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ASTM D02.B0.07 Semi-Annual Report Bench Test Monitoring

D874 (SASH), D5133 (GI), D5800 (NOACK), D6082 (HT FOAM), D6335 (TEOST), D6417 (GC VOL), D6557 (BRT), D6594 (HTCBT), D6794 (EOWT), D6795 (EOFT), D7097(MTEOS), D7216 (EOEC/LDEOC) and D7528 (ROBO)

October 1, 2025 – March 31, 2026

Table of Contents

Table of Contents

Section	Topic		
Test Area Status (cont.)	TEST	LABS*	STANDS*
Ball Rust Test (BRT)	D6557	5 (+0)	5 (+0)
HTCBT	D6594	9 (+0)	25 (–1)
EOWT	D6794	6 (+1)	N/A
EOFT	D6795	6 (+0)	N/A
MTEOS	D7097	10 (–1)	33 (–2)
EOEC Elast. Compat.	D7216-E	9 (+2)	N/A
LDEOC Elast. Compat.	D7216-L	9 (+0)	N/A
ROBO	D7528	6 (+0)	35 (–1)
* Between 10/1/2025 and 3/31/2026			

B0.07 Bench Testing Executive Summary

- D874 (Sulfated Ash)
- No failing calibration runs this period for D874. Reference test results were found to be on-target this semester. With 34 total Reference Oil 92 datapoints in-hand, final targets should be established now.
- D5133 (Gelation Index)
- Same number of labs but one fewer stand were calibrated this semester. Calibration testing is shifted mild with performance at -0.60s.
- D5800 (NOACK)
- One less lab, and one fewer stands calibrated this semester. Precision moved closer to target, and Performance is less severe (0.25) as compared to last semester (0.37). All units are now NS2 (Procedure D) or NCK25G (Procedure B) units.

B0.07 Bench Testing Executive Summary

- D6082 (High Temperature Foam)
- No new labs/stands added this period. Test is still trending Severe (+0.66s).
- D6335 (TEOST)
- Two fewer labs and two fewer stands were calibrated this semester. Performance (+0.71) has moved more severe this semester versus last semester (+0.61). Precision regressed (13.23s) from target and fail rate increased significantly (30.3%) versus last semester (3.3%).
- D6417 (GC Volatility)
- Same number of Labs, but fewer Stands this semester. Precision remains consistent and on-target. Severity is close to target, but slightly more severe this semester.
- D6557 (BRT)
- All calibrations continue to be run on RO 1006 only. A re-write of the procedure to add Gen 3 analysis system has been completed and an Information Letter issued. However, additional work is being conducted to determine if the new Gen 3 analysis system is more severe than the previous systems.

B0.07 Bench Testing Executive Summary

- D6594 (HTCBT)
- Same number of labs, but one fewer stand was calibrated this semester. Most labs have now moved on to Batch P coupons although some labs still possess Batch O coupons. Copper and Lead results are on-target for Precision, and both showed lower Severity.
- D6794 (EOWT)
- One new lab became calibrated this semester. Surveillance Panel changed the calibration requirement to be based upon a 30-day period (not one with each candidate batch). Potential replacement for RO79 is being evaluated.
- D6795 (EOFT)
- No labs added this semester. Surveillance Panel changed the calibration requirement to be based upon a 30-day period (not one with each candidate batch). Potential replacement for RO79 is being evaluated.

B0.07 Bench Testing Executive Summary

- D7097 (MTEOS)
- One less lab, and two fewer stands calibrated this semester. Precision improved to 6.73s, but Performance (Severity) regressed further this period to 0.71s. All operationally valid tests this period report using Rod Batch N. Most labs have now moved to Catalyst Batch 23AB, but three calibrations used Catalyst Batch 20AB. No labs used Catalyst Batch 19BA.
- D7216 (EOEC)/D7216 (LDEOC)
- All calibrations are using Ref Oil SL-107. Two additional labs calibrated EOEC elastomers this semester, and same number of labs calibrated LDEOC. A re-write of the D7216 procedure was completed in 2025 and additional updates have been added by the Surveillance Panel this semester. These changes will be available in an upcoming Information Letter.
- D7528 (ROBO)
- Same number of labs, but one fewer stand calibrated this semester. Precision remained steady at 0.21 (target 0.15). Performance (Severity) crossed over to slightly severe (+0.11) but was closer to target this semester.

TABLE of CONTENTS

D02.B0.07
TMC Monitored Tests

ASTM D 874

Sulfated Ash

October 1, 2025 – March 31, 2026

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Calibrated Labs and Stands*

(change shown in parentheses)

Test	Labs	Stands
D874	5 (+0)	N/A
*As of 3/31/2026		

D874: Sulfated Ash

Test Status	Validity Code	No. Tests
Acceptable Calibration Test	AC	10
Unacceptable Calibration Test	OC	0
Total		**10**

Number of Labs Reporting Data: 5
Fail Rate of Operationally Valid Tests: 0%

D874: Sulfated Ash

Statistically Unacceptable Tests (OC)	No. Of Tests
Failing Calibrations (Mild)	0

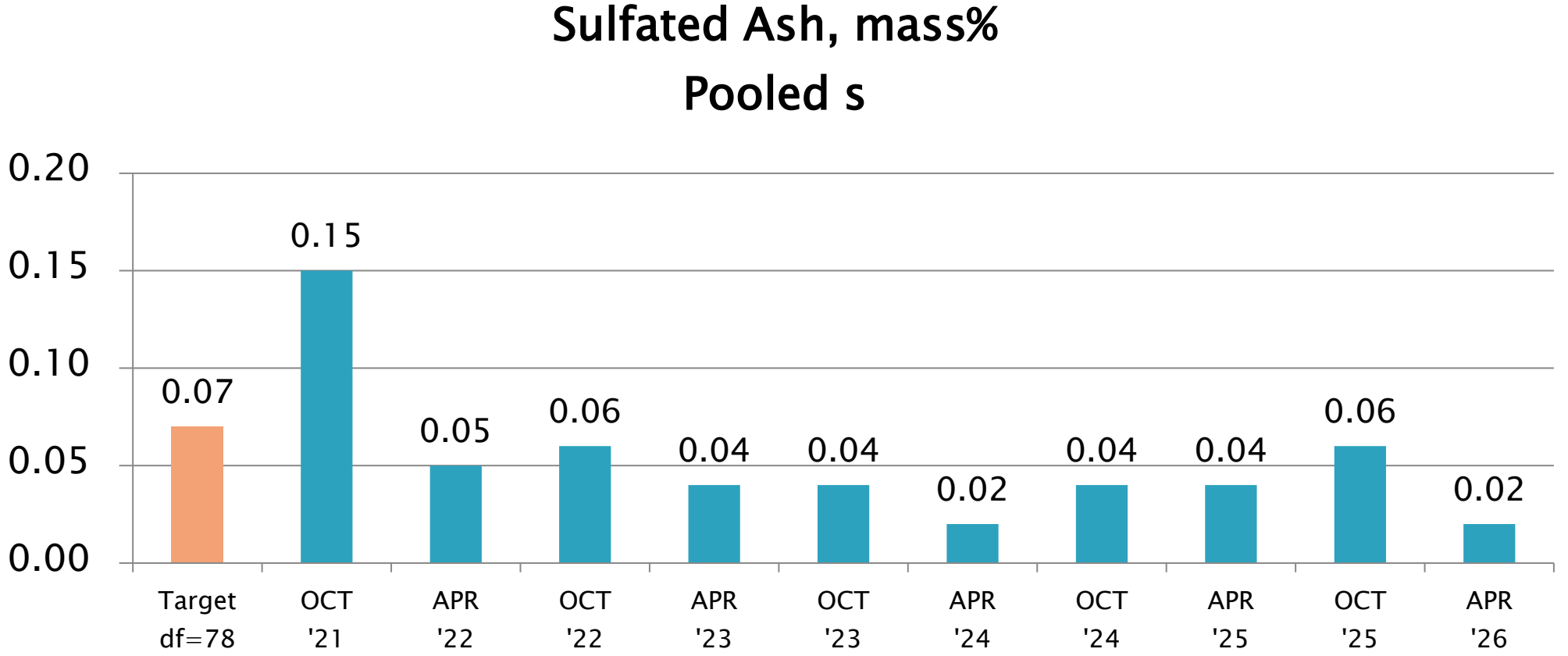
- No statistically unacceptable tests this report period.

D874: Sulfated Ash

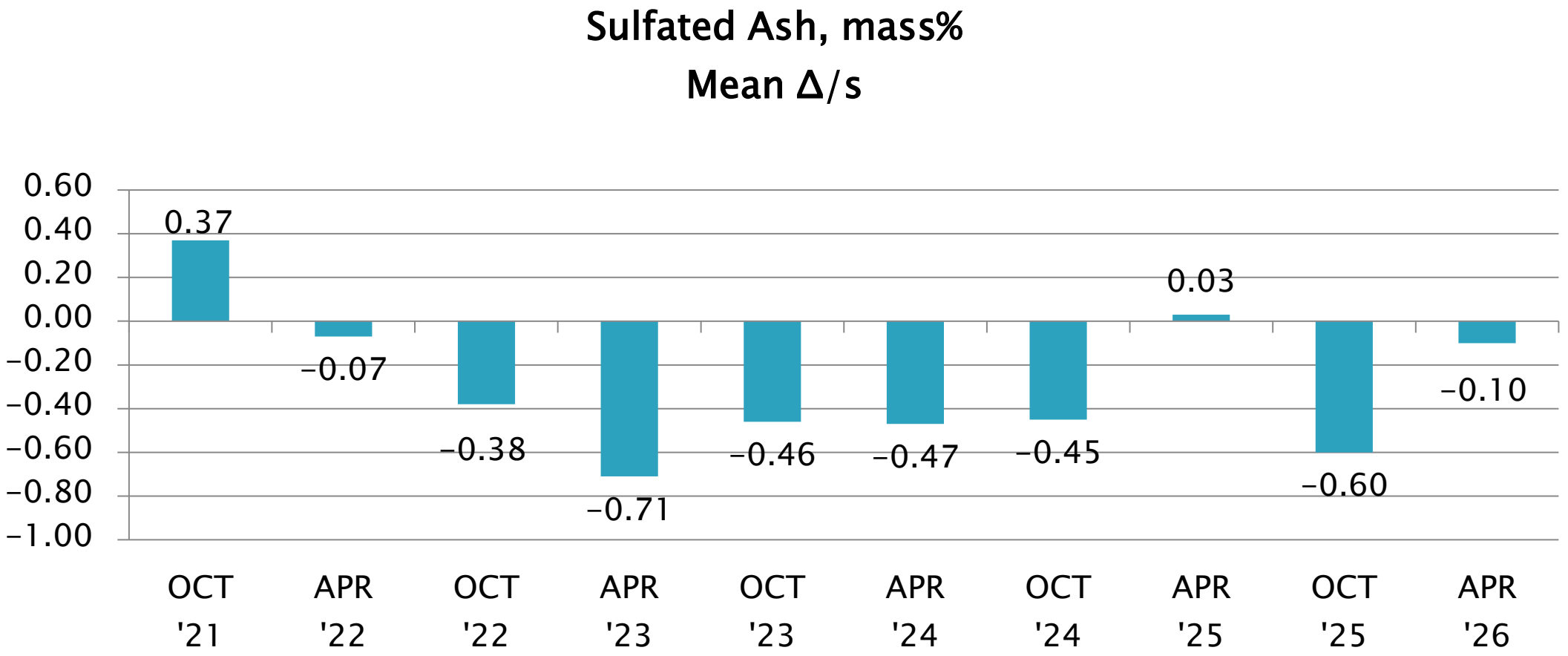
Period Precision and Severity Estimates

Total Deposits, mg	n	df	Pooled s	Mean Δ/s
Current Targets	81	78	0.07	-----
10/1/20 through 3/31/21	8	5	0.02	-0.35
4/1/21 through 9/30/21	10	7	0.15	0.37
10/1/21 through 3/31/22	9	6	0.05	-0.07
4/1/22 through 9/30/22	8	6	0.06	-0.38
10/1/22 through 3/31/23	11	8	0.04	-0.71
4/1/23 through 9/30/23	10	7	0.04	-0.46
10/1/23 through 3/31/24	11	8	0.02	-0.47
4/1/24 through 9/30/24	9	7	0.04	-0.45
10/1/24 through 3/31/25	10	7	0.04	0.03
10/1/25 through 3/31/26	12	9	0.06	-0.60
10/1/25 through 3/31/26	10	6	0.02	-0.10

D874: Sulfated Ash



D874: Sulfated Ash



October 1, 2025 – March 31, 2026

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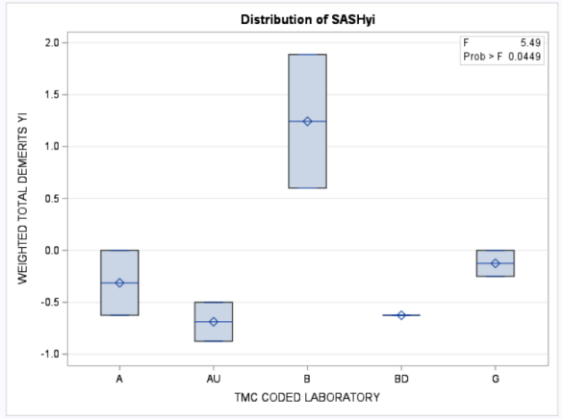
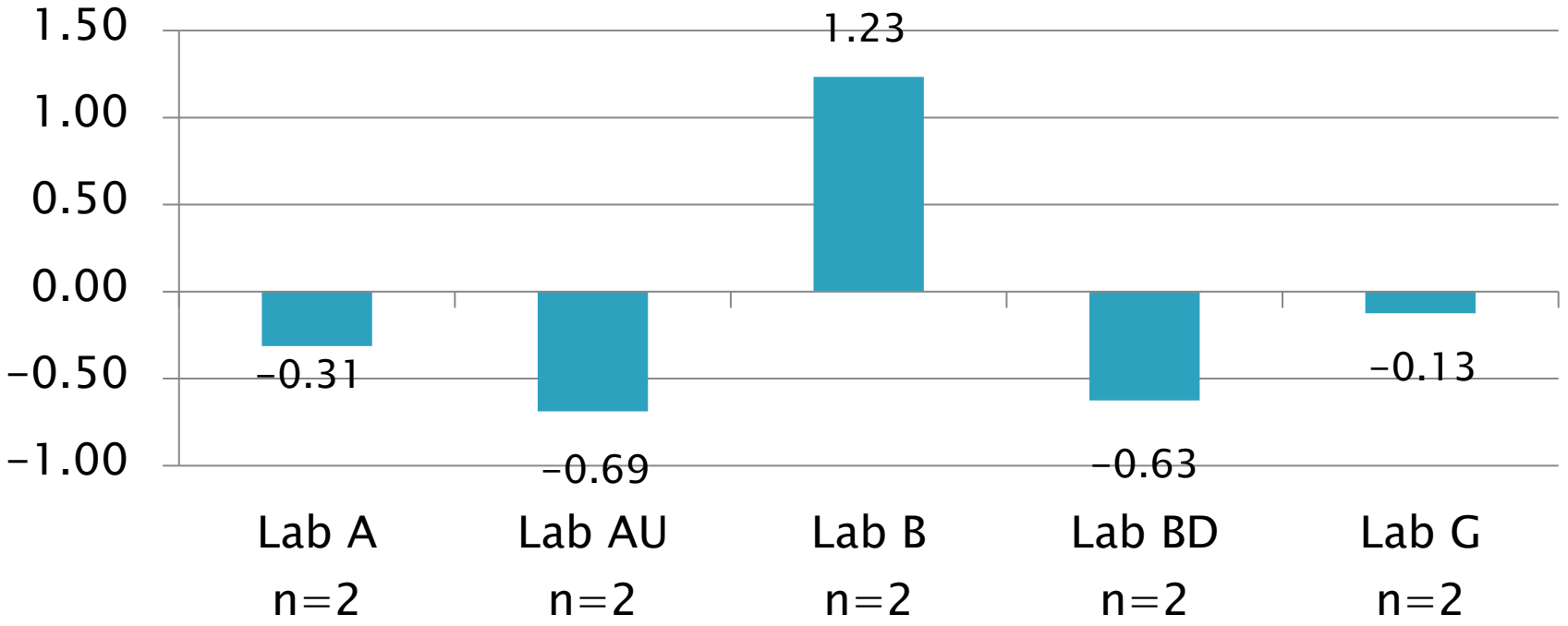
D874: Sulfated Ash



Sulfated Ash, mass%

Mean Δ/s

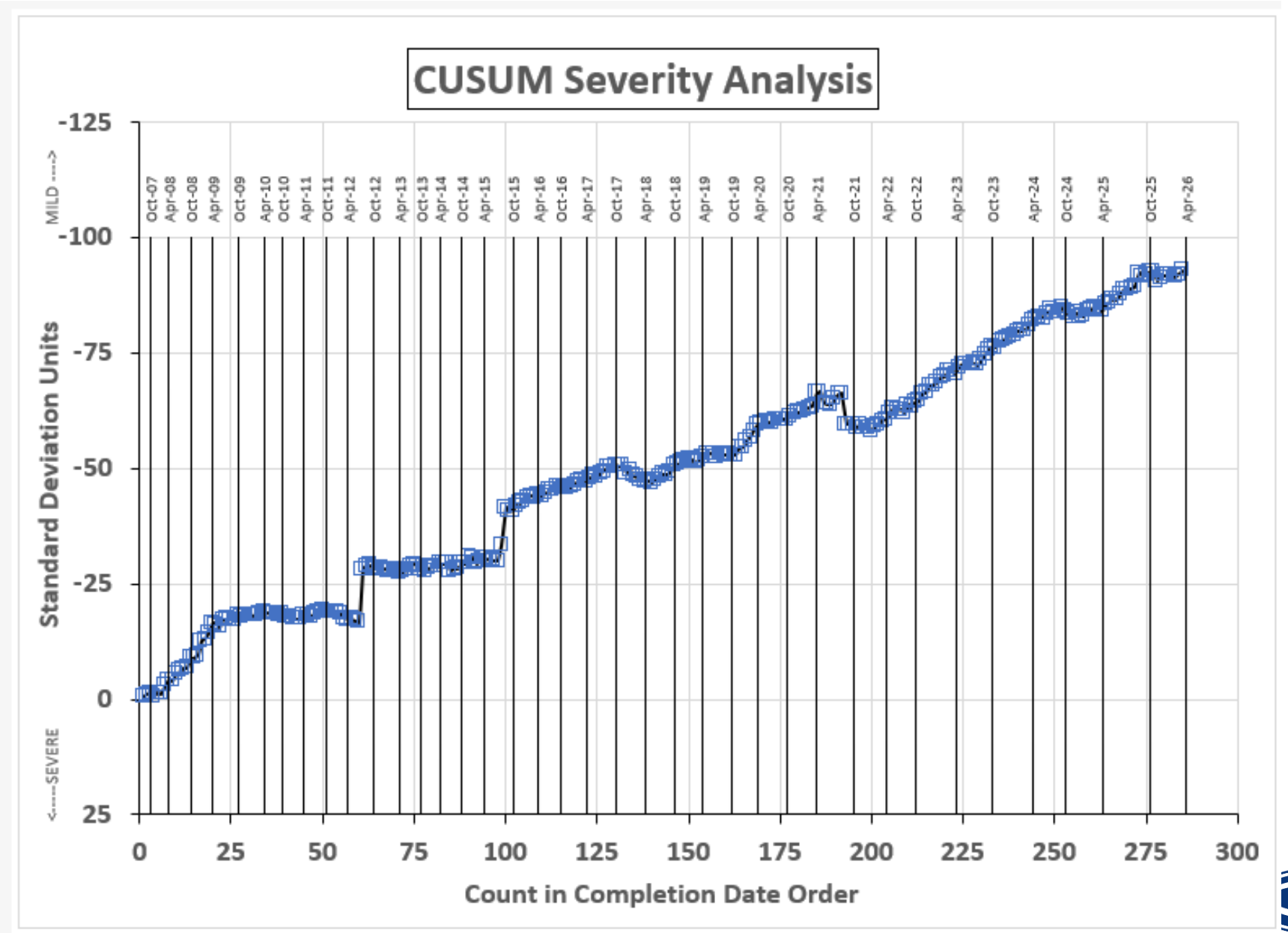


D874 (Sulfated Ash) Status

- Precision (Pooled s) regressed slightly to 0.02 this semester.
- Performance (Mean Δ/s) at −0.13 moved towards target.
- Labs with remaining Reference Oil 90 will be assigned until supply is consumed (1 TESTKEY remaining). TMC inventory of Reference Oil 90 has been consumed (none left for DailyQC).
- Reference Oil 92 now has 34 datapoints (20 from Round Robin + 14 from calibration testing). TMC recommends that final RO 92 target and standard deviation values may now be set.

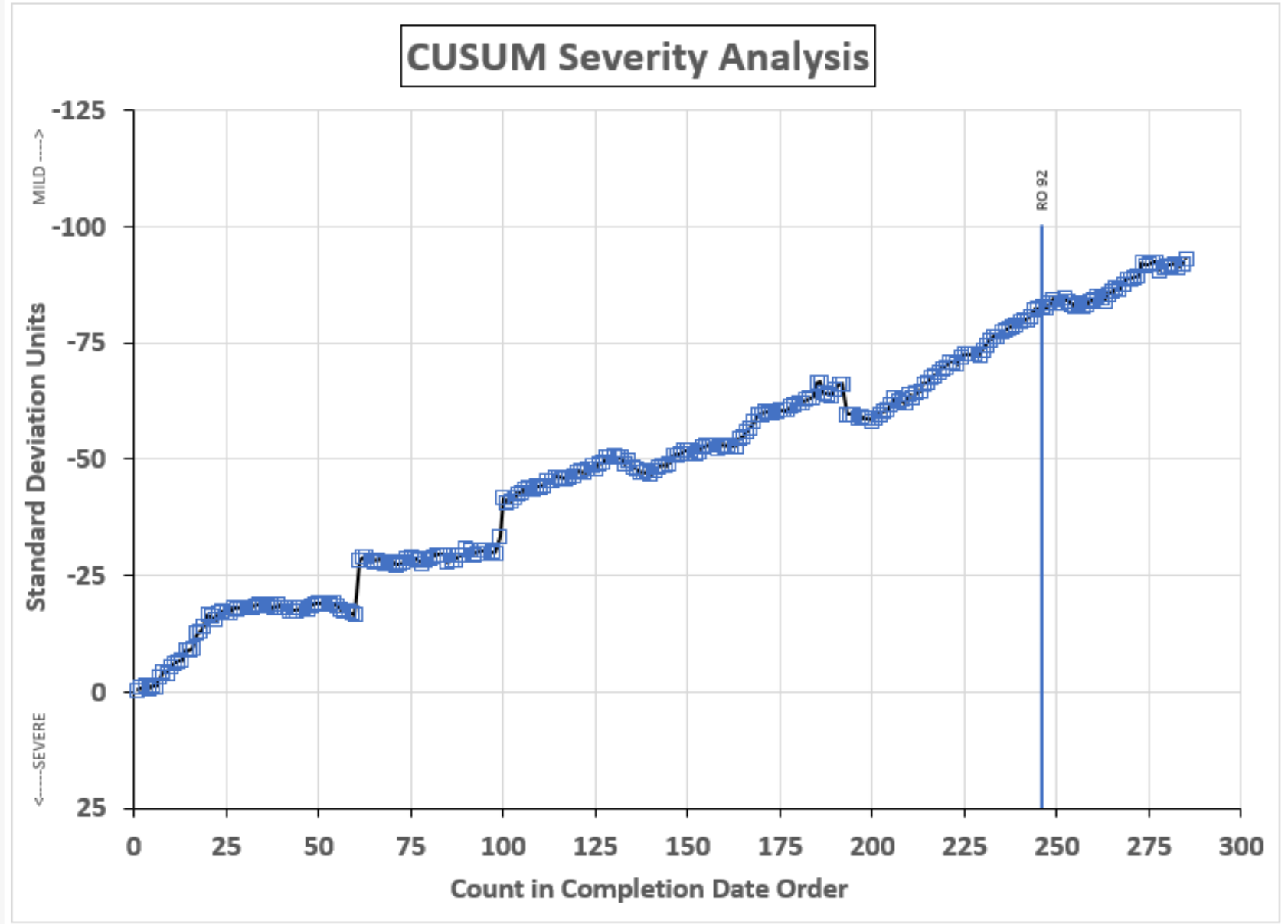
D874 INDUSTRY OPERATIONALLY VALID DATA

TEST SAMPLE PERCENT SULFATED ASH

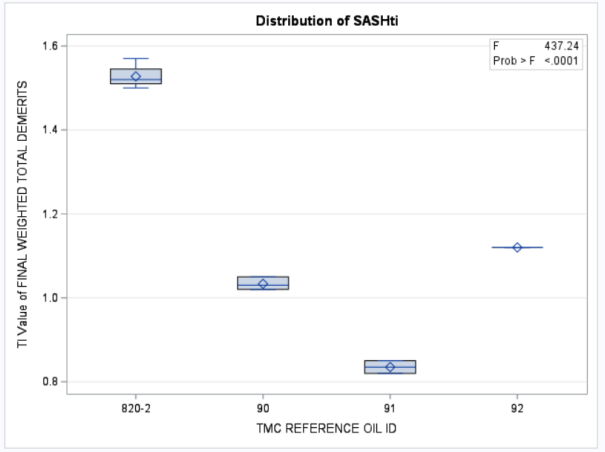


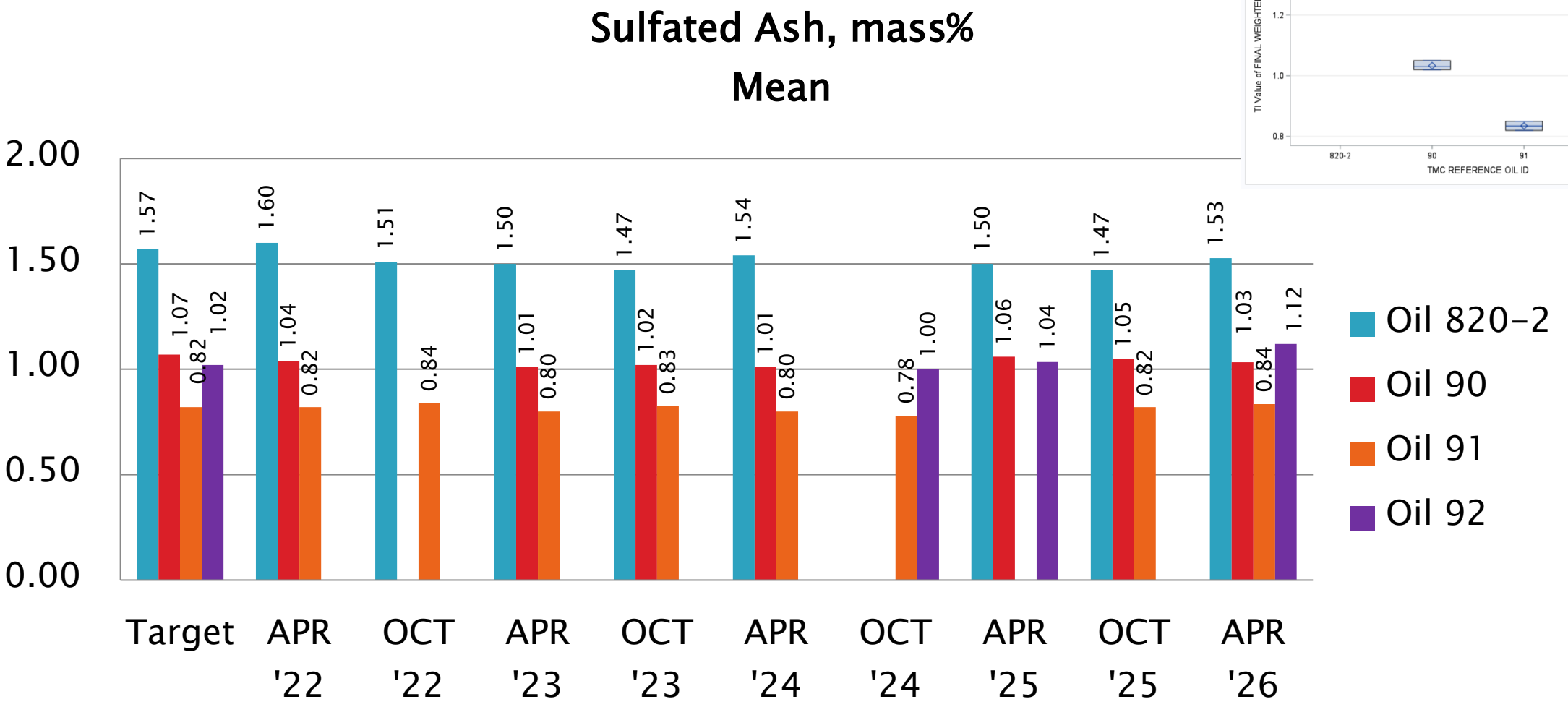
D874 INDUSTRY OPERATIONALLY VALID DATA

TEST SAMPLE PERCENT SULFATED ASH



D874: Sulfated Ash





October 1, 2025 – March 31, 2026

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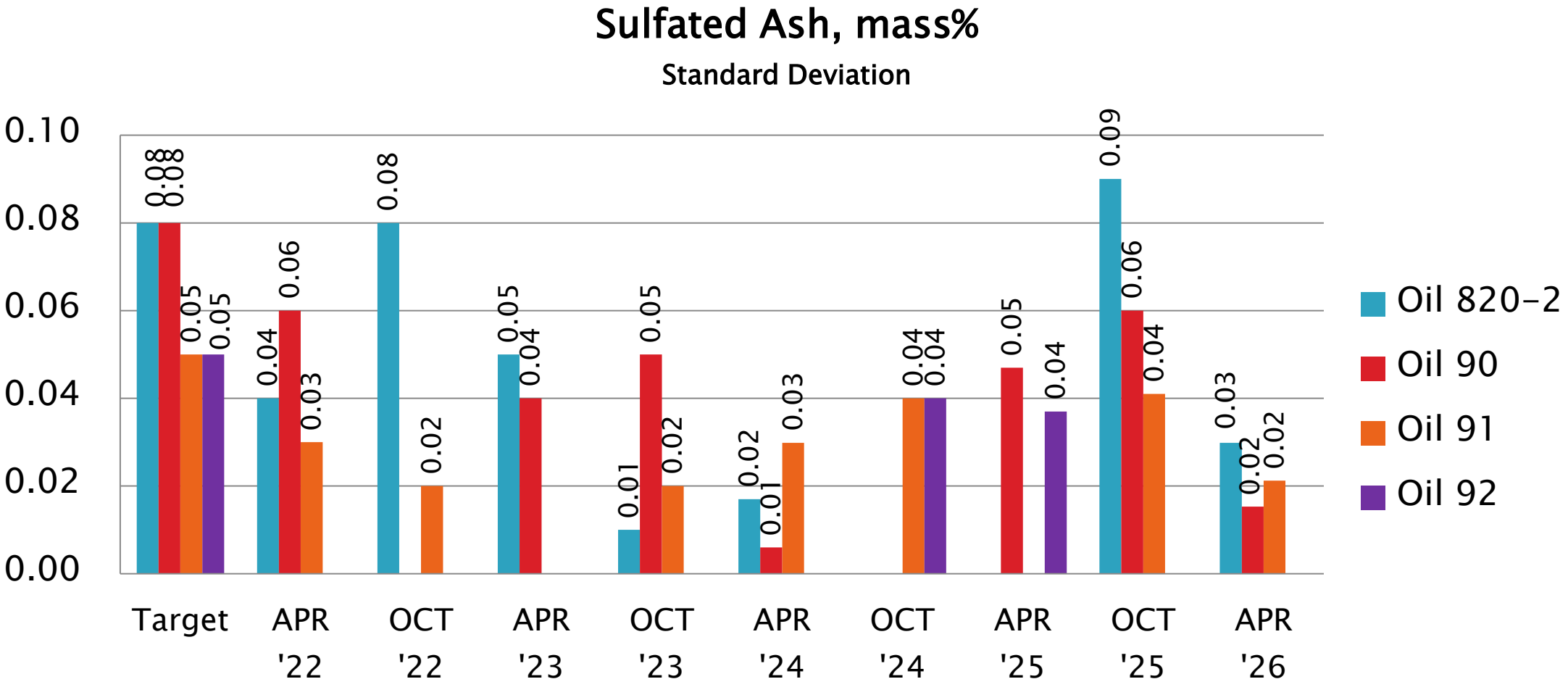
D874: Sulfated Ash



October 1, 2025 – March 31, 2026

Test Monitoring Center
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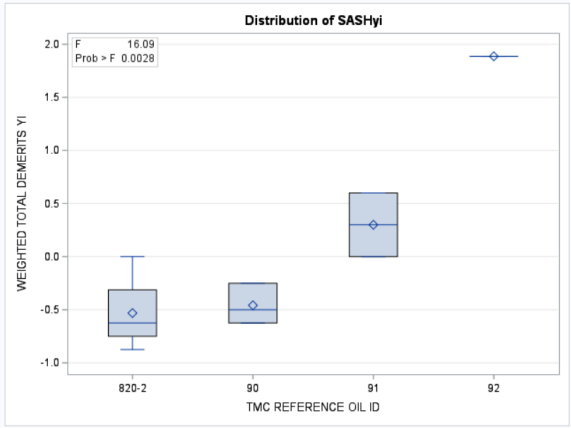
D874: Sulfated Ash



Sulfated Ash, mass%

Mean Δ/s

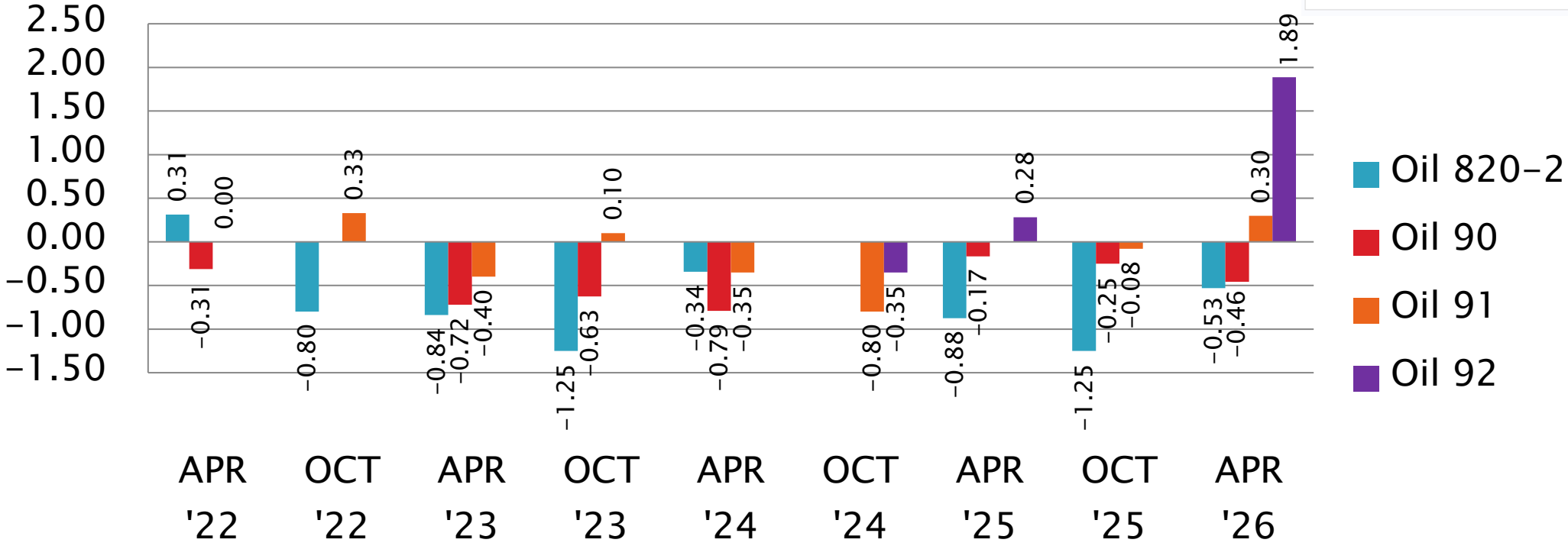


TABLE of CONTENTS

Test Monitoring Center
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Reference Oil Inventory

D874

Oil	Year Rec'd By TMC[A]	Tests	TMC Inventory, gallons	Gallons Shipped last 6 months	Estimated Life
820-2	2001	D874	5.8	0.06	5+ years
90	2005	D874QC	0.00	0.90	None
91	2006	D874	2.8	0.06	5+ years
92	2020	D874	52.4	0.02	5+ years

[A] Integrity of TMC reference oils is confirmed annually by analytical QC testing of chemical and physical properties.

D02.B0.07
TMC Monitored Tests

ASTM D 5133

Gelation Index (GI)

October 1, 2025 – March 31, 2026

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Calibrated Labs and Stands*

(change since last Semi-Annual Report)

Test	Labs	Stands
D5133	8 (+0)	43 (-1)
*As of 3/31/2026		

D5133: Gelation Index

Test Status	Validity Code	No. Tests
Acceptable Calibration Test	AC	48
Failed Calibration Test	OC	6
Operationally Invalidated by Lab	LC / LS / LN / XC / XS	3
Operationally Invalidated After Initially Reported as Valid	RC/RS	0
Acceptable Discrimination Tests	AS	30
Failed Discrimination Tests	OS	3
Informational Runs	NN / MN	2
Total		**92**

Number of Labs Reporting Data:	9	(previous 8)
Fail Rate of Operationally Valid Calibration Tests:	11.1%	(previous 7.5%)
Fail Rate of Operationally Valid Discrimination Tests:	9.1%	(previous 0.0%)

D5133: Gelation Index

Statistically Unacceptable Calibration Tests (OC)	No. Of Tests
Gelation Index Severe	0
Gelation Index Mild	6
Total	**6**

- Of the SIX "OC" tests
  - 4-GIC18
  - 2-GIA17
- Six between -1.96 and -3.0 sd from target
- None greater than -3.0 sd from target

D5133: Gelation Index

Statistically Unacceptable Discrimination Tests (OS)	No. Of Tests
Gelation Index Severe (> 7.2)	3
Total	**3**

- Three Failing Discrimination Runs this Semester

D5133: Gelation Index

Tests Excluded From Statistics (Operationally or Otherwise)	Validity Code	No. Tests
Invalidated Runs	LC, LS, LN, RC, RS	0
Aborted Runs	XC, XS	3
Informational Runs (Acceptable Result)	NN	1
Informational Runs (Unacceptable Result)	MN	1
Total		**5**

- Three Aborted Runs due to Viscometer Failure

D5133: Gelation Index

Period Precision and Severity Estimates

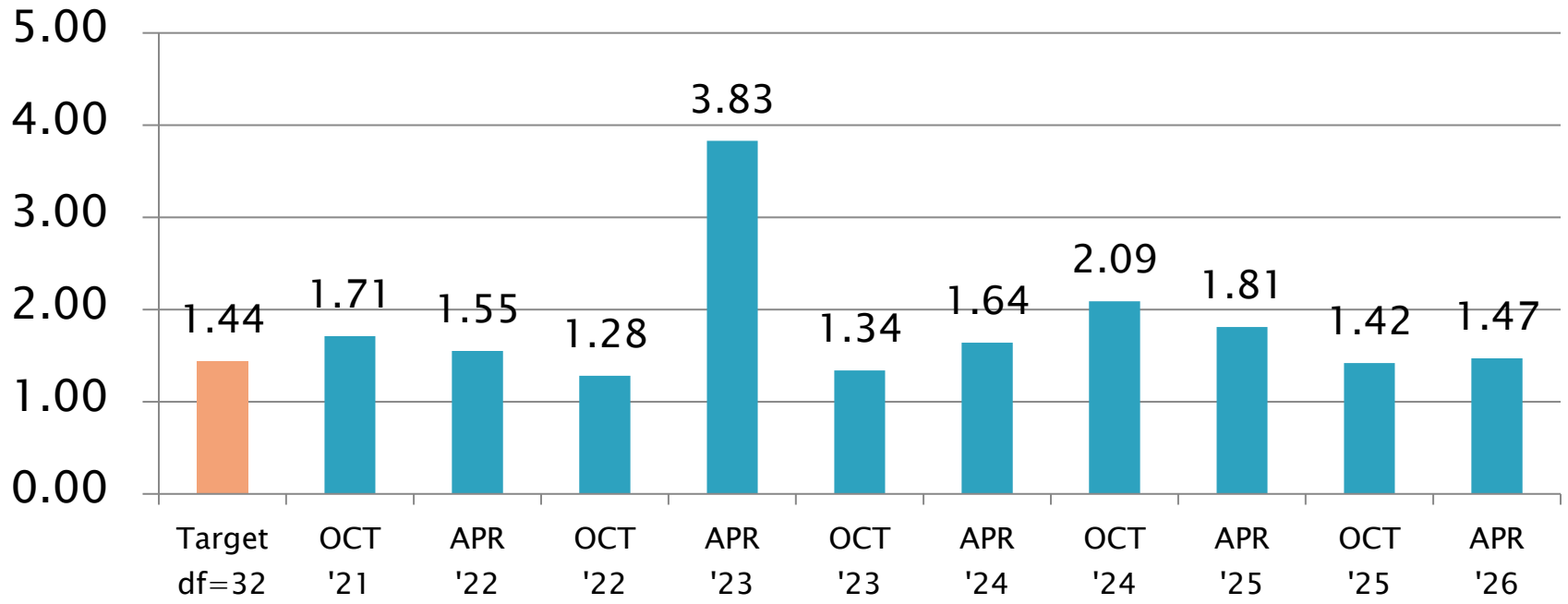
Gelation Index	n	df	Pooled s	Mean Δ/s
Targets Updated 20201001[1]	34	32	1.44	-----
10/1/20 through 3/31/21[2]	116	113	3.74	-0.86
4/1/21 through 9/30/21	75	73	1.71	-0.20
10/1/21 through 3/31/22	61	59	1.55	-0.84
4/1/22 through 9/30/22	57	55	1.28	-0.41
10/1/22 through 3/31/23	84	80	3.83	-0.08
4/1/23 through 9/30/23	62	59	1.34	-0.21
10/1/23 through 3/31/24	57	54	1.64	-0.03
4/1/24 through 9/30/24	62	59	2.09	-0.92
10/1/24 through 3/31/25	69	66	1.81	-0.25
10/1/25 through 3/31/26	53	50	1.42	-0.04
10/1/25 through 3/31/26	54	51	1.47	-0.60

[1]Target precision based upon GIA17 and 1009 reference oils 10/1/2020
[2]Changed from bath to head-based monitoring scheme 10/1/2020

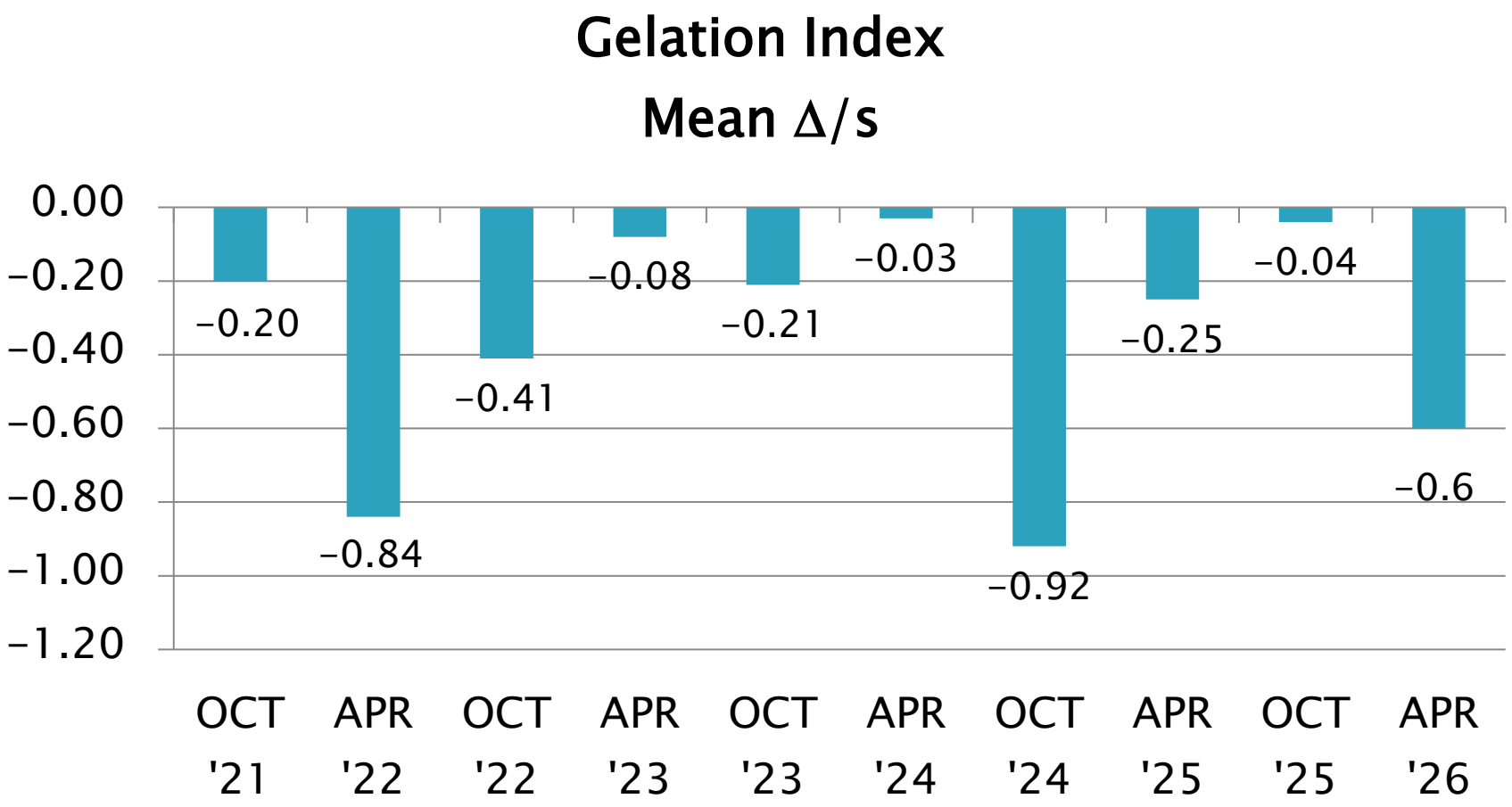
D5133 Precision Estimates

Gelation Index

Pooled s



D5133 Severity Estimates



October 1, 2025 – March 31, 2026

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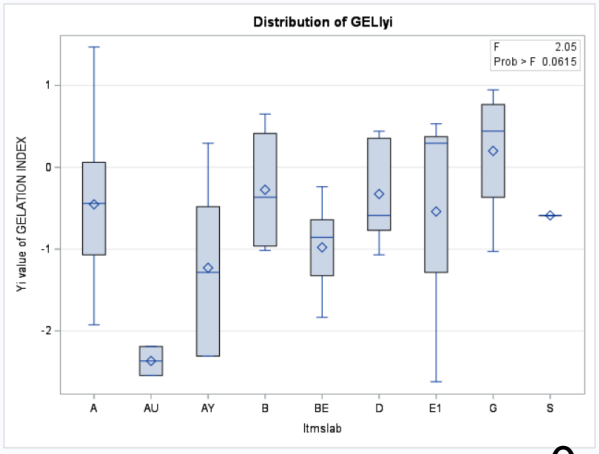
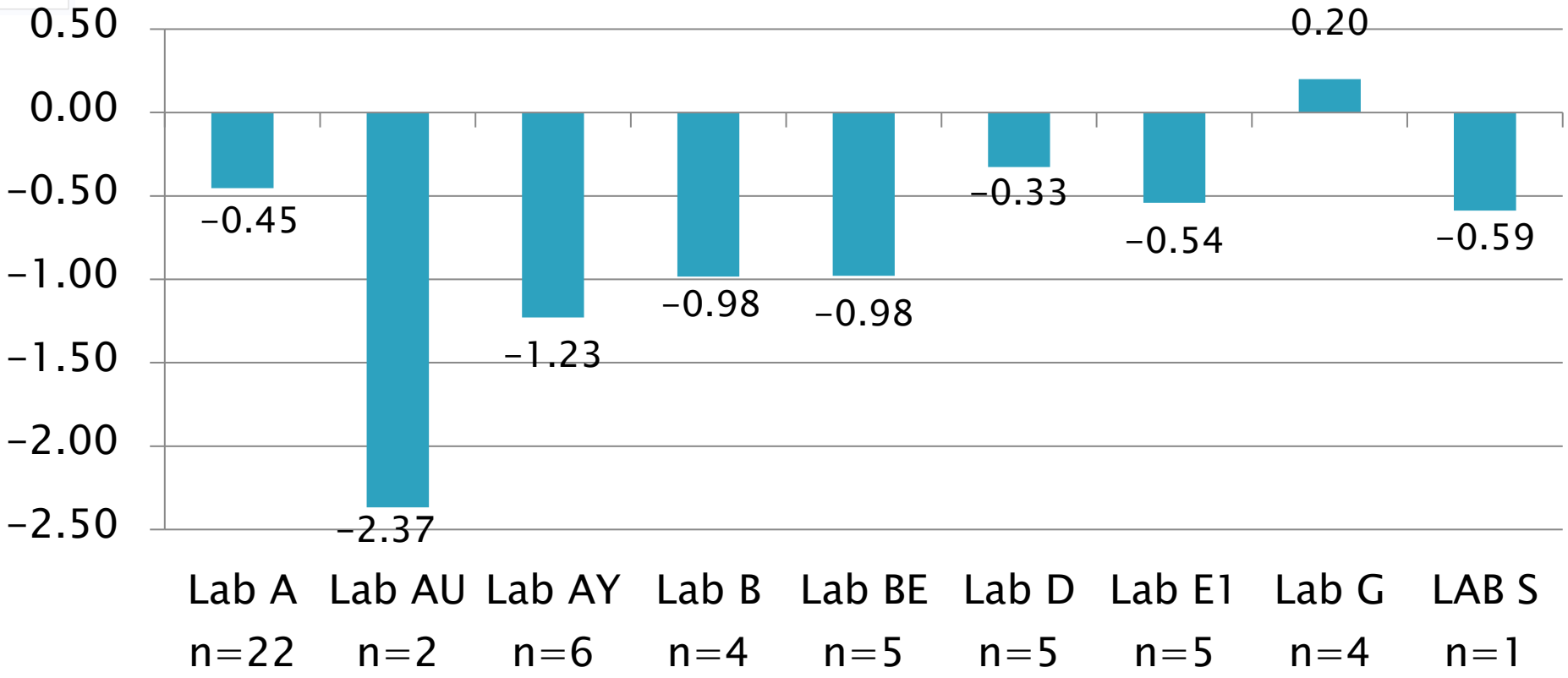


D5133 Lab Severity Estimates

Gelation Index

Mean Δ/s



October 1, 2025 – March 31, 2026

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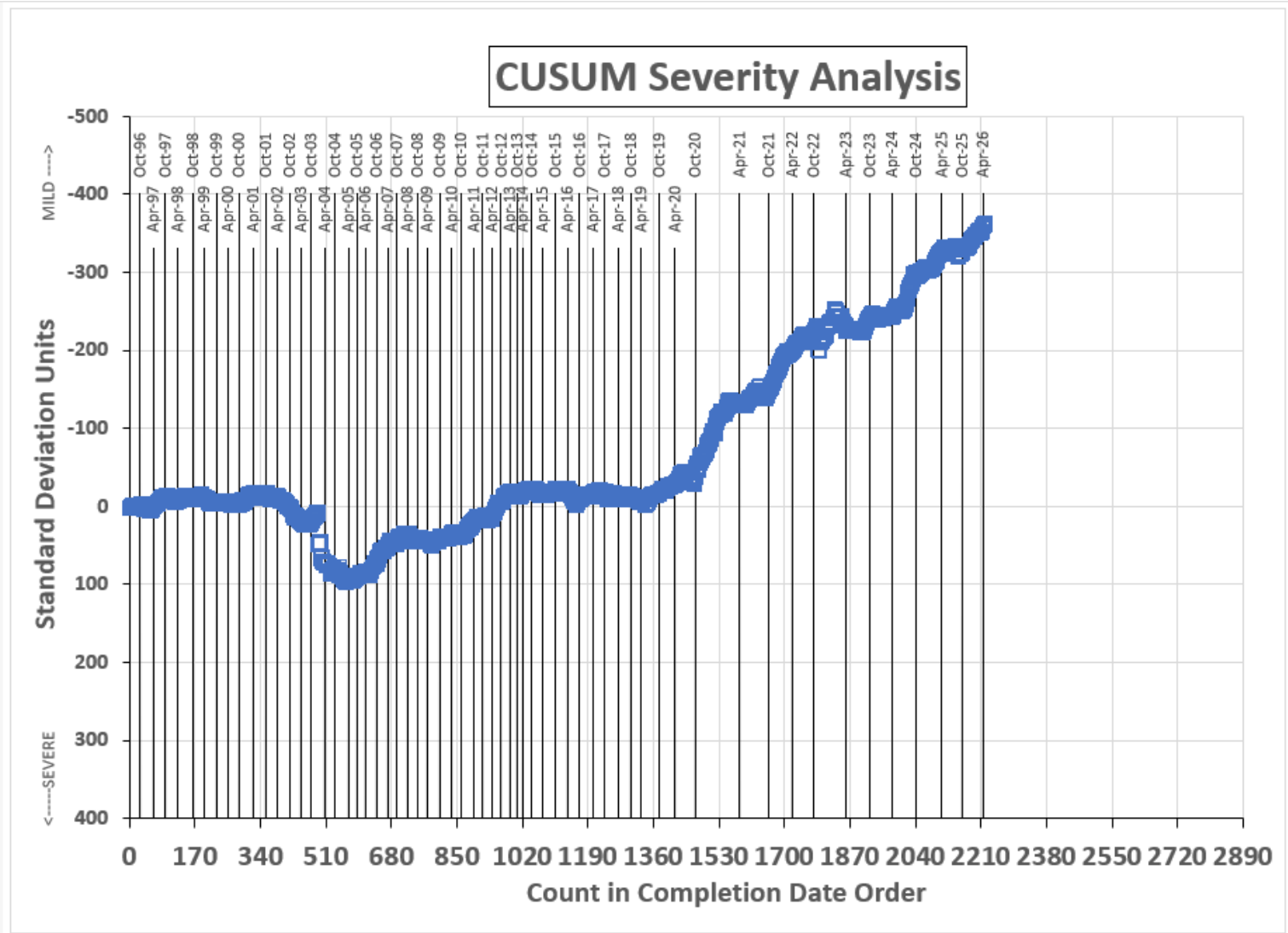
D5133: Gelation Index Test Status

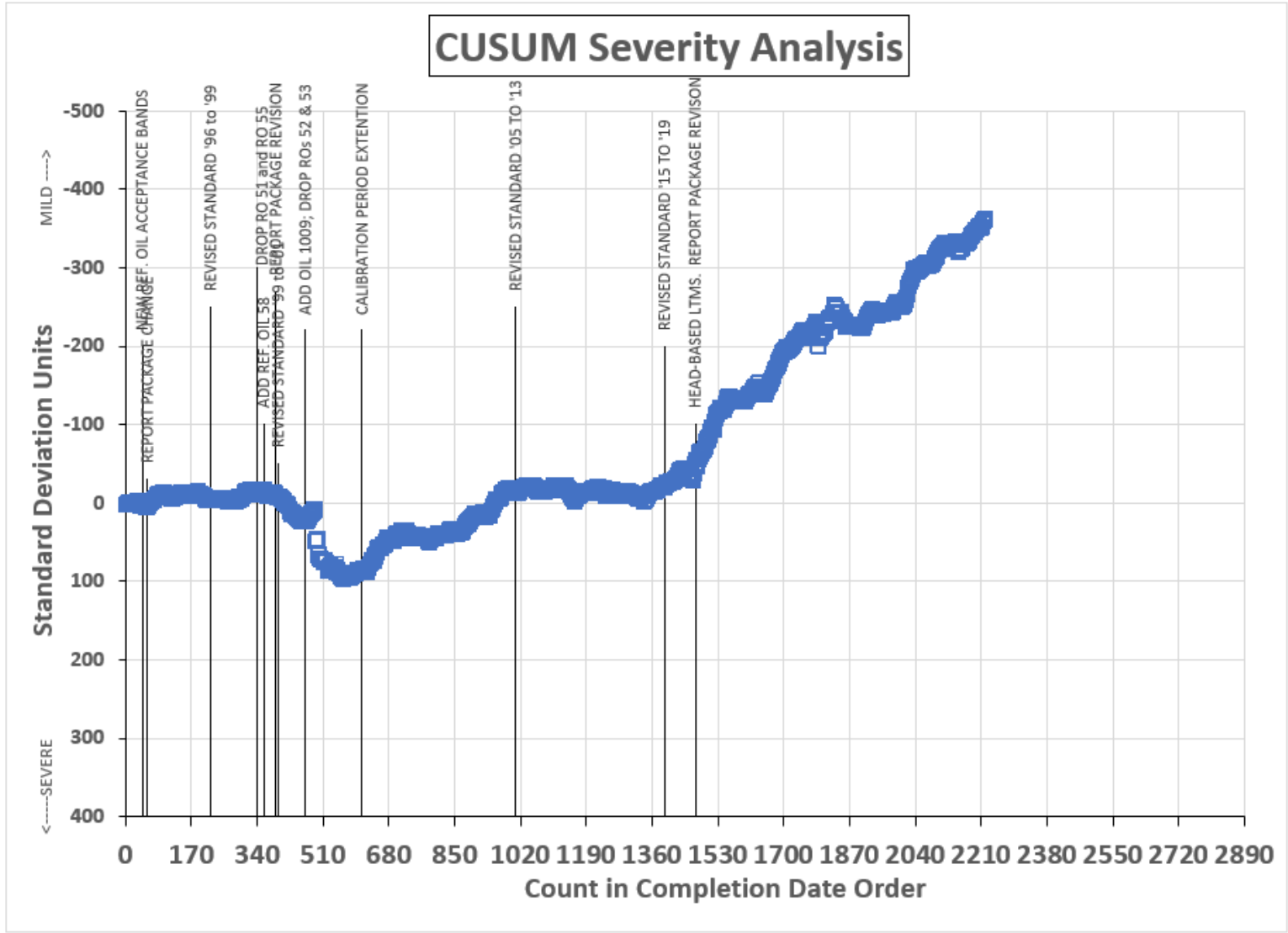
- Fail rate of operationally valid tests increased slightly this semester at 11.1%
  - Fail rate last period was 7.5%
- Three operationally valid discrimination runs failed this period
  - Zero (0) discrimination runs failed last period
- Precision (Pooled s) was 1.47, close to target (1.44).
- Performance (Mean Δ/s) regressed significantly to −0.60s (−0.04 s last period).

GELATION INDEX



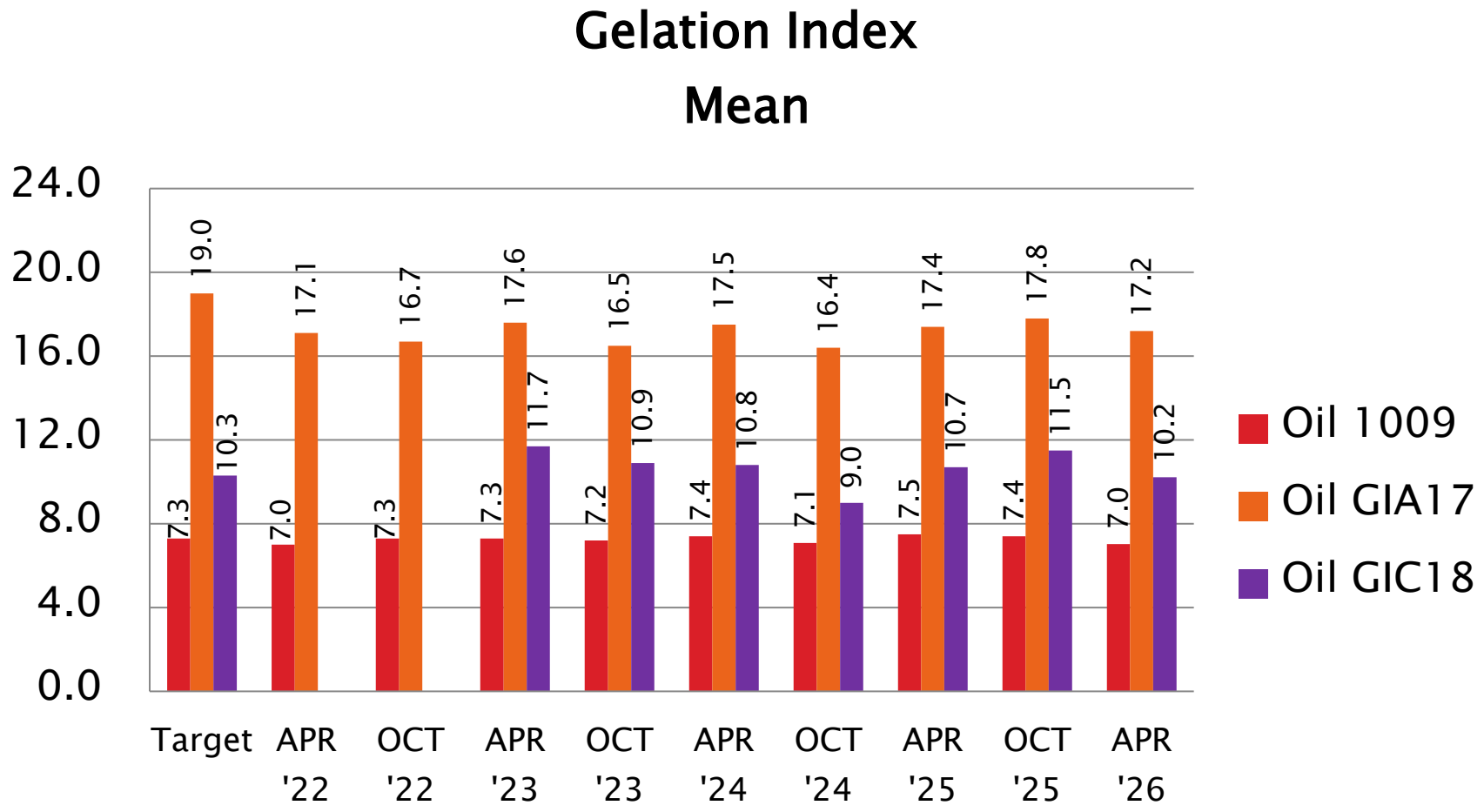
October 1, 2025 – March 31, 2026

GELATION INDEX



October 1, 2025 – March 31, 2026

D5133 Performance by Oil



October 1, 2025 – March 31, 2026

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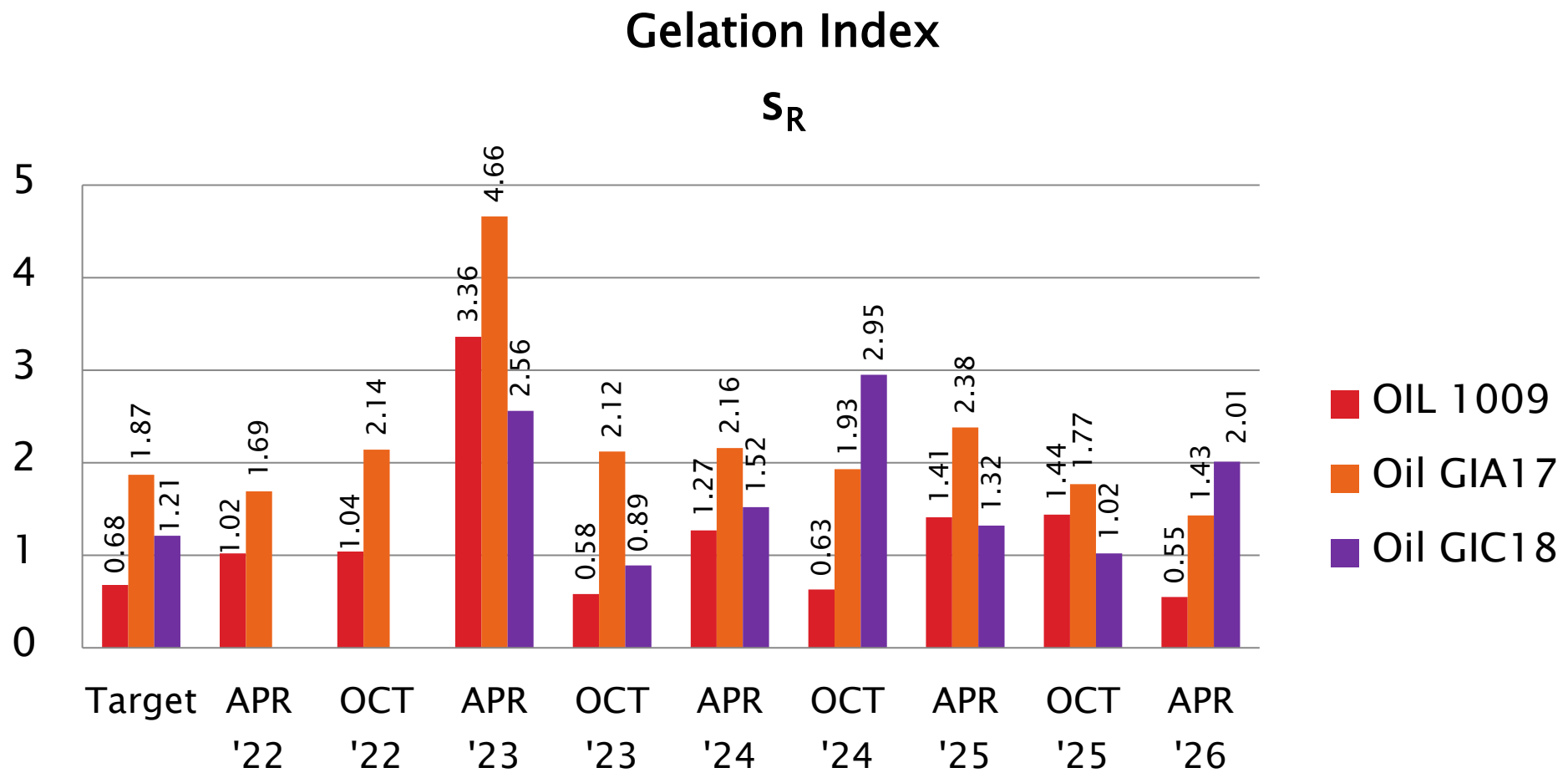
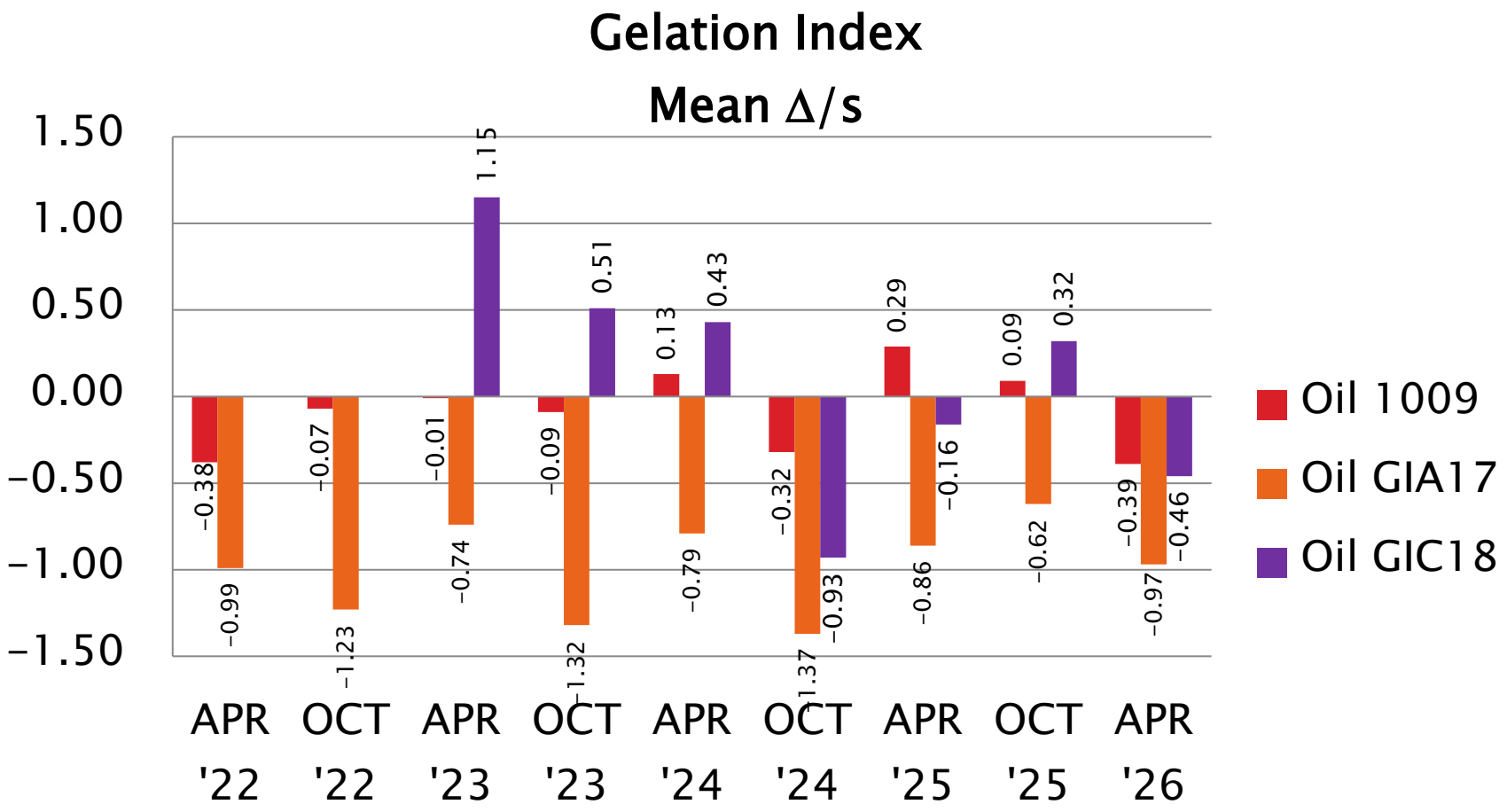
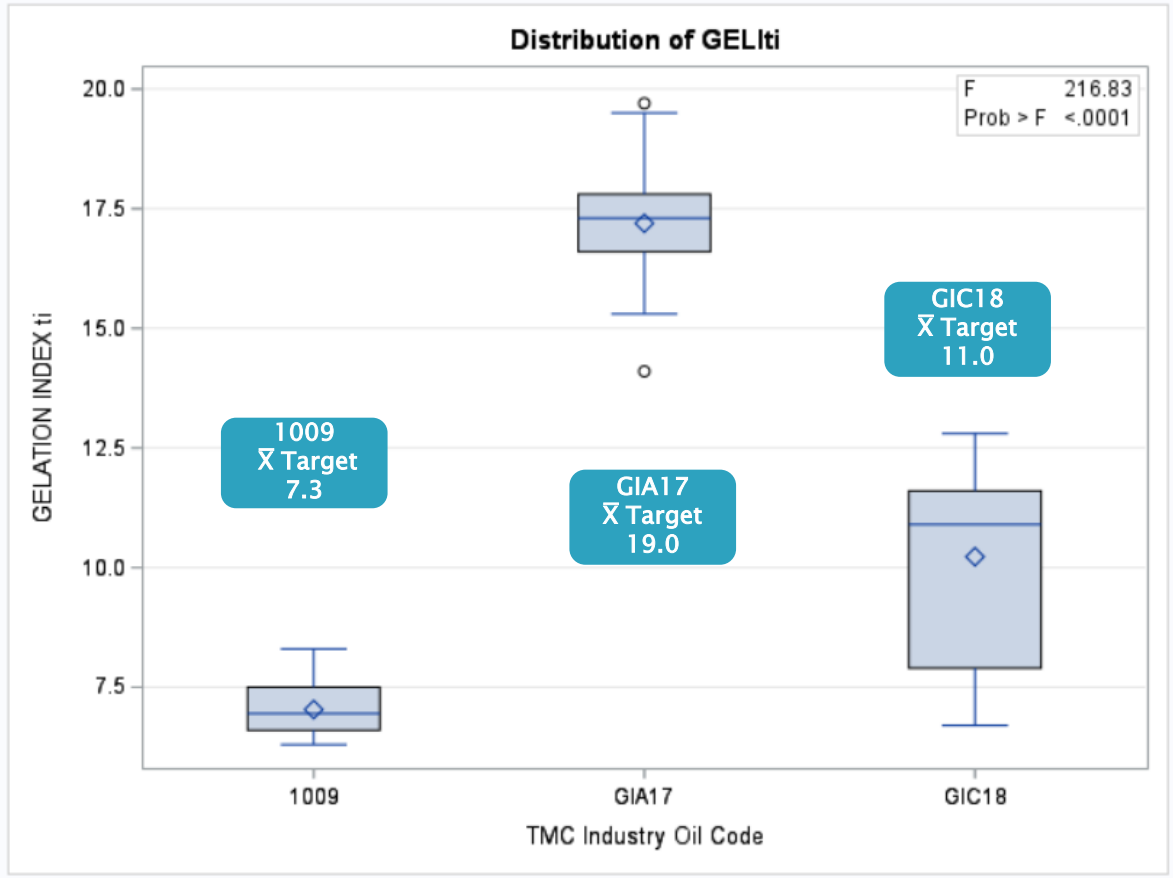
D5133 Performance by Oil



D5133 Performance by Oil



ASTM D5133 (GI): OCT2025 – MAR2026 Results



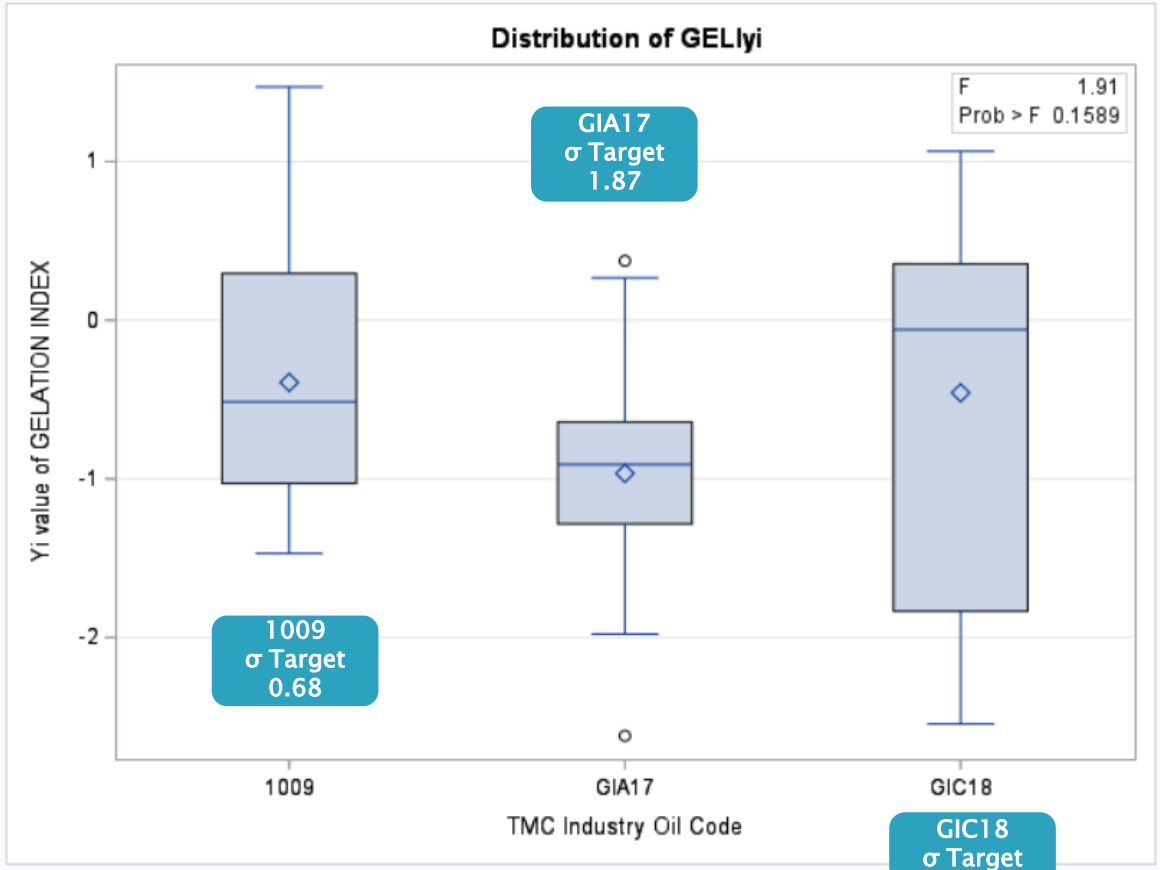


TABLE of CONTENTS

Test Monitoring Center
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Reference Oil Inventory

GI (D5133)

Oil	Year Rec'd By TMC[A]	Tests	TMC Inventory, gallons	Gallons Shipped last 6 months	Estimated Life
58[B]	1998	GI	111.2	0.48	5+ years
GIA17	2017	GI	4.9	0.09	5+ years
GIC18	2018	GI	7.6	0.12	5+ years
1009	2002	GI	33.0	0.96	5+ years

[A] Integrity of TMC reference oils is confirmed annually by analytical QC testing of chemical and physical properties.
[B] Reference Oil 58 is used in multiple Bench Test Areas and is the Discrimination Oil in D5133 (GI)

D02.B0.07
TMC Monitored Tests

ASTM D 5800

NOACK Volatility

October 1, 2025 – March 31, 2026

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Calibrated Labs and Stands*

(change since last Semi-Annual Report)

Test	Labs	Stands
D5800	13 (-1)	39 (-1)

*Between 10/1/2025 and 3/31/2026

D5800: Evaporation Loss of Lubricating Oil by Noack Method

Test Status	Validity Code	No. Tests
Acceptable Calibration Test	AC	181
Failed Calibration Test	OC	8
Operationally Invalidated by LAB	LC	2
Operationally Invalidated by TMC	RC	3
Aborted Test	XC	0
Acceptable Shakedown Run	NN	0
Unacceptable Shakedown Run	MN	0
Total		**194**

Number of Labs Reporting Data: 13 (previous 14)
Fail Rate of Operationally Valid Tests: 4.23% (previous 4.00%)

D5800: Evaporation Loss of Lubricating Oil by Noack Method

Statistically Unacceptable Tests (OC)	No. Of Tests
Ei Level 3 Alarm Mild	3
Ei Level 3 Alarm Severe	1
Zi Level 2 Alarm Severe	3
Zi Level 2 Alarm Mild	1
Zi Level 2 and Ei Level 3 Alarms, Mild	0
Zi Level 2 and Ei level 3 Alarms, SEVERE	0

- EIGHT OC tests were on FIVE different rigs at THREE different labs.
- THREE operationally valid tests exceeded ±3.0 s this period.

D5800: Evaporation Loss of Lubricating Oil by Noack Method

Failed (OC) Details	Procedure	Model	No. Tests
Ei Level 3 Alarm: Rig (BD-6) Mild, too imprecise to predict SA	D	NS2	1
Ei Level 3 Alarm: Rig (D-6) Mild, too imprecise to predict SA	D	NS2	1
Ei Level 3 Alarm: Rig (G-7) Mild, too imprecise to predict SA	B	NS2	1
Ei Level 3 Alarm: Rig (G-11) Severe, too imprecise to predict SA	D	NS2	1
Zi Level 2 Alarm: Rig (D-6) Mild	D	NS2	1
Zi Level 2 Alarm: Rig (G-7) Severe	B	NCK25G	2
Zi Level 2 Alarm: Rig (G-5) Severe	B	NCK25G	1
Total			**8**
Fail Rate of Operationally Valid Tests: 4.23%			

D5800: Evaporation Loss of Lubricating Oil by Noack Method

Operationally Invalid Tests (LC, RC)

Two labs had invalidated calibration runs this period

- Three tests were invalidated by Lab due to DAILY QC Out of Range (RC)
- One test was invalidated by Lab due to use of wrong oil or wrong test unit (LC)
- One test was invalidated by Lab due to Sensor Failure (LC)

Informational, Non-Blind Tests (NN,MN)

No labs ran an informational (Non-Blind) Test

D5800: Evaporation Loss of Lubricating Oil by Noack Method

D5800 Technical Memos

No D5800 technical memos were issued by the TMC this period.

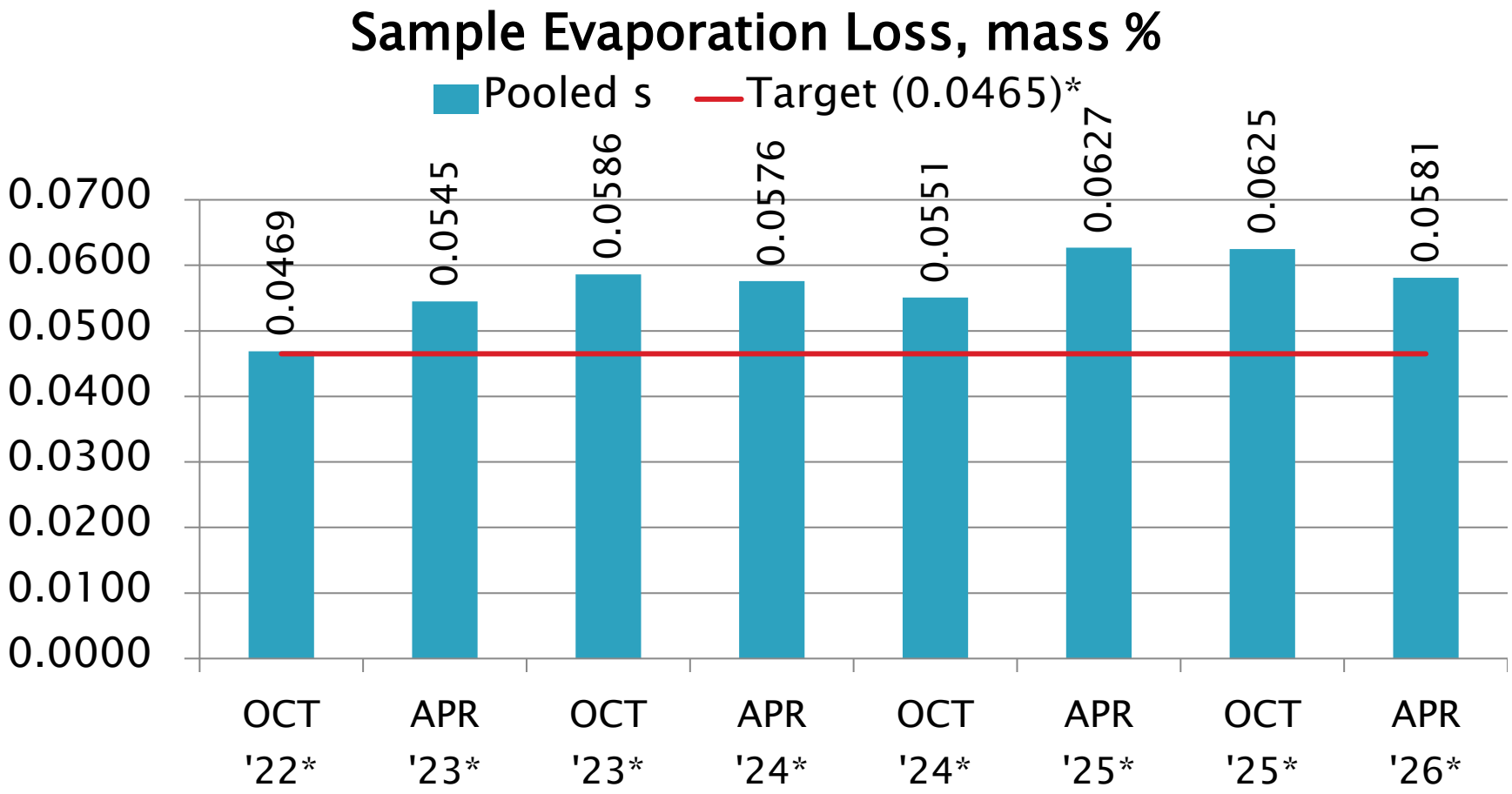
D5800: Evaporation Loss of Lubricating Oil by Noack Method

Period Precision and Severity Estimates

Sample Evaporation Loss, mass %	n	df	Pooled s	Mean Δ/s
Targets Effective 02/07/20[1]	78	75	0.0465	-----
10/1/21 through 3/31/22[1]	139	136	0.0463	0.24
4/1/22 through 9/30/22[1]	136	133	0.0469	-0.10
10/1/22 through 3/31/23[1]	136	133	0.0545	-0.15
4/1/23 through 9/30/23[1]	169	166	0.0586	0.33
10/1/23 through 3/31/24[1]	174	171	0.0576	0.37
4/1/24 through 9/30/24[1]	189	187	0.0551	0.23
10/1/24 through 3/31/25[1]	186	183	0.0627	0.21
10/1/25 through 3/31/26[1]	193	190	0.0625	0.37
10/1/25 through 3/31/26[1]	189	186	0.0581	0.25

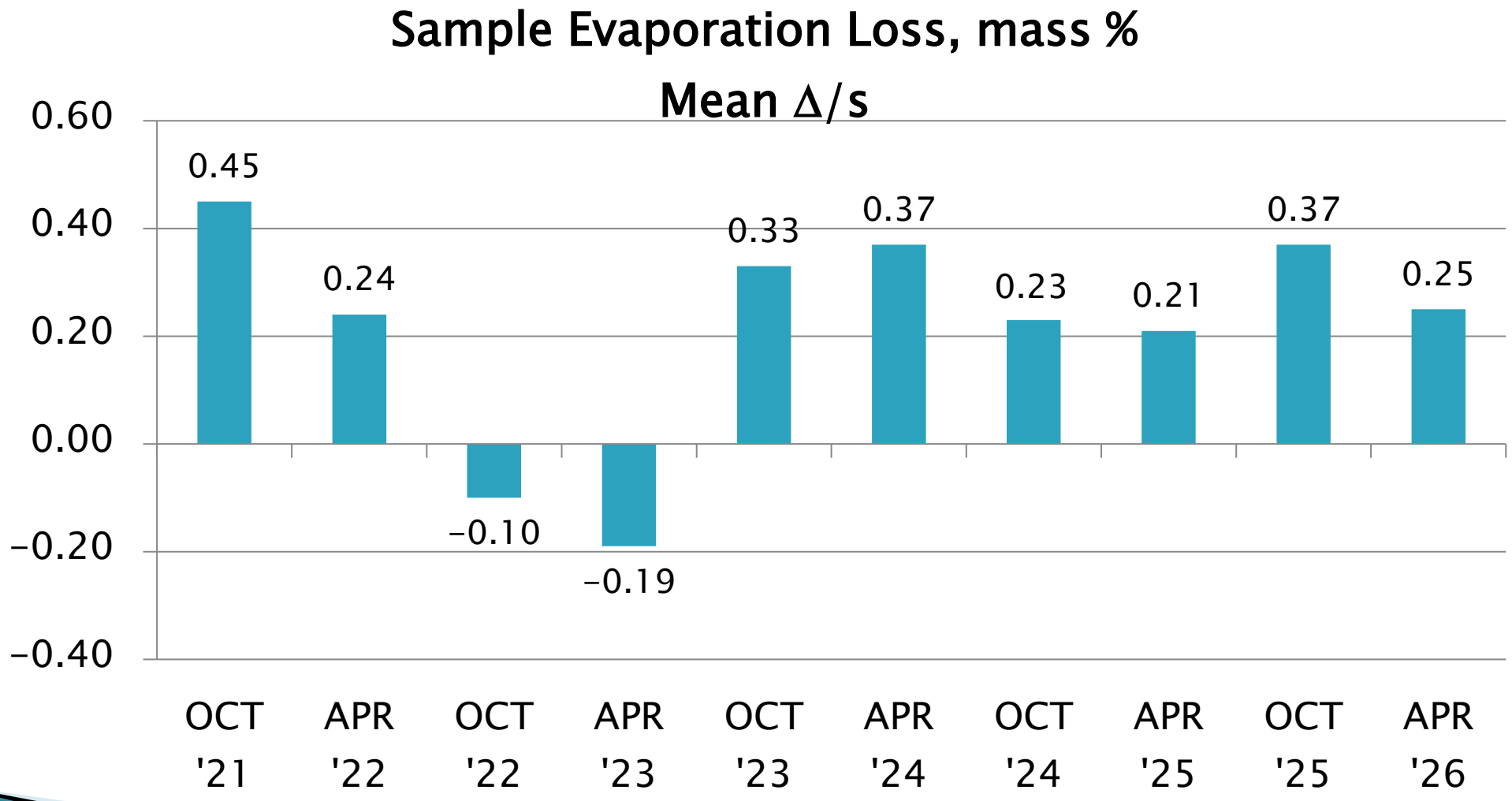
[1]Began monitoring natural log transformed test results on 20200207 making logarithmic scale changes for target and period precision estimates starting April 2020 report period

D5800 Precision Estimates



*Began monitoring natural log transformed test results on 20200207 making logarithmic scale changes for target and period precision estimates starting April 2020 report period.

D5800 Severity Estimates



October 1, 2025 – March 31, 2026

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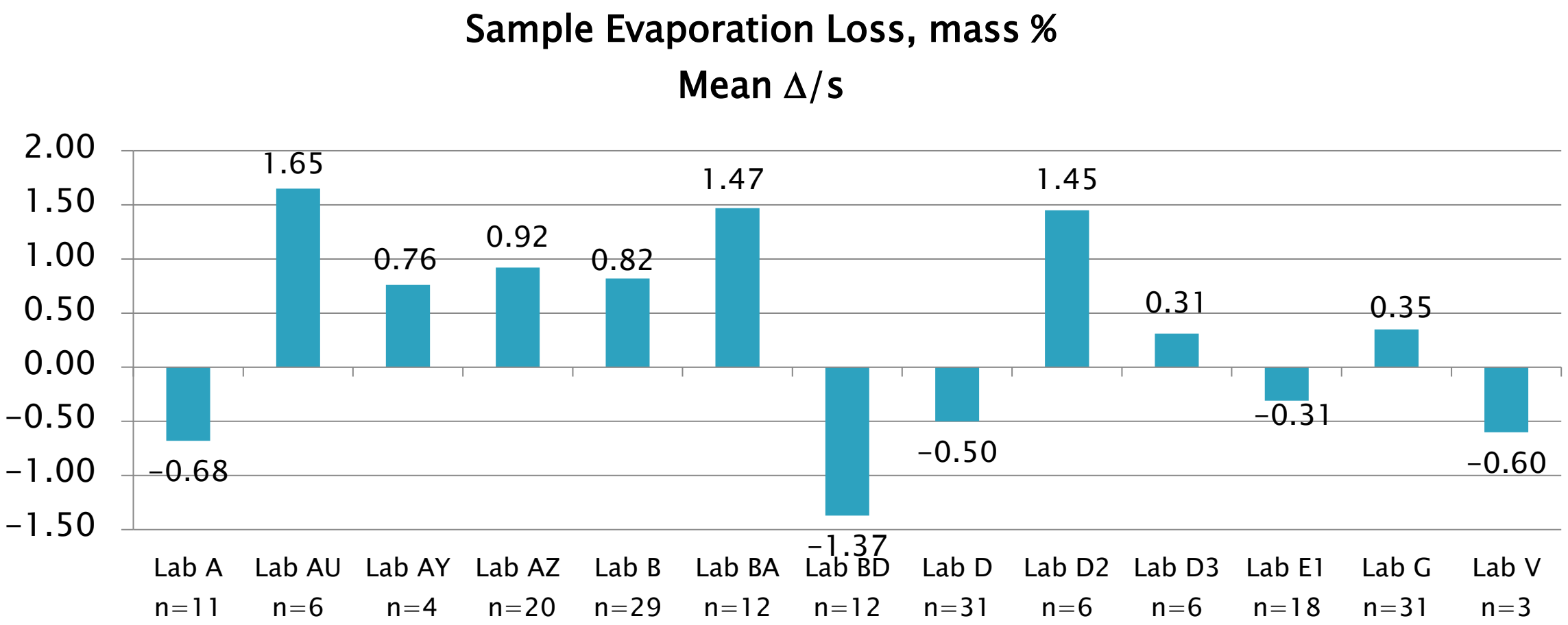
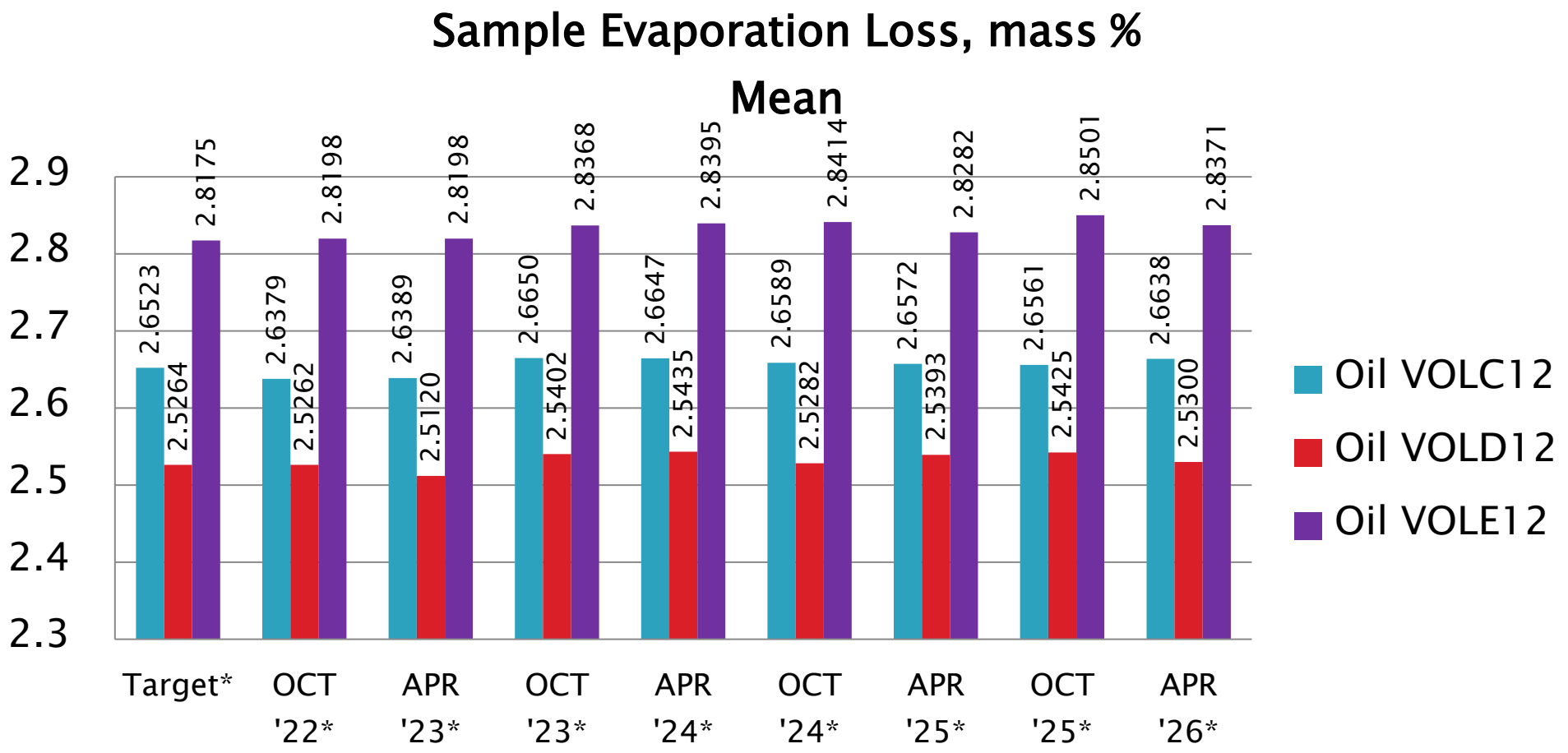
D5800 Lab Severity Estimates

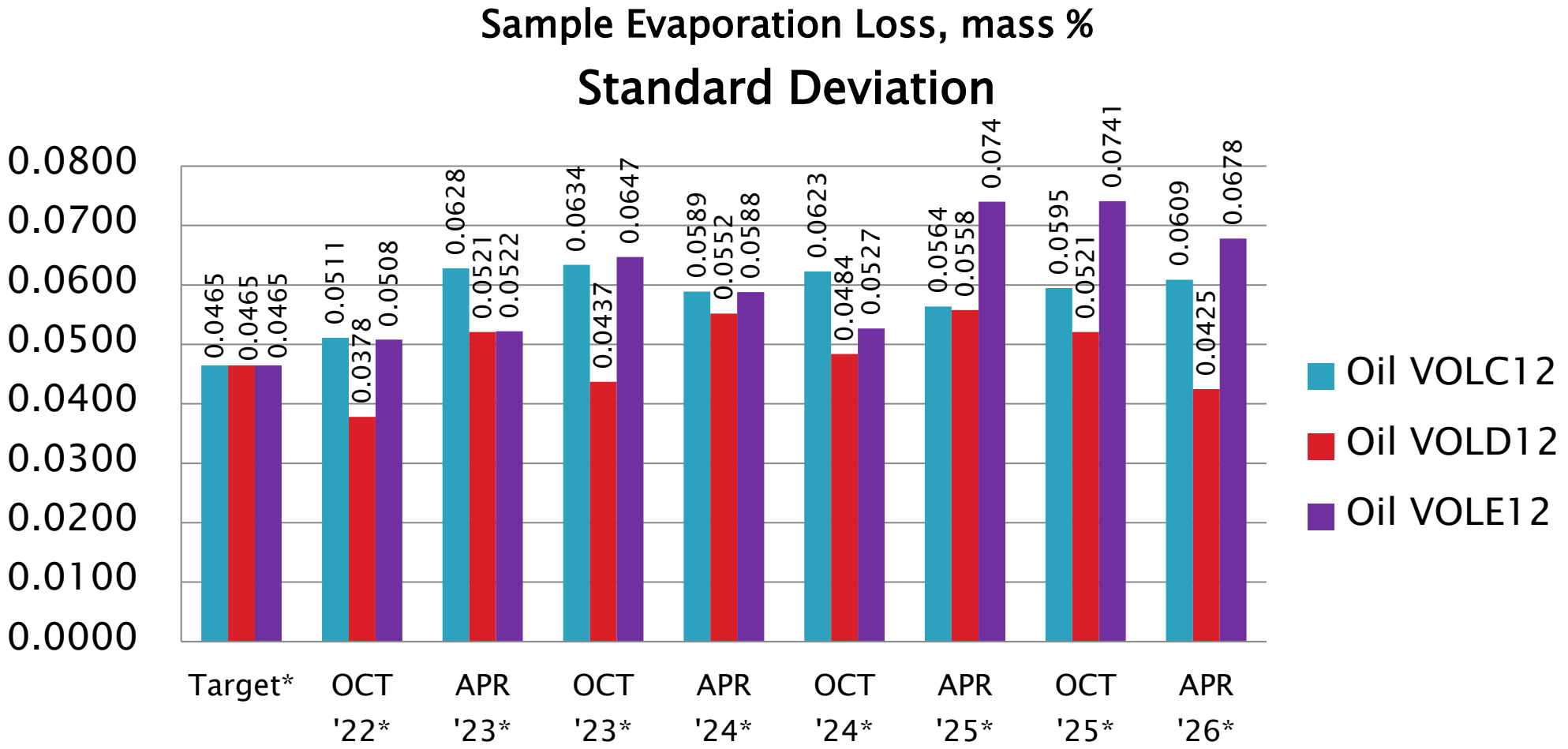


D5800 Performance by Oil



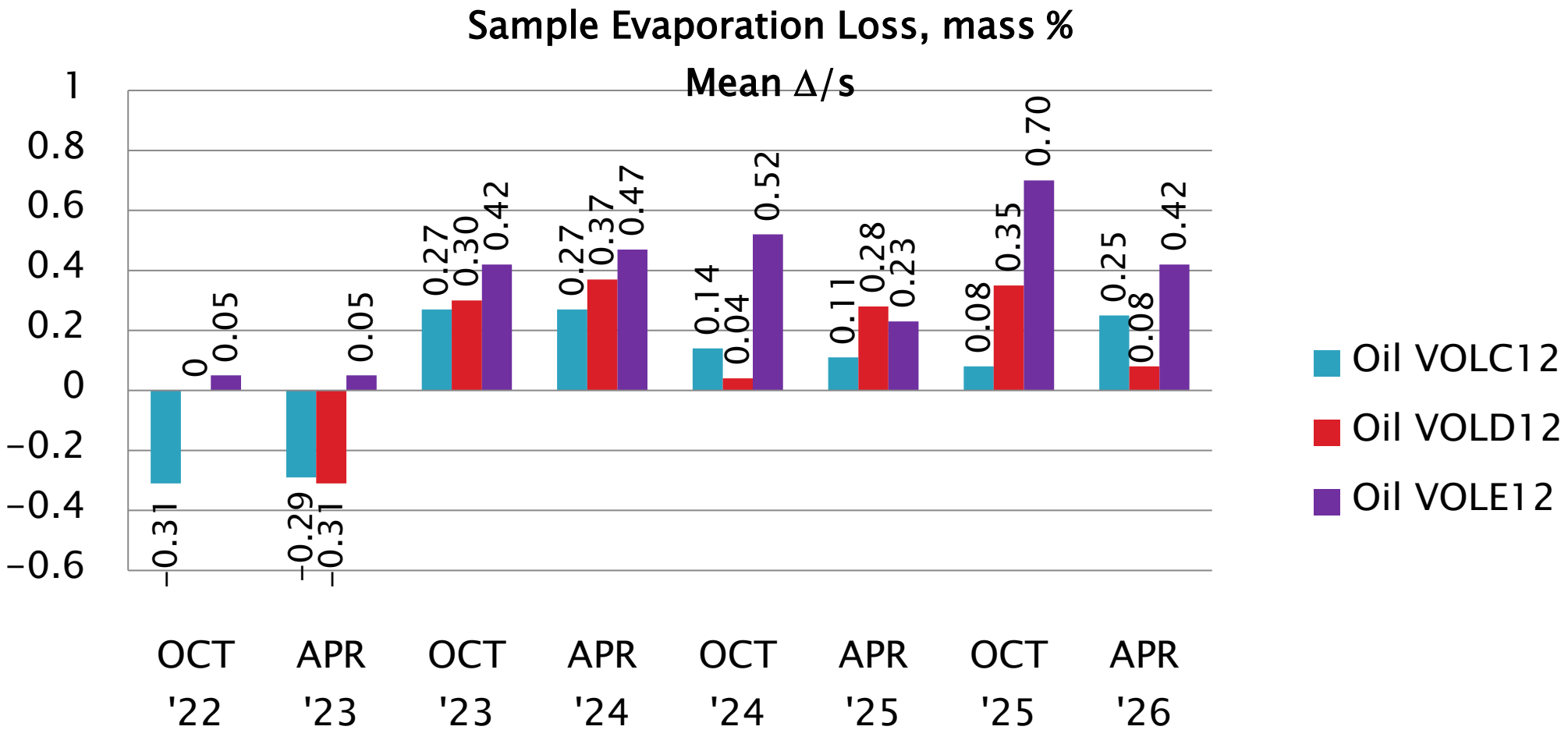
*Results transformed to natural log per updated LTMS 20200207

D5800 Performance by Oil



*Results transformed to natural log per updated LTMS 20200207

D5800 Performance by Oil



October 1, 2025 – March 31, 2026

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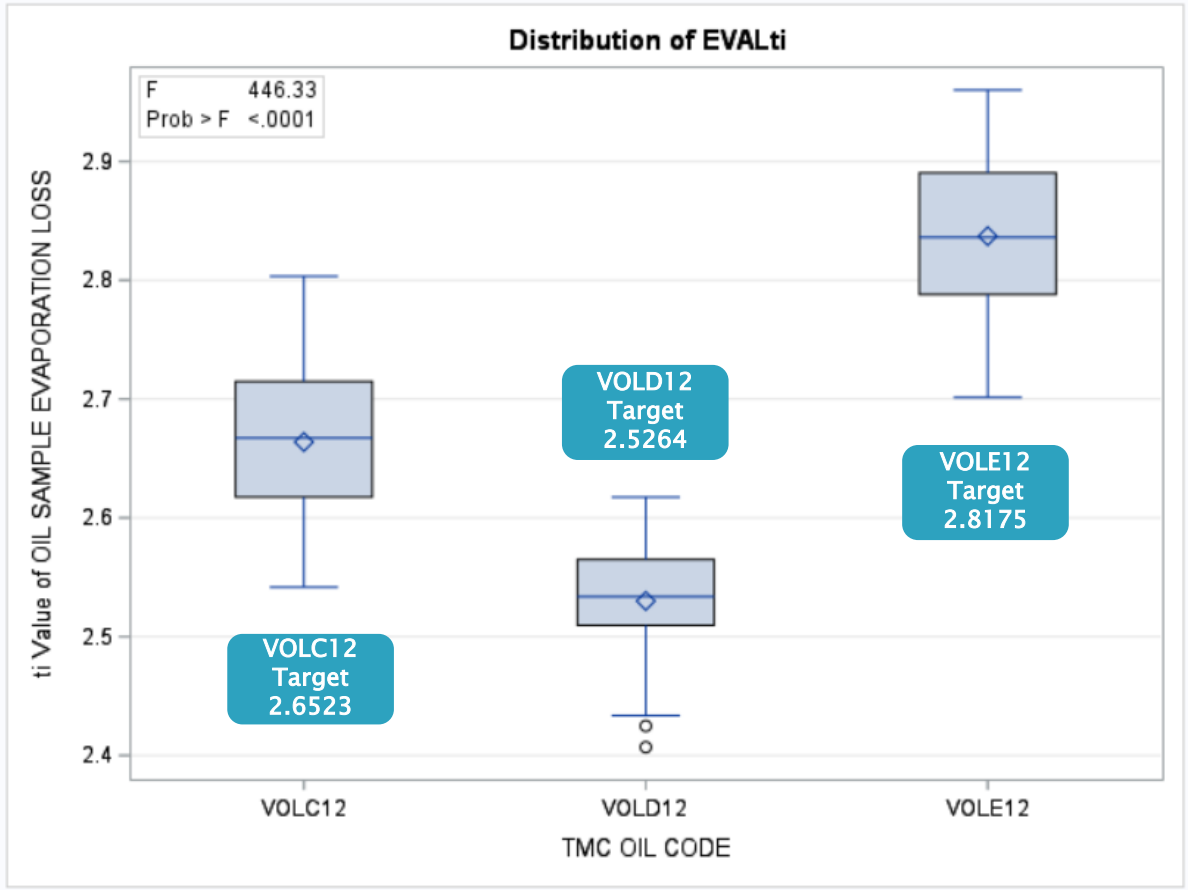
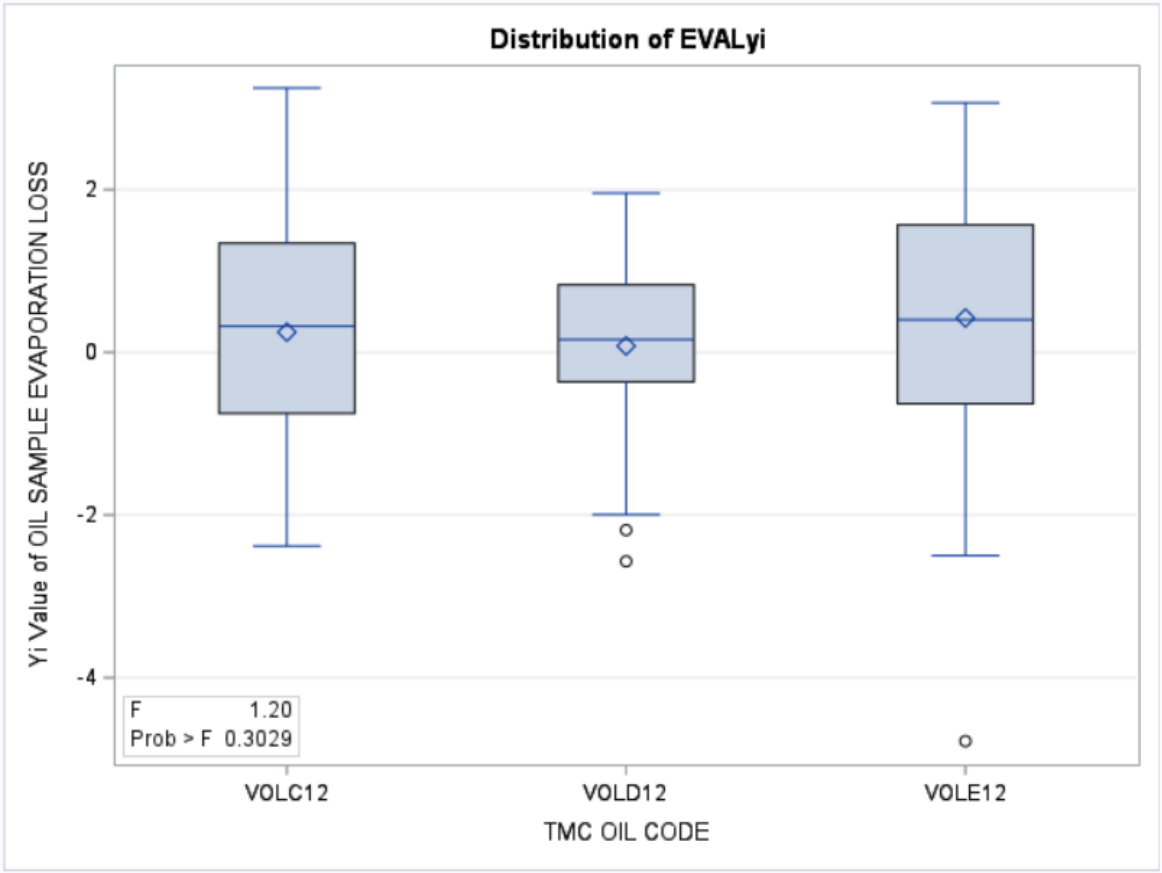
ALL

