Report of Meeting
L-60-1 Surveillance Panel
February 2th , 2024

Attendees:

SwRI -	**Mueller,** Charron
Lubrizol -	**Schaup**, Ariemma, Drlja, Gingerich, Mlachak, Venhoff
Afton -	**Sangpeal,** Bell, Horvath
Intertek -	**Lange,** Smith, Portell
TMC -	**Beck,**
BASF -	**Goyal,** Mosher
Dana -	**Zyski**
Cummins-Meritor -	**Carowick**
Army -	Sattler, **Comfort**
AAM -	**Muransky**
Navistar -	Morris
Fuchs -	Bender,
Oronite-	**Warden**, Jackson
Shell-	**Banas**, Jordan, Schweitzer

Voting Members in **BOLD**

1.0 Membership Review

No Change

2.0 Meeting minutes Approval

– November 8th, 2023, ASTM Meeting #211

Motion #1 → Nick Schaup 1st /2nd Troy Muranksi to approve the meeting minutes from the November 8th, 2023, ASTM Meeting. Motion passed unanimously, 11-0-0 (Yes-No-Abstain).

3.0 L-60-1 Target Proposal

- Labs accepted stats group recommendation with the exception of ACV Standard Deviation
- Labs moved standard deviation from .586 to .708

4.0 Extended EOT tests are now included in ASTM procedure

- **10.7** Run the test at the conditions specified for 50.0 h ± 0.1 h. Terminate the test if more than 5 min of total downtime occurs during the test period. Record any downtime on Form 4. Non-reference oil tests may run longer than 50h provided that all posttest measurements required are performed at the extended EOT and the additional EOT h are reported on the appropriate forms. The same 50h requirements for rating and oil analysis apply to extended EOT tests. Extending the test from 50h does not invalidate the test.
- This information letter should be distributed and effective on the 21st of February

5.0 Old Business

6.0 New Business

- To review reference data during the August meeting

7.0 Adjourn

Motion #3 → Anthony 1st /2nd Nick Schaup to adjourn. Motion passed unanimously, 11-0-0 (Yes-No-Abstain).

Respectfully submitted,

Nicholas Schaup
L-60-1 Surveillance Panel Chairman

D02.B0.03

L-60-1 Surveillance Panel Meeting

2/7/2024

14:00 pm– 15:00 pm

Nick Schaup

Agenda

- Call to Order/Agenda review
- Membership review
- Meeting Minute Approvals
  - Nov. 8th 2023, ASTM Meeting
- Viscosity Increase stats group recommendation
- 300 hour covering 50 hr
- Old Business?
- New business
- Adjournment

Membership Review

Allen Comfort	**US Army**
Amy Zyski	**Dana**
Arjun Goyal	**BASF**
Anthony Lange	**Intertek**
Jessica Carowick	**Cummins - Meritor**
Dylan Beck	**TMC**
Nick Schaup	**Lubrizol**
Matt Sangpeal	**Afton**
Caroline Mueller	**SwRI**
Rob Banas	**ExxonMobil**
Troy Muransky	**AAM**
Rebecca Warden	**Oronite**

Meeting Minutes Approval

- November 8th, 2023, ASTM Meeting

L-60-1 155-2 Target Update – Stats Review

February 6, 2024

Statistics Group

- Amanda Stone, Afton/New Market
- Dylan Beck,TMC
- Jo Martinez, Chevron Oronite
- Travis Kostan, SwRI
- Samuel Demel, Shell
- Ricardo Affinito, Chevron Oronite
- Elisa Santos, Infineum

Summary

- ASTM E178 at 95% confidence level indicates one outlier in TOL (4).
- ASL, TOL, and PEN do not show significant difference between 155-1 and 155-2 batches, suggesting 155-1 targets can be carried over to 155-2 .
- ACV has historically performed below target, but a shift in severity occurred in 2023. The new reference oil 155-2 performs the same as 155-1 in the past year.
- VISI shows significant differences between 155-1 and 155-2 batches, therefore a target update is suggested.

Introducing a Re-Blend

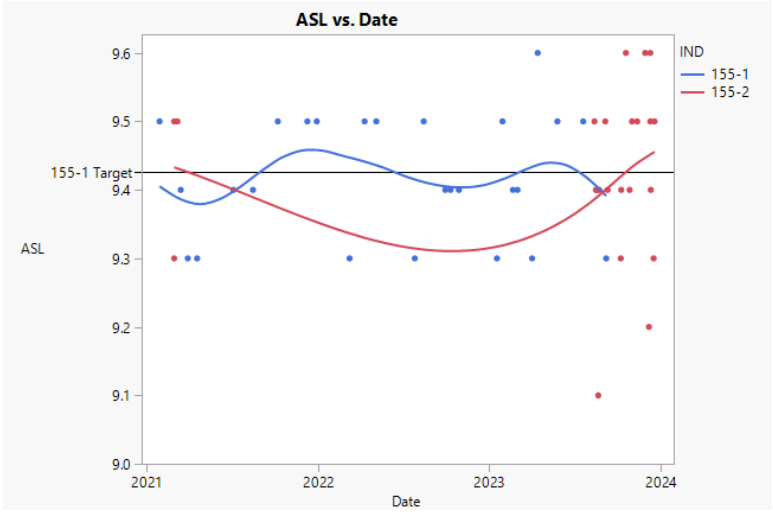
- The goal of a re-blend introduction is to keep the test performing exactly as the previous blend was performing.
- If a test has already been performing severe or mild of target the introduction of a re-blend shouldn't change that.
- For example, if the original reference oil is currently performing 0.5 merits severe of its target, then the re-blend target should also be 0.5 merits severe of how the re-blend is performing.
- If we just use the re-blend mean, we are accounting for re-blend differences plus current test severity differences. This impacts labs' severity adjustments, and this means we would end up treating candidates differently.
- Any current test severity differences should not be handled through target updates, or we will lose track of where we expect candidates are truly performing.

