Annex G Insulating Fluids Subcommittee

April 28, 2021
Virtual Meeting

Chair: Scott Reed
Vice-Chair: Jerry Murphy
Secretary: Alan Sbravati

G.1 Introductions, Roll Call of Members for Quorum, Meeting Agenda Approval, S19 Minutes Correction and Approval, and Chair's Comments

G.1.1 Chair's Opening Remarks:

a. Presentation of the Vice-Chair, Jerry Murphy, and the Secretary Alan Sbravati.

b. The chair reminded the task force and working group chairs that a 'New Meeting" needs created in AMS and the meeting attendance needs entered under 'View Calendar." Some of the task force have not done this for past meetings and they need to update the records so it is documented.

c. Reminded that the SC minutes are due June 11, 2021- WG and TF meeting minutes are due for submittal to the Insulating Fluids Subcommittee (IFSC) Secretary Alan Sbravati due within 15 days of their meetings (May 19, 2021.

G.1.2 Roll Call of SC members: (Quorum requirement: 20 minimum)

a. 31 Members signed in, from a total of 44 members. Quorum was achieved.

b. Total of 114 attendees. 83 Guests attended, and 16 requested membership, whose eligibility will be verified.

c. Registered Attendance:

Gregory Ante	- Guest	Eric Doak	- Guest
Edmundo Arevalo	- Guest	Don Dorris	- Member
Elise Arnold	- Guest	Lee Doyle	- Guest
Suresh Babanna	- Guest	James Dukarm	- Member
Claude Beauchemin	- Member	Florin Faur	- Guest
Jean-Noel Berube	- Guest	Norman Field	- Guest
William Boettger	- Guest	Paul Gabriel Florida	- Guest
Joshua Bohrn	- Guest	John Foschia	- Member
Paul Boman	- Member	George Frimpong	- Guest
Mike Bonn	- Member	Rainer Frotscher	- Guest
Jeremiah Bradshaw	- Guest	James Gardner	- Guest
David Calitz	- Member	Ali Ghafourian	- Guest
Juan Carrizales	- Guest	Rob Ghosh	- Guest
Edward Casserly	- Member	Orlando Giraldo	- Guest
Juan Castellanos	- Member	James Graham	- Member
Stuart Chambers	- Member	Attila Gyore	- Member
Luiz Cheim	- Member	David Hanson	- Guest
Rhett Chrysler	- Guest	Robert Harper	- Guest
Brandon Dent	- Guest	Roger Hayes	- Member
Stephanie Denzer	- Member	Saramma Hoffman	- Guest
Larry Dix	- Guest	Andrew Holden	- Guest

David Holland	- Guest	Kevin Rapp	- Guest
Derek Hollrah	- Guest	Robert Rasor	- Guest
John John	- Member	Timothy Raymond	- Guest
Toby Johnson	- Member	Scott Reed	- Chair
Kurt Kaineder	- Member	Jonathan Reimer	- Guest
Jon Karas	- Member	Clemens Reiss IV	- Guest
Gary King	- Guest	Afshin Rezaei-Zare	- Guest
Zan Kiparizoski	- Member	Diego Robalino	- Guest
Michelle Kutzleb	- Guest	Patrick Rock	- Guest
John Lackey	- Guest	Josue Rodriguez	- Guest
Donald Lamontagne	- Guest	Andre Rottenbacher	- Guest
Andrew Larison	- Guest	Mickel Saad	- Member
Christopher Lianides	- Guest	Albert Sanchez	- Guest
Nigel Macdonald	- Guest	Anil Sawant	- Guest
Alejandro Macias	- Guest	Alan Sbravati	- Secretary
Jinesh Malde	- Member	Jeffrey Schneider	- Guest
Darrell Mangubat	- Guest	Jaber Shalabi	- Guest
Kumar Mani	- Member	Hamid Sharifnia	- Guest
Balakrishnan Mani	- Guest	Stephen Shull	- Guest
Rogelio Martinez	- Guest	Igor Simonov	- Guest
Lee Matthews	- Guest	Jonathan Sinclair	- Guest
James Mciver	- Guest	Brian Sparling	- Guest
Justin Minikel	- Guest	Fabian Stacy	- Member
Hali Moleski	- Guest	Gregory Steeves	- Member
Paul Morakinyo	- Guest	James Thompson	- Guest
Jerry Murphy	- Vice-Chair	Ryan Thompson	- Member
Ashmita Niroula	- Guest	Risto Trifunoski	- Guest
Jayme Nunes, Jr	- Guest	Duy Vo	- Guest
Anastasia O'Malley	- Guest	Evanne Wang	- Guest
Parminder Panesar	- Guest	William Whitehead	- Guest
Dwight Parkinson	- Member	Christopher Whitten	- Guest
Nitesh Patel	- Guest	Roger Wicks	- Guest
Arismendis Pena	- Guest	Helena Wilhelm	- Guest
Nicholas Perjanik	- Member	Malia Zaman	- Guest
Tejasvi Prakash	- Guest	Anand Zanwar	- Guest
Thomas Prevost	- Member		

G.1.3 Agenda Approval:

a. A motion was made by Mike Bonn and seconded by Jon Karas to approve the agenda. The agenda was approved unanimously without objection.

G.1.4 Approval of minutes from the F20 meeting (virtual):

a. A motion was made by Mike Bonn and seconded by Luiz Cheim to approve the minutes. The minutes were approved unanimously without objection.

