A Systematic Approach for Synthesizing Multicomponent Distillation Sequences

H. Hou*, Y. Luo

Tianjin University, China

Abstract

By using non-sharp split as a prefractionator in a multicomponent distillation column system, the energy consumption can be significantly reduced comparing to the sharp distillation sequence systems. This is because remixing effect, which inherently exists in a sharp distillation sequence for the middle components, can be avoided. The problems of synthesis of multicomponent separation systems with non-sharp split have been widely investigated. Matrix method and Coding procedure are the most popular methods recently. However, the matrix method cannot guarantee to obtain all of the distillation configurations, while the coding procedure has to do huge number of works to ensure the separation sequences are feasible and need a complex decoding procedure to generate the corresponding separation process structure. What’s more, both of them do not have an algorithm to get sequences directly, and ensure all the distillation column sequences are got without repetition.

To solve the problems mentioned above, this paper proposes a methodology based on a new coding procedure. For an N-component mixture separation, the distillation sequences is comprised of N-1 columns, the non-sharp splits of which contain an arbitrary number of middle components. The distillation column sequences we got are feasible certainly, and corresponding to unique separation sequences. Finally, an example problem has been solved to arrive at the overall minimum cost for the process, which demonstrates the method is more effective and is much better than existing methods.