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Design and control of extractive distillation process for separation of the minimum-boiling azeotrope ethyl-acetate and ethanol

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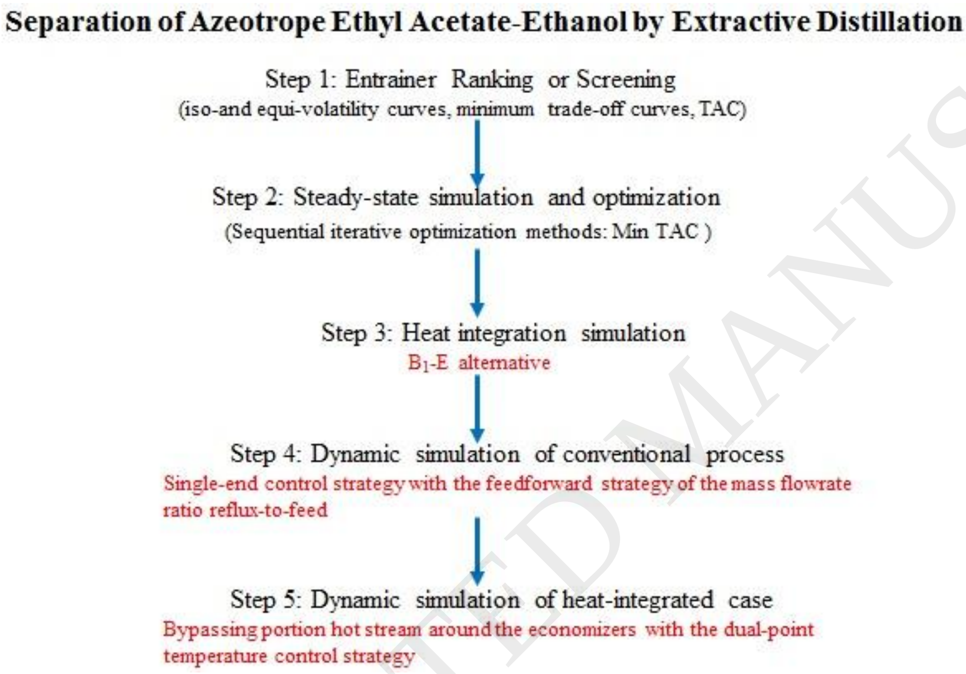
Graphical Abstract



Highlight:

- ★1. The capable solvent is screened by the IECs, minimum-tradeoff curves and TAC.
- ★2. The three evaluation indicators are employed to rank the different configurations.
- ★3. The application of exergy loss analysis represents the thermodynamic efficiency.
- ★4. The simple types of heat integration (B_1-E, F-B_1-E) are investigated.
- ★5. A new control scheme of bypassing stream with dual-temperature strategy is devised.

Abstract: Design and control of extractive distillation process is explored by taking the separation of minimum-boiling azeotrope ethyl-acetate and ethanol as an example. The two evaluation indicators of second-law efficiency and CO_2 emissions are employed to evaluate different alternatives, which consist of conventional case, F-E process (hot solvent stream to preheat fresh feed of extractive column), B_1-E process (hot solvent stream to preheat feed of recovery column), and F-B_1-E process (hot solvent stream to preheat feed of extractive and recovery column). The conventional case can