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Test Monitoring Center

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

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

MEMORANDUM: 12-008

DATE: April 27, 2012

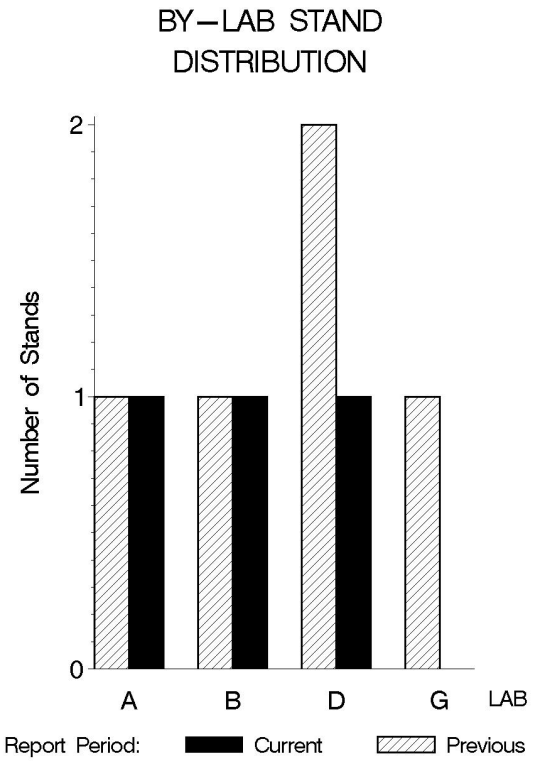
TO: Wes Venhoff, Chairman, L-37 Surveillance Panel

FROM: Scott Parke

SUBJECT: L-37 Testing from October 1, 2011 through March 31, 2012

A total of 7 L-37 tests were reported to the Test Monitoring Center during the period from October 1, 2011 through March 31, 2012. Following is a summary of testing activity this period.

	Reporting Data	Calibrated on 3-31-12
Number of Labs	3	3
Number of Stands	3	3

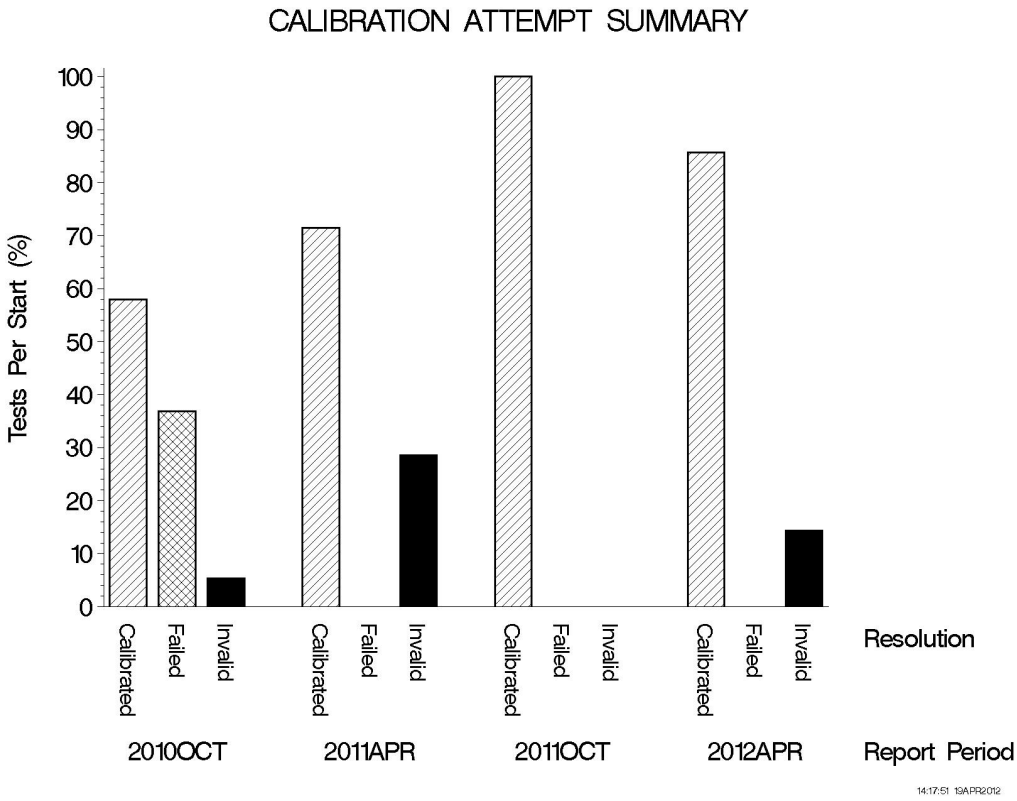


Test Distribution by Oil and Validity

		134	152-1	153-1	155	Totals Last Period	Totals This Period
Accepted for calibration	AC	0	4	0	2	11	6
Rejected (Mild)	OC	0	0	0	0	0	0
Rejected (Severe)	OC	0	0	0	0	0	0
Rejected (Precision)	OC	0	0	0	0	0	0
Invalidated	LC	1	0	0	0	0	1
Unacceptable hardware approval	MI	0	0	0	0	0	0
Acceptable hardware approval run	NI	0	0	0	0	22	0
Total		1	4	0	2	33	7

Calibration Attempt Detail

	Gear Batch	Acceptable	Failed	Total
LUBRITED	none	0	0	0
	Total	0	0	0
NONLUBRITED	V1L417/P4L792	0	0	0
	V1L500/P4T813	6	0	6
	Total	6	0	6


CALIBRATION ATTEMPT SUMMARY
Tests Per Start (%)
100
90
80
70
60
50
40
30
20
10
0
Calibrated
Failed
Invalid
Resolution
2010OCT
2011APR
2011OCT
2012APR
Report Period
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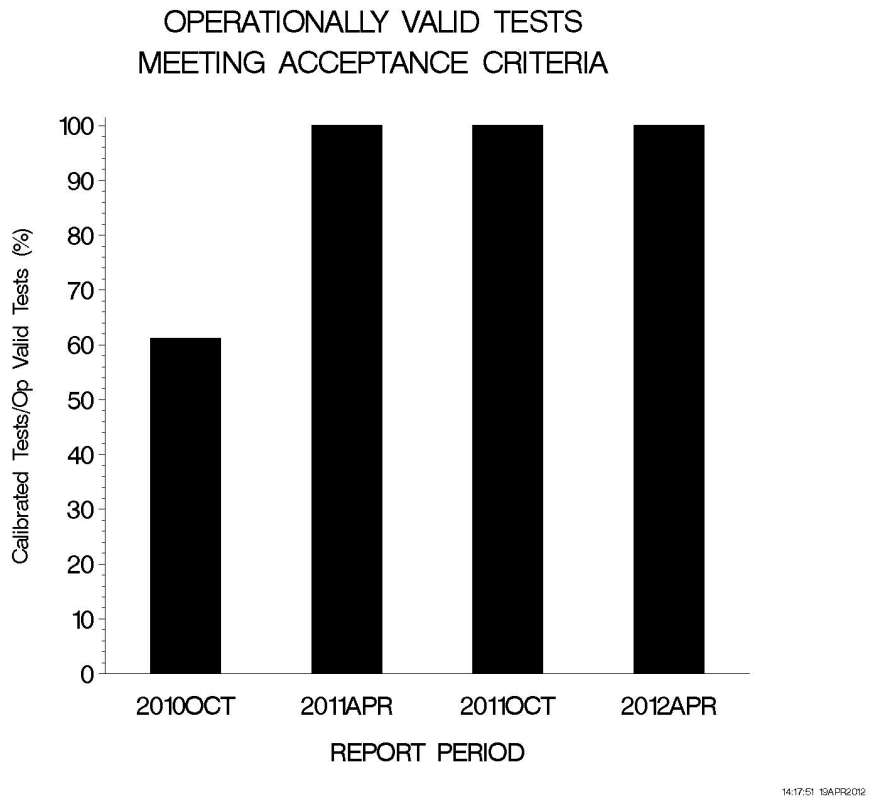
OPERATIONALLY VALID TESTS
MEETING ACCEPTANCE CRITERIA
Calibrated Tests/Op Valid Tests (%)
100
90
80
70
60
50
40
30
20
10
0
2010OCT
2011APR
2011OCT
2012APR
REPORT PERIOD
14:17:51 19APR2012

CAUSES FOR LOST TESTS:

		Oil				Validity			Loss Rate		
		134	152-1	153-1	155	LC	RC	XC	Lost	Starts	%
Lab	LUBRITED								0	0	0%
	None								0	0	0%
Lab	NONLUBRITED	1	0	0	0	1	0	0	1	7	14%
B	Invalid oil run.	●				●			1	4	25%
	Lost	1	0	0	0	1	0	0			
	Starts	1	4	0	2	7	7	7			
	%	100%	0%	0%	0%	14%	0%	0%			

GEAR BATCH SEVERITY:

The mean Δ/s by gear batch, overall mean Δ/s, and shift in merits for the operationally valid, non-lubrited calibration tests reported this period are tabulated below. No lubrited tests were completed this period due to an industry-wide shortage of lubrited hardware.

