CIGRE Study Committee N° D1

PROPOSAL FOR CREATION OF A NEW WORKING GROUP

WG* N° D1.29	**Name of Convenor :** Jitka Fuhr (CH)

Title of the Group: Partial Discharges in Transformers

Scope, deliverables and proposed time schedule of the Group :

Background :

It is now 8 years since CIGRE TF 15.01.04 reported on partial discharge defects in transformer insulation. Several typical discharge generating defects and their characteristics were described: These sources will depend on the PD-defects, their location and the applied voltage, producing local current-pulses that vary in shape and frequency content.
Since then, considerable experience from field measurements has been acquired. Several universities developed and also commercially available PD-detection systems are in use, applying various frequency ranges, sensor types and measurement bandwidths. Their applicability and sensitivity in the field depend on their detection band and on how the HV circuit is arranged (in-service, energized from LV side, separate voltage source, etc).
It is known that defect severity cannot only be evaluated based on detected signal level alone. For conventional measurements according to IEC 60270, signal strength will depend on how deep in the winding the defect is located. Furthermore, non-critical sources may give large signals and it is possible that the converse could be true for critical ones. Some measure of PD signal energy may potentially be a better parameter than apparent charge for defect assessment. In addition, it is clear that knowledge of the defect location is also important to inform the assessment of defect severity for the purpose of deciding whether or not remedial action should be taken and, if so, what that action should be. In the case of modern high frequency PD detection methods, relating the measured signals to either apparent charge or energy is another problem.
Manufacturers and utilities often employ PD detection techniques when, for example, a new transformer fails to pass acceptance tests or suspicious gassing behaviour is observed on units in service. There is a clear need for better knowledge on benefits which can be obtained from PD measurements on power transformers, supported by a better and more widely agreed procedure for interpreting PD measurements from the various measurement techniques that are available.

Scope :

1. A survey on the available detection systems (i.e. bandwidth and frequency range) and influence of detection sensitivity. This will include all methods that can respond to the individual PD pulse. So, for example, acoustic and bushing tap measurements will be included, but not dissolved gas analysis, which is an important, but separate topic. For each technique, practical issues for deployment will be described, i.e., number of sensors required, methods of sensor attachment/installation, etc.

2. A survey of the more common types of defect that are evidenced by PD. The aims will be to:
    a. identify which components of the transformer are most important for PD detection,
    b. group defects according to the actions that are most likely to be taken if they are discovered (e.g., continue in service, repair, replace), and
    c. inform on the development of realistic model PD sources that can be used to benchmark different PD detection techniques.

3. Collate information on time-resolved and frequency-resolved signatures from typical defects and provide examples from field measurements of defects, their signatures and

characteristics. The interpretation of conventional phase-resolved PD measurements will also be considered, since the phase of the local electric field at a specific point in the tank can differ from the phases at the bushings.

4. Obtain some consensus about the criteria for evaluation of severity of a detected defect (location, defect recognition, signal level). For example, how should PD thresholds be defined for in-service transformers?

5. Investigate and report on possible methods for energy-based PD measurements as an alternative to charge-based ones.

Deliverables : Report to be published in Electra or technical brochure with summary in Electra Turorial

Time Schedule : start :September 2009 **Final report** : 2013

Comments from Chairmen of SCs concerned : A2

Approval by Technical Committee Chairman : Klaus Fröhlich **Date** :16/12/2009