Advanced Power Transformer Diagnostics and Testing Training Course

14 - 18 Dec 2026

Cape town

4600 € (Per Person)

Ref: #ERE8656_273672

Course Introduction / Overview:

This course provides a comprehensive exploration of power transformer diagnostics and testing, essential for ensuring the reliability and longevity of critical electrical assets. In an era where grid stability is paramount, understanding the health of power transformers is not just a maintenance task but a strategic necessity. This program moves beyond routine procedures to instill a deep understanding of the principles behind various diagnostic techniques, from fundamental electrical tests to advanced methods like Dissolved Gas Analysis (DGA) and Sweep Frequency Response Analysis (SFRA). As detailed in foundational texts like Martin J. Heathcote's "The J & P Transformer Book," a holistic approach is crucial for effective condition assessment. Participants will learn to interpret complex data, diagnose incipient faults, and make informed decisions regarding maintenance, repair, or replacement. BIG BEN Training Center has designed this curriculum to bridge the gap between theoretical knowledge and practical application, empowering professionals to implement robust condition monitoring and asset management strategies that minimize downtime and prevent catastrophic failures. This training is the definitive guide for mastering transformer life assessment and predictive maintenance.

Target Audience / This training course is suitable for:

- Electrical Engineers and Technicians.
- Substation Maintenance and Operations Personnel.
- Asset Management Professionals.
- Testing and Commissioning Engineers.
- Reliability and Maintenance Engineers.
- Power System Protection Engineers.
- Technical Managers and Supervisors in the utility sector.
- Industrial Electricians and High Voltage Specialists.

Target Sectors and Industries:

- Electrical Power Generation, Transmission, and Distribution Utilities.
- Oil, Gas, and Petrochemical Industries.
- Heavy Manufacturing and Processing Plants.
- Renewable Energy Sector including Wind and Solar Farms.
- Railway and Transportation Networks.
- Mining and Mineral Processing Operations.
- Governmental Agencies and Public Works Departments.
- Large Industrial and Commercial Facilities.

Target Organizations Departments:

- Maintenance and Operations.
- Engineering and Technical Services.
- Asset Management and Strategy.
- Substation Engineering and Design.
- Testing and Commissioning.
- Reliability and Condition Monitoring.
- Health, Safety, and Environment (HSE).
- Project Management.

Course Offerings:

By the end of this course, the participants will have able to:

- Master the fundamental principles of power transformer operation and construction.
- Perform and interpret standard electrical tests including winding resistance, TTR, and insulation resistance.
- Analyze power factor and capacitance test results to assess insulation condition.
- Implement and interpret Dissolved Gas Analysis (DGA) according to IEC and IEEE standards.
- Utilize Sweep Frequency Response Analysis (SFRA) to detect mechanical winding deformations.
- Conduct and evaluate partial discharge measurements for locating insulation defects.
- Assess the condition of transformer oil, bushings, and on-load tap changers (OLTC).
- Develop a comprehensive transformer condition monitoring and life assessment program.
- Apply root cause failure analysis techniques to transformer incidents.
- Formulate effective predictive and preventive maintenance strategies for transformer fleets.

Course Methodology:

The training methodology at BIG BEN Training Center is designed to foster a deep, practical understanding of power transformer diagnostics. This course emphasizes an immersive and interactive learning environment, moving beyond traditional lecture-based formats. Participants will engage with real-world case studies of transformer failures, analyzing diagnostic data to perform root cause analysis in collaborative group settings. The curriculum incorporates interactive sessions, expert-led demonstrations of test data interpretation, and problem-solving workshops. We believe in learning by doing; therefore, participants will work through complex diagnostic scenarios, simulating the decision-making process required in the field. This hands-on approach ensures that theoretical concepts are firmly linked to practical application. Our expert instructors facilitate discussions, provide personalized feedback, and encourage the sharing of experiences among participants, creating a rich and dynamic educational experience. The focus is on building tangible skills in data interpretation and strategic asset management that can be immediately applied in the workplace to improve reliability and operational efficiency.

