




Test Monitoring Center

Carnegie Mellon University
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412-365-1000

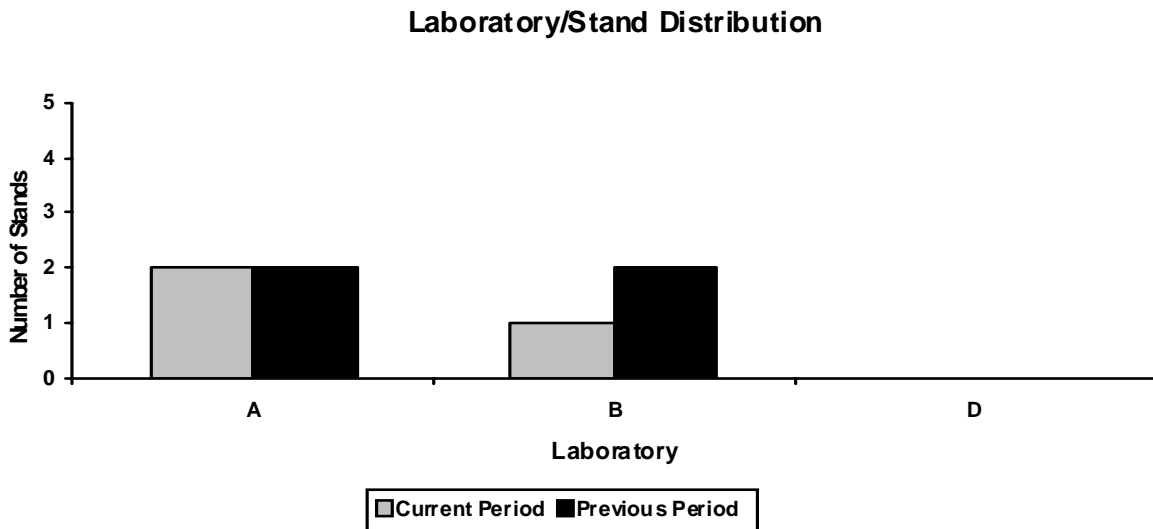
Memorandum: 08-058
Date: October 31, 2008
To: Fred Gerhart, Chairman, Sequence VIII Surveillance Panel
From: Richard E. Grundza 
Subject: Sequence VIII Semiannual Report: April 1, 2008 to September 30, 2008

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, 2008 to September 30, 2008.

Lab/Stand Distribution

	Reporting Data	Calibrated as of September 30, 2008
Number of Laboratories:	2	2
Number of Stand/Engine Combinations:	4	3

The following chart shows the laboratory/stand distribution:

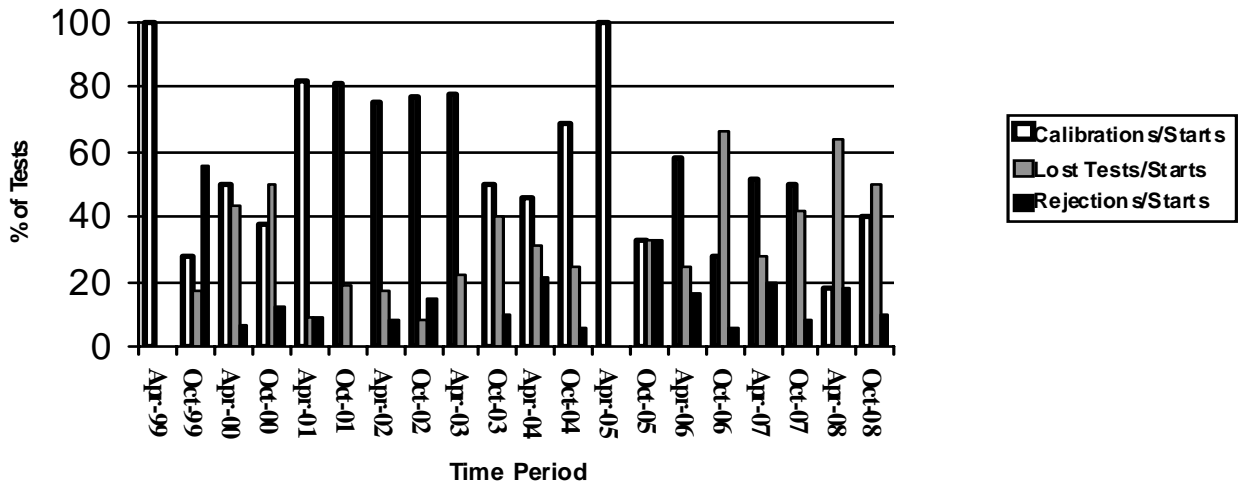


The following summarizes the status of the reference oil tests reported to the TMC:

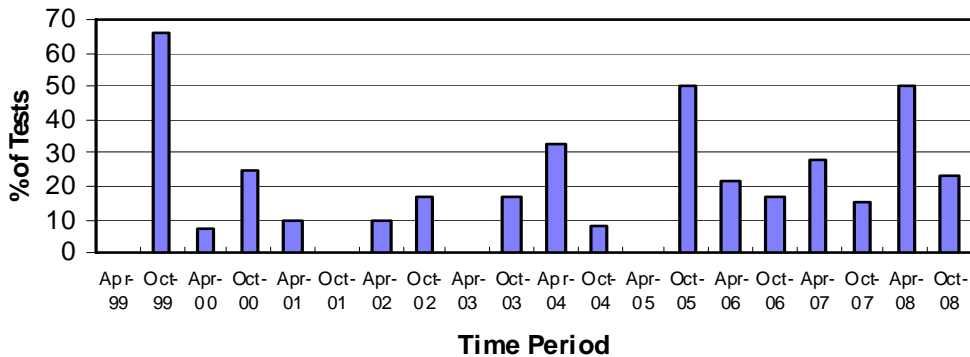
Calibration Start Outcomes	TMC Validity Code	No. of Tests
Operationally and Statistically Acceptable	AC	10
Operationally Invalid (laboratory judgment)	LC	11
Aborted	XC	1
Statistically unacceptable Calibration Test	OC	3
Total		25

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

Calibration Attempt Summary



Rejected Operationally Valid Tests



Three tests failed acceptance criteria during the period. Two failed for severe BWL and the remaining test failed for severe SVIS.

