

Condition Assessment of Oil Transformer Insulating System

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Abstract. Reliable operation of transformers largely depends on a lifetime of insulating system. For this reason the paper deals with a description of our experience with developed monitoring system, which is focused mainly on a control of oil filling of experimental transformer. Relative humidity, amount of dissolved gases and increased temperature are observed, as they have decisive influence on insulating system of transformer. Monitoring of these characteristics is completed with analysis of oil samples by infrared spectroscopy in mode of Attenuated Total Reflection technique.

From the on-line monitoring point of view, it is preferable to monitor mainly the active part of transformer. The current passage through the winding causes the warming of the conductors. This warming increases with increasing loading and conductors then warm also the insulation and contribute to its higher degradation (thermal aging of paper-oil insulation systems was mathematically described by Montsinger).

It is useful to focus on measurement of temperature of winding in case of monitoring of thermal stress of the insulation, as the temperature of winding is always higher than the temperature of oil filling and causes then more degradation. It is possible to compare the temperature of winding to courses of loading currents and voltages of single phases of transformer. The measurement of operation voltages and currents enables to obtain the characteristics necessary for assessment of instantaneous loading of transformer. Loading current moreover influences the quantity of Joule losses in the winding, hence its assessment allows the estimation of thermal loading of transformer insulating system.

Amount of gases dissolved in transformer oil is another important characteristics which helps to identify a contingent failure. Gas analysis provides the first information on appearance of failure in transformer and allows its detection in the early stage.