Technical Expert services for Network design

Power and productivity
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Improving reliability and utilization of industrial electrical networks by efficient network design

Industrial electrical networks are often redesigned when extending or rebuilding the plant. Energy consumption increases, and the electrical system reaches its limits. For this reason the plant is not able to work at its full capacity, which means economical losses.

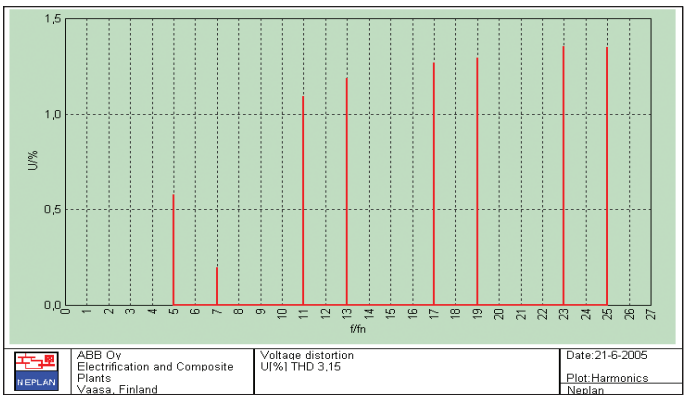
The complexity of the industrial network system is often underestimated. If not planned correctly, the probability of voltage drops, unplanned outages, inadequate protection functions or overloading is considerable in the plant network. Subsequently, because of the inferior quality of the power supply, the production process is not optimized and the lifetime of the electrical system is reduced. That, in turn, leads to further costs, which might be avoidable through correct network designing. This could involve, for example, adjusting relay settings, optimizing the power factor and filtering and performing different types of disturbance analyses.

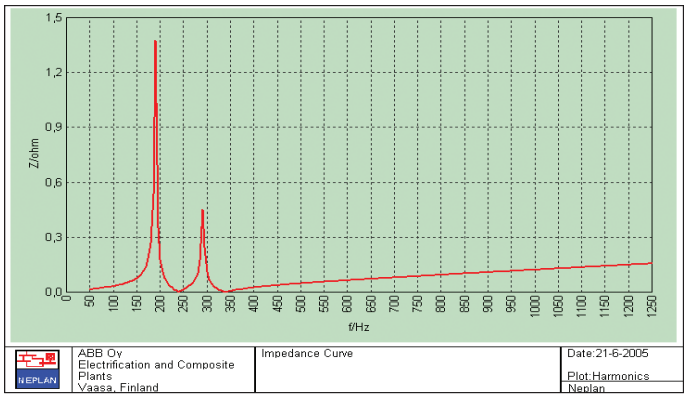
ABB offers Technical Expert Services for the Network Design of electrical networks based on 30 years experience and know-how.
Our services include different types of network calculations that are of great help when considering different alternatives at the mill planning or extension stages. Based on a network study, we can suggest improvements in order to eliminate any bottlenecks in a network. Both economical and technical aspects, including network reliability, are examined.
The starting point for a network study is always the identification of customer' needs. Based on these, an analysis for solving the problems and fulfilling the needs can be decided upon. The network study shall begin with the mill network data collection.

Calculation modules

- Load-flow calculation: voltage levels in the network, reactive and active power losses, reactive and active power flow in the network, transformer tap settings, compensation aspects, loading of components
- Short-circuit calculation: different types of faults in the network
- Network harmonics calculations: distortions and filtering in the network
- Motor start calculation: behavior of a motor during start-up, voltage drop during start-up, motor starting time
- Protection coordination studies: relay settings, selectivity of the network protection
- Dynamic analyses: island operation, load shedding, effects of turbine and voltage regulation and protection during network state changes, etc.

The amount of network data to be collected for calculation depends on the analysis at hand. It may sometimes be beneficial to do some on-site measurements, if appropriate network data is not available. Based on the collected data, the network is modeled and an analysis is carried out. The analysis can include several types of calculations from the list above, depending on the customer's needs.





