Sequence V Surveillance Panel | MINUTES

Revision Date *11/20/2016 2:32:00 PM*

Relevant Test:	Sequence VG and VH
Note Taker:	Chris Mileti
Meeting Date:	11-17-2016
Lubrizol Attendees:	
Comments:	Face-to-face Sequence V Surveillance Panel meeting hosted by Southwest Research.

1. GENERAL UPDATES:

a) TMC Update on Sequence VG Test:

i) The TMC issued their most recent Sequence VG report on November 4th.
ii) The current inventory of REO1009 is extremely low.
  (1) Fortunately, there is a sufficient quantity of REO1009 at each laboratory to cover the upcoming Precision Matrix.
  (2) The REO1009 re-blend was expected almost a year ago.
    (a) The TMC still does not have an estimated time of arrival for the REO1009 replacement.
iii) There are currently (6) calibrated Sequence VG stands in the Industry.
iv) The Sequence VG test is now projected to be available almost through the middle of 2017.
  (1) This will provide the Surveillance Panel with sufficient time to release the Sequence VH test before the Sequence VG test becomes unavailable.

b) Haltermann Update on SVGM2 Fuel Inventory:

i) The fuel situation is stable.
  (1) The current inventory should be adequate for the next year.
  (2) Haltermann shipped out two loads of SVGM2 fuel this week.
ii) Ritchie cautioned that the Industry will likely see a surge in SVGM2 consumption within the next few months.
  (1) Haltermann stated that they will monitor the situation closely.
iii) ***Inventory:***
  (1) Haltermann has 355,000-gallons of fuel in their storage tanks.
  (2) Approximately 300,000-gallons of this fuel is easily accessible and available for sale.
iv) ***Haltermann's Fuel Projections for Precision Matrix and 1st Calibration Period:***

280,000	Current Haltermann SVGM2 Inventory				
750	Gallons per VG or VH Test				
373	Total VG and VH Tests				
					gallons
matrix	750	7	4		21,000
1st cal	750	15	15		168,750
period	750	8	2		12,000
total					201,750
total tests for precision matrix + 1st calibration period			269		
total tests available beyond pm and 1st cal period			104		

2. STATISTICIAN PRESENTATION [D. BOESE]:

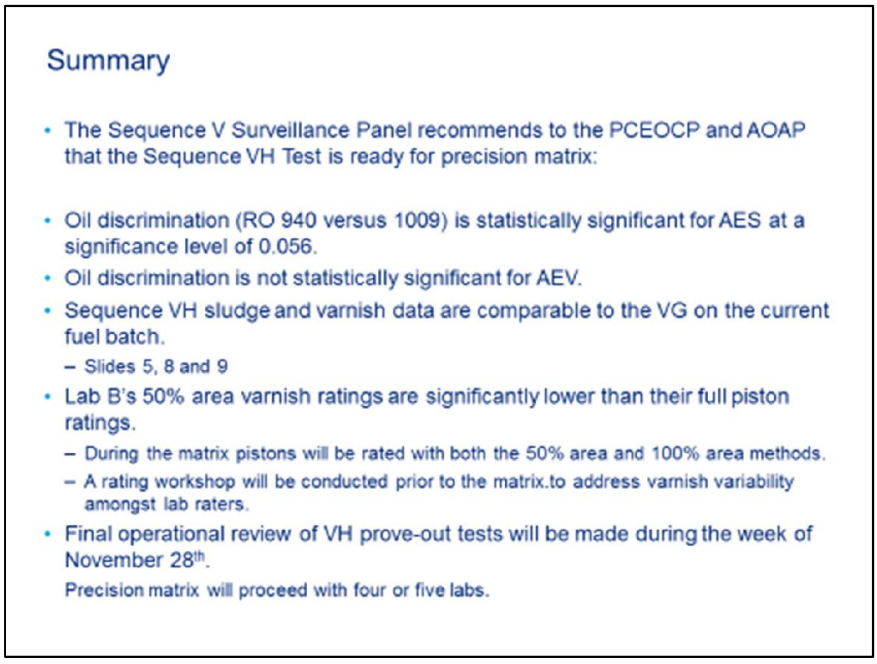
a) Important Notes:

i) This presentation was updated by the Surveillance Panel throughout the meeting.

ii) The slides presented in this document reflect the final version of the presentation.
(1) ***File name:*** *VH Prove Out – 111716 Revised.pptx*

iii) Also, all of the data included in this presentation was generated using the new "DJ" SVGM2 Haltermann fuel batch.

b) "Summary" Slide:



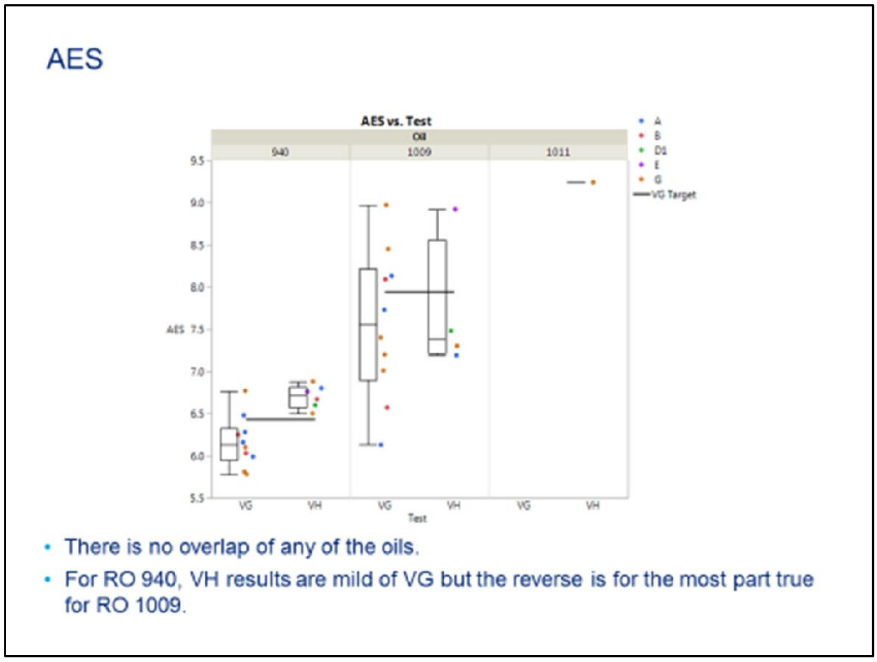
Summary

- The Sequence V Surveillance Panel recommends to the PCEOCP and AOAP that the Sequence VH Test is ready for precision matrix:
- Oil discrimination (RO 940 versus 1009) is statistically significant for AES at a significance level of 0.056.
- Oil discrimination is not statistically significant for AEV.
- Sequence VH sludge and varnish data are comparable to the VG on the current fuel batch.
  - Slides 5, 8 and 9
- Lab B's 50% area varnish ratings are significantly lower than their full piston ratings.
  - During the matrix pistons will be rated with both the 50% area and 100% area methods.
  - A rating workshop will be conducted prior to the matrix.to address varnish variability amongst lab raters.
- Final operational review of VH prove-out tests will be made during the week of November 28th.

Precision matrix will proceed with four or five labs.

i) The issue regarding Lab B's severe APV50 ratings is being addressed by an Industry "round-robin" that is currently in progress.
   (1) This issue is the result of lab-to-lab and Rater-to-Rater rating differences and not necessarily the hardware itself.

c) "AES" Slide:

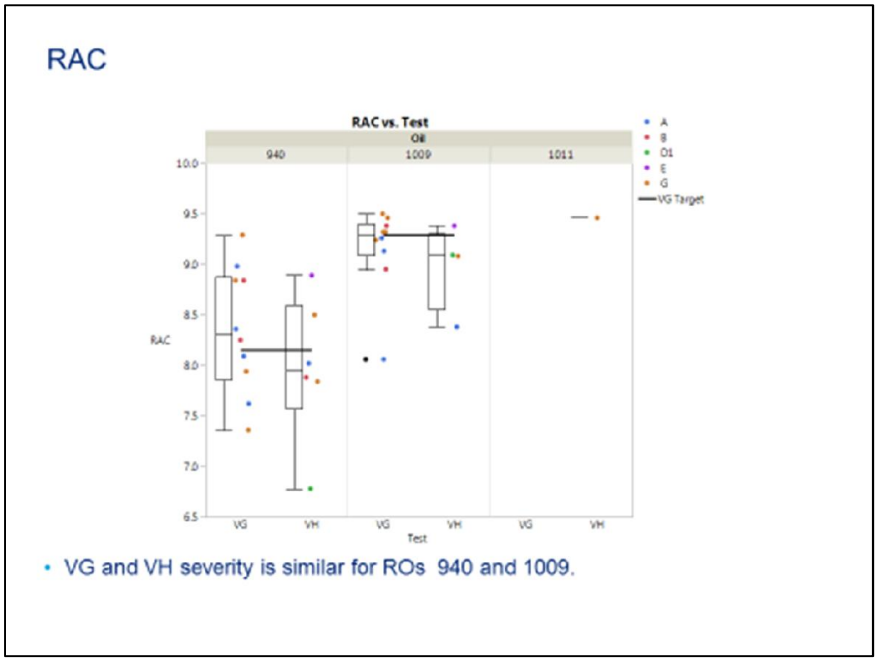


i) ***REO940:***
   (1) There is a nice grouping of VH data with REO940.
   (2) The VH test is clearly milder than the current REO940 target.

