

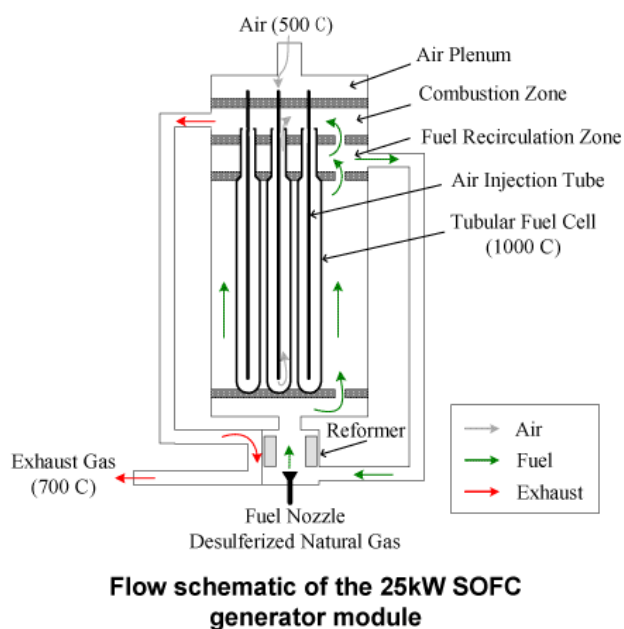
SOLID OXIDE INTEGRATED FUEL CELL SYSTEMS

OVERVIEW

The Siemens Westinghouse 25 kW Tubular Solid Oxide Fuel Cell (SOFC) is the first integrated SOFC precommercial prototype and research platform. Siemens Westinghouse Power Corporation has developed tubular SOFC technology as part of the U.S. Department of Energy's (DOE) advanced fuel cell research program, which is managed by DOE's Office of Fossil Energy and overseen by its National Energy Technology Laboratory in Morgantown, West Virginia. The system was initially installed at the Highgrove Generating Station of Southern California Edison in the spring of 1994. It was relocated to the National Fuel Cell Research Center and restarted first in January 1998 where it has been operated primarily on natural gas. This fuel cell was the first to operate on diesel and JP-8 fuels. As of January 2004, the system has operated for a total of 19,750 hours. The system is projected to operate for up to 20,000 hours, after which time the system may be retired to the Smithsonian Museum as the "world's first integrated solid oxide fuel cell system."



25kW SOFC system being installed at NFCRC



GOALS

NFCRC goals for testing the 25 kW SOFC system are to:

- Provide long-term operating data on the tubular Solid Oxide Fuel Cell (SOFC) design.
- Test component designs including heat exchangers, gas heaters, reformer technology, and controls.
- Investigate the emissions and dynamic performance of integrated fuel cell reformer systems with detailed measurements of the dynamic performance.
- Examine the fuel flexibility of SOFC systems using the 25 kW SOFC system to test operation on natural gas, diesel, JP-8, simulated coal gas, and simulated landfill and digester gas.

CURRENT RESEARCH

Test procedures and equipment are being implemented to test system operation with different fuels, such as natural gas, diesel reformat and coal gas. Coal gas is simulated according to specifications from advanced coal gasifiers. The coal gas consists of a mixture of hydrogen, carbon monoxide, methane, carbon dioxide and nitrogen. The integrated system performance and emissions of tubular SOFC systems with tolerance to a wide range of contaminants (CO, etc.) is being studied. Both the steady state and the dynamic performance of the system will be investigated.

Gas compositions and heating values for natural gas, simulated diesel reformat and simulated coal gas

Composition, vol. %	Natural Gas	Diesel gas	Coal Gas
CO	0	0	45
H ₂	0	30	35
CO ₂	0.94	20	16
N ₂	2.41	0	2
CH ₄	96.65	50	2
Total	100	100	100
LHV, kj/mole	800	474	217

PERSONNEL

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