



Test Monitoring Center

@ Carnegie Mellon University
6555 Penn Avenue, Pittsburgh, PA 15206, USA

<http://astmtmc.cmu.edu>
412-365-1000

MEMORANDUM: 20-012
DATE: April 7, 2020
TO: Robert Slocum, Chairman, L-37-1 Surveillance Panel
FROM: Dylan Beck *Dylan Beck*
SUBJECT: L-37-1 Testing from October 1, 2019 through March 31, 2020

Attached is a summary of reference oil testing activity this period.

DJB/djb/mem20-012.djb.doc

cc: Frank Farber
Jeff Clark

L-37 Surveillance Panel

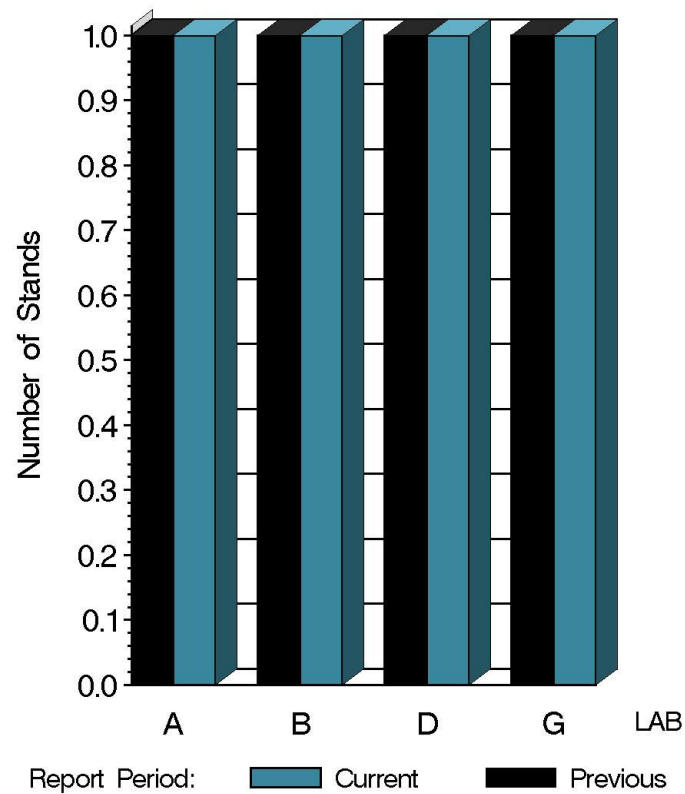
<http://www.astmtmc.cmu.edu/ftp/docs/gear/1371/semiannualreports/1371-04-2020.pdf>

Distribution: email

L-37-1 (D8165)

	Reporting Data	Calibrated on 3-31-20
Number of Labs	4	4
Number of Stands	4	4

BY-LAB STAND
DISTRIBUTION



7:47:50 02APR2020

L-37-1 (D8165)

Test Distribution by Oil and Validity

					Totals	
		134/ 134-1	152-2	155-1	Last Period	This Period
Accepted for calibration	AC	2	3	2	10	7
Rejected (Mild)	OC	1	2	0	1	3
Rejected (Severe)	OC	1	1	0	2	2
Rejected (Precision)	OC	0	0	0	0	0
Aborted run	XC	3	0	0	4	3
Acceptable info run	NI	3	4	0	29	7
Aborted info run	XI	0	0	0	2	0
Not Acceptable info run	MI	0	0	0	10	0
Total		10	10	2	58	22

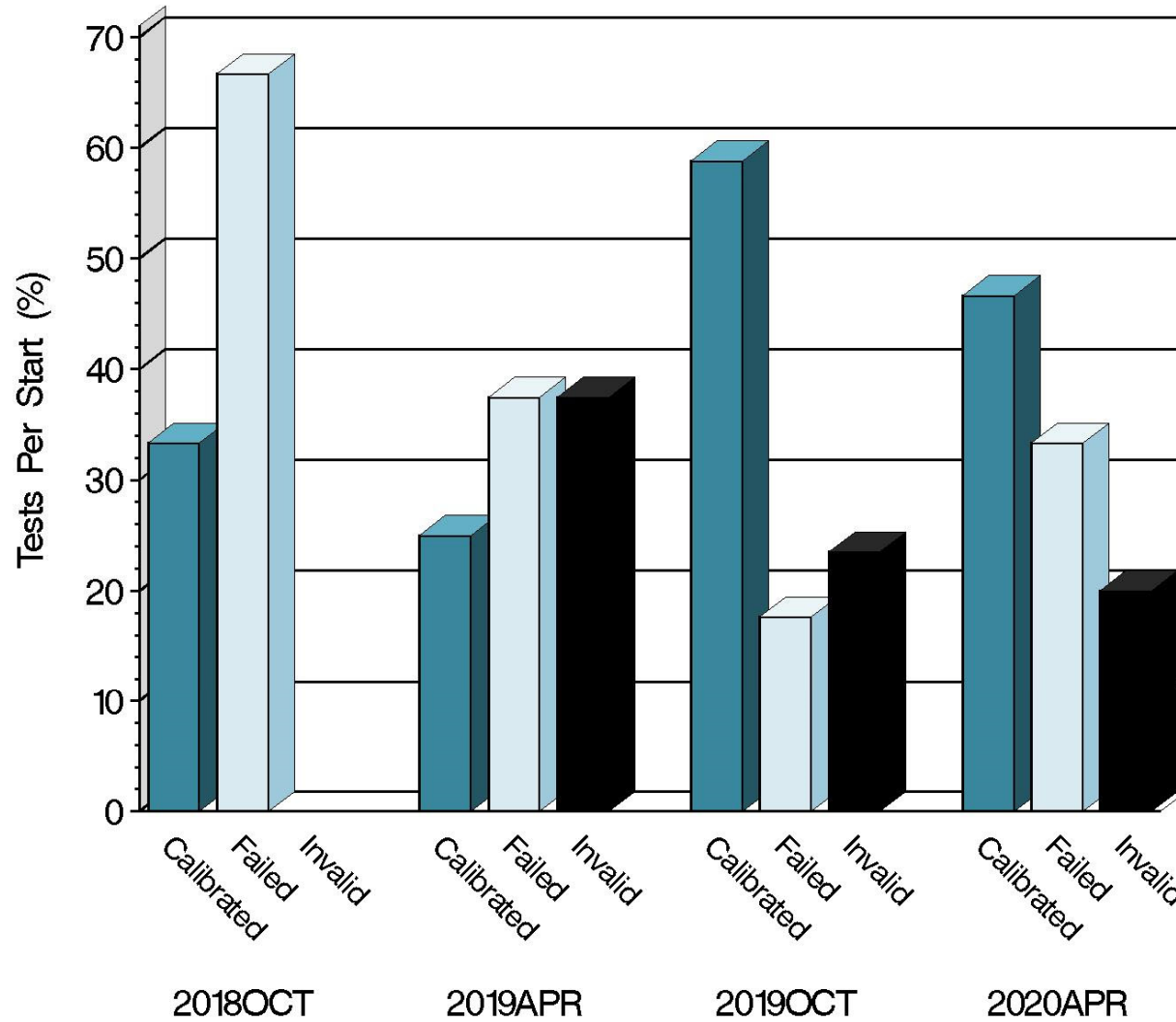
L-37-1 (D8165)

Calibration Attempt Detail

	Gear Batch	Acceptable	Aborted	Failed	Total
LUBRITED	04-2014	4	0	0	4
NONLUBRITED	04-2014	0	3	2	5
	06-2018	3	0	3	6
	Total	7	3	5	15

L-37-1 (D8165)

CALIBRATION ATTEMPT SUMMARY



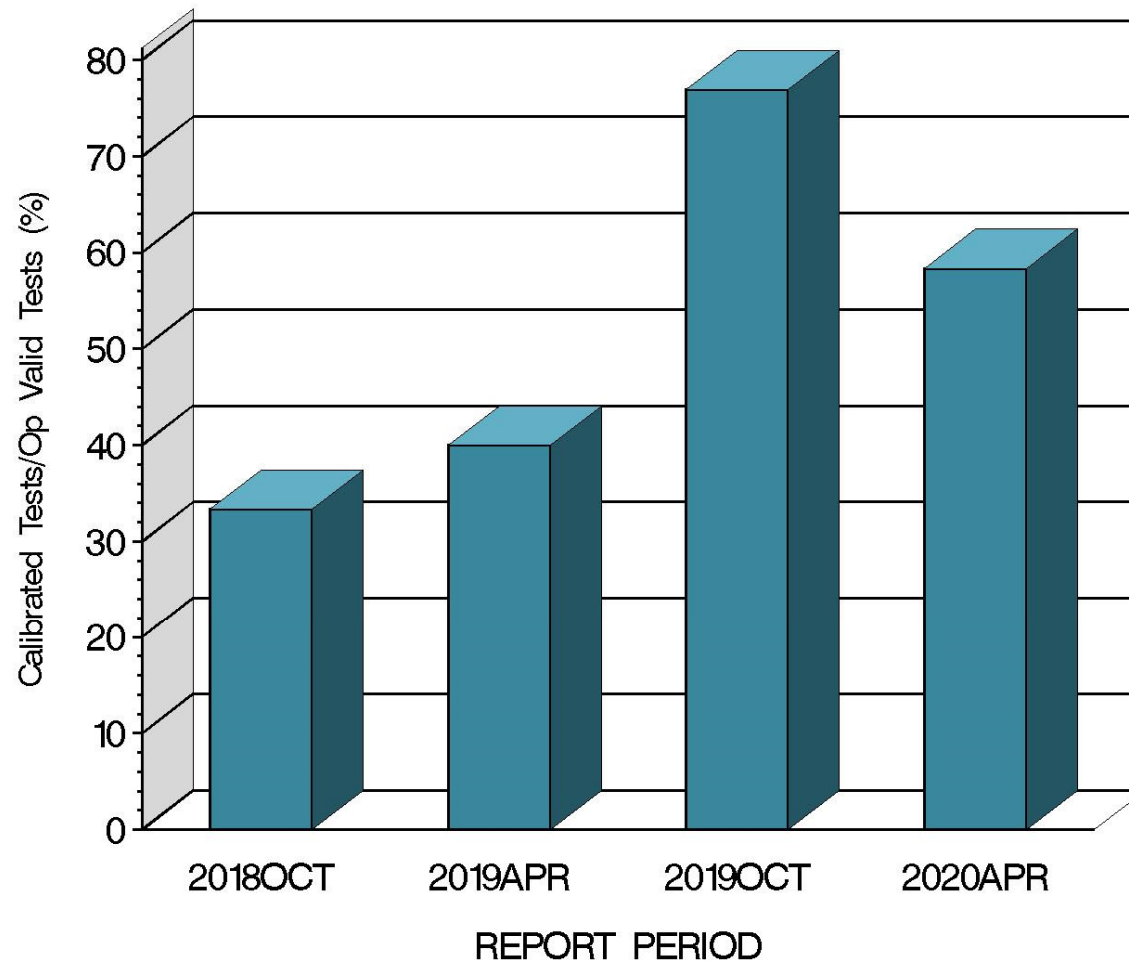
Resolution

Report Period

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L-37-1 (D8165)

OPERATIONALLY VALID TESTS
MEETING ACCEPTANCE CRITERIA



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L-37-1 (D8165)

CAUSES FOR LOST TESTS

Lab	Cause	Oil				Validity			Loss Rate		
		134	134-1	152-2	155-1	XC	LC	XI	Lost	Starts	%
D	Broken Tooth		•			•			1	9	11%
B	Broken Teeth		•			•			2	8	25%
	Lost	0	3	0	0	3	0	0			
	Starts	0	10	10	2	22	22	22			
	%	0%	30%	0%	0%	14%	0%	0%			

L-37-1 (D8165)

GEAR BATCH SEVERITY

LUBRITED HARDWARE						
Parameter	Gear Batch	N	Δ/s	s^A	Overall Δ/s	Overall Shift (in Merits) ^B
RIDG	04-2014	4	0.135	0.599	0.135	0.194
RIPP	04-2014	4	0.502	0.679	0.502	0.239
SPIT	04-2014	4	0.167	0.236	0.167	0.097
WEAR	04-2014	4	0.126	0.829	0.126	0.065

NON-LUBRITED HARDWARE						
Parameter	Gear Batch	N	Δ/s	s^A	Overall Δ/s	Overall Shift (in Merits) ^B
WEAR	04-2014	2	0.44	0.79	0.64	0.46
RIDG	04-2014	2	0.11	0.00	-0.41	-0.27
RIPP	04-2014	2	1.6	0.47	0.43	0.24
SPIT	04-2014	2	-3.24	2.08	-1.03	-0.87
WEAR	06-2018	6	0.71	1.02	0.64	0.46
RIDG	06-2018	6	-0.58	1.07	-0.41	-0.27
RIPP	06-2018	6	0.04	0.47	0.43	0.24
SPIT	06-2018	6	-0.29	0.72	-1.03	-0.87

^A As computed using SA standard deviation published in the LTMS document.

L-37-1 (D8165)

LAB SEVERITY

LUBRITED HARDWARE AVERAGE Δ/s						
Gear Batch	Lab	N	RIDG	RIPP	SPIT	WEAR
04-2014	A	1	-0.458	-0.250	0.000	-0.889
	B	2	0.650	0.914	0.333	0.634
	D	1	-0.300	0.429	.	0.125

NON-LUBRITED HARDWARE AVERAGE Δ/s						
Gear Batch	Lab	N	RIDG	RIPP	SPIT	WEAR
04-2014	B	1	0.111	1.933	-1.765	-0.111
	D	1	0.111	1.267	-4.706	1.000
06-2018	B	2	0.083	0.415	-0.882	0.882
	D	4	-0.917	-0.154	0.000	0.625

L-37-1 (D8165)

SUMMARY OF SEVERITY & PRECISION

Severity

Nonlubrited – RIDG exceeded the action limit with the most recent test. SPIT WEAR and RIPP remained within the limits this period.