NON-LUBRITED HARDWARE						
Gear Batch	Parameter	N	Δ/s	s[A]	Overall Δ/s	Overall Shift (in Merits)[B]
V1L500/P4T813	Ridging	6	0.348	0.668	0.348	0.232
	Rippling	6	0.261	1.098	0.261	0.145
	Spall/Pit	6	0.399	0.065	0.399	0.338
	Wear	6	0.392	1.000	0.392	0.279

[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.

LAB SEVERITY:

Hardware	Gear Batch	Lab	N	Ridging	Rippling	Spall/Pit	Wear
Non-lubrited	V1L500/P4T813	A	1	-0.118	-0.676	0.484	-0.911
		B	3	0.590	1.261	0.399	1.036
		D	2	0.218	-0.771	0.357	0.077

INDUSTRY CONTROL CHARTS:

The industry control charts begin on the following page.

Both precision and severity performance for all parameters on both lubrited and non-lubrited hardware are currently performing within control chart alarm limits.

L-37 LUBRITED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR WEAR

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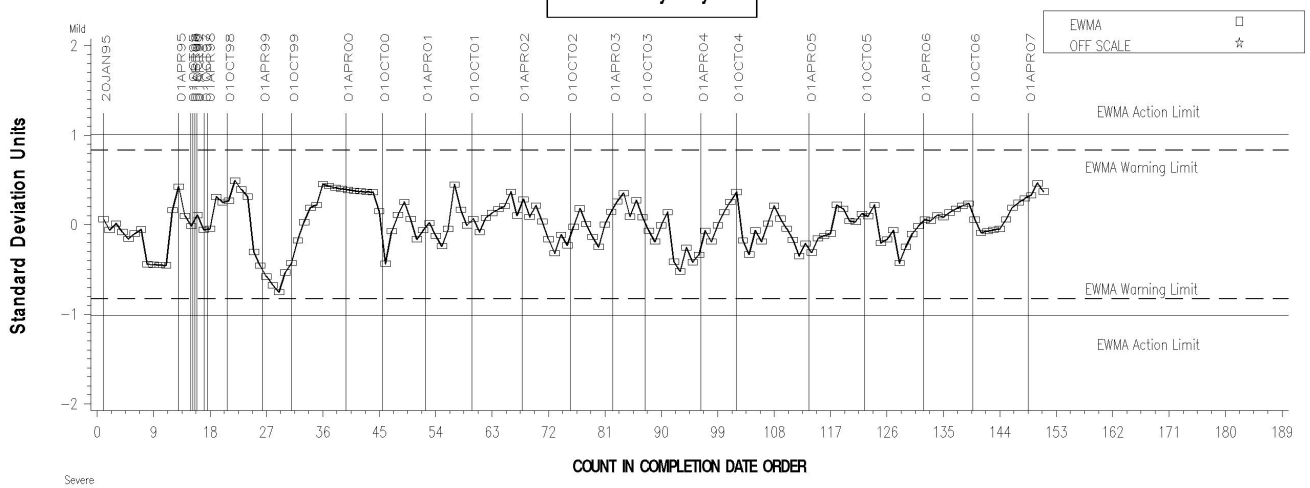
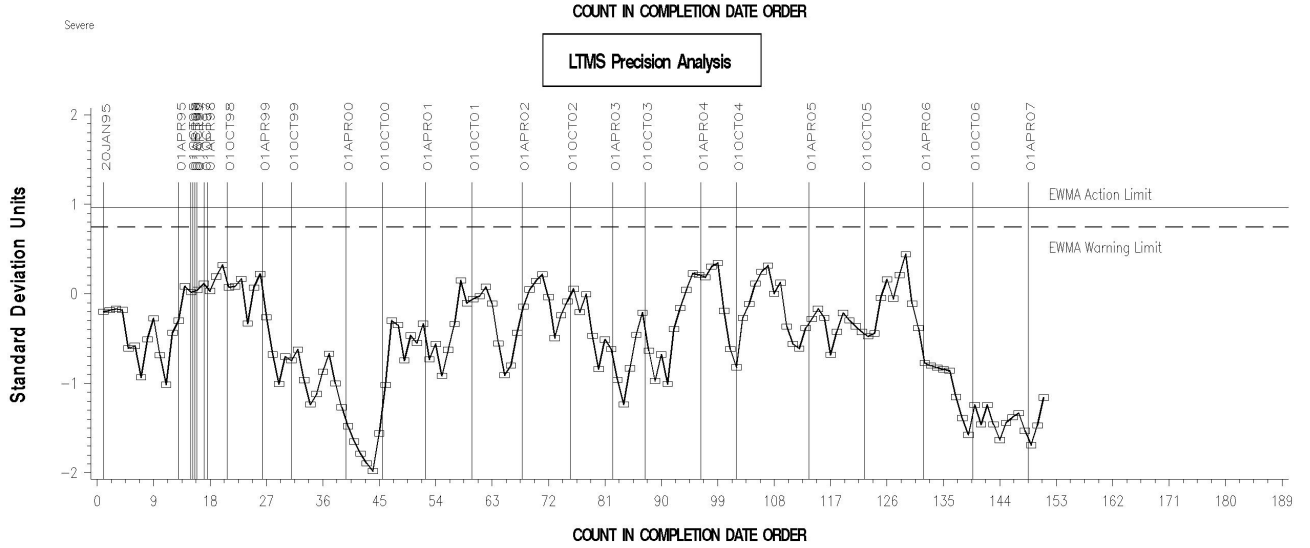
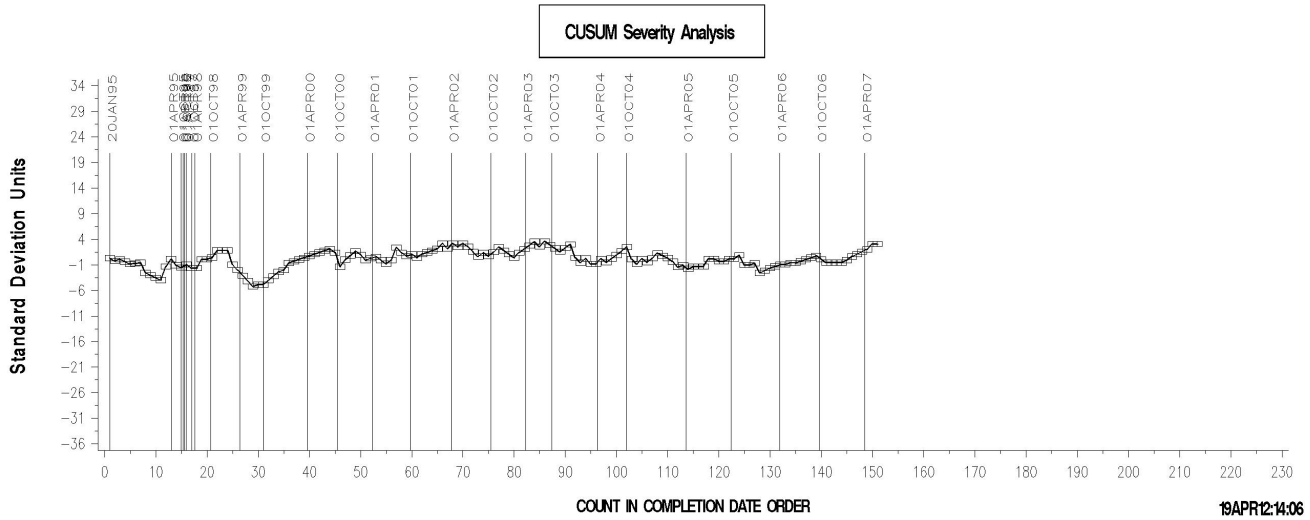
LTMS Severity Analysis



