Fabrication Of Hydrogen Powered Engines

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Abstract—*Fuel optimization plays a vital role all over the world. So the alternative fuel needs are now a days gradually increasing. The hydrogen also a one of most common alternative fuels. The hydrogen can be generated by the HHO generation unit. HHO otherwise known as hydroxy or Browns Gas is the gas produced from splitting water into hydrogen and oxygen from electrolysis and allowing the gas to stay in a premixed state for use on-demand without the need for storage. In 1918 Charles Frazer, a North American inventor, patented the first water electrolysis machine act as a hydrogen booster for internal combustion engines. The proposed HHO generating device is compact and can be installed in the engine compartment. This auxiliary device was integrated and tested on a gasoline engine. Four stroke single cylinder engine was procured for this project. From this design the fuel utility is reduced from 15% to 30% which minimizes the carbon deposition in the cylinder thereby increasing the changing period of engine oil, it also improves the efficiency of the engine and the life span. Engine torque also increased and pollution gets reduced to maintaining the greenhouse effect. Overall the cost of the product is very low.*

Keywords— HHO, NOx, PWM

1. INTRODUCTION

Alternate fuel is important and it should be fossil one. Actually we spend one third of our income for our vehicle fuelling and the vehicle gives harmful decomposed materials like CO, NOx,HC, WCBSFC, etc... In the form of smoke. These materials are all affects the engine performance, and pollutes the environment. Compare to other kinds of fuel around the world, water is one of the free recourses and by applying the technique, it can be converted into hydrogen with oxygen, its chemical term is HHO and in general "FreeEnergy".

It is cheaper, safer, tremendous explosive and never pollutes the atmosphere. While crossing a gas or diesel operated car we can feel the smell of the respective fuels, it shows that the fuel is not completely burnt. It is explicit that we waste fuel and pollute the atmosphere.

To avoid these drawbacks, some level of HHO is mixed with filtered air, which is after the air filter system and before the engine in taken system of the car. This mixed HHO ignites releasing the extra electrons into the igniting fuel and thus the added extra energy from the HHO leads cent percent of complete burning of the fuel. The HHO has Polymorphism that is it acts differently - before burning, while burning, and after burning.

Before burning of Hydrogen, which is a lightest gas with one proton and one electron and more efficient fuel three times of the explosive power when camper to fuel gas and five times than petrol. Actually, the Hydrogen requires little bit of energy of ignition to produce wide level of tremendous flammable temperature in the speed of lighting and there is no chance to compare with other fuel in this world.

As a result of fact it increases the engine performance, torque, and millage and minimums fuel consumption. During burning the HHO into the engine with a tremendous explosion on that area and gives off high power of energy and automatically reverts to water vapour at once.

2. LITERATURE SURVEY

Effects of On-board HHO and Water Injection in a Diesel Generator, October 2012, Rick Cameron, ETAL

BROWN'S GAS is created via the process of water electrolysis where the hydrogen and oxygen are allowed to stay mixed. Water contains a ratio of 2 parts hydrogen to one part oxygen bonded in a tetrahedral molecular arrangement with two lone pairs of electrons and two bonding pairs of electrons connecting the hydrogen atoms to the central oxygen atom. Eckman proposed that when water is electrolyzed and the gas products are not separated by a semi-permeable membrane, Rydberg clusters may be formed. These clusters are of a mixture of hydrogen and oxygen species including linear water molecules in the highly energized trigonal-bypyramidal geometry, monatomic and diatomic hydrogen, free electrons and oxygen.

The extra energy stored in one liter of HHO due to Rydberg clusters is theorized to be 600±34J. Rydberg clusters are most common in solids and liquids and are typically stable from nanoseconds to hours. In the case of HHO or Brown's Gas these clusters have shown a life span of 11 minutes. Due to these highly energized clusters HHO contains much more energy than equivalent stoichiometric ratio of hydrogen and oxygen in the form of extra electrons, this state has been explained as cold plasma. Cold plasma is a state of matter where the atom nuclei are relatively unenergetic or slowly moving, but the electrons are in highly energized states at higher atomic orbitals. Normally the presence of water in a burning fuel gas greatly reduces the heat energy due to the high specific heat capacity of water (4.18J/g-K), however the linnear water content of HHO has greatly reduced hydrogen bonds and electrically transfers its electrons under combustion at the surface of the contacting material. The flame temperature generated by HHO can range from 150°C to over 9000°C based on the contact materials' electrical conductivity, thermal conductivity, density and vapor

point. The HHO generated for addition into the diesel engine in this research project will not have a water vapor removal (desiccant) stage at the output, so as to test the effects of the claimed additional energy release during combustion.

3. WORKING PRINCIPLE

Here is a simplified explanation on how the systems work in changing water into Hydrogen and Oxygen. Let's start with the water, it should be at least filtered or distilled and a gallon is about the best amount to have prepared for your HHO generator. We call it an HHO generator because it produces both Hydrogen and Oxygen simultaneously thru the process of electrolysis.

When water is introduced with electrical current/voltage [preferably DC] it has a tendency to become excited and divides into its primary elements of Hydrogen and Oxygen. The produced Hydrogen and Oxygen are now in a gaseous state from the liquid water. It's been said by others that the two elements have been split apart from one another into their sub-diatomic molecular state.

