Gowthaman.M.R et al. International Journal of Recent Research Aspects ISSN: 2349-7688, Vol. 4, Issue 4, Dec 2017, pp. 220-226

Fabrication of Fuel Efficiency Improvement in A Petrol Engine By Using Water Injection

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Abstract- **In Internal combustion engines, water injection, also known as anti-detonate injection, is spraying water into the cylinder or incoming fuel-air mixture to cool the combustion chamber of the engine, allowing for greater compression ratios and largely eliminating the problem of engine knocking. This effectively reduces the air intake temperature in the combustion chamber. The reduction of the air intake temperature allows for more aggressive ignition timing to be employed, which increases the power output of the engine. Depending on the engine, improvement in power and fuel efficiency can also be obtained solely by injecting water. Water injection may also reduce Nitrous oxide or carbon monoxide emissions. The purpose of this experiment is to investigate the effect of water injection on the engine performance, exhaust gas temperature and exhaust gas emission of a SI engine, water is injected in controlled quantities with the compressed air. Single cylinder, four stroke, air cooled type, 100 cc petrol engines used in the experiment.**

I. INTRODUCTION

Today's petrol engine is well established, has been used extensively in the last century for various applications. These include aircraft, automobiles, electrical generators and multipurpose industrial engines. Water injection produces to reduce pre-detonation in the combustion chamber and fuel consumption was studied extensively. The experiment worked that carried out on a single cylinder engine established water injection system, different water quantities supplied constantly with air to the engine. Data was recorded over a period of time. Significantly, fuel and energy consumption rate increased with small amounts of water addition, water injection really represents a new way to avoid detonation and control nitrous oxide formation in SI engines. Several different methods of water addition have been developed. These studies have shown that further reduction of harmful emissions is still possible. The aim of the project work is to investigate experimentally the effect of the water injection to reduce the fuel conception and temperature of a 100 cc petrol engine.

ENGINE

In this project, we use 100 cc SPARK IGNITION four stroke single cylinder engine. It consists of a piston that moves within the cylinder fitted with two valves. The distance moved in one direction is called stroke and the cylinder diameter is bore. The piston is said to be at the top dead centre position the volume of the cylinder is minimum. The piston is at bottom dead centre when the cylinder volume is maximum the volume swept out by the piston between TDC and BDC is called swept volume.

A spark-ignition engine is an internal combustion engine generally a petrol engine, where the combustion process of the air-fuel mixture is ignited by a spark from a spark plug. This is in contrast to compression-ignition engines, typically diesel engines, where the heat generated from compression together with the injection of fuel is enough to initiate the combustion process, without needing any external spark.

FUELS

Spark-ignition engines are commonly referred to as "gasoline engines" in North America, and "petrol engines" in Britain and the rest of the world. However, these terms are not preferred, since spark-ignition engines can (and increasing are) run on fuels other than petrol/gasoline, such as auto gas (LPG), methanol, ethanol, bio ethanol, compressed natural gas, hydrogen and nitro methane.

CARBURETOR

A carburetor is a device that mixes air and fuel for internal combustion engines in the proper ratio for combustion. It is sometimes colloquially shortened to carb in UK and North America or carby in Australia. To carburate or carburet means to mix the air and fuel or to equip (an engine) with a carburetor for that purpose.

Carburetors have largely been supplanted in the automotive and, to a lesser extent, aviation industries by fuel injection. They are still common on small engines for lawn mowers, rot tillers and other equipment.

The main function of a carburetor is to maintain a small reserve of petrol at a constant level in float chamber which atomize the petrol and mix it with air and to supply air-fuel ratio vapor mixture at correct ratio according to 100 cc engine equipment.

Fixed-Venturi :

In which the varying air velocity in the Venturi alters the fuel flow; this architecture is employed in most carburetors found on cars.

Variable –Venturi:

The most common variable Venturi (constant depression) type carburetor is the side draft SU carburetor and similar models from Hitachi, Zenith-Stromberg and other makers. The UK location of the SU and Zenith-Stromberg companies helped these carburetors rise to a position of domination in the UK car market, though such carburetors were also very widely used on Volvos and other non-UK makes. Other similar designs have been used on some European and a few Japanese automobiles.

