

# MIXED INTEGER PROGRAMMING FOR PRODUCTION PLANNING AND SCHEDULING

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## **Abstract**

We present an introduction to the use of mixed integer programming to solve production planning and sequencing problems modeled with discrete time intervals. First we discuss the importance of strong formulations and decomposition in tackling NP-hard problems. This has led to the detailed study of formulations for a variety of single-item lot-sizing and single machine scheduling problems, with positive results for lot-sizing and largely negative results for machine scheduling.

For the production problems, the challenge is to extend these results for single-item problems so as to tackle the many multi-item variants encountered in practice. Here we specifically consider a two-level supply chain model involving production and transportation with fixed costs at both levels, and a parallel machine problem with sequence-dependent start-up costs. For the scheduling problems, the challenge is to learn from constraint programming and develop hybrid methods, as well as to pursue the search for “good” formulations.