A fallacy out there is that it takes more energy to produce the HHO than the energy it releases. Not at all true, that's why there are HHO generators available out there. You can produce HHO with as little as 1.5 volts DC and an amp of current. It's not only how it's done but the way in which the HHO generator is configured to permit a useful output with minimal power input. You can put 2 bare ended wires into a bucket of water with an electrolyte and produce a small quantity of HHO by putting a DC current through the wires. The principle is to produce as much HHO as possible with the least amount of electrical energy and generated exothermic heat. In reality, once the HHO generator has been charged up it actually acts like a wet cell battery.

It holds a charge of 1.5 - 2.0 volts DC and can operate when charged with the power switch turned off, until the remaining suspended HHO gas is pulled off and the cell ultimately discharges. The power switch is primarily used to maintain the HHO generators charge.

What we do here is draw off that produced gaseous material by vacuum created by the vehicles engine and feed the gasses directly into the engine for combustion purposes. The system is an on demand system, "NOT" a pressurized storage system the HHO generator only produces what the vehicles engine may call for, nothing more.

Can we idle an engine on pure HHO, the answer is absolutely, but to actually operate the vehicle under normal driving conditions the current technology is not quite there yet. Currently most of our users see from 25 - 45% on average concerning fuel savings. But don't think it stops there; the NEW Magnum Series HHO generators are pushing the fuel savings into the upper 50% range. If we keep on working on the problems that hold us from using just HHO long enough we will reach that point where the vehicles fuel tank will become a water reservoir tank for holding just water.

The process is as follows, you start with water and an electrolyte and there are many different types. You add DC current, the H2o breaks down into H2 & O [we just call it HHO]. We introduce it into the engine by use of the engines vacuum. The HHO combines with the gasoline and air in the combustion chamber and is burnt. Once burnt, it converts back to H20 [water].

A. Equations

HHO is popular and common gas produced from electrolysis .It is really a combination of two gases hydrogen H2 and Oxygen O2.The simple chemical equation for conversion of water (liquid) to HHO (gas) can be written as

$$H_2O\ (l) \rightarrow HHO\ (g)$$

Connected with a help of Direct current to Electrolytic cells is to dissociate water into hydrogen and oxygen.

$$2\ H_2O + \text{ENERGY} \rightarrow 2H_2 + O_2$$

The chemical process could be easily speed up by using catalyst and during the process the selected compound does not change its property. The main purpose of the catalyst is to reduce the amount of energy required for conversion. The following chemical equation describes the function of catalyst.

$$2\ H_2O + \text{CATALYST} + \text{ENERGY} \rightarrow 2H_2 + O_2 + \text{CATALYST (Req)}$$

As a result, Hydrogen (H2) as well as oxygen (O2) will be produced while splitting up of water. Chemically the following process is going on

Electrolysis: $2\ H2O \rightarrow 2\ H_2 + O_2$

B. MATERIAL SELECTION TO DESIGN ELECTRODES

There are different materials could be used as an electrode. But each one has its own merits and demerits .From the overall search the selection of material for electrodes should be stainless steel thicker in size. The electrodes shape is either in plate or tube form. The numbers of electrode depends on our gas requirements. The distance between each plate should be minimum and should have equal space all over the arrangement of electrodes.

There are two methods of arrangements of electrodes - without-neutral and with-neutral. The without neutral electrodes construction consists of number of positives P and negatives N plates which are all arranged alternatively, example if there are three set of positive and negative electrodes then P-N-P-NP-N is the arrangement.

Next with-neutral electrodes construction consists of number of positives P ,neutral Nu ,and negatives N plates which are all arranged in the following manner P-Nu-Nu-N-Nu-Nu-P-Nu-Nu-N, or, P-Nu-Nu- Nu-N-Nu-Nu-Nu-P-Nu-Nu-Nu-N, etc…

The purpose of neutral plate is to prove better cooling effect while electro processing. Here the neutral plates are also of the same material and same size .But in this work the former one has been selected and designed as P-N-P-N-P-N. For the connectivity among positive electrodes and negative electrodes, they are arranged not to make any shot circuit at any condition and mechanically should be strong to withstand the electrolytecorrosions.

4. RESULT AND DISCUSSION

This project work has provide us an excellent opportunity and experience, to use our limited knowledge. We gained a lot of practical knowledge regarding, planning, purchasing, assembling and machining while doing this project work. We feel that the project work is a good solution to bridge the gates between institution and industries.

We are proud that we have completed the work with the limited time successfully, the "FABRICATION OF HYDROGEN POWERED ENGINES" is working with satisfactory conditions. We are able to understand the difficulties in maintaining the tolerances and also quality. We have done to our ability and a skill making maximum use of available facilities.

In conclusion remarks of our project work, let us add a few more lines about our impression project work. Thus we have developed "FABRICATION OF HYDROGEN POWERED ENGINES" which help to produce the more amount of hydrogen by electrolysis process and it will carry by the easy way to handle also the blasting of hydrogen storage tank can be avoided in this project. by using more techniques, they can be modified and developed according to the applications.

5. CONCLUSION

May the people say water is used for the fuel for the automobiles. Water crisis will arrive but it already proved in chemistry. When hydrogen subjected under chemical reaction it will turn in to water. So in exhaust the water vapor will be emitted. There will not be any kind of pollution in the exhaust gas.

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