Insulating Fluids Subcommittee
F. J. Gryszkiewicz, Chair; R.K. Ladroga, Vice-Chair

Submitted By Richard Ladroga
May 11, 2006

Introduction/Attendance
The Insulating Fluids Subcommittee met in Costa Mesa, California on Wednesday, March 22, 2006 with XX members and XX guests present.

Approval of Meeting Minutes

The Minutes of the Memphis, Tennessee meeting were approved as written.

Subcommittee Membership

There were no changes to report in the Subcommittee Roster.

Current Subcommittee Business

C57.106 – IEEE Guide for Acceptance and Maintenance of Insulating Oil in Equipment

March 21, 2006

From: Chair and Vice Chair of Working Group to Revise C57.106 (PC57.106)
To: IEEE Transformer Committee and IEEE Insulating Fluids Subcommittee

The Working Group for the revision of the IEEE Guide for Acceptance and Maintenance of Insulating Oil in Equipment (or IEEEC57.106) met at Costa Mesa, California on Tuesday March 21, 2006. There were 4 members and 18 guests. A request for any patent disclosures received no response. The Working Group history for the last seven meetings was briefly reviewed. The Chair extended a thank you to all persons that voted on the PC57.106 ballot conducted from December 5, 2005 through January 4, 2006. The ballot received 100 affirmative votes and 7 negative votes with comments, 1 negative vote without comments and 1 abstention vote. This resulted a 93% affirmative rate. Negative ballot resolution efforts began after ballot closing and were expected to continue for an additional two weeks followed with a 10-day recirculation ballot scheduled to begin around April 10, 2006. A signup sheet was provided at this Working Group meeting for receiving, via email, the seven Power Point© presentations for the past Working Group meetings as well as the IEEE San Diego panel presentation on moisture in transformers. It was suggested that they also be posted on the IEEE Transformer Committee/Insulating Fluids Subcommittee web site and a request will be submitted to post them in Adobe Acrobat© format.

Respectfully submitted,

Jim Thompson, Chair PC57.106 Working Group
TV Oommen, Vice Chair PC57.106 Working Group

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

Costa Mesa, California
Tuesday, March 21, 2006
Minutes of WG Meeting

The meeting was called to order by Rick Ladroga at 1:50 pm, Tuesday, March 21, 2006. Due to the WG starting with a new PAR, there are presently no WG members. There were 85 guests plus the Chair, Vice-chair, and secretary present with 34 guests requesting membership.

Guests requesting membership were:

Oscar Bello	Don Duckett	Iqbal Hussain	Tim Raymond
Paul Boman	Jim Dukarm	Joe Kelly	Jin Sim
Arnold Calros	Pierre Feghali	Terence Lee	Brian Sparling
Juan Castellanos	George Forrest	Stan Lingren	Robert Tillman
Don Cherry	James Gardner	Kent Miller	David Wallach
Bill Chiu	David Goodwin	Dan Morgan	Barry Ward
Don Chu	Jim Graham	Mark Perkins	Jim Zhang
Clair Claiborne	Bill Griesacker	Don Platts	
Bill Darovny	Jack Hammers	Tom Prevost	

Rick went over the history of the Guide. The PAR for revision was established in 1996, and was extended in 2000, 2002, and 2004. There were some significant negative ballots during the balloting process. Due to the comments that were outstanding, a decision was made in Memphis to withdraw the standard. A decision to withdraw the 1991 Guide was made at the same time. Therefore, at this time, there is no approved guide available.

A new PAR has been filed to start over with the guide. A proposal was made to make minor changes to the 1991 Guide that would allow it to be put out for use, and then start an immediate new revision to cover the issues that were raised during the recent ballot.

Rick requested a motion to approve the minutes from the Memphis, October 2005 meeting. The motion was passed.

The IEEE Patent disclosure requirements were discussed and a request was made for disclosure of any patents that may be related to the work of the WG. There were no responses to the request for disclosure.

Rick again indicated that he proposes that we revisit the 1991 Guide, decide what needs to be changed, and get it sent out for comment and ballot.

Brian Sparling from GE Syprotec gave a presentation prepared by Claude Beauchemin on the gas-in-oil limits for C57.104 D11d. Table 1 and section 7.3:

Brian recommended that additional data from the other laboratories be requested to have a larger sample size for determining what the values in Table 1 should be.

The CO question – do we need to discriminate between sealed and breather type transformers? Sealed units were assumed to have a ratio of O/O+N of <5%, breather type were assumed to have a ration >15%. Based on the data provided, (3-1 ration of ppm of CO in sealed versus breather type units) the conclusion of his presentation is that there does need to be a classification made as to whether the unit is a sealed or breather type unit.
A pdf of Brian's presentation will be posted on the web site. Samples were all taken from units in service, not failed units. The samples were a mix of industrial and utility larger units, not pole top type units.