ii) ***REO1009:***
   (1) The Lab E result with REO1009 is significantly milder than the other labs.

iii) There is no overlap in the data from each reference oil with the VH test.

d) "RAC" Slide:



i) ***REO940:***

(1) The REO940 results for both the VG and VH tests are clustered around the same range.

(a) The VH test may be slightly more severe than the VG test.

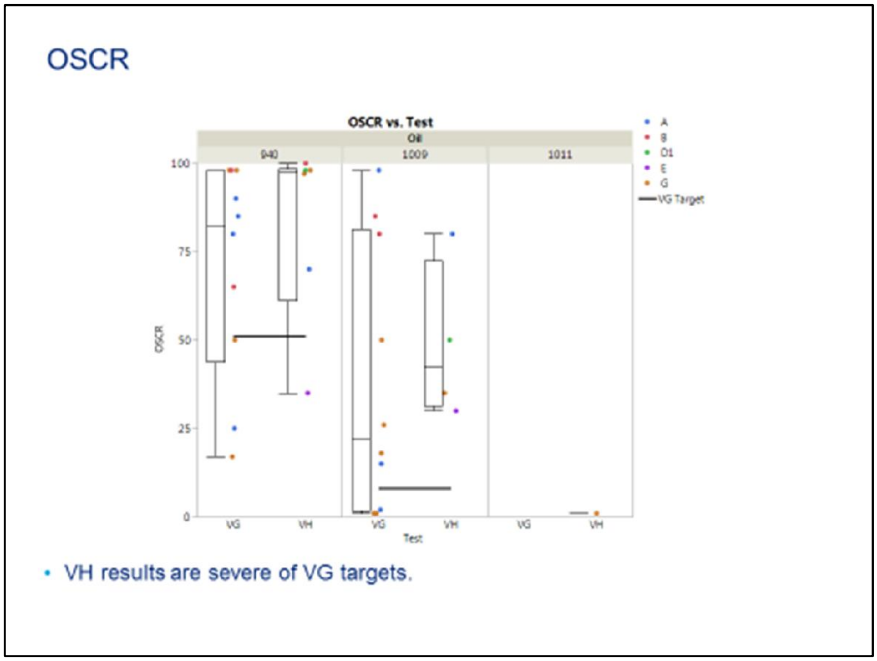
ii) ***REO1009:***

(1) The VH test is slightly more severe than the VG test.

iii) There is an overlap in the data from each reference oil with the VH test.

(1) However, it should be noted that this overlap existed with the VG test as well.

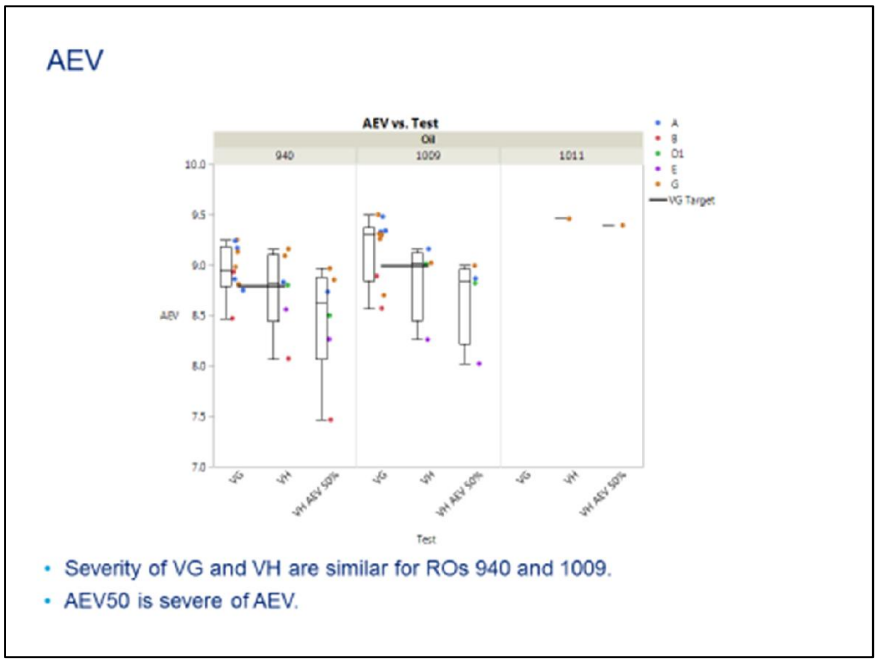
e) "OSC" Slide:



i) The oil screen clogging (OSC) parameter is not generating desirable data for either the VG or the VH test.

