1. Insulation Life Subcommittee

October 22, 2014

Washington DC Metro Area

**Chair: Bruce Forsyth  
Vice-Chair: Barry Beaster  
Secretary: Eric Davis**

The Insulation Life Subcommittee met in Washington, DC on October 22, 2014 at 8:00 AM.

A hand count of the members at the beginning of the meeting revealed that 54 of 91 members and 0 of 7 corresponding members were present. A quorum was present.

P. McClure made a motion to approve the Savannah, GA Meeting minutes as written. K. Miller seconded the motion. There was no discussion on the minutes. It was unanimously approved.

The agenda was reviewed. There was no discussion on the agenda. It was unanimously approved.

The attendance rosters show that the meeting was attended by 170 people, 61 of 91 members and 109 guests. 12 guests requested membership. 8 of these guests meet the membership requirements. The complete attendance is recorded in AMS.

# Chair’s Report

The Chair, Bruce Forsyth, was not able to attend this meeting. The Vice-Chair, Barry Beaster, ran the meeting.

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

The Spring 2015 IEEE Transformers Committee Meeting will be held April 12, 2015 through April 16, 2015 in San Antonio, TX. The Fall 2015 Meeting will be held November 1, 2015 through November 5, 2015 in Memphis, TN.

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 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 November 19, 2014

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

Tauhid Haque Ansari Steve Brinkman Julio Caldeira

Jonathan Cheatham Martin Hinnow Rodrigo Ronchi

Subhas Sarkar Kevin Sullivan Roger Verdolin

David Wood

## 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.

### 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

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

Monday, 10/20/2014

Chair: Phil McClure

Vice Chair: Robert Thompson

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

The meeting began with the members and guests introducing themselves. There were 8 members and 16 guests in attendance. There are 11 members in the Task Force and a quorum was achieved. One guest - Jeff Golarz - requested membership.

The minutes of the Spring 2014 meeting in Savannah were sent to the members prior to the meeting and after asking if there were any questions or discussion, a motion to approve the minutes was requested by the Chair. A motion to approve the minutes was made by Josh Herz and seconded by Dave Wallach followed by unanimous approval.

**Old Business:**

The Task Force had two projects in process from the last meeting; the experimental investigation of WTI response time and the technical paper which describes heated thermowell simulating WTI’s, summarizes the results of the experiment and suggests alternate WTI systems.

The report on the experiment had been discussed, revised and balloted at the Spring 2014 meeting. After the changes were made, the document was balloted and 8 of 9 members approved. There was one abstention. In the interim between meetings, the authorized changes were made and two further changes were discovered that were discussed in previous meetings but not captured in the document. These changes were shown in a red-lined document that was circulated to the members prior to the meeting. The intent was to re-ballot the document at this meeting. Tim Rinks made a motion to accept the changes and ballot the document. Jorge Gonzalez de la Vega seconded the motion. The motion passed unanimously 7-0. One member arrived late to the meeting and did not participate in the vote. The experiment report as approved will be made available to Sue McNelly for placement on the appropriate page of the IEEE Transformer Committee’s website

The technical paper’s version was draft 13 coming into the meeting. The sections that were discussed at the Spring 2014 meeting were edited by members in the interval between meetings and the full red-lined paper was distributed to the members prior to the meeting. Each section was again discussed and consensus on changes that need to be made was achieved. Several members agreed and/or volunteered to edit the sections. The changes are planned to be made and circulated prior to the next meeting, with the intent to ballot the document at the next meeting.

At 10:45am, having run out of time, a motion to adjourn was made by Gary Hoffman, seconded by Josh Herz and carried unanimously.

