

July 14, 2017

Caterpillar Surveillance Panel Teleconference Minutes

Teleconference Attendees:

Andrew Stevens (Chairman), Bill Larch- Lubrizol
Jim Gutzwiller– Infineum
Jim Carroll (Secretary), Jim McCord, Gary Hammer– SwRI
Hind Abi-Akar, Mark Jarrett – Caterpillar
Jim Moritz, Garret White, Joshua Ward– Intertek
Sean Moyer - TMC
Bob Campbell - Afton

Priority Items

Alternative Strategy for C13 Boost Control

- Review of 1N Part ID codes procedure updates / Review of 1N Coolant Flow Op Data – Deciding Warmup/Cooldown “limits” for controlled systems
- Fuel Filter Part/Part No. Change – Tracking of part numbers and changes
- Valve Seal Issues **Not discussed**

Secondary Items

- C13 Liners Supply Source
- Proper recording of parts data for C13 (specifying serial number, date code, etc and ensuring consistency between labs) **Not discussed.**
- Proper recording of parts data for 1P (specifying serial number, date code, etc and ensuring consistency between labs) **Not discussed.**

Alternative Strategy for C13 Boost Control

Jim McCord showed photos of the turbo wastegate. He is using a lock nut to set intake manifold pressure at 284kPa. Putting a butterfly after the Modine intercooler allowed up to 15kPa delta P and pressure set to 280kPa. He is having a problem with drift, and think the operators are adjusting the wastegate. He is working on tuning the P control. Can get up to a 10 kPa delta P during these runs. Running now with a set wastegate. Can control well at 280kPa. Delta P is 4-10 kPa. Might get a larger control range by setting the wastegate higher at the start.

Initially it was a safety concern to keep people away from a hot wastegate. Putting an auto control on the wastegate had problems with sticking and getting a sudden high or low reading and going to a shut down. As the turbo accumulates run time, the wastegate needs more and more frequent adjustment.

SwRI is using the turbos as long as possible for consistency. If the wastegate sticks badly they pull it and unlock it but it gets looser each time. Normal replacement is due to too much chatter in the wastegate. Locking it in place gets rid of this problem.

Andrew: We use an air pressure actuator and have not had a control problem.

McCord: I had shut downs due to sticking and sudden release. Stepper motors also work well until the wastegate sticks.

Andrew: I get what you're doing technically. But you are putting more back pressure on the system.

McCord: There is up to a 15 kPa drop due to differences in intercoolers at different labs. Don't know if I will use this option on my referenced stand.

Andrew: If you want to do this with a reference stand, you should run it by the surveillance panel. Air flow dynamics have changed so it may affect the test.

McCord: Most tests are 2-3 kPa drop, but as they foul it can get to 8-10 kPa. Stands even without this system could have a 10 kPa drop.

Campbell. Measuring oil temperature at the turbo drain may show something.

McCord: There is no stream of oil, it is a froth there.

McCord: I looked at exhaust temperatures off of the turbo. There is some increase.

Jim G: We control exhaust backpressure. It would be interesting to see how that is affected.

McCord: I have pressures and temperatures at multiple locations in the exhaust.

Andrew: If you pursue this up to a reference stand. Then SwRI will need to show all data collected during the testing.

- Review of 1N Coolant Flow Op Data – Deciding Warmup/Cooldown “limits” for controlled systems

Andrew showed his revised Table A14.1 from the 1N procedure and collected data to help decide what updates were needed. He has Lubrizol and Intertek data.

Stage 1 and 2 have same flow

Stage 3 bumps up

Stage 4 and 5 have the same flow

During cool down the flows do not repeat on the way down.

Incorporated changes into table 14.1 fuel flow \pm 1 g/min

He put coolant flow into the table in L/min

Notes were added to state that if using an engine driven coolant pump then coolant flow is not controlled to specs. Range for coolant flow only applies to Stage 5. 120 second ramps between stages.

Gary: I have no issues. But plan to keep running with engine driven pumps until we run out.

Andrew: Anyone else?

The rest of the panel did not raise any concerns.

Andrew: I plan to run some shakedown tests. Do I run with a utility oil to see if I can replicate tests?

Sean: This change needs to be voted on by the Surveillance panel.

Andrew: We should propose the plan to validate it to the panel and see how they respond.

Sean: Add the new system trace to the collected data.

Mark: Add coolant pressure and temperatures with both the old and new system. How do we document the changes?

Sean: In the minutes.