Lubrited – All parameters remained within the limits this period.

L-37-1 (D8165)

SUMMARY OF SEVERITY & PRECISION (cont.)

Precision

Nonlubrited - WEAR, RIDG, and RIPP remained within the precision limit this period. SPIT briefly exceeded the precision limit this period but has since returned within the limits.

Lubrited – All parameters remained within the precision limit this period.

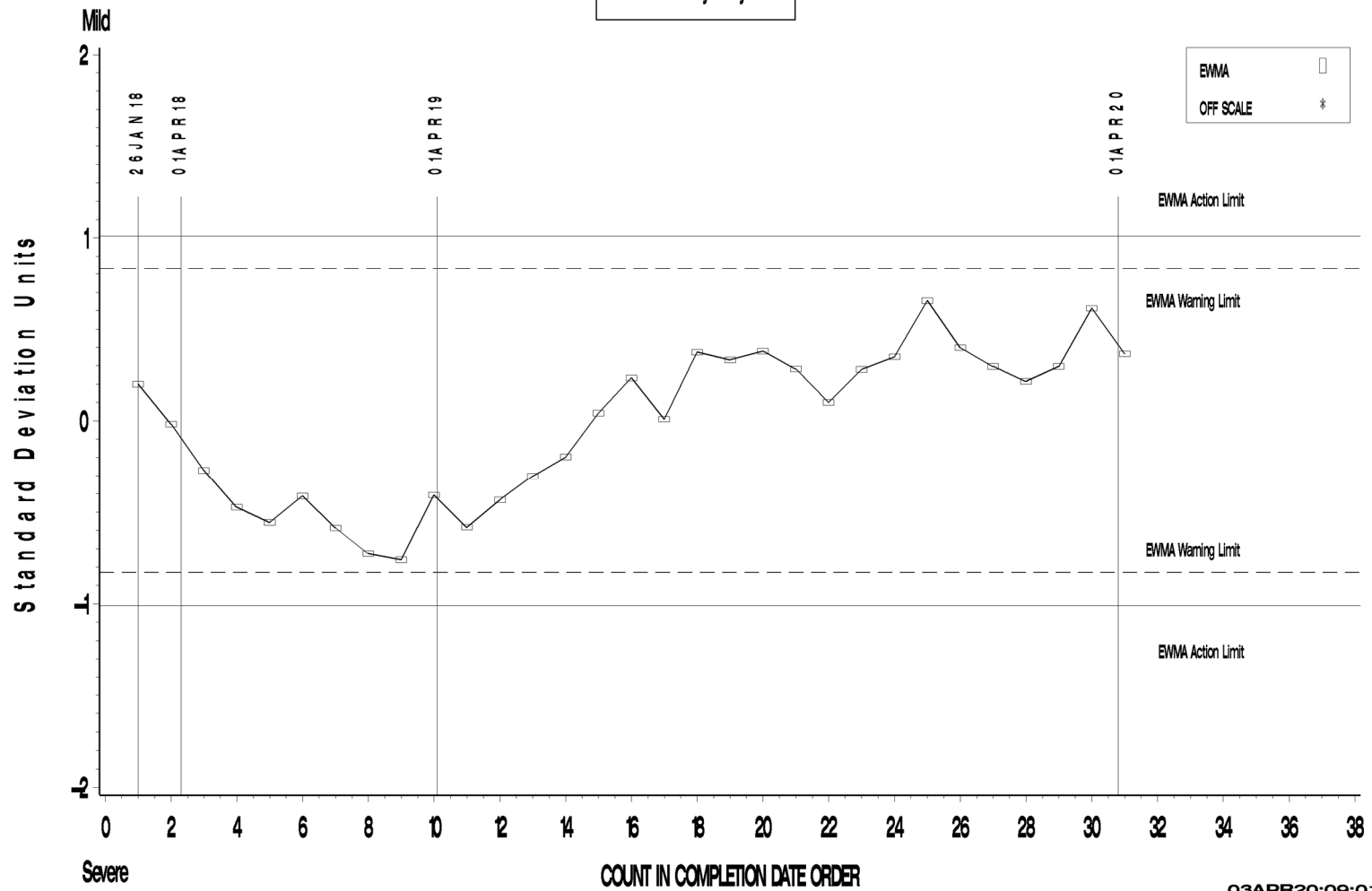
Industry control charts follow.

L-37-1 (D8165)

L-37-1 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR WEAR

LTMS Severity Analysis



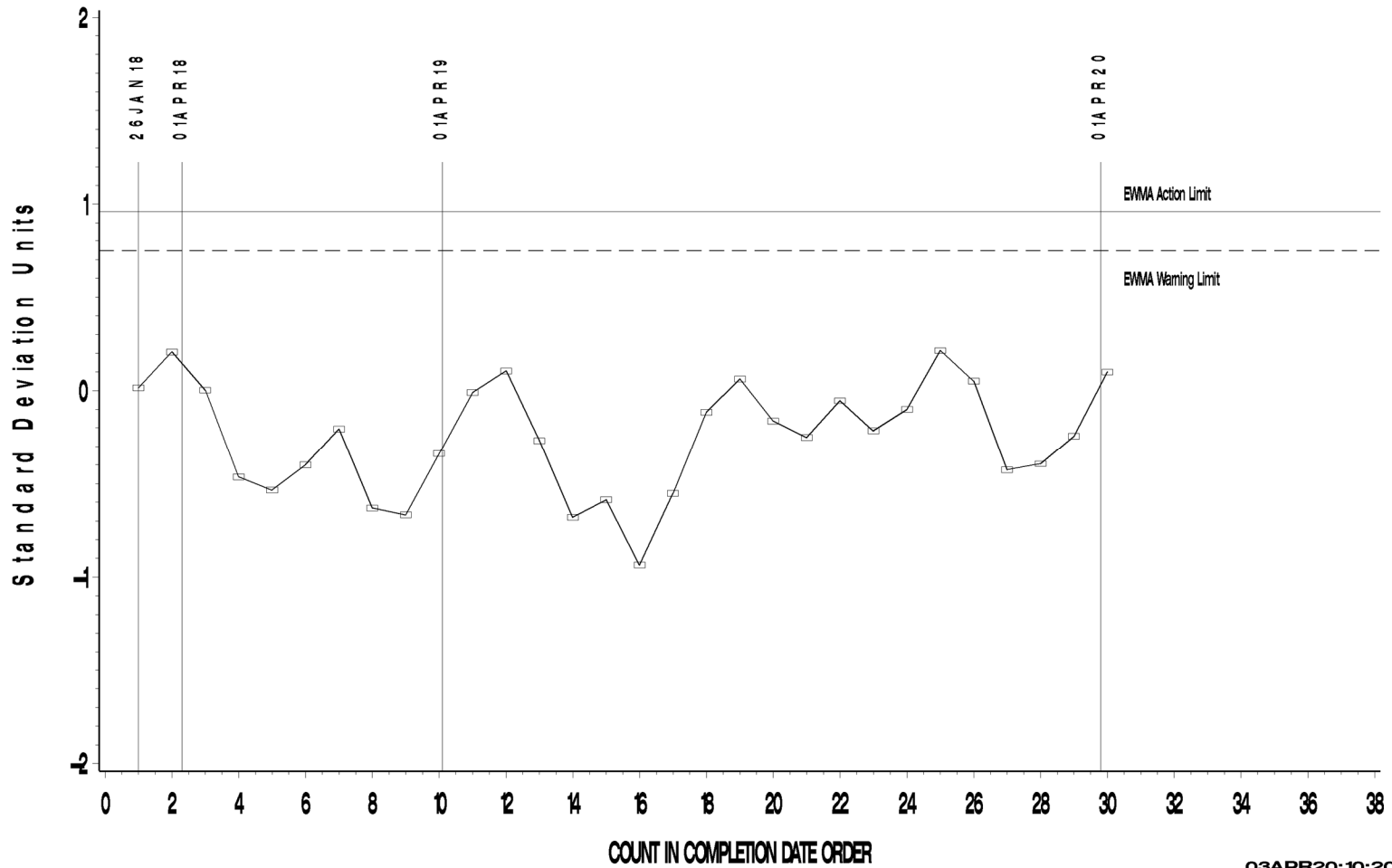
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L-37-1 (D8165)

L-37-1 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR WEAR

LTMS Precision Analysis



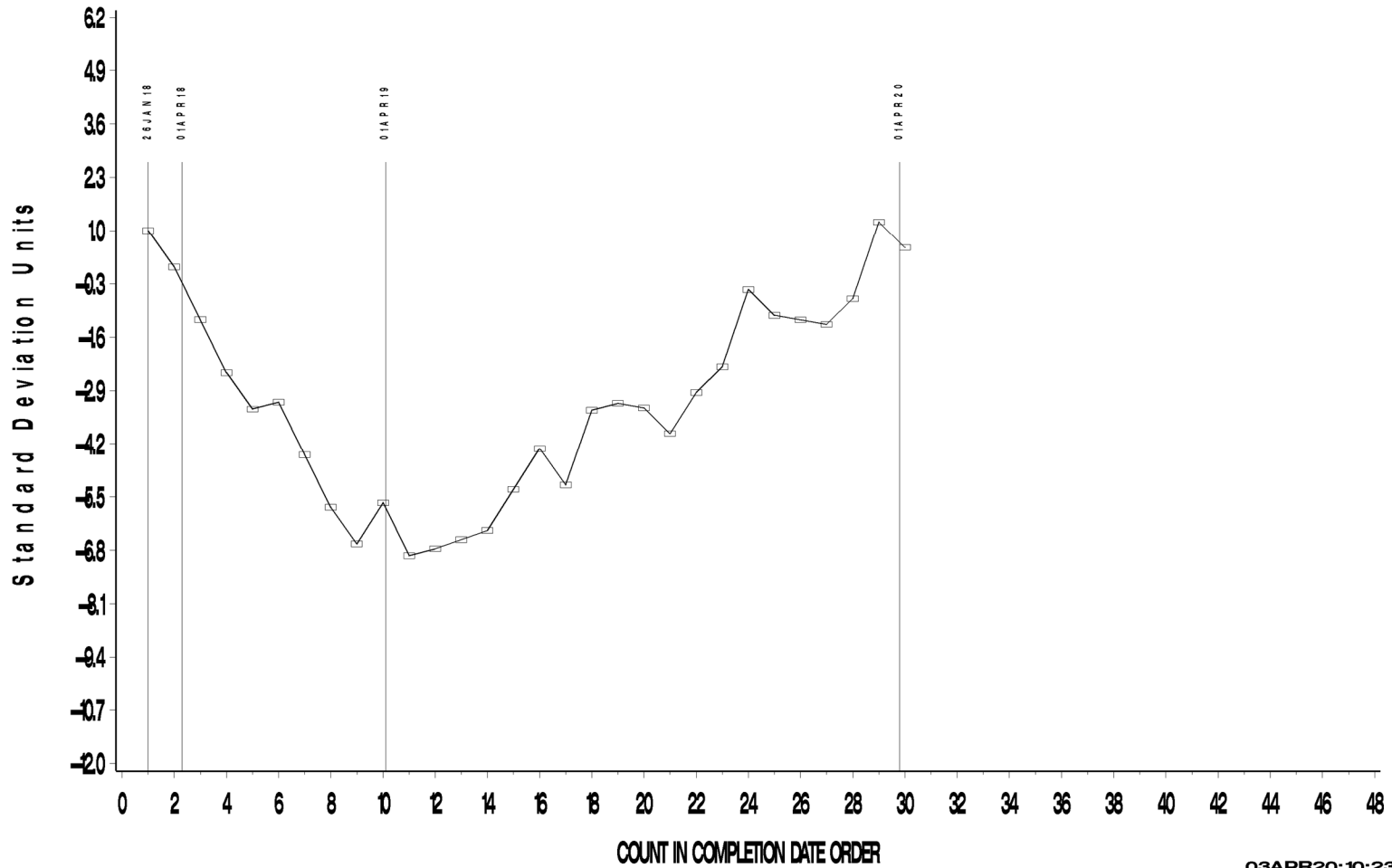
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L-37-1 (D8165)