All Procedures: OCT2025 – MAR2026 Results

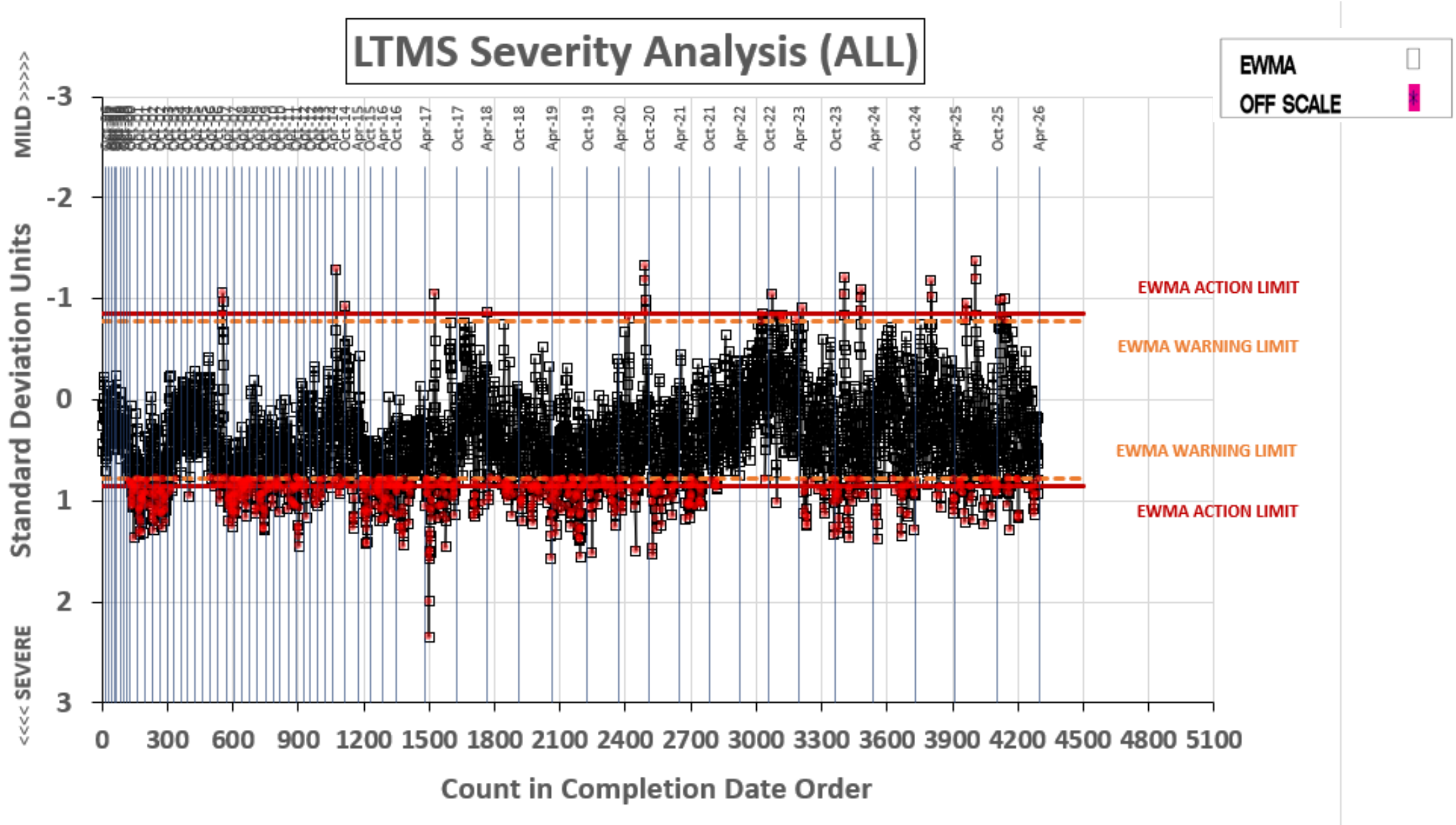




ALL

D5800 VOLATILITY BY NOACK INDUSTRY OPERATIONALLY VALID DATA

EVAPORATION LOSS, MASS%



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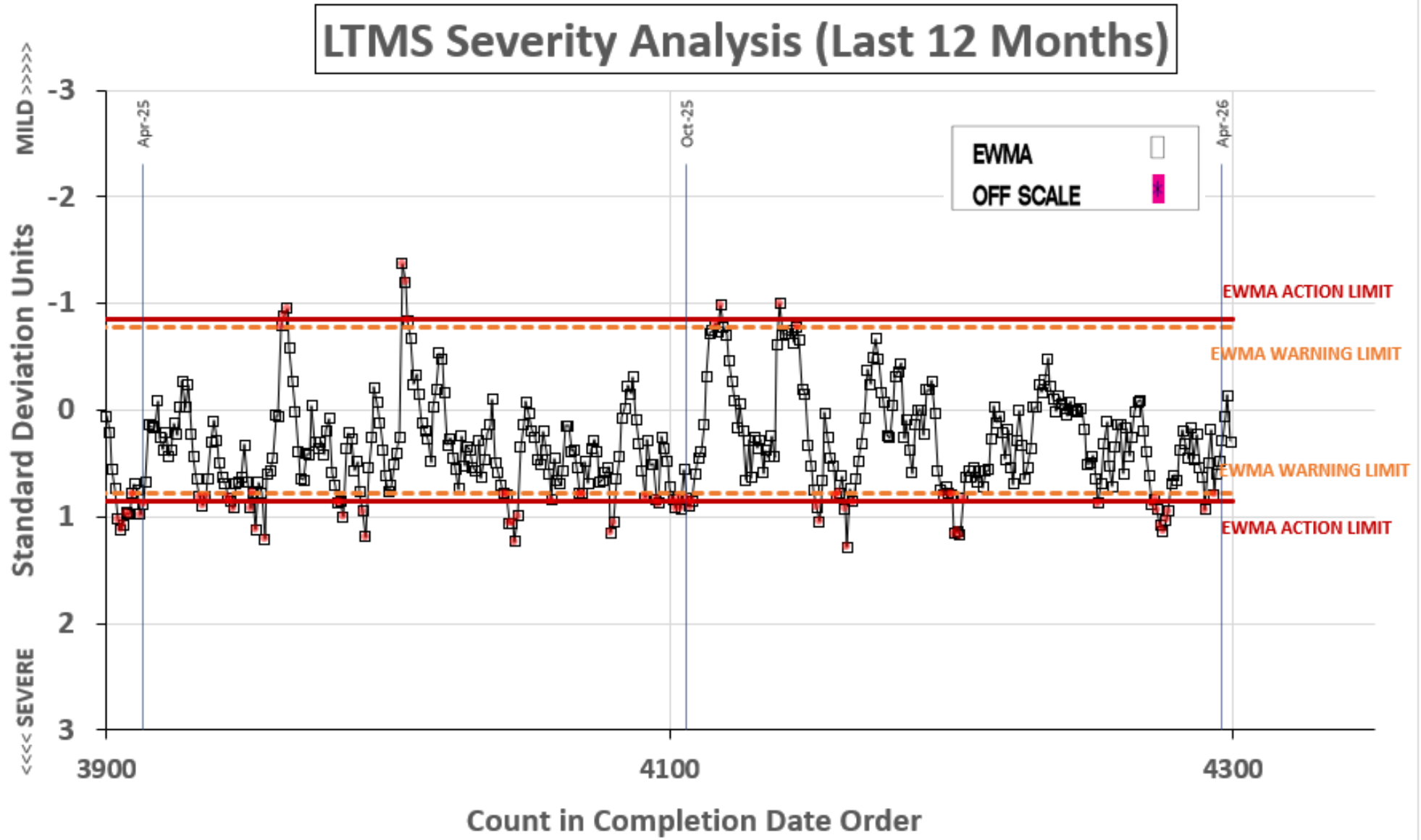
ALL

D5800 VOLATILITY BY NOACK INDUSTRY OPERATIONALLY VALID DATA

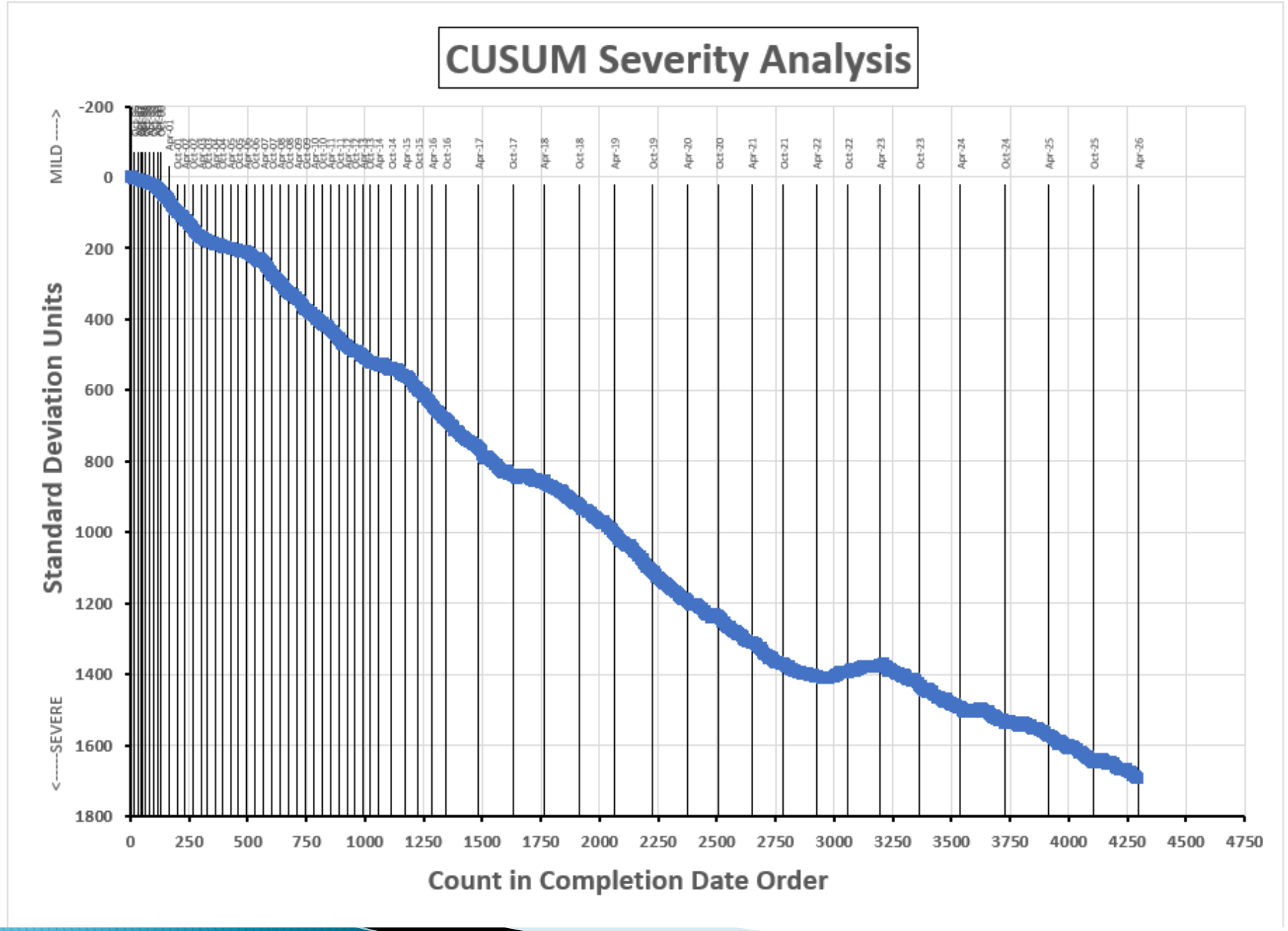
EVAPORATION LOSS, MASS%



D5800 VOLATILITY BY NOACK INDUSTRY OPERATIONALLY VALID DATA

ALL

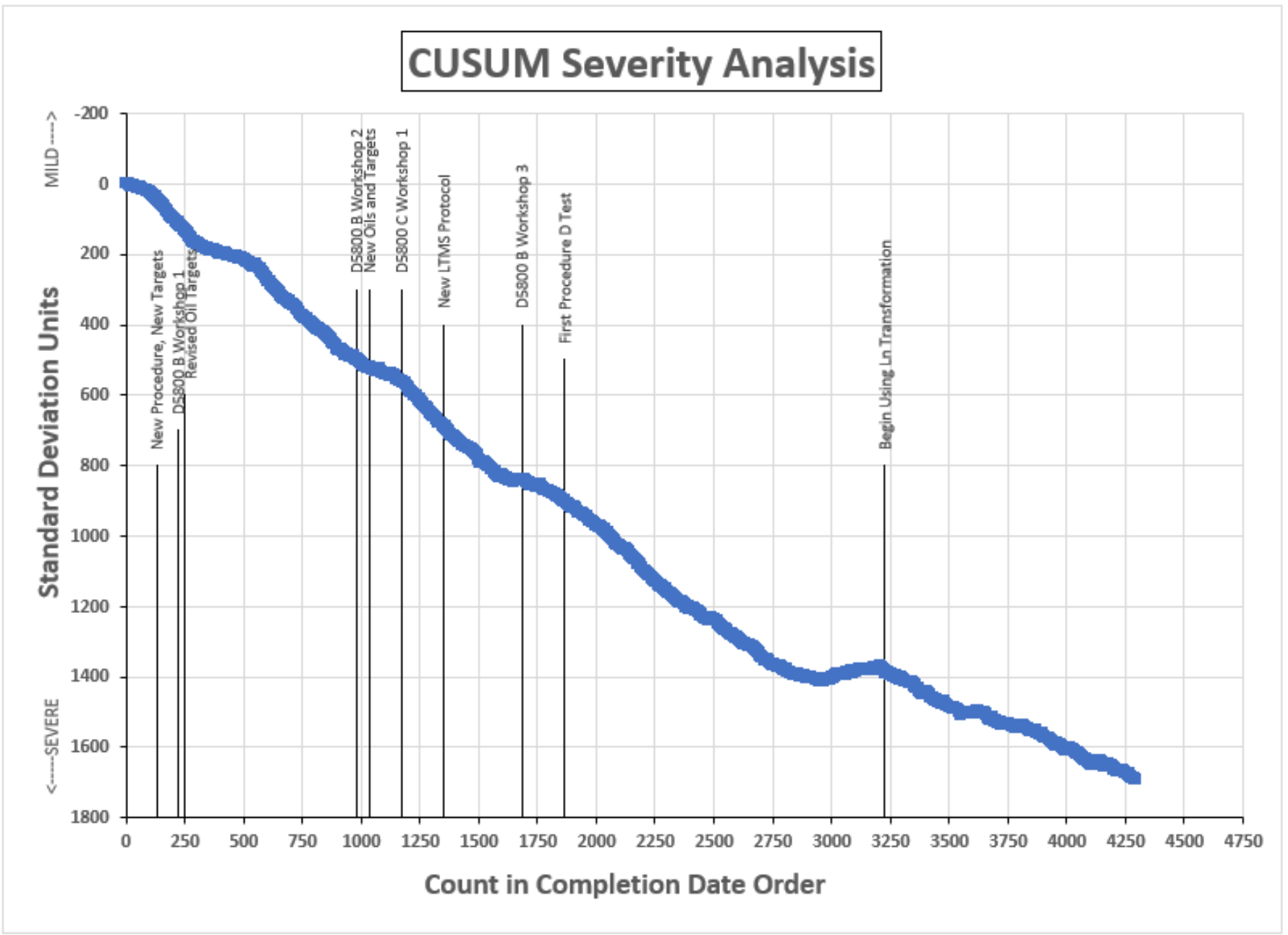
EVAPORATION LOSS, MASS%



D5800 VOLATILITY BY NOACK INDUSTRY OPERATIONALLY VALID DATA

ALL

EVAPORATION LOSS, MASS%



D5800: Evaporation Loss of Lubricating Oil by Noack Method and Rig Model

Performance Comparison
Sample Evaporation Loss, Mass %

Model	n	df	Pooled s	Mean Δ/s
NCK2 (Procedure B)	0	0	n/a	n/a
NCK25G (Procedure B)	100	97	0.0326	1.06
NS2 (Procedure D)	89	86	0.0465	-0.66

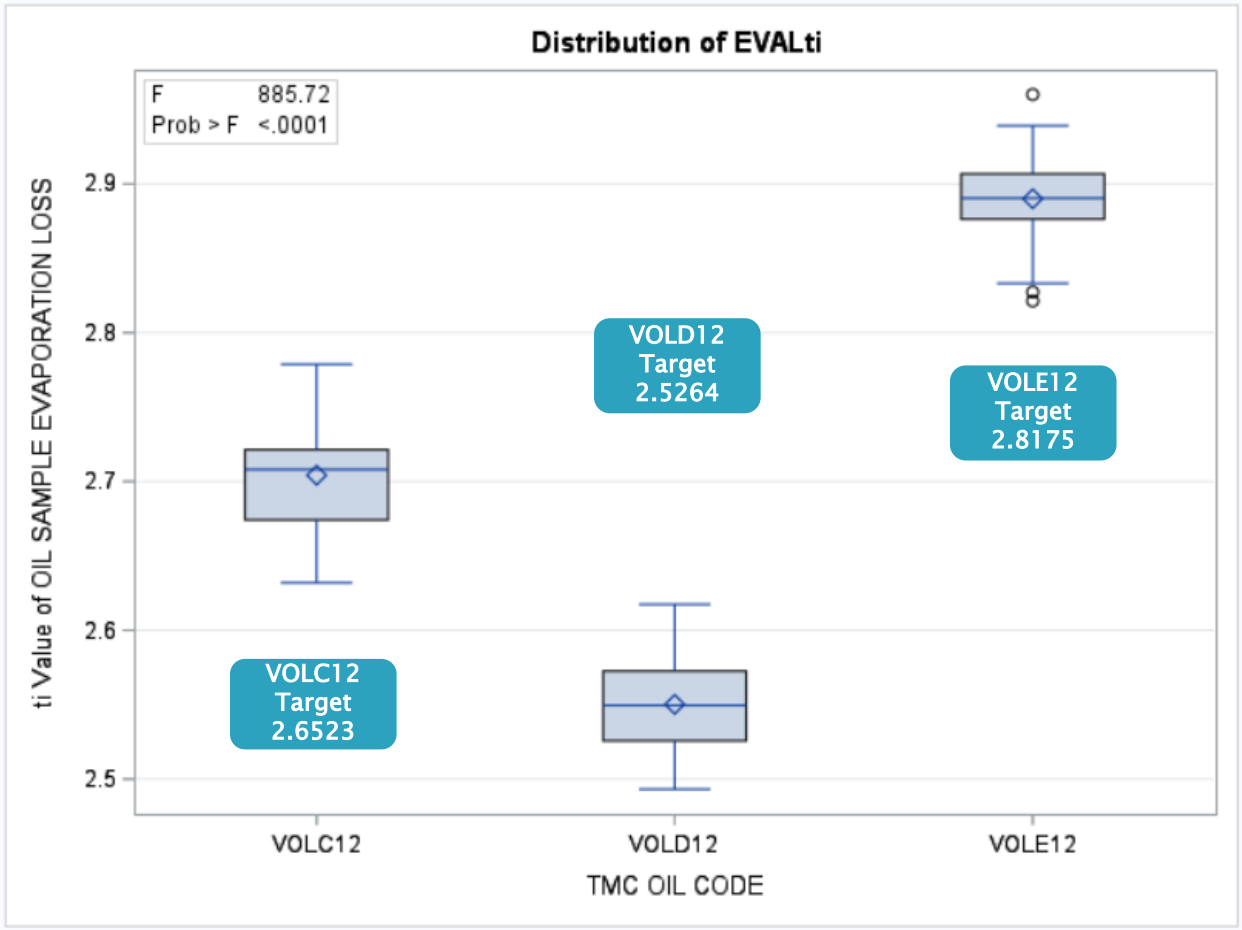
0 (+0) Procedure B NCK2 Rig
23 (-2) Procedure B NCK25G Rigs in 9 Labs
17 (+2) Procedure D NS2 Rigs in 7 Labs

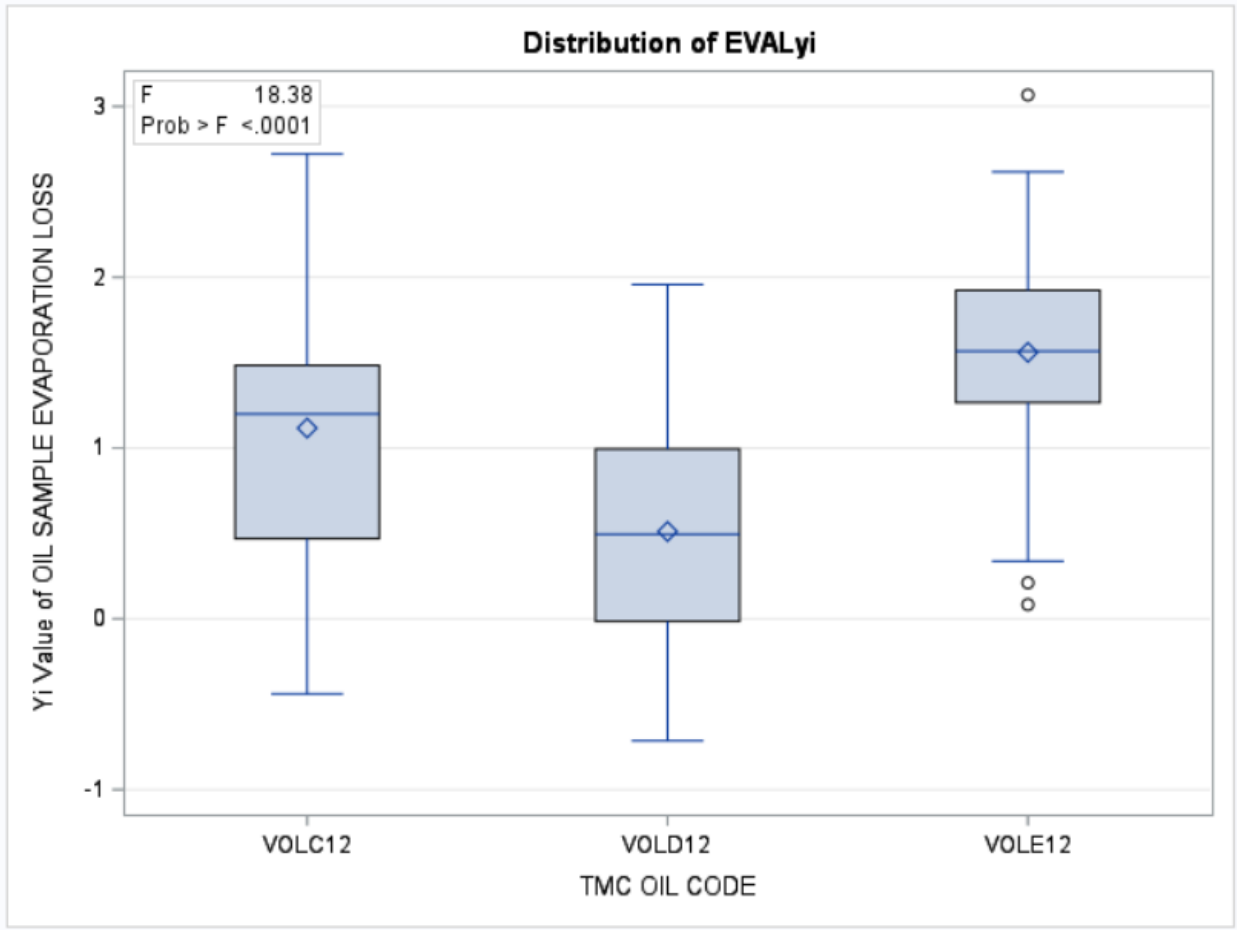
D5800: Evaporation Loss of Lubricating Oil by Noack Method: Industry Procedure B

Test Status	Validity Code	No. Tests
Acceptable Calibration Test	AC	96
Failed Calibration Test	OC	4
Total		**100**

Number of Labs Reporting Data: 9
Fail Rate of Operationally Valid Tests: 4.0%

Procedure B: OCT2025 – MAR2026 Results





B only

D5800 VOLATILITY BY NOACK INDUSTRY OPERATIONALLY VALID DATA
PROCEDURE B ONLY
EVAPORATION LOSS, MASS%

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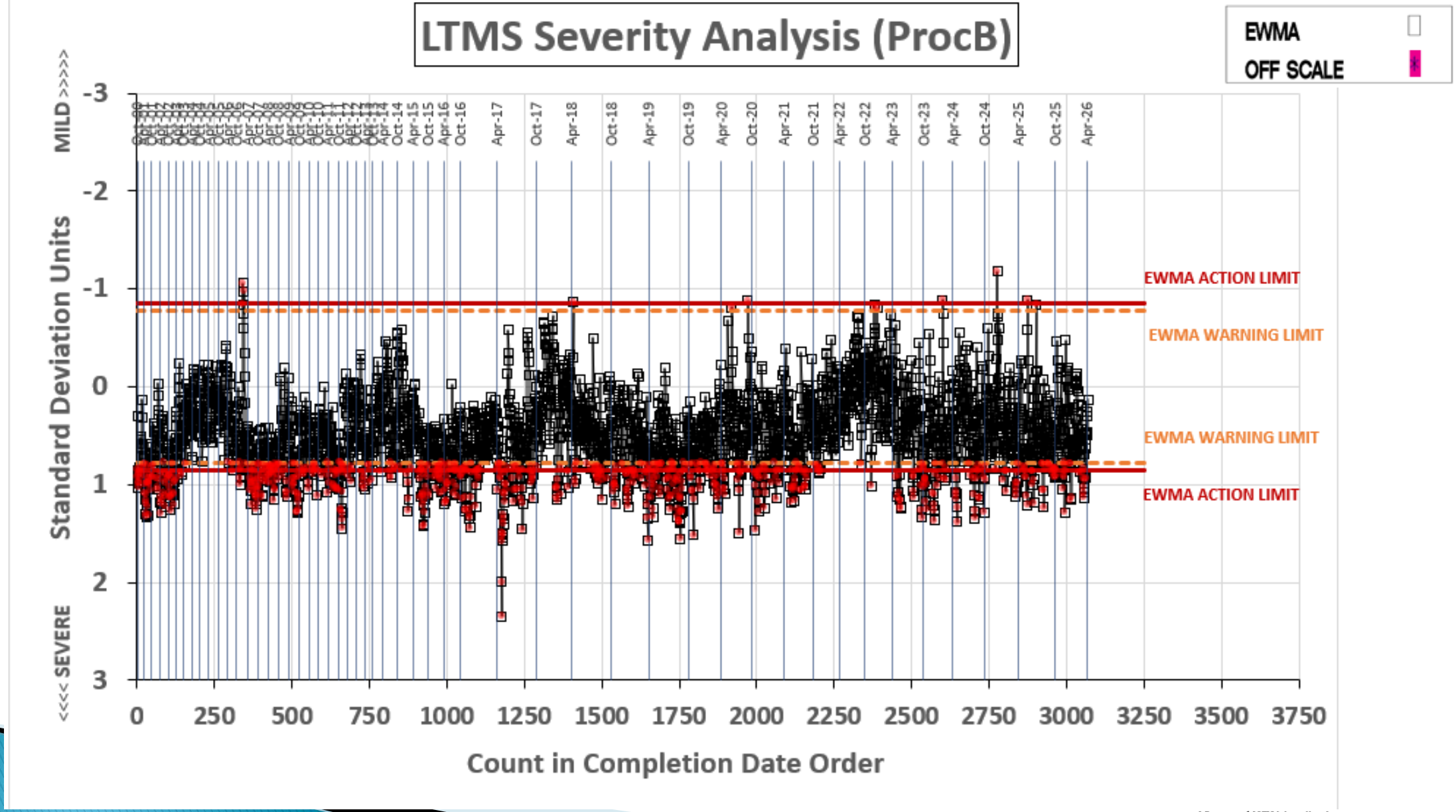

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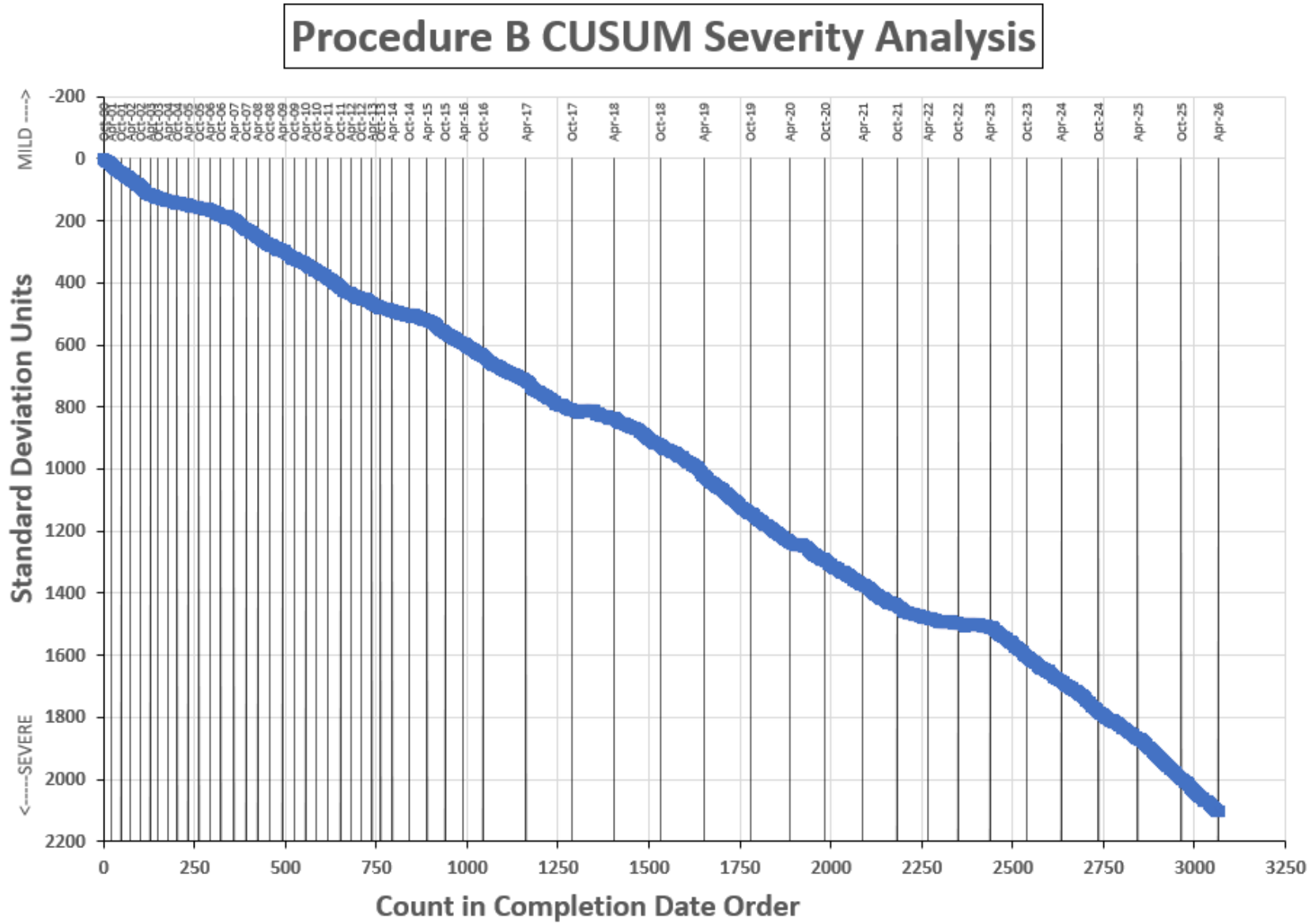
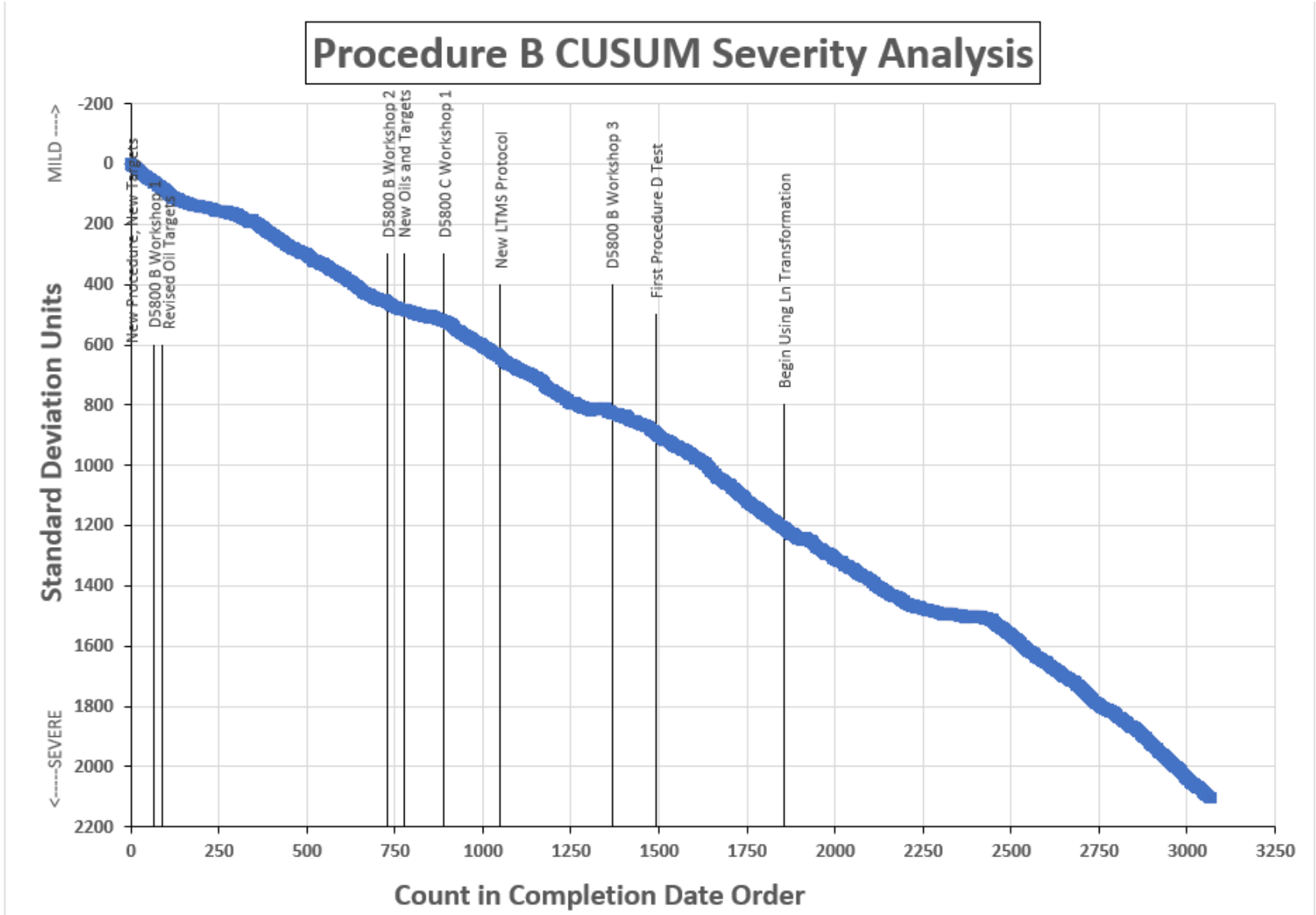
B only

D5800 VOLATILITY BY NOACK INDUSTRY OPERATIONALLY VALID DATA
PROCEDURE B ONLY
EVAPORATION LOSS, MASS%



B only

D5800 VOLATILITY BY NOACK INDUSTRY OPERATIONALLY VALID DATA
PROCEDURE B ONLY
EVAPORATION LOSS, MASS%

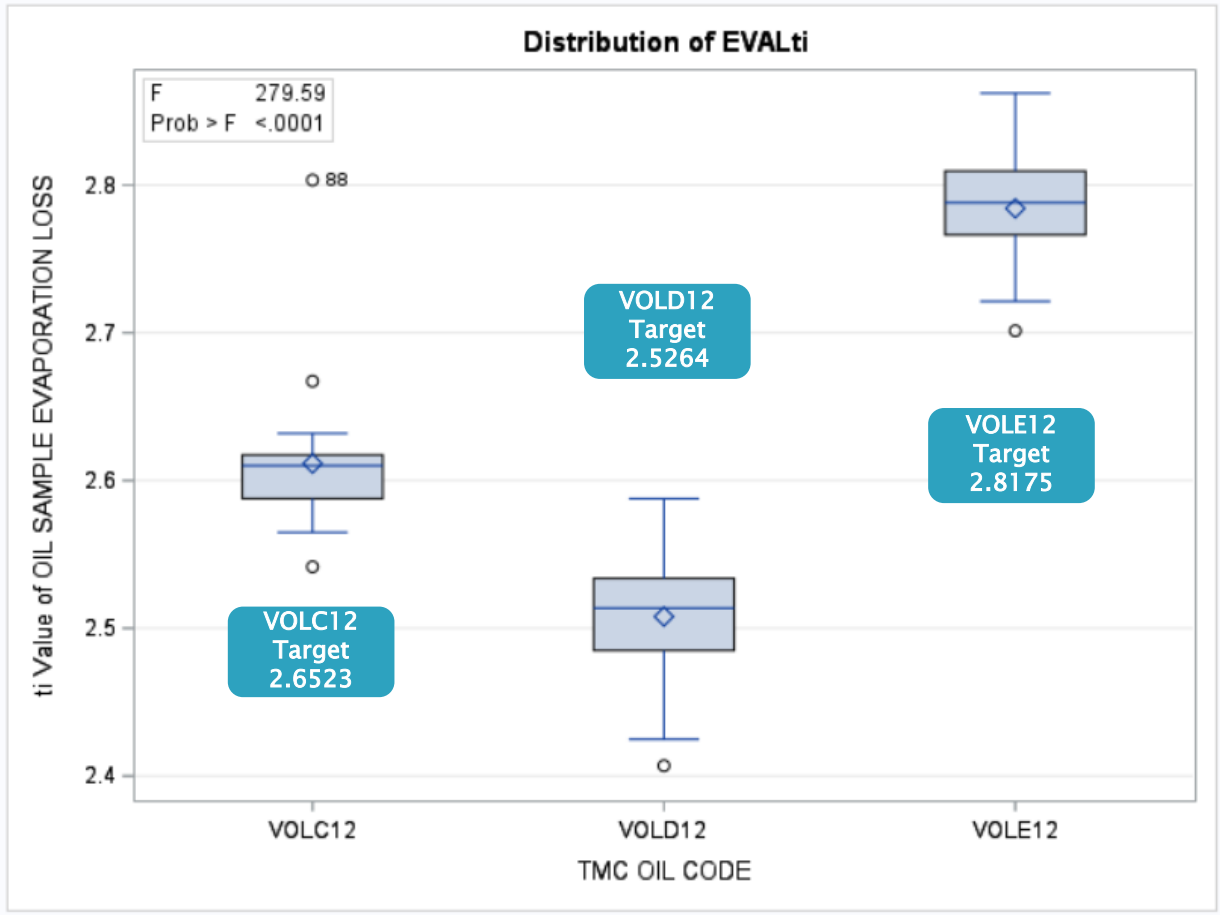


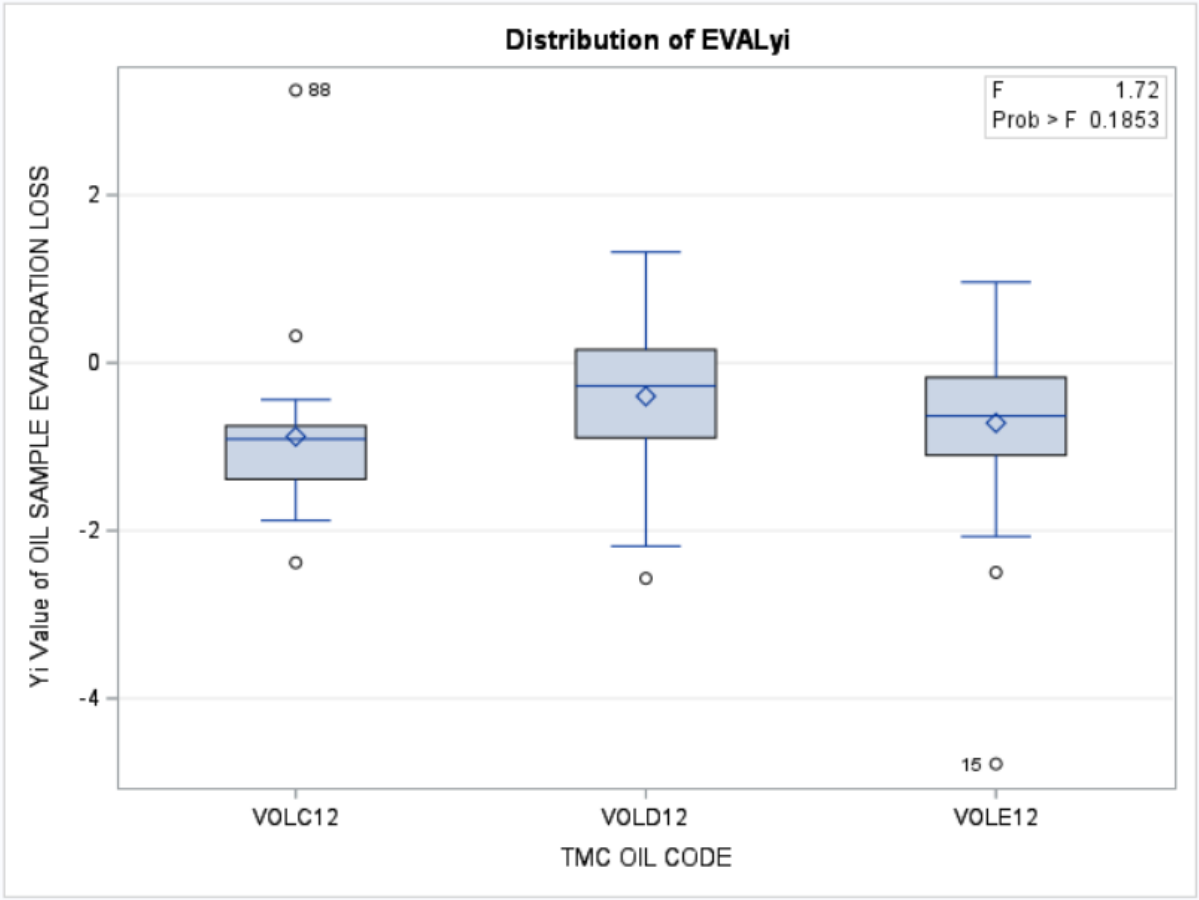
D5800: Evaporation Loss of Lubricating Oil by Noack Method: Industry Procedure D

Test Status	Validity Code	No. Tests
Acceptable Calibration Test	AC	85
Failed Calibration Test	OC	4
Total		**89**

Number of Labs Reporting Data: 7
Fail Rate of Operationally Valid Tests: 4.49%

Procedure D: OCT2025 – MAR2026 Results



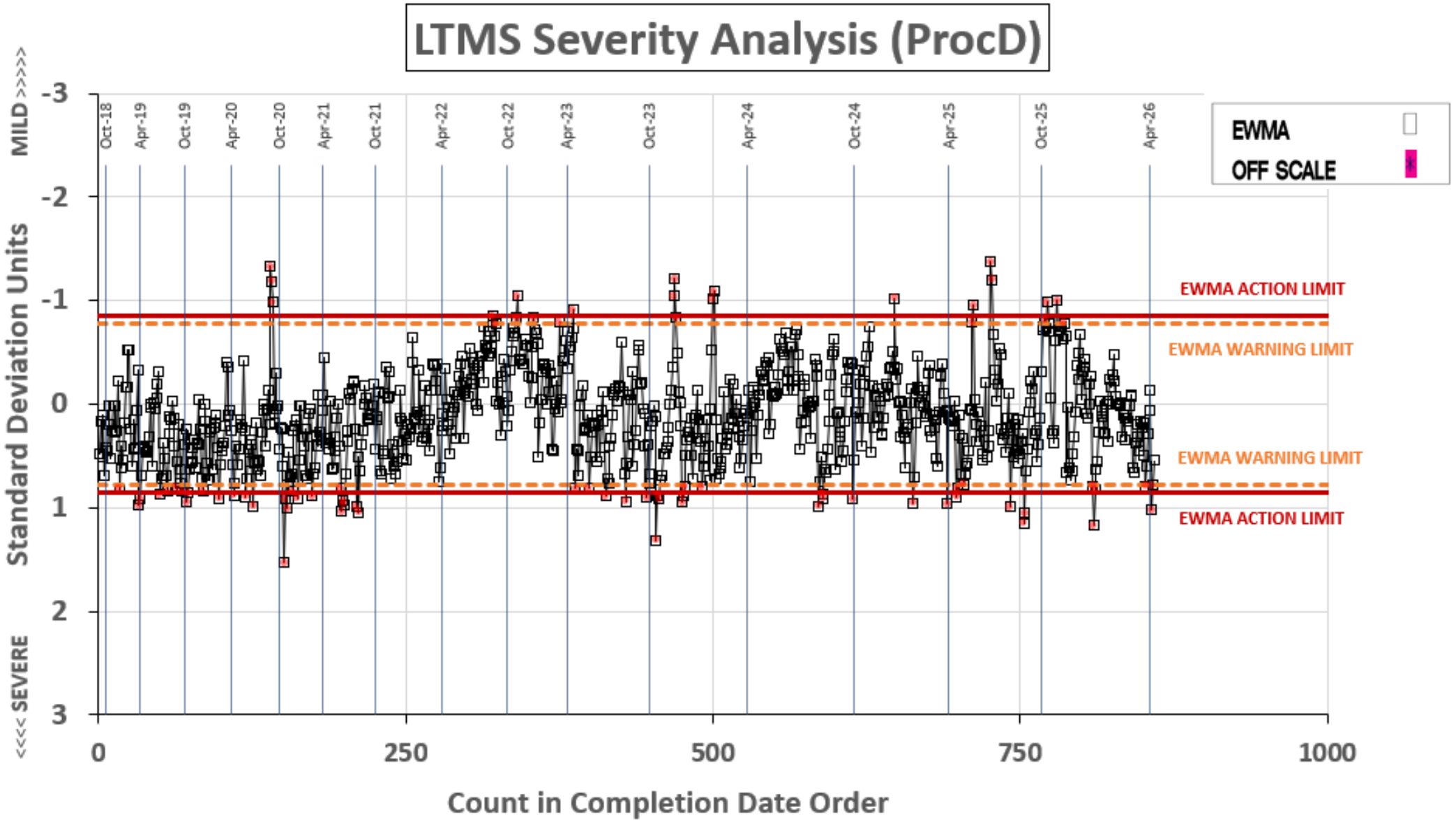


D only

D5800 VOLATILITY BY NOACK INDUSTRY OPERATIONALLY VALID DATA

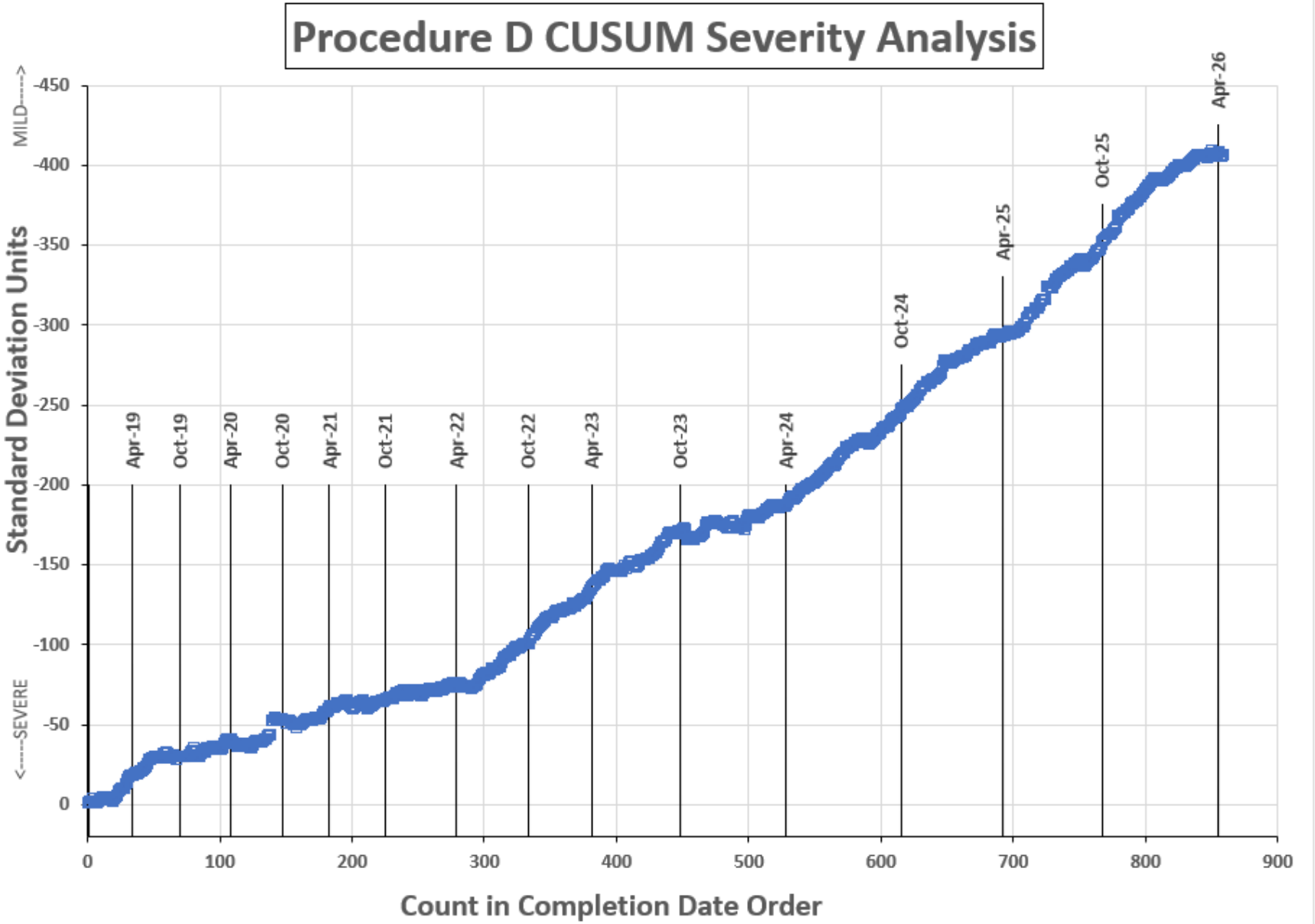
Procedure D Only

EVAPORATION LOSS, MASS%



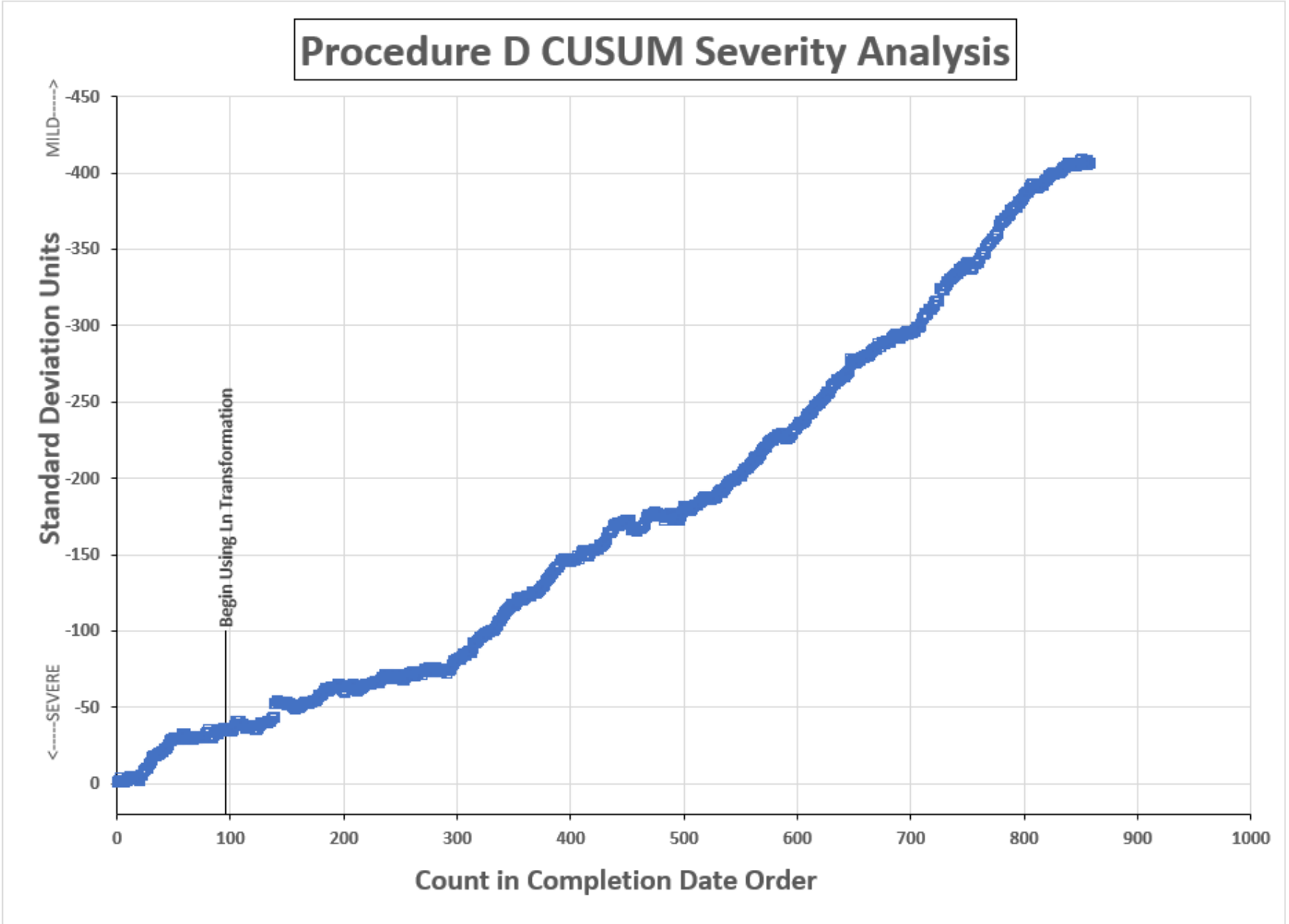
D only

D5800 VOLATILITY BY NOACK INDUSTRY OPERATIONALLY VALID DATA
Procedure D Only
EVAPORATION LOSS, MASS%



D only

D5800 VOLATILITY BY NOACK INDUSTRY OPERATIONALLY VALID DATA
Procedure D Only
EVAPORATION LOSS, MASS%



Reference Oil Inventory

D5800

Oil	Year Rec'd By TMC[A]	Tests	TMC Inventory, gallons	Gallons Shipped last 6 months	Estimated Life
VOLC12	2013	D5800	12.5	2.6	2.5 years
VOLD12	2013	D5800	10.7	2.7	2 years
VOLE12	2013	D5800	8.5	2.7	1.5 years
VOLD18	2018	D5800QC	423	40.7	5 years

[A] Integrity of TMC reference oils is confirmed annually by analytical QC testing of chemical and physical properties.

D5800: Evaporation Loss of Lubricating Oil by Noack Method: Semester Summary

Precision (Pooled s) moved closer to target this semester.

Performance (Mean Δ/s) was slightly less severe at +0.25 s.

- Procedure B rigs continue to trend severe (+1.06 s) while Procedure D rigs continue to trend mild (-0.66s).

All calibrated instruments are NS2 (Proc D) or NCK25G (Proc B).

TABLE of CONTENTS

D02.B0.07
TMC Monitored Tests

ASTM D 6082

High Temperature Foam

October 1, 2025 – March 31, 2026

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Calibrated Labs and Stands*

(change since last Semi-Annual report)

Test	Labs	Stands
D6082	7 (+0)	9 (+0)

*Between 10/1/2025 and 3/31/2026

D6082: High Temperature Foam

Test Status	Validity Code	No. Tests
Acceptable Calibration Test	AC	16
Failed Calibration Test	OC	3
Acceptable Discrimination Test	AS	7
Failed Discrimination Test	OS	1
Operationally Invalid, Reported as Valid	RC, RS	0
Operationally Invalid, Reported by Lab	LC, LS	0
Informational Run (Valid)	NN	1
Aborted Tests	XC, XS	0
Total		**28**

Number of Labs Reporting Data: 7
Fail Rate of Operationally Valid Calibration Tests: 15.8%

D6082: High Temperature Foam

Statistically Unacceptable Tests (OC, OS)	No. Of Tests
Foam Tendency Mild (OC)	1
Foam Tendency Mild (OS)	1
Foam Tendency Severe (OC)	2
Total	**4**

- FOUR statistically unacceptable calibration tests reported period.

D6082: High Temperature Foam

Operationally Unacceptable Tests (RC, LC, LS, XC, XS)	No. Of Tests
LC (Lab Invalid Calibration Run)	0
XC (Lab Aborted Calibration Run)	0
RC (TMC Invalidated Calibration Run)	0
XS (Lab Aborted Discrimination Run)	0
LS (Lab Invalid Discrimination Run)	0
Total	**0**

- No operationally invalid results were reported period.

D6082: High Temperature Foam

Informational Runs (MN, NN)	No. Of Tests
Non-blind Informational run on-target, valid (NN)	1
Non-blind Informational run out of range, valid (MN)	0
Total	**1**

- ONE informational run was conducted this period.

D6082: High Temperature Foam (Tendency)

Period Precision and Severity Estimates

Foam Tendency, ml	n	df	Pooled s	Mean Δ/s
Targets updated 20201001[1]	18	17	9	-----
4/1/21 through 9/30/21	14	13	7	-0.48
10/1/21 through 3/31/22	13	12	7	-0.57
4/1/22 through 9/30/22	15	14	4	-0.52
10/1/22 through 3/31/23	16	15	10	-0.69
4/1/23 through 9/30/23	14	13	4	-0.68
10/1/23 through 3/31/24	19	18	10	-0.62
4/1/24 through 9/30/24	18	17	13	-0.01
10/1/24 through 3/31/25	17	16	18	0.88
10/1/25 through 3/31/26	18	17	10	0.45
10/1/25 through 3/31/26	19	18	13	0.66

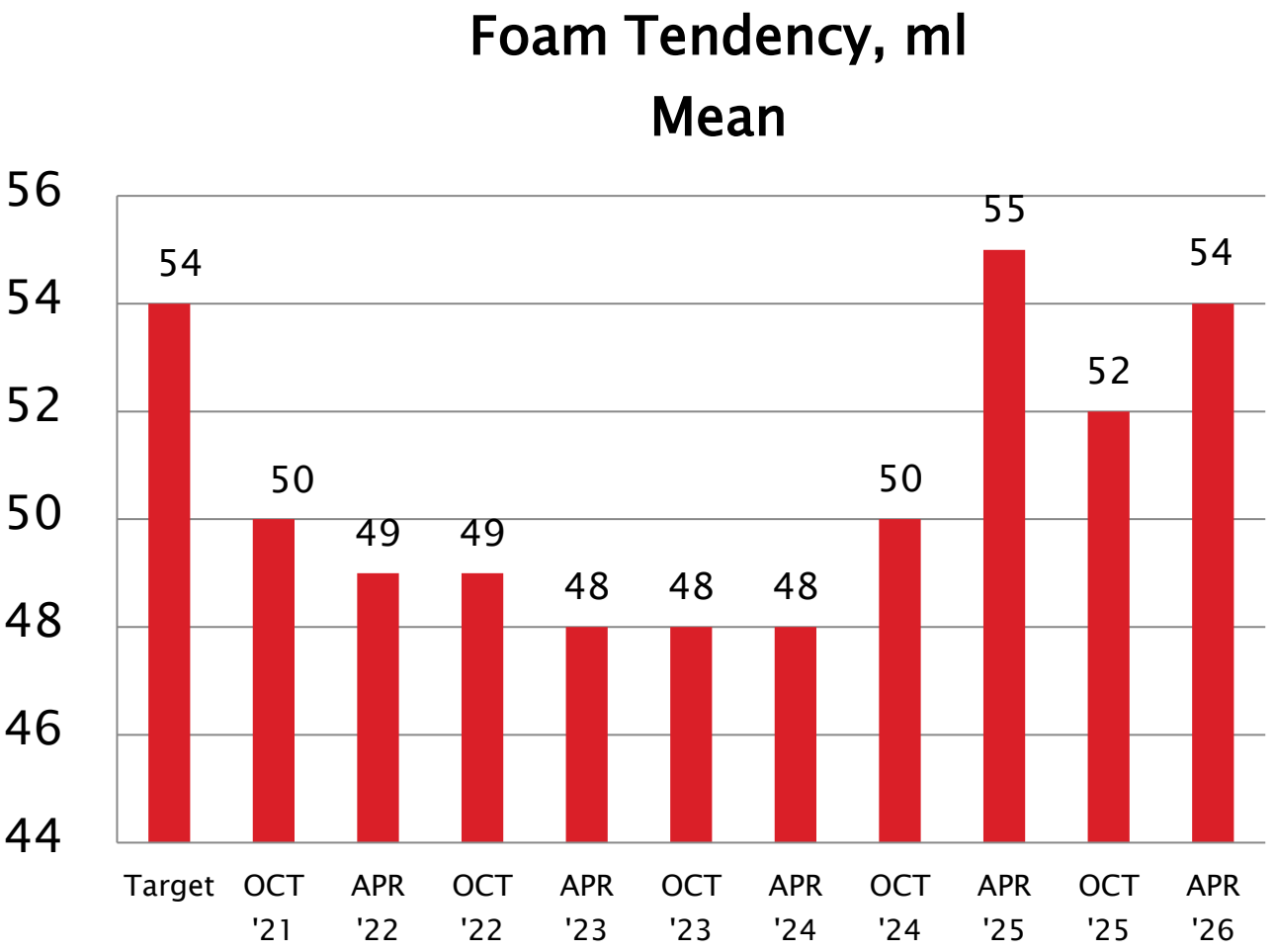
[1]Target precision updated to current reference oil FOAMB18

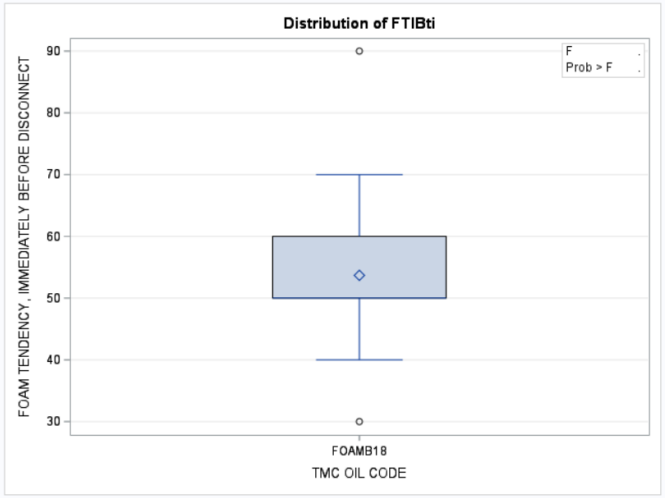
D6082: High Temperature Foam (Stability)

Period Precision and Severity Estimates

Foam Stability @ 1 min, ml	n	Mean	s
Current Targets	18	0.00	0.00
4/1/21 through 9/30/21	14	No non-zero occurrences	
10/1/21 through 3/31/22	13	No non-zero occurrences	
4/1/22 through 9/30/22	15	No non-zero occurrences	
10/1/22 through 3/31/23	16	No non-zero occurrences	
4/1/23 through 9/30/23	14	No non-zero occurrences	
10/1/23 through 3/31/24	19	No non-zero occurrences	
4/1/24 through 9/30/24	18	No non-zero occurrences	
10/1/24 through 3/31/25	18	No non-zero occurrences	
10/1/25 through 3/31/26	18	No non-zero occurrences	
10/1/25 through 3/31/26	19	No non-zero occurrences	

D6082 Performance by Oil





Oil FOAMB18

October 1, 2025 – March 31, 2026

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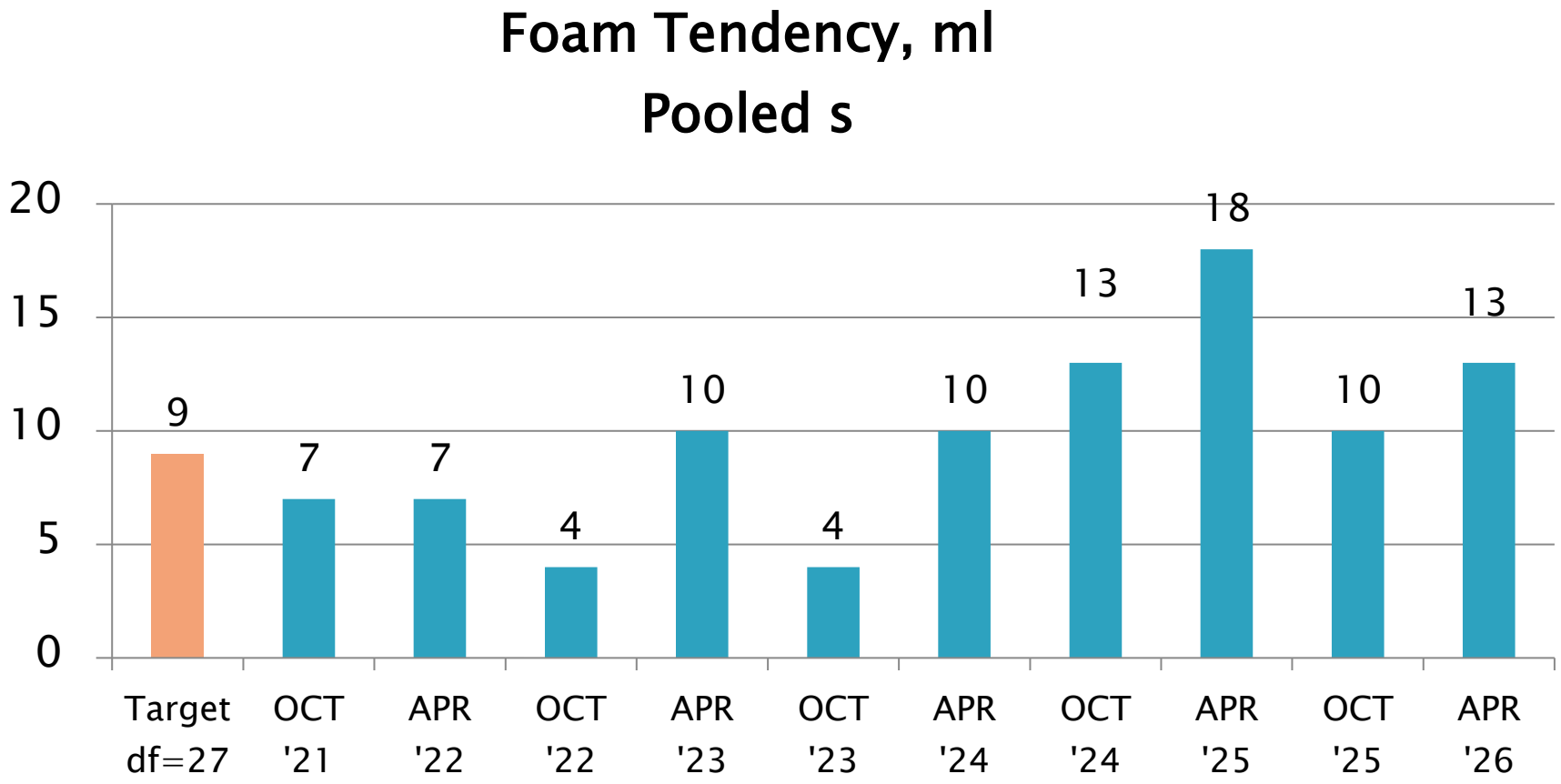
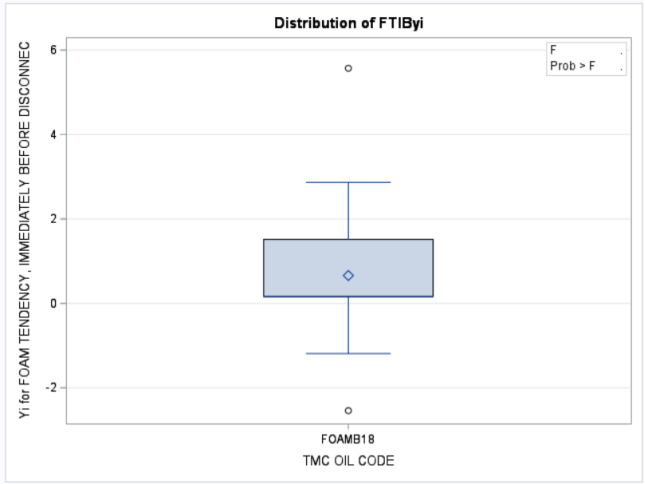
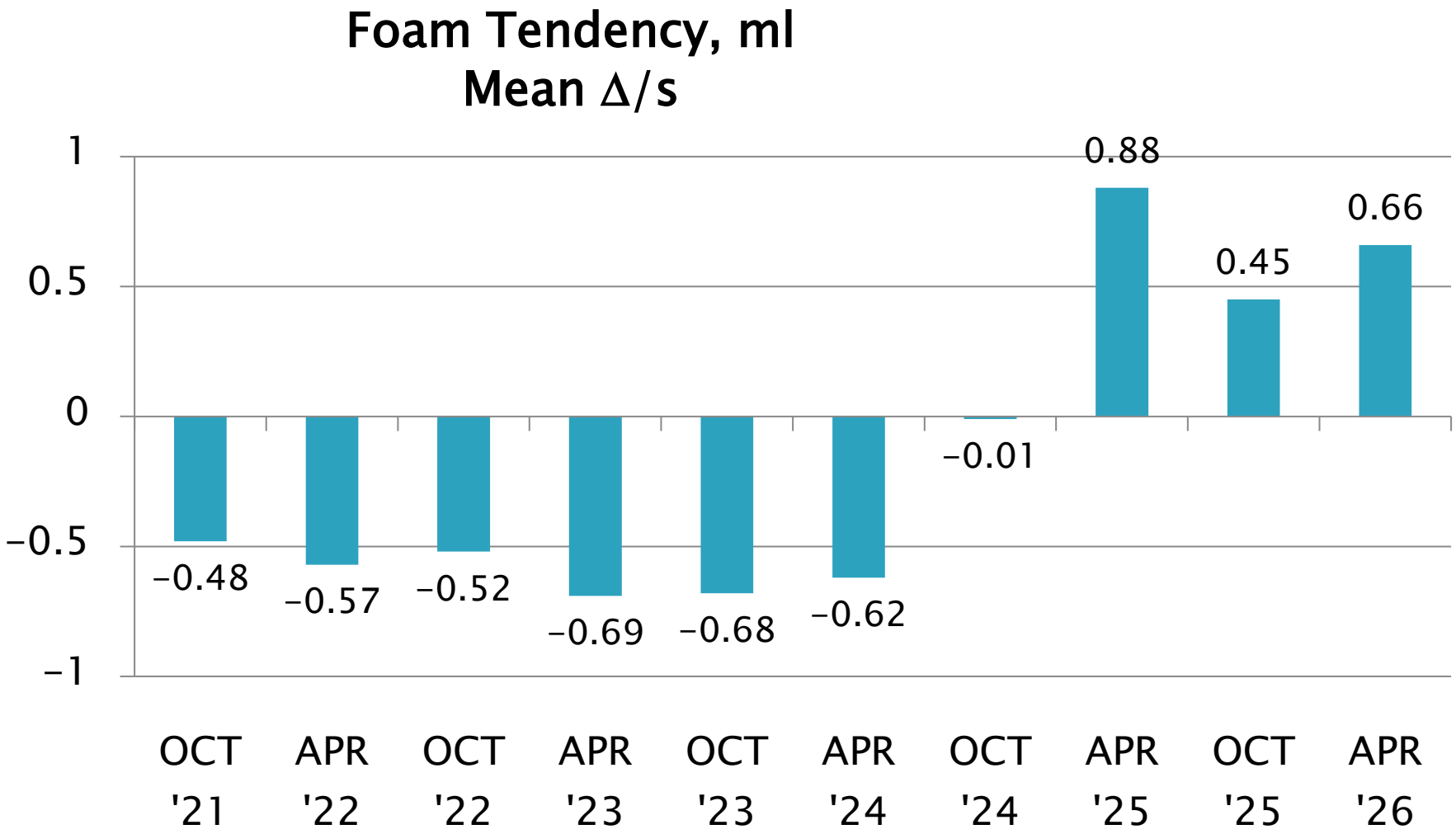
D6082: High Temperature Foam



D6082: High Temperature Foam





October 1, 2025 – March 31, 2026

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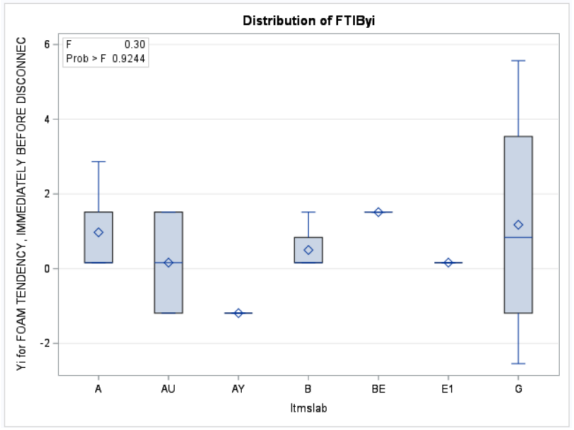
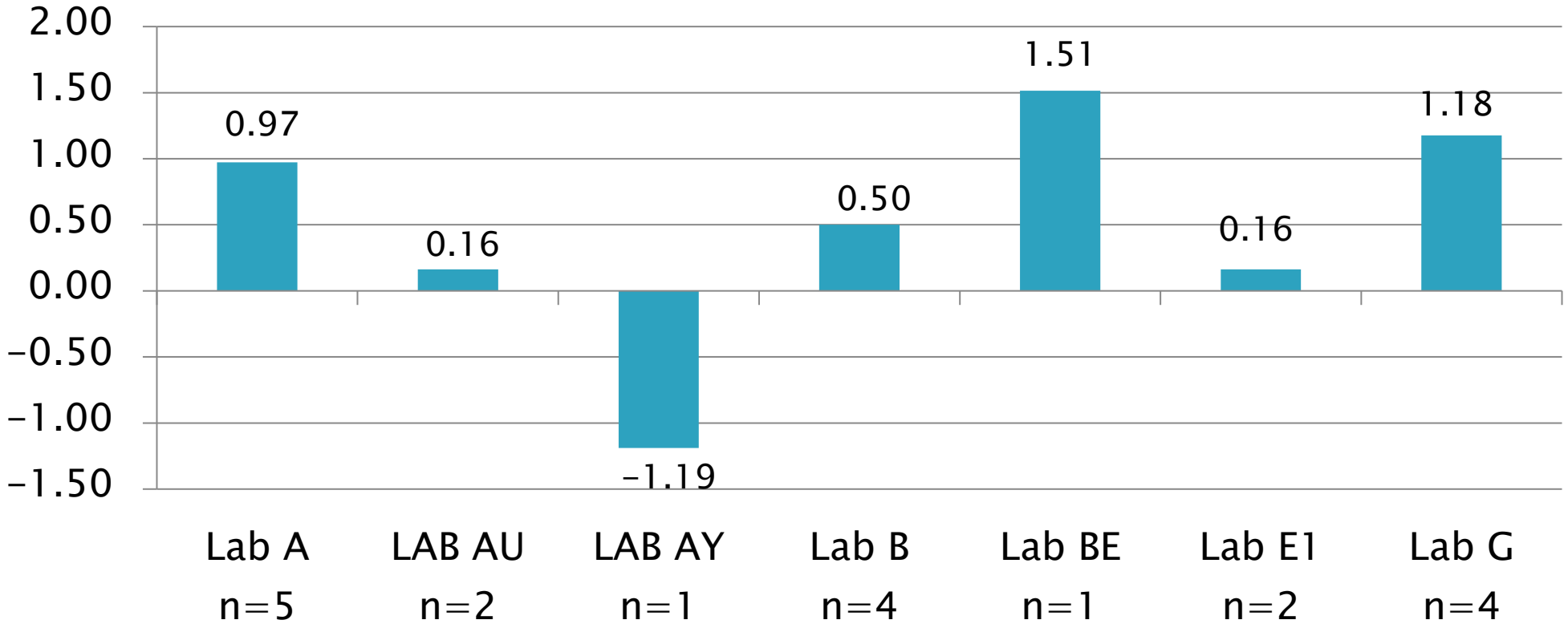


D6082: High Temperature Foam

Current Period Severity Estimates by Lab
Foam Tendency, ml



October 1, 2025 – March 31, 2026

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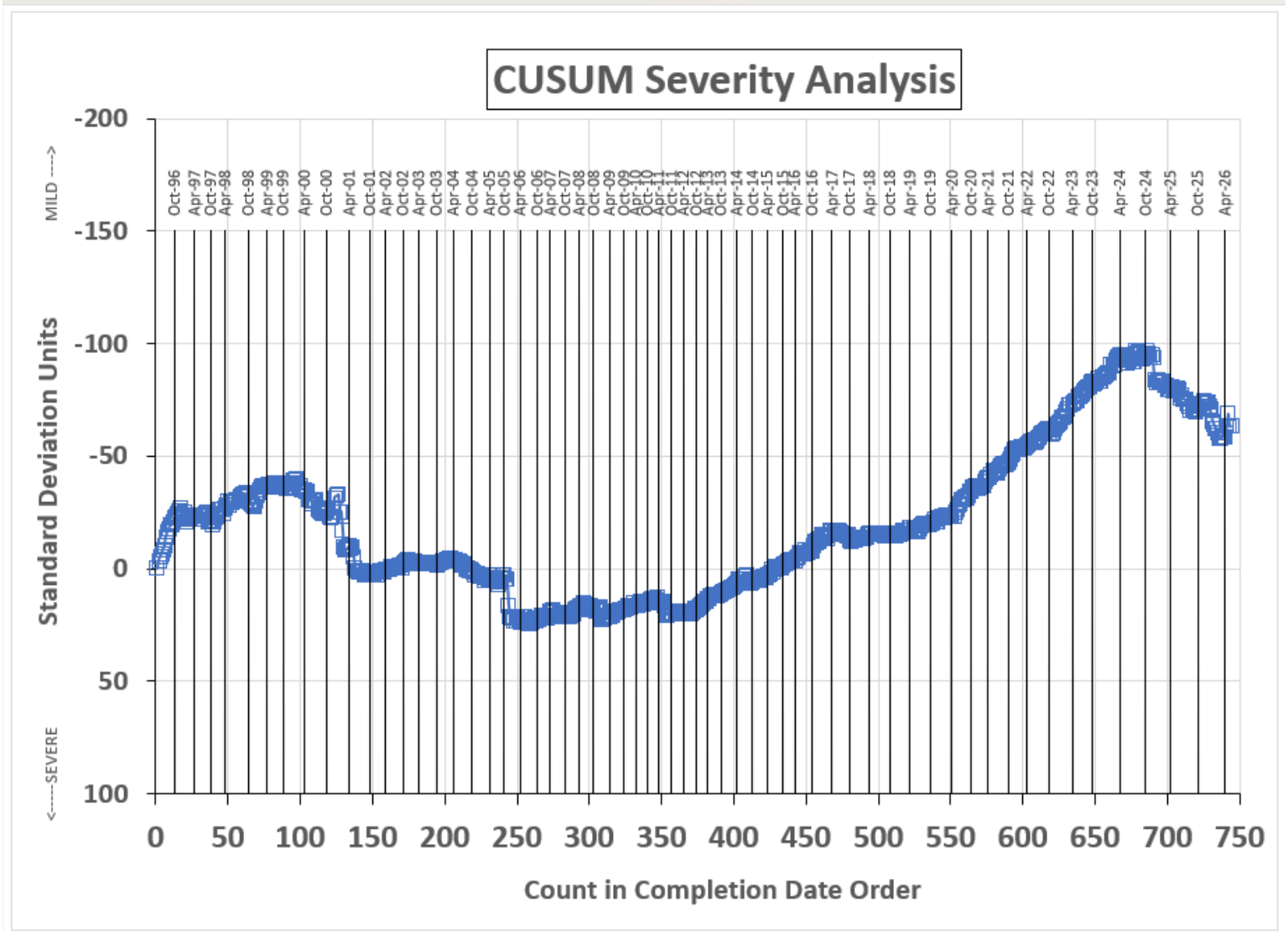
D6082: High Temperature Foam Status

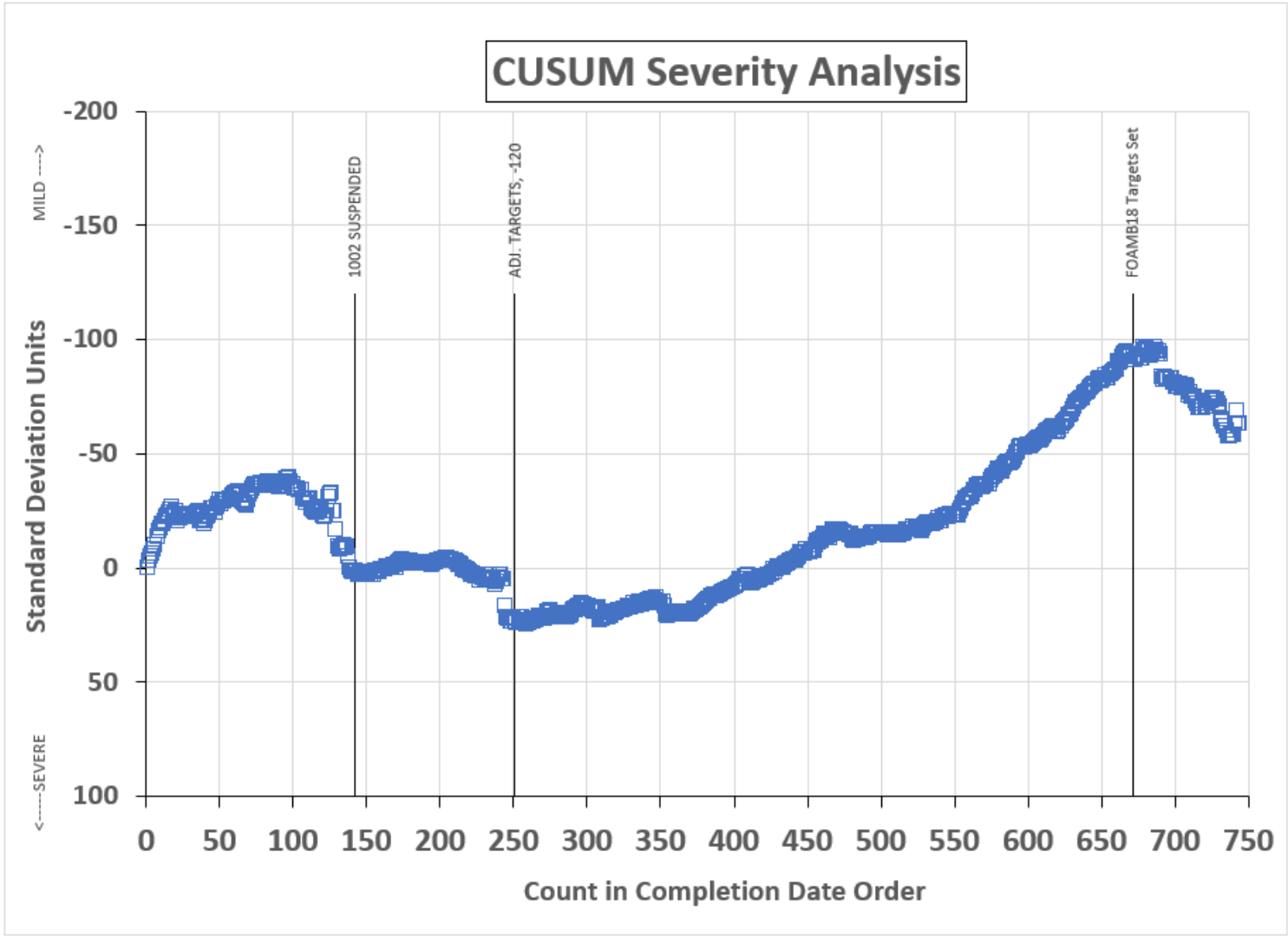
- Foam Tendency Precision (Pooled s) has regressed (to 13) this semester. Previous semester Precision was 10.
- Performance (Mean Δ/s) has moved to a more severe position at +0.66s.
- No non-zero occurrences of Foam Stability
- One discrimination run (on TMC oil 66) failed this semester.

FOAM TENDENCY



October 1, 2025 – March 31, 2026

FOAM TENDENCY



October 1, 2025 – March 31, 2026

D6082 HIGH TEMPERATURE FOAM INDUSTRY OPERATIONALLY VALID DA
Last 120 Data Points
FOAM TENDENCY

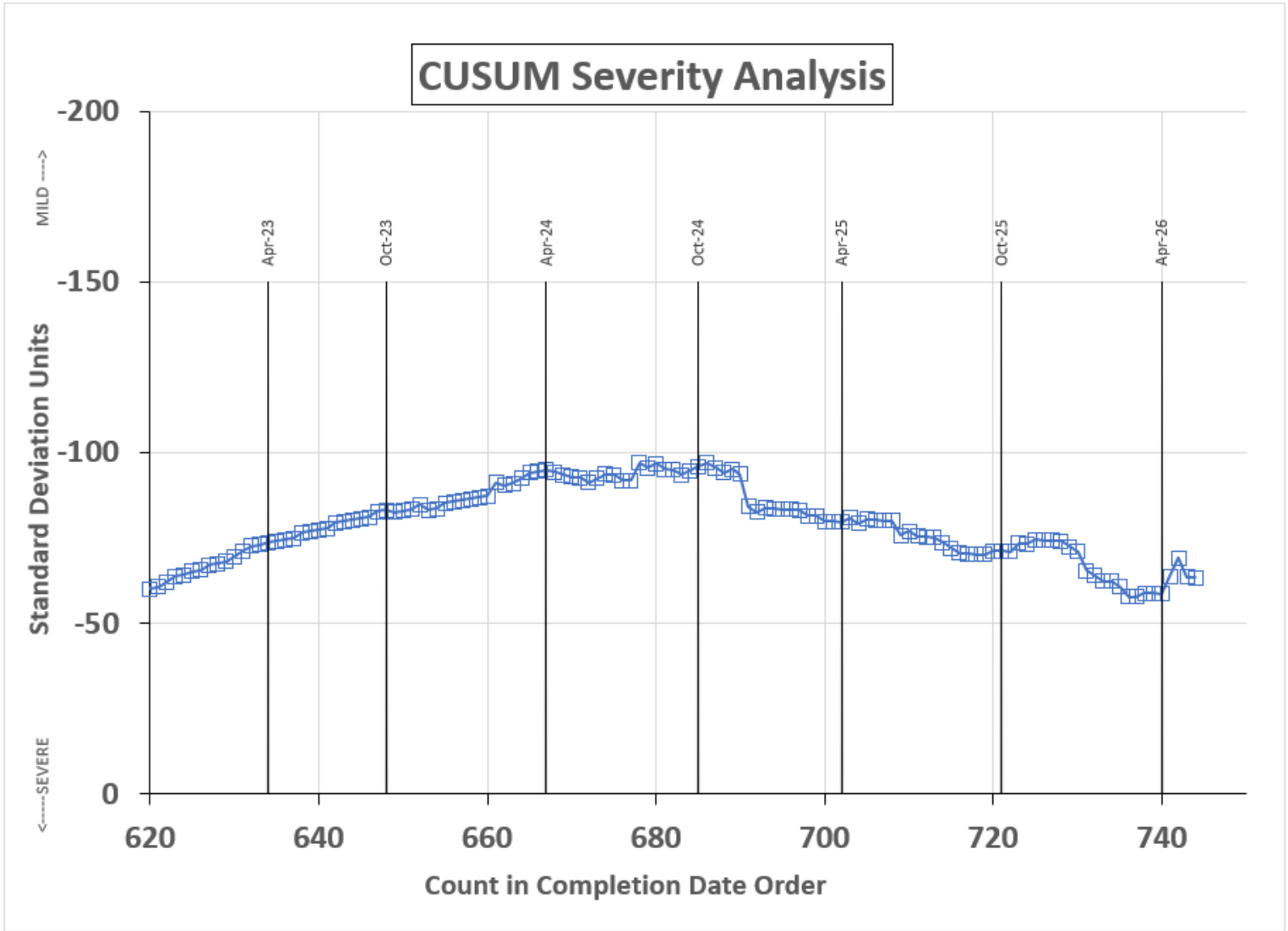


TABLE of CONTENTS

Reference Oil Inventory

D6082

Oil	Year Rec'd By TMC[A]	Tests	TMC Inventory, gallons	Gallons Shipped last 6 months	Estimated Life
FOAMB18	2018	D6082	60.4	5.2	5+ years
66	2002	D6082	63.3	2.0	5+ years

[A] Integrity of TMC reference oils is confirmed annually by analytical QC testing of chemical and physical properties.
[B] D874QC Samples (1L sizes) could quickly deplete Reference Oil 90 availability.

D02.B0.07
TMC Monitored Tests

ASTM D 6335

TEOST

October 1, 2025 – March 31, 2026

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Calibrated Labs and Stands*

(change since last Semi-Annual report)

Test	Labs	Stands
D6335	6 (-2)	12 (-2)
*As of 3/31/2026		

D6335: Deposits by TEOST-33C

Test Status	Validity Code	No. Tests
Acceptable Calibration Tests	AC	23
Failed Calibration Tests	OC	10
Operationally Invalid or Aborted by Lab	LC, XC	1
Informational Run (Test Result In Range)	NN	5
Informational Run (Test Result Out of Range)	MN	4
Total		**43**

Number of Labs Reporting Data: 8 (8 Labs Last Period)
Fail Rate of Operationally Valid Tests: 30.3% (3.3% Last Period)

D6335: Deposits by TEOST-33C

Statistically Unacceptable Tests (OC)	No. Of Tests
Total Deposits Severe	8
Total Deposits Mild	2
Total	**10**
Operationally Invalid Tests (LC, XC)	**No. Of Tests**
XC: Lab Invalidated Run (Issues with Airflow)	1
Total	**1**

- RO reblend 75-2 approved for use with current RO 75-1 acceptance range.

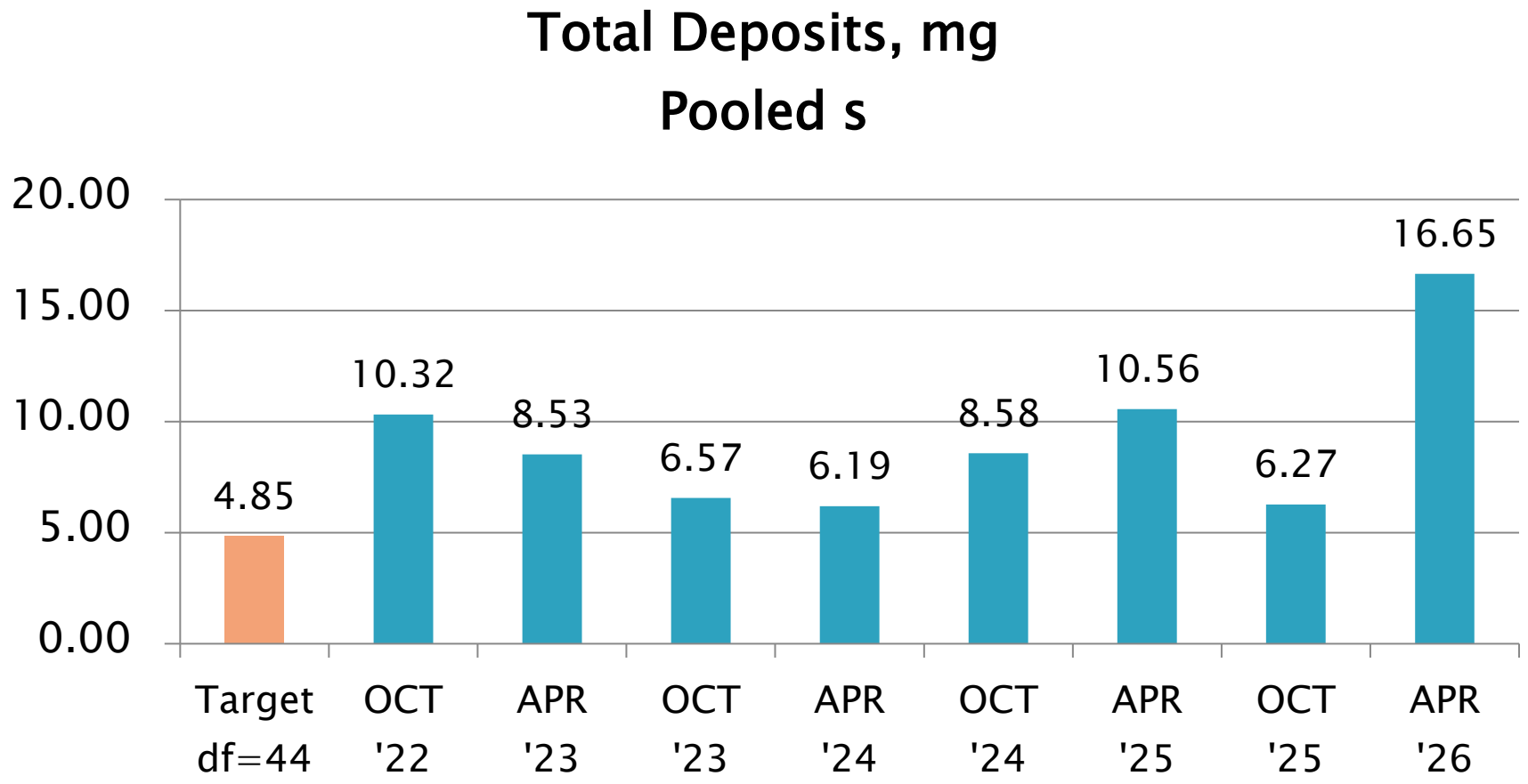
D6335: Deposits by TEOST-33C

Period Precision and Severity Estimates

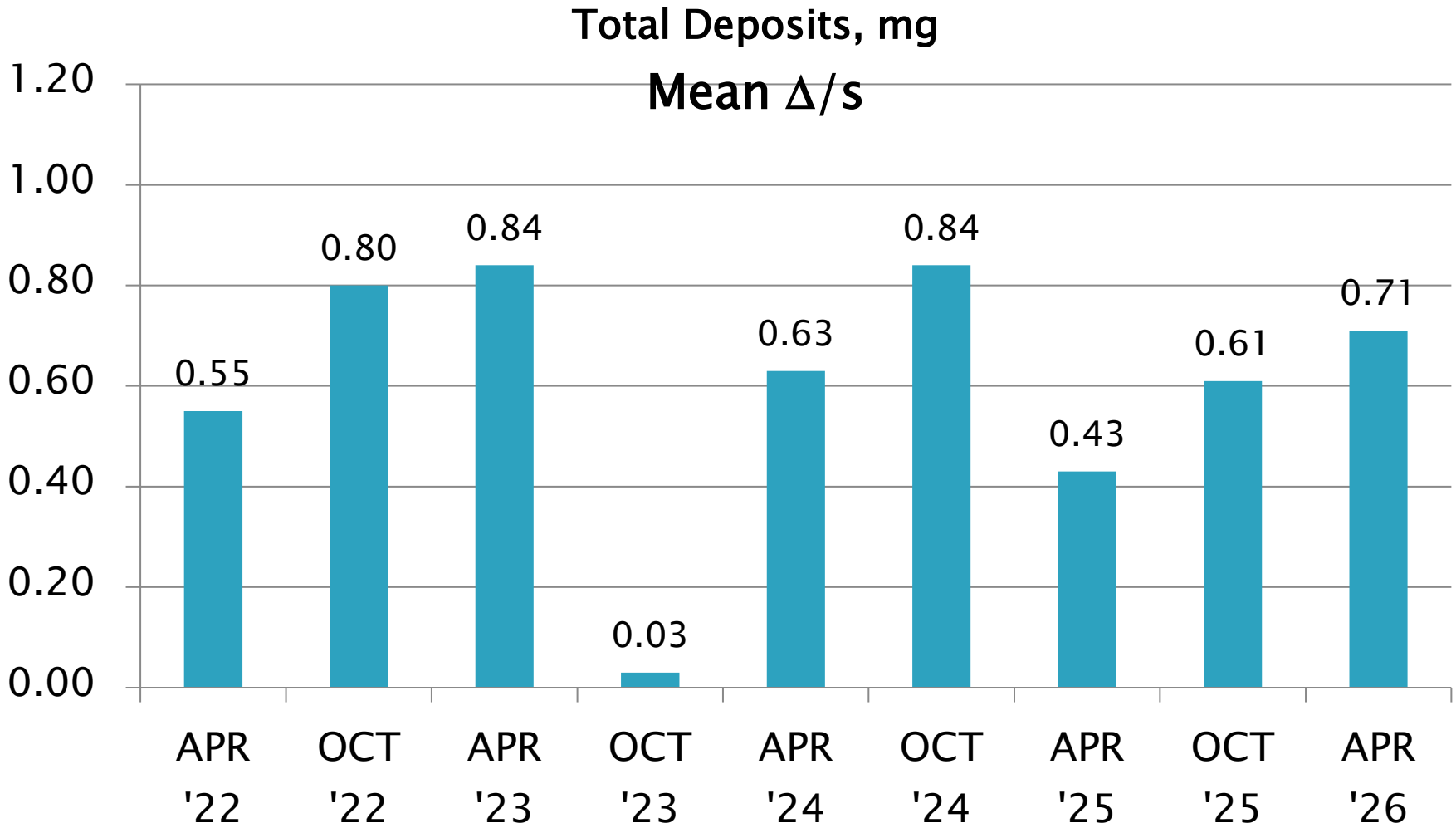
Total Deposits, mg	n	df	Pooled s	Mean Δ/s
Updated Targets 20201001[1]	46	44	4.85	-----
4/1/21 through 9/30/21	31	28	8.27	-0.36
10/1/21 through 3/31/22	27	25	6.22	0.55
4/1/22 through 9/30/22	29	27	10.32	0.80
10/1/22 through 3/31/23	35	33	8.53	0.84
4/1/23 through 9/30/23	30	28	6.57	0.03
10/1/23 through 3/31/24	34	32	6.19	0.63
4/1/24 through 9/30/24	41	39	8.58	0.84
10/1/24 through 3/31/25	29	27	10.56	0.43
10/1/25 through 3/31/26	30	27	6.27	0.61
10/1/25 through 3/31/26	33	30	16.65	0.71

[1]Target precision updated to include only current oils 75-1 and 435-2

D6335 Precision Estimates



D6335 Severity Estimates



October 1, 2025 – March 31, 2026

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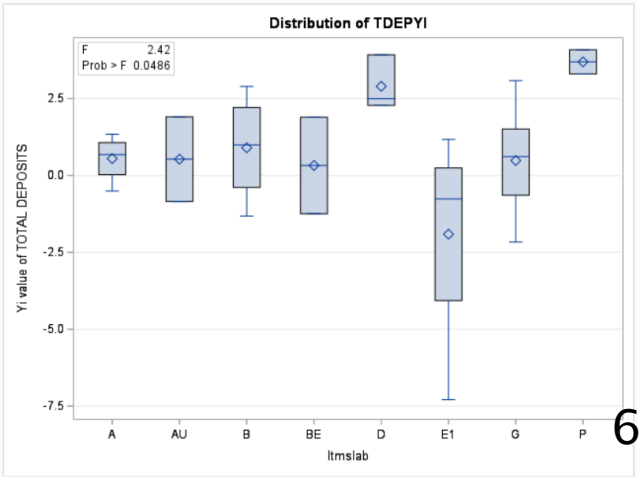
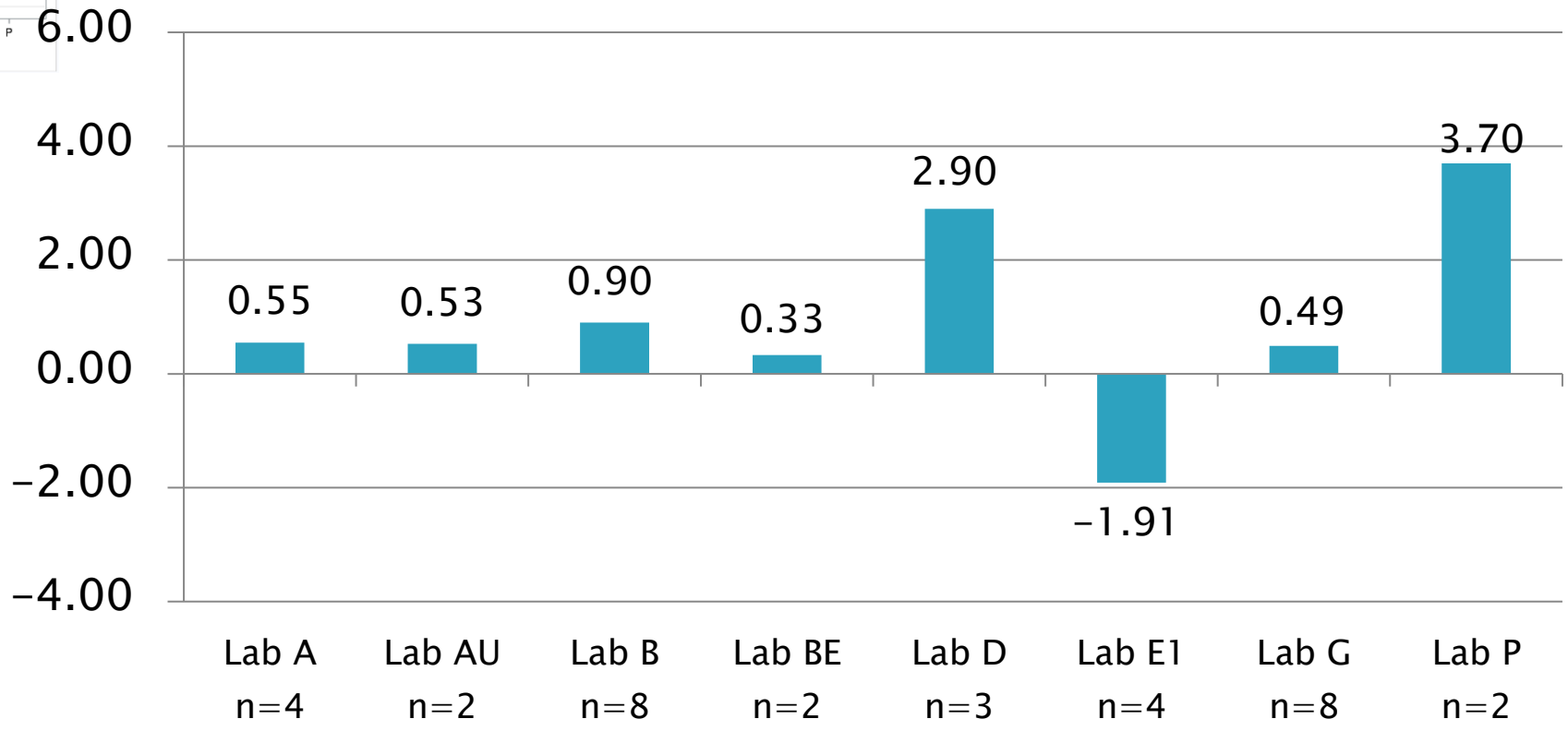


D6335 Lab Severity Estimates

Total deposits, mg

Mean Δ/s

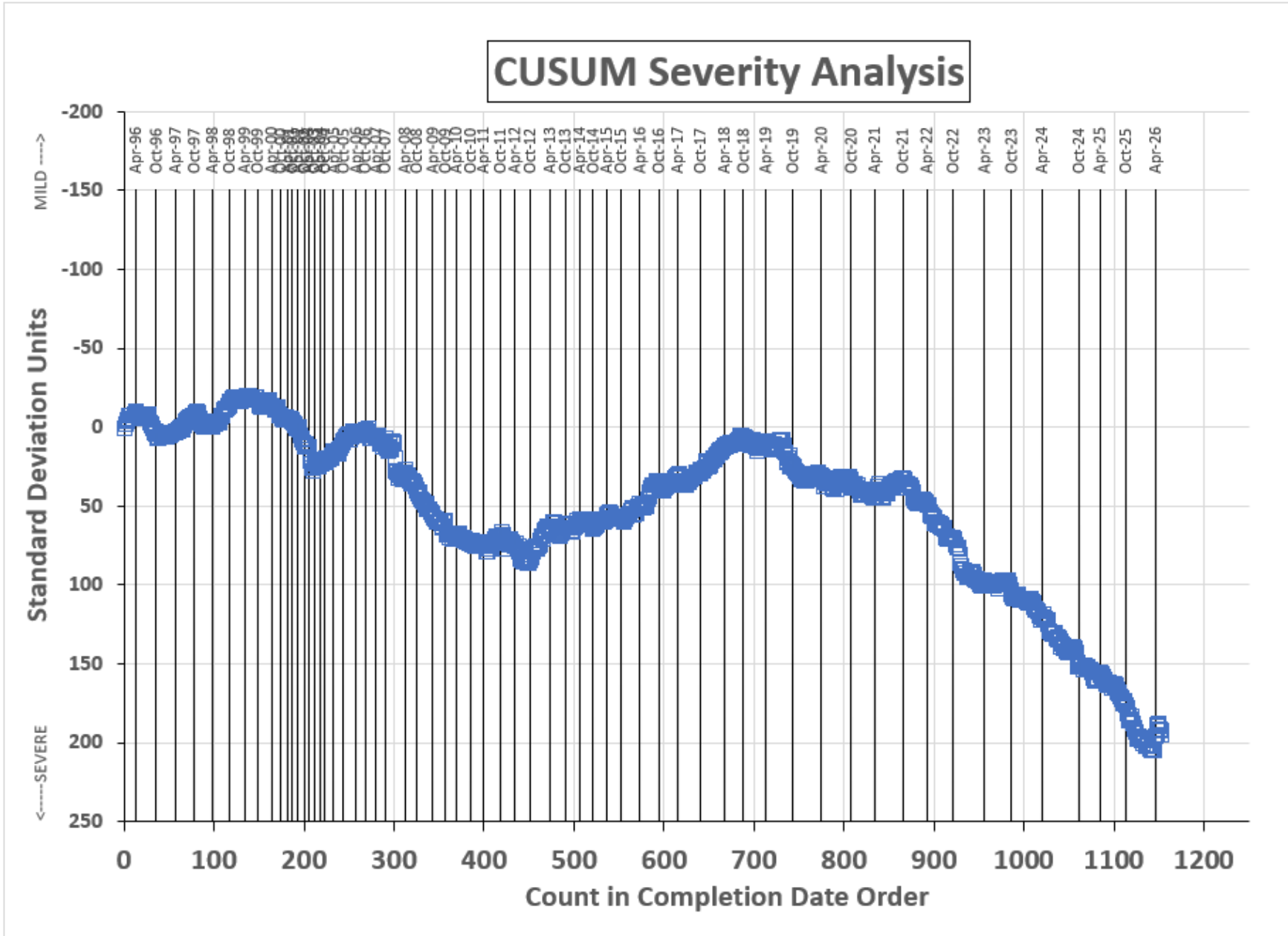


D6335: Deposits by TEOST-33C Status

- Precision (Pooled s) regressed away from target this semester (13.23s vs 6.27s)
- Performance (Mean Δ/s) regressed this this period moving to 0.71 (0.61 last semester)
- Fail rate increased significantly to 30.3% this semester, last semester fail rate was 3.3%.
- All tests this period report used Rod Batch N.
- Reblend RO 75-2 has replaced batch 75-1. Only one lab has RO 75-1 TESTKEYs in inventory.

