



# Test Monitoring Center

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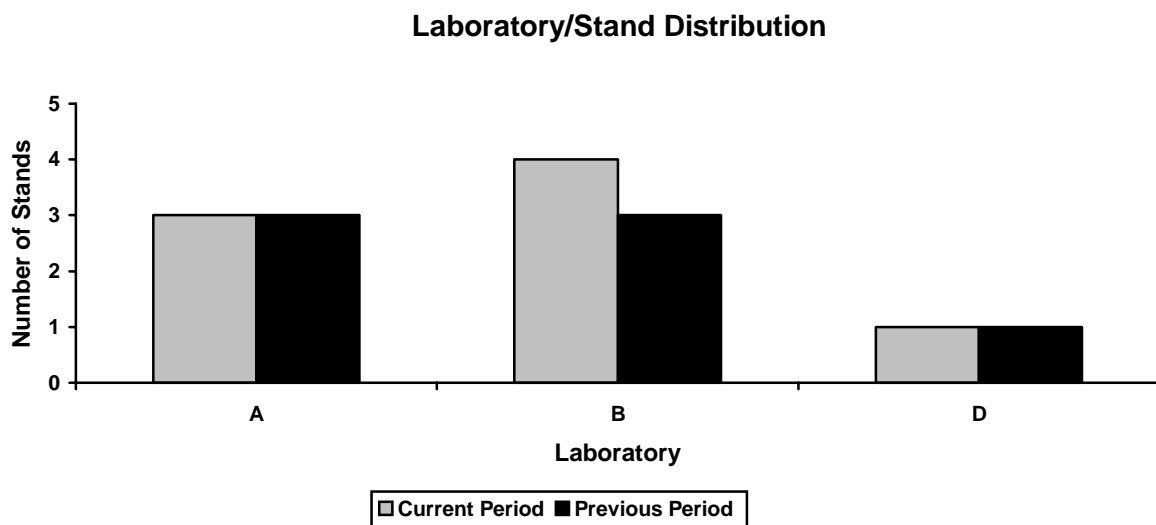
Memorandum: 02-101  
Date: October 23, 2002  
To: Fred Gerhart, Chairman, Sequence VIII Surveillance Panel  
From: Michael T. Kasimirsky *Michael T. Kasimirsky*  
Subject: Sequence VIII Semiannual Report: April 1, 2002 to September 30, 2002

The following is a summary of Sequence VIII reference oil tests that were reported to the Test Monitoring Center during the period from April 1, 2002 to September 30, 2002.

## Lab/Stand Distribution

	Reporting Data	Calibrated as of September 30, 2002
Number of Laboratories:	3	3
Number of Stand/Engine Combinations:	8	5

The following chart shows the laboratory/stand distribution:



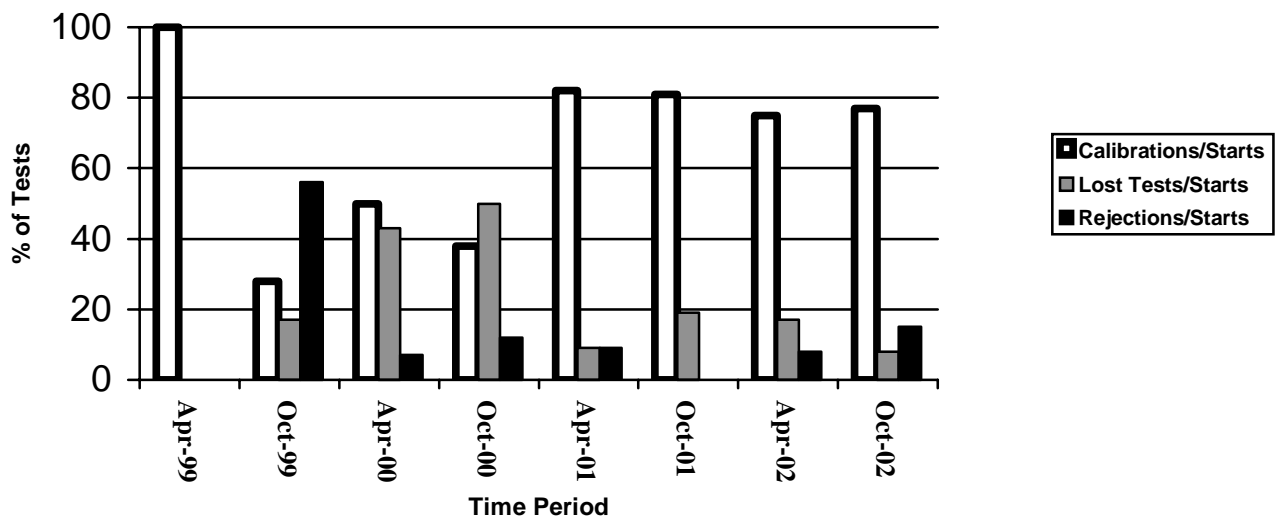
The following summarizes the status of the reference oil tests reported to the TMC:

Calibration Start Outcomes	TMC Validity Code	No. of Tests
Operationally and Statistically Acceptable	AC	10
Failed Acceptance Criteria	OC	2
Stand/Engine failed to successfully calibrate, engine abandoned and data pulled	MC	0
Operationally Invalid (Laboratory Judgment)	LC	1
Operationally Invalid (Laboratory & TMC Judgment)	RC	0
Aborted	XC	0
Total		13

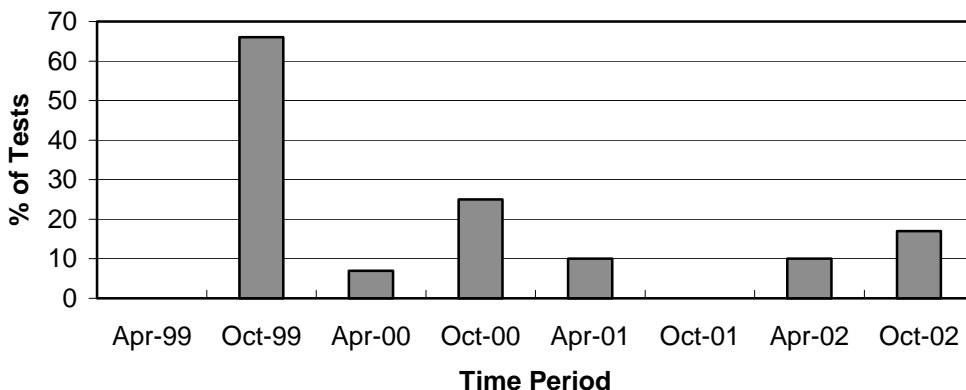
Donated & Industry Support Outcomes	TMC Validity Code	No. of Tests
Shakedown Run	AG	1
Donated Test on Reference Oil 1009	AG	3
Total		4

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

**Calibration Attempt Summary**



### Rejected Operationally Valid Tests



One test failed this period due to mild BWL results.

