



Test Monitoring Center

@ Carnegie Mellon University
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<http://astmtmc.cmu.edu>
412-365-1000

MEMORANDUM: 19-017
DATE: April 25, 2019
TO: Robert Slocum, Chairman, L-37-1 Surveillance Panel
FROM: Dylan Beck *Dylan Beck*
SUBJECT: L-37-1 Testing from October 1, 2018 through March 31, 2019

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

DJB/djb/mem19-017.djb.doc

cc: Frank Farber
Jeff Clark

L-37 Surveillance Panel

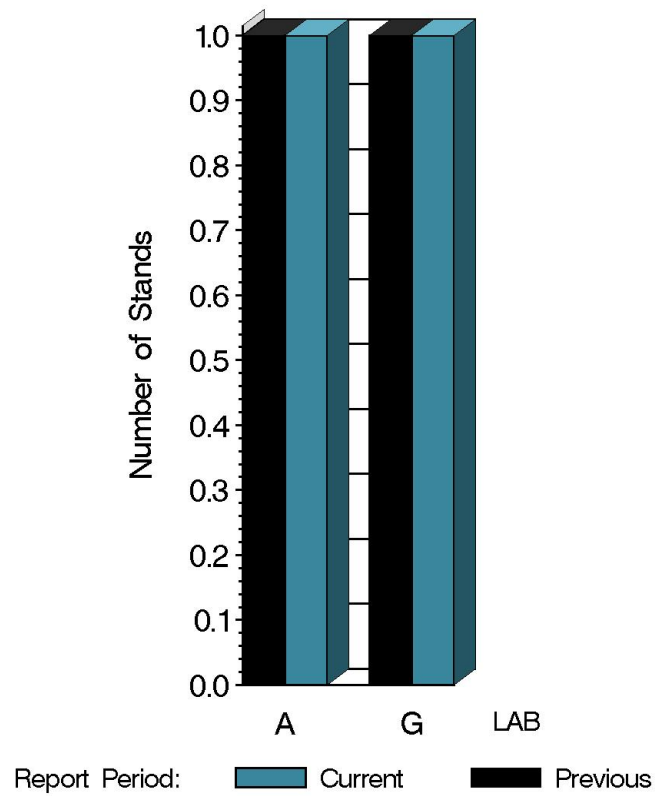
<http://www.astmtmc.cmu.edu/ftp/docs/gear/l371/semiannualreports/l371-04-2019.pdf>

Distribution: email

L-371 (D8165)

	Reporting Data	Calibrated on 3-31-19
Number of Labs	2	2
Number of Stands	2	2

BY-LAB STAND
DISTRIBUTION



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Test Distribution by Oil and Validity

					Totals	
		134-1	152-2	155-1	Last Period	This Period
Accepted for calibration	AC	2	0	0	-	2
Rejected (Mild)	OC	0	0	0	-	0
Rejected (Severe)	OC	0	1	2	-	3
Rejected (Precision)	OC	0	0	0	-	0
Operationally invalid	LC	0	1	2	-	3
Aborted run	XC	0	0	0	-	0
Acceptable info run	NI	2	1	1	-	4
Not Acceptable info run	MI	0	0	1	-	1
Total		4	3	6	-	13

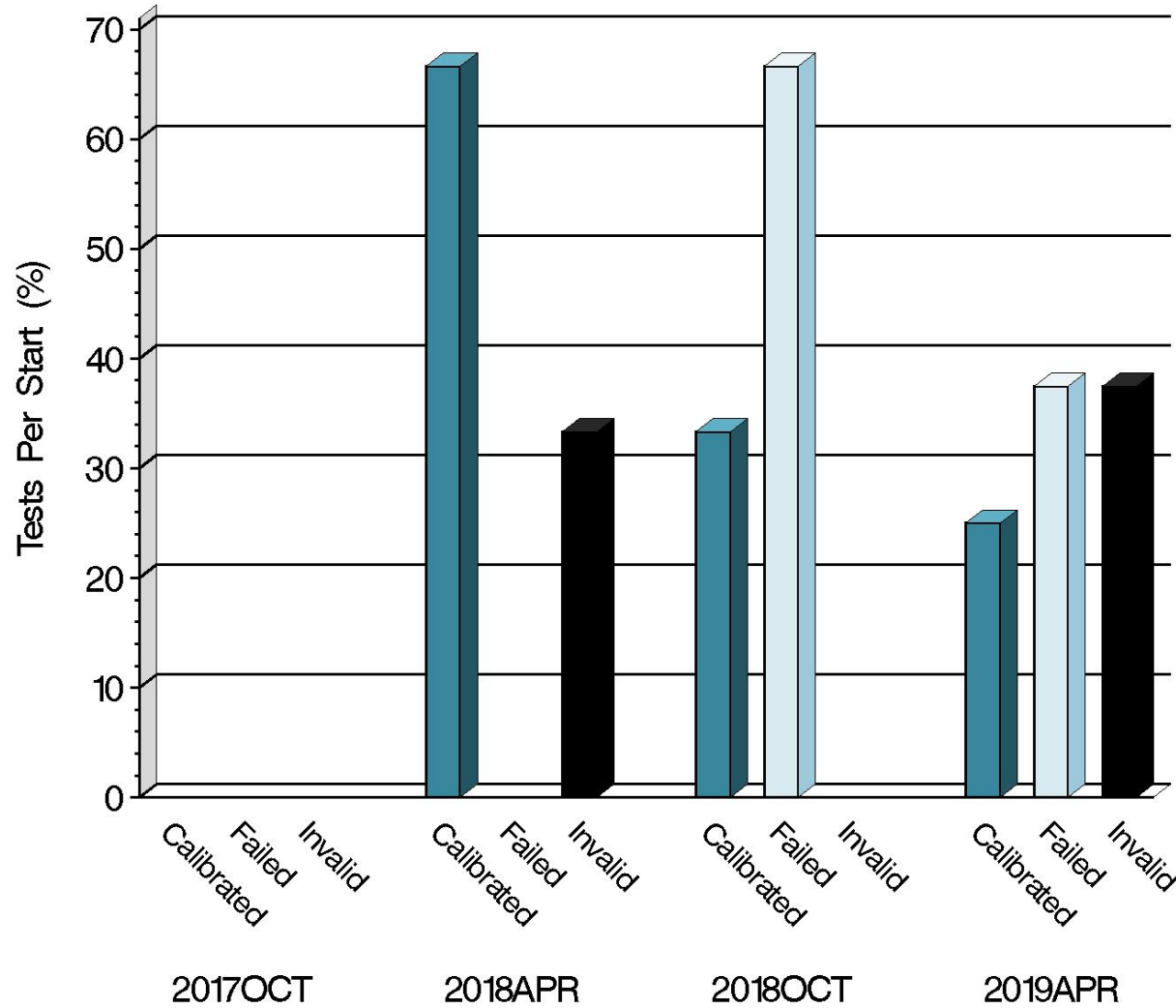
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Calibration Attempt Detail

	Gear Batch	Acceptable	Failed	Total
NONLUBRITED	2153061/2153064	0	3	3
	2153060/2153063	0	1	1
	2135703/2135700	2	0	2
	2124463/2124397	2	3	5
	2122701/2722705	2	0	2
	Total		6	7

