

Sequence VG-A Task Force | MINUTES

Revision Date 04-28-2016 | Revision 1.0

Relevant Test:	Sequence VG and VG-A
Note Taker:	CHTM
Meeting Date:	04-27-2016
Lubrizol Attendees:	CHTM, JABS and KVOM
Comments:	Meeting called to discuss releasing the “DJ” fuel batch for the Sequence VG test.

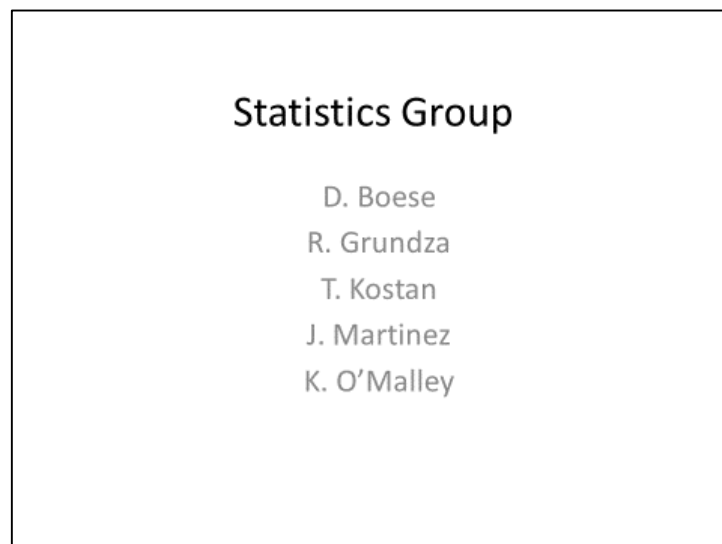
STATISTICIAN ANALYSIS:

1. Supporting Documentation:

- a. VG-A New Fuel Batch Test Results – 042716.ppt
- b. VG New Fuel Batch Additional Testing – 042616.ppt

2. Review of “VG New Fuel Batch Additional Testing – 042616” Presentation [Boese]:

a. Slide 2:



- i. This slide lists the statisticians that were involved in this analysis.
- b. **Slide 3:**

Proper New Fuel Batch Matrix

Lab	IAR		SwRI		LZ
	Stand 1	Stand 2	Stand 1	Stand 2	Stand 1
Run 1 *		940	940		940
Run 2 *	1009	1009	1009	940	1009
Run 3 *	940	940	1006-2	1009	1006-2
Run 4	1006-2			1009	

- The initially proposed new fuel batch matrix is recommended to provide sufficient confidence in evaluating the need for, and calculation of, correction factors.
- The decision to run less tests in this case does **not** change this recommendation for future fuel batch changes, if any.
 - This case is a limited number of candidate tests to which the correction factors will be applied and relatively well behaved new fuel batch results to date.
- Correction factors can be generated based on the data from 8 tests (2 additional tests plus the 6 existing tests), but the surveillance panel will need to be comfortable with the risks associated with utilizing correction factors generated from fewer than normal tests and potentially data from only 2 of the 3 reference oils.

- The current situation is unusual because the fuel batch is being analyzed using the results from a small number of tests.
- As a result, the confidence interval for any correction factors will be broader than normal.
 - The Surveillance Panel will need to be willing to accept this increased risk.

c. Slide 4:

Testing Proposal

- The following proposal was based on the assumption that 2 labs would provide calibration tests with the new fuel batch.
- The proposals for testing 2 additional oils in decreasing preferred ranked order follow:
 - Oil 1009 at Lab G and Oil 940 at Lab A
 - Purpose is to dilute effect of apparent errant results.
 - Oil 1006-2 at Lab A and G
 - No data is available for this oil on this fuel / hardware combination.
 - Oil 1009 at Lab A and G
 - Oil 1009 yielded more apparent errant results than 940.

- This slide contains three options proposed by the statisticians.
- These options were based on the assumption that Intertek and Southwest would each donate one additional test.
- Option #1:*
 - This is the option that the statisticians are recommending.
 - This option will exclude the use of REO1006-2 as a calibration oil for the VG engine when it is used with the “DJ” fuel batch.
 - One additional test will be run at Lab G with REO1009, and one additional test will be run at Lab A with REO940.
 - The goal of the two additional tests is to dilute the effect of the outlying results in the existing dataset.
- Option #2:*
 - The statisticians feel that this option is less preferred than Option #1.