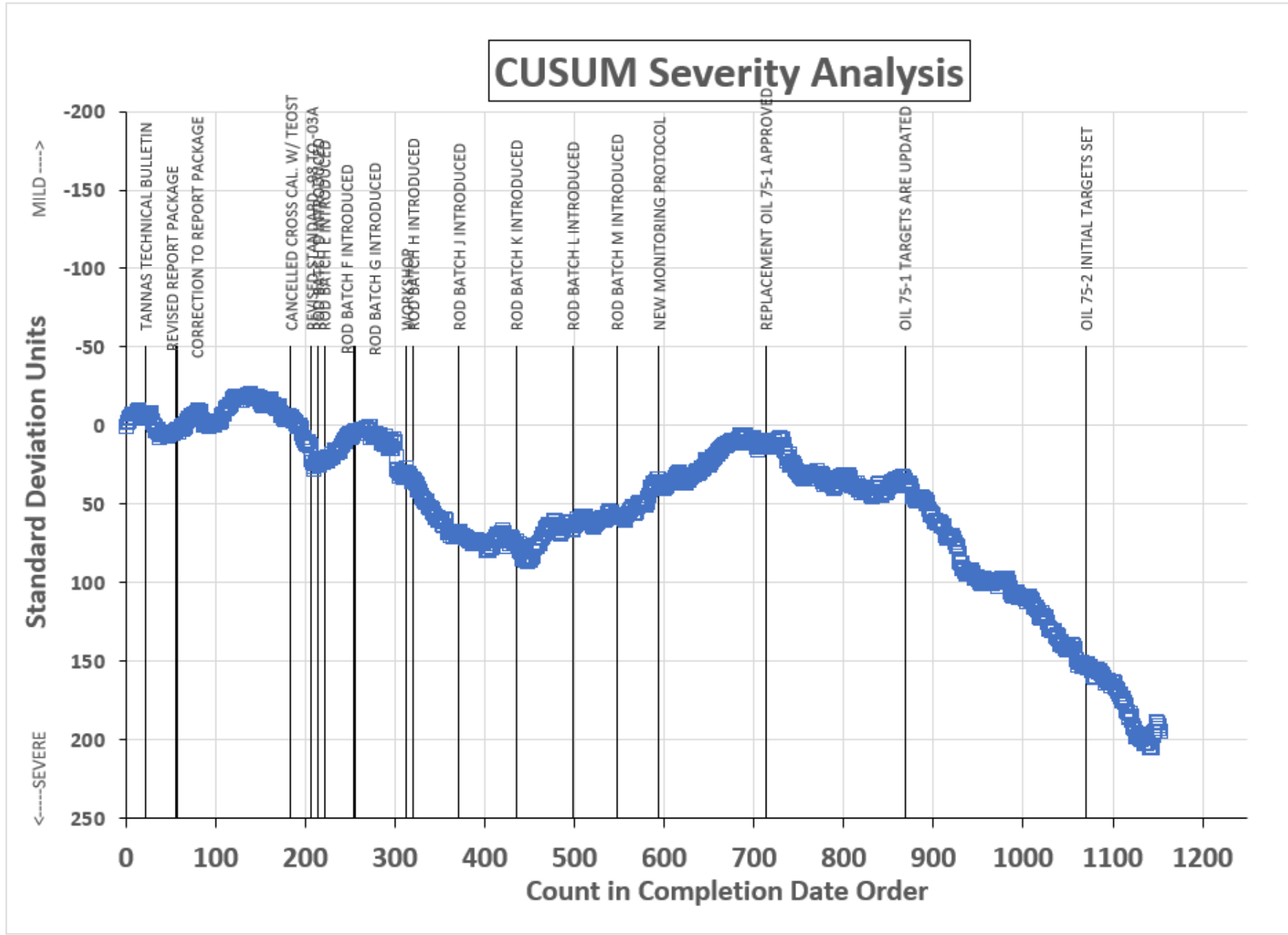
TEOST –33C INDUSTRY OPERATIONALLY VALID DATA

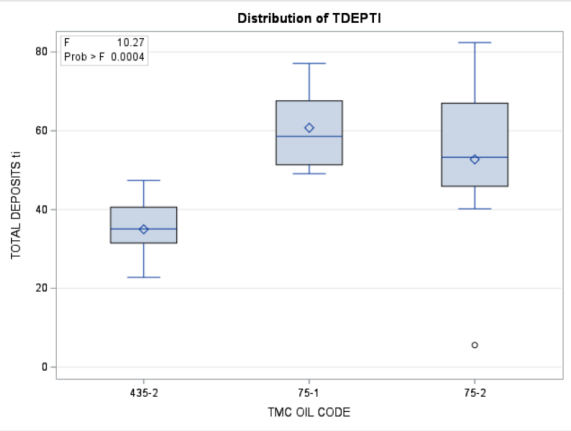
TOTAL DEPOSITS MG



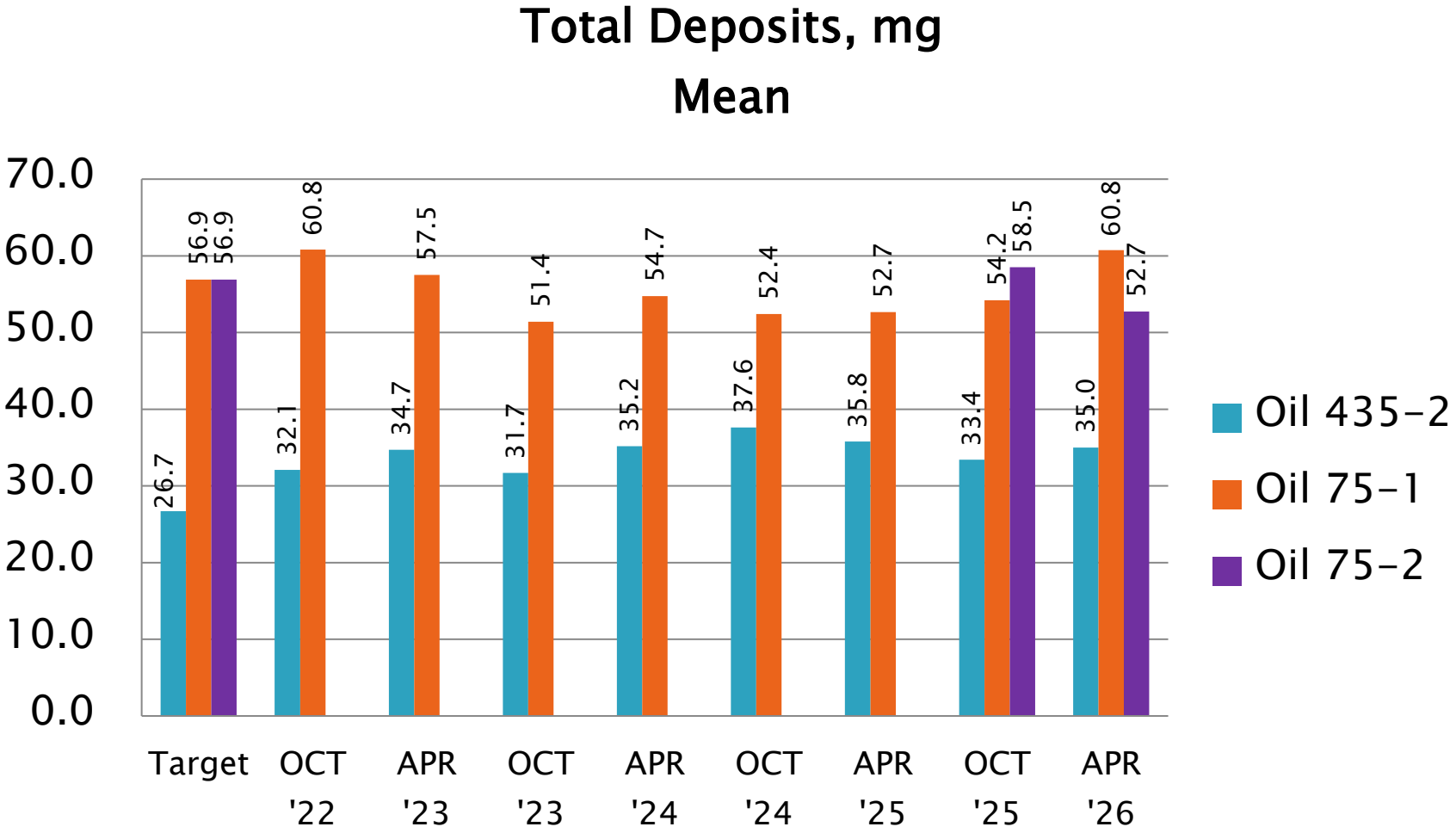
TEOST –33C INDUSTRY OPERATIONALLY VALID DATA

TOTAL DEPOSITS MG





D6335 Performance by Oil



October 1, 2025 – March 31, 2026

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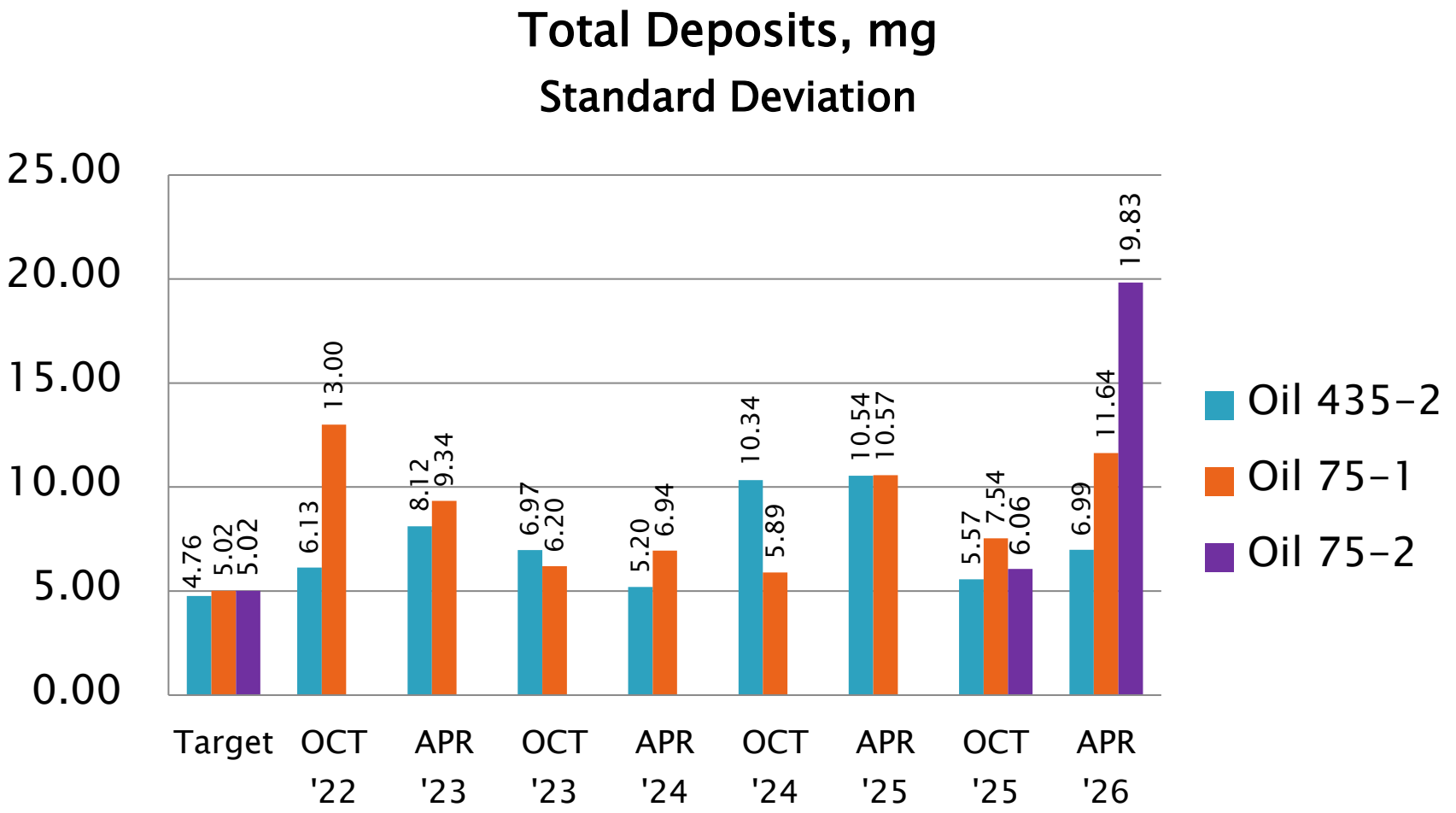
D6335 Performance by Oil



October 1, 2025 – March 31, 2026

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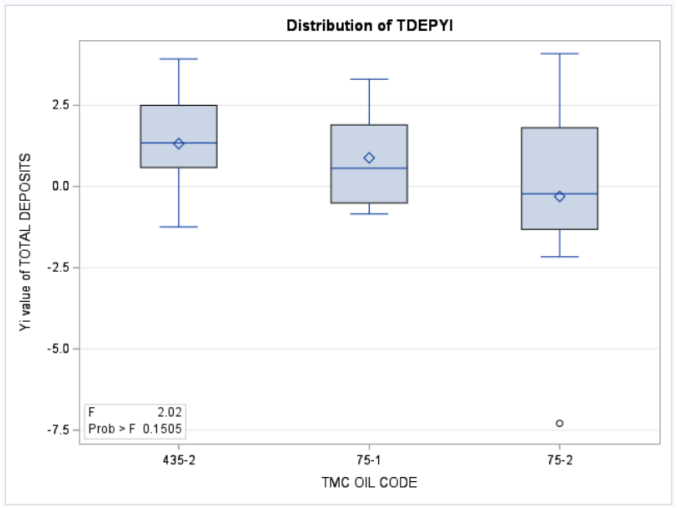

D6335 Performance by Oil

Total Deposits, mg

Mean Δ/s

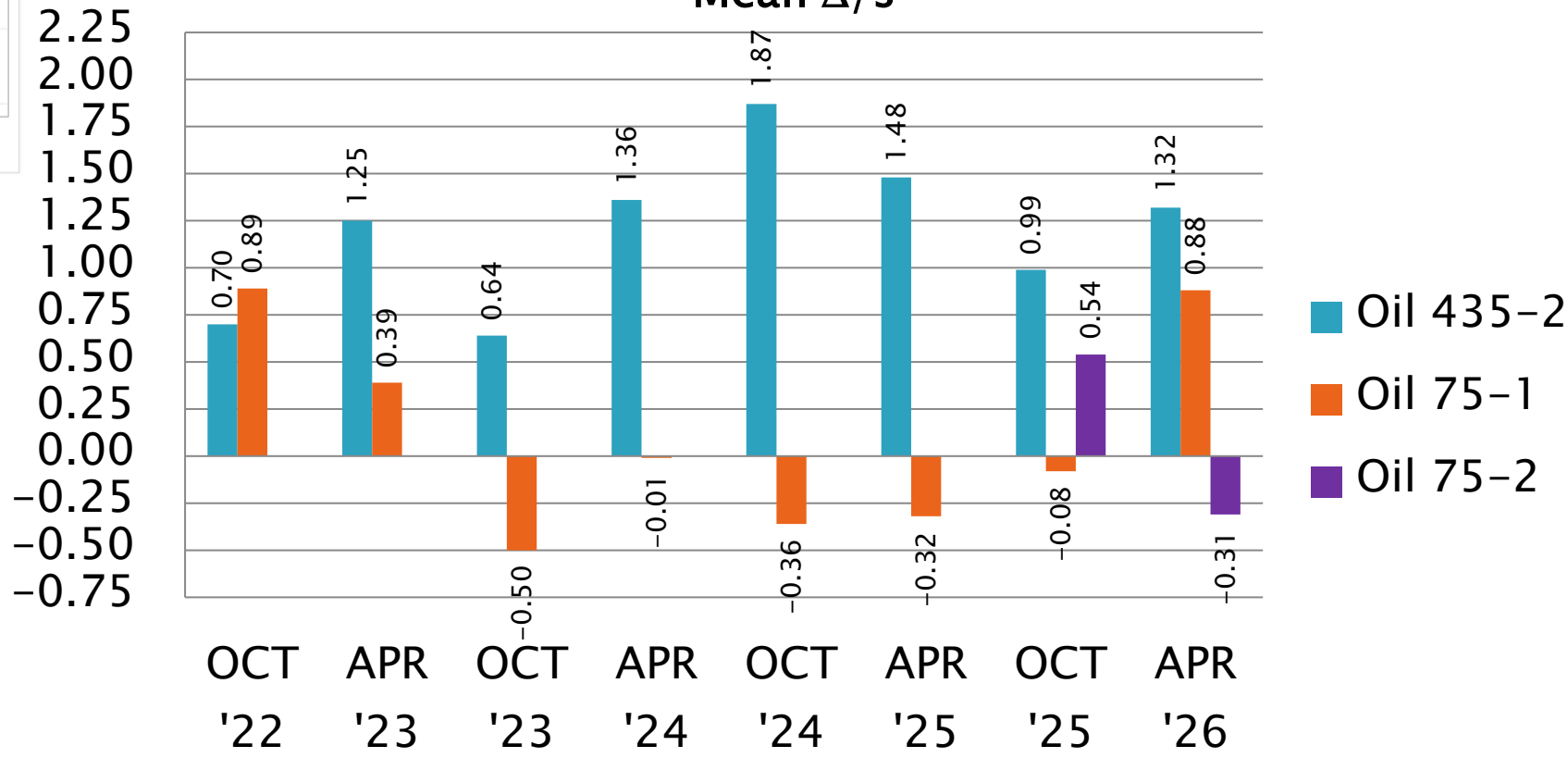

TABLE of CONTENTS

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Reference Oil Inventory

TEOST

Oil	Year Rec'd By TMC[A]	Tests	TMC Inventory, gallons	Gallons Shipped last 6 months	Estimated Life
75-2	2024	TEOST	4.40	1.08	2 years
435-2[B]	2010	TEOST	30.2	1.3	5+ years

[A] Integrity of TMC reference oils is confirmed annually by analytical QC testing of chemical and physical properties.
[B] Multi-test oil; estimated aliquot reserved for bench testing.

D02.B0.07
TMC Monitored Tests

» ASTM D 6417

October 1, 2025 – March 31, 2026

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D6417 Calibrated Labs and Stands*

(change since last Semi-Annual report)

Test	Labs	Stands
D6417	7 (+0)	10 (-2)

*Between 10/1/2025 and 3/31/2026

D6417: Estimation of Engine Oil Volatility by Capillary GC

Test Status	Validity Code	No. Tests
Acceptable Calibration Test	AC	18
Failed Calibration Test	OC	1
Total		**19**

Number of Labs Reporting Data: 7
Fail Rate of Operationally Valid Tests: 5.3%

D6417: Estimation of Engine Oil Volatility by Capillary GC

Statistically Unacceptable Tests (OC)	No. Of Tests
Volatility Loss Mild	1
Volatility Loss Severe	0

Operationally Invalid Tests (LC)	No. Of Tests
Daily QC was out of range (Severe)	0

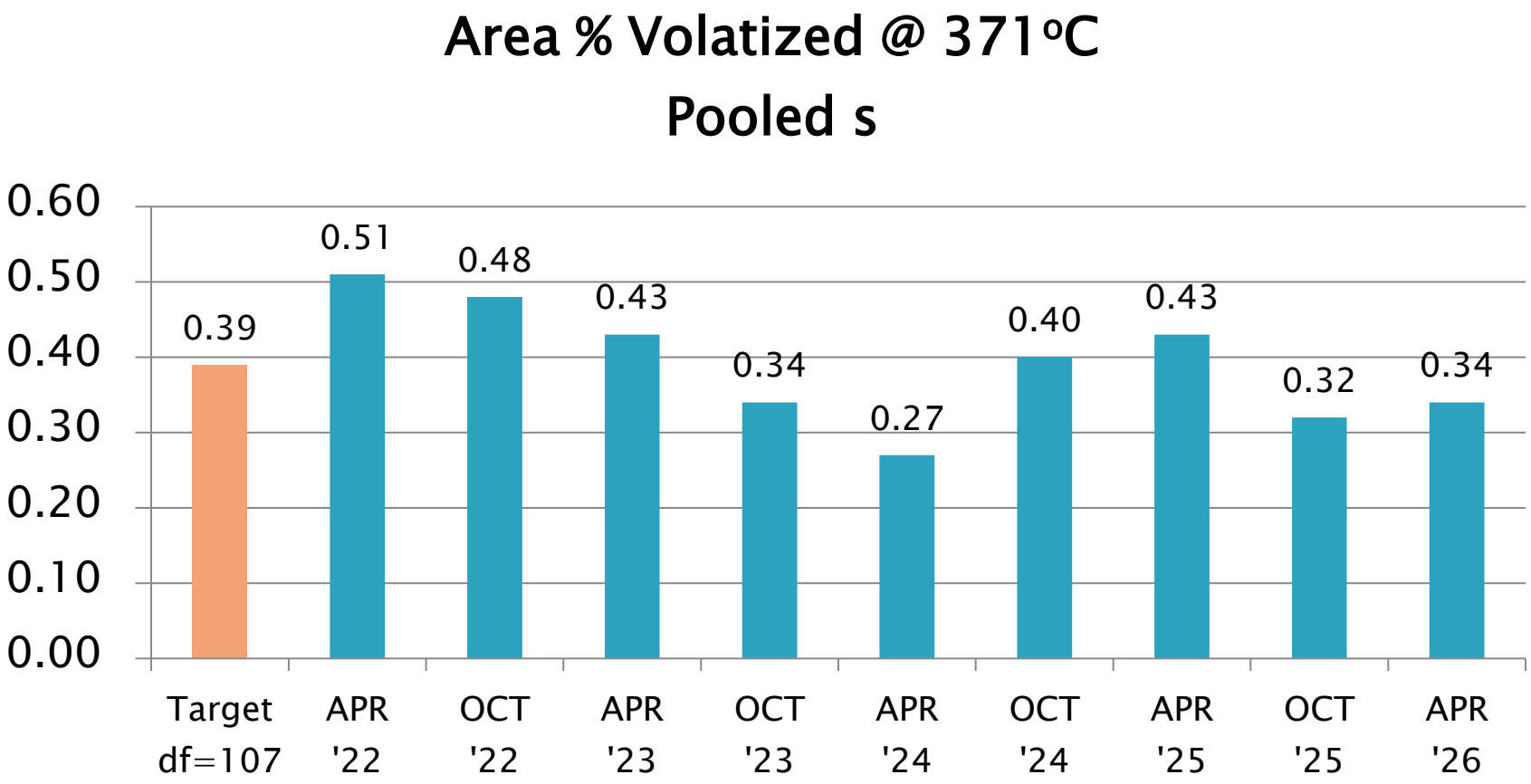
- No D6417 TMC technical updates were issued this report period.

D6417: Estimation of Engine Oil Volatility by Capillary GC

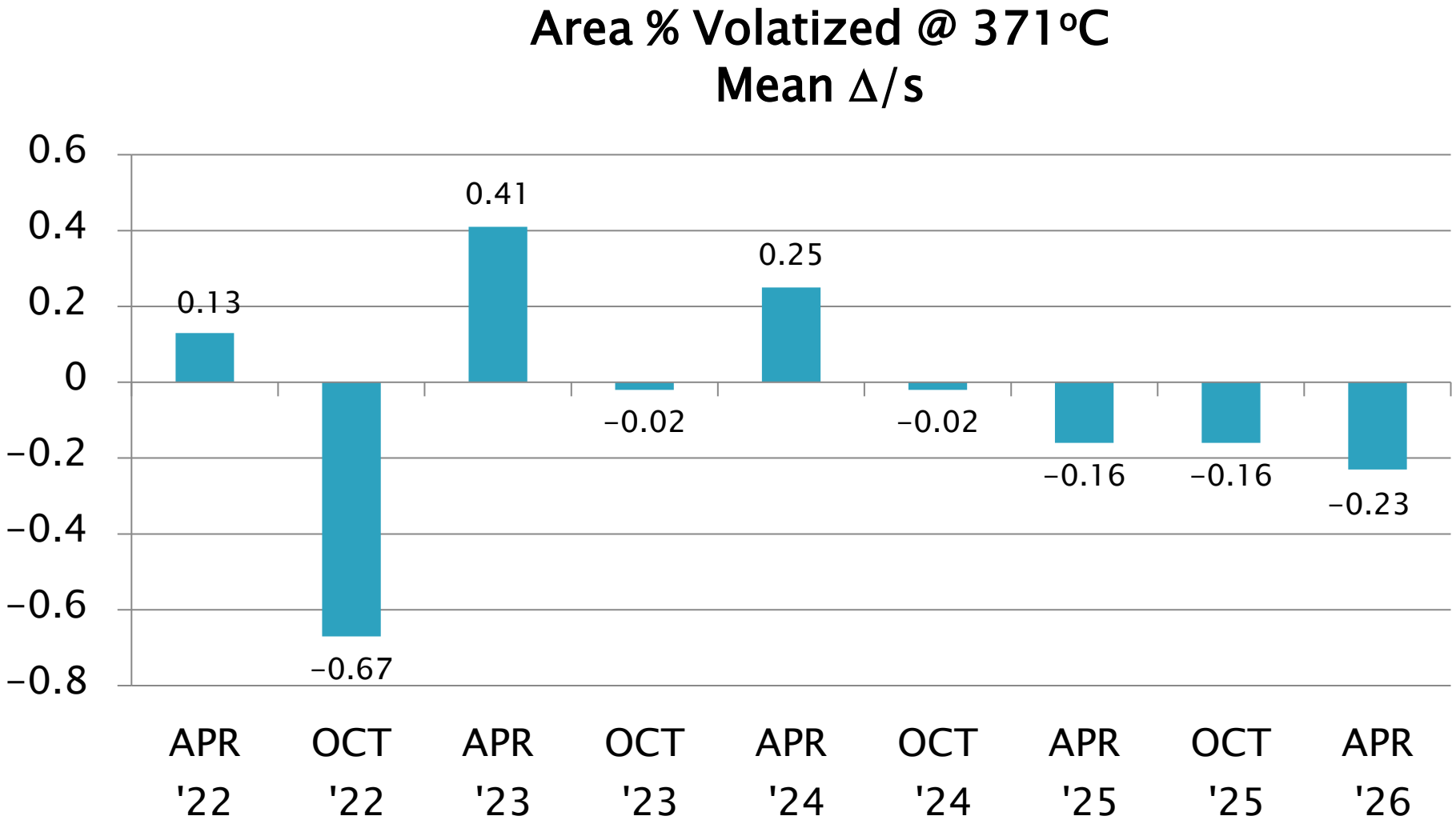
Period Precision and Severity Estimates

Area % Volatized @ 371°C	n	df	Pooled s	Mean Δ/s
Initial Selected Oils from RR	54	51	0.39	-----
4/1/21 through 9/30/21	17	14	0.39	-0.28
10/1/21 through 3/31/22	20	17	0.51	0.13
4/1/22 through 9/30/22	19	16	0.48	-0.67
10/1/22 through 3/31/23	18	15	0.43	0.41
4/1/23 through 9/30/23	16	13	0.34	-0.02
10/1/23 through 3/31/24	18	15	0.27	0.25
4/1/24 through 9/30/24	20	17	0.40	-0.02
10/1/24 through 3/31/25	20	17	0.43	-0.16
10/1/25 through 3/31/26	21	18	0.32	-0.16
10/1/25 through 3/31/26	19	16	0.34	-0.23

D6417 Precision Estimates



D6417 Severity Estimates



October 1, 2025 – March 31, 2026

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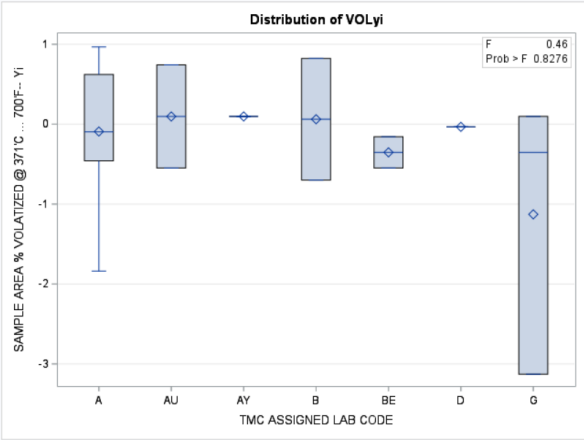
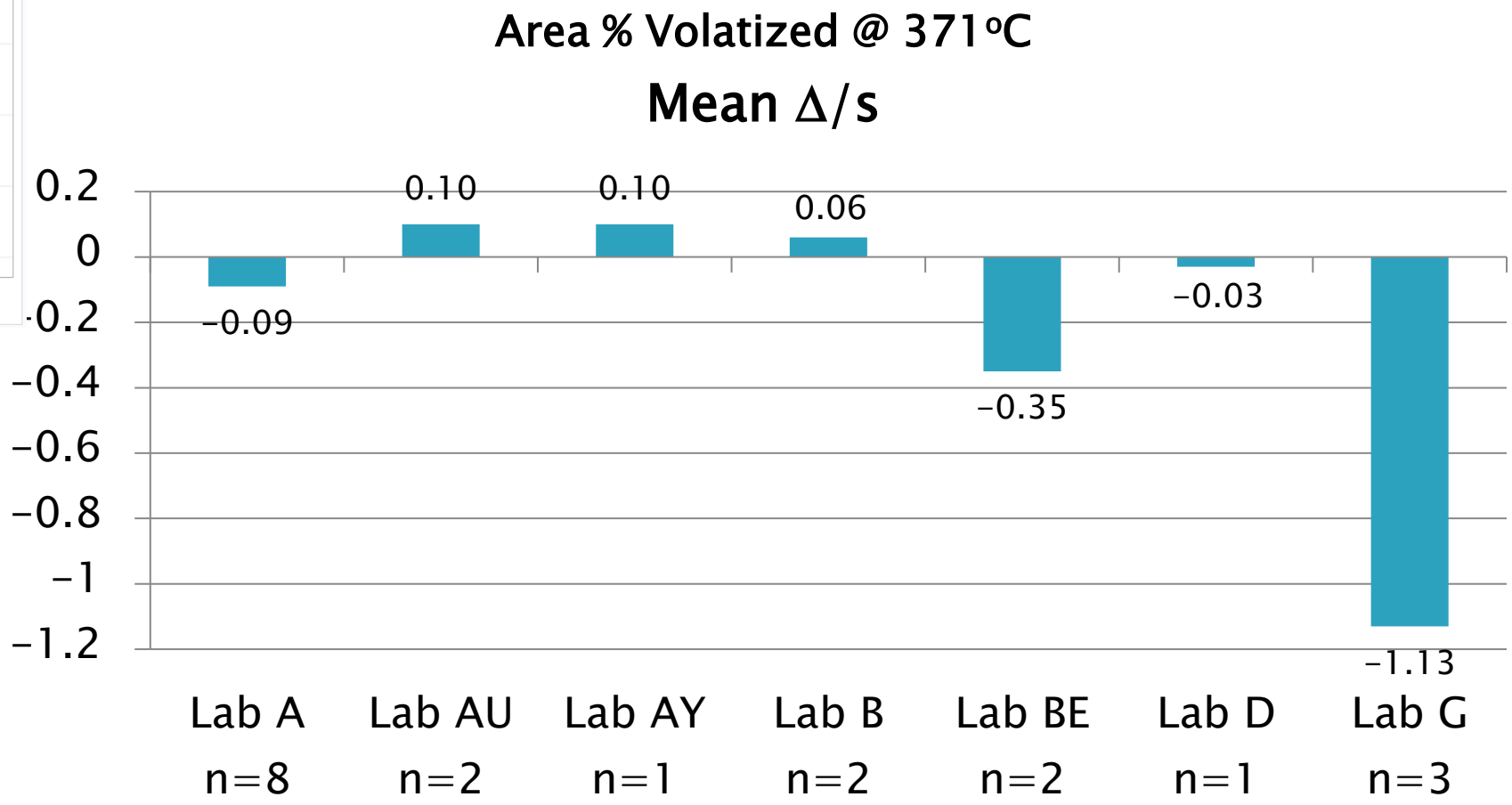
D6417 Lab Severity Estimates





October 1, 2025 – March 31, 2026

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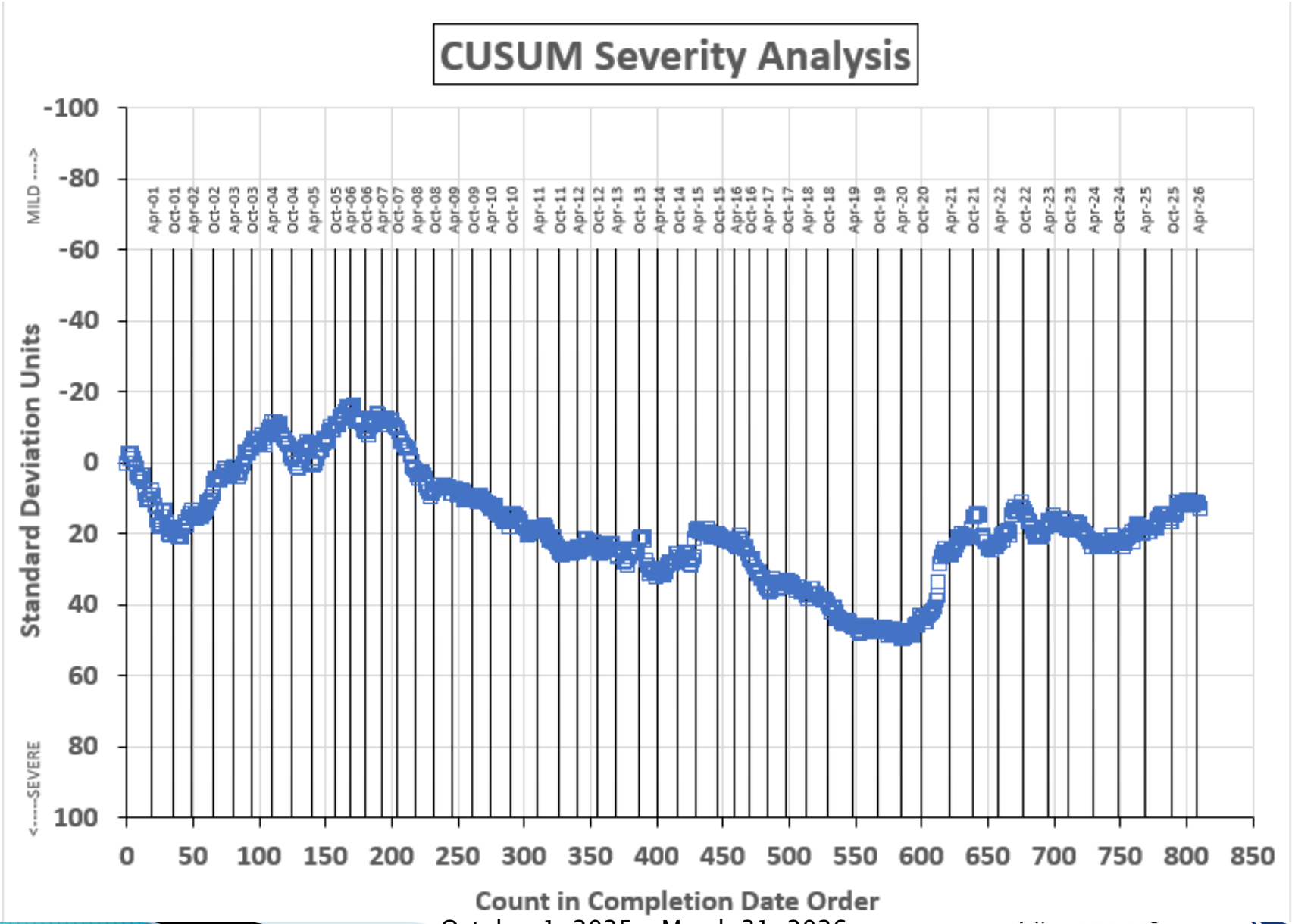
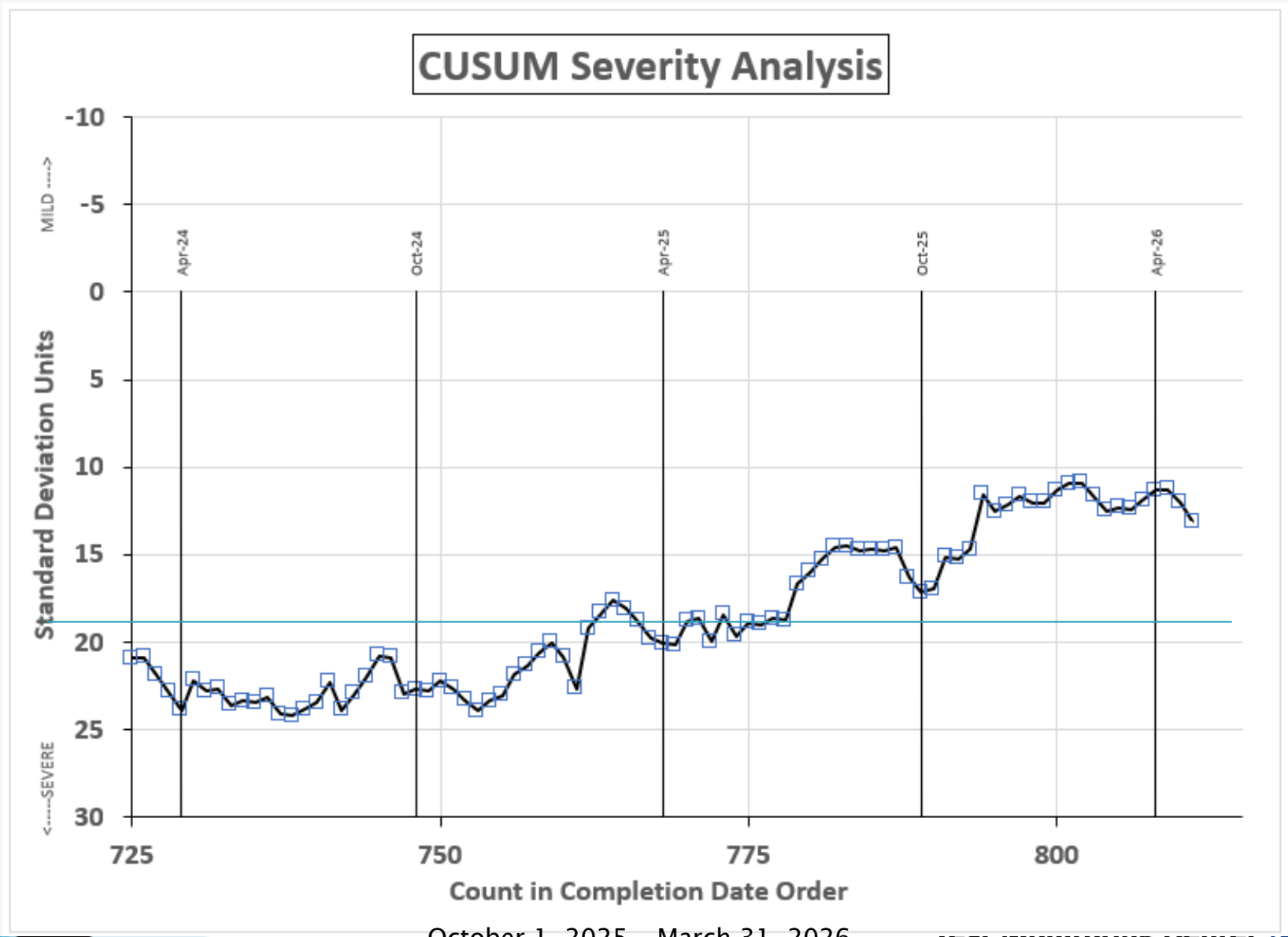
D6417 VOLATILITY BY GC INDUSTRY OPERATIONALLY VALID DATA

SAMPLE AREA % VOLATIZED



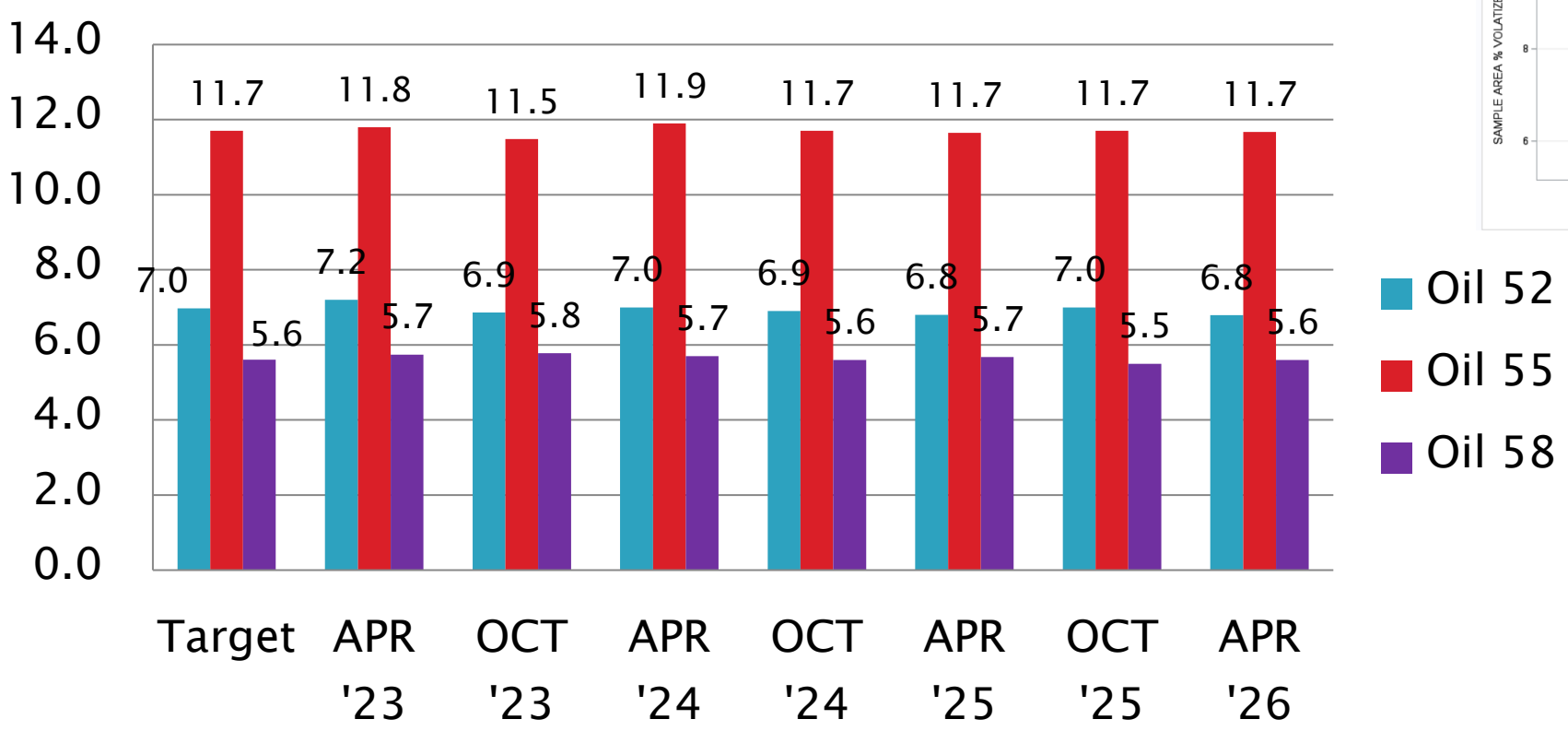
October 1, 2025 – March 31, 2026

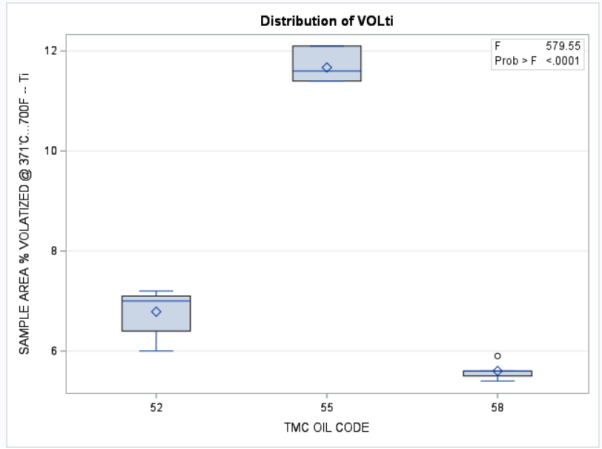
D6417 VOLATILITY BY GC INDUSTRY OPERATIONALLY VALID DATA
LAST 90 Points
SAMPLE AREA % VOLATIZED



October 1, 2025 – March 31, 2026

D6417 Performance by Oil





October 1, 2025 – March 31, 2026

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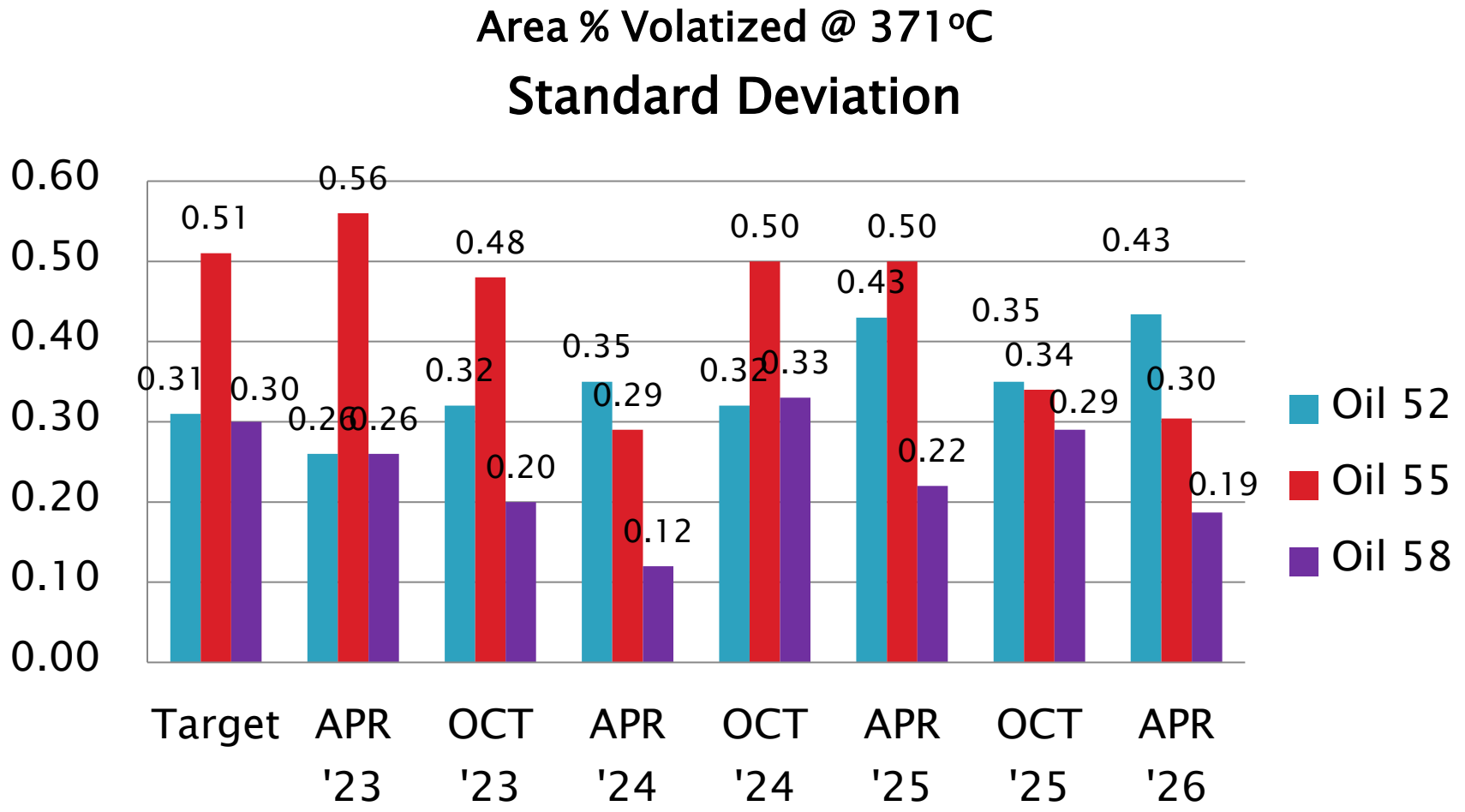
D6417 Performance by Oil



October 1, 2025 – March 31, 2026

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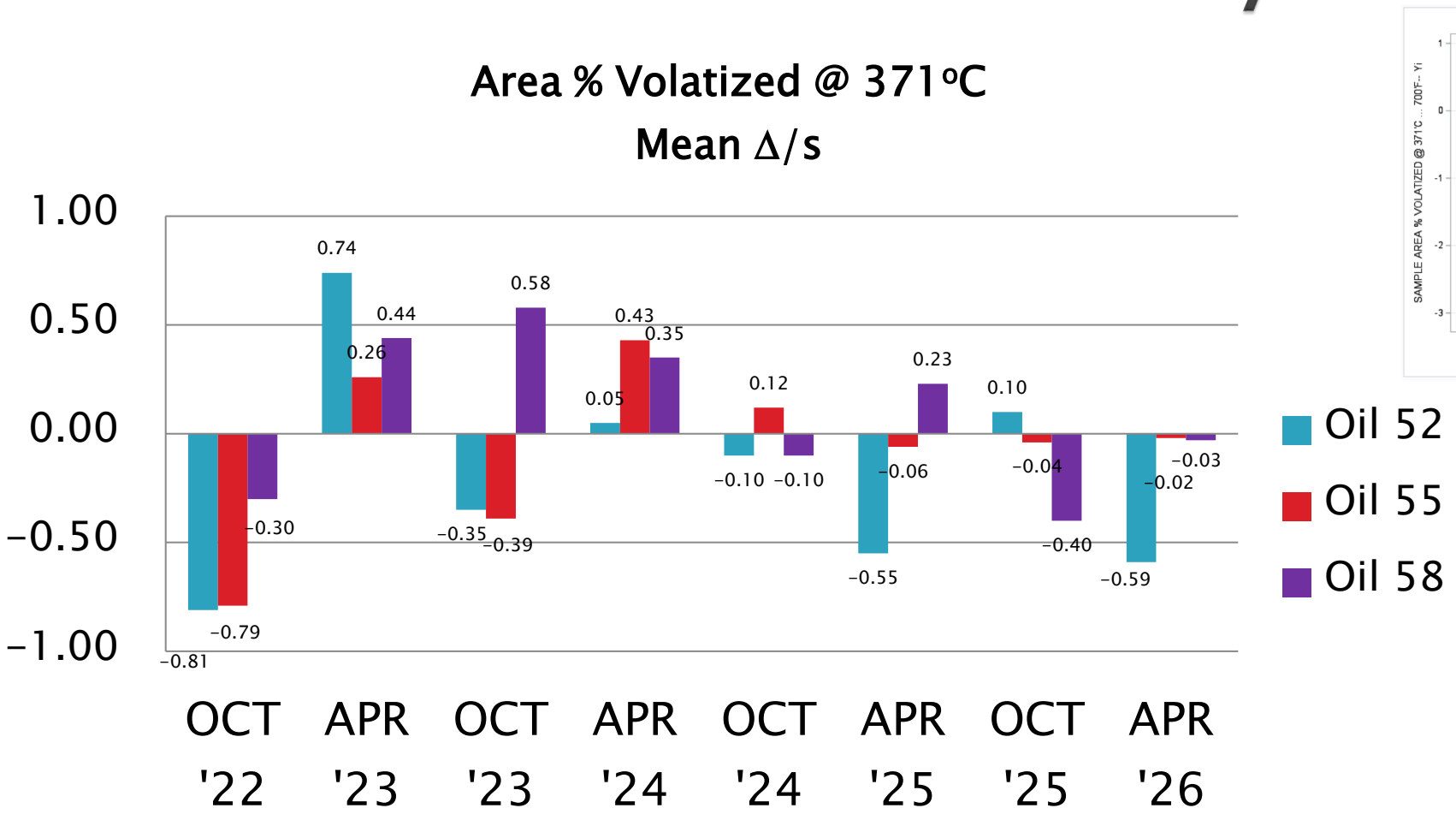
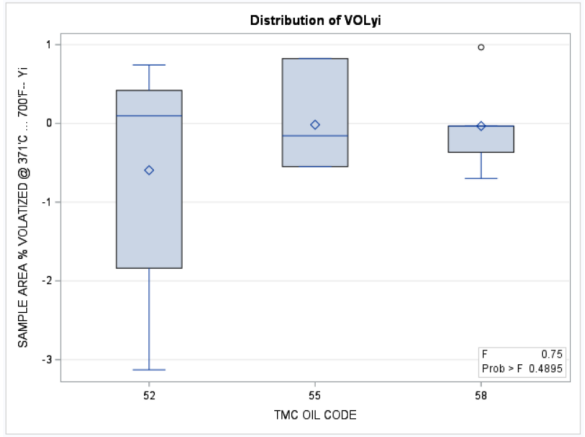
D6417 Performance by Oil





October 1, 2025 – March 31, 2026

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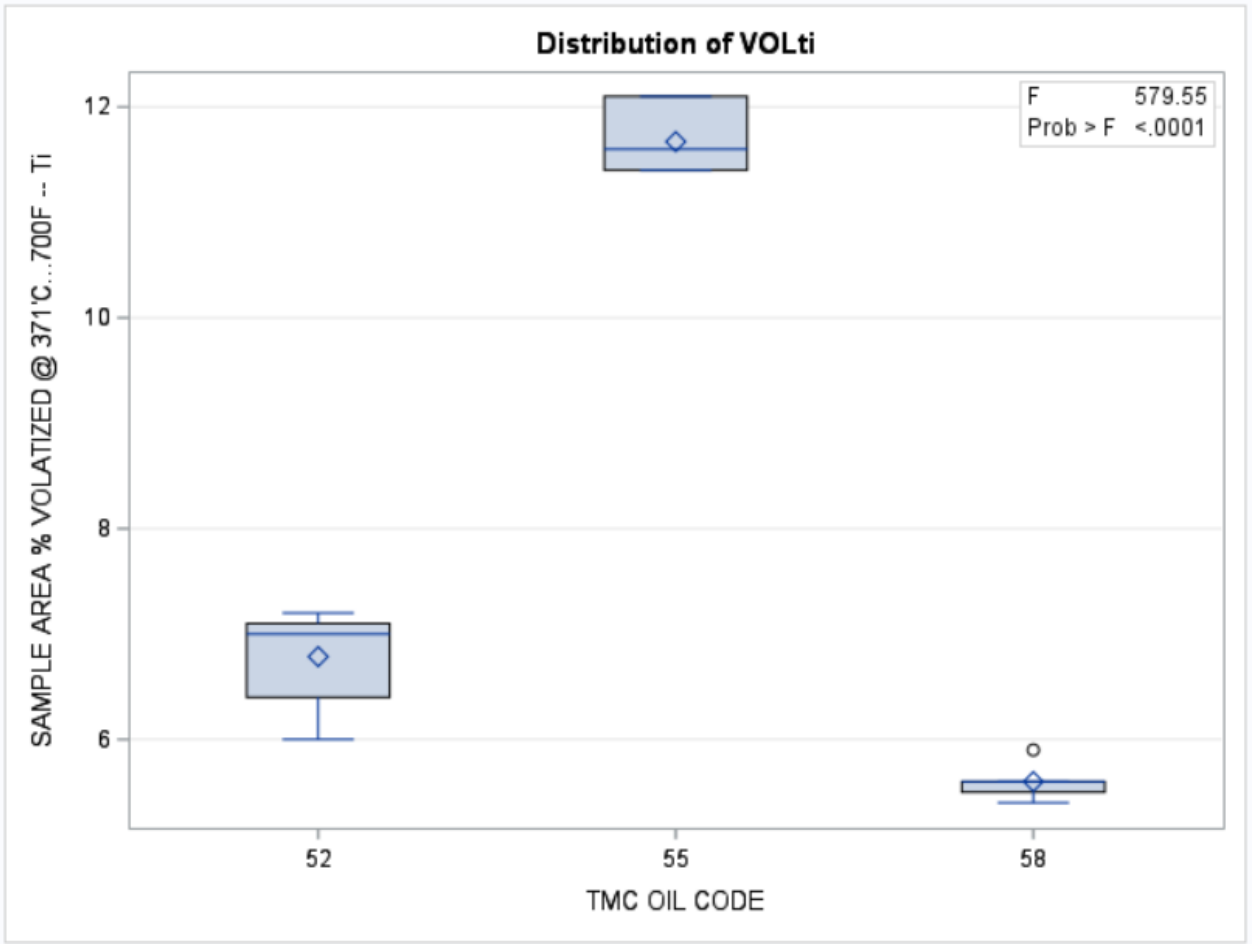
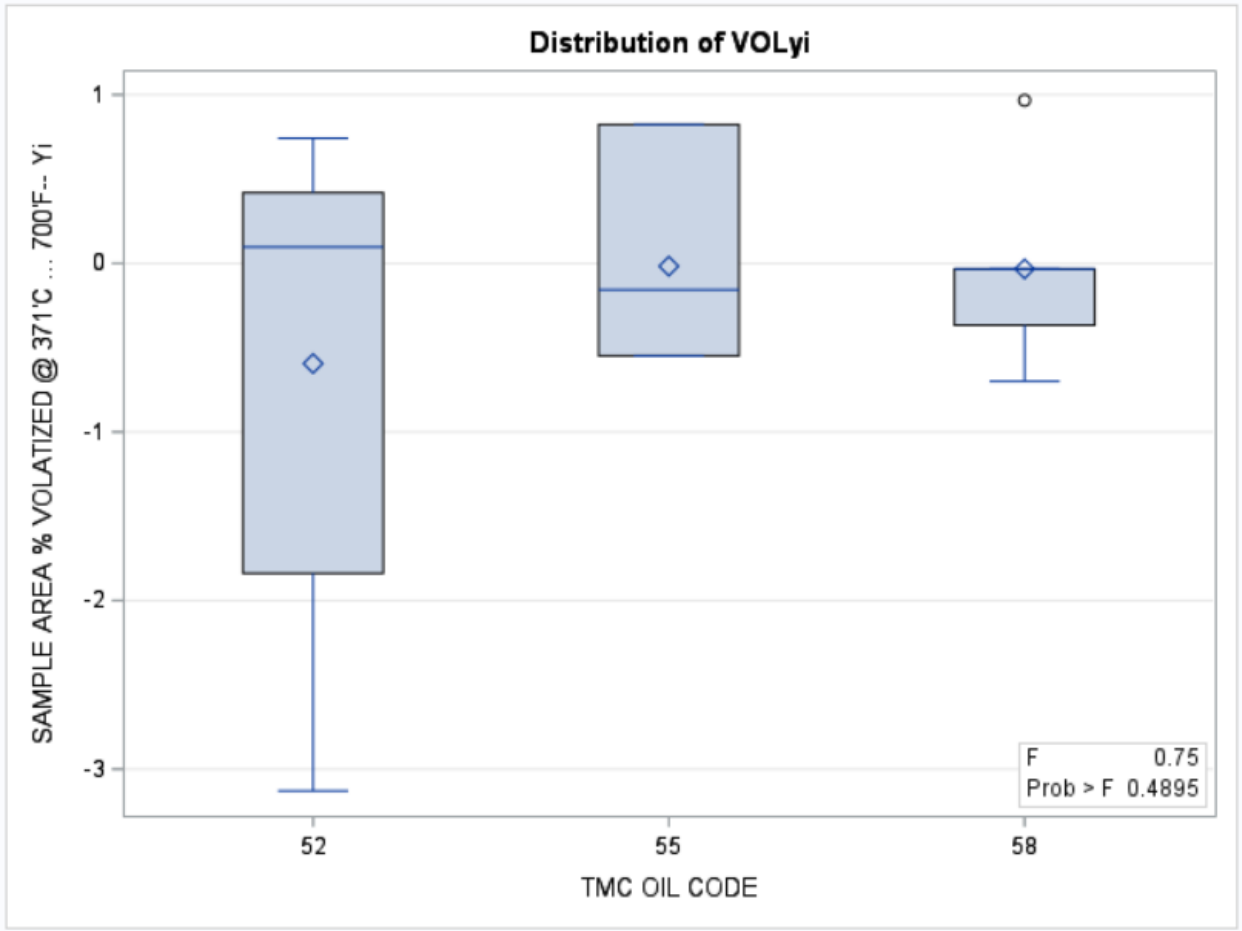
D6417 Performance by Oil





D6417: Estimation of Engine Oil Volatility by Capillary GC Status

- Precision (Pooled s) continues to be remarkably consistent and on target (again) this past semester.
- Performance (Mean Δ/s) regressed slightly this semester (-0.23 vs -0.16), however it is still near target.
- CUSUM severity continuing to be relatively flat this semester

TABLE of CONTENTS

Reference Oil Inventory

D6417

Oil	Year Rec'd By TMC[A]	Tests	TMC Inventory, gallons	Gallons Shipped last 6 months	Estimated Life
52[B]	1995	D6417	59.4	<0.01	5+ years
55	1995	D6417	65.9	<0.01	5+ years
58	1998	D6417, D6417QC	111.2	0.1	5+ years

[A] Integrity of TMC reference oils is confirmed annually by analytical QC testing of chemical and physical properties.
[B] Reference Oil 58 is used in multiple Bench Test Areas.

D02.B0.07
TMC Monitored Tests

ASTM D 6557

Ball Rust Test (BRT)

October 1, 2025 – March 31, 2026

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Calibrated Labs and Stands*

(change since last Semi-Annual report)

Test	Labs	Stands
D6557	5 (+0)	5 (+0)
*As of 3/31/2026		

BRT Test Activity*

Test Status	Validity Code	Number of Tests
Acceptable Calibration Test	AC	169
Failed Calibration Test	OC	0
Operationally Invalid	LC, RC, LS, RS	1
Aborted Run	XC, XS	1
Shakedown Run (Result Within Acceptance Band)	NN	0
Shakedown Run (Result Outside Acceptance Band)	MN	0
Total		**171**

- FIVE labs reported data

BRT Failed Tests

Failed Parameter (OC)	Number of Tests
Severe (low) Average Gray Value	0
Mild (high) Average Gray Value	0
Total	**0**

RO 82-1	No Assignments
RO 86	No Assignments
RO 87	No Assignments
RO 1006	No Failed Tests

BRT Failed Tests (OC) by Lab

Failed Parameter	LTMS Lab					#
	A	B	D	G	L	
Severe Average Gray Value	0	0	0	0	0	0
Mild Average Gray Value	0	0	0	0	0	0
Total	0	0	0	0	0	0

BRT Lost Tests*

Failed Parameter (LC, RC, XC)	Number of Tests
Temperature Control Issues (LC)	0
Shaker Tabel Failure (LC)	0
Testing Time Error (LC)	0
Aborted due to loss of power (XC)	1
Invalidated by TMC. Image calibration out of range (RC)	1
Total	**2**

*Invalid (LC, RC) and Aborted (XC) calibration tests

BRT Lost Tests by Lab

Cause	LTMS Lab					#
	A	B	D	G	L	
Temperature Control Issues (LC)	0	0	0	0	0	0
Shaker Tabel Failure (LC)	0	0	0	0	0	0
Testing Time Error (LC)	0	0	0	0	0	0
Aborted due to loss of power (XC)	0	0	0	1	0	1
Image Calibration Out of Range (RC)	0	0	0	1	0	1
Total	**0**	**0**	**0**	**2**	**0**	**2**

BRT (D6557) Rust Protection Test

Period Precision and Severity Estimates

Average Gray Value	n	df	Pooled s	Mean Δ/s
10/1/21 through 3/31/22	141	138	16.28	0.12
4/1/22 through 9/30/22	154	151	21.10	-0.29
10/1/22 through 3/31/23	165	162	15.56	-0.17
4/1/23 through 9/30/23	171	168	17.56	0.34
10/1/23 through 3/31/24	183	179	13.75	0.32
4/1/24 through 9/30/24	166	162	14.41	-0.07
10/1/24 through 3/31/25	170	168	7.90	-0.61
10/1/25 through 3/31/26	177	176	3.63	-0.63
10/1/25 through 3/31/26	169	168	3.99	-0.45

*Period statistics for all Valid Reference Oil Results (pooled)

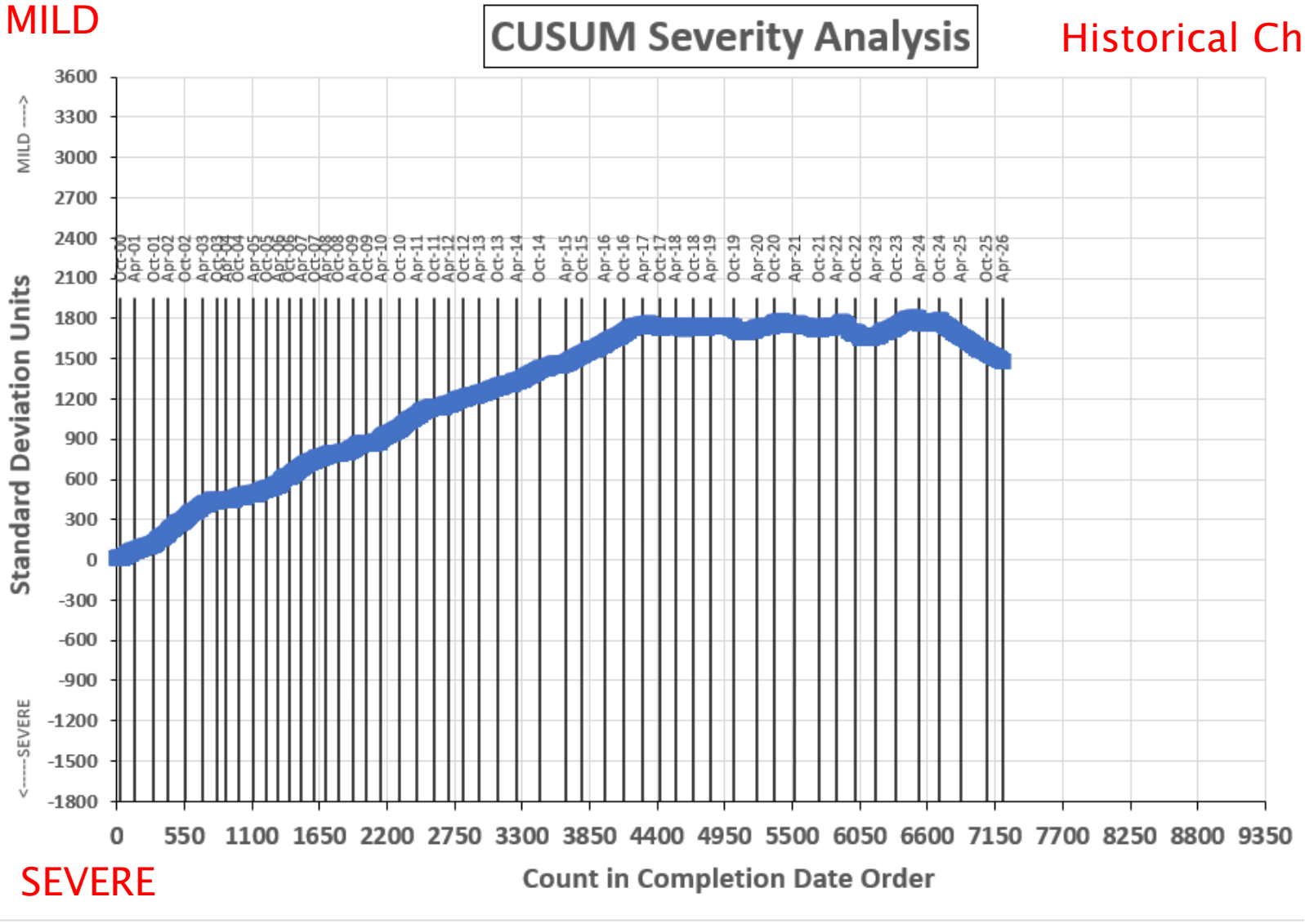
D6557: Ball Rust Test Status

- Calibration tests continue to be run only on Reference Oil 1006 (High Reference Oil).
- A re-write of the test procedure to add Gen 3 analysis system has been completed and an Information Letter was issued.
- One lab noticed that test results in the lower AGV range was a bit different for the Gen 3 system versus older systems. Labs are currently conducting round-robin testing of the analysis system using previously tested hardware (with known AGV results) to determine how best to tune the new analysis system.

BALL RUST TEST INDUSTRY OPERATIONALLY VALID DATA

REFERENCE AVERAGE GRAY VALUE

MILD



SEVERE

BALL RUST TEST INDUSTRY OPERATIONALLY VALID DATA
Last 500 Points
REFERENCE AVERAGE GRAY VALUE

MILD

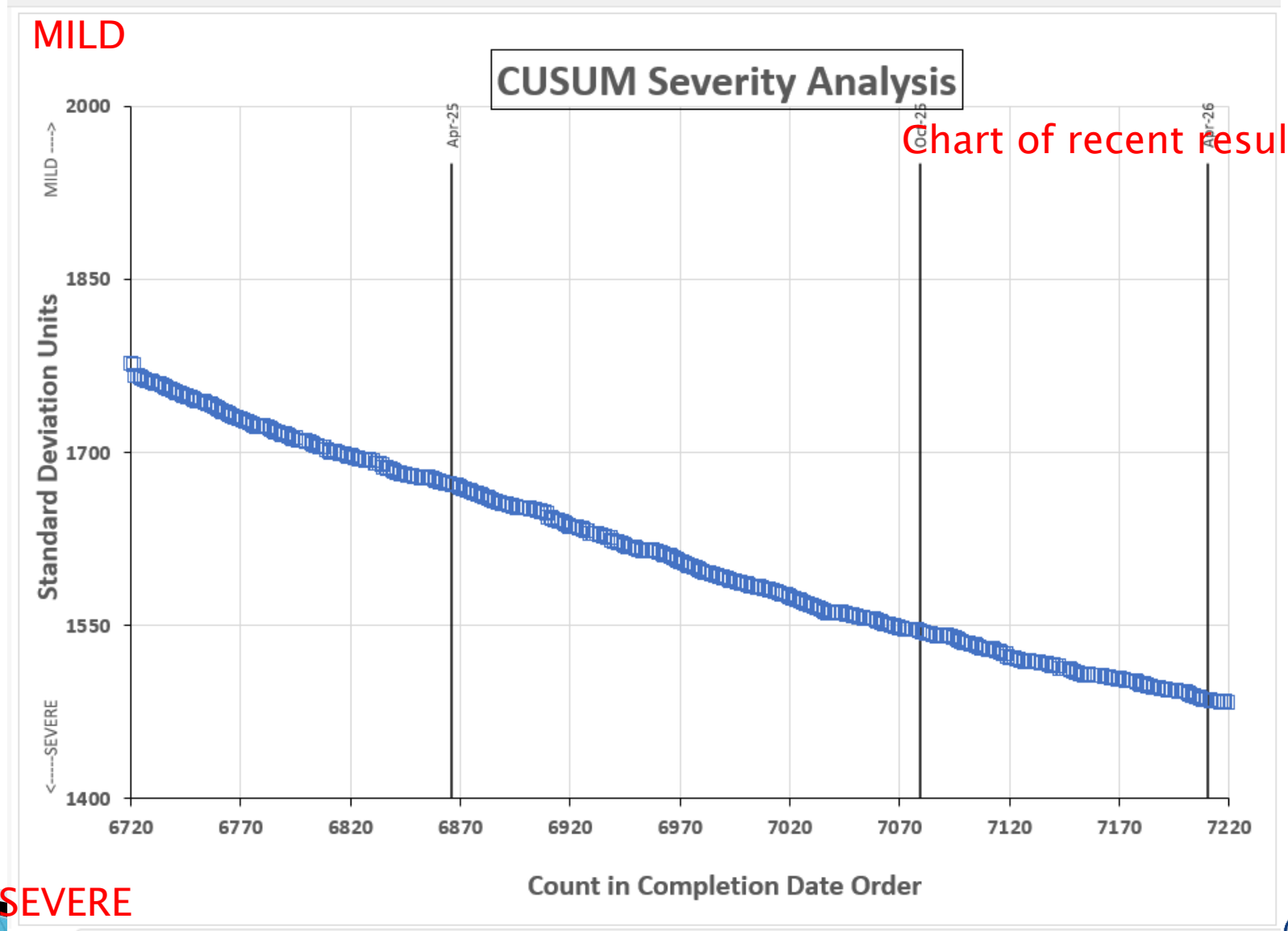


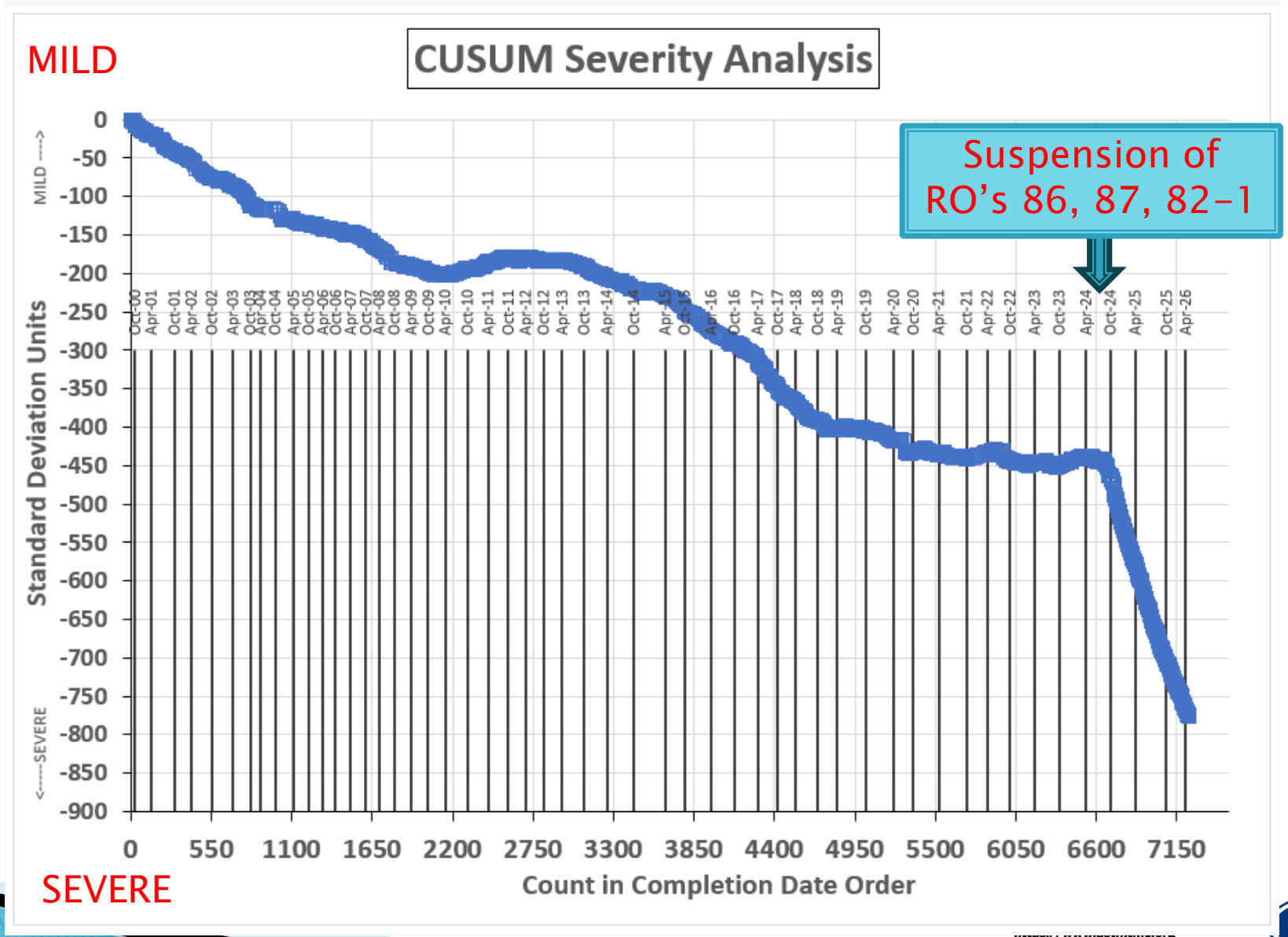
Chart of recent results

SEVERE

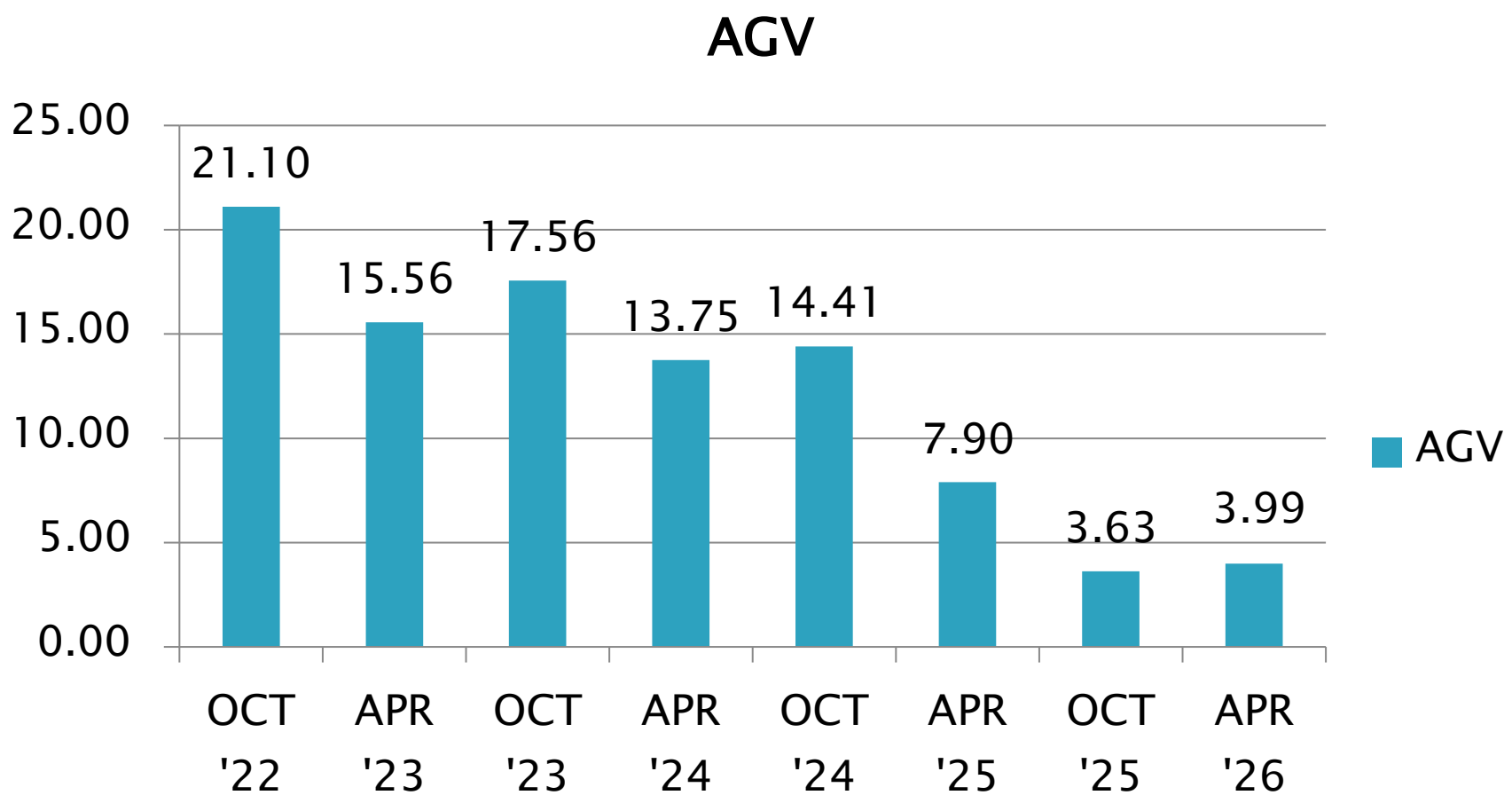
BALL RUST TEST INDUSTRY OPERATIONALLY VALID DATA

REFERENCE AVERAGE GRAY VALUE

REF OIL 1006 Test Results



BRT Precision (Pooled s) Estimates



October 1, 2025 – March 31, 2026

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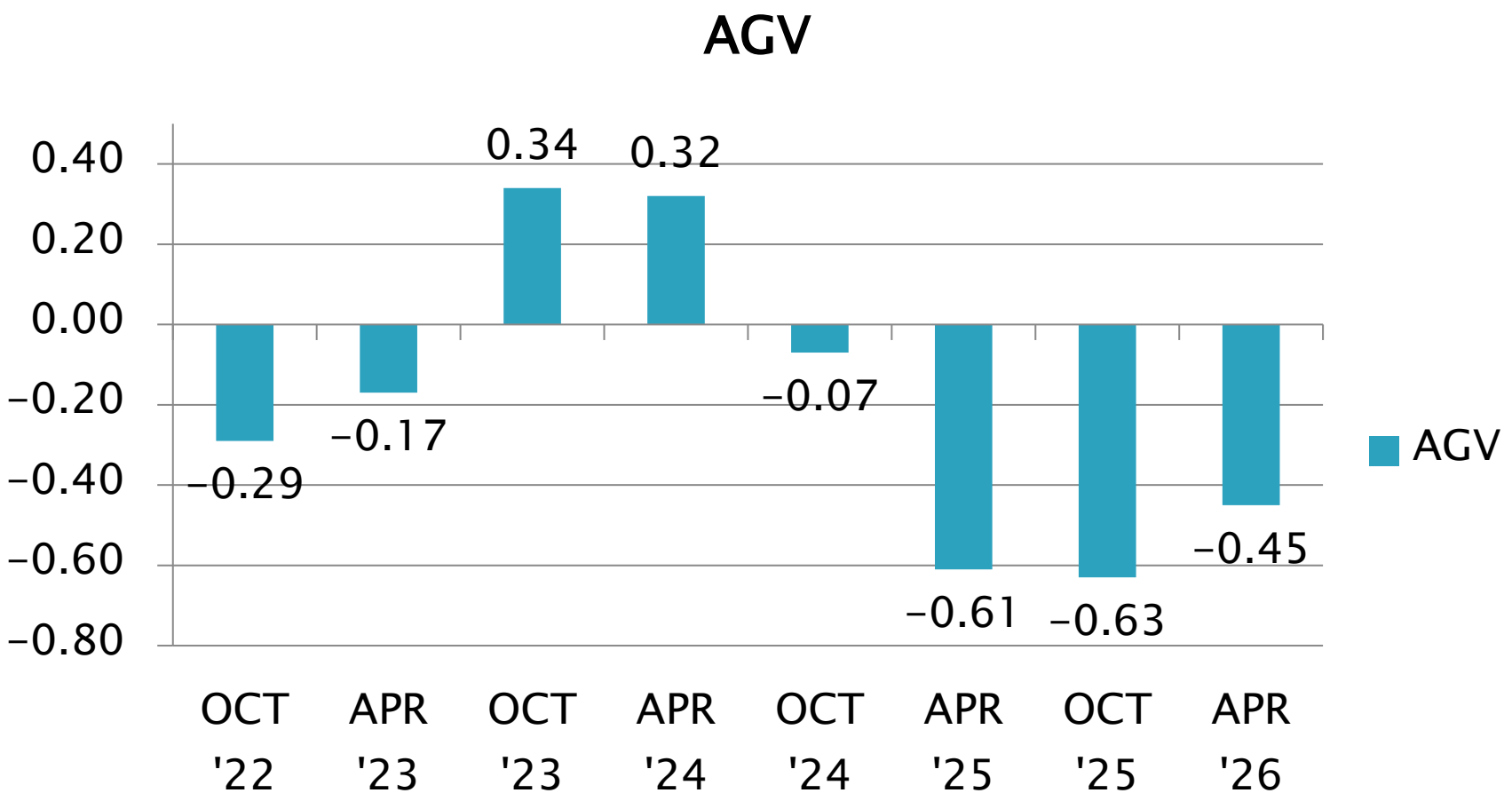
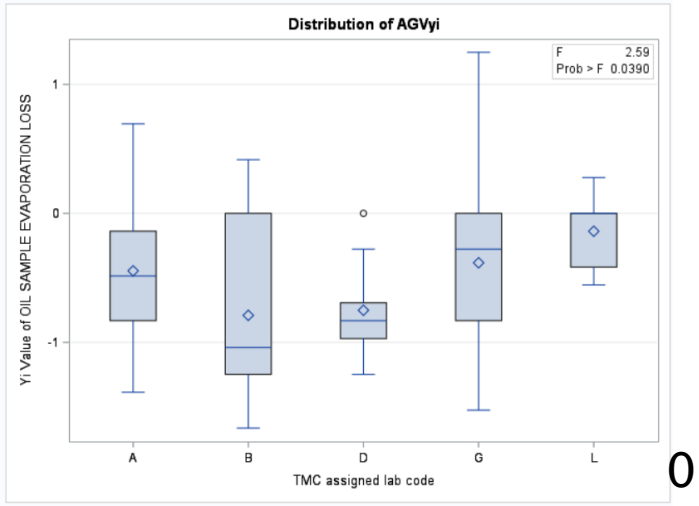
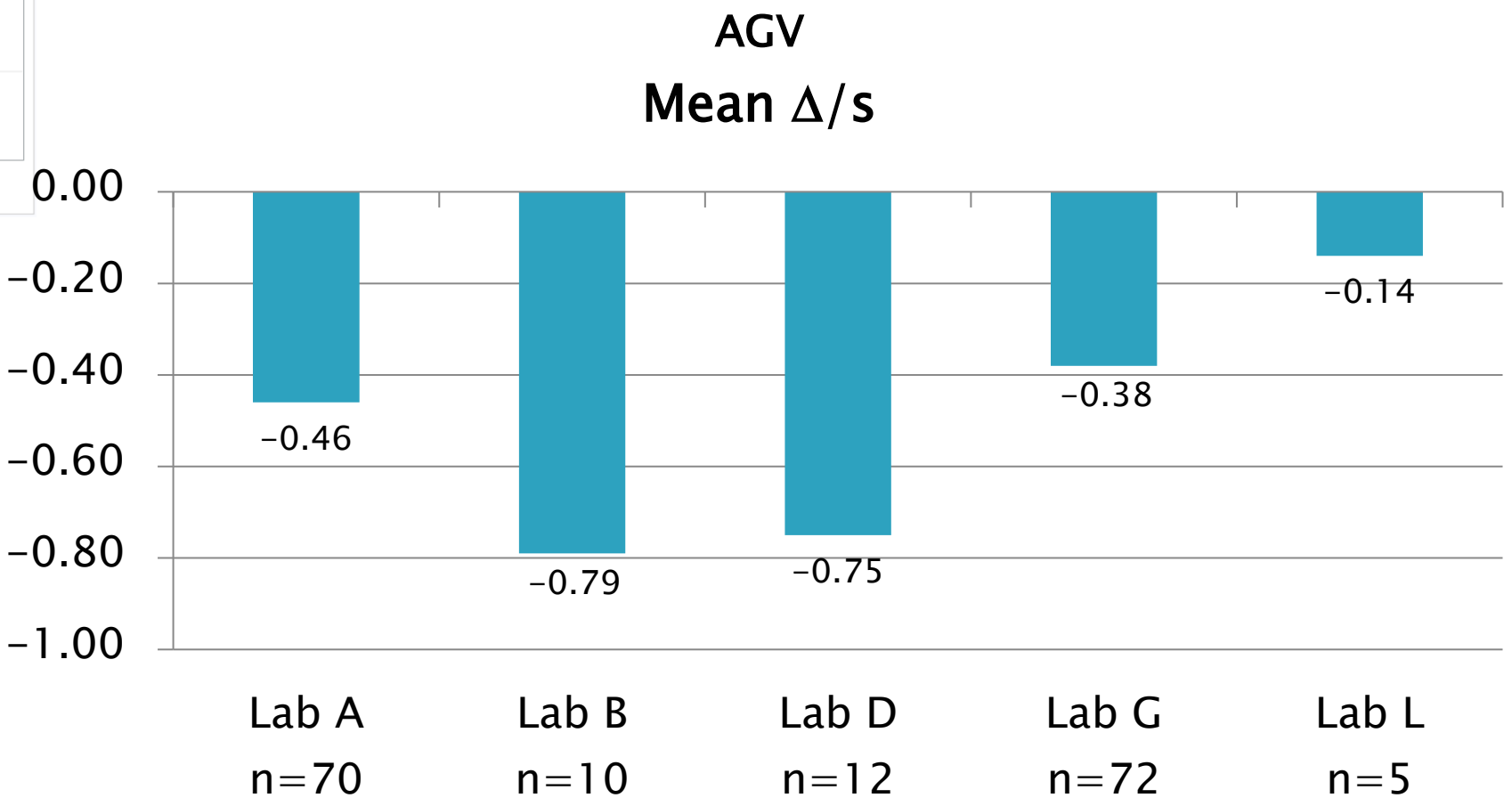
BRT Performance (Mean Δ/s) Estimates



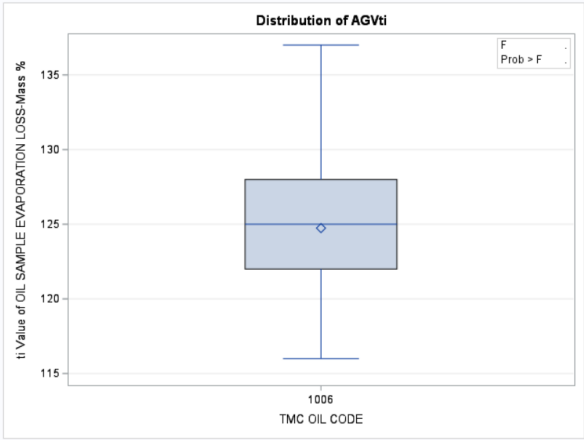
October 1, 2025 – March 31, 2026



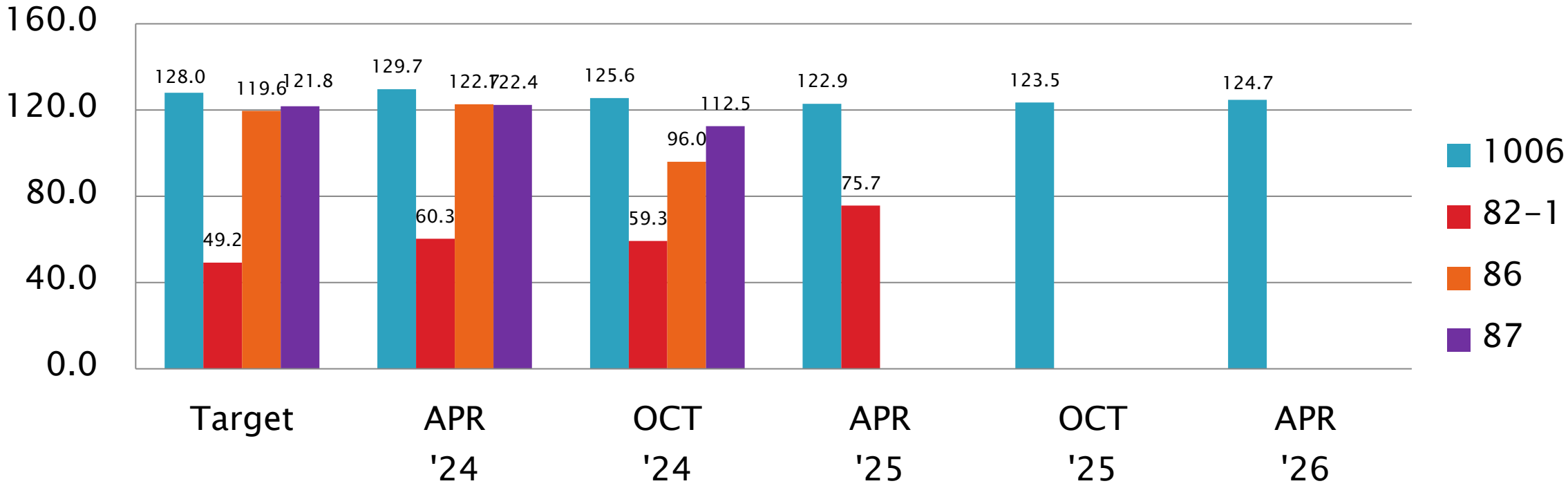
BRT Lab Severity Estimates



BRT Performance by OIL



Average Gray Value
Mean



October 1, 2025 – March 31, 2026

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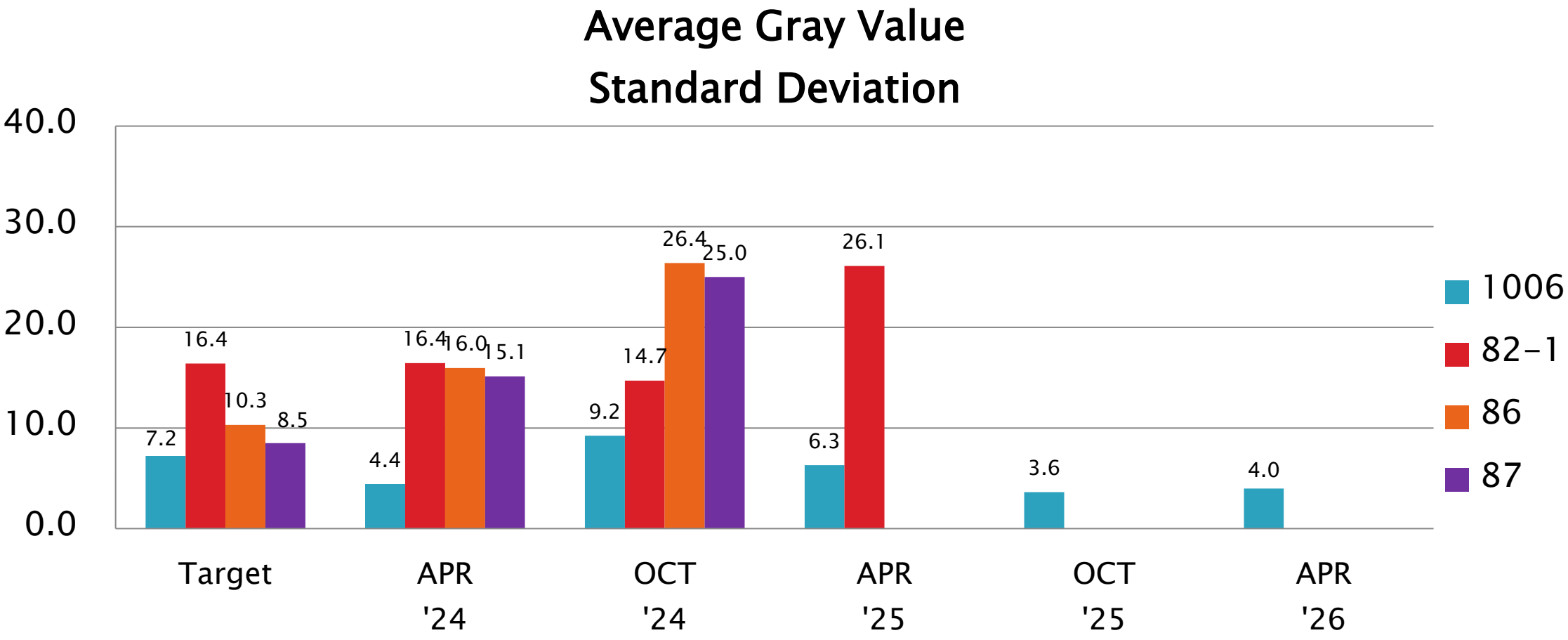
BRT Performance by OIL



October 1, 2025 – March 31, 2026

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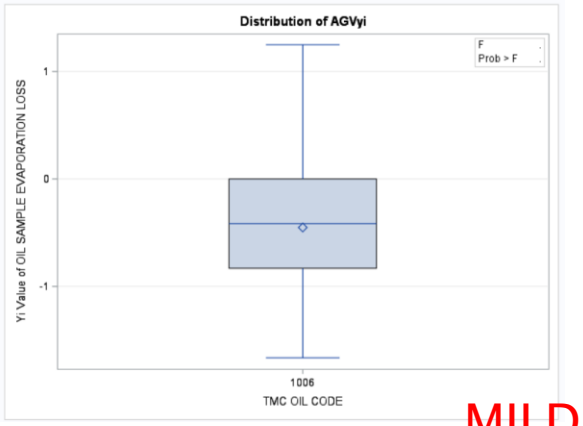
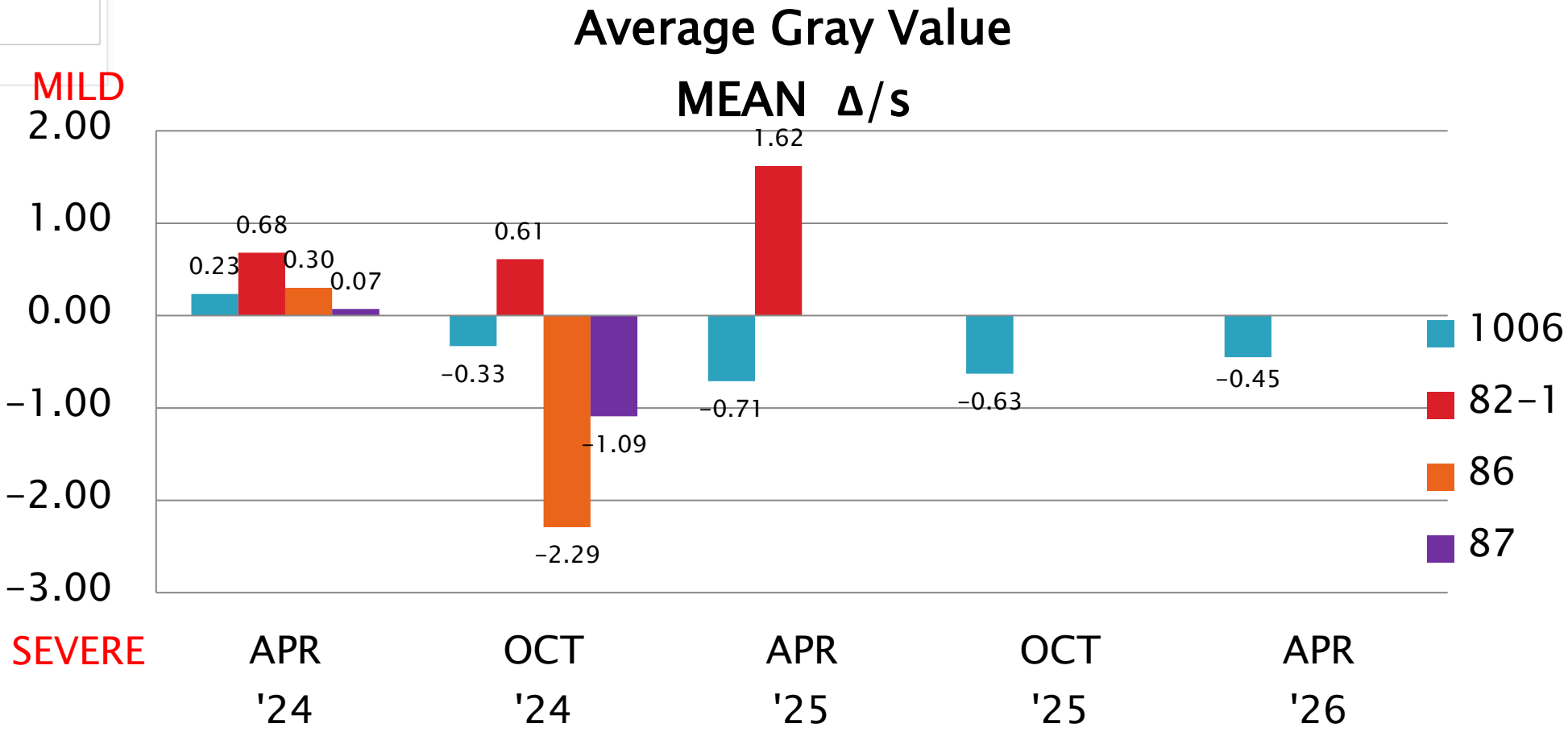


BRT Performance by OIL



October 1, 2025 – March 31, 2026

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Information Letters & Memos*

One information letter was issued this semester.

