Design and Fabrication of Water Fuel Engine in Miniboat

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Abstract- *A hydrogen vehicle is an alternative fuel vehicle that uses hydrogen as its onboard 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 economy. Hydrogen fuel does not occur naturally on Earth and thus is not an energy source, but is an energy carrier. Currently it is most frequently made from methane or other fossil fuels. However, it can be produced from a wide range of sources (such as wind, solar, or nuclear) that are intermittent, too diffuse or too cumbersome to directly propel vehicles. Integrated wind-to-hydrogen plants, using electrolysis of water, are exploring technologies to deliver cost low enough, and quantities great enough, to compete with traditional energy sources.*

Keywords- Hydrogen, IC engines, Fuel, canal boats, fuel cells, battery.

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

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 an 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 of 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.

DaimlerChrysler CEO

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.

Water splitting by electrolysis was a well-known laboratory phenomenon. Otto, in the early 1870s, considered a variety of fuels for his internal combustion engine, including hydrogen. In 1924 Ricardo conducted the first systematic engine performance tests on hydrogen. He used a one cylinder engine and tried various compression ratios. At a compression ratio of 7:1, the engine achieved a peak efficiency of 43%. Several attempts have been made to the effect of using hydrogen in internal combustion engines [1-5]. Das (2000) evaluated the potential of using hydrogen for small horsepower SI engines and compared hydrogen fuelling with compressed natural gas (CNG). Another study dealt on certain drawbacks of hydrogen fuelled SI engines, such as high NOx emission and small power output determined the performance, emission and combustion characteristics of hydrogen fuelled SI and CI engines (Das, 2002). Karim (2000) reviewed the design features and the current operational limitations associated with the hydrogen fuelled SI engine. Li and Karim (2004) investigated the onset of knock in hydrogen fuelled SI engine applications.

III. COMPONENTS AND DESCRIPTION

- Engine
- Battery
- Fuel tank
- Wheel
- Chain drive
- Sprocket

I.C engine

Internal combustion engines are those heat engines that burn their fuel inside the engine cylinder. In internal combustion engine the chemical energy stored in their operation. The heat energy is converted in to mechanical energy by the expansion of gases against the piston attached to the crankshaft that can rotate.

Petrol engine

The engine which gives power to propel the automobile vehicle is a petrol burning internal combustion engine. Petrol is a liquid fuel and is called by the name gasoline in America. The ability of petrol to furnish power rests on the two basic principles;

- Burning or combustions always accomplished by the production of heat.
- When a gas is heated, it expands. If the volume remains constant, the pressure rises according to Charle's law.

Working

There are only two strokes involved namely the compression stroke and the power stroke; they are usually called as upward stroke and downward stroke respectively.

Upward stroke

During this stroke, the piston moves from bottom dead center to top dead center, compressing the charge-air petrol mixture in combustion chamber of the cylinder, at the time the inlet port is uncovered and the exhaust, transfer ports are covered. The compressed charge is ignited in the combustion chamber by a spark given by spark plug.

Downward stroke

The charge is ignited the hot gases compress the piston moves downwards, during this stroke the inlet port is covered by the piston and the new charge is compressed in the crankcase, further downward movement of the piston uncovers first exhaust port and then transfer port and hence the exhaust starts through the exhaust port. As soon as the transfer port open the charge through it is forced in to the cylinder, the cycle is then repeated.
Engine terminology

The engine terminologies are detailed below,

Cylinder

It is a cylindrical vessel or space in which the piston makes a reciprocating motion.

Piston

It is a cylindrical component fitted to the cylinder which transmits the bore of explosion to the crankshaft.

Combustion chamber

It is the space exposed in the upper part of the cylinder where the combustion of fuel takes place.

Connecting rod

It inter connects the piston and the crankshaft and transmits the reciprocating motion of the piston into the rotary motion of crankshaft.

Crankshaft

It is a solid shaft from which the power is transmitted to the clutch.

