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

**Elastomers
EOEC/LDEOC
(D7216)**

October 2022 – March 31, 2023

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Section	Topic		
Summary Items	Executive	Reference Oil Inventories	Additional Information
Test Area Status	TEST	LABS*	STANDS*
* As of 3/31/2023			

B0.07 Bench Testing Executive Summary

- ▶ **D7216 (EOEC/LDOEC)**
- ▶ Supply of 1006 Ref Oil has been completely exhausted. All tests now use Ref Oil SL-107. Surveillance Panel has agreed to resume Adjustment Factors for EOEC. Several labs participated in Round Robin tests of ACM1 batch 25 vs batch 26 to understand what would be the result of returning to a previous manufacturing method for the Polyacrylate elastomer. TMC will officially monitor the EOEC/LDEOC bench tests, adding a section to LTMS.

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Section	Topic		
Test Area Status (cont.)	TEST	LABS*	STANDS*
EOEC Elast. Compat.	D7216-E	6 (-2)	N/A
LDEOC Elast. Compat.	D7216-L	8 (+0)	N/A
* As of 3/31/2023			

D02.B0.07

TMC Monitored Tests



ASTM D 7216

Engine Oil Elastomer Compatibility (EOEC/HDEOC)

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ASTM Reference Testing Semi-Annual Report D7216 EOEC

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ASTM D 7216

Engine Oil Elastomer Compatibility (EOEC/HDEOC)

OHT CURRENT ELASTOMER BATCH CODES FOR ASTM D7216

AS OF: 3/9/2023

EOEC (PC 9)	
OHT PART NUMBER	BATCH CODE
OHTPC9-NBR-1	29
OHTPC9-ACM-2	31
OHTPC9-FKM-1	30
OHTPC9-MAC-1	23

LDEOC (J2643)	
OHT PART NUMBER	BATCH CODE
OHTJ2643-HNBR-1	30
OHTJ2643-FKM-1	28
OHTJ2643-ACM-2	25
OHTJ2643-VMQ-1	40
OHTJ2643-AEM-2	30

Calibrated Labs and Stands*

(change shown in parentheses)

Test	Labs	Stands
D7216	6 (-2)	N/A

*As of 3/31/2023

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EOEC Test Activity*

Test Status		Fluoroelast.	Nitrile	Polyacrylate	Silicone	VAMAC	Total
Acceptable Calibration Test	AC	58	67	61	56	55	297
Failed Calibration Test	OC	0	0	0	0	2	2
Operationally Invalid, by lab	LC	0	4	0	0	0	4
Operationally Invalid, by TMC	RC	0	0	0	0	0	0
Aborted	XC	0	0	0	0	0	0
Total		58	71	61	56	57	303

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EOEC Failed Calibration Tests*

Cause	Elastomer	No. of Tests
Tensile Strength Change (MILD)	EOECV	1
Volume Change (MILD)	EOECV	1
Total		2

*Two failing calibration tests, one (each) reported by two different labs

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EOEC Lost Tests*

Validity	Cause	No. of Tests
LC	Wrong Temperature	1
LC	Wrong Elastomer Material	1
LC	Sample Lost	2
Total		4

*Invalid and aborted calibration tests

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EOEC Test Severity

Fluoroelastomer (FKM)

Parameter	Period Mean Δ/s	Status
Volume Change	-0.04	On-Target
Points Hardness Change	0.00	On-Target
Tensile Strength Change	0.57	Severe
Elongation Change	-0.58	Mild

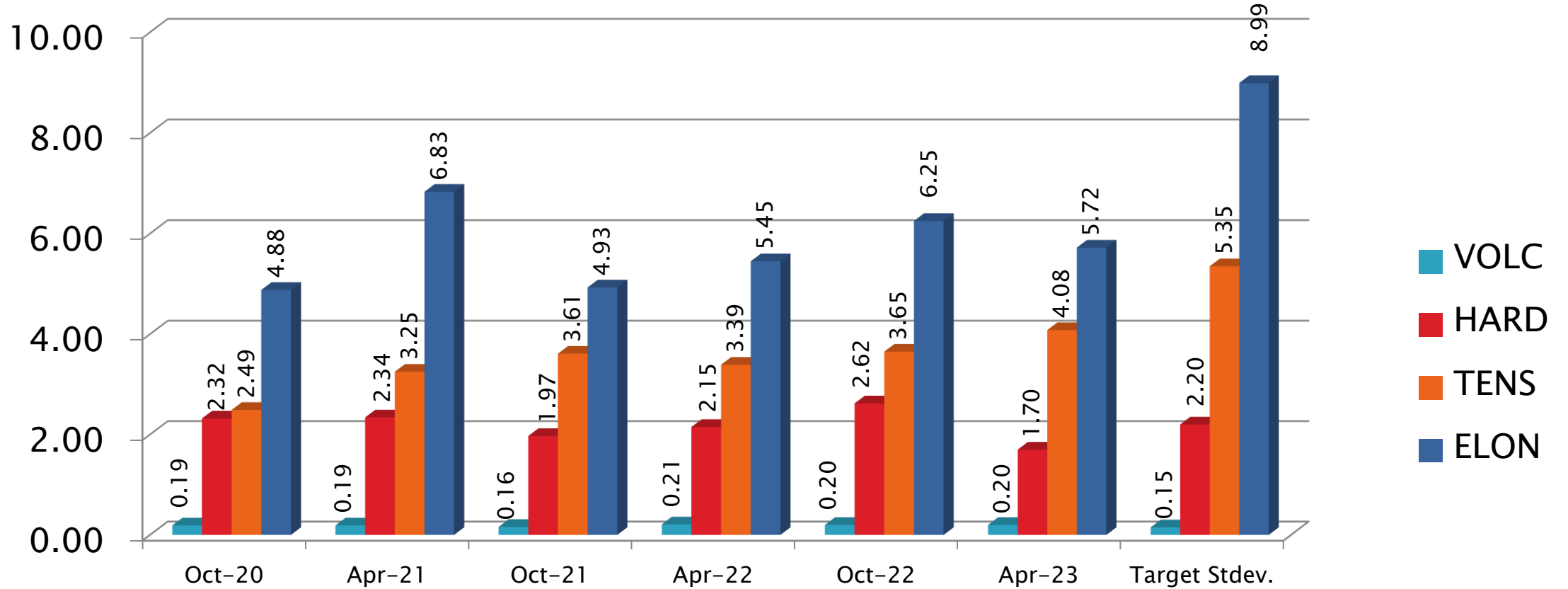
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EOEC Precision (Pooled s) Estimates: Fluoroelastomer



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EOEC Precision Estimates by Lab: FKM

Test Parameter	Statistic	LTMS Lab				
		A	B	L	I	G
	n=	19	3	4	14	18
Volume	Mean	0.37	0.39	0.35	0.61	0.39
	Pooled s	0.10	0.08	0.05	0.30	0.14
	Mean /s	-0.46	-0.34	-0.61	1.12	-0.32
Hardness	Mean	8.89	9.67	8.25	7.71	7.06
	Pooled s	1.15	1.15	1.26	1.44	1.95
	Mean /s	0.39	0.74	0.1	-0.15	-0.45
Tensile Strength	Mean	-70.8	-72.3	-70.4	-65.4	-66.7
	Pooled s	1.93	2.14	1.78	0.69	4.44
	Mean /s	0.09	-0.19	0.17	1.10	0.87
Elongation	Mean	-67.8	-66.2	-68.1	-58.3	-62.3
	Pooled s	2.69	1.51	1.42	6.27	4.53
	Mean /s	-1.04	-0.86	-1.07	0.02	-0.42

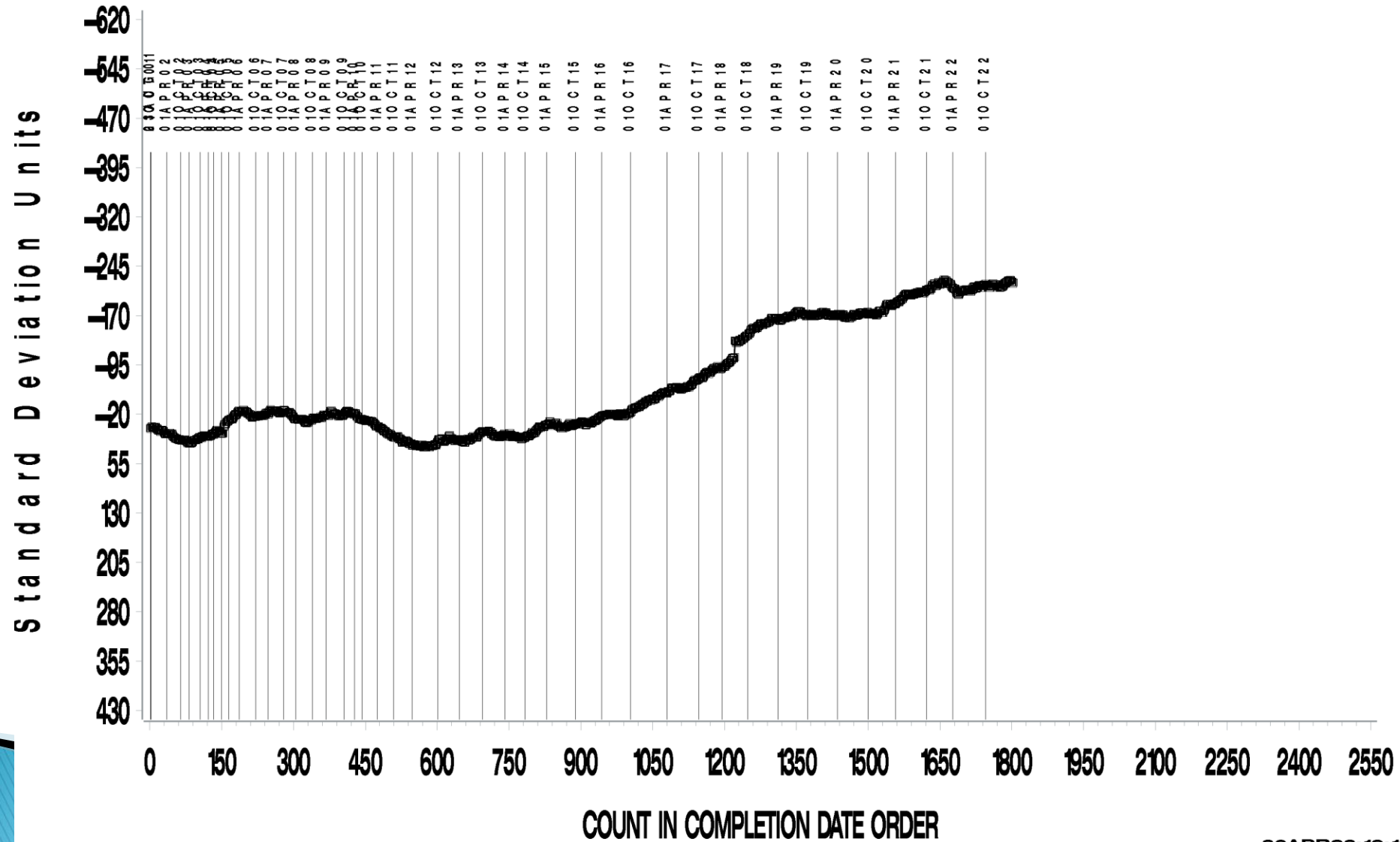
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FLUOROELASTOMER VOLUME CHANGE CORRECTED AVERAGE

CUSUM Severity Analysis



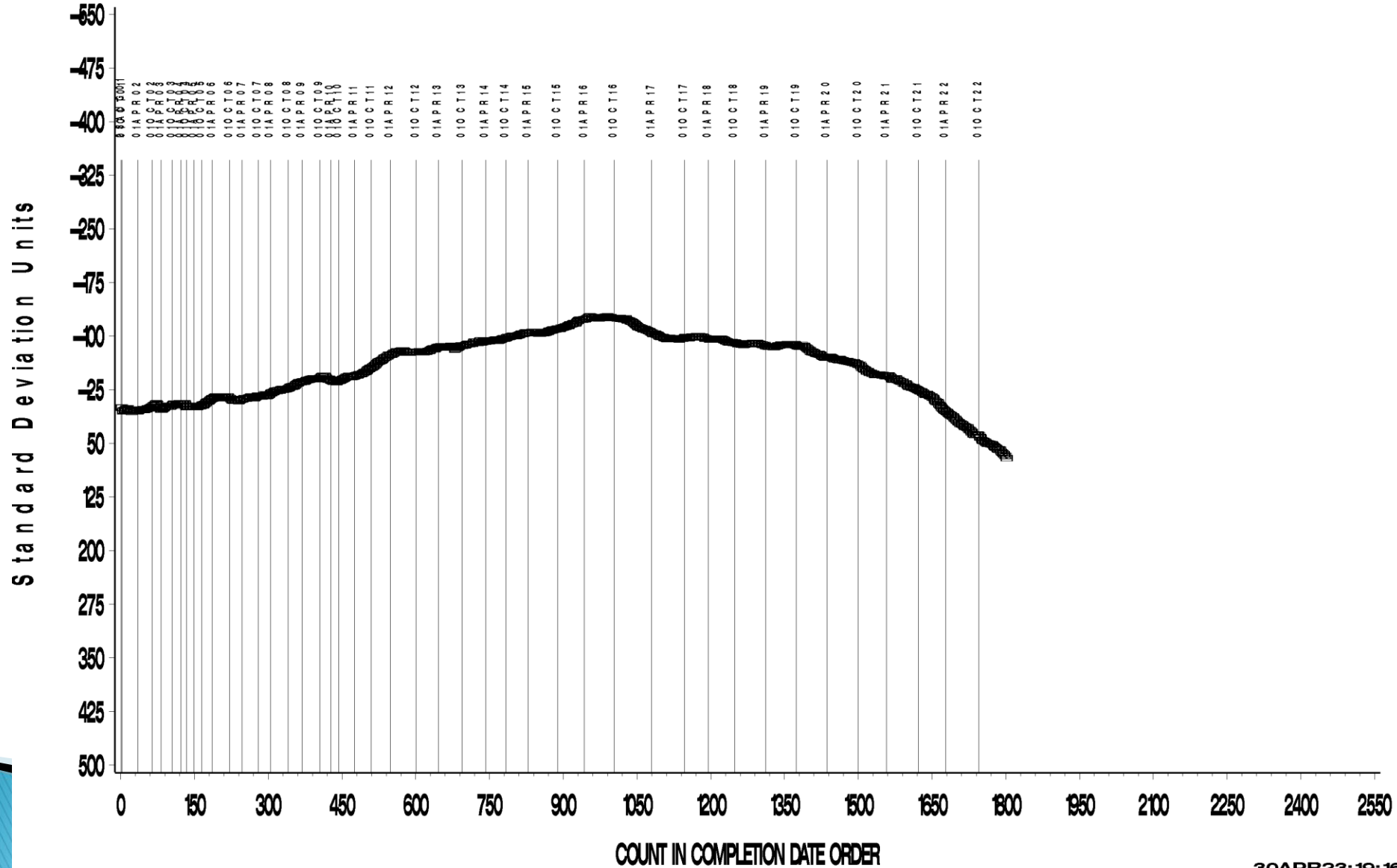
FLUOROELASTOMER PTS HARDNESS CHANGE CORRECTED AVG

CUSUM Severity Analysis



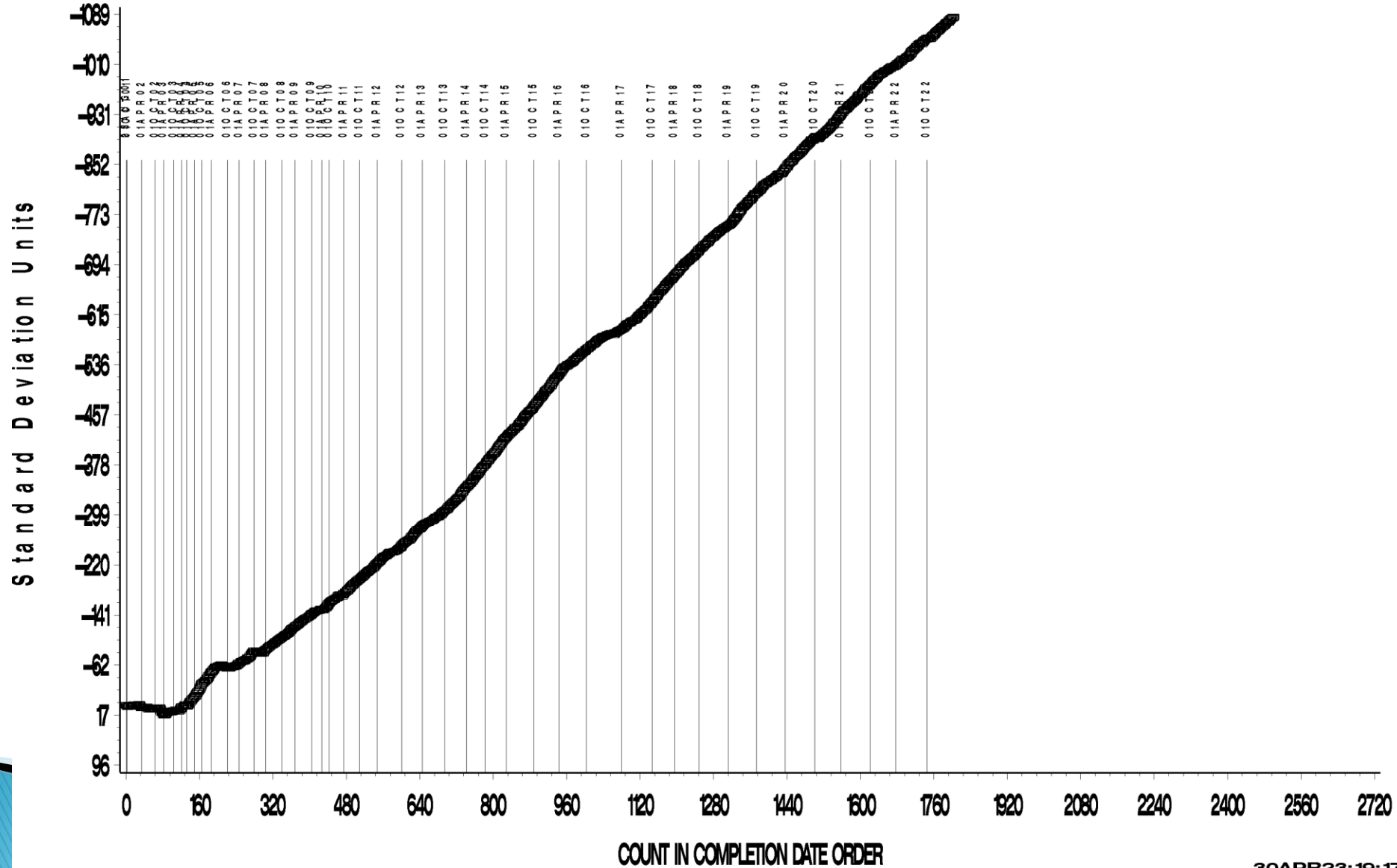
FLUOROELASTOMER TENS STRENGTH CHANGE CORRECTED AVG

CUSUM Severity Analysis



FLUOROELASTOMER ELONGATION CHANGE CORRECTED AVG

CUSUM Severity Analysis



EOEC Test Severity

Nitrile (NBR)

Parameter	Period Mean Δ/s	Status
Volume Change	0.06	On-Target
Points Hardness Change	0.83	Severe
Tensile Strength Change	-0.68	Mild
Elongation Change	-0.15	Slightly Mild