G.1.5 Chair's review of key IFSC Standards:

a. The chair reviewed the status of each of the 11 guides under the Sub-Committee Insulating Fluids. C57.106, C57.111, C57.121, C57.147 will be superseded by C57.166, so no activity is required at this point for these standards.

b. C57.155 will expire in 2024. C57.637, C57.130, C57.139 will expire in 2025.

c. C57.104 was published in November 1, 2019.

d. C57.146, C57.162 and C57.166 have active PAR's.

G.2 WG & TF Reports Presented at the SC Meeting

G.2.1.1 IEEE C57.166 Consolidation of Insulating Liquids Guides (PAR Expiration: Dec 2022)

WG Chair: Tom Prevost

The report of the WG Meeting was presented at the IFSC meeting by Tom Prevost:

a. The WG meeting had ~~XX attendees. Of these,~~ 29 of 36 members were present so a quorum was achieved.

b. Call for patents was presented without any claim.

c. Six Task Forces chairs each gave a status report of their respective sections. TF1, with Jinesh Malde, is doing a very good job and the first draft of the document will be shared within one month. The group is already interacting with Toby, for adjusting the format of the tables.

d. TF2 is with Scott Reed. Most of the work is completed and a draft will be circulated before the F21 meeting.

e. TF3 is with Alan Sbravati. Work is completed, and there was a discussion around the annex for transformers retrofill procedure.

f. TF4 was canceled, as the revision of the IEEE 637 will cover the reconditioning / reclaiming procedures, based on the limits given in C57.166.

g. TF5 is with Rainer Frotscher. The document is also almost finalized. A discussion point was around the voltage classes used in the document, as Rainer used the values from IEC. A motion was presented to have only the IEEE voltage classes used throughout the document. Rainer acknowledge that and he will implement the changes.

See ***Appendix I*** for the S21 Minutes (unapproved) of C57.166 WG Meeting as submitted.

G.2.1.2 IEEE C57.146 IEEE Guide for Interpretation of Gasses Generated in Silicone-Immersed Transformers (PAR Expiration: Dec 2022)

WG Chair: Jon Karas

a. The working group had a very 32 attendees, but only 11 members, not getting quorum.

b. The guide will expire by the end of this year, so the group acknowledge the guide will expire until the publication of the new version.

c. Claude Beauchemin presented preliminary analysis of owner provided DGA data, but sources of the data are pending. The Duval triangle for silicone will be include.

d. They are searching for case studies.

See ***Appendix II*** for the S21 Minutes (unapproved) of C57.146 WG Meeting as submitted.

G.2.1.3 TF C57.104 IEEE Guide for the Interpretation of Gases Generated in Mineral Oil-Immersed Transformers

TF Chair: Claude Beauchemin

a. The working group had 118 attendees. Out of the 59 members, 35 attended the meeting, confirming quorum.

b. The main discussion was around the possibility of expanding the analysis performed for the development of guide, aiming to reach a transformer assessment rather than DGA status. Discussion around the efficiency of the methods, the time between the failure and the DGA and other parameters.
c. Zack Draper provided a PowerPoint presentation on a methodology that could be used with transformer in-service and failure DGA data to evaluate the different industry interpretation methodologies.
d. Meeting was adjourned.

See ***Appendix III*** for the S21 Minutes (unapproved) of C57.104 TF Meeting as submitted.

G.2.1.4 TF C57.637 – Guide for the Reclamation of Mineral Insulating Oil and Criteria for Its Use

TF Chair: Stephanie Denzer

a. Being the first meeting, they have no members for quorum verification. Scott Reed served as the secretary provisionally.
b. The group discussed expanding the application of the guide for insulating liquids other than mineral oil. Reclamation of ester fluids will be included.
c. Next topic was the discussion of the Title, Scope and Purpose. Motions were presented and the three items were modified accordingly.
d. Stephanie presented a motion for the Task Force to submit a PAR and become a Working Group. The motion was seconded by Jinesh Malde. Motion was approved unanimously.

See ***Appendix IV*** for the S21 Minutes (unapproved) of C57.637 TF Meeting as submitted.

G.2.1.5 TF C57.155 – Guide for Interpretation of Gases Generated in Natural Ester and Synthetic Ester-Immersed Transformers

TF Chair: Alan Sbravati

a. Being the first meeting, they have no members for quorum verification. Scott Reed served as the secretary provisionally.
b. The group the motivations for the revision.
c. Next topic was the discussion of the Title, Scope and Purpose. Motions were presented and the three items were modified accordingly.
d. Alan presented a motion for the Task Force to submit a PAR and become a Working Group. The motion was seconded by Jinesh Malde. Motion was approved unanimously.

See ***Appendix V*** for the S21 Minutes (unapproved) of C57.155 TF Meeting as submitted.

G.2.1.6 TF C57.130 – Guide for the Use of Dissolved Gas Analysis Applied to Factory Temperature Rise Tests for the Evaluation of Mineral Oil-Immersed Transformers and Reactors

TF Chair: John Foschia

a. Being the first meeting, they have no members for quorum verification. Scott Reed served as the secretary provisionally.
b. The group had some discussions around the history of the standard.
c. Next topic was the discussion of the Title, Scope and Purpose. Motions were presented to keep the items as they are currently.
d. A friendly amendment to the title was presented by the Chair Scott Reed, which was accepted by John.
e. A motion was presented for the submission of a PAR by John Foschia and seconded by Claude Beauchemin.
f. A survey will be presented for verifying the availability of test results of transformers insulated with ester liquids. Depending on the availability of additional data, the title and the scope will be modified for including this information as an annex to the standard.

g. Discussions were presented around the convenience of already adjusting the title and scope. As the group expectation is not to have sufficient data available, they preferred to keep the current verbiage and, eventually submit a request for modifying the PAR later.
h. No objections were presented. Motion carries.

