13.3 CIGRE liaison report JC Riboud

Study Committee A2 Transformers

Last SC committee met in Moscow last June

Main members
Chairman is Mr Pierre Boss (CH) pierre.boss@ch.abb.com
Secretary is Mr Claude Rajotte (Ca) pierre.boss@ch.abb.com

The SC A2 has 4 advisory groups :

Transformer technology leaded by H Reijnders	h.f.reijnders@smit-trafo.nl
Transformer users leaded by C Rajotte	rajotte.claude@hydro.qc.ca
Tranversal cigre activityleaded by P Lorin	pierre.lorin@ch.abb.com
Strategic planning leaded by P Boss	pierre.boss@ch.abb.com

Hot Topic

- Corrosive sulphur in oil TF A2 31
  A new task force was set up in Moscow which already achieved its first target with the preparation of a term of reference ready for publication in electra.

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Ongoing Work:

- Liaison with D1 01 oil impregnated paper
  D1 01 leaded by lars Lundgaart lars.lundgaard@sintef.no deals with paper fluid impregnated systems. Liaisons have been created with TF 13 on oil maintenance : N Dominelli from BC Hydro and with TF 12 on furanes : L Cheim cheim@siemens.com

- JWG A2/ A3 B3/ 21 Electrical environment
  Has issued a report for publication in electra
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- A2 23 Life time data management

  The report of A2.23 is under preparation and it will contain 3 main sections:
  - The main report body explaining the work, positioning our activities,
  - Appendix 1 - containing the generic data model. Please note that the appendix 1 will contain the items which we have now in the excel workbook. the Excel version is for easy working and idea exchange.
  - Appendix 2 - dealing with transformer lifetime data management and IT technologies.

  Publication forseen in Electra soon as final revision of the document was held in august
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- A2 24 thermal performances:
  J Declercq jan.declercq@pauwels.com

- A2 25 bushing reliability
  A survey has been sent a few failure have been reported by utilities and will be compiled.

A2 26 Mechanical condition assessment

The CIGRE Working Group A2.26 main objective is to develop a guide on the mechanical condition assessment of transformer windings using the Frequency Response Analysis (FRA) method. The CIGRE working group consists of industry experts representing utilities, transformer manufacturers, and FRA equipment manufacturers. Specific talents such as FRA application, equipment development, and data interpretation are well represented. The working group is divided in three task forces: 1-Introduction to FRA, 2-Techniques and 3-Interpretation. The WG (started in June 2004) should deliver a final report in December 2006. This report summarizes the progress of the WG main deliverables.

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PROGRESS

TF1 – Introduction to FRA and final report structure

A second draft of the guidance document was prepared in January 2005.

TF2 – FRA techniques

A survey performed within the working group showed that experienced users around the world use different test techniques and there is no generally accepted way for performing FRA measurement. The differences are at several levels: driving signal, measuring principle (How the measurement is made? Sweep or Impulse), connection of the leads to the transformer terminals (Which measurement is made?), cables grounding configuration, instrument input impedance, use of current transducer, etc. A test program was carried out in January 2005 at the Siemens factory in Nuremberg, Germany, to compare existing FRA techniques. The objectives of this experimental comparison were:

- To characterize the differences in FRA techniques used by experienced users
- To compare FRA signatures (resonances, damping, resolution) using different techniques and see the possibilities to use this comparison for diagnostic purposes
- To generalize good FRA practices to ensure repeatability and define the limitations

The selected unit is a mobile 266-MVA single-phase generator step-up transformer originally manufactured in 1975 and recently refurbished including new winding assembly. Nine practitioners participated to the FRA tests. A summary report was prepared by the WG to present the results and main conclusions. The content and conclusions will be discussed during next Moscow A2.26 meeting.

TF3 – Interpretation

TF3 leadership was changed in January 2005 because Yves Guillot could not continue his contribution within the group. Jochen Christian accepted to take the lead of this TF. This TF is certainly the most challenging and important one. Interpretation of the FRA results has been a constant concern of the transformer industry since the early development of the technique at the end of the 70's. From the preliminary discussions between members, it seems unrealistic to deliver a complete and general interpretation guide (with industry accepted criteria and threshold) within the short time frame of this working group. However, the TF can summarize existing interpretation knowledge based on real case studies and previous academic work. The TF can also study and validate simulation models to support interpretation, using Nuremberg results and test object design details. The TF should also present the required further work to continue the developments on the FRA interpretation. Complementary techniques should also be discussed.

