



Test Monitoring Center

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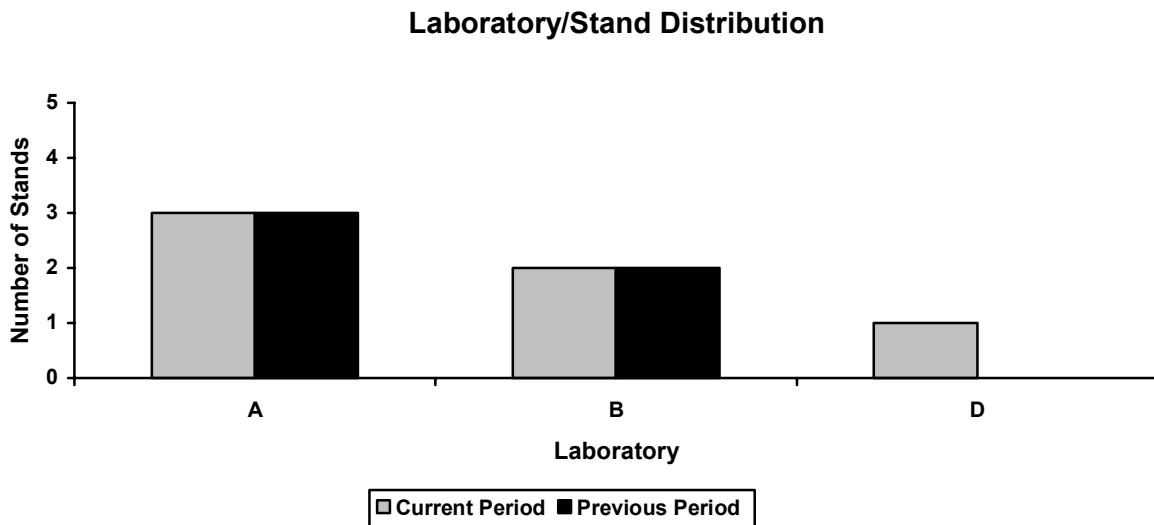
Memorandum: 04-032
Date: April 21, 2004
To: Fred Gerhart, Chairman, Sequence VIII Surveillance Panel
From: Michael T. Kasimirsky *Michael T. Kasimirsky*
Subject: Sequence VIII Semiannual Report: October 1, 2003 to March 31, 2004

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, 2003 to March 31, 2004.

Lab/Stand Distribution

	Reporting Data	Calibrated as of March 31, 2004
Number of Laboratories:	3	1
Number of Stand/Engine Combinations:	6	3

The following chart shows the laboratory/stand distribution:



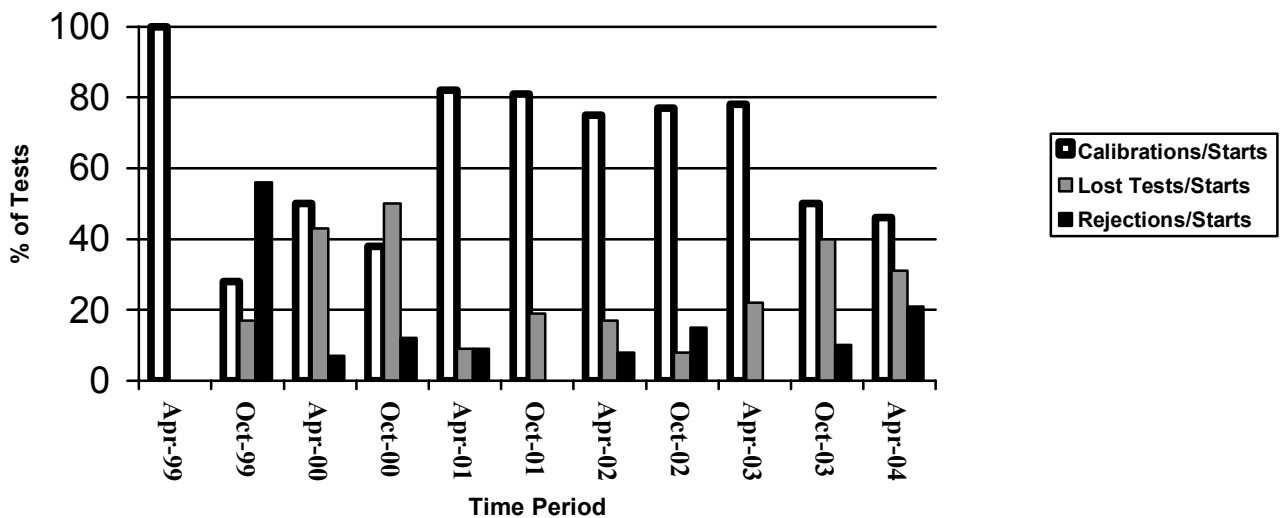
The following summarizes the status of the reference oil tests reported to the TMC:

Calibration Start Outcomes	TMC Validity Code	No. of Tests
Operationally and Statistically Acceptable	AC	6
Failed Acceptance Criteria	OC	3
Stand/Engine failed to successfully calibrate, engine abandoned and data pulled	MC	0
Operationally Invalid (Laboratory Judgment)	LC	4
Operationally Invalid (Laboratory & TMC Judgment)	RC	0
Aborted	XC	0
Total		13

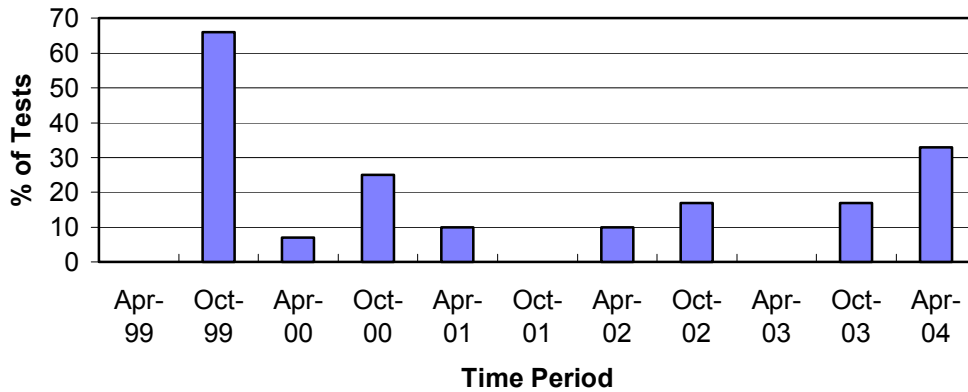
Donated & Industry Support Outcomes	TMC Validity Code	No. of Tests
Invalid test on decoded oil – mechanical bearing wear.	LG	1
Total		0

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

Calibration Attempt Summary



Rejected Operationally Valid Tests



Three tests failed this period, two for BWL severity problems and one due to severe stripped viscosity results.