2. REO1006-2 would be run at both Lab A and Lab G.
3. The goal of the two additional tests is to develop a history with REO1006-2 on this engine and fuel combination.
4. REO1006-2 would then continue to be used as a calibration oil for the VG engine when it is used with the "DJ" fuel batch.
- v. *Option #3:*
 1. The statisticians feel that this is the least preferable of the three options.
 2. REO1009 would be run at both Lab A and Lab G.
 3. The additional REO1009 data would compensate for the outlying REO1009 results in the existing dataset.
 4. This option would also require REO1006-2 to be suspended as a calibration oil when the VG engine is run with the "DJ" fuel batch.
- vi. *Discussion about Suspending REO1006-2:*
 1. The statisticians feel that temporarily suspending REO1006-2 as a calibration oil would only impact a small number of reference tests.
 - a. The VG test is expected to run out of critical hardware by the end of the year.
 2. Intertek worries that the removing REO1006-2 could impact candidate oils that typically run in the same range of sludge severity.
 3. *TMC:*
 - a. REO1009 actually provides the most information with respect to the pass limits of current candidate oils.
 - b. The information from REO940 is also needed.
 - c. There is a mathematical reason for running two reference oils.
 - i. REO940 provides a good anchor point so that the linear fit has the appropriate slope.
 4. Ford will defer to the statisticians and support Option #1.

MOTIONS AND FORWARD ACTION PLAN:

1. Ritchie feels that a pragmatic approach is needed at this point, even if it is not ideal

2. First Attempt at Making a Motion:

- a. Option #1 will be used.
- b. Correction factors will be derived and applied (if needed) so that the fuel can be run with the VG engine.
 - i. The establishment of correction factors for the VG engine does not mean that this fuel is ready for use in the VG-A engine.
- c. Two additional tests will be run at the San Antonio labs.
 - i. Lab G will run REO1009 and Lab A will run REO940.
- d. **Original Motion:** Two additional tests will be run at the San Antonio labs to complete the VG fuel release matrix for the "DJ" fuel batch. Intertek will run REO1009 and Southwest will run REO940. The statisticians will analyze the data to derive correction factors for this combination (if needed). The "DJ" fuel batch will be released for the VG test pending approval by the Surveillance Panel.
- e. **Affon asked when the two labs could start this testing:**
 - i. Intertek will select a stand within the next week.
 1. The statisticians stated that it would be ideal to use the same test stand that was used to generate the earlier data, but that this is not mandatory.
 - ii. The original stand used at Southwest is now out of calibration.

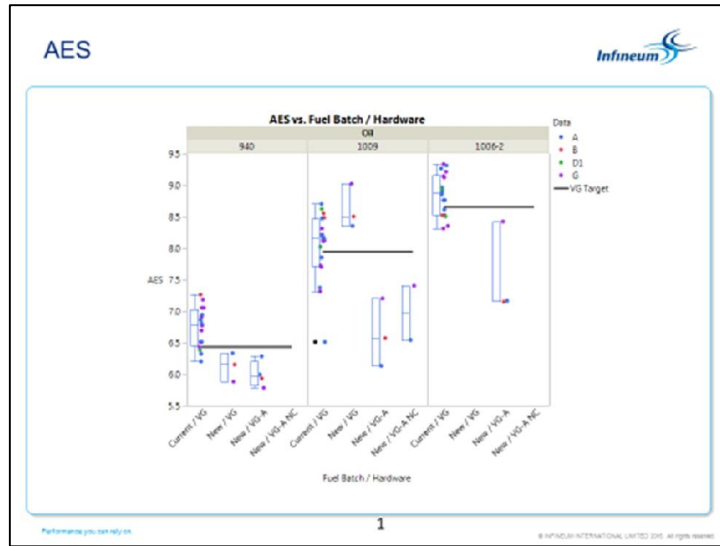
1. TMC confirmed that they can use this stand as long as it has not been out of calibration for an extended period of time (i.e. 6-12 months).
- f. **Afton asked if this testing could be used to calibrate the Southwest stand:**
 - i. TMC stated that this test could be used to calibrate this stand with the "DJ" fuel if it meets the newly established correction factors.
 1. Essentially, it would be calibrated for the "AK" fuel batch with the established "AK" correction factors.
 2. When the "AK" batch runs out, this stand can use the "DJ" fuel batch with the new correction factors.
- g. **Intertek inquired what would happen if one of the labs failed this fuel matrix test:**
 - i. TMC stated that the stand would not be considered calibrated.
 - ii. This resulted in a considerable amount of discussion regarding whether it is appropriate to use a test result to establish a correction factor, and then use this correction factor to determine if the test result is acceptable.
 1. Boese stated that this concept has been used in the past, but that it is definitely not ideal.
 - iii. There were also concerns that a lab could be penalized for "failing" a donated test and losing a stand's calibration.
 - iv. Grundza will review these two issues with TMC management and report back to the group with a recommendation.

