




Test Monitoring Center

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

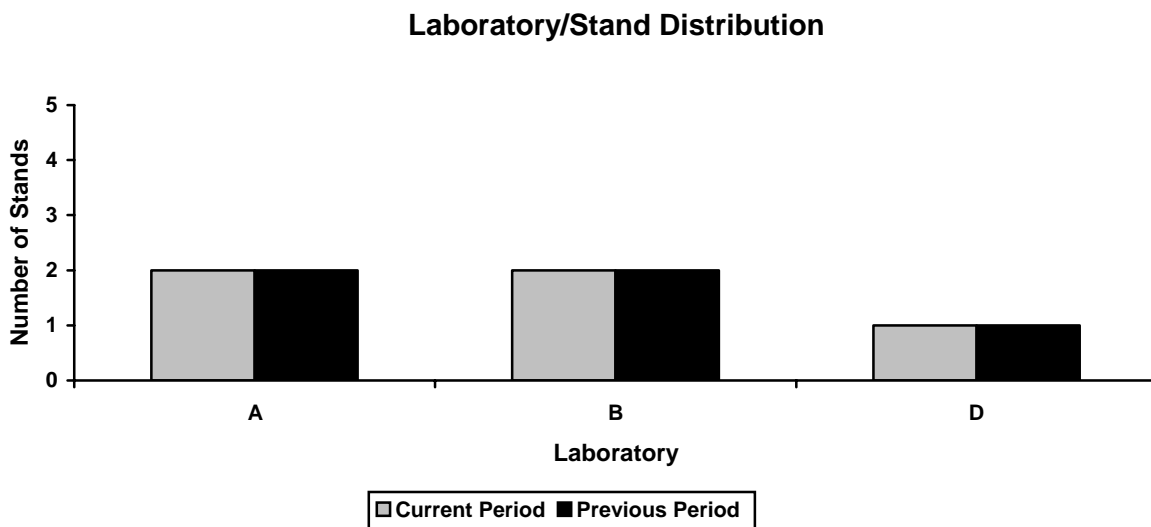
Memorandum: 06-080
Date: October 23, 2006
To: Fred Gerhart, Chairman, Sequence VIII Surveillance Panel
From: Richard E. Grundza 
Subject: Sequence VIII Semiannual Report: April 1, 2006 to September 30, 2006

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, 2006 to September 30, 2006.

Lab/Stand Distribution

	Reporting Data	Calibrated as of September 30, 2006
Number of Laboratories:	3	2
Number of Stand/Engine Combinations:	5	3

The following chart shows the laboratory/stand distribution:

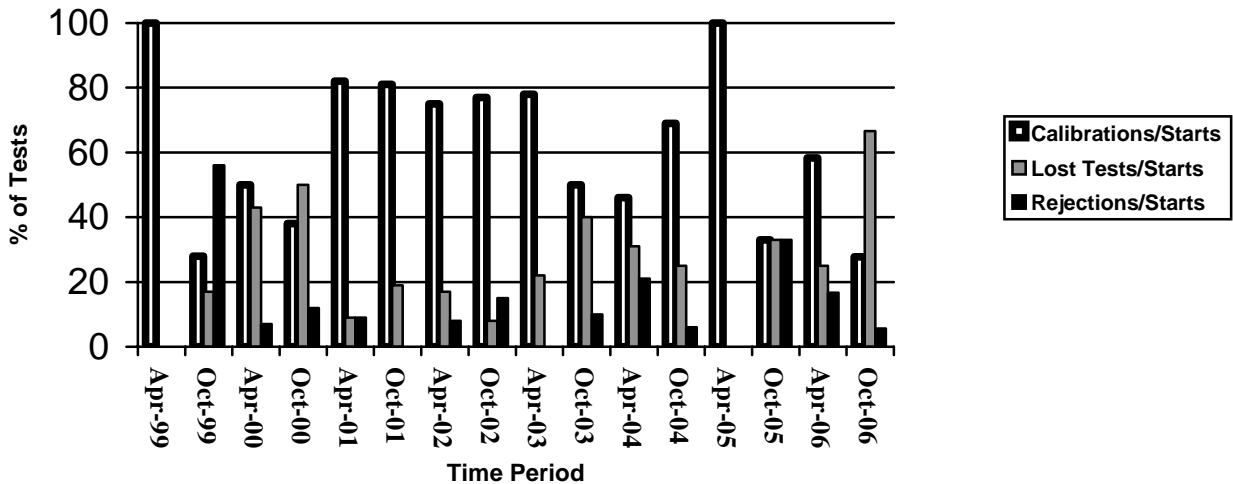


The following summarizes the status of the reference oil tests reported to the TMC:

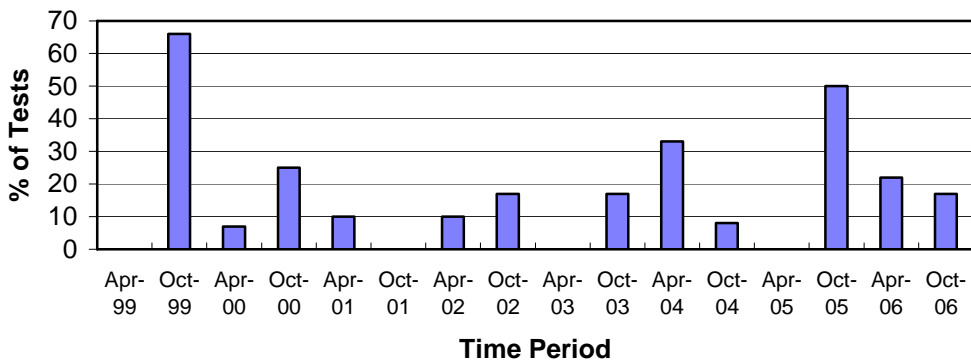
Calibration Start Outcomes	TMC Validity Code	No. of Tests
Operationally and Statistically Acceptable	AC	5
Abandoned Stand/Engine	MC	1
Operationally Invalid (laboratory judgment)	LC	8
Aborted	XC	3
Statistically unacceptable Calibration Test	OC	1
Not for Industry Statistics	NN	12
Total		30

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

Calibration Attempt Summary



Rejected Operationally Valid Tests



One test failed this period for mild SVIS Shewhart severity.

