

# Sequence IVB | MINUTES

REVISION DATE: 6/25/2018 3:42:00 PM

<b>Relevant Test:</b>	Sequence IVB
<b>Note Taker:</b>	Chris Mileti
<b>Meeting Date:</b>	06-12-2018
<b>Comments:</b>	This was a back-to-back conference call with the two Sequence IVB Sub-Groups – <b>IVB Procedure Review Sub-Group</b> and <b>IVB Precision/Operations Sub-Group</b> .

## 1. OPENING DISCUSSION:

### 1.1. Opening Comments from Chairman:

1.1.1. Most of the Precision Matrix stands are coming due for routine calibration.

1.1.2. Two reference tests just completed at Intertek.

1.1.2.1. A 3<sup>rd</sup> reference test will be completing shortly.

#### 1.1.3. 1<sup>st</sup> Reference Test (IAR100):

1.1.3.1. The oil is probably REO1011.

1.1.3.2. This was a 1<sup>st</sup> run engine.

1.1.3.3. The AVLI result is 2.49mm<sup>3</sup>, which is more severe than the most severe Precision Matrix test on this stand.

1.1.3.4. However, this result is not particularly surprising.

#### 1.1.4. 2<sup>nd</sup> Reference Test (IAR101):

1.1.4.1. The oil is REO1012.

1.1.4.2. This was a 5<sup>th</sup> run engine.

1.1.4.3. The AVLI result was 2.41mm<sup>3</sup>, which is very severe for this oil.

1.1.4.4. Intertek is reviewing the operational data for this test now.

1.1.4.4.1. They have not found anything that could explain the severe result.

1.1.4.4.2. They are currently focusing on vibration and engine alignment as potential explanations.

1.1.4.5. Even though the result was severe, this stand should calibrate.

1.1.4.6. It is possible that the stand itself is trending severe.

1.1.4.6.1. The last Precision Matrix test on this stand with REO300 was also severe.

#### 1.1.5. Possible Reference Test on IAR102:

1.1.5.1. Intertek's reference plans for this stand are contingent on if they can get a candidate start.

1.1.5.2. If they reference the stand, they will use an engine that underwent a cylinder head swap and one candidate test.

1.1.5.2.1. So, this would be an 8<sup>th</sup> run reference test.

#### 1.1.6. Non-Precision Matrix Test Stand References:

1.1.6.1. In May, they calibrated a non-Precision Matrix stand with two runs (1.06mm<sup>3</sup> and 1.79mm<sup>3</sup>) on REO1012.

1.1.6.2. The stand is calibrated.

### 1.2. Reference Testing Updates from Other Labs:

#### 1.2.1. Lubrizol Update:

1.2.1.1. Lubrizol will be running a reference test shortly.

1.2.1.2. It will likely use a 4<sup>th</sup> run engine.

**1.2.2. Southwest Update:**

1.2.2.1. Southwest is running one reference test now.

1.2.2.2. The calibration period for one of their Precision Matrix stands will not expire for 3-weeks, and the calibration period for their other Precision Matrix stand will not expire for another month.

1.2.2.3. Their Precision Matrix stands have a longer reference period because they ran supplementary tests in January 2018.

**1.3. TMC Comments on Reference Oil Targets:**

1.3.1. The TMC will not update reference oil targets until the Surveillance Panel recommends that they review standard deviations.

1.3.2. Targets are not altered in the new LTMS system under normal circumstances.

1.3.3. The statisticians typically recommend changing the standard deviations and not the targets themselves.

1.3.4. There may be a need to make changes as laboratories generate reference data on older engines.

1.3.4.1. However, this will need to be first discussed with the Statistics Group.

**1.4. BOI/VGRA Matrix:**

1.4.1. The TMC noted that the Industry is trying to utilize LSPI-compliant technologies for the BOI/VGRA matrix oils.

1.4.2. The BOI/VGRA committee will make the final decision regarding the oils that will be used.

**1.4.3. Comments from Intertek:**

1.4.3.1. Intertek recommended holding a face-to-face Surveillance Panel meeting before the start of the BOI/VGRA Matrix.

1.4.3.2. Afton agreed that there would be value to such a meeting.

1.4.3.3. Intertek will send out an email to the Surveillance Panel soliciting feedback on a date for this meeting.

**2. ACTION ITEM REVIEW:**

**2.1. Metrology Sub-Group (Lubrizol):**

2.1.1. Lubrizol noted that there are several important open action items related to the Keyence and intake lifter measurements.