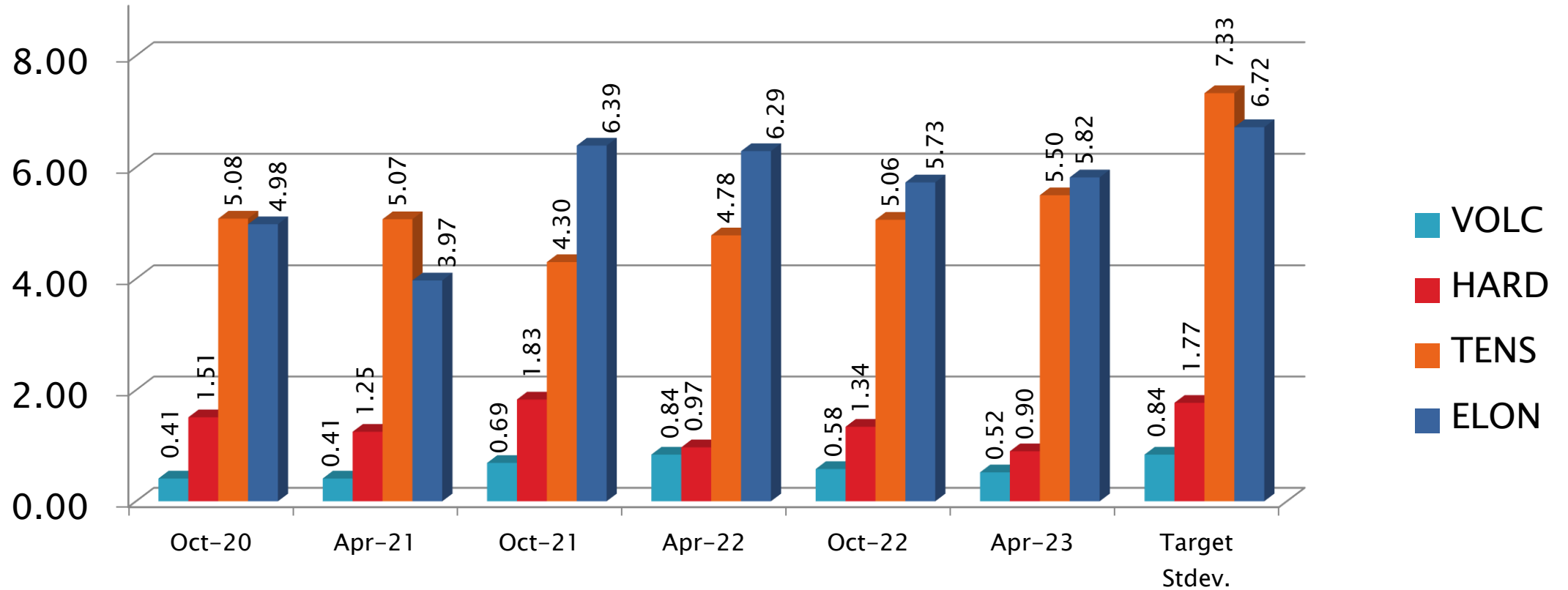
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EOEC Precision Estimates – Nitrile



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EOEC Precision Estimates by Lab: NBR

Test Parameter	Statistic	LTMS Lab				
		A	B	L	I	G
	n=	24	3	4	16	20
Volume	Mean	1.93	2.36	1.49	2.02	1.42
	Pooled s	0.31	0.27	0.09	0.51	0.56
	Mean /s	0.23	0.73	-0.30	0.33	-0.38
Hardness	Mean	3.08	3.67	3.00	3.12	3.70
	Pooled s	0.72	1.15	0.82	0.72	1.13
	Mean /s	0.71	1.04	0.66	0.73	1.06
Tensile Strength	Mean	-0.16	-7.43	2.12	-1.94	-4.76
	Pooled s	4.75	3.14	3.92	2.66	6.94
	Mean /s	-0.40	-1.40	-0.09	-0.64	-1.03
Elongation	Mean	-34.7	-37.6	-34.3	-37.5	-32.2
	Pooled s	4.19	0.44	1.64	3.43	8.50
	Mean /s	-0.15	-0.58	-0.91	-0.56	0.22

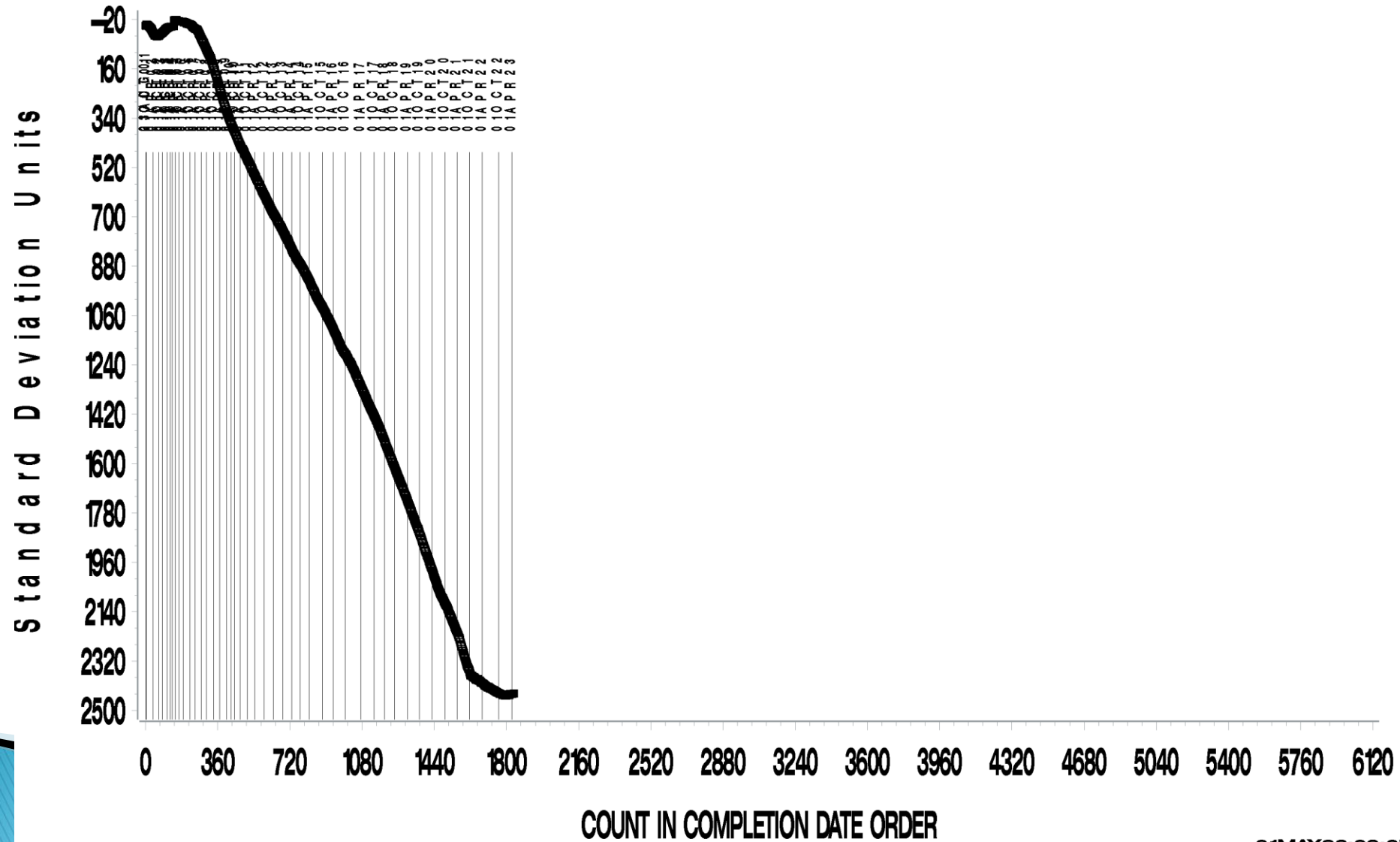
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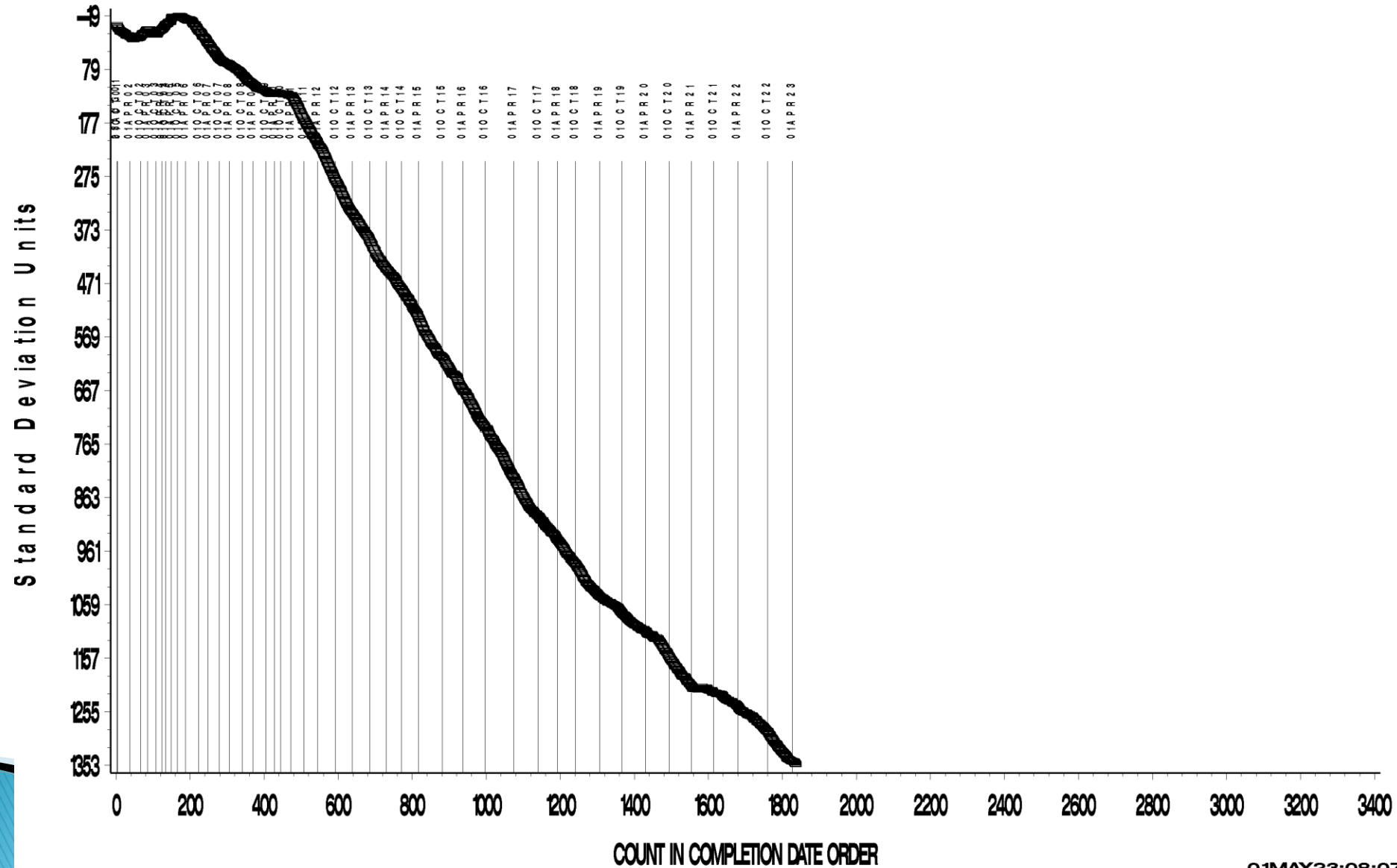
REFERENCE NITRILE VOLUME CHANGE CORRECTED AVERAGE

CUSUM Severity Analysis



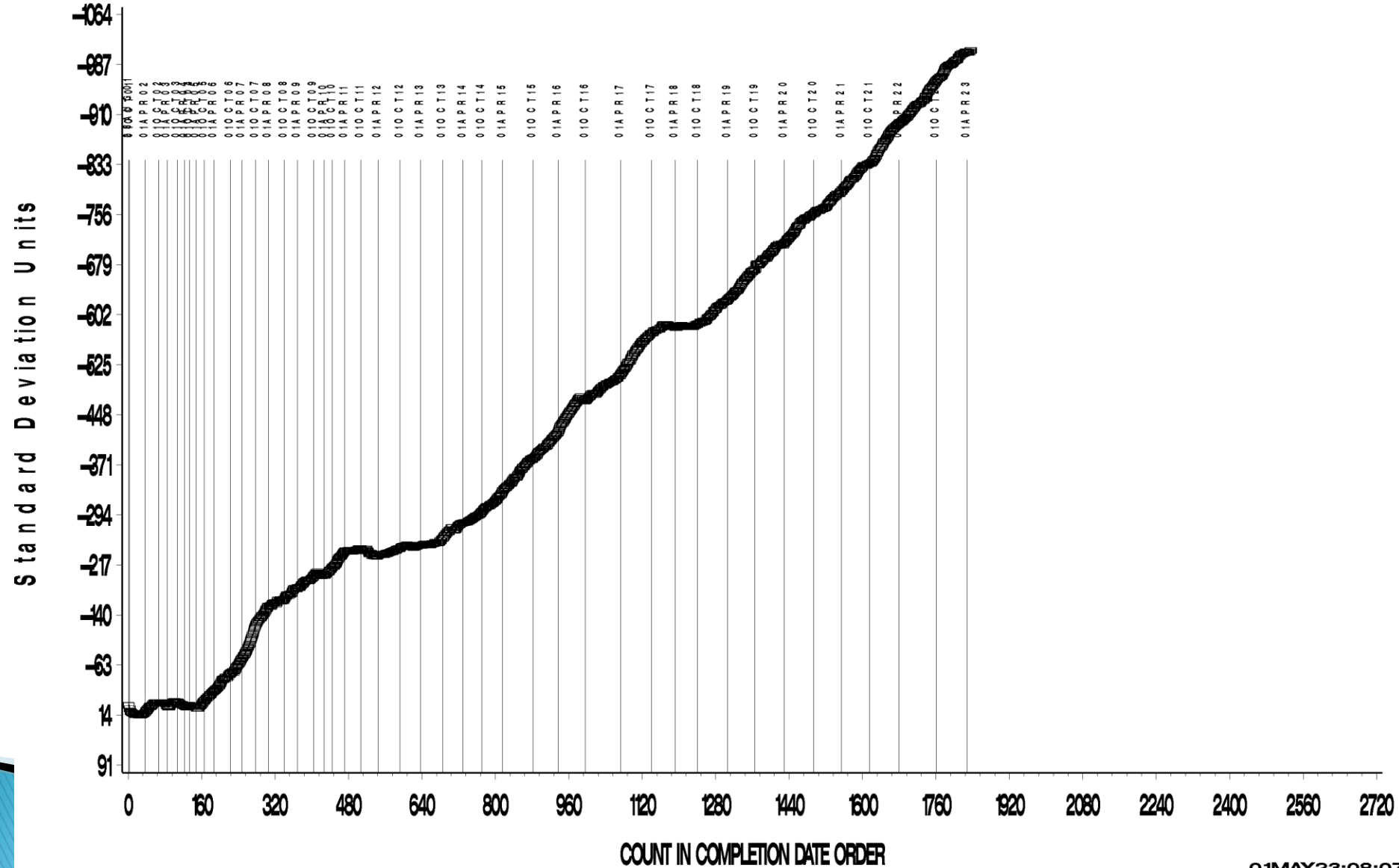
REFERENCE NITRILE PTS HARD CHANGE CORRECTED AVG

CUSUM Severity Analysis



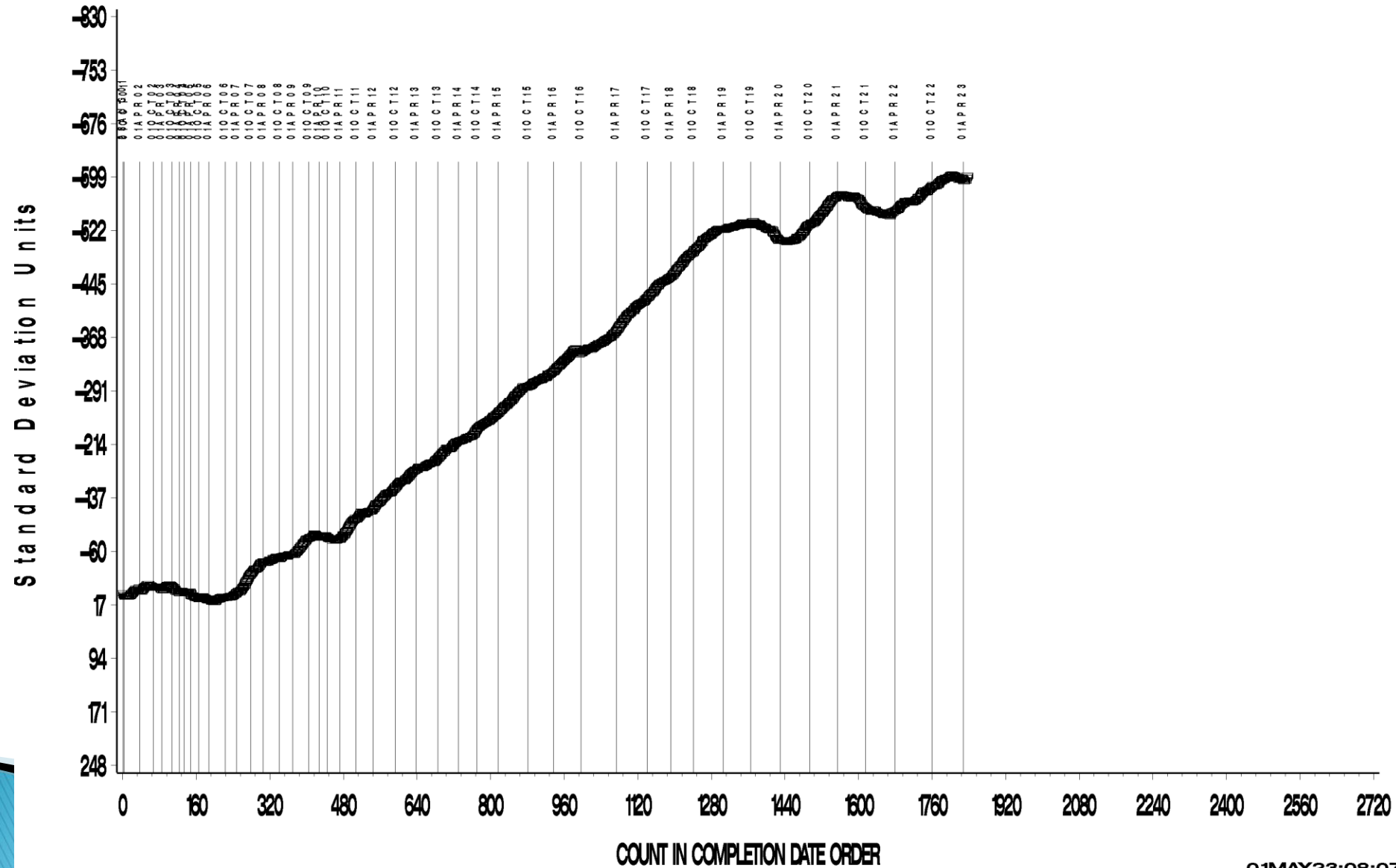
REF NITRILE TENS STRENGTH CHANGE CORRECTED AVG

CUSUM Severity Analysis



REF NITRILE ELONGATION CHANGE CORRECTED AVERAGE

CUSUM Severity Analysis



EOEC Test Severity

Polyacrylate (ACM)

Parameter	Period Mean Δ/s	Status
Volume Change	1.81	Severe
Points Hardness Change	-0.21	Mild
Tensile Strength Change	-0.26	Mild
Elongation Change	0.33	Severe

