel requirement to run these vehicles is also increasing day by day. also due to the effect of some adverse geopolitical situation there is a drastic hike in the prices of crude oil these all situations are putting its huge impact on common man's life because ultimately it is leading to rise in fuel prices. Also, another had a problems like corruption are finding it's deep roots in almost every sector and hence to curtain the impact of corruption from at least one factor that is petroleum industry we are trying to develop a model which could be installed in any vehicle with ease and thereby making consumers to re-authenticate the amount of fuel field into their vehicle with the help of display unit.*

***Key Words*: (power generation, non-renewable source, two and four wheelers, geopolitical situation, fuel)**

1.INTRODUCTION

Petrol has become an in dispensable part of our life and we can't imagine our life without it. However, fuel prices are skyrocketing, and this will eventually affect everything we use in our day-to-day lives. Poor people already struggle to get by on a square meal a day, and this increase is likely to paralyses them. The price of gasoline has climbed tenfold in three years and continues to rise. It's only putting more fuel on the fire. For manufacturing and transportation, the increase in the price of gasoline has a direct or indirect impact on all main sectors such as transportation, textiles, car, FMCG, and so on. This has an impact on the prices of basic necessities that are transported on a regular basis. The banking industry is also projected to suffer as a result of the high level of inflation. Food prices will rise in tandem with fuel prices. Poor households spend more than half of their money on food and only a tenth on fuel, so this will have a greater impact on them. It's a chain reaction that, once initiated, will have an impact on everyone. An increase in the price of gasoline will raise transportation costs, which will raise the price of products, and this increase in the price of goods will gradually push people to loosen their purse strings even more, and so on, the chain will continue to spread. These ups and downs push more people into poverty, worsening the plight of those who are already poor. This has undoubtedly caused consternation among ordinary people who are struggling to make ends meet. In comparison to the higher-wage salaried class, the price increase only affects low-wage or fixed-salaried middle-class households. The present middle class is being squeezed, and many people aiming to achieve the middle-class standard are finding it increasingly difficult to do so. There will be no detrimental impact on government employees because their Das will be increased proportionally. The wealthy and crooked are unconcerned about it. The burden will be transferred to the common people by the business class, such as auto-rickshaw drivers, so that they are also safe When doing business, ordinary people should transfer the burden on to their customers and create a chain reaction. These are only some of the issues that ordinary people and the working class are facing as a result of rising fuel prices, but there is another side to the coin that is gaining traction in practically every sector, and that significant concern is corruption. We can now locate it in practically any industry. So the major question is: how did corruption begin in the petroleum selling industry? When you ask for Rs 1,000 worth of petrol, the attendant only gives you Rs 200 worth of oil. When you question him why he didn't fill up for Rs 1,000, he says he didn't have enough money. He'll smile innocently and claim he heard Rs 200 and would fill the remaining Rs 800, then he'll reset the meter and fill up another Rs 800 of gasoline, and you'll pay Rs 1,000 (200+800). What exactly is the ruse here? The issue is that he never resets the meter; instead, he goes from Rs 200 to Rs 800, implying that you only obtain petrol worth Rs 800 but pay Rs 1,000. The secret is that he goes towards the. meter when he says he's resetting it to zero. You will have a natural tendency to look

at him or hear him, and in those 3-4 seconds, the main attendant will restart the meter, and by the time you look at it, it will be somewhere near 300-400, giving the impression that the meter has restarted from zero, when in fact it was only continued from the 200 points. So, you've lost Rs 200. We have a mathematical analysis of how an ex-petroleum pump owner makes money in this industry. First and first, we must understand how petrol stations make money. Essentially, they receive a commission for each liter of fuel sold. The commission is Rs.2.50 per liter for PETROL. 1.50 rupees per liter DIESEL (approx. As per the new revised government norms) Profits from the selling of lubricants are also included. As a result, earnings are obviously dependent on the amount of fuel sold at a single gas station. Typically, interstate gas stations make more money than city stations. Each month, an average gas station sells 40,000 liters of gasoline and 150,000 liters of diesel. On that basis, the average salary is: 40000*2.5 = Rs. 100000 PETROL 150000 * 1.5 = Rs. 225000 DIESEL Rs.3,25,000 in gross income Rs. 1,00,000 in total expenditure (including maintenance) 3,25,000 - 1,00,000 = Rs. 2,25,000 in net income. Various marketing methods can constantly be used to try to enhance sales. Providing credit to bulk buyers is one method (construction contractors, bus services). Various strategies are being implemented in order to attract individuals. Bettering our services (drinking water, clean toilets, free air). Appointing personnel who are well-behaved.

