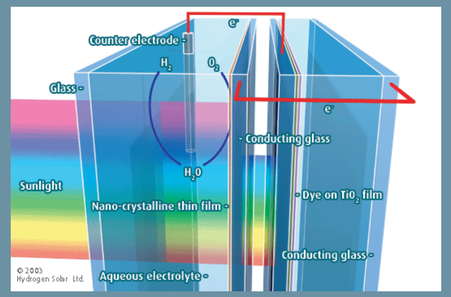
HYDROGEN FUEL CELL TECHNOLOGY



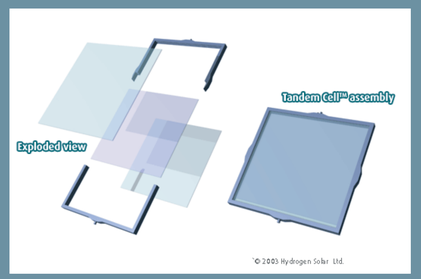
Fuel cells have been in limited use since the Apollo program, but have lately been gaining a lot of public interest. In fact, they are on the verge of worldwide commercialization. There are many different kinds of fuel cells, but they all share some similarities. They are quiet, and low maintenance, with no moving parts. The cell itself only emits water as a byproduct. Their light, compact design also makes them ideal for transportation purposes.

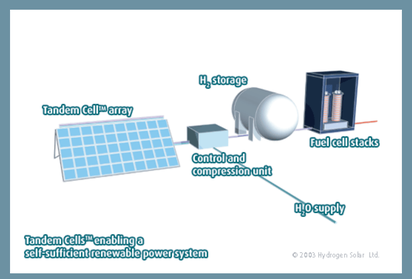
Fuel cells can be thought of as constantly recharging batteries. They use a chemical reaction to generate energy in the form of electricity and heat as long as there is fuel available. The typical fuel cell is made up of two electrodes sandwiching an electrolyte. Hydrogen fuel is fed into the anode of the cell as oxygen is fed into the cathode. A catalyst stimulates the hydrogen atom to split, and the proton passes through the electrolyte. The electrons create a separate currant that can be utilized before returning to the cathode to be united with the oxygen, and hydrogen proton to create water.

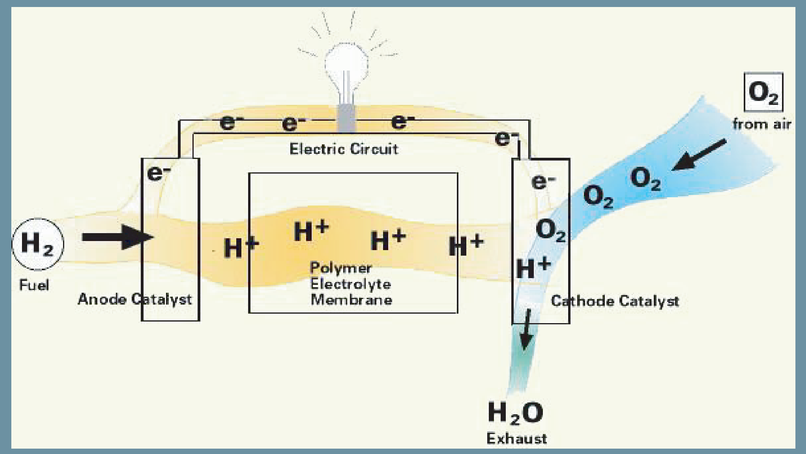
Hydrogen is a very reactive and sometimes explosive gas, if it is handled incorrectly. However this should not be a major deterrent in its commercialization, seeing as the same is true for most industrial gasses on the market today. In some ways it is actually safer. For instance, hydrogen is lighter than air. This means that it will rise, and escape, instead of sink like gasoline fumes, and build up where electrical outlets and other ignition hazards tend to be.

The idea of converting the suns energy into hydrogen fuel is not brand new, but until recently it was just that, an idea. Hydrogen Solar, founded by Julian Keable, has found a way to turn that idea into reality. The Tandem Cell is part of a self-sufficient power system that can be implemented on rooftops to supply power to the building, and fuel for vehicles. On November 24th of 2004, the University of Nevada Las Vegas Resource Foundation awarded Hydrogen Solar with $400,000 for the first year of a multi-year project to demonstrate the use of the Tandem Cell in conjunction with vehicle fueling.

"The Tandem Cell consists of two photo catalytic cells in series: the front cell absorbs the high energy ultraviolet and blue light in sunlight, using nano-crystaline metal oxide thin films to generate electron-hole pairs. The longer wavelength light in the green to red region passes through the front cell and is absorbed in a Graetzel Cell producing electrical potential under nearly all light conditions. The two cells are connected electrically and together provide the potential required to split the water molecules in the electrolyte."







This presentation mainly concentrates on regenerative or solar "closed system" fuel cells that use hydrogen from sunlight and recycled water that can produce near perpetual energy output. This type of fuel cell is the most sustainable, but there are many other types in the fuel cell family. Bio mass fuel cell systems trap the hydrogen gasses that are produced from the decay of plant matter. In the future this technology may allow you to run your car off of your compost material.

The most common fuel cell being produced to day is the proton exchange membrane fuel cell or (pem). These systems operate at a relatively low temperature and can vary their energy output to meet shifts in power demand making them ideal for automobiles and potentially for much smaller devices such as rechargeable batteries. Alkaline fuel cells are another type that have been used by NASA in the past. These systems work more like the conventional alkaline battery and require a more constant fuel input. These "battery" fuel cells have a much shorter shelf life and are usually to expansive for commercial applications.

Direct methanol fuel cells (dmfc) use extracted hydrogen from the fossil fuel methanol. This requires a fuel reformer component added to the fuel cell system to extract the hydrogen before it can be converted in to electricity. Adding another component to any fuel cell system complicates the energy production process and usually adds to the cost, lowering the overall efficiency of the fuel cell.

Fuel cells are being researched and produced to meet a wide variety of applications. Everything from cell phones to large scale buildings can be run off fuel cells and because they are lightweight and compact they are ideal for transportation purposes. Within a few years we will see computers, camcorders, cars, and home appliances that run on fuel cell technology commercially available. Today every major automobile manufacturer is investing in this technology and are starting to produce prototypes that will replace conventional fossil fueled automobiles.

World wide, governments are realizing the environmental and educational benefits of fuel cell projects and in many areas are providing financial incentives and research grants. Moderate implementation of fuel cells in to our society's everyday uses would dramatically reduce urban air pollution, decrease oil imports, reduce the trade deficit, and produce American Jobs.

The U.S. Department of energy (DOE) projects that if a mere ten percent of automobiles nationwide were powered by fuel cells, air pollutants would be cut by one million tons per year and sixty million tons of the greenhouse gas carbon dioxide would be eliminated. DOE projects that the same ten percent of fuel cell cars would cut oil imports by eight hundred thousand barrels a day, about thirteen percent of total imports. Fuel cells running on hydrogen derived from a renewable source will produce no emissions but water vapor.

Sources:

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