

# Sequence IVB Sub Groups | MINUTES

REVISION DATE: 8/6/2018 3:49:00 PM

<b>Relevant Test:</b>	Sequence IVB
<b>Note Taker:</b>	Chris Mileti
<b>Meeting Date:</b>	07-31-2018
<b>Comments:</b>	Conference call for Sequence IVB Precision and Procedure Sub-Groups.

## 1. DISCUSSION:

### 1.1. Section 4 of the Engine Assembly Manual (Intertek):

- 1.1.1. Intertek distributed a draft for Section 4 prior to the previous sub-group conference call.
- 1.1.2. Intertek has not yet received any feedback from the other labs.

#### 1.1.3. Comments from Lubrizol:

- 1.1.3.1. Lubrizol has reviewed the document.
- 1.1.3.2. Lubrizol does not plan to use this procedure until it experiences a camshaft lobe failure.
- 1.1.3.3. However, it supports incorporating Section 4 into the Engine Assembly Manual.
- 1.1.4. Intertek asked Afton and Southwest to review the document at their earliest convenience.
  - 1.1.4.1. Section 4 will be incorporated into the Engine Assembly Manual once the remaining two labs approve it.

#### 1.1.5. Comments from Intertek:

- 1.1.5.1. Intertek has used Section 4 to rebuild (5) engines that have experienced camshaft lobe failures.
- 1.1.5.2. Two of their mechanics have already reviewed and updated the document.

#### 1.1.6. Comments from Afton:

- 1.1.6.1. *Has the TMC received any supplemental information regarding camshaft lobe failures as part of their recent ACC audit?*
- 1.1.6.2. Intertek will be providing the TMC with a new template that can be used to collect additional camshaft lobe failure data from the labs (i.e. engine hours at time of failure, lifter position, etc.).
- 1.1.6.3. The TMC confirmed that they will conduct another audit of the labs once this information is available.

### 1.2. Engine Life Data to Statisticians:

- 1.2.1. An effort is underway to compile break-in and engine life data that can be provided to the Statistics Group for analysis.
  - 1.2.1.1. This analysis is needed to finalize the iron pass/fail parameter.
- 1.2.2. Four of the five labs have supplied data for the engines that they have run since the 2<sup>nd</sup> Precision Matrix.
  - 1.2.2.1. Intertek will send Lubrizol all this data.
  - 1.2.2.2. Lubrizol will compile this data into a single spreadsheet that is designed to facilitate the statistical analysis.

- 1.2.3. Southwest has data from one additional engine that they will supply to Intertek/Lubrizol.
- 1.2.4. Lubrizol will attempt to have this data compiled by the middle of next week.

### **1.3. Analysis of All Precision Matrix E.O.T. Oil Samples at Intertek:**

- 1.3.1. Intertek has secured new oil samples for each reference oil.
- 1.3.2. They will start the measurements shortly.
- 1.3.3. The results will be placed in a single spreadsheet that will be combined with the dataset being compiled by Lubrizol.

#### **1.3.4. Comments from Lubrizol:**

- 1.3.4.1. There will be a disparity between the iron measurements used to populate the engine life dataset and the iron measurements collected by Intertek.
- 1.3.4.2. The iron data in the engine life dataset will be unadjusted.
- 1.3.4.3. The iron data collected through Intertek's measurements of the 2<sup>nd</sup> Precision Matrix E.O.T. oil samples will be adjusted.
- 1.3.4.4. Lubrizol will have separate columns in the engine life dataset for adjusted and unadjusted iron measurements.
- 1.3.4.5. There will also be a column that identifies the element used for the adjustment.

#### **1.3.5. Comments from Intertek:**

- 1.3.5.1. If the iron adjustment method gets approved by the Surveillance Panel, the adjustment will need to be retroactively applied to the candidate and reference tests run since the Precision Matrix.

#### **1.3.6. Comments from TMC:**

- 1.3.6.1. There may be an issue with identifying the detergent used for the iron adjustment.
- 1.3.6.2. Calcium may not be common in LSPI-compliant oils.
- 1.3.6.3. Also, the calcium adjustment does not drastically improve the data.

#### **1.3.7. Comments from Intertek:**

- 1.3.7.1. The proposed iron adjustment procedure does provide guidance on selecting the appropriate element.
- 1.3.7.2. The lab is to use whichever element (Na, Ca or Mg) has the highest concentration.
  - 1.3.7.2.1. That element will be used in the adjustment.

#### **1.3.8. Comments from Toyota:**

- 1.3.8.1. In theory, variation in the end-of-test iron can be caused by fuel dilution.
- 1.3.8.2. Fuel dilution, which is approximately 11%-14% at 200HRS, is significant with this test.
- 1.3.8.3. This effort is basically a comparison of the variation in fuel dilution (from test-to-test) and the precision of the ICP measurements.