LTMS Precision Analysis



CUSUM Severity Analysis



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L-37 LUBRITED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR RIDGING

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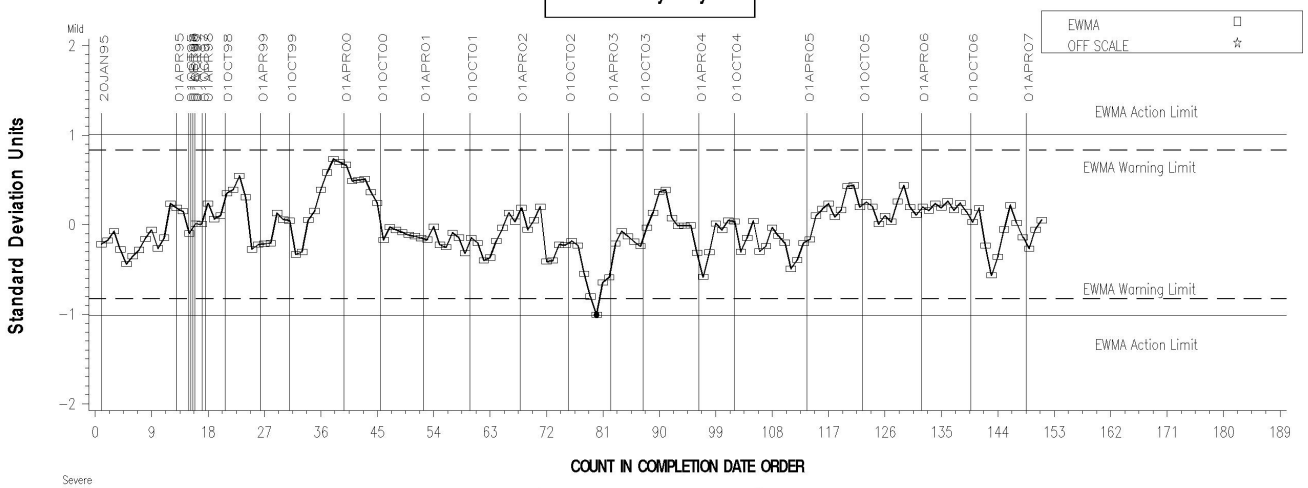
LTMS Severity Analysis



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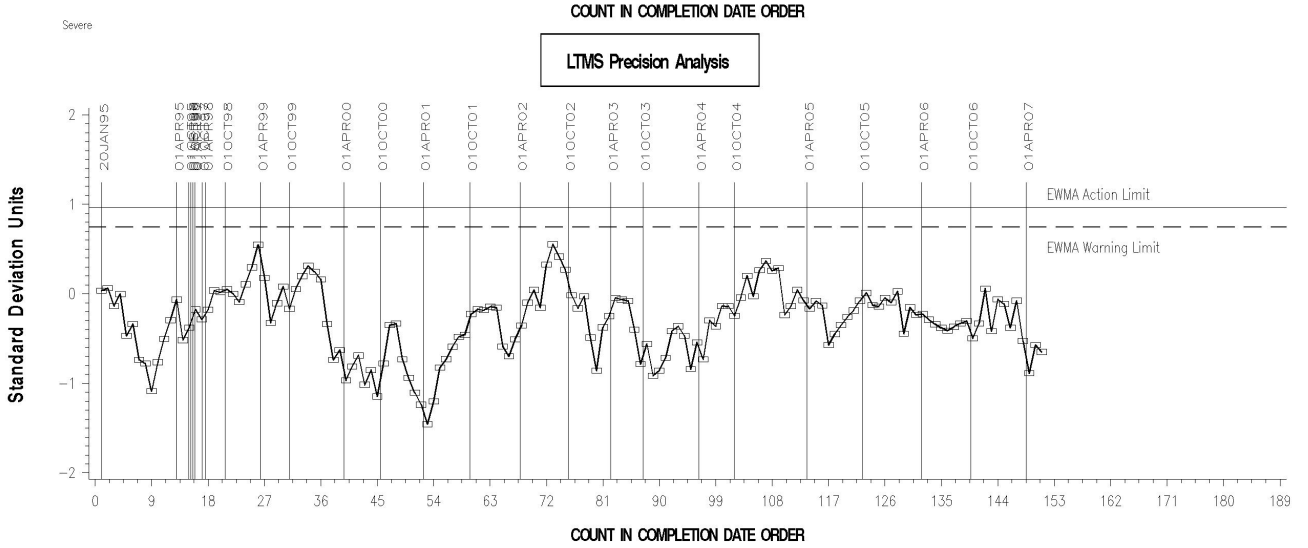
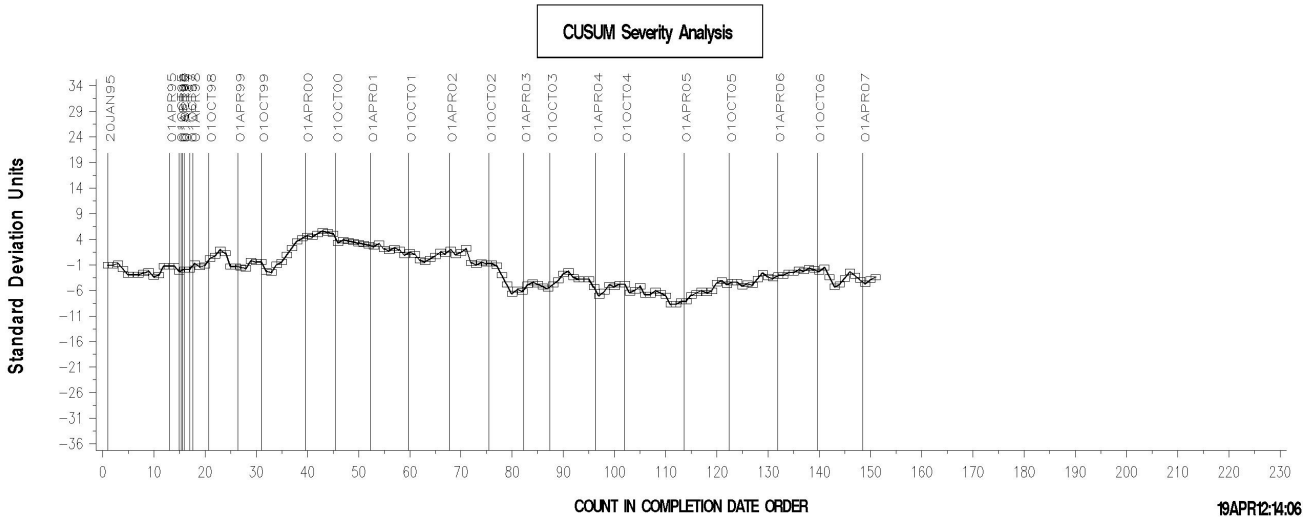


CUSUM Severity Analysis



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L-37 LUBRITED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR RIPPLING