2. Problem Statement

Due to the above-mentioned cases and frauds going in the country the people of India are unknowingly facing major losses. Also, the tactics behind such frauds are hidden and so the people are fooled under their nose. Though paying attention to any such trick, we are fooled some of the other way. Hence there is a need to develop a device to prevent such frauds. So, identifying the problem we have its stated as Development of fuel measuring device through flow sensor. With the help of developing this device and installing in any sort of vehicles i.e. in their respective fuel tanks every time while filling the fuel we can get a double authentication about the volume we are putting firstly on the screens of the fuel filling machine and secondly on the screens of our vehicle dashboard. During our survey about this major problem, we have also found some of the reports showcasing the same problems.

3. Objectives

The objective of this project is to reduce the losses which the country is unknowingly facing. The main objectives of the project include:

1)To reduce the number of fraudulent cases of fuel filling in the country.
2) To reduce the losses which are unknowingly faced by the people.
3) To authenticate the amount of fluid filled in the fuel tanks.
4) To increase the transparency between seller and customer.
5) To provide complete customer satisfaction.

4. Components Requirement

4.1 Axial Turbine Flow meter

The turbine flow meter (also known as an axial turbine) converts the mechanical action of a turbine revolving in a liquid flow around an axis into a rate of flow that can be measured by the user (gpm, lpm, etc.). All of the flow tends to travel around the turbine. Natural gas and liquid flow are both measured using turbine flow meters. At low flow rates, turbine meters are less precise than displacement and jet meters, but the measuring element does not obstruct or significantly restrict the entire flow path.

Fig.1-Axial Turbine Flow meter

In comparison to displacement-type meters, the flow direction through the meter is often straight, allowing for larger flow rates and less pressure loss. They are the preferred meter for large business users, fire protection, and water distribution system. master meters. In most cases, strainers are necessary in front of the meter to protect the measuring element from gravel or other material that may enter the water distribution system. Turbine meters are typically available for pipe sizes ranging from 4 to 30 cm (1 1212 in) or larger. Bronze, cast iron, and ductile iron are common materials for turbine meter bodies. Internal components might be made of plastic or non-corrosive metal

alloys turbine elements. They are accurate in normal working conditions but are greatly affected by the flow profile and fluid conditions.

4.2 Solenoid Valve

A solenoid valve is an electromechanical device in which the solenoid generates a magnetic field and thus operates a mechanism that regulates the opening of fluid flow in a valve by using an electric current. The solenoid's power consumption and supply requirements vary depending on the application, with fluid pressure and line diameter being the most important factors. For example, a common 3/4" 150 psi sprinkler valve with a transient inrush of 7.2 VA and a holding power requirement of 4.6 VA is designed for 24 VAC (50 - 60 Hz) residential systems. In comparison, an industrial 1/2" 10000 psi valve with an inrush of 300 VA and a holding power of 22 VA is designed for 12, 24, or 120 VAC systems in high pressure fluid and cryogenic applications. In the unpowered state, neither valve specifies a minimum pressure required to keep it closed.

Fig.2-Solenoid Valve

4.3 Level Sensor

Liquids, other fluids, and fluidized solids, such as slurries, granular materials, and powders with an upper free surface, are detected by level sensors. Gravity causes flowing substances to become almost horizontal in their containers (or other physical constraints), but most bulk solids pile up at an angle of repose to a peak. The substance to be measured can be in its natural state or inside a container (e.g., a river or a lake). Continuous or point values can be used to measure the level. Continuous level sensors identify the exact amount of material in a given location by measuring the level within a specified range, whereas point-level sensors merely tell whether the substance is above or below the sensing point. The latter, in general, detects levels that are abnormally high or low. The selection of the best level monitoring method for industrial and commercial processes is influenced by a number of physical and application aspects. Physical: phase (liquid, solid, or slurry), temperature, pressure, or vacuum, chemistry, medium dielectric constant, density (specific gravity), agitation (activity), acoustical or electrical noise, vibration, mechanical shock, tank or bin size and form are among the selection factors. Price, accuracy, appearance, reaction rate, ease of calibration or programming, physical size and mounting of the instrument, and monitoring or control of continuous or discrete (point) levels are all relevant application restrictions. In a nutshell, level sensors are one of the most significant sensors that are used in a wide range of consumer and industrial applications. Level sensors, like other types of sensors, are available or can be built to use a number of sensing principles.

