ASTM D02.B1 Semiannual Report
Passenger Car Reference Oil Testing

April 2025

Table of Contents

Table of Contents

Table of Contents

Passenger Car Engine Oil Testing
Executive Summary

- Reblends of oils 224-2, 221-1, API01-1 and API02-1.
  - The Sequence IX panel is currently introducing Oils 224-2, API01-1 and API02-1.
  - A reblend of reference oil 221-1 is available for introduction and is to be introduced during the next report period.
  - The TMC is pursuing a reblend of reference oil 544

Return to Table of Contents

Passenger Car Engine Oil Testing
Executive Summary (cont.)

- IIIH Batch 8 Pistons and PHOS Trend
  - Batch 8 pistons were successfully introduced this report period. PHOS had been encountering several warning alarms during the past two periods, but is now in action alarm. All other parameters are in control.
- Sequence VIE Severity
  - FEI1 and FEI2 are in control and have shown near target trends in the Cusum and EWMA charts for the past two report periods.

Return to Table of Contents

Passenger Car Engine Oil Testing
Executive Summary (cont.)

- Aged Oil LSPI
  - Re-blends of both reference oils API01 and API02 have been obtained and are being introduced.
- Sequence VH
  - Industry is currently in action alarm for AES and RAC. The panel is actively working on obtaining a new fuel batch and is meeting bi-weekly to address this and other issues.

Return to Table of Contents

Calibrated Labs and Stands*

Test	Labs	Stands
IIIH/A/B	5	10
IVA	1	1
IVB	3	4
VH	3	9
VIE	5	16
VIF	3	4
VIII	2	4
IX	4	7
IXAGED	4	7
X	4	6

Return to Table of Contents

*As of 3/31/2025

Sequence IIIH/A/B

April 2025

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

Sequence IIIH/A/B Activity

Test Status	Validity Code	#
Acceptable Calibration Test	AC	27
Unacceptable Calibration Test	OC	2
Total		29

Sequence IIIH – Failing Tests

Test Status	#
Ei Level 3 Alarm WPD, Mild direction	1
Ei Level 3 Alarm WPD, Severe direction	1
Total	**2**

Sequence IIIH – Lost Tests

Test Status	Cause	#
	No lost tests this reporting period	
Totals		**0**

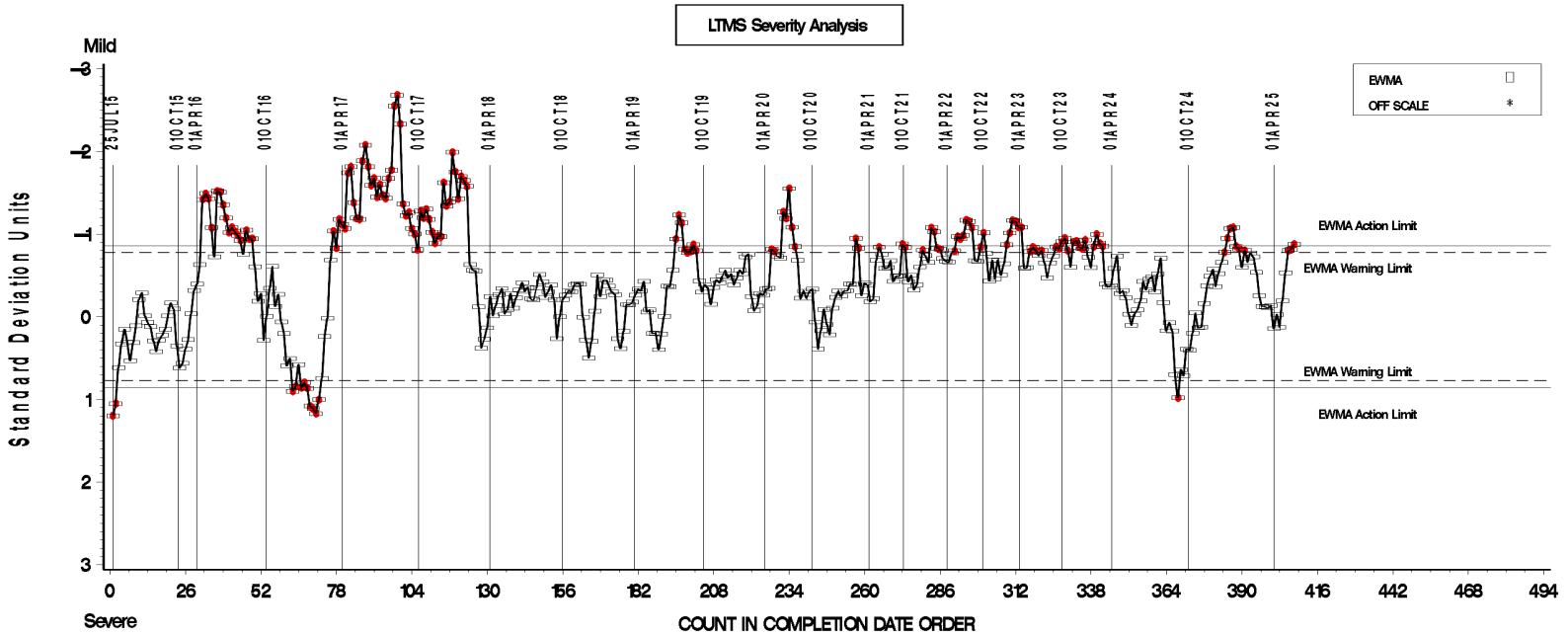
Sequence IIIH Test Severity

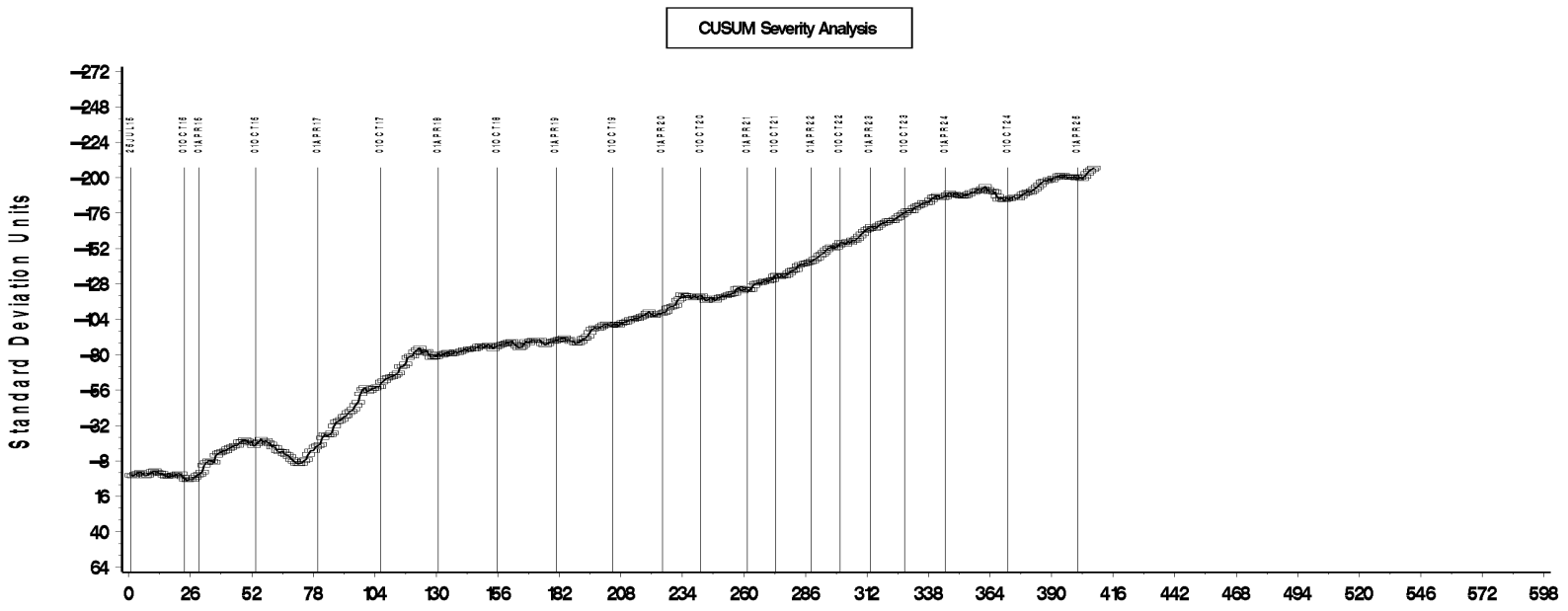
- VISI is in action alarm (mild direction)
- WPD exceeded the action limit this period (severe direction) now within limits
- APV and MRP both exceeded the action limit this period (mild direction) now within limits.
- All other parameters are in control.

SEQUENCE IIIH INDUSTRY OPERATIONALLY VALID DATA

A Program of ASTM International

VISCOSITY INCREASE FINAL ORIG UNIT RES

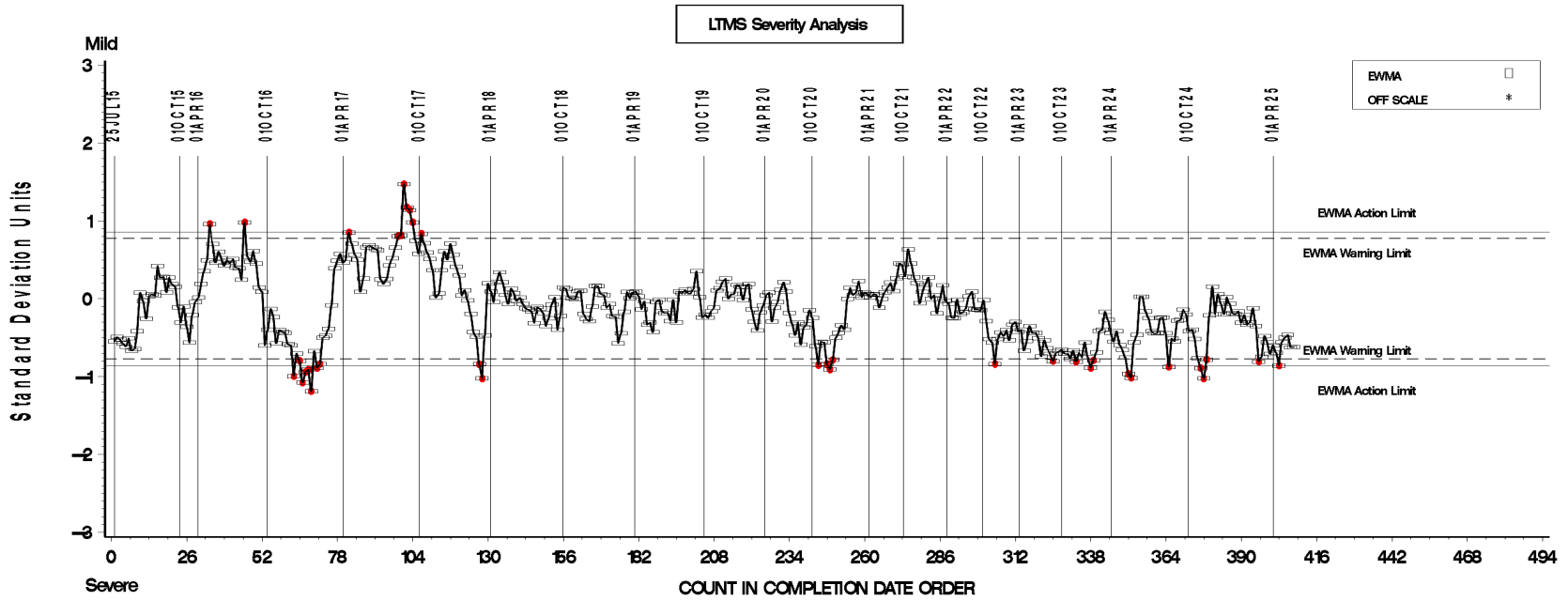


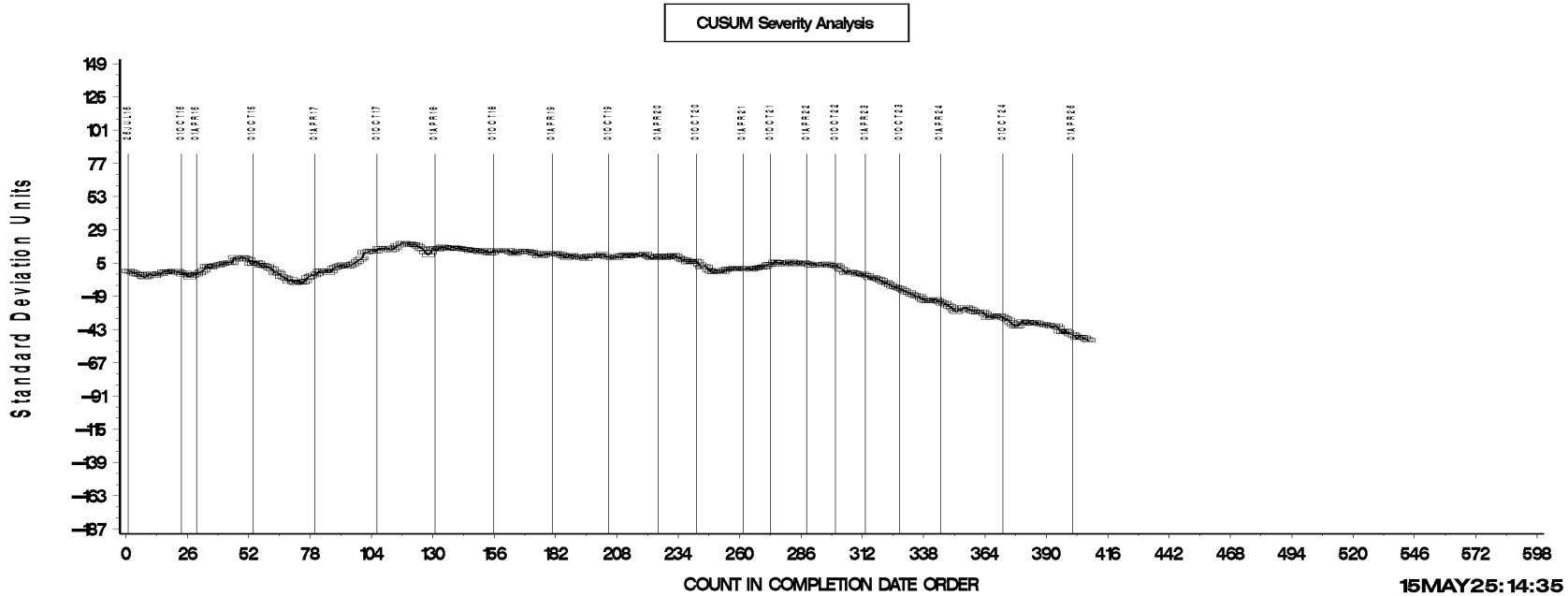


15MAY25:14:31

SEQUENCE IIIH INDUSTRY OPERATIONALLY VALID DATA

AVERAGE WEIGHTED PISTON DEPOSITS FNL ORIG U



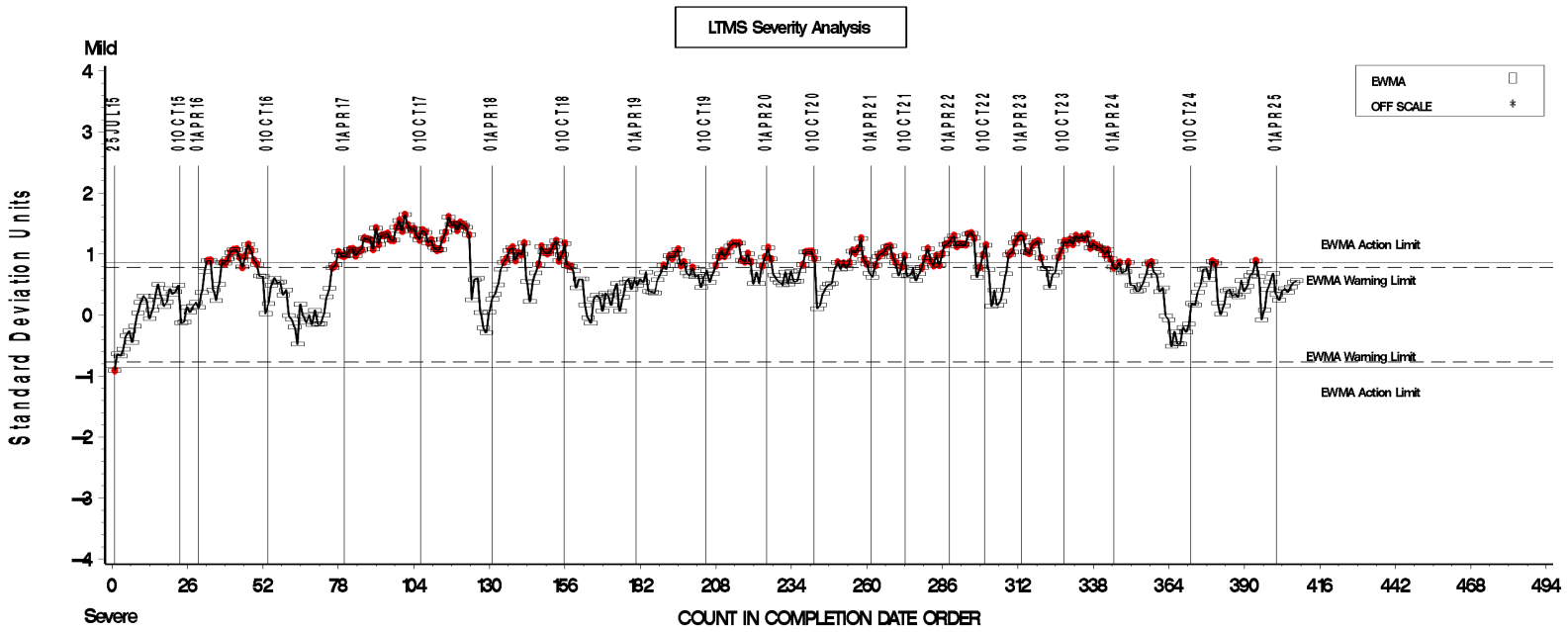


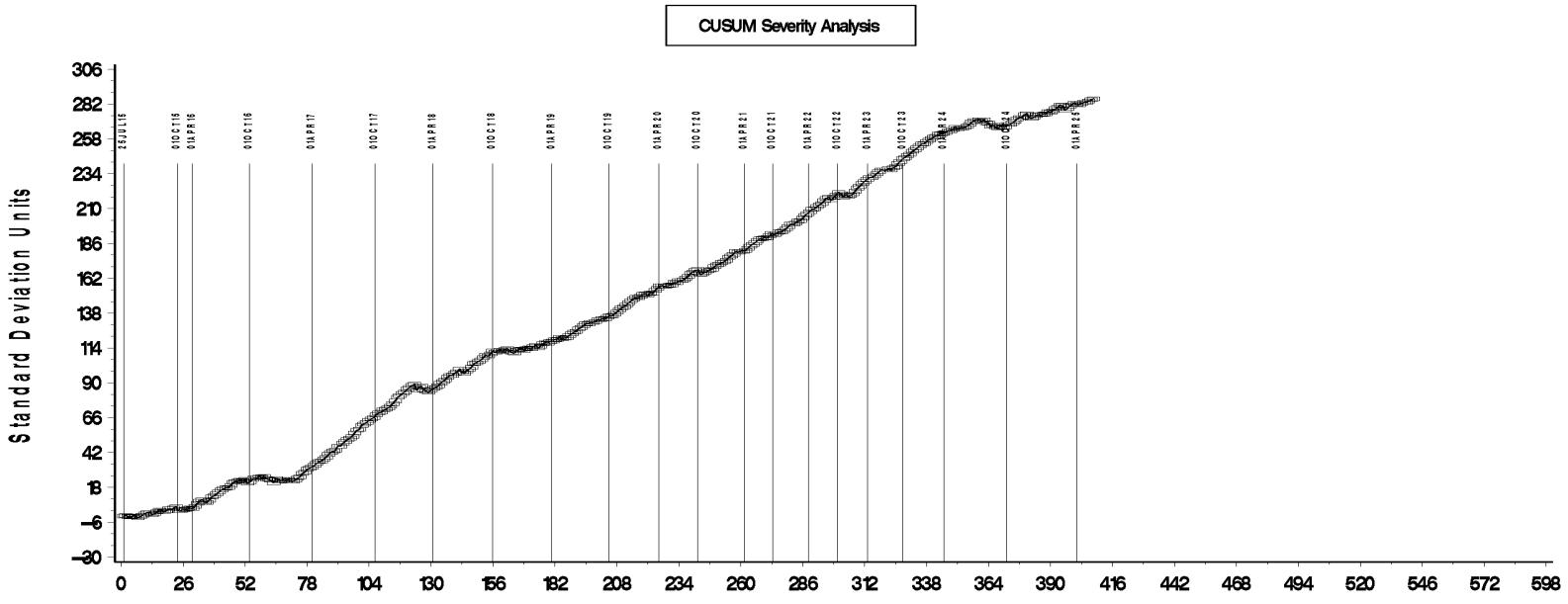
15MAY25:14:35

SEQUENCE IIIH INDUSTRY OPERATIONALLY VALID DATA

A Program of ASTM International

AVERAGE PISTON SKIRT VARNISH



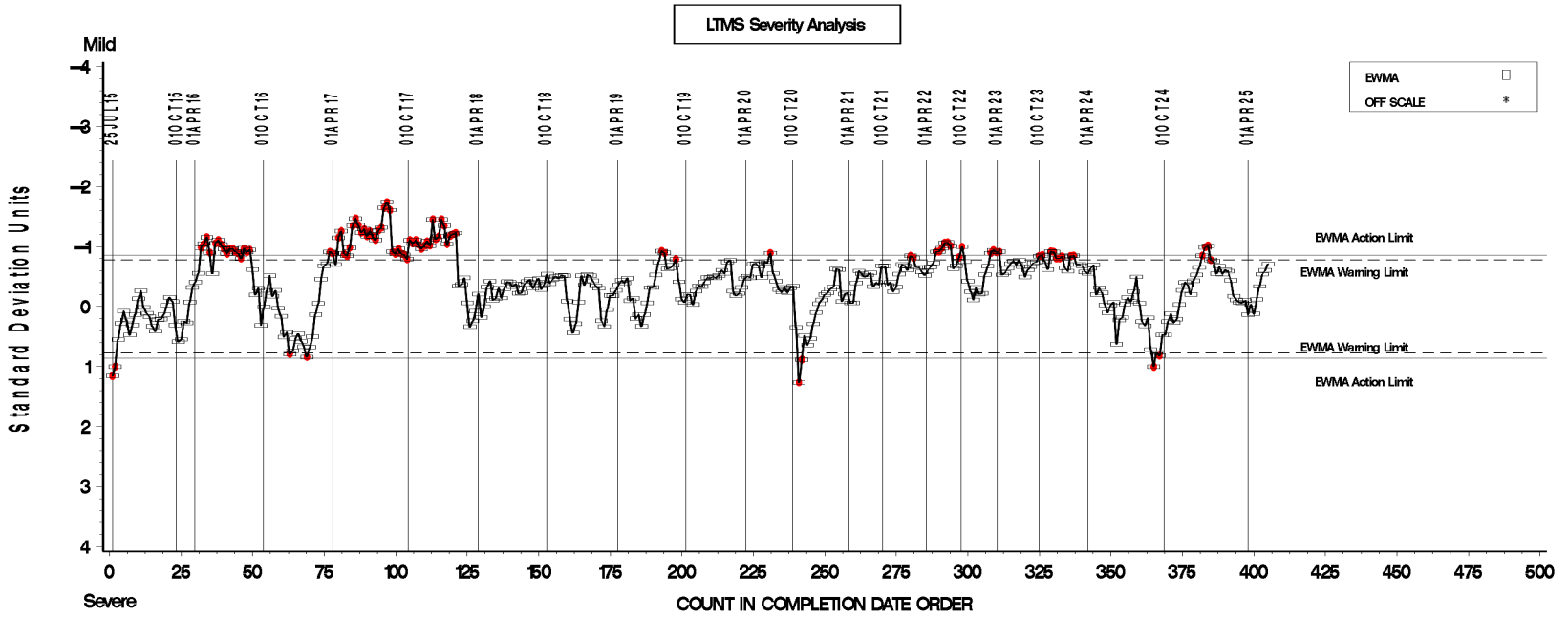


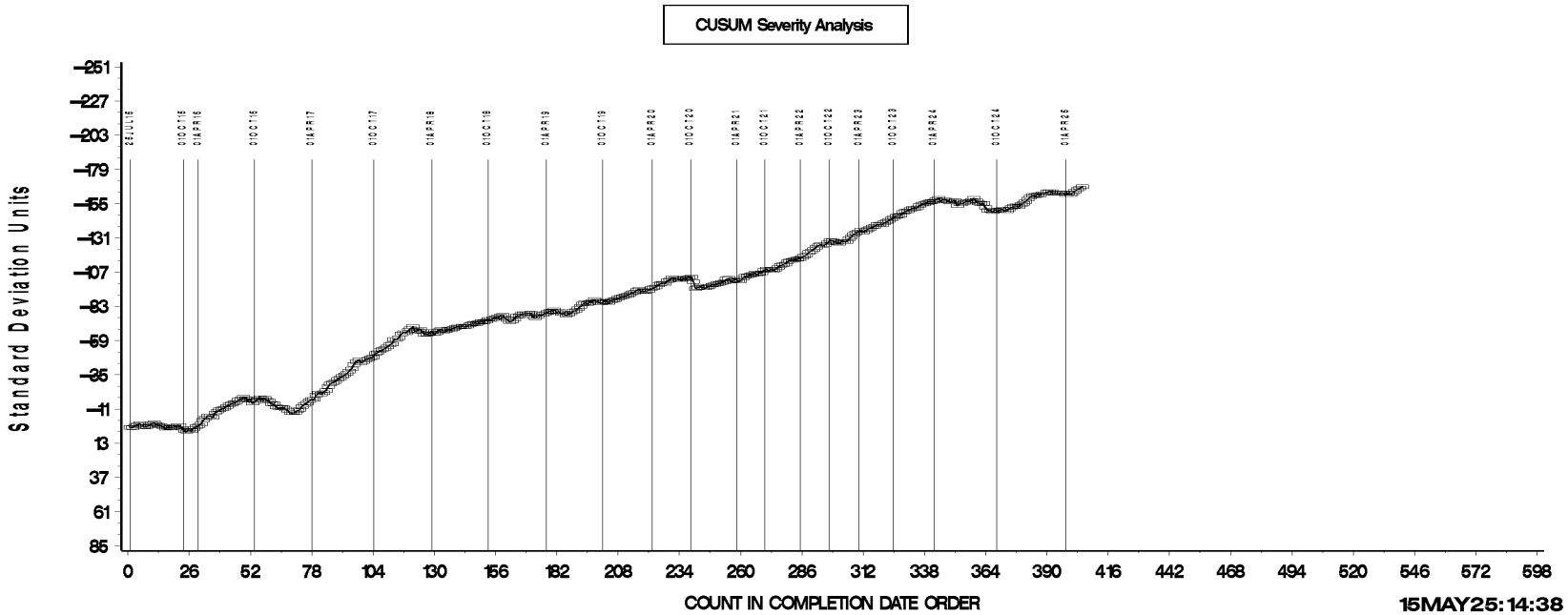
02JUN25:09:55

SEQUENCE IIIHA INDUSTRY OPERATIONALLY VALID DATA

A Program of ASTM International

MRV FINAL ORIG UNIT RES [NM, FROZEN, SOLID]



