April 10, 2018

Caterpillar Surveillance Panel Teleconference Minutes

Conference Attendees:
Mark Jarrett, Hind Abi-Akar – Caterpillar
Jim Gutzwiller (Chairman) Elisa Santos, Bob Salgueiro, Gang Hu – Infineum
Garrett White, Tim Griffin, Jim Moritz – Intertek
Demetrius Lytle, Alex Ebner, Andrew Stevens, Kevin O'Malley- Lubrizol
Jim Carroll (Secretary), Jim McCord, Travis Kostan - SwRI
Christian Porter - Afton
Dan Lanctot – TEI
Sean Moyer – TMC
Mark Cooper - Chevron

AGENDA

COAT
Review COAT runs on Oil-833 from Labs A & B and compare to initial Aeration System results from lab G
Review/compare Operational data from the 3 labs
Discuss next step, are we ready to run additional calibration tests?

C13 Deposit Test
Review reference oil Deposits by cylinder

Elisa showed slides of data from the five prove out runs with the new aeration systems
These data will be available on the TMC website shortly.

Tim: Did Lubrizol change the oil heat exchanger?
Demetrius: Yes we did.
Tim: Did everyone change springs in the oil filter holder?
All labs said yes.
McCord: (Regarding the oil pump out pressure) What units are these pressures reported in since ours would match if we went from kPaG to kPaA?
It was agreed that all units were kPaA.

Sean Why was there a drop in pressure in the last run at Intertek?
Tim: I don't know
McCord: I believe we went through and matched our oil pumps (high vs low flow pumps) early in test development.
Gutzwiller: We are supposed to be using the same pump.
Hind: Are these the values that have been seen all along?

McCord Except for the springs in the filter block everything is the same here.
Tim: I think my fuel pressure is in absolute which is why its ~100 more than SwRI's.
Demetrius: Our fuel pressure is in gauge.
Gutzwiller: All the labs need to confirm that we are reading fuel pressure in the same spot and with the same units.
Tim and McCord: The aeration system temperatures and pressures are much tighter with the new aeration systems.
There was discussion of the difference in gallery pressures between engines.at the start of test: Lubrizol ~550 kPaA, Intertek ~ 530 kPaA, SwRI ~500 kPaA.
McCord: Mark, in the field would you be concerned about 35 kPa difference?
Mark: No
Hind and Sean: What about with aeration?
McCord: Let's see if this the aeration ranks with pressures.
Mark: I think we were further apart before.
Gutzwiller: That was probably due to the narrow baffle heat exchanger at Lubrizol.
McCord: We had the lowest pressure drop.
It was noted that SwRI's JTech seems to need to be cleaned because blowby readings were erratic.
Demetrius: Ours is measured in gauge.
Sean: Send everything in data dictionary units next time.

Tim brought up the difference in the D4052 90C density used by the labs and did not see a concern.

Demetrius: We did not include the changes due to calibration. We could not get to 90C.
Carroll: You did not correct?
Demetrius: Yes.
Carroll: I believe we were supposed to do this.
Demetrius: We are pulling the insulation off and re-running.
Sean: The whole point was to do the same thing during this exercise.
Demetrius: we are not making this change yet. Our rtd did not match the oil temperatures.

Tim: Lubrizol had 12.1% aeration. At my lab it came in at 13.1%.
Hind: They all seem to be shifted higher than they were before.
McCord: Yes, ours was a bit lower before.

McCord: Do you think the difference in Tim' runs are due to filter differences?
Tim: It follows the oil pressures. If I have a shift in one
McCord: The blip may be a problem if it was later in the test. It would be good to know if the filter was the first off the roll or the last off the roll.
Hind: I don't know: It was the same batch.
Was it the same roll?
Hind: Yes, that is what we asked for

McCord: I found that the filter material density changed as you got to the center of the roll. We could mark the cans as they come off the roll we could then track them.
Hind: They were consecutive.
McCord: Who put the numbers on them?
Tim: TEI laser etches them as they are ordered.

Elisa showed more opertional temperatures to the panel

Hind would the sump temperature differences make a differences in aeration.
McCord: A little.
Gutzwiller: We went to a jacketed oil pan for this.
McCord: We argued way back about controlling sump vs. oil gallery.

