ASTM INTERNATIONAL
Helping our world work better

100 Barr Harbor Drive
PO Box C700
West Conshohocken, PA
19428-2959 USA

tel +1.610.832.9500
fax +1.610.832.9666
www.astm.org

COMMITTEE D02 on PETROLEUM PRODUCTS, LIQUID FUELS, AND LUBRICANTS

CHAIR:	Scott Fenwick, Clean Fuels Alliance America, PO Box 104848, Jefferson City, MO 65110-4898, (800) 841-5849, e-mail: sfenwick@CleanFuels.org
FIRST VICE CHAIR:	Gregory C Miiller, Tannas Co, 4800 James Savage Rd, Midland, MI 48642, United States (989) 496-2309, Fax: (989) 496-3438, e-mail: gmiiller@savantgroup.com
SECOND VICE CHAIR:	James J Simnick, Ph.D, Simnick Consulting LLC, 1424 Brush Hill Circle, Naperville, IL 60540, (630) 269-8662, e-mail: jim.simnick@gmail.com
FIRST SECRETARY:	Ian P Mylrea, Stanhope-Seta, 70 Bramley Drive, Hampshire, RG27 8ZF, United Kingdom (44) 1932 574589, e-mail: im@stanhope-seta.co.uk
SECOND SECRETARY:	Barbara E. Goodrich, John Deere Product Engineering, 1017 Washington St., Cedar Falls, IA 50613, (319) 464-4417, email: goodrichbarbarae@johndeere.com
STAFF MANAGER:	Alyson Fick, ASTM International, (610) 832-9710, e-mail: afick@astm.org

Sequence VIII Surveillance Panel Meeting Minutes
Thursday September 21, 2023
Teams Meeting (Virtual)
10:00 - 11:00 AM CDT

Minutes recorded by Patrick Lang
Direct any comments or corrections to: patrick.lang@swri.org

The attendance list can be found as Attachment #1.

There were no membership changes brought to the attention of the panel.

Agenda:

The agenda can be found as Attachment #2.

Minutes Approval:

Pat Lang advised that the minutes from the June 21, 2023, virtual meeting were posted to the TMC website. A motion was made for approval of the minutes by Pat Lang and seconded by Robert Stockwell. The minutes were approved with no objections or changes.

Travis Kostan went through the recommendation of the stats group; the presentation can be found as Attachment #3.

The highlights are as follows:

According to Stats group, the new Bearing Batch can be accepted. We should re-evaluate soon once additional data becomes available because a lot of assumptions were made with little data.

Travis explained that stand B1 produced severe results after the 1009 run on that stand, so actual performance is unclear due to mechanical wear on two of the tests from that stand. One of the severe results was on 704-1. There was another data point generated on 704-1 on stand B2 during the severity investigations that was considered in this evaluation along with a 1009-1 run at both labs since all three runs were conducted in a similar manner. This gave us 14 data points in the evaluation.

Two options moving forward for the ICF:

Option 1:

A) ICF= -4.9 /1009-1 target of 14.9 mg *(4 data points used for determining the 1009-1 mean*)
B) Bottom line: this option gives a larger ICF because it assumes the new bearing batch is more severe and we shouldn't attribute that bias to the 1009-1 reblend. Remember, the ICF compensates for the current severity trend not the difference in 1009 performance as a result of the reblend (1009-1).
C) Possible detriment: If bearings are not really different, the ICF could over correct candidates.
D) Reality: This larger correction factor is minimal compared to the other option and is not going to turn a bad candidate into a pass.

Option 2:

A) ICF= -3.6/1009-1 target of 16.2 mg *(7 data points used to determine the 1009-1 mean)*
B) Bottom Line: This option gives a slightly smaller ICF because the target update for 1009-1 uses data from both bearing batches. Using data from both batches makes the assumption that there is no difference in bearing batches, i.e., the variation is normal. These additional datapoints skew the 1009-1 mean a bit higher. So now labs need a smaller correction to be on target when running references on 1009-1. As a result, the ICF, which is designed to compensate for the severity bias outside of the reblend, is smaller.
C) Possible detriment: Candidates tests get a smaller correction when they should get more.
D) Reality: this smaller correction is only minimal compared to Option #1.

There was a lot of discussion amongst the members on which option to choose. It was noted that there really isn't a "bad" option to choose from. The decision really hinges on whether or not you are of the opinion that the bearings are different. Jo Martinez of Oronite pointed out that there are three 1009-1 results on the new bearing batch (03-22) and two of the three produced higher results than on the 06-16 bearings (current batch). She further added that there is an obvious difference in performance when you look at the plot, but it is considered a marginal difference statistically. Travis advised that there was one more data point on 1009-1 from lab B that was produced after the matrix was complete and the data analyzed. This datapoint could be considered in the analysis if the group thought it would appropriate.

In general, most of the group was leaning towards Option #1. George Szappanos mentioned that if there is a difference in the bearings, it will affect candidates so we shouldn't lump all of the 1009-1 results together. As a result, we need to consider that when we make our decision. If you agree with this then Option #1 is the appropriate option because it only utilized the four tests on 1009-1 with the 06-16 bearings when determining the 1009-1 LTMS mean.

The direction question was asked to the OEM's on their preference. Mike Deegan from Ford and Brad Cosgrove from GM were leaning toward Option #2. Travis advised that this is a more conservative choice.

At this point, the time that was allocated for the meeting was already up. The group agreed that we need more time to make a decision, so another call was in order. Additionally, there was no remaining time to review the recommendation for stripped viscosity. This will be done on the next call.

Rich Grundza cautioned the group that since we are looking at an LTMS change with the addition of a new reference oil, we will likely have to exercise the two-week waiting period before it can be officially implemented.

Next Meeting:

The next meeting will be Thursday September 28 at 9:00 CDT.

Attachment #1

Attendance List

√ = present

ASTM SEQUENCE VIII SURVEILLANCE PANEL
VOTING MEMBERSHIP ATTENDANCE RECORD

Teams MTG
9-21-23

Name	Address	Attendance
Alfanso, Adrian	Intertek 5404 Bandera Road San Antonio, TX 78238 Phone:210-647-9429 adrian.alfonso@intertek.com	✓
Bowden, Jason	OH Technologies, Inc. P.O. Box 5039 Mentor, OH 44061-5039 Phone: 440-354-7007 dhbowden@ohtech.com	✓
Savant, Amol	Valvoline 21st and Front Streets Ashland, KY 41101 Phone: 606-585-8982 acsavant@valvolineglobal.com	✓
Maddock, Ben	Afton Chemical 500 Spring Street P.O. Box 2158 Richmond, VA 23218 Ben.Maddock@aftonchemical.com	✓
Grundza, Rich	ASTM/TMC Phone: 412-365-1031 reg@astmtmc.org	✓
Hsu, Jeff	Shell Projects and Technology-USA 3333 Hwy 6 Houston, TX 77082 Phone:281-544-8619 J.Hsu@shell.com	✓
Hairston, William	Haltermann Solutions 15600 W. Hardy Road Houston, TX 77060 Phone No: 832-647-9264 whhairston@haltermann.com	✓
Riou, Joseph	Southwest Research Institute 6220 Culebra Road P.O. Box 28510 San Antonio, TX 78228-0510 Phone: 210-522-6266 jriou@swri.org	✓

ASTM SEQUENCE VIII SURVEILLANCE PANEL
VOTING MEMBERSHIP ATTENDANCE RECORD

Name	Address	Attendance
Lanctot, Dan	Test Engineering Inc. 12718 Cimarron Path San Antonio, TX 78249-3423 Phone: 210-690-1958 dlanctot@tei-net.com	
Kowalski, Teri	Toyota Motor North America, Inc. 1555 Woodridge Ann Arbor, Mi 48105 Phone: 734-995-4032 Cell: 734-355-8082 teri.kowalski@tema.toyota.com	
Cosgrove, Bradley	GM Global Propulsion Systems Phone: 313-590-2186 Bradley.Cosgrove@gm.com	
Rubas, Paul	ExxonMobil Research and Engineering Company 600 Billingsport Rd. Paulsboro, NJ 08066 Email: paul.j.rubas@exxonmobil.com	
Tang, Haiying	Stellantis Phone: 248-512-0593 haiying.tang@stellantis.com	
Stockwell, Robert	Chevron Oronite Company LLC 4502 Centerview Drive Suite 210 San Antonio, TX 78228 Phone: 210-232-3188 Robert.stockwell@chevron.com	
Agudelo, Jorge	BP Lubricants USA 1500 Valley Rd Wayne, NJ 07470 Jorge.Agudelo@BP.com	

ASTM SEQUENCE VIII SURVEILLANCE PANEL
VOTING MEMBERSHIP ATTENDANCE RECORD

Name	Address	Attendance
Deegan, Mike	Ford Motor Company 17228 Federal Drive Allen Park, MI 48101 Phone: 313-805-8942 mdeegan@ford.com	✓
Ritchie, Andy	Infineum P.O. Box 735 1900 East Linden Ave. Linden, NJ 07036-0735 Phone: 908-474-2097 andrew.ritchie@infineum.com	✓
Szappanos, George	Lubrizol Corporation 29400 Lakeland Blvd. Wickliffe, OH 44092 Phone: 440-347-2631 George.szappanos@lubrizol.com	✓

