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: 10-028

DATE: June 15, 2010

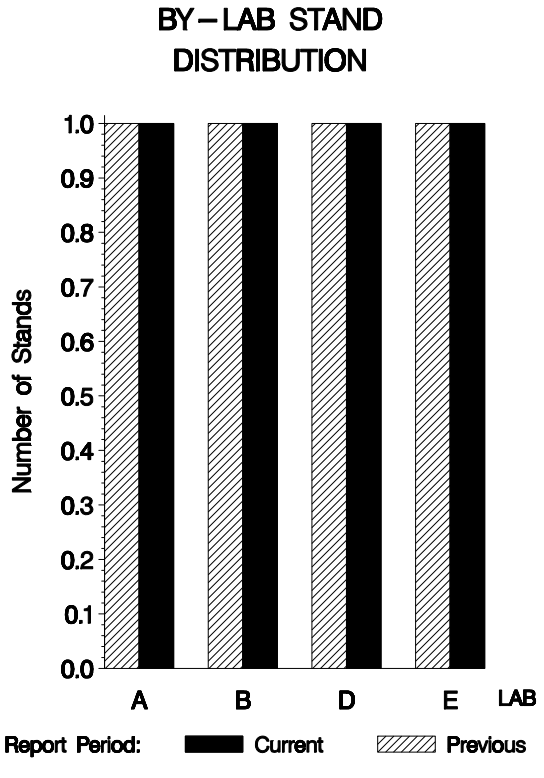
TO: Galen Greene, Chairman, L-37 Surveillance Panel

FROM: Scott Parke

SUBJECT: L-37 Testing from October 1, 2009 through March 31, 2010

A total of 92 L-37 tests were reported to the Test Monitoring Center during the period from October 1, 2009 through March 31, 2010. Following is a summary of testing activity this period.