Data Used for Analysis

- Dylan Beck – ASTM TMC explained that the Panel believed that 155-1 is an extremely old reference oil and has possibly changed over time. After discussion within the stats group, it was decided that it would be better to use more recent data to capture how the test is performing currently compared to targets.
  - 28 test results for 155-1 with validity AC
  - 24 test results for 155-2 deemed acceptable for analysis in last Panel meeting
- ACV can be further reduced to account for shift in severity for ACV in 2023.
  - 11 test results for 155-1 in 2023 with validity AC
  - 21 test results for 155-2 in 2023 deemed acceptable for analysis in last Panel meeting

Average Sludge

- Reference oil 155-2 is not significantly different from 155-1 and there is not significant lab differences.
- Recommendation: Proceed with 155-1 targets for 155-2.



Response ASL

Whole Model

Summary of Fit

RSquare	0.058922
RSquare Adj	-0.02117
Root Mean Square Error	0.104629
Mean of Response	9.421154
Observations (or Sum Wgts)	52

Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob>|t|
Intercept	9.4129952	0.017328	543.22	<.0001*
LTMSLAB[A]	-0.00558	0.025235	-0.22	0.8260
LTMSLAB[B]	0.0016587	0.034918	0.05	0.9623
LTMSLAB[D]	0.0376086	0.024133	1.56	0.1259
IND[155-1]	-0.006038	0.015551	-0.39	0.6996

Effect Tests

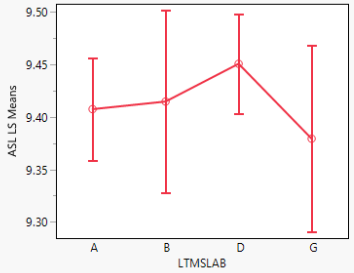
Source	Nparm	DF	Sum of Squares	F Ratio	Prob > F
LTMSLAB	3	3	0.03155523	0.9608	0.4191
IND	1	1	0.00165047	0.1508	0.6996

LTMSLAB

Least Squares Means Table

Level	Least Sq Mean	Std Error	Mean
A	9.4074153	0.02420850	9.40500
B	9.4146539	0.04302786	9.41667
D	9.4506038	0.02344730	9.45000
G	9.3793078	0.04395462	9.38333

Least Squares Means Plot

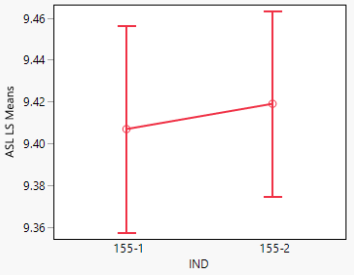


IND

Least Squares Means Table

Level	Least Sq Mean	Std Error	Mean
155-1	9.4069569	0.02454710	9.41786
155-2	9.4190335	0.02194634	9.42500

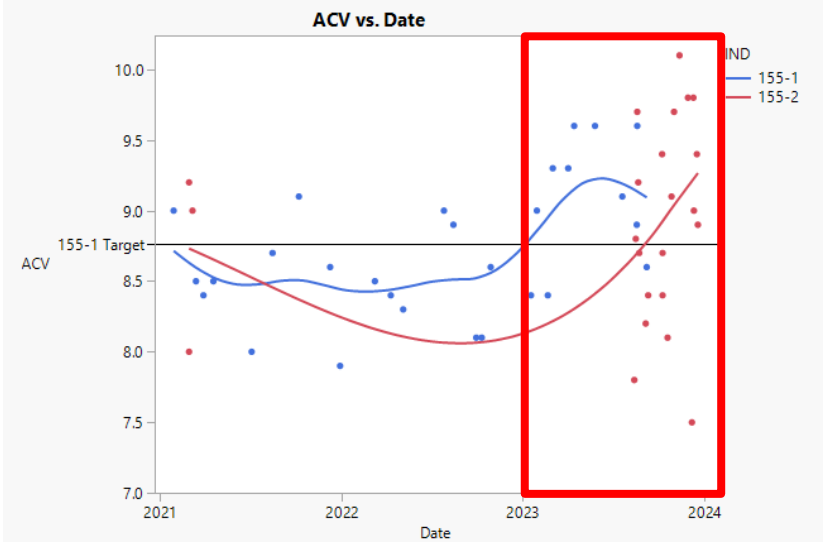
Least Squares Means Plot



Average Carbon/Varnish

Analysis with data from 2023 forward

- An upward shift in severity occurred in 2023, and the test seems to be performing on target now.
  - Is there a mechanical reason for this?
- Using only data from 2023 forward we see no difference between reference oils 155-2 and 155-1 indicating that a target update is not needed.
- Recommendation: Proceed with 155-1 targets for 155-2.



