Optimal Test Plan for Degradation Tests Based on Student-

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Abstract

Stochastic processes are broadly used to assess reliability of high quality products, and the Wiener process is a particularly common one in degradation analysis. As an extension of the Wiener process, the Student-*t* process possesses the applicability and flexibility of degradation data with the heavy-tailed characteristic. This study discusses the D-optimal test plan (such as the inspection frequency, the number of measurements, and sample size) for a degradation test based on a Student-t process. Under a total experimental cost constraint, the D-optimal test plan not only utilizes to control experimental test time and cost efficiently but also increases the precision of the parameter estimators. The resistance data is presented as an illustrative example and the corresponding sensitivity analysis indicates robustness of the D-optimal test plan as the deviation of the estimated values is within 90% confidence interval of the model parameters.

Keyword: Conjugate distribution, Cauchy process, First passage time, Volterra integral equation