

FUEL CELLS - THE ULTIMATE FUEL



Chuck Nicholson

In previous articles, we touched on various alternate fuels including new diesels, natural gas, ethanol and gas/electric hybrids. Today's subject is Hydrogen fuel cell power, which many insiders consider to be the ultimate fuel because hydrogen is the most abundant fuel, and can be refined from renewable energy sources, such as the sun, wind, water and biomass, as well as from traditional energy sources such as oil and natural gas and emits zero emissions from the tailpipe, only water. Many engineers think that today's alternate fuels such as hybrids are not the long term answer to our fuel needs and are only a temporary "bridge" until the ultimate fuel, hydrogen fuel cell, can be affordably brought to the market in sufficient volume.

FUEL CELL TECHNOLOGY

In the last four decades, fuel cell technology has taken man to the moon and back. And while space exploration has marked the most visible demonstration of fuel cell technology benefits to date, the future is filled with endless possibilities.

The historical "de-carbonization" of energy supplies - from coal to oil to natural gas - has led logically to hydrogen, the most elementary and available fuel. Hydrogen's simple chemical structure results in fewer emissions. Put simply, fuel cell operation consists of oxygen and hydrogen in, pure water out. This removes pollutants such as nitrogen oxides (NOx) and greenhouse gases from the equation.

HOW FUEL CELLS WORK

A fuel cell harnesses the electricity created in the chemical reaction that occurs when hydrogen and oxygen are combined. Hundreds of fuel cells are "stacked" together, combining their electrical outputs into enough electricity to power a car.

In the not-too-distant future, fuel cells will change how we live our everyday lives. They will power our vehicles, homes and office buildings more efficiently and with significantly less impact on the environment than fossil fuels. Fuel cell technology could end energy shortages and reduce reliance on imported oil.

However, four important challenges must be addressed before practical fuel cell use can become a reality. They are hydrocarbon fuel reforming, storage, cost and infrastructure development.

By far the largest challenge to fuel cell commercialization is infrastructure.

GM FUEL CELL TEST VEHICLE ON THE ROAD

GM has been working on hydrogen vehicles for many years and on January 10th, 2005 GM revealed their latest vehicle, the "GM Sequel" according to Larry Burns, General Motors' vice president of research, development and planning.

"This is a real car," Burns says of the Sequel, GM's latest incarnation of advanced technology. "This is a doable car."

That's a big step forward. GM's past fuel cell concepts were too far out for the average consumer or for the average assembly plant.

The car, about the size of a Cadillac SRX, breaks new ground for GM in several areas.

GM has doubled the range on the Sequel to 300 miles, halved the 0-to-60 mph acceleration to less than 10 seconds and increased power by 25 percent over previous models. And the car still emits only water.

Burns says the automaker's goal is to design and validate a fuel cell propulsion system that could be manufactured and sold in less than 5 years.

GM has said that producing the vehicle for sale would depend on a hydrogen fuel infrastructure and adoption of regulations for the technology.

"Ultimately, we want to build something at scale affordably," Burns says.

Among the Sequel's other benefits, compared with previous GM concepts, are better control on snow, ice or uneven terrain; a 42 percent increase in torque; and shorter breaking distances.

What excites Burns is that Sequel's performance is achieved with technology available today and does not depend upon some science yet to be invented.



GM TESTS FUEL CELL ENDURANCE

Earlier in '05, GM announced that it would enter an experimental hydrogen race car, the "HydroGen3" in the grueling Monte Carlo rally. The route passes through Switzerland, Italy and France to Monaco, and according to the rules, the fuel cell vehicles are allowed one stop for refueling. "Because it passes through the Maritime Alps, the Rally Monte Carlo is considered one of the most difficult in the world," says Dr. Udo Winter, Chief Engineer at GM Fuel Cell Activities centre in Germany.

"We want to expose the HydroGen3 to this particular challenge because, in terms of fuel cell technology, we are at a development stage in which it all comes down to testing, particularly under extreme conditions."

The HydroGen3 has already proven its endurance, most recently in the summer of 2004 at the Fuel Cell Marathon. In 38 days, the prototype traveled over 6,000 miles between Hammerfest, Norway and Cabo da Roca, Portugal - a new world record for a fuel cell vehicle.

NEXT WEEK - HYDROGEN VEHICLES PART TWO

GM...MORE THAN MEETS THE EYE...YESTERDAY...TODAY...TOMORROW

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