

## **The order picking problem under a scattered storage policy**

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The rapid growth in e-commerce and the high customer expectations with respect to short lead times put warehouses under large pressure. In this paper, we study how the use of a scattered storage policy can help to improve the order picking efficiency. Under such a policy, each stock keeping unit (SKU) is stored at multiple locations inside the warehouse. Consequently, there are more opportunities to pick the SKU from a location that is close to the other SKUs that are picked by the same picker in the same pick tour. This flexibility comes with the cost of an additional decision to be made, namely the decision from which storage location should an SKU be picked.

We extend the mathematical formulation of the order picking problem to comply with the assumption of a scattered storage policy. To achieve this, we make use of the Generalized Travelling Salesman Problem formulation. All storage locations that contain the same SKU, are grouped together in a so-called cluster and picking an SKU is equivalent to visiting exactly one vertex in the cluster of this SKU. The objective is to minimize the total distance travelled by the pickers while serving all outstanding customer orders. As the ILP formulation becomes intractable for larger (more realistic) order picking instances, we present a Guided Local Search algorithm for solving the order picking problem under scattered storage policy. Both methods are tested extensively on benchmark instances from the literature.

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