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

No lab visits were conducted by the TMC this period.

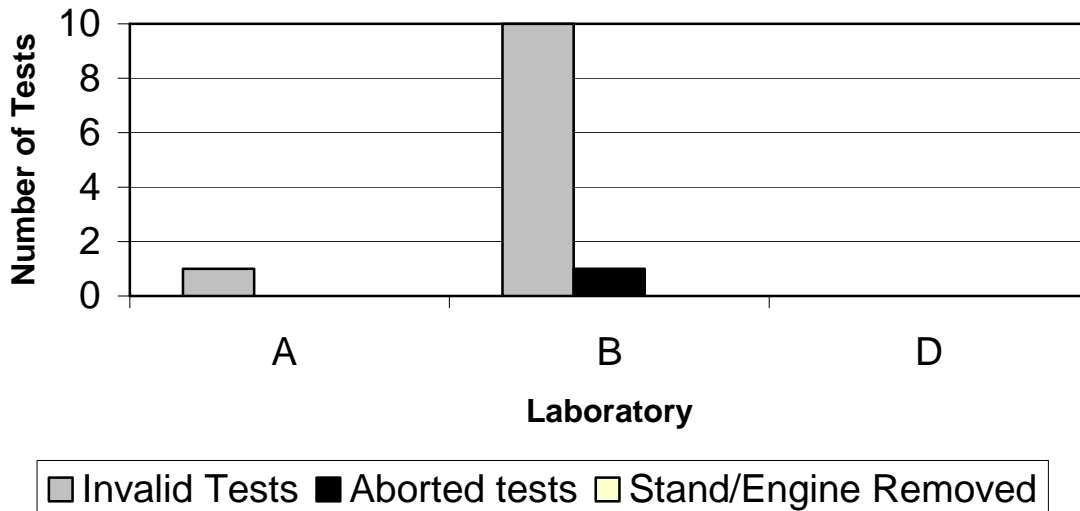
Lost Test Summary

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

Reasons for Lost Test(s)	Number
High mechanical wear	10
% deviation exceeded, crankcase pressure	1
Excessive downtime	1

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

Lost Test Distribution



Information Letters

Two information letters were issued this period. Information Letter 08-1 was issued May 15, 2008. This letter revised the rocker cover inlet connection to allow a reservoir to be added to facilitate oil additions. Information letter 08-2 was issued June 12, 2008. This letter provided clarifications for hardware reuse.

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 values 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	0.151	4.867 (df=11)	0.73 mg
SVIS	-0.887	0.084 (df=11)	-0.07 cSt

Average Δ/s by Laboratory		
Lab	BWL	SVIS
A	-0.372	-1.198
B	1.329	-0.188
D	-	-

Bearing Weight Loss (BWL)

The industry control charts for severity began the period in warning alarm. The severity charts cleared for six tests and sounded an additional two warning alarms before clearing at the end of the period. Precision control charts started the period in warning alarm and remained in warning alarm throughout most of the period, ending the period in control (see Figure 1).

The Industry BWL mean Δ/s was 0.151 severe for this report period (see Figure 3). This equates to a shift of 0.73 mg in reported units. The pooled standard deviation for the period is 4.867 mg (see Figure 4), which has degraded 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 44 ppm. Lead content for 05-08 bearings is not plotted, as lead is not available since these bearings are not stored in oil.

Stripped Viscosity (SVIS)

The industry control chart for severity began the period in control, but went into warning with the last three tests reported during the period. Precision was in control for the period (see Figure 2).

The Industry SVIS mean Δ/s is -0.887 severe for this report period (see Figures 2 & 5), and equates to a shift of -0.07 cSt in reported units. The pooled standard deviation for the period is 0.084 cSt (see Figure 6), which is comparable to historical performance.

Hardware

Batch 05-08 bearings were introduced this period. Two labs have successfully calibrated on these bearings.

TMC Memoranda

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	302	151	4	5+ years
1006	41	20	1	3 months ¹
1006-2	4,281	2,140	5	3+ years ¹
1009	631	315	5	3+ years ¹

¹ 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-10-2008.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