Test	Date	IL / Memo	Topic
BRT	20260330	IL 26-1	Addition of Generation 3 (Gen 3) Image Analysis System to the Procedure

*Available from TMC Website

Reference Oil Inventory Estimated Life

Oil	TMC Inventory (gallons)	Quantity Shipped in last 6 months (gallons)	Total Assignments[1] made over Semester	Estimated Life
1006	23.4	0.8	173	5+ years
82-1	0.5	0.0	0	< 1 year
86	49.0	0.0	0	5+ years
87	92.9	0.0	0	5+ years

[1]- Includes Informational (i.e. "Shakedown") run assignments

D02.B0.07
TMC Monitored Tests

ASTM D 6594

High Temperature Corrosion Bench Test (HTCBT)

October 1, 2025 – March 31, 2026

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Calibrated Labs and Stands*

(change since last Semi-Annual report in parentheses)

Test	Labs	Stands
D6594	9 (+0)	25 (-1)
*As of 3/31/2026		

HTCBT Test Activity*

Test Status	Validity Code	Number of Tests
Acceptable Calibration Test	AC	202
Failed Calibration Test	OC	19
Operationally Invalid, by lab	LC, LN	5
Calibration Test Aborted	XC	4
Information Run in Range	NN	16
Information Run out of Range	MN	7
Total		**253**

HTCBT Failed Tests

Failed Parameter (OC)	Number of Tests
Lead Concentration Severe	5
Lead Concentration Mild	3
Copper Concentration Severe	4
Copper Concentration Mild	6
Lead (SEVERE) and Copper (MILD)	1
Total	**19**

NOTE: Of the 19 failing tests
7 (37%) were on runs with 1005-5 Reference Oil
12 (63%) were on runs with 44-5 Reference Oil

HTCBT Failed Tests by Lab

Failed Parameter (OC)	LTMS Lab										#
	A	L	G	I	V	BB	BC	B	P	BE	
Lead Concentration Severe	0	0	2	0	3	0	0	0	0	0	5
Lead Concentration Mild	1	0	0	1	0	0	0	0	1	0	3
Copper Concentration Severe	0	0	0	0	4	0	0	0	0	0	4
Copper Concentration Mild	0	0	3	1	2	0	0	0	0	0	6
Lead and Copper Concentrations (both) Severe	0	0	0	1	0	0	0	0	0	0	1
Totals	1	0	5	3	9	0	0	0	1	0	19

HTCBT Lost Tests*

Status (LC, XC, LN, XN)	Cause	#
Invalid Calibration (LC)	Lab invalidated due to Air Supply Issues	2
Invalid Calibration (LC)	Lab invalidated due to Power Outage	2
Aborted Calibration (XC)	Test stopped because of Vessel Broken	1
Aborted Calibration (XC)	Test stopped because of Power Failure	1
Aborted Calibration (XC)	Lab stopped Calibration Test	2
Aborted Information (LN)	Lab stopped Informational Test	1
Total		**9**

*Invalid or Aborted calibration tests

October 1, 2025 – March 31, 2026

HTCBT Lost Tests by Lab

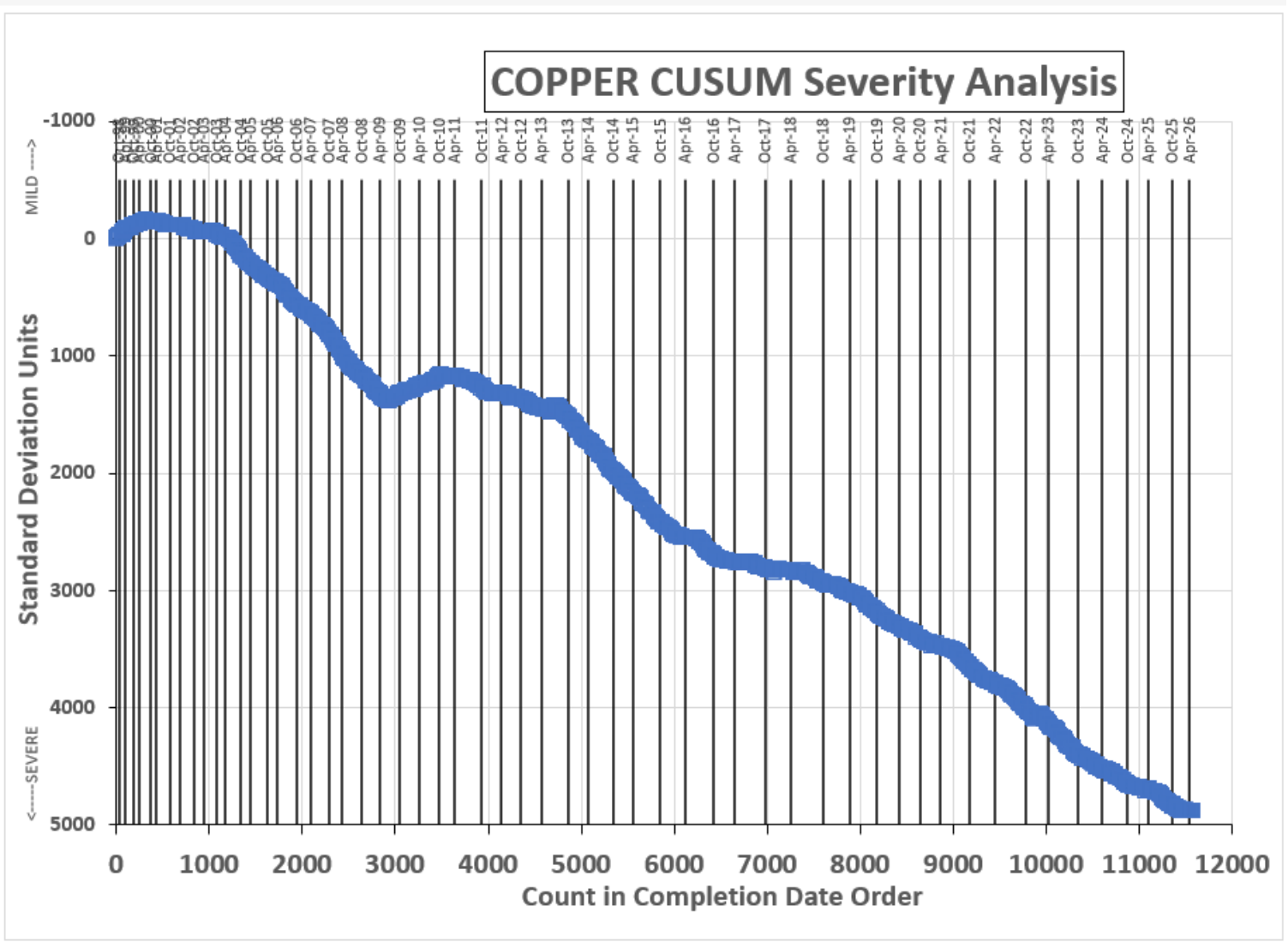
Failed Parameter (LC, XC, LN, XN)	LTMS Lab										#
	A	L	G	I	V	BB	BC	B	P	BE	
Lab invalidated due to Air Supply Issues (LC)	0	0	2	0	0	0	0	0	0	0	2
Lab invalidated due to Power Outage (LC)	0	0	0	0	0	0	0	2	0	0	2
Test stopped because of Vessel Broken (XC)	1	0	0	0	0	0	0	0	0	0	1
Test stopped because of Power Failure (XC)	0	0	0	0	0	0	0	0	1	0	1
Lab stopped test (XC)	0	0	0	0	2	0	0	0	0	0	2
Lab terminated Informational Run (LN)	0	0	1	0	0	0	0	0	0	0	1
Total	**1**	**0**	**3**	**0**	**2**	**0**	**0**	**2**	**1**	**0**	**9**

HTCBT Test Status

- Most labs now using Batch P coupons although a few labs continue to test with Batch O coupons.
- Few TESTKEYs of Reference Oil 44-4 remaining at labs. Most labs now using Reference Oil 44-5.
- Same number of labs calibrated this semester, but one fewer stand was calibrated this semester

HIGH TEMP CBT INDUSTRY OPERATIONALLY VALID DATA

COPPER CHANGE (ppm)



October 1, 2025 – March 31, 2026

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HIGH TEMP CBT INDUSTRY OPERATIONALLY VALID DATA
LAST 600 DATA POINTS
COPPER CHANGE (ppm)

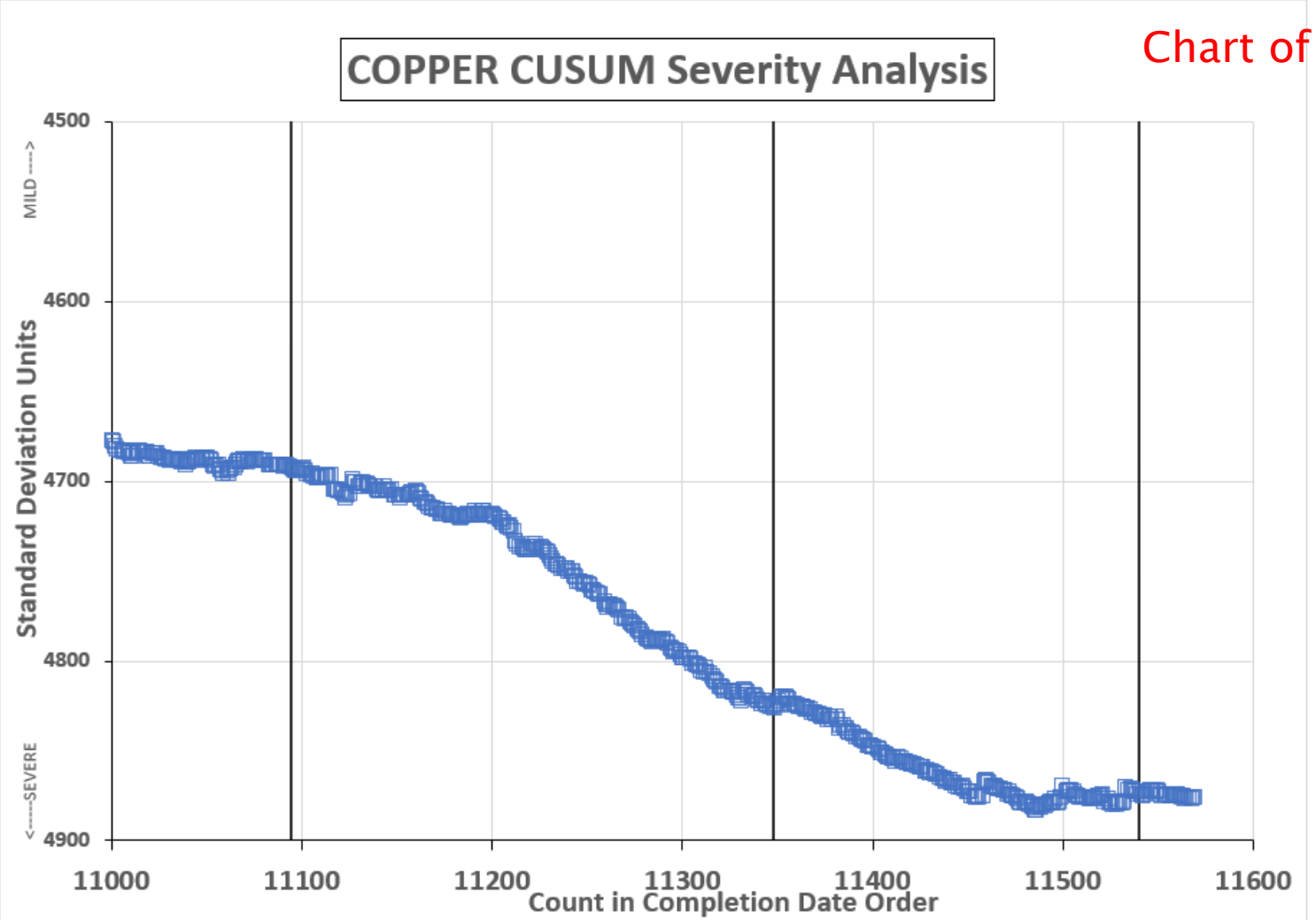

Chart of recent results

October 1, 2025 – March 31, 2026

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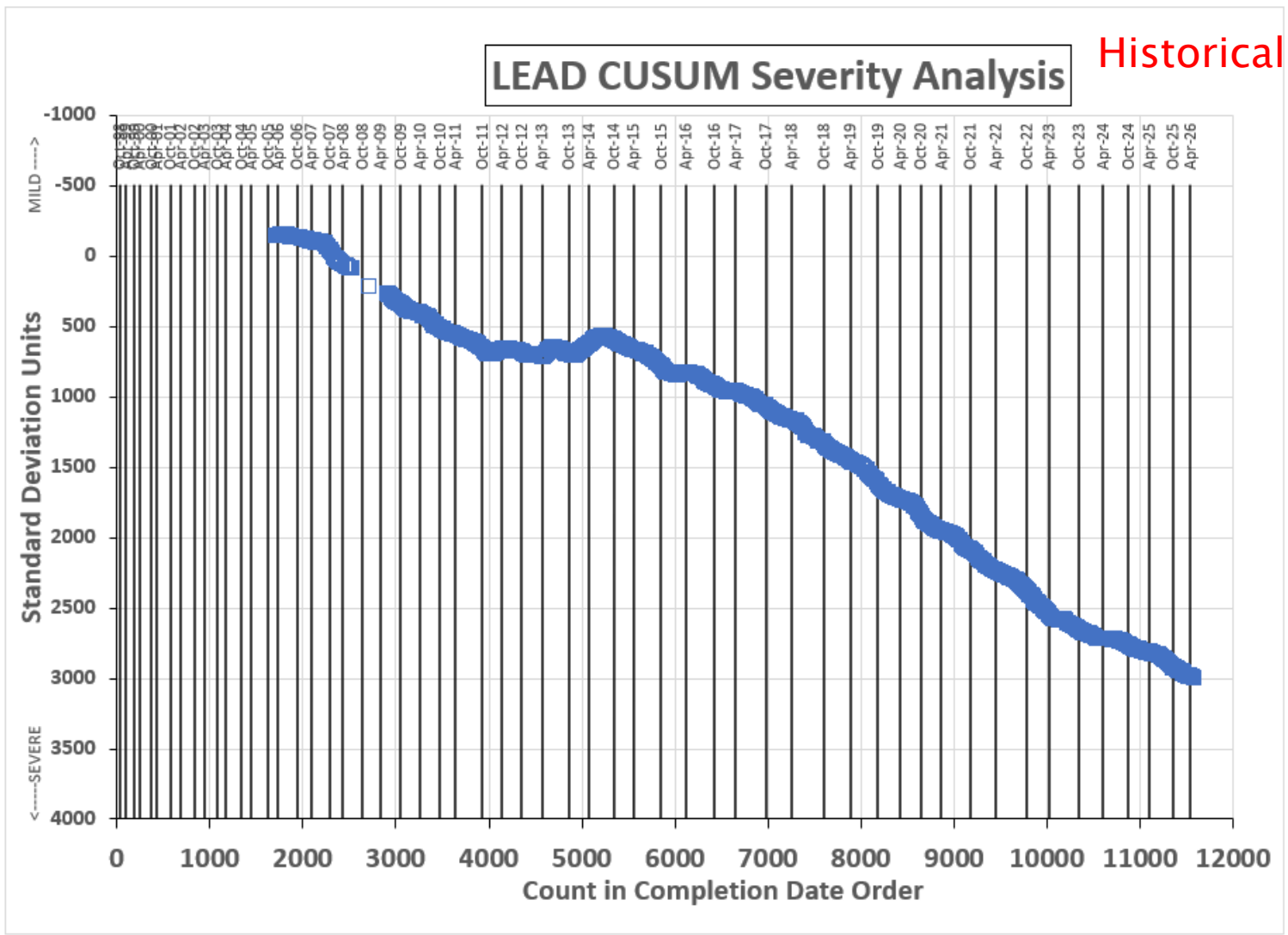
HIGH TEMP CBT INDUSTRY OPERATIONALLY VALID DATA

LEAD CHANGE (ppm)



October 1, 2025 – March 31, 2026

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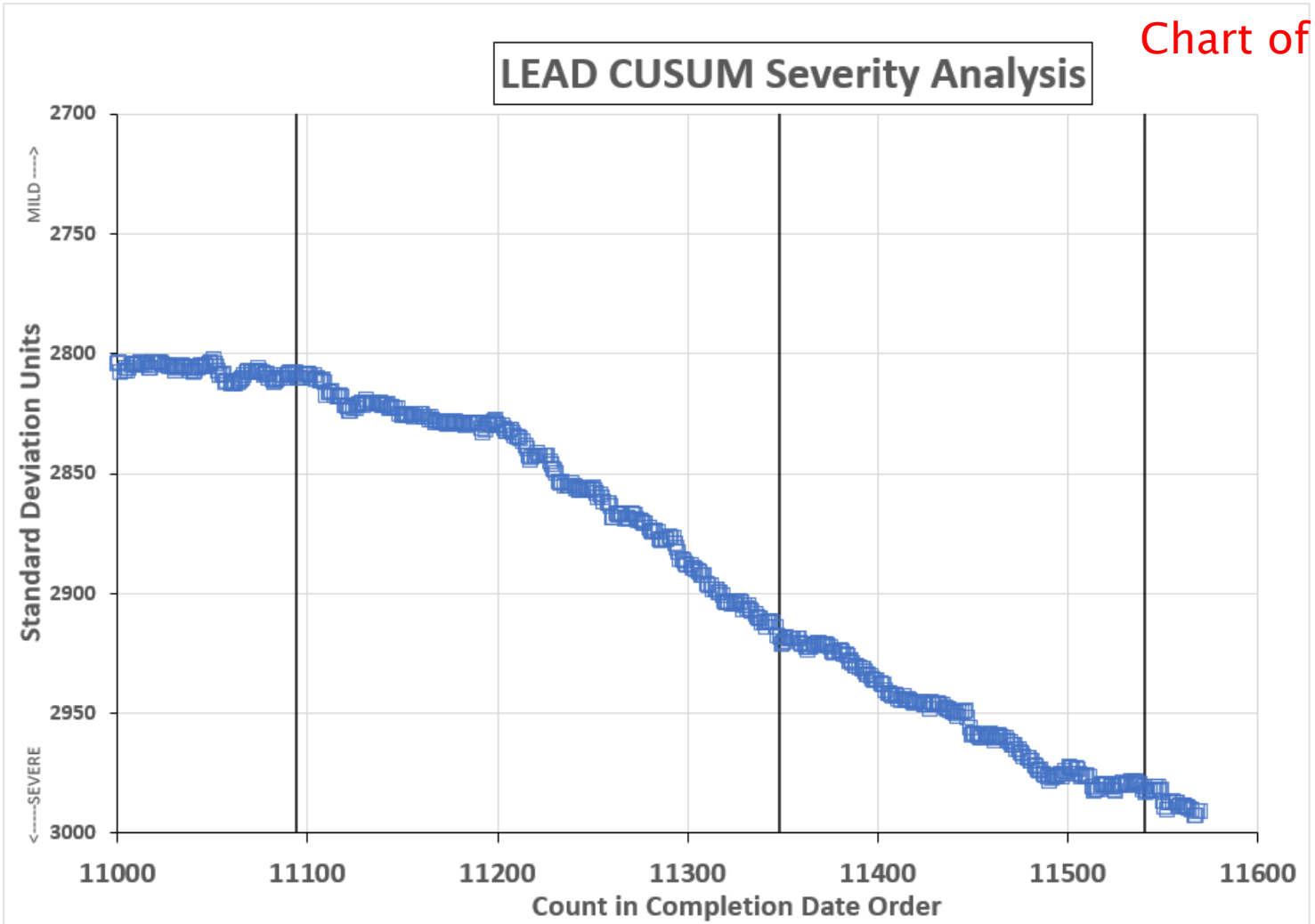
HIGH TEMP CBT INDUSTRY OPERATIONALLY VALID DATA
LAST 600 DATA POINTS
LEAD CHANGE (ppm)

Chart of recent results



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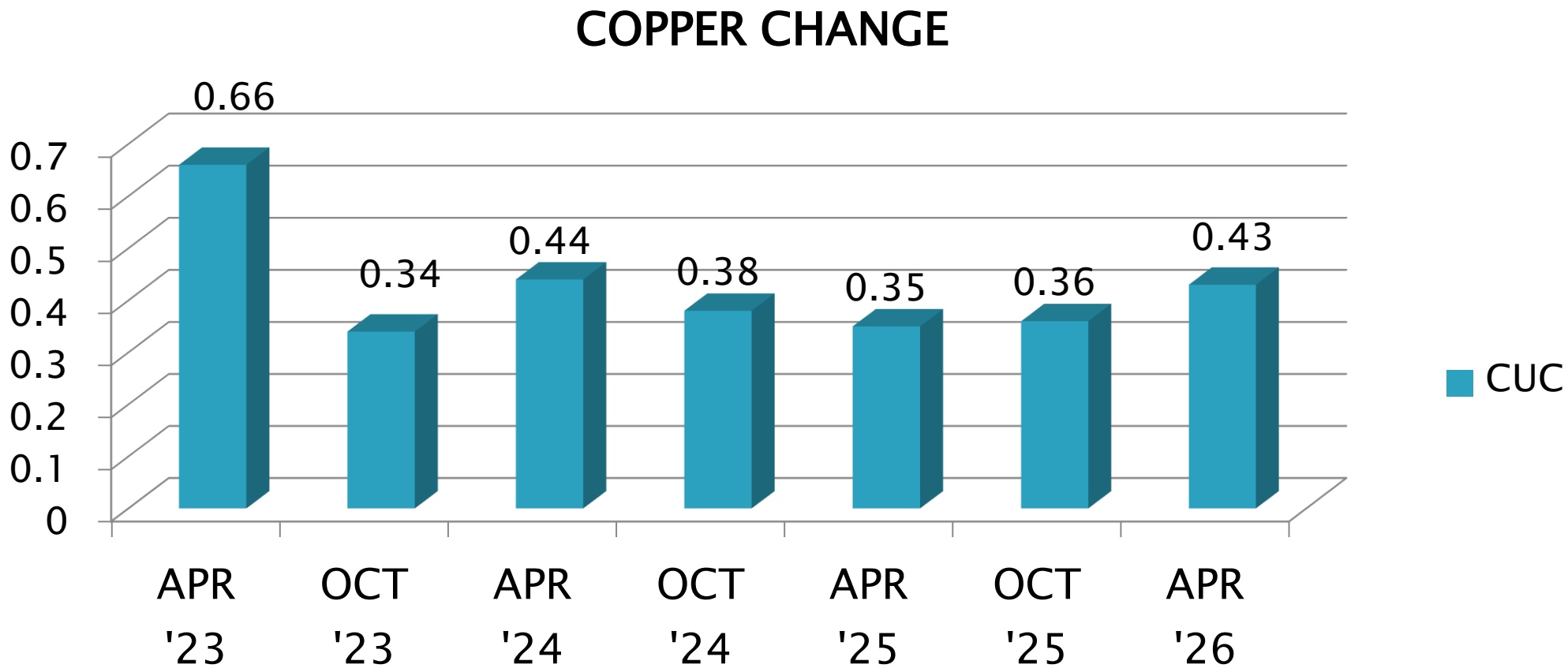
HTCBT (D6594): High Temperature Corrosion Bench Test

Period Precision and Severity Estimates: Copper Change

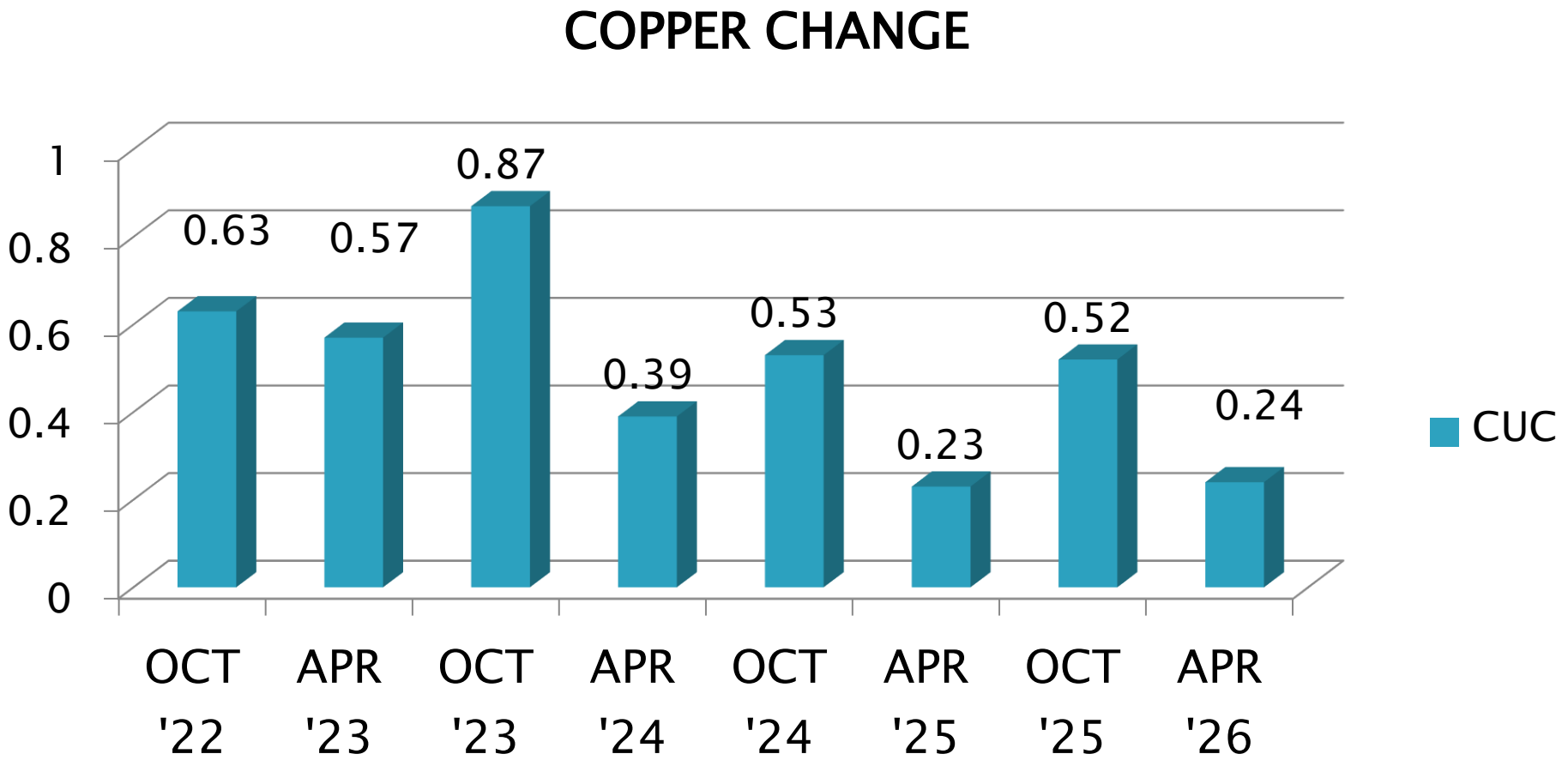
Date Range	n	df	Pooled s	Mean Δ/s
10/1/21 through 3/31/22	305	302	0.31	0.53
4/1/22 through 9/30/22	306	303	0.33	0.63
10/1/22 through 3/31/23	263	260	0.66	0.57
4/1/23 through 9/30/23	296	293	0.34	0.87
10/1/23 through 3/31/24	287	284	0.44	0.39
4/1/24 through 9/30/24	244	241	0.38	0.53
10/1/24 through 3/31/25	250	248	0.35	0.23
10/1/25 through 3/31/26	226	223	0.36	0.52
10/1/25 through 3/31/26	221	218	0.43	0.24

*Period statistics for all Valid Reference Oil Results (pooled)

HTCBT Precision (Pooled s) Estimates



HTCBT Performance (mean Δ/s) Estimates



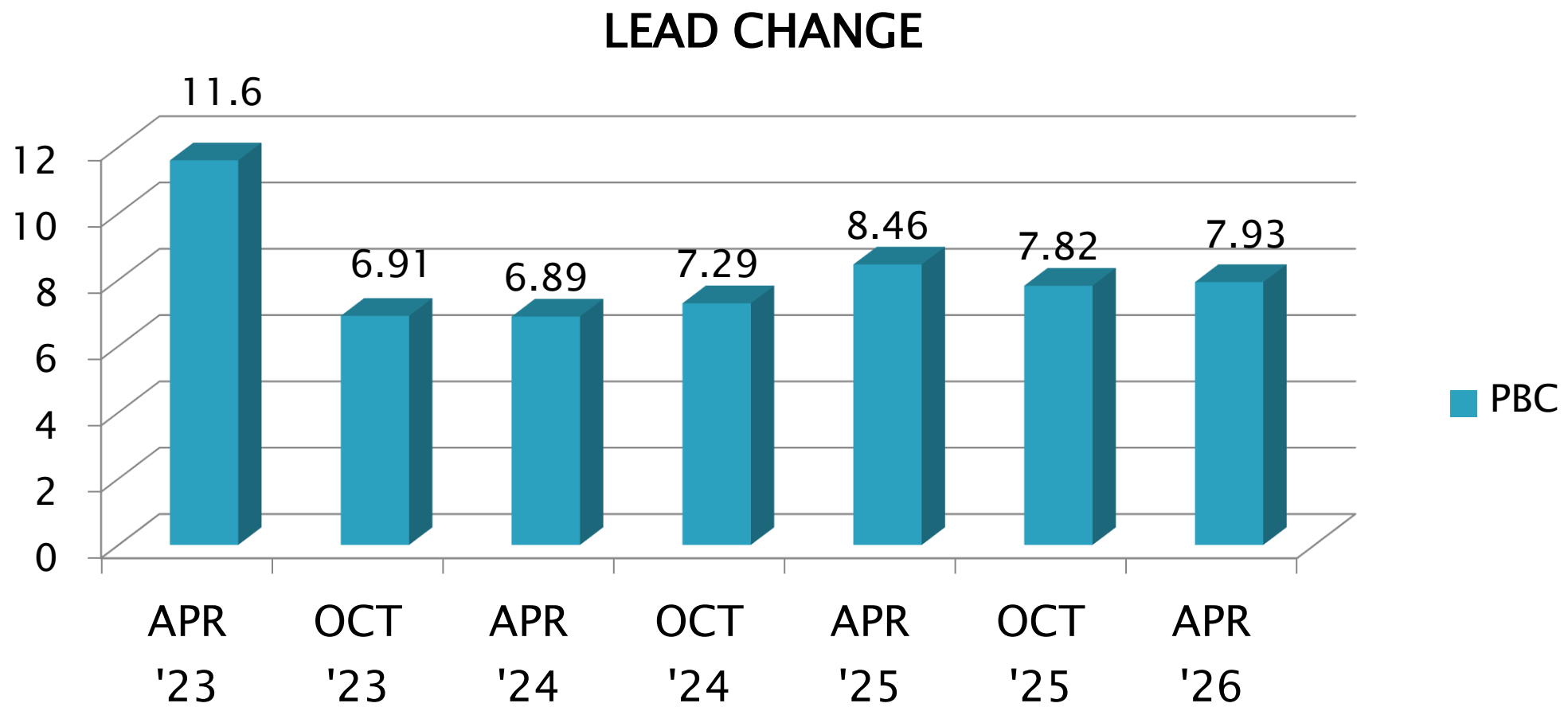
HTCBT (D6594): High Temperature Corrosion Bench Test

Period Precision and Severity Estimates: Lead Change

Average Gray Value	n	df	Pooled s	Mean Δ/s
10/1/21 through 3/31/22	305	302	8.20	0.55
4/1/22 through 9/30/22	306	303	5.72	0.43
10/1/22 through 3/31/23	263	260	11.6	0.69
4/1/23 through 9/30/23	296	293	6.91	0.31
10/1/23 through 3/31/24	287	284	6.89	0.20
4/1/24 through 9/30/24	244	241	7.29	0.20
10/1/24 through 3/31/25	250	248	8.46	0.24
10/1/25 through 3/31/26	226	223	7.82	0.41
10/1/25 through 3/31/26	221	218	7.93	0.33

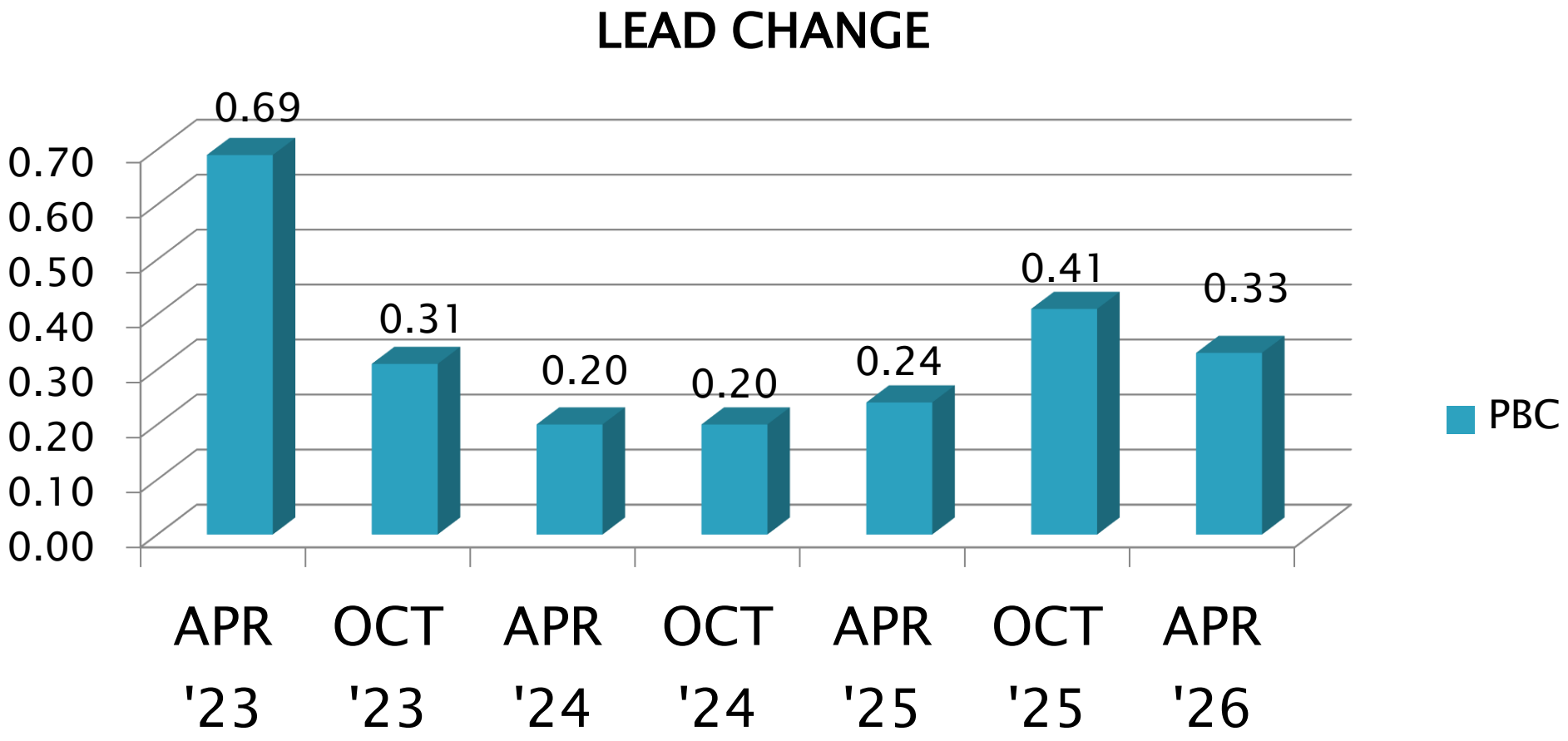
*Period statistics for all Valid Reference Oil Results (pooled)

HTCBT Precision (Pooled s) Estimates



October 1, 2025 – March 31, 2026

HTCBT Performance (mean Δ/s) Estimates



October 1, 2025 – March 31, 2026

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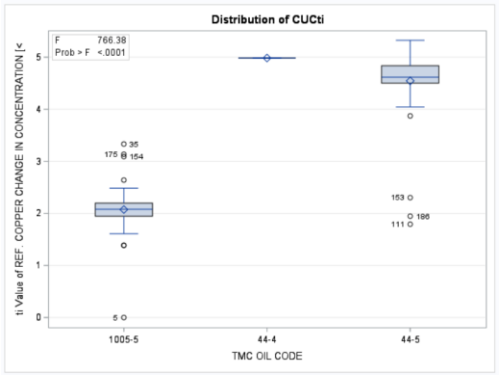
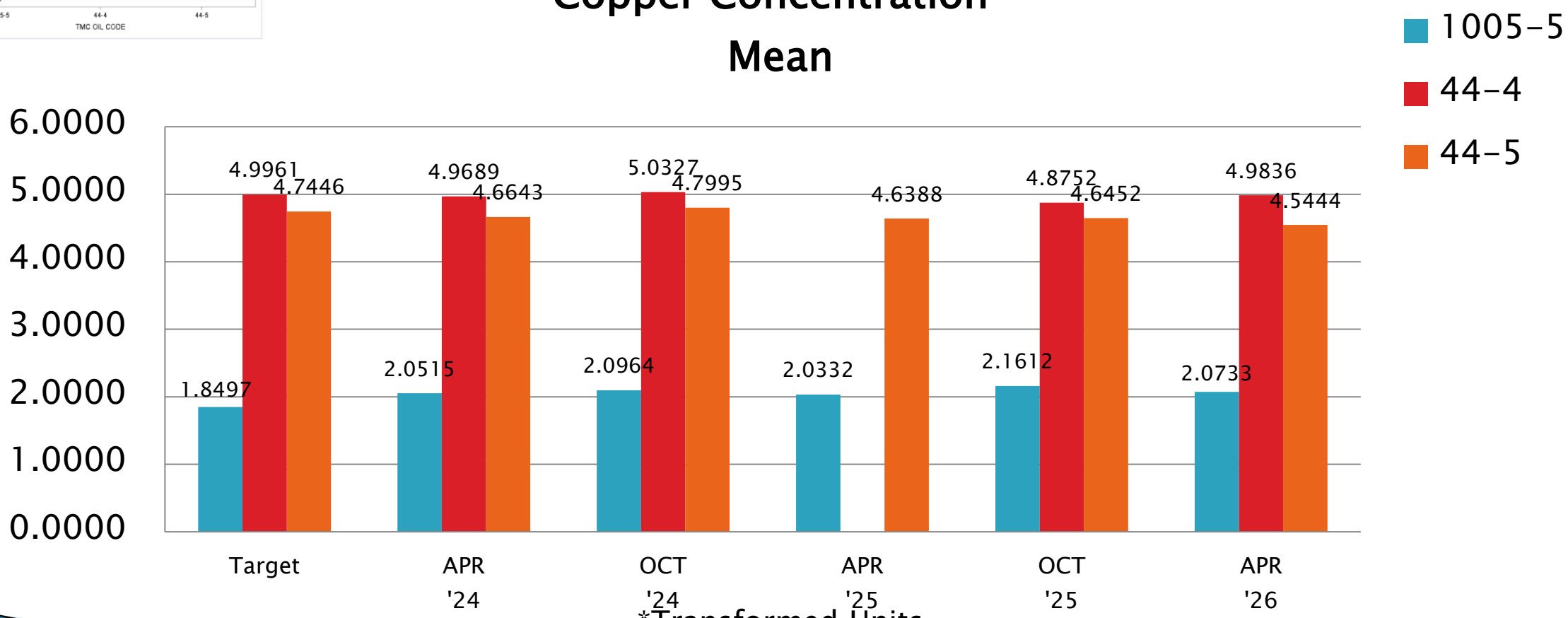


HTCBT Performance by OIL

Copper Concentration*
Mean



*Transformed Units

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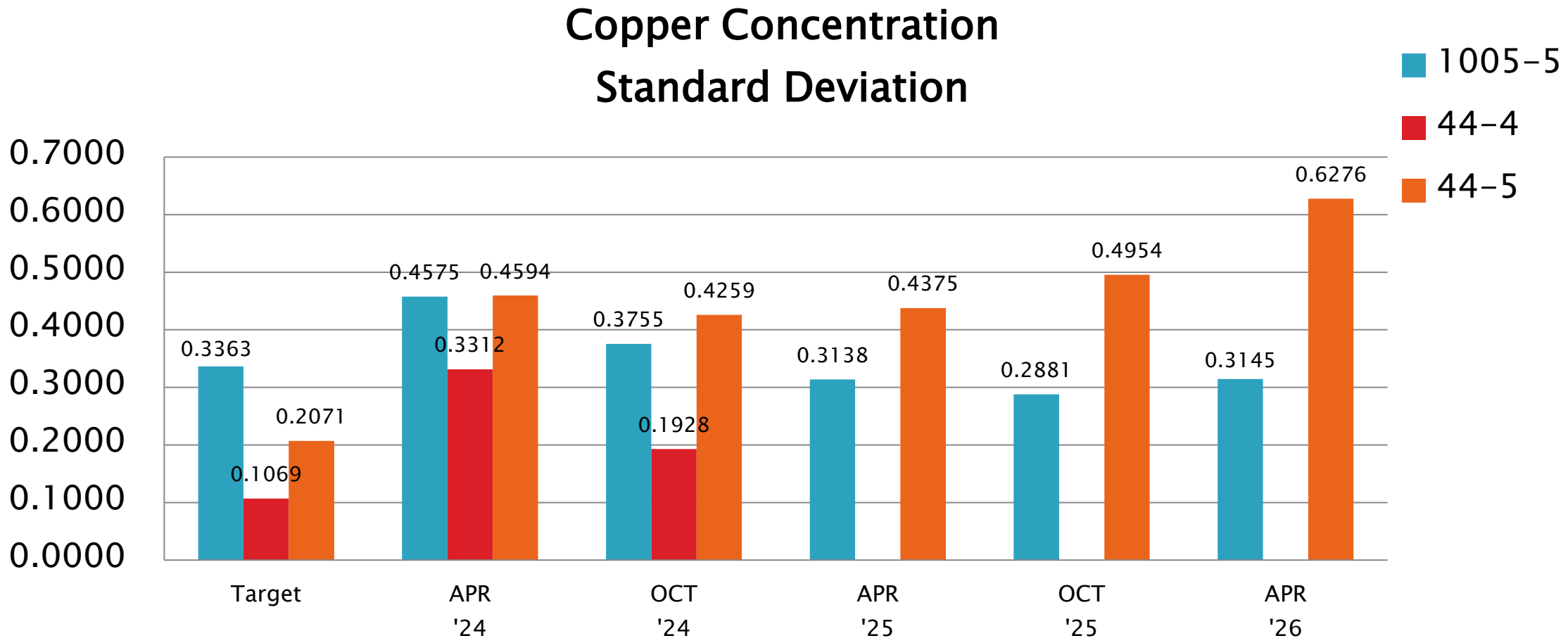
HTCBT Performance by OIL



October 1, 2025 – March 31, 2026

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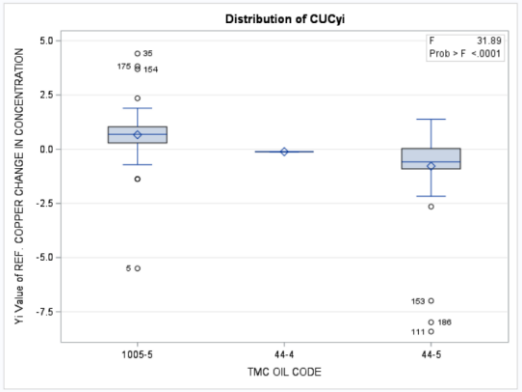
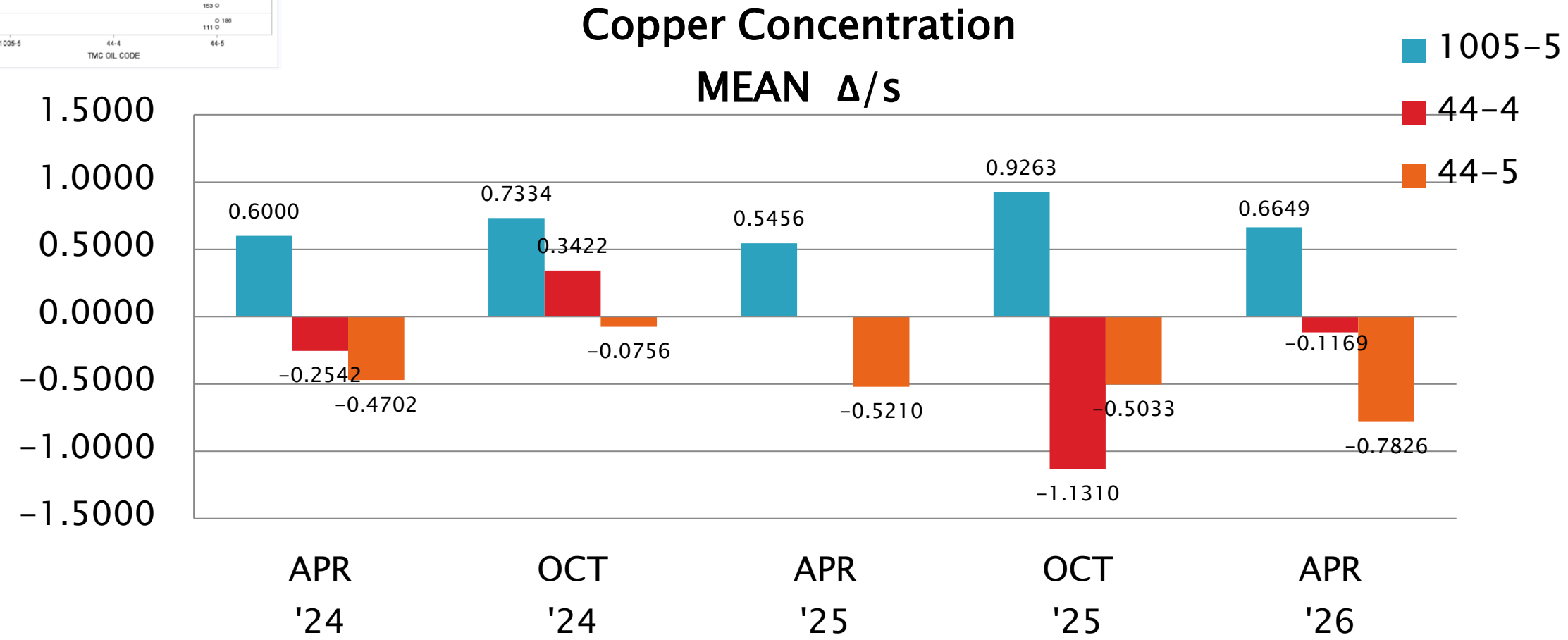


HTCBT Performance by OIL



October 1, 2025 – March 31, 2026

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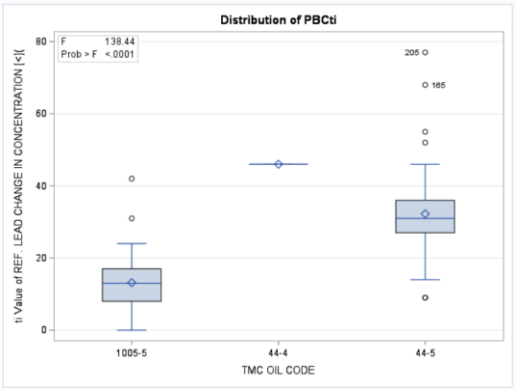
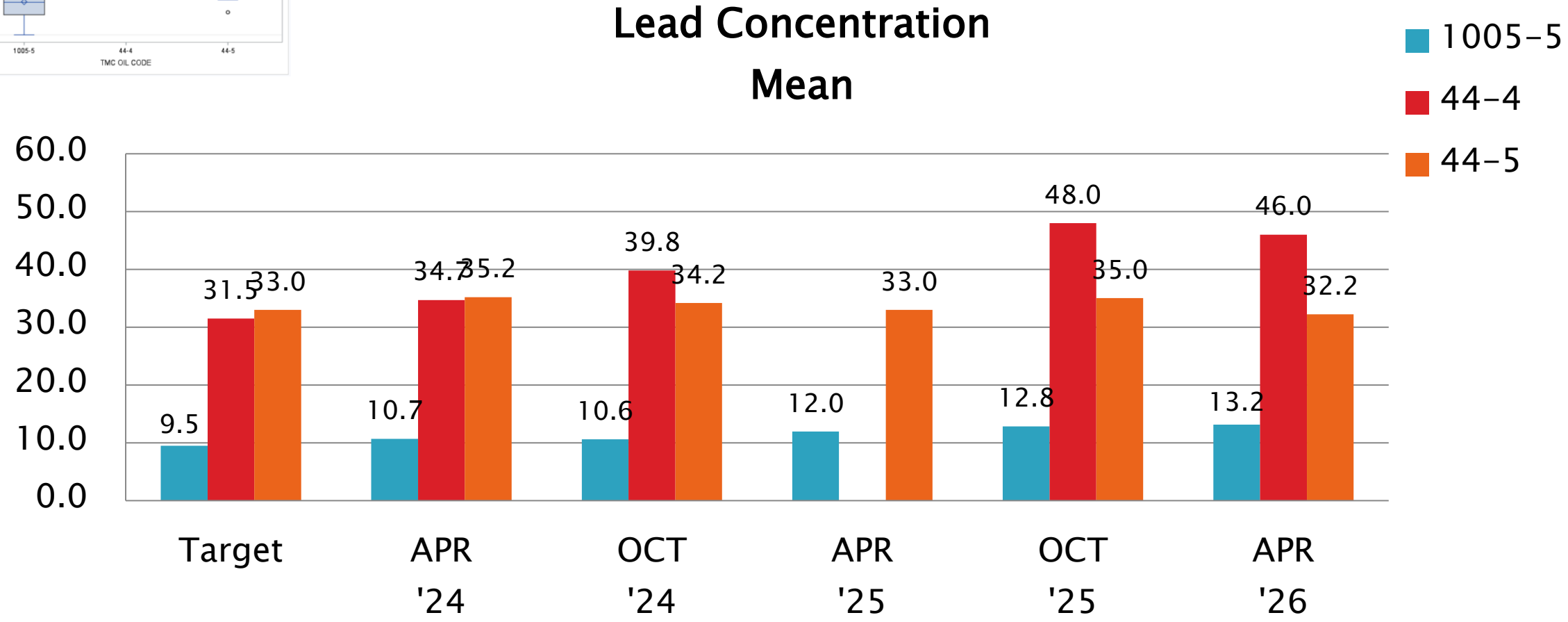


HTCBT Performance by OIL

Lead Concentration
Mean



October 1, 2025 – March 31, 2026

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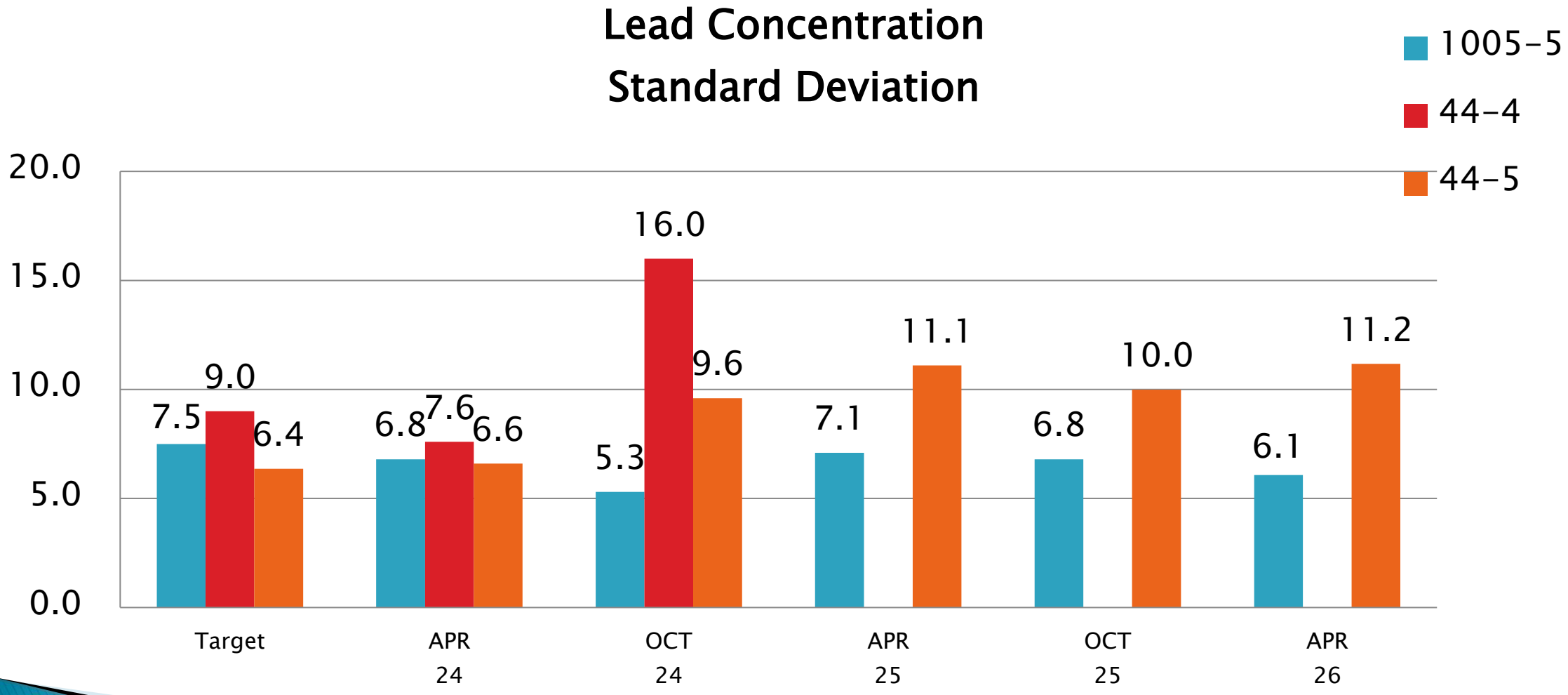
HTCBT Performance by OIL



October 1, 2025 – March 31, 2026

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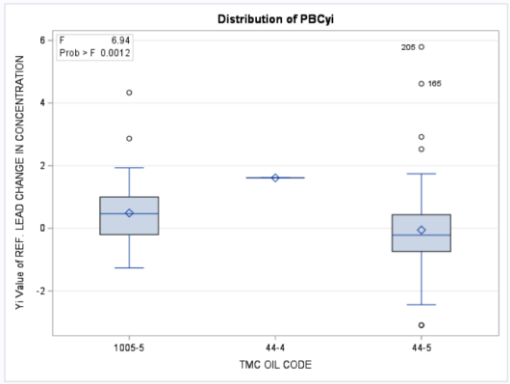
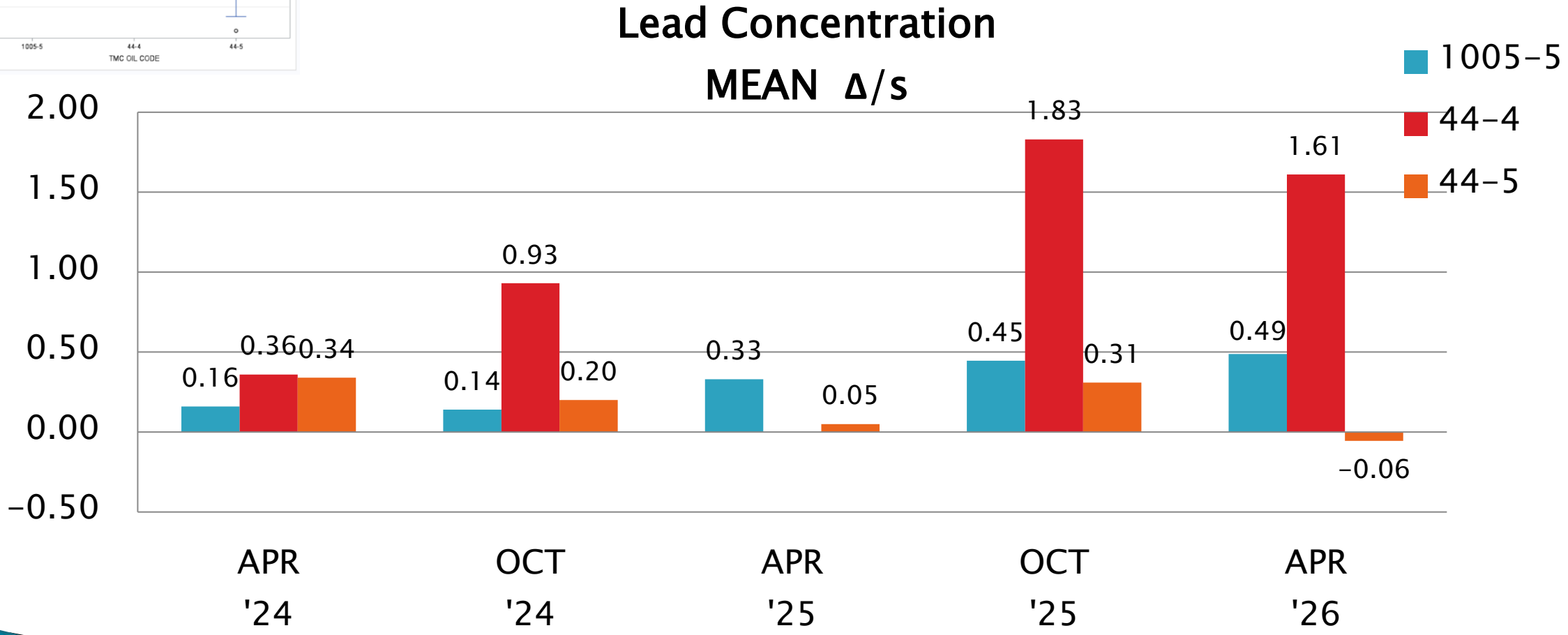


HTCBT Performance by OIL



October 1, 2025 – March 31, 2026

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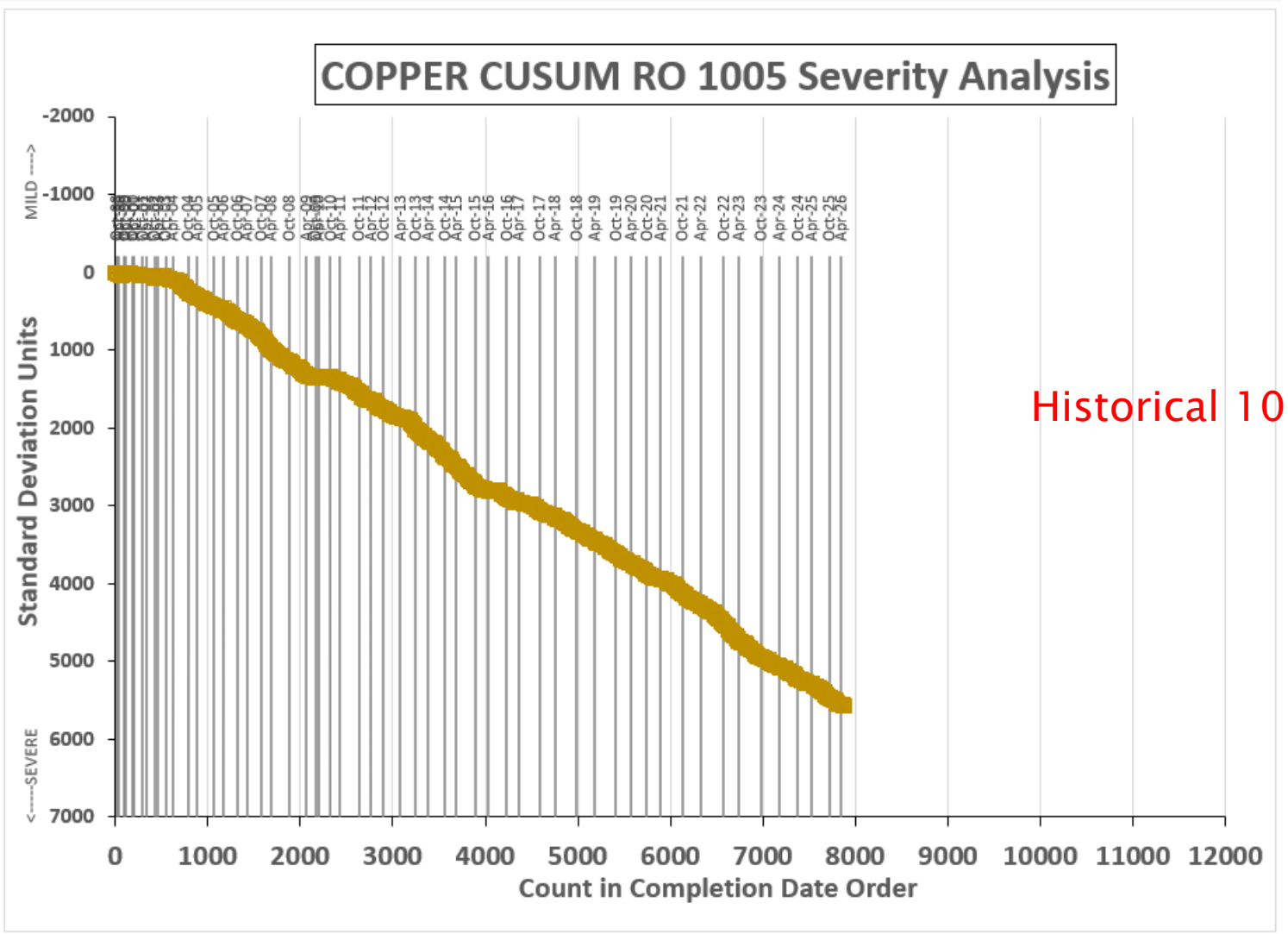
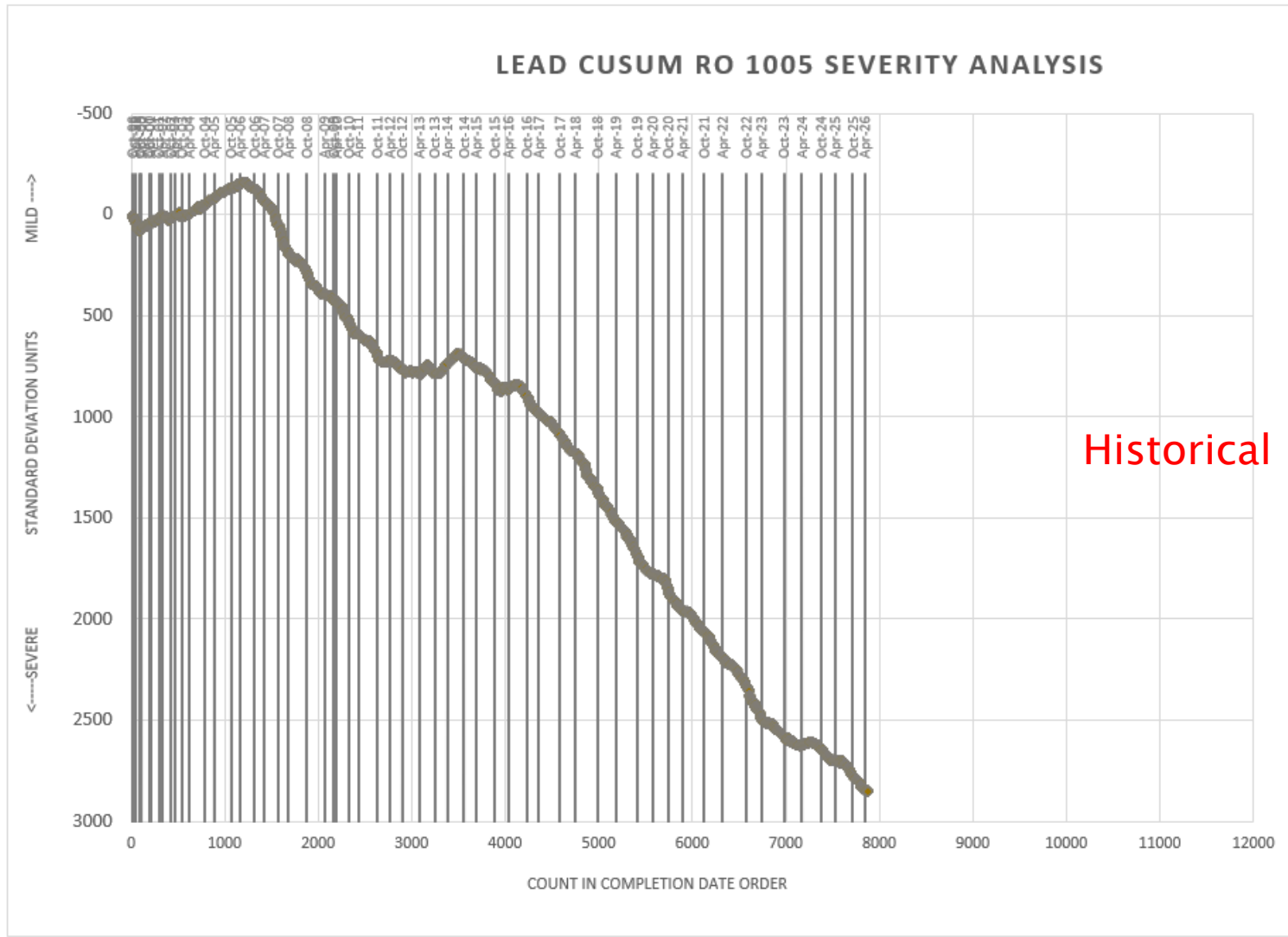
HIGH TEMP CBT INDUSTRY OPERATIONALLY VALID DATA
Oil 1005 –x Only
COPPER CHANGE (ppm)



Historical 1005-x Chart

HIGH TEMP CBT INDUSTRY OPERATIONALLY VALID DATA
Oil 1005 –x Only
LEAD CHANGE (ppm)



Historical 1005-x Chart

October 1, 2025 – March 31, 2026

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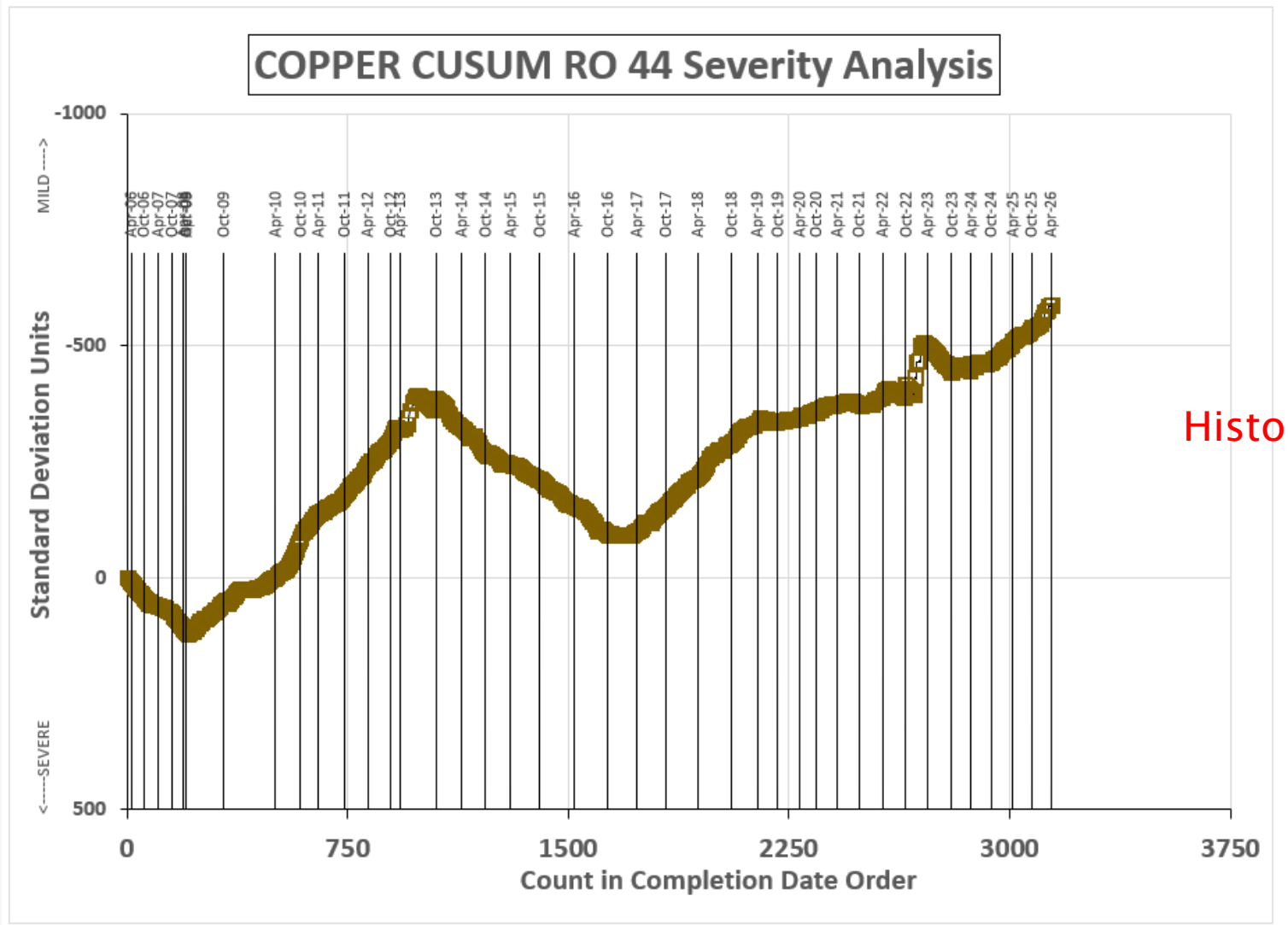
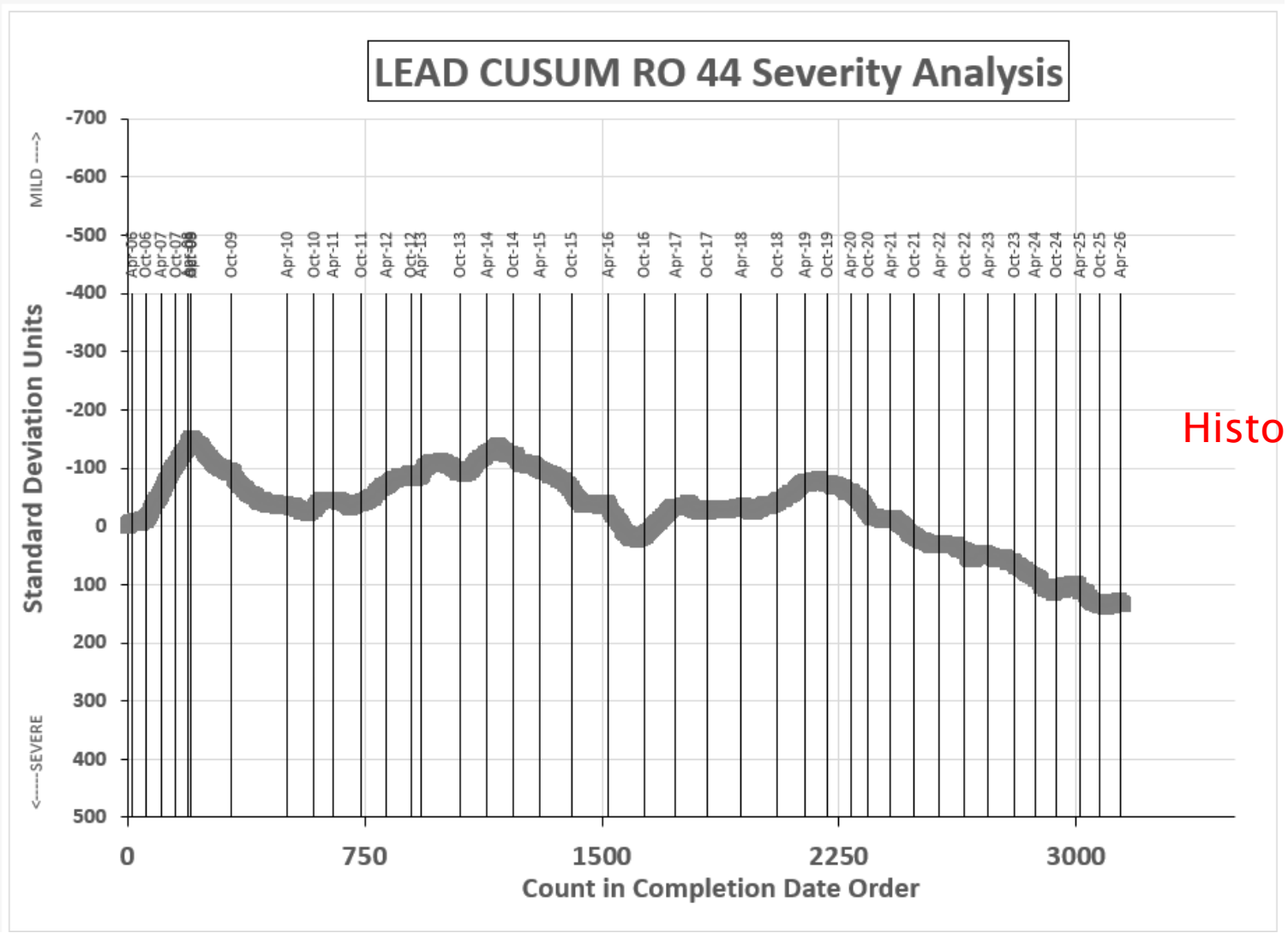
HIGH TEMP CBT INDUSTRY OPERATIONALLY VALID DATA
Oil 44–x Only
COPPER CHANGE (ppm)



Historical 44-x Chart

HIGH TEMP CBT INDUSTRY OPERATIONALLY VALID DATA
Oil 44 –x Only
LEAD CHANGE (ppm)



Historical 44-x Chart

Information Letters and Memos*

Test	Date	IL/Memo	Topic
HTCBT			

No new Information Letters or Memos issued this semester.

*Available from TMC Website

Reference Oil Inventory Estimated Life

D6594

Oil	TMC Inventory (gallons)	Quantity Shipped in last 6 months (gallons)	Lab Assignments Made	Estimated Life
44-5	39.4	2.6	83	5+ year
1005-5	10.3 (Reserved drum – Additional oil available at the TMC)	7.1	185	5+ year

TABLE of CONTENTS

D02.B0.07
TMC Monitored Tests

ASTM D 6794

Engine Oil Water Tolerance (EOWT)

October 1, 2025 – March 31, 2026

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Calibrated Labs and Stands*

(change since last Semi-Annual report)

Test	Labs	Stands
D6794	6 (+1)	N/A
*As of 3/31/2026		

- 7 labs reported data

EOWT Test Activity by Treat Rate

Test Status	Validity Code	Number of Tests by Water Treat Rate				Total
		0.6%	1.0%	2.0%	3.0%	
Acceptable Calibration Test	AC	158	156	159	158	631
Failed Calibration Test[1]	OC	8	10	9	9	36
Acceptable Information Run	NN	2	6	5	4	17
Unacceptable Information Run	MN	5	1	2	1	9
Invalid Calibration Test	LC, RC	0	0	0	0	0
Aborted Calibration Test	XC	0	0	0	0	0
Aborted/Invalid Informational Test	XN, LN	1	1	1	3	6
Total		174	174	176	175	699

[1] Calibration Fail Rate: 5.4% (previous semester: 2.1%)

EOWT Test Activity by Reference Oil*

Test Status	Validity Code	Number of Tests by Reference Oil		Total
		77-3	79	
Acceptable Calibration Test	AC	323	308	631
Failed Calibration Test	OC	13	23	36
Acceptable Informational Test	NN	5	12	17
Unacceptable Informational Test	MN	6	3	9
Invalid Calibration Test	LC, RC	0	0	0
Aborted Calibration Test	XC	0	0	0
Aborted/Invalid Informational Test	XN, LN	5	1	6
Total		**352**	**347**	699

- No Informational runs requested this semester

EOWT Failed Tests

Failed Parameter (OC)	Number of Tests				Total
	0.6%	1.0%	2.0%	3.0%	
Severe Change in Flowrate	6	7	4	7	24
Mild Change in Flowrate	2	3	5	2	12
Total	**8**	**10**	**9**	**9**	**36**

EOWT Failed Tests by Lab

Failed Parameter (OC)	LTMS Lab							#
	A	B	BE	G	I	L	V	
Severe Change in Flowrate	1	NA	0	1	1	0	21	24
Mild Change in Flowrate	7	NA	0	3	0	0	2	12
Total	**8**	**NA**	**0**	**4**	**1**	**0**	**23**	**36**

EOWT Lost Calibration Tests*

Cause	Number of Tests				#
	0.6%	1.0%	2.0%	3.0%	
INCORRECT WATER LEVEL (RC)	0	0	0	0	0
INCORRECT OIL USED (LC)	0	0	0	0	0
FILTERING ISSUE (LC)	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**

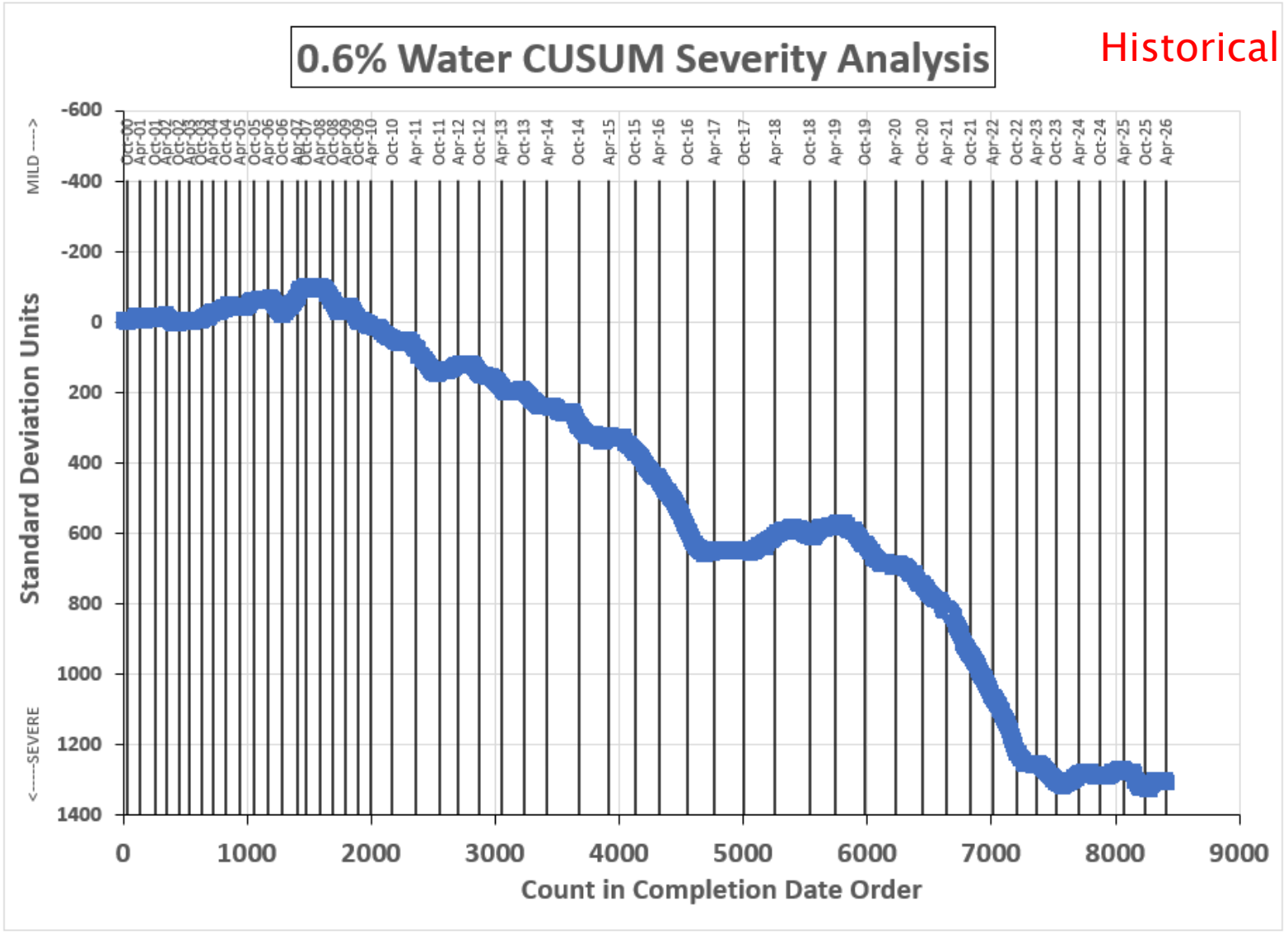
*Invalid (LC,RC) and Aborted (XC) calibration tests

D6794: EOWT

Period Precision and Severity Estimates

Change in Filtration Rate	H_2O %	n	df	Pooled s	Mean Δ/s
10/1/25 through 3/31/26	ALL	667	665	5.06	-0.04
10/1/25 through 3/31/26	0.6	166	164	5.24	-0.07
10/1/25 through 3/31/26	1.0	166	164	4.79	-0.22
10/1/25 through 3/31/26	2.0	168	166	4.79	0.20
10/1/25 through 3/31/26	3.0	167	165	4.44	-0.06

EOWT INDUSTRY OPERATIONALLY VALID DATA
CFA 0.6% Water Treat Rate
20 —25 ML CHANGE IN FLOWRATE AVG.



October 1, 2025 – March 31, 2026

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EOWT INDUSTRY OPERATIONALLY VALID DATA
CFA 0.6% Water Treat Rate (Last 400 Data Points)
20 —25 ML CHANGE IN FLOWRATE AVG.

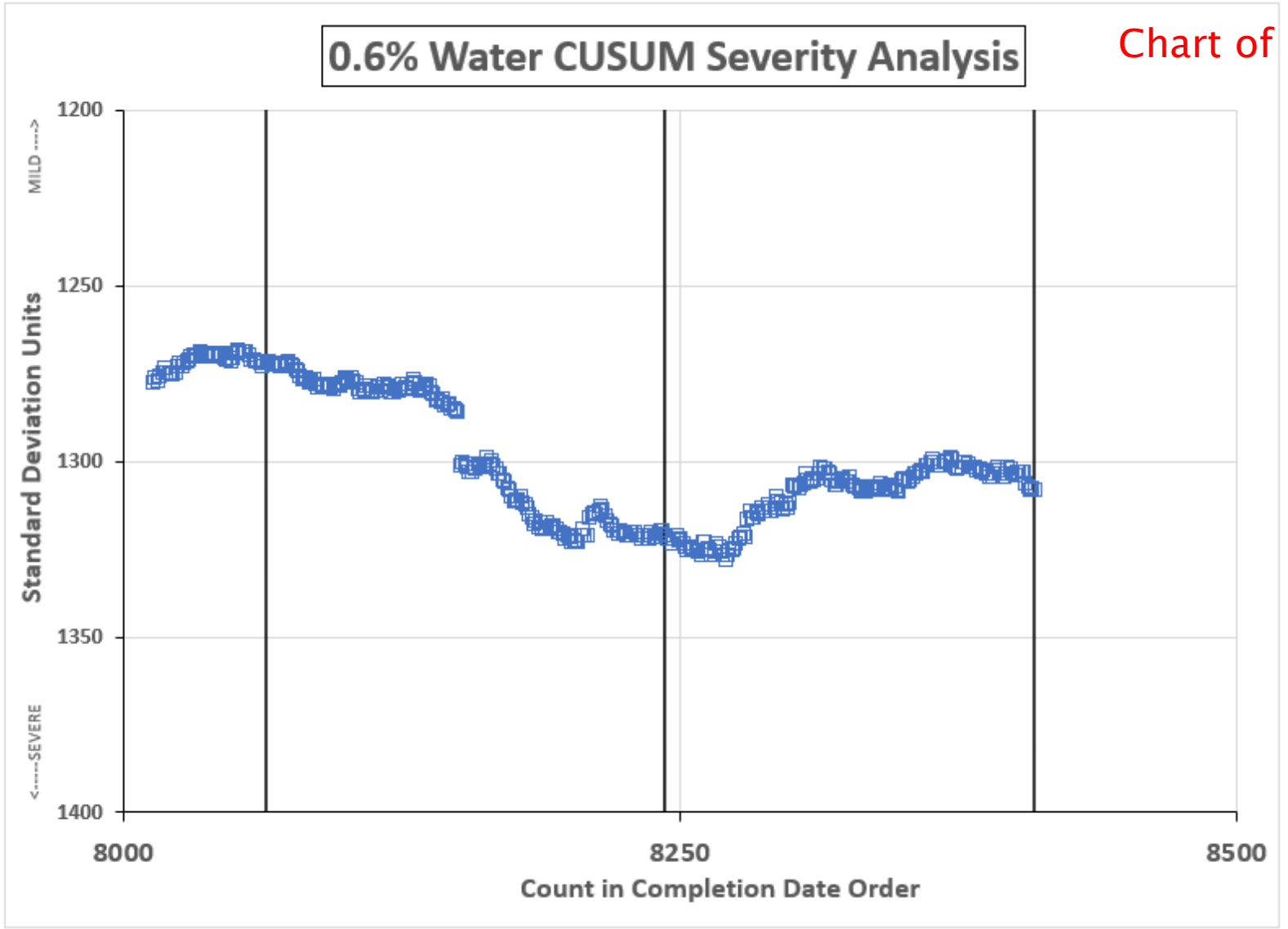

Chart of recent results

October 1, 2025 – March 31, 2026

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EOWT INDUSTRY OPERATIONALLY VALID DATA
CFA 1.0% Water Treat Rate
20 —25 ML CHANGE IN FLOWRATE AVG.

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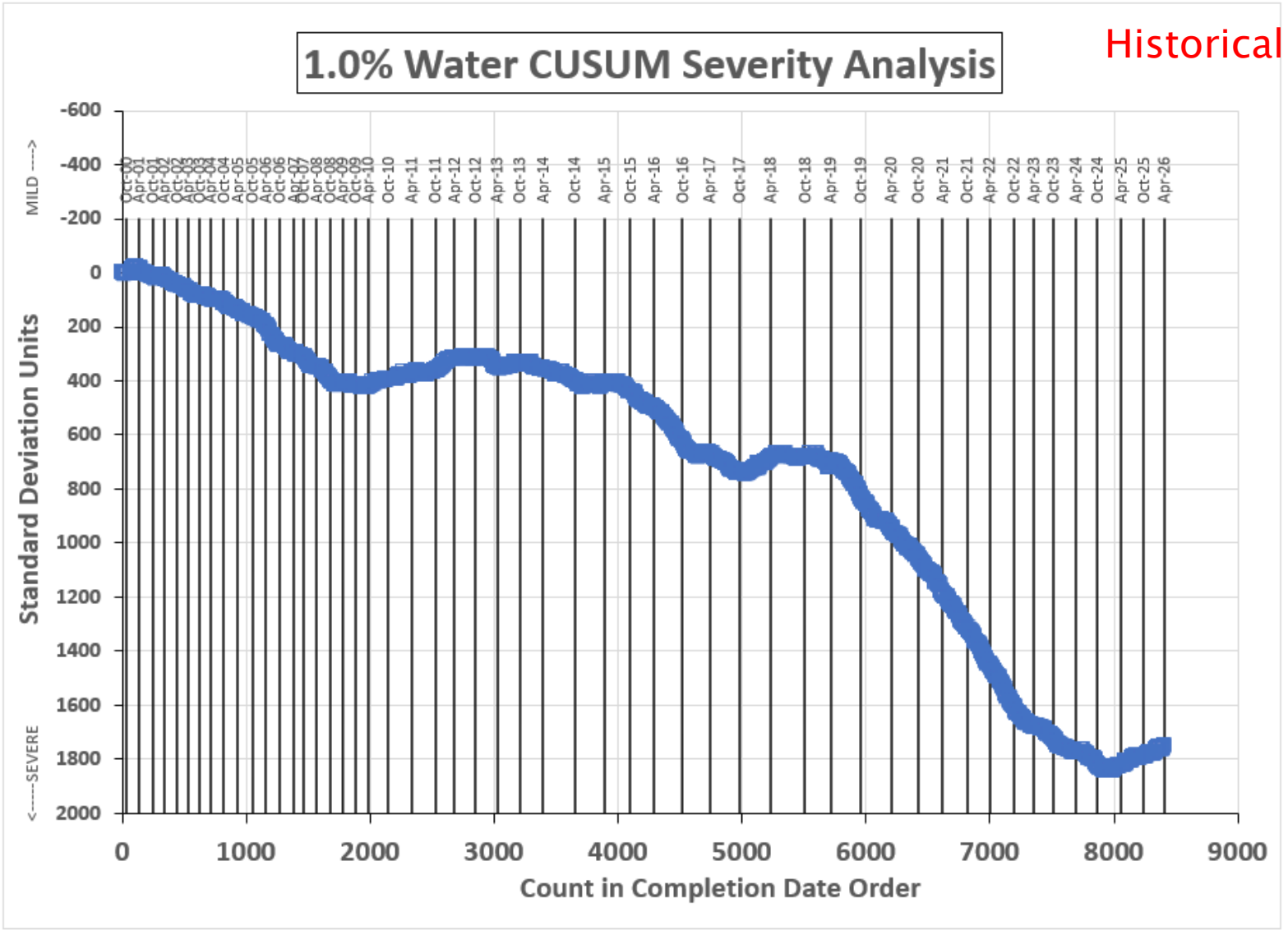
Historical Chart



October 1, 2025 – March 31, 2026

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EOWT INDUSTRY OPERATIONALLY VALID DATA
CFA 1.0% Water Treat Rate (Last 400 Data Points)
20 —25 ML CHANGE IN FLOWRATE AVG.

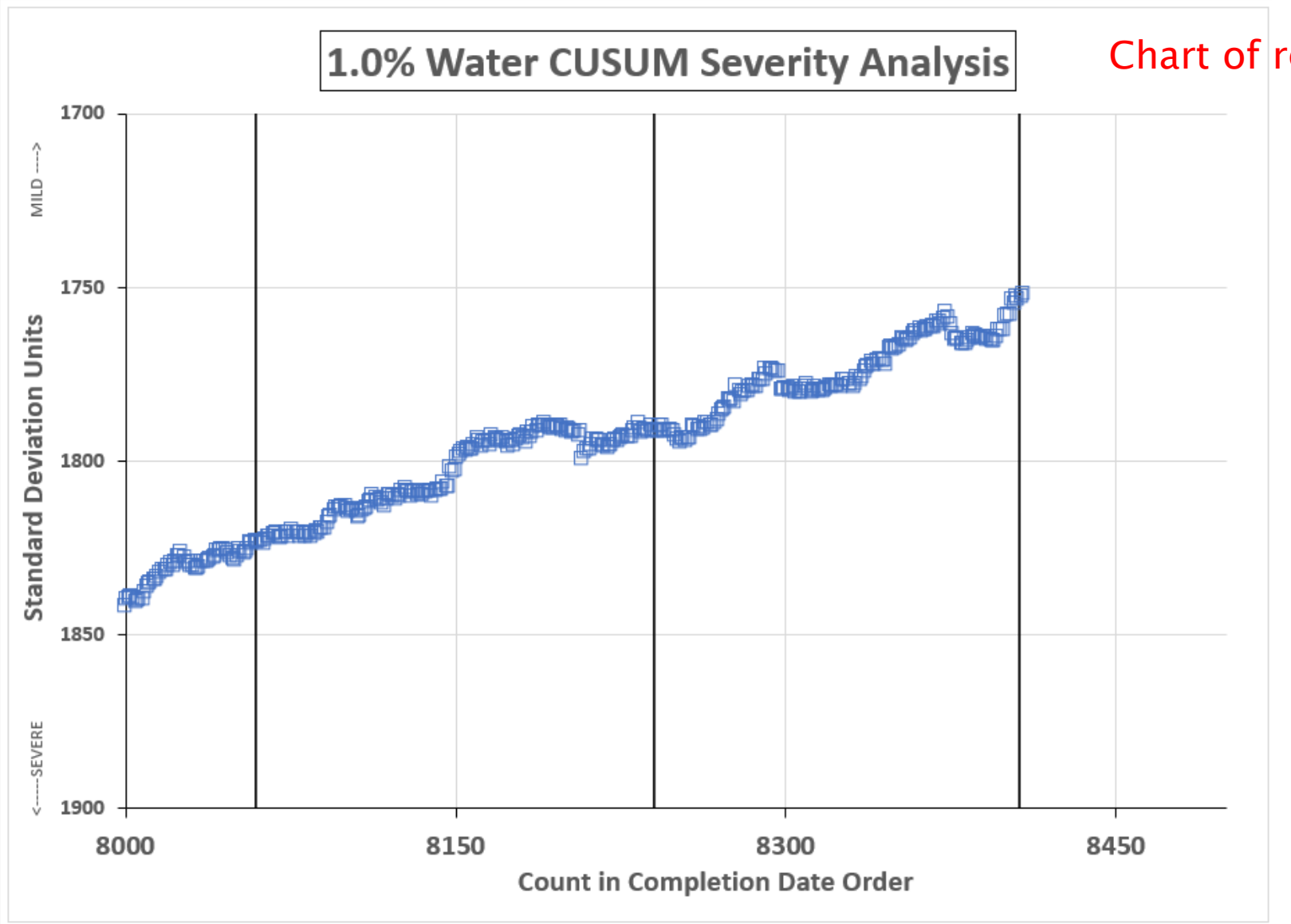

Chart of recent results

October 1, 2025 – March 31, 2026

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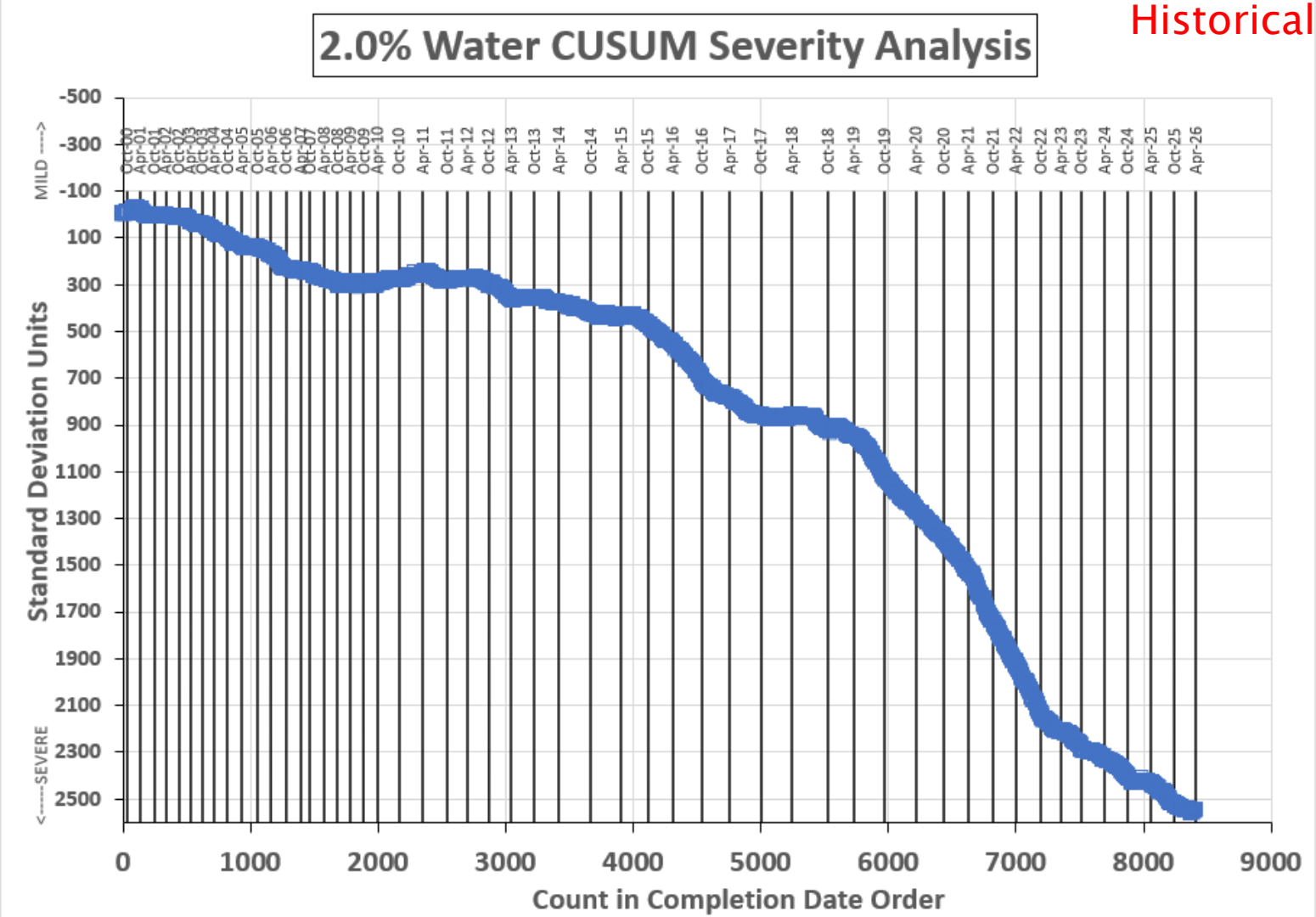
EOWT INDUSTRY OPERATIONALLY VALID DATA
CFA 2.0% Water Treat Rate
20 —25 ML CHANGE IN FLOWRATE AVG.

Historical Chart



October 1, 2025 – March 31, 2026

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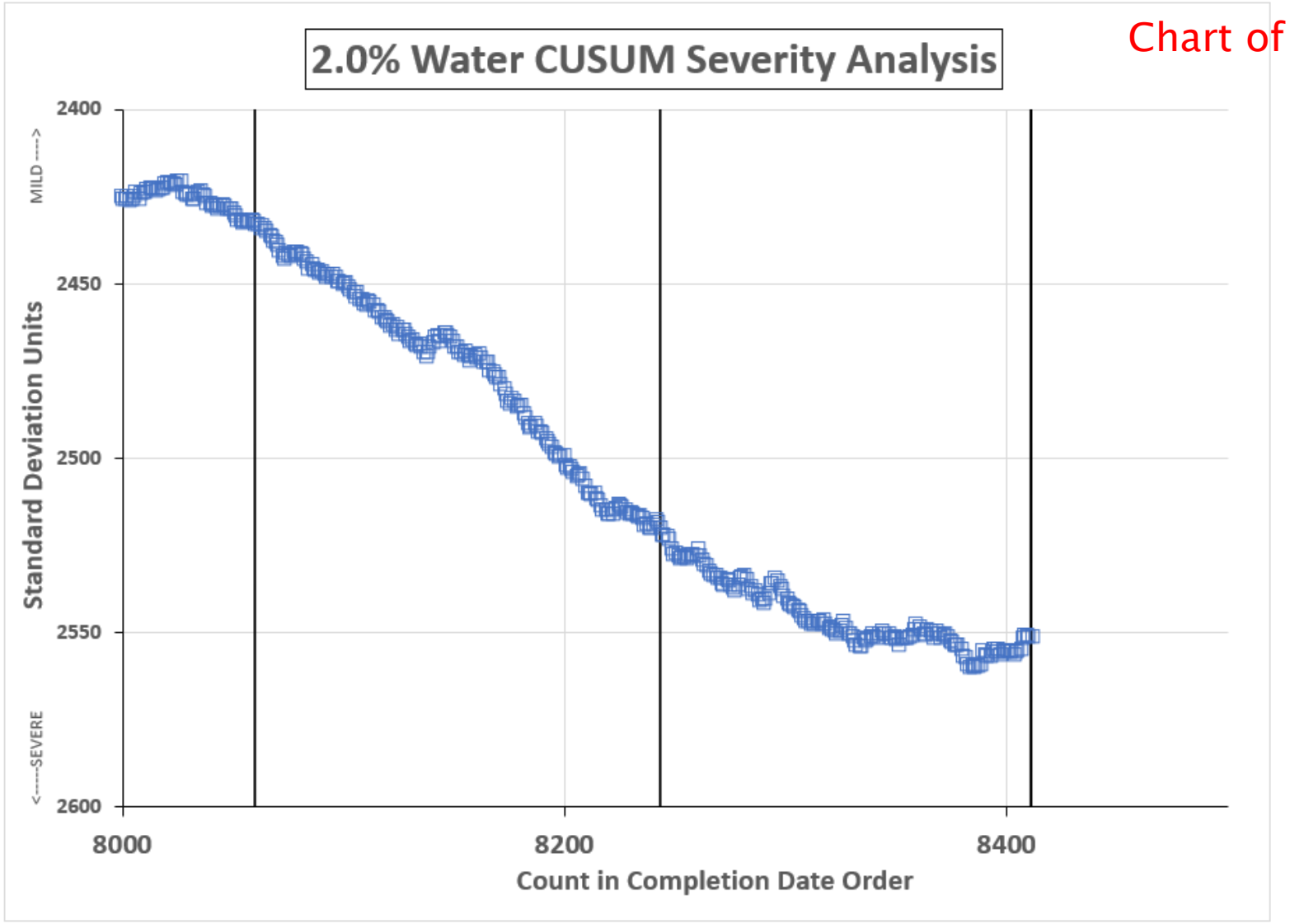
EOWT INDUSTRY OPERATIONALLY VALID DATA
CFA 2.0% Water Treat Rate (Last 400 Data Points)
20 —25 ML CHANGE IN FLOWRATE AVG.

Chart of recent results



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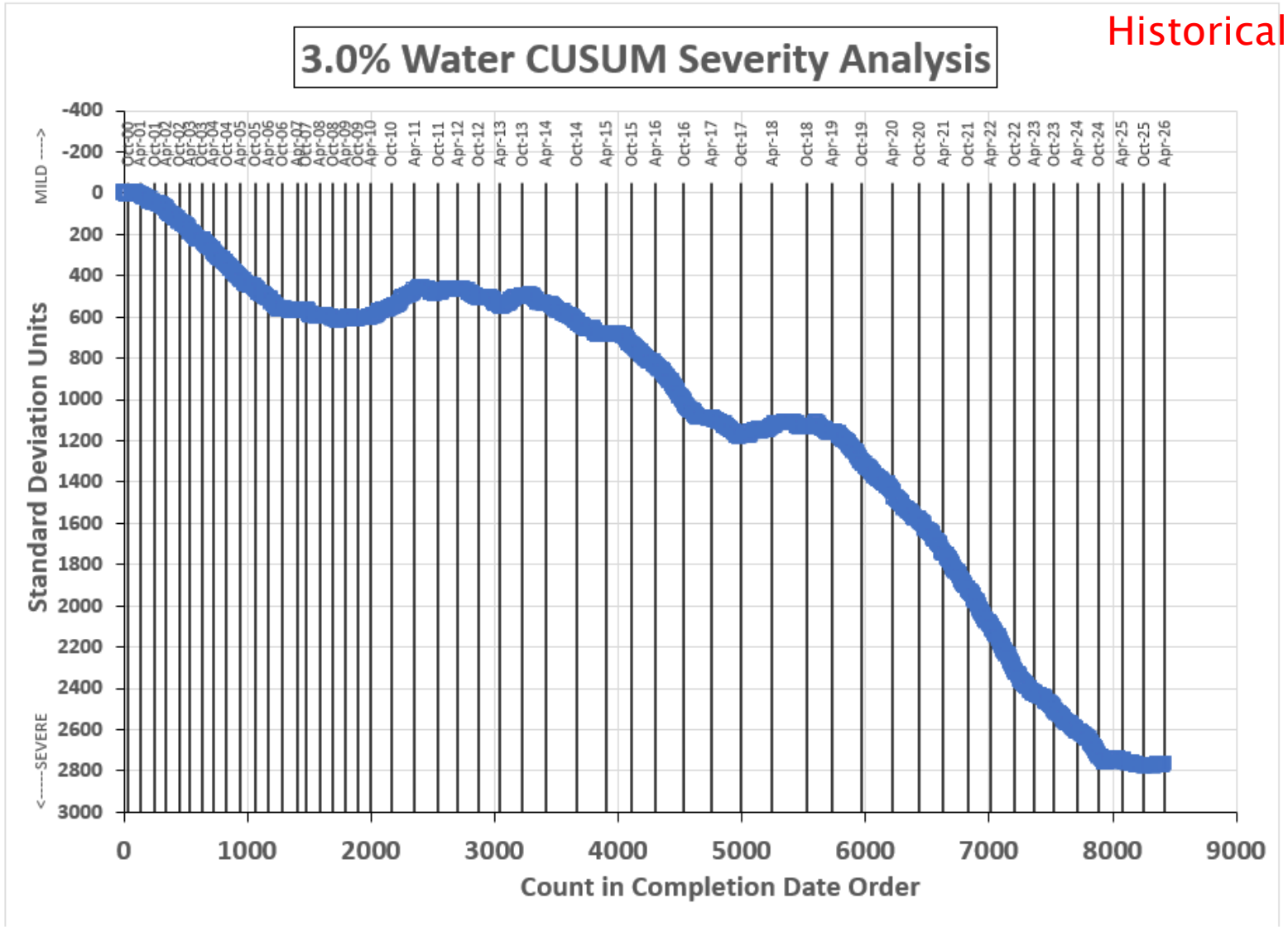
EOWT INDUSTRY OPERATIONALLY VALID DATA
CFA 3.0% Water Treat Rate
20 —25 ML CHANGE IN FLOWRATE AVG.

Historical Chart



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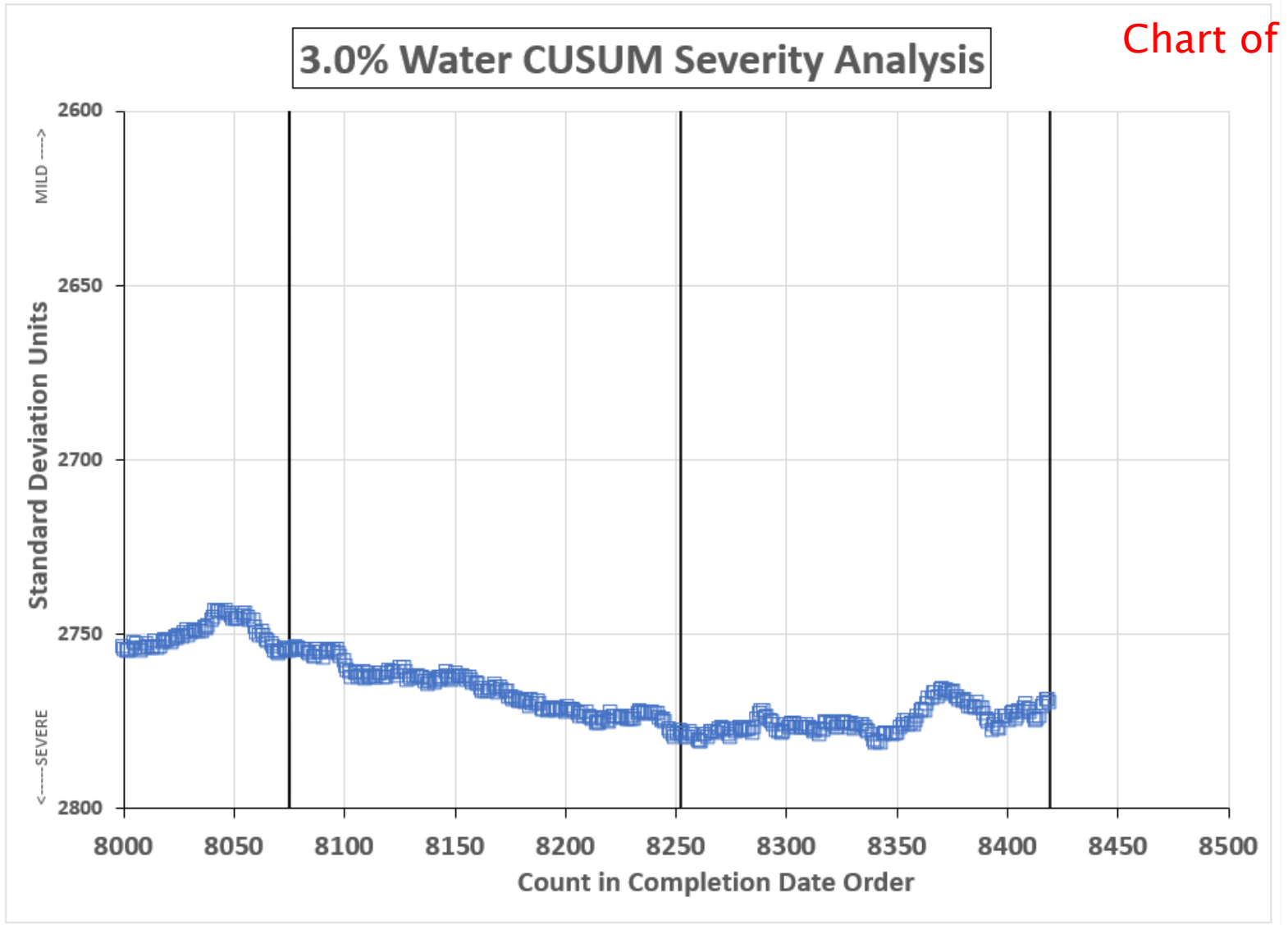
EOWT INDUSTRY OPERATIONALLY VALID DATA
CFA 3.0% Water Treat Rate (Last 400 Data Points)
20 —25 ML CHANGE IN FLOWRATE AVG.