These carburetors are also referred to as "constant velocity" or "constant vacuum" carburetors. An interesting variation was Ford's VV (Variable Venturi) carburetor, which was essentially a fixed Venturi carburetor with one side of the Venturi hinged and movable to give a narrow throat at low rpm and a wider throat at high rpm. This was in which the fuel jet opening is varied by the slide (which simultaneously alters air flow). In "constant depression" carburetors, this is done by a vacuum operated piston connected to a tapered needle which slides inside the fuel jet. A simpler version exists, most commonly found on small motorcycles and dirt bikes, where the slide and needle is directly controlled by the throttle position.

Basics:

A carburetor basically consists of an open pipe through which the air passes into the inlet manifold of the engine. The pipe is in the form of a Venturi it narrows in section and then widens again, causing the airflow to increase in speed in the narrowest part. Below the Venturi is a butterfly valve called the throttle valve a rotating disc that can be turned end-on to the airflow, so as to hardly restrict the flow at all, or can be rotated so that it (almost) completely blocks the flow of air.

MAIN OPEN-THROTTLE CIRCUIT:

As the throttle is progressively opened, the manifold vacuum is lessened since there is less restriction on the airflow, reducing the flow through the idle and off-idle circuits. This is where the Venturi shape of the carburetor throat comes into play, due to Bernoulli's principle (i.e., as the velocity increases, pressure falls). The Venturi raises the air velocity, and this high speed and thus low pressure sucks fuel into the airstream through a nozzle or nozzles located in the center of the Venturi. Sometimes one or more additional booster Venturis is placed coaxially within the primary Venturi to increase the effect.

As the throttle is closed, the airflow through the Venturi drops until the lowered pressure is insufficient to maintain this fuel flow, and the idle circuit takes over again, as described above.

Bernoulli's principle, which is a function of the velocity of the fluid, is a dominant effect for large openings and large flow rates, but since fluid flow at small scales and low speeds (low Reynolds number) is dominated by viscosity, Bernoulli's principle is ineffective at idle or slow running and in the very small carburetors of the smallest model engines. Small model engines have flow restrictions ahead of the jets to reduce the pressure enough to suck the fuel into the air flow. Similarly the idle and slow running jets of large carburetors are placed after the throttle valve where the pressure is reduced partly by viscous drag, rather than by Bernoulli's principle. The most common rich mixture device for starting cold engines was the choke, which works on the same principle.

POWER VALVE:

For open throttle operation a richer mixture will produce more power, prevent pre-ignition detonation, and keep the engine cooler. This is usually addressed with a spring-loaded "power valve", which is held shut by engine vacuum. As the throttle opens up, the vacuum decreases and the spring opens the valve to let more fuel into the main circuit. On two-stroke engines, the operation of the power valve is the reverse of normal it is normally "on" and at a set rpm it is turned "off". It is activated at high rpm to extend the engine's rev range, capitalizing on a two-stroke's tendency to rev higher momentarily when the mixture is lean.

Alternative to employing a power valve, the carburetor may utilize a metering rod or step-up rod system to enrich the fuel mixture under high-demand conditions. Such systems were originated by Carter Carburetorin the 1950s for the primary two Venturies of their four barrel carburetors, and step-up rods were widely used on most barrel Carter carburetors through the end of production in the 1980s. The step-up rods are tapered at the bottom end, which extends into the main metering jets. The tops of the rods are connected to a vacuum piston or a mechanical linkage which lifts the rods out of the main jets when the throttle is opened (mechanical linkage) or when manifold vacuum drops (vacuum piston). When the step-up rod is lowered into the main jet, it restricts the fuel flow. When the step-up rod is raised out of the jet, more fuel can flow through it. In this manner, the amount of fuel delivered is tailored to the transient demands of the engine. Some 4-barrel carburetors use metering rods only on the primary two Venturis, but some use them on both primary and secondary circuits, as in the Rochester Quadra jet.

