Sequence V Surveillance Panel Meeting
November 10th, 2022 2 PM EST, via Webex

Roll Call:

Afton:	B. Campbell, B. Maddock, A. Stone
BP:	J. Agudelo
ExxonMobil:	P. Rubas
Ford:	M. Deegan, R. Zdrodowski
General Motors:	B. Cosgrove
Infineum:	D. Boese, C. Laufer, A. Ritchie (Chair)
Intertek:	A. Lopez
Lubrizol:	T. Catanese, P. Scinto, G. Szappanos
OHT:	J. Bowden
Oronite:	J. Martinez, R. Stockwell
Shell:	J. Hsu
SwRI:	D. Engstrom, T. Kostan, P. Lang
TEI:	D. Lanctot
TMC:	R. Grundza

Meeting Summary:
- The matrix composition options and role of RO 940 were discussed.
- It was agreed the priority is to run row 1 as-is. The group recognizes 940 is not as important as the other two, especially 931 which is closest to the target.
- The group will reconvene at the next meeting, prepared to discuss and decide on row 2 and 3 configurations.

Next meetings:
- F2F: Wednesday, November 16th, 2022 at 8 AM CST in San Antonio
- Task Force session to agree next steps (not fixed), lab visits (target 1Q23)

Meeting Details:

Group reconvened to review targets for RO 940 and discuss matrix options. The Chair pulled the notes from October 11th minutes:

- Proposed new 15 VH test matrix was endorsed but it was agreed that it would be reexamined when the 5 Row 1 test results are available.

Run	SwRI1	SwRI2	IAR1	IAR2	Afton		RO	n-size
1	931	1011-1	931	1011-1	1011-1		940	3
2	1011-1	931	1011-1	931	931		931	6
3	931	940	940	1011-1	940		1011-1	6

- Concern expressed at the ability to set good 940 targets with the new fuel, if only 3 (Row 3) 940 data points are available. Group agreed to revisit this concern when Row 1 and 2 VH data is available.

With the fuel going out to the labs shortly, the assumption remains that Row 1 will run as shown above and discussed at a number of previous VH calls.

On behalf of the statisticians' group, Travis Kostan (SwRI) guided the SP through a presentation (see Appendix for slides), outlining the VH fuel matrix approval options.. He opened with the background and the key question to answer:

Background

Past fuel approval matrices have included 5 tests on each of 3 references oils. A suggestion was made to increase the run frequency on the better performing oils (1011-1 and 931) to six tests and to reduce the number of tests on the failing reference oil (940) to three tests. Therefore, a discussion about how 940 will be used in future testing is necessary. One must keep in mind not just the estimate of the fuel difference, but also the usage of Oil 940 in calculation of future severity adjustments.

Question

Is 940 as capable as the other two reference oils in estimating the difference in the fuel and in monitoring severity of candidate performance changes over time? Is understanding the severity at the performance level of 940 as important?

Answers:
1. Yes, 940 is equally as good and important as the other oils.
    ◦   If this is the case, we should run 5,5,5 of each reference oil in the fuel matrix, as this results in the minimum average confidence interval of the oil means with the new fuel, and therefore the best estimate of the fuel difference.
2. 940 may be different, but is like a small number of candidates, so we want to use it but down-weight its impact.
    ◦   Current 3-6-6 matrix works fine for this purpose.
    ◦   Statisticians would not use least square means in a model containing "Oil", in order to avoid equal weighting of oils with different n-counts.
    ◦   If 940 can't represent most candidates, should it be used with 1/3 assignment frequency in LTMS for severity adjustments?
3. 940 may be different and is unrepresentative of almost all candidates. It is only needed as a reference oil to show discrimination.
    ◦   Consider removing as a reference oil OR down-weighting its usage in SA calculating (option to give no weight).