15 present (voting)

18 voting members

ASTM SEQUENCE VIII SURVEILLANCE PANEL
NON- VOTING MEMBERSHIP and GUESTS ATTENDANCE RECORD

Name	Address	Phone/Fax/Email	Attendance
Travis Kostan	Suri		✓
Amanda Stone	Afton		✓
Ricardo Affinito	Oronite		✓
Todd Dvorak	Infineum		✓
Jo Martinez	Oronite		✓
Ed Hennessy	Halterman		✓

Attachment #2

Agenda

1. Welcome

2. Attendance

3. Approval of the minutes from the June 21, 2023, virtual meeting. Minutes posted to TMC website.

4. Review of the matrix data.

    a. Review of stats group recommendation for the industry correction factor (ICF) -Travis Kostan

5. Next Meeting will be at call of the chair

6. Adjournment

Attachment # 3

Stats Group ICF Matrix Recommendation

Sequence VIII
Correction Factor Matrix, RO 1009-1 Intro, and Bearing Batch Intro

STATS GROUP

SEPTEMBER 2023

Stats Group

- Amanda Stone, Afton
- Amy Ross, Valvoline
- 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

Executive Summary

General Comments:

- The new bearing batch can be accepted.
- A lot of assumptions have been made with little data. We should re-evaluate soon once additional data becomes available.

Bearing Weight Loss:

- Option #1:
  - Apply an industry correction factor of -4.9 mg for tests moving forward.
  - 1009-1 will have an LTMS mean of 14.9 mg and a standard deviation of 3.01 mg.
  - This is the option to choose if you think the bearings might be more severe and we should only consider a re-blend difference on the same hardware.
- Option #2:
  - Apply an industry correction factor of -3.6 mg for tests moving forward.
  - 1009-1 will have an LTMS mean of 16.2 mg and a standard deviation of 3.01 mg.
  - This is the option to choose if you believe the new bearings are the same and we can use all data to estimate the difference due to the oil re-blend.
- Based on the methodology used, with both options there is some evidence that this may slightly over correct candidates < 10 mg and may under correct candidates > 20 mg (no candidate data offered > 20mg to study).
- Severity adjustment standard deviation should be updated from 4.8 to 3.0.

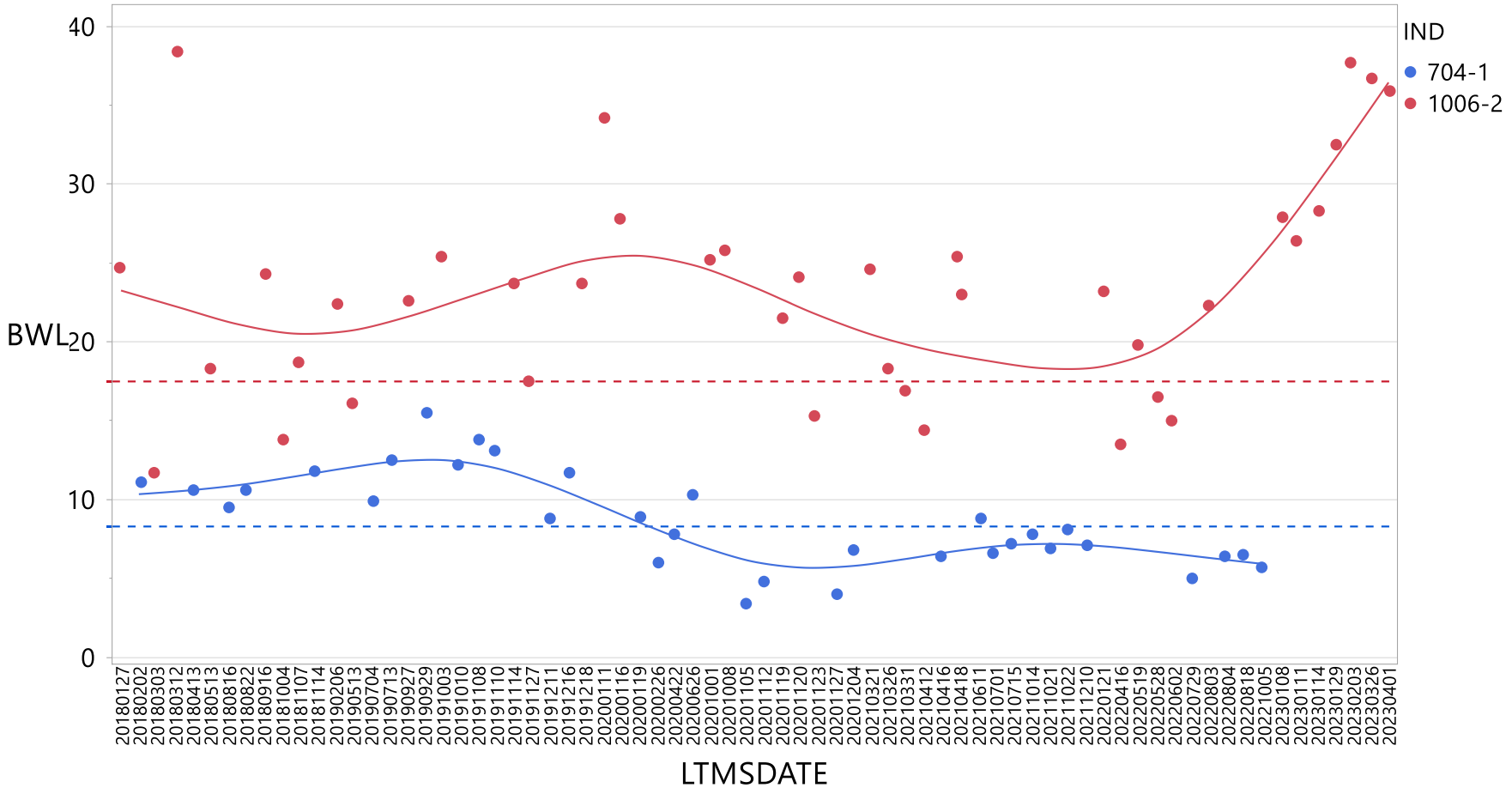
Stripped Viscosity:

- It is recommended to apply and industry correction factor of -0.14 cSt for tests moving forward.
- 1009-1 is recommended to have an LTMS mean of 9.73 cSt and a standard deviation of 0.07 cSt.

Bearing Weight Loss (BWL)

BWL Since 2018

The dashed lines are the oil targets, and all data is shown for operationally valid tests only.



Timeline

- <u>December 2022 - January 2023:</u>
  - Both labs starting producing 1006-2 results > 25.
- <u>January 2023 - April 2023:</u>
  - More than 20 experimental runs in total were conducted between the two labs varying parts, fuel, and oil retains on 1006-2 to try to return severity to a normal level with no success (both labs averaged slightly over 30 mg.
  - Two tests on 1009-1 resulted in 17.4 mg and 18.7 mg and one test on 704-1 of 12.5 suggested that the test was indeed severe but not as bad for oils with a lower target performance.
- <u>May 2023:</u>
  - With 704-1 nearly depleted, SP agreed to run two 1009 tests to determined the feasibility of introducing 1009-1 as a reference oil moving forward. (results were 18.3 and 16.4).
- <u>June 2023:</u>
  - SP agrees to run the rest of the stats group matrix (an additional 8 runs), which is shown on the following slide.

TOTAL BEARING WEIGHT LOSS
Unit of Measure: mg
CRITICAL PARAMETER

Reference Oil	Mean	Standard Deviation
704-1	8.3	2.32
1006	15.9	4.85
1006-2	17.5	4.23

Sequence VIII Reference Oil Targets					
		Effective Dates		TBWL	
Oil	n	From[1]	To[2]	$\bar{X}$	s
1009	5	1-7-03	1-23-05	12.8	2.00
	11	1-24-05	5-21-21	13.8	2.14

Test Matrix

The matrix below was the recommended matrix. The data generated from these tests, and possibly including some of the previously generated data, could be used to:

1. Estimate an industry correction factor.
2. Introduce 1009-1 as the sole reference oil moving forward (704-1 supply depleted).
3. Prove-out the 03-22 bearing batch.

A1	A2	B1	B2
1009	704-1	1009	1009-1
704-1	1009-1	704-1	704-1
1009-1	1009-1	1009-1	1009-1

- Yellow highlighted = 06-16 (current) bearing batch
- Green highlighted = 03-22 (new) bearing batch

Test Matrix

During the test matrix, there was a higher than normal result on the second run in stand B1 producing 16.5 mg BWL. Following this test, clear mechanical wear was seen on the third run in the stand. A couple of additional runs were made on the stand which also exhibited mechanical wear, and the lab has requested to have the analysis completed without the final data point from this stand.