Andrew: I will put together a bundle of data and comments to send out to the full panel.

Carroll: Please look into the cooldown flows between stages.

Jim G: Your graph doesn't show the complete cooldown.

Andrew: Yes, I will re-graph the warmup and cooldown data and include engine speed to show the stage changes.

- Review of 1N Part ID codes procedure updates

Andrew to Sean: Have you put the Powerpoint description on the website?

Sean: Yes.

Andrew to Jim G: Can you add this to the surveillance panel agenda? This is to finalize the Parts ID codes.

Jim G: Yes, will have to.

Sean: We can send it out as proposed changes and vote by email.

Andrew: Good we need to start using this.

Sean: Are the proposed changes OK?

Andrew: Who is responsible to get the email together?

ACTION Sean: I can, but I need to know if the draft I sent out is OK. I will send it out again for review.

Andrew: Put a note with it to give 1 week to respond.

Sean: Will do.

- Fuel Filter Part/Part No. Change – Tracking of part numbers and changes

Does CAT have any info?

Mark: It's a replacement and meets the specs. It looks to be finer.

Hind and Mark: We don't think it will impact the individual test, but should aid the longevity of the fuel system.

Andrew: Any other labs see these filters?

Gary: I have not noticed.

Andrew: We should make note of when we start using these filters.

Mark: We should document this. Maybe at the TMC website.

Andrew: Should we have a more formal way of tracking part number changes and part changes?

Hind: We need something central.

Bob Sean can put it in the TMC website. We can put just text on the website but it is possible. It is at a database system at TMC called TIMELINES.

Andrew: We can add changes to it.

Mark: What parts do we want to include? There are many parts that will have no effect.

Andrew: Bring it up in these meetings and see if it needs to be added. Mark, do you use a CAT system to track new parts?

Mark: Only when you look up a part you get a note saying there is a new PN.

Hind: We have a huge system, and cannot keep track of individual changes.

Andrew: Could we just put an EXCEL document at TMC?

Sean: Someone will have to make the changes once a document is begun.

McCord: Does the C13 test has a form like this?

Bob: What is the objective benefit and who will keep it up?

Hind: To keep track I had a Powerpoint file I kept updated. I still have it. We could send it out to the group. It has not been updated lately.

Andrew: I know what you are talking about. Maintaining document is not always done at the website.

Hind: We can continue to do this and be part of the ownership of the document.

Andrew: Are you going to research this? (to Hind)

Hind: I can begin to do this.

Mark: We should update it.

Andrew: We could put updates in the minutes also.

Gary: Mark, can you give us an update on the 1Y4016 piston crowns? They are not in the system yet.

ACTION Mark: I checked, and it was not in inventory. I can ask the suppliers about this after the meeting.

- C13 Liners Supply Source

Mark 108 pieces are to be available on July 21. PN 470-5896 (C13 liners)

Hind: Do we need to start working on the references?

Andrew: We can sync up with the other labs.

McCord: Ours is due in October, but we can run early. It's better to bring in new hardware while old hardware is available. So that comparisons can be made.

Mark: The liners have a different RP and look different. Tannish, if you clean it properly.
ACTION We should send out the cleaning procedure. Note: Later that day Mark sent around an email with the solvent and procedure. (Appended below)

Hind: Is there an Emerson trip update?

Jim G: August 15 and 16. With tour of production and calibration facilities. Plus discuss calculations and procedures. I will send out a note to all with agenda. Could set up a Webex meeting. Not planning a surveillance panel meeting, just COAT discussions. Plus we will send questions to Emerson.

End of Meeting

Appendix

Note from Mark Jarret on cylinder cleaning

All,

The new C13 liners have an RP on them which protects them better but it gives the liners a slight tan appearance to them after they have been run in an engine. It has no effect on the oil consumption, deposits or emissions. However, the appearance may give some concern for the oil testing so we investigated some various cleaning methods.

We found that cleaning with "Hydrosolv 4165" worked the best. We tested a number of different cleaners and the Hydrosolv worked the best. Attached is a data sheet on this product.

