

Fuel from Water to Run an IC Engine Vehicle

¹ Vaibhav Khopade, ²Suraj Prajapati, ³Mayur Gavade, ⁴Rohit Salunke, ⁵Prof.A.M.Kasar.

Zeal college of Engineering, Nahre, Pune.

Abstract- Petroleum fuels have its disadvantages. Use of Alternative fuels is need of future. But alternative fuels also have some drawbacks. To reduce the drawback of petroleum fuels need to do some improvements like use of hydrogen gasoline blend to run IC engine, which don't have much drawbacks. Use of additive fuel in IC engine will reduce the emission also increase the efficiency of IC engine. By electrolysis of water we get Brown's gas (HHO gas), which can be used as additive fuel for IC engine. HHO blended fuel is introduced to combustion chamber of IC engine. While burning of charge HHO gas reduces the specific fuel consumption. By using HHO gas as additive will reduces the combustion temperature. Extra oxygen molecule (H-H-O) ensures clean burning of fuel which results low emission. This is low cost system, which can be used to any petrol engine.

Keywords- HHO gas generator, IC engine, mission control in IC engine.

1.INTRODUCTION

We know the sources of petroleum fuels are very less also petroleum fuels have very adverse effect on global environments. Pollutants produced by exhaust of IC engine causes acid rains, Global warming etc. To reduce this we go with alternative fuels like solar energy, wind power, Bio-fuels etc. But still Alternative fuels have disadvantages hence it cannot be used commercially. To overcome this additives are used. The researcher that discovered amazing new process in the late 1960's, Yull Brown, realized that we didn't need to separate the gases from each other, or pressurize hydrogen in a storage tank. He discovered one could utilize both the hydrogen and the oxygen in a novel. Not separating them, but using them immediately as they rose up out of the water, "on demand". The new gas was coined Brown's Gas and has been more popularized recently as HHO Gas. HHO gas is blended with petrol and supplied to intake of IC engine.

Brown's gas is a mixture of monoatomic and diatomic oxygen and hydrogen. George Wiseman defines Brown's gas as, "The entire mixture of gases evolving from an electrolyzer specifically designed to electrolyze water and not to separate the resulting gases." Although there is multiple way of producing free hydrogen, those methods require converting combustible molecules into hydrogen or consuming electric energy. We selected brown's gas electrolyzer which is also called as HHO generator for producing the HHO gas.

An attempt has been made in this project to use additive fuel in four stroke internal combustion engine. Our main aim in selecting this work is to use non-conventional fuel HHO with conventional fuel. We select an engine of Honda Activa 102 cc, 7 BHP at maximum speed of 7000 rpm for this project work and working model has been developed to support the idea of work. In IC engines the combustion of a gasoline fuel produces CO₂ and H₂O. Some of the fuel is not burnt due to the IC engines are not perfectly efficient, which results in the presence of HC, CO and NOx. The HHO generator uses electrolysis process to split water (H₂O) into its base molecules, 2-hydrogen and 1-oxygen molecule. The HHO gas is not an alternative to petrol but an additive to increase the efficiency. This project asses the performance characteristics of a four stroke IC engine that is run by petroleum fuel blended with HHO fuel, which is fed through the in inlet manifold. Reduction in fuel consumption and emission is the main work of this project work.

2.BASIC ELECTROLYSIS

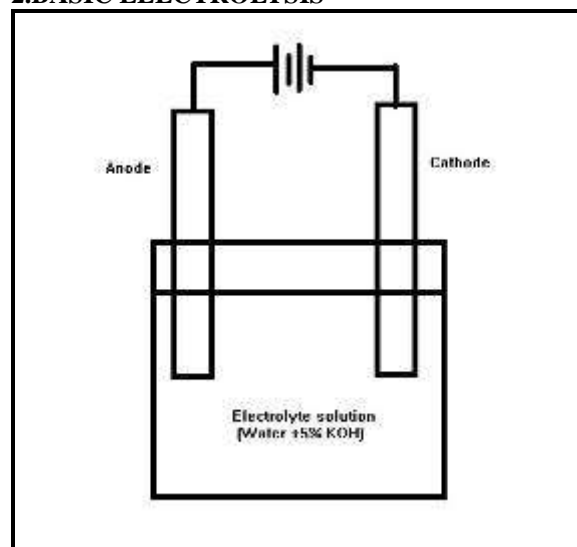


Fig 1: Basic Electrolysis

When electricity flows between two metal conductors that are immersed in water, the water molecule is broken down into its two basic atoms - Hydrogen and Oxygen; through a process called Electrolysis of Water. This electricity is DC (direct current) flowing from the negative Cathode to the positive Anode (like from a battery). Normally water by itself is like an insulator and will not conduct DC electricity, so to make this happen we have to add a little catalyst, called an "Electrolyte". The electrolyte allows current to flow between the -ve side and the +ve side of the plates.