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

Three lab visits were conducted this period.

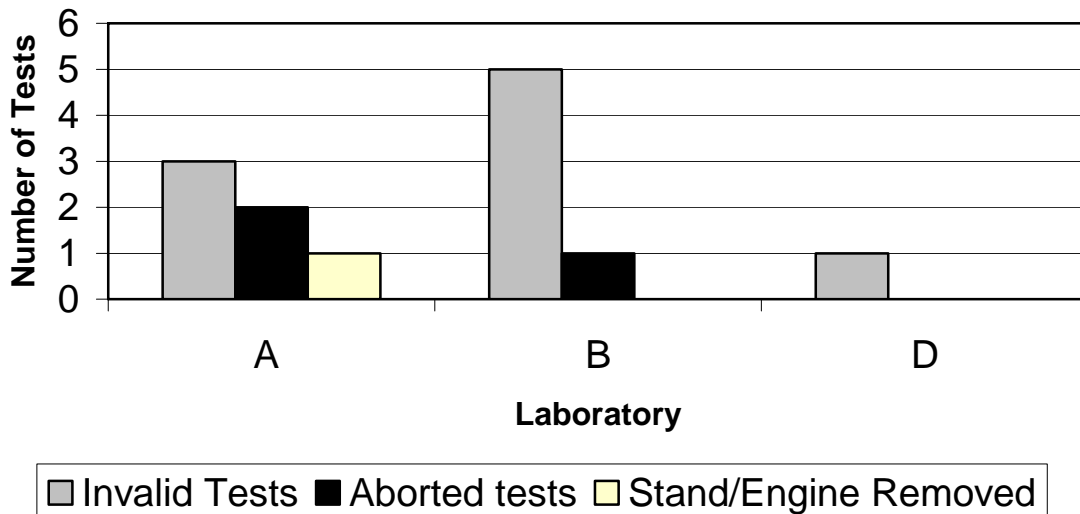
Lost Test Summary

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

Reasons for Lost Test(s)	Number
High mechanical wear	3
Broken transfer case bolt	2
Fuel flow deviation percentage	1
Wrong engine installed in stand	1
Bent connecting rod	1
Connecting rod cap damaged	1
Broken counterweight	1
Improper build	1
Test engine failure, overheated during test	1

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

Lost Test Distribution



There were twelve test run for hardware approval purposes, to introduce and evaluate the 03-06 bearing batch. These tests have validity code of NN. Of the twelve lost tests this period, three were attempted on the 03-06 bearing batch, while the remaining nine were all attempted on the 11-93 batch.

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	0.448	0.811 (df=5)	0.36 mg
SVIS	0.580	0.149 (df=5)	0.08 cSt

Average Δ/s by Laboratory		
Lab	BWL	SVIS
A	0.61	0.367
B	0.37	1.279
D	-	-

Bearing Weight Loss (BWL)

The industry control charts for severity and precision were in control for the period. (see Figure 1).

The Industry BWL mean Δ/s is 0.448 severe for this report period (see Figure 3). This equates to a shift of 0.36 mg in reported units. The pooled standard deviation for the period is 0.811 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 with the 11-93 batch was 84 ppm and 56 ppm with the 03-06 batch of bearings.

Stripped Viscosity (SVIS)

The industry control chart for severity was in control for the period. With the exception of two warning alarms, precision was in control for the period (see Figure 2).

The Industry SVIS mean Δ/s is 0.580 mild for this report period (see Figures 2 & 5), and equates to a shift of 0.08 cSt in reported units. The pooled standard deviation for the period is 0.149 cSt (see Figure 6), which is comparable to historical performance.

Tests were run to evaluate 03-06 batch bearings this period. The Surveillance Panel approved the bearings for use on October 19, 2006, via a teleconference. Three of the six charted tests this period were conducted on this bearing batch.

Reference Oils

Oil	TMC Inventory, In gallons	TMC Inventory, In tests	Laboratory Inventory, in tests	Estimated Life
704-1	353	176	3	5+ years
1006	43	21	1	3 months ¹
1006-2	4,610	2,305	3	3+ years ¹
1009	715	357	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-10-2006.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