Cam shaft

It is drive by the crankshaft through timing gears and it is used to control the opening and closing of two valves.

Cam

These are made as internal part of the camshaft and are designed in such a way to open the valves at the current timing.

Piston rings

It provides a tight seal between the piston and cylinder wall and preventing leakage of combustion gases.

Inlet

The pipe which connects the intake system to the inlet valve of the engine end through which air or air fuel mixture is drawn in to the cylinder.

Exhaust manifold

The pipe which connects the exhaust system to the exhaust valve of the engine through which the product of combustion escape in to the atmosphere.

Inlet and exhaust valve

They are provided on either on the cylinder head or on the side of the cylinder and regulating the charge coming in to the cylinder and for discharging the product of combustion from the cylinder.

Flywheel

It is a heavy steel wheel attached to the rear end of the crank shaft. It absorbs energy when the engine speed is high and gives back when the engine speed is low.

Nomenclature

This refers to the position of the crank shaft when the piston is in it slowest position.

Bore (d)

Diameter of the engine cylinder is refers to as the bore.

Stroke

Distance traveled by the piston in moving from TDC to the piston in moving from TDC to the BDC.

Clearance volume (v)

The volume of cylinder above the piston when it is in the TDC position.

Swept volume (v)
The swept volume of the entire cylinder
Vd = Vs N
Vs ------- Swept Volume
N --------- Number of cylinder
Compression ratio (r)
It is the ratio of the total cylinder volume when the piston is at BDC to the clearance volume.

Engine specification

Type of fuel used	:	Petrol/Hydrogen with PETROL
Cooling system	:	Air cooled
Number of cylinder	:	Single
Number of stroke	:	Four Stroke
Arrangement	:	Vertical
Cubic capacity	:	100 cc

IV. SPARK IGNITION ENGINE

A spark ignition (SI) engine runs on an Otto cycle—most gasoline engines run on a modified Otto cycle. This cycle uses a homogeneous air-fuel mixture which is combined prior to entering the combustion chamber. Once in the combustion chamber, the mixture is compressed, and then ignited using a spark plug (spark ignition). The SI engine is controlled by limiting the amount of air allowed into the engine. This is accomplished through the use of a throttling valve placed on the air intake (carburetor or throttle body). Mitsubishi is working on the development of a certain type of SI engine called the gasoline direct injection engine.

Advantages

- A century of development and refinement - For the last century the SI engine has been developed and used widely in automobiles. Continual development of this technology has produced an engine that easily meets emissions and fuel economy standards. With current computer controls and reformulated gasoline, today's engines are much more efficient and less polluting than those built 20 years ago.
- Low cost - The SI engine is the lowest cost engine because of the huge volume currently produced.

Disadvantages

- The SI engine has a few weaknesses that have not been significant problems in the past, but may become problems in the future.
- Difficulty in meeting future emissions and fuel economy standards at a reasonable cost - Technology has progressed and will enable the SI engine to meet current standards, but as requirements become tougher to meet, the associated engine cost will continue to rise.
- Throttling loss lowers the efficiency - To control an SI engine, the air allowed into the engine is restricted using a throttling plate. The engine is constantly fighting to draw air past the throttle, which expends energy.
- Friction loss due to many moving parts - The SI engine is very complex and has many moving parts. The losses through bearing friction and sliding friction further reduce the efficiency of the engine.
- Limited compression ratio lowers efficiency - Because the fuel is already mixed with the air during compression, it will auto-ignite (undesirable in a gasoline engine) if the compression ratio is too high. The compression ratio of the engine is limited by the octane rating of the engine.

Bearing with bearing cap

The bearings are pressed smoothly to fit into the shafts because if hammered the bearing may develop cracks. Bearing is made upon steel material and bearing cap is mild steel.