Response ACV

Whole Model

Summary of Fit

RSquare	0.260433
RSquare Adj	0.150867
Root Mean Square Error	0.590436
Mean of Response	9.009375
Observations (or Sum Wgts)	32

Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob>|t|
Intercept	8.83185	0.133448	66.18	<.0001*
LTMSLAB[A]	0.20815	0.187721	1.11	0.2773
LTMSLAB[B]	-0.37295	0.276782	-1.35	0.1890
LTMSLAB[D]	0.47405	0.170188	2.79	0.0097*
IND[155-1]	-0.0411	0.116602	-0.35	0.7272

Effect Tests

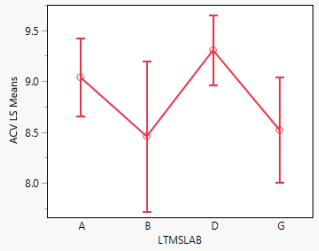
Source	Nparm	DF	Sum of Squares	F Ratio	Prob > F
LTMSLAB	3	3	3.2473034	3.1050	0.0431*
IND	1	1	0.0433131	0.1242	0.7272

LTMSLAB

Least Squares Means Table

Level	Least Sq Mean	Std Error	Mean
A	9.0400000	0.18671240	9.04000
B	8.4589000	0.36027913	8.50000
D	9.3059000	0.16595361	9.31538
G	8.5226000	0.25326902	8.55000

Least Squares Means Plot

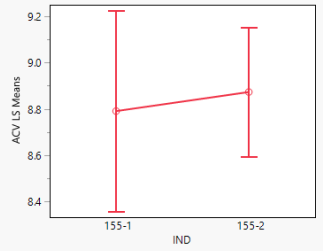


IND

Least Squares Means Table

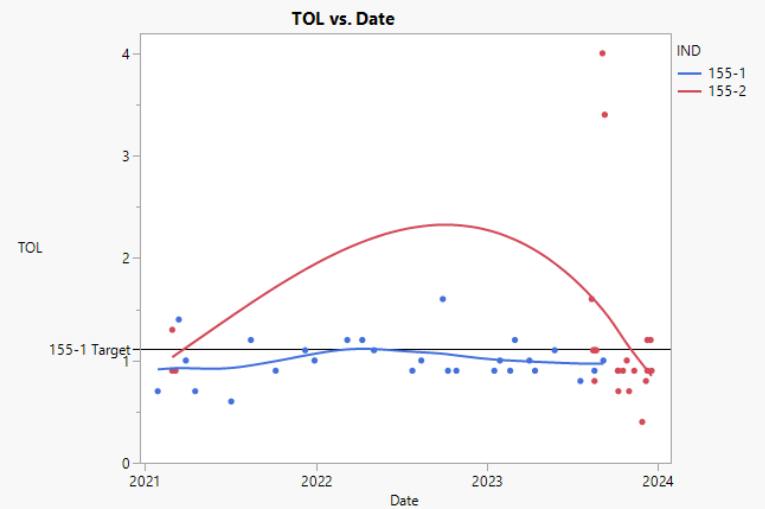
Level	Least Sq Mean	Std Error	Mean
155-1	8.7907500	0.21048321	9.07273
155-2	8.8729500	0.13603550	8.97619

Least Squares Means Plot



Toluene

- According to ASTM E178 there is one outlier (4) in the 155-2 data set.
- Model with and without outlier indicates that there is no significant difference between reference oil 155-2 and 155-1 so a target update is not needed.
- Recommendation: Proceed with 155-1 targets for 155-2.



Response TOL

Whole Model

Summary of Fit

RSquare	0.261445
RSquare Adj	0.198589
Root Mean Square Error	0.51318
Mean of Response	1.096154
Observations (or Sum Wgts)	52

Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob>|t|
Intercept	1.259066	0.084991	14.81	<.0001*
LTMSLAB[A]	-0.233411	0.123773	-1.89	0.0655
LTMSLAB[B]	0.0528878	0.171263	0.31	0.7588
LTMSLAB[D]	-0.367652	0.118367	-3.11	0.0032*
IND[155-1]	-0.014138	0.076275	-0.19	0.8537

Effect Tests

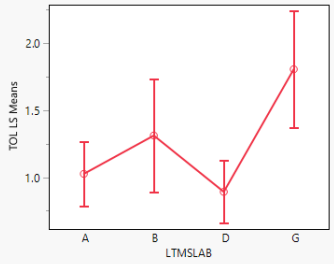
Source	Nparm	DF	Sum of Squares	F Ratio	Prob > F
LTMSLAB	3	3	3.9009534	4.9375	0.0046*
IND	1	1	0.0090486	0.0344	0.8537

LTMSLAB

Least Squares Means Table

Level	Least Sq Mean	Std Error	Mean
A	1.0256554	0.11873723	1.02000
B	1.3119539	0.21104191	1.31667
D	0.8914138	0.11500373	0.89000
G	1.8072410	0.21558748	1.81667