Respectfully,

Phil McClure, Chair

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

Washington, DC USA

Sheraton Premiere at Tysons Corner

Tuesday October 21, 2014

The working group had a short meeting in the Washington Boardroom 11:00 AM on Tuesday. This was the first meeting of the WG and it was convened with 4 of the 5 WG members in an off schedule time slot. All four attendees requested membership and a quorum was achieved. The full attendance record is available in the AM System. Tom Prevost has agreed to serve as Secretary to the WG, but was not present due to a conflict. There were no previous minutes to approve since it was the first WG meeting. The draft had been reviewed by the members and a number of changes were suggested and agreed to. The WG unanimously agreed to submit the document for ballot and to request Subcommittee approval.

With no further business, the meeting was adjourned at 11:35 AM.

Subsequent to the meeting, a formal email motion was made by Don Platts to accept the draft wording, and proceed to sponsor ballot. This motion was seconded by Tom Prevost and followed by a WG vote. All five members voted yes to the motion.

Respectively submitted

Richard P. Marek, WG Chair

### 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 44 out of 74

Guest 29

Guests Requesting Membership 6

Meeting Minutes

Tom Prevost, chair, introduced himself, Valery Davydov, vice chair, and Deanna Woods, secretary, of the working group and then members and guests introductions.

A quorum of the working group members were present 44 out of 74.

Minor correction was made in number of Task Force numbers in the minutes.

The meeting minutes were approved with Don Cherry making a motion and Claude Beauchemin seconding the motion.

Tom Prevost presented the Par and explained the agenda. For this meeting he wanted to break into individual task forces to have each meet.

Tom Prevost ask for approval of the agenda, Don Cherry making a motion and Claude Beauchemin seconding the motion for the agenda. Approved.

Tom Prevost went over the PAR and then described each task force.

The task force then broke into individual groups and finished the meeting time in their respective groups.

Tom Prevost explained that individuals would need to pick a task force to participate in which is the unfortunate with breaking into groups.

**Task Force 1 Terminology and Definitions  
Task Force Leaders - 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. This is the list of members so far;

1. Alex Macias
2. Shawn Luo
3. Oleg Roizman
4. Valery Davydov

**Task Force 2 Measurement and evaluation of moisture-in-gas insulation parameters (Rich was not present for the meeting, therefore Tom Prevost described the task force.)**

**Task Force Leaders - Rich Simonelli** [**rich.simonelli@spx.com**](mailto: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. Task members are:

* Tom Prevost
* Gary Hoffman
* Tom Melle
* Bob Kinner
* Deanna Woods

We reviewed the charter for the TF and detailed our goals

TF Goal:

Investigate and detail the methodology, application, and limitations, of using the dew point measurements from a gas filled power transformer as means to the extrapolate moisture content of the solid insulation contained therein.

The group discussed alternative methods of obtaining the dew point measurement, Bob Kinner suggested a “sweep gas measurement”.

Action Items:

Deanna Woods will provide a word version for C57.93

Rich Simonelli will distribute data and details of previous dew point studies conducted in 2009 to the TF for review

Our task force will communicate via email and schedule a conference call to discuss next steps

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

**Task Force Leaders- 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

TF3 had about 12 participants. Half of them are requiring membership. I did a presentation of what is KF and what is capacitive sensor with an outline of what we are looking for in building this chapter. We did not set a date for a conference call.

**Task Force 4 Measurement of moisture in solid insulation  
Task Force Leader - Paul Griffin** [**pgriffin@doble.com/**](mailto:pgriffin@doble.com/) **Ronald Hernandez**

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.

The task force 4 on measurement of moisture in solid insulation met on Monday October 20, 2014 at 11:30 AM. The meeting was chaired by Ronald Hernández. Attendees of the meeting were the following:

* Clair Claiborne
* Solomon Chiang
* Luiz Cheim
* Byoung “Sam” Kang
* Mohamed Diaby
* Ronald Hernández

Tom Prevost asked to be included in this task force. Paul Griffin could not attend the meeting but he is also a member (chair) of this task force.