Ball and roller bearings are used widely in instruments and machines in order to minimize friction and power loss. While the concept of the ball bearing dates back at least to Leonardo da Vinci, their design and manufacture has become remarkably sophisticated. This technology was brought to its present state of perfection only after a long period of research and development. The benefits of such specialized research can be obtained when it is possible to use a standardized bearing of the proper size and type. However, such bearings cannot be used indiscriminately without a careful study of the loads and operating conditions. In addition, the bearing must be provided with adequate mounting, lubrication and sealing. Design engineers have usually two possible sources for obtaining information which they can use to select a bearing for their particular application:

a) Textbooks
b) Manufacturers'

Catalogs Textbooks are excellent sources; however, they tend to be overly detailed and aimed at the student of the subject matter rather than the practicing designer. They, in most cases, contain information on how to design rather than how to select a bearing for a particular application. Manufacturers' catalogs, in turn, are also excellent and contain a wealth of information which relates to the products of the particular manufacturer. These catalogs, however, fail to provide alternatives – which may divert the designer's interest to products not manufactured by them. Our Company, however, provides the broadest selection of many types of bearings made by different manufacturers.

For this reason, we are interested in providing a condensed overview of the subject matter in an objective manner, using data obtained from different texts, handbooks and manufacturers' literature. This information will enable the reader to select the proper bearing in an expeditious manner. If the designer's interest exceeds the scope of the presented material, a list of references is provided at the end of the Technical Section. At the same time, we are expressing our thanks and are providing credit to the sources which supplied the material presented here.

Construction and Types of Ball Bearings

A ball bearing usually consists of four parts: an inner ring, an outer ring, the balls and the cage or separator.

To increase the contact area and permit larger loads to be carried, the balls run in curvilinear grooves in the rings. The radius of the groove is slightly larger than the radius of the ball, and a very slight amount of radial play must be provided. The bearing is thus permitted to adjust itself to small amounts of angular misalignment between the assembled shaft and mounting. The separator keeps the balls evenly spaced and prevents them from touching each other on the sides where their relative velocities are the greatest. Ball bearings are made in a wide variety of types and sizes. Single-row radial bearings are made in four series, extra light, light, medium, and heavy, for each bore, as illustrated in Fig. 1.

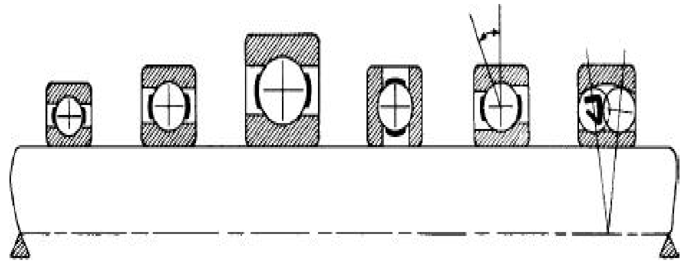

Figure 1. Types of Ball Bearings.

The heavy series of bearings is designated by 400. Most, but not all, manufacturers use a numbering system so devised that if the last two digits are multiplied by 5, the result will be the bore in millimeters.

Sprocket and chain drive

This is a cycle chain sprocket. The chain sprocket is coupled with another generator shaft. The chain converts rotational power to pulling power, or pulling power to rotational power, by engaging with the sprocket.

The sprocket looks like a gear but differs in three important ways:

1. Sprockets have many engaging teeth; gears usually have only one or two.
2. The teeth of a gear touch and slip against each other; there is basically no slippage in a sprocket.
3. The shape of the teeth is different in gears and sprockets.

Engagement with Sprockets:

Although chains are sometimes pushed and pulled at either end by cylinders, chains are usually driven by wrapping them on sprockets. In the following section, we explain the relation between sprockets and chains when power is transmitted by sprockets.

Back tension

First, let us explain the relationship between flat belts and pulleys. When the pulley is fixed and the left side of the belt is loaded with tension (T0), the force needed to pull the belt down to the right side will be:

T1 = T0 3 eµu

For example, T0 = 100 N: the coefficient of friction between the belt and pulley, µ = 0.3; the wrap angle u = ¼ (180).

