A Program of ASTM International

Test Monitoring Center

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412-365-1000

MEMORANDUM: 08-059

DATE: December 1, 2008

TO: Don Bartlett, Chairman, L-37 Surveillance Panel

FROM: Donald Lind

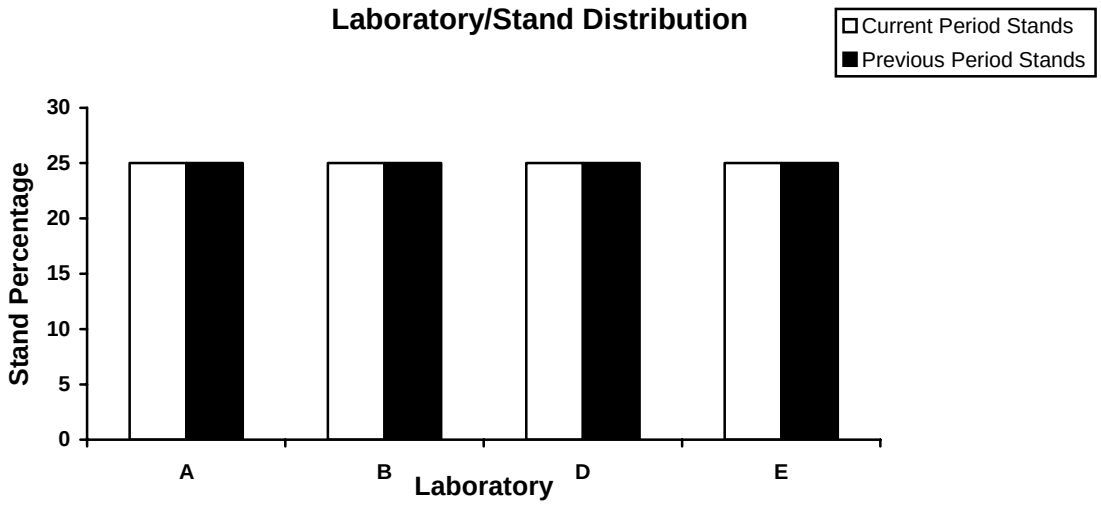
SUBJECT: L-37 Reference Test Status from April 1, 2008 through September 30, 2008

The following is a summary of the L-37 reference oil tests that were reported to the Test Monitoring Center during the period April 1, 2008 through September 30, 2008.

Lab/Stand Distribution

	Reporting Data	Calibrated as of 9/30/08
Number of Laboratories	4	3
Number of Stands	4	3

The following chart shows the laboratory/stand distribution:



The following summarizes the status of the reference oil tests reported to the TMC:

	TMC Validity Codes	Number of Tests
Operationally and Statistically Acceptable	AC	10
Failed Acceptance Criteria	OC	5
Operationally Invalid (Lab Judgment)	LC	0
Not Acceptable For Intended Purpose	MC	0
Aborted	XC	1
Total		16

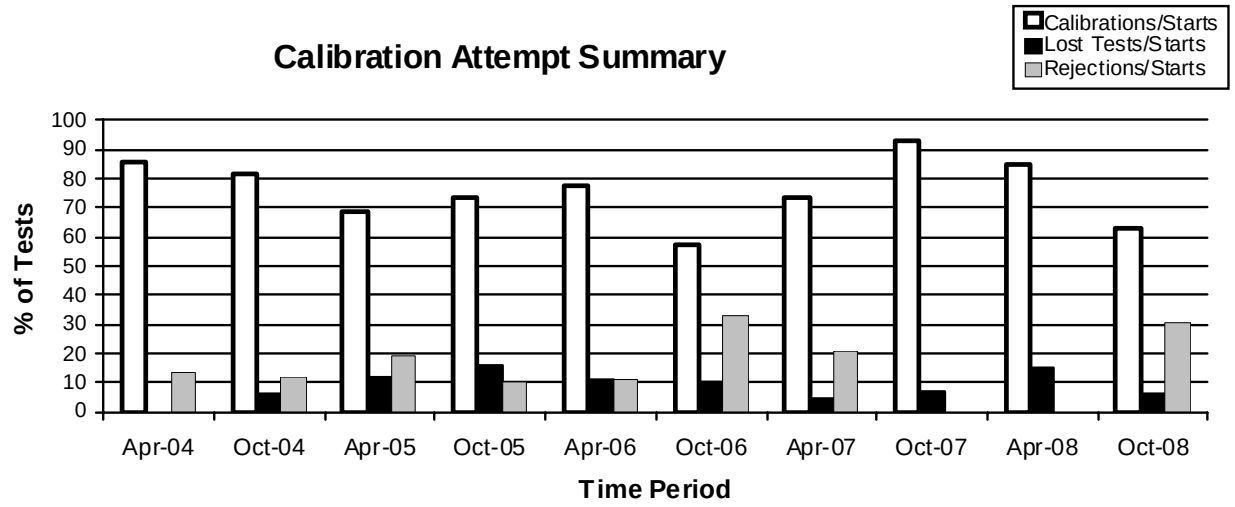
There were no lubrited hardware tests reported this report period due to an industry wide shortage of lubrited hardware. The following summarizes the acceptable and failed acceptance criteria tests by gear batch:

	Gear Batch	n-size	Acceptable	Failed Acceptance Criteria
Non-lubrited	V1L417/P4L792	15	10	5

Additional Tests

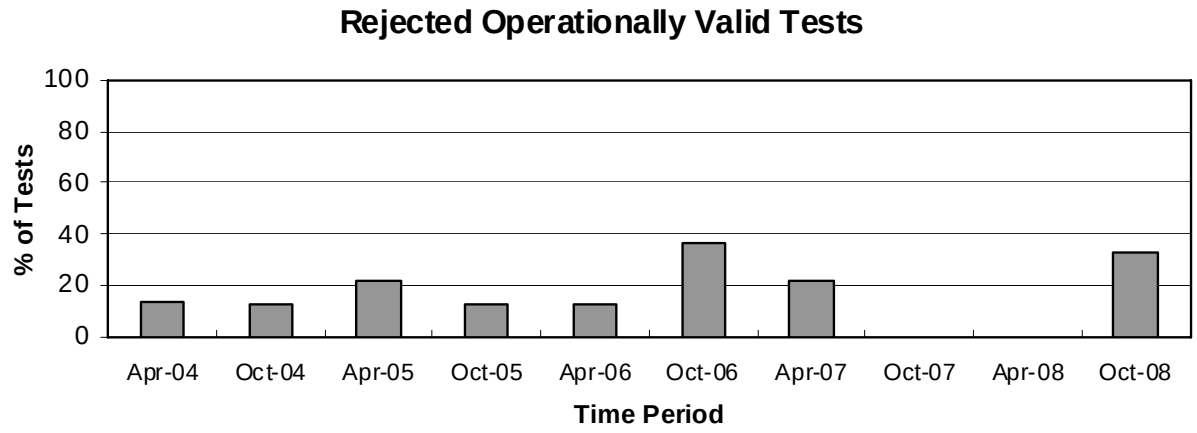
There were 39 additional tests (29 lubrited and 10 non-lubrited) conducted to evaluate new hardware this report period.

Calibrations per start, lost tests per start and rejection per start rates are summarized below:

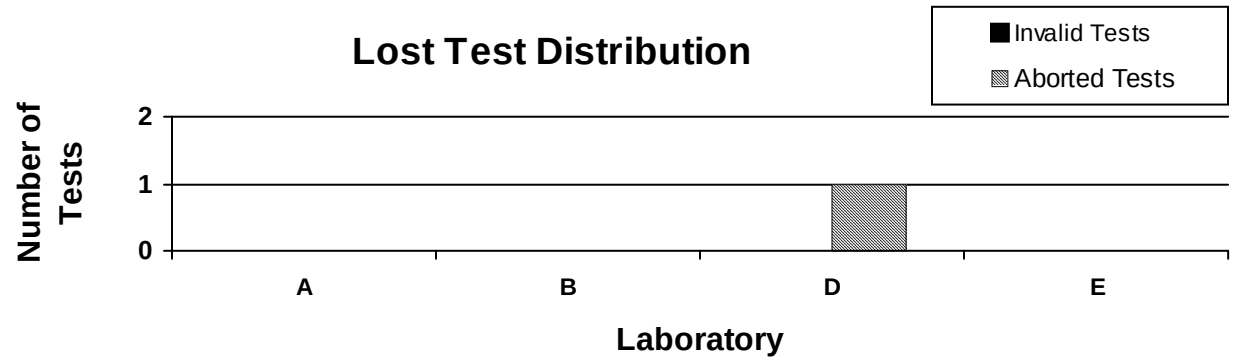


The calibration per start and lost test per start rates have decreased with respect to the previous period. The rejected per start rate has increased with respect to the previous period.

The operationally valid statistically rejected test rate, as shown below, has increased with respect to the previous period.



The laboratory distribution of lost tests is shown below. A detailed list of reasons for tests declared operationally invalid or aborted is shown in Table 3.



Severity and Precision

The mean Δ/s by gear batch, overall mean Δ/s, and shift in merits for the operationally and statistically valid calibration tests reported this period are tabulated below for non-lubrited hardware. There were no lubrited data to report this period due to an industry wide shortage of hardware. Severity is summarized for this report period by laboratory, hardware, and gear batch in the attached Table 2.

NON-LUBRITED HARDWARE						
Parameter	Gear Batch	N	Δ/s	s [D]	Overall Δ/s	Overall Shift In Merits
Wear	V1L417/P4L792	15	-0.17	0.79	-0.15	-0.12 [C]
Ridging	V1L417/P4L792	15	-0.75	0.92	-0.75	-1.22 [A, C]
Rippling	V1L417/P4L792	15	-0.43	0.61	-0.43	-0.40 [A, C]
Pitt/Spall	V1L417/P4L792	15	-2.45	7.70	-2.45	-2.51 [B, C]

[A] Level for determining shift in merits (8.0) [B] Level for determining shift in merits (9.3)
[C] Used SA standard deviation as published in the LTMS document for determining shift in merits
[D] A straight standard deviation was used. The number of tests conducted this report period was too small to calculate an accurate pooled standard deviation.

Industry Control Charts

Lubrited

Figures 1 through 4 are the lubrited industry control charts for pinion Wear, Rippling, Ridging, and Pitting/Spalling, respectively. Figures 5 through 8 are the lubrited industry control charts of the last 20 test results for pinion Wear, Rippling, Ridging, and Pitting/Spalling, respectively. There were no lubrited data to report this period due to an industry wide shortage of hardware.

