UNAPPROVED MINUTES
SC Insulating Fluids Meeting

10.5. SC Insulating Fluids Meeting
November 2, 2011
Boston, MA

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

10.5.1. Introduction/Attendance, F10 Minutes Approval, & Patent Disclosure Request

The Insulating Fluids Subcommittee meeting in Boston, Massachusetts was called to order by the Chair at 3:00 PM on Wednesday, November 2, 2011.

Introductions and the subcommittee roll call followed. All of the officers of the SC were present. Twenty six of thirty six members attended so the quorum requirement was met. 55 guests were present, of which twelve indicated they wish to become members.

The Chair announced that five persons were removed from membership status due to inactivity. She welcomed three new subcommittee members: Sub Joon Han, Jerry Reeves, and Brian Sparling.

The Minutes of the Spring 2011, San Diego, CA meeting were approved as written.

Guests requested membership.

- Larry Christodoulou
- Paul Caronia
- Marc Cyr
- George Forrest
- Thomas Melle
- Steven Brauer
- Stephanie Denzer
- Eduardo Garcia
- John Lackey
- James Mustacchio
- Jimmy Rasco
- Prabhu Soundarrajan

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

10.5.2.1. Working Group C57.104 – Guide for the Interpretation of Gases Generated in Oil-Immersed Transformers - WG Chair Rick Ladroga, Vice-Chair Claude Beauchemin

The WG Report Given at the Sub-Committee Meeting, presented by Claude Beauchemin:

- Announced that Michelle Duval has been awarded the Herman Halpern Award which will be presented at S12 meeting.
- Approx. 500,000 samples data received

The Minutes (unapproved) of WG Meeting as Submitted:
Tuesday, November 1, 2011

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 46 of 73 members present. There were 56 guests, and 12 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 (9 of the 12) will be added as WG members):

Paramjit Bhatia*	Shawn Luo*
Michael Botti*	Ron Nicholas*
Stephan Brauer	Roderick Sauls*
Larry Christodoulou*	Prabhu Soundarrajan*
Taraq Humayin	Robert Tillman Jr.*
Min Jea Lee	Jane Ann Verner*

Agenda

1. Welcome & Quorum Check
2. Introductions
3. Approval of Minutes from Spring 2011 San Diego meeting.
4. Report of DGA Data collected to date: Norm Field
5. Preliminary analysis of collected data, Luiz Cheim
6. New Business

The minutes from the Spring 2011 San Diego, California meeting were approved as written.

Rick Ladroga announced that Michel Duval has been awarded the Herman Halpern award.

Review of recent activities:

Norm Field presented a report for the DGA Data TF. There were 10 suppliers of data supplying 475,000 DGA samples representing 161,500 transformers. A full copy of the presentation will be posted on the web site.

Data for outright failed transformers, not in service (spares), non mineral oil samples, and samples not from transformers were removed from the data base. Samples from OEMs, repair shops, specified as "in-bottle", without a transformer ID or sample date, duplicate samples, and blank or nonsense data entry samples were also removed.

There was data clean up required such as V to kV, text to numeric values, sample date format, and MVA basis.

For comparison of values in Table 1 of the Guide, the individual gas concentration data was analyzed.

Luiz Cheim presented on the analysis of the database that both he and Lan Lin did. He showed a representation of the distribution of suppliers of the data, MVA, voltage class, oil preservation types, and the reason for the DGA test. Ordered statistics (percentiles) were used to analyze the data.

An analysis of H2, C2H2, and CO vs age was presented. The same was also shown for voltage class, MVA rating, and source of data. The CO values were well above the IEEE limit of 350ppm in all cases. He showed the same analysis for suspicious units.

Rates of gas formation (ppm/yr) for Hydrocarbons and for CO, CO2, and TDCG and using the Michel Duval triangular conditions were also presented. From the triangular evaluation, 10 conditions were identified with Michel Duval's assistance. For completeness, the data was evaluated using Roger's Ratios as well.

