

Behavior of insulating oil in terms of the temperature inside the large power transformers

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Abstract:

The streaming electrification in oil immersed transformers is the cause of some failures. Amongst the tools used for checking the electrostatic hazards, the Electrostatic Charging Tendency (ECT) Minitester is the most commonly employed. In our laboratory, with the EDF support, we have carried out an enhanced device and protocol to check the electrostatic hazards inside the large power transformers, perfected with regard to the initial protocol recommended by Westinghouse in 1984. Moreover, in order to reach better knowledge of the behavior of the couple oil/pressboard on the temperature range where the large power transformers effectively work (typically 40°C-80°C) we have built a new device to study the behavior of the oil samples in terms of the temperature.

Measurements of the Electrostatic Charging Tendency in terms of the temperature were performed with several oil samples:

- New mineral oil, and new vegetable oil,
- Oil samples medium-aged or very aged,
- Samples of different oils mixed in various proportions.

The activity curves allow proposing an empirical law on a wide temperature range. Thanks to these results, it is possible to propose a simplified protocol to plan the evolution of the electrostatic hazards according to the temperature. These curves of activity also allow reaching an approached value of the activity energy.