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Gasoline Purity Meter Using Peripheral Interface Controller for Automobile Applications

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***Abstract*— The gasoline is having a wide range of applications in automobile industry. A purity meter using a Peripheral Interface Controller was designed using two sensors namely temperature sensor and density sensor. They are interfaced with the PIC microcontroller which helps to find the temperature and density of gasoline when automobiles are due for fuelling. The temperature sensor will be able to find the temperature of gasoline with no time. Similarly the density sensor. The two sensors collect the information and send it to the microcontroller. The microcontroller will get the information and compare the values of both the information given by the sensors and output is displayed by using separate LEDs to show the purity of the gasoline. The controller compare the values which has been programed already, this project will helps the customer to find whether the petrol is pure are not and customer can view the temperature and density of petrol by the LCD display which has been placed near the speedometer. This helps the customer to know where the pure petrol is available.**

***Index Terms*—Gasoline, PIC, LED, LCD, Sensor.**

I. INTRODUCTION

This project has two main sensors that will be explained in details in the further chapters. The first sensor used here is temperature sensor which helps to find the accurate value in the gasoline liquid and give the information to the microcontroller which has been kept by the visibility of the customer.

The second sensor used here is density sensor which helps to find the density of the gasoline which helps to find the accurate value in the gasoline liquid and give the information to the microcontroller which has been connect with the temperature sensor the density varies according to the temperature when temperature goes down density will automatically increases similarly temperature goes up density will automatically goes down.

The main part of this project is microcontroller which to use to compare the information which gets from the both sensor and gives the output by led and display the temperature and density value by using LCD.

1.1 Fractional Distillation

Fractional distillation is the most common form of separation technology used in petroleum refineries, petrochemical and chemical plants, natural gas processing and cryogenic air separation plants. In most cases, the distillation is operated at a continuous steady state. New feed is always being added to the distillation column and products are always being removed. Unless the process is disturbed due to changes in feed, heat, ambient temperature, or condensing, the amount of feed being added and the amount of product being removed are normally equal. This is known as continuous, steady-state fractional distillation. [1]

Industrial distillation is typically performed in large, vertical cylindrical columns known as distillation or fractionation towers or distillation columns with diameters ranging from about 65 centimeters to 6 meters and heights ranging from about 6 meters to 60 meters or more. The distillation towers have liquid outlets at intervals up the column which allow for the withdrawal of different fractions or products having different boiling points or boiling ranges. By increasing the temperature of the product inside the columns, the different hydrocarbons are separated. [8] The lightest products (those with the lowest boiling point) exit from the top of the columns and the heaviest products (those with the highest boiling point) exit from the bottom of the column. For example, fractional distillation is used in oil refineries to separate crude oil into useful substances (or fractions) having different hydrocarbons of different boiling points. The crude oil fractions with higher boiling points.

- have more carbon atoms
- have higher molecular weights
- are less branched chain alkanes
- are darker in colour
- are more viscous
- are more difficult to ignite and to burn

Large-scale industrial towers use reflux to achieve a more complete separation of products. Reflux refers to the portion of the condensed overhead liquid product from a distillation or fractionation tower that is returned to the upper part of the tower as shown in the schematic diagram of a typical, large-scale industrial distillation tower. Inside the tower, the reflux liquid flowing downwards provides the cooling needed to condense the vapour flowing upwards, thereby increasing the effectiveness of the distillation tower. The more reflux is provided for a given number of theoretical plates, the better the tower's separation of lower boiling materials from higher boiling materials. Alternatively, the more reflux provided for a given desired separation, the fewer theoretical plates are required.

1.2 Gasoline

Petroleum is a fossil fuel derived from ancient fossilized organic materials, such as zooplankton and algae. Vast quantities of these remains settled to sea or lake bottoms, mixing with sediments and

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being buried under anoxic conditions. As further layers settled to the sea or lake bed, intense heat and pressure build up in the lower regions. This process caused the organic matter to change, first into a waxy material known as kerogen, which is found in various oil shales around the world, and then with more heat into liquid and gaseous hydrocarbons via a process known as catagenesis. Formation of petroleum occurs from hydrocarbon pyrolysis in a variety of mainly endothermic reactions at high temperature or pressure. [7]

When a kerogen layer gets buried one to three miles deep, the temperature climbs to the 120 to 300 degree-Fahrenheit range, and the pressure escalates. Over the course of several or tens of millions of years, the carbon bonds in kerogen and the other molecules break apart. This process called cracking, produces the simple hydrocarbon molecules that we call petroleum.

Methane, propane, asphaltene and propylene are all examples of petroleum hydrocarbons, which differ from each other in the way the hydrogen and carbon atoms that compose them are arranged. Some hydrocarbons exist as liquids while others are gaseous, and they are thus known as oil and natural gas, respectively.

Hydrocarbons are composed purely of carbon and hydrogen, their combustion with oxygen can only produce water as a result of the combination between hydrogen and oxygen and carbon dioxide as a result of the combination of carbon and oxygen. The energy produced by burning a hydrocarbon comes from breaking both carbon-hydrogen and carbon-carbon bonds and recombining them into carbon-oxygen and hydrogen-oxygen bonds. Because an unsaturated hydrocarbon has fewer hydrogen carbon bonds, it has less hydrogen per molecule than a similar unsaturated hydrocarbon and will produce more carbon dioxide. This also means unsaturated hydrocarbons produce less energy when burned than do saturated hydrocarbons. In order to gain the same amount of energy, a greater quantity of unsaturated hydrocarbon must be burned and as a result more carbon dioxide is created in the process.[10] Thus, unsaturated hydrocarbons are less environmentally friendly than saturated hydrocarbons.

Extracting crude oil typically begins with the process of drilling wells into underground reservoirs, once they're found. Once tapped, a geologist, known as a mudlogger notes its presence. Often, several wells are drilled into the same reservoir to make certain the extraction is economically practical.

