




Test Monitoring Center

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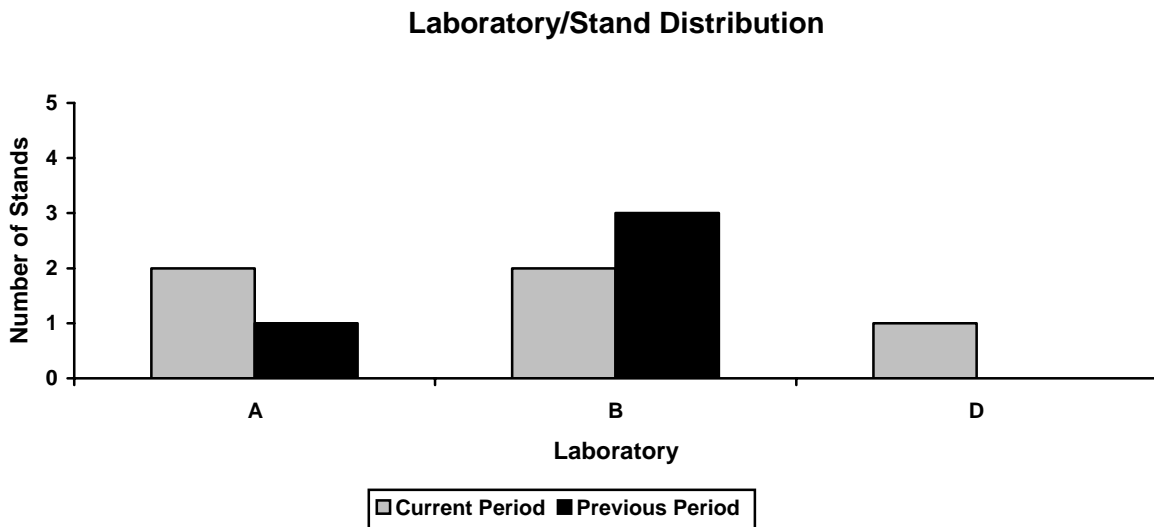
Memorandum: 06-022
Date: April 12, 2006
To: Fred Gerhart, Chairman, Sequence VIII Surveillance Panel
From: Richard E. Grundza 
Subject: Sequence VIII Semiannual Report: October 1, 2005 to March 31, 2006

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, 2005 to March 31, 2006.

Lab/Stand Distribution

	Reporting Data	Calibrated as of March 31, 2006
Number of Laboratories:	3	3
Number of Stand/Engine Combinations:	7	5

The following chart shows the laboratory/stand distribution:

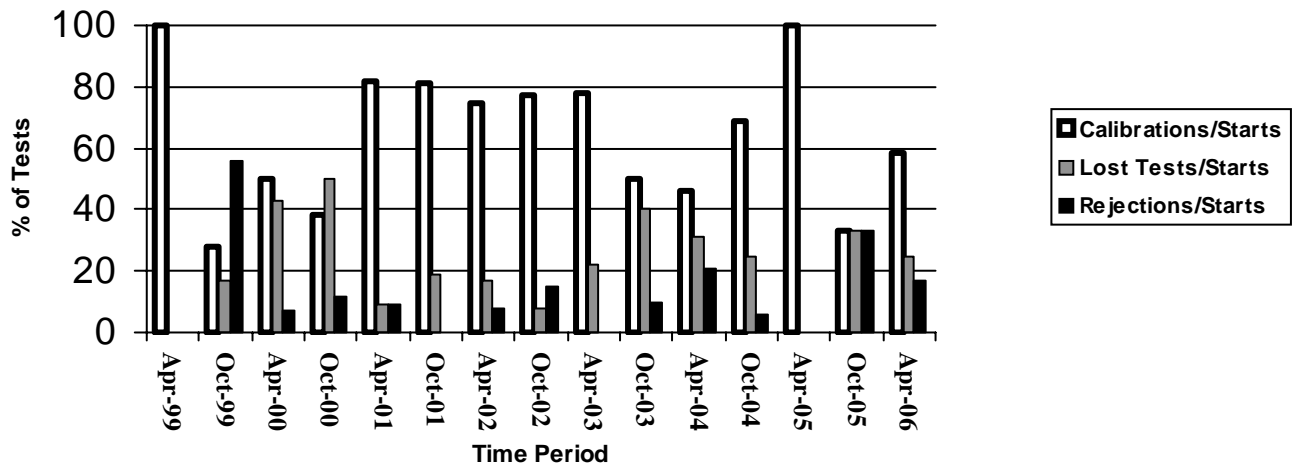


The following summarizes the status of the reference oil tests reported to the TMC:

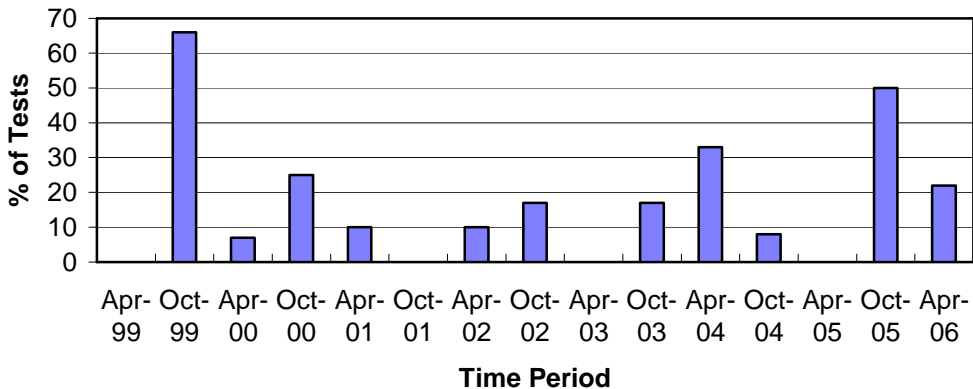
Calibration Start Outcomes	TMC Validity Code	No. of Tests
Operationally and Statistically Acceptable	AC	7
Operationally and Statistically Unacceptable	OC	2
Operationally Invalid (laboratory judgement)	LC	2
Aborted	XC	1
Total		12

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

Calibration Attempt Summary



Rejected Operationally Valid Tests



Two tests failed this period. One test failed due to a stand precision EWMA alarm (Qi) for BWL. The remaining test failed for mild SVIS shewhart severity.

