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过程系统工程

基于子网络强制进化的大规模换热网络优化

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摘要 换热网络优化是典型的混合整数非线性规划（MINLP）问题，此问题的非线性约束以及到处存在的局部极值，使得最优解的获得尤其困难。特别是对于大规模网络来说，当物流数目增加时，可行的结构数目呈指数增长，目前还没有一种有效的算法来解决此类问题。应用改进的混合遗传算法，首先对换热网络进行初始优化，对初步优化结果进行子网络的划分，然后进行基于官能团（子网络）的重组、分解和交叉操作，获得了很好的结果。

关键词

换热网络优化 子网络 MINLP 大规模

分类号

Optimization of large-scale heat exchanger networks by evolution of sub-networks

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Abstract

The optimization of heat exchanger networks (HEN) is a typical MINLP problem.For large-scale HEN, when the number of process streams increases, its feasible configurations could increase exponentially.Till now, no effective methods are available to solve such problems.A new strategy based on the optimization of the sub-networks of HEN was proposed.According to the first optimization, the sub-networks underwent recombination,decomposition and transplantation operations were further optimized with the hybrid genetic algorithm.Evolution of the sub-networks instead of the optimization of the whole HEN was simple and fast.A large-scale HEN with 22 hot and 17 cold streams from literature was calculated with this new method and a better result was obtained. Although the exchanger area increased a little, the number of heat exchanger units was less, also utility and total annual cost decreased.

Key words

heat exchanger network optimization sub-network MINLP large-scale

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