




# Test Monitoring Center

6555 Penn Avenue  
Pittsburgh, PA 15206-4489  
(412) 365-1000

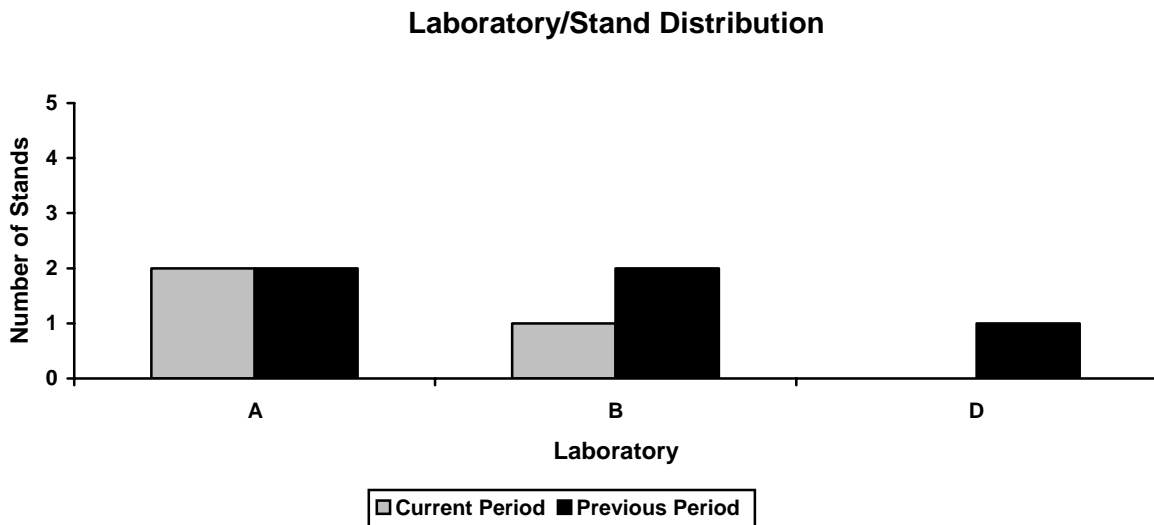
Memorandum: 07-056  
Date: October 9, 2007  
To: Fred Gerhart, Chairman, Sequence VIII Surveillance Panel  
From: Richard E. Grundza   
Subject: Sequence VIII Semiannual Report: April 1, 2007 to September 30, 2007

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, 2007 to September 30, 2007.

## Lab/Stand Distribution

	Reporting Data	Calibrated as of September 30, 2007
Number of Laboratories:	2	2
Number of Stand/Engine Combinations:	3	2

The following chart shows the laboratory/stand distribution:

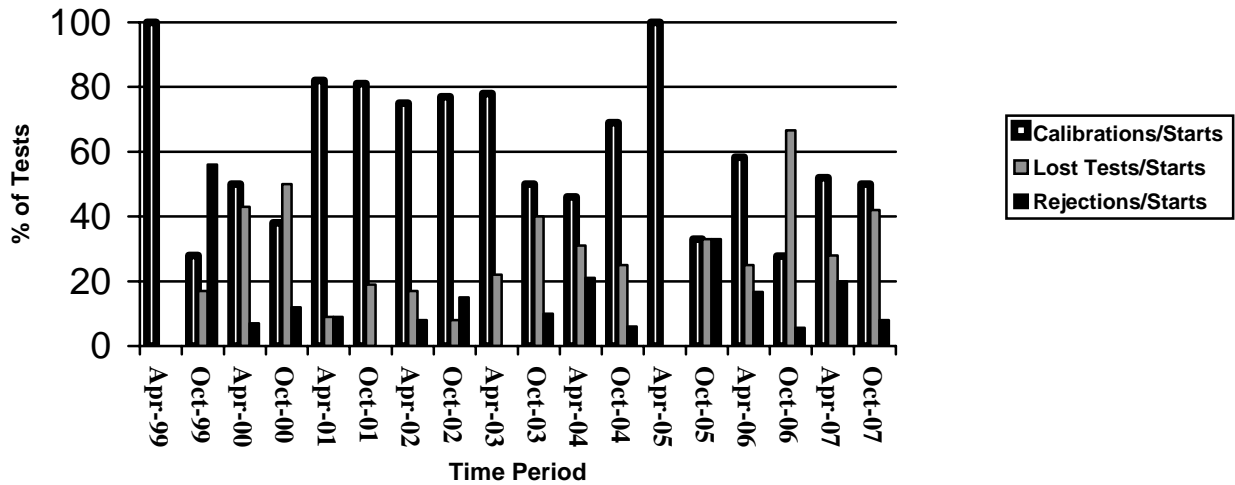


The following summarizes the status of the reference oil tests reported to the TMC:

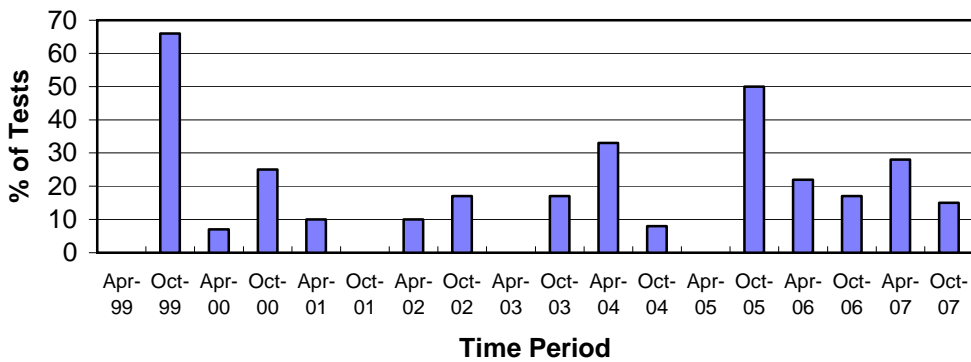
Calibration Start Outcomes	TMC Validity Code	No. of Tests
Operationally and Statistically Acceptable	AC	6
Operationally Invalid (laboratory judgment)	LC	3
Aborted	XC	2
Statistically unacceptable Calibration Test	OC	1
Total		12

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

### Calibration Attempt Summary



### Rejected Operationally Valid Tests



One test failed acceptance criteria during the period, for severe BWL.

