A Study on Working of IC Engine by Using Hydrogen and Petrol as a Fuel

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Abstract

In the current study it has been made an attempt to run an Internal Combustion Engine by Hydrogen fuel along with petrol. The electrolysis method reaction of Potassium with pure water will produce hydrogen gas which is directly introduced into combustion chamber of 2 stroke petrol engine along with petrol. Engine runs with 100 ml petrol runs for period 20 minutes 34 seconds, speed 98 rpm at atmospheric conditions. Hydrogen gas with petrol as a fuel the engine runs for period 25 minutes 6 seconds, speed 98 rpm at atmospheric conditions. The other results of engine shows that the mechanical efficiency remains constant, Thermal and overall efficiencies are high as compared to without hydrogen fuel. By Introducing small quantity of Hydrogen in a regular IC engine The Thermal and Overall efficiencies increases and engine will run longer period. The testing of engine is done under no load atmospheric condition.

Keywords— *Potassium hydroxide, IC Engine, Thermal Efficiency, Hydrogen, Electrolysis.*

I. INTRODUCTION

Many companies are working to develop technologies that might efficiently exploit the potential of hydrogen energy for mobile uses. 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.

The drawbacks of hydrogen use are low energy content per unit volume, high tank age weights, the storage, transportation and filling of gaseous or liquid hydrogen in vehicles, the large investment in infrastructure that would be required to fuel vehicles, and the inefficiency of production processes.

Buses, trains, PHB bicycles, canal boats, cargo bikes, golf carts, motorcycles, wheelchairs, ships, airplanes, submarines, and rockets can already run on hydrogen, in various forms. NASA uses hydrogen to launch Space Shuttles into space. There is even a working toy model car that runs on solar power, using a regenerative fuel cell to store energy in the form of hydrogen and oxygen gas. It can then convert the fuel back into water to release the solar energy.

The current land speed record for a hydrogen-powered vehicle is 286.476 mph (461.038 km/h) set by Ohio State University's Buckeye Bullet 2, which achieved a "flying-mile" speed of 280.007 mph (450.628 km/h) at the Bonneville Salt Flats in August 2008. For production-style vehicles, the current record for a hydrogen-powered vehicle is 333.38 km/h (207.2 mph) set by a prototype Ford Fusion Hydrogen 999 Fuel Cell Race Car at Bonneville Salt Flats in Wend over, Utah in August 2007. It was accompanied by a large compressed oxygen tank to increase power. Honda has also created a concept called the FC Sport, which may be able to beat that record if put into production.

II. LITERATURE SURVEY

NECESSITY OF USING ALTERNATIVE FUEL: In the automobile field now the fuel used is known as petrol and fuel oil (Diesel). Petrol is a volatile fuel which is used in spark ignition engines and fuel oil which is used in compression ignition engine.

Basically both the fuels petrol and diesel is obtained from the crude oil (i.e.) petroleum. Now the problem is, its availability is decreasing day by day in bulk and insufficient for future decades. Hence an alternative fuel is essential to fight against scarcity. In term of long sight some alternative fuels are suggested and experimented by various manufacturing units with technicians, such alternative fuels are as follows.

1. Hydrogen Gas with PETROL
2. Methyl alcohol
3. Compressed Natural gas (CNG)
4. Liquefied Petroleum gas (PETROL)

In this project we have installed hydrogen gas with PETROL as alternative fuel in four stroke Gasoline engine.

At the beginning of 2002, the Bush Administration announced the .Freedom CAR initiative, an industry-government cooperative effort, to develop fuel cell vehicles. This prompted a subcommittee of the POPA Energy and Environment Committee to commence work on a report about fuel cells and Freedom CAR. The rationale for preparing such a report is that the topic is an important aspect of the nation's energy policy a topic that physicists justifiably feel competent to discuss. Previous POPA studies have been on nuclear energy, energy supplies, etc.

Fuel cells are of interest to the physics community (*e. g.,* see the recent *Physics Today* article by Joan Ogden) and physicists are actively involved in research areas for potential hydrogen storage, such as carbon Nano tubes. The materials aspects of fuel cells are especially within the purview of physicists. Overall systems considerations, wells-to-wheels energy efficiency, and related issues can benefit from analysis by physicists. In view of the high expectations for fuel-cell vehicles generated by the Freedom CAR initiative, it seems reasonable to examine what is reality and what is unsupported optimism. Of those who have read the Ogden article or popular-press fuel cell articles, some will want to know more. This report is a start on a balanced discussion that intends to educate, rather than persuade or advocate. The intended audience is POPA and the APS membership.

The motivation for the Freedom Car initiative is to reduce U.S. dependence on imported petroleum, to reduce emissions of atmospheric pollutants, and to reduce CO2 emissions by improving fuel economy and/or by going to a hydrogen-based system. Since the transportation sector itself uses more oil than produced domestically (Fig. 1), Freedom CAR also addresses a serious national security issue.

The big three automotive manufacturers have publicly committed their companies to participation in the initiative. General Motors Chairman Jack Smith: .With the Freedom CAR program, we are taking a major step towards creating a future where the vehicle is no longer part of the energy and environmental debate.

Dieter Zetsche: Freedom CAR focuses on jointly developing technologies that are important to the entire automotive industry. This program allows us to continue to work together as an industry in a way that can make a difference. Ford Chairman and Chief Executive Officer William Clay Ford Jr.: .Our companies have made significant progress in reducing the environmental impact of our products. Our participation in Freedom CAR signifies our commitment to continue that progress. Freedom CAR has the following technology-specific goals for 2010.

• To ensure reliable systems with costs comparable with conventional internal combustion engine/automatic transmission systems, future fuel cell power trains should have o Electric propulsion system with a 15-year life capable of delivering at least 55 kW for 18 seconds and 30 kW in a continuous mode, at a system cost of $12/kW peak.

