

## **Fabrication of Fuel Flow Quantity and Quality Measuring Device**

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**Abstract**—The emanations from vehicles bring about increment of ozone depleting substances like carbon dioxide. One of the significant explanations behind expanded discharges is defilement of car fuel. The adulterant that is blended with petroleum and diesel by and large is lamp fuel. The motivation behind why lamp oil is picked as an adulterant is its minimal effort. This defilement brings about diminished execution and lifetime of motor and different parts of a car. Redirection of a lot of lamp fuels with the end goal of contaminated decreases its accessibility to the destitute individuals. So this has constrained them to utilize wood as an option in contrast to lamp fuel for their family unit purposes. This by implication prompts increment in a dangerous atmospheric deviation by expanding air contamination and chopping down of trees. So to anticipate all these evil impacts, a way to deal with programmed fuel debasement discovery and detailing framework is proposed.

**Keywords** — Adulteration, Level Detection, Pollution, Automatic.

### **I. Introduction**

A fuel is any material that can be made to respond with different substances so it discharges vitality as warmth vitality or to be utilized for work. The idea was initially connected exclusively to those materials fit for discharging compound vitality however has since additionally been connected to different wellsprings of warmth vitality, for example, atomic vitality. Adding contaminations to any substance to expand its amount which straightforwardly diminishes its quality so as to pick up benefit in any kind of business is known as Adulteration. Substances utilized for corruption are called as adulterants. More often than not, adulterants will be of various sort when contrasted with the first substance where it is blended. They lessen the nature of the substance where they are included. Debasement should be possible to any substance. Defilement has destructive impacts.

### **II. WORKING PRINCIPLE**

The Figure demonstrates the genuine execution of fuel corruption recognition in autos. In this procedure, when an individual opens the cover of the fuel tank and begins filling fuel in to it, a little part of the fuel goes in to a little assembly of limit 50ml. This chamber is made out of glass and a camera is put at a fixed position at a separation of around 20 centimeters. At the point when the filling is finished and the cover of the tank is shut, a sign is given to the Raspberry-pi. In the wake of accepting this sign, the Raspberry-pi consequently begins to warm the chamber by sending a sign to the warming component that warms the chamber. This warming will happen just for a predefined measure of time that is pre-customized in the Raspberry-pi as per the fuel utilized.

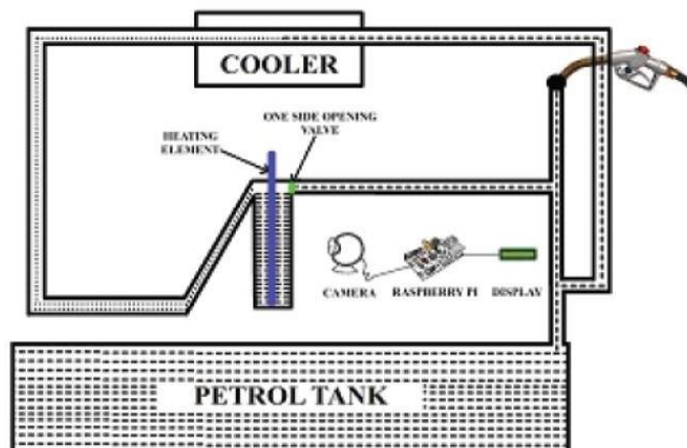


Figure-1: Implementation diagram of Fuel adulteration detection system

### Inspection Working Method for Petrol:

This is the real measure of time required for 50ml of unadulterated petroleum to dissipate totally under typical Conditions. On the off chance that the filled in fuel is corrupted, after the warming, the fluid left in the chamber comprise just the adulterants. The camera takes image of the glass tube and sends it to the Raspberry-pi for preparing. By utilizing the vigilant edge identification procedure, the Raspberry-pi forms the picture and tracks the pixel at which the edge happens. Utilizing this pixel esteem, the Raspberry-pi figures the measure of adulterant left in the cylinder. This is changed over in to rate and showed in the LCD.

### Inspection Working Method for Diesel:

In the Diesel assessment technique one should know the real measure of time required for 50ml of Kerosene to vanish totally under typical conditions. After the warming, the fluid left in the chamber will comprise of just the diesel fuel. The camera takes image of the glass tube and sends it to the Raspberry-pi for handling. By utilizations the Canny edge identification method, the Raspberry-pi forms the picture and tracks the pixel at which the edge happens. Utilizing this pixel esteem, the Raspberry-pi figures the measure of diesel in the cylinder. From this worth, the Raspberry-pi figures the measure of corrupted lamp fuel in the diesel fuel. This is changed over in to rate and showed in the LCD.

