Cat Aeration Task Force Meeting

March 18, and March 19, 2015, Lubrizol Facility, Wickliffe, OH

Attendees: Names Highlighted in <mark>Yellow</mark> attended the meeting

Participant	Name	Email	
1	Caroline Laufer Elisa Santos Pat Fetterman James Gutzwiller Bob Salgueiro	caroline.laufer@infineum.com elisa.santos@infineum.com pat.fetterman@infineum.com james.gutzwiller@infineum.com bob.salgueiro@infineum.com	Infineum
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7	Jason Bowden Matt Bowden	jhbowden@ohtech.com	OHT
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21	Dan Arcy	Dan.arcy@shell.com	Shell
22	Heather Debaun		Navistar

Executive Summary:

1. The Task Force reviewed the test data and continued the Matrix tests analysis. As a result the group developed the LTMS system for this test, developed the QI parameters, reviewed and updated the procedure, and reviewed and updated Appendix K

2. The Task Force voted on the readiness of the test for the PC-11 category. The result is as follows:

   Motion (Moritz): the Caterpillar engine oil aeration test (COAT) is accepted for use in the PC-11 category.

   Second: Thompson

   Vote: TMC: Waive; All others: approve

   The motion passed.

Details

Test data analysis

Caroline presented an analysis of the operational data of the three rerun tests from Lab A comparing them with the original tests of the same oils.

Elisa presented an analysis that included many options for accounting for Engine hours and determining which subset the Task Force wanted to use for generating test targets and the standard deviation. Based on the analyses of operational parameters and aeration, the group decided the following:

> Lab A: Only runs 15, 16, and 17 will be included in the final analysis (existing tests not considered due to kink in heated line)

> Lab G: Only runs 8 through 14 will be included (G2, G3, G6, G7 were excluded due to oil gallery P, sump temperature and other uncontrolled parameters)

> Lab B: All tests included (tests with shutdowns and other operational parameters were discussed in detail)

This resulted in 22 tests in the matrix after exclusion of the tests per above.

Elisa redid the statistical analysis of the data per the tests accepted above. The data was presented in the afternoon.

Mean and standard deviations of the 22 tests were shared with the group.

Comparison of Rsquare and RMSE were presented with and without Engine Hours correlation for the 22 tests. The results showed similar parameters with the Coeff LN Eng. Hrs at -0.382447. This was agreed to that it is not significant as a correction factor for engine hours.

Needed information for NCDT: Test procedure, References, LTMS (current LTMS model, but consider LTMS2 in parallel), models for the analysis, justification for looking at 22 tests, etc.

Day 2: Further analysis, standard deviation recalculated per the models and removing the lab effects was given per Technology. The severity adjustment and the LTMS analysis were presented and discussed.

Following the discussions and explanations, the Task Force voted on the acceptance of this test. The motion passed.

QIs

Jeff Clark introduced the QIs: the equation governing the QIs (given below in this document) and their implications on the test control.

Jeff directed the discussions using QI calculations of the operating parameters based on C13 deposit tests and initial assumptions.

The group discussed the operational parameters and determined the following:

	Target	U&L	Comment
RPM	1800	±2.5	Same as C13
Inlet Air temp	25 °C		A6 is threshold test
Inlet Manifold Temp	40 °C	± 0.5	Same as C13
Fuel In temp	40 °C	± 0.4	Same as C13
Coolant out temp	90.0 °C	± 0.4	Same as C13
Oil gallery temp	90.0 °C	± 0.2	Tighter than C13
Exhaust back pressure	104 kPa	± 0.3	
Crankcase pressure	103 kPa	± 0.25	
Sample oil temp (avg of MM in/out T)	90.0 °C	± 0.2	
Sample oil flow	1.5 l/min	± 0.03	
Sample oil pressure (avg of MM in/out)	84 kPa	± 0.35	

Initial data for the first 2 minutes should not be included. Labs will follow up on response time. Spikes during the tests will be monitored

Action: It was agreed that the sample oil pressure could be brought to 84 kPa in the last step of warm-up procedure and before starting the test. Test procedure will be changed to reflect this change.

The initial data may have spikes in the parameters due to starting the measurement procedure. These spikes do not represent the actual parameters and introducing negative values to the QIs.

QI equation: $QIi = 1 - \frac{1}{n} \sum_{1}^{n}(\frac{U+L-2Xi}{U-L})2$

Procedure review

Martin led the review of the current procedure. Updates were made to the procedure based on the current information learned through the Matrix tests. This procedure will be shared with NCDT as a part of several required documents.