Constrained Optimal Control of a Two-Stage Queueing Inventory System with Production Delay

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Abstract

In this paper we investigate a make to stock two-stage queueing-inventory system with production delay. Under such production policy, the manufacturing facility may be shut down whenever it is idle and there is a non-negligible setup cost involved each time the facility reactivates its production. We also allow a non-negligible setup time for each reactivation process. Quasi-birth-and-death (QBD) models are employed to model the studied queueing-inventory system. We obtain the performance measures for the whole system using a convolution approach after the variation of inter-departure time of the first stage is obtained. A convexity-based searching scheme is developed to find the joint thresholds of production delay and target inventory levels for minimizing inventory holding and setup costs under a time-based service level constraint. Numerical examples are provided with discussions.

Keywords: Queueing-inventory, production delay, setup, departure, QBD.