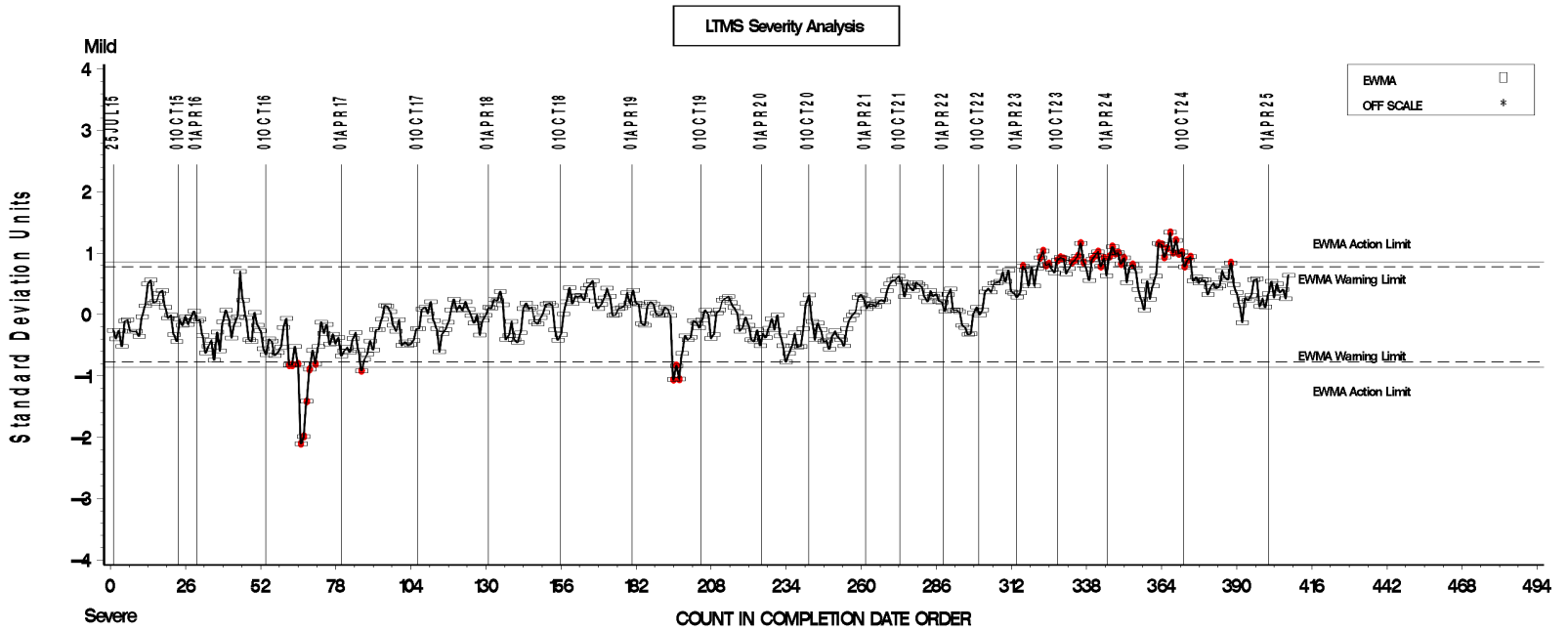


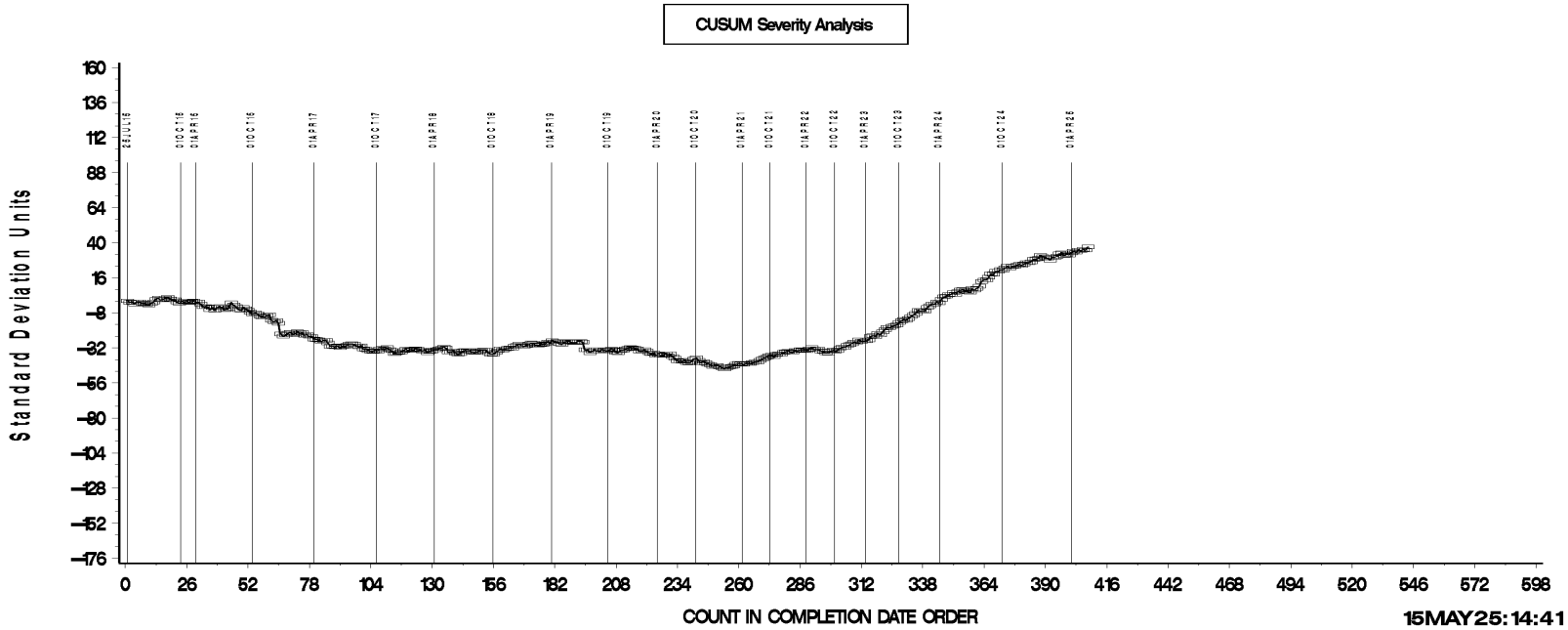
15MAY25:14:38

SEQUENCE IIIHB INDUSTRY OPERATIONALLY VALID DATA

A Program of ASTM International

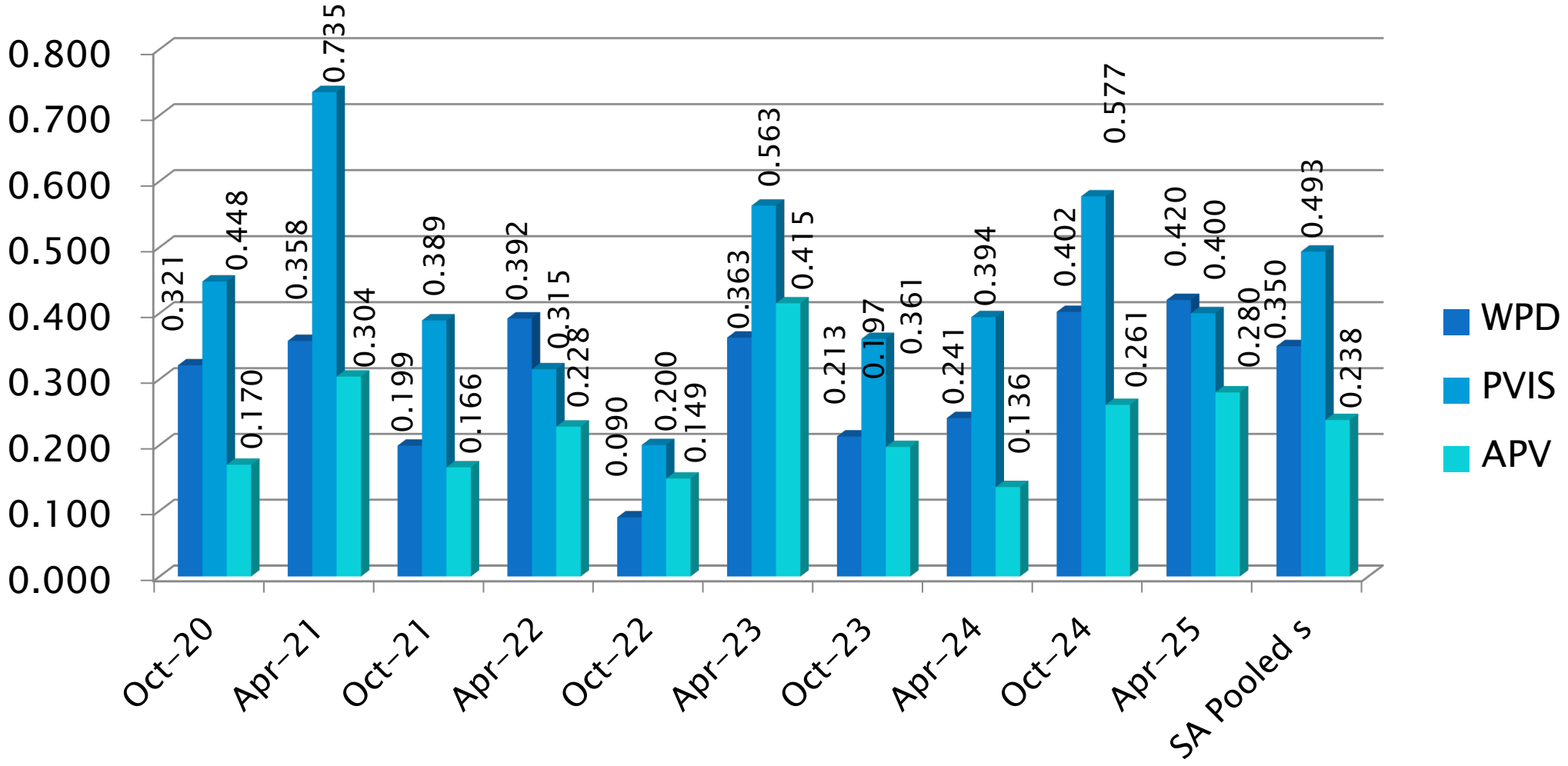
PHOSPHORUS RETENTION, FINAL RESULT





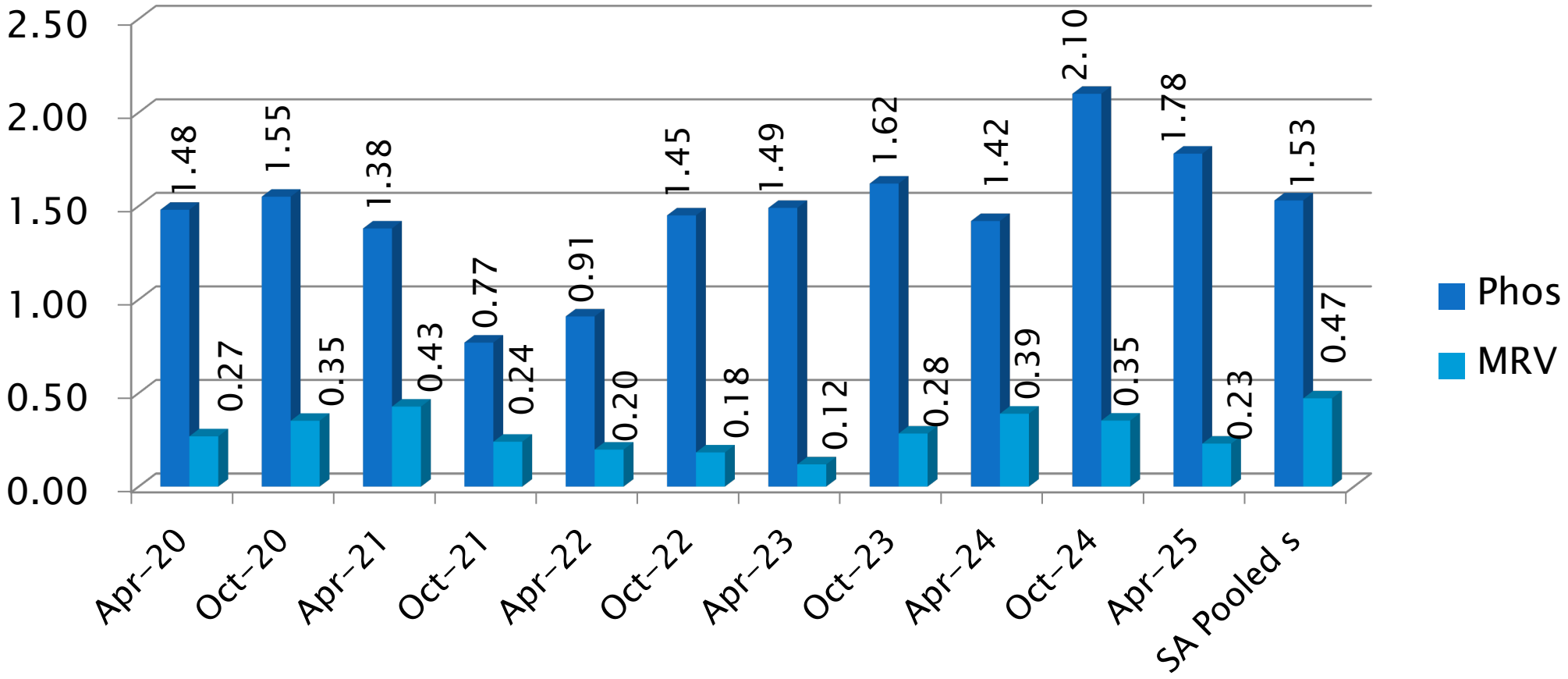
15MAY25:14:41

IIIH Precision Estimates



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

Sequence IIIHA/B Precision Estimates



Return to Table of Contents

Sequence IVA

- April 2025

Test Monitoring Center
https://www.astmtmc.org

A Program of ASTM International

Sequence IVA Activity

Test Status	Validity Code	#
Acceptable calibration attempt	AC	1
Total		1

Sequence IVA Test Severity

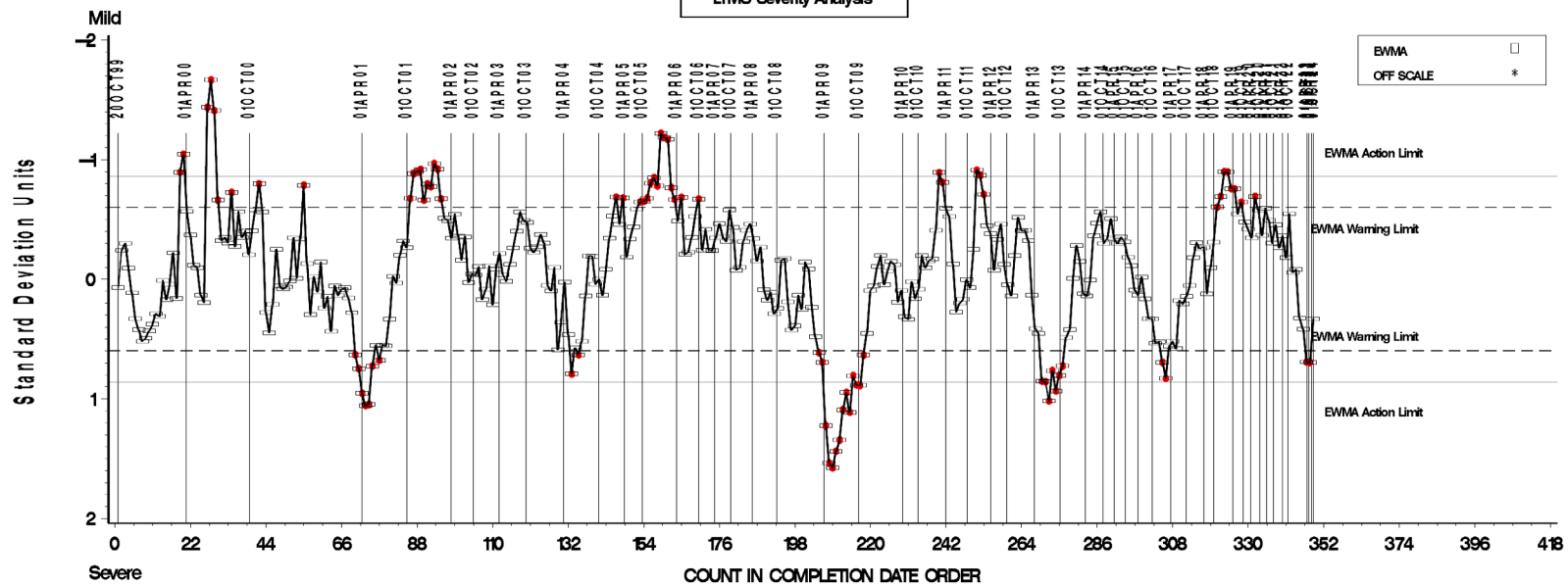
- Severity and precision started the period exceeding the warning limits but are now within the limits.

