

Sequence X Alternate Fuel Supplier Requirements Task Force

Teleconference Minutes

09/06/2023 – 13:30-14:30 CST

1. Attendance:

Rob Zrodowski (Ford)	Christine Eickstead (SWRI)
Izabela Gabrel (Haltermann Carless)	Pat Lang (SWRI)
Ricardo Affinito (Chevron)	Rich Grundza (TMC)
Na Tyrer (GM)	George Szappanos (Lubrizol)
Tony Cantanese (Lubrizol)	Michael Deegan (Ford)
Paul Rubas (Exxonmobil)	Samuel Demel (Shell)
Jo Martinez (Chevron)	Todd Dvorak (Infineum)
Robert Stockwell (Chevron)	Michael Lochtte (SWRI)
Amanda Stone (Afton)	Travis Kostan (SWRI)
Indresh Mathur (Haltermann)	Jason Soto (Intertek)
Al Lopez (Intertek)	
Dan Lanctot (TEI)	

2. Agenda:

- Overview from last meeting.
- Review the alternate fuel matrix design proposed by statisticians.

3. Minutes:

Jo Matinez: Presenter for fuel matrix design. Gave recap of test design requirements (presentation in Appendix). Gave the recommendation that at least two stands should run oil 271 at two different labs. Sequence IIIH selected a 9-test matrix design for approval.

Travis Kostan: The Sequence IIIH matrix design uses 3 reference oils. Recommended the 6-test matrix design with 10% significance level of caution. A total of 8 tests including 271 runs.

Al Lopez: Asked how many labs are interested in participating in the matrix.

Travis Kostan: There does not need to be commitment from any labs to run.

Patt Lang: We just need to approve the minimum requirements for the introduction of an alternate fuel. There is no need for labs to commit. The fuel supplier will approach and pick labs.

Travis Kostan: Recommended Table 2a on the Design Options slide based on the Zi values. Table 2a also has more stands than table 1a. The matrix design does not guarantee there will not be any differences in the fuel, just no major differences. The severity adjustment will take care of the differences. Group agreed on the design from Table 2a.

Jo Martinez: Action for stats group to finalize on criteria. Task force to finalize conditions for running the prove out program.

Rich Grundza: Conditions- two successful calibration runs in the past 24 months and one successful calibration in the last year.

Jason Soto: Stats group will get back to us in three weeks with finalized criteria.

Patt Lang: Meet again or go to Surveillance Panel?

Rich Grundza: Suggested circulating the final criteria through email then we go to the Surveillance Panel.

Travis Kostan: We need the final document before going to the Surveillance Panel. We already have the model from the IIIH.

Patt Lang: Does anyone have any objections before proceeding? No objections.

4. **Next Meeting:** TBD

5. **Appendix:**

Sequence X Alternate Fuel Matrix Design

June 12, 2023

Statistics Group

- Amanda Stone, Afton
- Ricardo Affinito, Chevron Oronite
- Jo Martinez, Chevron Oronite
- Todd Dvorak, Infineum
- Martin Chadwick, Intertek
- Phil Scinto, Lubrizol
- Seth Demel, Shell
- Travis Kostan, SwRI
- Richard Grundza, TMC

Recap – Test Design Requirements

The following design criteria were agreed upon during the Sequence X Alternate Fuel Supplier TF meeting on April 11

- oils 270 and oil 271 to be included in testing
 - Though not a requirement from the panel, because 271 doesn't give us as much information as 270, it makes sense that 270 should be run more than 271 to tell us about any mean shift due to alternate fuel
- all tests will be conducted on the alternate fuel

Test Statistic

The test matrices considered only include tests on the potential alternate fuel. The Y_i results for each stand, which represent the severity of the potential alternate fuel in standardized units, will be compared against the previous Z_i for each stand before the qualification testing, which represents the severity of the current fuel.