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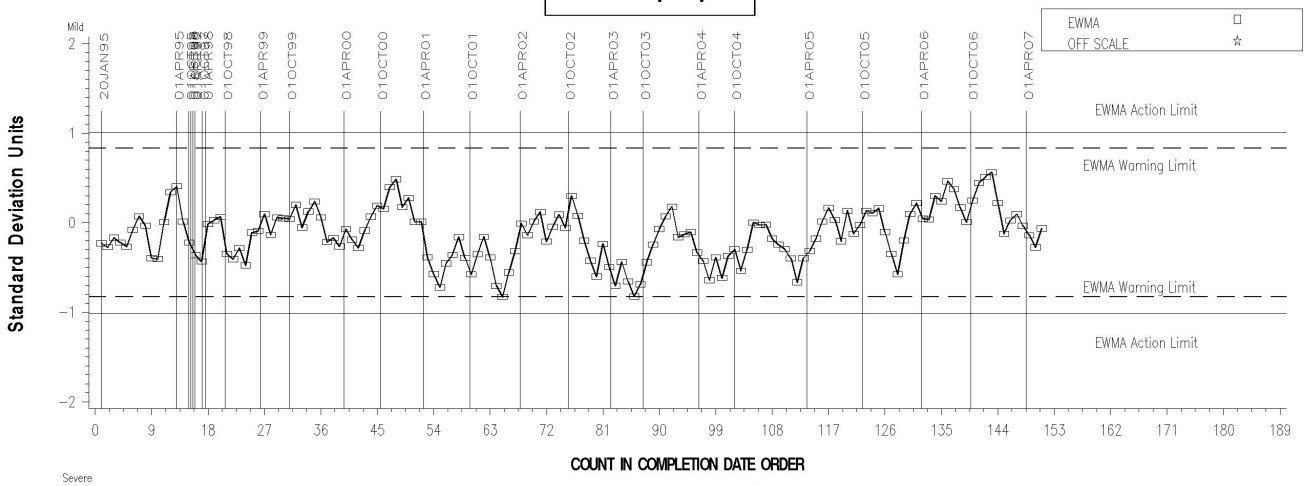
LTMS Severity Analysis



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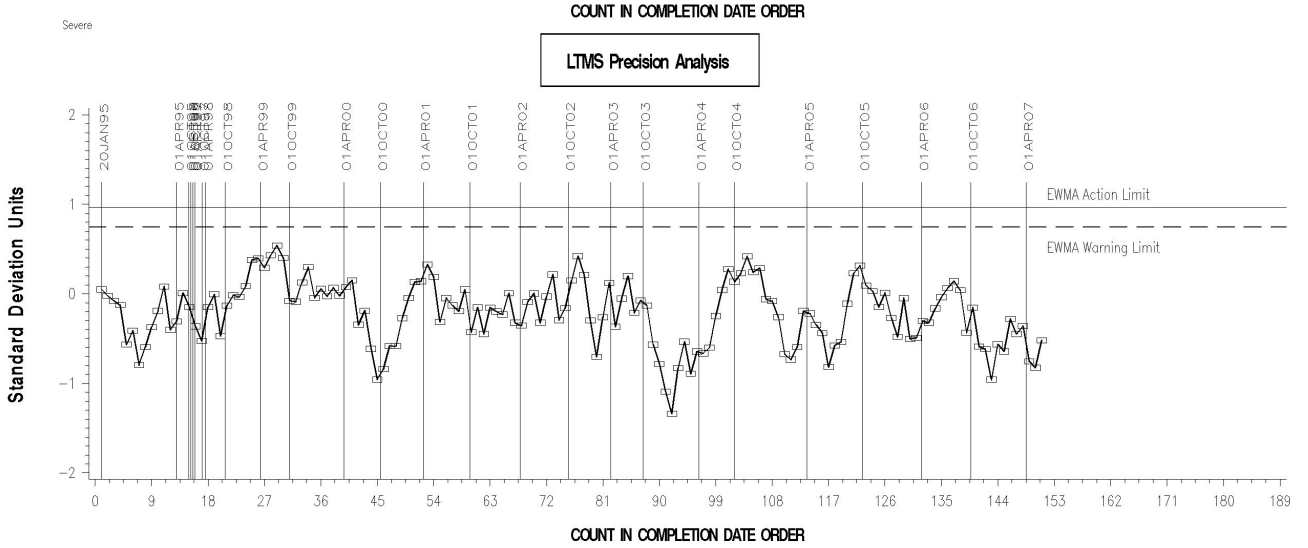
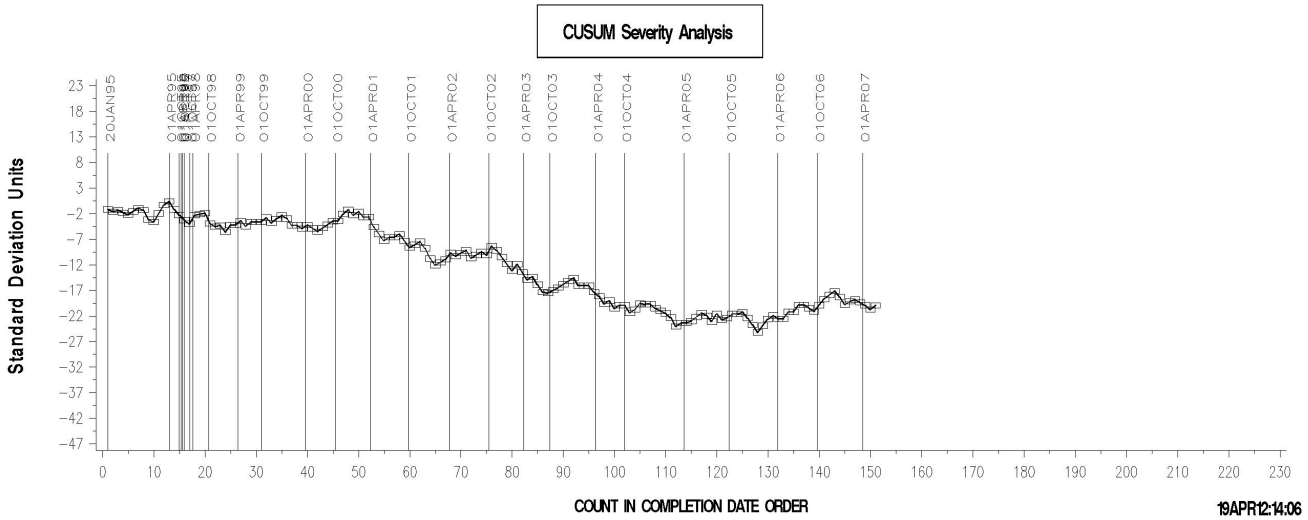


CUSUM Severity Analysis



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L-37 LUBRITED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR PITTING/SPALLING

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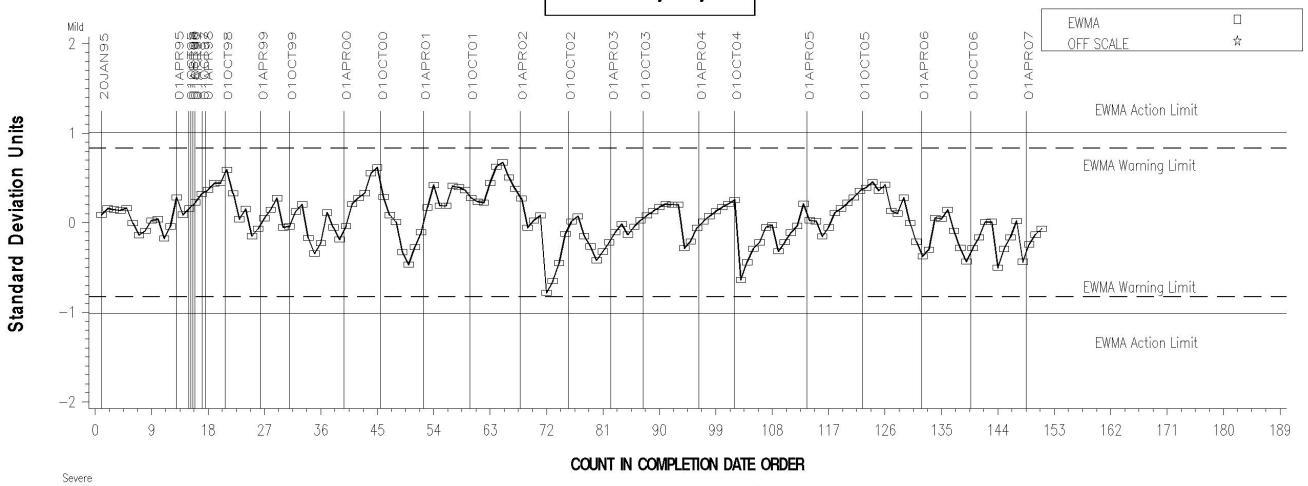
LTMS Severity Analysis



