SELECTED OPTIONS TO INCREASE THE EFFICIENCY OF A STEAM METHANE REFORMER

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Industrial hydrogen production via Steam Methane Reforming (SMR) is characteristic by a two-step production mechanism: a high-temperature catalytic reforming of hydrocarbons is followed by water gas shift reaction performed at lower temperatures. SMR units may employ one or two shift reactors. In this study we examined the possible means of increasing the efficiency and lowering the energy intensity of an industrial SMR unit: Addition of the low-temperature shift reactor and CO_2 removal from syngas via pressure swing adsorption. Both options were assessed by their impact on auxiliary fuel consumption, electricity consumption and maximal production capacity of the plant. The impact of changed high pressure steam export was included as well. Shift reactor addition reduced specific feed (natural gas) consumption but led to increased specific auxiliary fuel consumption with the overall change in the natural gas balance being close to zero. Carbon dioxide removal, even without its sequestration, reduced the energy intensity of the plant. Calculations considering the implementation of both options at once showed synergic effects.

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