FUEL SUPPLY:

To ensure a ready mixture, the carburetor has a "float chamber" (or "bowl") that contains a quantity of fuel at near-atmospheric pressure, ready for use. This reservoir is constantly replenished with fuel supplied by a fuel pump. The correct fuel level in the bowl is maintained by means of a float controlling an inlet valve, in a manner very similar to that employed in a cistern. As fuel is used up, the float drops, opening the inlet valve and admitting fuel.

As the fuel level rises, the float rises and closes the inlet valve. The level of fuel maintained in the float bowl can usually be adjusted, whether by a setscrew or by something crude such as bending the arm to which the float is connected. This is usually a critical adjustment, and the proper adjustment is indicated by lines inscribed into a window on the float bowl, or a measurement of how far the float hangs below the top of the carburetor when disassembled, or similar.

Floats can be made of different materials, such as sheet brass soldered into a hollow shape, or of plastic; hollow floats can spring small leaks and plastic floats can eventually become porous and lose their flotation; in either case the float will fail to float, fuel level will be too high, and the engine will not run unless the float is replaced. The valve itself becomes worn on its sides by its motion in its "seat" and will eventually try to close at an angle, and thus fails to shut off the fuel completely;

again, this will cause excessive fuel flow and poor engine operation.

Conversely, as the fuel evaporates from the float bowl, it leaves sediment, residue, and varnishes behind, which clog the passages and can interfere with the float operation. This is particularly a problem in automobiles operated for only part of the year and left to stand with full float chambers for months at a time commercial fuel stabilizer additives are available that reduce this problem.

The fuel stored in the chamber (bowl) can be a problem in hot climates. If the engine is shut off while hot, the temperature of the fuel will increase, sometimes boiling ("percolation"). This can result in flooding and difficult or impossible restarts while the engine is still warm, a phenomenon known as "heat soak". Heat deflectors and insulating gaskets attempt to minimize this effect. The Carter Thermo-Quad carburetor has float chambers manufactured of insulating plastic (phenolic), said to keep the fuel 20 degrees Fahrenheit (11 degrees Celsius) cooler.

FUEL TANK:

The fuel tank will supply the petrol in to carburetor. This tank is made up of plastic material.

A fuel tank (or petrol tank) is a safe container for flammable fluids. Though any storage tank for fuel may be so called, the term is typically applied to part of an engine system in which the fuel is stored and propelled (fuel pump) or released (pressurized gas) into an engine. Fuel tanks range in size and complexity from the small plastic tank of a butane lighter to the multi-chambered cryogenic Space Shuttle external tank.

Typically, a fuel tank must allow or provide the following:

Storage of fuel: the system must contain a given quantity of fuel and must avoid leakage and limit evaporative emissions.

Filling: the fuel tank must be filled in a secure way, without sparks.

Provide a method for determining level of fuel in tank, gauging (the remaining quantity of fuel in the tank must be measured or evaluated).

Venting (if over-pressure is not allowed, the fuel vapors must be managed through valves).

Feeding of the engine (through a pump).

Anticipate potentials for damage and provide safe survival potential.

Plastic (high-density polyethylene HDPE) as a fuel tank material of construction, while functionally viable in the short term, has a long term potential to become saturated as fuels such as diesel and gasoline permeate the HDPE material.

Considering the inertia and kinetic energy of fuel in a plastic tank being transported by a vehicle, environmental stress cracking is a definite potential. The flammability of fuel makes stress cracking a possible cause of catastrophic failure. Emergencies aside, HDPE plastic is suitable for short term storage of diesel and gasoline. In the U.S., Underwriters Laboratories approved (UL 142) tanks would be a minimum design consideration.

Automotive Fuel Tanks:

The maximum distance a combustion-engine powered car with a full tank can cover is the product of the tank capacity and its fuel efficiency (as in miles per gallon). While larger tanks increase the maximum distance, they also take up more space and (especially when full) add to the total weight, requiring higher fuel consumption for the same performance. Fuel-tank capacity is therefore the result of a trade-off in design considerations. For most compact cars, the capacity is in the range 45–6 liters (12–17 US gal). The original model Tata Nano is exceptional with its 15 liters (4 US gal) fuel tank. SUVs and trucks tend to have considerably larger fuel tanks.

