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## Advanced Electrical Transformer Training

Contact us Today for a FREE quotation to deliver this course at your company's location.

<https://www.electricityforum.com/onsite-training-rfq>

One of the most important electromagnetic systems today is the electrical transformer. The robustness, range of operation energy density and simplicity associated with the relatively long life make the transformer a unique component in the Electrical Power Transmission and Distribution Systems.

As an owner of transformers you are faced with the challenge of how to minimize downtime and maximize life expectancy of your valuable asset. With budget restraints, knowing how to prioritize your transformer testing and maintenance expenditures is crucial. This transformer testing and maintenance course will review what traditional and new maintenance testing procedures should be utilized by transformer owners. We will also look at the latest developments in transformer design, construction. Many electric utilities and large industrial, commercial and institutional owners of medium and large power transformers are beginning to develop their own "Life Cycle Transformer Management" programs.

Our Electrical Transformer design, testing and maintenance course will deal with many of the technical and economic issues dealing with a) The Screening Process to prioritize the

transformer fleet; b) Transformer Condition Assessment of individual transformers, and c) Life Cycle Decisions: retire, refurbish, replace, relocate.

### **Students will learn**

- The principle of operation of the transformers
- Types of transformer core: one phase; 3 phase; Autotransformer
- Most important and typical applications;
- Sizing of a transformer for a specific application;
- How to calculate the main parameters based on equivalent schematic
- Factors that affect the proper operation of the Power and Distribution Transformers
- Connection Diagrams of primary and secondary winding; Y; Delta and Zigzag
- Special transformers for low power: Current and Voltage-Autotransformers; Special Core construction and special winding diagrams
- Relay Protection for Power and Distribution Transformers
- Buchholz Gas relay Protection and indication
- Paralleling Backup Power transformers
- Voltage transients during operation
- Surge arrestors required
- Coordination of the BIL with the rest of the System
- Thermal Stress and normal limits
- Forced ventilation and oil circulation
- Overload Capability of Power transformers
- Installation conditions for specific application
- Off Load and On Load tap changer
- Testing the dry type Power Transformers
- Testing Oil Cooled Power transformers
- On Power and Off Power Oil Test

**WHO SHOULD ATTEND**

Field and shop technicians, field engineers, supervisors and others responsible for the testing and maintenance of power transformers rated 750kVA to 500MVA and 4.16kV to 500kV.

### STUDENTS RECEIVE

- This Course Includes Our Latest Electrical Transformer Digital Handbook!! (Value \$20)
- **\$100 Coupon** Toward Any Future Electricity Forum Event (Restrictions Apply)
- 1.4 Continuing Education Unit (CEU) Credits
- **FREE** Magazine Subscription (Value \$50.00)
- Course Materials In Paper Format

### COURSE OUTLINE

#### DAY ONE

##### **Part 1. Construction and Major Elements of Power Transformers**

- Major Electrical parts of the Power transformer
- Major Magnetic Parts
- Insulation System
- Voltage Control Tap Changer
- Enclosure Types and Heat Dissipation
- Cooling System
- Internal Protection

##### **Part 2. Power Transformer governing equations and major parameters**

- Equivalent Schematic of the transformer

- Equations governing the power transformers
- Inrush and magnetization current
- Phase diagram of the transformer in normal operation
- Phase diagram of a transformer in short circuit condition
- Active and reactive losses in the Transformer
- Power factor and efficiency
- External Characteristic of a Power Transformer
- Main and Leakage Flux circulation in a Power Transformer

### **Part 3. Transients and Overvoltages**

- Voltage distribution inside the Power Transformer
- Connecting and Disconnecting a Power transformer
- Traveler Waves and Resonant effect
- Design Consideration for minimisation of the Transients
- Short Circuit parameters of the Power transformers

### **Part 4. Special transformers and applications**

- Open Delta – connection transformer
- Tertiary Winding Application
- Autotransformers
- Special core design transformers
- Phase Shift Transformers
- Transformers for Power Electronic Loads-K Factor
- Generator Unit Transformer
- Current transformers and applications

### **Part 5. Calculations**

- How to size a Power transformer for a dedicated Application
- Magnetic Circuit Equivalent schematic
- Saturation conditions

- Nameplate of the Power transformer
- Transformer Loss Calculation
- Transients and Sub-transient model of the Power transformer
- Short circuit calculation for a power transformer
- Forces and Mechanical Stress in a Power Transformer
- Heat dissipation Calculation

### **Quiz 1:**

Students will size and specify a Power Transformer for a specific application.

## **DAY TWO**

### **Part 6. Connection Diagrams**

- Type of connection: Y-Y; Y-Delta; Delta –Y
- Vector group of connection
- Z-connection and applications
- Unbalance condition and internal current circulation study for Y; Delta and Z connection

### **Part 7. Paralleling Power Transformers**

- Conditions to parallel Power Transformers
- Special Consideration to minimize current circulation
- Load sharing between the two parallel transformers

### **Part 8. Overload Capability of the Power Transformers**

- Dry Type Power transformers overload capability
- Oil Type Power transformers overload capability
- Optimum Loading Curve for maximum life expectancy

## **Part 9. Grounding of Power Transformers**

- Solid Grounding and Advantages
- Resistive Grounding
- Impedance Grounding
- Monitoring the Grounding System

## **Part 10. Protection of the Power transformer**

- Winding temperature monitoring and trip
- Oil temperature monitoring and trip
- Protection relay and fuse used for Power Transformer
- Typical Protection scheme for Power Transformers
- Insulation Coordination-BIL
- Surge arrestors and Grounding Grid
- Optimum use of protections to prolong the life of the transformer

## **Part 11. Special considerations for Power transformers**

- Type of Nonlinear Loads
- Total Harmonic Distortion Generated by the load
- K-Crest factor of the transformer
- Harmonics Effect On Power Transformer
- Resonance
- In line Reactors and Filters consideration
- Root cause investigation and failure mode analyses
- Safe operation of the power transformers
- Standards applicable for power transformers
- Example of Selection and Calculation of a Power Transformer for a Distribution System

## **COURSE TIMETABLE**

**Both days:**

Start: 8:00 a.m.  
Coffee Break: 10:00 a.m.  
Lunch: 12:00 noon  
Restart: 1:15 p.m.  
Finish: 4:30 p.m.

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