Course Agenda (Course Units):

Unit One: Fundamentals of Power Transformers and Diagnostic Principles

- Introduction to power transformer theory, design, and construction.
- Understanding transformer nameplate data and specifications.
- Key failure modes and aging mechanisms in transformers.
- The philosophy of condition-based vs. time-based maintenance.
- Safety protocols and procedures for high-voltage testing.
- Overview of international standards (IEC and IEEE) for transformer testing.
- Introduction to the transformer asset health index concept.

Unit Two: Essential Electrical Testing Procedures

- Winding Resistance Measurement (Doble and Megger methods).
- Transformer Turns Ratio (TTR) testing and deviation analysis.
- Insulation Resistance and Polarization Index (PI) tests.
- Excitation Current measurement and analysis.
- Power Factor and Capacitance testing for bushings and windings.
- Short-Circuit Impedance testing for detecting winding movement.
- Interpreting and correlating results from various electrical tests.

Unit Three: Advanced Diagnostic Methods for Internal Faults

- Principles and application of Dissolved Gas Analysis (DGA).
- Interpreting DGA results using Duval's Triangle and Pentagon methods.
- Sweep Frequency Response Analysis (SFRA) for mechanical integrity assessment.
- SFRA test interpretation and comparison with baseline data.
- Partial Discharge (PD) theory and measurement techniques (acoustic and electrical).
- Locating PD sources and assessing their severity.
- Vibration analysis for core and winding issues.

Unit Four: Insulating System and Mechanical Component Assessment

- Transformer oil sampling techniques and best practices.
- Comprehensive oil quality analysis (moisture, dielectric strength, acidity).
- Furan analysis for estimating the degree of polymerization of paper insulation.
- On-Load Tap Changer (OLTC) diagnostics and maintenance.
- Bushing condition assessment using power factor and hot-collar tests.
- Infrared thermography for detecting connection and cooling system issues.
- Assessing the condition of ancillary components like pressure relief devices and Buchholz relays.

Unit Five: Data Integration, Life Assessment, and Asset Management Strategies

- Integrating data from multiple diagnostic tests for a holistic assessment.
- Developing a transformer condition assessment report.
- Techniques for remaining life assessment and risk analysis.
- Developing and implementing a comprehensive transformer maintenance strategy.
- Online transformer monitoring systems and their benefits.
- Case studies in transformer failure analysis and diagnostics.
- Final review, Q&A session, and strategic planning for asset management.

FAQ:

Qualifications required for registering to this course?

There are no requirements.

How long is each daily session, and what is the total number of training hours for the course?

This training course spans five days, with daily sessions ranging between 4 to 5 hours, including breaks and interactive activities, bringing the total duration to 20 - 25 training hours.

Something to think about:

Considering the rise of renewable energy sources and their intermittent nature, how must traditional transformer diagnostic strategies evolve to ensure grid stability and asset longevity?

What unique qualities does this course offer compared to other courses?

This course distinguishes itself by adopting a holistic, strategic perspective on transformer health, moving far beyond a simple procedural overview of testing methods. While other programs may focus on how to perform a test, we concentrate on the critical subsequent steps: how to interpret the complex data, how to correlate findings from multiple diagnostic techniques, and most importantly, how to translate these technical insights into actionable, cost-effective asset management decisions. The curriculum is built around a philosophy of root cause failure analysis and predictive intelligence rather than reactive maintenance. We emphasize the "why" behind each diagnostic signal, enabling participants to diagnose incipient faults with greater accuracy. Furthermore, the course content is deeply rooted in practical application, utilizing an extensive library of real-world case studies that challenge participants to solve complex diagnostic puzzles. This approach ensures that attendees leave not just with technical knowledge, but with the refined judgment and strategic foresight required to manage critical transformer assets effectively, directly impacting organizational reliability and financial performance.