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CALIBRATION ATTEMPT SUMMARY



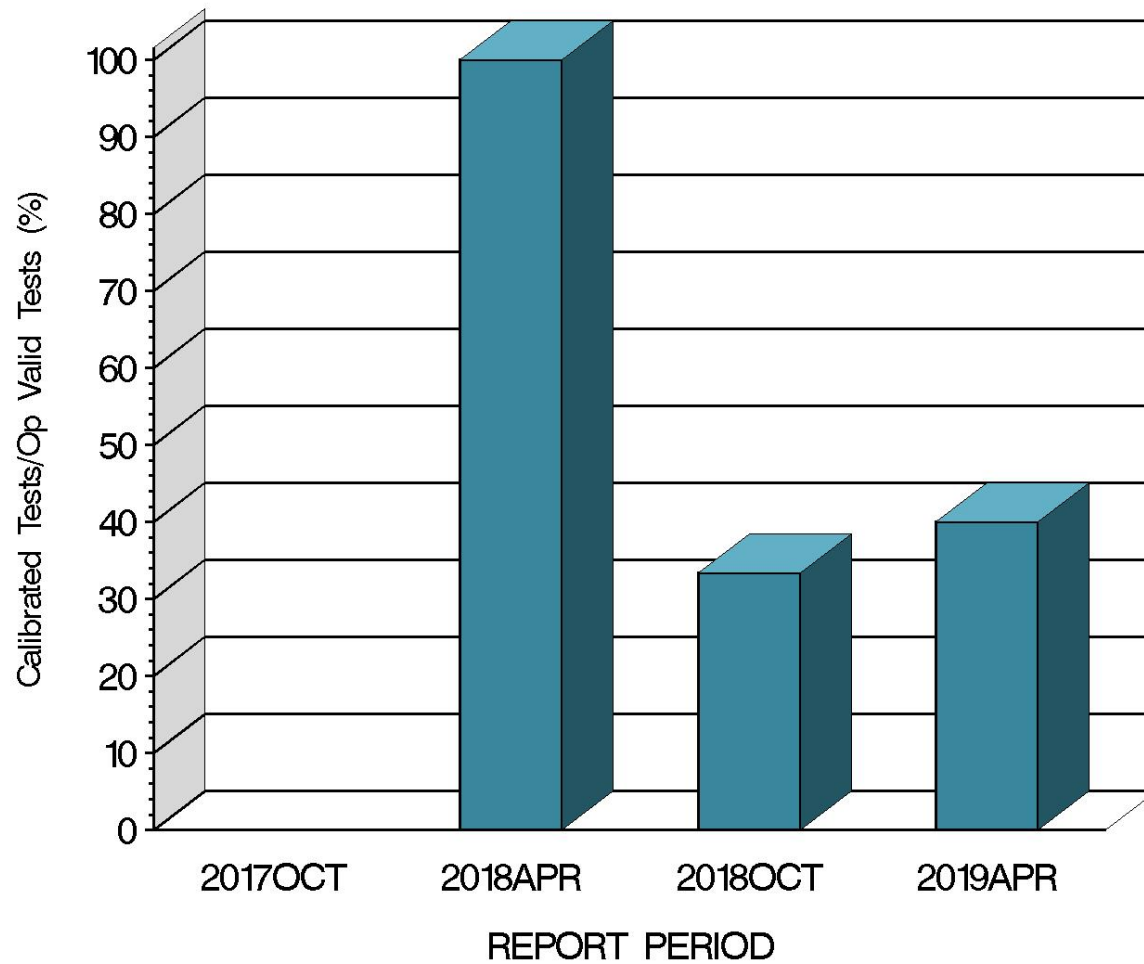
Resolution

Report Period

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OPERATIONALLY VALID TESTS
MEETING ACCEPTANCE CRITERIA



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CAUSES FOR LOST TESTS

Lab	Cause	Oil					Validity			Loss Rate		
		134	134-1	152-2	155	155-1	XC	LC	XI	Lost	Starts	%
G	Adhesive wear			●				●		1	9	11%
A	Adhesive wear					●		●		2	4	50%
	Lost	0	0	1	0	2	0	3	0			
	Starts	0	0	3	0	6	13	13	13			
	%	0%	0%	33%	0%	33%	0%	23%	0%			

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GEAR BATCH SEVERITY

NON-LUBRITED HARDWARE						
Parameter	Gear Batch	N	Δ/s	s^A	Overall Δ/s	Overall Shift (in Merits) ^B
RIDG	2124463/2124397	2	-0.130	0.420	-0.10	-0.07
RIPP	2124463/2124397	2	-0.300	0.520	-2.67	-1.49
SPIT	2124463/2124397	2	-149999.53	212132.7	-59999.78	-50819.81
WEAR	2124463/2124397	2	0.060	1.340	-0.46	-0.33
RIDG	2135703/2135700	1	0.170	.	-0.10	-0.07
RIPP	2135703/2135700	1	-2.330	.	-2.67	-1.49
SPIT	2135703/2135700	1	0.160	.	-59999.78	-50819.81
WEAR	2135703/2135700	1	0.170	.	-0.46	-0.33
RIDG	2153060/2153063	1	0.800	.	-0.10	-0.07
RIPP	2153060/2153063	1	-5.200	.	-2.67	-1.49
SPIT	2153060/2153063	1	0.000	.	-59999.78	-50819.81
WEAR	2153060/2153063	1	-1.290	.	-0.46	-0.33
RIDG	2153061/2153064	1	-1.200	.	-0.10	-0.07
RIPP	2153061/2153064	1	-5.200	.	-2.67	-1.49
SPIT	2153061/2153064	1	0.000	.	-59999.78	-50819.81
WEAR	2153061/2153064	1	-1.290	.	-0.46	-0.33

^A Because the number of tests completed this period was too small to compute a representative pooled standard deviation, the straight standard deviation is shown.

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

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LAB SEVERITY

NON-LUBRITED HARDWARE AVERAGE Δ/s						
Gear Batch	Lab	N	RIDG	RIPP	SPIT	WEAR
2124463/2124397	G	2	-0.131	-0.302	-149999.530	0.056
2135703/2135700	G	1	0.167	-2.333	0.160	0.16667
2153060/2153063	A	1	0.800	-5.200	0.000	-1.286
2153061/2153064	A	1	-1.200	-5.200	0.000	-1.286

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SUMMARY OF SEVERITY & PRECISION

Severity

Nonlubrited – SPIT and RIPP are currently exceeding the severity limit. RIDG and WEAR remained within the limits this period.

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SUMMARY OF SEVERITY & PRECISION (cont.)

Precision

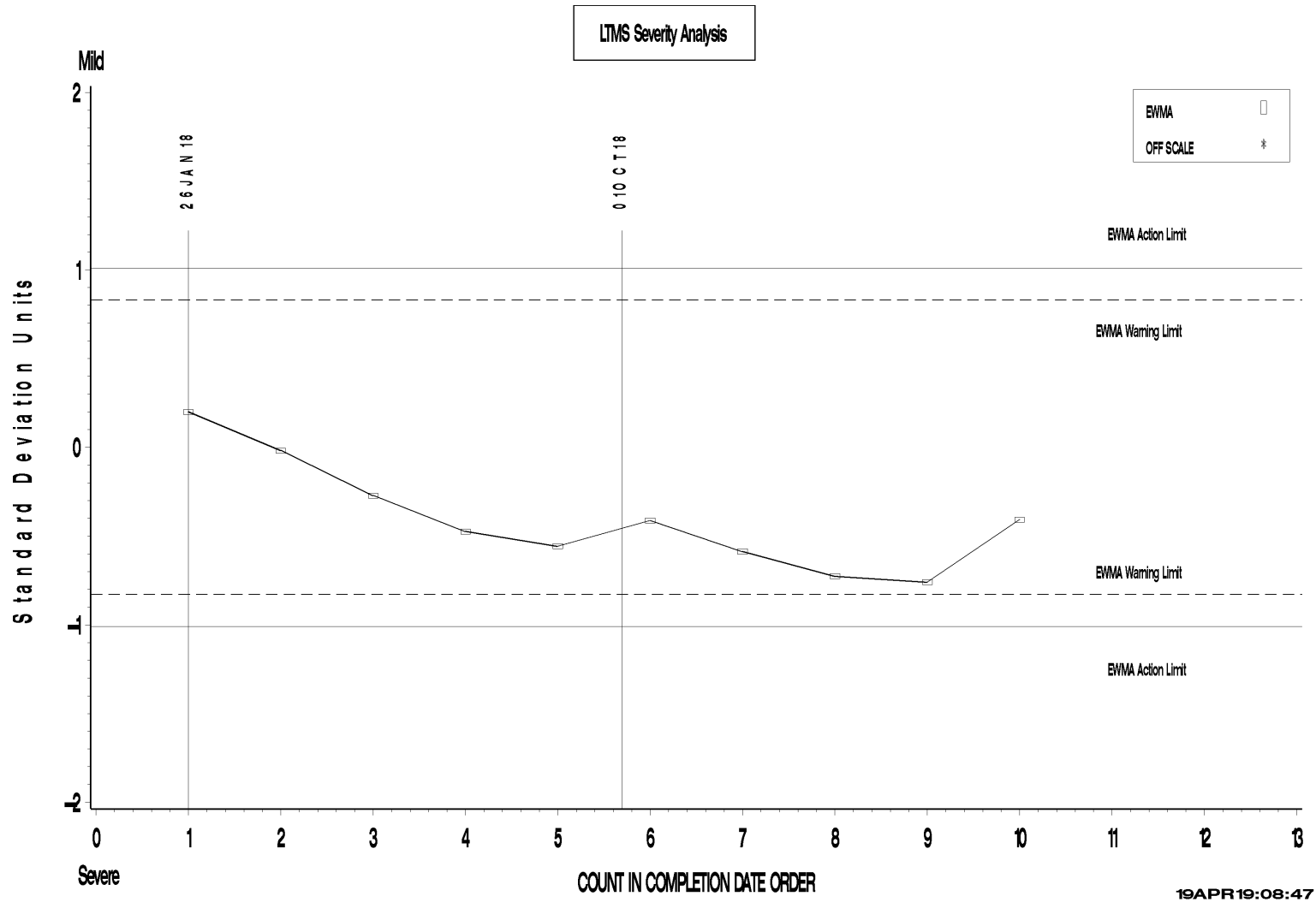
Nonlubrited – SPIT is currently exceeding the precision limit. RIPP, RIDG, and WEAR all remained within the precision limit this period.

