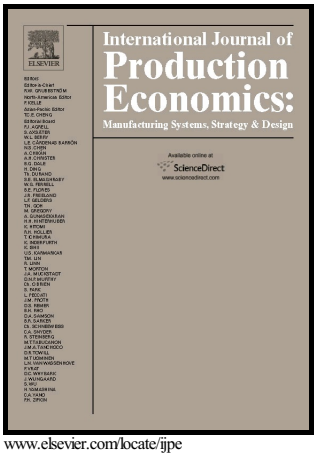

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An Integrated Production-Inventory Model for Deteriorating Items with Consideration of Optimal Production Rate and Deterioration during Delivery

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Abstract

Most of the literature of single-vendor single-buyer integrated production-inventory models for deteriorating items assumed a fixed production rate. Little attention has been paid to finding the optimal production rate for minimizing the total system cost. This paper investigates how production rate affects the total system cost, and develops a solution procedure for finding the optimal production rate for the traditional models. Based on the findings, this paper proposes an integrated single-vendor single-buyer model of an exponentially deteriorating item, in which non-stop production is considered and production rate is included as one of the decision variables. It has been shown, with numerical examples, that the proposed model can provide a lower cost solution than the traditional models which assume a fixed production rate. The proposed model also considers deterioration during deliveries, which is usually neglected in the literature of inventory models of deteriorating items. Furthermore, the proposed model is extended to relax the constant cost parameter assumption, which is prevalent even in non-constant production rate models, and optimize the cost for a system in which some of the cost parameters are production rate dependent.

Keywords: Supply Chain Management, Production-inventory Model, Coordination, Deteriorating items

1. Introduction

In the literature of inventory models of deteriorating items, production rate was usually fixed arbitrarily and much larger than the demand rate of the product. This paper investigates the effect of changing production rate on the system cost of a single-vendor single-buyer supply chain. It is found that in many cases, a lower production rate can result in a lower system cost. Hence, we propose a continuous production model in which the production rate is demand-driven. The results of our numerical experiments show that the model can achieve a lower system cost when compared with that of the traditional model which assumes an arbitrarily fixed production rate. The proposed model also considers deterioration during transportation which is usually ignored due to the general assumption of instantaneous shipments in most inventory models of deteriorating items. The model reduces the average

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