Least Squares Means Plot

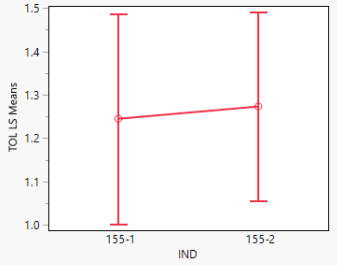


IND

Least Squares Means Table

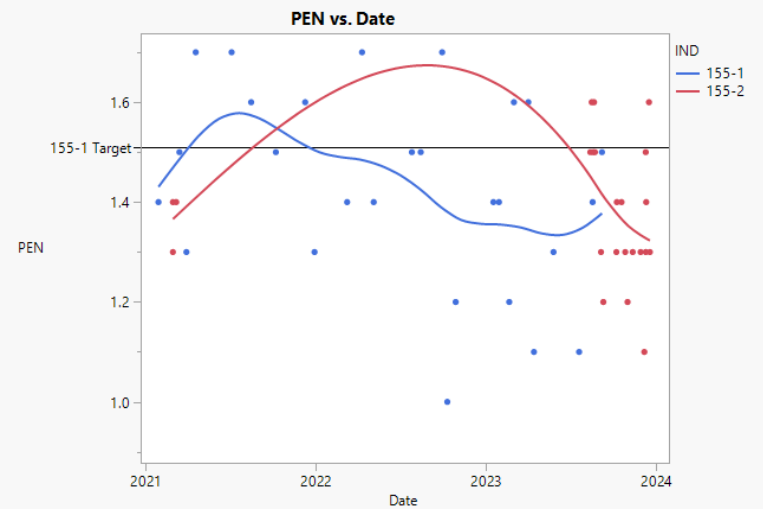
Level	Least Sq Mean	Std Error	Mean
155-1	1.2449276	0.12039800	1.00714
155-2	1.2732045	0.10764184	1.20000

Least Squares Means Plot



Pentane

- Reference oil 155-2 is not significantly different from 155-1 so a target update is not needed.
- Recommendation: Proceed with 155-1 targets for 155-2.



Response PEN

Whole Model

Summary of Fit

RSquare	0.25896
RSquare Adj	0.195892
Root Mean Square Error	0.150639
Mean of Response	1.403846
Observations (or Sum Wgts)	52

Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob>|t|
Intercept	1.4036242	0.024948	56.26	<.0001*
LTMSLAB[A]	-0.076555	0.036332	-2.11	0.0405*
LTMSLAB[B]	0.1071514	0.050273	2.13	0.0383*
LTMSLAB[D]	0.0681431	0.034746	1.96	0.0558
IND[155-1]	0.032327	0.02239	1.44	0.1554

Effect Tests

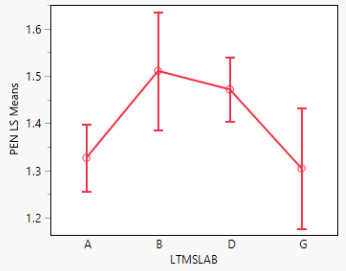
Source	Nparm	DF	Sum of Squares	F Ratio	Prob > F
LTMSLAB	3	3	0.33561463	4.9300	0.0047*
IND	1	1	0.04730511	2.0847	0.1554

LTMSLAB

Least Squares Means Table

Level	Least Sq Mean	Std Error	Mean
A	1.3270692	0.03485416	1.34000
B	1.5107757	0.06194929	1.50000
D	1.4717673	0.03375822	1.47500
G	1.3048846	0.06328360	1.28333

Least Squares Means Plot

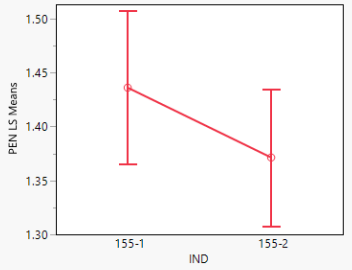


IND

Least Squares Means Table

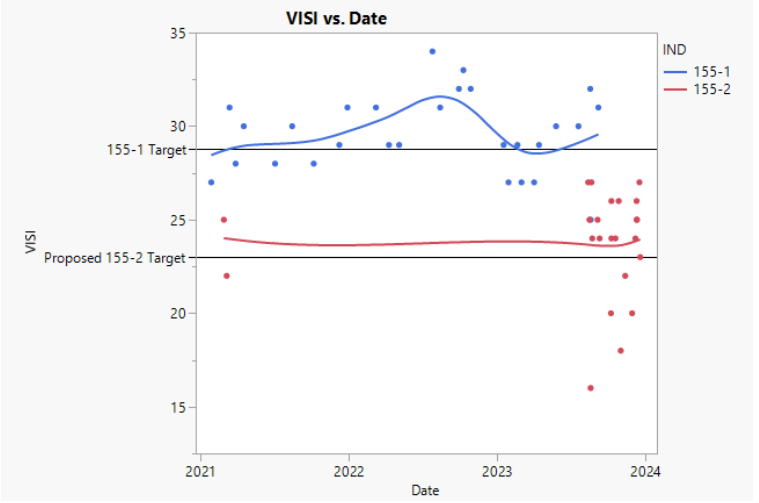
Level	Least Sq Mean	Std Error	Mean
155-1	1.4359512	0.03534166	1.42857
155-2	1.3712973	0.03159721	1.37500