A question was asked if the WG expects to have limits based on the different ratings, age etc. Claude indicated that it is too early to determine that, but there could very well be more than one table based on age or voltage class.

Jim Thompson indicated that DGA has traditionally been used as a tool for trending. Does this data help with that aspect? The answer is that yes it would.

A suggestion was made from Joe Foldi that the data also be evaluated and compared to the IEC limits.

Rick reported that there has also been significant work on development of case studies.

Jim Dukarm gave a short presentation on DGA Survival Analysis.

Jin Sim asked about the use of artificial neural networks (ANN) to crunch the data for trending and analysis. This will have to be discussed and reviewed.

The meeting was adjourned at 4:30 pm.

Rick Ladroga
WG Chair

Claude Beauchemin
WG Vice-Chair

Susan McNelly
WG Secretary

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

Sue McNelly stated the PAR revision was issued because it will expire end of this year, Bob Rasor will Chair. Jim Thompson offered to be Vice Chair and has documents from the last cycle. This revision is not driven by any major technical issues but technical updating is needed. The last revision was driven due to moisture equilibrium curves per Tom Prevost. Reaffirmation is no longer an option due to IEEE SA policy change.

10.5.2.3. WorkingGroup 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 WG Report Given at the Sub-Committee Meeting, presented by Jim Thompson:

1. No quorum.
2. Discussed changing the scope from “Trial Use Guide” to “Guide”, and “oil” to “mineral oil”.
3. Discussion of issues regarding consensus of setting value limits.
4. Question: Are HVDC data included? Answer: Luis Cheim will supply such data.

The Minutes (unapproved) of WG Meeting as Submitted:

The working group meeting was called to order by Chair Jim Thompson on Tuesday, November 1.
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”

The working group meeting was conducted on November 1, 2011 at Boston Massachusetts with 57 people in attendance, including 10 of the 30 working group members.

There was a request for patent declarations regarding the PC57.130 document and none given.

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 labeled draft 19.

A motion and a second were made for approval of minutes. Also Tom Prevost offered a motion with a second to change the guide from a trial use guide to a guide and a motion with a second to add the word mineral to the title so the phrase reads mineral oil. After a show of hands indicated a lack of quorum, the motions were tabled. The motions (and the discussions below) will be reconsidered at the next meeting.

Data was presented and discussed for gas (ppm/hr) generation rates for a 1 per unit factory load tests. Jin Sim mentioned that the previous guide draft issues included--limiting the trial-use guide based on minimum gallons, gassing differences related to winding types e.g. disc versus layer designs, various loading rates during factory tests, and relatively small gas values as opposed to reproducibility between labs.

Then discussion included precision statements from ASTM members Paul Griffin and Lance Lewand and other guests. ASTM 3612, Standard Method for Analysis of Gases Dissolved in Electrical Insulating Oil by Gas Chromatography, has precision statements that should be referenced in the document.

Other discussion included clarification that this is a guide only and that statistical data gives information but due to bias and uncertainty it does not provide absolute conclusions when establishing consensus values in the guide.

A suggestion was made to consider a template in Excel for submission of the data, including a request for additional information. Another suggestion was made to document the ambient temperature data during the load test. Another suggestion was that the IEC documents 61181 and 60076-2 Feb. 2011 should be previewed and discussed at the next meeting. One commenter discussed that 90 percentile statistical values be used in the table rather than absolute values.

The Power Point © presentation and the current draft of the document will be posted on the Insulating Fluids Subcommittee web site.

Respectfully submitted,
Chair Jim Allen Thompson

10.5.2.4. Working Group C57.139 - Guide for Dissolved Gas Analysis in Transformer Load Tap Changers - Chair David Wallach, Secretary Sue McNelly

The WG Report Given at the Sub-Committee Meeting, presented by Dave Wallach:

- No quorum (15/40).
- Kick off meeting since doc was published last year 2015 expiration.
- Hope to avoid PAR extension by starting now.
- Will be adding rate of change component to the analysis.