	Reporting Data	Calibrated on 3-31-10
Number of Labs	4	4
Number of Stands	4	4

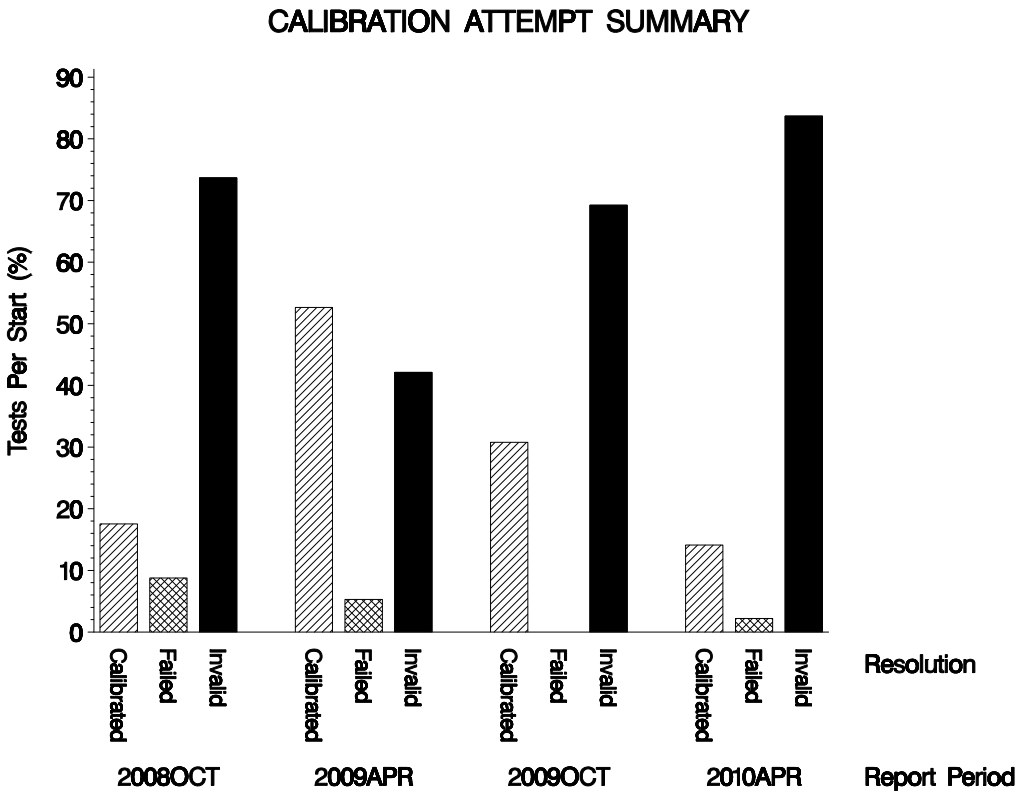


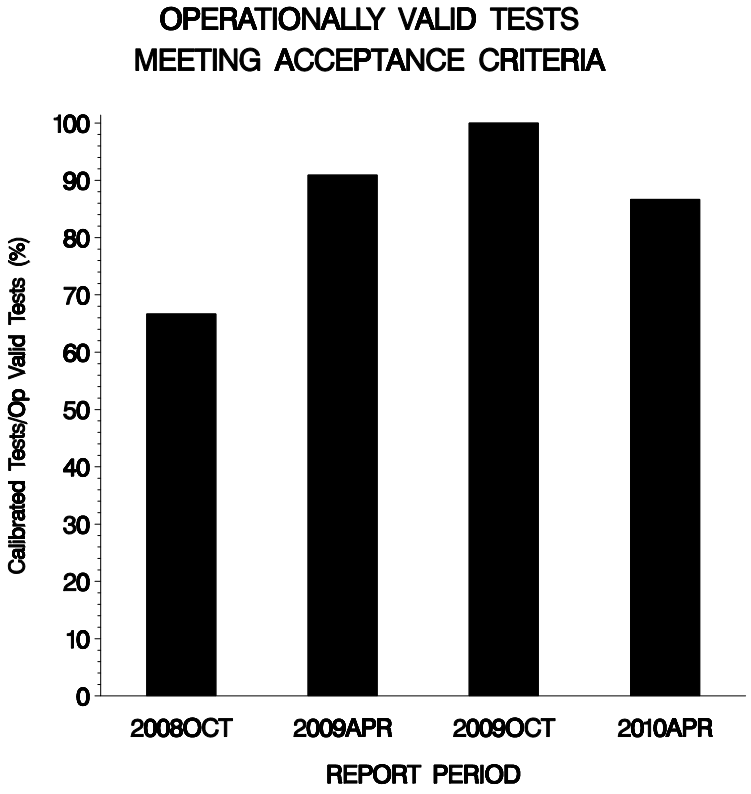
Test Distribution by Oil and Validity

		134	151-3	152-1	153-1	155	Totals Last Period	Totals This Period
Accepted for calibration	AC	0	1	4	3	5	8	13
Rejected (Mild)	OC	0	0	0	1	0	0	1
Rejected (Severe)	OC	0	0	0	0	0	0	0
Rejected (Precision)	OC	0	0	0	0	1	0	1
Acceptable donated test	AG	8	0	15	2	15	0	40
Invalidated donated test	LG	0	0	0	0	1	0	1
Acceptable non-blind info run	NN	1	0	21	6	3	0	31
Unacceptable non-blind info run	MN	0	0	2	0	0	0	2
Invalidated non-blind info run	LN	0	0	1	0	0	0	1
Aborted non-blind info run	XN	1	0	0	0	0	0	1
Acceptable hardware approval run	NI	0	0	0	1	0	0	1
Total		10	1	43	13	25	8	92

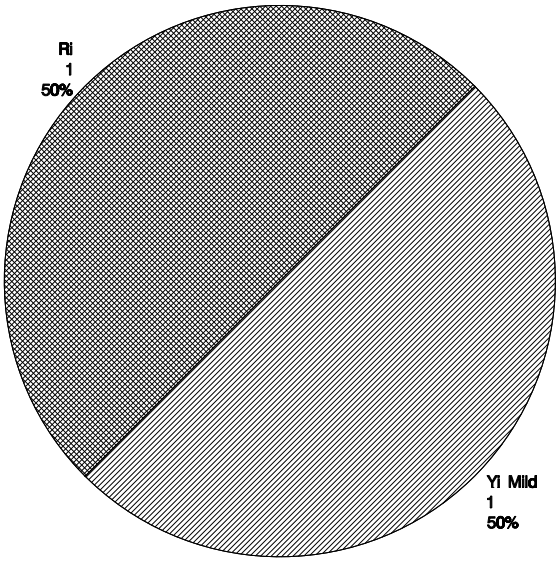
Calibration Attempt Detail

	Gear Batch	Acceptable	Failed	Total
LUBRITED	none	0	0	0
	Total	0	0	0
NONLUBRITED	V1L417/P4L792	10	2	12
	V1L500/P4T813	3	0	3
	Total	13	2	15

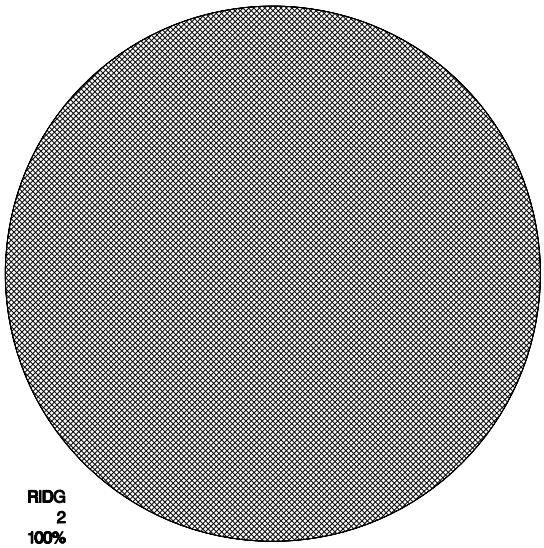

CALIBRATION ATTEMPT SUMMARY
Tests Per Start (%)
90
80
70
60
50
40
30
20
10
0
Calibrated
Failed
Invalid
Resolution
2008OCT
2009APR
2009OCT
2010APR
Report Period


OPERATIONALLY VALID TESTS
MEETING ACCEPTANCE CRITERIA
Calibrated Tests/Op Valid Tests (%)
100
90
80
70
60
50
40
30
20
10
0
2008OCT
2009APR
2009OCT
2010APR
REPORT PERIOD

DISTRIBUTION OF FAILING TESTS
(By Alarm Type)



DISTRIBUTION OF FAILING TESTS
(By Test Parameter)



CAUSES FOR LOST TESTS:

		Oil			Validity				Loss Rate		
		134	152-1	155	LG	LN	XN	MN	Lost	Starts	%
Lab	LUBRITED								2	41	5%
B	%Out exceeded limits			●	●				2	13	15%
	Wrong procedure was run		●			●					
Lab	NONLUBRITED								3	51	6%
B	Broken gear teeth	●					●		1	15	7%
D	Ring spalling and broken teeth		●					●	2	15	14%
	Broken tooth		●					●			
	Lost	1	3	1	1	1	1	2			
	Starts	10	43	25	92	92	92	92			
	%	10%	7%	4%	1%	1%	1%	2%			

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						
Parameter	Gear Batch	N	Δ/s	s[D]	Overall Δ/s	Overall Shift (in Merits)
Wear	V1L417/P4L792	12	0.05	0.39	-0.01	-0.01 [C]
	V1L500/P4T813	3	-0.22	1.06		
Ridging	V1L417/P4L792	12	-0.39	1.50	-0.31	-0.45 [A,C]
	V1L500/P4T813	3	-0.02	0.55		
Rippling	V1L417/P4L792	12	0.14	0.94	0.20	0.17 [A,C]
	V1L500/P4T813	3	0.43	1.19		
Spall/Pit	V1L417/P4L792	12	-0.03	0.30	0.08	0.04 [B,C]
	V1L500/P4T813	3	0.52	0.40		

