CAT Aeration Test Task Force meeting
Jan 30, 2015

Matrix Progress and Data Review

Attendees: Names Highlighted in Yellow 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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22	Heather Debaun		Navistar

Testing updates
EG, Tim: repeat of test 1, oil G, is ongoing, 10.2 to 10.3% at 40 hours.
SWRI, Martin: finished repeat test 1. Data submitted.
Retains of 1005 was run to tie back to earlier results.
LZ, Greg: All 12 tests are completed and submitted to TMC

Data submitted: all LTMS tests are uploaded and processed. Few corrections are being resolved. (Missing engine hours for example)

Operational data: uploaded to TMC. Some operational data were missing and some filter information need to be updated. Refer to the action items below.
Caroline will update the summary file.

Action: finalize and correct the data (LTMS and Operational) and submit to TMC by Feb 6, 2015. Refer to details later in this document.

Summary of action items. Refer to details below.

Parameter	**Action**	**Comment**
Shut Down information	Labs to review their tests with shutdown and provide data as requested below	Data requested include when and how long were the shutdowns and data profile following shutdown
Blowby	labs should check the JTEC information	
Filter bypass Pressure	Mark and Jim G will work on this issue	discussions are needed to ensure that all labs have the same setup
Rounding of aeration data	**Two decimal places to be reported**	One or two decimal points: LTMS files have 1 decimal point and data analysis is using 2 decimal points
Engine hours	Report SOT as total engine hours at start of test conditions	Currently, SOT or EOT are reported by the labs
Engine serial #	Sean will clarify the description of this field and add appropriate column size	Currently: it is not clear what is the # reported and the field is not adequate for more than 6 digits
LTMS files	Re-submit updated LTMS files by Tuesday morning	Files will be corrected per above actions.
Density	Determine a common approach	Need robust representative process

Statistical Analysis update:
Elisa reviewed the status of the data analysis
Two group 2 and three technologies were tested. One technology showed higher aeration results than the other two.

Action: In order to have the statistical data for the NCDT deadline, Elisa needs the complete data from all the labs.

Discussion of the apparent discrimination in one of the labs, while other data is not clearly discriminated.
Precision within the labs, absolute levels, and number of tests in each lab will impact the final data. Precision within labs versus separation was discussed.

Engine hours: should there be a correction?
Transformation of data? Range is narrow, so it may not be transformed. Kevin and Jim R discussed this point.
Operational data have been averaged over the entire test time or those at the 30-50 hours used for data analysis.
Question from McCord: reporting on-test data not including warm up and no data after shutdown until the level is back to on-test expected.

Warm up period is about 40 min.

Shutdown information: discuss in detail during the face-to-face meeting.
Group discussed this issue and all agreed that data has to be analyzed to give direction:

- When during the test did the shutdown happen?
- How long was the shutdown?
- How long did it take for the data to return to the prior level?
- Can the data be averaged with and without the shutdown data?

LTMS files do not reflect the shutdown information.
Caroline showed the tests with shutdowns. The levels of aeration after shutdown were not consistent.

Suggestions:

- Don't include data with offsets
- Eliminate data of the shutdown data as it rises to the stable level.
- Calculate slopes of the operational data in before and after shutdown as well as the aeration average.
- Are there confounding operational factors in the test (crank case P has changed after the shutdown in G04 test)

Tests with shutdowns: **A04, A14, B01 B04, G04 and G05**

Density reported: question if the procedure is the same across labs and whether the Caroline recalculated the aeration values. The files were re-updated with the new values. For lab G, four tests still showed noise in the density measurements.

Tim is working on this issue (temperature corrected discrepancy).
Discussion of "predicted" versus "actual" density values – although these are very close.
Two labs are reporting the 90 C value per D4052

Procedure: update the group at the face-to-face meeting

Hours reported: Lisa looked also at 40-50 and did not see any statistical differences. This is consistent with prove-out data. The 40-50 data will be shared next time.

Procedure:
Last repeat at SWRI has a temperature is higher by 1 deg and the aeration is higher. Caroline explained the micromotion correction upon measurement of the temperature at the inlet/outlet as well as within the micromotion and the correction of density output based on this temperature.

Differences in the blowby need to be resolved as they may impact aeration:

Action: labs should check the JTEC information

Action: Mark and Jim G will work on the filter by-pass pressure – need more discussions to ensure that all labs have the same

Action: need to decide on the rounding of the aeration data, one or two decimal points. LTMS files has one decimal point and the data analysis is using two decimal points

Two decimal places to be reported

Jim G reviewed the data files and provided comments to the labs.

Action: re-submit updated LTMS files. Tuesday morning.

Action: include information on the shutdown: When during the test did the shutdown happen? And how long was the shutdown?

Sean: there are specific questions in the LTMS related to the shutdown

Engine hours: reported as EOT or SOT. Warm up hours are accounted for at the start of the new test.

Action: SOT needs to be reported as total hours on the engine at start of test conditions.

Engine serial/arrangement/assigned #: do we need to expand this field from 6 to 8?

Action: Sean will clarify the description of these fields. Will make this field of appropriate description and size.

Density measurement:
The labs are not measuring the density by the same process. The discussion included whether one measurement at 90C, or extrapolation after testing at various temperatures need to be done. More discussions are needed to rapidly get to a final procedure.

Next meeting: Friday Feb 6, 12:00 noon.

Relevant information from the meeting on Jan 16, 2015:
Technical Data review, Caroline Laufer
A review of the technical data reported was conducted.

Key outcomes:

1- **Oil aeration calculations:**

The calculations conducted by Caroline was identical to SWRI and LZ. Average was identical to EG, but there was a range in the "delta check".
Tim: Density calculations is through an internal loop, which is resulting in the discrepancy. Statistically no difference, since the discrepancy is 0.02%, but this needs to be resolved.

Tim will resubmit the report with revised aeration calculations.

2- **Shut down data:**

Shutdown data, including during warm up, was requested from the labs. The group discussed the quick changes during the first hour of the test. It was agreed that shutdowns should be are reported in the test report
The data shows few tests with shutdowns. The data in general gets back to the prior test level in about 5 hours. The longest shutdown was test 5 at EG and it was ~24 hours

Suggestion: extend the test by the amount of data omitted.
Certain Operational data appear to be impacted by the shutdown.

Action: we need to study the data of tests with shutdown to determine the number of hours that need to be excluded.

Action: All agreed to consider the data in more depth and come back with proposals.