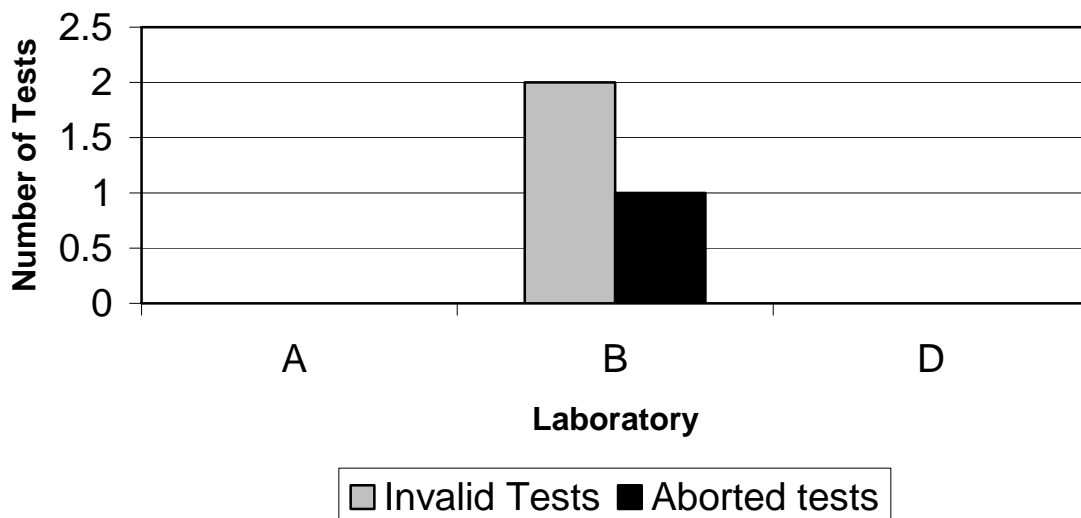
There were no LTMS Deviations this period. There have been three deviations from the LTMS to date.

One lab visit was conducted this period.

Lost Test Summary

Three tests were lost this period, two due to mechanical bearing wear and a third due to a main bearing failure. These tests were conducted on different stand/engine combinations in the same laboratory. 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 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	-0.257	3.20 (df=8)	-0.82 mg
SVIS	-0.035	0.12 (df=8)	-0.00 cSt

Average Δ/s by Laboratory		
Lab	BWL	SVIS
A	0.17	-1.05
B	-0.64	1.00
D	-0.45	-0.12

Bearing Weight Loss (BWL)

The industry control chart for severity was in control for the period. Control charts for precision exceeded control limits for four of the nine tests reported this period. The first alarm event was caused by one result which was $-2.384\Delta/s$ from target (see Figure 1).

The Industry BWL mean Δ/s is 0.257 severe for this report period (see Figure 3). This equates to a shift of -0.82 mg in reported units. The pooled standard deviation for the period is 3.20 mg (see Figure 4), which has improved 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 was 407 ppm.

Stripped Viscosity (SVIS)

With the exception of two warning alarms at the beginning of the period, the industry control charts for severity were in control for the period. Precision was in control for the period (see Figure 2).

The Industry SVIS mean Δ/s is -0.035 for this report period (see Figures 2 & 5), which is on or near target. This equates to a shift of 0.00 cSt in reported units. The pooled standard deviation for the period is 0.12 cSt (see Figure 6), which is comparable to historical performance.

Hardware

No hardware changes were made during the period.

Reference Oils

Oil	TMC Inventory, In gallons	TMC Inventory, In tests	Laboratory Inventory, in tests	Estimated Life
704-1	391	195	3	5+ years
1006	43	21	1	3 months ¹
1006-2	4,681	2,340	2	3+ years ¹
1009	757	378	3	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-04-2006.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