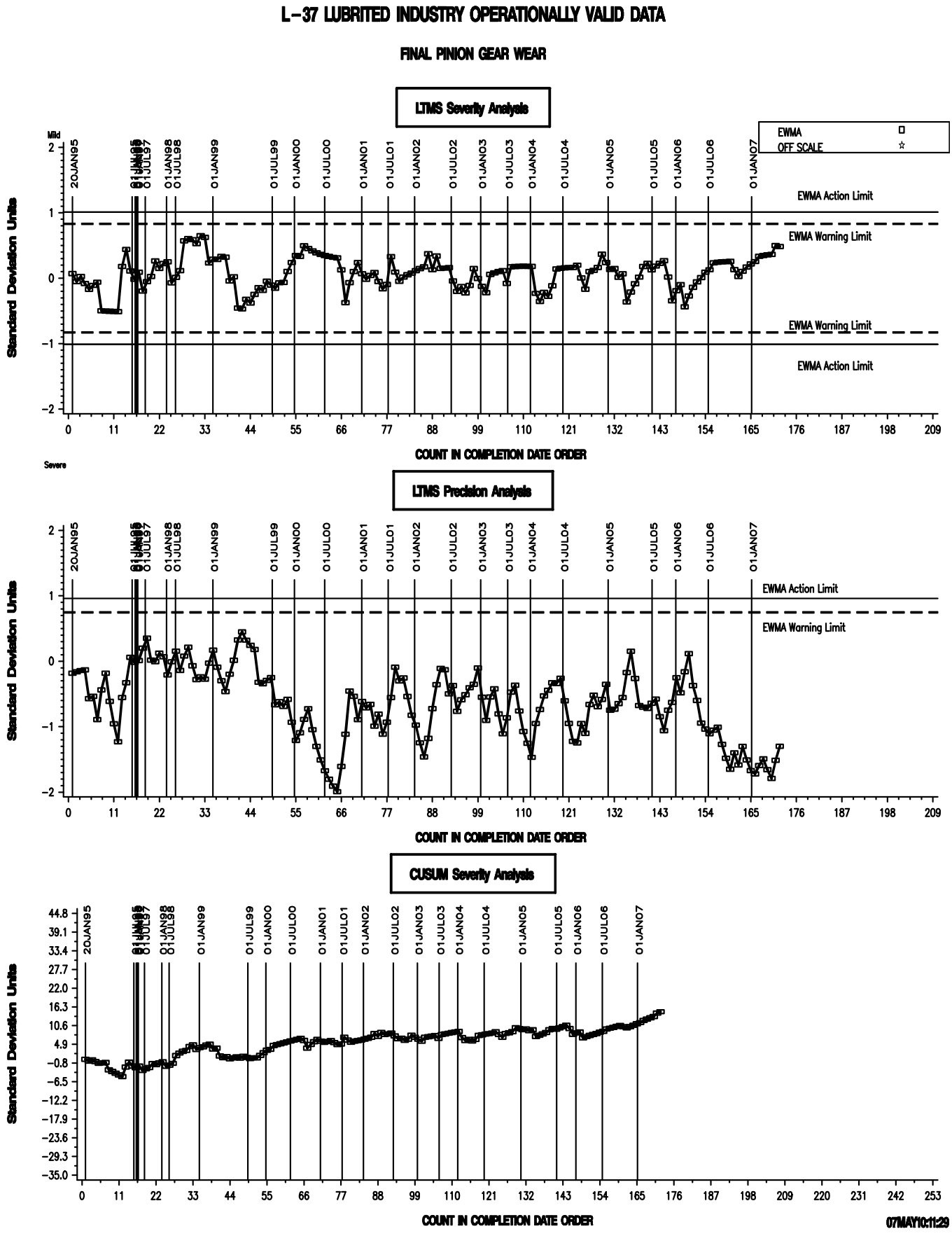
[A] Level for determining shift in merits = 8.0
[B] Level for determining shift in merits = 9.3
[C] Used SA standard deviation as published in the LTMS document for determining merit shift
[D] Because the number of tests completed this period was too small to compute a representative pooled standard deviation, the straight standard deviation is shown.

LAB SEVERITY:

Hardware	Gear Batch	Lab	N	Wear	Ridging	Rippling	Spall/Pit
Non-lubrited	V1L417/P4L792	A	3	0.124	-0.778	0.324	-0.043
		B	3	-0.304	-0.187	1.088	-0.043
		D	2	0.291	-0.412	-0.320	0.057
		E	4	0.128	-0.229	-0.474	-0.065
	V1L500/P4T813	A	1	-0.994	0.297	-0.257	0.751
		B	1	0.994	0.297	1.800	0.751
		D	1	-0.647	-0.661	-0.257	0.050

