

A Multi-criteria Computer Package for Power Transformer Fault Detection and Diagnosis

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Abstract

Maintenance activities are critical for assuring the reliability and extending the useful life of any industrial equipment as well as for reducing the associated further costs. Traditionally, maintenance strategies can be classified in: i) corrective maintenance; ii) preventive maintenance, time-scheduled maintenance or routine time-based; and iii) predictive maintenance or condition-based maintenance. In the electrical power system scenario, transformers play a key role in energy transmission and distribution, and a high percentage of power transformers built decades ago remain still in use. Theoretically, they have an almost eternal useful life, but some studies and experiences demonstrate that the average useful life is around 25-30 years because of the natural aging process, some usual stress conditions or electrical faults. Therefore, the change from routine time-based to predictive maintenance is becoming popular. Damages in power transformers derive from overloads, short-circuit currents, switching transients, earthquakes, careless transportation between factory and installations, explosion of combustible gases produced into the transformer oil tank,... A huge number of predictive techniques and methods to diagnose the health of the transformer are available in the literature [1]. Some of the most frequently used diagnosis methods are: dissolved gas analysis (DGA) technique, short-circuit impedance (SCI) measurement, frequency response analysis (FRA), power factor testing, winding resistance and winding ratio, and thermography. We have first determined the requirements of these tests to be applied and we have coordinated their input data and their output (diagnoses and recommendations). We have afterwards developed a package in Maple that guides the user throughout the diagnostic processes, automatizes data processing and returns the results of the different tests (underlining if any contradiction arises). The method is extensible/scalable (the techniques could be detailed and more techniques could be added). At this stage this is a proposal of application of a battery of methods, not yet validated by a field study, so only intended for teaching and prediagnosis.

References

1. M. WANG AND A. J. VANDERMAAR AND K. D. SRIVASTAVA. Review of condition assessment of power transformers in service. IEEE Electr. Insul. Mag. 18/6 (2002) 12-25.