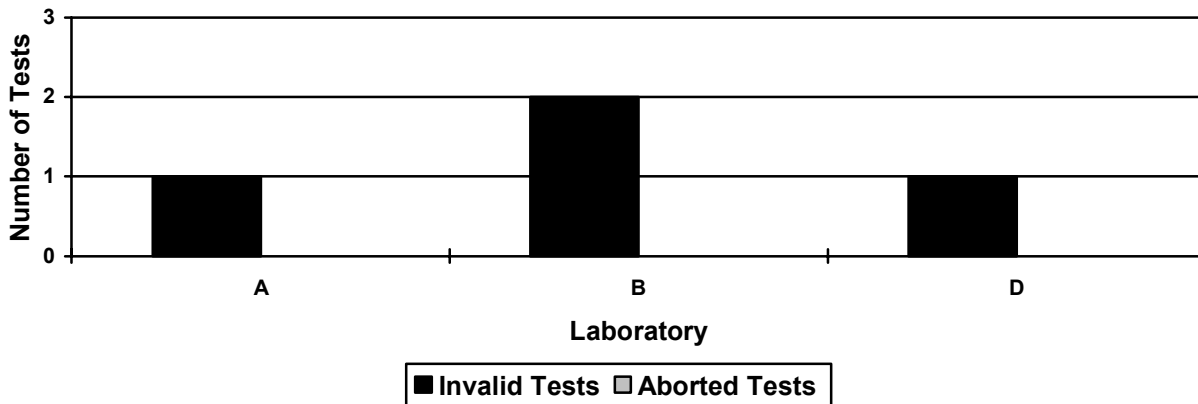
There were no LTMS Deviations this period. There have been no deviations from the LTMS since its introduction in 1999.

Two labs visit was performed this period. No significant problems were found.

Lost Test Summary

Four tests were lost this period: two due to mechanical bearing wear, one due to a problem with the flywheel supports not being retracted, and one due to a counter balance malfunction. These tests were conducted on three stand/engine combinations at three different laboratories. Aborts and Operationally Invalid tests, reported by laboratory, are summarized with the following chart:

Lost Test Distribution



Information Letters

Sequence VIII Information Letter 03-1, Sequence No. 5, was issued on November 17, 2003 and contained specifications for Mineral Spirits and Test Fuel used in the Sequence VIII test.

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	0.21	4.03 (df=6)	0.8 mg
SVIS	-0.05	0.113 (df=6)	-0.01 cSt

Average Δ/s by Laboratory		
Lab	BWL	SVIS
A	0.07	-0.64
B	0.31	0.69
D	-	-

Bearing Weight Loss (BWL)

The industry was within limits on precision (see Figure 1) but has currently experienced two mild EWMA severity alarms since the last report. The industry began the period with a severity alarm that was caused by a single mild failing result ($-2.5 Y_i$ result) at one laboratory. The rerun of this test, and a subsequent test at another laboratory, were within limits (-0.8 and $-1.8 Y_i$ results, respectively) but did not clear the industry alarm. A fourth test, on another stand/engine combination at the second laboratory to run data after the alarm sounded, cleared the alarm. The second alarm is currently in effect right now and was triggered by a mild ($-1.9 Y_i$ result) test on reference oil 704-1. A rerun on the same stand/engine combination generated passing results on reference oil 1006-2 but did not clear the alarm.

The Industry BWL mean Δ/s is 0.21 severe for this report period (see Figure 3), which reverses the long-standing mild performance trend. This equates to a shift of 0.8 mg in reported units. However, recent performance seems to indicate a return to the previous mild trend on BWL. The pooled standard deviation for the period is 4.03 mg (see Figure 4), which is worse than the last four periods but still comparable to overall 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 232 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 severity for the period (see Figure 2). The Industry SVIS mean Δ/s is -0.05 severe for this report period (see Figures 2 & 5). This equates to a shift of -0.01 cSt in reported units. During the period, the industry experienced a four-point precision alarm on SVIS due to a single run on reference oil 1006-2 ($3.0 Y_i$ result). The pooled standard deviation for the period is 0.113 cSt (see Figure 6), which is the worst precision estimate on SVIS since the April 2000 report period. No cause for this change has been identified at this time.

Hardware

The Billet Crankshaft was approved for use in Sequence VIII testing during the period.

Reference Oils

Oil	TMC Inventory, In gallons	TMC Inventory, In tests	Laboratory Inventory, in tests	Estimated Life
704-1	421	210	6	10+ years
1006	44	22	3	3 months ¹
1006-2	4,886	2,443	3	3+ years ¹
1009	891	450	3	3+ years ¹

¹ Multiple test area reference oil; total TMC inventory shown

Stripped Viscosity Measurement Investigation

On January 28, 2004, the panel approved a motion via e-ballot to discontinue the Stripped Viscosity Round Robin activity. No additional activities on this topic are planned at this time.

