MACK-Volvo Surveillance Panel Meeting Notes
04/22/2021 @ 10:00 AM EST

Attendees

SwRI: Robert (Bob) Warden, Isaac leer, Jose Starling, Michael Lochte
Oronite: David Lee, Josephine Martinez
Afton: Christian Porter, Bob Campbell, Brent Calcut, Todd Dvorak
Infineum: David Brass (Chairman), Elisa Santos, Jim Gutzwiller
Intertek: Garrett White (Secretary), Pablo Ramirez, Martin Chadwick, Juan Vega
Lubrizol: Nick Ariemma, Jim Matasic
CP Chem: Jon VanScoyoc
Haltermann: Prasad Tumati
Exxon Mobil: Paul Rubas, Steve Jetter
TMC: Sean Moyer
TEI: Derek Grosch

Agenda

1. Mack T-11/T-12 Parts
    a. Update from SwRI on OC Tests
    b. Piston Crown Analysis
    c. Next Steps
2. Volvo T-13 New Engine Referencing
3. Volvo T-13 Alternative Fuel

Action Items and Key Points

- SwRI OC experiments in the T-12 show a strong correlation between batch F crowns with serial numbers ending with A and high oil consumption. In comparison batch F crowns with serial numbers ending with E produced lower oil consumption.
- Derek to contact the manufacturer for the batch E crown measurements and to follow up with the dealer on whether the same or similar date codes for the next batch of rings (batch Y) can be obtained.
- **Motion passed** to run T-12 coordinated references with W liners, X top rings, X 2nd rings, X oil rings, and Batch F subgroup E piston crowns, Y connecting rod bearings and P main bearings. X rings (top, 2nd and oil rings) to be saved for the T-12.
- **Motion passed** to increase the 20-character cylinder ID cells to 25 characters on Form 14 of the T-12 report and Form 10 of the T-11 report.

- All labs will need submit new T-11 and T-12 reports with the F batch crown subgroup identifiers in the format agreed upon in the motion above for the non-chartable reference runs with the new hardware. Format is batch letter, 4-digit code, and subgroup letter (i.e. F4940A).
- **Motion passed** to add tables for reporting the average OC from 25 to 100 hours in stage 1 (phase 1) on T-12 (form 8) and T-12A (form 6) reports.
- Afton will conduct their first T-13 reference in their new stand using an old (current) block rather than the new style engine blocks.

Summary of Discussion

Mack T-11/T-12 Parts

Isaac from SwRI provided an update on their OC experiments in the T-12.

- Cylinders 1-5 used piston crowns from their recent high oil consumption reference run, all of which had serial numbers ending with the letter A. Cylinder 6 used a crown with a serial number ending with the letter E. Phase 1 oil consumption average was 55.6 g/hr.
- Their next run (Stage 7) used crowns with SN's ending with E in all 6 cylinders and oil consumption came down to 19.2 g/hr for phase 1 and phase 2 90.4 g/hr.
- Garrett – Were oil samples obtained during this experiment and were they accounted for in the oil consumption measurement?
- Isaac – No oil samples were pulled.
- Bob Campbell – How long did each phase run?
- Isaac - Phase 1 ran 50 hours, phase 2 ran 10 hours.
- David – Were the first 25 hours taken out for phase 1?
- Isaac – Yes, only the data from 24-50 hours were used for OC calculation.

David shared data on the different casting codes from the batch F piston crowns.

- 6 different casting codes found; each casting number had a wide range of manufacturing codes spanning the course of over 1 year.
- FM claims the differences in casting would not have a substantial impact on oil consumption.
- Timeline deciphered from manufacturer codes. Julian date code. (yyddd)
- 3-4 groupings of crowns based on manufacturing date at plants were found.
- The spread in manufacturing dates is from May 2019 to October 2020.

Measurements from the manufacturer for the F batch piston crowns and their different subgroups (different letter ending SN's) were presented by David.

