

Sequence IVB Sub Groups | MINUTES

REVISION DATE: 8/20/2018 1:29:00 PM

Relevant Test:	Sequence IVB
Note Taker:	Chris Mileti
Meeting Date:	08-07-2018
Comments:	Conference call for Sequence IVB Precision and Procedure Sub-Groups.

1. DISCUSSION:

1.1. Section 4 of Engine Build Manual:

- 1.1.1. Section 4 deals with rebuilding an engine after a camshaft lobe failure.
- 1.1.2. Intertek has received feedback from Afton.

1.1.3. Intertek has also received feedback from OHT:

- 1.1.3.1. OHT supplied bearing part numbers.
- 1.1.3.2. OHT would like to recommend a specific mylar tape for crankshaft polishing.
 - 1.1.3.2.1. Currently the grit is specified but not the material.

1.2. Engine Health Checklist:

- 1.2.1. A draft for the Engine Health Checklist was provided by Lubrizol.

1.2.2. Feedback from Intertek:

- 1.2.2.1. Intertek has updated the original draft document and will distribute it to the sub-groups for review.
- 1.2.2.2. It is difficult to set-up the magnetic runout gauge to measure crankshaft end-play.
 - 1.2.2.2.1. They measured 7/1000ths end-play on the crankshaft of a 4th run engine.
- 1.2.2.3. Intertek also added pictures to the original document.
- 1.2.2.4. They added a note to confirm that the timing chain cannot be pulled enough to "jump a link" on the timing sprocket.
 - 1.2.2.4.1. Intertek has had timing chains "jump a link" during operation due to excessive timing chain wear.
- 1.2.2.5. It is important to borescope the intake runners.
 - 1.2.2.5.1. This will require removing the intake manifold.
- 1.2.2.6. They disagree with Lubrizol's recommendation about the acceptable width of bore polishing.
 - 1.2.2.6.1. These criteria will need to be refined by analyzing the width of bore polishing on an engine block that is known to experience high oil consumption.
 - 1.2.2.6.2. High oil consumption is generally defined as 1000g-1200g.
- 1.2.2.7. Photos will need to be added to the checklist to illustrate valve tip deformation.
- 1.2.2.8. They would like to remove the requirement to borescope the oil pan and pick-up tube.

1.2.3. Feedback from Afton:

- 1.2.3.1. Lubrizol has also received feedback from Afton regarding the Engine Health Checklist.

- 1.2.3.2. Afton is concerned that the borescope measurements will be time consuming.
- 1.2.3.3. They would like the checklist to specify some threshold (i.e. E.O.T. iron content) that will trigger the borescope measurements.
- 1.2.3.4. Lubrizol agrees with Afton's concerns.

1.3. Procedure for Stand Maintenance after Camshaft Lobe Failure:

- 1.3.1. Intertek just finished the procedure for stand maintenance after a camshaft lobe failure.
- 1.3.2. This procedure includes more detailed instructions for cleaning the external oil system and external blowby system.

1.3.3. Cleaning Oil System:

- 1.3.3.1. All the external hardware is to be completely disassembled.
- 1.3.3.2. All O-rings and gaskets are to be replaced.
- 1.3.3.3. Intertek will add illustrations/photographs to the procedure.

1.3.4. Oberg Filters:

- 1.3.4.1. Intertek washes and reuses the filters if they appear to be serviceable.
- 1.3.4.2. The filter is deemed unserviceable if debris gets stuck within the fabric mesh.
- 1.3.4.3. They use a copper press-washer to keep the Oberg housing from dripping.

1.3.4.4. Oberg Bypass Warning Light:

- 1.3.4.4.1. OHT still stocks the warning light system that illuminates when the Oberg filter goes into bypass.
- 1.3.4.4.2. Intertek believes that these warning lights may have been used early in IVB development.
- 1.3.4.4.3. OHT thinks these lights are stocked under a Sequence VIA part number.
- 1.3.4.4.4. OHT cautioned that these lights lost popularity because they sometimes give false positives.

- 1.3.5. All components that connect to the engine's oil gallery must be cleaned.

- 1.3.6. The procedure includes the steps necessary to reassemble the external oil system.

1.3.7. Cleaning Blowby System:

- 1.3.7.1. Intertek's draft procedure includes a photograph of the optional heat exchanger baffle.
- 1.3.7.2. Their proposed blowby stack cleaning is almost identical to the cleaning that is specified in the procedure.
- 1.3.7.3. Intertek has found that the ultrasonic cleaner is significantly more effective than solvent at cleaning the oil separator.
- 1.3.7.4. Intertek uses stainless steel thumb screws in the oil separator.
- 1.3.8. Intertek is looking for feedback from the other labs on this draft.

1.4. Master Dataset to Statisticians:

- 1.4.1. Intertek has been forwarding all the break-in and aging datasets to Lubrizol.
- 1.4.2. Intertek hopes to have engine life data to Lubrizol today.
- 1.4.3. Lubrizol will combine all this data into a master spreadsheet that can be provided to the statisticians for analysis (break-in, aging, engine life, iron, calcium adjusted iron, camshaft lobe failure information, etc.).
- 1.4.4. Intertek is working on a template that the TMC can use to collect supplemental camshaft lobe failure data.

