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Optimal Sequential Scheduling of Imperfect Maintenance Last Policy for a System Subject to Shocks

Authors : Yen-Luan Chen

Abstract : Maintenance has a great impact on the capacity of production and on the quality of the products, and therefore, it deserves continuous improvement. Maintenance procedure done before a failure is called preventive maintenance (PM). Sequential PM, which specifies that a system should be maintained at a sequence of intervals with unequal lengths, is one of the commonly used PM policies. This article proposes a generalized sequential PM policy for a system subject to shocks with imperfect maintenance and random working time. The shocks arrive according to a non-homogeneous Poisson process (NHPP) with varied intensity function in each maintenance interval. As a shock occurs, the system suffers two types of failures with number-dependent probabilities: type-I (minor) failure, which is rectified by a minimal repair, and type-II (catastrophic) failure, which is removed by a corrective maintenance (CM). The imperfect maintenance is carried out to improve the system failure characteristic due to the altered shock process. The sequential preventive maintenance-last (PML) policy is defined as that the system is maintained before any CM occurs at a planned time Ti or at the completion of a working time in the i-th maintenance interval, whichever occurs last. At the N-th maintenance, the system is replaced rather than maintained. This article first takes up the sequential PML policy with random working time and imperfect maintenance in reliability engineering. The optimal preventive maintenance schedule that minimizes the mean cost rate of a replacement cycle is derived analytically and determined in terms of its existence and uniqueness. The proposed models provide a general framework for analyzing the maintenance policies in reliability theory.

Keywords : optimization, preventive maintenance, random working time, minimal repair, replacement, reliability
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