A hole is drilled into the earth with an oil rig to create a well; then a steel pipe is placed inside the hole to provide structural strength to the newly drilled wellbore.[11] Holes are made in the base of the well to facilitate oil to pass into the bore. Finally, a bundle of valves which regulate and control the flows of oil are affixed to the top. The collection of valves is called a Christmas Tree. During the primary recovery phase, typically 5-15% of the oil is recovered.

1.3 Gasoline Purity

Petroleum contains many impurities that must be removed during the refining process before gasoline suitable for automotive use is produced. At one time, considerable corrosion was caused by the sulfur inherent in petroleum products however modern refining processes have reduced it to almost negligible amounts. Another problem was the tendency for the hydrocarbons in the gasoline to oxidize into a sticky gum when exposed to air, resulting in clogged carburetor passages, stuck values and other operational difficulties. Chemicals that control gumming are now added to gasoline. Dirt, grease, water, and various chemicals also must be removed to make gasoline an acceptable fuel.

II. PROBLEM IDENTIFICATION

The main aim of processing this project is to avoid the major problems in the environment the petrol is mixed with the lead this cause the major problems like brain damage and the engine life time gets out. The petrol is mixed with lead and forms leaded petrol goes to the engine with a no proper ratio it get burned suddenly that time the piston can't control the action so that it gets moves suddenly down that time the crankshaft will get damage. By the sudden force given by the piston crankshaft it will stop working for a several mill second this may causes sudden stop of our automobile application when we are driving and forms a sudden stock while driving this may reduce our engine life time.

In 1919, Dayton metal products co. merged with general motors. They formed a research division that set out to solve two problems they are need for high compression engines and insufficient supply of fuel that would run them. The Charles F. Kettering and his assistant Thomas Midgley and T.A Boyd added tetraethyl lead to the fuel in the laboratory engine.

There was also a common problem that the density of petrol was displayed on every petrol bunk but no one knows that for what shake it has been displayed to avoid this problem we introduce this project to how the density is inked with temperature and it also create a new awareness.

2.1 Leaded Petrol Vs Unleaded Petrol

Different types of petrol can be bought at the pump. Although some may be self-explanatory, there are still some that many find confusing like leaded and unleaded petrol. The main difference between leaded petrol and unleaded petrol is the additive tetraethyl lead. There were other types used previously, but this is the most popular. [10] This additive, used in leaded petrol and not in unleaded petrol, contains the element of lead.

Petrol was just petrol until engines started having higher compression rates and they started to auto-ignite, commonly referred to as knocking or pinging. Petrol companies discovered that adding a lead-based additive eliminated the knocking, thus giving rise to leaded petrol. Much later it was discovered that lead had some undesirable side effects, and governments started to discourage the use of leaded petrol and urged companies to develop unleaded petrol as an alternative.

The combustion of leaded petrol causes the lead to be released into the air. Lead is a heavy pollutant that does damage not only to the environment but also to the people who are exposed to it. The prevalent use of leaded petrol saw a steady rise in the lead levels of people residing in populated areas where vehicles were prevalent. Prolonged exposure to large amounts of lead can eventually cause lead poisoning, which can be fatal.

As the negative effects of lead were discovered, governments were keen to remove leaded petrol from regular use. [11] They started off with different tax rates for leaded and unleaded petrol, then some eventually resorted to banning leaded petrol altogether and imposing very stiff fines for those caught possessing or using it. Still, there are some areas where the use of leaded petrol is still allowed. A few examples include motor racing, heavy equipment, and marine vehicles.

Even though leaded petrol is no longer available at the pump, the name of unleaded petrol has stuck ever since. Oil companies have also managed to find alternative additives to increase the octane rating of their petrol without using lead. As long as you use the recommended petrol for your vehicle, you should have no problems whatsoever.

- Leaded petrol contains lead additives while unleaded petrol doesn't.
- Leaded petrol creates more pollution than unleaded petrol.
- Leaded petrol poses more of a health risk than unleaded petrol.
- Unleaded petrol is available for public consumption while leaded petrol is banned.

2.2 Why Unleaded Petrol Is Introduced?

Lead is a highly dangerous pollutant. Long term exposure to even low levels of lead can affect mental development in children. Government air pollution experts recently concluded that the most substantial evidence of effects of low levels of lead on health relates to effects on the central nervous system and, in particular, on the developing brain of children" and went on to say that "the higher the average blood lead concentration in a population, the lower that population's average IQ. Cars using leaded petrol also have higher emissions of highly dangerous particulates, because of the lead content of their fuel.

Concerns about unleaded petrol stem from fears about the levels of benzene and other aromatic hydrocarbons in unleaded petrol. These aromatics reduce the tendency of the engine to 'knock'. Benzene is a known carcinogen and it is argued that using unleaded petrol increases the risk of cancer. However, according to the UK Petroleum Industry Association, unleaded petrol will not necessarily have a higher benzene level than leaded. Government reconsider of unleaded petrol in cars without catalytic converters. This view was dismissed by both the Government and the Royal Commission on Environmental Pollution both of whom restated their strong support for unleaded petrol. Further doubt was thrown on the Committee's view when it was revealed that their scientific adviser was also an adviser to Associated Octel, the world's leading manufacturer of lead additives.

As part of a Europe-wide strategy to cut pollution from cars, the general sale of leaded petrol in the UK will be banned from 1 January 2000. Motorists with cars using unleaded petrol will not be affected by this decision. Some leaded petrol may still be sold for use in classic cars. Other options such as drop-in lead additives will be available for those whose cars cannot be converted to run on unleaded petrol.

