

Rule-based PLS modeling for adaptive monitoring

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Process/quality monitoring based on PLS model has played an important role in detecting process upsets, off-spec qualities, or other special events. However, the frequent changes of operating conditions require frequent updates of models. The key of adaptive monitoring is the fast and correct identification of operating mode changes from normal variations due to disturbances. This paper proposes a novel PLS modeling approach based on a method for detecting and classifying process state changes into operating mode changes or variations due to disturbances. Key idea of detecting and classifying process states is to extract process knowledge on detecting operating mode changes as if-then rules. If the changing state is not accepted through the defined rules, the change is classified as the variation due to disturbances. The PLS model is updated with two alternative update styles when identifying the changed states as mode change: update of only scaling parameter and update of all the model parameter. The proposed approach was applied to process data collected from an industrial fired heater in a refinery plant. It showed less update frequency and better prediction performance than block-wise recursive PLS approach.