

# MACK-Volvo Surveillance Panel Meeting Notes

## 04/22/2024 11:00 AM EST

### Attendees

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

### Agenda

1. Volvo T-13 Oil Consumption Discussion
2. Volvo T-13 Parts Analysis
3. Reference Oil 823-1 Testing Plan

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### *Action Items and Key Points*

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- Lubrizol to begin a reference test early May using pistons with date codes containing the year 2019 and ring sets with serial numbers higher than 1000000.
- At the time of the meeting, Afton was 72 hours in on their reference test. The average oil consumption rate through this test hour was 37.8 g/hr.
- Lubrizol completed dimensional analysis of rings used in recent testing. Some dimensional differences found in the top and 2<sup>nd</sup> rings, with the largest differences found in the 2<sup>nd</sup> ring top segments and outer bevel on the liner side.

## Summary of Discussion

### Volvo T-13 Oil Consumption Discussion

- A scatter plot of average oil consumption rates from 48-192 hours and 48-96 hours on reference oils 823 and 823-1 was shared. This data begins at the point of when humidity control was introduced and up to now.
- Mid-2022 is when the oil consumption rate from 48-96 hours had a noticeable increase with some tests ranging as high as 35-45 g/hr oil consumption rate.
- The historic average for oil consumption from 48-96 hour is 26.5 g/hr while the 48-192 hour historic average is 24.8 g/hr. 65 tests made up both calculated averages.
- Tests that have oil consumption over 45 g/hr for an extended period might not complete 360 hours due to low oil volume. Tests that had this high of oil consumption had no data reported for oil consumption at the end of 360 hour period.
- Intertek completed a 3 run experiment with change of rings from a reference. The reference test on kit 866 completed with 48-96 hour average oil consumption rate of 29.4 g/hr. Run 1 of the experiment used all hardware from kit 939 and produced an average oil consumption of 44.4 g/hr. Run 2 of the experiment used all kit 939 hardware with the exception of the rings which came from kit 866. Run 2 produced an average oil consumption rate from 48-96 hours of 26.9 g/hr. Run 3 was a repeat of run 1 which produced an average oil consumption rate from 48-96 hours of 36.2 g/hr. First run with kit 939 and then rings from kit 866, switched to originals in 939 and found oil consumption jumped back to 36.2 g/hr. Conclusion drawn is that the rings may be a driver of the initial elevated oil consumption seen in recent tests.
- Pistons in kit 866 were from August 2022 and the pistons in kit 939 were from January 2023.
- Top rings in kit 866 had serial numbers ranging from 903000-934000 while top rings in kit 939 all were 101700.
- 2<sup>nd</sup> rings in kit 866 had serial numbers ranging from 897000 to 934000 while 2<sup>nd</sup> rings in kit 939 ranged from 998000 to 1020000.
- Oil rings in kit 866 ranged from 900000 to 945000 while oil rings in kit 939 ranged from 950000 to 974000.
- No noticeable measurement differences between the 900000 series to 1000000 series rings based on data supplied by TEI. 800000 to 900000 saw a shift in some measurements.
- Oil consumption shift also occurred around the point of using pistons with a starting date code of 0922 or newer.
- Oil consumption seems to be highest with the combination of D liners, piston codes 0922 or newer and rings stamped with serial numbers 934,000 or higher.
- Volvo has been engaged about this issue; however, no answer has been provided yet. Hopefully will receive an answer within the next week or two.
- Different colored pistons have been seen. Pistons with date codes ranging from 2019 to 2020 seem to have a darker/blacker coating. Newer pistons with date codes from November 2022 to April 2023 have a greener/lighter coating.
- Another item that appears to have changed on the pistons is the starting number for the date codes. Older pistons have a Julien 5-digit code, 24922. Newer pistons have a P number. Depending on what month they were produced in. This might mean a different manufacturing site. David B will investigate this further through Volvo to find out what the change means.

