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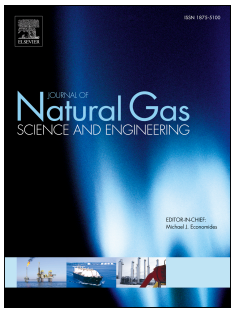

Modeling and multi-optimization of thermal section of Claus process based on kinetic model

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Modeling and multi-optimization of thermal section of Claus process based on kinetic model

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Abstract

The Claus process consists of two basic stages: thermal and catalytic sections. In this study, modeling by a kinetic model and multi-objective optimization of the thermal section of Claus process were described. The industrial data of the South Pars Refinery in Asaluyeh, Iran was used to validate this model. In order to investigate the influences of the inlet flow rates of fuel and air, inlet stream temperature, furnace pressure and waste heat boiler (WHB) outlet temperature on the sulfur recovery efficiency, the steam production and the H_2S/SO_2 ratio, a sensitivity analysis was done by simulator software. Three objects of the sulfur recovery efficiency, the steam production and the H_2S/SO_2 ratio were optimized by using the software and a multi-optimization approach based on the response surface methodology. The results showed that the decrease of the sulfur recovery efficiency from 0.6129 to 0.6099 leads to the addition of 8.54 Kgmole/h to the medium pressure steam production capacity and more closeness of the H_2S/SO_2 ratio to number 2 for better performance of the catalytic section. However, the 66% improvement in the H_2S/SO_2 ratio leads to increase the conversion of H_2S in the catalytic section, compensating the decrease of the sulfur recovery efficiency in the thermal section. Moreover, the total fuel consumption was reduced about 0.6843 Kgmol/h.

Keywords: Sulfur recovery, Claus, Furnace reactor, Kinetic model