Travis then showed the reference oil performance differences between 940 and 1011-X on the GI fuel batch:

For Average Engine Sludge Yi: Thought not always directionally the same difference, 940 does tend to perform differently than oil 1011-X in ¾ labs. Doyle Boese (Infineum) noted that it is not universal that 940 is higher than 1011: for Lab D, the results fall on top of each other, whereas for lab G, 1011 is higher and for Lab B, 940 is higher.

Removed 931 and Lab E (too little data)
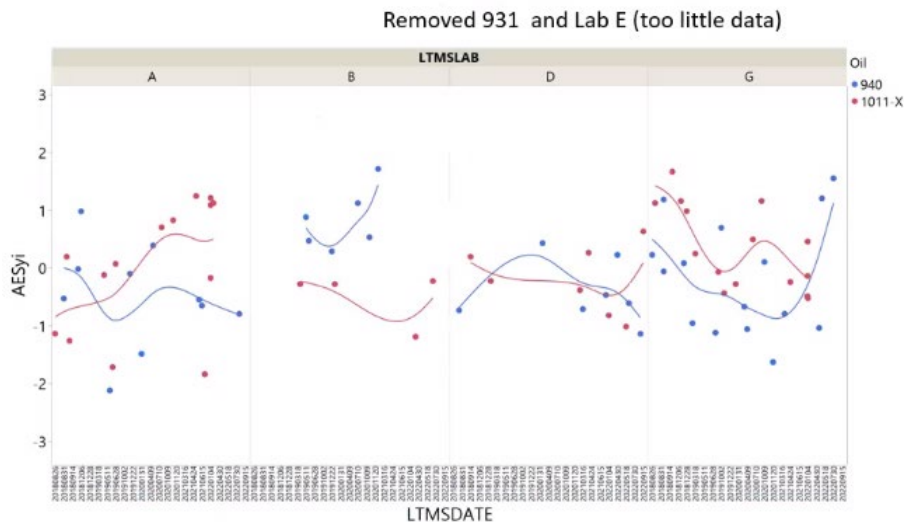
For Rocker Arm Cover Yi: 940 does tend to perform differently than oil 1011-X on Rocker Cover Sludge, but there is a confounding here with other known issues.

Removed 931 and Lab E (too little data)
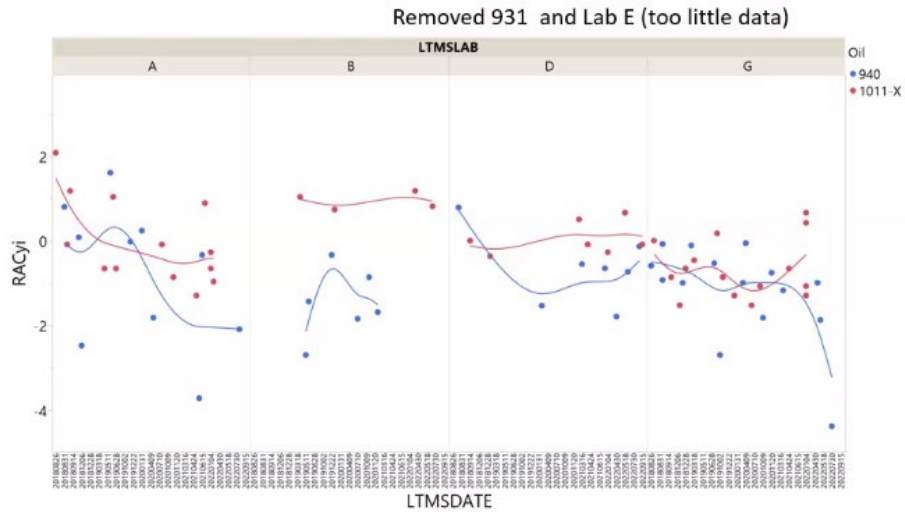
For Average Piston Varnish Yi: 940 is somewhat different than 1011-X on AP50.

