10.5. SC Insulating Fluids Meeting Minutes
October 24, 2012;
Milwaukee, Wisconsin

Chair: Susan McNelly
Vice-Chair: Jerry Murphy
Secretary: C. Patrick McShane

10.5.1. Introduction/SC Member Roll Call/New SC IF Members

The Chair started the meeting with a welcome and asking the attendees to state their names and affiliations. The Chair explained that it is an IEEE requirement for attendees to indicate their respective affiliations. The AMS data base for the SC and WG rosters must be kept up to date.

The member roll call was made. This was followed by the special role call for those that recently requested membership status. Four of the twelve were present as indicated with an asterisk below and welcomed as new members. The quorum requirement was met with 30 of 45 members present.

Anthony McGrail *
Paul Mushill
Nicholas Perjanik *
Melvin Wright *
Shawn Galbraith
Ken Kampshoff
Jayme Nunes Jr. *
Marc Cyr
Thomas Melle
James Mustacchio
Prabhu Soundarrajan

Guest requesting membership at this meeting:

Paramjit Bhatia
Dave Hanson
James Rowland
Robert Kinner
Jeffery La Marca
Mark McNally
Jimmy Rasco
Russell Martin

Two members have requested that their status be changed to Corresponding Member:

Tom Lundquist
Thomas Spitzer

10.5.2. Approval of the posted minutes from Spring 2012

A motion was made for approval of the minutes. It was seconded and approved.

10.5.3. Working Group and Task Force SC Reports and Submitted Unapproved Minutes

10.5.3.1. C57.104 – IEEE Guide for the Interpretation of Gases Generated in Oil – Immersed Transformers
WG Chair: Rick Ladroga, Vice-Chair: Claude Beauchemin, Secretary: Sue McNelly

The WG Report at the Sub-Committee Meeting, presented by Rick Ladroga:

The WG had a quorum. Participation in the WG has been active. Approximately a million sets of data have been received.

The new schedule to complete the guide is somewhat aggressive. Several meetings between the S12 and F12 meeting have occurred. The next meeting will be in January in Long beach. The plan is for the 1st draft to be ready in February. Six task forces met Tuesday.

One new business item was discussed on the need to consider stray gassing due to moderate core heating. Rick emphasis that the Data provided by users will be stored securely.

There was no discussion or questions from the attendees.

The Minutes (unapproved) of C57.104 WG Meeting as Submitted:

C57.104 – IEEE Guide for the Interpretation of Gases Generated in Oil – Immersed Transformers

Tuesday, October 23, 2012
Milwaukee, Wisconsin
Minutes of WG Meeting

The meeting was called to order by Chair Rick Ladroga at 3:15pm. Vice Chair Claude Beauchemin and Secretary Susan McNelly were also present.

There were 49 of 87 members present. There were 62 guests, and 10 guests requesting membership. A membership quorum was achieved. Guests attending the WG meeting for the first time who request membership will be deferred until the next meeting attended.

Guests requesting membership were (those identified with an asterisk (7 of the 10) will be added as WG members):

Vivek Bhatt*
Jagdish Burde*
Jonathan Cheatham*
Jeffrey LaMarc*
Michael Miller*
Pugazhenthi Selvaraj*
Sukhdev Walia*
Tim Albers
Rainer Frotsches
Paul Griffin

Agenda

1. Attendance Roster Circulation
2. Member Roll Call & Quorum Check
3. Approval of the Spring 2012 minutes
4. Chair's Remarks
5. Task Force Chair Reports
   a. Bibliography – Jerry Murphy
   b. Case Studies – Paul Boman

c. Data – Luiz Cheim
6. New Business – Core Steel Heating
7. Adjournment

The minutes from the spring 2012 Nashville, Tennessee meeting were approved as written.

Review of recent activities:

- Chair's Remarks
  - Restatement of WG History, Goals, and Objectives
    Task Force Structure
    - Framework – Jim Dukarm, Dave Hanson, Rick Ladroga
    - Data – Norman Field, Luiz Cheim, Claude Beauchemin
    - Diagnostic Methods – Michel Duval, David Wallach
    - Case Studies – Paul Boman, Arturo Nunez
    - Arc Furnace Transformers – Tom Lundquist
    - Bibliography – Jerry Murphy, Tom Prevost
  - Data Update
  - Data Security Measures and System Development
  - Timeline Review
    - Data Analysis Complete – December 31, 2012
    - Offsite Meetings (Stowe, Montreal, Newport Beach – Jan 22-23, 2013) – Review Draft V1

Rick gave a summary of recent activities and indicated that offsite meetings/webinars will be held between TR Committee meetings. The next offsite meeting will be held in January 22 & 23, 2013 in Newport Beach, California.

Security and archival of the data used in development of the Guide is important. Work on this is progressing and it is expected that this will be available in the near future.