L-37-1 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR WEAR

CUSUM Severity Analysis



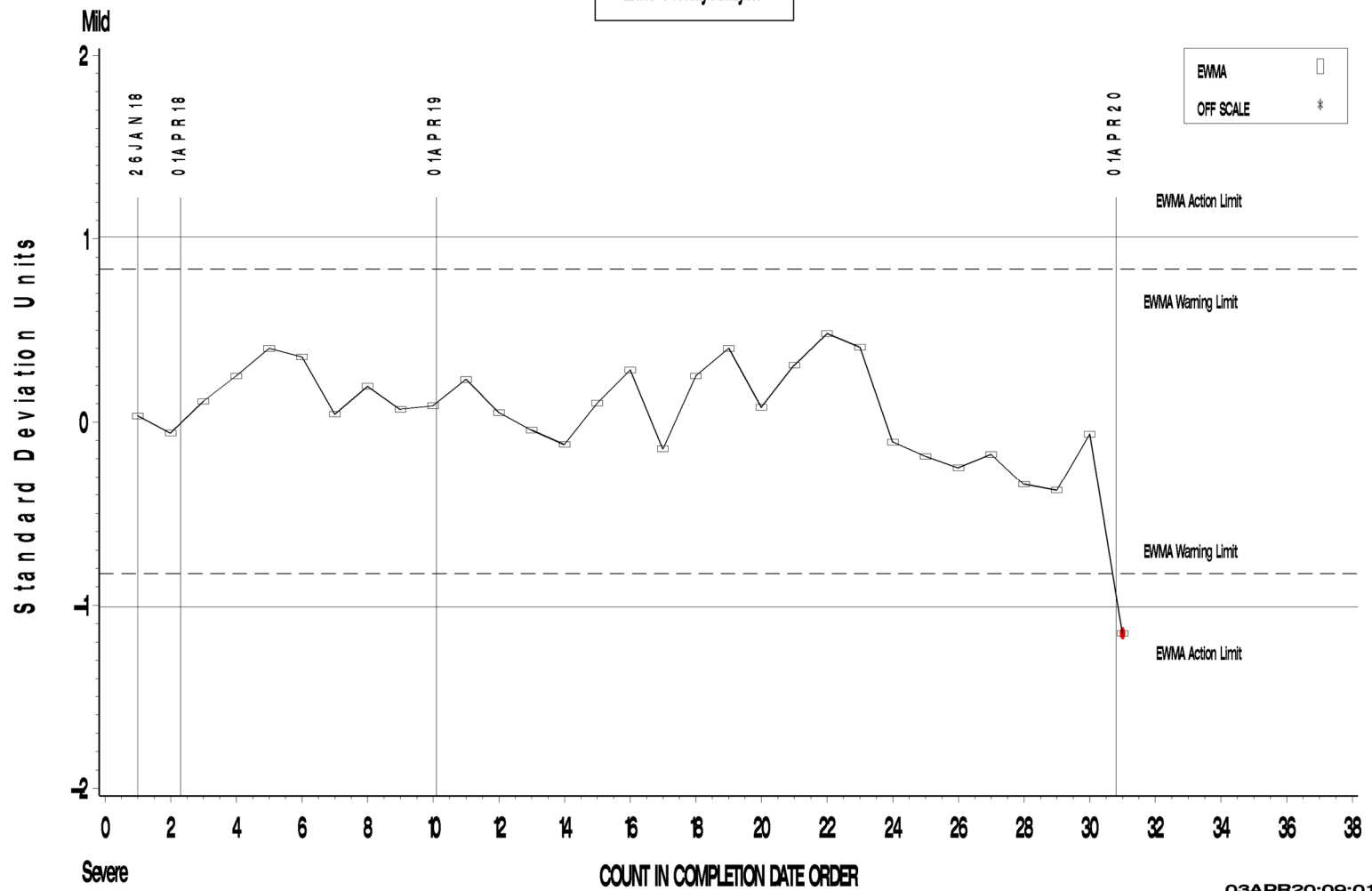
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L-37-1 (D8165)

L-37-1 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR RIDGING

LTMS Severity Analysis

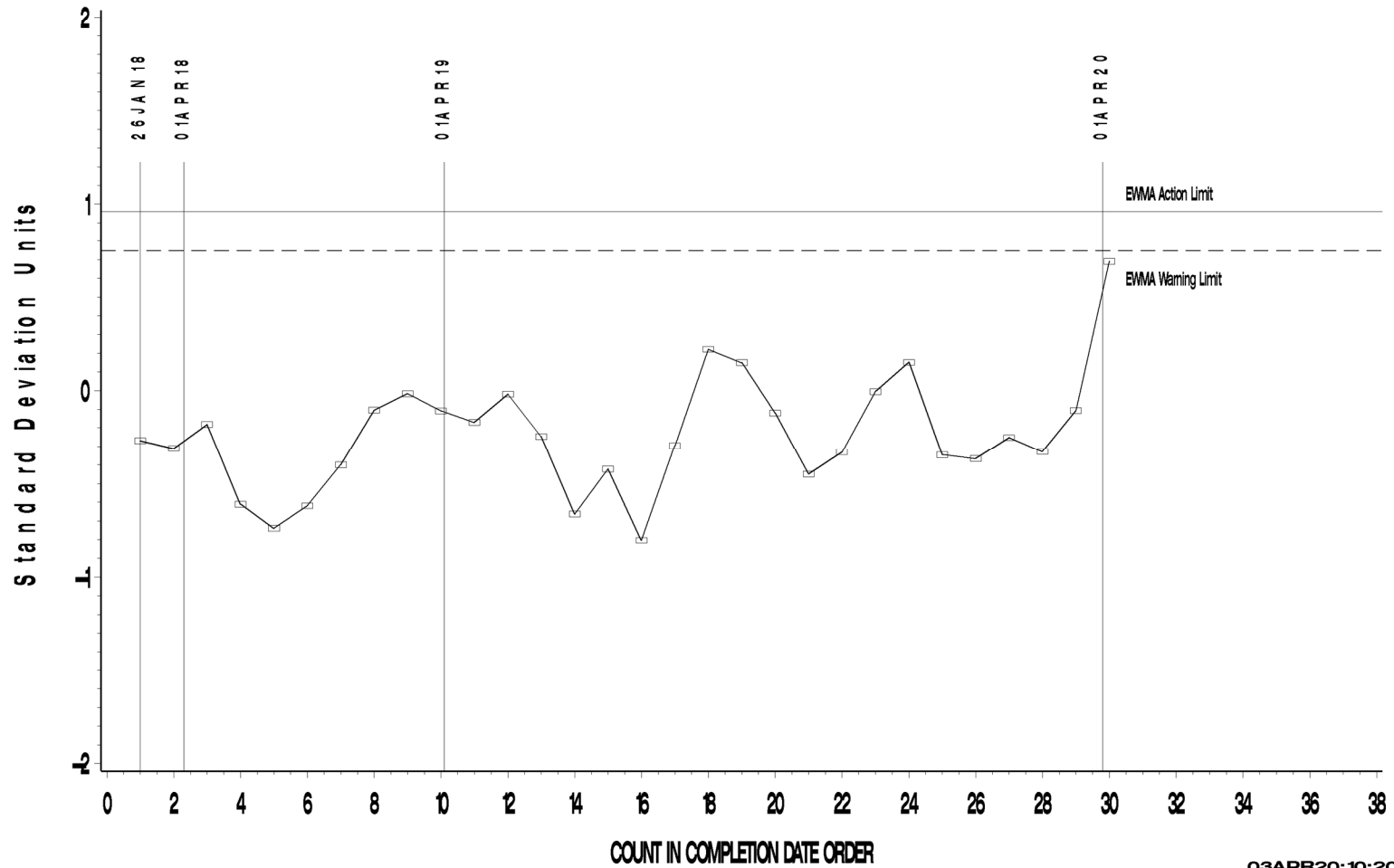


L-37-1 (D8165)

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FINAL PINION GEAR RIDGING

LTMS Precision Analysis



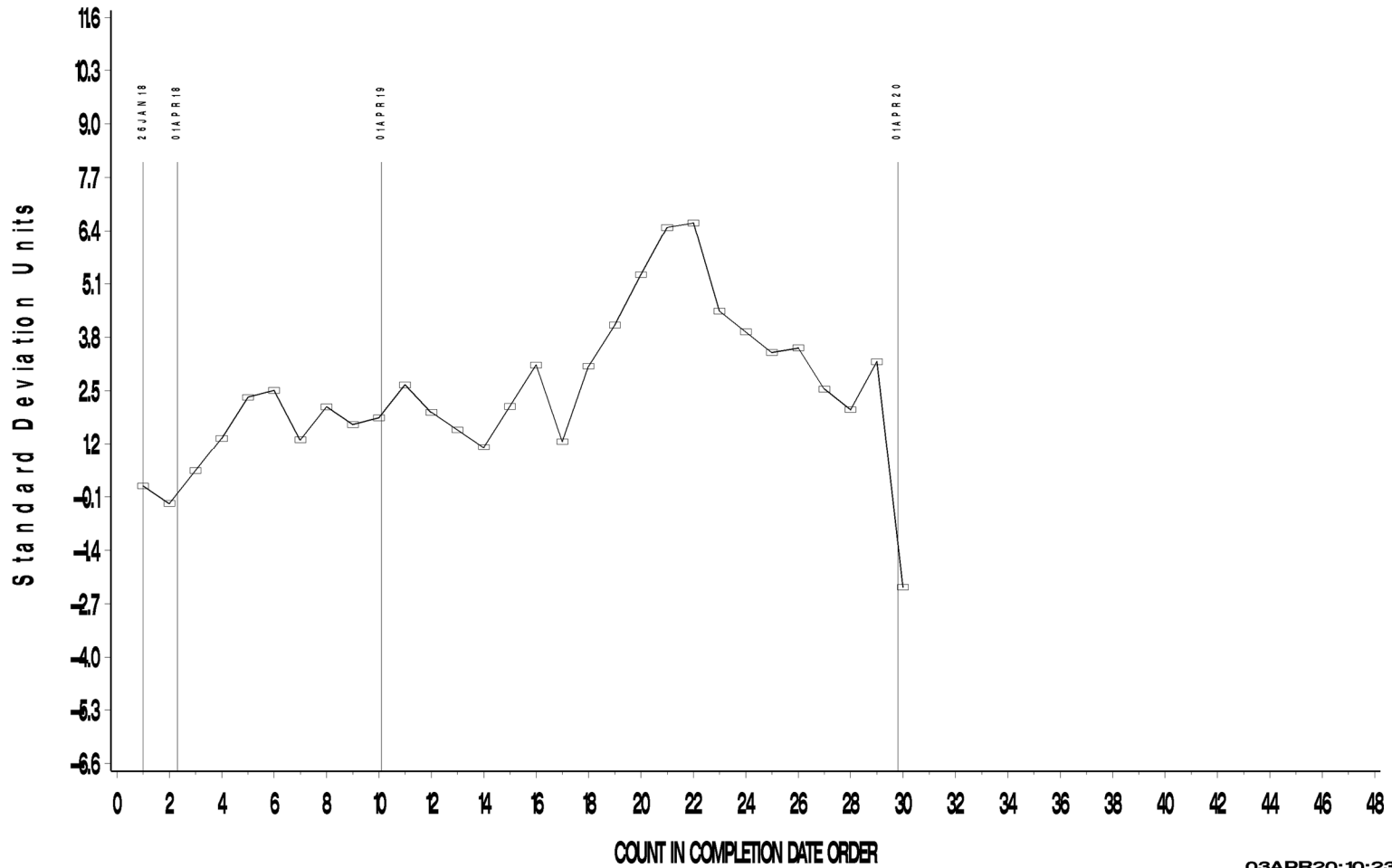
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FINAL PINION GEAR RIDGING

CUSUM Severity Analysis



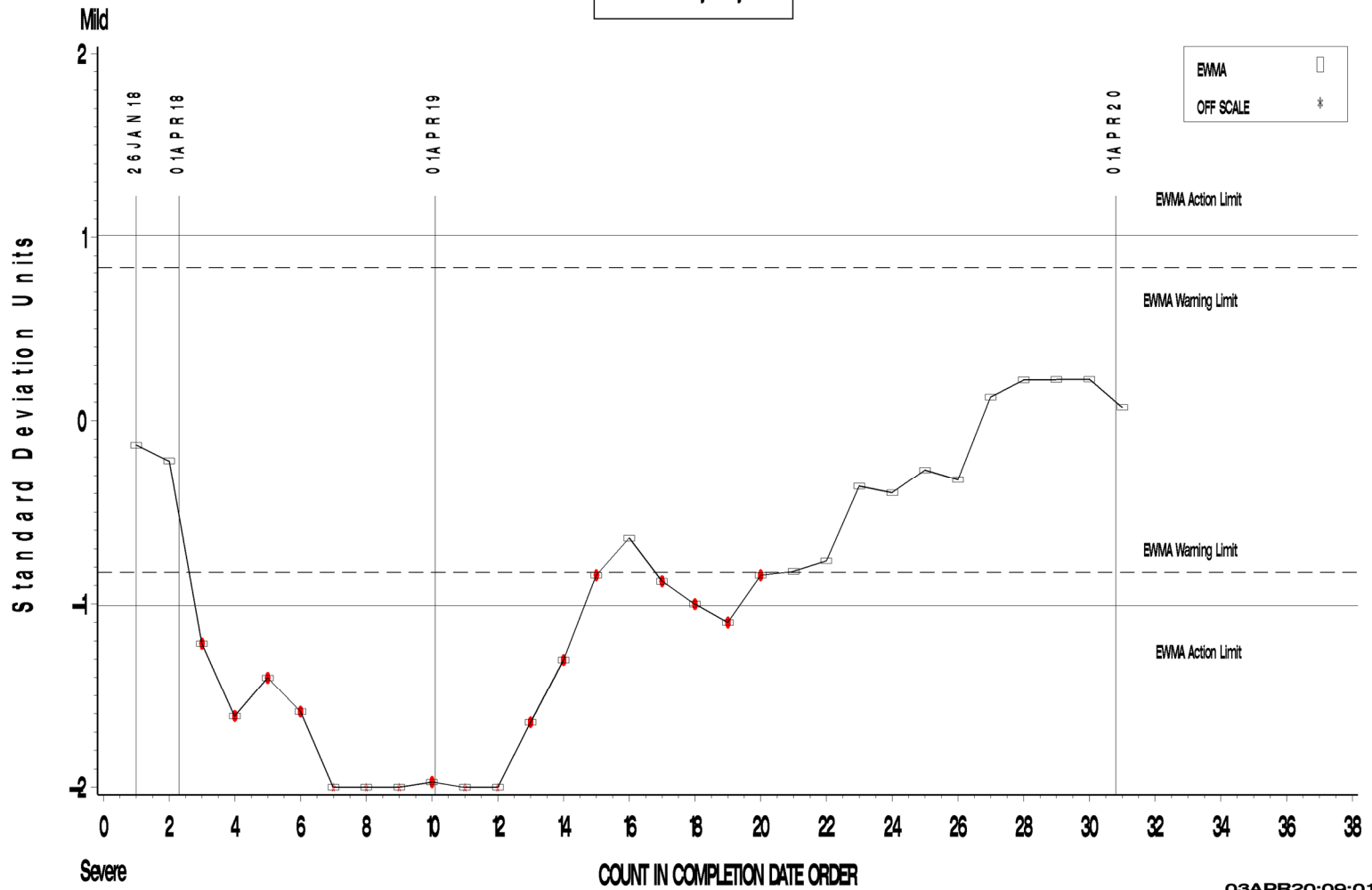
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L-37-1 (D8165)

