

May 4, 2016

## Caterpillar Surveillance Panel Conference Minutes

### Attendees:

Jim Gutzwiller (Chairman), Bob Salgueiro, Elisa Santos – Infineum  
Jim McCord, Jim Carroll (Secretary), Robert Warden, Travis Koston – SwRI  
Hind Abi-Akar, Mark Jarrett – CAT  
Jim Matasic, Greg Miranda, Andrew Stevens – Lubrizol  
Sean Moyer – TMC  
Tim Rutherford, Robert Stockwell, Mark Cooper – Chevron Oronite  
Andrew Stevens, Bill Larch – Lubrizol  
Jim Moritz, Mey Dewey, Tim Griffin, Stacy Bond – Intertek  
Bob Campbell – Afton  
Bhaskar Prabhakar, Cliff Salvesen – Exxon Mobil  
Chris Taylor – VP Racing Fuels

### Teleconference:

Caroline Laufer – Infineum  
Jason Bowden, Matt Bowden

### Agenda Items

- The C13 procedure is unclear on how to handle the oil consumption regression if there is a shutdown. The procedure says to not include 4 hours of values after a shutdown, but nothing about using weighted segments like other procedures.

Mey Dewey presented the method using time-weighted averaging within each 50 hr period if there is a shutdown. Some revisions were incorporated into the write up by the panel and was completed as follows:

11.4 Oil Consumption—Using the 6 min oil mass measurements, determine the oil consumption in grams per hour by performing linear regression on the data for each of the ten 50 h periods. The oil consumption for a 50 h period is the slope of the regression line for that same period.

11.4.1, Exclude the first 4 h of oil mass data following any shutdowns or oil additions from the regression to account for the stabilization of the oil scale.

11.4.2 If any shutdowns occur during a 50 h period, the result for that 50 h period shall be the weighted average of all the regression slopes that apply to that period. The weighting of a regression slope is the length of run time associated with it. For example, a test experiences a shutdown at test hour 20. The slope for the first period of 16 h (hour 4 to 20) is 14.6 g/h, and the slope for the second period of 26 h (hour 24 to 50) is 28.6 g/h. The weighted average is calculated as follows:

$$\text{weighted average} = \frac{(14.6\text{g/h})(16\text{h})+(28.6\text{g/h})(26\text{h})}{16\text{h}+26\text{h}}$$

A motion was made to accept the revised method. The motion carried unanimously.

- There is disagreement of report precision of results between the report, merit calculation and limits table. The procedure (Table A8.2) says report deposits to 0.1 rating units and the report has 0.01 rating unit, but the merit table has whole number values for limits. Oil consumption is similar with 0.1 in the Table A8.2 and the report, but whole numbers in the merit table for limits.

Comment: D4485 has different precision than the ACC template.

Comment: It should be easier for users of the report to recreate final results from the data in the report.

Comment: Should we ask users what they want?

Comment: Don't use D4485 as a guide. Define the method in the test procedure.

The panel did not come to a consensus.

- How do we handle reporting oil consumption when there was a leak or confirmed turbo effect on OC? Can we adjust the OC data somehow to remove the influence of the leak or bad turbos?

Example: Intertek had a hard shut down and OC increased. Turbo was replaced and OC returned to earlier rate.

Comment: Maybe omitting the known problem period from data should be allowed with comment in the report on how data was handled. The report Comment should mention the known cause for an outlier, and identify viable data. There was discussion on how to word the directive to laboratories.

Action Item: Mey Dewey was 'volunteered' to produce a draft directive to the laboratories.

- 1N/1K humidity calibration instrument. The current procedure specifies a chilled mirror. I believe with the new technology we should be able to use something else with similar or better accuracy. It would be nice if we could extend the 24 hr. period as well.

The current text in the procedure was re-worded by the panel as follows:

"Calibrate the primary humidity measuring system during the stand calibration or within 48 h of the start of a stand calibration test with a chilled mirror dew point hygrometer or equivalent having an accuracy of + or - 0.55 °C at 24 °C dew point and moisture content in dry air of + or - 0.6 g / kg. Perform additional stand calibrations when ambient temperature and ambient humidity conditions differ from the last semi-annual ambient test condition to ensure that the stand humidity remains within test requirements."

A motion was made, and seconded, to accept the changes and incorporate them into the procedure. Motion carried with no waivers, or nays.

Action Items:

CAT will find out whether the panel agreed that a different heat exchanger could be used.

CAT will check with their vendor if a minimum order for the oil pump would be needed before production.

- COAT - Micromotion calibration by manufacturer may not cover the temperature range we use in the test.

Greg Miranda reviewed the Lubrizol experiments with Micromotion internal temperature readings. Lubrizol found a significant effect of MM internal temperature calibration (offset from actual oil temperature was ~4C.) adjusting to 90C caused a 1.4-1.7% difference.

Discussion started on reproduction of the experiment by other laboratories.

Opinion: 'Inlet and outlet pressure has more impact on aeration level.'

Opinion: 'If during the experiment you see changes to density and, when you go back to original settings you get the same result, then I don't think you should have to re-reference.'

There were discussions of how to adjust for a shift, and whether the Micromotion temperature reading should be calibrated. These questions were tabled until results became available.

- Discussion to rescind the prior motion was agreed to by the SP (no vote).

Hind drafted a motion to allow the agreed upon earlier experiment to be run by the laboratories without requiring another reference.

- Run the experiment as described by SP on a test oil, return the MM to original settings and generate data. Send the data to TMC for verification that the stand is still in calibration.

Jim McCord made the motion, Bob Campbell seconded.

One opposed (Mark Cooper), one waive (TMC). Motion carried.

- Engine Hardware

No discussion

- Update from Caterpillar

No discussion

- NEW C13 LINER timing and introduction with stand referencing

No discussion

Old Action Item:

Laboratories are to estimate due dates for their next C13 references to coordinate delivery and availability of liners by CAT.

- Any new issue from the engine labs

No discussion

- Old Business / New Business

None