A Program of ASTM International

Test Monitoring Center

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

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

MEMORANDUM: 20-013

DATE: April 16, 2020

TO: Robert Slocum, Chairman, L-37 Surveillance Panel

FROM: Dylan Beck

SUBJECT: L-37 Testing from October 1, 2019 through March 31, 2020

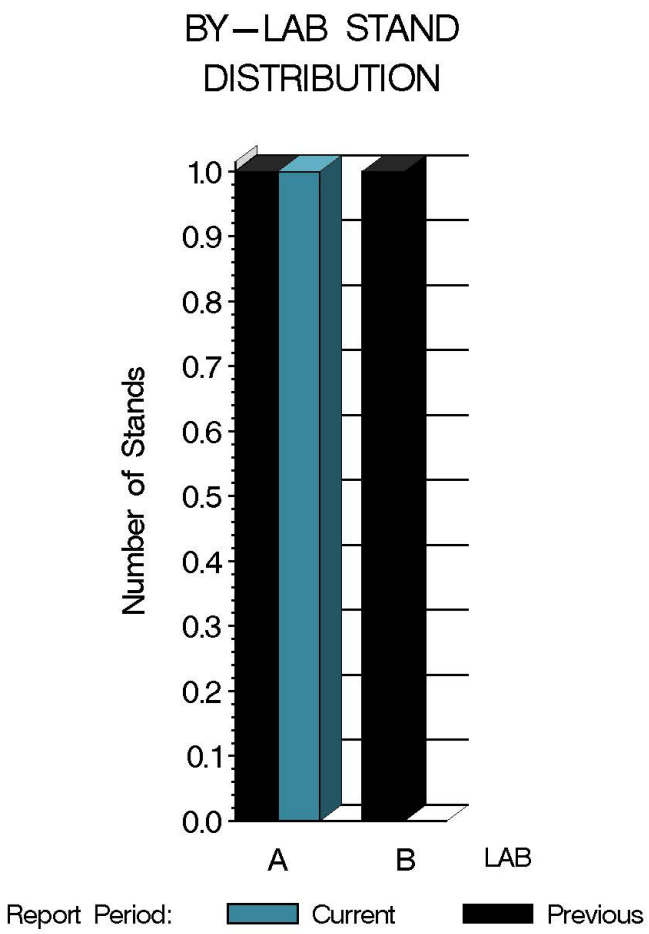
Attached is a summary of reference oil testing activity this period.

DJB/djb/mem20-013.djb.doc
cc: Frank Farber
Jeff Clark
L-37 Surveillance Panel
http://www.astmtmc.cmu.edu/ftp/docs/gear/l37/semiannualreports/l37-04-2020.pdf

Distribution: email

L-37 (D6121)

	Reporting Data	Calibrated on 3-31-20
Number of Labs	1	1
Number of Stands	1	1



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L-37 (D6121)

Test Distribution by Oil and Validity

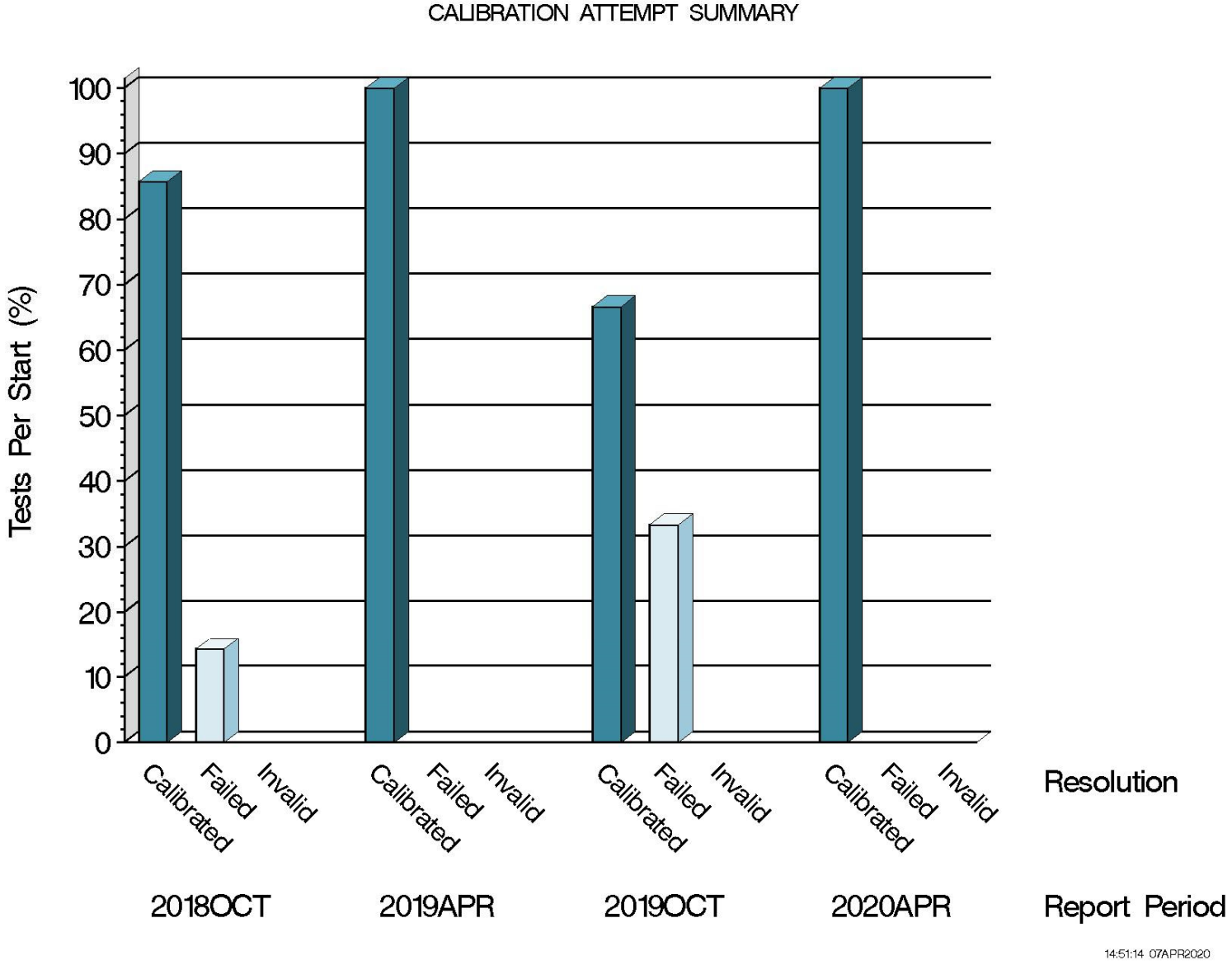
		134-1	152-2	155	155-1	Totals	
						Last Period	This Period
Accepted for calibration	AC	1	0	0	0	2	1
Rejected (Mild)	OC	0	0	0	0	0	0
Rejected (Severe)	OC	0	0	0	0	1	0
Rejected (Precision)	OC	0	0	0	0	0	0
Operationally invalid	LC	0	0	0	0	0	0
Aborted run	XC	0	0	0	0	0	0
Acceptable info run	NI	0	0	0	0	0	0
Aborted info run	XI	0	0	0	0	0	0
Total		1	0	0	0	3	1

L-37 (D6121)

Calibration Attempt Detail

	Gear Batch	Acceptable	Failed	Total
LUBRITED	V1L500/P4T813	0	0	0
	V1L528/P4T883A	1	0	1
	Total	1	0	1
NONLUBRITED	V1L500/P4T813	0	0	0
	V1L528/P4T883A	0	0	0
	Total	0	0	0

L-37 (D6121)


CALIBRATION ATTEMPT SUMMARY
Tests Per Start (%)
100
90
80
70
60
50
40
30
20
10
0
Calibrated
Failed
Invalid
Resolution
2018OCT
2019APR
2019OCT
2020APR
Report Period
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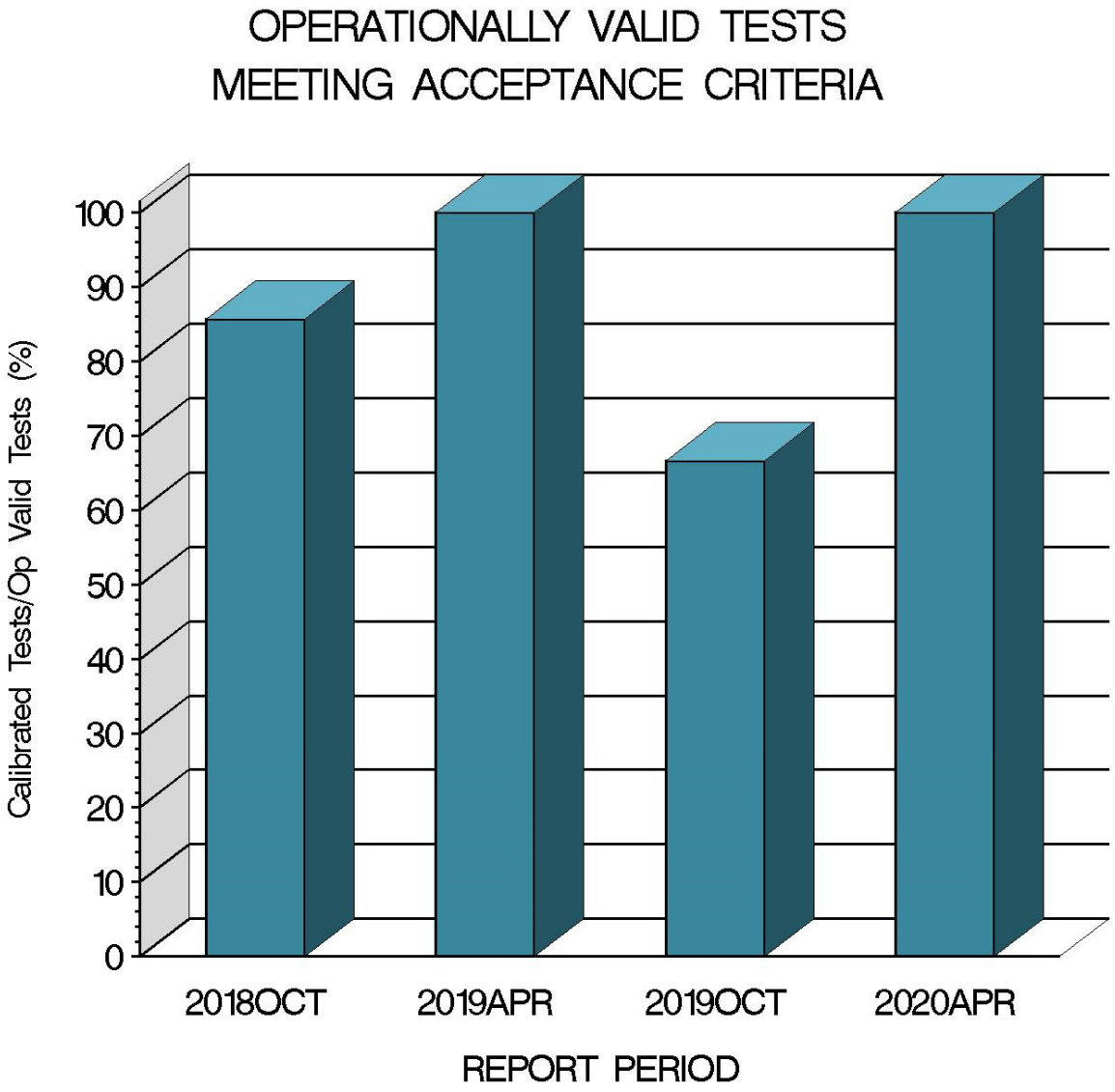
L-37 (D6121)


OPERATIONALLY VALID TESTS
MEETING ACCEPTANCE CRITERIA
Calibrated Tests/Op Valid Tests (%)
100
90
80
70
60
50
40
30
20
10
0
2018OCT
2019APR
2019OCT
2020APR
REPORT PERIOD
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L-37 (D6121)

CAUSES FOR LOST TESTS

			Oil					Validity			Loss Rate		
Lab	Cause		134	134-1	152-2	155	155-1	XC	LC	XI	Lost	Starts	%
	No tests lost this period										0	1	0
		Lost	0	0	0	0	0	0	0	0			
		Starts	0	1	0	0	0	1	1	1			
		%	0%	0%	0%	0%	0%	0%	0%	0%			

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GEAR BATCH SEVERITY

LUBRITED HARDWARE						
Parameter	Gear Batch	N	Δ/s	s[A]	Overall Δ/s	Overall Shift (in Merits)[B]
RIDG	V1L528/P4T883A	1	-1.514	.	-1.514	-2.165
RIPP	V1L528/P4T883A	1	0.445	.	0.445	0.212
SPIT	V1L528/P4T883A	1	-0.280	.	-0.280	-0.162
WEAR	V1L528/P4T883A	1	-0.718	.	-0.718	-0.373

[A] Because only one test was completed this period, the standard deviation is not reported.

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

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LAB SEVERITY

LUBRITED HARDWARE AVERAGE Δ/s						
Gear Batch	Lab	N	RIDG	RIPP	SPIT	WEAR
V1L528/P4T883A	A	1	-1.514	0.445	-0.280	-0.718

NON-LUBRITED HARDWARE AVERAGE Δ/s						
Gear Batch	Lab	N	RIDG	RIPP	SPIT	WEAR
V1L528/P4T883A	All	0	.	.	.	.

L-37 (D6121)

SUMMARY OF SEVERITY & PRECISION

Severity
Nonlubrited – RIDG ended the period exceeding the warning limit in the severe direction. All other parameters were within limits. Lubrited –SPIT remained outside of the action limit in the severe direction this period. WEAR and RIDG are currently exceeding the warning limit in the severe direction. RIPP stayed within the limits this period.