For each new vehicle a specific fuel system is developed, to optimize the use of available space. Moreover, for one car model, different fuel system architectures are developed, depending on the type of the car, the type of fuel (gasoline or diesel), nozzle models, and region.

Metal (steel or aluminum) fuel tanks welded from stamped sheets. Although this technology is very good in limiting fuel emissions, it tends to be less competitive and thus less on the market, although until recent times automotive fuel tanks were almost exclusively made from sheet metal.

Plastic high-density polyethylene (HDPE) fuel tanks made by blow molding. Blow molded HDPE can take complex shapes, for instance allowing the tank to be mounted directly over the rear axle, saving space and improving crash safety. Initially there were concerns over the low fracture toughness of HDPE, when compared to steel or aluminum. Concern for safety and long term ability to function should be considered and monitored.

WATER TANK

The water tank will supply the water in to the manifold between carburetor and engine with the help of nozzle, water flow will control by the flow control valve.

A water tank is a container for storing water. Water tanks are used to provide storage of water, irrigation agriculture farming, both for plants and livestock, chemical manufacturing, food preparation as well as many other uses. Water tank parameters include the general design of the tank, and choice of construction materials, linings.

Various materials are used for making a water tank plastics(polyethylene, polypropylene),fiberglass, concrete, stone, steel(welded or bolted, carbon or stainless).Earthen plots also function as water storages. Water tanks are an efficient way to help developing countries to store clean water.

2. LITERATURE REVIEW

1] The paper by studied A.A. Iyer and I.P Rane on ‘Reduce the Emission’ Extensive research work has been carried out in the field of water injection in an internal combustion engine. The current project is a cumulative work of these research papers in combination to reduce the overall emissions Busuttil et al. Experimentally investigated the optimum quantity of water to be injected for a particular engine. The experimentation was done using a combination of injectors and a specially designed circuit Breda et al. Investigated using CFD analysis the solutions to increase the knock resistance. Methanol, water or a combination of both is added to the intake manifold to maintain the knock resistance. 87Ma et al. Observed that introducing Intake Manifold Water

Injection has positive effects on mainly three parameters namely- Chemical Effect, Dilution Effect and Thermal Effect Boretti found that Injection of water upstream proved effective in reducing the temperature of gases and at the entry of engine which resulted in increasing power densities and better fuel efficiencies for same temperature of turbocharger Daggart et all.

2] The paper studied by C.K. Joy Das and G.E Rahul Malik on 'Reduce the Exhaust Gas Temperature' the water along with compressed air was injected just after the carburetor, due to the high latent heat of vaporization of water reduction in overall temperature inside the cylinder was quite significant. As the temperature inside the cylinder reduced, the amount of harmful emissions from the cylinder such as NOx and CO were also should be reduced to a greater extent thus bringing down pollution to a considerable amount. If the temperature inside the cylinder due to combustion is higher, then it is always accompanied greater mean effective pressure. These conditions lead to detonation, referred to as engine knock, in this case the fuel-air mixture burns in an undesirable manner and it is undesirable. To combat the knock and the emissions from the engine, the solution is to reduce the temperature inside the cylinder. The exhaust temperature gas characteristics are plotted in Figures 3 and 4. From the exhaust gas characteristics curves, it is inferred that as the mass % of water injection was increased the exhaust gas temperature was decreasing continuously.

3] The paper studied by G.Goudah on 'Water Produced by the Combustion Process' Water is also produced by the combustion process itself, with the mass floe rate henceforth noted combustion. The combustion process taken into account is the complete on of an (oxygenated) hydrocarbon fuel of composition $C_xH_yO_z$ with air. Complete means that the possible production of more complex and often hazardous components such as unburnt hydrocarbons, carbon monoxide and nitrogen oxides, are not considered, neither the potential involvement of water in another chemical reaction.

4] The paper is studied by A.S.Moktar and R.Yunus on 'Decreasing the amount of nitrogen oxides(NOx)' Engines polluting emissions, water injection participates to decrease the amount of nitrogen oxides(NOx) finally rejected by the combustion, in decreasing the flame temperature the main source of NOx being the oxidation process of atmospheric nitrogen contained in the air composing the fresh mixture, due to a too high combustion peak temperature. On the contrary, the production of unburnt hydrocarbons increases, purportedly because of an enlargement oh the quenching layers of combustion, due to the cooling process of the cylinder inner surface. Finally water injection can whether decrease the production of carbon monoxide (CO), depending on the specific experimented configuration.

