1. Insulation Life Subcommittee

November 4, 2015

Memphis Tennessee

**Chair: Bruce Forsyth  
Vice-Chair: Barry Beaster  
Secretary: Sam Sharpless**

The Insulation Life Subcommittee met in Memphis Tennessee on November 4, 2015 at 8:00 AM.

A hand count of the members at the beginning of the meeting revealed that 55 of 100 members were present. A quorum was declared.

S. Som made a motion to approve the San Antonio TX Meeting minutes as written. D. Cherry seconded the motion. There was no discussion on the minutes. It was unanimously approved.

G. Hoffman made a motion to approve the Agenda with the location corrected to read “Memphis Tennessee”. T. Prevost seconded the motion. There was no discussion and it was unanimously approved.

The attendance rosters show that the meeting was attended by 228 people. 71 members indicated presence on the roster by the end of the meeting. There were 170 guests and 22 guests requested membership. 10(or11) of these guests meet the membership requirements and will be admitted as members at the next meeting. The complete attendance is recorded in AMS.

# Chair’s Report

The Chair, Bruce Forsyth, welcomed everyone to the meeting.

The Chair reminded everyone that this is a volunteer organization and thanked the members for their participation and efforts. The chair thanked activity leaders for leading effective meetings and keeping activity documents up to date.

The chair announced that the Spring 2016 IEEE Transformers Committee Meeting will be held March 20-24 in Atlanta, Georgia. The date and location of the Fall 2016 Meeting has not been finalized. Those present were directed to the committee website for details as they become available.

Due to the size of the group, general introductions were not made. The chair requested that each person state their name and affiliation when addressing the subcommittee. Consultants working on behalf of others must identify the parties they represent.

The Chair requested member input regarding the scope of the Insulation Life Subcommittee as defined in the current IEEE POWER & ENERGY SOCIETY TRANSFORMERS COMMITTEE ORGANIZATION AND PROCEDURES MANUAL, section 3.19. This section was read from the manual as follows;

3.1.9 Insulation Life Subcommittee

a. Study and review methods to determine maximum safe insulation temperatures, ambient temperatures, insulation aging characteristics, safe duration of loads in excess of nameplate (including short circuits) and to determine methods of calculating or measuring temperatures reached during both transient and steady state loads.

b. Develop and maintain related standards, recommended practices, and guides for such criteria.

c. Coordinate with other technical committees, groups, societies, and associations as required.

Sanjib Som questioned the use of the word “safe” in paragraph “a” and suggested it be replaced with “allowable”. Luiz Cheim suggested that “safe” be replaced with “suggested”. The chair took this information under advisement.

The Chair noted that the minutes for each Activity Group should include:

* The name of the activity
* The date and time of the meeting
* The number of members and guests in attendance. Full attendance should be recorded in the AMS system.
* The presence or absence of a quorum
* A summary of the discussion. Intricate detail is not required. A separate document can be kept to explain the reasoning for decisions that are made.
* A record of the decisions made in the meeting.
* If there will be another meeting. If so, state the place and time.

The Chair requested that activity group minutes be submitted as soon as possible, but no later than December 4, 2105. The Chair asked if any felt that this date could not be achieved and there was no disagreement from the membership.

The Chair noted that 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.

New members of the Insulation Life Subcommittee were welcomed.

## 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

C57.100 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.

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

1538 is valid until 2021.

## Working Group and Task Force Reports

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

Working Group Chairman Rick Marek reported that the group did not meet because the amendment was published on September 11, 2015.

### 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

A meeting was held on November 2, 2015 for WG PC 57.162 Guide for the Interpretation of Moisture Related Parameters in Dry, Gas Insulated and Liquid Immersed Transformers and Reactors. (Moisture in insulation systems)

Attendance Members 40 out of 78

Guests 81

Guests Requesting Membership 12

Meeting Minutes

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

A quorum of the working group members were present (40 out of 78).

The previous meeting minutes were approved with Bruce Forsyth making a motion and Luiz Cheim seconding the motion.

Tom Prevost also mentioned he sent out April’s meeting notes as amended. Then a motion was made to approve the meeting minutes. Mike Barnes made the motion to approve and Valery Davydov seconded the motion passed.

In order to save time, the WG skipped discussion of the Scope and Purpose. The effort is 2 and a half years into the PAR therefore the WG is close to deadline.

The chair noted that some Task Forces have made great progress and others need some more work by Late March 2016 so that the Working Group can have a document to be put out for circulation and comments.