SEQUENCE IVA INDUSTRY OPERATIONALLY VALID DATA

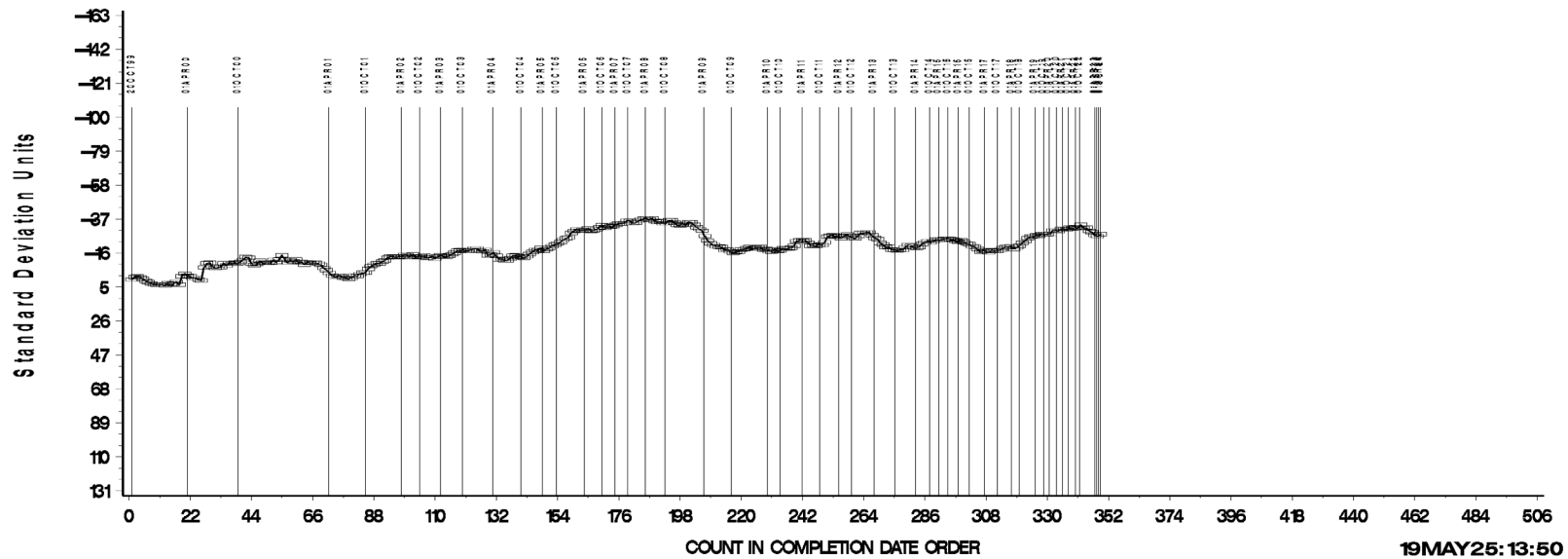
A Program of ASTM International

AVERAGE CAM WEAR

LTMS Severity Analysis



CUSUM Severity Analysis

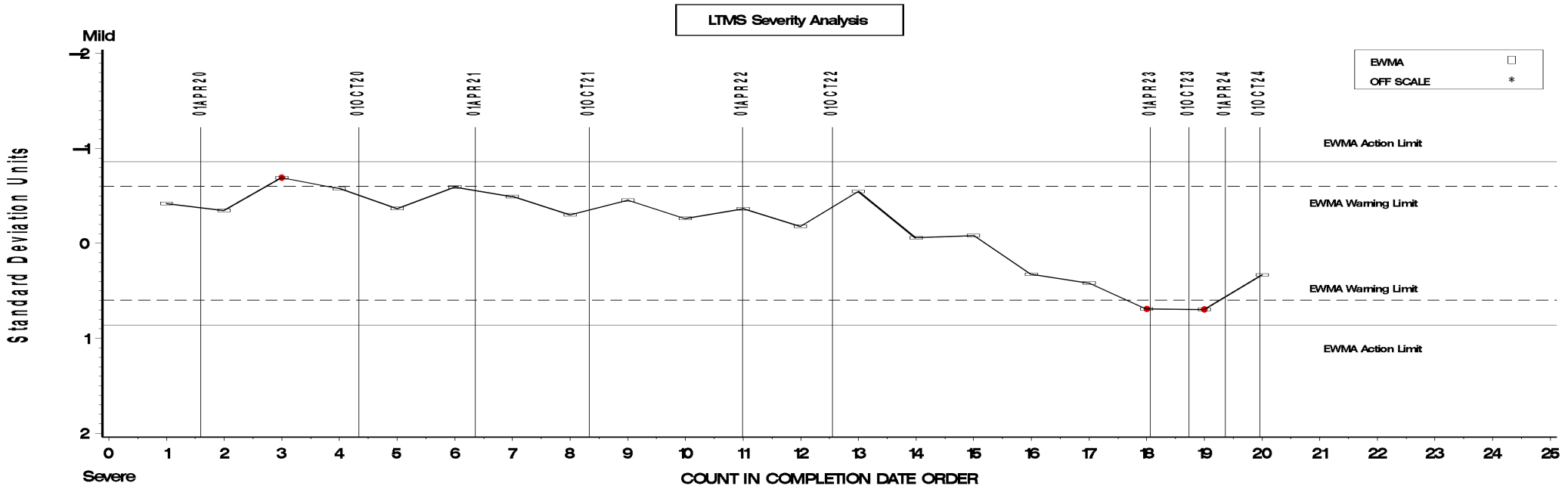


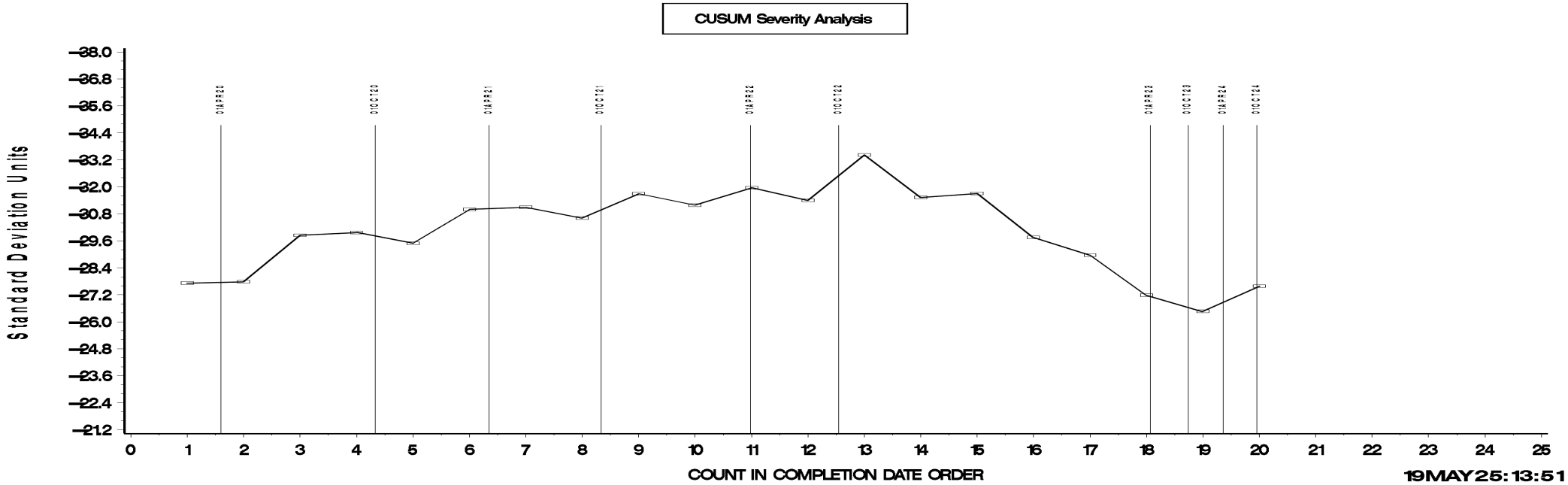
19MAY25:13:50

SEQUENCE IVA INDUSTRY OPERATIONALLY VALID DATA

A Program of ASTM International

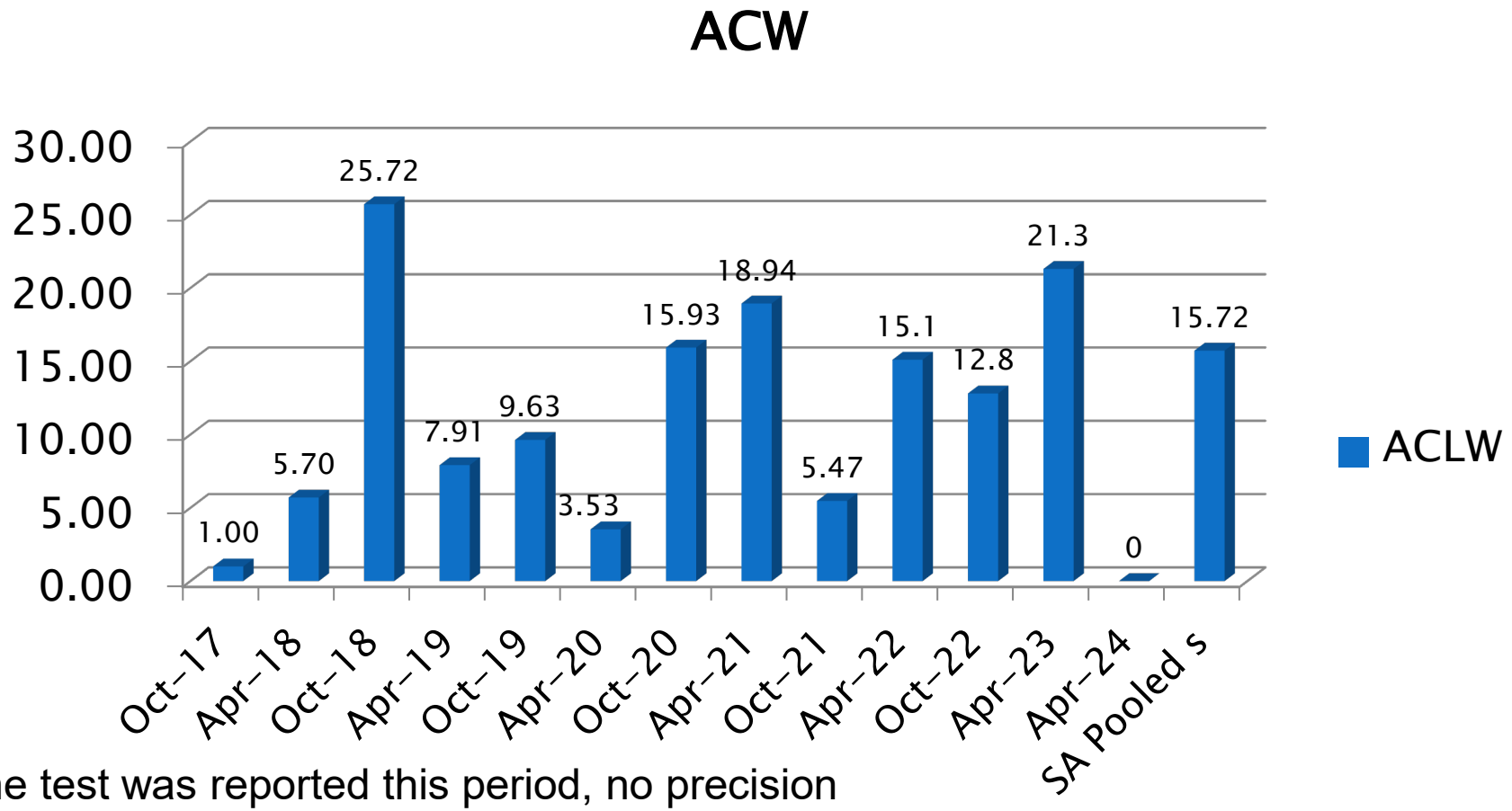
AVERAGE CAM WEAR





19MAY25:13:51

Sequence IVA Precision Estimates



Only one test was reported this period, no precision estimate is available

Return to Table of Contents

Sequence IVB

- April 2025

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

Sequence IVB Activity

Test Status	Validity Code	#
Acceptable Calibration Test	AC	9
Failed Calibration Test	OC	2
Aborted Calibration Test	XC	1
Total		**12**

Sequence – Failing Tests

Test Status	Validity Code	#
Failed Calibration Test, end of test Iron (mild)	OC	1
Failed Calibration Test, end of test Iron (severe)	OC	1
Total		**2**

Sequence – Lost Tests

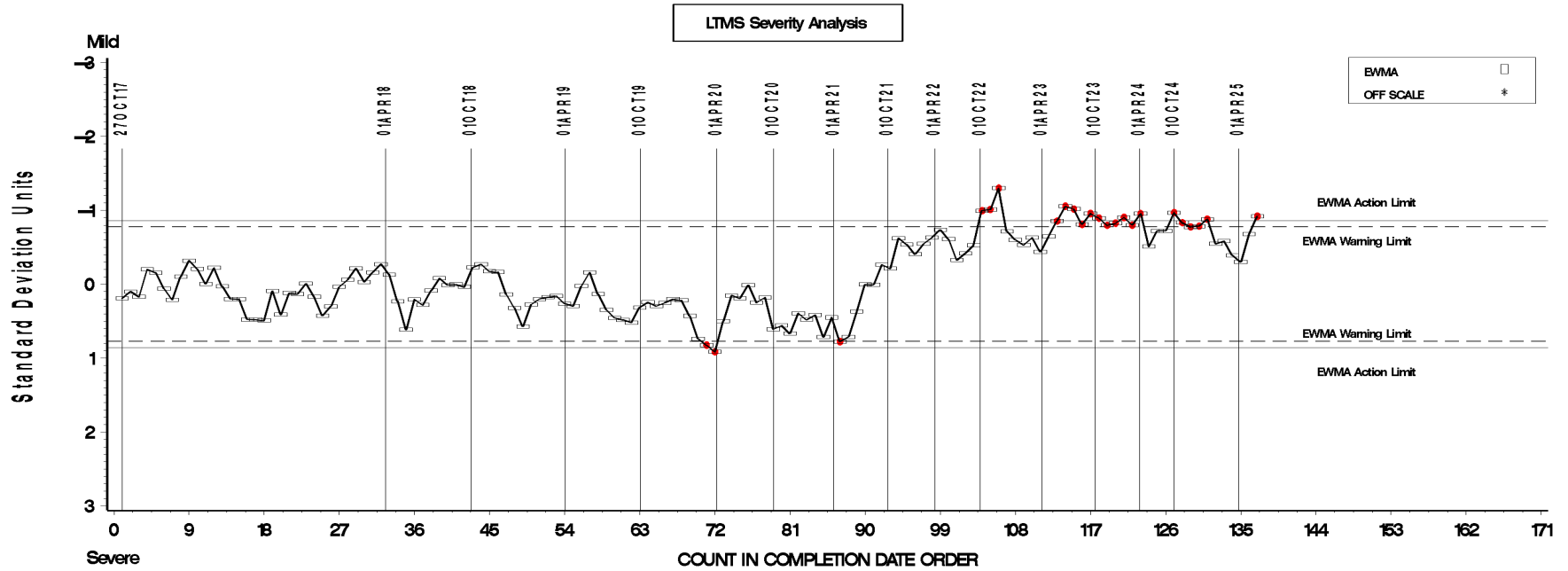
Test Status	Cause	#
XC	Test aborted due to high oil consumption	1
Totals		**1**

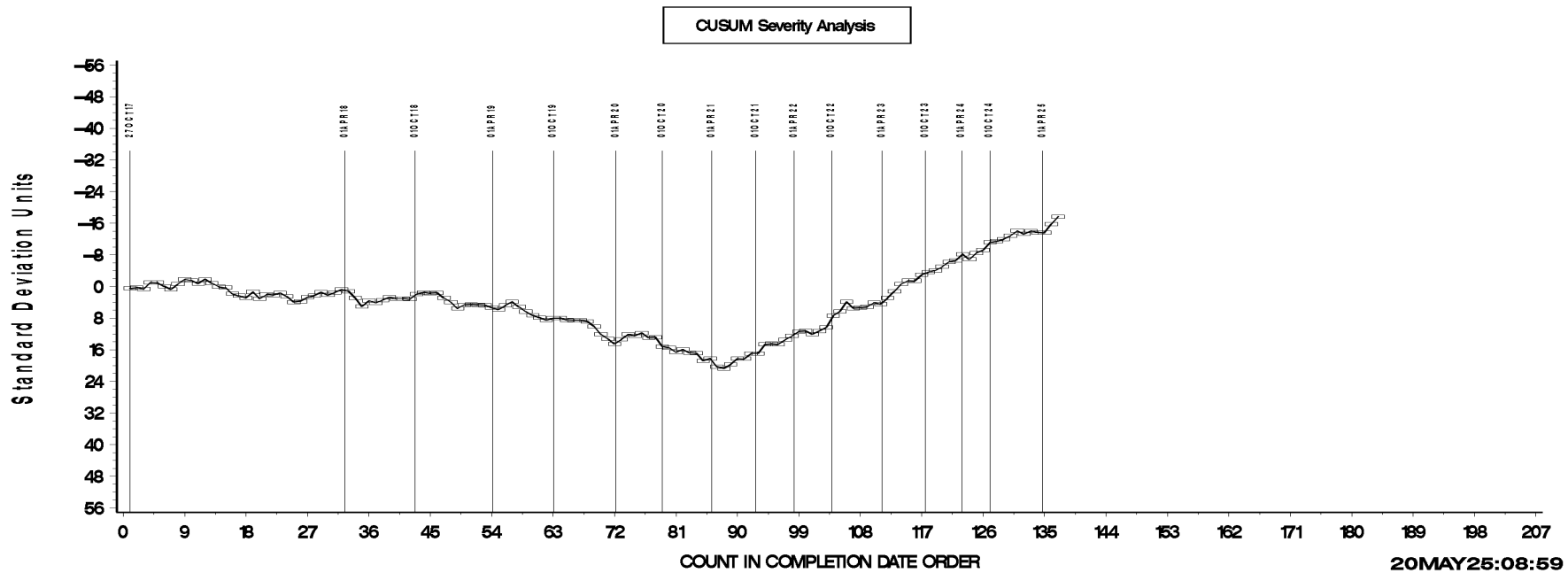
Sequence IVB Test Severity

- AVL finished the reporting period exceeding the action limit in the mild direction.

SEQUENCE IVB INDUSTRY OPERATIONALLY VALID DATA

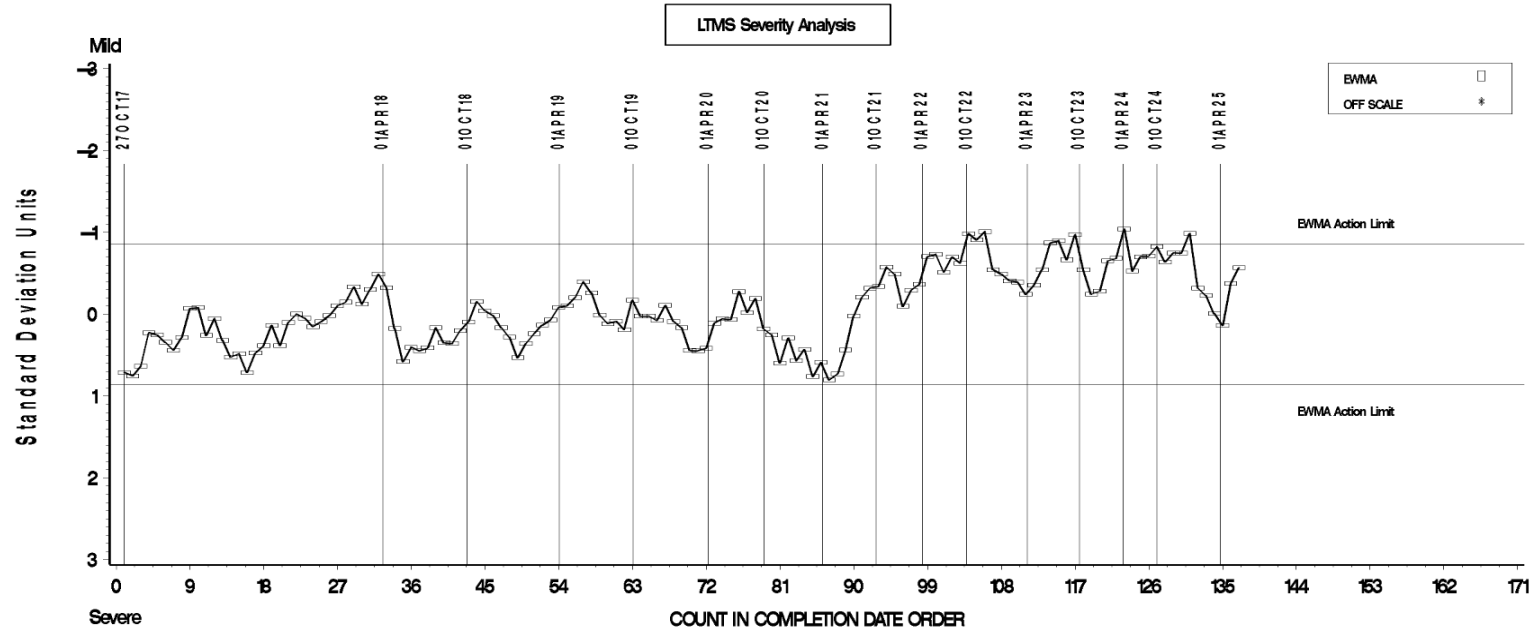
AVERAGE VOLUME LOSS BY KEYENCE INTAKE Final

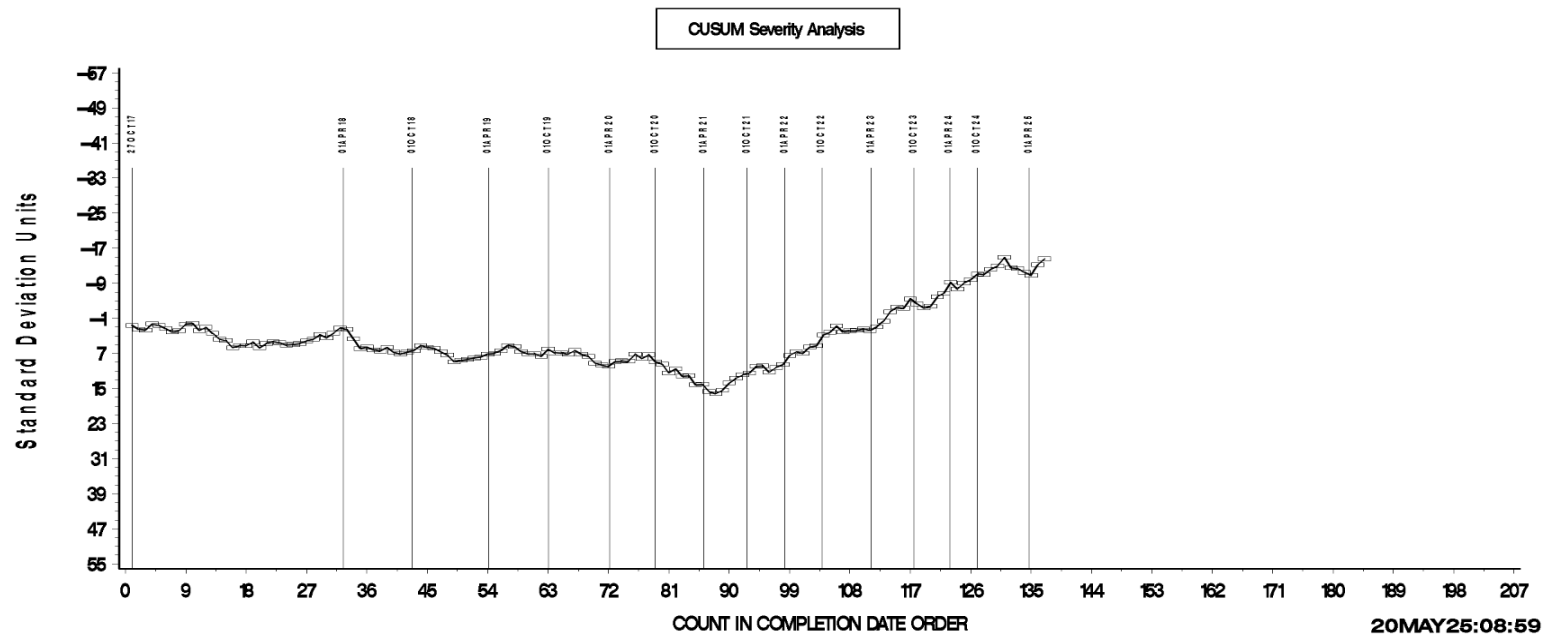




SEQUENCE IVB INDUSTRY OPERATIONALLY VALID DATA

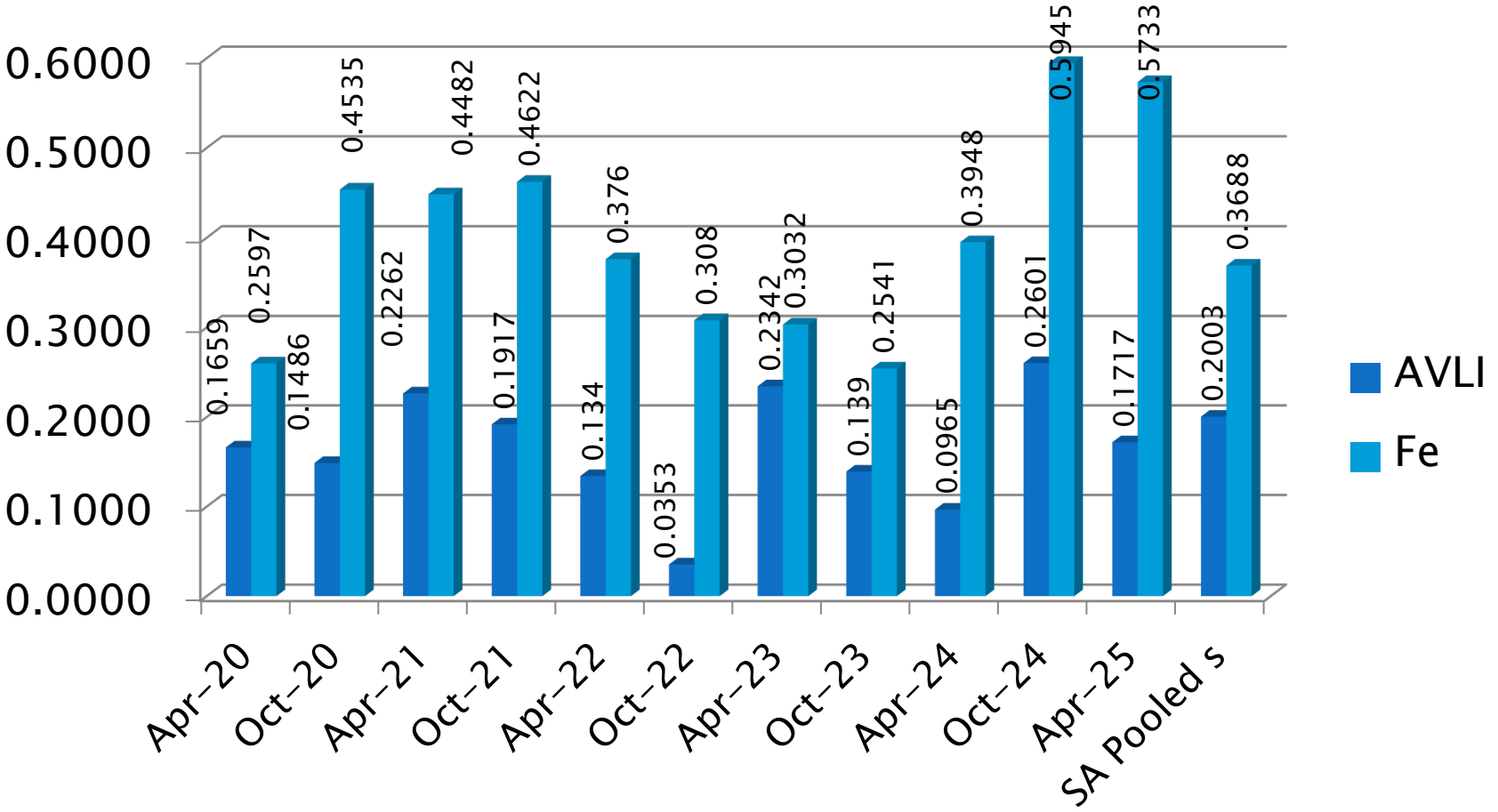
END OF TEST FE FINAL Severity Adjusted RESULT





20MAY25:08:59

Sequence IVB Precision Estimates



Return to Table of Contents

Sequence VH

April 2025

Test Monitoring Center
https://www.astmtmc.org

A Program of ASTM International

Sequence VH Activity

Test Status	Validity Code	#
Acceptable Calibration Test	AC	5
Statistically Unacceptable Calibration Test	OC	3
Fuel Approval Test	PF	6
Total		

