MILP Models for Medium-Term Planning and Scheduling in Multiproduct Multistage Continuous Plants

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Abstract.

The planning and scheduling of multiproduct multistage continuous and batch plants have been intensively studied for the last 20 years in different manufacturing areas, e.g., pharmaceutical, automotive and chemical industries. Previous contributions for multiproduct continuous plants were developed considering only a single-stage or focusing in the cycle scheduling, but no many have been proposed for multistage continuous processes.
We will focus our attention on the planning and scheduling problem of multiproduct multistage continuous plants with a single production unit per stage. Concerning this problem, Liu et al. (2009) proposed a hybrid discrete/continuous time model for the planning of multiproduct multistage plants with sequence-dependent changeovers based on the classic Traveling Salesman Problem (TSP) for the assignment and precedence-based constraints for the task's sequencing.
In this work two hybrid discrete/continuous time MILP (Mixed Integer Linear Programming) models for multiproduct multistage processes with sequence-dependent issues are presented. The main ideas of these models are based in the integration of a reformulated version of the well-known Traveling Salesman Problem (TSP), presented in Liu et al. (2009), with the sequencing decisions of the general-precedence and unit-specific general-precedence representations (Mendez et al., 2006). In order to deal with large instances, a rolling horizon procedure and a local-search algorithm are derived for solving the whole problem in a reasonable computational time (Castro et al., 2011). Results demonstrate the benefits of the new formulations in comparison with other general precedence representations proposed in Kopanos et al. (2009) and Aguirre et al. (2012) adapted for this problem and also the effectiveness of the solution approach.

References

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