Test Monitoring Center
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(412) 365-1000

Memorandum: 03-054

Date: May 7, 2003

To: Fred Gerhart, Chairman, Sequence VIII Surveillance Panel

From: Michael T. Kasimirsky

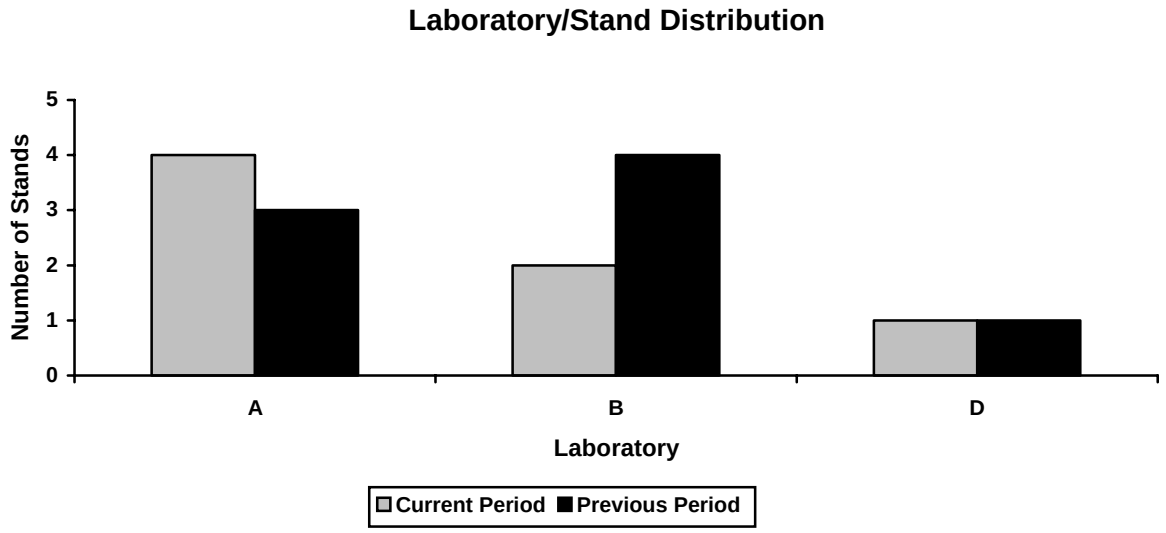
Subject: Sequence VIII Semiannual Report: October 1, 2002 to March 31, 2003

The following is a summary of Sequence VIII reference oil tests that were reported to the Test Monitoring Center during the period from October 1, 2002 to March 31, 2003.

Lab/Stand Distribution

	Reporting Data	Calibrated as of March 31, 2003
Number of Laboratories:	3	3
Number of Stand/Engine Combinations:	7	7

The following chart shows the laboratory/stand distribution:

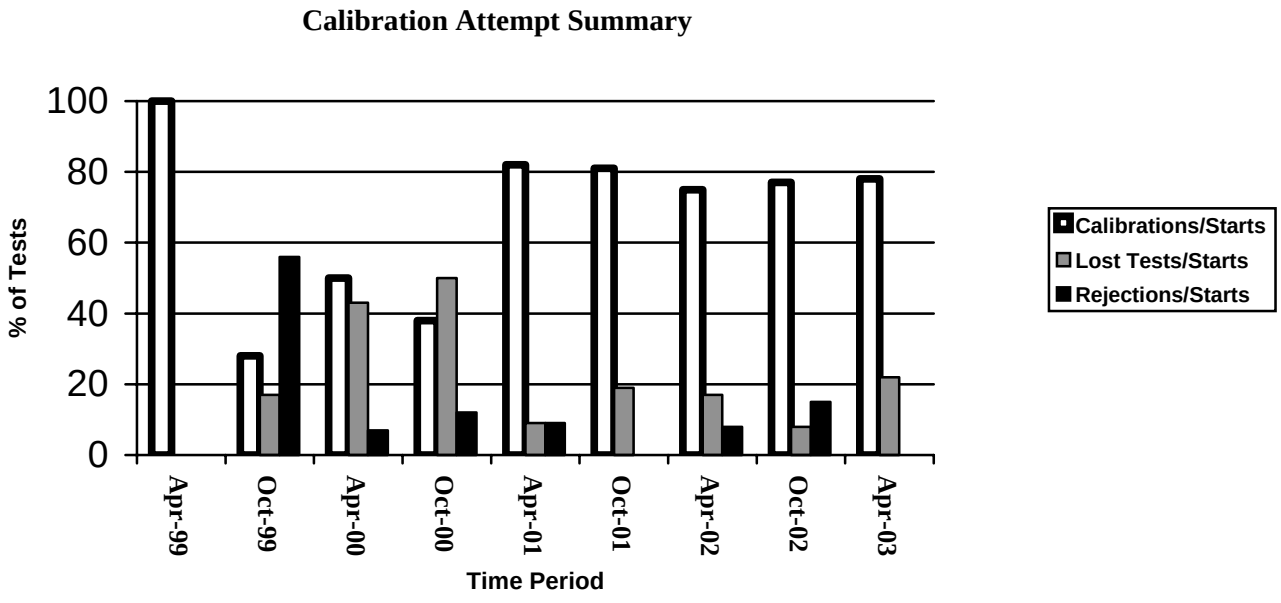


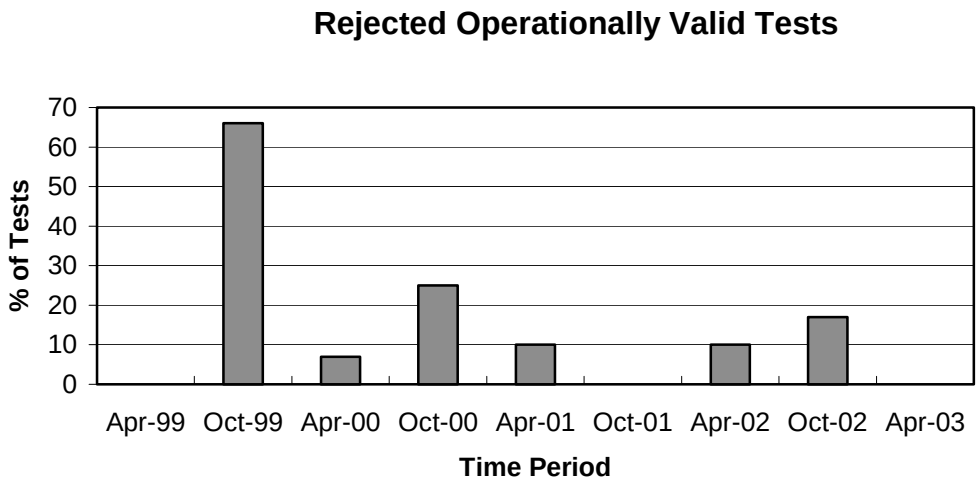
The following summarizes the status of the reference oil tests reported to the TMC:

Calibration Start Outcomes	TMC Validity Code	No. of Tests
Operationally and Statistically Acceptable	AC	7
Failed Acceptance Criteria	OC	0
Stand/Engine failed to successfully calibrate, engine abandoned and data pulled	MC	0
Operationally Invalid (Laboratory Judgment)	LC	2
Operationally Invalid (Laboratory & TMC Judgment)	RC	0
Aborted	XC	0
Total		9

Donated & Industry Support Outcomes	TMC Validity Code	No. of Tests
Donated Test on Reference Oil 1009	AG	2
Total		2

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





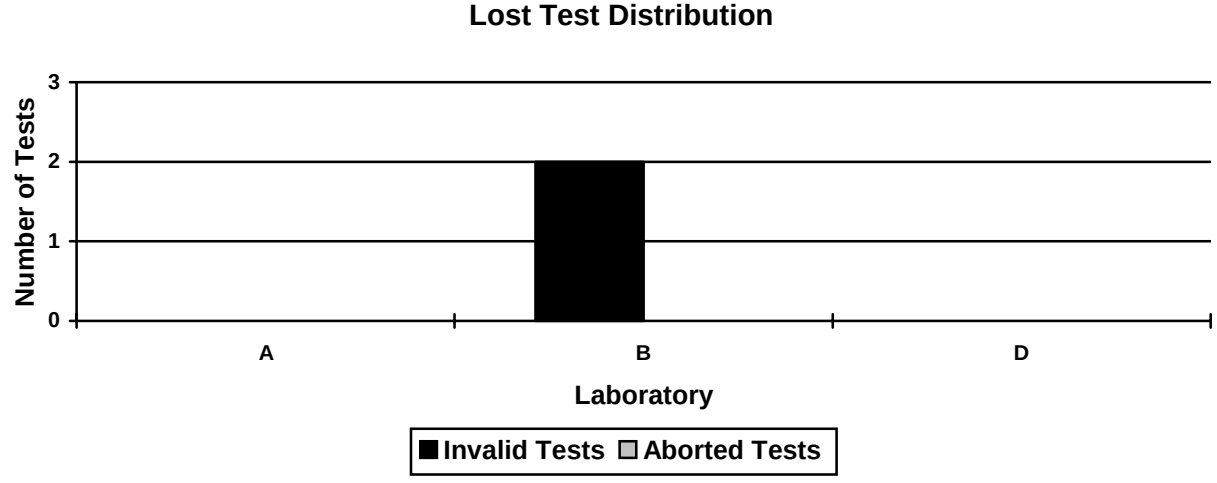
No tests failed this period.

There were no LTMS Deviations this period. There have been no deviations from the LTMS since its introduction in 1999.

No lab visits were performed this period.

Lost Test Summary

Two tests were lost this period, one due to mechanical bearing wear at end of test and the other due to the BWL measurement not being performed within the required four hour period after end of test. Aborts and Operationally Invalid tests, reported by laboratory, are summarized with the following chart:



Information Letters

Information Letter 02-2, Sequence No. 4, dated November 18, 2002, was issued this period and contained numerous editorial revisions to D6709-01.

Severity and Precision Analysis

Below is a summary of the average Δ/s, pooled standard deviation, and average Δ in reported units for the tests reported during this period. Also below is a summary of the average Δ/s value for all laboratories reporting data during this period.

Industry Severity Summary			
Parameter	**Average Δ/s**	**Pooled standard deviation (degrees of freedom)**	**Average Δ, in reported units**
BWL	-0.40	2.71 (df=4)	-1.1 mg
SVIS	-0.54	0.051 (df=4)	0.03 cSt

Average Δ/s by Laboratory		
Lab	BWL	SVIS
A	-0.34	-0.55
B	-1.11	-0.39
D	0.72	-0.76

Bearing Weight Loss (BWL)

During the period, the industry was within limits on both severity and precision (see Figure 1). The Industry BWL mean Δ/s is -0.40 mild for this report period (see Figure 3), which is comparable to historical performance. This equates to a shift of -1.1 mg in reported units. The pooled standard deviation for the period is 2.71 mg (see Figure 4), which is also comparable to historical performance.

Figures 7 and 8 graphically illustrate the lead content, in ppm, in the bearing storage oil. The highest concentration of lead reported this period was 145 ppm. The lead levels in the bearing storage oil continue to rise. This increase in lead levels in the bearing storage oil may be related to the overall mild trend in BWL results. However, further investigation is necessary to determine what effect, if any, this rise in lead levels is having on overall BWL results.

Stripped Viscosity (SVIS)

The industry has been within limits for both severity and precision for the period (see Figure 2). The Industry SVIS mean Δ/s is -0.54 severe for this report period (see Figures 2 & 5). This equates to a shift of 0.03 cSt in reported units. The pooled standard deviation for the period is 0.051 cSt (see Figure 6), which exceeds the best historical performance to date.

Hardware

There were no hardware changes for the period.