L-37-1 NONLUBRICATED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR RIBBLING

LTMS Severity Analysis



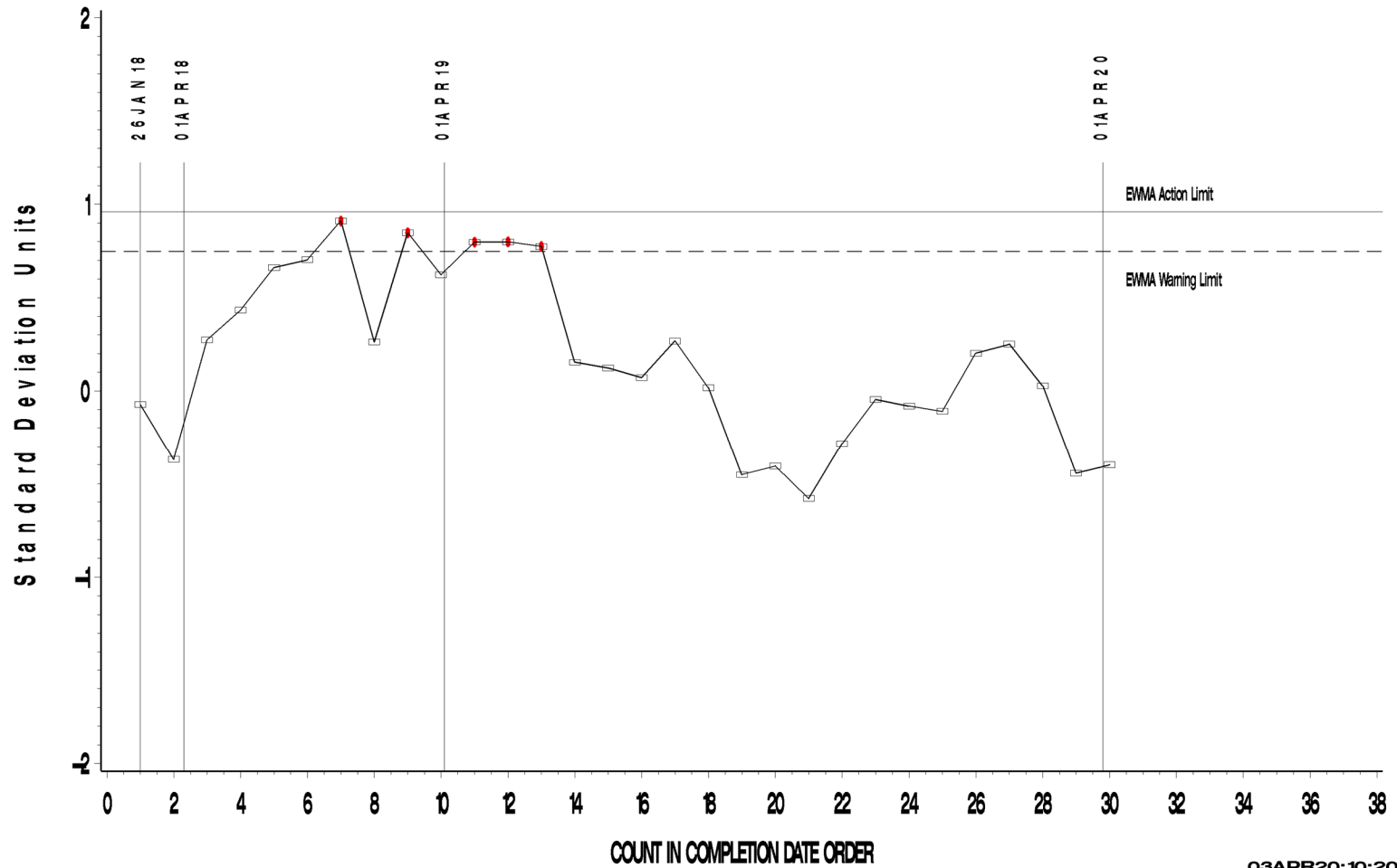
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L-37-1 (D8165)

L-37-1 NONLUBRICATED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR RIPPLING

LTMS Precision Analysis



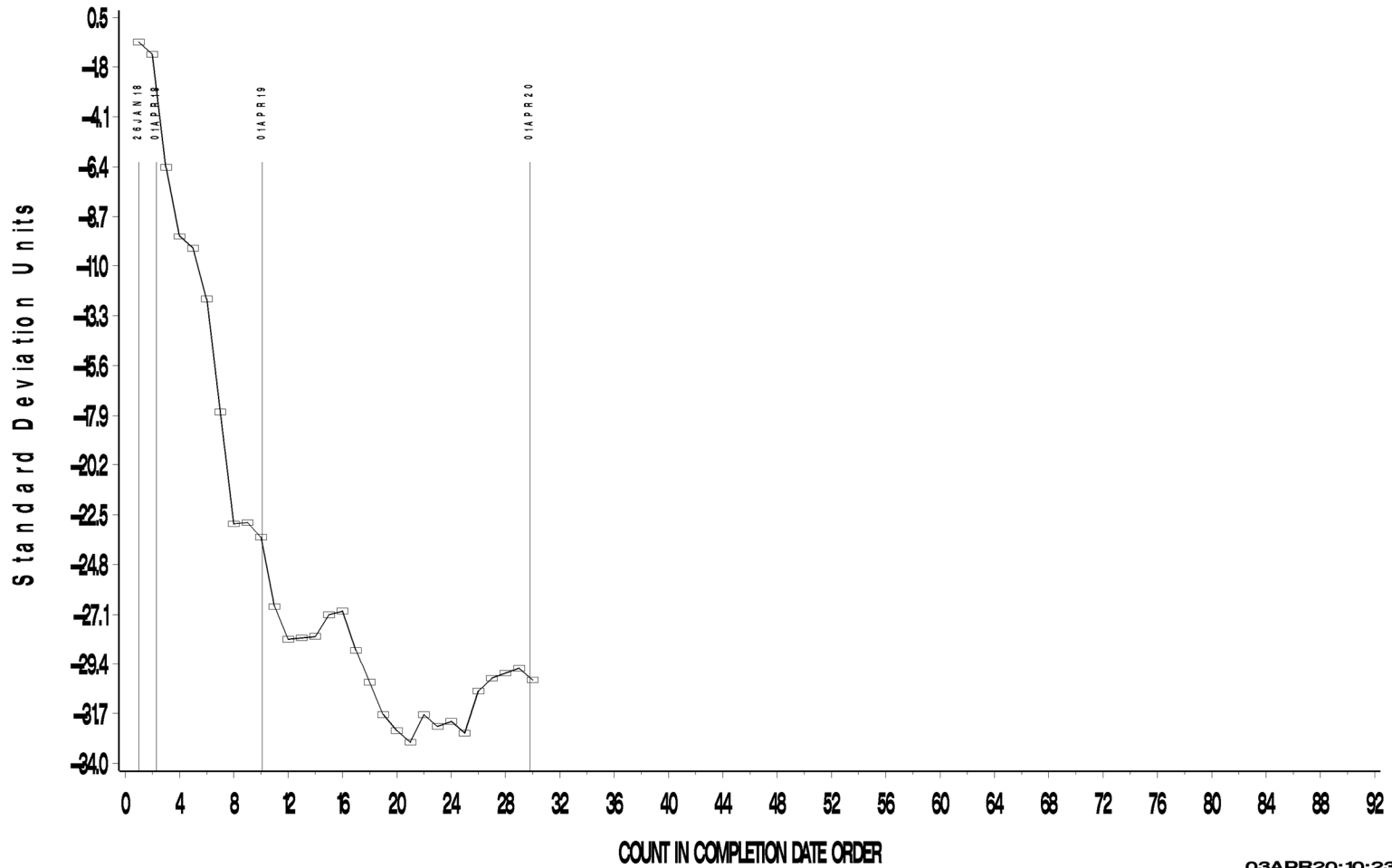
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L-37-1 (D8165)

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FINAL PINION GEAR RIPPLING

CUSUM Severity Analysis



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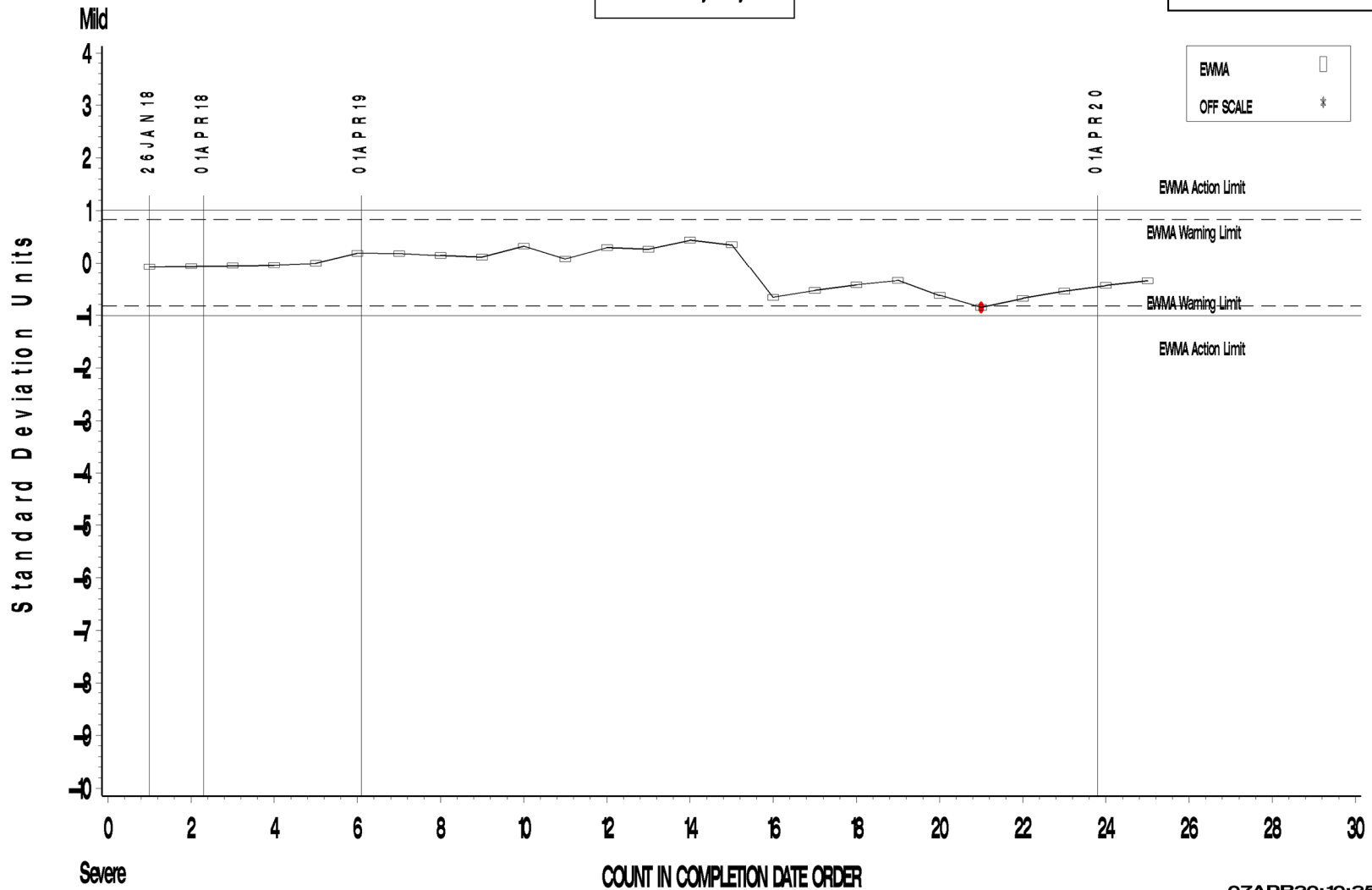
L-37-1 (D8165)

L-37-1 NONLUBRICATED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR PITTING/SPALLING

LTMS Severity Analysis

Results for 155-1 reference oil were not included in this SPIT charts based on the current targets for the oil leading to undefined calculations. Two 152-2 results (129856, and 138440) were also omitted.



