# Insulation Life Subcommittee - Unapproved Meeting Minutes

**March 26, 2014 – Savannah, GA**

**Chair: Bruce Forsyth**

**Vice-Chair: Barry Beaster**

**Secretary: Eric Davis**

The Insulation Life Subcommittee met in Savannah, GA on March 26, 2014 at 8:00 AM.

A hand count of the members at the beginning of the meeting revealed that 58 of 98 members and 0 of 3 corresponding members were present. A quorum was present.

K. Miller made a motion to approve the St. Louis Meeting minutes as written. D. Duckett seconded the motion. There was no discussion on the minutes. It was unanimously approved.

The agenda was reviewed. D. Platts made a motion to approve the agenda. T. Prevost seconded the motion. There was no discussion on the agenda. It was unanimously approved.

The attendance rosters show that the meeting was attended by 198 people, 65 of 98 members and 133 guests. 16 guests requested membership. 10 of these guests meet the membership requirements. The complete attendance is recorded in AMS.

## Chair’s Report

The Chair reminded everyone that this is a volunteer organization and thanked the members and activity leaders for their participation and efforts.

The Fall 2014 IEEE Transformers Committee Meeting will be held October 19, 2014 through October 23, 2014 in the Washington DC area.

Due to the size of the group, general introductions will not be made. Please state your name and affiliation when you address the subcommittee.

The Chair reviewed the purpose and scope of the Subcommittee and encouraged the Task Forces and Working Groups to review their purpose and scope at the beginning of every meeting.

The minutes for Activity Groups should record:

* The attendance including the number of members, the number of guests, and if a quorum was present
* Include a statement that the full attendance record is available in AMS.
* The Chair or Acting Chair
* The Secretary or Acting Secretary
* The name of the member who makes a motion, the name of the Member who seconds the motion, a restatement of the motion and if the motion carried or was defeated.
* A summary of the discussion and comments.
* Minutes should be submitted by April 9, 2014

The Chair reviewed the process to submit documents for Sponsor ballot. Working Groups must have a 2/3 majority to submit the document for Sponsor ballot. The Subcommittee must achieve a simple majority to submit a document for Sponsor ballot.

The Chair welcomed the following new members of the Insulation Life Subcommittee:

Jeffrey Britton Jeffery Golarz Peter Heinzig John John

Zan Kiparizoski Mario Locarno Ali Naderian Mark Perkins

## Project Status Reports

### C57.91 IEEE Guide for Loading Mineral-Oil-Immersed Transformers

C57.91 is valid until 2021.

### C57.100 IEEE Standard Test Procedure for Thermal Evaluation of Liquid-Immersed Distribution Transformers

This standard is valid until 2021.

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

C57.119 is valid until 2018.

### C57.154 Design, Testing and Application of Liquid-Immersed Transformers with High-Temperature Insulation

C57.154 is valid until 2022.

### C57.162 - Guide for the Interpretation of Moisture Related Parameters in Dry, Gas Insulated and Liquid Immersed Transformers and Reactors

The C57.162 PAR expires December 31, 2017. The standard is valid until 2018.

### 1276 Guide for the Application of High Temperature Insulation Materials in Liquid-Immersed Power Transformers

The 1276 PAR expires December 31, 2016. The standard is valid until 2018.

### 12.8.2.7 1538 IEEE Guide for Determination of Maximum Winding Temperature Rise in Liquid-Filled Transformers

1538 is valid until 2021.

## Working Group and Task Force Reports

### Task Force on Winding Temperature Indicators - Phil McClure

Chair: Phil McClure, Vice Chair: Bob Thompson

Monday, 03/24/14 Savannah, GA

The meeting was called to order at 9:30am.

Members and guests introduced themselves.

Members in attendance were identified and to document a quorum, a roster was circulated. There were 9 members and 22 guests in attendance. There are 11 members in the Task Force, and therefore a quorum was achieved. Three guests requested membership. The full attendance roster is available on the association management system (AMS) website.

Minutes of the Fall 2013 meeting in St Louis were presented and discussed. After discussion, a motion was put forward by Josh Herz to approve the minutes. The motion was seconded by Jean-Noel Berube and the minutes were then unanimously approved by vote of the members present.

