A real-world inventory routing problem for waste collection

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Abstract

With more than ten million tonnes of waste produced every day in the world, waste logistics management has become a major cost reduction and optimization challenge. In this talk, we present a new inventory routing problem that arises when a (waste) collection company wants to collect from a set of voluntary drop-off containers placed in public spaces or industrial sites. These containers are dedicated to various products (cardboard, glass, paper, household waste) that are randomly filled by consumers throughout the studied horizon and must be collected before overflowing. A heterogeneous fleet of vehicles is used to perform this service. Each vehicle has its own cost structure (fixed cost, linear distance and duration costs) and product capacity. All vehicles must start and end their trip at a central depot and can empty their content at a set of intermediate outlets (facilities) in order to continue their tour or collect a different product. Each location (containers and outlets) must be served within one of its multiple time windows. We address the deterministic case of this real-world routing problem over a fixed planning horizon (typically a week). To solve it, we propose an Adaptive Large Neighborhood Search (ALNS) method and apply our approach on benchmarks from the literature and real data from a French waste transport and logistics company.

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