Least Squares Means Plot



VISI

- Reference oil 155-2 is significantly different from 155-1 indicating that a target update is needed.
- There are no outliers in the 155-2 data set, but there does seem to be some lab differences.
- Oil 155-1 is currently performing 1.2 higher than its current target (30.0 - 28.8)
  - Our target for 155-2 should be 1.2 lower than where 155-2 is currently performing (24.2 - 1.2)
- Standard deviation from 155-2 data will be used for update
- Recommended Target Update:
  - Mean = 23.0
  - Std Dev = 2.832



Response VISI

Whole Model

Summary of Fit

RSquare	0.775048
RSquare Adj	0.755903
Root Mean Square Error	1.887703
Mean of Response	26.90385
Observations (or Sum Wgts)	52

Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob>|t|
Intercept	27.100325	0.312633	86.68	<.0001*
LTMSLAB[A]	0.8753007	0.455294	1.92	0.0606
LTMSLAB[B]	1.0449865	0.629983	1.66	0.1038
LTMSLAB[D]	-2.443919	0.435408	-5.61	<.0001*
IND[155-1]	2.9359352	0.280572	10.46	<.0001*

Effect Tests

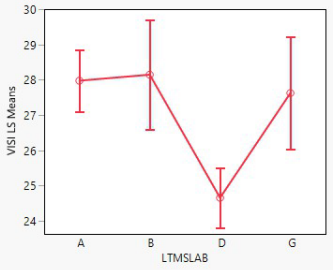
Source	Nparm	DF	Sum of Squares	F Ratio	Prob > F
LTMSLAB	3	3	133.69769	12.5065	<.0001*
IND	1	1	390.18579	109.4975	<.0001*

LTMSLAB

Least Squares Means Table

Level	Least Sq Mean	Std Error	Mean
A	27.975626	0.43676820	29.1500
B	28.145312	0.77630572	27.1667
D	24.656406	0.42303470	24.9500
G	27.623957	0.79302635	25.6667

Least Squares Means Plot

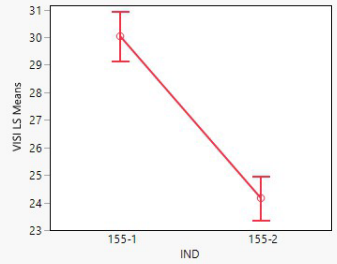


IND

Least Squares Means Table

Level	Least Sq Mean	Std Error	Mean
155-1	30.036260	0.44287723	29.6071
155-2	24.164390	0.39595441	23.7500

Least Squares Means Plot



Proposed Targets from Statistics Group

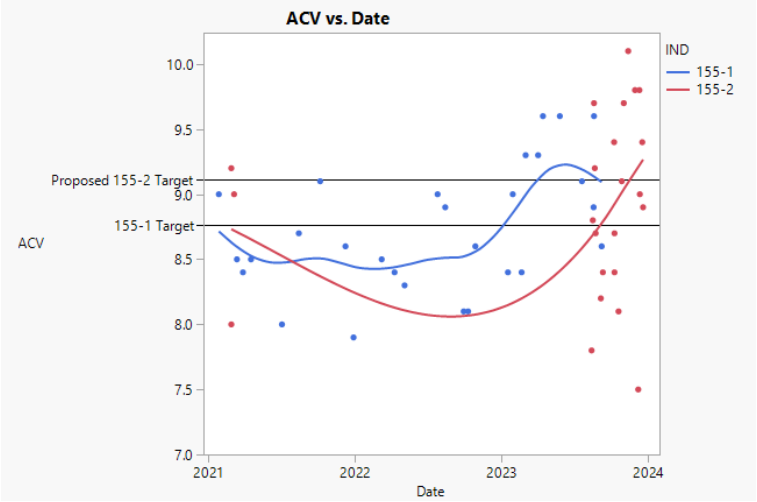
155-1 Targets	Mean	Std Dev
ASL	9.426	0.101
ACV	8.76	0.586
TOL	1.109	0.53
PEN	1.509	0.434
VISI	28.8	3.669

155-2 Proposed Targets	Mean	Std Dev
ASL	9.426	0.101
ACV	8.76	0.586
TOL	1.109	0.53
PEN	1.509	0.434
VISI	23.0	2.832

APPENDIX

Average Carbon/Varnish

Analysis with data from 2021 forward



- Reference oil 155-2 is significantly different from 155-1 indicating that a target update is needed.
- There are no outliers in the 155-2 data set, but there does seem to be some lab differences.
- Oil 155-1 is currently performing 0.26 lower than its current target (8.76 - 8.5)
- Our target for 155-2 should be 0.26 higher than where 155-2 is currently performing (8.85 + 0.26)
  - Standard deviation from 155-2 data will be used for update
- Recommended Target Update:
  - Mean = 9.11

Response ACV

Whole Model

Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob>|t|
Intercept	8.6742415	0.090041	96.34	<.0001*
LTMSLAB[A]	0.1961856	0.131128	1.50	0.1413
LTMSLAB[B]	-0.382931	0.18144	-2.11	0.0402*
LTMSLAB[D]	0.4283652	0.125401	3.42	0.0013*
IND[155-1]	-0.176068	0.080807	-2.18	0.0344*