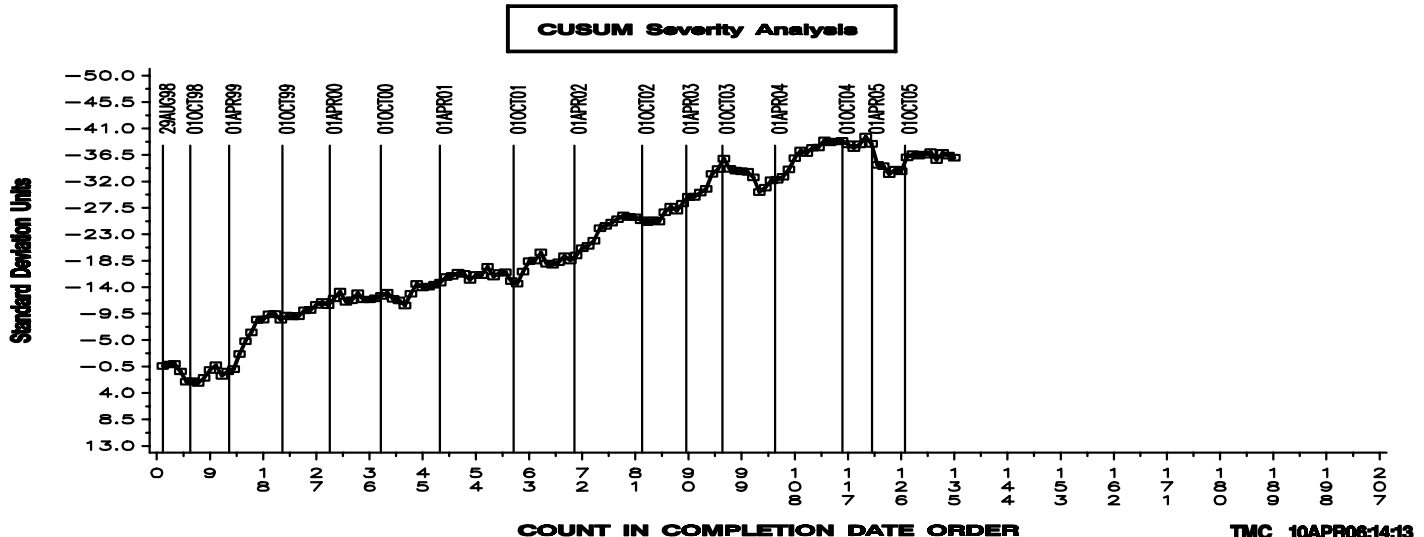
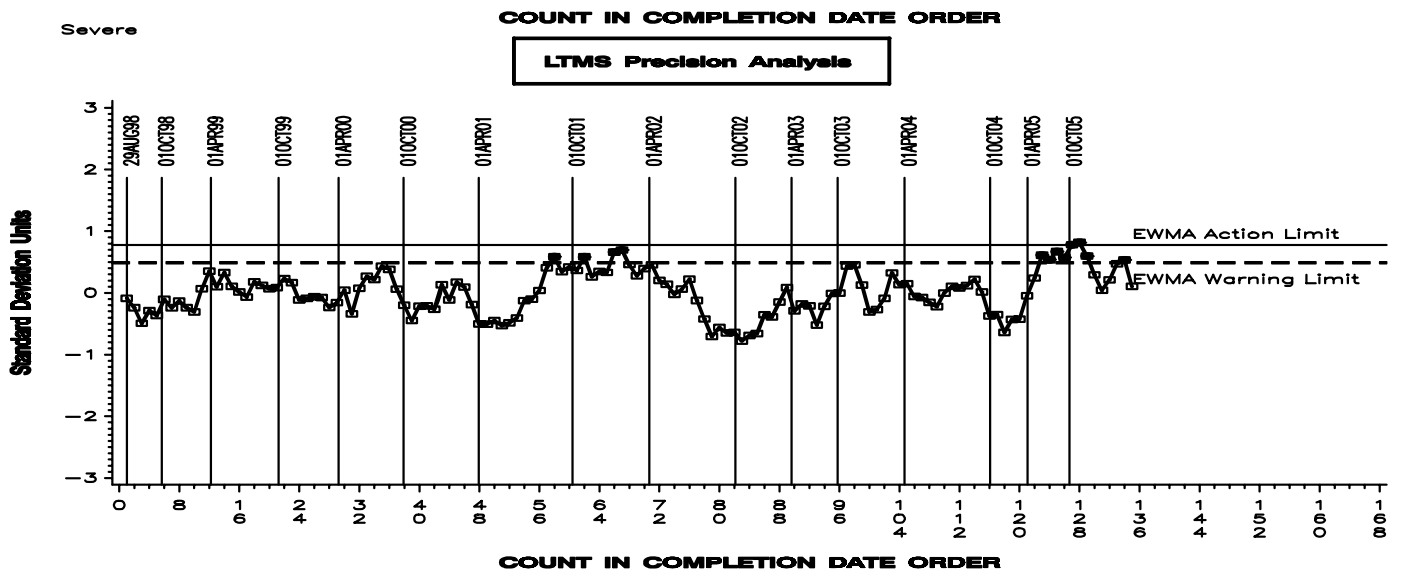
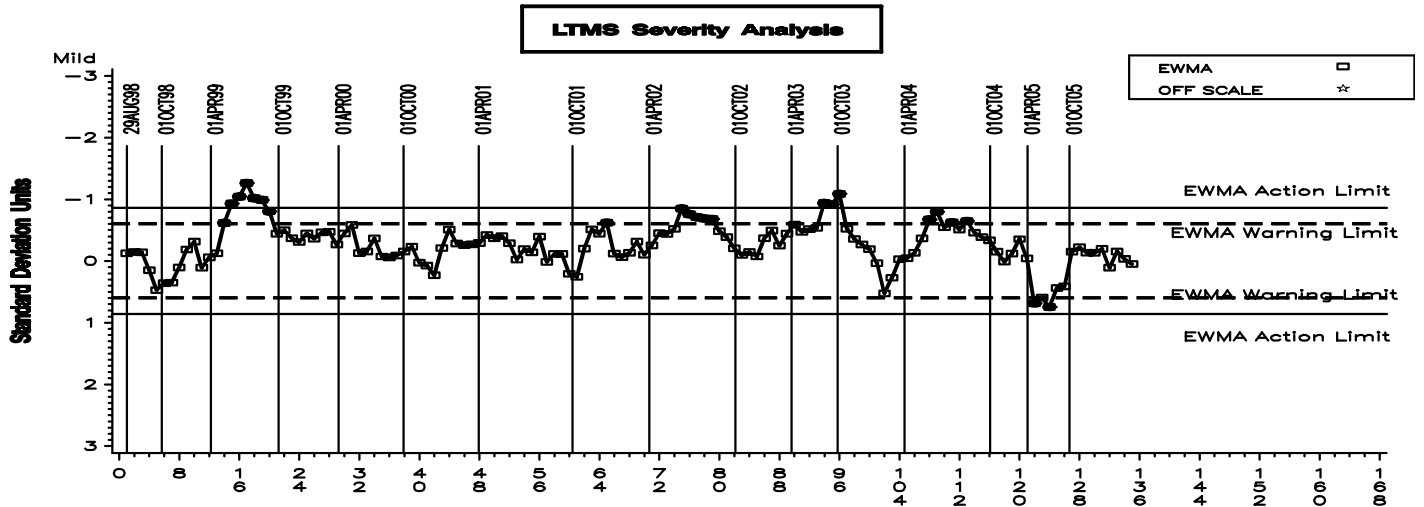


