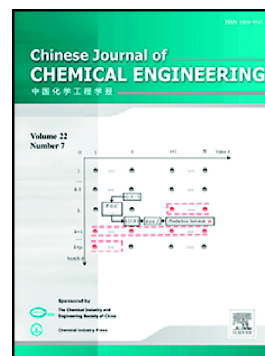


Accepted Manuscript

Total plant performance evaluation based on big data:
Visualization analysis of TE process

Mengyao Li, Wenli Du, Feng Qian, Weiming Zhong



PII: S1004-9541(17)31318-6
DOI: doi:[10.1016/j.cjche.2018.06.009](https://doi.org/10.1016/j.cjche.2018.06.009)
Reference: CJCHE 1172

To appear in: *Chinese Journal of Chemical Engineering*

Received date: 4 October 2017
Revised date: 29 April 2018
Accepted date: 11 June 2018

Please cite this article as: Mengyao Li, Wenli Du, Feng Qian, Weiming Zhong , Total plant performance evaluation based on big data: Visualization analysis of TE process. Cjche (2018), doi:[10.1016/j.cjche.2018.06.009](https://doi.org/10.1016/j.cjche.2018.06.009)

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Process Systems Engineering and Process Safety

Total plant performance evaluation based on big data: Visualization analysis of TE process

Mengyao Li, Wenli Du*, Feng Qian*, Weiming Zhong

Key Laboratory of Advanced Control and Optimization for Chemical Processes, Ministry of Education, East China University of
Science and Technology, Shanghai 200237, China

Abstract: The performance evaluation of the process industry, which has been a popular topic nowadays, can not only find the weakness and verify the resilience and reliability of the process, but also provide some suggestions to improve the process benefits and efficiency. Nevertheless, the performance assessment principally concentrates upon some parts of the entire system at present, for example the controller assessment. Although some researches focus on the whole process, they aim at discovering the relationships between profit, society, policies and so forth, instead of relations between overall performance and some manipulated variables, that is, the total plant performance. According to the big data of different performance statuses, this paper proposes a hierarchical framework to select some structured logic rules from monitored variables to estimate the current state of the process. The variables related to safety and profits are regarded as key factors to performance evaluation. To better monitor the process state and observe the performance variation trend of the process, a classification-visualization method based on kernel principal component analysis (KPCA) and self-organizing map (SOM) is established. The dimensions of big data produced by the process are first reduced by KPCA and then the processed data will be mapped into a two-dimensional grid chart by SOM to evaluate the performance status. The monitoring method is applied to Tennessee Eastman process. Monitoring results indicate that off-line and on-line performance status can be well detected in a two-dimensional diagram.

Keywords: performance evaluation; structured logic rules; hierarchical framework; multidimensional visualization; KPCA-SOM

1. INTRODUCTION¹

The performance evaluation has many advantages to the process industry, for example, assessing the ability of a system, identifying the weakness, adjusting and optimizing, verifying the resilience and reliability of the process. It has become a significant issue to seek out the appropriate method to assess the process performance accurately.

At present, much research has been conducted on the performance assessment of the process industry, most of which are concentrated on two aspects: one on the evaluation of factory management and the other on the assessment of controllers. Studies on factory management are mainly focused on improving the sustainability of factories[1-4]. In these articles, a performance index is first proposed, and some factors related to the performance index are listed; the sub-factors of the related factors are listed step by step, namely, the famous analytical hierarchy process (AHP)[5]. For example, RK Singh et al.[6] presented a methodology for developing a composite sustainability performance index

¹ Supported by the National Nature Science Foundation of China (61590923, 61422303, 21376077)

* Corresponding authors. E-mail: wldu@ecust.edu.cn (W.Du); fqian@ecust.edu.cn (F. Qian).

Download English Version:

<https://daneshyari.com/en/article/10150270>

Download Persian Version:

<https://daneshyari.com/article/10150270>

[Daneshyari.com](https://daneshyari.com)