

Hydrogen Powered Petrol Engine

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Abstract-In this paper we have studied the basic properties of gas generated through electrolysis of water and then used this gas in the a bike as a fuel with gasoline by mixing it with air. This results the increased mileage of bike 5 to 10% and reduce the polluting contents from the exhaust gases. Taking a prominent place in these strategic plans is hydrogen as a future energy carrier. Energy stored in hydrogen would be available at any time and at any place on Earth, regardless of when or where the solar irradiance, the hydropower, or other renewable sources such as biomass, ocean energy or wind energy was converted.. Hydrogen gas combined with the standard air/fuel mixture increases the mileage. This form of alternative fuel is provided by a hydrogen generator mounted in the vehicle. Once set up is ready, the hydrogen gas (fuel) will be produced from water, an electrolyte process, and electricity supplied from a battery provided. Here we are designing a mixed fuel two wheeler engine that is in a conventional SI engine we are incorporating traces of hydrogen along with gasoline in order to minimum consumption of gasoline as well as to increase the power of vehicle. Here in addition, a hydrogen generating unit is made to produce hydrogen. It is actually an electrolysis unit having high grade stainless steel/graphite/semiconductors as electrodes in a closed container and mixture of water & suitable ionic solution(Sodium Bicarbonate) as electrolyte. Power for electrolysis is taken from an additional battery provided (12V). This battery can be recharged from a dynamo/alternator/motor provided on the vehicle.

Keyword- KOH, NaOH, SI engine, electrolysis of water, hydrogen cell.

I. INTRODUCTION

Hydrogen is the first element on the periodic table and the lightest element. Since hydrogen gas is so light, it raises in the atmosphere and is therefore rarely found in its pure form H₂. The hydrogen (H₂) reacts with oxygen (O₂) to form water (H₂O) and releases energy Hydrogen can actually deliver serve the purpose of an alternative fuel and reduce our reliance on oil. Hydrogen has since been used extensively in the space pro-gram since it has the best energy-to-weight ratio of any fuel. Liquid hydrogen is the fuel of choice for rocket engines and has been

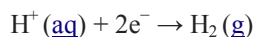
utilized in the upper stages of launch vehicles on many space missions, hence the hydrogen can be used in IC engines also along with the gasoline, and it can be supplied to the engine through the carburetor

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. 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 NO_x, CO, CO₂, and unburned hydrocarbons. Hydrogen is a clean fuel which on combustion produces water vapor as the only product. The use of hydrogen in IC engines not only help to 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 of 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.

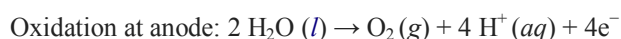
II. METHODOLOGY

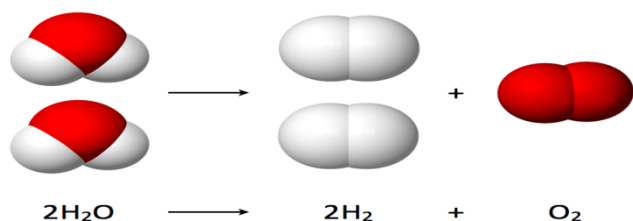
A. Principles of Water Fuel Cells

Hydrogen production involves the principal of electrolysis process. Electrolysis is the process that converts water to gas. The electrical supply for the process is used from the Vehicles battery or alternator. An electrical power source is connected to the two electrode materials which are placed in the water. Pure water is electric insulator in order to increase the conductivity of the water sodium bicarbonate or Calcium hydroxide is added



At the positively charged anode, an oxidation reaction occurs, generating oxygen gas and giving electrons to the anode to complete the circuit:



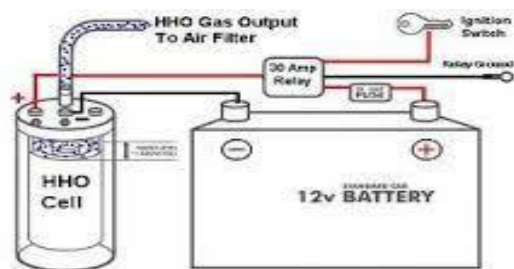


The same half reactions can also be balanced with base as listed below. Not all half reactions must be balanced with acid or base. Many do, like the oxidation or reduction of water listed here. To add half reactions they must both be balanced with either acid or base. The acid-balanced reactions predominate in acidic (low pH) solutions, while the base-balanced reactions predominate in basic (high pH) solutions.