MTK/mtk

Attachments

c: F. M. Farber, TMC
Sequence VIII Surveillance Panel
<ftp://astmtmc.cmu.edu/docs/gas/sequenceviii/semiannualreports/VIII-04-2004.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

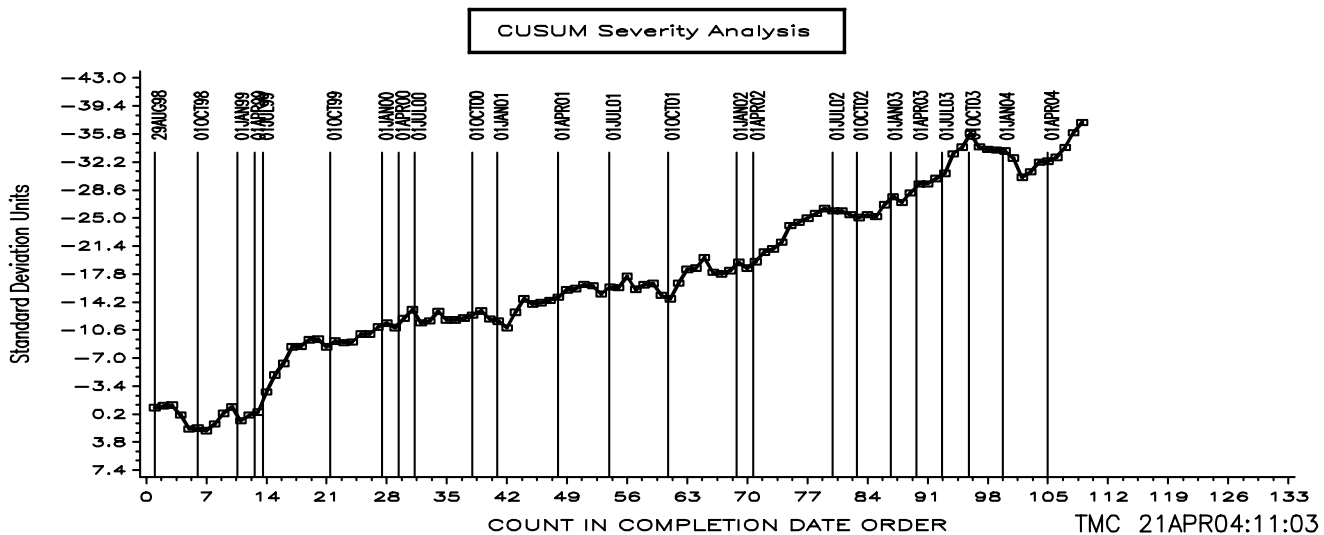
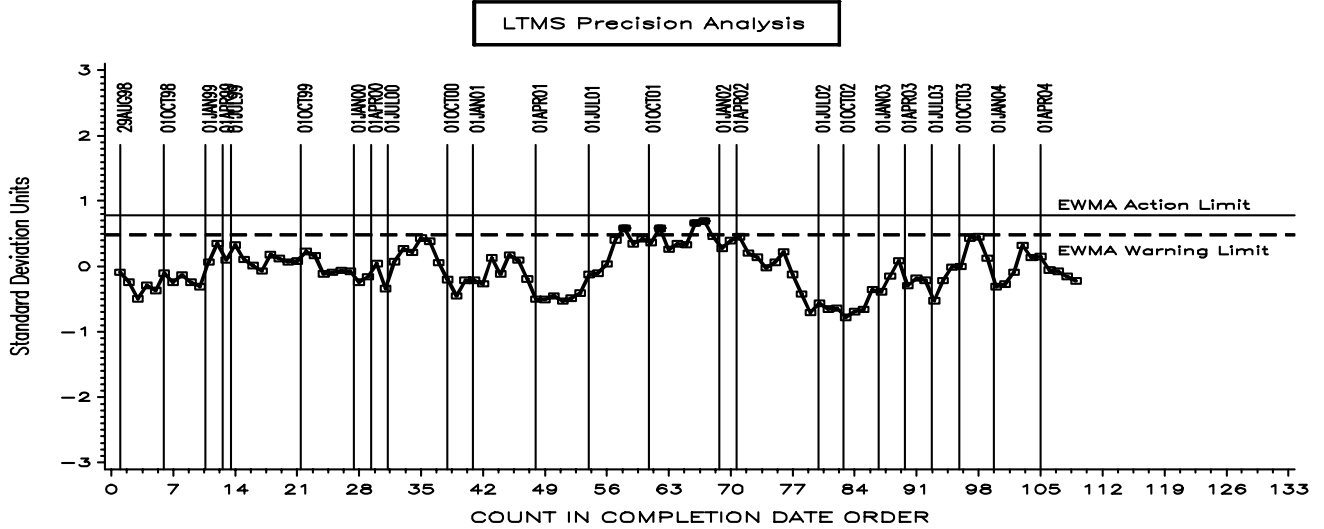
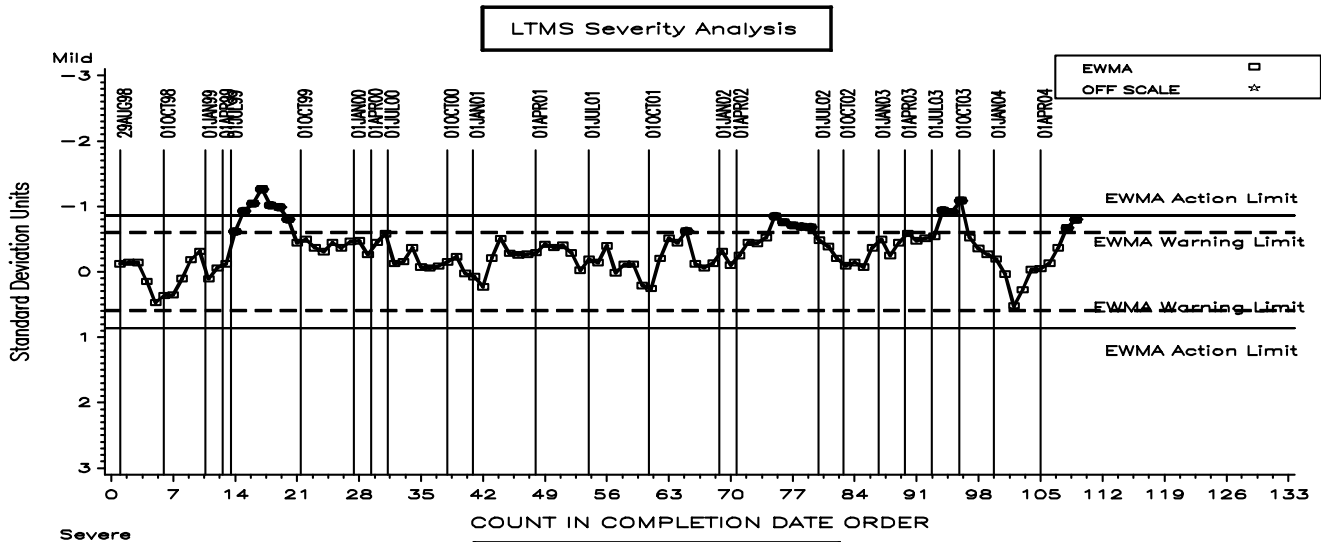


