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DESIGN AND PRODUCTION OF A FUEL TANK MEASURING SYSTEM USING COMPUTER INTERFACE

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ABSTRACT: This project took into account the processes involved in the design of the fuel tank measuring system using a computer interface. Our level sensor is Capacitance-based and was used to measure through variations in dielectric constant despite the varying fuel viscosity or tank conditions. A detailed design was done and the components carefully selected to ensure that they are compatible with the fuel to be measured. We Equipped it with a digital indicator to display process values and powering of the sensor with a 12volts battery. Capacitance level sensors are rugged and easy to use without any moving parts. They were used in constricted places due to its compact size. At the end of the design and fabrication, the project was confirmed to be effective for use in any underground storage fuel tank.
Key words: Tank, Design, Measuring system, Computer interface.

I. INTRODUCTION.

An underground storage fuel tank is a metallic container used in storing fuel for use in energy production system. An underground storage fuel tank measuring system is an assembly if special component to provide analysis of the measurement of the fuel in the tank.

A computer interface is a system together a given proceeding or activities being undertaken by monitoring it through a computer .these is made possible through the use of programming language encoded in the computer and said proceeding or computer .

The underground storage fuel tank measuring system using computer interface is the design of a system that will provide volumetric analysis and reading of fuel in its tank and monitor it through a computer.

Statement of Problem

Most fuel and gas users especially automobile users do not know the exact volume of their fuel as it is being used.

Gas stations and fuel depots also tend to be faced with this difficulty as they normally have underground or overhead tank for storage. This is because the current instrument used in calculating the quantity of the remaining fuel is a long calibrated rod.

This has proven incorrect as in some case, the tank tend to bend to one side due to other factors acting on the tank such as pressure, gravity etc. There are also cases of certain quantities of fuel tending to change state (liquid-gaseous) at an increased temperature.

Objective of Project

The project was aimed at providing users of fuel tank a system for identify an exact quantities of fuel in the underground storage tank even when it is being used. It also aims:

1. To detect the different interface level in underground storage tank using standard technology
2. To design computer interface for underground storage fuel tank measurement.
3. To monitor the stock level of the underground fuel storage tank

In 1970 the point level sensor was introduced by Peter Lunational which was used to mark a single discrete liquid height and present level conduction. This type of sensor functions as a high alarm signally an over filled condition or a low fill condition. Akaakiner improved the work made by Peter Lunational in 1980 by introducing the continuous

level sensor which was used to check the fuel level in the tank. It proved level monitoring of the entire system. It measures fluid level within a range rather than at a point, producing an analogue output that directly correlate to the level in the vessel and create a level management system. The output signal is linked to a process control loop and to a visual indicator/display.