- All sub-groups' data was plotted and compared for any major differences.
- Measurements included the following: top land top diameter, top land bottom diameter, 1st groove root diameter, 2nd land top diameter, 2nd land bottom diameter, 2nd groove root

diameter, 3rd land top diameter, 3rd land relief diameter, 3rd groove root diameter, 4th land diameter, 1st groove position (top of piston to center line of 1st groove), 2nd groove width, 3rd groove width, component height and pin hole diameter (vertical and horizontal) and overall component height (from center of pin hole to the top of the crown)

- Martin – Were measurements taken of the chamfers?
- David – Chamfer data not provided in this set.
- F crown batch subgroups included (blank), A, B, C, D, E, and H (ending SN letters)
- 1st groove diameter over rolls, subgroup E rolls seem higher than others. Matches subgroup D the closest.
- 1st groove widths at the gage diameter for subgroup E were closest to the manufacturer's target.
- First 3 groups were manufactured in some order. But the groupings themselves may have been only 100-200 crowns and then jumped to the next group (change in ending SN letter)
- Span of TEI found manufacturing codes, 19134 to 20304. This would be from May 2019 to October 2020.
- Elisa – Do we know which subgroup E crowns are being used in the SwRI runs?
- David – Crowns from 350 to 960 of subgroup E have been used in the SwRI runs.
- Groove root diameter, very back diameter of groove
    - Most of the subgroups are close to manufacturers target, not much spread or variance noted.
- 3rd land top diameter, 3rd land relief diameter, 4th land diameter.
    - 3rd land relief diameter for E crowns is higher than other crowns, other crowns are slightly below the manufacturers target.
- Elisa – Could the fliers in the E group be screened out? There is a small group far below most of the subgroup E crowns.
- David – We could potentially screen out the crowns and toss whichever do not meet the tolerance band. Will discuss further in our next steps for the T-11/T-12 hardware.
- 3rd land relief diameter major differences, higher diameter of over rolls in subgroup E also found.
- Top ring seating and oil ring seating both critical for oil consumption according to the manufacturer.
- Pablo – Do we have any batch E measurements?
- David – We do not have the full manufacturer measurements for batch E.
- **Derek – Will follow up with them to see if they have them.**

David presented an updated summary table composed of all T-11 and T-12 runs on the new hardware.

- Table now grouped by matching hardware combinations.
- The initial T-12 coordinated reference runs produced phase 1 oil consumption around 40 g/hr and phase 2 oil consumption around 100 g/hr in phase 2. Most batch F crowns used in these runs had serial numbers ending with A (or subgroup A).
- Target OC is 25 or less in phase 1 and around 90 in phase 2 for the T-12 going forward.
- Batch F subgroup C crowns ran at Intertek had phase 1 oil consumption of 34 g/hr. Phase 2 oil consumption was 91 g/hr.

- Most batch F subgroup E crown runs produced OC around 19 g/hr in phase 1 and 90 g/hr in phase 2.
- Pablo – Intertek's current T-11 reference with hardware combination WXXXE is currently at about 26 g/hr.
- Steve – Is the crown batch E or batch F subgroup E?
- Pablo – It is a batch E crown, not a subgroup of F batch.

David presented current inventory levels for T11-T12 hardware.

- W liner, X top ring, X 2nd ring, X oil ring, F piston crown, Y connecting rod bearings, P main bearings are hardware batches to be used in the T-12.
- Currently limited by the X 2nd rings, only 83 kits worth remaining
- Top rings and oil rings are also close to those levels.
- Out of all the subgroups for batch F crowns, subgroup E is the largest number of crowns on hand at 831 (approximately 138 kits).
- Derek - Total number of rejected piston crowns have been 1-2 so far. Total F crowns we have on hand is 2682.
- David - Most of the F batch crowns used so far in testing have been from subgroup A.
- Based on manufacturer's date code, H subgroup could be close to E crowns as far as performance and manufacturing. There are approximately 20 subgroup H crowns at TEI.
- H was created since E subgroup reached 999, highlighting they are likely similar to subgroup E.
- David – Do we have enough data generated to step into a coordinated reference test using the before mentioned hardware batches and subgroup E crowns from batch F?
- Garrett – Will we have to run coordinated references with each subgroup?
- David – We will have to bring in other hardware too such as bearings and rings so we could also introduce the new subgroups at the same time.
- Martin – We could move forward with subgroup E and continue measurements to identify the driver.
- David – Most concerned about A subgroup. We have about 4 other subgroups that could get the test going.
- David – Derek, at what point would we order the Y grouping of rings?
- Derek – We can order them at any time, but they will be PNB (parts not batched). They will come from the dealer network.
- David – Is it possible to request all same date code of parts?
- **Derek – I can talk to the dealer and see if they have a big group of rings and bearings of the same or similar date codes but there are no guarantees. They already informed me they would not be making batches.**

David – Motion to run T-12 coordinated references with W liners, X top rings, X 2nd rings, X oil rings, and Batch F subgroup E piston crowns, Y connecting rod bearings and P main bearings. X rings (top, 2nd and oil rings) to be saved for the T-12.

