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Alternating Fuel for Internal Combustion Engine

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ABSTRACT

In this paper, testing alternative fuel in IC engine is performed, the objective of this test is to provide a hydrogen based fuel utilization. So the present study aims for hydrogen based internal combustion engine is making pollution free a hydrogen vehicle is an alternative fuel vehicle that uses hydrogen as its on-board fuel for motive power. Internal combustion engine powered vehicles can possibly operate with both petroleum products and dual-fuels with hydrogen. Because of hydrogen has a wide range of ignition, hydrogen engine can be used without a throttle valve. By this way engine pumping losses can be reduced. The term may refer to a personal transportation vehicle, such as an automobile, or any other vehicle that uses hydrogen in a similar fashion, such as an aircraft. The power plants of such vehicles convert the chemical energy of hydrogen to mechanical energy either by burning hydrogen in an internal combustion engine, or by reacting hydrogen with oxygen in which test main aim produce hydrogen from chemical process, and test its performance in IC engine.

Keyword: *- I C Engine, Hydrogen Energy, Low Emission*

1. INTRODUCTION

Hydrogen is an energy carrier that can be produced and converted into energy through a variety of ways Hydrogen can transform our fossil-fuel dependent economy into a Hydrogen economy. It provides an emission free transportation fuel many companies are working to develop technologies that might efficiently exploit the potential of hydrogen energy for mobile users. The attraction of using hydrogen as an energy currency is that, if hydrogen is prepared without using fossil fuel inputs, vehicle propulsion would not contribute to carbon dioxide emissions.

A hydrogen vehicle is an alternative fuel vehicle that uses hydrogen as its on-board fuel for motive power. The term may refer to a personal transportation vehicle, such as an automobile, or any other vehicle that uses hydrogen in a similar fashion, such as an aircraft. The power plants of such vehicles convert the chemical energy of hydrogen to mechanical energy either by burning hydrogen in an internal combustion engine, or by reacting hydrogen with oxygen in a fuel cell to run electric motors. The widespread use of hydrogen for fueling transportation is a key element of a proposed hydrogen economy.

Hydrogen are most important gas which contributed for do less pollution, when hydrogen burn then remaining by product are not contribute for creating pollution, hydrogen most effective as a alternative fuel, now today all vehicle manufacturing company are focus on manufacturing electrical vehicle as well as gas vehicle, because by considering its effectiveness as well as feature and by considering environmental issues, Hydrogen is a clean fuel. It is an energy carrier that can be used for a broad range of applications. Hydrogen is considered an alternative fuel.

2. HYDROGEN POWERED ENGINE

Hydrogen powered engine are most economical and create less pollution then this hydrogen fuel used for run engine, hydrogen is produce from water, from water hydrogen and oxygen spit and produced hydrogen are use as alternative fuel, to produce hydrogen we have two method once electrolysis and other chemical method, Hydrogen are high flammable gas, when it go in the engine it instantly ignite and power generated in piston cylinder arrangement, hydrogen are clean gases it we can produce by various method but electrolysis and chemical method generally refer, hydrogen vehicle have best transport medium, Hydrogen fuelled engines are highly recommended

alternatives for the gas fuel led engines due to their ability to conserve the environment. Hydrogen is being advocated to being the alternative of fuel source because it also avoids the over dependence on fossil fuels. It is believed to be the best fuel because it produces water as a byproduct compared to the harmful carbon dioxide emitted by gasoline and diesel.

Another alternative fuel tried for IC engine is hydrogen, a number of automobile manufacturers have built modified engine which operate on hydrogen fuel, the most appealing features of hydrogen as an IC engines fuel are that it can be produced from a potentially available raw material, water and main products of its combustion again is water. Hydrogen has very low density both as gas and liquid. So, in spite of its high calorific value on mass basis its energy as liquid is only one fourth that of gasoline. As a gas it has less than one tenth the density of air its heating value per unit volume is less than one third that of methane, Hydrogen has to be stored as compressed gas, as liquid or in absorbed from, none of which is as convenient as gasoline storage, hydrogen has extremely wide ignition limits this allows a spark ignition engine to operate on hydrogen with very little throttling a decided advantage. Stoichiometric hydrogen air mixture burn seven times as fast as the corresponding gasoline air mixture. This leads to higher engine speed and greater thermal efficiency.

