




# Test Monitoring Center

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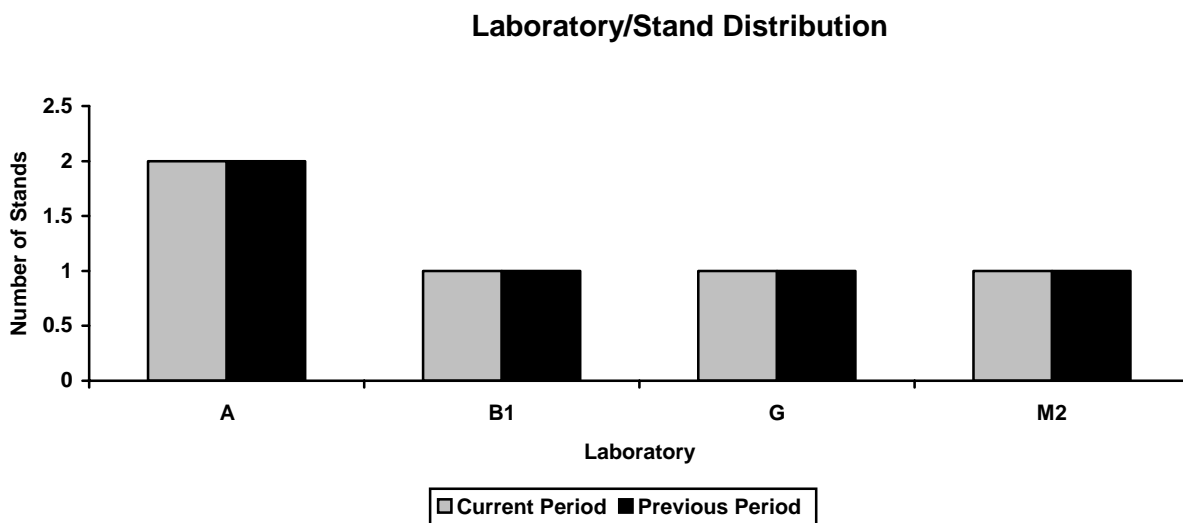
Memorandum: 07-058  
Date: October 11, 2007  
To: Dave Glaenger, Chairman, Sequence IIIF Surveillance Panel  
From: Richard E. Grundza   
Subject: Sequence IIIF Semiannual Report: April 1, 2007 through September 30, 2007

The following is a summary of Sequence IIIF reference tests that were reported to the Test Monitoring Center during the period April 1, 2007 through September 30, 2007.

## Lab/Stand Distribution

	Reporting Data	Calibrated as of September 30, 2007
Number of Laboratories:	4	4
Number of Test Stands:	5	5

The following chart shows the laboratory/stand distribution:

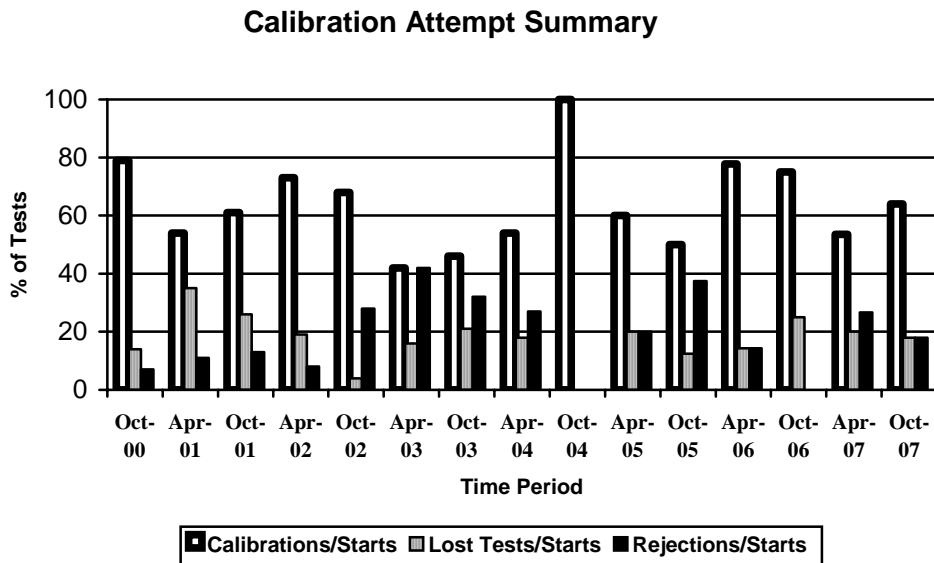


The following summarizes the status of the reference oil tests reported to the TMC:

Calibration Start Outcomes	TMC Validity Codes	No. of Tests
Operationally and Statistically Acceptable	AC	7
Operationally Invalid (Laboratory Judgment)	LC	1
Operationally Valid, Statistically Unacceptable	OC	2
Aborted	XC	1
Total		11

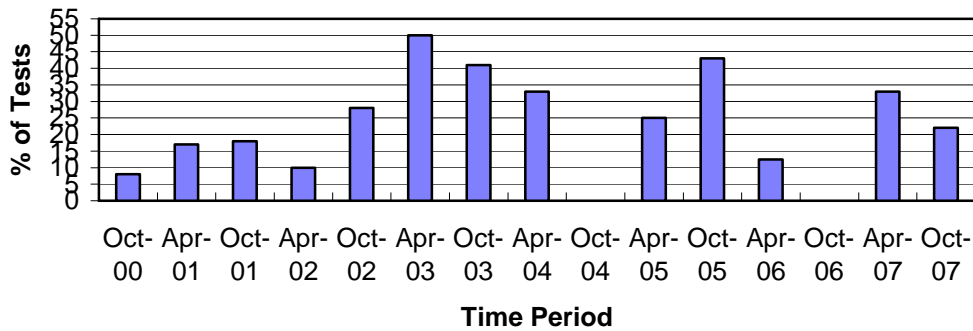
Donated & Industry Support Outcomes	TMC Validity Codes	No. of Tests
Decoded Oil	OG	0
Total		0

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



The calibration per start rate has increased with respect to the previous period. Both lost test and rejected test per start rates has decreased with respect to the previous period. All rates for the period compare well with historical rates.

