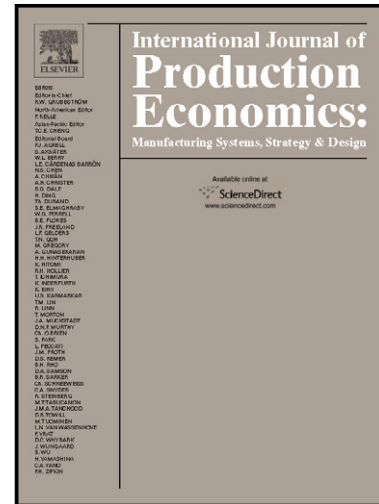


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Qinglin Duan, T.Warren Liao



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A new age-based replenishment policy for supply chain inventory optimization of highly perishable products

Qinglin Duan, T. Warren Liao*

Department of Mechanical and Industrial Engineering, Louisiana State University, Baton Rouge, LA 70803

*Corresponding author. Tel.: +1 225 578 5365.

Email: ieliao@lsu.edu

Abstract

A simulation optimization framework is proposed for supply chain inventory management of highly perishable products. A new replenishment policy based on old inventory ratio is developed, hence called OIR policy. It is an age-based policy using only partial age information to measure the freshness of the entire inventory. The efficiency of the new policy is evaluated in detail for a single-vendor-multi-buyer platelet (with a limited shelf life of 5 days) supply chain. The inventory objective is to minimize the expected system outdate rate under a predetermined maximal allowable shortage level. The new OIR policy is compared with two existing order-up-to policies: one is the order-up-to policy without age consideration; the other one is the "EWA" policy developed by Broekmeulen and van Donselaar (2009). The three policies are compared under both decentralized and centralized controls for different levels of the fill-rate constraint. The computational results show that adopting centralized control over the whole platelet supply chain greatly helps reducing the system expected outdate rate from 19.6% down to 1.04% on average while keeping sufficiently high fill rate at each entity. The two policies with age consideration are generally better than the policy without age consideration under both control strategies. This is particularly true for decentralized control. The new OIR policy is recommended because it is the best among all three, consistently yielding good results in all cases studied.

Highlights

- This paper proposes a new age-based replenishment policy called the old inventory ratio policy.
- It develops centralized & decentralized models for a SC of highly perishable.
- It solves the models with simulation optimization methodology to determine optimal policies.

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