Figure 2

SEQUENCE VIII INDUSTRY OPERATIONALLY VALID DATA

STRIPPED VIS. @ 100 DEG C

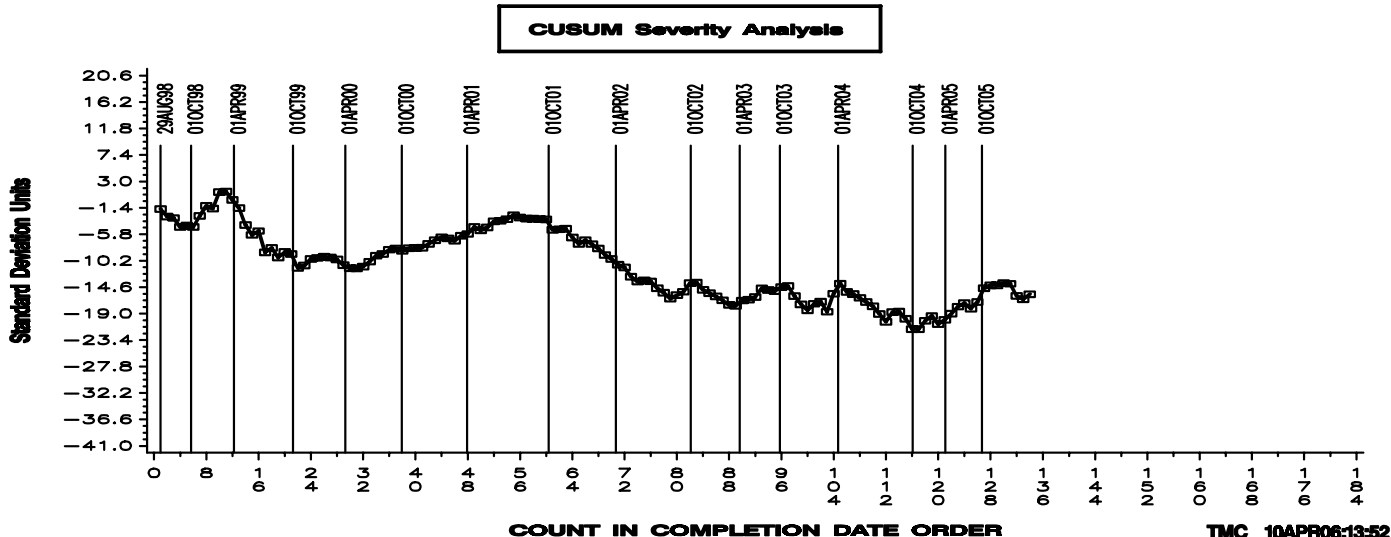