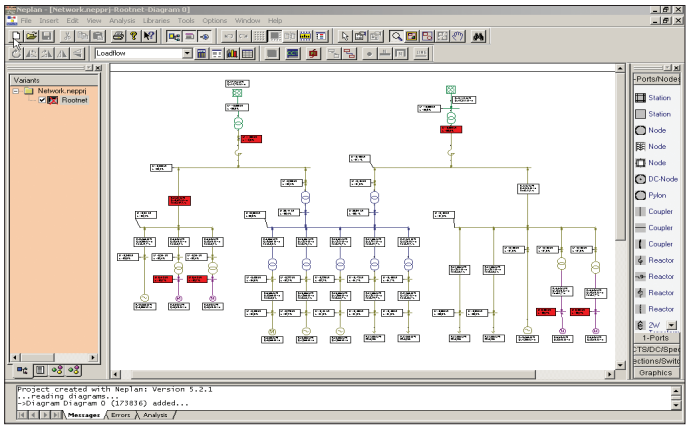
User benefits

A network analysis shall give good grounds for decision-making and opportunities for cost savings and other benefits in a predefined operating environment. Potential benefits are

- Compliance with guidelines and standards
- Reduced maintenance costs due to the extended lifetime of the network components
- Increased availability and reliability of the plant due to reduced downtimes in the network
- Reduced energy costs

User interface

The calculation program NEPLAN is provided with a graphical user interface, which allows the creation of main circuit diagrams for modeling. From the user's point of view this allows convenient network setup and result interpretation. It is also easy to carry out different types of comparison calculations in order to ensure that the best possible solution is found. As there is no limitation on the network size, it is always possible to model the network to be studied accurately enough.



Reporting

The final report will give expert recommendations on improvements or other measures to be carried out in the electrical network of the plant. The final report of the study includes the results of the calculations performed in a graphical form. Based on the calculations, a text report is also delivered. The report includes a detailed description of the calculation procedures, background information for each case processed and the proposals made. Finally, the customer receives a detailed analysis of the current condition of the network and suggestions for its improvement, while the report itself serves as a valuable document about the network for years to come.

References

ABB has wide experience in designing of electrical networks dated back to 1990-s. Some latest examples of Network studies done by ABB:

- UPM Simpele, 2011
  - network calculation
- Kemira Oyj, Sastamala, 2011
  - harmonic and load flow study for medium voltage network
- APP Lontar Papyrus, Indonesia, 2011
  - network calculation and relay settings
- April Rizhao, Kiina, 2010
  - network calculation and relay settings
- IP Svetogorsk, Venäjä, 2010
  - short circuit and load flow study and relay settings
- TVO Olkiluoto nuclear power plant, Finland, 2009
  Network study including;
  - overvoltage simulation in plant own consumption network
  - asynchronous motor operation during undervoltage
- Visy Paper, Australia, 2008
  - Short-circuit, load flow and motor start calculation. Protection coordination and harmonic analysis for mill network
- Neste Oil Naantali, Finland, 2008
  - Short-circuit, earth-fault and load flow calculation
- Sappi Saiccor, South-Africa, 2007
  - Short-circuit, load flow and motor start calculation. Protection coordination, harmonic and dynamic analysis for mill network
- APP Dagang, China, 2005
  - Short-circuit calculation for medium voltage network and relay settings
- UPM-Kymmene Oy, Tervasaari, Finland, 2004
  - Protection coordination and short-circuit calculation for high and medium voltage network
- Tervakoski Oy, Finland, 2004
  - Protection coordination and short-circuit calculation for medium-voltage network
- Eesti power Plant, Estonia, 2003
  - Relay settings for generators and main transformers
- UPM-Kymmene Oy, Jämsänkoski, Finland, 2002
  EMTP-simulation for the plant network
- UPM-Kymmene Oy, Jämsänkoski, Finland, 2002
  - Short-circuit calculation for medium-voltage network and relay settings
- Metsä-Botnia Oy, Äänekoski, Finland, 2001
  - Short-circuit for medium-voltage network
- Metsä-Botnia Oy, Kaskinen, Finland, 2001
  - Short-circuit and earth-fault calculation for medium-voltage network and relay settings
- CMPC Procor, Chile, 2001
  - Short-circuit calculation and protection coordination
- Västerås Energi & Vatten, Sweden, 2000
  - Protection coordination

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3BFI 710008 R0201 / 13.10.2010

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