See ***Appendix VI*** for the S21 Minutes (unapproved) of C57.130 TF Meeting as submitted.

G.3 Old Business

a. Rainer Frotscher volunteered for becoming the task force chair for C57.139 Guide for Dissolved Gas Analysis in Transformer Load Tap Changers.

G.4 New Business

a. No new business

G.5 Next IFSC Meeting:

October 20, 2021 – Milwaukee, WI

G.6 Adjournment

A motion for the meeting to be adjourned was presented by Claude Beauchemin and seconded by Stuart Chambers.

The subcommittee adjourned at 3:26 p.m.

Respectively Submitted, Alan Sbravati, Secretary IFSC

Unapproved Minutes from the S19 IFSC WG and TF meetings

Appendix I

Working Group for Acceptance and Maintenance of Insulting Liquids PC57.166

Tuesday, April 27th, 2021
12:55 – 2:10 PM (central time)
Virtual Meeting

Minutes of WG Meeting

Chairman Tom Prevost
Vice Chair Scott Reed
Secretary Alan Sbravati

The meeting was called to order at 1:00 pm by Chair Tom Prevost.

There were 33 of 39 members present. There were 75 guests. A membership quorum was achieved.

Attendance list:

Juan Acosta	- Guest	Roger Hayes	- Member
Jeff Benach	- Guest	Ronald Hernandez	- Guest
Enrique Betancourt	- Guest	Saramma Hoffman	- Guest
Kevin Biggie	- Guest	Andrew Holden	- Guest
William Boettger	- Guest	David Holland	- Guest
Sanket Bolar	- Guest	Derek Hollrah	- Guest
Dominique Bolliger, Ph.D.	- Member	John John	- Guest
Paul Boman	- Member	Toby Johnson	- Member
Mike Bonn	- Member	Kurt Kaineder	- Member
Jeremiah Bradshaw	- Member	Jon Karas	- Member
Erich Buchgeher	- Guest	Gael Kennedy	- Guest
Edward Casserly	- Member	Robert Kinner	- Guest
Stuart Chambers	- Member	Zan Kiparizoski	- Member
James Cross	- Guest	Peter Kleine	- Guest
Michael Dahlke	- Guest	Michelle Kutzleb	- Guest
Brandon Dent	- Guest	Donald Lamontagne	- Guest
Stephanie Denzer	- Guest	Lance Lewand	- Guest
Eric Doak	- Guest	Chao Li	- Guest
Don Dorris	- Member	Tiffany Lucas	- Guest
Zachary Draper	- Guest	Nikola Lukenda	- Member
Evgenii Ermakov	- Guest	Nigel Macdonald	- Guest
Florin Faur	- Guest	Jinesh Malde	- Member
George Frimpong	- Guest	Kumar Mani	- Member
Rainer Frotscher	- Member	Balakrishnan Mani	- Guest
Eduardo Garcia Wild	- Member	Paul Morakinyo	- Guest
James Gardner	- Member	Ali Naderian	- Guest
Rob Ghosh	- Guest	Anthony Natale	- Guest
James Graham	- Member	Brady Nesvold	- Guest
Taylor Gray	- Guest	Ashmita Niroula	- Guest
Ismail Guner	- Guest	Jayme Nunes, Jr	- Guest
Attila Gyore	- Guest	Rodrigo Ocon	- Guest
Didier Hamoir	- Guest	Anastasia O'Malley	- Guest
David Hanson	- Guest	Parminder Panesar	- Guest
Robert Harper	- Guest	Nicholas Perjanik	- Member
Thomas Hartmann	- Guest	Thomas Prevost	- Chair

John Pruente	- Guest	Jonathan Sinclair	- Member
Kevin Rapp	- Member	Gregory Steeves	- Member
Jimmy Rasco	- Guest	Paul Su	- Guest
Robert Rasor	- Member	Christopher Sullivan	- Guest
Timothy Raymond	- Member	Troy Tanaka	- Guest
Scott Reed	- Vice-Chair	Marc Taylor	- Guest
Clemens Reiss IV	- Guest	James Thompson	- Guest
Diego Robalino	- Member	Ryan Thompson	- Guest
Patrick Rock	- Member	Timothy Tillery	- Guest
Josue Rodriguez	- Guest	Risto Trifunoski	- Guest
Mickel Saad	- Member	Richard vonGemmingen	- Guest
Albert Sanchez	- Guest	Dejan Vukovic	- Guest
Lina Sandsten	- Guest	David Wallach	- Guest
Alan Sbravati	- Secretary	Evanne Wang	- Member
Pugal Selvaraj	- Member	Peter Werelius	- Guest
Jaber Shalabi	- Guest	William Whitehead	- Guest
David Sheehan	- Guest	Mana Yazdani	- Guest
Peter Sheridan	- Guest	Malia Zaman	- Guest
Igor Simonov	- Guest	Peter Zhao	- Guest

Introductions
Approval of Agenda
Approval of Fall 2020 Minutes
Call for Patents
Task Force Reports
- TF1 Types of Insulating Liquids—Jinesh Malde
- TF2 In Service—Scott Reed
- TF3 Mixture of Insulating Liquids—Alan Sbravati
- TF4 Maintenance of Insulating Liquids—Andy Holden
- TF5 Insulating Liquids for LTCs—Rainer Frotscher
- TF6 Editorial—Toby Johnson

Voltage Levels within Acceptance Tables- Discussion
New Business
Adjourn

The agenda of the meeting was presented by the coordinator. A motion for approval was presented by Diego Robalino and seconded by Kumar Mani. Without objection, the agenda was unanimously approved.

