



Test Monitoring Center

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

Memorandum: 04-098
Date: November 5, 2004
To: William M. Nahumck, Chairman, Sequence IIIF Surveillance Panel
From: Michael T. Kasimirsky *Michael T. Kasimirsky*
Subject: Sequence IIIF Semiannual Report: April 1, 2004 through September 30, 2004

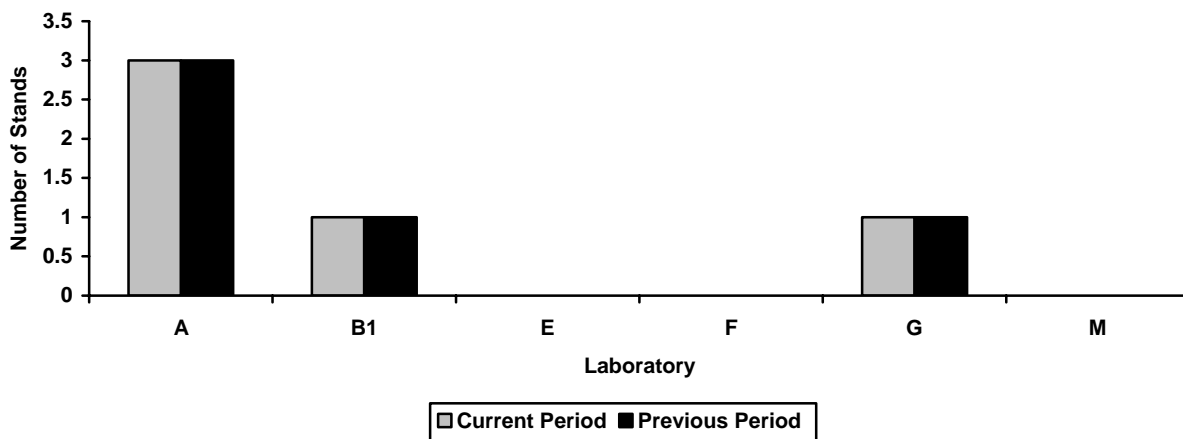
The following is a summary of Sequence IIIF reference tests that were reported to the Test Monitoring Center during the period April 1, 2004 through September 30, 2004.

Lab/Stand Distribution

	Reporting Data	Calibrated as of September 30, 2004
Number of Laboratories:	3	3
Number of Test Stands:	5	5

The following chart shows the laboratory/stand distribution:

Laboratory/Stand Distribution



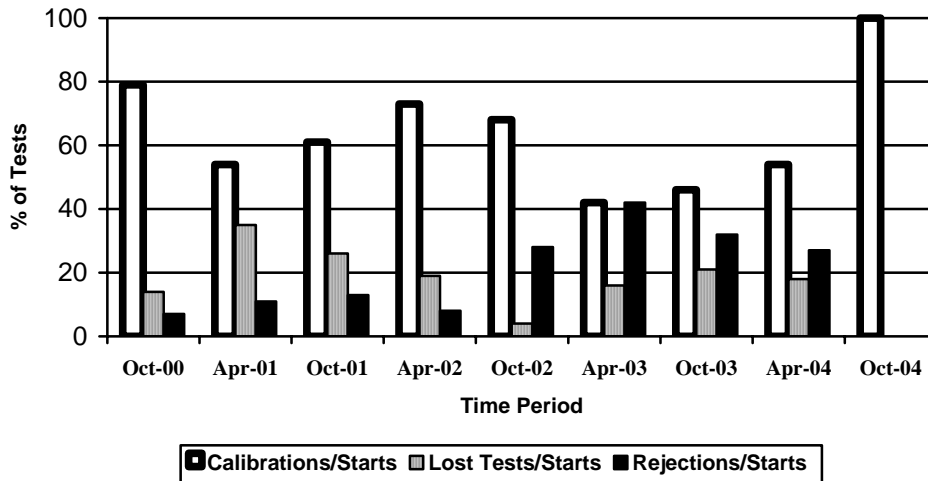
The following summarizes the status of the reference oil tests reported to the TMC:

Calibration Start Outcomes	TMC Validity Codes	No. of Tests
Operationally and Statistically Acceptable	AC	9
Failed Acceptance Criteria	OC	0
Operationally Invalid (Laboratory Judgment)	LC	0
Operationally Invalid (Lab & TMC Judgment)	RC	0
Stand Failed Reference Sequence – data pulled	MC	0
Aborted	XC	0
Total		9

Donated & Industry Support Outcomes	TMC Validity Codes	No. of Tests
Decoded Oil	OG	1
Total		1

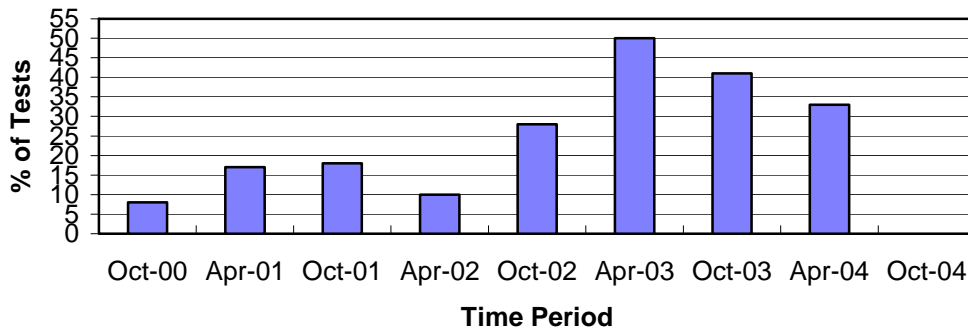
Calibrations per start, lost tests per start and rejection rates are summarized below:

Calibration Attempt Summary



The calibration per start rate is the highest on record. The lost test rate and the rejected test rate are the lowest on record. Overall testing activity has dropped significantly so these changes should be viewed with that information in mind.

Rejected Test Rate for Operationally Valid Tests



The rate of rejection of operationally valid tests has decreased significantly from last period.

There were no failing tests for the period.

There were no LTMS Deviations written this period. There have been four deviations from the LTMS since its introduction in June of 2000.

Two Sequence IIIF lab visits were performed this period. No significant problems were found.

Lost Test Summary

No tests were lost this period.

Information Letters

Sequence IIIF Information Letter No. 04-1, Sequence No. 14, was issued during the period on April 13, 2004, and contained the following topics: Incorporation of Past Information Letters into the Test Method, Revised Intake Manifold Gasket, and Additional Allowable Sealing Materials.

Sequence IIIF Information Letter No. 04-2, Sequence No. 15, was issued during the period on June 15, 2004, and contained the following topics: Undercrown Rating Area Definition Clarification, Flow Meter Specifications, MRV Reporting, and Amount of Test Oil Used for Camshaft & Lifter Lubrication.

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, by parameter, 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
PVIS	0.163	0.008 (df=6)	11.5% Viscosity Increase ¹
APV	0.266	0.153 (df=6)	0.04 Merits
WPD	-0.008	0.405 (df=6)	-0.003 Merits
PV60 ²	-0.170	0.136 (df=6)	-6.7% Viscosity Increase ³

¹ At the GF-3 Pass Limit of 275% Viscosity Increase

² Not a pass/fail parameter in the Sequence IIIF test; Sequence IIIFHD use only

³ At the CH-4 Pass Limit of 295% Viscosity Increase @ 60 Hours; Sequence IIIFHD use only.

Average Δ/s Results, by Laboratory				
Laboratory	PVIS	APV	WPD	PV60
A	-0.03	-0.06	-0.30	-0.11
B1	0.58	0.82	0.75	-0.89
E	-	-	-	-
F	-	-	-	-
G	0.23	0.52	-0.05	0.40
M	-	-	-	-

Percent Viscosity Increase (PVIS)

The industry was within limits for both severity and precision for the period (see Figure 1). Industry performance was slightly mild for the period, with an average Δ/s value of 0.163 for the period (see Figures 1 & 5), which equates to a shift of 11.5% in reported units. Precision for the period has improved significantly, making this the best period on record when compared to historical performance (see Figure 9).

Weighted Piston Deposits (WPD)

The industry was within limits on both severity and precision for the period (see Figure 2). The industry was essentially on-target for the period, with an average Δ/s value of -0.008 , or -0.003 merits (see Figure 6). Precision for the period improved significantly with a pooled standard deviation of 0.405 (see Figure 10) making it one of the most precise periods in history.

Average Piston Skirt Varnish (APV)

The industry was within limits on both severity and precision for the period (see Figure 3). The industry was 0.04 Merits mild for the period with an average Δ/s value of 0.266 (see Figure 7). Precision has improved over last period, with a pooled standard deviation of 0.153, which is comparable to the best performance on record for this parameter (see Figure 11).

Average Camshaft-plus-Lifter Wear (ACLW)/Screened Average Camshaft-plus-Lifter Wear (SACLW)

No tests failed during the period on SACLW.

Percent Viscosity Increase at 60 Hours

The industry control chart for PV60 is shown in Figure 4. The average Δ/s and pooled standard deviation for this period, and previous report periods, are shown in Figures 8 and 12 respectively. This parameter is not a pass-fail parameter in the Sequence III F test and is used only in Sequence III FHD testing. Therefore, the industry control charts are presented for information purposes only and any alarms shown on those charts do not require action by the Sequence III F Surveillance Panel. A review of Figure 4 shows that the industry continues to run within limits, after being consistently severe of target on this parameter.

