

Designing A Screening Experiment For Highly Reliable Products

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Abstract– Within a reasonable life-testing time, how to improve the reliability of highly-reliable products is one of the great challenges to today’s manufacturers. By using a resolution III experiment together with degradation test, Tseng *et al.* (1995) presented an interesting case study of improving the reliability of fluorescent lamps. However, in conducting such an experiment, they did not address the problem of how to choose the optimal settings of variables, such as sample size, inspection frequency, and termination time for each run, which are influential to the correct identification of significant factors and the experimental cost.

Assuming that the product’s degradation paths satisfy Wiener processes, this paper proposes a systematic approach to the aforementioned problem. First, an intuitively appealing identification rule is proposed. Next, under the constraints of a minimum probability of correct decision and a maximum probability of incorrect decision of the proposed identification rule, the optimum test plan (including the determinations of inspection frequency, sample size, and termination time for each run) can be obtained by minimizing the total experimental cost. An example is provided to illustrate the proposed method.

Key words– *Resolution III design; Degradation tests; Optimal test plan; Wiener process; Inspection frequency; Termination time.*

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