Sequence VH – Failing Tests

Test Status	#
Ei Level 3 varnish, Severe direction	3
Total	**3**

Sequence VH – Lost Tests

Test Status	Cause	#
	No lost tests this reporting period	
Totals		

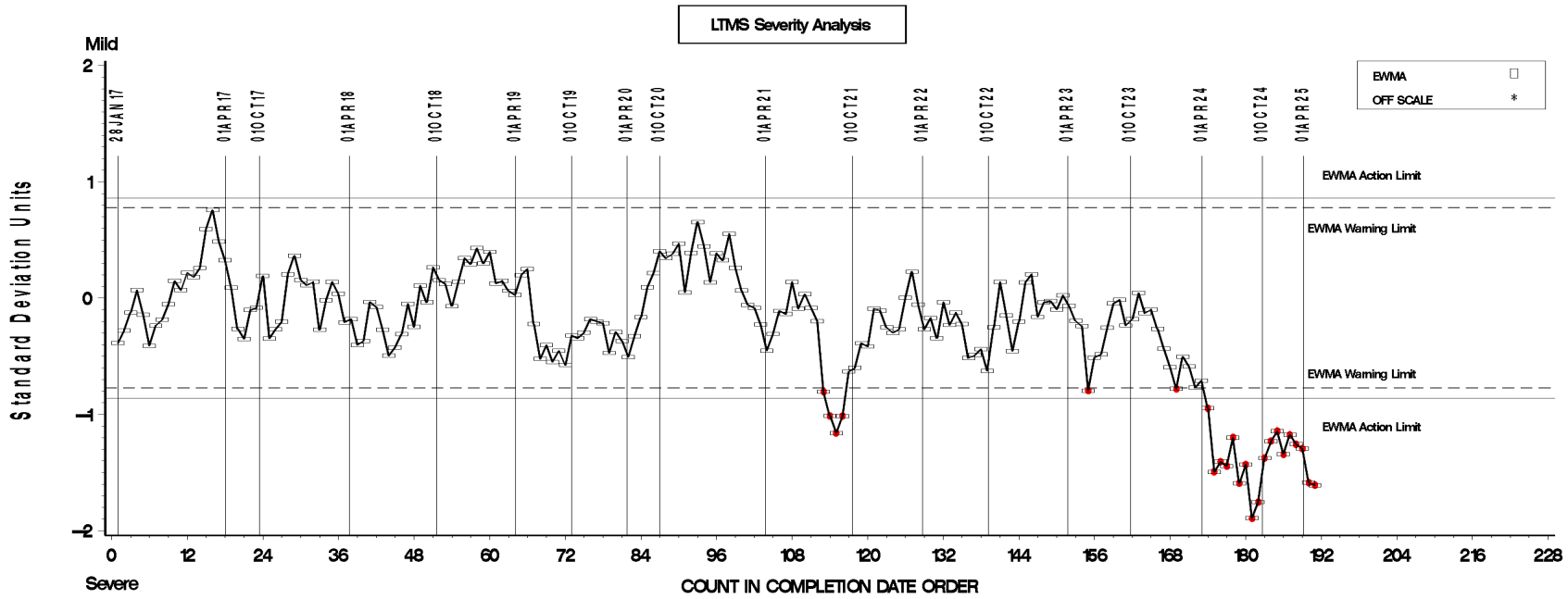
Sequence VH Test Severity

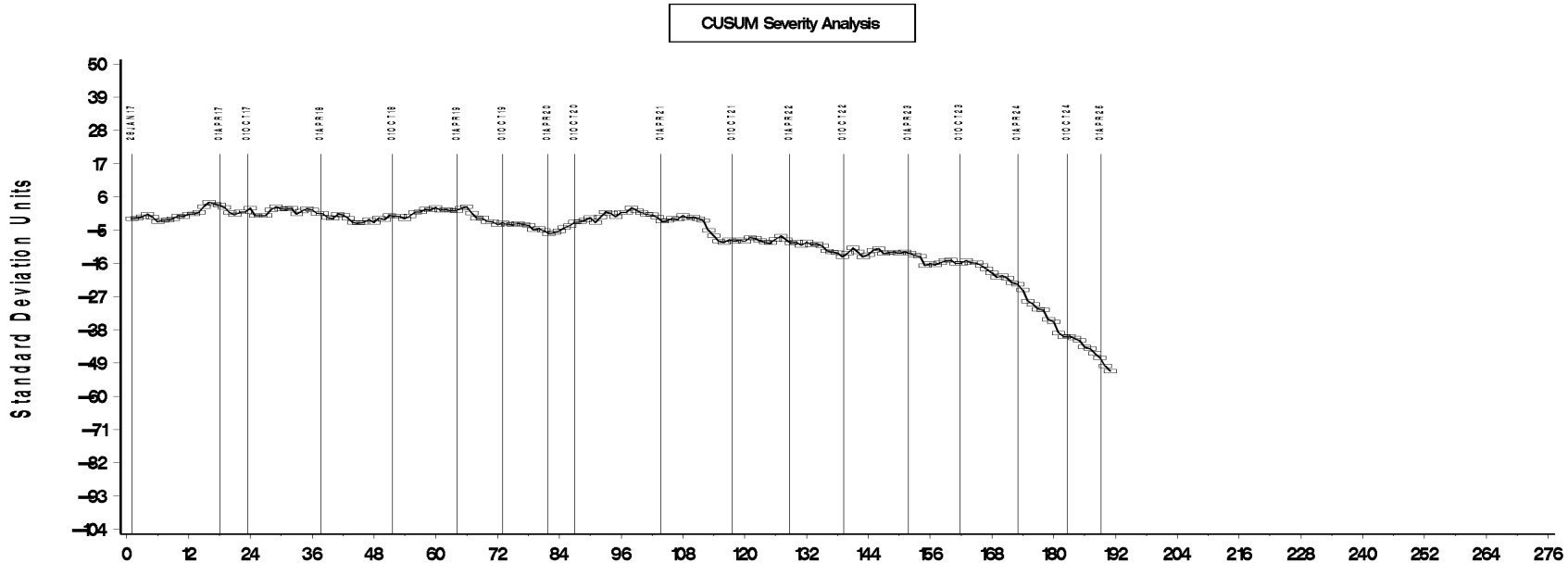
- AES, AE50 and AP50 parameters are all in action alarm (severe direction)
- RAC is in control