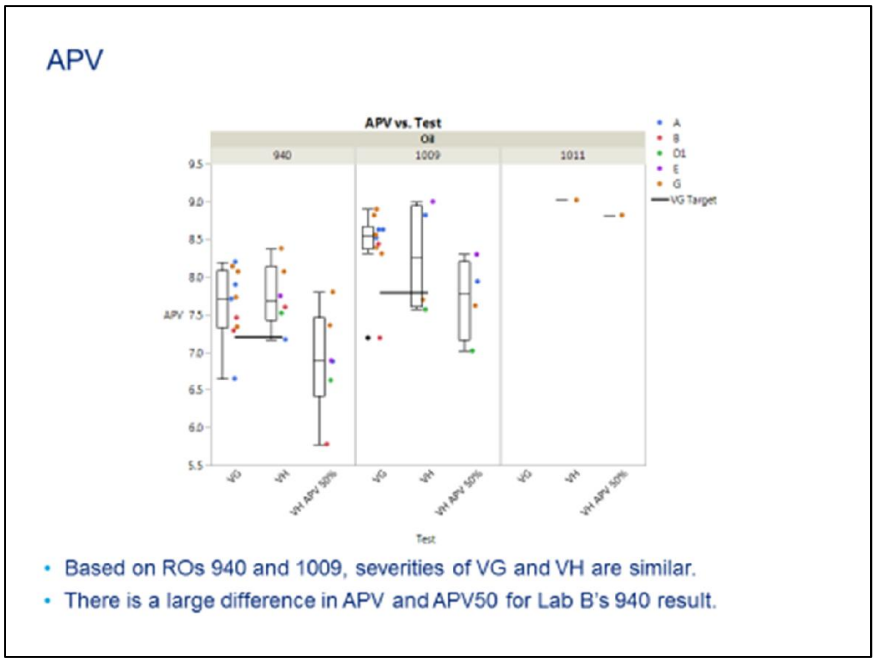
ii) The group agreed that OSC is essentially a random number.

f) "AEV" Slide:



i) The VH test is generally more severe for AEV than the VG test for both REO940 and REO1009.
ii) Also, AEV50 (average engine varnish calculated using the 50% average piston varnish rating) is more severe than AEV for the VH test.
iii) There is considerable overlap in the data from each reference oil with the VH test.
   (1) However, it should be noted that this overlap existed with the VG test as well.
   (2) The VH test does show a clear separation between REO1011 and the other two reference oils (although there is only one data point available for REO1011).
iv) There is a large drop between the AEV and AEV50 results for REO940 at Lab B.
   (1) This is due to the rating differences identified earlier.

g) "APV" Slide:



i) APV50 (average piston varnish rating that only uses the top half of the skirt) is clearly more severe than APV for all three reference oils.
ii) ***Lubrizol Comments:***
   (1) Lubrizol acknowledged that there is a discrepancy with its APV50 result for REO940.
   (2) These pistons are currently being used in an Industry "round-robin".
      (a) Intertek had the mildest APV50 ratings while Lubrizol had the most severe ratings.
      (b) The Afton ratings were somewhere in the middle of these other two laboratories.
iii) The APV50 rating techniques were briefly discussed during the 2016 Fall Rater Workshop.
   (1) However, the group acknowledged that the Rater Workshop is not an ideal venue for this type of discussion.
iv) ***Afton Comments:***
   (1) The most experienced Raters in the industry are showing differences in their APV50 results.
   (2) This is extremely concerning and must be addressed as soon as possible.
   (3) The best way to address this problem is to get the Raters together in one room.
v) ***Intertek Comments:***
   (1) The differences in APV50 results are also apparent among the Raters from a single lab.
   (2) The VH Development Task Force has already agreed to submit both 100% and 50% piston skirt varnish ratings through the end of the Precision Matrix.
vi) ***TMC Comments:***
   (1) There is typically a variation of ±0.2-merits for APV among the experienced Raters.

(2) The current variation with APV50 is unreasonably large.

vii) ***Action Item:***

(1) The Industry's Raters must convene to find a resolution to this APV50 issue before the Precision Matrix is started.

