
Tackling a large production-routing problem in the meat stores of a hypermarket chain

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Abstract

Even though the joint optimization of sequential activities in supply chains is known to yield significant cost savings, the literature concerning optimization approaches that handle the real-life features of industrial problems is scant. The problem addressed in this work is inspired by the case of a Portuguese hypermarket chain which applies a Vendor-Managed Inventory (VMI) policy to its meat stores. The supply chain comprises a single meat processing centre with 13 production lines and a fleet of 35 vehicles that is used to deliver different products to 188 stores spread across the country. We propose a novel methodology which analyses the company's historical data to reduce the problem size, focusing on three main dimensions. First, similar SKUs with small sales quantities are aggregated. Second, stores with similar geographic positions and served at similar times are also clustered. Third, a reduced set of potential vehicle routes is generated, taking into account the characteristics of routes performed in the past. The aggregated data are fed into an Inventory-Routing Problem (IRP) model to solve the distribution part of the problem which outputs a delivery schedule and the quantities to be supplied by the processing centre. Afterwards, a Lot-Sizing Problem (LSP) formulation defines the product setups as well as the quantities to be produced by each production line. The company's operation is still based on handmade (decoupled) production and transportation plans, despite the promising gains offered by integration. Our objective is to solve the integrated problem and quantify the potential gains of this integration.

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