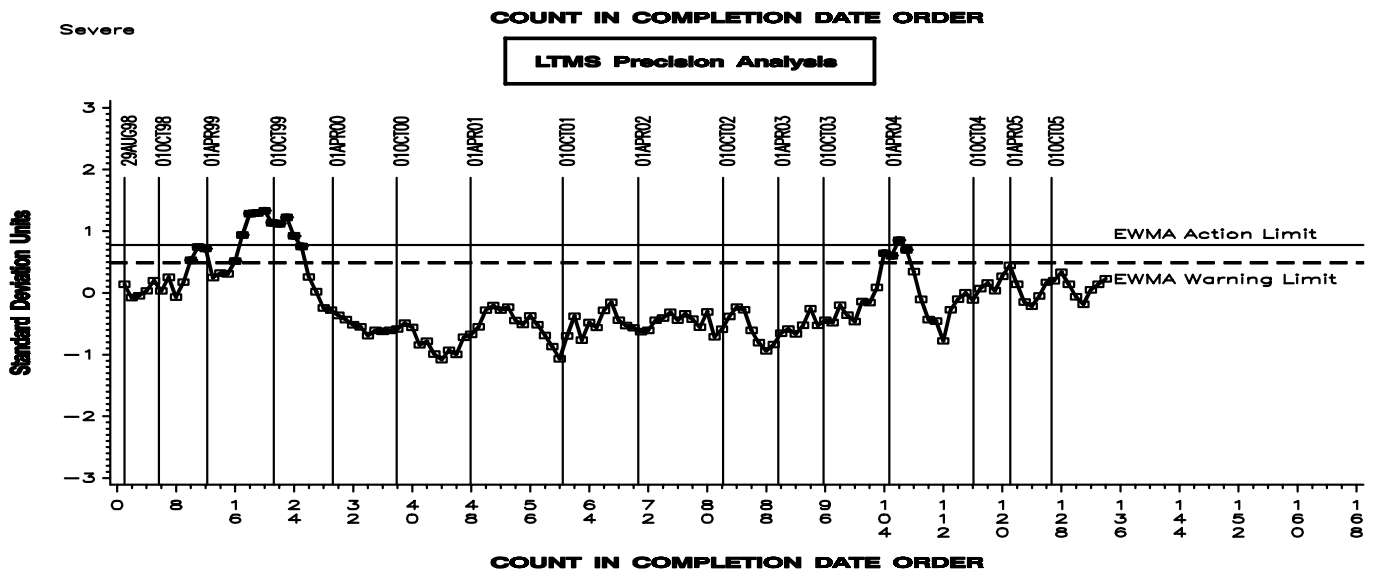
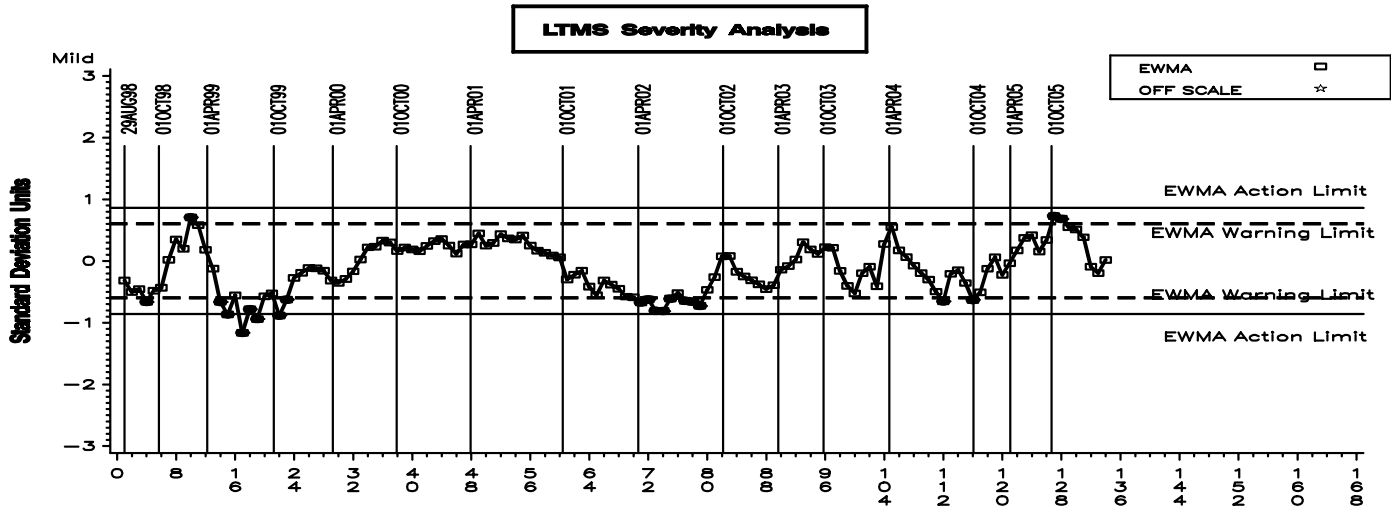
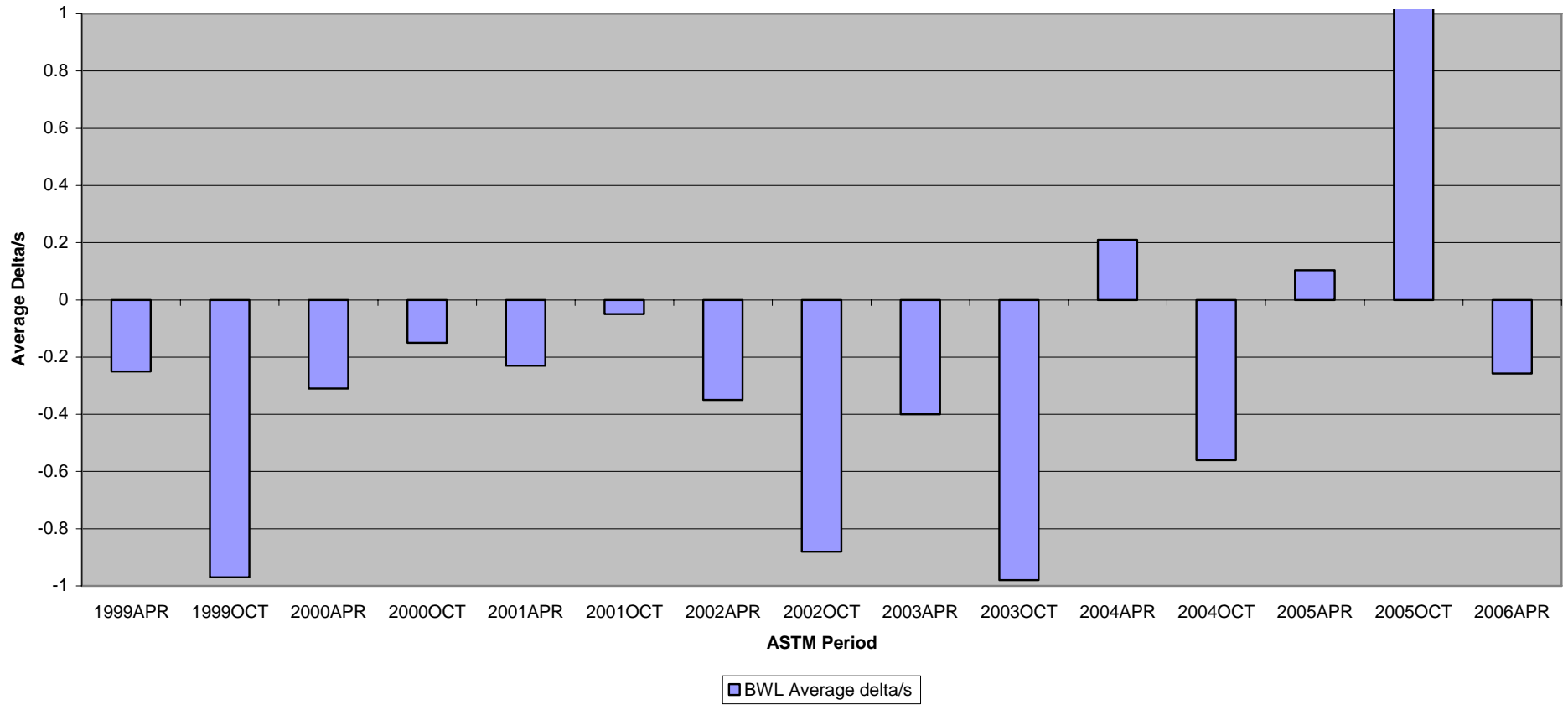