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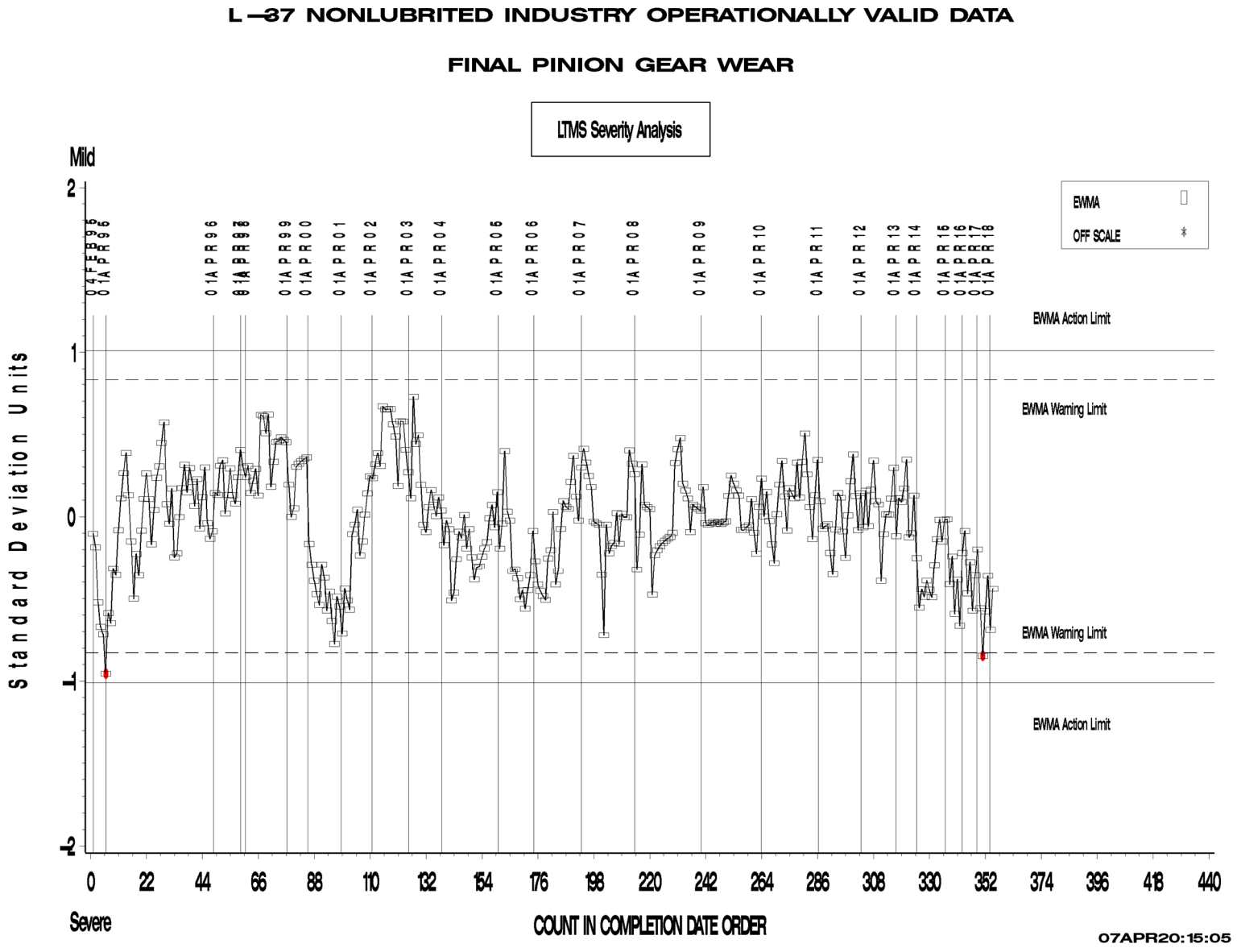
SUMMARY OF SEVERITY & PRECISION (cont.)

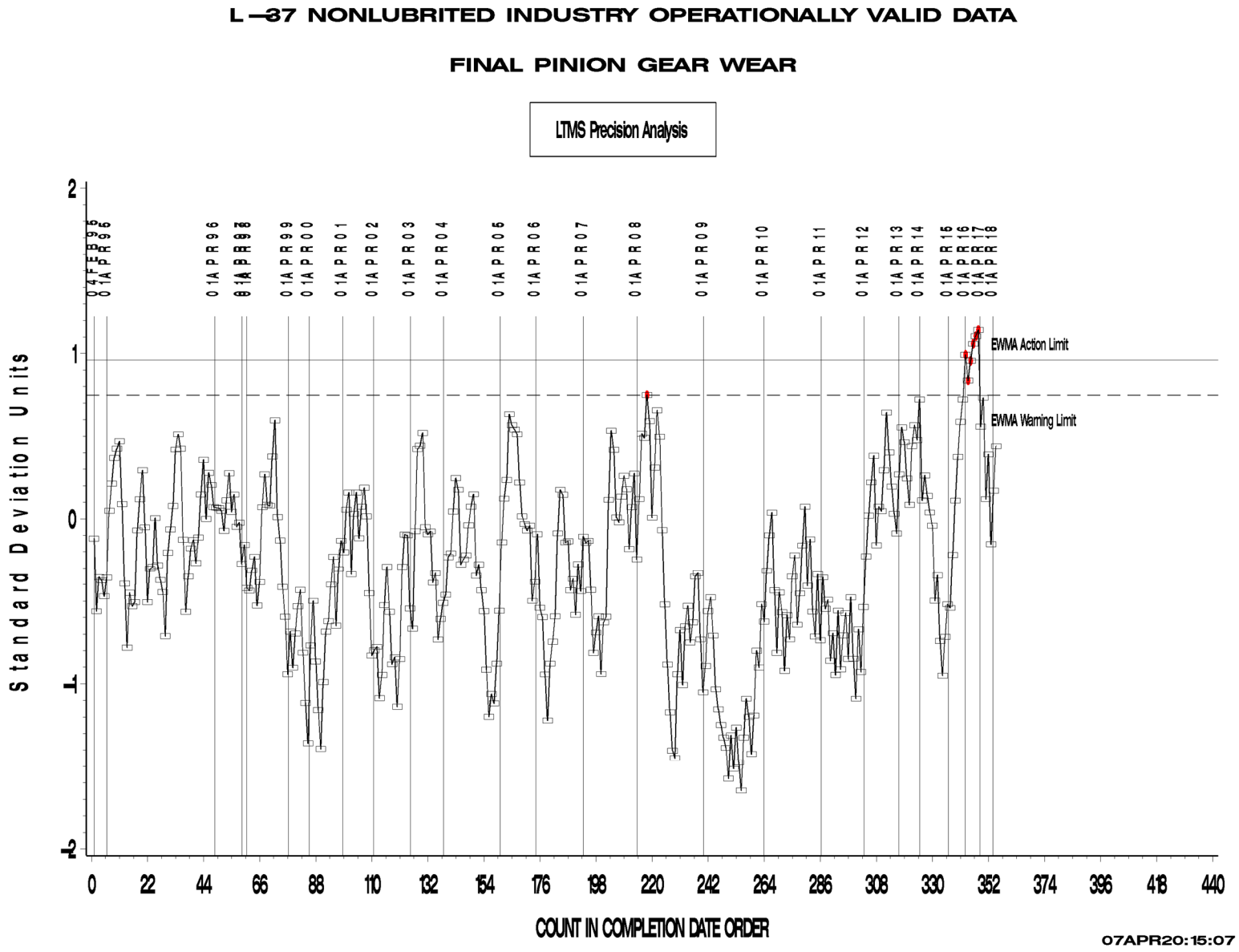
Precision
Nonlubrited – All parameters within limits during this period. Lubrited –SPIT remains outside the action limit this period. All other parameters were within limits.

Industry control charts follow.

L-37 (D6121)


L –37 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR WEAR
LTMS Severity Analysis
Mild
Severe
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
EWMA
OFF SCALE
EWMA Action Limit
EWMA Warning Limit
EWMA Warning Limit
EWMA Action Limit
07APR20:15:05

L-37 (D6121)


L–37 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR WEAR
LTMS Precision Analysis
Standard Deviation Units
EWMA Action Limit
EWMA Warning Limit
COUNT IN COMPLETION DATE ORDER
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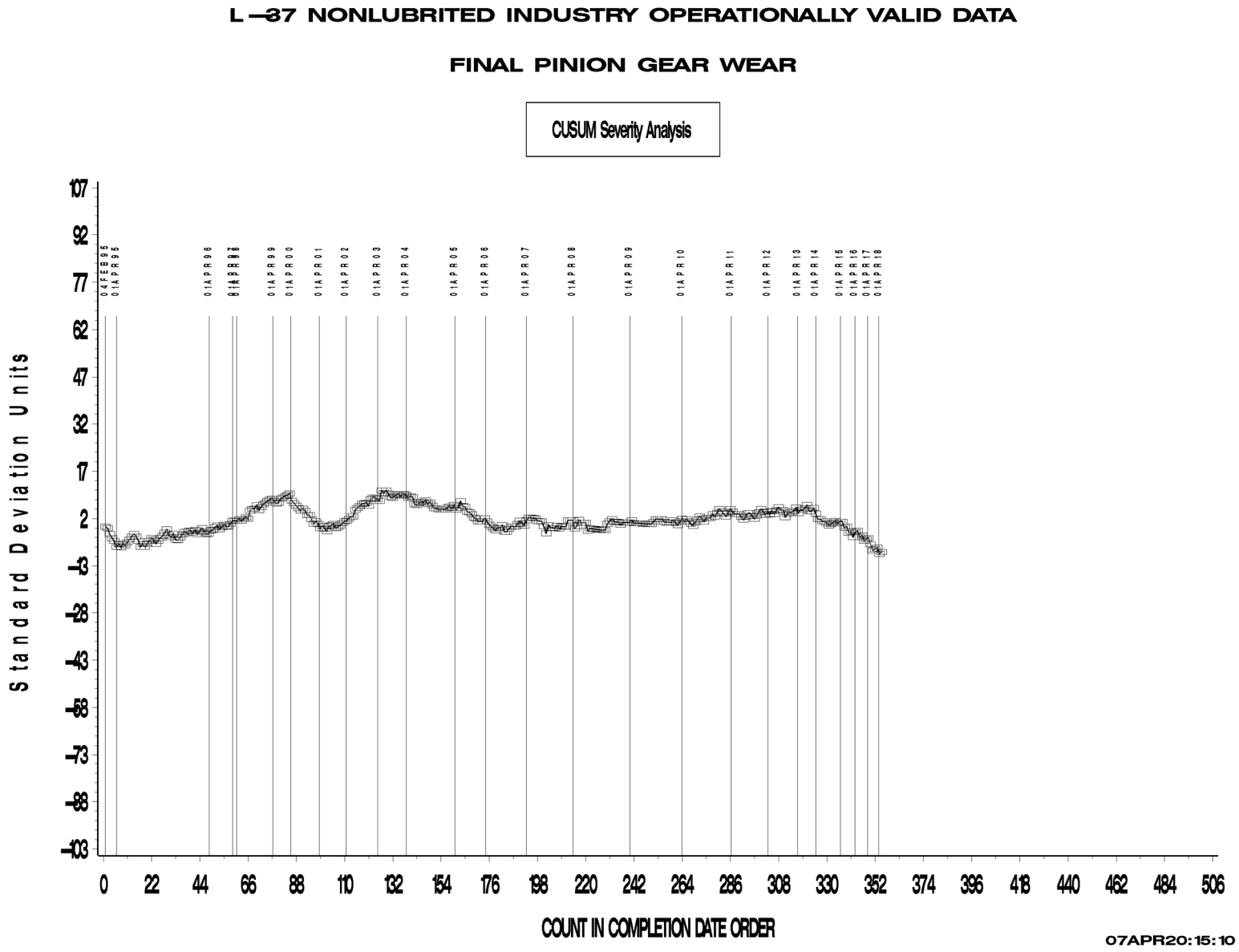
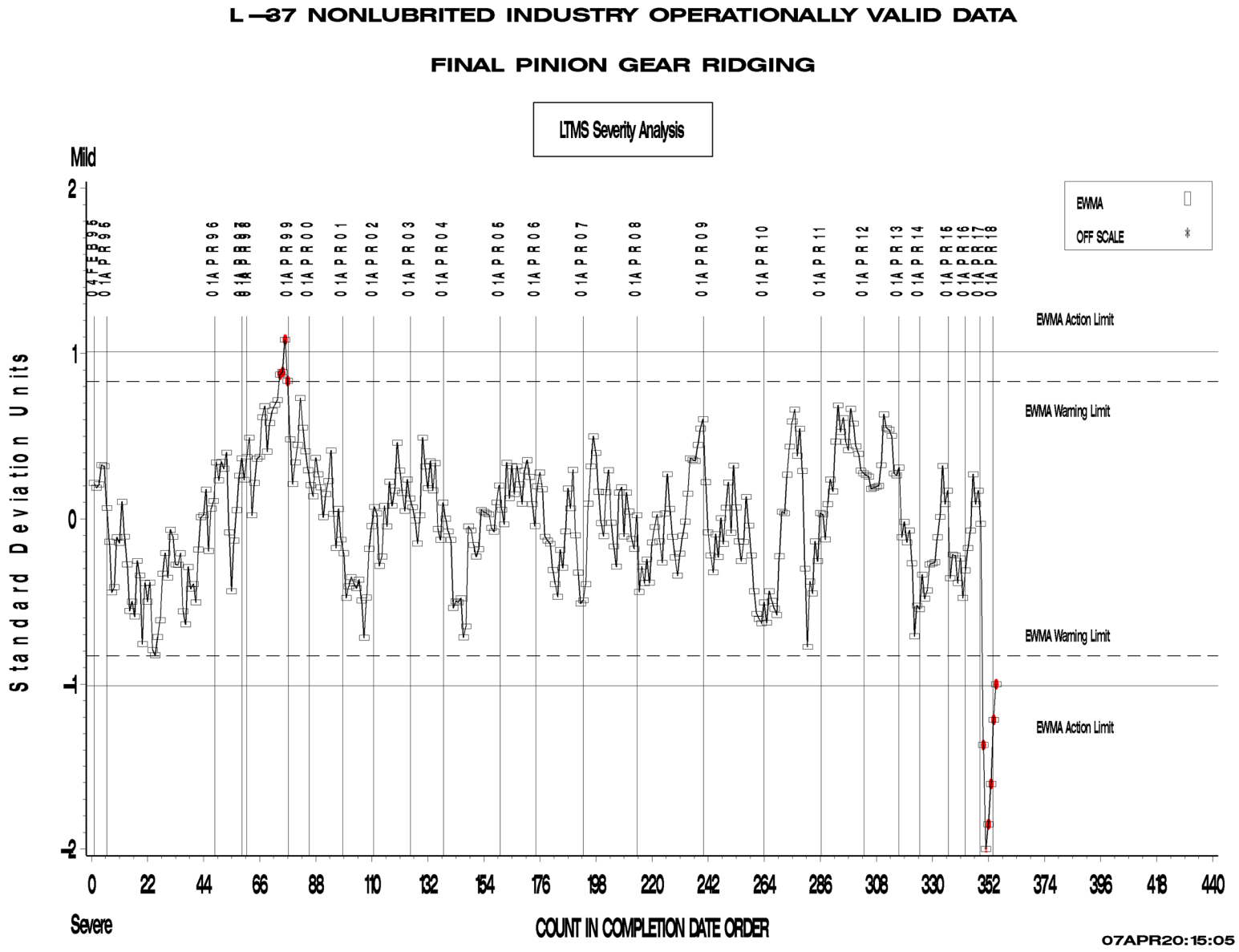
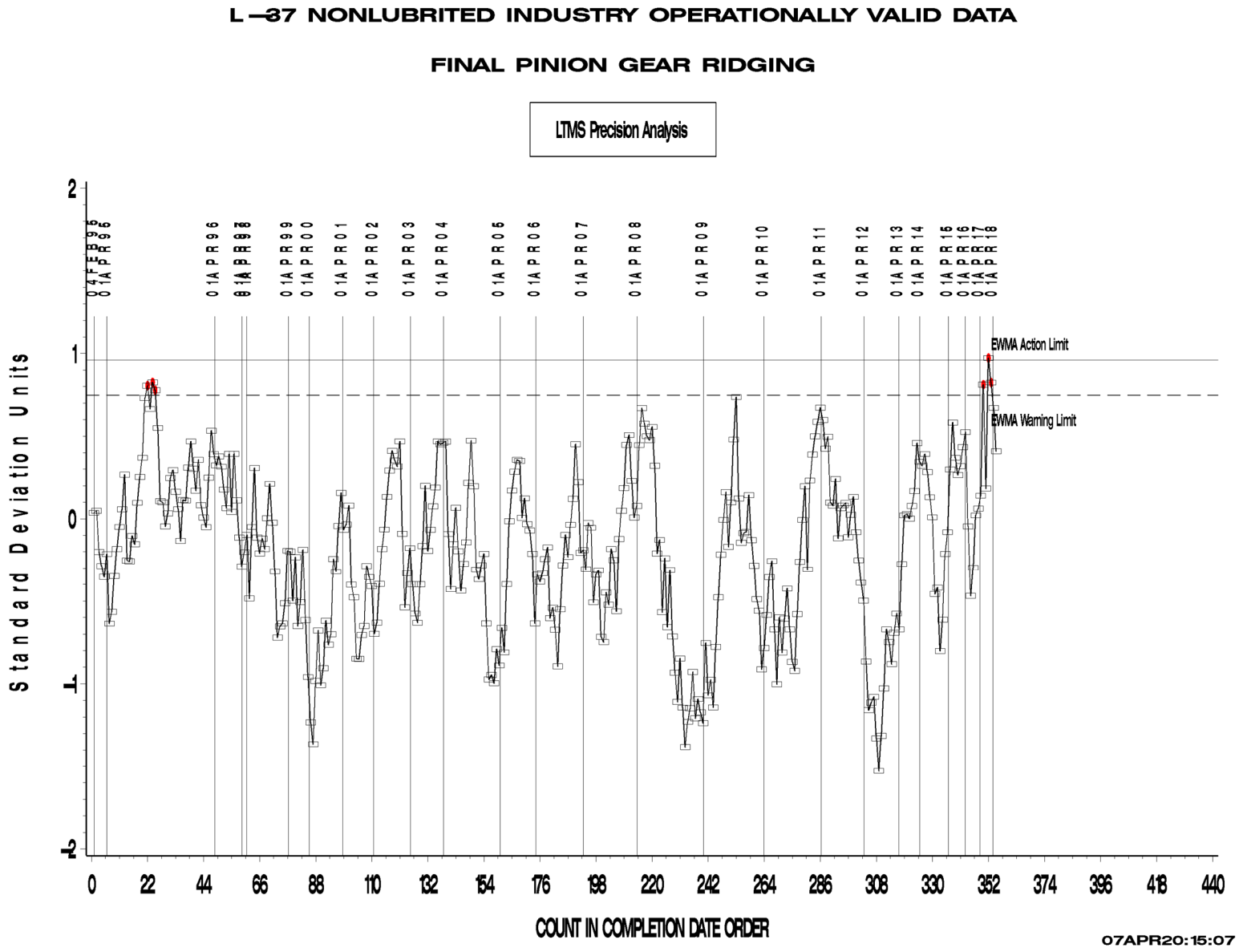
L-37 (D6121)