### Rejected Test Rate for Operationally Valid Tests



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

Two tests failed the acceptance criteria this report period. One test failed severe for viscosity increase, while the other test was severe for weighted piston deposits.

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

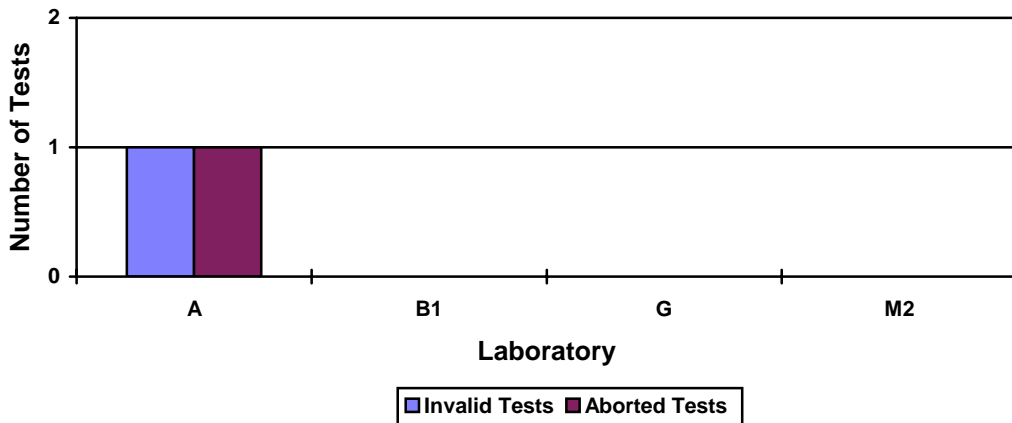
Four Sequence IIIF lab visits were performed this period.

#### Lost Test Summary

Two tests were lost this period. The reasons for the lost tests are shown in the following table:

Lab	Reason for Lost Test	Number of Tests	Breakdown of Tests (LC/RC/XC/MC)
A	AFR control problems	1	1/0/0/0
A	Spun a rod bearing	1	0/0/1/0

#### Lost Test Distribution



Information Letters

Sequence IIIF Information letter 07-2 No. 25, was issued during the period on June 5, 2007 and contained: Changed the designation of the IIIGVIS test to IIIGVS and revised Table A4 to reflect metric units.

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  $\Delta/s$  value, by parameter, for all laboratories reporting data during this period.

Industry Severity Summary			
Parameter	Average $\Delta/s$	Pooled standard deviation (degrees of freedom)	Average $\Delta$ , in reported units
PVIS	-0.873	0.012 (df=8)	127.8 % Viscosity Increase <sup>1</sup>
APV	0.976	0.16 (df=8)	0.16 Merits
WPD	0.076	0.91 (df=8)	0.07 Merits
PV60 <sup>2</sup>	0.867	0.11 (df=8)	29.5% Viscosity Increase <sup>3</sup>

<sup>1</sup> At the GF-3 Pass Limit of 275% Viscosity Increase

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

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

Average $\Delta/s$ Results, by Laboratory				
Laboratory	PVIS	APV	WPD	PV60
A	-1.555	0.705	0.141	1.422
B1	-0.275	1.556	0.804	0.167
G	-0.256	0.941	-1.388	0.703
M2	-0.577	0.971	1.288	0.370

*Percent Viscosity Increase (PVIS)*

The industry severity control charts started the period in control, but sounded a warning and action alarm at the end of the period (see Figure 1). Precision control charts were in control for the period. Industry performance was severe for the period, with an average  $\Delta/s$  value of -0.873 for the period (see Figures 1 & 5), which equates to a shift of 127.8 % in reported units. Precision for the period has improved with respect to the previous period (see Figure 9). The severity alarms late in the period are the result of two tests from one lab, which were -3.074 and -1.718  $\Delta/s$  from target.

*Weighted Piston Deposits (WPD)*

Severity and precision control charts were in control for the period. Industry was 0.07 merits mild for the period with an average  $\Delta/s$  value of 0.076 (see Figure 6). Precision has degraded with respect to the previous period with a standard deviation of 0.91 (see Figure 10).

*Average Piston Skirt Varnish (APV)*

Industry severity was in warning or action alarm for the period (see Figure 3). Industry precision was in control for the period. Industry was mild for the period with an average  $\Delta/s$  value of 0.976 or 0.16 merits (see Figure 7). Precision for the period has degraded when compared with the previous period with a pooled standard deviation of 0.16 (see Figure 11).

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

No test failed for ACLW/SACLW this report period.