QI Deviations

There were no QI Deviations written this period. There have been a total of 25 QI Deviations written since the test was introduced in June of 2000.

Hardware

Powdered metal connecting rods came into widespread use during the period. These connecting rods use a different fastener than the previous cast connecting rods and require the use of different fastener torque specifications as a result. The connecting rods do not appear to have had any effect on test severity with their introduction.

Reference Oils

Oil	TMC Inventory, in gallons	TMC Inventory, in tests (4 gal/test)	Laboratory Inventory, in tests	Estimated life
1006	43	10	8	Not currently used in IIIF ¹
1006-2	4,774	1,193	10	~3+ years ¹
1007	474	118	11	Not currently used in IIIF ²
1008	29	7	8	No longer shipped ¹
1008-1	1,646	411	7	~3+ years ¹
1009	834	208	12	Not currently used in IIIF ¹
432	118	29	12	Not currently used in IIIF
433	10	2	2	No longer shipped
433-1	592	148	11	~3+ years

¹ Multiple test area reference oil; total TMC inventory shown

² Not reblendable

Introduction of the GF-3 Category Oil, Reference Oil 1009, has been tabled indefinitely.

During the period the TMC received sufficient data to generate updated test targets on Reference Oil 1008-1. The updated targets for reference oil 1008-1, based on these 20 data points, are shown in the following table:

Updated Reference Oil 1008-1 Test Targets		
Parameter	Mean	Standard Deviation
PVIS	0.0930792	0.0059248
APV	9.77	0.103
WPD	4.57	0.699
PV60	4.33528	0.118673

These new targets are effective for all tests completed on or after June 21, 2004.

MTK/mtk

Attachments

c: F. M. Farber, TMC

Sequence IIIF Surveillance Panel

<ftp://ftp.astmtmc.cmu.edu/docs/gas/sequenceiii/semiannualreports/IIIF-10-2004.pdf>

Distribution: Electronic Mail

List of Figures

- Figures 1, 2, 3, and 4 are EWMA severity and precision control charts and also the CUSUM Δ/s plots of PVIS, WPD, APV, and PV60, annotated with date lines, using the same data set as the EWMA severity and precision control charts. Transformed units are used, when appropriate.
- Figures 5, 6, 7, and 8 are bar charts of average Δ/s , by report period, for PVIS, WPD, APV, and PV60.
- Figures 9, 10, 11, and 12 are bar charts of pooled standard deviation, by report period, for PVIS, WPD, APV, and PV60.
- Figure 13 is the Sequence IIIIF Timeline.

Figure 1

SEQUENCE IIIF INDUSTRY OPERATIONALLY VALID DATA

VISCOSITY INCREASE FINAL ORIG UNIT RES

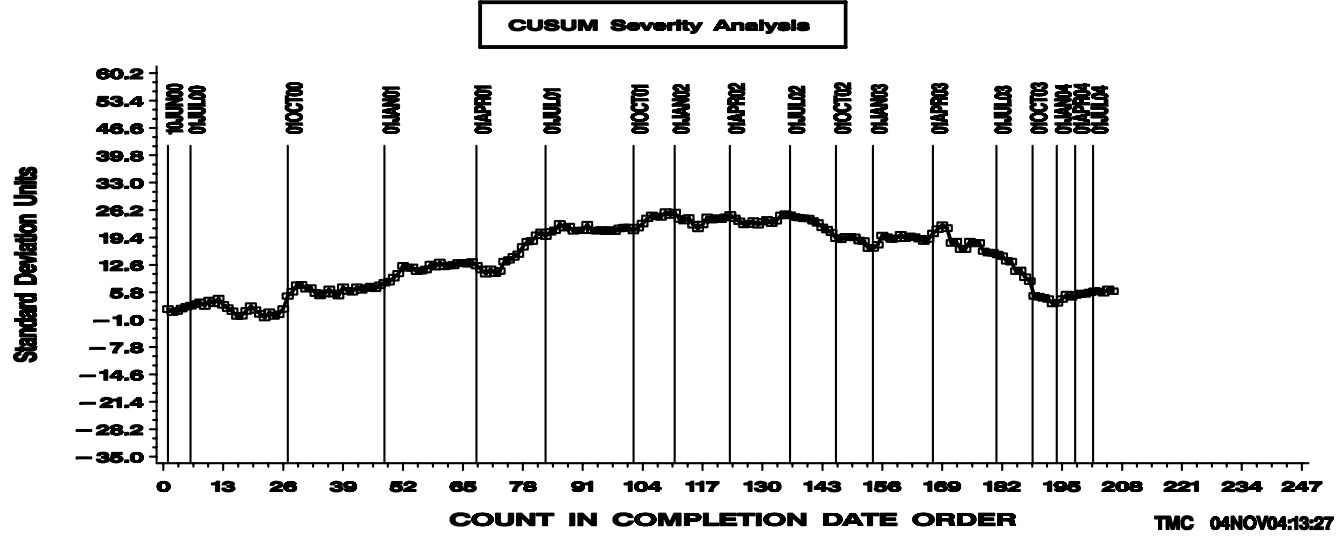
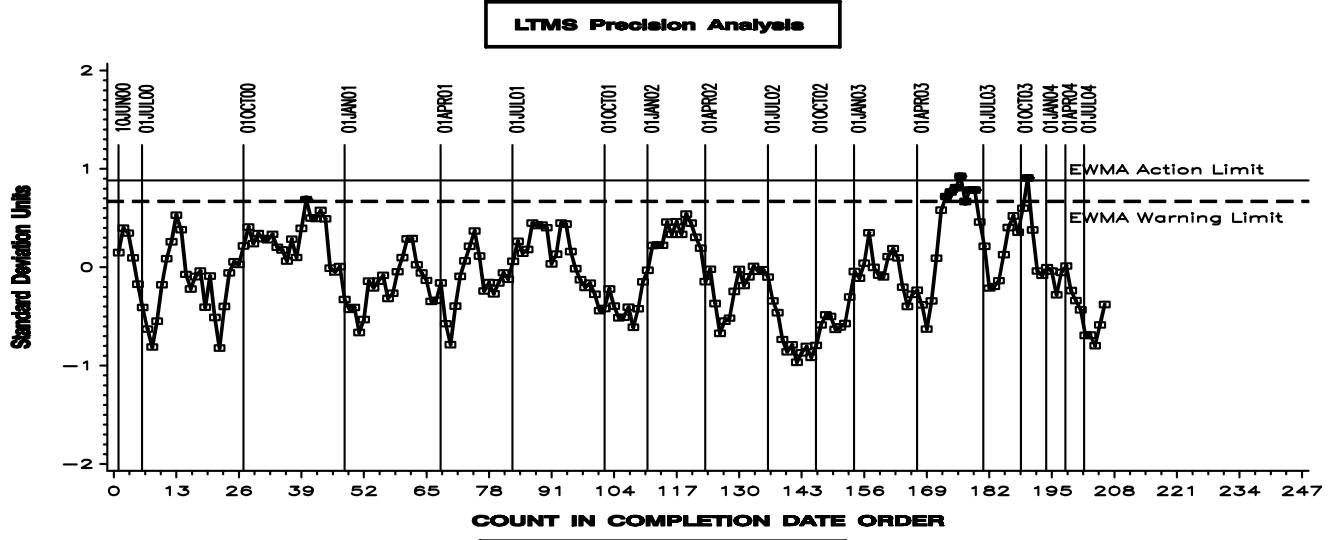
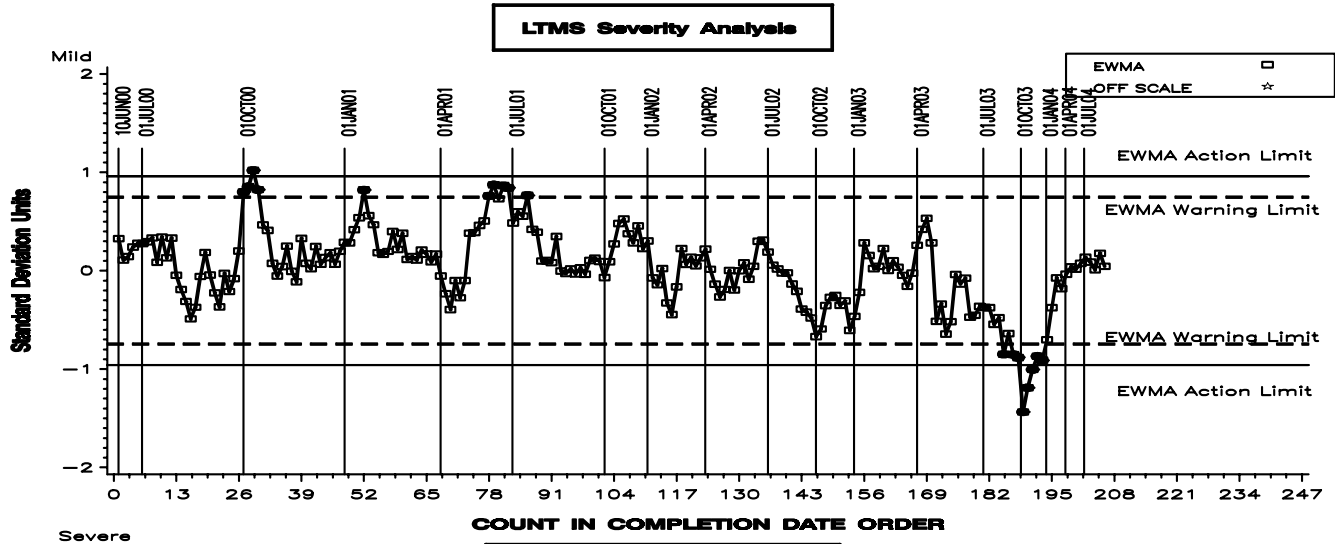