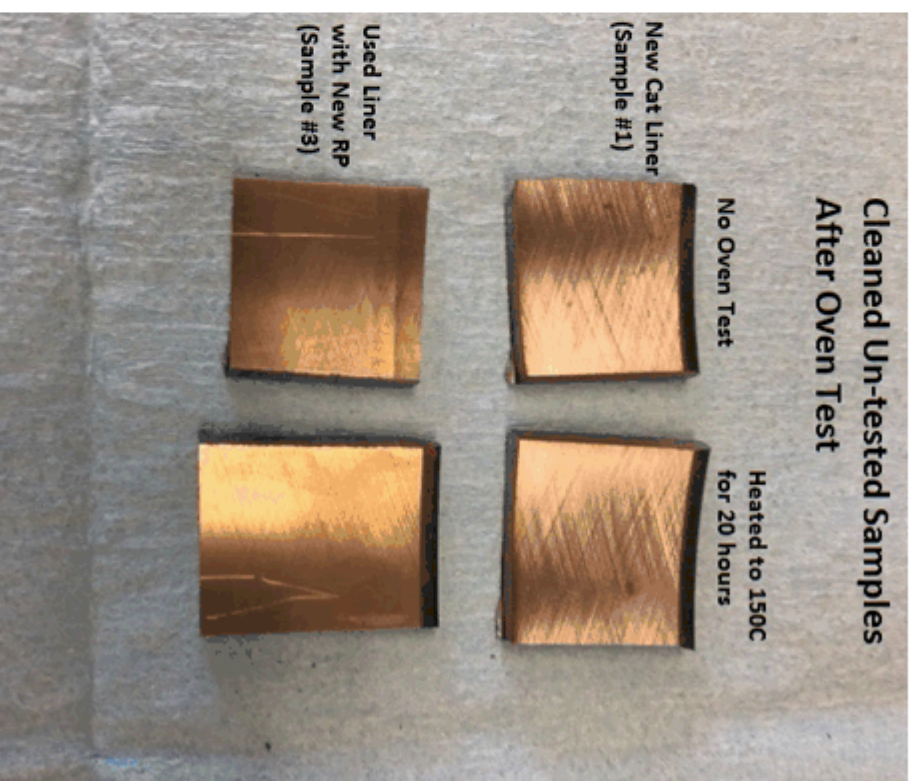
Please provide feedback on availability of this cleaner at the labs and if this is a workable solution.

Thanks,
Mark

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Oven Testing After Cleaning

- Pieces that were cleaned with Hydrosolv 4165 and not previously tested in the oven were heated to 150°C for 20 hours to see if discoloration would happen again
- No discoloration was seen after the oven test (see picture)
- When RP is completely removed with the Hydrosolv 4165, no discoloration is seen



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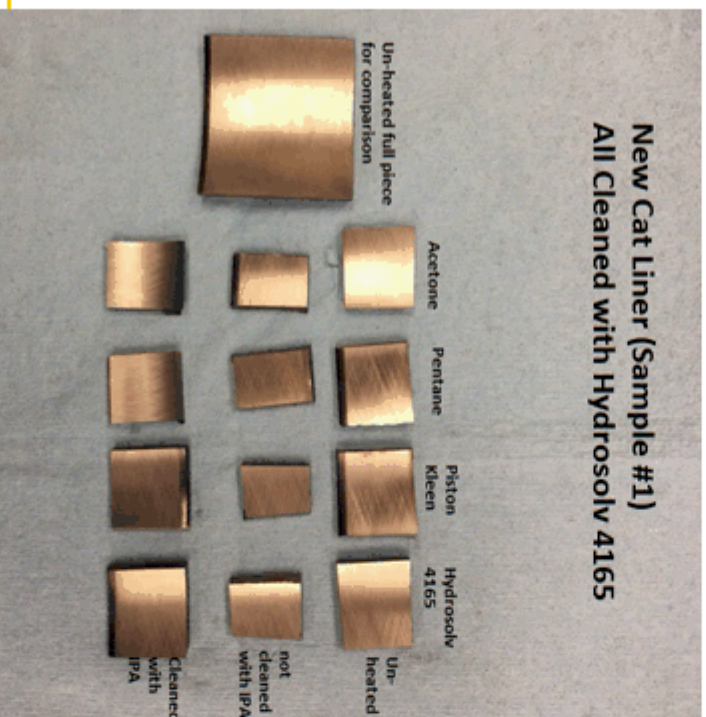
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Cleaning

- Each sample was cleaned with 4 different solvents
 - Acetone – polar solvent
 - Pentane – non-polar solvent
 - Piston Kleen – weak base
 - Hydrosolv 4165 – strong base
- Acetone, pentane, and Piston Kleen had little to no effect on the discoloration
- Hydrosolv 4165 cleaned the discoloration off completely



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