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
LTMS Severity Analysis
Mild
Severe
EWMA
OFF SCALE
EWMA Action Limit
EWMA Warning Limit
EWMA Warning Limit
EWMA Action Limit
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
LTMS Precision Analysis
EWMA Action Limit
EWMA Warning Limit
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
CUSUM Severity Analysis
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
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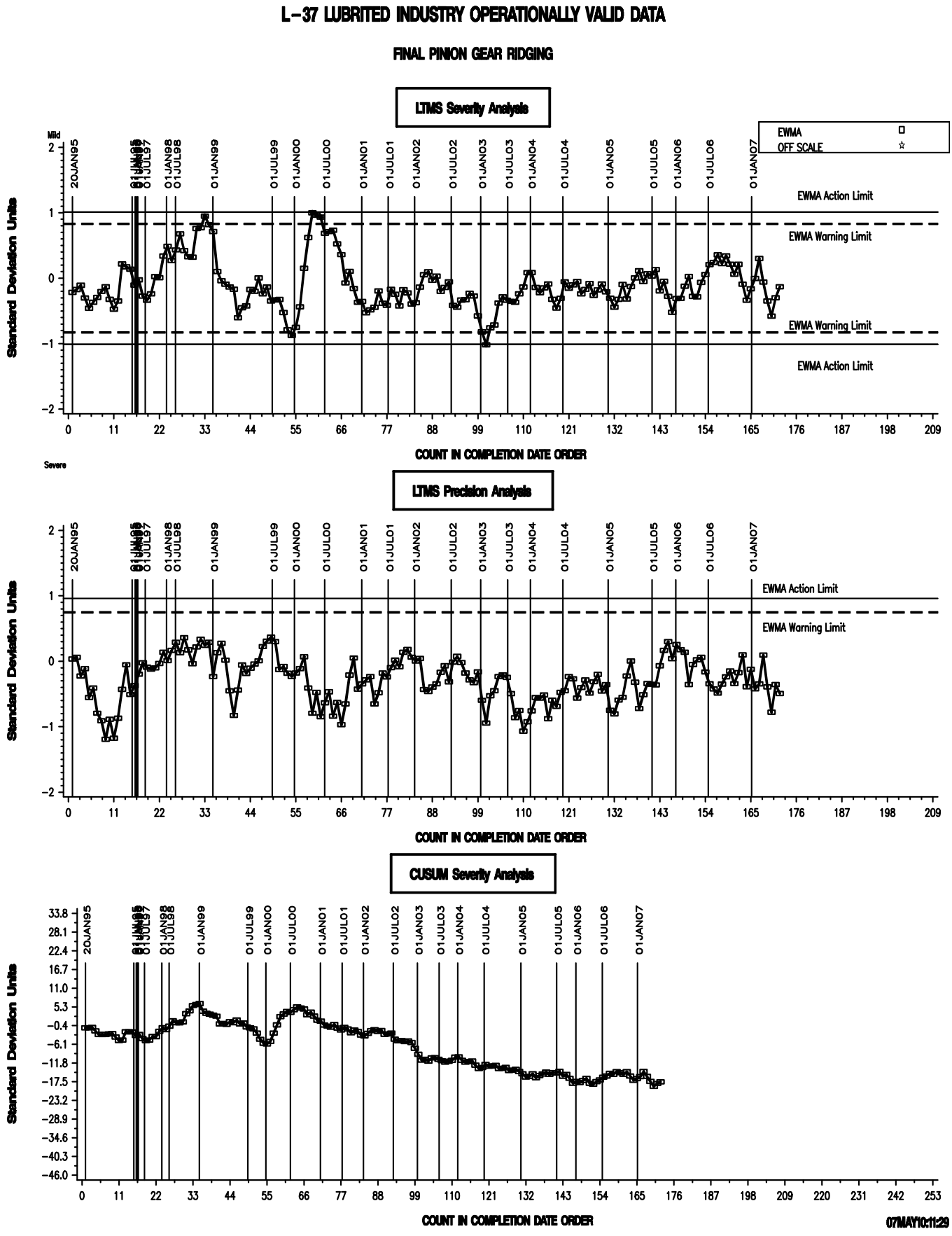
L-37 LUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR RIDGING
LTMS Severity Analysis
Mild
Severe
EWMA
OFF SCALE
EWMA Action Limit
EWMA Warning Limit
EWMA Warning Limit
EWMA Action Limit
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
LTMS Precision Analysis