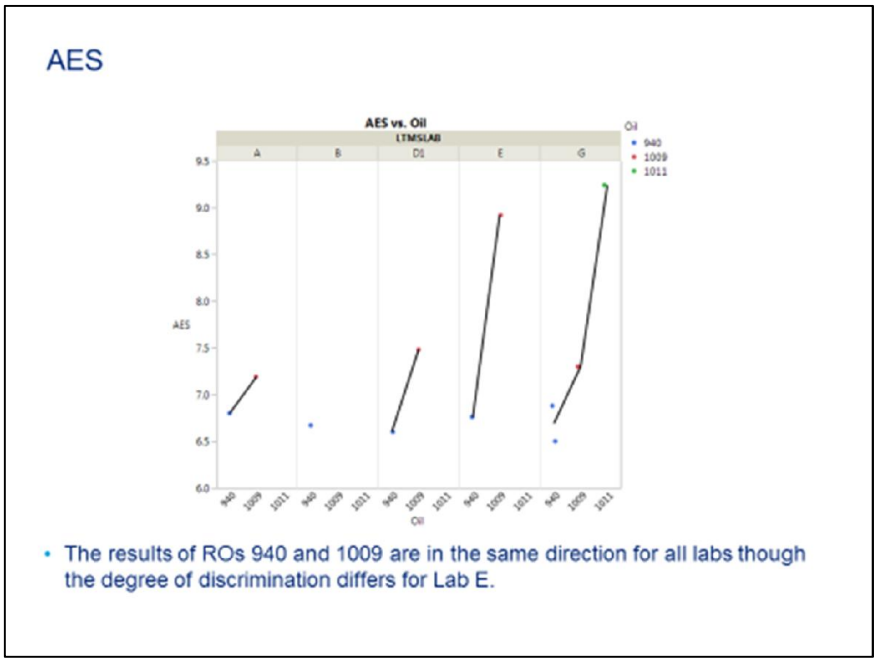
(2) Lubrizol is willing to host this event, which will likely take place during the week of November 27th.

(3) The Lubrizol pistons can be used as a "severe" hardware sample.

(a) However, at least one other piston set needs to be included as a "mild" hardware sample.

(4) The Raters must also use this meeting to confirm that each lab is using the piston skirt template in the same way.

h) "AES" Slide #2:



i) It should be noted that there is only one data point available at each lab for each reference oil.

ii) There is a positive slope between reference oils at all four labs.

i) "AES Regression Analysis" Slide:

AES Regression Analysis

- AES was regressed on Lab and Oil.
  - Lab effect is not statistically significant.
  - Oil discrimination is statistically significant.
  - ROs 1011 and 940 are statistically significantly different.

AES Effects Table

Effect	df	p-Value
LTMSLAB	4	0.509
Oil	2	0.021

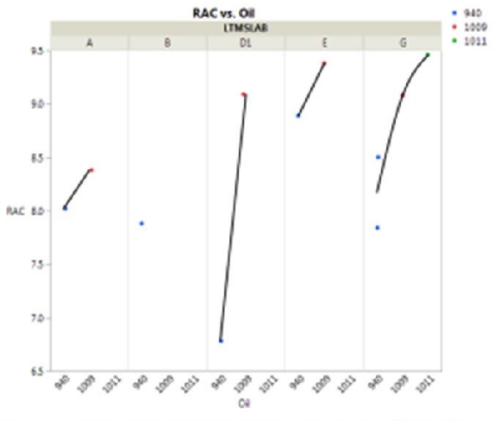
Oil	Level		LS Mean
1011	1		9.40
1009	1	2	7.71
940		2	6.73

Oils not connected by the same level are statistically significantly different.

i) REO940 and REO1009 are not statistically different with the VH test.
ii) REO1011 does show discrimination between itself and the other two reference oils.
   (1) However, only one lab has currently run REO1011.
iii) ***Discussion about M.O.A. Requirements:***
   (1) The MOA states that all of the oils used for discrimination must have two valid runs at each laboratory.
      (a) The Test Development Task Force must approve the results.
      (b) The MOA does not state that the oils must show <u>statistical</u> discrimination.
iv) Lubrizol noted that the VH data looks better than the VG data from a subjective standpoint.

j) "RAC" Slide #2:

RAC

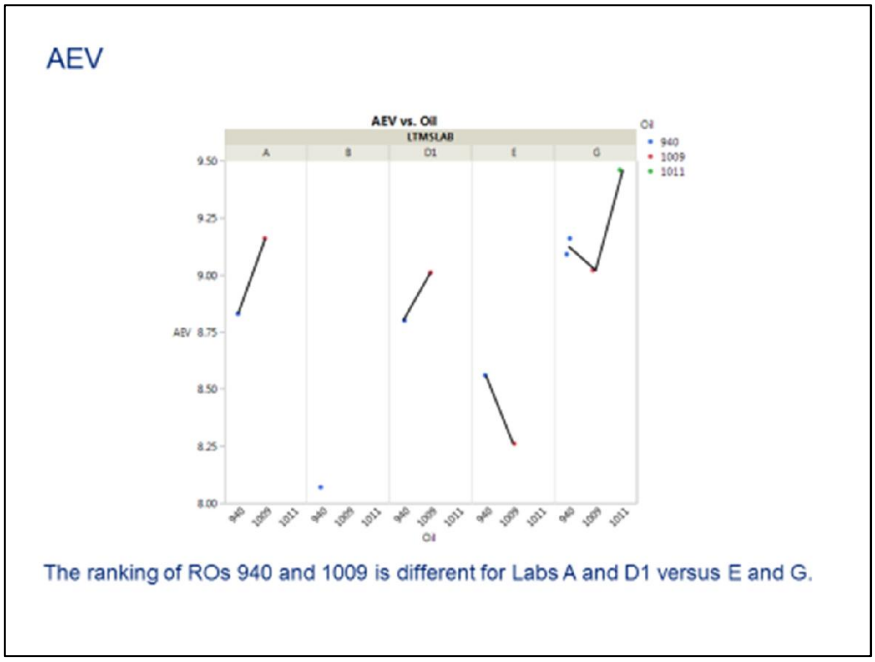


For each lab, the result for RO 1009 is higher than for RO 940.

i) All of the labs have positive slopes between the reference oils.

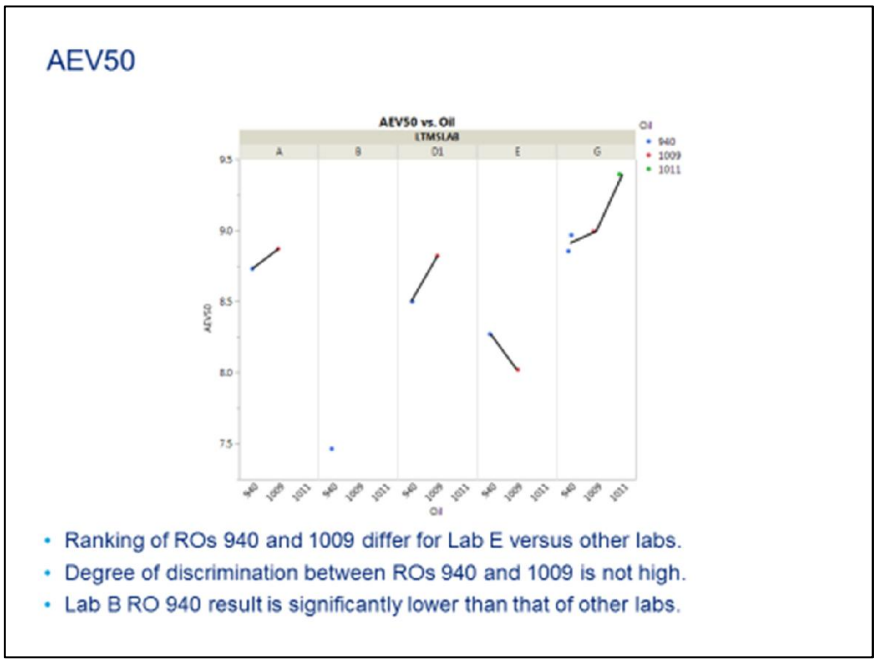
ii) The REO940 result for Lab D1 is much more severe than the RAC results at the other laboratories.
iii) The RAC results at Lab E are much milder than the RAC results at the other laboratories.

k) "AEV" Slide #2:



i) Labs A and D1 have positive slopes between the reference oils.
ii) Labs E and G have negative slopes between the REO940 and REO1009 reference oils.