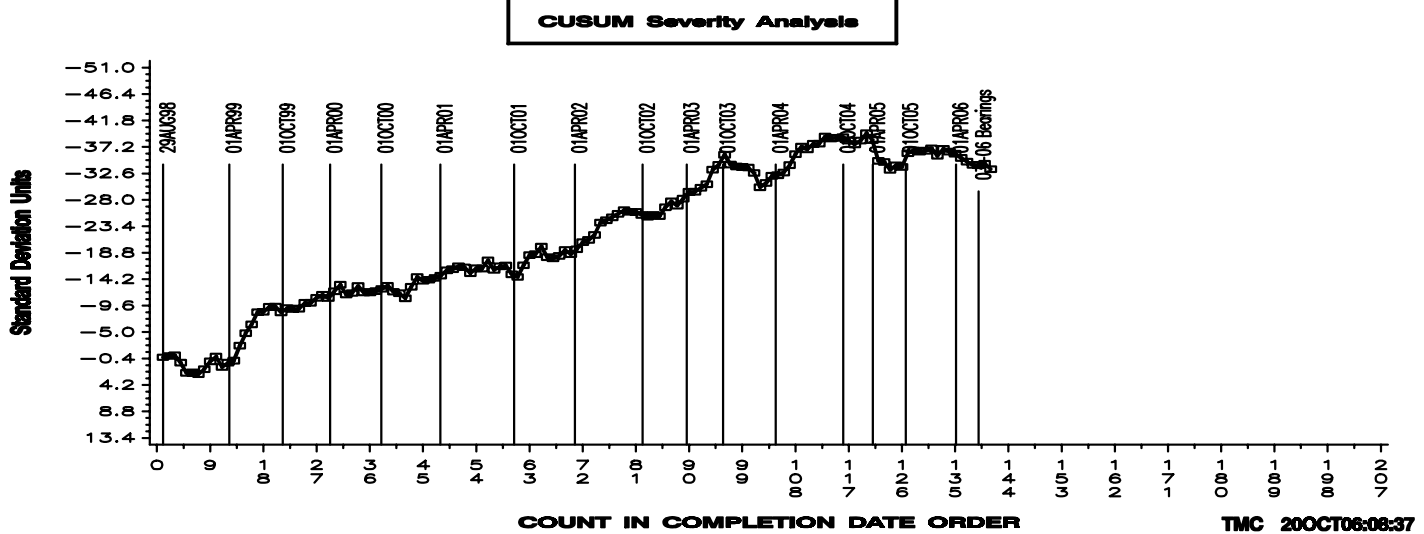
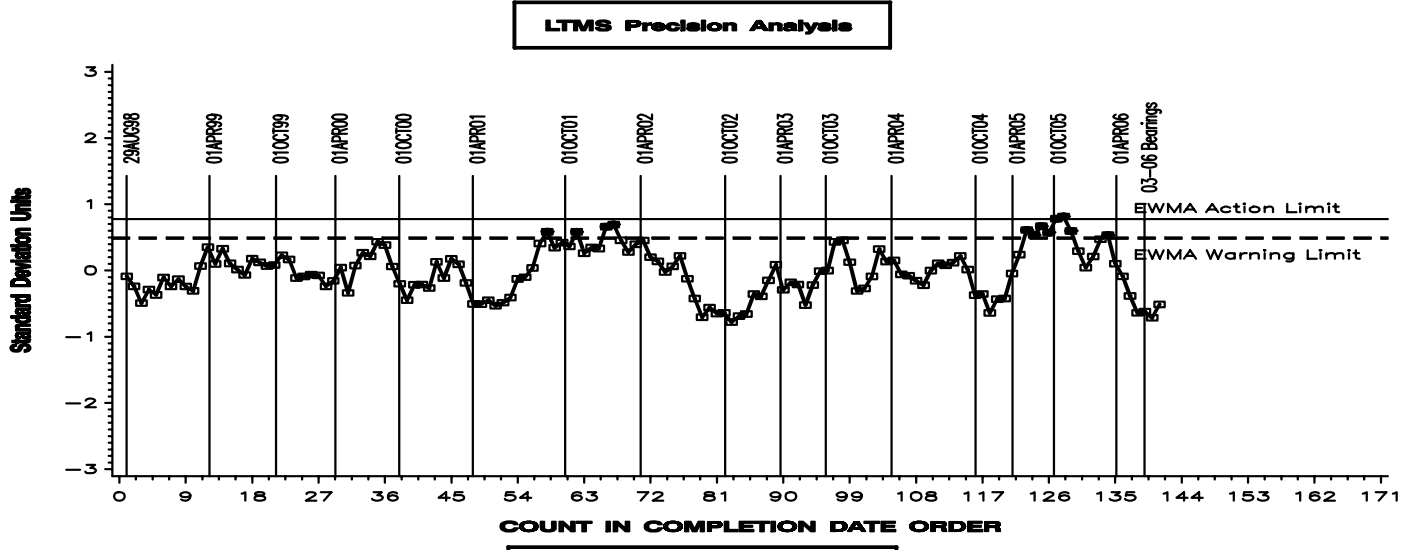
