

5.3 Moisture in Oil

Excessive moisture is one of the worst enemies of transformers. Moisture in solid paper insulation may result in accelerated aging, risk of bubble formation during load changes and reduction of dielectric strength. However in present practice, moisture in the solid insulation cannot be directly measured, but is inferred by the moisture level in oil. ~~Any inference~~ ~~The correlation~~ between moisture in oil and moisture in paper must also consider the amplitude and rate of temperature change.

Measurement of water dissolved in oil may be carried out with a variety of on line technologies [B10, B11]. Moisture in oil should be correlated with temperature measurement made in the immediate vicinity of the moisture sensor.

Moisture content in oil, measured by moisture sensors is an important parameter used to evaluate trends of the moisture state in the transformer oil/paper complex. The key relationship used in this evaluation is the change of moisture content as a function of temperature. During an oil temperature increase, moisture migrates from the paper to the oil. During an oil temperature decrease, the moisture migrates back to the paper [10]. Moisture content in oil in the vicinity of solid insulation may vary from bottom to top oil depending on cooling mode. Moisture content and the impact on loading are contained in C57.91-1995 [8].

Because of the dynamic nature of moisture migration in the paper-oil insulation system of an operating transformer, it is not possible to determine trends in the moisture state of the transformer oil/paper complex from a set of data obtained at a single point in time or during a relatively short period of time (e.g. minutes or hours).

Draft 3 4-08-2008 Doble Client Conference

**Andre Lux
Tony Pink
David Woodcock
David Sheehan
David Harris
Mark Tostrud**