Chart of recent results



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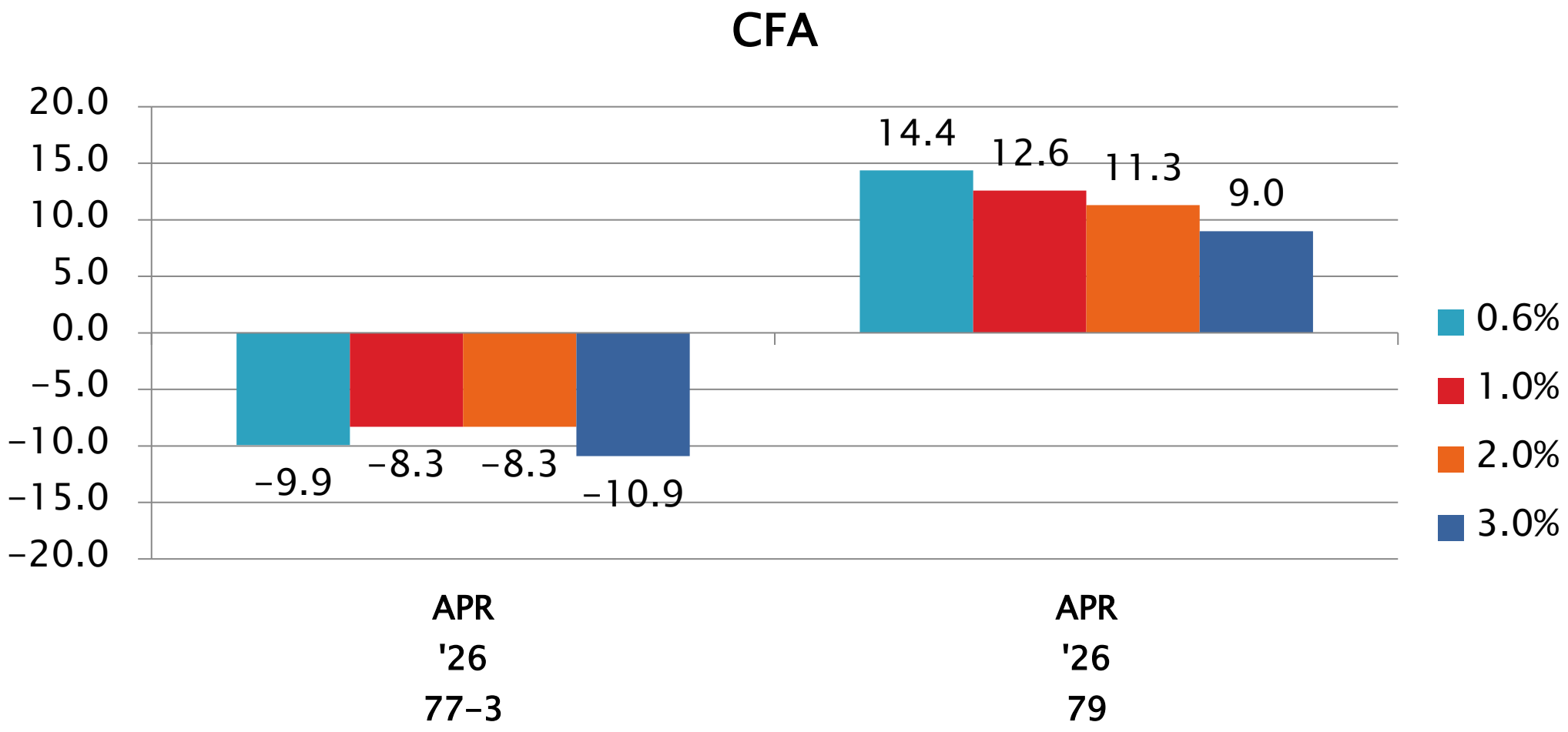
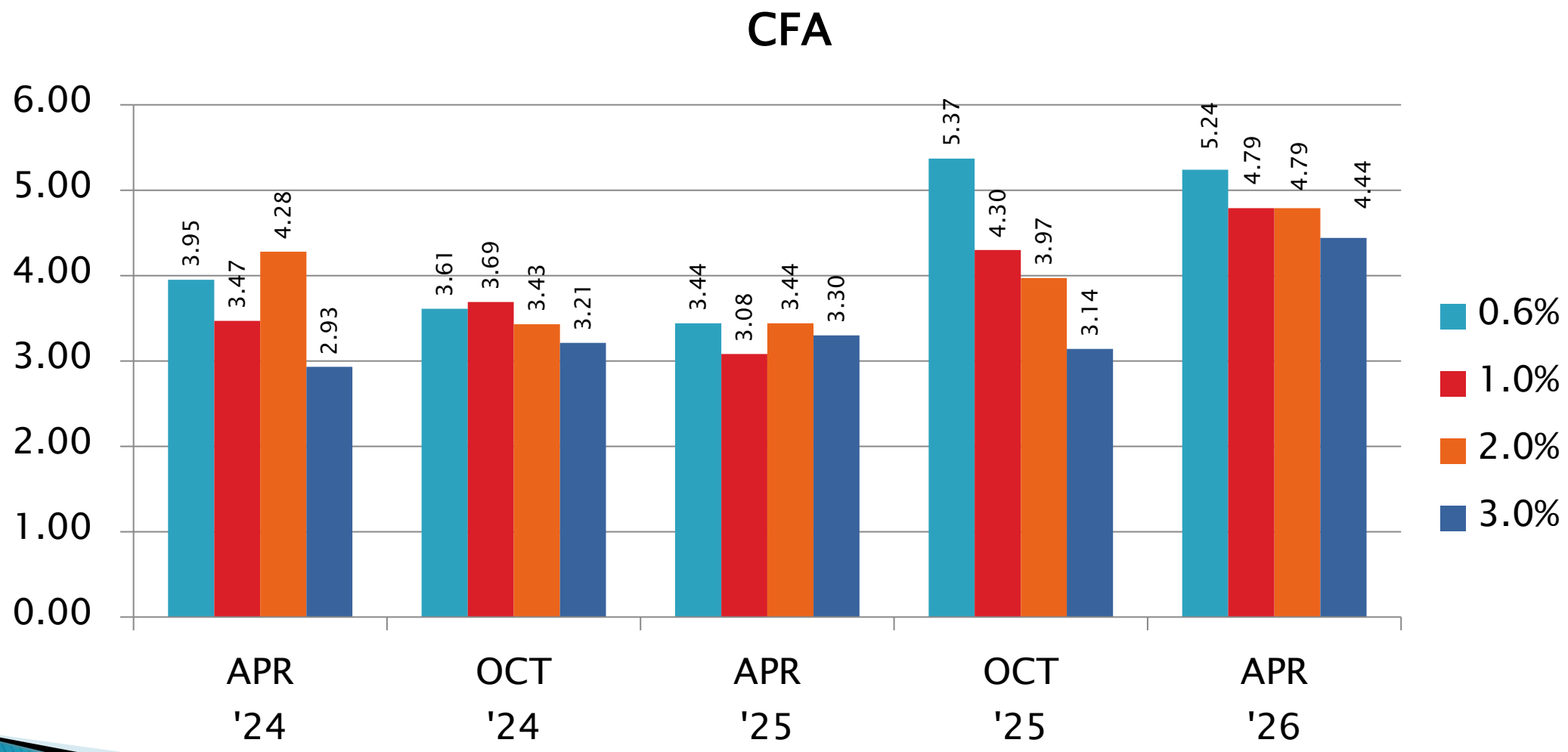
EOWT MEAN CFA's (%) by Reference Oil



EOWT Precision (Pooled s) Estimates



October 1, 2025 – March 31, 2026

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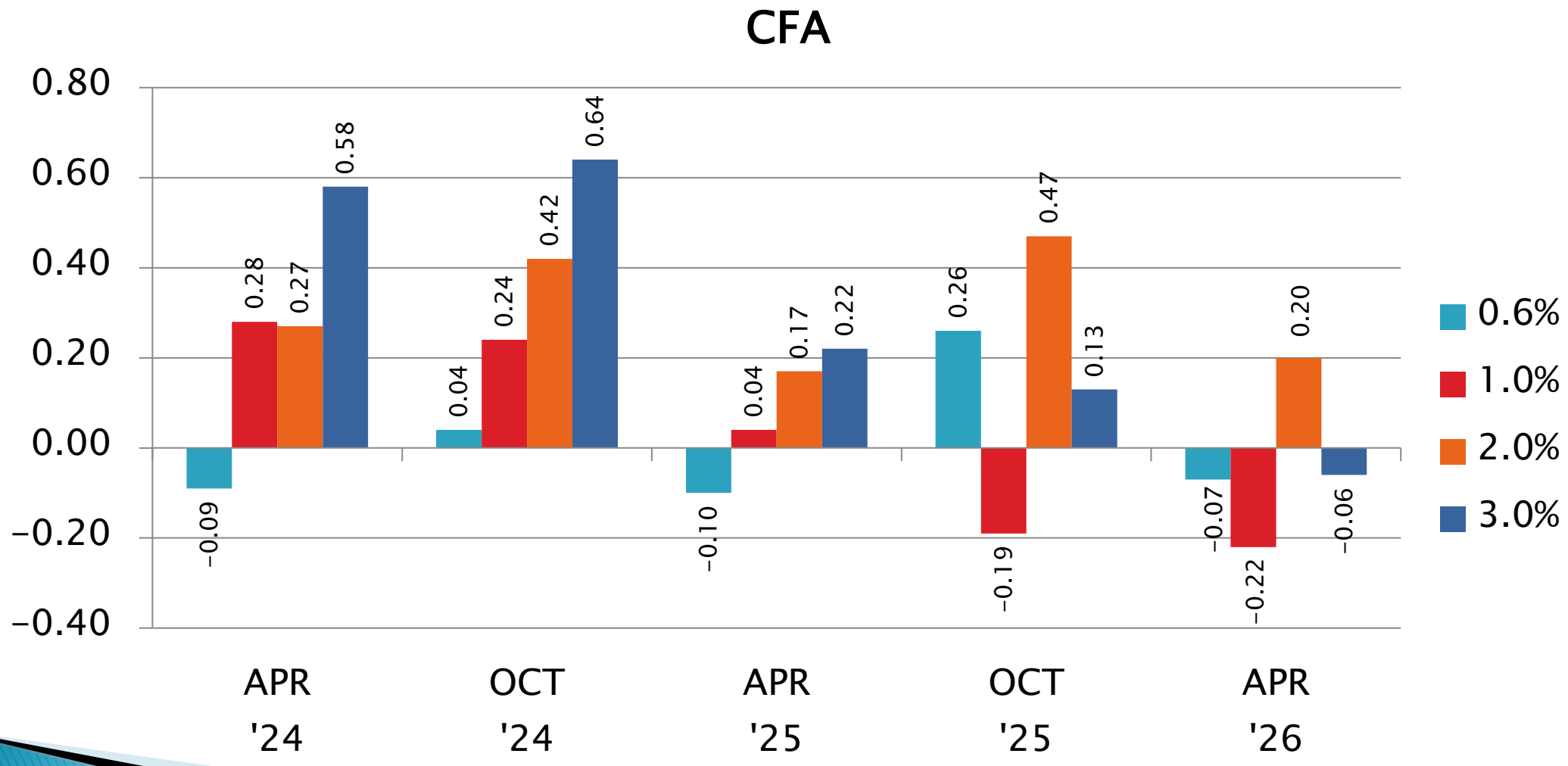
EOWT Performance (Mean Δ/s) Estimates



October 1, 2025 – March 31, 2026

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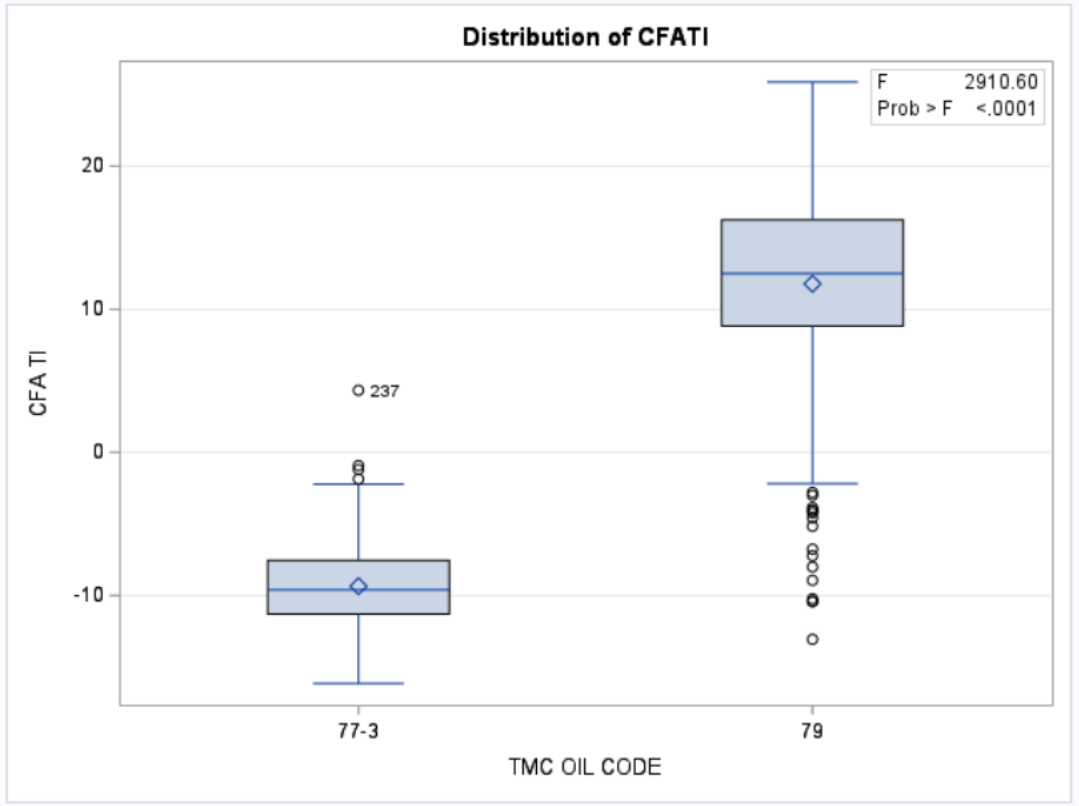
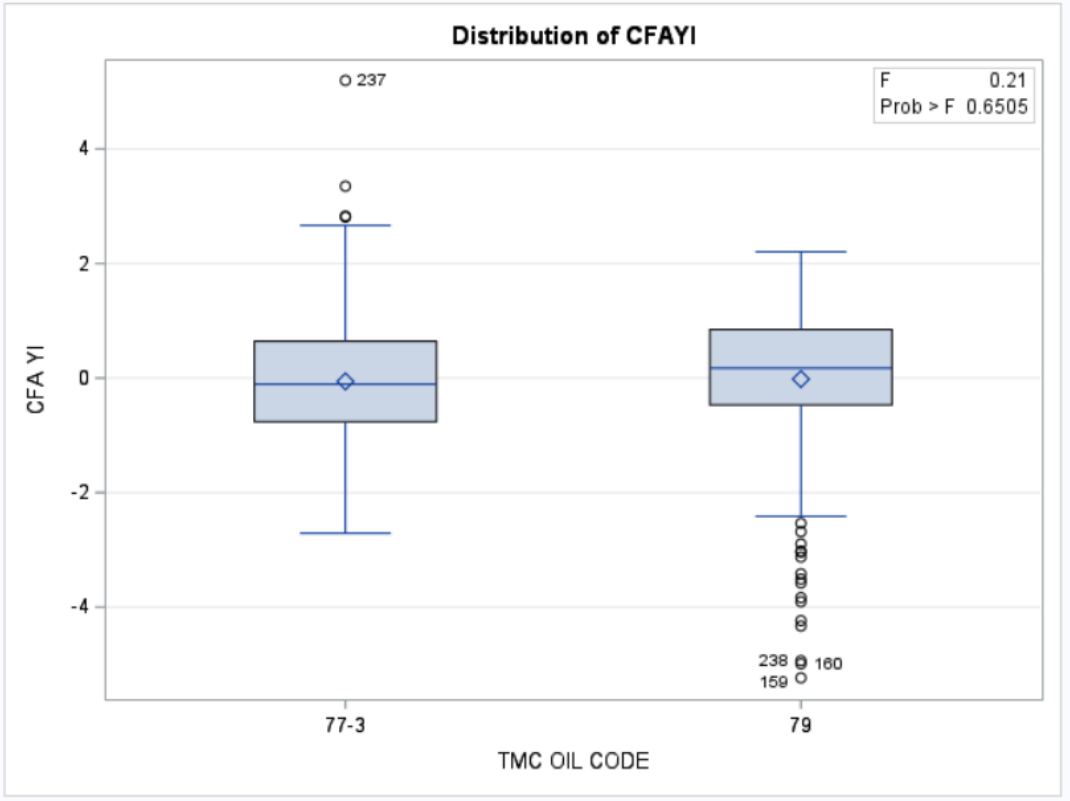
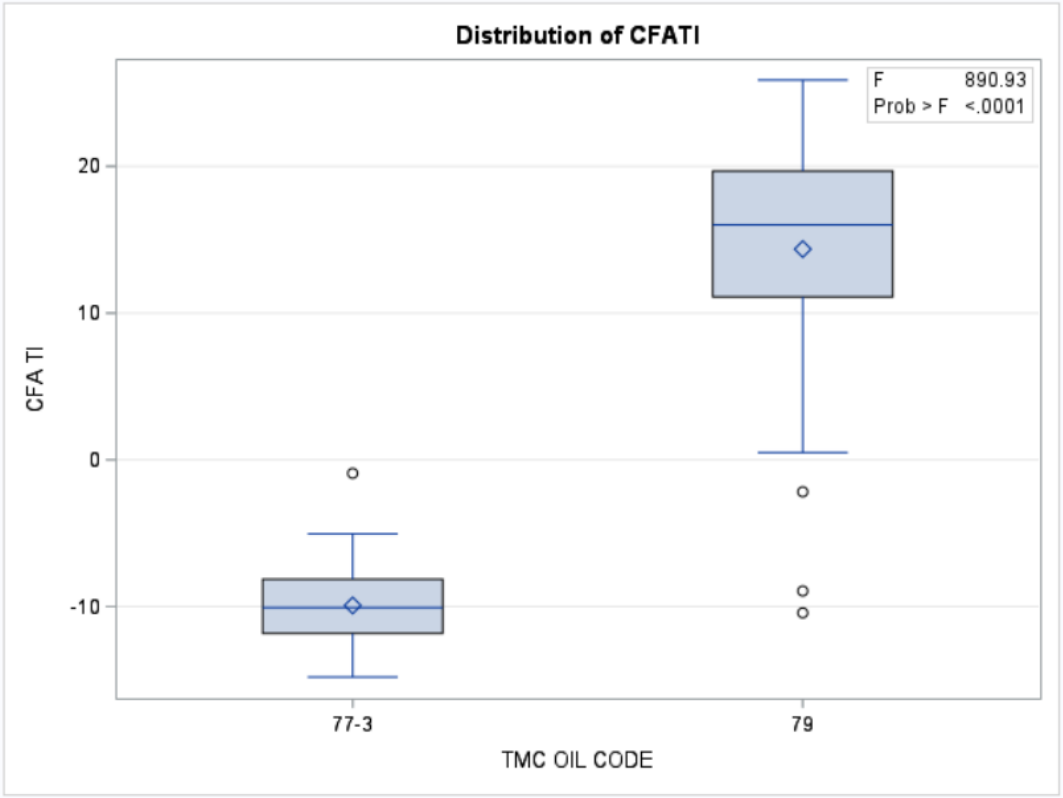
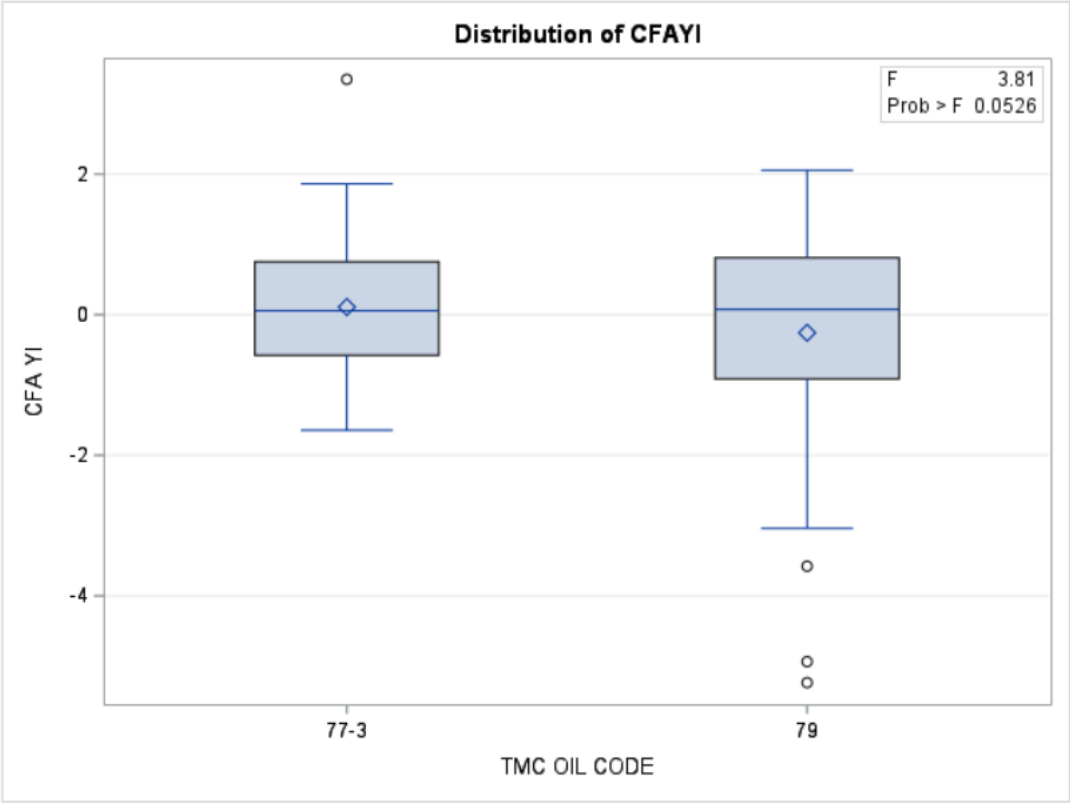
EOWT Results by Reference Oil: All Water Levels



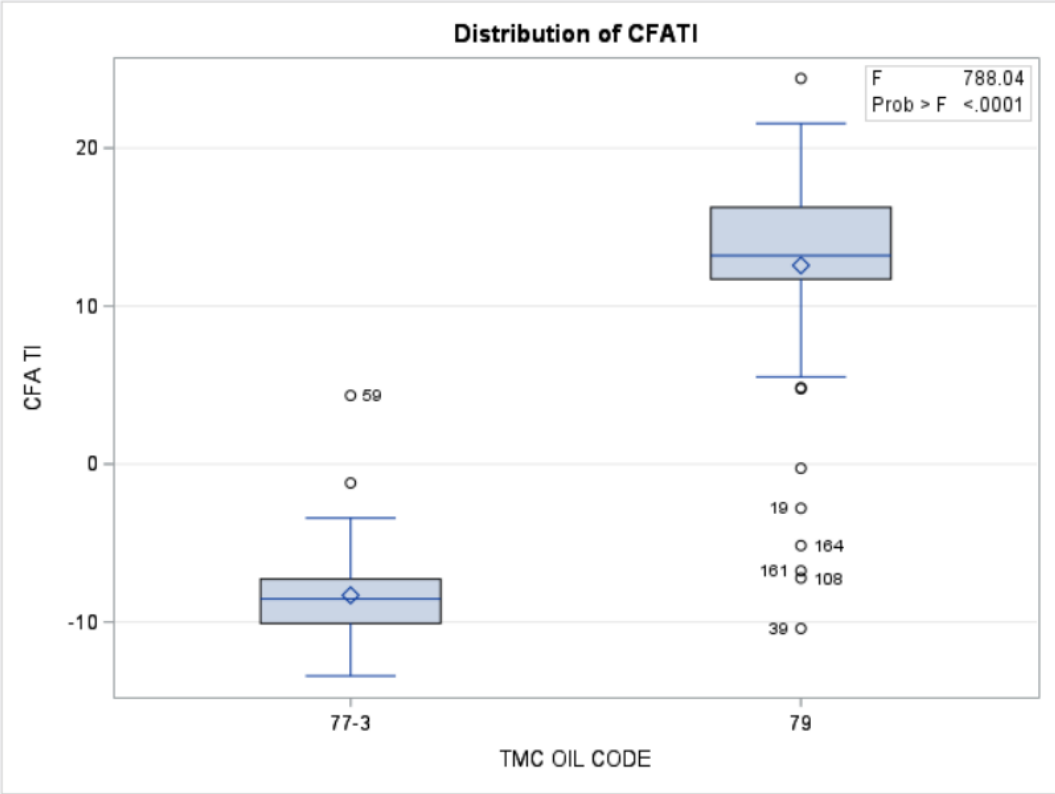


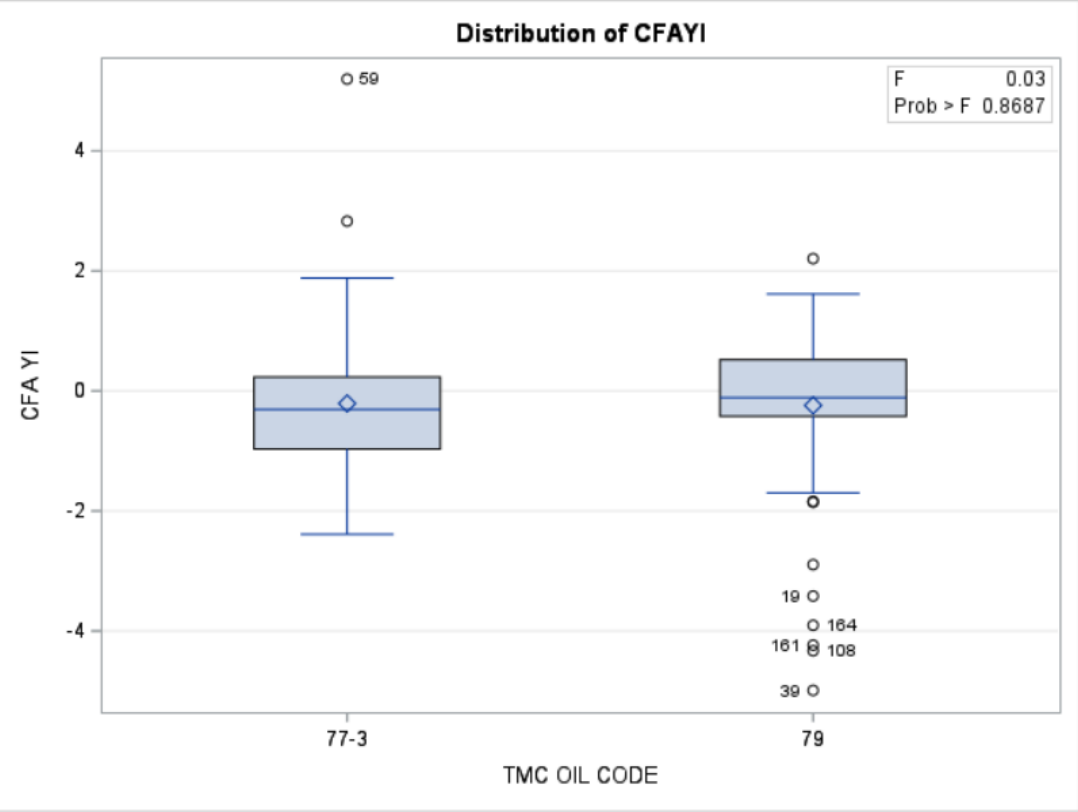
EOWT 0.6% Results by Reference Oil



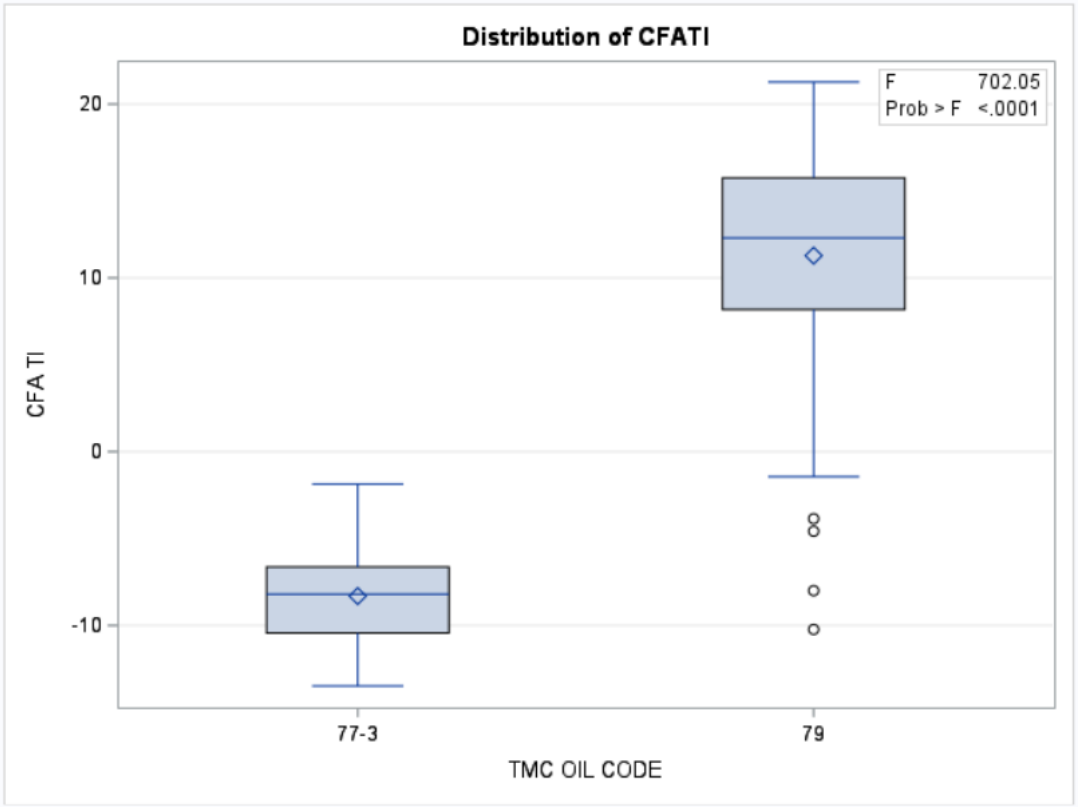


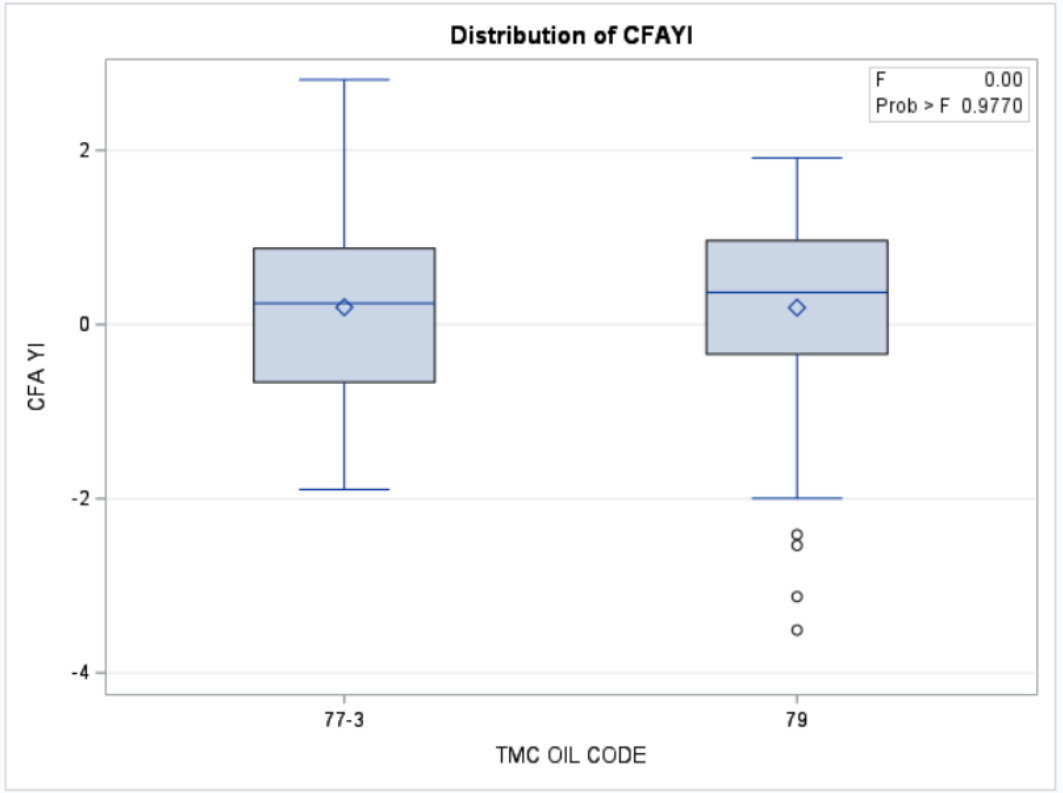
EOWT 1.0% Results by Reference Oil



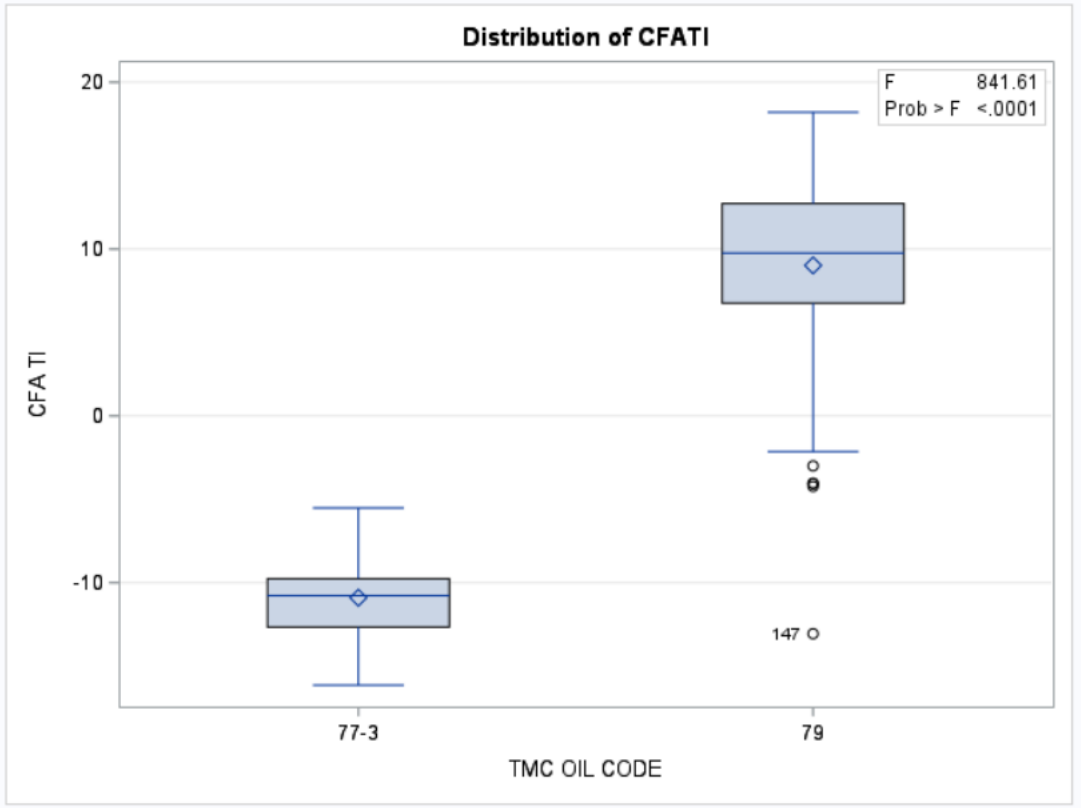


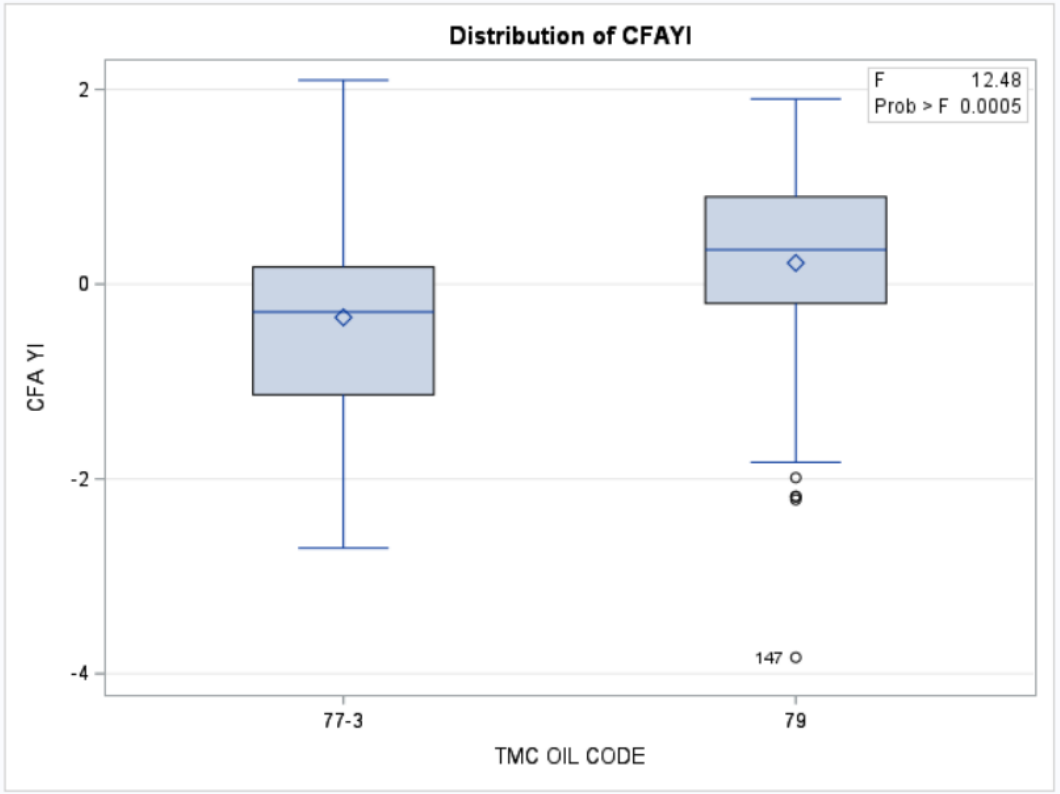
EOWT 2.0% Results by Reference Oil





EOWT 3.0% Results by Reference Oil





Information Letters*

One information letter was issued this semester.

Test	Date	IL	Topic
EOWT	20260325	IL 26-1	Revision of Calibration Requirements

*Available from TMC Website

EOWT Test Status

- One new test lab became calibrated, and a lab previously under calibration attempted to regain calibration status. There were many “shakedown” runs and failing calibration attempts which is evident in the high number of MN, NN and OC test results logged by TMC this semester.
- Calibration requirements were modified by the Surveillance Panel from one test per each candidate “batch” to one test per 30 days. TMC issued an Information Letter on March 25th to notify the industry.
- TMC has acquired a possible Reference Oil 79 replacement from the RO79 supplier. Labs are currently running a Round Robin to collect data on this replacement candidate.

Reference Oil Inventory Estimated Life

EOWT & EOFT

Oil	TMC Inventory (gallons)	TEST	Gallons Shipped Past 6 Months	Estimated Life[1]
77-3	300	EOWT	15	5+ years
79	11.8	EOWT	19.9	3 years
		EOFT		

[1]Based upon new monthly calibration requirements for EOWT & EOFT.

TABLE of CONTENTS

D02.B0.07
TMC Monitored Tests

ASTM D 6795

Engine Oil Filterability Test (EOFT)

October 1, 2025 – March 31, 2026

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Calibrated Labs and Stands*

(change since last Semi-Annual report)

Test	Labs	Stands
D6795	6 (+0)	N/A
*As of 3/31/2026		

- 7 labs reported data

D6795: EOFT

Period Precision and Severity Estimates

Change in Filtration Rate	n	df	Pooled s	Mean Δ/s
Target established 7/20/15	70	--	4.56	--
4/1/24 through 9/30/24	130	129	4.51	0.64
10/1/24 through 3/31/25	116	115	5.76	0.81
4/1/25 through 9/30/25	154	153	5.26	0.41
10/1/25 through 3/31/26	131	130	5.28	0.33

EOFT Test Activity*

Test Status	Validity Code	Number of Tests
Acceptable Calibration Test	AC	128
Failed Calibration Test	OC	3
Invalid Calibration Test	LC	0
Acceptable Informational Run	NN	4
Unacceptable Informational Run	MN / XN	2
Total		**137**

- 2.3% EOFT Calibration Fail Rate
- 7 labs reported data this semester

EOFT Failed Tests

Failed Parameter	Number of Tests
Change in Flow Average (CIFA) Severe	2
Change in Flow Average (CIFA) Mild	1
Total	**3**

EOFT Failed Tests by Lab

Failed Parameter	LTMS Lab							#
	A	B	BE	G	I	L	V	
Change in Flow Average (CIFA) Severe	0	N/A	0	2	0	0	0	2
Change in Flow Average (CIFA) Mild	1	N/A	0	0	0	0	0	1
Totals	**1**	**N/A**	**0**	**2**	**0**	**0**	**0**	**3**

EOFT Lost Tests*

Status	Cause	No. of Tests
Invalid (L,R)		0
Aborted (X)		0
Total		**0**

*Invalid and aborted calibration tests

There were no Invalid or Aborted calibration tests this semester.

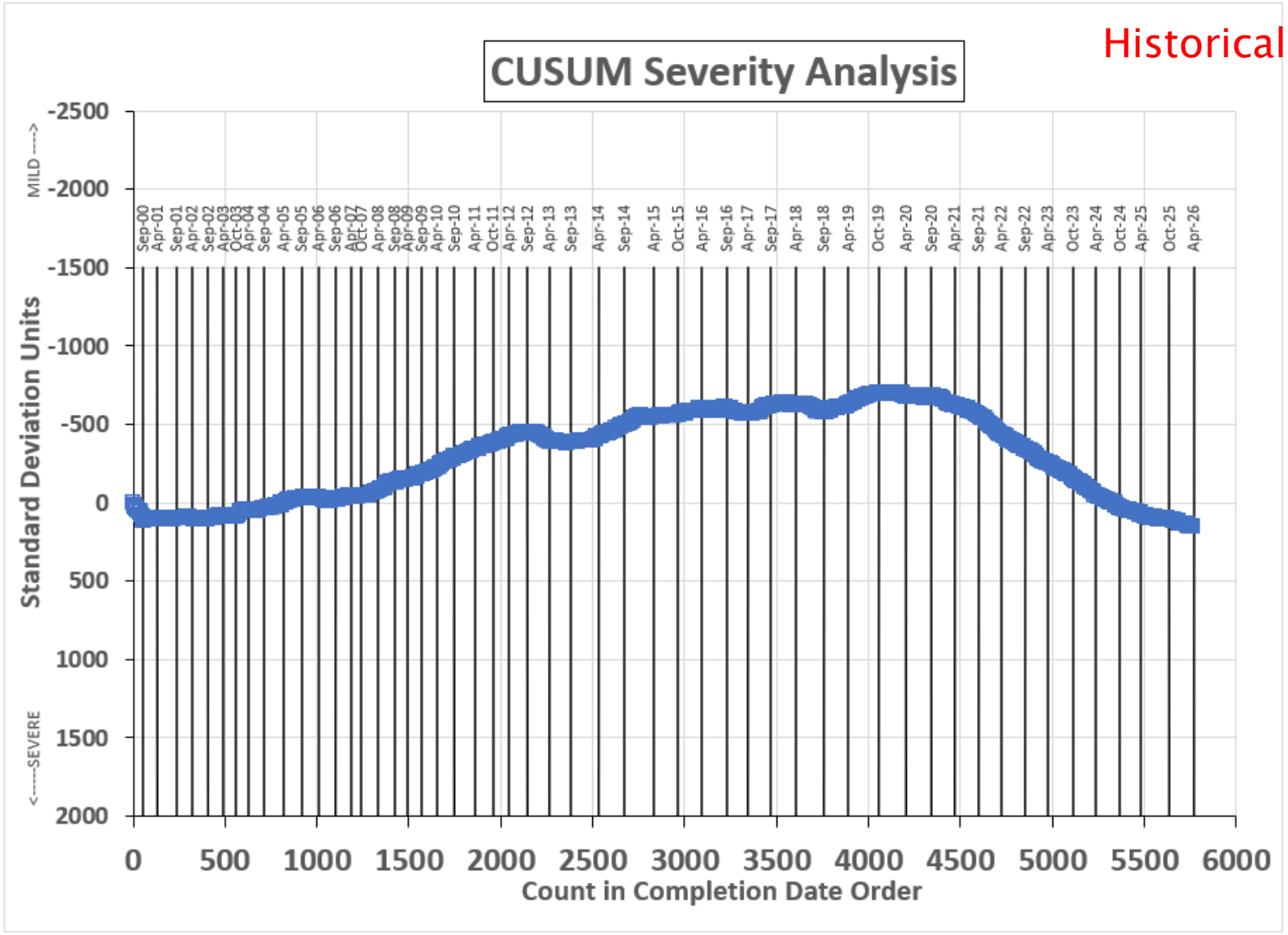
EOFT Information/Shakedown Tests

Informational / Non-blind Results	Number of Tests
Informational / Non-blind Test Result In-Range (NN)	4
Informational / Non-blind Test Result Severe (MN)	1
Informational / Non-blind Test Result Mild (MN)	1
Total	**6**

EOFT INDUSTRY OPERATIONALLY VALID DATA

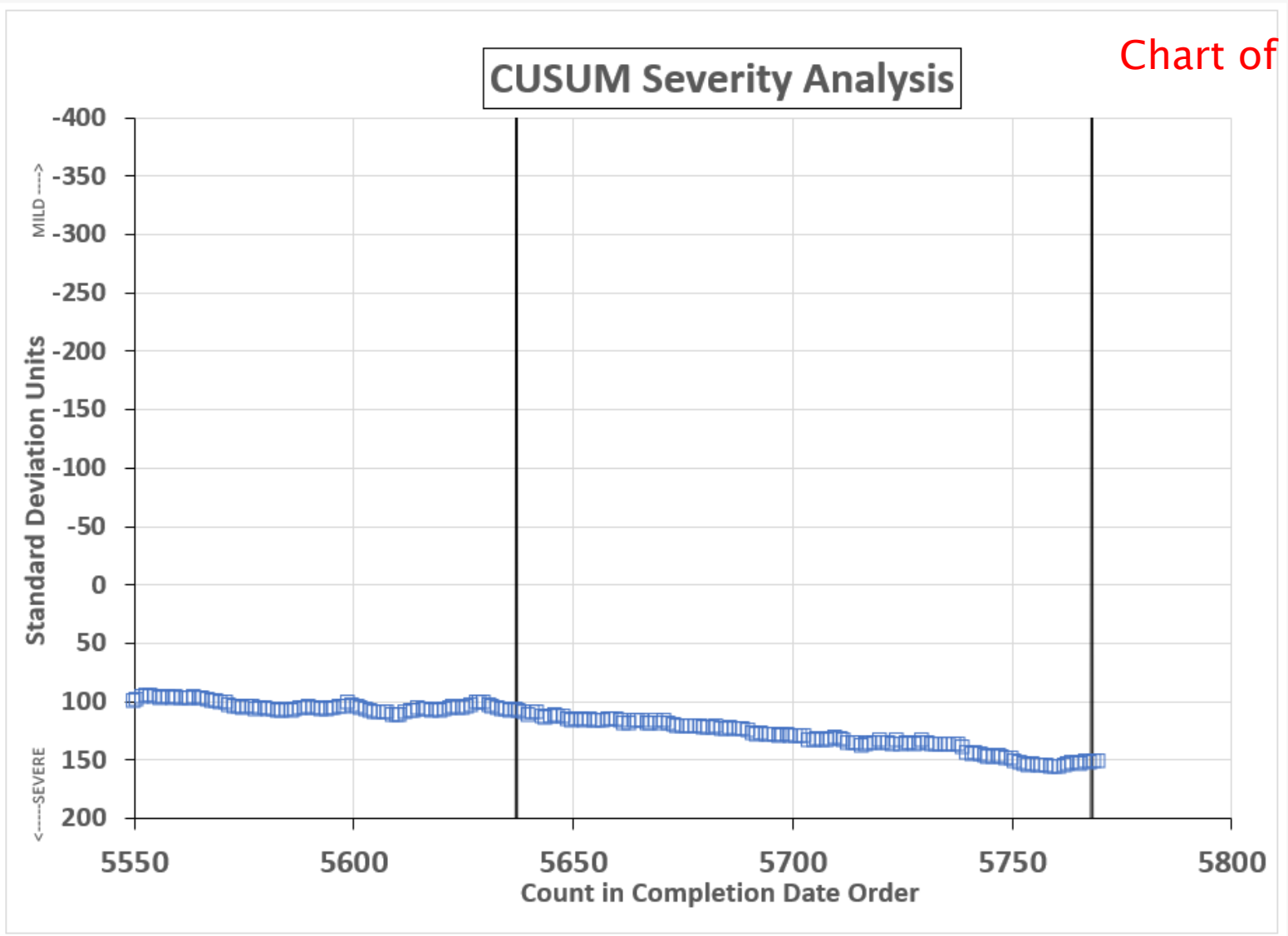
20 —25 ML CHANGE IN FLOWRATE AVERAGE (%)

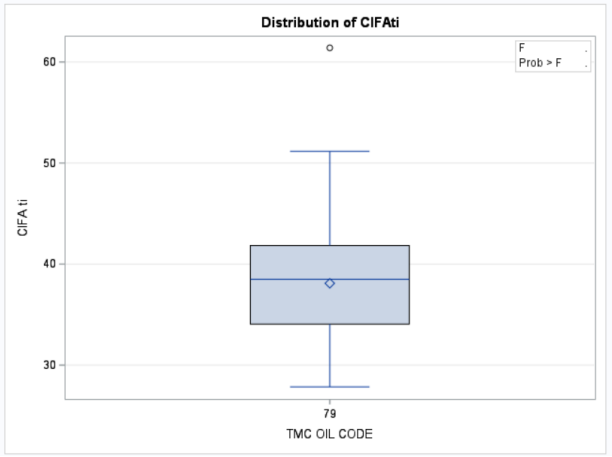
Historical Chart



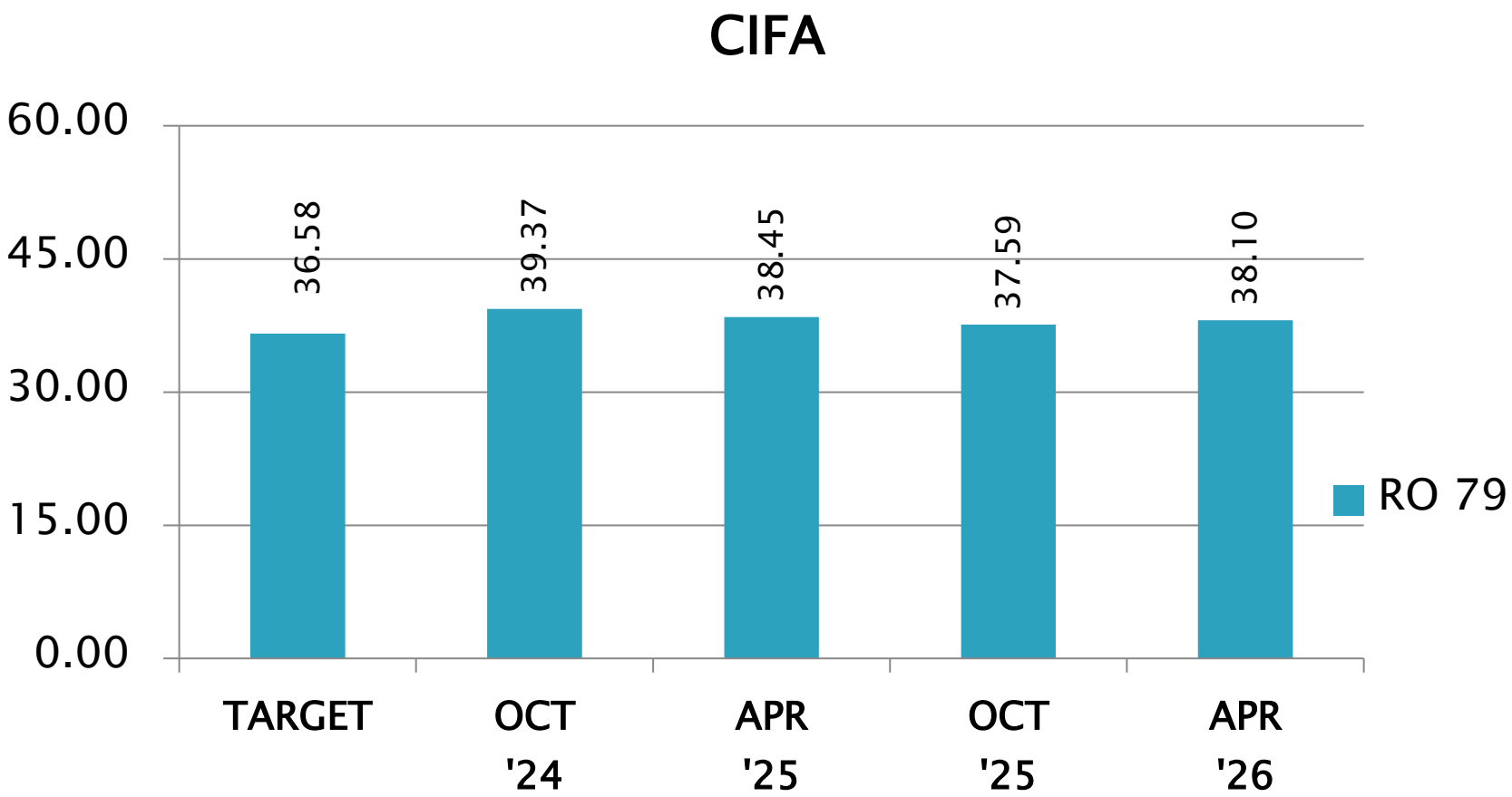
EOFT INDUSTRY OPERATIONALLY VALID DATA
Last 250 Data Points
20 —25 ML CHANGE IN FLOWRATE AVERAGE (%)

Chart of recent results





EOFT MEAN CIFA's (%)



October 1, 2025 – March 31, 2026

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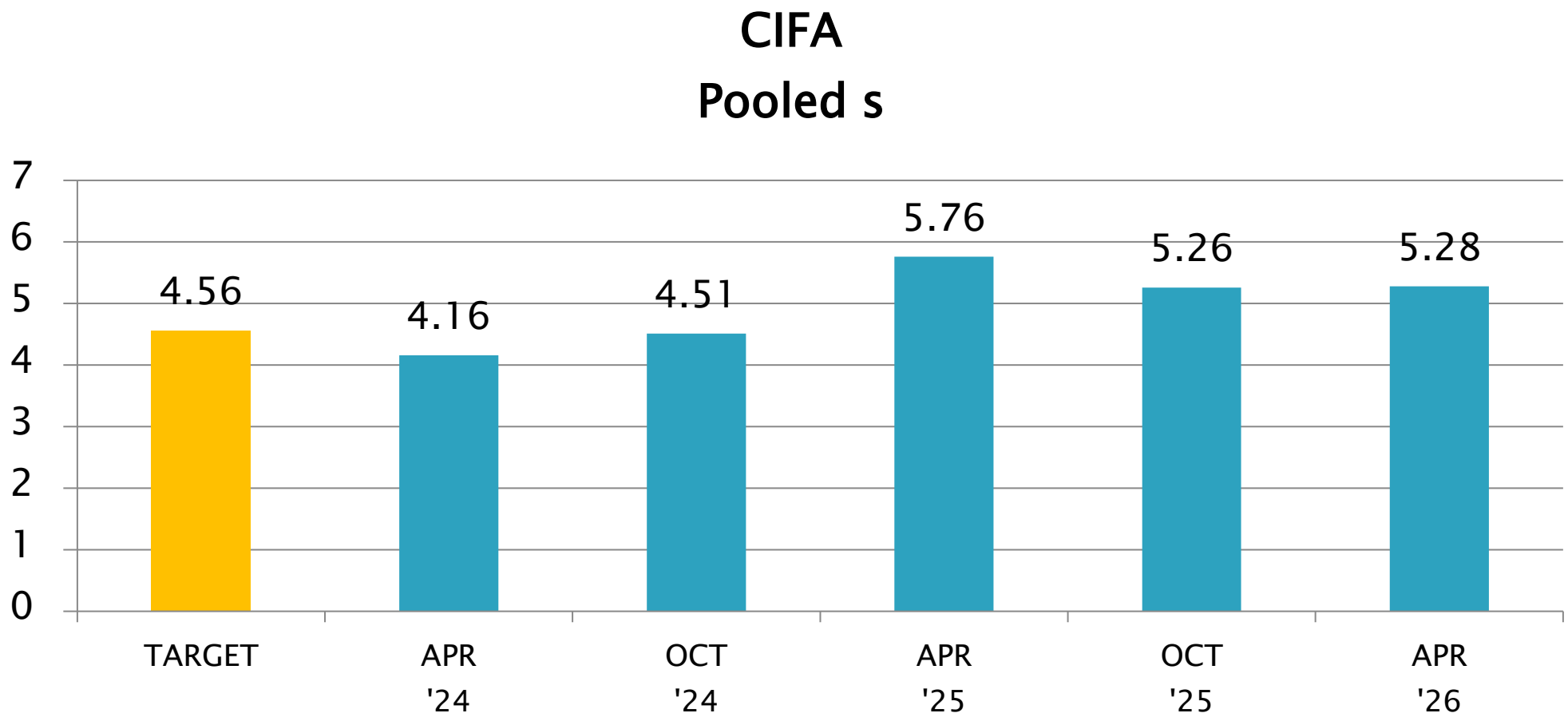
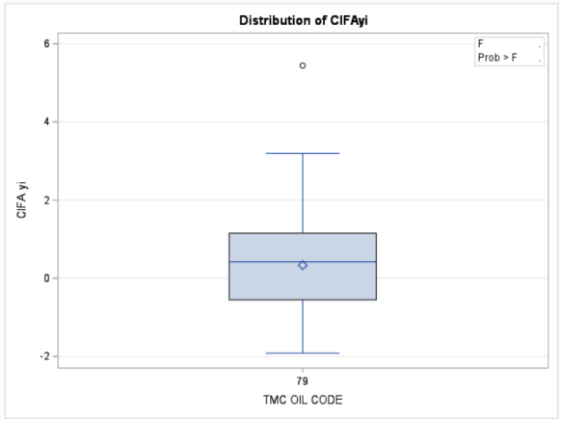
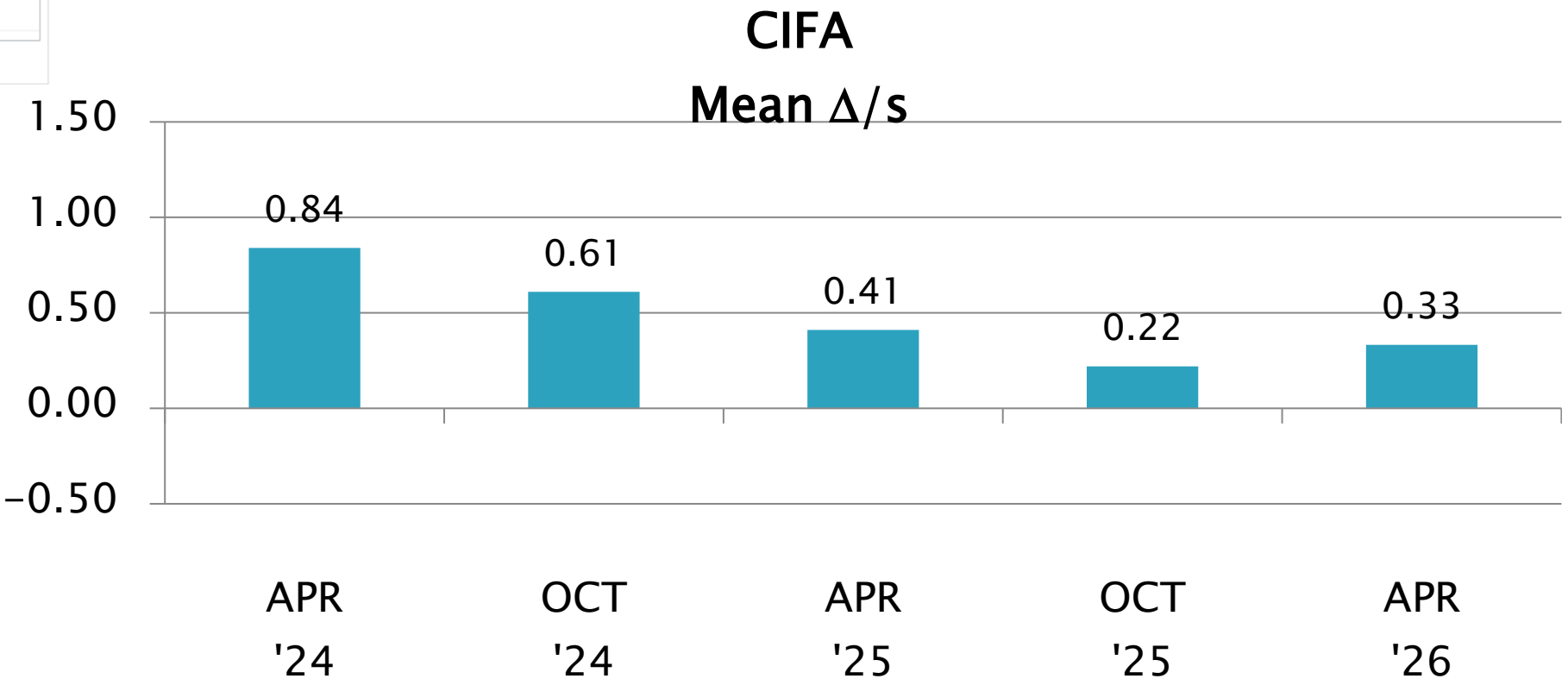
EOFT Precision Estimates



EOFT Severity Estimates





October 1, 2025 – March 31, 2026

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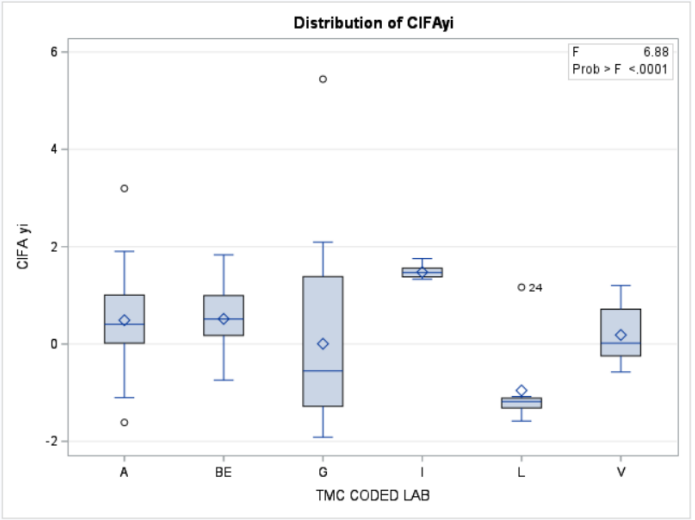
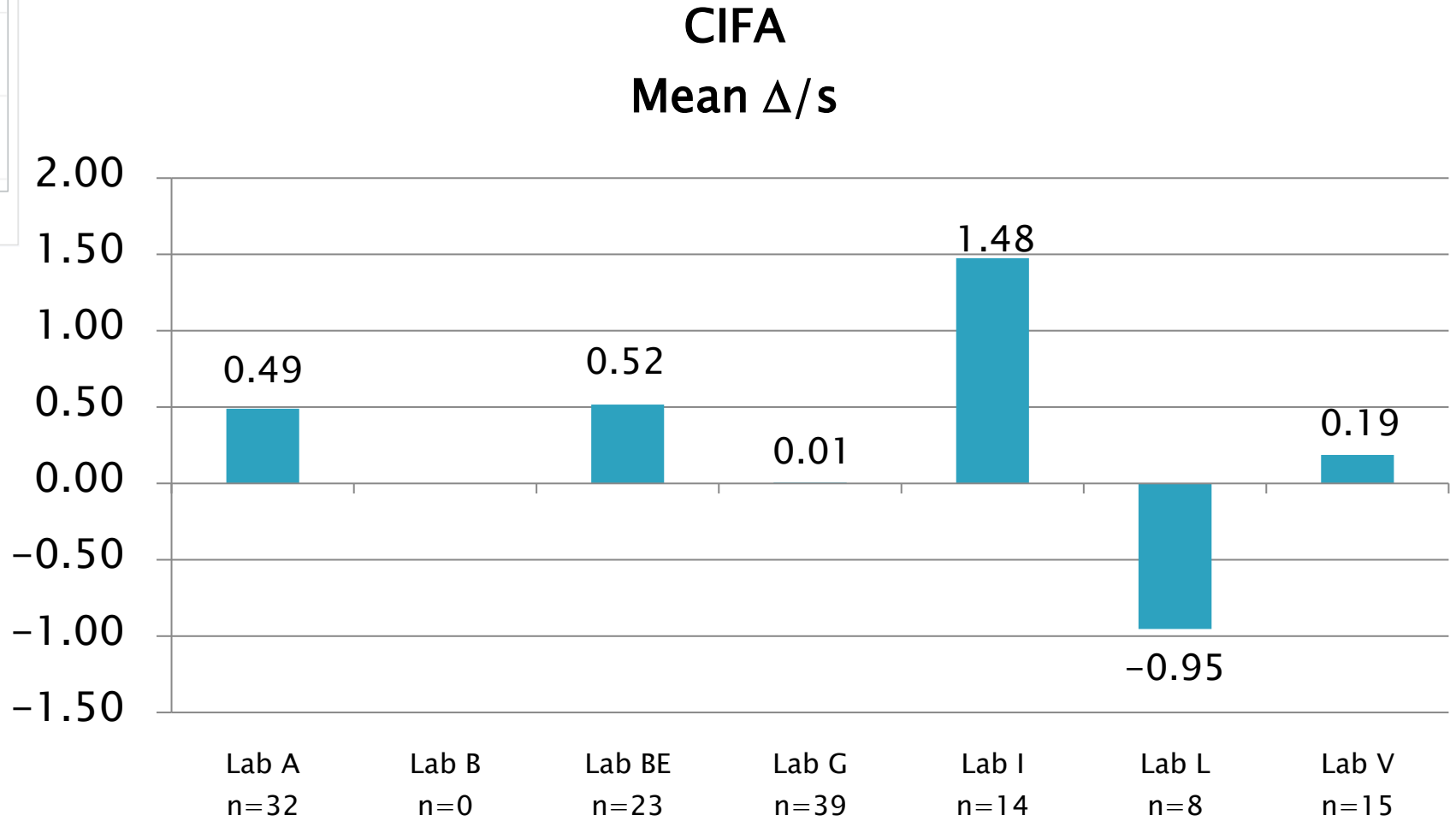


EOFT Lab Severity Estimates



October 1, 2025 – March 31, 2026

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Information Letters*

One information letter was issued this semester.

Test	Date	IL	Topic
EOFT	20260325	IL 26-1	Revision of Calibration Requirements

*Available from TMC Website

EOFT Test Status

- TMC has acquired a possible Reference Oil 79 replacement from the RO79 supplier. Labs are currently running a Round Robin to collect data on this replacement candidate.
- Surveillance Panel modified the calibration requirements from one per each candidate "batch" to one calibration test per 30 days. An Information Letter was issued on March 25th to announce this change.
- Change in Flow Average (CIFA) continues to trend severe. Performance (Mean Δ/s) moved slightly more severe (0.33 s) versus last semester (0.22 s).
- Precision (Pooled s) is unchanged 5.28 s.

Reference Oil Inventory Estimated Life

EOWT & EOFT

Oil	TMC Inventory (gallons)	TEST	Gallons Shipped Past 6 Months	Estimated Life[1]
77-3	300	EOWT	15	5+ years
79	11.8	EOWT	19.9	3 years
		EOFT		

[1]Based upon new monthly calibration requirements for EOWT & EOFT.

TABLE of CONTENTS

D02.B0.07
TMC Monitored Tests

ASTM D 7097

Medium High Temperature TEOST (MTEOS)

October 1, 2025 – March 31, 2026

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Calibrated Labs and Stands*

(change since last Semi-Annual report)

Test	Labs	Stands
D7097	10 (-1)	33 (-2)
*As of 3/31/2026		

D7097: Deposits by MTEOS

Test Status	Validity Code	No. Tests
Acceptable Calibration Test	AC	63
Failed Calibration Test	OC	6
Operationally Invalidated by Lab	LC	3
Operationally Invalidated by TMC	RC	1
Operationally Invalid (Aborted)	XC	1
Acceptable Informational Run	NN	0
Unacceptable Informational Run	MN	1
Total		**75**

Number of Labs Reporting Data: 11 (+0)
Fail Rate of Operationally Valid Tests: 8.7% (9.7% last period)

D7097: Deposits by MTEOS

Statistically Unacceptable Tests (OC)	No. Of Tests
Total Deposits Severe	6
Total Deposits Mild	0
Total	**6**

FOUR Labs had OC results.
TWO Severe fails on RO 434-3
FOUR Severe fails on RO 432.

D7097: Deposits by MTEOS
Summary of Invalid Tests

Operationally Invalid Tests (LC, RC, XC)		Validity Code	No. Of Tests
Aborted by Lab	Temperature Control Issue	XC	1
Invalidated by TMC	Test Sample Prep Error	RC	1
Invalidated by Lab	Sample lost, line slippage	LC	1
Invalidated by Lab	Power to Instrument Cut Off	LC	1
Invalidated by Lab	Thermocouple Depth Error	LC	1
Total			**5**

D7097: Deposits by MTEOS
Summary of Informational Tests

Informational / Non-blind Tests (NN, MN)	Validity Code	No. Of Tests
Informational run, Deposits in Range	NN	0
Informational run, Deposits not in Range (Severe)	MN	0
Informational run, Deposits not in Range (Mild)	MN	1
Total		1

D7097: Deposits by MTEOS

Period Precision and Severity Estimates

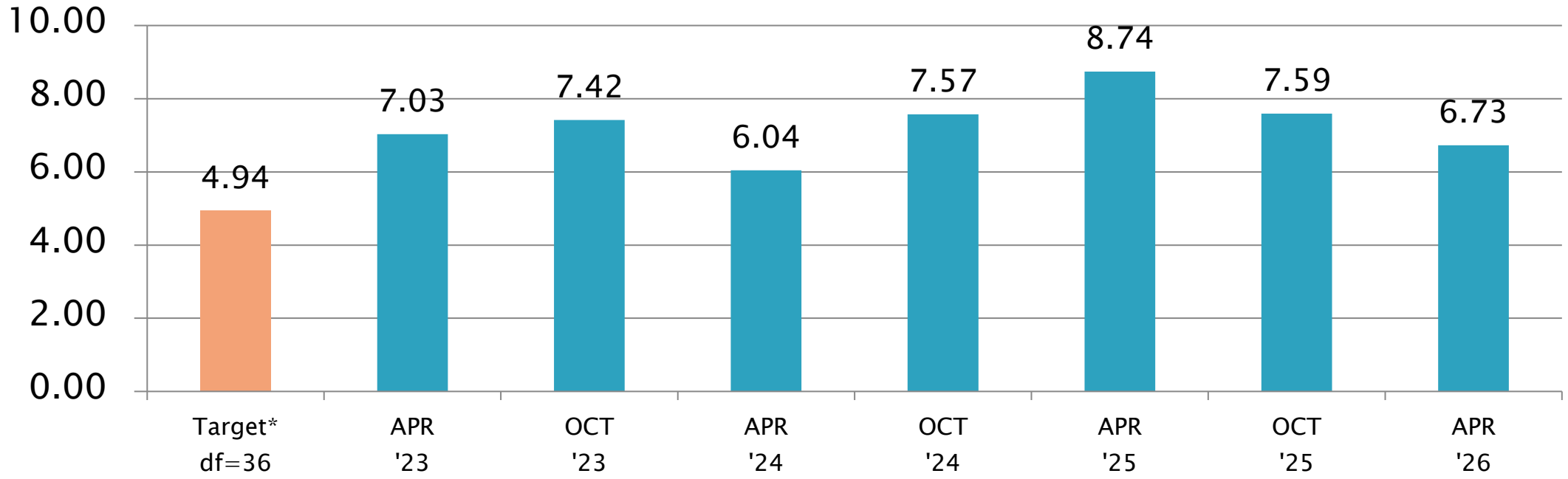
Total Deposits, mg	n	df	Pooled s	Mean Δ/s
Current Targets 9/30/2021[1]	38	36	4.94	-----
10/1/20 through 3/31/21	101	99	8.40	0.17
4/1/21 through 9/30/21	81	78	7.25	-0.02
10/1/21 through 3/31/22	75	73	8.86	0.18
4/1/22 through 9/30/22	77	75	7.69	0.69
10/1/22 through 3/31/23	67	65	7.03	0.41
4/1/22 through 9/30/23	74	71	7.42	0.31
10/1/23 through 3/31/24	65	62	6.04	0.19
4/1/24 through 9/30/24	76	73	7.57	0.43
10/1/24 through 3/31/25	72	70	8.74	0.31
4/1/25 through 9/30/25	72	70	7.59	0.52
10/1/25 through 3/31/26	69	67	6.73	0.71

[1]Target precision updated to reference oils 432 and 434-3 preliminary

D7097 Precision Estimates

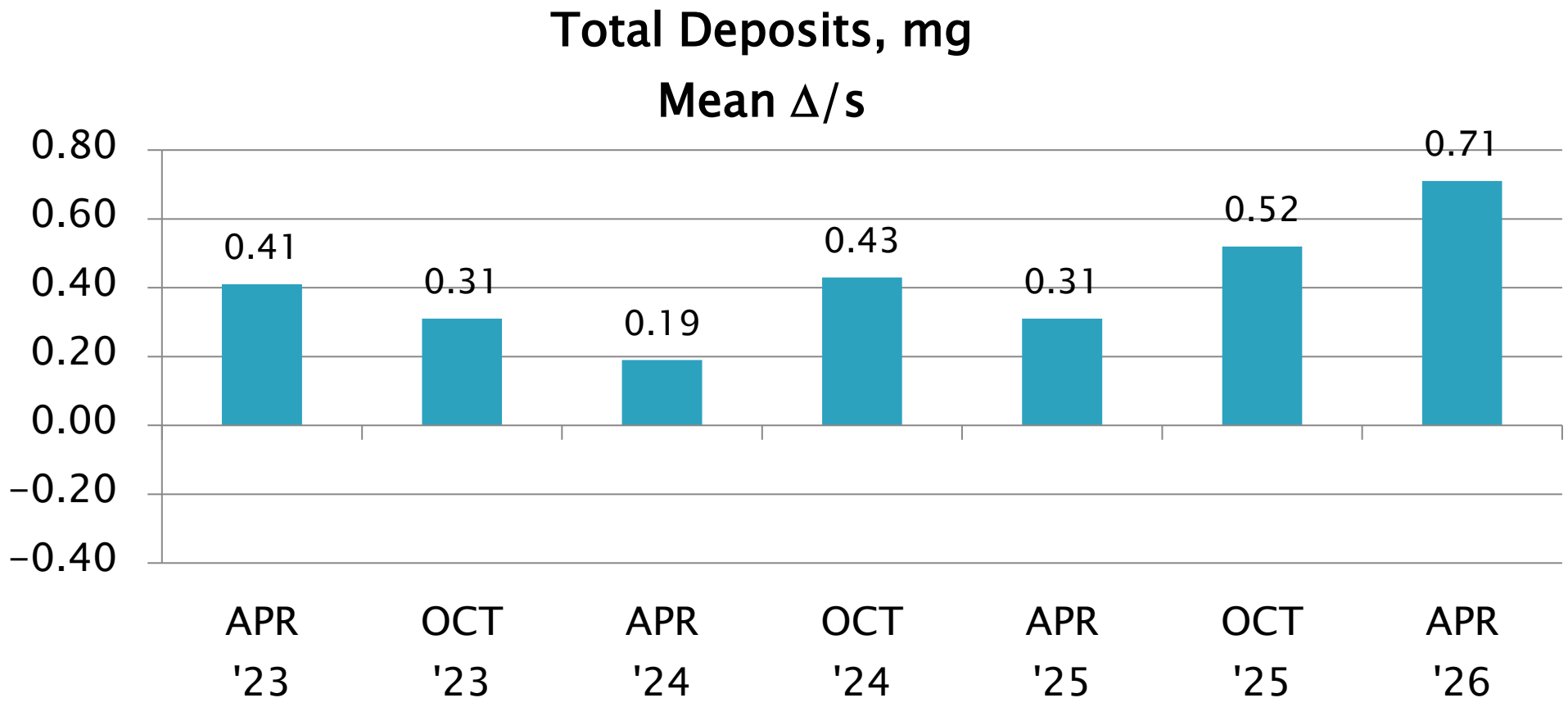
Total Deposits, mg

Pooled s



*Target precision updated to reference oils 432 and 434-3 preliminary

D7097 Severity Estimates



October 1, 2025 – March 31, 2026

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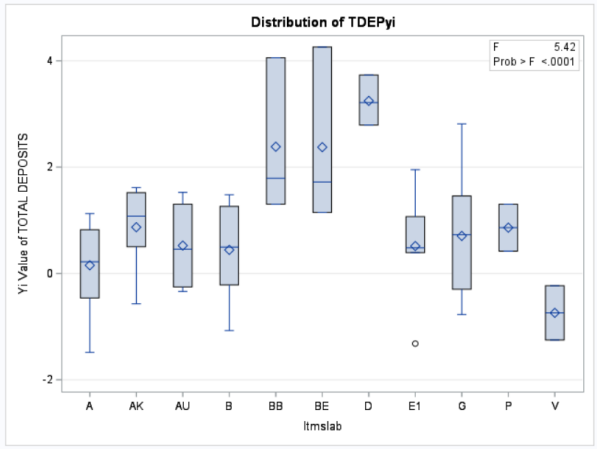
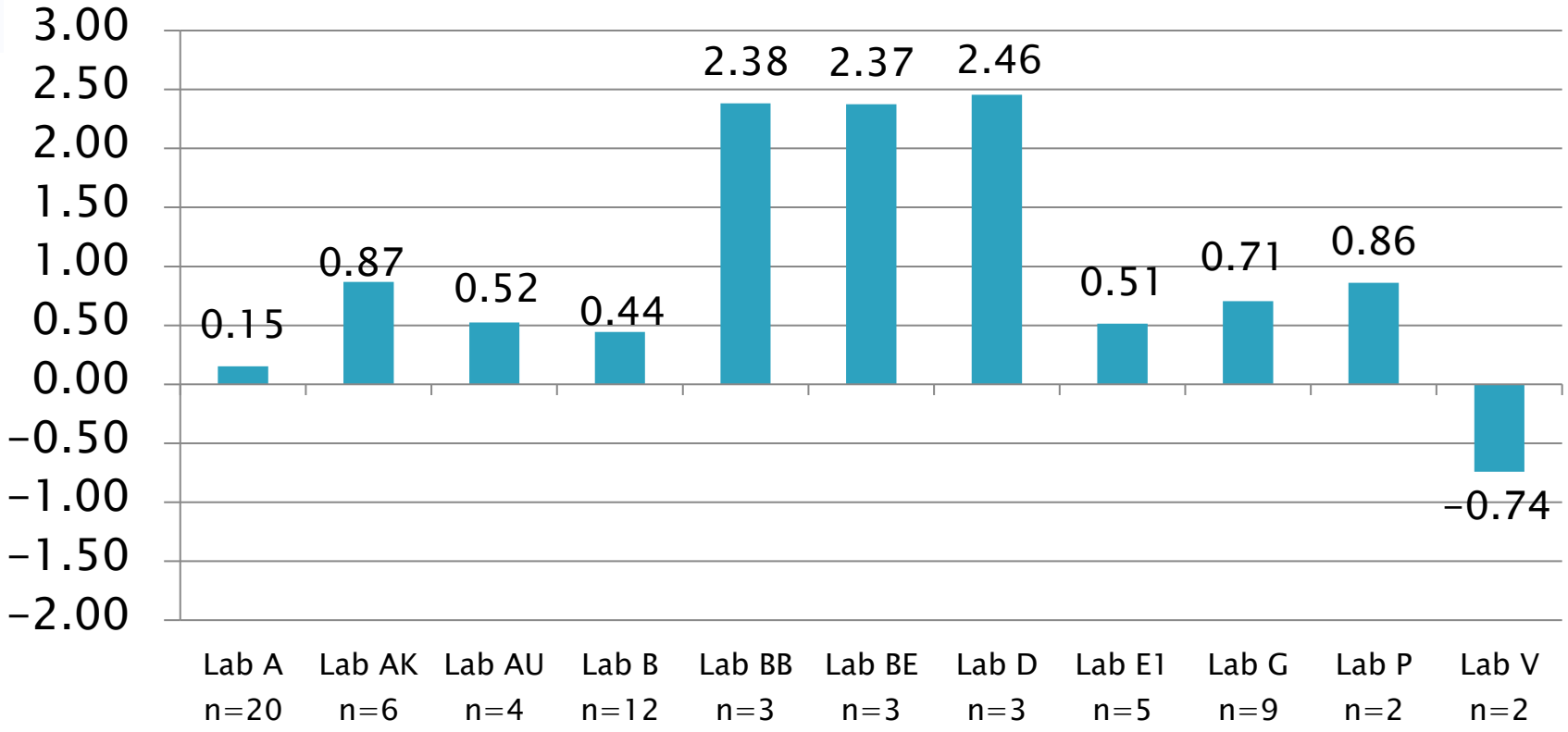


D7097 Lab Severity Estimates

Total Deposits, mg

Mean Δ/s



October 1, 2025 – March 31, 2026

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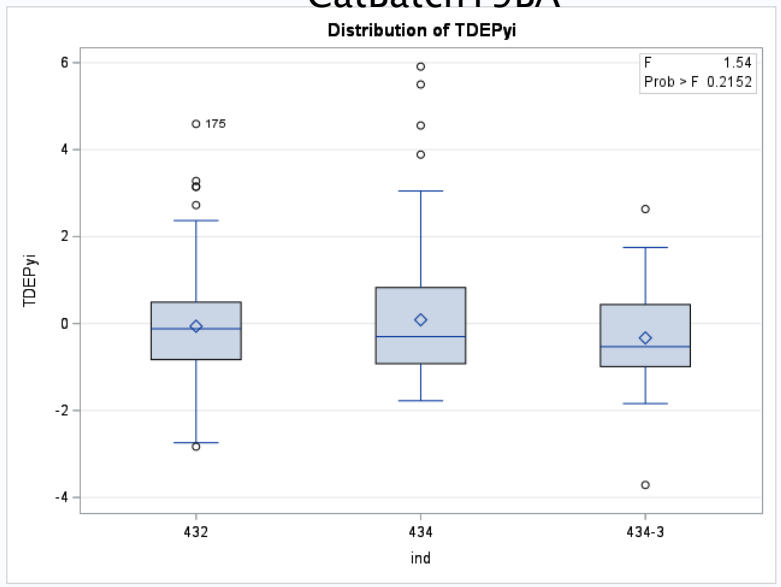
D7097: Deposits by MTEOS

- Precision (Pooled s) has improved to 6.73s this reporting period (last period 7.59s).
- Performance (Mean Δ/s) has further regressed to 0.71s (0.52s previous semester).
- All 69 operationally valid tests this period report using Rod Batch N.
- Most operationally valid calibration tests this period report using Catalyst Batch 23AB (n=66). Three tests used Catalyst Batch 20AB (n=3).
  - No runs used Catalyst Batch 19BA this semester

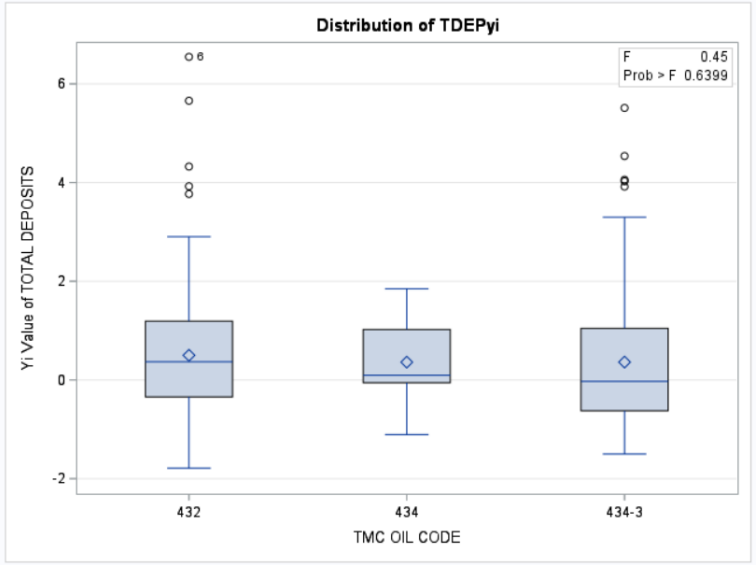
D7097: Deposits by MHT TEOST

- No new runs on catalyst batch 19BA this semester
  - Total Runs and Yi statistic for batch 19BA remain at n=349, Yi = -0.02.
- Only 3 runs on catalyst batch 20AB (total n=326). Performance (Yi) unchanged at 0.43s.
- Newest catalyst batch 23AB now has 272 runs. Performance (Yi) now at 0.48s.
  - Yi = APR2026 (0.48); OCT2025 (0.44); APR2025 (0.44); OCT 2024 (0.53); APR2024 (1.39)

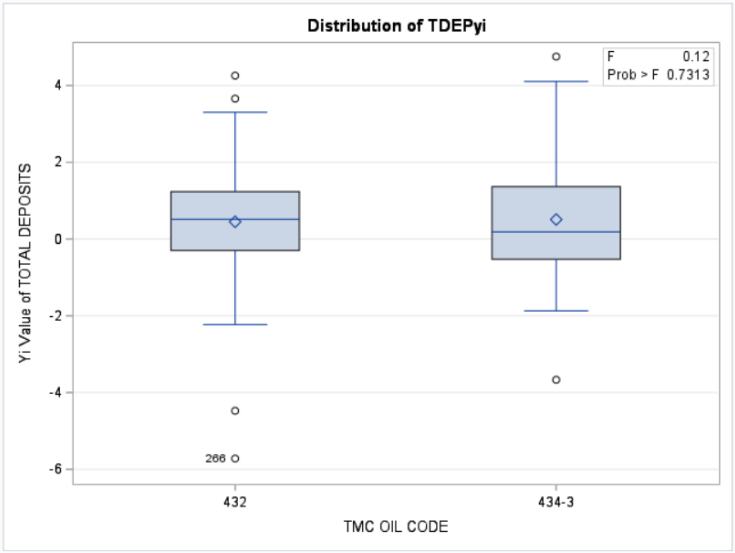
CatBatch19BA



CatB5atch20AB

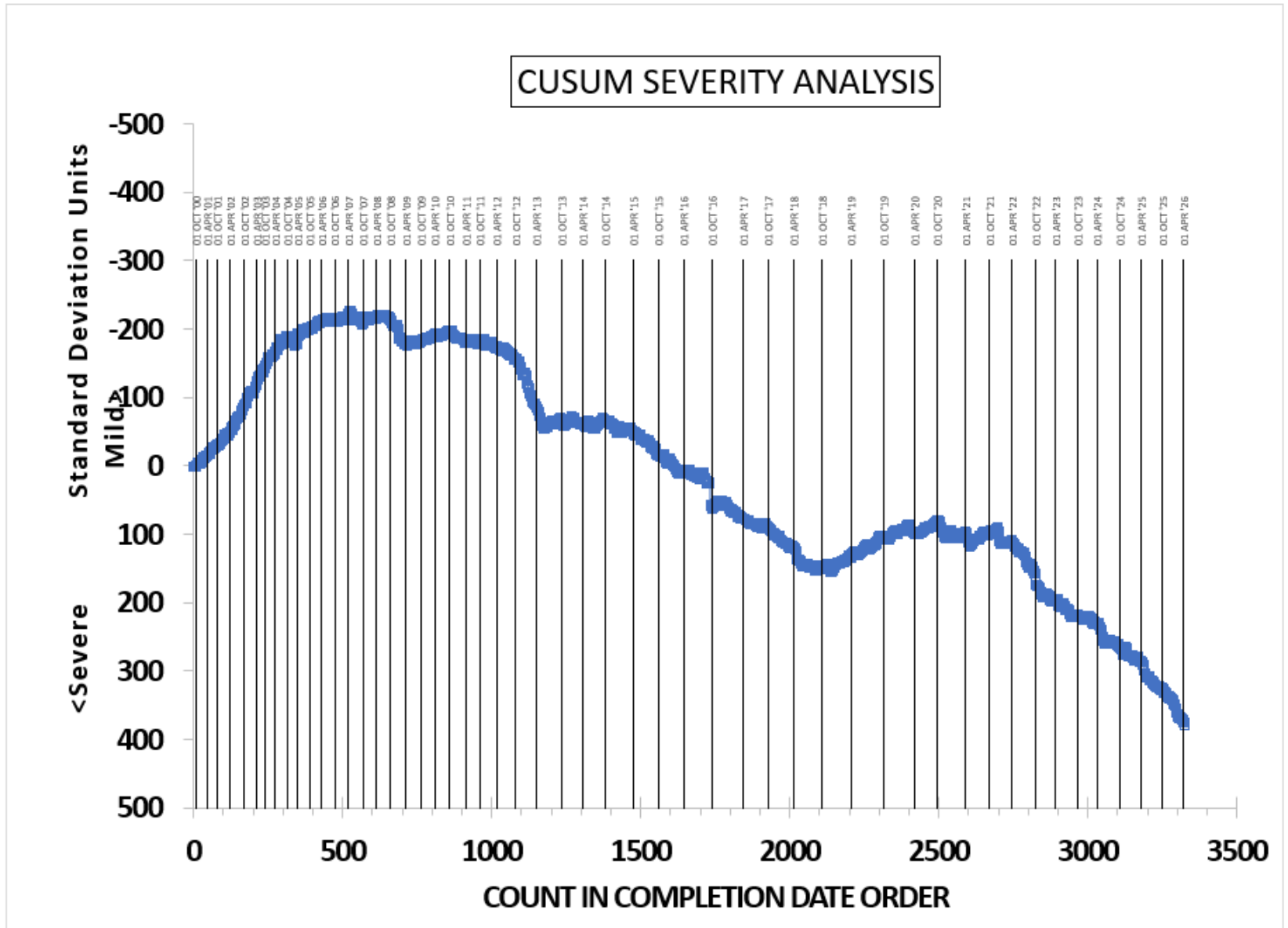


CatBatch23AB

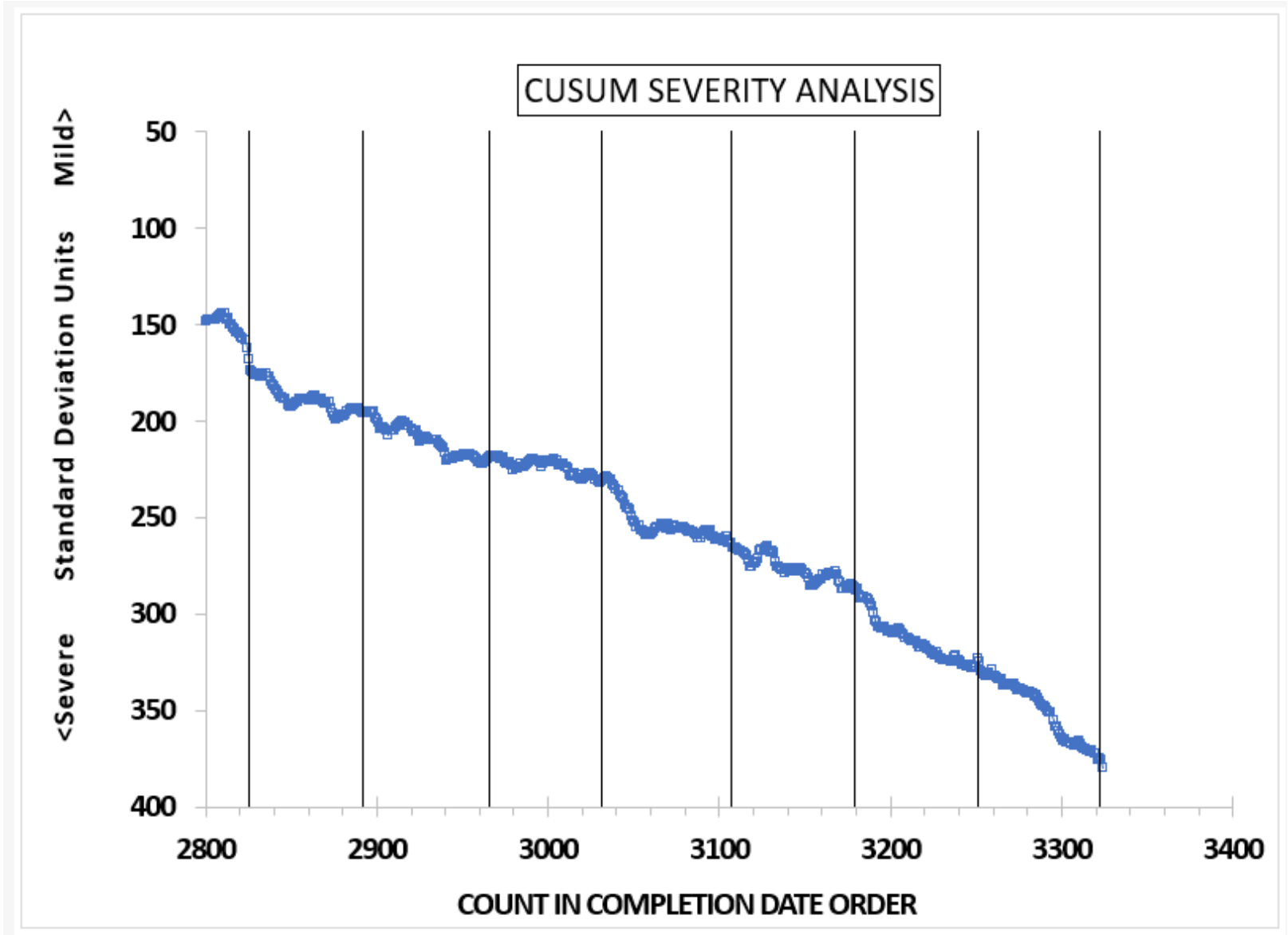


MHT—4 TEOST INDUSTRY OPERATIONALLY VALID DATA

TOTAL DEPOSITS MG



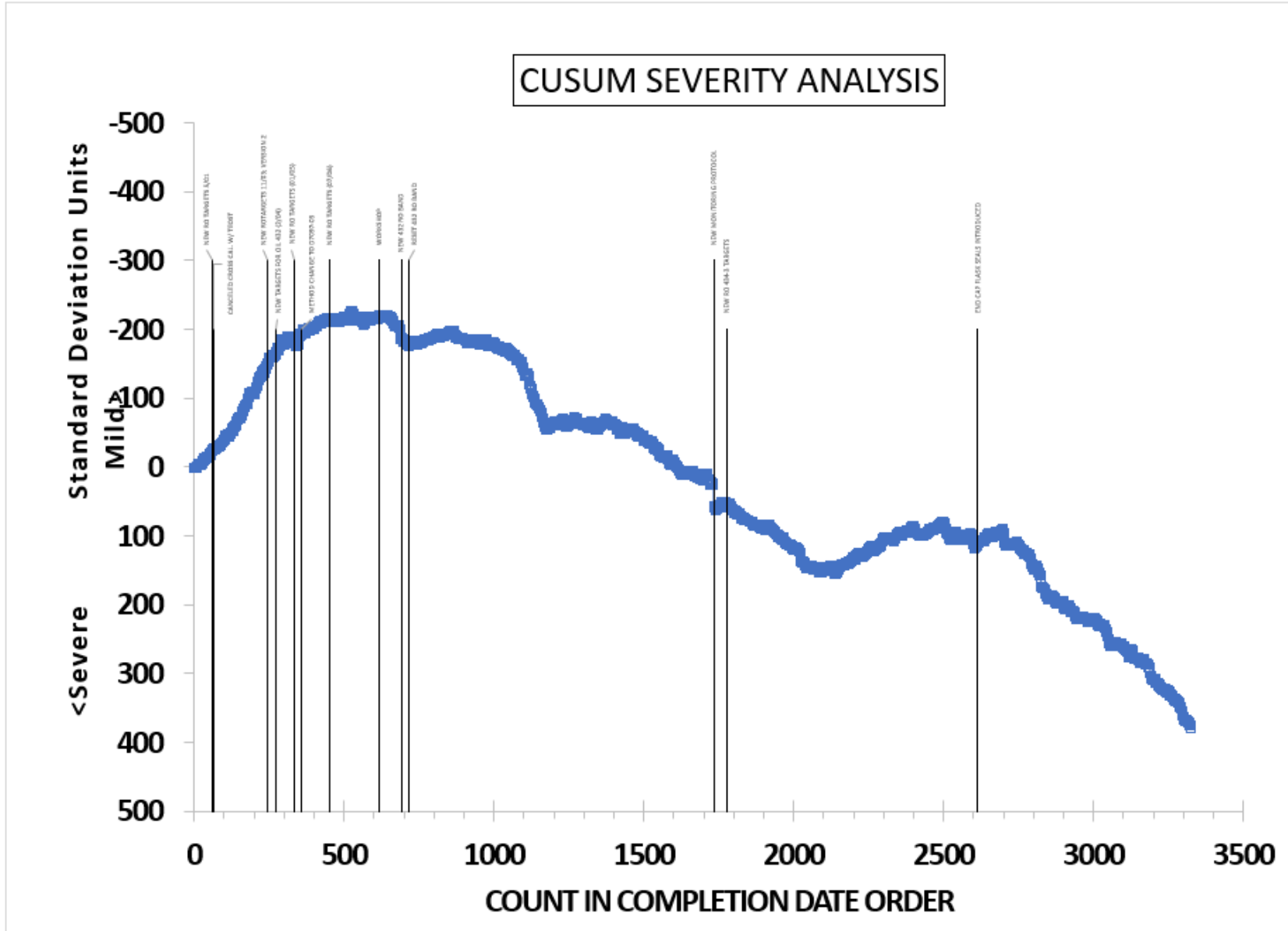
MHT—4 TEOST INDUSTRY OPERATIONALLY VALID DATA
Last 500 Points
TOTAL DEPOSITS MG



MHT—4 TEOST INDUSTRY OPERATIONALLY VALID DATA

SEVERITY DATES

TOTAL DEPOSITS MG



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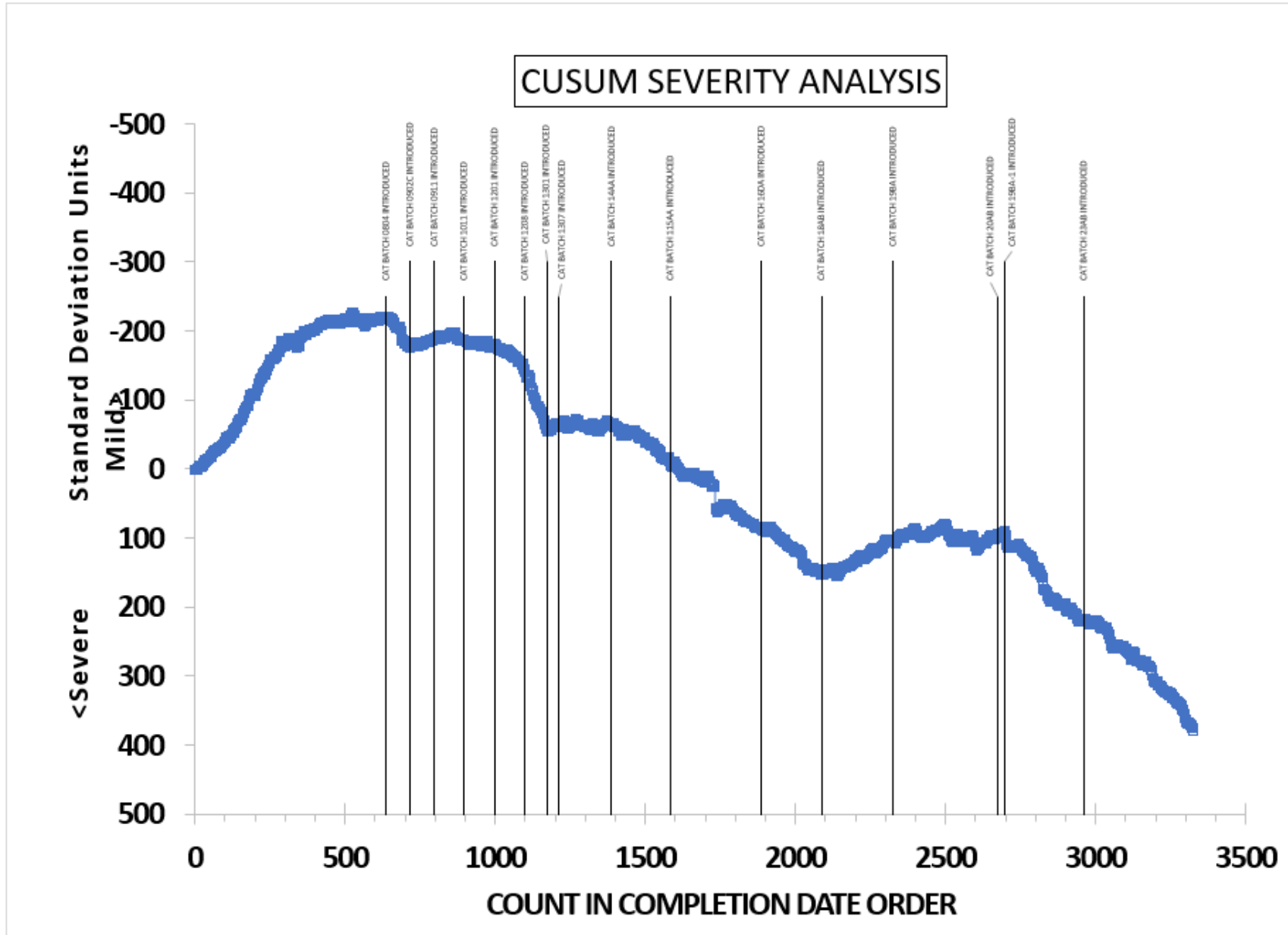
MHT—4 TEOST INDUSTRY OPERATIONALLY VALID DATA

CATALYST BATCH

TOTAL DEPOSITS MG



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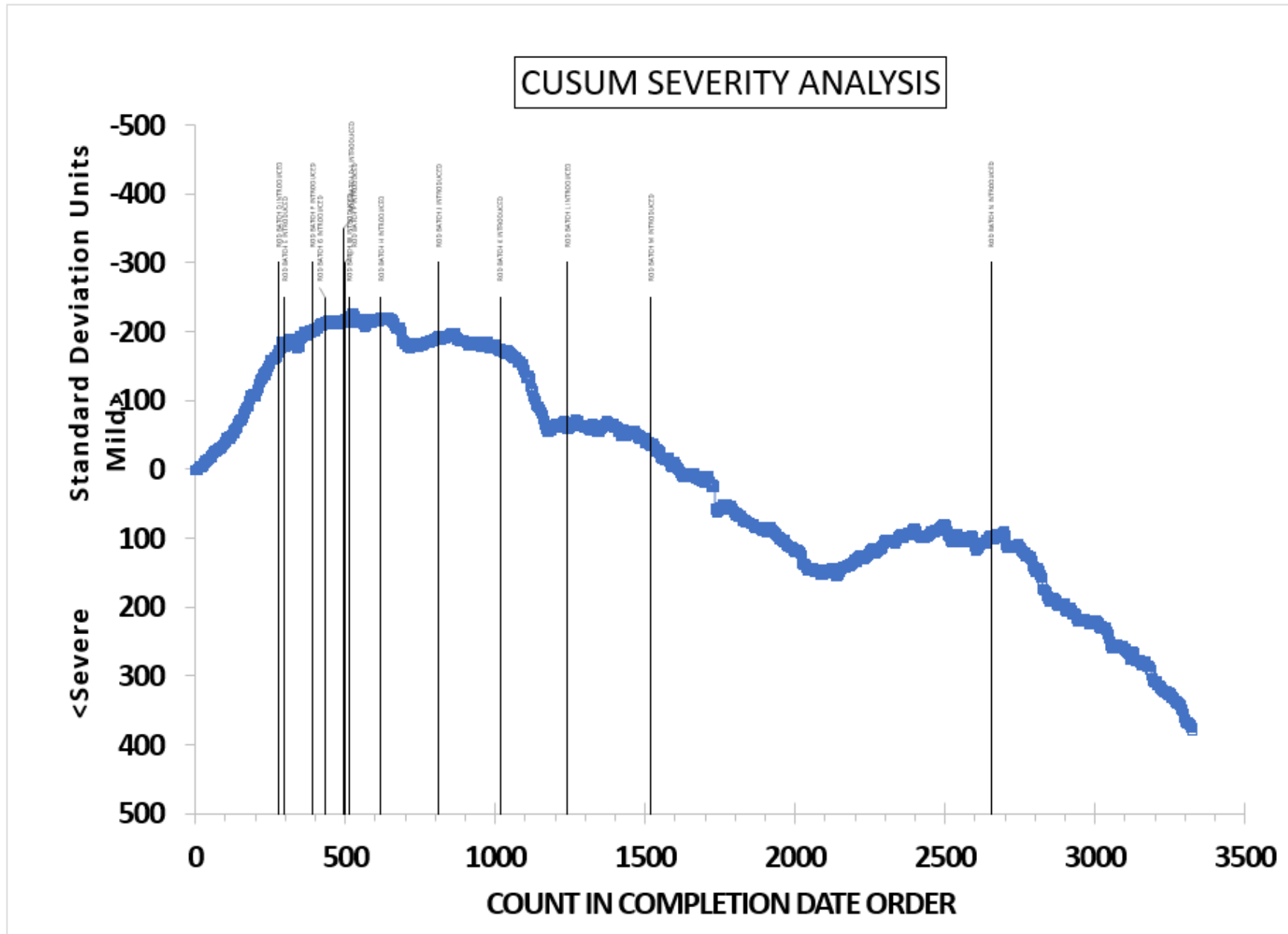
MHT –4 TEOST INDUSTRY OPERATIONALLY VALID DATA

ROD BATCH

TOTAL DEPOSITS MG



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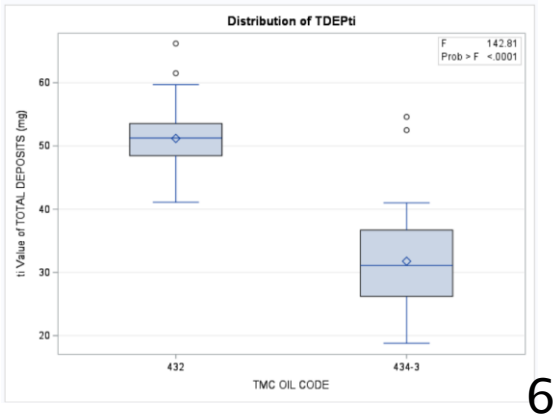
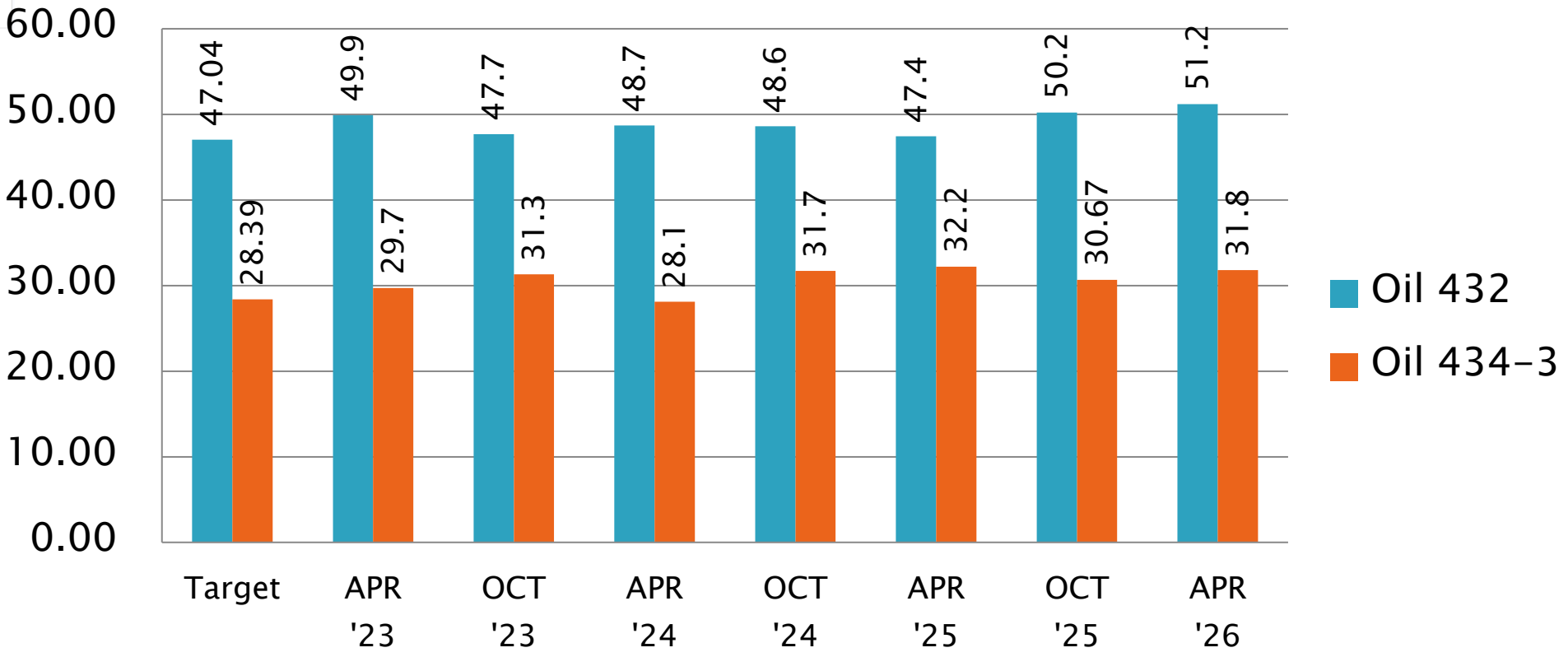


D7097 Performance by Oil

Total Deposits, mg

Mean



October 1, 2025 – March 31, 2026

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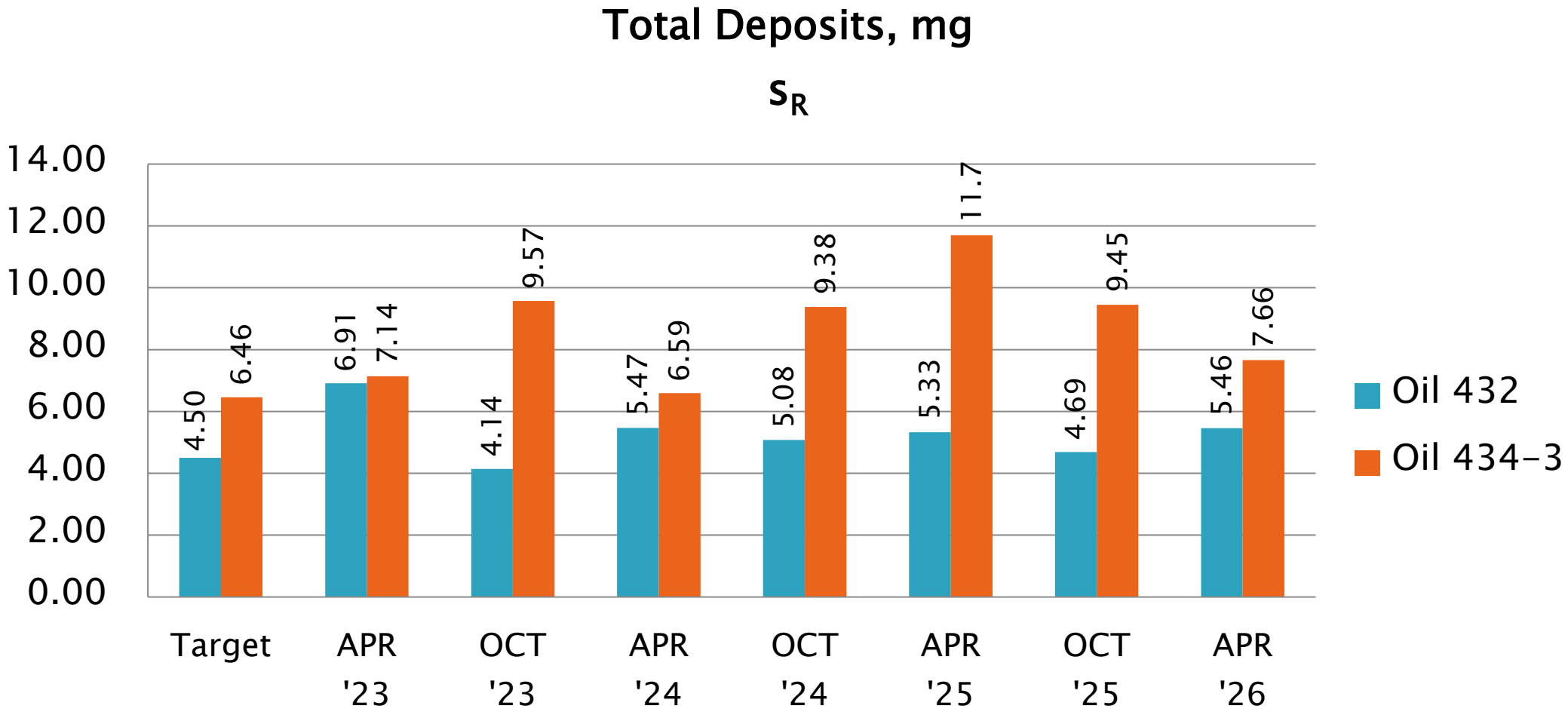
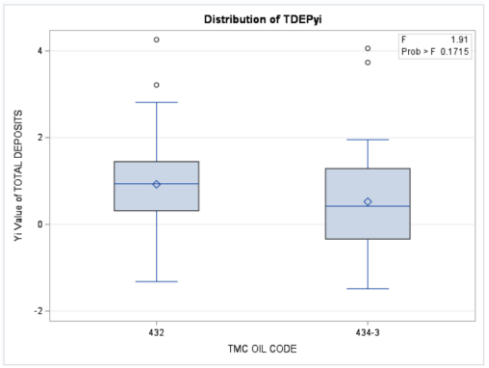
D7097: Deposits by MHT TEOST





D7097: Deposits by MHT TEOST

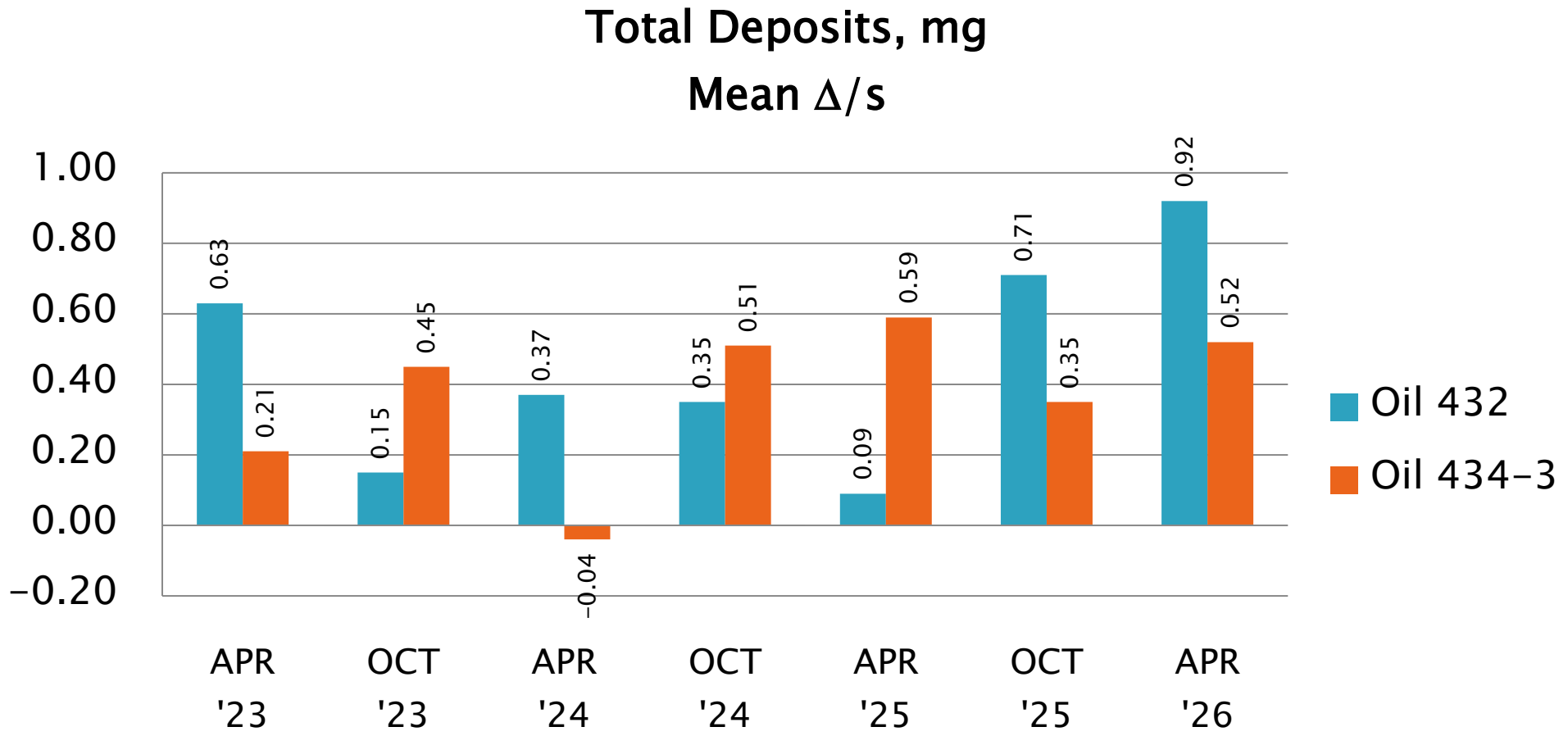


TABLE of CONTENTS

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Reference Oil Inventory

MTEOS

Oil	Year Rec'd By TMC[A]	Tests	TMC Inventory, gallons	Gallons Shipped last 6 months	Estimated Life
432	1998	MTEOS	100.7	0.1	5+ years
434-3[B]	2017	MTEOS	3.2	4.3	6 months

[A] Integrity of TMC reference oils is confirmed annually by analytical QC testing of chemical and physical properties.
[B] Multi-test oil; estimated supply of drum reserved for bench testing – other drums available.

