

Scheduling Inbound Trucks at a Cross-Docking Facility: A Multi-objective and a Hierarchical Approach*

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Abstract

In this paper we deal with the scheduling of inbound trucks (ITs) to the available inbound doors at a cross-docking facility, where we optimize two conflicting objectives: minimizing the total service time for all the ITs and minimizing the delayed completion of service for a subset of the ITs, which are considered as preferential customers (preferential ITs). The problem is formulated as a bi-objective and as a bi-level unrelated machine scheduling problem. Due to the nature of the former and complexity of the later formulation, a Genetic Algorithms and k-th best based heuristics are proposed as the solution approaches. Computational examples are used to discuss the advantages and drawbacks of each formulation.

Key words: Logistics, Cross-docking, Multiple Objective Programming, Hierarchical Programming

1 Introduction

In today's customer driven economy moving products quickly, efficiently, and cost effectively offers a crucial advantage to companies. To achieve such goals, more and more companies, are finding that cross-docking can play an integral part of their distribution model, partially replacing or complementing existing warehousing facilities. In a typical logistics distribution network, products are sent to a warehousing facility for storing, retrieving, sorting and reconsolidating [1]. The products are then sent out to retailers upon requests. However, as inventory costs are one of the main costs in a supply chain, cross-docking becomes an attractive alternative to warehousing. Cross-docking is a material handling operation, where products move quickly and directly from inbound (inbound trucks-ITs) to outbound trucks (OTs), after being resorted or consolidated with limited storage, normally not exceeding 24 hours [2, 3]. These types of facilities are generally used for "hub-and-spoke" arrangements, where (de)consolidation of cargo occurs similar to the case of transshipment, so that products are delivered to customers in truckload (TL). Since first pioneered by the Wal-Mart corporation, where about 85% of its commodities are delivered through cross-docking facilities, companies have been increasingly starting to adopt cross-docking operations. A survey of 547 industry professionals performed by Saddle Creek's

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