

Title: “Workshop Weibull Statistics for Decision-making after Failures: repair or replace?”

Abstract

The workshop aims at dissemination of method and freeware Weibull Data Analyzer that was produced in the FINDGO-project that reviewed and developed asset management techniques for the Netherlands utilities in cooperation with the European Network of Transmission System Operators. The methods and tools aims at supporting resilience of electrical grids by analyzing small sets of times of high impact failures that may or may not be the start of a series of high impact failures.

The workshop will consist of two presentations and two interactive parts. It builds further on the Data Analytics paper (paper register number # 1570788827).

Electrical power grids are strategic infrastructures that consists of many components. The lifecycle of both product batches and assemblies like circuits and substation bays are often represented by bathtub curves. The classic approach is a mix of three competing processes: teething, random failure and wear-out. Teething is though of as due to imperfections that occur up to commissioning; random failure is incidental (‘bad luck’) and often by external influences; wear-out is due to aging causing equipment to run out of useful life. Alternative bathtub curves involve extremely fast wear and periodic renewal by servicing. These will be illustrated with practical examples.

The optimum operational region of the bathtub curve is the bottom of the bathroom curve where failures are rare and mainly due to ‘bad luck’. Asset management is particularly alarmed by three classes of failure events: 1. Teething (also called child disease of child mortality); 2. Wear-out and 3. Early failures during operation. Such events jeopardize the security of energy supply. An effective counter measure is redundancy, although it has its limits. Failures will occur and resilience is served by handling and interpreting incidents well. The workshop will discuss and treat example cases.

After an introduction on As part of an asset management focused project, a Weibull Data Analyzer is developed as a freeware excel application for non-commercial and for educational purposes. The spreadsheet is based on IEEE Standard 930 with added features. It can be downloaded from the IWO website by then. The facilities and the use of the freeware spreadsheet is demonstrated during the workshop. After the workshop the participants should be able to:

- Analyze failure data from tests and operation, including censored data
- Produce a Weibull plot of two data sets and 1 reference set with confidence intervals
- Obtain estimated distribution parameters by weighted or ordinary linear regression
- Obtain an optimal service cycle based on service and replacement costs
- Predict the time of a next failure with confidence limits

Outline of the Workshop

The workshops scheme is:

1. Presentation on introduction on statistics (Weibull, lifecycles, plots,
2. Demonstration of build-up, capabilities and use of Weibull Data Analyzer
3. Workshop and discussion on data analytics of failure data (bring you own)

Proposed Length:

- 2 hours

Résumé Prof. Dr. Robert Ross

Rob Ross worked in the electrical energy sector for over 35 years. He worked at Utrecht University, KEMA, National Institute of Materials & Chemical Research (Tsukuba, Japan), Institute for Science & Development (IWO), Netherlands Defense Academy (NLDA), TenneT TSO (utility in Netherlands and Germany), HAN University of Applied Sciences and Delft University of Technology (TUD). IWO and TUD are active affiliations.



He conducted projects in Europe, Asia, Africa and USA. One of his most successful project was the ITM-project that investigated the aspects sustainability, reliability and socio-economy of large-scale smart charging of electric vehicles. This project gave an important impulse to the Dutch electricity sector in the field of electric vehicles.

The spectrum of subjects comprises: reliability and availability of electrical energy and components; applied superconductivity; forensic investigations after failure; decision-making based on small data sets; diagnostic techniques; sustainable energy. His work led to 4 patent applications on materials or superconductivity. A book on Reliability Analysis is published with Wiley/IEEE (ISBN 9781119125174).

He received the 2004 SenterNovem Annual Award for Best invention in the category Energy & Environment (NL) and was nominated by the World Technology Network (USA) in the category Best Researcher Energy in 2006. He has built up a network in the electricity sector and the maritime sector through Cigré, IEC, IEE, IEEE, ENTSoe, Maritime Knowledge Centre and the IWO Foundation.

Budget:

- There will be no charges for attending the workshop
- Donations to the IWO Foundation are always welcome