*Percent Viscosity Increase at 60 Hours*

The industry control chart for PV60 is shown in Figure 4. The average  $\Delta/s$  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 was in control for most of the period, sounding a severe warning and action alarm at the end of the period.

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

There were no hardware changes this period.

Reference Oils

Oil	TMC Inventory, in gallons	TMC Inventory, in tests (4 gal/test)	Laboratory Inventory, in tests	Estimated life
1006	41	10	7	Not currently used in III F <sup>1</sup>
1006-2	4,492	1123	7	~3+ years <sup>1</sup>
1007	411	102	4	Not currently used in III F <sup>2</sup>
1008	29	7	8	No longer shipped <sup>1</sup>
1008-1	1140	285	8	~3+ years <sup>1</sup>
1009	669	167	3	Not currently used in III F <sup>1</sup>
432	117	28	10	Not currently used in III F
433	10	2	2	No longer shipped
433-1	517	129	6	~3+ years

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

<sup>2</sup> Not reblendable

Memo 07-058

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

REG/reg

Attachments

c: F. M. Farber, TMC

Sequence IIF Surveillance Panel

<ftp://ftp.astmtmc.cmu.edu/docs/gas/sequenceiii/semiannualreports/IIF-10-2007.pdf>

Distribution: Electronic Mail

List of Figures

- Figures 1, 2, 3, and 4 are EWMA severity and precision control charts and also the CUSUM  $\Delta/s$  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  $\Delta/s$ , 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