2.1.2. For instance, there has been no statistical comparison (i.e. "round robin") between the Keyence units at the three original laboratories (Intertek, Southwest and Lubrizol) and the two new laboratories (Exxon and Afton).

2.1.3. Also, a consensus has not yet been reached regarding how to use the Keyence G2 software to pre-screen lifters for acceptable profiles.

2.1.4. Lubrizol offered to lead a Metrology Sub-Group to address these open action items so that the two engineering sub-groups can focus on other issues.

2.1.4.1. The remaining four labs will send Lubrizol a list of metrology technicians that they would like to have participate in this sub-group.

2.1.5. Each lab confirmed that they are no longer performing PDI measurements on lifters.

**2.1.6. Comments from Intertek:**

2.1.6.1. During the last face-to-face IVB Metrology Workshop, the team agreed to relax the screening criteria for lifter profiles.

- 2.1.6.2. Full profile screening was reimplemented shortly thereafter.
- 2.1.6.3. This issue needs to be revisited.
- 2.1.6.4. Rejection rates for 28-grade, 30-grade and 32-grade lifters is very high.
- 2.1.7. Lubrizol noted that it is hard to "recycle" rejected intake lifters as exhaust lifters because the grade requirements are very different.

#### **2.1.8. Additional Comments from Intertek:**

- 2.1.8.1. Fred Gerhart established the original profile criteria for this test.
- 2.1.8.2. He based his recommendations on the PDI profile measurements.
- 2.1.8.3. He wanted very consistent profiles.
- 2.1.8.4. During the last IVB Metrology Workshop, the group agreed that irregular profiles do not impact lifter rotation.
  - 2.1.8.4.1. This is proven by the fact that these irregular profiles do not pose any problems when used on the exhaust side of the engine.
- 2.1.8.5. It also important to note that the lifter's profile does not adversely impact the Keyence measurements.
  - 2.1.8.5.1. The Keyence is insensitive to irregular profiles because it captures all the material that is removed.

#### **2.1.9. Comments from Toyota:**

- 2.1.9.1. The lifter is acceptable if its profile is flat or domed.
  - 2.1.9.1.1. A flat lifter/tappet will still rotate.
- 2.1.9.2. Concave shapes are not acceptable.
- 2.1.9.3. This is the same criteria used when selecting lifters for production engines.
- 2.1.9.4. Toyota and Intertek agreed that there cannot be a concave profile if the  $W_T$  (height) criteria is positive.

## **2.2. Oil Consumption Limit:**

- 2.2.1. This action item can be addressed once the historical engine information is provided by each lab.

#### **2.2.2. Customer Approvals to Release Data:**

- 2.2.2.1. Lubrizol and Afton have already approved the release of their candidate data.
- 2.2.2.2. Intertek has received approval from all but one of their clients.
- 2.2.2.3. Southwest has also received approval from all but one of their clients.
- 2.2.2.4. Lubrizol would like to put a deadline on approving the release of this data.

## **2.3. Procedure for Dealing with Camshaft Lobe Failures:**

- 2.3.1. Intertek is approximately 85% done with this action item.

## **2.4. Timing Chain Wedges:**

- 2.4.1. OHT is waiting on feedback from the labs regarding dimensions and desired materials.
- 2.4.2. Intertek and Afton questioned whether this should be an action item.
  - 2.4.2.1. *All the labs already have timing chain wedges, so why do we need to design a new one?*
  - 2.4.2.2. Lubrizol noted that the action item was introduced during a Surveillance Panel meeting on 10/03/2018.

## **2.5. Intertek and Southwest to Swap E.O.T. Oil Samples for Analysis:**

- 2.5.1. Lubrizol will remove this as an action item because it has been superseded by another action item (i.e. all labs send E.O.T. oil samples to Intertek).
- 2.5.2. Intertek will analyze all the E.O.T. samples provided by the other four labs.
  - 2.5.2.1. They will also collect measurements using the final iron adjustment procedure.
  - 2.5.2.2. They hope to have these measurements available by the end of July.

## **2.6. Compare Lifter Wear vs. Lifter Profile Position:**

2.6.1. Lubrizol will follow-up with the statisticians on this action item.

## **2.7. Finalize Sequence IVB Report Form:**

2.7.1. Intertek will revisit this action item by making recommendations to the TMC.

2.7.2. The current report format will need to be updated now that iron is a pass/fail parameter.

## **2.8. Reevaluate QI for Oil Gallery Temperature:**

2.8.1. Intertek would like the statisticians to reevaluate this action item now that the Precision Matrix data is available.