There were no LTMS Deviations this period. There have been three deviations from the LTMS to date.

Two lab visits were conducted by the TMC this period.

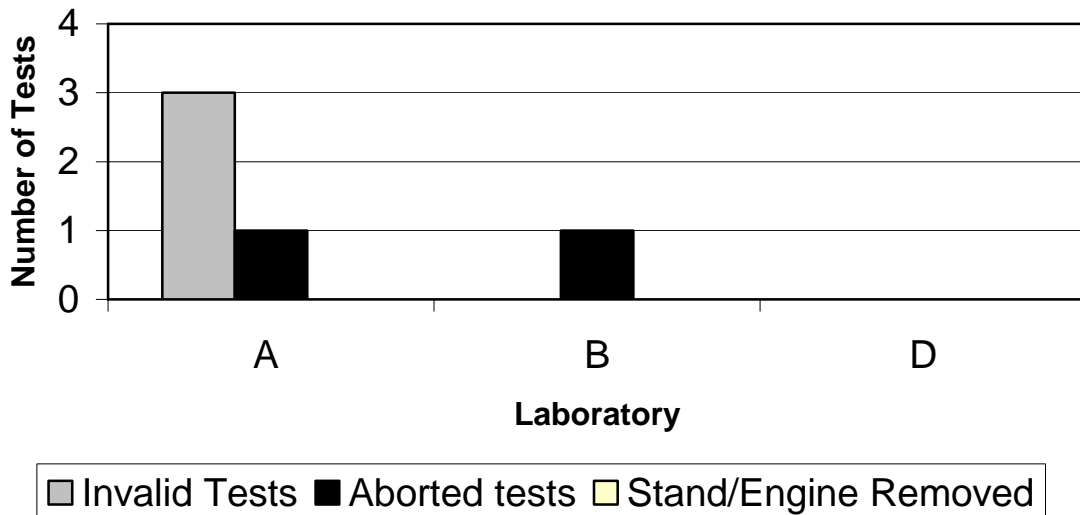
Lost Test Summary

Five tests were lost this period. The reasons for the lost tests are tabulated below:

Reasons for Lost Test(s)	Number
High mechanical wear	3
Heater malfunction	1
High oil consumption	1

Aborts and operationally invalid tests, reported by laboratory, are summarized in the following chart:

**Lost Test Distribution**



Information Letters

No information letters were issued this period.

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  $\Delta/s$  values 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	1.079	3.039 (df=6)	3.28 mg
SVIS	-0.143	0.086 (df=6)	-0.01 cSt

<b>Average <math>\Delta/s</math> by Laboratory</b>		
<b>Lab</b>	<b>BWL</b>	<b>SVIS</b>
A	0.324	-0.952
B	1.644	0.464
D	-	-

**Bearing Weight Loss (BWL)**

The industry control charts for severity have been in warning or action alarm for the entire period. Precision control charts were in control for the period. (see Figure 1).

The Industry BWL mean  $\Delta/s$  is 1.079 severe for this report period (see Figure 3). This equates to a shift of 3.28 mg in reported units. The pooled standard deviation for the period is 3.039 mg (see Figure 4), which is essentially unchanged with respect to the previous period and compares well with historical estimates.

Figures 7 and 8 graphically illustrate the lead content, in ppm, versus test severity in delta/s. The highest concentration of lead reported this period with the 03-06 batch of bearings was 202 ppm.

**Stripped Viscosity (SVIS)**

The industry control chart for severity began the period in warning alarm, but after the second test, the charts were within control limits for the remainder of the period. With the exception of a warning alarm at the end of the period, precision was in control for the period (see Figure 2).

The Industry SVIS mean  $\Delta/s$  is -0.143 severe for this report period (see Figures 2 & 5), and equates to a shift of -0.01 cSt in reported units. The pooled standard deviation for the period is 0.086 cSt (see Figure 6), which is comparable to historical performance.

Hardware

All tests reported during this period were run on the 03-06 Batch bearings.

TMC Memorandum

No TMC Memoranda were generated this report period.

Reference Oils

Oil	TMC Inventory, In gallons	TMC Inventory, In tests	Laboratory Inventory, in tests	Estimated Life
704-1	326	163	4	5+ years
1006	43	21	1	3 months <sup>1</sup>
1006-2	4,492	2,246	5	3+ years <sup>1</sup>
1009	669	334	5	3+ years <sup>1</sup>

<sup>1</sup> Multiple test area reference oil; total TMC inventory shown

REG/reg

Attachments

c: F. M. Farber, TMC  
Sequence VIII Surveillance Panel  
<ftp://ftp.astmtmc.cmu.edu/docs/gas/sequenceviii/semiannualreports/VIII-10-2007.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

