Finite's Stainless Steel Compressed Air Filters Protect Fuel Cell Membranes

Case Study

A fuel cell system manufacturer utilizes electrolysis of water (H_2O) to generate the necessary hydrogen. Because of the source, the hydrogen gas can contain aerosols of liquid water. If the aerosols reach the membrane, it can become flooded, reducing the power output and eventually stopping the reaction. To protect the performance and life of the system, this manufacturer has chosen Parker Finite S1R stainless steel filters with grade 4 elements to remove water and other particulates from the hydrogen gas stream. Parker's grade 4 elements are especially designed and proven in the filtration of hydrogen for fuel cell applications. This filter is 99.995% efficient in trapping contaminants 0.01 micron or larger.

Application

PEM cell systems can use a variety of sources for the hydrogen. Some of the common methods include pure hydrogen storage cylinders, extraction of hydrogen from natural gas and the dissociation of water by electrolysis. In all cases, the hydrogen must be filtered to remove water and other contaminants that can damage the membrane and shorten fuel cell life.

Background

A fuel cell converts chemical energy directly into electrical energy in a chemical reaction between an electrolyte membrane and a fuel such as hydrogen. Polymer Electrolyte Membrane (PEM) fuel cells--also known as Proton Exchange Membrane fuel cells--are the type typically used in automobiles. The polymer electrolyte membrane is sandwiched between two electrodes (anode, cathode). Hydrogen gas is fed to the anode where a catalyst separates the negatively charged electrons from the positively charged ions protons. The membrane allows only the positively charged protons to pass through it to the cathode. The negatively charged electrons must travel along an external circuit wire to the cathode, creating the electrical energy. At the cathode, the electrons and positively charged ions combine with oxygen from the atmosphere to form water.

"Hydrogen and fuel cells have the potential to solve several major challenges facing America today: dependence on petroleum imports, poor air quality, and greenhouse gas emissions."

-U.S. Department of Energy

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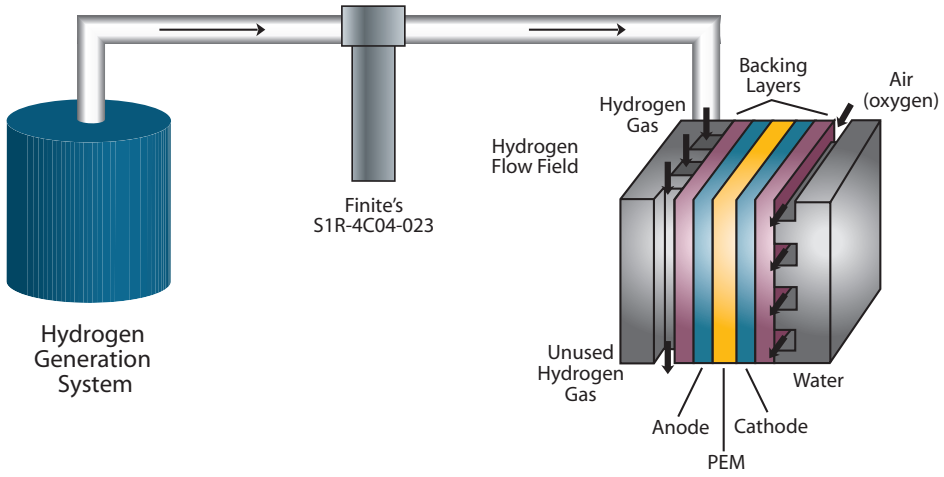

Parker Solution: Finite's Stainless Steel Filters

A Parker Hannifin stainless steel filter, with a coalescing filter element, was installed upstream of the hydrogen fuel cell. The coalescing media traps any contamination that may come through the pipes and into the fuel cell. The hydrogen must be filtered to remove water and other contaminants that can damage the membrane and shorten fuel cell life.

Filter Element Type Used in this Application

Media type C

This coalescing element is made with our special UNI-CAST construction. Composed of an epoxy saturated, borosilicate glass micro-fiber media, this media is used in applications requiring the removal of liquid and particulate contamination. This element is metal retained for extra strength. A grade 4, which is 99.995% efficient at removing liquid aerosols, is recommended when lighter weight gases, such as hydrogen, are being filtered.

For more information on this product, please see Finite's Bulletin 1300-997/USA.

S1R Specifications:

Model Number	Port Size (NPT)	Max. Pressure	Max. Temp.	Materials of Construction			Seals	Sump Capacity	Weight	Dimensions	
				Head	Internals	Bowl				Length	Width
S5R, S1R	1/8", 1/4"	5000 PSIG (345 bar)	350°F	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel	Fluoro-carbon	0.25 oz. (7.4 ml)	1.16 lbs. (0.53 kgs.)	4.0" (101.6mm)	1.75" (50.8mm)

Flow Rates (SCFM):

Filter Housing Model	Media Grade	100 PSIG	1000 PSIG	1500 PSIG	2000 PSIG	2500 PSIG	3000 PSIG	3500 PSIG	4000 PSIG	4500 PSIG	5000 PSIG
S5R/S1R	4	6.4	56	85	112	140	168	196	224	252	280

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