**Discussion:**

1. It was suggested to remove from the original title of this task force the last two words “using balance” to avoid any confusion since Karl Fischer titration methods are also covered in this task. Thus the new title of the task force is: **Measurement of Moisture in Solid Insulation**.
2. The task force reviewed the scope and agreed to define it as follows:

**Scope:**  This section describes the existing methods of measurement of moisture in solid insulation using balance for non-oil-impregnated insulation and a Karl Fischer titration using solvent extraction or vapor extraction for oil-impregnated insulation.

1. The task force agreed to include the following items for the description of the methods of measurement:
   * Sampling and retaining of samples for moisture measurement
   * Methodology of measurement and specific details if outside of standard methods:
     + Range of % moisture the method is able to measure
     + Recommended range of paper/pressboard/composite insulation thickness
     + Accuracy of the balance
     + Calculation of the reported results
     + Extraction time and temperature ranges when using vapor extraction
   * Repeatability and accuracy of measurements.

**Next Course of Action:**

The task force members volunteered to develop the following sections:

* Measurement of moisture in solid insulation using balance methods for non-oil-impregnated insulation: Solomon Chiang and Byoung “Sam” Kang.
* Measurement of moisture in solid insulation using Karl Fischer titration – solvent extraction for oil-impregnated samples: Mohamed and Tom Prevost.
* Measurement of moisture in solid insulation using Karl Fischer titration – vapor extraction for oil impregnated samples: Ronald Hernández and Paul Griffin.
* Repeatability and accuracy of measurements: Clair Claiborne.
* Interpretation of the procedure and results: Luiz Cheim.

**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)

Members: Mario Locarno ([mlocarno@doble.com](mailto:mlocarno@doble.com)), Peter Werelius ([peter.werelius@megger.com](mailto:peter.werelius@megger.com)), Kathleen McHugh ([Kathleen.mchugh@sabic-ip.com](mailto:Kathleen.mchugh@sabic-ip.com)), Dinesh Chhager ([dinesh.chhager@megger.com](mailto:dinesh.chhager@megger.com)), Josh Herz ([jherz@qualitrolcorp.com](mailto:jherz@qualitrolcorp.com)), Jermaine Clounts ([Jermaine.clounts@powerpartners.com](mailto:Jermaine.clounts@powerpartners.com)), Lorne Gara ([lgara@orbisengineering.net](mailto:lgara@orbisengineering.net)), Yukiyasu Shirasaka ([yukiyasu.shirasaka@hitachi.com](mailto:yukiyasu.shirasaka@hitachi.com)), Mohamed Diaby ([mohamed.diaby@efacec.com](mailto:mohamed.diaby@efacec.com)), Diego Robalina ([diego.robalina@megger.com](mailto:diego.robalina@megger.com)), Ebrahim Cham,

There were two items about the scope from the Savanah meeting that had to be decided by the task force: 1) to consider only the frequency domain measurements (DFR and power frequency power factor) 2) to consider moisture and temperature distribution.

There was discussion that in the field, there is typically access to just temperature gauge measurements of the winding and top oil. It is not feasible to measure temperature distribution in the winding without preinstalled temperature probes. In addition, since these measurements are by design bulk moisture measurements, it is not feasible to measure the distribution of moisture in the windings. Consequently, these provisions will be dropped from the scope.

There are standards and/or guides available or under development for DFR and power frequency power factor, whereas there are currently no IEEE documents that would help a user in the use of other dielectric response methods. The scope will therefore be limited to DFR and power frequency power factor measurements.

There were discussions about including:

* a correlation between moisture estimation via 60 Hz power factor and moisture estimation via DFR
* information on power factor (dissipation factor) as a function of moisture
* limitation for moisture estimation using these methods
* making a note that currently DFR moisture estimation is applicable to mineral oil insulated transformers and that more investigations may be needed for application to ester filled transformers

George presented some measurements made in the ABB St. Louis factory. The measurements were for DFR, power factor and moisture in oil sample right after shut down from the ONAF heat run tests and after cool-down of the transformer. The goal of these measurements is to see the effect of rapid decline in temperature (e.g. right after de-energization of loaded transformer) on moisture estimation and to provide some guidance to users on when to make measurements after de-energizing a transformer. It was agreed that the lessons learned from such tests may be more suited for inclusion in the DFR Guide (PC57.162) than in this guide.