Reference Oils

Oil	TMC Inventory, In gallons	TMC Inventory, In tests	Laboratory Inventory, in tests	Estimated Life
704-1	433	216	8	10+ years
1006	44	22	4	3 months[1]
1006-2	5,067	2,533	5	3+ years[1]
1009	985	492	5	3+ years[1]

[1] Multiple test area reference oil; total TMC inventory shown

Reference oil 1006-2 was introduced into the LTMS during the period using the existing targets for reference oil 1006. Test targets for this new oil were to be generated when five data points were available for review by the Surveillance Panel for possible implementation. The Surveillance Panel approved those targets on October 25, 2002, for all tests on reference oil 1006-2, i.e. they would be retroactively applied to all existing data on this oil. The targets for this oil will also be automatically updated at 10, 20, and 30 data points as usual. The new targets for reference oil 1006-2 are shown below:

Parameter	Mean	Standard Deviation
BWL	13.0	4.26
SVIS	9.23	0.07

No changes were made to the status of existing tests; the only effect will be on any laboratory severity adjustments resulting from the change. Any new severity adjustments will be in effect moving forward from October 25, 2002, i.e. there will be no retroactive changes to existing test results or severity adjustments.

On January 7, 2003, the panel successfully approved an electronic ballot to the Sequence VIII Surveillance Panel on introducing reference oil 1009 into the LTMS. The motion contained in this ballot was to introduce reference oil 1009 into the LTMS at a 33% usage rate and using the preliminary test targets shown in TMC Memorandum 02-127. The motion also specified that these targets be updated when 10, 20, and 30 data points become available, as is normal practice. The initial targets for this oil are shown below:

Parameter	Mean	Standard Deviation
BWL	12.8	2.00
SVIS	9.51	0.10

These targets are in effect for all tests completed on or after January 7, 2003.

Stripped Viscosity Measurement Investigation

The TMC was tasked with obtaining a used oil sample for use in the stripped viscosity investigation from a calibration test on reference oil 1009. At this time a sample has not yet been obtained. When one is obtained, samples will be sent out to the testing laboratories for the next iteration of the stripped viscosity investigation.

MTK/mtk

Attachments

c: F. M. Farber, TMC
Sequence VIII Surveillance Panel
ftp://ftp.astmtmc.cmu.edu/docs/gas/sequenceviii/semiannualreports/VIII-04-2003.pdf

Distribution: Electronic Mail

List of Figures

- Figure 1 graphically presents the Industry control charts for BWL and also the CUSUM delta/s plot (by count in completion date order) of bearing weight loss for operationally valid tests.

- Figure 2 graphically presents the Industry control charts for SVIS and also the CUSUM delta/s plot (by count in completion date order) of bearing weight loss for operationally valid tests.

- Figure 3 graphically presents a historic perspective for BWL mean delta/s by report period.

- Figure 4 graphically presents a historic perspective for BWL pooled standard deviations by report period.

- Figure 5 graphically presents a historic perspective for SVIS mean delta/s by report period.

- Figure 6 graphically presents a historic perspective for SVIS pooled standard deviations by report period.

- Figure 7 graphically presents a comparison of Total Bearing Weight Loss (Delta/s) vs. the amount of lead content, in ppm, in the bearing storage oil.

- Figure 8 graphically presents the amount of lead content, in ppm, in the bearing storage oil by completion date order (Sequence VIII and L-38 data combined).

- Figure 9 is the Sequence VIII Timeline, created to track changes in test hardware and operations.

