

Residual Life Estimation Based on Multi-Phase Nonlinear Wiener Process

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Abstract : Residual life (RL) estimation based on multi-phase nonlinear Wiener process was studied in this paper, which is significant for complicated products with small samples. Firstly, nonlinear Wiener model with random parameter was introduced and multi-phase nonlinear Wiener model was proposed to model degradation process of products that were nonlinear and separated into different phases. Then the multi-phase RL probability density function based on the presented model was derived approximately in a closed form and parameters estimation was achieved with the method of maximum likelihood estimation (MLE). Finally, the method was applied to estimate the RL of high voltage plus capacitor. Compared with the other three different models by log-likelihood function (Log-LF) and Akaike information criterion (AIC), the results show that the proposed degradation model can capture degradation process of high voltage plus capacitors in a better way and provide a more reliable result.

Keywords : multi-phase nonlinear wiener process, residual life estimation, maximum likelihood estimation, high voltage plus capacitor

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