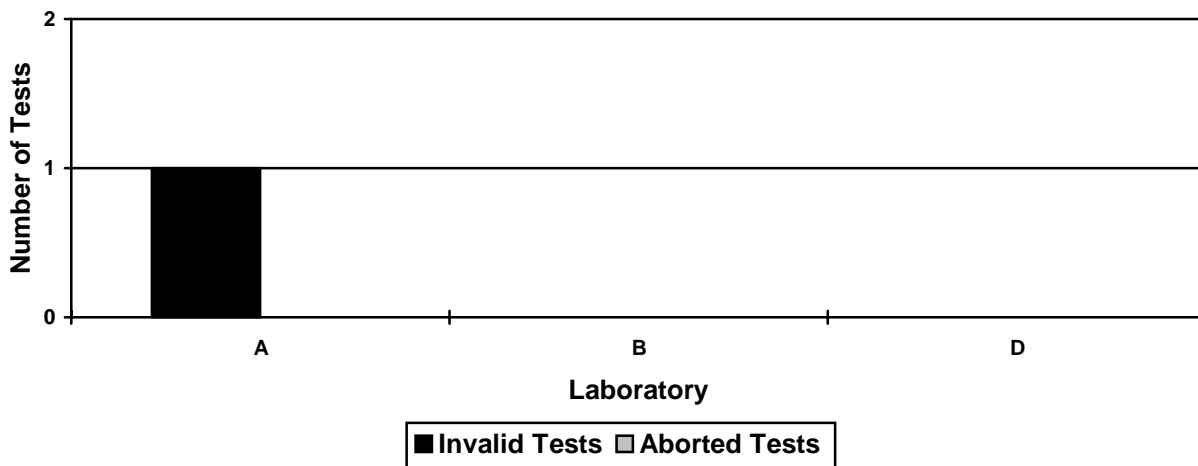
There were no LTMS Deviations this period. There have been no deviations from the LTMS since its introduction in 1999.

No lab visits were performed this period.

### Lost Test Summary

One test was lost this period due to excess bearing wear at end of test. Aborts and Operationally Invalid tests, reported by laboratory, are summarized with the following chart:

### Lost Test Distribution



### Information Letters

Information Letter 02-1, dated May 20, 2002, was issued this period and contained revisions to the Stay-In-Grade Oil Analysis Procedure.

Severity and Precision Analysis

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

<b>Industry Severity Summary</b>			
<b>Parameter</b>	<b>Average <math>\Delta/s</math></b>	<b>Pooled standard deviation (degrees of freedom)</b>	<b>Average <math>\Delta</math>, in reported units</b>
BWL	-0.88	2.32 (df=10)	-2.0 mg
SVIS	0.44	0.067 (df=10)	0.03 cSt

<b>Average <math>\Delta/s</math> by Laboratory</b>		
<b>Lab</b>	<b>BWL</b>	<b>SVIS</b>
A	-0.55	-0.11
B	-1.15	0.75
D	-0.92	1.26

**Bearing Weight Loss (BWL)**

The Industry BWL mean  $\Delta/s$  is -0.88 mild for this report period (see Figure 3). This equates to a shift of -2.0 mg in reported units. The pooled standard deviation for the period is 2.32 mg (see Figure 4). During the period, the industry experienced two severity alarms of one and eight data points respectively and a precision alarm of one data points (see Figure 1). The first severity alarm was caused by a mild, but still acceptable, test result and was cleared with the following test. The second severity alarm was caused by two failing reference oil tests on a single stand/engine combination. Subsequent testing cleared the alarm and that stand/engine combination has not conducted a reference oil test since that time, nor is it considered calibrated at this time. Overall, the industry continues to trend mild on BWL results and the mild trend appears to be increasing with time.

The industry also began the period with a precision alarm of one data point, which cleared with the following test result. Overall precision for the period is on par with the best historical performance in the Sequence VIII test (see Figure 4).

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 139 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 SVIS mean  $\Delta/s$  is 0.44 mild 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 0.067 cSt (see Figure 6). The industry has been within limits for precision for the period (see Figure 2), but the most recent reference oil test has generated a mild severity alarm on SVIS. No cause for the alarm has been found at this time.

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	451	225	7	10+ years
1006	45	22	4	3 months <sup>1</sup>
1006-2	5,154	2,577	5	3+ years <sup>1</sup>
1009	1,015	507	4	3+ years <sup>1</sup>

<sup>1</sup> 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. Those targets were prepared and distributed to the panel in TMC Memorandum 02-090 and are currently being e-balloted by the Surveillance Panel with a closing date on the ballot of October 29, 2002. The targets for this oil will also be automatically updated at 10, 20, and 30 data points as usual. The proposed targets for reference oil 1006-2 are shown below:

Parameter	Mean	Standard Deviation
BWL	13.0	4.26
SVIS	9.23	0.07

If approved, these targets will be retroactively applied to all reference oil 1006-2 data in the TMC database on October 30, 2002. No changes will be 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 that date, i.e. there will be no retroactive changes to existing test results or severity adjustments.