Figure 1

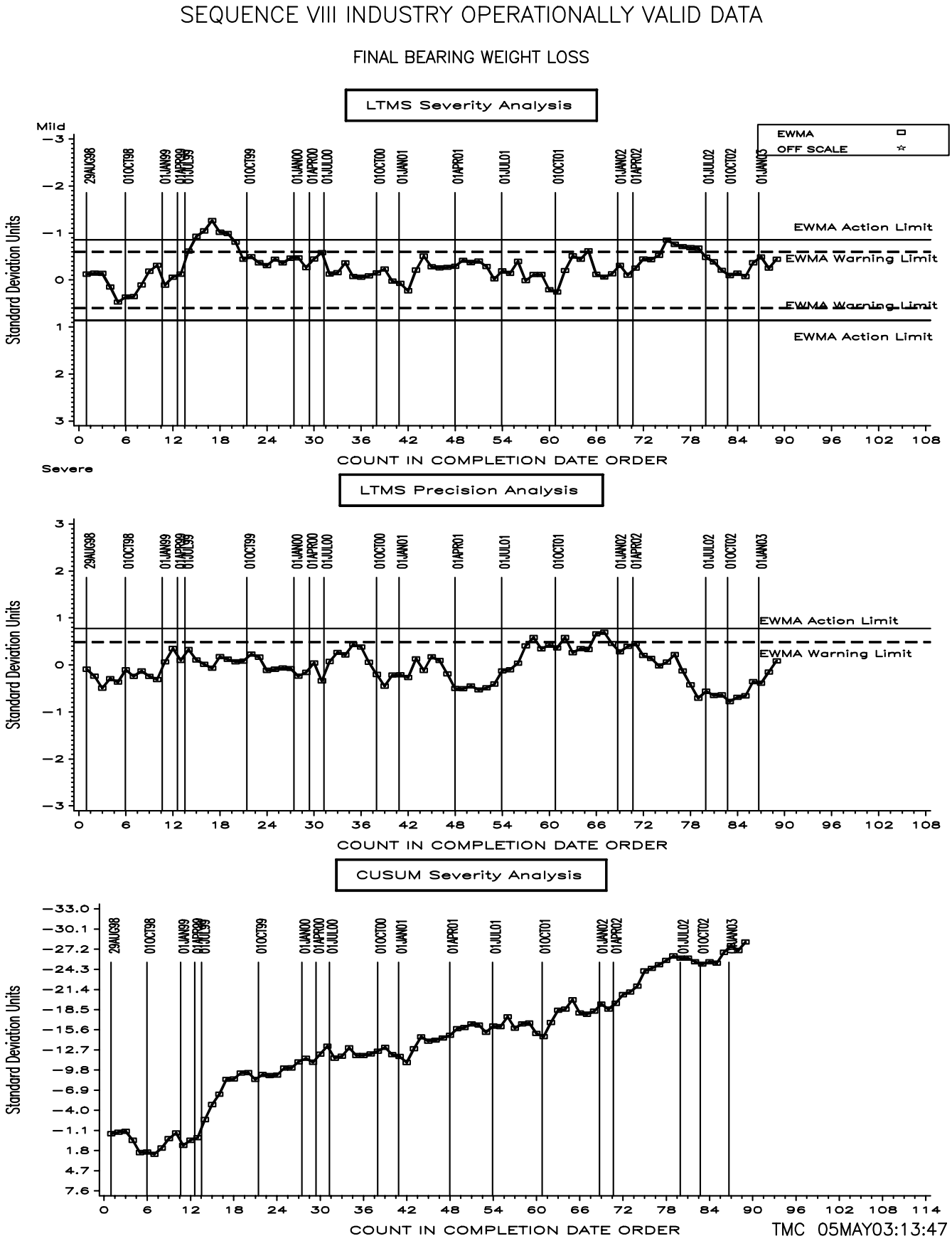

SEQUENCE VIII INDUSTRY OPERATIONALLY VALID DATA
FINAL BEARING WEIGHT LOSS
LTMS Severity Analysis
Mild
Severe
EWMA
OFF SCALE
EWMA Action Limit
EWMA Warning Limit
EWMA Warning Limit
EWMA Action Limit
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
LTMS Precision Analysis
EWMA Action Limit
EWMA Warning Limit
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
CUSUM Severity Analysis
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
TMC 05MAY03:13:47

Figure 2

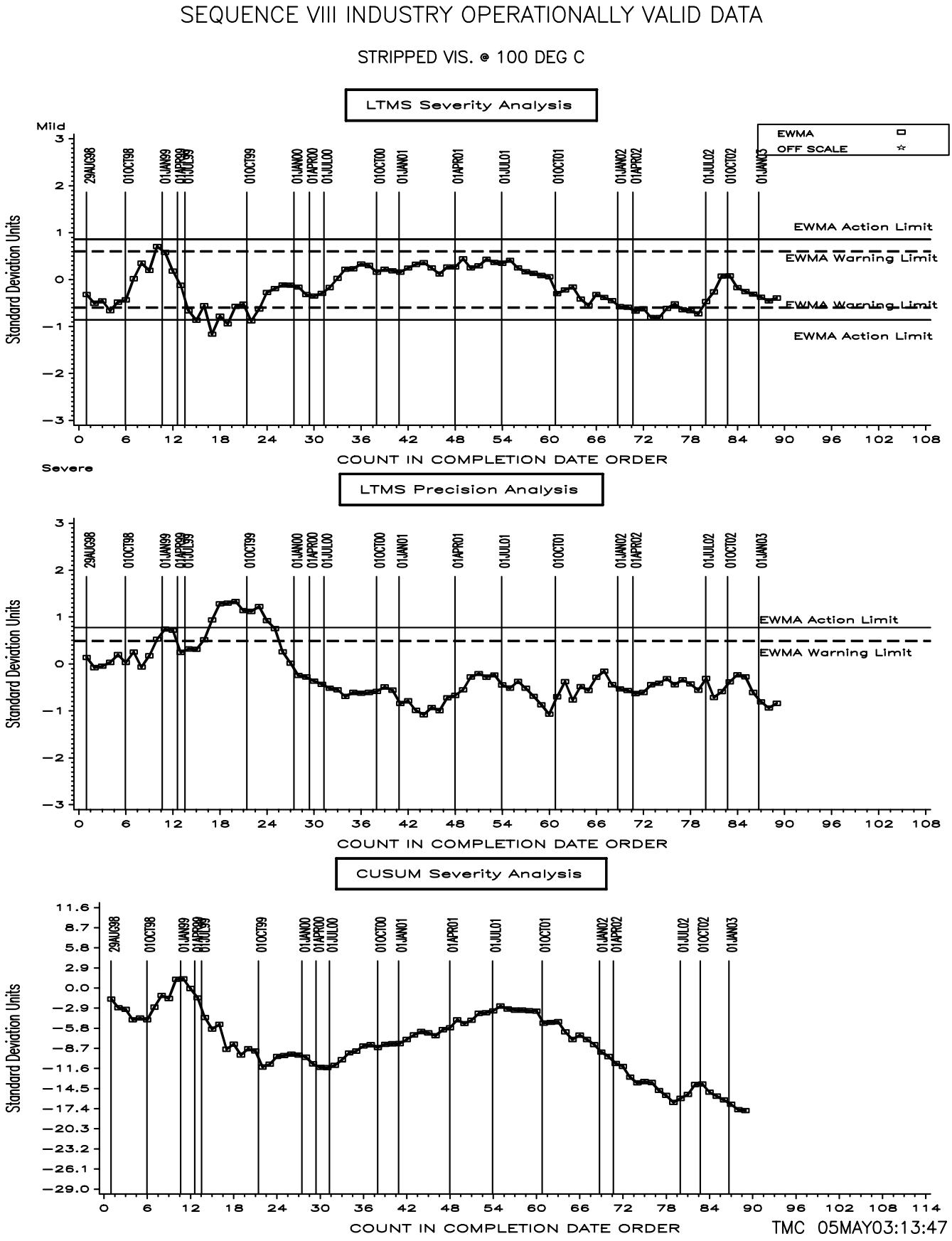

SEQUENCE VIII INDUSTRY OPERATIONALLY VALID DATA
STRIPPED VIS. @ 100 DEG C
LTMS Severity Analysis
Mild
Severe
EWMA
OFF SCALE
EWMA Action Limit
EWMA Warning Limit
EWMA Warning Limit
EWMA Action Limit
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
LTMS Precision Analysis
CUSUM Severity Analysis
29AUG98
01OCT98
01JAN99
01APR99
01JUL99
01OCT99
01JAN00
01APR00
01JUL00
01OCT00
01JAN01
01APR01
01JUL01
01OCT01
01JAN02
01APR02
01JUL02
01OCT02
01JAN03
TMC 05MAY03:13:47