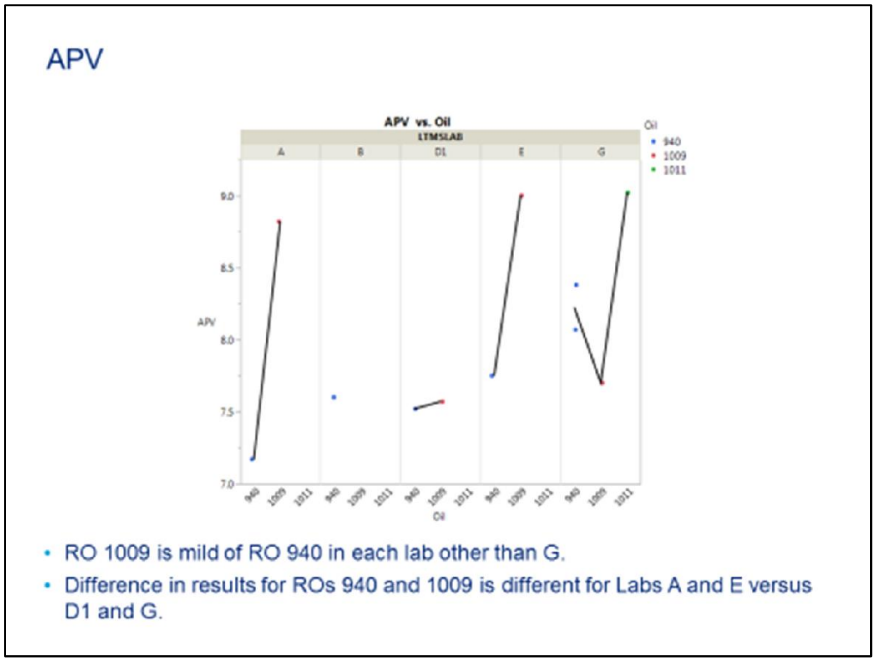
l) "AEV50" Slide #2:



i) The slope between the REO940 and REO1009 reference oils for Lab G was negative with the AEV parameter.
(1) The slope between these reference oils for Lab G became positive with the AEV50 parameter.

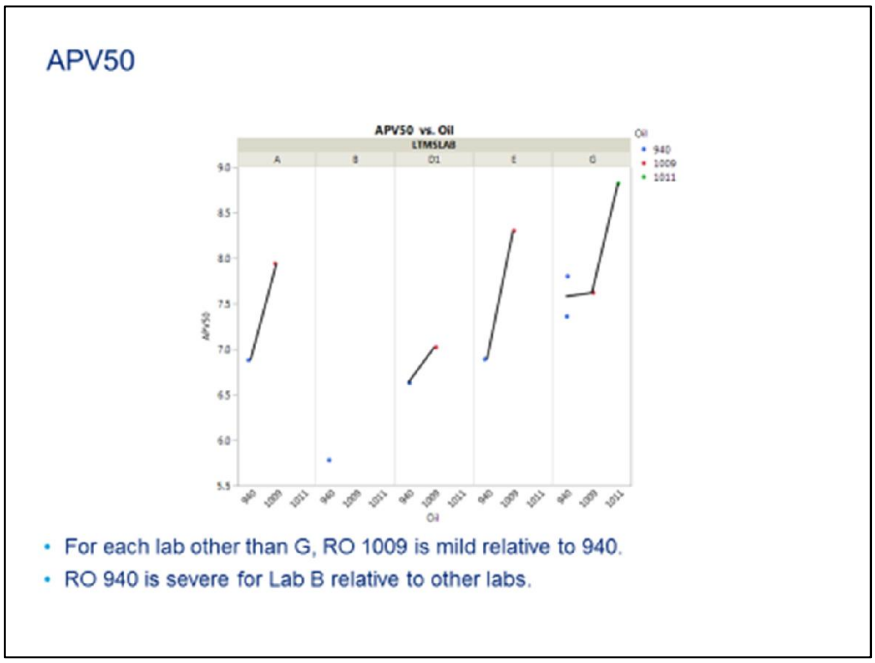
ii) The slope between reference oils for Lab E remained negative with the AEV50 parameter.

m) "APV" Slide #2:



i) There are large differences in APV between the REO940 and REO1009 reference oils for Labs A and E.
ii) Labs A and E have a positive slope between reference oils.
(1) Lab G has a negative slope between the REO940 and REO1009 reference oils.

n) "APV50" Slide #2:



i) The slope between REO940 and REO1009 is almost horizontal at Lab G.
ii) Lubrizol suggested that the accuracy of the current APV50 data is questionable at best.
(1) This parameter should be revisited after the Raters have the opportunity to refine their APV50 procedures.

3. FINAL DISCUSSION:

a) Final Comments on Statistician Presentation:

i) ***Afton Comments:***

(1) The Sequence VH is probably a fairly good sludge test.

(2) The question is whether or not some of the other parameters will drop off after the Precision Matrix.

ii) ***Ford Comments:***

(1) Ford wants to keep the varnish parameters with the Sequence VH test.

