

## POWERFACTORY

Introductory Course: Load Flow  
and Short Circuit CalculationSeptember 15<sup>th</sup> - September 17<sup>th</sup> 2021

Online training course via Zoom

This training gives the participants an introduction to the handling and basic calculation functions of *PowerFactory*.

It begins with the introduction of the handling and the basics for modelling a network. Afterwards a load flow calculation is executed to analyse the network. Occurring voltage problems will be eliminated by implementing different control strategies.

With the short-circuit current calculation according to ANSI, typical 3-pole and 1-pole faults at different fault locations are simulated. Thereby, the short-circuit rating of the equipment as well as different earthing concepts are evaluated. The introduction of the tools for network planning and network operation serves as a further training content. With these tools it is possible to plan future expansion scenarios and to perform calculations on the same network for different operating cases.

The training ends with additional information on the base package and some tips & tricks for working with *PowerFactory*.

## WHO SHOULD ATTEND:

The course is intended for

- Utility engineers
- Power system operators
- Project Developers
- Manufacturers
- Consultants and electrical engineers

Whilst no experience with the program is required, it is assumed that the participant is familiar with the network modelling fundamentals and power system analysis methods.

## PRICE PER PARTICIPANT:

- \$1,716.00 (with valid maintenance contract)
- \$1,950.00 (without valid maintenance contract)
- \$585.00 (with valid student identification)

\* Prices do not include GST.

## Training schedule

Central Standard Time (UTC -06:00)

## DAY 1

9:00 Introduction to *PowerFactory*

Introduction to the *PowerFactory* structure and data model, graphical user interface, diagrams, users, libraries and power equipment modelling. Creating projects and grids, defining elements and types. Single line and graphical diagrams, detailed substation diagrams.

## 10:30 Coffee break

## 11:00 Exercise: Creation of a Network Model

Development of a high voltage network. Modelling of busbars, cables and overhead lines, transformers, generators and loads. Working with the graphical user interface, Data Manager and Network Model Manager. Single line diagram and detailed substation layout diagrams.

## 12:30 Lunch break

## 1:30 Load Flow Analysis

Theoretical introduction to the Load flow calculation methods and settings. Results analysis and reporting. Result colouring in the single line diagram.

## 2:00 Exercise: Load Flow Analysis Part I

Executing a load flow calculation and analysing the results. Results are analysed in the single line diagram, results tables and reports. Evaluation of overloading and voltage violations.

## 3:00 Coffee break

## 3:30 Exercise: Load Flow Analysis Part II

Advanced load flow calculation settings. Reactive power and voltage control using synchronous generators and tap changing transformers. Reactive power limits of generators.

## 5:00 End of the first day

## DAY 2

## 9:00 Exercise: Network Enhancement

Expansion of an existing medium voltage network in a separate grid. Data management and diagrams for multiple grids. Defining templates.

## 10:30 Coffee break

## 11:00 Short Circuit Analysis

Explanation and comparison of the different short circuit current calculation methods. Presentation of the application areas of short-circuit analysis for different processes such as cable dimensioning, equipment dimensioning, etc.

## 12:30 Lunch break

## 1:30 Exercise: Short Circuit Analysis Part I

Three-phase short circuit calculation at various locations in the network according to ANSI. Evaluation of thermal and mechanical stresses with regard to the network components such as cables and busbars. Dimensioning of a circuit-breaker.

## 3:00 Coffee break

## 3:30 Exercise: Short Circuit Analysis Part II

Execution of single-phase faults in the medium voltage network. Neutral point handling at the transformer and investigation of different earthing concepts.

## 4:30 Exercise: Short Circuit Analysis Part III

Short circuit analysis using the complete method and calculation of multiple faults. Optional exercise on dynamic voltage support.

## 5:00 End of the second day

## DAY 3

## 9:00 Exercise: Connection of Grids

Grouping of networks in different grids and diagrams, e.g. according to voltage level or regional subsystems. Connection of different grids or subsystems topologically and graphically.

## 9:30 Grid Expansion and Operational Planning

Data management including Grids, Variations and Expansion Stages for grid expansion planning. Usage of Operation Scenarios to consider different operating conditions and Study Cases for analysing the network.

## 10:30 Coffee break

## 11:00 Exercise: Grid Expansion Planning

Grid expansion planning using Variation and Expansion Stages on the basis of the basic network. Defining time dependent network changes in variations and expansion stages. Comparison of network variations.

## 12:30 Lunch break

## 1:30 Exercise: Operation Planning

Defining Operation Scenarios in *PowerFactory* for various load and generation conditions and switching states in the grid.

## 2:00 Exercise: Network Analysis

Analysis of the network with the help of the defined operation scenarios at different points in time in the previously prepared network expansion planning. Use of study cases to combine active operation scenarios, variations and grids for a convenient analysis of different possible scenarios.

## 3:00 Coffee break

## 3:30 Exercise: Feeders

Defining feeders. Feeder load flow analysis using Load Scaling and Voltage Profile Diagrams.

## 4:00 Exercise: Load Scaling

Extended network analysis. Use of feeder load scaling to be able to represent operating states based on real measurements.

## 4:30 Additional Information

Additional information on the base package. Tips & Tricks for working with *PowerFactory*.

## 5:00 End of the course