

Reaction kinetics models of naphtha thermal cracking and catalytic reforming applied to retrofit petrochemical complex with simulated moving bed

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The objective of this study is to investigate the effect of the normal paraffins (n-paraffins) separation on reaction kinetics of the naphtha thermal cracking (NTC) and catalytic reforming (NCR) for the olefins and aromatics productions, respectively. First a process simulation of the SMB unit which is integrated to the petrochemical complex (PCC) was performed. Secondly, chemical reaction kinetics of the NTC and NCR were proposed and validated with plant data measured in conventional PCC (cPCC). Thirdly, cPCC were compared with retrofit PCC with SMB unit (rPCC) and modified rPCC (mrPCC) in terms of energy consumption, products rates and yields. The results of this work showed that olefins and aromatics yields of NTC and NCR can increase 22% and 19% than those in the cPCC, respectively, in mrPCC. However, total energy consumption of the mrPCC increases significantly by about 480 MJ/ton of naphtha feedstock because of higher operating temperatures of NTC and NCR, additional heat for thermal cracking, and desorbent recovery of the SMB unit.