

## Watlow's Experience And Superior Products Help Optimize Fuel Cell Performance



Fuel cell developers, manufacturers and application developers are on a quest to optimize fuel cell cost and performance characteristics. Watlow's heaters, temperature sensors and temperature controllers are "enabling technologies" that are helping to reduce costs and increase performance of fuel cells and plant systems. In addition, Watlow's thermal systems capabilities and Single Iteration thermal modeling and machine design services help fuel cell companies get to market faster.

Watlow has experience working in a variety of fuel cell technologies including PAFC, PEMFC, MCFC and SOFC technologies. Watlow's thermal products are used primarily in the following areas:

- Fuel cell moisture management
- Fuel cell temperature management
- Ancillary systems temperature management

### Application Successes

#### Fuel Cell Test Stands (or Testing Stations)

Test stands not only test the performance of fuel cells, but also induce artificial operating conditions to see how the fuel cells respond to varying temperatures, humidities, etc. Watlow heaters such as cartridge, silicone rubber, band or circulation heaters provide quick heat up and excellent control for a variety of fluids such as coolant, de-ionized water, air and other gases such as methane or used to dump excess wattage production. Watlow thermocouples or RTD probes precisely sense fuel cell stack temperatures and auxiliary system temperature such as gases, liquids, etc. to provide accurate data.

#### Fuel Processors

The desulfurization and reforming operations of a fuel processor often need heat to ensure proper catalytic action. The type of processing technology used will drive the type of Watlow products used.

The principal Watlow applications are for fuel vaporization and heating of catalytic reactors. Ceramic fiber, cartridge or even band heaters are used in or around a chamber to vaporize fuel prior to processing. The same types of heaters are also used to optimize catalytic reactions. Watlow temperature sensors and temperature controllers are used for accurate and reliable temperature monitoring and control.

#### Air Preheating Systems

On higher temperature fuel cell systems such as solid oxide (SOFC) and molten carbonate (MCFC), air used to operate the fuel cell must be preheated to the proper inlet temperatures [typically above 650°C (1200°F)]. The air must achieve a minimum temperature so as not to cool down the fuel cell below optimal temperatures. Typically, a larger kW type of Watlow circulation heater with a Watlow control panel or turnkey skidded process heating system might be employed to accomplish this, especially on plant scale applications. Heat given off by fuel cell operation might be recuperated (recovered) and used to preheat the air in addition to or instead of electric heat.



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