L-37 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR WEAR
CUSUM Severity Analysis
Standard Deviation Units
107
92
77
62
47
32
17
2
-13
-28
-43
-58
-73
-88
-103
04FEB95
01APR95
01APR96
01APR97
01APR98
01APR99
01APR00
01APR01
01APR02
01APR03
01APR04
01APR05
01APR06
01APR07
01APR08
01APR09
01APR10
01APR11
01APR12
01APR13
01APR14
01APR15
01APR16
01APR17
01APR18
0
22
44
66
88
110
132
154
176
198
220
242
264
286
308
330
352
374
396
418
440
462
484
506
COUNT IN COMPLETION DATE ORDER
07APR20:15:10

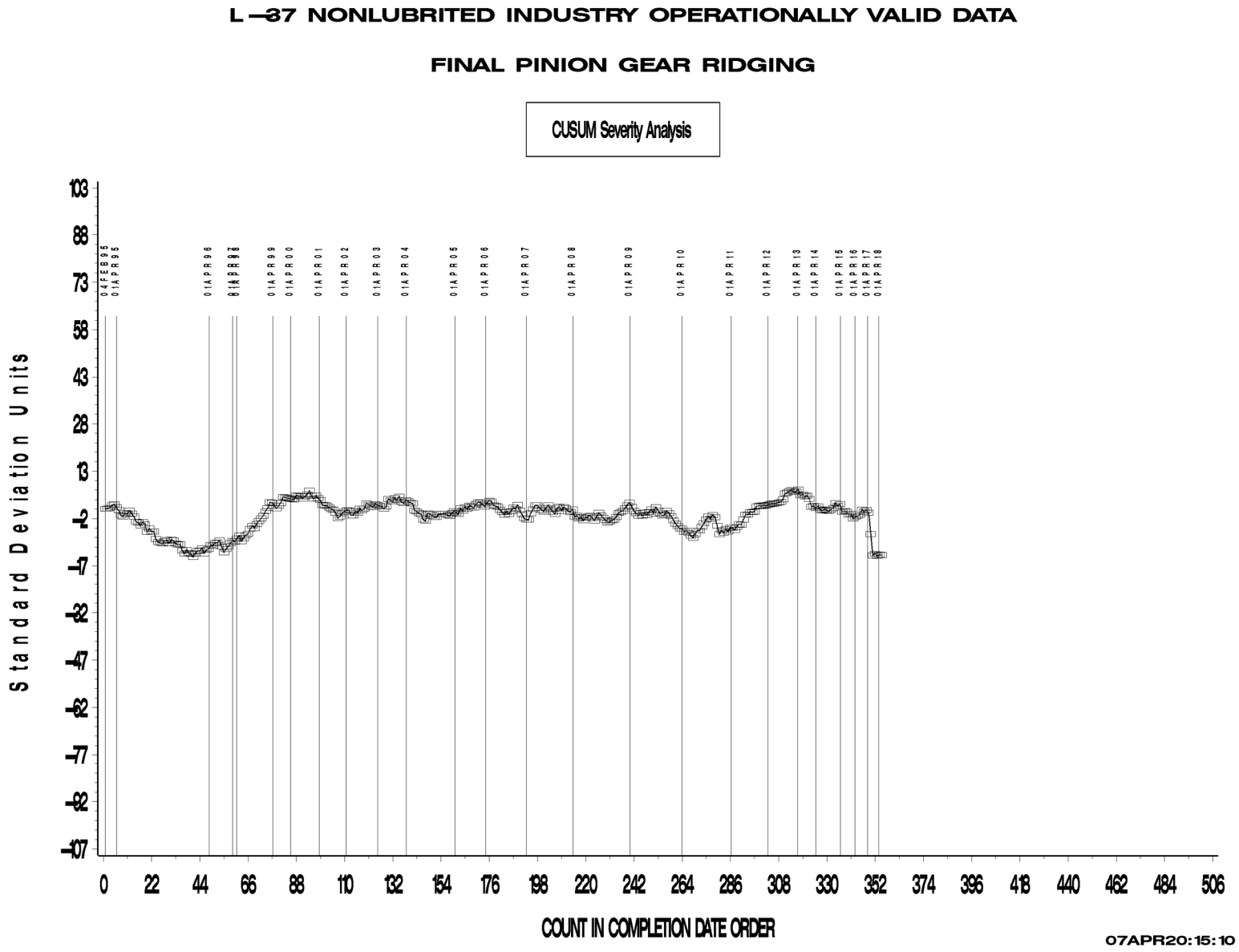
L-37 (D6121)


L–37 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR RIDGING
LTMS Severity Analysis
Mild
Severe
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
EWMA
OFF SCALE
EWMA Action Limit
EWMA Warning Limit
EWMA Warning Limit
EWMA Action Limit
07APR20:15:05

L-37 (D6121)


L–37 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR RIDGING
LTMS Precision Analysis
Standard Deviation Units
2
1
0
-1
-2
0 1A P R 9 6
0 1A P R 9 9
0 1A P R 0 0
0 1A P R 0 1
0 1A P R 0 2
0 1A P R 0 3
0 1A P R 0 4
0 1A P R 0 5
0 1A P R 0 6
0 1A P R 0 7
0 1A P R 0 8
0 1A P R 0 9
0 1A P R 10
0 1A P R 11
0 1A P R 12
0 1A P R 13
0 1A P R 14
0 1A P R 15
EWMA Action Limit
EWMA Warning Limit
0
22
44
66
88
110
132
154
176
198
220
242
264
286
308
330
352
374
396
418
440
COUNT IN COMPLETION DATE ORDER
07APR20:15:07

L-37 (D6121)


L–37 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR RIDGING
CUSUM Severity Analysis
Standard Deviation Units
103
88
73
58
43
28
13
-2
-17
-32
-47
-62
-77
-92
-107
04FEB95
01APR95
01APR96
01APR97
01APR98
01APR99
01APR00
01APR01
01APR02
01APR03
01APR04
01APR05
01APR06
01APR07
01APR08
01APR09
01APR10
01APR11
01APR12
01APR13
01APR14
01APR15
01APR16
01APR17
01APR18
0
22
44
66
88
110
132
154
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198
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242
264
286
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374
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418
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462
484
506
COUNT IN COMPLETION DATE ORDER
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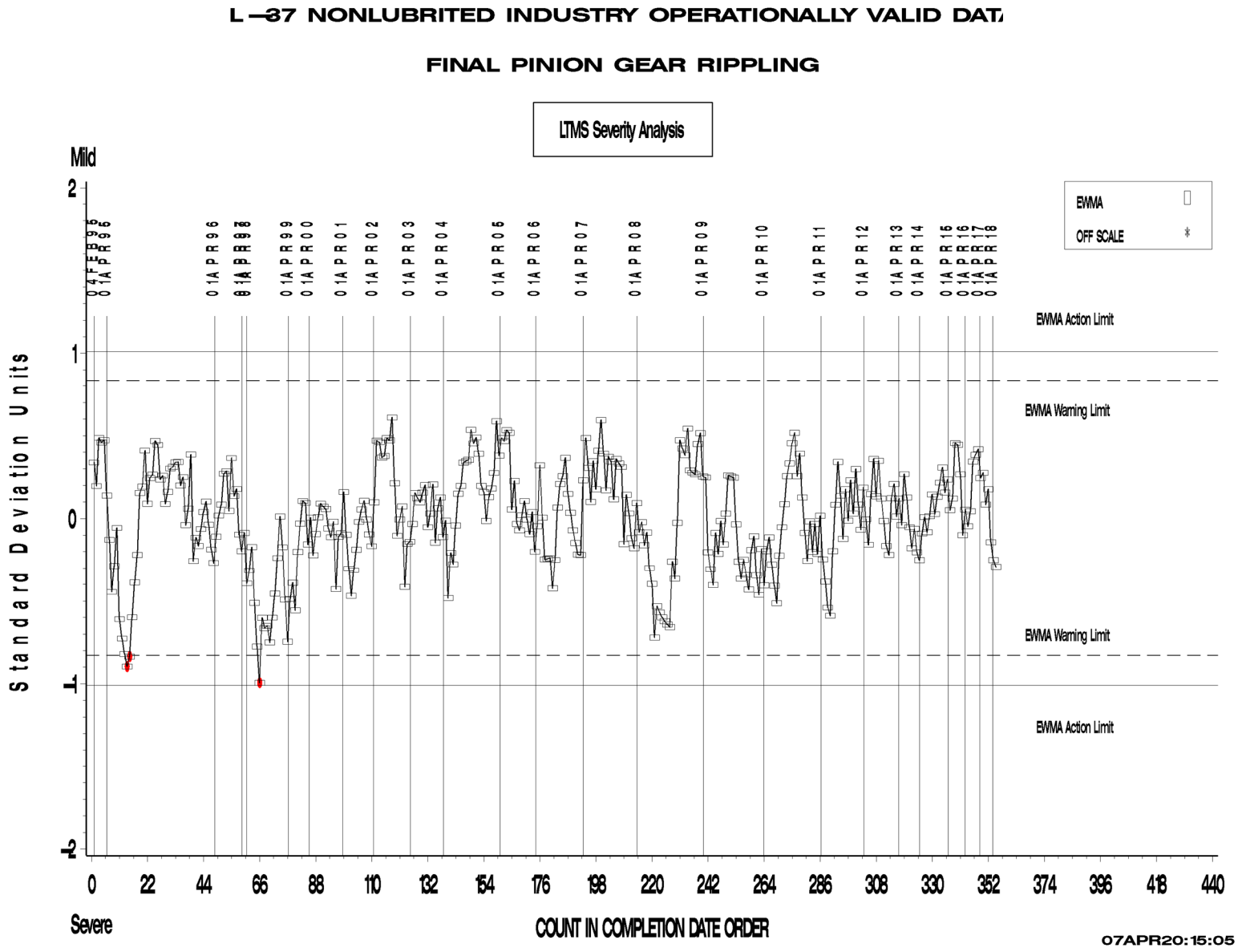
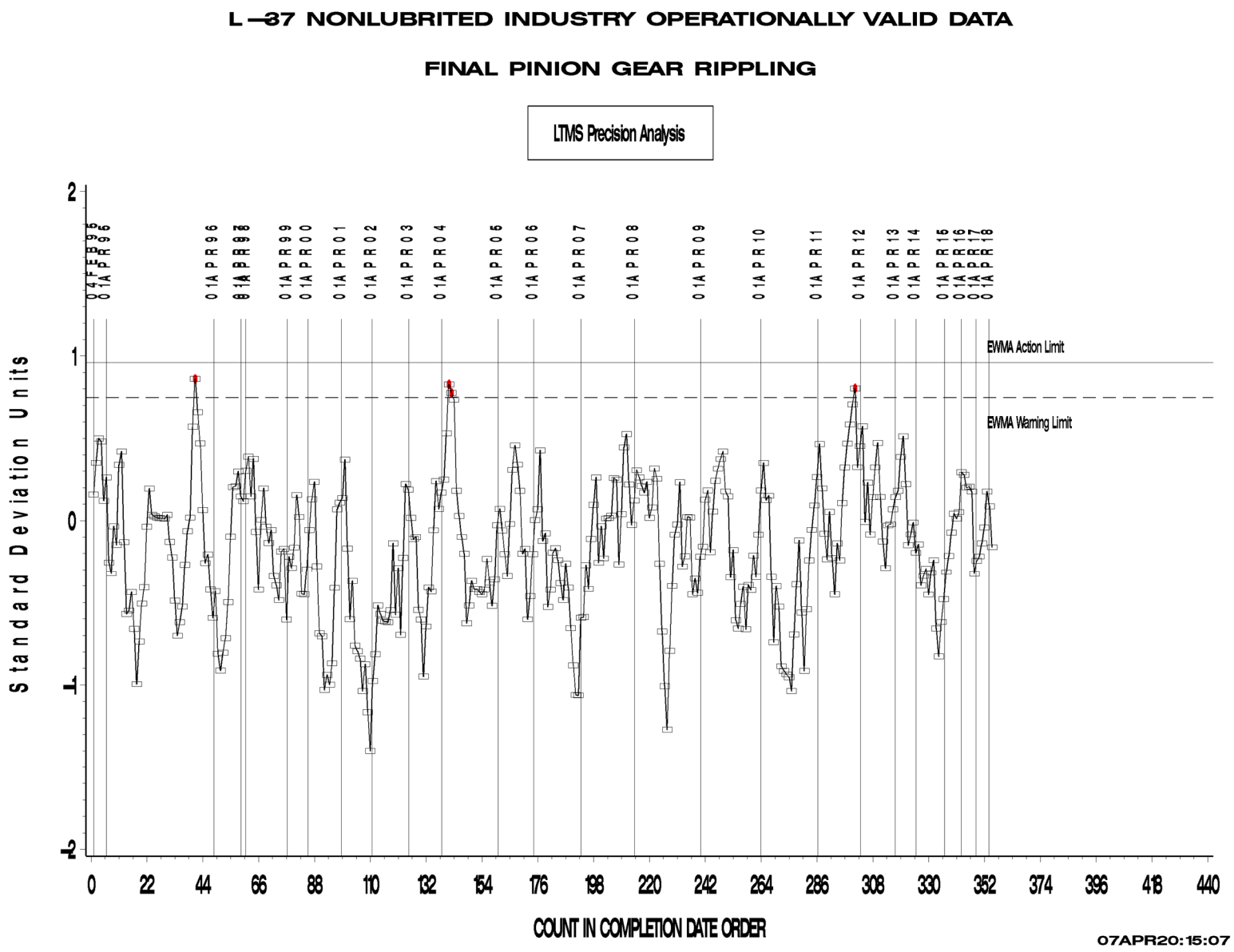
L-37 (D6121)