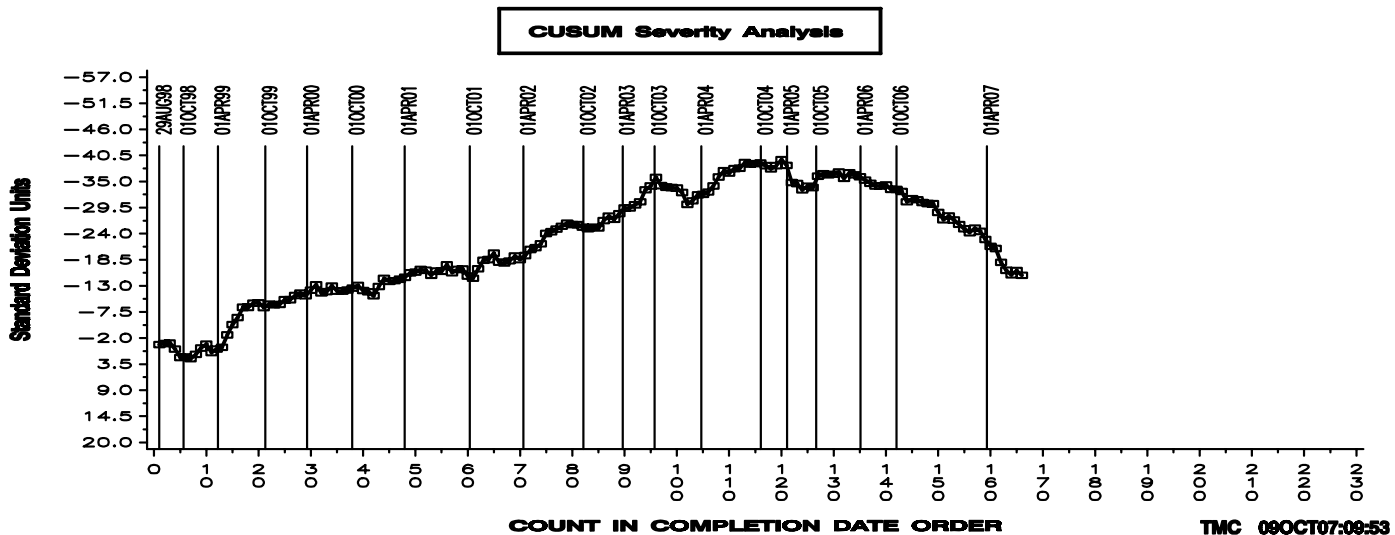
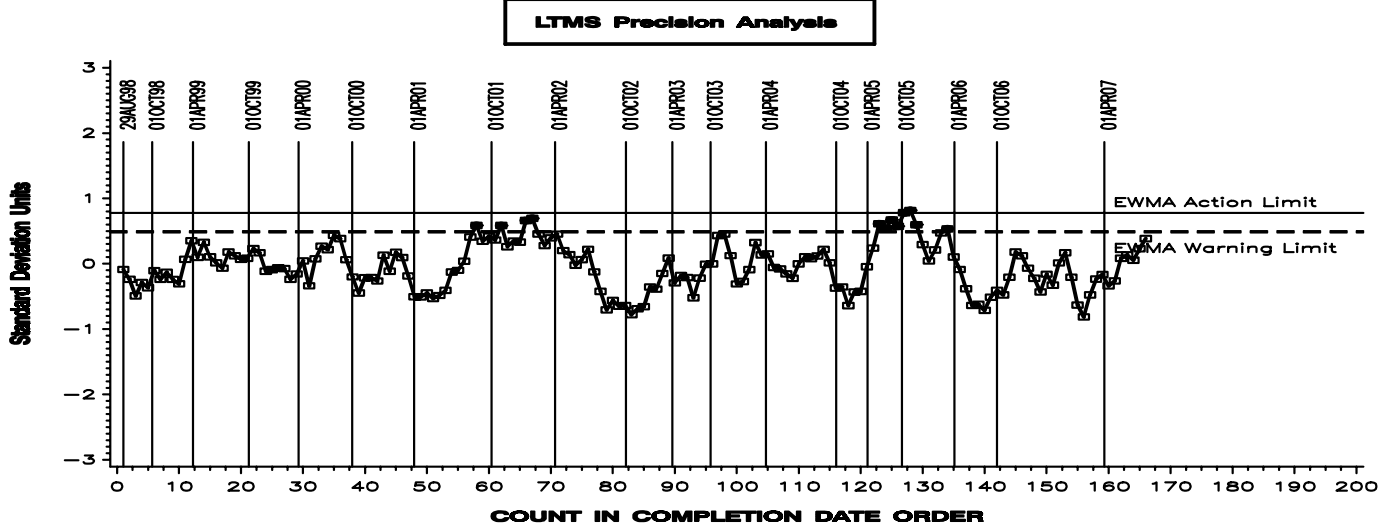
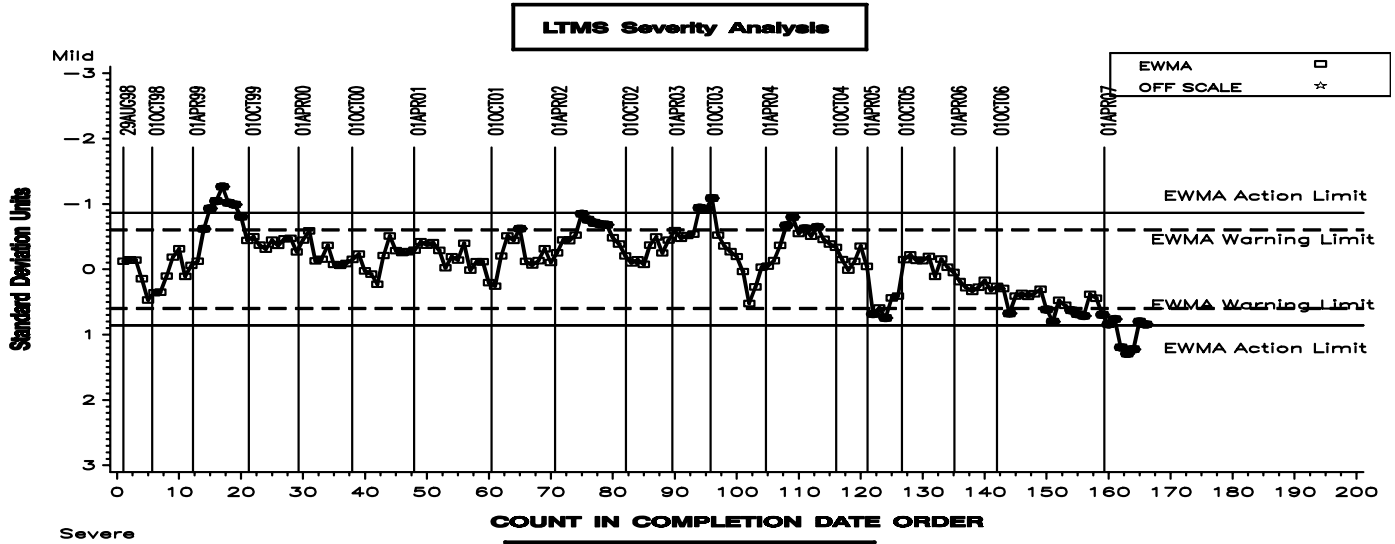


