

## Determining the Health of a Transformer

(with a focus on Oil Analysis and Electrical Testing)

### Course Overview

This course has been developed to equip the attendee with the knowledge of oil analysis and electrical testing on transformers. These diagnostic tests are essential when assessing the transformers' ability to withstand dielectric, thermal and mechanical stresses. The different diagnostic tests approaches are discussed in detail which includes theory, setup and test methodology, acceptance criteria and case studies to give the attendees a greater appreciation. The course is designed to train you to look for expected results in the absence and presence of a fault which will ensure an informed decision and avoid costly misdiagnoses. The culmination of these diagnostic tests is key in assessing the transformer's health and risk of failure.

### Course Outline

- **Basic Theory**
  - *Physics of electromagnetism*
  - *Insulation System*
- **Transformer Failure Mode Analysis**
- **The Engineer and Oil Analysis**
- **Oil Quality Essentials**
  - *Degraded by contaminants*
  - *Moisture and Relative Saturation*
  - *Dielectric Strength*
- **Dissolved Gas Analysis (DGA)**
  - *DGA explained from an Engineer's perspective*
  - *Detection of dielectric and thermal faults*
  - *Stray Gassing*
  - *Analytics (IEC, Duval, etc)*
- **Furanic Analysis**
  - *Introduction into Cellulose Insulation*
  - *Cellulose degradation principals*
  - *Degree of Polymerisation (DP)*
- **Onsite Electrical Testing**
  - *Power Factor/Tan Delta*
  - *Turns Ratio*
  - *Exciting Current*
  - *DC Winding Resistance*
- *RLC Circuit*
- *Stress Models*
- *Acidity*
- *Interfacial Tension*
- *Interpretation using DGA Signatures*
- *Chaos (false positives)*
- *Practical Case Studies of South African Transformers*
- *Furanic Compounds*
- *Conversion from 2FAL to DP*
- *Practical Case Studies of South African Transformers*
- *Insulation Resistance*
- *Sweep Frequency Response Analysis (SFRA)*
- *Leakage Reactance*
- *Partial Discharge (PD)*

### Learning Outputs

- Understand the fundamental theory of transformers that pertains to diagnostic tests
- Understand the use of oil analysis as a tool to detect incipient faults
- Learn the principal of assessing the condition of the paper insulation
- Understand the basics of PD, its detection, and consequences
- Gain a greater insight into onsite electrical testing, its applicability to detect a fault and its correlation to oil analysis
- Improve asset management decisions by understanding the dielectric, thermal and mechanical condition of your transformer

### Target Audience

Electrical Engineers, Technicians, Technologists, Maintenance Electricians, Managers, Supervisors, and other technical staff involved in testing and condition assessment of transformers.

Duration: 2 Days

Venue: Pretoria and Durban

**Presenters:** Luwendran Moodley (*BSc Eng Pr Eng*) and Kamendren Govender (*BSc Eng Pr Eng*)

The presenters have been involved in diagnostics testing and analysis of transformers for more than 20 years. They have been involved in transformer diagnostics across the energy sector which includes generation, transmission, wind turbines, dry type, furnace, rectifier transformers etc. They have pioneered advanced onsite diagnostic test techniques and have developed methods to seamlessly merge oil and electrical testing to ascertain the severity and location of faults.

*Interested in this course, then contact us:*

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