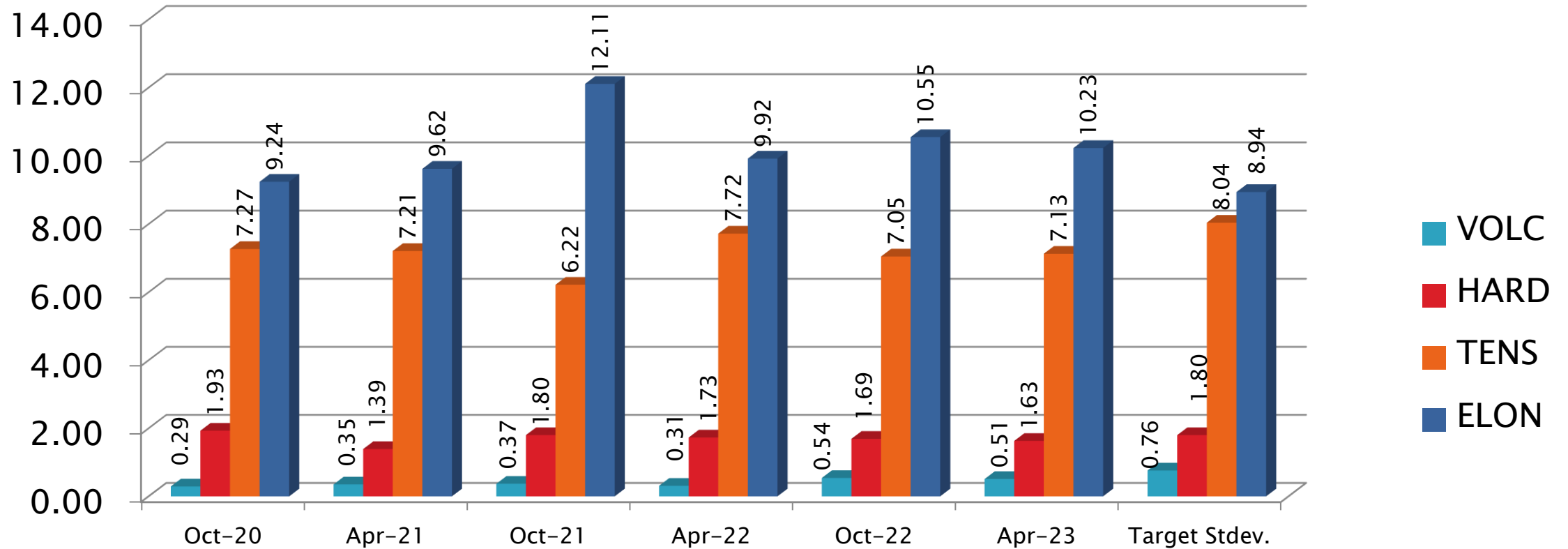
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EOEC Precision Estimates – Polyacrylate



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EOEC Precision Estimates by Lab: ACM

Test Parameter	Statistic	LTMS Lab				
		A	B	L	I	G
	n=	20	2	4	15	20
Volume	Mean	1.35	1.51	1.60	1.99	1.49
	Pooled s	0.21	0.20	0.48	0.66	0.46
	Mean /s	1.51	1.72	1.84	2.36	1.70
Hardness	Mean	-0.55	-1.00	-1.00	-0.67	-0.30
	Pooled s	1.15	1.41	0.82	1.10	2.39
	Mean /s	-0.30	-0.55	-0.55	-0.03	-0.16
Tensile Strength	Mean	-1.80	0.80	-3.50	-1.25	-1.84
	Pooled s	6.58	2.12	6.48	7.26	8.37
	Mean /s	-0.27	0.05	-0.48	-0.20	-0.27
Elongation	Mean	-21.8	-15.6	-13.5	-23.2	-16.3
	Pooled s	11.05	11.95	10.70	6.70	10.63
	Mean /s	0.08	0.79	1.01	-0.07	0.70

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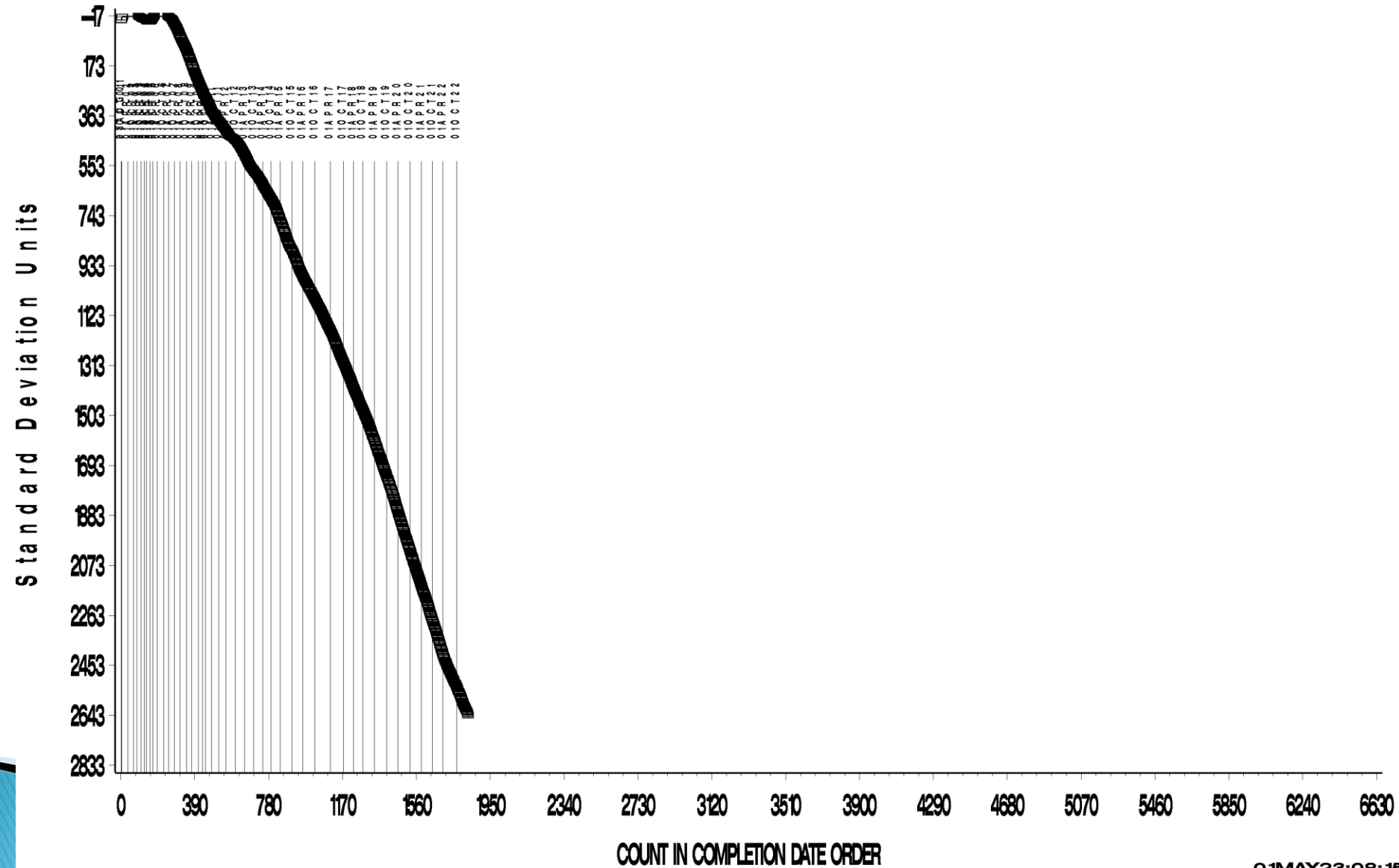
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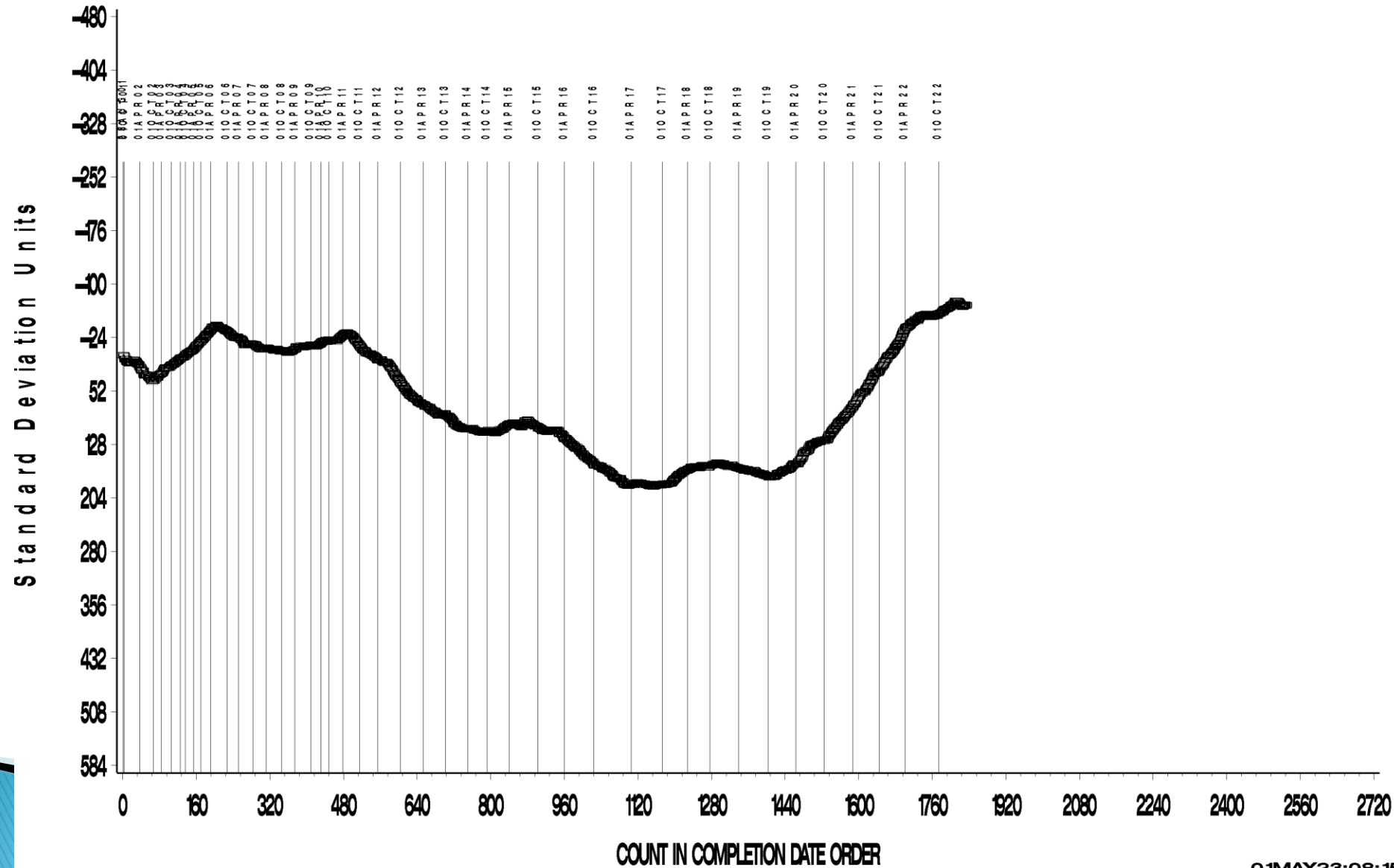
REFERENCE POLYACRYLATE VOLUME CHANGE CORRECTED AVG

CUSUM Severity Analysis



REF POLYACRYLATE PTS HARD CHANGE CORRECTED AVG

CUSUM Severity Analysis



REF POLYACRYLATE TENS STRNGTH CHANGE CORRECTED AVG

CUSUM Severity Analysis



EOEC Test Severity

Silicone (VMQ)

Parameter	Period Mean Δ/s	Status
Volume Change	0.61	Severe
Points Hardness Change	-0.72	Mild
Tensile Strength Change	0.52	Severe
Elongation Change	0.22	Severe

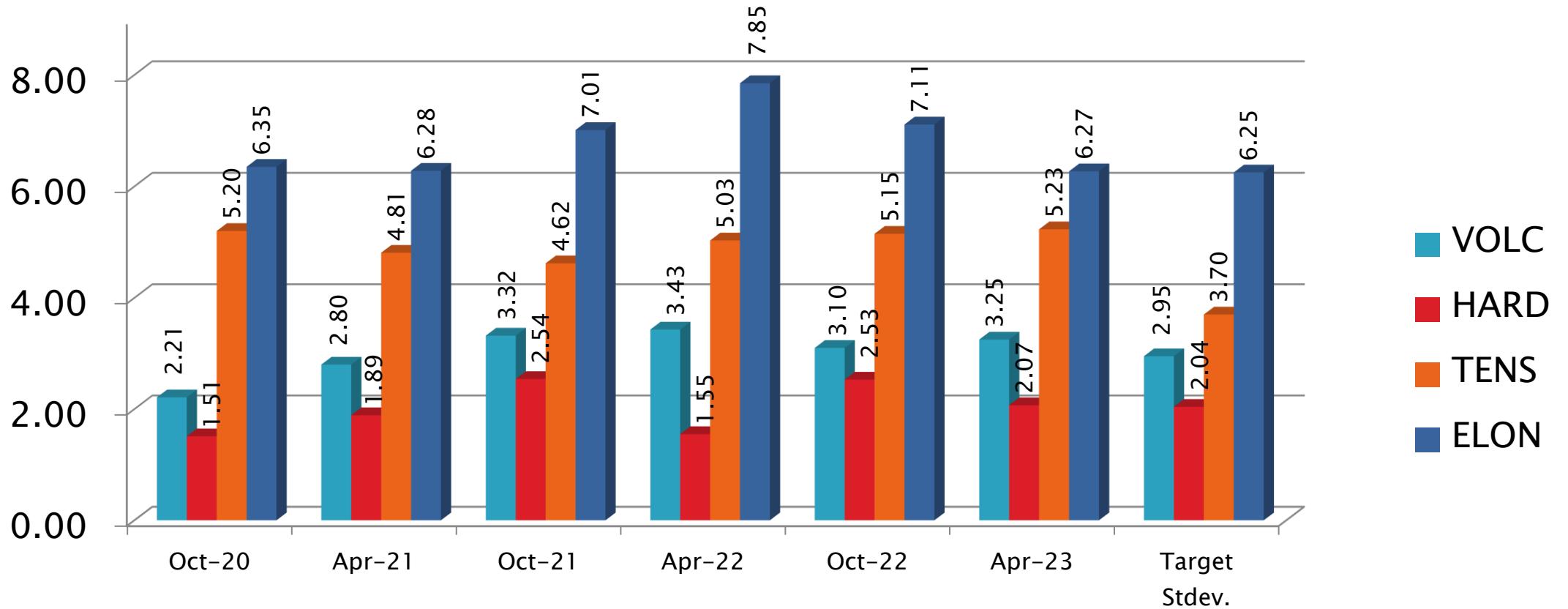
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EOEC Precision Estimates - Silicone



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EOEC Precision Estimates by Lab: VMQ

Test Parameter	Statistic	LTMS Lab					
		A	B	L	I	G	V
	n=	17	3	4	14	16	2
Volume	Mean	33.3	33.2	29.2	31.6	38.3	32.4
	Pooled s	1.65	0.81	1.29	1.06	1.51	0.01
	Mean /s	0.40	0.36	-1.00	-0.20	2.07	0.06
Hardness	Mean	-24.5	-23.7	-18.8	-22.4	-23.2	-24.0
	Pooled s	1.33	1.15	0.50	1.65	1.84	0
	Mean /s	-1.37	-0.97	1.44	-0.37	-0.77	-1.14
Tensile Strength	Mean	-28.4	-27.8	-31.4	-37.3	-32.5	-24.0
	Pooled s	3.15	5.46	0.78	3.16	4.88	1.77
	Mean /s	1.44	1.60	0.64	-0.97	0.33	2.62
Elongation	Mean	-23.9	-17.1	-18.6	-24.0	-25.2	-21.7
	Pooled s	2.66	5.97	3.31	5.80	9.06	1.27
	Mean /s	0.15	1.23	1.00	0.13	-0.06	0.50

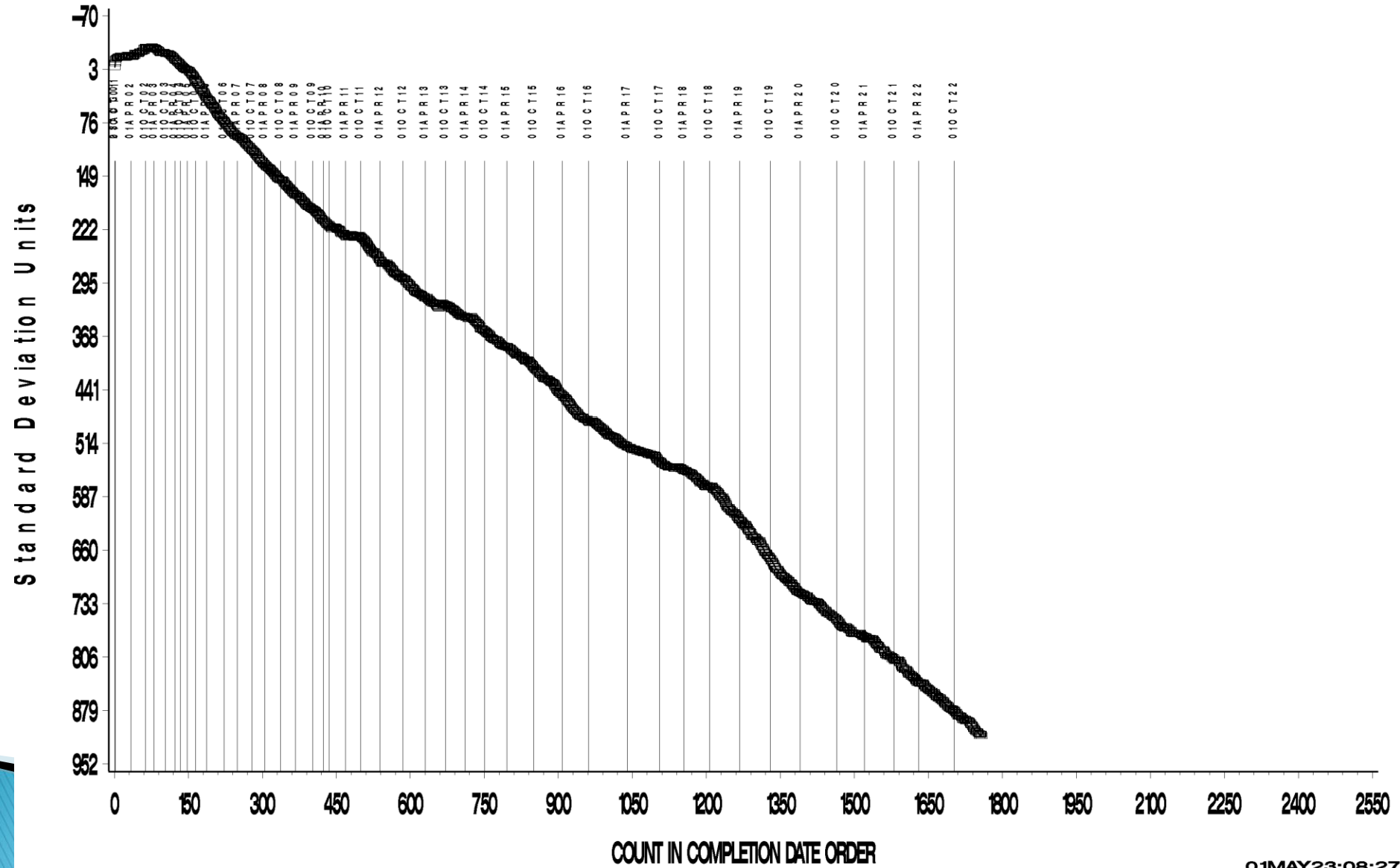
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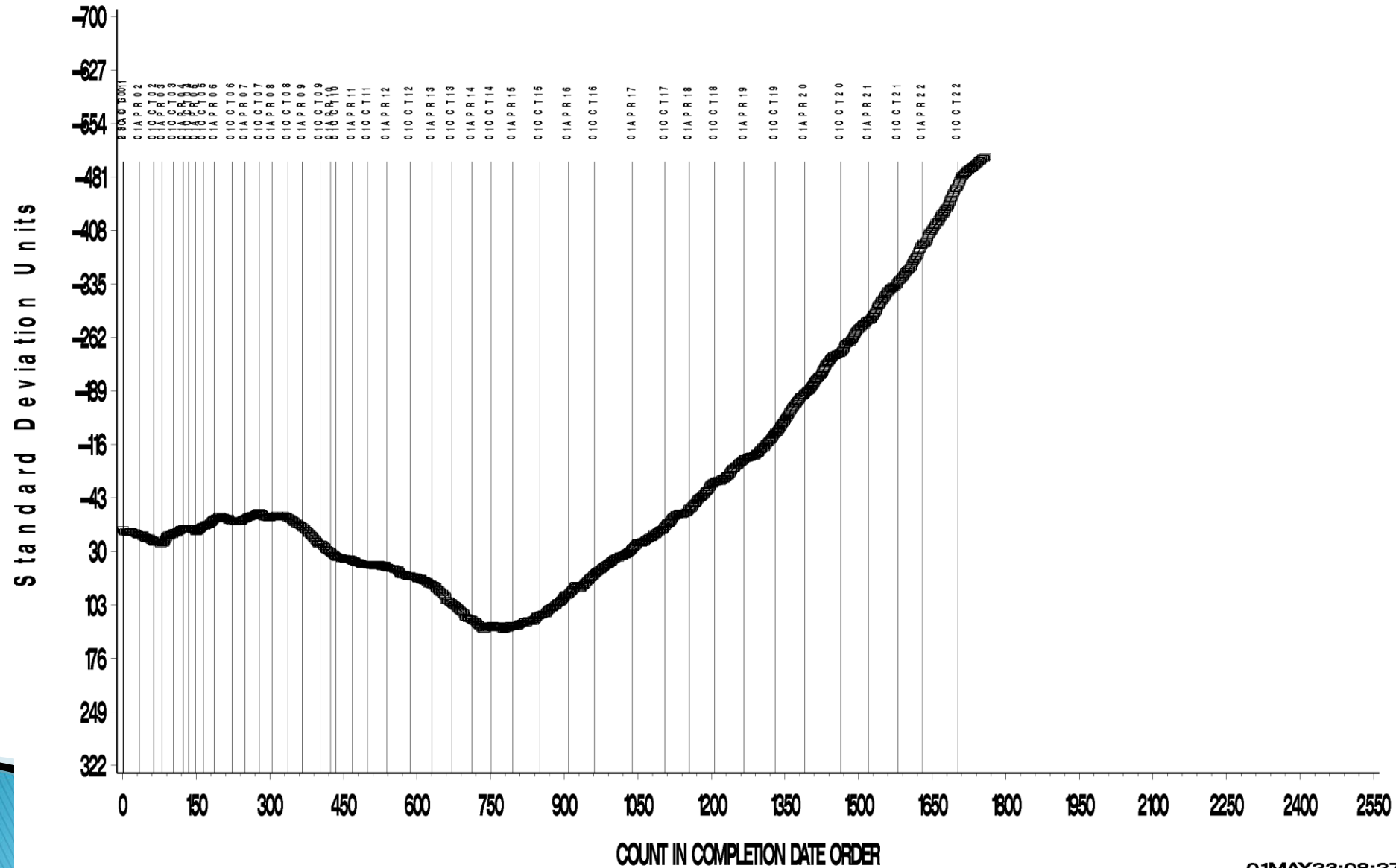
REFERENCE SILICON VOLUME CHANGE CORRECTED AVG

