Fuel Cells Essay, Research Paper

Abstract:

The purpose of this paper is to inform you why fuel cells are a good source of

energy. In principle a fuel cell operates like a battery. Unlike batteries fuel cells don’t

run down or require recharging. In the first section the energy source will be defined

and described. The three sub-sections are; how they work, current us, and the future of

fuel cells. In the second section the two criteria chosen will be defined. The two criteria

are environmental friendliness and reliability. In the third and final section the two

chosen criteria will be applied to the energy source. To understand fuel cells you need to

know how they work. You also need to know the current use and development. Although

no one can tell the future of fuel cells, you can tell what direction they are headed.

Environmental friendliness is a good piece of criterion to use when analyzing an energy

source. Fuel cells are environmentally friendly because their only waste product is

water. Reliability is also a good piece of criterion to use when evaluating an energy

source. Fuel cells are reliable because they run on hydrogen and we will have hydrogen

forever.

Introduction.

What would the world be like without electricity? If you really think about it you

will find that many of the everyday things we do would be impossible. You would not be

able to eat many foods without cooking them over some kind of flame. You would have

absolutely no luxuries such as TVs, computers, cars, and many other things that use

electricity. This could be reality someday if something is not done to find an alternative to

our traditional methods of burning coal and oil. Someday these resources will run out and

we will be stuck without electricity. This is why we should invest our time, money, and

research into the production of fuel cells. Fuel cells are a good energy source because

they are environmentally friendly and reliable despite being expensive.

In principle a fuel cell operate like a battery. Unlike batteries fuel cells don’t run

down or require recharging. It will produce energy in the form of electricity as long as

fuel is supplied(Little, Authur). The main fuel of the cells is liquid hydrogen. On March

17,1999, DaimlerChrysler unveiled the NECAR 4, the first fuel powered car. The

compact car seats five passengers. Although DaimlerChrysler claims to lead the fuel cell

car industry, Ford Motor co. officials say they will have a driveable version of their five

seat compact car, the P2000, this spring.

In the first section the energy source will be defined and described. The three

sub-sections are; how they work, current us, and the future of fuel cells. In the second

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friendliness and reliability. In the third and final section the two chosen criteria will be

applied to the energy source.

Section I.

To understand fuel cells you need to know how they work, how they are being

used today, and how they will be used in the future.

How they work.

In principle, a fuel cell operates like a battery. Unlike a battery, a fuel cell does not

run down or require recharging. It will produce energy in the form of electricity and heat

as long as fuel is supplied. A fuel cell consists of two electrodes sandwiched around an

electrolyte. Oxygen passes over one electrode and hydrogen over the other, generating

electricity, water, and heat. Hydrogen fuel is fed into the “anode” of the fuel cell. Oxygen

(or air) enters the fuel cell through the cathode. Encouraged by a catalyst, the hydrogen

atom splits into a proton and an electron, which take different paths to the cathode. The

proton passes through the electrolyte. The electrons create a separate current that can be

utilized before they return to the cathode, to be reunited with the hydrogen and oxygen in

a molecule of water (Little,Aurthur).

Current Use.

To understand fuel cells you need the current use and development. On March 17,

1999, DaimlerChrysler unveiled the NECAR 4, the first fuel cell powered car. The

compact car seats five passengers. Although DaimlerChrysler claims to lead the fuel cell

passenger car companies, who aims to market them by the year 2004, Ford Motor Co.

officials said they expect to have a driveable version of their five-seat fuel cell car, the

P2000, this spring.

Ferdinand Panik, head of DaimlerChrysler’s fuel cell program, said the NECAR 4

was a breakthrough because the fuel cell technology was small enough to fit into a

compact car but there was still room to seat five passengers. The fuel cells were stacked

underneath the car’s floor board and the liquid hydrogen tank took up some space in it’s

small trunk (Associated Press).

The car drives like a normal car, has a top speed of 90 miles per hour and can go

280 miles without refueling. It weighs 1,100 pounds more than a typical compact

gasoline-powered car because of the fuel dell technology.

Right now, ONSI Corporation in Windsor, Conn., a subsidiary of International

Fuel Cells, is the only commercial manufacturer of fuel cells. Seventy-four of its units,

each the size of a minivan, are now in operation, often in locations such as hospitals and

remote hotels where grid power is expensive and reliability is worth a premium. Each cell

produces 200 kilowatts of power; the heat each produces can also be used to warm

buildings, an approach known as cogeneration. ONSI’s marketing manager, Gregory J.

Sandelli, states that in 1.25 million hours of total use, his company’s cells have remained in

operation 95 percent of the time–a figure that bests on-site, diesel-powered generators.

The units, which use phosphoric acid as an electrolyte, are designed to last twenty years

(Scientific American).

Phosphoric acid-based cells tend to be heavy, which makes them less ideal for use

in vehicles. Other companies are developing cells that are specifically designed for that

purpose. Ballard Power Systems in Vancouver, BC, has for several years been developing

a lightweight fuel cell, the “proton-exchange membrane” (PEM) type. In place of

phosphoric acid, PEM cells employ a thin polymer membrane as their electrolyte. By mid-

1997, Ballard planned to launch a pilot fleets of a fuel cell-powered passenger buses in

Vancouver and Chicago. The U.S. Department of Transportation is also developing fuel

cell buses.

When portability is not an issue, as it is not for municipal utilities, other

possibilities open up. “Molten carbonate” and “solid oxide” fuel cell technologies, for

instance, could bring extraordinary efficiencies to power-generating stations. These

devices run at far higher temperatures than PEM or phosphoric acid cells. Molten

carbonate and solid oxide cells might be able to achieve an impressive efficiencies of 55

percent or more, according to Robert R. Rose of Fuel Cells 2000, an advocacy group.