Figure 2

SEQUENCE VIII INDUSTRY OPERATIONALLY VALID DATA

STRIPPED VIS. @ 100 DEG C

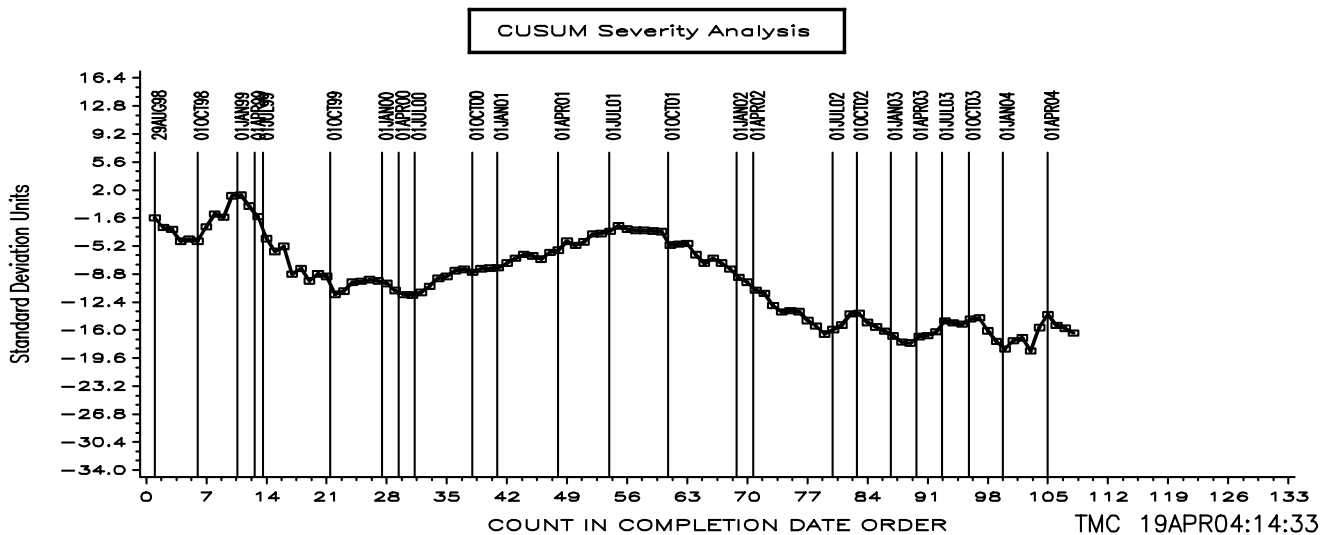