2.3 Chemical Properties of Leaded Petrol

TEL is the weakness of its four C–Pb bonds. At the temperatures found in internal combustion engines, $(CH_3CH_2)_4Pb$ decomposes completely into lead and lead oxides as well as combustible, short-lived ethyl radicals. [7] Lead and lead oxide scavenge radical intermediates in combustion reactions. Engine knock is caused by a cool flame, an oscillating low-temperature combustion reaction that occurs before the proper, hot ignition. Lead quenches the pyrolysed radicals and thus kills the radical chain reaction that would sustain a cool flame, preventing it from disturbing the smooth ignition of the hot flame front. Lead itself is the reactive antiknock agent, and TEL serves as a gasoline-soluble lead carrier. When $(CH_3CH_2)_4Pb$ burns, it produces not only carbon dioxide and water, but also lead:

$$(CH_3CH_2)_4Pb + 13\ O_2 \rightarrow 8\ CO_2 + 10\ H_2O + Pb$$

This lead can oxidize further to give species such as lead(II) oxide:

$$2\ Pb + O_2 \rightarrow 2\ PbO$$

Pb and PbO would quickly over-accumulate and destroy an engine. For this reason, the lead scavengers 1,2-dibromoethane and 1,2-dichloroethane are used in conjunction with TEL these agents form volatile lead(II) bromide and lead(II) chloride, respectively, which are flushed from the engine and into the air.

2.4 Phaseout and Ban

Vehicles designed and built to run on leaded fuel may require modification to run on unleaded gasoline or autogas. These modifications fall into two categories: those required for physical compatibility with unleaded fuel, and those performed to compensate for the relatively low octane of early unleaded fuels. [8] Physical compatibility requires the installation of hardened exhaust valves and seats. Compatibility with reduced octane was addressed by reducing compression, generally by installing thicker cylinder head gaskets and rebuilding the engine with compression-reducing pistons. The availability of high-octane unleaded gasoline (or LPG) has reduced or eliminated the need to decrease compression ratios.

Leaded gasoline remained legal as of late 2014 in parts of Algeria, Iraq, Yemen, Myanmar, North Korea, and Afghanistan. It was available at the pump in most of these countries as of 2011, but very little was used in North Korea and it was not clear whether it was sold in Afghanistan. Specialty chemical company Innospec says that it is the world's only manufacturer of TEL and sells it for automotive use nowhere except to Algeria as of late 2014. Innospec previously sold TEL to Iraq and Yemen as of 2011, but remains unclear after head executives were charged for bribing various government state owned oil companies, to approve the sale of their TEL products. North Korea and Myanmar buy their TEL from China. The governments of Algeria and Iraq have scheduled the final elimination of leaded gasoline in their countries in 2015, after refinery upgrades. The status in Afghanistan, Yemen, and Myanmar is unclear.

III. PROPOSED METHOD

The overview of the project is gasoline purity meter using peripheral interface controller. The main aim of this project is to find the purity of gasoline by the customer side itself by placing the meter near to the speedometer which contain both led and lcd display. The peripheral interface controller was interfaced with two sensors they are temperature sensor and density sensor. The temperature sensor scene the value when the petrol goes inside the tank within a fraction of second similarly the density sensor also act and gives the accurate value to the microcontroller. [5] Which compare both the value and gives the output which has been placed near the speedometer and lcd display also placed which shows the value of temperature and density of the petrol so that the customer can get an idea where the pure petrol is available.

A quality product is one that complies with prescribed specifications and is free from any contamination or adulteration. To ensure that our consumers get contamination free products, personnel at our outlets check the products regularly. In addition sales officers carry out regular checks at all the outlets to prevent any malpractices. Club Mobile Labs and Industry Mobile labs also conduct surprise inspections in the Retail outlets on a regular basis. The petrol supplier can mix the petrol with lead. Leaded petrol is dangerous to us so the government has advice to stop the leaded petrol in the market to save our environment

3.1 PROPOSED METHOD

The proposed method clearly shows the block of the different component which contain fuel tank which was fixed with temperature sensor and density sensor. [4] The temperature sensor sense the temperature of fuel and give the information to microcontroller. Similarly density sensor also do the same operation and give the information to the microcontroller. [6] The microcontroller compare both the values which has been programed and gives the output via LED'S. If the values are correct it gives output of green LED. If the values are wrong it give the output of red LED. The customer can also check the density and temperature via LCD display which has been placed near the speedometer it works when the controller accept both the values. [6]

3.2 BLOCK DIAGRAM

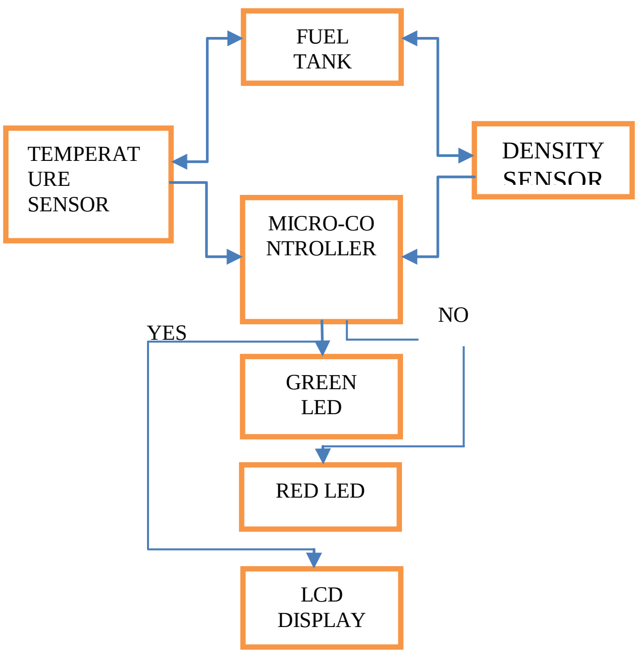


Fig. 3.2 Block Diagram of Proposed Method

The block diagram figure 4.1 clearly represents that the fuel tank is placed above which was connected to the two sensors they are temperature sensor and density sensor. Which measures both the values and gives to the microcontroller. The controller will compare the value and give the output which has been programed already. [10] If the controller gives the green light to blink the petrol is pure one and displays the value of temperature and density. If the controller gives the output to blink red led the petrol is not pure so that the customer can identify the quality of petrol.