Chairman McClure briefly reviewed progress and the current state of our efforts toward completion of the experiment report and technical paper. He had circulated revision 5 of the report and draft 12 of the paper to members for review prior to the meeting.

Discussion began with the report of the experiment. Noting the title had been changed as previously requested to include the words “Task Force Report”, Bruce Forsyth clarified that his advice at our previous meeting in regard to the necessity of those words was in regard to the fact that this was not a Task Force experiment, but the report on the experiment is a Task Force document. The clarification was acknowledged and discussion of the test report continued.

Dave Wallach indicated that the reference to Cooper Power in the material and equipment table should be revised to indicate the new owners of this company –Cargill

A misspelling was found and that concluded discussion on the experiment report.

A motion was put forward by Dave Wallach to approve the test report with corrections as described in the meeting. The motion was seconded by Jorge Gonzalez de la Vega and approved by unanimous vote of the members present.

The report will be corrected as approved and circulated to the members of the Task Force for ballot as revision 6 in the time between meetings.

At this point general discussion was continued by Chairman McClure in regard to transformers with OF, non-directed cooling and why when the pumps are activated it results in top oil temperatures that are significantly cooler than transformers with ON oil circulation. Jean-Noel Berube said that he had data that illustrates this phenomena and offered it to the Task Force. One of the group asked if the data could be made available by the Task Force, whereupon Bruce Forsyth indicated that such data would not be made public by the Task Force, but interested parties could contact Jean-Noel privately.

Chairman McClure continued the discussion with a review of the most recent changes in the paper, as presented in draft 12. He explained that draft 12 comprised major parts of revision 9, which were brought forward and heavily edited to condense them into the most pertinent content.

Discussion of the paper included:

* List of members
* Contents section (particularly section title revisions)
* A brief discussion of all newly added and/or edited sections

It was noted that section additional contributions for section 5.1 were submitted just after the cut-off for material for the meeting and what was there, was not quite ready for review. It will be added and circulated in between meetings.

Upon reading of the conclusions section, several attendees objected to some statements that were not supported by evidence in the document. While acknowledging that the statements may be true, it was decided to strike them rather than search out supporting documents, since that may be beyond the scope of the document.

It was stated that the changes noted during the meeting would be made, the new version of section 5.1 would be added to the technical paper and it would be circulated as draft 13 to the members in the time between meetings.

Jean-Noel raised a question as to whether an existing heated well can be used with a new probe which requires an unheated well, by simply disconnecting the heater. Phil said he had experience adjusting the probe depth to locate the hottest position and leaving the probe at that depth. Several other attendees nodded agreement and one commented that some installation instructions require a specific insertion depth.

Old Business: No old business

New business: No new business

Having no more business to cover, Dave Wallach moved to adjourn and Jean-Noel Berube seconded, followed by a unanimous vote of the members present to approve the motion. The meeting adjourned at 10:32 am.

Written and Respectfully Submitted by,

Bob Thompson, Vice Chair

### Task Force on 1538 - IEEE Guide for Determination of Maximum Winding Temperature Rise in Liquid-Filled Transformers – Rick Marek

While the TF did not meet during the Transformers Committee meeting, the TF investigated the options according to the IEEE Standards Association Policies and Procedures which define the development process for four types of document development:  New, Revision, Amendment, Corrigendum and Erratum.  The TF agreed that Amendment was the correct process.  A scope and purpose were determined with all in favor as determined by email vote.  According to the charter of the TF, the chairman agreed to present the findings to the IL SC and request authorization to submit a PAR request.

Rick Marek moved that the Subcommittee approve the following scope and purpose for a PAR for the Amendment of IEEE 1538.

Scope: This amendment will expand the clause that addresses direct measurement by fiber optic detectors and will also add an annex detailing installation techniques for fiber optic probes. References will also be updated.

Purpose: The state of the art has improved over the years since the last reaffirmation of this guide. This amendment adds substantial detail and general recommendations for sensor location, based on the historical experiences of many fiber optic measurements, providing sufficient detail for everyday use on common designs.  Information is also provided on proper sensor installation that was missing from the current guide.