T1 = T0 3 2.566 = 256.6 N

In brief, when you use a flat belt in this situation, you can get 256.6 N of drive power only when there is 100 N of back tension. For elements without teeth such as flat belts or ropes, the way to get more drive power is to increase the coefficient of friction or wrapping angle. If a substance, like grease or oil, which decreases the coefficient of friction, gets onto the contact surface, the belt cannot deliver the required tension.

In the chain's case, sprocket teeth hold the chain roller. If the sprocket tooth configuration is square, as in Figure 2, the direction of the tooth's reactive force is opposite the chain's tension, and only one tooth will receive all the chain's tension. Therefore, the chain will work without back tension.

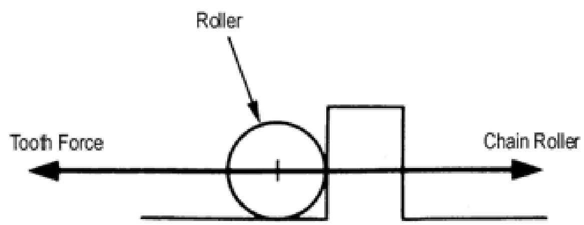

Figure 2. Simplified Roller/Tooth Forces

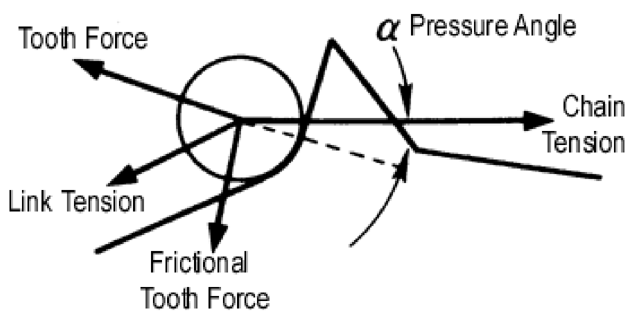

Figure 3. The balance of forces around the Roller

But actually, sprocket teeth need some inclination so that the teeth can engage and slip off of the roller. The balances of forces that exist around the roller are shown in Figure 3, and it is easy to calculate the required back tension. For example, assume a coefficient of friction μ = 0, and you can calculate the back tension (Tk) that is needed at sprocket tooth number k with this formula:

Tk = T0 3 sin ø k-1 sin (ø + 2b) Where:

Tk= back tension at tooth k

T0 = chain tension

ø = sprocket minimum pressure angle 17 ¬ 64/N(š)

N = number of teeth

2b = sprocket tooth angle (360/N)

k = the number of engaged teeth (angle of wrap 3 N/360); round down to the nearest whole number to be safe

By this formula, if the chain is wrapped halfway around the sprocket, the back tension at sprocket tooth number six is only 0.96 N. This is 1 percent of the amount of a flat belt. Using chains and sprockets, the required back tension is much lower than a flat belt. Now let's compare chains and sprockets with a toothed-belt back tension. Although in toothed belts the allowable tension can differ with the number of pulley teeth and the revolutions per minute (rpm), the general recommendation is to use 1/3.5 of the allowable tension as the back tension (F). This is shown in below Figure 4. Therefore, our 257 N force will require 257/3.5 = 73 N of back tension. Both toothed belts and chains engage by means of teeth, but chain's back tension is only 1/75 that of toothed belts.

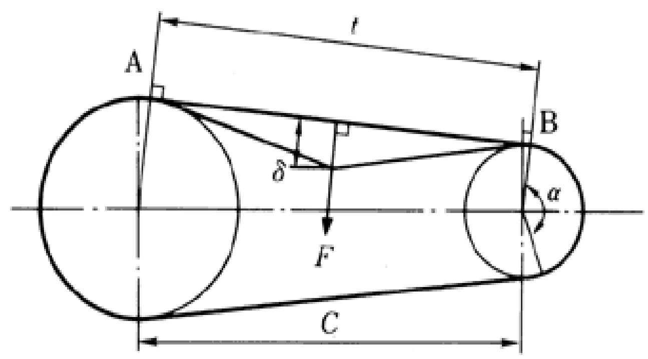

Figure 4. Back Tension on a Toothed Belt

Basic Structure of Power Transmission Chain

A typical configuration for RS60-type chain is shown in Figure 5.