The Minutes (unapproved) of WG Meeting as Submitted:

Tuesday, November 1, 2011

Chair Dave Wallach called the WG meeting to order at 11am. WG Secretary Susan McNelly were also present. There were 15 of 40 members (Quorum requirement was not met). There were 55 guests present with 13 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 (9 of the 13) will be added as WG members):

Peter Balma	Stephanie Danzer
Stephan Brauer*	Ali Naderian*
Jagdish Burde*	Ron Nicholas*
Luiz Cheim*	Prabhu Soundarrajan*
Donald Cherry*	Mark Tostrud
Larry Christodoulou*	Peter Zhao*
Marc Cyr*	

Agenda:

1. Introductions/Member Roll Call
2. Approval of minutes from Spring 2011 meeting
3. PAR & Schedule
4. Task Forces for focus areas next revision
5. Task Force Assignments
6. New Business

Minutes from the Spring 2011 San Diego, California meeting were not approved due to a lack of quorum.

Schedule

1. Task force work and document updates (Live Meetings) – Proposed meetings in Spring 2012, Fall 2012, Spring 2013, Fall 2013, and Spring 2014

2. Begin Balloting process – Mid 2014

3. PAR expiration – December 31, 2015

Task Forces

The following are proposed task forces for work on revision of the Guide.

- Data Analysis
  - Develop generic design category norms for Appendix A LTC Types
  - Variation of norms between users due to loading, maintenance, temperatures

  A request for a volunteer to lead this task force was made. Jim Dukarm was asked and agreed to chair this TF. Shuzhen Xu, Tony McGrail, Mark Tostrud, Luiz Cheim, Prabhu Soundarrajan, and Stephanie Denzer volunteered to work on the TF.

- Other Diagnostic Methods to Add
  - Triangle (Duval)
  - Monograms (e.g. Jakob, Dukarm efforts)

  A request for a volunteer to lead this task force was made. There were no voluntees to head up the TF, however, Fredi Jacob, Tony McGrail, Arturo Nunez volunteered to work on these topics.

Other Topics for possible future TF

- Presence of Benzene and Toulene (Vijayakumaran Moorkath)
- Use of word "fault" with DGA (Kent Brown) – This may be an issue to take up at the IFSC meeting to make sure that we are aligned with terminology used in C57.104 and other documents.

Goals for next meeting (leads and TF members):

- Data Analysis
  - 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

- Other Diagnostic Methods to Add
  - Review methods and if appropriate, develop draft text

- Other Topics
  - Benzene and Toulene?
  - Use of word "fault" with DGA – send to Insulation Fluids?

Discussions

Jim Dukarm gave an update on items that he has been working on or thinking about since the last meeting to try and help fill some of the gaps in the present guide.

Not much was indicated regarding actual diagnosis in the last revision due to lack of time. Since the document was completed, Jim has collaborated with some other people and has come up with some ideas for how to fill in some of the existing gaps in the existing document. For resistive type tap changers under stress, they may produce gases that may look like a fault has occurred. Jim indicated that if something is truly wrong with the tap changer, it should get worse. Therefore, looking at rates of change may be a way to identify a developing problem.

The other issue was that no generic limits are presently available. Jim indicated that when Michel Duval first published the triangle there was a normal zone. This zone provides may provide some inherent limits. The triangle was developed based on a large data base. It may be possible to do model specific refinements using this method.

Cigre has issued a technical bulletin #443 for tap changers that has taken a similar approach to categorizing LTCs.

Summary
With five meetings between now and beginning next ballot we need to get started!

The meeting was adjourned at 11:45am.

