Integration of a reduced first-principles model in predictive control of a complex distillation column

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Abstract
As operating conditions are changed continuously driven by the economic optimization layer, performance problems in the regulatory layer due to poor tuning escalate. These performance problems prevent reaping off most of the potential economic gains of real-time optimization. In this work, the integration of a reduced process model with Parametric Predictive Control (PPC) is discussed for bottom temperature control of a distillation column. The obtained control law is very simple to implement and exhibits excellent performance over a wide range of operating conditions without any need for retuning. Disturbances that have been studied include changes to the composition and temperature in the column feed and to the internal reflux flow rate. The use of a state estimator to compensate for modelling errors is discussed. Results obtained are very encouraging and an industrial implementation of the controller is currently underway.

Keywords: Predictive control, Nonlinear process control, Modelling for control.