



LIVE TANK OIL SAMPLING FOR RING MAIN UNITS

Over recent years, TJH₂b's UK subsidiary has analysed thousands of oil samples and data supplied by customers to gain detailed knowledge of the condition of oil within 11 kV oil filled switchgear. The ultimate aim was to determine how long the oil can safely be left in the equipment before maintenance is required.

It was determined that the use of a generic oil sampling regime could be used to determine the optimum maintenance period for various types of oil filled switchgear. *The most important factor to prevent degradation of the solid materials in the switchgear tank and ensure long service was the cleanliness and condition of the insulating oil.*

RCM studies completed on 11 kV oil filled switchgear have concluded that it is the oil condition that determines the maintenance of the equipment. Invasive maintenance is only required when significant degradation has occurred.

Completing a series of fluid tests monitors the condition of the oil filled switchgear. By completing on-going monitoring, it is possible to determine degradation processes and determine the optimum time required for maintenance.

BENEFITS:

- Significant cost savings by optimizing the maintenance periods for individual units.

- Identifies units in danger of imminent failure enabling immediate action to be taken.
- Cost effective oil sampling system resulting in reduced switching requirements.
- Maintenance policies based on oil condition are now justifiable in practice.
- Minimal disruption to the system.
- Determines the maintenance schedule for each individual switch.
- Complete system, from equipment supply to oil analysis reports with recommendations, available from TJH₂b.

LIVE TANK OIL SAMPLING (LTOS)

TJH₂b have an innovative system that allows samples to be taken from any "live" switchgear oil tank that is fitted with a tank access lid. Subsequent testing can determine whether imminent failures exist due to oil quality.

The process involves access to the oil tank via the test probe access point, with only feeder isolation and earthing necessary to open the test access cover. Therefore, the sampling is undertaken when some parts of the switch within the oil tank are live. The procedure is subject to the issue of appropriate safety documentation within the overall safety regime of the parent company. The sampling process involves the use of specifically designed equipment and adherence to a detailed written procedure.

The equipment used is essentially in two parts:

- reusable cover plate for the test probe access
- disposable syringe based sampling assembly

The reusable cover plate is a specifically manufactured component which fits over the test probe access in a similar manner to the top plate of a set of test probes. When fitted, it effectively blanks off the test probe access area. A specifically machined orifice over on of the test probe entry points allows insertion of the sampling tube.

The disposable sampling assembly consists of a syringe, an end fitting and a short length of polyethylene tubing. The final assembly is such that the syringe and sampling tube interface fits snugly into the location point on the cover plate with the sampling tube protruding through the into the oil tank (as shown in the diagram below).



Diagram above: Test Access Cover Plate and Sample Kit Fitted on a Long and Crawford T3GF3 Ring Main Unit

The design of the end fitting, tube assembly, and orifice in the cover plate area are such that, once assembled, no component can enter into the oil tank if it were to become detached. The kit was also designed to minimize the risk of introducing any foreign body into an active area of the oil tank during the sampling process.

Extensive research was completed in order to ensure an oil sample taken from the top of the tank was satisfactory in determining the condition of the unit and the requirement for maintenance. The results showed that the LTOS method could be used to effectively manage the maintenance scheduling of 11 kV oil filled switchgear.

USE OF RESULTS:

After evaluating thousands of oil results, criteria for the condition assessment of the switchgear using LTOS was established. The result from each test was given a weighting, and the sum of these weightings determines the action required on the unit.

PASS: Indicates satisfactory condition, which enables an extensive maintenance interval to be adopted. This generally involves a retest at the next maintenance interval or 5 years (whichever is the shorter).

RETEST: Indicates evidence of some degradation; unit should be retested at 50% of the maintenance interval or 3 years (whichever is the shorter).

MAINTAIN: Indicates evidence of advanced degradation. Unit should be maintained within 6 months.

For further information on this technology, please contact Mahanga Holdings Limited on Phone: (64) 9 444 0663 or Email: mhl@xtra.co.nz