- Yellow highlighted = 06-16 (current) bearing batch
- Green highlighted = 03-22 (new) bearing batch

Requested Matrix

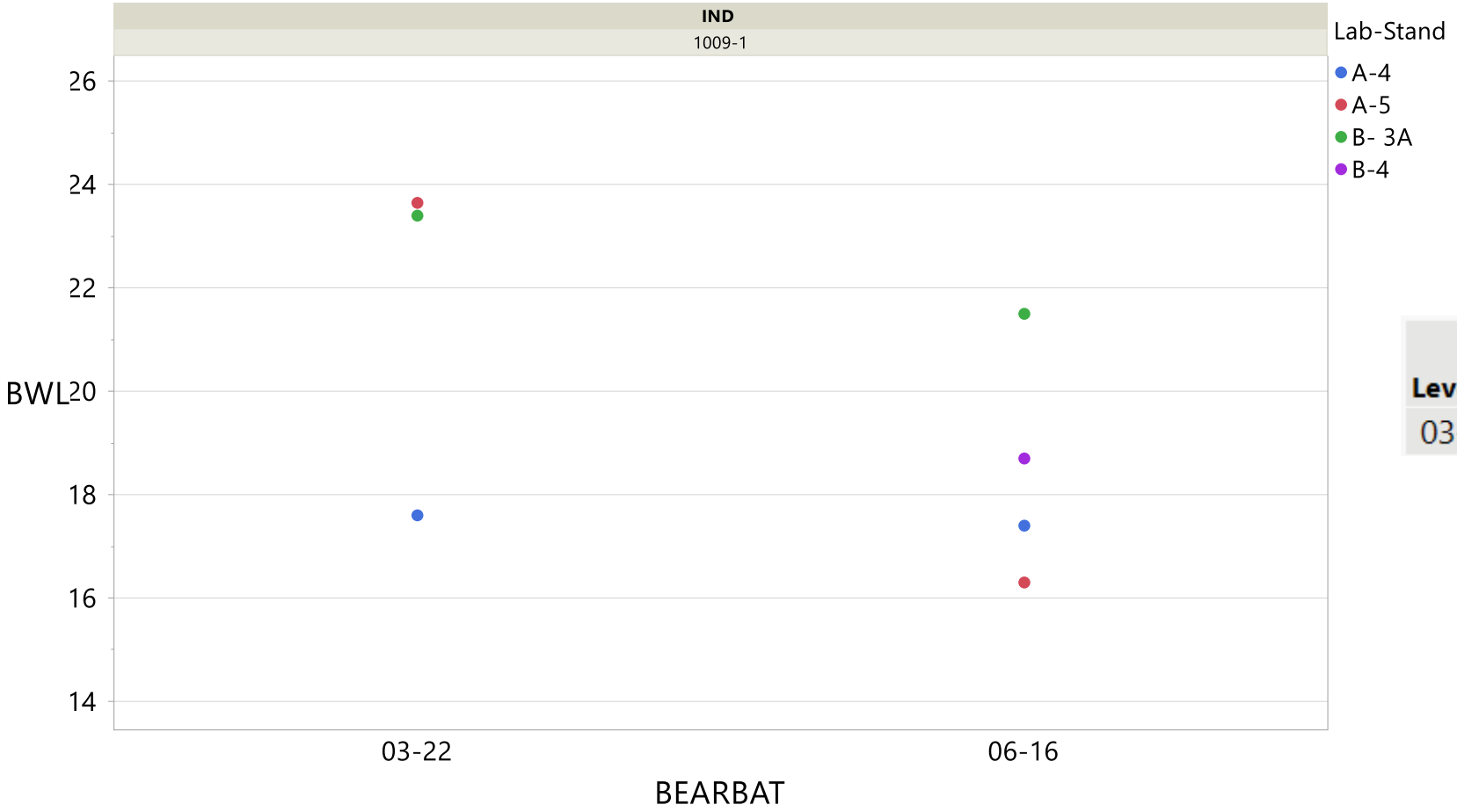
A1	A2	B1	B2
1009 ✓	704-1 ✓	1009 ✓	1009-1 ✓
704-1 ✓	1009-1 ✓	704-1 ?	704-1 ✓
1009-1 ✓	1009-1 ✓	1009-1 X	1009-1 ✓

Other recent data

A1	A2	B1	B2
1009-1	--	1009-1	704-1

Bearing Batch

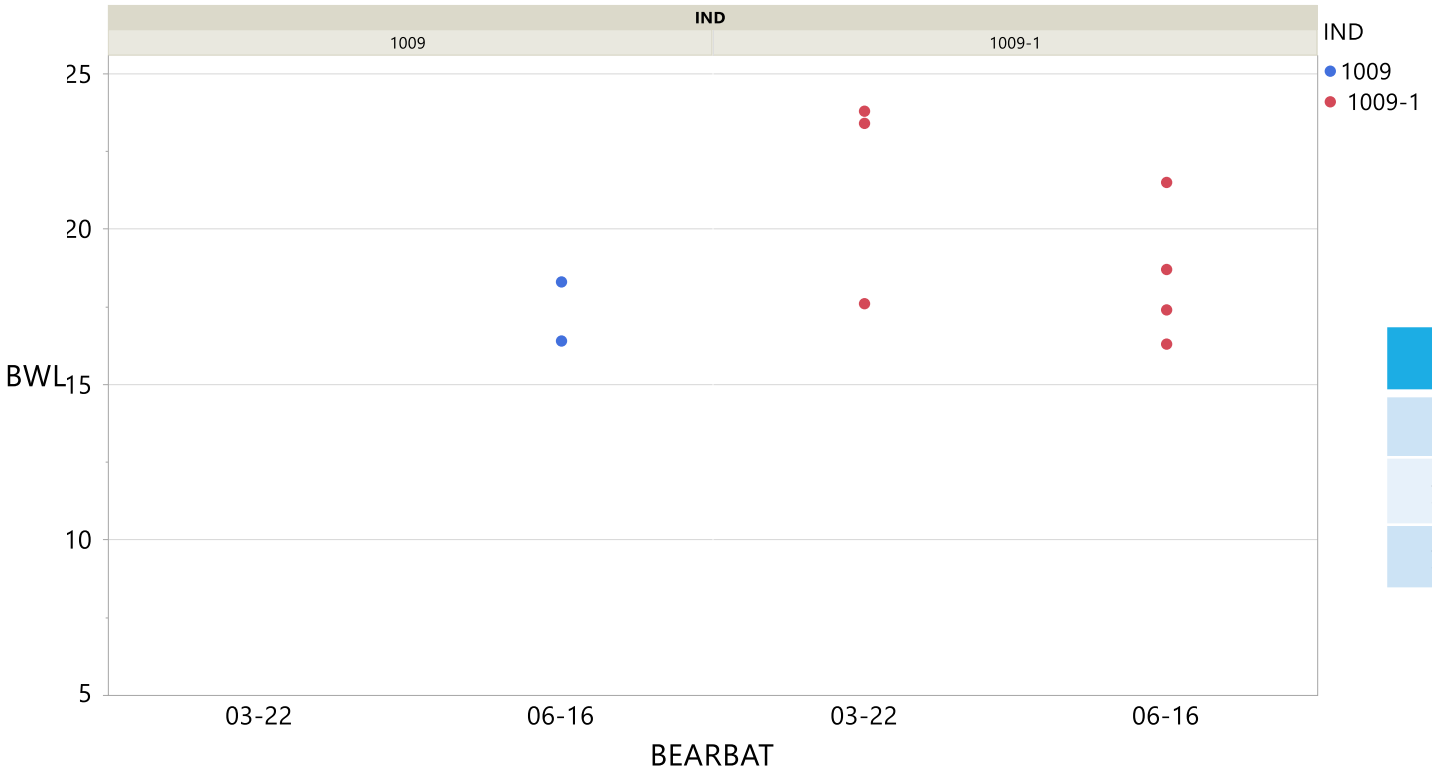
It is unclear if the new bearing batch is different at this time, but the current estimated difference is 3.1 mg.
It is not recommended to add in this difference at this time as an additional contribution to the ICF.



Level	- Level	Difference	p-Value
03-22	06-16	3.058333	0.2077

1009-1 vs. 1009

Using data generated only on identical hardware for the estimated re-blend difference results in a target update to 14.9 mg. Using all data on 1009-1 results in a target update of 16.2.