Non-lubrited

Figures 9 through 12 are the non-lubrited industry control charts for pinion Wear, Rippling, Ridging, and Pitting/Spalling, respectively. Figures 13 through 16 are the non-lubrited industry control charts of the last 20 test results for pinion Wear, Rippling, Ridging, and Pitting/Spalling, respectively. Severity EWMA charts for pinion Wear and Rippling were in control this report period. The Ridging parameter triggered three severity EWMA warning alarms. The alarms do not appear to be related to any one lab, stand, gear batch, or reference oil. The Pitting/Spalling parameter triggered 15 severity EWMA alarms (two warning and 13 action alarms). The alarms were triggered by two severe test results (-29 and -7 standard deviations severe). Figure 17 is the Pitting/Spalling control chart excluding the two severe results. Precision EWMA charts for pinion Wear, Ridging, and Rippling were in control this report period. The Pitting/Spalling parameter triggered 10 precision EWMA alarms (two warning and eight action alarms). The alarms were caused by the same two severe test results (-29 and -7 standard deviations severe). Figure 17 is the Pitting/Spalling control chart excluding the two severe results.

Reference Oil Status

The following is a listing of reference oils with the expected number of tests remaining at the Test Monitoring Center and at the testing laboratories. L-37 reference oils are shipped in quantities of one gallon per test.

Oil	Number of Tests Remaining				
	Lab A	Lab B	Lab D	Lab E	TMC
127	0	1	0	1	1
134	2	3	0	0	153
151-3	2	0	4	1	*
152-1	12	11	4	9	97
153-1	8	15	8	11	79
155	5	8	5	7	**

* 0 Gallons (Multiple test area usage)
** 332 Gallons (Multiple test area usage)

TMC Lab Visits

There were four lab visits this report period. There was only one discrepancy noted. The same discrepancy was noted at all four labs. Sections 8.2.5 and 8.2.6 in the test procedure states that the carrier parts are to be lubricated with the test lubricant or non-additized neutral base oil and then drained for a minimum of 5 minutes. During the visits these two steps were not preformed as outlined in the test procedure.

Information Letters

There were no information letters issued this report period.

DML/dml

Attachments

c: ftp://ftp.astmtmc.cmu.edu/docs/gear/l37/semiannualreports/l37-10-2008.pdf
L-37 Surveillance Panel
J. L. Zalar
F. M. Farber

Distribution: Email

Listing of Tables and Figures Included as Part of This Report to the L-37 Surveillance Panel

Table 1

	L-37 Timeline	
Effective Date	Topic	IL#
19931221	Report Forms and Dictionary Version 19931209	1
19940104	Rear Cover Plate Sensor Loc.	2
19940104	Data Reporting Response Time	2
19940317	Referencing Schedule	3
19940428	Report Forms and Dictionary Version 19940422	4
19940728	Report Forms and Dictionary Version 19940707	5
19950820	Rating Scale Revision	6
19950820	Report Form 5 Wording Change	6
19950820	Report Forms and Dictionary Version 19950424	6
19960309	Rating Revisions of the Rating Scale	96-1
19960325	Rating Revisions affecting Spalling and Pitting	96-2
19960116	TMC Address	96-2
19960603	Report Forms and Dictionary Version 19960425	96-3
19960603	Revised Wording of Rating Scale	96-3
19960317	Rating Revisions to the Wear Step Area	96-4
19970825	Revised Reference Testing Frequency and Number of Tests for Stands Out of Calibration > 6 months	97-1
19980309	Report Forms and Dictionary Version 19971223	98-1
19980309	Revised Alternate Rating Method For Drive Side Pinion Gear Pitting Values on Gear Set C1L426/P4L415A	98-1
19980309	Test Reporting Clarifications	98-1
19980309	Revisions to Stand Calibration Requirements	98-2
19980309	Restrictions On Reference Oil Analysis	98-2
19980309	Reporting of Non-standard Tests to the TMC	98-2
19980309	LTMS Implementation	98-2
19980310	Report Forms and Dictionary Version 19980203	98-3
19980603	Deviation Percentage Calculation Clarification	98-4
19980901	Combining of Pitting and Spalling Ratings	98-4
19981116	Numerical Rating Precision Clarification	98-5
19990101	Developed Reference Oil Test Targets by Gear Batch (Grandfathered For All Test Starting 19950101)	
19990113	Addition of Exclusion Zone for Determining the Pitting/Spalling Result on Non-lubrited Hardware, Gear Batch V1L303/P4L514A	99-1
19990113	Deletion of Section A8.3.5	99-1
19990503	Updated Reference oil 128-1 Targets (18 Tests), Gear Batch V1L303/P4L514A (Grandfathered For All Test Starting 19950101)	
19990510	Revisions to Precision and Bias Statement	99-2
19990728	Cover Plate Thermocouple Location	99-3
20000613	Root/Tip Polishing Comment for V1L686/P4L626A Non-lubrited Gears	00-1, Sequence No. 20
20000613	Pitting/Spalling Table A9.1 Clarifications	00-1, Sequence No. 20
20001001	CRC Reference Photography of Gear Distress Photographs	00-2, Sequence No. 21
20001115	Correction Factor for V1L686/P4L626A Lubrited Gears	01-1, Sequence No. 22
20010612	Ring Correction Factor for V1L686/P4L626A Lubrited Gears	01-2, Sequence No. 23
20011101	Addition of Annex 12 Addressing Distress Rating Exclusion Comments	01-2, Sequence No. 23
20011101	Revised Report Forms	01-2, Sequence No. 23
20020101	CRC Rating Manual 21	02-1, Sequence No. 24
20020211	Revised Report Forms and Data Dictionary	02-1, Sequence No. 24
20020211	Rating With Magnification	02-2, Sequence No. 25

Table 1 (Continued)

	L-37 Timeline	
Effective Date	Topic	IL#
20030401	Rater Calibration Monitoring System	03-1, Sequence No. 26
20030327	Revised Wear Rating Definitions	03-2, Sequence No. 27
20030421	Deletion of Catastrophic Distress Levels for Wear, Rippling, and Ridging	03-3, Sequence No. 28
20030421	Non-interpretable Tests	03-3, Sequence No. 28
20030421	Tooth Breakage	03-3, Sequence No. 28
20030421	Rating Corrosion On Ring and Pinion	03-3, Sequence No. 28
20030909	Addition of SAE J2360 As a Reference Document	03-4, Sequence No. 29
20030909	Revised Speed Specification for Balancing Dynamometer Connecting Shafts	03-4, Sequence No. 29
20030909	Revised Speed Specification for Balancing Drive Shafts	03-4, Sequence No. 29
20030909	Revised Test Axle Preparation	03-4, Sequence No. 29
20030909	Revised Note 1	03-4, Sequence No. 29
20030909	Discontinue Optional Inspection of Gear Set	03-4, Sequence No. 29
20030909	Shutdown and Downtime Revisions	03-4, Sequence No. 29
20030909	Recording Test Parameters	03-4, Sequence No. 29
20030909	New Note 2 for Gear Test Phase Conditions	03-4, Sequence No. 29
20040101	Revised Cleaning Solvent Specification	03-4, Sequence No. 29
20040630	Standardization Revisions	04-1, Sequence No. 30
20040825	Lubrited Hardware, Gear Batch V1L686/P4L626A Correction Factor	04-1, Sequence No. 30
20040917	Intermediate Precision and Reproducibility Revisions	04-1, Sequence No. 30
20040922	Drive Shaft Wall Thickness	04-2, Sequence No. 31
20040922	Alternating Lubrited and Non-lubrited Hardware	04-2, Sequence No. 31
20041115	Revised Drive Shaft and Axle Shaft Specifications	04-3, Sequence No. 32
20041115	Revised Drawing for the Spray Nozzles Location	04-3, Sequence No. 32
20050204	Non-lubrited Hardware, Gear Batch V1L351/P4T771 Approval	
20050218	Revise Solvent Specification	05-1, Sequence No. 33
20050218	Donated Reference Oil Test Programs/Calibration Period Length Adjustment	05-1, Sequence No. 33
20050504	Updated Test Precision	05-2, Sequence No. 34
20050504	Rounding Test Results Using ASTM E 29	05-2, Sequence No. 34
20060215	Correction Factor for L247/T758A Gear Batch (Canadian Version Tests Only)	06-1, Sequence No. 35
20070627	Revised Calibration Requirement	07-1, Sequence No. 36
20071213	Revised Backlash Measurement Procedure	07-2, Sequence No. 37

Table 2

Severity Summary for This Report Period by Laboratory, Hardware, and Gear Batch

Mean Δ/s (NON-LUBRITED HARDWARE)																
	Wear				Ridging				Rippling				Pitt/Spall			
	Lab A	Lab B	Lab D	Lab E	Lab A	Lab B	Lab D	Lab E	Lab A	Lab B	Lab D	Lab E	Lab A	Lab B	Lab D	Lab E
V1L417/ P4L792	-0.34	-0.37	-0.09	0.14	-0.89	-0.79	-0.99	-0.16	-0.44	0.01	-0.55	-0.80	-0.05	0.13	-5.98	-2.42

Table 3
Lost Tests Summary

Tests declared operationally invalid or aborted are summarized below by laboratory, reason, number of lost tests, and percent of lost tests:

LAB	REASON	Tests Lost
D	Test aborted due to dyno controller malfunction.	1

Figure 1

L−37 LUBRITED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR WEAR

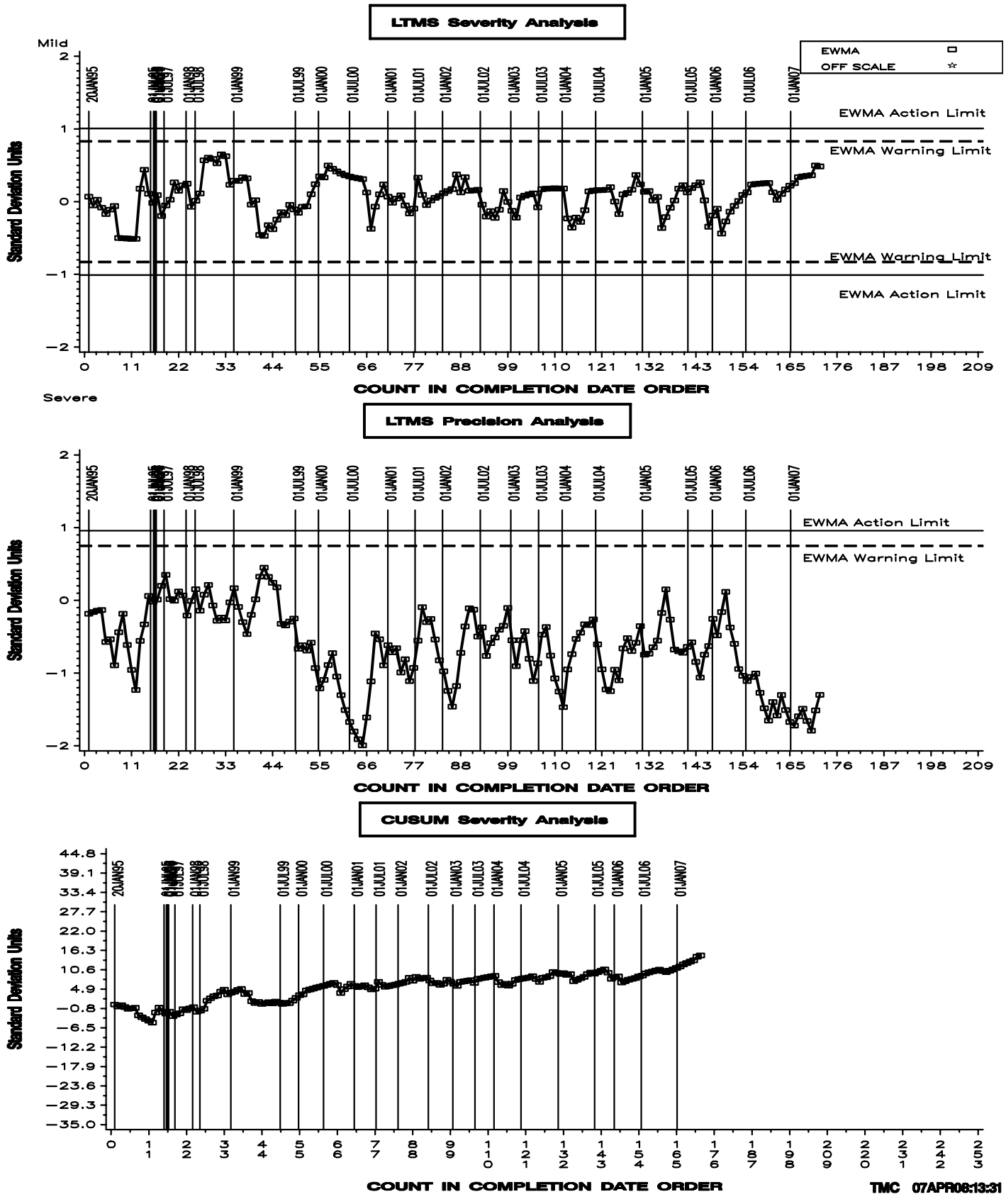
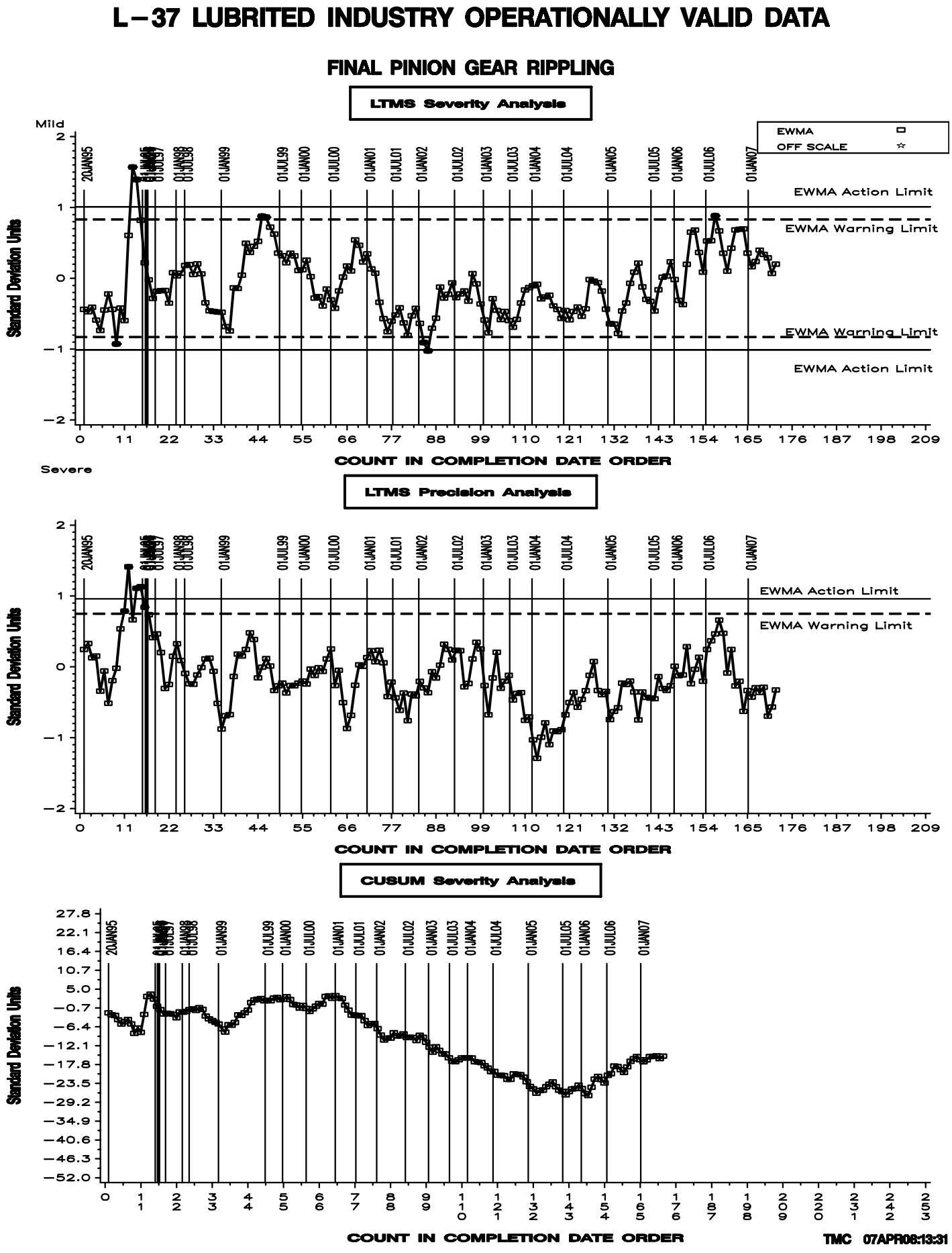


Figure 2


L-37 LUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR RIPPLING
LTMS Severity Analysis
Mild
Severe
Standard Deviation Units
EWMA
OFF SCALE
EWMA Action Limit
EWMA Warning Limit
EWMA Warning Limit
EWMA Action Limit
20JAN95
01JAN97
01JUN97
01JAN98
01JUL98
01JAN99
01JUL99
01JAN00
01JUL00
01JAN01
01JUL01
01JAN02
01JUL02
01JAN03
01JUL03
01JAN04
01JUL04
01JAN05
01JUL05
01JAN06
01JUL06
01JAN07
COUNT IN COMPLETION DATE ORDER
LTMS Precision Analysis
EWMA Action Limit
EWMA Warning Limit
COUNT IN COMPLETION DATE ORDER
CUSUM Severity Analysis
COUNT IN COMPLETION DATE ORDER
TMC 07APR08:13:31

L-37 LUBRITED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR RIDGING

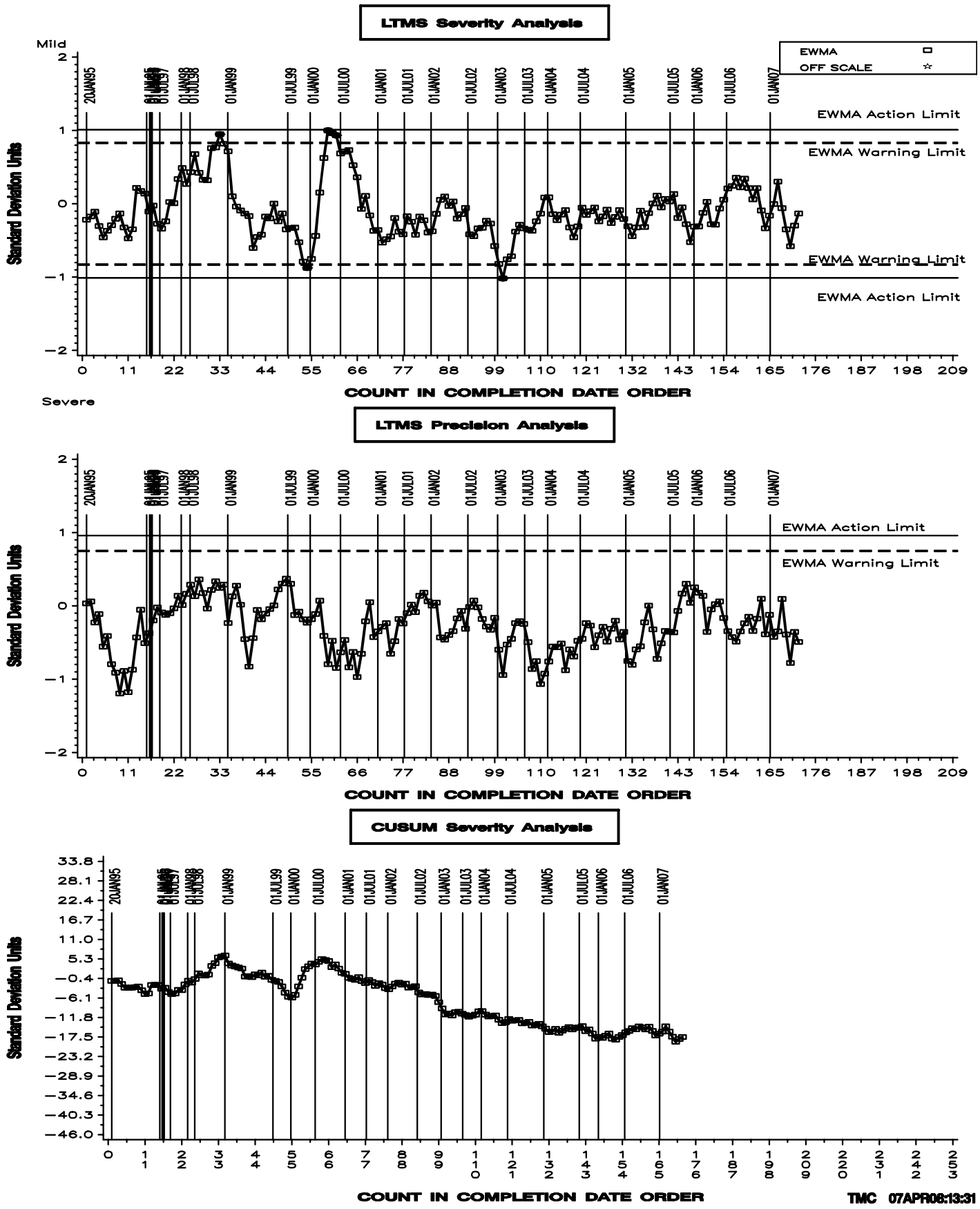


Figure 4

L-37 LUBRITED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR PITTING/SPALLING

