



HYDROGEN ENERGY

Hydrogen Power Systems

As the world looks to reduce dependence on power generation using petroleum derived fuels, hydrogen gas is fast developing into an efficient and sustainable option.

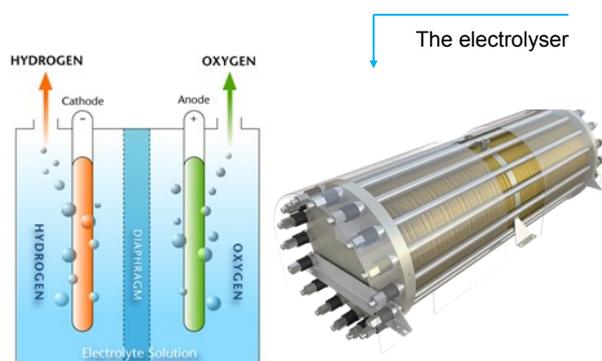
Hydrogen gas is manufactured using an electrolyser through the process of electrolysis. In a process that is carbon and pollution free, fuel cells produce electricity from the hydrogen gas, with oxygen and water the only resulting by-products.

Hydrogenics is a global company committed to a better future through research and development of hydrogen technology. Hydrogenics manufactures both electrolysers and fuel cells.

The gas is currently used in a number of industrial processes including metallurgy, power plants, food industry, in the production of electronic components and as the fuel source for fuel cells to create electricity.

What are Electrolysers?

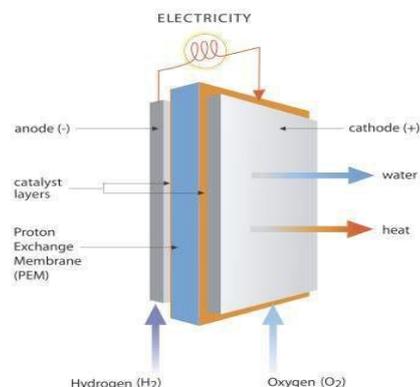
Electrolysers are devices that produce hydrogen and oxygen through the process of electrolysis. Electrolysis is an electrochemical reaction that splits water into Hydrogen and Oxygen, using electricity. It is a 100% emission free and carbon-free process.



Electrolysis - the process

What is a Hydrogen Power System?

Hydrogen Power Systems use hydrogen gas as a fuel source and a proton exchange membrane (PEM) to create a direct current power supply.



A fuel cell is an electro-chemical conversion device that produces DC electricity, water and heat using hydrogen as fuel and oxygen in the air. Because chemical energy is converted directly to electrical energy, hydrogen fuel cells are highly efficient.





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Hydrogen power systems put the electrolyser and the fuel cell together to create power systems that generate their own fuel to create a regular source of electrical power.

Range of Hydrogen Power Systems

Hydrogen power systems can range from 1.5kW backup power systems (see “Zeus—Backup Power Systems”) to 1MW+ standalone power stations.

Hydrogenics is also a key player in the personal and commercial transport industry, designing and manufacturing fuel cells for cars and buses, as well as forty-five hydrogen re-fuelling stations around the world.

Distributors for Hydrogenics products in Australia are Melbourne-based Covertel Power, collaborating with Alberfield as the Western Australian channel partner.



The standard Hydrogenics fuel cell

A typical backup power system which can range from 1.5kW to 30kW. These systems are scalable to meet your power requirements.

Containerised power systems can generate up to 240kW for remote locations.



Containerised HFC Power System with electrolyser to generate H₂ for the fuel cells. The system shown can supply up to 250kW.

What is a Hybrid Power System?

Sustainable power systems such as solar PV and wind power have limitations in maintaining a base load level of power.

Solar PV works very efficiently when the sun is shining, but not at all when the sun has gone. Wind power will work for twenty-four hours but the amount of power generated is variable and will depend on having a regular and consistent wind speed.

Hybrid power systems add hydrogen fuel cells into the system to provide consistent power for a twenty-four hour period by harnessing the surplus power of solar and wind. This surplus power is used to create H₂, which powers the fuel cell to enhance and balance the power supply.