The TF then reviewed the scope and agreed to make this task no more complicated than defined as follows:

Scope: This section describes the methods of measurement of moisture in solid insulation using dielectric response. Consideration will be given to those methods that analyze the results in the frequency domain (DFR and power frequency power factor) and to changes in temperature during the measurement.

The chair decided to confirm his understanding of the requirements of the scope with the WG Chair and then set up a TF meeting to prepare a draft of the section.

**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)

The separate task forces split. This TF met in the Washington Room. Introductions were skipped since they were done in the WG prior. There were 18 attendees listed in the roster, including Chair Valery Davydov.

It was noted that 4 existing members were present. Two other existing members, Paul Boman and Claude Beauchemin, were not in attendance. 6 new attendees have requested membership.

Members and attendees requesting membership were:

1. Valery Davydov (Chair)
2. Hali Moleski (Secretary)
3. Oleg Roizman
4. Jeff Golarz
5. Emilio Morales Cruz
6. Dave Hanson
7. Stephanie Denzer
8. Tom Golner
9. Peter Heinzig
10. Egou Kirdenmayv.

Valery (Chair) had prepared a presentation. The presentation began by giving parameters that may affect inferring moisture in solid insulation.

The main points of the presentation were:

1. The solution to the issue of “Moisture Exchange vs. Moisture Diffusion” would lay in measuring or evaluating the two parameters:
   1. Water content of surface of solid insulation
   2. Maximum water content of inner layers of solid insulation
2. Additional moisture-in-insulation parameters to consider:
   1. Variations of the two above parameters with the position of solid insulation in the unit due to the non-uniform temperature
   2. Water content of solid insulation in the hottest spot
   3. Water content of solid insulation in the wettest spot
   4. Water content of solid insulation evaluated by DFR
   5. Other?
3. List of moisture equilibrium charts suggested for TF6 chapter:
   1. WCP vs T and P (e.g.: copy from IEEE C57.93)
   2. WCP vs T and RH for new kraft ppr
   3. WCP vs T and RH for aged kraft ppr (???)
   4. WCP vs T and RH for other types of new ppr
   5. WCP vs T and WCO for:
      1. New MO
      2. Moderately deteriorated MO
      3. Badly deteriorated MO
   6. WCP vs T and WCO for:
      1. New SE
      2. New NE1
      3. New NE2
   7. Color chart
4. Terms to define for TF6 (suggestions):
   1. Layer of solid insulation
   2. Surface layer of solid insulation
   3. Inner layer of solid insulation
   4. Water content of the surface of solid insulation
   5. Water content of an inner layer of solid insulation
   6. Maximum water content of inner layers of solid insulation
   7. Moisture exchange between the surface of solid insulation and surrounding gaseous or liquid medium
   8. Moisture diffusion within solid insulation
   9. Establishing baselines of moisture in solid insulation:
      1. For new units and/or workshop repaired units
      2. For units operating in the field with no baseline established earlier
   10. Tracking and interpreting of changes against the baselines throughout the life of the transformer or reactor.

Dave H. commented that paper type may also be important. How are inner and outer layers defined? Perhaps manufacturers should help us better define types of paper - this would be a good 1st step.

Oleg commented diffusion is much slower than absorption / desorption.

Valery commented that inner and outer layers must be defined and we want to keep it general.

Definitions will be gone over and reviewed by the group.

A list of 15 or so of term definitions has been already done by Oleg.

A comment was made that we should look more at dynamics of fluid movement of moisture.

Valery stated that we need to remember both gas and liquid movement.