Figure 2

SEQUENCE IIIF INDUSTRY OPERATIONALLY VALID DATA

AVERAGE WEIGHTED PISTON DEPOSITS FNL ORIG UNIT RES

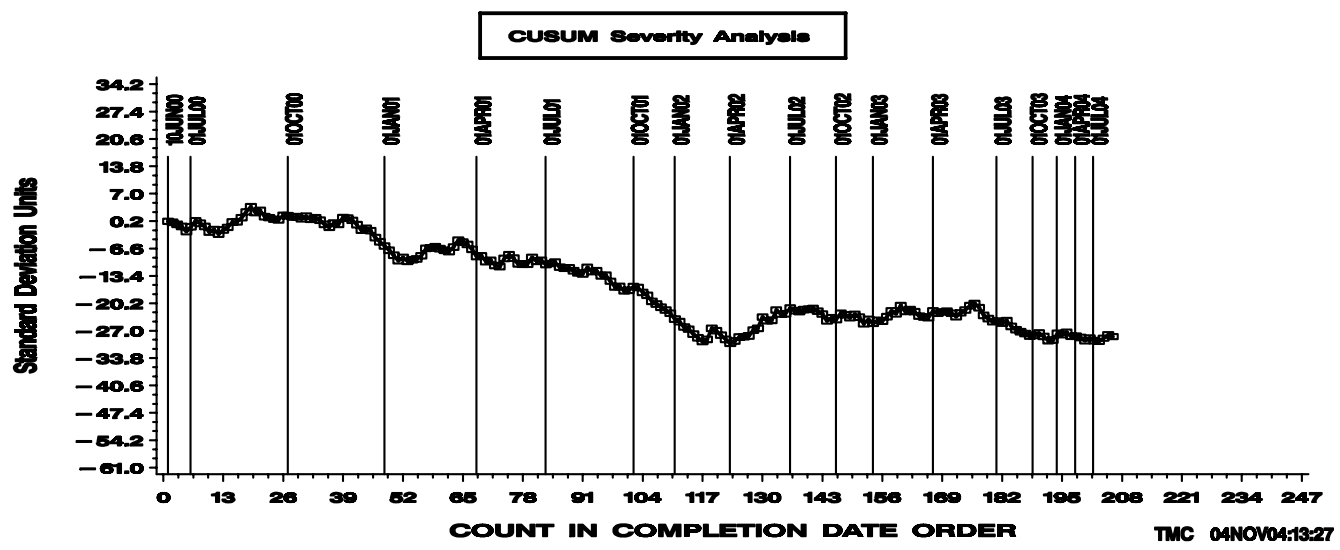
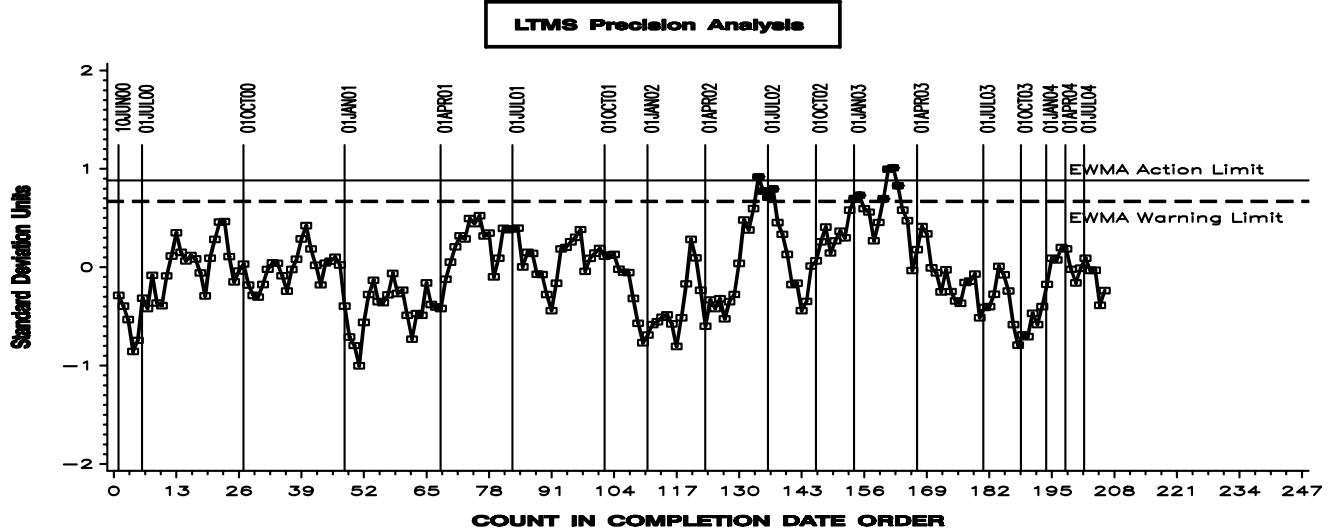
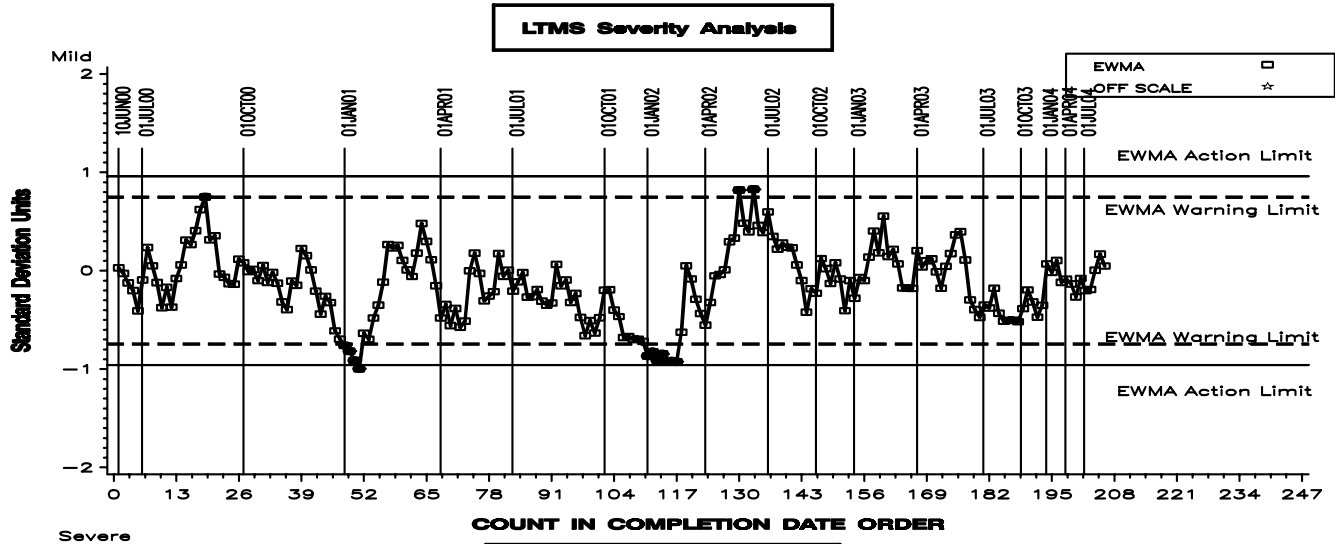


