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Abstract

Recent research suggests that short-term procurement is emerging as a powerful replenishment strategy, especially in a context where companies evolve in a rapidly changing market and many unforeseen events can force a quick update of supply needs. Being able to identify the optimal conditions under which a decision maker can choose one supplier over another, based on the whole system state, can help companies improve their productivity and control costs. This paper addresses this issue, and is intended to propose a control policy which coordinates supplier selection, replenishment, production and quality inspection decisions. We consider a manufacturing-oriented supply chain composed of multiple suppliers characterised by costs, delivery delays and quality that change randomly in time, and an unreliable manufacturer that operates in a dynamic stochastic context is considered. To solve this problem, a combination of mathematical formulation, simulation and optimization techniques has been adopted. Based on numerical examples and a sensitivity analysis, the results confirm the significant cost savings that our proposed dynamic supplier selection policy may ensure, as compared to a common long-term procurement strategy. Moreover, our extensive numerical examples demonstrate that under our proposed policy, considering more suppliers improves cost savings.

Keywords: Stochastic optimal control, Decision making, Sampling plan, Supplier selection, Production control, Simulation.