5% KOH is added into the water which acts as electrolyte solution. As the current is released to flow from one plate to another, the combined voltage and current begin to separate the molecular bond holding the atoms together and the Hydrogen and Oxygen atoms separate, and begin floating to the surface. The Hydrogen and Oxygen in the water separate and become a new blend of gases made up of its original atoms Hydrogen, Hydrogen and Oxygen; hence the terminology "HHO gas".

3.HHO GENERATOR

Plate type HHO generator having plates of 316L stainless steel (which doesn't corrode under heavy exposure to current). The generator is comprised of a plate stack of steel plates, separated by gaskets that go around the perimeter of each plate, with holes drilled in each plate for the electrolyte to flow from one chamber to the next. The stack is not immersed in a liquid bath; rather the water is fed to inside of stack from an external reservoir. Brute force method is used for supply the energy to the generator in which the output of battery is directly connected to the input of system.

There are 13 electrodes of 15 × 15 × 0.2 cm thickness. Additional 20 × 20 × 2 cm thickness cover plates were made of acrylic is provided for visual indication of electrolyte level.

For supply water tank (contains water + 5%KOH) and for safety purpose bubbler tank is used.



Fig 2:Plate type Electrolyzer

4.INSTALLATION AND ASSEMBLY

The figure 3 shows assembly of HHO generator system with carburetor. In this assembly the two tanks viz. water tank (containing electrolyzer) and bubbler tank is connected as shown in fig. i.e. output of water tank is fed input to Bubbler tank. Electrolyzer took input electrolyte solution from water tank and electrolyzer is connected with battery supply. As soon as the battery supply is ON the reaction getting started and HHO gas is generated which is further supplied to bubbler tank. HHO gas is then supplied to air

intake of carburetor, which will further mixed with Petrol and then goes to combustion chamber.

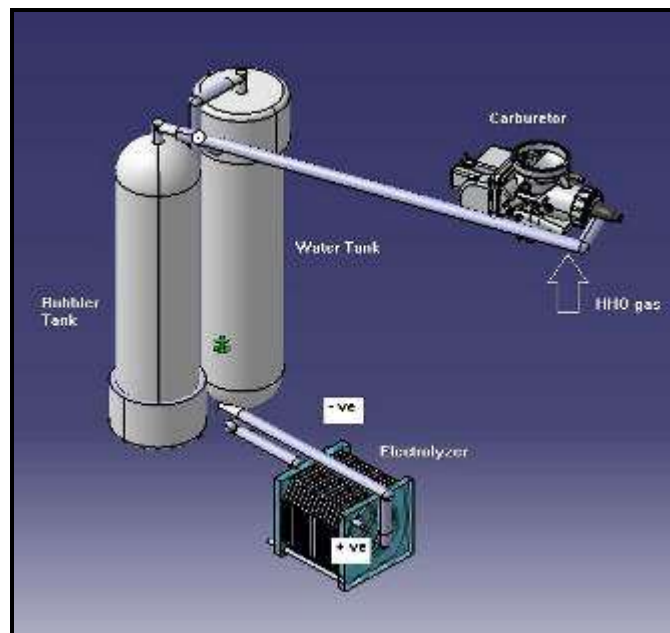


Figure 3: CATIA model of HHO generator system



Figure 4: Assembly of HHO (a)



Figure 5: Assembly of HHO (b)

In above assembly white pipe is connected to input of carburetor from which HHO gas is supplied.

