

Transformer Oil Analysis



Transformers were traditionally over-designed by 300% to ensure a long service life. Today, this margin has been reduced due to the majority of transformers operating at a 25% higher work load than recommended. This leads to higher gas production and faster deterioration of the insulation paper and oil. The average service life of a transformer in South Africa is now only 12.5 years.

Changing role of transformer analysis in SA

- Condition monitoring (monitoring or checking of parameters on a regular basis) is now essential for transformer owners.
- Movement away from doing just classic moisture, acid and dielectric (MAD) tests to more “specialist” tests.
- Driven by environmental legislation and insurance requirements.
- Transformer laboratories have become better equipped and the focus is now on quality and accuracy.



Transformer Tests

The tests monitor various aspects of the transformer

- Oil condition** - moisture, acid content and dielectric strength
- Internal working** - dissolved gas analysis (DGA)
- Paper condition** - furanic analysis
- Contaminants** - PCB and corrosive sulphur

Moisture Analysis

Why is it important to determine the moisture content in transformer oil?

- To determine if there are any leaks in the transformer
- Increase in moisture accelerates insulating paper degradation
- To determine if decrease in insulating strength is due to high water content in the transformer oil
- Paper and oil degradation

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Total Acid Number (TAN)

TAN is an indication of the acidity of the oil. High acidity will cause oil degradation and sludge formation which will cause paper degradation, cooling problems and internal corrosion.

Dielectric Strength

Dielectric strength is the voltage at which the electric breakdown of the oil occurs. By analysing the voltage the amount of contaminants and the insulating quality can be predicted.

Dissolved Gas Analysis (DGA)

Dissolved gases in transformer oils are inherent gases and gases that form due to the breakdown of the paper, oil under stress or degradation, or mechanical faults.

With regular DGA testing the following problems can be detected months in advance

- Overheating
- Breakdown in insulation
- Partial discharge
- Overloading
- Loose connections
- Arcing
- Corona
- Sparking

Furanics

Furanics are degradation by-products of the insulation paper found in transformers.

Analysing furanics is important in predicting the degradation of the insulating paper.

The following will destroy insulation paper

- Water (moisture)
- Heat
- Oxygen
- Oil oxidation

Corrosive Sulphur

Corrosive sulphur forms acidic conditions in transformers. This is a vital test as DGA, MAD and furanic tests may indicate normal operation even when failure is imminent. If corrosive sulphur oil is found, oil will need to be replaced.

Polychlorinated Biphenyl (PCB) Analysis

PCBs were released in the 1970's during the oil crisis in order to bulk up transformer oil volume. Due to the high toxicity and environmental impact of PCBs it is now been legislated to know the PCB content of your transformer oil.

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