INTERNATIONAL JOURNAL OF ADVANCE RESEARCH, IDEAS AND INNOVATIONS IN TECHNOLOGY

ISSN: 2454-132X
Impact factor: 4.295
(Volume 4, Issue 5)
Available online at: www.ijariit.com

Use of oxy hydrogen gas in stationary devices: A review

Mohammad Affan Usmani
affanusmani007@gmail.com
Integral University, Lucknow, Uttar Pradesh

Saleem Khan
saleemk7800@gmail.com
Integral University, Lucknow, Uttar Pradesh

Bakhtawar Hasan Khan
bakhtawar.khan4@gmail.com
Integral University, Lucknow, Uttar Pradesh

Safwan Ahmed
kzaid5220@gmail.com
Integral University, Lucknow, Uttar Pradesh

ABSTRACT

Now a day's pollution increasing by petroleum fuels day by day in India as well as in the whole world and as we know petroleum fuels are non-renewable so a shift in scientist's interests, recently observed, toward lower Fuel consumption and emission engines take place. This encourages researchers to seek alternative solutions to be used in engines without the need for a dramatic change in the vehicle design so the scientific society works as an alternative fuel. In many alternatives oxyhydrogen (HHO) gas is one of the best options. HHO gas can be reduced the percentage of HC and CO. This review study deals with the use of oxyhydrogen gas four stroke petrol engines for stationary devices like electricity generator.

Keywords— *HHO gas, Fuel cell, Petrol engine, Electrolysis, Emission*

1. INTRODUCTION

Oxy hydrogen gas known as Brown's gas, green gas and hydroxy gas etc. it was introduced by former Bulgarian engineer Yull Brown (March 28, 1978) but Mr. Brown was not first who invent this gas, William Rhodes (March 21, 1961) also achieve this gas by the special electrolysis process in leak-proof container. Oxy hydrogen gas can be formed by the simple electrolysis process of distilled water but for the increasing the rate of reaction we use catalyst like sodium bicarbonate, sodium chloride or sodium hydroxide etc.

Distilled water +sodium bicarbonate +electricity=cheap and clean oxy hydrogen

It can be said the fourth form of water which is made up of magnicules of hydrogen gas (HH) attached to loan oxygen atom (O). HH and O attached by the magnifier bond. HHO can be formed easily but the storage of HHO is not possible. It is very diffusible gas so in case of any leakage, it can diffuse in the air easily. Schematic diagram of the HHO generator is shown in figure 1.

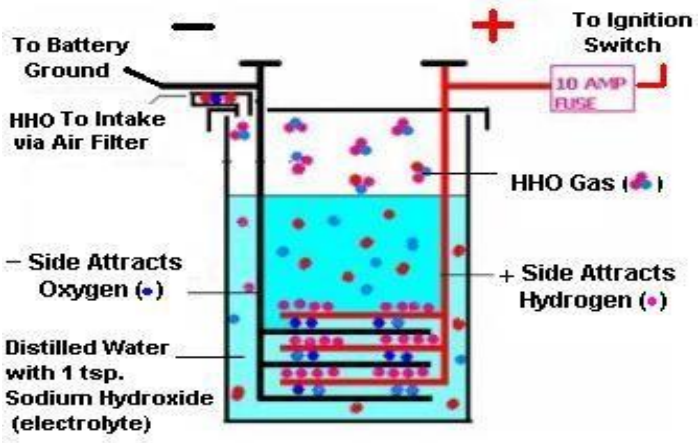

Fig. 1: Schematic diagram of the HHO generator

In both type of engines (dynamic and stationary) installation of HHO generator is very simple. HHO generator attached with a battery and when we pass the current formation of HHO starts rate of current flow is directly proportional to the rate of formation of HHO. Attachment of fuel cell and battery are as shown in figure 2.

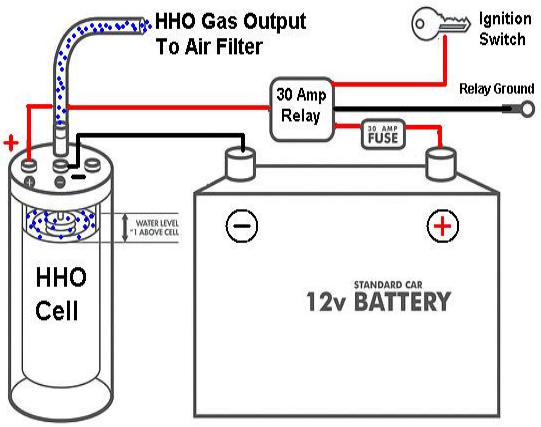

Fig. 2: Attachment of fuel cell and battery

2. PROPERTIES OF HHO GAS

HHO is new generation fuels which in form of the bubble it is also known as the fourth form of water. Oxy hydrogen gas shows good properties when it mixes with petroleum fuel. It has mix easily in petroleum fuel. For a stoic metric Mixture at normal atmospheric pressure, auto ignition of hydrogen gas occurs at about 5700C (10650F) the minimum energy required to ignite such a mixture with a spark is about 20 micro joule at normal temperature and pressure [1]. The basically HHO diatomic structure so we can say that it is not hydrogen plus oxygen because they are not separated after electrolysis their bond known as magnicular bond