IV. SELECTION OF COMPONENTS AND SOFTWARES

The selection of materials involves the study of their Characteristics, advantages, availability, cost, user friendly property of components that we want to use. In our project, we select each and every components by study thoroughly about them. By proceeding like that only, we done our selection.

- The software and device chosen to programming the execution of our idea is by using mikroC pro for pic.
- The software used for the simulation is PROTEUS 7.5.
- The Software used to interface microcontroller by using PIC KIT 2 software.

The detailed description for selecting components is given below

4.1 PERIPHERAL INTERFACE CONTROLLER

PIC is a family of microcontrollers made by Microchip Technology, derived from the PIC1650 originally developed by General Instrument's Microelectronics Division. The name PIC initially referred to Peripheral Interface Controller. The first parts of the family were available in 1976 by 2013 the company had shipped more than twelve billion individual parts, used in a wide variety of embedded systems.

Early models of PIC had read-only memory (ROM) or field-programmable EPROM for program storage, some with provision for erasing memory. All current models use flash memory for program storage, and newer models allow the PIC to reprogram itself. Program memory and data memory are separated. Data memory is 8-bit, 16-bit, and in latest models, 32-bit wide. Program instructions vary in bit-count by family of PIC, and may be 12, 14, 16, or 24 bits long. The instruction set also varies by model, with more powerful chips adding instructions for digital signal processing functions.

The hardware capabilities of PIC devices range from 6-pin SMD, 8-pin DIP chips up to 144-pin SMD chips, with discret NO pins, ADC and DAC modules, and communications ports such as UART, I2C, CAN, and even USB. Low-power and high-speed variations exist for many types.

PIC devices are popular with both industrial developers and low cost, wide availability, large user base, extensive collection of application notes, availability of low cost or free development tools, serial programming, and re-programmable Flash-memory capability.

4.1.1 PIC 16F887

The PIC16F887 is one of the latest products from Microchip. The figure 5.1 shows the features all the components which modern microcontrollers normally have. For its low price, wide range of application, high quality and easy availability, it is an ideal solution in applications such as: the control of different processes in industry, machine control devices, measurement of different values etc. Some of its main features are listed below.

The PIC16F887 are microcontroller supplied by Microchip. It is just one device among many PIC microcontrollers and it is a veteran chip compared with many others. There are lots of articles, projects and circuit diagrams available on the web that use the PIC16F887 This is especially true of the latest MPLAB X, including the XC8 C compiler. Next, there are a number of newer PIC's with the same pin out so that the circuit layout would be the same as in any PIC16F887 diagrams.

RISC architecture

- Only 35 instructions to learn
- All single-cycle instructions except branches

Operating frequency 0-20 MHz

Precision internal oscillator

- Factory calibrated
- Software selectable frequency range of 8MHz to 31KHz

Power supply voltage 2.0-5.5V

- Consumption: 220uA (2.0V, 4MHz), 11uA (2.0 V, 32 KHz) 50nA (stand-by mode)

Power-Saving Sleep Mode

Brown-out Reset (BOR) with software control option

35 input/output pins

- High current source/sink for direct LED drive
- software and individually programmable *pull-up* resistor
- Interrupt-on-Change pin

8K ROM memory in FLASH technology

- Chip can be reprogrammed up to 100.000 times

In-Circuit Serial Programming Option

- Chip can be programmed even embedded in the target device

256 bytes EEPROM memory

- Data can be written more than 1.000.000 times

368 bytes RAM memory

A/D converter:

- 14-channels
- 10-bit resolution

3 independent timers/counters

Watch-dog timer

Analogue comparator module with

- Two analogue comparators
- Fixed voltage reference (0.6V)
- Programmable on-chip voltage reference

PWM output steering control

Enhanced USART module

- Supports RS-485, RS-232 and LIN2.0
- Auto-Baud Detect

Master Synchronous Serial Port (MSSP)

- supports SPI and I2C mode

Analog Features

- 10-bit 14 channel Analog-to-Digital (A/D) Converter
- 2 Analog Comparator modules with:
- Programmable on-chip Voltage Reference (CVREF) module (% of VDD)
- Fixed 0.6 Vref
- Comparator inputs and outputs externally accessible
- SR Latch mode

The mikroC PRO for PIC is a powerful, feature-rich development tool for PIC microcontrollers. It is designed to provide the programmer with the easiest possible solution to developing applications for embedded systems, without compromising performance or control.

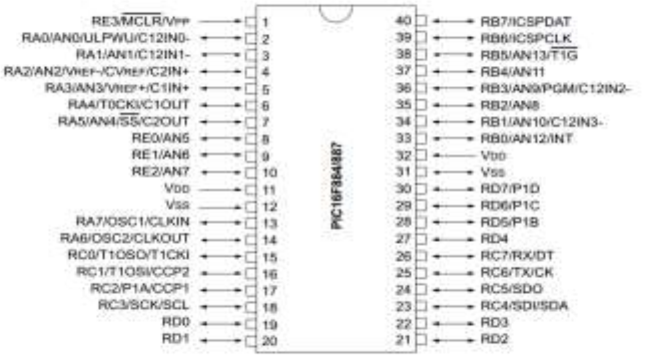


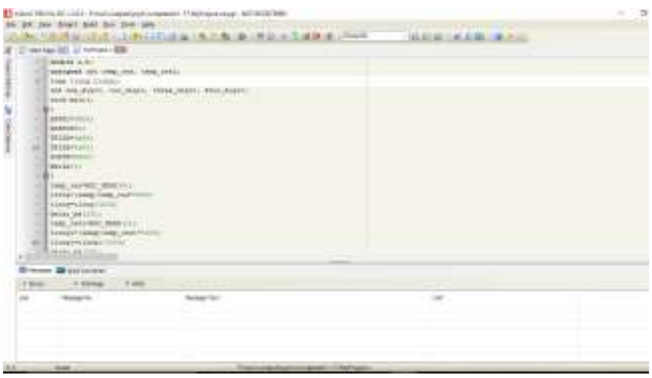
Fig. 4.1 PIC 16F887

4.1 mikroC PRO FOR PIC

PIC and C fit together well: PIC is the most popular 8-bit chip in the world, used in a wide variety of applications, and C, prized for its efficiency, is the natural choice for developing embedded systems. mikroC PRO for PIC in figure 5.2 provides a successful match featuring highly advanced IDE, ANSI compliant compiler, broad set of hardware libraries, comprehensive documentation, and plenty of ready-to-run examples.

mikroC PRO for PIC allows you to quickly develop and deploy complex applications:

- Write your C source code using the built-in Code Editor
- Use included mikroC PRO for PIC libraries to dramatically speed up the development: data acquisition, memory, displays, conversions, communication etc.