A motion for approving the minutes of meeting from F20 was presented Tim Raymond, second Kumar Mani. No comments were presented, minutes from Fall 2020 were approved unanimously.

Chairman Prevost posted the Patent Claim. No claims were made.

Chairman Prevost presented the copyright policy slides.

TF 1 – Jinesh Malde

- The task force has been working for two years. Since a few months having biweekly meetings, with very good attendance.
- The proposed text and tables were reviewed line by line with the TF participants.
- Expectation is completed it during the next month. The secretary will share with the other task forces for using as their template. It will also be sent to Toby for starting the integration of the other texts into a full draft.
- Sessions for storage and handling were also incorporated in TF1.

TF 2 – Scott Reed

- Document is very almost complete. Pending definitions of in-service limits for synthetic esters liquids as IEC revision of IEC61203 is not completed yet.
- It requires updating the tables and format according to the template from TF 1.
- Draft circulation can be ready by F21. If necessary, provisional values will be included but clearly marked.
- In the IEC working group they are having discussions around the characterization of the acids. Some of the tests and parameters in IEC will not match the IEEE methods. A database with information of some synthetic ester cases in North America will be provided to the TF.

TF 3 – Alan Sbravati

- Text is finalized. It requires adjusting the format to the template from TF1
- A new item for sampling will be included (reference to ASTM D923)
- As per the suggestion from C57.154, we will include some items C4 and C5 from the Annex C of their previous version, as this annex is being excluded. These items will be included in the informative annex about transformers retrofill.

TF 4 – Andy Holden

- The chapter will be a reference to IEEE Std. 637, for the sake of avoiding repetition.
- TF was discontinued

TF 5 – Toby Johnson

- All drafts will be sent to Toby for combining in a single document

TF 6 – Rainer Frotscher

- Text is completed, pending the formatting according the template.
- As per the decisions there will be a need to adjust the tables for matching the voltage classes to the IEEE standards.

Voltage classes discussion:

- A decision around the harmonization of voltage classes was pending from last meeting. TF1 did an analysis of the reasons for the voltage classes used in IEEE and concluded it would not be possible to change.
- It was clarified that the voltage classes allow for a range of voltage regulation, for instance, having the 230kV as the reference value for the definition of basic impulse levels and other tests. This is different from IEC where the definition considers the maximum voltage and some small variations of regulation may imply the utilization of the next class.
- Jinesh presents a motion to use only IEEE voltage class levels in the whole document: ≤69kV, >69kV & <230kV, ≥230kV.
- Motion as seconded by Kumar Mani.
- Rainer Frotscher abstained. No one opposed. Motion stands.
- As previously mentioned, the text from TF 6 will be adjusted accordingly.

Old Business: Chairman Prevost mentioned there are no old business.
New Business: No new business.

The meeting was adjourned at 2:13 pm.
Next meeting is scheduled for Oct 17-21, 2021 in Milwaukee, Wisconsin.

Alan Sbravati, Secretary
Scott Reed, Vice Chair

Appendix II

Working Group C57.146 IEEE Guide for DGA in Silicone

Monday, April 26th, 2021
10:45 PM to 12:00 PM (central time)
Virtual Meeting

Minutes of Working Group Meeting

Chair Jon Karas / Vice Chair Toby Johnson
Secretary Paul Boman

Attendance total 32, members 11, guest 15 and 6 requested membership

	Name	Member		Name	Member
1.	Thang Hochanh		17.	Eric Davis	X
2.	Scott Reed	X	18.	Bill Whitehead	
3.	Florin Faur	X	19.	Ramon Benedict	
4.	Juan Castellanos		20.	Zack Draper	X
5.	Hali Moleski		21.	Stephanie Denzer	X
6.	Jim Graham	X	22.	Roger Fenton	
7.	George Jalhoum		23.	David Hanson	
8.	Edward Casserly		24.	Rob Ghosh	X
9.	Marc Taylor		25.	Toby Johnson	Vice-Chair
10.	James Dukarm		26.	Helena Wilhelm	
11.	Claude Beauchemin	X	27.	Jon Karas	Chair
12.	Nick Perjanik		28.	Paul Boman	Secretary
13.	Hakim Dulac		29.	Juan Acosta	
14.	Mauricio Soto		30.	Josue Rodriguez	
15.	Andy Holden	X	31.	Michelle Kutzleb	
16.	Ashmita Niroulaa		32.	John Pruente	X

Call for patents – none at this time

Copyright discussed

Membership roll call where quorum was not met for this meeting
Chair gave timeline of Guide progress with the Guide expiration at the end of 2021.
Claude Beauchemin presented preliminary analysis of owner provided DGA data
- Data categories for oxygen to nitrogen ratio for <0.2 and >=0.2 along with total mean values.
- Comparison was also provided to CIGRE TB433 and C57.146-2005 Edition data
- Currently 4 data sources with one source pending

Adding Section 6.5 for analytic tools using the Duval Triangle with annex using wording from C57.104.
Chair requested case studies from silicon fluid filled transformers.
Planning a WG teleconference for next month
Meeting adjourned

Appendix III

TF Next Revision to C57.104: Guide for Interpretation of Gases Generated in Mineral Oil-Immersed

Monday, April 26th, 2021
3:45 PM - 5:00 PM (central time)
Virtual Meeting

Minutes of Task Force Meeting

The virtual meeting was called to order by Chair Claude Beauchemin at 3:45 PM central time. Claude introduced himself, Norman Field (Vice Chair) and Hali Moleski (Secretary). There were 118 attendees at the start of the meeting. There are 59 members. Quorum was made with 35 of the 59 members according to the poll (in italic and highlighted in blue below). There were 23 attendees that requested membership, corrected to 24 post meeting. If all membership requests were accepted, the new membership count would be 83 members.