CUSUM Severity Analysis



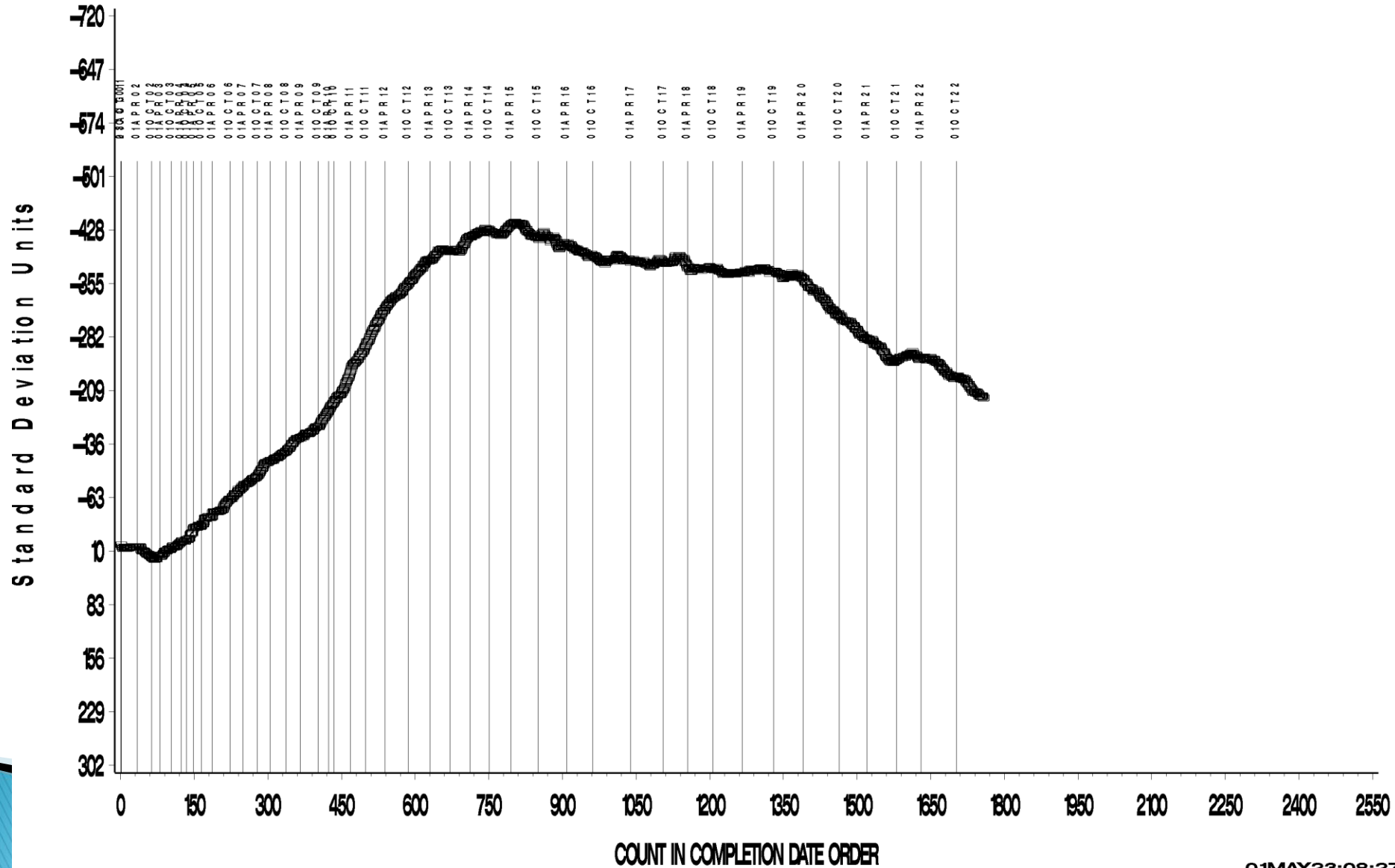
REFERENCE SILICON PTS HARD CHANGE CORRECTED AVG

CUSUM Severity Analysis



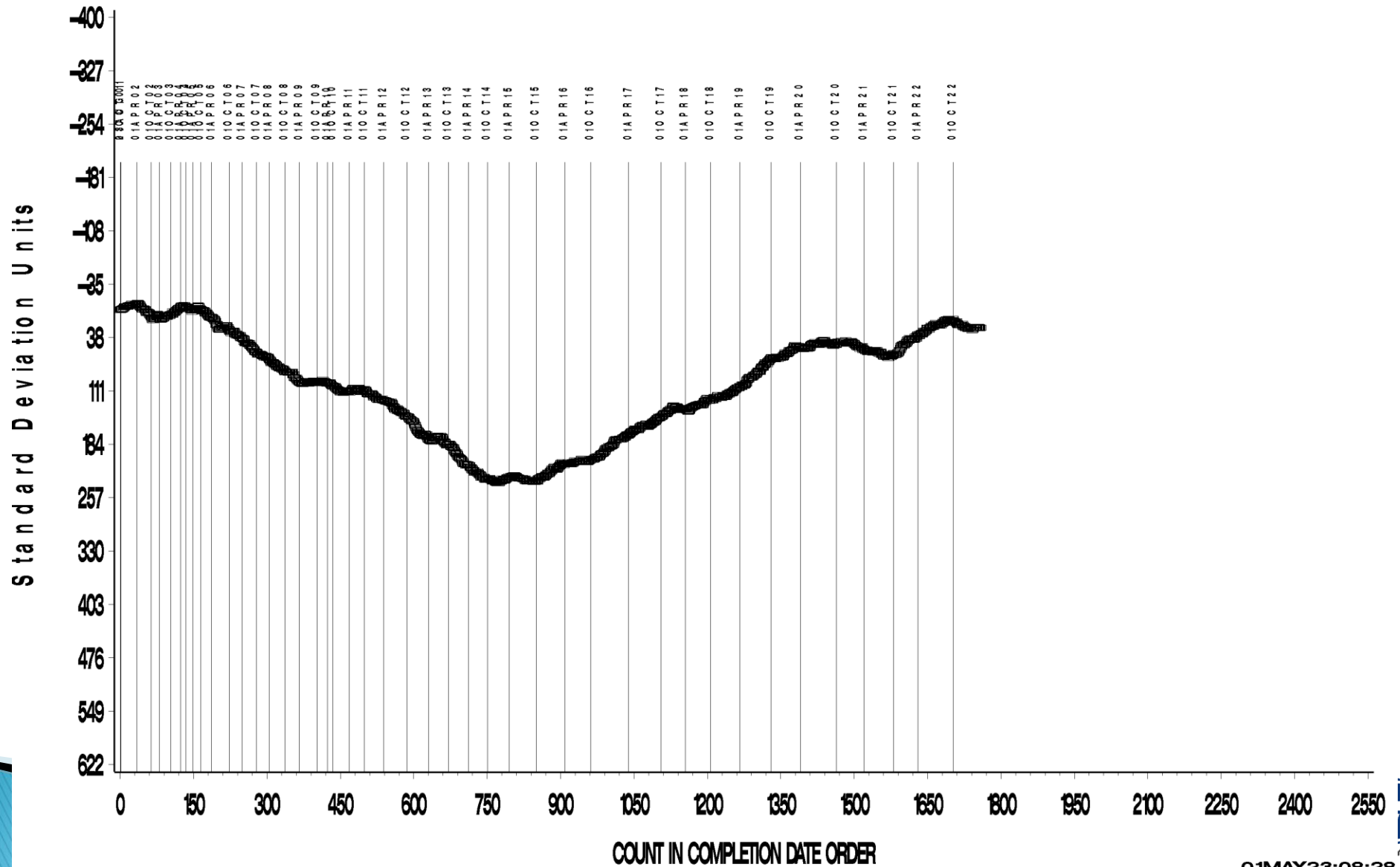
REF SILICON TENSILE STRENGTH CHANGE CORRECTED AVG

CUSUM Severity Analysis



REF SILICON ELONGATION CHANGE CORRECTED AVG

CUSUM Severity Analysis



EOEC Test Severity

VAMAC (MAC)

Parameter	Period Mean Δ/s	Status
Volume Change	0.40	Severe
Points Hardness Change	-0.88	Mild
Tensile Strength Change	0.05	On-Target
Elongation Change	-0.40	Mild

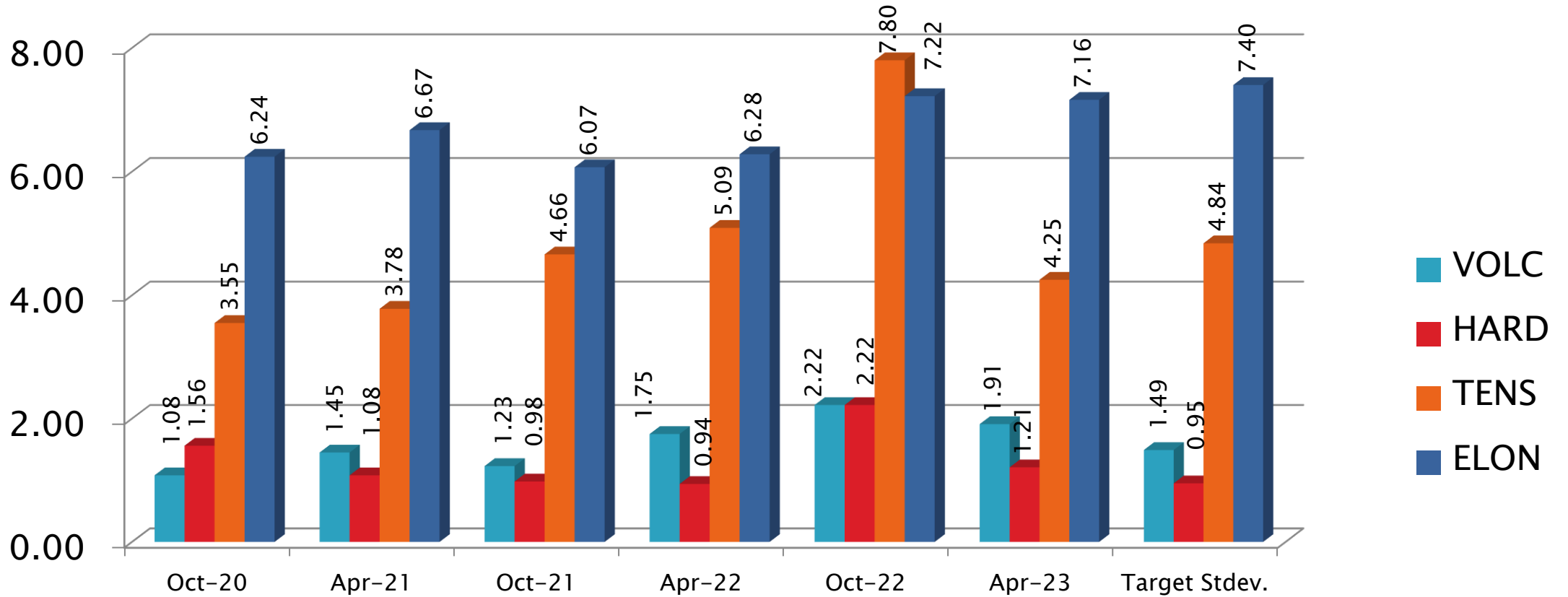
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EOEC Precision Estimates – VAMAC



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EOEC Precision Estimates by Lab: MAC

Test Parameter	Statistic	LTMS Lab				
		A	B	L	I	G
	n=	19	3	4	14	17
Volume	Mean	18.8	18.9	17.5	19.6	19.5
	Pooled s	0.41	0.39	0.40	0.77	3.31
	Mean /s	0.18	0.25	-0.67	0.71	0.66
Hardness	Mean	-8.79	-9.00	-6.50	-8.57	-7.88
	Pooled s	1.08	1.00	0.58	0.85	1.27
	Mean /s	-1.38	-1.60	1.03	-1.15	-0.42
Tensile Strength	Mean	-13.3	-16.4	-18.0	-14.8	-16.3
	Pooled s	5.08	4.24	2.34	3.28	3.81
	Mean /s	0.41	-0.23	-0.55	0.10	-0.20
Elongation	Mean	-38.3	0.88	-38.0	-41.9	-33.6
	Pooled s	4.98	-41.3	2.43	3.28	10.26
	Mean /s	-0.46	1.50	-0.40	-0.94	0.18

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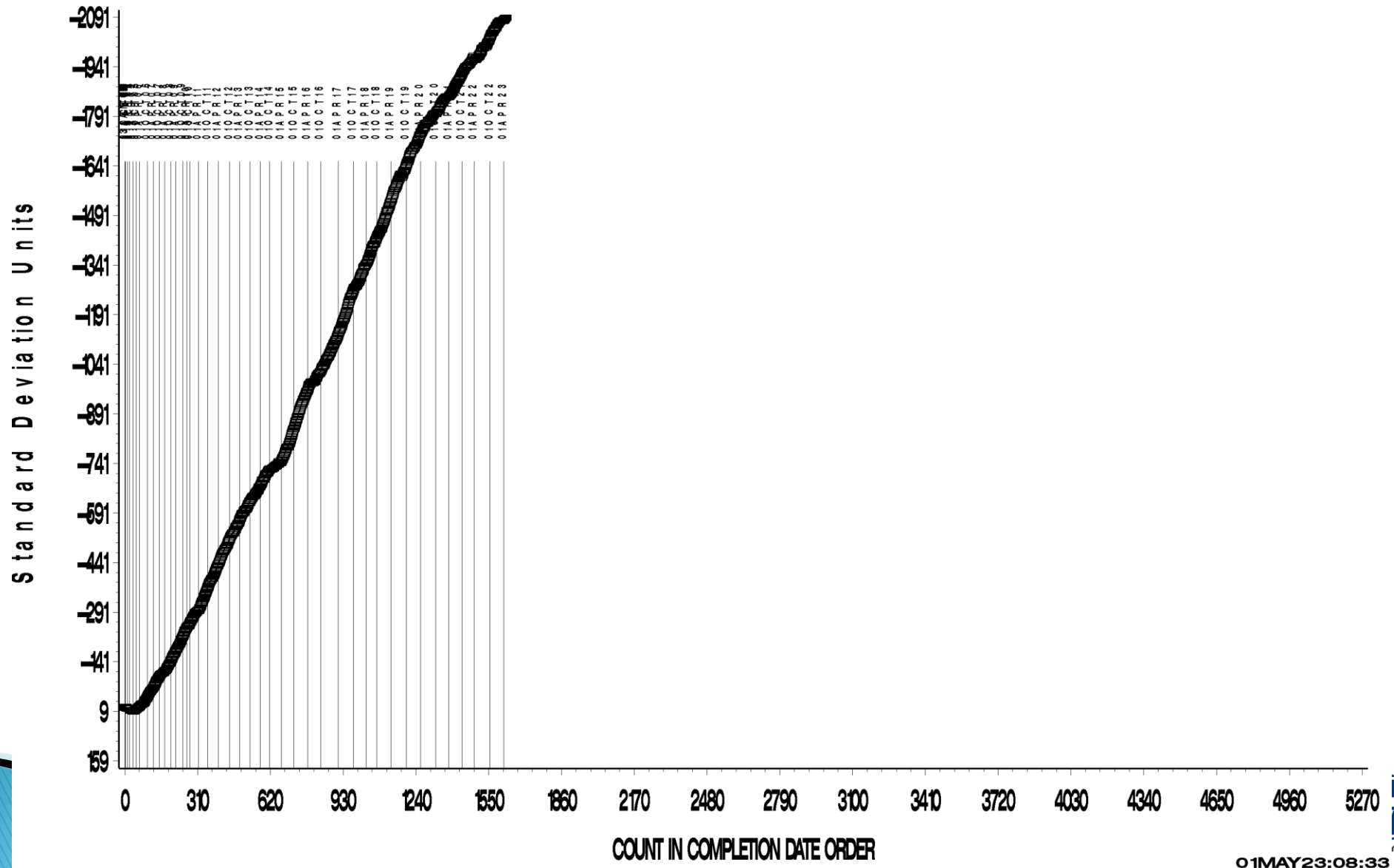
REFERENCE VAMAC G VOLUME CHANGE CORRECTED AVERAGE