Oleg suggested adding an introduction section to the guide.

Dave suggested we discuss this suggestion with Tom P (WG Chair), as it could be addressed by the main WG.

Oleg asked who is doing the work and how we will communicate. Valery said we will go through a general approach outlined in his 2012 paper; it was published and is on website. If agreed, then we can decide how we will operate. This new guide will be a reference document for other guides.

It was asked if IEC or CIGRE have documents like this that we could start with reading.

Valery could not think of just one, but we all will look at it.

Valery stated that the outline of the guide content is already done in the paper, and Section 4.3 of his document is what is to be covered by this TF. We can use this as a starting point.

Valery asked for comments and ideas if we start with this structure.

For the next correspondence, we will email. We want to address terms at the next meeting and comments on Section 4.3 as a starting point.

We know we need to address the other guides. Do we want to know water content in hottest spot and wettest paper in transformer overall – e.g. for bubble evolution?

If modelling for a surface of insulation is created, can we assign porosity, etc?

Discussion of DFR and how it is covered in the other TF has followed. Valery stated our TF infers moisture in insulation based on the other TFs input. What we do with DFR information is up to us.

Meeting ended 12:20 PM.

*The initial notes for the minutes were taken by the TF Secretary, Hali Maleski. These notes were modified by the TF Chair, Valery Davydov*

**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 is the purpose of this task force.

Task force started out with solicitation of volunteers for this task force. Here is the list of volunteers:

Name Company Email Papers

Donald Cherry ABB [don.cherry@us.abb.com](mailto:don.cherry@us.abb.com) 1-13

Oscar Pinon Garcia WEG [opinon@weg.net](mailto:opinon@weg.net) 14-26

Thomas Holifield Howard Industries [tholif@howard-ind.com](mailto:tholif@howard-ind.com) 27-39

Sasha Levin Weidmann Electrical [aleksandr.levin@wicor.com](mailto:aleksandr.levin@wicor.com) 40-52

Technology

Jeewan Puri Transformer Solutions, Inc. [jpuri@carolina.rr.com](mailto:jpuri@carolina.rr.com) 53-65

Michael Shannon Rea Magnet Wire [mshannon@reawire.com](mailto:mshannon@reawire.com) 66-78

Sam Sharpless Rimkus [slsharpless@rimkus.com](mailto:slsharpless@rimkus.com) 79-91

Dave Stankes 3M IPT [dsstankes@mmm.com](mailto:dsstankes@mmm.com) 92-104

Kiran Vedante ABB [kiran.b.vedante@us.abb.com](mailto:kiran.b.vedante@us.abb.com) 105-117

Roger Wicks DuPont [roger.c.wicks@usa.dupont.com](mailto:roger.c.wicks@usa.dupont.com) 118-139

We next reviewed the previously developed scope for this task force:

This section describes approaches for evaluation of parameters of end of life of solid insulation affected by moisture. Consideration of the affects of moisture, oxygen and aging byproducts in transformer aging tests.

We then discussed our objectives for what we want to accomplish prior to the next meeting in San Antonio.

1. Solicit the Task Force to identify deliverables for this section
2. Define the “systems” which this work will cover
3. Using cellulose mineral oil, we will start with the CIGRE 323 report (Ageing of Cellulose in Mineral-Oil Insulated Transformers) and identify which of the documents in the extensive bibliography are of interest to our document (as well as which portions of the document can be used as a guide for our work. May also be other such documents in IEEE C57.91 Annex, etc.
4. Circulate a request for meeting times in the first two weeks of December, and then have a conference call at the best time.

CIGRE 323 Report – 139 papers in the bibiliography – the papers to review from the CIGRE document are listed in the table above….