L-37 NONLUBRITED INDUSTRY OPERATIONALLY VALID DAT
FINAL PINION GEAR RIPPLING
LTMS Severity Analysis
Mild
Severe
Standard Deviation Units
2
1
0
-1
-2
EWMA
OFF SCALE
EWMA Action Limit
EWMA Warning Limit
EWMA Warning Limit
EWMA Action Limit
0 1A P R 9 6
0 1A P R 9 9
0 1A P R 0 0
0 1A P R 0 1
0 1A P R 0 2
0 1A P R 0 3
0 1A P R 0 4
0 1A P R 0 5
0 1A P R 0 6
0 1A P R 0 7
0 1A P R 0 8
0 1A P R 0 9
0 1A P R 10
0 1A P R 11
0 1A P R 12
0 1A P R 13
0 1A P R 14
0 1A P R 15
0 1A P R 16
0 1A P R 17
0 1A P R 18
0
22
44
66
88
110
132
154
176
198
220
242
264
286
308
330
352
374
396
418
440
COUNT IN COMPLETION DATE ORDER
07APR20:15:05

L-37 (D6121)


L–37 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR RIPPLING
LTMS Precision Analysis
Standard Deviation Units
2
1
0
-1
-2
EWMA Action Limit
EWMA Warning Limit
0 1A P R 9 6
0 1A P R 9 7
0 1A P R 9 8
0 1A P R 9 9
0 1A P R 0 0
0 1A P R 0 1
0 1A P R 0 2
0 1A P R 0 3
0 1A P R 0 4
0 1A P R 0 5
0 1A P R 0 6
0 1A P R 0 7
0 1A P R 0 8
0 1A P R 0 9
0 1A P R 1 0
0 1A P R 1 1
0 1A P R 1 2
0 1A P R 1 3
0 1A P R 1 4
0 1A P R 1 5
0 1A P R 1 6
0 1A P R 1 7
0 1A P R 1 8
0
22
44
66
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110
132
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374
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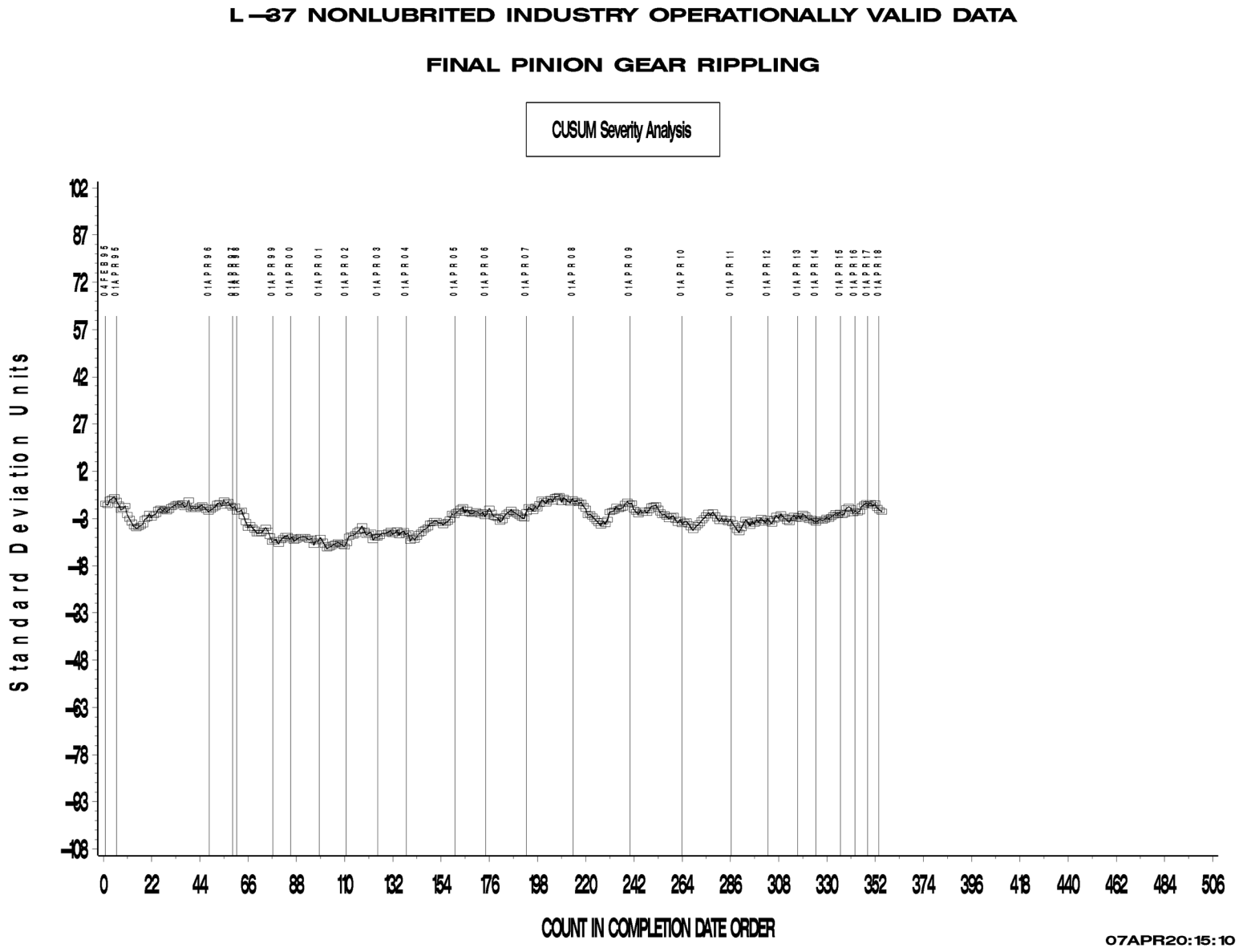
418
440
COUNT IN COMPLETION DATE ORDER
07APR20:15:07

L-37 (D6121)


L-37 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR RIPPLING
CUSUM Severity Analysis
Standard Deviation Units
102
87
72
57
42
27
12
-3
-18
-33
-48
-63
-78
-93
-108
04FEB95
01APR95
01APR96
01APR97
01APR98
01APR99
01APR00
01APR01
01APR02
01APR03
01APR04
01APR05
01APR06
01APR07
01APR08
01APR09
01APR10
01APR11
01APR12
01APR13
01APR14
01APR15
01APR16
01APR17
01APR18
0
22
44
66
88
110
132
154
176
198
220
242
264
286
308
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418
440
462
484
506
COUNT IN COMPLETION DATE ORDER
07APR20:15:10

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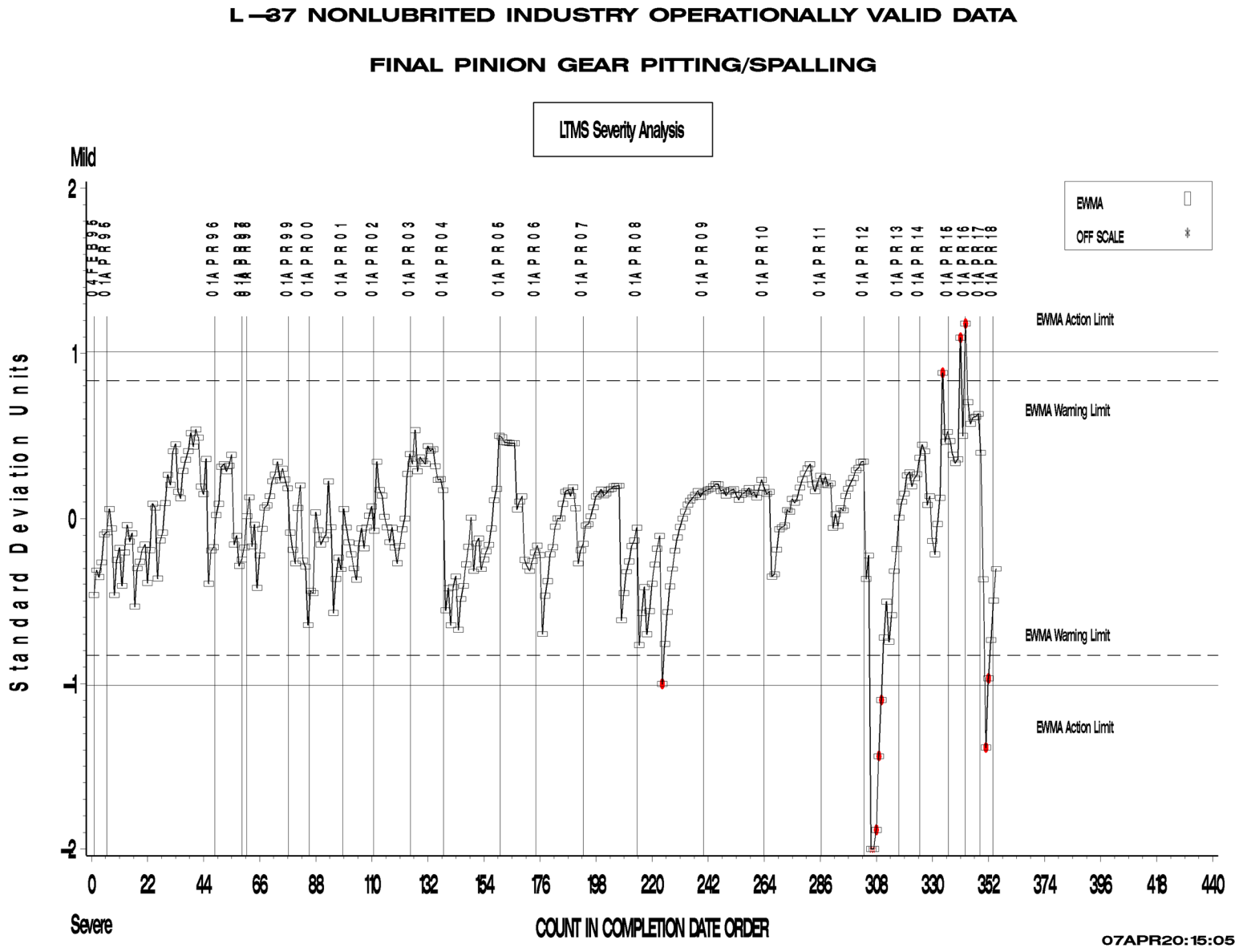
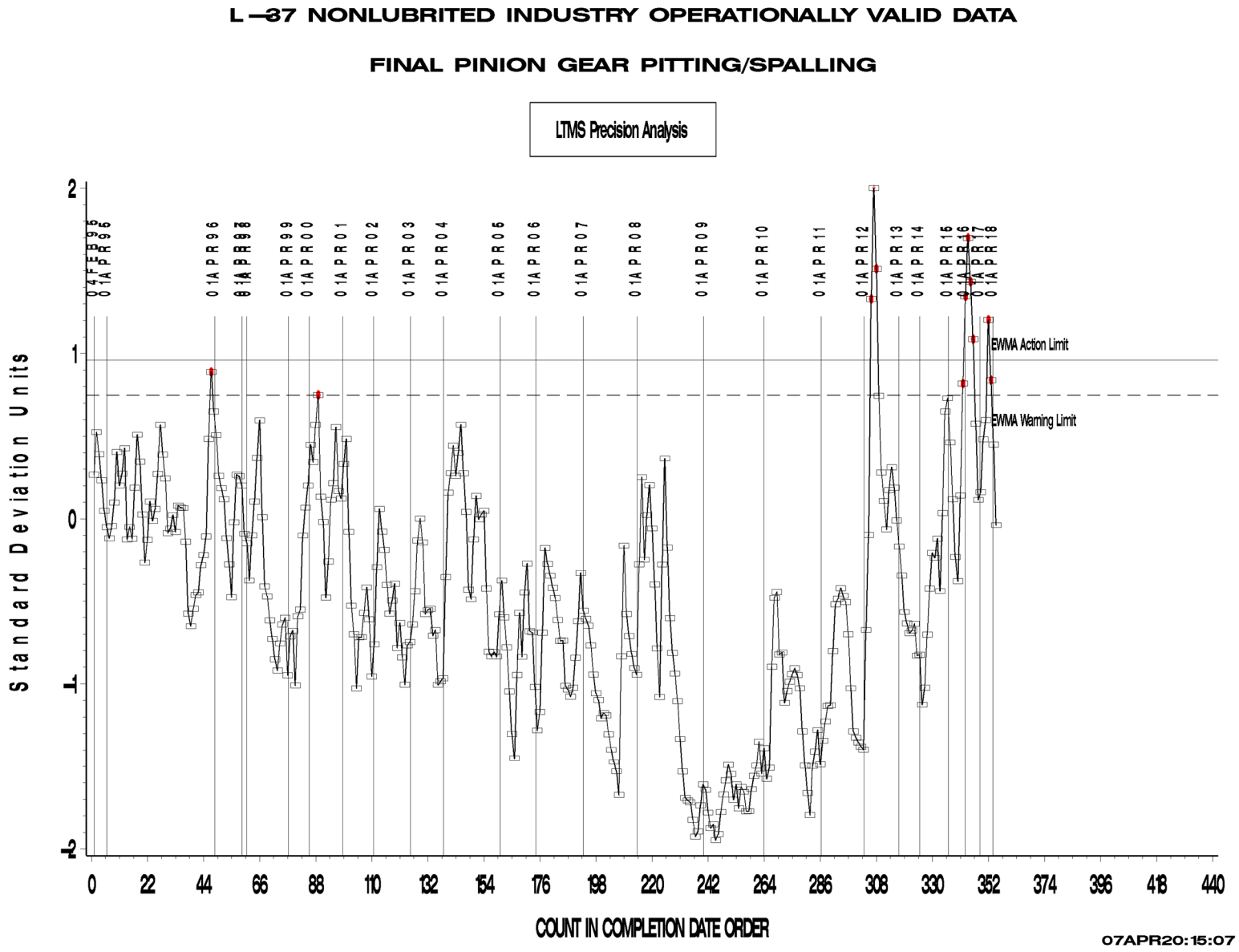
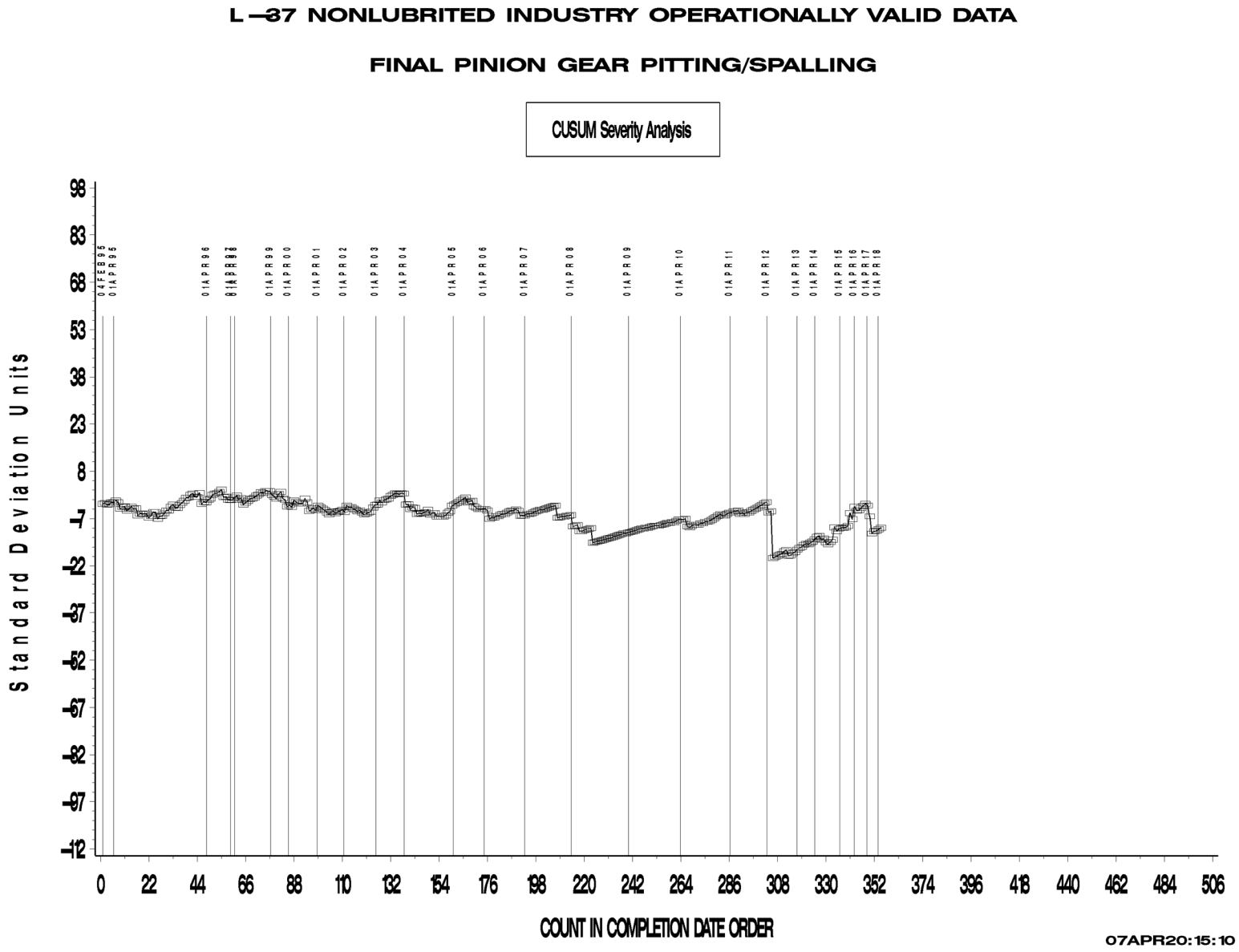