SEQUENCE VH INDUSTRY OPERATIONALLY VALID DATA

A Program of ASTM International

AVERAGE ENGINE SLUDGE



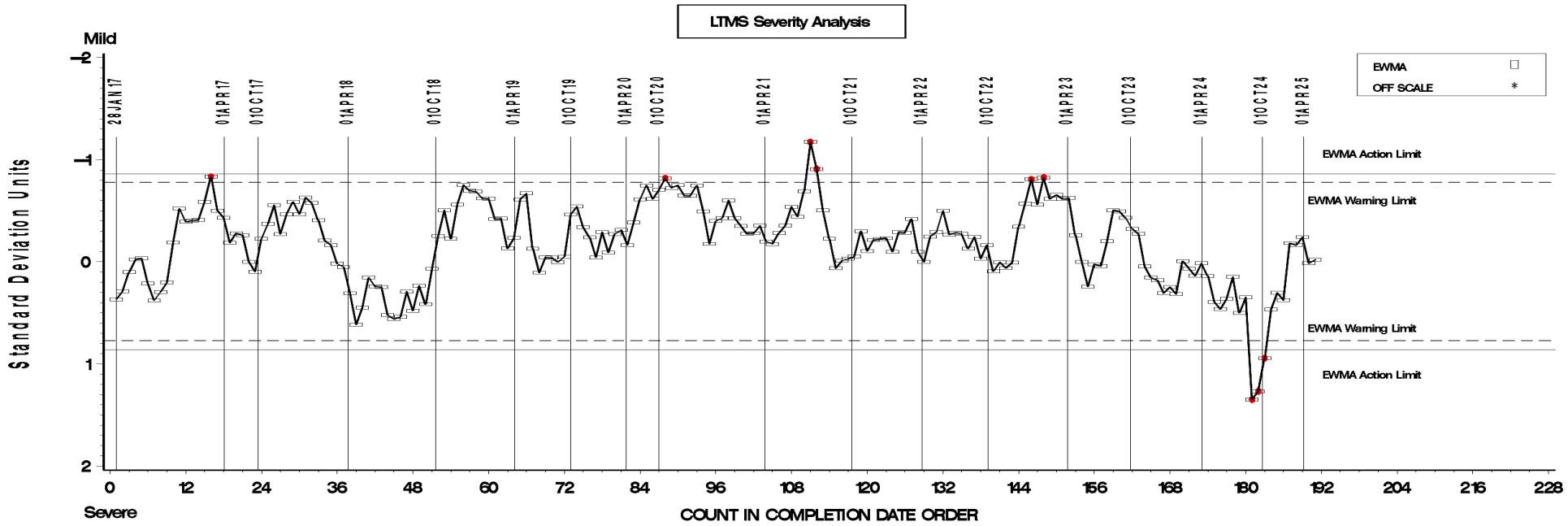


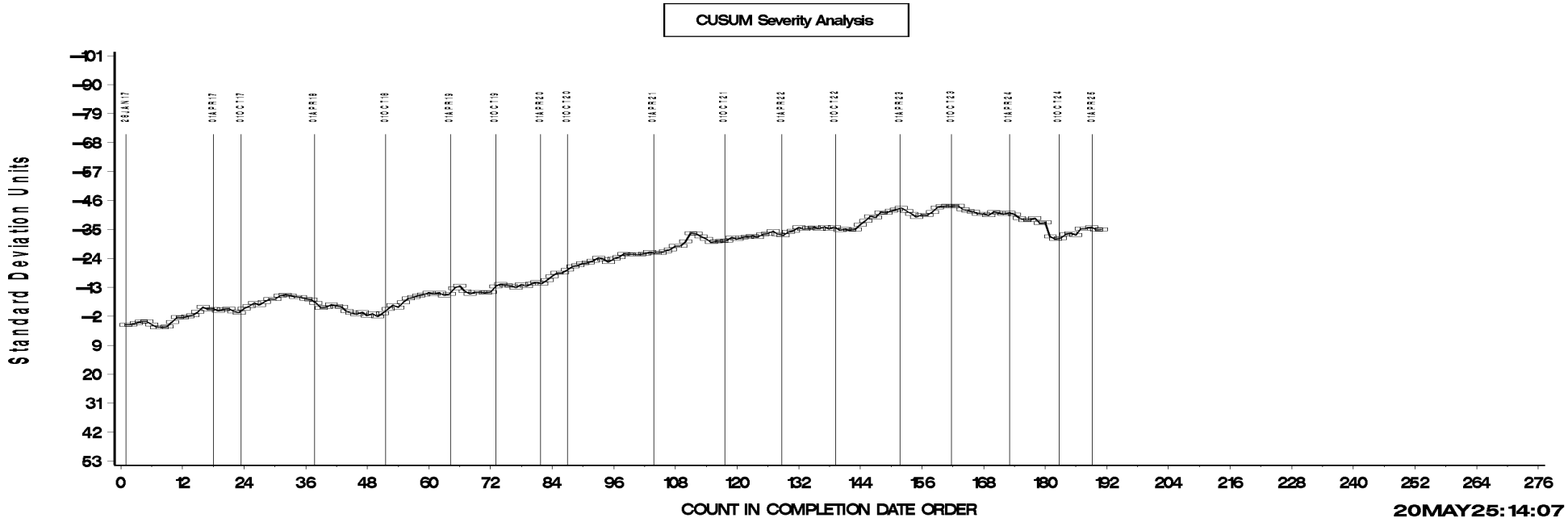
20MAY25:14:07

SEQUENCE VH INDUSTRY OPERATIONALLY VALID DATA

A Program of ASTM International

AVERAGE ROCKER COVER SLUDGE



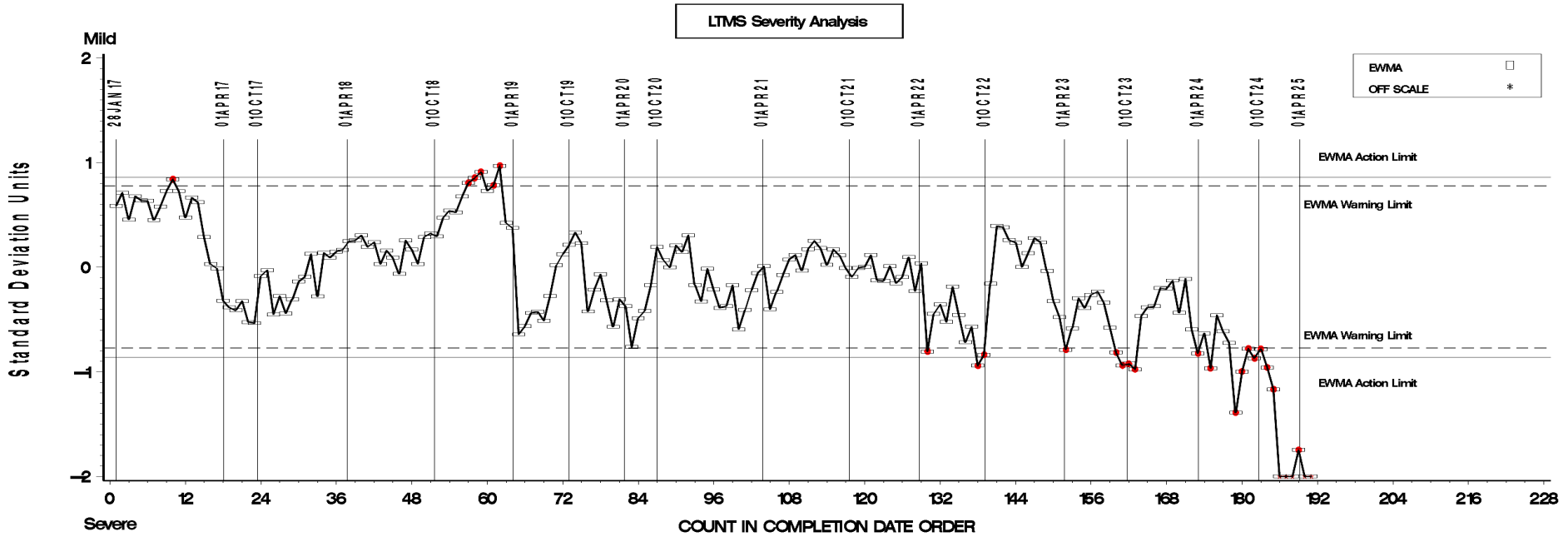


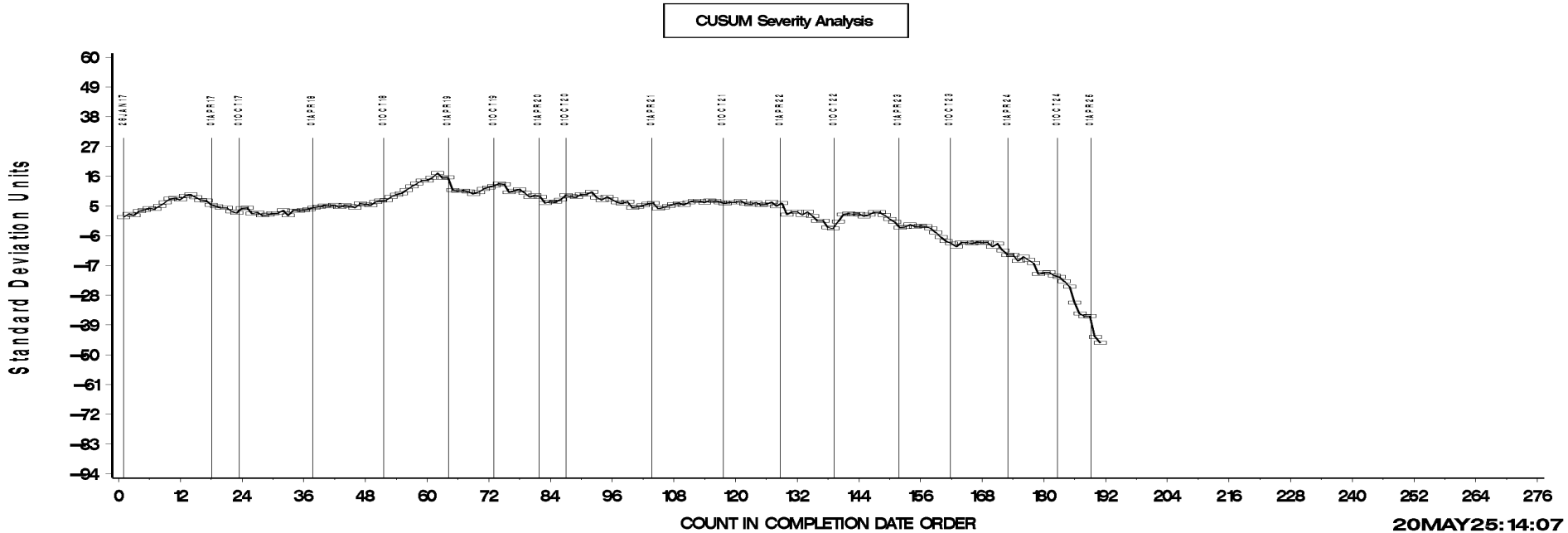
20MAY25:14:07

SEQUENCE VH INDUSTRY OPERATIONALLY VALID DATA

A Program of ASTM International

AVG. ENG. VARN. 50% RATING





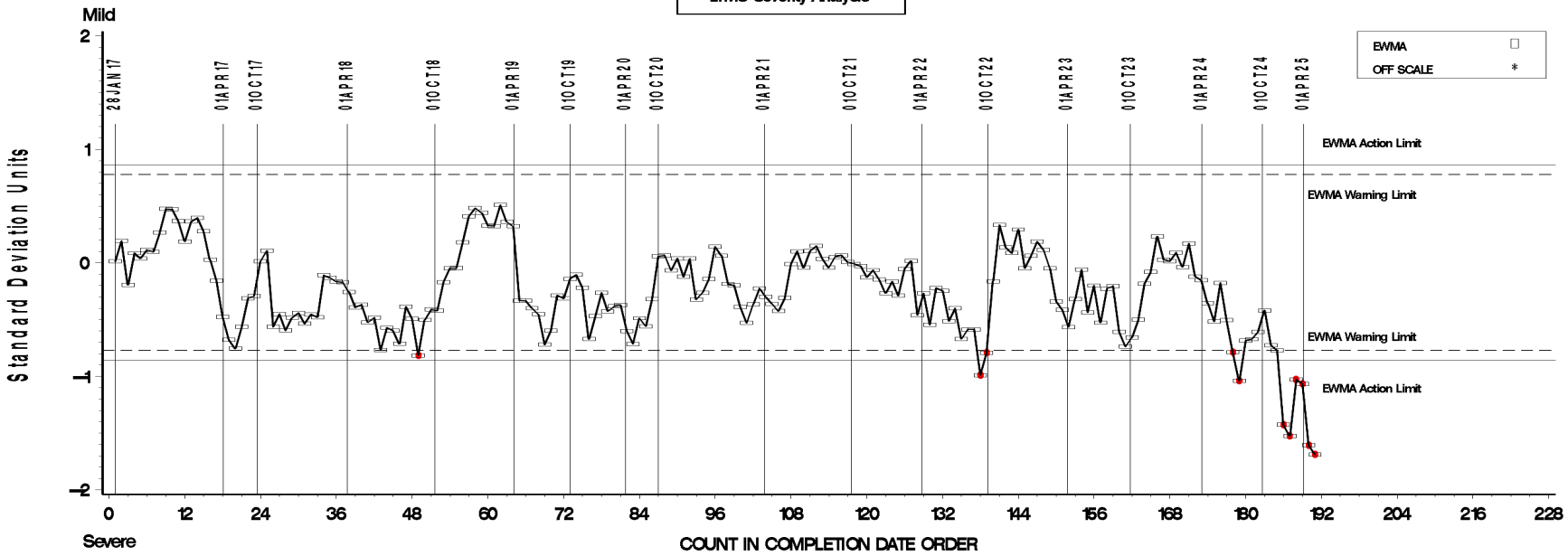
20MAY25:14:07

SEQUENCE VH INDUSTRY OPERATIONALLY VALID DATA

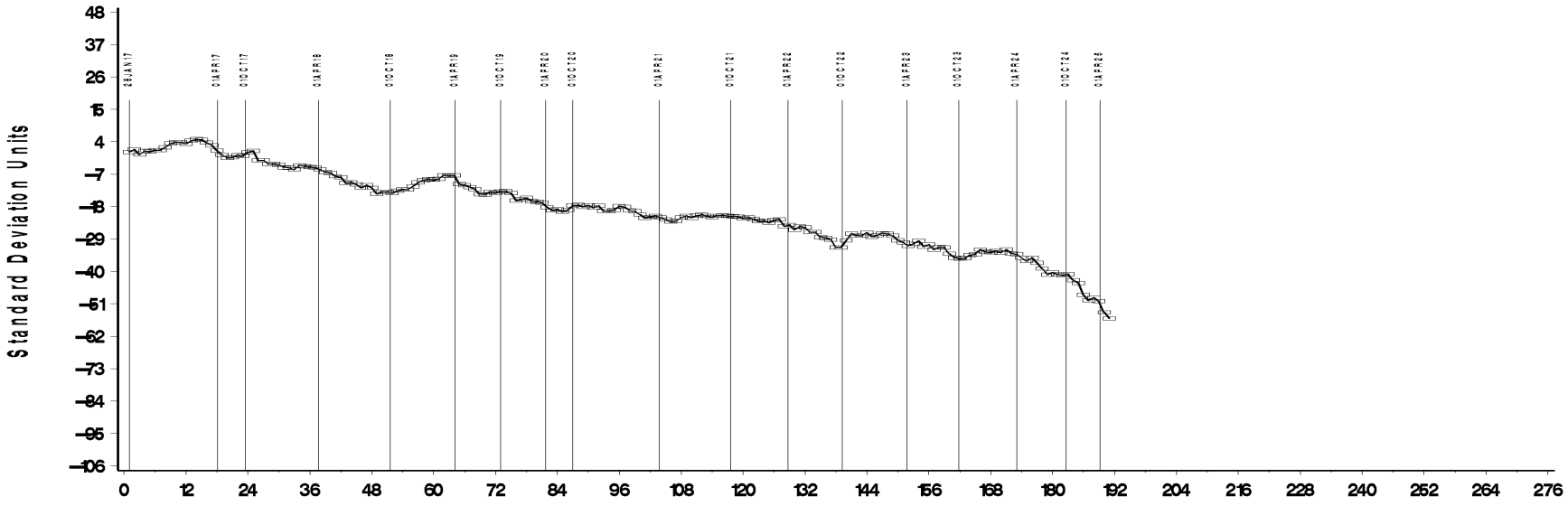
A Program of ASTM International

AVG PISTON SKIRT 50% RATING

LTMS Severity Analysis

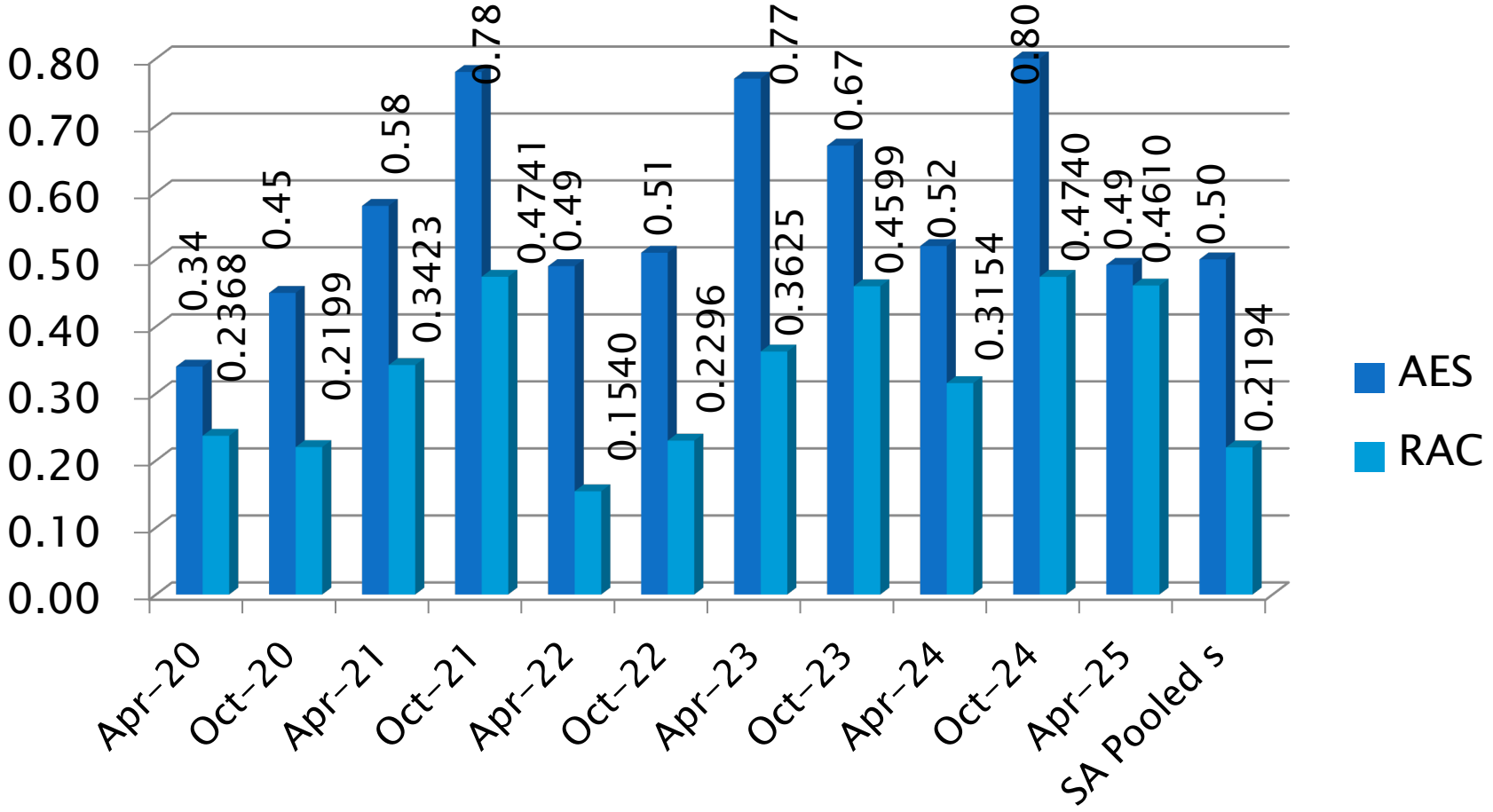


CUSUM Severity Analysis

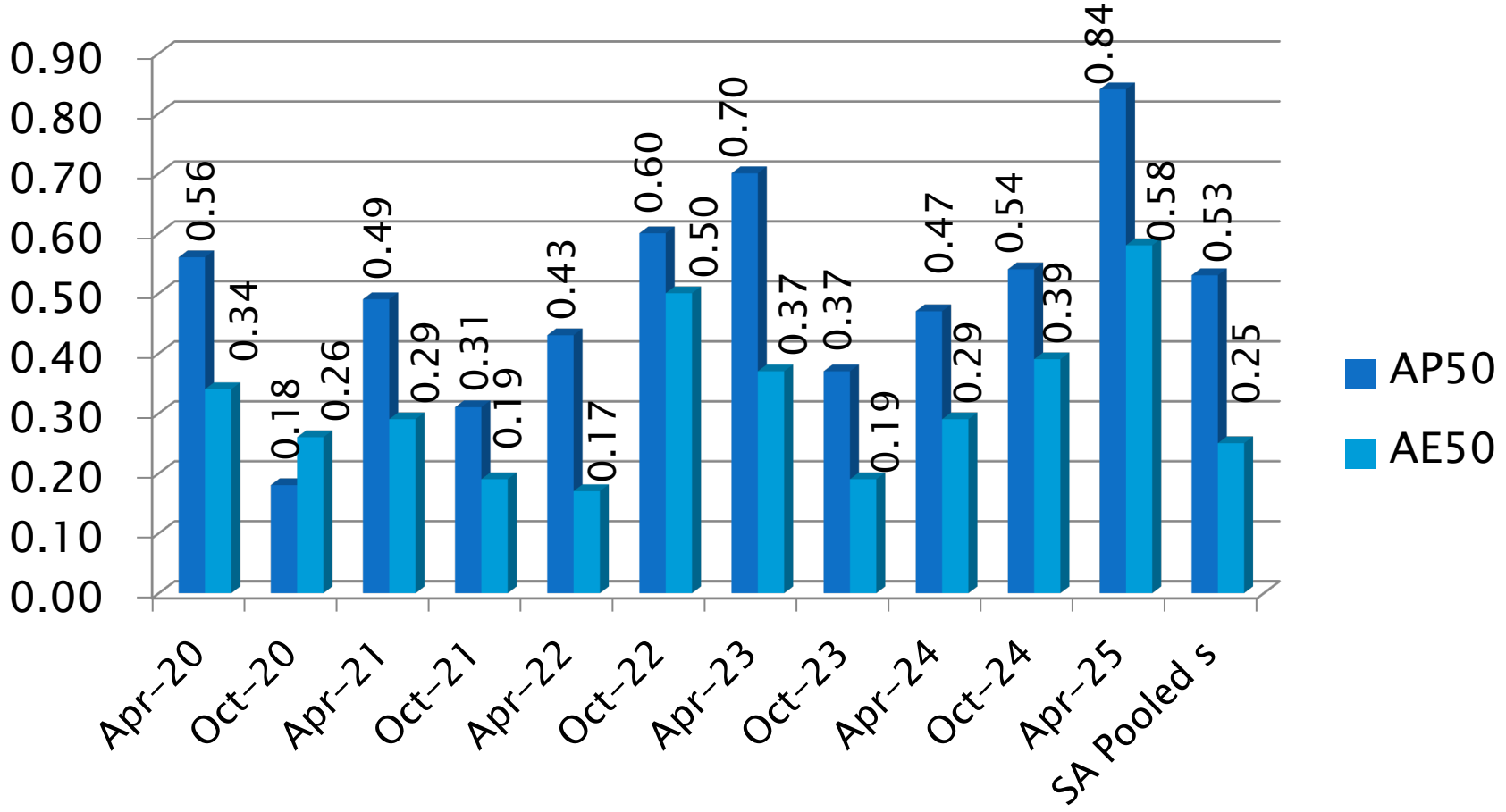


20MAY25:14:07

Sequence VH Precision Estimates



Sequence VH Precision Estimates



Return to Table of Contents

Sequence VIE

- April 2025

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

Sequence VIE Activity

Test Status	Validity Code	#
Acceptable Calibration Test	AC	37
Engine Abandoned	MC	2
Statistically Unacceptable Calibration Test	OC	1
Aborted Calibration Test	XC	2
Invalid Test	LC	1
Acceptable Non-blind Information Run (VIG development)	NN	1
Total		**44**

Sequence VIE – Failing Tests

Test Status	#
FEI1 & FEI2 severe	1
Total	**1**

Sequence VIE – Lost Tests*

Test Status	Cause	#
Aborted	Oil charge accidentally flushed during troubleshooting	1
Aborted	Allowable stage restarts exceeded	1
Invalid	Coolant in temp out spec BLA5	1
Totals		**3**

*Invalid and aborted tests

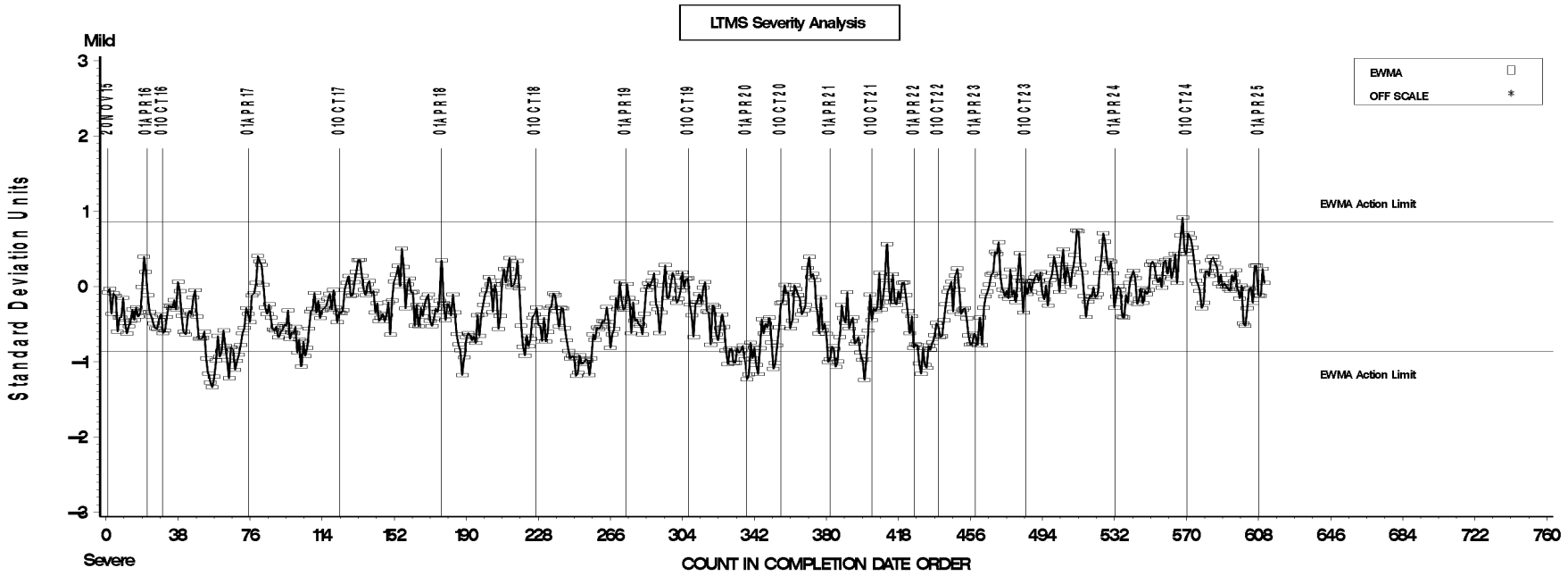
Sequence VIE Test Severity

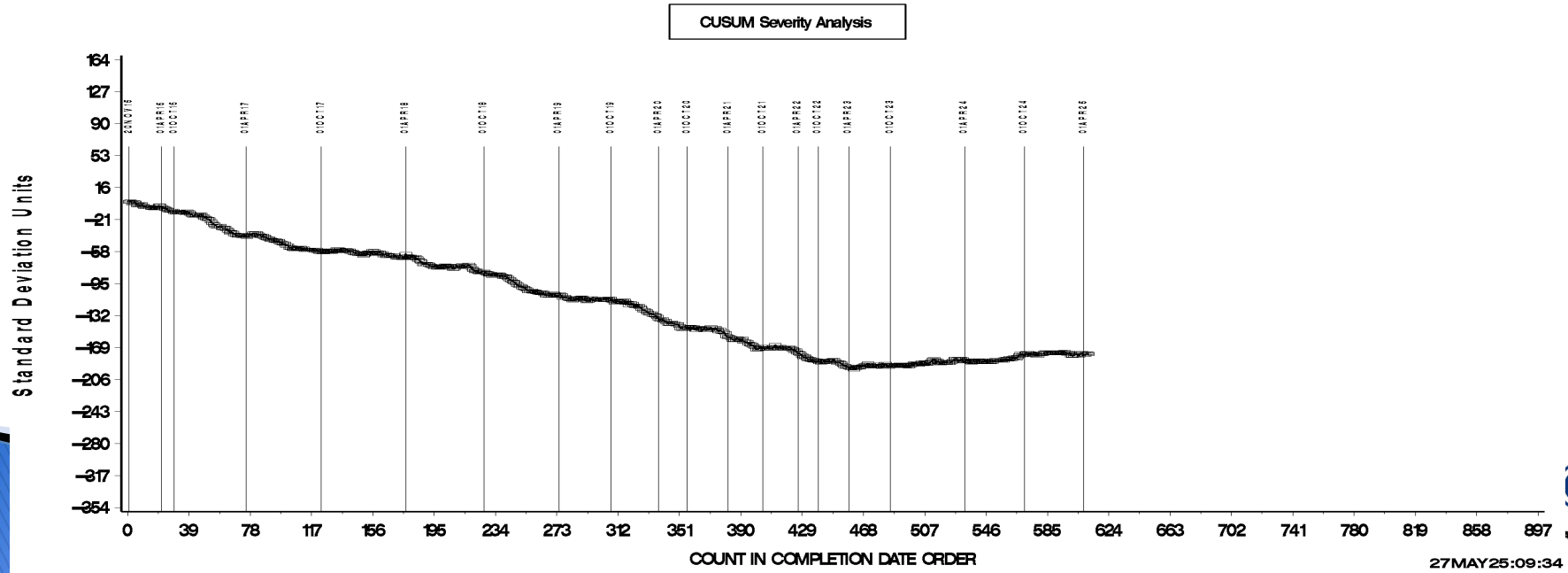
- FEI1 and FEI2 are in control and have shown near target trends in the Cusum and EWMA charts for the past two report periods.

SEQUNCE VIE INDUSTRY OPERATIONALLY VALID DATA

FEI FINAL RESULT PHASE I

A Program of ASTM International





A Program of ASTM International

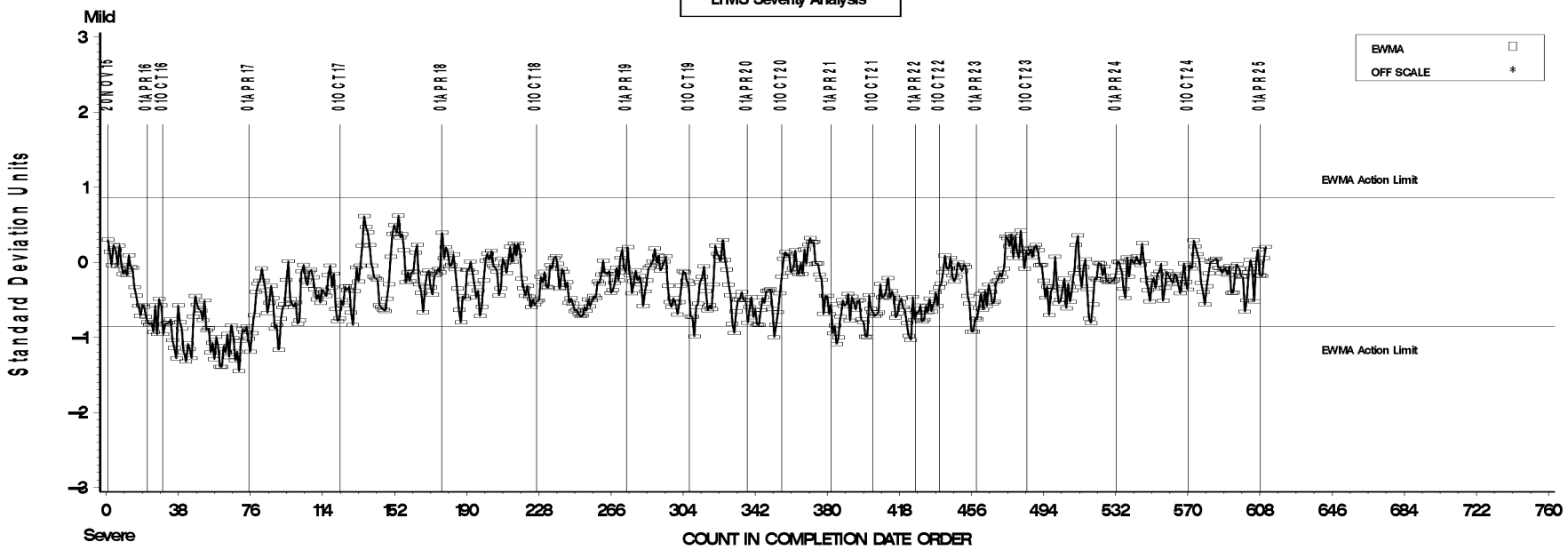
27MAY25:09:34

SEQUNCE VIE INDUSTRY OPERATIONALLY VALID DATA

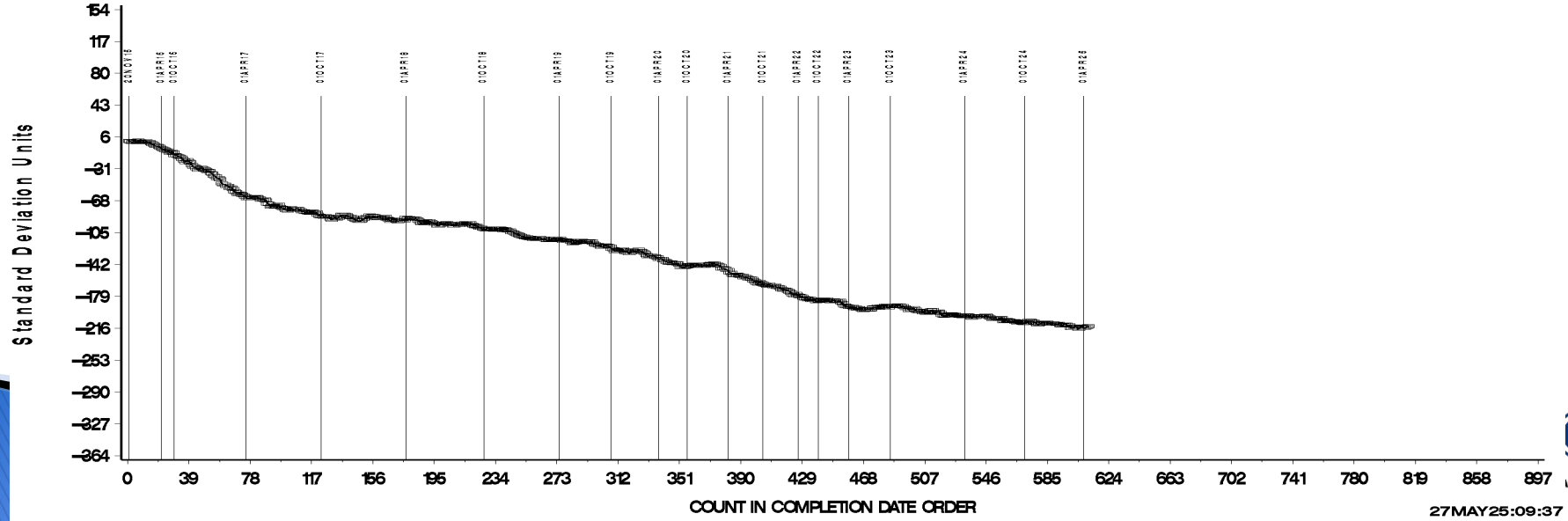
FEI FINAL RESULT PHASE II

A Program of ASTM International

LTMS Severity Analysis



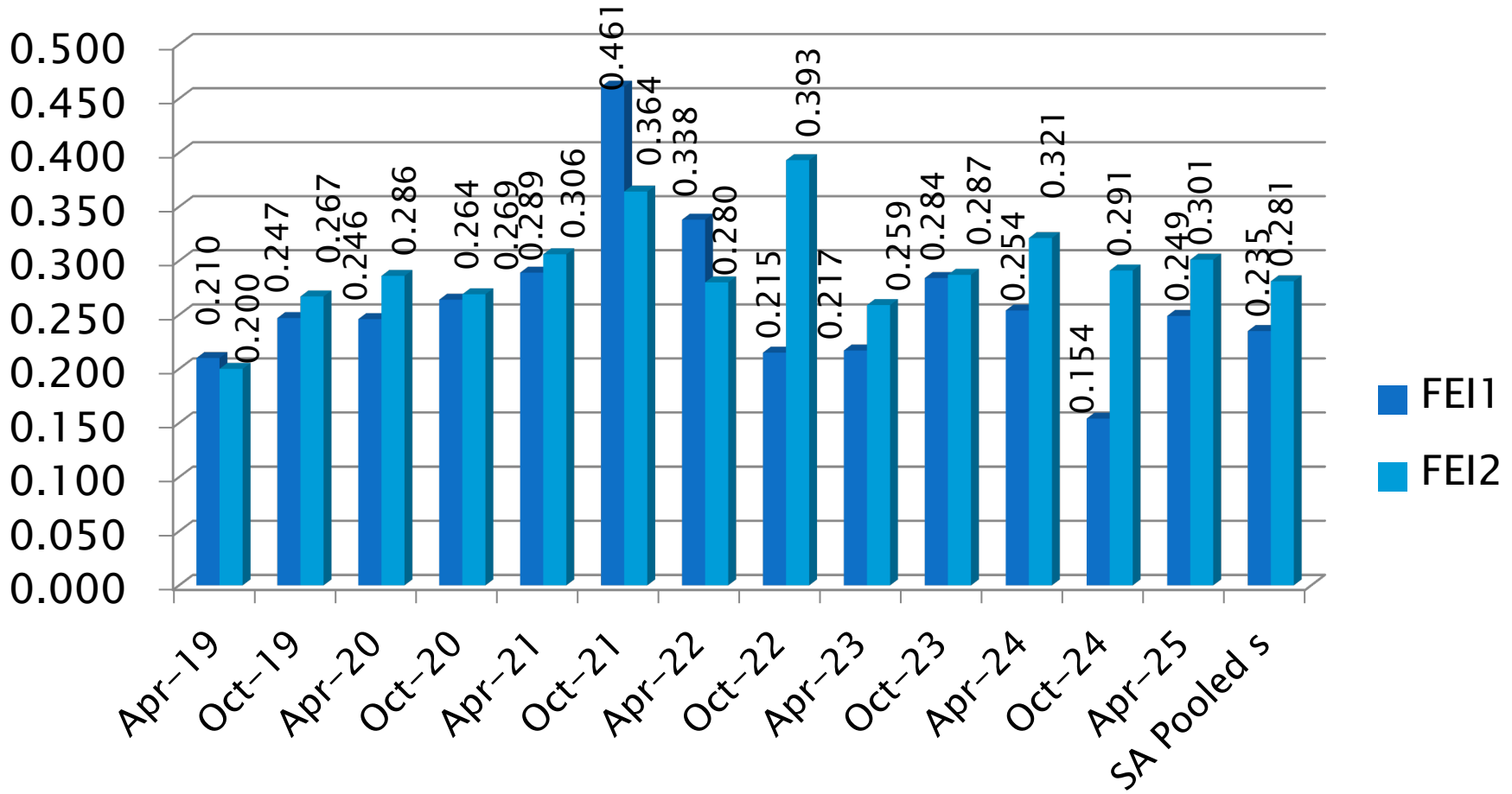
CUSUM Severity Analysis



A Program of ASTM International

27MAY25:09:37

Sequence VIE Precision Estimates



Return to Table of Contents

Sequence VIF

- April 2025

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

Sequence VIF Activity

Test Status	Validity Code	#
Acceptable Calibration Test	AC	12
Engine Abandoned	MC	1
Total		**13**

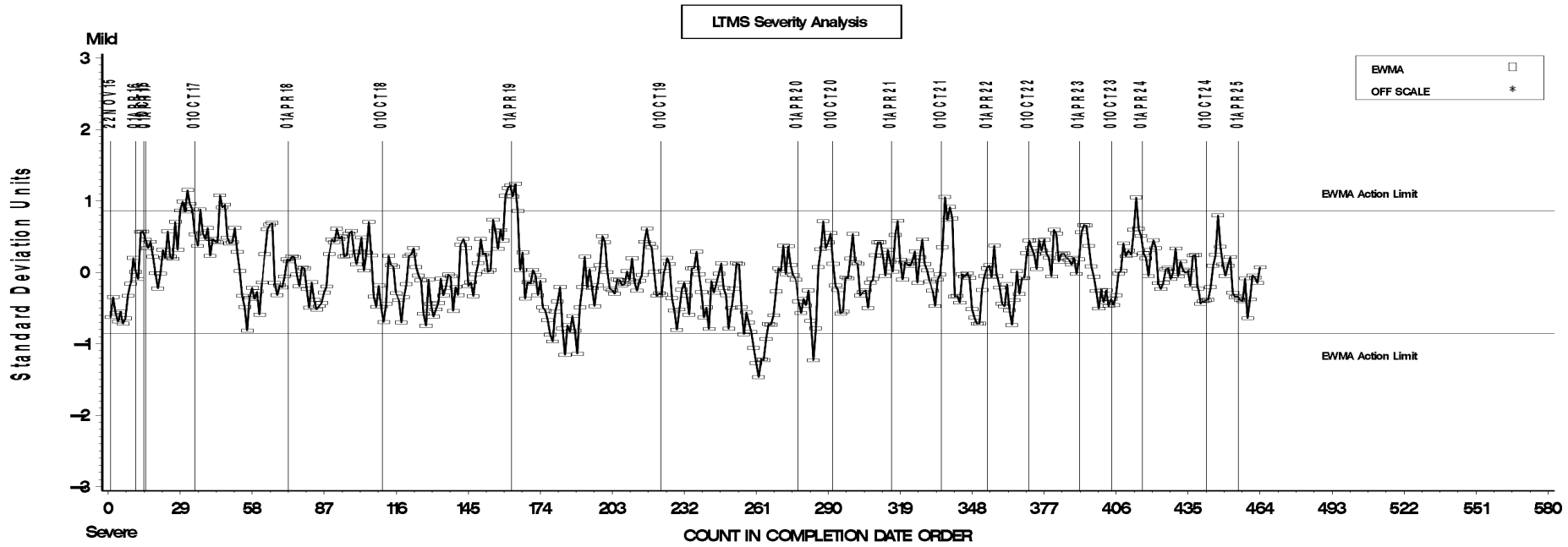
Sequence VIF Test Severity

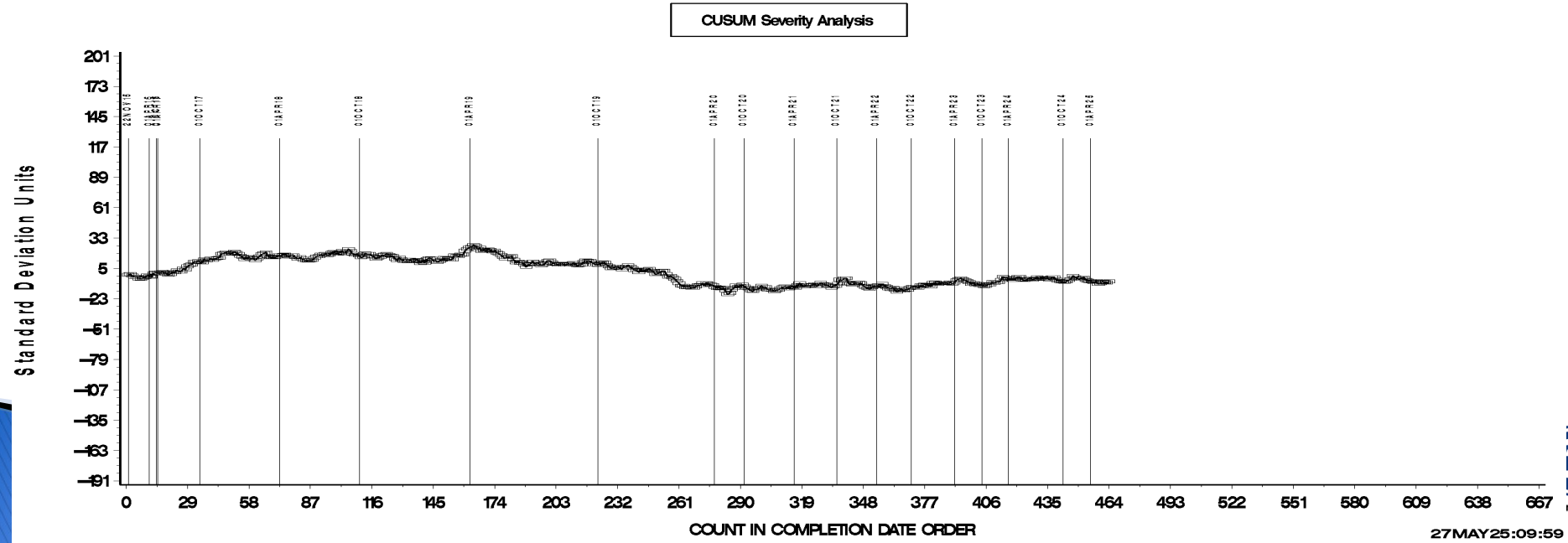
- FEI1 is in control
- FEI2 is in control