5] The paper is studied by A.R.Abu Talib on 'Water Injection Using Air Craft Engines' Water injection has been in use in air craft engines as a means of internal cooling from the early 20th century. This internal cooling can provide space or means for additional charge to be allowed in the cylinder for more power output without the danger or premature detonation of the charge inside the cylinder. Water is frequently used so that water does not freeze at high altitudes.

6] The paper is developed by D.Sarkar on 'Heat Release From the Fuel and Exhaust Gas' a cycle simulation code for direct water injection in engine based on combustion equilibrium with uniform zonal properties concept considering heat release from the injected fuel, heat losses due to exhaust gas.

7] The paper is numerically studied by Niko Samec on 'Give to Better Atomization' water emulsified fuel combustion in petrol engine using as fuel for a better understanding of atomization process influenced by vaporized water droplets. It was reported that the primary spray fuel droplets are further divided as a result of explosive vaporization caused by the rapid heating of water dispersed within the individual fuel droplets. The internal water droplets are converted into steam by absorbing the heat in the combustion chamber. Micro explosion of the emulsion fuels seem to enhance the mixing of the fuel with the surrounding air for faster and more efficient combustion also resulting in a higher heat release gradient at the beginning of the combustion process.

3. COMPONENTS AND DESCRIPTION

COMPONENTS USED:

- Engine
- Carburetor
- Silencer
- Fuel tank
- Water tank
- Electrode (stainless steel)
- Battery
- Electrolyte
- Hose and connector

DESCRIPTION:

Engine:

An engine, or motor, is a machine designed to convert one form of energy into mechanical energy. Heat engines, including internal combustion engines and external combustion engines (such as steam engines) burn a fuel to create heat, which then creates a force. Electric motors convert electrical energy into mechanical motion, pneumatic motors use compressed air and others such as clockwork motors in wind-up toys use elastic energy. In biological systems, molecular motors, like myosin's in muscles, use chemical energy to create forces and eventually motion.

"Engine" was originally a term for any mechanical device that converts force into motion. Hence, pre-industrial weapons such as catapults, trebuchets and battering rams were called "siege engines". The word "gin," as in "cotton gin", is short for "engine." The word derives from Old French engine, from the Latin in genium, which is also the root of the word ingenious. Most mechanical devices invented during the industrial revolution were described as engines—the steam engine being a notable example.

In modern usage, the term engine typically describes devices, like steam engines and internal combustion engines, that burn or otherwise consume fuel to perform mechanical work by exerting a torque or linear force (usually in the form of thrust). Examples of engines which exert a torque include the familiar automobile gasoline and diesel engines, as well as turbo shafts. Examples of engines which produce thrust include turbofans and rockets.

When the internal combustion engine was invented, the term "motor" was initially used to distinguish it from the steam engine which was in wide use at the time, powering locomotives and other vehicles such as steam rollers. "Motor" and "engine" later came to be used interchangeably in casual discourse. However, technically, the two words have different meanings. An engine is a device that burns or otherwise consumes fuel, changing its chemical composition, whereas a motor is a device driven by electricity, which does not change the chemical composition of its energy source.

A heat engine may also serve as a prime mover a component that transforms the flow or changes in pressure of a fluid into mechanical energy. An automobile powered by an internal combustion engine may make use of various motors and pumps, but ultimately all such devices derive their power from the engine. Another way of looking at it is that a motor receives power from an external source, and then converts it into mechanical energy, while an engine creates power from pressure (derived directly from the explosive force of combustion or other chemical reaction, or secondarily from the action of some such force on other substances such as air, water, or steam). Devices converting heat energy into motion are commonly referred to simply as engines.