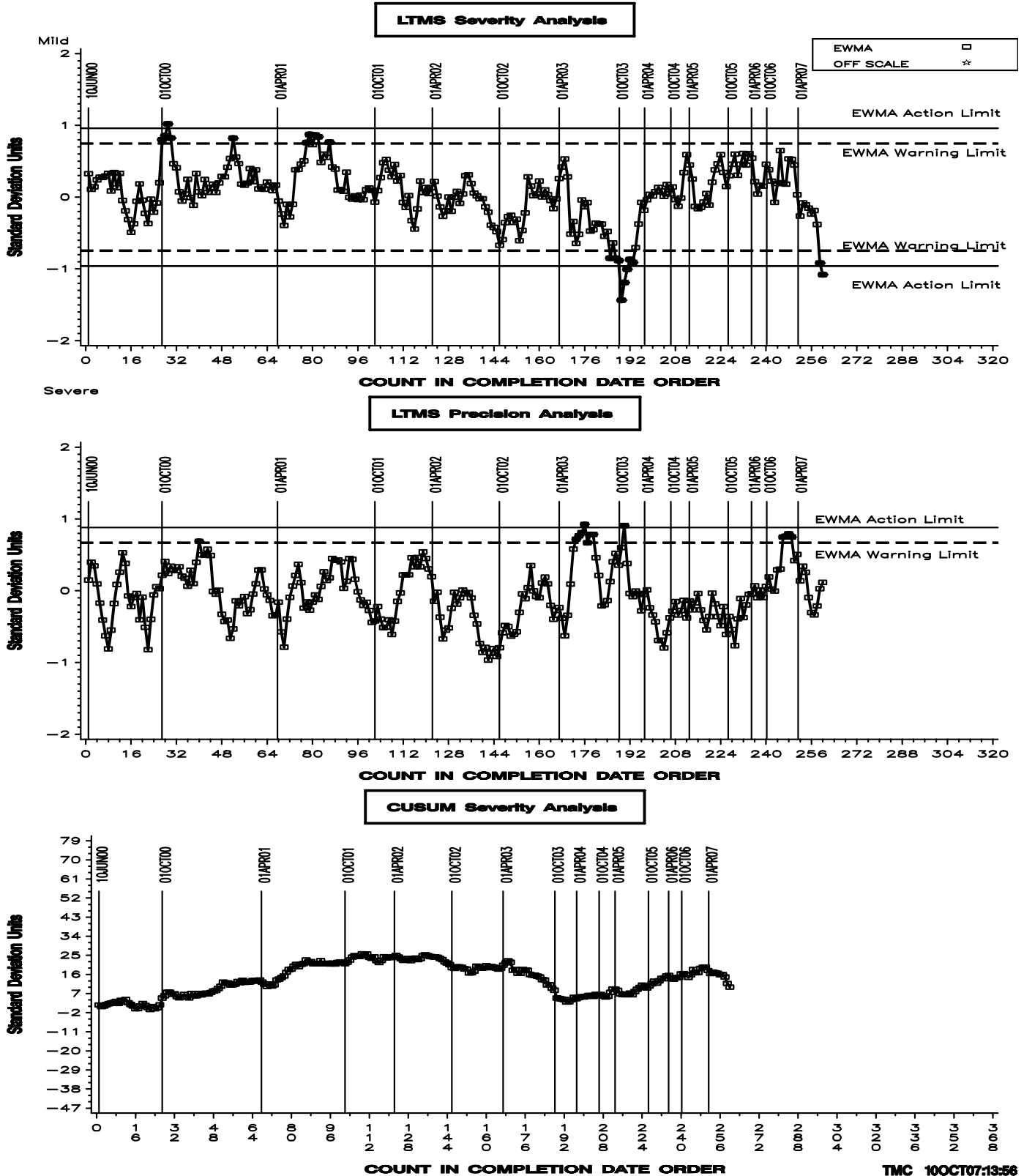




Figure 2

# SEQUENCE IIIF INDUSTRY OPERATIONALLY VALID DATA

## AVERAGE WEIGHTED PISTON DEPOSITS