The GF-3 Category Reference Oil, reference oil 1009, is in the process of being introduced into the Sequence VIII LTMS at this time. At the last meeting, the Surveillance Panel approved a motion to obtain five donated tests on this reference oil from the calibrated testing laboratories. At this time, three of the five donated tests have been completed. The results obtained to date are shown in the following table:

Lab	LTMS Date	BWL	SVIS
A	7/1/02	13.7	9.45
D	7/12/02	10.9	9.37
A	8/16/02	15.8	9.51

When these five donated tests are complete, the TMC will generate test targets for this reference oil for review and acceptance by the Surveillance Panel. Usage rates of this oil have yet to be determined by the Surveillance Panel.

Stripped Viscosity Measurement Investigation

The TMC was tasked with obtaining a used oil sample for use in the stripped viscosity investigation from one of the donated tests 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.

Memo 02-101

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MTK/mtk

Attachments

c: F. M. Farber, TMC  
Sequence VIII Surveillance Panel  
<ftp://astmtmc.cmu.edu/docs/gas/sequenceviii/semiannualreports/VIII-10-2002.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

### VIII INDUSTRY OPERATIONALLY VALID DATA

#### FINAL BEARING WEIGHT LOSS

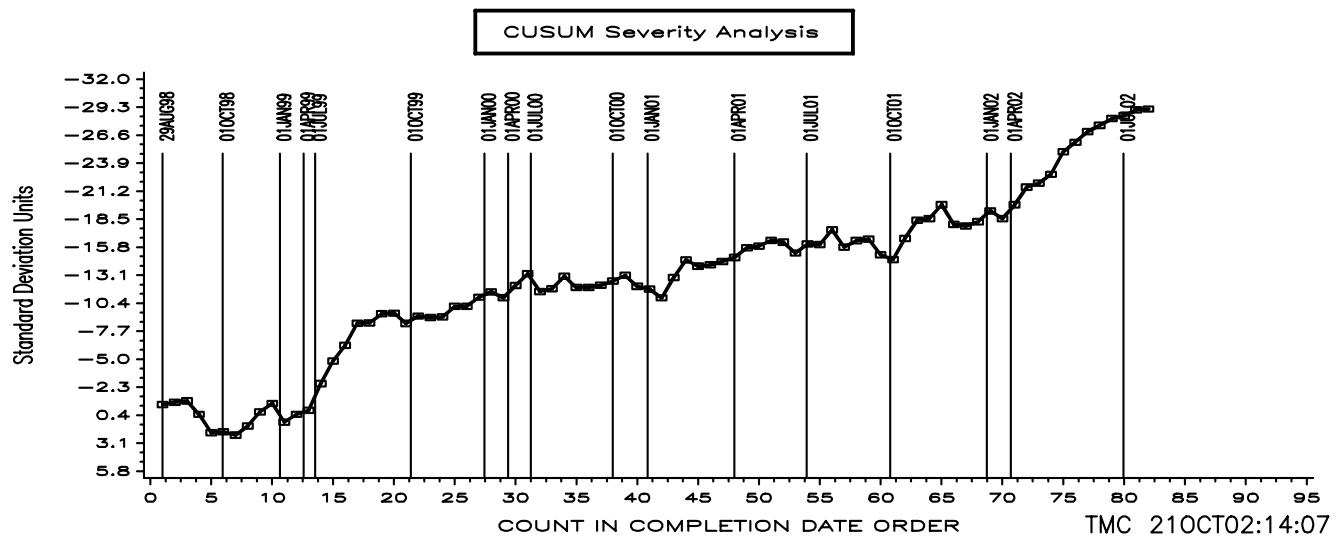
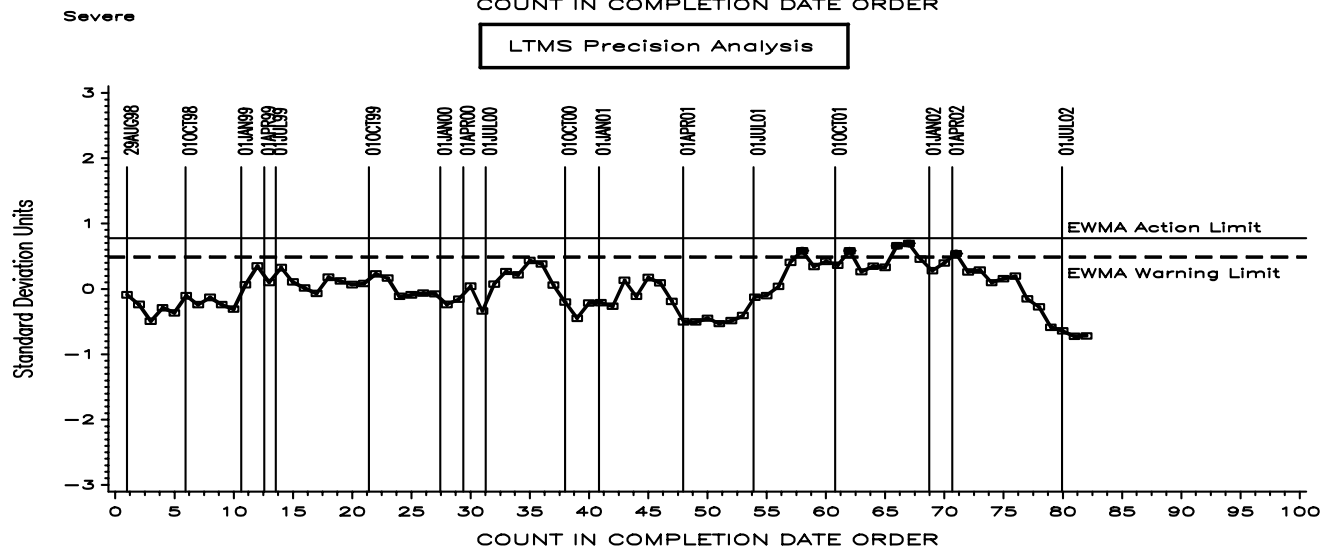
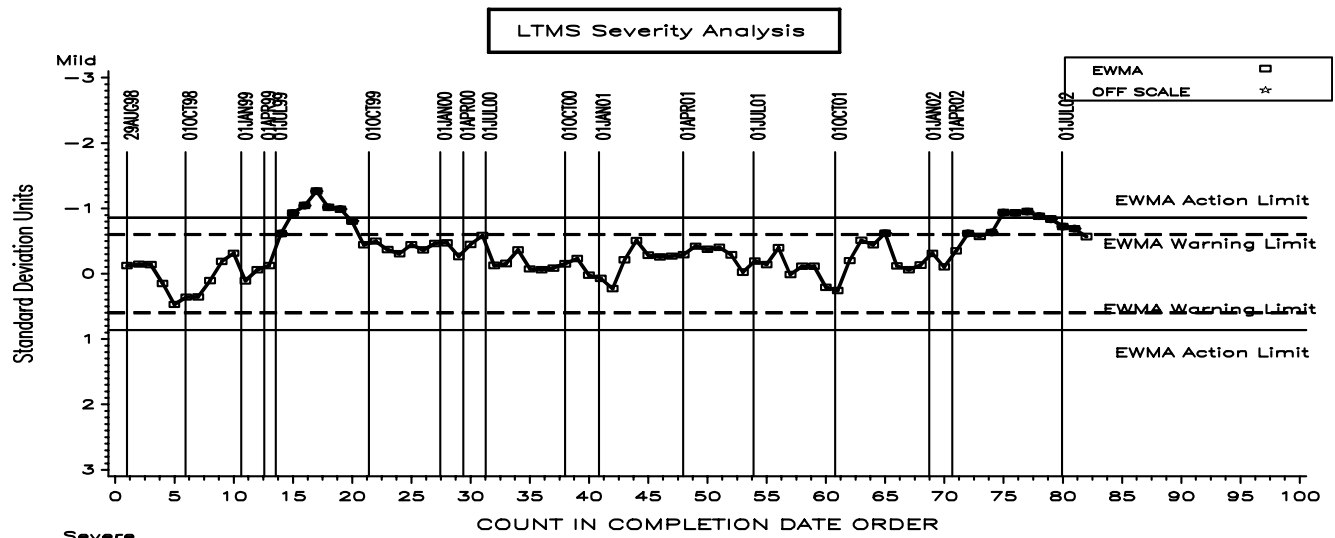
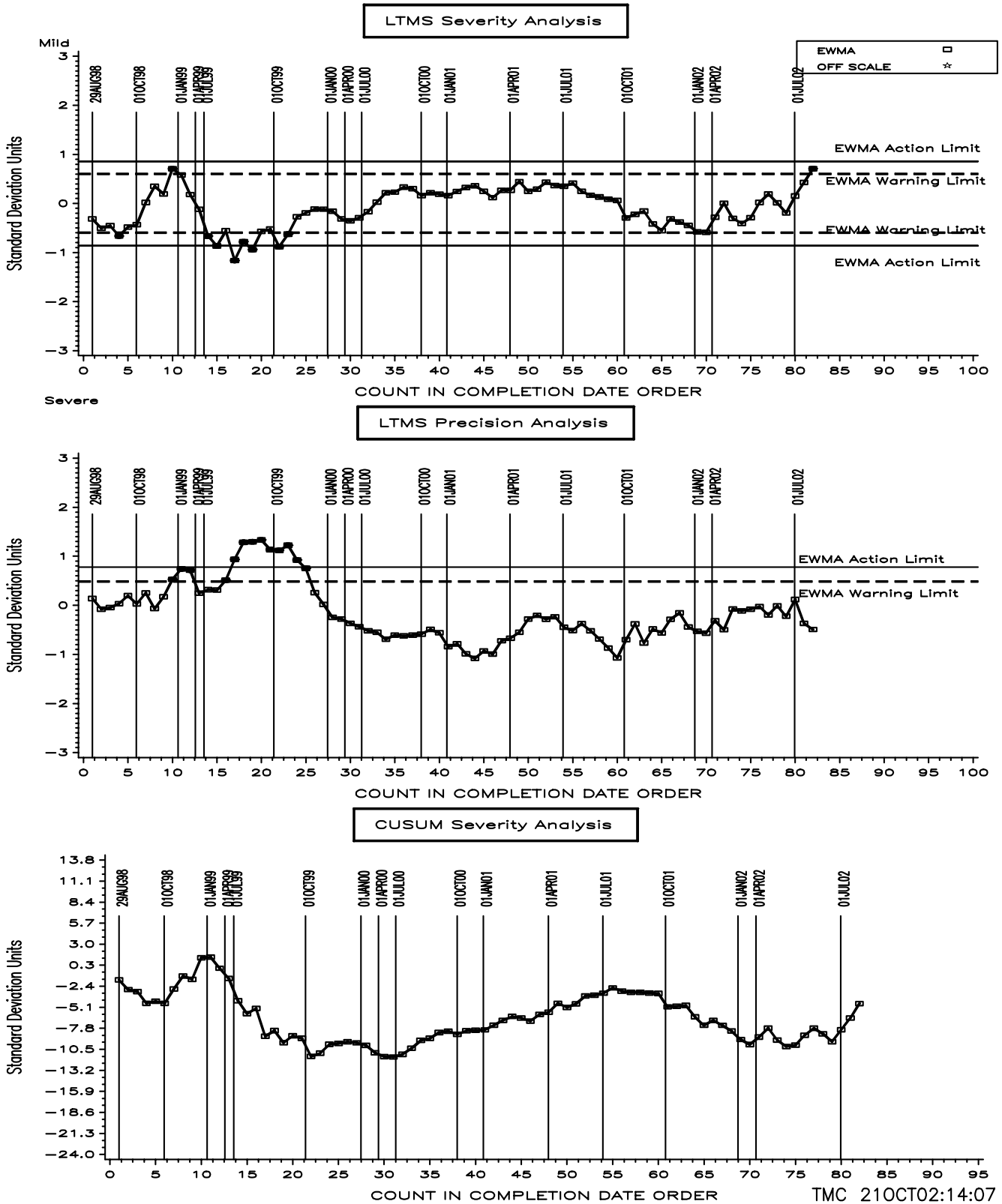