There is one item that needs to be addressed and it is to form a new Task Force (TF10). The TF will take a look at moisture equilibrium curves. Bruce Forsyth has agreed to chair the TF and he will need some help in pursuing the completion of the work. Tom Prevost asked for TF10 members and provided Bruce’s email for volunteers to contact.

**Task Force 1 - Terminology and Definitions**

Task Force Leader - Jeff Golarz [jgolarz@lumasenseinc.com](mailto: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 asked Jeff Golarz to come forward and discuss his task force and go over the scope.

Jeff sent out the TF latest compilation of terminology and definitions to TF leaders for comments and received no response. Tom asked if he could send the email again for response versus proceeding with the TF on its own.

**Task Force 2 - Measurement and evaluation of moisture-in-gas insulation parameters**

Task Force Leader – Tom Melle [tom.melle.us@ieee.org](mailto:tom.melle.us@ieee.org)

This section describes existing measurement, evaluation and methods of moisture and other relevant parameters in a gaseous medium. Tom is looking for scientific people to help and someone with field experience with dew point and moisture and finally someone with historical research.

Tom Melle has taken over for Rich Simonelli due to Rich’s time constraints. Claude Beauchemin volunteered to assist Tom.

**Task Force 3 - Measurement and evaluation of moisture-in-liquid insulation parameters**

Task Force Leader - Claude Beauchemin [beauchemin@tjh2b.com](mailto:beauchemin@tjh2b.com)

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

Claude reported that he has been out of touch for the last year and hoped to increase the TF efforts in the next months.

**Task Force 4 - Measurement of moisture in solid insulation**

Task Force Leader - Paul Griffin pgriffin@doble.com / Ron Hernandez is taking lead

Ron went over the purpose that 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. Ron stated that they have reached out to CIGRE for input and is still looking for members.

**Task Force 5 - Evaluation of moisture in solid insulation using dielectric response methods**

Task Force Leader - George Frimpong [george.k.frimpong@us.abb.com](mailto:george.k.frimpong@us.abb.com)

The TF has sent out a draft to capture what is needed and introduced the 6 members and stated he is comfortable where they are in their progress.

A discussion was introduced on the make of a document and the two ways it can be circulated. The document will be compiled and sent out for comments.

**Task Force 6 - Inferring of moisture in solid insulation from measurements conducted in liquid or gaseous medium**

Task Force Leader - Valery Davydov [valery.davydov@ieee.org](mailto: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.

Valery Davydov provided a detailed presentation.

**Task Force 7 - Evaluation of aging and end of life of solid insulation parameters**

Task Force Leader- Roger Wicks [roger.c.wicks@usa.dupont.com](mailto: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 are addressed by this task force.

Roger reported no real update since the last meeting. Roger also stated that they looked at CIGRE reports but the main issue with that was the references were not easily accessible by members of the task force causing road blocks.

Roger mentioned that there are eight to nine members in the TF.

**Task Force 8 - Factory/workshop application of knowledge on moisture; establishing baselines**

Task Force Leader - Poorvi Patel [poorvi.patel@us.abb.com](mailto: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 reported that they expect to have a draft put together by the next meeting. Poorvi explained that one point that is needed pertains to relative saturation and it needs to be explored in more depth. One of the members of the TF, Shane Smith shared some works of Dr. Roizman who was not able to make the meeting but he went through slides that the Dr. Roizman provided. Shane also shared that they have six transformers in the experiment so far with measurements and the equilibrium curve is yet to be determined.

**Task Force 9 - Field application of knowledge on moisture**

Task Force Leader - Jim Thompson [serve1@svtv.com](mailto:serve1@svtv.com)

This section lists the risks associated with moisture

Jim has passed along a draft survey spreadsheet and has yet to have final outcome returned. Jim reported that there are 11 members in the TF. Jim was asking for field data on transformers and where the location sampling was taken in respect to the physical location of the transformer.

Tom Prevost asked if anyone had an objection to adjourn the meeting. Meeting adjourned.

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

The Peabody Memphis Hotel – Memphis, Tennessee, USA

Room – Grand Ballroom B

November 3, 2015, 3:15pm – 4:30pm

Roger Wicks – Chair Mike Franchek – Vice Chair Javier Arteaga - Secretary

1. Welcome & Chairman's Remarks R. Wicks

Roger opened the meeting at 3:15pm with a brief description of the scope of the Working Group.