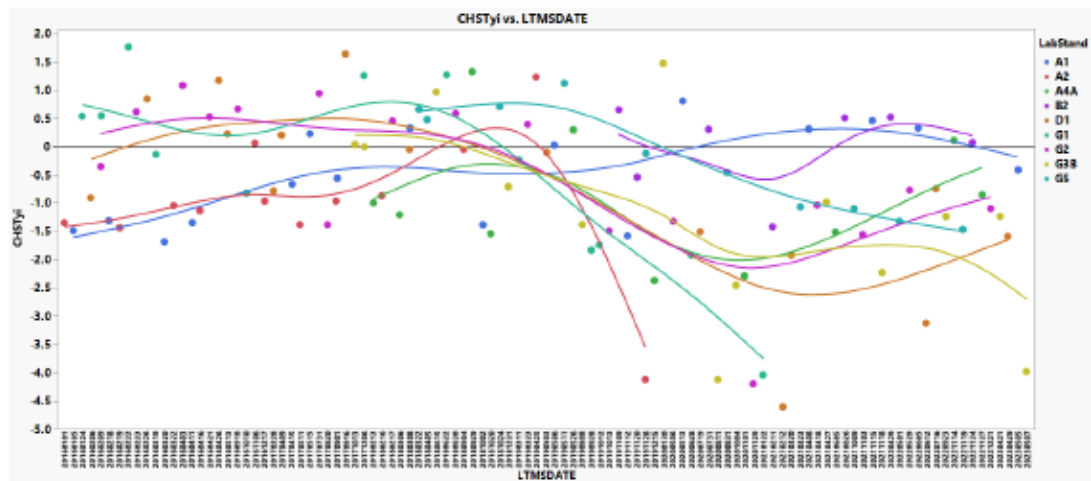
For example, if we let $Z_{(i-1)}$ represent the Z_i of a given stand before testing begins, then for the three tests on that stand, the results would be:

$$\text{Result}_1 = Y_{(i)} - Z_{(i-1)}$$

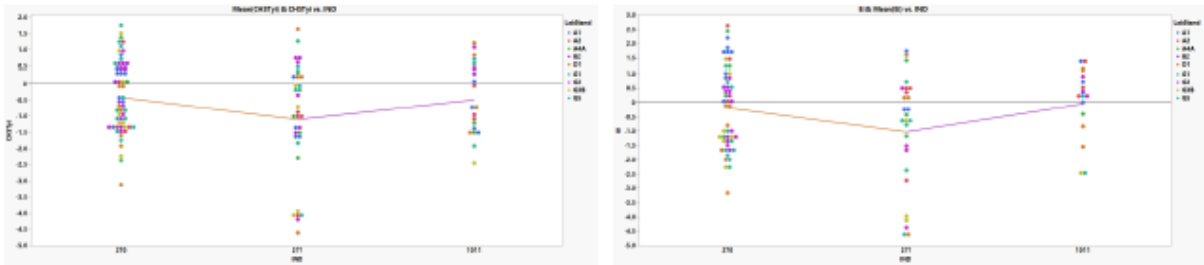
$$\text{Result}_2 = Y_{(i+1)} - Z_{(i-1)}$$

$$\text{Result}_3 = Y_{(i+2)} - Z_{(i-1)}$$

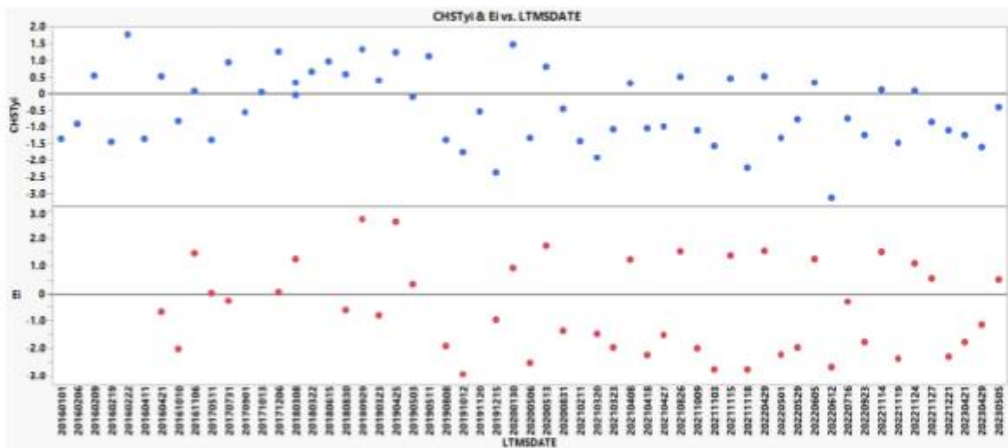
Evaluation of Test Statistic on Current Fuel



