

Optimal Opportunistic Maintenance Policy for a Two-Unit System

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Abstract : This paper presents a maintenance policy for a system consisting of two units. Unit 1 is gradually deteriorating and is subject to soft failure. Unit 2 has a general lifetime distribution and is subject to hard failure. Condition of unit 1 of the system is monitored periodically and it is considered as failed when its deterioration level reaches or exceeds a critical level N . At the failure time of unit 2 system is considered as failed, and unit 2 will be correctively replaced by the next inspection epoch. Unit 1 or 2 are preventively replaced when deterioration level of unit 1 or age of unit 2 exceeds the related preventive maintenance (PM) levels. At the time of corrective or preventive replacement of unit 2, there is an opportunity to replace unit 1 if its deterioration level reaches the opportunistic maintenance (OM) level. If unit 2 fails in an inspection interval, system stops operating although unit 1 has not failed. A mathematical model is derived to find the preventive and opportunistic replacement levels for unit 1 and preventive replacement age for unit 2, that minimize the long run expected average cost per unit time. The problem is formulated and solved in the semi-Markov decision process (SMDP) framework. Numerical example is provided to illustrate the performance of the proposed model and the comparison of the proposed model with an optimal policy without opportunistic maintenance level for unit 1 is carried out.

Keywords : condition-based maintenance, opportunistic maintenance, preventive maintenance, two-unit system

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