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Fuel Cells & Alternative Fuel Vehicles

By Andrea Susan Glass

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FUEL CELLS & ALTERNATIVE FUEL VEHICLES

The history of the fuel cell can be traced back to the 19th century. Since then the development and usage of fuel cells in a variety of applications have come a long way. Fuel cells hold great promise for fueling alternative fuel vehicles. Here is some of the history of the development of fuel cells:

William Grove invented the fuel cell in 1839.

General Electric invented proton exchange membrane fuel cells in the 1950s

Francis Bacon demonstrated a 5kW alkaline fuel cell in 1959.

NASA's use of fuel cells during the Apollo space missions in the 1960s was the first commercial use of fuel cells.

Alkaline fuel cells have flown over 100 missions and operated for more than 80,000 hours in spacecrafts operated by NASA.

The US Navy has been using fuel cells in submarines since the 1980s

Fuel cell buses are running in several cities around the world, the largest being the European Union backed CUTE project (Clean Urban Transport for Europe).

All major automakers have prototypes of alternative fuel vehicles using fuel cells on the road—some have already been leased to customers.

Iceland has plans to convert its fishing fleet from diesel engines to hydrogen fuel cells as part of a national project to create a fossil fuel free economy

Several car manufacturers are hoping to produce their first semi-commercial models of fuel cell cars by 2005, yet they will most probably not be mass produced until 2010.

Numerous fuel cell products will be coming to market—portable direct methanol fuel cells will power mobile phones, laptops and cameras in the near future

A fuel cell is around 60% efficient at converting fuel to power, double the efficiency of an internal combustion gas engine—which makes it perfect for alternative fuel vehicles.

Fuel cells have several advantages over conventional power sources like internal combustion gas engines or batteries. Additionally, there are disadvantages facing manufacturers hoping to commercialize fuel cells. See how they stack up as the next best fuel for alternative fuel vehicles.

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Advantages

Fuel cells reduce pollution that is caused by the burning of fossil fuels—their only by-product is water. If the hydrogen used in the fuel cell comes from the electrolysis of water, then using fuel cells will eliminate greenhouse gases.

Because fuel cells don't need conventional fuels like oil or gas, they eliminate economic dependence on politically unstable countries.

Since hydrogen can be manufactured anywhere there is water and electricity, production of potential fuel can be allocated in various areas.

Fuel cells operate at a higher efficiency than diesel or gas engines which makes them an ideal source of efficient power for alternative fuel vehicles.

Most fuel cells operate silently, while internal combustion engines do not.

Fuel cells can operate for longer times than batteries, therefore to double the operating time, only the fuel needs to be doubled and not the capacity of the unit itself.

The maintenance of fuel cells is relatively straightforward since there are few moving parts in the system.

Disadvantages

Energizing fuel cells continues to be a major problem while production, transportation, distribution and storage of hydrogen remains difficult.

Reforming hydrocarbons via a reformer to produce hydrogen is technically challenging and not actually environmentally friendly.

The refuelling and the starting time of fuel cell vehicles are longer, while the driving range is shorter than in a conventional vehicle.

Fuel cells are normally somewhat larger than comparable batteries or engines, however, the size of the units continues to decrease with research and testing.

Fuel cells are currently expensive to produce, since most units are hand-made and some use expensive materials.

The technology is not yet fully developed, therefore few products are readily available.

Although hydrogen fuel cells appear to be the most promising source of alternative fuel, other sources are being researched and tested. Alternative transportation fuels provide economic advantages while also offering significant environmental benefits. They offer air quality advantages through reduced emissions and some fuels produce less greenhouse gas emissions than gasoline. There's significant research being conducted worldwide. Canada, for example, is recognized as a world leader in the development and use of alternative transportation fuels with more than 170,000 alternative fuel vehicles in use across Canada. Some of the most promising alternative fuel sources being suggested for future use in motor vehicles are:

Ethanol

Propane

Natural gas

Biodiesel

Electricity

Hydrogen

At this point, it's anyone's guess what the future holds for alternative fuel vehicles.

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Flex Fuel Vehicle And Ethanol

By Simon Oldmann

Flexible fuel vehicles are just like an average car in the sense that they use a single gas tank. But it can run on a mixture of gasoline and alcohol based fuel. Any car made after 1988 can run on a mixture of 10% ethanol and 90% gasoline. A flexible fuel vehicle can run on a mixture of up to 85% ethanol. Modifications are needed for this ratio as alcohol based fuels are corrosive.

Fuel tanks and engines must be modified in flexible fuel vehicles. In the US, there is a special indicator used that analyzes the ratio of the mix and adjusts itself accordingly to make sure that the fuel is burned clean. This is done by adjusting the timing and the fuel injection and happens automatically. Many flexible fuel vehicles are also required to use a special engine oil.

Why use ethanol?

Ethanol offers motorists an environmentally friendly alternative to using fossil based gasoline fuels, since ethanol is much more environmentally friendly and a renewable resource it seems to be an ideal alternative fuel for an environmentally friendly motorist. Studies show that using a mix of 10% ethanol reduces carbon monoxide levels by up to 17% , CO₂ emissions by 4.2% and hydrogen emissions by up to 5%. By using a mixture of 85% ethanol greenhouse gas effects are reduced by up to 37%

What countries are using ethanol fuel?

There are three countries currently using ethanol in their vehicles – US, Brazil and Sweden.

* Brazil has been using ethanol mixtures in their fuel since the 1970's and it is required by law that all fuel mixes be at a ratio of 29–25% ethanol.

* Sweden is the only country that has flexible fuel vehicles in Europe, although there are plans to introduce fuel mixes of up to 85% in other European countries.

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* US has many cars designed to run on 85% ethanol fuel mixes. These flexible fuel cars make up 4 million of the cars in the US, although less than 1% of these vehicles are currently running on a mixture of 85% ethanol.

The future of ethanol based fuels

At the moment the future of ethanol fuel mixtures seems a little bleak. Until the fuel companies can make the mixtures of gasoline and ethanol fuel mixes more efficient and provide a superior mileage, people will still continue using gasoline and small mixes of ethanol such as a 10% ratio. Once this obstacle has been corrected, ethanol will be more widely used in flexible fuel vehicles.

There is potential for future growth in the ethanol industry. Last year an energy bill was created that is calling for refiners to begin using more renewable fuels. The national ethanol industry currently produces more than 4 billion gallons of ethanol fuel per year with more plants being built all the time. The ethanol industry is definitely set to sky-rocket in coming years.

Simon Oldmann is an avid writer and a green activist, he has been writing about Ethanol use since the growing popularity of Ethanol these days, Simon writes for

at

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