Table 1: The properties of hydrogen

Pp Properties	Diesel	Unleaded gasoline	Hydrogen
Auto-ignition temperature (K)	530	533-733	858
minimum ignition energy (ml)	-	0.24	0.02
Flammability limits (volume % in air)	0.7-5	1.4-7.6	4-75
Stoichiometric air-fuel ratio on mass basis	14.5	14.6	34.3
Limits of flammability (equivalence ratio)	-	0.7-3.8	0.1-7.1
Density at 16 _C and 1.01 bar (kg/m3)	833-881	721-785	0.0838
Net heating value (MJ/kg)	42.5	43.9	119.93
Flame velocity (cm/s)	30	37-43	265-325
Quenching gap in NTP air (cm)	-	0.2	0.064
Diffusivity in air (cm^2/s)	-	0.08	0.63
Research octane number	30	92-98	130
Motor octane number	-	80-90	-

3. LITERATURE REVIEW

G. Ajay Kumar et al. [1]: In this experimental study author investigate the performance of oxy hydrogen gas in two-stroke petrol engine and proposed idea use of HHO suitable for stationary engine like generator etc. according to the author Oxy-Hydrogen is an enriched mixture of oxygen and hydrogen bonded with each other molecularly as well as magnetically. In this experiment Oxy-Hydrogen Gas is produced in a common ducted electrolyser & then sent to the intake manifold to introduce into the combustion chamber of the engine. HHO gases will combust in the combustion chamber when brought to its auto-ignition or self-ignition temperature. For a stoichiometric mixture at normal atmospheric pressure, auto-ignition of oxy hydrogen gas occurs at about 570°C (1065°F). The minimum energy required to ignite such a mixture with a spark is about 20 micro joules. At normal temperature and pressure, Oxy-Hydrogen gas can burn when it is between about 4% and 94% hydrogen by volume. When ignited, the gas mixture converts to water vapors and releases energy. The maximum temperature of about 2800°C is achieved with a pure stoichiometric mixture, about 700°C hotter than a hydrogen flame in air.

TS De Silva et al. [2]: This paper proposed the idea of designing an efficient oxy hydrogen (HHO) gas generator, which produces oxy hydrogen gas. And this gas can be used to increase the fuel efficiency in an internal combustion engine. In this research, the work author gives a convenient and efficient method to build up an HHO generator.

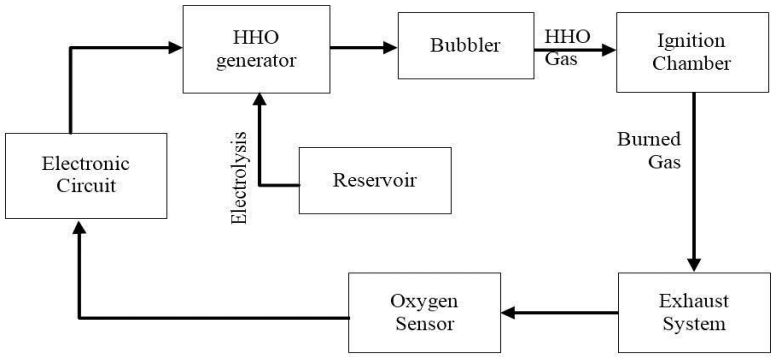

Fig. 3: Method to build up an HHO generator

According to the results observed the number of HHO increases as per the supply current is increased. In addition, increasing cell temperature also increases the production of HHO. To make an efficient HHO generator some fact is work like the distance between the plates, Catalyst used, the material used and also the number of plates and electrodes used should thoroughly concede. In this approach, the amount of current flows through the generator increases with the temperature of the generator which makes the battery to drain fast. Taking this fact into consideration, future research will focus on limiting the current flow through the generator to obtain an optimal rate of HHO production.

Rajasekaran T. et al. [3]: In this experimental work author investigate the performance and emission characteristics of single cylinder petrol engine operated with gasoline, LPG, gasoline with HHO and LPG with HHO according to the author The experimental results show that by the addition of HHO to either gasoline or LPG gives us reduced fuel consumption rates. While in gasoline with HHO mixture a proportionately good result in all emission parameters. The following conclusions are as below.

