

MACK-Volvo Surveillance Panel Meeting Notes

03/19/2024 @ 2:00 P.M. EST

Attendees

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

Agenda

1. Volvo T-13 Oil Consumption Testing (IAR)
2. Volvo T-13 Parts Analysis
3. AOB

Action Items and Key Points

- Run 1 and run 2 of the oil consumption experiment at Intertek have completed. Run 1 contained piston rings from a newer kit number (939) which produced an average oil consumption rate from 24 to 96 hours of 44.4 g/hr. Run 2 contained piston rings from a used reference test kit (866) which produced an average oil consumption rate from 48-192 hours of 25.3 g/hr. This run produced an oil consumption rate from 24 to 96 hours of 26.9 g/hr. Run 3 (which was a repeat of Run 1). Run 3, which is a repeat of Run 1, at the time of the meeting, was 39 hours in with an oil consumption rate from 24 to 39 hours of 39.2 g/hr.
- Lubrizol to meet with their internal metrology group to determine what detailed measurements can be taken of the T-13 pistons.
- Intertek to review the TEI piston ring data for kits 866 and 939 and to provide a response on whether they will be able to conduct another 96-hour run using different date coded pistons.

Summary of Discussion

Volvo T-13 Oil Consumption Testing (IAR)

- Garrett presented data on the oil consumption experiment runs performed at Intertek.
 - All runs were performed with reference oil 823-1 and ran to 96 hours.
 - Run 1 contained all original hardware from kit 939 and had a 24-96 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 24-96 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. Currently, 39 hours have been completed. The oil consumption from 24-39 hours is 39.2 g/hr.
 - This repeat run was performed to determine whether liner wear-in from run 1 impacted the oil consumption rate in run 2.
- Robert W – What are the next steps?
- Garrett – Conduct a deeper dive into the ring measurements of 866 and 939, then identify any differences.
- David – Is it looking like it will take a couple more days to run?
- Garrett – Yes, we do plan to complete the run to 96 hours to confirm the current oil consumption rate seen from 24-39 hours.

Volvo T-13 Parts Analysis

- David shared reference oil data in order of lowest to highest average oil consumption rates from 24 to 96 hours and 48 to 192 hours. It appears peak height oxidation and delta viscosity are not directly impacted by oil consumption within this range of rates.
- David – Although results are not impacted based on this data the concern is running tests that will stop early due to insufficient oil volume.
- David shared a table of reference test data containing oil consumption rates with their respective piston date codes, in order from lowest to highest oil consumption rates. All data in the table is with reference oil 823-1, except for the run on CMIR 172877 which used reference oil 823.
- There appears to be some correlation with piston date codes 0922 and newer producing higher oil consumption rates.
 - 09 signifies the 9th month of the year (September) and 22 signifies the year (2022) in which the pistons were produced by the manufacturer.
- Sean – My initial reaction is the data is compelling but the middle run with 0522 date coded pistons had elevated oil consumption. (Referring to reference run on CMIR 177775).
- David – This may not just be just a piston issue. Rings changed around kit 854 so it's possible we ended up with a combination of good pistons and bad rings.

- Garrett – Is there anyone at MACK/Volvo to ask about possible design changes?
- David – We can reach out to them, but I am not sure we will receive a response.
- Isaac – Have we tried reaching out directly to Mahle?
- Derek – We have not.
- David – Perhaps we need to start batching additional parts with what has occurred recently with the oil consumption rates.
- Derek – We met with one of our dealers about batching rings and pistons. Things were moving along but COVID happened, and the discussion fell off the table. I reached out 6 months ago, and they do not seem to have interest in doing batched parts.
- Isaac – Through Volvo or Mahle?
- Derek – Through Volvo.
- Jacob – Do you think we have enough instances of high and low OC runs to conduct a deep dive into the measurements of the rings and pistons?
- Derek – We really do not have the capability to measure pistons. Most of what we could do is measure things like groove widths, not so much measure chamfer angles.
- Austin B – I can speak with our metrology lab to see if they can conduct detailed measurements.
- Garrett – How often would you say the same piston rings stayed with the pistons that came in the power unit kits, if at all?
- Derek – Almost never.
- David – The main concern is whether the tests will be able to finish without running out of oil. It would be beneficial to run similar testing to what Intertek is completing but with pistons.
- Sean – Is all this data on 823-1?
- David – The only exception is the top row for stand A2, CMIR 172877 run.
- Jacob – Low hanging fruit would be to complete a detailed analysis of the rings used in Intertek's experiment runs.
- David – if it's possible it would also be beneficial to look at the pistons before and after the 0922 date code.
- Derek – I have a piston from June of 2015 that we could measure and compare to the current ones.
- Austin – We had one from 2021 and a recent candidate piston pulled out for comparison.
- Derek – If Austin can do the measurements, I can send a set of the April 2023 pistons. They might have differences in comparison to the 0922's.
- David – What is Intertek's appetite on running another test?
- Garrett – I will need to speak with upper management about another run before we commit.
- David – To recap it looks like we have some compelling data from Intertek's experiment runs and some correlation with piston date codes before and after 0922. Lubrizol is going to check with metrology on measuring pistons. Compare 866 and 939 pistons.
- Garrett – Just to clarify we have 0123's running in all runs of the experiment, and we did see oil consumption come down in run 2. So it's possible the newest piston date codes are good based on the experiment run data.
- David – There might just be a short time span of pistons from 0922 to a more recent date that performed poorly. The idea would be to use newer pistons from after 0223 (Feb 2023) and see

how oil consumption is influenced. It is possible that if we got pistons produced in the last year that they would be better. It would be beneficial to batch if possible.

- The group agreed roughly 3 weeks' time would be needed to complete the action items created in this meeting.

AOB

None

Next Meeting Date/Time

April 8th in the afternoon. Specific time to follow.

Meeting adjourned on 3/19/2024 at 2:54 PM EST