

Sequence IV Surveillance Panel | MINUTES

REVISION DATE: 7/27/2018 10:43:00 AM

Relevant Test:	Sequence IVA and IVB
Note Taker:	Chris Mileti
Meeting Date:	07-17-2018
Comments:	Sequence IV Surveillance Panel conference call. The discussion focused on the current IVB action item list.

1. REVIEW OF RECENT ASTM MEETINGS (BUSCHER):

1.1. Background:

1.1.1. Buscher reviewed the **IVB Update to AOAP 20180627** PowerPoint presentation.

1.1.2. This is the version of the presentation that was given to the AOAP.

1.1.3. There were two main areas of discussion during the Industry meetings in June:

1.1.3.1. **ACC Registration of IVB Tests:**

1.1.3.1.1. The Surveillance Panel approved an LTMS system for AVLI back in May.

1.1.3.1.2. FEWMEOT was not included in LTMS during this time.

1.1.3.1.3. However, both AVLI and FEWMEOT have been proposed as pass/fail parameters for GF-6.

1.1.3.1.4. Toyota is receiving feedback that some ACC members want the Surveillance Panel to finalize all aspects of the FEWMEOT parameter before the start of test registration.

1.1.3.2. **BOI/VGRA Task Force:**

1.1.3.2.1. Two of the three planned technologies have recently been changed.

1.1.3.2.1.1. The change was made to introduce LSPI-compliant technologies into the matrix.

1.1.3.2.2. Procurement of the new oils is in progress.

1.1.3.2.3. This Task Force also wants the FEWMEOT, camshaft lobe failure, and oil consumption limit issues resolved before the BOI/VGRA matrix begins.

1.2. Slide #2:

- Fully developing the FEWMEOT parameter, including:
 - FEWMEOT measurement procedure
 - Evaluate FEWMEOT for all precision matrix 2 tests
 - Implement FEWMEOT into LTMS
- Finalizing the definition and all procedures associated with camshaft lobe failures, including:
 - Camshaft lobe failure definition
 - Test interpretability and/or test validity criteria for camshaft lobe failure
 - Engine health checklist
 - Engine reconditioning after a lobe failure procedure
 - Stand maintenance after a lobe failure procedure
- Finalizing test interpretability and/or test validity criteria for oil consumption

1.2.1. The Surveillance Panel should focus on three main areas related to FEWMEOT:

- 1.2.1.1. Improve the measurement procedure.
- 1.2.1.2. Evaluate E.O.T. oil samples from the 2nd Precision Matrix using the final measurement procedure.
- 1.2.1.3. Determine whether FEWMEOT will be incorporated into LTMS, or whether it will be treated like the Hot Suck Rings parameter from the Sequence V.

1.2.2. The Surveillance Panel should focus on four main areas related to camshaft lobe failures:

- 1.2.2.1. Establish a formal definition for a lobe failure.
- 1.2.2.2. Finalize interpretability and validity criteria for tests that experience a lobe failure.
- 1.2.2.3. Establish an engine “health” checklist.
- 1.2.2.4. Finalize a procedure for reconditioning an engine and test stand after a camshaft lobe failure.

1.2.3. The Surveillance Panel should also focus on establish an oil consumption validity limit.

- 1.2.3.1. This limit will be addressed as part of the upcoming analysis of iron and engine life data.

1.3. Slide #14:

Next Surveillance Panel Meeting

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- Sequence IV surveillance panel will meet face-to-face in July or August, prior to the start of the BOI/VGRA matrix
- Topics for discussion at the next Sequence IV surveillance panel meeting include:
 - Updates from sub-groups
 - Motions on sub-group recommendations
 - ACC registration and retro-registration (if needed)
 - Starting the BOI/VGRA matrix

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- 1.3.1. This slide summarizes the forward action plan for the Surveillance Panel and its three sub-groups.
- 1.3.2. Motions will be made to adopt the various sub-group recommendations at the next Surveillance Panel face-to-face meeting.
- 1.3.3. The Surveillance Panel will also need to make a recommendation as to when the BOI/VGRA matrix can start.
- 1.3.4. All the major action items will need to be completed within the next few months.