07APR20:10:25

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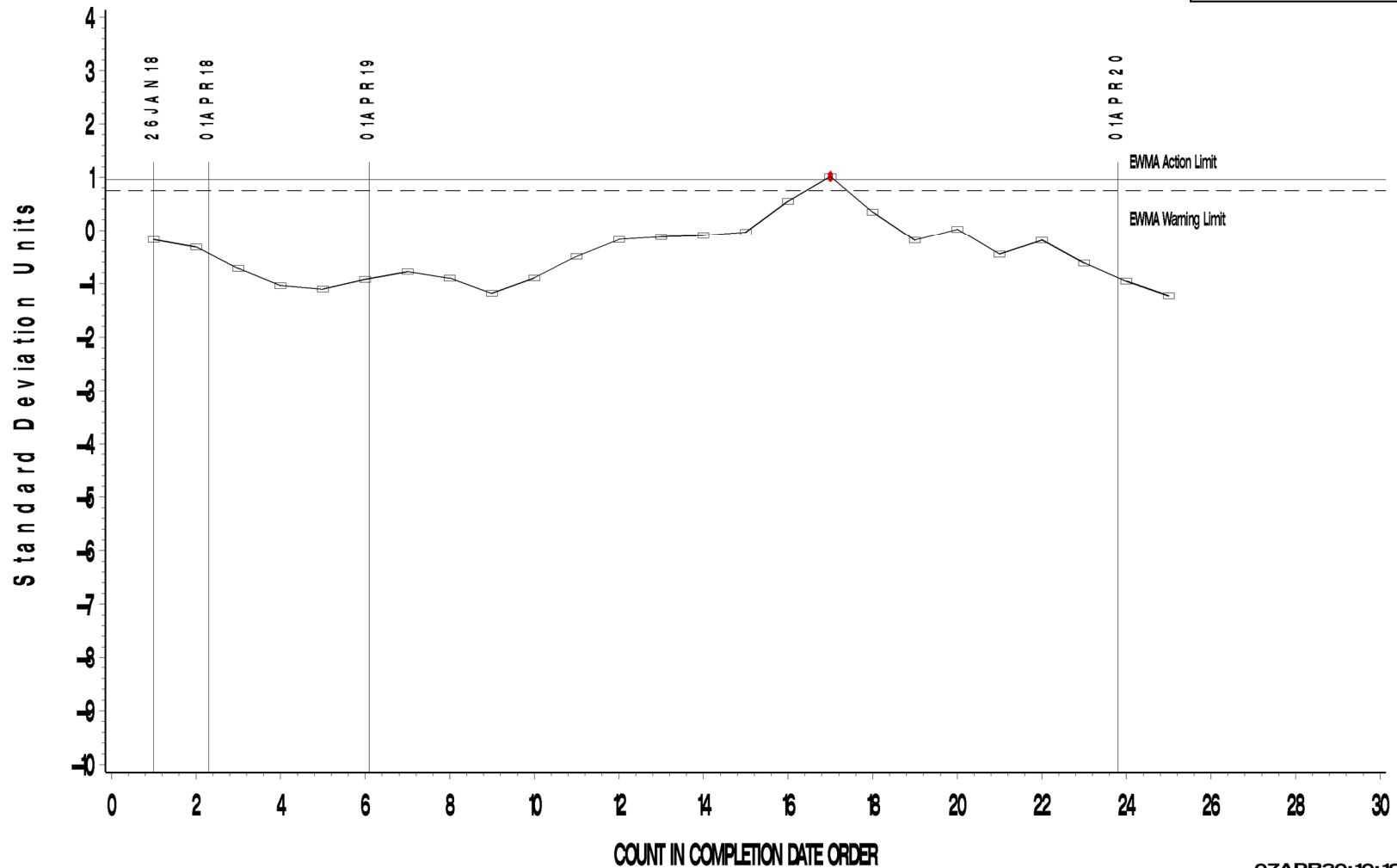
L-37-1 (D8165)

L-37-1 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR PITTING/SPALLING

LTMS Precision Analysis

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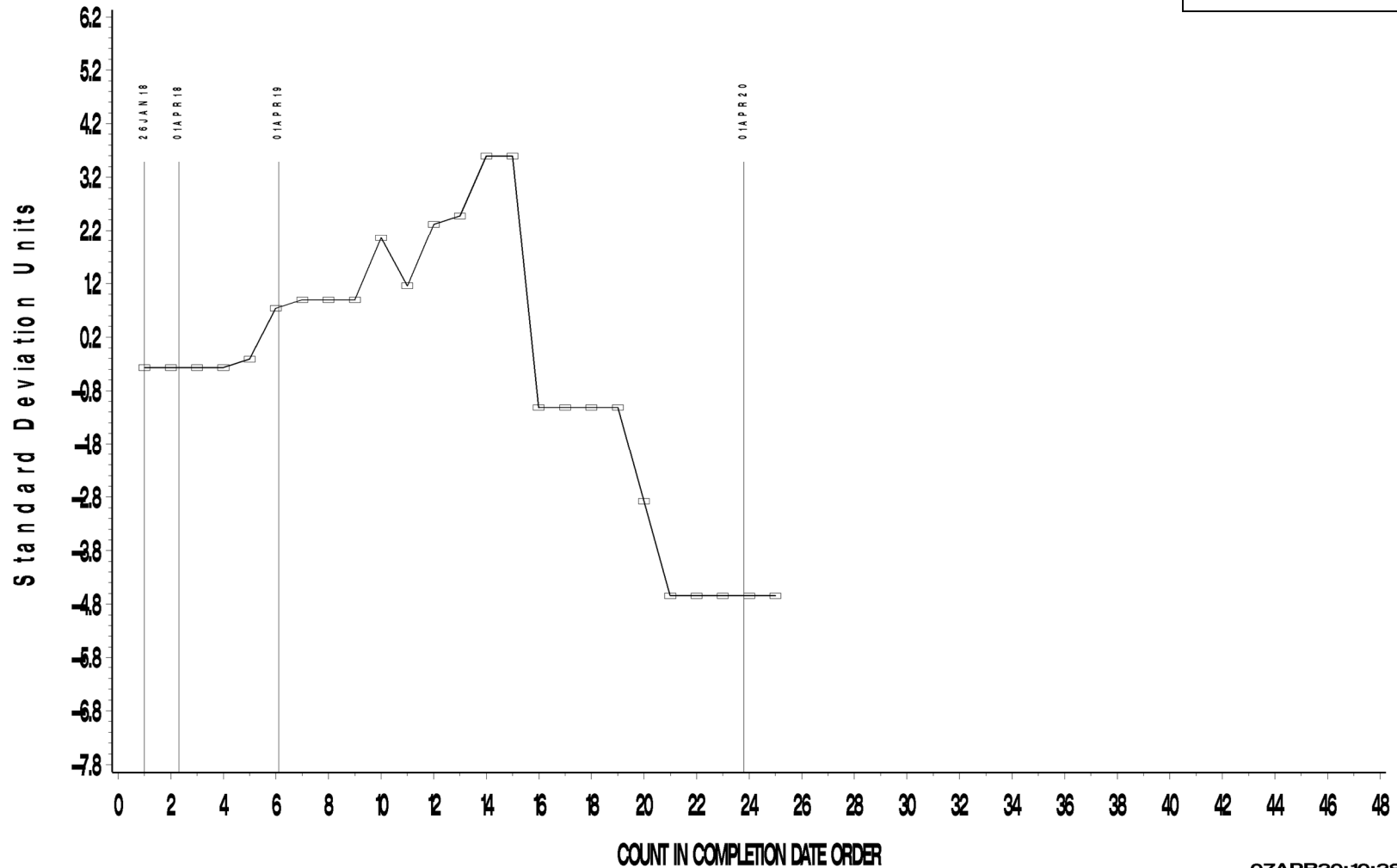


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L-37-1 (D8165)

L-37-1 NONLUBRICATED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR PITTING/SPALLING

CUSUM Severity Analysis



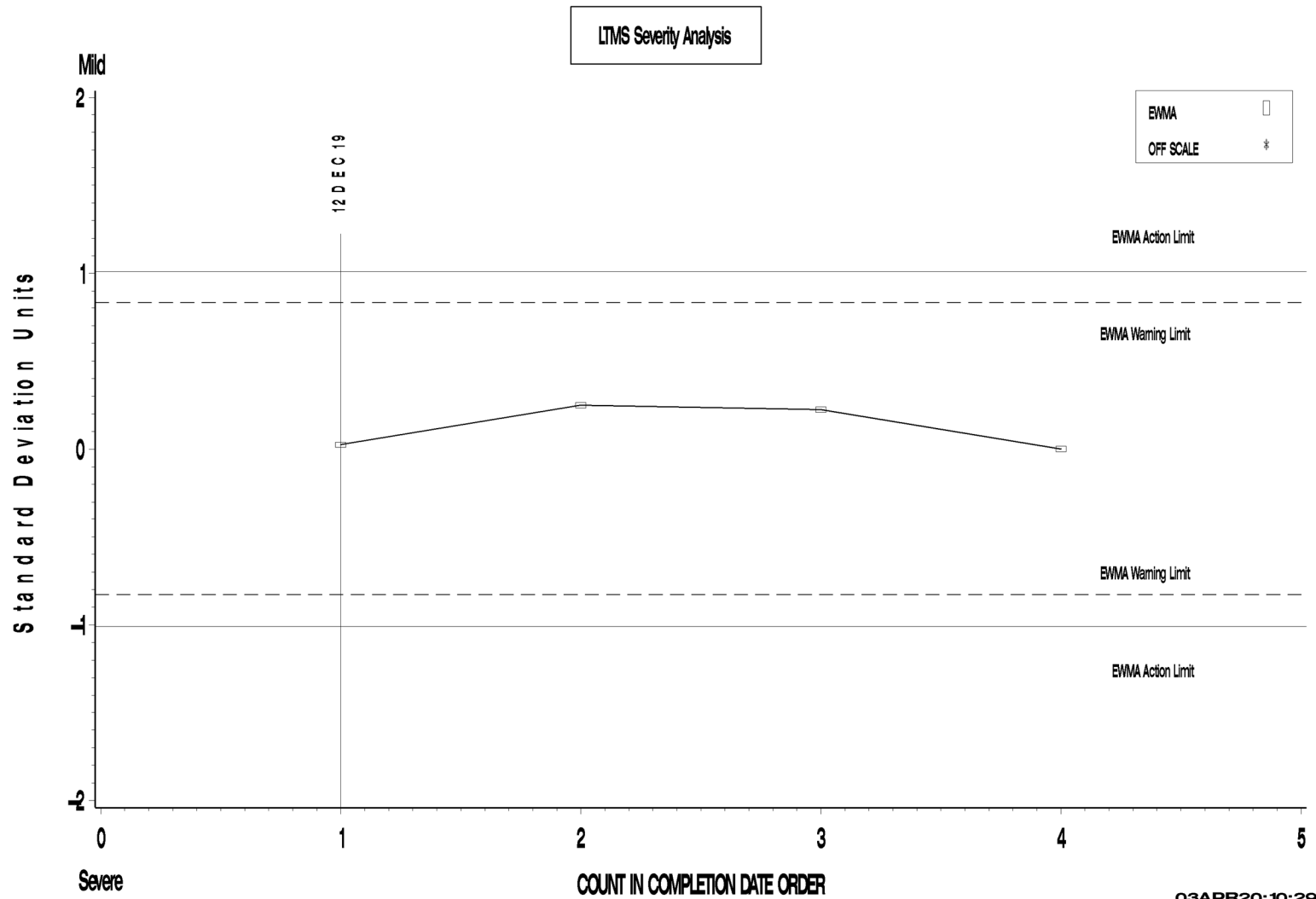
Results for 155-1 reference oil were not included in this SPIT charts based on the current targets for the oil leading to undefined calculations. Two 152-2 results (129856, and 138440) were also omitted.

07APR20:10:28

L-37-1 (D8165)

L-37-1 LUBRITED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR WEAR

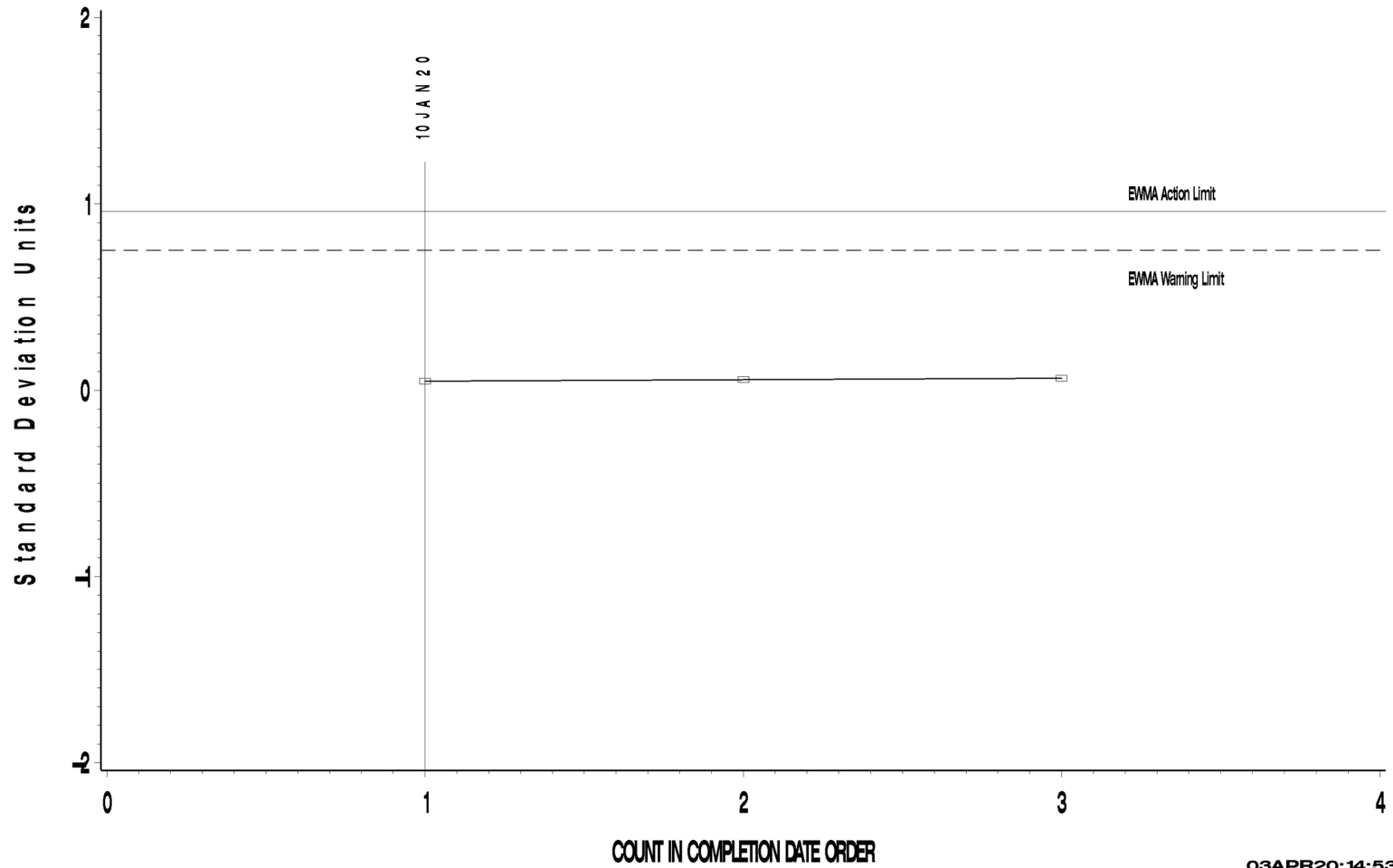


L-37-1 (D8165)