Figure 3 - Sequence VIII Reference Oil Data
Bearing Weight Loss



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

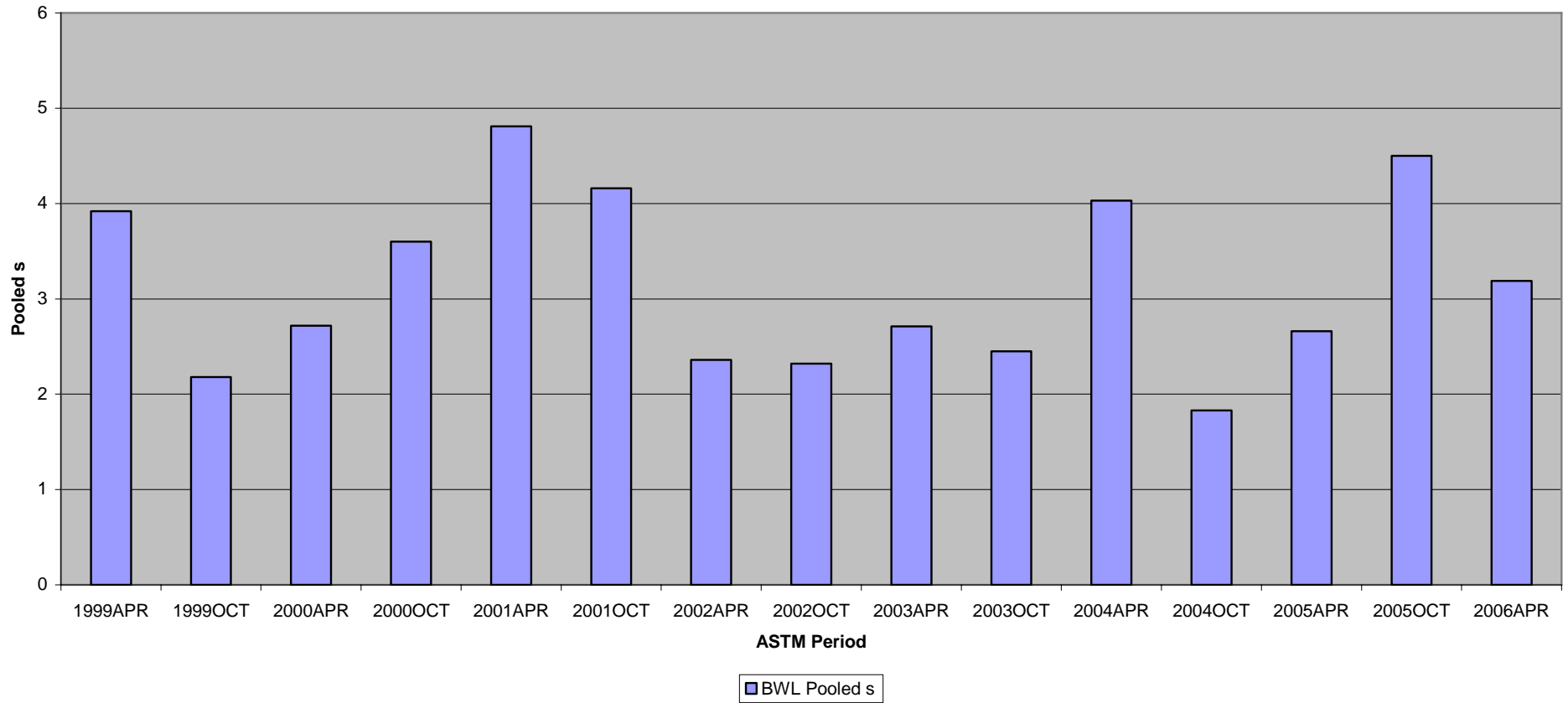
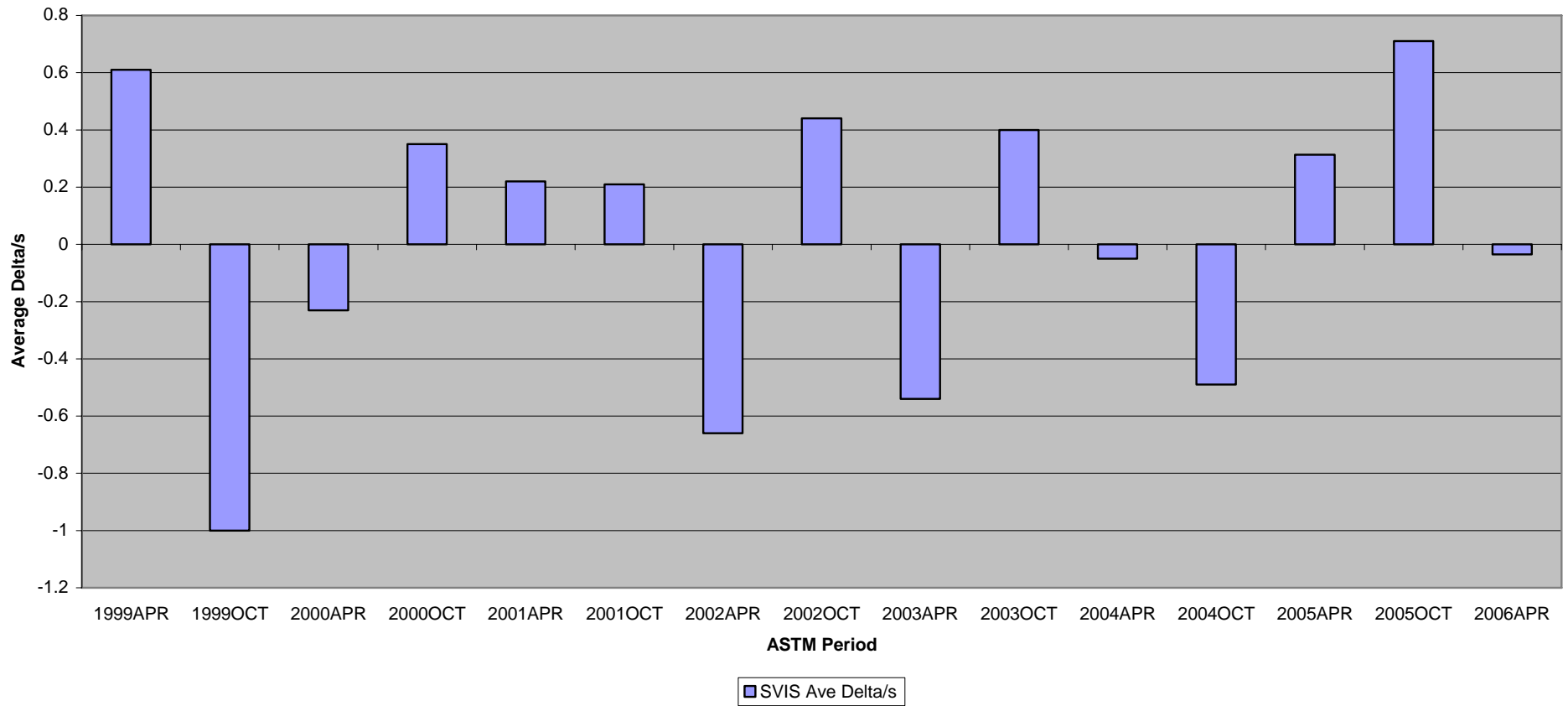