Fig.3-Level Sensor

4.4 Boost Converter Circuit

A boost converter (also known as a step-up converter) is a DC-to-DC power converter that increases voltage while decreasing current from its input (supply) (load). It's a type of switched-mode power supply (SMPS) with at least two semiconductors (a diode and a transistor) and one energy storage device. A capacitor, an inductor, or a combination of the two is used in this circuit. To reduce voltage ripple, capacitor-based filters (often in combination with inductors) are typically added to the output (load-side filter) and input of such a converter.. Any acceptable DC source, such as batteries, solar panels, rectifiers, and DC generators, can be used to power the boost converter. DC to DC conversion is a procedure that converts one DC voltage to another DC voltage. A boost converter is a DC-to-DC converter that produces a higher

output voltage than the input voltage. Because it "steps up" the source voltage, a boost converter is also known as a step-up converter. The output current is lower than the source current because electricity must be conserved.

Fig.4-Boost Converter Circuit

4.5 Battery

The positive terminal of a battery is the cathode, and the

Fig 3.6 Battery

negative terminal is the anode when it is supplying electric power. The negative terminal is the source of electrons that will flow to the positive terminal via an external electric circuit. A redox reaction occurs when a battery is connected to an external electric load, converting high-energy reactants to lower-energy products, and the free-energy difference is

Fig.5- Battery

provided to the external circuit as electrical energy. Historically, the term "battery" referred to a device made up of numerous cells, but its meaning has expanded to include devices made up of a single cell. Compared to typical fuels like gasoline, batteries have a substantially lower specific energy (energy per unit mass). In cars, this is partially countered by electric motors' superior efficiency in transferring chemical energy to mechanical effort as compared to combustion engines.

5. Fabrication and assembly of model

5.1 Selection and Fabrication of Tank

We chose a four-wheeler fuel tank to make a demonstration model, indicating that this technology might readily fit in a four-wheeler. Among the various possibilities for tank selection, we chose th Maruti Suzuki Omni tank as the best

Fig.6- Fuel tank of passenger vehicle

5.1.1 Welding of Tank

The fuel tank was welded using mild steel rods using the oxy-acetylene gas welding process. Oxy-acetylene welding is also used to join mild steel rods. Welding (sometimes referred to as fusion welding) is the process of fusing two or more materials (typically metals) together. can merge, occasionally with the inclusion of filler (a third metal). The term "gas welding" is used when the heating is provided by gas. Gas welding procedures include oxyacetylene and oxy-MAPP.Both require a gas-fueled torch to heat two comparable metal pieces to the fusion point, which allows them to flow together. To integrate the two base materials, a filler rod is utilized to deposit additional metal as needed. The gas and oxygen must be mixed in the torch at the precise proportions and pressures, and the torch can be adjusted to produce flames that are acceptable for the metal being welded.

Oxy-Acetylene Welding Safety When welding:

1) Always wear safety clothes, such as flame-retardant overalls, when welding.
2) Always use the proper eye protection.
3) Keep the spindle key in the acetylene cylinder valve at all times.

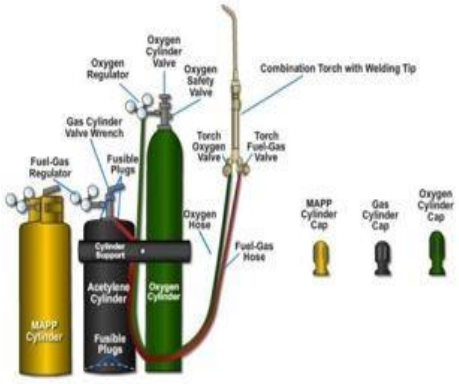

Fig.7- Oxy-Acetylene welding

4) Keep cylinders in an upright position at all times. Always check for leaks with a soapy solution, NEVER with a naked flame.
5) Oil or grease should never be allowed to come into contact with oxygen equipment.
6) Weld an enclosed vessel, such as a petrol or oil barrel, only after it has been thoroughly cleaned.
7) Never operate alone in an enclosed vessel, and always store cylinders outside. If you're operating in an enclosed vessel, make sure you have enough ventilation and firefighting equipment.
8) If the hoses are damaged, shut off the gas supply at the cylinder and notify your instructor.
9) Remember that this equipment might be deadly if it is overused or broken. If you have any questions, ask your instructor for help and explanation.