CUSUM Severity Analysis



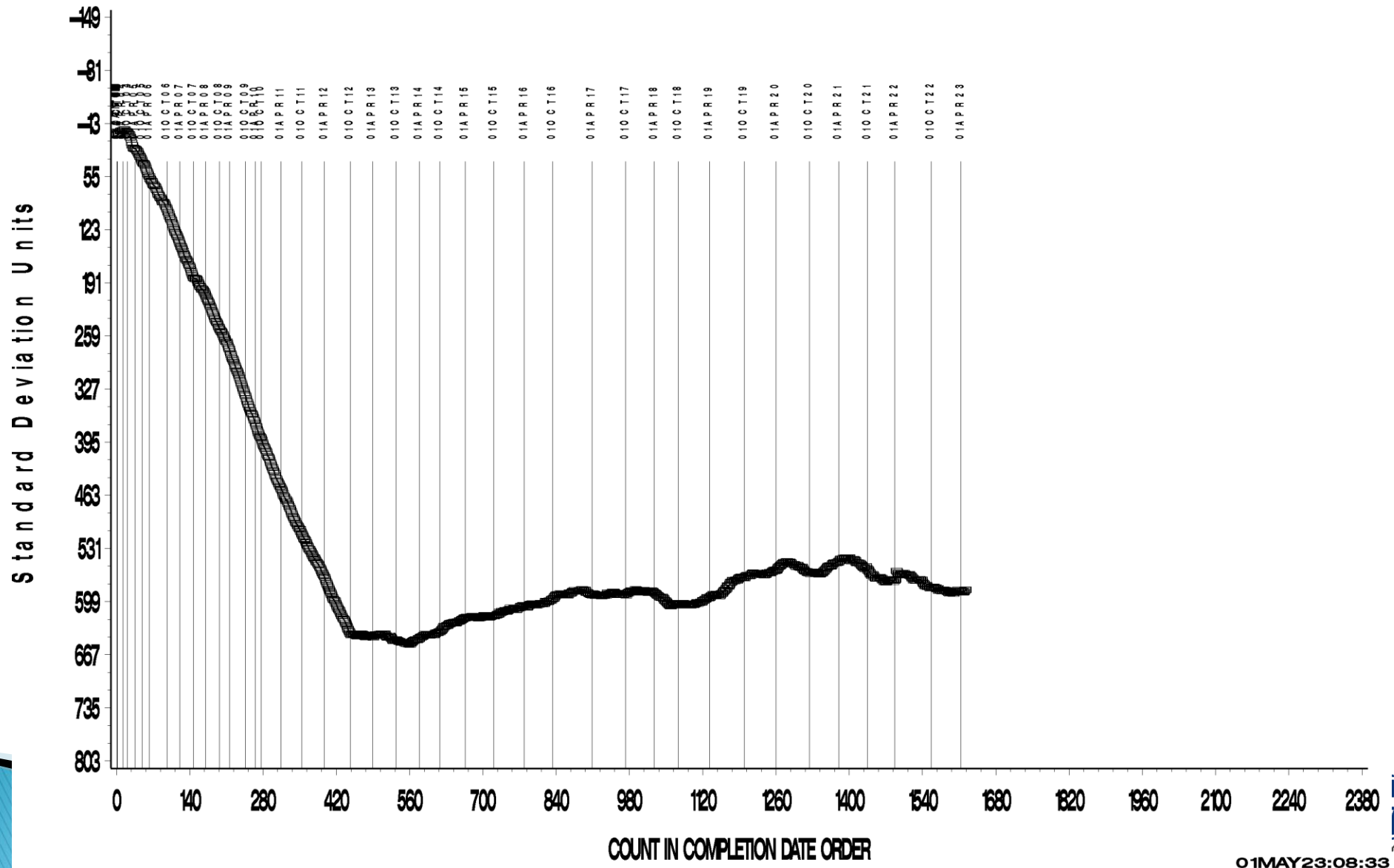
REF VAMAC G POINTS HARDNESS CHANGE CORRECTED AVG

CUSUM Severity Analysis



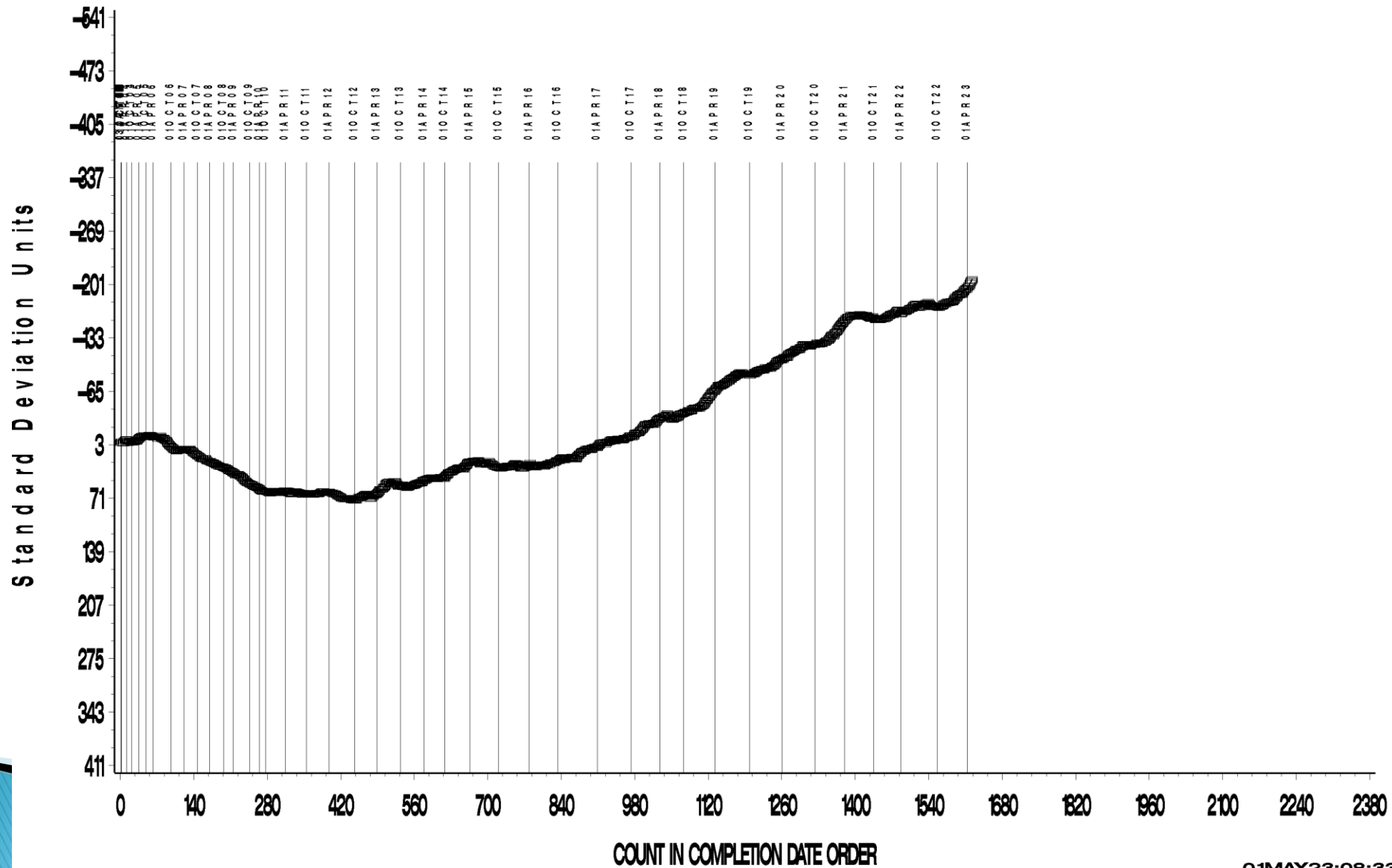
REF VAMAC G TENSILE STRENGTH CHANGE CORRECTED AVG

CUSUM Severity Analysis



REF VAMAC G ELONGATION CHANGE CORRECTED AVG

CUSUM Severity Analysis



Information Letters & Technical Updates*

Test	Date	IL or Memo Number	Topic
EOEC	20230118	M23-002*	Elastomer SP Votes to Eliminate the use of 1006 Reference Oil

*Available from TMC Website

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Reference Oil Inventory Estimated Life EOEC/LDEOC

Oil	TMC Inventory Gallons	Gallons Shipped Past 12 Months	Estimated Life
SL107 ^{A, B}	2174	198	3.7 years

^ATMC Inventory is used across several test methods

^BSL107 has fully replaced oil 1006; Oil 1006 is no longer used as an EOEC Reference Fluid

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ASTM D 7216

Engine Oil Elastomer Compatibility (EOEC/HDEOC)

OHT CURRENT ELASTOMER BATCH CODES FOR ASTM D7216

AS OF: 3/9/2023

EOEC (PC 9)	
OHT PART NUMBER	BATCH CODE
OHTPC9-NBR-1	29
OHTPC9-ACM-2	31
OHTPC9-FKM-1	30
OHTPC9-MAC-1	23

LDEOC (J2643)	
OHT PART NUMBER	BATCH CODE
OHTJ2643-HNBR-1	30
OHTJ2643-FKM-1	28
OHTJ2643-ACM-2	25
OHTJ2643-VMQ-1	40
OHTJ2643-AEM-2	30

LDEOC Test Activity*

Test Status		Ethylene Acrylate	Fluoroelast.	Nitrile	Polyacrylate	Silicone	Total
Acceptable Calibration Test	AC	66	63	68	76	75	348
Failed Calibration Test	OC	0	0	0	0	0	0
Operationally Invalid, by lab	LC	0	0	0	1	1	2
Operationally Invalid, by TMC	RC	0	0	0	0	0	0
Aborted	XC	0	0	0	0	0	0
Industry Information Runs	NI	0	0	0	10	0	10
Total		66	63	68	87	76	360

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Calibrated Labs and Stands*

(change shown in parentheses)

Test	Labs	Stands
D7216	8 (+0)	N/A

*As of 3/31/2023

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LDEOC Failing Calibration (OC) Tests*

Validity	Cause	#
OC		
OC		
OC		
Total		0

*Invalid and aborted calibration tests

No Failing LDEOC Calibration Tests were reported this period.

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LDEOC Lost Tests*

Validity	Cause	No. of Tests
LC	Sample Lost	1
LC	Heating Bath Failure	1
Total		2

*Invalid and aborted calibration tests

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LDEOC Test Severity

Ethylene Acrylate (AEM1)

Parameter	Period Mean Δ/s	Status
Volume Change	-0.39	Mild
Points Hardness Change	0.14	Severe
Tensile Strength Change	-0.38	Mild

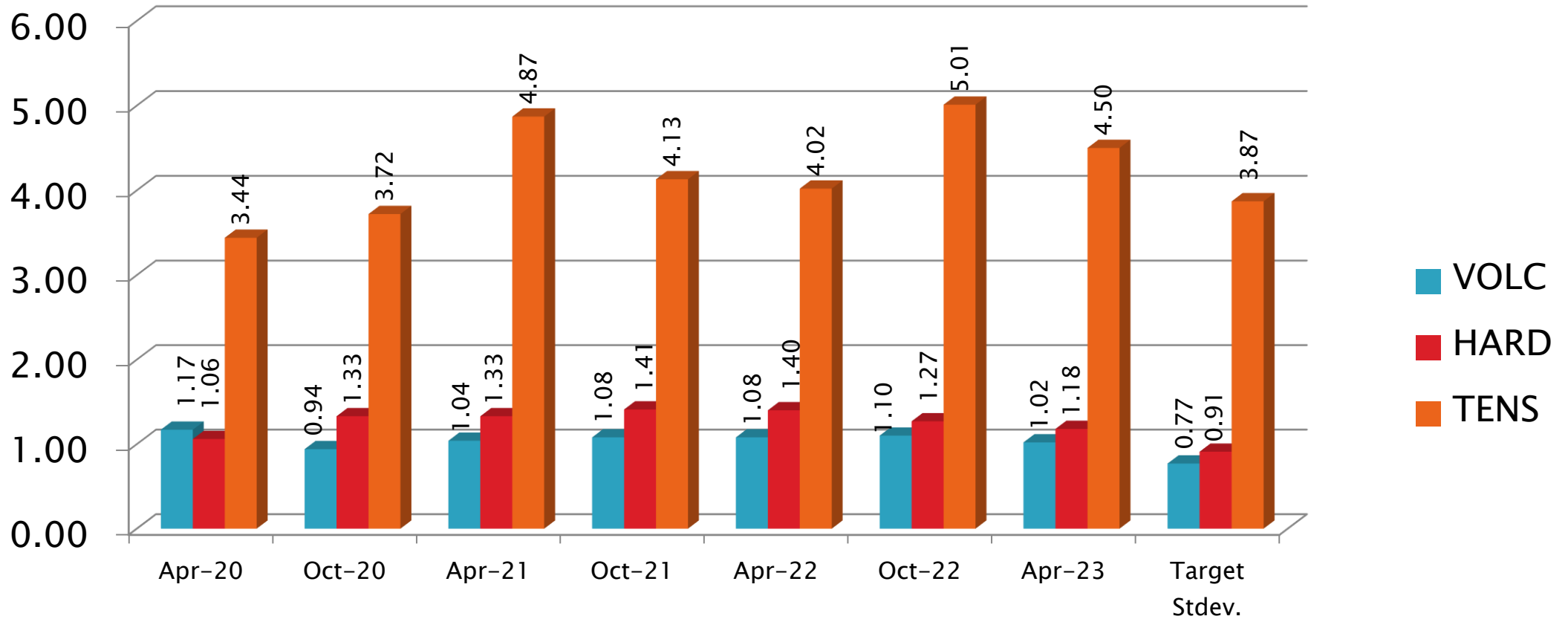
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LDEOC Precision Estimates – Ethylene Acrylate



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LDEOC Precision Estimates by Lab: AEM1

Test Parameter	Statistic	LTMS Lab					
		A	B	L	I	P	G
	n=	23	5	3	10	3	22
Volume	Mean	23.2	23.7	22.4	24.6	23.4	24.6
	Pooled s	0.36	0.56	0.28	1.11	0.64	0.91
	Mean /s	-1.27	-0.63	-2.29	0.50	-1.10	0.52
Hardness	Mean	-13.1	-13.4	-11.7	-12.0	-12.3	-12.3
	Pooled s	0.97	0.55	1.15	1.05	1.53	1.25
	Mean /s	-0.44	-0.73	1.17	0.80	0.44	0.45
Tensile Strength	Mean	-18.2	-18.9	-10.5	-19.9	-22.5	-18.2
	Pooled s	3.25	2.43	5.05	4.34	5.01	4.99
	Mean /s	-0.34	-0.54	1.64	-0.79	-1.47	-0.34

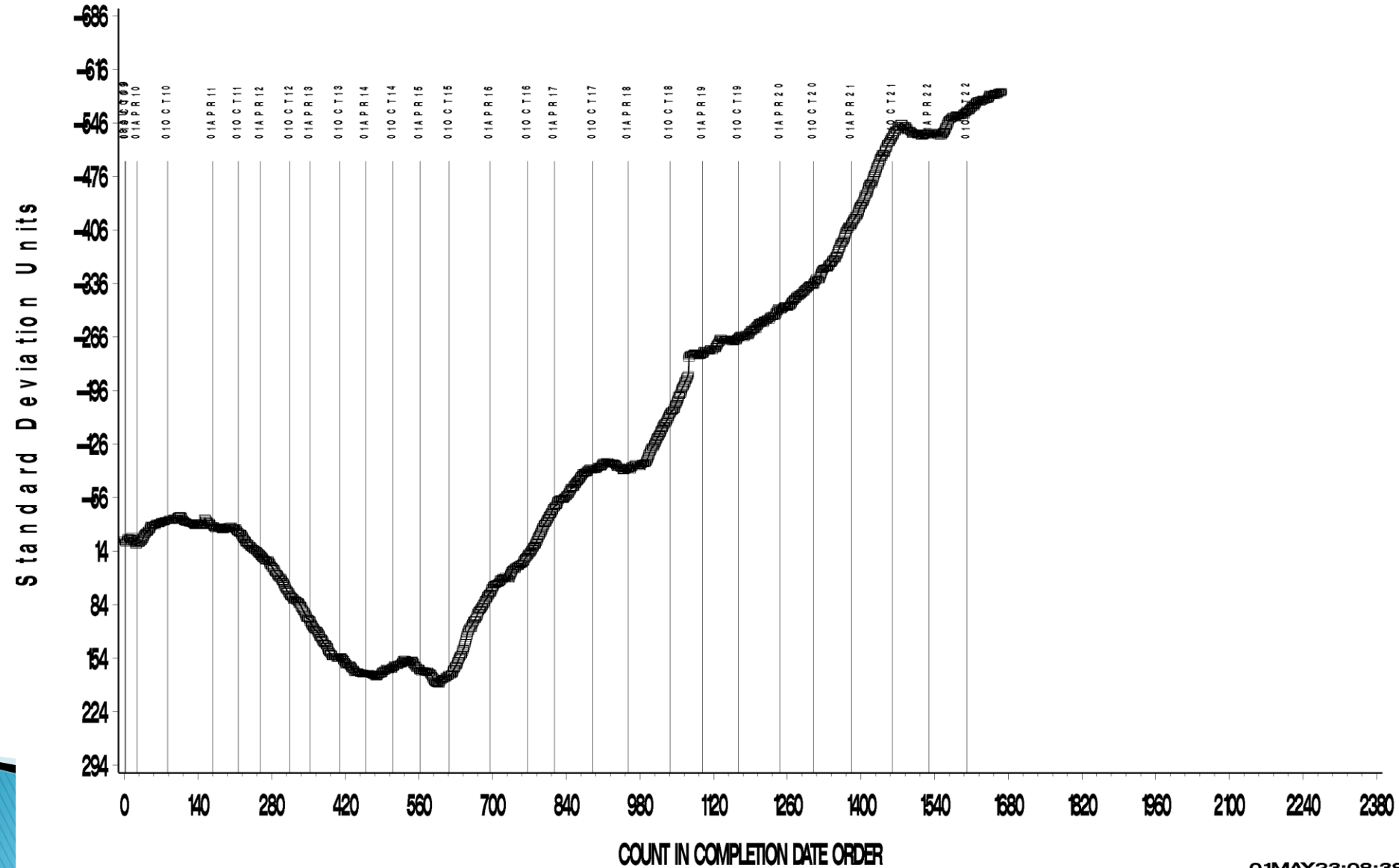
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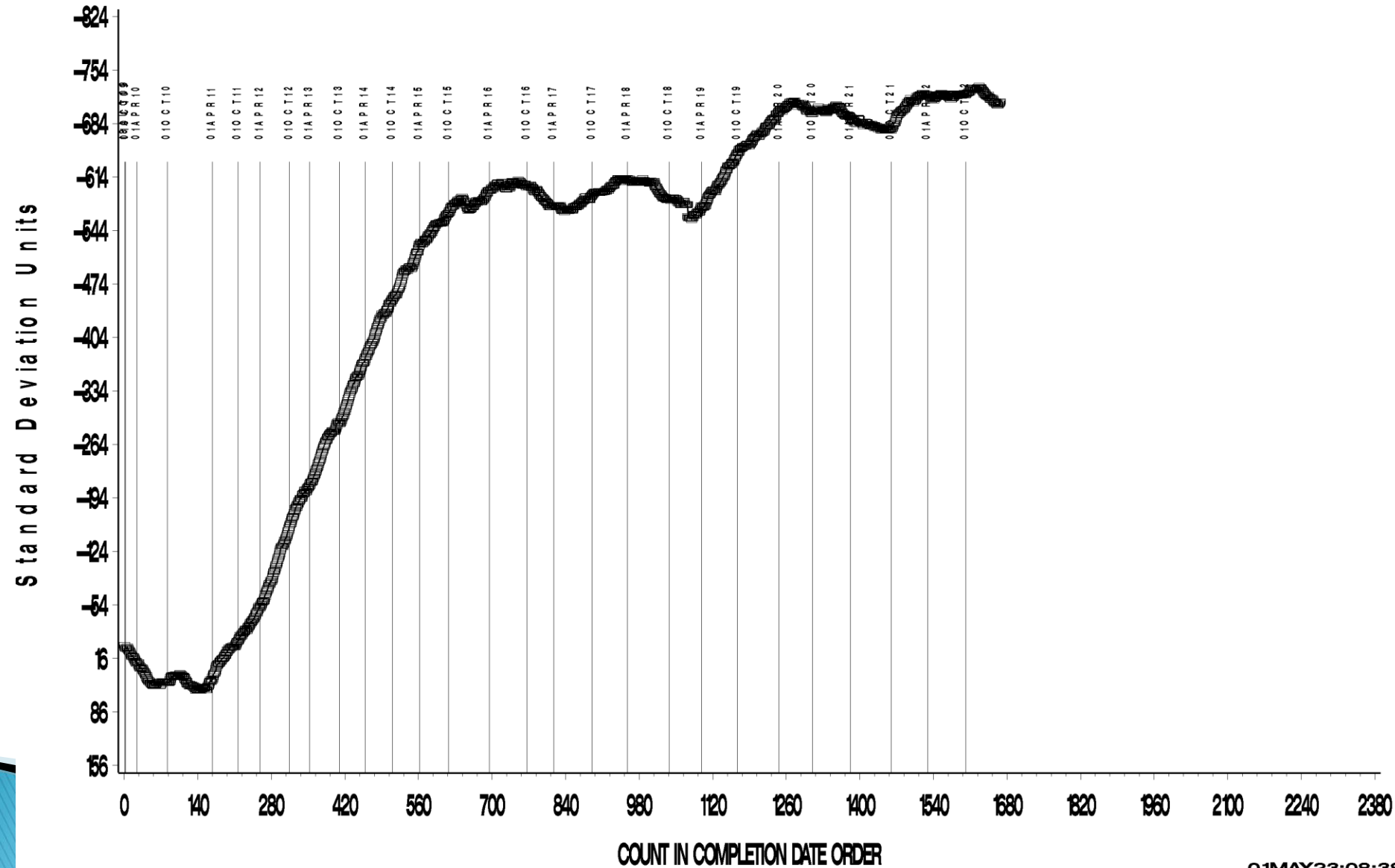
REF ETH ACRYLATE VOLUME CHANGE FINAL

