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Simulation and Optimization of an Annular Methanol Reformer

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Abstract : This research aims to design a heat-exchanger type of methanol reformer coupled with a preheating design in gPROMS® environment. The endothermic methanol steam reforming reaction (MSR) and the exothermic preferential oxidation reaction (PROX) occur in the inner tube and the outer tube of the reformer, respectively. The effective heat transfer manner between the inner and outer tubes is investigated. It is verified that the countercurrent-flow type reformer provides the higher hydrogen yield than the cocurrent-flow type. Since the hot spot temperature appears in the outer tube, an improved scheme is proposed to suppress the hot spot temperature by splitting the excess air flowing into two sites. Finally, an optimization algorithm for maximizing the hydrogen yield is employed to determine optimal operating conditions.

Keywords : methanol reformer, methanol steam reforming, optimization, simulation
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