Effect Tests

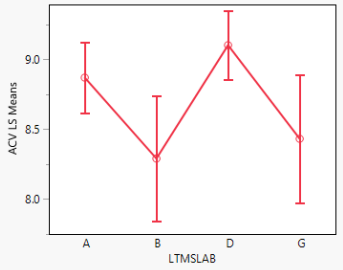
Source	Nparm	DF	Sum of Squares	F Ratio	Prob > F
LTMSLAB	3	3	3.9644861	4.4709	0.0077*
IND	1	1	1.4032599	4.7475	0.0344*

LTMSLAB

Least Squares Means Table

Level	Least Sq Mean	Std Error	Mean
A	8.8704271	0.12579244	8.80000
B	8.2913108	0.22358173	8.35000
D	9.1026068	0.12183709	9.08500
G	8.4326215	0.22839739	8.55000

Least Squares Means Plot

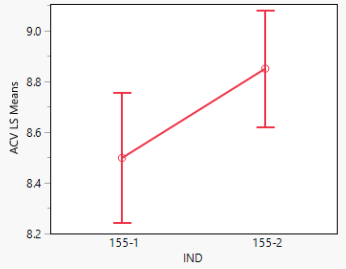


IND

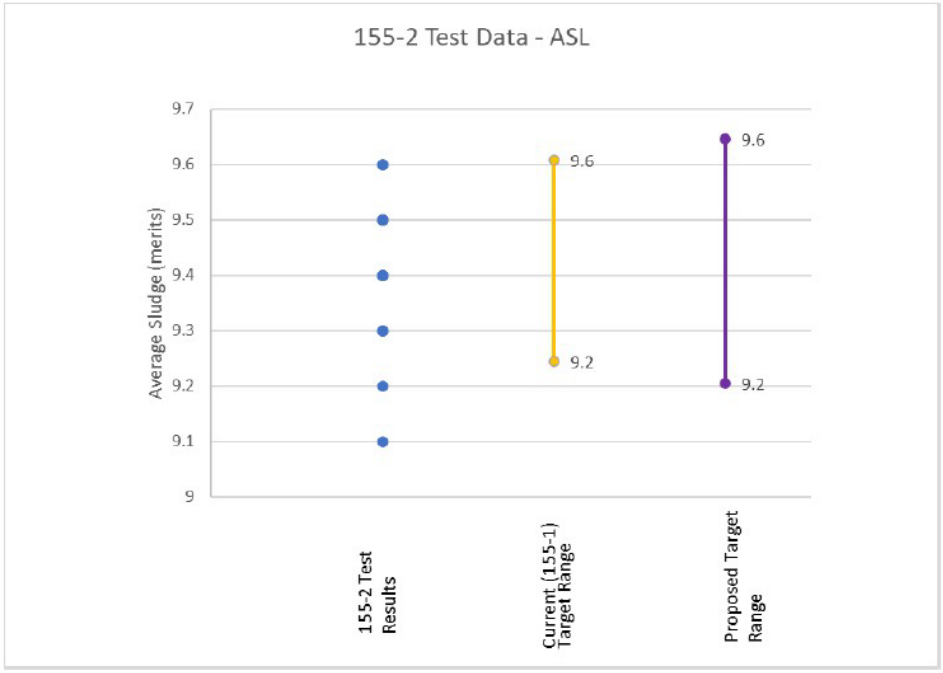
Least Squares Means Table

Level	Least Sq Mean	Std Error	Mean
155-1	8.4981738	0.12755188	8.72857
155-2	8.8503093	0.11403777	8.94583

