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The Use of Degradation Measures to Design Reliability Test Plans

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Abstract : With short production development times, there is an increased need to demonstrate product reliability relatively quickly with minimal testing. In such cases there may be few if any observed failures. Thus it may be difficult to assess reliability using the traditional reliability test plans that measure only time (or cycles) to failure. For many components, degradation measures will contain important information about performance and reliability. These measures can be used to design a minimal test plan, in terms of number of units placed on test and duration of the test, necessary to demonstrate a reliability goal. In this work we present a case study involving an electronic component subject to degradation. The data, consisting of 42 degradation paths of cycles to failure, are first used to estimate a reliability function. Bootstrapping techniques are then used to perform power studies and develop a minimal reliability test plan for future production of this component.

Keywords : degradation measure, time to failure distribution, bootstrap, computational science
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