

过程系统工程

丙烯精馏塔智能控制系统设计及应用

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摘要

针对乙烯生产装置丙烯精馏塔的工艺特征和操作特点, 利用支持向量机在小样本数据建模中的优势, 提出一种基于支持向量机丙烯浓度软测量技术, 解决了塔釜建模数据样本少的问题, 实现了塔釜丙烯浓度在线测量。在上述软测量系统的基础上, 设计了丙烯浓度智能控制系统。该系统采用模糊PID作为丙烯浓度控制器, 其输出量作为灵敏板温度控制器的设定值, 与灵敏板温度控制构成串级调节系统, 同时为了克服进料量对灵敏板温度造成的干扰, 设计了进料流量前馈控制器。丙烯浓度智能控制系统对塔釜丙烯指标进行实时控制, 提高了塔釜丙烯浓度的控制平稳度, 解决了塔釜丙烯浓度超标问题。现场应用效果表明, 该丙烯浓度软测量系统测量精度高, 控制系统可以有效控制塔釜丙烯浓度, 取得了良好的控制效果, 满足了工业现场运行的需要。

关键词

[支持向量机](#) [软测量](#) [丙烯精馏装置](#) [智能控制](#)

分类号

Design and implementation of intelligent control system for propylene distillation column

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Abstract

In this paper, a soft sensor technique on the basis of support vector machines (SVM) was proposed to estimate the propylene concentration on the bottom of the distillation column, which took into consideration of the process knowledge and operation characteristics of the propylene distillation column. The advantage of SVM in small samples modeling was taken in the soft sensor technique. Furthermore, an intelligent control system was designed to real-time control the bottom propylene concentration in the distillation. A fuzzy PID was used as the master controller for the propylene concentration. One PID controller was used as the slave controller for the sensitive plate temperature. The two controllers constituted a cascade control system. In order to eliminate disturbance of the feed stock, a feedforward controller was designed in the system. The designed soft sensor and control strategy were used in one selected olefin plant and the results were demonstrated and discussed in this paper. The results were promising and showed that the constructed soft sensor was precise enough to satisfy the industrial on-site requirements. Moreover, the control strategy was efficient to guarantee the bottom propylene concentration under the specified limit.

Key words

[support vector machines](#) [soft sensor](#) [propylene distillation column](#) [intelligent control](#)

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