A solar PV system coupled to a hydrogen fuel cell and electrolyser can provide a base load level of power on a 24/7 basis. The hybrid system can be designed as an efficient and sustainable power supply for remote regions and for off grid locations.

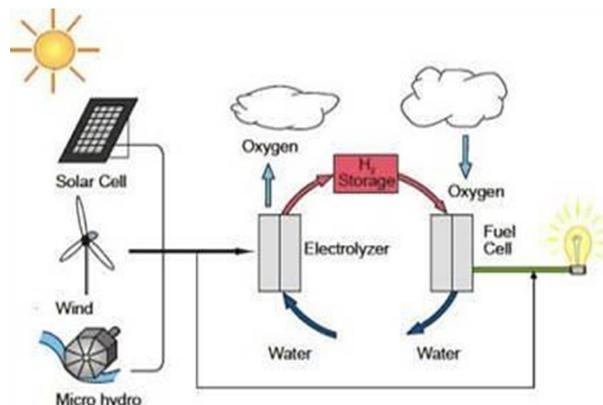
Off-Grid/Remote Power Supplies

A major issue with off-grid or remote power requirements is the need for a power supply system with the capacity to meet both a base load and a variable demand power requirement, as at a remote mine site, telecommunications station or an isolated country town.

Hybrid power systems that use two or more different power systems to generate a base load power supply on a 24/7 basis have a number of key advantages over a diesel system.

Hybrid systems generate their own fuel on-site and are generally self-sustaining. The H₂ production equipment and the fuel cells generally require minimal maintenance. The latest control systems provide for remote monitoring and fine tuning of equipment.

The following schematic shows the hybrid cycle:





Flexibility in Design and Project Construction

Hydrogen fuel cells are used as back-up power systems through to whole of town/city power systems.

The team at Alberfield and Hydrogenics are full service companies. We can design the system with you and then either supply the product only or carry out the design, construction project management as required .

Hybrid power systems need to be designed for their particular application and the team at Hydrogenics have designed and built Hybrid power systems around the world.

Alberfield adds its engineering expertise and local knowledge to this design team to provide clients with the best possible outcome for their need.

Standards & Codes

Hydrogenics Europe NV — manufacturers of HySTAT electrolyzers are certified to the following Bureau of Veritas Standards:

- ISO 1400:2004 [cert No BE008440-1];
- OHSAS-18001 2007 [cert no BE008441-1];
- ISO9001:2008 [cert no BE008349-1].

They are compliant with European Directives and international codes & standards. A copy of the full document (HySTAT™ Electrolyser Codes & Standards) is available on request from info@alberfield.com.au

Hydrogenics Corporation (Canada) — manufacturers of the HyPM fuel cell comply with the following codes & standards:

- Module designed to comply with UL FC1, IEC 62282-2;
- Module designed to comply with NEBS GR-1089-CORE (Tests As Per 3.1.3 – FCC Part 15, 3.2.1 - Radiated Emissions, 3.2.2 – Conducted Emissions);
- NEBS GR-63-CORE R4-66 R4-68 R4-72 R4-81-83;
- RoHS Compliant.

Installation and Maintenance

Installation is carried out by a Perth-based team trained in all aspects of the work.

Maintenance is minimal and Alberfield will provide a service contract to ensure maintenance is carried out correctly and on time.

Alberfield also offers training to maintenance teams operating in a remote environment so the procedures can be carried out during regular maintenance operations on other equipment.

Alberfield Plus+

As a technical consultancy, Alberfield can assist with assessing existing power consumption, and work with you to design the best system for your current and future power needs.

WA Contact Details

Contact: Harry Porrins
Mob: +61 451 284 043
harry.porrins@alberfield.com.au

Alberfield

Level 29, 221 St George's Tce,
Perth WA 6000

Tel: +61 8 9288 0682
Fax: +61 8 9480 3705

www.alberfield.com.au