1.4.5. FEWMEOT Results from 2nd Precision Matrix Using New Procedure:

- 1.4.5.1. Southwest has finished re-running their samples with the new procedure.
- 1.4.5.2. Intertek will use the Southwest template to report their measurements for all the E.O.T. samples from the 2nd Precision Matrix.
- 1.4.5.3. Lubrizol's repeat measurements are also available.
- 1.4.6. Intertek will send a letter to the Statistics Group to better understand their current workload.

1.5. Oil Consumption Limit Action Item:

- 1.5.1. Afton suggested that the sub-group address this action item now.
 - 1.5.1.1. There is nothing stopping the group from issuing a recommendation.
 - 1.5.1.2. This group also needs to establish the protocol for when this threshold is exceeded (is the test invalid, is the test non-interpretable, etc.).
 - 1.5.1.3. *What is the assignable cause for excessive oil consumption – the engine or the oil?*
- 1.5.2. Lubrizol noted that the original plan was to set this limit after the statisticians have reviewed the master dataset.
 - 1.5.2.1. However, they do not object to addressing this action item now.
 - 1.5.2.2. Lubrizol would like to set the initial limit at 1000g.
- 1.5.3. Intertek is comfortable with Lubrizol's proposal of 1000g.
 - 1.5.3.1. The limit should not be set any lower than this.
 - 1.5.3.2. *Does this limit require an e-ballot with the Surveillance Panel?*
- 1.5.4. Intertek has concern over losing a test if an operator accidentally spills an end-of-test oil charge.
- 1.5.5. There was consensus among the participants that a lab will be responsible for an invalidated test if "they pushed the engine too far".

1.5.6. E-Ballot:

- 1.5.6.1. There was a consensus among the participants that a motion will be needed at the Surveillance Panel.
- 1.5.6.2. Buscher will issue an e-ballot with an end date of August 21st.
- 1.5.6.3. This e-Ballot will also request approval for several other key items that were recently agreed upon by these sub-groups.
- 1.5.6.4. The TMC recommended having a follow-up conference call if any of the e-ballot items receive negative votes.
- 1.5.6.5. Intertek believes that a comprehensive e-ballot could eliminate the need for a face-to-face meeting.
- 1.5.6.6. Items to include on comprehensive e-ballot:
 - 1.5.6.6.1. Oil consumption limit
 - 1.5.6.6.2. Lobe failure definition
 - 1.5.6.6.3. Reporting a camshaft lobe failure as uninterpretable
 - 1.5.6.6.4. Section 4 – rebuilding an engine after a camshaft lobe failure
 - 1.5.6.6.5. Extended shutdown procedure
 - 1.5.6.6.6. Engine health checklist

1.6. Updating Test Report Form (and Data Dictionary) Action Item:

- 1.6.1. Lubrizol considers this to be a critical action item.

1.6.2. Retroactive Reporting for Candidate Tests:

- 1.6.2.1. Lubrizol inquired as to whether candidate test reports will need to be submitted with the updated test report format.
- 1.6.2.2. Response from the TMC:
 - 1.6.2.2.1. There may be a need to retroactively update candidate test reports to address the iron pass/fail parameter.
 - 1.6.2.2.2. The final version of Form 4 will have two main pass/fail parameters: AVLI and FEWMEOT.
 - 1.6.2.2.3. There is a lot of currently reported data that may not be included in the new test reports.
- 1.6.2.3. Response from Intertek:
 - 1.6.2.3.1. The new test report may have new fields added outside of Form 4.

1.6.2.3.2. It is likely that the final test report will have fields to identify whether an engine experienced a camshaft lobe failure.

1.7. REO300-1 Introduction, Action Item:

- 1.7.1. Lubrizol considers this to be a critical action item.
- 1.7.2. The TMC is out of REO300.
- 1.7.3. The TMC traditionally uses the original targets for all new blends of reference oils.
 - 1.7.3.1. This works 80%-90% of the time.

1.7.4. Comments from Intertek:

- 1.7.4.1. Intertek was originally going to use REO300 for the Keyence "Round Robin" test.
- 1.7.4.2. However, they are open to using REO300-1 instead.
- 1.7.4.3. The TMC supports this suggestion and will provide Intertek with an inventory of REO300-1.

1.8. Update on Keyence Round Robin:

- 1.8.1. Lubrizol and Exxon have completed their measurements.
- 1.8.2. Southwest is measuring the hardware now.
- 1.8.3. Afton will receive the hardware after Southwest.

1.9. Review Test Procedure (Intertek):

- 1.9.1. The sub-group will need to figure out what sections of the procedure will need to be updated with the new documentation.
- 1.9.2. Once this is done, the Surveillance Panel will need to review the procedure from start to finish.

1.10. Meeting Next Week:

- 1.10.1. Lubrizol will host a meeting to review the template that it is going to use for the master dataset.

1.11. Statistician Work Load:

- 1.11.1. O'Malley confirmed that the Statistics Group is very busy with BOI/VGRA data analysis.
- 1.11.2. The Sequence IIIH, Sequence VIE and Chain Wear tests all have BOI/VGRA data to review.
- 1.11.3. In regard to the master IVB dataset, the Surveillance Panel will need to provide the statisticians with a clear list of objectives.

Action Items	Person responsible	Completion Date

Follow-up Notes/Updates	Initials	Date Added

Attendees	Organization	Contact Information