Removed 931 and Lab E (too little data)
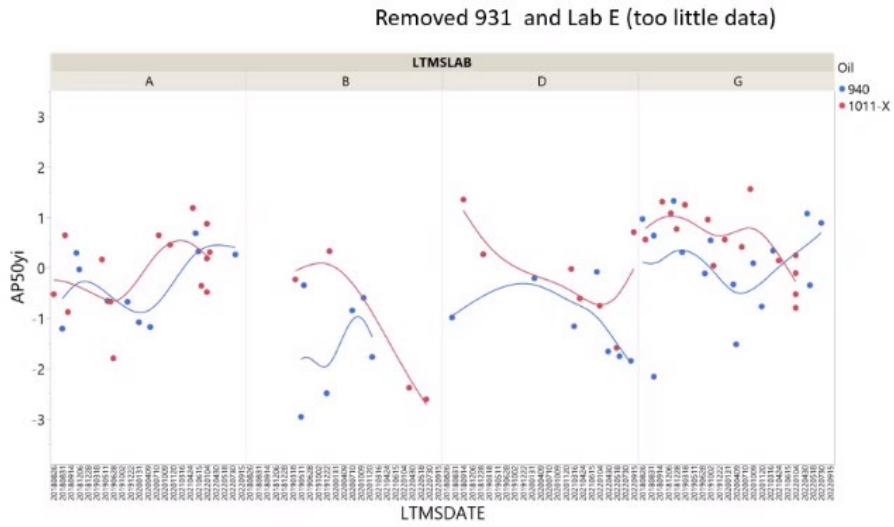
For Average Engine Varnish Yi: 940 is somewhat different than 1011-X on AE50

Removed 931 and Lab E (too little data)
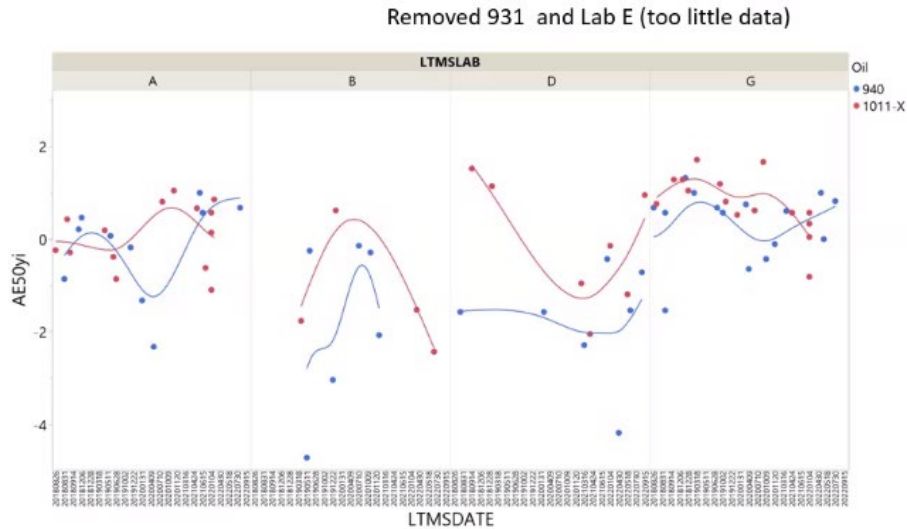
The Chair asked if it would be possible to run three 940s and have the charts catch up later? Travis clarified that if the fuel correction factor (if needed) is set, it would not change after 3 more tests are run. Doyle added that there could always be a chance of shift in test severity so it's preferred to obtain the data as soon as possible.

Al Lopez (Intertek) commented that IAR is seeing several candidate performance levels at below 7 AES. To Doyle's point, Al asked how we would know the test hasn't shifted if we don't have a reference oil at that low performance level and made the case for the inclusion of 940 for an accurate fuel correction factor.