- Garrett - Did Lubrizol see this P code and 24922 on the pistons they measured?
- Austin – I don't recall seeing a P number but can check.
- Peak height oxidation and percent viscosity increase values shared of reference tests performed on 823-1. Not seeing a severity shift with the increased starting oil consumption.
- One thing to note about the table of reference data shared is the runs were all in different stands.

### **Volvo T-13 Parts Analysis**

- Lubrizol performed a dimensional analysis of the piston rings used in a low oil consumption and high oil consumption test at their lab.
- The first set of rings were from a high oil consumption test which had 0922 pistons along with top and 2<sup>nd</sup> rings ranging with serial numbers from 964000 to 976000.
- The second set of rings were from a low oil consumption test which had 0521 pistons along with top and 2<sup>nd</sup> rings ranging with serial numbers from 621000 to 671000.
- Very little differences were found in the top rings.
- The 2<sup>nd</sup> rings showed the most difference.
  - Outer bevel of the 2<sup>nd</sup> rings used in the high oil consumption run were 49.40 microns larger at the max difference point compared to the 2<sup>nd</sup> rings used in the low oil consumption run.
  - The top segment of the 2<sup>nd</sup> rings used in the high oil consumption run were 92.51 microns larger at the max difference point compared to the 2<sup>nd</sup> rings used in the low oil consumption run.
- Austin – We are talking internally about pulling older ring kits and measuring to determine other differences in other serial number groups as well.
- Derek – We might have a box full of rejected top and 2<sup>nd</sup> rings. These rings were rejected for stains, not dimensional concerns. Will send over info to Lubrizol if they are interested in them.
- Most pistons on hand at TEI are February and April 2023s. Some older year pistons trickling in with the power unit kits. There is 1 kit worth of 2019 pistons. Older pistons coming in at a slow rate with older rings in the 500000-600000 serial number range.
- TEI has 1 set of batch C liners. The remainder are batch D liners.
- Lab D running reference on 823-1 using pistons coded with 0423, top rings stamped with 1017729 and batch D liners.
- Joseph – We are 72 hours into the test. The average oil consumption so far is 37.8 g/hr. Everything else looks good operationally. This is within the same range as what has been recently seen starting out in other tests here.
- David B - When will labs need to run references?
- Austin –Lubrizol is ready to conduct a reference. Willing to help where needed in whatever combination is needed and can start in the next couple of weeks.
- David B – Is TEI able to easily obtain the older piston date codes?
- Derek – I'll reach out to the dealer to see if there's any help they can provide.
- Robert – We are a couple months out before we would be ready to run a reference.

- Garrett – Intertek is along the same timeline, a couple of months away from starting our next reference.
- Garrett – I think it would be beneficial for Lubrizol to run the oldest pistons with the newest rings with 1000000 serial numbers or higher. This would mean going to the opposite end of the extreme of what we at Intertek did in the 3 run experiments. Would also be beneficial to have Lubrizol do pre-test profile traces and rings analysis.
- David – We do have one run from lab A like that combination with some older pistons and the early 900000 rings which produced low oil consumption.
- Derek – We will assemble a kit for Lubrizol with the 2019 pistons and the 1000000 serial numbered rings.

#### **Reference Oil 823-1 Testing Plan**

- David B – What more do we need to see to consider running the new reference oil?
- David B – If Lubrizol were to start their reference, it would be roughly early May. Afton just started their reference and will most likely finish in a couple weeks.
- David B – The recommendation to Lubrizol is to run older pistons with newer rings in their next reference. Derek, could you build a kit with the 5 0119 pistons and 1 0619 piston along with the newer 1000000 series rings?
- Derek - Yes.
- TEI to also send the box of older series rings that were rejected for stains and minor defects to Lubrizol for comparison measurements.

#### **Next Meeting Date/Time**

May 13<sup>th</sup>, 2024 at 11:00 AM EST

Meeting adjourned 04/22/2024 at 11:47 AM EST