D02.B0.07
TMC Monitored Tests

ASTM D 7216

Engine Oil Elastomer Compatibility (EOEC/LDEOC)

October 1, 2025 – March 31, 2026

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ASTM Reference Testing Semi-Annual Report D7216 EOEC

October 1, 2025 – March 31, 2026

ASTM D 7216

Engine Oil Elastomer Compatibility

EOEC (Heavy-Duty)	
OHT PART NUMBER	BATCH CODE*
OHTEOEC-NBR-A	34
OHTEOEC-ACM-B	34
OHTEOEC-FKM-A	32
OHTEOEC-MAC-A	26
OHTLDEOC-VMQ1-A	44
OHTLDEOC-HNBR-A	1
OHTEOEC-FKM2-A	1

* As of 20260401

Calibrated Labs and Stands[1]

(change since last Semi-Annual report)

Test	Labs	Stands
D7216 EOEC	9[2] (+2)	N/A

[1] As of 3/31/2026

2 Not all elastomer types were run at each lab

EOEC Test Activity

Test Status		FKM	NBR	ACM	VMQ	MAC	HNBR	FKM2	Total
	LABS	9	8	8	8	8	4	3	8
	BATHS	32	22	32	32	34	12	3	34
Acceptable Calibration Test	AC	66	65	64	60	63	20	3	341
Failed Calibration Test	OC	0	3	13	1	3	1	0	21
Operationally Invalid, by lab	LC	1	3	1	0	0	2	0	7
Operationally Invalid, by TMC	RC	0	0	0	0	1	0	0	1
Aborted	XC	2	2	2	1	2	0	0	9
Acceptable Informational Run	NN	0	0	0	0	0	0	0	0
Unacceptable Informational Run	MN	0	0	0	0	0	0	0	0
Total		69	73	80	62	69	23	3	379

EOEC Failed Calibration Tests

Cause	Elastomer	No. of Tests
HARDNESS (MILD)	MAC	1
HARDNESS (SEVERE)	VMQ1, MAC	2
ELONGATION (MILD)		0
ELONGATION (SEVERE)		0
VOLUME CHANGE (MILD)	HNBR	1
VOLUME CHANGE (SEVERE)	ACM(12), MAC	13
TENSILE STRENGTH (SEVERE)		0
TENSILE STRENGTH (SEVERE)	NBR	1
TENSILE (SEVERE), ELONGATION (SEVERE)	NBR(2)	2
HARD (SEVERE), ELONGATION (SEVERE)	ACM	1
Total		**21**

EOEC Lost Tests*

Validity	Cause	No. of Tests
LC	Elongation Data Error (Invalid)	3
LC	Wrong Bath Temperature (Invalid)	2
LC	Test Time not 336HRs (Lab Invalidated)	1
LC	Undeclared Reason (Lab Invalidated)	1
RC	Test Time not 336HRs (TMC Invalidated)	1
XC	Loss of Power (Aborted)	9
Total		**17**

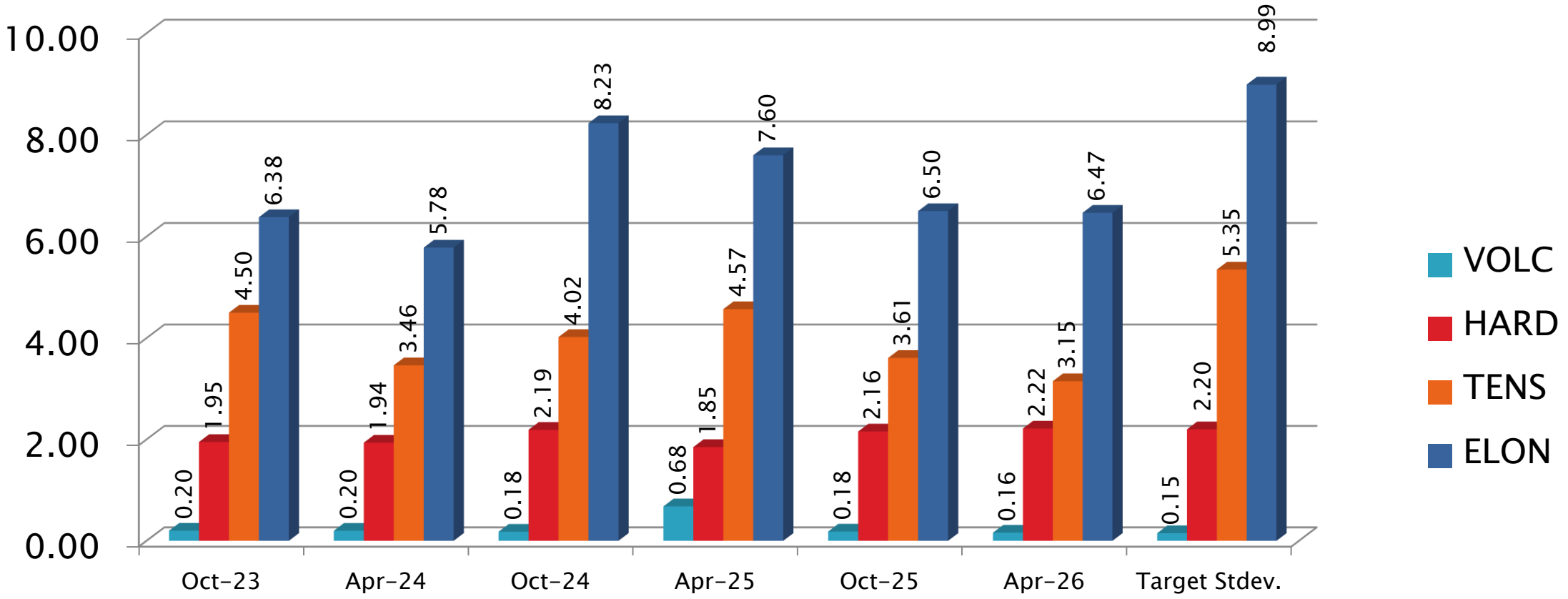
*Invalid (LC,RC) and Aborted (XC) calibration tests

EOEC Test Severity

Fluoroelastomer (FKM)

Parameter	Period Mean Δ/s	Status
Volume Change	0.1769	On Target
Points Hardness Change	0.2691	Slightly Severe
Tensile Strength Change	0.1367	On Target
Elongation Change	-0.6145	Mild

EOEC Precision (Pooled s) Estimates: Fluoroelastomer



EOEC Precision Estimates by Lab: FKM

Test Parameter	Statistic	LTMS Lab								
		A	B	BB	G	I	K	L	P	V
	n=	22	9	2	16	7	1	3	2	4
Volume	Mean	0.4564	0.4411	0.4450	0.4794	0.4814	0.3500	0.4333	0.4750	0.6200
	Pooled s	0.1402	0.0861	0.0354	0.1560	0.3189		0.0611	0.2758	0.1023
	Mean /s	0.1106	0.0075	0.0338	0.2660	0.2799	-0.8660	-0.2296	-0.2080	1.2162
Hardness	Mean	10.0909	7.7778	8.0000	6.3125	10.000	5.0000	8.3333	8.5000	11.250
	Pooled s	0.9211	1.4814	0	1.4477	1.1547		2.0817	6.3640	0.5000
	Mean /s	0.9322	-0.1192	-0.0182	-0.7852	0.8909	-1.5765	0.2224	-0.1193	1.4591
Tensile Strength	Mean	-71.659	-71.444	-74.300	-68.806	-68.186	-69.600	-70.667	-64.000	-74.925
	Pooled s	1.5969	1.0978	2.6870	3.9641	1.7421		1.5948	0.5657	0.6752
	Mean /s	-0.0634	-0.0232	-0.5570	0.4699	0.5858	-0.0199	0.0083	1.4050	-0.6738
Elongation	Mean	-67.427	-63.756	-70.500	-59.419	-60.543	-65.300	-66.767	-56.050	-75.150
	Pooled s	2.7168	1.7664	5.6568	8.3704	2.2597		2.7062	1.2021	1.7540
	Mean /s	-0.9952	-0.5868	-1.3370	-0.1044	-0.2295	-0.0808	-0.6756	1.0479	-1.8543

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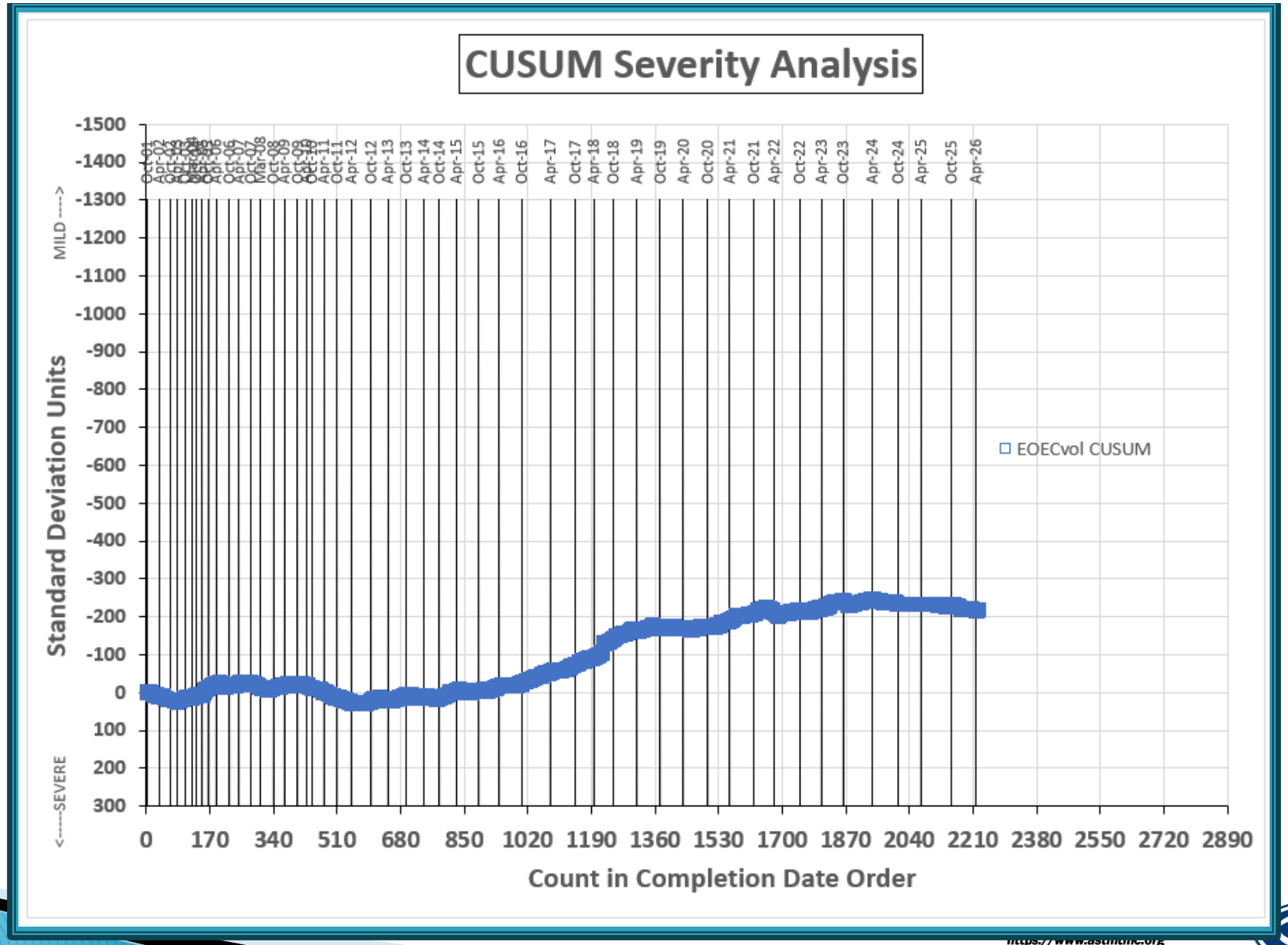
FLUOROELASTOMER VOLUME CHANGE CORRECTED AVERAGE



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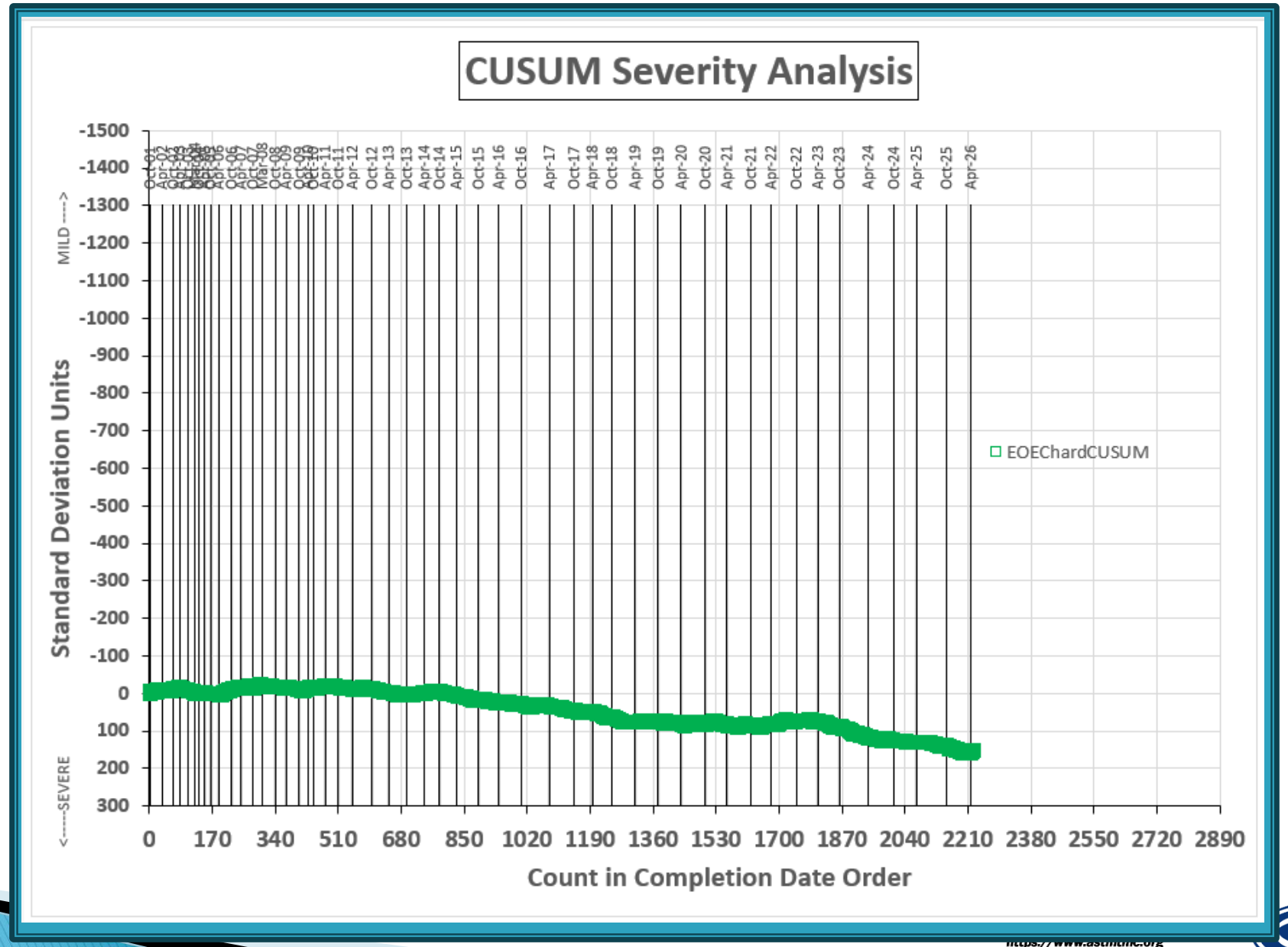
FLUOROELASTOMER PTS HARDNESS CHANGE CORRECTED AVG



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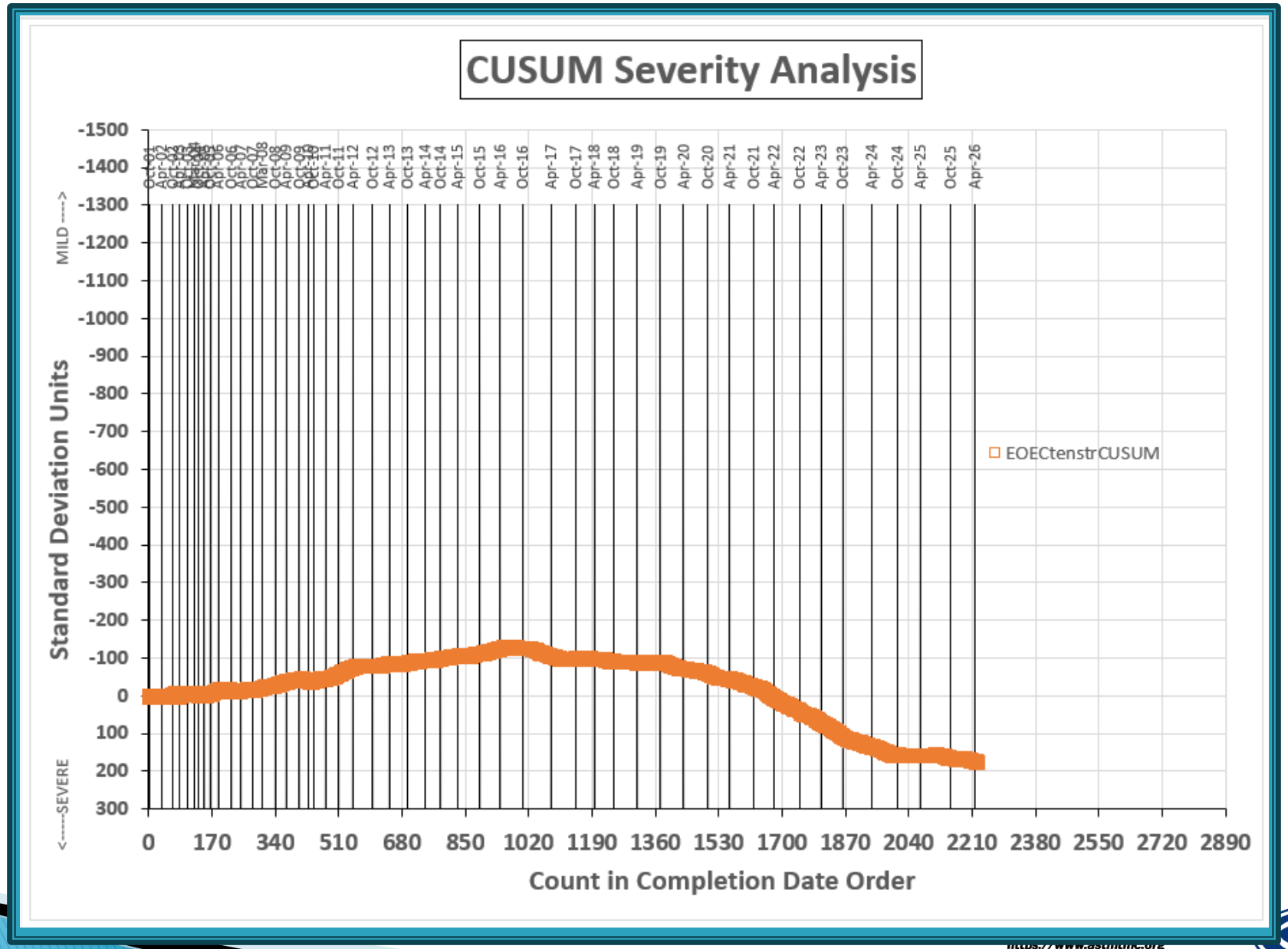
FLUOROELASTOMER TENS STRENGTH CHANGE CORRECTED AVG



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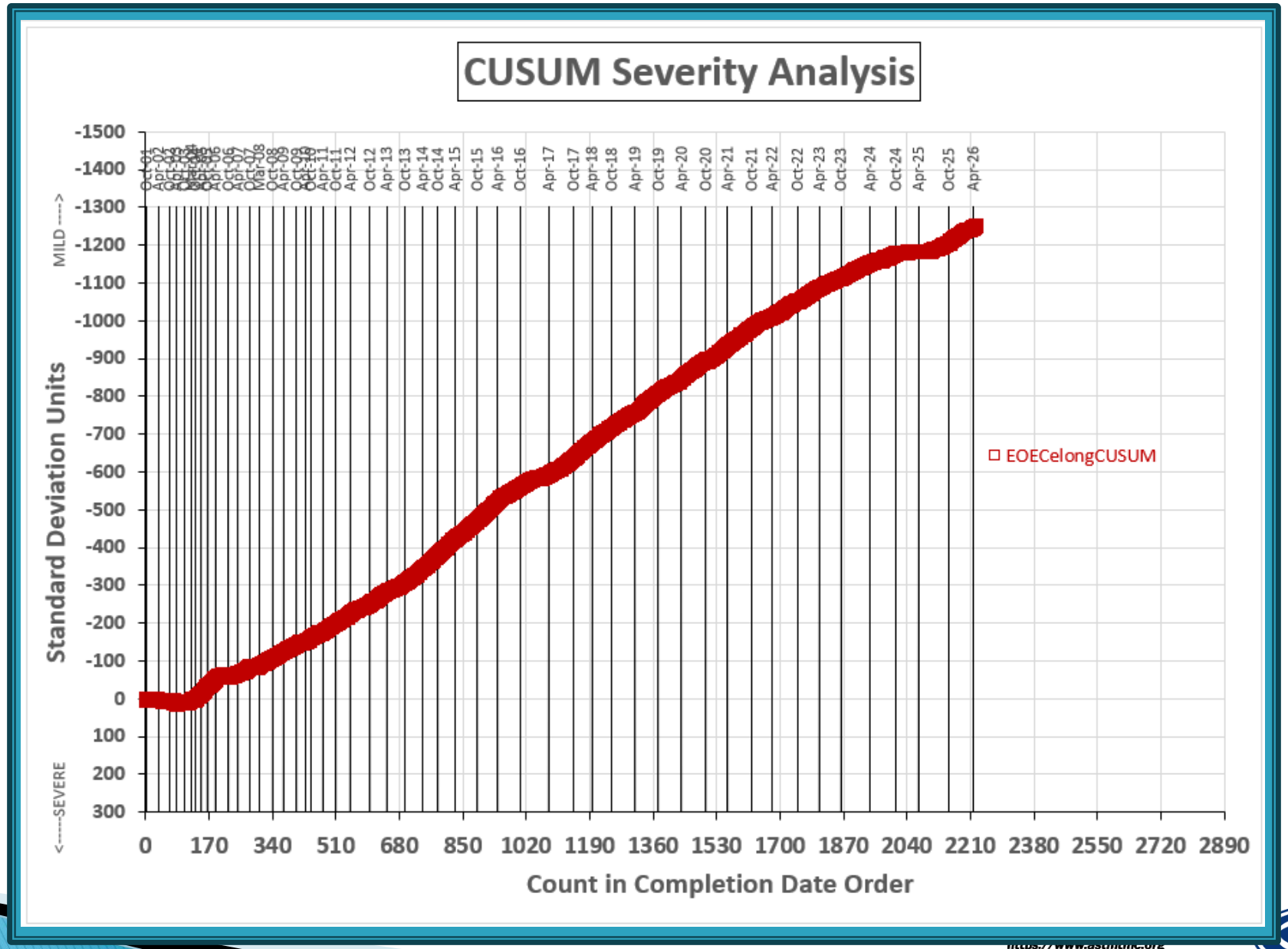
FLUOROELASTOMER ELONGATION CHANGE CORRECTED AVG



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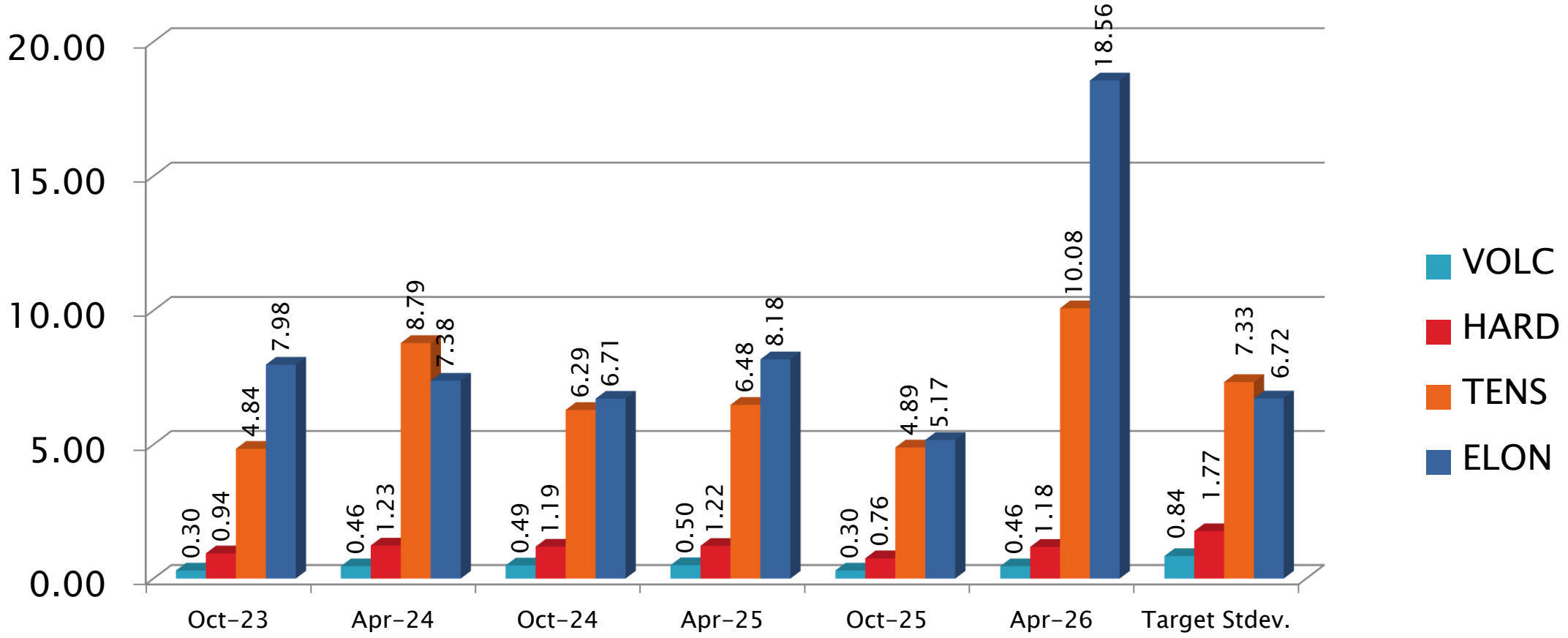
EOEC Test Severity

Nitrile (NBR)

Parameter	Period Mean Δ/s	Status
Volume Change	-0.3950	Mild
Points Hardness Change	1.3506	Severe
Tensile Strength Change	-1.6259	Mild
Elongation Change	-0.0282	On Target

EOEC Precision Estimates – Nitrile



October 1, 2025 – March 31, 2026

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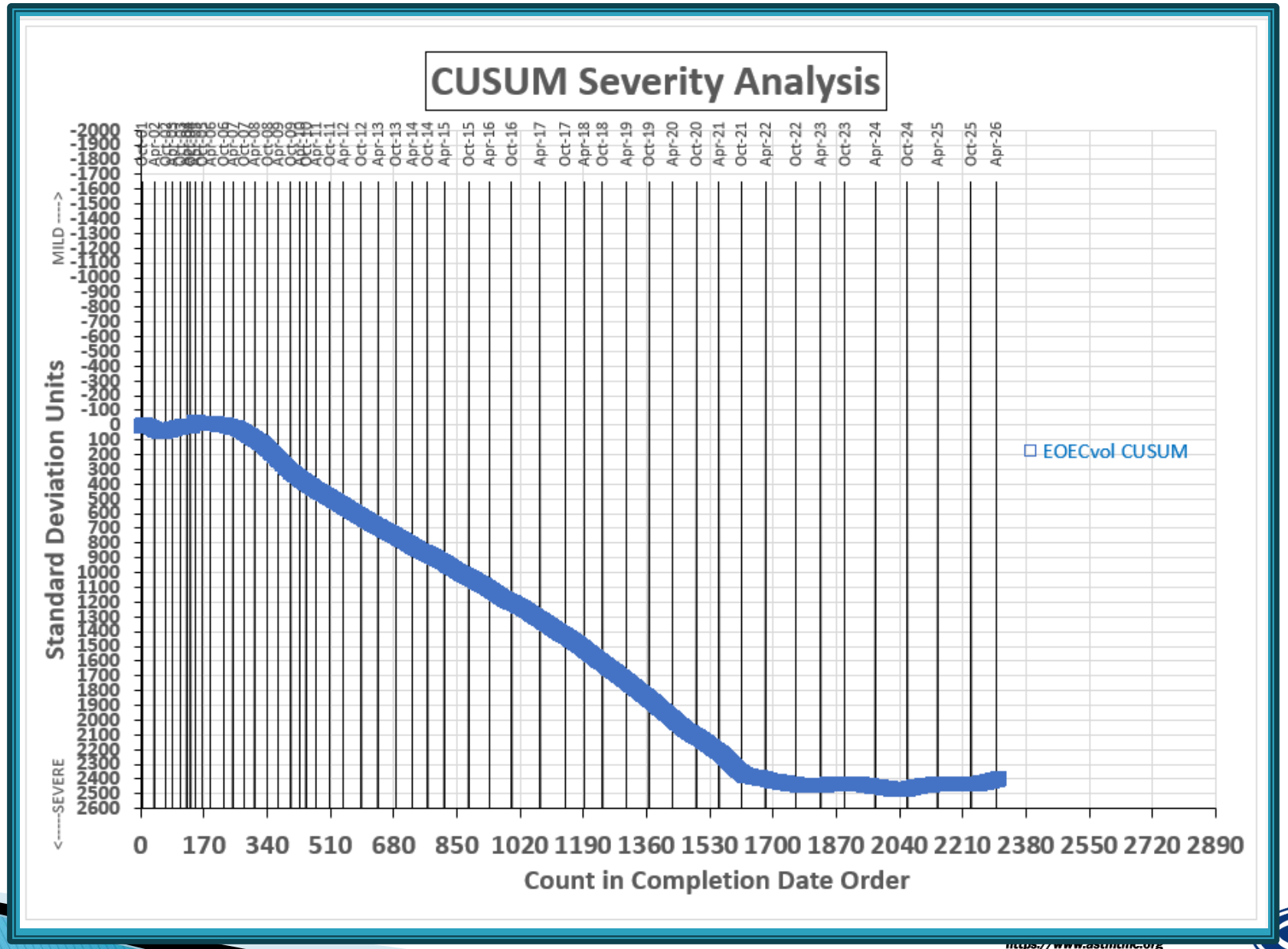
EOEC Precision Estimates by Lab: NBR

Test Parameter	Statistic	LTMS Lab							
		A	B	BB	G	I	L	P	V
	n=	23	10	2	12	10	5	3	3
Volume	Mean	1.4230	1.5470	1.2450	1.1117	1.7650	1.0480	1.5233	1.4233
	Pooled s	0.3010	0.4094	0.1626	0.5117	0.3940	0.6198	0.3980	0.8109
	Mean /s	-0.3773	-0.2298	-0.5893	-0.7480	0.0298	-0.8238	-0.2579	-0.3770
Hardness	Mean	4.0870	4.2000	1.5000	4.8333	4.5000	3.8000	4.6667	4.0000
	Pooled s	0.7332	0.6325	2.1213	1.1934	1.5092	0.8367	1.5275	2.0000
	Mean /s	1.2751	1.3390	-0.1864	1.6968	1.5085	1.1130	1.6026	1.2560
Tensile Strength	Mean	-6.0174	-7.6400	-7.550	-18.333	-7.7500	-7.3800	-0.4333	-18.133
	Pooled s	2.9580	2.7870	2.8991	17.293	3.6277	16.072	3.8188	12.232
	Mean /s	-1.2029	-1.4243	-1.4120	-2.8831	-1.4393	-1.3888	-0.4411	-2.8558
Elongation	Mean	-35.613	-34.390	-34.250	-25.833	-37.120	-34.400	-30.867	-42.167
	Pooled s	4.1936	2.8302	4.3134	43.224	3.8107	12.853	0.9292	5.8226
	Mean /s	-0.2862	-0.1042	-0.0833	1.1691	-0.5104	-0.1057	0.4201	-1.2614

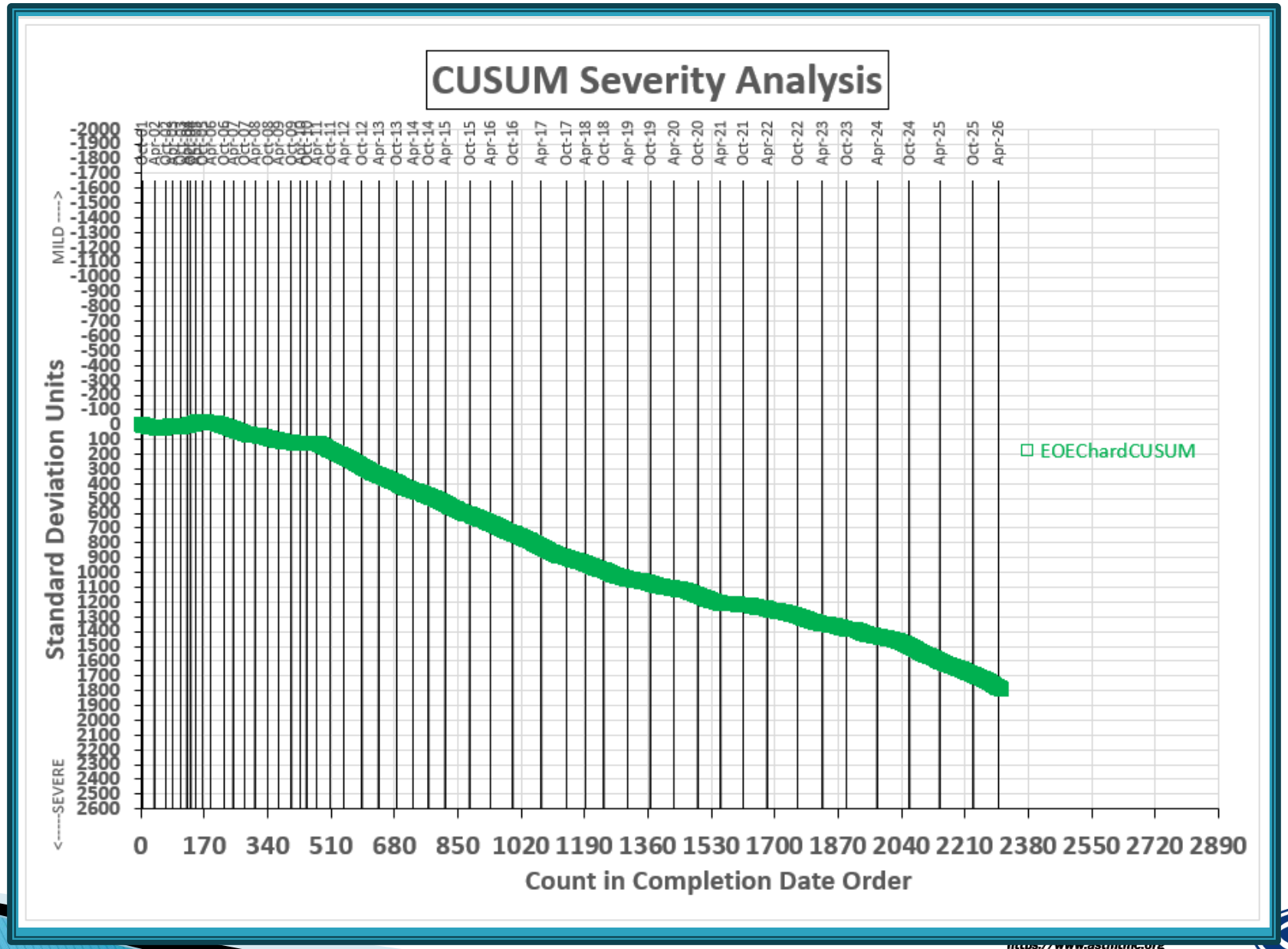
EOEC — NITRILE INDUSTRY OPERATIONALLY VALID DATA

REFERENCE NITRILE VOLUME CHANGE CORRECTED AVERAGE



EOEC — NITRILE INDUSTRY OPERATIONALLY VALID DATA

REFERENCE NITRILE PTS HARD CHANGE CORRECTED AVG



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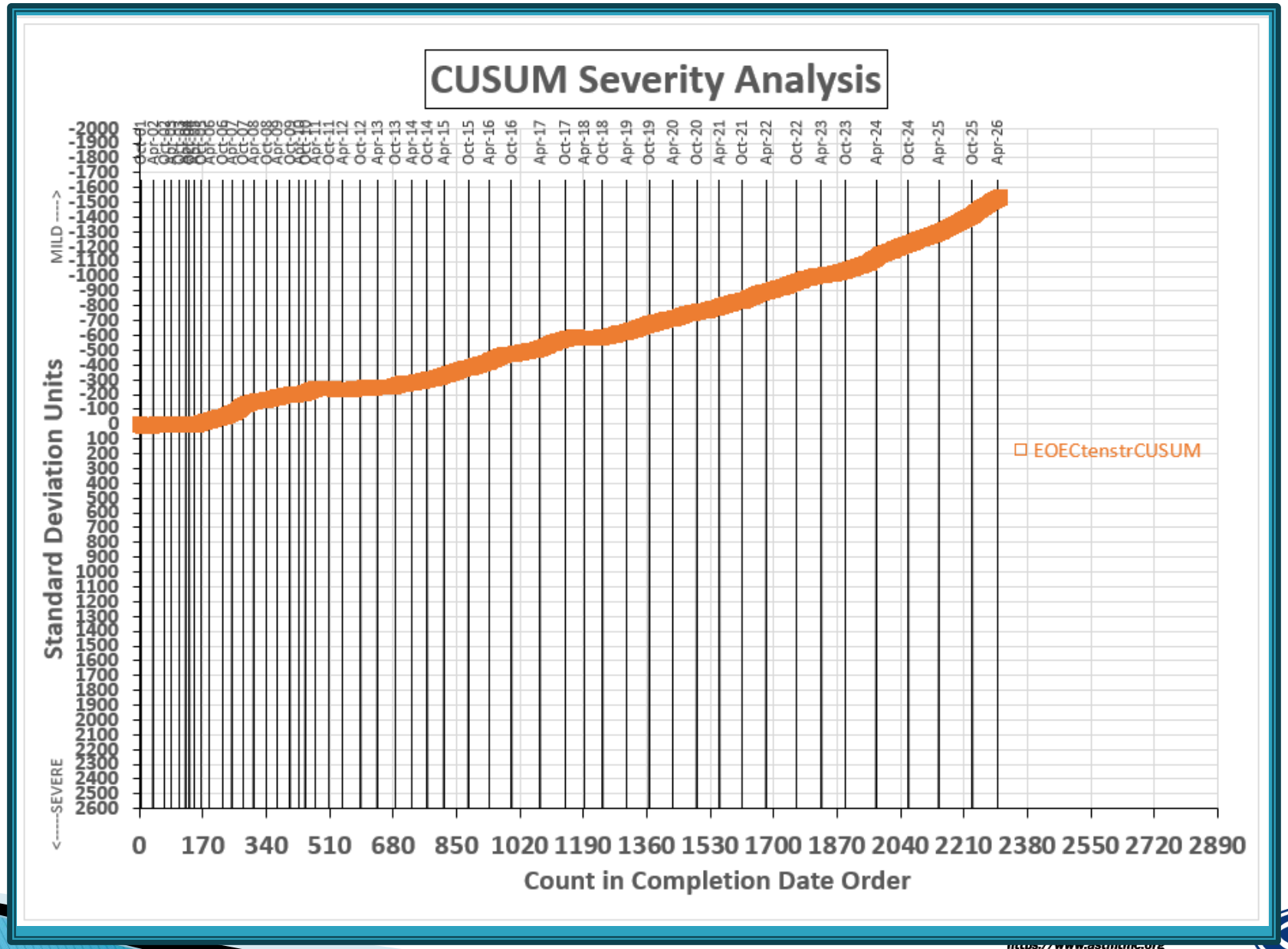
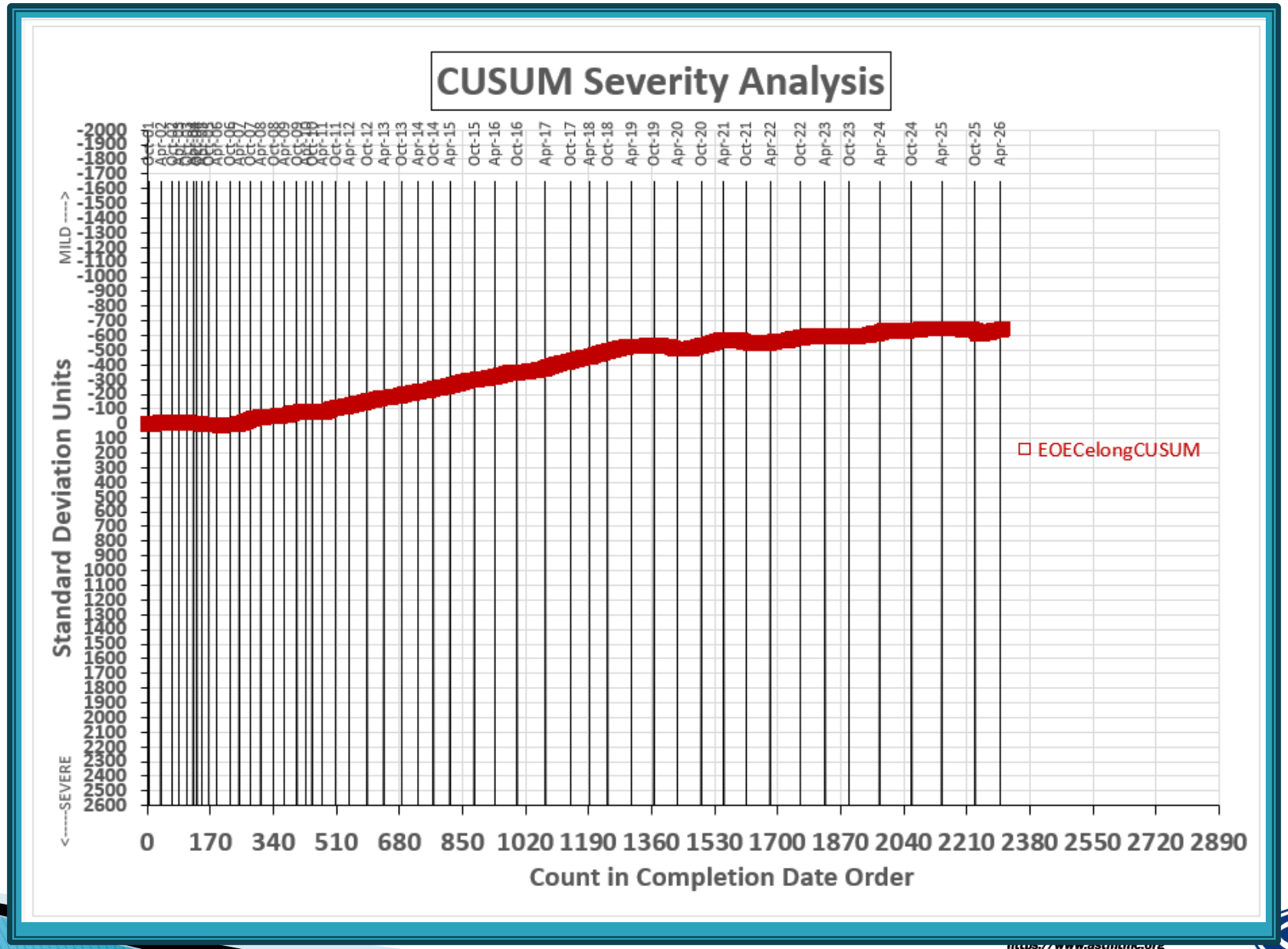
REF NITRILE TENS STRENGTH CHANGE CORRECTED AVG



EOEC — NITRILE INDUSTRY OPERATIONALLY VALID DATA

REF NITRILE ELONGATION CHANGE CORRECTED AVERAGE

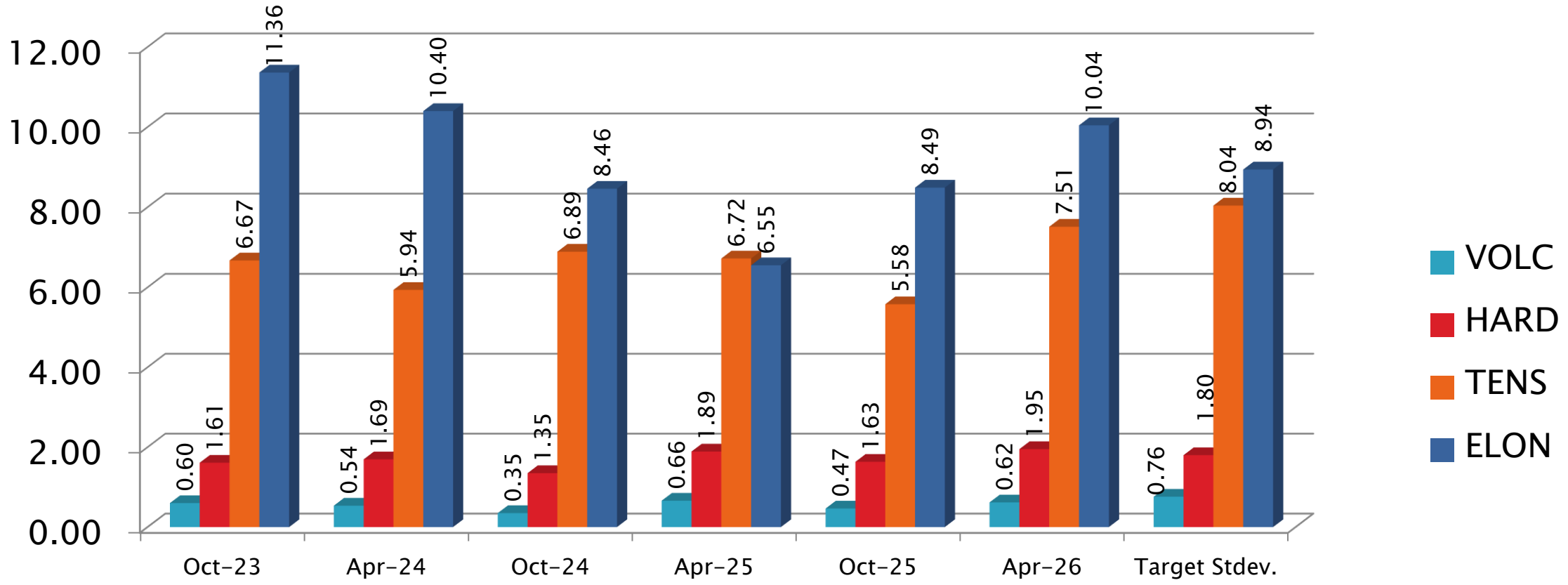


EOEC Test Severity

Polyacrylate (ACM)

Parameter	Period Mean Δ/s	Status
Volume Change	2.1290	Very Severe
Points Hardness Change	-0.8097	Mild
Tensile Strength Change	0.3390	Severe
Elongation Change	0.3641	Severe

EOEC Precision Estimates – Polyacrylate



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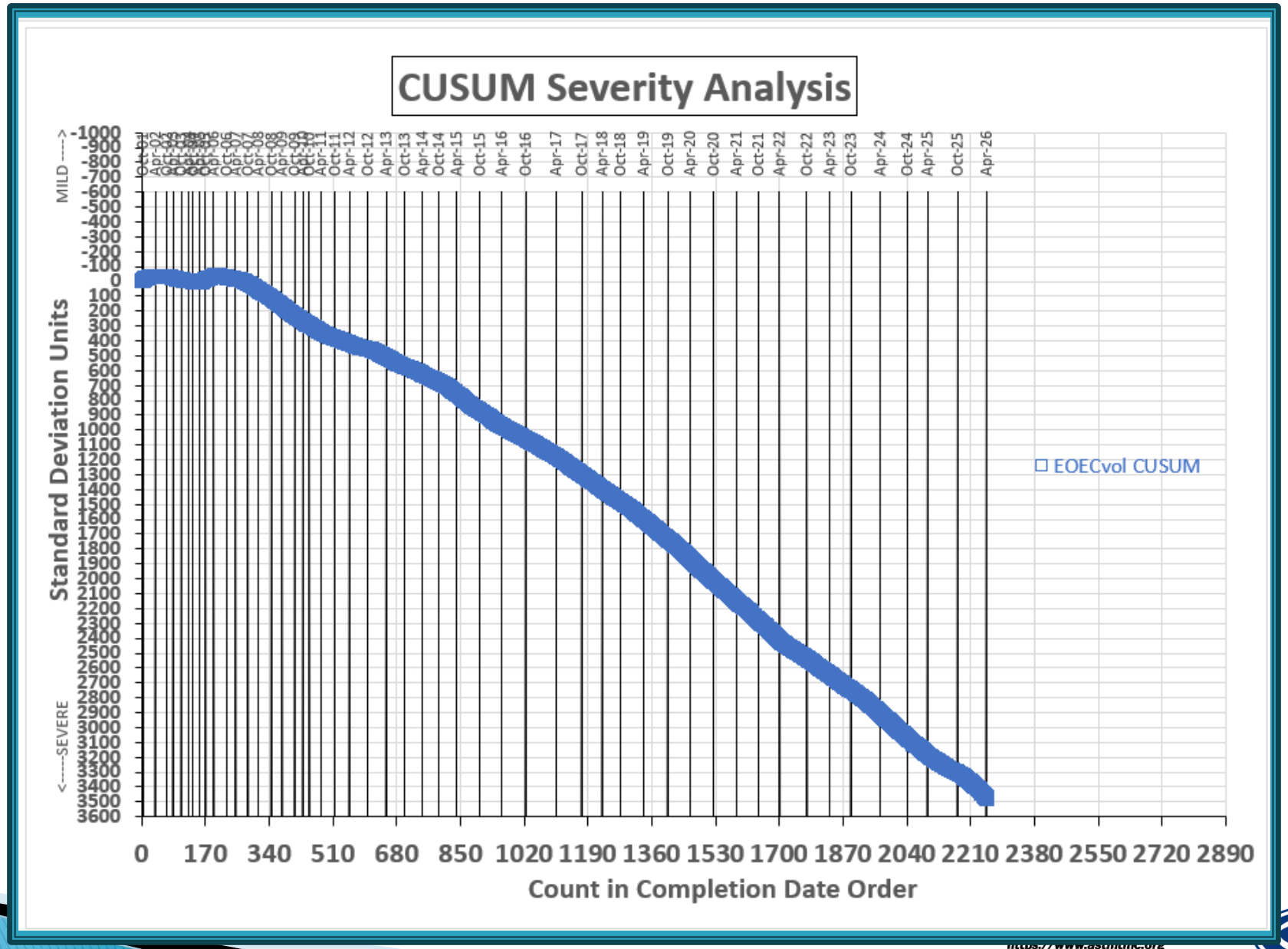
EOEC Precision Estimates by Lab: ACM

Test Parameter	Statistic	LTMS Lab							
		A	B	BB	G	I	L	P	V
	n=	30	11	2	16	7	5	3	3
Volume	Mean	1.9470	1.9691	0.8450	1.7762	1.9229	1.0506	2.4600	1.2300
	Pooled s	0.6282	0.6651	0.2758	0.4313	0.4308	0.1358	0.6946	0.2234
	Mean /s	2.2987	2.3278	0.8487	2.0740	2.2670	1.1263	2.9737	1.3553
Hardness	Mean	-2.5000	-2.2727	0.5000	-0.4375	-0.7143	0.0000	1.0000	-1.6667
	Pooled s	1.1671	1.1037	0.7071	2.9205	0.7559	1.0000	1.0000	1.1547
	Mean /s	-1.3833	-1.2571	0.2833	-0.2375	-0.3913	0.0056	0.5611	-0.9204
Tensile Strength	Mean	5.1833	4.9273	-2.7500	-4.4875	4.8571	5.5800	10.7000	3.7333
	Pooled s	7.9458	2.7836	2.1920	6.9820	5.6674	3.7171	0.8660	2.3180
	Mean /s	0.5999	0.5681	-0.3838	-0.6029	0.5593	0.6492	1.2861	0.4196
Elongation	Mean	-19.787	-12.718	-16.000	-24.681	-23.342	-16.840	-16.167	-10.500
	Pooled s	8.5987	8.1358	2.9698	13.719	8.1745	7.4386	2.4420	3.1000
	Mean /s	0.3125	1.1031	0.7360	-0.2350	-0.0853	0.6421	0.7174	1.3512

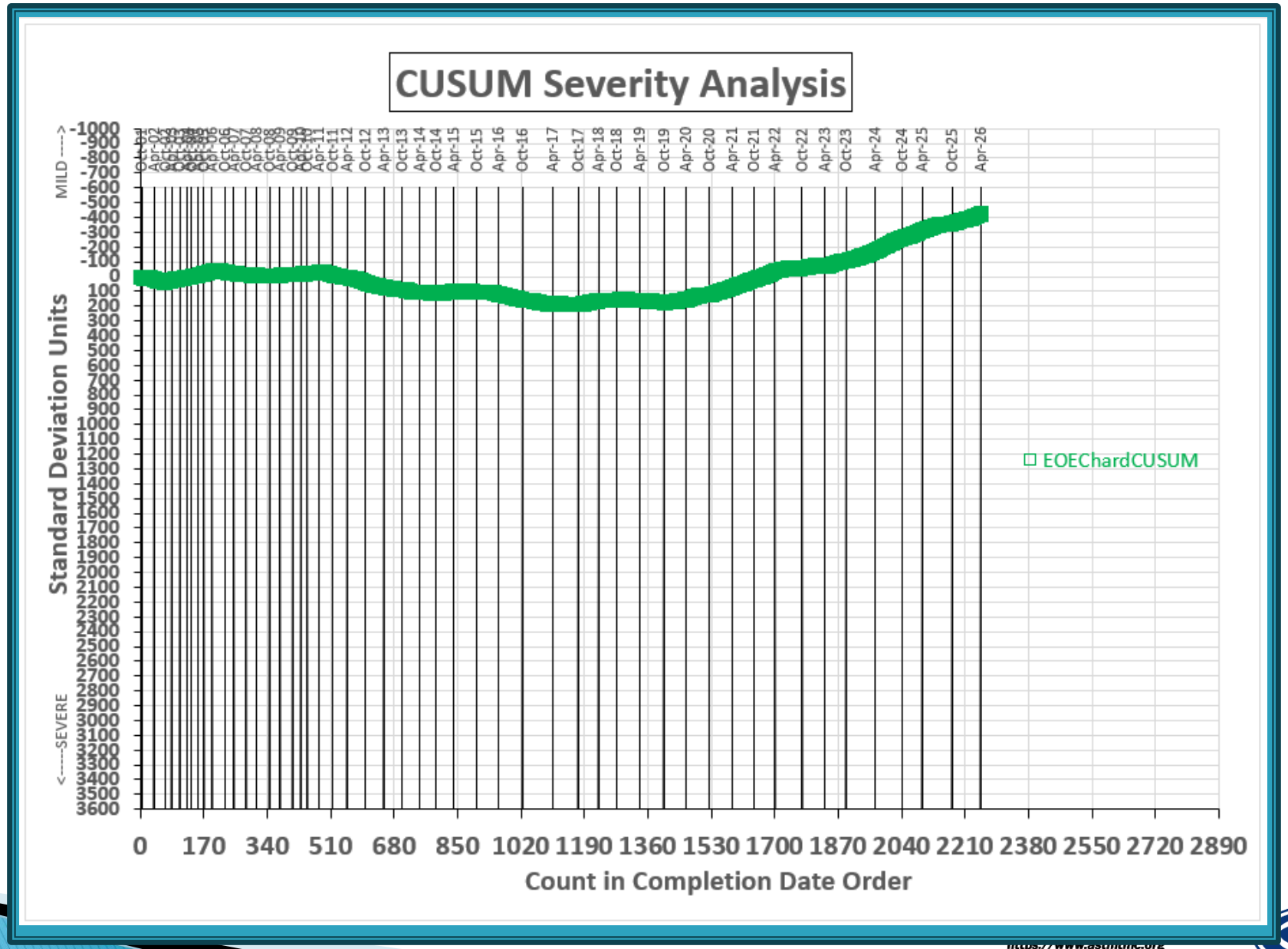
EOEC — POLYACRYLATE INDUSTRY OPERATIONALLY VALID DATA

REFERENCE POLYACRYLATE VOLUME CHANGE CORRECTED AVG



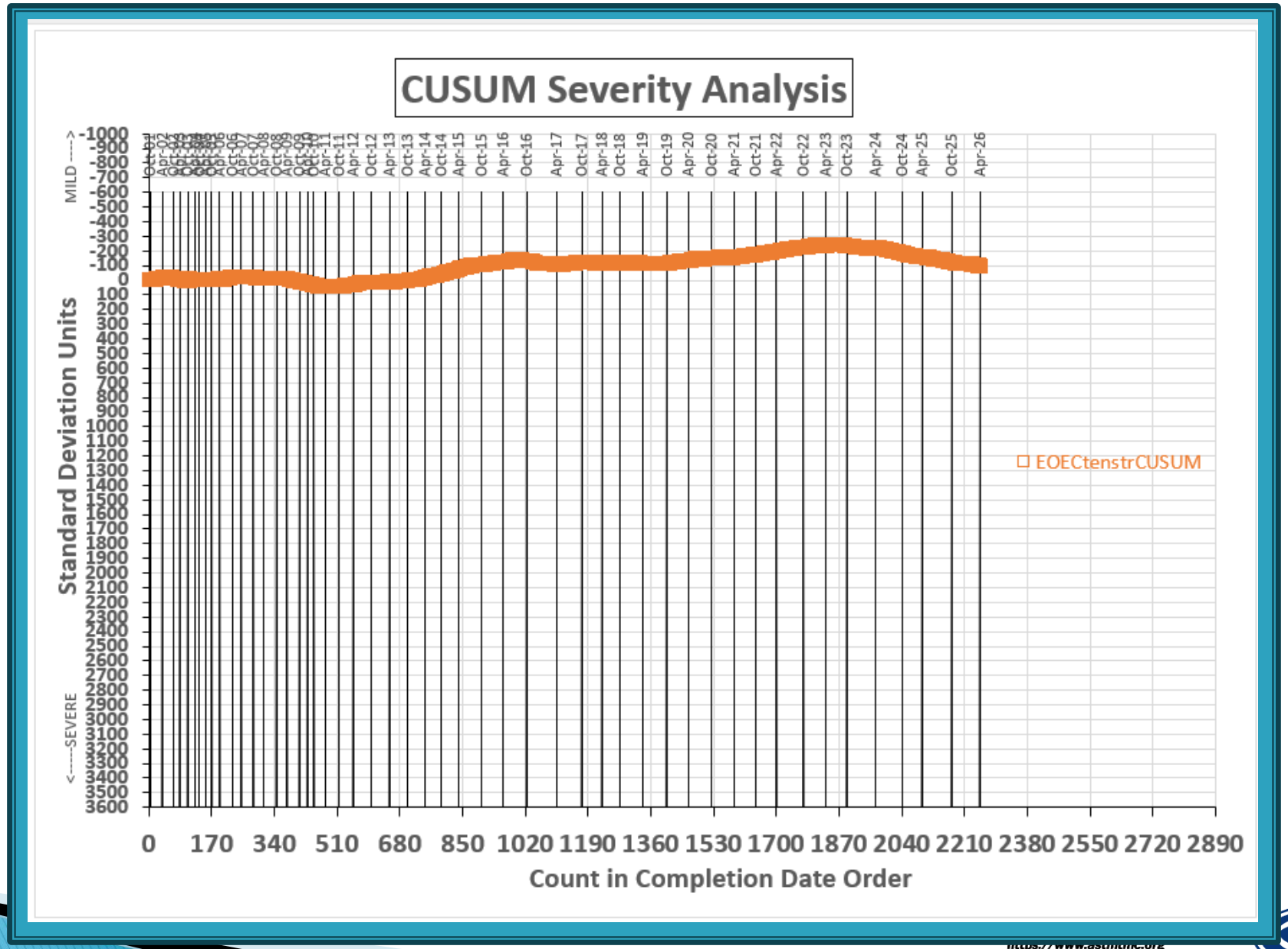
EOEC —POLYACRYLATE INDUSTRY OPERATIONALLY VALID DATA

REF POLYACRYLATE PTS HARD CHANGE CORRECTED AVG



EOEC —POLYACRYLATE INDUSTRY OPERATIONALLY VALID DATA

REF POLYACRYLATE TENS STRNGTH CHANGE CORRECTED AVG



EOEC —POLYACRYLATE INDUSTRY OPERATIONALLY VALID DATA

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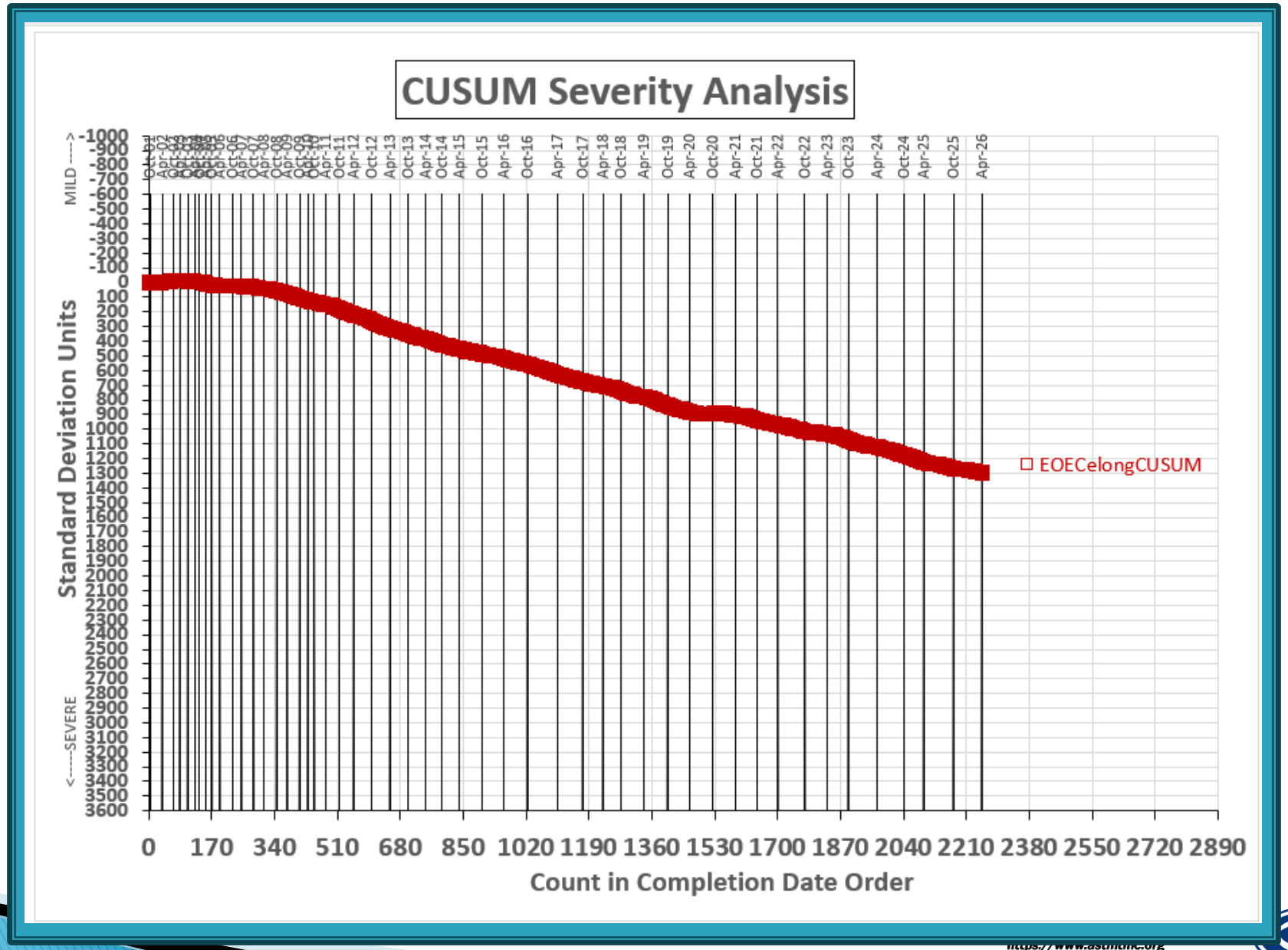
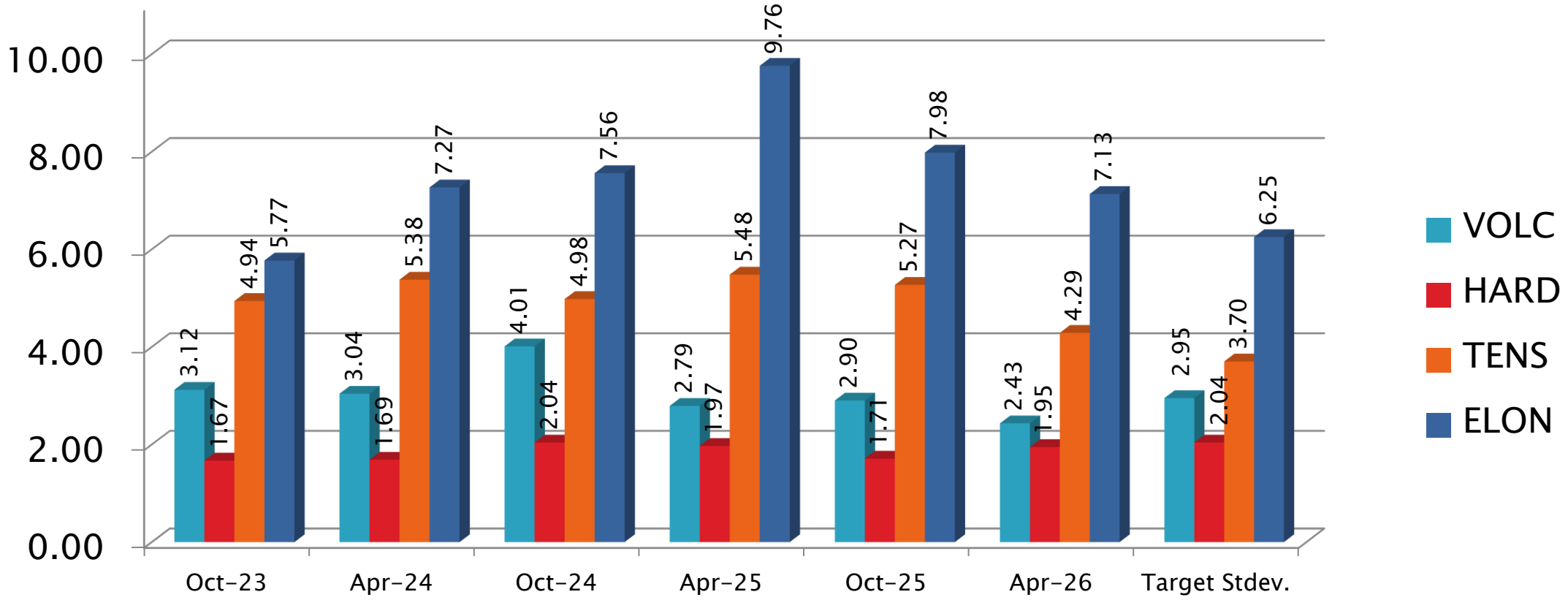


EOEC Test Severity

Silicone (VMQ)

Parameter	Period Mean Δ/s	Status
Volume Change	0.8152	Severe
Points Hardness Change	-0.5747	Mild
Tensile Strength Change	0.0202	On Target
Elongation Change	0.1296	Slightly Severe

EOEC Precision Estimates – Silicone



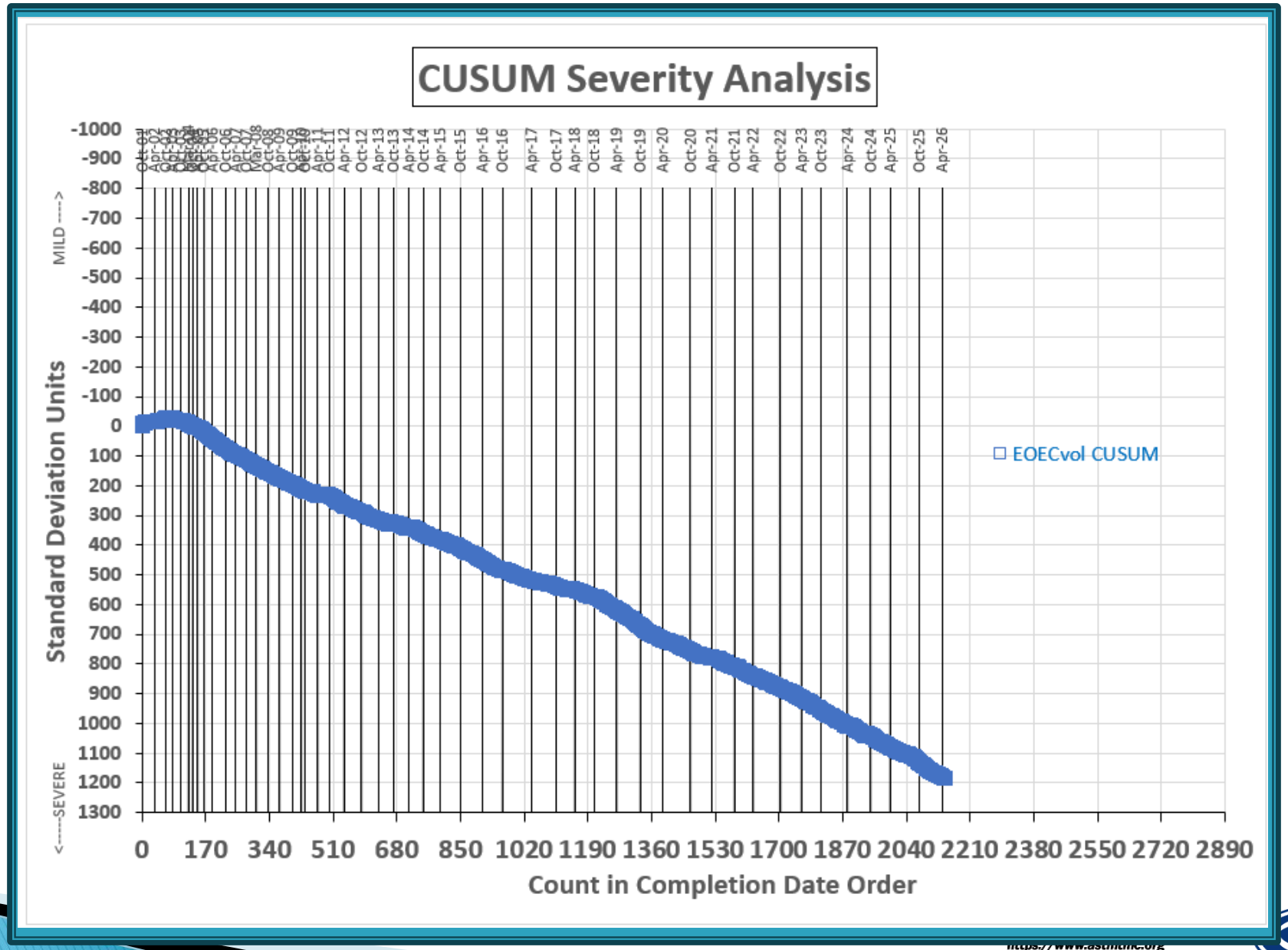
October 1, 2025 – March 31, 2026

EOEC Precision Estimates by Lab: VMQ

Test Parameter	Statistic	LTMS Lab							
		A	B	BB	G	I	L	P	V
	n=	18	10	2	15	7	3	3	3
Volume	Mean	34.652	34.541	31.250	37.313	31.476	32.0167	34.183	32.930
	Pooled s	0.8178	0.8854	2.0223	2.5812	0.9208	0.4934	1.2543	0.2893
	Mean /s	0.8412	0.8037	-0.3119	1.7435	-0.2354	-0.0520	0.6825	0.2576
Hardness	Mean	-23.722	-22.700	-18.500	-23.467	-22.571	-18.333	-25.000	-21.000
	Pooled s	0.8948	1.7029	0.7071	1.1872	1.1339	0.5774	2.6458	1.000
	Mean /s	-1.0011	-0.5000	1.5588	-0.8758	-0.4370	1.6405	-1.6274	0.3333
Tensile Strength	Mean	-32.050	-31.450	-37.150	-35.060	-36.186	-32.900	-34.733	-35.467
	Pooled s	2.7584	3.7687	0.3536	4.7886	4.0728	3.5595	5.4354	8.1082
	Mean /s	0.4595	0.6216	-0.9189	-0.3541	-0.6583	0.2297	-0.2658	-0.4640
Elongation	Mean	-25.683	-24.14	-30.400	-18.493	-27.671	-23.033	-24.000	-29.100
	Pooled s	3.4476	8.6474	2.2627	8.787	3.7317	4.4814	4.7149	8.937
	Mean /s	-0.1397	0.1072	-0.8944	1.0107	-0.4578	0.2843	0.1296	-0.6864

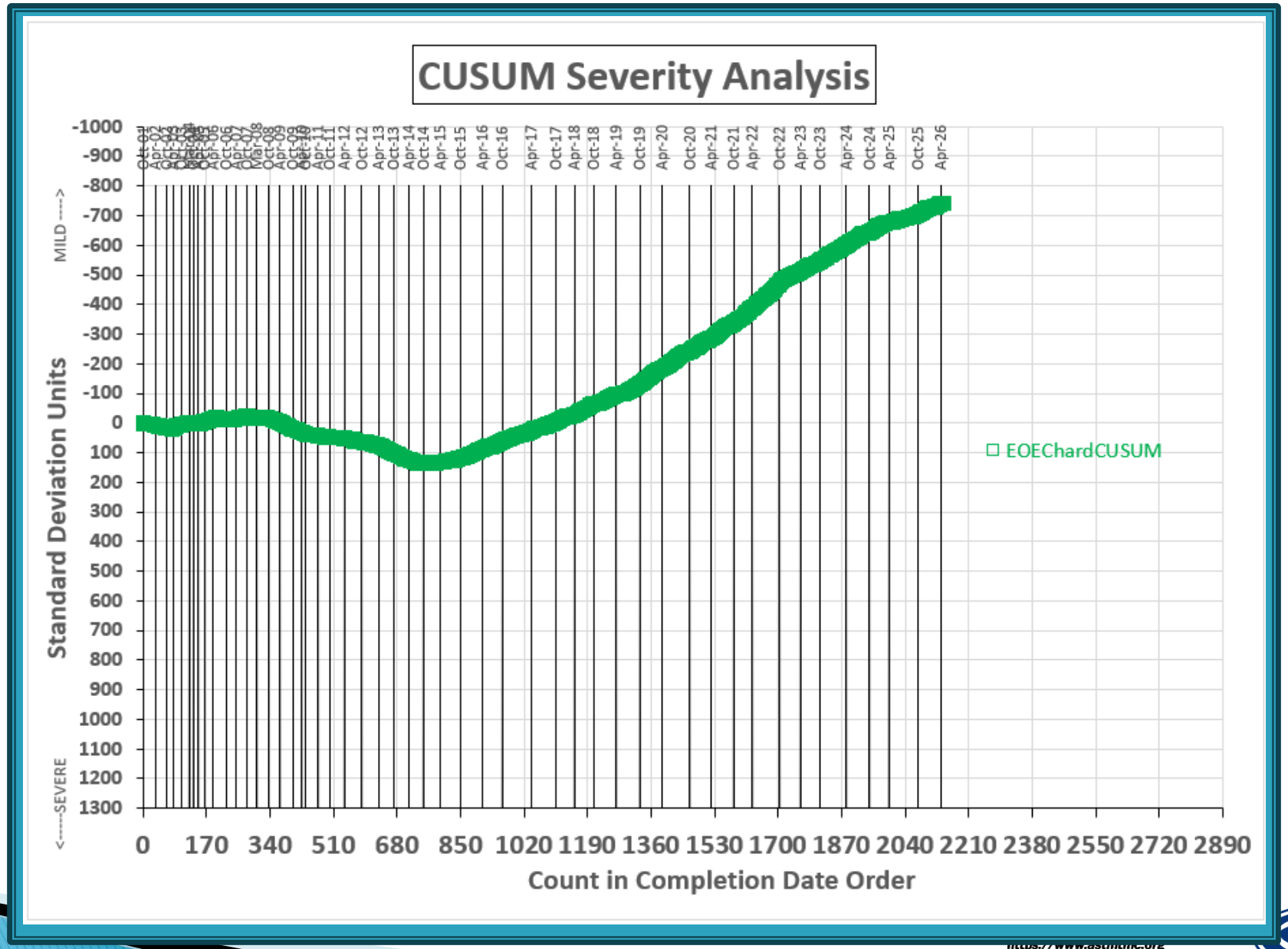
EOEC —SILICONE INDUSTRY OPERATIONALLY VALID DATA

REFERENCE SILICON VOLUME CHANGE CORRECTED AVG



EOEC —SILICONE INDUSTRY OPERATIONALLY VALID DATA

REFERENCE SILICON PTS HARD CHANGE CORRECTED AVG



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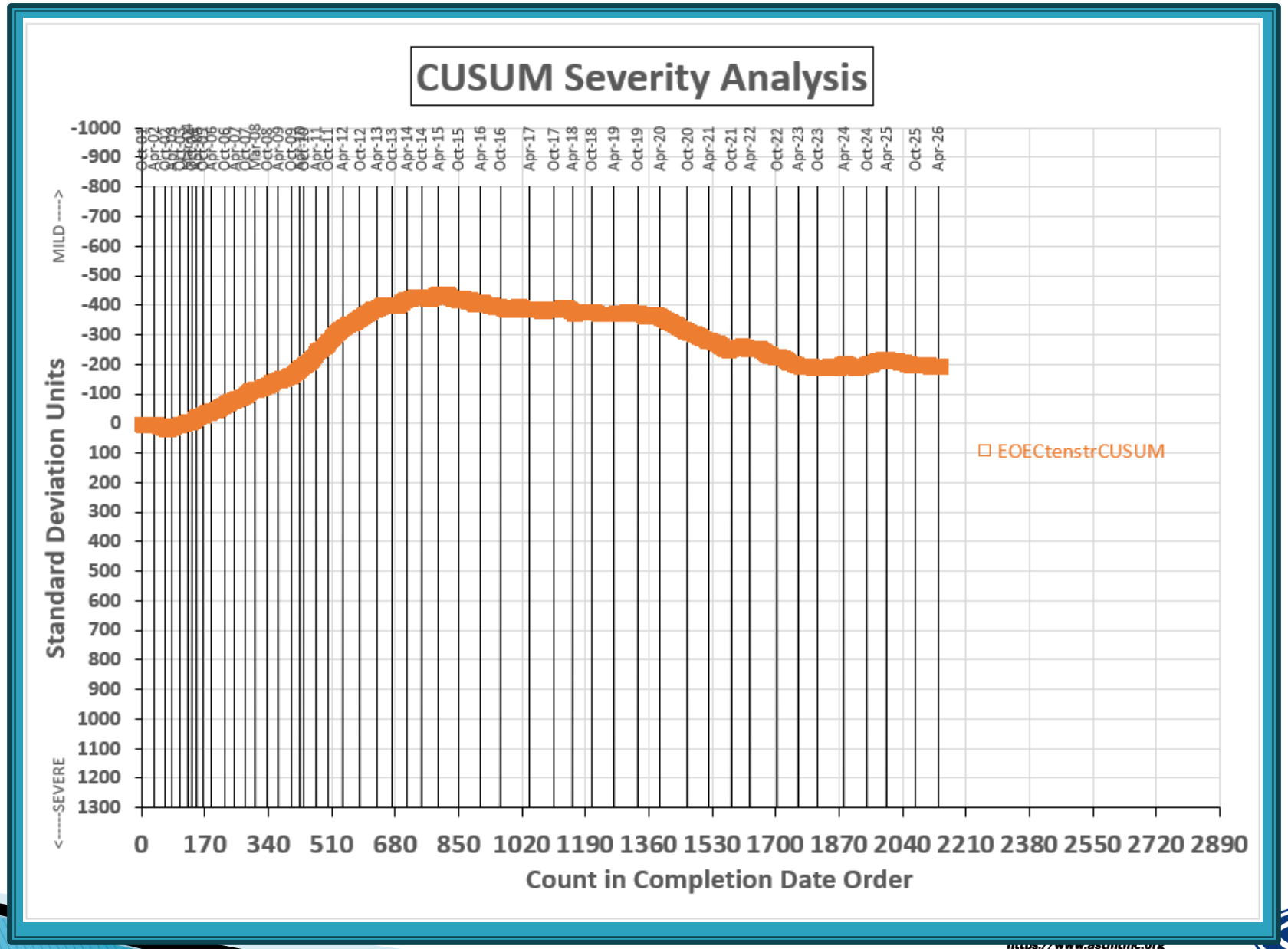
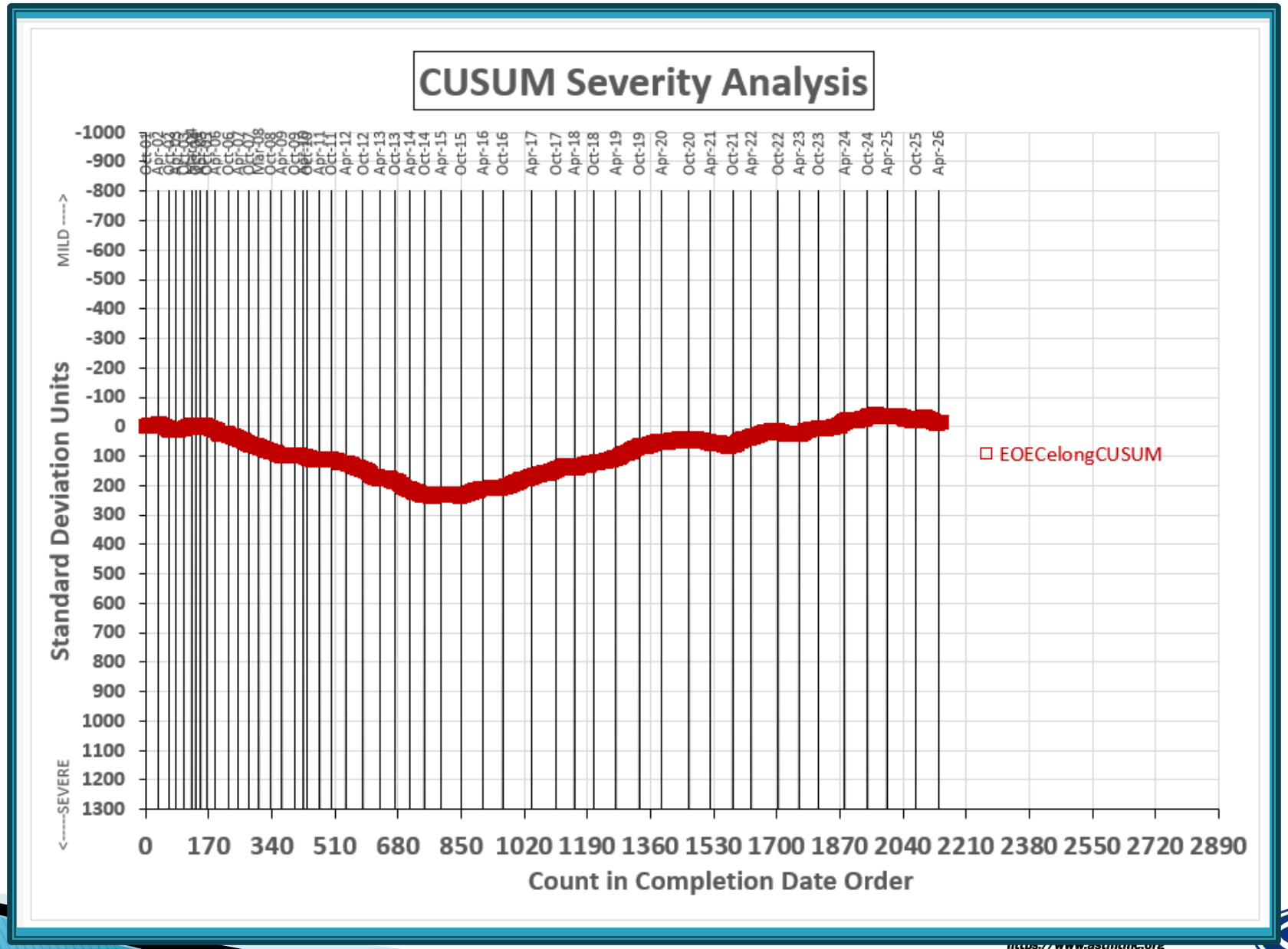


EOEC —SILICONE INDUSTRY OPERATIONALLY VALID DATA

REF SILICON ELONGATION CHANGE CORRECTED AVG

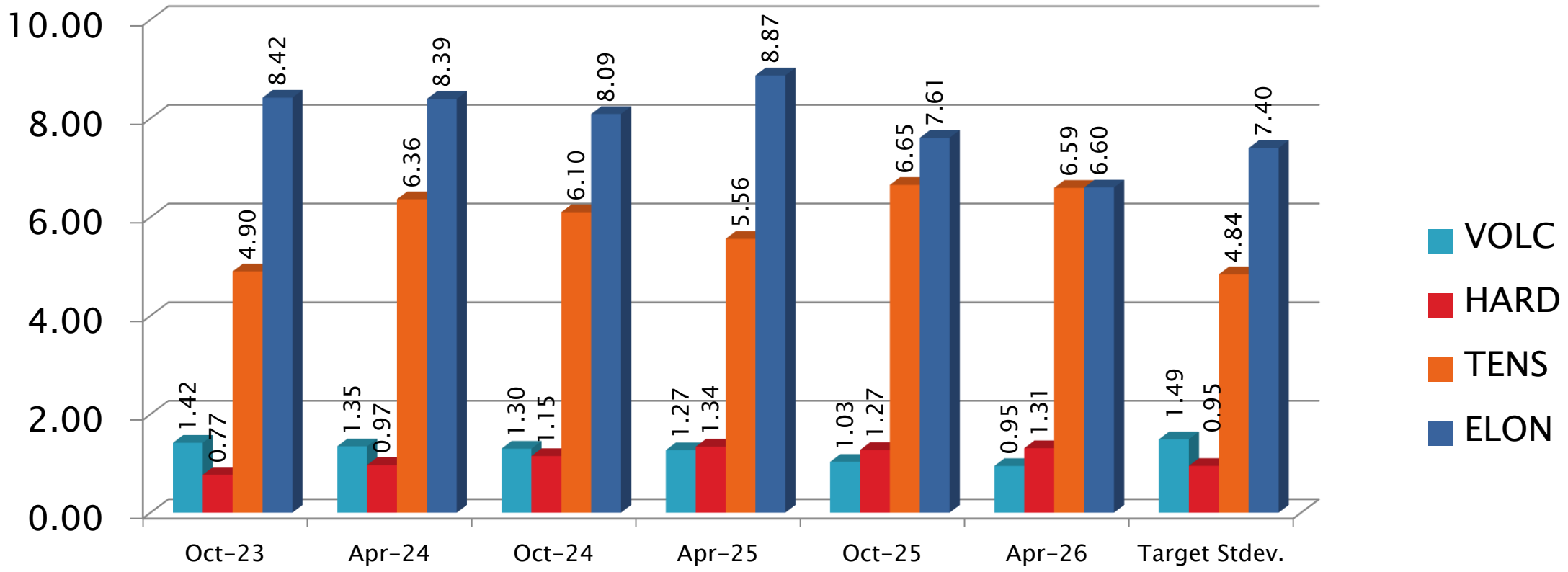


EOEC Test Severity

Ethylene Acrylate "VAMAC" (MAC)

Parameter	Period Mean Δ/s	Status
Volume Change	0.1920	Slightly Severe
Points Hardness Change	-0.7866	Mild
Tensile Strength Change	-0.3657	Mild
Elongation Change	-0.0934	On Target

EOEC Precision Estimates – VAMAC

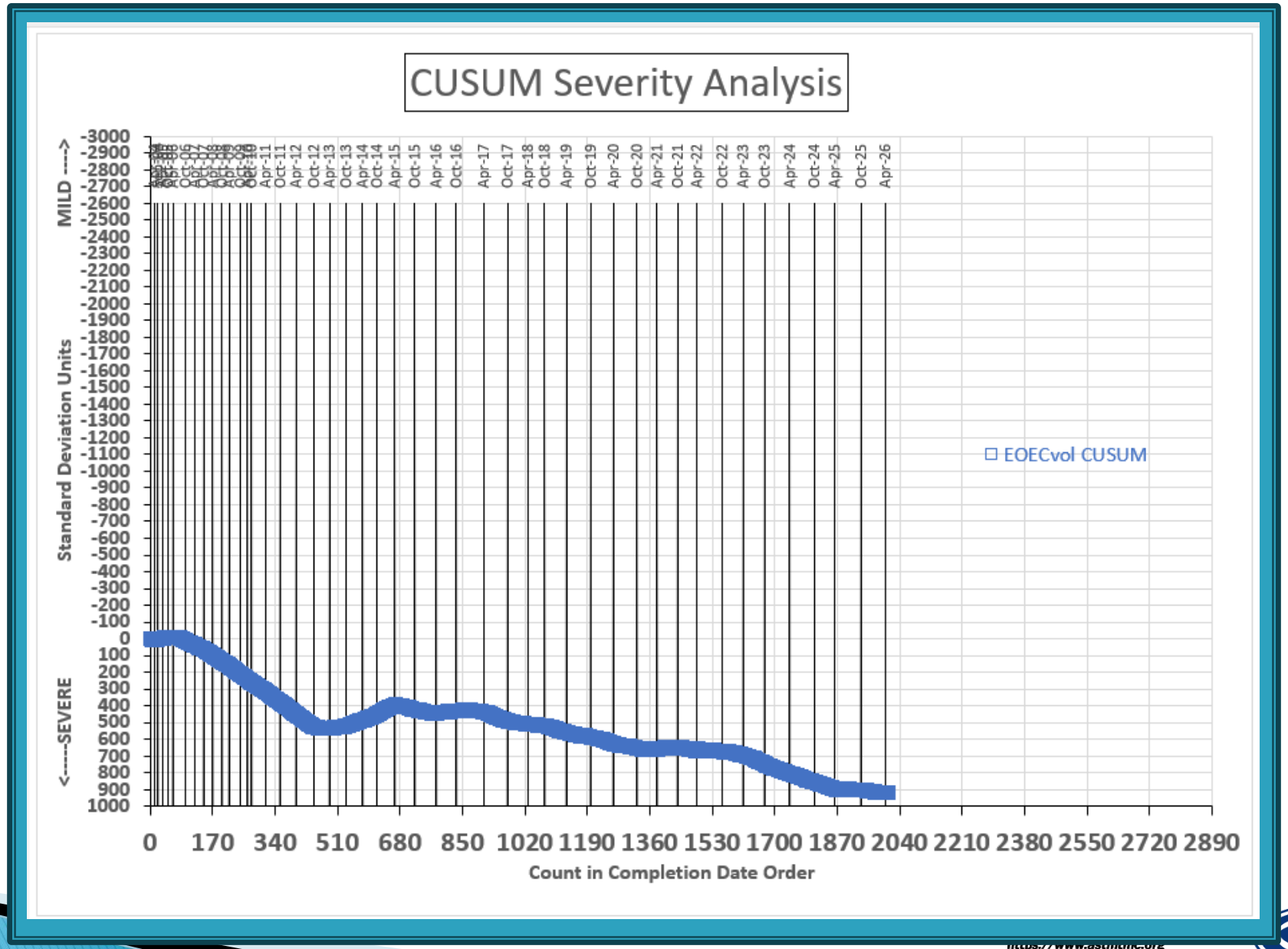


EOEC Precision Estimates by Lab: MAC

Test Parameter	Statistic	LTMS Lab							
		A	B	BB	G	I	L	P	V
	n=	24	11	2	13	7	3	1	5
Volume	Mean	18.758	18.804	18.685	19.282	19.291	17.897	18.91	17.946
	Pooled s	1.2051	0.3888	0.8132	0.7713	0.7918	0.4188		0.4490
	Mean /s	0.1460	0.1769	0.0973	0.4977	0.5043	-0.4318	0.25	-0.3987
Hardness	Mean	-9.1250	-8.4545	-7.5000	-7.0769	-7.8571	-6.0000	-9.00	-8.4000
	Pooled s	0.9470	1.2933	0.7071	1.1152	00.6901	0		0.5477
	Mean /s	-1.7316	-1.0258	-0.0210	0.4243	-0.3970	1.5579	-1.60	-0.9684
Tensile Strength	Mean	-16.508	-18.854	-23.100	-20.977	-12.900	-5.8667	-11.30	-17.380
	Pooled s	6.4373	6.1239	0.8485	5.7542	4.4083	1.8148		5.7129
	Mean /s	-0.2435	-0.7282	-1.6054	-1.1667	0.5021	1.9552	0.83	-0.4236
Elongation	Mean	-34.558	-36.736	-34.900	-36.538	-39.800	-29.367	-37.80	-34.040
	Pooled s	5.4818	5.2452	2.4042	9.779	3.0854	8.0376		7.3596
	Mean /s	0.0543	-0.2400	0.0081	-0.2133	-0.6540	0.7559	-0.38	0.1243

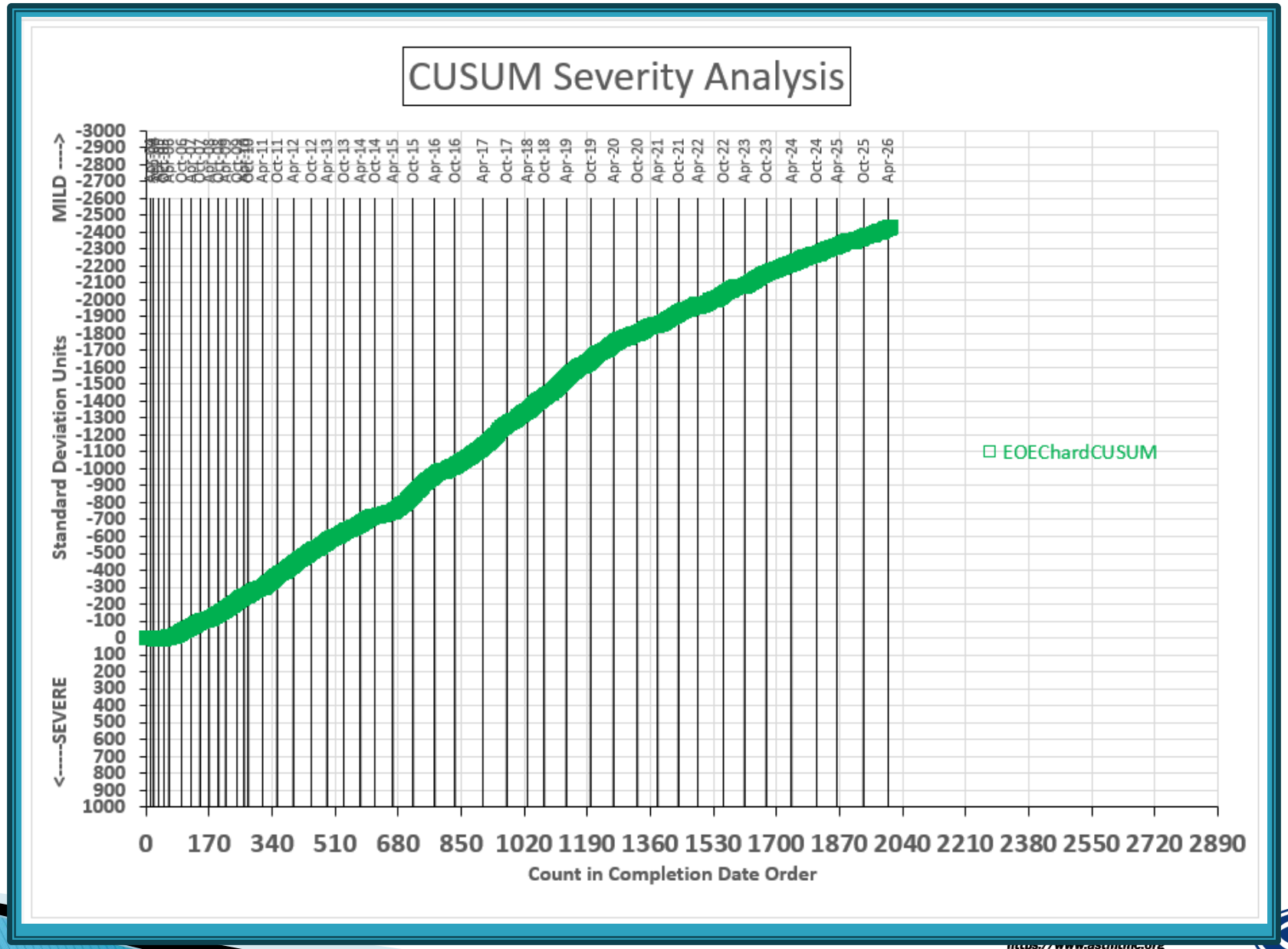
EOEC — ETHYLENEACRYLATE INDUSTRY OPERATIONALLY VALID DATA

REFERENCE VAMAC G VOLUME CHANGE CORRECTED AVERAGE



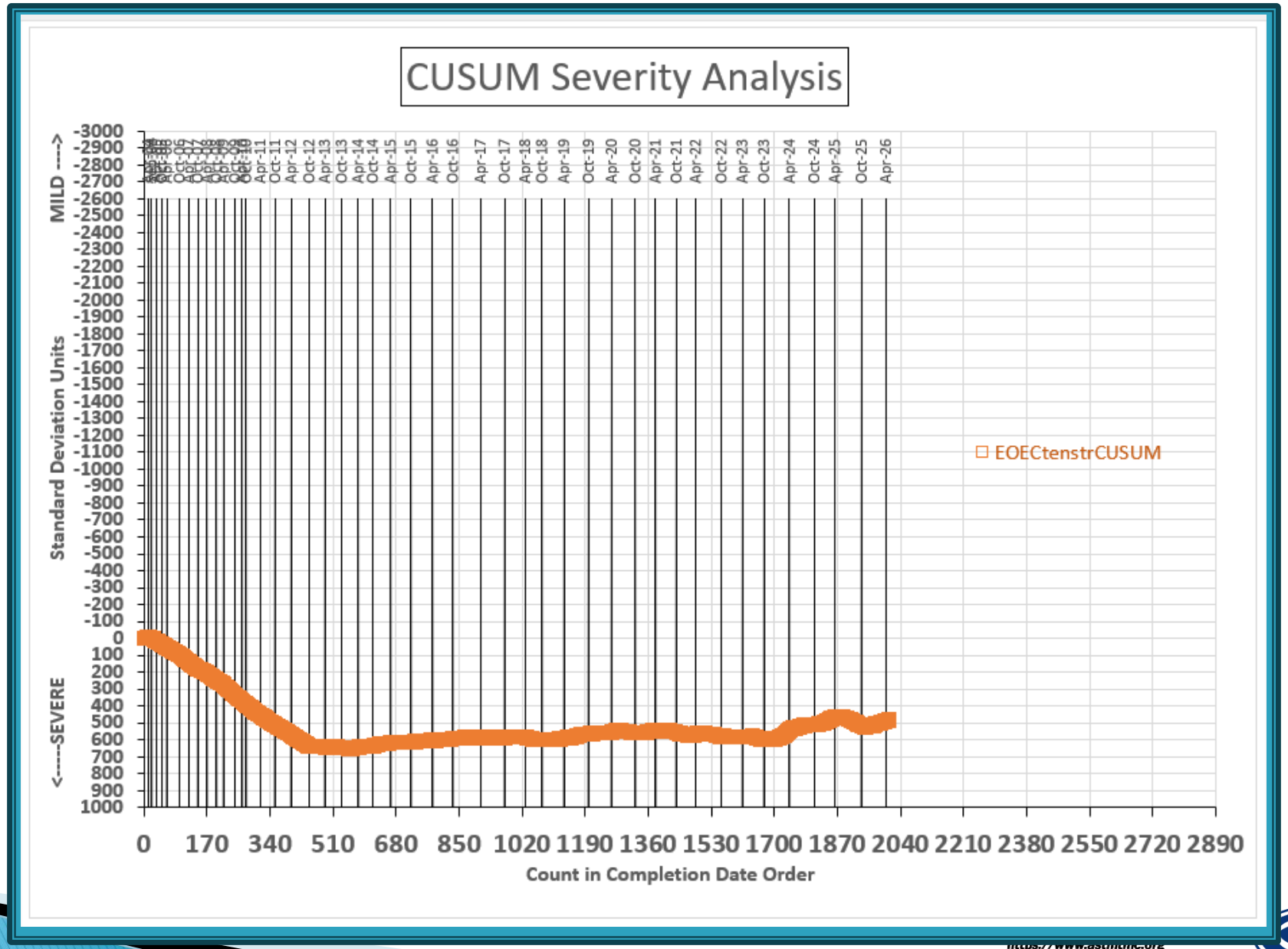
EOEC — ETHYLENEACRYLATE INDUSTRY OPERATIONALLY VALID DATA

REF VAMAC G POINTS HARDNESS CHANGE CORRECTED AVG



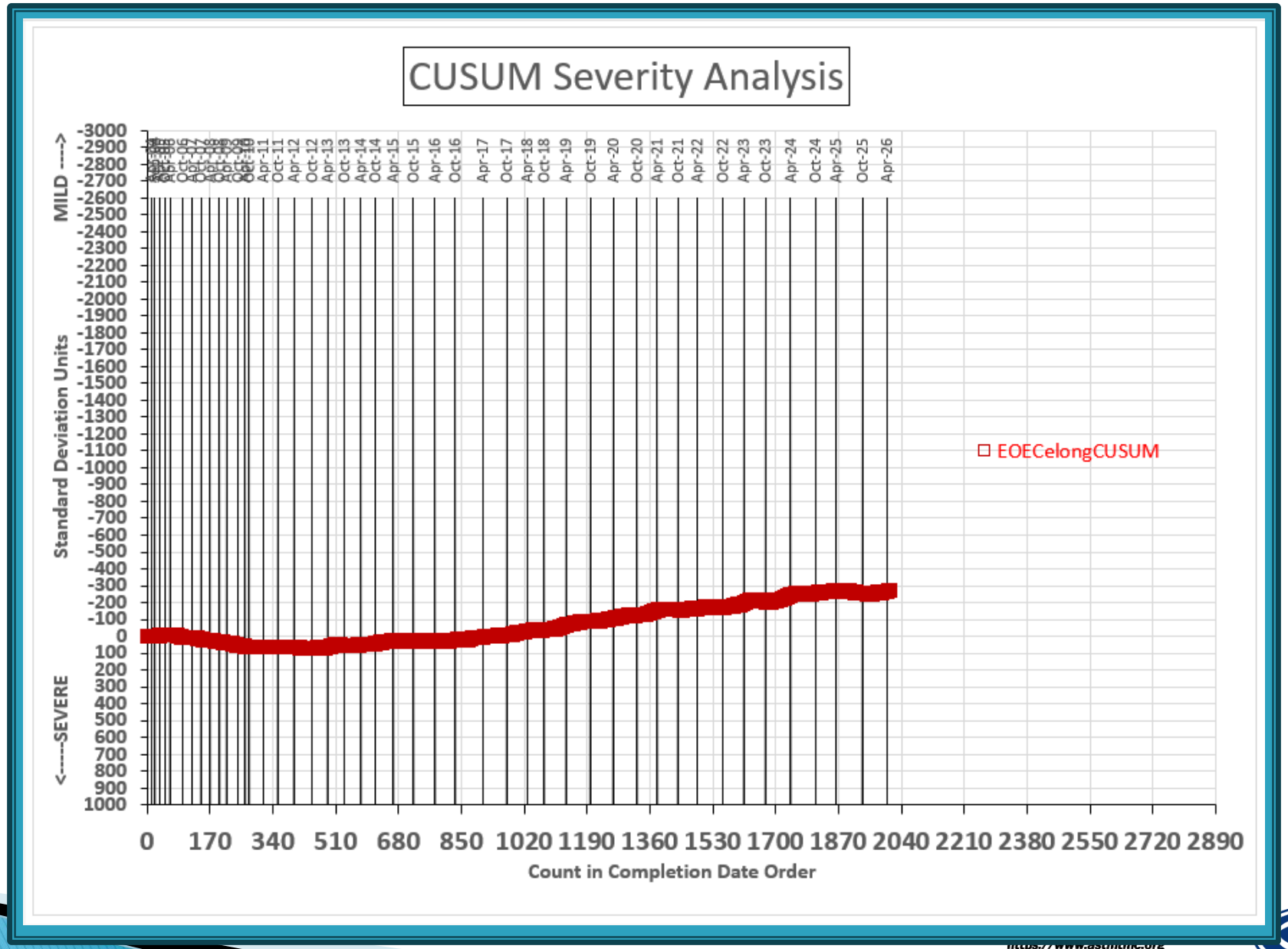
EOEC — ETHYLENEACRYLATE INDUSTRY OPERATIONALLY VALID DATA

REF VAMAC G TENSILE STRENGTH CHANGE CORRECTED AVG



EOEC — ETHYLENEACRYLATE INDUSTRY OPERATIONALLY VALID DATA

REF VAMAC G ELONGATION CHANGE CORRECTED AVG

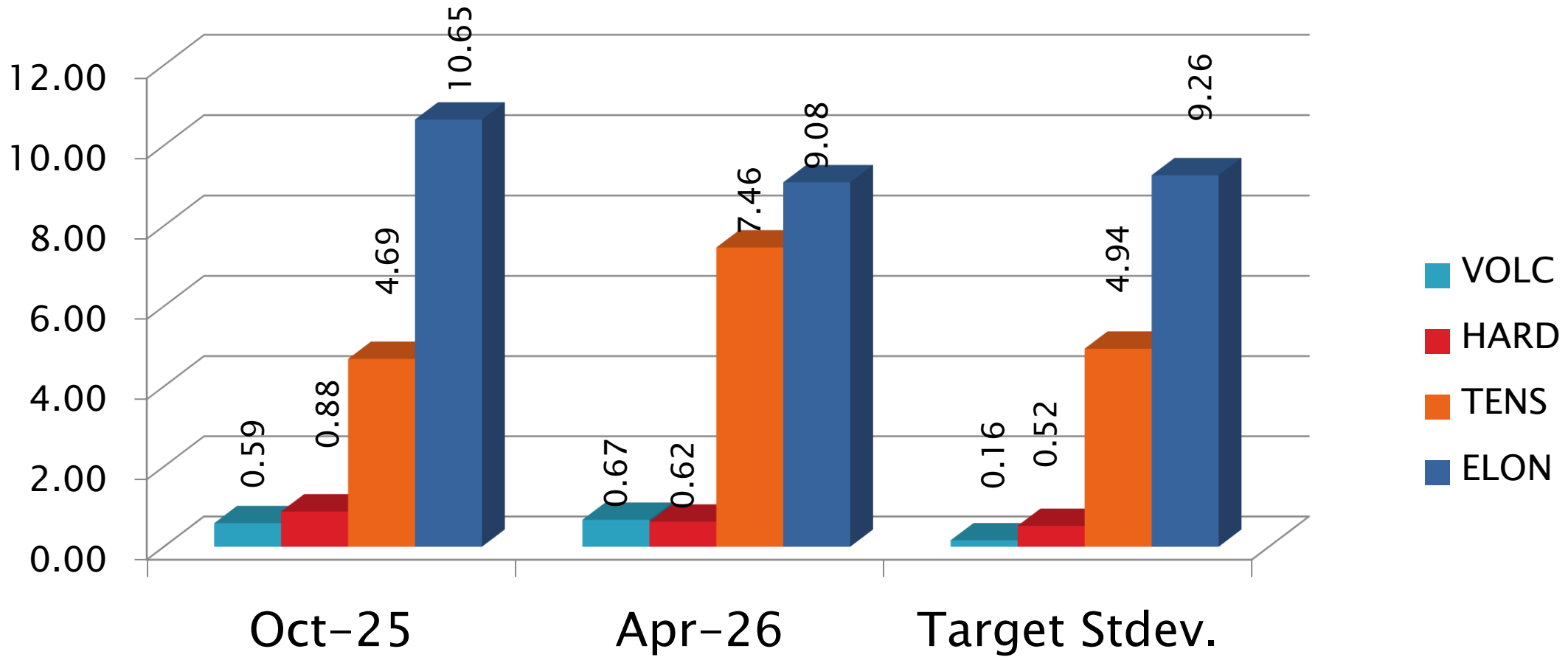


EOEC Test Severity

Hydrogenated NBR (HNBR)

Parameter	Period Mean Δ/s	Status
Volume Change	0.5476	Severe
Points Hardness Change	-0.5283	Mild
Tensile Strength Change	-0.5348	Mild
Elongation Change	-0.7002	Very Mild

EOEC Precision Estimates – Hydrogenated NBR

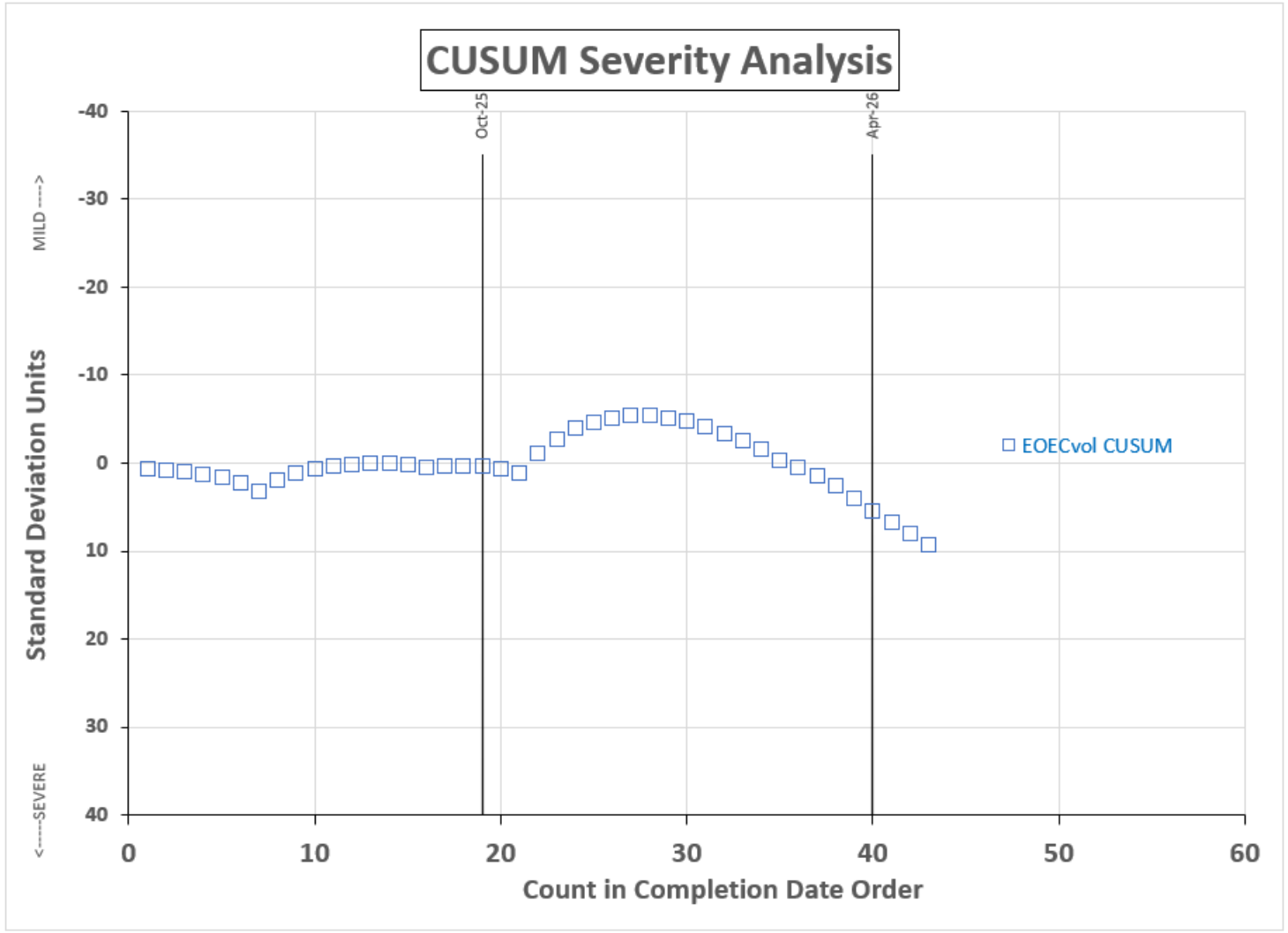


EOEC Precision Estimates by Lab: HNBR

Test Parameter	Statistic	LTMS Lab							
		A	B	BB	G	I	L	P	V
	n=	11	3	0	6	0	0	0	1
Volume	Mean	4.4118	4.4367		4.2300				1.3500
	Pooled s	0.08205	0.1692		0.14588				
	Mean /s	1.7614	1.9167		0.6250				-17.375
Hardness	Mean	-2.0909	-1.6667		-1.6667				-2.000
	Pooled s	0.7006	0.5774		0.5164				
	Mean /s	-0.8864	-0.0705		-0.0705				-0.7115
Tensile Strength	Mean	6.2273	3.8333		4.4833				1.0000
	Pooled s	5.7278	0.5132		12.225				
	Mean /s	-0.3143	-0.7989		-0.6673				-1.3725
Elongation	Mean	-5.1636	-5.9333		1.6000				-10.900
	Pooled s	6.8112	4.6361		13.300				
	Mean /s	-0.8676	-0.9507		-0.1371				-1.4870

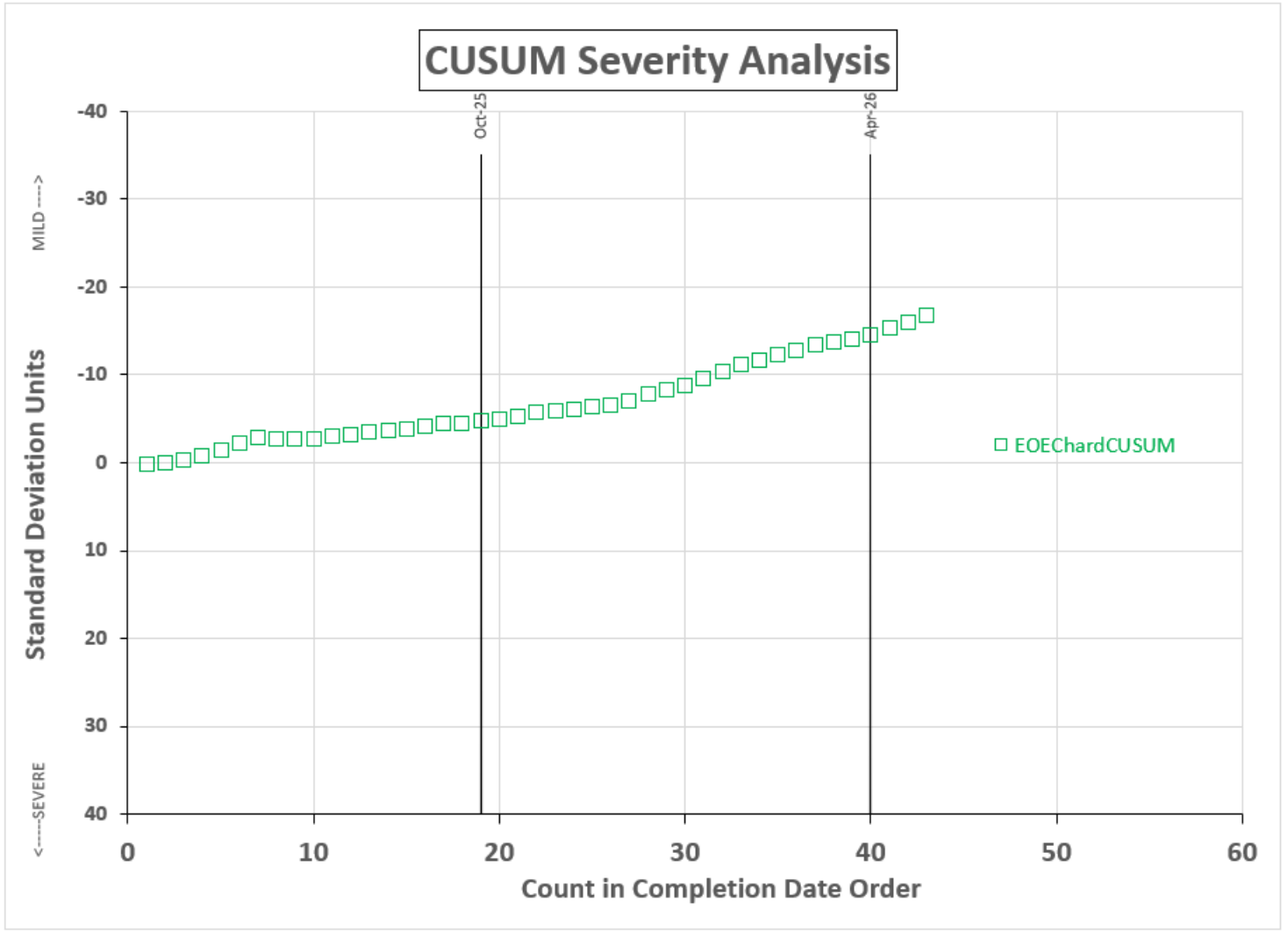
EOEC - HYDROGENATED NITRILE INDUSTRY OPERATIONALLY VALID DATA

REFERENCE HNITRILE VOLUME CHANGE CORRECTED AVERAGE



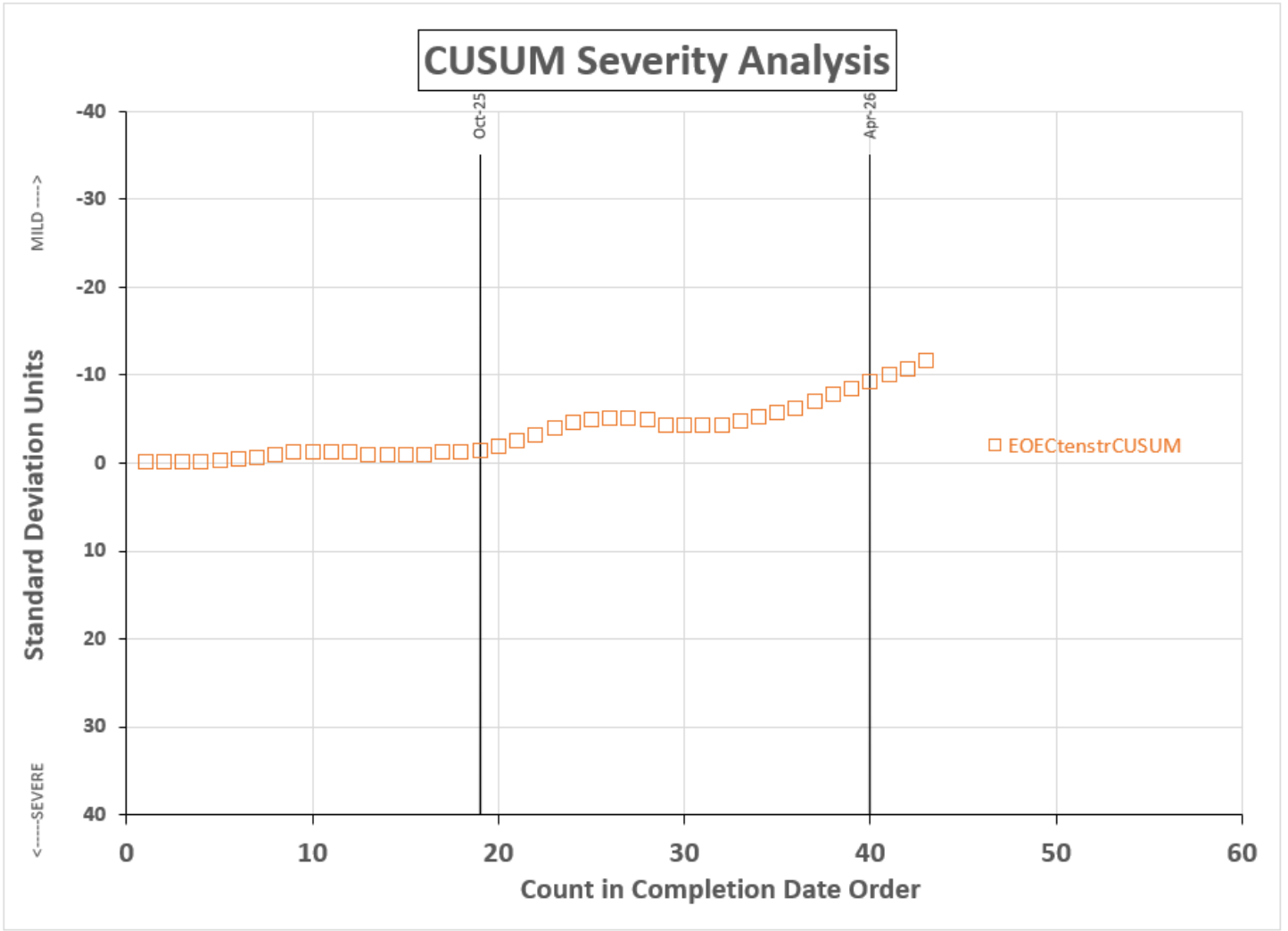
EOEC - HYDROGENATED NITRILE INDUSTRY OPERATIONALLY VALID DATA

REFERENCE HY NITRILE PTS HARD CHANGE CORRECTED AVG



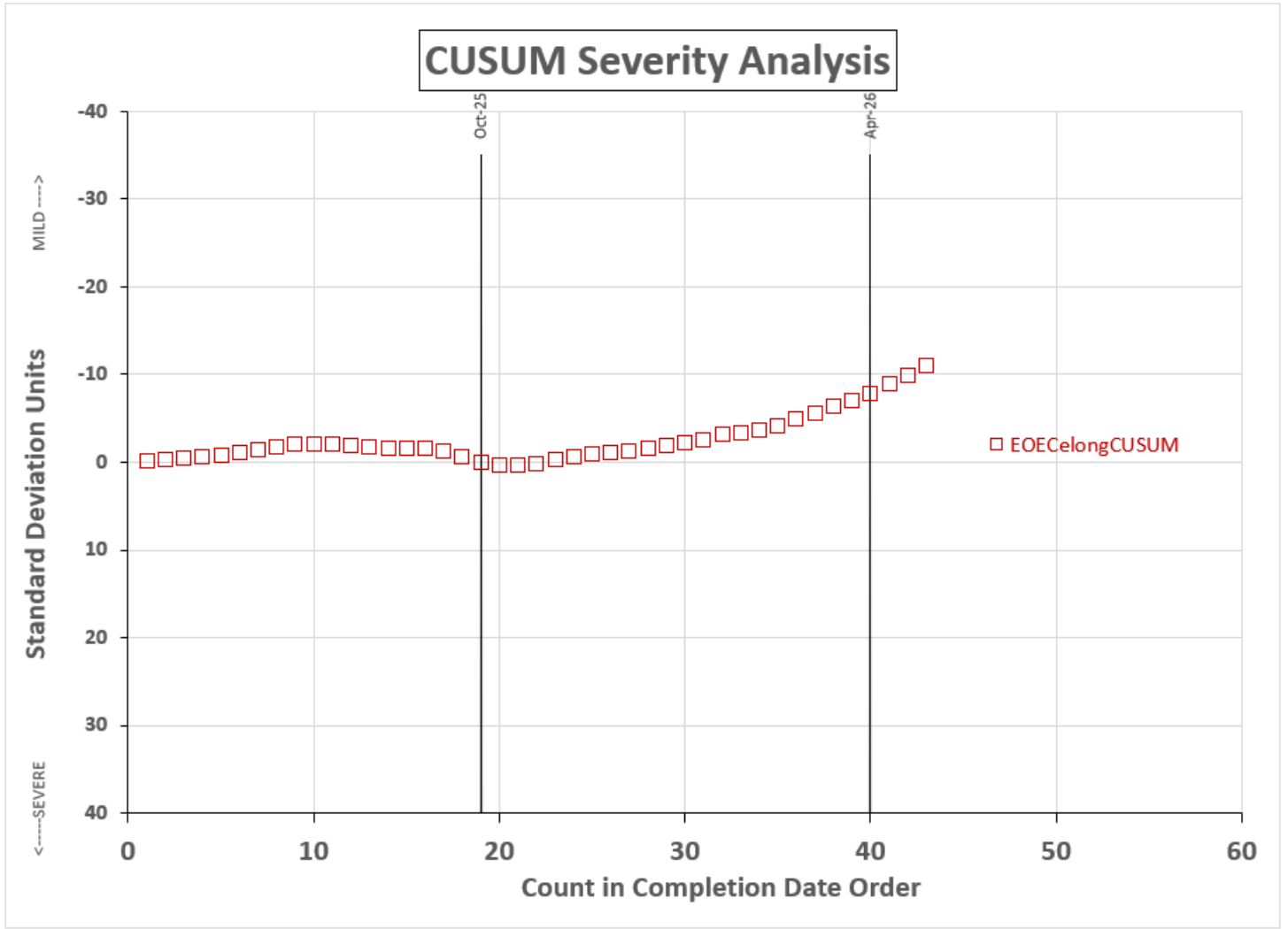
EOEC - HYDROGENATED NITRILE INDUSTRY OPERATIONALLY VALID DATA

REF HYD NITRILE TENS STRENGTH CHANGE CORRECTED AVG



EOEC - HYDROGENATED NITRILE INDUSTRY OPERATIONALLY VALID DATA

REF HY NITRILE ELONGATION CHANGE CORRECTED AVERAGE



Information Letters & Technical Updates*

No new information letters or technical updates were released this semester.