Features of Fuel Tank Measuring System Using Computer Interface

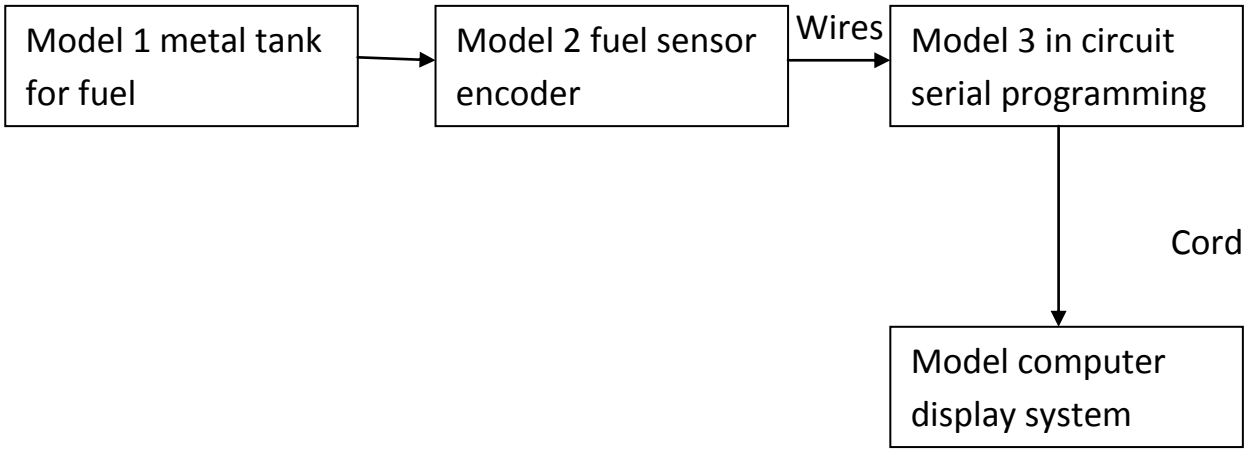


Fig 1: The underground fuel tank computer interface

MODULE 1

The metal tank is used to store the fuel that will be used.

MODULE 2

This consists of a sensor used in encoding or decoding the level of fuel gas in the tank. And the low energy ultrasonic device fitted with sensor measuring the liquid level at a certain point. It consists of a few monitored sensors.

MODULE 3

This is an in-circuit serial programming (ICSP) port connector which sends and receives the encoded signal from the fuel sensor attached to the tank.

MODULE 4

It is a computer system used in interfacing the ICSP port connector for displaying the status of or the level of the fuel in the tank.

Material and Methods Relating To Design

i. Tank, **Sub Base Tank**, **Underground Storage Tanks** , **Resistors.**

Fig 2: Underground fuel tank

II. MATERIAL AND METHOD

Materials

Materials were selected after the conceptual design was done .the materials selected for this purpose are listed below.

i. Light emitting diode (LED)
ii. Aluminum sheet
iii. Wood
iv. Wire
v. Battery
vi. Universal serial bus (USB)
vii. Tap head
viii. Crystal oscillator
ix. Infrared sensor (LDR).
x. Resistor
xi. Capacitor

xii. Diode

DESIGN CALCULATIONS.

The fuel tank is designed specifically to store fuel and retain about 25liters.

Body Casing Design

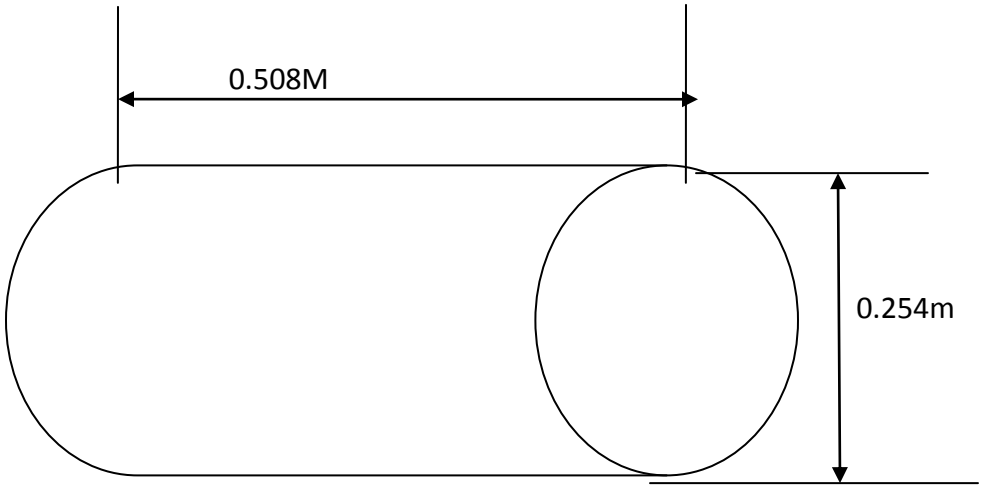


Fig 3: Body casing of underground fuel tank

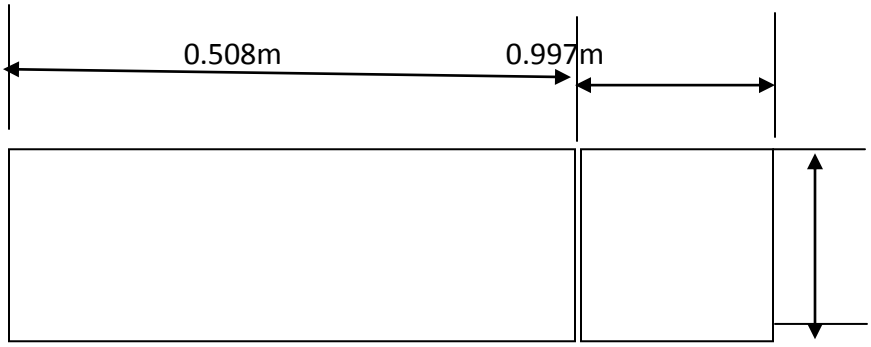


Fig 4: Size of aluminum metal sheet

To find the radius and diameter of the cylinder, we compare the area of the rectangular to that of a cylinder