FNL ORIG UNIT RES

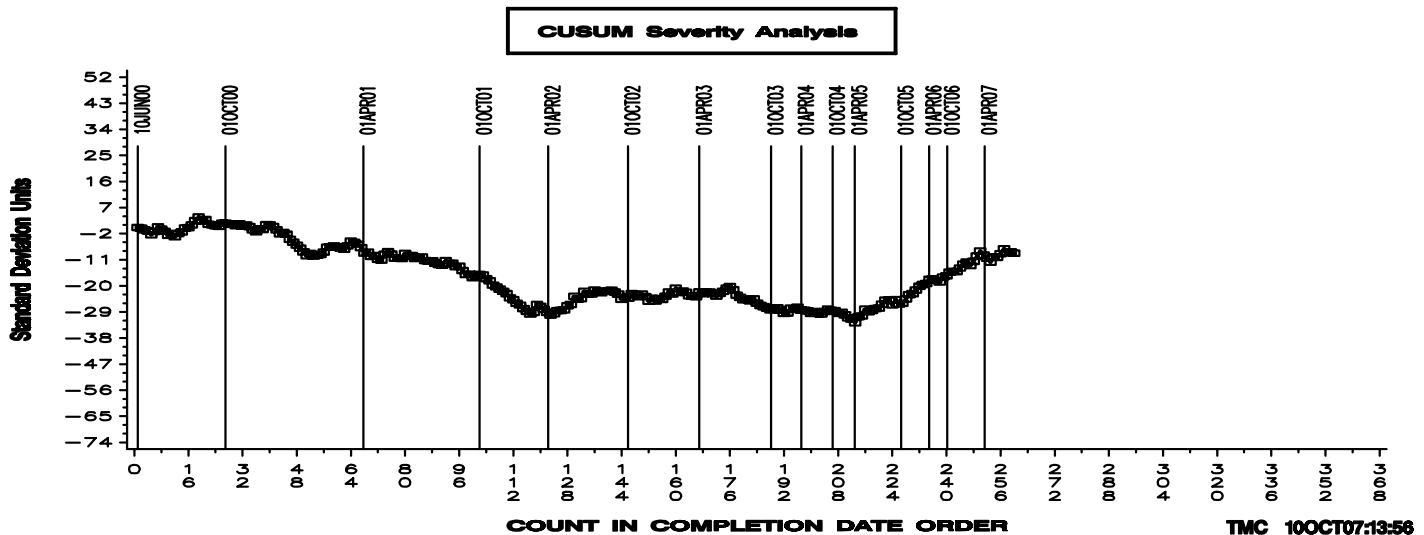
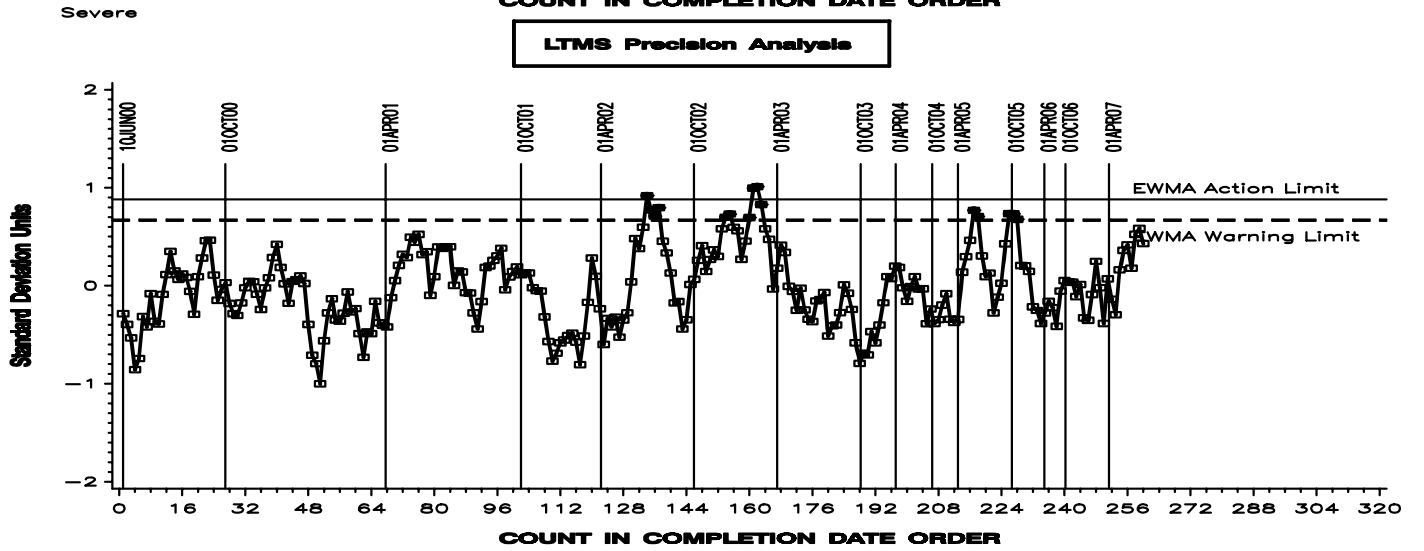
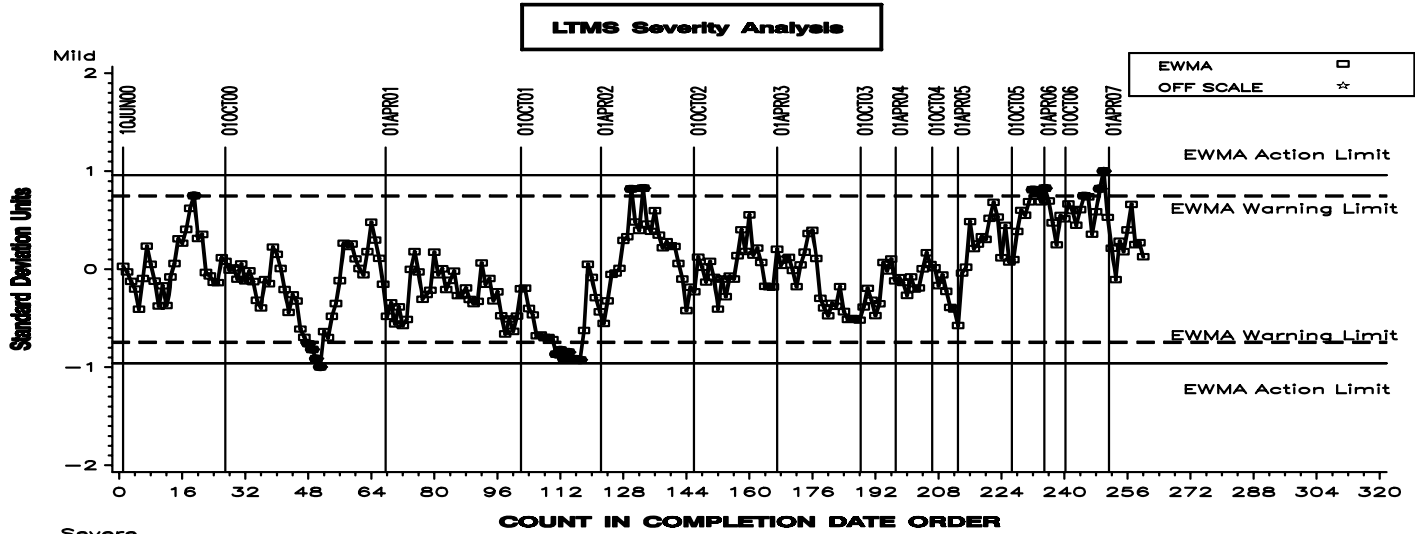