Industry control charts follow.

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L-37-1 NONLUBRICATED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR WEAR

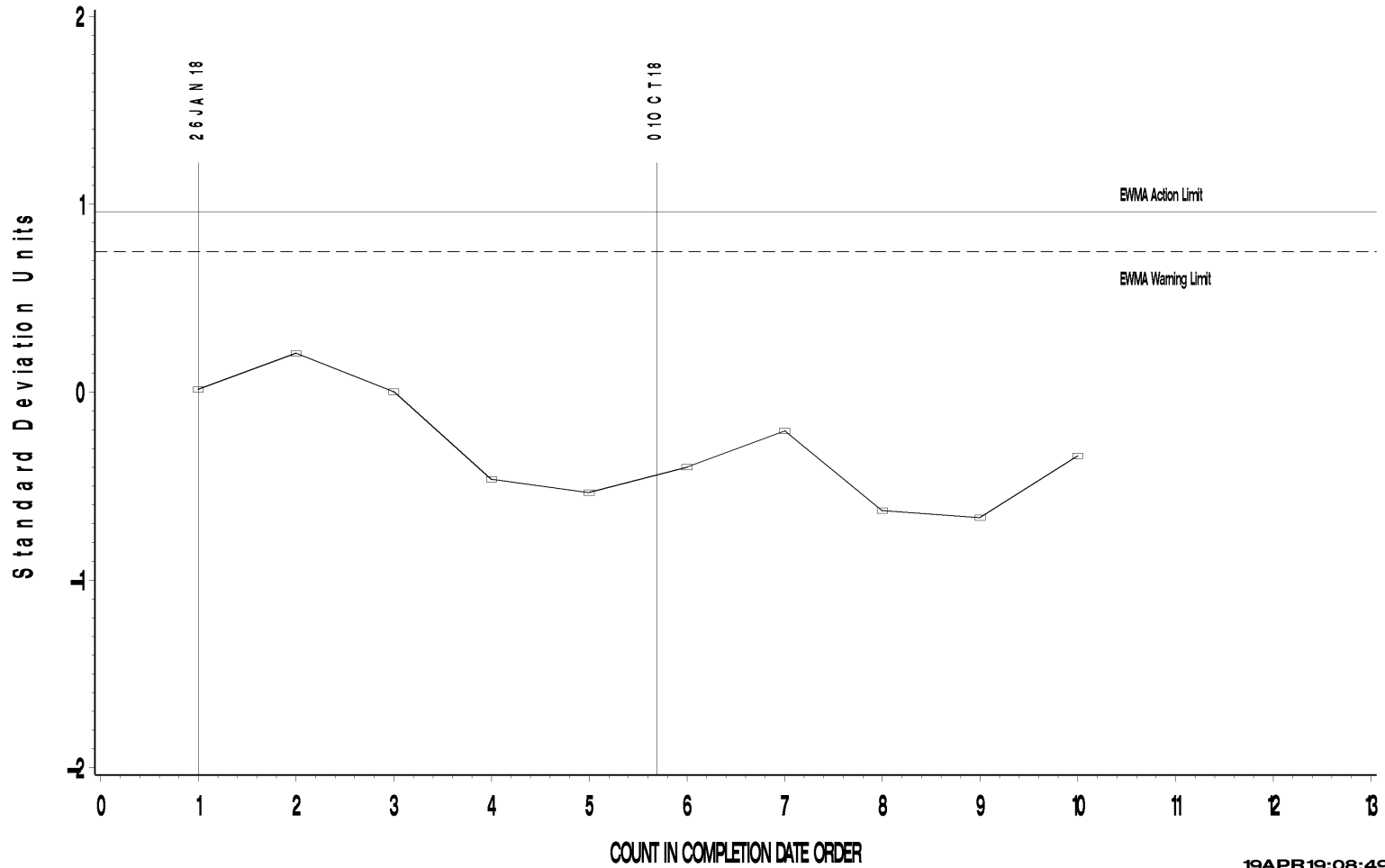


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L-371 NONLUBRICATED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR WEAR

LTMS Precision Analysis



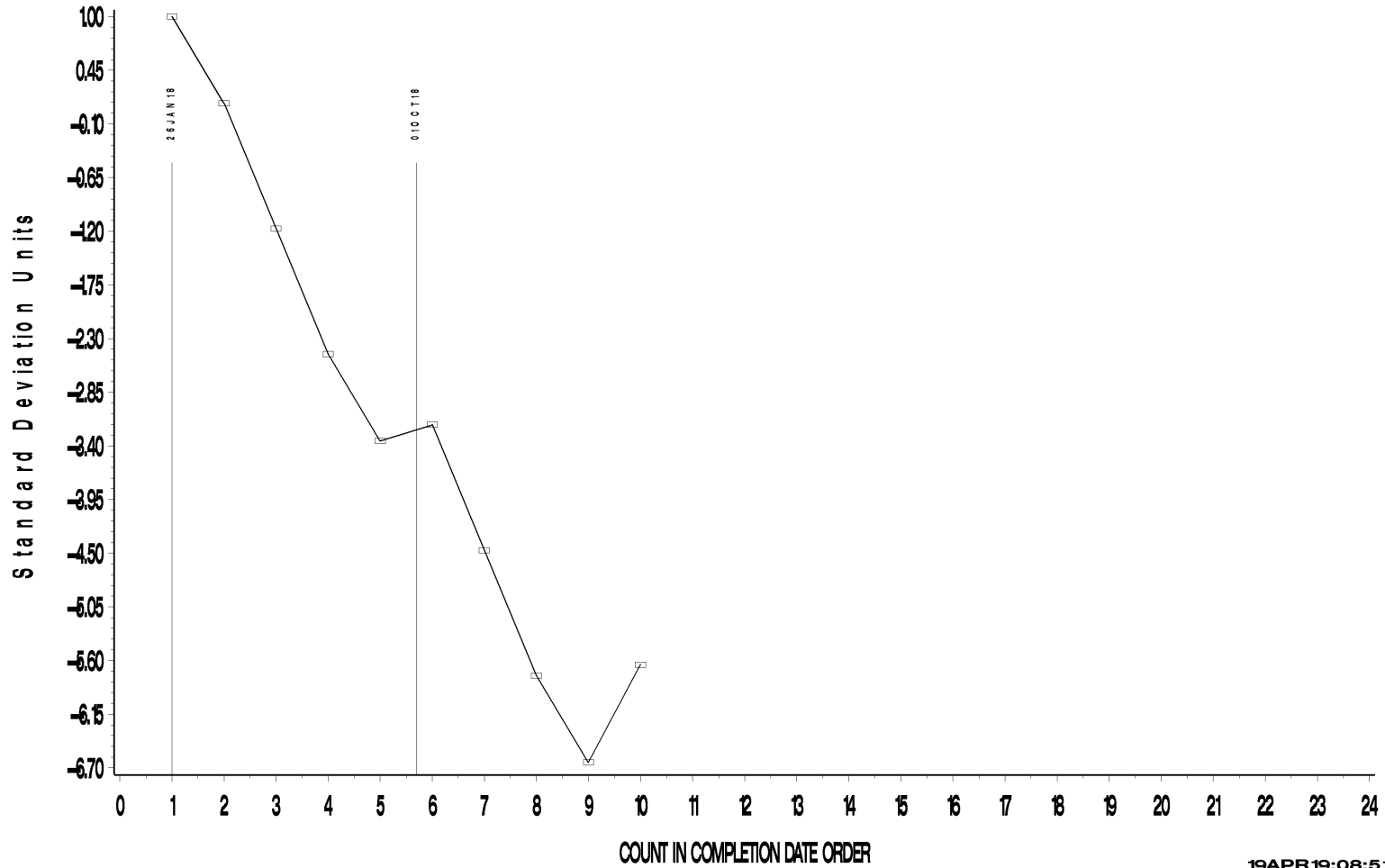
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L-371 NONLUBRICATED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR WEAR