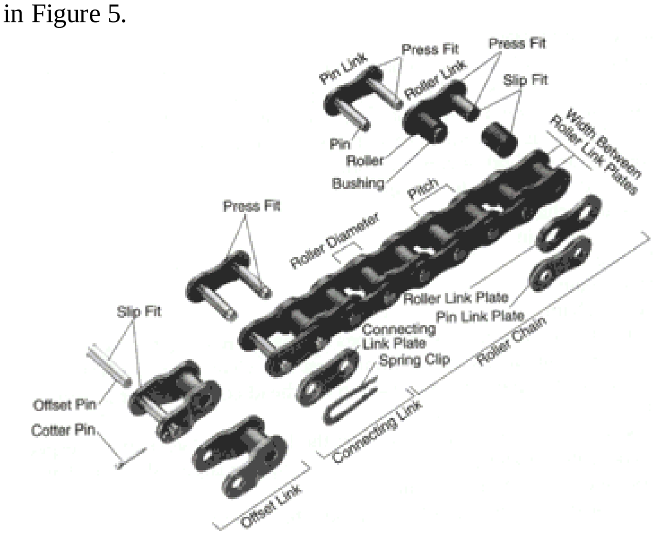

Figure 5. The Basic Components of Transmission Chain

Connecting Link

This is the ordinary type of connecting link. The pin and link plate are slip fit in the connecting link for ease of assembly. This type of connecting link is 20 percent lower in fatigue strength than the chain itself. There are also some special connecting links which have the same strength as the chain itself. (See Figure 1.2) .

Tap Fit Connecting Link

In this link, the pin and the tap fit connecting link plate are press fit. It has fatigue strength almost equal to that of the chain itself. (See Figure 1

Offset Link

An offset link is used when an odd number of chain links is required. It is 35 percent lower in fatigue strength than the chain itself. The pin and two plates are slip fit. There is also a two-pitch offset link available that has fatigue strength as great as the chain itself. (See Figure 6)

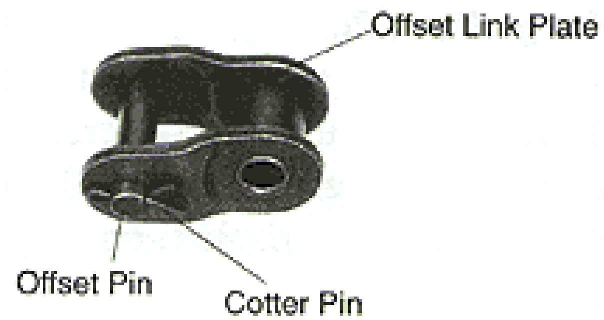

Figure 6. Offset link

Battery

In isolated systems away from the grid, batteries are used for storage of excess solar energy converted into electrical energy. The only exceptions are isolated sunshine load such as irrigation pumps or drinking water supplies for storage. In fact for small units with output less than one kilowatt.

Batteries seem to be the only technically and economically available storage means. Since both the photo-voltaic system and batteries are high in capital costs. It is necessary that the overall system be optimized with respect to available energy and local demand pattern. To be economically attractive the storage of solar electricity requires a battery with a particular combination of properties:

1. Low cost
2. Long life
3. High reliability
4. High overall efficiency
5. Low discharge
6. Minimum maintenance

A. Ampere hour efficiency
B. Watt hour efficiency

We use lead acid battery for storing the electrical energy from the solar panel for lighting the street and so about the lead acid cells are explained below

Lead-acid wet cell:

Where high values of load current are necessary, the lead-acid cell is the type most commonly used. The electrolyte is a dilute solution of sulfuric acid (H_2SO_4).