Figure 3

# SEQUENCE IIIIF INDUSTRY OPERATIONALLY VALID DATA

## AVERAGE PISTON SKIRT VARNISH FINAL ORIG UNIT RES

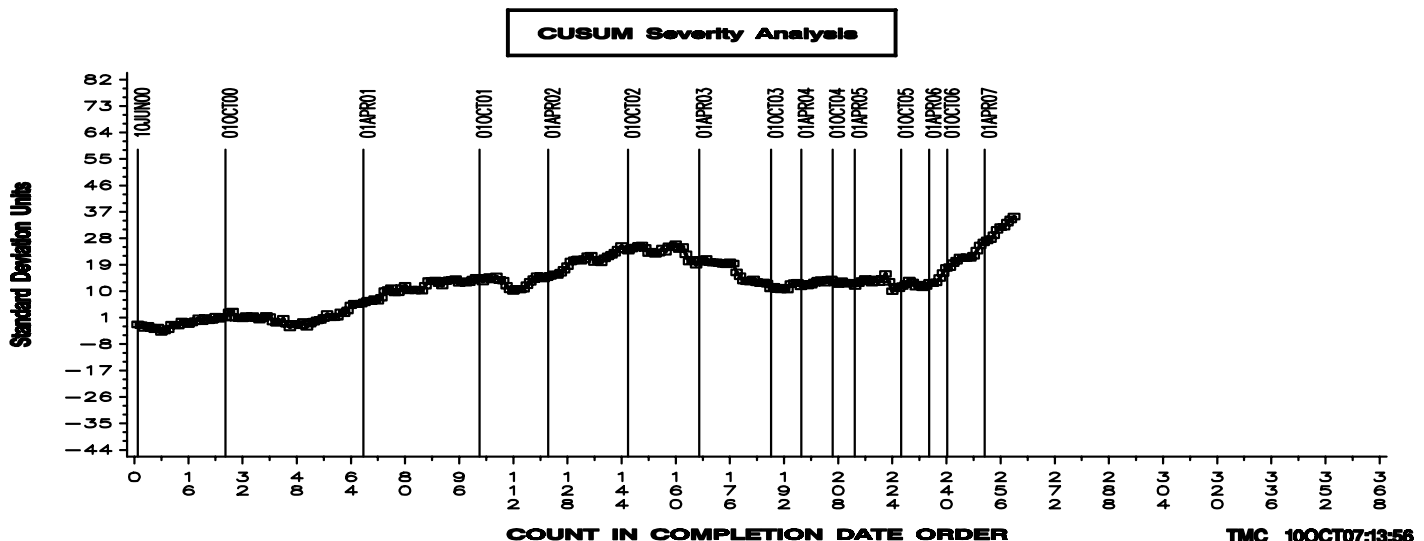
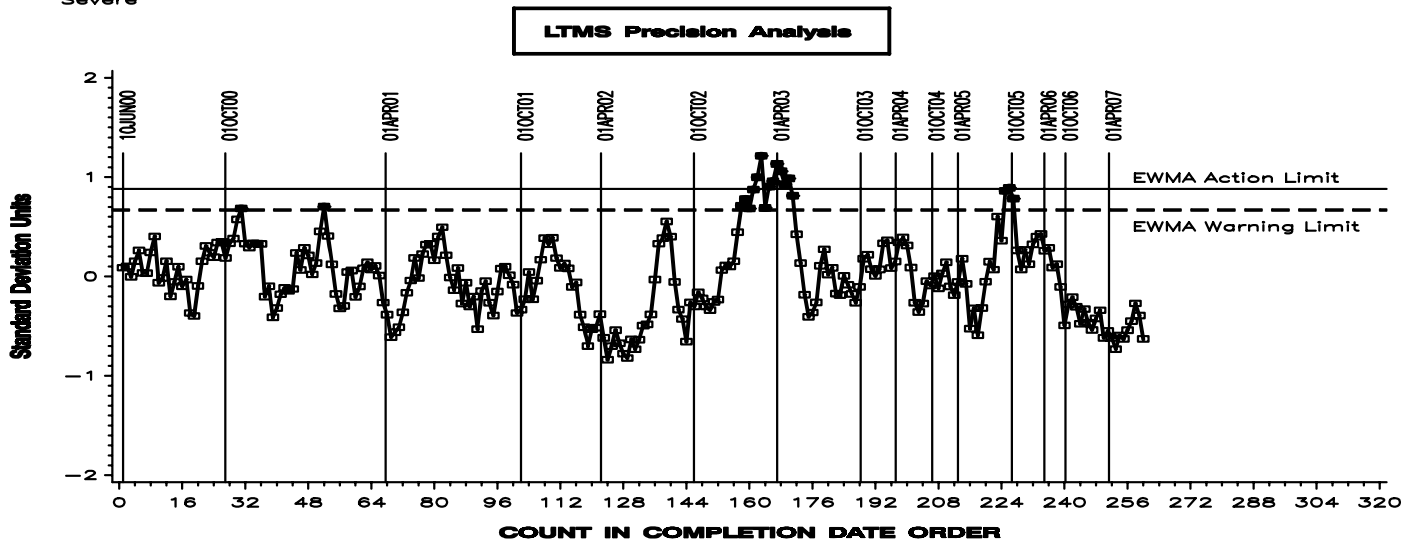
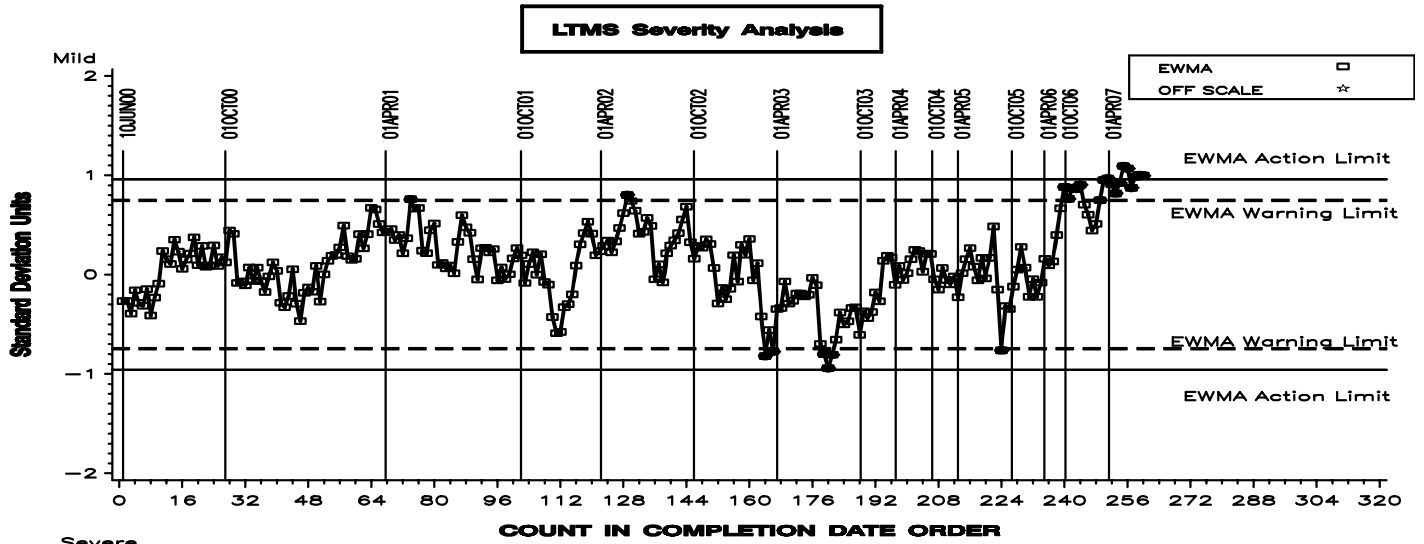