Timeline: The PAR expires in 2014, so time is moving very quickly.
- Resolve Draft Issues, Issue Draft V1 to WG members – February, 2013
- Discuss Draft Comments and Feedback – Munich, March 17 – 21, 2013
- Issue Straw Ballot – May, 2013
- Resolve Straw Ballot Comments – June/July/Aug 2013
- Issue V2 for Ballot, September, 2013
- Discuss Ballot Negatives, Resolve Comments - Fall 2013 Meeting, October 20-24, St Louis
- Issue V3 for Recirculation Ballot December, 2013

Task Force Chair Reports: All report have been posted on the website
- Case Studies – Paul Boman
- Bibliography – Jerry Murphy
- Data – Luiz Cheim

New Business
- (Craig Stiegemeier) I've attached a note I just sent to Steve Snyder for consideration into C57.12.00 based on the results of the work of the Core Over-Excitation Requirements Task Force. As part of the Task Force's suggestions, a future revision of C57.104 should include the following:
- A guideline that low levels (in terms of ppm/day) of gas generation with a H2/CH4 ratio in the range of 6-8 in transformers filled with mineral oil can be caused by moderate core overheating

- Text should be included to note that moderate core overheating doesn't place the transformer at risk
  Mechanism: (Ramsis Girgis – Found out in some TRs, when the core hot spot reaches 110C and above you get a ratio of H_2/Methane of about 7 to 1. At these low levels of temperature, because of the thin film you get H_2 and Methane.

  There are four papers that will be posted to the web.

  Michel Duval indicated that you can also get this from other parts, not just from the core. It may be due to corona/PD as well.

  Ramsis indicated that when this does happen, it is fairly uniform.

Comment from Fredi Jacobs that we can't look at TCG, it should be weighted. He indicated that there is a paper available that addresses this.

The meeting was adjourned at 4:40 pm.

Rick Ladroga
WG Chair

Claude Beauchemin
WG Vice-Chair

Susan McNelly
WG Secretary

10.5.3.2. C57.106 - Guide for the Acceptance and Maintenance of Insulating (Mineral) Oil - Chair: Bob Rasor

The WG Report Given at the Sub-Committee Meeting, presented by Bob Rasor:

The WG met on Monday, with 48 attendees. A quorum was achieved. Four new member requests were received. Since 1st meeting in Nashville, the WG has held five conference calls. The draft document was reviewed.

No Discussion or questions.

The Minutes (unapproved) of WG Meeting as Submitted:

Monday, October 22, 2012 4:45 PM
WG C57.106 IEEE Guide for Acceptance and Maintenance of Insulating Mineral Oil in Electrical Equipment
Monday, October 22nd, 2012 4:45 PM

The meeting was called to order by Chair Bob Rasor at 4:50PM. Introductions were given and roll call was taken. There were 48 attendees. Quorum was reached as 17 of the 24 members were present.

Attendees requesting membership were:

1. Michael Kaufman
2. Marcelo Catugas
3. Tom Melle
4. Sukhdev S. Walia

Minutes from the Nashville meeting were approved unanimous. A quick review of past activities including 5 conference calls since Nashville was given. There are written rolling minutes from the conference calls available.

Draft document was reviewed

- No change in abstract or keywords
- Some minor wording changes
- Replace service-age with in-service and some discussion following. It was left for further discussion as it may have some distinction as to how long it has been in the transformer or whether it is in a tank or the transformer.
- Discussion on removing 'factory-fill lines' and agreement reached to remove it.
- Discussion on removing 're-refined'. It was left for further discussion as the suggestion was made it may have contaminants not in new oil.
- Discussion on if Table 1 should match ASTM D3487 since refineries need only meet this criteria. Water content and acidity are both more stringent in C57.106, but refineries are only required to meet ASTM. This poses an issue with some manufacturers as the strict water content denies the ability to buy oil in drums without further processing due to its tendency to have higher water content than 25 ppm. There was disagreement whether a drum with 35 ppm water would pass the dielectric D1817. There was also discussion on how the neutralization number is stricter in C57.106. It was mentioned that if oil from the refinery met ASTM D3487, it could still need corrected prior to putting in a transformer. This would not be able to be done without a filtering media such as fuller's earth. Refineries present said that new oil always comes at 0.01acid, so not an issue. Tom Prevost made a motion that Table 1 reconcile with ASTM. The motion was seconded. During discussion there was concern about the neutralization number also being changed and a request to amend the motion to address only Karl Fischer Moisture. The motion was not amended and a vote was taken. 13 for and 3 negatives. Motion was approved.
- Meeting was adjourned.

10.5.3.3. C57.130 Trial-Use Guide for Dissolved Gas Analysis During Factory Temerature Rise Tests for the Evaluation of Oil-Immersed Transformers and Reactors. WG Chair Jim Thompson

The C57.130 WG Report Given at the Sub-Committee Meeting:

Jim Thompson presented The WG met on October 23 and quorum was achieved. There were 58 people in attendance, of which 11 were members, and 4 requested membership. The PAR was issued in 2010, and the WG group is on Draft 3. In the document, it reflects more of a guide, not trial-use. The draft guide will posted be available for straw ballot.

Discussion by attendees: An attendee stated that there is still a need to change the PAR title from "Oil-Immersed" to "Mineral Oil Liquid-Filled" to adhere to the pending guidelines. It was noted that these are at present just expected recommendations, but that it was likely this would be the direction in which to move.