The Chair collected member views on how the 15 test matrix should be designed. Summary:
- Al Lopez (Intertek): 5 5 5, the way the matrix was originally designed
- Dan Engstrom (SwRI): ok with either 3 6 6 or 5 5 5 as long as they're handled appropriate with the fuel correction factor
- Bob Campbell (Afton) expressed primary interest in having the fuel properly corrected at the GF-6 and Gen 3 limits. He advocated for the inclusion of only 931 and 1011, as we wouldn't want 940-like oils in the field anyways. The Chair agreed that we do not want oils like 940 in the field, but the group is responsible to avoid that. Bob didn't disagree but made the point about investing a third of our funds to see where the performance is at the 6 merit level when he is more interested to know the accuracy at the 7, 8 merit level. Al Lopez (Intertek) added that if we don't have resolution in the 7 range, then our confidence of performance around the GF-6 level will be lowered.
- George Szappanos (Lubrizol) explained that since he and Tony Catanese (Lubrizol) are relatively new to the V, they will waive and defer to provide any argument. However, they are leaning toward option "1a". Travis clarified that the "1a" option is not ignoring 940, but rather recognizing that it's not as important. In other words, reduce the frequency but not eliminate. The Chair gathered that no one on the call disagreed with this option.
- Rich Grundza (TMC) also waives. With whichever option the group selects, he will make sure the proper assignments get made.
- Doyle Boese (Infineum) said if we go with 3 6 6 and there's an outlier among the 3, it will really distort things. He offered an alternative option of 4 5 6 (four 940 tests, five 1011, and six 931. 931 has the most since it is closest to the target).
- Jo Martinez (Oronite) preferred either 5 5 5 or 3 6 6.

- Travis Kostan (SwRI) proposed another hybrid option: If we get at least two 940s in row 2 (either three 940s in row 2 or two 940s in row 2 and one early in row 3), we can see if we get good agreement between the results and leave an option open at the end to change one of the tests in the end to a 4th 940 if one of the prior 3 results is suspect. Another option is to have one 940 test in row 1.
- The Chair pushed back on the option of including 940 in row 1 since we knew it was going to generate sludge.   The first challenge was for the new fuel batch to generate more sludge with 931 and 1011 than the original fuel batch did.
- Mike Deegan (Ford) agreed with the general consensus of running row 1 as-is. Then be open to change row 2 and 3 and decide if we want to do 3 6 6, 4 5 6, or 5 5 5.

After discussion, it was agreed the priority is to run row 1 as-is. The group recognizes 940 is not as important as the other two, especially 931 which is closest to the target. The group will reconvene at the next meeting, prepared to discuss and decide on row 2 and 3 configurations.

Meeting adjourned at 2:52 PM EST.

Appendix: Presentation shared by Travis Kostan

Sequence VH Fuel Matrix Approval Options

NOVEMBER 10, 2022

1

List of Magicians

- ○ Amanda Stone, Afton
- ○ Doyle Boese, Infineum
- ○ Jo Martinez, Oronite
- ○ Martin Chadwick, Intertek
- ○ Phil Scinto, Lubrizol
- ○ Rich Grundza, Test Monitoring Center
- ○ Travis Kostan, Southwest Research Institute

2

Background

Past fuel approval matrices have included 5 tests on each of 3 references oils. A suggestion was made to increase the run frequency on the better performing oils (1011-1 and 931) to six tests and to reduce the number of tests on the failing reference oil (940) to three tests. Therefore, a discussion about how 940 will be used in future testing is necessary. One must keep in mind not just the estimate of the fuel difference, but also the usage of Oil 940 in calculation of future severity adjustments.

Current Fuel Matrix

The current fuel matrix is shown below.

Reference Oil	n-size
940	3
931	6
1011-1	6

| Run	SwRI 1	SwRI 2	IAR 1	IAR 2	Afton
1	931	1011-1	931	1011-1	1011-1
2	1011-1	931	1011-1	931	931
3	931	940	940	1011-1	940

Question

Is 940 as capable as the other two reference oils in estimating the difference in the fuel and in monitoring severity of candidate performance changes over time? Is understanding the severity at the performance level of 940 as important?

