

Optimal design of reactor-column-recycle system for selectivity engineering in column with side-reactor distillation

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The industrial manufacturing processes often proceed in a multi-reaction schemes involving desired and undesired products. Selectivity and yield towards the desired product usually improve by keeping the large reaction vessel or by maintaining the large recycle flow rate of excess reactant. Therefore, for these multiunit chemical processes, the foremost design trade-off is between the volume of reaction vessel and the recycle flow rate. This article studies the competing effects between these two design trade-offs in a SRC configuration to achieve some specified conversion or yield criterion. Two real chemical processes involving side-reactors, non-reactive distillation column, and recycle streams are considered and their optimal design configurations are discussed in detail. This work was supported by the Basic Science Research Program through the National Research Foundation of Korea (NRF), funded by the Ministry of Education (2018R1A2B6001566), and by the Priority Research Centers Program through the National Research Foundation of Korea (NRF 2014R1A6A1031189).