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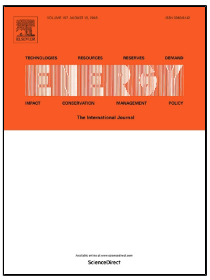

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Abstract: Ejector technology is introduced to perform the anode and cathode recirculation loops with low maintenance costs and high reliability. Four different operating strategies were designed for the novel solid oxide fuel cell-gas turbine hybrid system with anode and cathode ejectors to keep high efficiency and safety at a part-load operating condition. The part-load characteristics under different operating strategies were compared according to the simulation results. The comparison results show that the operating strategy has great effect on the part-load performance of the hybrid system with anode and cathode ejectors. Maintaining the SOFC operating temperature with variable speed operation has a great significance on the system efficiency. Moreover, fuel utilization, turbine inlet temperature, fuel cell temperature should be controlled and monitored to guarantee safely operating. Specifically, a concept of monitoring the temperature difference between anode and cathode channel is proposed. It can effectively avoid huge fuel cell temperature differences and compressor surge. Therefore, case 4 is an effective and appropriate operating strategy, which adjusts the primary fuel flow rate of SOFC, rotational speed, assistant fuel flow rate, compressor/turbine bypass flow rate to maintain turbine inlet temperature and temperature differences between anode and cathode.

Key words: Solid oxide fuel cell; Gas turbine; Anode and cathode ejectors; Operating strategy

1. Introduction

Fossil fuels will continue to supply the vast majority of the world's energy consumption in the next decades, and will contribute about 78% of the total energy consumption according to the EIA report [1]. The energy-hungry and environment issues are increasingly outstanding due to overuse of the fossil fuels [2-4]. There is a growing realization on the significance of the sustainable development. Establishment of an efficient, clean, economic energy structure has become the consensus of the world [5-9]. It has generated a lot of attention towards the fuel cell-gas turbine hybrid system as one of the most promising new energy conversion technologies due to its high efficiency and low emissions [10-15]. Moreover, ejector technology can be introduced to perform the anode and cathode recirculation loops, and it has lower maintenance costs and higher reliability compared with high temperature blower [16, 17]. Ejector technology has been widely introduced in the SOFC recirculation system, especially in the anode recirculation loop. Furthermore, the steady-state

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