CUSUM Severity Analysis

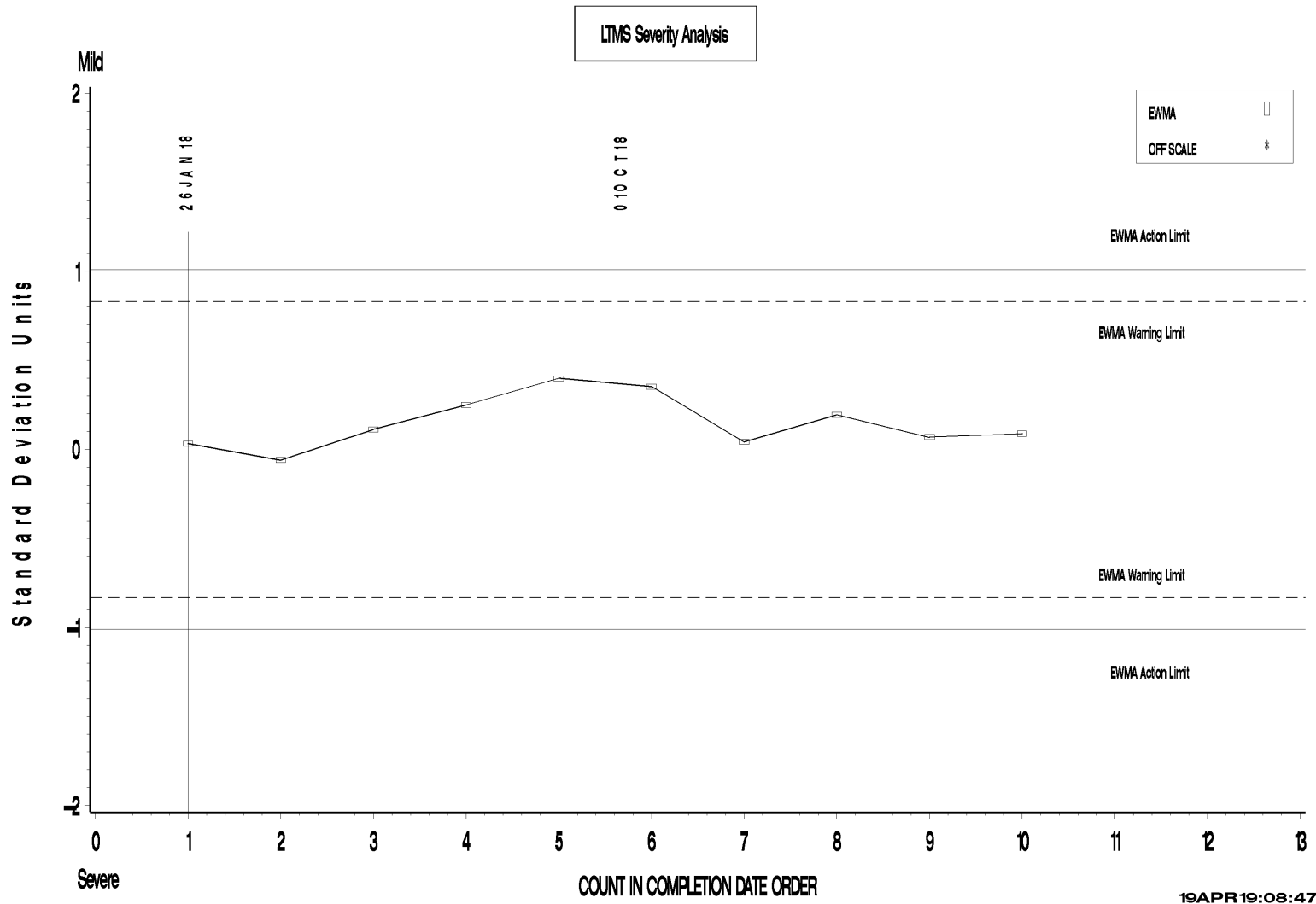


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L-371 NONLUBRICATED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR RIDGING

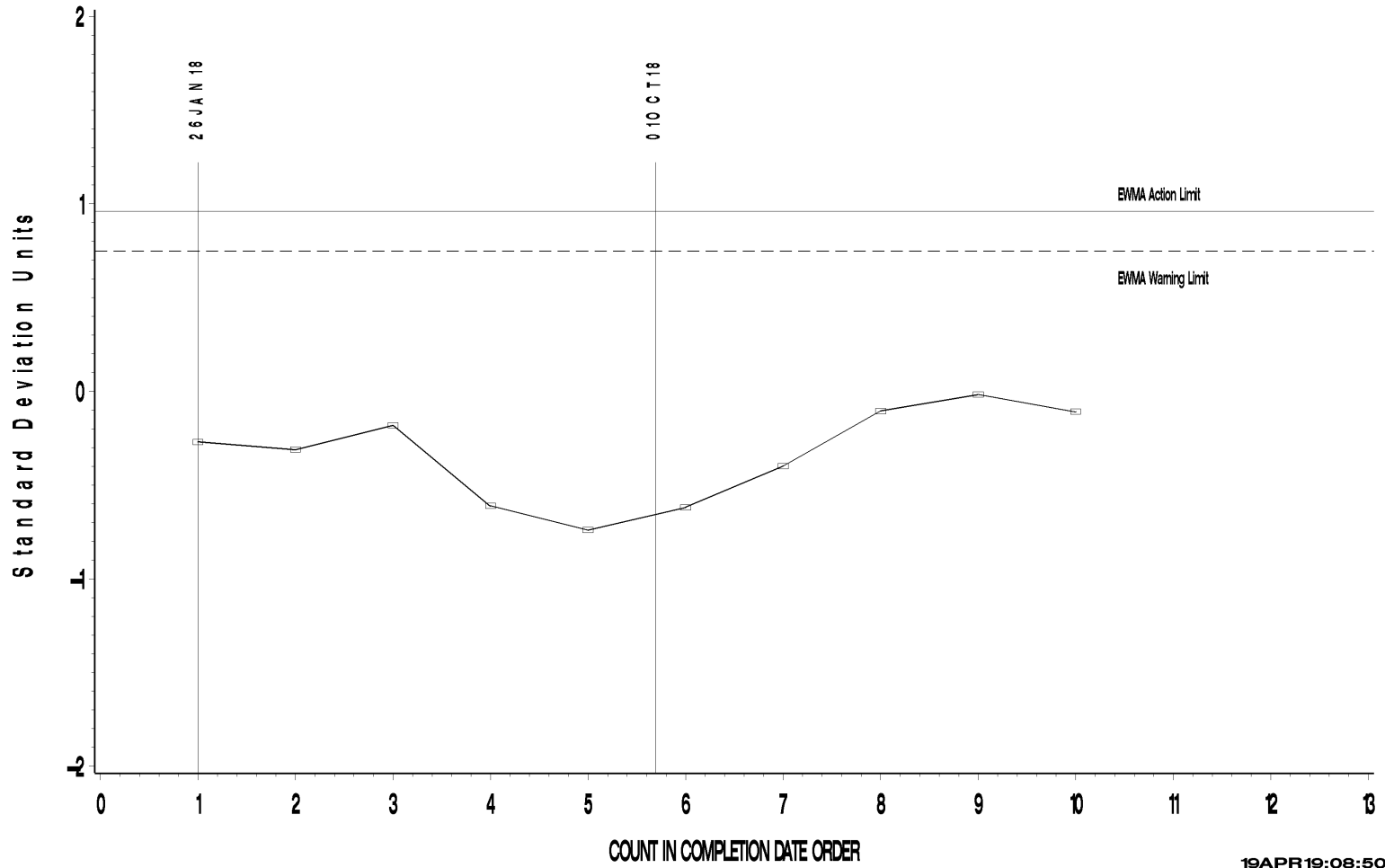


L-371 (D8165)