(2) The varnish parameters may not be ideal with the VH test, but they are no better or no worse than those of the VG test.

(3) The VH test is doing a good job at discriminating sludge performance between the reference oils.

(4) The current reference oil selection satisfies the MOA requirements.

(a) These three reference oils cover a range of different technologies.

b) Addendum K:

i) ***D.2.2:***

(1) Critical hardware for the Sequence VH test is not currently being serialized.

(a) Batch changes are tracked for all critical parts with this test.

(b) The VH procedure needs to reflect the current methodology being used to track critical hardware with this test.

(2) Any new batches of VH critical hardware will need to be released via reference testing.

(3) The individual labs maintain internal documentation that tracks hardware batches.

(a) This information is not necessarily reported to the TMC.

ii) ***D.4.1:***

(1) The field correlation score was changed from "C" to "A".

iii) ***D.4.2:***

(1) Development of the test procedure is still in progress.

(2) However, it reflects all of the latest changes with the test.

(3) A facilitator is currently converting this document into an ASTM format.

(4) The score was changed from "C" to "B".

c) Discussion about "Summary" Slide from Statistician Presentation:

i) Four of the five development laboratories currently meet the MOA criteria.

(1) The fifth lab (Lubrizol) should report its REO1009 result next week.

(2) Lubrizol agrees that it should not participate in the Precision Matrix if it cannot submit a valid REO1009 result.

ii) Ford does intend to make OSC a "rate and report" parameter for the Sequence VH.

d) Motions and Action Items [Provided by B. Buscher (Intertek)]:

i) These motions and action items were recorded verbatim from B. Buscher's document, "***V Motions and Action Items 11-17-16.docx***":

Action Item – Conduct a rating workshop for Sequence VH piston rating and report results prior to the start of the precision matrix. Target the week of November 27, 2016. Location to be determined.

Action Item – Include Lubrizol pistons, plus two additional sets of pistons in the rating workshop for Sequence VH piston rating.

Action Item – Track batch changes of all critical parts (pistons, piston rings, etc.) for the Sequence VH test. Add batch numbers for all critical parts to Sequence VH data dictionary and report forms.

Motion – Sequence V Surveillance Panel approves the Sequence VH test as ready for precision matrix testing and recommends proceeding with the precision matrix.

Ron Romano / Al Lopez / Passed Unanimously 16 – 0 – 0

Action Item – Sequence V Surveillance Panel chair to inform the PCEOCP and AOAP chairs of the surveillance panel's recommendation for proceeding with the Sequence VH precision matrix, including all provisions.

Action Item – Sequence V Surveillance Panel chair to distribute the Sequence VH presentation from today's surveillance panel meeting to the PCEOCP and AOAP chairs and request that they distribute it, along with the note on the surveillance panel's recommendation, to their panel members.

Action Item – Precision matrix labs to submit the raw operational data files from the twelve (12) Sequence VH prove-out tests to the ASTM TMC by end of business on Monday, November 28, 2016. The Sequence VH Task Force to conduct an operational data study and test validity criteria review, using this data set, during the week of November 27, 2016 (coinciding with the rating workshop for Sequence VH piston rating).

Action Items	Person responsible	Completion Date

Follow-up Notes/Updates:	Initials	Date Added

Attendee Name	Company	Comment
Ed Altman	Afton Chemical Corp.	
Dan Lanctot	Test Engineering Inc. (TEI)	

Attendee Name	Company	Comment
Doyle Boese	Infinium	
Jason Bowden	OH Technologies (OHT)	
Jerry Brys	Lubrizol	Call-in attendee
William Buscher	Intertek	
Amol Savant	Valvoline	Proxy voter for Tim Caudill
Toll Dvorak	Aton Chemical Corp.	
Richard Grundza	TMC	
Jeffrey Hsu	Shell	
Al Lopez	Intertek	
Josephine Martinez	Oronite	
Bruce Matthews	GM	
Christopher Mileti	Lubrizol	
Andrew Ritchie	Infinium	
Ron Romano	Ford	Call-in attendee
Kaustav Sinha	Chevron	
Charlie Leverett	Infinium	
Ryan Rieth	Infinium	
Cole Hudson	SWRI	
Travis Kostan	SWRI	
Lisa Dingwell	Afton	
Bob Campbell	Afton	
Christian Porter	Afton	
Chris Taylor	VP Racing Fuels	
Mark Overaker	Haltermann	
Mike Raney	GM	
Tim Wohing	GM	
Cliff Salvesen	ExxonMobil	
Kevin O'Malley	Lubrizol	
Jim Matasic	Lubrizol	