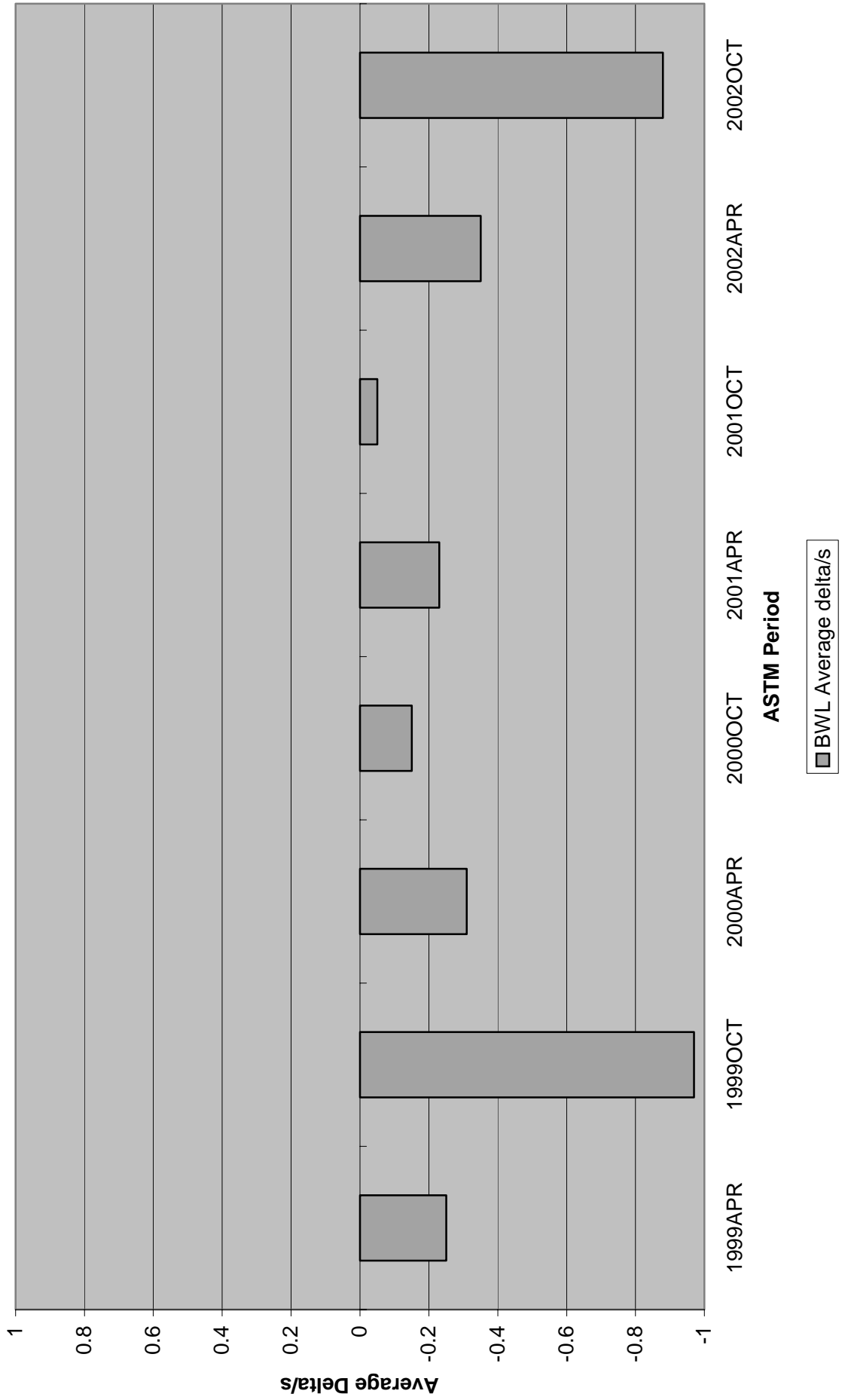
Figure 2

### VIII INDUSTRY OPERATIONALLY VALID DATA

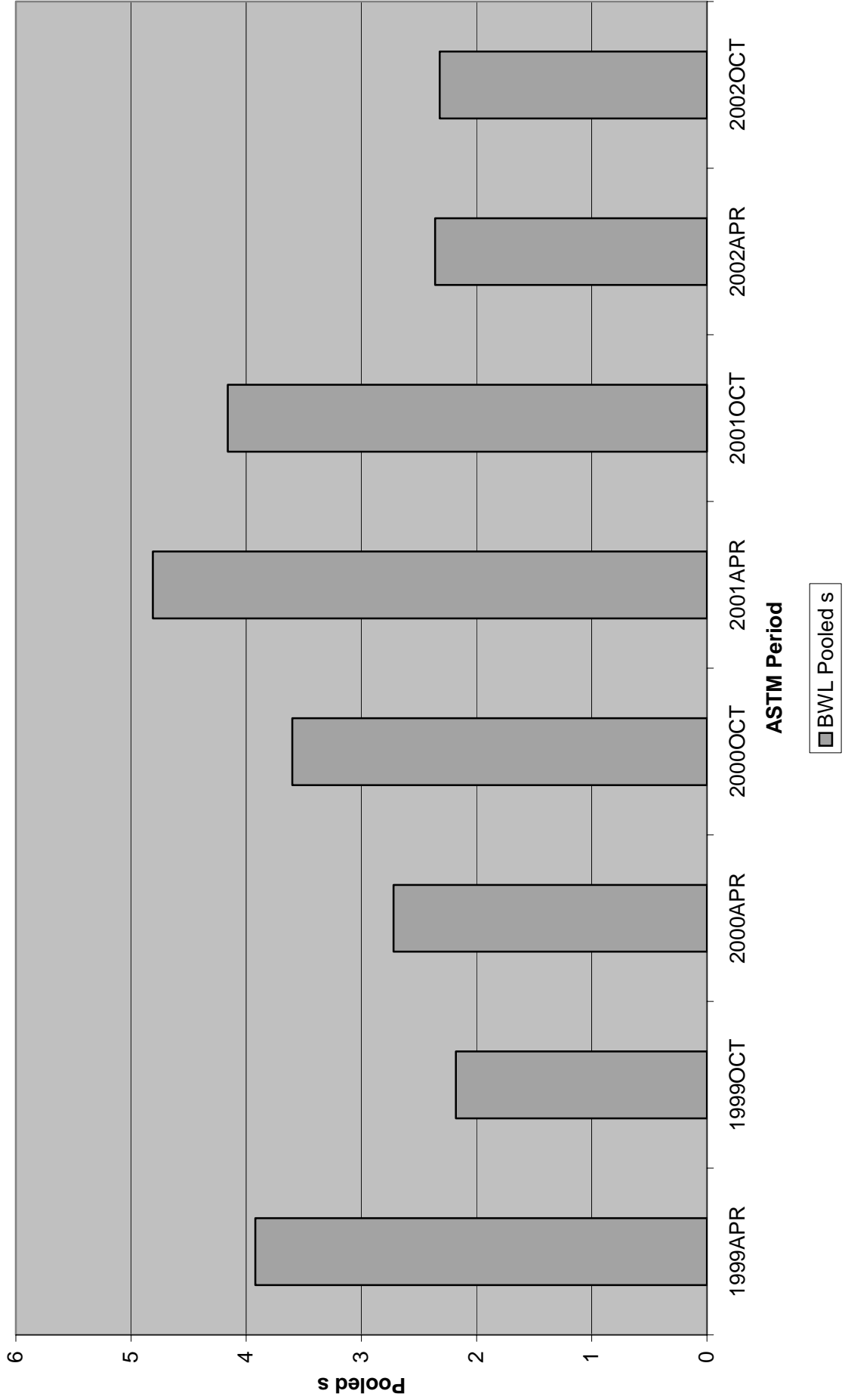
