

Advanced Transformer Maintenance and Testing

4.5 Days, 3.6 CEUs

Aging transformers require a higher level of inspection and maintenance to extend their useful service life. If maintaining these devices is your responsibility, this course provides the necessary tools to succeed. Power and Instrument Transformers are critical and expensive components of the electric energy system, maintaining safe and reliable operation is essential.

Technology has made the fundamental principles of energy transfer a complex set of mathematical algorithms used to improve the four main areas of a transformer's design: mechanical, electro-magnetic, dielectric and thermal.

Prerequisite: Before attending the Advanced Transformer Maintenance and Testing training course it is recommended the attendee has:

- Already completed the basic Transformer Maintenance and Testing training course
- Previous knowledge of transformer components and is familiar with the operation of transformers in the field
- Familiarity with the basic safety requirements needed to perform low voltage and high voltage testing as well as low current and high current testing on power transformers
- Familiarity with different types of transformers and their application in the field
- Familiarity with fundamental transformer testing and recognizes the limits of acceptance of each test
- Familiarity with test templates and recommended testing sequences for each component of the transformer

Learning Objectives:

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

- Brainstorm with attendees, gain knowledge about transformers, and apply information attained from the course
- Provide attendees with theoretical and practical training on the art of testing power and instrument transformers
- Deliver a program that is structured to provide conceptual knowledge of the latest revisions of national and international standards, related to testing and diagnostics of power and instrument transformers
- Ensure attendees are able to generate a testing plan based on availability of instrumentation
- Ensure attendees are able to evaluate the electro-mechanical condition of the transformer based on fundamental testing practices supported by advanced diagnostics techniques
- Ensure attendees are able to evaluate the condition of the insulation system of the transformer based on fundamental dielectric testing practices and advanced diagnostics techniques
- Discuss and understand the effect of moisture in insulation. Attendees to this training program will be capable of deciding and determining the most practical, efficient, and cost effective method to extract the moisture from the insulation system
- Ensure attendees are capable of performing recommendations for advanced diagnostics, repair or return to operation of tested units
- Ensure attendees learn the proper methodology to estimate "loss of life" of power and instrument transformers. A good understanding of the aging process of power and instrument transformers will be given, including recommendations to scrap, replace and declare end of service life of the unit

TRAINING INSTITUTE, INC.



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SCOPE

Day 1*

- I. Introduction to Advanced Transformer Training
- II. International Standards and Guidelines
- III. Electromechanical Condition Assessment
Winding and Core Tests
- IV. Labs
 1. LV Turn Ratio & Polarity test
Excitation Current
Winding Resistance and Demagnetization (1 hour)
 2. Leakage Reactance (1 hour)
 3. HV Turn Ratio Test and Excitation Current (1 hour)

Day 2

- V. Advanced Electromechanical Diagnostics
Sweep Frequency Response Analysis (SFRA)
- VI. Simulation of SFRA Testing and Instrument Verification
- VII. Transformer Insulation: Solid and Liquid
- VIII. Physical, Chemical and Electrical Analysis
- IX. Liquid Insulation Analysis
Dissolved Gas Analysis

Day 3

- X. Special Topics of Insulation Diagnostics by the Power Factor Method
- XI. Dielectric Frequency Response
Frequency Domain Spectroscopy
- XII. Simulation of DFR Testing and Instrument Verification
- XIII. Labs
 4. Insulating Liquids – Electrical Testing (1 hour)
 5. Lab Power Factor – ITC, VDF, and Tip-Up (1 hour)
 6. Sweep Frequency Response Analysis

Day 4

- XIV. Transformer Dry-Out Process
Advanced Monitoring
- XV. Loading of Oil-Immersed Power Transformers
Life Estimation
- XVI. Instrument Transformer Testing
Advanced Current Transformer Diagnostics
- XVII. Transformer Test Data Management

XVIII. Labs

7. Transformer DFR (1 hour)
8. CT Multi-Tap Testing (1 hour)
9. Instrument Transformer and Bushing DFR (1 hour)

XIX. Labs

Day 5 (Half Day)

XX. Conclusion

- A. Evaluation of Results – Group Specific Work
- B. Preparing Presentations of Evaluations
- C. Final Written Examination
- D. Group Specific Work – Presentation (Each Group Presents Results in 20 Minutes)

*Class scheduling times may vary based on discussions and size of class