Optimal designs for gamma degradation tests

Hung-Ping Tung[1], Yu-Wen Chen[1]

Department of Industrial Engineering and Management, National Yang Ming Chiao Tung University

ABSTRACT

This study analytically investigates the optimal design of gamma degradation tests, including the number of test units, the number of inspections, and inspection times. We first derive optimal designs with periodic inspection times under various scenarios. Unlike previous studies that typically rely on numerical methods or fix certain design parameters, our approach provides an analytical framework to determine optimal designs. In addition, the results are directly applicable to destructive degradation tests when number of inspection is one. The investigation is then extended to designs with aperiodic inspection times, a topic that has not been thoroughly explored in the existing literature. Interestingly, we show that designs with periodic inspection times are the least efficient. We then derive the optimal aperiodic inspection times and the corresponding optimal designs under two cost constraints.

Keywords: Reliability; Degradation tests; Gamma process; Inspection time; Optimal design.