Least Squares Means Plot



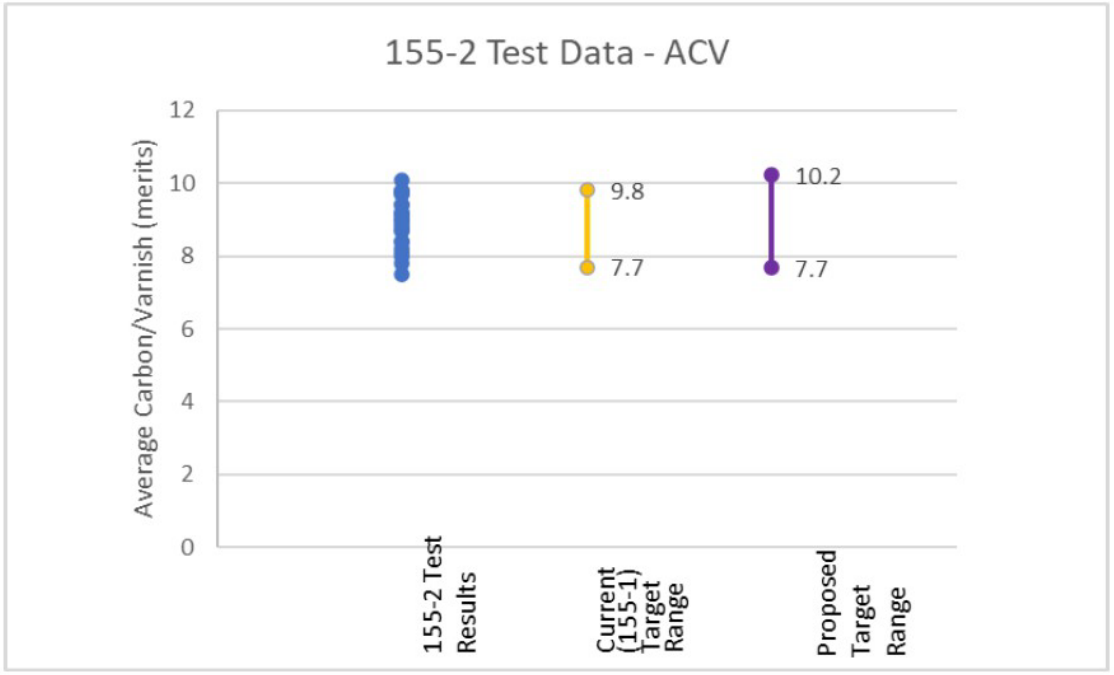
L-60-1 155-2 Results: Average Sludge



		ASL
155-2 Proposed Targets	Mean	9.425
	Std.	0.122
	Upper Y(i)	9.6
N=24	Lower Y(i)	9.2

		ASL
155-1 Targets	Mean	9.426
	Std.	0.101
	Upper Y(i)	9.6
N=35	Lower Y(i)	9.2

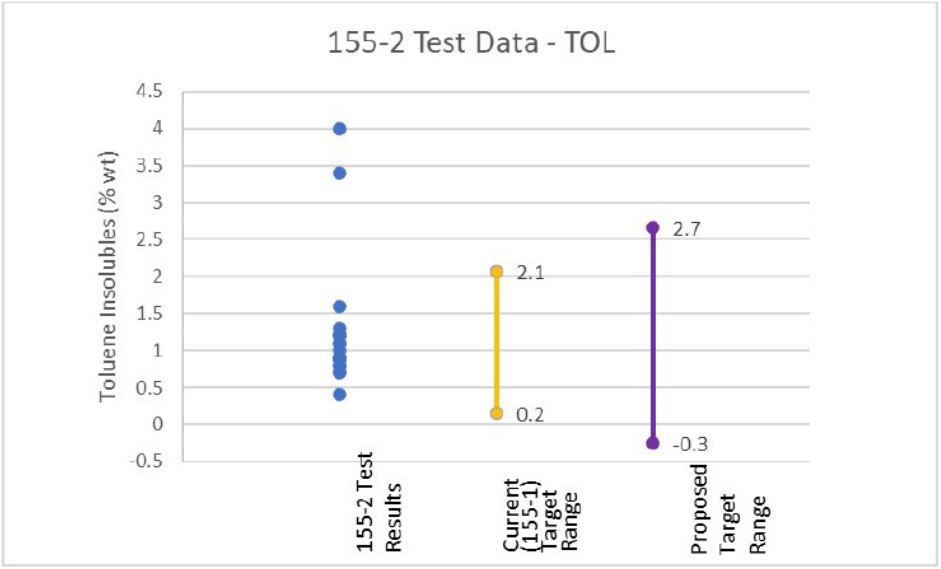
L-60-1 155-2 Results: Average Carbon/Varnish



		ACV
155-2 Proposed Targets	Mean	8.95
	Std.	0.708
	Upper Y(i)	10.2
N=24	Lower Y(i)	7.7

		ACV
155-1 Targets	Mean	8.76
	Std.	0.586
	Upper Y(i)	9.8
N=35	Lower Y(i)	7.7

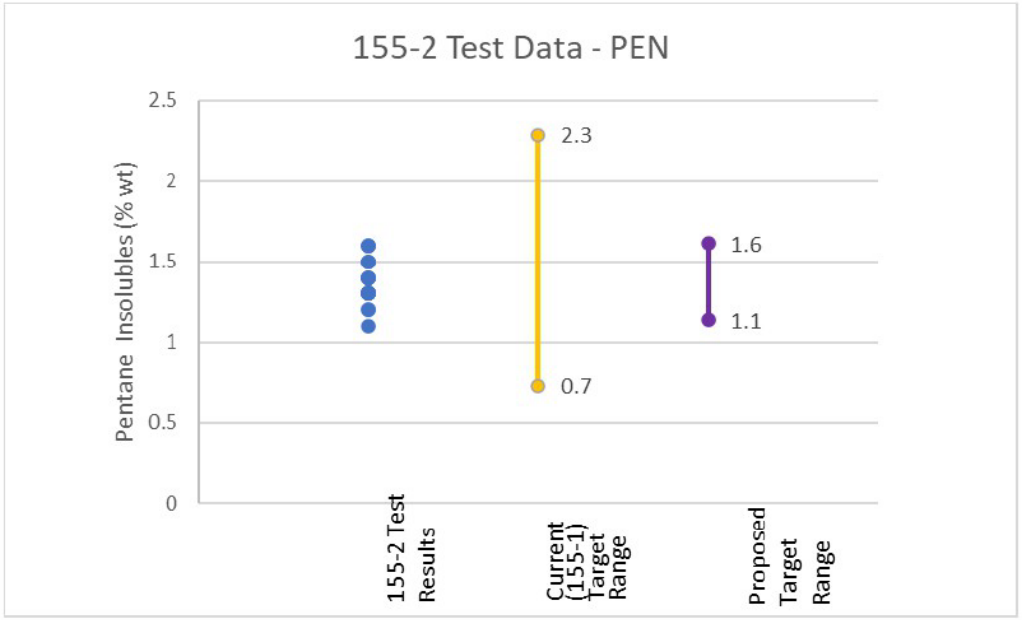
L-60-1 155-2 Results: Toluene



		TOL
155-2 Proposed Targets	Mean	1.200
	Std.	0.81
	Upper Y(i)	2.7
N=24	Lower Y(i)	-0.3

