Weibull Engineering 3-Day workshop

Instructors: Wes Fulton, Carl Tarum (one or more will present the material)
Web sites: weibullnews.com, bathtubsoftware.com, fultonfindings.com
Course Text: *The New Weibull Handbook*, by Dr. Robert Abernethy.

Overview

Course teaches the fundamentals and extensions of Weibull and other reliability-based models with their applications. Each attendee receives a FULL single-user license of SuperSMITH® software for Weibull applications.   Attendees should have a computer available with software installed. We cover main chapters of the Course Text plus other topics as appropriate. Following is a day by day agenda.

--- Day 1 ---
Introduction: Background. Core concepts and vocabulary. Goals for the class requested from each attendee for class tailoring.

Ch 1: Overview. Introduction to Weibull Engineering. Video short course covering several case studies.

Ch 2: Good Weibulls. Simple Weibull math and plot. How to include nonfailures with failures. Class work, plots by hand, plot interpretation. (Lunch)

Ch 3: Bad Weibulls. Causes of point pattern oddities, cusps, dog legs, curves. How different distributions like lognormal or a minimum life may improve fit. Goodness of fit with ccc (Critical Correlation Coefficient) or pve (P-Value Estimate). Outlier test. Class to view several problem plots and note possible issues and actions.

Ch 4: Failure Forecasting and Risk. Predicting event occurrences from the model fit line and input data. Comparing current expected risk to actual data for batch issue detection. Spare parts requirements, resource allocation. If cost for unplanned replacement is higher than planned, there may be an optimum interval to achieve lowest cost. Also, Monte Carlo simulation explained.

Software Overview: Brief orientation to SuperSMITH software.

--- Day 2 ---
Ch 5: MLE & other methods. The Maximum Likelihood Estimate (MLE) method explained. MLE bias. Other methods like regressing X-on-Y vs Y-on-X. Dauser Shift possible for unknown suspension ages. Analyzing Inspection Data. Interval MLE, Coarse Data. Probit data. Evaluating the statistical power of each method.

Ch 6: Weibayes & Test Planning. Fitting data when the Weibull slope is known. Weibayes benefits. Test Planning to prove a new design. Sudden death testing advantages. Accelerated testing and step-stress testing. Uses of a Weibull Library. (Lunch)

SuperSMITH® PlayTIME™ class work. Class to work through problems in the PlayTIME tutorial booklet. Some students may work with their own input data in the software to get familiar with features and analysis.

--- Day 3 ---
Ch 7: Confidence Bounds. Uncertainty limits. How to compare multiple data sets to see if there is significant difference.

Ch 8: Related Models. Overview of Binomial, Poisson, Extreme Value, Exponential, and Kaplan-Meier models. Stress/Strength models. Barringer Process Reliability for process improvement. Quality Limits with non-normal distributions. Clues for Batch effects.

--- Day 3 (continued) ---
Ch 9: Crow-AMSAA, Warranty. Introduction to Crow-AMSAA (Duane model) with examples for predicting reliability growth. Discussion of Warranty Data with production. Basics of Life Cycle Cost for better management decisions.

Ch 10: Flow Chart. This flow chart guides users in their analysis based on number of input data values, what is known, and available solutions. (Lunch)

--- Additional Topics ---
The following topics may be covered depending on class interests:
- **Weibull Mixtures:** Models and analysis where there are batch issues or mixtures of failure modes.
- **Missing Data:** Techniques to estimate fit when it is known that data are missing.
- **Optimizing Gage Calibration.** Learn how to optimize calibration intervals.
- **Student-Provided Data Sets.** Some students may share their data and analysis.
- **Chapter 11 Case Studies.** Selected cases may be presented and studied in class.

"Ph.D Oral Examination". Class group quiz on the presented material.

Evaluations: Opportunity to provide feedback for course improvement.