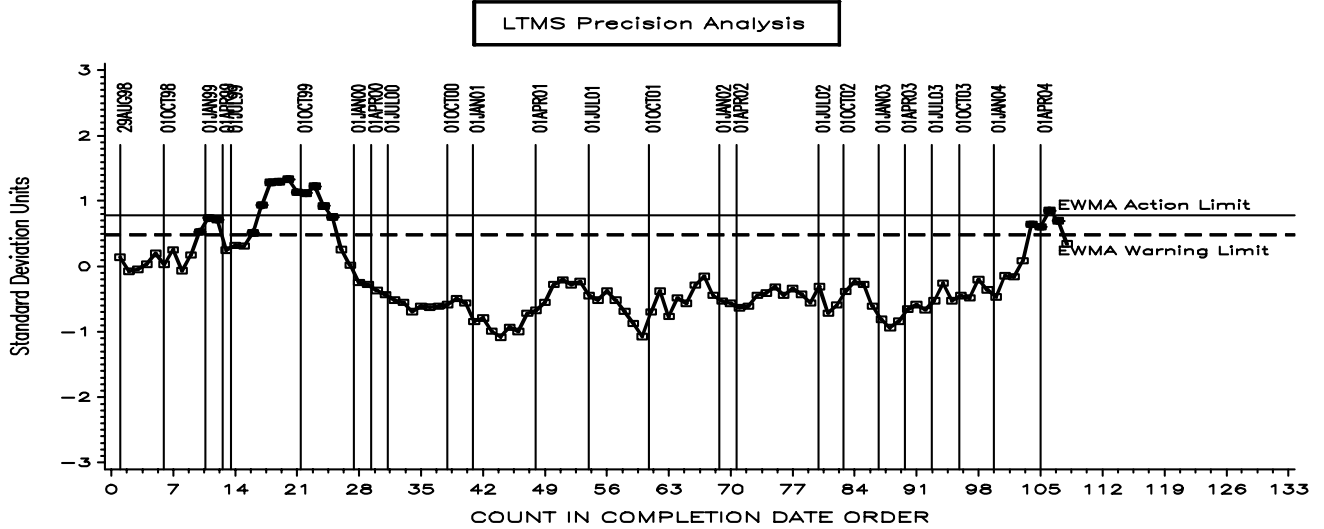
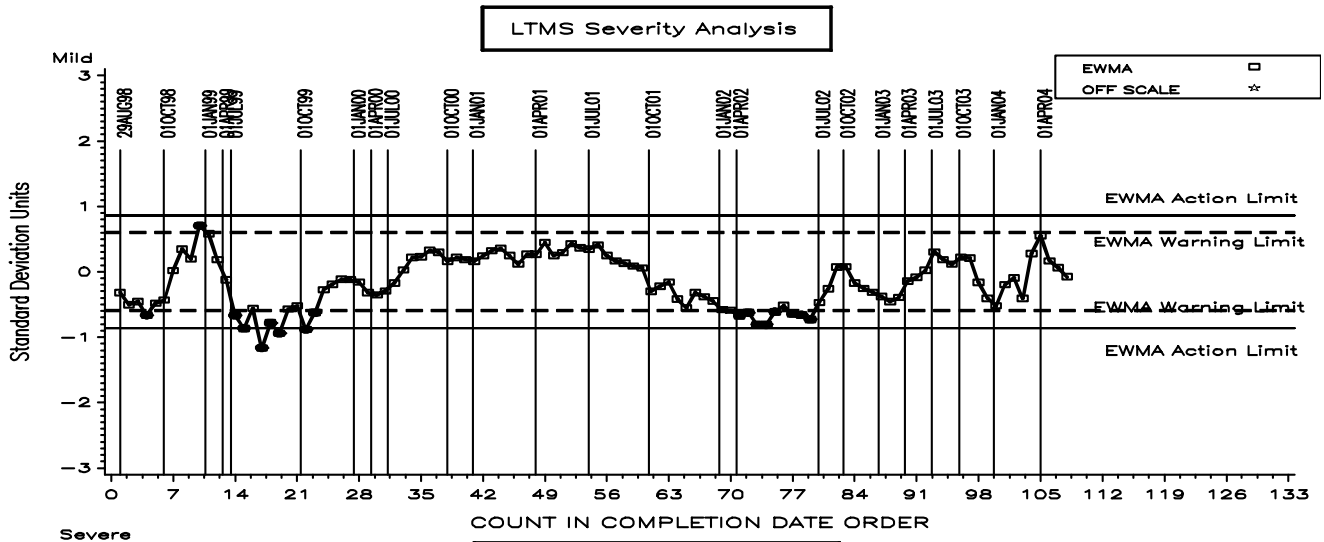
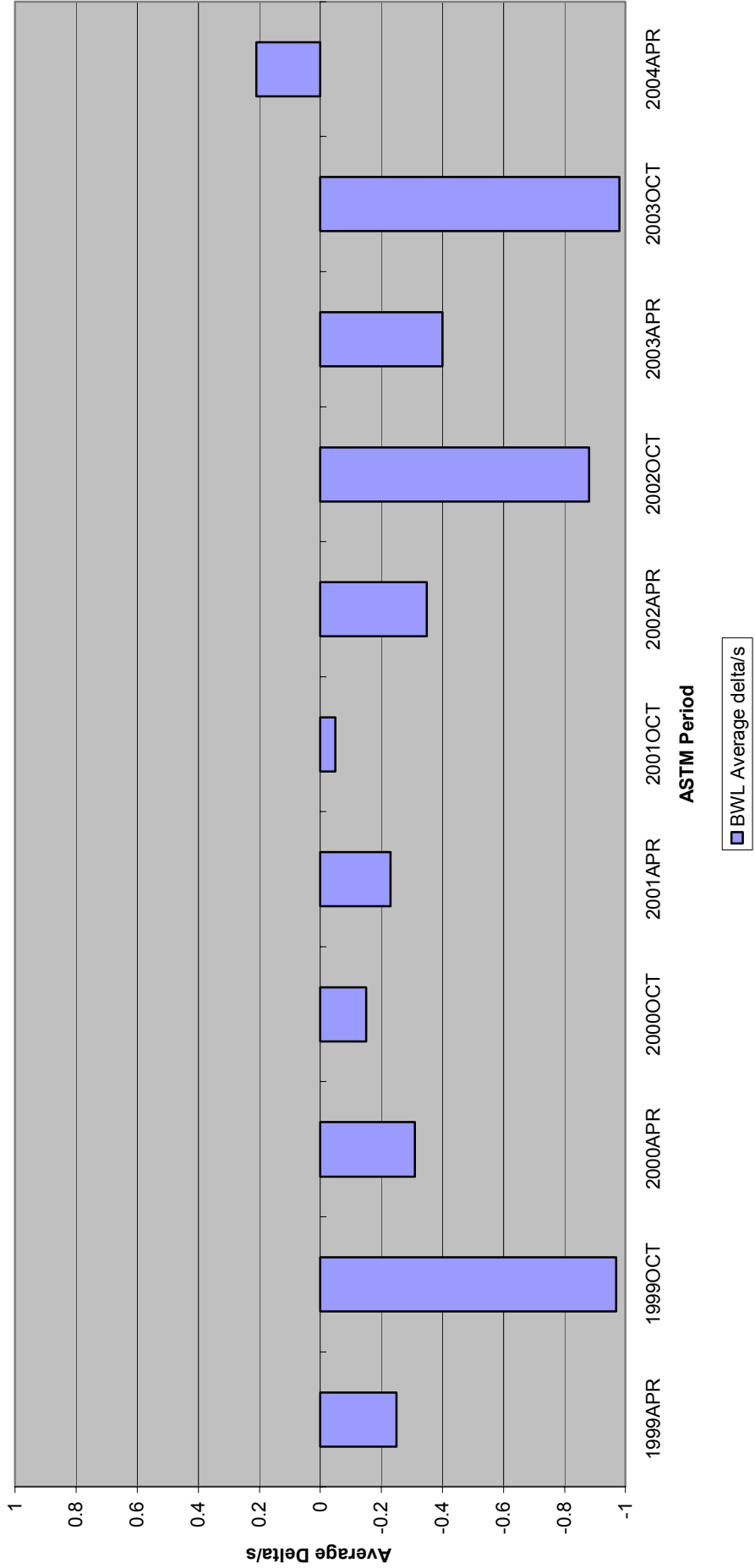