**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

Attendees at this meeting was

* Zan Kiparizoski
* Juliano Montanha
* Shane Smith

The members of this Task Force is

* Zan Kiparizoski
* Juliano Montanha
* Shane Smith
* Bruce Forsyth
* Tauhid Ansari

The task for this task force is to describe methods to establish baseline moisture content in the solid insulation. We have discussed to include following methods for moisture estimation in the factory environment

1. Dew Point- Especially prior to shipping
2. Sample Block Method+ KF- which is not described in any of the IEEE documents as we know
3. Water Extraction Rate- method
4. Relative Saturation in Oil-method
5. Power Factor during the acceptance test – refer to stand IEEE standard for this test.

We have also divided the work for these chapters

1. Dew Point- Especially prior to shipping--- Bruce and Tauhid
2. Sample Block Method+ KF- which is not described in any of the IEEE documents as we know- Zan
3. DFR- Poorvi
4. Water Extraction Rate- method- Bruce and Zan
5. Relative Saturation in Oil-method- Shane
6. Power Factor during the acceptance test – refer to stand IEEE standard for this test.- Poorv

Juliano to come back to Poorvi to let her know what section he would like to contribute to

Follow up Conference call for the sections would be December 15th at 11-12  Central time.

**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](mailto:serve1@svtv.com)

Members

|  |  |  |
| --- | --- | --- |
| Jim Thompson | T & R Service | [serve1@svtv.com](mailto:serve1@svtv.com) |
| Enrique Betancourt | Prolect GE | [ebetanco@ieee.org](mailto:ebetanco@ieee.org) |
| David Wallach | Duke Energy | [david.wallach@ieee.org](mailto:david.wallach@ieee.org) |
| Hugo Flores | EFACEC | [hugo.flores@efacec.com](mailto:hugo.flores@efacec.com) |
| Waldemar Ziomek | CG Power Systems | [waldemar.ziomek@cgglobal.com](mailto:waldemar.ziomek@cgglobal.com) |
| Sergio Coreno | Siemens | [sergio.coreno@siemens.com](mailto:sergio.coreno@siemens.com) |
| Paul Boman | HSB | [paul.boman@hsb.com](mailto:paul.boman@hsb.com) |
| Peter Zhao | Hydro One | [peter.zhao@hydroone.com](mailto:peter.zhao@hydroone.com) |
| Hanxin Zhu | BC Hydro | [hanzin.zhu@bchydroone.com](mailto:hanzin.zhu@bchydroone.com) |
| Julio Caldeira | M & I Materials | [juliocaldeira@mimaterials.com](mailto:juliocaldeira@mimaterials.com) |
| Bob Rasor | SD Myers | [bob.rsor@sdmyers.com](mailto:bob.rsor@sdmyers.com) |

October 20, 2014

The Task Force Chair began the meeting with introductions of the 11 members. Following that there was a review of the current knowledge of moisture in transformers. Since moisture in an operating transformer is a dynamic and distributed parameter that varies with temperature, location, and time--then the Chair discussed searching the IEEE digital library for the last ten years for papers published with a search description of “field application of knowledge of moisture in transformers.” There were 1,119 documents reported but a search of the documents indicated that none addressed moisture in oil correlation to moisture in paper. Then the Chair discussed searching the IEEE digital library for the last ten years for papers published with a search description of “field application of knowledge of moisture in transformers based on oil moisture content.” Again a search of the documents indicates that none addressed moisture in oil correlation to moisture in paper. Then there was a brief mention that the Field Application of Knowledge of Moisture should be based on the underlying mechanism and physical chemistry involved so that the Field Application of Knowledge of Moisture results can be reviewed using basic scientific methodology.

The chair then mentioned the recent article in the March/April 2014 issue in IEEE Electrical Insulation Magazine titled “Equilibrium Charts for moisture in Paper and Pressboard Insulation in Mineral and Natural Ester transformer Oils” by Vasovic et al., PP 10-16. This recent article supports the general understanding that an operating transformer does so in non-equilibrium conditions. Several of the references in the document are past IEEE presentations on moisture dynamics by J. Thompson and TV Oommen that were presented during the development of the IEEE C57.106-2006 guide.