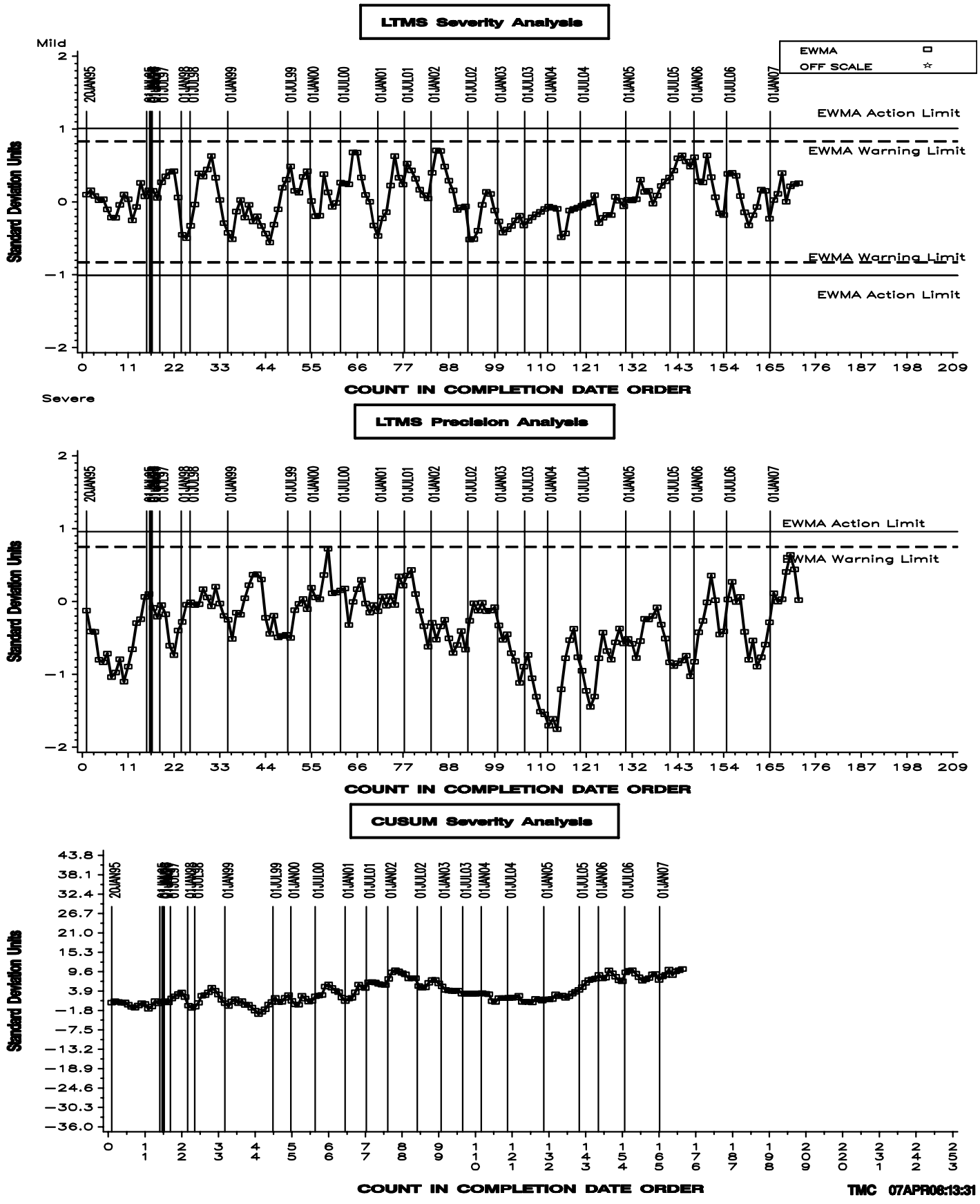


Figure 5

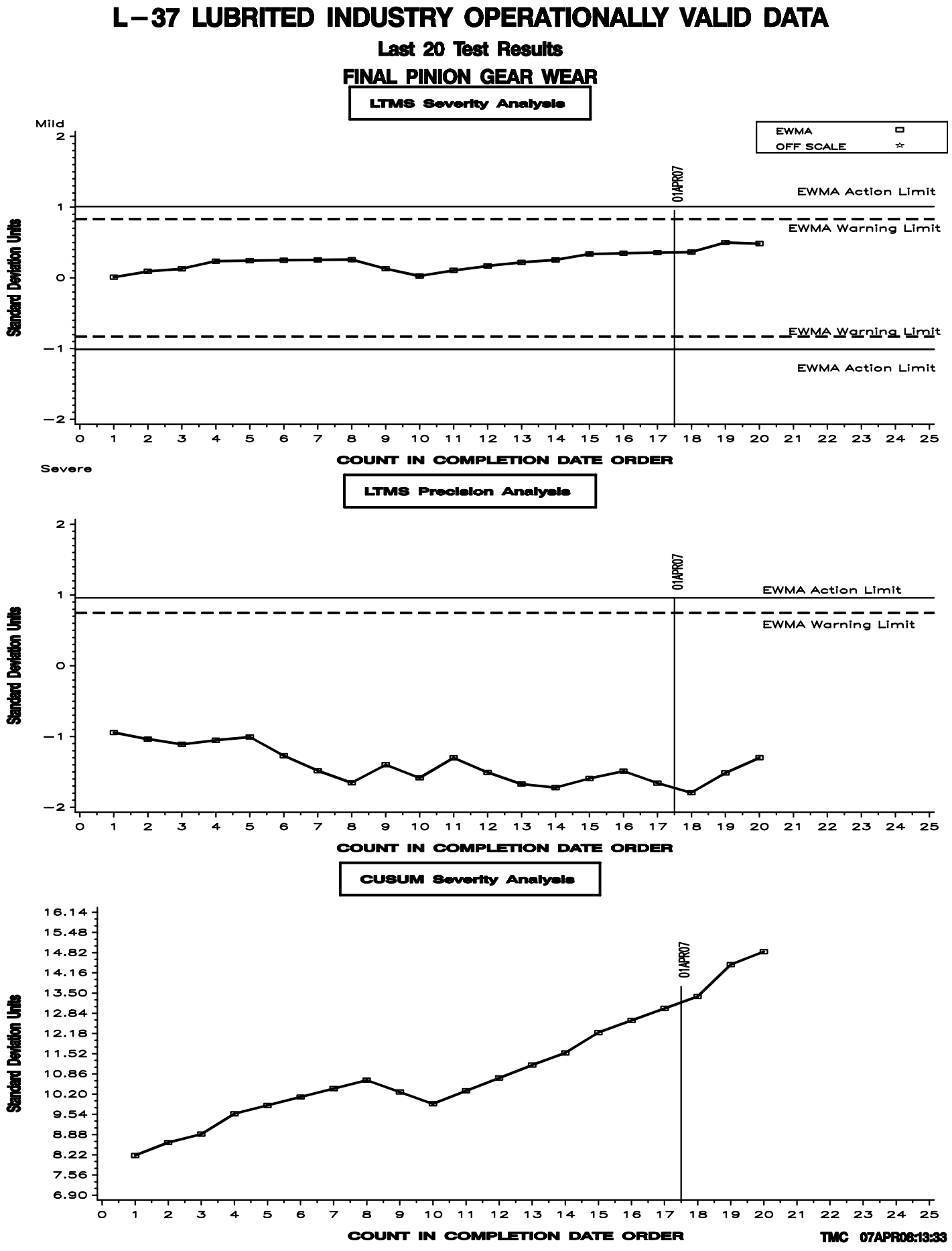
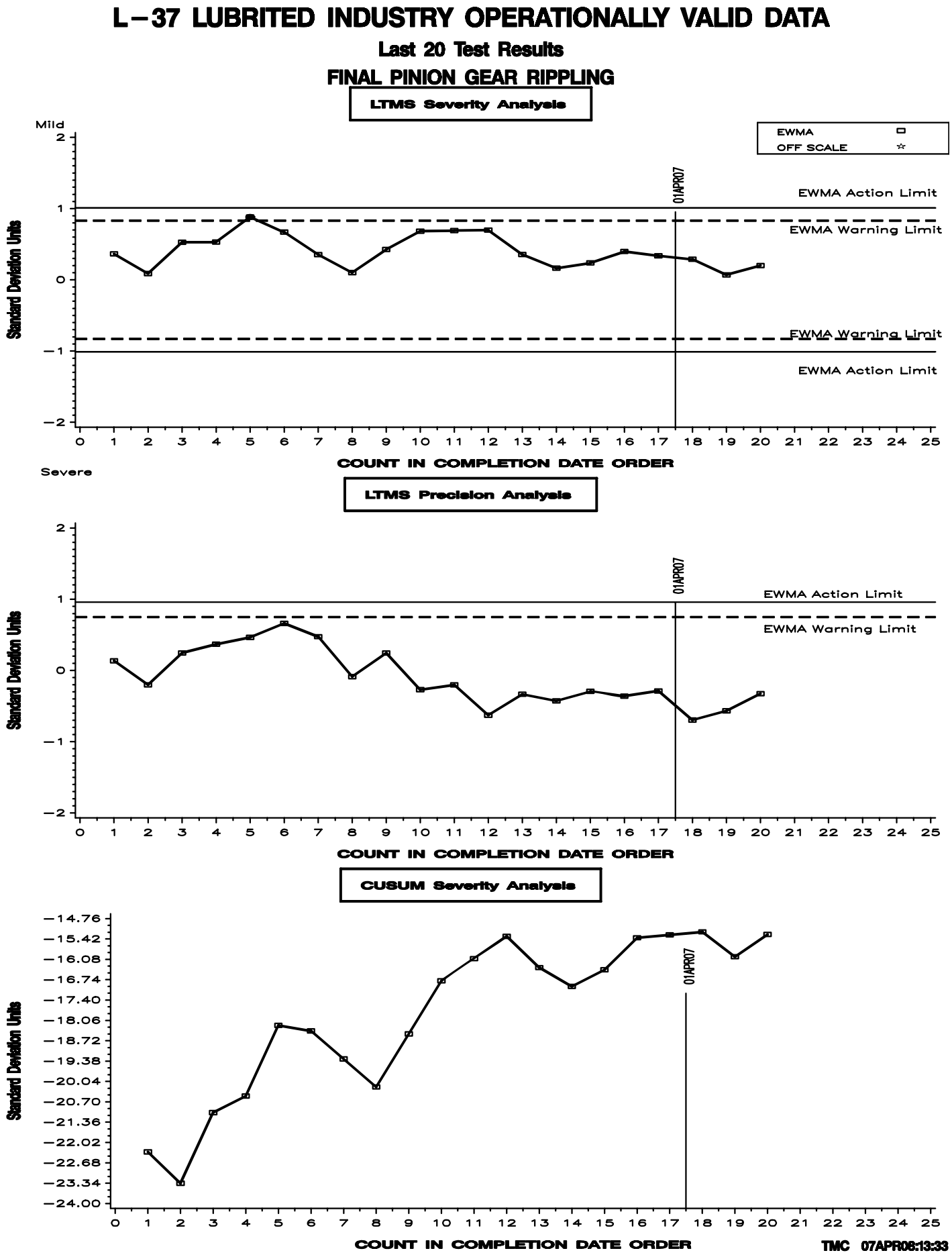

