

Training Content

Introductory course: Load Flow and Short Circuit Calculation

MODULE 1: Introduction to *PowerFactory* (Estimated Time: 1h)

***PowerFactory* User Interface and Data Structure**

Introduction to the *PowerFactory* structure and the user interface including menus, drawing tools and output window. Use of the Data Manager to access the data. Organisation of users and projects.

Exercise: Import a project

Understand the modelling concept and the graphical user interface in an existing project.

MODULE 2: Network Modelling (Estimated Time: 3h)

Network Modelling

Introduction to the data arrangement within the project: network data, diagrams, library. Concept of type and network element data. Introduction to sophisticated modelling options of substations in comparison to simple busbar modelling.

Exercise: Creation of a Network Model

Development of a high voltage network. Modelling of busbars, lines, transformers, generators and loads. Working with the graphical user interface, Data Manager and Network Model Manager.

Exercise: Use of Substations

Enhancement of the network with the replacement of busbars with substations. Reconnection of network elements. Use of bays and detailed diagrams.

MODULE 3: Load Flow Analysis (Estimated Time: 3h)

Load Flow Analysis

Theoretical introduction to the Load flow calculation methods and settings. Results analysis and reporting. Result colouring in the single line diagram. Voltage and reactive power control. Station controller and automatic tap changer.

Exercise: Load Flow Analysis

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.

Exercise: Load Flow Calculation with Voltage Control

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

MODULE 4: Network Enhancement (Estimated Time: 1.5h)

Exercise: Network Enhancement

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

MODULE 5: Short-Circuit Calculation (Estimated Time: 3.5h)

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. Different star point grounding concepts.

Exercise: Short Circuit Analysis - Equipment Dimensioning

Three-phase short circuit calculation at various locations in the network according to IEC 60909. Evaluation of thermal and mechanical stresses with regard to the network components such as cables and busbars. Dimensioning of a circuit-breaker.

Exercise: Short Circuit Analysis - Comparison of Calculation Methods

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

Exercise: Short Circuit Analysis - Star Point Grounding

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

MODULE 6: Connection of Grids (Estimated Time: 1h)

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.

MODULE 7: Network Planning (Estimated Time: 3.5h)

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 usage of Study Cases for analysing the network.

Exercise: Variations and Expansion Stages

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.

Exercise: Operational Planning

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

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.

MODULE 8: Additional Information (Estimated Time: 0.5h)

Additional Information

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



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