L-37-1 LUBRICATED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR WEAR

LTMS Precision Analysis



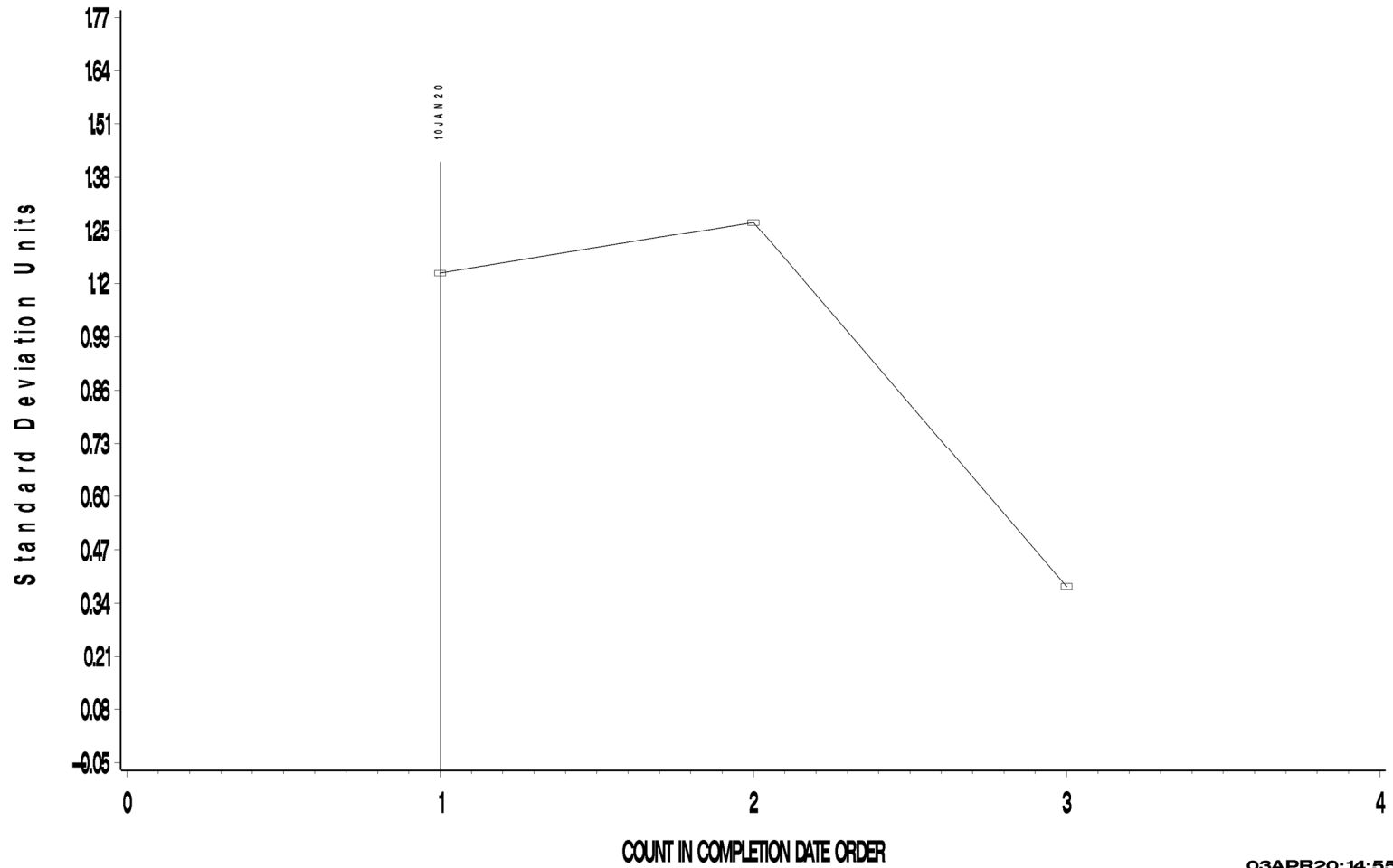
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L-37-1 (D8165)

L-37-1 LUBRITED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR WEAR

CUSUM Severity Analysis



03APR20:14:55

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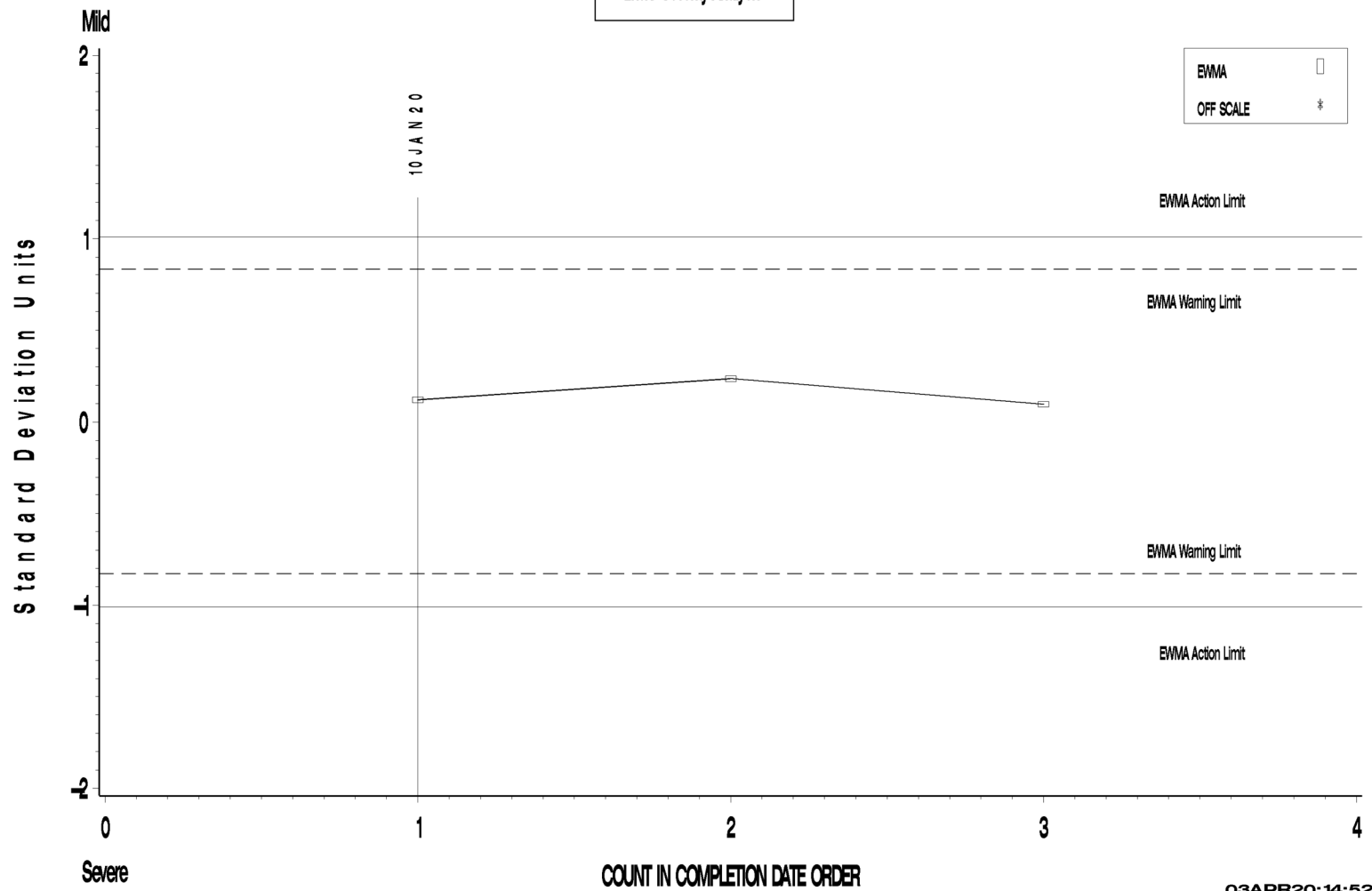
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L-37-1 (D8165)

L-37-1 LUBRITED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR RIDGING

LTMS Severity Analysis

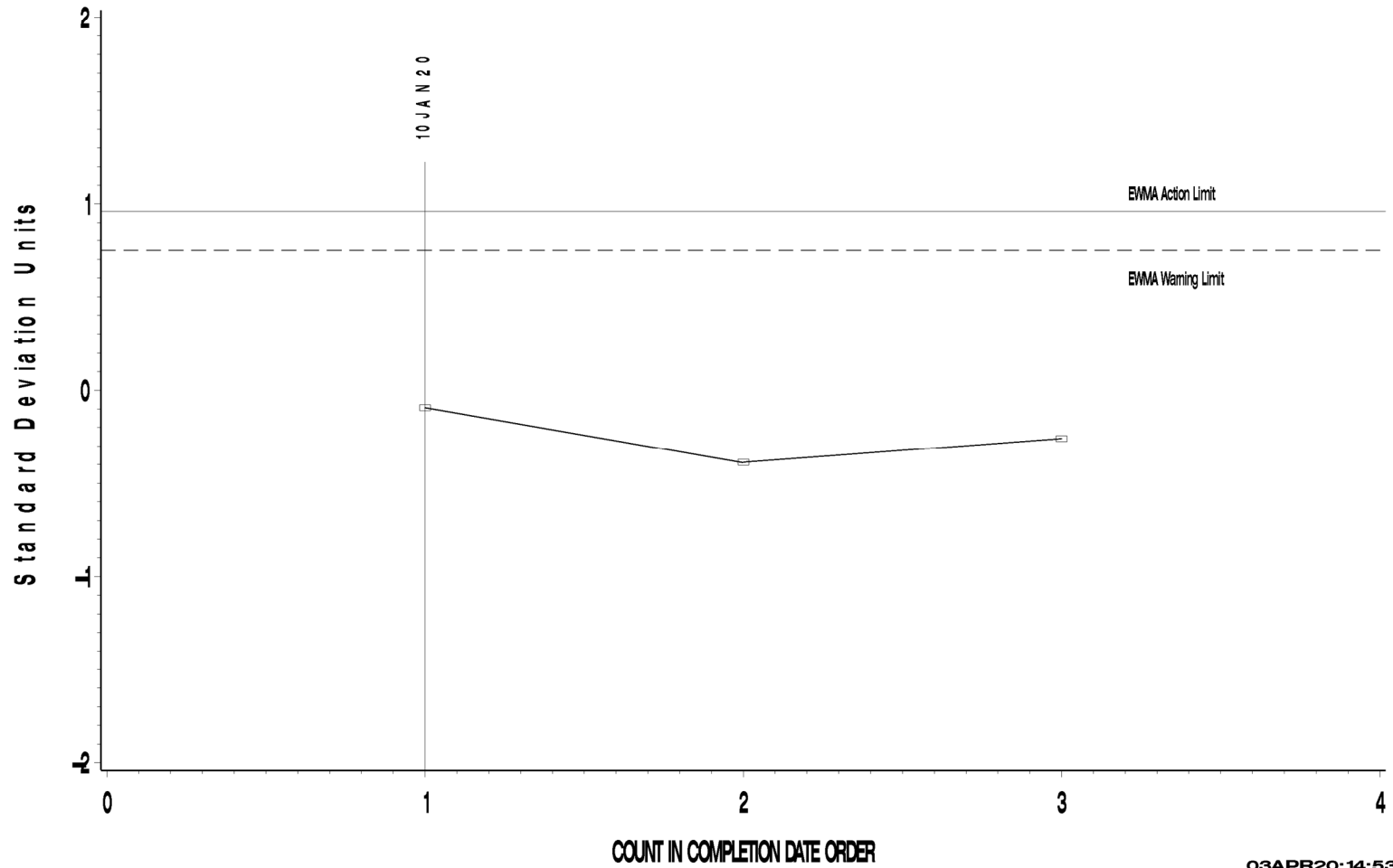


L-37-1 (D8165)