The Chair requested any papers or references to peer reviewed articles “Field Application of Knowledge of Moisture” to be sent via email to the task force Chair.

Then the members of the task force were each asked to provide their experiences with Field Application of Knowledge of Moisture. These then included general discussion of methods referenced in Cigre meetings or papers, internal company methods, and commercial methods.

Future data submission is the goal of this group so that it can be reviewed and summarized for the guide using a good scientific methodology.

Prior to the end of the meeting, email addresses were collected and the Chair will send out a brief summary of the meeting discussion.

During the Insulation Life Subcommittee Meeting, R. Marek made the following motion:

Approve the WG going to ballot with the amendment.

D. Platts seconded the motion. There was no discussion. The motion was approved unanimously.

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

Sheraton Tyson Corners – Washington DC Metro

Room – Ash Grove BC

October 21, 2014 – 3:15pm – 4:30pm

1. Welcome & Chairman's Remarks M. Franchek

Mike opened the meeting at 3:16pm and provided some feedback from the Adcom meeting related to how to operate within the working group environment.

1. Circulation of Attendance Rosters R. Wicks

Circulated

1. Attendance for Quorum R. Wicks

17 members in attendance so we have a quorum. From the rosters at the end of the meeting there ended up being a total of 19 members in attendance and 43 guests. Of these 43 guests, 6 requested membership. Two of these guests will be added to the membership list and four were attending their first meetings so they will be informed of the requirements for future membership (attend three meetings in their first five opportunities). This brings us to a total of 31 members (including two corresponding). The co-chair will send an email to these two corresponding members to ask them to choose between membership and guest going forward.

1. Approval of Spring 2014 Meeting Minutes – Savannah, GA R. Wicks

No comments related to the minutes, so they are approved.

1. Approval of Meeting Agenda M. Franchek

John Luksich motion, Dave Stankes second – passed unanimously.

1. Review of IEEE 1276 D1 Table of Contents/Changes All

Mike provided an update of the timing of the work of the working group. His target is to meet the completion by the end of 2016. Objective is to have a draft by fall of 2015. We need first to complete the outline (draft new table of contents by Dec. 2014).

* 1. Most sections will need rewritten and update - gray
  2. Format according to new document style - Done
  3. Assignment of tasks

Introduction – agreed at last meeting that we still need an introduction, but that it needs to be updated from what was put in the past document. Volunteers – Dave Stankes, Patrick McShane, Mike Franchek, Javier Arteaga.

Section 4 - Merits of high temperature operation. Discussion regarding this section. John Luksich thought it would be useful to add wind transformers. Volunteers – Kurt Kaineder, Marion Jaroszewski, John Luksich and Tom Golner.

Section 5 – Insulation system ratings, test procedures and material aging qualifications. Volunteers – Mike Franchek, Roger Wicks, Ken McNeish and Tom Golner.

Section 6 – Insulating Materials – characteristics, materials fluids Volunteers – Claire Claiborne, Javier Arteaga, Julio Calderia, Patrick McShane. There is an annex in C57.154 which can be a starting point for this work.

Section 7 – Types of transformers hybrid/semi-hybrid, etc. Power and Distribution transformers (very different insulation systems). Volunteers – Kurt Kaineder, Mike Franchek, Arup Chakraborty, plus other people to be assigned later.

Section 8 – Loading guidelines for high-temperature transformers. John Luksich, Arup Chakraborty

Section 9 – Nameplate. Rick Marek input – Nameplate information tends to be part of standards not guides. Rick Marek – motion to remove nameplate information from TOC. John Luksich – second. Javier reminded us why the nameplate information was described in the past document. Rick noted that it has now been defined in C57.154. Sam Mehta mentioned rational in past. Kurt Kaineder – missing class of material – not included – difference between IEC and IEEE standards. Motion passes to remove this information from the current draft TOC.

