

Cable Design and Diagnostic Testing

Overview:

This interactive 3-day course will cover the entire asset life cycle for cables, combining theoretical background with practical experience to provide vital knowledge to understand power cable design, selection and operation and maintenance best practices. Through a better understanding of these key aspects of the cable life cycle, the Participant will acquire the skills to start developing power cable reliability improvement strategies.

The wide range of different cable designs and materials used within the industry, across all different voltage classes, will be discussed including self-contained fluid-filled, PILC/MIND, PE, XLPE, TR-XLPE and EPR cable designs. Each design presents different challenges to the cable engineer. Doble encourages participants to bring their unique real-world problems for discussion.

Learning Outcomes:

Upon completion of this course, the participant will be able to:

- Understand types of AC cables used in electric power industry at medium-, high- and extra high-voltage (up to 380 kV). The training includes the different types of cables, cable materials and cable systems.
- Discover how understanding aging characteristics of insulating materials can help extend asset life.
- Understand how to determine the condition of electrical apparatus using field electrical tests, what tests to use for what cable types and how to interpret the results.
- Learn about operational considerations for hot climates and corrosive environments.
- Establish correct process for performing forensic examination of cable samples recovered from service as part of an asset management program to understand the cable health and state of degradation. Understand when to perform various off-line and in-service electrical tests

Course Audience:

Electrical engineers working in operations, maintenance, engineering, or other service field in which knowledge of cable design and electrical testing methods and evaluation is required part of job responsibility.

Duration:

Three Days

Class Size:

8-15 Attendees

Credits:

Up to 2.4 CEUs or 24 Professional Development Hours

COURSE OUTLINE

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The course program contains the following training outline:

Day 1:

- Design Parameters – Part 1
 - Key components of a cable system
 - Key design parameters
 - o Electrical design
 - o Thermal design
 - o Mechanical design
 - o Ancillary systems
 - Types of MV to EHV cables
 - o Polymeric
 - o Oil-filled
 - Wet and dry MV designs
 - Sheathing options
 - Key differences between different designs
 - Key cable materials
 - o Insulation
 - o Semiconductors
 - o Jacketing
 - Overview of materials manufacture
 - Importance of material grades and differences
 - New developments in materials field

Day 2:

- Design Parameters – Part 2
 - Joints and terminations
 - o Design considerations
 - o Different types
 - Earthing and bonding
- Cable & Accessories Manufacturing
 - Types of manufacturing line
 - Materials handling
 - Materials processing
 - Quality checks
 - Routine testing
- Cable Installation

Day 3:

- Ageing Mechanisms
 - Ageing processes in different cable designs
 - o Thermal
 - o Mechanical
 - o Electrical
 - o Electro-chemical
 - Signs of degradation
 - Detection methods and diagnostics
 - o Offline
 - o Online
- Asset Management
 - Before purchase
 - o Specifications
 - o Standards
 - o Cable qualification and testing
 - After installation
 - o On site commissioning
 - During operation
 - o Routine inspection
 - o Testing methods and applicability
 - Inspection of recovered cable samples and forensic examinations
- Cable ratings
 - Basics of cable rating
 - Considerations for ratings
 - Distributed temperature sensing systems

Presenter(s):

Simon Sutton, Technical Solutions Director EMEA, Doble PowerTest UK

Division of Responsibilities:

If the course is hosted at a customer location, to ensure smooth training course delivery, Doble requests the following division of responsibilities:

Doble will provide:

- Confirmed training dates upon receipt of a purchase order.
- Technical agenda for program.
- One experienced instructor including their travel/living expenses.
- Training manual (soft copy) to each participant.
- If applicable, all required measurement test equipment and tools for class and site training.
- All personnel safety equipment for Doble's instructor.

Customer will provide:

- Confirmed training schedule at least 60 days in advance.
- Training coordinator through whom all contractor requests will be coordinated.
- Training facility, AV equipment, whiteboard and pens.
- Printing hard copy training material as required.