L-37-1 LUBRITED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR RIDGING

LTMS Precision Analysis



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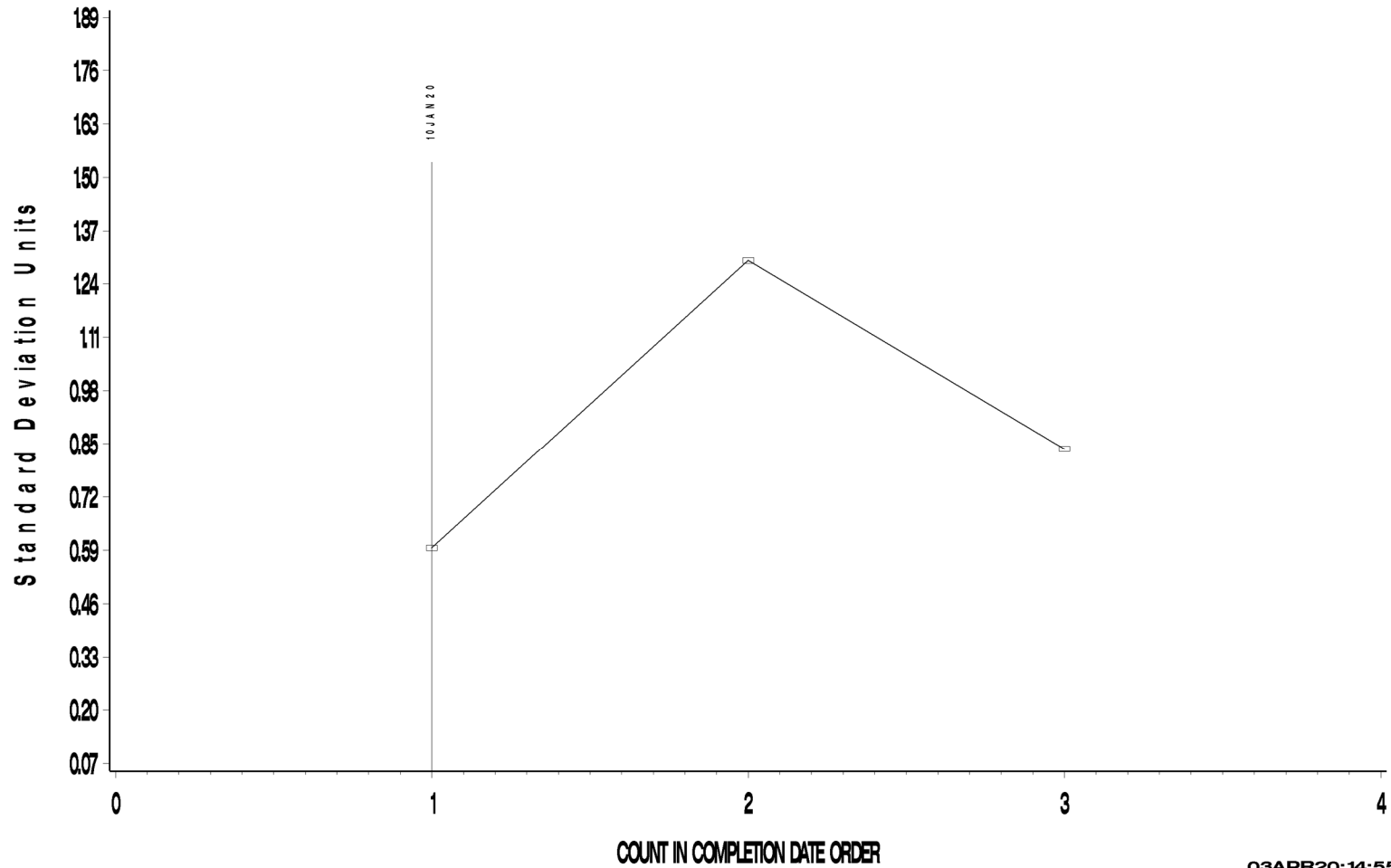
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L-37-1 (D8165)

L-37-1 LUBRITED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR RIDGING

CUSUM Severity Analysis



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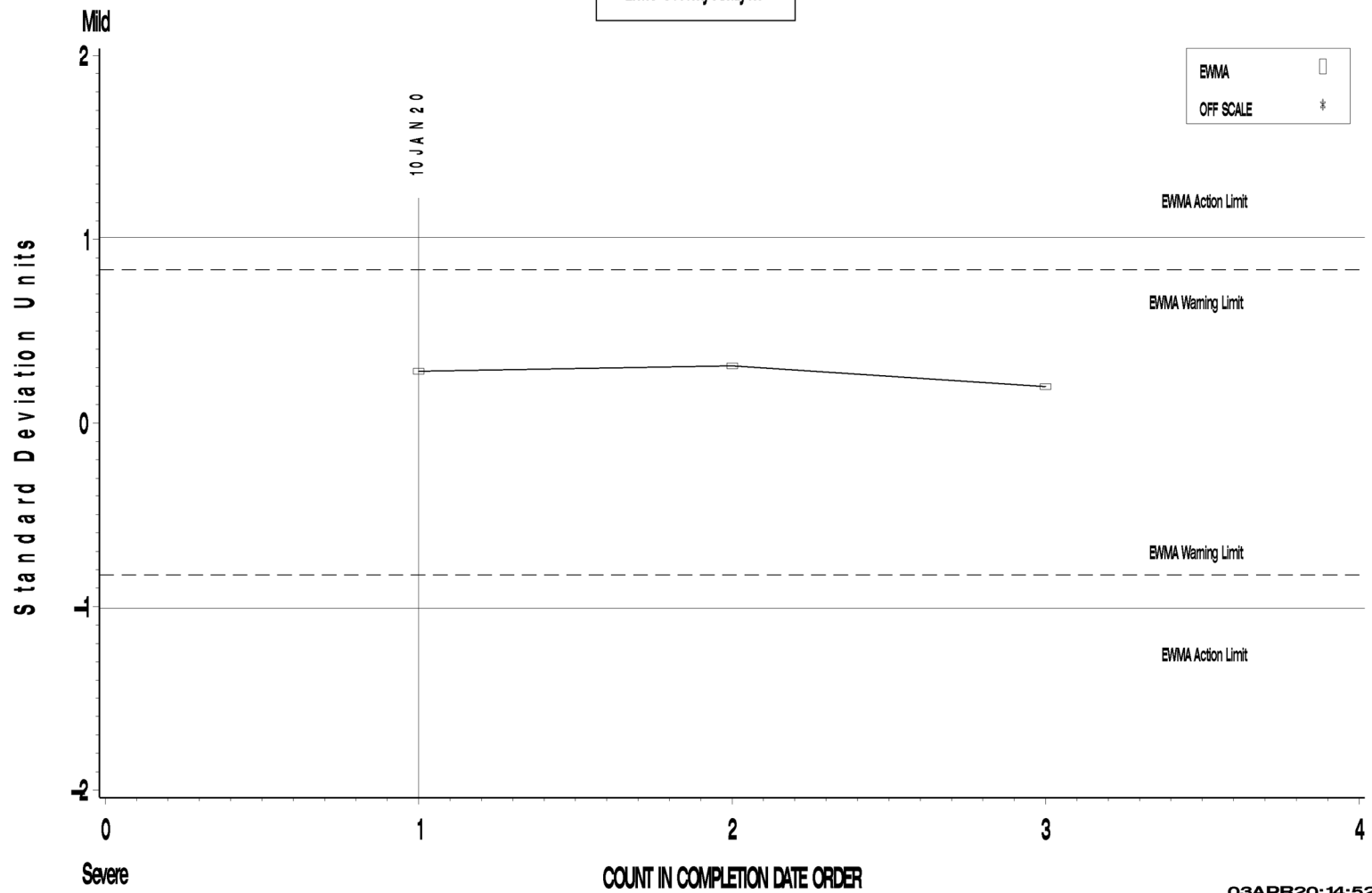
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L-37-1 (D8165)

L-37-1 LUBRITED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR RIBBLING

LTMS Severity Analysis

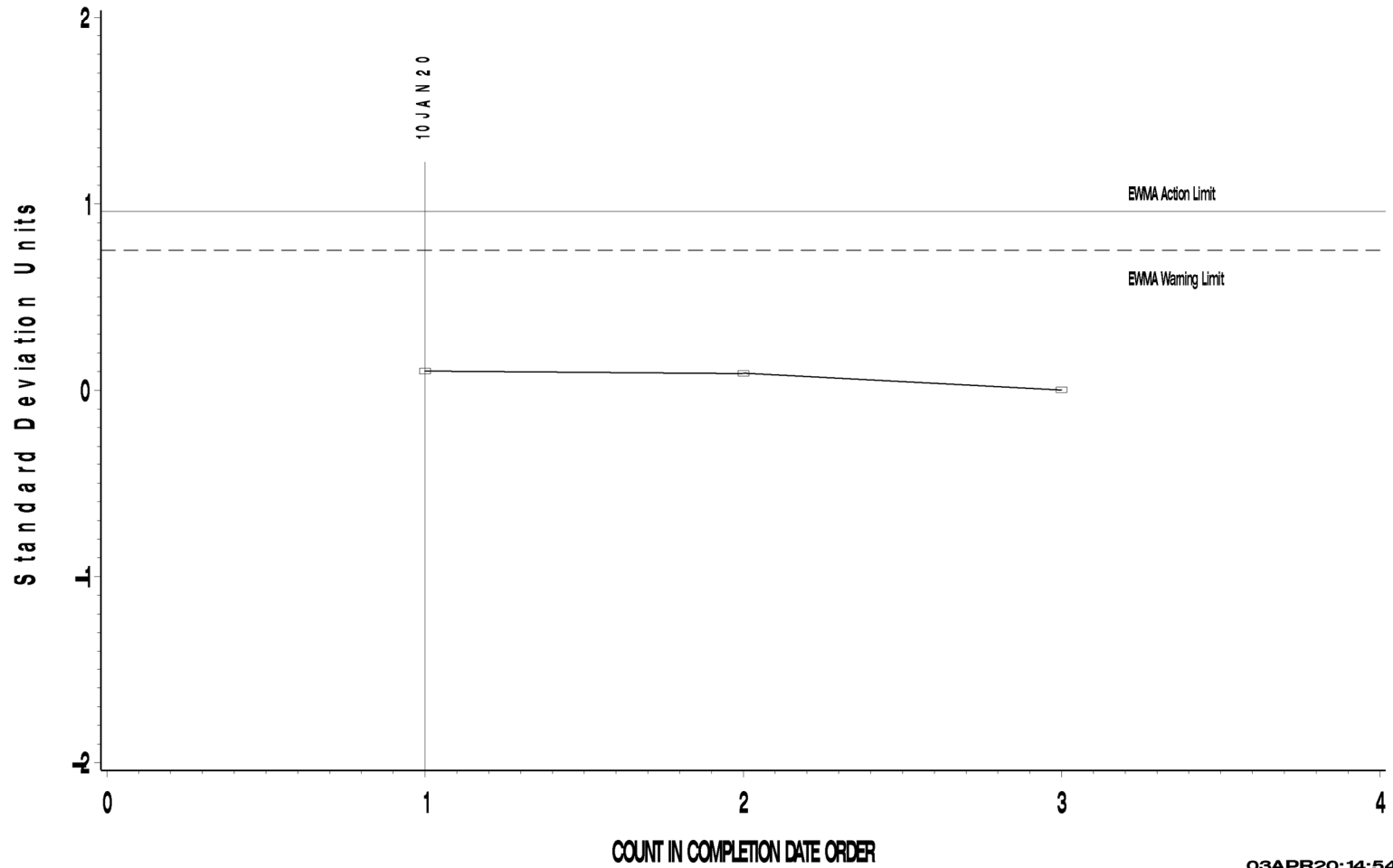


L-37-1 (D8165)

