

Experimental Investigation of Anode/Cathode Pressure Differences for a Solid Oxide Fuel Cell Gas Turbine Hybrid Power Plant

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Solid Oxide Fuel Cells (SOFC) and gas turbines can be coupled directly to form efficient hybrid power plants providing electricity based on various fuels. To ensure stable and efficient system operation the different operating characteristics of the major components SOFC and gas turbine require careful consideration of component design and operating strategy.

The DLR undertakes efforts to erect and operate a pilot hybrid power plant in the range of 30 kW of electrical power. Technical feasibility is to be demonstrated and the operating and design parameters for proper system operation are to be determined. The SOFC system pressure management is considered very important from SOFC perspective. Pressure variations originating from normal gas turbine operation might harm or even destroy the SOFC stack. If considering start-up or shut-down procedures or flame-out the situation becomes even more critical. Since very little information is available on acceptable pressure differences for SOFC stacks, a test rig for differential pressure test was set up and operated. Several stacks have been pressurized up to their mechanical failure level with overpressure on anode and cathode side and in stationary and transient operation.

The presentation will illustrate the general concept of the test rig and summarize the test results as well as identify potential reasons for pressure sensibility and stack failure.