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Production and delivery batch scheduling with a common due date and multiple vehicles to minimize total cost

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Abstract. This paper studies production and delivery batch scheduling problems for a single-supplier-to-a-single-manufacturer case, with multiple capacitated vehicles wherein different holding costs between in-process and completed parts are allowed. In the problem, the parts of a single item are first batched, then the resulting batches are processed on a single machine. All completed batches are transported in a number of deliveries in order to be received at a common due date. The objective is to find the integrated schedule of production and delivery batches so as to satisfy its due date and to minimize the total cost of associated in-process parts inventory, completed parts inventory and delivery. It should be noted that both holding costs constitute a derivation of the so-called actual flow time, and the delivery cost is proportional to the required number of deliveries. The problem can be formulated as an integer non-linear programming and it is solved optimally by Lingo 11.0 software. Numerical experiences show that there are two patterns of batch sizes affected by the ratio of holding costs of in-process and completed parts. It can be used by practitioners to solve the realistic integrated production and delivery batch scheduling problem.

1. Introduction

High expectations of customers and high competition in today's global market force companies to decrease cost without reducing manufacturing service level. It can be achieved by integrating decisions of different functions such as outsourcing, procurement, production planning, inventory and distribution [1]. However, due to the complexity of the problems, it is not easy to build a model which includes the decisions of all functions. This could be the reason of increasing the models of research pieces in integrating production and distribution, so called IPODS ((Integrated Production and Outbound Distribution Scheduling). The most IPODS models consider three performance measures represented by cost-based, time-based and revenue-based[2].

This paper discusses batch scheduling problems for a single supplier produces parts and then the completed parts are delivered to a single manufacturer within a short lead time. In order to satisfy on time delivery, the supplier links both production and delivery stages with minimum inventories. It will lead to decrease cost. Thus, the integrated schedule of production and delivery enables to decrease cost without reducing manufacturing service level.

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