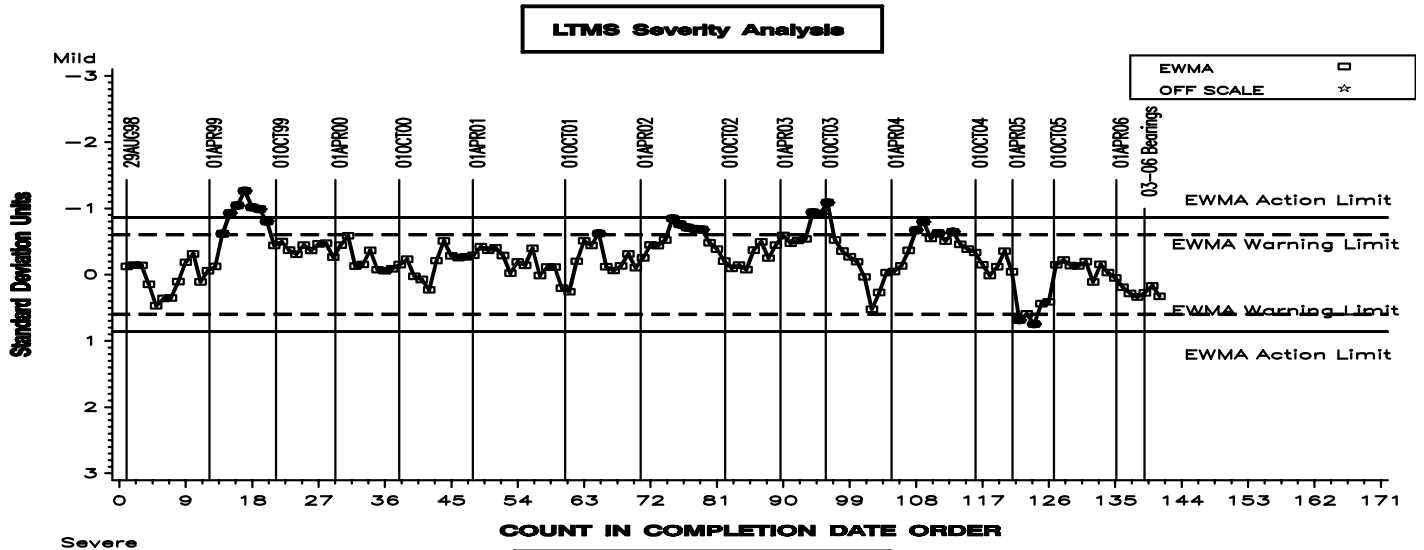
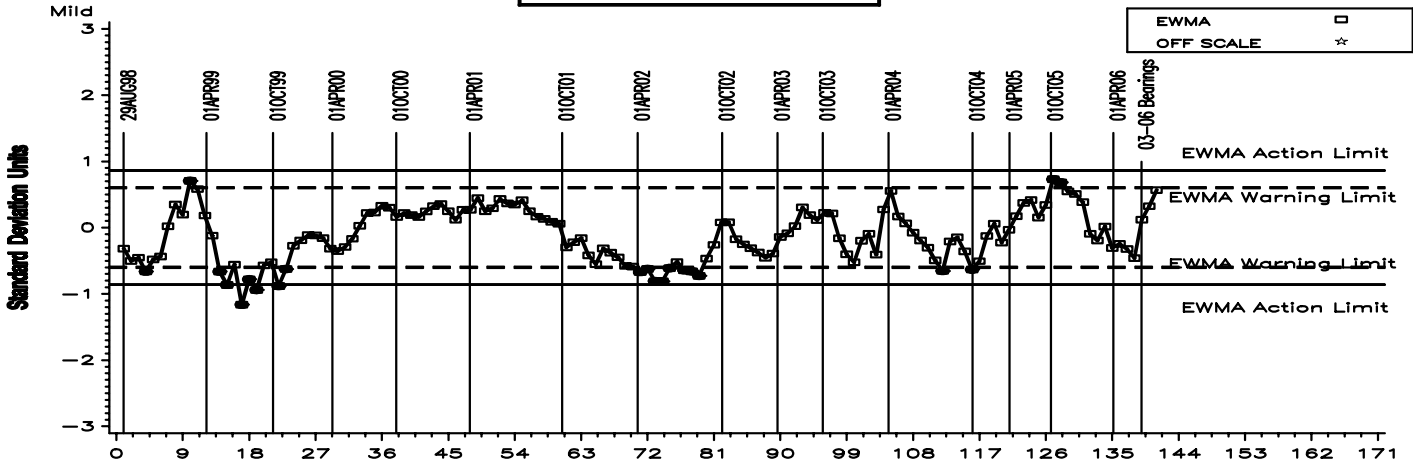