In the application of battery power to start the engine in an auto mobile, for example, the load current to the starter motor is typically 200 to 400A. One cell has a nominal output of 2.1V, but lead-acid cells are often used in a series combination of three for a 6-V battery and six for a 12-V battery.

The lead acid cell type is a secondary cell or storage cell, which can be recharged. The charge and discharge cycle can be repeated many times to restore the output voltage, as long as the cell is in good physical condition. However, heat with excessive charge and discharge currents short ends the useful life to about 3 to 5 years for an automobile battery. Of the different types of secondary cells, the lead-acid type has the highest output voltage, which allows fewer cells for a specified battery voltage.

V. CONSTRUCTION

Inside a lead-acid battery, the positive and negative electrodes consist of a group of plates welded to a connecting strap. The plates are immersed in the electrolyte, consisting of 8 parts of water to 3 parts of concentrated sulfuric acid. Each plate is a grid or framework, made of a lead-antimony alloy. This construction enables the active material, which is lead oxide, to be pasted into the grid. In manufacture of the cell, a forming charge produces the positive and negative electrodes. In the forming process, the active material in the positive plate is changed to lead peroxide (pbo_2). The negative electrode is spongy lead (pb).

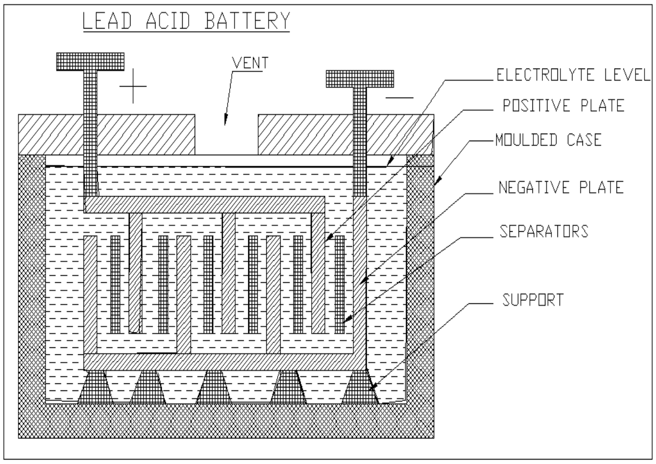

Figure 7. Lead acid battery

Automobile batteries are usually shipped dry from the manufacturer. The electrolyte is put in at the time of installation, and then the battery is charged to from the plates. With maintenance-free batteries, little or no water need be added in normal service. Some types are sealed, except for a pressure vent, without provision for adding water. The construction parts of battery are shown in figure 7.

Chemical action:

Sulfuric acid is a combination of hydrogen and sulfate ions. When the cell discharges, lead peroxide from the positive electrode combines with hydrogen ions to form water and with sulfate ions to form lead sulfate. Combining lead on the negative plate with sulfate ions also produces he sulfate. Therefore, the net result of discharge is to produce more water, which dilutes the electrolyte, and to form lead sulfate on the plates.

As the discharge continues, the sulfate fills the pores of the grids, retarding circulation of acid in the active material. Lead sulfate is the powder often seen on the outside terminals of old batteries. When the combination of weak electrolyte and sulfating on the plate lowers the output of the battery, charging is necessary.

On charge, the external D.C. source reverses the current in the battery. The reversed direction of ions flows in the electrolyte result in a reversal of the chemical reactions. Now the lead sulfates on the positive plate reactive with the water and sulfate ions to produce lead peroxide and sulfuric acid. This action re-forms the positive plates and makes the electrolyte stronger by adding sulfuric acid.

At the same time, charging enables the lead sulfate on the negative plate to react with hydrogen ions; this also forms sulfuric acid while reforming lead on the negative plate to react with hydrogen ions; this also forms currents can restore the cell to full output, with lead peroxide on the positive plates, spongy lead on the negative plate, and the required concentration of sulfuric acid in the electrolyte.