Hydrogen has a high self-ignition temperature but required very total energy to ignite it. Hence is highly prone to resignation and back flash in SI engine. Adiabatic flame temperature for hydrogen is a little lower than for gasoline but the rapid combustion allows very little heat loss to surrounding and hence high instaneous local temperature are produced. This lead to high nitric oxide formation the major advantages of this engine are Eliminate harmful exhaust emission that pollute the environment and contribute to global warming. Your engine will add oxygen to the environment instead of polluting it.

2.1 Methods *of using hydrogen as a fuel in* IC *engines*

A mixture of fuel gas and air, with an approximately constant fuel to air ratio is introduced into the cylinder intake manifold. The engine power is controlled by varying the quantity of mixture entering the cylinder by means of throttle valve. It is not safe because the mixture is formed in the manifold.

The hydrogen is injected directly into the engine cylinder through a valve under pressure and air is inducted through another intake valve. This method is safer one, since hydrogen and air are supplied separately; an explosive mixture is occurred inside the cylinder only. The engine power output is controlled by varying the pressure of hydrogen gas from about 14 atm at low power to 70 atm at high power.

During the intake stroke, the hydrogen gas at normal or moderate pressure is drawn through the throttle valve into the engine cylinder whereas unthrottled air is drawn in through the intake port. The variation of engine power can be achieved with adjustment of hydrogen inlet throttle. The changes in fuel proportion as well as power is developed due to supply of un throttle air and power variation is possible because of the wide composition range over which hydrogen-air mixture can be ignited.

2.2 Environmental aspects of hydrogen energy

The use of hydrogen as a fuel is inherently very clean. Hydrogen consumed by either combustion or a fuel cell produces only water as a product. The high temperatures involved in combustion may stimulate some NOx production from nitrogen and oxygen in the air, but this problem is familiar from other fuels and can be controlled. Unlike other fuels, hydrogen contains no other pollutant producing elements, so it has no potential to produce SO2, CO, CO2, volatile organic chemicals, etc. The environmental consequences of hydrogen. production should also be considered, however. As mentioned above, production from fossil fuel feed stocks by steam reforming leads to carbon dioxide emissions greater than production from feedstock by itself.. Steam reformers should also somehow dispose of feed stock impurities such as sulphur. Electrolysis is responsible for the emissions of whatever power plants are used to generate the needed electricity. Production of hydrogen from sustainable harvested biomass, solar energy, or other renewable sources might considerably reduce production emissions, but (as described above) such

techniques are being fully developed for commercialization. It concludes, "Substantial emissions can be generated when hydrogen is produced from certain energy sources," namely fossil fuels. Thus, the technique of hydrogen production remains crucial.

3. MAIN COMPONENTS OF RECIPROCATING IC ENGINES

3.1 cylinder

It is the main part of the engine inside which piston reciprocates to and fro. It should have high strength to withstand high pressure above 50 bar and temperature above 2000 oC. The ordinary engine is made of cast iron and heavy duty engines are made of steel alloys or aluminum alloys. In the multi-cylinder engine, the cylinders are cast in one block known as cylinder block

3.2 Cylinder head

The top end of the cylinder is covered by cylinder head over which inlet and exhaust valve, spark plug or injectors are mounted. A copper or asbestos gasket is provided between the engine cylinder and cylinder head to make an air tight joint.

3.3 Piston

Transmit the force exerted by the burning of charge to the connecting rod. Usually made of aluminum alloy which has good heat conducting property and greater strength that higher temperature.

Figure shows the different components of IC engine.

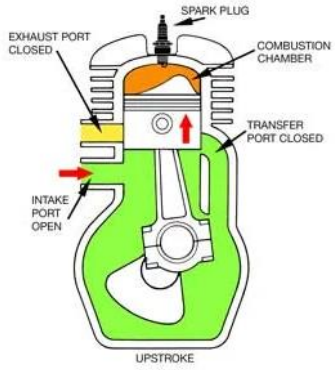

Figure 1. Different Components of IC Engine

3.4 Piston rings

These are housed in the circumferential grooves provided on the outer surface of the piston and made of steel alloys which retain elastic properties even at high temperature. 2 types of rings- compression and oil rings. Compression ring is upper ring of the piston which provides air tight seal to prevent leakage of the burnt gases into the lower portion. Oil ring is lower ring which provides effective seal to prevent leakage of the oil into the engine cylinder.