STRIPPED VIS. @ 100 DEG C



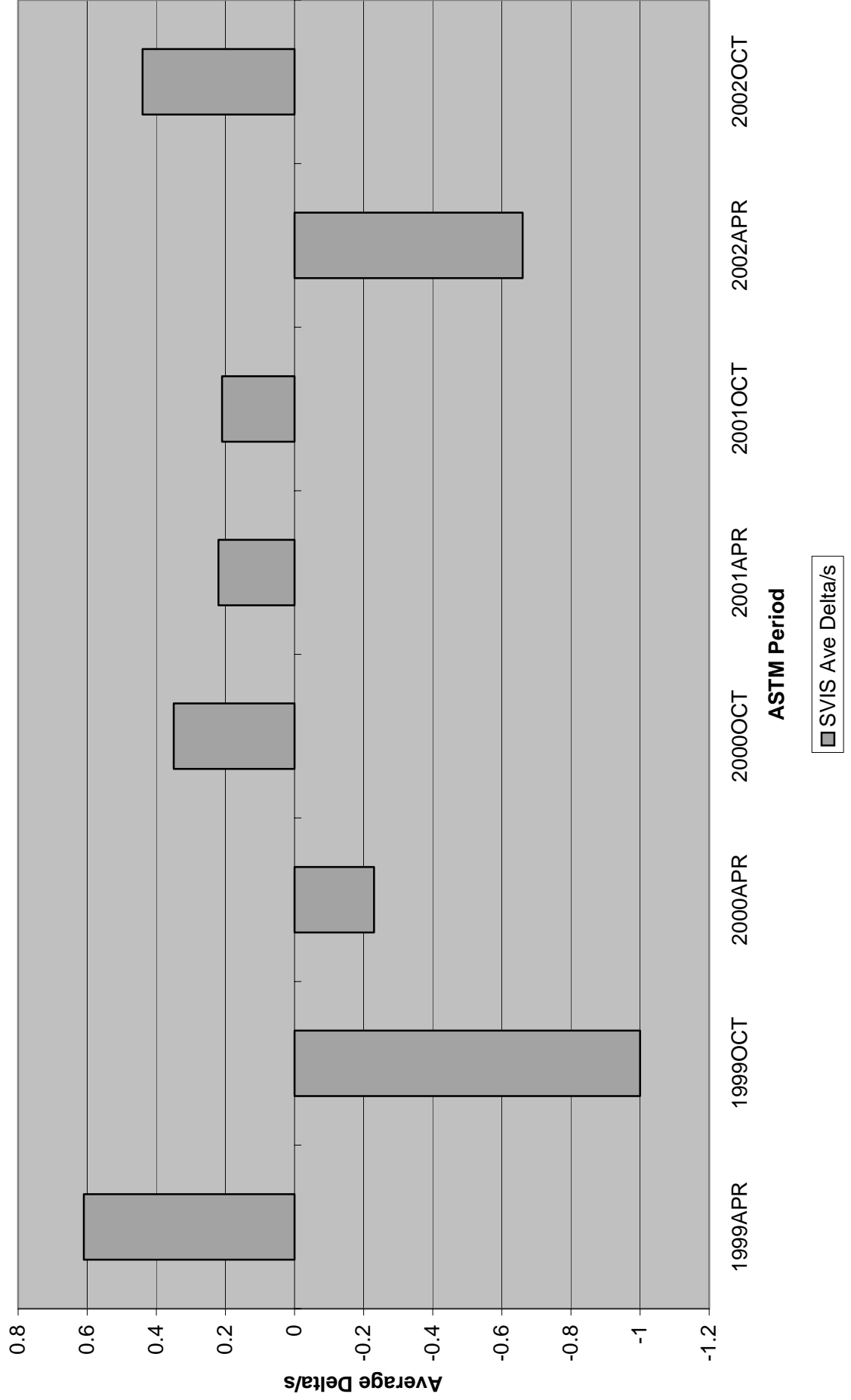
**Figure 3 - Sequence VIII Reference Oil Data  
Bearing Weight Loss**