1) *Fig. 4.2 Screenshot of mikroC pro for PIC Software*

- Monitor your program structure, variables, and functions in the Code Explorer.
- Generate commented, human-readable assembly, and standard HEX compatible with all programmers.
- Use the integrated mikroICD (In-Circuit Debugger) Real-Time debugging tool to monitor program execution on the hardware level.
- Inspect program flow and debug executable logic with the integrated Software Simulator.
- Generate COFF (Common Object File Format) file for software and hardware debugging under Microchip's MPLAB software.

- Active Comments enable you to make your comments alive and interactive.
- Get detailed reports and graphs: RAM and ROM map, code statistics, assembly listing, calling tree, and more.
- mikroC PRO for PIC provides plenty of examples to expand, develop, and use as building bricks in your projects. Copy them entirely if you deem fit – that's why we included them with the compiler.

4.2 PROTEUS 7.5

The Proteus Design Suite is a proprietary software tool suite used primarily for electronic design automation. The software is used mainly by electronic design engineers and technicians to create schematics and electronic prints for manufacturing printed circuit boards.

Fig. 4.3 Screenshot of Proteus Software

The first version of what is now the Proteus Design Suite was called PCB and was written by the company chairman, John Jameson, for DOS in 1988. Schematic Capture support followed in 1990, with a port to the Windows environment shortly thereafter. Mixed mode SPICE Simulation was first integrated into Proteus in 1996 and microcontroller simulation then arrived in Proteus in 1998. More recently a dedicated IDE for simulation was added in 2011 and MCAD import/export was included in 2015. Feature led product releases are typically biannual, while maintenance based service packs are released as required.

4.2.1 Schematic Capture

Schematic capture in the Proteus Design Suite is used for both the simulation of designs and as the design phase of a PCB layout project. It is therefore a core component and is included with all product configurations.

4.2.2 Microcontroller Simulation

The micro-controller simulation in Proteus works by applying either a hex file or a debug file to the microcontroller part on the schematic. It is then co-simulated along with any Analog and digital electronics connected to it. This enables its use in a broad spectrum of project prototyping in areas such as motor control temperature control and user interface design It also finds use in the general hobbyist community. Since no hardware is required is convenient to use as a training or teaching tool. Support is available for co-simulation of

- Microchip Technologies PIC10, PIC12, PIC16, PIC18, PIC24, dsPIC33 Microcontrollers.
- Atmel AVR (and Arduino), 8051 and ARM Cortex-M3 Microcontrollers
- NXP 8051, ARM7, ARM Cortex-M0 and ARM Cortex-M3 Microcontrollers.
- Texas Instruments MSP430, PICCOLO DSP and ARM Cortex-M3 Microcontrollers.

4.2.3 PCB Design

The PCB Layout module is automatically given connectivity information in the form of a netlist from the schematic capture module. It applies this information, together with the user specified design rules and various design automation tools, to assist with error free board design. Design Rule Checking does not include high speed design constraints. PCB's of up to 16 copper layers can be produced with design size limited by product configuration.

4.3 PIC KIT 2

The PICkit 2 was introduced in May 2005 replaced the PICkit 1. The most notable difference between the two is that the PICkit 2 has a separate programmer/debugger unit which plugs into the board carrying the chip to be programmed, whereas the PICkit 1 was a single unit. This makes it possible to use the programmer with a custom circuit board via an In Circuit Serial Programming (ICSP) header.

The PICkit 2 uses an internal PIC16F887 with FullSpeed USB. The latest PICkit 2 firmware allows the user to program and debug most of the 8 and 16 bit PICmicro members of the Microchip product line.

The PICkit 2 is open to the public, including its hardware schematic, firmware source code (in embedded C language) and application programs (in embedded C language). End users and third parties can easily modify both the hardware and software for enhanced features

The PICkit 2 has a programmer-to-go (PTG) feature, which can download the hex file and programming instructions into on-board memory (128 KB I²C EEPROM or 256 KB I²C EEPROM), so that no PC is required at the end application. The Microchip version of PICkit 2 has a standard 128 KB memory. 256 KB memory can be achieved by modifying the hardware or from third party clones. Additionally, a 500 kHz three-channel logic analyser and a UART tool are built into the PICkit 2. These features are missing from the PICkit 3.

Since release of V2.61, PICkit 2 PC software now supports a maximum 4 megabytes of memory for the programmer-to-go feature. This modification makes the PICkit 2 support eight times as much memory as the PICkit 3. The figure 5.3 shows the enhancement has been contributed by Au Group Electronics and the PICkit 2 firmware is also reported to be submitted to Microchip PICkit 2 team in the middle of March 2009.

Fig. 4.4 PIC Kit 2

4.4 SENSORS

A sensor is an electronic component, module, or subsystem whose purpose is to detect events or changes in its environment and send the information to other electronics, frequently a computer processor. A sensor is always used with other electronics, whether as simple as a light or as complex as a computer.

Sensors are used in everyday objects such as touch-sensitive elevator buttons and lamps which dim or brighten by touching the base, besides innumerable applications of which most people are never aware. With advances in micromachinery and easy-to-use microcontroller platforms, the uses of sensors have expanded beyond the traditional fields of temperature, pressure or flow measurement for example into MARG sensors. Moreover Analog sensors such as potentiometers and force-sensing resistors are still widely used. Applications include manufacturing and machinery, airplanes and aerospace, cars, medicine, robotics and many other aspects of our day-to-day life.