Specification of engine:

Type	Four strokes
Cooling System	Air Cooled
Bore/Stroke	50 x 50 mm
Piston Displacement	98.2 cc
Compression Ratio	6.6:1
Maximum Torque	0.98 kg-m at 5,500 RPM

Types of engine:

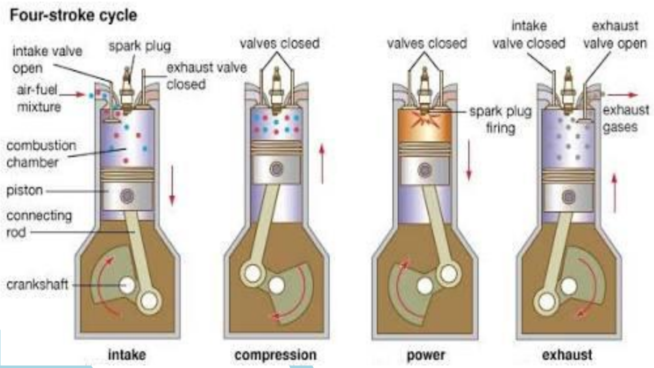
An engine can be put into a category according to two criteria: the form of energy it accepts in order to create motion, and the type of motion it outputs.

1. Heat engine
2. Combustion engine

Combustion engines are heat engines driven by the heat of combustion process.

i)Internal combustion engine:

The internal combustion engine is an engine in which the combustion of a fuel (generally, fossil fuel) occurs with an oxidizer (usually air) in a combustion chamber. In an internal combustion engine the expansion of the high temperature and high pressure gases, which are produced by the combustion, directly applies force to components of the engine, such as the pistons or turbine blades or a nozzle, and by moving it over a distance, generates useful mechanical energy.



ii)External combustion engine:

An external combustion engine (EC engine) is a heat engine where an internal working fluid is heated by combustion of an external source, through the engine wall or a heat exchanger. The fluid then, by expanding and acting on the mechanism of the engine produces motion and usable work.[16] The fluid is then cooled, compressed and reused (closed cycle), or (less commonly) dumped, and cool fluid pulled in (open cycle air engine).

"Combustion" refers to burning fuel with an oxidizer, to supply the heat. Engines of similar (or even identical) configuration and operation may use a supply of heat from other sources such as nuclear, solar, geothermal or exothermic reactions not involving combustion; but are not then strictly classed as external combustion engines, but as external thermal engines.

The working fluid can be a gas as in a Stirling engine, or steam as in a steam engine or an organic liquid such as n-pentane in an Organic Rankine cycle. The fluid can be of any composition; gas is by far the most common, although even single-phase liquid is sometimes used. In the case of the steam engine, the fluid changes phases between liquid and gas.

Air-breathing combustion engines:

Air-breathing combustion engines are combustion engines that use the oxygen in atmospheric air to oxidise ('burn') the fuel, rather than carrying an oxidiser, as in a rocket. Theoretically, this should result in a better specific impulse than for rocket engines.

A continuous stream of air flows through the air-breathing engine. This air is compressed, mixed with fuel, ignited and expelled as the exhaust gas.

Silencer:

A muffler (silencer in British English, or back box in Irish English) is a device for reducing the amount of noise emitted by the exhaust of an internal combustion engine. Mufflers are installed within the exhaust system of most internal combustion engines, although the muffler is not designed to serve any primary exhaust function.

The muffler is engineered as an acoustic soundproofing device designed to reduce the loudness of the sound pressure created by the engine by way of Acoustic quieting. The majority of the sound pressure produced by the engine is emanated out of the vehicle using the same piping used by the silent exhaust gases absorbed by a series of passages and chambers lined with roving fiberglass insulation and/or resonating chambers harmonically tuned to cause destructive interference wherein opposite sound waves cancel each other out. An unavoidable side effect of muffler use is an increase of back pressure which decreases engine efficiency. This is because the engine exhaust must share the same complex exit pathway built inside the muffler as the sound pressure that the muffler is designed to mitigate.

4. WORKING PRINCIPLE OF OXY HYDROGEN GENERATOR (HHO):

Oxy hydrogen added in to the air intake manifold and injects into the cylinders (where HHO mixes) with the fuel, ignites-results complete combustion of the Hydrocarbon fuel, lowering emission and increasing fuel efficiency.