The Minutes (unapproved) of C57.130 WG Meeting as Submitted:

October 23, 2012

Unapproved Minutes Working Group Meeting for IEEE PC57.130
IEEE "Trial-Use Guide for the Use of Dissolved Gas Analysis Applied to Factory Temperature Rise Tests for the Evaluation of Oil-Immersed Transformers and Reactors"
Chair Jim Thompson

The working group meeting was conducted on October 23, 2012 at Milwaukee, Wisconsin with 58 people in attendance, including 11of the 14 current working group members. Prior to the meeting

the membership was reduced based on prior attendance. Four new guests requested membership and will be considered.

This document was in draft 18 when the decision was made to let the PAR expire in 2009. A new PAR was approved on June 17, 2010 and is presently in draft 3.

The previous minutes from S11 (spring 2011), F11 (fall 2011), and S12 (spring 2012) were presented for approval with a working group quorum. The S11 minutes approval, motion by Don Cherry and second by Tom Prevost, was followed by unanimous approval. The F11 minutes approval, motion by Susan McNelly and second by Don Cherry, was followed by unanimous approval. The S12 minutes approval, motion by Don Platts and second by Bill Darovny, was followed by unanimous approval.

Tom Prevost's previous motion at the F11 meeting to change the guide from a trial use guide to that of a guide and add the word "mineral" to "oil" in the title was discussed. After a motion by Bill Darovny and second for the change by Don Platts the motion was discussed regarding the document as a guide. Tom mentioned that this would help get the document in place as a guide more quickly. The vote was unanimous in favor.

Discussion included the introduction material to be revised to pertain to a guide document rather a trial use document. A note in draft 19 uses zero as a value in the text and the wording will be changed to "non-detectable."

Then discussion included precision for Analysis of Gases Dissolved in Electrical Insulating Oil by Gas Chromatography. It was mentioned that the parts per million in oil are cumulative over the temperature rise test and so the levels are higher than the minimum detection levels.

Other discussion included changing the document to add a note that it is common practice to take backup samples and also to provide data reports for the factory test values to the user. The document will be posted on the web site, provided to the working group members for straw ballot, reviewed by Susan McNelly for conformance with the IEEE formatting requirement, and then the plan is submit it to the MEC for review and then to ballot.

Respectfully submitted,
Chair Jim Allen Thompson

10.5.3.4. C57.139 - Guide for Dissolved Gas Analysis of Load Tap Changers
WG Chair: David Wallach, Secretary: Sue McNelly:

The C57.139 WG Report Given at the Sub-Committee Meeting:

The goal of the WG is to be able to develop generic design category norms for different LTC types. However, based on data collected so far, this may be difficult to do because of variations between users on loading, maintenance, and temperatures. IEEE has indicated that the WG is not able to obtain a list of users and contact them to inquire if they would be willing to share data.

A presentation on "Experience with Use of C57.139 LTC DGA Guide" was presented by John Pruente and is available for review on the web. This was used to analyze a specific manufacturer's LTC. The analysis emphasized the previous concerns regarding loading, maintenance, and temperature differences.

The Minutes (unapproved) of WG Meeting as Submitted:

WG Meeting C57.139 - Draft IEEE Guide for Dissolved Gas Analysis of Load Tap Changers
Tuesday, October 23, 2012
Milwaukee, Wisconsin
Minutes of WG Meeting:

Chair Dave Wallach called the WG meeting to order at 11:00am. WG Secretary Susan McNelly was also present. There were 33 of 57 members present (Quorum requirement was met). There were 60 guests present with 8 guests requesting membership. Guests attending the WG meeting for the first time who request membership will be deferred until the next meeting attended.

Guests requesting membership were (those identified with an asterisk (4 of the 8) will be added as WG members):

Marcelo Catugas*	Filberto Zaweta
Han Suh Joon*	Tim Rinks
Robert Kinner*	Rainer Frotscher
Egon Kirchenmayer*	Larry Kirchner

Agenda:

1. Introductions/Member Roll Call
2. Approval of minutes from past two meetings
3. PAR & Schedule Review
4. Task Force Updates
5. User feedback and Guide improvements
6. New Business
7. Adjourn

Dave asked that if anyone was interested in the open Vice-Chair position, to please see him after the meeting. Following the meeting, Mark Cheatham indicated interest and will serve as WG vice-chair.

Minutes from the spring 2012 Nashville, Tennessee and the fall 2011 Boston, Massachusetts meetings were approved.

PAR & Schedule

1. Working group meetings until next revision needs to begin ballot:
    i. Fall 2012
    ii. Spring 2013
    iii. Fall 2013, and
    iv. Spring 2014
2. Balloting process – Mid 2014
    a. Straw Ballot
    b. MEC
    c. Form Ballot Pool
    d. Ballot
    e. Ballot Resolution
3. PAR expiration – December 31, 2015
    Submit balloted document to REVCOM by October 15, 2015 deadline

Task Force Updates

- Tasks
  - Develop generic design category norms for Appendix A LTC Types
    - Gather data by type and operating conditions
    - Begin attempts to develop generic design category norms
  - Variation of norms between users due to loading, maintenance, temperatures

- Data sources – we contacted IEEE and we are not able to obtain a list of users of this Guide to contact them to inquire if they would be willing to share data (legal/privacy).

- REPORT: Suggested set of LTC DGA data fields, vetted by data task group.
  Jim Dukarm indicated that they plan to put out a list of items that people should collect when collecting data. Jim indicated that there are some issues due to the extreme differences in results for different populations that may make it difficult to develop norms.

