



Transformers: Operation, Maintenance & Testing

Course Description

While the operating principles of transformers have remained the same for nearly a century, the challenges of maintaining and testing transformers have evolved along with transformer design and construction. Modern transformers are designed to closer tolerances than ever before. Proper testing is essential for evaluating the condition of a transformer. This predictive data will guide maintenance activities and help prevent catastrophic failure that damages downstream equipment and endangers personnel

Course Objectives

This course aims are to provide understanding of the basic fundamentals and constructional features of transformers with particular reference to the design, testing, operation and maintenance.

Delegates will gain a detailed appreciation of the following:

- Practical solutions for specifying, operating and maintaining transformers in a utility or plant environment
- Comprehensive understanding of principles, selection, testing and commissioning, protection, maintenance and troubleshooting of distribution transformers
- The necessary safe procedures relating to transformer operation and related circuitry
- Testing and maintenance of transformers
- How to care for your transformers

Course Outline:

Introduction, General Principles and Classification

- General Classification of Transformers:
 - Transformer Construction
 - Core-Type
 - Shell-Type
 - Dry-type Transformers
 - Oil-filled Transformers
 - Auto Transformer
- Transformer Windings, Interconnection of Windings and Tertiary Windings
- Parallel Operation of Transformers, Loadings of Transformers in Parallel and Paralleling Requirements
- Standards for Transformers, Types and Requirements
- Transformer Tappings and Connections
- Ability to withstand Short Circuit, Impedance Percentage and Sound Level
- Case studies and workshop discussion

Transformer Constructional Details

- Transformer Oil, Characteristics, Oil Oxidation, Breakdown Voltage, Moisture Content, Acidity, Oil Testing, Dissolved Gas Analysis, Treatment and Regeneration of Oil
- Effect of Oil Expansion, Breathing Action, Buchholz Relay, Explosion Vents
- Instrument Transformers
- Transformers for Industrial Applications:
 - Arc Furnace Transformers
 - Rectifier Transformers
 - High Voltage Testing Transformers
 - Green Transformers
 - SF Transformers
- Internal and external cooling of transformers
- Construction and Details Of Transformer Cooling, Natural Cooling, Forced Cooling
- Case studies and Workshop Discussion



Transformer Features and Thermal Performance

- Thermal performance and Cyclic Rating of Transformers. Temperature indicators and alarms
- Transformer Electromagnetic Forces Radial and Axial
- Transformer Construction:
 - Cores
 - Assembly
- Transformer Windings Construction:
 - Disc Coils
 - Cross-over Coils
 - Concentric Coils
 - Sandwich Coils
 - Transpositions
- Transformer Tanks, Radiators and Tank Losses
- Transformer Fittings and Thermometers
- Case studies and Workshop Discussion

Transformer Operation and Maintenance

- Distribution Voltage Adjustment, Off-Load Tap Changing, On-Load Tap Changing
- Earth fault and Over-Current Protection of Distribution Transformers
- Transformer Maintenance:
 - Oil preservation
 - Deterioration of oil
 - Breathers
 - Condition Monitoring
 - Faults in Transformers
 - Tappings and Windings
- Advanced Transformer Maintenance
- Guidelines on how to care for your Distribution Transformer
- Remote monitoring of transformers
- Case studies and Workshop Discussion

Duration: 5 Days