SEQUNCE VIF INDUSTRY OPERATIONALLY VALID DATA

FEI FINAL RESULT PHASE I

A Program of ASTM International



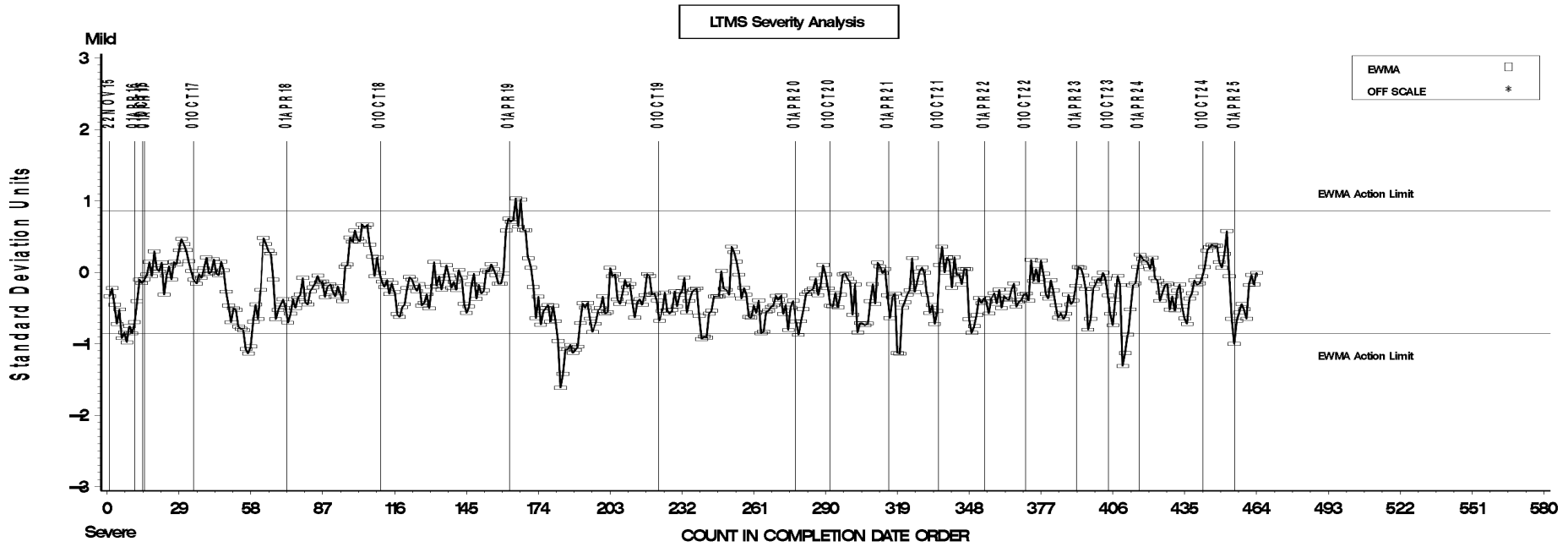


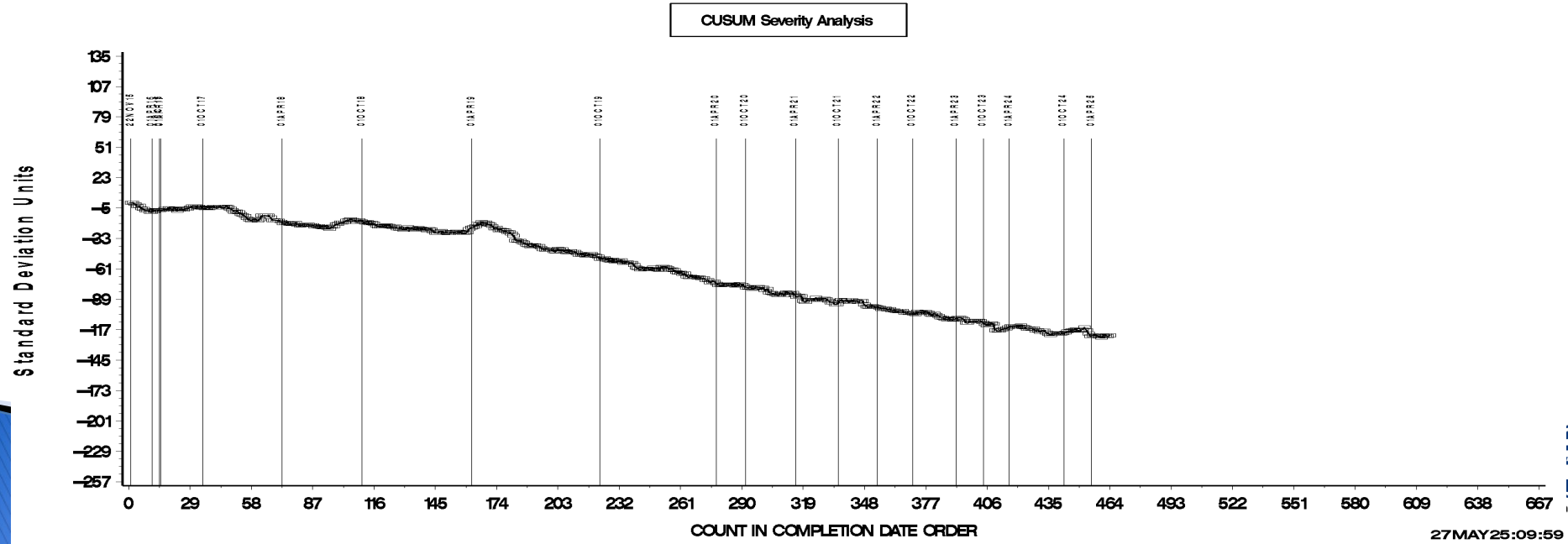
27MAY25:09:59

SEQUNCE VIF INDUSTRY OPERATIONALLY VALID DATA

FEI FINAL RESULT PHASE II

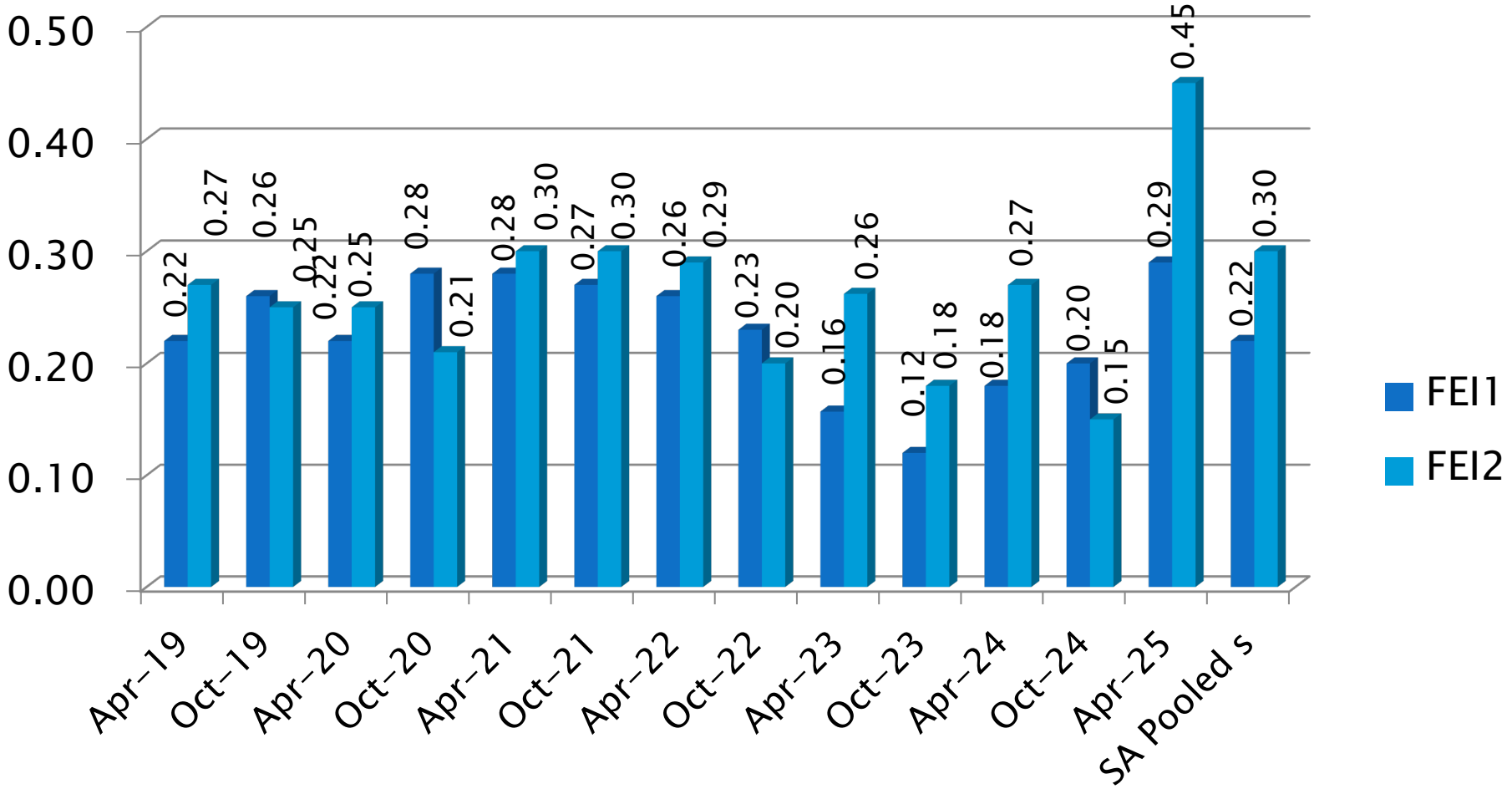
A Program of ASTM International





27MAY25:09:59

Sequence VIF Precision Estimates



Return to Table of Contents

Sequence VIII

- April 2025

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

Sequence VIII Activity

Test Status	Validity Code	#
Acceptable Calibration Test	AC	3
Failed Calibration Test	OC	2
Operationally Invalid Calibration Test (High Mechanical Wear)	LC	3
Aborted	XC	1
Invalid (Reported as Valid)	RC	1
Total		10

Sequence VIII – Lost Tests*

Test Status	Cause	#
Invalid	High Mechanical Wear	3
Aborted	High Mechanical Wear, Rerun Failed	1
Invalid	High Mechanical Wear, Wrong Oil Orifice	1
Totals		**5**

*Invalid and aborted tests

Sequence VIII– Failed Tests

Test Status	#
Stripped Viscosity (SVIS) Mild	1
Bearing Weight Loss (BWL) Severe	1
Total	2

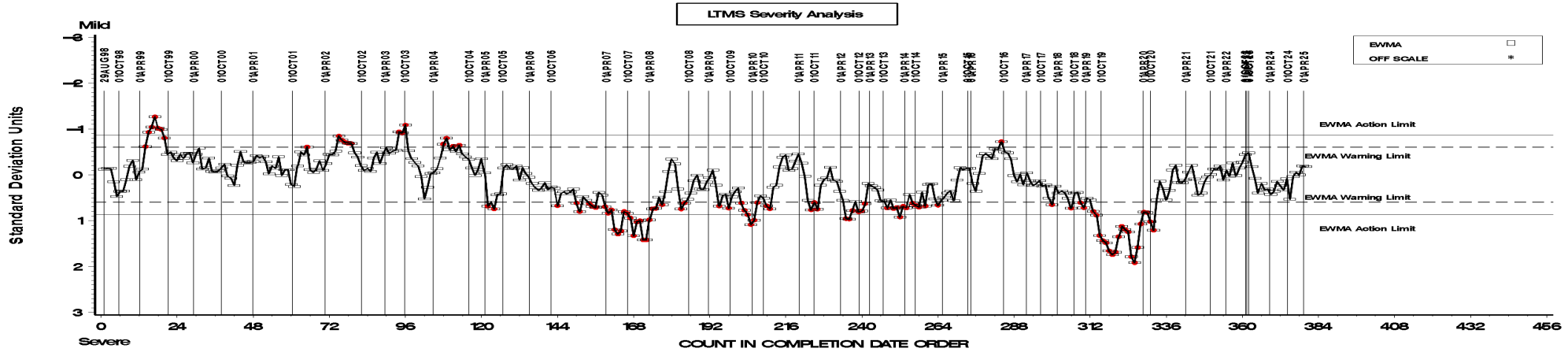
Sequence VIII Test Severity

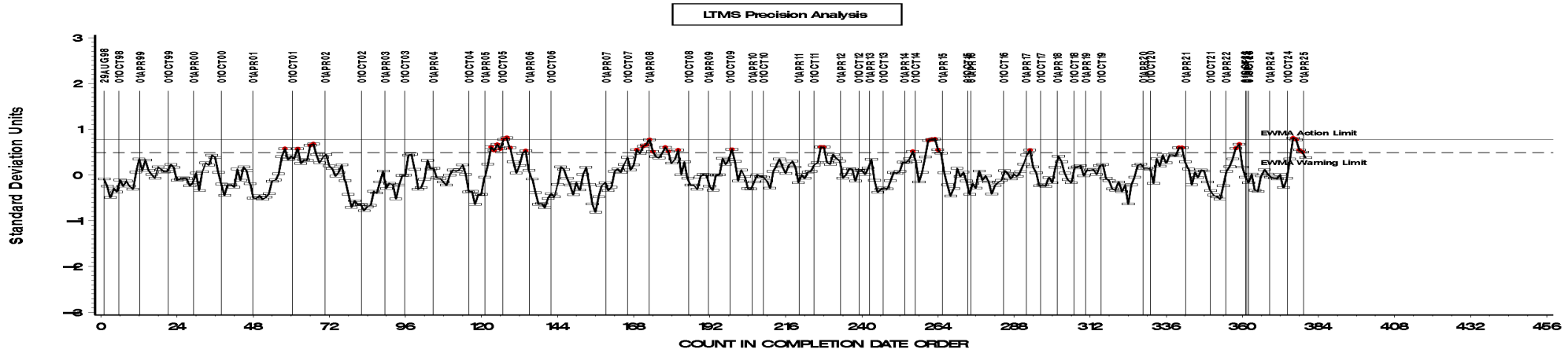
- BWLS is in control
- SVIS is in control

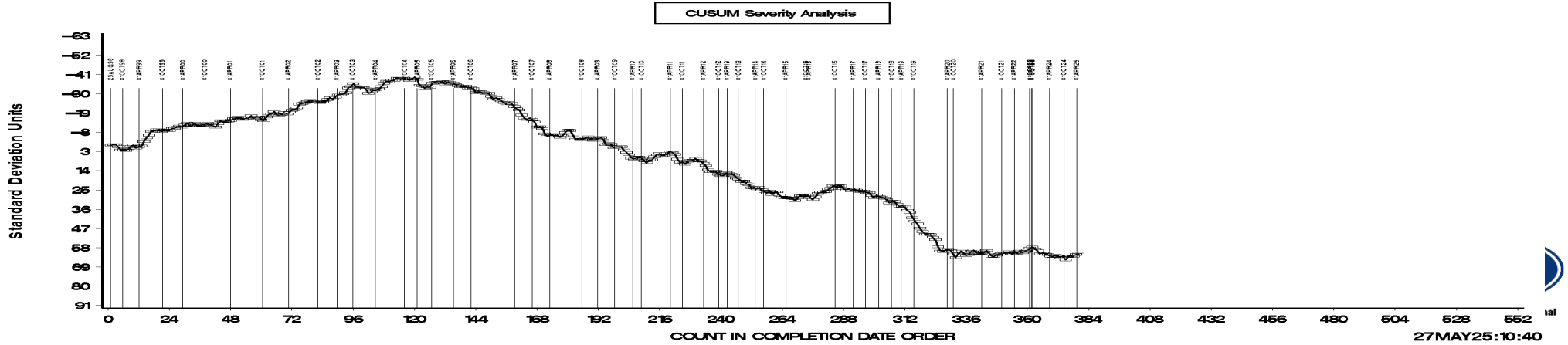
SEQUENCE VIII INDUSTRY OPERATIONALLY VALID DATA

FINAL BEARING WEIGHT LOSS

A Program of ASTM International



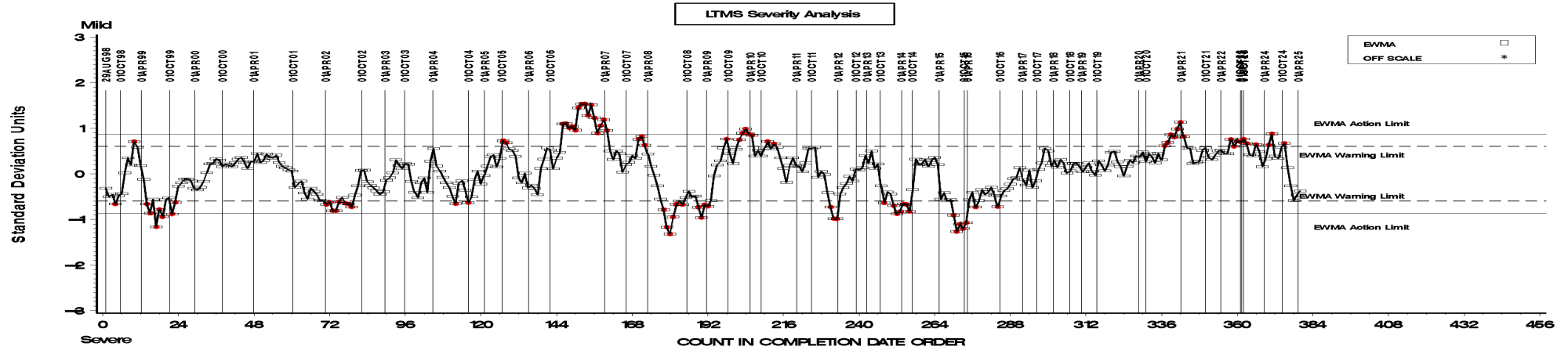


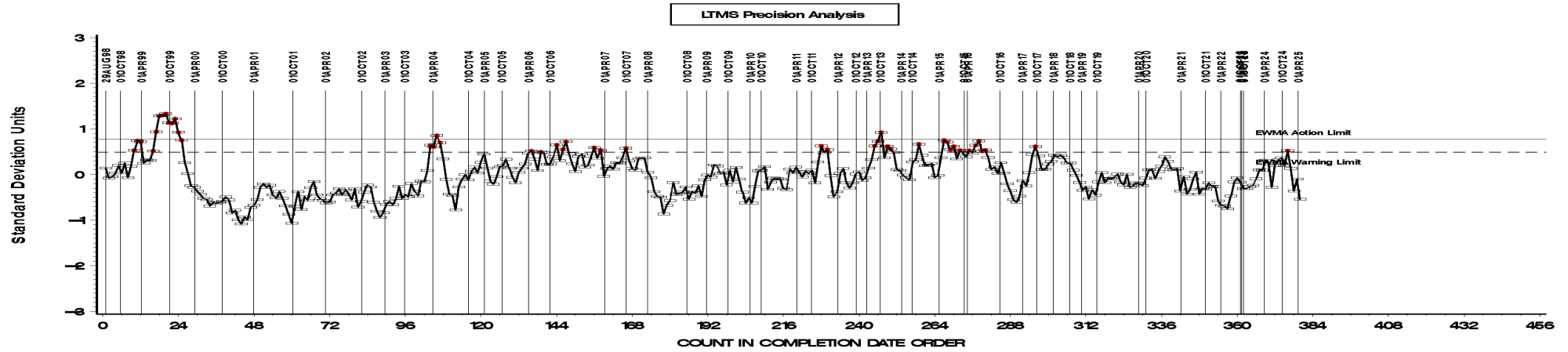


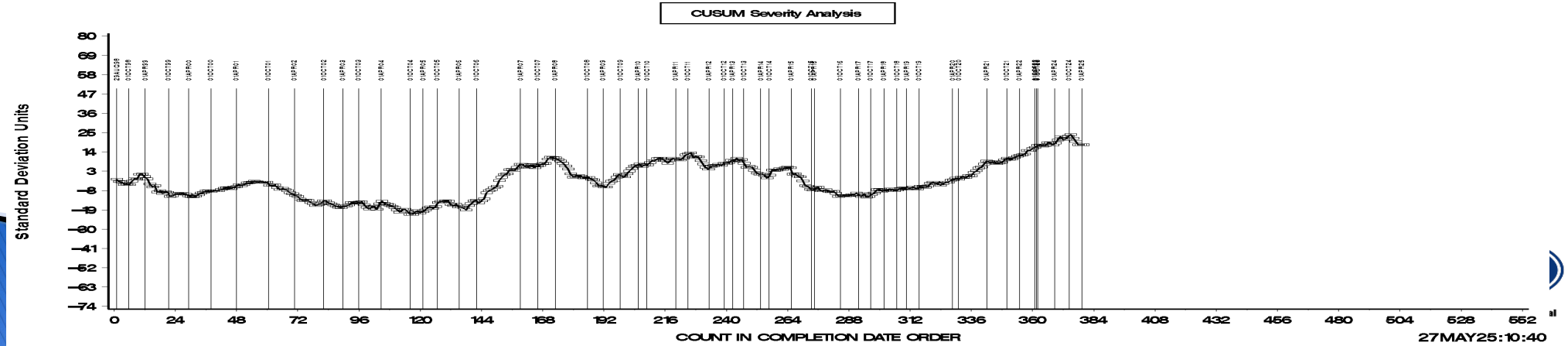
SEQUENCE VIII INDUSTRY OPERATIONALLY VALID DATA

STRIPPED VIS. @ 100 DEG C

A Program of ASTM International







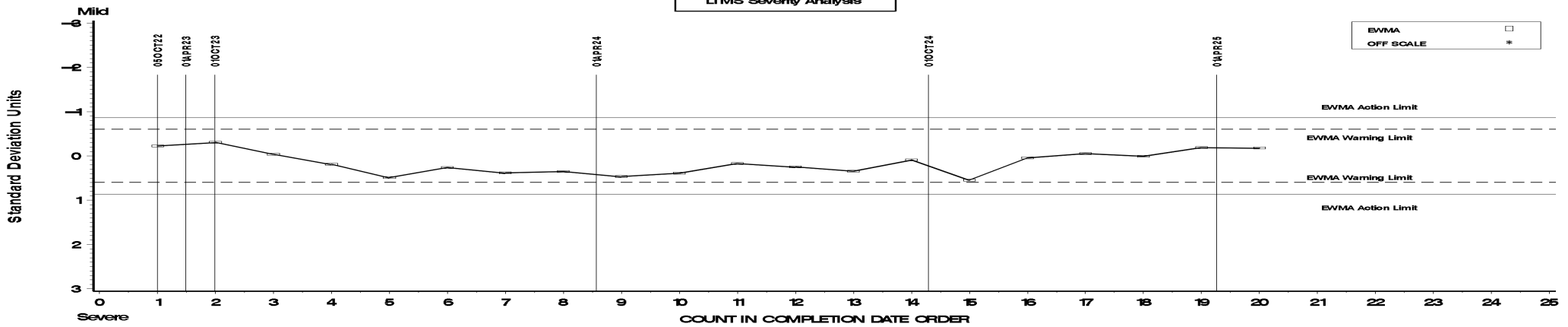
SEQUENCE VIII INDUSTRY OPERATIONALLY VALID DATA

LTMSDATE> ='20221005'