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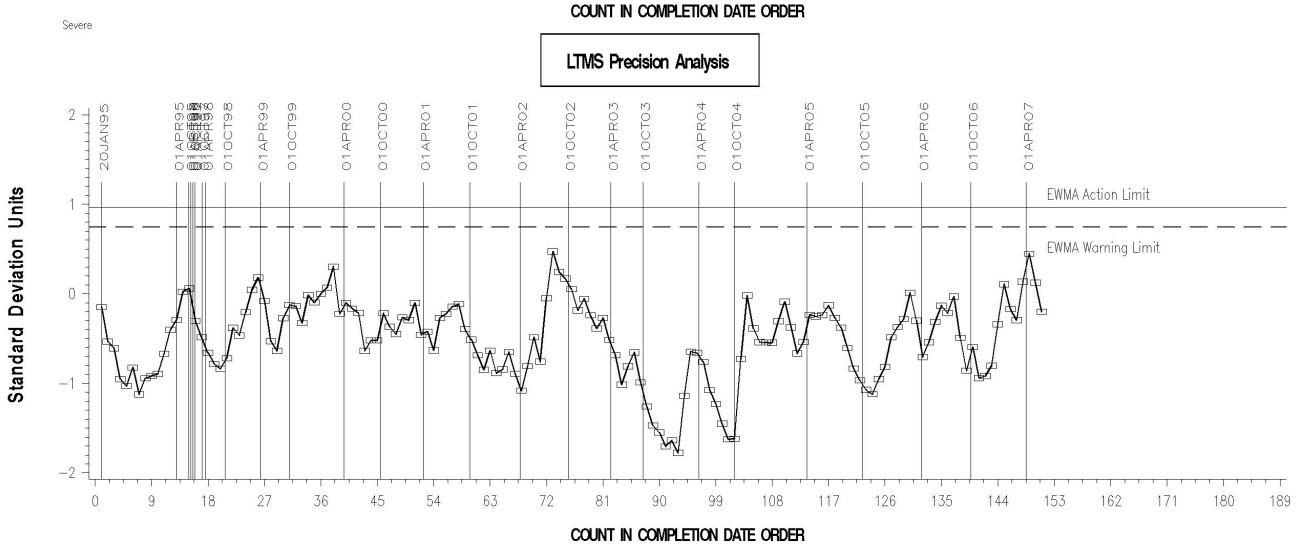
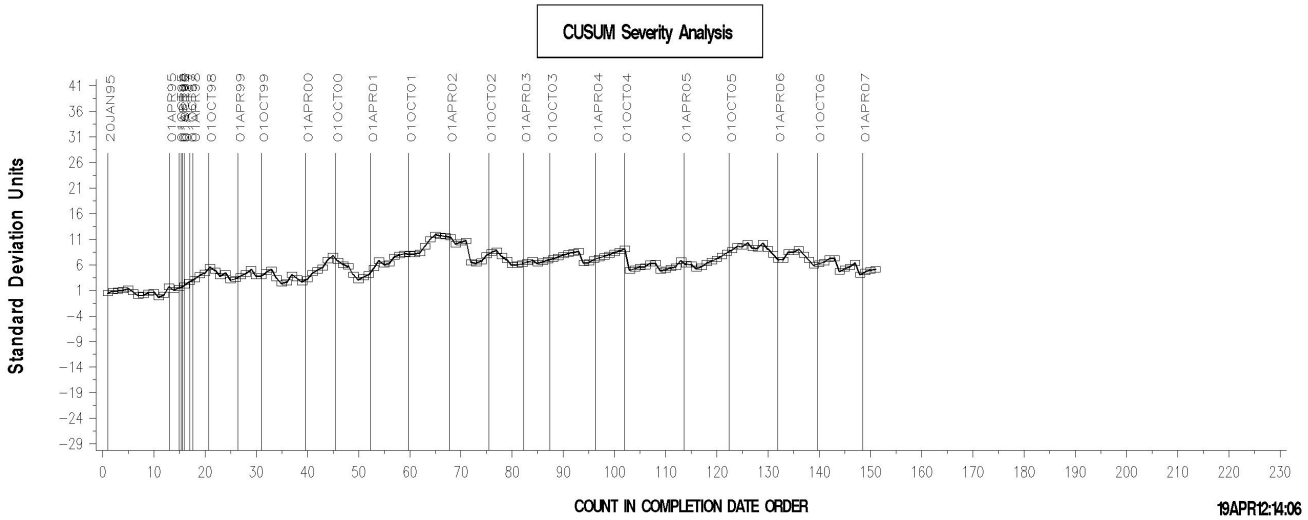


CUSUM Severity Analysis



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L–37 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR WEAR

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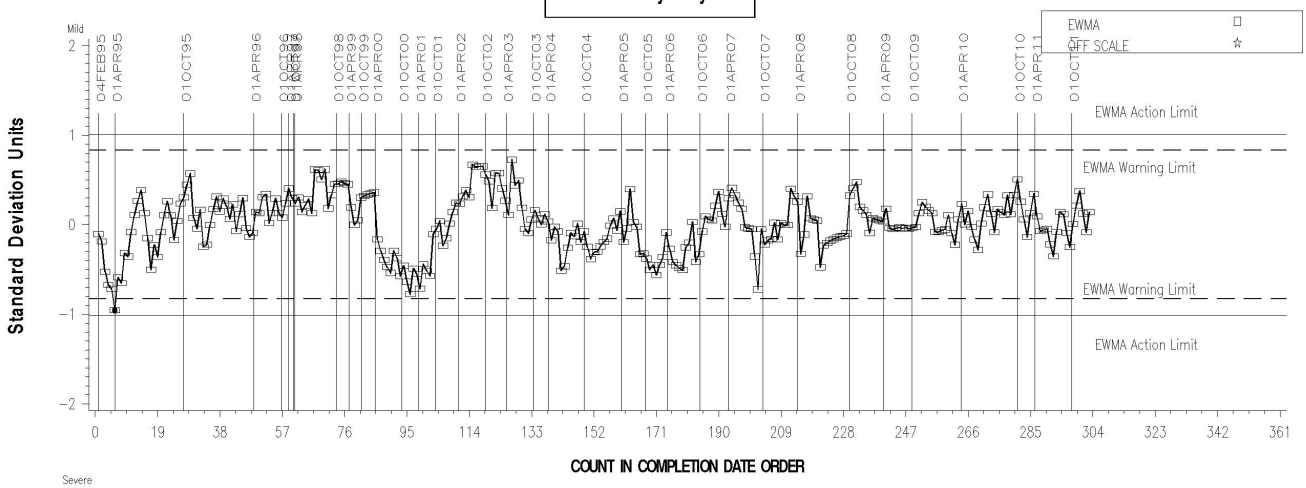
LTMS Severity Analysis