Figure 3 - Sequence VIII Reference Oil Data
Bearing Weight Loss

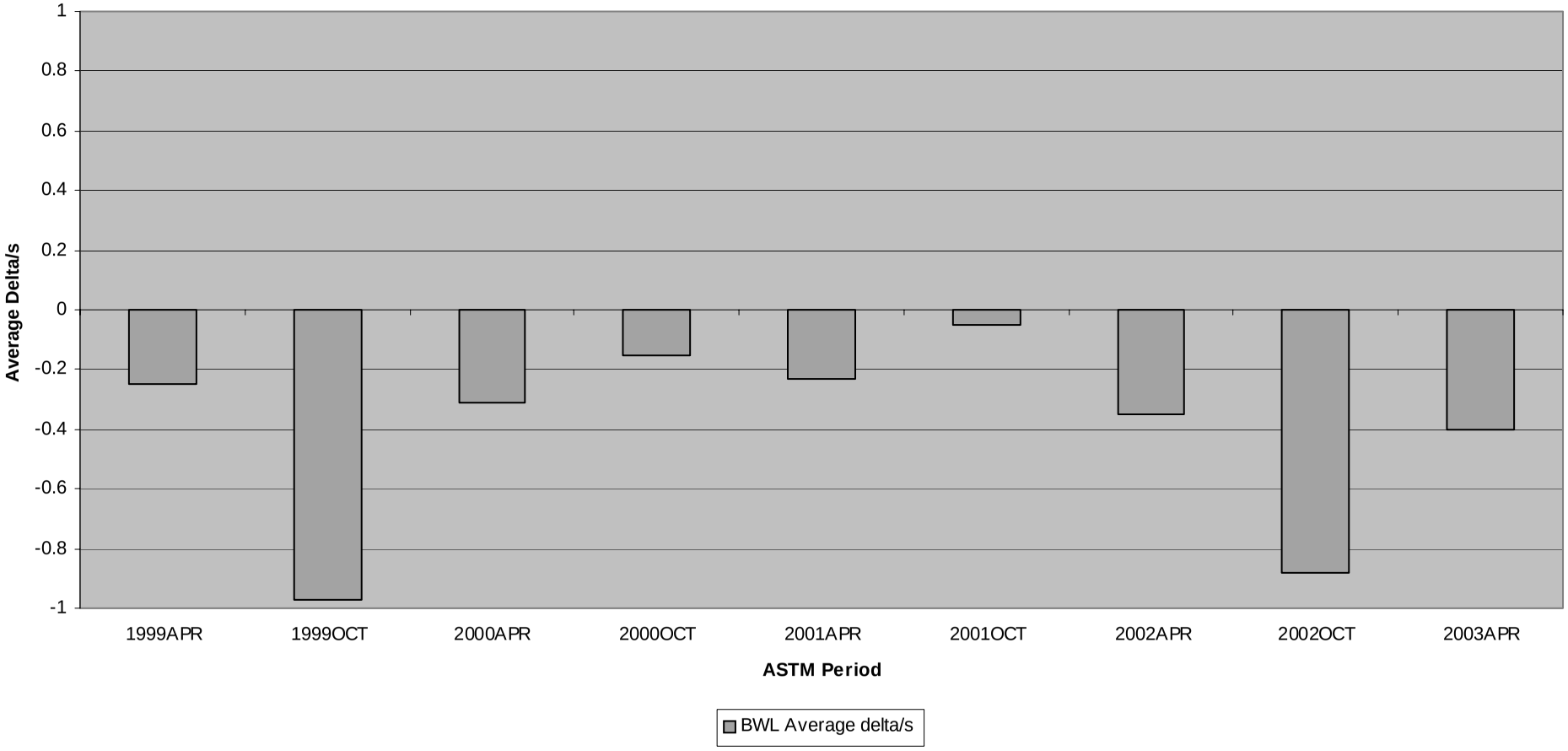


Figure 4 - Sequence VIII Reference Oil Data
Bearing Weight Loss

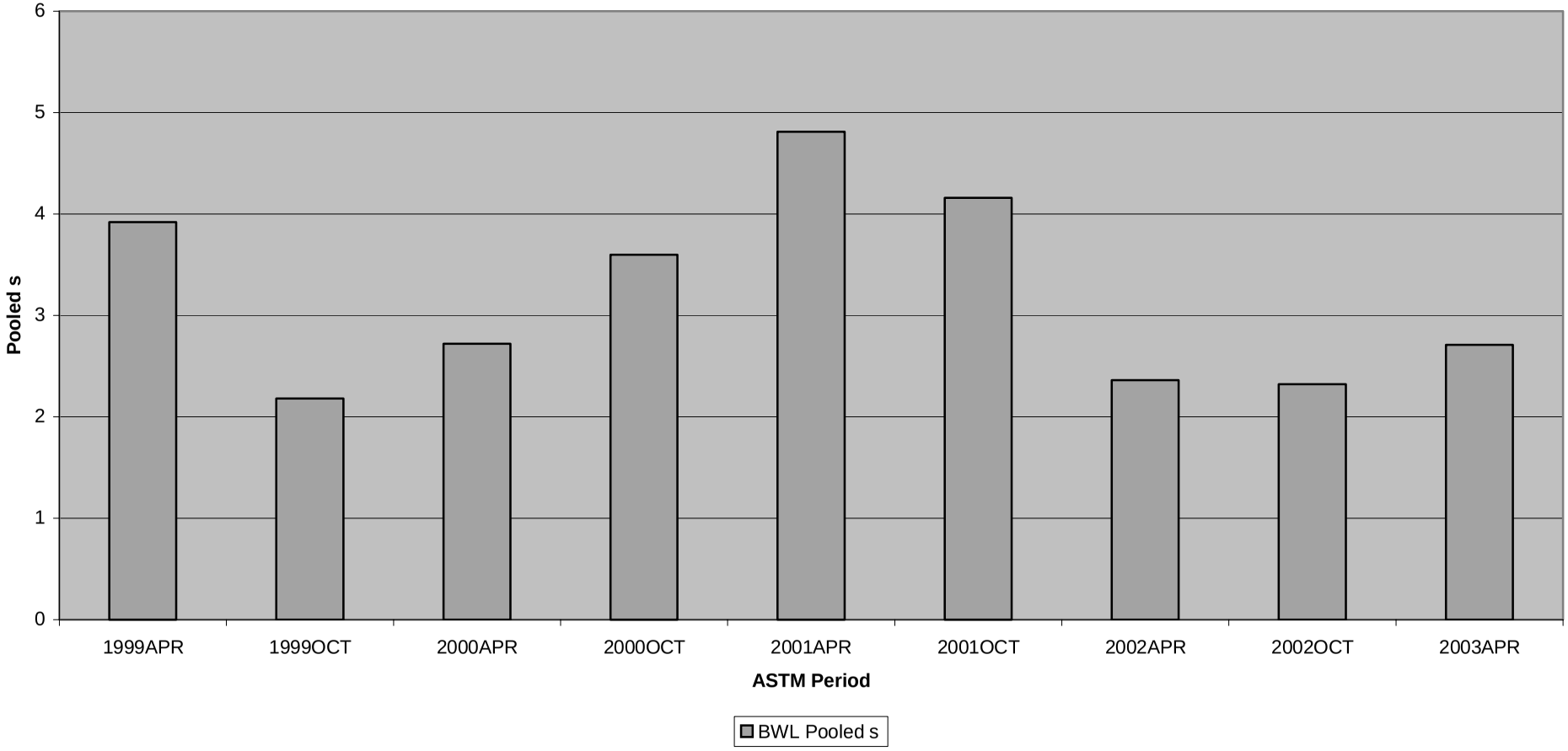


Figure 5 - Sequence VIII Reference Oil Data
Stripped Viscosity

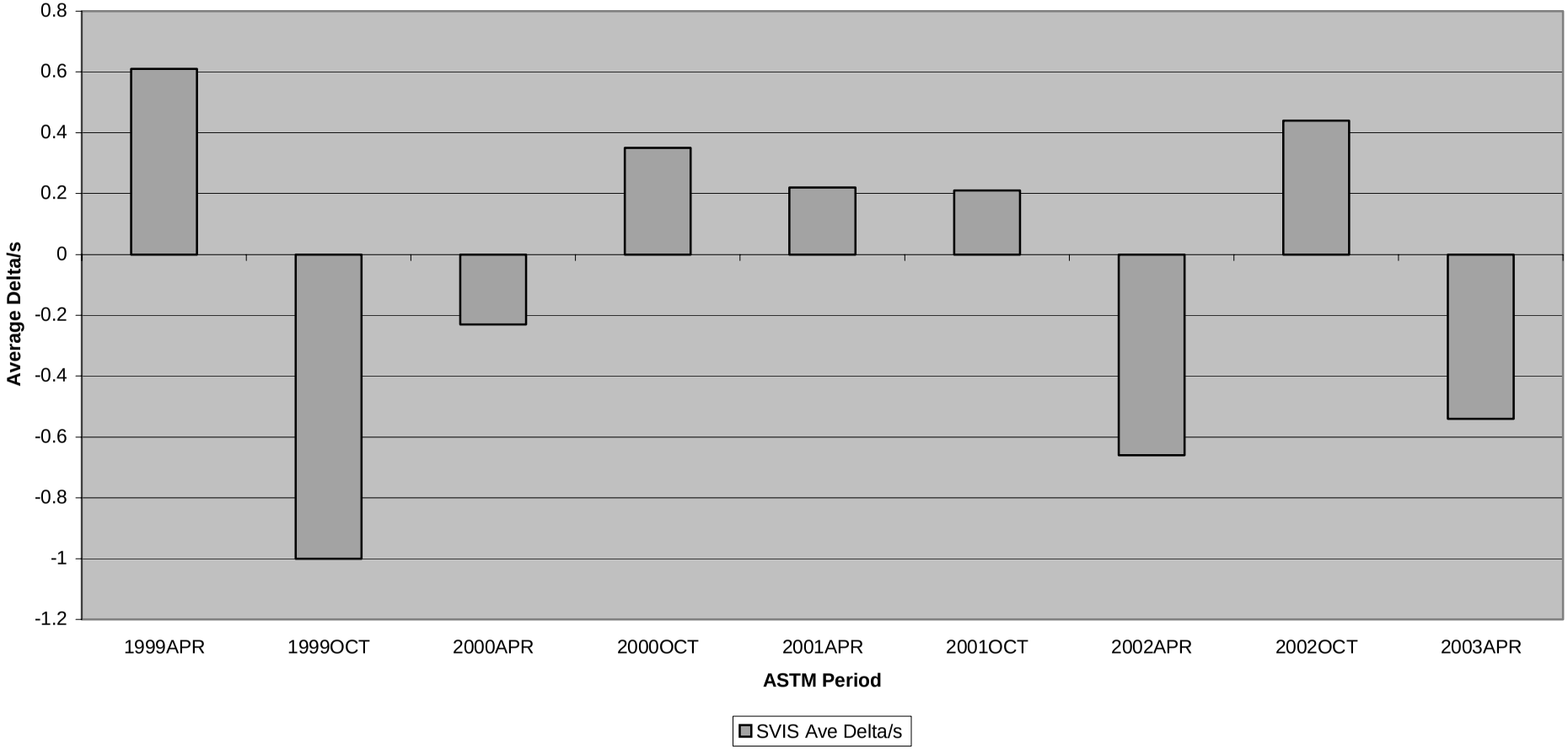


Figure 6 - Sequence VIII Reference Oil Data
Stripped Viscosity

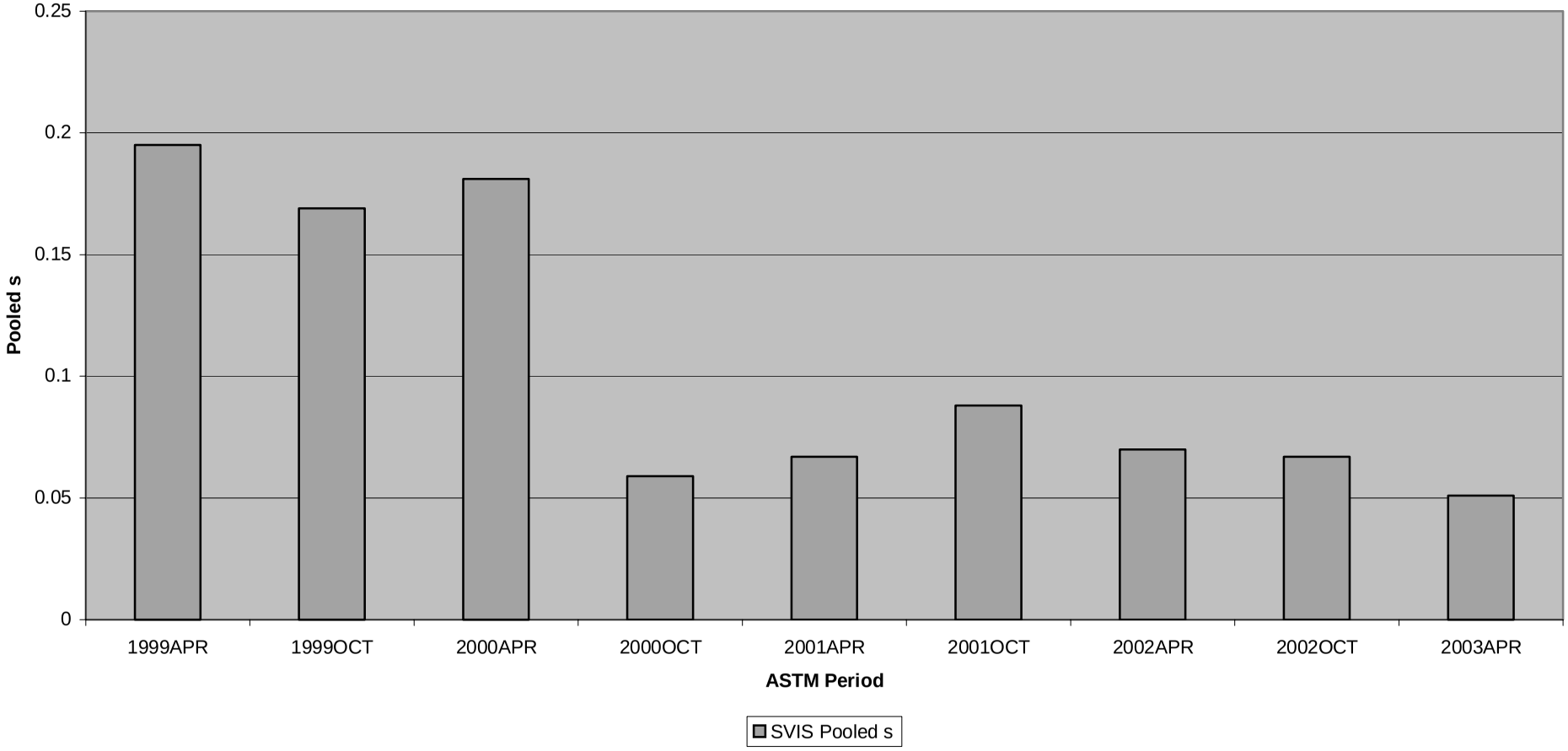


