

Insulation Life Subcommittee - Un-Approved Meeting Minutes
March 14, 2007 – Dallas, Texas

7.4 Insulation Life Subcommittee – Don Platts, Chairman

The Insulation Life Subcommittee met in Dallas, Texas on March 14, 2007 at 8:00 AM. There were 50 members and 68 guests present, with 13 guests requesting membership in the subcommittee.

The minutes of our meeting in Montreal, Quebec, Canada on October 25, 2006 were approved as submitted.

7.4.1 Chair’s Report

7.4.1.1 The IEEE Transformers Committee Meeting schedule is listed on the Transformers Committee website.

7.4.1.2 All members are encouraged to verify their Subcommittee and Transformer Committee membership. Please let the Committee know if you think there is a mistake.

7.4.1.3 Fellow nominations are being accepted by the Committee Officers. Please provide names of potential nominees to them as soon as possible.

7.4.1.4 The Committee is continuing discussions with IEEE regarding the conversion of old documents.

7.4.1.5 Working Groups that need additional meeting time may want to consider holding meetings at the PES Technical Meetings held in January each year.

7.4.1.6 Testing of repaired transformers is becoming a major point of discussion. Both the Dielectric and Insulation Life Subcommittees will begin investigating this topic.

7.4.2 Project Status Reports

7.4.2.1 Reaffirmation Ballot C57.119, IEEE Recommended Practice for Performing Temperature Rise Tests on Oil-Immersed Power Transformers at Loads Beyond Nameplate Ratings

The reaffirmation ballot had 78% participation and achieved 96% approval. Several negative comments were received. Subhash Tuli will be initiating the effort to resolve the negative comments in the next few weeks.

7.4.3 Working Group and Task Force Reports

7.4.3.1 Working Group for the Revision to C57.91 Loading Guide - Tim Raymond

Meeting Minutes not received.

7.4.3.2 Working Group On Thermal Evaluation Of Power And Distribution Transformers (C57.100) – Roger Wicks

7.4.3.2.1 Introduction and Rosters

The working group met on Monday, March 12, 2007 at 11:00 AM with 11 members and 47 guests attending, with three guest requesting membership. This brings the number of members to 54.

7.4.3.2.2 Approval of minutes from March 20, 2006 meeting

The minutes of the October 23, 2006 meeting in Montreal were approved as written.

7.4.3.2.3 Patent Disclosure

The chairman asked if anyone knew of any patents that could pertain to this project. There were none.

7.4.3.2.4 Discussion of DuPont-Weidmann test of power transformer model.

The chairman gave a presentation to the working group of the dual temperature aging model. He gave a brief background of the model and then proceeded to present some of the recent test results. A copy of the presentation will be posted on the IEEE PES transformers committee website. Some specific topics were presented with the data that has been collected so far. These include:

- Testing of “wet” vs. “dry cells
- Furan Testing update (including wet vs. dry)
- Arrhenius data for non-upgraded vs. three levels of upgrading
- Additional data for areas covered in the past

7.4.3.2.5 Following the presentation the chair opened the floor for discussion and comments:

- Both Jin Sim and Geoff Gill provided input prior to the meeting related to the document test methods and organization, which were discussed during the meeting.
- The Chair provided input related to test times, temperature ranges, sample numbers within the document. Additional topics included how the document should specify a “control” system for the basis of the comparison when a new system is evaluated. In general the working group agreed that there needs to be established minimum/maximum times for the aging (such as one point >5000 hours and one point above 100 hours and one between), but that the temperature spread needs to be a minimum (not too close together). It was also noted that if oxygen and moisture are considered in the “control” system, that the aging times vs. temperature may be more reasonable than that predicted with “dry” testing seen in the DuPont-Weidmann testing. One example was to select the hottest temperature based on the loading guide

short-term overload temperature, and a second point based on long-time emergency temperature. (Note – this may not work with materials of thermal capability different than thermally upgraded kraft).

- Jin Sim proposed that the dual temperature model should be the test method of choice and to include both the Lockie test and sealed tube tests into the annex. After a spirited discussion, Jin revised his proposal to include both the dual temperature model (for power) as well as the Lockie test (for distribution) in the body of the document, and to leave the sealed tube method in the Annex. The working group agreed with this proposal.
- Tom Prevost noted that he would be looked to discuss at Tim Raymond's loading guide meeting the possibility of using only a single curve (based on the near overlap of the DP 200 data with the 50% tensile data). Tim will try and provide 15 minutes for his meeting.
- Don Platts reminded the working group that this work is part of a sequence started by the task force to define thermally upgraded kraft, followed by the inclusion of a requirement in C57.12.00 to meet curves in C57.100, and finally our work to have the curves consistent with those requirements.