Figure 2

# SEQUENCE VIII INDUSTRY OPERATIONALLY VALID DATA

## STRIPPED VIS. @ 100 DEG C

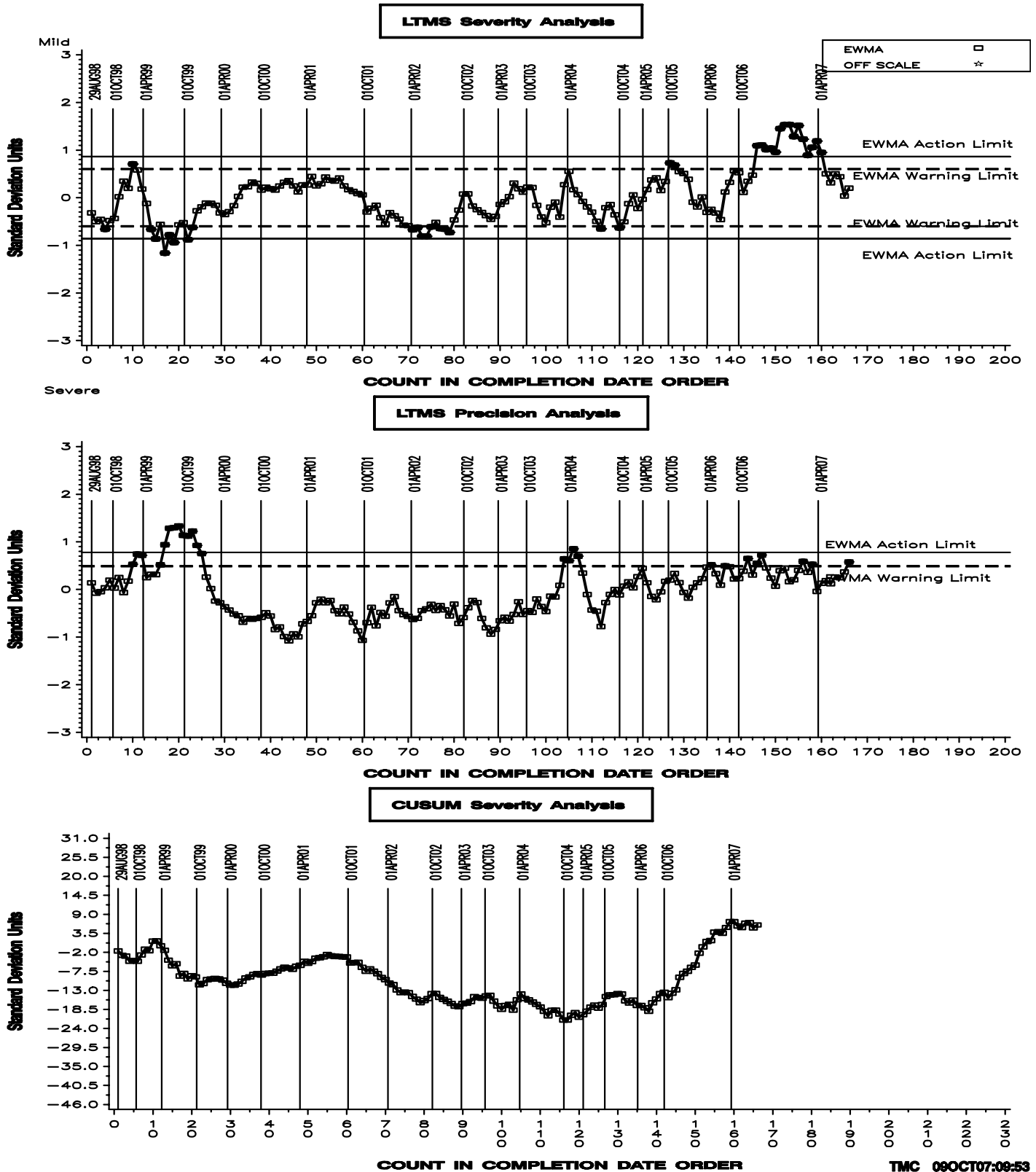
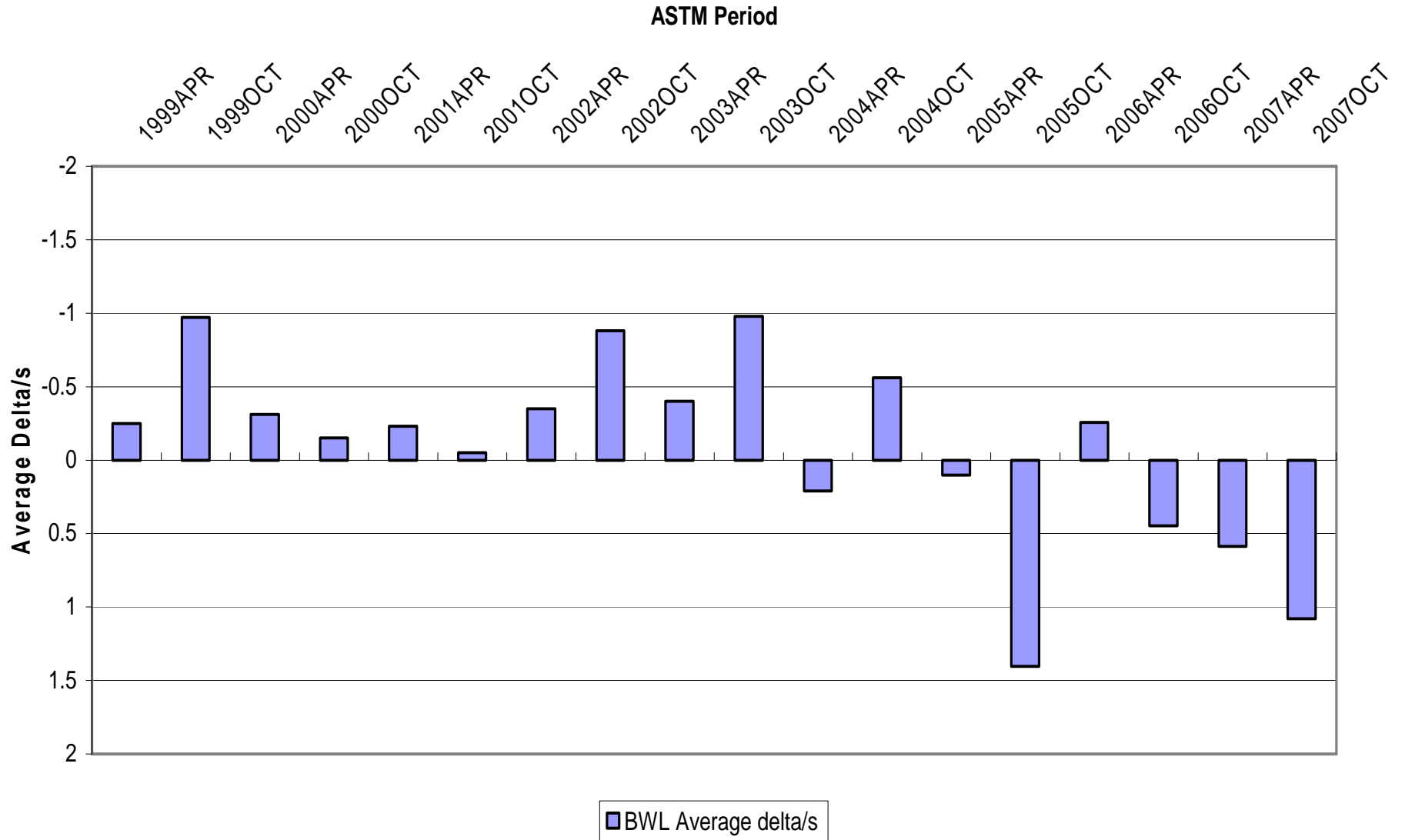
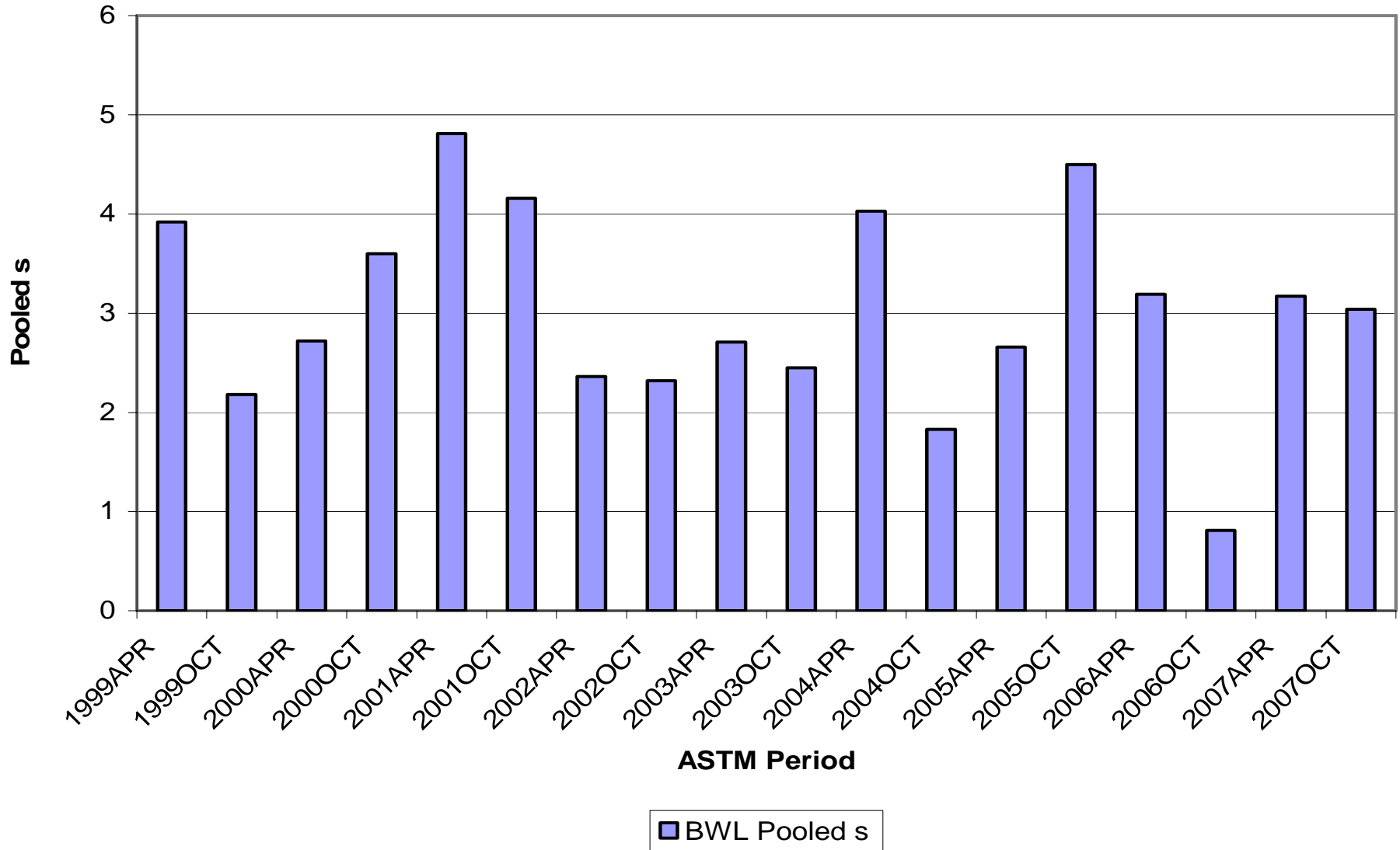




