

MACK-Volvo Surveillance Panel Meeting Notes

04/08/2024 @ 11:00 A.M. EST

Attendees

SwRI: Isaac Leer, Robert Warden
Oronite: Josephine Martinez
Afton: Joseph Hoehn, Amanda Stone
Infineum: David Brass (Chairman), Elisa Santos, Jacob Goodale
Intertek: Garrett White (Secretary)
Lubrizol: Austin Brininger
CP Chem:
Haltermann:
Exxon Mobil: Paul Rubas
TMC: Sean Moyer
TEI: Derek Grosch
Ford:
Volvo:
John Deere: Ashu Gupta

Agenda

1. Volvo T-13 Parts Analysis
2. Volvo T-13 New Reference Oil Matrix
3. Volvo T-13 Oil Consumption Testing
4. Volvo T-13 Parts Batching
5. AOB

Action Items and Key Points

- Lubrizol performed profilometer traces of a 0521 and 0922 used piston. Both trace profiles were nearly identical with small differences in the 2nd grooves most likely caused by deposits.
- Lubrizol plans to conduct additional trace measurements of different date coded pistons and on different sets of rings.
- The panel agreed to not begin new PC-12 reference oil matrix testing for the T-13 out of concern that the tests may not generate full oil consumption data sets due to early emptying of the external oil weight vessel.

Summary of Discussion

Volvo T-13 Parts Analysis

- Afton shared oil consumption data for each 24 hour period from references. The data was used to compare the early oil consumption rate of batch D liners versus all other batches. Tests performed with batch D liners produced higher 48 and 72 hour oil consumption compared to other liner batches on the reference oil.
- David B – Do you know how these coordinated with the piston date codes?
- Joseph – I haven't finished that part yet of comparing this data to the piston date codes but will do so next.
- Lubrizol conducted measurements on two different date coded pistons which were 0521 and 0922, both of which were used in candidate tests. The test using 0521 pistons produced an average oil consumption of 19.9 g/hr. while the 0922 pistons produced an average oil consumption of 27.8 g/hr.
 - The 0922 pistons produced oil consumption in the first 100 hours ranging from 34.8 to 48.8 g/hr.
- Austin – Our metrology department worked on piston measurements. Profilometer trace used to generate profile of the ring grooves and lands. Profile scans and 3D scans taken. 0521 used as the baseline. The profile overlap shows pistons are similar. Only difference we noticed was a slight difference in 2nd ring groove but it might be from deposits or oil build up since these are used pistons. Will try cleaning again. We will also continue to measure pistons from other date codes. 3D scans also showed similar features and profile.
- David B – Do we have any new pistons of these date codes (0922 and 0521)?
- Austin – We do have a couple of kits containing 0922's. Might need TEI to send an old 0521 pistons.
- Afton does have a piston from 2016 which can be provided for measurement.
- Derek – If you need a specific date code of piston I can check and send if we have them.
- Austin – Interested in seeing the newer ones?
- David B – Yes, measurements of the newest date codes would be good. We could just be in a range of date codes that are bad. We could get outside of this range and possibly see better oil consumption performance with the latest pistons. Intertek's testing does show the rings are a factor though and should be kept in mind.
- Austin - We will investigate and measure the rings next.

Volvo T-13 New Reference Oil Matrix

- New reference oil matrix testing has been on hold due to T-13 parts issues causing elevated oil consumption.
- New batches of parts coming in soon but perhaps some similar date code parts.
- There are 4 stands in the industry which were used for coordinated referencing on 823-1. These are now off reference.
- David B - What are the labs thoughts on waiting to begin referencing? Any additional things that can be done to help move along the investigation into the high oil consumption?

