

Simulation and Optimization of the Phosgenation Reactive Distillation Process for Producing Toluene Diisocyanate

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Abstract

Toluene diisocyanate (TDI) is an important chemical intermediate prepared by phosgenation reaction between toluene diamine and phosgene with two steps name cold and thermal phosgenation respectively. In this paper, the reactive distillation model for the thermal phosgenation reaction based the kinetics equations was established for an industrial installation, and the effects of the different parameters on the process performance were studied firstly; then based on the analysis results, a thermal coupling process between the towers of reactive distillation and phosgene purification was presented and investigated; finally, the optimal operation scheme was simulated and the results showed that the proposed process can save the heat and cold energy with 7.29% and 32.78%, respectively, and reduce the total annual cost about 17.11%. The result of the paper can be used to guide the operation configuration or the revampment of the TDI production equipment.

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