5.EXPERIMENTAL OBSERVATIONS

5.1 Mileage testing

For finding mileage of vehicle we took 200 ml of petrol to run vehicle on fixed defined path without and with HHO

generator. For given fuel the observations are noted as follows:

Table 1: Mileage test

Speed	Distance covered (Without HHO)	Distance covered (With HHO)
30	8.3 km	9.5 km
40	12.2 km	13.1 km
50	8.0 km	9.3km
60	7.3 km	9.1 km

Emission testing
Only Petrol

Table 2 Emission test (a)

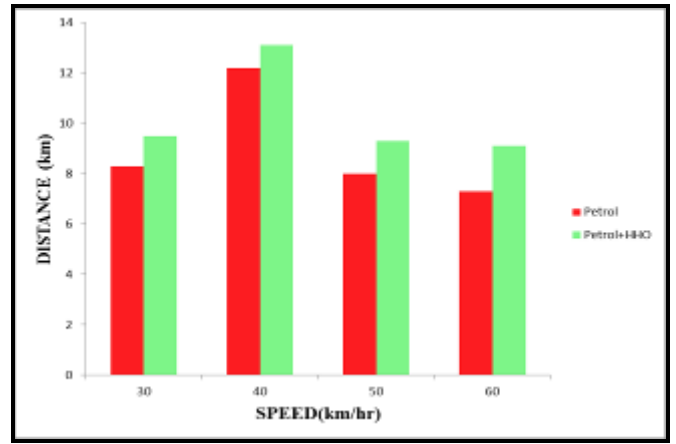
Speed (rpm)	CO	CO ₂	HC
1200	3.3	7.8	445
1500	3.84	11.7	1393
2100	4.9	12.1	824
2400	5.33	12.3	438

Petrol with HHO gas

Table 3: Emission Test (B)

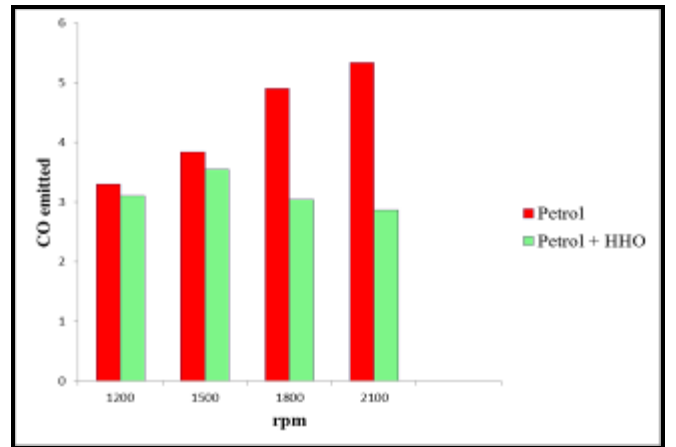
Speed (rpm)	CO	CO ₂	HC
1200	3.3	7.8	445
1500	3.84	11.7	1393
2100	4.9	12.1	824
2400	5.33	12.3	438

6.RESULTS AND DISCUSSIONS



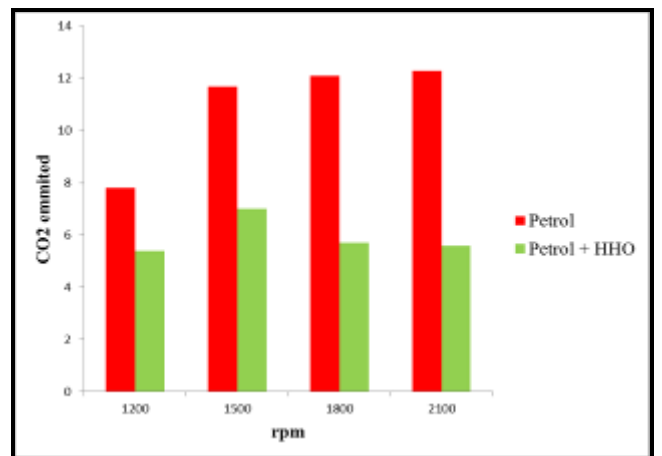
Graph 1: Speed Vs Distance

Above graph shows, speed (km/hr) vs distance traveled (km) characteristics. When we added HHO gas with petrol, the distance travelled by the model vehicle is increased .



