

Determination of Starting Design Parameters for Reactive-Dividing Wall Distillation Column Simulation Using a Modified Shortcut Design Method

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Abstract : A new shortcut method for the design of reactive-dividing wall columns (RDWC) is proposed in this work. The RDWC is decomposed into its thermodynamically equivalent configuration naming the Petlyuk column, which consists of a reactive prefractionator and an unreactive main fractionator. The modified FUGK(Fenske-Underwood-Gilliland-Kirkbride) shortcut distillation method, which incorporates the effect of reaction on the Underwood equations and the Gilliland correlation, is used to design the reactive prefractionator. On the other hand, the conventional FUGK shortcut method is used to design the unreactive main fractionator. The shortcut method is applied to the synthesis of dimethyl ether (DME) through the liquid phase dehydration of methanol, and the results were used as the starting design inputs for rigorous simulation in Aspen Plus V8.8. A mole purity of 99 DME in the distillate stream, 99% methanol in the side draw stream, and 99% water in the bottoms stream were obtained in the simulation, thereby making the proposed shortcut method applicable for the preliminary design of RDWC.

Keywords : aspen plus, dimethyl ether, petlyuk column, reactive-dividing wall column, shortcut method, FUGK

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