Figure 3 - Sequence VIII Reference Oil Data
Bearing Weight Loss



**Figure 4 - Sequence VIII Reference Oil Data
Bearing Weight Loss**

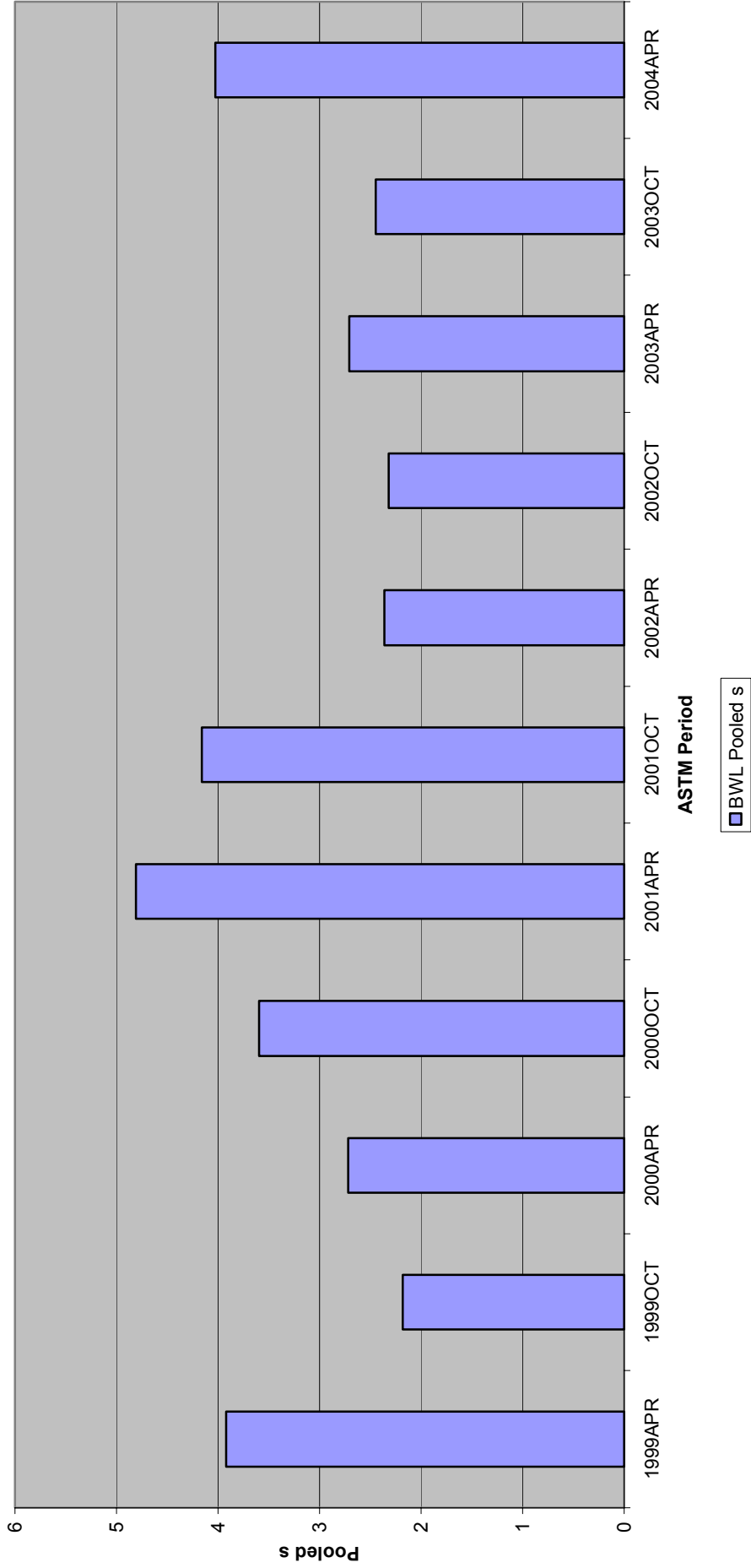


Figure 5 - Sequence VIII Reference Oil Data