Members:

1. *Anand Zanwar*
2. Anastasia O'Malley
3. Bill Whitehead
4. Bob Rasor
5. Brad Staley
6. *Brady Nesvold*
7. *Cihangir Sen John*
8. *Claude Beauchemin (Chair)*
9. *David Calitz*
10. David Murray
11. David Wallach
12. *Diego Robalino*
13. *Dmitriy Klempner*
14. *Don Dorris*
15. *Donald Lamontagne*
16. *Dwight Parkinson*
17. *Emilio Morales-Cruz*
18. Eric Doak
19. Erich Buchgeher
20. *Florin Faur*
21. *Hali Moleski (Secretary)*
22. *James Dukarm*
23. *Jayme Nunes*
24. *Jerry Murphy*
25. Jim Graham
26. *John K John*
27. *John Pruente*
28. John Sinclair
29. *Jon Karas*
30. *Juan Acosta*
31. Kris Zibert
32. *Mani Kumar*
33. Larry Christodoulou
34. Lee Doyle
35. *Luiz Cheim*
36. *Marco Espindola*
37. Markus Schiessl
38. Michael Botti
39. Mickel Saad
40. Monty Goulkhah
41. *Nick Perjanik*
42. Nitesh Patel
43. *Norman Field (Vice Chair)*
44. Oleg Roizman
45. *Paul Boman*
46. *Roger Hayes*
47. *Samragni Dutta Roy*
48. *Scott Reed*
49. Shiva Rampersad
50. Stacey Kessler
51. *Stephanie Denzer*
52. *Stuart Chambers*
53. Sukhdev Walia
54. *Susan McNelly*
55. Timothy Raymond
56. Ashmita Niroulaa
57. *William Boettger*
58. *Zack Draper*
59. *Zan Kiparizoski*

Attendees requesting membership are:

1. Afshin Rezaei-Zare
2. Ali Naderian
3. Amitahh Sarkar
4. Anatoliy Mudryk
5. Anthony Franchitti
6. Ashmita Niroulaa
7. Balakrishnan
8. Branimir Petosic
9. Brian Sparling
10. Edward Casserly
11. Egon Kirchenmayer
12. Evanne Wang
13. George Frimpong
14. Ion Radu
15. Israel Barrientos
16. James Gardner
17. Jeff Benach
18. Josh Bohrn
19. Juan Castellanos
20. Mark Perkins
21. Mike Waldrop
22. Onome Avanoma
23. Robert Harper
24. Stephan Brauer

The agenda was reviewed along with patent call and copywrite policy. The motion to approve the Fall 2020 meeting minutes was made by Jerry Murphy and seconded by Luiz Cheim. There was unanimous approval of the past meeting minutes.

Claude reviewed the scope of the task force and reiterated that more work was needed after the publication of the revised C57.104 Gas Guide. The purpose of the task force is to evaluation the way forward for the next Gas Guide updating with the six (6) items listed in the scope. Current C57.104 used statistical normalization but could be improved by having transformer failure data and tool(s) to evaluate if the purely statistical approach used in the 2019 revision is 'doing the job'.

With that, Claude introduced Zack Draper who provided a PowerPoint presentation. This presentation introduced a tool (statistical screening tool) that could be used with transformer in-service and failure DGA data to evaluate the different industry interpretation methodologies (i.e., IEC, IEEE). Data from five (5) utilities (roughly 15k transformers in service and 300 failures) was used in conjunction with IEEE (2008, 2019), IEC (2015 with CIGRE TB 771 values), and a proprietary method to compare the various interpretation methods graphically. The tool uses statistics to compare the different methodologies (indicates if method has good performance).

1. Collect failure data (history, date, and reason of failure)
2. Use screening test/tool to evaluate the method that better classifies failure
3. Evaluate the curve to see what method has greater performance (area)
4. Change steps to see if method improves statistically

After the presentation, the virtual floor was opened for discussion:

- Bertrand Poulin: Is there a way to include more than failures, such as when a monitor prevents failure. Some anomalies can lead to quick failures.
  Zack – they did not include this but would be interesting and would give a better sense of time scale. Fault type could be compared to how quickly it failed. Could investigate further.

- Luiz Cheim: Two key points need to be elaborated.
  - Was it that the 300 failures were major failures (arcing, etc.)? Seventy percent of failures are not catastrophic type. How do we define failures and if we are excluding non catastrophic type?
  - Timing of sampling and determination if DGA results have anything to do with the failure. Interval of last DGA sample and the failure is important.

Zack: Agree in principle, but 6 months to 1 year is routine sampling therefore we can assume that interval unless online DGA data is provided. Monitor data would be beneficial.
Claude: Agreed interval/time is a contribution. Of the failures, some DGA data was more than a year old at the time of the failure and had a lower "success" rate than the one closer to the failure date. More work is needed to look at the sample time interval. Data is key. For this presentation, failure was defined as that the transformer had to be pulled from service.
Luiz: Would like to see distribution of catastrophic and those taken out of service.
Claude: Very true and will keep us busy. Though, at least we have a tool to evaluate.

