

LIMITATIONS OF TRADITIONAL TEMPERATURE INDICATORS

The WTI is a critical device on a transformer because it not only controls the cooling system, but also provides the transformer with thermal protection. Therefore, a failure of this device or even an incorrect indication may have an important impact on transformer aging and may affect transformer reliability especially if a transformer has to be operated under overloading conditions. Utility experience indicates that a significant part of transformer maintenance is devoted to WTI's.



For many decades it has been a standard practice to install on new transformers Oil temperature (OTI) and Winding temperature indicators (WTI). These devices typically are comprised of a temperature sensing bulb inserted into a dry well in the top layer of the insulating fluid. In addition to this, the WTI incorporates a heater element to which a sample of the load current carried by the transformer, is applied. This current causes the temperature bulb to read the oil temperature plus a temperature increment that is intended to be the same as the winding hottest spot temperature rise above top oil temperature. The fluid in the bulb expands through a capillary tube connected to a dial gauge equipped with switches that can be adjusted to any temperature within the operating range. These mechanical devices provide an accuracy of 3 - 5°C, assuming that the transformer designer has properly evaluated the winding hottest-spot temperature. These devices are typically used for cooling control and temperature alarms. They are sufficiently rugged to be used for protection purposes IF the recommended maintenance and/or calibration verification is carried out every 4 to 5 years.

TEMPERATURE INDICATORS

There are occasions when this regular maintenance is not carried out for extended periods of time, or never carried out at all, either through oversight or ignorance of the issue.

Often they are prone to mechanical damage of the small-bore tubing or spiral wound Bourdon tube in the measuring device. Moreover, internal component oxidation may lead to increased mechanical friction or seizing up entirely, further reducing the accuracy without signaling this malfunction to the operator. It may result in an inaccurate simulation of the winding hotspot temperature, which can lead to inefficient cooling and tripping control. The devices in the picture reveal this very issue on a transformer that was only 3 years old. The WTI is indicating 5°C LESS than the Top oil measured. This is a physical impossibility.

ELECTRONIC TEMPERATURE MONITOR

The use of a fully electronic device such as the Dynamic Ratings B100 Electronic Temperature Monitor (ETM) that continuously calculates the winding hottest temperature (WHS) on up to three windings, from measured values of top oil temperature (via existing PT100 RTD sensors) and load current measurements from the bushing CT's. The computations follow the well-known and established equations found in the loading Guides of IEEE and IEC, where the WHS is taken as the sum of the top oil temperature, plus an increment proportional to the load level elevated to a power (typically 1.8). With that information, cooling control of up to two stages of cooling can be programmed and the aging rate of the transformer calculated. All measured and computed data is recorded and stored every minute, for up to one year.

REDUCE INSTALLATION AND MAINTENANCE

Using the B100 ETM will significantly reduce installation and maintenance requirements. Manufacturers of traditional WTI's recommend calibration verification at regular intervals. With the DR-B100 the sensors are continuously checked, and the system has a failsafe watch-dog function to ensure proper operation of all components.

The further benefit of the B100 ETM, is its capability to be connected to SCADA and communicate its data and alarms to the operating and maintenance staff - even over the existing substation cabling (no need to lay fiber optic cables). That possibility is non-existent with traditional OTI and WTI devices.

SUMMARY

The use of ETM type devices within the electricity network is becoming commonplace, and many utilities are already starting to realise the benefits of the newer technologies over the historic equivalents. When embarking on this journey ensure your technology partner is providing a suitable and capable solution, as well as full support for the life of the product. Dynamic Ratings has been guiding many utilities on this journey, worldwide.

B100 SERIES

ELECTRONIC TEMPERATURE MONITOR



Transformer cooling controller provides:

Multiple winding temperature calculations

Communications over common SCADA and media protocols

Rugged IP66 enclosure

Screen visibility up to 18 meters

An optional iBridge system that can be used to communicate through existing wires

The B100 Series Electronic Temperature Monitor (ETM) provides transformer cooling control with excellent accuracy and advanced communications capability.

Learn more about the B100, retrofits, project management and other solutions at:

www.dynamicratings.com

MONITORING, CONTROL AND COMMUNICATIONS
SOLUTIONS FOR ELECTRICAL POWER APPARATUS