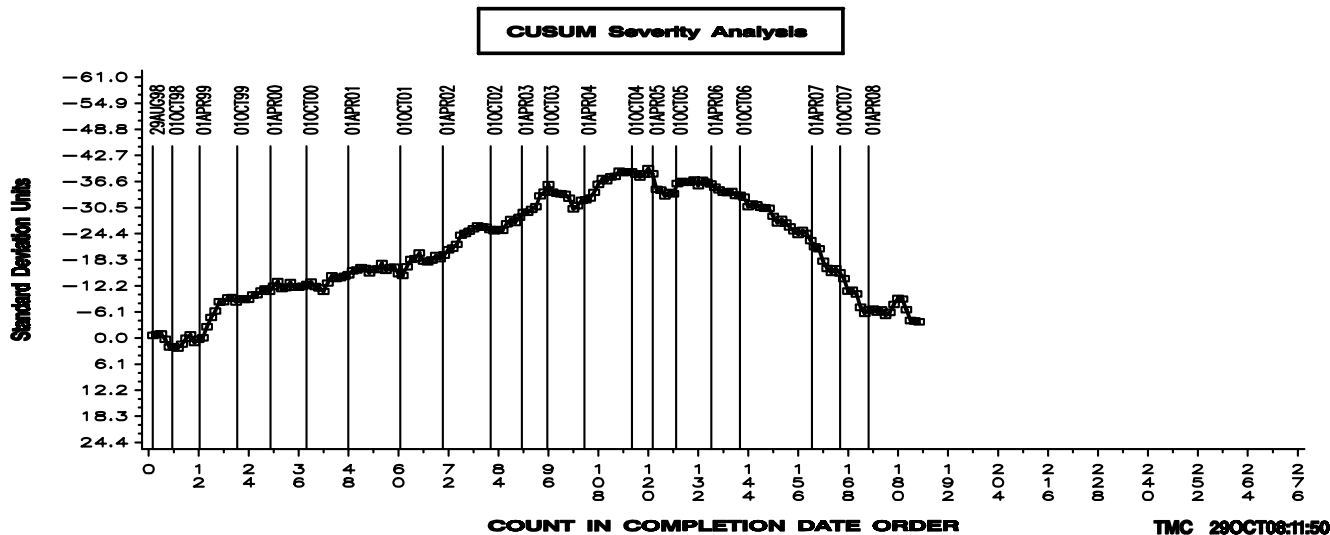
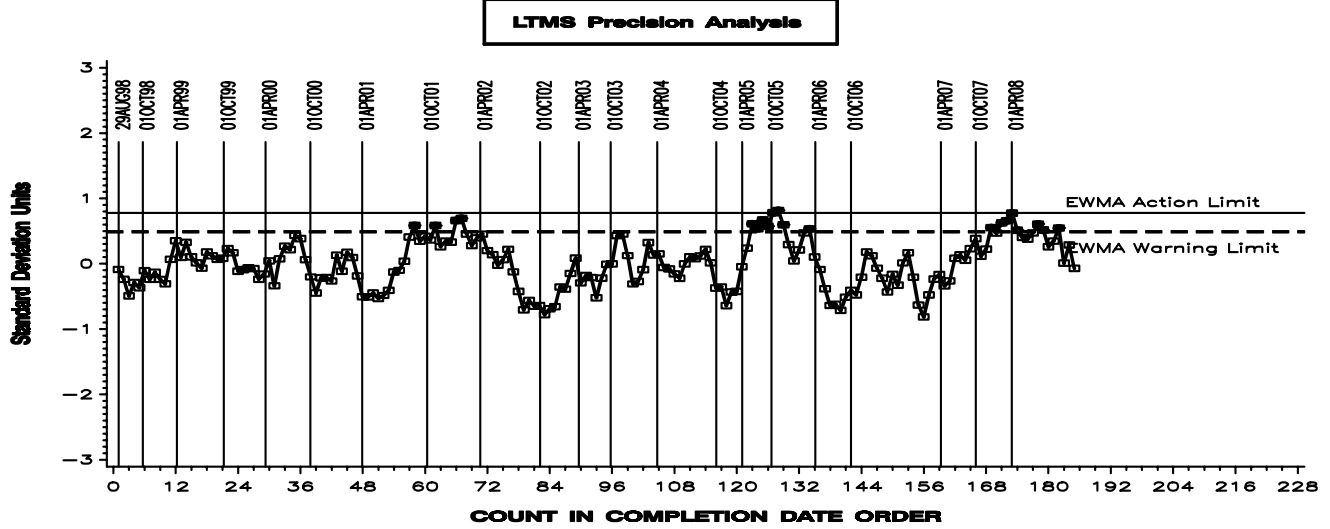
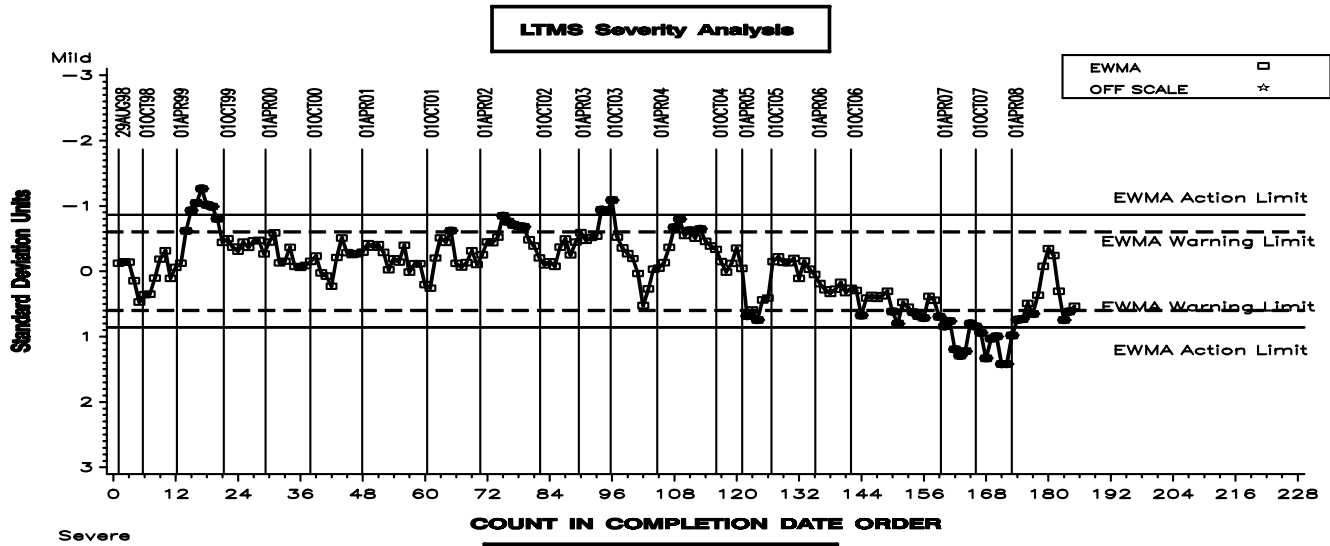
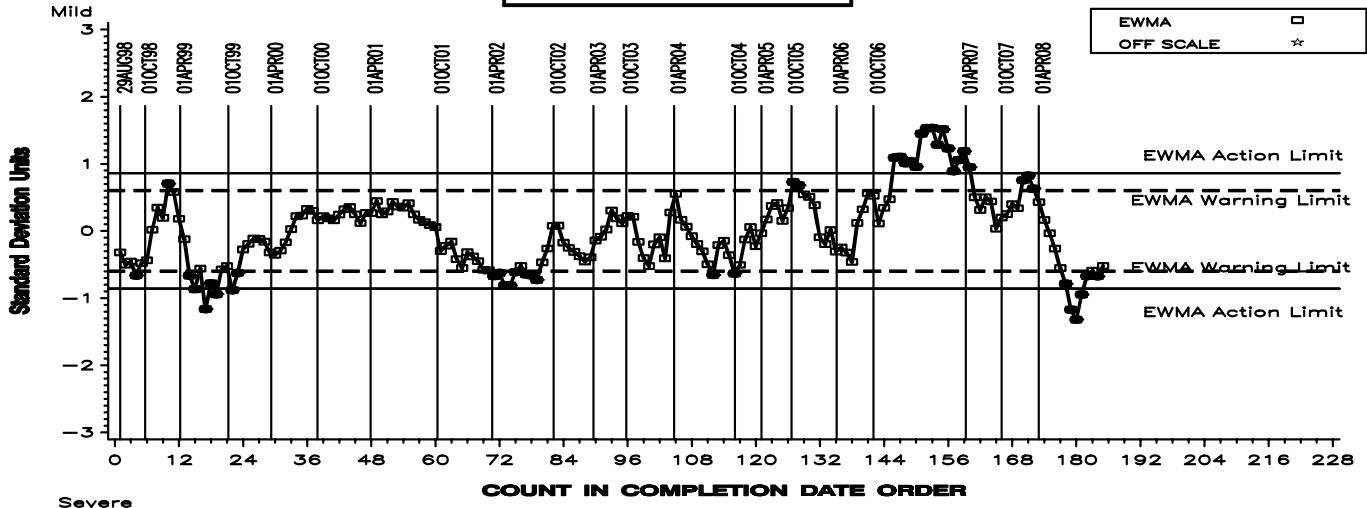