Figure 7

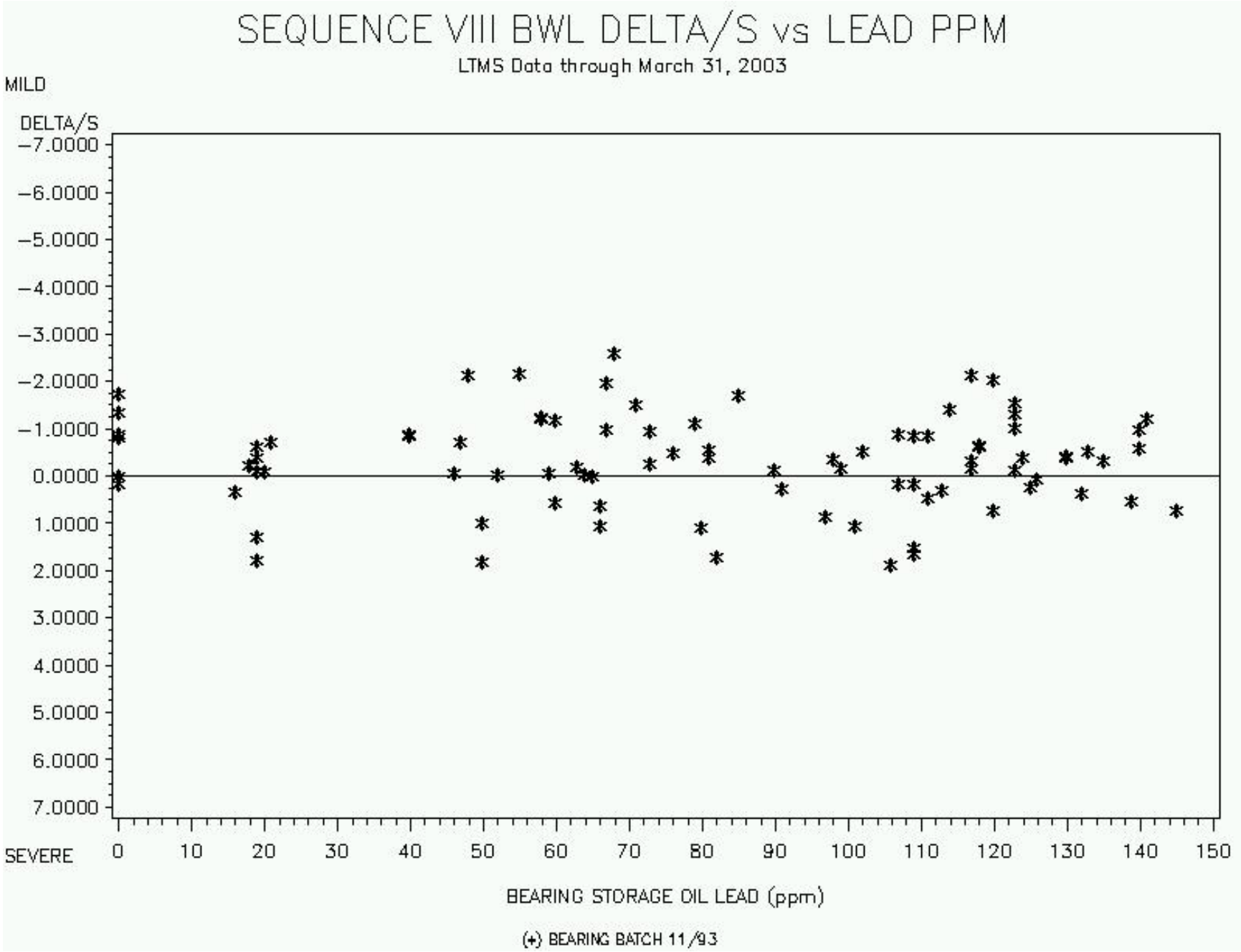

SEQUENCE VIII BWL DELTA/S vs LEAD PPM
LTMS Data through March 31, 2003
MILD
DELTA/S
−7.0000
−6.0000
−5.0000
−4.0000
−3.0000
−2.0000
−1.0000
0.0000
1.0000
2.0000
3.0000
4.0000
5.0000
6.0000
7.0000
SEVERE
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
BEARING STORAGE OIL LEAD (ppm)
(+) BEARING BATCH 11/93

Figure 8

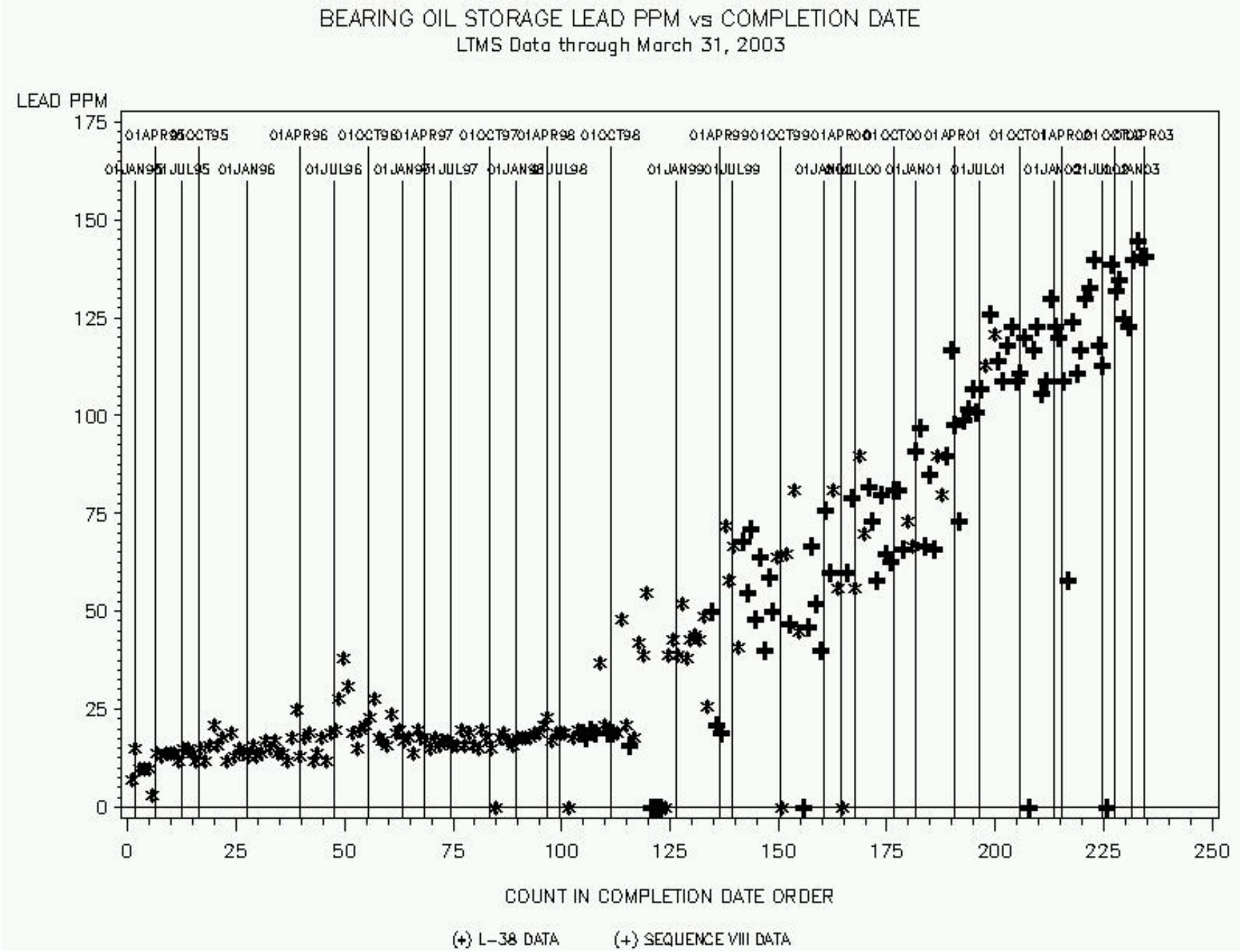