- James Dukarm: Zack has shown statistical approach Tool. This tool is not an improvement of the method in itself, but it is used to compare various DGA screening methods efficiency to each other. A future thought is to look at more data on maintenance records and do analysis. The tool presented is more versatile than just what was presented (it can be used to compare things other than methodologies).

- Bertrand Poulin: Reminded that DGA interpretation is not an exact science yet.

- Donald Lamontagne: Encourage looking at confirmed kills and actual failure reports with photos. Validate each failure (1st hand). Offered to discuss algorithm used in own fleet – artificial neural network.

- Claude thanked Zack for the presentation.

Claude presented the scope of CIGRE D1/A2.77 Working Group and how it has several points in common with IEEE work. The CIGRE WG tasks were listed, and it was shared that the CIGRE WG was made aware of the work performed for the update of C57.104.

Last item shared was that there is a running list of corrections in C57.104 and two items were added since the last meeting:

1. Typo in Table D3: In first line of fault C, the entry for C2H6 should be <24, not ≥24
2. T2 and T3 in Table and figure D.4 should really read “T2-H” and “T3-H”

Claude reminded that the working group on DGA in Esters was meeting Tuesday 4:45 pm and that it would be informative for those that want to attend. Meeting was opened for any other discussion.

Amitahh Sarkar: Data should include operating conditions as these conditions can be cumulative.

Claude: Agreed, operating data was poor as load, temperature, etc. was not known in the data set used for the 2019 revision. Hopeful that future data will have more operational data.

No other discussion was brough forward. The presentation from Zack Draper is soon to be published in IEEE Access. Donald Lamontagne offered to present his neural network work.

Meeting was adjourned.

Appendix IV

Task Force C57.637 Guide for the Reclamation of Mineral Insulating Oil and Criteria for Its Use

Tuesday, April 27, 2021
9:25 AM – 10:40 AM (central time)
Virtual Meeting

Minutes of Working Group Meeting

The meeting was called to order at 9:25 am by Chair Stephanie Denzer.

This was the first meeting of the Task Force, so there are no current members. There were 34 people in attendance. The Chair shared that Scott Reed will serve as Vice Chair of the group and Andy Holden as the Secretary.

Attendees:

1. Greg Steeves
2. Helena Wilhelm
3. Paul Boman
4. Jon Karas
5. Onome Avanoma
6. Chao Li
7. Thomas Hartman
8. Evanne Wang
9. Ryan Thompson
10. David Hanson
11. Bill Whitehead
12. Florin Faur
13. Ashmita Niroula
14. Jinesh Malde
15. Tom Prevost
16. Andy Holden (secretary)
17. Sanket Bolar
18. Marc Foata
19. Mike Bonn
20. Jimmy Rasco
21. Ronald Hernandez
22. Anand Zanwar
23. Claude Beauchemin
24. Perry Reeder
25. Israel Barrientos
26. Ed Casserly
27. Juan Acosta
28. Jim Thompson
29. Ed teNyenhuis
30. Rainer Frotscher
31. Josue Rodriguez
32. Stephani Denzer (chair)
33. Eric Doak
34. Scott Reed (vice chair)

Agenda
1) Introductions
2) Call for Patents
3) Copyright Notification.
4) Title, Scope and Purpose
5) Call for Volunteers and Members

Due to the time constraints, attendees did not introduce themselves.
Chair's Remarks:

Chair's Remarks:

Chairwoman Denzer requested a call for patents and no claims were made. Next, she reviewed with the Task Force the IEEE's copyright policy, of which no comments were made.

The Chair announced that this guide is set to expire 12/31/25 so it is time to start the renewal process. In accordance with the request of the Insulating Fluids Subcommittee vote on October 21, 2020, the task force debated expanding the guide to extend beyond mineral oil and include other insulating fluids such as natural esters and synthetic esters. Chairwoman Denzer shared that while reclaiming esters has occurred over the past ten years, there is no documented procedure.

There were numerous comments shared amongst the group. Jinesh Malde commented that there is a need for the guide to include reclamation and reconditioning of esters. Jim Thompson initially thought it was covered under C57.106 but Andy Holden explained that C57.166, which supersedes C57.106, voted to removed it from the guide and defer to C57.673 for reclamation and reconditioning. There was also discussion about the mixture of fluids and Jim Thompson stated that it was important to discuss not mixing fluids during reclamation. Jimmy Rasco made it a point that this new guide should exclude re-refined mineral oil as ASTM still has not developed a standard for this fluid.

Next, the task force discussed what the new title should be. Ed teNyenhuis stated that it was important to leave reclamation as part of the title. There was agreement amongst the task force. As a result, Jim Thompson made a motion that the title should be change to:

"IEEE Guide for Reclamation and Reconditioning of Insulating Liquids."

Jimmy Rasco seconded the motion. The motion passed unanimously.

Then the task force discussed the new scope. Jim Thompson made a motion that the scope should be change to:

"The scope of this guide applies to mineral oil, natural esters, synthetic esters, silicone and less flammable hydrocarbon (LFH) insulating liquids used in electrical equipment. The scope covers definition and description of reclaiming and reconditioning procedures; the test methods used to evaluate the progress and end point of the process. This guide does not cover the use of insulating liquids in new apparatus under warranty and re-refining of insulating liquids."

