

Hubert Hadera

TU Dortmund, BCI

Date: 4th of February 2015

Time: 4.00 p.m.

Room: 205, Otto-Hahn-Straße 16

Integration of Production Scheduling and Energy-Cost Optimization in Process Industry

Abstract:

The traditional strategy in industry is to schedule the production first. Then, energy purchase and sale optimization models find the best available energy portfolio based on energy demand prediction. This is not necessarily a system-optimal solution.

The common way reported in literature is to create a monolithic model which guarantees system-wide optimality. We propose such approach for a large-scale MILP scheduling problem at a stainless-steel plant. The problem is solved using a general precedence continuous-time scheduling approach and a tailored bi-level heuristic to overcome computational-time limitations.

Next, we propose to use the mean value cross decomposition strategy for solving the total problem as separated MILP models: the energy-aware production scheduling problem (as Dantzig-Wolfe's sub-problem) and energy-cost optimization problem (as Benders' sub-problem). We apply the developed approach to a Thermo-Mechanical Pulping (TMP) process using discrete-time Resource-Task Network approach. For industrial use the approach allows using existing models and obtaining very good quality solutions.

In both cases MILP-based scheduling model comprises the minimization of deviation penalties as a result of committed load problem. In energy cost optimization we use the generalized minimum cost flow network model to find the optimal structure of multiple time-sensitive electricity contracts including base load, time-of-use, day-ahead spot market and onsite power generation, and opportunity to sale electricity back to the grid with revenues.