# OPTIMIZING THE STORAGE ASSIGNMENT IN A WAREHOUSE SERVED BY MILKRUN LOGISTICS

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The storage assignment problem involves the placement of a set of items in a warehouse in such a way that some performance or cost measure is optimal. We investigate this problem in the context of a warehouse served by milkrun logistics, i.e. vehicles circulating according to pre-defined schedules between the warehouse and the production departments of the plant. Since each milkrun cycle (vehicle) serves the material requirements of a different department, and each department produces different end products, different milkrun cycles have different probabilities of requiring an item. Requests are processed simultaneously by multiple human order pickers assigned to a number of zones in the warehouse.

Informally, order picking times can be reduced by placing high-runner items near to the entrance of the warehouse, and by storing items that are often ordered together close to each other. Technically, this problem is a special case of correlated storage assignment, where the organizational structure behind the correlation among ordering probabilities of different items is known and can be exploited by a mathematical model. We show that with appropriate approximations of the probabilistic formulae, the problem can be represented as a MIP, and can be solved by commercial software.

We demonstrate that minimizing the order cycle time (maximum of individual pickers' times) and minimizing the average picking effort (sum of pickers' times) are conflicting criteria. Our MIP allows controlling the trade-off between these criteria by minimizing a linear combination of the two, or minimizing one of them subject to an upper bound on the other.

A simple simulation environment has been developed to test the performance of the proposed approach on a detailed model of order picking in the warehouse. The novel strategy has been compared to classical cube-per-order index-based (COI) techniques in computational experiments. Experimental results show that our approach leads to an up to 36-38% improvement in either criterion compared to COI.