Stripped Viscosity

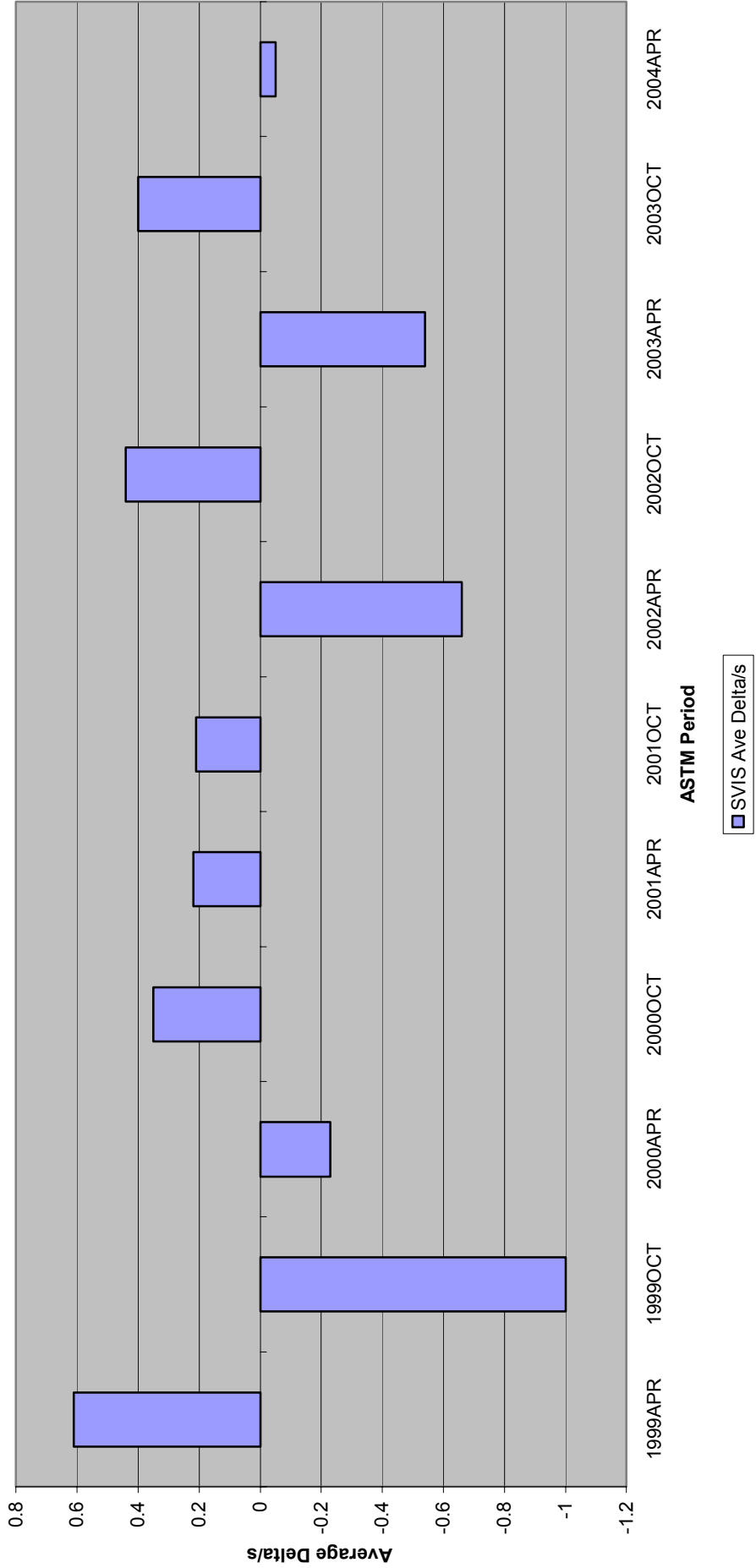


Figure 6 - Sequence VIII Reference Oil Data
Stripped Viscosity

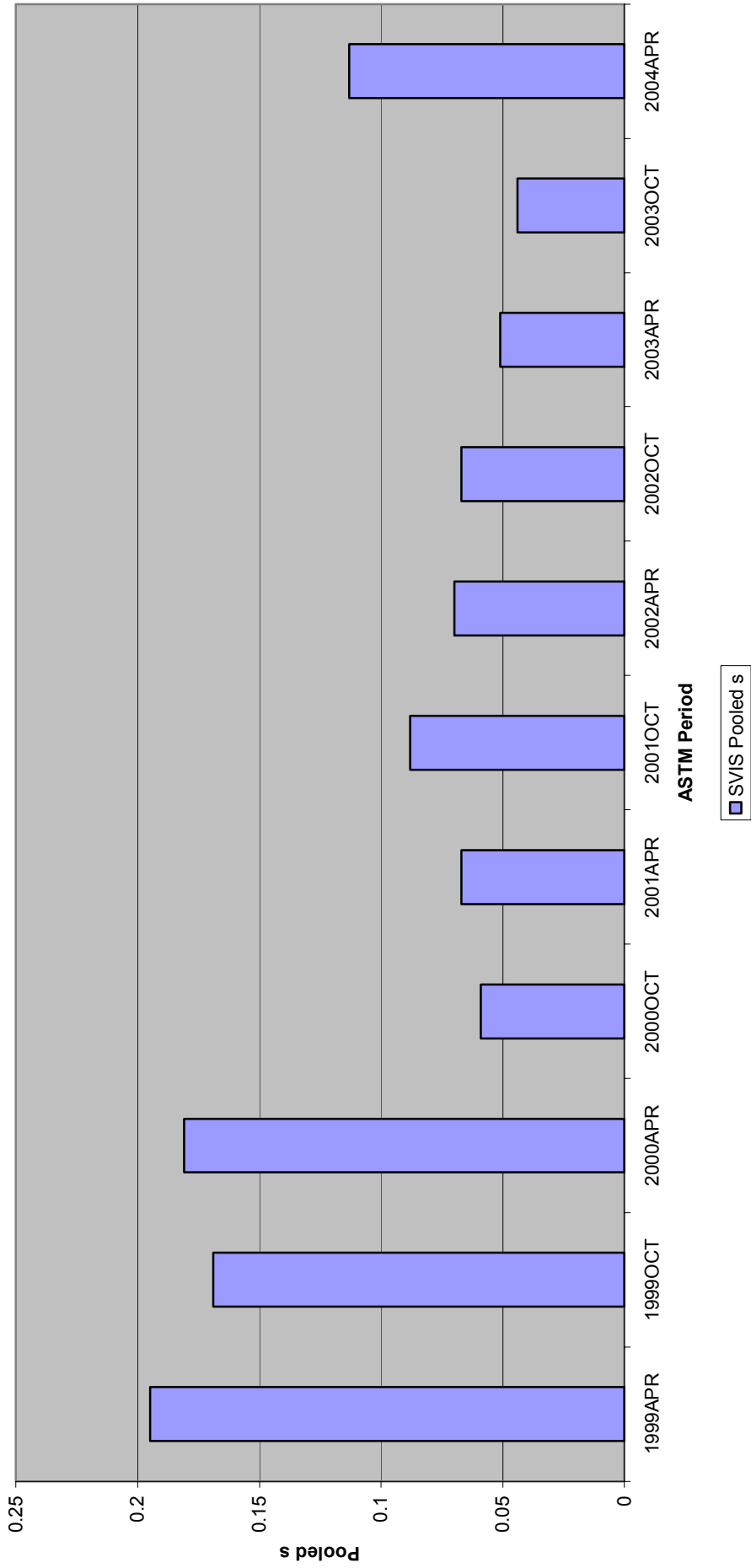
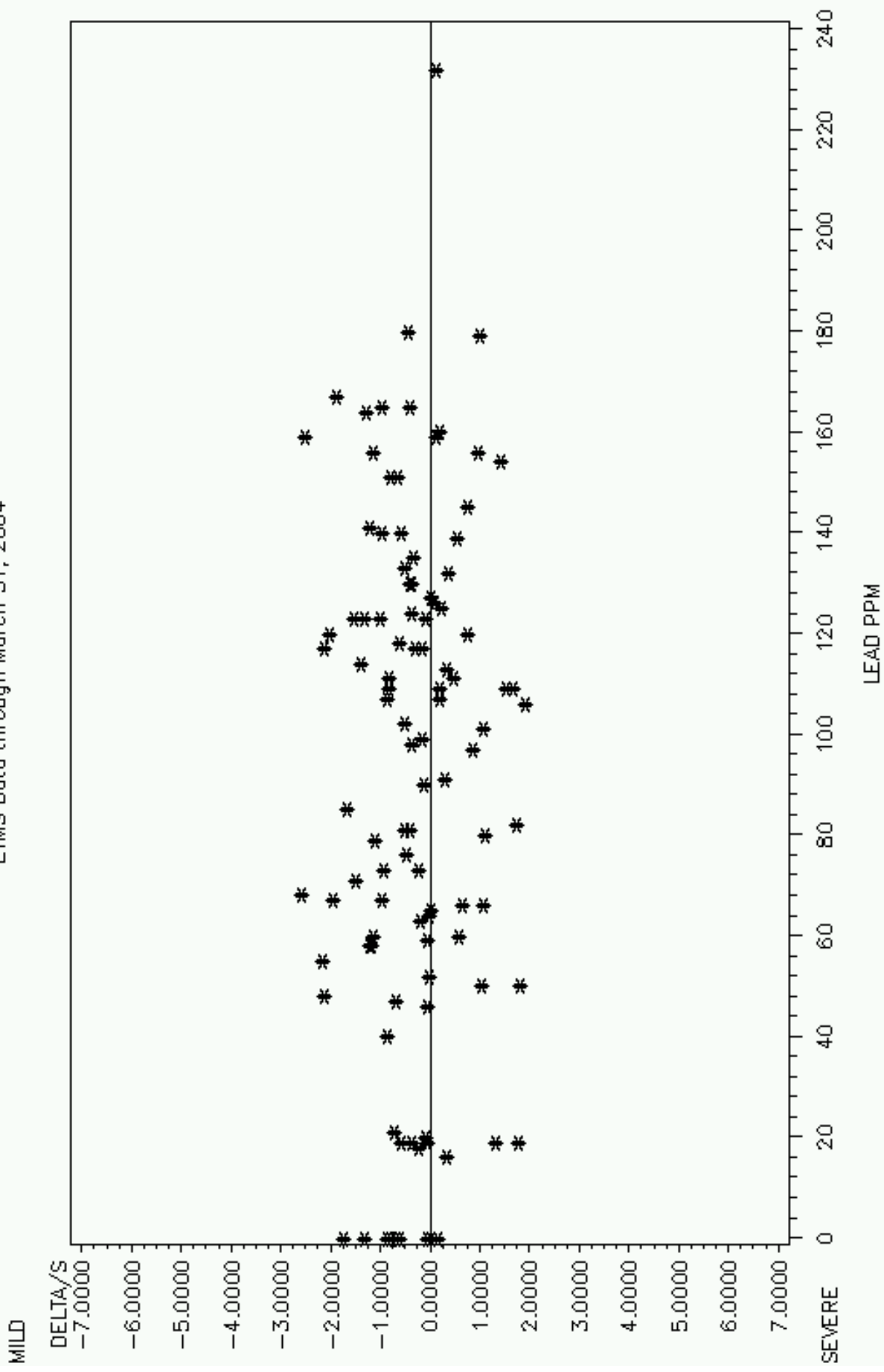