L-37-1 LUBRITED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR RIPPLING

LTMS Precision Analysis

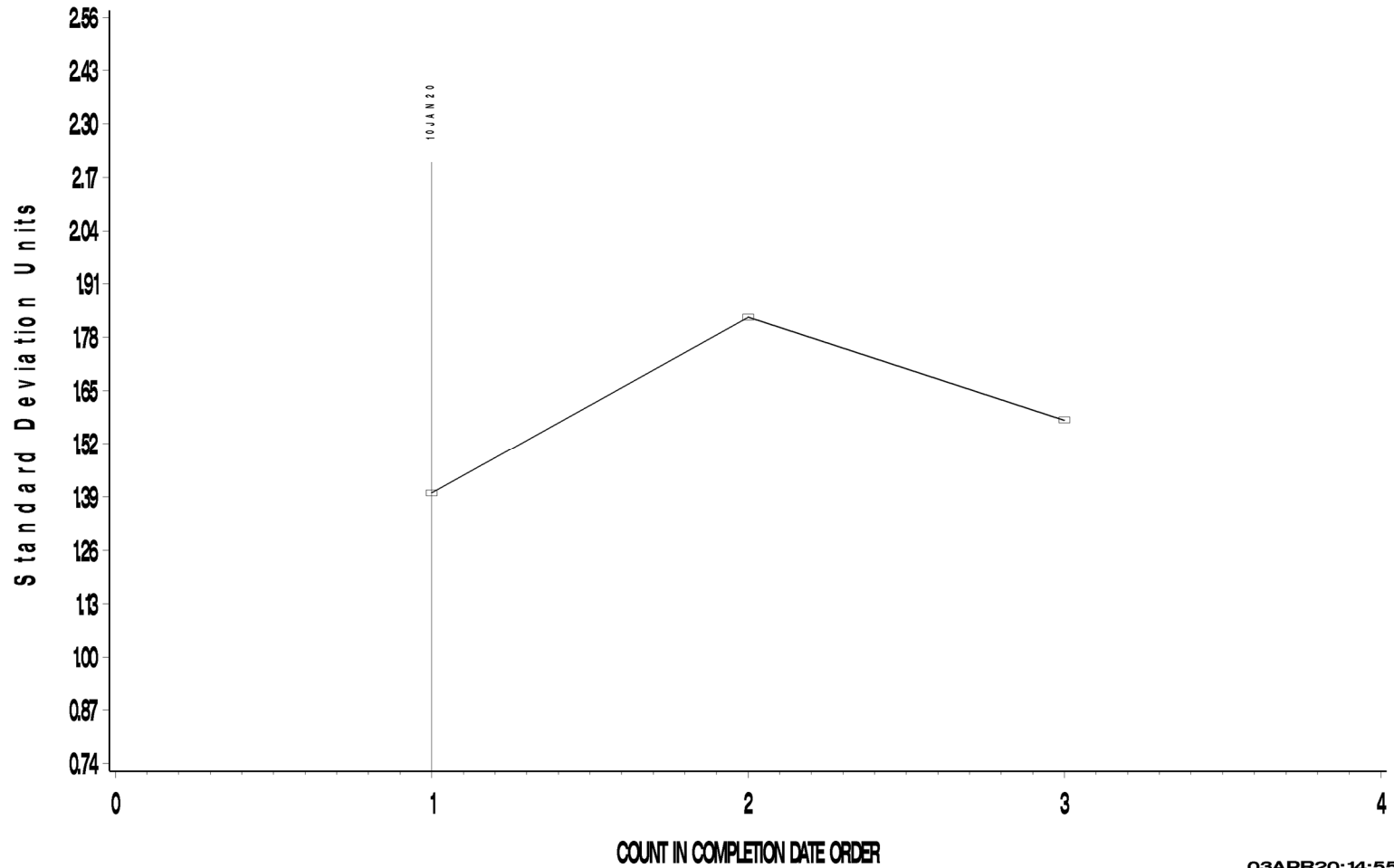


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CUSUM Severity Analysis



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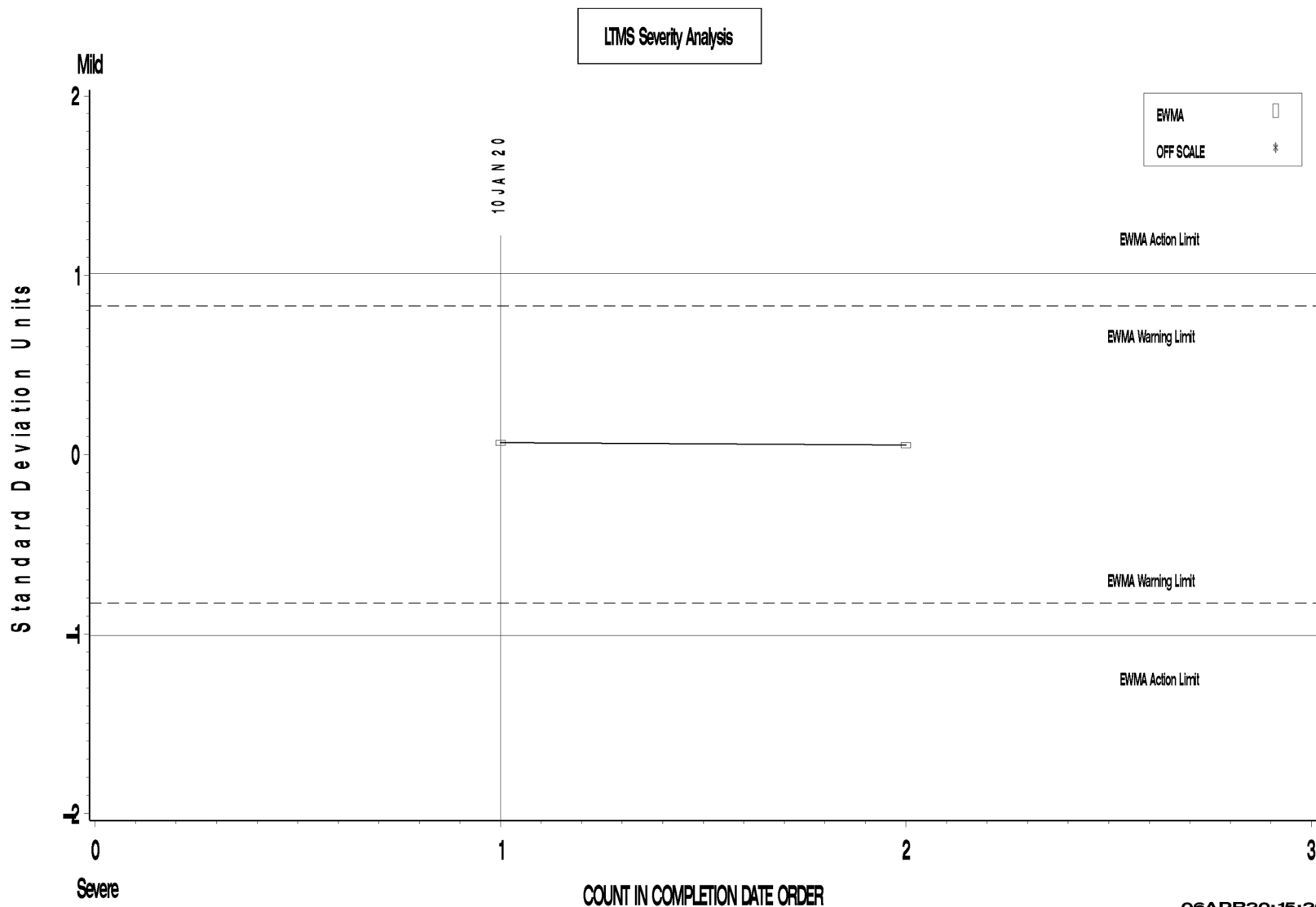
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L-37-1 (D8165)

L-37-1 LUBRITED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR PITTING/SPALLING

Results for 155-1 reference oil were not included in this SPIT charts based on the current targets for the oil leading to undefined calculations



06APR20: 15:20

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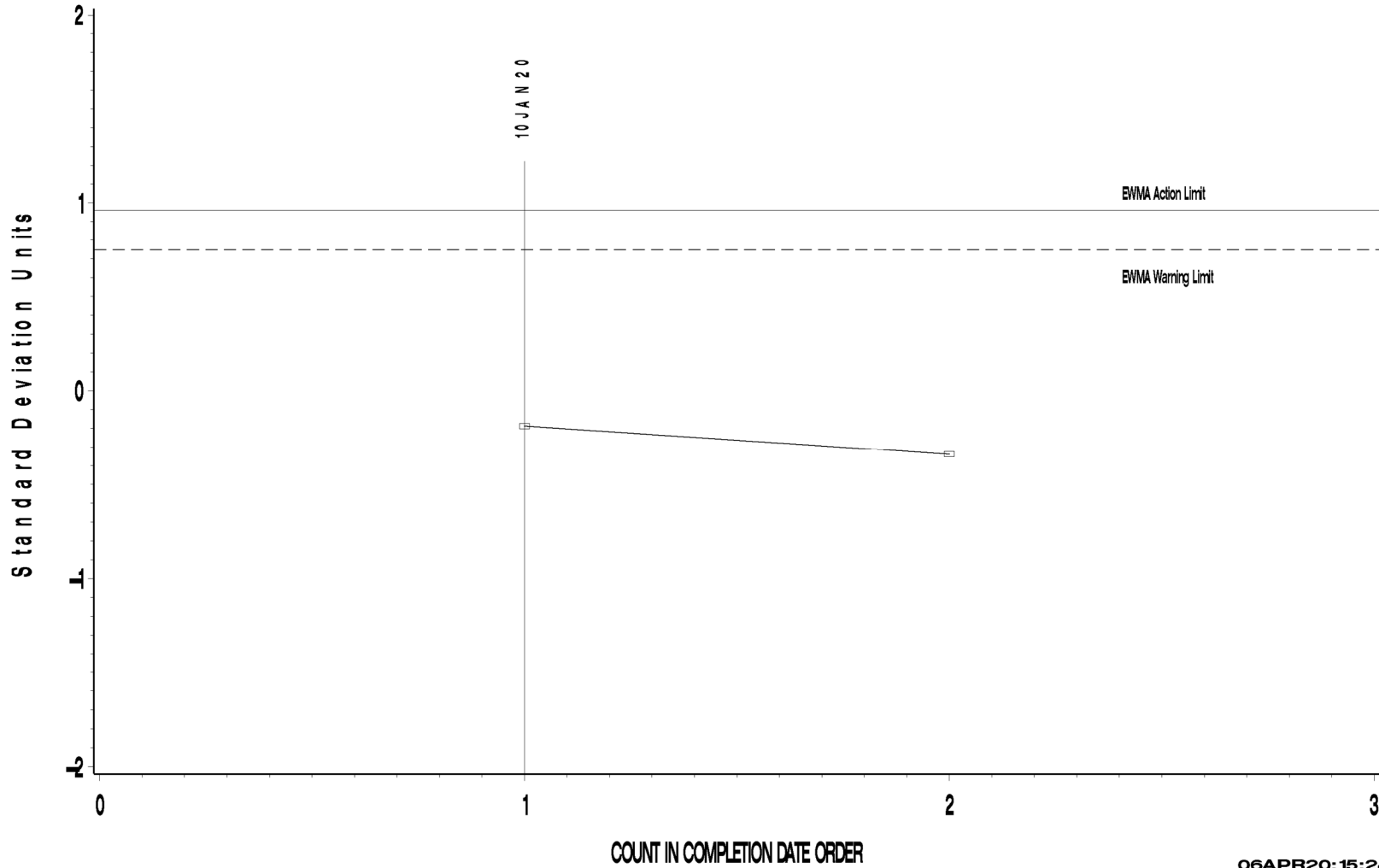
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L-37-1 (D8165)

L-37-1 LUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR PITTING/SPALLING

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LTMS Precision Analysis



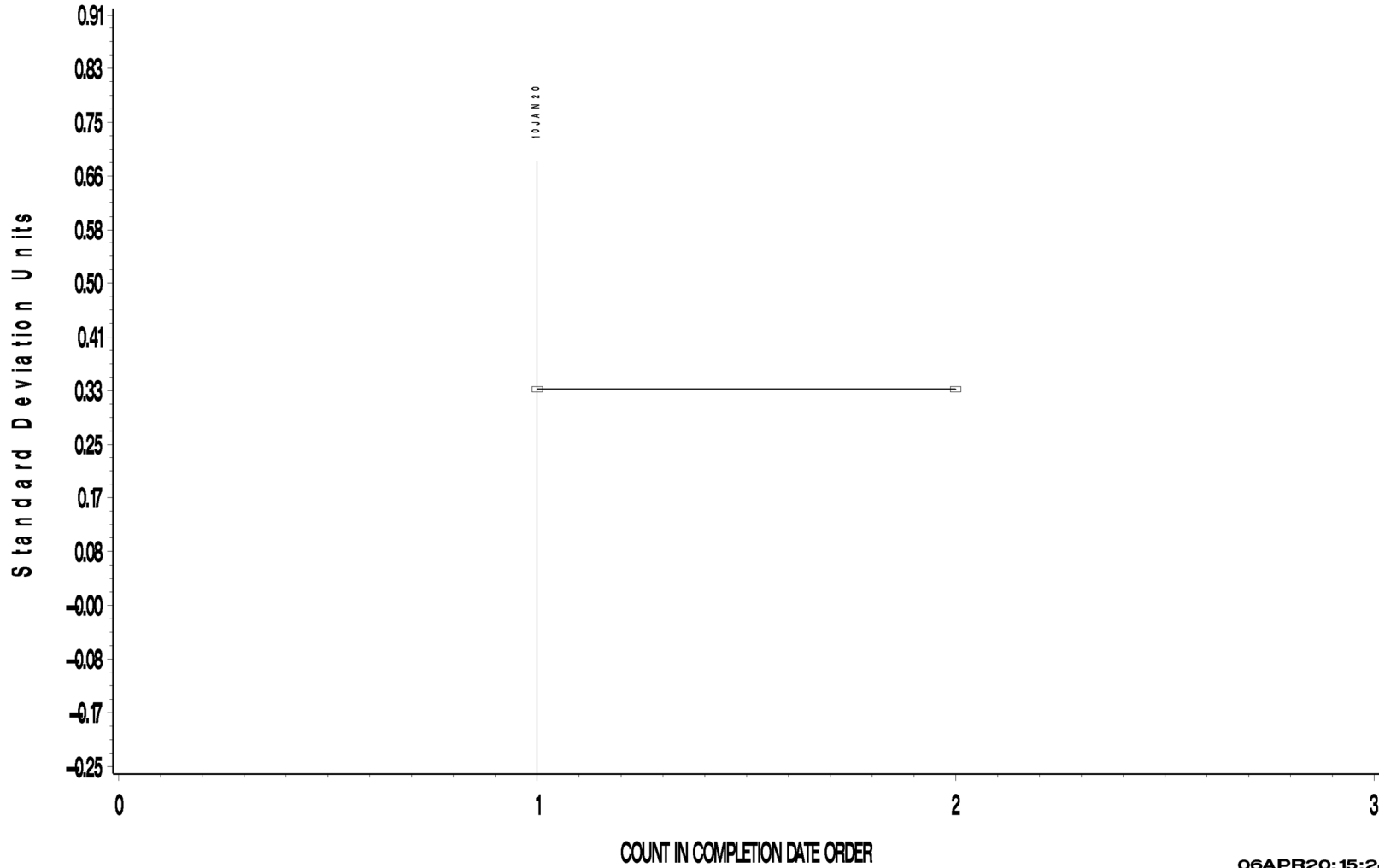
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L-37-1 (D8165)

L-37-1 LUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR PITTING/SPALLING

CUSUM Severity Analysis

Results for 155-1 reference oil were not included in this SPIT charts based on the current targets for the oil leading to undefined calculations



06APR20: 15:24

L-37-1 (D8165)

TIMELINE ADDITIONS

Effective Date	Information Letter	Event
October, 23 2019	19-4	Approval of Dana hardware previously approved for D6121 (L37) testing for use in the D8165 (L-371) electric test rig. Clarifications added to the procedure about what hardware is currently approved for testing.
January 8, 2020	20-1	Section 12.5 of the test procedure was modified to state that tests conducted on 134-1 reference oil that exhibit broke teeth can be rated to obtain results. Tests with broken teeth to the extent that the hardware cannot be rated are to be deemed non-interpretable.

L-37-1 (D8165)

LAB VISITS

Three L-371 lab visits were conducted during this period. All reviewed aspects were found to be in compliance with the test procedure.

INFORMATION LETTERS

Information letters 19-4, and 20-1 were issue this period.

L-37-1 (D8165)

LTMS DEVIATIONS

No LTMS deviations were written this report period.

L-37-1 (D8165)

STATUS OF REFERENCE OIL SUPPLY

Oil	Cans @ Labs	@ TMC	
		Cans	Gallons
117	11	328	328.5
118	3	156	156.0
134	1	0	0.0
134-1	20	143	143.0
152-2	17	80	80.0
155	5	27	27.5
155-1	20	65	65.4
Total	77	799	800.4

The TMC quantity remaining presumes usage only for L-371 testing. Oil 155/155-1 is also used in other test areas (L-33-1, L-60-1, and HTCT). The 155-1 total also reflects that the L-60-1 surveillance panel has requested that TMC reserve a quantity of that oil (currently 38.6 gal) for use in that test.

TMC stocks of oil 134 have been depleted. The 134-1 reblend has been introduced to testing.