**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**

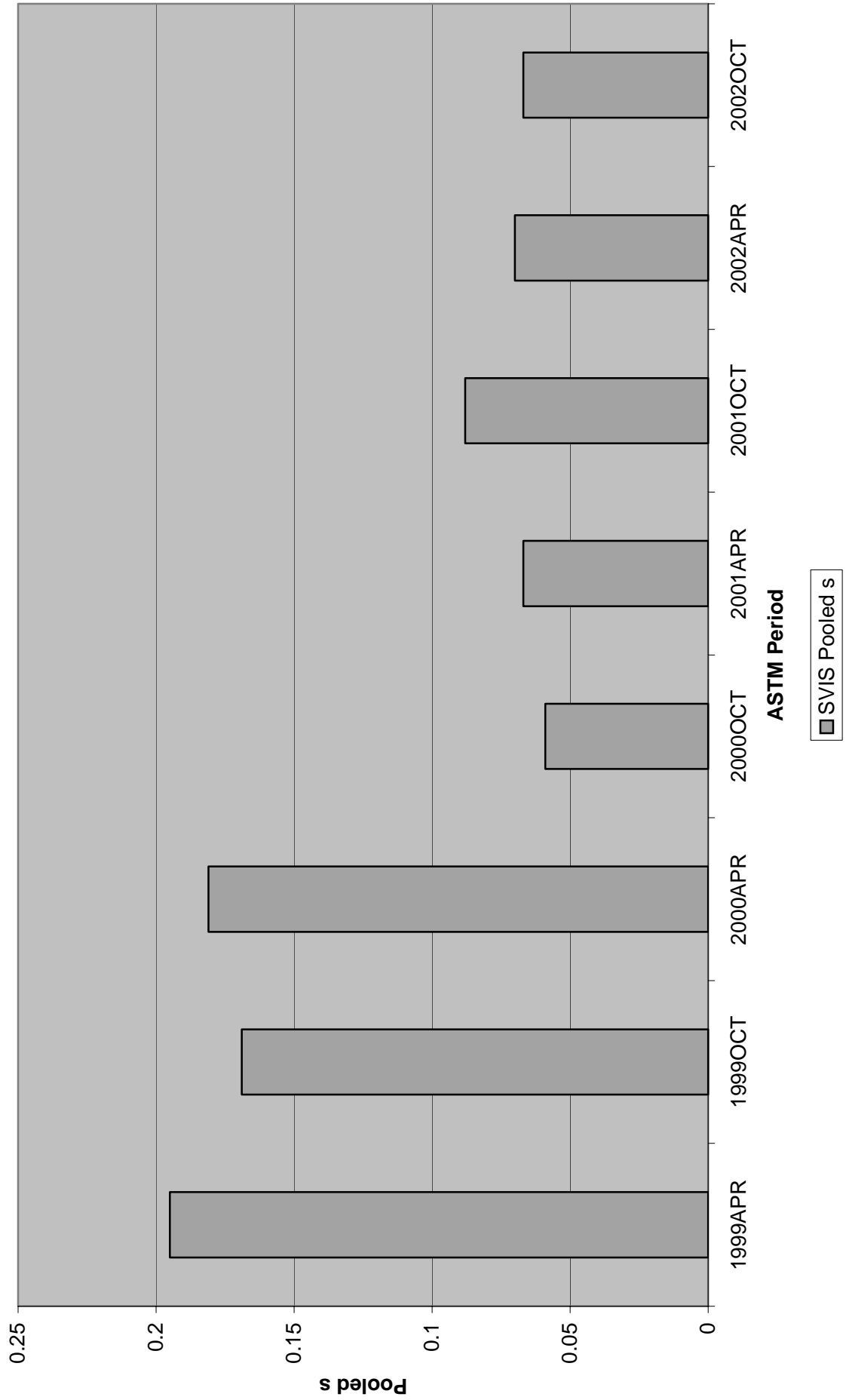
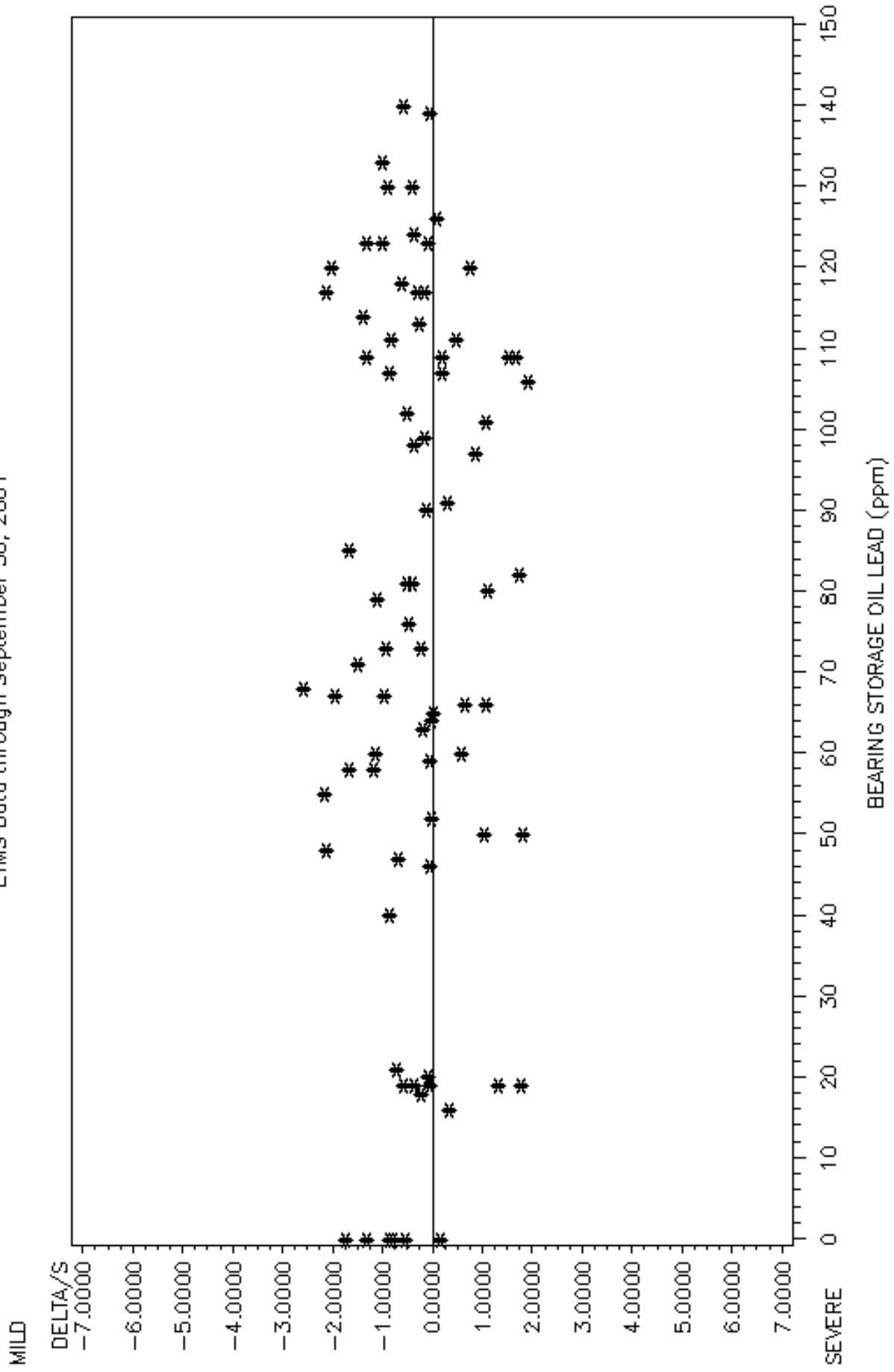