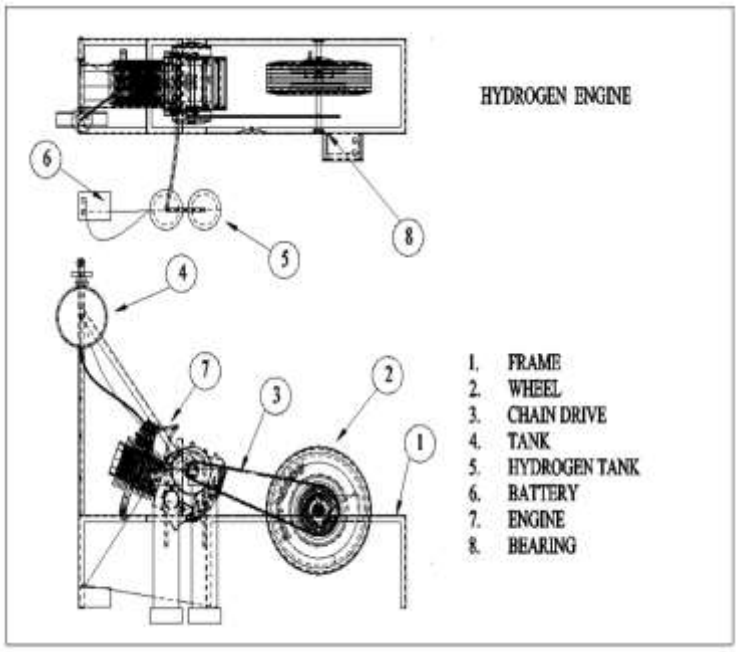
• A durable fuel cell power system (including hydrogen storage) that achieves 60% energy efficiency when operating at peak power and that offers a 325 W/kg power density and 220 W/L operating on hydrogen. Cost targets are $45/kW by 2010, $30/kW by 2015.

III. METHOD OF PRODUCING HYDROGEN GAS

Figure.1 2D Drawing of Engine coupled with Hydrogen Kit

The hydrogen gas is produced by mixing the KOH and multi with the help of cathode and anode terminals. The 12 volt battery supply is given to these electrodes, so that the hydrogen and petrol comes out from the negative terminal tank. This output gas is dipped to the multi tank so that hydrogen and petrol is produced.

Here's some information on a simple method for producing pure hydrogen gas. The beauty of this system is that it uses a common inexpensive chemical which is not consumed in the reaction, so it can be used again and again almost indefinitely (if you use pure multi in the reaction).



The chemical is Potassium hydroxide, commonly called caustic potash. Its chemical formula is KOH, and it is used to manufacture soaps, dyes, alkaline batteries, adhesives, fertilizers, drain pipe cleaners, asphalt emulsions, and purifying industrial gases.

The chemical reaction we are interested in occurs with multi in the following equation.

$$K + H_2O = KOH + H_2$$

The balanced equation is

$$2K + 2H_2O = 2KOH + 2H_2$$

Notice the free Hydrogen and petrol gas $2H_2$ which is stripped from the multi added to the KOH. Making this reaction more than a one-time event is the key to cheap hydrogen production, which means controlling the reverse reaction to recover the KOH without giving back the hydrogen. There is an easy way to do this however.

Thus the produced hydrogen is mixed with some amount of fuel and is fed to the engine. The efficiency is found to be much better than the conventional engines.

A brake drum is couple with that of the wheel arrangement such that when the wheel rotates, the brake drum also rotates. A belt is wound around the brake drum whose both ends are connected with the measuring gauges which is used to apply suitable loads on the wheels of the engine. Hence certain measurements are noted down in no load condition and suitable load are applied and the corresponding readings are noted down. Finally the efficiency is calculated and is compared with that of the conventional engines.

A. Experiment Setup

Two stroke petrol engine is coupled with Hydrogen tank in which hydrogen gas is produced by electrolysis method by using potassium reacting with a pure water. Hydrogen gas is directly supplied to engine cylinder along with petrol through inlet port of the engine, the engine runs under no load atmospheric conditions for a certain quantity of fuel and fuel + hydrogen gas.

B. Results and Discussions

The Engine runs with hydrogen and without hydrogen the results are as follows.

TABLE I
ENGINE READINGS FOR FUEL SUPPLY CONDITIONS

Fuel used	**Fuel Quantity (ml)**	**Engine runs (in time)**	**Speed of Engine in (RPM)**
PETROL	100	20min 34sec	98
PETROL + HYDROGEN	100 + Hydrogen gas	25min 06sec	98

Without hydrogen engine runs for a 100 ml fuel is 20 minutes 34 seconds, with hydrogen for same amount of fuel engine runs 25 minutes 06 seconds indicates that running the engine by adding small quantity of hydrogen to the regular fuel will cause an engine to run more time as compared to without the use of hydrogen. The efficiency values for the above readings are given below table.

TABLE II
ENGINE PERFORMANCE RESULTS

Parameters	**Petrol**	**Petrol + Hydrogen**
Mechanical Efficiency	78.3%	78.3%
Thermal Efficiency	78.07%	78.28%
Volumetric Efficiency	78.56%	78.56%
Overall Efficiency	47.97%	48.15%

IV. CONCLUSIONS

Running the IC Engines by using small quantity of hydrogen gas mixed with a regular fuel will cause an engine to run longer period as compared to normal IC engines which runs only on fuel, also marginally reduction in quantity of emission gases which cause pollution. The Efficiency of hydrogen fuel operated engine is higher than the normal engine. Overall the Hydrogen fuel operated engines are better and good for the futuristic conditions.

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