Answers:

1. Yes, 940 is equally as good and important as the other oils.
   - If this is the case, we should run 5,5,5 of each reference oil in the fuel matrix, as this results in the minimum average confidence interval of the oil means with the new fuel, and therefore the best estimate of the fuel difference.
2. 940 may be different, but is like a small number of candidates, so we want to use it but down-weight its impact.
   - Current 3-6-6 matrix works fine for this purpose.
     - Statisticians would not use least square means in a model containing "Oil", in order to avoid equal weighting of oils with different n-counts.
   - If 940 can't represent most candidates, should it be used with 1/3 assignment frequency in LTMS for severity adjustments?
3. 940 may be different and is unrepresentative of almost all candidates. It is only needed as a reference oil to show discrimination.
   - Consider removing as a reference oil OR down-weighting its usage in SA calculating (option to give no weight).
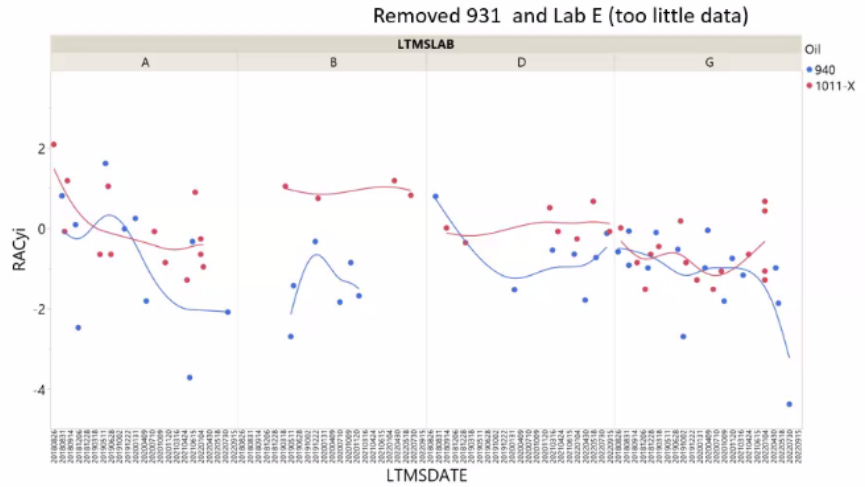
Reference Oil Differences on GI Batch

Though not always directionally the same difference, 940 does tend to perform differently than oil 1011-X in ¾ labs.