4.5 Temperature Sensor *(*DS18B20)

The DS18B20 Digital Thermometer provides 9 to 12-bit temperature readings which indicate the temperature of the device. The DS18B20 communicates over a 1-Wire bus that by definition requires only one data line and ground for communication with a central microprocessor. The figure 5.5 shows the DS18B20 can derive power directly from the data line eliminating the need for an external power supply. This sensor has been included in many applications such as Thermostatic Controls, Industrial Systems, Consumer Products, Thermometers, Thermally Sensitive System.

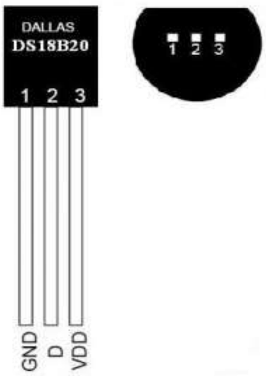


Fig. 4.5 Temperature Sensor

- Power supply range is 3.0V to 5.5V
- Measures temperatures from -55°C to +125°C. Fahrenheit equivalent is -67°F to +257°F
- ±0.5°C accuracy from -10°C to +85°C
- Converts 12-bit temperature to digital word in 750 ms (max.)
- Can be powered from data line
- Alarm search command identifies and addresses devices whose temperature is outside of programmed limits

These types of temperature sensor vary from simple ON/OFF thermostatic devices which control a domestic hot water heating system to highly sensitive semiconductor types that can control complex process control furnace plants.

We remember from our school science classes that the movement of molecules and atoms produces heat (kinetic energy) and the greater the movement, the more heat that is generated. Temperature Sensors measure the amount of heat energy or even coldness that is generated by an object or system, allowing us to sense or detect any physical change to that temperature producing either an analogue or digital output.

There are many different types of Temperature Sensor available and all have different characteristics depending upon their actual application. A temperature sensor consists of two basic physical types:

- Contact Temperature Sensor Types – These types of temperature sensor are required to be in physical contact with the object being sensed and use conduction to monitor changes in temperature. They can be used to detect solids, liquids or gases over a wide range of temperatures.
- Non-contact Temperature Sensor Types – These types of temperature sensor use convection and radiation to monitor changes in temperature. They can be used to detect liquids and gases that emit radiant energy as heat rises and cold settles to the bottom in convection currents or detect the radiant energy being transmitted from an object in the form of infra-red radiation.

The thermostat is a contact type electro-mechanical temperature sensor or switch, that basically consists of two different metals such as nickel, copper, tungsten or aluminium etc, that are bonded together to form a Bi-metallic strip. The different linear expansion rates of the two dissimilar metals produces a mechanical bending movement when the strip is subjected to heat.

The bi-metallic strip can be used itself as an electrical switch or as a mechanical way of operating an electrical switch in thermostatic controls and are used extensively to control hot water heating elements in boilers, furnaces, hot water storage tanks as well as in vehicle radiator cooling systems.

4.6 Density Sensor (FPS2820B12C4)

The FPS2820B12C4 is a novel fluid property sensor that will directly and simultaneously measure the viscosity, density, dielectric constant and temperature of fluids. Relying on patented tuning fork technology, the sensor monitors the direct and dynamic relationship between multiple physical properties to identify a wide variety of fuels like marine heavy fuel oil, light fuel oil or kerosene. The multi-parametric analysis capability improves fluid characterization algorithms. The FPS can also provide in-line monitoring of fluids for a wide range of OEM and aftermarket installations including fluid reservoirs, process lines and pressurized high flow conduits for applications that include on and off highway vehicles, HVACR, compressors, industrial equipment and turbines. A universal digital CAN J1939 compliant protocol provides easy to connect interface to main Host controller. A simple 4 pin connector allows for cost effective mounting options. The features of density sensor are as follows

• Rugged construction for high pressure and high flow environments

• Proprietary corrosion and contaminant resistant coating for wetted parts

• On-board microprocessor for real-time data analysis with 12 - 24 volts supply

New or existing installation, the Density Measurement Sensor easily installs on the OPW Magnetostrictive Probe. Combining industry-leading accuracy for water, product and density measurement, the SiteSentinel® family Density Measurement Sensor uses a single magnetostrictive in-tank probe assembly.

V. SOFTWARE AND HARDWARE

The embedded system is a combination of both hardware and software.

5.1 Requirements of Software Components

S.NO	COMPONENT	VERSION
1	mikroC pro for pic	-
2	Proteus	7.5
3	Pic kit	2

Table 5.1 Software Required

5.2 Requirements of Hardware Components

S.NO	COMPONENT	DESCRIPTION
1	PIC	16F887
2	PCB board	-
3	Temperature sensor	DS18B20
4	Density sensor	FPS2820B12C4
5	Display	LCD
6	Connecting wires	-

Table 5.2 Hardware Required

VI. METHODOLOGY

Initially, the temperature and density sensors sends the values to the microcontroller. So we prefixed the procedure as that sensors reading is transferred to PIC microcontroller which do the process of comparing the sensor values. We use computer as the programming device using the software mikroC the codding are made with it. We fix the LED and LCD as an output device which is used for indication and displaying the values. The hex file is to be dumped in the IC.

6.1 PROCEDURE

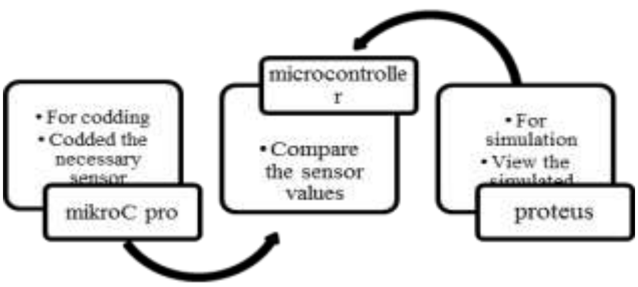


Fig. 6.1 Procedure Flow

The procedure flow show the three blocks the first block represent that the mikroC pro for pic software is used to program in the IC using embedded c programing.