Figure 7

SEQUENCE VIII BWL DELTA/S vs LEAD PPM

LTMS Data through March 31, 2004



(*) BEARING BATCH 11/93

Figure 8

BEARING OIL STORAGE LEAD PPM vs COMPLETION DATE
LTMS Data through March 31, 2004

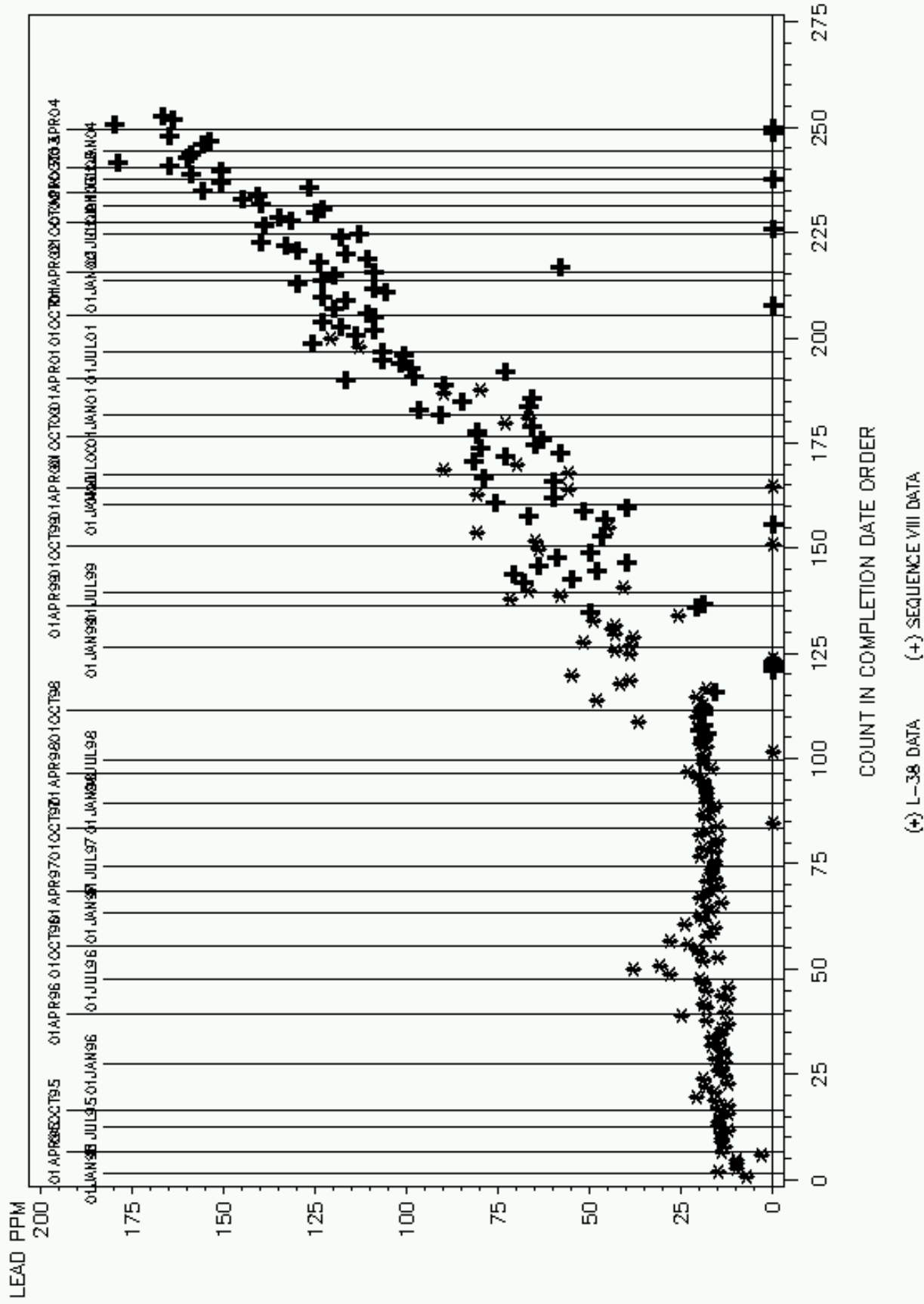


Figure 9 - Sequence VIII Timeline

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
1/26/04	BILLET CRANKSHAFT APPROVED FOR USE IN SEQUENCE VIII TESTING	