L–37 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR PITTING/SPALLING
LTMS Severity Analysis
Mild
Severe
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
EWMA
OFF SCALE
EWMA Action Limit
EWMA Warning Limit
EWMA Warning Limit
EWMA Action Limit
07APR20:15:05

L-37 (D6121)


L–37 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR PITTING/SPALLING
LTMS Precision Analysis
Standard Deviation Units
2
1
0
-1
-2
0 1A P R 9 6
0 1A P R 9 9
0 1A P R 0 0
0 1A P R 0 1
0 1A P R 0 2
0 1A P R 0 3
0 1A P R 0 4
0 1A P R 0 5
0 1A P R 0 6
0 1A P R 0 7
0 1A P R 0 8
0 1A P R 0 9
0 1A P R 1 0
0 1A P R 1 1
0 1A P R 1 2
0 1A P R 1 3
0 1A P R 1 4
0 1A P R 1 5
0 1A P R 1 6
0 1A P R 1 7
0 1A P R 1 8
EWMA Action Limit
EWMA Warning Limit
0
22
44
66
88
110
132
154
176
198
220
242
264
286
308
330
352
374
396
418
440
COUNT IN COMPLETION DATE ORDER
07APR20:15:07

L-37 (D6121)


L-37 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR PITTING/SPALLING
CUSUM Severity Analysis
Standard Deviation Units
98
83
68
53
38
23
8
-7
-22
-37
-52
-67
-82
-97
-112
04FEB95
01APR95
01APR96
01APR97
01APR98
01APR99
01APR00
01APR01
01APR02
01APR03
01APR04
01APR05
01APR06
01APR07
01APR08
01APR09
01APR10
01APR11
01APR12
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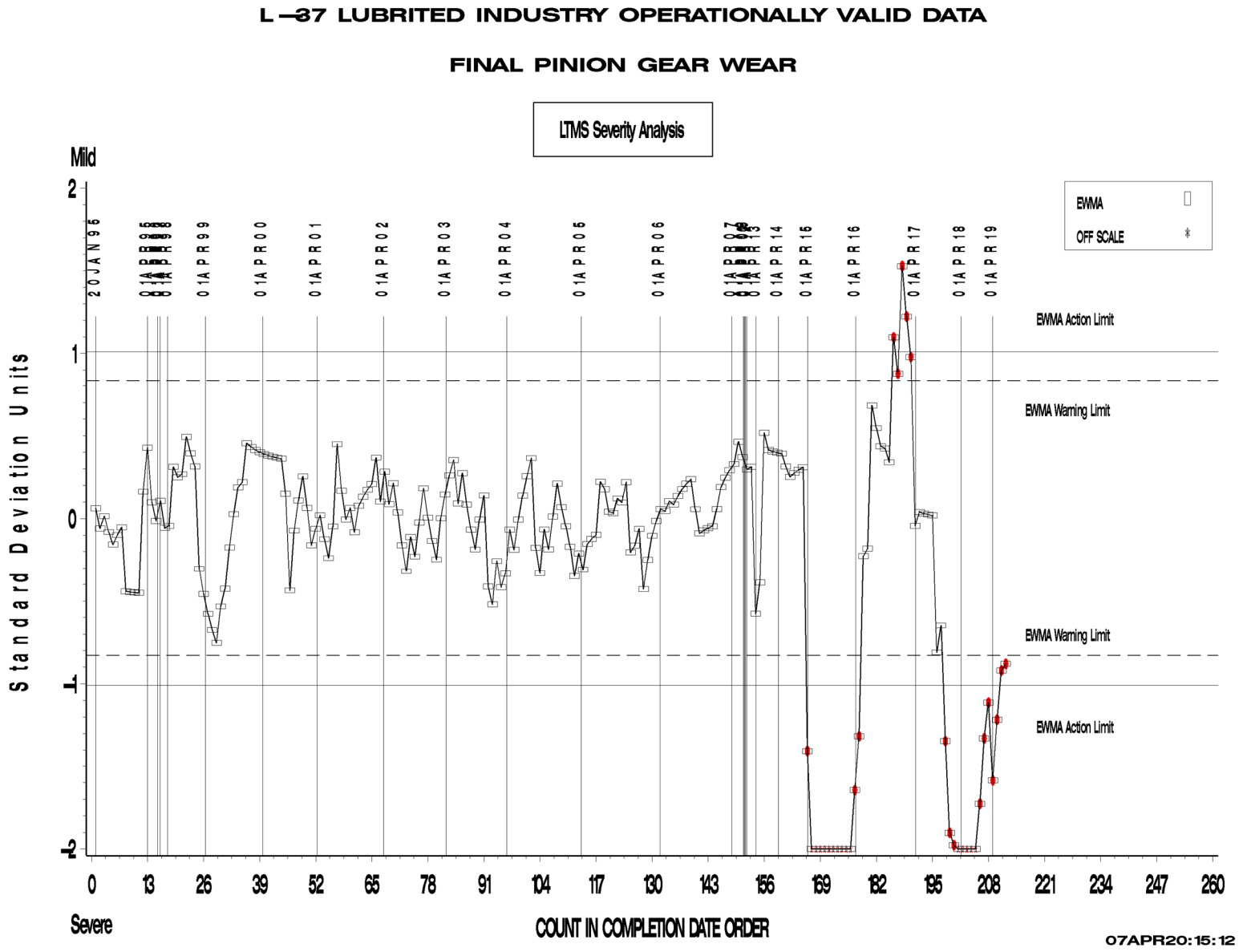
01APR15
01APR16
01APR17
01APR18
0
22
44
66
88
110
132
154
176
198
220
242
264
286
308
330
352
374
396
418
440
462
484
506
COUNT IN COMPLETION DATE ORDER
07APR20:15:10

L-37 (D6121)


L-37 LUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR WEAR
LTMS Severity Analysis
Mild
Severe
Standard Deviation Units
2
1
0
-1
-2
EWMA
OFF SCALE
EWMA Action Limit
EWMA Warning Limit
EWMA Warning Limit
EWMA Action Limit
20JAN95
01APR99
01APR00
01APR01
01APR02
01APR03
01APR04
01APR05
01APR06
01APR14
01APR15
01APR16
01APR17
01APR18
01APR19
0
13
26
39
52
65
78
91
104
117
130
143
156
169
182
195
208
221
234
247
260
COUNT IN COMPLETION DATE ORDER
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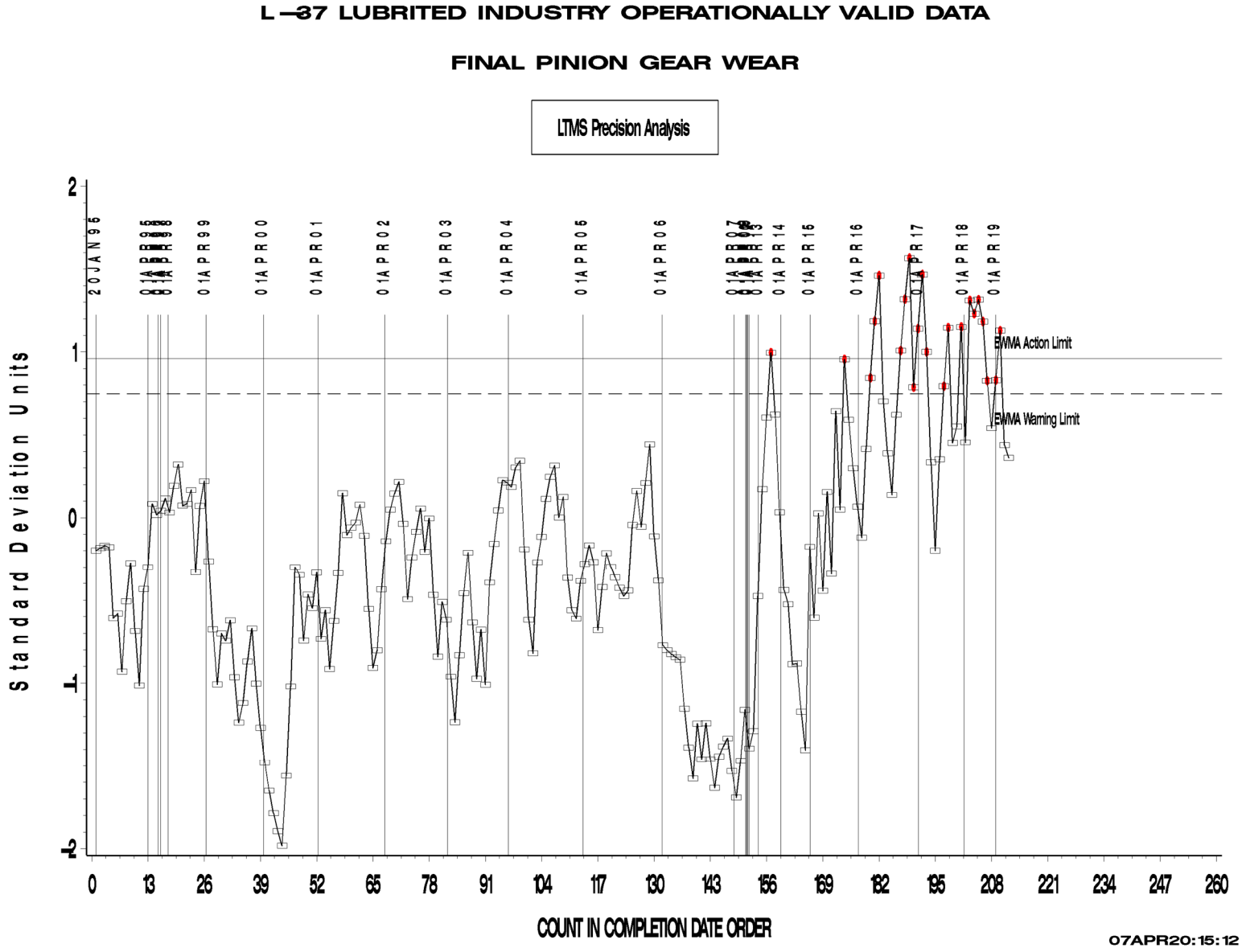
L-37 (D6121)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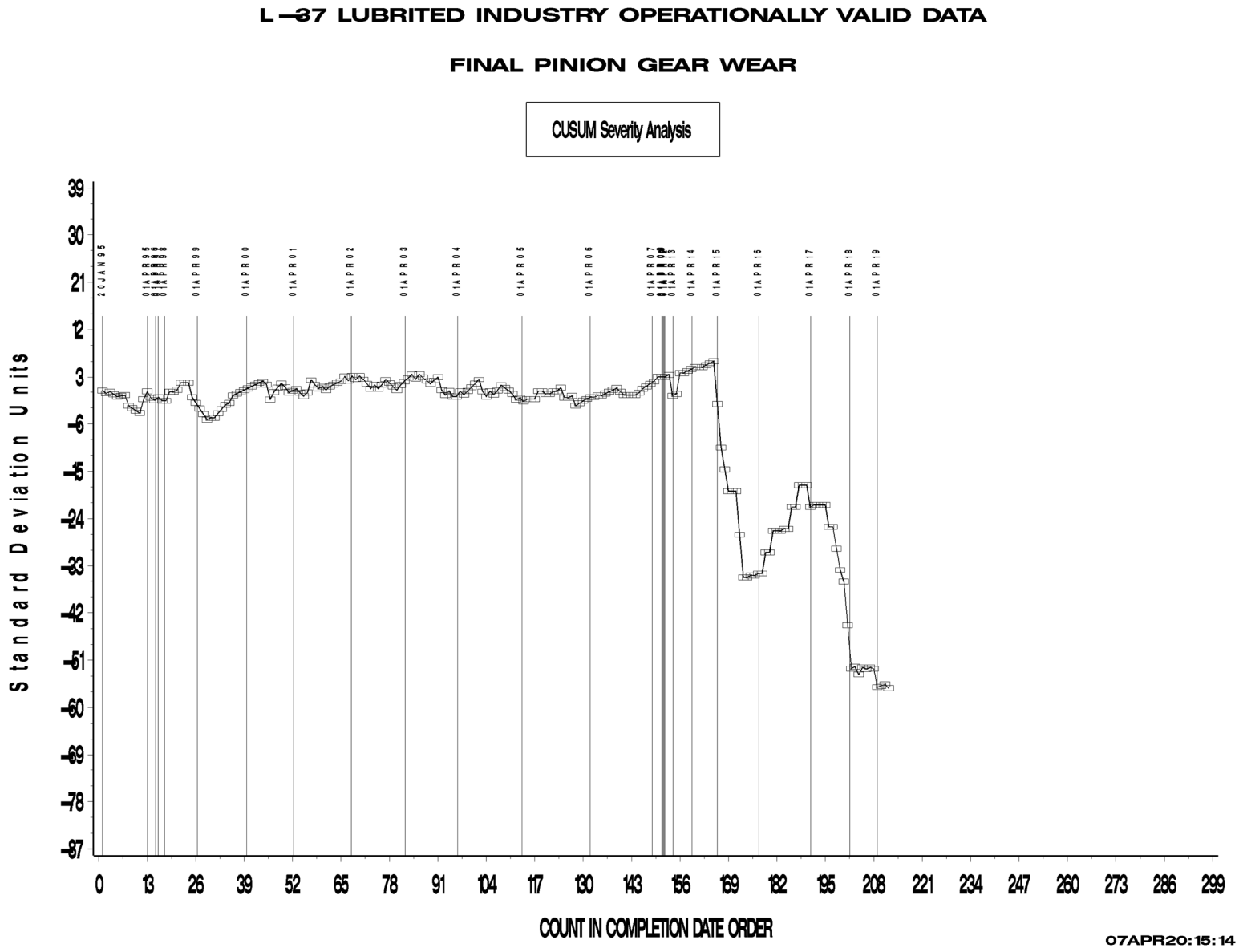
FINAL PINION GEAR WEAR
LTMS Precision Analysis
Standard Deviation Units
2
1
0
-1
-2
20JAN95
01APR99
01APR00
01APR01
01APR02
01APR03
01APR04
01APR05
01APR06
01APR14
01APR15
01APR16
01APR17
01APR18
01APR19
EWMA Action Limit
EWMA Warning Limit
0
13
26
39
52
65
78
91
104
117
130
143
156
169
182
195
208
221
234
247
260
COUNT IN COMPLETION DATE ORDER
07APR20:15:12

