

Strategy for Planning Accelerated Life Tests with Small Sample

by

Haiming Ma and William Q. Meeker
Iowa State University
March 2009

ABSTRACT

Previous work on planning accelerated life tests has been based on large-sample approximations to evaluate test plan properties. In this paper, we use more accurate simulation methods to investigate the properties of accelerated life tests with small sample sizes where large-sample approximations might not be expected to be adequate. These properties include the simulated s-bias and variance for quantiles of the failure-time distribution at use conditions. We focus on using these methods to find practical compromise test plans that use three levels of stress. We also study the effects of not having any failures at test conditions and the effect of using incorrect planning values. We note that the large-sample approximate variance is far from adequate when the probability of zero failures at certain test conditions is not negligible. We suggest a strategy to develop useful test plans using a small number of test units while meeting constraints on the estimation precision and on the probability that there will be zero failures at one or more of the test stress levels.