Area of rectangular =L×B

Area of cylinder $= 2\pi r^2 + 2\pi rh$. L×B $= 2\pi r^2 + 2\pi rh$

h=0.508m, b=0.254m and π=3.14, $=0.508\times0.997=2\times3.14\times r^2+ 2\times 3.14\times r \times 0.508$

$0.506476=6.28r^2+3.190r$

$6.28r^2+3.190r-o.506476=0$

Using the equation formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

r_1 =0.127M and r_2 =0.637m

The radius must be a real number or value

r=0.127m. Diameter=2r, =2×0.127m

Diameter =0.254m

To construct the part (b) in the diagram since the diameter is 0.254m

The meter sheet will be 0.254m×0.254m

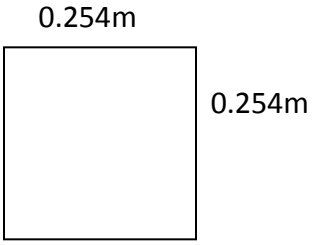


Fig 5: Size of the circular sheet

Using a compass, draw or construct a circle of radius of 0.127m

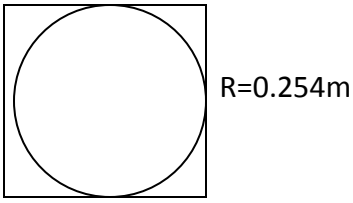


Fig 6: Circular metal sheets

Working Diagram

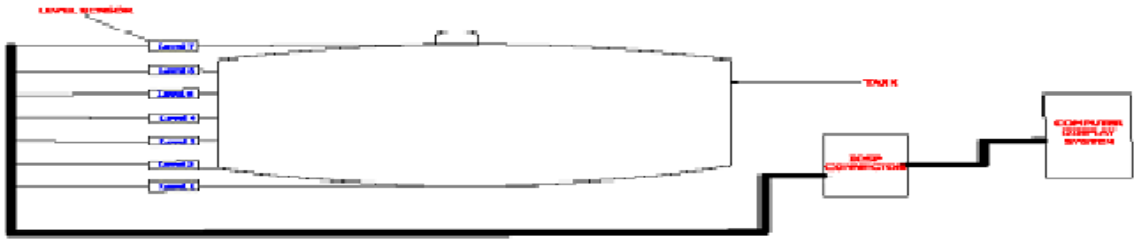
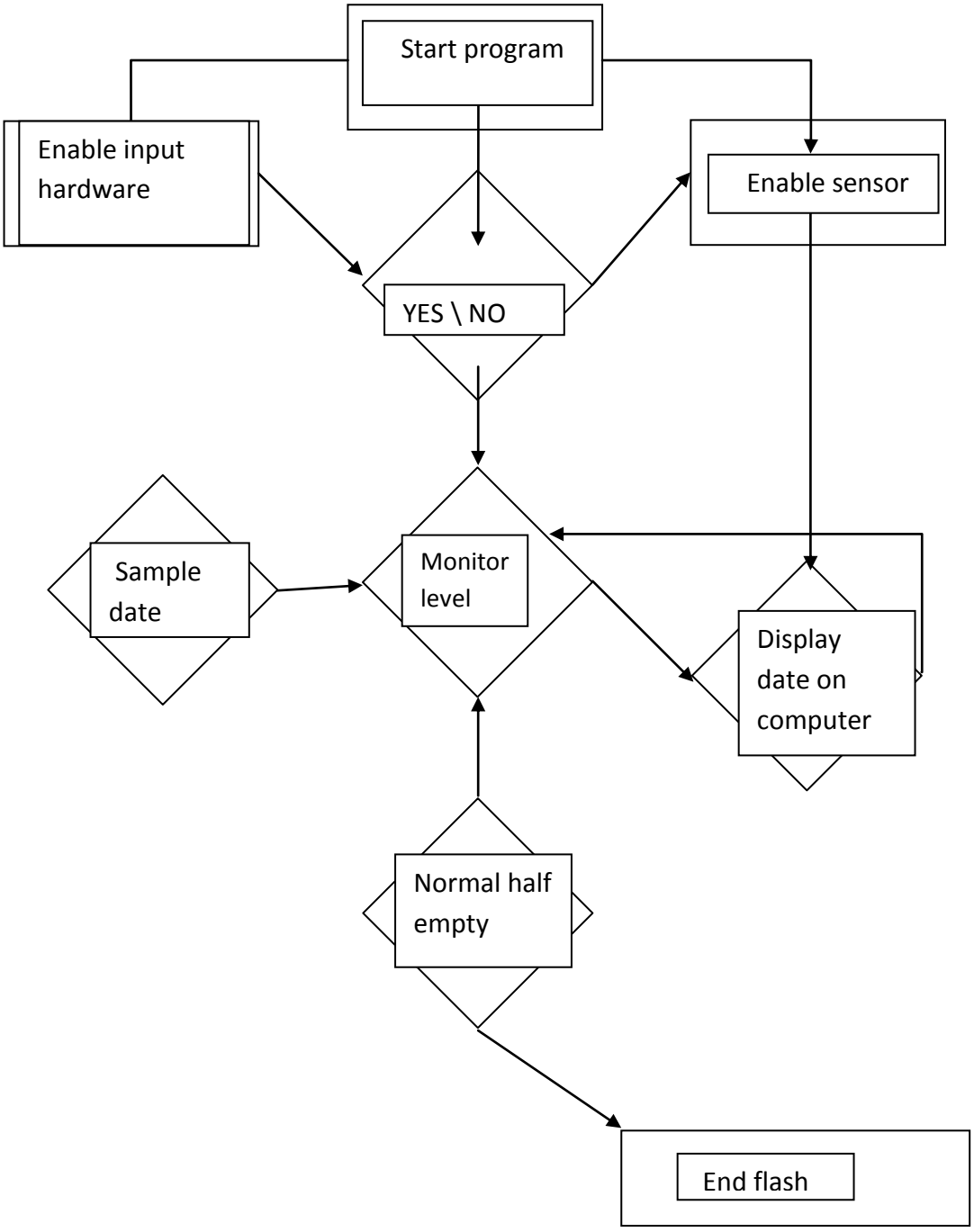


Fig7: Flow chart for measuring tank system

Programming Process



The flow of the fuel tank measuring system

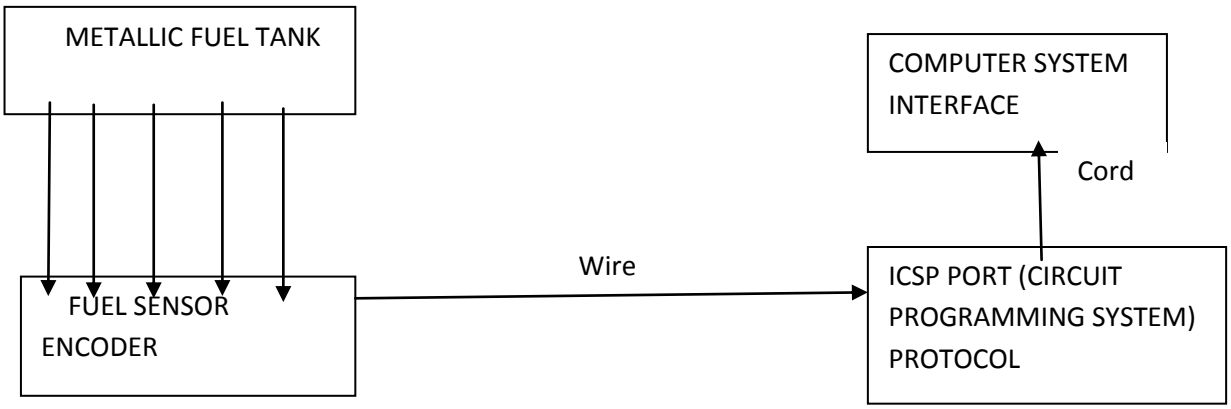


Fig8: Schematic diagram of the system

Fabrication Technique Used

The components that make up the machine consist of: the fuel tank and rectangular wood. The manufacturing sequence of the components is summarized below:

Table3: Fabrication technique

COMPONENTS	OPERATION NUMBER	MATERIAL	DESCRIPTION OF OPERATION
Fuel tank	N001	Aluminum sheet	Cutting of the material to size and dimensions given: • Length of the sheet 0.508m • Breadth 0.997m • Width 0.0025m • Circular plate (diameter of 0.254m and radius of 0.127m • Thickness of the sheet is 0.0023m The machine used in cutting was shearing machine, metal guillotine and hacksaw
	N002	Aluminum sheet	Welding of the cut pieces together: the aluminum sheet is turned and is welded. Weld the two circular plates to the main body. The machine used for the welding was gas welding machine. The machine used for the turning operation is the lathe machine.
Rectangular constructed box	N001	SOFT WOOD	The wood is cut into sizes Length=0.254m Bright=0.12m The machine used for this operation was jig saw.

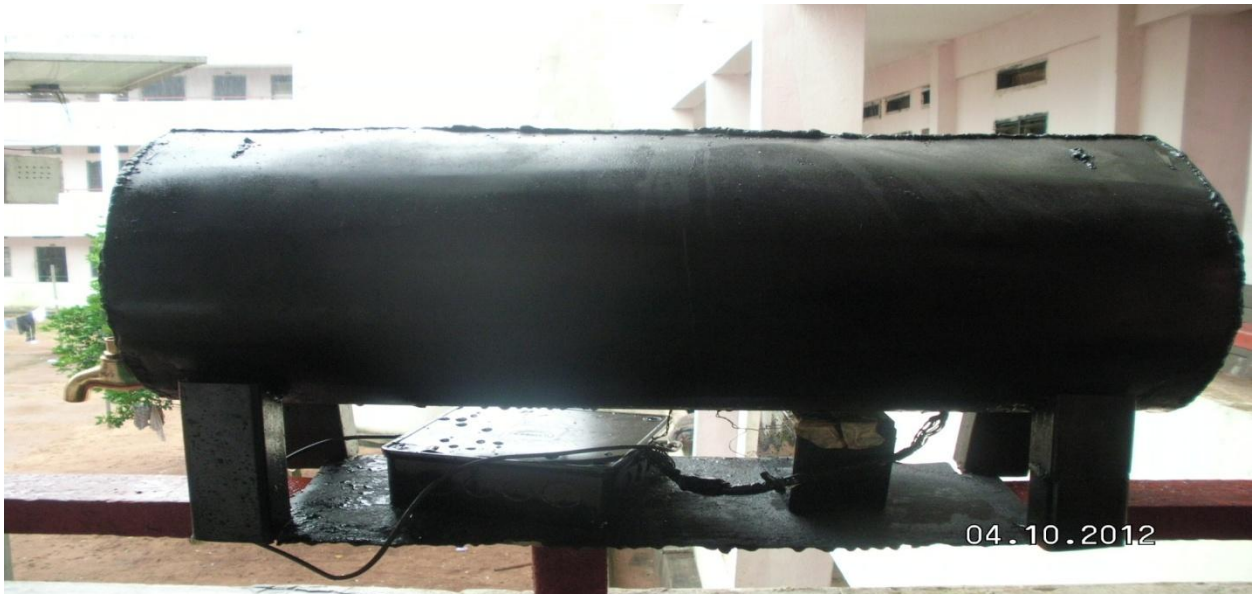


Fig 9: side view of underground storage fuel tank and measuring system

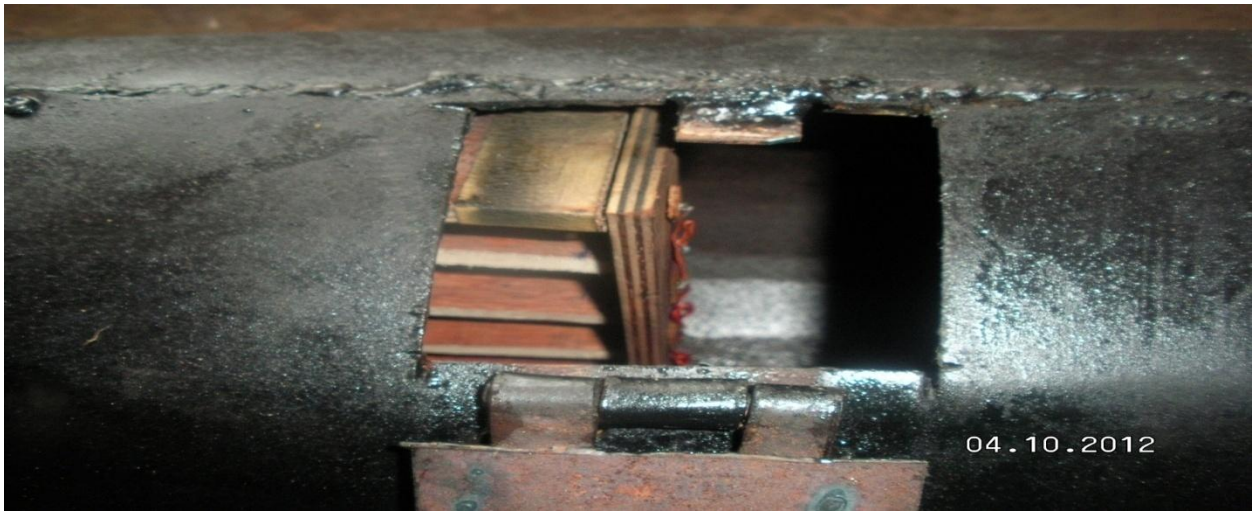


Fig 10: internal view of underground storage fuel tank and measuring system

III. OPERATION AND TESTING

Operation Analysis

The underground fuel storage tank measuring system using computer interface is to measure the fuel level and volume in the tank with the aid of the computer interface. The computer interface is a system of bringing together a given proceeding or activities being undertaken, by monitoring it through a computer. This is made possible through the use of programming language encoded in the computer.

The sensor employed is a low energy ultra-sonic device that measures the liquid level at a certain point. It consist of a few monitored sensors and internal solid state amplifier that is called contact ultrasonic sensor. They are equipped

with terminal blocks for connection of power source and external control devices. Therefore a fuel tank measuring system using computer interface has the capability of reading the fuel in its tank.