1.4. ACC Request to TMC Regarding Lobe Failures:

- 1.4.1. The ACC made a request to the TMC to survey the five Sequence IVB laboratories about their camshaft lobe failures.
- 1.4.2. The TMC provided this information to the ACC on July 10th.
 - 1.4.2.1. This survey only included tests that were run on the current version of the procedure.
- 1.4.3. One of the reasons for aborting the first Precision Matrix was that camshaft lobe failure rates approached 40%-50% at the time.
- 1.4.4. Camshaft lobe failures were under 10% during early test development.
- 1.4.5. The Surveillance Panel made changes to the test procedure (i.e. larger initial oil charge, revised OHT oil pan) after the 1st Precision Matrix to mitigate lobe failures.
 - 1.4.5.1. These changes reduced the frequency of failures but did not eliminate the problem.
- 1.4.6. The camshaft lobe failure rate for all oils (reference and candidate) is currently at 12%-13%.
 - 1.4.6.1. The camshaft lobe failure rate for candidate oils is around 16%.
- 1.4.7. Candidate oils experience lobe failures at a much higher frequency than reference oils.
 - 1.4.7.1. For instance, only two reference oils have experienced lobe failures since the 2nd Precision Matrix.
- 1.4.8. **PAP TG:**
 - 1.4.8.1. PAP TG is meeting this month and will review the data given to the ACC.
 - 1.4.8.2. Toyota expects PAP TG to contact them directly with their comments.

1.4.8.3. Toyota will share this feedback with the Surveillance Panel when it becomes available.

1.4.9. Comments from Infineum:

1.4.9.1. *Is there one batch of camshafts that is more susceptible to lobe failures than another?*

1.4.9.2. Reply from Intertek:

1.4.9.2.1. Camshaft batch code can easily be added to LTMS for review.

1.4.9.2.1.1. Intertek will follow-up with the TMC.

1.4.9.2.2. Intertek is currently running two different camshaft batches.

1.4.10. Comments from Afton:

1.4.10.1. *Are camshaft lobe failures related to viscosity grade?*

1.4.10.2. Viscosity grade should be included in the data set that will be sent to the Statistics Group.

1.4.10.3. Intertek noted that the test sponsors will need to approve publishing the viscosity grade for their candidate data.

1.4.10.4. Toyota agreed that it would be useful to know if any camshaft lobe failures occurred with exotic viscosity grades.

1.4.11. Comments from Intertek:

1.4.11.1. It would also be useful to know if any candidate oils had repeat lobe failures.

1.4.11.2. The labs should ask their test sponsors if this is information that they would be willing to provide.

1.4.12. Comments from Infineum:

1.4.12.1. It would also be useful to know the position (within the engine) of the lobe that failed.

1.4.13. Intertek agreed to provide a template to the TMC that can be used for a more comprehensive audit of camshaft lobe failures.

2. SUB-GROUP UPDATES:

2.1. Update on Precision Sub-Group (Intertek):

2.1.1. All sub-groups are focusing on the critical action items that were discussed earlier in this conference call.

2.1.2. The sub-groups have been meeting weekly or bi-weekly since May 2018.

2.1.3. One of the action items to recently be completed is Section 4 of the Engine Assembly Manual.

2.1.3.1. Section 4 deals with rebuilding an engine after a camshaft lobe failure.

2.1.4. The action item to collect data on engine life (for statistical analysis) is in-progress.

2.1.4.1. This data will eventually be used to set an oil consumption limit and better understand the iron pass/fail parameter.

2.1.4.2. Data from four of the five labs has been received.

2.1.5. An effort is being made to look at the impact of the external blowby system on test variability.

2.2. Update on Procedure Sub-Group (Intertek):

2.2.1. Hap Thompson is involved with this sub-group.

2.2.2. They are reviewing the IVB procedure and Engine Assembly Manual.

2.2.3. These documents will follow the necessary ASTM format.

2.2.4. Slides #10 and #11 list the documentation that has either been completed or is in a final draft form.

Summary of Activity Since 5/10/18

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- The initial focus for the Sequence IVB Procedure Review sub-group is on the following:
 - Reviewing and updating the EAM
 - Address all incomplete procedure and documentation related surveillance panel action items
 - Reviewing and updating the ASTM test procedure draft
- Numerous opened surveillance panel action items have been addressed and completed by both sub-groups in May and June
- Highlights include:
 - Completed ≈ 90% of Engine Assembly Manual Section 4 (reconditioning after a lobe failure)
 - Completed blowby flow meter cleaning procedure
 - Completed FEWMEOT measurement procedure
 - Completed test stand audit checklist
 - Completed fuel monitoring and handling procedures

