

عنوان مقاله:

Simulation and Economic Evaluation of Polygeneration System for Coproduction of Power, Steam, CH₃OH, H₂, and CO₂ from Flare Gas

محل انتشار:

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خلاصه مقاله:

Today, one of the challenging issues all over the world is the appropriate use of flare gases in oil, gas, and petrochemical industries. Burning flare gases having high heating value results in economic losses and the pollution of the environment. There are several methods to use flare gases; the heat and power generation, the production of valuable fuels, or the separation of more precious components are examples of these methods. In this study, a polygeneration system is designed and simulated for the coproduction of power, steam, methanol, H₂, and CO₂ from the flare gases in South Pars and Assaluyeh gas fields. The polygeneration system has advantages such as reducing greenhouse gases and the coproduction and sales of energy-related products. The polygeneration system for converting flare gases to energy and various products includes an acid gas removal unit, a synthesis gas production unit, a methanol synthesis unit, a hydrogen purification unit, a combined heat and power generation unit, and a CO₂ capture unit. The purpose of this study is to conduct an economic evaluation of the polygeneration system and obtain the total capital cost, the operating profit, and the payback period of this process. The simulation results show that using ۹۶۹۰ kg/h of flare gases produces ۸۱۳۳ kg/h methanol, ۶۵۳.۷ kg/h hydrogen, ۴۶۹۵۰ kg/h nitrogen, ۹۱۰۳ kg/h CO₂, ۱۰۹۸۵۰ kg/h medium-pressure steam, and ۳.۷ MW power. The economic evaluation results show that in the polygeneration system, the total raw material cost and the total utilities consumption cost are ۱۹۳.۸ and ۱۸۵۹.۵ per hour respectively, and the total product sales and the total utility sales are ۱۲۹۴۱.۸ and ۲۲۴۳.۵ per hour respectively; also, the operating profit is ۱۳۱۳۲ per hour. Also, the equipment cost, the installation cost, the total capital cost, and the total operating cost are ۲۹.۷ million per year, ۳۹.۲ million per year, ۷۱ million per year, and ۲۷.۹ million per year respectively; finally, the payback period is ۱.۵ years.

کلمات کلیدی:

Flare gas, Payback Period, Polygeneration, Simulation, Total Capital Cost

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