### Information Sharing:

In the event that an individual has advanced mobile phone the corruption finder can identify the measure of debasement in the fuel and send this data to an application in PDA through IOT. The application can refresh this data about the contaminated level in that filling station to a server utilizing web The application can refresh this data about the defilement level in that filling station to a server utilizing web

### Level Detection using Image Processing:

In the exploratory arrangement initial a fixed amount (50ml) of unadulterated petroleum is warmed with the goal that it totally vanishes and the time taken for this dissipation is recorded. At that point the tainted fuel is warmed for a similar measure of time with the goal that whole petroleum in the contaminated blend gets completely dissipated and just the adulterant remains. At that point this adulterant is moved to a glass container of 50ml volume. The camera takes image of the glass tube at a goals of 320\*240 pixels and sends it to the Raspberry-pi for preparing. Raspberry pi forms the picture to locate the degree of the fluid. Shrewd edge location is utilized for this reason.



Figure-2: Image to demonstrate canny detection technique.

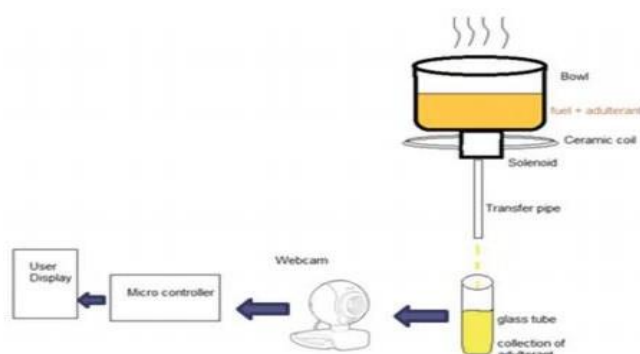


Figure-3: Experimental Setup using Image processing method.

Figure 3 is utilized to show vigilant discovery system. It delineates a glass cylinder containing adulterant. All pictures taken by cameras contain commotion, so to keep clamor from being erroneously distinguished as edges, commotion must be expelled. So the picture is first smoothened by utilizing a Gaussian channel. Shrewd calculation discovers edges where the dim scale force of the picture changes the most. First the inclinations in the x and y headings are approximated by utilizing parts. By utilizing Pythagoras hypothesis the Euclidean separation is estimated. The smoothened picture is then contrasted and the registered edge qualities. After every one of these procedures, the edges will end up unmistakable yet the edges are expansive and don't show precisely where they are. Presently, the obscured edges in the picture should be changed over to sharp edges, for this reason picture concealment is utilized. The edge quality of the present pixel is contrasted and the pixels in the positive and negative angle course. The estimation of edge quality is saved on the off chance that it is over a specific limit esteem else it is smothered. After this, the rest of the edge pixels qualities are stamped pixel by pixel. The Canny edge recognition calculation uses twofold thresholding. Edge pixels more grounded than the high limit are set apart as solid; edge pixels flimsier than the low edge are smothered and edge pixels between the two edges are set apart as powerless. Solid edges are incorporated into the last edge picture quickly and powerless edges are incorporated just on the off chance that they are associated with solid edges. By utilizing the shrewd edge identification system, the Raspberry-pi forms the picture and tracks the pixel position at which the edge happens. Utilizing this pixel esteem, the Raspberry-pi figures the measure of adulterant left in the cylinder. This is changed over in to rate and showed in the LCD.

### III. COMPONENTS USED

Sl. No.	Components Names	Numbers Used
1	Arduino UNO	1
2	LCD	1
3	Flow Sensor	1
4	4 channel Keypad	1
5	Relay	1
6	12 V Solenoid	1
7	Power Supply Board	1

TABLE I: COMPONENTS USED

#### ARDUINO UNO



*Figure-4: Arduino UNO*

The Arduino Uno is a microcontroller board dependent on the ATmega328 (datasheet). It has 14 advanced info/yield pins (of which 6 can be utilized as PWM yields), 6 simple data sources, a 16 MHz precious stone oscillator, a USB association, a power jack, an ICSP header, and a reset catch. It contains everything expected to help the microcontroller; just associate it to a PC with a USB link or power it with an AC-to-DC connector or battery to get begun. The Uno varies from every previous board in that it doesn't utilize the FTDI USB-to-sequential driver chip. Rather, it includes the Atmega8U2 customized as a USB-to-sequential converter.