L-37 LUBRITED INDUSTRY OPERATIONALLY VALID DATA
Last 20 Test Results
FINAL PINION GEAR WEAR
LTMS Severity Analysis
Mild
Severe
Standard Deviation Units
EWMA
OFF SCALE
01APR07
EWMA Action Limit
EWMA Warning Limit
EWMA Warning Limit
EWMA Action Limit
COUNT IN COMPLETION DATE ORDER
LTMS Precision Analysis
Standard Deviation Units
01APR07
EWMA Action Limit
EWMA Warning Limit
COUNT IN COMPLETION DATE ORDER
CUSUM Severity Analysis
Standard Deviation Units
01APR07
COUNT IN COMPLETION DATE ORDER
TMC 07APR08:13:33

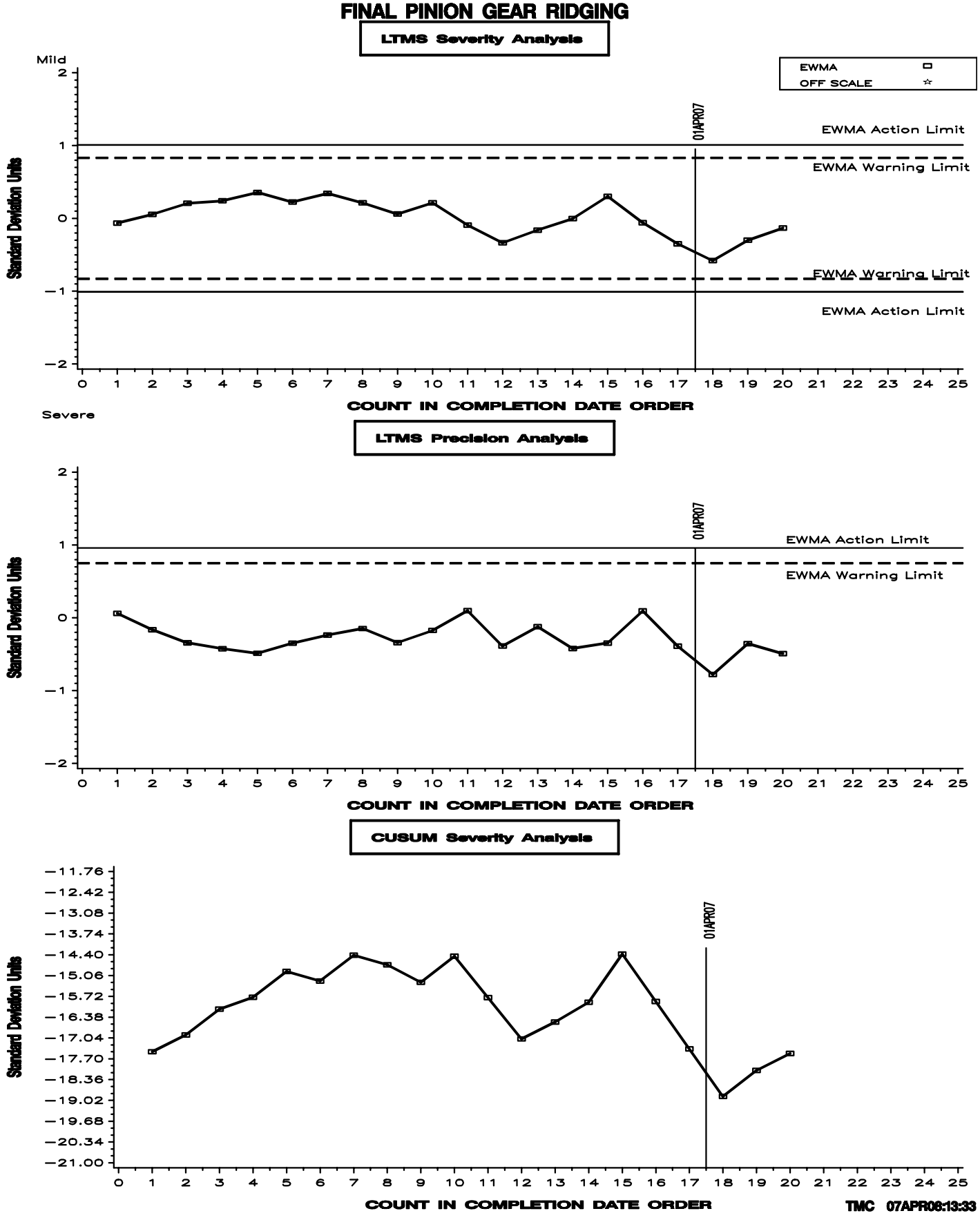
Figure 6


L-37 LUBRITED INDUSTRY OPERATIONALLY VALID DATA
Last 20 Test Results
FINAL PINION GEAR RIPPLING
LTMS Severity Analysis
Mild
EWMA
OFF SCALE
01APR07
EWMA Action Limit
EWMA Warning Limit
EWMA Warning Limit
EWMA Action Limit
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
Severe
LTMS Precision Analysis
CUSUM Severity Analysis
TMC 07APR08:13:33