- Other Diagnostic Method - Duval Triangle
  Dave indicated that Michel is working on draft text to add to document. We may want to look at putting this into the main body of the document.

- Other Topics
  - Presence of Benzene and Toluene
  - Use of word "fault" with DGA

Presentation: Experience With Use of C57.139 LTC DGA Guide, presented by John Pruente from SPX (presentation posted on the web in entirety)

Outline

- Background of UZD DGA Study
- Summary of Data Reviewed
- Results of Study to Date
- Suggestions for Revisions / Additions to C57.139 Guide for Consideration

Background:

- Began with request from Midwest utility in March 2010
- Too many "false positives" with code 4 DGA results from oil lab.
- Utility needed a better way to analyze and use DGA data as a predictive maintenance tool.
- Grown to include 5 utilities located in different regions around the United States:
  - Northeast
  - North Central
  - South Central
  - North Western
  - South Western
- Utility selection criteria
  - Have 50+ UZD's in service
  - Sample LTC for DGA annually (minimum)
  - Have historical DGA database to work with

Objectives

- Determine calculated DGA limits for each utility population based on the C57.139 guide applied to the historical data.
- Verify limits by correlating DGA diagnosis to maintenance inspection "as found" condition.
- Develop universal UZD DGA criteria for use by UZD owners (if possible).
- Develop a more consistent approach and analysis method (algorithm) for UZD DGA.

- Investigate “false positives” and identify a way to recognize them at the analysis stage.
- Identify most effective next steps to be taken when a UZD is outside the norms.
- Identify which maintenance activities are most critical for the UZD model.
- Learn as much as possible about operational performance of the UZD model LTC.

Results to Date

- Wide variation in limits between utilities
  - Differences in maintenance practices
    - Length of maintenance cycle
    - Replace vs. reuse oil
    - Use of on line filtration
    - Desiccant breather maintenance
  - Transformer loading
  - Frequency of operation
- False Positive “Maverick” Units Identified
  - Ethylene / Acetylene ratio outside calculated limits (>1)
  - First noticed at Utility A (< 7% of population)
  - Indicative of “Severe Contact Heating” classical DGA diagnosis
  - IR Scans while in service and internal inspections revealed no issues
  - Further research needed to identify source of elevated Ethylene
  - Trend using Duval Triangle 2[2] to verify stability

UZD Best Practices

- For units flagged outside the DGA norms established
  - Retest oil to verify trend and rate of change
  - Check Duval Triangle 2[2] trend
  - IR scan to check LTC tank temp and look for localized heating
  - Check N2/O2 to verify breather open (ratio should be < 4)
  - Check for recent change in loading and / or frequency of operation
  - Review past maintenance history for previous problems (repeating problem)
- After performing maintenance
  - Replace old oil with new , clean, filtered oil
  - Sample after oil filling and before energization (benchmark)
  - Re-sample again within one week of energization to verify no issues

Summary

- Universal DGA limits for UZD LTC’s not possible
- C57.139 Guide works well for given utility / LTC model population
- Application of U1 / U2 limits good start for alert and alarm levels
- Application 95% / 99% limits for key ratios worked well for identifying units outside the norm and with real problems
- N2/O2 ratio on free breathing LTC’s works well for identifying breathers in need of maintenance
- Identified “Maverick” gassing pattern for UZD’s and method of recognizing it
- Use of Duval Triangle 2[2] for trending LTC’s headed towards failure very useful

Suggested Changes

- Add suggestion on what to do when calculated limits are too low
  - Suggest using C2H4/C2H2 boundary limits of Duval Triangle 2:
    - <.35 – normal and in “N” Zone continue operation
    - > .35 and <1.2 – increase sample frequency / trend (Quarterly)
    - >1.2 and < 4.0 - increase sample frequency / trend (M`onthly / Weekly)
    - >4.0 – Consider outage and inspection
  - And/or apply Stenestram Ratio[1] limits for UZD, UZE, UZF, or UZG models
- Encourage utilities to correlate calculated limits to LTC inspection observations for refinement of initial limits

- Add use of Duval Triangle 2 for trending , possibly include case study example in Annex C
- Consider adding mention of importance of N2/O2 ratio for Free breathing LTC's or breath through a desiccant (dryer).
  - Ratio > 8 indicate plugged air path with high degree of confidence
- Add recommendation on how often limits should be recalculated and updated.
  - Suggest every 5 years or after any major maintenance initiatives involving multiple units of a given model are completed
- Add recommendation for replacing oil in LTC when maintenance performed
  - Due to length of time between maintenance intervals
  - Filtering used oil does not remove gasses, can cloud after maintenance benchmark
- Recommend "sanity" limits for individual gasses set at 5 – 10 X U2 calculated limit to catch cases where :
  - Breather is plugged and gas concentrations increase significantly
  - Excessive LTC operations due to faulty controller
  - Mechanical binding causing slow operation and longer than normal arc duration

Discussion of the presentation followed.

Future Activities

- Begin document revision using Central Desktop
  - Begin incorporation of Triangle write-up by Michel Duval.
  - Once we get a new draft started we can begin to make it available to the working group.

- Data Task Force
  - Consider how we should address generic design category norms
  - Generate draft position statement if needed to address ability or inability to create generic design category norms
  - Consider addition of case histories

New Business

No new business was discussed.