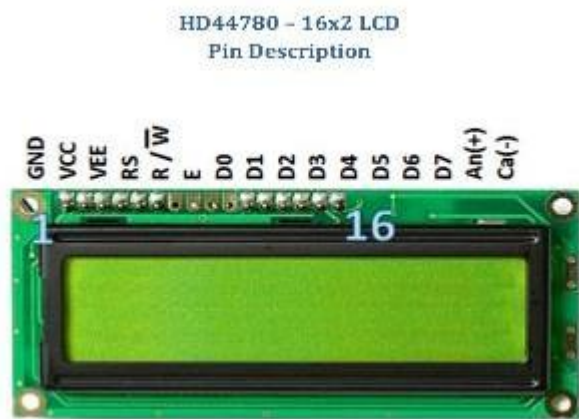
Arduino is chosen since it is an open-source stage, cheap and gives adequate simple/advanced I/O pins for adjustable applications. It works at 5V and is fueled with Atmel's ATmega328 small scale controller with a clock speed of 16 MHz's. It has a blaze memory of 32kB and Static Random Access Memory (SRAM) of 2kB. It has 6 simple pins and sequential ports. One of the sequential ports is associated inside to Universal Serial Bus (USB) port.

**LCD:**

The material "fluid gem" was found incidentally by the botanist Freidrich Reinitzer as right on time as 1888. Anyway the financially accessible fluid precious stones were not created until the late 1960's

We get the meaning of LCD from the name "Fluid Crystal" itself. It is really a mix of two conditions of issue – the strong and the fluid. They have both the properties of solids and fluids and keep up their individual states as for another. Solids more often than not keep up their state dissimilar to fluids who change their direction and move wherever in the specific fluid. Further examinations have demonstrated that fluid precious stone materials show to a greater extent a fluid state than that of a strong. It should likewise be noticed that fluid gems are more warmth touchy than expected fluids. A little measure of warmth can without much of a stretch transform the fluid precious stone into a fluid. This is the motivation behind why they are likewise used to make thermometers.

The fluid gem show has the unmistakable bit of leeway of having a low power utilization than the LED. It is ordinarily of the request of microwatts for the presentation in contrast with the some request of milliwatts for LEDs. Low power utilization necessity has made it good with MOS incorporated rationale circuit. Its different favorable circumstances are its minimal effort, and great differentiation. The principle downsides of LCDs are extra prerequisite of light source, a constrained temperature scope of activity (somewhere in the range of 0 and 60° C), low unwavering quality, short working life, poor perceivability in low encompassing lighting, moderate speed and the requirement for an air conditioner drive.



PIN	Description	
GND	GND connection	
VCC	V <sub>CC</sub> = 3.3 – 5 V	
VEE	LCD Character Dimmer	
RS	Control Signals	Selects between writing a command or data
R / W		Read or Write operation. This pin is usually wired to GND
E		Falling edge will trigger an operation
D0	Data Lines	Least significant bites, usually not connected since LCD is used in 4-bit operation.
D1		
D2		
D3		
D4		Most significant bites. Data and commands are written to these pins 1 nibble at a time, starting with the most significant nibble (MSN).
D5		
D6		
D7		
An(+)	Power supply for the back light, V <sub>CC</sub>	
Ca(-)	GND connection for the backlight, GND	

*Figure 5: LCD pin description*

### Basic structure of an LCD:

A fluid precious stone cell comprises of a slender layer (around 10  $\mu$  m) of a fluid gem sandwiched between two glass sheets with straightforward cathodes kept on their inside countenances. With both glass sheets straightforward, the cell is known as transmittive sort cell. When one glass is straightforward and different has an intelligent covering, the phone is called intelligent sort. The LCD does not create any brightening of its own. It, truth be told, depends totally on light falling on it from an outer hotspot for its enhanced visualization.

### Hall-Effect Flow Sensor

Exact stream estimation is an essential development both in the states of emotional and fiscal points of view. Stream meters have shown magnificent contraptions for evaluating water stream, and now it is definitely not hard to build a water the administrators structure using the acclaimed water stream sensor YF-S201. This sensor sits as per the water line and contains a pinwheel sensor to evaluate how much water has gone through it. There is a consolidated alluring Hall-Effect sensor that yields an electrical heartbeat with each steamed. The "YFS201 Hall Effect Water Flow Sensor" goes with three wires: Red/VCC (5-24V DC Input), Black/GND (0V) and Yellow/OUT (Pulse Output). By counting the beats from the yield of the sensor, we can without quite a bit of a stretch discover the water stream rate (in liter/hour – L/hr) using a sensible change condition.