Figure 2

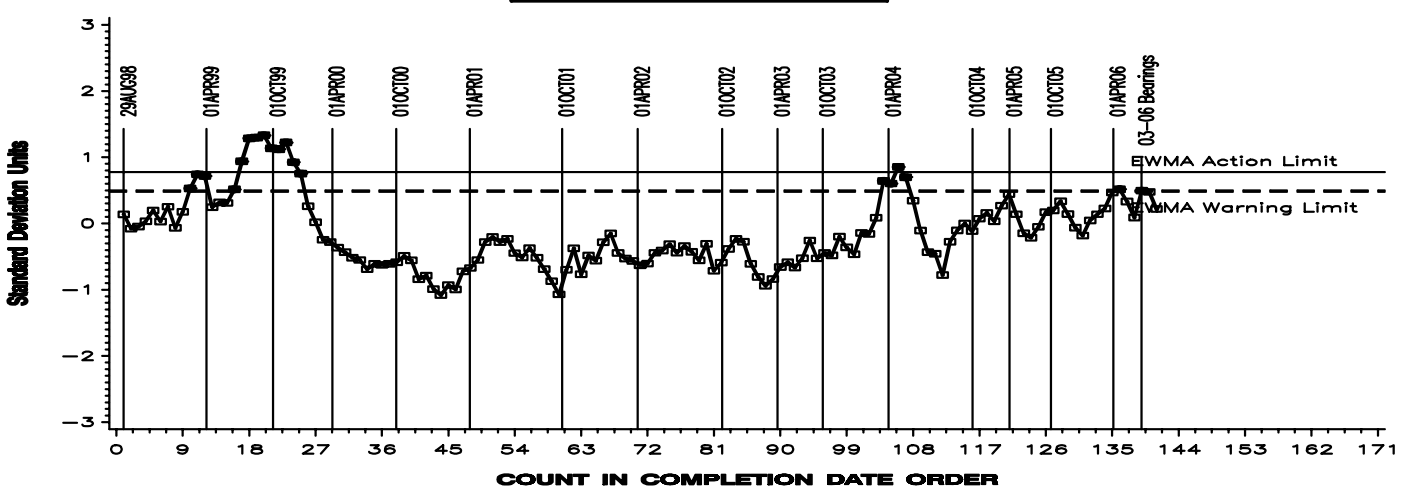
SEQUENCE VIII INDUSTRY OPERATIONALLY VALID DATA

STRIPPED VIS. @ 100 DEG C

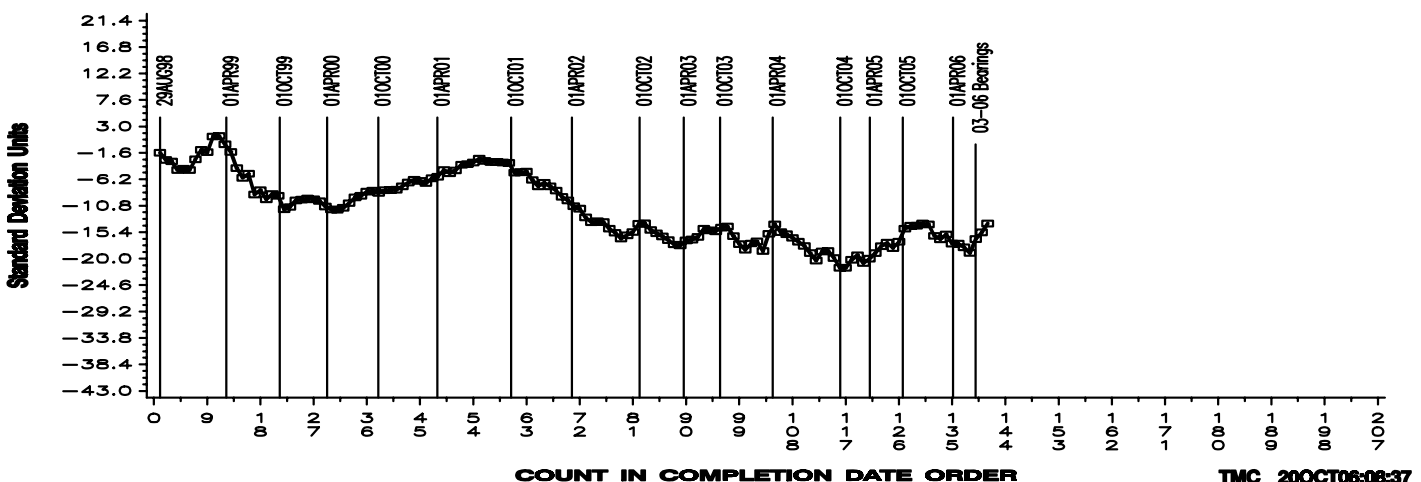
LTMS Severity Analysis



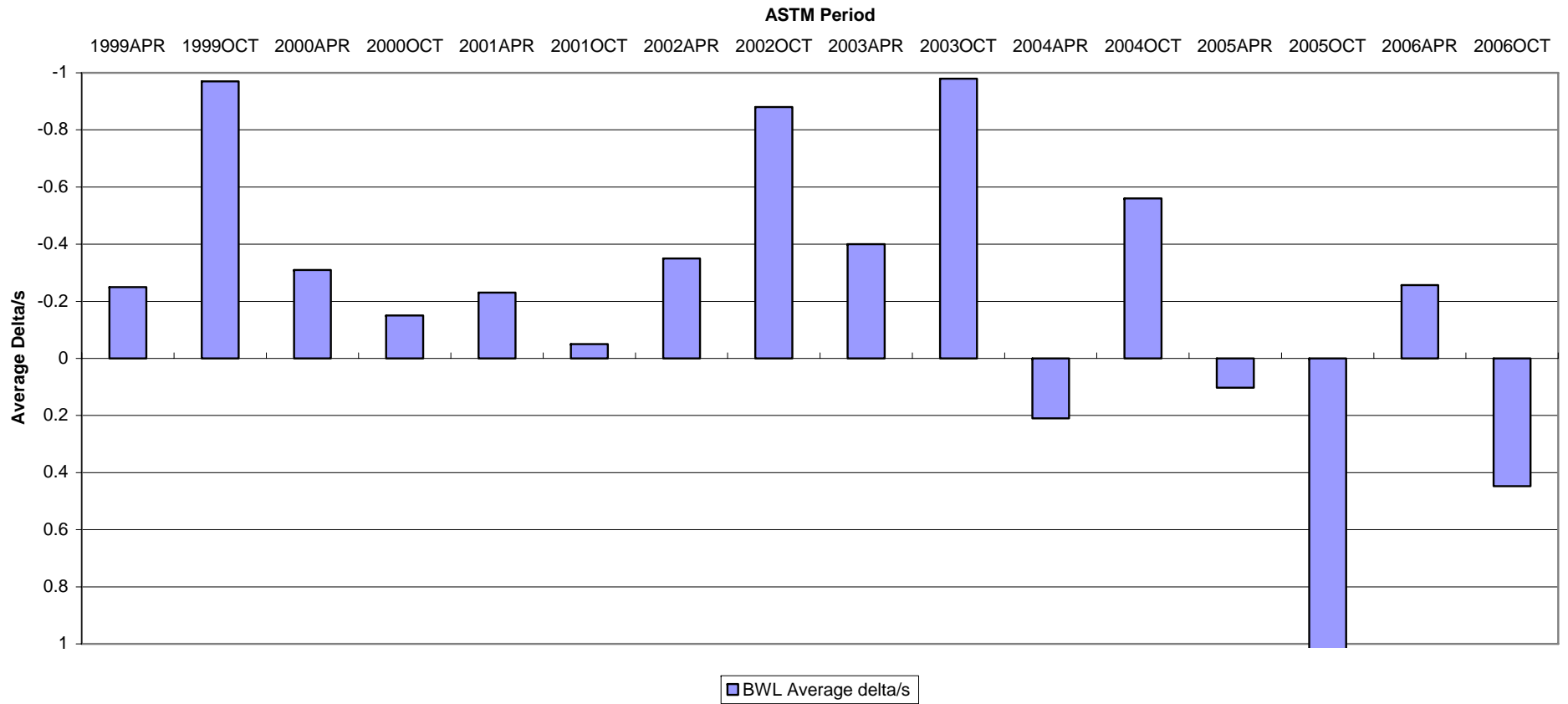