Dave Wallach, Chair

Susan McNelly, Secretary

10.5.2.5. Task Force PC57.147 - Guide for the Acceptance and Maintenance of Natural Ester Fluids in Transformers - Chair: Patrick McShane, Vice-Chair: Clair Claiborn, Secretary: Jim Graham

The Group Report Given at the Sub-Committee Meeting, presented by Patrick McShane

PAR Scope and Purpose wording developed and TF approved for submittal
Task Forces after PAR Approval formed and Chairs assigned:
TF 1: Section 4 - Fluid tests & significance-Dave Hanson
TF2: Section 6 - Handling & evaluation of NE as received- Lance Lewand
TF3: Section 7 - Evaluation of NE as received in new equipment and after filling on site- Don Cherry
TF4: Section 8 – Field Maintenance of NE- Stephanie Denzer and Jerry Murphy (Co-Chairs)
TF5: Annex B – Additional Technical Info- David Sundin
TF6: Field Application Guide and Equipment Evaluation - John Luksich
TF7: Miscellaneous - All other Sections – Patrick McShane/Jim Graham (Co-Chairs)

Minutes (unapproved) of the WG meeting as submitted:

The meeting was called to order at 8:15 AM. An attendance roster was circulated. Member roll call was taken and a quorum was established. The minutes of the spring 2011 task force meeting were approved. The chair's opening remarks laid out the meeting agenda and summarized the task force status.

The first agenda item was a discussion concerning a proposal to consolidate existing fluid acceptance and maintenance guides C57.106, C57.111, C57.121, C57.141, and C57.147 into a single document. John Luksich gave the background which led to the proposal. Lance Lewand expressed a concern that a combined document would be much more difficult to get approved because of the broader scope and potential for a larger number of contentious issues to resolve during the balloting process. Consensus was the task force will continue with the revision of C57.147 after PAR approval and address the consolidation in the future.

The second agenda item was a review of the PAR Scope. Roger Wicks asked why the scope includes only natural esters. The chair responded that synthetic esters are rarely used in the North American electrical industry. A question was raised re the use of the phrase "vegetable seed oils" in the scope. This was resolved by adding "(e.g. vegetable seed oils).

The third agenda item was a review of the PAR Purpose. The listing of equipment types was amended to read "distribution transformers, power transformers, and liquid-filled electrical equipment". The Purpose was also amended to address retrofilling of existing equipment more clearly. The chair advised a previous PAR submittal for a separate guide for field applications of natural esters was rejected with a recommendation to incorporate this material into a revised C57.147. Those present affirmed that material addressing field applications of natural esters should be added to the document. Lance Lewand asked if the reference to inhibitors in the purpose should be kept since there was limited information publicly available re what inhibitors were available for natural esters. Of the two manufacturers present, one shares with test labs

under non- disclosure agreement, the other does not share. The task force agreed to remove the reference. Juan Castellanos asked if C57.147 should address dissolved gas analysis. Sue McNelly responded that DGA was outside the scope of this task force and this topic would be discussed in the fluids subcommittee meeting later this week.

The revised Scope and Purpose were approved and will be included in the forthcoming PAR application.

The fourth agenda item was assignments of volunteers to chair the follow task forces as shown below. No work will start until after the PAR has been approved.

- TF 1: Section 4 - Fluid tests & … significance - **Dave Hanson** (chair)
- TF2: Section 6 - Handling & evaluation of NE as received - **Lance Lewand** (chair)
- TF3: Section 7 - Evaluation of NE as received in new equipment and filling on site - **Don Cherry** (chair)
- TF4: Section 8 – Field Maintenance of NE -**Stephanie Denzer and Jerry Murphy** (co-chairs)
- TF5: Annex B – Additional Technical Info - **David Sundin** (chair)
- TF6: Field Application Guide and Equipment Evaluation - **John Luksich** (chair)
- TF7: Miscellaneous - All other Sections - **Patrick McShane & Jim Graham** (co-chairs)

The last agenda item discussed was a discussion of items interest. Seventeen items were identified during the discussion. A list of these items will be posted on the task force web site. There was no unfinished business from the last meeting and no new business introduced.

SCOPE: This guide recommends tests and evaluation procedures, as well as criteria and methods of maintenance, for natural ester-based (e.g. vegetable seed oils) insulating fluids. Methods of reconditioning, field applications and diagnostics of natural ester-based insulating fluids are also described.