Figure 3

SEQUENCE IIIF INDUSTRY OPERATIONALLY VALID DATA

AVERAGE PISTON SKIRT VARNISH FINAL ORIG UNIT RES

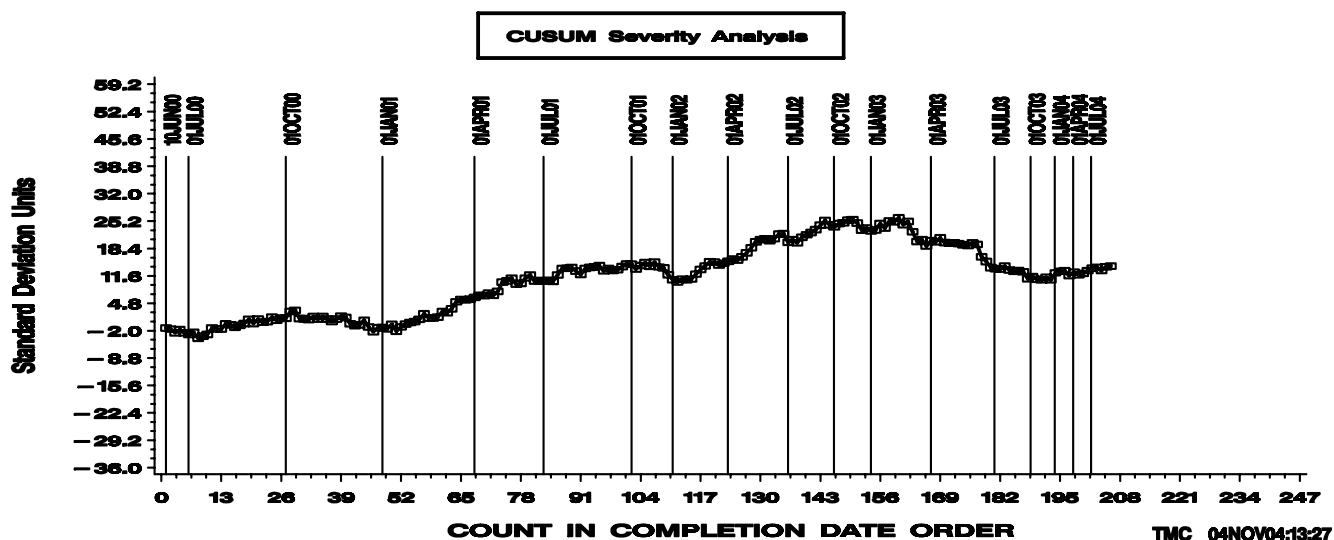
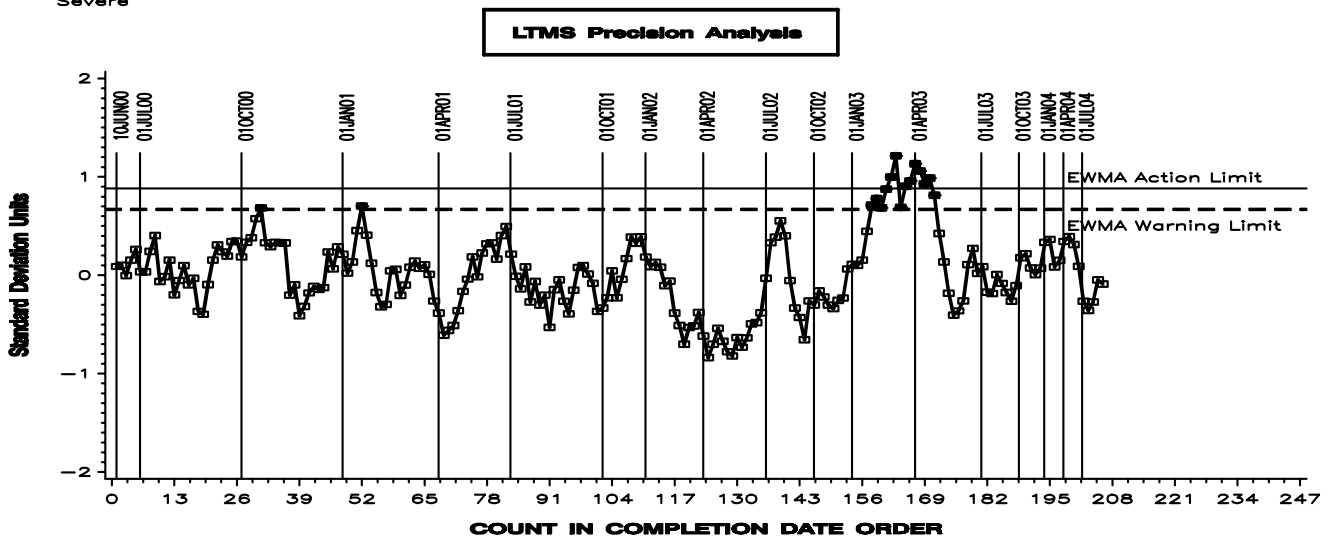
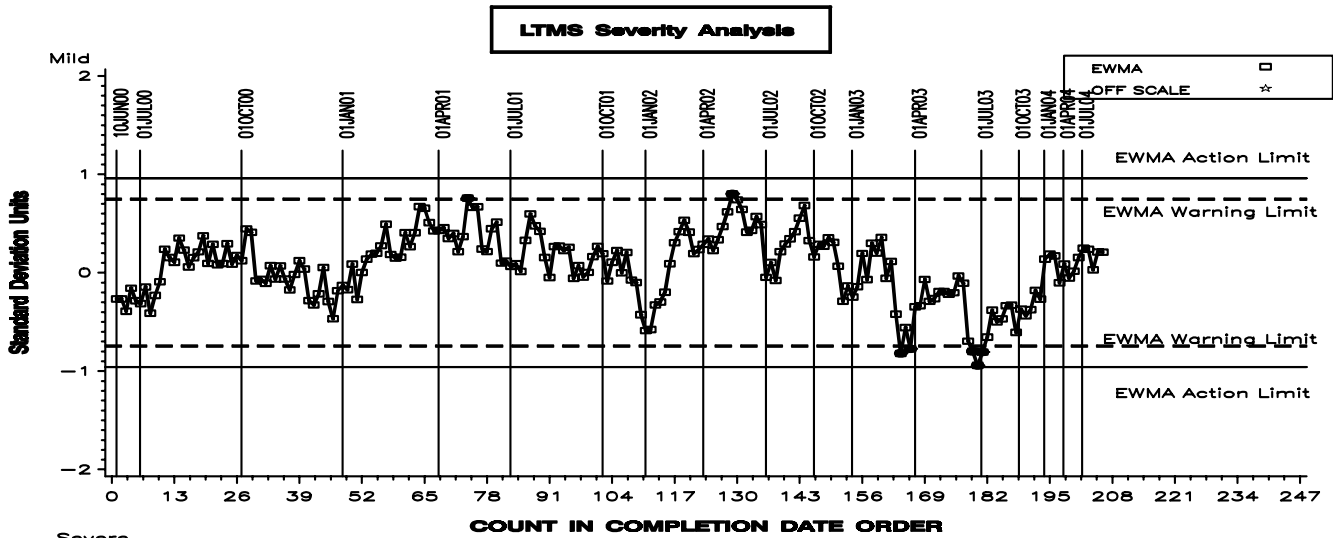