The second block shows that the microcontroller which is a hardware unit where the sensor is connected to the microcontroller. The figure 6.2 shows the procedure flow of the blocks.

The third block shows that the proteus software is used to simulate the circuit to check whether the program and the circuit this software is used to verify it.

6.2 PROGRAMING

The programming is done in mikroC pro for pic software. For our project we have to program according to accurate value of sensors. The sample programming Screen shots haven been attached to this file

The mikroC PRO for PIC is a powerful, feature-rich development tool for PIC microcontrollers. The figure 6.3 show the sample program It is designed to provide the programmer with the easiest possible solution to developing applications for embedded systems, without compromising performance or control.

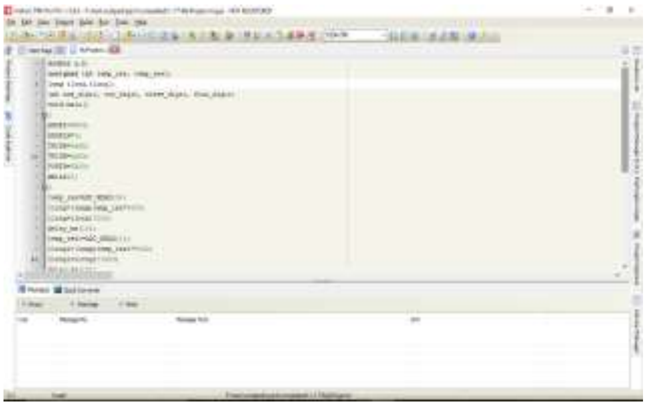


Fig. 6.2 Screenshot Program In mikroC Pro for PIC

PIC and C fit together well PIC is the most popular 8-bit chip in the world, used in a wide variety of applications, and C, prized for its efficiency, is the natural choice for developing embedded systems. mikroC PRO for PIC provides a successful match featuring highly advanced IDE, ANSI compliant compiler, broad set of hardware libraries, comprehensive documentation, and plenty of ready-to-run examples.

6.3 SIMULATION

The Proteus Design Suite is a proprietary software tool suite used primarily for electronic design automation. The software is used mainly by electronic design engineers and technicians to create schematics and electronic prints for manufacturing printed circuit boards.[9]

The first version of what is now the Proteus Design Suite was called PCB and was written by the company chairman, John Jameson, for DOS in 1988. Schematic Capture support followed in 1990, with a port to the Windows environment shortly thereafter. Mixed mode SPICE Simulation was first integrated into Proteus in 1996 and microcontroller simulation then arrived in Proteus in 1998. More recently a dedicated IDE for simulation was added in 2011 and MCAD import/export was included in 2015.

Feature led product releases are typically biannual, while maintenance based service packs are released as required.

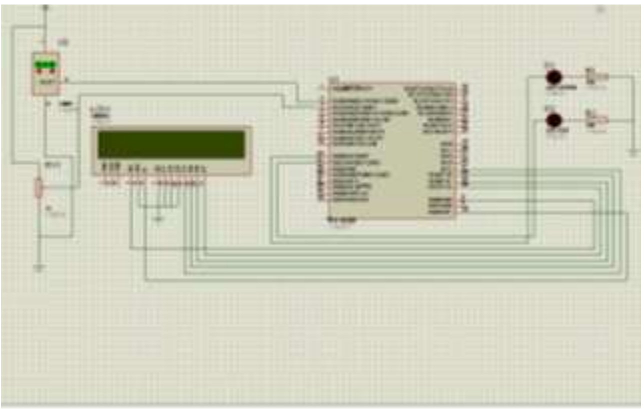


Fig. 6.4 Screenshot of Proteus Simulation

Schematic capture in the Proteus Design Suite is used for both the simulation of designs and as the design phase of a PCB layout project. It is therefore a core component and is included with all product configurations. [10]

The micro-controller simulation in Proteus works by applying either a hex file or a debug file to the microcontroller part on the schematic. The figure 6.5 shows the sample simulation It is then co-simulated along with any Analog and digital electronics connected to it. This enables its use in a broad spectrum of project prototyping in areas such as motor control temperature control and user interface design. [3] It also finds use in the general hobbyist community. Since no hardware is required is convenient to use as a training or teaching tool. Support is available for co-simulation of

- Microchip Technologies PIC10, PIC12, PIC16, PIC18, PIC24, dsPIC33 Microcontrollers.
- Atmel AVR (and Arduino), 8051 and ARM Cortex-M3 Microcontrollers
- NXP 8051, ARM7, ARM Cortex-M0 and ARM Cortex-M3 Microcontrollers.
- Texas Instruments MSP430, PICCOLO DSP and ARM Cortex-M3 Microcontrollers.

The PCB Layout module is automatically given connectivity information in the form of a netlist from the schematic capture module. [2] It applies this information, together with the user specified design rules and various design automation tools, to assist with error free board design. Design Rule Checking does not include high speed design constraints. PCB's of up to 16 copper layers can be produced with design size limited by product configuration.

VII. RESULT AND DISCUSSION

7.1 OUTPUT OF THE PURITY METER

In this thesis, we have discussed the detailed design and simulation of gasoline purity meter. This gives the detail information of controlling various fuel liquids like petrol, diesel and etc, from the information gathered by the two sensors namely temperature sensor and density sensor gives to the microcontroller the microcontroller will check the information and gives the output. Our main objective is to assist the customer to check whether the fuel is pure are not by their own automobile application.