(a) Fuel consumption rate has decreased by 9.65% for Gasoline Engines and 15.70% for Engine on LPG while introducing HHO.
(b) CO concentration has been reduced 27.53% in gasoline fuel but using LPG fuel 52.11% of concentration is increased.
(c) HC concentrations are highly reduced in medium speeds while using HHO for both fuels.
(d) The concentration of CO2 has been considerably decreased at lower speed but increased in higher speed for gasoline and decreased highly LPG when HHO added to the engine.
(e) In both fuels, exhaust oxygen concentration is highly low. This result shows the clean combustion of fuel and this lead to better fuel consumption and efficiency.
(f) The NOX average concentration has been reduced to about 25.54% at an average for gasoline and for LPG gives better results in higher speeds.

Ali Can Yilmaz et al [4]: in this experimental study oxy hydrogen gas (HHO gas kit) system was added to the engine without any modification. HHO gas was generated in reactor container by various types of electrodes (reactors) in various molality aqueous solutions of catalysts. The author gives two type of result one for mid and high speed and the second for low speed.

At mid and higher engine speed– According to the author HHO system with diesel fuel yields higher engine torque output compared to pure diesel-fueled engine operation unless HECU is added to the system. High burning velocity and low ignition energy of HHO and air mixture minimize the effect of the weakened in cylinder charge flow and the increased residual gas fraction which blocks the fuel to be fast and completely burnt at high speeds. However, increased CR may cause pre-ignition and this can be minimized by direct HHO injection into the cylinder.

At low engine speeds- At low engine speed it faces a big challenge due to the long opening time of intake manifold at low speeds, high volume occupation (reduced volumetric efficiency) of HHO becomes inevitable. Since minimum ignition energy of HHO-air mixture is a decreasing function of equivalence ratio till stoichiometric (richer) conditions, torque is reduced after HHO gas addition. A control unit has to be used to obtain appropriate electrolysis voltage and current (gas flow rate) to terminate the impairments of oxy hydrogen gas at low speeds.

Sa'ed A. Musmar [5]: in this experimental test author investigate the effect of HHO gas on the emission parameters of a Honda G 200 engine have been carried out. HHO gas has been generated by an electrolysis process in a Plexiglas box (fuel cell). The generated gas is mixed with a fresh air just before entering the carburetor. The exhaust is sampled by a gas analyzer and the exhaust constituents have been identified. The author gives some important result which are as:

(a) The concentration of nitrogen oxide has been reduced to almost 50% on average when HHO is introduced to the system.
(b) When HHO is introduced to the system, the average concentration of carbon monoxide has been reduced to almost 20% of the case where air/fuel mixture was used (no HHO).
(c) The NOX average concentration has been reduced to about 54% of the case where HHO was not introduced.

4. CONCLUSION

The main objective of the present study is to introduce some of the oxy hydrogen gas advantages and maintain the original specifications of the engine. By introducing HHO fuel cell improve engine performance, increase fuel efficiency and get a measurable reduction in pollution.

Various research studies show the installation of HHO fuel cell is easy but facing problem a problem in running automobile so I would like to suggest HHO fuel cell will be more effective in stationary devices like electricity generator etc.

5. REFERENCES

[1] G.Ajay Kumar, G.Venkatateswara rao.2013.performance characteristics of oxy hydrogen gas on two-stroke petrol engine.
[2] TS De Silva, L Senevirathne and TD Warnasooriya.2015HHO Generator – An Approach to Increase Fuel Efficiency in Spark Ignition Engines.
[3] Rajasekaran T., Duraiswamy K., Bharathiraja M. and Poovaragavan S.2015 Characteristics of engine at various speed conditions bymixing of HHO with gasoline and LPG.
[4] Ali can yilmaz, Erinc Uludamar, Kadir Aydin. 2010. Effect of hydroxyl (HHO) gas addition on performance and exhaust emission in compression ignition engines.
[5] Sa'ed A. Musmar, Ammar A. Al-rousan.2011. Effect of hho gas on combustion emission in gasoline engines.
[6] Nikhil Naraynan, Vanagamudi, P. naveenchandarn.2014.performance and emission characteristics of oxy hydrogen gas on three cylinders four stroke petrol engine.
[7] J.J Hurtak, Desiree Hurtak. 2014. The history and future of brown's gas.

[8] http://k9gb.blogspot.in/2012_05_01_archive.html
[9] http://hhosuperpack.com/
[10] Brown Y., Brown's Gas, United States Patent, US Patent 4014, 777; March 28, 1978.
[11] Al-Rousan AA. Reduction of fuel consumption in gasoline engines by introducing HHO gas into the intake manifold. Int J Hydrogen Energy.
[12] Mohammad Affan Usmani.2016. A review study of the use of oxy hydrogen gas in four strokes S.I. engine.