Andy Holden seconded the motion. The motion passed unanimously.

Finally, the task force reviewed the purpose. Claude Beauchemin made a motion that the purpose should be change to:

"The purpose of this guide is to provide detailed procedures for reclaiming and reconditioning insulating liquids by chemical and/or mechanical means, making them suitable for reuse as insulating liquids."

Jim Thompson seconded the motion. The motion passed unanimously.

The next step is to request a PAR at the IFSC meeting on April 28, 2021,

No New Business was discussed, and the meeting was adjourned at 10:40 am.

Appendix V

Task Force C57.155 – Guide for Interpretation of Gases Generated in Natural Ester and Synthetic Ester-Immersed Transformers

Tuesday, April 26, 2021
4:45 – 6:00 PM (central time)
Virtual Meeting

Minutes of Task Force Meeting

The meeting was called to order at 4:45 pm by Chair Alan Sbravati.

This was the first meeting of the Task Force, so there are no current members. There were 62 attendees at the meeting and 22 requested membership, which will be granted. The Chair asked those who wish to be a member of the task force place a comment in the chat group. Scott Reed will serve as Vice Chair of the group and they will need a Secretary.

Attendance list (all guests):

Juan Acosta
Tauhid Haque Ansari
Elise Arnold
Suresh Babanna
Claude Beauchemin
Paul Boman
Jeremiah Bradshaw
Stephan Brauer
Edward Casserly
Stuart Chambers
Luiz Cheim
James Cross
Brandon Dent
Stephanie Denzer
Eric Doak
Don Dorris
Hugo Flores
John Foschia
George Frimpong
Rainer Frotscher
James Graham
Ismail Guner
Attila Gyore
Didier Hamoir
David Hanson
Robert Harper
David Holland
Philip Hopkinson
Andrew Holden
Jon Karas
Robert Kinner
Peter Kleine
Michelle Kutzleb
Lance Lewand
Jinesh Malde
Ashmita Niroula
Chukwuemeka Okafor
Gylfi Olafsson
Juan Olmedo
Parminder Panesar
Sanjay Patel
Vinay Patel
Nicholas Perjanik
Branimir Petosic
Kevin Rapp
Jimmy Rasco
Scott Reed
Afshin Rezaei-Zare
Leopoldo Rodriguez
Josue Rodriguez
Hakan Sahin
Anil Sawant
Alan Sbravati
Markus Schiessl
Wesley Schrom
Mauricio Soto
Neil Strongosky
Dejan Vukovic
Pragnesh Vyas
William Whitehead
Helena Wilhelm
Mana Yazdani
Michael Zarnowski

Agenda

1) Introductions
2) Call for Patents
3) Title, Scope and Purpose
4) Review of Document Structure
5) New Business

Due to the time constraints, attendees did not introduce themselves.

Chair's Remarks:

Chairman Sbravati requested a call for patents and no claims were made. Next, he discussed the IEEE's copyright policy, of which no comments were made.

The Chair opened talking about C57.155 and how the guide will expire 12/31/2024. He commented about adopting C57.104 DGA approach for mineral oil where it is applicable to esters and referenced CIGRE's D1/A2.77 work that was developing DGA techniques. Luiz Cheim suggested adopting the approach that C57.104 took towards data analysis.

Next, the Chair announced that there is a need to fill the Vice Chair and the Secretary position. Attila Gyore and Lance Lewand offered to be the Vice Chair. Josue Rodriguez offered to be the Secretary but then later said he would have to find out from his company if he would be allowed to travel. Finally, an agreement was found having Lance Lewand as the Vice Chair and Attila Gyore as the Secretary.

There was a general discussion regarding the guide to include statements such as trace acetylene in the fluid as a result of welding the transformer lid to the tank before the task force discussed the Title, Scope and Purpose. Claude Beauchemin made a motion that the title should be revise to:

"IEEE Guide for the Interpretation of Gases Generated in Natural and Synthetic Ester Liquid Type Transformers."

Jinesh Malde seconded the motion. The motion passed unanimously.

Then the task force discussed the scope. Claude Beauchemin made a motion that the scope should be revised to:

"The guide's application is for natural and synthetic ester-immersed transformers. This guide addresses the following:

"The theory of combustible gas generation in a natural and synthetic ester-filled transformer.
- Interpretation of the gas analysis.
- Suggested operating procedures.
- Various diagnostic techniques.
- Case studies and examples.
- Evaluation criteria and guidelines.
- A bibliography of related literature"

Lance Lewand seconded the motion. The motion passed unanimously.

Finally, the task force reviewed the purpose. Claude Beauchemin made a motion that the purpose should be revised to:

"The purpose of this guide is to assist the transformer operator in evaluating dissolved gas analysis (DGA) results obtained from natural and synthetic ester liquid type transformers."

Jinesh Malde seconded the motion. The motion passed unanimously.
Discussion began on the document limitations but time expired.

No New Business was discussed, and the meeting was adjourned at 6:00 pm.

Appendix VI

Task Force C57.130 – Guide for the Use of Dissolved Gas Analysis Applied to Factory Temperature Rise Tests for the Evaluation of Mineral Oil-Immersed Transformers and Reactors

Tuesday, April 26, 2021
10:50 AM – 12:05 PM (central time)

Virtual Meeting

Minutes of Task Force Meeting

The meeting was called to order at 11:50 am by Chair John Foschia.