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Summary of Activity Since 5/10/18

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- Highlights cont'd:
 - Completed lifter grade selection procedure
 - Completed extended downtime procedure
 - Working on break-in and aging data collection and analysis
 - Working on engine life data collection and analysis
 - Working on defining oil consumption limit
 - Working on defining a lobe failure
 - Working on precision matrix EOT oil analysis, including FEWMEOT, at a single lab
 - Working on a “stand maintenance after a lobe failure” procedure
 - Working on engine health checklist
 - Working on reviewing and potentially updating QIs

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2.2.5. This sub-group still needs to update the Quality Index (QI) limits.

2.2.5.1. The original intent was to just review the QI limits for the oil gallery temperature.

2.2.5.2. However, the statisticians reminded the sub-group that it is customary to review all the QI limits after a Precision Matrix.

2.3. Update on Metrology Sub-Group (Lubrizol):

2.3.1. The Metrology Sub-Group has had two conference calls.

2.3.2. It is close to finalizing a procedure for using the Keyence to screen lifters for profile acceptance.

2.3.2.1. This includes identifying what constitutes an unacceptable lifter.

- 2.3.3. The sub-group is currently launching another Keyence round robin.
 - 2.3.3.1. The previous round robins only included Intertek, Southwest and Lubrizol.
 - 2.3.3.2. These previous round robins were also not conducted with the latest Keyence software or measurement procedure.
- 2.3.4. Minutes and action items from all calls are posted on the TMC website.
- 2.3.5. **Comments from Intertek:**
 - 2.3.5.1. A lot has been learned from the previous three round robins.
 - 2.3.5.2. Each one has resulted in a procedural enhancement.
 - 2.3.5.3. Metrology is an important aspect of the Sequence IVB, so this group's work could have a major impact on test precision.

2.4. Appendix K Update:

- 2.4.1. **Item C.1:**
 - 2.4.1.1. This item is listed as "C-Planned" instead of "A-Completed" because this decision is approved by the Passenger Car Class Panel instead of the Surveillance Panel.
- 2.4.2. **Section D (Reference Oils):**
 - 2.4.2.1. The proposed pass/fail limit for average intake lifter volume loss is 2.5mm³.
 - 2.4.2.1.1. There are reference oils that have average intake lifter volume losses below this limit.
 - 2.4.2.2. *Do we leave Item D.1.2 as "C-Planned", or should it be changed to "A-Completed"?*
 - 2.4.2.3. The Surveillance Panel decided to change it to "A – Completed".
- 2.4.3. **Item D.3.4:**
 - 2.4.3.1. A procedure has been drafted for introducing new batches of KA24E fuel.
 - 2.4.3.2. This draft procedure will be approved by the Surveillance Panel at the next face-to-face meeting.

3. OTHER ITEMS:

3.1. Technique to Adjust Iron for Oil Consumption:

- 3.1.1. The TMC took the phosphorous retention technique from the Sequence III and modified it for use with Sequence IVB iron.
- 3.1.2. Calcium (or other suitable element) will be used for the IVB adjustment.
- 3.1.3. The procedure drafted by the TMC has been distributed to the Precision Sub-Group for review.
 - 3.1.3.1. Buscher has received feedback from three of the sub-group members.
 - 3.1.3.2. All three members support approving this procedure.
- 3.1.4. **Analyze E.O.T. Oil Samples from 2nd Precision Matrix:**
 - 3.1.4.1. Intertek will use the TMC procedure to analyze the E.O.T. oil samples from each of the 2nd Precision Matrix tests.
 - 3.1.4.2. They will conduct ICP analysis with and without the calcium adjustment for iron.
 - 3.1.4.3. They have also obtained new reference oil samples for comparison.
 - 3.1.4.4. The dataset that they generate will be given to the Statistics Group.
- 3.1.5. **Comments from Lubrizol:**
 - 3.1.5.1. The Surveillance Panel needs to fully understand iron because it is now a pass/fail parameter.
 - 3.1.5.2. All the data relating to iron (break-in data, test data, adjusted E.O.T. oil sample data from Intertek, etc.) should be given to the Statistics Group in a single, comprehensive dataset.

