中国化学工程学报 2006 12 (5) 682-687 ISSN: 1004-0196, CN: 44-1803/R

SYSTEM ENGINEERING

间歇生产过程鲁棒统计监控及应用

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收稿日期: 修回日期: 网络版发布日期: 接受日期:

摘要: In order to reduce the variations of the product quality in batch processes, multivariate statistical process control methods according to multi-way principal component analysis (MPCA) or multi-way projection to latent structure (MPLS) were proposed for on-line batch process monitoring. However, they are based on the decomposition of relative covariance matrix and strongly affected by outlying observations. In this paper, in view of an efficient projection pursuit algorithm, a robust statistical batch process monitoring (RSBPM) framework, which is resistant to outliers, is proposed to reduce the high demand for modeling data. The construction of robust normal operating condition model and robust control limits are discussed in detail. It is evaluatedon monitoring an industrial streptomycin fermentation process and compared with the conventional MPCA. The results show that the RSBPM framework is resistant to possible outliers and the robustness is confirmed.

关键词: 间歇生产过程; 鲁棒; 多元统计; 投影; MPLS;

分类号:

DOI:

A Robust Statistical Batch Process Monitoring Framework and Its Application

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Received Revised Online Accepted

Abstract In order to reduce the variations of the product quality in batch processes, multivariate statistical process control methods according to multi-way principal component analysis (MPCA) or multi-way projection to latent structure (MPLS) were proposed for on-line batch process monitoring. However, they are based on the decomposition of relative covariance matrix and strongly affected by outlying observations. In this paper, in view of an efficient projection pursuit algorithm, a robust statistical batch process monitoring (RSBPM) framework, which is resistant to outliers, is proposed to reduce the high demand for modeling data. The construction of robust normal operating condition model and robust control limits are discussed in detail. It is evaluatedon monitoring an industrial streptomycin fermentation process and compared with the conventional MPCA. The results show that the RSBPM framework is resistant to possible outliers and the robustness is confirmed.

Key words robust statistical batch process monitoring; robust principal component analysis; streptomycin fermentation; robust multi-way principal component analysis;

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