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SCHEDULING, OPTIMIZATION AND CONTROL OF POWER FOR INDUSTRIAL COGENERATION PLANTS

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Highlights:

- Power scheduling application of cogeneration plants uses a first principle, steady-state, non-linear model
- Process model tuned continually with plant data and also used for online optimization
- Scheduler results are implemented using a model predictive controller

Abstract

Scheduling, optimization and control of power for three industrial cogeneration plants at one of Dow's Louisiana site is presented in this paper. A first principle mathematical model that includes mass and energy balances for gas turbines, heat recovery units, steam turbines, pressure relief valves and steam headers is used to formulate multiple optimization problems to recommend the best strategy to trade power. The model has detailed operational information that includes equipment status and control curves for different operating scenarios. The scheduled power offer curve is obtained by solving multiple optimization problems using the validated process model along with operational and equipment limitations. Adjustment of power schedule offer is done in the real-time market thirty minutes prior to the hour and implementation of the dispatched power schedule is done using a model predictive controller.

Keywords

industrial cogeneration process, day-ahead scheduling, real-time optimization, model predictive control

Introduction:

Scheduling power in day-ahead market for a combined heat and power (CHP) cogeneration plant requires accurate predictions of steam and electricity production, and fuel consumption for various operating scenarios. A good survey on short term cogeneration planning that includes day-ahead market has been published by Salgado and Pedrero (2008). Day-ahead short term planning typically consists of hourly planning intervals that require