L-37 (D6121)


L-37 LUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR WEAR
CUSUM Severity Analysis
Standard Deviation Units
39
30
21
12
3
-6
-15
-24
-33
-42
-51
-60
-69
-78
-87
20JAN95
01APR95
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01APR01
01APR02
01APR03
01APR04
01APR05
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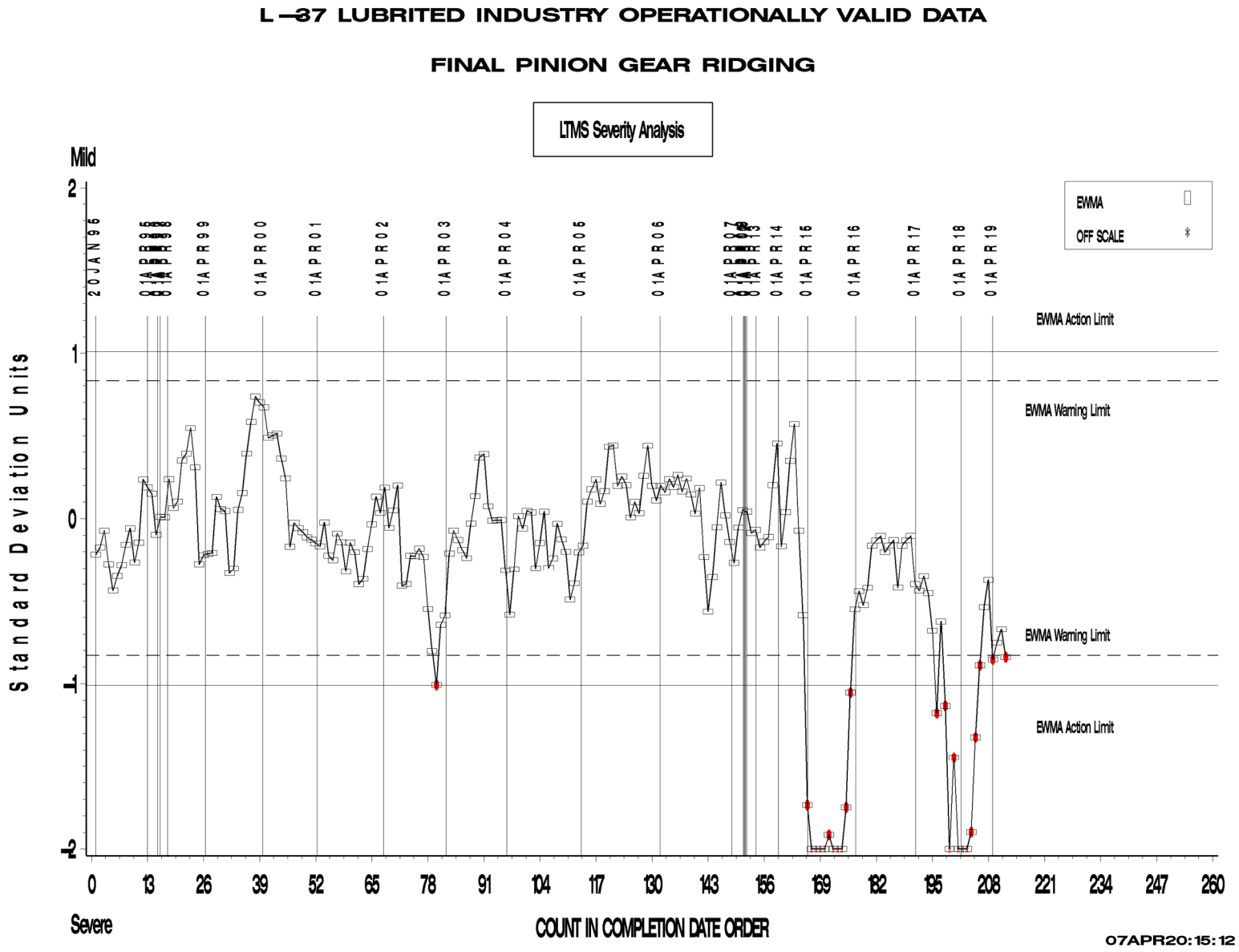
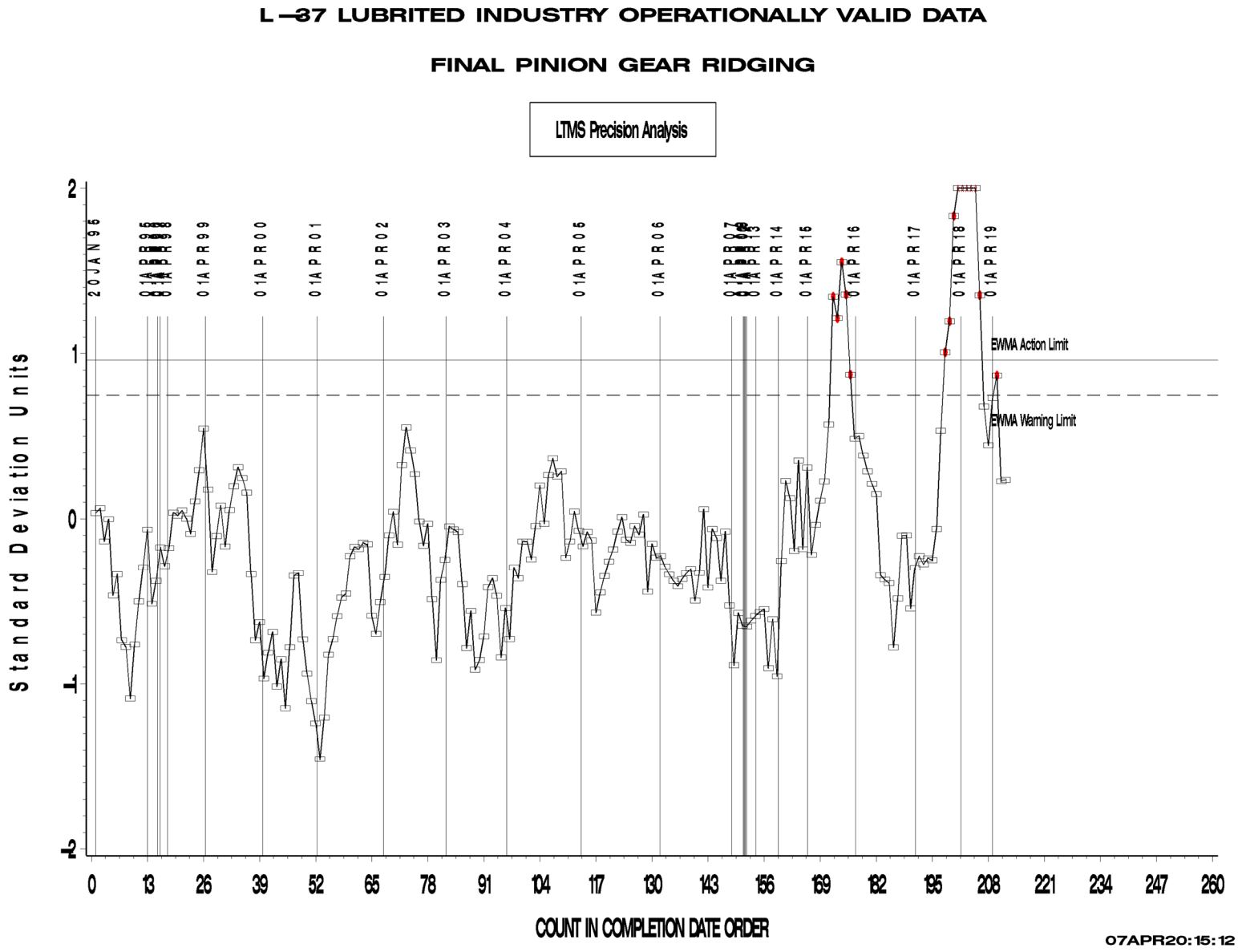
13
26
39
52
65
78
91
104
117
130
143
156
169
182
195
208
221
234
247
260
273
286
299
COUNT IN COMPLETION DATE ORDER
07APR20:15:14

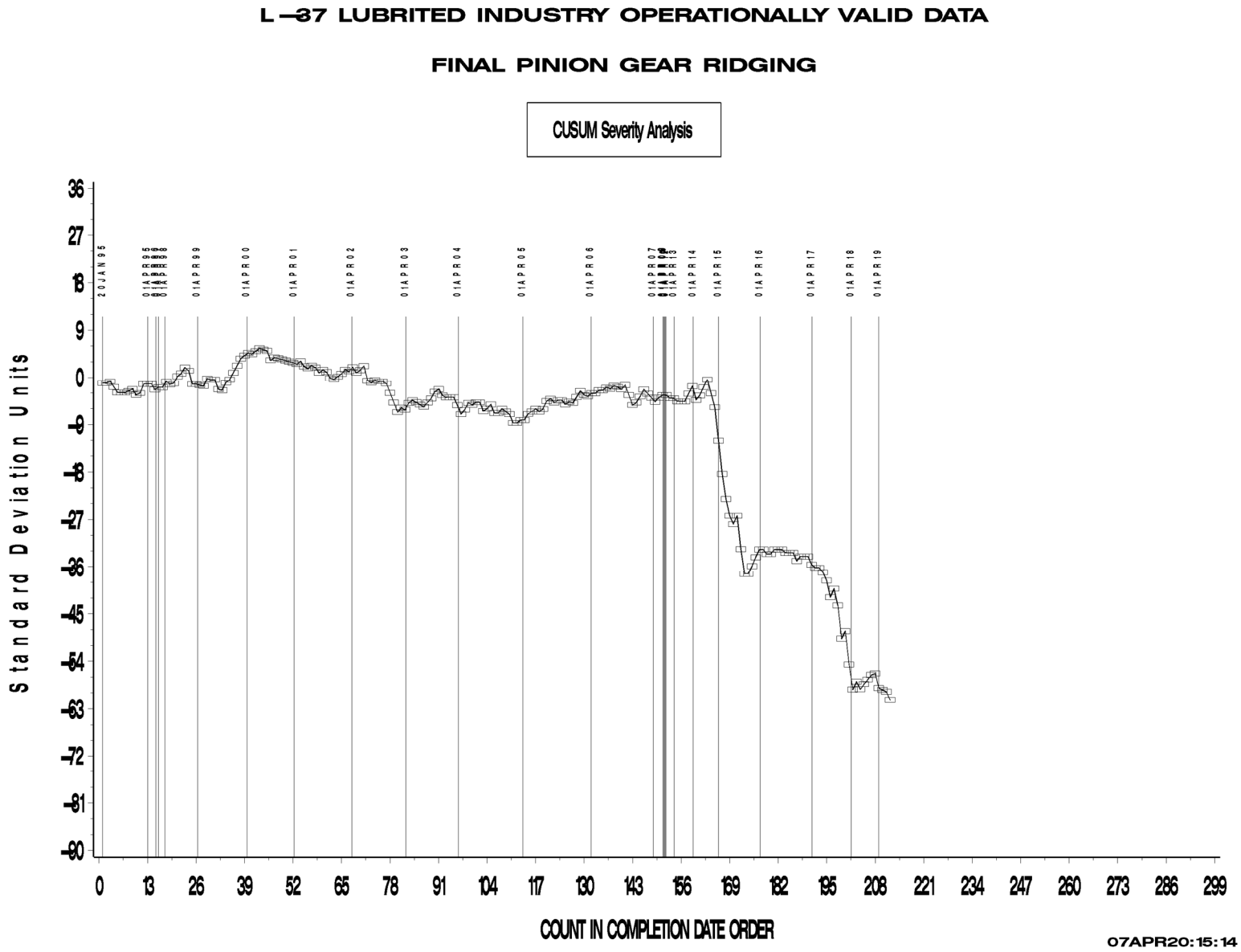
L-37 (D6121)


L-37 LUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR RIDGING
LTMS Severity Analysis
Mild
Severe
Standard Deviation Units
2
1
0
-1
-2
EWMA
OFF SCALE
EWMA Action Limit
EWMA Warning Limit
EWMA Warning Limit
EWMA Action Limit
20JAN96
01APR99
01APR00
01APR01
01APR02
01APR03
01APR04
01APR05
01APR06
01APR14
01APR15
01APR16
01APR17
01APR18
01APR19
0
13
26
39
52
65
78
91
104
117
130
143
156
169
182
195
208
221
234
247
260
COUNT IN COMPLETION DATE ORDER
07APR20:15:12