L-371 NONLUBRICATED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR RIDGING

LTMS Precision Analysis



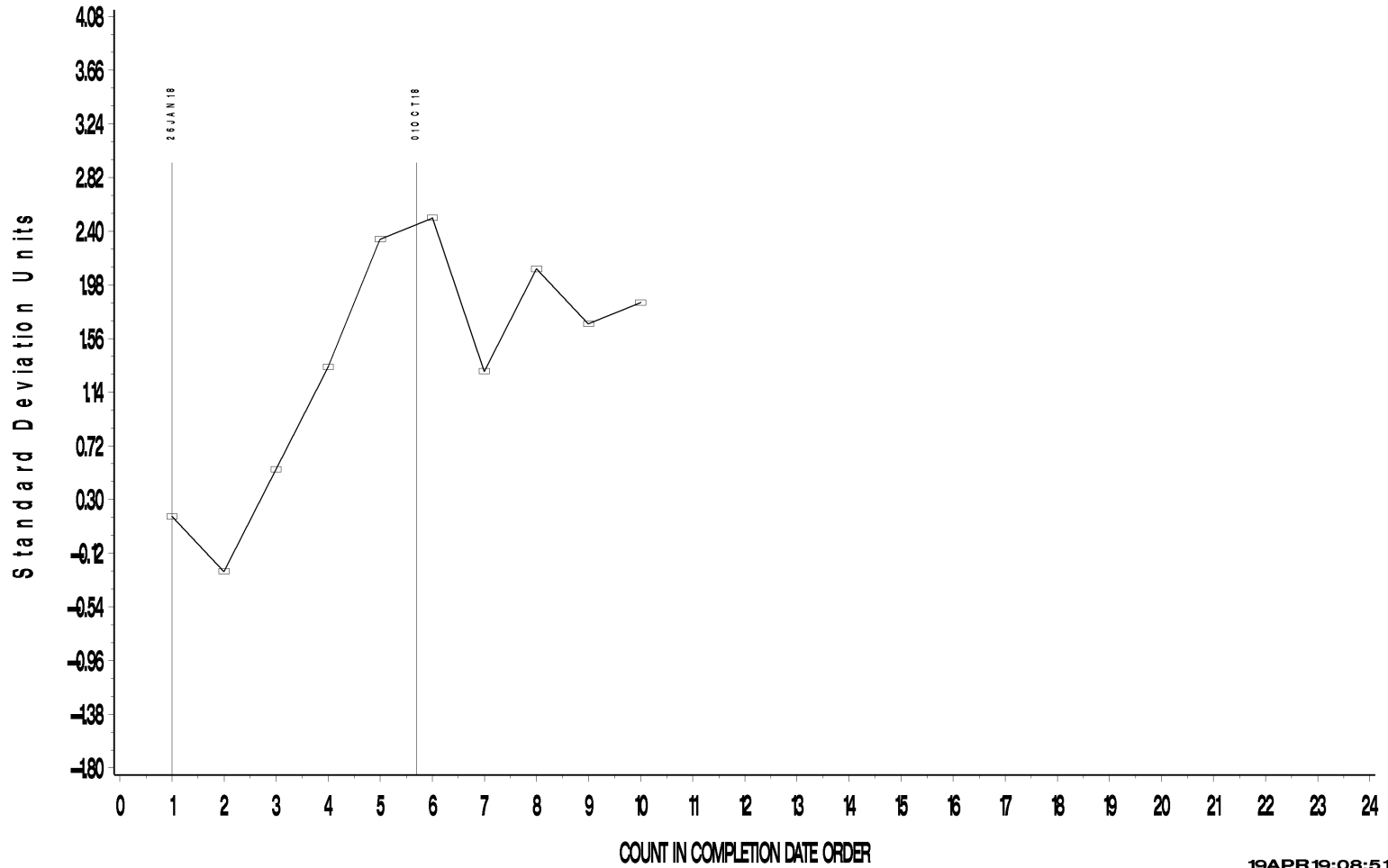
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L-37-1 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR RIDGING

CUSUM Severity Analysis

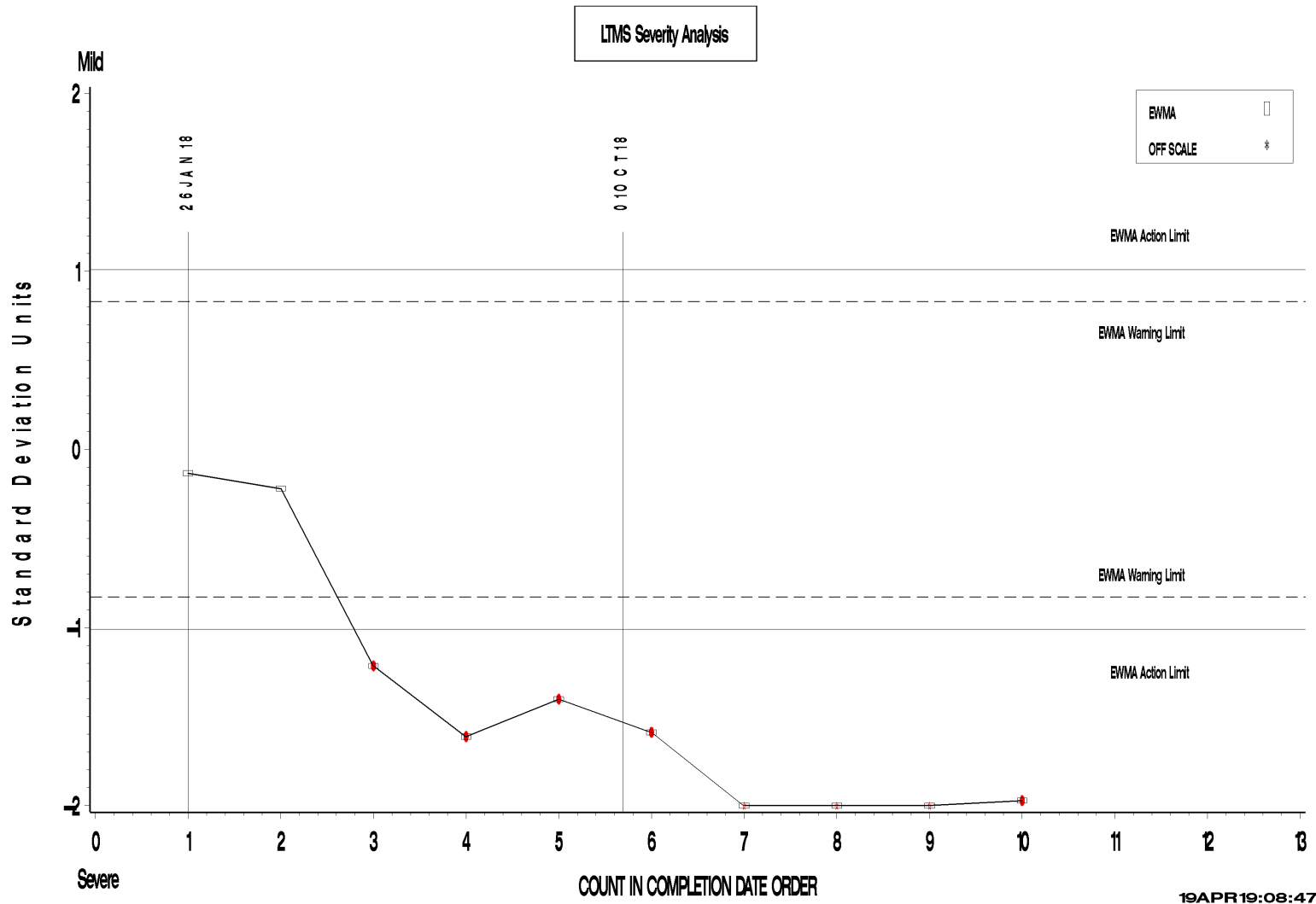


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L-371 NONLUBRICATED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR RIPPLING

