MIDEL® 7131

Fluid Maintenance Guide - Distribution Transformers

General

MIDEL 7131 is a very robust fluid which is capable of giving long service, even in the most demanding of applications. As with mineral oil, in order to ensure that MIDEL 7131 gives continued good service it is possible to monitor a number of the fluid parameters throughout the life of the transformer. Testing the fluid also has the added benefit of picking up any potential problems with the transformer before a failure occurs.

Generally, for distribution transformers, sampling of the fluid is recommended before energising, after the first year of service and at five year intervals thereafter. For larger power transformers, highly loaded or critical units, the frequency of testing may be increased.

It is important to understand some fundamental differences between MIDEL 7131 and mineral oils when carrying out fluid testing for maintenance. Many laboratories are now experienced in the testing of MIDEL 7131, but at times a failure can be logged against a sample when the incorrect mineral oil limits are applied.

Table 1 shows the typical fluid testing parameters and the limits according to IEC 61203 'Synthetic organic esters for electrical purposes - Guide for maintenance of transformer esters in equipment'. It should be noted that this guide and the IEC 61203 standard do not apply to retrofilled transformers, i.e. those that have previously been filled with another fluid.

Table 1 - Common Test Parameters and Guidance Limits

Parameter	Test Method	IEC 61203
Appearance	IEC 61203 3.1	Clear, without visible contamination
Water Content*	IEC 60814	max. 400 ppm
Neutralisation Value	IEC 61099 9.11	max. 2.0 mg KOH/g
Breakdown Voltage	IEC 60156	min. 30 kV
Fire Point	ISO 2592	min. 300 ºC

*At ambient temperature

Breakdown Voltage Testing

The breakdown voltage of new MIDEL 7131 is typically in excess of 75kV when tested to the IEC 60156 2.5mm gap method. Testing has demonstrated that even after long term ageing of the fluid there is little deterioration of the breakdown voltage. In addition, even at very high moisture contents, up to 1000ppm at ambient temperature, testing has shown that the breakdown voltage will be preserved well above the 30kV lower limit.

There are some issues that can cause a drop in breakdown voltage and the first is particulate matter in the fluid. Particles can float between the test probes and cause a localised weakness when carrying out the breakdown test. This can usually be identified by erratic results when comparing a series of breakdowns. If particles are suspected to be causing a breakdown issue then the fluid can be filtered through a fine paper filter and re-tested.

Another issue that can arise is if not enough settling time is allowed between each breakdown test. In this case gas bubbles formed by the breakdown arc are not given sufficient time to dissipate and can cause a weak link between the probes. Typically an average of six breakdown tests are taken and it is recommended to leave a minimum settling time of ten minutes before the first breakdown test and then five minutes between each subsequent breakdown test to ensure that gas bubbles have sufficient time to disperse.

Fire Point Testing

Fire point testing can be conducted to determine if the MIDEL fluid has been contaminated with another fluid with a lower fire point, such as mineral oil. However, fire point is less indicative of the condition of the fluid than other tests, such as the neutralisation value. If there is no possibility of cross contamination then fire point testing may not be required on a routine basis.

DGA and Furan Analysis

Diagnosis of transformer performance by traditional DGA and Furan analysis is still applicable to MIDEL 7131 filled transformers. The methods used to diagnose faults with DGA in mineral oil can be used with MIDEL 7131 provided minor adjustments are made to Duval triangle boundaries and table ratios. For further information contact the MIDEL technical department: mideltech@mimaterials.com.