Removed 931 and Lab E (too little data)
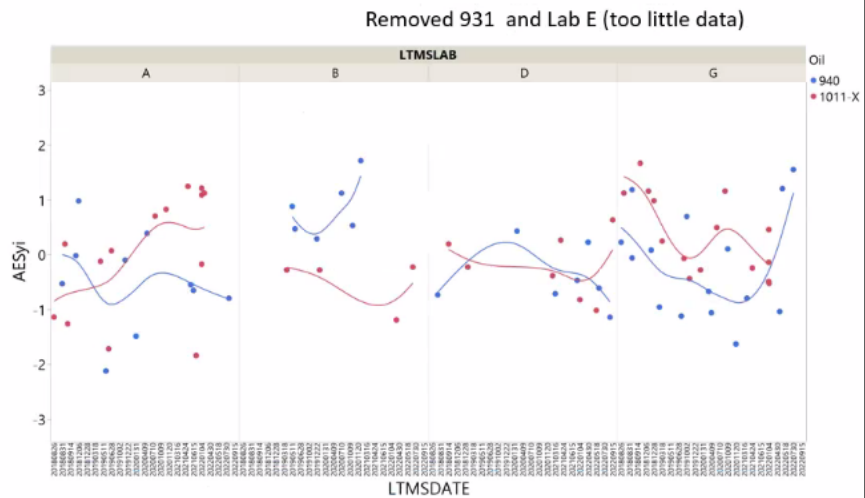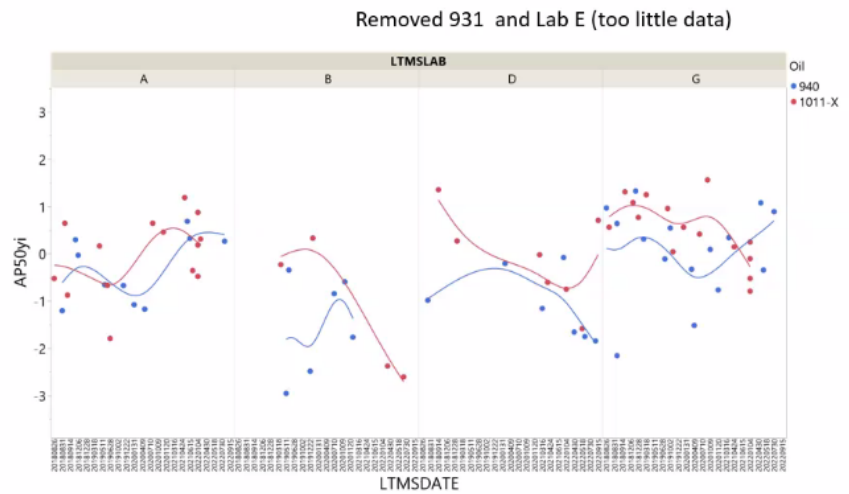
Reference Oil Differences on GI Batch

940 does tend to perform differently than oil 1011-X on Rocker Cover Sludge, but there is confounding here with other known issues.
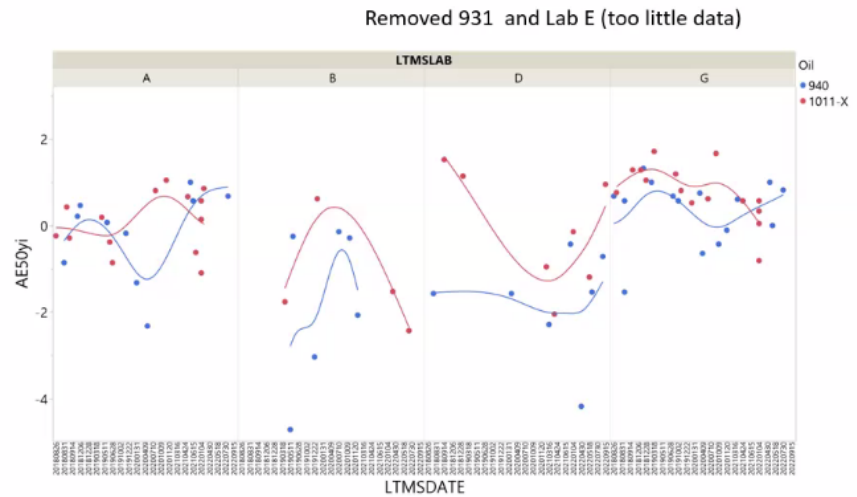

Reference Oil Differences on GI Batch

940 is somewhat different than 1011-X on AP50.

Reference Oil Differences on GI Batch

940 is somewhat different than 1011-X on AE50.

Removed 931 and Lab E (too little data)

Options

1. Continue with Current matrix with n-counts 3-6-6.
   - One option with the plan is to reduce future calibration oil assignment frequency to match this methodology (40% ROs 1011-1 and 931, 20% RO 940).
   - If 940 is so different from all candidates that severity changes can't be trusted for calculating severity adjustments, consider removing 940 from referencing system or not using in SA calculations.
2. Adjust fuel matrix to 5-5-5 to match future calibration oil assignment frequency and weighting in calculation of severity adjustments.