2.8.1.1. Kevin O'Malley confirmed that the current QI's were established before the Precision Matrix.

2.8.1.2. O'Malley also said that all QI parameters are typically revisited after a Precision Matrix.

2.8.2. This action item needs to be modified so that it includes all QI calculations.

2.8.3. Intertek and Lubrizol recommended using the three 1-hour operational data files from each Precision Matrix test for this review.

2.8.4. The TMC believes that all the necessary data files are already posted on the TMC website.

## **2.9. TMC to Work with Labs to Complete Precision Matrix #2 Test Reports:**

2.9.1. Lubrizol is the only lab to have not submitted final versions of its Precision Matrix reports.

2.9.2. The TMC noted that there are several non-Precision Matrix test reports missing.

2.9.2.1. Lubrizol is missing a report from its first REO300 prove-out test.

2.9.2.2. Southwest is missing one of its prove-out test reports as well.

2.9.2.3. Southwest is also missing the report from one of its supplemental tests.

## **2.10. Compare 200HR Operational Data Plots for the 2<sup>nd</sup> Precision Matrix:**

2.10.1. Intertek, Southwest and Lubrizol confirmed that their data has been posted to the TMC website.

2.10.2. The group agreed to conduct this comparison during the next face-to-face Surveillance Panel meeting.

2.10.3. This comparison will focus specifically on the following parameters (which have historically shown the most significant lab-to-lab and stand-to-stand differences):

2.10.3.1. Exhaust gas temperature

2.10.3.2. Crankcase pressure/blowby flow

2.10.3.3. Intake manifold pressure

2.10.3.4. AFR

## **2.11. Compile Notes from January 2018 Sequence IVB Engine Build Workshop:**

2.11.1. Lubrizol has already documented its notes from this workshop.

2.11.2. Lubrizol agreed to take this action item.

2.11.3. Lubrizol requested that the remaining labs forward any notes or photographs that they have from this workshop.

2.11.3.1. It will compile everything into a single document.

## **2.12. TMC to Issue an Information Letter that Summarizes New IVB LTMS System:**

2.12.1. The TMC confirmed that an LTMS document was released.

2.12.1.1. However, it was released as an LTMS manual update and not a IVB Information Letter.

2.12.1.2. The update is dated 05-20-2018.

2.12.2. Intertek will forward the email announcing the LTMS manual update to the sub-group members.

**2.13. Engine “Health” Checklist:**

2.13.1. Lubrizol is still waiting on feedback from the other four laboratories.

**2.14. Assess the Impact of Camshaft Lobe Failures on Engine Severity:**

**2.14.1. Comments from Affon:**

2.14.1.1. They are particularly concerned about this action item.

2.14.1.2. *Could a candidate test be adversely affected if it follows a high-wear test or a test with a camshaft lobe failure?*

2.14.1.3. Their concern was intensified after Exxon's recent lobe failure.

**2.14.2. Comments from Intertek:**

2.14.2.1. Form 4 of the test report currently contains a “yes or no” field to identify if a lobe failure has occurred.

2.14.2.2. Another “yes or no” field could be added to identify whether the test followed a lobe failure or a high iron result.

2.14.2.3. This “yes or no” field would need to track the engine and not the test stand.

2.14.3. Lubrizol recommends setting the “high iron” threshold at 400ppm initially.

2.14.3.1. Toyota supports the Lubrizol proposal.

**2.15. Weighting Lifter Wear by Lifter Position:**

2.15.1. Kevin O'Malley reminded the group that lifter weighting is also an open action item.

2.15.2. During a previous analysis, the Statistics Group found a spike in the volume loss of the first two intake lifters in the engine.

2.15.2.1. However, he cautioned that there were some anomalies in the data that they analyzed.

2.15.3. The Surveillance Panel previously asked the Statistics Group to evaluate the AVL parameter when Lifters #1 through #3 were weighted both higher and lower than the remaining five lifters.

2.15.3.1. This analysis has not yet been performed.

2.15.4. Also, the Surveillance Panel never clarified its position on outlier screening.

Action Items	Person responsible	Completion Date

Follow-up Notes/Updates	Initials	Date Added

Attendees	Organization	Contact Information