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Combining Petroleum Coke and Natural Gas for Efficient Liquid Fuels Production

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ABSTRACT

This work explores the technical feasibility and economic profitability of converting petroleum coke (petcoke) and natural gas to liquid fuels via Fischer-Tropsch synthesis. Different petcoke conversion strategies were examined to determine the conversion pathway which can be competitive with current market prices with little or no adverse environmental impacts. Three main design approaches were considered: petcoke gasification only, combined petcoke gasification and natural gas reforming through traditional processing steps, and combined petcoke gasification and natural gas reforming by directly integrating the gasifier's radiant cooler with the gas reformer. The designs investigated included scenarios with and without carbon capture and sequestration, and with and without CO₂ emission tax penalties. The performance metrics considered included net present value, life cycle greenhouse gas emissions, and the cost of CO₂ avoided. The design configuration that integrated natural gas reforming with the gasification step directly showed to be the more promising design for the wide range of analyses performed. The Aspen Plus simulation files have been made freely available to the public.

Keywords: Petcoke, Natural gas, Gasification, Fischer-Tropsch, CO₂ capture

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