Material used:
Electrode(stain less steel)
12v 4ah battery
Hose and connector
Electrolyte
Container

Electrolyzer:

An electrolyzer is a device used to separate Hydrogen and Oxygen from water via electrolysis.

ELECTROLYSIS:
Electrolysis is a non spontaneous chemical reaction using direct current (DC)
Electrolysis is commercially highly important as a stage in separation of elements from naturally occurring sources such as ores using an electrolytic cell
Batteries are the main source of electricity in the field of automobile its works under the principle of Electrolysis.

ELECTRODE:
An electrode is a conductor through which electric current is passed. It can be in various forms like wires, plates or rods.
Electrode can may be constructed of metal, such as copper ,stainless steel, silver or lead. However, an electrode may also constructed using Non-Metals like carbon.
An electrode passes current between a Metallic part and Non-Metallic part of an electrical circuit.
In an electrochemical cell, an electrode is called either an anode or cathode
A cathode is described as a negative electrode. Current enters the cell at the cathode and reduction takes place. Electrons are repelled from cathode.
An anode is a positive electrode where oxidation takes place. Current leaves the cell at the anode.

ELECTROLYTE:

An electrolyte is any substance containing free ions that make the substance electrically conductive.
The most typical electrolyte is an ionic solution, but molten electrolytes and solid electrolytes. Commonly, electrolytes are solutions of acids, bases or salts.
Some gases may act as electrolytes under conditions of high temperature or low pressure. Electrolyte solutions are normally formed when a salt is placed into solvent such as water. $NaCl(s) \rightarrow Na^+(aq) + Cl^-(aq)$
If a high proportion of the solute dissociates to form free icons, the electrolyte is strong; if most of the solute does not dissociate, the electrolyte is weak.
The properties of electrolytes may be exploited using electrolysis to extract constituent elements and components contained within the solution.

NECESSITY OF USING ALTERNATIVE FUEL:
In the automobile field now the fuel used is known as petrol and fuel oil (Diesel). Petrol is a volatile fuel which is used in spark ignition engines and fuel oil which is used in compression ignition engine.
Basically both the fuels petrol and diesel is obtained from the crude oil (i.e.) petroleum. Now the problem is, its availability is decreasing day by day in bulk and insufficient for future decades. Hence an alternative fuel is essential to fight against scarcity. In term of long sight some alternative fuels are suggested and experimented by various manufacturing units with technicians, such alternative fuels are as follows.

BENEFITS:
ENVIRONMENTAL FRIENDLY:
As shown in the given diagram, use of HHO gas reduces the Carbon monoxide (CO) emission to 27%, Nitric oxide (NO) emission to 28%, Nitrogen dioxide (NO_2) emission to 51%, Nitrogen oxides (NOX) emission to 32%.
FUEL SAVING:
Additional fuel burning – resulting fuel saving up to 30% depending on the condition of the engines and running platform.
INCREASE ENGINE EFFICIENCY:
Hydrocarbon fuels and lower ignition energy of fuel – resulting. Increased fuel efficiency between 10 to 30% - results, investment on Hydro-Gen can be recouped in less than a year. Reducing emission minimum by 60%.
Engine runs smoother and Vehicle life extended as well.
Engine heat-up is minimized at 15 to 20%.

FUEL SAVINGS:
Additional fuel burning resulting fuel saving Engine Make Cummins up to 30% depending on the condition of the Engine CC 100 engines and running platform.

SAFE:
HHO will be produced on demand, meaning no worries about transporting and storing dangerous pressurized gas fuel tanks - ensure safe and continuous operation. Storing only water.

ENVIRONMENT FRIENDLY:

Use of HHO gas reduces the Carbon monoxide(CO) emission to 27%, Nitric oxide (NO) emission to 28%, Nitrogen dioxide(NO2) emission to 51%, Nitrogen oxides (NOX) emission to 32%. 100% Before Hydro-Gen Installed After Hydro-Gen Install

VERSATILE:

Hydro-Gen can be used in the applications of variety of fuels like Petrol(Gasoline), Diesel, Heavy oil, Acetylene, Propane, Kerosene, Furnace Oil and LPG etc. Petrol Diesel LPG Heavy Oil Acetylene Kerosene Propane Furnace Oil And More