

Optimal Maintenance Policy for a Partially Observable Two-Unit System

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Abstract : In this paper, we present a maintenance model of a two-unit series system with economic dependence. Unit#1, which is considered to be more expensive and more important, is subject to condition monitoring (CM) at equidistant, discrete time epochs and unit#2, which is not subject to CM, has a general lifetime distribution. The multivariate observation vectors obtained through condition monitoring carry partial information about the hidden state of unit#1, which can be in a healthy or a warning state while operating. Only the failure state is assumed to be observable for both units. The objective is to find an optimal opportunistic maintenance policy minimizing the long-run expected average cost per unit time. The problem is formulated and solved in the partially observable semi-Markov decision process framework. An effective computational algorithm for finding the optimal policy and the minimum average cost is developed and illustrated by a numerical example.

Keywords : condition-based maintenance, semi-Markov decision process, multivariate Bayesian control chart, partially observable system, two-unit system

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