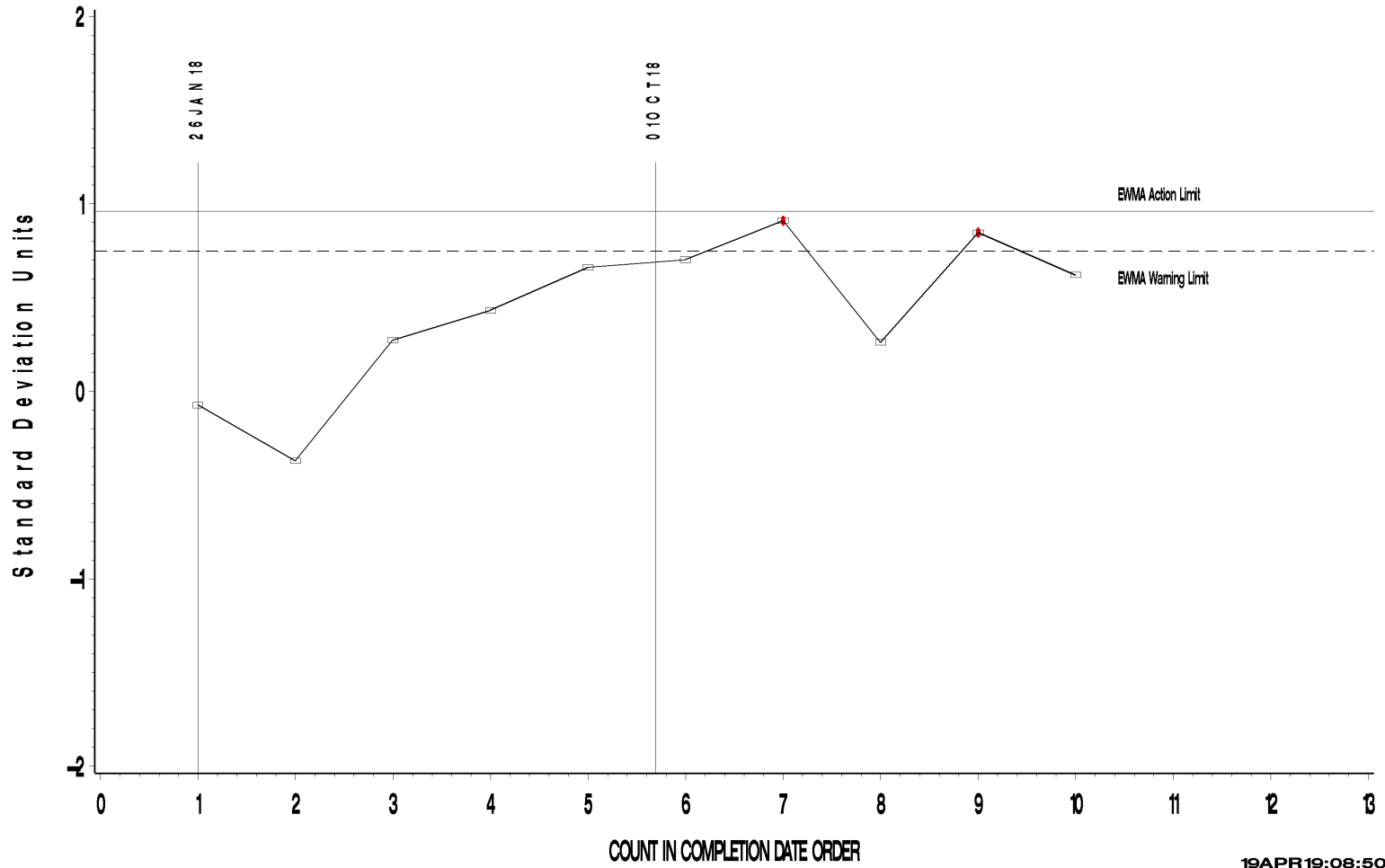


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L-371 NONLUBRICATED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR RIPPLING

LTMS Precision Analysis



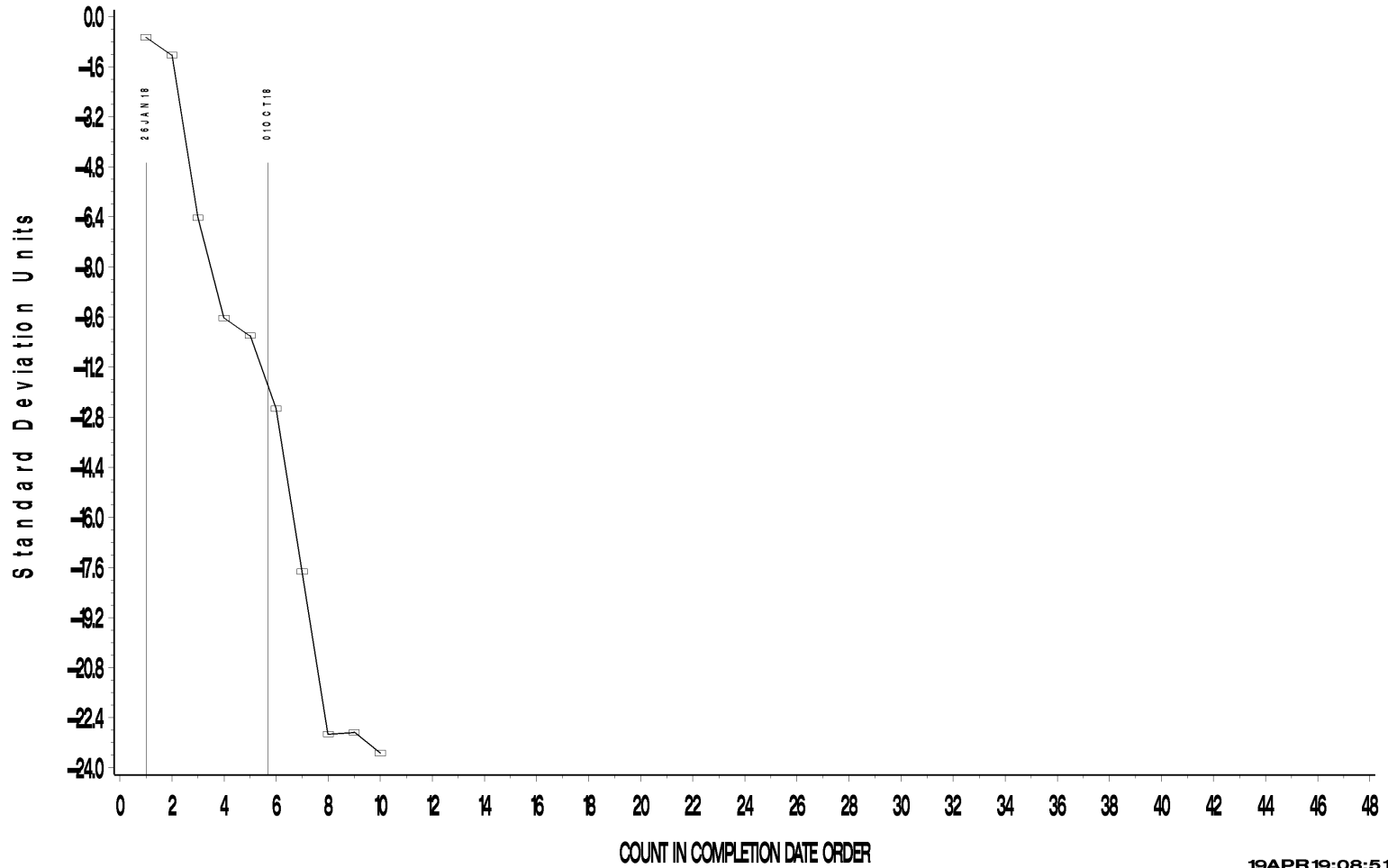
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L-371 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR RIPPLING