LTMS Precision Analysis



CUSUM Severity Analysis



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



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

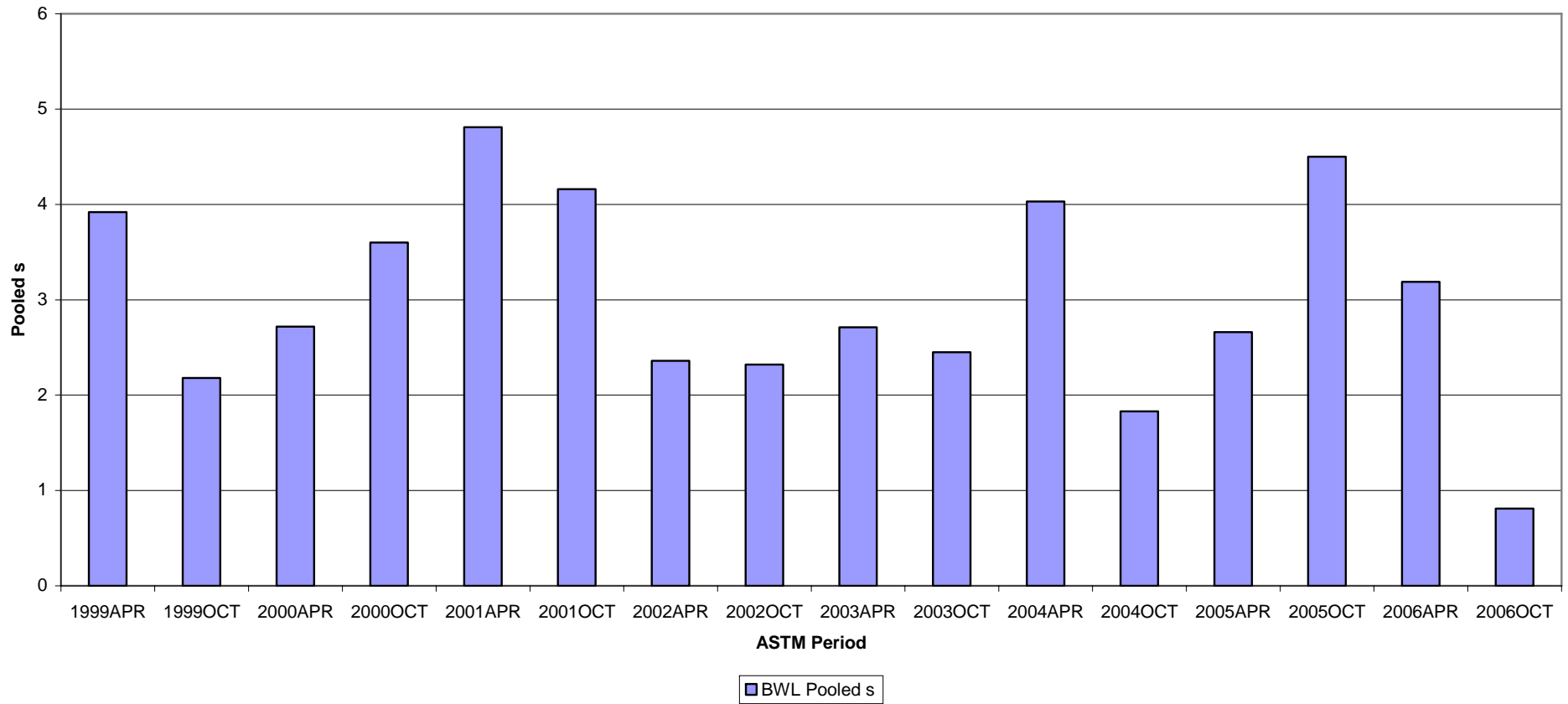
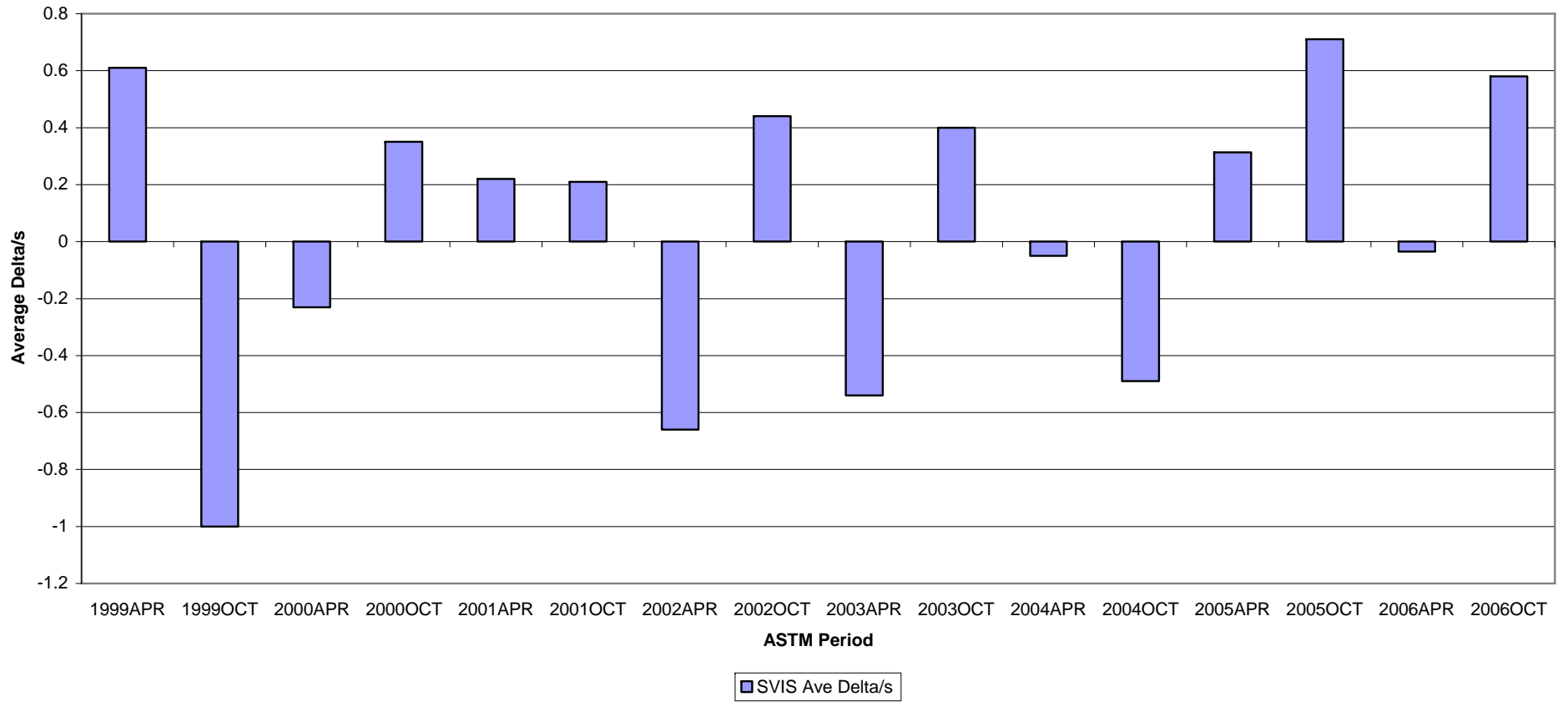