PURPOSE: There is growing interest in the use of natural ester fluids for dielectric coolant application in distribution and power transformers and other liquid-filled electrical equipment. Natural esters are also being applied in retrofilling of existing liquid-filled equipment. This guide assists the equipment operator in maintaining the fluid in serviceable condition. This guide, therefore, recommends standard tests and evaluation procedures of natural ester fluids. It also provides recommendations for field applications including field testing of equipment, methods of reconditioning and reclaiming natural ester fluids, and the analysis results at which reprocessing becomes necessary.

Task Force Action Items

A PAR application will be prepared and submitted by the chair by the end of November 2011 incorporating the task force approved Scope and Purpose as shown below.

A conference call will be arranged as soon as possible after PAR approval with the volunteer task force chairs.

The meeting adjourned at 9:15 AM.

Submitted by Jim Graham, TF Secretary

10.5.2.6. WorkingGroup PC57.155 Natural Ester and Synthetic Ester DGA Guide - Chair: Paul Boman, Secretary: John Luksich

Report given at the Sub-Committee Meeting by Paul Boman:

- No quorum.
- Dave Hanson presented lab test method and data results, which were similar to the Halstead graphs.
- Presentation will be posted at the TC web site.
- Additional work is needed to determine if lab results are reflective of actual field experience.
- Osward coefficient values has been requested, and some have offered to provide. How to list for each ester product offered is being reviewed, as some of the expensive lab work was done under contract and the results proprietary.
- Question: Sue McNelly asked if the C57.104 data base includes any esters samples? Answer: Yes, and that data will be provided to the ester DGA wG. Claude stated the data is also available for other committee work.

Minutes (unapproved) of the WG meeting as submitted:

Meeting Date: November 1, 2011 Time: 9:30 AM

Attendance: 22 members out of 55 members were in attendance, total attendance was 66 and 5 people requested membership.

- Quorum not present
  - intend to approve minutes on-line or at next meeting with quorum
  - review Spring 2011 minutes; no comments or corrections

Roll call postponed for late arrivals

<u>Continued business</u>

2) Dave Hansen presentation
Q: Were oil degradation products studied?
A: Will be included in the continuing work

Q: Do the gases and acids make stoichiometric sense?
A: Good question! Continued research is planned.

Q: Was the water content measured?
A: No. Planning measure on next set of tests.

Q: How would inhibited oils compare with those tested?
A: A subject for further study.

Q: Wouldn't the inhibitor affect the oxygen reactions?
A: Oxygen was not present, so this degradation was not an oxidative process. Worth further study.

Comment: The large volume inception points look to be similar to those of mineral oil, so this could aid gas analysis down the line.

Q: Do these oils generate gases other than those used in mineral oil dissolved gas analysis that should be added to aid ester analysis?
A: Don't think so.

Q: Will different esters require different analyses techniques?

A: Hard to say. We have data from lab studies but need real life transformer fault data.

Comments from two and agreement by all via applause: great job!

Further floor discussion
Chairman How does this compare to Halsted's work? Was there a problem with lost gasses in liquid phase due to saturation?
Dave Hanson: Halsted did vapor phase analysis, I think.
Fredi Jakob: What about partial discharge?
Chairman: Dave will have some results from his work with Univ. of Manchester. EPRI also has results.
Lance Lewand: This study looks at oil only. We need to remember that the addition of transformer materials may change the gases.
Fredi Jakob: What about uv penetration of syringes?
Dave Hanson: Results will be available for the next meeting.
Lance Lewand: The presence of O2 will also be important.
Dave Hanson: We presented earlier the effect of light exposure on stored totes, so we have some data available for the guide.

4) We will use the silicone guide as a template.
Mark Cyr: Ostwald coefficients should be included.
Jim Mustacchio (NYCO): will investigate if available for synthetic esters.
Lance Lewand: Labs put a lot of work into determining Ostwald coefficients, so may not want to share.
Chairman: Want to thank the labs and manufacturers for all their hard work.
CIGRE technical bulletin 443 gives partition coefficients for synthetic and natural esters.

Chairman: Need volunteers to convert the data spreadsheets into charts.
Claude Beauchemin, Jerry Murphy, Roberto Asano Jr. and Joon Han volunteer.
Chairman: Case studies of faulted transformers are needed.