CUSUM Severity Analysis

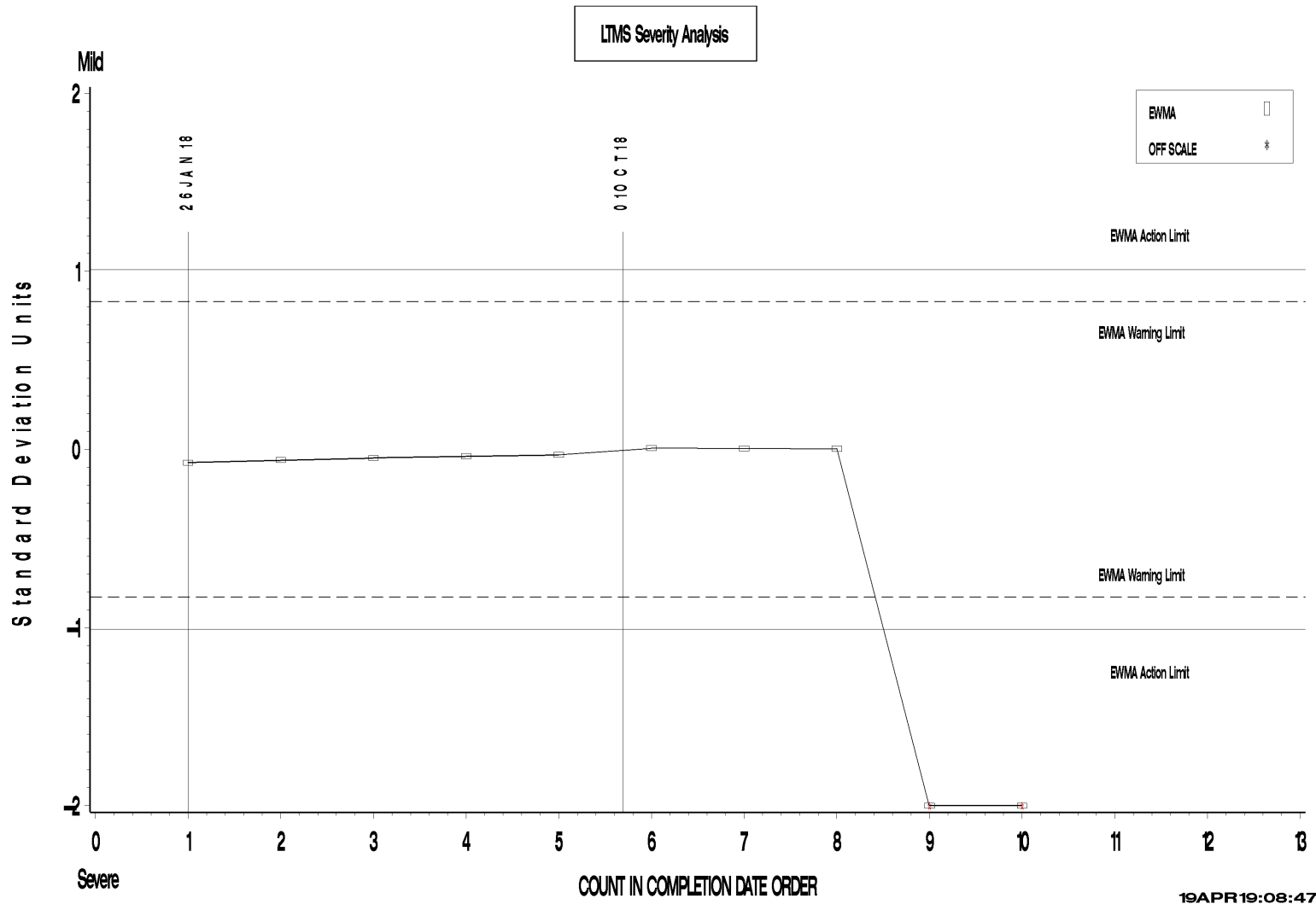


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L-371 NONLUBRICATED INDUSTRY OPERATIONALLY VALID DATA

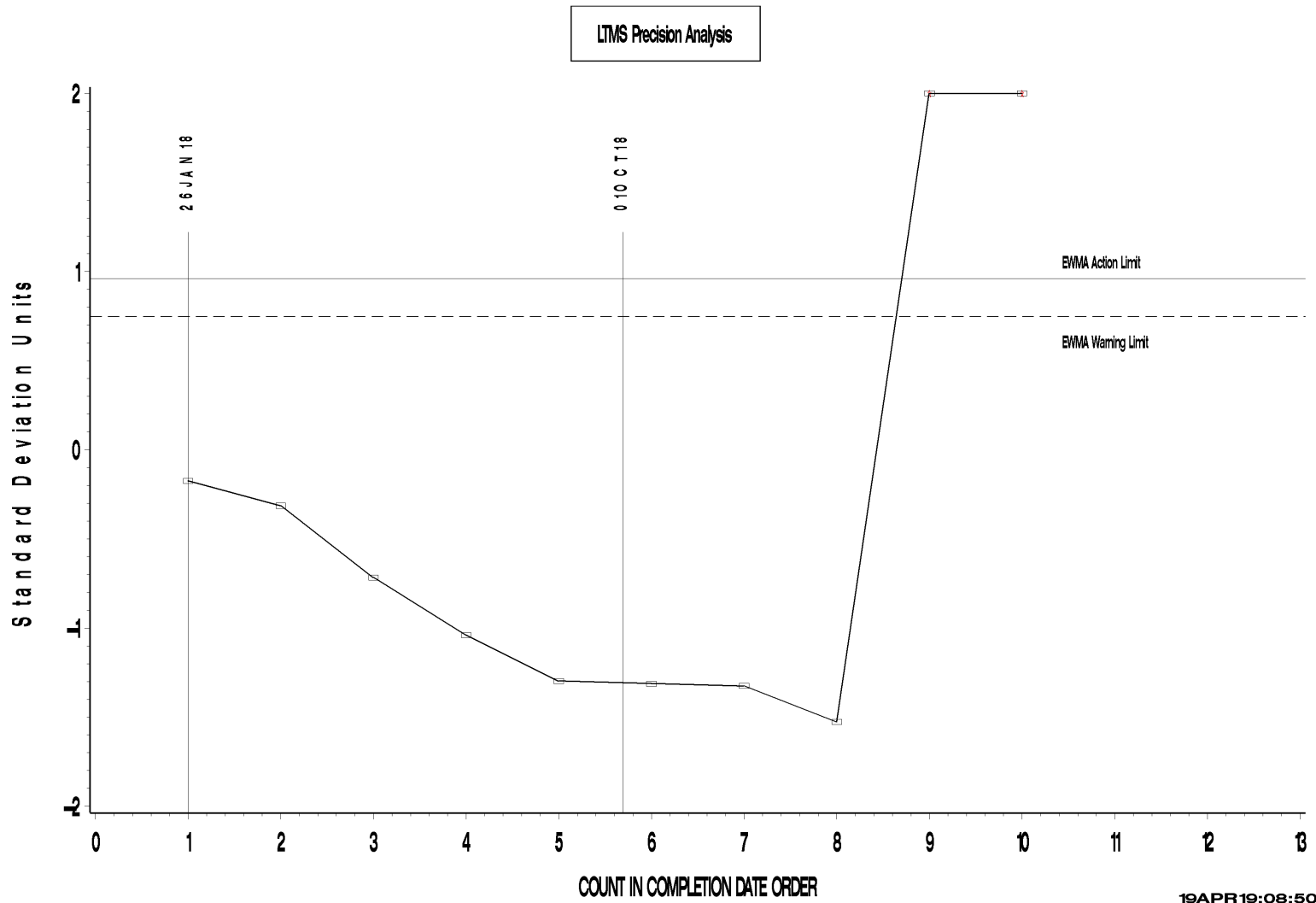
FINAL PINION GEAR PITTING/SPALLING



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L-371 NONLUBRICATED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR PITTING/SPALLING

