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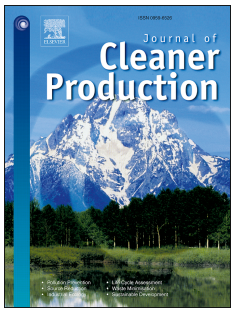

Multi-stage cleaner production process with quality improvement and lead time dependent ordering cost

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Multi-stage cleaner production process with quality improvement and lead time dependent ordering cost

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Abstract

To maintain a multi-stage cleaner production process, the major task is eliminating all defective items during the production system and an investment is necessary to reduce the probability of *in-control* state to *out-of-control* state of machinery system. In this direction, a logarithmic expression suggested by Porteus (1986) to consider in a single-stage imperfect manufacturing process for quality improvement, whereas this paper enables to consider the similar investment in a complex multi-stage imperfect manufacturing process to clean the production system. Using it, this paper develops a joint replenishment problem for complex multi-stage quality improvement. The study investigates a stochastic inventory model with a budget constraint for simultaneously optimizing number of shipments, replenishment interval, safety factor, backorder discounts, quality factor, and lead time as decision variables. Lead time is assumed as stochastic in nature, where a lead time crashing cost is used to reduce the lead time. As lead time is stochastic, a backorder price discount is allowed to save lost sells. To solve this problem, an improved algorithm is developed and two theorems are proved to obtain global optimal solution for this model analytically. Finally, some numerical examples and graphical illustrations are given to illustrate this model.

Keywords: Multi-stage cleaner production; Inventory; Quality improvement; Joint replenishment problem; Controllable lead time.

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