The meeting was adjourned at 11:45am.

Dave Wallach, Chair

Susan McNelly, Secretary

10.5.3.5. Working Group PC57.147, Guide for the Acceptance and Maintenance of Natural Ester Fluids in Transformers
TF Chair: Patrick McShane, Vice-Chair: Clair Claiborne, Secretary: Jim Graham

The C57.147 WG Report Given at the Sub-Committee Meeting:

Patrick McShane presented. The WG's objectives, issues to consider in the revision, responsibilities of the several TFs, and TF chairs and members have been determined. He expressed his appreciation for the high interest and number of volunteers that have joined this WG.

All of the TFs, but one, are behind schedule, so conference calls between the TC meetings will be required. He thanked Don Cherry for having his TF draft completed.

The current standard will be made available to WG members.

Minutes (unapproved) of the PC57.147 WG meeting as submitted:

PC57.147 October 22, 2012, Milwaukee, WI

- Call to Order was made at 3:15 PM.
- Introductions/Membership Attendance/Quorum Check
- The attendance
  - 24 of 34 members
  - 56 guests
  - total attendance = 80
  - 9 guests requesting membership

- A motion to approve the Spring 2012 minutes was made by Don Cherry, seconded by Jerry Murphy. The Spring 2012 Minutes were approved

- Chair's Remarks, Patrick McShane:
  - Welcome of new members
  - WG membership requirements & responsibilities were reviewed

- The Chair proposed expanding section 9, Safety and Environmental Care Procedures by detailing the Environmental, Health & Safety (EHS) properties of natural ester fluids. One user comment supported the expansion, stating that if a customer specifies NE fluid for safety or environmental reasons the guide should define EHS capabilities. Some comments were made against this proposal, including an insulating manufacturer, primarily because there are too many different regulation bodies at the local, state or provincial and national levels to be able to specifically state a particular fluid meets a particular requirement or regulation. However, meeting regulations is not the objective raised by the Chair, rather setting a few key property values, such as biodegradability similar to the US EPA's Design for Environment (EdF) program, and the Federal BioPreferred product purchase program based on percent of bio-based content. This would be similar to having limits on flash and fire points in current standard related to fire safety.

- Task Force Reports
  - Revised task force rosters were given to the task force chairs
  - Don Cherry reported TF1 has met by teleconference and completed a first draft of recommended revisions to section 4 of the guide. This draft was submitted to the Chair.
  - TF Chairs were asked to meet with their volunteers after the WG meeting adjourned to schedule future TF efforts.
  - All task force Chairs were directed by the chair to prepare their recommended revisions and submit them before the spring 2013 meeting.

- Items of Interest for this revision of the guide previously identified were assigned to the task forces to evaluate and resolve. No additional items were added to the listing. The issue assignments are attached to these minutes.

- WG officers will review the C57.93 Installation Guide to determine if any items of interest for revision would be more appropriately addressed in the installation guide.

- Old Business (None)

  - TF volunteers will be contacted by the TF chair and advised of upcoming TF meetings

- New Business

  - The Chair advised a Word copy of the active C57-147-2008 guide would be made available to the task force chairs to aid in their review and revision proposals.
- A motion to approve the Spring 2012 minutes was made by Jerry Murphy, seconded by Don Cherry. The adjourned at 4:17 pm.

Respectively submitted,
Jim Graham, Secretary

C57.147 Minutes Annex I: Item of Interest for Revision and Respective Task Force Assignments

TF 1: Section 4 - Fluid Tests & Significance

- Low Temperature Properties TF1 & TF2
- Particle Count limits - statement addressing lack of data by TF1
- Partial discharge inception TF1 & TF2
- Furan analysis TF1
- DGA (coordination with NE DGA WG) TF1

TF 2: Section 6 - Handling & Evaluation of NEF used in field filling

- Testing evaluating oxidation stability - TF2
- Dielectric performance. (Is ASTM D6871 sufficient?) TF2
- Large Gap and Creep Withstand TF2
- Highly non-uniform fields TF2
- Low Temperature Properties TF1 & TF2
- Different minimum values of dielectric breakdown for totes and drums as received vs. bulk shipments TF2
- Flash point limits for vapor phased and retro filled transformers TF2
- Partial discharge inception TF1 & TF2

TF 3: Compatibilities of NE Fluids with Components & Accessories
(includes Current Section 7 - Evaluation of NEF in New Equipment)

- No section on load tap changers (unlike C57.106) TF3

TF 4: Section 8 - Maintenance of NEF

- Additive level evaluation

TF 5: Annex B (Misc. Technical Issues)

TF 6: Field Application Guide & Equipment Evaluation

- Determining new loading limits for retro filled xfmrs - TF6.
- Online monitoring/diagnostics sensors (dissolved gas, moisture, temperature)
- NE Fluid Handling vs. Mineral Oil
- Transportation and Storage Requirements for NE Fluids vs. Mineral Oil
- Retro-Filling Existing Equipment
    a. NE Fluid Filling Procedures
    b. Post Fill Procedures – Recommended Tests *
    c. Start-Up Procedures
    d. Key Properties Change of NE fluid as it ages
- Filling New Equipment
    a. NE Fluid Filling Procedures
    b. Post Fill Procedures - Recommended Tests *
    c. Start-Up Procedures
    d. Key Properties Change of NE fluid as it ages
- Cold Start Operations
- Recommended Monitoring
- Proper NE Fluid Disposal Procedures
- Nameplate changes and/or informational labels