Figure 5 - Sequence VIII Reference Oil Data
Stripped Viscosity



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

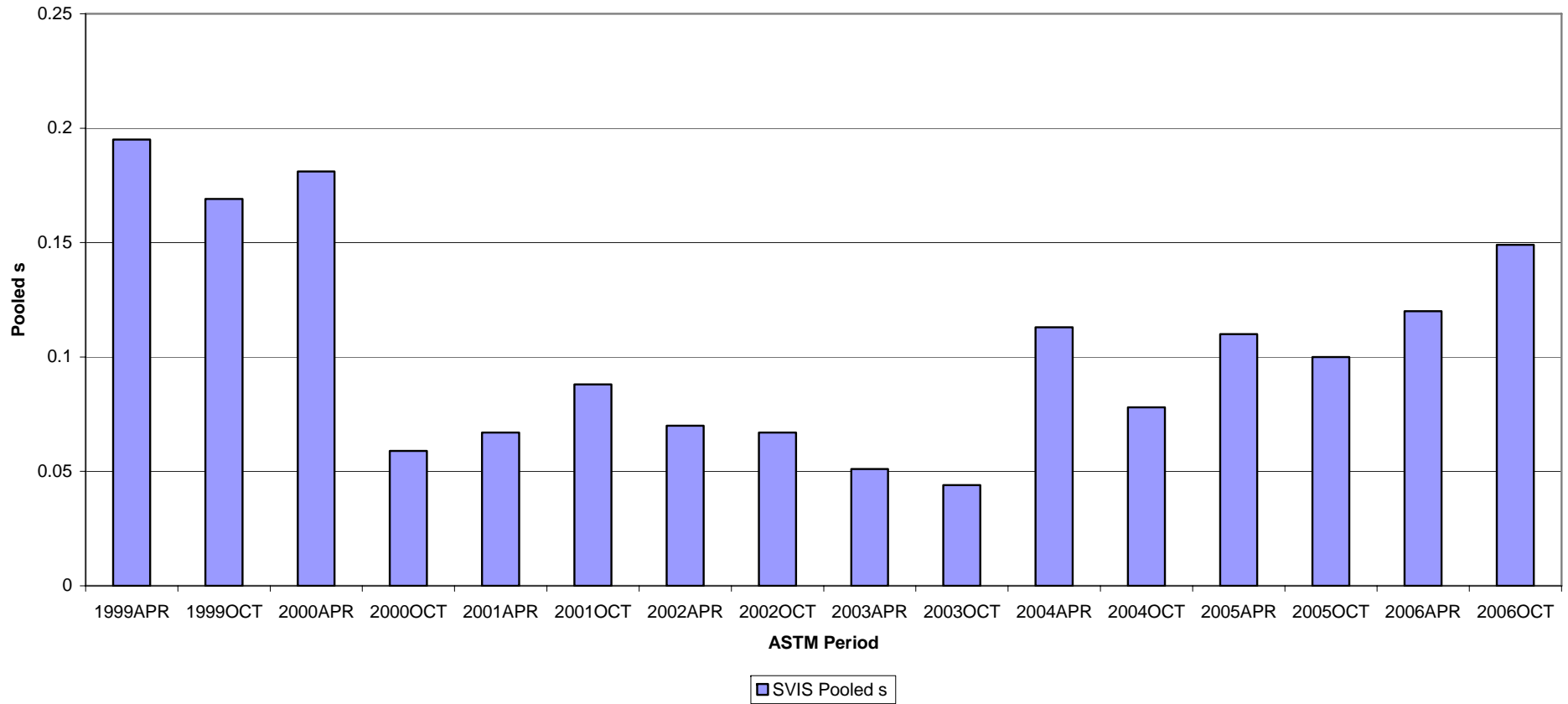
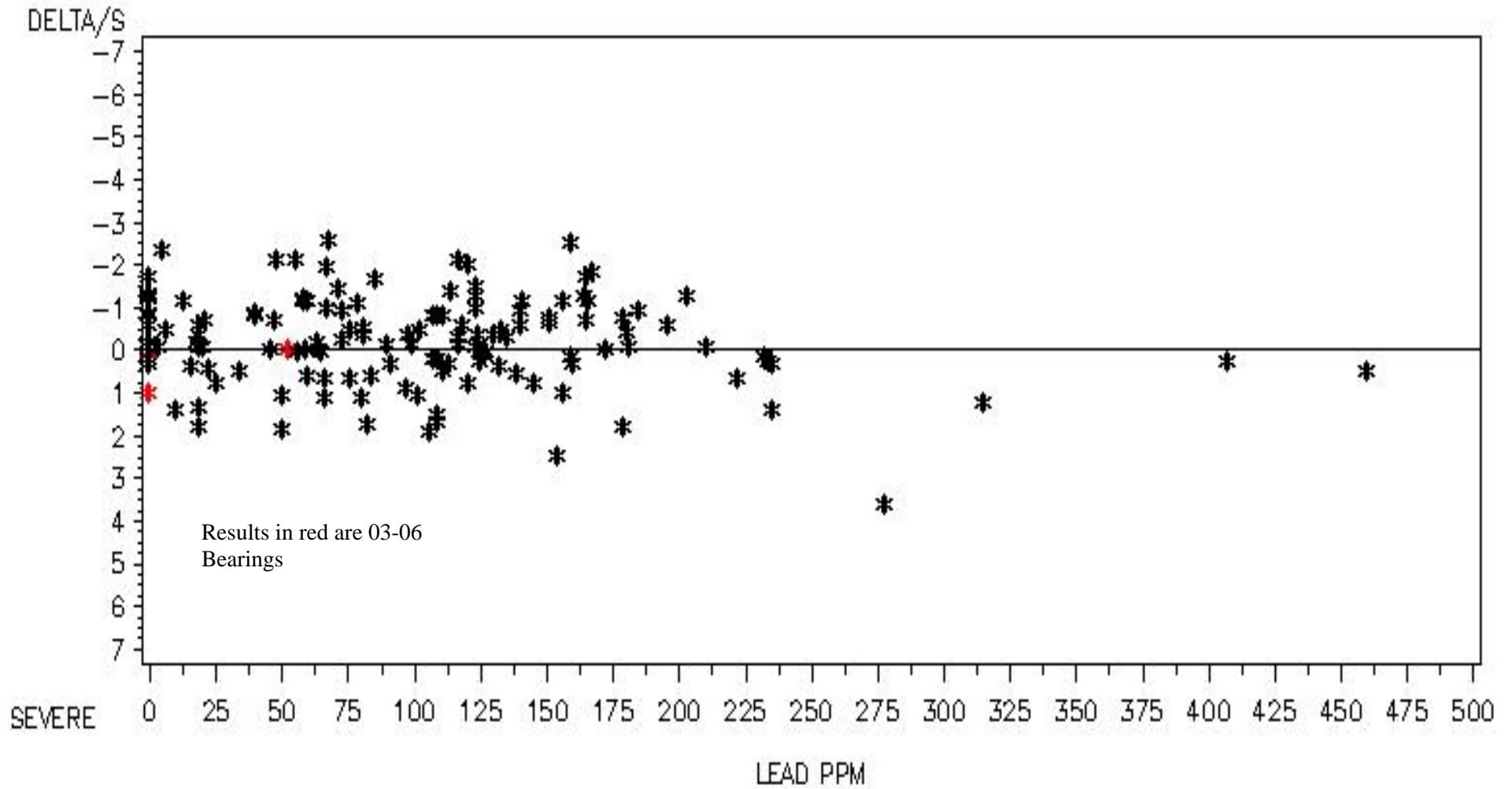