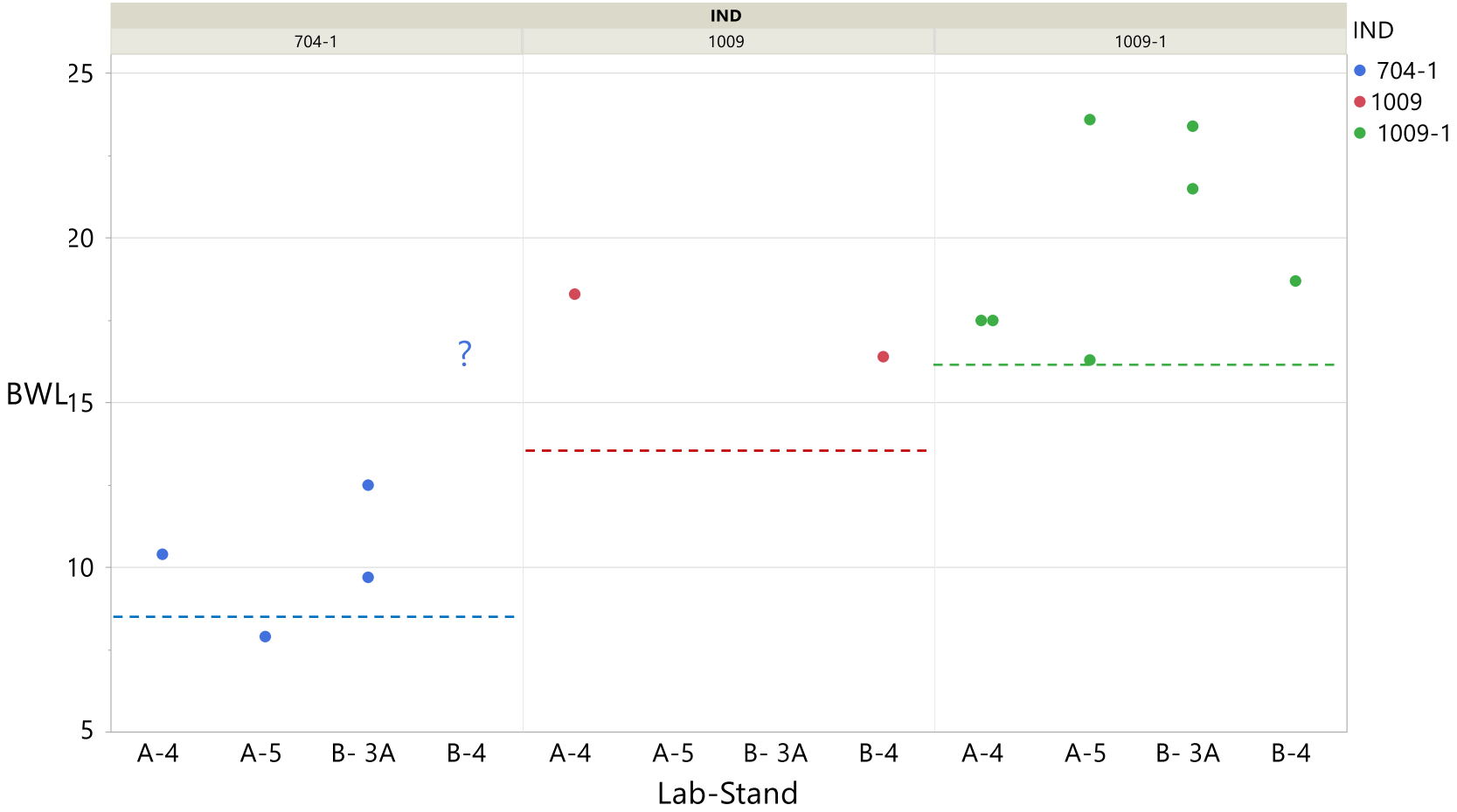
- 1009 Average: 17.4
- 1009-1 All Data: 19.8 (+2.4 mg)
- 1009-1 06-16 Only: 18.5 (+1.1 mg)

Oil	Data Used	LTMS Mean	Std. Dev.
1009	LTMS Target	13.8	2.14
1009-1	All Data (n=7)	13.8+2.4 = 16.2	3.01
1009-1	06-16 Only (n=4)	13.8+1.1 = 14.9	2.77 (pooled)

Correction Factor Using 16.2 Target for 1009-1

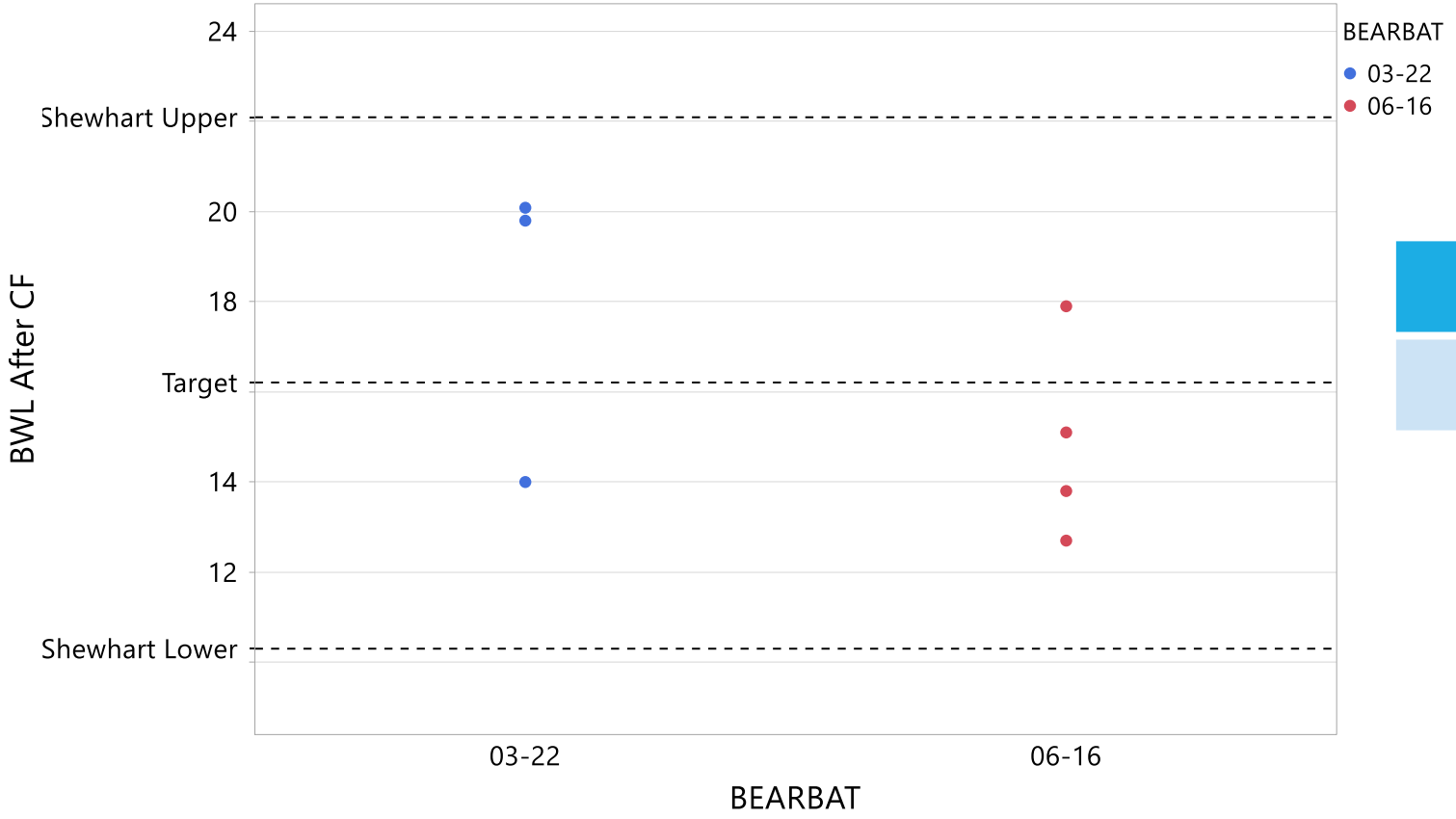
To estimate an ICF we consider all data and 1009-1 only. It is recommended to use the 1009-1 only difference of 3.6 mg as the ICF. Though 1009-1 is further from target than 704-1, it is less than the difference seen in 1006-2. This suggests we might slightly over correct candidates < 10 mg (solid passes anyway), but may potentially under correct candidates > 20 mg.

Method	All Data w/o high 704-1	All Data w/ high 704-1	1009-1 Only
Avg. difference from target	3.0	3.4	3.6



1009-1 Data After Correction Factor of -3.6 mg

The graph below shows the data after the -3.6 mg correction factor, along with the Shewhart severity upper and lower limits.

