

December 12, 2016

**Caterpillar Surveillance Panel
COAT Task Force Teleconference Minutes**

Teleconference Attendees:

Jim Gutzwiller (Chairman), Caroline Laufer, Elisa Santos, Bob Salgueiro, Gang Ha – Infineum
Jim McCord, Jim Carroll (Secretary) – SwRI
Hind Abi-Akar, Mark Jarrett – Caterpillar
Greg Shank - Volvo
Kevin O'Malley, Alex Ebner – Lubrizol
Sean Moyer – TMC
Jim Moritz – Intertek
Bob Campbell – Afton
Jim Rutherford, Mark Cooper – Chevron-Oronite
Dan Lanctot - TEI

AGENDA

• **Proposed change to COAT Test Numbering**

Sean Moyer recommended that the COAT test naming convention be adjusted to include the engine number in the name. Here is the directive he recommended:

9.5.1 The test number for both reference and non-reference oils has four parts: W, X, Y, and Z, where W represents the test-stand number, X the engine number, Y the sequential test-stand-run number, and Z the number of hours run on the stand since the last reference-oil test. For example 27-25050-15-150 indicates run number 15 on stand-engine number 27-25050, and the stand-engine having been run for 150 h since the last reference-oil test. The test stand run number, Y, will increase sequentially by one for each test start (reference oil or non-reference oil). A letter suffix may also be necessary (see 9.5.2).

9.5.2 A reference-oil test conducted subsequent to an unacceptable reference-oil test shall include a letter suffix after Y. The letter suffix shall begin with A and incremented alphabetically until acceptable reference-oil test is completed. For example, if two consecutive unacceptable reference-oil tests were conducted and the first number was 27-25050-15-150, the second test number would be 27-25050-16A-150. A third calibration attempt would have the test number 27-25050-17B-150. If the third test were acceptable, then 27-25050-17B-150 would identify the reference-oil test in the test report.

A motion was made and seconded that the COAT naming convention be changed to the above recommendation. The motion passed unanimously. TMC will send out an industry memorandum, and put the wording before the appropriate ASTM committee to update D8047.

- **Proposal for COAT to be alternate test for EOAT**

Elisa Santos presented data analyses and recommendations for the COAT test to be used as an alternative to the EOAT test. The presentation is attached to with these minutes.

The presentation focused on the available data for TMC-1005 oil which is a reference oil of the EOAT that has been run using the COAT procedure.

Elisa commented during the presentation that their limit recommendation was based on an upper bound prediction interval based on 95% confidence interval for the mean of TMC-1005-4.

Elisa stated that they tested different correlations with laboratory differences. And, that she did not see a statistically significant difference between the 6 results at the three laboratories which ran TMC-1005 oil in their COAT engines.

The presentation suggested this Action:

Suggest Caterpillar Surveillance Panel considers a motion to recommend to API Lubricants Group (LG) and Category Life Oversight Group (CLOG) to accept COAT test with a 13.5% Aeration limit, as an alternate to the EOAT test, with an 8.0% Aeration limit, for API CH-4, API CI-4 and API CJ-4.

The presentation graphically shows the six results produced with TMC-1005 in the industry's COAT stands. Results from Laboratory B were visibly higher than results from the other two laboratories.

There were various skeptical remarks made regarding the use of these data to set 13.5% as the EOAT oil limit. No one questioned the statistics presented, but a common note was made that 13.5% may allow 'any' oil to pass.

A question came up whether the newer Micromotion with the Puck interface affected the results. Elisa responded that with the data available there is no correlation. And, a comment was also made that Laboratory G could not go back to the older Micromotion technology.

Elisa was asked if the same engine was used by the laboratories for their multiple TMC-1005 tests, and she affirmed that it was the same engine.

It was declared that the intent at this point is to establish a pass/fail equivalency for the EOAT using the COAT.

