

过程系统工程

柔性换热器网络综合与清洗时序安排同步优化

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摘要

提出在柔性换热器网络设计时考虑设备投入运行后实施在线清洗时序安排的同步优化方法, 实现换热器网络动态综合。为降低该问题计算的复杂性, 提出采用两阶段法。第一阶段利用虚拟温-焓图法初步综合获得考虑设备结垢过程和流股入口温度、热容流率发生变化时的多周期柔性网络, 在同步优化之前识别出较优匹配候选。第二阶段, 换热网络结构、设备面积和清洗时序安排利用遗传/模拟退火算法进行同步优化。通过积分方法来计算随时间变化的公用工程消耗, 所建立的数学模型因此比以往文献更加严格。计算实例表明, 所提方法有效降低年度总费用, 同时能够解决大规模柔性换热器网络综合问题。

关键词

[柔性换热器网络](#) [清洗时序安排](#) [同步优化](#)

分类号

Simultaneous optimization of synthesis and cleaning schedule for flexible heat exchanger network

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Abstract

A novel method is presented for synthesizing flexible heat exchanger network (HEN) and optimizing on-line cleaning schedule simultaneously at the initial design stage, so that dynamic synthesis of HEN can be implemented. To reduce severe problem complexity, a two-stage approach is introduced. In the first stage, a multi-period network over source stream temperature, heat capacity flowrate and overall heat transfer coefficient is preliminarily synthesized by pseudo-temperature enthalpy diagram approach, thus most promising matches favorable to thermal economy are identified. In the second stage, the network structure is further optimized in parallel with heat exchanger areas and cleaning schedule by genetic/simulated annealing algorithms (GA/SA). As utility consumptions are acquired by integral approach, the established mathematical model in this work is more rigorous than those reported in literatures. Finally, the proposed method is proved to be capable to decrease the total annual cost with a numerical example. Moreover, it may be applied to solve relatively large-scale flexible HEN synthesis problems.

Key words

[flexible HEN](#) [cleaning schedule](#) [simultaneous optimization](#)

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