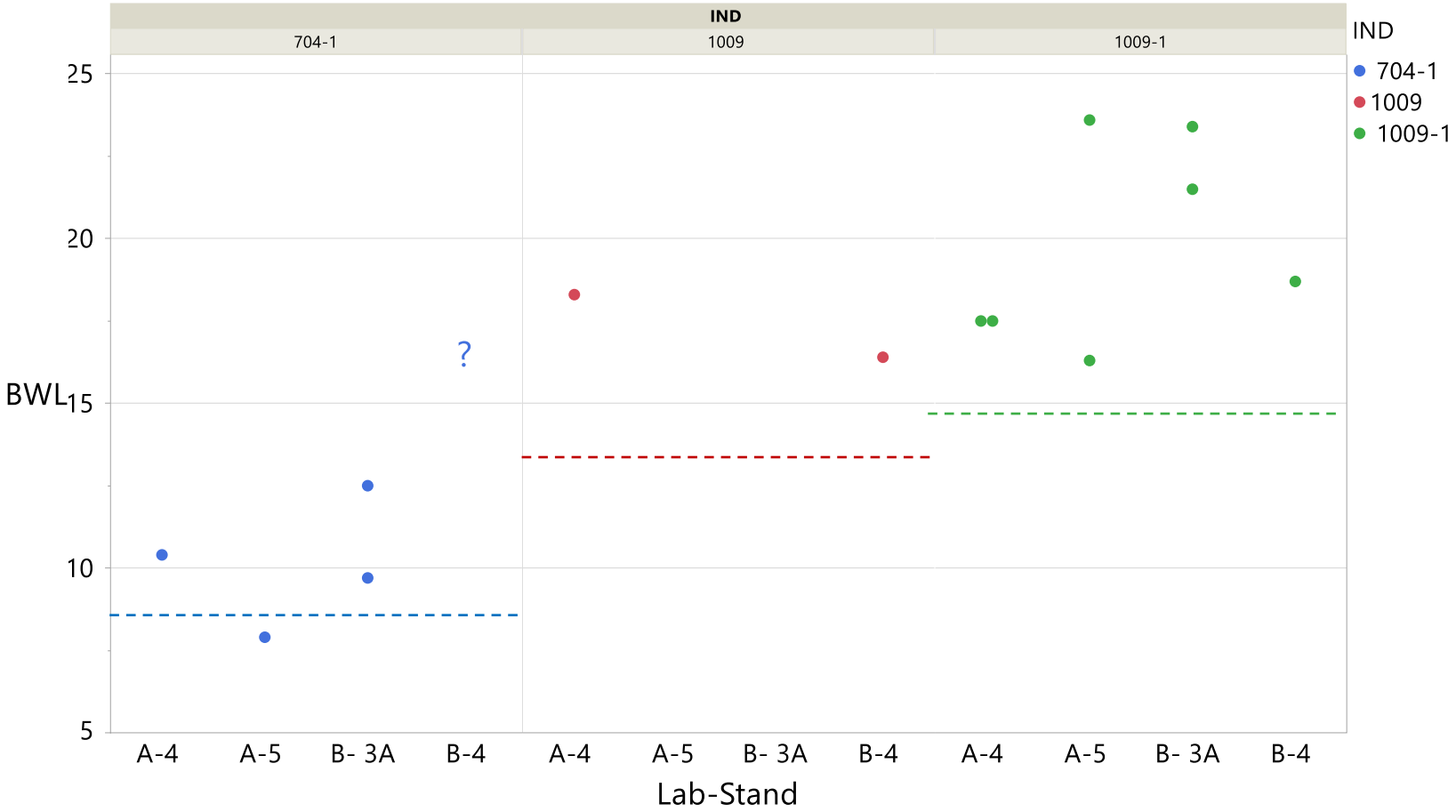


Oil	Mean	Std. Dev.
1009-1	16.2	3.01

Correction Factor Using 14.9 Target for 1009-1

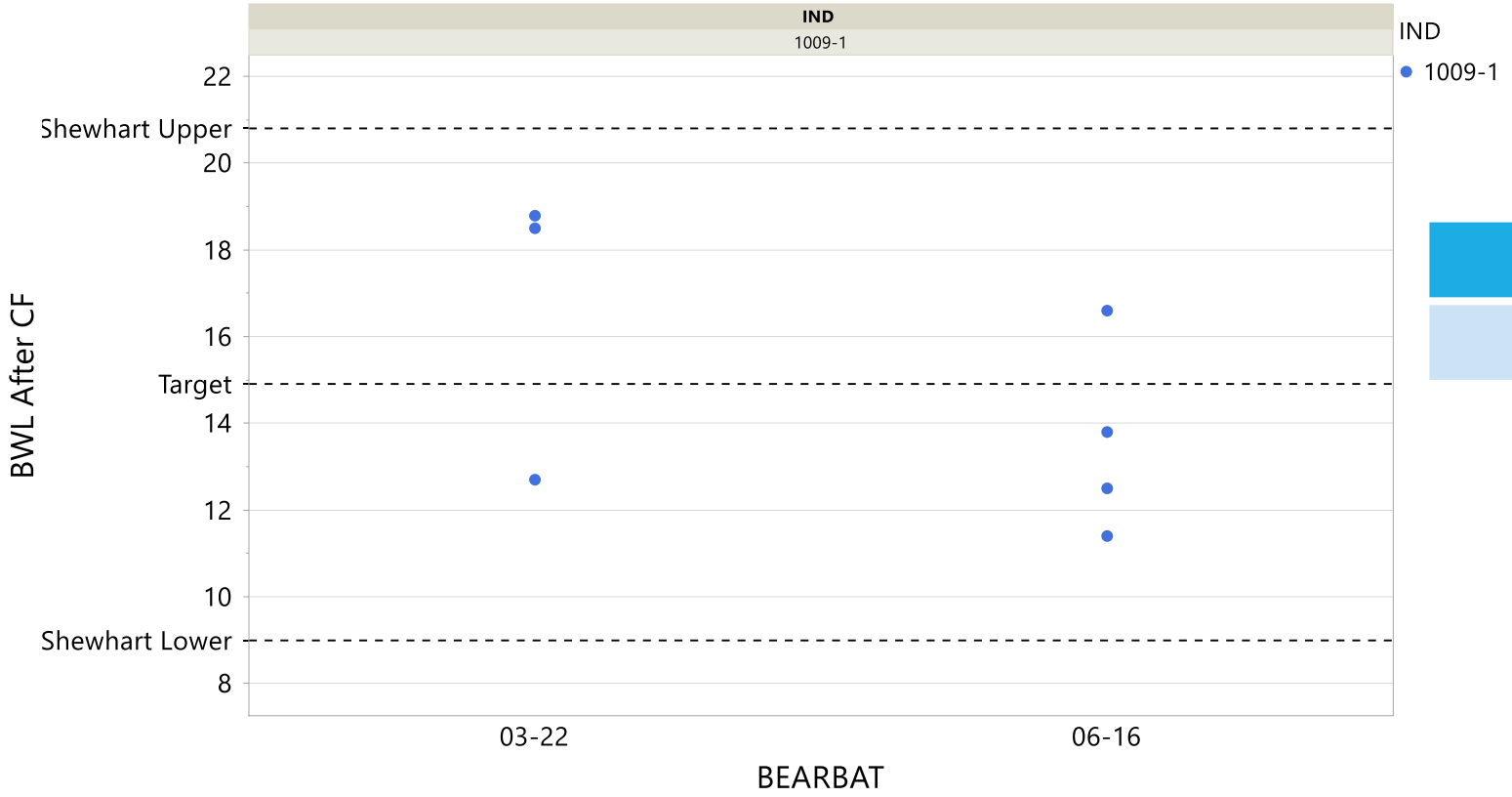
To estimate an ICF we again consider all data and 1009-1 only. It is recommended to use the 1009-1 only difference of 4.9 mg as the ICF.

Method	All Data w/o high 704-1	All Data w/ high 704-1	1009-1 Only
Avg. difference from target	3.7	4.1	4.9



1009-1 Data After Correction Factor of -4.9 mg

The graph below shows the data after the -4.9 mg correction factor, along with the Shewhart severity upper and lower limits.



Oil	Mean	Std. Dev.
1009-1	14.9	3.01

Model Predictions

Summary of Fit

RSquare Adj	0.796039
Root Mean Square Error	2.282551
Mean of Response	16.43846
Observations (or Sum Wgts)	13

Analysis of Variance

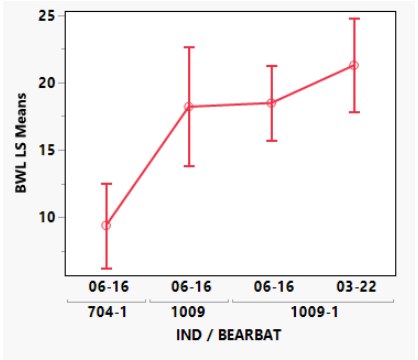
Source	DF	Sum of Squares	Mean Square	F Ratio
Model	6	275.27055	45.8784	8.8058
Error	6	31.26022	5.2100	Prob > F
C. Total	12	306.53077		0.0090*

Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob>|t|	VIF
Intercept	15.821271	0.737952	21.44	<.0001*	.
IND[704-1]	-6.428374	1.124845	-5.71	0.0012*	2.5
IND[1009]	2.3765474	1.41269	1.68	0.1435	2.7
LTMSLAB[A]	-0.677796	0.684935	-0.99	0.3606	1.2
LTMSLAB[A]:LTMSAPP[4]	-0.231432	0.909695	-0.25	0.8077	1.1
LTMSLAB[B]:LTMSAPP[3A]	1.4642058	1.192468	1.23	0.2655	1.6
IND[1009-1]:BEARBAT[06-16]	-1.398098	0.909695	-1.54	0.1752	1.1

Effect Tests

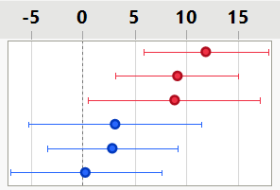
Source	Nparm	DF	Sum of Squares	F Ratio	Prob > F
IND	2	2	260.05529	24.9571	0.0012*
LTMSLAB	1	1	5.10200	0.9793	0.3606
LTMSAPP[LTMSLAB]	2	2	7.89162	0.7573	0.5090
BEARBAT[IND]	1	1	12.30622	2.3620	0.1752



Least Squares Means Table

Level	Least Sq Mean	Lower 95%	Upper 95%
[704-1] 06-16	9.4	6.2	12.5
[1009] 06-16	18.2	13.8	22.6
[1009-1] 06-16	18.5	15.7	21.3
[1009-1] 03-22	21.3	17.8	24.7