- A2 27 recommendation for condition monitoring facilities

The WG will propose and consider the benefits of possible standardisation of the interface between monitoring systems and the transformer. The interface may be the electrical or other connection to permanently installed sensors, the mechanical facility for the later fitting of sensors or the provision of relevant data from another collection system. The review will include, but will not necessarily be limited to: tank valves, oil pipes, dielectric windows, bushing tap arrangements for fitting PD sensors, aerials, acoustic sensors, temperature, pressure and vibration measurement. In addition transformer design features that make condition monitoring or diagnostic testing easier or more accurate will be considered and recommendations developed where appropriate.
Specifically the WG will:

- Review existing and developing condition monitoring systems and practices to determine the range of sensors and facilities employed.
- Determine whether standardization could improve the market for, or implementation of, condition monitoring systems, sensors or techniques.
- Make recommendations for the provision of sensors facilities or data from new transformers to facilitate the later application of condition monitoring or condition assessment

Where appropriate the WG will review the circumstances under which systems are installed, the methods of installation and whether there are safety concerns during or after installation, but work already carried out in other forums specifically within the IEEE will not be duplicated. Communication protocols will not be considered, but the WG output may help to guide transformer data requirements for example for IEC 61850 application.

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- JWG A2 B4 28 HVDC transformers

The salient activities of the JWG in the period of August 2004 to June 2005 were as follows:

- Review of the IEC draft standard 61378-3
- Review of the CIGRE Brochure No. 227.
- Work on a design guide for HVDC Converter Transformers (starting from the IEEE guide).
- **HVDC Converter Transformers Reliability Questionnaire**

The focus of the activity was on the renewed Reliability Questionnaire. The questionnaire was sent to 22 HVDC system users, out of which 11 reported failures.

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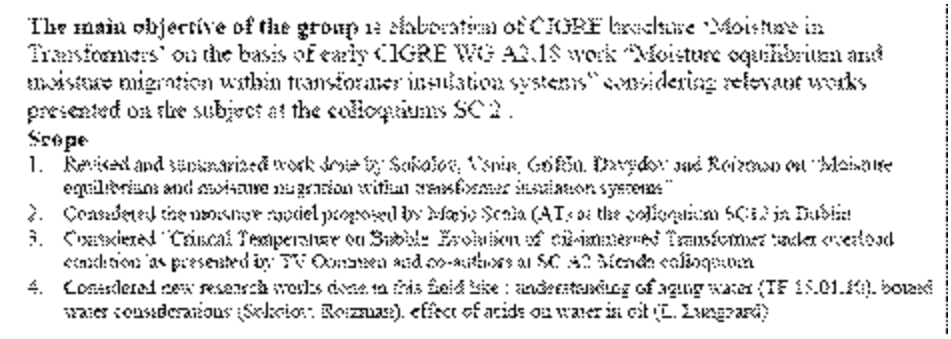
- A2- 30 Moisture:



The main objective of the group is elaboration of CIGRE brochure "Moisture in Transformers" on the basis of early CIGRE WG A2.18 work "Moisture equilibrium and moisture migration within transformer insulation systems" considering relevant works presented on the subject at the colloquiums SC 2 .

Scope

1. Revised and summarized work done by Sokolov, Vanin, Griffin, Davydov and Roizman on "Moisture equilibrium and moisture migration within transformer insulation systems"
2. Considered the moisture model proposed by Mario Scala (AT) at the colloquium SC12 in Dublin
3. Considered "Critical Temperature on Bubble Evolution of oil-immersed Transformer under overload condition" as presented by TV Oommen and co-authors at SC A2 Merida colloquium
4. Considered new research works done in this field like : understanding of aging water (TF 15.01.10), bound water considerations (Sokolov, Roizman), effect of acids on water in oil (L. Lundgaard)

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- A2- 29 reliability

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Future publications
SF6 transformers by Dennis Allan

Transients in Russian grid by Lokhanin

Miscellaneous
Peter Heinzig will prepare a term of reference for 800 kV transformer specification which will be used as the basis of a new task force.

Next Session Paris 2006

The preferential subjects are:

PS1 : Transformer reliability on tec hnical , economical and strategic aspect.
PS2 : Phase shifter application and specification
PS3 : Effect of transients on transformers performances

You can find more on www.cigre-scA2.org