



POWER TRANSFORMER

Failure Analysis & Troubleshooting

Course Introduction:

Electricity is high-grade energy. Working in the electrical substations and generating stations needs to be able to deal with the power transformers. All staff managers, administrators, engineers or technicians need to understand the power transformers rules and their applications also learn the requirements of power maintenance, testing and transformer failure Analysis and troubleshooting and be able to understand the protection system of power transformers

This course is designed to raise the level of electrical engineers deal with the power transformers to provide specific guidance to those who must implement and follow the associated procedures

Course Objectives:

Delegates will:

- Develop a thorough understanding of electrical power transformer Rules and their application.
- Understand individual responsibilities for power transformers in Substations
- Learn the detailed procedures for testing of power transformers standards
- Understand the Power transformer failure analysis & Troubleshooting
- Learn requirements for the maintenance of power & distribution transformers
- Develop an understanding of the role of switchgear and associated protection in transformers
- Be able to identify key issues for the improvement of their company's power transformers operation.

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Course Outline:

- Transformer theory & transformer types
- Basic operation of transformers
- The components of power transformer
- Core characteristics
- Conservator
- Transformer tank
- Transformer windings
- Transformer oil
- Tap changer
- Scope & service conditions of power transformer
- Preferred values of rated power and distribution transformers

- Standard of Insulating Oil & Power Transformer
- Estimate of paper deterioration (On-line)
- Methods of transformer cooling
- Winding connections
- Main causes of failures of transformers in service
- Failure due to defective design of power transformers
- Failures due to manufacturing deficiencies
- Failures due to defective materials
- Adverse operating conditions of power transformer
- Improper maintenance practices
- Failure of HV, LV and Tertiary Winding due to Short Circuit and Surge Voltages
- Failure of magnetic circuits
- Failure of on-load taps changers (OLTC)
- Failure of bushings
- Problems external to transformer **overloading, over fluxing and over voltage**
- **Hot joints and spark over**
- Frequent feeder tripping due to reflected faults
- Testing Sequence for Power Transformers
- Over current conditions & short circuit tests
- Testing of transformers according to IEC 60 076
 - + Routine tests
 - + Type tests
 - + Installation tests
 - + Commissioning tests

Examples and Case Studies

- Measurements of winding resistance
- Transformer turns-ratio and polarity tests
- No load loss and current
- Voltage ratio measurement and check of vector group
- Induced voltage withstand test
- Tests of temperature rise
- Transformer troubleshooting

Examples and Case Studies

- Impulse voltage test
- Measurements of insulation resistance
- Mechanical requirements

- Information required with enquiry and order selection of level
- Details of transformer connection with general use
- Parallel operation of three phase transformers
- Distribution transformers
- Protection of power transformers
- Grounding of transformers
- Maintenance of transformer
- Transformer oil testing
- Main causes of transformer failure
- Dissolved gas analysis

Fault-gas analysis

- Duval triangle

Insulating-liquid analysis

Diagnosing transformer problems utilizing dissolved gas analysis and the Duval triangle

- Testing and quality assurance
- Ensuring transformer reliability

Examples and Case Studies

Detection of fault of transformers

Check List for Transformer Assembly

Neutral grounding resistor

Protection of power transformer

Ratio meters

Course Methodology:

A variety of methodologies will be used during the course that includes:

- (30%) Based on Case Studies
- (30%) Techniques
- (30%) Role Play
- (10%) Concepts
- Pre-test and Post-test
- Variety of Learning Methods
- Lectures
- Case Studies and Self Questionnaires
- Group Work
- Discussion
- Presentation

Course Certificate:

International Center for Training & Development (ICTD) will award an internationally recognized certificate(s) for each delegate on completion of training.

Course Fees:

To be advised as per course locations. This rate includes participant's manual, Hand-Outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Course Timings:

Daily Course Timings:

08:00 - 08:20	Morning Coffee / Tea
08:20 - 10:00	First Session
10:00 - 10:20	Coffee / Tea / Snacks
10:20 - 12:20	Second Session
12:20 - 13:30	Lunch Break & Prayer Break
13:30 - 15:00	Last Session

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