Tom Prevost seconded the motion. After a brief discussion it was approved unanimously.

The Chair appointed Rick Marek as the Chair of the new Working Group.

### Working Group on PC57.162 - Guide for the Interpretation of Moisture Related Parameters in Dry, Gas Insulated and Liquid Immersed Transformers and Reactors – Tom Prevost

Attendance Members 34 out of 66

 Guest 72

 Guests Requesting Membership 10

Meeting Minutes

Tom Prevost, discussed at the first meeting that if you ask for membership you were granted membership, but from now on you will need to be at two consecutive meetings after requesting membership. Please if you do have comments or questions please introduce yourself and your affiliation to meet the rules.

Tom Prevost, chair, introduced himself, Valery Davydov, vice chair, and Deanna Woods, secretary, of the working group and to save time members and guests introduction was skipped.

A quorum of the working group members were present 34 out of 64.

The first meeting minutes approved with Don Cherry making a motion and Emilio Morales seconding the motion.

Tom Prevost then reviewed the scope and the purpose of the working group and then a slide of PAR was shown. Tom Prevost also called for any literature or papers for use while working in this group. (Bibliography for reference) In order to obtain the goal of this working group within four years, the group has been broken down into eight task forces. He then mentioned he sent the agenda to the members and guests. Tom Prevost talked about the break out of the group into task force and would like to see three to five volunteers on each task force so the work can get done.

#### Task Force 1 Terminology and DefinitionsTask Force Leaders - Jeff Golarz jgolarz@lumasenseinc.com

This section will list and define the terminology for moisture related phenomena in solid, liquid and gaseous insulating materials used in transformers and reactors.

Tom Prevost ask Jeff Golarz to come forward and discuss his task force and go over the scope.

Volunteers – Please forward your information to Jeff

#### Task Force 2 Measurement and evaluation of moisture-in-gas insulation parametersRich was not present for the meeting, therefore Tom Prevost described the task force.Task Force Leaders - Rich Simonelli rich.simonelli@spx.com

This section describes existing measurement, evaluation and methods of moisture and other relevant parameters in a gaseous medium. It would great to someone from the transformer manufacturers

Volunteers – Please forward your information to Rich

#### Task Force 3 Measurement and evaluation of moisture-in-liquid insulation parameters Task Force Leaders- Claude Beauchemin beauchemin@tjh2b.com

Claude came forward and described what the task force scope entailed.

This section describes the existing measurement and evaluation methods of moisture parameters and other relevant parameters in the liquid medium of a transformer or reactor for sequential or continuous on-line moisture assessments.

* -Karl Fisher Methodology
* -Consider effect of chemical solutions used for new aged and contaminated insulating liquids
* -Consider types of insulating liquid
* -Relative Saturation
* -Consider measurement method
* -Capacitive probe
* -Derived from Karl Fisher
* -Effect of aging (contamination) on water solubility

Volunteers – Please forward your information to Claude

Tom Prevost mentioned that with a group of this size that these meeting will detail updates on the task force progress and presentations of interest during the meetings. Also, the evolution of the guide will be given as part of the update at the meetings.

#### Task Force 4 Measurement of moisture in solid insulationTask Force Leader - Paul Griffin pgriffen@doble.com

Paul was not present at the meeting therefore, Tom Prevost described the task force.

This section describes the methods of measurement of moisture in solid insulation using a balance, for un-oiled insulation and a Karl Fisher method using solvent extraction or vapor extraction for oiled insulation.