Figure 5 - Sequence VIII Reference Oil Data
Stripped Viscosity



**Figure 6 - Sequence VIII Reference Oil Data
Stripped Viscosity**

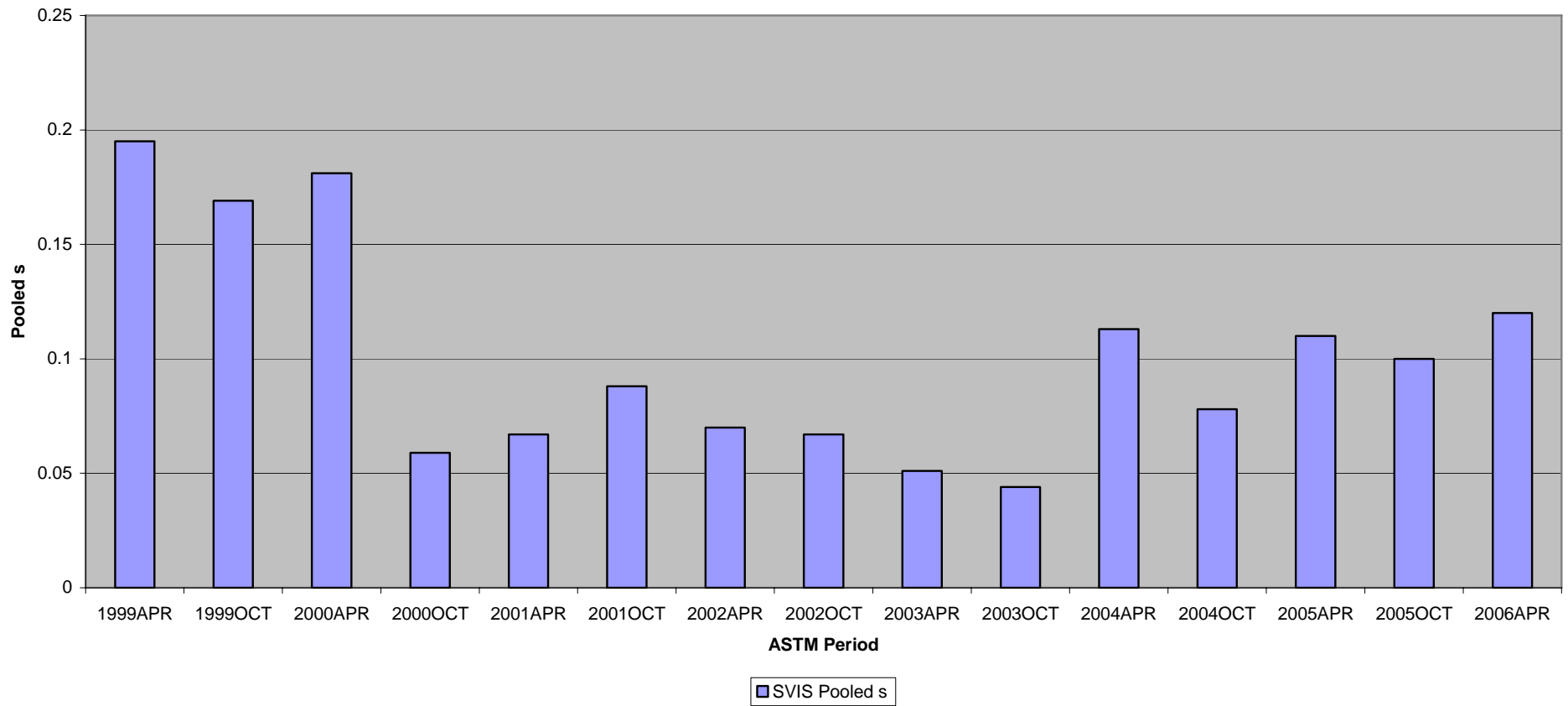
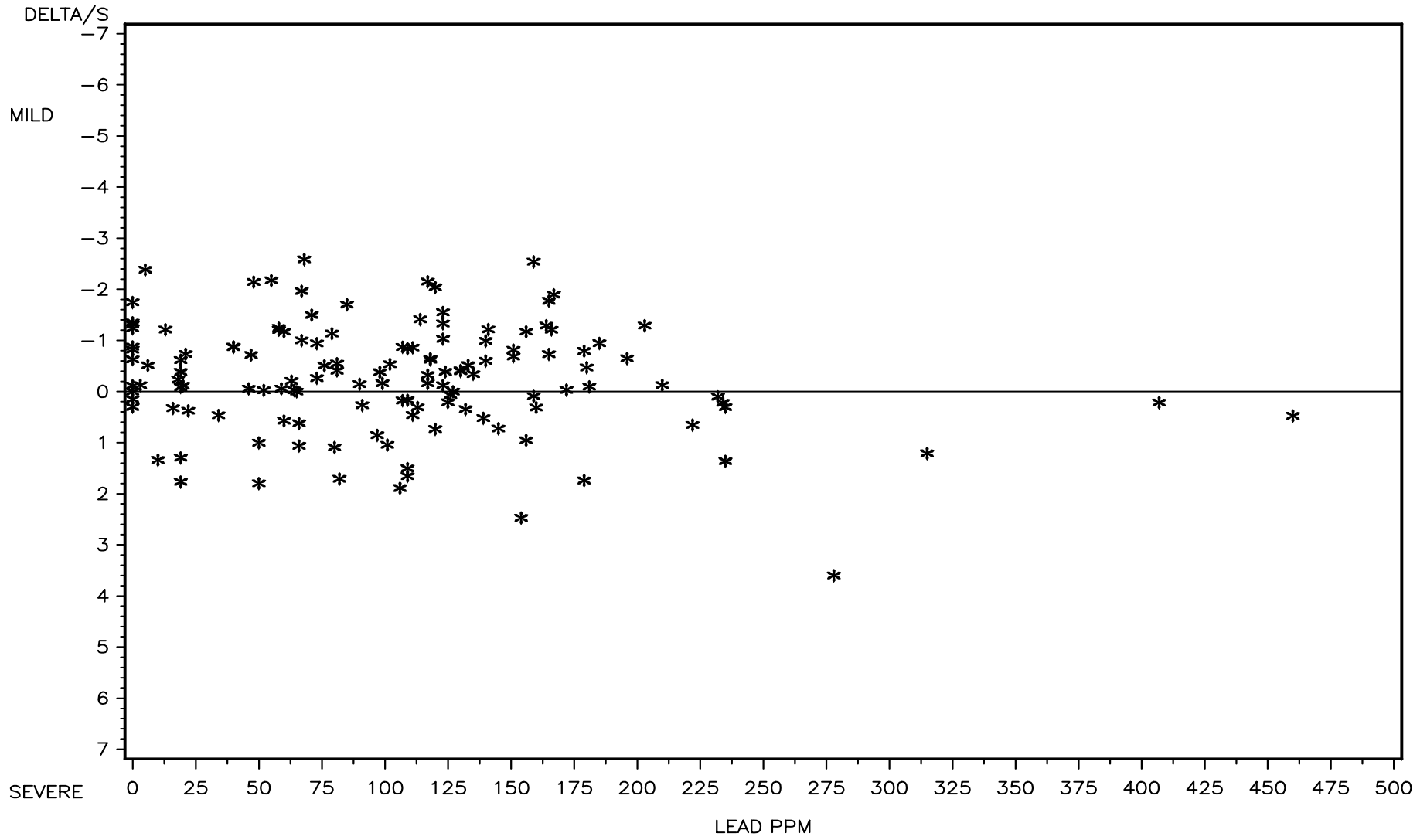