3.1.6. **Comments from Affon:**

- 3.1.6.1. Repeatability and reproducibility will be key components to the statistical analysis of the iron parameter.
- 3.1.6.2. It will be hard to evaluate repeatability and reproducibility if one lab (Intertek) is evaluating the calcium adjustment on all the E.O.T. oil samples from the 2nd Precision Matrix.

3.1.7. **Comments from Intertek:**

- 3.1.7.1. Each lab should have additional E.O.T. drain oil available from their Precision Matrix tests.
- 3.1.7.2. These labs could run the new calcium adjustment procedure in parallel with Intertek.

3.1.8. **Comments from Lubrizol:**

- 3.1.8.1. Lubrizol agreed with Intertek that all labs should reanalyze their E.O.T. oil samples.
 - 3.1.8.2. The purpose of this exercise is to set iron pass/fail limits, so the measurements need to be done like they would be during normal testing.
 - 3.1.8.3. Each lab should have enough oil remaining to complete this exercise.
- 3.1.9. All laboratories agreed to re-test their E.O.T. oil drains using the latest procedure, and to provide this data to the Surveillance Panel.

3.1.10. **Comments from Lubrizol to clarify how repeat tests will be performed:**

- 3.1.10.1. The procedure drafted by the TMC requires that the S.O.T. and E.O.T. measurements should each be conducted in duplicate.
 - 3.1.10.1.1. The two duplicate measurements are then averaged.
- 3.1.10.2. The group needs to clarify whether the new oil samples for the upcoming trial will also be measured in duplicate.
- 3.1.10.3. The consensus among the five laboratories is that the procedure needs to be followed verbatim.
 - 3.1.10.3.1. Both the new and used oil samples will be measured in duplicate.

3.1.11. **Comments from Intertek:**

- 3.1.11.1. The procedure states that all the oil samples must be measured at the same time.
- 3.1.11.2. This basically means that all the measurements must be conducted during the same calibration period of the ICP device.

3.1.12. **Comments from Southwest:**

- 3.1.12.1. *Should the labs use the new oil sample from each of their Precision Matrix tests to guarantee that the oil is from the correct "vintage"?*
- 3.1.12.2. *Or is it acceptable to get a new oil sample from their current reference oil inventory?*
- 3.1.12.3. Reply from Intertek:
 - 3.1.12.3.1. All TMC oils are homogenized.
 - 3.1.12.3.2. Either option presented by Southwest should be acceptable.
 - 3.1.12.3.3. This decision should be left up to the discretion of the lab.

3.2. **Lubrizol Comments about Action Item List:**

- 3.2.1. The three sub-groups are working on about of dozen major action items.
- 3.2.2. However, the most pressing action item is to compile a comprehensive database of iron and engine life data.
- 3.2.3. An analysis of this database is needed to set limits for the iron pass/fail parameter, establish validity criteria for oil consumption, and determine how iron will be addressed in LTMS.

3.3. **Upcoming Face-to-Face Surveillance Panel Meeting:**

- 3.3.1. The next face-to-face meeting will be two days long.

- 3.3.2. The first day will be used for sub-group meetings.
- 3.3.3. The second day will convene the full Surveillance Panel.
- 3.3.4. The consensus among the Panel members is that this meeting should not take place until the three sub-groups have made solid progress on their action items.
- 3.3.5. Toyota is amenable to having this face-to-face meeting in early September.
 - 3.3.5.1. Buscher will send a note to the AOAP and Passenger Car Panels informing them that the Surveillance Panel will need more time to complete its major action items.

Action Items	Person responsible	Completion Date

Follow-up Notes/Updates	Initials	Date Added

Attendees	Organization	Contact Information