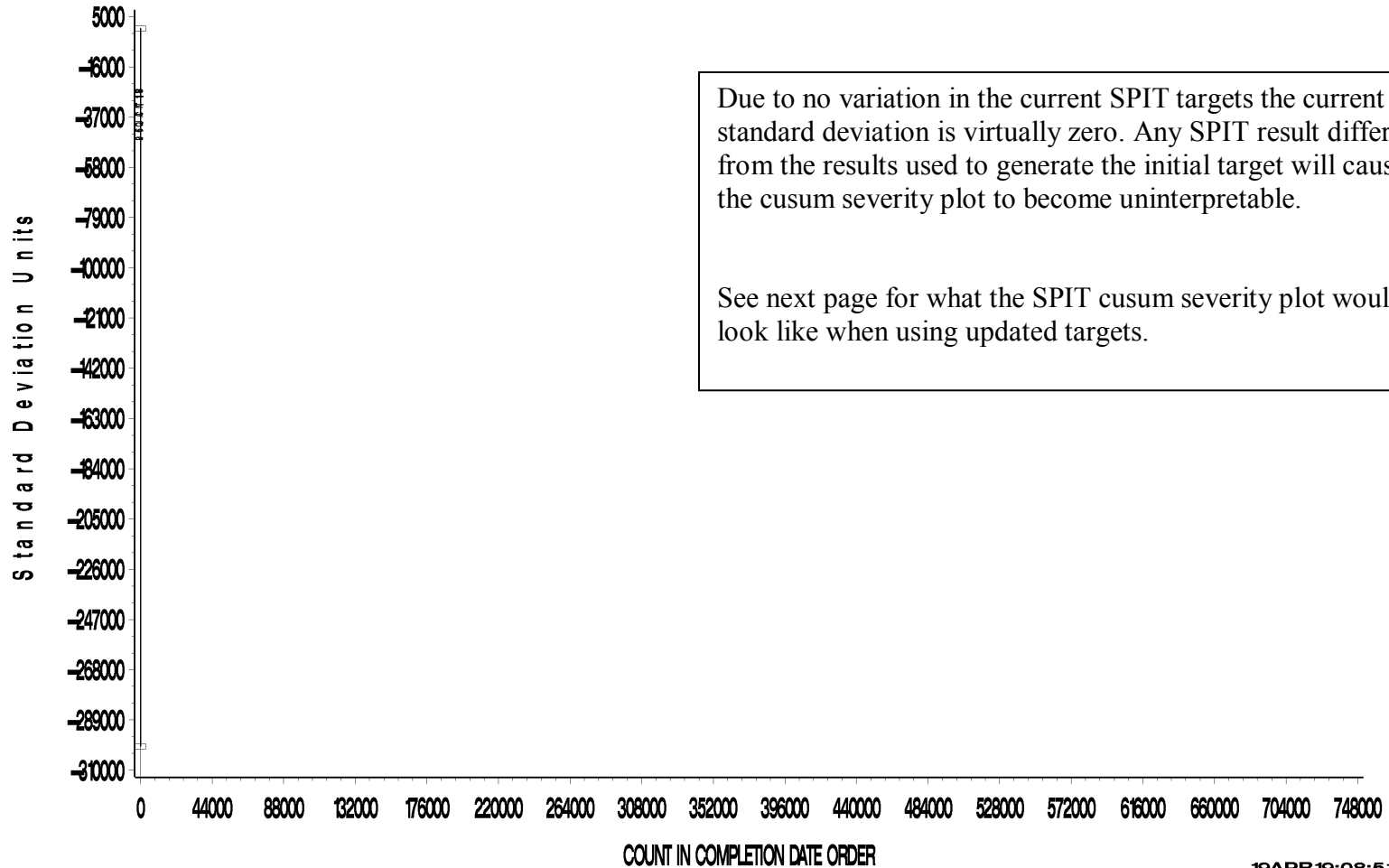


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L-371 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR PITTING/SPALLING

CUSUM Severity Analysis



Due to no variation in the current SPIT targets the current standard deviation is virtually zero. Any SPIT result different from the results used to generate the initial target will cause the cusum severity plot to become uninterpretable.

See next page for what the SPIT cusum severity plot would look like when using updated targets.

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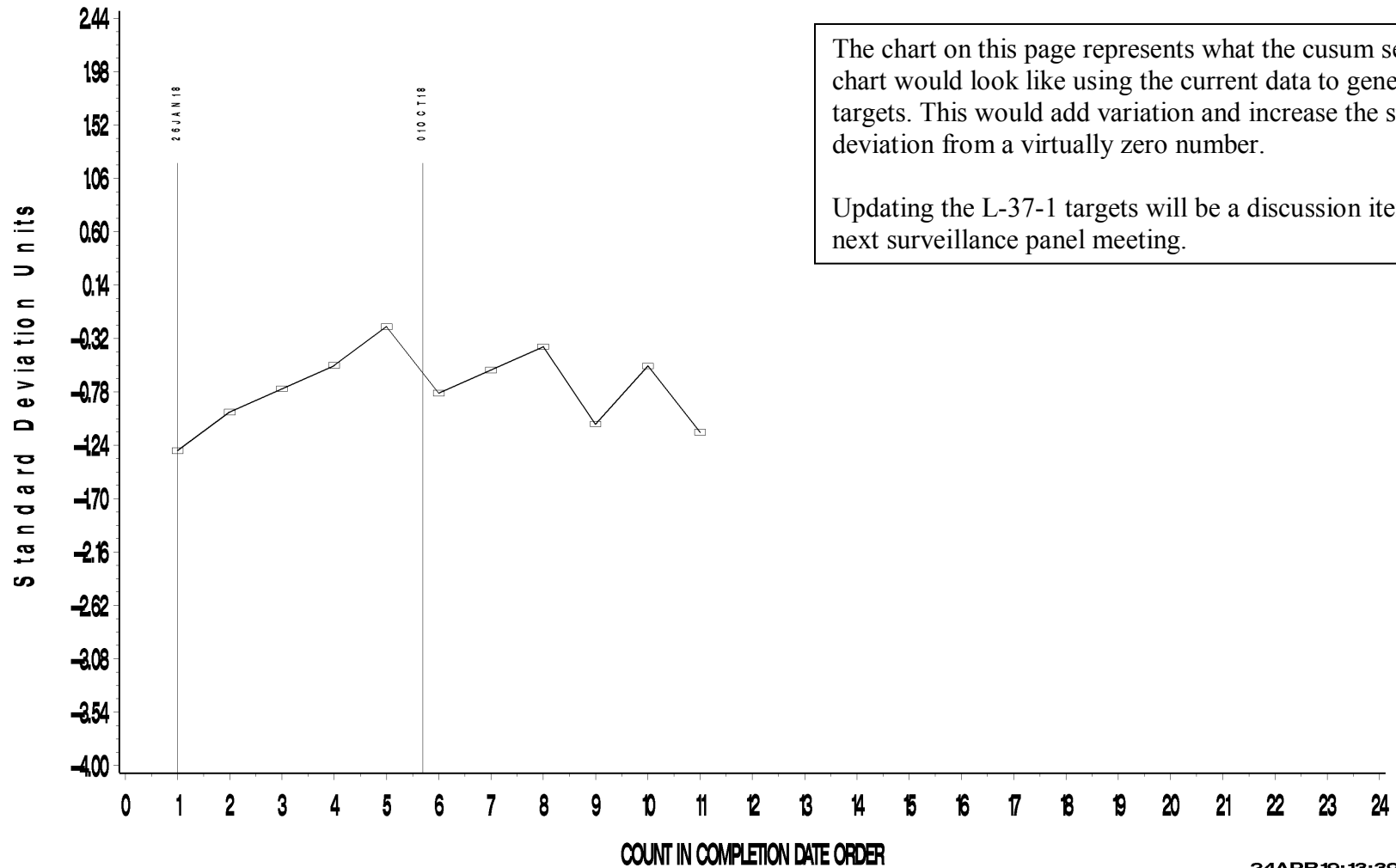
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L-37-1 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR PITTING/SPALLING

CUSUM Severity Analysis



The chart on this page represents what the cusum severity chart would look like using the current data to generate new targets. This would add variation and increase the standard deviation from a virtually zero number.

Updating the L-37-1 targets will be a discussion item at the next surveillance panel meeting.

24APR19: 13:39

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TIMELINE ADDITIONS

Effective Date	Information Letter	Event
November 29, 2018	18-1	<p>Several procedure updates. Note added to include both drive and coast side photos of the ring gear in the test report.</p> <p>Clarification added to note that any non-reference oil test that exhibits broken or cracked teeth is non-interpretable.</p>
February 21, 2019	19-1	<p>Typographical error corrected in the test procedure. Correction made to the axle lubricant temperature requirements of the gear test phase.</p>

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LAB VISITS

One L-371 lab visit was conducted this period. All observed aspects of the test stand were found to be in compliance with the test procedure.

INFORMATION LETTERS

Information letters 18-1, and 19-1 were issue this period.

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LTMS DEVIATIONS

No LTMS deviations were written this report period.

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STATUS OF REFERENCE OIL SUPPLY

Oil	Cans @ Labs	@ TMC	
		Cans	Gallons
117	11	360	360.0
118	3	156	156.0
134	1	0	0.0
134-1	17	172	172.0
152-2	21	111	111.9
155	5	27	27.5
155-1	18	97	97.6
Total	76	923	925.0

The TMC quantity remaining presumes usage only for L-37 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.