

**THE IMPORTANCE OF IDENTIFYING DIFFERENT COMPONENTS OF A
MIXTURE DISTRIBUTION IN THE PREDICTION OF FIELD RETURNS**

by

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ABSTRACT

Data from a mixture of distributions with two different increasing hazard functions can behave, over some period of time, like a distribution with decreasing hazard functions. As a result, reliability predictions based on data from a mixture of units with two or more different physical designs could be seriously wrong if the pooled data are used to extrapolate in time. Thus, it is important to identify components of the mixture and do statistical inference based on the stratified data. In this paper, the importance of this principle is investigated analytically and illustrated with lifetime data on high-voltage transformers. From engineering knowledge, the lifetime distribution of a transformer has an increasing hazard due, largely, to insulation aging. However, data from a population of units could indicate a decreasing hazard due to a mixture of units with different designs or environmental conditions. Comparisons are made between the predictions based on the pooled-data and stratified-data models and the importance of correct stratification in practice is shown. Some suggestions for practitioners are also given.