The hot steam and carbon dioxide they produce can be used to drive a gas turbine that

generates additional electricity, an approach that could push their efficiency to an unheard-

of 80 percent. They are potentially up to twice as efficient as a typical oil or coal-fired

plant (Scientific American).

Energy Research Corporation (ERC) in Danbury, Conn., has built a two-megawatt

pilot molten carbonate plant for the municipality of Santa Clara, Calif. The fuel cells run at

about 650 degrees Celsius (1,200 Fahrenheit) and consume hydrocarbon fuel that is re-

formed into hydrogen right inside the cells. Problems with electrical shorts within the cells

have restricted the plant’s output so far to about one megawatt. As the ERC’s William V.

Baker is at pains to point out, however, that still makes the Santa Clara plant the highest-

powered fuel cell unit in the U.S. The company is currently developing a modified design

rated at 2.85 megawatts (Scientific America).

Future.

Although no one can tell the future of fuel cells, you can tell what direction they

are headed. DaimlerChrysler plans to market their fuel cell cars by the year 2004.

Engineers plan to take off 660 pounds of the engine weight before marketing to the public.

Ford says they will unveil a fuel cell car this spring. Other automakers such as General

Motors Corp. and Honda Motor Co. are pouring in hundreds of millions of dollars into the

fuel cell car industry. (Associated Press) Companies are developing solid-oxide fuel cells.

DaimlerChrysler officials are working on NECAR X, which will run on methanol.

Methanol contains hydrogen and is the auto industry’s favored fuel to power fuel cells.

However, methanol-fueled cars would require a national network of methanol stations.

To understand fuel cells you need to know how they work, how they are being

used today, and how they will be used in the future.

Section II.

When evaluating an energy source two good criteria to use are environmental

friendliness and reliability.

Environmental friendliness is a good piece of criterion to use when evaluating an

energy source. Environmental friendliness is how much the resource affects the

environment. Environmental impact is very important because if you don’t respect the

earth now you won’t have any resources later. Without natural resources we won’t be able

to live. If we keep letting carbon dioxide go into the atmosphere and kill trees and other

plants we will die of carbon dioxide poison. We will also continue global warming.

Electricity is a good example of environmental friendliness because it doesn’t have any

harmful waste products.

Reliability is a good criterion to use when evaluating an energy source. Reliability

is how well you can depend or trust something. Reliability is very important because it is

often in crisis or when we need something the most that it is unavailable or doesn’t work.

In an emergency situation reliability is very important because it can save lives. When

your power goes out you want a reliable flashlight, or when your driving down a deserted

highway you want reliable tires so you don’t get a flat. Therefore reliability is a very

important criterion to use when analyzing an energy source. Solar power is reliable

because the sun comes up every day. It is a fact that sun will come up everyday.

These two criteria are very important when evaluating an energy source.

Section III.

In this section you will be told how the criteria apply to the energy source. Fuel

cells are a good energy source because they are environmentally friendly and very reliable

despite being expensive.

Fuel cells are environmentally friendly because their waste product is a little heat

and water vapor. This shows environmental friendliness because they do not pollute the

earth. By not polluting they don’t kill plants, which supply people with oxygen. If you

take care of the environment now it will help you later. Fuel cells are environmentally

friendly because if just 20 percent of cars used fuel cells, we would cut oil imports by 1.5

million barrels of oil every day. (Fuel Cells 2000) By cutting that many barrels of oil every

day you would not only save enormous amounts of oil, you would also help the

environment. By not burning 1.5 million barrels of oil you would not harm the

environment as much. Big cities would have much less smog if fuel cell-powered cars

were used. The U.S. Department of Energy projects that if a mere 10 percent of

automobiles were powered by fuel cells, regulated air pollutants would be cut by one

million tons per year and 60 million tons of the greenhouse gas carbon dioxide would be

eliminated. (Fuel Cells 2000) This shows that fuel cells are environmentally friendly

because they would eliminate 60 million tons of harmful gas. Without that harmful gas

plants will live longer, supplying people with cleaner air. If we invest our time and money

in these great machines they will provide us with a very environmentally safe form of

energy.

Fuel cells are reliable because they run on hydrogen and we will have hydrogen

forever. By never running out of hydrogen fuel cells are the perfect energy source. Fuel

cells are very reliable because they will always have fuel to run on. Fuel cells are very

reliable because they have no moving parts, which decreases the chances of parts breaking.

In cars, fuel cells can go 280 miles without refueling. This shows their reliability because

they can go a long way without having to worry about refueling. The less fueling you

have to do makes the car more reliable.

This shows why fuel cells are environmentally friendly and reliable.

Conclusion.

Fuel cells are a good energy source because they are environmentally friendly and

reliable despite being expensive. You might be saying to yourself ” So what?”. If we

don’t find an energy source that we can use in the future when we run out of coal to burn.

One day one of our most treasured luxuries, electricity, could be gone if we don’t develop

a new way to produce it. Fuel cells are the perfect source from which to produce

electricity because they will always run when there is fuel, they don’t pollute, they have no

moving parts, they don’t make noise, and they are built to last twenty years. Fuel cells

power plants have an efficiency rate of 80 percent. They are twice as efficient as a typical

oil or coal fired plant. If we keep the planet free of destructive exhaust fumes, which

cause ozone depletion, we would have cleaner air to breathe. We also wouldn’t have to

worry about oil tankers spilling millions of gallons of oil in the oceans, causing harm and

death to millions of ocean plants and fish. If we take care of the earth now, we will have

more natural resources such as trees, water, and animals, later. If we find ways to

conserve oil and coal now we will be able to ration it out for a very long time but if we

don’t find alternative methods of getting energy we will run out of these highly consumed

resources.

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