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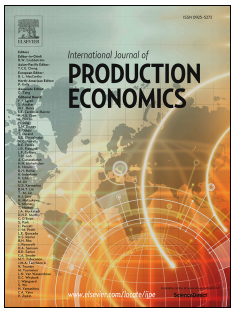

Joint production, quality and maintenance control of a two-machine line subject to operation-dependent and quality-dependent failures

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Joint production, quality and maintenance control of a two-machine line subject to operation-dependent and quality-dependent failures

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Abstract – In the literature of operations management, the reliability of multistage manufacturing systems has been always modeled with uncorrelated failure processes where the reliability of each machine is assumed to be independent of any failure in the other machines. However, in real-life, machines may be subject to complex correlated failures such as increased degradation and tool wear caused by defective parts produced in preceding machines. Ignoring the correlation effect when modeling the reliability of multistage systems generally results in inaccurate estimation of the overall system reliability and inefficient operations policy accordingly. In this paper, we deal with the problem of integrated production, quality and maintenance control of production lines where machines are subject to quality and reliability operation-dependent degradation. Also, machines' reliability is correlated with the level of incoming product quality. For illustration, we study in this paper a two-machine line model. We propose a combined mathematics and simulation-based modeling framework to jointly optimize the production, quality and maintenance control settings. The objective is to minimize the total cost incurred under a constraint on the outgoing quality. Numerical examples are given to show the effectiveness of the resolution approach and to study important aspects in multistage systems such as the allocation of inspection and maintenance efforts, the Quality-Reliability chain and the interdependence between production, quality and maintenance control settings. The results obtained demonstrate that