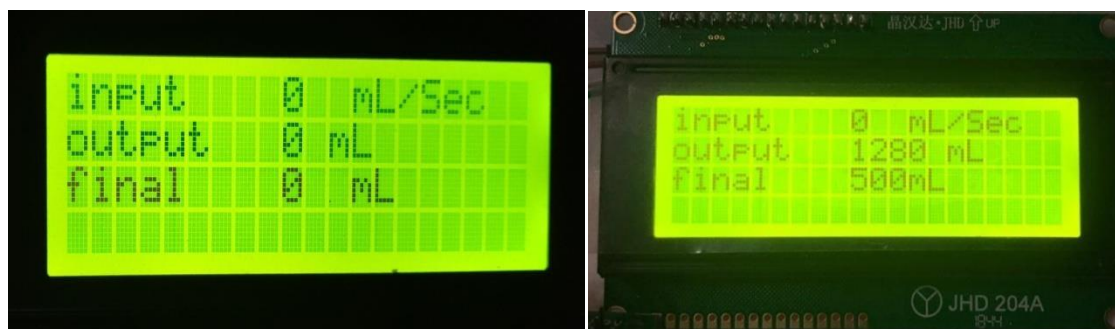


Figure-6:Flow sensor

## IV. RESULTS AND DISCUSSION

Initially, the plan was to fabricate a device which could actually be fixed to the inlet of the automobile's fuel tank. But later, we had to come up with a prototype due to the hurdles faced and thus the project was carried out with lots of twists and turns since it had many difficulties. The prototype has been proposed efficiently which serves the purpose effectively. The plastic tank was apparently used as fuel tank which was attached with the flow sensor. Fuel tank had an outlet to which a 12 V Solenoid was attached. This solenoid acted as a switch with the help of relay in-order to control the flow of fuel from petrol tank to the test tube to test the quality. Solenoid had two outlets, out of which, one acted as inlet to the engine and the other acted as inlet to test tube. Very small quantity of fuel was taken to test the quality. When the fuel was made to flow through the flow sensor, the quantity was measured. The flow sensor was calibrated in such way that the measured results were accurate. Once the fuel quantity is measured, a small quantity is taken to test the quality. This flow is actuated by solenoid and relay switch. This entire functioning was controlled by a programmed Arduino UNO board with the help of a microcontroller mounted on it. A 4 channel keypad was used to manually control the operation. Once the fuel is taken in test tube, the heating is turned ON. If the adulterant is present then the residue will be present and if the fuel is pure, then the entire fuel will get evaporated and the test tube will be left empty. Once the heating and evaporation is done, the camera clicks the image and processing will be started. The system with the help of previously trained images identifies the quality of the fuel. In-order to obtain an accurate result, the system was trained with many respective images. Once the system identifies the quality of the fuel, it uploads the measured quantity and tested quality results to the cloud along with the temperature. Thus the result can be displayed on our mobile phone. This feature really helps us to stay away from being cheated. We can also help the society by informing if any fraud activities are being carried out by the fuel vendor.

**Quantity Result:**



*Figure 7: Images of quantity result*

The image on the left shows the initial display before the fuel is poured. The image on the right shows the final reading of the quantity of fuel poured in the tank.

**Test Images for image processing:**



*Figure 8: Images for pure fuel*

The above image on the left is considered as pure because, the beaker will be empty after evaporation, if the fuel is pure. The image on the right is pure petrol.



*Figure 9: Images for impure fuel*

image on the left is considered as impure because, the beaker will have residues after evaporation, if the fuel is adulterated. The image on right is mixture of fuel and adulterant.

These images have been classified, replicated and trained using machine learning algorithms, so that the quality result given by the system is highly accurate.