I don’t know if anyone is using balances but we can find out at the meeting.  I think many today are using ovens attached to a Karl Fischer titration instrument or solvent extraction.  Once the group is together we can develop the scope but I would think there would be key areas that needed to be covered.   For both non-oiled and oil-impregnated insulation things to explore are:

1. How to acquire samples and retain them for moisture measurements
2. Methods of measurement and specific details if outside of standard methods
3. Repeatability and accuracy of measurements

Volunteers – Please forward your information to Paul

#### Task Force 5 Evaluation of moisture in solid insulation using dielectric response methodsTask Force Leader - George Frimpong george.k.frimpong@us.abb.com

George came forward as described the task force, he did rewrite the scope to include (DFR< power frequency power factor). The topic to be stricken from the task force is to include DFR since there is a group already working on this topic and stick with the frequency domain. Struck out temperature distribution there is not temperature probes in the insulation so there is no way to do this prescribe method. Moisture distribution was also taken out due to the fact that these are all bulk moisture measurements. This section describes the methods of measurement of moisture in solid insulation using dielectric response methods.

Consideration will be given to methods that analyze dielectric response in the frequency domain (DFR< power frequency power factor)

Consideration of the following parameters needs to be included:

1. changes in temperature during the test
2. acid content of the paper (from oil acidity)
3. Geometry of insulation

Any comments- Valery Davydov is not sure if we only need to leave this in the frequency domain but I will leave this to the task force to decide. Valery main concern is the distribution of the moisture. George is relying on DFR working group. The group needs to discuss the effect of moisture and the effect of other contaminates on the DFR. The TF needs to have the discussion to include DFR.

Volunteers – Please forward your information to George

#### Task Force 6 Inferring of moisture in solid insulation from measurements conducted in liquid or gaseous mediumTask Force Leader - Valery Davydov valery.davydov@ieee.org

This section describes methods of inferring moisture in solid insulation from that measured in the liquid or gaseous medium for both sequential and continuous on-line measurements.

For equilibrium methods this section will discuss errors introduced due to moisture diffusion time constants and temperature measurement accuracy.

Valery Davydov gave presentation on is task force in detail.

Distribution of temperature and distribution of moisture must be considered. Valery stated his proposed suggestions of the direction of his task force but he also stated that these are not necessarily the final product of the guide.

Tom Prevost then gave a summation of Valery presentation and describes the scope of the task force. The goal of the task force is to combine what we are measuring and in each of these phases and infer what the moisture is solid insulation.

Don Platts then had a question about a procedural occurrence. He wanted to know the direction of the task force. Don Platts wants to make sure everyone has an input even at the task force level. Tom Provost hope and desire is that Valery has a starting point but it is far from concluding what the outcome that will be finalized with the task force.

Volunteers – Please forward your information to Valery

#### Task Force 7 Evaluation of aging and end of life of solid insulation parametersTask Force Leader- Roger Wicks roger.c.wicks@usa.dupont.com

This section describes approaches for evaluation of parameters of end of life of solid insulation affected by moisture.

The consideration of the effects of moisture, oxygen and aging byproducts in transformer aging tests is the purpose of this task force.

Roger came forward to describe the scope of the task force he will be leading for the working group. Roger stated he can easily document from literature that is sent to Deanna but not sure of a good test one could use in dry applications.

Tom Prevost agreed with the point of gas or air insulated equipment could be difficult to get a good method that can be used for that and if not define the scope that will not be addressed.

Volunteers – Please forward your information to Roger Wicks

#### Task Force 8 Factory/workshop application of knowledge on moisture; establishing baselinesTask Force Leader - Poorvi Patel poorvi.patel@us.abb.com

This section describes a factory/workshop approach to the establishment of a baseline for each important moisture related parameter

Poorvi Patel came forward to describe the task force.

What is already used to establish a baseline in the industry will be convenient to use ( i.e. dew point, DFR) and discussion on other oil test used already in a factory to determine dryness of the insulation.

Volunteers – Please forward your information to Poorvi

#### Task Force 9 Field application of knowledge on moisture\* Note: *This section lists the risks associated with moisture*Task Force Leader - Jim Thompson serve1@svtv.com

Jim was not in attendance at this meeting

Tom Prevost describes the scope of this task force. This is the document the risk and the effect of having high moisture in your transformers. Help with any ideas on how to mitigate the moisture and looking at absolute but also rate of change as well. Then the values will be used as risk assessment for those values.

Volunteers – Please forward your information to Jim.

