FIELD FAILURE PREDICTION USING DYNAMIC ENVIRONMENTAL DATA

by

Yili Hong and William Q. Meeker
Virginia Tech and Iowa State University

January 2011

ABSTRACT

Due to the dynamics of the environment and the variability on the product usage, product units in the field are usually exposed to varying failure-causing stresses. Some products are equipped with sensors and smart chips that measure and record usage/environmental information over the life of the product. For some products, it is possible to track environmental variables dynamically, even in real time, providing useful information for field-failure prediction. In many applications, predictions are needed for individual units, giving the remaining life of individuals, and for the population, giving the cumulative number of failures at a future time. It is always desirable to obtain more accurate predictions for both the population and the individuals. This paper outlines a model and methods that can be used for field-failure prediction using dynamic environmental data. Multivariate time series models are also used to describe the dynamic covariate information. The cumulative exposure model is used to link the explanatory variables which are recorded as a multivariate time series, and the failure-time model.