

Modeling and optimization of the retrofit petrochemical complex with naphtha simulated-moving bed (SMB) unit

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The aim of this study is to optimize the operating conditions of the SMB unit and evaluate the their impacts to downstream processes including the naphtha thermal cracking and catalytic reforming. To achieve this aim, firstly a model of naphtha SMB unit integrating to the PCC is developed using the process simulator, Aspen Plus. The SMB unit, which contains two adsorption chambers of SMB and two distillation columns, is optimized regarding to energy and desorbent consumption. Secondly, reaction kinetics of naphtha thermal cracking and catalytic reforming after the SMB unit are also incorporated to the Aspen Plus model. A kinetic of one naphtha pseudo-decomposition and twenty molecular reactions is developed to calculate product yields of the naphtha thermal cracking reaction. While a rigorous kinetics model, which include 32 pseudo components and 84 reactions, is applied to map the continuous catalytic reforming reactions. The simulation result shows the increasing yields of both olefins and aromatics in the naphtha thermal cracking and catalytic reforming reactions following SMB unit by over 10%. Techno-economic analysis will proceed to evaluate the feasibility of the project.