Figure 4

SEQUENCE IIIF INDUSTRY OPERATIONALLY VALID DATA

% VISCOSITY INCREASE @ 060 HOURS

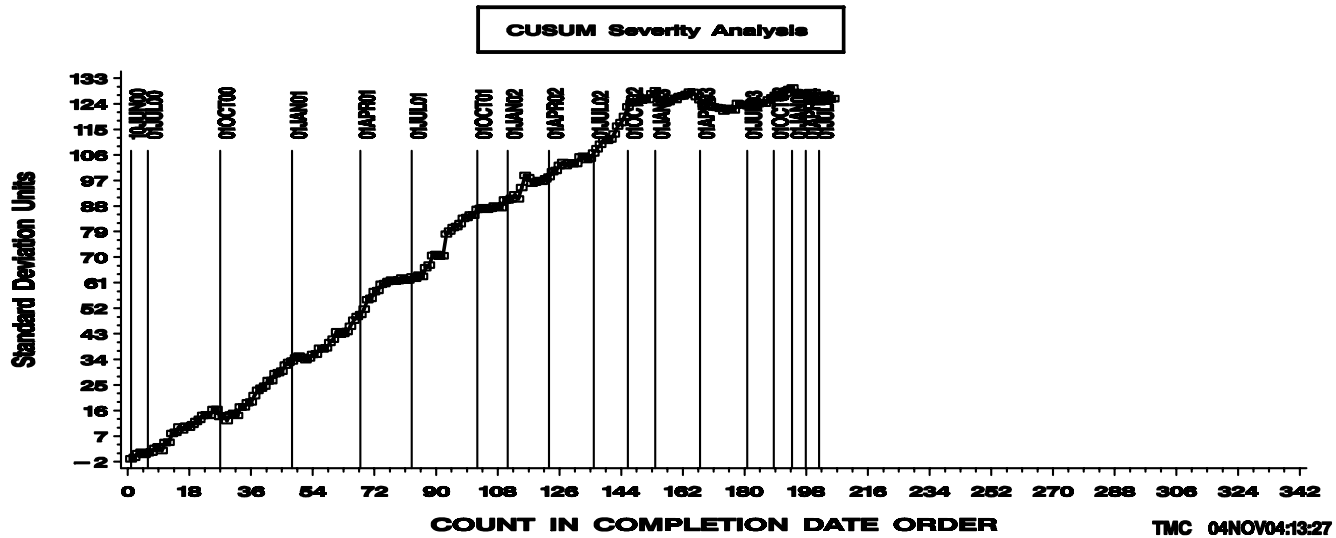
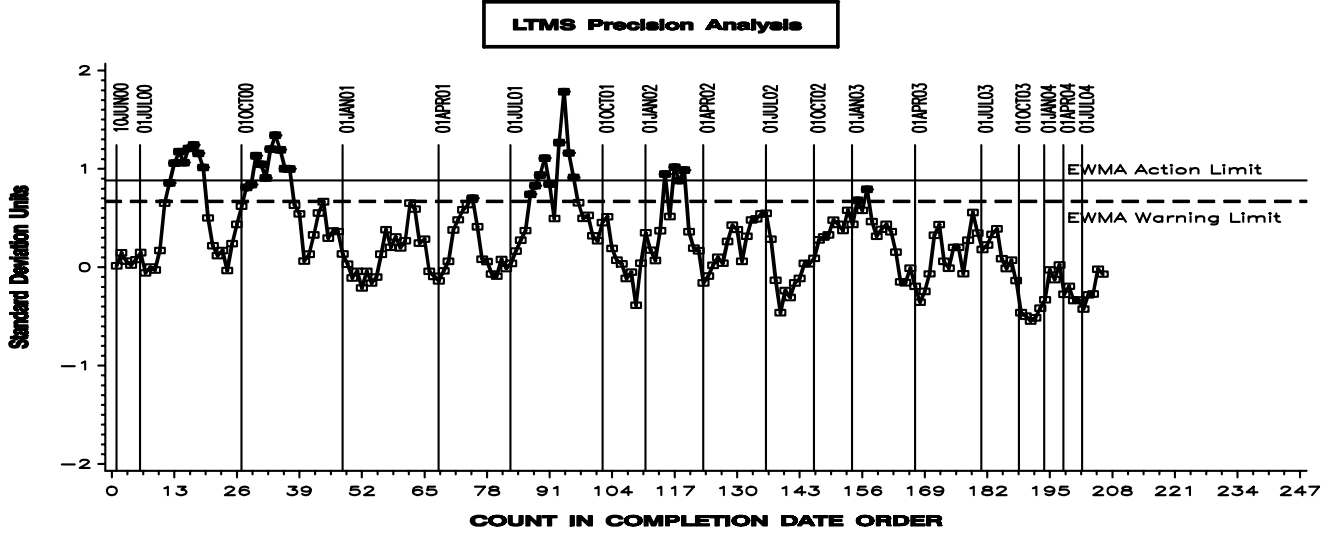
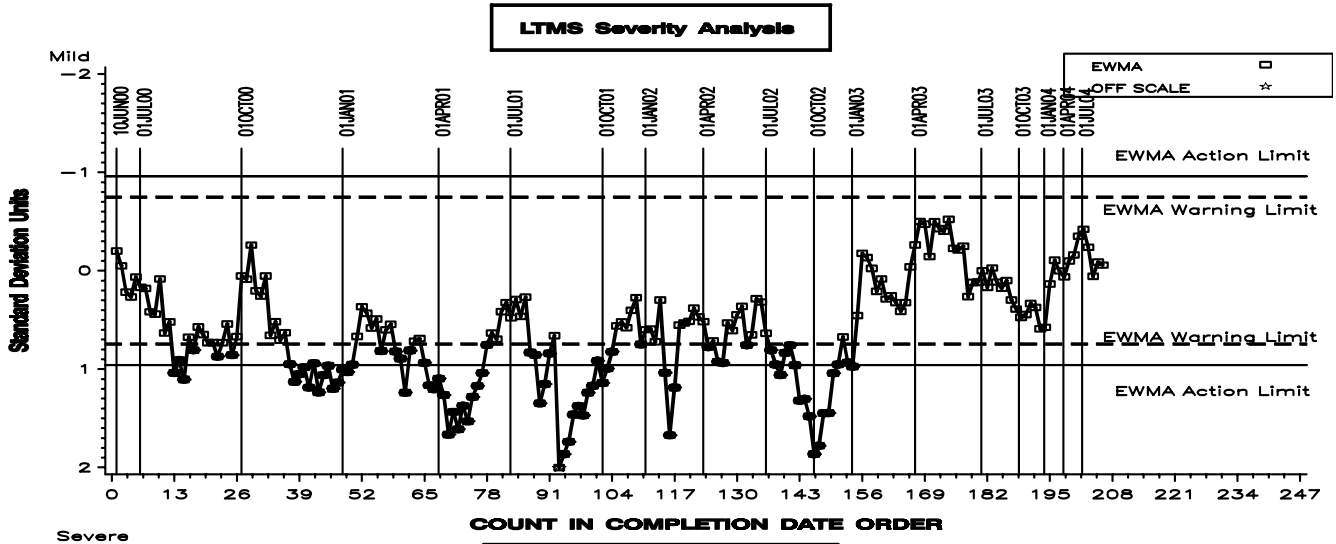


