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Standards Worldwide

COMMITTEE D02 ON PETROLEUM PRODUCTS, LIQUID FUELS, AND LUBRICANTS

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> Issued: 10.08.2019 Reply to: Dan Worcester Southwest Research Institute 6220 Culebra Rd. San Antonio. TX 78238 Phone: 210.522.2405 Email: dworcester@swri.org

These are the unapproved minutes of the 10.02.2019 Sequence VI Conference Call.

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The meeting was called to order at 9:03 AM Central Time by Chair Andrew Stevens.

- The Agenda is Attachment 1. Attendance is Attachment 2. 1.0
 - 1.1 Tracey King and Jim Carter are now voting members.
 - The Attendance list has been updated to be easier to record votes 1.2for motions.

2.0 Old Business

- 2.1 The minutes for the 09.13.2019 call were approved unanimously.
- 2.2 Those minutes are posted on the TMC site.
- 2.3 This meeting was a continuation of the call to define the acceptance criteria for an alternate fuel supplier. Slide 12 was discussed and included at Attachment 3.
- 2.4 There was discussion at the previous call on a sigma limit for the first criteria. Ben noted this was too large a window and recommended 0.75 sigma.
- Adrian: The Task Force had recommended 1 sigma, but did agree the limit was a Surveillance Panel decision.
- Bob: At the Task Force the decision was not unanimous. Afton would vote against that limit. The concern is a lab might choose to move to a mild fuel beficial to their testing. He does not want an industry correction factor.
- Travis: Slide 12 shows actual pass limits on current data [real numbers]. The ideal would be zero but test this cannot be proven due to test variability.
- Rich: He noted that 0.75 sigma might reject a fuel that would be considered "good" for testing.
- Adrian: He recommended a straw vote. However a motion was made.
- <u>Motion</u>: Recommend to the Surveillance Panel 0.75 sigma be used for the first criteria for fuel approval for an alternate supplier. Ben Maddock, Prasad second. 9 yes, 5 waive. The motion passed.
- Action: An e-ballot was sent out to approve the procedure changes.
 - 3.0 New Business
 - 3.1 There was no new business.

The meeting adjourned at 10:02 AM Central Time

Sequence VI Surveillance Panel Call Meeting Agenda October 2, 2019 @ 10:00-11:30 EST

Webex Meeting Details Below Agenda

1. Roll Call (start 10:05 EST)

1.1. SP Membership changes and additions

2. Old Business

2.1	Approve meeting minutes from 9/13 call	Andrew Stevens
2.2	Updates on intermediate precision and repeatability estimates, addition of details of viscosity testing of samples (if there are updates to be made)	Rich Grundza/TMC
2.3	Discussion about standards for introducing a new fuel supplier	Panel

3. New Business

3.1	None unless issues raised by panel on call	Panel
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4. Next Meeting

4.1. SP Meeting: TBD

5. Meeting Adjourned

Meeting Information

Meeting link: https://lubrizol-1586.my.webex.com/lubrizol-1586.my/j.php?MTID=m70fe2dd85fb872db93f7ef4790ff4fc9 Meeting number: 620 334 530 Password: Vkxthnwf Host key: 728269 More ways to join

Join by video system

Dial 620334530@lubrizol-1586.my.webex.com You can also dial 173.243.2.68 and enter your meeting number. Join by phone +1-510-338-9438 USA Toll Access code: 620 334 530

Global call-in numbers

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Name	Email		Company	Attend
	T	1	1	
MOTION:	USE 0.75 SIGMA			
Adrian Alfonso	APPROVE			
Jason Bowden				
Kevin Brodwater	APPROVE [RS]			
Jim Carter	WAIVE			
Aleise Gauer	WAIVE			
Rich Grundza	WAIVE			
Jeff Hsu				
Teri Kowalski				
Tracey King	WAIVE			
Dan Lanctot	WAIVE			
Ben Maddock	APPROVE			
Brianne Pentz				
Andy Ritchie	APPROVE [CL]			
Ron Romano				
Clifford Salvesen	APPROVE			
Amol Savant	APPROVE			
Andrew Stevens	APPROVE			
Haiying Tang				
Prasad Tumati	APPROVE			
Dan Worcester	APPROVE			
COUNT	9 YES, 5 WAIVE			

Name	Email		Company	Attend
MOTION:				
Adrian Alfonso				
Jason Bowden				
Kevin Brodwater				
Jim Carter				
Aleise Gauer				
Rich Grundza				
Jeff Hsu				
Teri Kowalski				
Tracey King				
Dan Lanctot				
Ben Maddock				
Brianne Pentz				
Andy Ritchie				
Ron Romano				
Clifford Salvesen				
Amol Savant				
Andrew Stevens				
Haiying Tang				
Prasad Tumati				
Dan Worcester				

Sequence VI Alternate Fuel Supplier Testing Stopping Criteria

Statistics Sub-Group

August 01, 2019

Statistics Sub-Group

- Jo Martinez, Chevron Oronite
- Richard Grundza, TMC
- Todd Dvorak, Afton
- Travis Kostan, SwRI

Recap – Test Design Requirements

The following test design requirements have been agreed upon by the group:

Test Design Requirements:

Test using reference oil 1010-1 on a minimum of two engines, using the first four runs of each engine's valid test life per the following procedure:

- Current Fuel = "Fuel A"
- Potential Alternative Supplier Fuel = "Fuel B"
- Run Order #1, Engine #1 Break in with Fuel A, then test Fuel A Fuel B Fuel A Fuel B
- Run Order #2, Engine #2 Break in with Fuel B, then test Fuel B Fuel A Fuel B Fuel A
- If the statistical stopping criteria has not been met after Engine #2, continue testing on additional engines, alternating between run order #1, and run order #2, until the stopping criteria has been met.
- All testing shall be conducted in a single lab and on a single stand.