3.5 Connecting rod

It converts reciprocating motion of the piston into circular motion of the crank shaft, in the working stroke. The smaller end of the connecting rod is connected with the piston by gudgeon pin and bigger end of the connecting rod is connected with the crank with crank pin. The special steel alloys or aluminum alloys are used for the manufacture of connecting rod.

3.6 Crankshaft

It converts the reciprocating motion of the piston into the rotary motion with the help of connecting rod. The special steel alloys are used for the manufacturing of the crank shaft. It consists of eccentric portion called crank

4. WORKING

4.1 Chemical reaction

This reaction are exothermic reaction, Sodium hydroxide reacts with Aluminum to produce Hydrogen, the reaction between aluminum metal and water to form aluminum hydroxide and hydrogen is the following:

$2Al + 6H2O = 2Al(OH)3 + 3H2.$

Then add sodium hydroxide in mixture of aluminum and water so after that reactions found to occur between aluminum, sodium hydroxide, and water are shown below:

$2Al + 2NaOH + 6H2O \rightarrow 2NaAl(OH)4 + 3H2$

Note that it takes a few seconds for the reaction to get going. This is because Aluminum is always covered by a layer of un-reactive Aluminum Oxide. In order for the Aluminum to react, the aluminum oxide layer has to be broken down first. The following are possible reactions of aluminum with water:

$2Al + 6H2O = 2Al(OH)3 + 3H2$ .....(1)

$2Al + 4H2O = 2AlO(OH) + 3H2$ .... (2)

$2Al + 3H2O = Al2O3 + 3H2$ .....(3)

The first reaction forms the aluminum hydroxide bayerite ($Al(OH)3$) and hydrogen, the second reaction forms the aluminum hydroxide boehmite ($AlO(OH)$) and hydrogen, and the third reaction forms aluminum oxide and hydrogen.

All these reactions are thermodynamically favorable from room temperature past the melting point of aluminum (660 oC). All are also highly exothermic. From room temperature to 280 o C, $Al(OH)3$ is the most stable product, while from 280-480 o C, $AlO(OH)$ is most stable. Above 480 o C, $Al2O3$is the most stable product, So finally hydrogen get from above reaction

4.2 Physical Properties of Hydrogen

i. High Flame Speed
ii. High Diffusivity
iii. Low Density
iv. Wide Range of Flammability
v. Low Ignition Energy
vi. Small Quenching Distance
vii. High Auto ignition Temperature

4.3 Engine specification

Engine Displacement	26cc
Engine Type	Air Cooled, 2Stroke
Number Of Cylinder	1
Max Power	5500 rpm
Starting	Kick Start
Fuel Type	Hydrogen Gas

Figure 2: Two Stroke IC Engine

Figure 3: Hydrogen powered IC Engine

4.4 Advantages of using hydrogen as I.C. engine fuel

It is readily available. It is a basic earth element and is very abundant. However, it time consuming to separate hydrogen gas from its companion substances. While that may be the case, the results produce a powerful clean energy source.

It doesn't produce harmful emissions. When it is burned, it doesn't emit harmful substances. Basically, it reacts with oxygen without burning and the energy it release scan be used to generate electricity used to drive an electric motor. Also, it doesn't generate carbon dioxide when burnt, not unlike other power sources

It is environmentally friendly. It is a non-toxic substance which is rare for a fuel source. Others such as nuclear energy, coal and gasoline are either toxic or found in places that have hazardous environments. Because hydrogen is friendly towards the environment, it can be used in ways that other fuels can't even possibly match.

It can be used as fuel in rockets. It is both powerful and efficient. It is enough to provide power for powerful machines such as spaceships. Also, given that it is environmentally friendly, it is a much safer choice compared to other fuel sources. A fun fact: hydrogen is three times as powerful as gasoline and other fossil fuels. This means that it can accomplish more with less.

5. CONCLUSIONS

This paper has indicated the advantages of hydrogen as a fuel for spark ignited internal combustion engines and has shown that the hydrogen engine is growing up. An overview is given of the development by automobile manufacturers. The design features in which a dedicated hydrogen engine differs from traditionally fuelled engines.

Fuel costs to consumers will gradually decrease as these technologies and the delivery infrastructure are optimized and grow to maturity. Ultimately, hydrogen represents an important component of our national strategy to diversify energy resources. The use of hydrogen in IC engines can be realized by reducing the weight of the automobile and development of better auxiliary systems. The current technology uses petrol methane etc. in order to increase the range of the vehicle. Hence the goal of researchers is to develop automobiles which use only hydrogen as the only fuel.

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