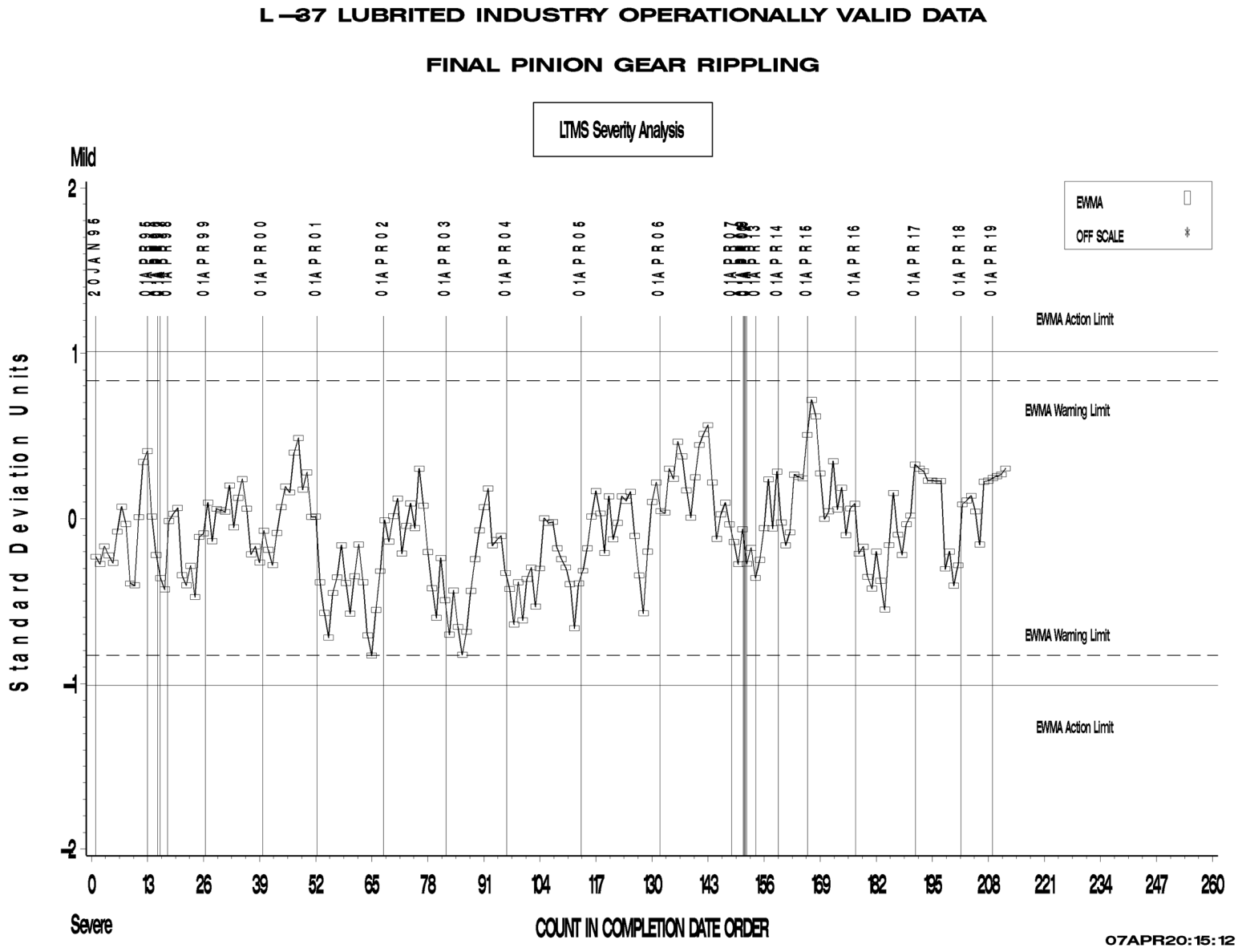
L-37 (D6121)


L-37 LUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR RIDGING
LTMS Precision Analysis
Standard Deviation Units
2
1
0
-1
-2
20JAN96
01APR99
01APR00
01APR01
01APR02
01APR03
01APR04
01APR05
01APR06
01APR14
01APR15
01APR16
01APR17
01APR18
01APR19
EWMA Action Limit
EWMA Warning Limit
0
13
26
39
52
65
78
91
104
117
130
143
156
169
182
195
208
221
234
247
260
COUNT IN COMPLETION DATE ORDER
07APR20:15:12

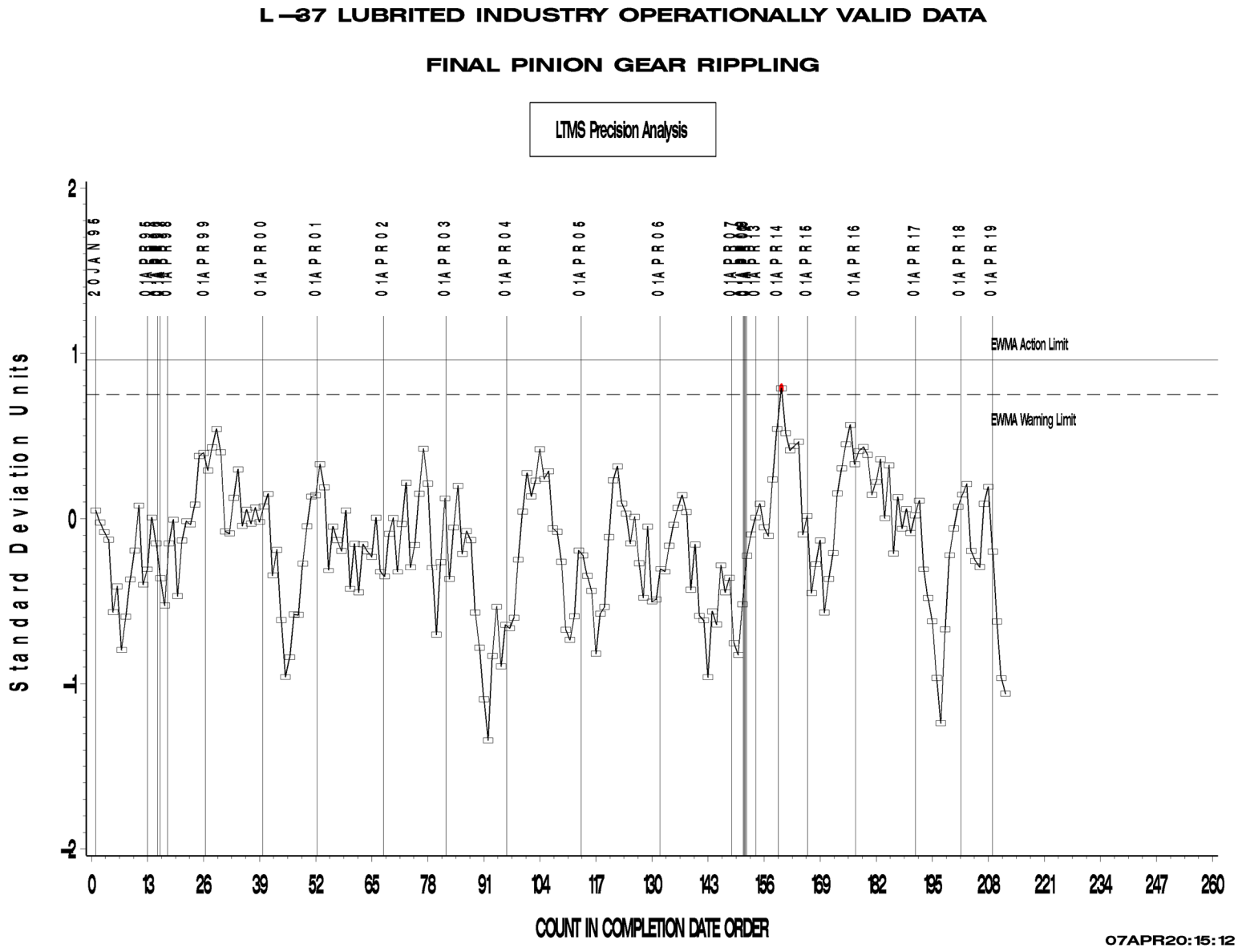
L-37 (D6121)


L-37 LUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR RIDGING
CUSUM Severity Analysis
Standard Deviation Units
36
27
18
9
0
-9
-18
-27
-36
-45
-54
-63
-72
-81
-90
20JAN95
01APR95
01APR99
01APR00
01APR01
01APR02
01APR03
01APR04
01APR05
01APR06
01APR07
01APR13
01APR14
01APR15
01APR16
01APR17
01APR18
01APR19
0
13
26
39
52
65
78
91
104
117
130
143
156
169
182
195
208
221
234
247
260
273
286
299
COUNT IN COMPLETION DATE ORDER
07APR20:15:14

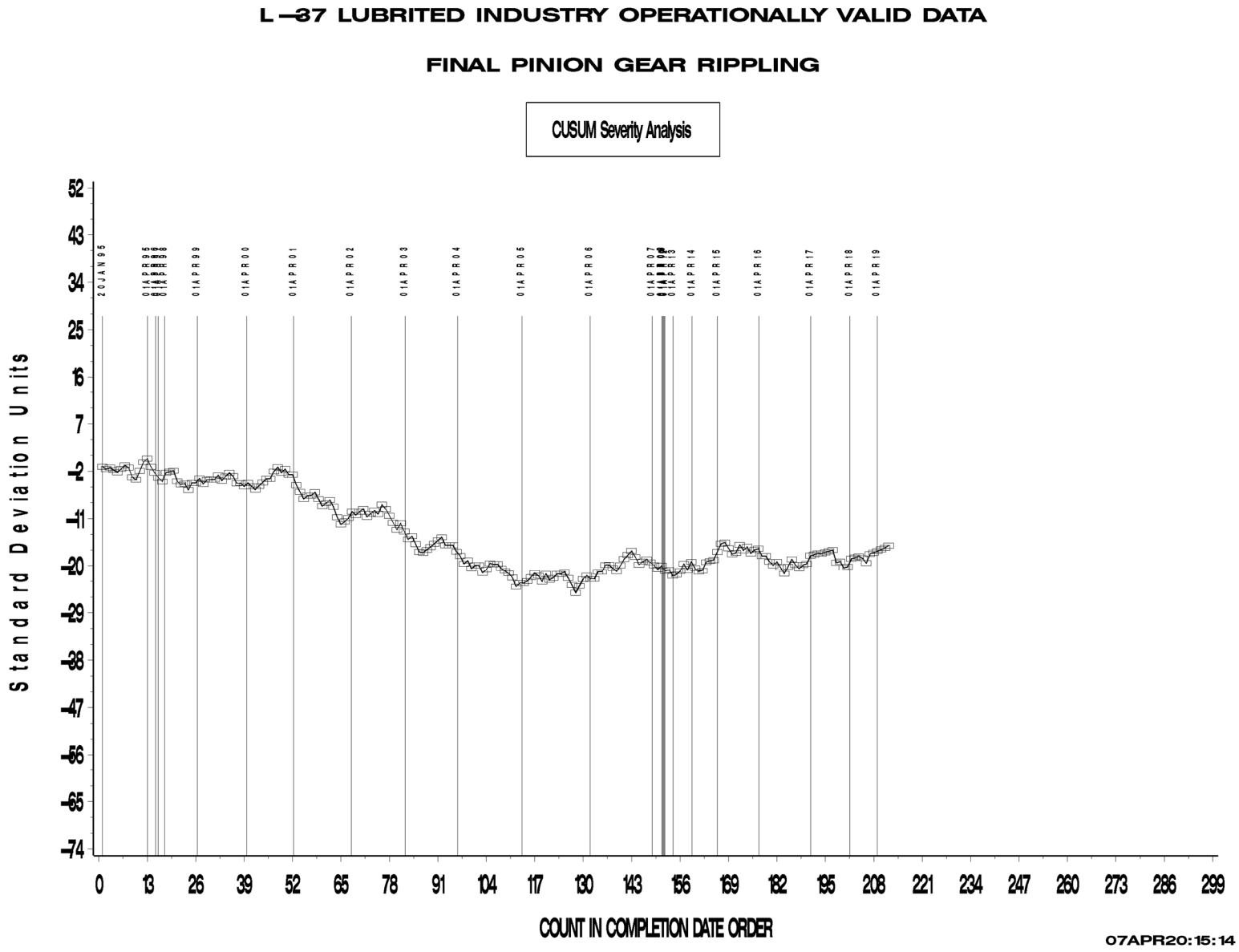
L-37 (D6121)


L-37 LUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR RIPPLING
LTMS Severity Analysis
Mild
Severe
Standard Deviation Units
2
1
0
-1
-2
EWMA
OFF SCALE
EWMA Action Limit
EWMA Warning Limit
EWMA Warning Limit
EWMA Action Limit
20JAN96
01APR99
01APR00
01APR01
01APR02
01APR03
01APR04
01APR05
01APR06
01APR14
01APR15
01APR16
01APR17
01APR18
01APR19
0
13
26
39
52
65
78
91
104
117
130
143
156
169
182
195
208
221
234
247
260
COUNT IN COMPLETION DATE ORDER
07APR20:15:12

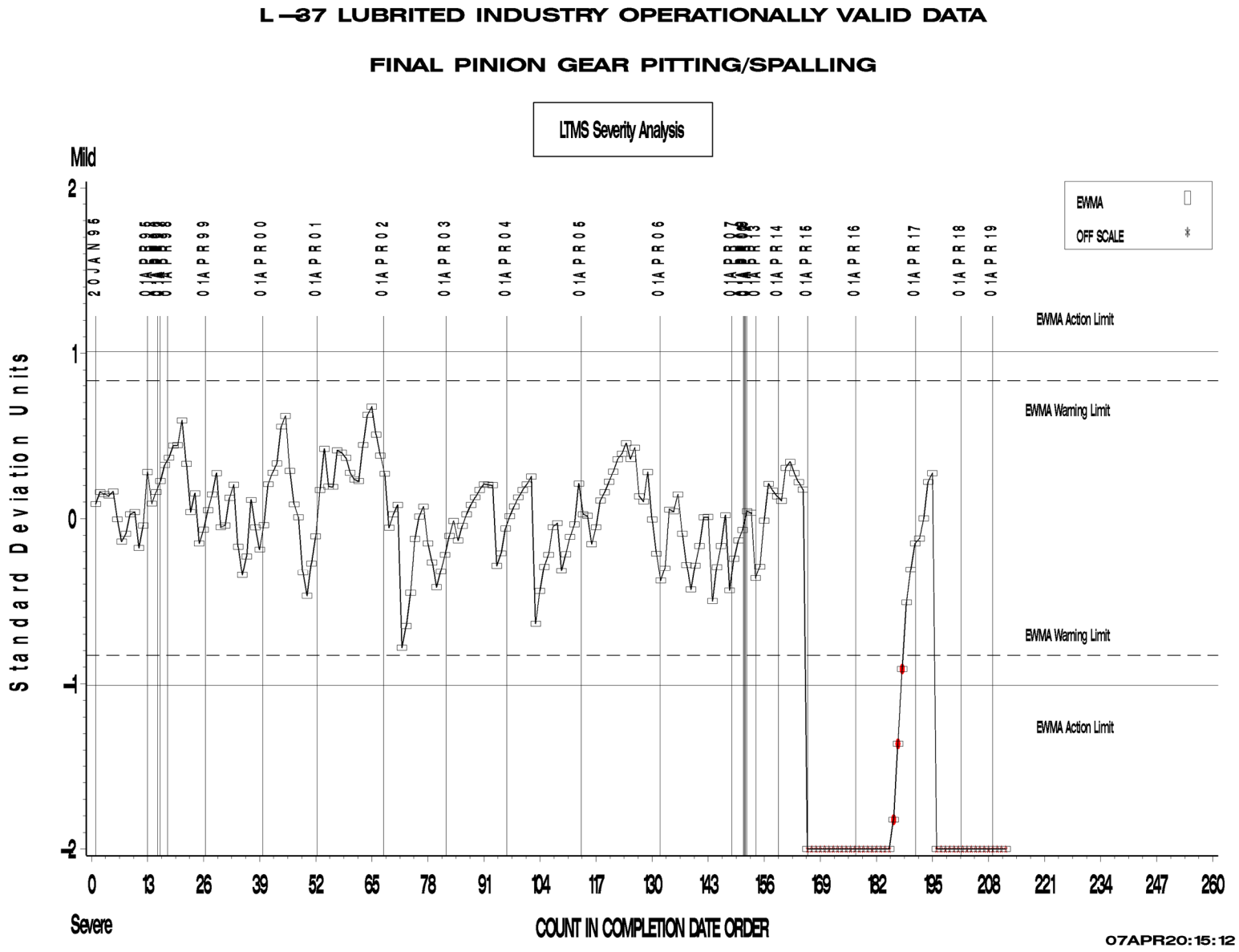
L-37 (D6121)