5) roll call: 22 of 55 members present. No quorum.

End of meeting.

<u>Other Items</u>
- Marc Cyr: Have Ostwald coefficients been adequately established? Restated desire which was first stated at Spring 2011 meeting.
- John Luksich: EPRI presented their findings early on but have not yet issued a final report. Jocelyn Jalbert published a paper with his findings.

Jalbert, J., Gilbert, R., Tétreault, P., El Khakani, M.A., "Matrix effects affecting the indirect calibration of the static headspace-gas chromatographic method used for dissolved gas analysis in dielectric liquids", Analytical Chemistry, Vol. 75, No. 19, October 1, 2003, pp. 5230-5239

- Michel Duval: For method C, CIGRE recommends using gas-in-oil standards to calibrate the equipment rather than using published partition coefficients.
- Marc Cyr: It would be helpful to include the coefficients calculated using the gas-in-oil standards along with the dissolved gas data so that WG members can review them. Labs should get the same coefficients if they operate using the same conditions (temperature, pressure). Including the coefficients with the data will allow the WG members to critique or correct the gas data we end up publishing in the guide.

Polled attendees about including Duval Triangle in guide- Response positive.

Fredi Jakob: move to adjourn, Claude Beauchemin: second

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

- Quorum achieved.
- Par 2008 approved, may need to extend
- Four sections were discussed including economics, 5.5 precautions worker protection, general reference to regulations outside of USA discussed

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

November 1, 2011

Chair Jim Thompson, Vice-Chair TV Oommen
The working group meeting was conducted at 8 am on November 1, 2011 at Boston, Massachusetts with 22 people in attendance and with 10 of the 19 current working group members present. This document was reaffirmed in 2007 and the PAR for revision was approved December 10, 2008. Working Group member Jim Thompson (chair) conducted the meeting. There was a request for patent declarations regarding the PC57.637 document and none given.

There was a motion to approve the April 12, 2011 Working Group minutes by Dave Sundin and a second by Don Cherry. The approval of the minutes was unanimous. The discussion of the meeting included sections 4 (submitted by Mark McNally), 5.3 (submitted by Ryan Thompson), and 5.5 (submitted by the chair). There was also discussion about adding ASTM D1275 and ASTMD924 to the reference section as well as discussion about language to be included in the document to include a general reference to regulatory agencies outside the USA. The Power Point © presentation will be posted on the Insulating Fluids Subcommittee web site along with draft 2 and the above mentioned revisions.
Respectfully submitted,

Chair Jim Allen Thompson
Vice Chair TV Oommen

10.5.2.2. Task Force on Particle Count Limits in Mineral Oil – Chair: Mark Scarborough, Vice Chair: T.V. Oommen, Secretary: Paul Boman

The Report given at the Sub-Committee Meeting:

- Oleg Roizman will provide a study from Eastern Europe on synergistic impact on dielectric strength of three factors: moisture, particles, and dissolved gas.
- Sue asked if the TF should continue. No response. She determined that the TF can continue but without a time slot at the S12 meeting due to number of other active WG and TF of the SCIF.

TF meeting minutes (unapproved) as received:

Meeting Date: October 31, 2011 Time: 1:45 – 3:00 PM

Attendance: 16 members out of 36 members were in attendance, total attendance was 47 and 4 people requested membership. At the beginning of the meeting during roll call we only had 16 members present, so the meeting proceeded as without a quorum.

The meeting was called to order at 1:45 PM. Attendance rosters were circulated.

The following agenda was followed:

1. Introductions & Roster
2. Origins
3. Activities Since Spring 2011 San Diego Meeting
4. Member List / Quorum
5. Purpose / Scope
6. Presentation by Dave Hanson and Don Platts
7. Discussion
8. Adjournment

Since we did not have a quorum, we were not able to vote on the approval of the October 27, 2010 and April 11, 2011 minutes as written.

Teleconference activities were reviewed.

Scope and purpose were reviewed.

