

Meeting Minutes
Task Force on PCS Revisions to C57.12.90
October 30, 2017, 11:00am-12:15pm
Marriott VI Room, Marriott Hotel; Louisville, Kentucky USA
Hakan Sahin, Chairman; Craig Stiegemeier, Secretary

The TF Chair called the meeting to order at 11am.

The chair went through a review of the purpose of the task force and the proposed agenda for the meeting.

Fall 2017 Agenda

1. Administrative
 - A. Statement of Purpose
 - B. Introductions and attendance sheets
 - C. Approval of agenda
 - D. Approval of minutes of meeting – Spring -2017
2. Old Business
 - A. Changes to C57.12.90 on the Load Tap Changer performance voltage test and current test
3. New Business
4. Adjourn

The chair asked if any changes to the agenda needed to be made or if anyone had new business. Stephen Schroeder requested time for two new business items.

The Chair (Hakan) confirmed a motion had been made and seconded to approve the agenda – there was unanimous approval.

Rodrigo Ronchi motioned, Kenneth Skinger second for approval of the minutes after Hakan covered a summary of the Minutes of the Spring 2017 New Orleans meeting were reviewed. The minutes were approved unanimously. The task force moved on to old business, which is the LTC performance voltage test and current test to be included in future versions of C57.12.90.

There were 43 of the 61 TF members in attendance making this meeting “official” as a quorum of 70% was reached. In addition, 83 guests were present at the meeting, of which 27 were first time attendees. 21 of the guests who attended previous meetings requested membership on the Task Force. They will be added if they meet the membership requirements before the Spring 2017 meeting.

A proposal to sections 8.7 and 9.6 was developed and presented to the group at this meeting. They are:

8.7 **On-Load Tap Changer End to End Voltage Test**

In order to verify the performance of a transformer that has a load tap changer (LTC), the LTC shall be operated through one end to end to end (from one extreme tap to the other extreme tap and back) with the transformer energized at rated voltage. The test may be performed in intervals if needed, but it is a

requirement that the transformer be energized at no less than rated voltage for each tap change, and the applied voltage can be adjusted to the rated voltage of the tap position. The transformer shall be observed during this test and the operator shall identify that the sound during the tap changing operations was either normal or abnormal. Note that with some types of tap changers, there will be an abnormally loud sound if components are not connected properly. The transformer will have passed this test if the tap changer operates normally, with no abnormal sound, and no abnormal observations in the test control system which may cause the test circuit to trip. Oil samples taken from the diverter compartment of vacuum type tap-changers, before and after the test, may show some increase of dissolved gases, which is due to current commutation, resistor heating and / or stray-gassing of the oil. The increase of the sum of H₂, CH₄, C₂H₆, C₂H₄ and C₂H₂ should not exceed 12 ppm for in-tank type LTCs and 6 ppm for compartment type LTCs.

Note: During the operation of the change-over selector (reversing switch or coarse-tap selector), the sound can be slightly different.

Hakan gave 3 minutes for those attending to read the above text to enable a discussion. He then showed the following test for section 9.6.

9.6 Load Tap Changer End to End Current Test

In order to verify the performance of a transformer that has a load tap changer (LTC), the LTC shall be operated through one end to end (from one extreme tap to the other extreme tap) with the transformer current at the top nameplate MVA rating. The test may be performed in intervals if needed, but it is a requirement that the transformer current be no less than 80% of the top MVA nameplate current for each tap change. The transformer shall be observed during this test and the operator shall identify that the sound during the tap changing operations was either normal or abnormal. Note that with some types of tap changers, there will be an abnormally loud sound if components are not connected properly. The transformer will have passed this test if the tap changer operates normally, with no abnormal sound and no abnormal observations in the test control system may cause the test circuit to trip. Oil samples taken from the diverter compartment of vacuum type tap-changers, before and after the test, may show some increase of dissolved gases, which is due to current commutation, resistor heating and / or stray-gassing of the oil. The increase of the sum of H₂, CH₄, C₂H₆, C₂H₄ and C₂H₂ should not exceed 12 ppm for in-tank type LTCs and 6 ppm for compartment type LTCs.

Note: During the operation of the change-over selector (reversing switch or coarse-tap selector), the sound can be slightly different.

The chair then opened up the meeting for discussion. The following members and guests came forward and made those comments:

Steven Brzoznowski of Bonneville Power – Wanted to confirm that these are proposed routine tests for class 2 transformers.

Steve Schroeder of ABB – thinks this should also apply to Class 1 transformers – basically any transformer with on on-load tap changer

Joe Foldi, consultant – This came about as issues on site were found for larger transformers.

Sam Mehta, consultant – this was a hot issue for voltage regulators, so a decision was made to just stop at Class 2.

Steve Antosz, consultant – The class requirement comes from 12.00. This should just be for a procedure to perform the test.

Krishnamurthy Vijayan of PTI Manitoba – Is this for both types of tap changers? Rainer Frotscher pointed out that this is for vacuum-type only LTCs. For non-vacuum determination of a problem is only the sound level.

Tony Franchetti or PECO – Control voltage at 8F% should be added to the procedure.

Someone from SPX – Questioned whether information is adequate for natural esters. Rainer noted that this is only for mineral oil.

Dan Blaydon – BG&E – Would like to see a tolerance on the 80% voltage. Joe Foldi noted that impedance is changing across the tap range, so that's why a minimum is specified.

Dave Geibel – ABB – Gas sampling should be performed on LTC's without a diverter compartment. Rainer agreed and said that the oil from the LTC should be taken from all compartments. Sam Mehta noted that testing should be performed on all LTCs.

Pierre Riffon – would like a sentence for all oil type tap changers. He also wanted to understand the logic of the range of operation testing. Joe Foldi – since the tap changer could have a problem at any tap. That's when it was agreed to test the complete operating range of the LTC.

Jeff Ray – Pointed out that a minimum of 80 or 85% allows going from one end to the other without having to adjust the test set up.

Don Ayres – We may want to align the current test here from the requirements of the heat run.

The Chair asked for 10-15 volunteers who would review the text and come up with something that can help move the tests forward.

Dave Geibel – Commented that he's not aware of a test that sounds significantly different at 95% than 80%.

New Business

Steve Schroeder – two items

1. We should address the fact that a transformer must be tested with in the same fluid that it will be filled in service. This is due to the fact that natural ester and

mineral oil have very different properties. This is most critical for temp run and dielectric tests. Ed teNyenhuis suggested that by filling with regular oil may degrade the fire point of the final installation. Steve Antosz pointed out that from a practical/commercial/technical standpoint this is a good suggestion, but we need to make sure that this is the right TF for consideration.

2. For wye connected transformers with a neutral bushing brought out the winding resistance test currently is line to line. A bad neutral connection could be missed, and he suggests that line to neutral resistance should also be measured. The supplier needs to do something with winding resistance including the neutral.

There was agreement on both topics that they should become new business for the TF.

We need a secretary for the task force with Craig Stiegemeier moving on the PCS Chair role.

Dan Sauer motioned and Ed teNyenhuis seconded to adjourn. All agreed and the meeting was adjourned at 11:56am.