

Reliability assessments with restricted degradation measurements

Shuen-Lin Jeng (鄭順林)

Department of Statistics, National Cheng Kung University

Abstract

Complete degradation measurements may not be available for certain devices during a life test. The devices under testing may be inoperable when the cumulative degradation crosses a threshold level (TL) or may have a mode change after a particular degradation level. The testing budget will also limit the sample size and the inspection frequency in order to reduce costs. In this research we investigate the effects of the restricted degradation measurements (RDMs) on the life time inferences based on a nonhomogeneous compound Poisson model. Two data sets, ultra-thin gate oxides (UTGOs) and metallized film pulse capacitors (MFPCs), are analyzed by our approach. The UTGO data is recorded from continued inspections and the compound part of the process is modeled by a Weibull distribution. The MFPC data is recorded from scheduled inspections and the compound part of the process is modeled by a gamma distribution. Simulations based on the failure mechanisms of UTGO and MFPC are carried out to explore the effects of sample size, restricted degradation level, and inspection frequency on the lifetime estimates.