Optimal Total Reflux Period Duration in Batch Distillation

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Abstract
Batch distillation is a widely used method for mixtures separation and purification most suitable for flexible small-scale separations in chemical, biochemical and pharmaceutical industries. In this dynamical process, product is collected in the production phase which is preceded by the total reflux start-up phase when mixture in column top is enriched by more volatile components necessary for the desired product quality. Most commonly employed start-up strategy is a total reflux operation until achieving steady state composition before product removal which can consume substantial portion of total process energy. In this work, total reflux phase duration is optimised using a binary batch distillation mathematical model. The goal of the optimization is to minimize overall process duration needed to obtain desired product quantity and quality by varying total reflux phase duration. Effect of separation difficulty and tray and reflux tank holdup on optimal total re flux duration is examined.