The chemical equation for the lead-acid cell is Charge

$$Pb + pbO_2 + 2H_2SO_4 \underset{\text{Discharge}}{\overset{\text{Charge}}{\rightleftharpoons}} 2pbSO_4 + 2H_2O$$

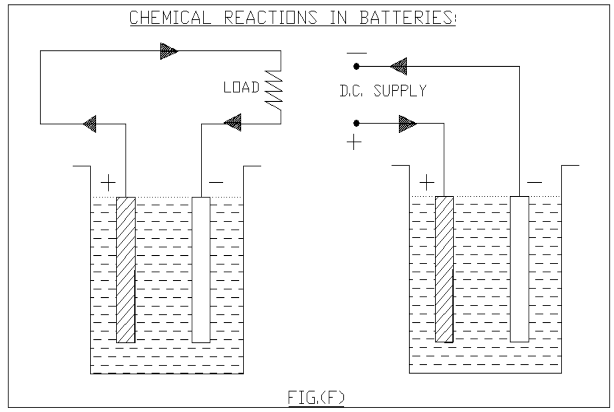

Figure 8. Chemical reaction in batteries

On discharge, the pb and pbo_2 combine with the SO_4 ions at the left side of the equation to form lead sulfate ($pbSO_4$) and water (H_2O) at the right side of the equation. One battery consists of 6 cell, each have an output voltage of 2.1V, which are connected in series to get a voltage of 12V and the same 12V battery is connected in series, to get a 24 V battery. They are placed in the water proof iron casing box as shown in fig 8.

Working principle

The hydrogen and petrol 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 is comes out from the negative terminal tank. This output gas is dipped to the multi tank so that hydrogen and petrol is produced. This will explained in the above chapter.

Here's some information on a simple homegrown method for producing pure hydrogen and petrol 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 its 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.

$KOH + H2O = KOOH + H2$

The balanced equation is

$2KOH + 2H2O = 2KOOH + 2H2$

Notice the free Hydrogen and petrol gas 2H2 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 and petrol production, which means controlling the reverse reaction to recover the KOH without giving back the hydrogen and petrol. There is an easy way to do this however.

Design and drawings

The design of water fuel engine in mini boat is shown in figures 9, 10 and 11.