Test	Date	IL or Memo Number	Topic
EOEC			

*Available from TMC Website

Reference Oil Inventory Estimated Life

EOEC & LDEOC

Oil	TMC Inventory Gallons	Gallons Shipped Past 6 Months	Estimated Life [C]
SL107 [A, B]	632	250	1.0 years

[A] TMC Inventory is used across several test methods

[B] SL107 has fully replaced oil 1006; Oil 1006 is no longer used as an EOEC Reference Fluid

[C] Use Rate of SL107 has accelerated due to addition of five new Elastomers to D7216:
FOUR: ILSAC GF-7
ONE: PC-12

TABLE of CONTENTS

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Test Monitoring Center

https://www.astmtmc.org

ASTM Reference Testing Semi-Annual Report D7216 LDEOC

October 1, 2024 to March 31, 2025

ASTM D 7216

Engine Oil Elastomer Compatibility

LDEOC (Light-Duty)	
OHT PART NUMBER	BATCH CODE*
OHTLDEOC-HNBR1-A	34
OHTLDEOC-FKM1-A	32
OHTLDEOC-ACM1-B	27
OHTLDEOC-VMQ1-A	44
OHTLDEOC-AEM1-B	33
OHTLDEOC-ACM2-A	4
OHTLDEOC-AEM2-A	4
OHTLDEOC-FKM3-A	3
OHTLDEOC-AEM3-A	4

* As of 20260401

Calibrated Labs and Stands[1]

(change shown in parentheses)

Test	Labs	Stands
D7216 LDEOC	9[2] (+0)	N/A

[1] As of 3/31/2026

[2] Not all Elastomer Types were run at each lab

LDEOC Test Activity

Test Status		Ethylene Acrylate	Fluoroelast.	Nitrile	Polyacrylate	Silicone	Total
	LABS	9	9	9	8	9	
	BATHS	37	37	20	33	36	
Acceptable Calibration Test	AC	68	74	69	74	78	**363**
Failed Calibration Test	OC	7	0	0	0	2	**9**
Operationally Invalid, by lab	LC	0	0	2	1	0	**3**
Operationally Invalid, by TMC	RC	0	0	1	0	0	**1**
Aborted	XC	1	1	2	2	1	**7**
Acceptable Informational Run	NN	0	0	0	0	0	**0**
Unacceptable Informational Run	MN	0	0	0	0	0	**0**
Total		**76**	**75**	**74**	**77**	**81**	**383**

LDEOC Test Activity

Test Status		Ethylene Acrylate 2	Ethylene Acrylate 3	Fluoroelast.3	Polyacrylate2	Total
LABS BATHS		8 30	8 30	8 33	8 35	
Acceptable Calibration Test	AC	70	68	68	71	277
Failed Calibration Test	OC	4	4	0	3	11
Operationally Invalid, by lab	LC	1	0	1	2	4
Operationally Invalid, by TMC	RC	0	0	0	0	0
Aborted	XC	1	1	1	1	4
Acceptable Informational Run	NN	0	0	0	0	0
Unacceptable Informational Run	MN	0	0	0	0	0
Total		**76**	**73**	**70**	**77**	**296**

LDEOC Failing Calibration (OC) Tests

Cause	Elastomer	#
TENSILE STRENGTH (SEVERE)	AEM1,VMQ1,AEM2(2), AEM3(4),ACM2 (2)	10
TENSILE STRENGTH (MILD)	VMQ1	1
VOLUME (MILD)	AEM1(5)	5
VOLUME (SEVERE)	ACM2	1
HARDNESS (MILD)	AEM1	1
HARDNESS (SEVERE)	AEM2	1
HARD/TENS (SEVERE), VOL (MILD)	AEM2	1
Total		**20**

There were SEVENTEEN failing LDEOC Calibration Tests reported this period from EIGHT different labs.

LDEOC Lost Tests

Validity	Cause	No. of Tests
LC	BATH TEMPERATURE/POWER OUTAGE	2
LC	TEST TIME NOT 336Hrs	2
LC	MISSING WEIGHTS DATA (VOLUME TESTING)	3
XC	ABORTED: POWER OUTAGE	11
XC	WRONG ELASTOMER TESTED	0
RC	INCORRECT RUN TIME	0
RC	BATH TEMPERATURE/POWER OUTAGE	1
RC	WRONG ELASTOMER TESTED	0
Total		

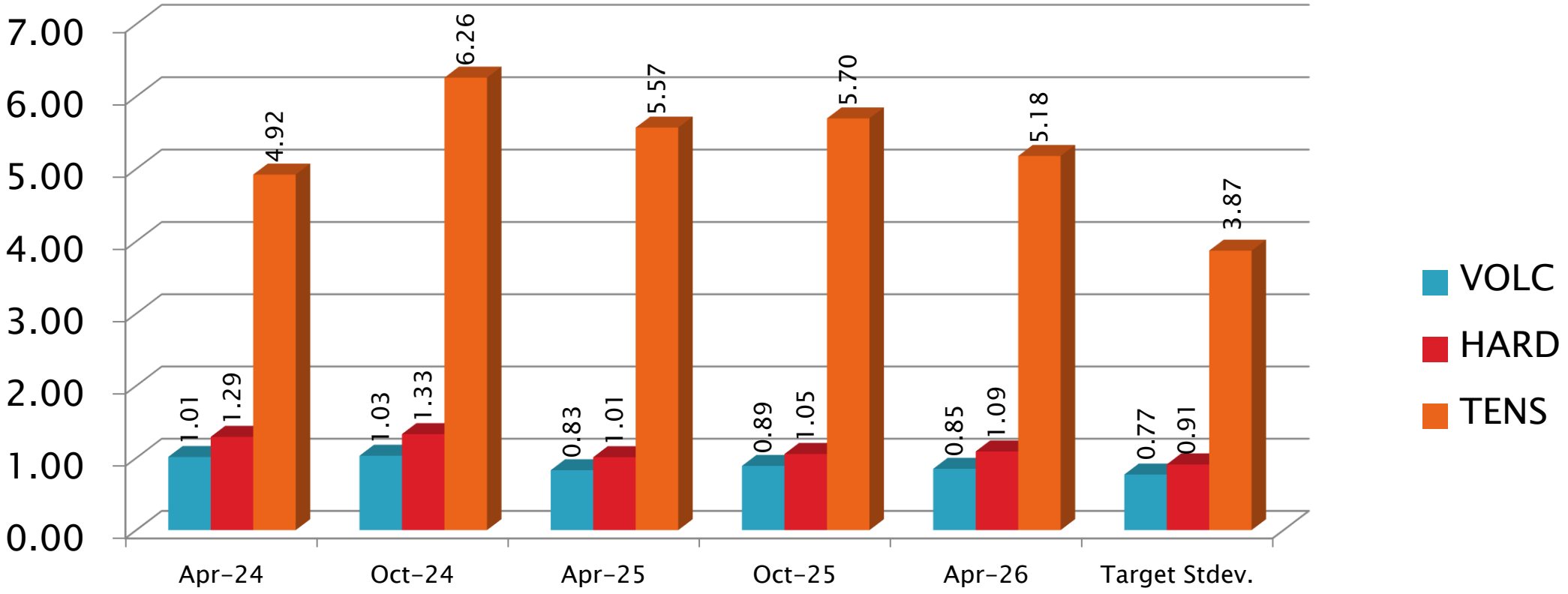
*Invalid (LC,RC) and Aborted (XC) calibration tests

LDEOC Test Severity

Ethylene Acrylate (AEM1)

Parameter	Period Mean Δ/s	Status
Volume Change	-1.3823	Very Mild
Points Hardness Change	0.8315	Very Severe
Tensile Strength Change	-0.5485	Mild

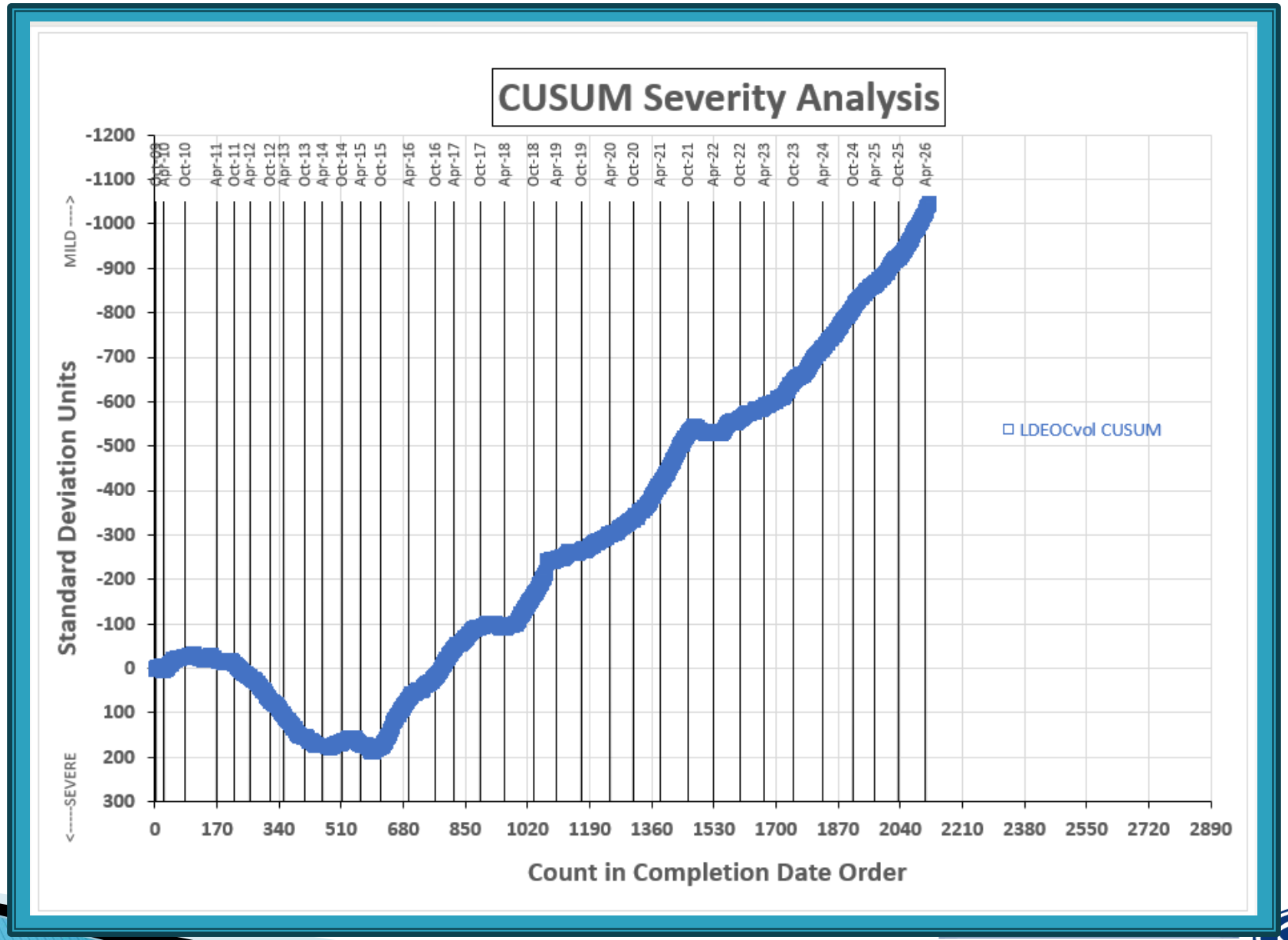
LDEOC Precision Estimates – Ethylene Acrylate



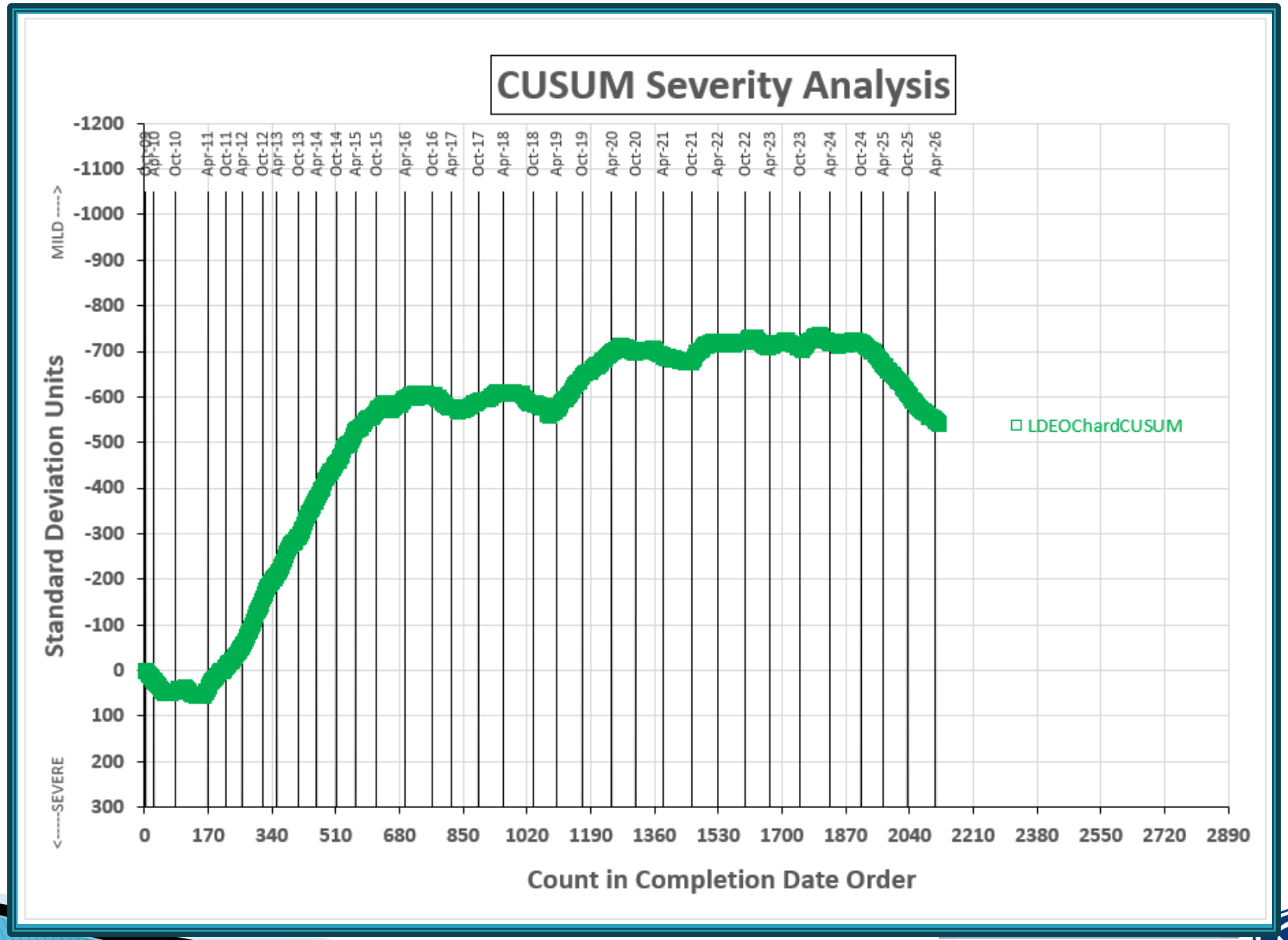
LDEOC Precision Estimates by Lab: AEM1

Test Parameter	Statistic	LTMS Lab								
		A	B	BB	G	I	K	L	P	V
	n=	23	7	4	18	8	1	4	2	8
Volume	Mean	22.794	23.167	24.142	23.382	24.105	22.88	23.982	23.360	21.616
	Pooled s	0.3307	0.3213	0.7709	0.4157	0.9665		0.3983	0.1838	0.5028
	Mean /s	-1.8261	-1.3414	-0.0747	-1.0628	-0.1234	-1.71	-0.2825	-1.0909	-3.3555
Hardness	Mean	-12.261	-12.286	-13.500	-11.611	-11.500	-10.00	-11.250	-12.000	-12.000
	Pooled s	1.2142	0.4880	0.5774	1.0369	0.5345		0.9574	1.4142	0.9258
	Mean /s	0.5155	0.4882	-0.8462	1.2295	1.3516	3.00	1.6264	0.8022	0.8022
Tensile Strength	Mean	-17.909	-20.986	-21.525	-19.578	-15.488	-29.50	-20.250	-16.250	-19.750
	Pooled s	5.3942	4.4570	1.8786	5.5856	2.1182		5.4836	2.8991	5.7612
	Mean /s	-0.2761	-1.0712	-1.2106	-0.7074	0.3494	-3.27	-0.8811	0.1525	-0.7519

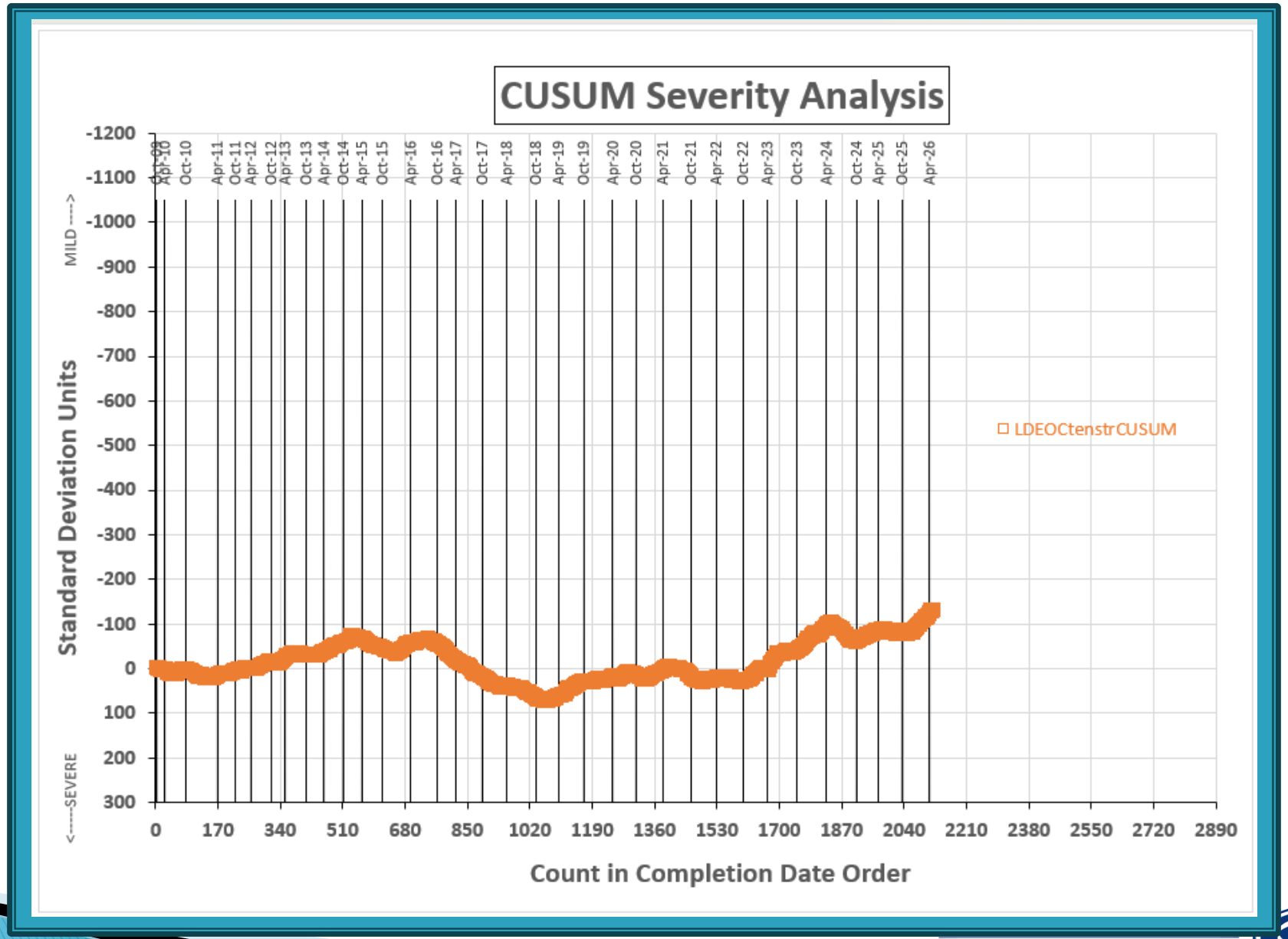
LDEOC – ETHYLENE ACRYLATE INDUSTRY OPERATIONALLY VALID DATA
ETHYLENE ACRYLATE VOLUME CHANGE FINAL



LDEOC – ETHYLENE ACRYLATE INDUSTRY OPERATIONALLY VALID DATA
ETHYLENE ACRYLATE HARDNESS CHANGE FINAL



LDEOC – ETHYLENE ACRYLATE INDUSTRY OPERATIONALLY VALID DATA
ETHYLENE ACRYLATE TENSILE STRENGTH CHANGE FINAL

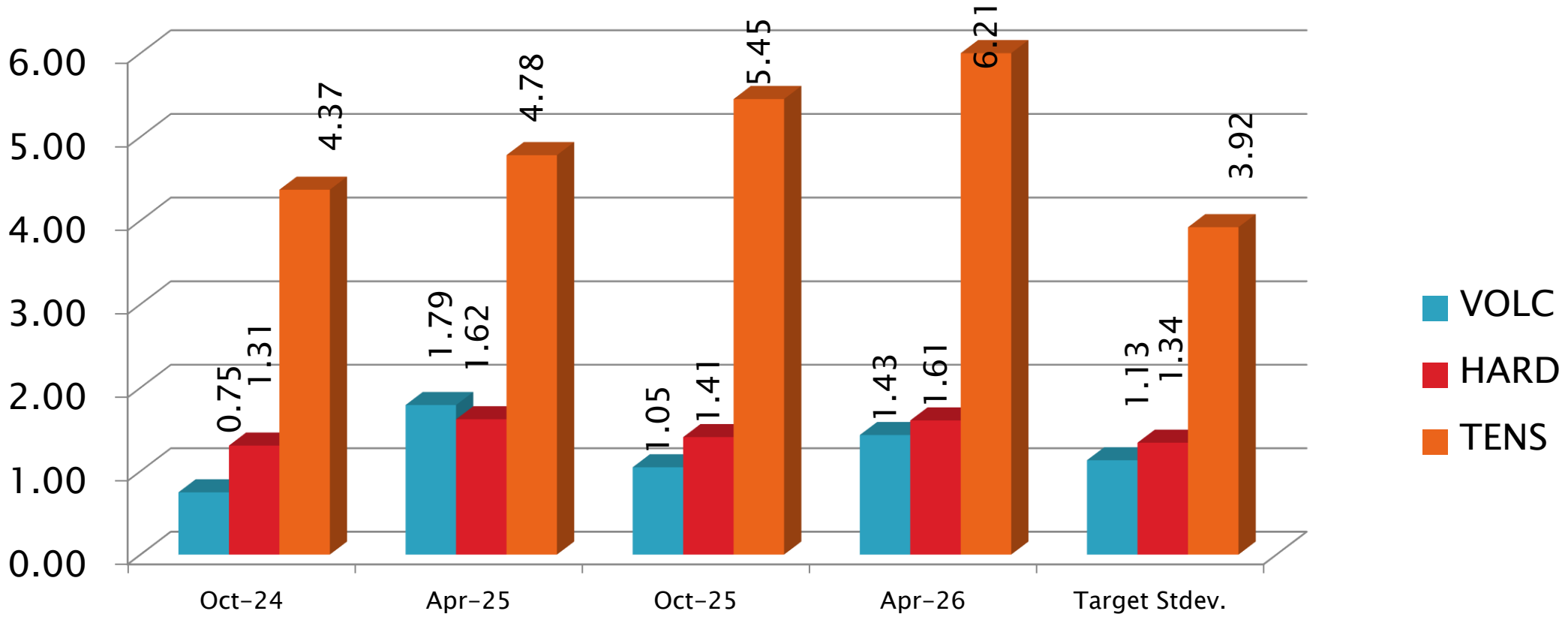


LDEOC Test Severity

Ethylene Acrylate (AEM2)

Parameter	Period Mean Δ/s	Status
Volume Change	-0.3314	Severe
Points Hardness Change	0.1839	Slightly Mild
Tensile Strength Change	-0.4759	Severe

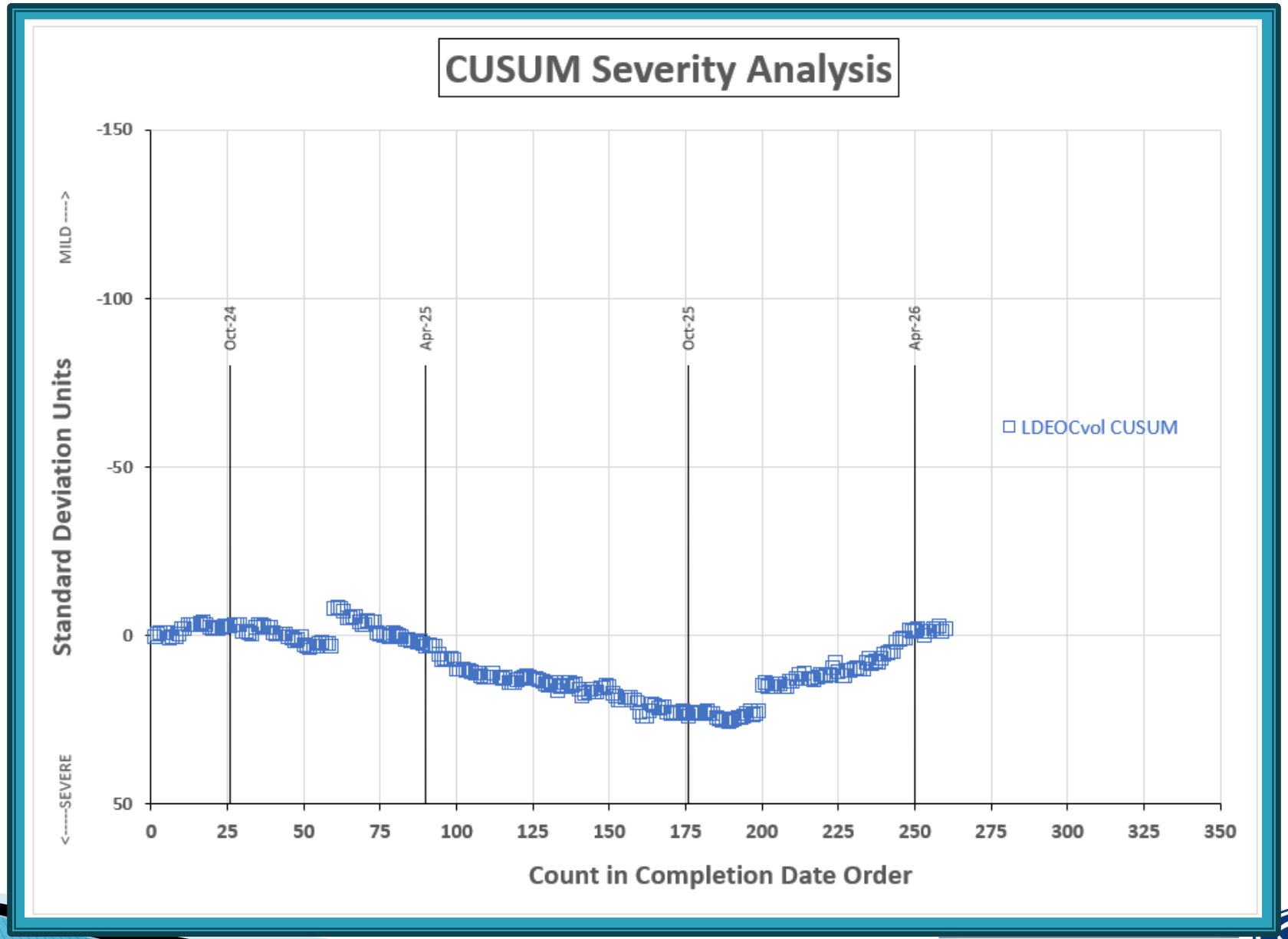
LDEOC Precision Estimates – Ethylene Acrylate 2



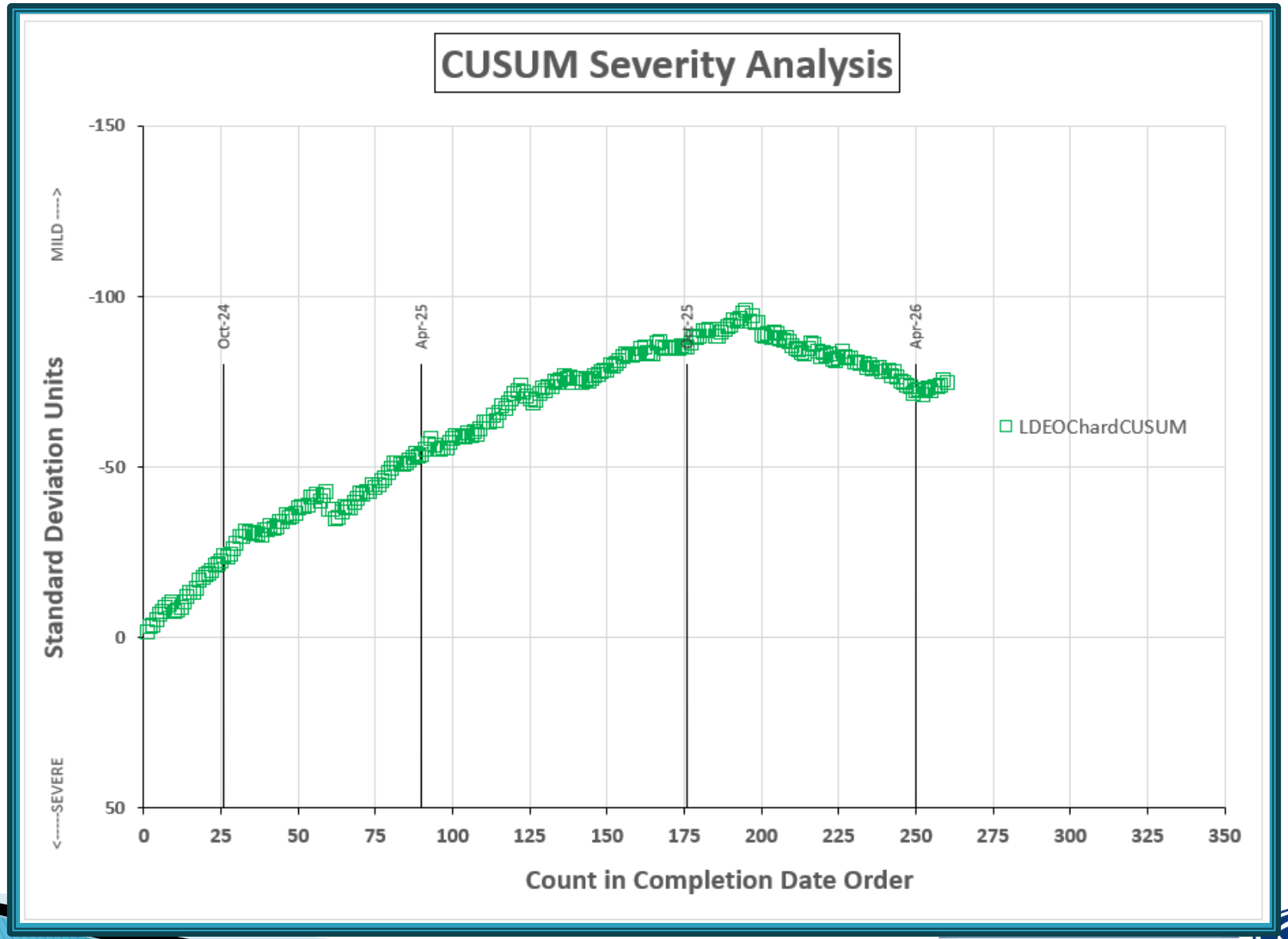
LDEOC Precision Estimates by Lab: AEM2

Test Parameter	Statistic	LTMS Lab							
		A	B	BB	G	I	L	P	V
	n=	24	5	4	15	10	4	1	11
Volume	Mean	20.427	21.046	22.010	21.519	20.350	19.950	21.010	19.474
	Pooled s	0.7329	0.2818	0.8309	1.0622	2.8178	0.0966		0.9413
	Mean /s	-0.4897	0.0584	0.9115	0.4767	-0.5575	-0.9115	0.0265	-1.3331
Hardness	Mean	-8.2917	-7.0000	-10.000	-7.2000	-6.7000	-5.2500	-6.0000	-7.2727
	Pooled s	1.1602	1.0000	0.0000	1.5675	1.8288	1.5000		1.0090
	Mean /s	-0.3968	0.5672	-1.6716	0.4179	0.7910	1.8731	1.3134	0.3636
Tensile Strength	Mean	-43.475	-47.880	-42.775	-45.080	-41.280	-34.700	-42.000	-47.555
	Pooled s	4.8482	3.6383	3.3260	4.9919	9.57229	2.4913		5.7268
	Mean /s	-0.3737	-1.4974	-0.1952	-0.7832	0.1862	1.8648	0.0026	-1.4144

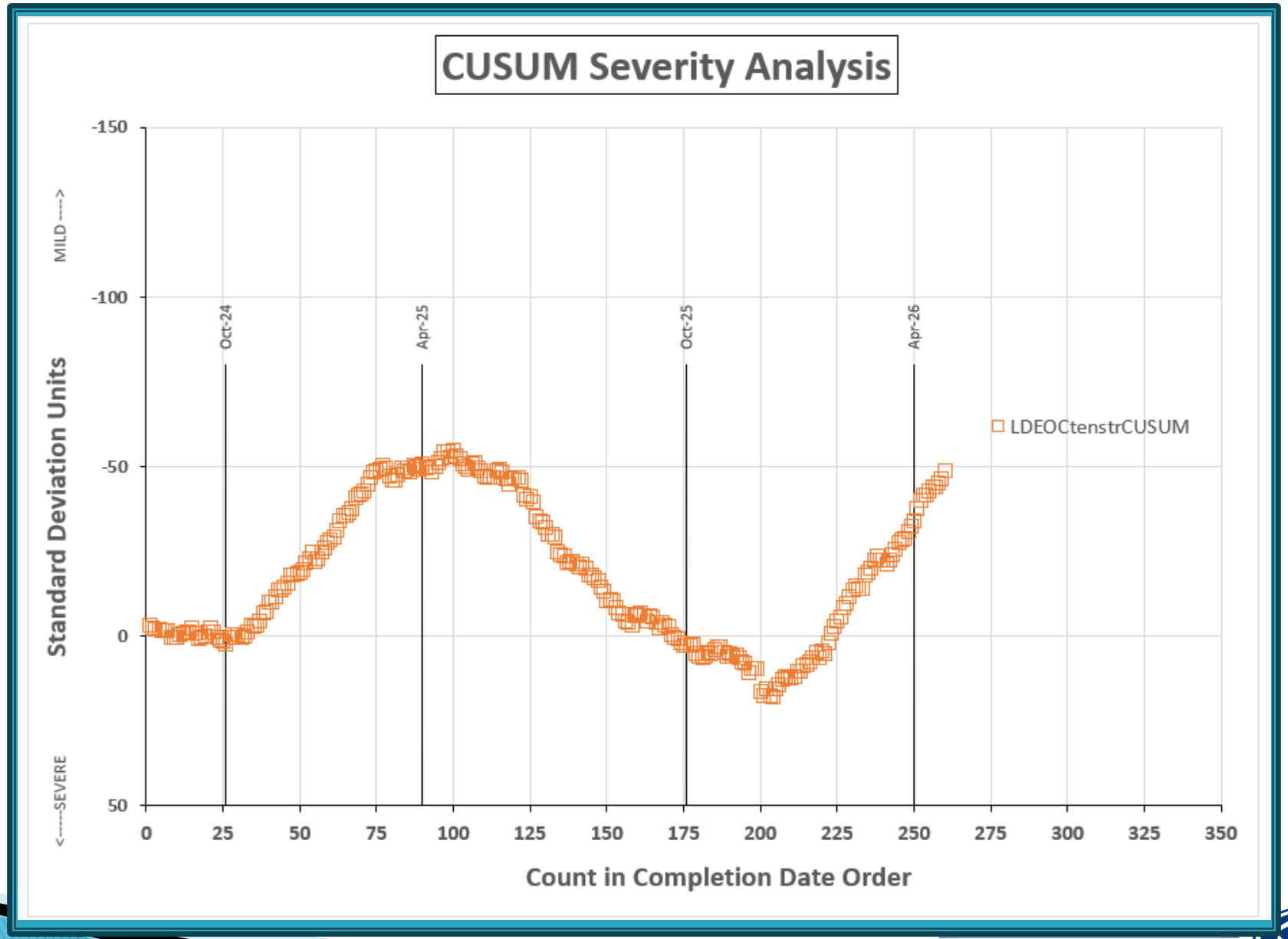
LDEOC – ETHYLENE ACRYLATE INDUSTRY OPERATIONALLY VALID DATA
ETHYLENE ACRYLATE-2 VOLUME CHANGE FINAL



LDEOC – ETHYLENE ACRYLATE INDUSTRY OPERATIONALLY VALID DATA
ETHYLENE ACRYLATE-2 HARDNESS CHANGE FINAL



LDEOC – ETHYLENE ACRYLATE INDUSTRY OPERATIONALLY VALID DATA
ETHYLENE ACRYLATE-2 TENSILE STRENGTH CHANGE FINAL

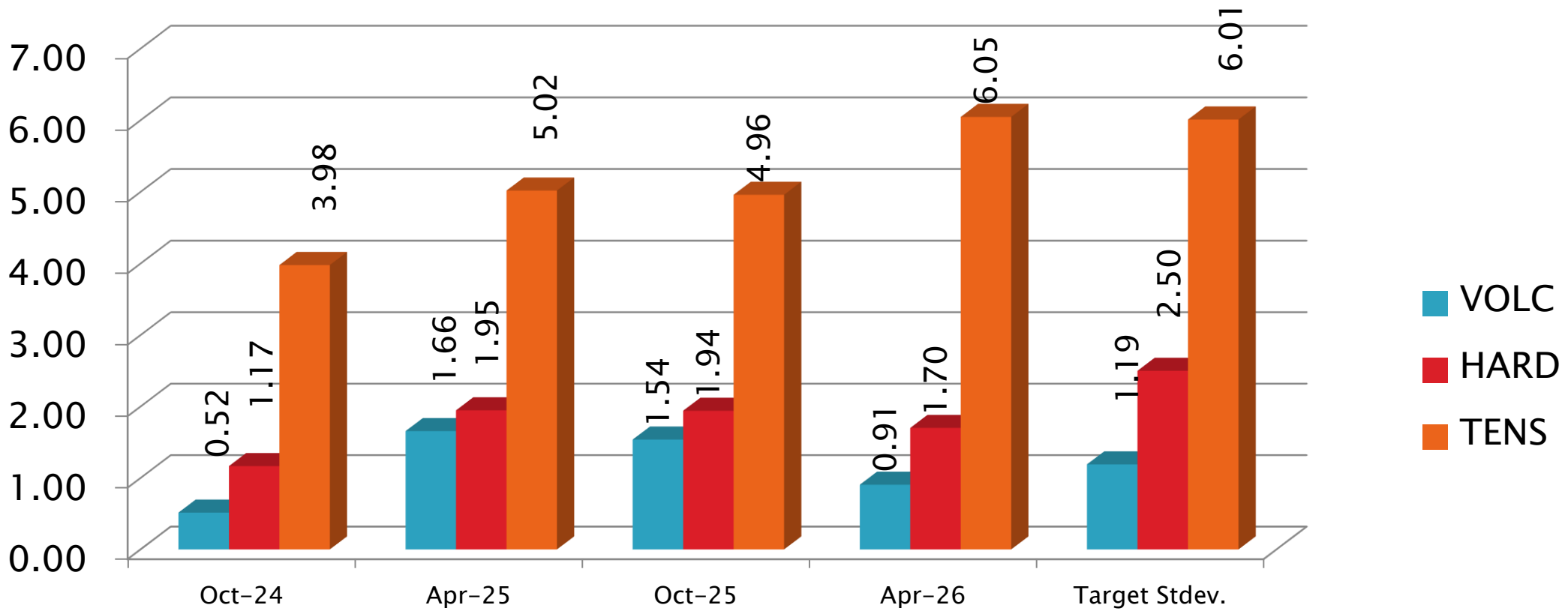


LDEOC Test Severity

Ethylene Acrylate (AEM3)

Parameter	Period Mean Δ/s	Status
Volume Change	-0.1352	Slightly Mild
Points Hardness Change	0.6538	Severe
Tensile Strength Change	-1.9115	Very Mild

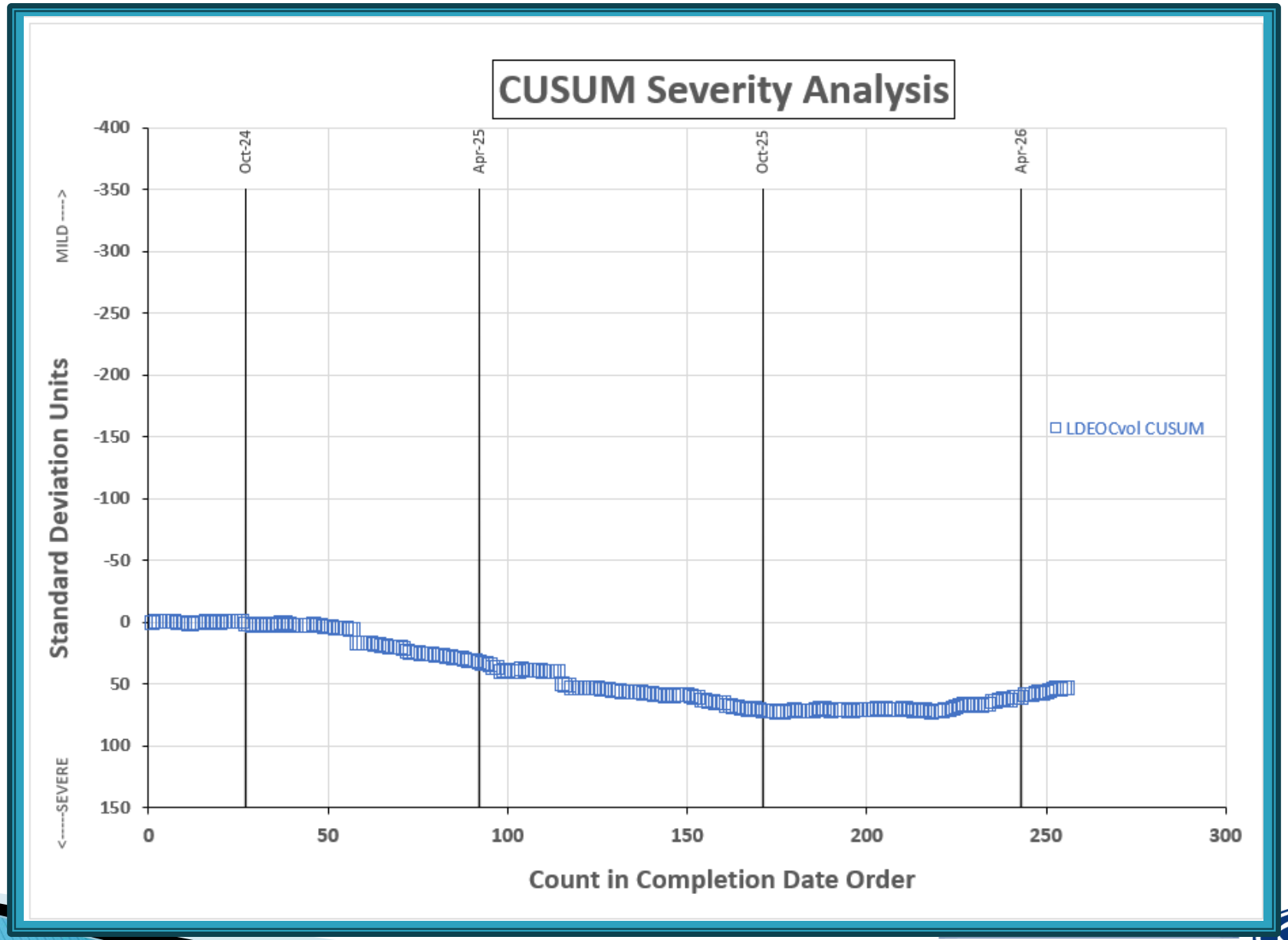
LDEOC Precision Estimates – Ethylene Acrylate 3



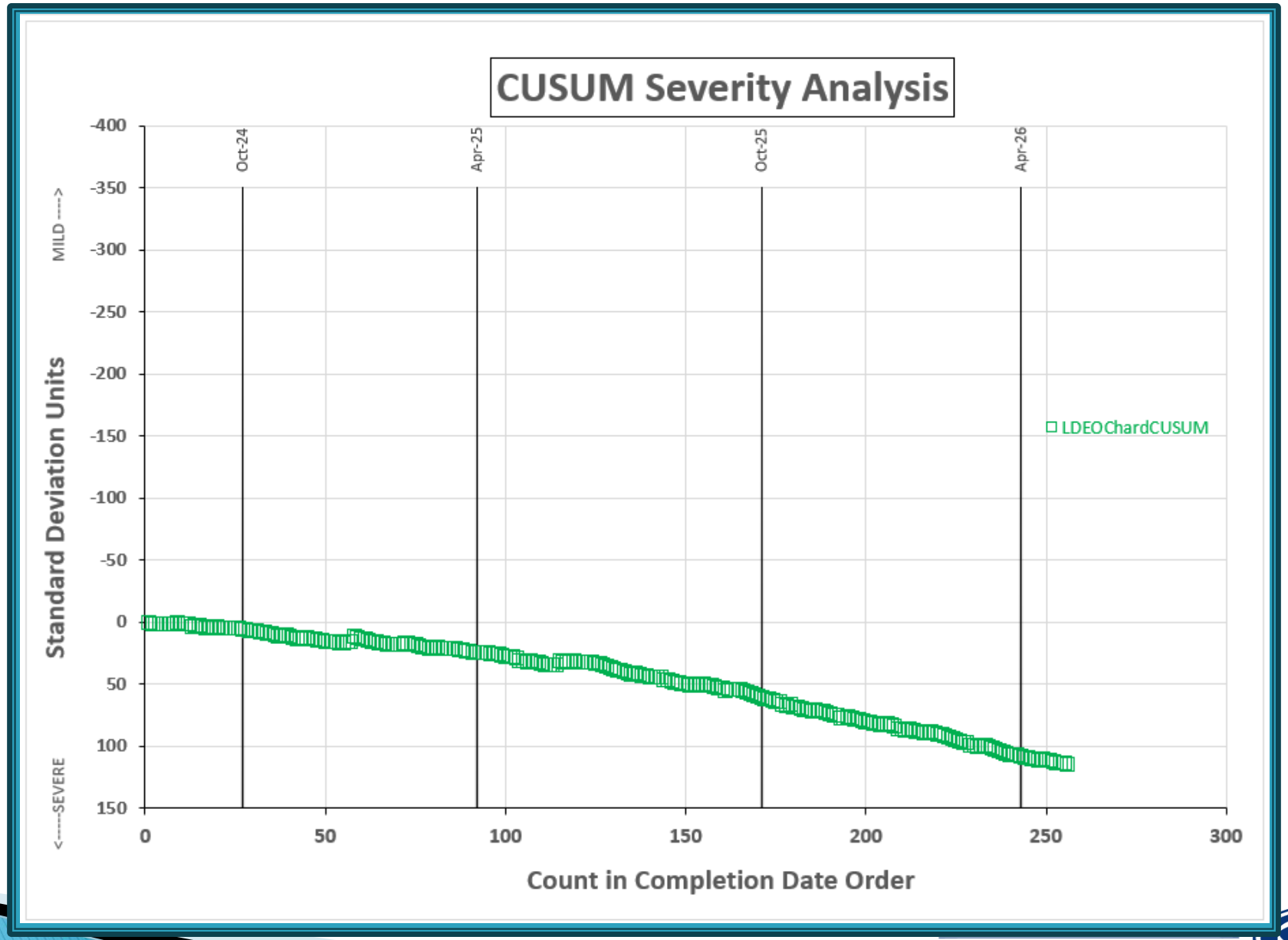
LDEOC Precision Estimates by Lab: AEM3

Test Parameter	Statistic	LTMS Lab							
		A	B	BB	G	I	L	P	V
	n=	26	6	3	15	9	3	1	9
Volume	Mean	7.9400	7.8017	9.3633	8.4873	8.8767	7.6300	7.7900	7.2622
	Pooled s	0.6532	0.4197	0.1447	1.1754	0.7160	0.1637		0.5477
	Mean /s	-0.2857	-0.4020	0.9104	0.1742	0.5014	-0.5462	-0.4117	-0.8553
Hardness	Mean	0.7308	2.0000	-3.6667	1.4000	2.5556	2.0000	2.0000	1.5556
	Pooled s	1.0792	0.8944	1.1547	1.8048	1.3333	1.0000		0.8819
	Mean /s	0.4683	0.9760	-1.2907	0.7360	1.1982	0.9760	0.9760	0.7982
Tensile Strength	Mean	-48.369	-53.267	-49.833	-52.473	-48.033	-42.900	-52.600	-49.778
	Pooled s	7.0235	4.1548	1.2503	3.1664	6.5692	5.5245		6.2898
	Mean /s	-1.6970	-2.5119	-1.9407	-2.3799	-1.6412	-0.7870	-2.4010	-1.9314

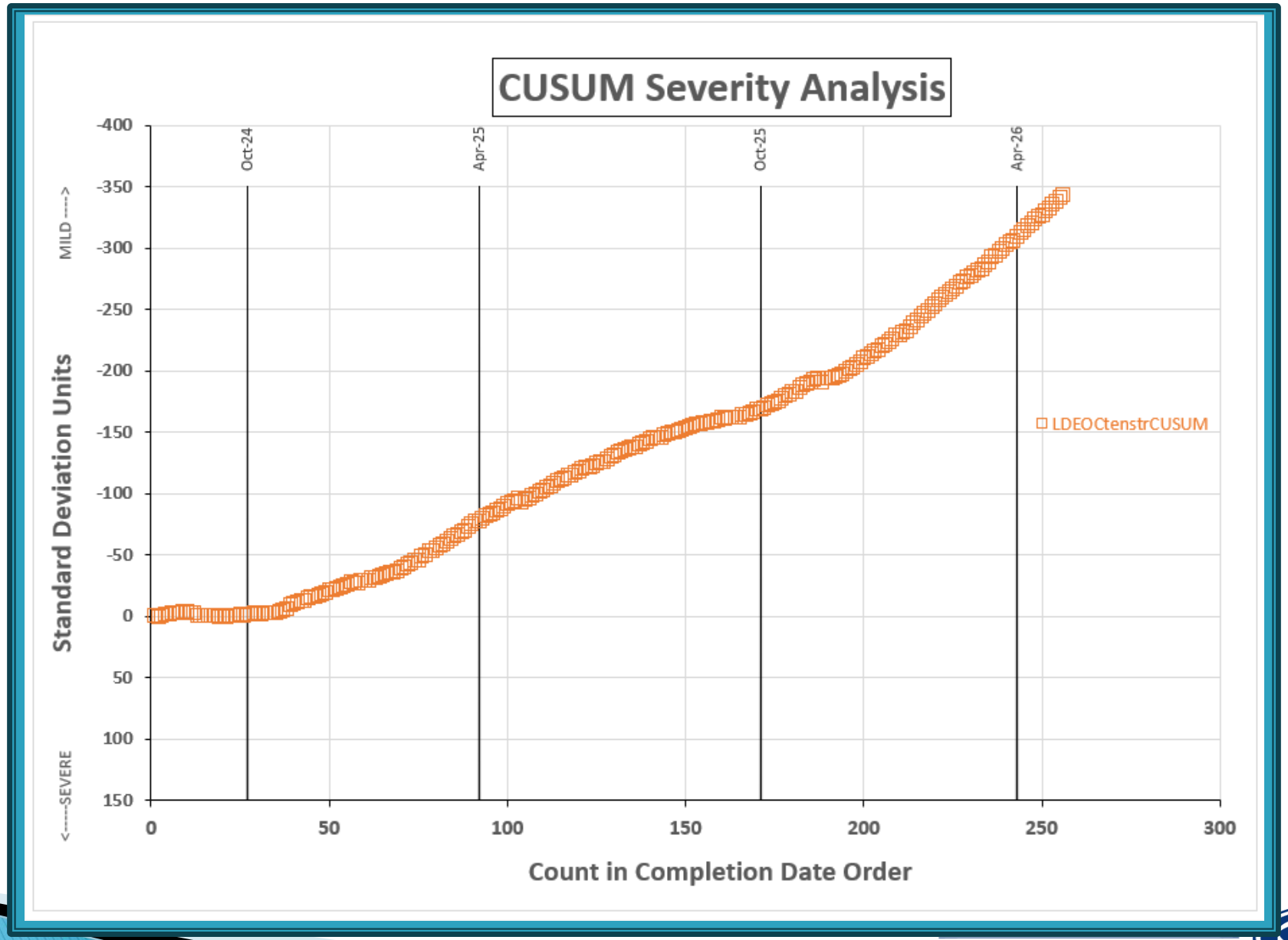
LDEOC – ETHYLENE ACRYLATE INDUSTRY OPERATIONALLY VALID DATA
ETHYLENE ACRYLATE-3 VOLUME CHANGE FINAL



LDEOC – ETHYLENE ACRYLATE INDUSTRY OPERATIONALLY VALID DATA
ETHYLENE ACRYLATE-3 HARDNESS CHANGE FINAL



LDEOC – ETHYLENE ACRYLATE INDUSTRY OPERATIONALLY VALID DATA
ETHYLENE ACRYLATE-3 TENSILE STRENGTH CHANGE FINAL

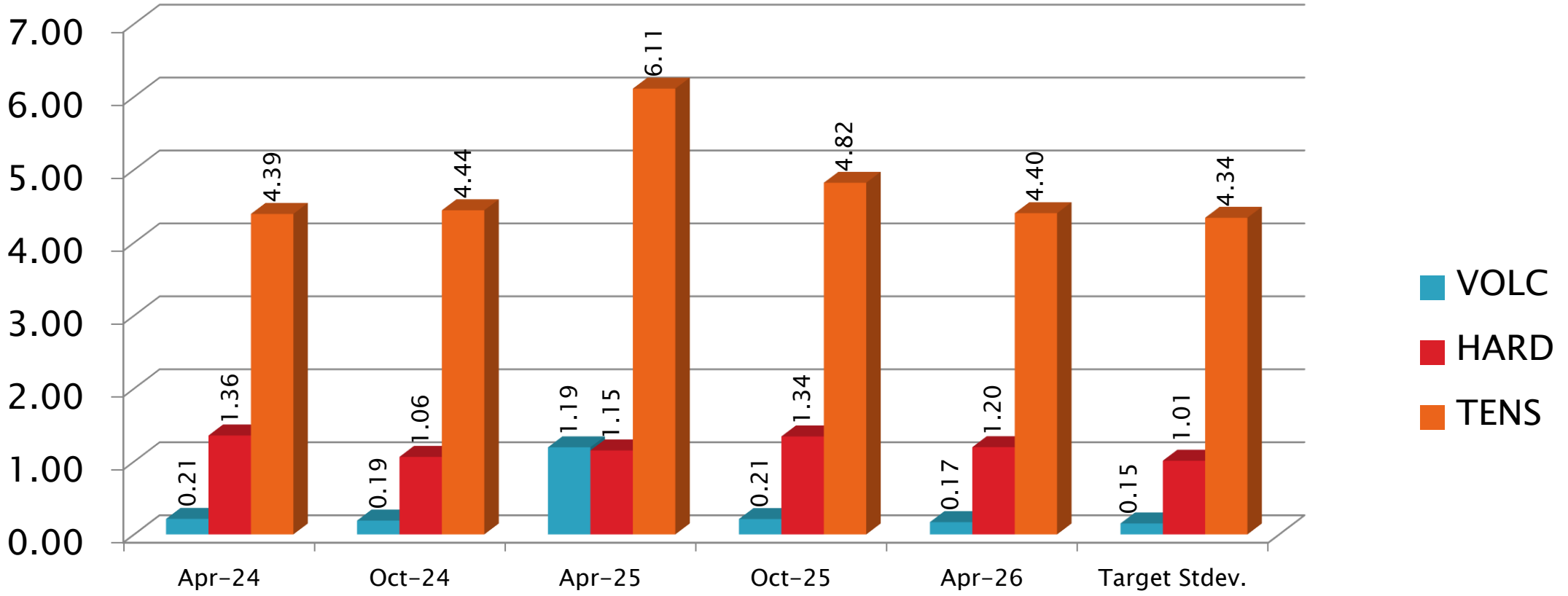


LDEOC Test Severity

Fluoroelastomer (FKM1)

Parameter	Period Mean Δ/s	Status
Volume Change	-0.4207	Mild
Points Hardness Change	0.4228	Severe
Tensile Strength Change	-0.1183	Slightly Mild

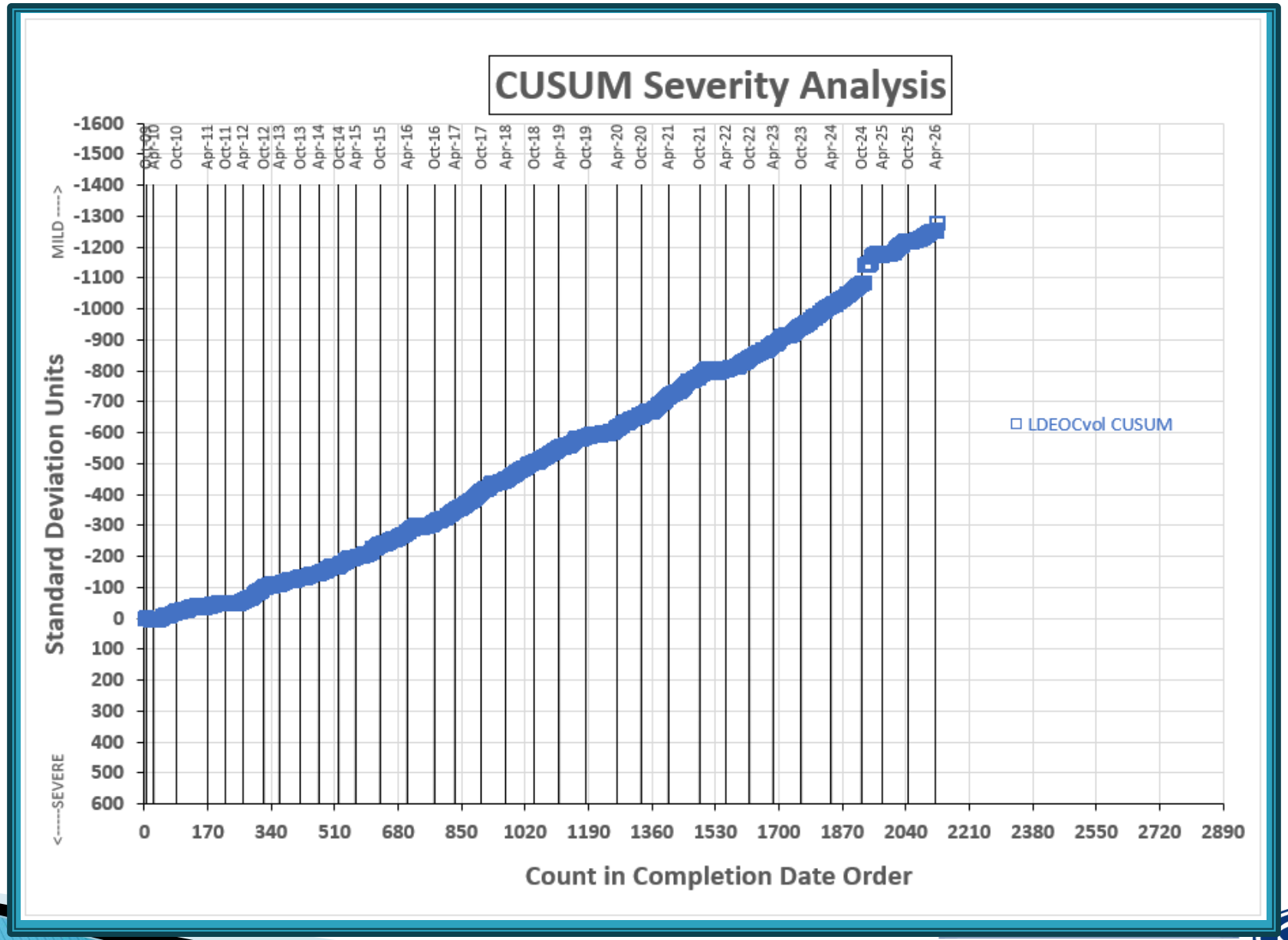
LDEOC Precision Estimates – Fluoroelastomer



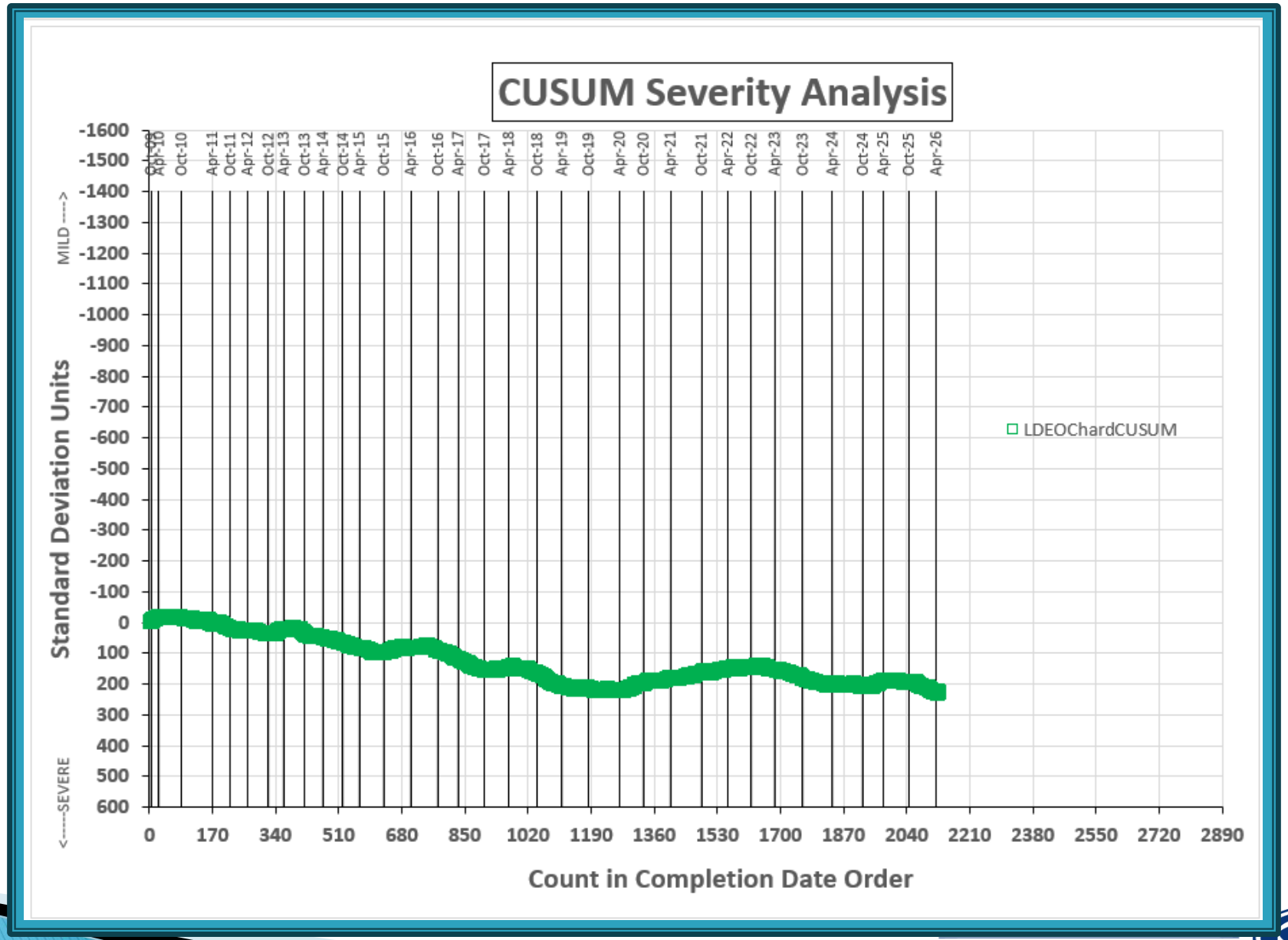
LDEOC Precision Estimates by Lab: FKM1

Test Parameter	Statistic	LTMS Lab*								
		A	B	BB	G	I	K	L	P	V
	n=	23	6	4	17	8	1	5	2	8
Volume	Mean	0.6113	0.4950	0.6675	0.6241	0.7462	0.63	0.5240	0.6250	0.6038
	Pooled s	0.0949	0.0745	0.0221	0.2003	0.2965		0.0991	0.3465	0.1417
	Mean /s	-0.4580	-1.2333	-0.0167	-0.3725	0.4417	-0.33	-1.0400	-0.3667	-0.5083
Hardness	Mean	4.6956	3.6667	3.0000	4.2353	4.2500	4.00	4.6000	5.0000	6.2500
	Pooled s	0.8221	1.3663	1.1547	1.1472	0.8864		0.8944	1.4142	0.7071
	Mean /s	0.5898	-0.4290	-1.0891	0.1340	0.1485	-0.10	0.4950	0.8911	2.1287
Tensile Strength	Mean	-57.635	-58.017	-58.450	-58.576	-51.900	-61.4	-58.760	-54.600	-62.838
	Pooled s	2.2701	1.9549	2.353	6.5399	1.8693		1.3278	1.4142	1.5464
	Mean /s	-0.0541	-0.1421	-0.2419	-0.2711	1.2673	-0.92	-0.3134	0.6452	-1.2529

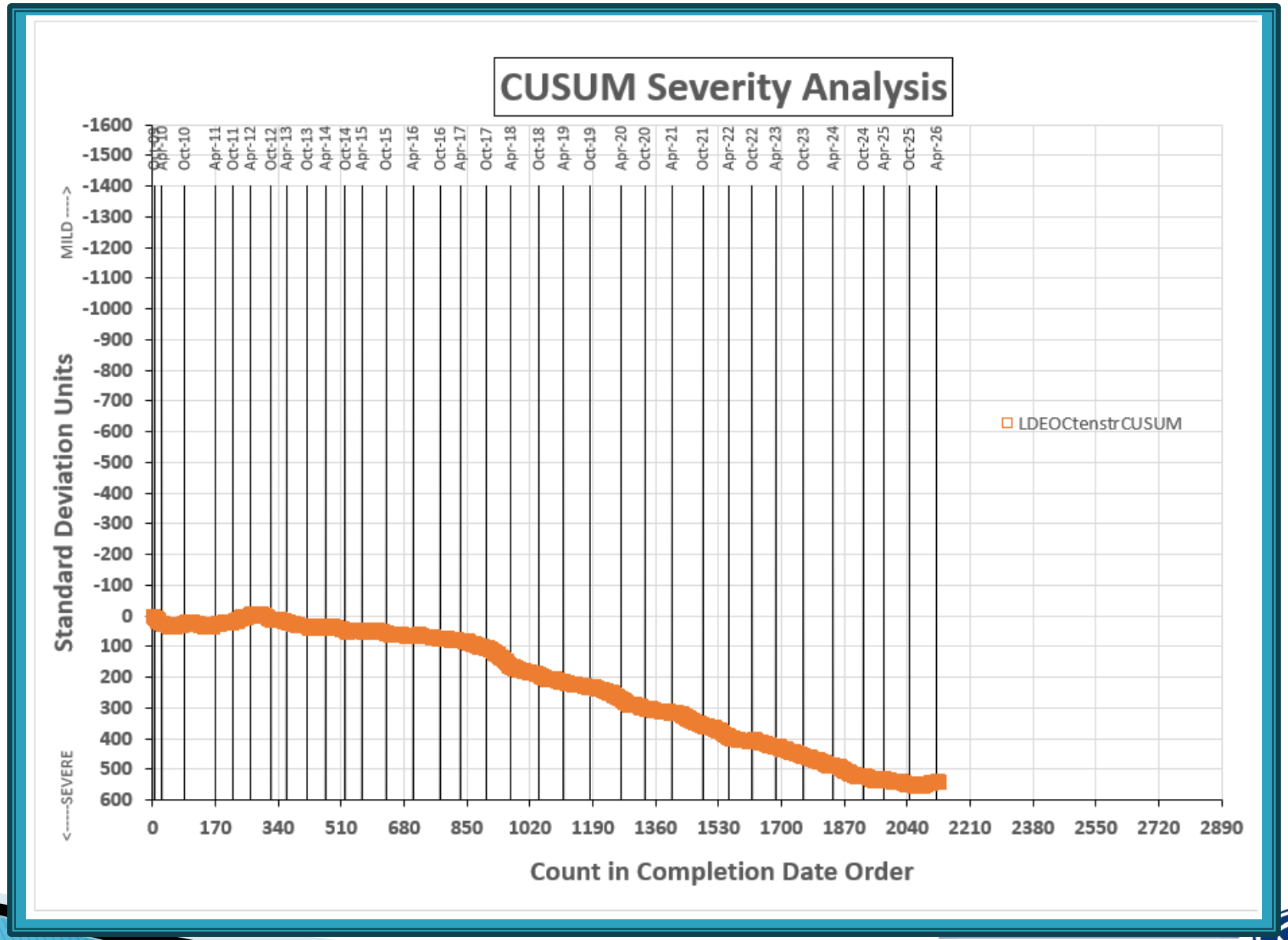
LDEOC – ETHYLENE ACRYLATE INDUSTRY OPERATIONALLY VALID DATA
FLUOROELASTOMER VOLUME CHANGE FINAL



LDEOC – ETHYLENE ACRYLATE INDUSTRY OPERATIONALLY VALID DATA
FLUOROELASTOMER HARDNESS CHANGE FINAL



LDEOC – ETHYLENE ACRYLATE INDUSTRY OPERATIONALLY VALID DATA
FLUOROELASTOMER TENSILE STRENGTH CHANGE FINAL

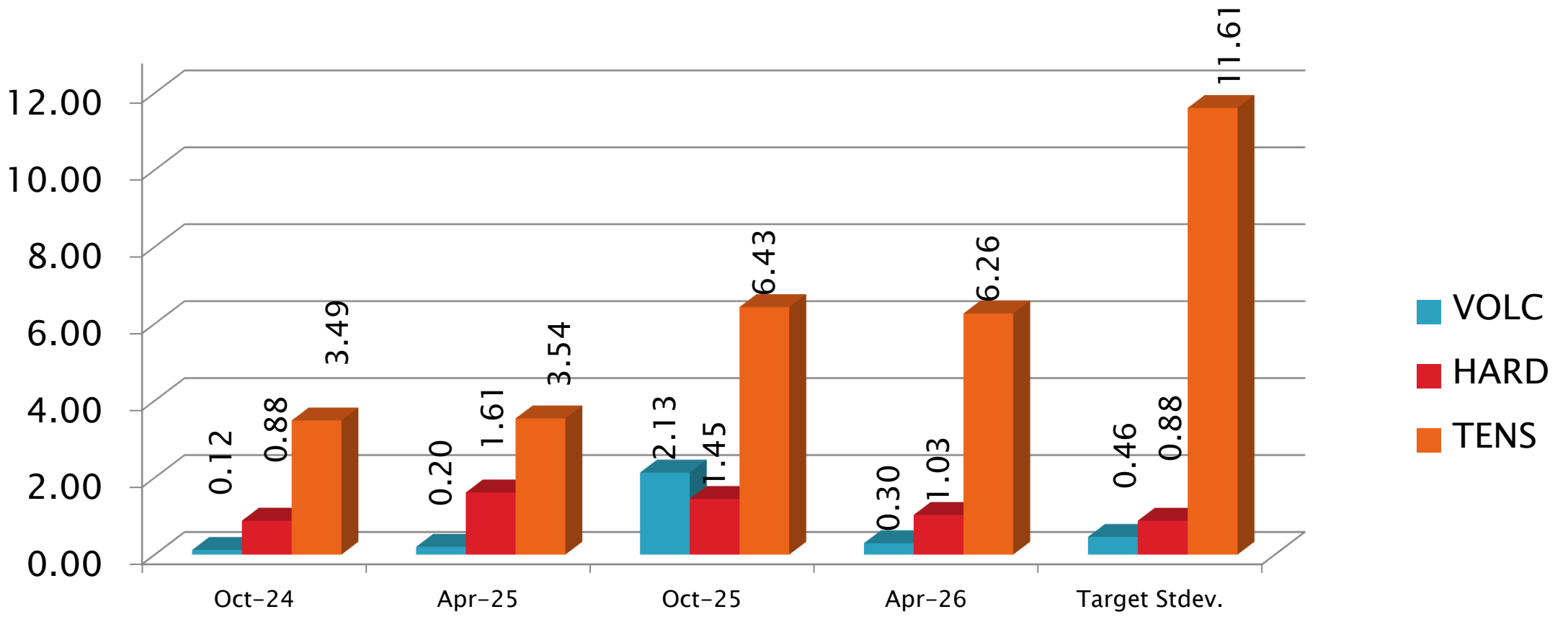


LDEOC Test Severity

Fluoroelastomer (FKM3)

Parameter	Period Mean Δ/s	Status
Volume Change	0.1579	Slightly Severe
Points Hardness Change	0.3008	Severe
Tensile Strength Change	-0.5033	Mild

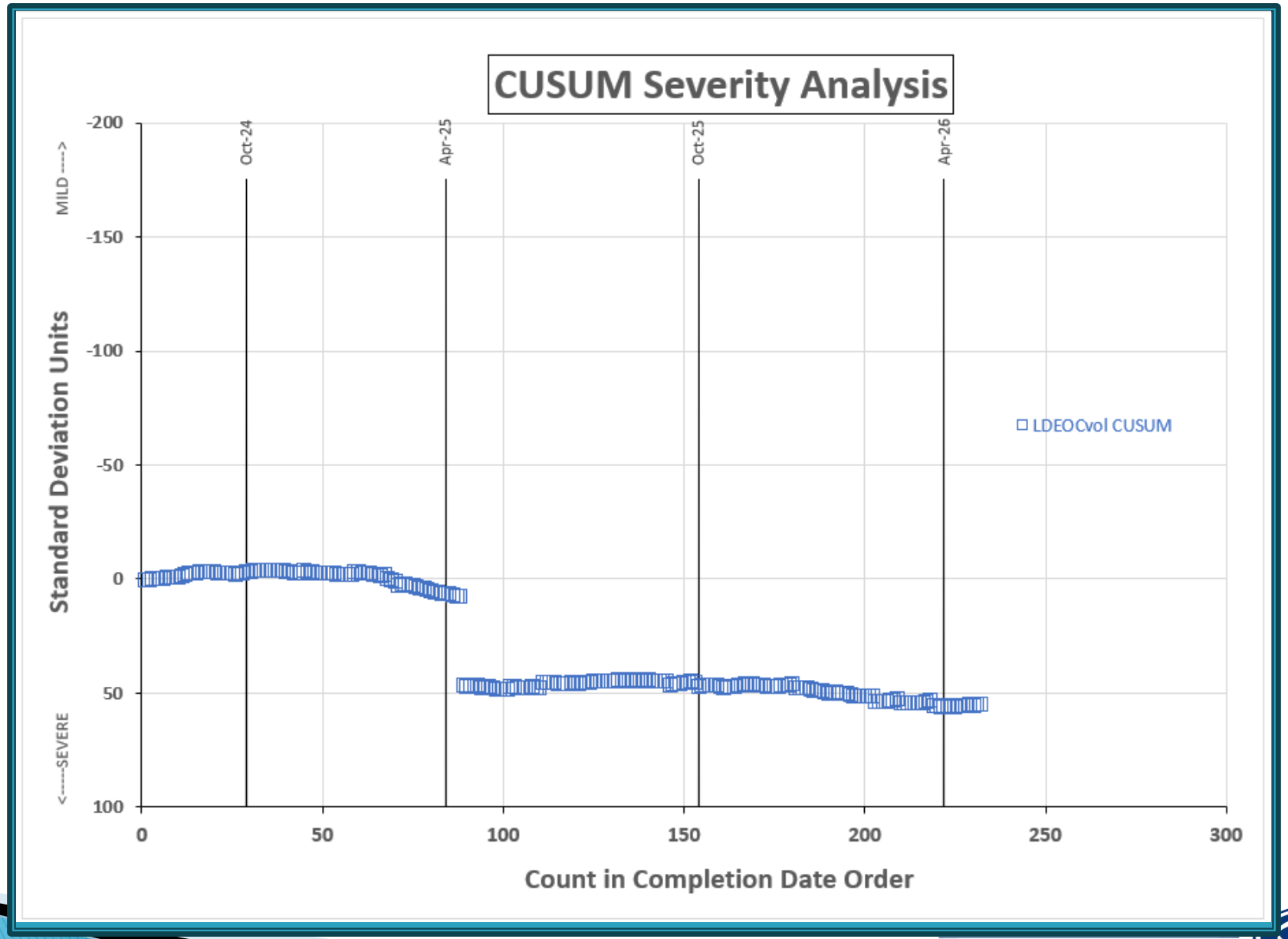
LDEOC Precision Estimates – Fluoroelastomer3



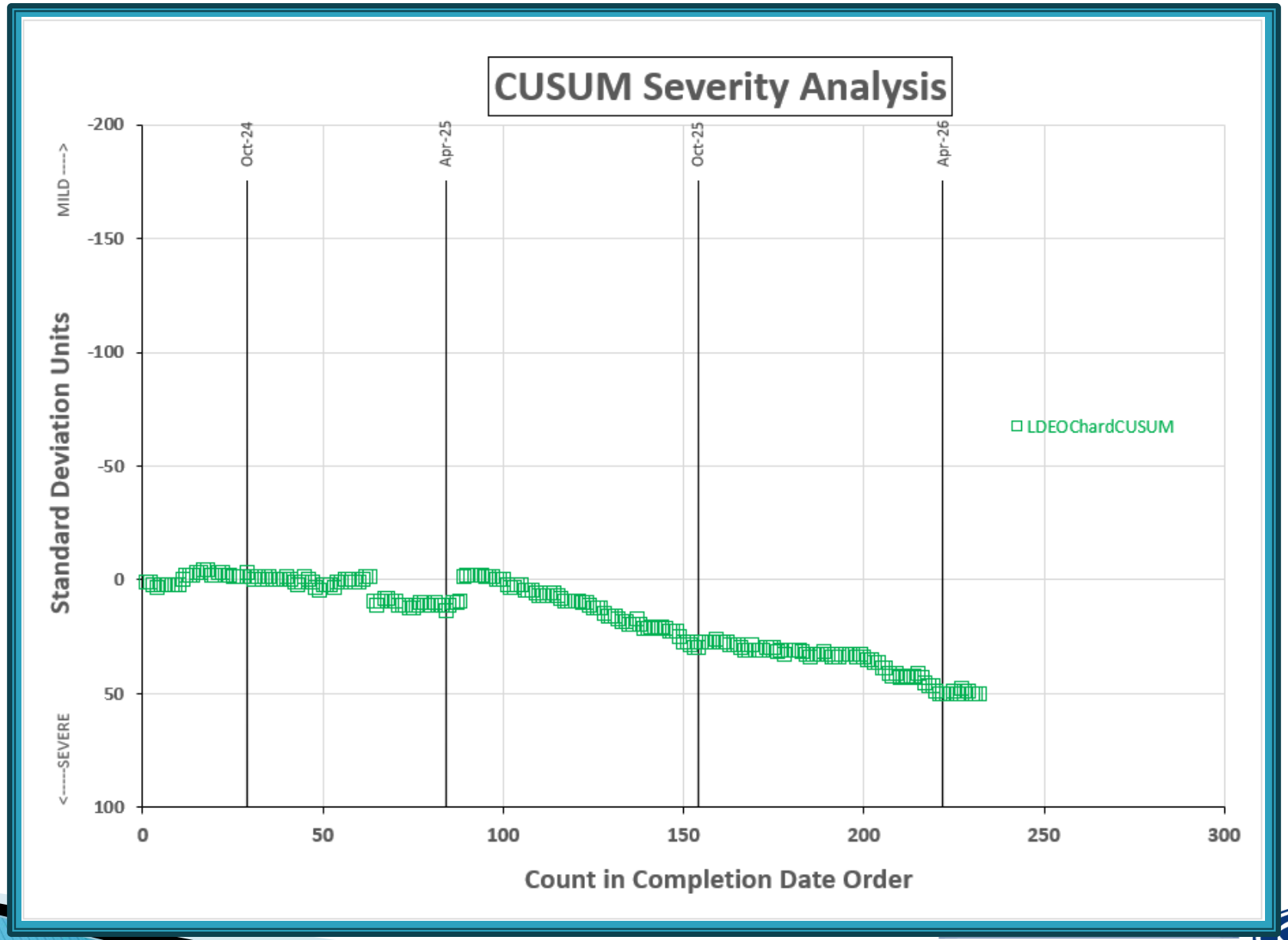
LDEOC Precision Estimates by Lab: FKM3

Test Parameter	Statistic	LTMS Lab*							
		A	B	BB	G	I	L	P	V
	n=	21	4	3	14	10	4	2	10
Volume	Mean	0.7995	1.0275	1.0700	0.7707	0.9310	0.6525	0.6400	0.7840
	Pooled s	0.1597	0.5916	0.4215	0.3307	0.4007	0.0789	0.0000	0.1944
	Mean /s	0.1077	0.6033	0.6957	0.0450	0.3935	-0.2120	-0.2391	0.0739
Hardness	Mean	4.4286	4.7500	3.3333	3.3571	4.5000	3.2500	5.0000	5.3000
	Pooled s	0.7464	0.5000	0.5774	0.8419	1.1785	0.5000	0.0000	0.6749
	Mean /s	0.4870	0.8523	-0.7576	-0.7305	0.5682	-0.8523	1.1364	1.4773
Tensile Strength	Mean	-58.243	-56.475	-61.700	-51.443	-52.170	-58.700	-51.750	-60.960
	Pooled s	3.2631	5.7956	1.9157	9.9208	1.3124	0.5477	2.7577	2.4954
	Mean /s	-0.6764	-0.5241	-0.9742	-0.0907	-0.1533	-0.7158	-0.1171	-0.9104

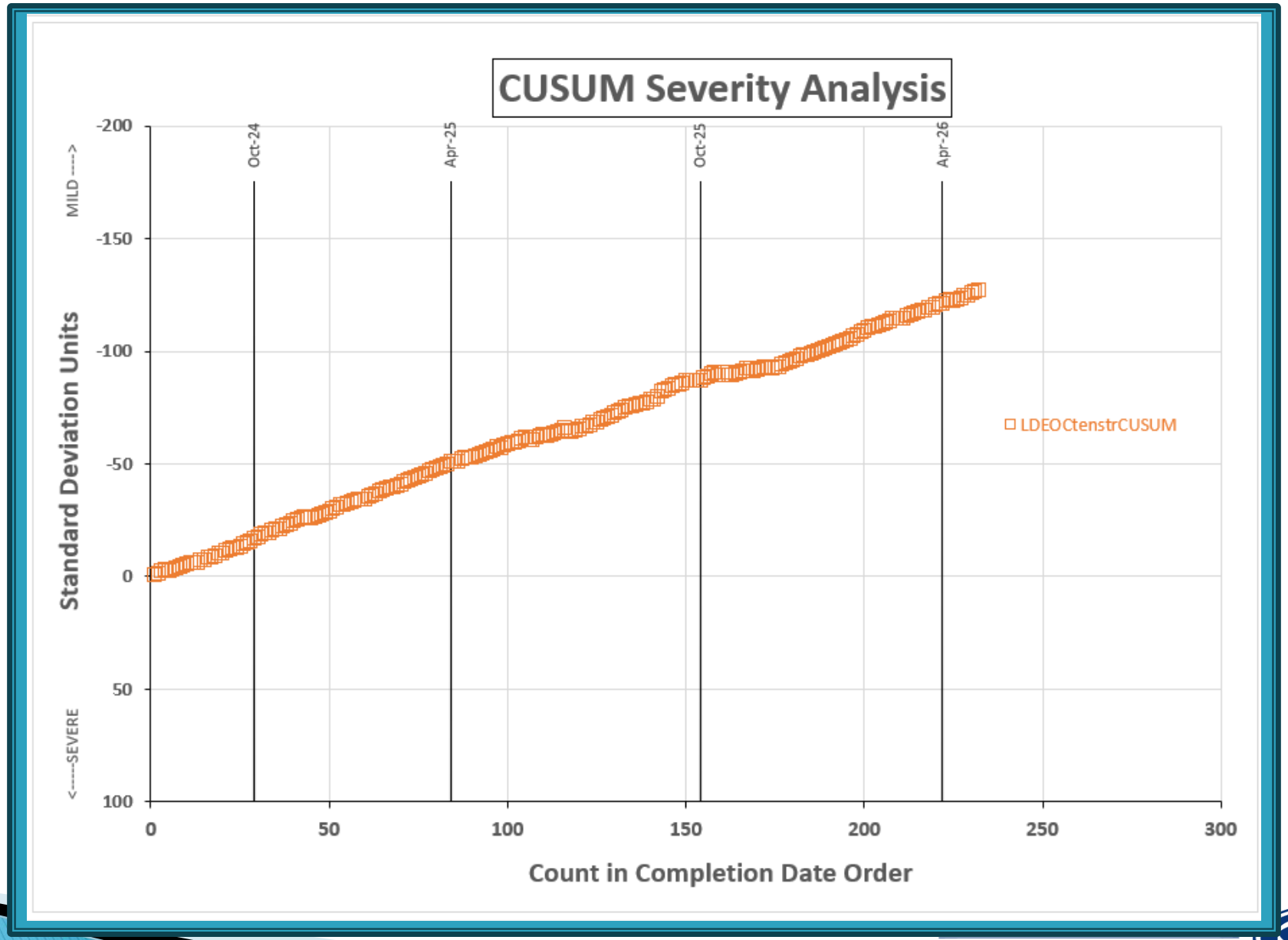
LDEOC – ETHYLENE ACRYLATE INDUSTRY OPERATIONALLY VALID DATA
FLUOROELASTOMER-3 VOLUME CHANGE FINAL



LDEOC – ETHYLENE ACRYLATE INDUSTRY OPERATIONALLY VALID DATA
FLUOROELASTOMER-3 HARDNESS CHANGE FINAL



LDEOC – ETHYLENE ACRYLATE INDUSTRY OPERATIONALLY VALID DATA
FLUOROELASTOMER-3 TENSILE STRENGTH CHANGE FINAL

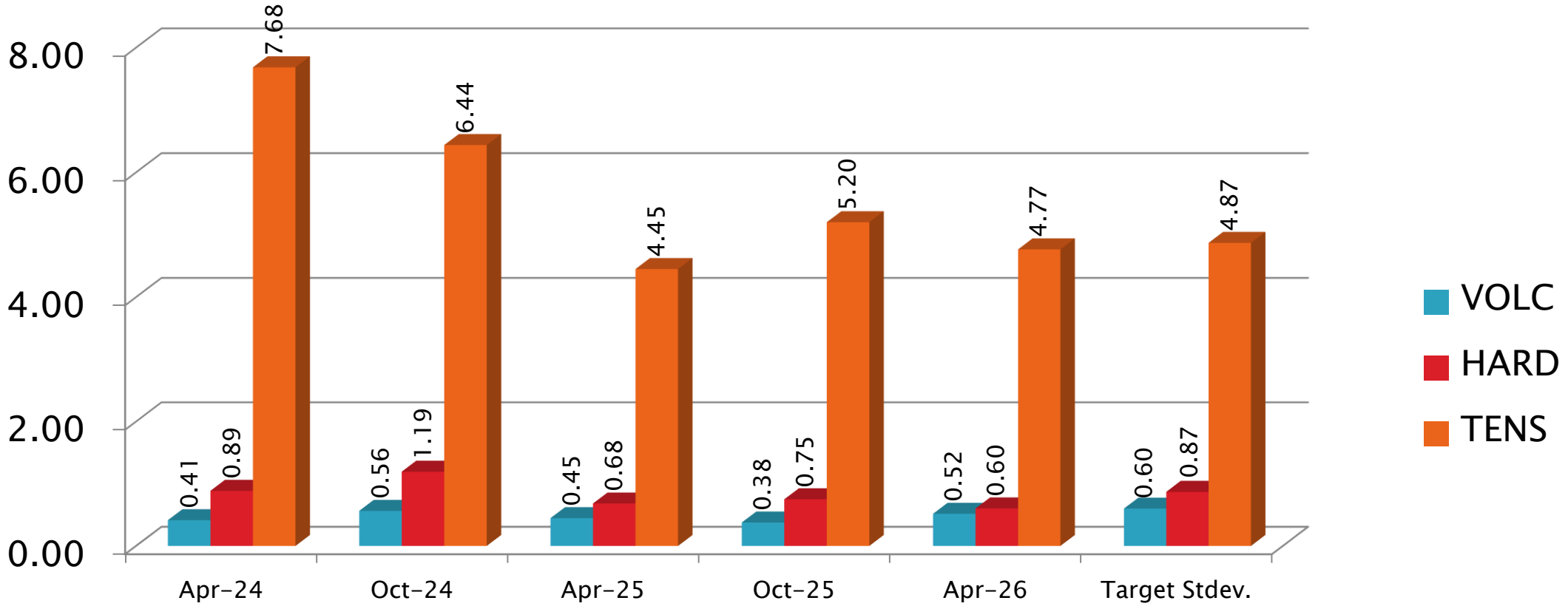


LDEOC Test Severity

Nitrile (NBR1)

Parameter	Period Mean Δ/s	Status
Volume Change	1.6657	Very Severe
Points Hardness Change	-0.4594	Mild
Tensile Strength Change	-0.9363	Very Mild

LDEOC Precision Estimates – Nitrile

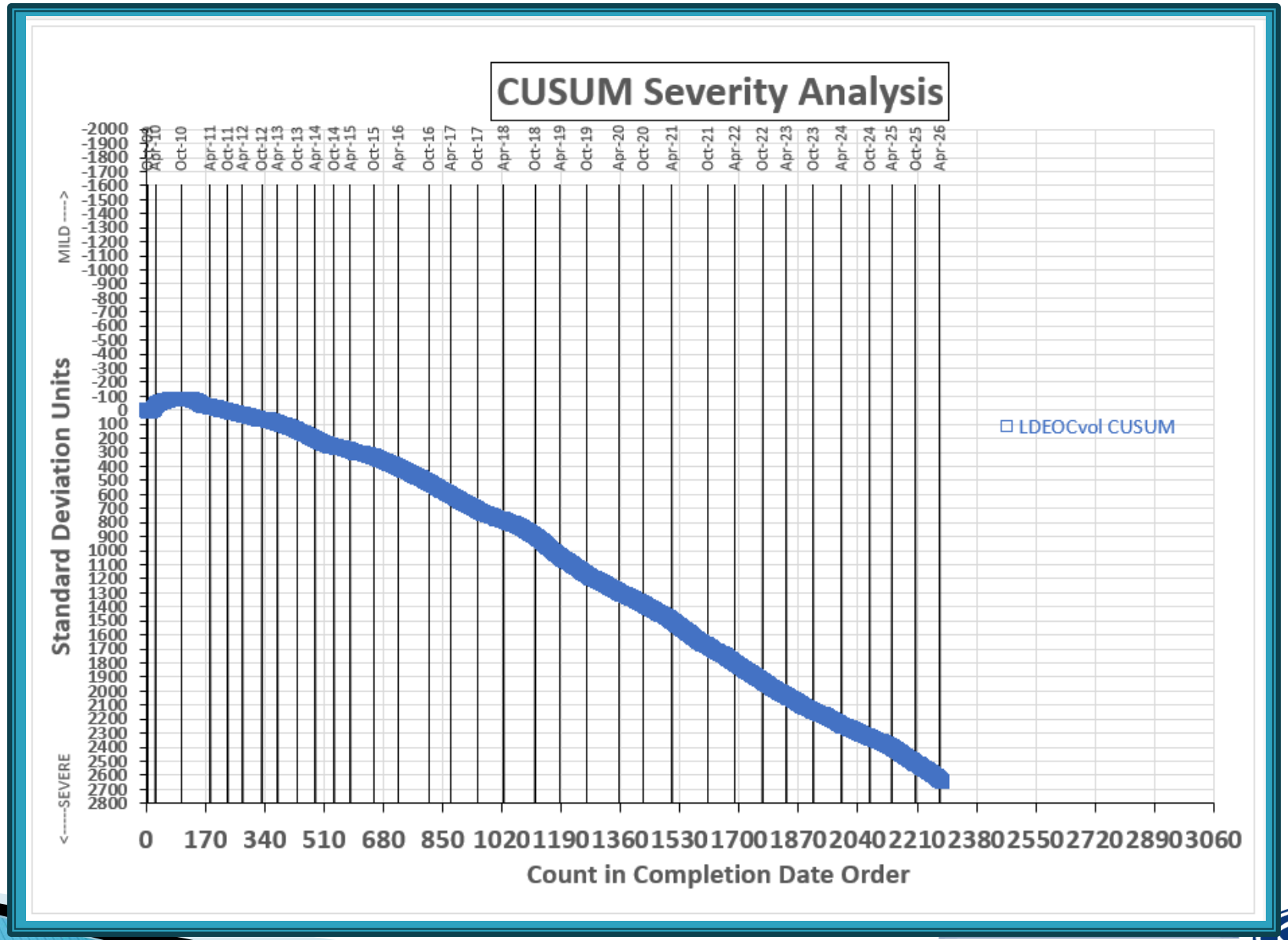


LDEOC Precision Estimates by Lab: NBR1

Test Parameter	Statistic	LTMS Lab								
		A	B	BB	G	I	K	L	P	V
	n=	22	6	4	14	10	1	4	1	7
Volume	Mean	1.4841	1.3983	1.0900	1.1936	1.0840	1.8100	1.0175	1.1100	1.5857
	Pooled s	0.1869	0.0870	0.2736	0.7959	0.8198		0.1502		0.1128
	Mean /s	1.9402	1.7972	1.2833	1.4559	1.2733	2.4833	1.1625	1.3167	2.1095
Hardness	Mean	-1.5909	-1.3333	-1.5000	-1.6429	-1.8000	0.0000	-2.0000	-1.0000	-1.4286
	Pooled s	0.5903	0.8165	0.5774	0.4972	0.4216		0.8165		0.5345
	Mean /s	-0.4723	-0.1762	-0.3678	-0.5320	-0.7126	1.3563	-0.9425	0.2069	-0.2857
Tensile Strength	Mean	2.4500	2.5500	1.2000	-1.2714	2.2900	-1.3000	3.4000	-0.6000	0.9286
	Pooled s	3.8556	2.2242	2.2906	6.9544	2.5774		3.8401		6.9498
	Mean /s	-0.7228	-0.7023	-0.9795	-1.4869	-0.7556	-1.4928	-0.5277	-1.3491	-1.0352

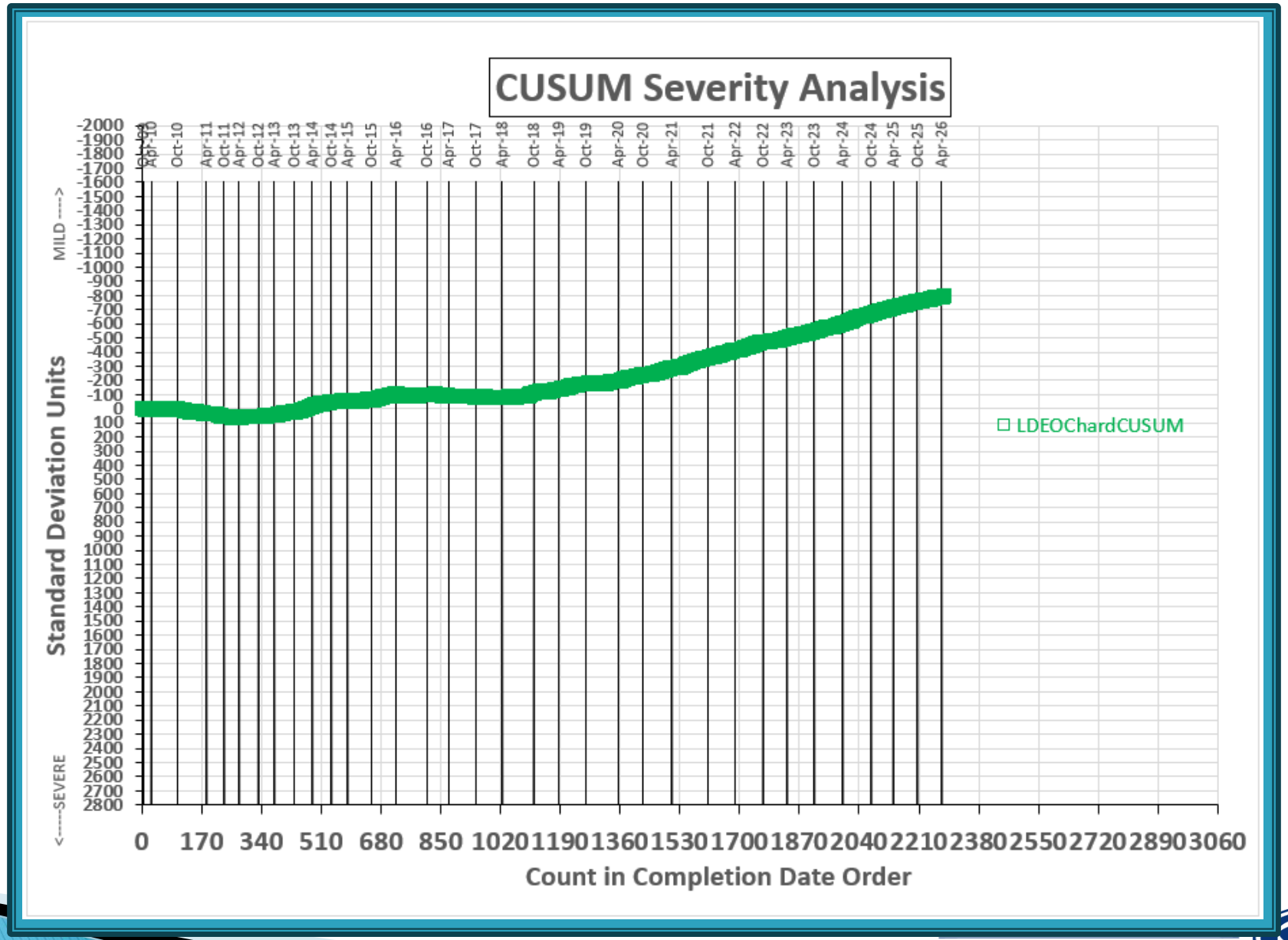
LDEOC — NITRILE INDUSTRY OPERATIONALLY VALID DATA

REFERENCE NITRILE VOLUME CHANGE FINAL



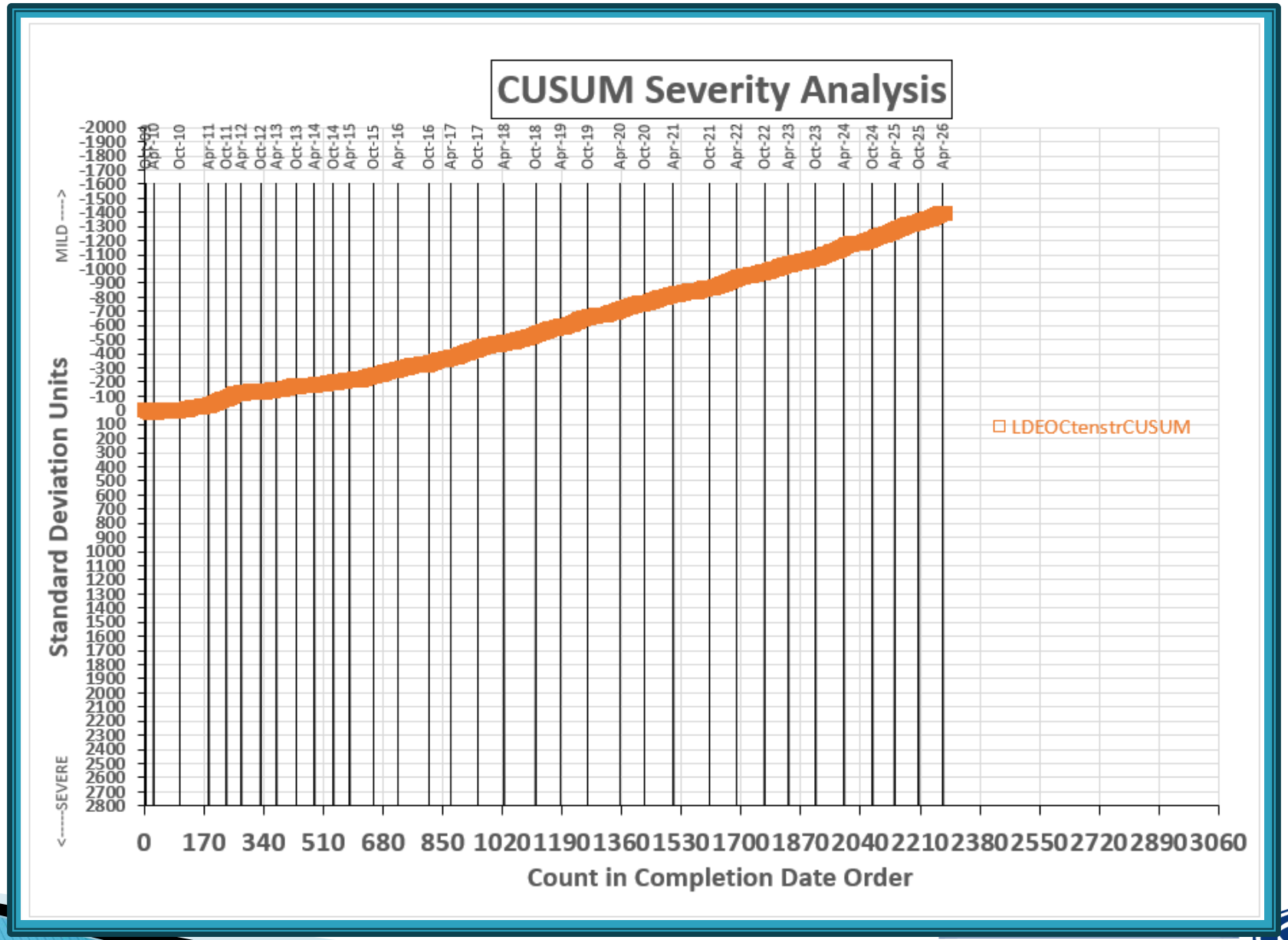
LDEOC —NITRILE INDUSTRY OPERATIONALLY VALID DATA

REF NITRILE POINTS HARDNESS CHANGE AVERAGE



LDEOC —NITRILE INDUSTRY OPERATIONALLY VALID DATA

REF NITRILE TENSILE STRENGTH CHANGE FINAL

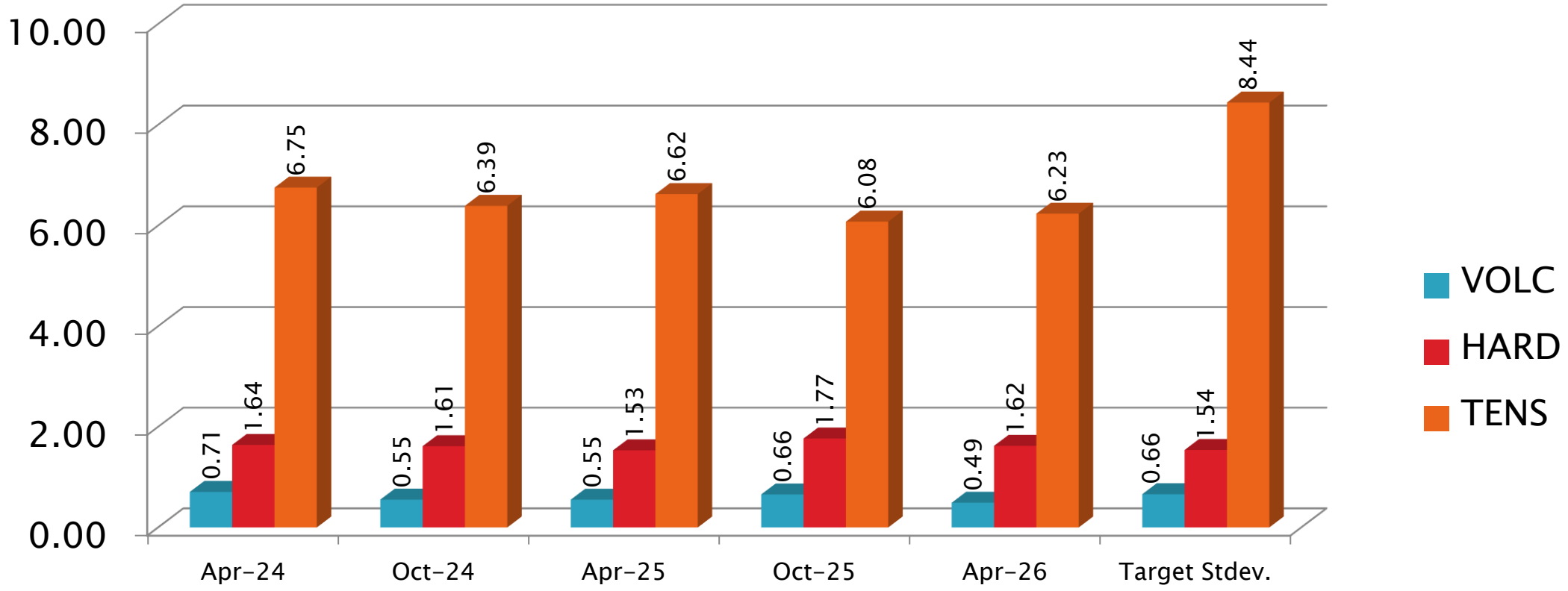


LDEOC Test Severity

Polyacrylate (ACM1)