## Cloud Result

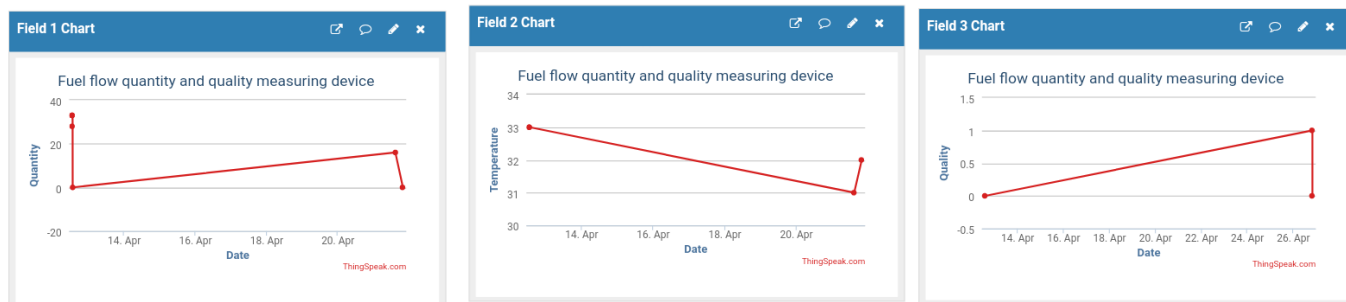


Figure 10: Image of cloud result

The result of entire test can be viewed on our mobile phone using cloud data. The parameters like quantity, temperature and quality is displayed. The quantity is displayed in millilitre. In the graph of quality, 0 indicates impure fuel and 1 indicates pure fuel.

## V. SUMMARY AND CONCLUSIONS

- The main aim of this project was to stop the fuel vendors from cheating the customers and making more profits.
- The project had to be carried out as a prototype since the device has to be made more carefully with sophisticated components which required more time.
- The project serves its purpose effectively.
- When the fuel is poured, the flow sensor measures the quantity according to its calibrated value accurately.
- With the help of 4 channel keypad, the operation of the model can be controlled.
- The 12V solenoid controls the fuel flow to the test tube with the help of a relay.
- Once the fuel is sent to the test tube, heating is turned ON with the help of 4 channel keypad.
- The temperature sensor constantly measures the temperature.
- Once the heating is done, entire fuel evaporates if the fuel is pure, or, there will be residues left in the test tube if the fuel is impure.
- A camera clicks a photo of the test tube after heating and gives the quality test result.
- This system has been trained with machine learning algorithm to detect the quality by image processing technique.
- The entire result of the test will be uploaded to cloud and the results can be seen in our mobile phones.
- The result includes the parameters like quantity measured, quality of the fuel and the temperature.

The prototype works as per the requirement and thus it can be further used as a reference to develop a completely automatic device.

**VI. SCOPE FOR FUTURE WORK**

- This project has been carried out to give a prototype of the desired model.
- Prototype works as per the requirements and can be used as a reference to develop a device which can be actually mounted on automobile.
- With the help of this prototype, we have shown that such device can be developed in-order to help customers.
- The device can be easily designed with the help of this prototype.
- The device can make use of the same components which are used in this prototype.
- Only the processor with high speed capacity has to be upgraded.
- Once the device is developed successfully then it can be easily patented.
- Customers will be happily satisfied with the device since it helps them to avoid being cheated by the fuel vendors.
- With the help of this device, any vendors carrying out fraud activities can be easily held and investigated.
- Thus the prototype helps for the development of such device and acts as a source for social improvements in this modern world.
- Heater used to heat the fuel is solder pot. This takes 6 minutes to heat the fuel completely. The time frame can be reduced by using any other method of heating the fuel.

**REFERENCES**

- [1]. Mishra, V, Jain SC, Singh N, Poddar GC, Kapur P. Fuel adulteration detection using long period fiber grating sensor technology. Indian J Pure Applied Phys. 2008; 46:106–110.
- [2]. Sarkar S. Fuel Adulteration.
- [3]. Ranjan Dey, Anumeha-Dwivedi-Journal of Energy and Chemical Engineering- Design and Simulation of Portable Fuel Adulteration Detection Kit, Apr.2014, Vol.Issue.2, PP.74-80
- [4]. Vivekanand Mishra Vidushi Tiwari P.N. Patel- Nano-porous Silicon Micro-cavity Based Fuel Adulteration Sensor, Silicon DOI 10.1007/s12633-015-9311-x
- [5]. G.Rajakumar,--FPGA Implementation of Dip based Adulteration Identification in Food Samples International Journal of Computer Applications (0975 – 8887) Volume 35– No.1, December 2011
- [6]. Garima Tripathi, Jagruti Save-An Image processing and Neural Network based Approach for Detection and Classification of Plant Diseases, International Journal of Computer Engineering & Technology