Level	- Level	Difference	Std Err Dif	Lower CL	Upper CL	p-Value
[1009-1] 03-22	[704-1] 06-16	11.87830	1.760790	5.78296	17.97364	0.0021*
[1009-1] 06-16	[704-1] 06-16	9.08210	1.720614	3.12584	15.03836	0.0075*
[1009] 06-16	[704-1] 06-16	8.80492	2.384935	0.54898	17.06087	0.0384*
[1009-1] 03-22	[1009] 06-16	3.07338	2.428521	-5.33345	11.48020	0.6134
[1009-1] 03-22	[1009-1] 06-16	2.79620	1.819390	-3.50200	9.09439	0.4739
[1009-1] 06-16	[1009] 06-16	0.27718	2.132058	-7.10338	7.65774	0.9991



Contrast

Test Detail

[704-1] 06-16	0
[1009] 06-16	0.5
[1009-1] 06-16	0.5
[1009-1] 03-22	-1
Estimate	-2.935
Std Error	1.8621
t Ratio	-1.576
Prob>|t|	0.1661
SS	12.941
Lower 95%	-7.491
Upper 95%	1.6217

SS	NumDF	DenDF	F Ratio	Prob > F
12.94	1	6	2.4839	0.1661

Current 1009 target: 13.8

Difference between 1009 and 1009-1 for 06-16 bearing batch = 0.3

1009-1 new target: 14.1

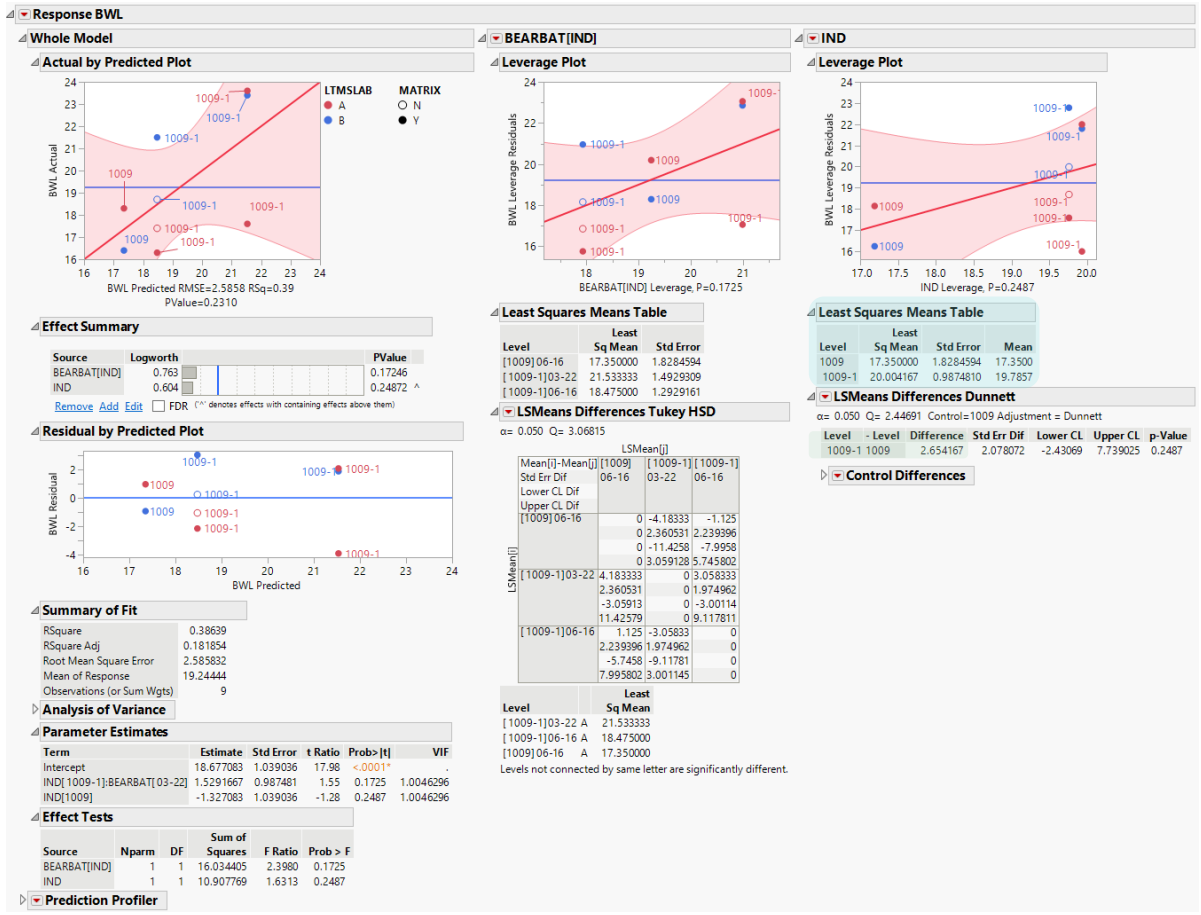
Difference between 1009 06-16 and current target: -4.4

Difference between 06-16 and 03-22 batch: -2.9

ICF = -7.3

Model Predictions

BWL (VIII) Correction/Targets Evaluation



- Data Used: All 1009 & 1009-1 Data (Matrix) + 2 Tests 1009-1 resulted in 17.4 mg and 18.7 mg (01/23 – 04/23)
- Model Used: BWL ~ IND + BEARBAT[IND]
- 1009 LSMeans = Mean = 17.4 mg, SD (assume 1009 = 1009-1) = 2.6 mg
- ICF (based on 1009) = 13.8 mg – 17.4 mg = -3.6 mg
- 1009-1 LSMeans = 20.0 mg = 17.4 mg + 2.6 mg (unadjusted)
- 1009-1 After ICF = 20.0 mg – 3.6 mg = 16.4 mg (unadjusted)

- ICF = -3.6 mg, 1009-1 LTMS mean = 16.4mg, SD = 2.6

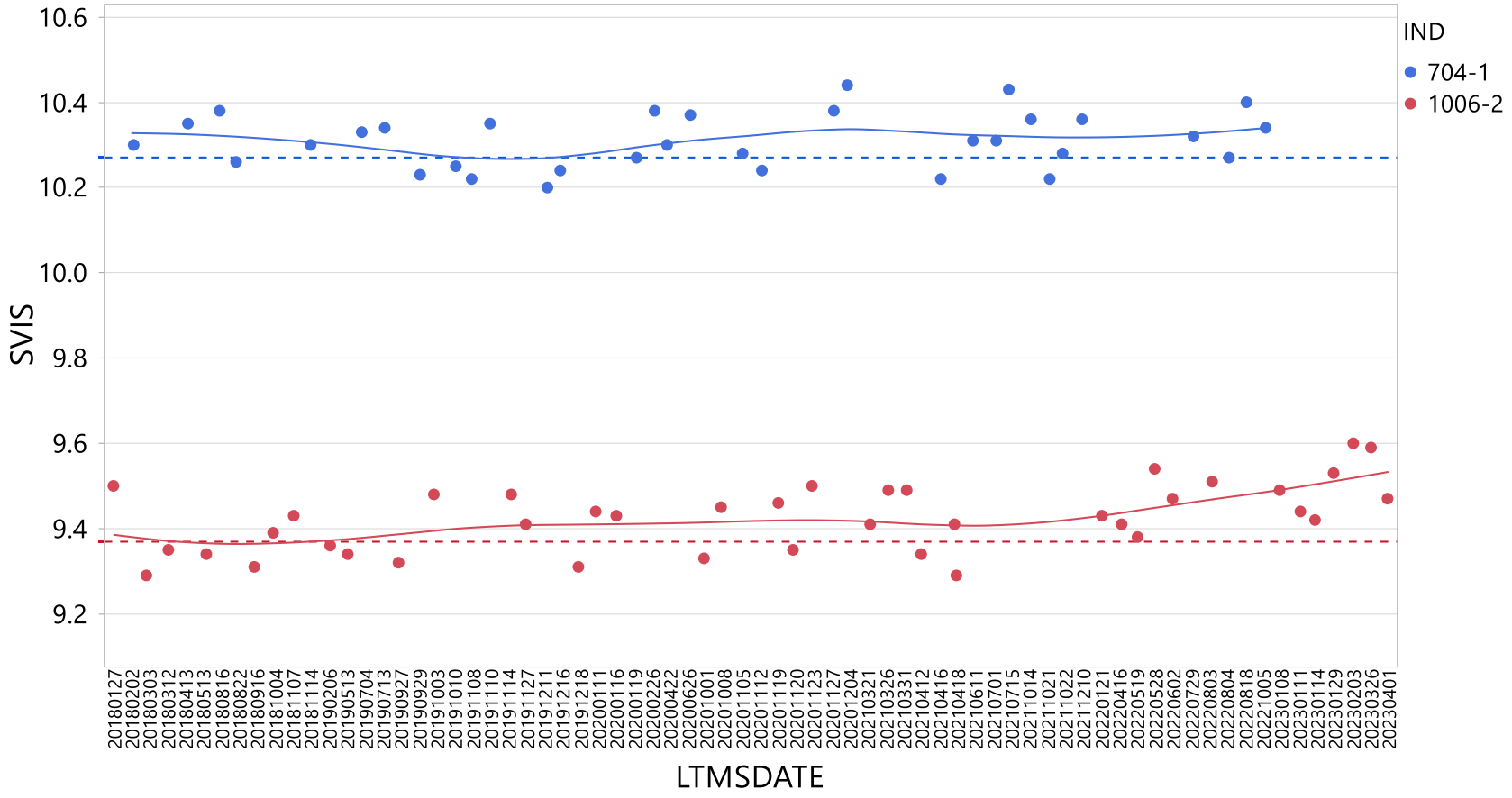
10 Hour Stripped Viscosity

SVIS Since 2018

SVIS also increased at the same time as bearing weight loss with 1006-2.