Safety.

I. The fuel should be handled carefully so as to avoid any hazard. Fuel is flammable

ii. Handle the material carefully to avoid any injury.

iii. Clean the tank body with dry cloth

Installation
The machine can be installed in the filling stations, refinery and any fuel company. The machine should be properly installed for efficient working. the installation platform should be flat and smooth and the machine should stand erect.

Data Analysis
The fuel tank measuring system when subjected to test was effective in the measurement of the fuel through the various levels of the gauge. The minimum gauge reading is indicated zero (0) when the tank is completely empty. 10 is the minimum acceptable range for refill in the computer display. While 50 is the maximum display capacity of the measuring system.

Given the tank capacity as 17 litres

50 represent 17 litres, while 10 represent 3.4 litres.

Thus, when the fuel content of the tank reaches 3.4 litres, low fuel level is indicated on the computer screen.

IV. CONCLUSION

Irrespective of the challenges encountered, the design and manufacture of this project, fuel measuring system was a successful venture. Thedesign and fabrication of this fuel measuring system has been tested and found workable. The machine can be used in filling stations, refinery and any fuel consuming company\industry.

V. RECOMMENDATION

The following recommendation were made

i. the machine is suitable for filling stations, refinery and any fuel consuming company
ii. The machine can be used for practical purpose in higher institution of learn especially in mechanical engineering and as well for entrepreneurial development.
iii. Improvement on this design to enable it accommodates larger storage tanks.

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