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**SOLVING MULTI-ITEM CAPACITATED LOT-SIZING
PROBLEMS WITH SETUP TIMES BY BRANCH-AND-CUT**

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Abstract

Instances of the multi-item capacitated lot-sizing problem with setup times (MCL) often appear in practice, either in standard form or with additional constraints, but they have generally been difficult to solve to optimality. In MCL demand for multiple items must be met over a time horizon, items compete for a shared capacity, and each setup uses up some of this capacity. In this paper we use results concerning the polyhedral structure of simplified models obtained from a single time period of MCL to obtain strong valid inequalities for MCL. To the best of our knowledge, these inequalities are the first to consider demand for multiple items and the joint capacity restriction simultaneously. We also discuss how to implement these inequalities successfully in a branch-and-cut algorithm. Our computational results suggest that our contributions represent significant progress in solving instances of MCL.

Keywords: Mixed integer programming, cutting planes, production planning, capacitated lot-sizing, setup times.

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