

Low frequency drying of power transformers (LFH drying)

The challenge:

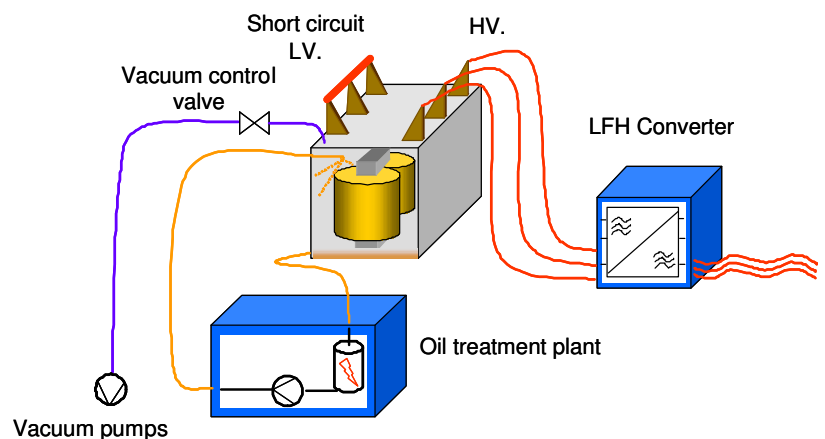
The technical lifetime of transformers is mainly depending on the condition of the organic insulation system. Besides the operation temperature is the moisture the main enemy of the insulation material. The moisture content is not only influencing the breakdown voltage but also the degradation speed.

Moisture:

The moisture value in a transformer will increase over time. Main reasons are the moisture ingress through breathing (even with a silica gel breather) and the water production due to paper degradation. Also a major repair on site where the active part is exposed to air is a major contributor for the total moisture content. Over 99% of the moisture is absorbed in the insulation paper. An efficient and fast drying procedure is therefore always including heat and vacuum. A simple oil treatment will not remove any considerable amount of moisture from the insulation material.

The LFH system:

With the LFH system the windings will be heated directly with a low frequent current (approx. 1 Hz). The heat is thus produced where it is needed, and it will force the moisture out of the insulation paper. Due to the low frequency and the resulting low voltage needed the transformer can be heated electrically even under vacuum conditions. So heat and vacuum are present from the beginning and are ensuring an optimal drying process. Due to the continues temperature control of the windings is it possible to reach safely higher temperatures then with classical oil processes. This makes the LFH technique the most efficient drying system for onsite drying of power transformers.



Advantages on one glance:

- Optimal drying result with residual moisture levels down to 1% wt.
- Shortest process time (approx. 4 days for a 200 MVA transformer)
- Easy installation
- Computer controlled process
- Mobile installation in a 20' Container for worldwide operation
- Over 15 years of own experience and unique expert knowledge
- Individual temperature control of high- and low voltage windings
- Dual heating system (individual heating of high voltage windings) for optimized heat dissipation

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Technical data:

- Converter rated power: 160 kVA
- Max. current: 630 A
- Max. voltage: 1000V
- Ideal for transformers from 1-1000 MVA
- El. connection: 3*400V / 200A
- Frequency range 0.001-1.5 Hz
- Installed in a 20' container
- Manufacturer: ABB Micafil



Our LFH plant connected to a 2 MVA transformer

Process description:

The LFH process is during the first phase often in combination with a classical oil process (hot oil circulation or hot oil spray). With this combination one can make sure that also insulation parts away from the main windings are heated. After the first step the oil is drained and the rest of the drying happens with LFH heating only. As this happens under vacuum (no oxygen), have even temperatures above 100°C now measurable negative effect on the paper degradation. After the drying process oil will be filled again in order to protect the active part from moisture. As the transformer was under vacuum for a long period, now additional vacuum holding time is needed.



LFH drying of a 750MVA/500 kV autotransformer (picture: ABB)

Profit from our huge experience in the field of power transformer drying and increase the lifetime of our most valuable asset.

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