7.4.3.2.6 The chair closed the meeting by noting that there are five main bodies of work required to complete this document. These are:

- Distribution Transformer Testing (Lockie)
- Dual-Temperature Aging (IEC 62332)
- Sealed Tube Test (Annex)
- What test to run under which conditions (certain changes may be single point test, others – full aging curve, etc.)
- What should the “standard” conditions be for the control test (for each of the three methods).

The chair is looking for volunteers to help with each of these sections.

7.4.3.2.7 Adjournment

The meeting adjourned at 12:10 PM

7.4.3.3 Working Group for Temperature Rise Test Procedures Section 11 of C57.12.90 - Paulette Payne

The Working Group met at 8:00am March 13, 2007 in Lincoln 1 of the Hilton Dallas Lincoln Centre Dallas, Texas. In attendance were thirteen members and thirty-three guests. There were no patent disclosures.

The minutes of the October 24, 2006 meeting were approved as written.

The major topics of discussion were hot resistance measurements: re-stabilization and statistical accuracy, and cooling curve methodology.

Hot resistance measurements: re-stabilization – A recap was given on the WG position on to return to the top oil temperature rather than resuming the heat run for one hour when needed to meet the time limit established. A subsequent proposal has been made by Jerry Corkran to stabilize the winding gradient and correct the top oil temperature to time of shutdown. There was no additional discussion of the topic at this meeting.

Hot resistance measurements: statistical accuracy - Mark Perkins gave a presentation for a large GSU showing good curve fitting for exponential and polynomial methods with readings initiating before 4 minutes, and the effect on curve fitting of readings initiating after 4 minutes of shutdown. The curve for readings initiated after 4 minutes of shutdown resulted in higher resistance at shutdown compared with the curve of readings initiated before 4 minutes. Concerns were raised that saturation is not achievable for some winding configurations and test systems within 4 minutes of shutdown. *Mark Perkins and Bob Ganser will provide a proposal for the timing of readings and Sam Mehta will augment the proposal as to how saturation can be achieved in a shorter time frame.* Mark Perkins suggested a 10 minute time period for recording measurements which agrees with Bob Ganser's original proposal.

Cooling Curve Methodology – Sam Mehta briefly discussed the methodology used by Bertram Poulin. The methodology based on Montsinger, necessitates an accurate average oil temperature. A cross-check of the Hot Resistance – Heat Run method of IREQ and Montsinger's methodology was performed by Bob Ganser achieving good results. Thang Hochang gave a presentation indicating good curve fitting for data provided by WG members using the Hot Resistance – Heat Run methodology.

Old Business – A recap was given of the discussion of temperature rise at constant current. Core heating increases losses resulting in inaccuracy of top oil temperature. Pennsylvania Transformer compensates the current for core losses to mitigate this effect. *As Subash Tuli was unavailable for discussion, the Chairperson will follow up with him.*

New Business – Hasse Nordman has found for bottom oil measurement of distribution transformers “average winding temperature to average oil temperature” to differ significantly from both IEEE and IEC. *Hasse will make a presentation at the next WG meeting.* Marcel Fortin discussed that for the back-to-back method, it is not necessary to have duplicate transformers. An auxiliary transformer with the same voltage ratings and KVA equal or higher than the test unit is adequate. *Marcel will make a presentation at the next WG meeting.*

Respectfully submitted,

Paulette Payne Powell, Chair
Juan Castellanos, Co-Chair

7.4.3.4 Task Force: on Moisture Estimation in Transformer Insulation – Jin Sim

TF Moisture Estimation did not meet. Chairman Jin Sim reported that Jacque Aubin of GE was conducting experiments this summer regarding moisture estimation in transformer insulation. The Task Force would evaluate the results when they were available.

7.4.4 Old Business:

Phil McClure provided an update on the privatized paper on Winding Temperature Indicators (WTI). Additional testing is required to determine the response time of the WTI. The paper will be completed as soon as possible after obtaining this information.

Joe Foldi presented his concerns about the improper calibration of the WTI for the ONAN/ONAF/ODAF type units. The WTI is normally calibrated for the top rating of the transformer, which is the ODAF cooling mode in this case. This calibration will indicate the winding hot spot temperatures that are lower than the actual winding hot spot temperatures for the ONAN and ONAF cooling modes. This leads to delayed operation of the second forced stage fans and the pumps, causing premature ageing of the transformer insulation. The figures presented by Joe Foldi are attached.