*** May need to bring in relevant transformer subcommittees**

TF 7: All other sections - Miscellaneous

- Consolidation SC IF Fluids Guides impact on revision process.- TF7
- Should guide include environmental values TF7
- Joint participation with IEC TC10 / TC14 TF1 & TF2
- Research relevant published papers & update bibliography

C57.147 Task Force Rosters 30 October, 2012

TF 1: Section 4 - Fluid tests & Significance
Chair: Don Cherry
Members: Dave Hanson, Jimmy Rasco, Mel Wright, Paul Caronia, Mark Scialdone, Marcelo Catugas, Andrea Cavallini

TF 2: Section 6 - Handling & Evaluation of NEF used in field filling
Chair: Lance Lewand
Members: Clair Claiborne, Derek Baranowski, Rich Simonelli, Juan Castellanos, James Gardner

TF 3: Compatibilities of NE Fluids with Components & Accessories (includes Section 7 - Evaluation of NEF in New Equipment)
Chair: Jerry Murphy
Members: Tony Reiss, Sheldon Kennedy, Marshall Stewart, Greg Stem, James Gardner, Dave Harris, Christopher Sullivan, Rowland James

TF 4: Section 8 - Maintenance of NEF
Chair: Stephanie Denzer
Members: Libin Mao, Nick Perjanik, Mel Wright

TF 5: Annex B
Chair: David Sundin
Members: S. Joon Han, Dave Hanson, Paul Caronia, Bob Kinner, Mark Scialdone, Jesse Inkpen

TF 6: Field Application Guide & Equipment Evaluation
Chair: John Luksich
Members: Roberto Asano, Dave Harris, Rowland James, Jane Verner, Scott Reed, Thomas Spitzer, Bob Kinner

TF 7: All other sections - Miscellaneous
Co-Chair: Patrick McShane
Co-Chair: Jim Graham
Members: Sue McNelly

10.5.3.6. WG PC57.155 Natural Ester and Synthetic Ester DGA Guide
Chair: Paul Boman, Secretary: John Luksich

The C57.155 WG Report Given at the Sub-Committee Meeting:

John Luksich reported in place of Chair Paul Boman. The WG is finishing laboratory experiments. Evaluation of about 4800 in service TRs is being performed. There were discussions on the interpretation and the validity of using laboratory data and it was suggested that this data should be put in an Appendix rather than in the main document. There was also a suggestion that the guide be changed to a Trial-Use Guide. No decision to make this changes was made.

Minutes (unapproved) of the WG meeting as submitted:
Meeting Date: October 23, 2012 Time: 9:30 AM

Attendance: 22 members out of 57 members were in attendance, total attendance was 82 and 6 people requested membership.

- Quorum not present
- intend to approve minutes on-line or at next meeting with quorum
- review Spring 2012 minutes; no comments or corrections

Reviewed plan to adjust Workgroup membership for non-attendance and non-participation

<u>Continued business</u>

PAR Approved March 2010 and expires on Dec 31, 2014

Chair feels that enough information is available to move forward with Guide

Timeline for guide process:

- Draft Guide for Workgroup review
- Maybe several sections of Guide may be send out for Workgroup comment prior to Draft
- Comment resolution
- Mandatory IEEE Review
- Voting pool maybe around Spring 2013 meeting depending on the number of comments
- Ballot

The question of a dual logo standard came up. Jin Sim suggested that the ASTM TC10 liaison (Kevin Rapp) be contacted for dual logo discussions. Michel Duval mentioned that IEC 60599 may contain information on liquids other than mineral oil, and that IEC interest will be low.

Proposed Guide Structure presented with no comments.

Guide Section 4 on Theory

- The Chairman asked for feedback on the theory section.
- Will push for a draft by December and ballot pool before the Spring meeting.
- The 90th percentile results for 4800 transformers will be sent out
- Patrick McShane suggested borrowing the oxygen discussion from the silicone gas guide. Jerry Murphy, who did the last revision, stated that there isn't much there.
- Joon requested an expanded discussion of the pyrolysis steps for the laboratory tests.
- Luis stated that the carbon oxides ratio is essential and would like a discussion of the carbon oxide ratios.
- Jin Sim does not want to see carbon oxide limits in the guide, but would like a discussion of such limits.
- Bob asked about the water content of the laboratory tests, as the water gas shift chemistry affects the results. He also wondered if CO was produced directly or formed from a reduction of CO2.
- Q. What was the laboratory test cell material? A. stainless steel.
- Patrick McShane suggested, due to insufficient data and round robin testing, that this document be changed from a guide to a trial use guide.
- Judy said that the trial use guide has a life of 2 years and can be revised or elevated to a full use guide.
- There was some concern expressed about the amount of laboratory data. Fredi Jacob stated that the laboratory data are critical for application and ratio development.
- Jerry Murphy suggested that the laboratory data be in an appendix.
- Typical values 90th percentiles: Jin Sim expressed concern with giving typical levels without adequate wording

Moved to adjourn

10.5.3.7. WG PC57.637 Guide for the Reclamation of Insulating Oil and Criteria for Its Use
WG Chair Jim Thomson, Vice-Chair TV Oommen

The C57.637 WG Report Given at the Sub-Committee Meeting:

Jim Thompson presented. There were 32 attendees at the meeting. The WG has 15 members of which 11 were present so the quorum was achieved. Draft 3 will be posted soon. There was an issue of voltage class division that did not coincide with C57.106, so that will be changed to match. Sue McNelly volunteered to help assure it meets the IEEE format. The goal is to have approved before the 2014 expiration.

