

Full Scale PEM Fuel Cell Research at the Hawaii Fuel Cell Test Facility: Recent Progress

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Extensive research and development of proton exchange membrane (PEM) fuel cells has been conducted on small-scale cells, with areas on the order of 50cm². Research using industrial scale PEM fuel cells has been more limited. In response, the Hawaii Fuel Cell Test Facility (HFCTF) was developed by the Hawaii Natural Energy Institute in partnership with the Hawaiian Electric Company, UTC Fuel Cells, and the Office of Naval Research with extensive testing capabilities for full size PEM fuel cells up to 700cm². Opened for operation in April 2003, the facility currently houses three single-cell test stands for full size cells. Current facility expansion focuses on adding one single cell test stand in addition to one short stack (ca. 5 kW) test stand. In support of test stand operations, there is a host of auxiliary equipment including on-site hydrogen generation and storage systems, and a high-resolution auto-sampling facility gas analyzer including sub-ppm resolution for CO, CO₂, hydrocarbons, and 1 ppb S detection. Recent progress at the HFCTF includes the successful completion of 2000-hour reformat-based endurance tests of industrial-scale fuel cells. Apparent during these tests were important degradation mechanisms limiting cell life, including the detrimental effects of sub-ppm impurities in the fuel. This paper describes the unique capabilities of the HFCTF for long-term diagnostic evaluation of industry-scale fuel cells, and discusses recent progress.