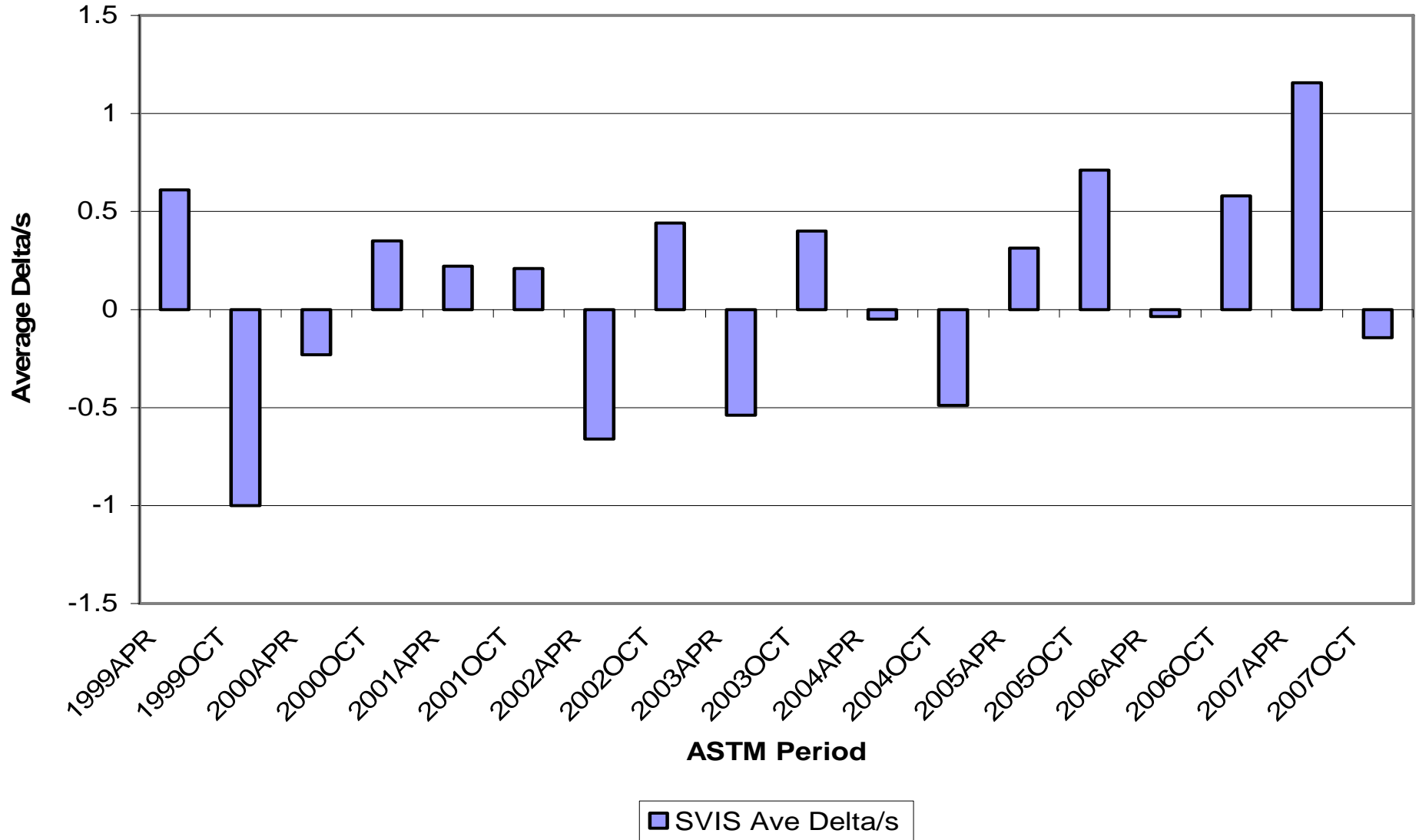
Figure 3 - Sequence VIII Reference Oil Data  
Bearing Weight Loss