CUSUM Severity Analysis



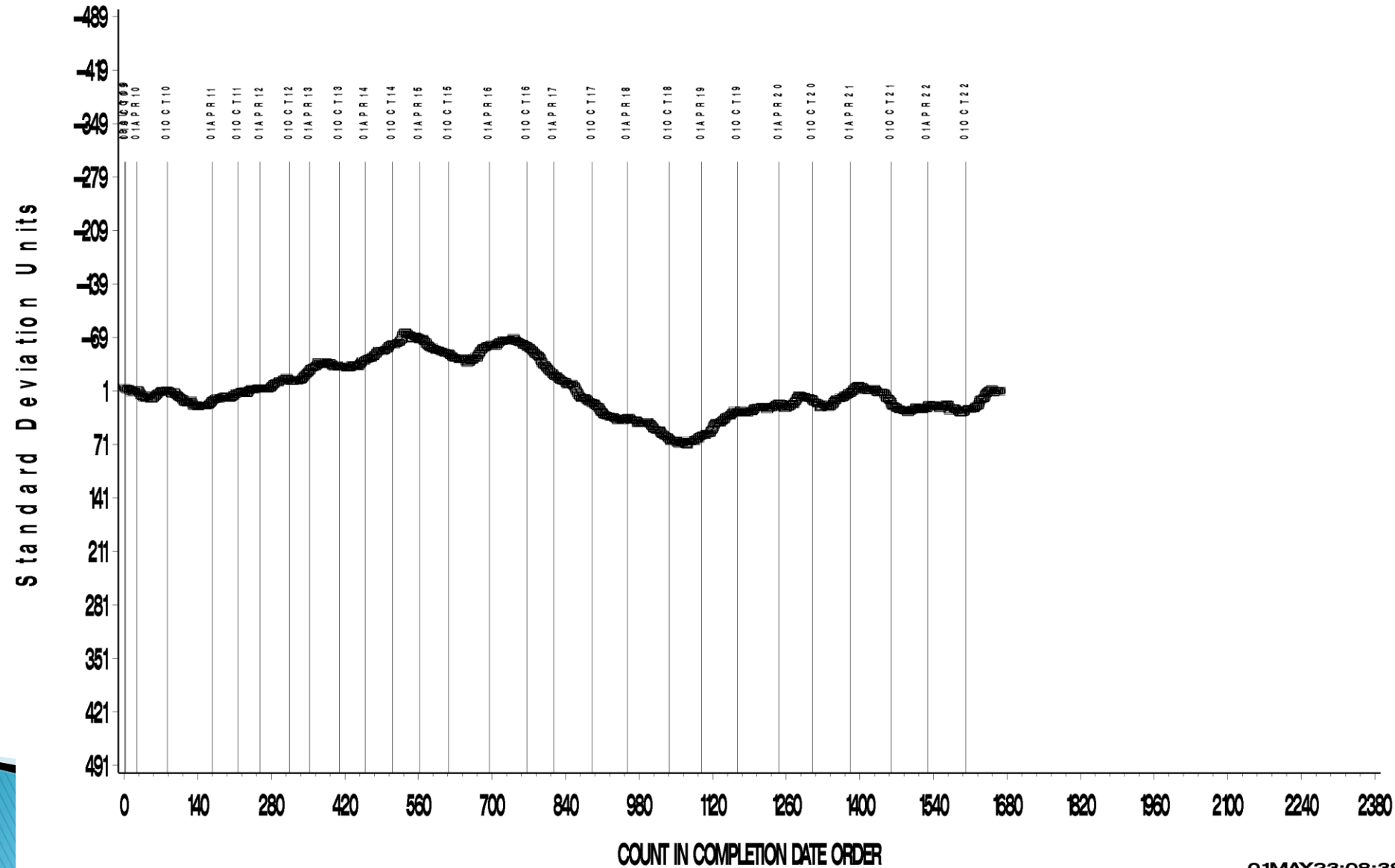
REF ETH ACRYLATE POINTS HARDNESS CHANGE FINAL

CUSUM Severity Analysis



REF ETH ACRYLATE TENSILE STRENGTH CHANGE FINAL

CUSUM Severity Analysis



LDEOC Test Severity

Fluoroelastomer (FKM1)

Parameter	Period Mean Δ/s	Status
Volume Change	-0.75	Mild
Points Hardness Change	0.06	On-target
Tensile Strength Change	0.31	Severe

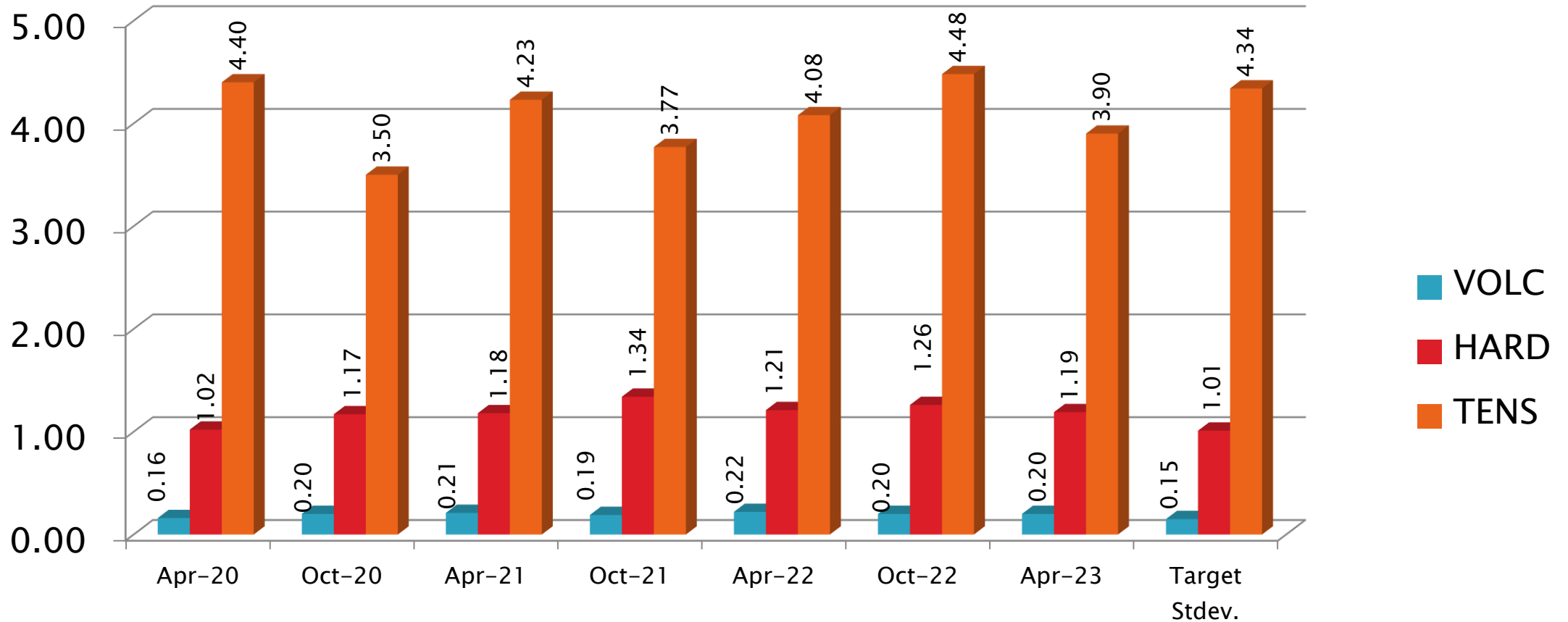
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LDEOC Precision Estimates – Fluoroelastomer



*One 1006 reference oil result not included in this table

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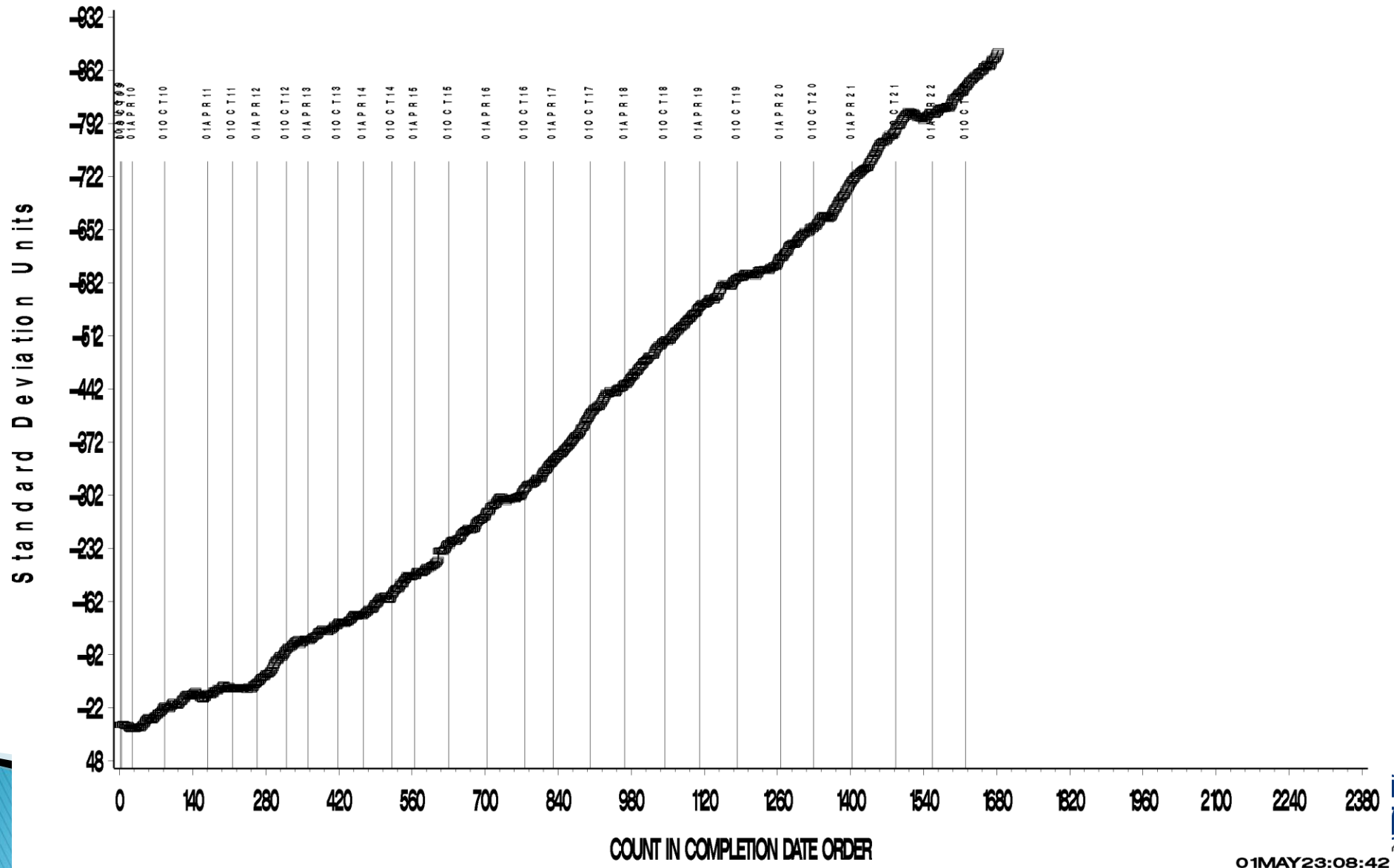
LDEOC Precision Estimates by Lab: FKM1

Test Parameter	Statistic	LTMS Lab					
		A	B	L	I	P	G
	n=	20	6	3	10	3	21
Volume	Mean	0.48	0.51	0.41	0.71	0.50	0.63
	Pooled s	0.13	0.02	0.04	0.26	0.04	0.22
	Mean /s	-1.31	-1.13	-1.82	0.21	-1.18	-0.36
Hardness	Mean	4.65	4.17	4.00	4.50	5.00	3.43
	Pooled s	0.81	0.41	1.00	1.08	1.00	1.43
	Mean /s	0.54	0.07	-0.10	0.40	0.89	-0.66
Tensile Strength	Mean	-58.6	-58.8	-58.9	-51.9	-57.0	-54.3
	Pooled s	2.27	1.66	1.04	1.93	0.91	4.24
	Mean /s	-0.27	-0.31	-0.35	1.27	0.08	0.71

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REF FLUOROELASTOMER VOLUME CHANGE FINAL

CUSUM Severity Analysis



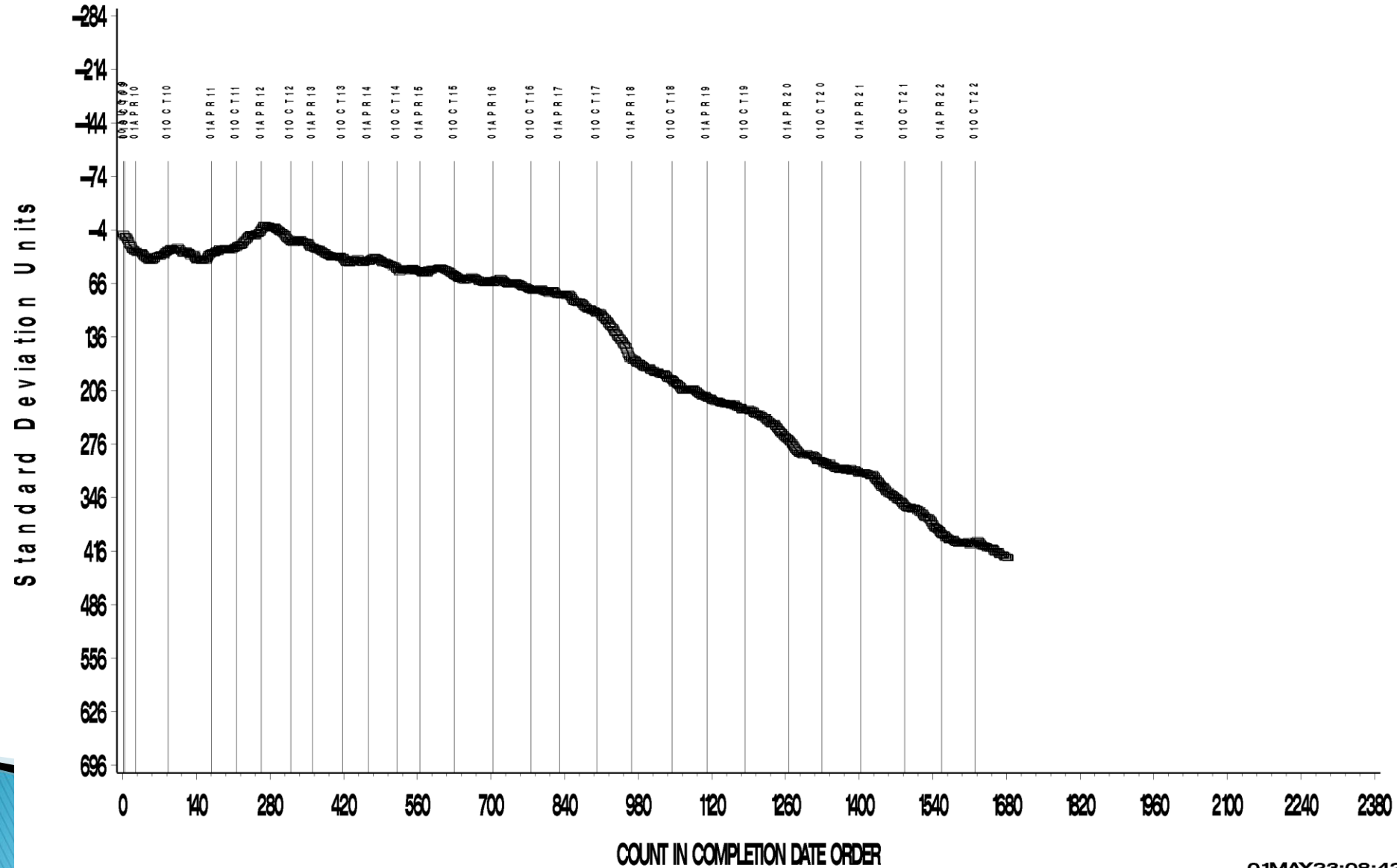
REF FLUORO POINTS HARDNESS CHANGE FINAL

CUSUM Severity Analysis



REF FLUORO TENSILE STRENGTH CHANGE AVERAGE

CUSUM Severity Analysis



LDEOC Test Severity

Nitrile (NBR1)

Parameter	Period Mean Δ/s	Status
Volume Change	1.55	Severe
Points Hardness Change	-0.42	Mild
Tensile Strength Change	-0.75	Mild

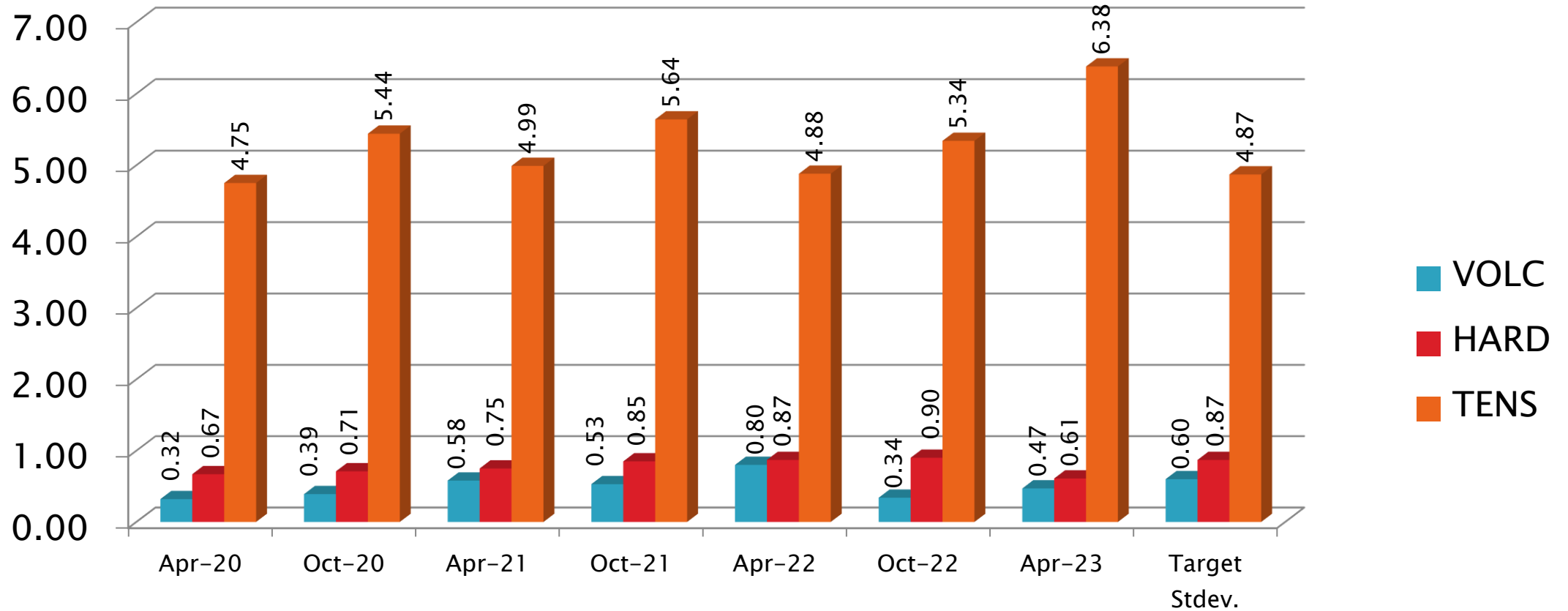
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LDEOC Precision Estimates – Nitrile



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LDEOC Precision Estimates by Lab: NBR1

Test Parameter	Statistic	LTMS Lab						
		V	A	B	L	I	P	G
	n=	2	23	5	3	10	3	22
Volume	Mean	1.51	1.26	1.27	1.28	1.56	1.14	1.08
	Pooled s	0	0.18	0.22	0.13	0.66	0.09	0.63
	Mean /s	1.98	1.58	1.58	1.60	2.06	1.37	1.26
Hardness	Mean	-2.00	-1.65	-1.80	-1.33	-1.10	-1.33	-1.59
	Pooled s	0	0.57	0.45	0.58	0.74	0.58	0.59
	Mean /s	-0.94	-0.54	-0.71	-0.18	0.92	-0.18	-0.47
Tensile Strength	Mean	-0.70	0.64	0.52	-3.53	2.96	-0.17	5.59
	Pooled s	8.77	4.63	3.02	0.21	3.63	1.85	8.60
	Mean /s	-1.37	-1.09	-1.12	-1.95	-0.62	-1.26	-0.08

