

**Training Title**

**POWER TRANSFORMER FAILURE ANALYSIS & TROUBLESHOOTING**

**Training Duration**

5 days

**Training Dates & Venue**

REF	Power Transformer Failure Analysis &				
EE069	Troubleshooting	5	13-17 January, 2019	\$4,250	Dubai, UAE

Training will be held at any of the 5 star hotels. The exact venue will be informed once finalized.

**Training Fees**

- 4,250 US\$ per participant for Public Training includes Materials/Handouts, tea/coffee breaks, refreshments & Buffet Lunch

**Training Certificate**

Define Management Consultancy & Training Certificate of course completion will be issued to all attendees.

**TRAINING OVERVIEW**

**TRAINING DESCRIPTION**

The Electricity Companies have to supply electricity to the consumers at the lowest possible cost commensurate with safety. Power Transformers represent a major capital asset for electricity suppliers. While in service power Transformers must be maintained and monitored in order to anticipate faults and possibility avert any failure. Faults in Power Transformers can occur at any time, and the causes are many and varied. When faults do occur they generally cause loss of supply to customers and loss of revenue for suppliers. So it is imperative that the fault location process is efficient and accurate to minimize excavation time, which results in results in reducing the inconvenience to all concerned. For fault locating to be efficient and accurate technical staff needs to have expert knowledge accompanied with experience in order to attained service reliability. This course is designed to ensure that those responsible for diagnosis, operation, Testing , maintenance and monitoring of power transformers understand the technical issues involved and comply with relevant specifications and requirements.

**TRAINING OBJECTIVES**

After the end of the course, participants will be able to:

- Understand the essential characteristics and requirements of Power Transformers.
- Appreciate the technical options for diagnosis, Operation, and Testing of Power Transformers.
- Apply practices for Fault detection and location for Power Transformers.
- Identify Problems and failure modes .
- Perform routine & preventative Maintenance and testing of Power Transformers

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## WHO SHOULD ATTEND?

Engineers and Technicians from Electrical Power Utilities Companies, Manufactures and Distributors of Power Transformers, Engineering Professional in Petrochemical Companies, and Commercial Buildings. Participants need no specific requirements other than basic understanding of Electricity and Magnetism and knowledge of nature and operation of Power supply and distribution system.

## TRAINING METHODOLOGY

A highly interactive combination of lectures and discussion sessions will be managed to maximize the amount and quality of information and knowledge transfer. The sessions will start by raising the most relevant questions, and motivate everybody find the right answers. The delegates will also be encouraged to raise their own questions and to share in the development of the right answers using their own analysis and experiences. Tests of multiple-choice type will be made available on daily basis to examine the effectiveness of delivering the course.

All presentations are made in excellent colorful power point. Very useful Course Materials will be given.

- 30% Lectures
- 30% Workshops and work presentation
- 20% Group Work & Practical Exercises
- 20% Videos & General Discussions

## DAILY OUTLINE

### Module (1) Introduction of Power Transformers

- 1.1 Historical survey of Transformer Development and Applications
- 1.2 Transformer Design and Construction
- 1.3 Defining Transformer Life Expectancy
- 1.4 The Insulation System
- 1.5 Life Time of Transformer
- 1.6 Transformer's Oil

### Module (2) Routine Tests

- 2.1 Measurement of Voltage Ratio and Check of Vector Relationship.
- 2.2 Measuring of Winding Resistance
- 2.3 Measuring of Impedance Voltage and Load Loss
- 2.4 Measuring of No-Load Loss and Current
- 2.5 Dielectric Tests
- 2.6 Separate- Source Voltage withstand Test
- 2.7 Induced over - Voltage withstand Test
- 2.8 Partial Discharge Measurement
- 2.9 Test on On - Load Tap Changer

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### Module (3) Special Tests

- 3.1 Temperature Rise Test
- 3.2 Measurement of Zero Sequence Impedance
- 3.3 Measurement of Voltage & Current Harmonics
- 3.4 Measurement of Insulation Resistance
- 3.5 Measurement of Capacitance and ( $\tan \delta$  )
- 3.6 Lightning Impulse Test
- 3.7 Switching impedance Test
- 3.8 Measurement of Acoustic Sound Level

### Module (4) Oil Immersed Transformers

- 4.1 Application Field
- 4.2 Categories of Equipments
- 4.3 Transformer Classification
- 4.4 Specification for uninhabited Insulation mineral Oil
- 4.5 Main Standards used for Routine Tests
- 4.6 Recommended limits for unused mineral insulating oils field in new Power Transformer
- 4.7 Oil Functions
- 4.8 Dissolved Gas Analysis (DGA)
- 4.9 Incipient Fault Detection in Oil Immersed Trans- former and Faults Types

### Module (5) Measurements of Insulation Resistance

- 5.1 Introduction of Insulation Resistance Measurements
- 5.2 Two Windings Measurements
- 5.3 Three Windings Measurements
- 5.4 Measurement Analysis
- 5.5 Measurement Instruments

### Module (6) Measurements of Voltage Ration

- 6.1 Introduction
- 6.2 Measuring Circuit
- 6.3 Measurements Analysis
- 6.4 Measurements Instruments

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### Module (7) Capacitance & Power Factor ( $C$ & ( $\tan \delta$ )

- 7.1 Introduction
- 7.2 Bushing Capacitance
- 7.3 Power Factor Measurements
- 7.4 Tap Insulation Capacitance
- 7.5 Hot Collar Technique

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- 7.6 Transformer Capacitance
- 7.7 Two Windings Transformer Test procedures
- 7.8 Three Windings Transformer Test Procedures
- 7.9 General Test Procedures for Windings
- 7.10 Losses and Cos  $\theta$  variation with Test Voltage
- 7.11 Test of Oil Insulation Power Factor
- 7.12 Transformer Exciting Current Measurements

## Module (8) Partial Discharge Techniques

- 8.1 Introduction
- 8.2 What is Partial Discharge?
- 8.3 Why Test for Partial Discharge?
- 8.4 Occurrence of Discharge
- 8.5 Physical Background of Partial Discharge
- 8.6 Type of Partial Discharge
- 8.7 Magnitude of Discharge
- 8.8 Characteristic of discharge Patterns
- 8.9 Partial Discharge Test Facility
- 8.10 Partial discharge with Induced Voltage
- 8.11 Actual Detection Circuits
- 8.12 How to calibrate the Partial Discharge System?
- 8.13 How to measure Partial Discharge?
- 8.14 Partial Discharge Methods Available
- 8.15 On - Site Partial Discharge Measurements

### NOTE:

Pre & Post Tests will be conducted  
Case Studies, Group Exercises, Group Discussions, Last Day Review & Assessments will be carried out.

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P.O BOX 45304  
ABU DHABI, U.A.E

T +971 2 6264455  
F +971 2 6275344

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