**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**

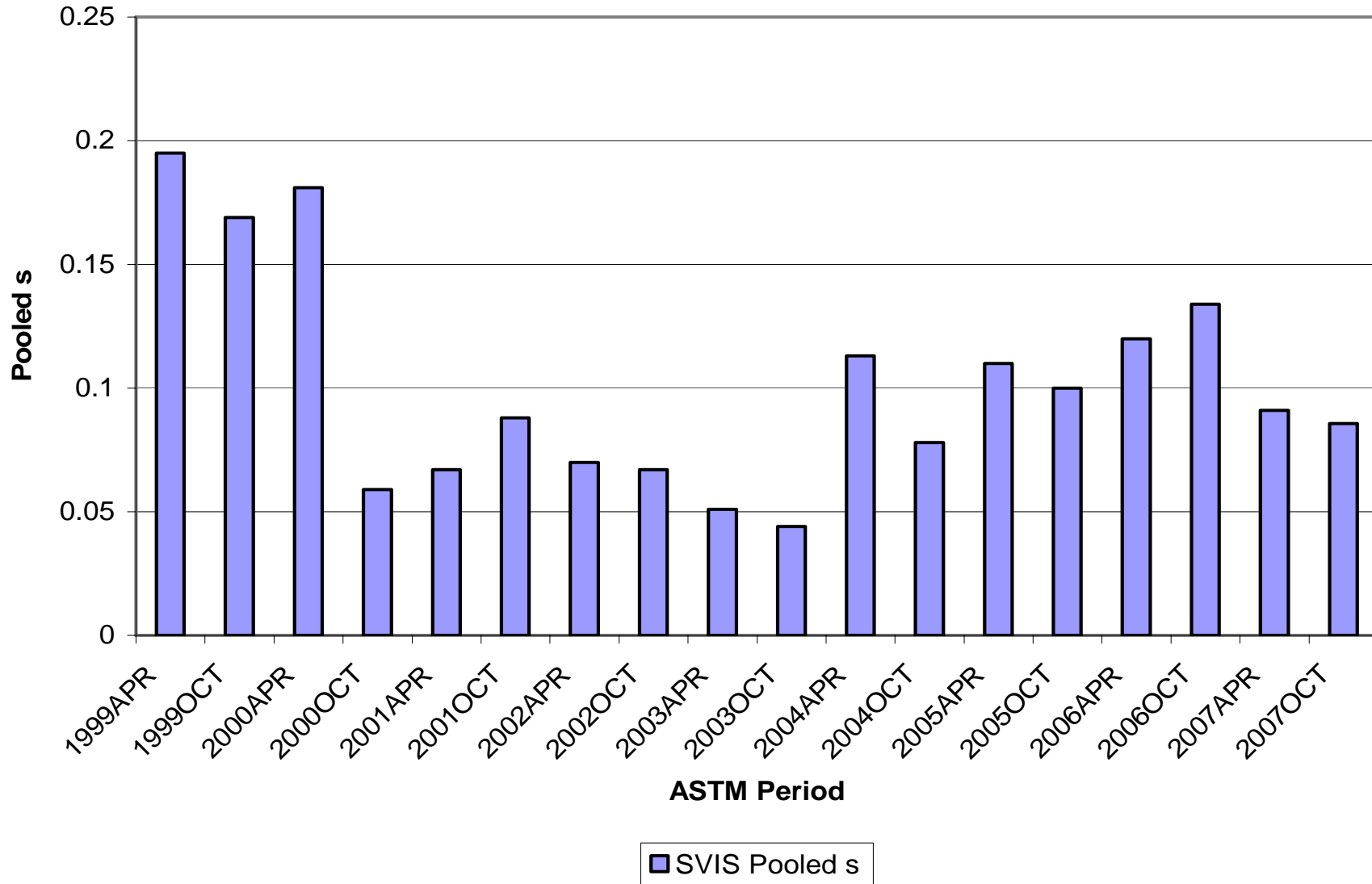
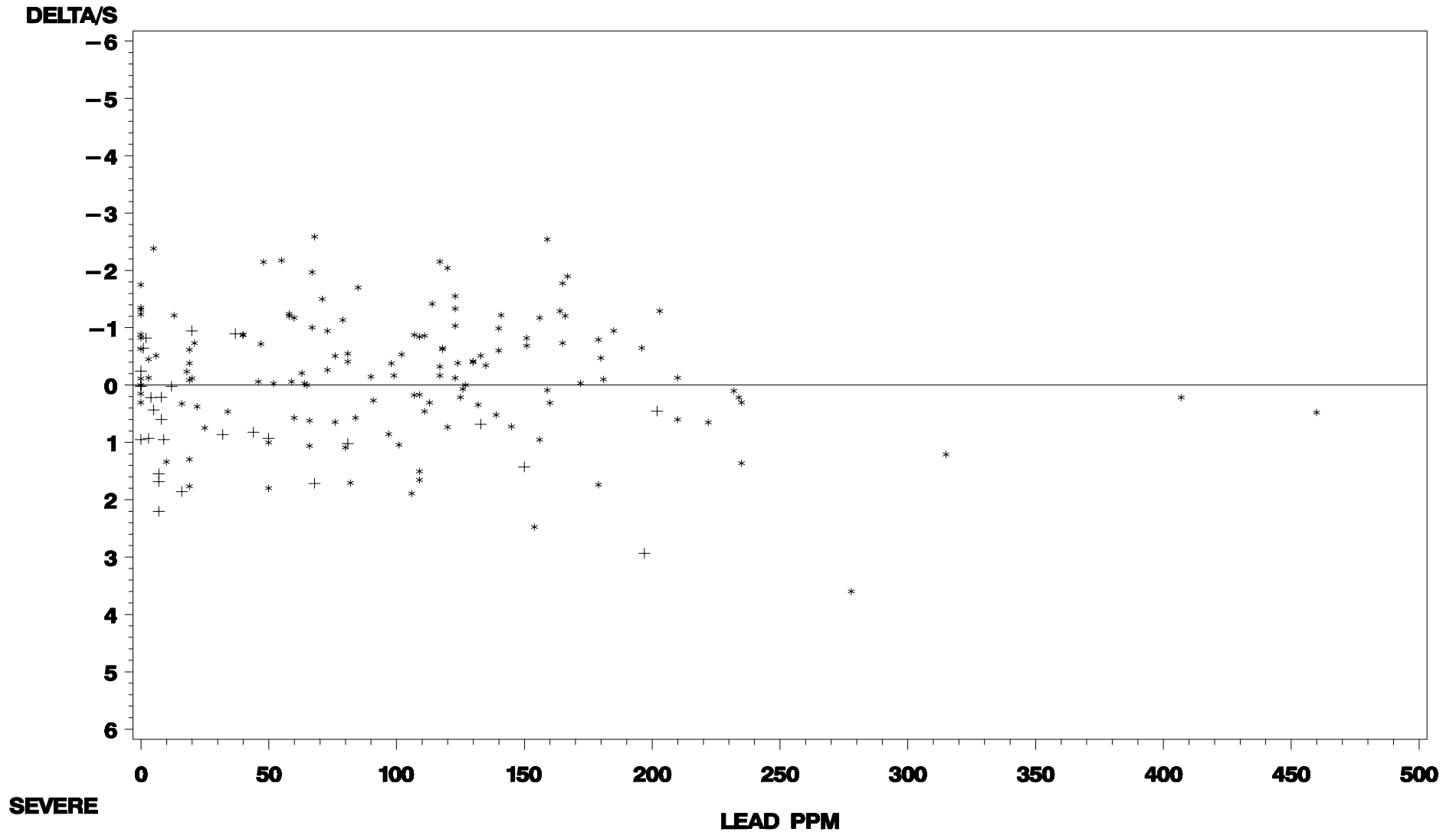