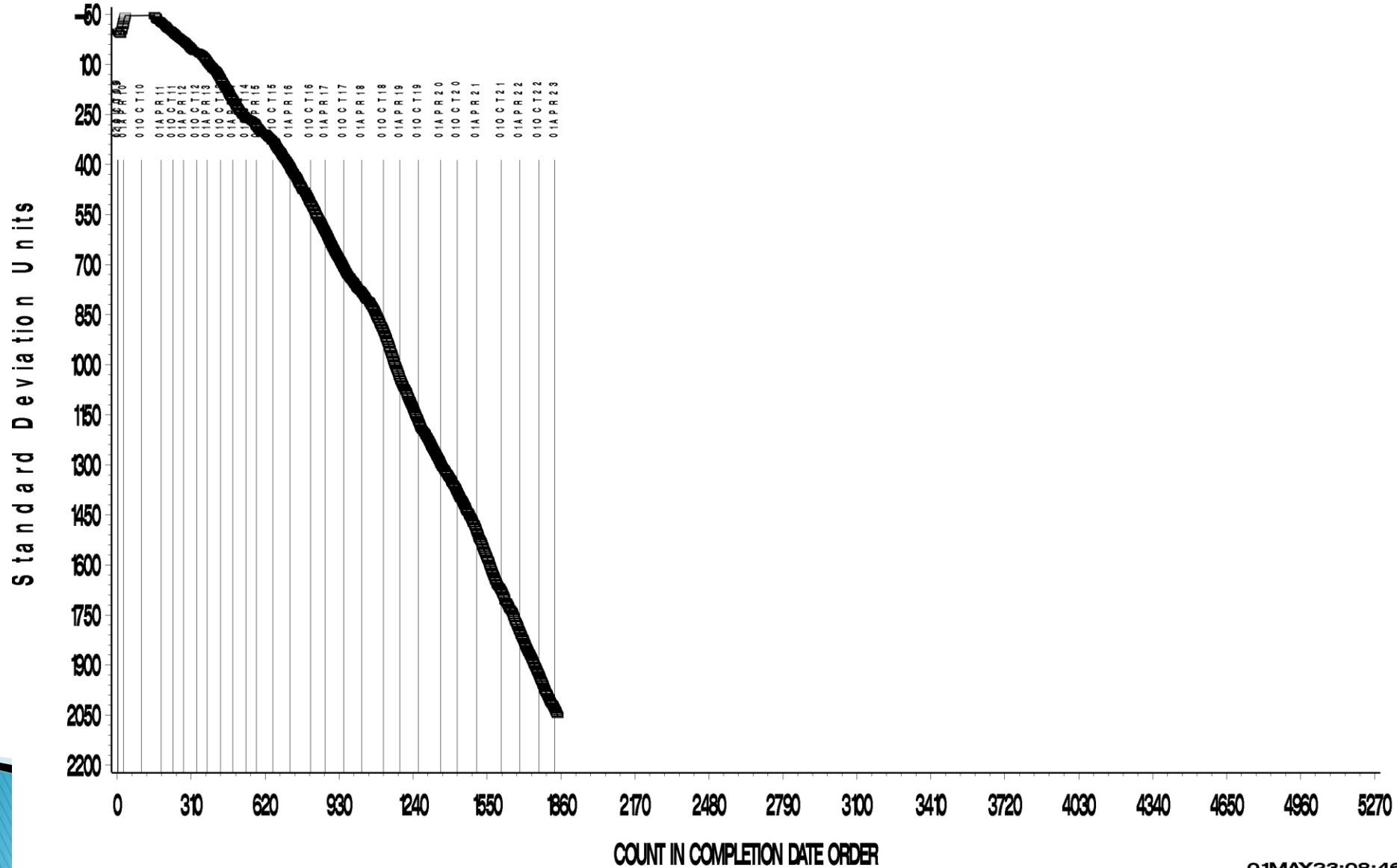
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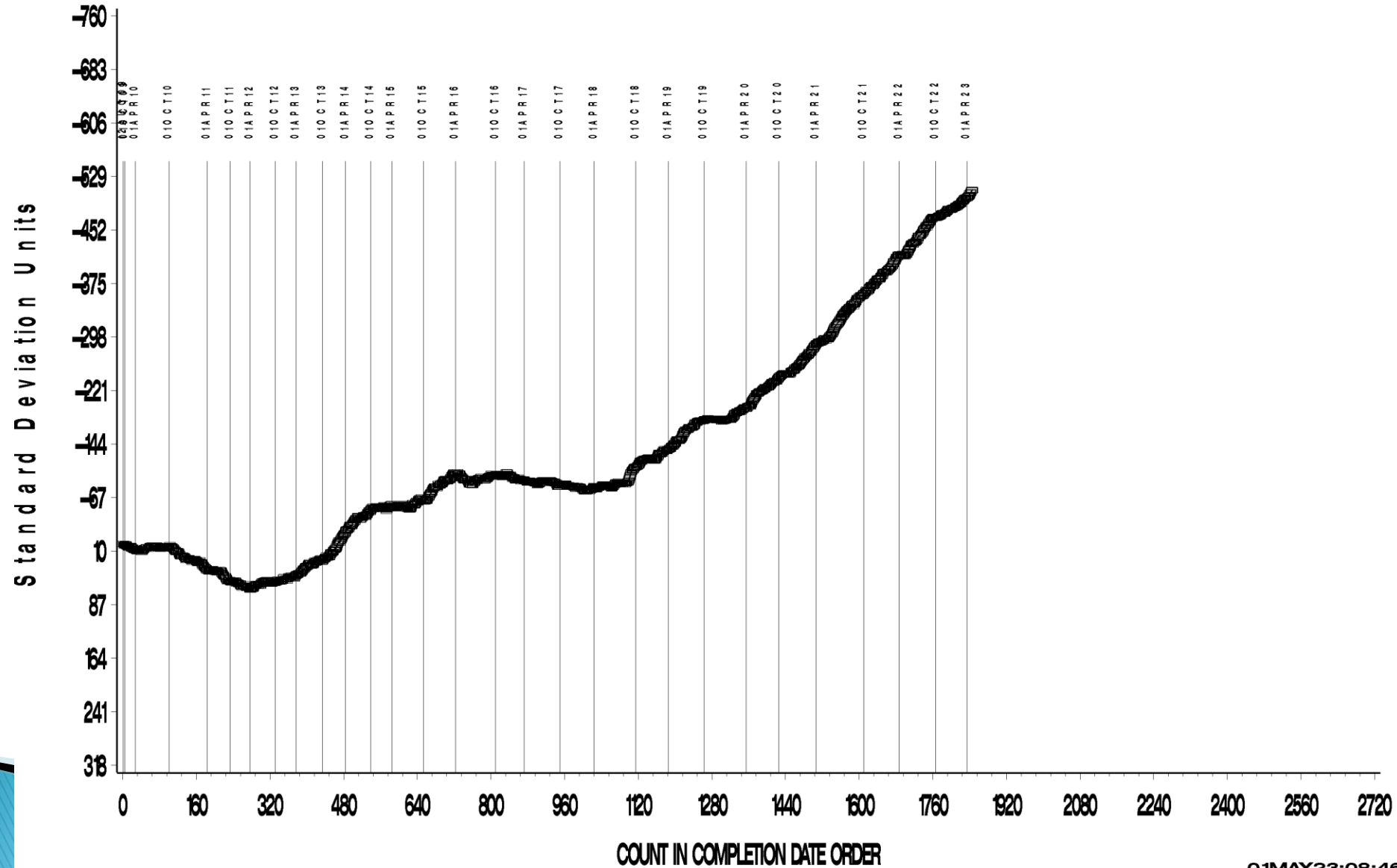
REFERENCE NITRILE VOLUME CHANGE FINAL

CUSUM Severity Analysis



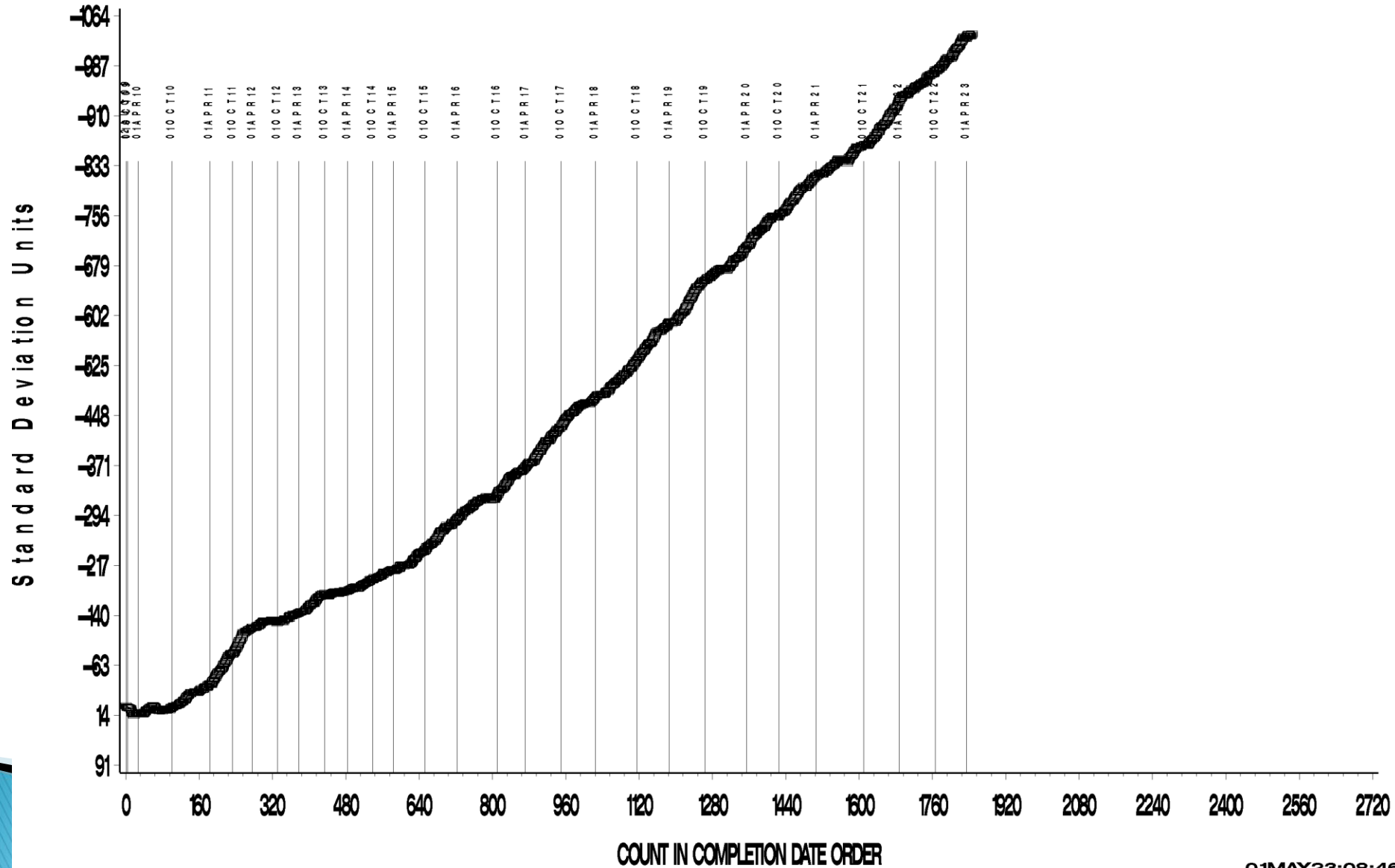
REF NITRILE POINTS HARDNESS CHANGE AVERAGE

CUSUM Severity Analysis



REF NITRILE TENSILE STRENGTH CHANGE FINAL

CUSUM Severity Analysis



LDEOC Test Severity

Polyacrylate (ACM1)

Parameter	Period Mean Δ/s	Status
Volume Change	0.68	Severe
Points Hardness Change	-0.76	Mild
Tensile Strength Change	-0.64	Mild

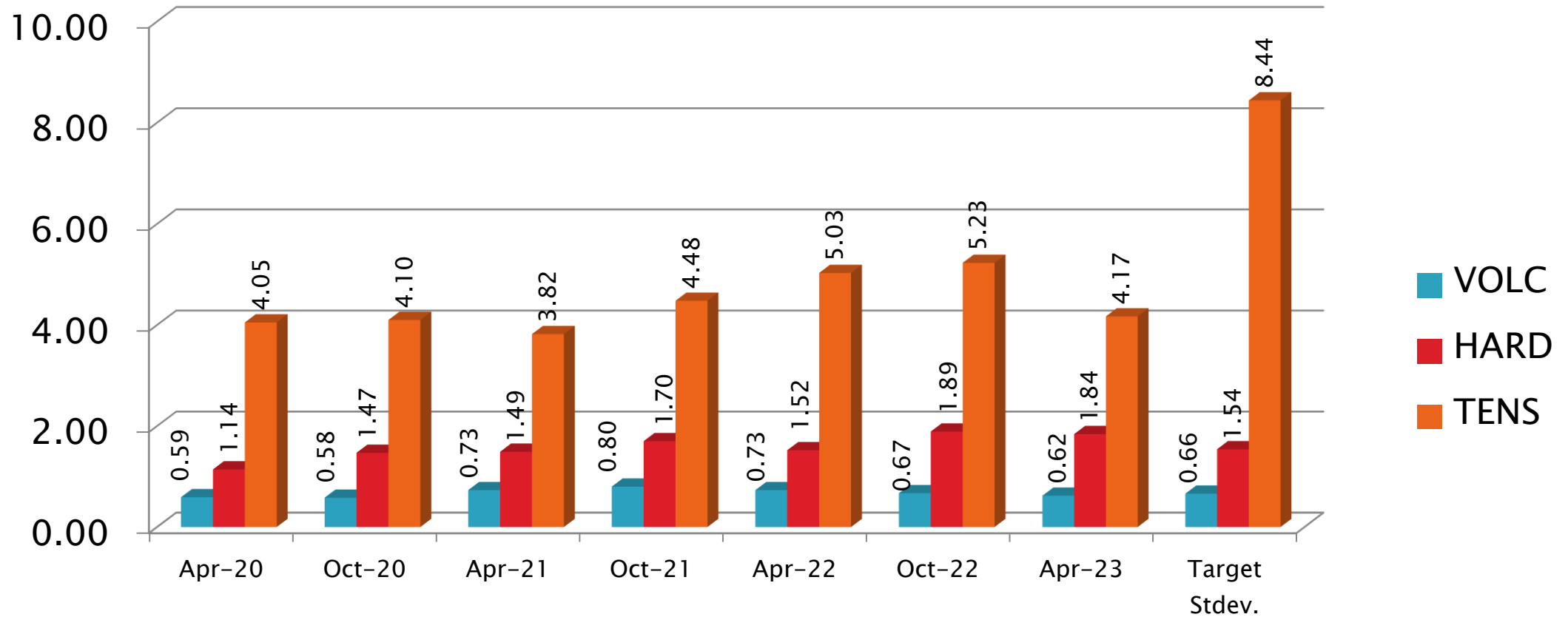
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LDEOC Precision Estimates – Polyacrylate



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LDEOC Precision Estimates by Lab: ACM1

Test Parameter	Statistic	LTMS Lab							
		E	V	A	B	L	I	P	G
	n=	2	2	23	7	3	12	3	24
Volume	Mean	2.47	1.76	2.42	2.07	2.07	3.35	2.50	2.39
	Pooled s	0.04	0.24	0.26	0.56	0.16	0.72	0.39	0.58
	Mean /s	0.64	-0.44	0.56	0.03	0.02	1.97	0.69	0.51
Hardness	Mean	-1.50	-2.50	-2.39	-2.86	-2.00	-0.50	0.33	-0.46
	Pooled s	0.71	0.71	0.94	0.90	1.00	1.57	1.53	2.22
	Mean /s	-0.84	-1.49	-1.41	-1.72	-1.16	-0.19	0.35	-0.16
Tensile Strength	Mean	0.35	0.40	-2.68	-1.77	-2.60	-3.66	-4.53	-3.23
	Pooled s	1.91	0.57	3.68	1.74	3.27	2.88	2.37	5.86
	Mean /s	-0.26	-0.26	-0.62	-0.52	-0.61	-0.74	-0.84	-0.69

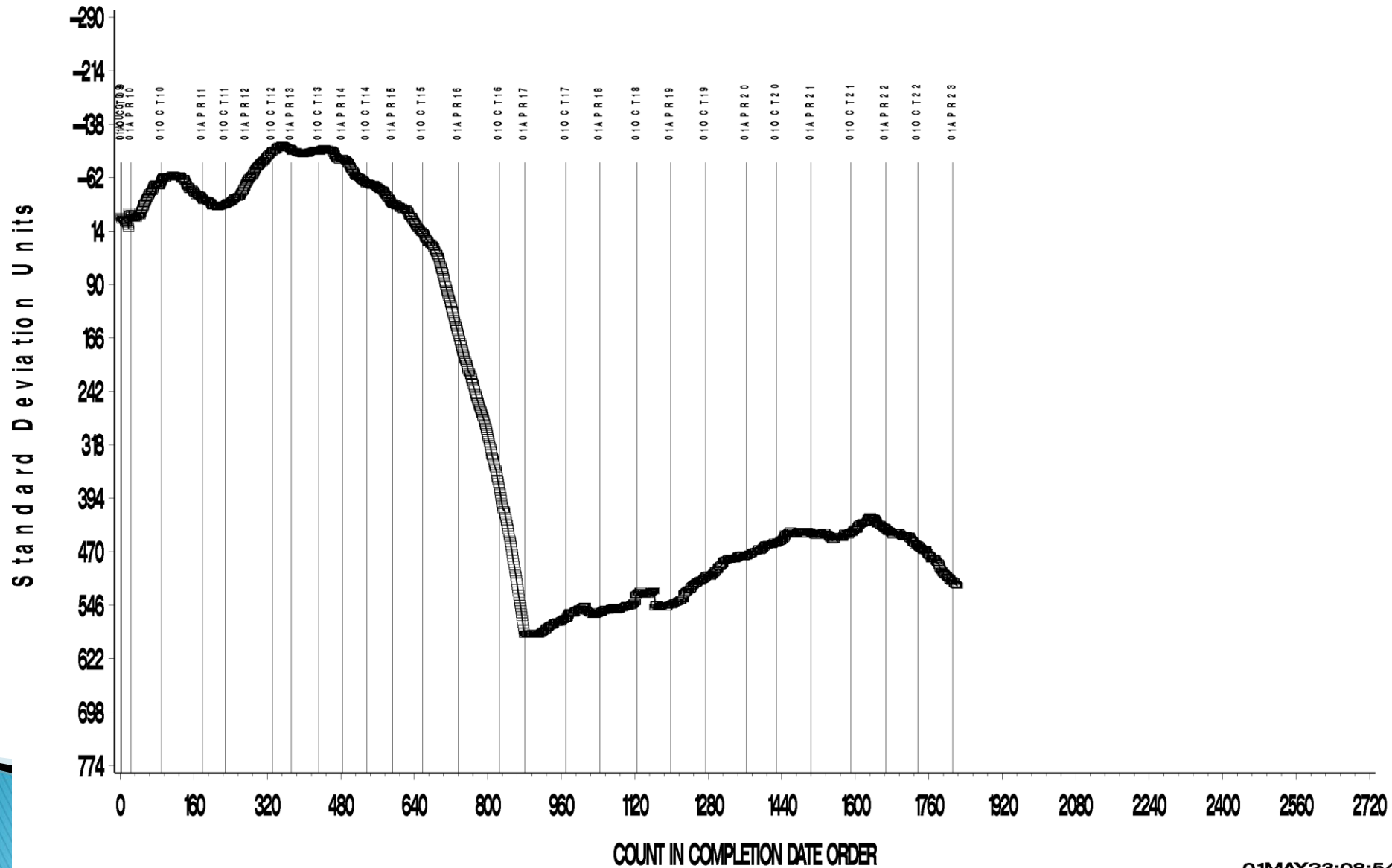
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REF POLYACRYLATE VOLUME CHANGE FINAL

