Oil Reclaiming Solutions for aged oil
Extend the life time of your transformers

Introduction
The state of the oil-cellulose insulation system in a transformer is one of the key parameters influencing:
- Life expectancy
- Reliability

The ageing rate of this organic insulating materials depends on different parameters such as:
- Original insulation material
- Oil temperature
- Water content
- Oxygen content
- Acids from oil degradation

Oxidation is the main reason for oil ageing. Ageing is influenced by temperature, as well as metals like copper and iron. Water, acids and sludge are the oxidation products that cause the most concern. Reclaiming of transformer oil is a measure to restore the oil's properties to very near those of new oil.

What is reclaiming?
The definition of reclaiming, according to IEC, is “a process which eliminates, by chemical and adsorbent: means, the acidic and colloidal contaminants and products of oil deterioration from the oil, to obtain an oil with many characteristics similar to those of a new product”.

It is important to point out that reclaiming is not a drying process. If the transformer insulation is very wet, drying of the transformer should be considered in combination with reclaiming.

Degassing and filtering is not a reclaiming process.

Why reclaim transformer oil?
By removing acids, sludge and other degrading products the ageing rate of the oil is lowered. This will also have a beneficial effect on the ageing of the paper insulation.

When should reclaiming take place?
When the oil shows unacceptable values for acidity, interfacial tension and dissipation factor, oil reclaiming should definitely be considered.

Since the ageing of insulation is an irreversible process, it is important to reclaim before the degradation has gone too far.
Customer Success Story

For a customer in Norway, two identical transformers were treated – one with an oil change and the other with oil reclaiming. As can be seen acidity increases rapidly after the oil change. After a few years the acidity level returned to the same level as before the oil change. This acidity increase is caused by contamination from the residual oil in the tank and in the insulation, which over time contaminates the new oil. In the transformer where oil is reclaimed, six years later the acidity level is still approximately at the same level. According to ABB’s worldwide experience the acidity and other ageing parameters have acceptable values many years after reclaiming when using sufficient absorbent (500-700 kg/ton oil).

The graph below illustrates the above long lasting effect of oil reclaiming where acidity is shown as function of year.

ABB’s oil reclaiming method

Using an oil reclaiming rig, the total oil volume of the transformer is circulated several times (8-12 times) over the absorption columns which are filled with Fuller’s earth. During the process the absorption material is automatically reactivated several times with no need to replace Fuller’s earth. With the conventional technique, Fuller’s earth would have to be changed and disposed of between circulation cycles. The reactivation method makes it economically viable to use sufficient Fuller’s earth (500-700 kg/ton oil) to remove ageing products from the oil as well as from the insulation. When the oil is replaced or insufficient absorbent is used, the long-term effect is not lasting.

As a thumb rule it is less costly to change oil for transformers smaller than <2 MVA than to reclaim it.

For transformers larger than >10 MVA it will be approximately 30% more expensive to change oil compared to reclaiming the oil.

Conclusion

Reclaiming oil with a reactivated Fuller’s earth system is the only economical method to restore the properties of the transformer oil close to the values of new oil with a lasting effect. Also reclaiming oil provides an environmental advantage – instead of replacing a non-renewable resource, the oil is processed.

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