Figure 7

MILD

# SEQUENCE VIII BWL DELTA/S vs LEAD PPM

All LTMS Data

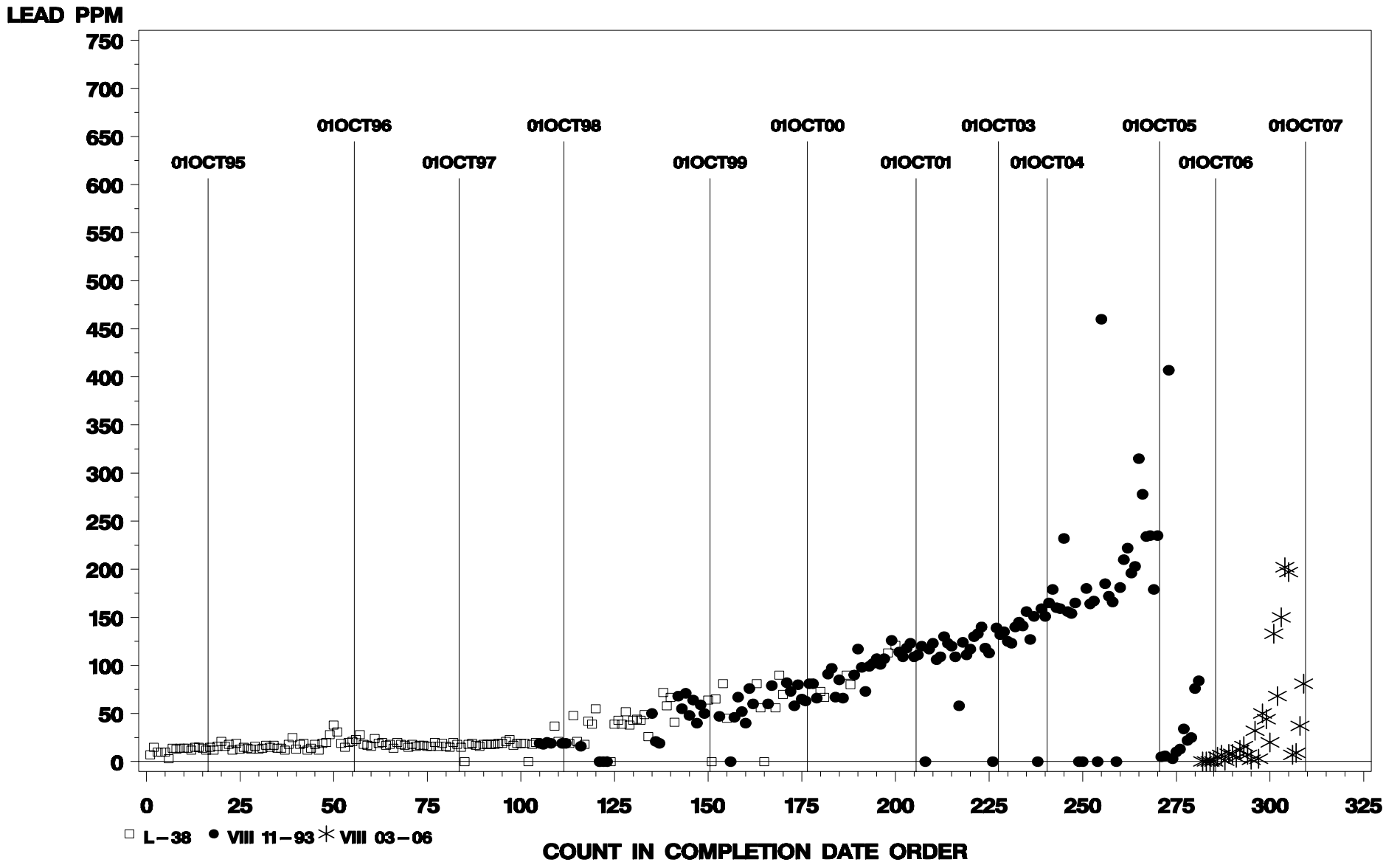


(\*) BEARING BATCH 11-93 (+) BEARING BATCH 03-06

Figure 8

# BEARING OIL STORAGE LEAD PPM vs COMPLETION DATE

All LTMS Data



<b>Figure 9 - Sequence VIII Timeline</b>		
<b>Date</b>	<b>Topic</b>	<b>Information Letter</b>
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
1/1/2004	NEWINERAL SPIRITS SPECIFICATION	03-1
1/26/04	BILLET CRANKSHAFT APPROVED FOR USE IN SEQUENCE VIII TESTING	
12/9/2004	CLARIFIED SOLVENT SPECIFICATION	04-1
12/9/2004	REVISED FUEL FLOW SPECIFICATION	04-1
12/9/2004	REQUIREMENTS FOR BUILDS WITH OVERSIZE PISTONS	04-1
6/23/05	DELETED ROCKER COVER INLET TEMPERATURE AND PRESSURE SENSORS, UPDATED PRECISION STATEMENT	05-1
9/20/06	FIRST TEST ON 03-06 BEARINGS	
10/24/06	REVISED BEARING CLEANING PROCEDURE IN ANNEX A9	06-1
3/12/07	TARGET UPDATE, REFERENCE OIL 1006-2	