Optimizing the production and distribution for a single-product supply chain

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Abstract

We consider the problem of jointly optimizing the production and distribution for a single product supply chain with multiple facilities, heterogeneous transporters (vessels), and multiple customer locations. Each facility has limited production capacity and each customer has different demand levels over the planning horizon. The distribution of product is made by vessels with different capacity, speed, and availability. The objective is to minimize the total production and logistics cost subject to the customer demand to be met on time.

We propose a two-phase approximation algorithm for the problem. Phase one solves a mixed integer program to find a feasible solution for a more restricted problem, and phase two improves the solution by relaxing the restrictions in Phase one. We analyze the error bound and report our empirical results based on a set of data from a a major supply chain in chemical industry.