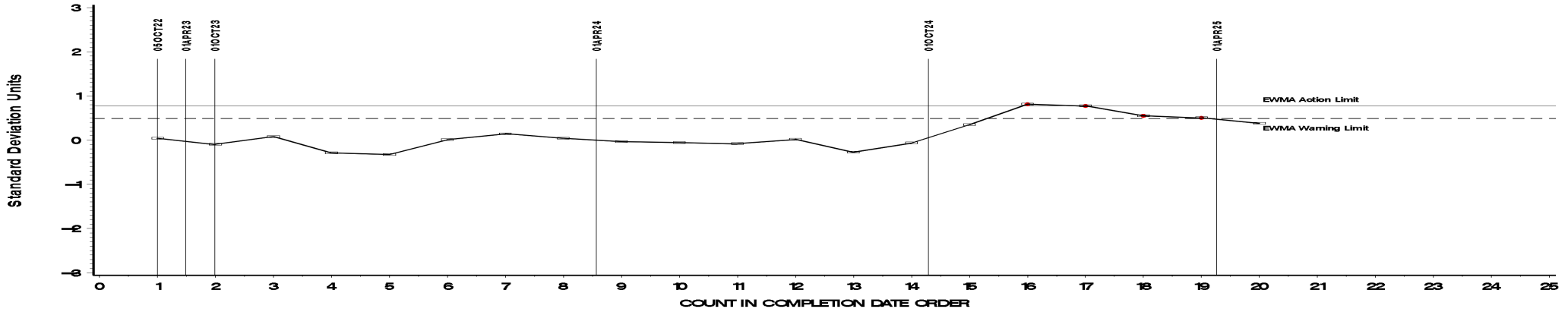
FINAL BEARING WEIGHT LOSS

A Program of ASTM International

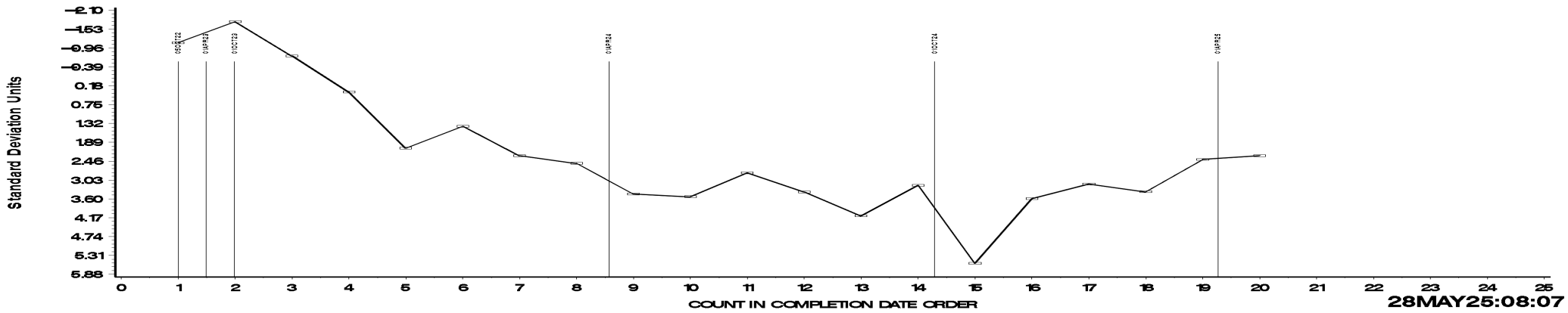
LTMS Severity Analysis



LTMS Precision Analysis



CUSUM Severity Analysis



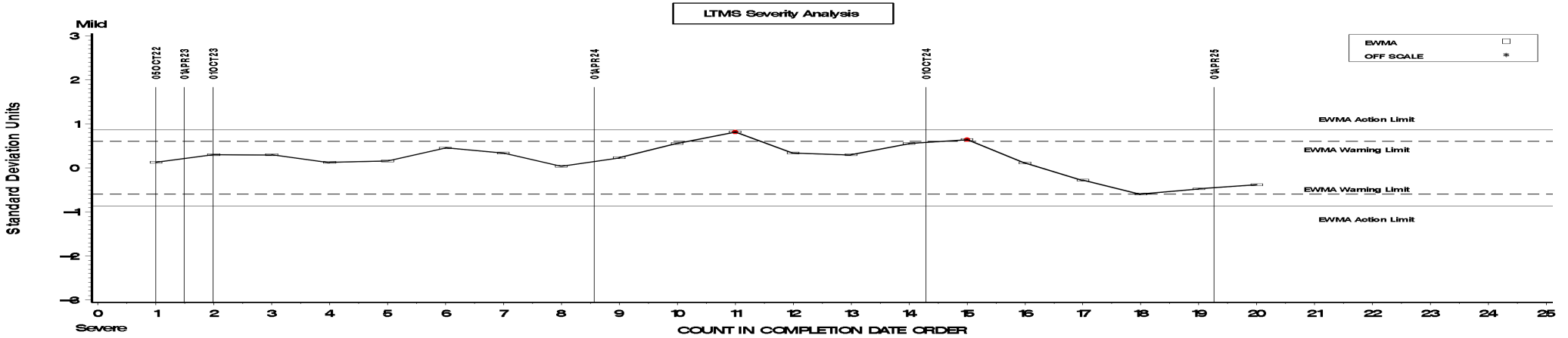
28MAY25:08:07

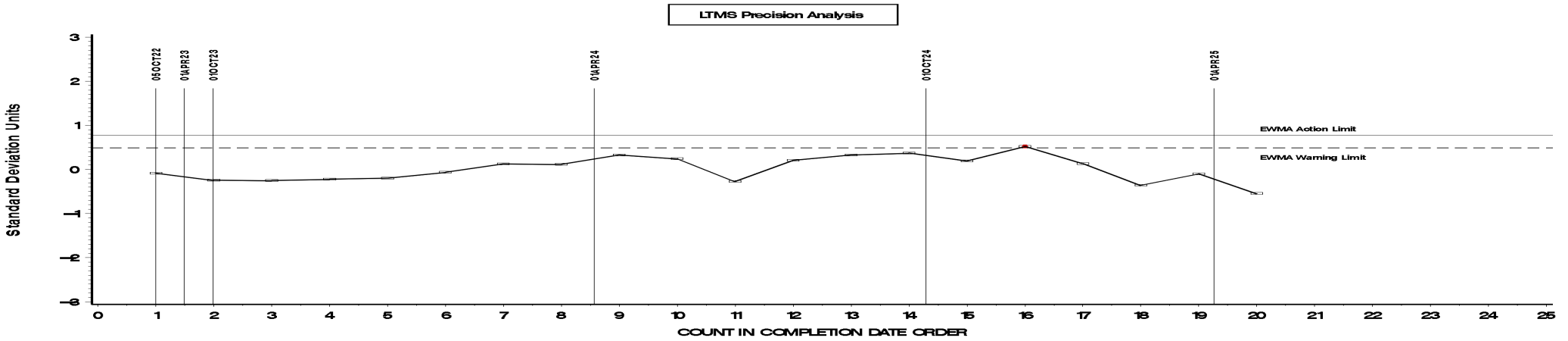
SEQUENCE VIII INDUSTRY OPERATIONALLY VALID DATA

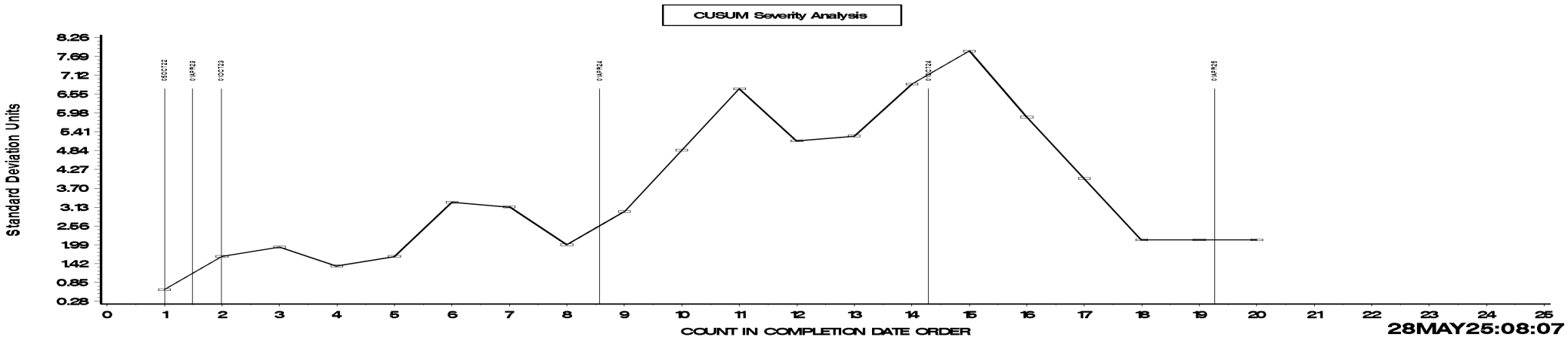
LTMSDATE> = '20221005'

STRIPPED VIS. @ 100 DEG C

A Program of ASTM International

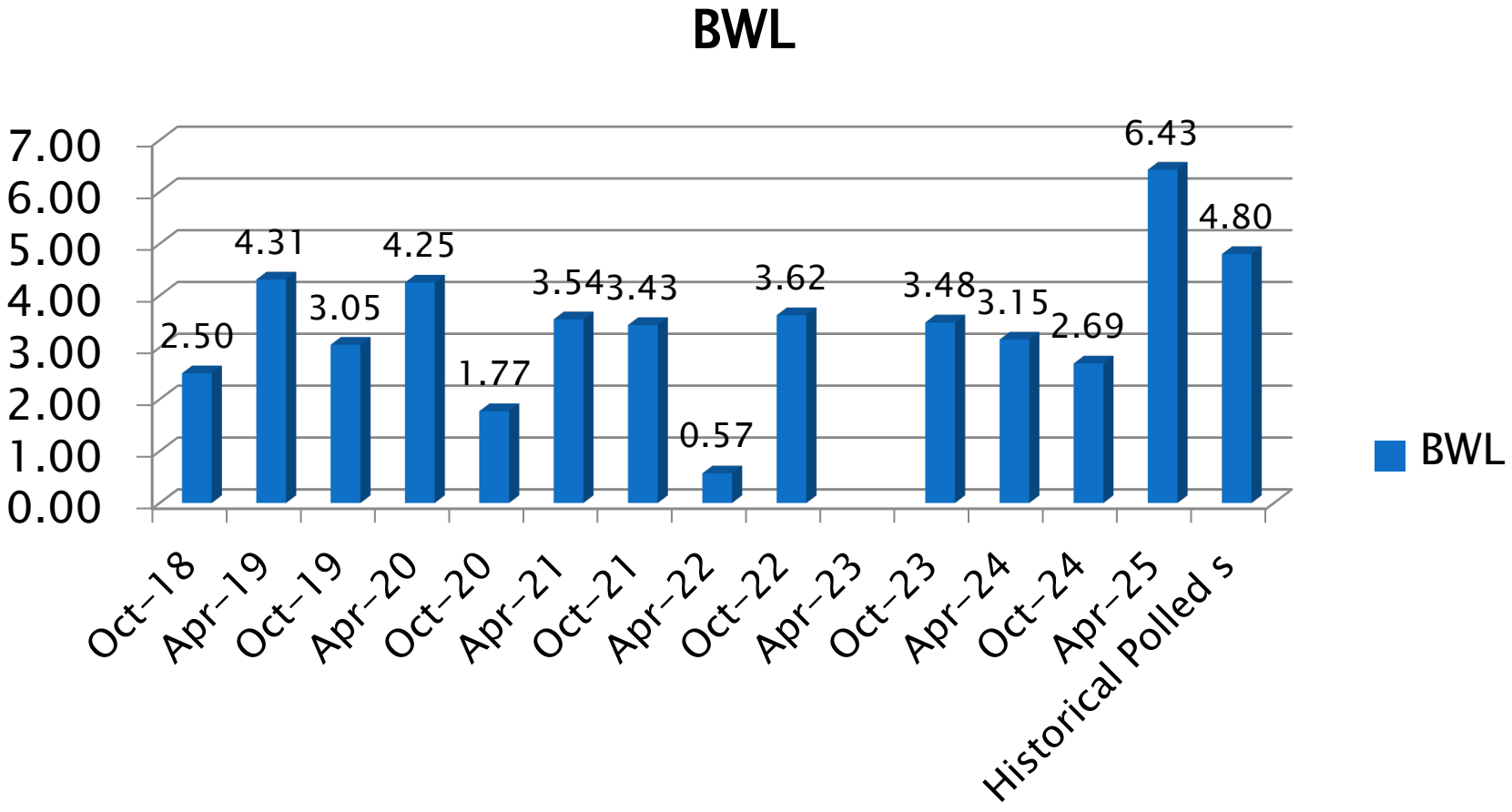






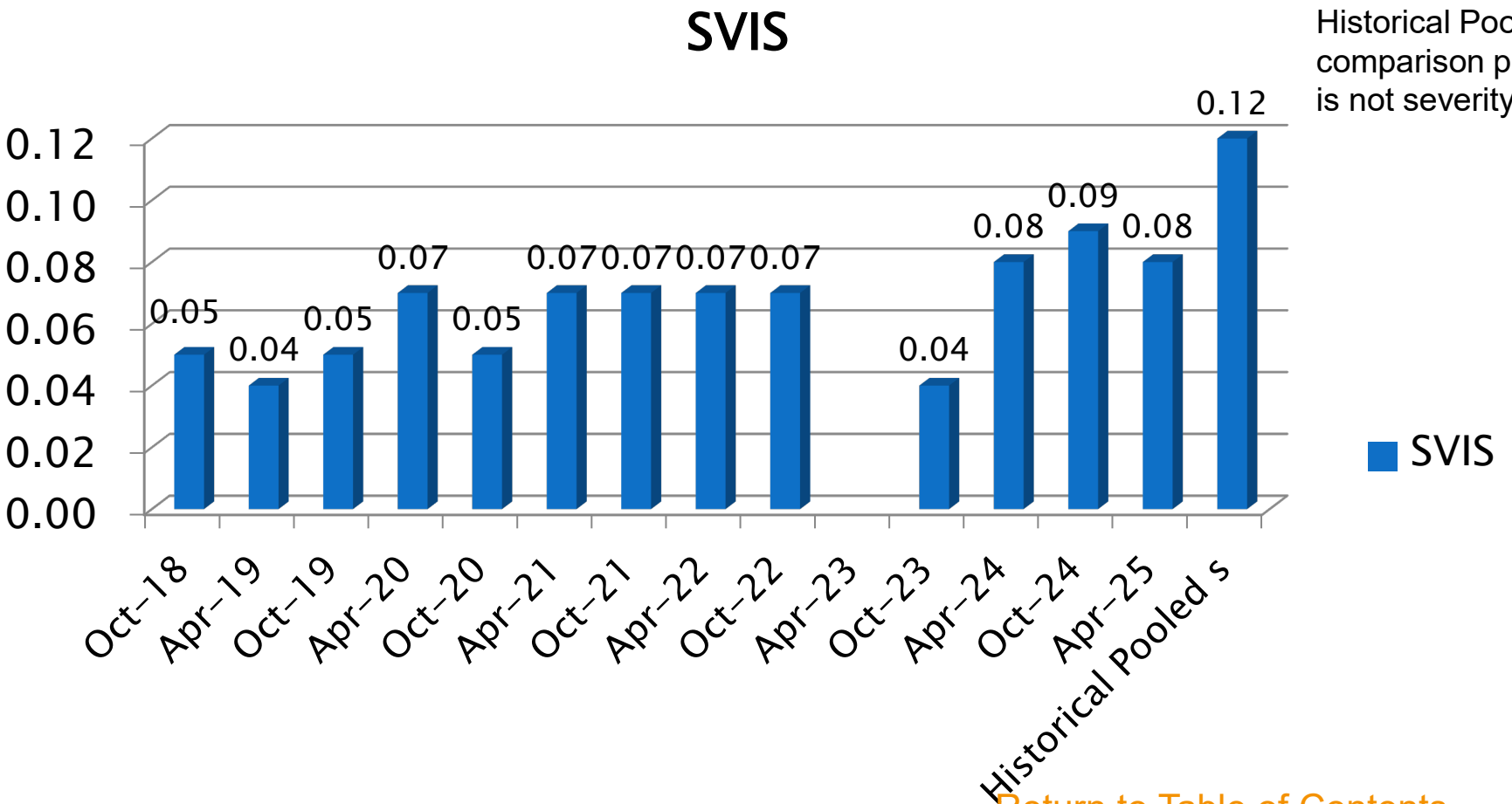
28MAY25:08:07

Sequence VIII Precision Estimates



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

Sequence VIII Precision Estimates



Historical Pooled s used for comparison purposes, parameter is not severity adjusted.

Return to Table of Contents

Sequence IX

- April 2025

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

Sequence IX Activity

Test Status	Validity Code	#
Acceptable Calibration Test	AC	43
Statistically Unacceptable Calibration Test	OC	8
Operationally Invalid Calibration Test (lab judgement)	LC	3
Engine Break-in	AN	3
Engine Abandoned	MC	4
Acceptable Donated Test, Reference Oil 221-1 Introduction	AG	4
Aborted Calibration Test	XC	1
Not Acceptable Donated, 221-1 Introduction	MG	1
Total		**67**

Sequence IX – Failed Tests

Test Status	Number of Tests
Ei Level 0 alarm (severe)	2
Ei Level 0 alarm (mild)	2
Ei Level 3 alarm (mild)	2
Zi Level 2 alarm (severe)	1
Zi Level 2, Ei Level 3 (severe direction)	1
Total	**8**

Sequence IX – Lost Tests*

Test Status	Cause	#
Invalid	Did not obtain 4 valid iterations	1
Invalid	High activity, engine retired	2
Aborted	Control issues	1
Totals		**4**

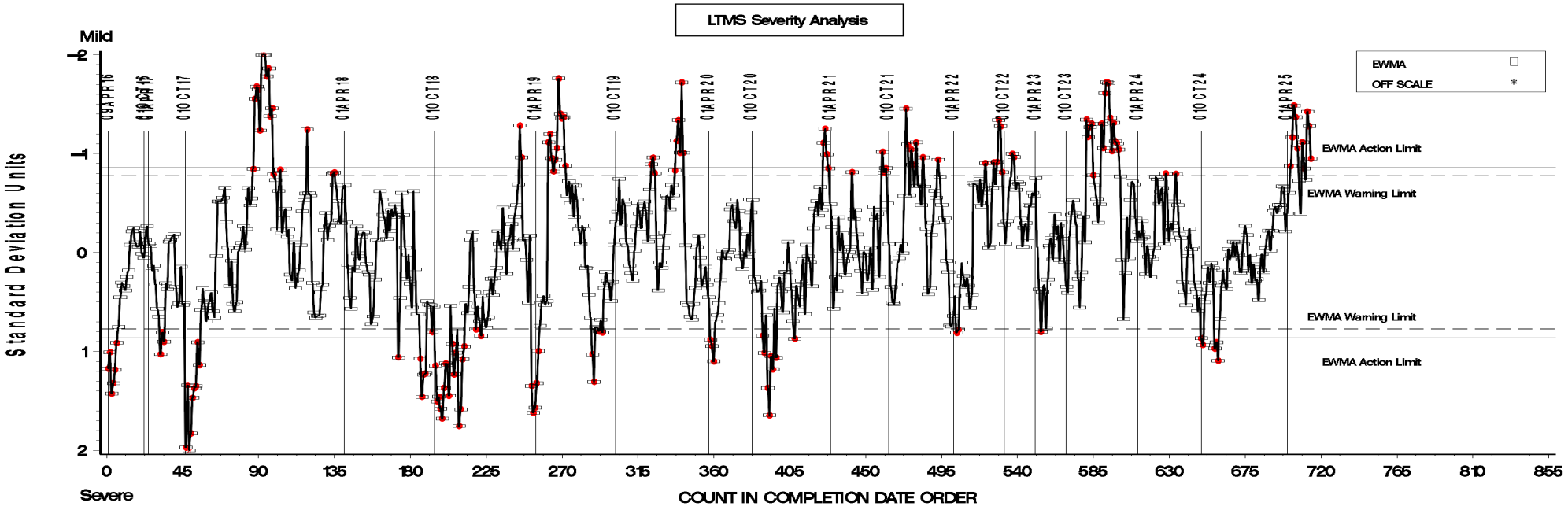
*Invalid and aborted tests

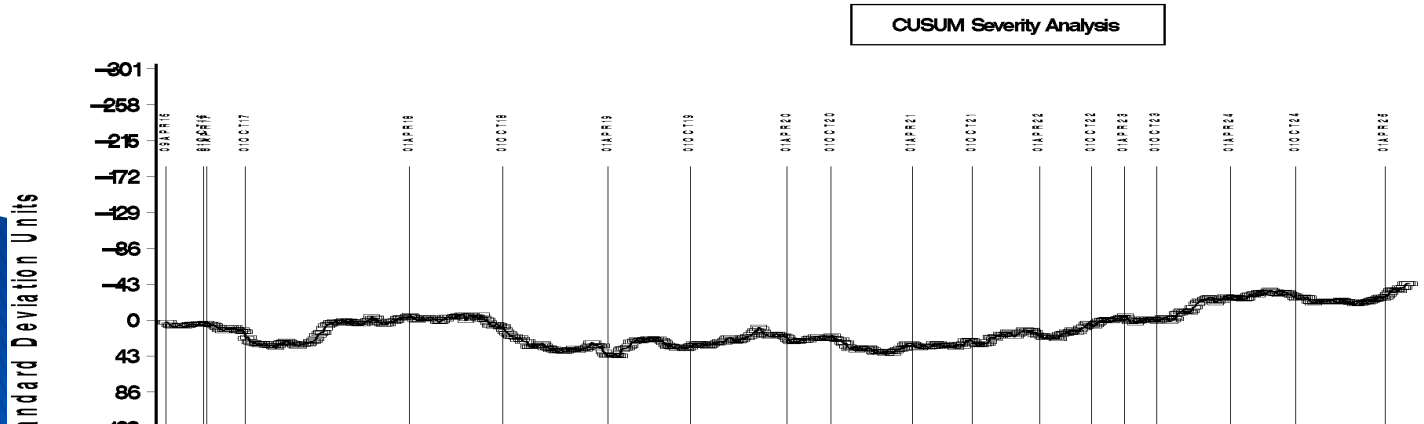
Sequence IX Test Severity

- Average number of pre-ignitions is in action alarm (mild direction).

