Effect of the temperature in the decanter on total annual cost of the separation process for binary heterogeneous azeotropic mixture

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Abstract

Hexane/methanol binary heteroazeotrope was studied to separate by a two-column/decanter process. The mixture was fed to the decanter and layered into two phases whose concentration is changing under various temperatures. Each phase was specified as the feed stream of the two columns so that the costs of the process changed when the decanter temperature are different. Total annual cost (TAC) was used to investigate and optimize the parameters of the process. The minimum TAC was optimized by a sequential iterative optimization procedure. A modified process was developed to further reduce the TAC. The results show that the minimum TAC of the modified process is 4.2 % lower than that of the conventional two-column/decanter process. The operational cost and the capital cost of the modified process are 10.3 % and 2.3 % lower than those of the conventional process. The costs differences under different temperatures demonstrate that the temperature has impacts on the process economics and it should be carefully considered when separating binary heteroazeotropes by the two-column/decanter processes.