No questions or comments were made.

The Minutes (unapproved) of the WG Meeting as Submitted:

October 23, 2012

Unapproved Minutes Working Group Meeting IEEE PC57.637, IEEE PES, Transformer Committee, Insulating Fluids Subcommittee, Working Group for the "IEEE Guide for Reclamation of Insulating Oil and Criteria for Its Use"

The working group meeting was conducted at 8 am on October 23, 2012 at Milwaukee, Wisconsin with 32 people in attendance and with 11 of the 15 current working group members present. This document was reaffirmed in 2007 and the PAR for revision was approved December 10, 2008. A PAR extension request was approved this summer until December of 2014. Working Group member Jim Thompson (chair) conducted the meeting.

The minutes for the F11 (fall 2011) meeting and the S12 (spring 2012) meeting were both reviewed. The F11 minutes approval, motion by Don Cherry and second by Dave Sundin, was followed by unanimous approval. The S12 minutes approval, motion by Don Cherry and second by Ed Tenyenhuis, was followed by unanimous approval.

The final sections were submitted by the volunteers and reviewed as draft 3 at this meeting. Sue McNelly offered to post the current draft on the IEEE Transformer Committee website. The ASTM document text in this document was revised to eliminate the dates of revision. The DBPC document reported by Mark McNally has been updated from the ASTM D27 series publication. The voltage class divisions in table 1 will be reviewed for revision to change the table heading value from 288 KV to 230 KV to reconcile with IEEE C57.106-2006. Sue McNelly volunteered to help ensure the document meets the IEEE and SA formatting requirements. The document will be provided to the working group members for straw ballot with a goal to submit it to the MEC review and approval and then for ballot.

Respectfully submitted,
Chair: Jim Thompson
Vice Chair: TV Oommen

10.5.3.8. TF on Particle Count Limits in Mineral Oil
Chair : Mark Scarborough, Vice-Chair T.V. Oommen, Secretary: Paul Boman

The TF Report given at the Sub-Committee Meeting:

Mark presented. No meeting was held in Milwaukee.. Mark is working with Tom Lundquist on a section in C57.152 which discusses particle count. The conclusion of TF was that results were too scattered to set limits. Tom Prevost stated in the end there was no correlation to be found. Valery Davydov indicated from a scientific point of view, that a negative result is still is a result and that maybe a document should be worked on. Arnold Carlos indicated that maybe we are looking at the wrong issues. Mel Wright indicated that D1816 is sensitive to particles. He indicated that sample procedures are insufficient. There are issues with cleanliness of the sample bottles and lab variance issues. Claude Beauchemin talked about the sample issue and that it is very difficult to find a supplier of bottles meeting requirements.

A question was asked about what is the future direction of the TF. Mark indicated he didn't have an opinion. Jim Thompson made a motion that the TF should create a report of findings as its deliverable. The motion carried.

10.5.3.9. TF on Moisture in Oil
Chair: Bob Rasor

The TF Report given at the Sub-Committee Meeting presented by Bob Rasor:

The core group of participants drafted 10 questions and sent out as a survey to 63 TF members with only 17 respondents. The survey results show that a majority of respondents use oil testing for moisture content.

Valery Davydov commented that the color chart can also be used as a method for determining moisture content if used correctly, but only for new oil. It was emphasized that present methods are only estimates of moisture content, and that while they may not be perfect, they can give indication of a unit's moisture content.

After much discussion, a motion was made and passed to have the TF continue its work. If and when the TF under the Insulation Life SC becomes an official WG, then we will review at that time the possibility of moving this work into that WG.

The TF Meeting Minutes (unapproved) as Received:

TF Moisture in Oil
Tuesday October23rd 2012 4:45 pm
Milwaukee, Wisconsin USA

The meeting was called to order by Chair Bob Rasor at 4:55pm. There were approximately 102 attendees. 27 of the 63 members were present. Two requested membership.

Attendees requesting membership:
Leon White
Emilio Morales Cruz

1. Roster was distributed
2. Introductions were given. There was not a quorum to approve minutes.
3. Minutes to last meeting were discussed briefly but not approved.
4. Scope was reviewed with a brief history of the TF

Discussion and review of past data was given – 6 slides

Slide1: Relative saturation is important to consider
Slide2: Response of moisture in oil to temperature. Valery Davydov explained the graph in detail
Slide3: Shows fluctuation of ppm values in winter vs. summer. Data is based on Karl Fischer (KF), with percent saturation being calculated.
Slide4: Again, shows seasonal variation of KF but with more than 20,000 sample points.
Slide5: Shows response of relative saturation with two different percentages of moisture in solid insulation examples. This was explained by Valery Davydov. Data was done in a test laboratory at a University, not a transformer. Percent moisture in the solid insulation was done by pulling paper samples. The idea was to show if temperature is constant, equilibrium curves may apply.

