

What is a Fuel Cell?



Fuel cells are used today in a variety of applications ranging from backup power for telecommunications and government industries to material handling vehicles to recreational vehicle support systems.

They are touted as a clean, green alternative to batteries and combustion engines, capable of passing the most stringent air quality standards.

They are famous for their role in the Space program since the late 1950s as a source of both power and water for crew consumption.

But what is a fuel cell and how does it work?



A New Era in Critical Backup Power

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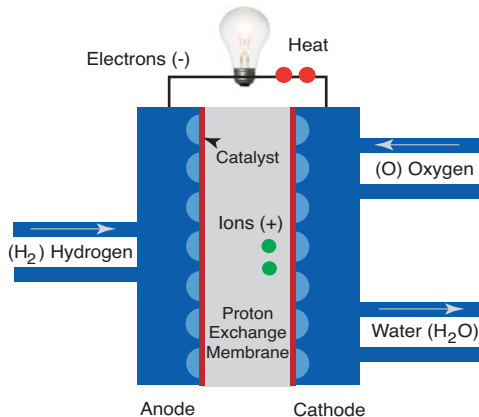
A fuel cell is an electrochemical energy conversion device that converts hydrogen and oxygen into water, producing electricity in the process. In simplified terms it works like this: Hydrogen is sent into one side of a special membrane (a proton exchange membrane, in this case). The hydrogen proton travels through the membrane, while the electron enters an electrical circuit, creating a DC electrical current. On the other side of the membrane, the proton and electron are recombined and mixed with oxygen from room air, forming pure water.

The other electrochemical device that is familiar to most people is the battery. A battery has all of its chemicals stored inside, and it converts those chemicals into electricity. Since the chemicals are stored, a battery eventually "goes dead" and is either thrown away or recharged. With a fuel cell, as long as there is a flow of hydrogen and oxygen into the cell, the electricity flows out of the cell. In this way, it is similar to a generator. Like a generator, if fuel runs out, the fuel cell stops. If fuel is replenished, the fuel cell may be restarted. Unlike either batteries or generators, fuel cells are a clean technology suited to corporate social responsibility initiatives.

About Hydrogen

Safe use of hydrogen calls for respect.

Is hydrogen dangerous? According to many sources, hydrogen is no more dangerous than other materials we use regularly — such as gasoline, propane, electricity and natural gas. But like these other substances, hydrogen's properties must be understood and respected for safe use. Because hydrogen rises and dissipates quickly, many actually consider it to be less dangerous in a spill situation than other fuels.



The Invention of the Fuel Cell

Sir William Grove invented the first fuel cell in 1839. Grove knew that water could be split into hydrogen and oxygen by sending an electric current through it (a process called electrolysis). He hypothesized that by reversing the procedure you could produce electricity and water. He created a primitive fuel cell and called it a gas voltaic battery. After experimenting with his new invention, Grove proved his hypothesis. Fifty years later, scientists Ludwig Mond and Charles Langer coined the term fuel cell while attempting to build a practical model to produce electricity.

Types of Fuel Cells

There are several different types of fuel cells, each using a different type of chemistry. Fuel cells are usually classified by their operating temperature and the type of electrolyte they use. Some types of fuel cells work well for use in stationary power generation plants. Others may be useful for small portable applications or for powering cars. ReliOn uses Proton Exchange Membrane fuel cells in its products.

Fuel Cell Type	Operating Temp. (°C)	Projected Efficiency	Suitable Applications
Proton Exchange Membrane (PEMFC)	70-80	35-45%	Small Stationary, Automotive, Portable
Alkaline (AFC)	80-100	60%	Space, Automotive
Phosphoric Acid	200-220	40-45%	Large Stationary
Molten Carbonate (MCFC)	600-650	45-60%	Large Stationary
Solid Oxide (SOFC)	800-1000	50-65%	Stationary, Automotive

Modular Cartridge Technology®

ReliOn's philosophy is that new technology should be innovative and ultimately more reliable than traditional technologies – otherwise, why change! The heart of ReliOn fuel cells is its patented hot-swappable Modular Cartridge Technology®. The cartridge is ReliOn's basic building block for customer solutions. Cartridges offer greater reliability, easier servicing, and fewer moving parts compared to other fuel cell designs. Any service needs can be accomplished quickly and easily by simply swapping out one cartridge for another, while the unit continues to provide power. The inherent advantages of this design include self-hydration, air cooling and the ability to operate at low pressures. ReliOn's Modular Cartridge Technology® provides its customers the ability to purchase the power they need – from under 500 Watts to 12 kilowatts.



NEBS Level 3



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 and other patents pending. Product specifications
 are subject to change at any time.

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