Section 10 – Heat run test and average winding temperature. Volunteers – Juan Castallenos, and Mike Franchek will work to get some additional volunteers on this document.

Section A – Gas Analysis – Discussion on this section. Arup Chakraborty – views it is important – not necessarily in line with typical transformers. Mike Franchek - Fluids – gas guide for alternative fluids (don’t want to duplicate this). Past document – similarities/differences from typical units. Looking for input on this. Tom Golner asked about what the past data represented (Mineral Oil as the fluid – due to the scope of the document). Mike noted we likely would need to collect some information as part of this work.

Question about temperature limits. Rick Marek confirmed that the C57.154 has these limits and Mike Franchek noted that we shouldn’t duplicate information from that document.

Mike Franchek – need to expand information in Bibliography. Mike added more already and solicited members and guests to provide documentation of more documents.

Mike Franchek noted the fact that the first draft (in the new IEEE format) has areas of gray highlighting where the bulk of the work is needed for this document. Dave Stankes asked about different between this formatted draft and our old document. Mike noted that there is a small amount of work in the non-grayed areas, where work still needs to be done (by the groups noted previously), but that the gray areas are the ones needing the most work.

Mike Franchek asked the groups to meet via conference calls between now and the next meeting. We then worked to identify the leaders of each of the groups (with most groups assigned). Roger Wicks will send the list of volunteers (along with contact information) to each group.

1. Old Business

Need a secretary – Javier Arteaga – has agreed to be the secretary.

1. New Business

Open discussion – no formal proposals.

Patrick McShane raised a question about Industrial – double ended substations. Steady state 65C raise – withstand significant overload for longer replacement. Mike Franchek noted that this was an application/approach that was identified in the past.

Mike Franchek also noted irrigation transformers.

Patrick McShane noted high moisture content in older units – thermal life okay – moisture related issues.

Hasse Nordmann – Life length transformers for windmill. Made it according to loading guide – got reasonable value. Using exponents from guides – but it this case was using different fluids (ester example). Exponents may be conservative vs. mineral oil – would be helpful to have this for this document.

Rainer Frotscher – raised question regarding tap changers – components in compartment type – Mike Franchek mentioned a lot is already in C57.154 (guide like information not standards like). Tap switch could be an issue with high temperature transformers. Javier Arteaga mentioned bushings and other components. We will have to see what is in C57.154 and what might be needed separately for this guide (which can be more tutorial in nature).

Arup Chakraborty mentioned mobile substation transformers.

1. Adjournment

No further discussion, so with this, John Luksich moved to adjourn, seconded by Sam Mehta. Meeting adjourned at 4:20pm

### 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

This was a new Task Force which will become a Working Group on Thursday. The Membership rooster shows 2 members total - Need 2 for Quorum - 2 showed up.

In accordance with the spring 2014 Meeting resolution on this Standard and after discussions with Tom Prevost, Bill Bartley, and Erin from SA, the sole purpose of this meeting was to approve the Document for forwarding to the Insulation Life Subcommittee for Approval to go out for Ballot. The Motion was made by (Tom Prevost) Vice chair and Seconded by the Gael Kennedy) chair and unanimously approved “to forward to the Subcommittee for Balloting”. Upon receiving comments, a Working Group Meeting will be held at the Spring 2015 Meeting for further discussion.

Meeting adjourned till Spring 2015

Gael Kennedy

Chair & Acting Secretary

During the Insulation Life Subcommittee Meeting, G. Kennedy made the following motion:

Approve the WG going to ballot with the document.

T. Prevost seconded the motion. There was no discussion. The motion was approved unanimously.

# Old Business

No old business.

# New Business

There was no new business.

# Adjournment

W. Boettger made a motion to adjourn. P. McClure seconded this motion. The meeting adjourned at 8:30 AM.

Respectfully submitted,

Eric Davis

Secretary, Insulation Life Subcommittee