EWMA Action Limit
EWMA Warning Limit
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
CUSUM Severity Analysis
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
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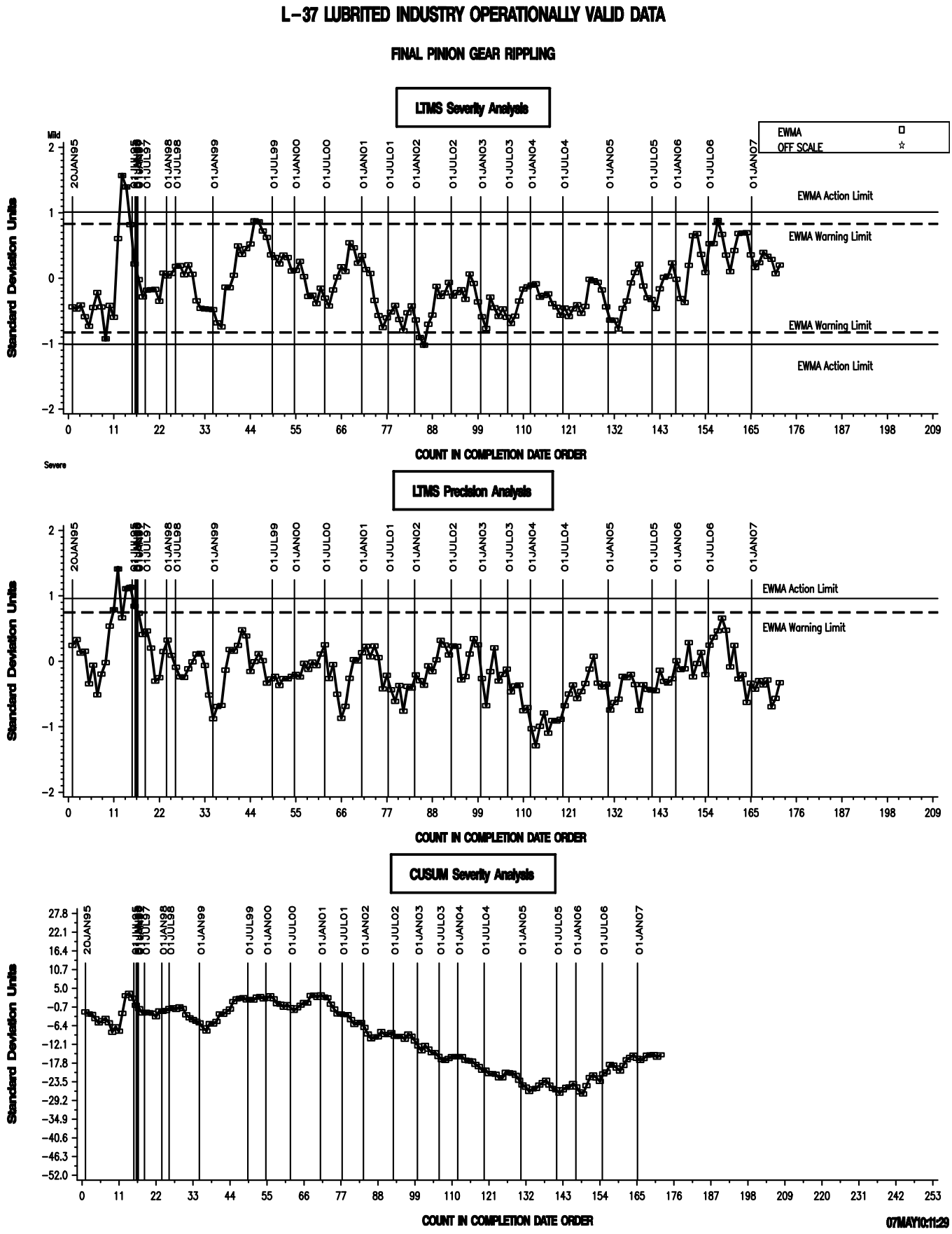
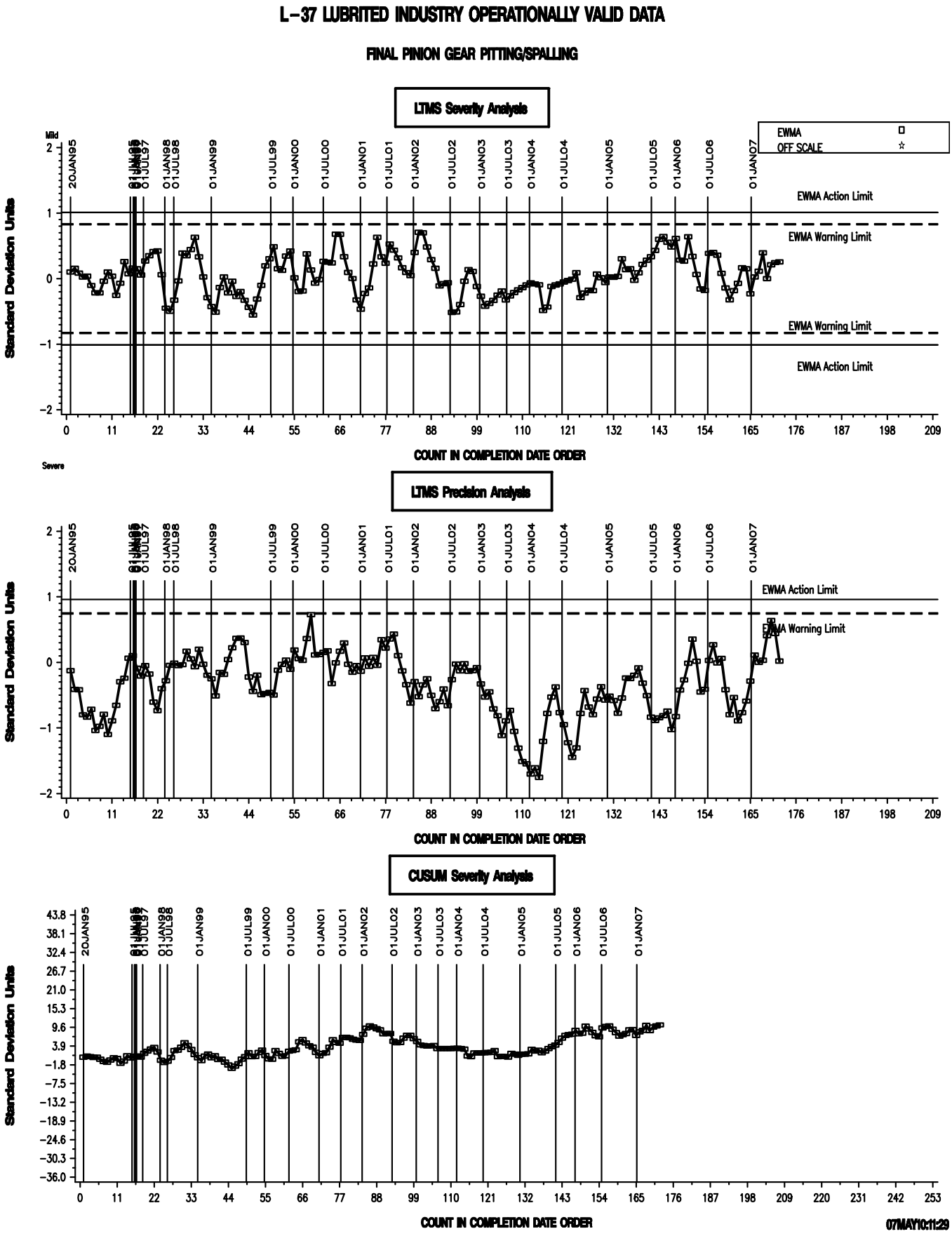
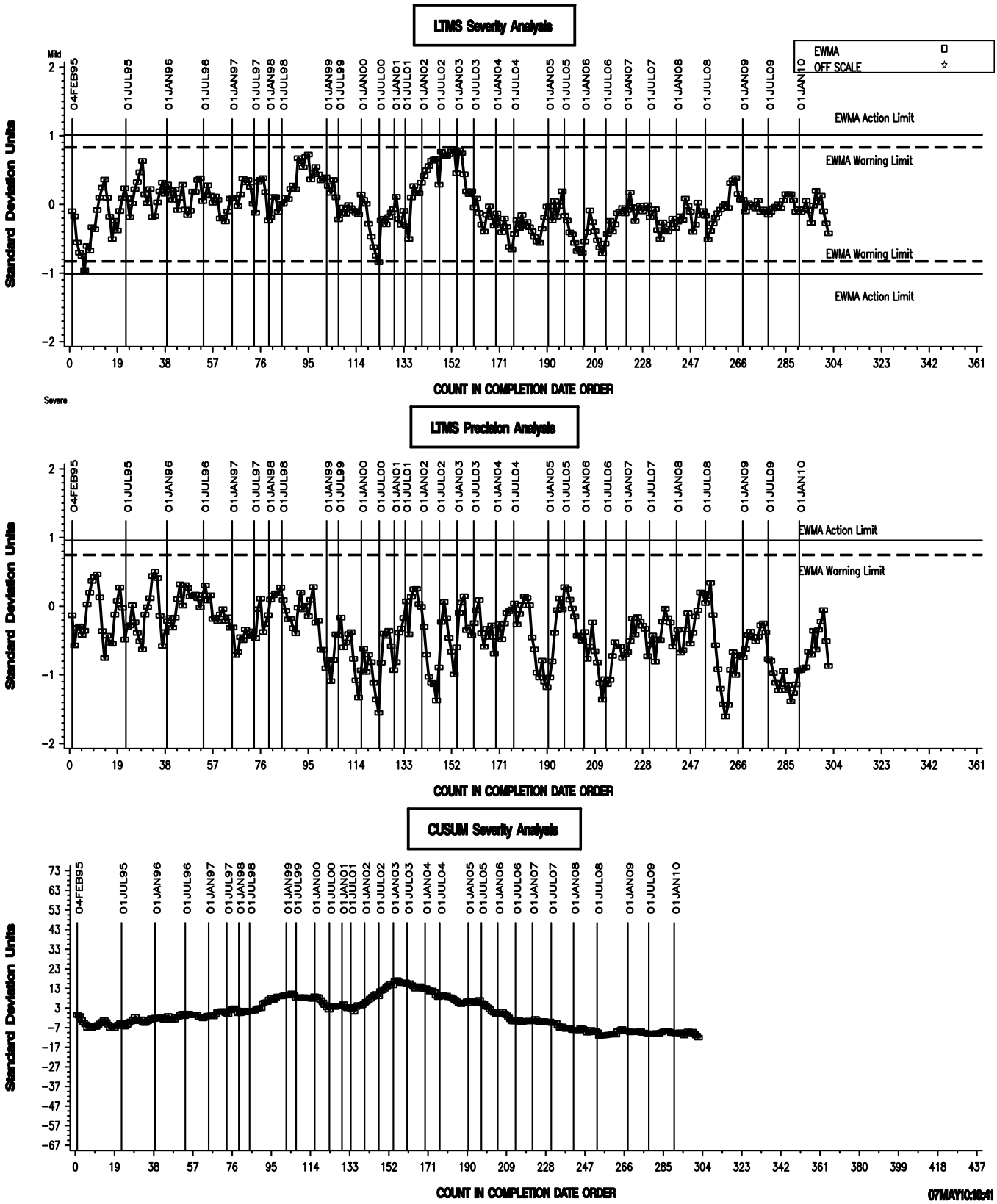
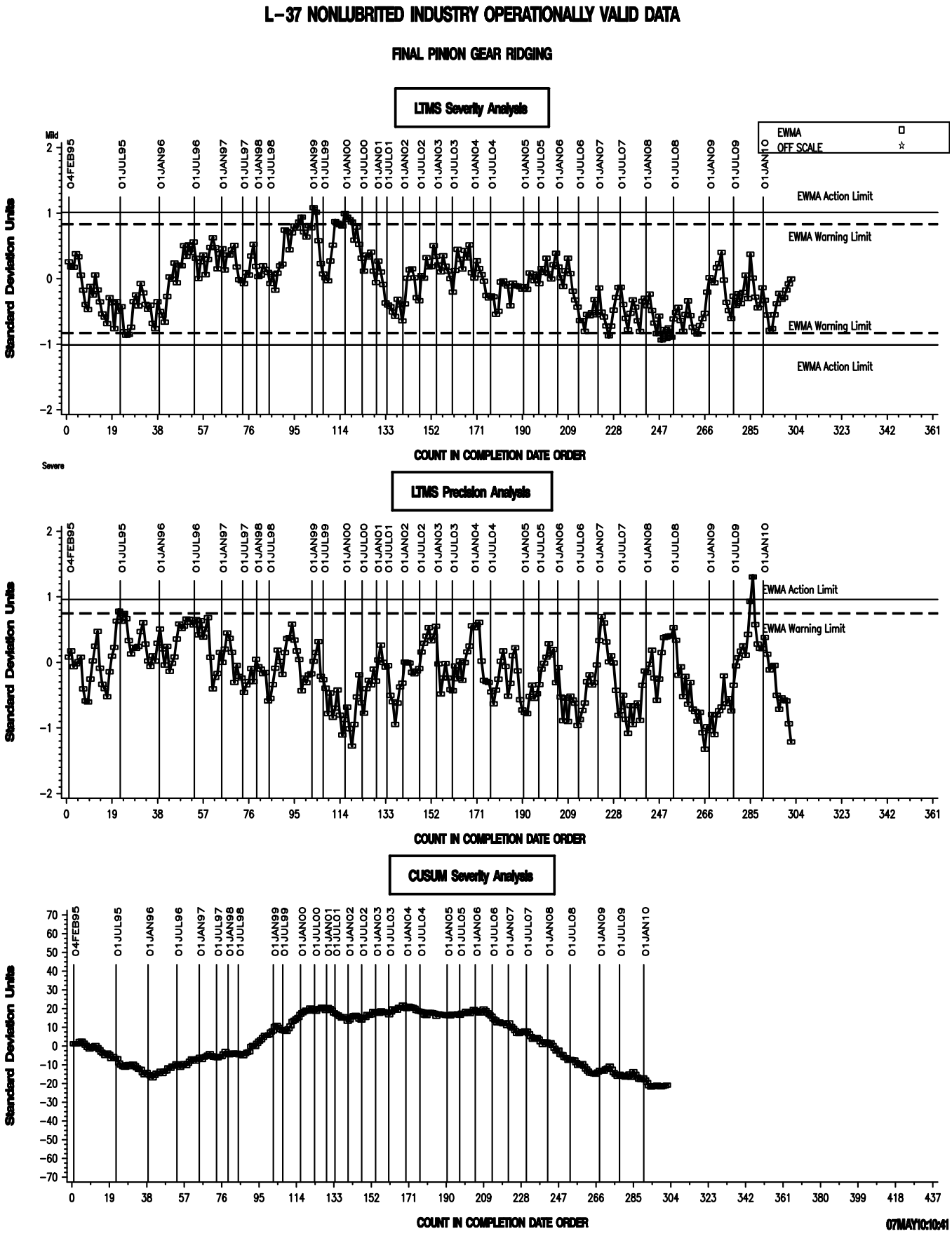

