

Maximizing reliability of multi-stage uncertain random systems by maintenance strategy

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June 14, 2022

Abstract

The existing researches have shown that internal degradation processes and external shocks may simultaneously interfere with the reliability of dynamic systems in uncertain random environments. Assume that failure processes are dependent, that is, shocks may accelerate degradation processes by additional degradations. Wear and additional degradations are uncertain, while shocks are considered to be random. As a natural consideration, it is necessary to maximize the reliability of multi-stage uncertain random systems. In this paper, a maximizing reliability problem is presented, and recurrence equations are provided by Bellman's principle. These are successfully applied to maximize reliability index in two special cases with linear and quadratic state equations. In addition, two effective algorithms are developed to achieve optimal solutions. Finally, a numerical example of a metallized film pulse capacitor is proposed which aims to indicate that optimization method is beneficial to maximize the reliability of multi-stage systems.

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