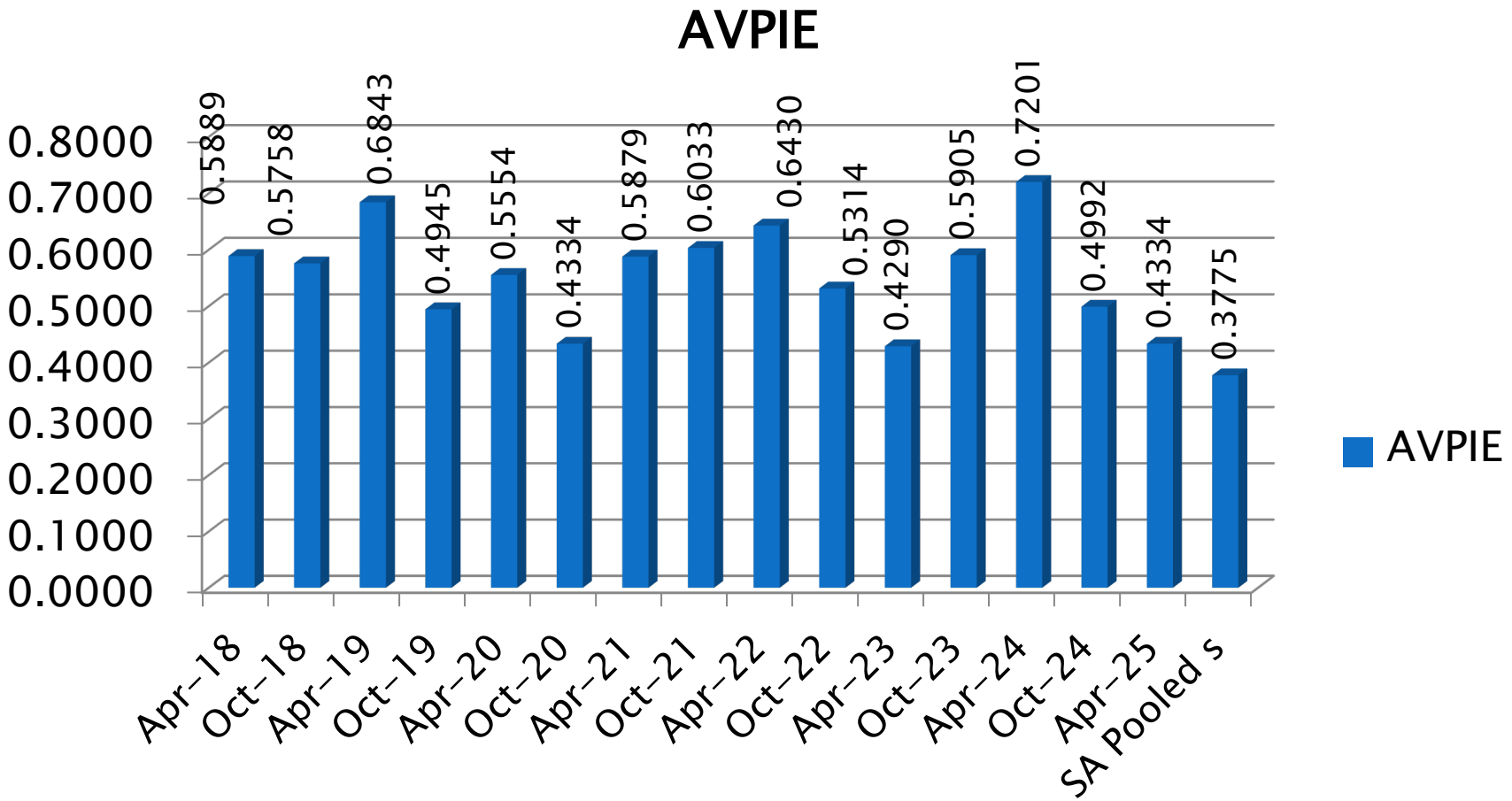
SEQUENCE IX INDUSTRY OPERATIONALLY VALID DATA

AVERAGE NUMBER OF PREIGNITIONS FROM VALID ITERATIONS





Sequence IX Precision Estimates



Return to Table of Contents

Sequence IXAGED

- April 2025

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

Sequence IXAGED Activity

Test Status	Validity Code	#
Acceptable Calibration Test	AC	12
Unacceptable Calibration test	OC	1
Aborted Calibration Test (lab judgement)	XC	1
Total		**14**

Sequence IX – Failed Tests

Test Status	Number of Tests
Ei Level 3 alarm (severe direction)	1
Total	**1**

Sequence IXAGED – Invalid Tests

Test Status	Cause	#
Aborted	Insufficient aged oil	1
Totals		**1**

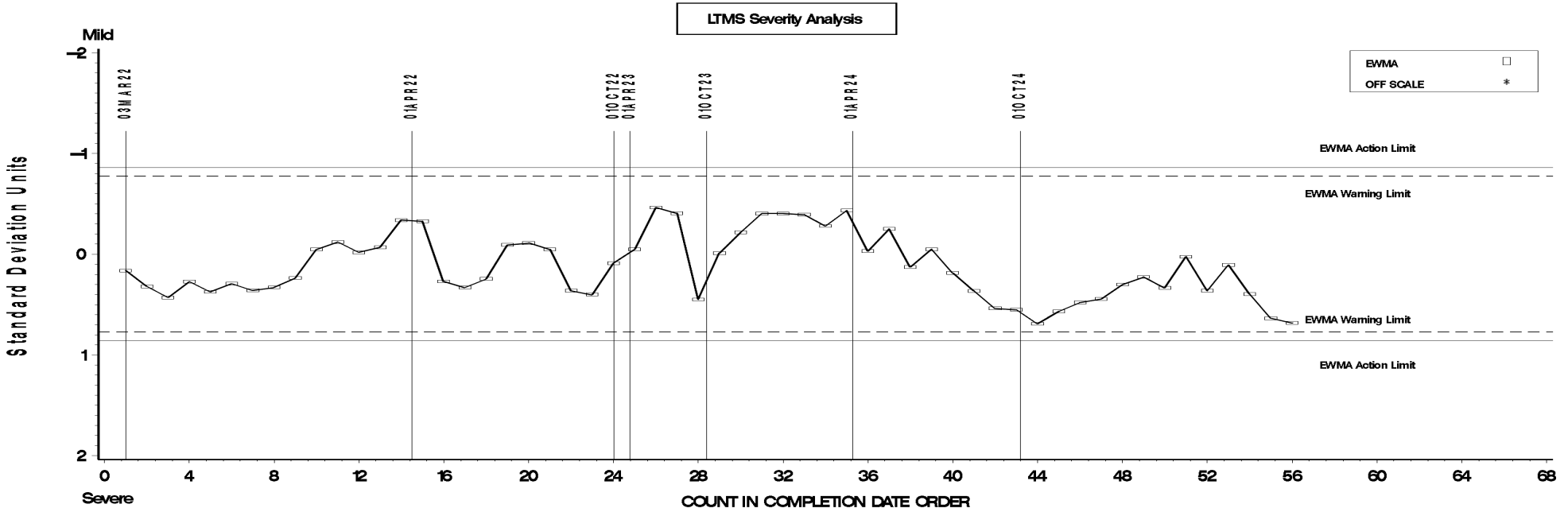
Sequence IXAGED Test Severity

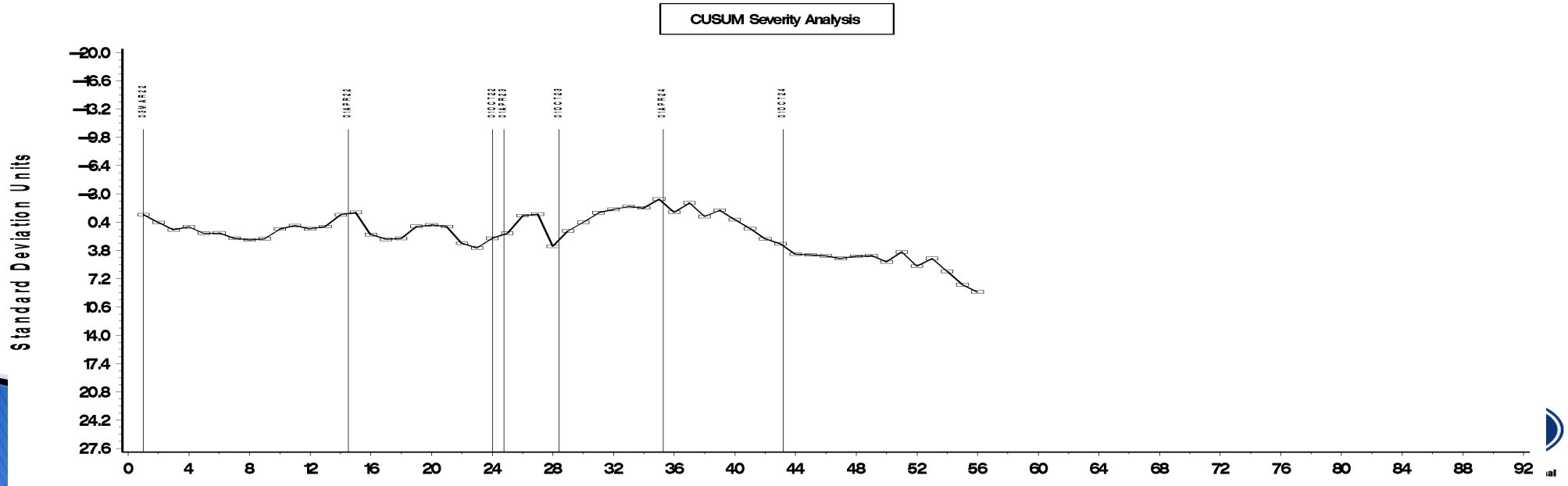
- Average number of Pre-ignitions in control.

SEQUENCE IX AGED INDUSTRY OPERATIONALLY VALID DATA

A Program of ASTM International

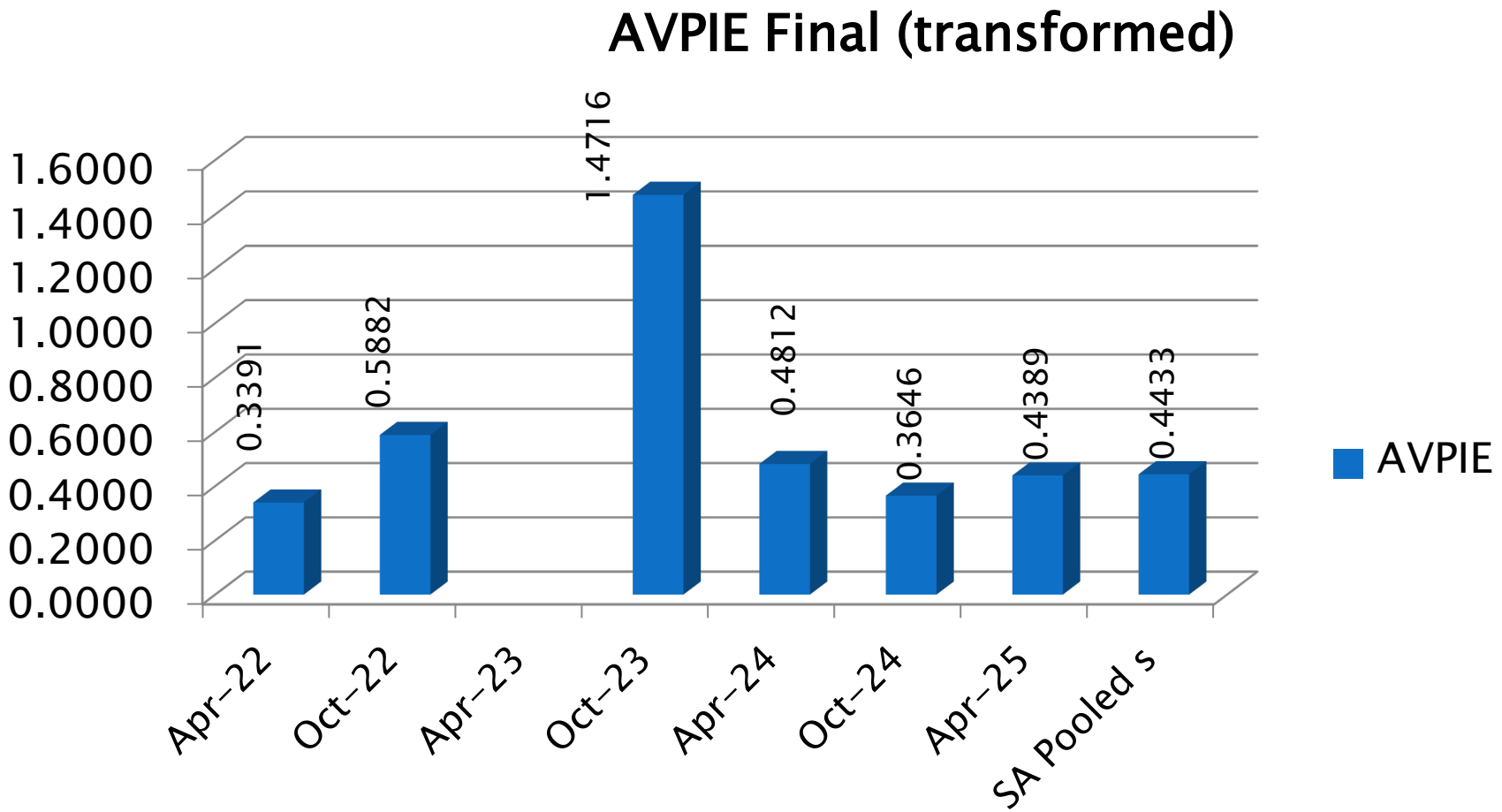
AVG # of Preignitions, original units





27MAY25:15:23

Sequence IXAGED Precision Estimates



Return to Table of Contents

Sequence X

April 2025

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

Sequence X Activity

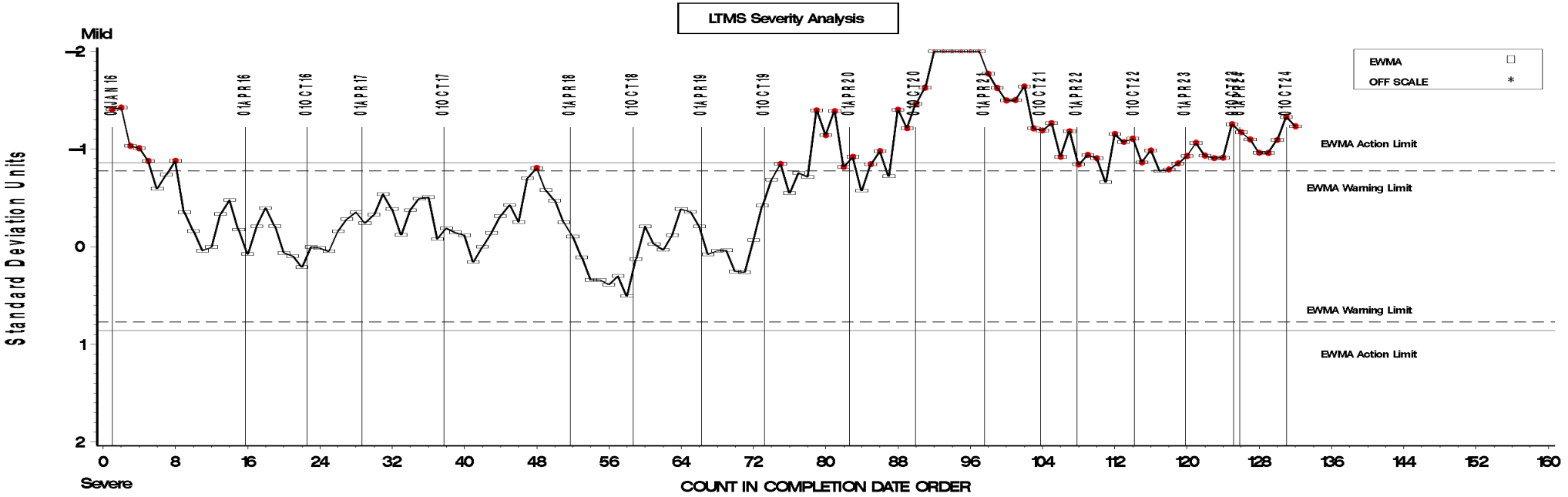
Test Status	Validity Code	#
Acceptable reference test	AC	1
Acceptable discrimination test	AS	1
Total Number of Tests		**2**

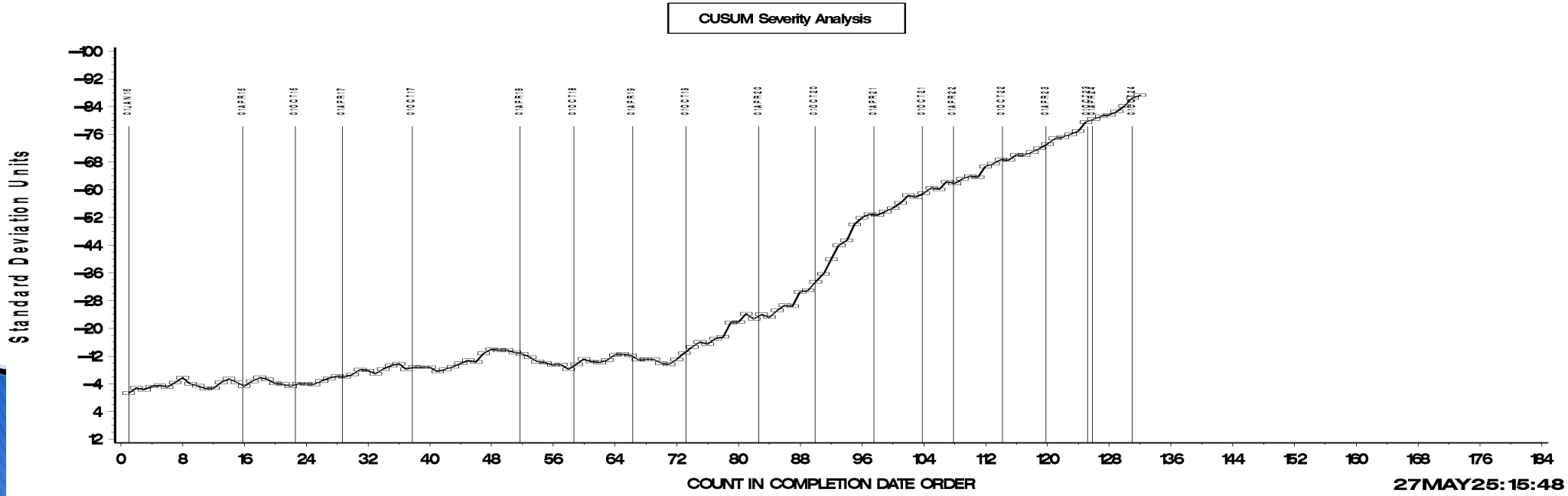
Sequence X Test Severity

- End of test chain wear is in action alarm (mild direction).

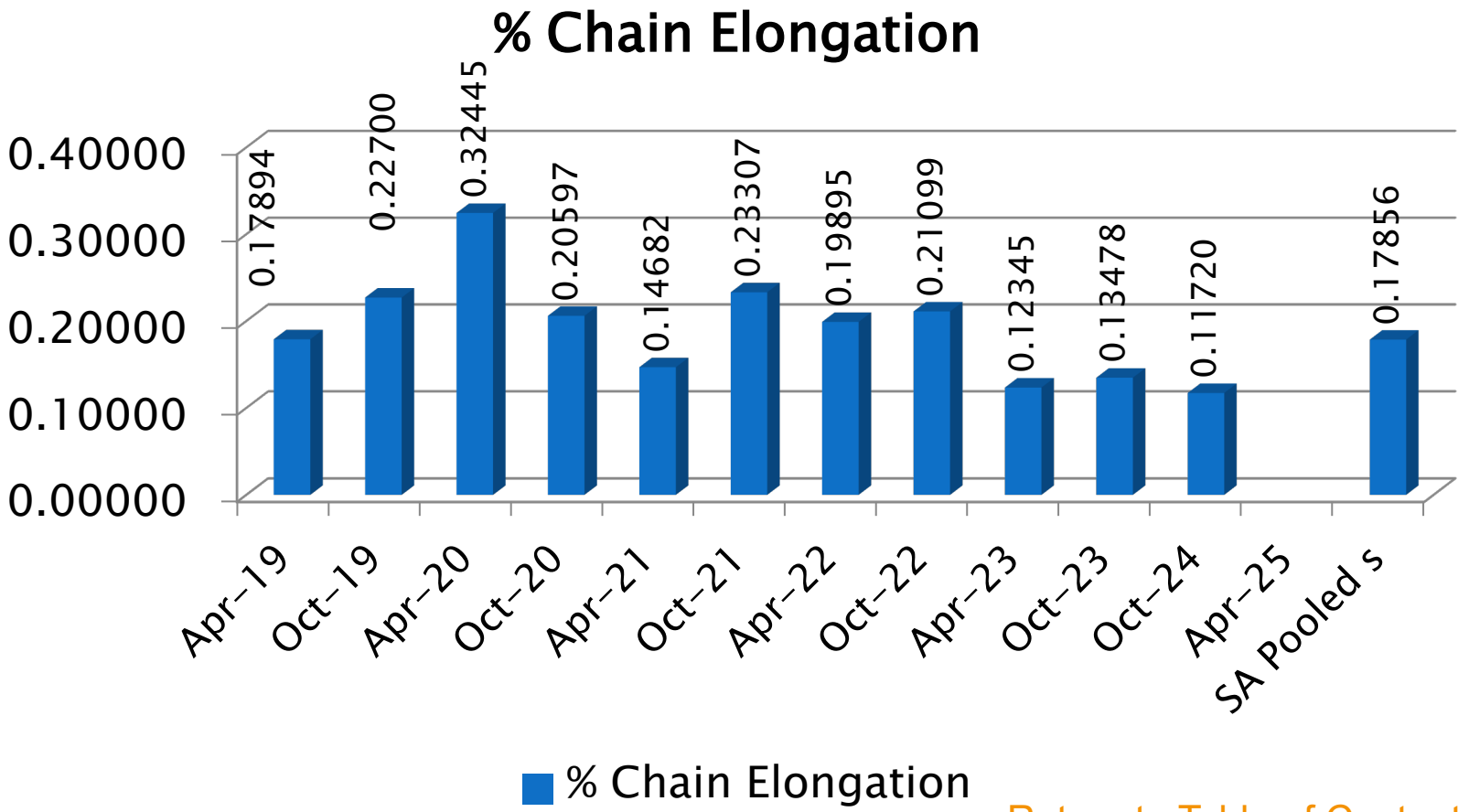
SEQUENCE X INDUSTRY OPERATIONALLY VALID DATA

END OF TEST CHAIN WEAR FINAL RESULT





Sequence X Precision Estimates



Return to Table of Contents

Information Letters

April 2025

Test Monitoring Center
https://www.astmtmc.org

A Program of ASTM International

Information Letters*

Test	Date	IL	Topic
IIIH	Dec 3, 2024	24-1	Section added to test method clarifying corrected PVIS results
IVB	Feb 4, 2025	25-1	Reduce number of oil flushes when conducting a second break-in on a new engine from four to two
VH	May 1, 2025	25-1	Surface finish analyzer settings added to the test method
VIE	Mar 10, 2025	25-1	Removal of thermocouple exposed sheathing requirement
VIF	Mar 10, 2025	25-1	Removal of thermocouple exposed sheathing requirement
VIII	Nov 27, 2024	24-1	Updated industry correction factors for SVIS & BWL
IX	Oct 17, 2024	24-3	Introduction of new piston types
IX	Jan 7, 2025	25-1	Clarification of how iterations and cycles are defined
X	Mar 10, 2025	25-1	New Chain tensioner hardware approval

*Available from TMC Website

Return to Table of Contents

Reference Oil Inventory

- Actions, Re-blends, Inventories and Estimated Life

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

Reference Oil Re-blends

- TMC 940
  - A limited quantity remains of reference oil 940. A reblend of this oil, 940-1 has been obtained by the TMC. The panel agreed to suspend the use of this oil until additional results on the other two oils with the new fuel batch could be evaluated.

Reference Oil Re-blends

TMC API01 and API02

- Reblends for both IXAGED reference oils are being introduced. Four tests have been reported with reference oil API01-1 and three have been reported on reference oil API02-1.

TMC 1006-2

- Less than 12 gallons remain at TMC. The Sequence VIII has dropped this oil because of age concerns and replaced it with 1009-1. The Sequence IVA will continue to use this oil for the foreseeable future.

TMC 544

- Inventory of 544 at the TMC has been depleted. A re-blend has been obtained but has not yet been approved by the surveillance panel for test use. This oil is used for referencing 20% of the time.

Reference Oil Inventory Estimated Life

Oil	Tests	Year	Blend Quantity	TMC Inventory	Estimated Life	Comment
220-1	IX	2022	1060	925	> 5	Break-In oil only
221-1	IX	2015	992	952	>5	
224-2	IX	2022	780	403	2	
270	X	2015	1100	462	>5	
271	X	2015	980	577	>5	
300-1	IVB	2017	378	176	3	
434-3	IIIH, GMOD	2017	980	456	4	
436	IIIH	2014	1100	544	3.5	
438-2	IIIH	2017	540	360	5	Suspended by panel
542-5	VIE, VIF	2021	1060	384	1	
543-1	VIF	2020	1000	790	> 5	
544	VIE	2015	1003	0	<1	544-1 is an available reblend.
544-1	VIE	2025	542	542		oil received by the TMC but not yet approved for test use by panel
931	VH	2020	912	704	> 5	
940-1	VH	2018	485	467	> 5	
1006-2	IVA, VIII	2000	5500	10	3	"Beyond useful life"
1009-1	VIII	2017	1000	803	> 5	
1010-2	VIE	2022	555	53.5	<1	Reblend requested
1011-1	IVB, VH, VF, X	2019	1395	638	<2	
1012	IVB	2017	2145	960	4	
API01-1	IXAGED	2024	480	369	5	
API02-1	IXAGED	2024	473	345	3	

LTMS Deviations

October 1, 2024 – March 31, 2025

Test Monitoring Center
https://www.astmtmc.org

A Program of ASTM International

LTMS Deviations

- No LTMS Deviations this period

LTMS Deviations

Historical Count of PCEO LTMS Deviations

Test	LTMS Deviations
IIIH	0
IVA	7
IVB	0
VH	0
VIE	0
VIF	0
VIII	3
IX	0
X	0

Return to Table of Contents

Quality Index Deviations

October 1, 2024 – March 31, 2025

Test Monitoring Center
https://www.astmtmc.org

A Program of ASTM International

Quality Index Deviations

- No Quality Index Deviations this period

Quality Index Deviations

Historical Count of PCEO Quality Index Deviations

Test	Quality Index Deviations
IIIH	10
IVA	33
IVB	2
VH	12
IX	3
X	3

Return to Table of Contents

TMC Laboratory Visits

October 1, 2024 – March 31, 2025

Test Monitoring Center
https://www.astmtmc.org

A Program of ASTM International

TMC Lab Visits

Test	Number of Labs Visited
IIIH	3
IVB	1
IX	3
VH	1
VIE/VIF	1
VIII	0
X	2

Lab Visit Issues

- Sequence IX
  - Exhaust thermocouples not 3mm in diameter as specified.
- Sequence IIIH
  - J-Tec flow meter installed horizontally instead of vertically as specified.
- Sequence VIE
  - Coolant thermocouple sheathing exposed – corrected during visit

Lab Visit Issues

- Sequence IVB
  - Amount of exposed sheathing for fuel inlet temperature was larger than shown in figure A7.7

Test Area Timelines

October 1, 2024 – March 31, 2025

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

Test Area Timeline Additions*

Test	Date	Topic	IL
IIIH	20241203	Section added to test method clarifying corrected PVIS results	24-1
VH	20250109	Surface finish measurements, cylinder bore and ring gap measurements and other hardware items added to the test report form	
VH	20250501	Surface finish analyzer settings added to test method	25-1
IVB	20250204	Reduce number of oil flushed when conducting a break-in on a new engine from four to two.	25-1
VIE	20250310	Removal of thermocouple exposed sheathing requirement	25-1
VIF	20250310	Removal of thermocouple exposed sheathing requirement	25-1
VIII	20241127	Updated industry correction factors for SVIS & BWL	24-1
IX	20241017	Introduction of new piston types	24-3
IX	20250107	Clarification of how iterations and cycles are defined	25-1
X	20250310	New chain tensioner hardware approval	25-1

*As of 03/31/2025

Miscellaneous Information

- Available on TMC Website:
  - Live Reference Test Data Bases
  - Surveillance Panel Meeting Minutes
  - Test Area Alarm Logs
  - Complete Test Area Timelines
  - LTMS Manual

- https://www.astmtmc.org

Return to Table of Contents

A Program of ASTM International