Dave Hanson and Don Platts provided a presentation on in-service equipment particle count data verses dielectric breakdown, moisture, acid number and interfacial tension. The presentation is posted on the web site. It should be noted that the focus of the TF is to investigate the need to establish particle count limits in new transformer oil and /or new transformers. The presentation was focused on in-service equipment.

Comments:

Mark Cyr: The D1816 dielectric tests have precision ranges that make it difficult to draw conclusion at a specific voltage.

Jim Dukarm: Using median values for the particle counts analysis in the presentation smoothes the curves but does not harm the integrity. Data should be used for population observation only.

Don Platts: Particle counts are useful for forensic analysis, cleanliness program (maybe) and effects dielectric strength (fluid properties). Don focused on the effects of particles on dielectric strength. Provided that the transformer oil is maintained and other tests are acceptable, particle count is not necessary.

Patrick McShane: There was a RTE study done circ 1977 on the synergistic impact on dielectric strength from contaminates including particles, water, and gas. Dave Hanson requested a copy of the study as he would like to reproduce the study if possible.

Mel Wright: In his experience, oxidized sample can hold more moisture and higher particles and still exhibit acceptable dielectric strength.

Dave Hanson: Thinks that the effects of particles is a multi-dimension model because data correlations presented.

Chair: Should Task Force continue? There was little response from the group. Interest in continuing is uncertain. The Chair will send out an e-mail survey to members list and ask if there is continued interest in this task force. The membership list will be modified as needed so a quorum can be established to approve previous meeting minutes and discuss next steps to close out this topic.

Don Platts: Stated that he was not certain what problem is trying to be solved.

Ray Bartnikas: Particle type is key. Fibrous particles are important if dipole moments are formed in electric fields.

Meeting adjourned at 2:45PM.

(Post Meeting Note: Chair attended the WG PC57.152 Field Test Guide meeting. The chair reviewed the current October 2011 draft of PC52.152 and there is a section on particle counts. This needs to be reviewed and revised so it meets the current ASTM and ISO standards. Chair plans on contacting WG PC57.152 chair.).

10.5.2.3. Task Force on Moisture in Oil - Chair: Bob Rasor

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

- Reviewed the current wording of the proposed scope.
- Summarized the activities of the TF since initiation in 2009.
- Two new presentations were held at the TF meeting. One focused on comparing when is moisture saturation value is more useful vs. when PPM value is more useful. The other on the issue of oil quality and water interaction. Both presentations will be posted on web site
- Claude Beauchemin working on presentation

The TF Meeting Minutes (unapproved) as Received:

TF on Moisture in Oil
Monday October 31st, 2011 3:15 pm
Boston, Massachusetts U.S.

The meeting was called to order by Chair Bob Rasor at 3:20 pm. There were 66 attendees. 20 of the 42 members were present. Six requested membership.

Members attending were:

Bob Rasor
Claude Beauchemin
Paul Boman
Stephanie Denzer
James Gardner
Jin H. Sim
Donald Platts
Jim Thompson
Mark Tostrud
David Hanson
Terence Martin
Oleg Roizman
Shuzhen Xu
Luiz Cheim
Mark Scarborough
Poorvi Patel
Valery Davydov
Barry Ward
Juan Castellanos
Donald Cherry

Attendees requesting membership were:

Lisa Colby
Mike Lau
Shawn Luo
Pugazhenthi Seluaray
Mahendea Soni
James Mustacchio

Agenda

1. Roster was distributed
2. Roll call was taken
3. Reviewed scope
4. List of recent conference calls and meetings were given
5. Presentation was given by Bob Rasor that included:
    i. Brief description of task force
    ii. Review of past data
    iii. Recent case studies
6. New data presented
    1. Data examples from online monitors in respect to relative saturation from Dr. Roizman.
    2. Recent case studies from Bob Rasor.

3. Dr. Davydov presented a case study correlating moisture, acid, IFT and dielectric break down and how they interacted with the given scenarios.

In summary, the TF presented data to demonstrate the many trends that can be seen with moisture and how all data parameters may need to be considered.

