

Switchgear Oil Diagnostics: Live Tank Oil Sampling (LTOS)



LTOS is a unique cost effective oil analysis technique for sampling switchgear units which minimises the switching requirements. The oil quality (Moisture, Acidity and Breakdown Voltage Strength) and filtration (solid contamination/residue analysis) techniques are utilised to understand the internal condition of the units and accurately determines whether invasive maintenance is required.

Oil quality

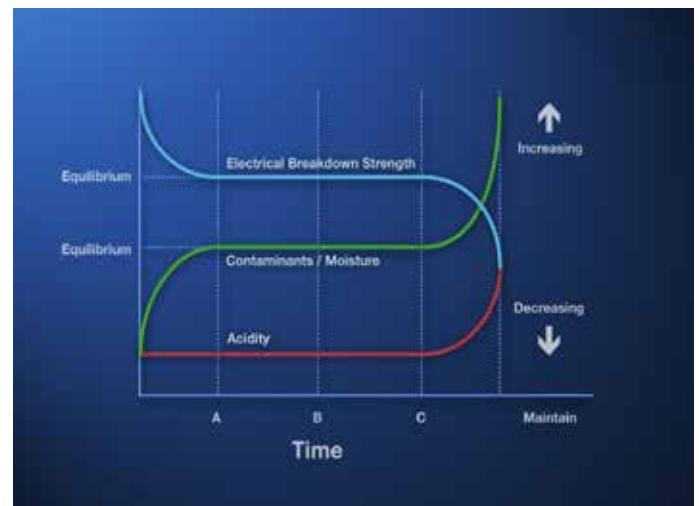
Measuring moisture, acidity, solid contamination and breakdown strength of the oil gives a good indication of the overall condition of the oil and internal components. The quality of the oil is also critical in preventing premature ageing of the transformer and extending service life.

Filtration & solid contamination assessment

The oil is filtered through a filter paper using a vacuum pump to draw the oil through. The contamination and residue is collected on the filter paper which is then dried and analysed under the optical / scanning electron (SEM) microscopes to identify the particulate. Typical particulate include fibres, debris, insects, metallic materials, paint flakes and insulation materials. This allows a deep understanding of the degradation of the oil and internal components.

Maintaining oil filled 11kV switchgear using a time-based schedule can result in considerable wastage, as not all the equipment will require maintenance. In fact, EA Technology research shows that in a typical switchgear population, over 90% will be operating normally and require no maintenance. Live Tank Oil Sampling is a simple and cost effective service that allows you to identify which assets require attention and which are operating normally, with minimal disruption to the switchgear operations.

Conventional switchgear maintenance, based on shutting down equipment regularly for inspections, can reduce reliability, increase health and safety risks and cause unnecessary downtime and disruption. Yet research proves that the vast majority of these units would operate safely and reliably for many years, without any additional maintenance.



Schematic representation of oil condition parameters as a function of time (for oil filled switchgear)

Benefits

- Saves money by eliminating wasteful, time-based maintenance
- Oil condition accurately indicates whether invasive maintenance is required or NOT
- Safely extends periods between maintenance interventions
- Identifies degradation of specific components BEFORE they lead to failure
- Warns of switchgear degradation problems BEFORE they lead to failures, increasing asset reliability AND reducing costs
- Cost effective and safe, proven method of retrieving an oil sample causing minimal disruption to the network

EA Technology Live Tank Oil Sampling is an innovative solution based on switchgear oil analysis, with samples obtained whilst part of the unit remains live, minimising the disruption to the network.

LTOS service Oil Sampling

- A 50ml sample is taken via the test access cover using a tailored cover plate to the specific switchgear type. The unit is left partially live during sampling.
- The syringe is sealed, labelled and returned to EA Technology for analysis
- The process is well-proven, safe and causes minimal disruption to the network

Oil Analysis and Reports

- Laboratory analysis is carried out to determine the quality of the oil. The moisture content, acidity content and breakdown voltage strength are assessed along with filtration of the oil in order to determine the solid contamination
- The analysis picks up characteristics in the oil which indicate that specific components are on the path to failure and assesses them against the degradation curve. This assists in determining how long the oil can be left safely in the equipment before maintenance is required
- Clients receive a report on the condition of the asset, together with maintenance recommendations

Results

Assets are reported to have one of four ratings:

- **PASS:** Satisfactory oil condition, which enables an extended maintenance interval to be adopted and the unit should be re-sampled in five years.
- **RETEST:** Evidence of some oil degradation, the unit should be retested in 30-36 months (half PF interval for oil degradation).
- **MAINTAIN:** Indicates very poor oil quality, unit should be maintained within 6months.
- **ACTION:** Extremely poor oil quality indicating the unit is prone to a catastrophic failure in the short term and the client will be advised accordingly.

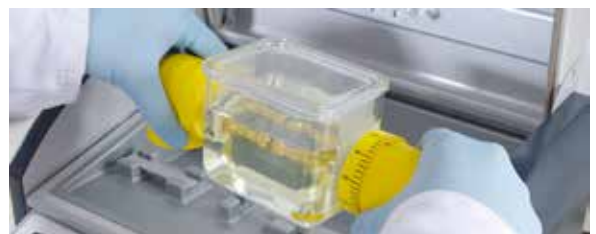
With typically over 90% of assets gaining a pass grade, it is clear that Live Tank Oil Sampling can result in a significant reduction in unnecessary inspections and maintenance and substantial savings on maintenance budgets

Safer, Stronger,
Smarter Networks



80% cost saving

Moving to LTOS from time-based maintenance has reduced the cost of maintaining 500 units by more than 80% per annum for one of our clients. The safety and reliability of their network has also improved, thanks to lower switching requirements and rates of failure.



www.eatechnology.com/oil-diagnostics

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