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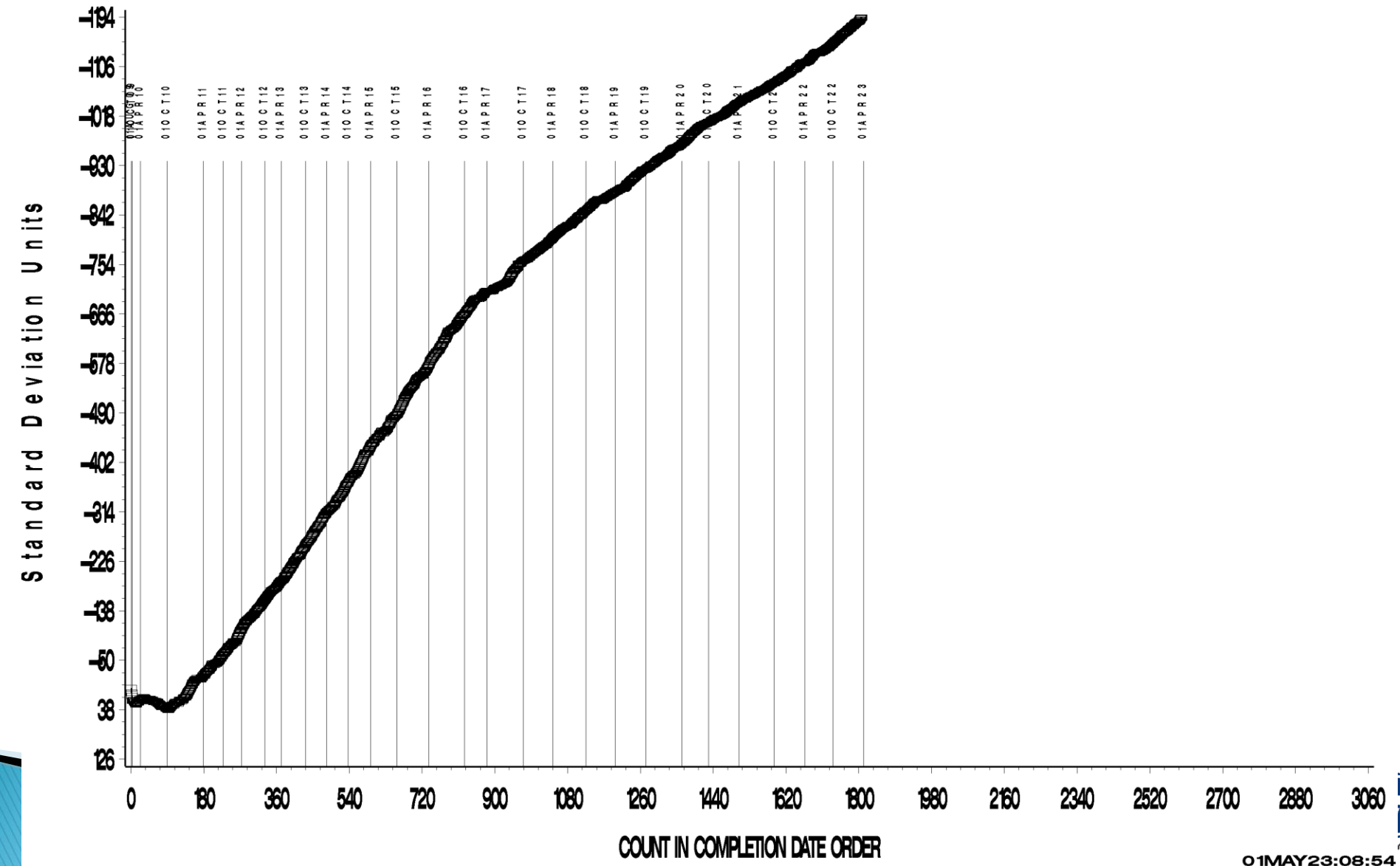
REF POLYACRYLATE POINTS HARDNESS CHG FINAL

CUSUM Severity Analysis



REF POLYACRYLATE TENSILE STRENGTH CHG FINAL

CUSUM Severity Analysis



LDEOC Test Severity

Silicone (VMQ1)

Parameter	Period Mean Δ/s	Status
Volume Change	0.58	Severe
Points Hardness Change	-0.84	Mild
Tensile Strength Change	0.73	Severe

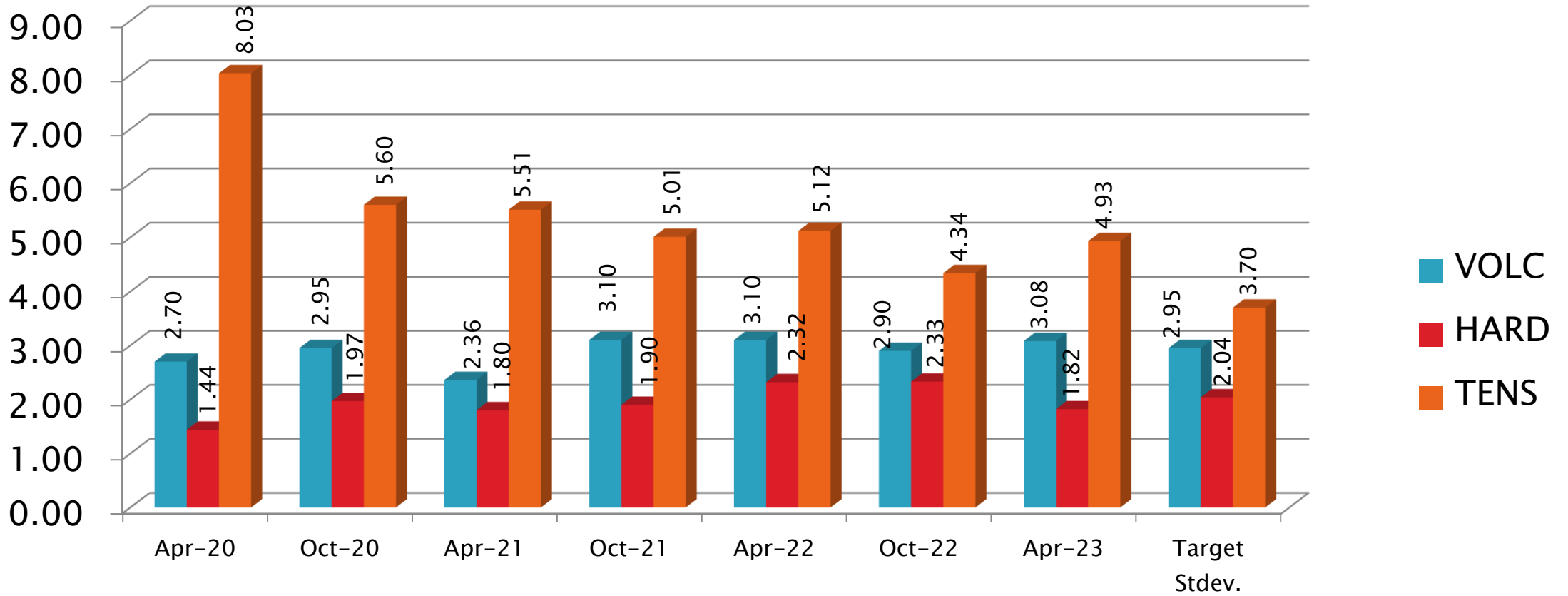
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LDEOC Precision Estimates – Silicone



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LDEOC Precision Estimates by Lab: VQM1

Test Parameter	Statistic	LTMS Lab						
		V	A	B	L	I	P	G
	n=	5	28	5	3	10	3	21
Volume	Mean	33.2	33.3	32.7	30.0	30.6	33.2	37.3
	Pooled s	0.43	1.32	0.78	0.50	1.49	0.09	3.15
	Mean /s	0.35	0.37	0.19	-0.73	-0.55	0.37	1.75
Hardness	Mean	-24.8	-24.4	-23.2	-18.7	-21.6	-23.7	-23.3
	Pooled s	0.45	1.34	1.10	0.58	1.17	1.55	1.42
	Mean /s	-1.53	-1.31	-0.74	1.48	0.04	-0.97	-0.79
Tensile Strength	Mean	-29.9	-28.2	-27.7	-30.4	-34.2	-34.6	-34.1
	Pooled s	8.09	2.80	2.01	3.11	4.04	3.96	4.92
	Mean /s	1.03	1.51	1.64	0.91	-0.12	-0.23	-0.09

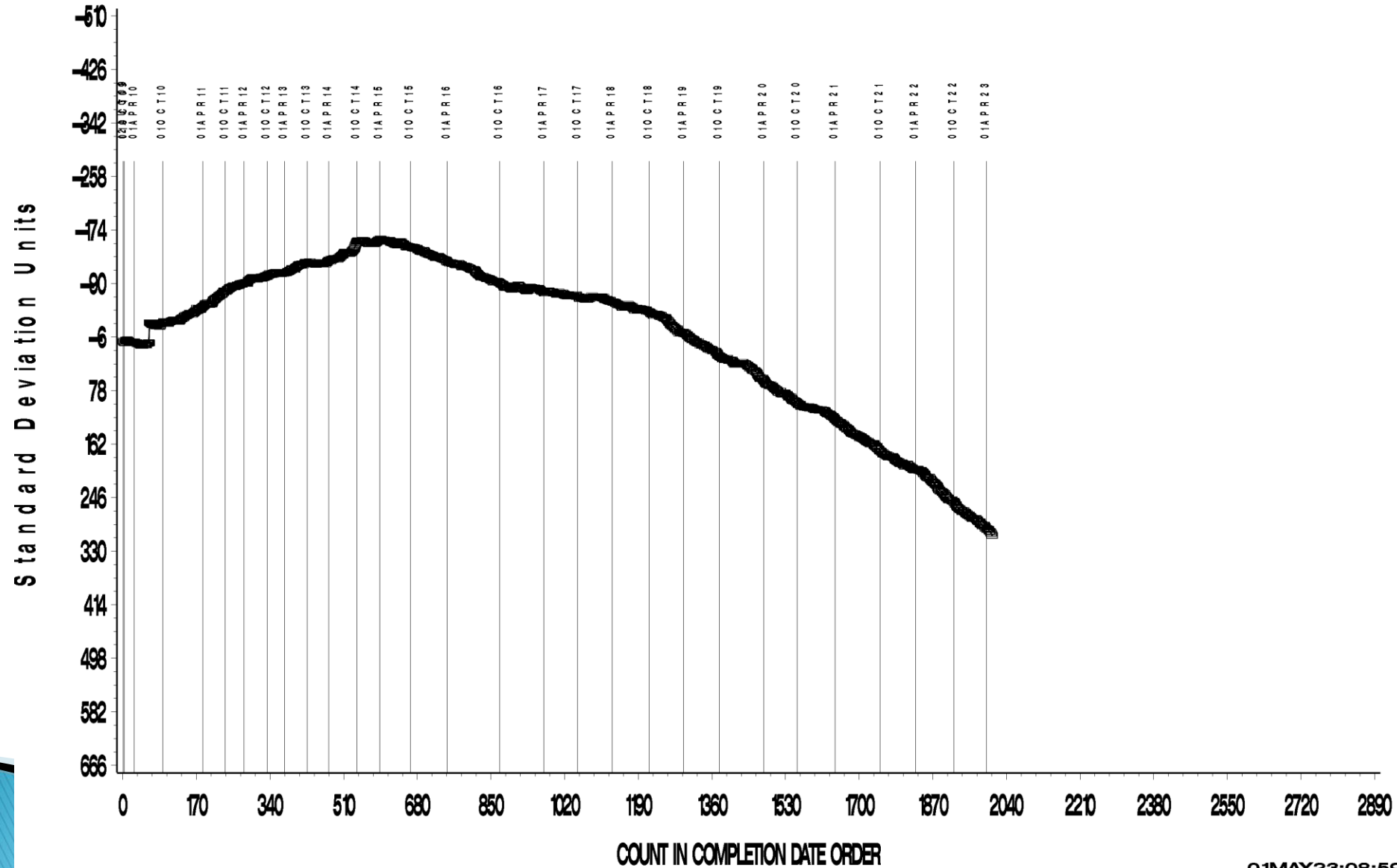
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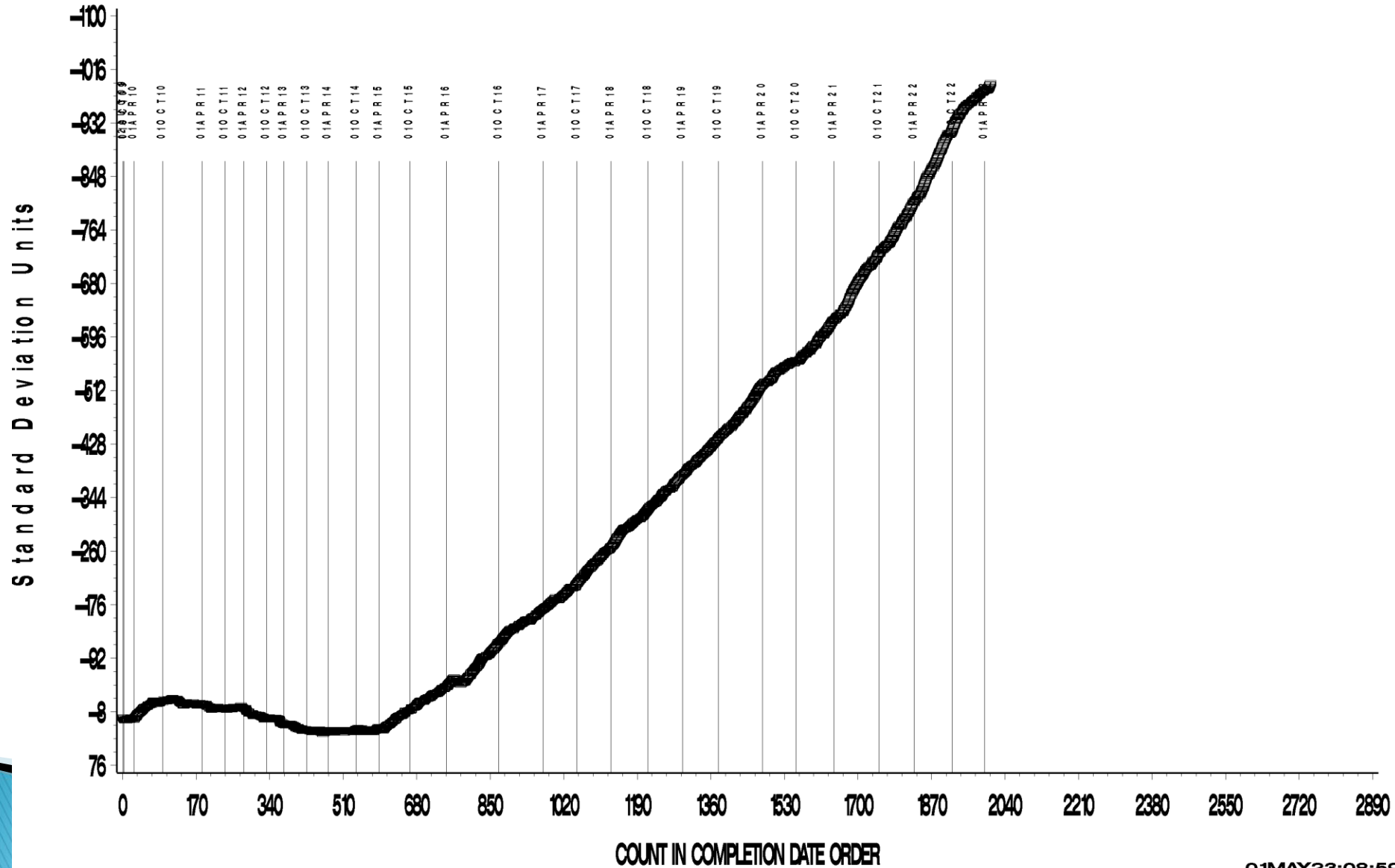
REFERENCE SILICON VOLUME CHANGE FINAL

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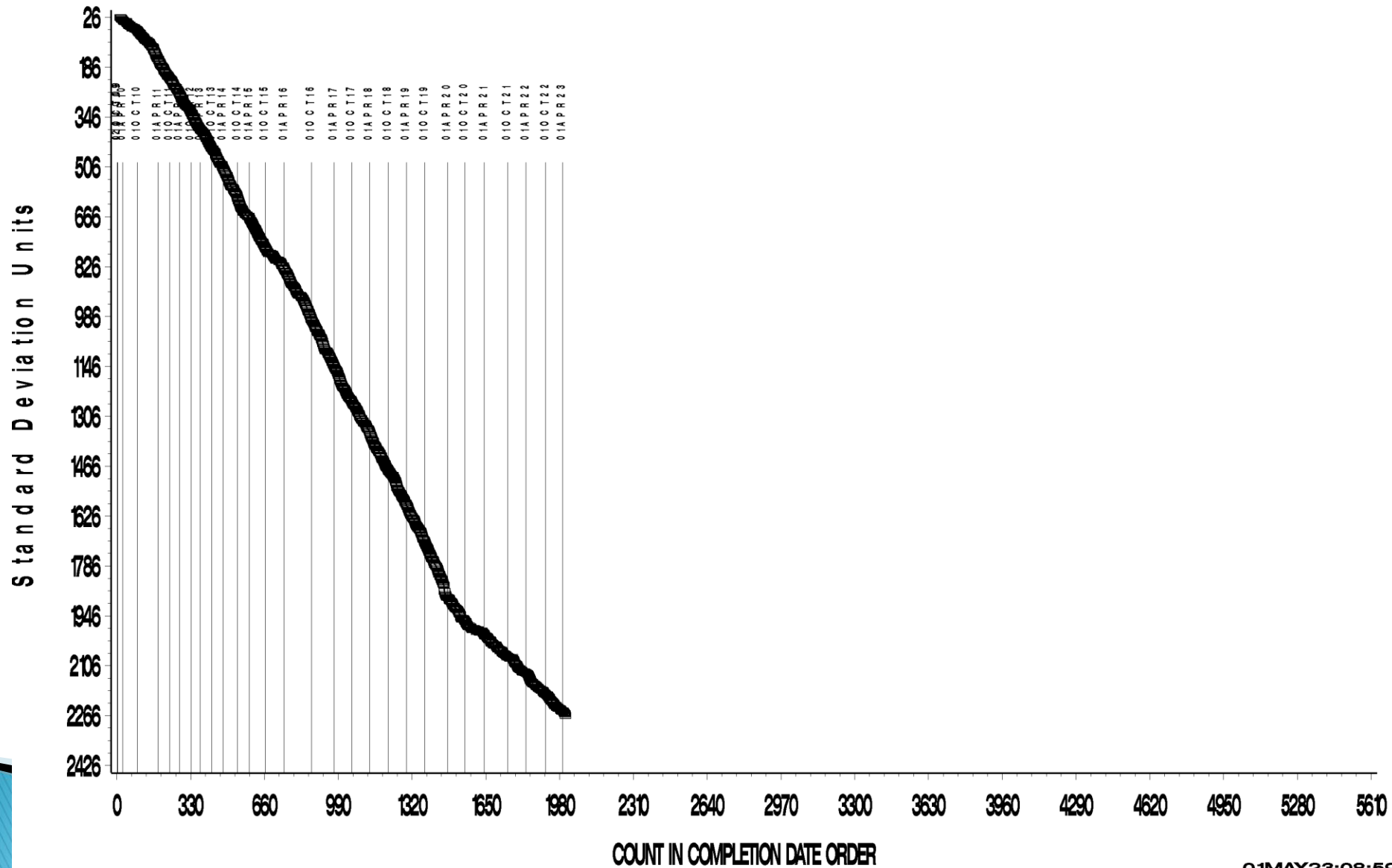
REFERENCE SILICON POINTS HARDNESS FINAL

CUSUM Severity Analysis



REF SILICON TENSILE STRENGTH CHANGE FINAL

CUSUM Severity Analysis



Information Letters & Technical Updates*

Test	Date	IL or Memo Number	Topic
LDEOC	20230118	M23-002*	Elastomer SP Votes to Eliminate the use of 1006 Reference Oil

*Available from TMC Website

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Reference Oil Inventory Estimated Life EOEC/LDEOC

Oil	TMC Inventory Gallons	Gallons Shipped Past 12 Months	Estimated Life
SL107 ^{A, B}	2174	198	3.7 years

^ATMC Inventory is used across several test methods

^BSL107 has fully replaced oil 1006; Oil 1006 is no longer used as an EOEC Reference Fluid

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Reference Oil Inventory



As of 3/31/2023

Reference Oil Inventory Estimated Life EOEC/LDEOC

Oil	TMC Inventory Gallons	Gallons Shipped Past 12 Months	Estimated Life
SL107 ^{A, B}	2174	198	3.7 years

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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

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