

VH Operational Data Review | MINUTES

Revision Date 5/12/2017 3:35:00 PM

Relevant Test:	Sequence VH
Note Taker:	Chris Mileti
Meeting Date:	05-02-2017
Lubrizol Attendees:	CHTM, JABS
Comments:	Meeting to discuss strategy for upcoming Sequence VH Precision Matrix operational data review.

1. DISCUSSION:

a) Opening Comments from A. Ritchie:

- i) The purpose of this meeting is to develop a strategy for the review of the remaining Precision Matrix operational data.
- ii) **The following tests have been completed:**
 - (1) *Afton* – 4 tests
 - (2) *Intertek* – 8 tests
 - (3) *Southwest* – 5 tests
 - (a) Their data will be posted to the TMC website by May 3rd.
 - (b) TMC will then need to review SWRI's QI calculations.
 - (4) *Ashland* – 3 tests

b) Update from Ashland:

- i) The first test that they submitted (REO1009) is valid.
- ii) The second test that they submitted (REO940) had to be invalidated because the rocker arm cover coolant temperature was out of limits for 30%-40% of the test.
- iii) The third test that they submitted (repeat of REO940) had to be invalidated because the fuel dilution was unusually low.
 - (1) They were unable to identify this problem immediately because of the delay in getting the oil analysis results.
 - (2) The fuel dilution returned to expected levels after they replaced the ECM (which was approximately 4-5 years old).
 - (3) The original ECM appears to have been commanding an incorrect spark timing:
 - (a) Stage 1 ~ 16°
 - (b) Stage 2 ~ 26°
 - (c) Stage 3 ~ 90°
 - (4) Ashland has requested additional ECM's from the other labs.
- iv) They are now running their REO1011 Precision Matrix test.
- v) The severity of Ashland's earlier prove-out tests was similar to the severity of the other development labs.
- vi) Ashland is willing to redistribute their remaining Precision Matrix tests to the other labs.

c) Two Options for the Remaining Precision Matrix Tests (A. Ritchie):

- i) There are currently (20) completed/valid tests from (3) separate labs.
 - (1) The original goal was to have (24) completed/valid tests from (4) separate labs.
- ii) As a result, the Sequence VH Precision Matrix currently meets the minimum requirement of (6) valid tests for each of the (3) reference oils.
- iii) **Comments from D. Boese:**
 - (1) These (20) tests are sufficient to perform a statistical analysis on the dataset.
 - (2) The (1) additional valid test result from Ashland will not provide any statistical benefit.

d) Comments from D. Boese Regarding the Precision Matrix Data:

- i) The sludge discrimination looks good.
- ii) The varnish discrimination is clear statistically but not visually.
 - (1) The varnish ratings calculated using 50% of the piston skirt show better discrimination than the varnish ratings calculated with the full piston skirt.
- iii) Oil screen clogging also shows statistical discrimination.
- iv) **Comments from Afton:**
 - (1) It is very possible that the severity level of this test will shift with subsequent fuel batches.
 - (2) The sludge generated during a VH test is darker and more liquid than the sludge generated during a VG test.
 - (a) This allows the sludgy oil to drain off of the cylinder head more easily.
 - (b) This, in turn, could be impacting oil screen clogging.
- v) **Comments from SWRI:**
 - (1) They agreed with Afton that the sludge is more liquid with the VH test.
 - (2) They speculate that this could be due to higher fuel dilution with the VH engine.
 - (3) They also noted that the difference in sludge severity between the left-side and right-side cylinder head (with the VH engine) is the opposite of what it was with the VG engine.

e) Oil Screen Clogging:

- i) **Comments from Lubrizol:**
 - (1) Lubrizol is leery of keeping oil screen clogging as a pass/fail parameter.
 - (2) OSC has historically been heavily influenced by fuel batch.
 - (a) This is best illustrated by the wildly different OSC industry correction factors needed for the last few batches of fuel.
- ii) **Comments from Intertek:**
 - (1) Intertek has been studying the behavior of the OSC parameter with the VH engine.
 - (2) They found that the OSC parameter can become lower if the oil screen is allowed to sit for a period of time.
 - (a) It is almost as if the oil film dissipates.
- iii) **Afton Comments:**
 - (1) The Intertek findings clearly indicate that the procedure should be updated to specify a time window in which the oil screen must be rated.
 - (2) Unfortunately, specifying a window of time does have a downside.
 - (a) *What does a lab due if the test ends on a Friday but the Raters are not available until the following Monday?*

f) Forward Action Plan:

- i) The TMC will conduct a review of the QI calculations by May 9th.
- ii) The engineers and statisticians can then conduct an operational data review on (or after) May 9th.
- iii) Ideally, the statisticians would be given a validated dataset by May 19th (or earlier).
- iv) It will take the statisticians approximately 1-month to review the data and make a recommendation regarding an LTMS system.

- (1) Boese noted that LTMS2 will be used for the Sequence VH test.
- v) Andy Ritchie will then recommend to the Surveillance Panel (around June 19th) that the Sequence VH be submitted for approval as an ASTM test.

g) Discussion about Sequence VH ECM's:

- i) There was a discussion regarding whether each lab should be required to have the capability to monitor ECM/ECU data.
- ii) Unfortunately, it is difficult to read data from these older ECM units.
- iii) The labs could install a spark box on their stands to monitor ignition timing.
 - (1) Lubrizol uses a system called the IGTM2000.
 - (2) It costs approximately \$3600 per unit.

2. ADDENDUM A (05-12-2017):

a) Background:

- i) Several changes were made to the timeline discussed during the original conference call on 05-02-2017.
- ii) These changes were made during the AOAP meeting on 05-11-2017, and communicated to the Sequence V Surveillance Panel engineering group by Ron Romano (email on 05-12-2017 at 9:20AM EST).

b) Changes to Forward Action Plan Timeline:

- i) The AOAP cancelled the June 29th meeting, so the next AOAP meeting will be on July 13th.
- ii) Romano expects to ask for a vote on the VH Precision Matrix during this July 13th meeting.
- iii) **So the revised forward action plan timeline is as follows:**
 - (1) May 18th – Engineers to complete operational data analysis and validation.
 - (2) May 23rd – Surveillance Panel to review test results and operational data.
 - (a) The Surveillance Panel will need to instruct the statisticians to perform a statistical review and make LTMS recommendations.
 - (3) June 12th – The development group will review the results of the statistical analysis and LTMS recommendations.
 - (4) Week of June 19th – The Surveillance Panel to vote that the test is ready to become an ASTM method with the intention of including it in the GF-6 category.
 - (a) This milestone could be pushed back to June 30th if needed.
 - (5) July 13th – AOAP/PCEOCP to vote that test is ready to become ASTM method and included in GF-6.

Action Items	Person responsible	Completion Date

Follow-up Notes/Updates:	Initials	Date Added

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