MODELLING STEAM METHANE REFORMER OPERATION WITH HYDROGEN-ENRICHED FEEDSTOCK

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Natural gas enrichment by renewable hydrogen belongs to key tools in reaching the ambitious decarbonization goals set by the European Union. Problems related to the renewable hydrogen production, its co-transport with natural gas and combustion properties of hydrogen-natural gas mixtures are researched intensely. Less attention is paid to the consequences of consumption of such gas mixtures in steam reformers – important natural gas consumers for industrial hydrogen production. Available studies recommend and assess hydrogen pre-separation. While possible, it is quite costly, especially regarding the inevitable presence of a large pressure gradient, whether in membrane or adsorption-desorption separations, coupled with large power requirements for the recompression of the low-pressure effluent. This stimulated the presented study devoted to assessing the operation of an industrial steam methane reformer with hydrogen-enriched feed and comparing the energy and carbon footprint of hydrogen production from conventional and enriched feed. Key findings are obtained, indicating which way of hydrogen recovery is more cost-effective and more environmentally friendly: whether hydrogen pre-separation or routing the hydrogen-enriched feed to the steam reformer.

Funding: This work was financially supported by the Slovak Research and Development Agency, Grant No. APVV-19-0170 and APVV-18-0134.