ELECTROLYSIS PROCESS



ELECTRICAL CONNECTION



COMBUSTIVE PROPERTIES OF HYDROGEN

Wide Range of Flammability- As can be seen the flammability limits (= possible mixture compositions for ignition and flame propagation) are very wide for hydrogen (between 4 and 75

percentage Engine Splendor, Air cooled Cubic Capacity 100 cc Stroke 4 Stroke Brake Power 7.37 HP (5.4KW) @ 8000 RPM Speed 1500 RPM Number of Cylinders Single Radius of the Brake

Low Ignition Energy-Hydrogen has very low ignition energy.

High Auto ignition Temperature-The high auto ignition temperature of hydrogen allows larger compression ratios to be used in a hydrogen engine than in a hydrocarbon engine.

High Flame Speed- Hydrogen has high flame speed at stoichiometric ratios. Some basics the burn speed of hydrogen is 0.098 to 0.197 ft/min (3 to 6 cm/min) compared gasoline's 0.00656 to 0.0295 ft/min (0.2 to 0.9 cm/min).

High Diffusivity- Hydrogen has very high diffusivity. Firstly, it facilitates the formation of a uniform mixture of fuel and air. Secondly, if a hydrogen leak develops, the hydrogen disperses rapidly. Thus, unsafe conditions can either be avoided or minimized.

DESIGN AND MODIFICATIONS

Low Freezing point- Thus this creates no starting problem in the cold environment.

Design modification of sparkplugs-Use cold rated spark plugs to avoid spark plug electrode temperatures exceeding the auto-ignition limit and causing backfire.

Use RTD (Resistance temperature detector)

RTD provide safety us because when the temperature of the engine of the bike exceed a particular limit then it cut off the gas supply consequently the bike will only on gasoline. Therefore chances of blasting are reduced to zero.

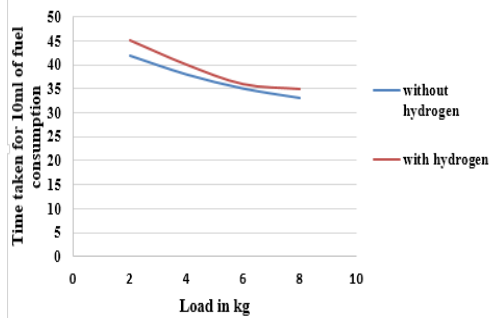
Ignition system- Avoid uncontrolled ignition, the spark plug gap can be decreased to lower the ignition voltage; this is no problem for hydrogen engines as there will be almost no deposit formation. Spark plug gaps as small as 0.25mm has been used.

Carburetor setting-After having installed the Cell and electrical connections made properly, we set the carburetor correctly to achieve better mileage. 1) Adjust the Fuel Control Valve so that the fuel supply is decreased to minimal and engine runs in idle condition smoothly. Finer setting of fuel supply will result in increased mileage of the vehicle. 2) Make sure to Fine Tune the Air Control Valve and Fuel Control Valve after running the vehicle for every 200 - 300 Kms until better mileage is achieved. As the carbon deposits on the inside wall of the engine is removed, the vehicle performance will increase gradually.

