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Experimental Investigation of Four Stroke Engine Run On Hydrogen, Instead Of Gasoline

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ABSTRACT

In the past few years automotive companies have been searching for technological advantages to increase fuel millage in order to protect the environment, while still providing an enjoyable driving experience for their customers. With gas prices on the rise, the average American wants a car that can do everyday activities whilst spending the least amount of fuel possible. Not only customers are demanding for better gas millage, but the government as well. Oxy-Hydrogen gas has recently been introduce to the auto industry as new source of energy. The present work purpose the design of a new device attached to the engine to integrate an HHO production system with gasoline engine. In fact, President Obama passed the Fuel Economy Reform Act, which states that by the year 2025 new cars are to have gas millage of 54.5 miles per gallon. In our senior thesis we will attempt to address this issue by designing and building an HHO generator. This generator uses the principle of electrolysis to split water into its two molecules, hydrogen and oxygen, in gas form. This gas will be introduced into the combustion chamber of an engine to increase its power, burn less gas, and exhaust water particles out to the environment.

Keywords: HHO, Hydrogen Cell

I. INTRODUCTION

Hydrogen powered bikes are those in which “HYDROGEN CELL” is used to produce a fraction of power for driving the bike. This results in decrease the fuel(petrol) thus increasing the mileage of the bikes. hydrogen gas kit is latest innovation to increase mileage and power of vehicle.HHO kit.

Combustion of fossil fuels has caused serious problems to the environment and the geopolitical climate of the world. The main negative effects on the environment by Fossil fuel combustion are emissions of NOx, CO, CO2, and unburned hydrocarbons. The main negative effect of burning fossil fuel on the geopolitical climate is the lack in supply of these fuels and the effect pollution has on politics.

Hydrogen is a clean fuel which on combustion produces water vapour as the only product. The use of hydrogen in IC engines not only help increase the efficiency of it but also it helps to reduce pollution and reduce the poisonous gases like carbon monoxide, nitrous oxide etc. The use of hydrogen helps to reduce their use and hence prevent the depletion of these precious natural resources. Through a process of electrolysis water that is in a sealed container under your hood is converting to HO gas. This gas is than introduce to airflow in the intake manifold using your engine vacuum. This gas is than mixed with the fuel providing better mileage.

II. LITERATURE SURVEY

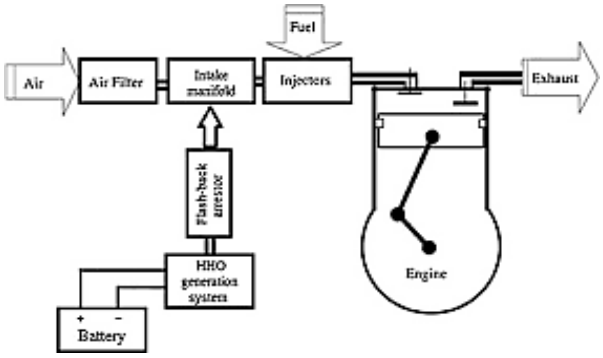
HISTORICAL BACKGROUND

In the beginning, all engine experiments were designed for burning a variety of gases, including natural gas, hydrogen, and propane. There had been many investigations on hydrogen enriched combustion in internal combustion engines. Rivaz (1807) of Switzerland invented an internal combustion engine with electric ignition which used the mixture of hydrogen and oxygen as fuel. He designed a car for his engine. This was the first internal combustion powered automobile (Bruno 1996, Ackermann 2001, Dutton 2006). Later, he obtained French patent for his invention in 1807. The sketch of his engine taken from his patent is shown in Figure 2.1. Cecil (1820) described a hydrogen engine in his paper entitled "On the application of hydrogen gas to produce a moving power in machinery; with a description of an engine which is moved by pressure of the atmosphere upon a vacuum caused by explosions of hydrogen gas and atmospheric air." In this document, he explained how to use the energy of hydrogen to power an engine and how the hydrogen engine could be built. This is probably one of the most primitive inventions made in hydrogen-fueled engines.