- Austin – Is there a way to leverage these non-calibrated stands to help generate some data? Anyone referenced on 0423 pistons?
- David B shared a compiled slide of piston date codes from each lab's references on 823-1. No labs have performed reference testing on the 0423 date coded pistons.
- David B – My other question is what more do we need to do to be comfortable before starting a matrix?
- Garrett – What is the end goal? Are we targeting a certain oil consumption rate out of concern of finishing tests?
- David B – Really want to have the 48-192 hour average oil consumption under 30 g/hr. Line in the sand is 40 g/hr. since it seems anything over would result in an empty oil weight bucket before 360 hours.
- Austin – It would be beneficial to review ring data and leverage off-calibration stands.
- David B – We have 4 stands available per say. Additional screening of parts could be done in references on oil 823-1, with selection of parts. Derek, do we only have batch D liners?
- Derek – We have 1 kit of C liners remaining.
- David B – I don't think going back to batch C is of any use. Going through the piston and ring combinations would be the better route. When is the latest order of rings and pistons coming in?
- Derek – They should be coming this week.
- David B – We have not done any testing on February 2023 pistons or later. We do have 0922s available.
- Garrett – Can TEI confirm if we have any pistons before 0922 available?
- Derek – I believe we do.
- Based on a table shared by David there are no pistons from before 0922 available.
- David B – The rings are taken out of the power unit kits received from the dealer and then reassembled with different pistons, correct?
- Derek – Correct.
- Isaac – The key point when we saw the shift in oil consumption was in kit 854 which is also in line with the change in top rings to the 900000 series.
- David B – We do have April 2023 pistons to conduct runs at labs if doable. If there are older 900000 to compare to the newer 1000000 series it would be beneficial to add to the review.
- Garrett – Are there any concerns with using used pistons if we are short on new pistons?
- David B – I don't think we are short on pistons as we have a supply, but we are running higher OC with what we have. When will Lubrizol be able to complete the additional measurements on the pistons and rings?
- Austin - Metrology should begin the measurements Wednesday. We should have the data by end of this week.

Volvo T-13 Oil Consumption Testing

- 48-192 hour average oil consumption ranges from 21 to 33 g/hr. on reference oil 823-1.
- FTIR (peak height oxidation) and percent viscosity increase numbers vary. Based on this data set it is uncertain if oil consumption is affecting test results based on the data collected thus far on 823-1.
- Recap of testing at IAR on ring swaps in 3 run experiment provided.
 - Run 1 contained all original hardware from kit 939 and had a 48-96 hour average oil consumption rate of 44.4 g/hr.
 - Run 2 contained pistons and liners from kit 939 and piston rings from kit 866 and had a 48-96 hour average oil consumption rate of 26.9 g/hr.
 - Piston rings from kit 866 were chosen because the average oil consumption rate for this reference test from 48-192 hours was 25.3 g/hr.
 - Run 3 contained all original hardware from kit 939 and had an average oil consumption rate from 48-96 hours of 36.2 g/hr.
 - This repeat run was performed to determine whether liner wear-in from run 1 impacted the oil consumption rate in run 2. The results suggest that it did not.
- Garrett – From the TEI measurements, there appears to be a slight correlation in the ring gaps where high gaps seem to align with higher oil consumption. However, it does not trend with the larger data set.
- Joseph – Was a fresh oil charge performed each time?
Garrett – Yes, we also conducted the standard break in before the start of each run.
- David B – Early 2022 pistons might have better oil consumption performance. There is just 1 test with May 22 pistons with high OC, but September 2022 to early 2023 might be a group with higher oil consumption. At this time there might be a combination of a piston and ring issue.

T-13 Parts Batching

- With the current oil consumption issue it is recommended to batch parts. Most importantly the pistons, rings, and liners for the T-13.
- The process will take time. In the meantime, we need to determine a way of screening the pistons and rings.
- Derek – We currently have less than a year's worth of the current hardware on hand.
- Garrett – It will certainly help the test, but it will be a matter of whether or not Volvo or the manufacturer will be willing to do so.
- David B – Any further info on batching from supplier?
- Derek – I sent another email to my supplier on batching. Last week, their district parts manager visited and discussed this matter. Hoping for some traction after this meeting.
- David B – A 3-year supply would be best to get us through tech demo and early parts of PC-12.
- Isaac – One more comment I have is we had a break in which we saw the oil weight dropping at a significant rate. In the turbocharger, the seal on the shaft appeared to be leaking oil on the compressor side. Something else to keep in mind when running tests.
- David B – When did the turbo design shift?

- Isaac – The design did not change. This is something we noticed 1 time and wanted to bring up for other labs to keep an eye on. Each test we start with a new turbocharger.
- David B – What was the fix?
Isaac – installing a new turbocharger.
- Garrett – Are any of the other labs starting with new turbos?
- Joseph – We don't run a new turbocharger for each run.
- Austin – Not common for us. Haven't observed this happening before.

AOB

- Surveillance panel mailing list: Companies are requested to review their mailing list and inform David Brass of any changes that need to be made.

Next Meeting Date/Time

April 22nd at 11:00 A.M. EST

Meeting adjourned 4/8/2024 at 12:32 PM EST