Advanced Power System Analysis In Electrical Networks Using ETAP Power Station Training

Description

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Course Description

Power systems equipment must withstand not only the rated voltage, which corresponds to the highest voltage of a particular system, but also expected short level. Accordingly, it is necessary to set protective relays based on these results obtained from short circuit study. One of hot issues now related to these is arc flashing study which is mainly based on the studies of short circuit and relay co-ordination as well. All these three issues should be dealt as integral parts & bulk.

Power System Analysis means verifying the adequacy of the power distribution system and it's components, recognize coordination related disturbances and outages and collecting the required data to perform a detailed required study.

The continuity and quality of electricity delivered safely and economically by today's and futures electrical power networks are important for both developed and developing economies. The correct modeling of power system equipment and correct fault analysis of electrical networks are pre-requisite to ensuring safety and they play a critical role in the identification of economic network investments. Environmental and economic factors require engineers to maximize the use of existing assets which in turn require accurate modeling and analysis techniques.

Course Objectives

On successful completion of this course, participants will be able to:

- Understand importance of power system modeling
- Understand the need for calculation the short circuit current.
- Consequences of sustained fault current & type if faults.
- Manual calculation of short circuit using simple methods like MVA method, P.U. system, etc…
- Balanced & unbalanced power flow analysis.
- Voltage drop

- Analyze the motor starting/acceleration.
- Switchgear rating (breaking & making capacities).
- Power problem problems & assessment.
- Importance of arc flashing and relay co-ordination studies from operation & safety point of view.
- Test cases simulation using computer software's.

Course Outlines

- Introduction – Reasons for Faults – and Classification of Faults.
- Distinction between Load and Fault Current.
- Sources of Short-Circuit Current.
- Rotating Machine Reactance Changes (Subtrasient, Transient & steady state).
- Electrical systems modeling and fundamentals.
- Benefits of calculated short circuit currents.
- Fault types & consequences of short circuits.
- Load flow (balanced & unbalanced) analysis.
- Optimal power flow.
- Optimum capacitor locations
- Introduction to Fault current Calculations.
- Breaking & making currents.
- Per unit systems.
- Different typical values of positive, negative & zero phase sequence impedances for unbalance faults.
- Manual Calculations of Isc by MVA Method.
- Calculation of Isc by Impedance method.
- Calculation of Isc by symmetrical components.
- Calculations as defined & recommended by IEC 60909/ANSI C37 standards.
- Different test simulation cases using ETAP power station/CYME PSAF/SKM power technologies.
- Short Circuit Studies (Fault-Levels – Switchgear/Fuse Rating).
- Typical cases for switchgear sizing.
- Relay co-ordination & Arc Flashing studies.
- Coordination Fundamentals

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Procedures

Data Collection

- Plotting Time/Current Curves
- LV Circuit Breakers, different types
- Fuses
- Time Delay/Instantaneous Relays
- Relay Coordination Intervals
- Equipments damage curves for cables, transformers, etc…
- System earthing (Solid, resistance & reactance or even ungrounded systems)
- Motor Acceleration Analysis
- Power Harmonics problems, related issues & assessment.
- Substation grounding grid design
- DC System Load Flow & Short-Circuit

- Battery Discharge & Sizing
- Course Evaluations & Summary

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