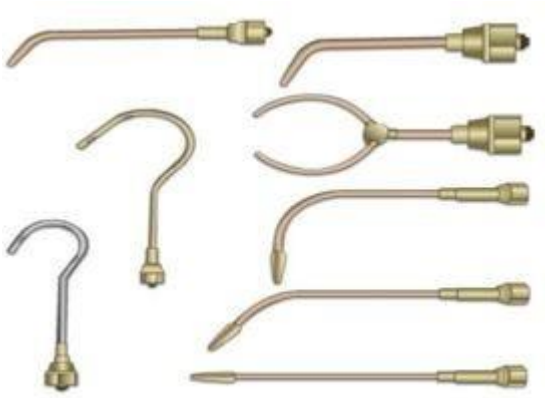

Fig.8- Different Types of Welding Tips

5.1.2Selection of Standard Hose

A fuel line is a hose that transports fuel from one vehicle to another or from a storage tank to a vehicle. To avoid splitting and kinking, it's usually made of reinforced rubber. This excludes any tubes or tubing that are exposed to the atmosphere, such as those used to route crankcase vapours to the engine's intake. For 7/16-inch and smaller inside-diameter diameters, standard neoprene fuel hose can be utilized for fuel, PCV, and EEC systems on any cars with working pressures under 50 psi and vacuum ratings under 24-in. Hg (10-in. Hg for-inch diameter hose). Fuel line is a petroleum-resistant nitrile tube with a weather-resistant, ozone-resistant, and heat-resistant covering that can be utilized for ethanol-laced fuels as well as diesel fuel. However, it should not be used on coolant, oil, or fuel-injection systems that produce pressures greater than 50 psi. The hose should have an SAE rating of 30R6 or 30R7 on it. On bulk rolls, neoprene fuel line comes in diameters ranging from 1/8-inch to 5/8-inch, with additional 3-foot lengths of huge 1-1/2-inch to 2-1/4-inch widths available for gas filler neck applications. For bespoke applications, neoprene with an exterior steel braiding is also available; however, it is difficult to clamp using a typical worm gear clamp. Steel-braided gasoline line frequently necessitates the use of AN-type connections. There's also a high-pressure fuel hose for clamp-type fuel injection systems. This SAE 30R9 gasoline hose has a fluoro elastomeric inner liner that can resist 180 pressures and 300 degrees Fahrenheit. The outside coating is ozone and abrasion resistant, and it's suitable for all fuel mixtures, even raw methanol. Although high-pressure fuel-injection pipe can be used in low-pressure situations, the price differential may persuade you to keep it for when you need it most.

Fig.9- Hose

6. Fitting of Proposed Assembly

6.1 Connection from the flow sensor

Effective water management is supplying water based on actual demand, hence measuring water is a critical stage in water management systems. There are numerous water flow measuring techniques as well as various types of water flow meters that can be used to determine the volume of water flowing through pipes, but they are all prohibitively expensive. With the use of commonly available and low-cost water flow sensors, this article offers ideas for the design and development of low-cost automatic water flow meters. Accurate flow measurement is a critical step from both a qualitative and economic standpoint. Flow meters have shown to be effective instruments for measuring water flow, and with the renowned water flow sensor YF-S201, it is now

relatively simple to design a water management system. This sensor's pinwheel sensor is aligned with the water line and monitors the amount of water that has passed through it. With each revolution, an embedded magnetic Hall-Effect sensor generates an electrical pulse. Red/VCC (5-24V DC Input), Black/GND (0V), and Yell- low/OUT are the three wires that come with the YFS201 Hall Effect Water Flow Sensor (Pulse Output). Using a proper conversion method, we can simply calculate the water flow rate (in liter/hour L/hr) by counting the pulses from the sensor's output.

Figure 10: Fitting of proposed assembly

We recommend soldering a pin header strip to the LCD screen's 14 (or 16) pin count connector before attaching it to your Arduino or Genuine board, as shown in the figure above.

6.2 Circuit Diagram

Connect the following pins to your board to connect your LCD screen:

- LCD RS pin to digital pin 12
- LCD Enable pin to digital pin 11
- LCD D4 pin to digital pin 5
- LCD D5 pin to digital pin 4
- LCD D6 pin to digital pin 3
- LCD D7 pin to digital pin 2

Additionally, connect a 10k pot to +5V and GND, with the wiper (output) connected to the VO pin on the LCD screen (pin3). The lighting of the display is powered by a 220 ohm

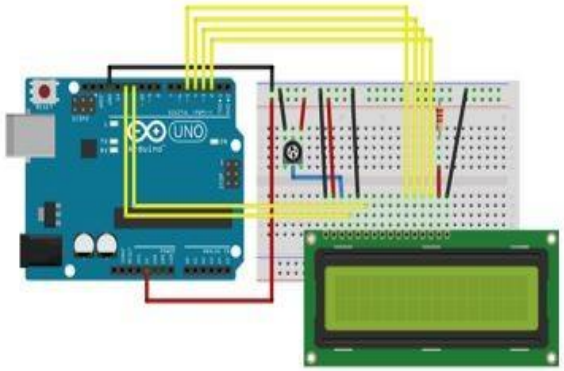

Fig.12-Circuit Connection

resistor, which is commonly connected to pins 15 and 16 of the LCD connector.