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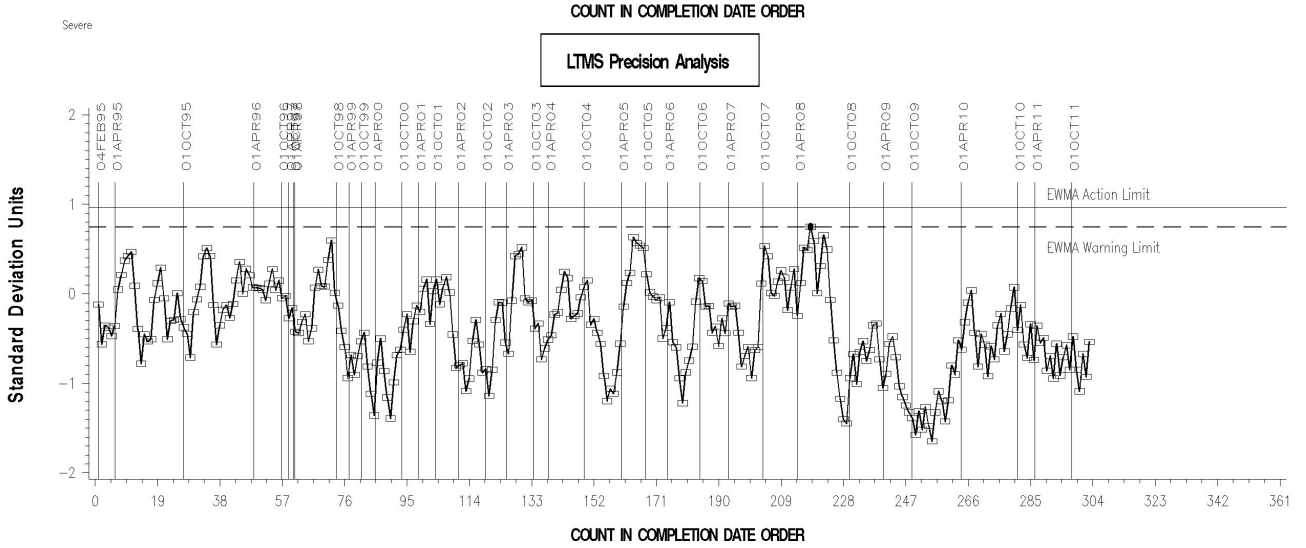
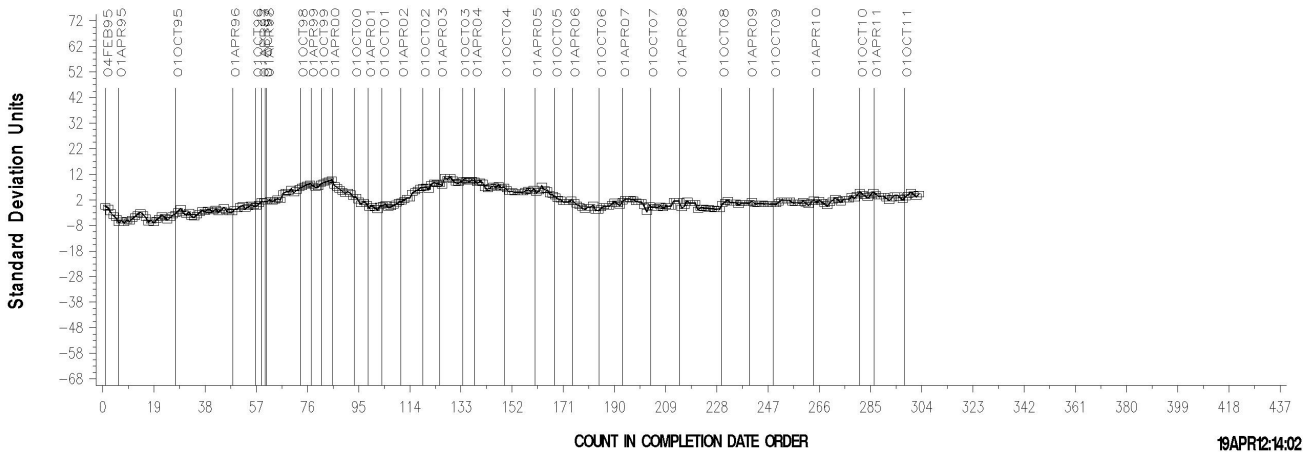


CUSUM Severity Analysis



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L–37 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR RIDGING

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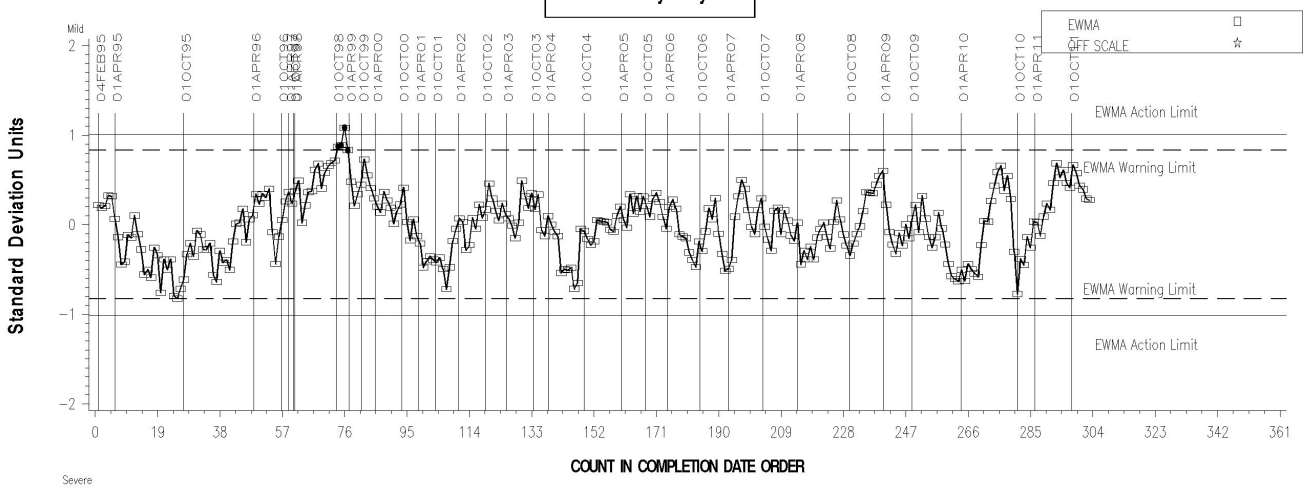
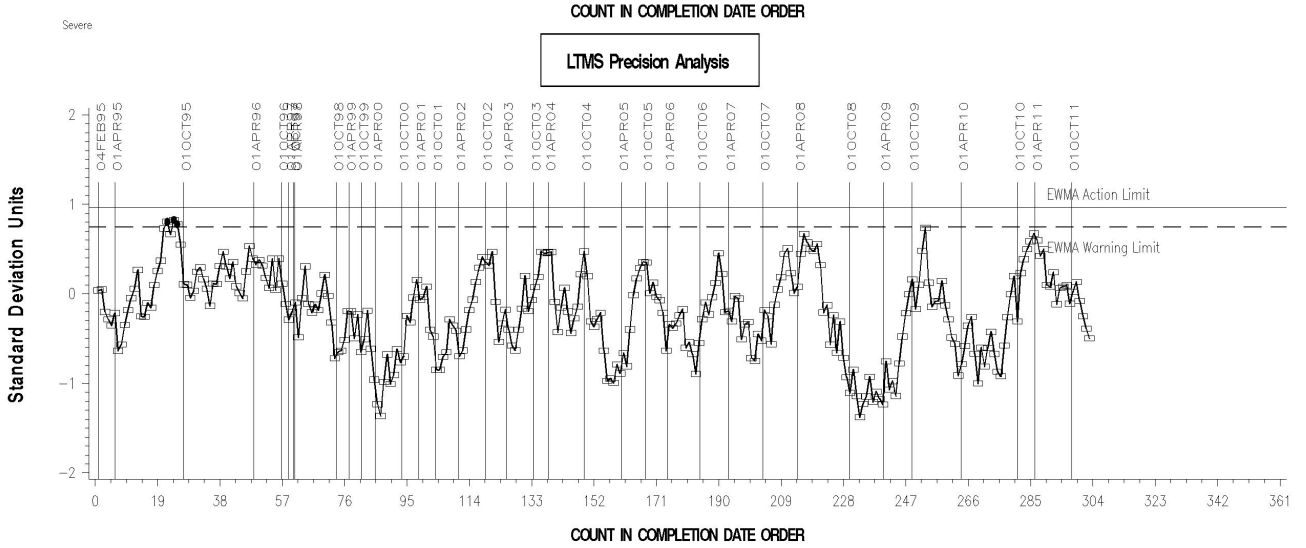
LTMS Severity Analysis



LTMS Precision Analysis



CUSUM Severity Analysis

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L-37 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA

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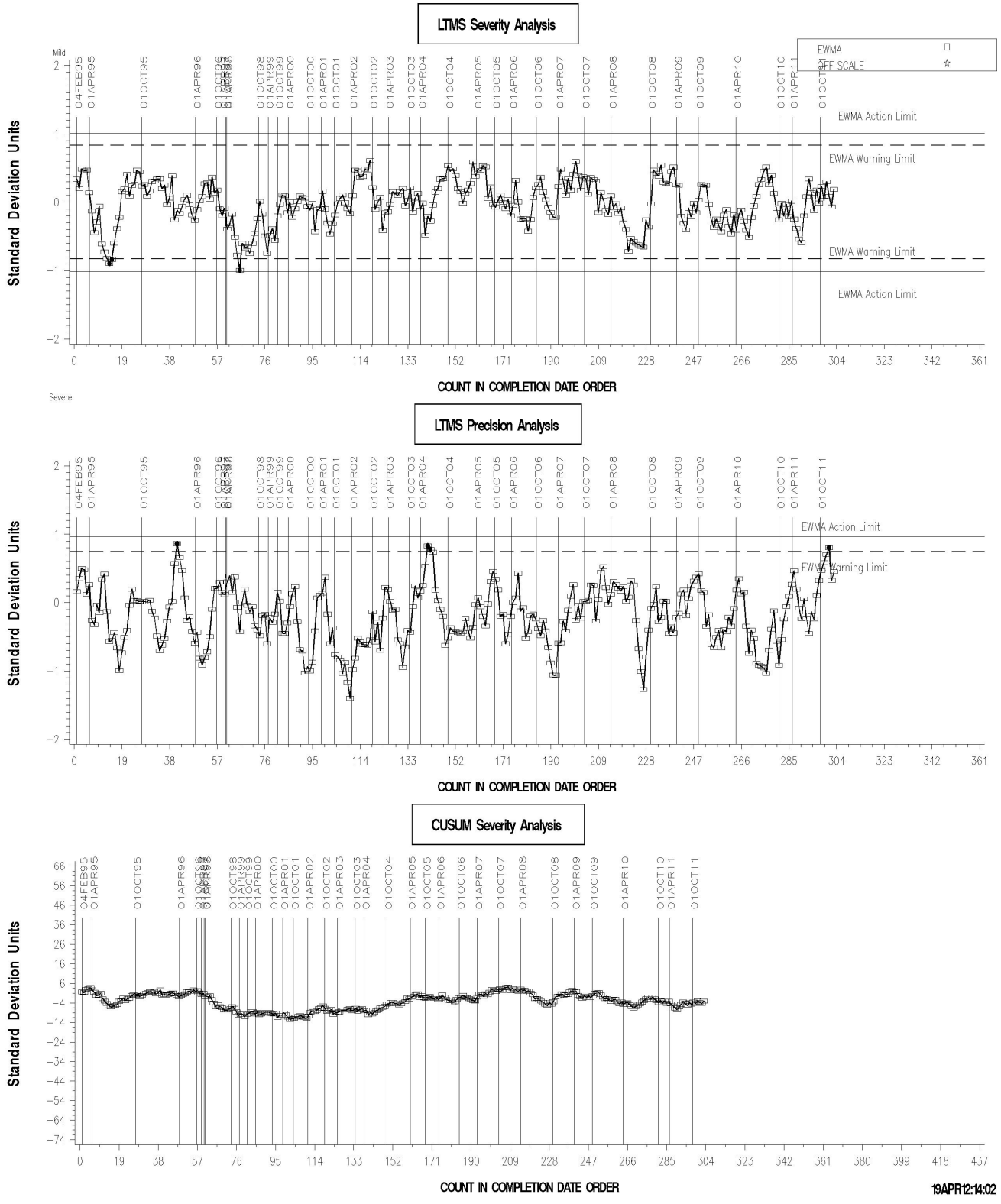
FINAL PINION GEAR RIPPLING



L–37 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR PITTING/SPALLING

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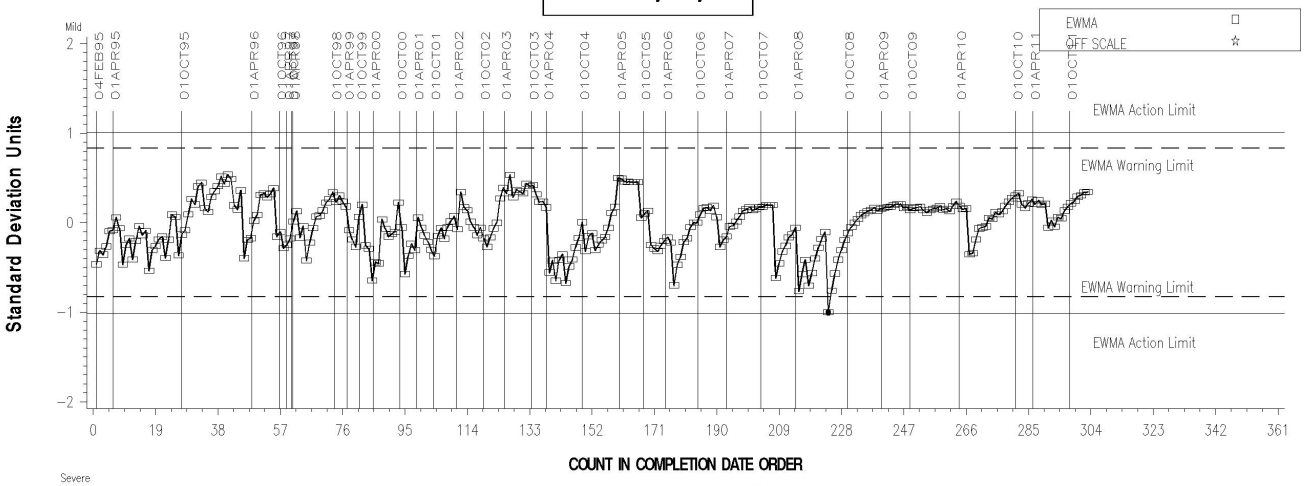
LTMS Severity Analysis



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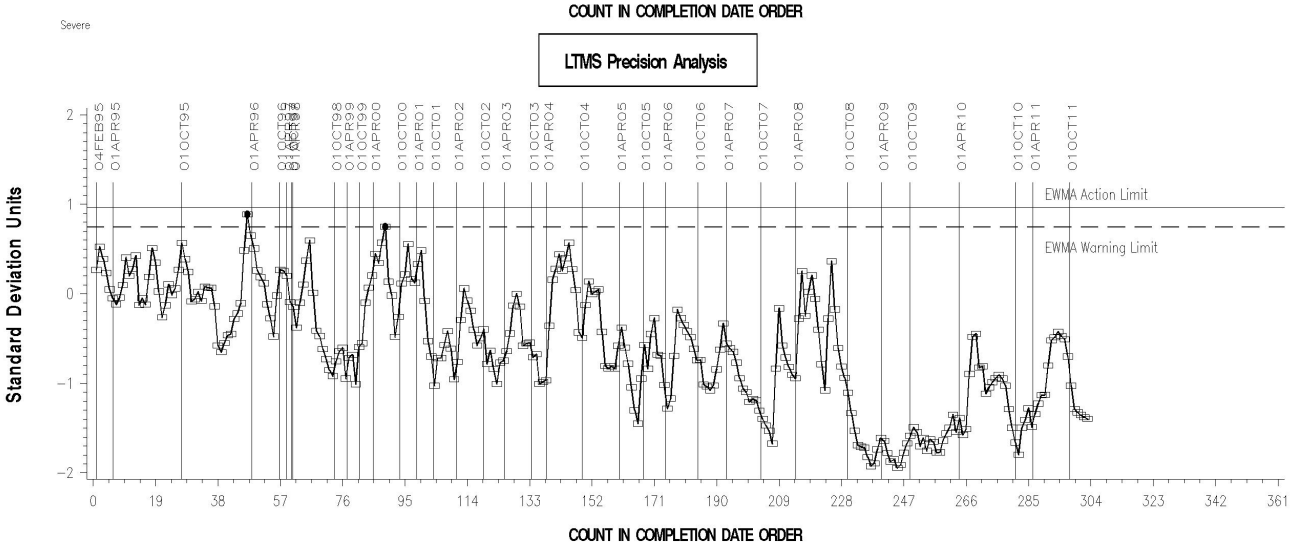
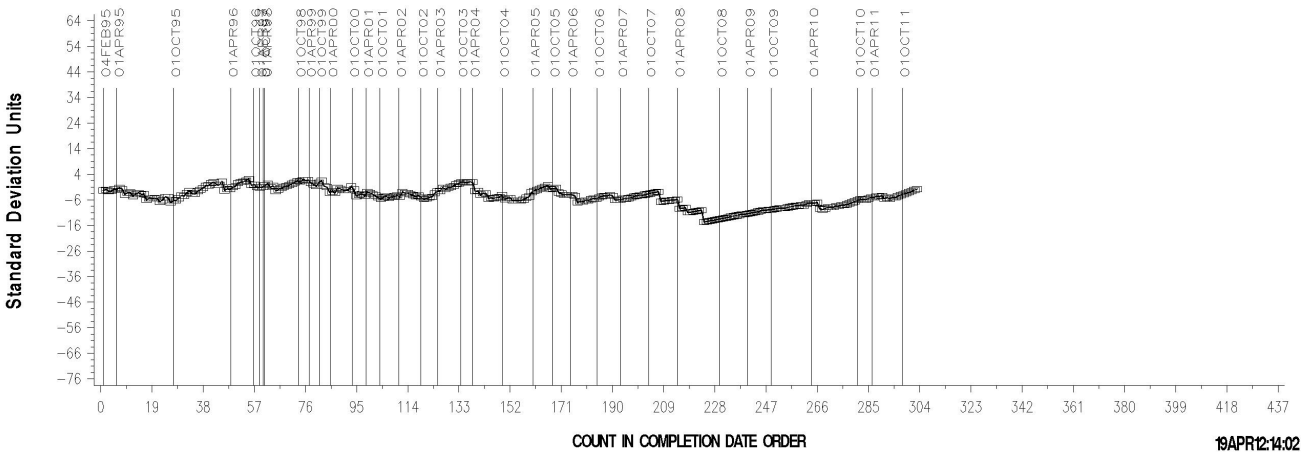


