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Enhanced Modules

PSS®SINCAL

Enhanced Modules for Planning and Managing Operations in Electrical Networks

These calculation methods provide enhanced functions for interpreting and optimizing electrical transmission and distribution networks. The following modules are available:

- Dimensioning of Low-Voltage Networks
- Optimal Branching
- Load Flow Optimization
- Compensation Optimization
- Multiple Faults
- Contingency Analysis
- Help Functions for Network Planning Tasks

Dimensioning of Low-Voltage Networks

This simulation combines load flow and short circuit calculations. In accordance with VDE standard 0102, PSS®SINCAL uses the minimum single-phase fault currents to determine the maximum permitted rated current of the appropriate fuse. For this purpose, the program examines the protected zone under investigation with help of a travelling fault to determine the point where the minimum fault currents flow through the adjoining fuses.

PSS®SINCAL identifies the existing fuses that have rated current in excess of the maximum permitted value. The program also notifies the user when the load current exceeds the maximum permitted current of the fuse.

Optimal Branching

In meshed networks, this method can be used to calculate the best positions for connecting points so these can be transferred to the network configuration at the press of a button. This lets you break down the network with minimum transmission losses into a simple radial network. The load flow calculations determine the point of minimum voltage in a program loop to isolate the feeder of minimum current at that point. This process continues until the whole network has been unmeshed.

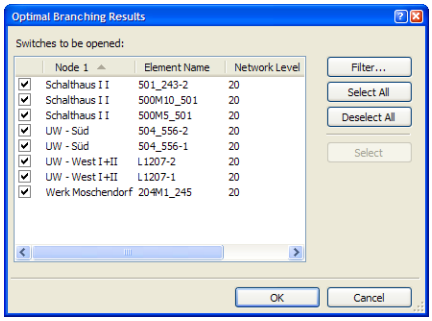

Figure 1: Results dialog box with optimal branching

This method is particularly good for pinpointing the correct disconnecting points between the different transformer ranges.

The important properties of this calculation method are:

- determining the radial network with the lowest losses
- calculating across network levels
- defining network groups that should not open
- automatically taking-over open switches
- selecting all open elements in the network graphics

Load Flow Optimization

This calculation method minimizes transmission losses in a given network. The system variables are generator voltages, generator reactive powers and transformer transformation ratios. The limitations include the loading of plant and equipment, the voltage range and the P/Q diagram allowed for the generators.

The optimum transformer tap positions and the generator powers from the calculations can be transferred to the network configuration at the press of a button.

Compensation Optimization

The purpose of PSS®SINCAL Compensation Power calculations is to reduce the reactive power at transformer low-voltage terminals. Load flow analysis for the entire network provides the basis for calculating compensation power, which can be either inductive or capacitive.

When determined compensation power is installed, this has the following advantages for the network:

- It reduces the amount of apparent power transported in the network
- It reduces the load of the equipment
- It reduces transmission losses
- It improves voltage in the network
- It helps to prevent violations of voltage limits
- It reduces the need for new transformer stations
- It reduces costs for supplying reactive power

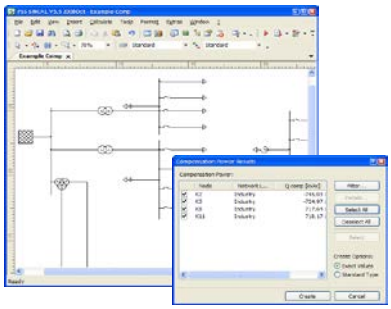

Figure 2: Determining compensation power

Multiple Faults

When faults and interruptions occur in several places simultaneously, e.g. in the not-so-rare case of a double earth fault, the multiple fault calculation ascertains the steady-state distribution of current and voltage in the network. The actual switching configuration is taken into account as preloading.

These calculation methods can, among other things, simulate the following kinds of disturbances often occurring in practice:

- Single-phase short breaks in rigid grounded networks
- Three-phase short breaks in deleted networks
- Double ground leakage in cable networks

Contingency Analysis

The purpose of this calculation method is to evaluate load flow in distribution networks when the following elements malfunction:

- Individual elements
- Elements that can operate only together
- Overloaded elements

Malfunction simulation provides network carriers with information on reliability and the deficiencies in the network. The utility gets important network information on:

- n - 1 criteria for network operation (and n-1-1)
- Breaks in supplies
- Overload conditions during network element malfunctions
- Impossible network conditions during network element malfunctions
- Priorities of network development measures
- Influences on consumer contractual agreements

Help Functions for Network Planning Tasks

A number of help functions are integrated into the user interface that will help you find the best answers to questions often coming up in network planning, e.g.:

- Optimal connection points for new loads (see Fig. 3)
- Optimal routes for new supply lines
- Resupply when equipment malfunction
- Network behavior when motors are accelerating

Most functions can be called up directly from the pop-up menu of the respective network element. Optimally designed dialog boxes are used to enter the control settings needed and present the results in clearly arranged manner.

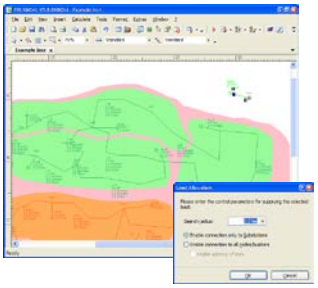

Figure 3: Load allocation

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