

The Preventive Maintenance and Inspection Policy for the System With Two Types of Failures

Qiaoqiao Gao and Dequan Yue

Yanshan University

Abstract

In this paper, the optimal inspection and preventive maintenance policy are investigated for a system with two types of failures, one type of failure is repairable, and the other is unrepairable. When the working time of the system reaches time T , the system will be detected, if a repairable failure is found then a failure repair will be carried out, and if an unrepairable failure is found then the system will be replaced. Otherwise, a preventive repair will be carried out. The system will be replaced by a new and identical one at the time following the N th repairable failure. We look for a bivariate optimal policy which makes the long-run expected profit per unit time maximization. The long-run average profit per unit time is obtained explicitly. Finally, we compute numerically a bivariate approximate optimal policy.

Keywords: Deteriorating systems, geometric process, inspections, preventive maintenance.

1. Introduction

In practice applications, because of the ageing effect and the accumulated wearing, many systems are degenerative in the sense that the successive operating times between failures will be shorter and shorter, while the consecutive repair times after failures are getting longer and longer. Lam [1, 2] first proposed the geometric process (GP) to describe such deteriorating systems and to study the optimal replacement problems. As a generalization of a renewal process, the geometric process has been applied in reliability analysis and maintenance policy optimization for various deteriorating systems by many authors, see Zhang and Yam [3], Zhang and Wang [4], Jia and Wu [5], Zhang and Wang [6], Liu et al. [7], Yu et al. [8], Wang and Zhang [9].

In the maintenance problems of a repairable system, a preventive repair for the system is usually adopted for improving the system reliability and implementing the system more economically. Therefore, the preventive repair problems for deteriorating systems have received more and more attention, see Valdez-Flores and Feldman [10] for further details. Zhang [11] studied a geometric process model with preventive repair,