Figure 4

# SEQUENCE IIIF INDUSTRY OPERATIONALLY VALID DATA

## % VISCOSITY INCREASE @ 060 HOURS

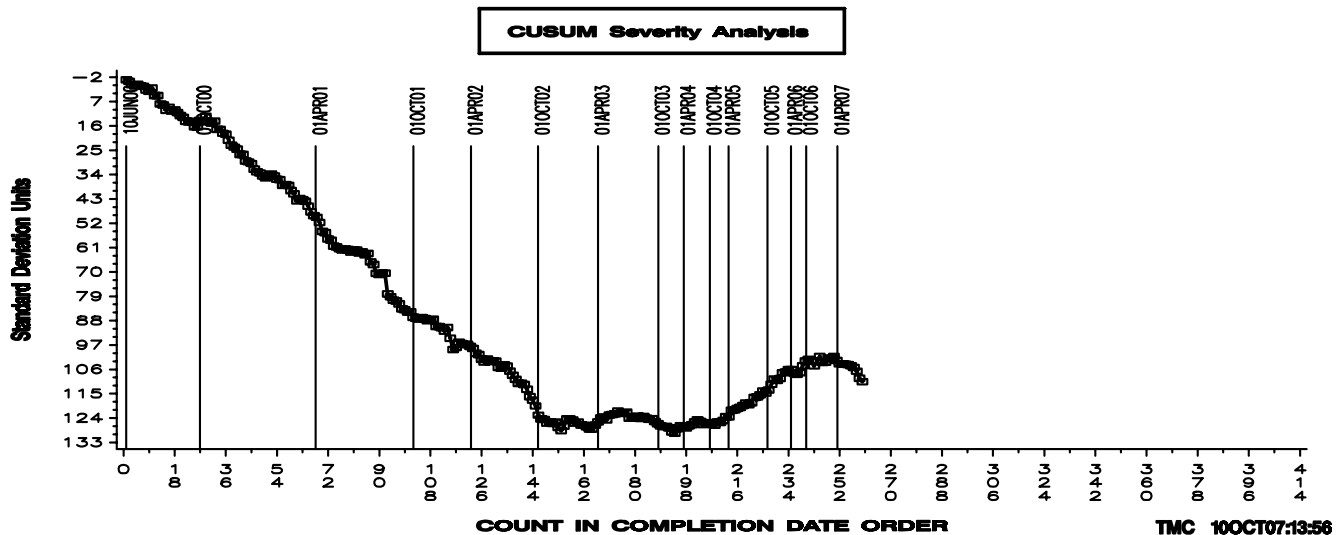
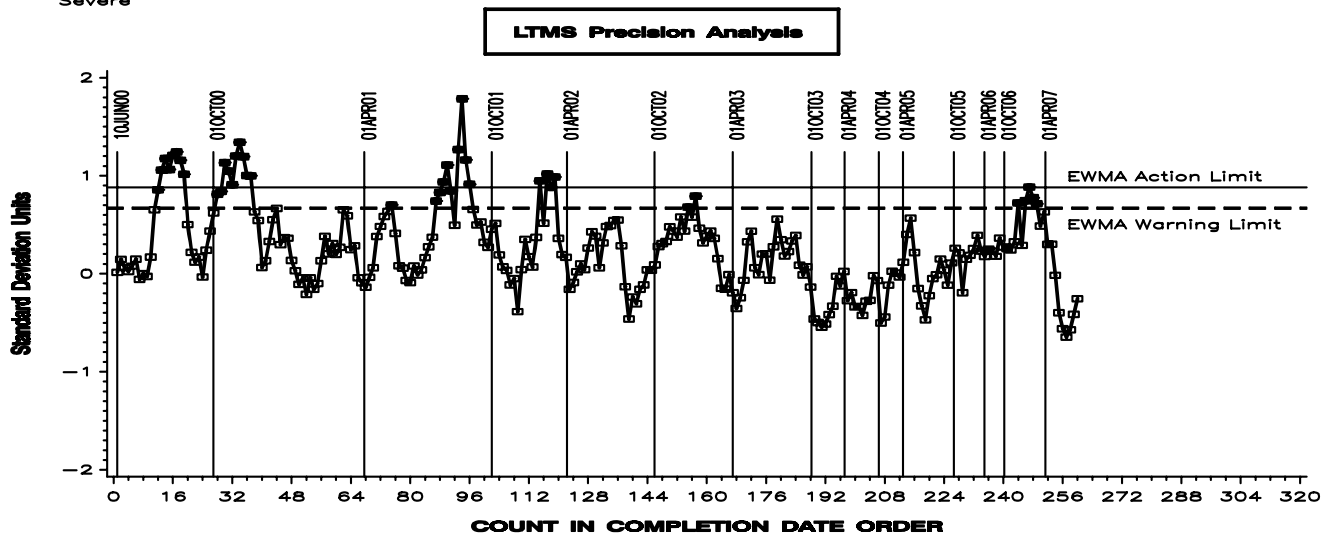
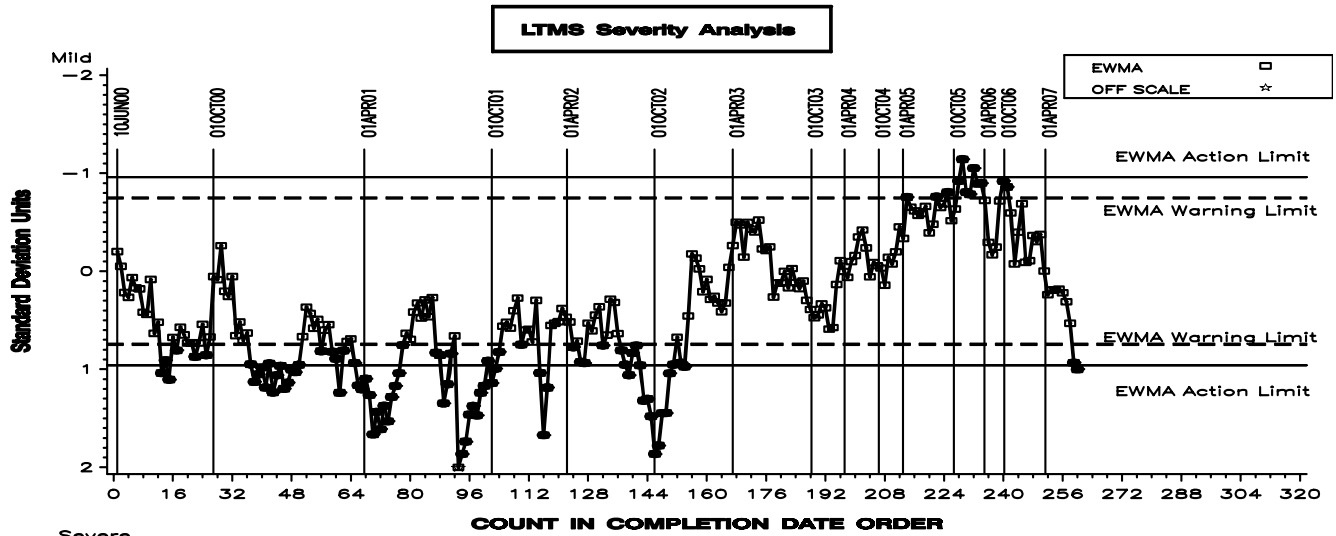