Bob Rasor stated that the group has been asked "where do we see the task force going"? The core group of participants drafted 10 questions and set them in a survey to the TF members.

There were 8 questions with a 1 (disagree) to 10 (fully agree) choice for the survey. The questions prompted discussion.

Of interest to the group is the fact that a large number of people use oil testing. Valery further explained the color chart and it was shown as an example of an industry method. Valery clarified this chart is only for Karl Fischer samples and only for new oil. Solubility limits differ for used oil and there are different coefficients for the saturation equation for used oil.

Bob reiterated that they are tools to only estimate moisture. They may not be perfect, but can give indication – especially for transformer owners than cannot put an online monitor on each transformer and can only pull samples for KF analysis. Further discussion on the color chart included:

- For aged oil, the solubility curves must change for saturation. Valery said three charts would be necessary to account for the different solubility limits and will be provided in the new TF Moisture in Insulation Systems. Jim Thompson commented there was 200% error reported in this method.
- Valery said the error is improved to 100% when taking solubility limits into account with three charts. And applying more data points reduces the error another 50%. The method is a reliable tool for estimation of the moisture condition in a transformer.
- A question was asked if bubble evolution is addressed. Valery gave an example of how saturation increased to near 100 % saturation and resulted in the creation of water droplets in that extreme load and temperature situation.
- Question 8 and 10 were not a 1-10 format, but comments. These were shared with the group.

Comments were then opened to the floor again.

- Jin Sim - relative saturation is important. However in the 2002 version of C57.106, the values were too strict, and laboratories flagged these and it caused problems as the transformers were dry.
- Valery - % saturation is measured with a moisture sensor. Also we need a Karl Fischer test to verify the meter. KF must only be done with a correct solubility limit and a correct temperature.
- Jin – How many transformers actually have these meters?
- Valery – Probably less than 1%. Use of color chart is then important. But it must be done correctly.
- Claude B - Should not just take 1 sample. There is a very high risk of error and oversimplifying.
- Jim Thompson - The 2002 version of C57.106 had an issue in that it gave moisture in the paper limits, and moisture in the paper cannot be estimated from the oil. Sensors cannot tell the moisture in the paper.
- Claude – that is the point he was trying to make. The problem is you cannot take the sample without the temperature. If you have the correct temperature, it can be done, but you must get the correct parameters.
- Jim T – Do the case studies presented have the temperature of the paper?
- Another comment from the floor was regarding looking at the moisture from a mass balance perspective.
- Valery D – this is extremely difficult in a real transformer because there are two types of moisture transition.

- Bob – How do members see the TF future as there is now a new TF on moisture in insulation systems?
- Valery –TF Moisture in Oil is a part of what they are doing in the new TF and this work is still very important. Getting data and case studies is still valid work.
- Don Platts – What was the goal of this group? Were the objectives met?
- Bob referenced the scope and said that case studies were provided, however the group is not yet ready to provide guidance. Saturation values can help estimate transformer condition.
- Jim - C57.106 is only an oil guide and is not supposed to do that. Guidance is found in other documents.

Meeting was adjourned at 6:00 pm

10.5.3.10. TF on Consolidation of Insulating Fluid Guides
Chair: Tom Prevost

The TF Report given at the Sub-Committee Meeting presented by

Tom Prevost presented. No TF meeting was held. Nothing to report.

Questions and Discussion:

The SCIF Chair asked Tom what is the plan for moving forward?

Tom stated that the concept is to bring all insulating fluids into one document. This was a result of a survey outcome and the basis to create his TF for the consolidation project. The SCIF needs to make sure the standard revisions and documents are a priority and current activity should continue. It is known that there are concerns with its practicality. A time slot for the S13 meeting will be requested.

10.5.4. Old Business:

Tutorials for future meetings Tom is still looking for ideas.
No topics were brought forth.

IEEE TC Data Archiving
The Chair stated that the TC is working to provide a secure location for archiving data obtained for the development of standards. Access issues still need to be resolved as some data is provided under the understanding that it be kept confidential and be accessible only to those working on standard revisions.

10.5.5. New Business:

New Revision of C57.121 Guide for HMWH – Dave Sundin

Dave Sundin addressed the SCIF that the High Molecular Weight Hydrocarbon insulating liquid guide recently underwent the reaffirmation process successfully. However, it is based on an old guide having very few updates since it first published (1998). Dave made a motion that a TF be formed to develop and submit a PAR to revise the Guide. Jim Thompson seconded.

Tom Prevost commented that this could impede progress on the consolidation of the insulating fluid guides. Several others joined in the discussion. It was determined that if progress on consolidation TF goes well, any PAR issued for C57.121could be cancelled and the work transferred to a new WG for consolidation of the guides. The motion carried.

New motion was made by Dave and Jim Thompson seconded. This second motion carried.

Call for other new business.

No additional requests received.

IFSC Adjourned at 4:15PM

Respectfully Submitted:

Susan McNelly, Fluids SC Chair
Jerry Murphy, Fluids SC Vice-Chair
Patrick McShane, Fluids SC Secretary