Figure 2

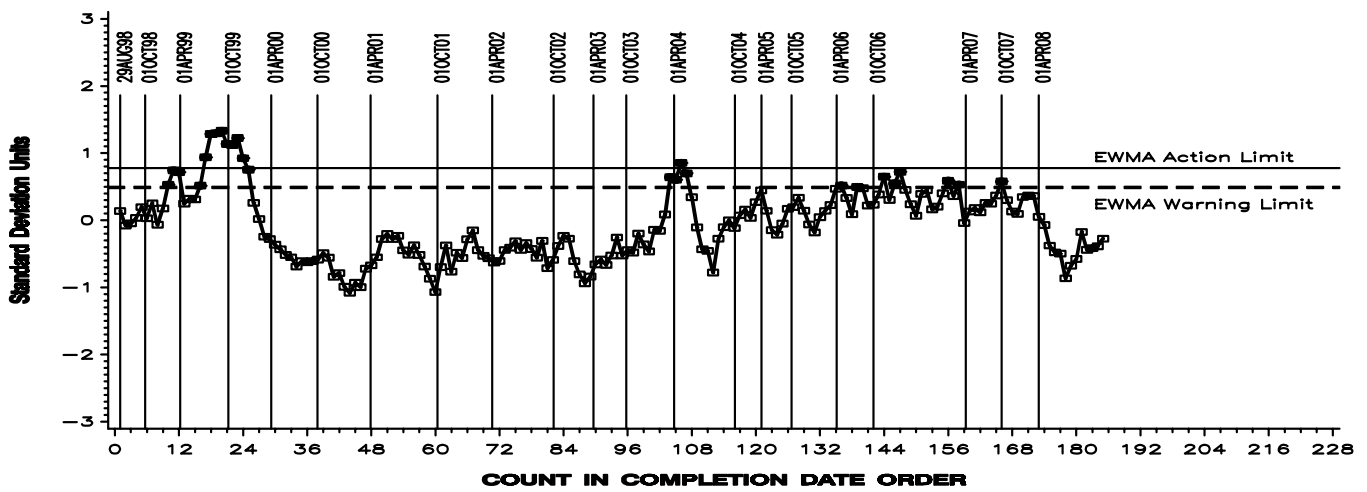
SEQUENCE VIII INDUSTRY OPERATIONALLY VALID DATA

STRIPPED VIS. @ 100 DEG C

