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J. Christian Lang

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Quantitative approaches for solving production planning and inventory management problems in industry have gained growing importance in the past years. Due to the increasing use of Advanced Planning Systems, a widespread practical application of the sophisticated optimization models and algorithms developed by the Production Management and Operations Research community now seem within reach. The possibility that products can be replaced by certain substitute products exists in various application areas of production planning and inventory management. Substitutions can be useful for a number of reasons, among others to circumvent production and supply bottlenecks and disruptions, increase the service level, reduce setup costs and times, and lower inventories and thereby decrease capital lockup. Considering the current trend in industry towards shorter product life cycles and greater product variety, the importance of substitutions appears likely to grow. Closely related to substitutions are flexible bills-of-materials and recipes in multi-level production systems. However, so far, the aspect of substitutions has not attracted much attention in academic literature. Existing lot-sizing models matching complex requirements of industrial optimization problems (e.g., constrained capacities, sequence-dependent setups, multiple resources) such as the Capacitated Lot-Sizing Problem with Sequence-Dependent Setups (CLSD) and the General Lot-Sizing and Scheduling Problem for Multiple Production Stages (GLSPMS) do not feature in substitution options.

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