

过程系统工程

基于线性规划的单杂质间歇过程用水最小化

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摘要 对间歇化工过程的单杂质用水网络提出了以新鲜水量最小为目标的优化设计方法。该方法对间歇过程的每个操作假定为一个操作接一个储罐,对所有操作按出口浓度从小到大排序,避免了高浓度水回用到低浓度水的操作中,去掉了用水网络中多余连接,构造了用水网络超结构。该超结构可以表述为一个线性规划模型。通过GAMS求解该模型得出每个操作周期的最小新鲜水量,并通过证明得出该最小用水量随操作周期增加最终不再变化。该方法可以用作有、无中间储罐间歇过程用水网络综合,实例计算结果表明该方法是可行的,与其他方法相比更简单。

关键词 [间歇过程](#); [用水网络](#); [优化](#); [线性规划](#)

分类号

Fresh water minimization for batch process with single contamination based on linear programming

Abstract

A method based on linear programming was proposed to design water network in batch chemical processes with a single contaminant. The aim was to determine the optimal water use structure for fresh water minimization in each operation cycle. Each operation in batch processes was assumed to connect with a tank. These operations are arranged in the order of outlet concentration from low to high. This method avoided the re-use of high concentration water in the operation with low concentration water. Then a superstructure was developed which entailed all the re-use possibilities. By solving the linear programming model corresponding to the superstructure with general algebraic modeling system (GAMS), the minimal fresh water was identified. Furthermore, it was proved that the final minimal fresh water reached a fixed value with repeating operation cycles. The proposed method could be applied to the optimization of batch water network with or without a storage tank. The results of the case study show that the method is feasible and simpler than other methods.

Key words [batch process](#) [water network](#) [optimization](#) [linear programming](#)

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