### Working Group for Application of High-Temperature Materials IEEE P-1276 – Mike Franchek

Tuesday, March 25, 2014

Savannah E, 3:15 pm – 4:30 pm

Marriott Riverfront Savannah GA, USA

#### Welcome & Chairman's Remarks M. Franchek

The Chair opened the meeting at 3:16pm, with comments related to the work of this group.

#### Circulation of Attendance Rosters R. Wicks

The Secretary circulated the attendance rosters. By the end of the meeting, there were 13 members and 42 guests in attendance with 4 repeat guests requesting membership. After addition to the membership list, this would increase our membership to 30 members. Full attendance has been included in the AM System.

#### Attendance for Quorum R. Wicks

Three quorum calls were made. At the start of the meeting there were only 10 members in attendance. Midway through the meeting there were twelve, and finally at the end of the meeting there were the requisite 13 members in attendance.

#### Approval of Fall 2013 Meeting Minutes – St. Louis, MO R. Wicks

At the end of the meeting, Dave Sundin made a motion to approve the minutes, Bruce Forsyth seconded and the minutes were approved unanimously.

#### Approval of Meeting Agenda M. Franchek

At the end of the meeting, Raj Ahuja made a motion to approve the agenda, John Luksich seconded and the agenda was approved as used in the meeting.

#### Status of PAR Revision to change scope M. Franchek

The chair reviewed the status of the PAR revision, noting that NESCOM will be meeting on 3/26/2014 (tomorrow) to approve the PAR revision. There were a number of questions asked prior to this meeting, which the chair responded to with no issues, so the approval is expected. Questions included concerns about timing, the omission of specific temperatures in the scope, etc., and these were addressed in the response.

The chair then finished this section of the meeting by reminding the members and guests the final scope and purpose that were submitted to NESCOM. The key differences between the revises scope and the 1997 version are the addition of distribution and regulating transformers as well as a reference to temperatures outside the scope of C57.12.00. The revised purpose was simplified vs. the prior document.

#### Review of IEEE 1276 - 1997 Table of Content / Changes All

The chair provided an overview of the difference between a guide and a standard. The guide allows introduction of tutorial type information not appropriate for a standard such as ways to apply high temperature materials (design and usage) and to provide examples of these by application.

The chair noted that this document will include distribution transformers, which have different insulation systems and winding types than those used in the power transformer specific 1997 version, so examples and temperature classes will need to be provided. This document should not be a duplicate of C57.154. Since this is a guide, the document can provide informative information in the body of the document rather than only in an appendix – since a guide by nature is all “informative”.

The chair provided an outline of a timeframe he would like to meet in order to complete this work prior to the PAR deadline of the end of 2016. To do this, he has proposed completing a table of contents by June of 2014 with a ballot of the document by the fall of 2015.

The chair noted that he has sent copies of the background paper, the 1997 version of 1276 and IEEE C57.154 to the working group members to help with the development of the standard. This has not gone out to the guests at this time. The chair noted that there is a similar document to C57.154 (IEC 60076-14), but he will not circulate this to the members.

John Luksich asked about a dual logo approach for this guide, however Rick Marek noted that there is a difference between the two standard documents due to the differences in the ambient temperatures between IEC and IEEE, which might make creating a dual logo version of the guide difficult.

The chair then reviewed the current table of contents from the 1997 version as a way to get the attendees thinking about the work needed for this revision. This lead to discussions on some of the sections which will be outlined below:

The past document contained at one and one-half long introduction which outlined some history and the rationale for the document. There was discussion from John L., Roger Wicks, Rick Marek, Raj Ahura and Radek Szewczyk along with the chair. At the end of the discussion, the consensus of those in attendance would be that there should be a short discussion in the revised introduction regarding the change from 1997 to the new version, and then the historical aspects of this introduction could become part of an expanded discussion on history (Editor’s note - need to consider that we already have a background paper with some detail).

The chair then went over the reference/definitions (noting will need to be updated, especially considering the expanded scope).

The chair discussed merits of high temperature operations and this was agreed to be kept.