Figure 7

# SEQUENCE VIII BWL DELTA/S VS LEAD PPM

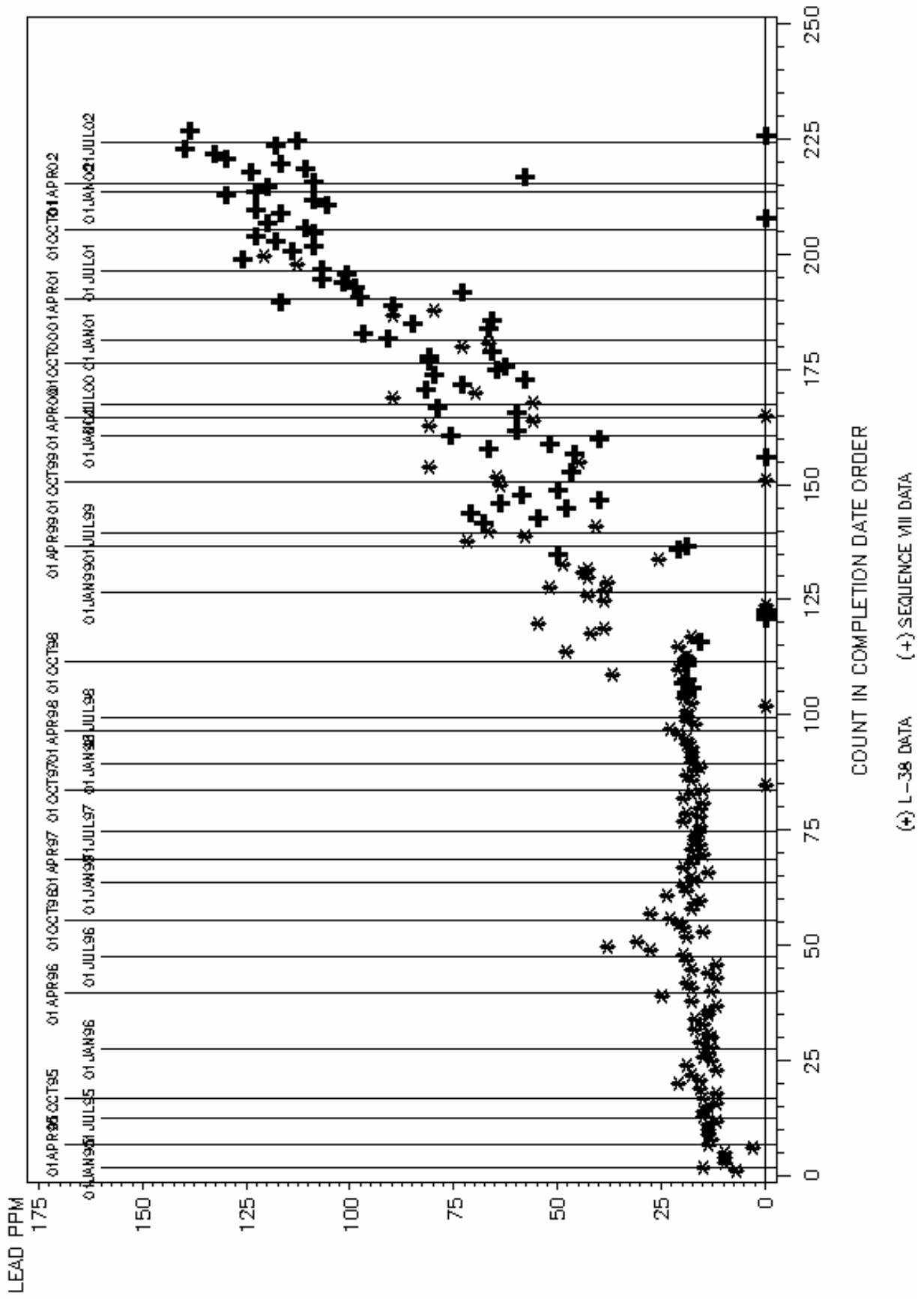
LTMS Data through September 30, 2001



(\*) BEARING BATCH 11/93

Figure 8

BEARING OIL STORAGE LEAD PPM vs COMPLETION DATE  
LTMS Data through September 30, 2001



**Figure 9 - Sequence VIII Timeline**

<b>Date</b>	<b>Topic</b>	<b>Information Letter</b>
2/10/99	NEW PISTON RING BATCH APPROVED FOR USE IN SEQUENCE VIII TESTING	00-1
4/16/99	DRAFT 3.1 OF THE SEQUENCE VIII TEST PROCEDURE ISSUED	99-1
5/19/99	REMOVAL OF RING BATCH REPORTING REQUIREMENTS	00-1
5/19/99	NEW OIL FILTER (RAYCOR LFS-62) IMPLEMENTED INTO TESTING	00-1
11/16/99	TEST ENGINEERING INC. NEW TEST PARTS SUPPLIER	00-1
1/28/00	PISTON CLEANING PROCEDURE FOR REUSING PISTONS IN SEQUENCE VIII TESTING	00-1
6/15/02	REVISED STAY-IN-GRADE PROCEDURE IMPLEMENTED	02-1