Tim: I believe “Pressure Controller Voltage” is actually temperature

McCord: We have a limit of 50% on the output of the pressure controller and we are now at about that limit. Should we reconsider this limit?
Tim: They are all similar so maybe that needs to go away. The micro pumps are different. Since everyone is close to 50 we should look at it.
Gutzwiller: We will look at it in the future it may change for 832 oil and others.

Hind: Regarding sample oil pressure and temperature. How does everyone feel about this? Both seem to be tight.
Tim: They are all pretty tight.

Tim I would expect the RTD temperatures to be closer between the runs.

Tim: The raw tube frequencies over-lay at Intertek and the other labs.
Tim: We need to make sure all the coefficients are correct.
Alex: I think they are.
Carroll: The spreadsheets we sent are using those inputs in the calculations.
Tim: The difference in RTD could be affecting us.
Carroll: It’s not used in the calculation.
Tim: It could be affecting the steel.

Christian: Are we discussing the C13 liners on this call?
Gutzwiller: We do have a few results and charts for that. I’d like to finish these slides and then go on to it.

We looked at graphs of Oil Gallery Pressure and Oil Pressure Drop.
McCord: The build manual says the relief springs are set to 380 kPa.
Gutzwiller: High pressure dump is 700 kPa.
McCord: I thought the gallery was controlled to 380.

Mark: It starts opening at 380-400.
Moritz: You informed us there were 2 springs for gallery.
Mark: There should be 1 for gallery, there are 2 for relief valve.
Mark to McCord: You replaced the housing?
McCord: Yes, housing, springs, and cups.

Gutzwiller: Are we ready to run a test with 832 oil to see if we show separation?
McCord: Do we have the final value for aerations?
Lubrizol: unadjusted 12.08%, adjusted 12.56%
SwRI: adjusted 12.26%
Intertek: unadjusted 12.62%

McCord: we agreed to make the corrections.
Mark: This is doing the stand cal?
McCord: It is not going to move much. We all agreed to do it. This could bring everyone closer together.
Gutzwiller: Tim could recalculate the box G run and see what the results tell us.
Moritz: What's the accepted error in D4052?
Mark: Are we calibrating to 90C?
Alex: As high as you can go. And get best fit lines from D4052 matched to best fit line from the calibration.
Sean: We need to do a complete procedure review.

Hind: The outcome of this meeting is: Are we comfortable going on to the next test or do we need to review more data?
McCord: I think we need to run 832 oil.
Hind: Then we need to recalculate.
Mark: Other than oil pressure data its close.
Sean: It's (aeration) still over 2 standard deviations.out.
Moritz: There's still uncertainty

Lubrizol was ready to go to the next step and SwRI said the same.

Tim: Originally the calibrations were done with analog temperatures. I don't think the correction will make much difference.
Hind: What is the direction? We went through the exercise to reduce variability. It seems the engine is still a variable. Jim and Elisa, do you see any flags in your deep dive?
Gutzwiller: No, we are ready to see if we have separation.
Hind: I think we have done the most we could do and am comfortable.

Moritz: I motion to run an 832 oil reference test.
Seconded by Gutzwiller.
No discussion
None opposed
No waives
Motion carried

C13 Deposit Test

Elisa showed on screen TGC, R2TCyi, TLC, and OC graphs from Lubrizol's new cylinder run ratings.

Alex: TLC has gone milder over time. It may need a CF. There is a whole lot of data with Yi below 0.
Sean: It's close to triggering an industry alarm.
Alex: I don't see an issue with using the liners.
Gutzwiller: We will have to schedule to have another meeting to discuss a CF.
Sean: Just to be clear we have already approved the use of these liners.

Gutzwiller: I will reschedule the meeting for C13 Relative Profiles for Top Groove Carbon And Elisa will get with statisticians to look at the Industry action alarm for the liners..

Gutzwiller: We will need to get the notes from Hind regarding the bracket design.
McCord: We have 3D printing available here but it's not cheap.

Gutzwiller: I will have separate meetings for COAT and C13.