

T13 Task Force Meeting

March 17, 2015 – Lubrizol (Wickliffe, OH)

Attendance

Sean Moyer (TMC), Jeff Clark (TMC), Mark Sutherland (TEI), Dan Lanctot (TEI), Jim Moritz (IAR), Luiz Garcia (IAR), Bob Salgueiro (Infineum), Pat Fetterman (Infineum), Elisa Santos (Infineum), Jim Gutzwiller (Infineum), Robert Warden (SwRI), Kevin Omalley (Lubrizol), Mike Conrad (Lubrizol), Jim Matasic, (Lubrizol), Bob Campbell (Afton), Greg Shank (Volvo), Riccardo Conti (XOM), Mark Cooper (Oronite), Jim Rutherford (Oronite)

Phone: Jim McCord (SwRI)

Starting Agenda

- Determination of Quality Index Values (TMC)
- Outlier Criteria for Liner Wear, Top Ring and Conrod Bearing Weight Loss (Rutherford)
- Test Method Review (All)
- Improved LTMS Discussion (Rutherford)

Meeting Notes

Greg mentioned that the API lubes group felt the test procedure needed a lot of work. The sections with “t12” scratched out may have had something to do with this.

QI Discussion

Jeff Clark reviewed the process for establishing Quality Index (QI) values. The system was based on the recommendations of the DACA II task force. Measurement of how far each data point is from the target.

QI levels below the threshold of 0.000 require an operational data review, they are not automatically invalid.

The study is 3 main steps: Operational data plots are shown to task force, QI Constants are determined, Operational validity is determined using these QI limits for each test.

33 Tests plotted for the discussion

Speed

T12 Range: ± 2.5 , T13 Selection: ± 2.5

Torque – If running a Torque Controlled Candidate, place in comments

This is going away, no QI values to be established at this time

Fuel Flow- If running a Fuel Flow Controlled Candidate, place in comments

T12 Range: ± 1 , T13 Range: ± 1 for now; needs to be revisited later. Candidate data, if run on fuel flow rate, should be supplied to TMC for calculations

Coolant Out Temp

T12 Range: ± 9 , T13 Range: Will design around stand A6-1 for U and L values to be just below 0.00, A1-2 should be positive value.

Oil Gallery Temp

T12 Range: ± 0.6 , T13: ± 0.3 . We seem to control fairly well until the oil breaks. Once it thickens the control becomes unstable at EOT and negative QI values should be commented on in the test report.

Inlet air Temp

T12 Range: ± 1 , T13: $\pm .6$

Inlet Manifold Temp

T12 Range: $\pm .8$, T13: Jeff to work on offline between A5-1 and G2-1

EGR Gas Out Temp

T13: ± 1 for now, subject for review based on T/C life

Fuel Temp

T12: $\pm .5$, T13: $\pm .5$. Some spikes and “rough patches” noted. Will go with the .5 deg for now.

Inlet Air Pressure

T12: Ranged, T13: $\pm .5$ kPa

Exhaust Back Pressure

T12: Ranged, T13: $\pm .4$ kPa

Intake Manifold Pressure

How we’ve been running: Ranged parameter for T13, target of 232kPa ± 5

Discussion on controlling intake manifold pressure closer to target. Consensus is to try and drive the set point closer to 232kPa, work with operational staff to minimize variability. If both targets cannot be hit, priority is manifold boost.

CO2 Data

Current: $2.06 \pm .05$, Future: 2.01-2.11%

Uncontrolled Parameters

Kevin mentioned that he was seeing trends with Oil Jet Pressure and Oil Sump Temperature from the matrix.

The option was presented about reporting test averages as only the middle portion of the test, not including the later hours once the oil has broken and things change.

Motion: Have two test averages reported; one for hours 48-192hr, and one for 0-360hrs

Validity Criteria

Oil Jet Pressure: It was decided that the next reference should be completed with the modified filter head shown in Riccardo's presentation from the Afton meeting. After much discussion, it then was decided that we shouldn't.

Limit for Oil Jet Pressure was **listed at 105kPa** in the notes from the February Task Force Meeting in Afton. This was used in selecting a low Jet Pressure run from the matrix to be removed from analysis, not for candidate validity.

Jim Matasic mentions that changes in hardware might result in a block that will not be able to meet a 110 or 120kpa limit. Greg responded that any hardware changes will result in an oil pressure going up, not down.

Oil Consumption Rate: No further discussion

LTMS

LTMS Data set as of 2/26 was shown. 3 eliminated, 2 aborted, and 3 new tests at that point. Some additional tests are now available.

One aborted test has a 360hr IRpk Ht value, but did not run that long

Lab A needs to resubmitted CMIR105822 as invalid along with the two other tests selected by the task force.

Motion: The three eliminated tests will be listed as non-chartable/invalid per the task force. Made by Sean Moyer, seconded by Bob Campbell. Unanimous approval.

Jim Rutherford's recommendation is that we use the improved system of LTMS2, but that we may need to evaluate alarm limits and continuous SA values.

Motion: The T13 test will utilize continuous severity adjustments (EWMA Chart Lab Action Severity of 0), the targets and standard deviations shown below, and a reduced-K value of 1.44 (Shewhart Chart Stand Severity). The LTMS draft document will be published by the TMC for the T13 portion of the LTMS. Made by Bob Warden, Seconded by Jim Matasic, no negative votes. TMC and TEI waive

Note: Targets for the oils below will not change, however the reference oil targets may differ slightly once the oil has been received. Intent is to maintain LTMSv1 and LTMSv2 (optimized), and review between all HD panels.

Reference Oil	IR Peak Height Mean	Standard Deviation
PC11A	142.7	12.4
PC11B	59.7	12.4
PC11C	121.1	12.4
PC11D	133.5	12.4
PC11E	59.2	12.4
PC11F	123.6	12.4

Reference Oil	KV40 Delta % Mean	Standard Deviation
PC11A	86.9	23.2
PC11B	25.2	23.2
PC11C	68.8	23.2
PC11D	77.6	23.2
PC11E	23.2	23.2
PC11F	87.1	23.2

Outlier Criteria and Metrology

Only evidence of cylinder profile is for CLW (higher #1)

Method: $\text{Max}(|\text{measurement of six} - \text{mean of six}|) / \text{standard deviation of six} > 1.8887$

Normalized values showed less response than raw data. Box plots were uneventful as well.

Liner wear data cannot be eliminated at this point

Piston Deposits – We measured on the matrix, but no reason to continue now (reference/candidate)

Humidity

Technology 3 does not like dew point, tech 2 likes it, tech 1 doesn't care.

Test Method

- KV100 run to D445
- Fuel Lubricity by HRFF, not SLBOCLE
- Many other changes!
- Start date/time: When test first reaches test conditions?
 - Need to separate an oil start date for when you've passed the point of no return vs. a test timer start time (t=0 for 0-360hrs)
 - New field on form 4 for start date and time

- IR T12 peak height method should be elevated to an ASTM procedure. The request shall come from the Mack Surveillance Panel (Mark Cooper and Greg Shank)
- Fuel sulfur measurements: D7039, D2622, and D5453 were called out and approved as suitable for use
- Further discussion followed on start date/time for reference tests.

Future Meetings

There was desire for a joint Surveillance Panel Meeting between the Cat, Cummins and Mack groups to review LTMS-Optimized pros and cons. No date is set.