EXTENDING THE SERVICE LIFE OF TRANSFORMERS

The average age of the transformers, which fails due to insulation damage, is 17.8 years; it is far below the expected lifetime of 35 to 40 years.*

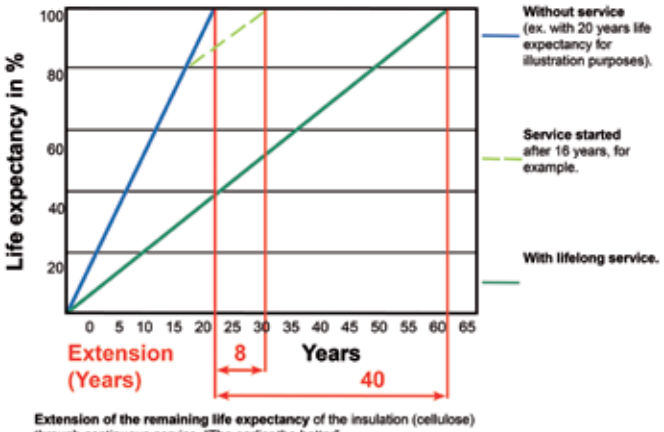
There are several things that reduce the service life of the transformer. Most of them are related to the insulation, such as: electrical / electro-magnetic overstress, ageing, oxidation and hydrolysis of insulation (cellulose) and insulation oil. This reduction can also be caused by the thermal effects due to load fluctuations and wear in the on-load tap changer; but in general, the insulation is the cause of most transformers breakdowns.

The consequences of not taking care of the transformer's insulation and the insulation oil can be drastic. There will be gas formation due to degradation or electrical overstress, occurrence of water, overheating, formation of acids due to ageing of the oil and cellulose, formation of particles in the on-load tap changer due to wear and, a considerable reduction in the breakdown voltage caused by water, particles, gases and acids.

In order to solve this issue, a service unit named TCU – Transformer Care Unit has been designed by HYDAC to extend the operating life of oil-filled transformers and reactors. This product provides a continuous degassing, dewatering and filtration of the insulating oil, ensuring that the oxygen content, water content and particle contamination in the transformer, are kept low and the breakdown voltage of the insulating oil is increased.

EXTENDED BY A FACTOR OF THREE

As a result, the service life of the insulation is also increased. Typically, the remaining service life of the transformer can be extended by a factor of three. The throughput of approximately 15 m³/week prevents the formation of damaging turbulence in the transformer. The TCU is used throughout the life of the transformer, while the transformer is connected and in operation. The volume of fault gases removed using the TCU corresponds to the gas formation rate in the transformer, which can be interpreted in accordance with DIN EN 60599 or DGA (Dissolved Gas Analysis).



Extension of the remaining life expectancy of the insulation (cellulose) through continuous service. "The earlier the better".

ALARM CAN BE TRIGGERED

In addition, the TCU is used to monitor the humidity and the total gas level in the insulating oil. This means that an alarm can be triggered if there are any significant changes.

The TCU can be used on the following applications: power transformers, compensating throttle pumps, HVDC transformers, phase shifter transformers, poly-transformers and single-phase transformers.

Transformer Care Unit applications

HYDAC also develops other components and systems that offer many advantages for the building and operation of transformer, the principal ones being: monitoring of the oil condition and cooling of the insulating oil.

Critical conditions in the transformer can be detected in good time and prevented by using sensors such HYDAC's Fluid Monitoring Module FMM or the pressure switch EDS 1700. Changes in an output condition, such as water content, oil cleanliness, temperature or pressure can be visualised and used as a basis for maintenance planning.

Also, in order to ensure reliable and efficient removal of the heat on transformers oil, HYDAC offers Oil / Air cooler and plate heat exchanger.

SUMMARY

In summary, using the Transformer Care Unit will preserve the insulating property of the transformer oil; it will increase the operating reliability and extend the remaining service life of the transformer by slowing down the process of cellulose ageing.

**An Analysis of Transformer Failure, William H. Bartley - 1997, Hartford Steam Boiler Inspection & Insurance Co.*