CUSUM Severity Analysis



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TIMELINE OF SIGNIFICANT EVENTS IN THE L-37 TEST:

Effective Date	Information Letter	Event
19931221	1	Report Forms and Dictionary Version 19931209
19940104	2	Rear Cover Plate Sensor Loc.
19940104	2	Data Reporting Response Time
19940317	3	Referencing Schedule
19940428	4	Report Forms and Dictionary Version 19940422
19940728	5	Report Forms and Dictionary Version 19940707
19950820	6	Rating Scale Revision
19950820	6	Report Form 5 Wording Change
19950820	6	Report Forms and Dictionary Version 19950424
19960116	96-2	TMC Address
19960309	96-1	Rating Revisions
19960317	96-4	Revised rating procedure for non-lubrited gear set C1L426/P4L415A
19960325	96-2	Rating Revisions
19960603	96-3	Report Forms and Dictionary Version 19960425
19960603	96-3	Revised Wording of Rating Scale
19970721	97-1	Revised Calibration Schedule and Calibration Requirements
19971014		Reference Test Targets Approved for Non-Lubrited Pinion Batches C1l308 & C1L426
19980309	98-1	Updated Report Forms & Data Dictionary Version 19971223
19980309	98-1	Revised alternate rating method for drive side pinion gear pitting values on gear set C1L426/P4L415A
19980309	98-1	Test Reporting Clarifications
19980309	98-2	Revisions to stand calibration requirements
19980309	98-2	Restrictions on Reference Oil Analysis
19980309	98-2	Reporting of non-standard tests to the TMC
19980310		Start of LTMS
19980310	98-3	Report Forms and Data Dictionary Version 19980203
19980310	98-4	Deviation Percentage Calculation Clarification
19980603	98-4	Combining of Pitting and Spalling Ratings
19981116	98-5	Numerical Rating Precision Clarification
19990101		Developed Reference Oil Test Targets by Gear Batch (Grandfathered for all tests starting 19950101)
19990113	99-1	Addition of exclusion zone for determining the pitt/spall result on non-lubrited gear batch V1L303/P3L514A
19990113	99-1	Deletion of Section A8.3.5
19990503		Updated ref oil 128-1 targets (18 tests), gear batch V1L303/P4L514A (Grandfathered all tests starting 19950101)
19990510	99-2	Revisions to precision and bias statement
19990728	99-3	Cover plate thremocouple location
20000613	00-1	Root/Tip Line Polishing Comment for V1L686/P4L626A Non-lubrited Gears
20001101	00-2	CRC Reference Photography of Gear Distress Photographs
20001115	01-1	Pinion Correction Factor for V1L686/P4L626A Lubrited Gears
20010612	01-2	Ring Correction Factor V1L686/P4L626A Lubrited Gears
20011101	01-2	Addition of Annex 12 Addressing Distress Rating Exclusion Comments
20011101	01-2	Revised Report Forms
20020101	02-1	CRC Rating Manual 21
20020211	02-1	Remove Report Forms and Data Dictionary from Standard

Effective Date	Information Letter	Event
20020211	02-2	Rating with magnification Change
20021125		Gear Batch V1L176/P4L741A approval
20030327	03-2	Revised Wear Rating Definitions
20030401	03-1	Rater Calibration Monitoring System
20030421	03-3	Deletion of catastrophic ditress levels for wear, rippling, and ridging
20030421	03-3	Non-interpretable tests
20030421	03-3	Tooth breakage
20030421	03-3	Rating corrosion on ring and pinion
20030909	03-4	Addition of SAE J2360 As a Reference Document
20030909	03-4	Revised Speed Specification for Balancing Dynamometer Connecting Shafts
20030909	03-4	Revised Speed Specification for Balancing Drive Shafts
20030909	03-4	Revised Test Axle Preparation
20030909	03-4	Revised Note 1
20030909	03-4	Discontinue Optional Inspection of Gear Set
20030909	03-4	Shutdown and Downtime Revisions
20030909	03-4	Recording Test Parameters
20030909	03-4	New Note 2 for Gear Test Phase Conditions
20040101	03-4	Revised Cleaning Solvent Specification
20040630	04-1	Standardization Revisions
20040825	04-1	Lubrited Hardware, Gear Batch V1L686/P4L626A Correction Factor
20040917	04-1	Intermediate Precision and Reproducibility Revisions
20040922	04-2	Drive Shaft Wall Thickness
20040922	04-2	Alternating Lubrited and Non-lubrited Hardware
20041115	04-3	Revised Drive Shaft and Axle Shaft Specifications
20041115	04-3	Revised Drawing for the Spray Nozzles Location
20050204		Non-lubrited Hardware, Gear Batch V1L351/P4T771 Approval
20050218	05-1	Revise Solvent Specification
20050218	05-1	Donated Reference Oil Test Programs/Calibration Period Length Adjustment
20050504	05-2	Updated Test Precision
20050504	05-2	Rounding Test Results Using ASTM E 29
20060208	06-1	Correction Factor for L247/T758A Lubrited Gear Batch (Canadian Tests Only)
20070627	07-1	Revised Calibration Requirement
20071213	07-2	Revised Backlash Measurement Procedure
20090228	09-1	Revisions to Preparation of Apparatus Procedure
20090228	09-1	Revision to Percent Deviation Calculation
20090228	09-1	Chipping Definition
20101101		End of transformations for ridging, rippling, and spitting
20110430	11-1	New gear rating photo introduction
20110413	11-2	Revised instrument calibration frequency and clarified wording for load during warmup following unscheduled shutdown
20110909	11-3	Removal of Requirement to Mail Paper Final Test Report to TMC
20110909	11-3	Precision Statement Corrected for Untransformed Test Results
20120229	12-1	Added definition and reporting requirements for broken tooth

TMC LAB VISITS

No L-37 lab visits were conducted during this report period.

INFORMATION LETTERS:

Information Letter 12-1 was issued February 29, 2012 to add a definition and reporting requirements for "broken tooth".

STATUS OF REFERENCE OIL SUPPLY:

At the end of this report period, the testing oil supply stood as outlined in the table below:

		@ TMC	
Oil	Cans @ Labs	Cans	Gallons
127	2	1	1.0
134	12	107	107.0
151-2	4	5	5.9
151-3	3	0	0.0
152-1	9	43	43.0
152-2	0	267	267.0
152-3	0	54	54.8
153-1	39	57	58.0
155	9	102	103.0
155-1	8	446	446.8
Total	86	1082	1086.3

The TMC quantity remaining presumes usage only for L-37 testing. Oils 151-2 and -3 and 155 are also used in other test areas. In 2005, the now nearly-depleted 151-3 was replaced by 155 which itself is nearing depletion. TMC has acquired a reblend of oil 155 which is ready for introduction. Samples of 155-1 have been delivered to all L-37 labs and await introduction.

SDP/sdp/mem12-008.sdp.doc
cc: Frank Farber
Jeff Clark
ftp://ftp.astmtmc.cmu.edu/docs/gear/l37/semiannualreports/l37-04-2012.pdf

Distribution: email