Figure 5 - Percent Viscosity Increase, Average Delta/s

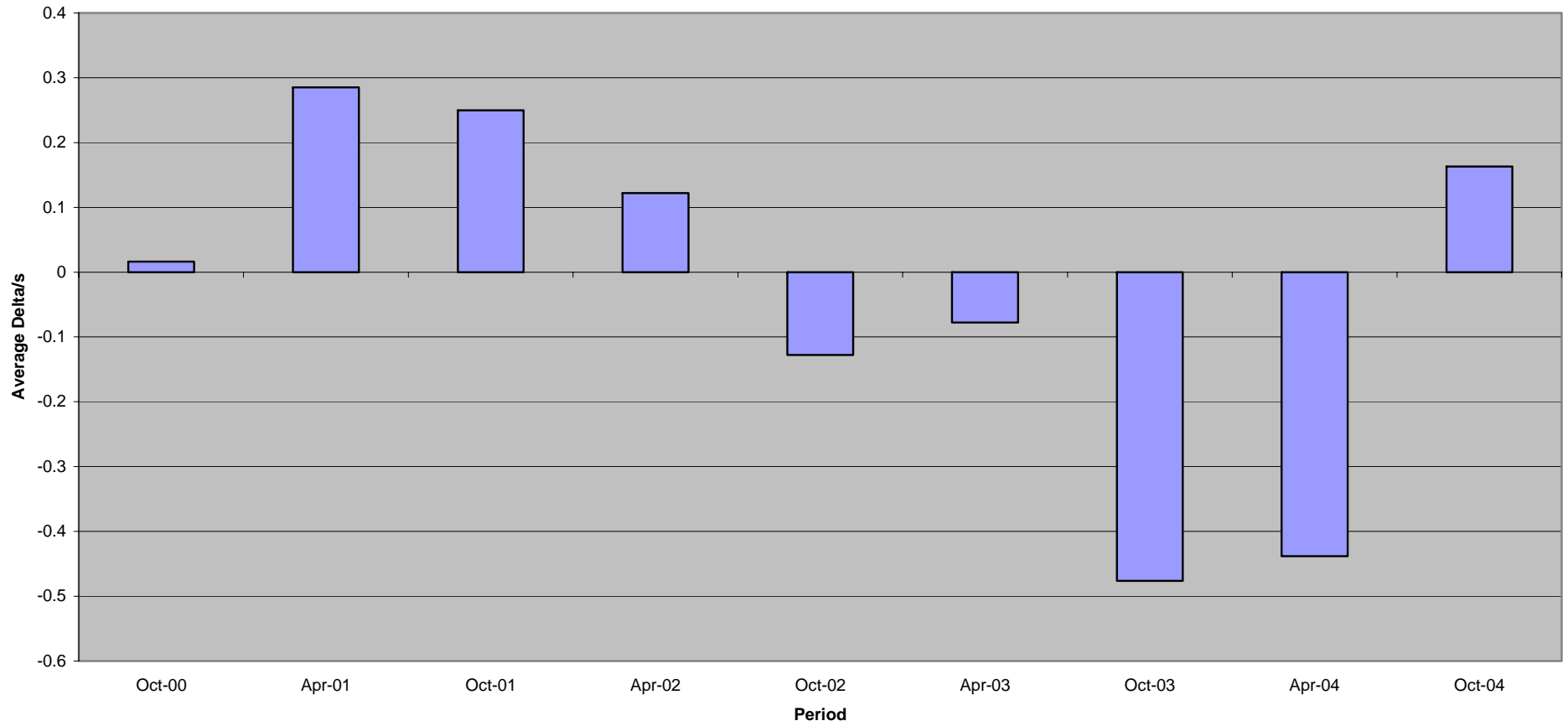


Figure 6 - Weighted Piston Deposits, Average Delta/s

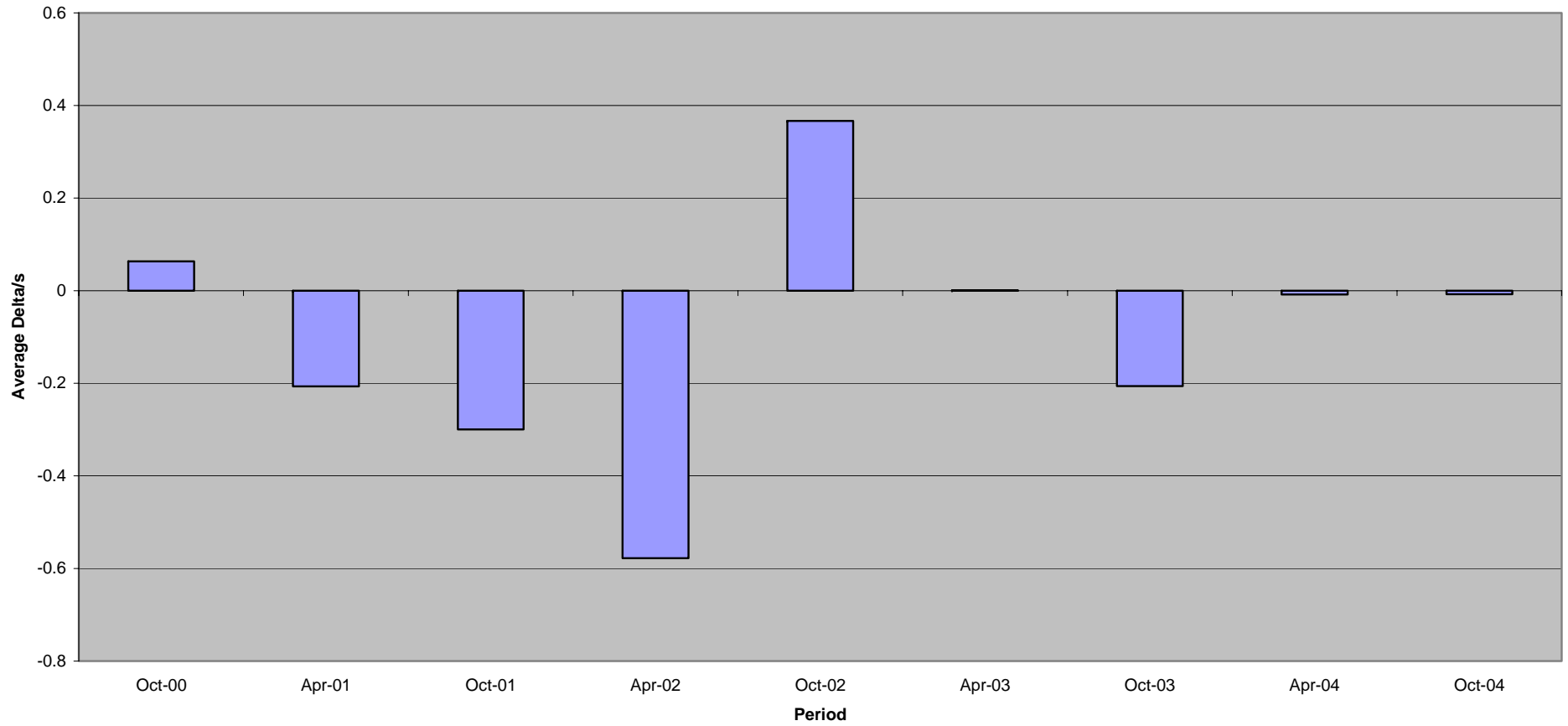


Figure 7 - Average Piston Varnish, Average Delta/s

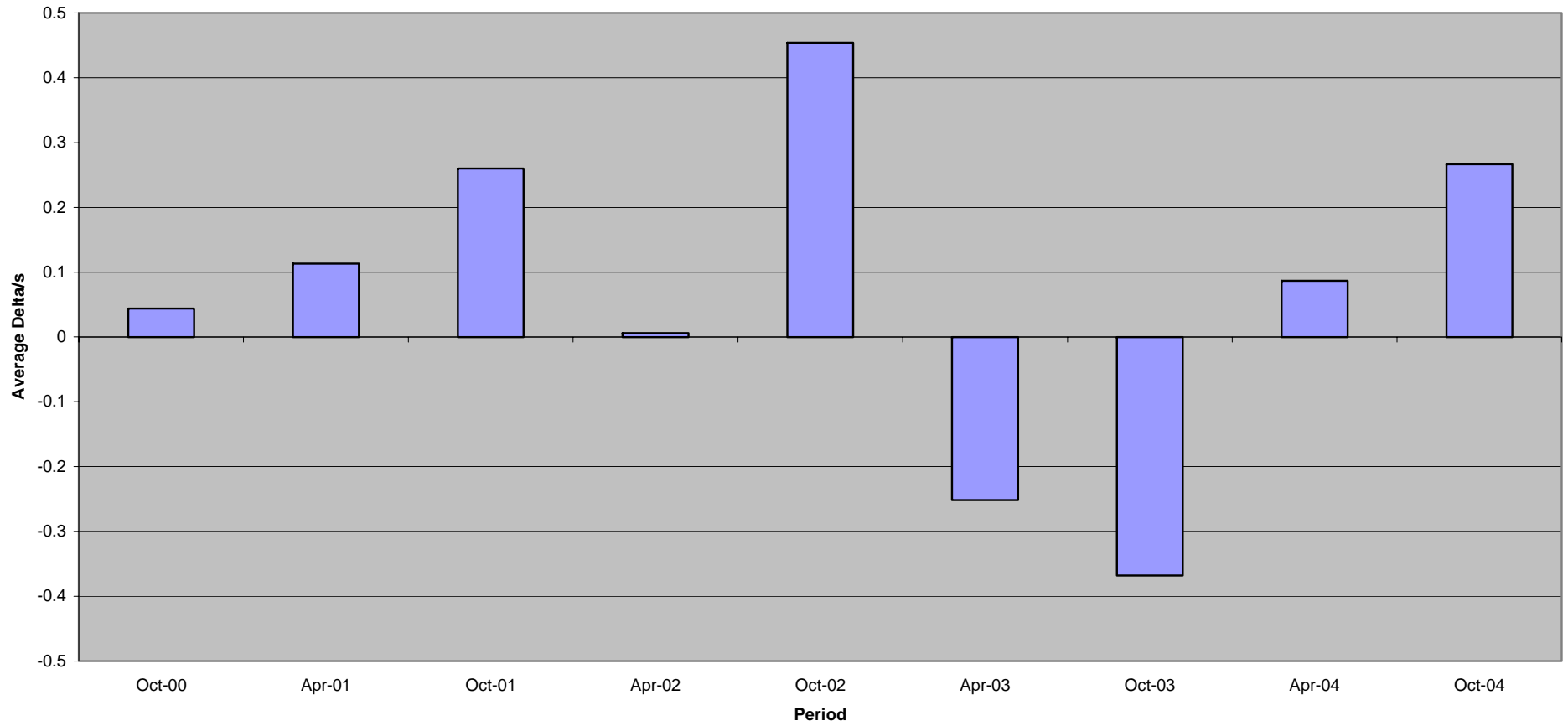


Figure 8 - Percent Viscosity Increase @ 60 Hours (Sequence III FHD), Average Delta/s