L-37 LUBRITED INDUSTRY OPERATIONALLY VALID DATA

Last 20 Test Results

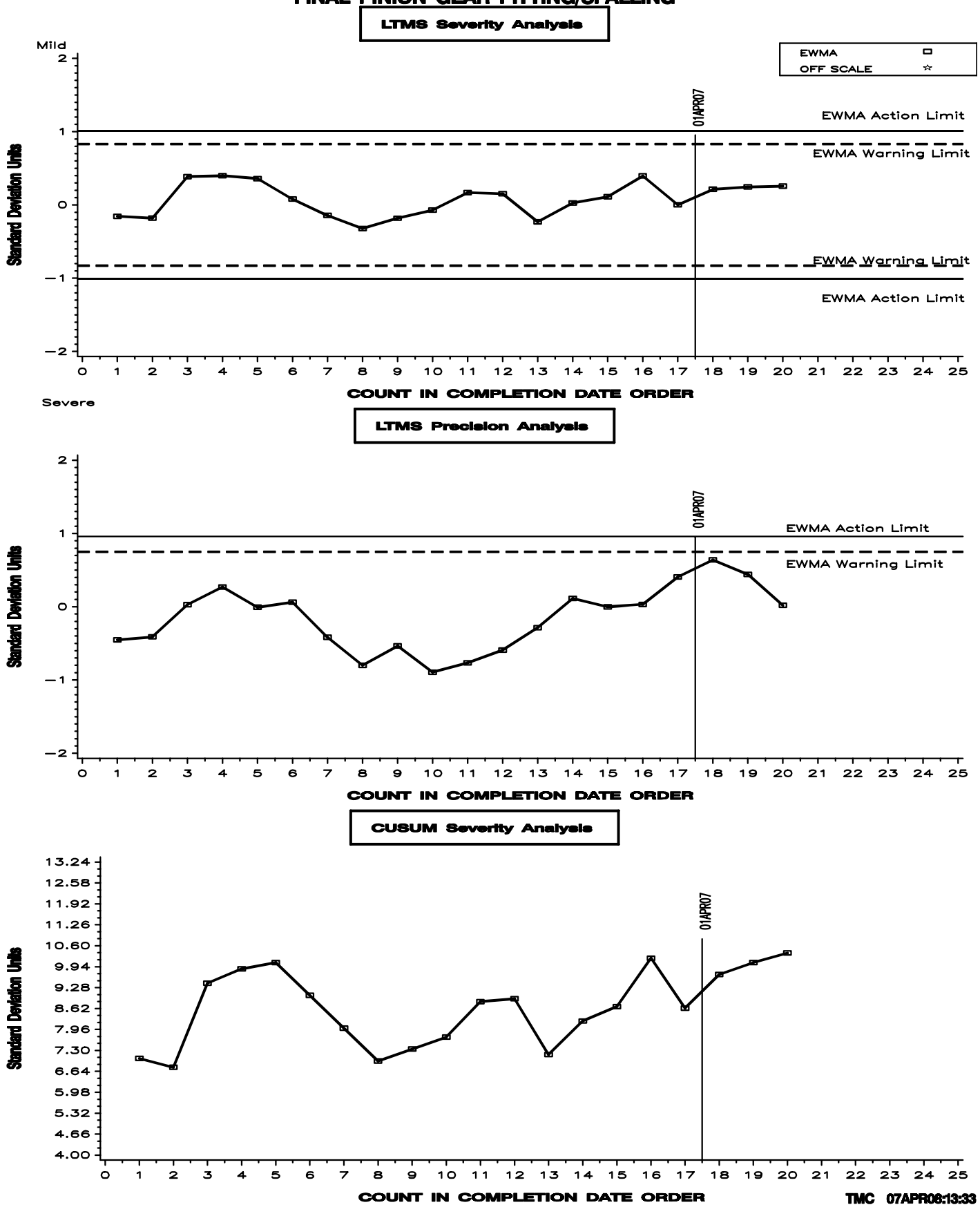
FINAL PINION GEAR RIDGING



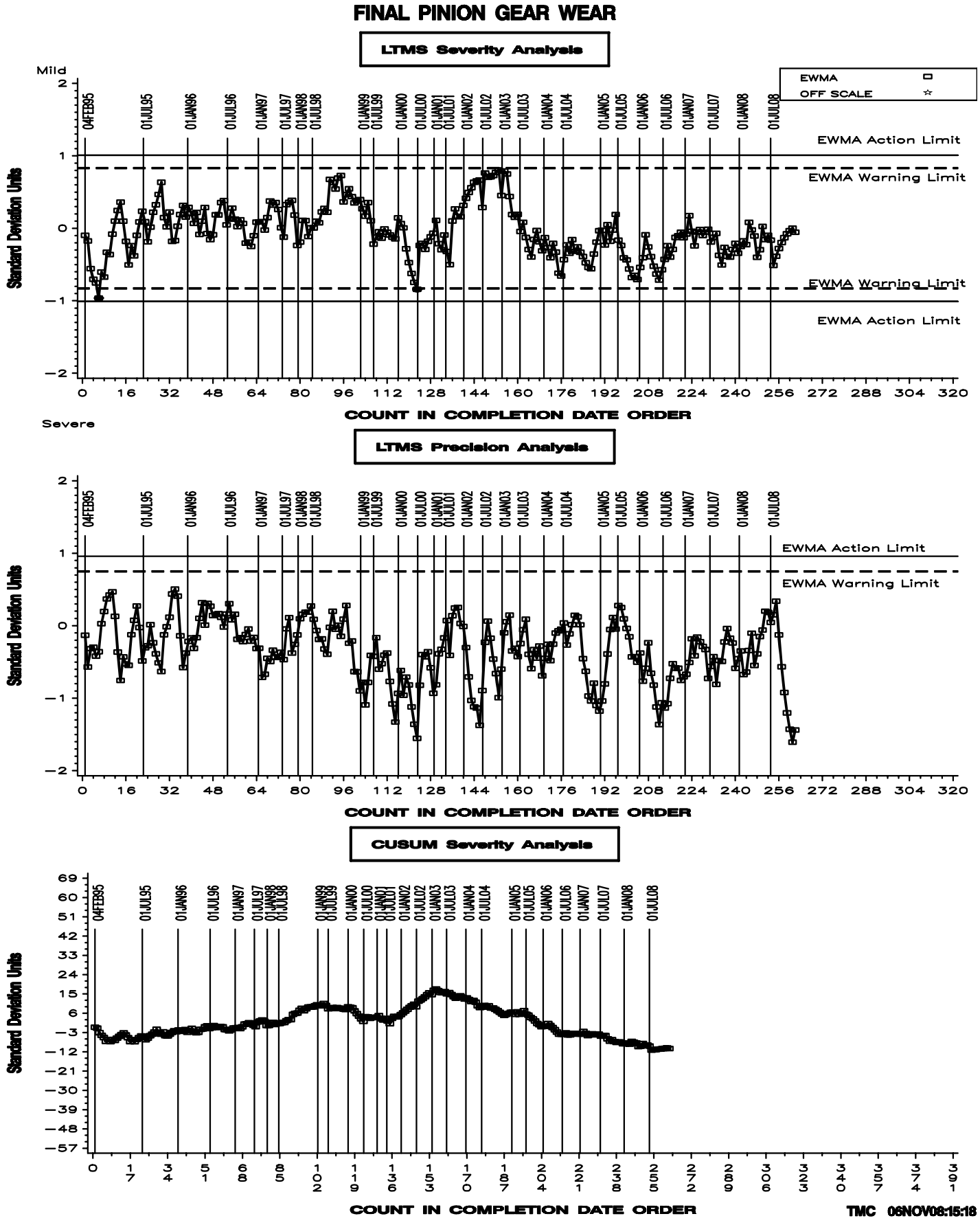
L-37 LUBRITED INDUSTRY OPERATIONALLY VALID DATA

Last 20 Test Results

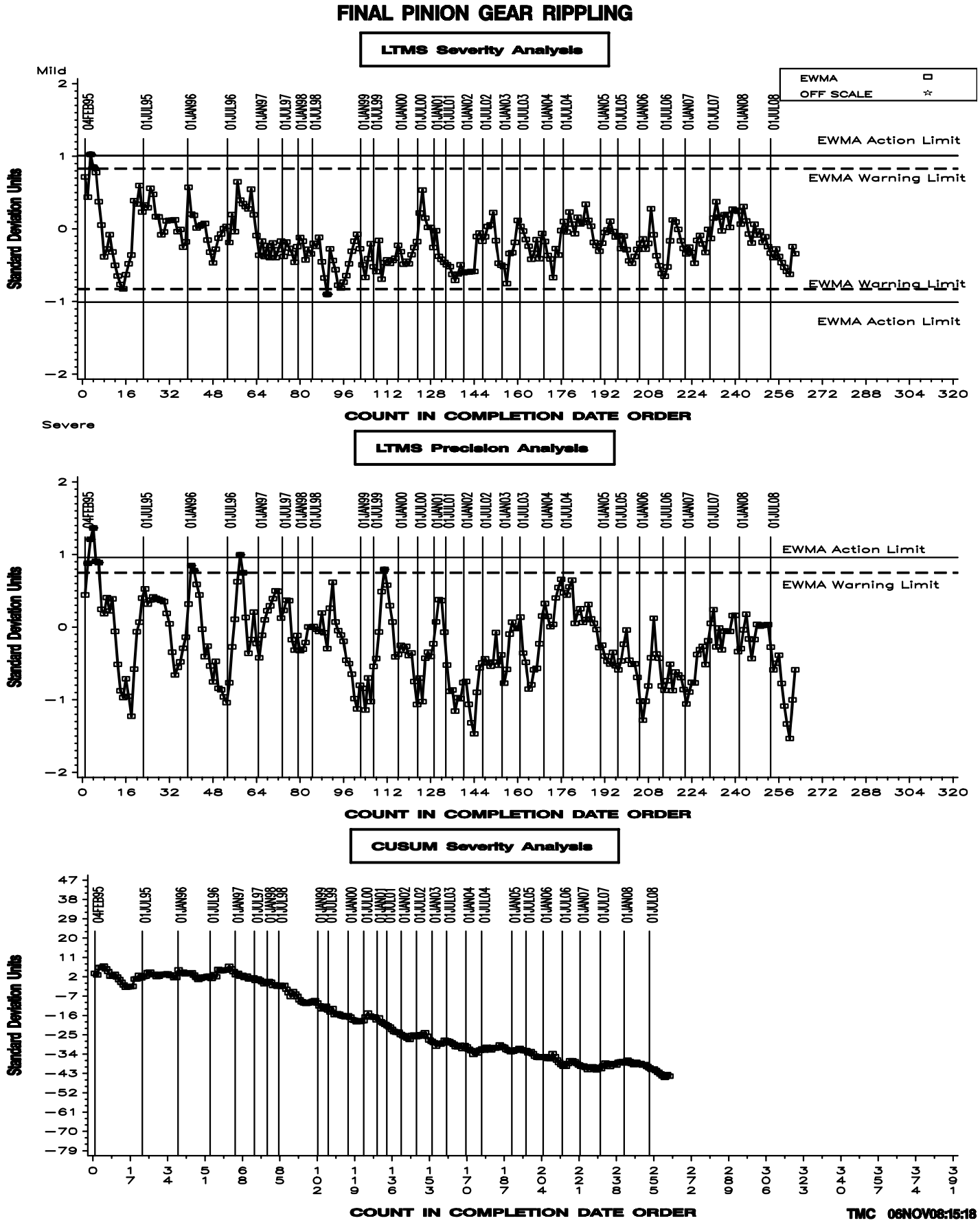
FINAL PINION GEAR PITTING/SPALLING



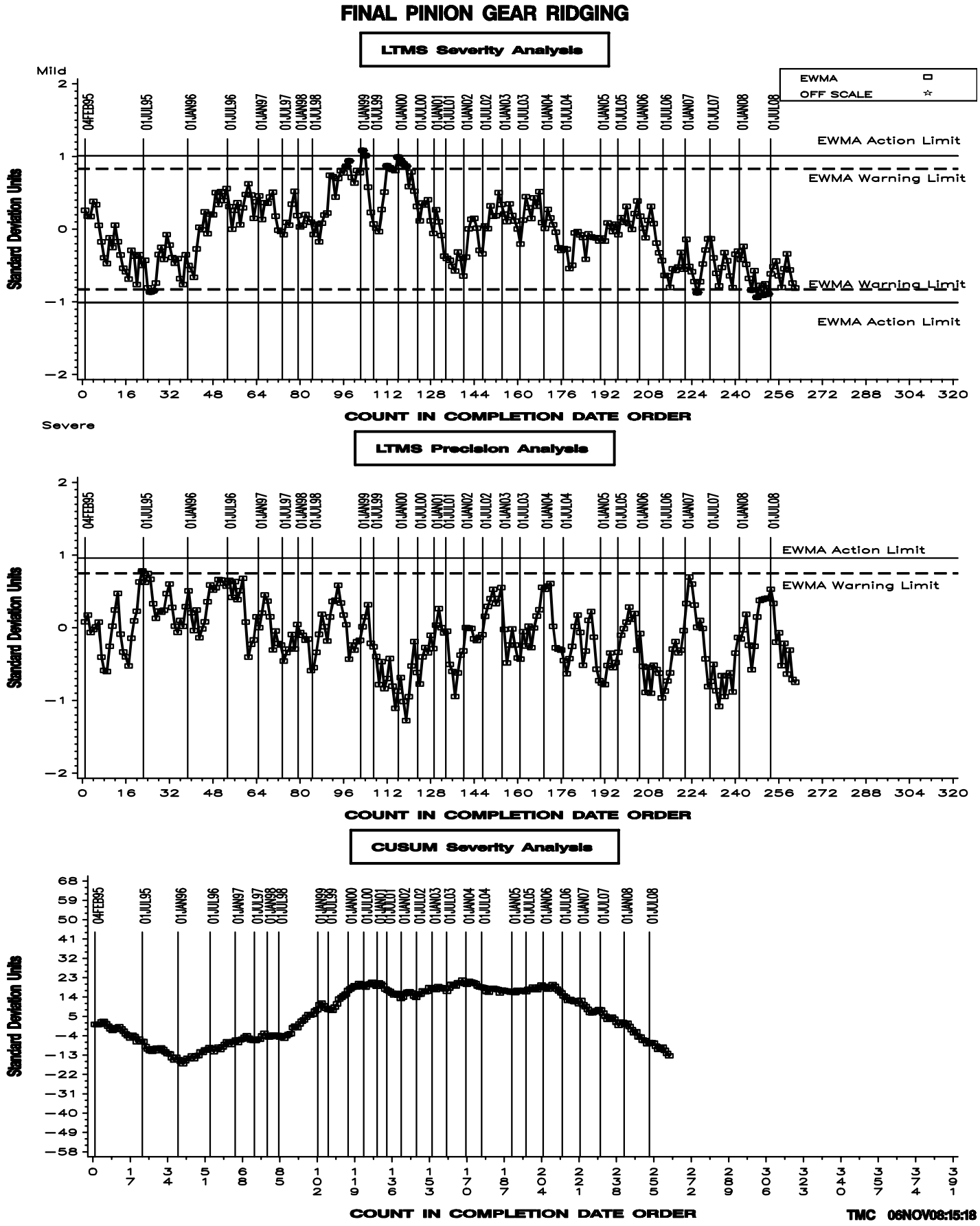
L-37 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA



L-37 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA



L-37 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA



L-37 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA

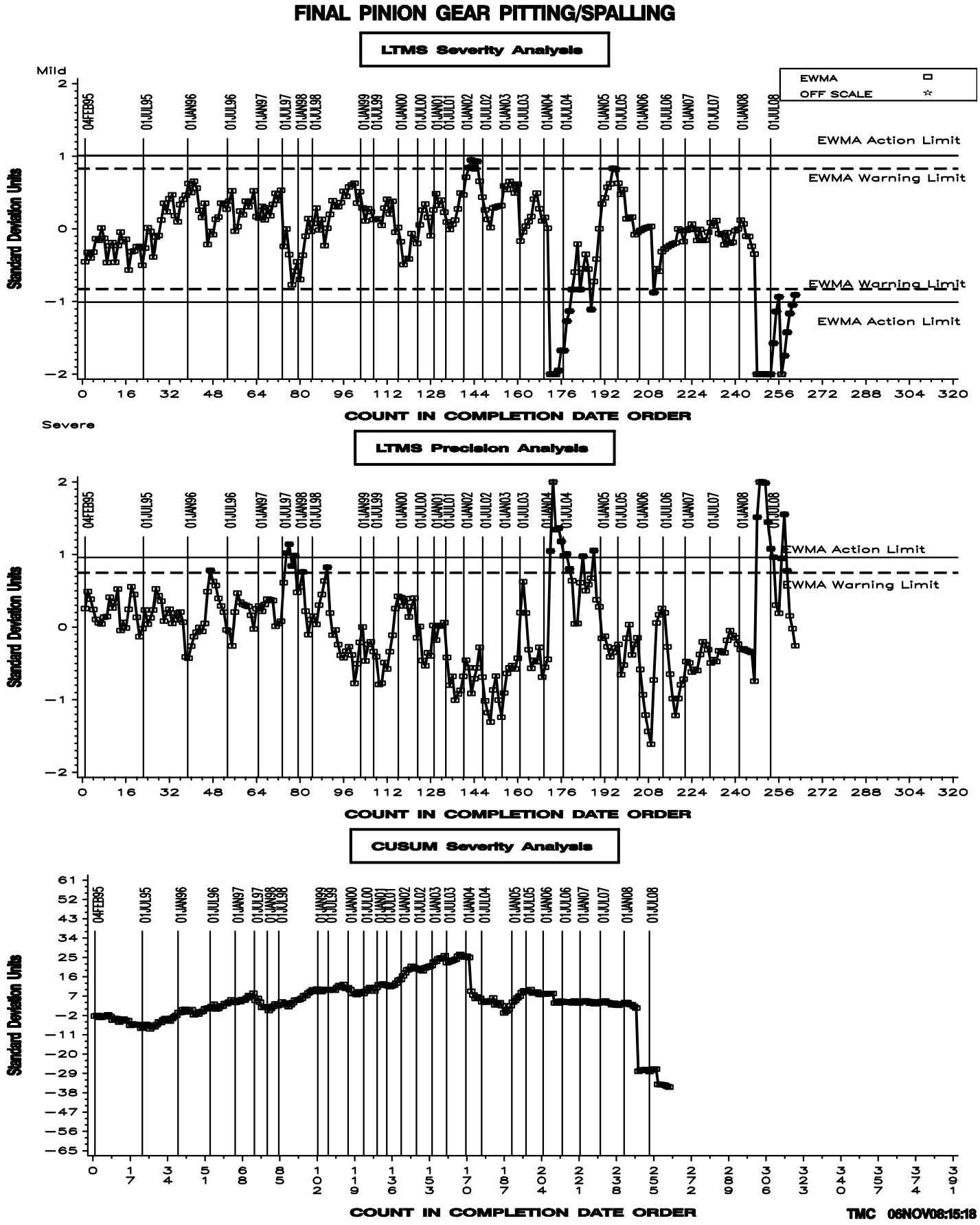


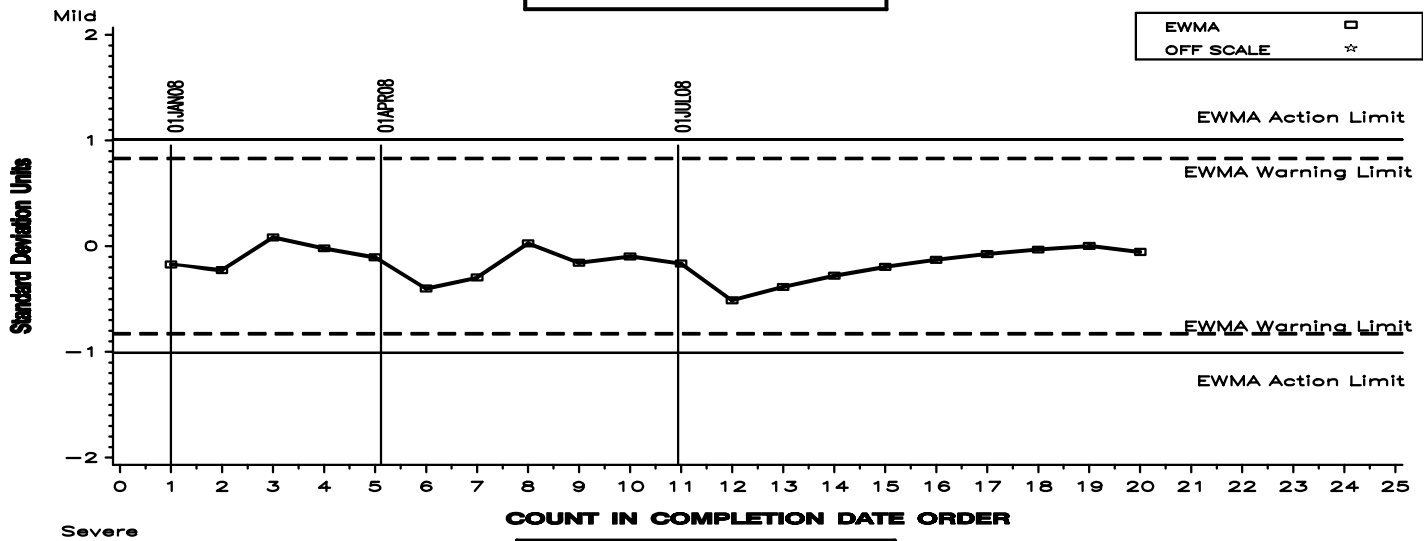
Figure 13

L−37 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA

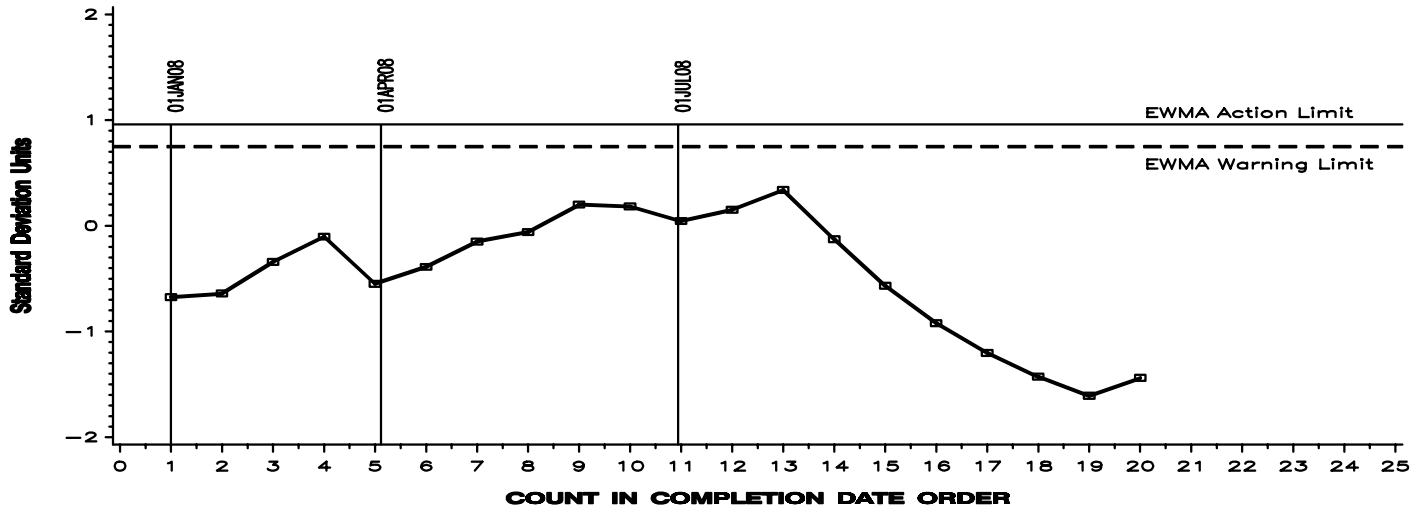
Last 20 Test Results

FINAL PINION GEAR WEAR

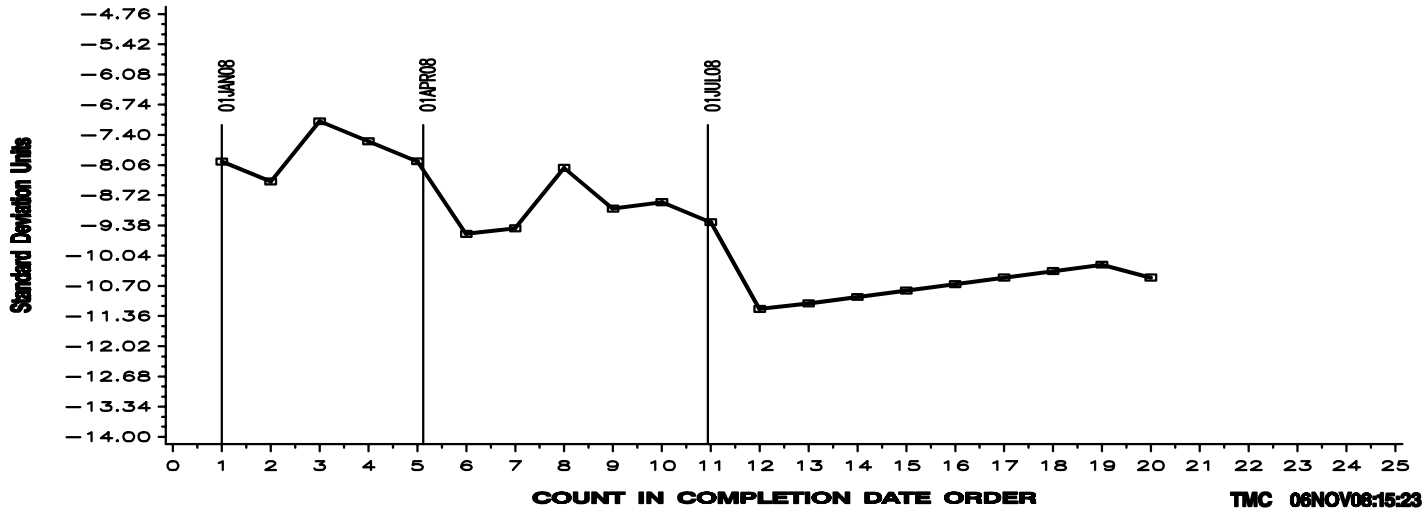
LTMS Severity Analysis



LTMS Precision Analysis



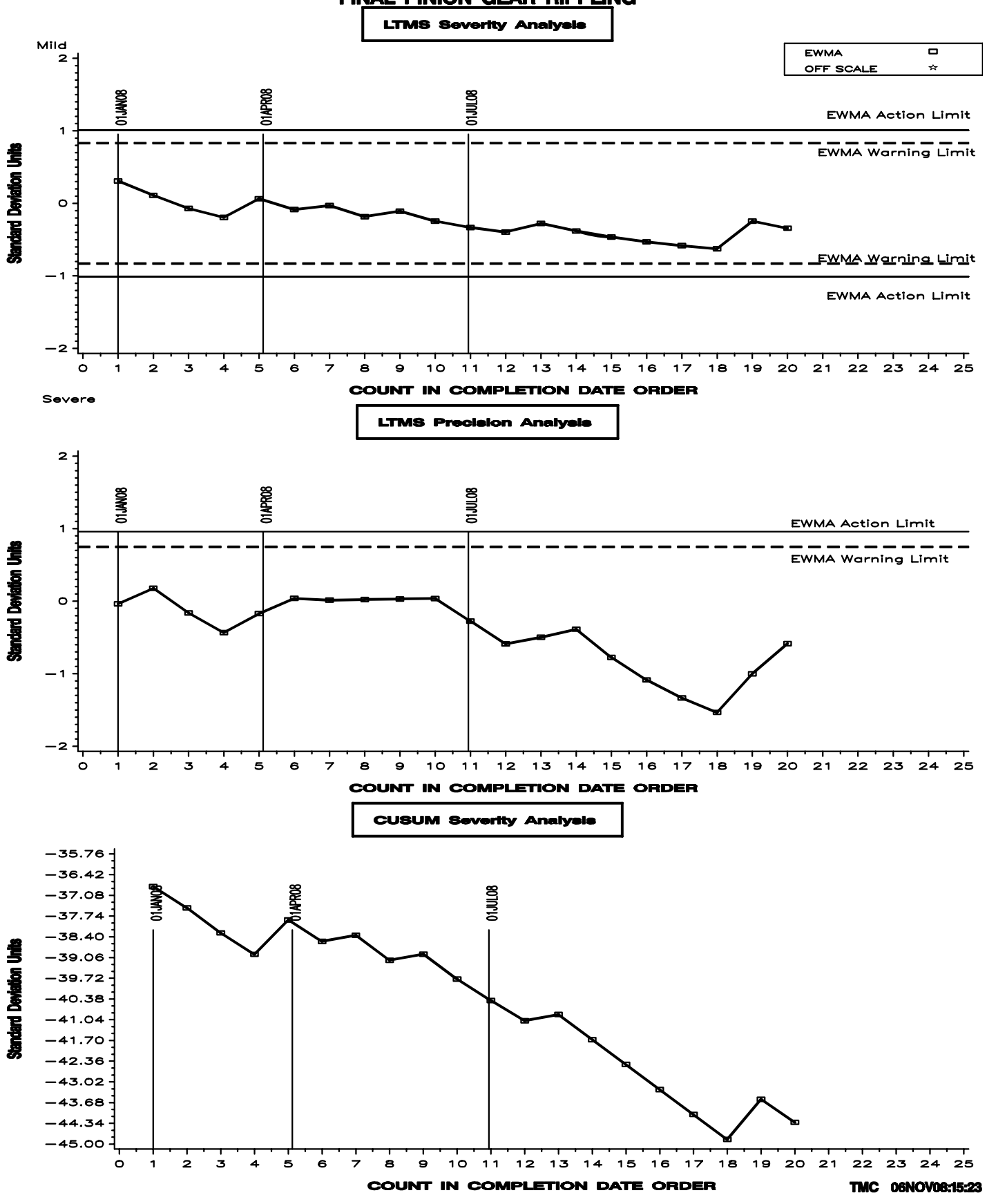
CUSUM Severity Analysis