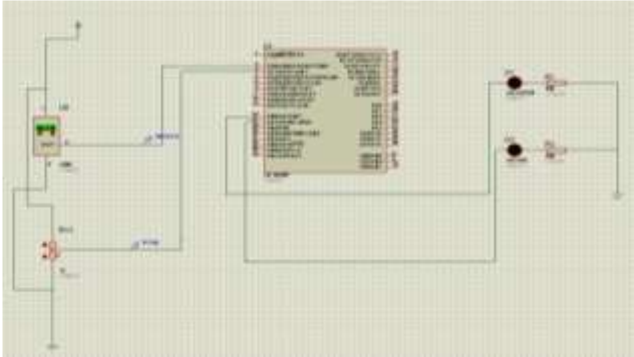


Fig. 7.1 Screenshot Output of the Prototype

This simulation clearly shoes that the sensors are connected to microcontroller and the two led's are connected to check whether the fuel is pure are not by the indication of red and green led's if the controller gives the output as red means the petrol is not pure similarly green light means fuel is pure one. The figure 7.1 output of the prototype.

7.2 OUTPUT OF PURE GASOLINE

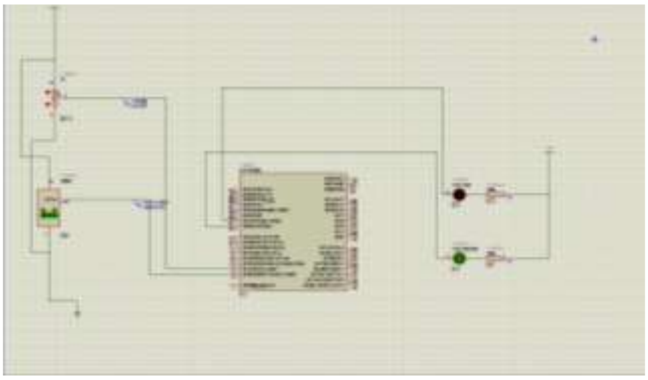


Fig. 7.2 Screenshot Output of Pure Gasoline

The output represcent that the petrol is pure by the indication of green light on led. The temperature sensore value and density sensor value are matched by the microcontroller by combination of program which has been programed already in the software called mikro c pro for pic. The figure 7.2 shows the output of pure gasoline. With the clock frequency of 11.0592 which has been programed by the connection made by the port the port are linked with the crystal oscilator and the two sensors are connected to the analog port. The input is given in the form of analog and it is converted by digital by the program of analog to digitral conveter.

7.3 OUTPUT OF IMPURE GASOLINE

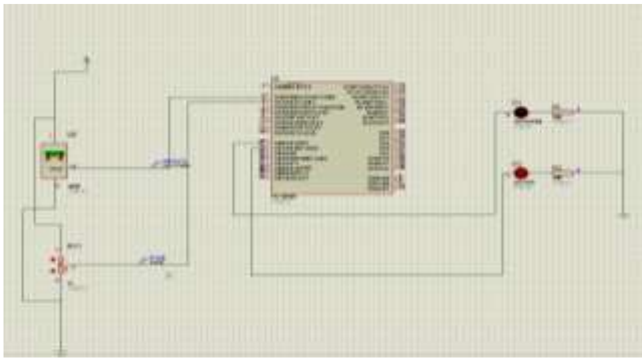


Fig. 7.3 Screenshot Output of Impure Gasoline

The output represcent that the petrol is not pure by the indication of red light on led. The temperature sensore value and density sensor value are matched by the microcontroller by combination of program which has been programed already in the software called mikro c pro for pic. In figure 7.3 With the clock frequency of 11.0592 which has been programed by the connection made by the port the port are linked with the crystal oscilator and the two sensors are connected to the analog port. The input is given in the form of analog and it is converted by digital by the program of analog to digitral conveter

7.4 OUTPUT OF THE METER WITH LCD

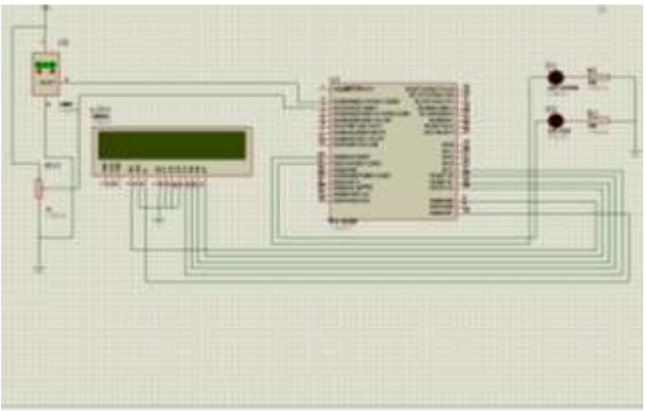


Fig. 7.4 Screenshot Output of The Meter Attached With LCD

This simulation clearly shows that the lcd is connected to the microcontroller which shoes the accurate value of temperature and density by the customer side. The temperature sensore value and density sensor value are matched by the microcontroller by combination of program which has been programed already in the software called mikro c pro for pic. The figure 7.4 With the clock frequency of 11.0592 which has been programed by the connection made by the port the port are linked with the crystal oscilator and the two sensors are connected to the analog port. The input is given in the form of analog and it is converted by digital by the program of analog to digitral conveter.

VIII. CONCLUSION

This work presents the prototype design of gasoline purity meter. Thus this meter was able to achieve its goal and takes the right form of purity indication that was both user-friendly and efficient. The LED and LCD used as an output device which gives the indication and display the density values according to the related temperature this done with the help of two sensors that is the density and temperature sensors. The microcontroller is used to compare the sensor values.

The gasoline purity meter is very useful for the customer. As to make in the form of product, it requires a bit of coding knowledge which include necessary code and the sensor values. The main process of comparing the sensor values done by the microcontroller with in a fraction of seconds. The customer, also able to understand the right form of purity by means of output device. A future scope could be to create an additional attachment of device and program to the gasoline purity meter, and then automatically gives the location which is useful for the customer to know the previous obtained information.

IX. FUTURE WORK

Using this system as framework, the system can be expanded to include various other options which could include GPS. Thus we can find the location of the petrol bunk. This would help the customer to know the location point at where the petrol is filled in past time. By using the gasoline purity meter with the attachment of GPS will be useful for the customer to make the right choice of the petrol bunk.

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