A comment was made that the RMSE of TMC-1005 might be a starting point and adding 0.2-0.4%.

Alternatively, the COAT standard deviation is 0.285 and the EOAT standard deviation is 0.25. So, we could use the ratio of the SDs to adjust the mean of the COAT 1005-4 to establish a limit.

Elisa re-iterated that statistically “there is no lab effect” so severity adjustments were not make. And, she is trying not to use what ‘I want to see’ as a result.

Another suggestion was to us the average of the COAT TMC-1005 test results and add 8/10 X SD to set the limit.

Bob Campbell was against the use of these data (in the presentation) since 4 datum are tight and 2 datum are ‘well off’ from the others. He suggested that a matrix of tests be setup to confirm equivalency.

Elisa noted that she excluded ‘recent’ data due to the filter change, and that there is no data in the presentation with the new segregated batch of filters.

Jim Rutherford asked whether anyone could suggest a different statistical approach, and asked what could be run now to associate COAT results with the EOAT test.

SwRI was asked if it could run COAT reference oils on the EOAT stand. Jim Carroll responded that he could support it but we need to discuss the size of the test matrix.

A table in the appendix of the presentation notes the shallow and steep profiles from the TMC-1005-4 tests run with the COAT system. This table prompted a change of discussion to the IR1808 filters.

No conclusions or recommendations were produced regarding a COAT test limit for EOAT oils. In addition, a concern was voiced whether any limit discussion is possible before resolving the question of filter batch effects on aeration.

Plans were made for a teleconference between the laboratories and statisticians to recommend to the surveillance panel a test matrix to determine the effect on final aeration levels using the segregated batch of filters.

December 16, 2016 teleconference on test matrix recommendation for segregated 1R1808 Oil Filters

Teleconference Attendees:

Jim Gutzwiller (Chairman), Caroline Laufer, Elisa Santos – Infineum

Jim McCord, Jim Carroll (Secretary) – SwRI

Hind Abi-Akar – Caterpillar

Kevin O’Malley, Alex Ebner – Lubrizol

Sean Moyer – TMC

Jim Moritz – Intertek

Bob Campbell – Afton

Jim Rutherford – Chevron-Oronite

A brief exchange was made regarding the batch of IR1808 oil filters set aside by Caterpillar and shipped to TEI. The filters are now available from TEI. Hind Abi-Akar confirmed that this batch of filters are from July, 2016.

Based on her analysis of filters and results from the different laboratories, Elisa Santos stated "I think the steep and shallow slopes are due the filters. I think!"

It was noted that the current setups at the three laboratories are the only test setups available. Two of the laboratories are referenced with 'older' model Micromotions and one is referenced with the 'new' style.

A comment was made that if newer filters are being used now, that 'if there is a difference' due to the filter some reference tests would have tripped a Level 2 alarm, but that was not implemented.

A comment was made that an Industry Correction factor may be produced for the set-aside batch of filters if a test matrix indicates it should.

A three test matrix was proposed for each laboratory to conduct. Jim McCord noted the cost of running tests, and that he was not expecting to run 3 tests. In addition, if three tests are run then the first two should be 'hardware' tests and the third would become the next reference.

There was discussion on which oil (832 or 833) should be used for the filter tests. It was noted that the lower aeration reference oil shows less test-to-test variability. If there is a difference between the labs that could be handled with a severity adjustment.

Recommendation to CAT Surveillance Panel.

Recommend that three oils be tested at each laboratory, two 833 oils and one 832 oil. These tests would all be run with the batch of filters at TEI. Oils will be assigned randomly by statisticians. First two runs will be donated hardware runs, and the last one would be a reference test.

Results will be statistically compared to each oil's target. The goal is to produce a correction factor for this batch of filters.

Issues

Support to the labs for the cost of running tests.

Correction factor calculation.

- **Next conference**

Next Caterpillar Surveillance Panel conference call is scheduled for January 10 at 1pm CST.