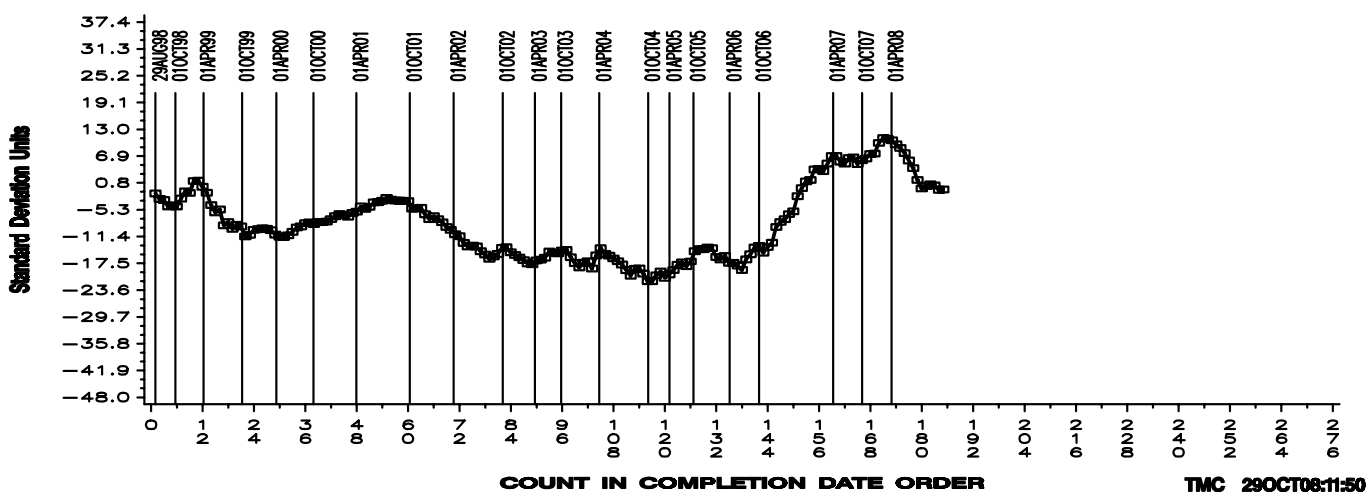
LTMS Severity Analysis



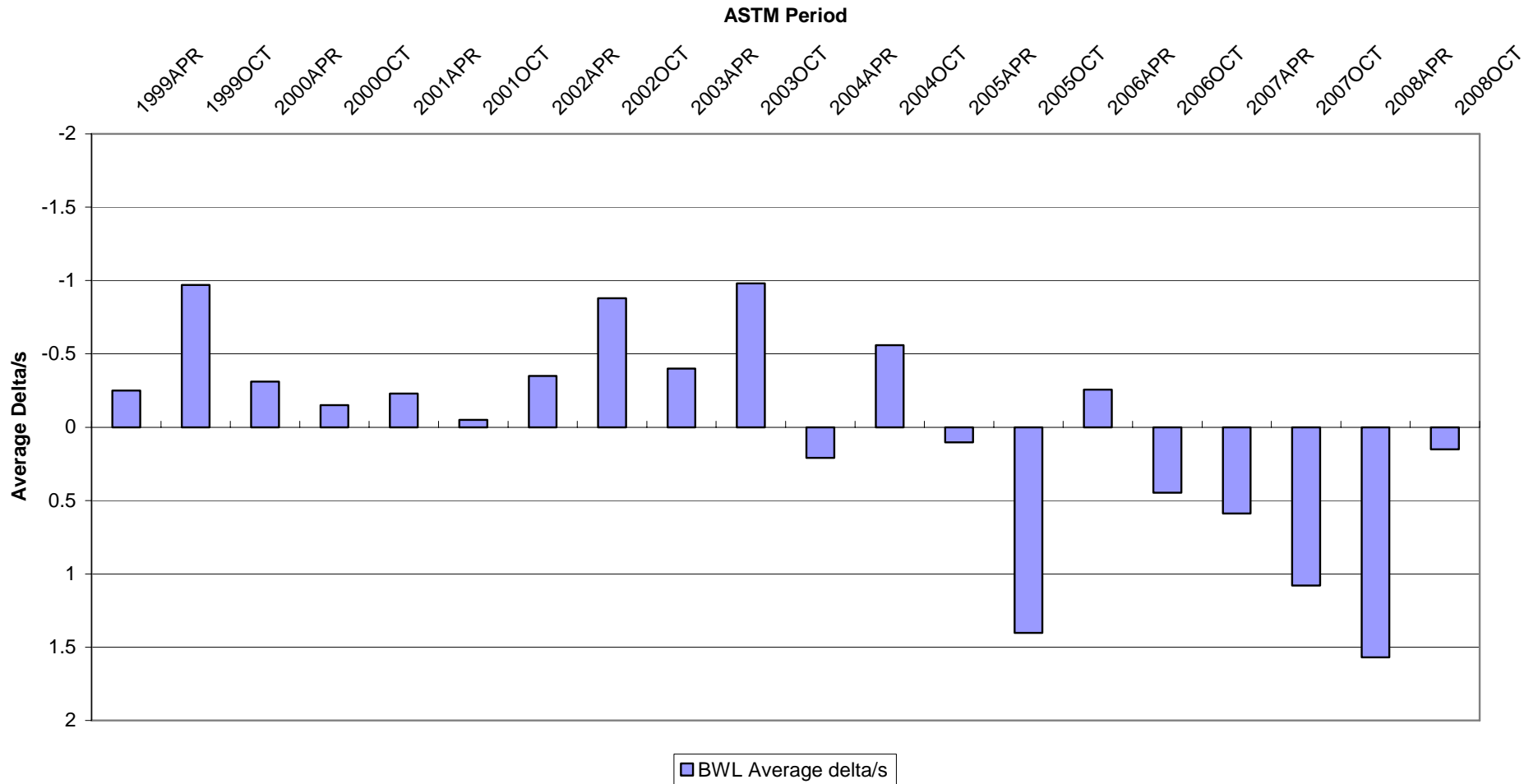
LTMS Precision Analysis



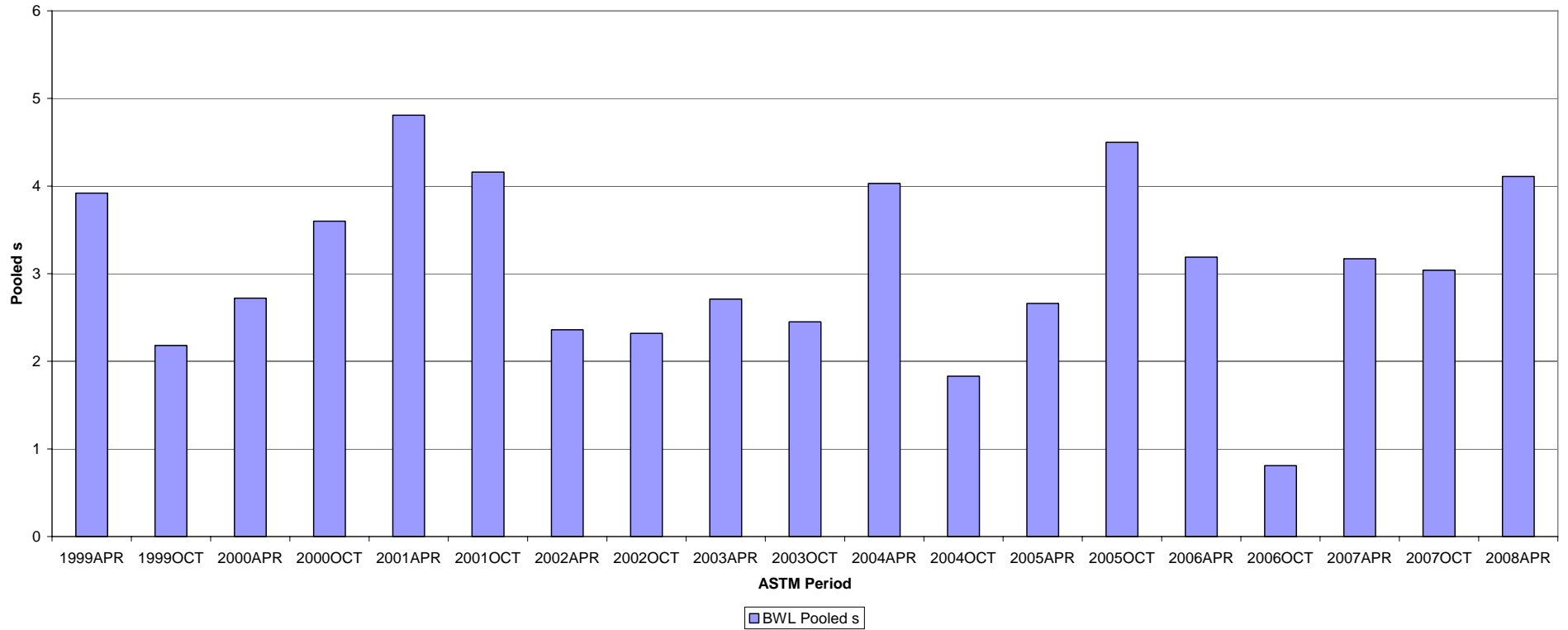
