

Long-term Performance Evaluation of a PEM Fuel Cell Stack in Dead-end Mode Operation

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Polymer electrolyte membrane fuel cells (PEMFC) are being developed for various applications. In some applications like submarines or aerospace systems, the fuel cell system cannot emit a large quantity of unused gas. So the fuel cell systems in such applications have to consume almost all gas which is supplied into the fuel cell.

Dead-end mode operation is one of the best ways to consume almost 100% of supplied gas. In dead-end mode, gas vent line of the fuel cell system is normally closed. During the operation, impurities among the supplied gas and generated water make the fuel cell performance (cell voltage) keep decreasing. If cell voltage is dropped to under the pre-defined value, the vent line opened and accumulated impurities and water are vented out of the fuel cell. These vent line close-open logic make the fuel cell maintain its performance, but it can also gives a pressure shock to fuel cell system. And this pressure shock can have an effect on the fuel cell durability. In this study, the performance change of a 2kW-class fuel cell stack is investigated, which has been operated in dead-end mode for over 1,500hrs.