A VNS approach to multi-location inventory redistribution with vehicle routing

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A VNS approach to multi-location inventory redistribution with vehicle routing

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Abstract

This paper analyzes a two-echelon inventory problem with uncertain demand, where perishable products are distributed from a central warehouse to retail stores. To better deal with uncertainty, we propose a model in which, at a certain point in time during the operation time window, transshipments between retail stores are allowed in order to re-balance the inventories. The model captures the following decisions: (i) which retail stores are included in re-balancing, (ii) in which sequence will they be visited, (iii) what are the optimal initial delivery and transshipment quantities and (iv) what is the optimal timing for transshipments. The model is solved with variable neighborhood search, which is extended with a dynamic programming sub-routine to handle inventory allocation. We compare our results with similar models from literature. The results show a noticeable improvement over the standard "single-order, no transshipments" policy even though only the inventory level of the visited customer is known. The transshipment quantities have to be determined without knowledge of the inventories of all other customers.