



2015 Activity Report

Study Committee A2

1. Highlights

- Three WGs were completed: WG A2.37 “Transformer Reliability Survey” (brochure #642), WG A2.40 “Cooper Sulphide Long Term Mitigation and Risk Assessment” (brochure 625), and WG A2.44 “Guide on Transformer Intelligent Condition Monitoring (TICM) Systems” (brochure 630).
- Two new WG started: WG A2.53 “Objective Interpretation Methodology for the Mechanical Condition Assessment of Transformer Windings Using Frequency Response Analysis (FRA)” and WG A2.54 “Power Transformer Sound Level Requirement”.
- Nine WG and four JWG are running within SC A2: WG A2.38, JWG A2/D1.41, WG A2.42, WG A2.43, WG A2.45, JWG A2/D1.46, WG A2.48, WG A2.49, WG A2.50, JWG A2/D1.51 and JWG A2/C4.52, WG A2.53 and WG A2.54.
- Continuation to the inventory of SC A2 member expertise by the use of mini-cv
- Maintenance of a library of all the Colloquium Publications held in the last 18 years

2. Working group changes since the last TC meeting

2.1 New WG

During year 2014, two new ToR were started: WG A2.53 “Objective Interpretation Methodology for the Mechanical Condition Assessment of Transformer Windings Using Frequency Response Analysis and WG A2.54 “Power transformer sound level requirements”. WG scopes include:

WG A2.53 “Objective Interpretation Methodology for the Mechanical Condition Assessment of Transformer Windings Using Frequency Response Analysis (FRA)”:

- Review of the state-of-the-art of quantitative interpretation methodologies.
- ‘Explain’ typical responses and common features, e.g.: generic differences between HV and LV responses, effect of delta connections, effect of internal leads between terminals and ends of windings, effect of capacitive coupling between phases, effect of the core magnetization, differences between core and shell form transformers, etc.
- Collect frequency response signatures for typical mechanical failure modes using high frequency transformer modelling, real case studies or a combination of both.
- Compare the performance of selected interpretation methodologies for typical failure modes.
- Discuss the applications for such methodologies (short-circuit testing, diagnostics and maintenance, end-of-life criteria, etc.) and make recommendations for best practices and possible standardisation.

WG A2.54 “Power transformer sound level requirements”:

- Units to be considered: distribution and power transformers with S = 10 kVA ... 1500 MVA.
- Description of basic sound development mechanisms - distinguish between no-load and load condition and cooling system. Describe techniques on how to combine these components.
- Define a minimum of necessary transformer classes with respect to sound level development and development of sound level ranges for all three components per transformer class.
- Distinction between 1 Θ and 3 Θ units and 50Hz / 60Hz units



2015 Activity Report

- Study and provide information on sound level legislation in different countries and compare with technical findings and summary information on sound mitigation (mounting, panels, enclosures, walls around units)

2.2 WG Disbanded

- Three WGs were disbanded: WG A2.37 “Transformer Reliability Survey”, WG A2.40 “Cooper Sulphide Long Term Mitigation and Risk Assessment”, and WG A2.44 “Guide on Transformer Intelligent Condition Monitoring (TICM) Systems”.

2.3 Number of active groups

- Nine WG and four JWG are currently running within SC A2: WG A2.38, JWG A2/D1.41, WG A2.42, WG A2.43, WG A2.45, JWG A2/D1.46, WG A2.48, WG A2.49, WG A2.50, JWG A2/D1.51 and JWG A2/C4.52, WG A2.53 and WG A2.54.
- In addition, another group named JWG D1/A2.47 is under the hat SC D1.
- Two ToR are currently in the TC approval process: WG A2.55 “Life Extension of oil filled Transformers and Shunt Reactors” and WG A2.56 “Power transformer efficiency”.

Several other subjects for Working Groups are currently under discussions, in particular "Effects of DC Bias on power transformers”.

2.4 Allocation of WG to the 4 TC strategic directions

The following table shows the relation of the SC A2 Working Groups with the TC Strategic directions (the last two WG are under approval by TC):

WG	Title of the WG	Strategic dir.*
A2.38	Transformer Thermal Modelling	2
A2/D1.41	Oil conductivity under DC condition	1,2
A2.42	Guide on Transformer Transportation	1,2
A2.43	Transformer bushings reliability	2,3
A2.45	Transformer failure investigation and post-mortem analysis	2,3
A2/D1.46	Field experience with transformer solid insulating ageing markers	2,3
A2.48	Technology and utilization of Oil Insulated HV Shunt Reactors"	1,2,3
A2.49	Condition Assessment of Power Transformers	2
A2.50	Effect of the distributed energy sources and consequent induced reverse power flow (step up) on transmission and distribution transformers	1,2,3
A2/D1.51	"Improvement to Partial Discharge Measurements for Factory and Site Acceptance Tests of Power Transformers"	2
A2.52	High-frequency transformer models for non-standard waveforms"	1,2
A2.53	“Objective Interpretation Methodology for the Mechanical Condition Assessment of Transformer Windings Using Frequency Response Analysis”	2
A2.54	“Power transformer sound level requirements”	1,3