Jim DuKarm discussed his experience with gas-in-oil limits and indicated that he was seeing similar values that Jerry presented. He provided some suggestions on the direction that the C57.104 Guide can go. He supported the idea of getting a useable document out there for people to use and then start working on getting the other issues resolved and incorporated into the Guide. He had the following suggestions for changes for the interim document:

- Table 1 needs to be revised and updated.
- Table 1 disclaimers are routinely ignored and need to be made more visible.
- Take the Rogers Ratio method as published in 1978. The one in the Guide was an attempt to summarize and in effect some cases were left out.
- Correct the typos and factual errors, these should be minor.

His suggestions for the new document:

- Use screening to separate the data into different probability groups.
- Outline a DGA fault detection and risk evaluation based on changes that indicate a real fault.
- In 1991 the Duval triangle was not well known, statistical studies show that the Duval triangle outperforms Rogers Ratio.

Jim indicated that he is willing to help with the revision of the Guide. His handout will be posted on the web site.

Jerry Corkran from Cooper gave a Carbon Oxides "Lockie" presentation. This will be posted on the web site.

- break -

Rick requested by show of hands how many would like to pursue reviving Draft 12? Only one person indicated they would prefer this option. No one indicated a desire to start from scratch on a new Guide.

Rick requested by show of hands how many would like to pursue the option of minor modification to get a working copy out as quickly as possible and then start an immediate revision. A majority of those present preferred this option.

Issues to resolve for the interim Guide to get something out and available for use.

Table 1

- Numbers for C2H2 (acetylene). These numbers should be dropped considerably lower. Rick suggested as low as 2 ppm for condition 1, but with a note that any time the initial value appears should be considered for investigation. Rick asked for any suggestions for the four levels. Jim Thompson suggested using the limits proposed by TV Oommen as follows:

Condition 1: less than 10 ppm

Condition 2: 10 – 20 ppm

Condition 3: 20 – 50 ppm

Condition 4: above 50 ppm

Jin Sim suggested the level for Condition 1 should be 0 or non detectable. His concern was for a first time test on a unit, he would want to know if there was any acetylene, where it was coming from. Otherwise he could live with whatever was decided for the remaining 3 conditions.

A suggestion was made by George Forrest to abandon the four conditions and go with a cutoff value that indicates additional investigation be done. Rick indicated that if we start making too many changes, it may not get out quickly and may not be accepted.

Don Platts indicated that if we intend to get a document out in a short timeframe, we need to leave the table as is with new more applicable values and then take on the task of how to deal with the misuse of the table in the next revision.

Jim Dukarm indicated that TV Oommen had a good suggestion that perhaps if the table is used by people for more than just an initial evaluation of a transformer, that perhaps we should modify the way that we indicate the table should be used to fit how it is actually being used.

Proposed Acetylene limits with a footnote indicating that the numbers are based on actual data:

Condition 1: 1 ppm

Condition 2: 2 - 9 ppm

Condition 3: 10 - 35 ppm

Condition 4: >35 ppm

Need to come up with more appropriate levels for CO and CO2 and to deal with the oil volume issue.

Due to lack of time, these values will be developed off line and sent out to the WG for review and comment.

The meeting was adjourned at 4:30 pm.

Rick Ladroga
WG Chair

William Bartley
WG Vice Chair

Respectfully Submitted
Richard K. Ladroga
March 24, 2006

C57.130 – Trial Use Guide for the Use of Dissolved Gas Analysis During Factory Temperature Rise Tests for the Evaluation of Oil- Immersed Transformers and Reactors

There is nothing new to report on this guide.

C57.139 – IEEE Guide for Dissolved Gas Analysis of Load Tap Changers

Costa Mesa, California
Tuesday, March 21, 2006
Minutes of WG Meeting

The meeting was called to order by Fredi Jakob at 11:00 am, Tuesday, March 21, 2006. There were 22 members and 41 guests present with 7 guests requesting membership.

Guests requesting membership were:

Dieter Dohnal
Jim Graham
Stan Hatch
Jim Morgan
Paul Mushill
Brian Sparling
Kiran Vedaute

Approval of minutes from the October 25, 2005 meeting was requested. The minutes were approved as written.

The IEEE Patent disclosure requirements were discussed and a request was made for disclosure of any patents that may be related to the work of the WG. There were no responses to the request for disclosure.