CUSUM Severity Analysis



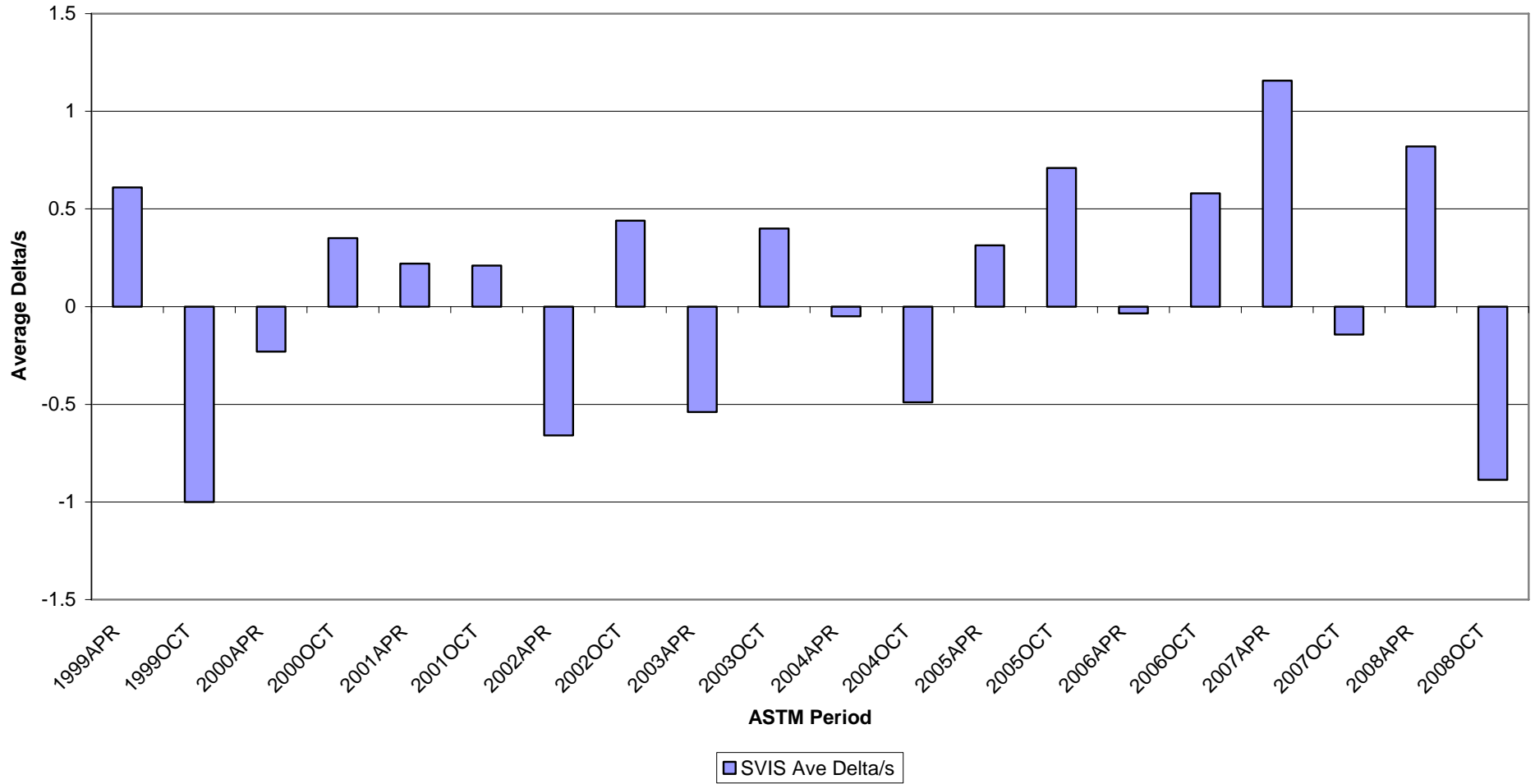
**Figure 3 - Sequence VIII Reference Oil Data
Bearing Weight Loss**



