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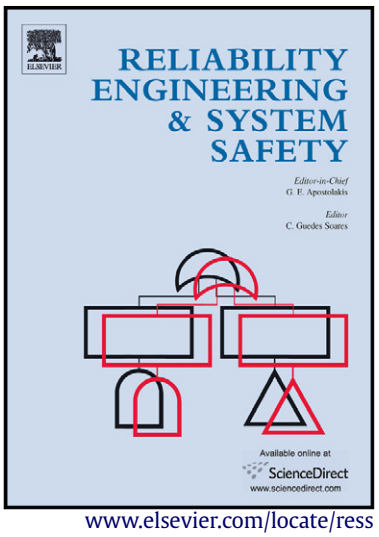

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PII: S0951-8320(14)00249-X
DOI: http://dx.doi.org/10.1016/j.ress.2014.10.009
Reference: RESS5160

To appear in: *Reliability Engineering and System Safety*

Received date: 17 February 2014
Revised date: 2 October 2014
Accepted date: 7 October 2014

Cite this article as: Suk Joo Bae, Tao Yuan, Shuluo Ning, Way Kuo, A Bayesian approach to modeling two-phase degradation using change-point regression, *Reliability Engineering and System Safety,* http://dx.doi.org/10.1016/j.ress.2014.10.009

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A Bayesian approach to modeling two-phase degradation using change-point regression

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Abstract

Influenced by defects or contaminants remaining after a series of manufacturing processes, the degradation paths of some products exhibit two-phase patterns over the testing period. This article proposes a hierarchical Bayesian change-point regression model to fit the two-phase degradation patterns, and derives the failure-time distribution of a unit that is randomly selected from its population. A Gibbs sampling algorithm is developed for the inference of the parameters in the change-point degradation model, as well as for the prediction of the failure-time distribution of the randomly selected unit. The proposed approach is applied to the degradation paths of plasma display panels (PDPs) presenting the two-phase pattern.

Keywords: Degradation modeling, change-point regression, failure-time distribution, Gibbs sampling, hierarchical Bayesian modeling

Accepted manuscript

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