Data was presented from online monitors and Karl Fischer testing. There was emphasis on different moisture scenarios that would require different measurement parameters (relative saturation or ppm).

Data examples also demonstrated that moisture content (ppm) responds to temperature and that that season affects moisture data. Relative saturation was shown to stay relatively stable as compared to moisture content on these graphs. When oil temperature increased, water content also increased dramatically, and proof was displayed to show that this shifting between acceptable and unacceptable levels can occur within days.

7. Discussion and questions followed
8. Dr. Davydov presented his case study
9. Meeting was adjourned at 4:30pm

Comments provided at the end of the meeting regarding the presentation include the following:

- A concern was raised that the data presented doesn't directly measure moisture in the paper.
- A statement was made that the current standard is not useful when temperature is not taken into consideration.
- It was requested to have the presentation posted to the IEEE website.
- It was suggested to take oil age and condition into consideration when analyzing moisture in transformers.

10.5.3. Old Business:

Ad Hoc Activity Reports

- **IF Standards Consolidation Review**, Chair: Tom Lundquist

The officers of the Transformer TC and the Standards SC have recognized a need for consolidation of the C57 standard series where it makes sense. An example would be having one general insulating fluids standard acceptance and guide, and have the value limits be listed for each specific type of fluid.

Sue presented a statement from Tom Lundquist, chair of the TF: "The task force is unanimous that combing these documents will be an advantage to the industry. There are a significant number of pages that are repeated in all documents that will be reduced to only one time. Also puts all fluids into one location. The combining will not be a short project but shouldn't be too bad since we are dealing with already approved guides. We took a quick look at including IEC but decided it would not work well as IEEE covers this well.

Jim Thompson stated that combination of the oil guides would be difficult due to the large amount of information required to cover the various fluids.

Tom Prevost disagreed that the document would cause improper mixing of types of fluids, and indicated that there is too much repetition in standards now. Tom indicated that his opinion was that it may be more important to have the information in one document. Claude Beauchemin agreed with Tom Prevost and indicated that it would be cheaper to buy a combined guide than separate guides.

Jim Thompson stated that the silicone guide already warns against mixing with mineral oil and that combining into one guide will be confusing.

Susan McNelly indicated that combining the documents is not indicating oils should be mixed, there could be common boiler-plate language and then separate sections as needed for identifying differences.

Tom Prevost made a motion to accept the findings of the TF and to proceed with combining the oil guides.

Bill Bartley supported the motion indicating that it is a struggle to handle all 104 standards of the Transformer Committee, of which there are presently 55 active PARs.

Clair Claiborne stated that Lance Lewand has indicated that it will be very difficult to work on revisions if combined.

Jerry Reeves volunteered to work on a TF that would develop a comparison of the different oil guides. Jim Dukram agreed with Lance, indicating that it would introduce an element of rigidity. Jim Thompson indicated a concern that it would result in guide four times as thick as each individual guide and that it would be very confusing to fill new equipment based on one guide.

Don Platts called for a close to discussions and to vote on the motion on the floor to combine all four Guides (C57-106, -111, -121, & -147). A vote was taken and passed with a narrow majority of 12 of the 23 WG members present. Dave Hanson offered to help write a section regarding mixtures of the fluids and possible consequences.

For the immediate future, the WGs for C57.106 and C57.147 will continue to work separately on revisions of their respective documents. In parallel with these efforts, a group will be formed to look at the best way to combine the documents. This effort may end up waiting until the work with the individual guides is completed. Discussions with IEEE will need to be had to determine what can or can't be done in parallel on this effort. After the meeting, Tom Prevost offered to chair a TF to work on the combination effort.

- **New TF of the Standards Subcommittee has been formed to study and report on Nomenclature Consistency for Insulating Fluids**, Chair: Patrick McShane:

  (Note:Time ran out before this topic could be discussed. (For information, see the Standards Subcommittee report when available.)

10.5.4. New Business:

None

SC IF Adjournment 4:15PM

Respectfully Submitted:

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