Parameter	Period Mean Δ/s	Status
Volume Change	-0.2324	Mild
Points Hardness Change	-1.1623	Very Mild
Tensile Strength Change	-0.7095	Mild

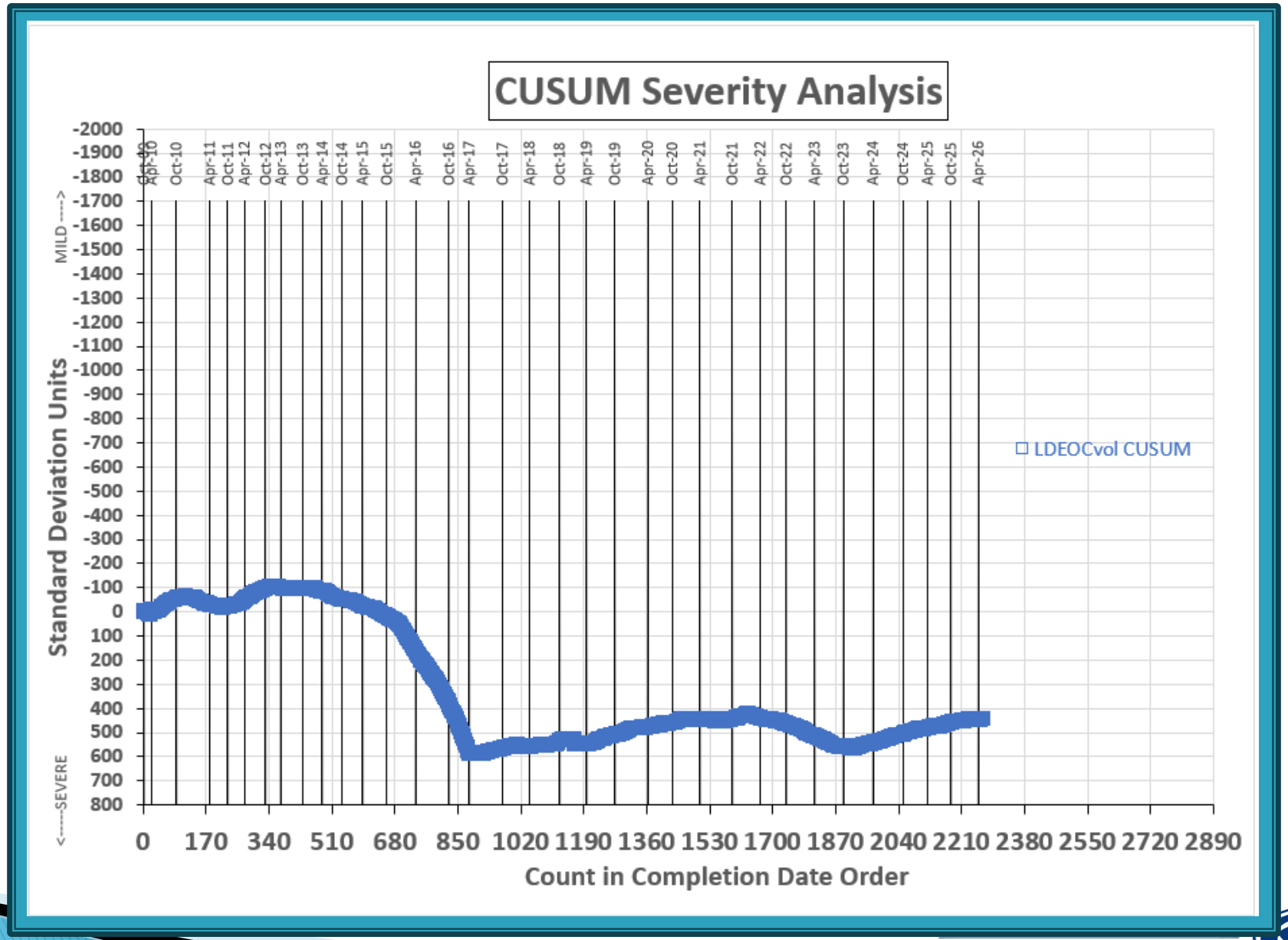
LDEOC Precision Estimates – Polyacrylate



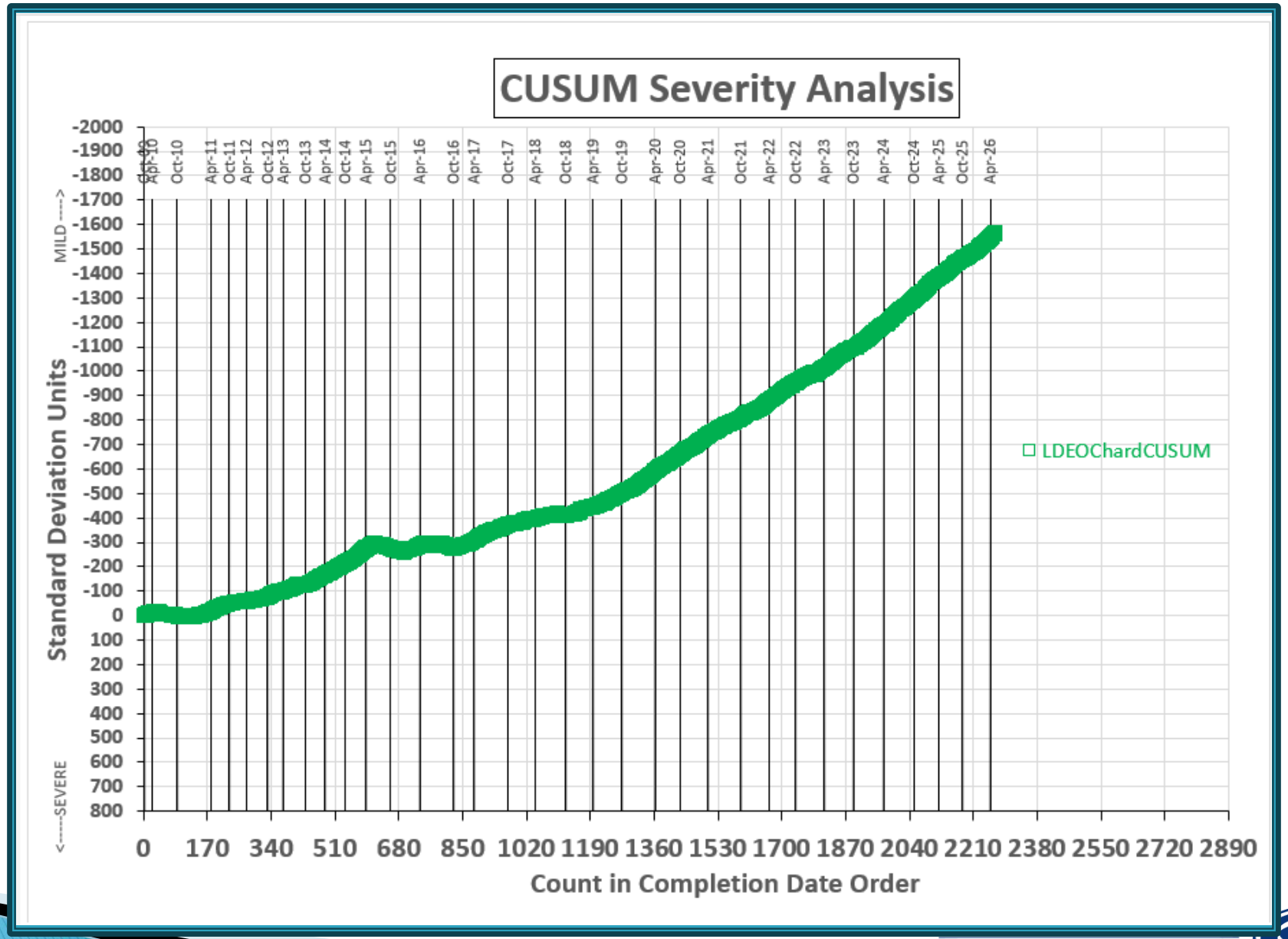
LDEOC Precision Estimates by Lab: ACM1

Test Parameter	Statistic	LTMS Lab							
		A	B	BB	G	I	L	P	V
	n=	24	6	4	18	9	4	1	8
Volume	Mean	1.9342	2.0517	1.3850	1.9622	2.1678	1.6375	2.40	1.5375
	Pooled s	0.3214	0.1419	0.5839	0.4060	0.8728	0.3479		0.4341
	Mean /s	-0.1755	0.0025	-1.0076	-0.1330	0.1785	-0.6250	0.53	-0.7765
Hardness	Mean	-2.6667	-1.8333	-3.0000	-0.8333	-1.3333	-1.0000	-2.00	-3.5000
	Pooled s	0.7020	1.3292	0.8165	2.3073	1.2247	0.0000		0.5345
	Mean /s	-1.5952	-1.0541	-1.8117	-0.4048	-0.7294	-0.5130	-1.16	-2.1364
Tensile Strength	Mean	-1.8958	-4.4333	-6.0250	-6.3833	-4.7667	1.1250	-0.50	-0.2750
	Pooled s	4.1407	4.0800	6.2473	9.0515	4.2471	4.1572		5.6124
	Mean /s	-0.5303	-0.8310	-1.0195	-1.0620	-0.8705	-0.1724	-0.36	-0.3383

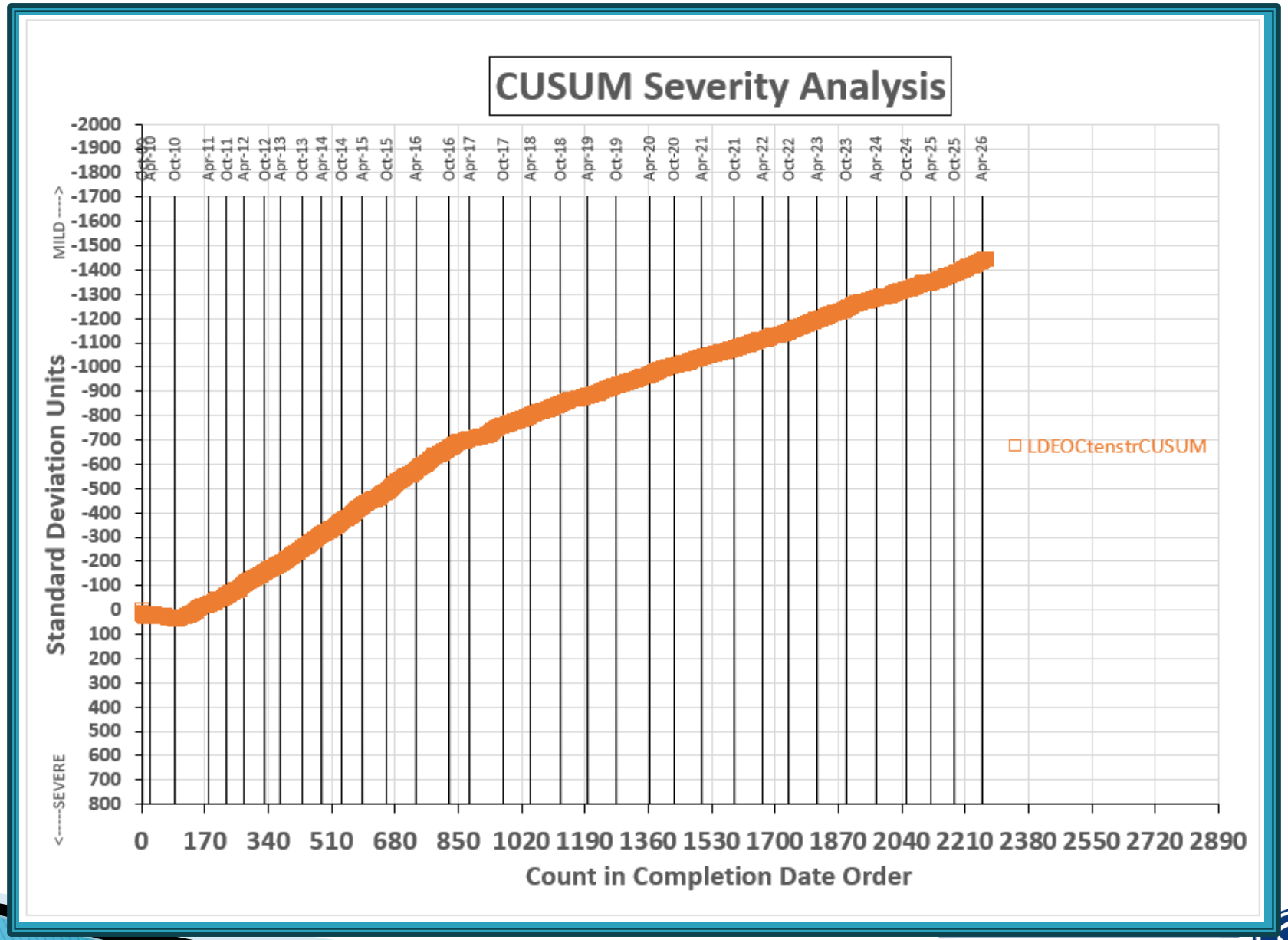
LDEOC – ETHYLENE ACRYLATE INDUSTRY OPERATIONALLY VALID DATA
POLYACRYLATE VOLUME CHANGE FINAL



LDEOC – ETHYLENE ACRYLATE INDUSTRY OPERATIONALLY VALID DATA
POLYACRYLATE HARDNESS CHANGE FINAL



LDEOC – ETHYLENE ACRYLATE INDUSTRY OPERATIONALLY VALID DATA
POLYACRYLATE TENSILE STRENGTH CHANGE FINAL

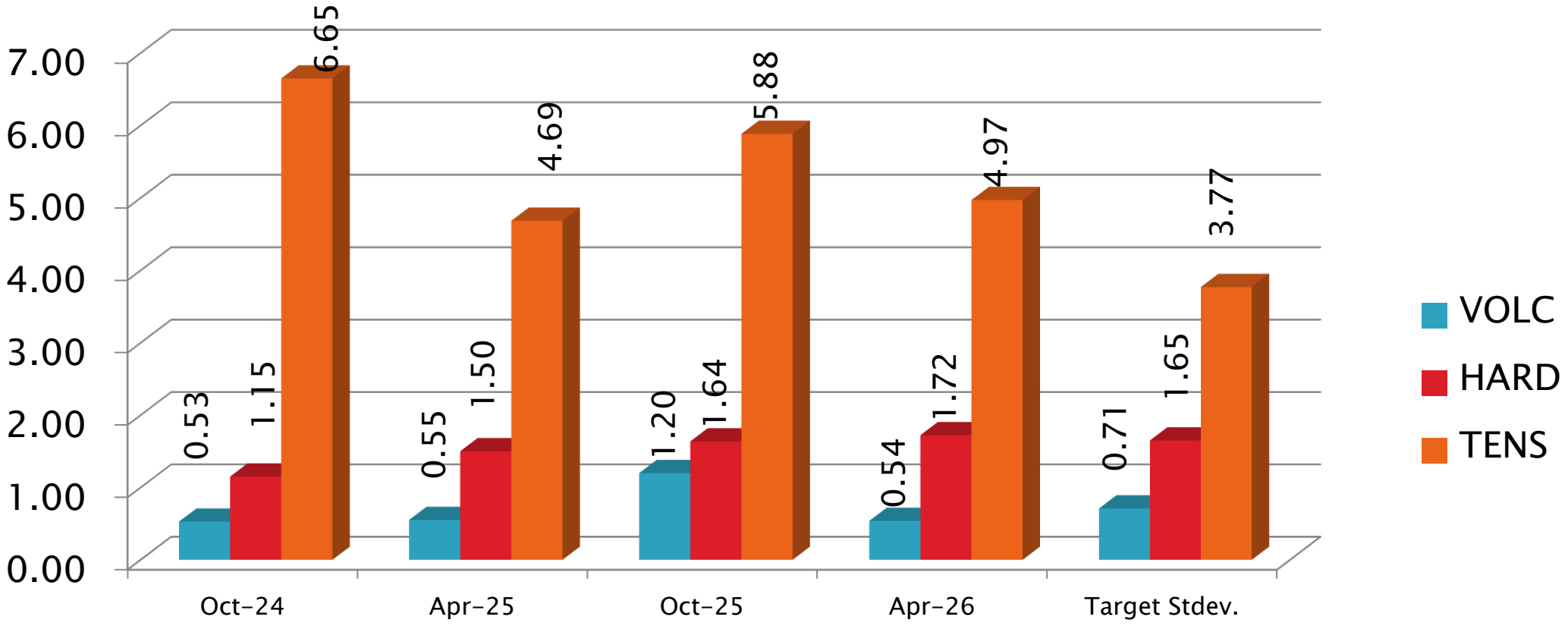


LDEOC Test Severity

Polyacrylate (ACM2)

Parameter	Period Mean Δ/s	Status
Volume Change	2.0053	Very Severe
Points Hardness Change	-1.6326	Very Mild
Tensile Strength Change	-0.4122	Mild

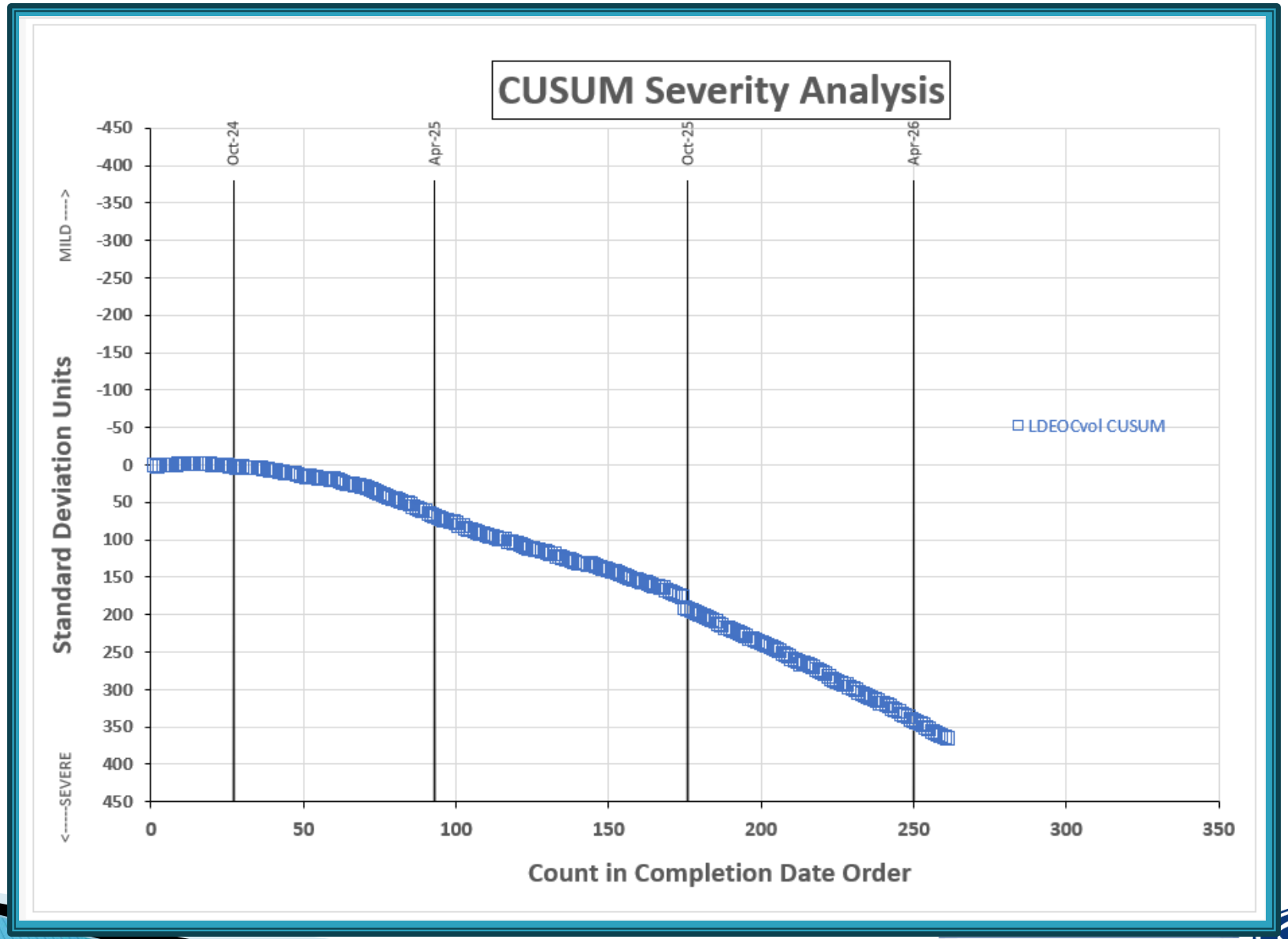
LDEOC Precision Estimates – Polyacrylate2



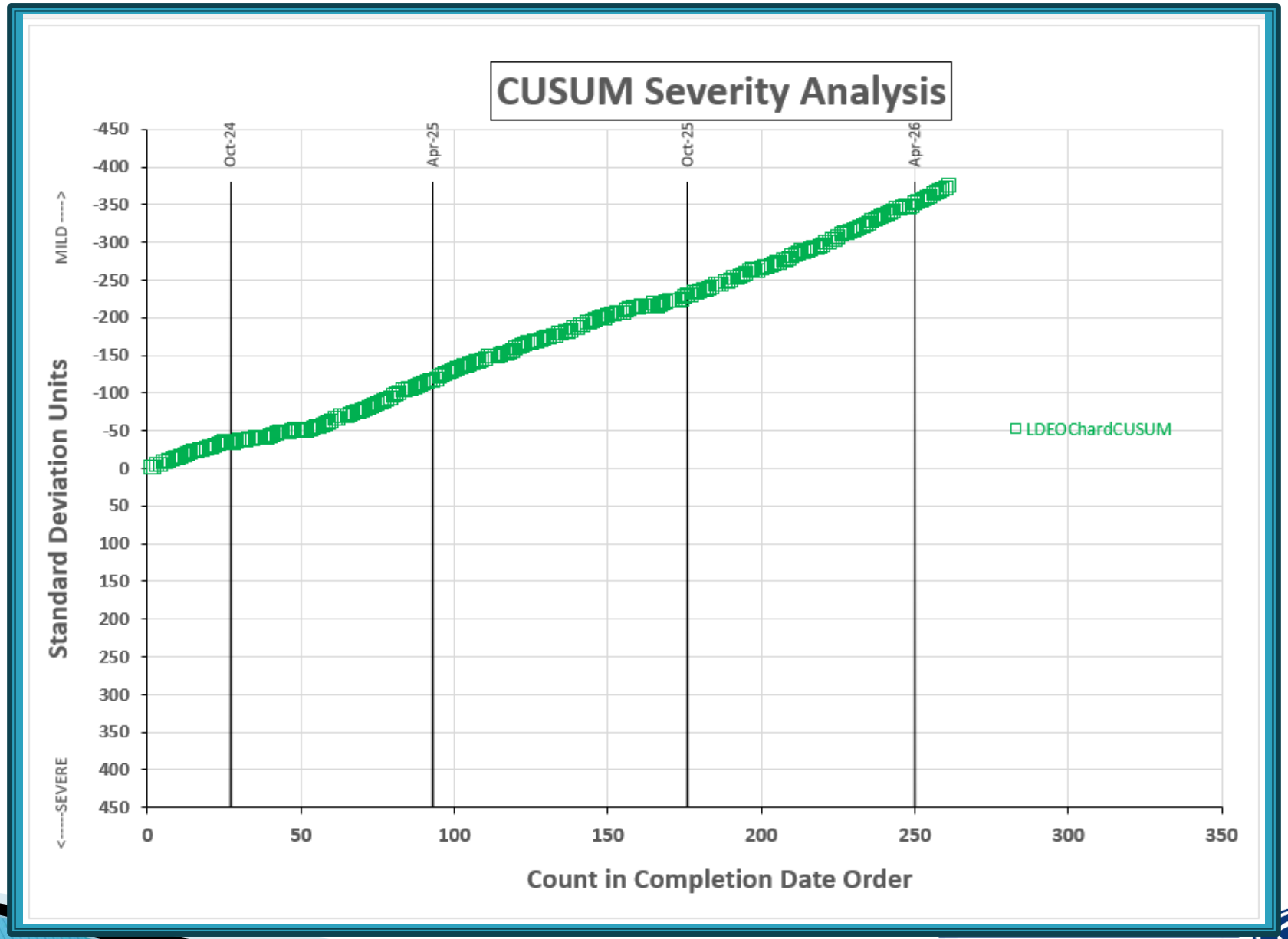
LDEOC Precision Estimates by Lab: ACM2

Test Parameter	Statistic	LTMS Lab							
		A	B	BB	G	I	L	P	V
	n=	25	5	3	17	9	4	2	9
Volume	Mean	12.342	12.642	10.800	12.636	12.724	11.965	12.640	12.113
	Pooled s	0.3195	0.1474	1.0371	0.2345	0.4310	0.4619	0.5091	0.4596
	Mean /s	1.9611	2.3831	-0.2113	2.3745	2.4992	1.4296	2.3803	1.6385
Hardness	Mean	-5.9600	-3.8000	-2.3333	-4.1765	-4.2222	-4.2500	-3.0000	-5.2222
	Pooled s	0.8888	1.4832	3.0551	1.7405	2.1082	0.9574	0.0000	0.9718
	Mean /s	-2.3455	-1.0364	-0.1475	-1.2645	-1.2923	-1.3091	-0.5515	-1.8983
Tensile Strength	Mean	-12.856	-15.340	-18.700	-16.771	-15.944	-11.850	-16.020	-21.789
	Pooled s	3.5976	3.948	3.4395	5.9239	1.7572	4.5735	2.6163	3.6856
	Mean /s	0.3300	-0.3289	-1.2202	-0.7084	-0.4892	0.5968	-0.5172	-2.0395

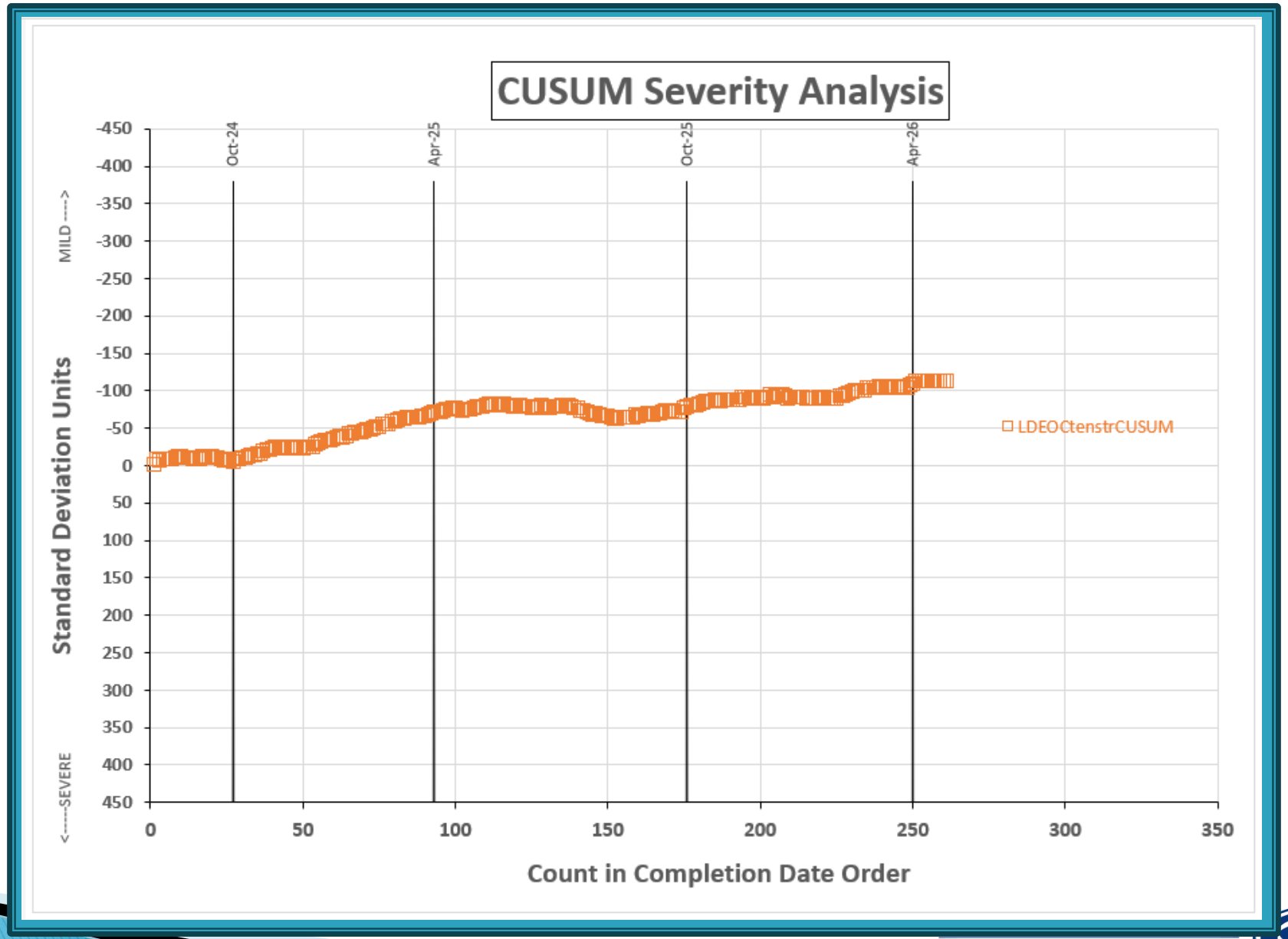
LDEOC – ETHYLENE ACRYLATE INDUSTRY OPERATIONALLY VALID DATA
POLYACRULATE-2 VOLUME CHANGE FINAL



LDEOC – ETHYLENE ACRYLATE INDUSTRY OPERATIONALLY VALID DATA
POLYACRYLATE-2 HARDNESS CHANGE FINAL



LDEOC – ETHYLENE ACRYLATE INDUSTRY OPERATIONALLY VALID DATA
POLYACRYLATE-2 TENSILE STRENGTH CHANGE FINAL

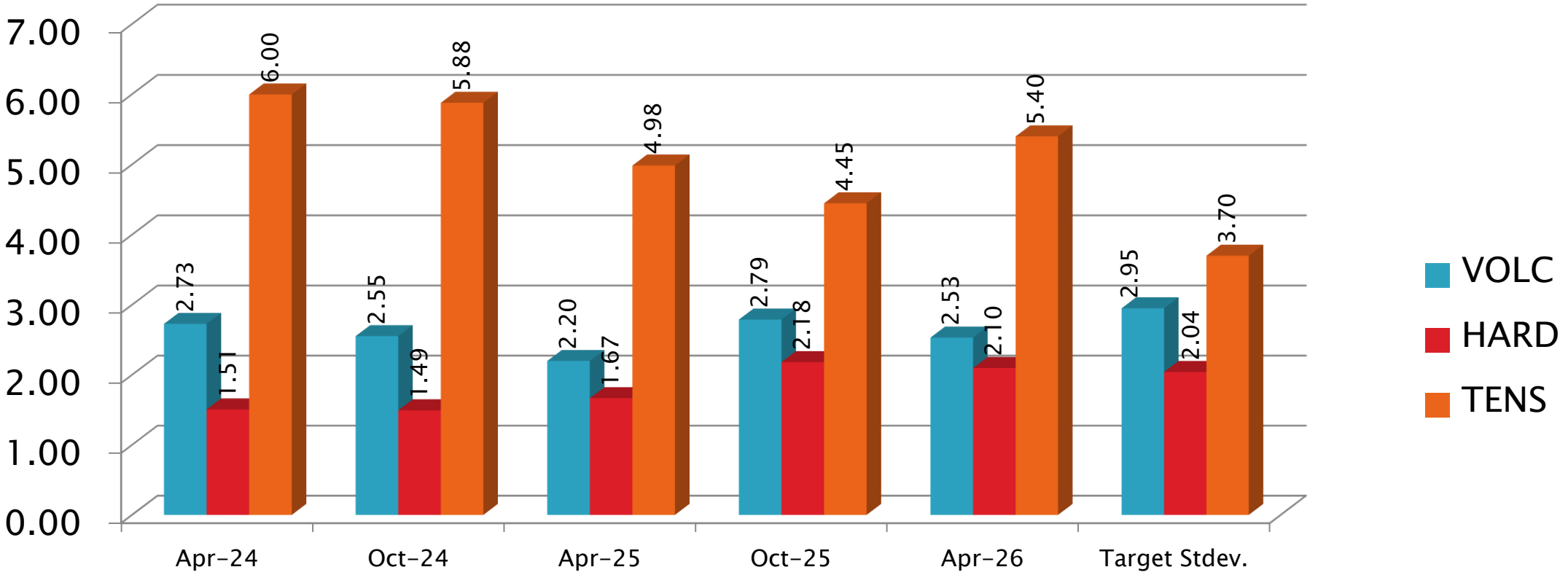


LDEOC Test Severity

Silicone (VMQ1)

Parameter	Period Mean Δ/s	Status
Volume Change	0.6553	Severe
Points Hardness Change	-0.3652	Mild
Tensile Strength Change	-0.0220	On-Target

LDEOC Precision Estimates – Silicone

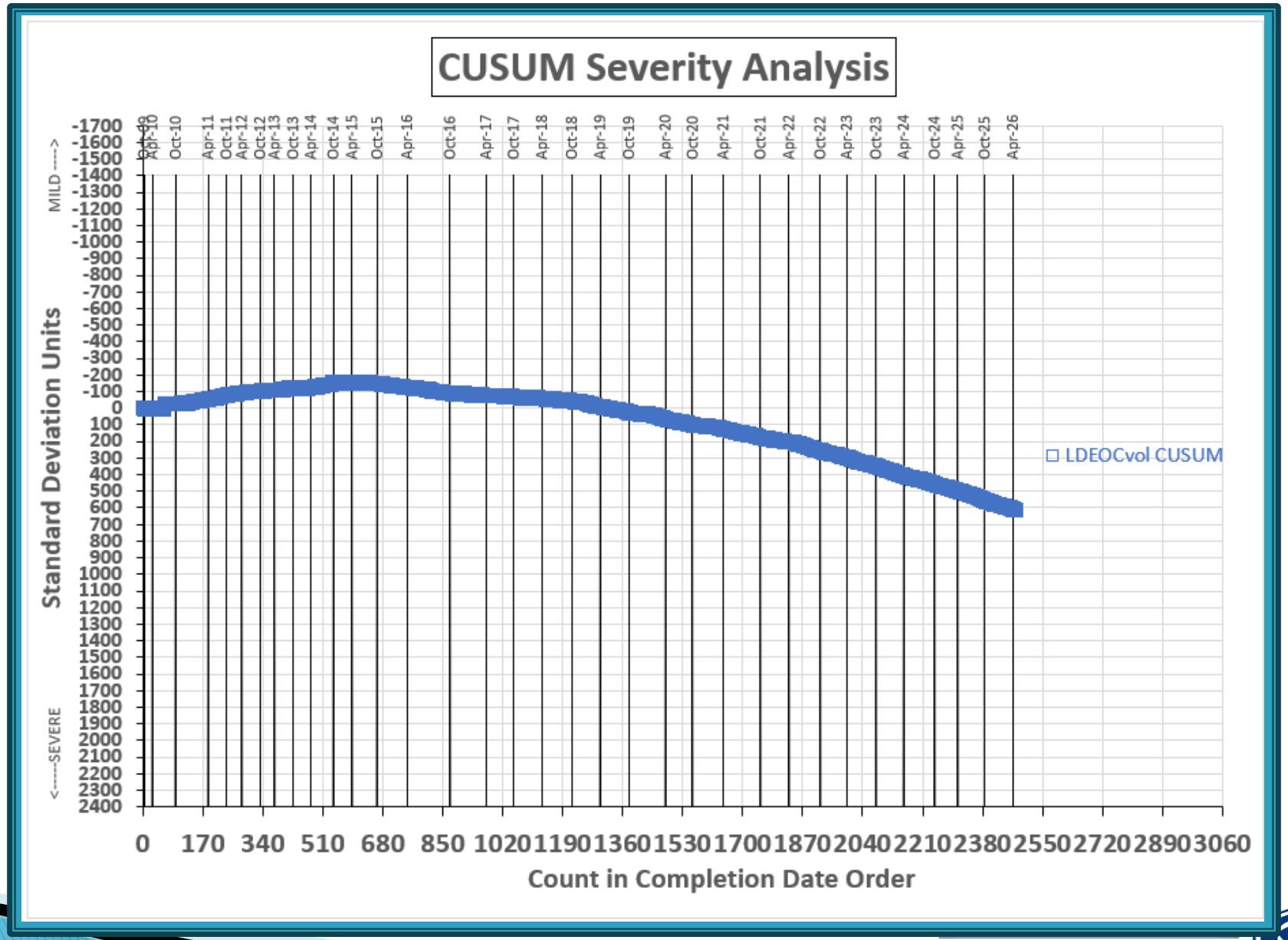


LDEOC Precision Estimates by Lab: VMQ1

Test Parameter	Statistic	LTMS Lab								
		A	B	BB	G	I	K	L	P	V
	n=	24	6	4	16	12	1	8	2	7
Volume	Mean	34.795	34.247	30.805	36.874	30.498	36.94	32.822	33.775	34.493
	Pooled s	0.5625	1.171	1.8094	2.5949	0.7078		1.1416	1.0394	1.2790
	Mean /s	0.8898	0.7040	-0.4627	1.5945	-0.5669	1.62	0.2212	0.5441	0.7874
Hardness	Mean	-23.583	-23.833	-18.750	-23.375	-22.083	-17.00	-18.750	-23.500	-22.429
	Pooled s	0.8805	1.4720	0.5000	1.2583	1.3114		1.0351	0.7071	1.5119
	Mean /s	-0.9330	-1.0556	1.4363	-0.8309	-0.1977	2.29	1.4363	-0.8922	-0.3669
Tensile Strength	Mean	-34.437	-27.717	-38.725	-34.100	-35.233	-38.70	-28.000	-36.650	-36.343
	Pooled s	4.5379	3.591	1.6029	4.3288	5.3796		4.6485	1.0607	7.0154
	Mean /s	-0.1858	1.631	-1.3446	-0.0946	-0.4009	-1.34	1.5541	-0.7838	-0.7008

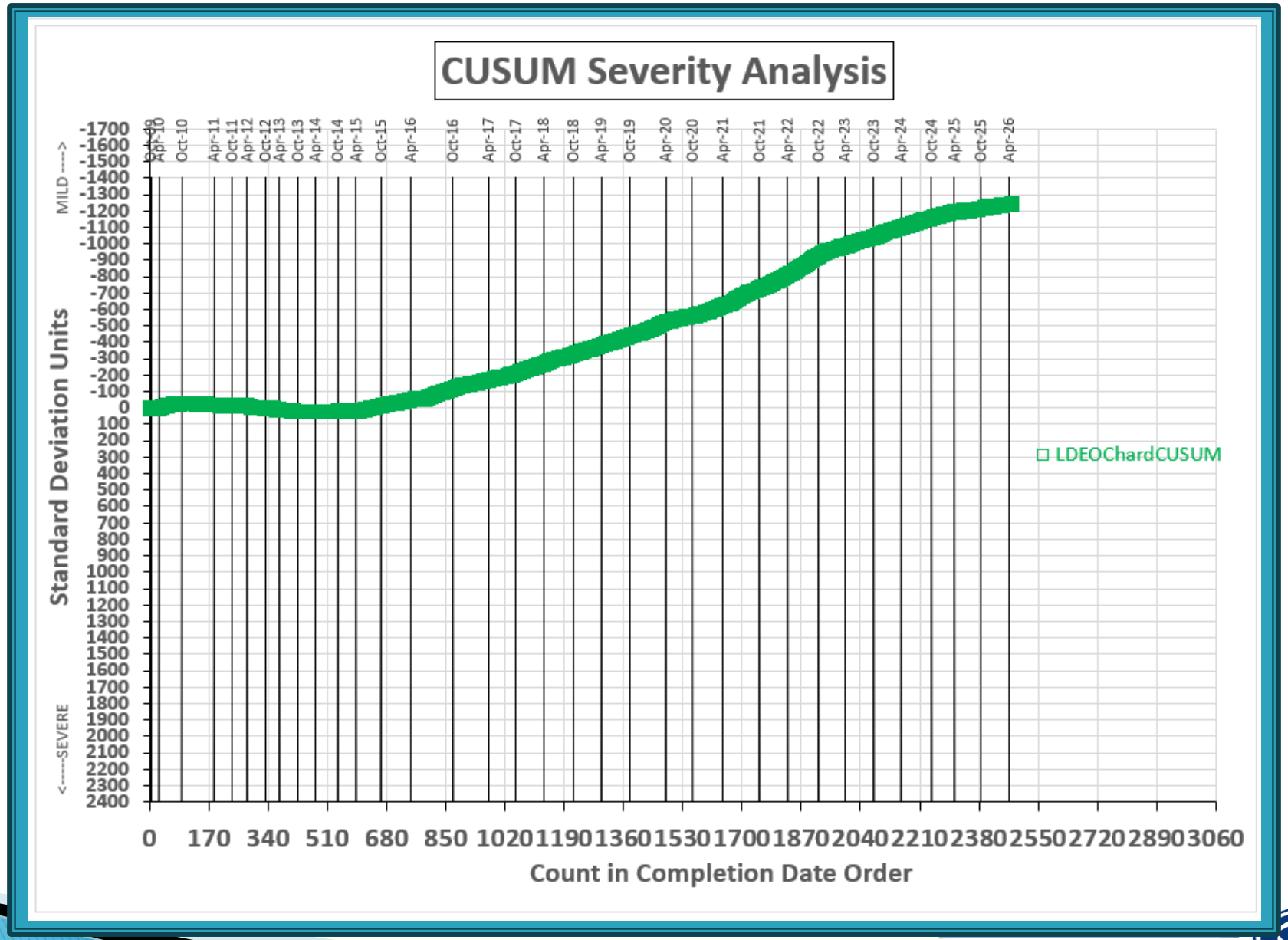
LDEOC —SILICONE INDUSTRY OPERATIONALLY VALID DATA

REFERENCE SILICON VOLUME CHANGE FINAL



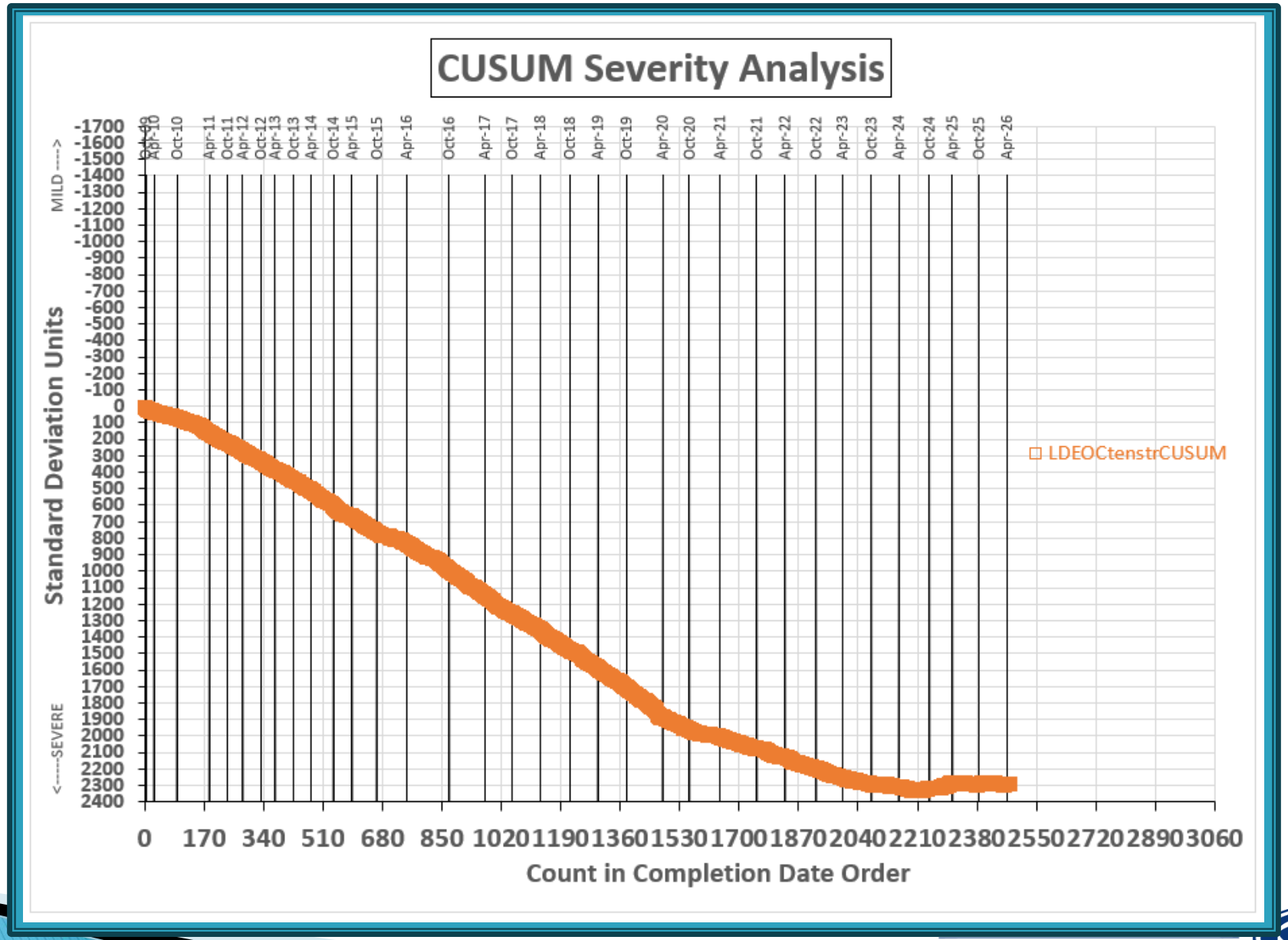
LDEOC —SILICONE INDUSTRY OPERATIONALLY VALID DATA

REFERENCE SILICON POINTS HARDNESS FINAL



LDEOC —SILICONE INDUSTRY OPERATIONALLY VALID DATA

REF SILICON TENSILE STRENGTH CHANGE FINAL



Information Letters & Technical Updates*

No new information letters or technical updates were released this semester.

Test	Date	IL or Memo Number	Topic
LDEOC			

*Available from TMC Website

Reference Oil Inventory Estimated Life

EOEC & LDEOC

Oil	TMC Inventory Gallons	Gallons Shipped Past 6 Months	Estimated Life [C]
SL107 [A, B]	632	250	1.0 years

[A] TMC Inventory is used across several test methods

[B] SL107 has fully replaced oil 1006; Oil 1006 is no longer used as an EOEC Reference Fluid

[C] Use Rate of SL107 has accelerated due to addition of five new Elastomers to D7216:
FOUR: ILSAC GF-7
ONE: PC-12

TABLE of CONTENTS

D02.B0.07
TMC Monitored Tests

ASTM D 7528

ROBO

October 1, 2025 – March 31, 2026

Test Monitoring Center
https://www.astmtmc.org
A Program of ASTM International

Calibrated Labs and Stands*

(change since last Semi-Annual report)

Test	Labs	Stands
D7528	6 (+0)	35 (-1)
*As of 3/31/2026		

D7528: Oxidation by ROBO

Test Status	Validity Code	No. Tests
Acceptable Calibration Test	AC	116
Failed Calibration Test	OC	10
Lab Reported Calibration Test as Operationally Invalid	LC	1
Calibration Test Aborted by Lab	XC	5
Calibration Test Declared Operationally Invalid by TMC	RC	1
Total		**133**

Number of Labs Reporting Data: 6
Fail Rate of Operationally Valid Tests: 7.9% (11.7% last period)

D7528: Oxidation by ROBO

Statistically Unacceptable Tests (OC)	No. Of Tests
Natural Log (MRV Viscosity) Severe	6
Natural Log (MRV Viscosity) Mild	4
Total	**10**

D7528: ROBO Failed Tests by Lab

Failed Parameter	LTMS Lab					Number of Tests
	A	AM	AQ	B	G	
Natural Log (MRV Viscosity) Severe	2	0	0	0	4	6
Natural Log (MRV Viscosity) Mild	2	0	0	0	2	4
Total	**4**	**0**	**0**	**0**	**6**	**10**

- TEN different units from TWO different labs reported failing calibration tests

D7528: Oxidation by ROBO

Operationally Invalid (LC, RC) or Aborted (XC) Calibration Tests

Test Status	Cause	No. of Tests
Invalidated by Lab (LC)	Issues with the NO2 Feed	1
Invalidated by TMC (RC)	Yield Stress NOT <35 Pa (and not RO 434-3)	1
Aborted Test (XC)	Test Temperature Out of Specification	1
Aborted Test (XC)	Reactor Vessel Failed	1
Aborted Test (XC)	Flow Control Issue	1
Aborted Test (XC)	Power Loss	1
Aborted Test (XC)	Testing Time Incorrect (Ran Overtime)	1
Totals		**7**

D7528: Oxidation by ROBO

Period Precision and Severity Estimates

Natural Log (MRV Viscosity)	n	df	Pooled s	Mean Δ/s
Targets Updated 20211021[1]	80	77	0.1551	-----
4/1/21 through 9/30/21	116	110	0.1992	-0.37
10/1/21 through 3/31/22	106	102	0.2103	-0.36
4/1/22 through 9/30/22	105	101	0.1868	-0.06
10/1/22 through 3/31/23	94	91	0.2000	0.11
4/1/23 through 9/30/23	103	100	0.1990	-0.11
10/1/23 through 3/31/24	91	88	0.1741	-0.12
4/1/24 through 9/30/24	92	88	0.1893	-0.72
10/1/24 through 3/31/25	97	94	0.1957	-0.37
10/1/25 through 3/31/26	137	134	0.2264	-0.25
10/1/25 through 3/31/26	126	123	0.2121	0.11

[1]Updated targets to include latest primary reference oils 434-3, 435-1 and 436

D7528: Oxidation by ROBO

NO_2 Delivery Mechanism	Number of Total Tests	Number Of AC Tests	Pass Rate (%)	Number of Labs	Number of Rigs	LAB ID's
Dilute	57	52	91.2	2	18	G, AM
Liquid	69	64	92.8	5	17	A, AQ, B, BC, G
BOTH (Totals)	**126**	**116**	**92.1**	**6***	**35**	**A, AM, AQ, B, BC, G**

*One lab is conducting tests with both NO_2 delivery methods.

D7528: Oxidation by ROBO

Precision, Performance (Mean Δ/s) by Lab and NO_2 Delivery Mechanism

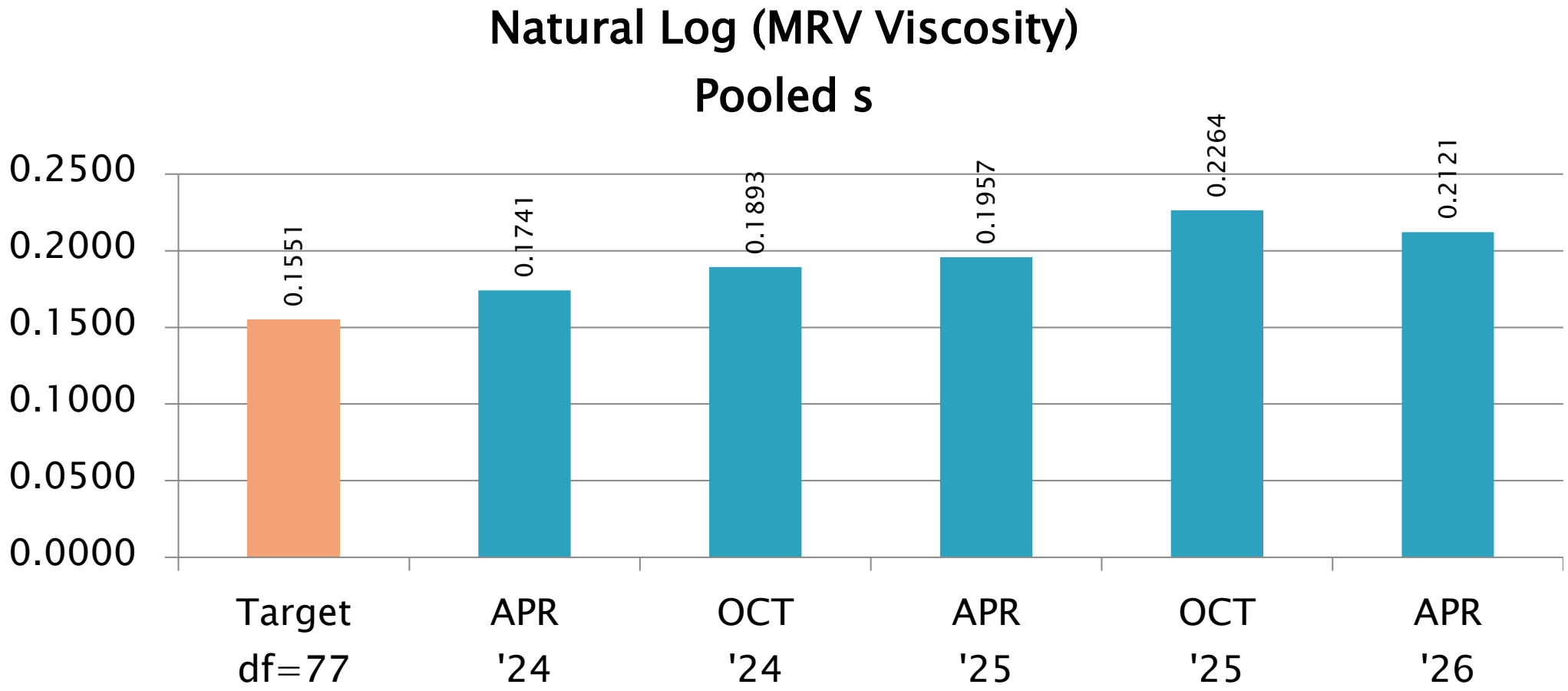
NO_2 Delivery		Ref Oil 434-3	Ref Oil 435-1	Ref Oil 436	TOTAL
Dilute	No. of Runs	14	27	16	57
	Mean	10.7679	11.1317	10.3626	10.8264
	Pooled s	0.1503	0.2615	0.1428	0.2098
	Mean Δ/s	-0.36	0.44	0.24	0.19
Liquid	No. of Runs	14	35	20	69
	Mean	10.7672	11.0451	10.3792	10.7957
	Pooled s	0.2724	0.2390	0.0836	0.2146
	Mean Δ/s	-0.36	0.02	0.37	0.04
BOTH	No. of Runs	28	62	36	126
	Mean	10.7676	11.0828	10.3719	10.8096
	Pooled s	0.2159	0.2507	0.1123	0.2121
	Mean Δ/s	-0.36	0.20	0.31	0.11

D7528: Oxidation by ROBO

Period Performance (Mean Δ/s) by Lab and NO_2 Delivery Mechanism

NO_2 Delivery Mechanism	LAB A (all L)	LAB AM (all D)	LAB AQ (all L)	LAB B (all L)	LAB BC (all L)	LAB G (mix)
Dilute	n = 0	n = 6	n = 0	n = 0	n = 0	n = 51
	N/A	-0.67	N/A	N/A	N/A	0.29
Liquid	n = 45	n = 0	n = 3	n = 10	n = 2	n = 9
	0.07	N/A	-0.73	0.63	-0.92	-0.27
BOTH	**n = 45**	**n = 6**	**n =3**	**n = 10**	**n = 2**	**n = 60**
	0.07	**-0.67**	**-0.73**	**0.63**	**-0.92**	**0.21**

D7528: Oxidation by ROBO



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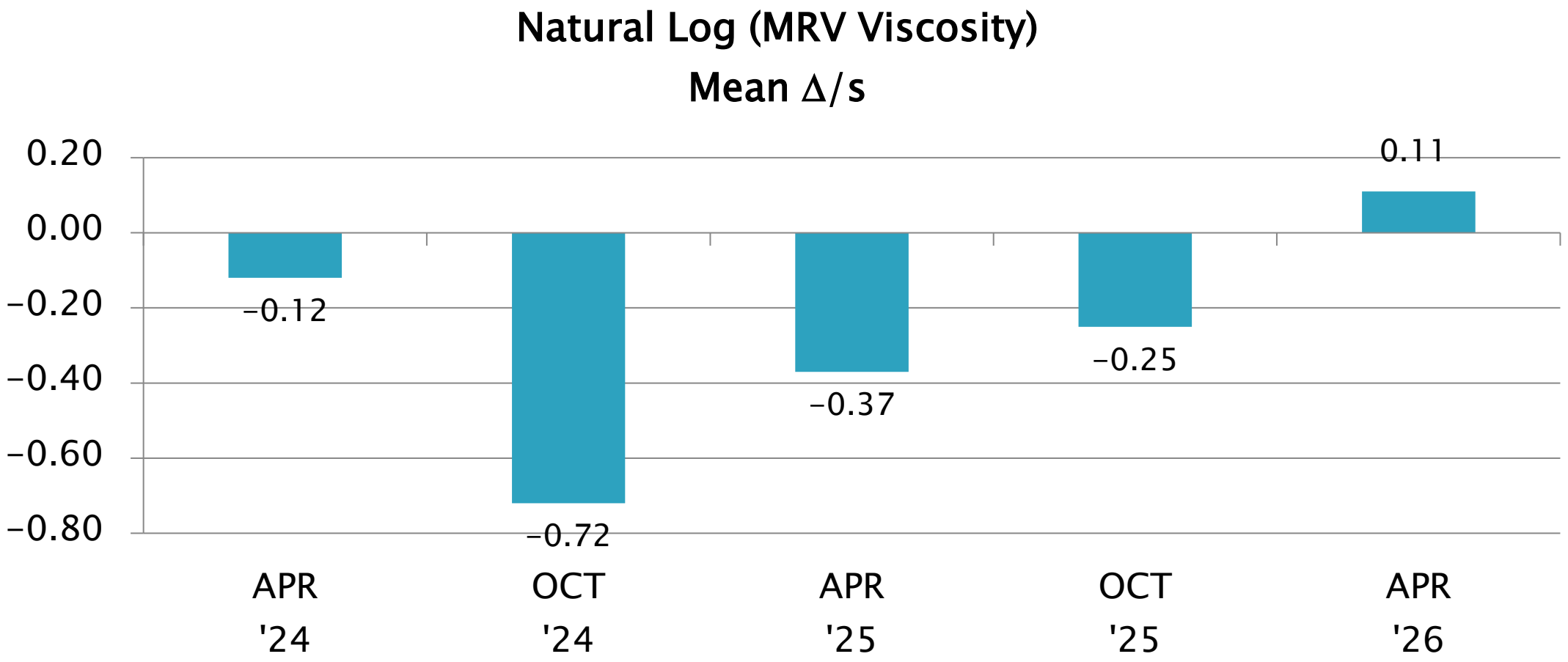

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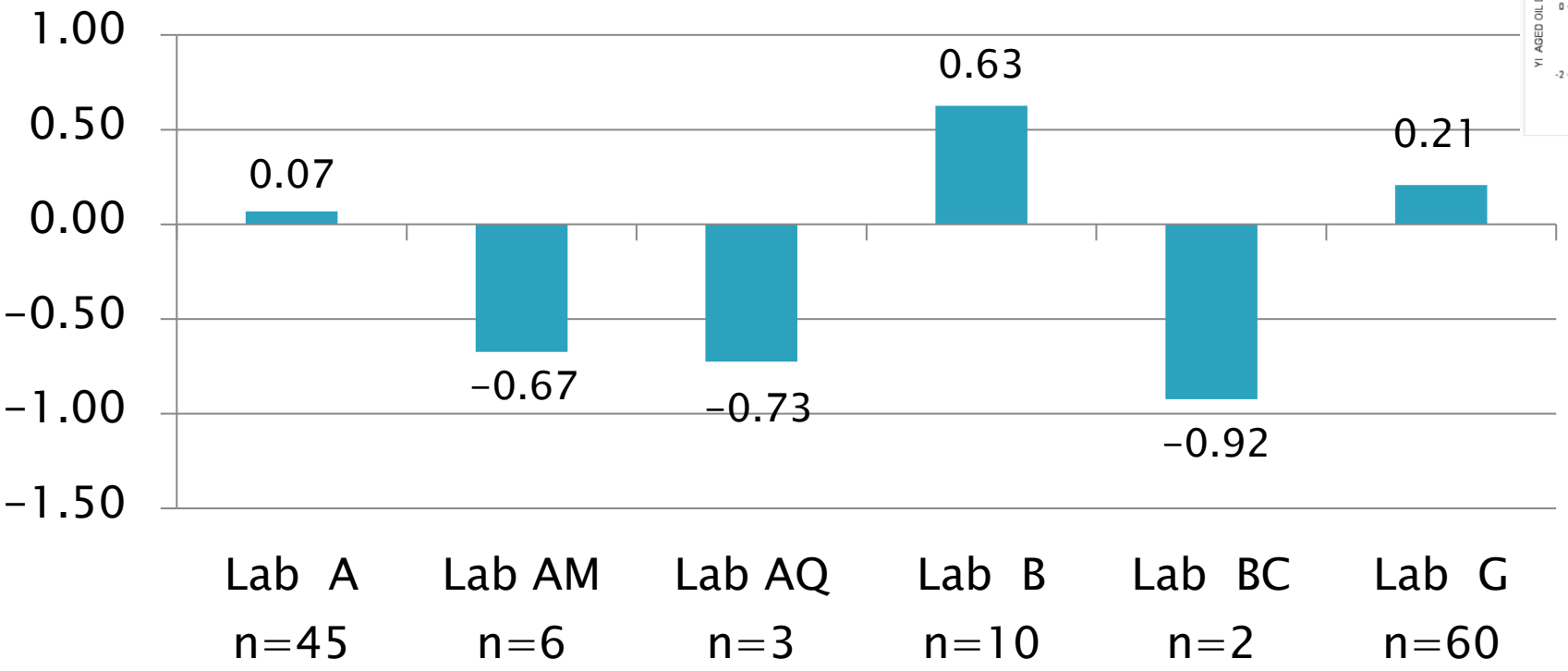
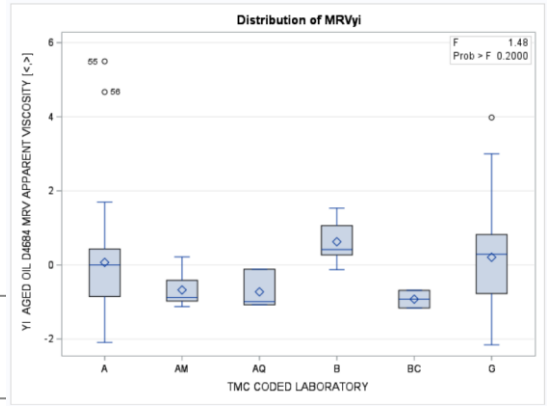
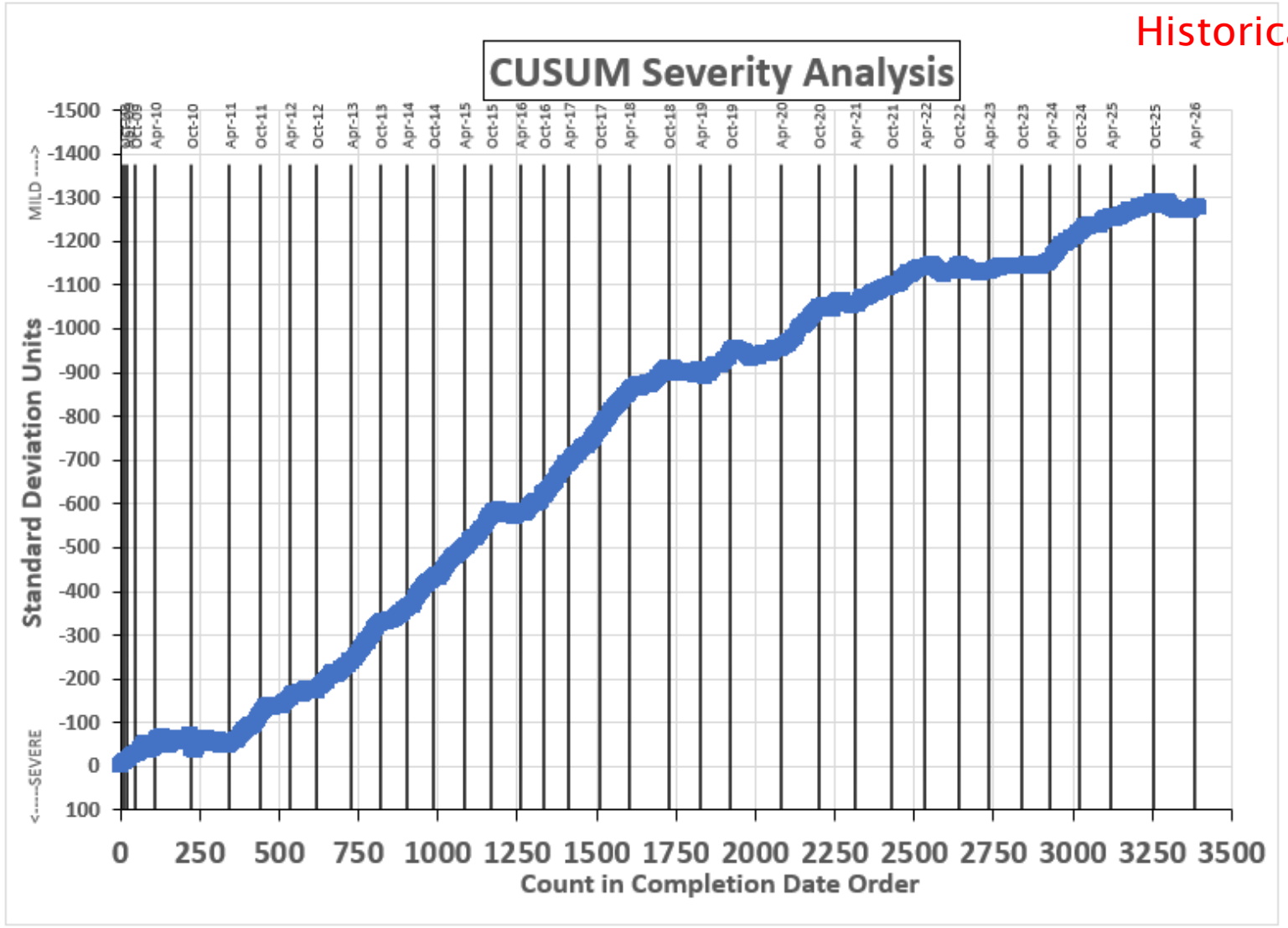




ROBO TEST INDUSTRY OPERATIONALLY VALID DATA

AGED OIL MRV APPARENT VISCOSITY

Historical Chart



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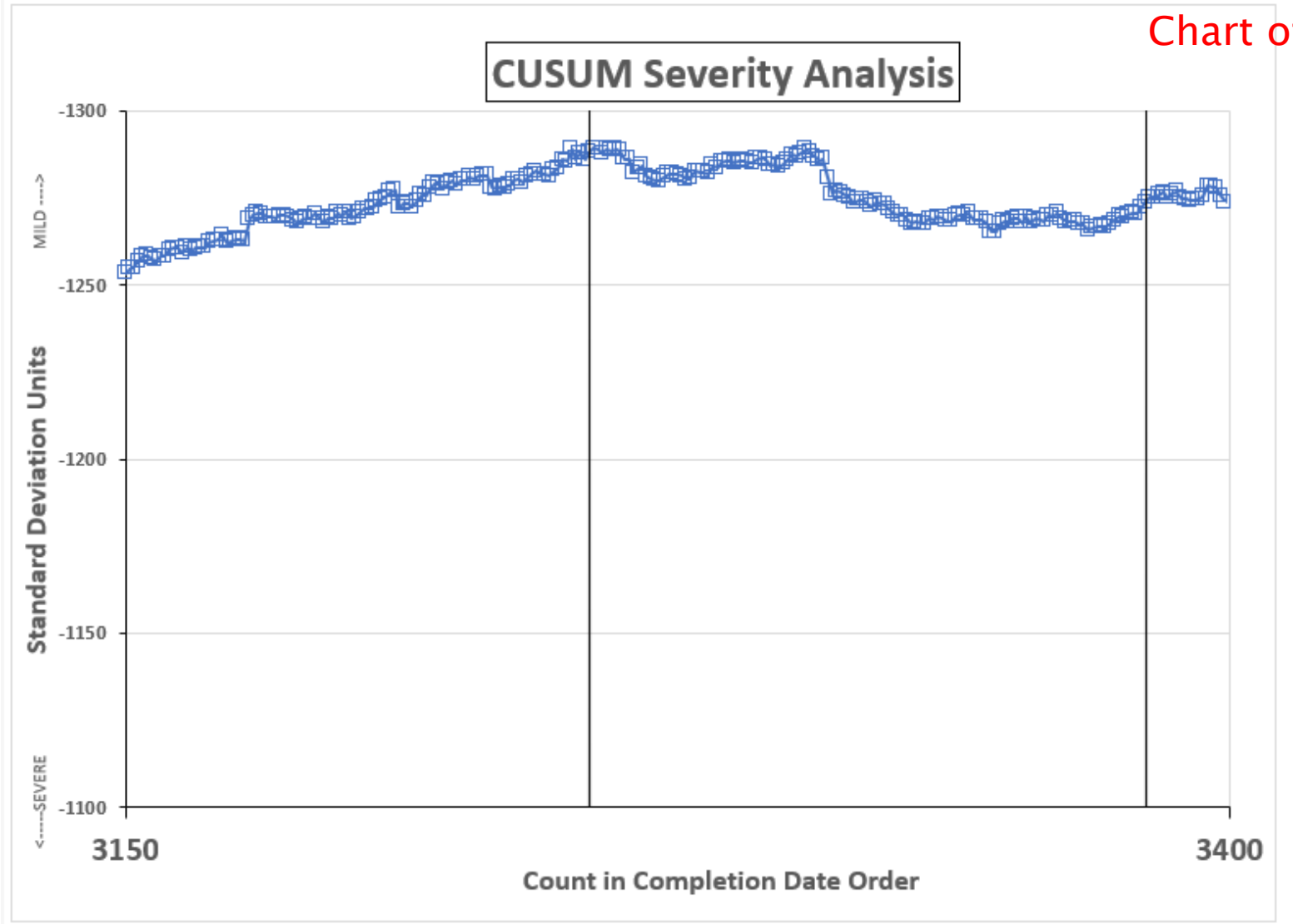
ROBO TEST INDUSTRY OPERATIONALLY VALID DATA
Last 200 Data Points
AGED OIL MRV APPARENT VISCOSITY

Chart of recent results



October 1, 2025 – March 31, 2026

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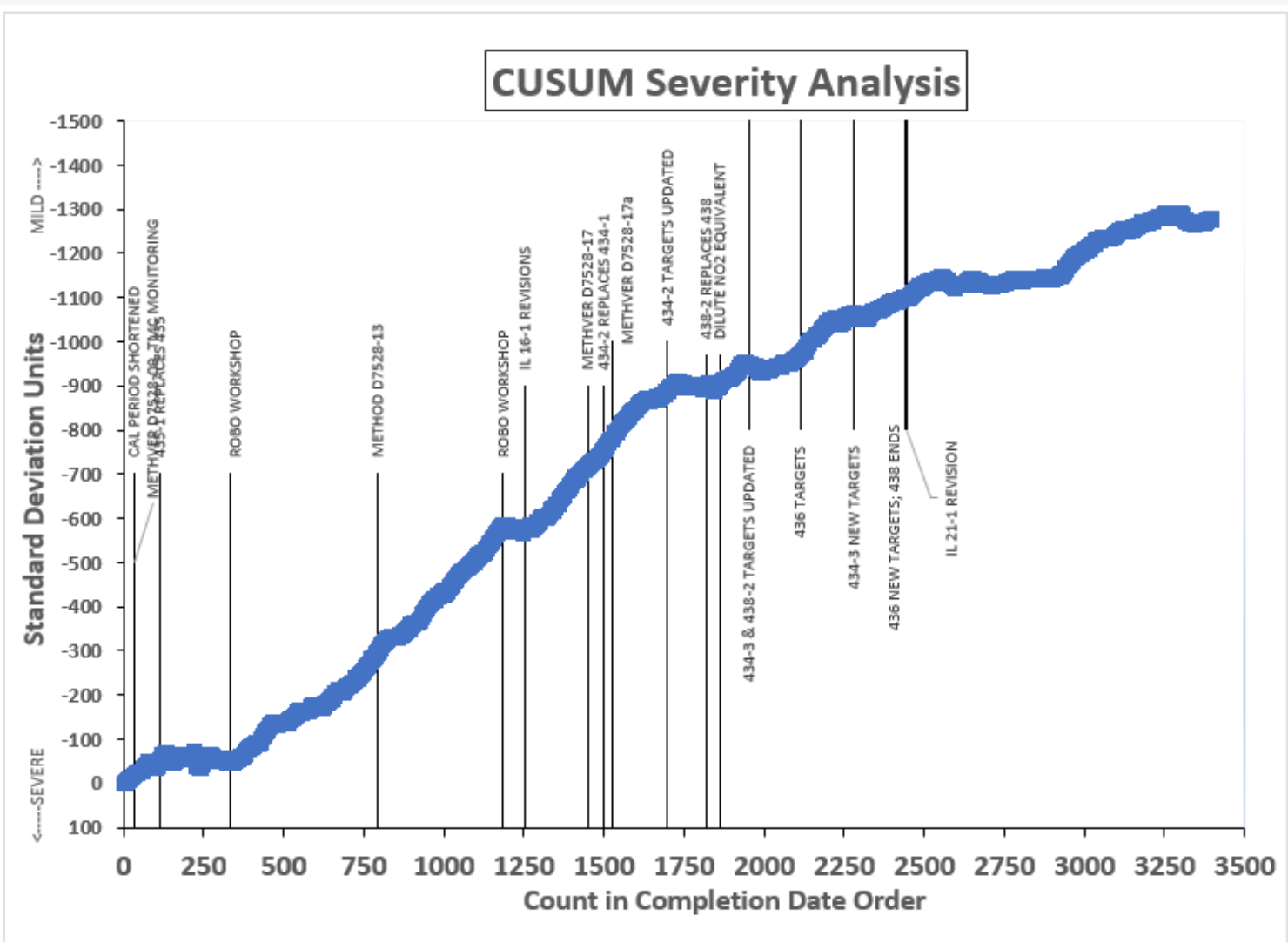
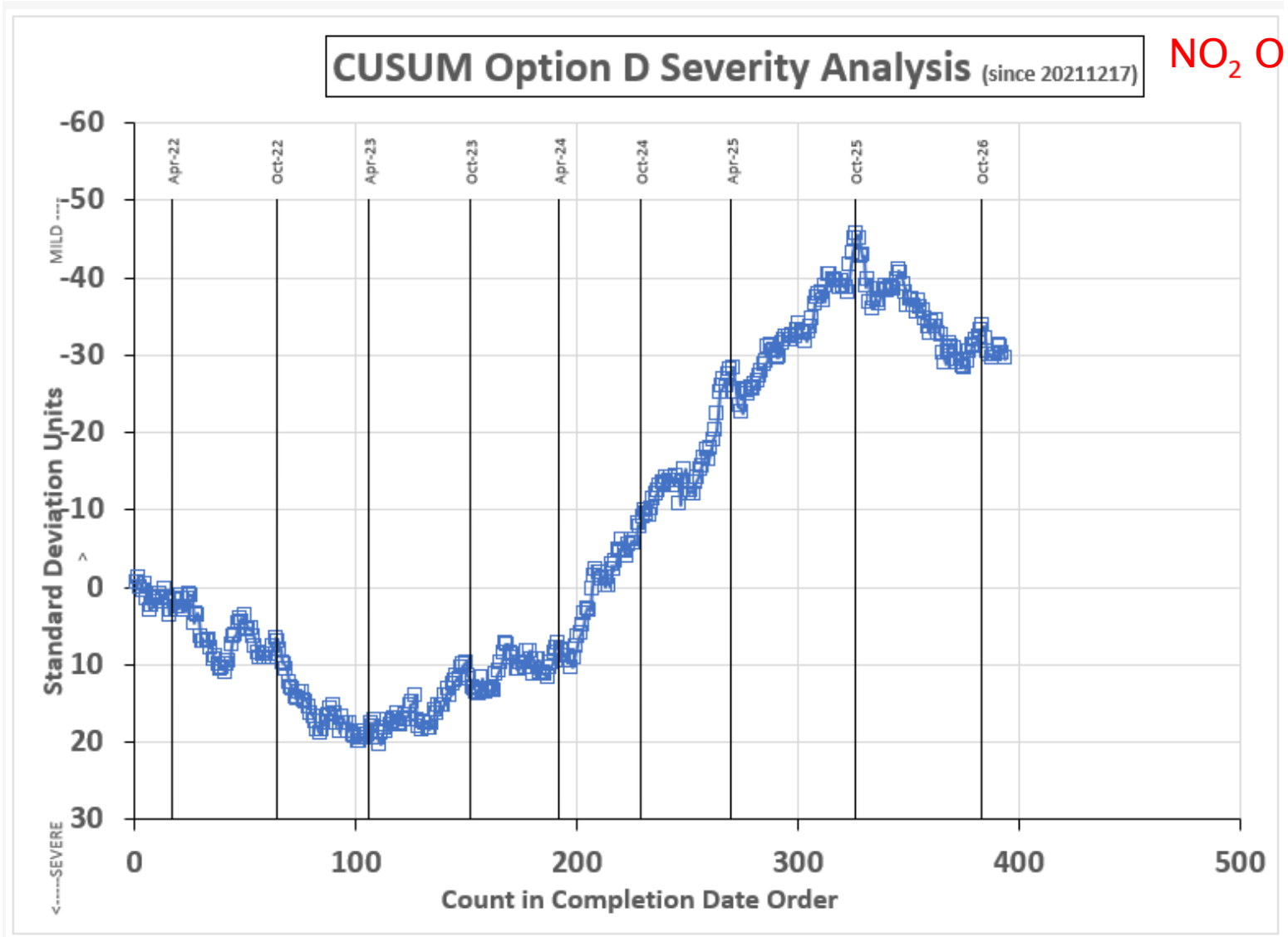
ROBO TEST INDUSTRY OPERATIONALLY VALID DATA

AGED OIL MRV APPARENT VISCOSITY



ROBO TEST INDUSTRY OPERATIONALLY VALID DATA
NO2 Option D ONLY
AGED OIL MRV APPARENT VISCOSITY



NO_2 Option D Chart

October 1, 2025 – March 31, 2026

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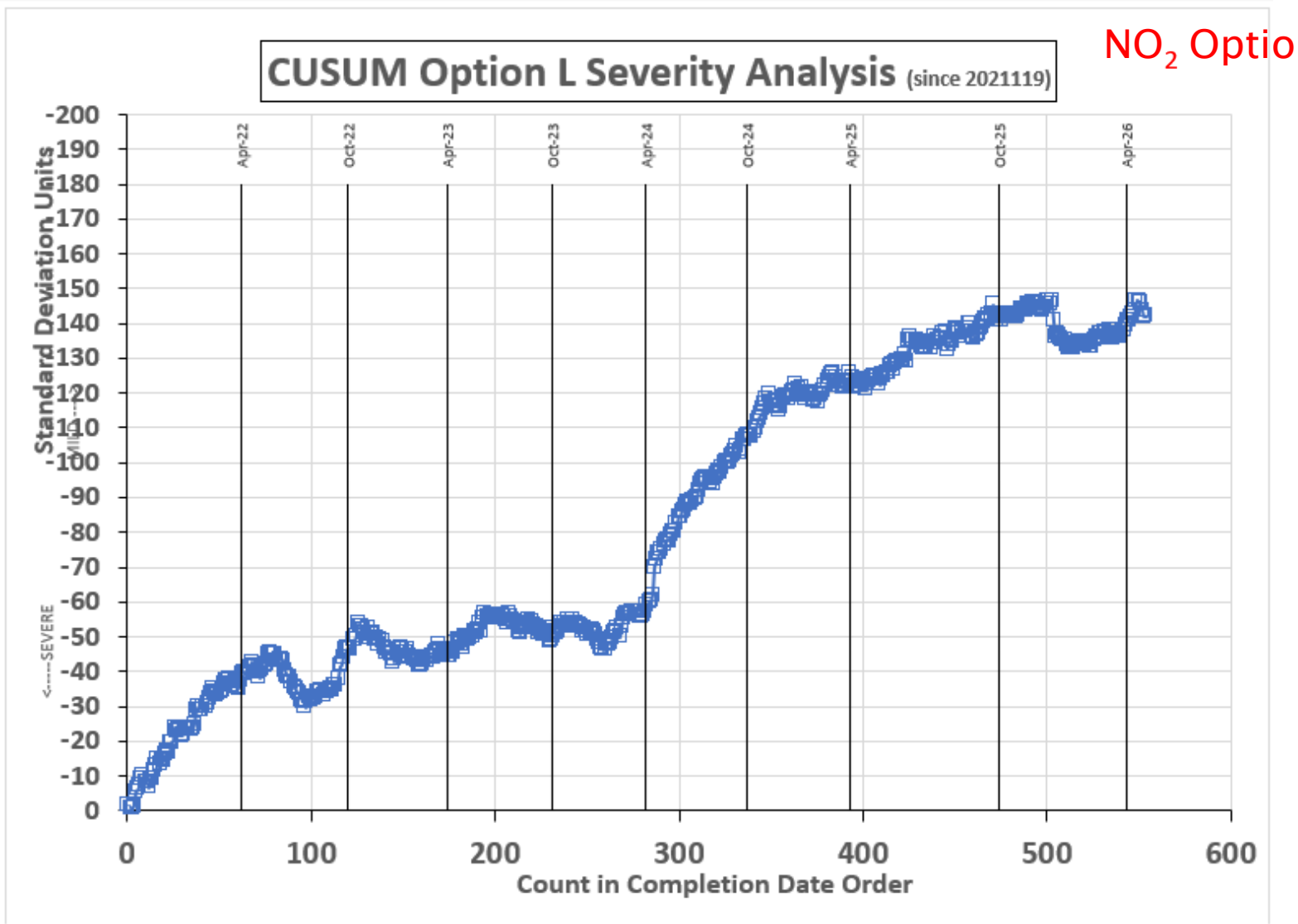
ROBO TEST INDUSTRY OPERATIONALLY VALID DATA
NO2 Option L ONLY
AGED OIL MRV APPARENT VISCOSITY

NO_2 Option L Chart



October 1, 2025 – March 31, 2026

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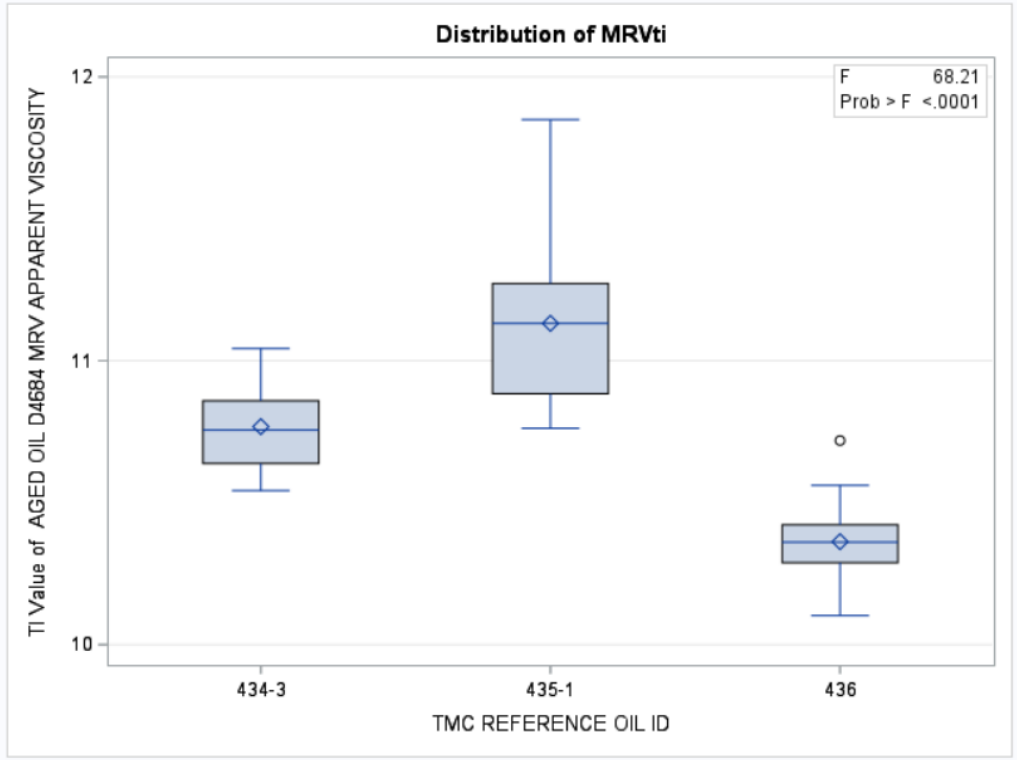
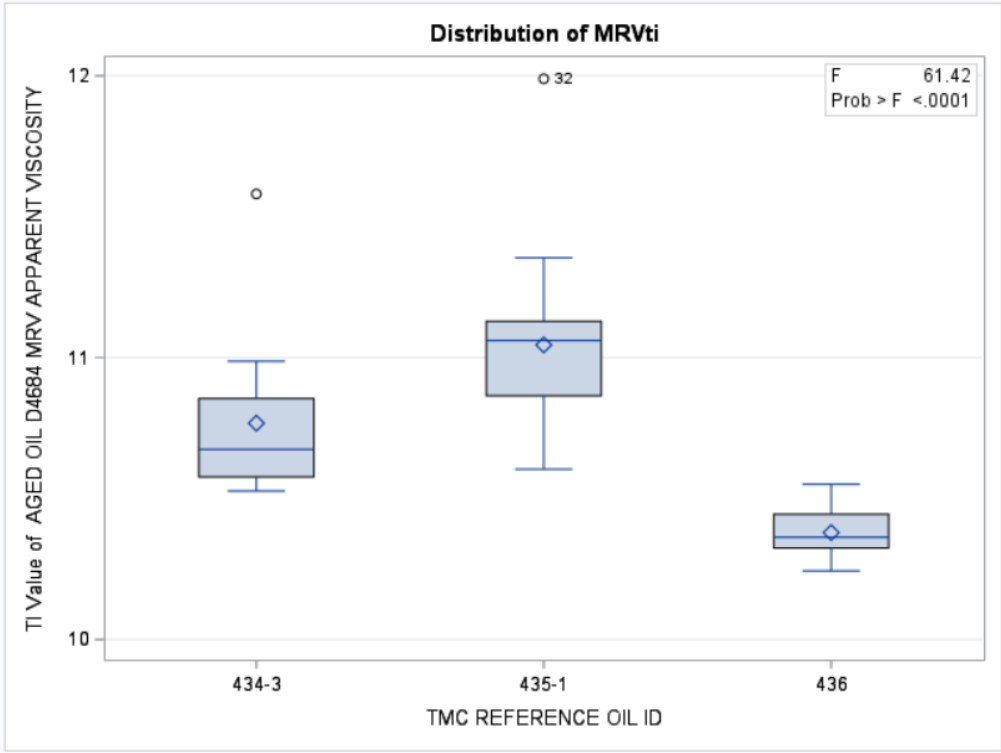
Means by Reference Oil, NO2 Delivery

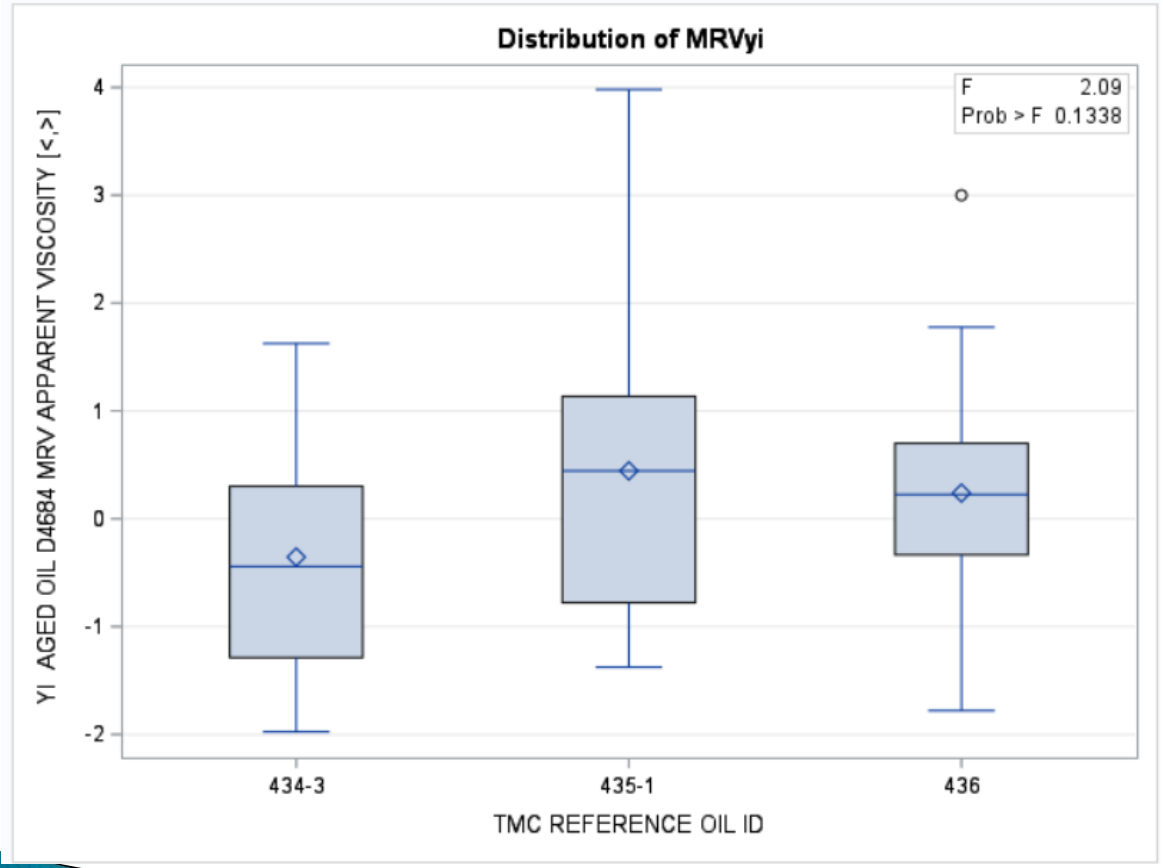
D (left) and L (right)

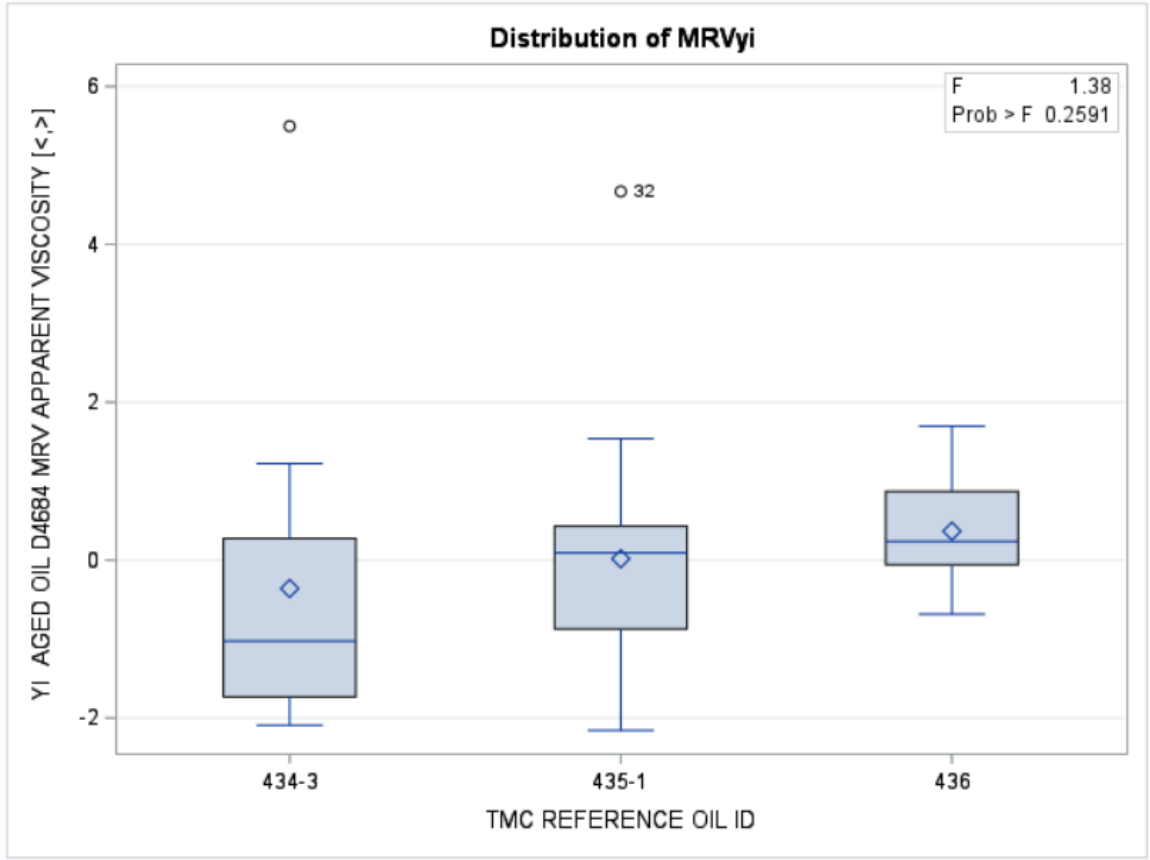




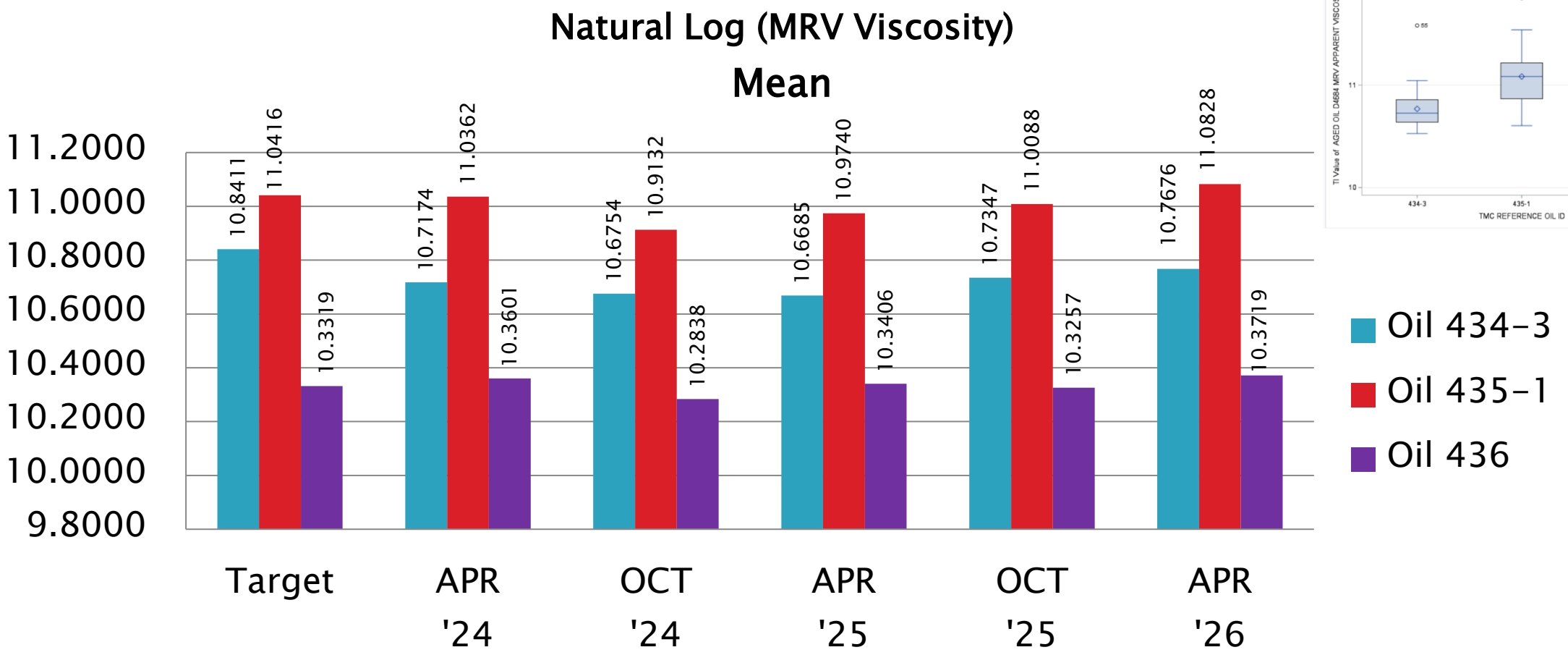
Performance by Ref Oil, NO2 Delivery

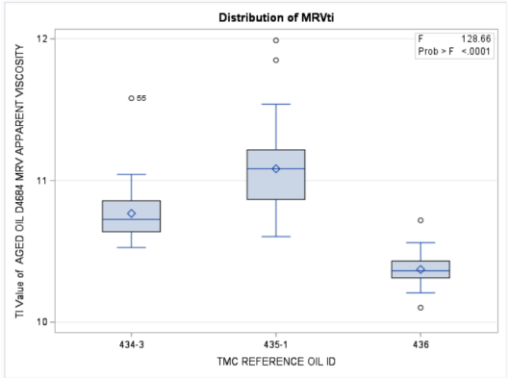
D (left) and L (right)





D7528: Oxidation by ROBO





October 1, 2025 – March 31, 2026

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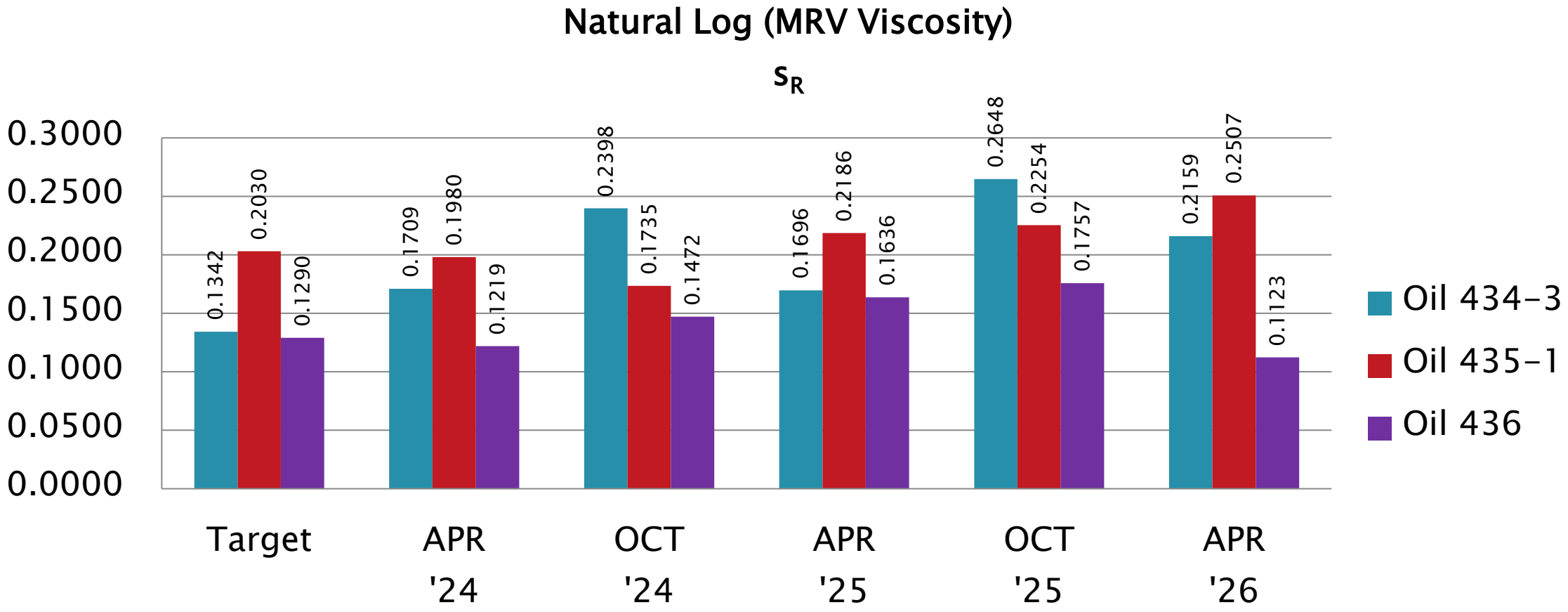
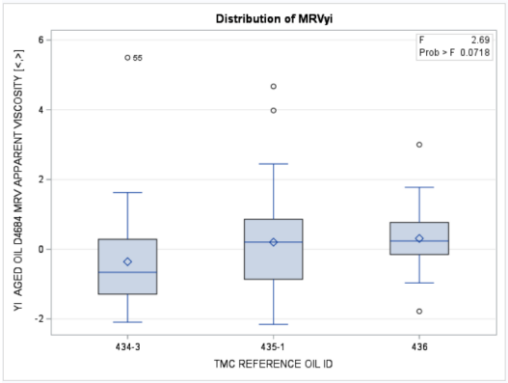
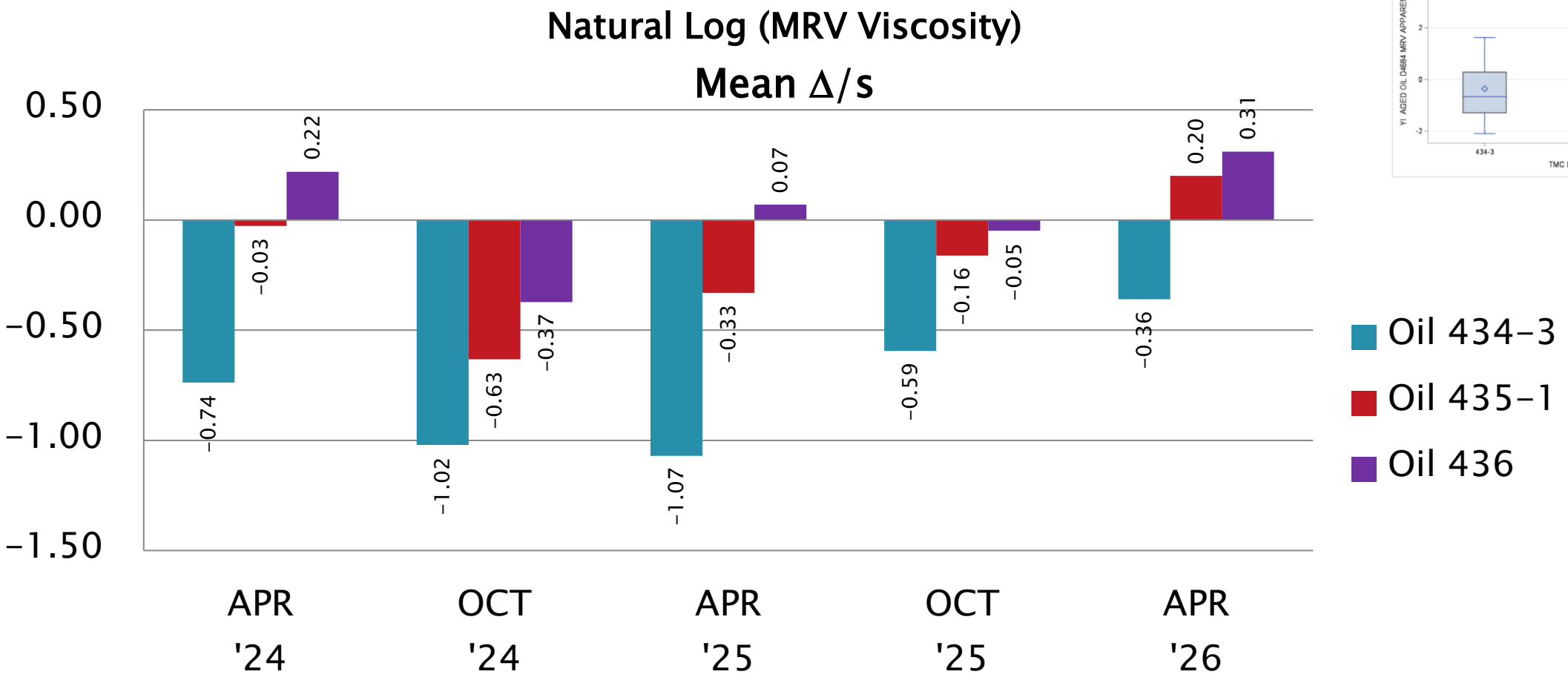
D7528: Oxidation by ROBO



October 1, 2025 – March 31, 2026

D7528: Oxidation by ROBO





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D7528: Oxidation by ROBO

- Precision (Pooled s) was steady at 0.2121 (previously 0.2264).
- Severity (Mean Δ/s) has moved to +0.11, continuing to move closer to target.
- CUSUM plot for NO2 delivery method (D = dilute) reversed course from previous semester and is now trending severe.
- CUSUM plot for NO2 delivery method (L = liquid) continues to exhibit an overall mild trend. However, a couple severe results occurring mid-semester makes the semester trend look flat.

Reference Oil Inventory

ROBO

Oil	Year Rec'd By TMC[A]	Tests	TMC Inventory, gallons	Gallons Shipped last 6 months	Estimated Life
434-3[B]	2017	ROBO	3.2	4.3	1.5 years
435-1[B]	2008	ROBO	10.8	10.3	0.5 years
436[B]	2014	ROBO	26.3	2.91	5+ years

[A] Integrity of TMC reference oils is confirmed annually by analytical QC testing of chemical and physical properties.
[B] Multi-test oil; estimated aliquot reserved for bench testing. Other drums are available.

TABLE of CONTENTS

Reference Oil Inventory

May 1, 2026

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Reference Oil Inventory: May 1, 2026

Original Blend	Oil	Tests	Year	Blend Quantity	TMC Inventory	Estimated Life
44	44-5	D6594	2022	54	39.4	> 5
52	52	D6417	1995	100	59.4	> 5
55	55	D6417	1995	100	65.9	> 5
58	58	D6417, D6417QC, GI	1998	159	111.2	> 5
66	66	D6082	2002	108	63.3	> 5
75	75-2	TEOST	2024	8	4.4	2
77	77-3	EOWT	2015	900	300	>5
79	79	EOFT, EOWT	2014	1026	11.8	3
82	82-1	BRT	2008	10	0.5	not assigned
86	86	BRT	2017	54	49	not assigned
87	87	BRT	2017	98	92.9	not assigned
90	90	D874QC	2005	49.5	0.0	None
91	91	D874	2006	5	2.8	> 5
92	92	D874	2020	52	52.4	> 5
432	432	MTEOS	1998	207	100.7	> 5
434	434-3	MTEOS, ROBO	2017	55	3.2	0.5
435	435-1	ROBO	2008	55	10.8	0.5
435	435-2	TEOST	2010	550	30.2	> 5
436	436	ROBO	2014	55	22.0	> 5
820	820-2	D874	2001	55	5.8	> 5
1005	1005-5	D6594	2015	55	10.3	1
1006	1006	BRT	1996	55	23.4	> 5
1009	1009	GI	2002	55	33.0	> 5
FOAMB18	FOAM18B	D6082	2018	102	60.4	> 5
GIA17	GIA17	GI	2017	10	4.9	> 5
GIC18	GIC18	GI	2018	10	7.6	> 5
SL107	SL107	EOEC, LDEOC	2019	3868	631.8	1
VOLC12	VOLC12	D5800	2013	55	12.5	2.5
VOLD12	VOLD12	D5800	2013	55	10.7	2
VOLD18	VOLD18	D5800QC	2018	1092	423.2	5
VOLE12	VOLE12	D5800	2012	55	8.5	1.5

TABLE of CONTENTS

Additional Information

Additional Information

- Available on the TMC's Website:
  - Lubricant Test Monitoring System (LTMS) Document
  - CUSUM Severity Plots
  - Reference Data, Period Statistics and Timelines
  - Information Letters and Technical Memos
  - Report Forms & Data Dictionaries
  - Online Store, and more…

- www.astmtmc.org

TABLE of CONTENTS

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