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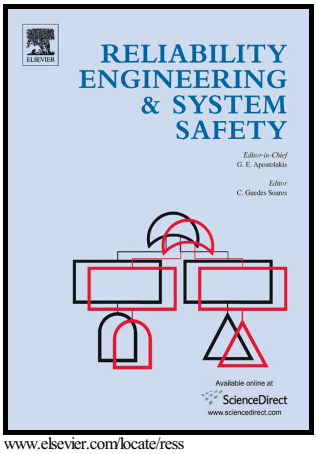

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PII: S0951-8320(17)30373-3
DOI: http://dx.doi.org/10.1016/j.ress.2017.03.034
Reference: RESS5794

To appear in: *Reliability Engineering and System Safety*

Cite this article as: Mohamed-Chahir Fitouhi, Mustapha Nourelfath and Stanley B. Gershwin, Performance evaluation of a two-machine line with a finite buffer and condition-based maintenance, *Reliability Engineering and System Safety*, http://dx.doi.org/10.1016/j.ress.2017.03.034

Performance evaluation of a two-machine line with a finite buffer and condition-based maintenance

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Abstract

This paper considers a two-machine continuous flow manufacturing system with a buffer of finite capacity, and where the machines are subjected to failures, minimal repairs, and condition-based preventive maintenance. Each machine can degrade into several discrete states, which are characterized by different performance parameters, ranging from perfect functioning to complete shutdown. When a specified degraded state is exited, a preventive maintenance action is performed to restore the machine to one of the higher performance states. We evaluate the impact of preventive maintenance strategies for each machine, in order to determine their impact on production rate and total cost. A methodology is developed to analyze the complex trade-off between the contributions of preventive maintenance and of the buffer to the system performance. It is shown that preventive maintenance should be scheduled not to optimize the performance for each machine individually; its scheduling is best considered from the perspective of the manufacturing system as a whole. The analysis also reveals the importance of considering machine speeds when optimizing the choice of maintenance policy.

Keywords: Multi-State Systems, Condition-Based Preventive Maintenance, Manufacturing Systems, Buffer, Performance Analysis

1. Introduction

We consider the relationship between maintenance and inventory in a two-machine manufacturing system with a buffer of finite capacity (B), and where the machines are

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