### **1.4. Extended Shutdown Procedure (Intertek):**

- 1.4.1. Intertek has drafted a procedure for handling extended periods of unscheduled downtime.
  - 1.4.1.1. The goal of this procedure is to minimize rust and oxidation.
- 1.4.2. Intertek recently applied this procedure to a test that was in-progress.
  - 1.4.2.1. The procedure worked well.
- 1.4.3. An "extended shutdown" is defined as a period of unscheduled downtime that exceeds 2-hours.
- 1.4.4. The procedure instructs the lab to remove the OHT rocker arm cover and place it on the RAC table supplied by TEI.
  - 1.4.4.1. This table was originally designed by Lubrizol.
  - 1.4.4.2. The table allows the OHT rocker arm cover to be stored without having to disconnect the coolant lines.

- 1.4.4.3. However, the blowby system does need to be disconnected.
- 1.4.5. Once the rocker arm cover is removed, the procedure instructs the lab to remove the OHT dipstick plug.
  - 1.4.5.1. A bottle is used to suck oil from the pan.
  - 1.4.5.2. The bottle is then used to spray the oil over the valvetrain to wash emulsion from the camshafts and lifters.
- 1.4.6. A clean stock rocker arm cover is then placed over the valve deck for the duration of the shutdown.

**1.4.7. Comments from Lubrizol:**

- 1.4.7.1. Lubrizol does not need to review this procedure in depth.
- 1.4.7.2. It is comfortable with the steps proposed by Intertek, and believes that this draft should be incorporated into the test procedure.

**1.5. Procedure for Conducting Stand Maintenance After Lobe Failure (Intertek):**

- 1.5.1. Intertek has almost completed the draft.
- 1.5.2. The procedure has extra steps for cleaning the stand's external oil system.
  - 1.5.2.1. An ultrasonic cleaner is used to clean some of the hardware.
- 1.5.3. Their goal is to have the draft finished this week.

**1.6. Update on Metrology Sub-Group (Lubrizol):**

- 1.6.1. This sub-group has started the Keyence round-robin with all five laboratories.
- 1.6.2. Lubrizol has completed its pre-test measurements and shipped the lifters to Exxon.
- 1.6.3. Exxon will try to have their pre-test measurements completed by the end of the week.
  - 1.6.3.1. The lifters will be sent to Southwest once they are done.

**1.7. Engine Health Checklist (Lubrizol):**

- 1.7.1. Last week, Lubrizol submitted a draft proposal to the sub-group for their review.

**1.7.2. Crankshaft End Play Tolerance:**

- 1.7.2.1. Southwest remembered there being a note in the draft with a question about tolerances.
- 1.7.2.2. Lubrizol confirmed this.
- 1.7.2.3. One step of the engine inspection is to measure crankshaft end play.
- 1.7.2.4. There is a note in the draft regarding whether Toyota has a tolerance specification for this measurement.
- 1.7.2.5. Hirano-san was not sure if there is a specification for this parameter, but agreed to follow-up on the issue.
- 1.7.2.6. Lubrizol will send Toyota an image regarding how this measurement is taken.
- 1.7.2.7. Intertek will add crankshaft end play to the list of tolerance specifications that are needed from Toyota.
  - 1.7.2.7.1. They will review this list with Toyota once it is complete.

**1.8. OHT Inventory Update:**

**1.8.1. Batch-E Exhaust Camshafts:**

- 1.8.1.1. There is 3-months of inventory remaining based on consumption rates from the last 7-months.

**1.8.2. Batch-D Intake Camshafts:**

- 1.8.2.1. There is 5-months of inventory remaining based on consumption rates from the last 7-months.

- 1.8.3. This update is for notification purposes only; there is no data suggesting a shift in performance with any of the camshaft batches.

- 1.8.4. OHT does not know how camshaft demand will change after the BOI/VGRA matrix is complete.
- 1.8.5. Intertek will send a note to the Task Force Chairperson of the BOI/VGRA matrix.
  - 1.8.5.1. This note will provide an update on current supplies of critical hardware.
- 1.8.6. If the BOI/VGRA matrix does not start soon, the Surveillance Panel will be left with two choices.
  - 1.8.6.1. Choice #1: Start the BOI/VGRA matrix with a mixture of camshaft batches.
  - 1.8.6.2. Choice #2: Transition to the next batch of hardware.

**1.9. Timing for Next Surveillance Panel Face-to-Face Meeting:**

- 1.9.1. The group agreed to not schedule the next face-to-face meeting until significant progress has been made on all the critical action items.
- 1.9.2. Lubrizol noted that the most critical action item is for the engineers to compile a single spreadsheet that includes engine life and iron (both with and without an adjustment) data.
  - 1.9.2.1. This spreadsheet must then be analyzed by the Statistics Group.
- 1.9.3. Lubrizol also noted that one potential hurdle to compiling this spreadsheet is having each lab repeat their ICP measurements (with an iron adjustment) on the E.O.T. oil samples from the 2<sup>nd</sup> Precision Matrix.
  - 1.9.3.1. Lubrizol will try to have this done by the middle of next week.
  - 1.9.3.2. Southwest has already completed this work.
  - 1.9.3.3. Afton believes that it is reasonable to have this work done within one week.
  - 1.9.3.4. Exxon will have this done within the next week (but may need to utilize an external lab).

Action Items	Person responsible	Completion Date

Follow-up Notes/Updates	Initials	Date Added

Attendees	Organization	Contact Information