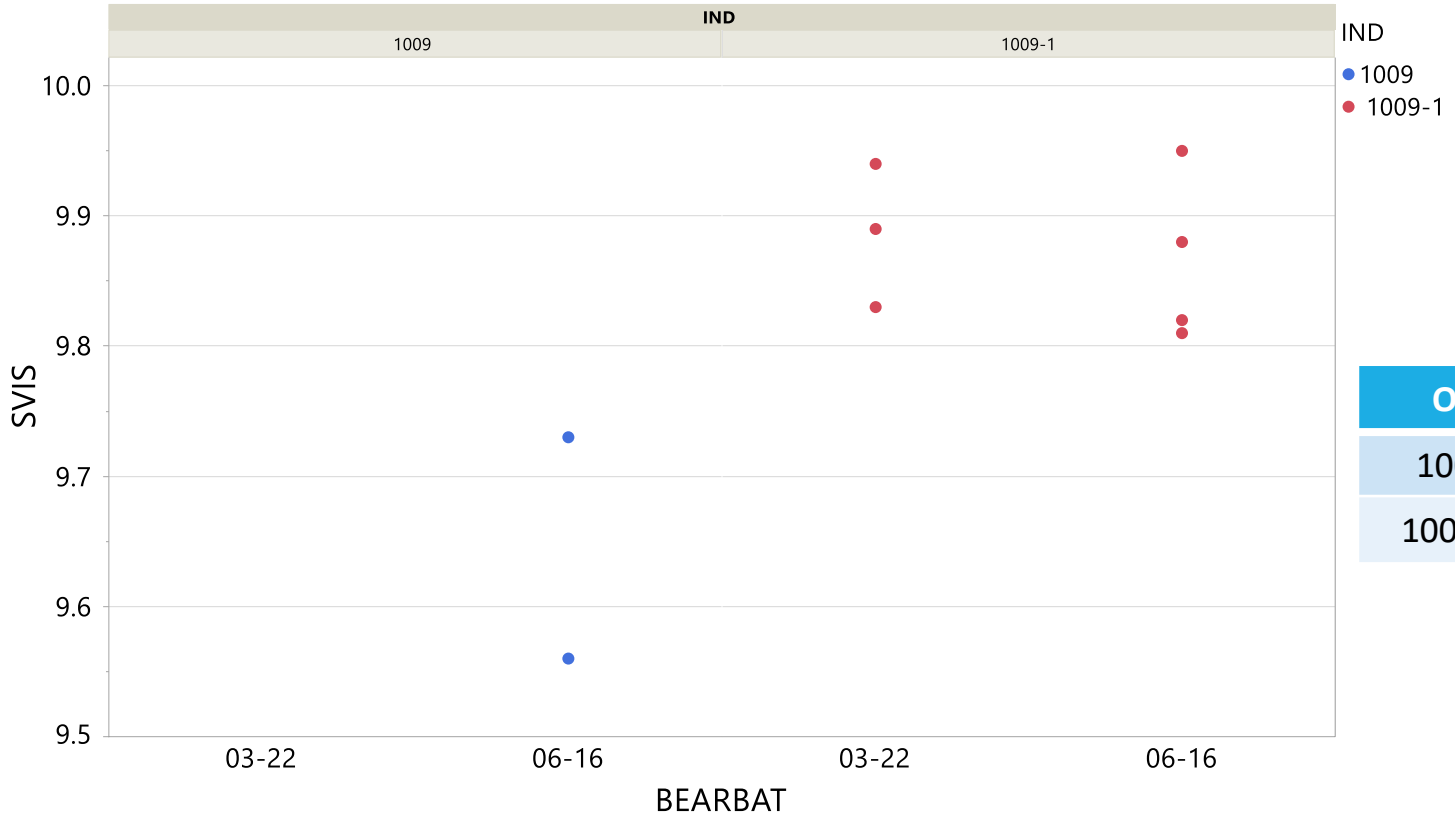
10-HOUR STRIPPED VISCOSITY
Unit of Measure: centistokes
NONCRITICAL PARAMETER

Reference Oil	Mean	Standard Deviation
704-1	10.27	0.11
1006	9.00	0.17
1006-2	9.37	0.07
1009	9.51	0.10



1009-1 vs. 1009

Consider the difference of the re-blend first. The re-blend data on both bearing batches is similar and shows an average difference from the original blend of 0.22 cSt, resulting in a target of 9.73 cSt.



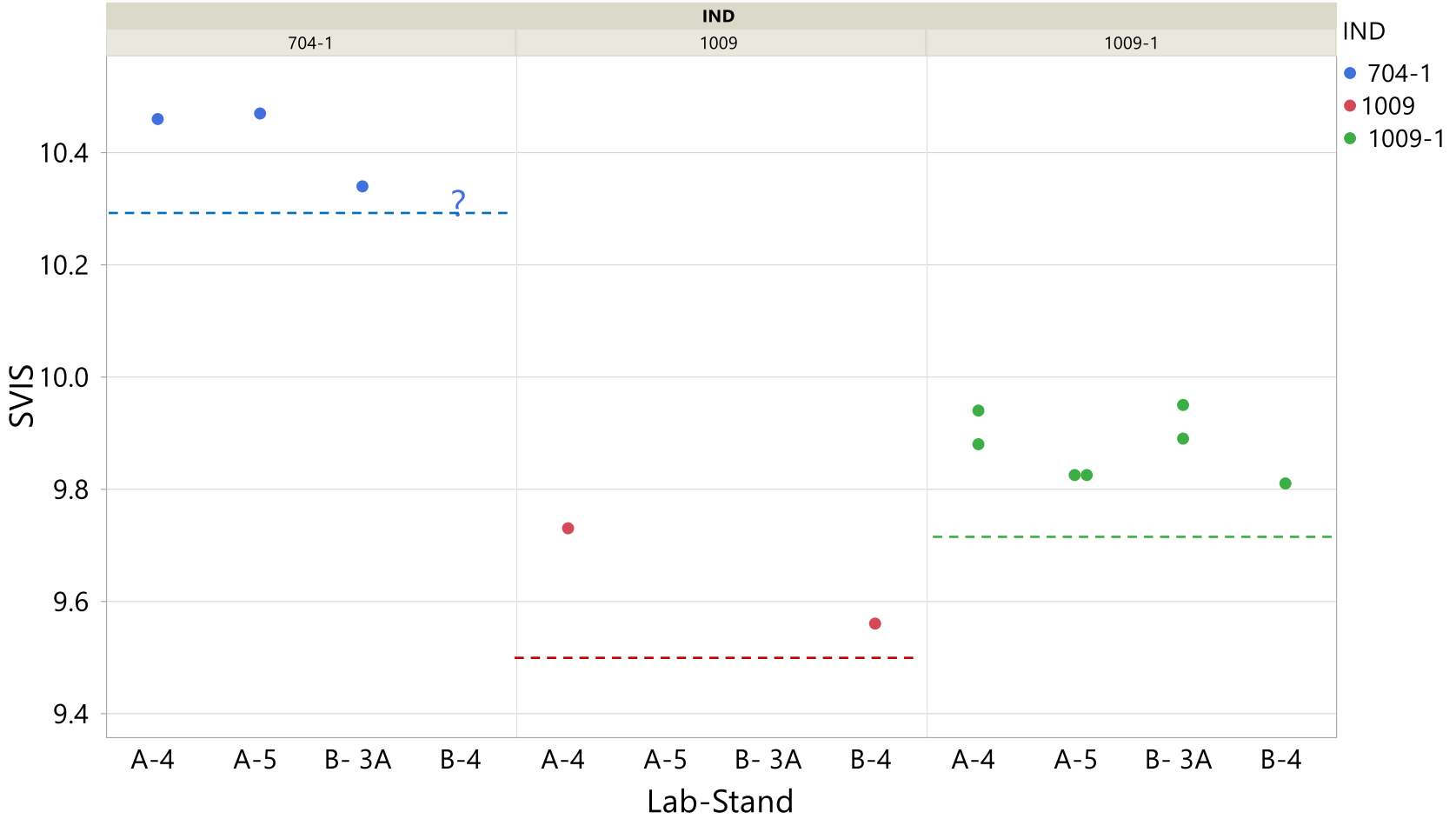
- 1009 Average: 9.65
- 1009-1 All Data: 9.87 (+0.22 cSt)
- 1009-1 06-16 Only: 9.87 (+ 0.22 cSt)

Oil	Data Used	LTMS Mean	Std. Dev.
1009	LTMS Target	9.51	0.10
1009-1	All Data	9.51 + 0.22 = 9.73	0.07