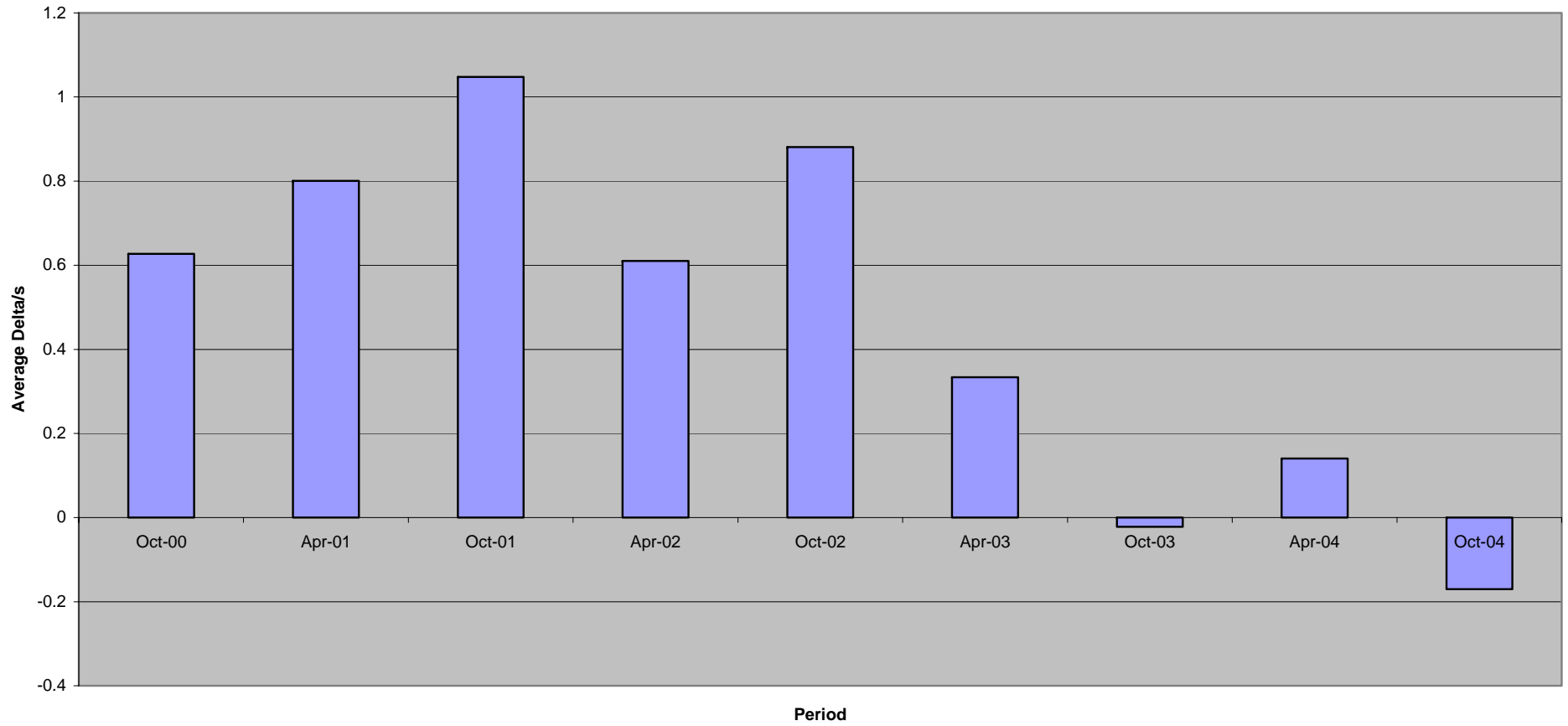


Figure 9 - Percent Viscosity Increase, Pooled Standard Deviation

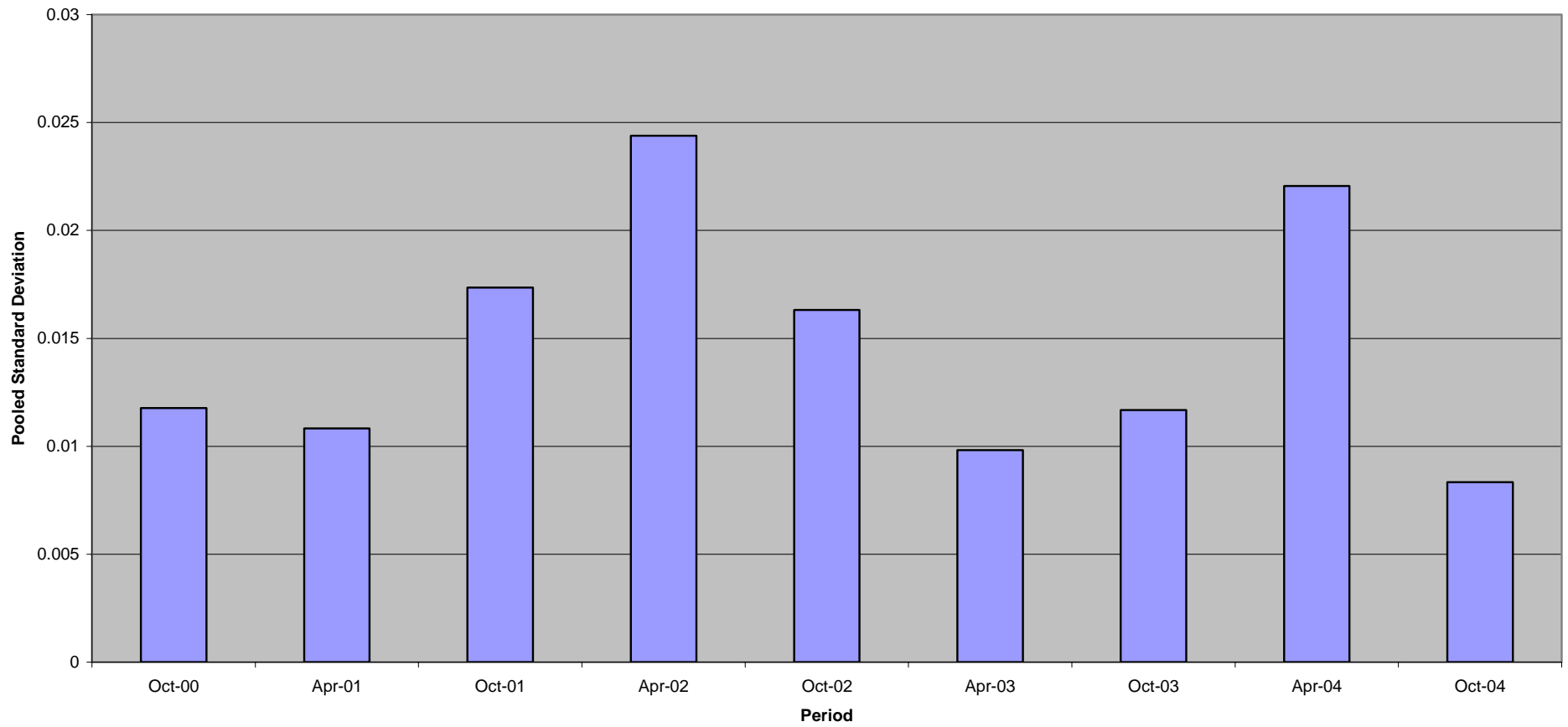


Figure 10 - Weighted Piston Deposits, Pooled Standard Deviation

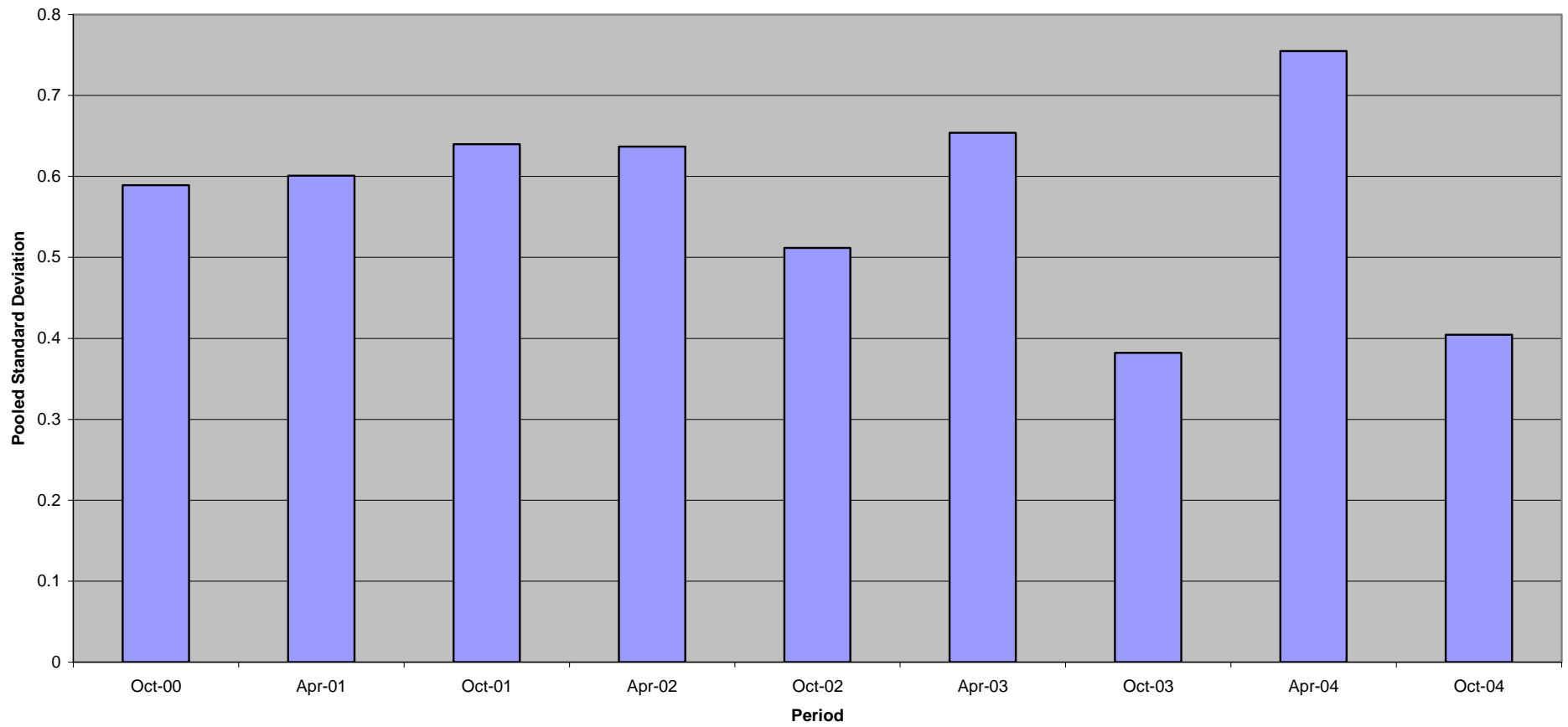


Figure 11 - Average Piston Skirt Varnish, Pooled Standard Deviation

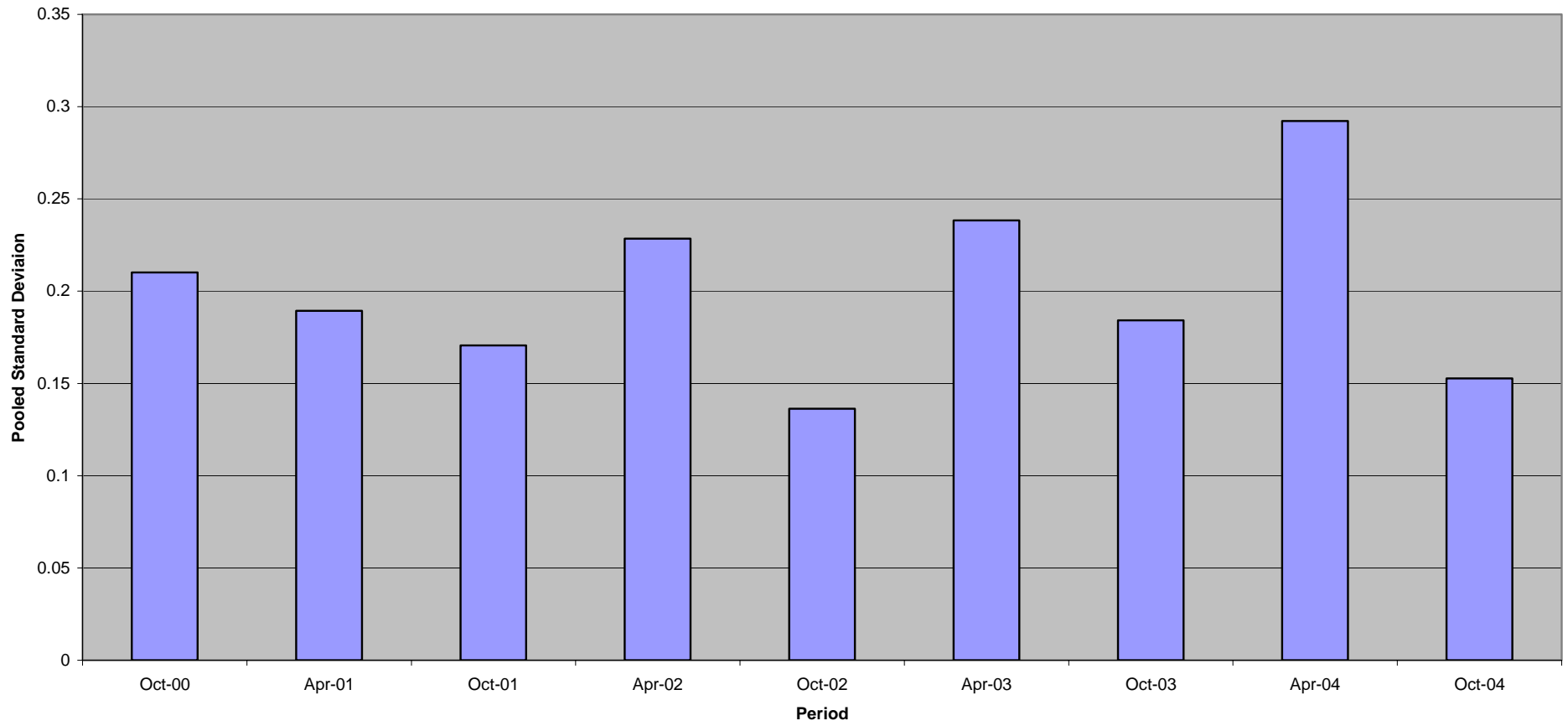


Figure 12 - Percent Viscosity Increase @ 60 Hours (Sequence III FHD), Pooled Standard Deviation

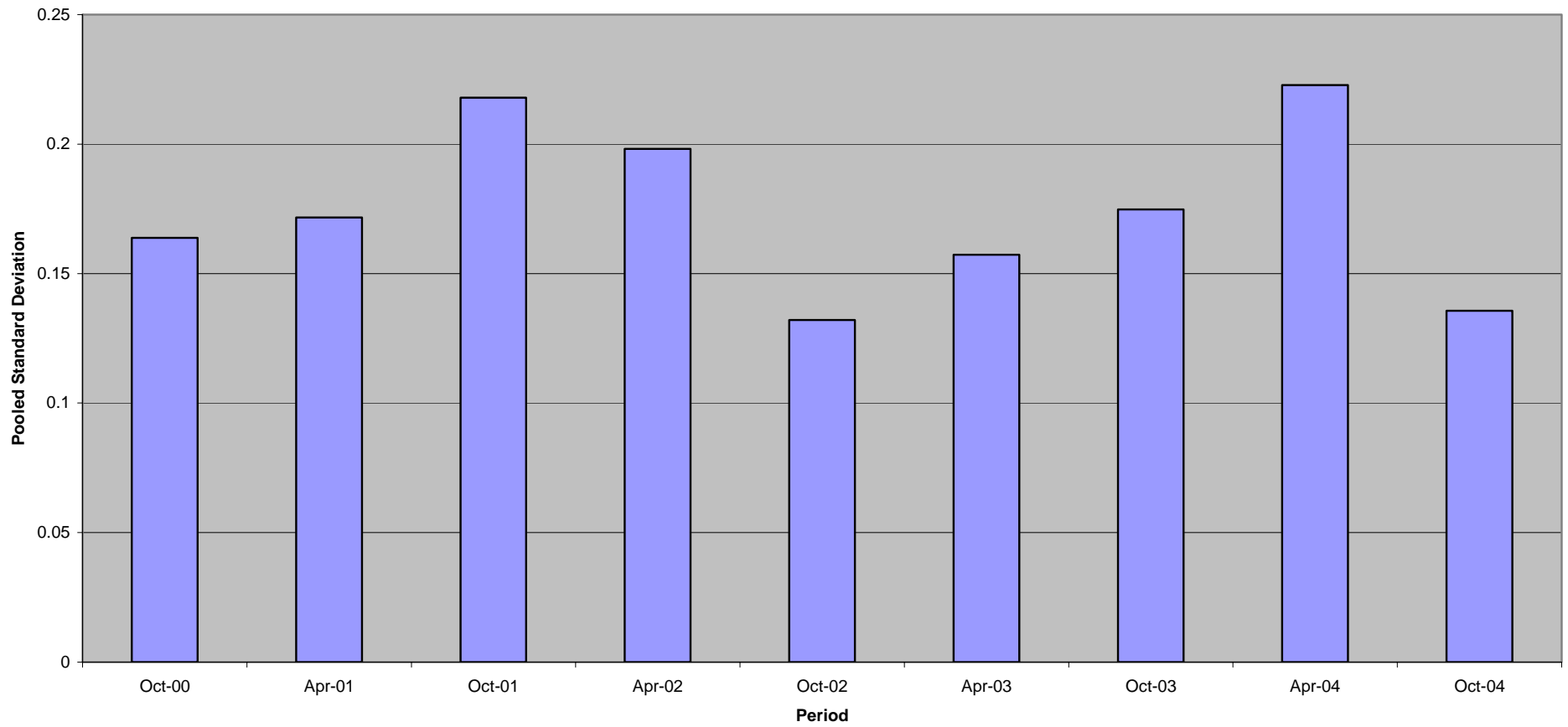


Figure 13 – Sequence IIIF Timeline

Date	Topic	Information Letter
6/10/2000	Revised Ring Sticking definitions implemented	00-2
7/25/2000	Oil Consumption as a test validity criteria dropped	00-2
8/28/2000	First occurrence of LC camshafts in LTMS data	
9/8/2000	Draft 3 of the Sequence IIIF Test Procedure released	00-1
9/27/2000	MRV & CCS Testing of used oil samples added	00-2
9/27/2000	Valve train assembly using build up oil implemented	00-2
10/4/2000	New QI U&L Values implemented	00-2
10/8/2000	First occurrence of Valve train assembly using build up oil in LTMS	00-2
12/6/2000	Oil Consumption as a test interpretability criteria added	00-3
4/25/2001	First occurrence of MB camshafts in LTMS data	
5/23/2001	Condenser Flow QI requirements dropped	01-1
5/23/2001	New oil addition at EOT dropped	01-1
5/23/2001	Condenser part number corrected	01-1
5/23/2001	Revised dipstick calibration curve implemented	01-1
5/23/2001	Revised MRV & CCS test procedures	01-1
5/23/2001	Upper limit of 8000cSt for viscosity measurements established	01-1
5/23/2001	Reexamination of Engine Speed and Condenser Coolant Out Temperature QI U&L values performed; no changes made	01-1
9/8/2001	Screened Average Cam-plus-lifter Wear (SACLW) replaces Average Cam-plus-lifter Wear (ACLW) as pass/fail parameter	01-2
9/8/2001	Valve train assembly using test oil reintroduced into IIIF test	01-2