3. Final Motion:

- a. The original motion was again brought to a vote.
- b. However, the final motion was made with the understanding that TMC needs to report back to the group regarding how the results of the two additional fuel matrix tests would impact stand calibration.
- c. Ron Romano from Ford made the motion.
- d. Al Lopez from Intertek seconded the motion.
- e. **Affirmative Votes:** 10 (Chevron, Exxon, Ford, Lubrizol, Ashland, Southwest, Intertek, Afton, Haltermann and Infinium)
- f. **Waive:** 1 (TMC)
- g. **Negative Votes:** 0

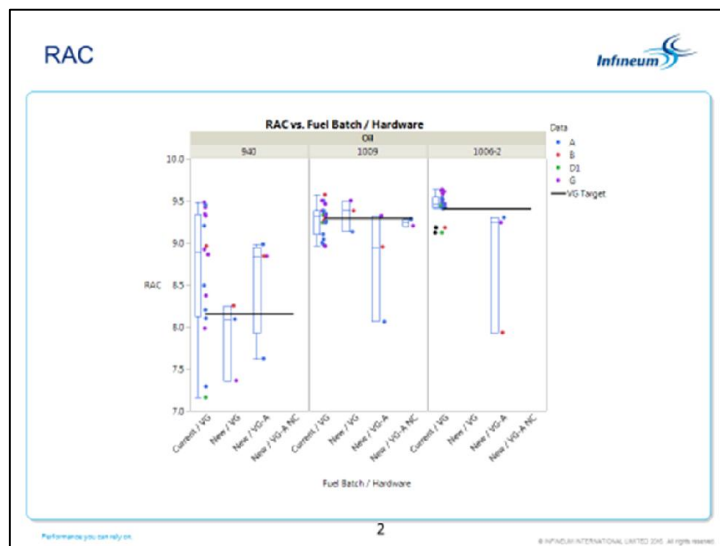
D. BOESE PRESENTATION:

1. **Review of "VG-A New Fuel Batch Test Results - 042716" Presentation [Boese]:**
 - a. **Slide 2:**



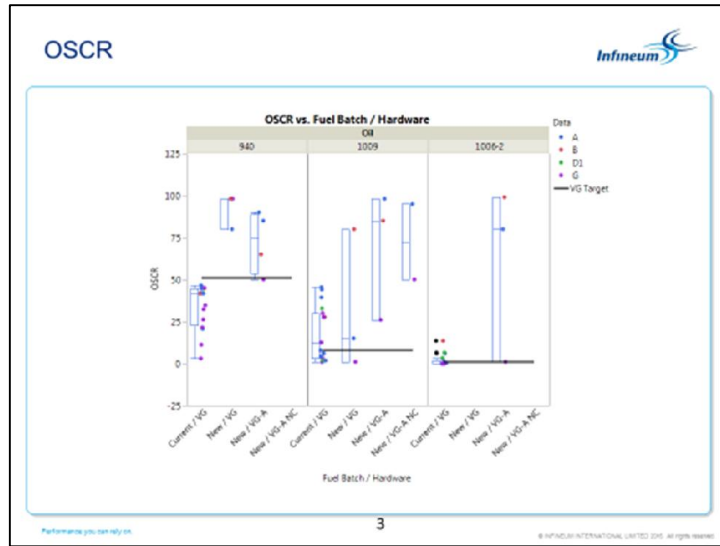
- i. The "NC" designation in the upcoming slides stands for "New Conditions".
 1. These new conditions were agreed upon during the recent operational data review performed by Lubrizol, Intertek and Southwest.
 2. All labs are to use Horiba Lambda sensors.
 3. Coolant flow set points were added to Stage 2 and Stage 3.
 4. Spacers were added to the timing chain tensioners (and sealed with silicone) to reduce the risk of oil hemorrhaging.
- ii. The REO1009 "new condition" AES results are slightly milder than the original REO1009 results.