Correction Factor

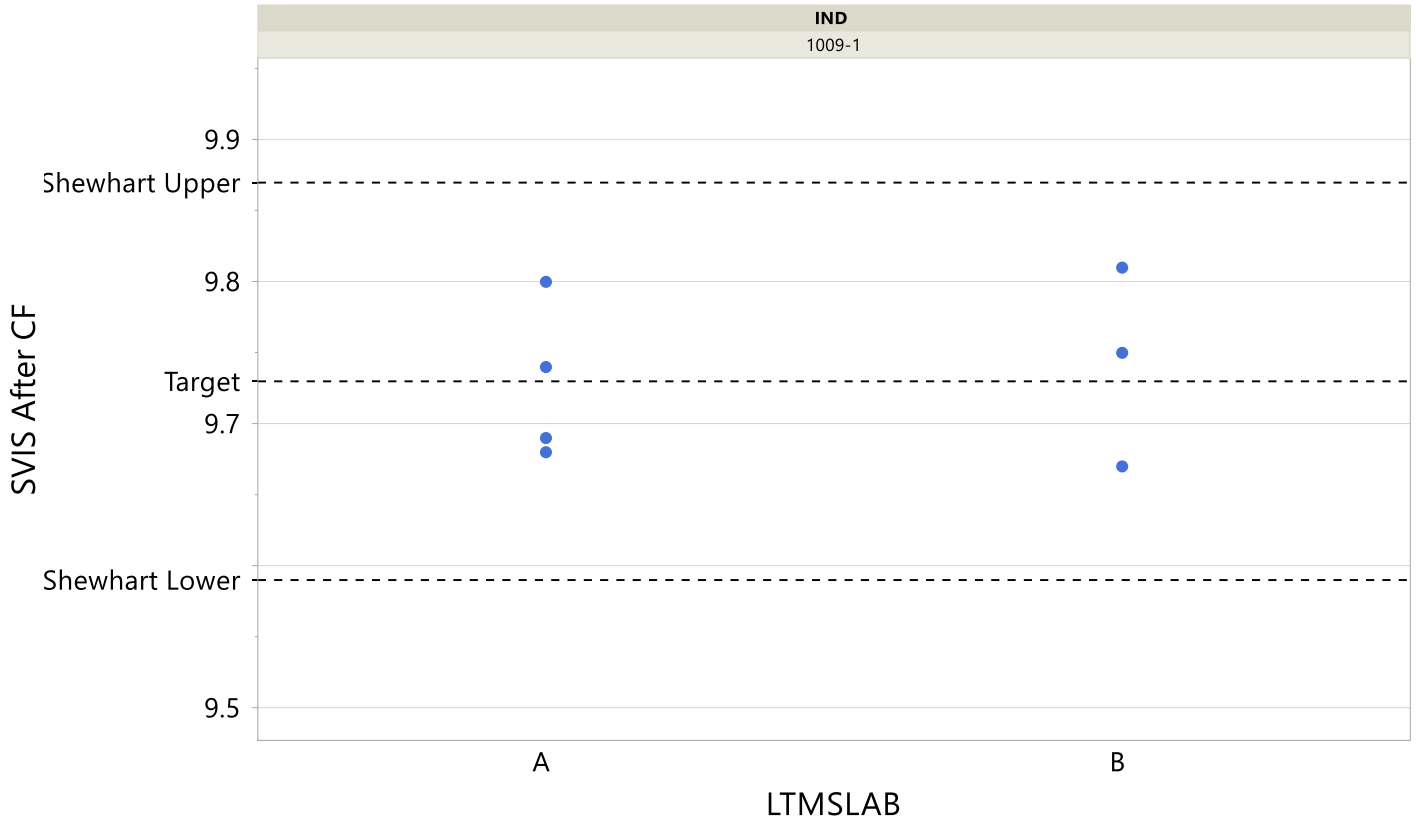
Modeling lab and stand differences seems inappropriate on the current data set. To estimate an ICF for the 06-16 bearings, we can take the average difference from target of all 6 results (recommended), or we can take an average of the two average differences.

Method	Using All Data	1009-1 Only
Avg. difference from target	-0.14	-0.14



1009-1 Data After Correction Factor of -0.14 cSt

The graph below shows the data after the -0.14 cSt correction factor, along with the Shewhart severity upper and lower limits.



Oil	Mean	Std. Dev.
1009-1	9.73	0.07

Model Predictions

Summary of Fit

RSquare	0.976565
RSquare Adj	0.948444
Root Mean Square Error	0.066237
Mean of Response	9.973333
Observations (or Sum Wgts)	12

Analysis of Variance

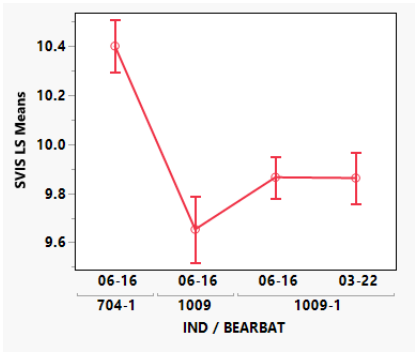
Source	DF	Sum of Squares	Mean Square	F Ratio
Model	6	0.91413021	0.152355	34.7264
Error	5	0.02193646	0.004387	Prob > F
C. Total	11	0.93606667		0.0006*

Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob>|t|	VIF
Intercept	9.9717535	0.022449	444.19	<.0001*	.
IND[704-1]	0.4268924	0.034267	12.46	<.0001*	2.3
IND[1009]	-0.318628	0.041136	-7.75	0.0006*	2.7
LTMSLAB[A]	0.0279688	0.02056	1.36	0.2318	1.1
LTMSLAB[A]:LTMSAPP[4]	0.0298438	0.0264	1.13	0.3096	1.1
LTMSLAB[B]:LTMSAPP[3A]	0.0460937	0.03529	1.31	0.2484	1.4
IND[1009-1]:BEARBAT[03-22]	-0.00151	0.0264	-0.06	0.9566	1.1

Effect Tests

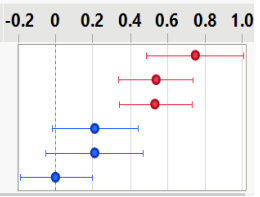
Source	Nparm	DF	Sum of Squares	F Ratio	Prob > F
IND	2	2	0.70655393	80.5228	0.0002*
LTMSLAB	1	1	0.00811850	1.8505	0.2318
LTMSAPP[LTMSLAB]	2	2	0.01511452	1.7225	0.2697
BEARBAT[IND]	1	1	0.00001436	0.0033	0.9566



Least Squares Means Table

Level	Least Sq Mean	Lower 95%	Upper 95%
[704-1] 06-16	10.40	10.29	10.50
[1009] 06-16	9.65	9.52	9.79
[1009-1] 06-16	9.87	9.78	9.95
[1009-1] 03-22	9.86	9.76	9.97

Level	- Level	Difference	Std Err Dif	Lower CL	Upper CL	p-Value
[704-1] 06-16	[1009] 06-16	0.7455208	0.0705791	0.485083	1.005959	0.0005*
[704-1] 06-16	[1009-1] 03-22	0.5366667	0.0540820	0.337103	0.736230	0.0007*
[704-1] 06-16	[1009-1] 06-16	0.5336458	0.0527992	0.338816	0.728476	0.0006*
[1009-1] 06-16	[1009] 06-16	0.2118750	0.0619587	-0.016754	0.440504	0.0656
[1009-1] 03-22	[1009] 06-16	0.2088542	0.0705791	-0.051584	0.469292	0.1061
[1009-1] 06-16	[1009-1] 03-22	0.0030208	0.0527992	-0.191809	0.197851	0.9999



Contrast

Test Detail

[704-1] 06-16	0
[1009] 06-16	0.5
[1009-1] 06-16	0.5
[1009-1] 03-22	-1
Estimate	-0.103
Std Error	0.0541
t Ratio	-1.903
Prob>|t|	0.1154
SS	0.0159
Lower 95%	-0.242
Upper 95%	0.0361

SS	NumDF	DenDF	F Ratio	Prob > F
0.016	1	5	3.6213	0.1154

Current 1009 target: 9.51

Difference between 1009 and 1009-1 for 06-16 bearing batch = 0.21

1009-1 new target: 9.72

Difference between 1009 06-16 and current target: -0.14

Difference between 06-16 and 03-22 batch: -0.10

ICF = -0.24

Model Predictions

SVIS (VIII) Correction/Targets Evaluation

- Data Used: All 1009 & 1009-1 Data (Matrix) + 2 Tests 1009-1 resulted in 9.81 cSt and 9.88 cSt (01/23 – 04/23)
- Model Used: SVIS ~ IND + BEARBAT[IND]
- 1009 LSMeans = Mean = 9.65 cSt, SD (assume 1009 = 1009-1) = 0.07 cSt
- ICF (based on 1009) = 9.51 cSt – 9.65 cSt = -0.14 cSt
- 1009-1 LSMeans = 9.88 cSt = 9.65 cSt + 0.23 cSt (unadjusted)
- 1009-1 After ICF = 9.88 cSt – 0.14 cSt = 9.74 cSt (unadjusted)

- ICF = -0.14 cSt, 1009-1 LTMS mean = 9.74 cSt, SD = 0.07 cSt