6.3 Working of Model-

The proposed assembly needs to maintain correct level of fluid in hose for sensor to work efficiently that is why level sensor is placed in hose which determines the level of fluid filled in hose whenever the level achieved the level sensor sends the signal to the microcontroller. Microcontroller synthesizes this based on algorithm which in turn sends the signal to relay module to activate the relay and bypass voltage from battery to solenoid valve. This solenoid valve activate based on the level of fluid filled in the hose. This assembly ensures to work at maximum efficiency due to such process. The fluid then flows through the flow meter which senses the pulse width modulation to arduino UNO which synthesizes it based on algorithm for flow sensor and calculate the amount of fluid passing through it this information is sent to microcontroller and is printed on 16 X 2 LCD display. This working set up should be prepared using utter care of electronic components. Proper safety should be ensured while making connections. Proper care should be taken while selecting relay module so as to endure 12 VDC supply and required rating based on load. Also the 16 X 2 display unit needs to be connected with the arduino interfaced properly. This module receives voltage from UNO and the values to be displayed on it is calculated by microcontroller itself and sent to this unit for displaying the required value.

Fig.14-Proposed Assembly

7. Conclusion-

From the tests carried with our device we came to the conclusion that the fluid which we have passed from our device gives the exact reading LCD display. Fur- ther if this device will be fitted in fuel tanks of automotive vehicles could serve the customers in a better way and help them to reauthenticate the quantity of fuel they have filled and hence could impact on the reduction of fraudulent cases.If we take an example of an ex-petrol distributor and we come to the observation that that distributor is twitching 50ml of fuel behind a liter and if he sales 1000 liters of fuel per day so looking at the current prices of fuel in the country (approx- imately Rs 75) .we can see that he gains an extra marginal profit of:Behind 1 liter its Rs 4 (approximately) Behind 1000 liter it goes up to Rs 4000 (approximately) If this kind of scenes are taking place on every day basis its a serious matter of consent and should be curtailed somewhere. If we have a word with the fuel distributor, they are unanswerable hence installation of our device could directly give us the results and bring the true face of fuel distributor in front of society. This device if is standardized by government authority and installed in each and every vehicle could make a huge revolutionary impact on the society an ultimately on the country. In this project the transparency between the seller and the customer is increased up to a great extent. The outcome of this project is a reading on display unit which will authenticate the reading on the fuel dispenser machine. This authentication is an utmost requirement today as we do not know how much fuel is actually filled within the tank of the vehicle or is really filled or not. Hence this device shall give a two-way check to the customer who is fooled under his own nose. If we assume there is a twitch of 50 ml per liter in a petrol pump, likewise the country can face a loss of rupees 24 lacs per day. Furthermore, this loss increases to 87 crores per year. So by using this device we can eliminate such losses. Also other diversionary tricks like long hose, two person disturbance trick can be avoided by introducing such device in market.Further this device has no emission in environment as it requires electricity pro- vided by a battery. Hence this device has no adverse effect on environment. By opening a double verification the customer will be satisfied up to a great extent.

8. References-

[1] C.A.Nalin, C.PMarcel, P.Lazo. Development of a measurement technique for detailed flow characterization in fuel bundles, St. Peters University Chennai, TamilNadu, 2015.

[2] H.Mobli, A.Jafri. Design and calibration of fuel consumption measurement sys- tem for a diesel tractor, University ofTehran, Karaj,Iran,2018.

[3] Michael Gunnesby. On flow predictions in fuel filler pipe design, University of Combo- dia,PhnomPenh,Combodia,2014.

[4] Yasuyuki Nishi, Genki Sato, Daishi Shiohara. A study of the flow field of an axial flow hydraulic turbine with a collection device in an open channel Renewable energy, Volume130,Jan- uary,2018.

[5] BinWang,NanZang,YihaoDu. Evaluatingapproachto dynamic characteristics of axial turbine flow meters considering calibration response, Flow Measurement and Instrumentation, Volume 64,December2018.

[6] Sergio Corbera, JoseLuis, Altonio Lozano. Multi- objective global optimization of a butterfly valve using geneticalgorithm,ISATransactions,volume63,July2016.