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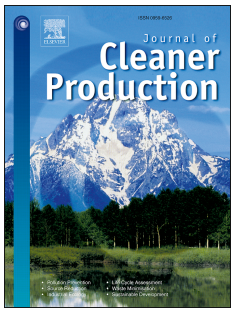

Optimal batch quantity in a cleaner multi-stage lean production system with random defective rate

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Optimal batch quantity in a cleaner multi-stage lean production system with random defective rate

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Abstract

Optimal batch size reduces variability in the lean manufacturing process with minimized system costs. It simplifies the scheduling, enhances the quality, reduces inventories, and improves the production process continuously. On account of this, determining optimal batch size is the area of interest for the researchers with the objective of reducing inventories and related system costs. Products of the textile sector are produced generally in a multi-stage production setup, and it consists of random defective rate within the long-run production systems. In this context, this paper revisits an economic production quantity (EPQ) model with an imperfect multi-stage production system and analyzes an inventory model by considering a random defective rate in a cleaner multi-stage lean manufacturing system. These defective items are reworked and converted into perfect quality items by incurring additional processing costs. The proportion of defective items can be reduced through continuous improvements in the production process reliability by performing various lean manufacturing techniques, enlisting the total productive maintenance at the highest rank. A mathematical model is developed using a familiar beta distribution density function for the random defective rate. Then, the total cost of the system is minimized through analytical technique, where the batch size is a decision variable. Outcomes through analytical and numerical study confirm that optimum batch size is obtained by this model and it has a direct relationship with number of production stages.

Keywords: Lean manufacturing; Multi-stage cleaner production; Imperfect system; Random defective rate; Rework.

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