This was the first meeting of the Task Force, so there are no current members. There were 70 people in attendance. The Chair asked those who wish to be a member of the task force place a comment in the chat. A total of 21 attendees requested membership through the chat window and are shown in the below attendance listing in blue italicized text. These individuals will be considered members for the next meeting.

Attendees (as reported via WebEx roster)

Those who membership is shown in *blue italicized* text.

1. Andrew Larison
2. Alvaro Portillo
3. Jarrod Prince
4. Raj Ahuja
5. Amitabh Sarkar
6. John John
7. Oleg Roizman
8. Stephanie Denzer
9. Radek Sqewczyk
10. James Nunes
11. *Ronnie Minhaz*
12. Juan Pablo Medina
13. *Norman Field*
14. *Elise Arnold*
15. Richard Marek
16. J. Dennis Marlow
17. Dharam Vir
18. Rob (SGHROB?)
19. Gael Kenne
20. George Frimpong
21. *Eduardo Garcia*
22. *Ryan Thompson*
23. *Asmita Niroulaa*
24. *Helena Wilhelm*
25. *Juan Carlos Cruz Valdes*
26. Anil Sawant
27. *Robert Mayer*
28. Nicholas Jensen
29. Erich Buchgeher
30. Claude Beauchemin
31. Suresh Babanna
32. Thomas Hartmann
33. Dinesh Sankarakurup
34. Anand Zanwar
35. *László Kádár*
36. *Edward Casserly*
37. Vijay Tendulkar
38. *Egon Kirchenmayer*
39. *Lance Lewand*
40. *Juan Castellanos*
41. Toby Johnson
42. Brad Staley
43. Jinesh Malde
44. David Hanson
45. *Juan Acosta*
46. Thomas Eagle
47. Tejasvi Prakash
48. Joseph Foldi
49. William Boettger
50. Taylor Gray
51. Scott Reed
52. Ryan Musgrove
53. *Hugo Flores*
54. John Lackey
55. Sheldon Kennedy
56. David Mangubat
57. Jim Thompson
58. *Samragni Dutta Roy*
59. Rodrigo Ocon
60. Andy Downey
61. *Nick Perjanik*
62. *Jon Karas*
63. John Foschia
64. George Jalhoum
65. *Attila Gyore*
66. Josue Rodrigues
67. Jonathan Reimer
68. James Gardner
69. Michelle Kutzleb
70. *Darrel Mangubat*

Agenda

1) Introductions
2) Call for Patents
3) Copyright Notification.
4) Title, Scope and Purpose
5) Call for Volunteers and Members

Due to the time constraints, attendees did not introduce themselves.

Chair's Remarks:

Chairman Foschia requested a call for patents and no claims were made. Next, he reviewed with the Task Force the IEEE's copyright policy, of which no comments were made.

The Chair informed the attendees that the vice chair and secretary positions are unfilled and if a member of the Insulating Fluids Subcommittee would be interested in filling one of these roles to make this known.

The Chair announced that this guide is set to expire 12/31/25 so it is time to start the renewal process. The task force debated expanding the guide to extend beyond mineral oil and include other insulating fluids such as natural esters and synthetic esters. There was consensus amongst the group that there is a need for a guide that includes data for ester fluids, but the lingering question is how much data is available. Jim Thompson suggested having the subcommittee entertain a new guide for ester DGA temperature rise test. Scott Reed stated that if the subcommittee needs to have an esters DGA temperature rise test guide, then it would be appropriate to have it as part of the C57.130 revision. After discussion, it was decided that even if there is not enough data yet to develop factory rise temperature test data for ester fluids, the group would consider placing the information in an appendix to the guide.

As a result, Chairman Foschia proposed taking a survey amongst the OEM's and utilities to see who would be willing to share data. Those in attendance to this first task group were supportive of this approach. Elise Arnold of SGB offered to check with her OEM about sharing data. Robert Mayer of Siemens also offered to check about sharing data.

Next the task force discussed the Table 2 limits. Juan Castellanos commented that he would like to see a separation of the H-C gas formation during the temperature rise test instead of a generic H-C value. There was discussion regarding the value of this data. As a result, Chairman Foschia proposed expanding the survey to include additional mineral oil data. This was agreed to by the task force and both Lance Lewand and Juan Castellanos offered to share data so the idea could be explored in greater detail.

Finally, the task force discussed the Title, Scope and Purpose. Jim Thompson made a motion that the title should be:

"IEEE Guide for the Use of Dissolved Gas Analysis Applied to Factory Temperature Rise Tests for the Evaluation of Mineral Oil-Immersed Transformers and Reactors."

Juan Castellanos seconded the motion. The motion passed unanimously.

Then the task force discussed the scope. Jim Thompson made a motion that the scope should be:

"This document provides guidance in the application of dissolved gas analysis (DGA) to transformers and reactors subjected to factory temperature rise tests. This document consists of evaluation procedures and

guidelines for acceptable levels of gases generated in conventional mineral oil-filled transformers and reactors during factory temperature rise tests."

Ryan Musgrove seconded the motion. The motion passed unanimously.

Finally, the task force reviewed the purpose. Jim Thompson made a motion that the purpose should be:

"The Purpose of this Guide is to provide guidance in the application of dissolved gas analysis (DGA) to transformers and reactors subjected to factory temperature rise tests. This document consists of evaluation procedures and guidelines for acceptable levels of gases generated in conventional mineral-oil filled transformers and reactors during factory temperature rise tests."

Ryan Musgrove seconded the motion. The motion passed unanimously.

No New Business was discussed, and the meeting was adjourned at 1:05 pm.