1. Circulation of Attendance Rosters J. Arteaga

Circulated

1. Attendance for Quorum J. Arteaga

17 members were in attendance meeting the quorum requirement of 16 members. From the rosters at the end of the meeting there were 16 members in attendance and 89 guests. Of these 89 guests, 13 requested membership. The attendance will be reviewed and new members will be added if they meet current attendance requirements. The attendance will be recorded in the AMS system.

1. Approval of Spring 2015 Meeting Minutes – San Antonio, TX J. Arteaga

The meeting minutes were approve unanimously as written without changes.

1. Approval of Meeting Agenda R. Wicks

The agenda was approved unanimously without changes.

1. Review of IEEE 1276 D1.2 All

Kurt Kaineder presented changes proposed to section 4, merits of operating at high temperatures and section 7, description of high-temperature transformers. He indicated that figures 1 and 2 cover a range of temperature very large and unrealistic, with winding gradients up to 90°C, and there is a need to review. Unfortunately the based data for these charts was no longer available and a new data is required, seeking the support of the working group to provide this information.

A modified section to cover mobile transformers was added with ODAF cooling system and further expansion on the topic is required.

Section 4.5 to cover the merits of other transformers need additional cases for types of transformers and the input from the working group was requested.

In section 7, description of high-temperature transformers, additional detail of the transformers with hybrid insulation is required, in special the section for distribution transformers that were not included on current version of guide.

Tom Golner presented his contribution consisting of a list of considerations for the design, components and accessories for transformers operating at elevated temperatures. He also indicated that the suppliers of high temperature liquids could provide additional recommendations.

Mark Perkins indicated that he needs to consider that the load losses would also increase with higher temperatures.

Craig Stiegemeier recommended the document include volume requirements for the expansion tank for these transformers.

It was also indicated that for distribution transformers the selection of the breakers and fuses should be also addressed in this guide.

Dharam Vir suggested to include values of DGA in the guide. It was also suggested to include consideration for current transformers.

Tom Golner also presented a list of major insulation, minor insulation, conductor components and core components that need to be addressed for higher temperature operation. In addition, he presented the different type of tests that would be required to qualify these materials for their use in transformers operating at elevated temperatures.

Valery Davydov indicated that the moisture in insulation also would be required to be included, however work is underway in PC57.162 to address this subject and current guide will make reference to this document.

Jinesh Malde pointed that required characteristics for diamond baked paper needs to be included in this guide.

Evan Langran suggested to include the additional mechanical stresses in conductors due to their thermal expansion when operating at elevated temperatures.

Chairman requested working group members and guests to participate in the elaboration of the sections required and the following new assignments were made:

Dave Sundin – Clauses 5 & 6, Evan Langran – Clause 7, Attila Gyore – Clause 6, Chuck Stevens – Clause 6, Shane Goydich – Clause 6, Jinesh Malde – Clauses 5 & 6, Dustin Davis – Clause 6

Chairman indicated that the working group will meet again in the Spring 2016 meeting.

1. Old Business

The Chair noted that our par expires at the end of 2016, and that we need to work quickly to complete this first draft with all of this additional input, likely in time to discuss at our Spring meeting so we will be in a better position to request a PAR expansion prior to the end of September 2016.

1. New Business

No new business

1. Adjournment

No further discussion, so with this, Attila Gyore moved to adjourn, seconded by Bruce Forsyth Meeting adjourned at 4:20 PM.

Submitted by Roger Wicks

### Working Group on C57-119 IEEE Recommended Practice for Performing Temperature Rise Tests on Oil-Immersed Power Transformers at Loads Beyond Nameplate Ratings – Gael Kennedy

The document has been balloted and is undergoing ballot resolution. This working group did not meet during the Memphis Conference.

Submitted by: Gael R Kennedy

# Old Business

Dave Wallach presented the findings of the Task Force working on a Winding Temperature Indicators PAR proposal. Discussion by the membership noted that this subject potentially overlaps several other documents and has the potential for scope creep. A motion was made by Gary Hoffman as follows; “A study group shall be formed to establish a title, scope, and purpose for the proposed guide for temperature measurement”. The motion was seconded by Robert Thompson. It was unanimously approved.

# New Business

The chair recommended action at a future meeting to consider C57.12.90 clause 11 temperature test measurements.

The Chair noted that his is his last meeting and expressed thanks to the subcommittee

Don Platts thanked the Chair for his service. Platts announced that the new Subcommittee Chair will be Sheldon Kennedy.

# Adjournment

Phil McClure made a motion to adjourn. Roger Wicks seconded this motion. The meeting adjourned at 9:15 AM.

Respectfully submitted,

Samuel L. Sharpless

Secretary, Insulation Life Subcommittee