Graph 2: Speed Vs Emission

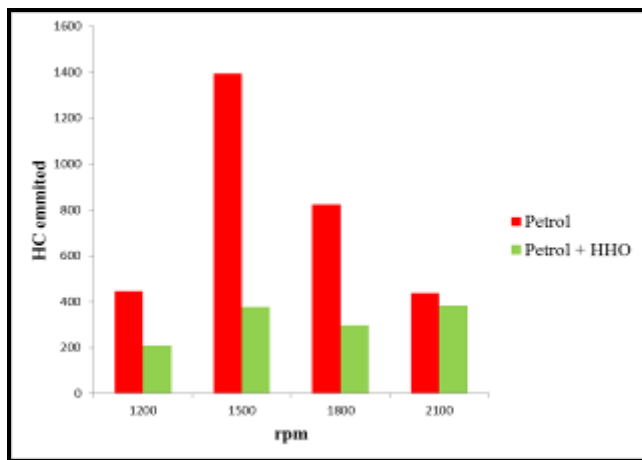
Above graph shows, speed (rpm) vs CO emission (% volume) characteristics. In case of Petrol as fuel, CO emission increases as rpm increases. In case of HHO blended fuel, CO emission reduced. It is due to clean burning of charge entering into combustion chamber.



Graph 4: Speed Vs Emission

Above graph shows, speed (rpm) vs CO₂ emission (% volume) characteristics. In case of Petrol as fuel, CO₂

emission increases as rpm increases. In case of HHO blended fuel, rate of CO₂ emission decreased. Maximum CO₂ produced at higher speed when only petrol is used as fuel in IC engine. HHO blended fuel controls CO₂ emission.



Graph 3: Speed Vs Emission

In the graph speed (rpm) Vs HC emission (ppm volume) characteristics are shown. In case of petrol as fuel, HC particles emitted are higher. In case of blended fuel, HC particle emitted is lesser compare to only petrol.

7. CONCLUSION

In this project work, after conducting experiment on Honda Activa engine we concluded that mileage of vehicle increases by 15.68%.

The emission is reduced as further:

CO emission is reduced by 27.68%.

CO₂ emission is reduced by 44.58 %.

HC emission is reduced by 50.66 %.

Hence we can conclude that HHO system applied vehicle is more efficient than conventional vehicle in which only petrol is used as fuel.

REFERENCES

- [1] Babariya, D., Oza, J., Hirani, B., & Akbari, G. (2015, April). AN EXPERIMENTAL ANALYSIS OF S.I ENGINE PERFORMANCE WITH HHO AS A FUEL. International Journal of Research in Engineering and Technology, 4(4), 609-615.
- [2] EL-Kassaby, M. M., Eldrainy, Y. A., Khidr, M. E., & Khidr, K. I. (2016). Effect of hydroxy (HHO) gas addition on gasoline. Alexandria Engineering Journal, 243-251.
- [3] Merchant, H. P., Maurya, K. A., Patel, B. J., Tandel, D. G., & Sompura, M. (2015, July). Four Stroke Hydra Engine. International Journal of Science and Research (IJSR), 4(7), 920-923.
- [4] Musmar, S. A., & Al-Rousan, A. A. (2011). Effect of HHO gas on combustion emissions in gasoline engines. Fuel 90, ELSEVER, 3066–3070.

[5] AADITYA, ABHISHEK, AJAY, VIPIN, & DEEPAK. (2015, May). HYDROGEN POWERED PETROL ENGINE. International Journal of Scientific & Engineering Research, 6(5), 66-73.

[6] Nafiz, K., & S., O. A. (2009). Experimental study of hydrogen in IC engine. NSTI-Nanotech, 107-110.

[7] P, N., A, H. b., Reddy, B., & Reddy, M. (2016). Analysis of hydrogen fuelled internal combustion engine. world wide journal of multidisciplinary research and development, 27-37.

[8] PUTHA, P., & SATISH BABU, G. (2015, June). Performance of I.C Engines using HHO GAS. International Journal of scientific engineering and technology research, 4(16), 2994-2998.

[9] Rajasekaran, T., Duraiswamy, K., Bharathiraja, M., & Poovaragavan, S. (2015, January). CHARACTERISTICS OF ENGINE AT VARIOUS SPEED CONDITIONS BY MIXING OF HHO WITH GASOLINE AND LPG. ARPN Journal of Engineering and Applied Sciences, 10, 47-51.

[10] Ramakrishna, A., P.Naveen kumar, & M.Sunil Raj. (March- April 2014). Modification Of S.I Engine To HHO Engine Using HHO. International Journal of Mechanical Engineering and Computer Applications, Vol 2, Issue 2.

[11] Sunil Raj, M., Ramakrishna, A., & Naveen kumar, P. (2014, March-April). Modification Of S.I Engine To HHO Engine Using HHO. International Journal of Mechanical Engineering and Computer Applications, vol 2, Issue 2, 2(2), 50-58.