Figure 7

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

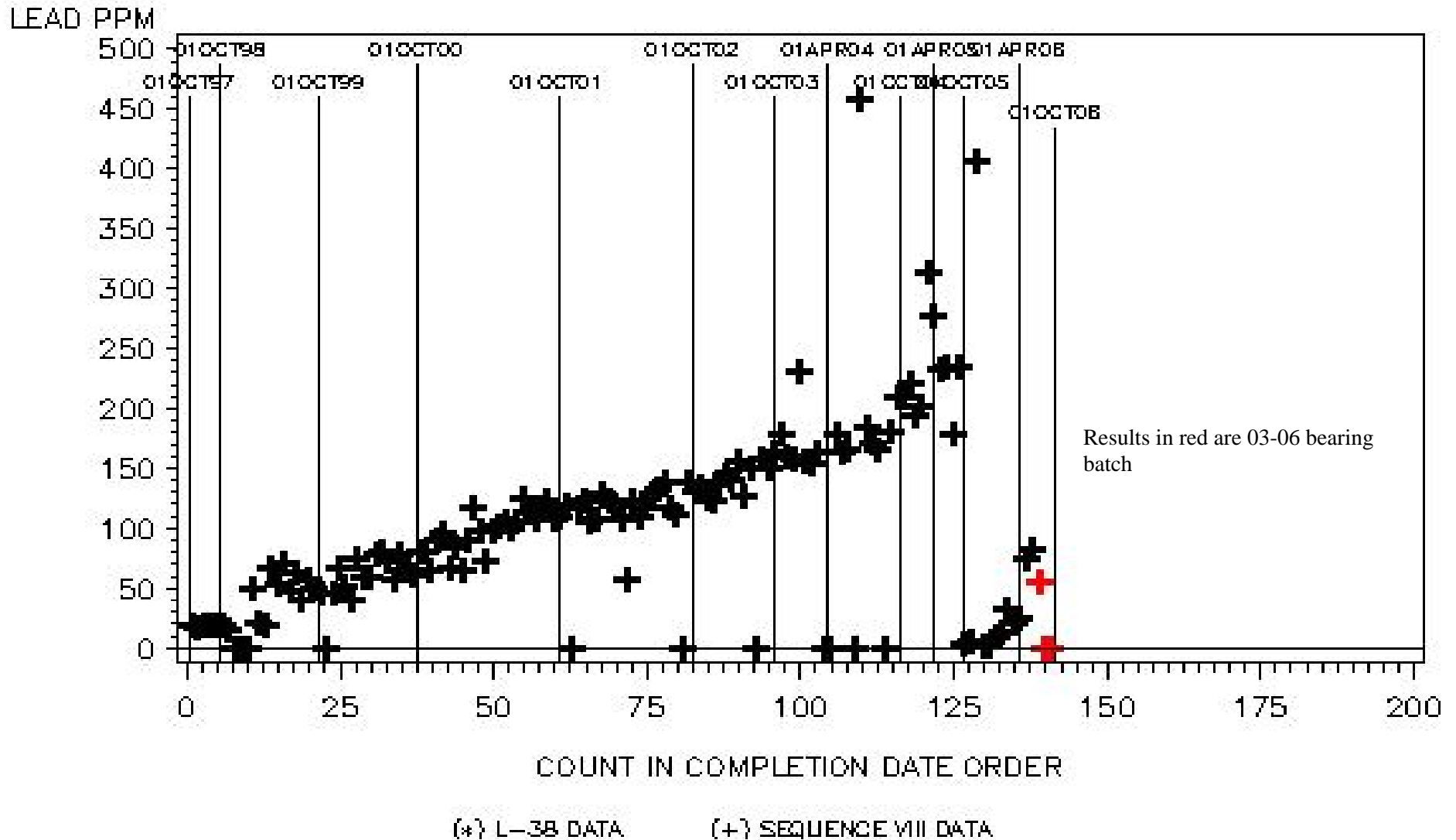


Figure 9 - Sequence VIII Timeline		
Date	Topic	Information Letter
2/10/1999	NEW PISTON RING BATCH APPROVED FOR USE IN SEQUENCE VIII TESTING	00-1
4/16/1999	DRAFT 3.1 OF THE SEQUENCE VIII TEST PROCEDURE ISSUED	99-1
5/19/1999	REMOVAL OF RING BATCH REPORTING REQUIREMENTS	00-1
5/19/1999	NEW OIL FILTER (RAYCOR 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
9/20/06	FIRST TEST ON 03-06 BEARINGS	