Bob Warden seconded the motion.

Opposed: None

Waive: None

Motion Carried

- Christian – How do we handle the other references already performed?
- Sean – They will be designated as non-chartable (NC).
- Martin – If the labs do not have the Batch F subgroup E crowns, can the ones they have on hand be shipped back and exchanged?
- Derek – Yes, we will exchange them.
- Bob – Do we want to set a target date for beginning the references?
- Garrett – Intertek would be ready in about 2 weeks.
- David – Middle of May time frame ok to begin the references?
- Lubrizol and Afton mentioned end of May would be more likely for their lab.

T-11 hardware was discussed since all X batch rings are now reserved for the T-12 only.

- David - Since all X rings are blocked off for T-12, we need to discuss how to move forward with T-11.
- This will leave W liners, W top rings, W 2nd rings, and W oil rings.
- Martin – Looks like the W 2nd ring will be the limiting factor for the T-11.
- David - All parts, with the exception of the Y top ring, are allowed to be used in the T-11.
- Derek – From September 2019 to now about 21 kits were purchased.
- David – What top ring goes into the new ring sets? We currently only have 21 kits for W ring sets (limited by 2nd ring inventory). Do we move on to the Y top rings?
- Martin – Do we need to send back the T-11 kits with X rings in them?
- David – I would say it should be ok to run those off in the T-11. Future kits will have the changes.
- Sean – Since there is no place on the report forms to input crown serial numbers, please place them in the comments on the report.
- David – Part numbers for the crowns all have a letter on the end of their number. This is in the report.
- David – Could we do a 2-letter code for the crowns in the report?
- Sean – 12 characters are allowed for the piston crown batch identifiers in the data dictionary. We need to agree on a format.
- David – Statisticians, would it better to do a – or ().
- Martin - FE or F-E is better, no parentheses.
- David – I propose F-E for the format.
- David – Blank would be F-?

- Jim G – Could we include the 4940?
- David – That may be a better route. Format would be F4940, F4941A.
- **David – NC runs will need to be re-reported to include subgroup crown data.**
- David – Same for the T-11?
- Sean – We do not have the batch code identifier in the report for the T-11.
- Final format. Batch identifier, 4-digit code, and ending letter i.e. F4940A
- Martin – How are the T-12 batches being reported?
- Bob Warden - Currently providing cylinder kit ID and then the batch codes for the hardware below.
- Sean – Kit ID number can be up to 20 characters.
- David – Is it possible to increase the character number?
- Sean – Yes, just need a motion and vote.

David – Motion to increase the 20-character cylinder ID cells to 25 characters on Form 14 of the T-12 report and Form 10 of the T-11 report.

Garrett seconded the motion.

Bob Warden – It would be good to expedite the process.

Opposed: None

Waive: None

Motion Carried

- Total number of characters would be 15 at this time when reporting the piston crown information.
- Sean – One lab has been leaving off the batch codes on the cylinder IDs.
- Isaac – Do we want to add a phase 1 OC field?
- David – Motion to add phase 1 OC field in the T-12 and T-12A data dictionary report going forward.
- T12A report does not contain OC, we will have to add a field into the T-12 report.
- Bob – Does it need to be on a Form?
- Sean – Yes, for it to be in the data dictionary it will have to be on a form.
- Martin – Form 4 has more room at the bottom where MRV is reported.
- David – OC reported would be from 25 to 100 hours?
- Sean – Average of the OC or just OC at 100 hours?
- Isaac – Average would be better.

David – Motion to add tables for reporting the average OC from 25 to 100 hours in stage 1 (phase 1) on T-12 (form 8) and T-12A (form 6) reports.

Garrett seconded the motion.

Opposed: None

Waive: None

Motion Carried

- Jim – Could we have a table listing what hardware can be ran and not ran?
- David – No new T-11 kits will consist of WXXXF combination of hardware. New T-11 kits for now will have WWWWF combination until hardware levels have been depleted. Labs that do still have T-11 kits with WXXXF combination can still use them in testing.
- Martin – Basically no X rings be in the T-11 kits at this time.
- David – Labs will need to count how many T-11 kits they have on hand now and what batches. They can be used now but future kits will not have that hardware in there.

Volvo T-13 New Engine Referencing

Christian – We (Afton) will move forward with running an old (current) block for referencing our new stand.

Meeting adjourned: 11:59 AM EST

Next Meeting Date/Time

May 13th @ 10:30 – 11:30 AM EST