**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**

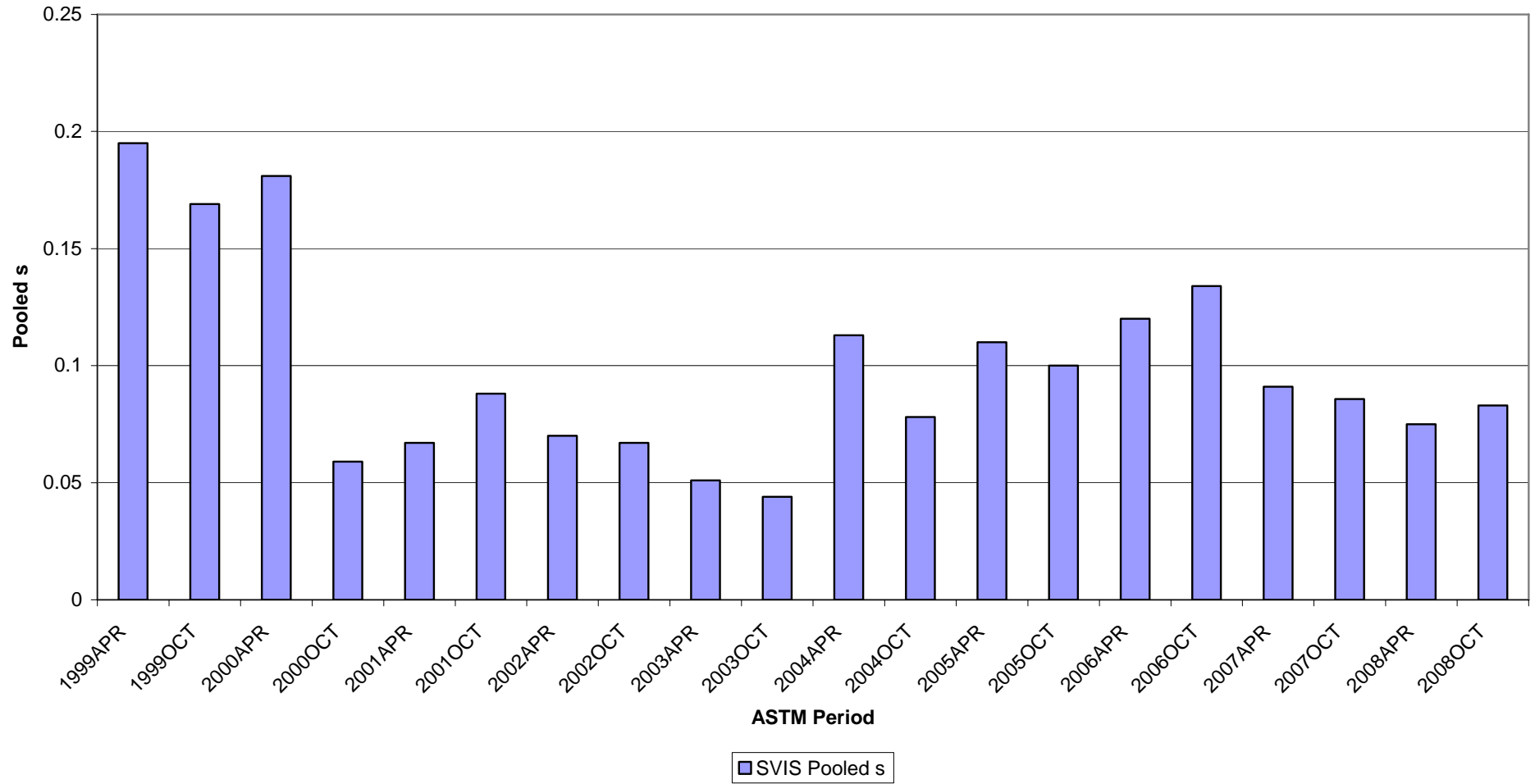


Figure 7

MILD

SEQUENCE VIII BWL DELTA/S vs LEAD PPM

All LTMS Data

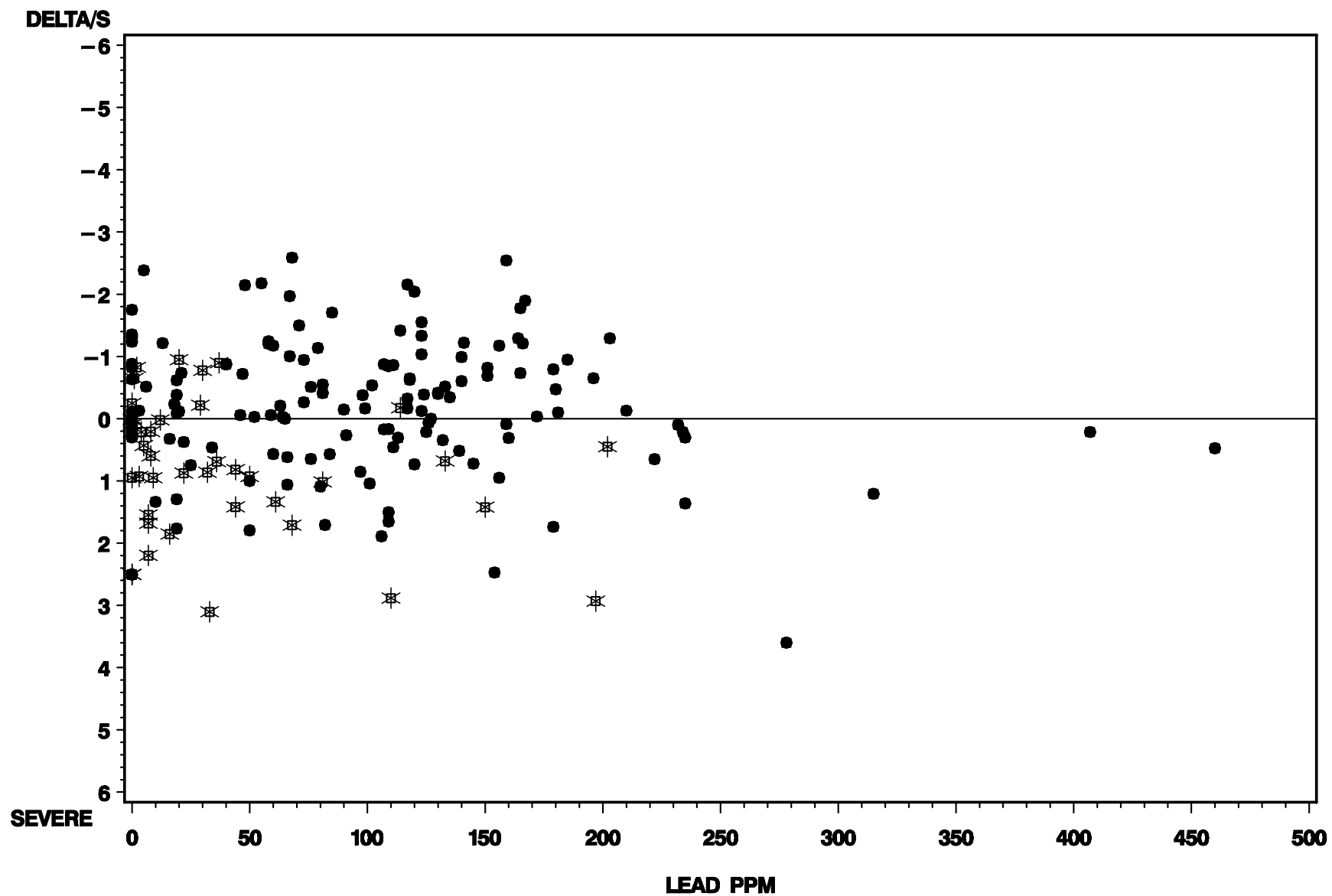


Figure 8

BEARING OIL STORAGE LEAD PPM vs COMPLETION DATE

All LTMS Data

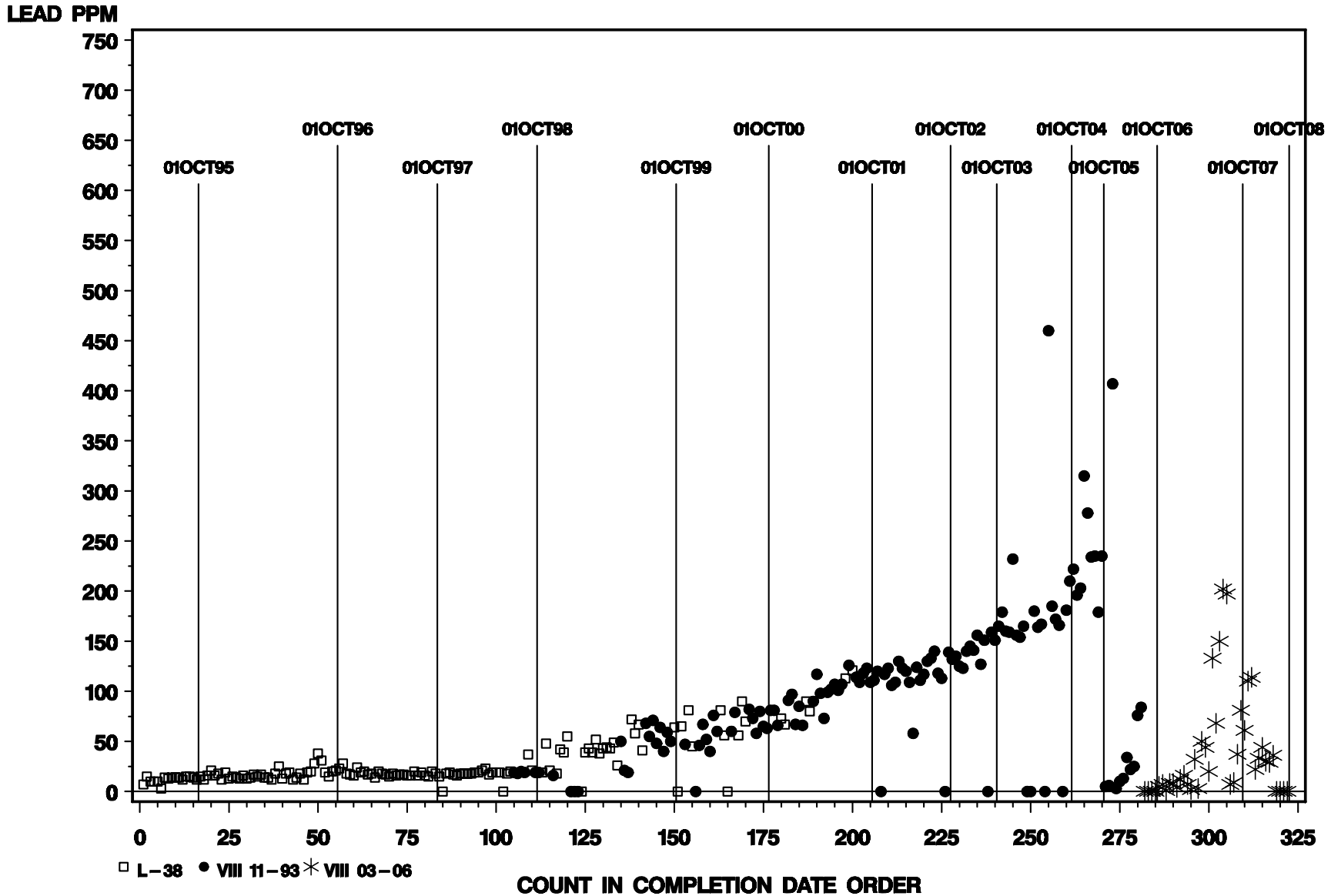


Figure 9 - Sequence VIII Timeline		
Date	Topic	Information Letter
2/10/1999	NEW PISTON RING BATCH APPROVED FOR USE IN SEQUENCE VIII TESTING	00-1
4/16/1999	DRAFT 3.1 OF THE SEQUENCE VIII TEST PROCEDURE ISSUED	99-1
5/19/1999	REMOVAL OF RING BATCH REPORTING REQUIREMENTS	00-1
5/19/1999	NEW OIL FILTER (RAYCOR 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
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	
5/15/08	ADDED RESERVIOR TO ROCKER COVER INLET	08-1
6/12/08	CLARIFIED HARDWARE REUSE GUIDELINES	08-2