Figure 7

SEQUENCE VIII BWL DELTA/S vs LEAD PPM
All LTMS Data



(*) BEARING BATCH 11/93

Figure 8

BEARING OIL STORAGE LEAD PPM vs COMPLETION DATE
All LTMS Data

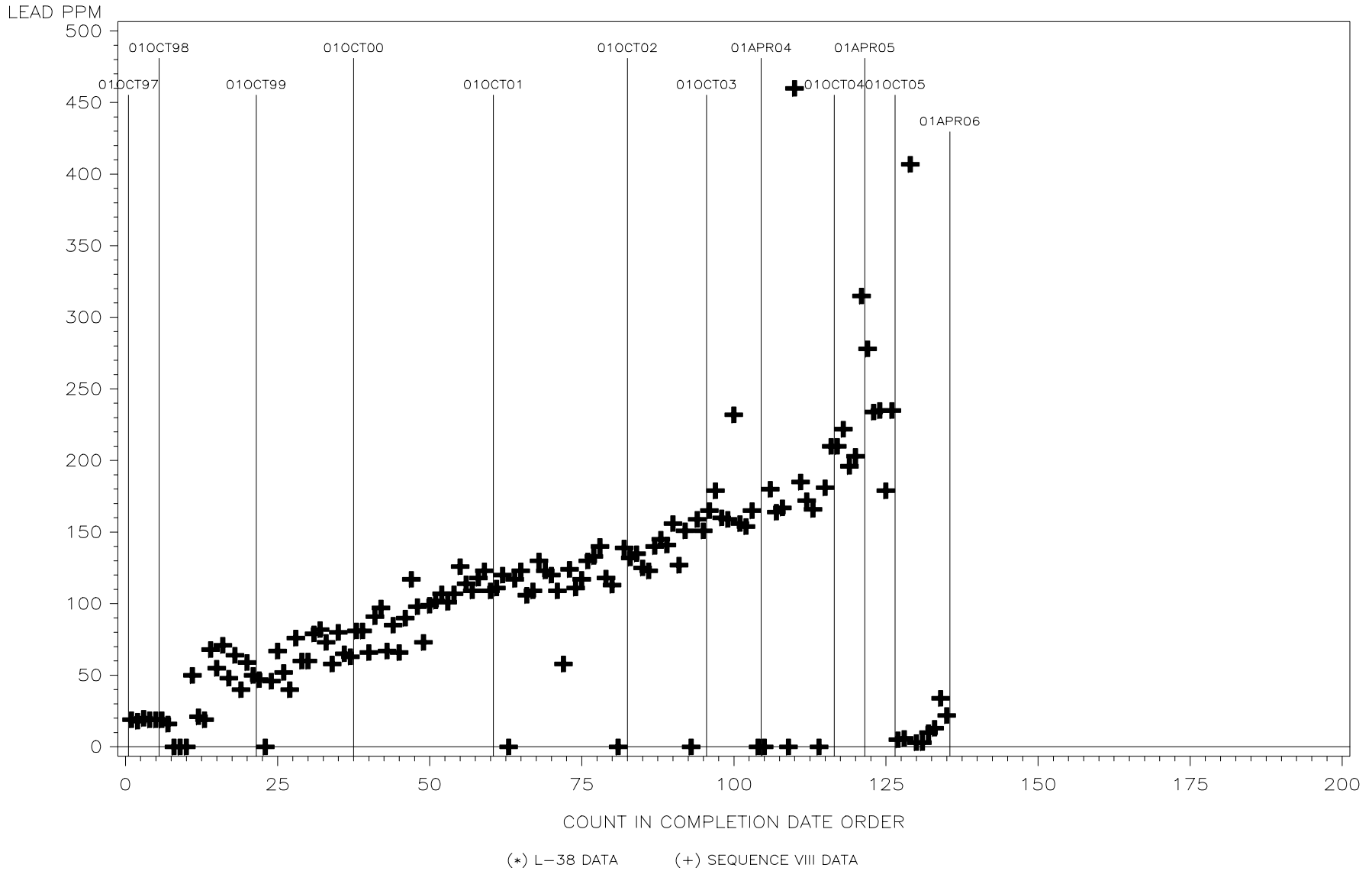


Figure 9 - Sequence VIII Timeline

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	New MINIERAL SPIRITIS 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