L−37 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA

Last 20 Test Results

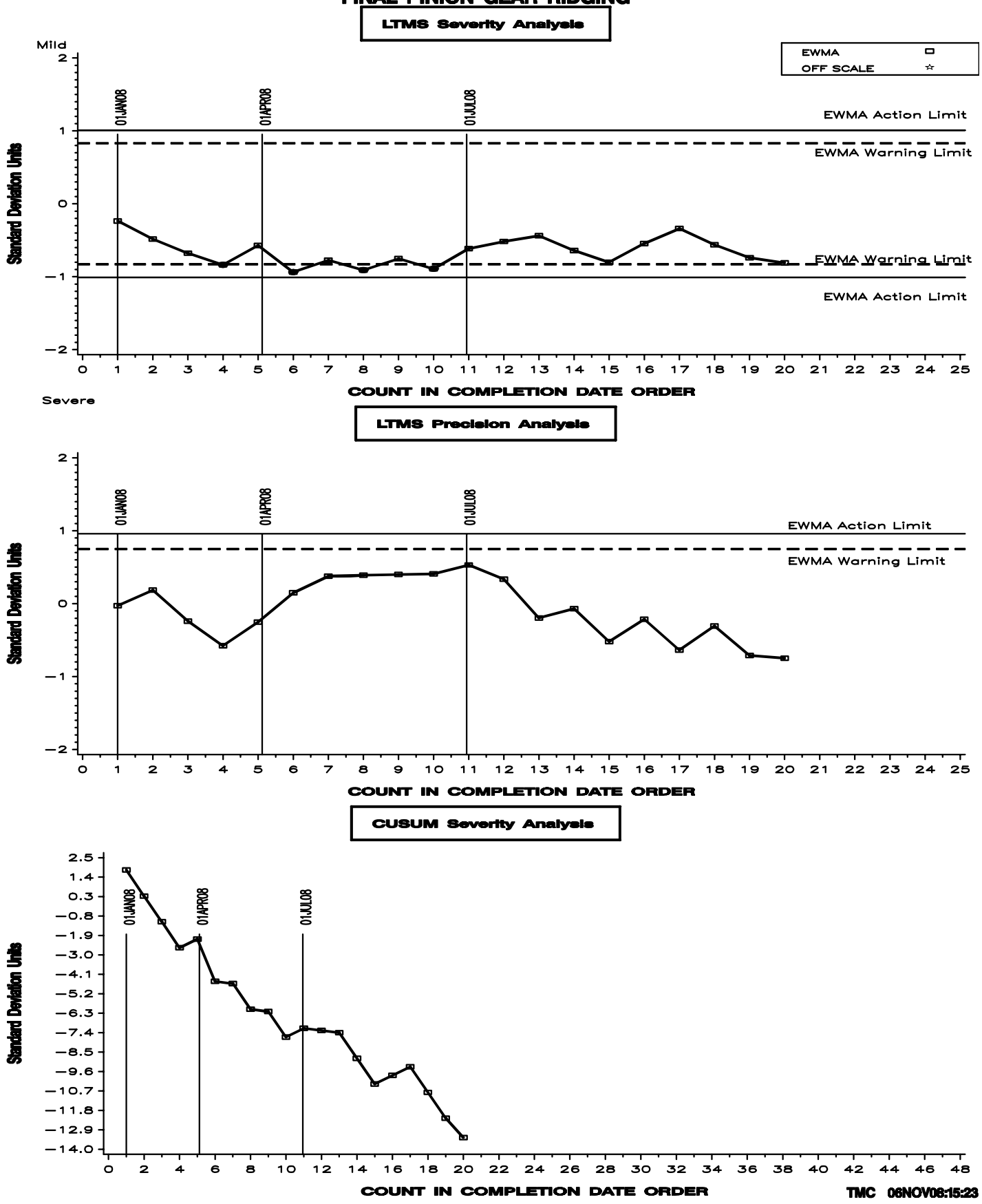
FINAL PINION GEAR RIPPLING



L-37 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA

Last 20 Test Results

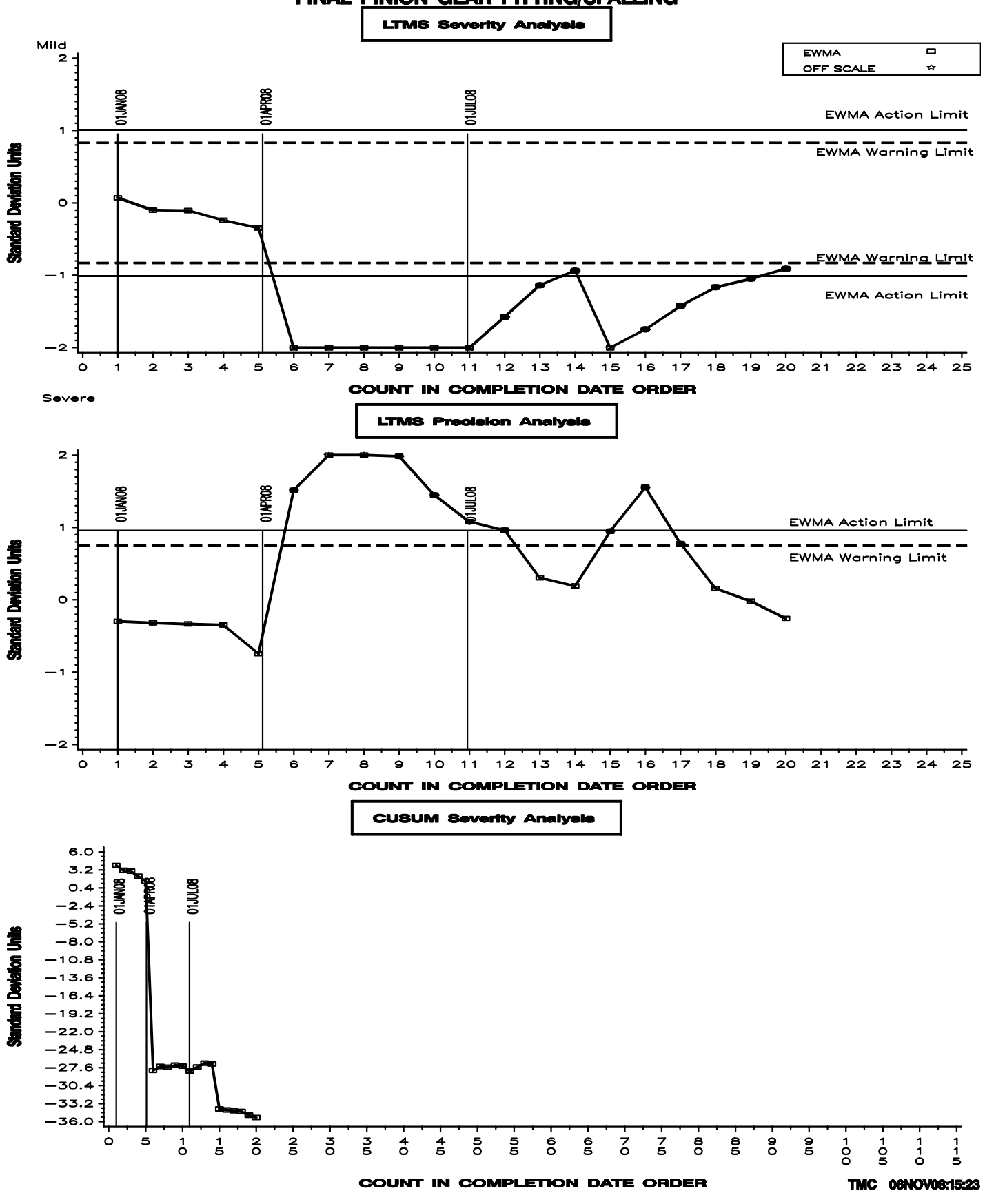
FINAL PINION GEAR RIDGING



L−37 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA

Last 20 Test Results

FINAL PINION GEAR PITTING/SPALLING



L-37 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA

Last 20 Test Results With The Two Severe Results Excluded

FINAL PINION GEAR PITTING/SPALLING