Joe Foldi proposed that the Insulation Life Subcommittee set up a Task Force to deal with this issue and other issues related to the determination of Winding Hot Temperature Rise during testing. No action was taken pending the issue of the paper by the Task Force on WTIs.

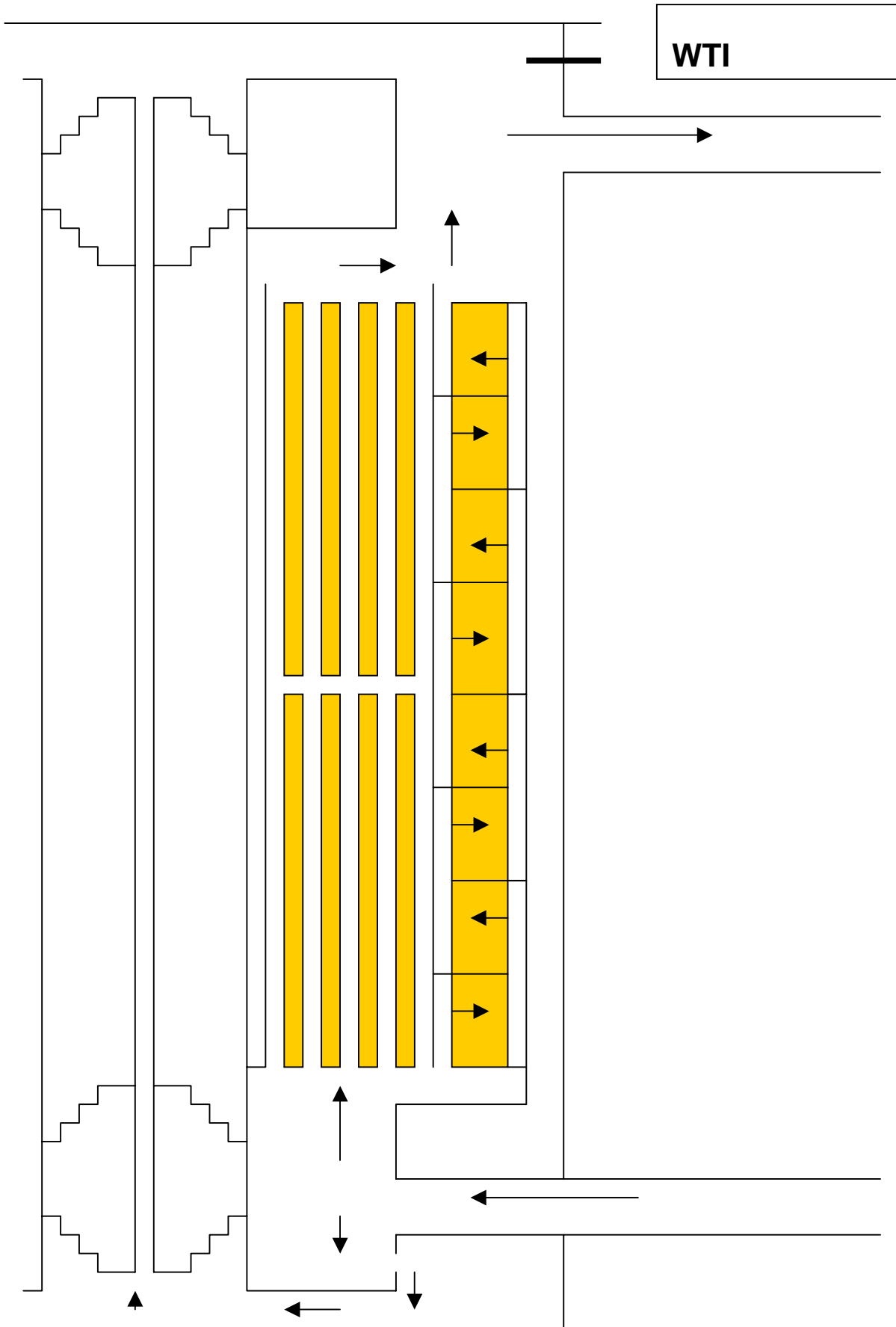
7.4.5 New Business:

Tom Prevost proposed that a Task Force be formed to investigate the use of Furan testing as a tool to determine and track insulation aging. His proposal was approved unanimously. Kent Haggerty will be the Task Force Chair.

7.4.6 The meeting adjourned at 9:10 AM

Don Platts
Chair, Insulation Life Subcommittee

Presented at the IEEE Transformer Committee Meeting in Dallas, March 14, 2007 by Joseph Foldi, Foldi & Associates, Inc.



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