* Strategic Directions: indicate the main strategic direction, or the two main directions if needed

- 1 : The future power system
- 2 : Best use of the existing power system
- 3 : Environment and sustainability
- 4 : Communication with the public and with political decision makers



2015 Activity Report

3. Publications

3.1 Publications since the last TC meeting (April 2010)

The following publications have been prepared by SC A2 since the last TC:

- Brochure 625: “Cooper Sulphide Long Term Mitigation and Risk Assessment
- Brochure 630:” “Guide on Transformer Intelligent Condition Monitoring (TICM) Systems”
- Brochure #642: “Transformer Reliability Survey”
- WG A2.40 – Publication in Electra – October 2015
- WG A2.44 – Publication in Electra - December 2015

3.2 Publication plan for the coming year

In the coming year, the following documents are planned to be published by SCA2:

- Annual report on SC A2 activities in Electra (February)
- Brochure and Electra Paper for WG A2.38 Transformer Thermal Modelling
- Brochure and Electra Paper for WG A2.42 Guide on transformer transportation
- Brochure and Electra Paper for WG A2.43 Transformer Bushing Reliability
- Brochure and Electra Paper for WG A2.48 Technology and utilization of Oil Insulated High Voltage Shunt Reactors
- Brochure and Electra Paper for WG A2.45 Transformer Post-mortem Analysis

3.3 Green book

During the 2011 SC A2 meeting (Kyoto), a “Transformer Green Book Project” was proposed by SC A2 Chairman. It appears that there was no consensus inside the SC about the initiation of such a project. Even if some members indicate it was a good idea because several existing books about transformers do not include users’ perspective (as CIGRE book would), several members think this was not the best use of the SC A2 workforce.

Some of the arguments concern the existence of several books about transformers in the market, in particular several transformer books produced by major manufacturers (it is not the case for SC B1 and B2). Moreover, as the CIGRE book should be based mainly on existing brochures that are sometimes partly obsolete, it would require a lot of efforts to update all this information. Such efforts would be invested at the expense of other efforts that would otherwise be invested in new subjects.

Thus, Chairman took the decision not to start a Transformer Green Book Project at this moment. Now that the SC B1 and B2 Green Book exist, the success of these initiatives can be evaluate and may influence future SC A2 decisions about this project for transformers.



2015 Activity Report

4. Tutorials and workshops in 2014

SC A2 Colloquium 2015 held in Shanghai in September 2015

- WG A2.44 results “Transformer Intelligent Condition Monitoring with a workshop on Transformer Condition Monitoring”
- WG A2.37 results “Transformer Reliability Survey
- WG A2.38 “Transformer Thermal Modelling”

5. Strategic Plan and Action Plan

An updated version of the Strategic Plan 2010-2016 is available on the SC A2 website

6. Planned SC meetings

- 2016: Monday August 22th in Paris during the CIGRE Paris Session
- 2017: During the SC A2 Colloquium that will be held in Krakow (Poland) on October 2017

7. Participation to Regional Meetings, colloquia and symposia :

SC A2 2015 Colloquium was held in Shanghai, China on September 20-25th, 2015 and was organized in collaboration with SC A3 and SC B3. The preferential subjects were the following:

- EHV/UHV and EVHDC/UHVDC Transformers and its components
- Equipment technologies for substations of the future and Smart Grid (in collaboration with SC A3 and SC B3)
- Making the Best use of the Existing transformer fleet

The colloquium was attended by 200 participants and was a great success.

8. Relations with other organisations

Strong relation with IEC TC14 and IEEE Transformer Committee

9. Specific actions for the recruitment of young experts, Place of Women in the SC

9.1 Young Experts

All WG and JWG Convenors are invited to promote the participation of young experts. All WG have at least one young expert in their WG.

9.2 Place of women in the SC

In 2015, SC A2 has one women convenor of WG/JWG and several women involved in different WG inside SC A2.



2015 Activity Report

10 SC website : on-line contents and date of last update

The SC A2 website is updated regularly and reflects the current structure and progress of the SC work forces. The content is typically updated at least every month.

In order to improve the SC A2 website technical content, short position papers for subjects of interest identified are published. Selected experts are requested to prepare short reports on these subjects. These short reports are approved by SC A2 and become the "opinion of SC A2 experts". SC A2 website currently contains four short position papers.

11 Miscellaneous

SC A2 took the initiative to ask to all SC members to prepare a short CV available to all other members. This initiative helps the chairman and secretary to know the competence and experience of each member, helps members to know each other and is helpful to facilitate the integration of new SC members.

SC A2 has created a library that contains the publication of colloquium held during the last 18 years: 1997 (Sydney), 1999 (Budapest), 2001 (Dublin), 2003 (Mérida), 2005 (Moscow), 2007 (Bruges), 2009 (Cape Town), 2011 (Kyoto), 2013 (Zurich) and 2015 (Shanghai).

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