b. **Slide 3:**

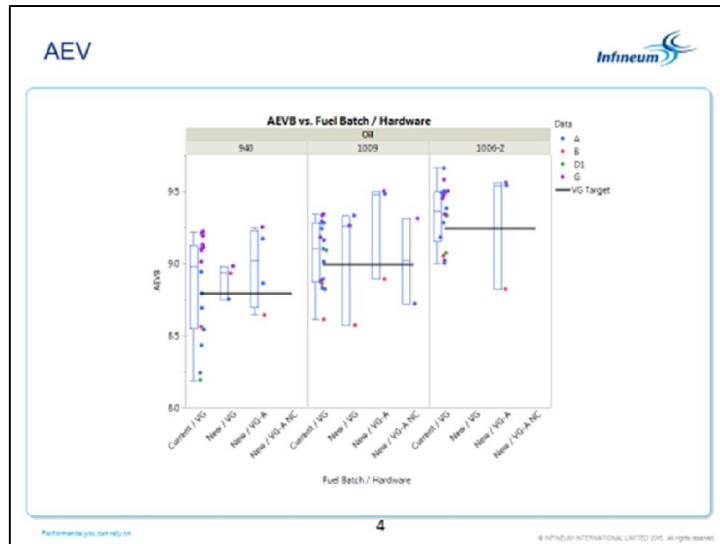


- i. The REO1009 RAC result for Lab A is significantly milder with the new conditions.

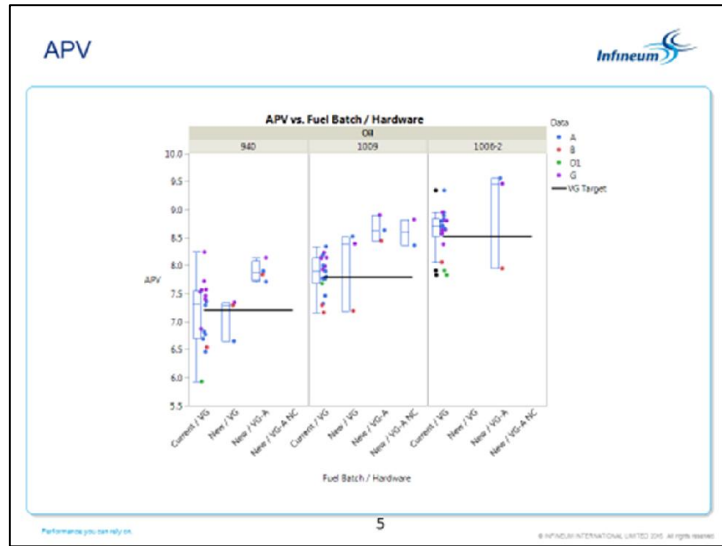
c. **Slide 4:**



- i. The REO1009 OSC result for Lab G is more severe with the new conditions.
- d. **Slide 5:**



- i. The REO1009 AEV result for Lab A is significantly more severe with the new conditions.
 - ii. The REO1009 AEV result for Lab G is slightly more severe with the new conditions.
- e. **Slide 6:**



- i. The REO1009 "new condition" APV results are slightly more severe than the original REO1009 results.
- ii. Boese clarified that all of the displayed APV results utilized the full skirt rating area.
 - 1. A complete data set of 50% piston skirt ratings is not yet available.
- f. **Intertek Comments on Presentation [Lopez]:**
 - i. Intertek repeated their original VG-A performance with REO1009.
 - ii. The new coolant flow strategy did not change their sludge results because they were controlling to set points that were close to their existing operating points.
 - iii. The next step is for Southwest to run the Intertek-supplied engine.

2. Discussion with Haltermann about Fuel Inventories:

- a. Haltermann inquired about how much fuel is needed to support the ongoing VG-A test development.
- b. **Ford Response:**
 - i. Southwest and Lubrizol still need to run the Intertek-supplied VG-A engines (2 tests).
 - ii. Once the VG-A test is finalized, a Precision Matrix will need to be run (4 tests per stand).
- c. Haltermann will provide enough fuel to each of the Sequence V labs (1800-gallons) to complete the required testing prior to the Precision Matrix.
 - i. Afton suggested that the Industry hold a VG-A engine build workshop prior to the start of the Precision Matrix.

Action Items	Person responsible	Completion Date

Follow-up Notes/Updates:	Initials	Date Added

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