Electrical Faults Causes, Analysis, Detection and Remedies Training

Description

Course Description

The course is concerned with the calculation of fault currents in practical electrical power systems. Short-circuit currents are associated with large amounts of very destructive energy and therefore calculations must be made to ensure that the short-circuit ratings of equipment are adequate to cater for these high currents. In addition, an accurate assessment of these currents is also essential for determining the settings of the system protection devices.

The methods of analysis, used throughout industry, are thoroughly explained in this course. A powerful engineering software package that makes complex and repetitive calculations easy to follow and document is used throughout the course to ensure that attention to detail is not compromised and minimum simplifications are made. A considerable portion of the course is devoted to the application of these methods to practical systems, starting from the preparation of the system for analysis through the calculation process, by manual calculation and by the use of computer analysis to the point of application of the results.

Course Objectives:

At the end of the course, each delegate will:

- Learn how to collect in a structured way data and information needed for a power system prior to fault analysis.
- Be exposed to the analytical techniques to study a power system under various types of faults.
- Understand faults, their effect and different types of calculations involved with short, medium and long time of these phenomena affecting the power system
- Be able to assess the design and functionality of protective equipment.
- Become familiar with the latest software based approaches to deal with complicated commercial and industrial power systems and their analysis under fault conditions.

Course Outline

Introduction to fault analysis

- Introductions
- Goals – discussion
- Source of fault current
- Fault statistics
- Basic assumptions
- Short-circuit rating of equipment
- Selecting the correct switchgear rating for fault duties
- Overview of per-unit system
- One-line diagrams
- Sources of impedance data for all items of plant
- Tutorial to demonstrate preparation of a system for study
- Introduction to the engineering software used throughout the course to make complex and repetitive calculations as accurate as possible
- Closing discussion

Three-phase short-circuit currents

- Review – summary – discussion
- Manual calculation of three-phase short-circuit current
- Circuit reduction techniques
- Industrial systems
- Electricity supply systems
- Tutorial – based on attendees plant
- Cables subjected to short-circuit currents
- Compliance with regulations
- Closing discussion

Unsymmetrical fault conditions

- Review – summary – discussion
- Overview of symmetrical components
- Consideration of various fault types
- Sequence networks
- Consideration of phase shift in two-winding transformers
- Consideration of earth impedance
- Consideration of three-winding transformers
- Closing discussion

Representation of unsymmetrical faults in power systems

- Review – summary – discussion
- Fault diagrams
- Interconnected sequence networks
- Special considerations with reference to limitation of earth fault current
- Demonstration examples based on industrial power systems

- Closing discussion

Computer based calculation of faults

- Review – summary – discussion
- Introduction to a scaled down industrial programme capable to model complex power systems under fault conditions
- Use of the software program in practical studies (checking manual calculations)
- Industrial standards
- Case studies of faults in a high voltage network
- Case study of faults in a low voltage network