The Minutes (unapproved) of TF Meeting as Submitted:

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

Monday, April 26th, 2021 3:45 PM (central time)

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. If all membership requests were accepted, the new membership count would be 82 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. *Kumar Mani*
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. Amitabh Sarkar
4. Anatoliy Mudryk
5. Anthony Franchitti
6. Balakrishnan
7. Branimir Petosic
8. Brian Sparling
9. Edward Casserly
10. Egon Kirchenmayer
11. Evanne Wang
12. George Frimpong
13. Ion Radu
14. Israel Barrientos
15. James Gardner
16. Jeff Benach

17. Josh Bohrn
18. Juan Castellanos
19. Mark Perkins
20. Mike Waldrop
21. Onome Avanoma
22. Robert Harper
23. 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. Clear cut DGA screening methods can be compared with this tool. 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). Jim emphasized that the study presented was to compare DGA interpretation methodologies, and not as an attempt to improve upon DGA interpretation.

- 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 Daper is soon to be published in IEEE Access. Donald Lamontagne offered to present his neural network work.

Meeting was adjourned.