		TOL
155-1 Targets	Mean	1.109
	Std.	0.53
	Upper Y(i)	2.1
N=35	Lower Y(i)	0.2

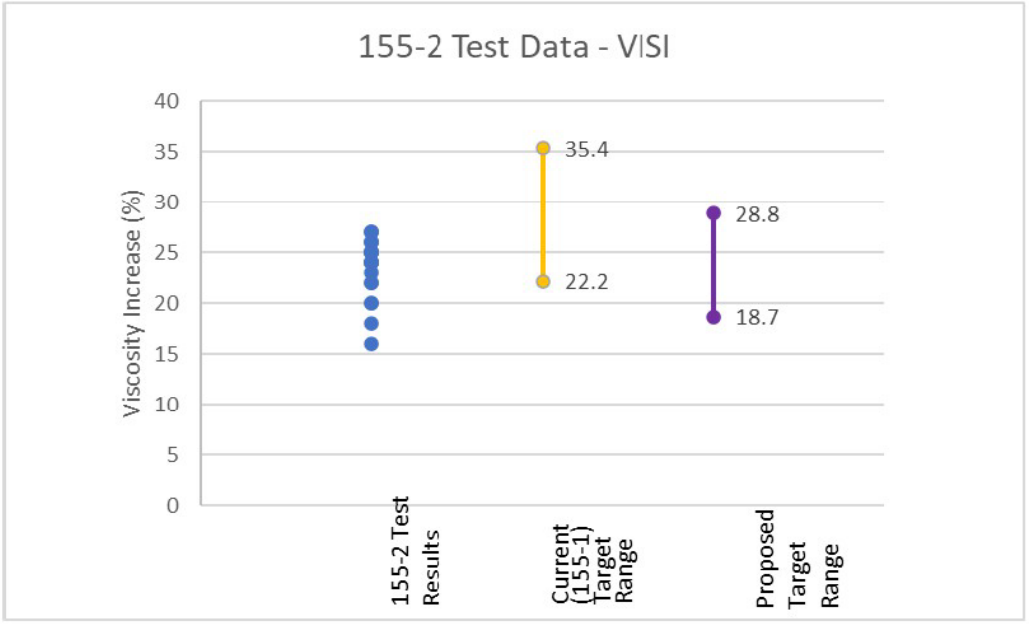
L-60-1 155-2 Results: Pentane



		PEN
155-2 Proposed Targets	Mean	1.375
	Std.	0.133
	Upper Y(i)	1.6
N=24	Lower Y(i)	1.1

		PEN
155-1 Targets	Mean	1.509
	Std.	0.434
	Upper Y(i)	2.3
N=35	Lower Y(i)	0.7

L-60-1 155-2 Results: Viscosity Increase



		VISI
155-2 Proposed Targets	Mean	23.8
	Std.	2.832
	Upper Y(i)	28.8
N=24	Lower Y(i)	18.7

		VISI
155-1 Targets	Mean	28.8
	Std.	3.669
	Upper Y(i)	35.4
N=35	Lower Y(i)	22.2

300 hour to fulfill 50 hour requirement

- **10.7** Run the test at the conditions specified for 50.0 h ± 0.1 h. Terminate the test if more than 5 min of total downtime occurs during the test period. Record any downtime on Form 4. Non-reference oil tests may run longer than 50h provided that all posttest measurements required are performed at the extended EOT and the additional EOT h are reported on the appropriate forms. The same timeline requirements for rating and oil analysis apply to extended EOT tests.

Old Business

New Business

Adjournment

Motion to approve amended stats group recommendation on oil 155-2 with an effective date of 2 weeks from meeting date (2/21/2024). The Z(i) will be re-calculated on all TCR's, however reference status will not be revoked for any stands. This will be revisited by the stats group and the panel in the august meeting.

155-2 Proposed Targets	Mean	Std Dev
ASL	9.426	0.101
ACV	8.76	.708
TOL	1.109	0.53
PEN	1.509	0.434
VISI	23.0	2.832

Motion Passed unanimously (11/0/0)

Motion #2 to approve the amendment of 10.7

- **10.7** Run the test at the conditions specified for 50.0 h ± 0.1 h. Terminate the test if more than 5 min of total downtime occurs during the test period. Record any downtime on Form 4. Non-reference oil tests may run longer than 50h provided that all posttest measurements required are performed at the extended EOT and the additional EOT h are reported on the appropriate forms. The same 50h requirements for rating and oil analysis apply to extended EOT tests. Extending the test from 50h does not invalidate the test.

- **Information Letter to follow**

Motion Passed unanimously (11/0/0)