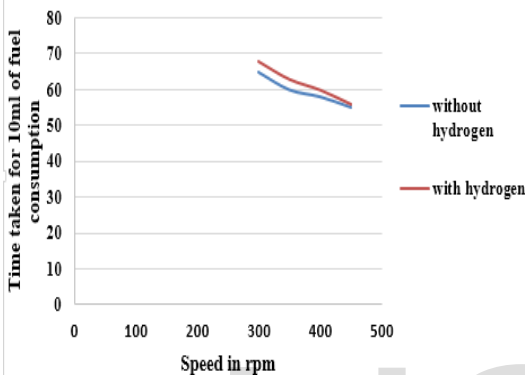
TESTING AND ANALYSIS

The electrolysis unit installed in a two wheeler and a road test is conducted.

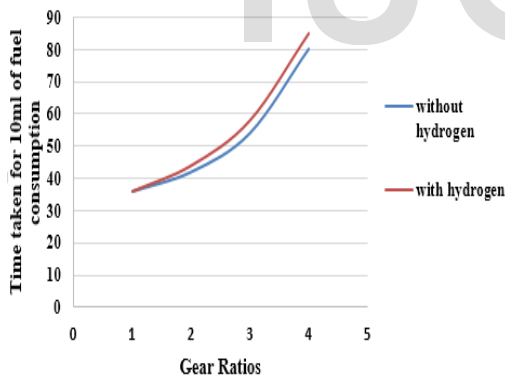
Time taken for 10ml of fuel consumption V/S Load



Time taken for 10ml of fuel consumptions V/S Speed



Time taken for 10ml of fuel consumptions V/S gear



MERITS, DEMERITS AND APPLICATIONS

MERITS

- It requires simple maintenance cares
- This method is fuel saving method
- Hydrogen production is simple requires less cost.
- Amount of oxygen entering into the cylinder increases results complete combustion Reduces the NOx or carbon monoxide emissions

DE-MERITS

- Space is required to install fuel cell.
- More cooling effect is required for engine
- Chances of engine cylinder corrosion

APPLICATIONS

Where ever the petrol engine or diesel engines are there Hydrogen cell can be introduced to it so that the performance of the engine can be increased and also reduces the pollution for example In Diesel Some the cars are runs with pure hydrogen, But for the present petrol or diesel engine cars without any modification it can be used

FEASIBILITY, NEED AND FUTURE SCOPE OF THE TOPIC

These projects have reliability in itself being an automobile. This project is also very economical since the major factor of high level of fuel (petrol) prices in the country, would be reduced. All the components used in the project are real and available easily. such type of bikes or automobiles are needed more in India because these reduces the air pollution and the amount of money involved in the fuel consumption. Currently, in India, air pollution is widespread in urban areas where vehicles are the major contributors and in a few other areas with a high concentration of industries and thermal power plants. Hydrogen is a fuel with heat content early three times that of gasoline. From our work we experimentally found out that the efficiency of an IC engine can be rapidly increased by mixing hydrogen with gasoline. Hydrogen is the Key to a Clean Energy Future. Thus the hydrogen powered bike would be the major automobile used by the country since the fuel used have more advantages as compare to the conventional fuels

CONCLUSION

It is advantageous to use enriched air as a fuel in internal combustion engines. Significant impact on brake thermal efficiency and brake power is observed upon the addition of Brown's gas enriched air. Fuel consumption and other emissions viz: NOx and smoke emissions are reduced to considerable amount. Hydrogen fuel enhancement from electrolysis (utilizing automotive alternators) has been promoted for use with gasoline powered and diesel trucks, although electrolysis-based designs have repeatedly failed efficiency tests and contradict widely accepted laws of thermodynamics. This project will 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. The performance of the petrol engine with hydrogen fuel was studied and compared with a standard engine without hydrogen supply.

From the readings taken, it is observed that the engine runs longer when hydrogen and oxygen employed than when it runs without hydrogen supply. This proves that the fuel

- From the readings taken, it is observed that the engine runs longer when hydrogen and oxygen employed than when it

runs without hydrogen supply. This proves that the fuel efficiency of the engine can be improved by using hydrogen

- The improvement in time, for a specific amount of fuel consumed when hydrogen and oxygen are injected into the engine, is in the range of 5% to 10%.

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