MCFC-based marine APU: Comparison between conventional ATR and cracking coupled with SR integrated inside the stack pressurized vessel

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Description

In the present work the implementation of MCFCs as auxiliary power units on-board large vessels, such as cruising, passengers or commercial, ships was investigated. The MCFC stack was designed to supply 500 kW_e and was fed with diesel oil undergoing a reforming process. The system modelling of the plant was performed in steady-state and aimed at assessing the power efficiency for different reforming strategies, process configurations and constituting items thermal integrations. The code Matlab/Simulink was used to this end. Two major fuel processing strategies were examined: "auto-thermal reforming" and "inside vessel steam reforming". The latter consisted of a pre-reforming unit in which the liquid fuel underwent a catalytic cracking in mild conditions; subsequently, the resulting gas mixture made of light hydrocarbons was mixed with steam and fed into a steam reformer inside the MCFC stack vessel ...