COMBUSTION OF HYDROGEN WITH GASOLINE

Stebar & Parks (1974) investigated about the hydrogen supplementation by means of extending lean operating limits of gasoline engines to control the NOX emissions. They carried out their test in a single cylinder engine. Their results showed that small additions of hydrogen to the fuel resulted in very low NOX and CO emissions for hydrogen-isooctane mixtures leaner than 0.55 equivalence ratio. They also obtained significant improvement in thermal efficiency beyond isooctane lean limit operation. However, HC emissions increased markedly at these lean conditions. They concluded that the success of hydrogen supplemented fuel approach would ultimately hinge on the development of both a means of controlling hydrocarbon emissions and a suitable hydrogen source on board the vehicle. Houseman & Hoehn (1974) presented the first engine dynamometer test results for a modified fuel system based on hydrogen enrichment for a V-8 IC engine. The engine burnt mixtures of gasoline and hydrogen under ultra lean conditions and yielded extremely low NOX emissions with increased engine efficiency. They produced hydrogen in a compact on-board generator from 45 gasoline and air. They cooled hydrogen-rich product gas and mixed with the normal combustion air in a modified carburettor. The engine was then operated in the conventional manner on atomized gasoline with spark ignition, but with hydrogen-enriched air and with a high spark advance of 40°-50° BTDC. Thus the engine received two charges of fuel: a charge of gaseous fuel from the hydrogen generator, and the normal gasoline charge. The results on hydrogen enrichment were compared with the 1973 V-8 baseline stock engine with emission controls and the same engine without controls and operated at maximum efficiency under lean conditions. Relative to the stock 1973 350 CID engine, an approximate 10% reduction in brake specific fuel consumption was measured over the entire level road load speed range. For the same condition, NOX emissions were reduced to below the equivalent 1977 EPA Standards. Rose (1995) made researches on the method and apparatus for enhancing combustion in an ICE through electrolysis and produced hydrogen along with oxygen yielded enhanced combustion at low engine loads for all types of engines.

III. METHODOLOGY



This works on the principal of electrolysis process. Electrolysis is the process that converts water to gas. The electrical supply for the process is used from your

Vehicles battery and alternator. An electrical power source is connected to the two electrode materials which are placed in the water. Hydrogen will appear at the cathode (the negatively charged electrode, where electrons enter the water), and oxygen will appear at the anode material (the positively charged electrode) reduction at cathode and oxidation at anode occurs According to ideal faradic efficiency. The amount of hydrogen generated is twice the number of moles of oxygen and both are proportional to the total electrical charge conducted by the electrodes solution.

The hydrogen generated at cathode is fed to the inlet manifold that is in air hose pipe of the carburettor, then this gas mix with the coming air from the air filter when the vacuum is created by the piston movement from TDC to BDC. As the hydrogen or HO gas mixed with air then it goes to engine cylinder with gasoline during suction stroke of the engine. At the end of compression stroke the spark is generated from the cold rated spark plug the combustion of gasoline and HO gas occurs. HHO itself contains 1/3 oxygen by volume and 2/3 hydrogen (which has an octane rating of 130). The hydrogen explosion is so fast that it fills the combustion cylinder at least 3 times faster, then the gasoline explosion and subsequent ignites the gasoline from all directions. Hence more power is generated consequently, the mileage of our bike gets increased. Some basics the burn speed of hydrogen is 0.098 to 0.197 f t/min (3 to 6 cm/min) compared gasoline´s 0.00656 to 0.0295 f t/min (0.2 to 0.9 cm/min).

IV. RESULT AND CALCULATION

RESULT

Without Hydrogen

Trial no.	Amount of Gasoline Consumption	Distance covered in KM	Distance covered in Miles
1	100ml	4.5	2.8
2	150ml	6.5	4.0
3	200ml	9.0	5.58

With Hydrogen

Trial no.	Amount of gasoline Consumption	Distance covered in KM	Distance covered in Miles
1	100ml	6.8	4.21
2	150ml	9.5	5.9
3	200ml	10.5	6.51

V. CONCLUSION

It is advantageous to use Brown's gas enriched air is a fuel in internal combustion engine. Significant impact on brake thermal efficiency and brake power is observed upon the addition of Brown's gas enriched air. Fuel consumption and other emission viz: NOx and smoke emission are reduced to considerable amount. Hydrogen fuel enhancement from electrolysis (utilizing automotive alternators) has been promoted for use with gasoline powered diesel trucks, although electrolysis based designs have repeatedly failed efficiency tests and contradict widely accepted law of thermodynamics. This project is help our country to be energy independence if it is used in a proper way. It will make INDIA free from pollution that is going to be a major problem of the world.

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