L-37 LUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR RIPPLING
LTMS Precision Analysis
Standard Deviation Units
EWMA Action Limit
EWMA Warning Limit
COUNT IN COMPLETION DATE ORDER
07APR20:15:12

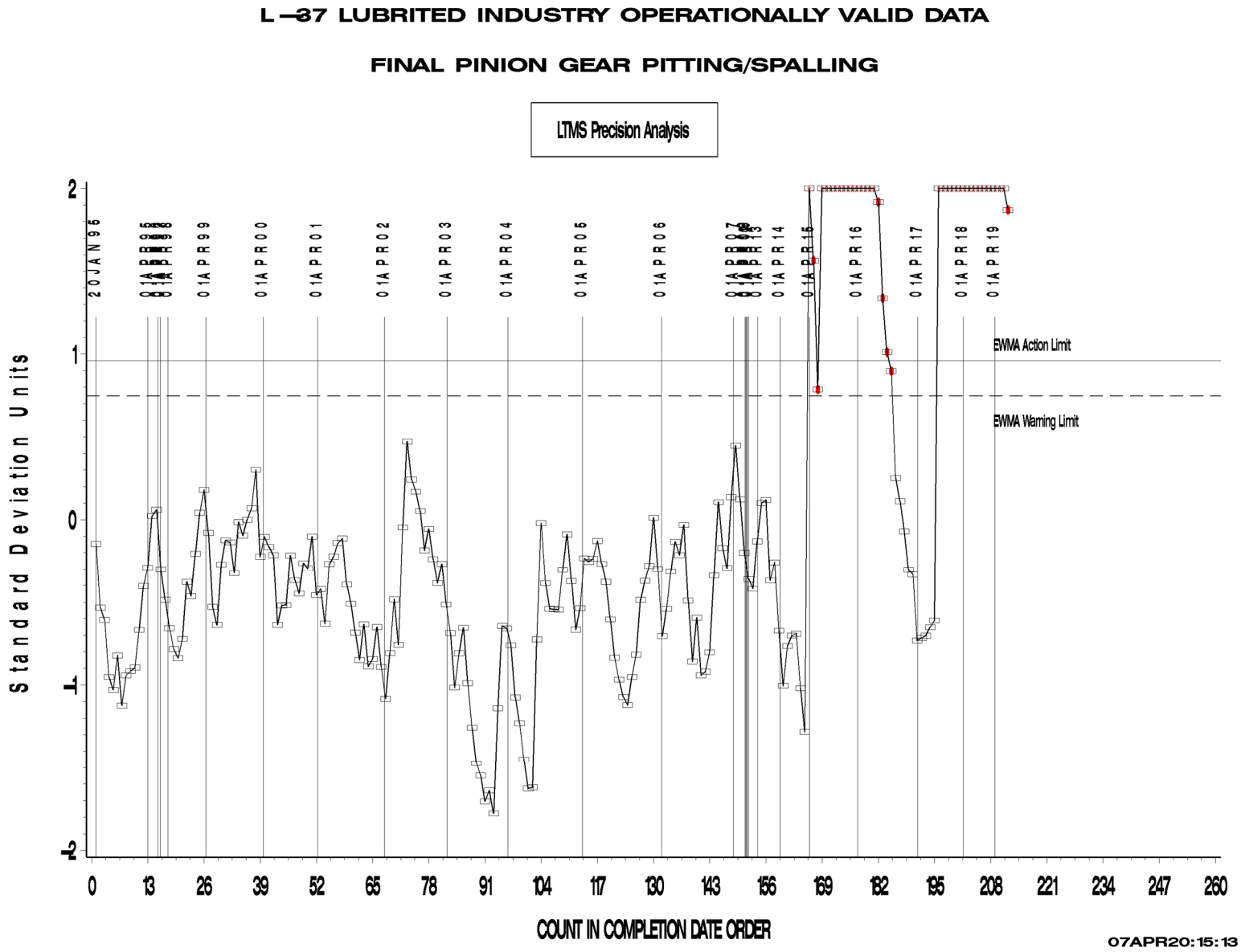
L-37 (D6121)


L-37 LUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR RIPPLING
CUSUM Severity Analysis
Standard Deviation Units
52
43
34
25
16
7
-2
-11
-20
-29
-38
-47
-56
-65
-74
20JAN95
01APR95
01APR99
01APR00
01APR01
01APR02
01APR03
01APR04
01APR05
01APR06
01APR07
01APR13
01APR14
01APR15
01APR16
01APR17
01APR18
01APR19
0
13
26
39
52
65
78
91
104
117
130
143
156
169
182
195
208
221
234
247
260
273
286
299
COUNT IN COMPLETION DATE ORDER
07APR20:15:14

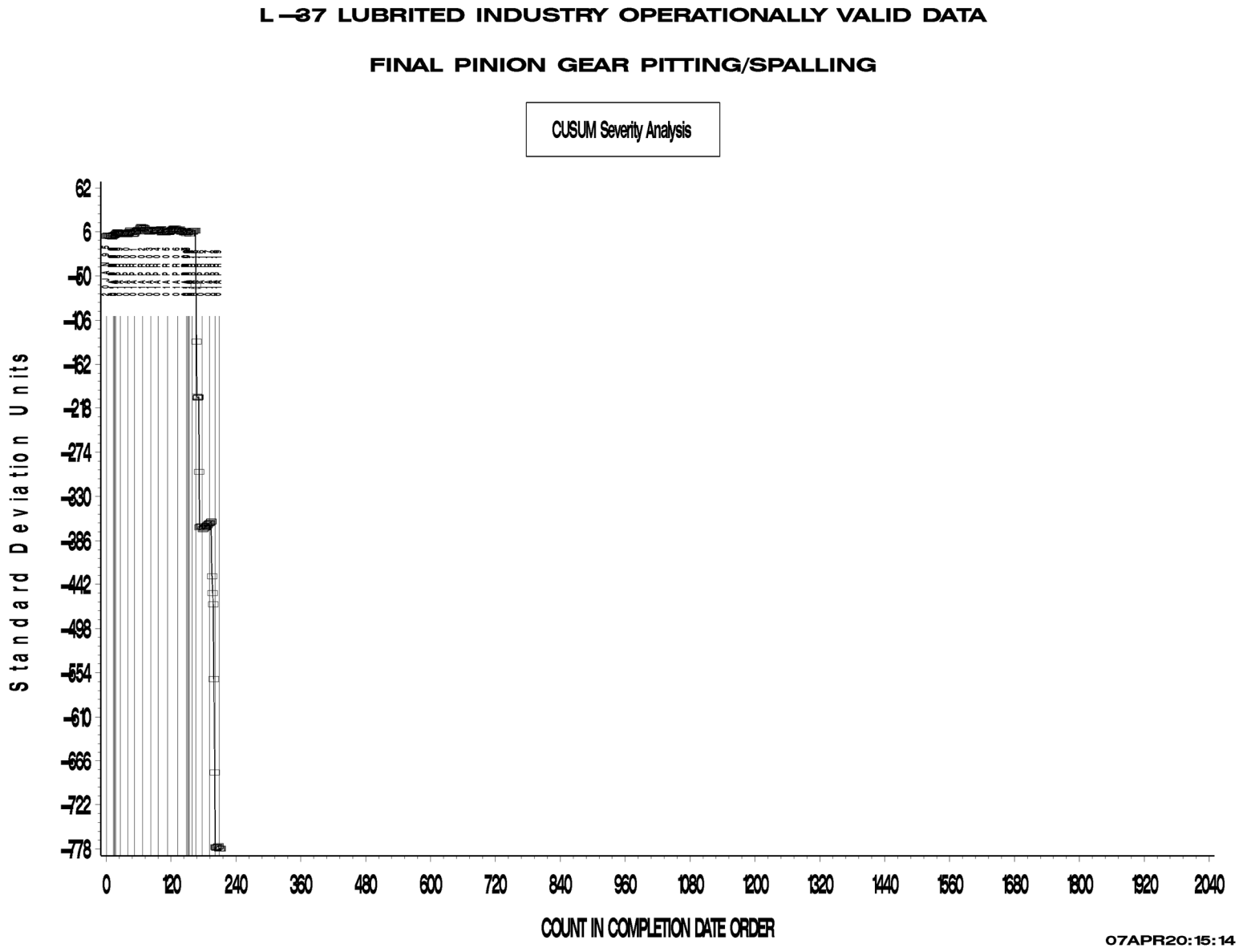
L-37 (D6121)


L-37 LUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR PITTING/SPALLING
LTMS Severity Analysis
Mild
Severe
Standard Deviation Units
2
1
0
-1
-2
EWMA
OFF SCALE
EWMA Action Limit
EWMA Warning Limit
EWMA Warning Limit
EWMA Action Limit
20JAN96
01APR99
01APR00
01APR01
01APR02
01APR03
01APR04
01APR05
01APR06
01APR14
01APR15
01APR16
01APR17
01APR18
01APR19
0
13
26
39
52
65
78
91
104
117
130
143
156
169
182
195
208
221
234
247
260
COUNT IN COMPLETION DATE ORDER
07APR20:15:12

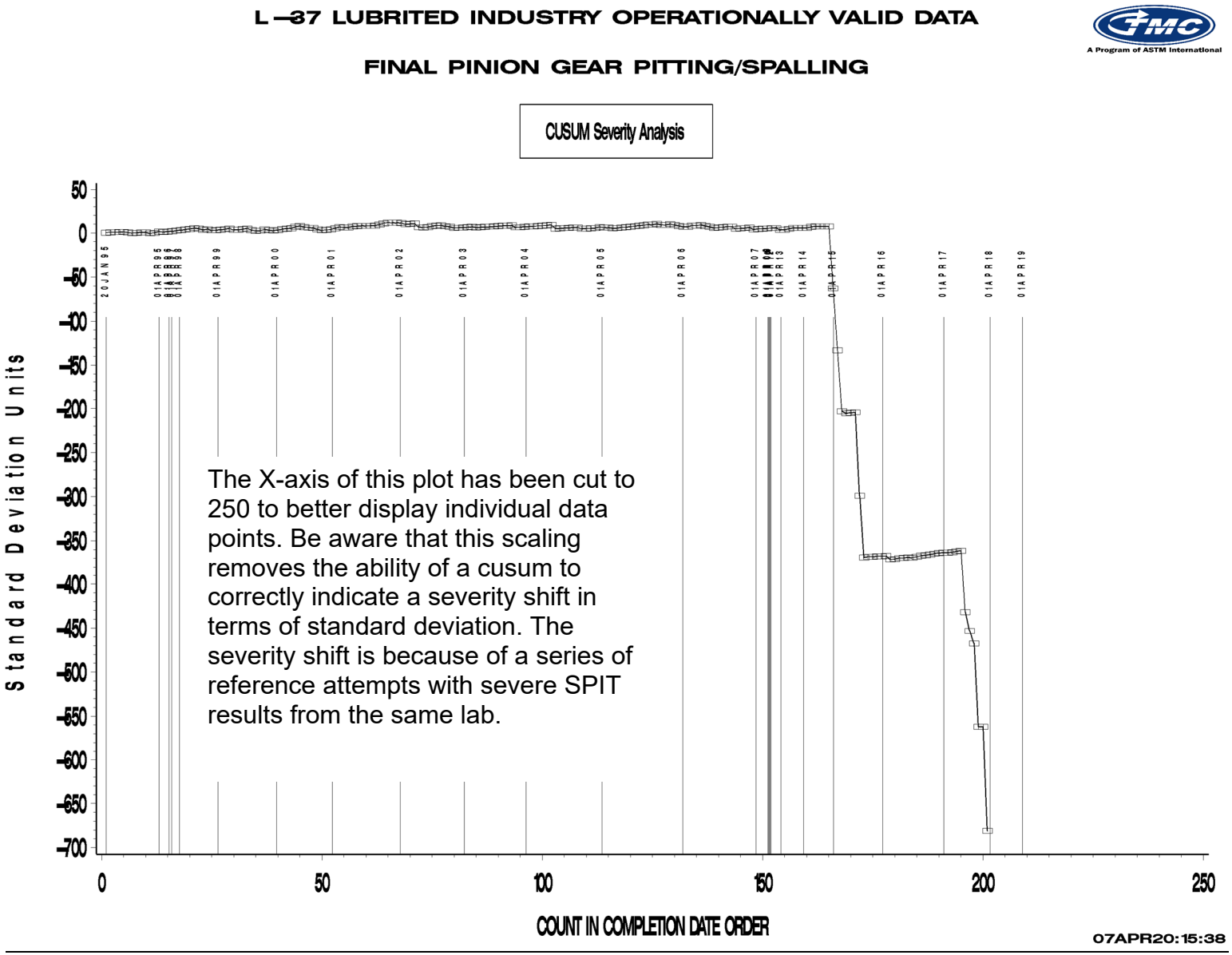
L-37 (D6121)


L-37 LUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR PITTING/SPALLING
LTMS Precision Analysis
Standard Deviation Units
2
1
0
-1
-2
20JAN96
01APR99
01APR00
01APR01
01APR02
01APR03
01APR04
01APR05
01APR06
01APR14
01APR15
01APR16
01APR17
01APR18
01APR19
EWMA Action Limit
EWMA Warning Limit
0
13
26
39
52
65
78
91
104
117
130
143
156
169
182
195
208
221
234
247
260
COUNT IN COMPLETION DATE ORDER
07APR20:15:13

L-37 (D6121)


L-37 LUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR PITTING/SPALLING
CUSUM Severity Analysis
Standard Deviation Units
62
6
-50
-106
-162
-218
-274
-330
-386
-442
-498
-554
-610
-666
-722
-778
0
120
240
360
480
600
720
840
960
1080
1200
1320
1440
1560
1680
1800
1920
2040
COUNT IN COMPLETION DATE ORDER
07APR20:15:14

L-37 (D6121)


L-37 LUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR PITTING/SPALLING
CUSUM Severity Analysis
Standard Deviation Units
50
0
-50
-100
-150
-200
-250
-300
-350
-400
-450
-500
-550
-600
-650
-700
0
50
100
150
200
250
COUNT IN COMPLETION DATE ORDER
07APR20:15:38
The X-axis of this plot has been cut to 250 to better display individual data points. Be aware that this scaling removes the ability of a cusum to correctly indicate a severity shift in terms of standard deviation. The severity shift is because of a series of reference attempts with severe SPIT results from the same lab.

L-37 (D6121)

TIMELINE ADDITIONS

Effective Date	Information Letter	Event
		No information letters were issued during this period.

L-37 (D6121)

LAB VISITS

No L-37 lab visits were conducted this period.

INFORMATION LETTERS

No information letters were issued during this period.

L-37 (D6121)

LTMS DEVIATIONS
No LTMS deviations were written this report period.

L-37 (D6121)

STATUS OF REFERENCE OIL SUPPLY

		@ TMC	
Oil	Cans @ Labs	Cans	Gallons
117	0	328	328.0
134	2	0	0.0
134-1	8	143	143.0
152-2	7	80	80.0
153-1	35	0	0.0
155	20	27	27.5
155-1	10	65	65.0
Total	82	643	643.5

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-37-1, 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.