9/12/2001	First occurrence of engine builds using test oil for valvetrain lubrication in LTMS	
11/28/2001	Sequence IIIF-HD Test Procedure Published	01-3
3/1/2002	Revised Sequence IIIF Test Procedure Published	02-1
3/15/2002	Sequence IIIFHD Test Procedure added to Revised Sequence IIIF Test Procedure. Editorial changes to IIIF Test Procedure also made and do	02-2
4/23/2002	Oil Filter and Oil Cooler Replacement Guidelines issued	02-3
6/1/2002	External Oil Bypass Valve System & Modified Oil Filter Adapter	02-4
12/15/2003	New Honing Procedure approved and added to Assembly Manual	
5/30/2003	New Oil Filter	03-1
6/30/2003	New Front Cover and Oil Filter Housing	03-1
6/30/2003	Sequence IIIG Dipstick	03-1
6/30/2003	Calibrated Flask for Initial Oil Charge	03-1
12/31/2003	New Solvent Specifications	03-1
10/29/2003	Revised Fuel Pressure Specification	03-3
10/29/2003	Automatic Parts Washing Machine Maintenance Requirement	03-3
10/29/2003	Main Bearing Bore Mandrel Procedure made optional	03-3
10/29/2003	Piston Ring Cleaning Requirements	03-3
10/29/2003	Additional Allowable RTV Sealing Compounds	03-3
10/29/2003	Main Bearing Cap Bolt Replacement Specification	03-3
10/29/2003	Revised Camshaft Measurement Procedure	03-3
10/29/2003	Revised Camshaft Lubrication & Installation Procedure	03-3
10/29/2003	Revised Oil Consumption Reporting Procedure	03-3
10/29/2003	Fluid Conditioning Module Equipment Specifications	03-3
10/29/2003	Revised Camshaft Measurement Equipment Specifications	03-3
10/29/2003	Rating Workshop Attendance Requirement	03-3
4/13/2004	Revised Intake Manifold Gasket	04-1
4/13/2004	Additional Allowable Sealing Materials	04-1
5/12/2004	Undercrown Rating Area Definition Clarification	04-2
5/12/2004	Flow Meter Specifications	04-2
5/12/2004	MRV Reporting	04-2
5/12/2004	Amount of Test Oil used for Camshaft & Lifter Lubrication	04-2