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Air Conditioning Variation of 1kW Open-Cathode Proton Exchange Membrane (PEM) Fuel Cell

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Abstract : The PEM fuel cell is a device that generate electric by electrochemical reaction between hydrogen fuel and oxygen in the fuel cell stack. PEM fuel cell consists of an anode (hydrogen supply), a cathode (oxygen supply) and an electrolyte that allow charges move between the two positions of the fuel cell. The only product being developed after the reaction is water (H2O) and heat as the waste which does not emit greenhouse gasses. The performance of fuel cell affected by numerous parameters. This study is restricted to cathode parameters that affect fuel cell performance. At the anode side, the reactant is not going through any changes. Experiments with variation in air velocity (3m/s, 6m/s and 9m/s), temperature (10oC, 20oC, 35oC) and relative humidity (50%, 60%, and 70%) have been carried out. The experiments results are presented in the form of fuel cell stack power output over time, which demonstrate the impacts of the various air condition on the execution of the PEM fuel cell. In this study, the experimental analysis shows that with variation of air conditions, it gives different fuel cell performance behavior. The maximum power output of the experiment was measured at an ambient temperature of 25oC with relative humidity and 9m/s velocity of air.

Keywords : air-breathing PEM fuel cell, cathode side, performance, variation in air condition
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