

Transformer temperature, oil level and pressure gauges



Transformer oil level indicator

Temperature controls are required in order to turn on and off the cooling equipment. These controls are usually combined with a visible dial-type gauge that measures 'winding temperature'.

This is really a misnomer because the gauge does not actually contact the winding.

Instead, it measures the **top oil temperature** plus a temperature gradient produced by a small heater surrounding the thermometer bulb. This heater is connected to a current transformer on one of the phases of the secondary leads, so as the secondary load increases, so does the current through the heater resistance.

The heater then becomes a mimic of the actual transformer winding with the winding temperature gauge measuring a temperature that is roughly equivalent to the true winding temperature.

In addition to (*or instead of*) the winding temperature gauge, most transformers have an oil temperature gauge that measures the actual top oil temperature. The difference in temperature between the winding temperature gauge and the top oil temperature gauge is one indication of how heavily the transformer is loaded.

Winding and/or top oil temperatures should be routinely observed to see whether the transformer is **operating within normal temperature limits**. There have been many cases where an abnormal temperature indication has uncovered serious problems with transformers.

One example of this was a case of an **OA cooling class transformer** operating with a very high oil temperature. Further investigation revealed that a leak in the radiator had caused the oil level to drop below the radiator inlet, resulting in a virtual total loss of cooling. In other cases, investigations of elevated transformer temperatures have revealed blocked coolers and malfunctioning cooler controls.

An **oil level gauge** is required so that the correct oil level can be maintained. There is usually a mark on the gauge that indicates the 25°C level, which is the proper oil level at that temperature. Maintaining the proper oil level is extremely important because if the oil level falls below the level of the radiator inlet, flow through the radiator will cease and the transformer will overheat.

A very low oil level can expose energized and current-carrying components that are designed to operate in oil and could result in overheating or an electrical flashover. If the oil level is too high, it could cause over pressurization when the oil expands.



Transformer pressure gauge

If the transformer is equipped with a **constant-pressure nitrogen oil preservation system**, then pressure gauges are included to measure the pressure of the gas blanket and the nitrogen in the make-up bottle.

Transformers that have a gas blanket over the oil in the main tank usually come equipped with pressure gauges. On random inspections, a sealed-tank unit should have a slight positive or a slight negative pressure. If the pressure gauge consistently records zero pressure under all loading and temperature conditions, this is an indication that the transformer tank has a leak, allowing it to **'breathe'**.

This condition must be taken seriously and fixed, because a transformer that breathes is probably contaminated with moisture.

Reference: *Power Transformers Principles and Applications* – John J. Winders, Jr.

Source:

<http://electrical-engineering-portal.com/transformer-temperature-oil-level-and-pressure-gauges>