The chair discussed insulation systems (noting that there are differences between power and distribution that will need to be discussed). Roger Wicks noted that there are inconsistencies between this document and IEEE C57.100 that will have to be rectified (from a draft version of IEEE C57.100 that never made it into the 1999 version). Roger also noted that wire enamel insulation testing will need to be expanded, as this was not listed in detail in IEEE C57.100, though he has added some on this in a similar IEC document (IEC 62332-2), and that this will be one area where volunteers will be needed.

The loading guide section will likely need to be renamed as loading guidelines for high temperature transformers. This will need to be expanded with the different types of insulation systems (distribution and power) as well as types of systems (hybrid, high temperature (solid and liquid), etc. The chair noted that the original document was mostly disk work power transformers (hybrid) so a lot of work and volunteers will be needed in these last two sections.

Rick Marek (Chair of the C57.154 document) reminded those in the audience that the merits of high temperature might be different for wider range of applications due to the expanded scope. The 1997 document noted future revisions would expand to cover new areas once applications were more broadly used beyond power and mineral oil, and this is now the case with current practices. Rick also mentioned that there is a new work proposal within Cigre (Hans Peter Gasser) to develop a thermal qualification method for fluids to determine thermal class of fluids (Radek mentioned this will be at the Cigre D1 materials session in August.

The chair continued with the old table of comments including a description of high temperature transformers, nameplate and heat run. He noted that a word version of the document has been promised by IEEE within a week to assist in this work. He finished the discussion of the old document by noting that there was an annex A related to gas analysis which likely will need to be expanded with new fluids, etc. and finally there was a bibliography which will need to be expanded.

Rick Marek noted that the nameplate information is in C57.154, and that the heat run might not need to be covered, however Radek noted that in from discussions in the DGA for factory heat run meeting that this might actually provide a lot of good information. John Luksich reminded that there is a difference in hottest spot vs. average winding with higher temperature transformers, as well as direct membership and the chair agreed, but thought it was already in the 1997 version for power units at least. Radek reminded that winding styles can be different (such as a semi-hybrid HV winding and full-hybrid LV winding) and this will need to be addressed in portions of the document (may affect loading, gassing, etc.).

The chair solicited volunteers for the TOC revision by June and the volunteers are Mike Franchek, Roger Wicks, John Luksich, Kurt Kaineder, and Mike Shannon. They will need to get this back to the chair by June by meeting with conference call, etc.

#### Old Business

There was no old business

#### New Business

The chair solicited volunteers for secretary, so that Roger could become Vice Chair (as the Adcom would like to see all three positions in working groups if possible).

#### Adjournment

A motion to adjourn the meeting was offered by Dave Sundin and seconded by John Luksich and passed unanimously, and the meeting was adjourned at 4:00 pm.

Secretary

Roger Wicks.

## Old Business:

No old business.

## 12.8.5 New Business:

**IEEE C57.119-2001 (Reaffirmed 2008) –**The Chair stated that C57.119 expires in 2018. He suggested that we reaffirm or revise this document.

There was general discussion about this topic. The key points of the discussion are shown below.

* We can no longer reaffirm standards. We can submit a revision without any changes but is must be balloted.
* A new bushing document has been approved. Is C57.119 in sync with it?
* Some folks felt that this document was not used while others stated that it was used.
* It was suggested that we survey the Subcommittee for comments and have a working group resolve them. Several people felt this would take too long.
* The intention is to ballot the document as is and address any comments that are submitted. If significant comments are submitted a working group will have sufficient time to resolve them before the standard expires.

T. Prevost made the following motion:

Submit a PAR for the revision of C57.119 with the intention to ballot as it stands and deal with the resulting comments.

D. Platts seconded this motion. During discussion, B. Bartley suggested revising the motion to include “with minor editorial changes.” D. Platts and T. Prevost both accepted this amendment. The Subcommittee voted on the following amended motion:

Submit a PAR for the revision C57.119 with the intention to ballot with minor editorial changes.

This motion received no negative votes and 3 abstentions. The motion was approved.

## Adjournment

P. McClure made a motion to adjourn. K. Miller seconded this motion. The meeting adjourned at 8:45 AM.

Respectfully submitted,

Eric Davis

Secretary, Insulation Life Subcommittee