Recap – Stopping Criteria Questions

To help determine what the statistical stopping criteria should be, the group should consider:

- 1. What does the group want the potential fuel to show? Is it...
 - a) that the potential fuel results are within a specified tolerance of the current fuel results?
 - b) that the potential fuel results are within a specified tolerance of the reference oil target?
 Selected, but the group was
 - c) a combination of a) and b) ?

d) other criteria?

Selected, but the group was reconsidering the need for criteria b.

2. What are the acceptable tolerances for the differences in #1 that are deemed important?

Criteria A Tolerances

a) that the potential fuel results are within a specified tolerance of the current fuel results?

What are the acceptable tolerances?

The statistics group recommends as a staring place for discussion the following tolerances for Criteria A. These tolerances would be judged based on an ANOVA model using the Yi values as the response variable (these are already in standard deviation units)

- 1. The estimate of the difference between fuels is less than 1 standard deviation.
- 2. No part of a 95% confidence interval of the difference between fuels exceeds 2.5 sigma.



Visualization of Stopping Criteria

- 1. The estimate of the difference between fuels is less than 1 standard deviation.
 - The black dot is the estimate of the fuel difference and cannot exceed the black dashed lines.
- 2. No part of a 95% confidence interval of the difference between fuels exceeds 2.5 sigma.
 - The confidence interval has a 95% probability of capturing the true difference between fuels. We should have at least 95% confidence the fuel difference is less than 2.5 sigma (the red dashed lines).



Distribution of 1010-1 Yi Results

FEI 1 Yi

FEI 2 Yi

- Data includes 2 years of 1010-1 • results from stands which had at least 2 tests after filtering for TMC validity codes AC and OC.
- The across lab Yi standard ٠ deviation is expected to be near one, since this is a normalized value. This across lab data does appear close to this value. The data also shows that the 1010-1 Yi results within a single stand are showing considerably less deviation than across labs, about 0.25 sigma less.



3

66

A5 - 7



A5 - 8



Fuel	Engine	FEI 1	FEI 1 Yi
Fuel A	Engine #1	1.89	-0.03
Fuel A	Engine #1	1.70	-1.01
Fuel A	Engine #2	2.10	1.03
Fuel A	Engine #2	1.95	0.27
Fuel B	Engine #1	1.67	-1.14
Fuel B	Engine #1	1.90	0.00
Fuel B	Engine #2	1.51	-1.96
Fuel B	Engine #2	1.69	-1.04



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Example FEI 1 After 3 Engines





Fuel	Engine	FEI 1	FEI 1 Yi
Fuel A	Engine #1	1.89	-0.03
Fuel A	Engine #1	1.70	-1.01
Fuel A	Engine #2	2.10	1.03
Fuel A	Engine #2	1.95	0.27
Fuel A	Engine #3	1.69	-1.04
Fuel A	Engine #3	1.84	-0.30
Fuel B	Engine #1	1.67	-1.14
Fuel B	Engine #1	1.90	0.00
Fuel B	Engine #2	1.51	-1.96
Fuel B	Engine #2	1.69	-1.04
Fuel B	Engine #3	1.87	-0.16
Fuel B	Engine #3	1.93	0.14



Probability of Meeting the Criteria Tolerances -Assuming Zero Fuel Difference and Yi Standard Deviation =1.0

P(Average Fuel Difference) < Various Sigma, Assuming Zero Actual Fuel Difference

# of Engines	P(Estimate < 0.5 Sigma) if Fuel Difference is Zero	P(Estimate < 0.75 Sigma) if Fuel Difference is Zero	P(Estimate < 1.0 Sigma) if Fuel Difference is Zero	P(Estimate < 1.25 Sigma) if Fuel Difference is Zero
2	0.52	0.71	0.84	0.92
3	0.61	0.81	0.92	0.97
4	0.68	0.87	0.95	0.99
5	0.74	0.91	0.97	0.99

P(CI Width within Various Sigma), Assuming Zero Actual Fuel Difference

# of Engines	P(CI Width within 1.5 Sigma) if Fuel Difference is Zero	P(CI Width within 2.0 Sigma) if Fuel Difference is Zero	P(CI Width within 2.5 Sigma) if Fuel Difference is Zero	P(CI Width within 3.0 Sigma) if Fuel Difference is Zero
2	-0.35	0.20	0.67	0.91
3	0.23	0.75	0.96	1.00
4	0.58	0.93	0.99	1.00
5	0.77	0.98	1.00	1.00
		A5 - 12		