Techno-economic analysis for methane steam reforming in a membrane reactor

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With an increasing interest in hydrogen as an eco-friendly energy carrier, techno-economic analysis for hydrogen production is very essential. Among the various hydrogen production methods such as methane steam reforming (MSR), coal gasification, oil-based hydrogen production, and water electrolysis, MSR is chosen in this paper because it is a commercialized production method accounting for about 48% of global hydrogen production. Comparative studies for MSR in a conventional packed-bed reactor and a membrane reactor equipped with a hydrogen separation membrane showed the improved reactant conversions and product yields in a membrane reactor because of *Le Chatelier*'s principle. In addition, economic analysis was carried out to assess its economic feasibility through itemized cost estimation based on capital and operating costs, sensitivity analysis, and profitability analysis using cash flow diagram.