BEARING OIL STORAGE LEAD PPM vs COMPLETION DATE
LTMS Data through March 31, 2003
LEAD PPM
175
150
125
100
75
50
25
0
0
25
50
75
100
125
150
175
200
225
250
COUNT IN COMPLETION DATE ORDER
(+) L-38 DATA
(+) SEQUENCE VIII DATA

Figure 9 - Sequence VIII Timeline		
Date	**Topic**	**Information Letter**
2/10/1999	NEW PISTON RING BATCH APPROVED FOR USE IN SEQUENCE VIII TESTING	00-1
4/16/1999	DRAFT 3.1 OF THE SEQUENCE VIII TEST PROCEDURE ISSUED	99-1
5/19/1999	REMOVAL OF RING BATCH REPORTING REQUIREMENTS	00-1
5/19/1999	NEW OIL FILTER (RAYCOR LFS-62) IMPLEMENTED INTO TESTING	00-1
11/16/1999	TEST ENGINEERING INC. NEW TEST PARTS SUPPLIER	00-1
1/28/2000	PISTON CLEANING PROCEDURE FOR REUSING PISTONS IN SEQUENCE VIII TESTING	00-1
6/15/2002	REVISED STAY-IN-GRADE PROCEDURE IMPLEMENTED	02-1
11/18/2002	EDITORIAL REVISIONS TO D6709-01	02-2