L-37 LUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR RIPPLING
LTMS Severity Analysis
Mild
Severe
Standard Deviation Units
EWMA
OFF SCALE
EWMA Action Limit
EWMA Warning Limit
EWMA Warning Limit
EWMA Action Limit
COUNT IN COMPLETION DATE ORDER
LTMS Precision Analysis
EWMA Action Limit
EWMA Warning Limit
COUNT IN COMPLETION DATE ORDER
CUSUM Severity Analysis
COUNT IN COMPLETION DATE ORDER
07MAY10:11:29


L-37 LUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR PITTING/SPALLING
LTMS Severity Analysis
Mild
Severe
EWMA
OFF SCALE
EWMA Action Limit
EWMA Warning Limit
EWMA Warning Limit
EWMA Action Limit
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
LTMS Precision Analysis
CUSUM Severity Analysis
07MAY10:11:29

L-37 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR WEAR




L-37 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR RIDGING
LTMS Severity Analysis
Mild
Severe
Standard Deviation Units
EWMA
OFF SCALE
EWMA Action Limit
EWMA Warning Limit
EWMA Warning Limit
EWMA Action Limit
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
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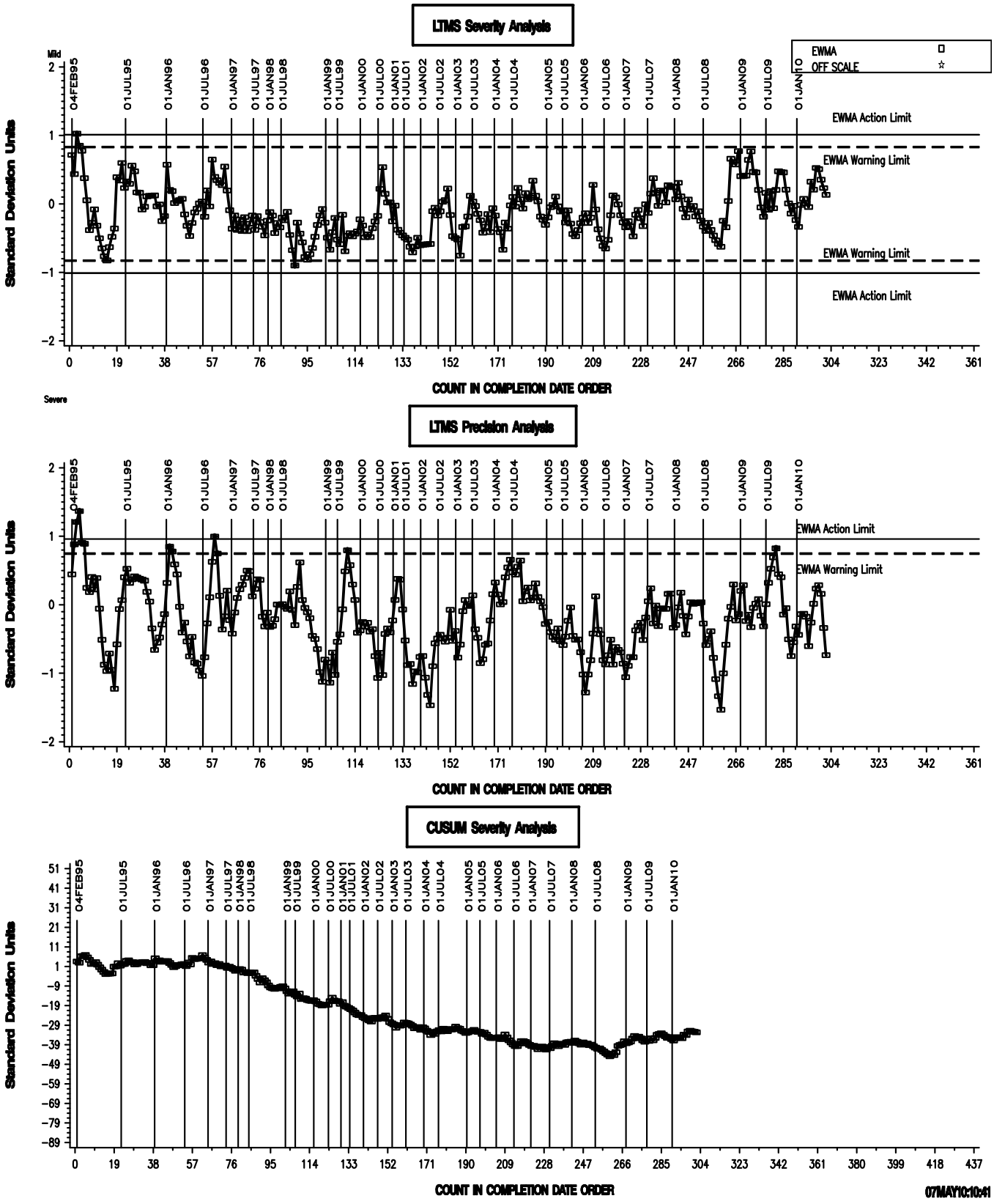
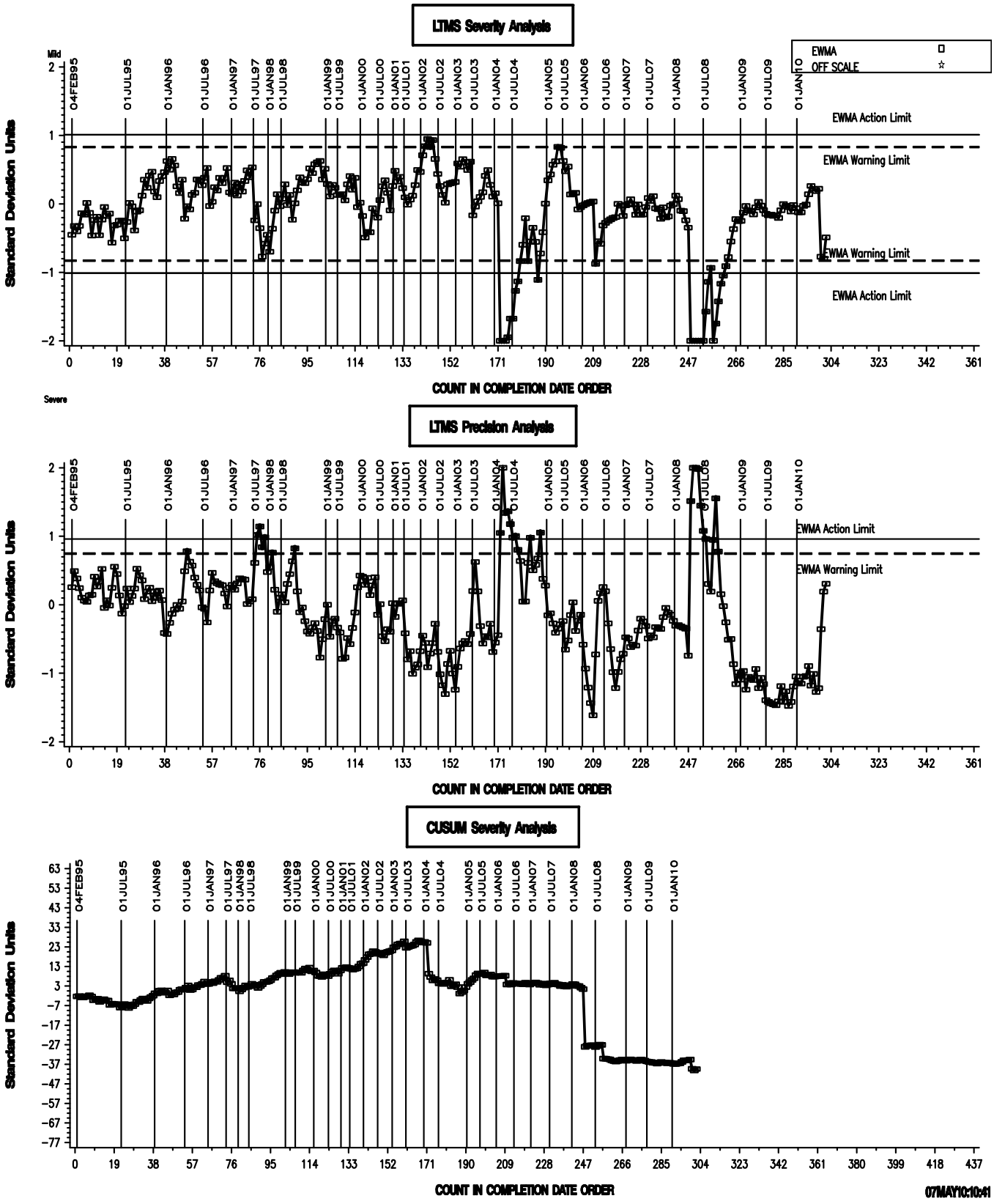
L-37 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR RIPPLING



L-37 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR PITTING/SPALLING



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
20020211	02-2	Rating with magnification Change

Effective Date	Information Letter	Event
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

TMC LAB VISITS

Two L-37 lab visits were conducted during this report period. Documentation to verify the drive shaft and dynamometer connecting shaft specifications was lacking at one of the labs. The shafts at this lab have since been rebalanced and the necessary documentation provided.

INFORMATION LETTERS:

Information Letter 09-2 was issued November 25, 2009 to document the revision of the stand calibration period to 4 months or 650 test hours.

Information Letter 10-1 was issued February 26, 2010 to document the reduced torque requirements for gear batch V1L500/P4T813. This information letter also documents the procedure change permitting the use of gears from any of the approved batches during the calibration period even when one batch might require a different dynamometer torque setting from the previously run gear set.

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	11	133	133.0
151-2	6	10	10.4
151-3	3	58	58.0
152-1	11	74	74.0
153-1	40	58	58.0
155	20	167	167.0
Total	93	501	501.4

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.

SDP/sdp/astm0410.doc/mem10-nnn.sdp.doc
c: Frank Farber
Jeff Clark
Don Lind
L-37 Surveillance Panel
ftp://ftp.astmtmc.cmu.edu/docs/gears/l37/semiannualreports/l37-04-2010.pdf

Distribution: email