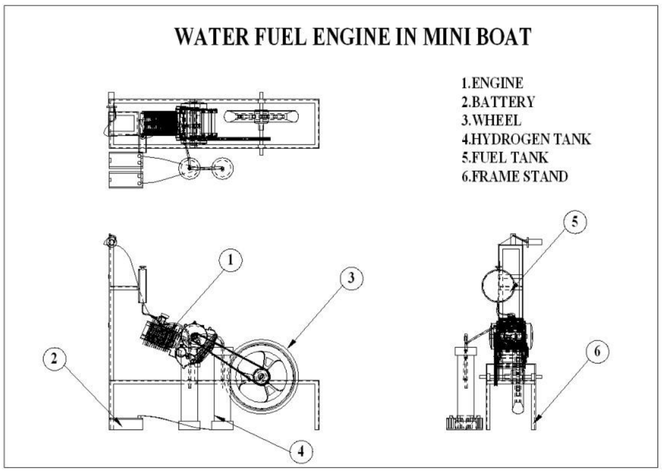

Figure 9. Water fuel engine in mini boat

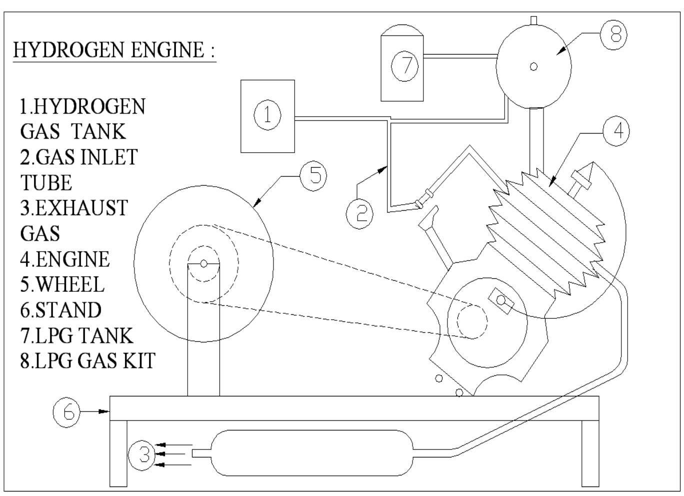

Figure 10. Schematic view of hydrogen engine

1. Four stroke engine
   - 100 cc
   - 6000 RPM
   - 7BHP
2. Sprocket with chain
   - Pitch 3/8
   - Ratio 3:1
3. Wheel
   - Diameter 300 mm
   - Width 100 mm
4. Electronic unit
   - Anode
   - Cathode
5. Hydrogen tank
   - Capacity 2.5 litres
6. L.P.G Tank
   - Capacity 2 litre
7. Gas cutter
8. Operating voltage
   - 240
9. Hose

Figure 11. Schematic view of Hydrogen engine (Two wheeler)

Advantages

Hydrogen cars are beneficial for the environment in a number of ways.

They do not emit greenhouse gases

These cars are much more fuel efficient than gasoline vehicles.

India's advantage

Transportation vehicles especially the 2 and 3 wheelers are primarily responsible for extremely poor air quality in India's major cities. Conversion of these 2/3-wheelers to run on hydrogen would result in dramatic improvement in air quality, in addition to economic benefits for the nation. While the industrialized world has begun to make the move towards a hydrogen economy that is free from fossil fuels the rate at which this will happen, and the pathways towards this goal must be different for different nations. The major automotive companies in the world are aiming towards hydrogen/fuel cell based light and heavy- duty vehicles, and the transition is expected to begin occurring sometime after 2012. This is expected to allow the technology developer's sufficient time for fuel cell costs to become affordable and also gives future energy companies time to develop a hydrogen infrastructure.

The fact that the daily needs of the average consumer in India and other developing nations are very modest as compared with the needs of the consumers in the highly industrialized countries can be put to advantage. For example, the US passenger vehicle will require 4-6 kg hydrogen fuel on board to deliver the desired performance, which includes the need for 480 Km range between charging or refueling, as compared to 100-500 grams of hydrogen required for a scooter for a range of 20-125 Km. The average daily driving distance in India is about 20 Km. India's lower per vehicle fuel requirements allow the country to leap frog by implementing hydrogen technologies in a much shorter time frame of 5-7 years

Applications

- Automobile application
- Two wheeler Application
- Four wheeler Applications

VI. CONCLUSION

The project adventured by us is the one that can be used for both Petrol and water with PETROL. Even though it is complicated to convert to water with PETROL in four stroke engine, we have entered to this project. We have done the project to simple in construction by low expenses.

This is one of the advantageous project conserving the cost and low fuel cost. This project work has provided us an excellent opportunity and experience, to use our limited knowledge. We gained a lot of practical knowledge regarding, planning, purchasing, assembling and machining while doing this project work. We feel that the project work is a good solution to bridge the gates between institution and industries.

We are proud that we have completed the work with the limited time successfully. The water fuel engine in miniboat is working with satisfactory conditions. We are able to understand the difficulties in maintaining the tolerances and also quality. We have done to our ability and skill making maximum use of available facilities.

Hydrogen can be used advantageously in internal combustion engines as an additive to a hydrocarbon fuel. Hydrogen is most commonly mixed with high pressure natural gas for this purpose since both gases can be stored in the same tank. If hydrogen is blended with other fuels, it usually has to be stored separately and mixed in the gaseous state immediately before ignition. Hydrogen is a very good candidate as an engine fuel. Appropriate changes in the combustion chamber together with better cooling mechanism would increase the possibility of using hydrogen across a wider operating range. The authors are currently working in the modifications.

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