Nonparametric estimation for accelerated life tests under intermittent inspection

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ABSTRACT

Accelerated life tests(ALTs) of items under higher-than-usual levels of stress involving high temperature, voltage, pressure, vibration, cycle rate, load, etc., are commonly used to obtain information quickly on the lifetime distribution of durable products at use condition stress. Test data collected at such accelerated stresses are extrapolated by means of a model to estimate the lifetime distribution at use condition stress. When continuous inspection is not possible, test items are intermittently inspected only at certain points in time. Intermittent inspection, which may also be used to reduce costs or for administrative convenience even when continuous inspection is possible, yields a set of grouped data consisting of the number of items failed in each inspection interval at each stress level.

This paper considers nonparametric estimation of lifetime distribution based on grouped data from constant stress ALTs under intermittent inspection. A method of estimating the lifetime distribution at use condition stress is proposed for the case where the time transformation function between lifetime and stress is a version of inverse power law. The proposed estimator is compared with the maximum likelihood estimator when the true lifetime distribution is Weibull.