Agenda:

1. **Discussion and Resolution of Doble comments regarding exceptions to gassing**
2. **Data - Dave Wallach and Fredi Jakob**
3. **WACTI LTC gassing data summary - Fredi Jakob**
4. **Threshold gas levels - Case Study-Fredi Jakob.**
5. **Discussion of revised tutorial - Fredi Jakob**
6. **Update from Dave Wallach on LTC type designations.**

Agenda Items 1 - 5:

Fredi presented a gas concentration table supplied from Weidmann. He also presented a diagnostic ratio table, also from Weidmann. There was a clear break at the 90th percentile for the Methane, Ethane and Ethylene over Acetylene and for Ethylene over Acetylene values. Not as clear of a break for the Ethane over Methane and Ethylene over Ethane.

Fredi provided some case study information from a non-disclosed utility. Need to come up with when the ratios are applicable. At what point are the ratios valid. In the first case study presented, the ratio of Ethylene over Acetylene was quite dramatic, however the gas levels themselves were not significantly high. Evaluation of the unit indicated severe coking. How should threshold values be treated?

Comment by J. Kelly – There should be some limits.

Fredi rewrote the tutorial.

Agenda Item 6:

Presentation by Dave Wallach. Dave is recommending that the LTC contact type table provided at the last meeting, be reviewed to determine if any further variations are needed before proceeding with collecting of data. Since we can't publish LTC specific makes and models, this type table needs to be accurate enough for the user to make a determination as to what type their LTC falls under. It is expected that once the guide is published, that there would be cheat sheets in existence out and about for people to use.

Status of Data:

- James Gardner worked with Dr. Dukarm (TOA) and obtained a query that may be used by TOA users to extract their data into a comma separated value file for analysis.
- Data recently posted on the website is from GE and Weidmann-ACTI
- Data must be cateforized prior to submission using the LTC type table.

Dave proposed that the table be left as is, as there were no comments to revise it provided.

Data:

Minimum data requirements were discussed at the Fall 2005 meeting.
Path forward:

- Modify LTC Type Table based upon discussion SP06.
- Develop data guide to send to end-users to collect transformer oil analysis (TOA) data or data from other sources including type.
- Analyze data for tables in the guide.

Hartford Steam Boiler will send additional information to Dave. Tim Raymond will send his cheat sheet that he has developed to Dave.
Before adjourning, Fredi asked if there were any comments on how we are moving forward. No comments were received.
The meeting was adjourned at 11:35 am.

Fredi Jakob
Chair

Tuesday, March 21, 2006

Costa Mesa, CA

Minutes of WG Meeting

The WG meeting was called to order at 9:30 am, on Tuesday, March 21, 2006 by the working group Chair, Patrick McShane. Vice Chair, Clair Claiborne and Secretary, Susan McNelly were also present. There were 11 members present and 33 guests, with 9 guests requesting membership.

Guests requesting membership include:

Don Chu
David Goodwin
George Frimpong
James Graham
Ron Nicholas
Martin Rave
Kjell Sundkvist
Dharam Vir
Shuzhen Xu

As required in IEEE SA Standard Boards by-law, Section 6.3.2, the IEEE patent disclosure requirements were discussed and a request was made for disclosure of any patents that may be related to the work of the WG. No new disclosures were forthcoming.

The minutes for the Fall 2005 meeting were approved as submitted and recorded on the website.

A Task Force was put together at the Fall 2005 meeting for……

Comments received since the last meeting:

We are presently working on Draft 8. Most of the comments received have been Editorial in nature.

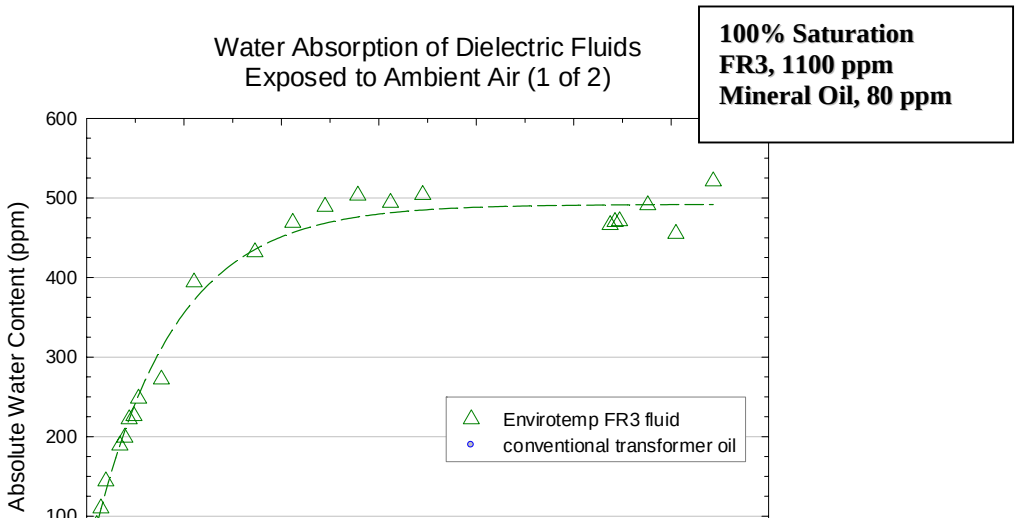
Discussed comments provided by J. Kelly and L. Dix. The following were some of the main points discussed:

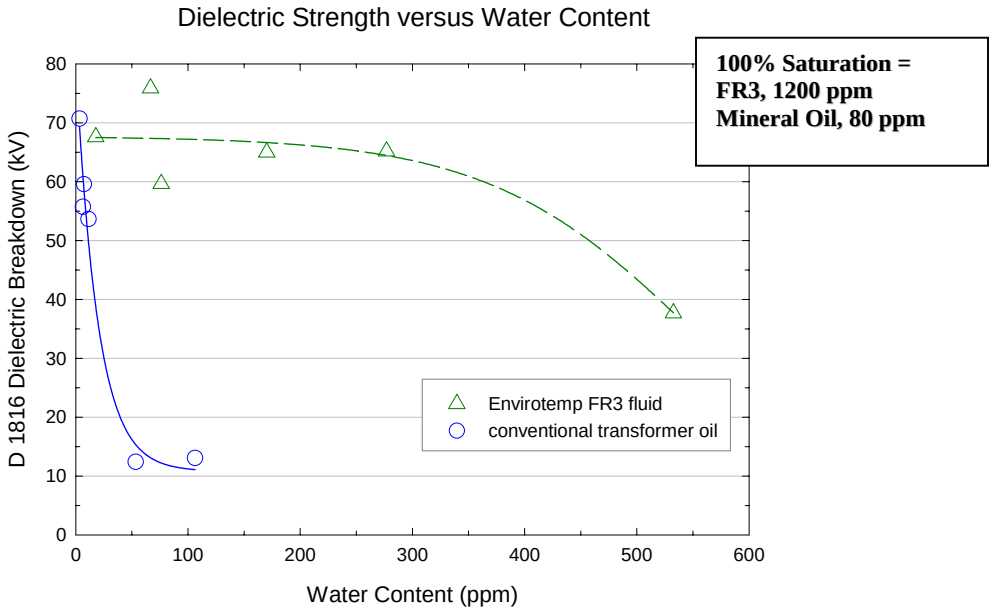
1. Clause 4.6 – Since ASTM has not established a recommended acceptance value limit should the WG come up with a recommended value. The comment is appreciated, however, this has been previously discussed and it had been decided to move ahead without it. This is a guide.

2. Clause 4.13 – The same types of gases are found. The statement is not implying the the ratios are the same. Rogers Ratio does not apply. Unit that have been in service for several years have a higher ethane amount which skew the Rogers Ratio values. Need to investigate whether there is a difference between electrical and thermal faults for the volume of gas generated. TV Oomen suggested adding a reference to a Doble paper on Natural Ester properties from about 2001. Patrick will get the information on the reference. If the document is publicly available, it can be added as a reference, otherwise would be added to the Bibliography.

3. TF made up of Jerry Murphy, TV Oommen, Patrick McShane, Gael Kennedy, and Bill Griesacker have been assigned to work on Clause 4.14.

4. Clause 4.15 – Comment from L. Dix on whether it night it be beneficial to insert graphs comparing typical oil versus typical ester fluid. Patrick presented graphs of Water absorption of dielectric fluids exposed to ambient air and dielectric strength versus water content for ester fluids versus mineral oil. A TF will be formed to come up with an Annex that discusses relative saturation at different temperatures and dielectric strengths.





5. Will reference Doble values in Clause 4.17

A motion to make changes agreed on today. A draft will be sent out for straw ballot with results from the two TFs that need to be made. Unless there is greater than 25% rejection, we will proceed to ballot. The motion passed.

The meeting was adjourned at 9:20am.

Respectfully Submitted

Patrick McShane
Working Group Chair

Clair Claiborne
Working Group Vice-Chair
October 25, 2005

Adjournment

The Subcommittee adjourned at 12:00 noon.

Next Meeting

The Insulating Fluids Subcommittee and its Working Groups will next meet in Montreal, Quebec, Canada during the period of October 22-26, 2006.