Feasibility of new pressure swing batch distillation methods

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Abstract

The pressure swing distillation in different batch column configurations is investigated by feasibility study and rigorous simulation calculations. Besides studying the well known batch configurations (rectifier, stripper, middle vessel column) we also suggest two novel configurations such as double column batch rectifier and double column batch stripper. The alternate application of a batch rectifier and a batch stripper is also studied. The feasibility method is based on the assumption of maximal separation. The results of the feasibility studies are verified by rigorous simulations based on less simplifying assumptions. The calculations are made by a professional dynamic flow-sheet simulator for the separation of a minimum (ethanol–toluene) and a maximum boiling (water– ethylene-diamine) azeotropic mixture. The different column configurations are compared. The double column batch stripper (for the separation of the minimum azeotrope) and the double column batch rectifier (for the maximum azeotrope) showed several advantages (e.g. only one production step without pressure change, lower energy consumption) compared with the other configurations.

Keywords: Batch Distillation, Separation of Azeotropes, Pressure Swing Distillation, Batch Column Configurations, Feasibility Study, Rigorous Process Simulation

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