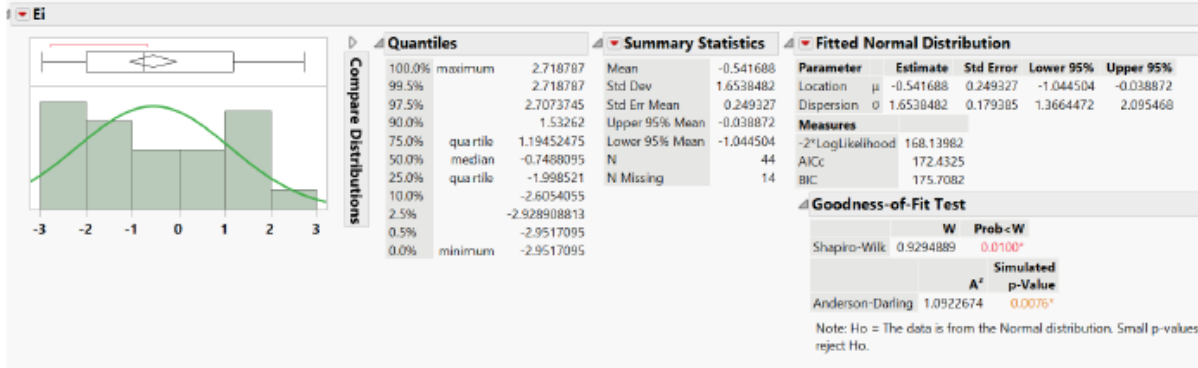
Yi and Ei results with all 3 oils



Yi and Ei for Oil 270 only



Ei (270 only) distribution not Normal



Power for oil 270

Unknown sigma (t-test)

real shift due to new fuel in standard deviation units	probability of detecting a difference (5% significance level)	probability of detecting a difference (10% significance level)
Option 1a: at least 2 labs, 2 stands (6 tests) or Option 2a: at least 2 labs, 3 stands (6 tests)		
0.75	32%	48%
1.0	51%	68%
1.5	83%	93%
2.0	97%	99%
Option 2b: at least 2 labs, 4 stands (8 tests)		
0.75	45%	61%
1.0	68%	82%
1.5	95%	98%
2.0	99%	99%
Option 1b: at least 2 labs, 3 stands (9 tests)		
0.75	51%	66%
1.0	75%	86%
1.5	97%	99%
2.0	99%	99%
Option 1c: at least 2 labs, 4 stands (12 tests)		
0.75	66%	78%
1.0	88%	94%
1.5	99%	99%
2.0	99%	99%

Known sigma (z-test)

real shift due to new fuel in standard deviation units	probability of detecting a difference (5% significance level)	probability of detecting a difference (10% significance level)
Option 1a: 2 labs, 2 stands (6 tests) or Option 2a: at least 2 labs, 3 stands (6 tests)		
0.75	43%	58%
1.0	69%	79%
1.5	96%	98%
2.0	99%	99%
Option 2b: at least 2 labs, 4 stands (8 tests)		
0.75	56%	68%
1.0	80%	88%
1.5	98%	99%
2.0	99%	99%
Option 1b: at least 2 labs, 3 stands (9 tests)		
0.75	61%	72%
1.0	85%	91%
1.5	99%	99%
2.0	99%	99%
Option 1c: at least 2 labs, 4 stands (12 tests)		
0.75	73%	82%
1.0	93%	96%
1.5	99%	99%
2.0	99%	99%

Design Options

- 2 stands from 2 different labs will run 271
- run 270 according to a design on the right

1a (6 tests): 2 labs		2a (6 tests): 2 or 3 labs		
Stand 1	Stand 2	Stand 1	Stand 2	Stand 3
270	270	270	270	270
270	270	270	270	270
270	270			

1b (9 tests): 2 or 3 labs			2b (8 tests): 2-4 labs			
Stand 1	Stand 2	Stand 3	Stand 1	Stand 2	Stand 3	Stand 4
270	270	270	270	270	270	270
270	270	270	270	270	270	270
270	270	270				

1c (12 tests): 2-4 labs			
Stand 1	Stand 2	Stand 3	Stand 4
270	270	270	270
270	270	270	270
270	270	270	270

Criteria

Criteria TBD

1. The average of the 9 results must be less than 0.62.
2. At most 1 result outside +/- 2.066, the level 3 e_i alarm limit, and should be replaced with another test.
3. A 95% C.I. on the mean must overlap zero and should have no part of the interval outside of +/- 1.5.
4. Discrimination criteria is met with oil 271

Conditions for Running the Prove-out Program

- A new fuel prove-out program shall not be done when test is deemed unstable.
- Requirements:
 - Test stands chosen shall have completed a minimum of **three** successful calibration tests in the past **18** months prior to starting this prove-out program, with no failed calibration tests including discrimination test.
 - During the time period spanning from two previous calibration tests through the completion of the prove-out program, there shall be no critical parts batch changes or reference oil re-blends.