Figure 5 - Percent Viscosity Increase, Average Delta/s

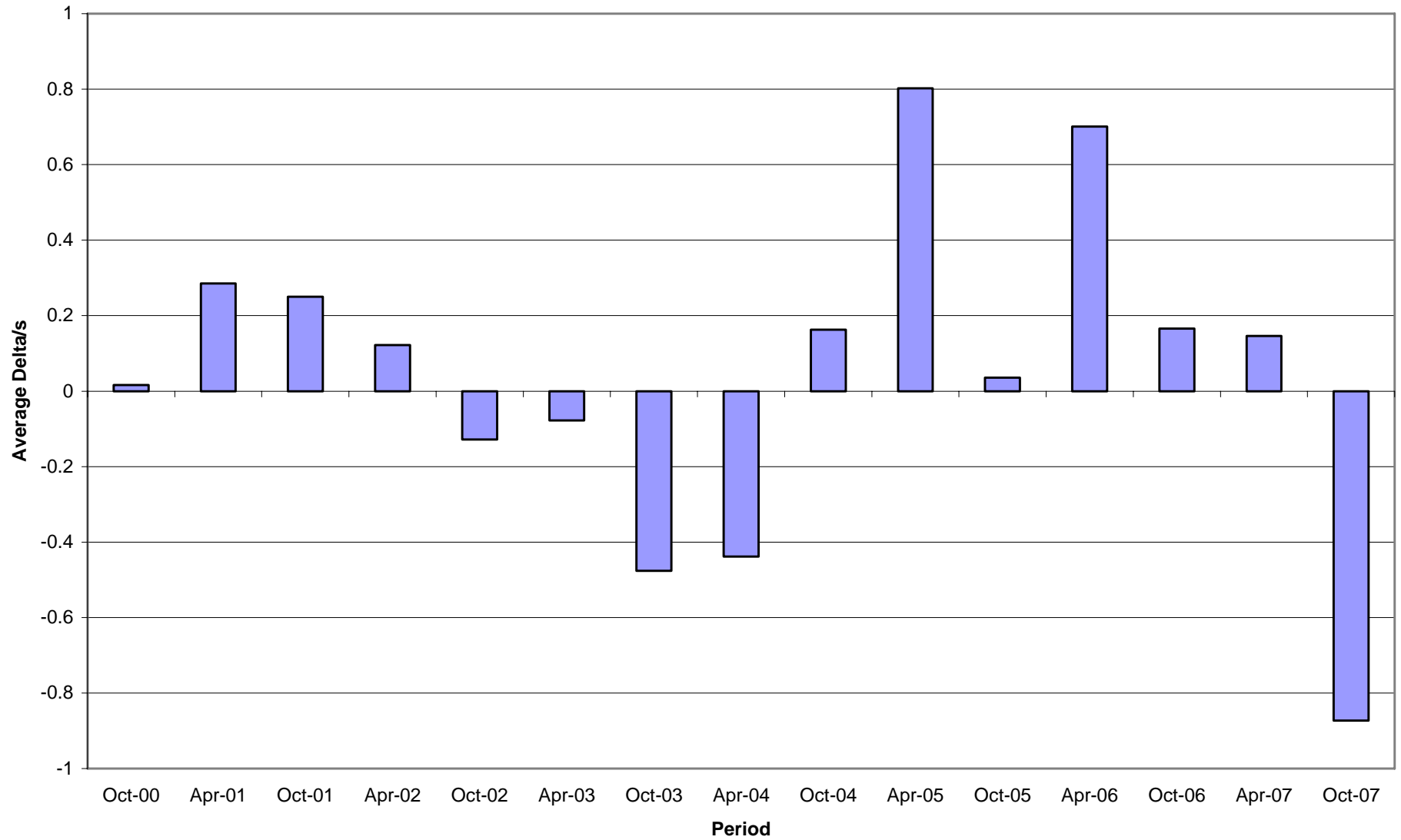


Figure 6 - Weighted Piston Deposits, Average Delta/s

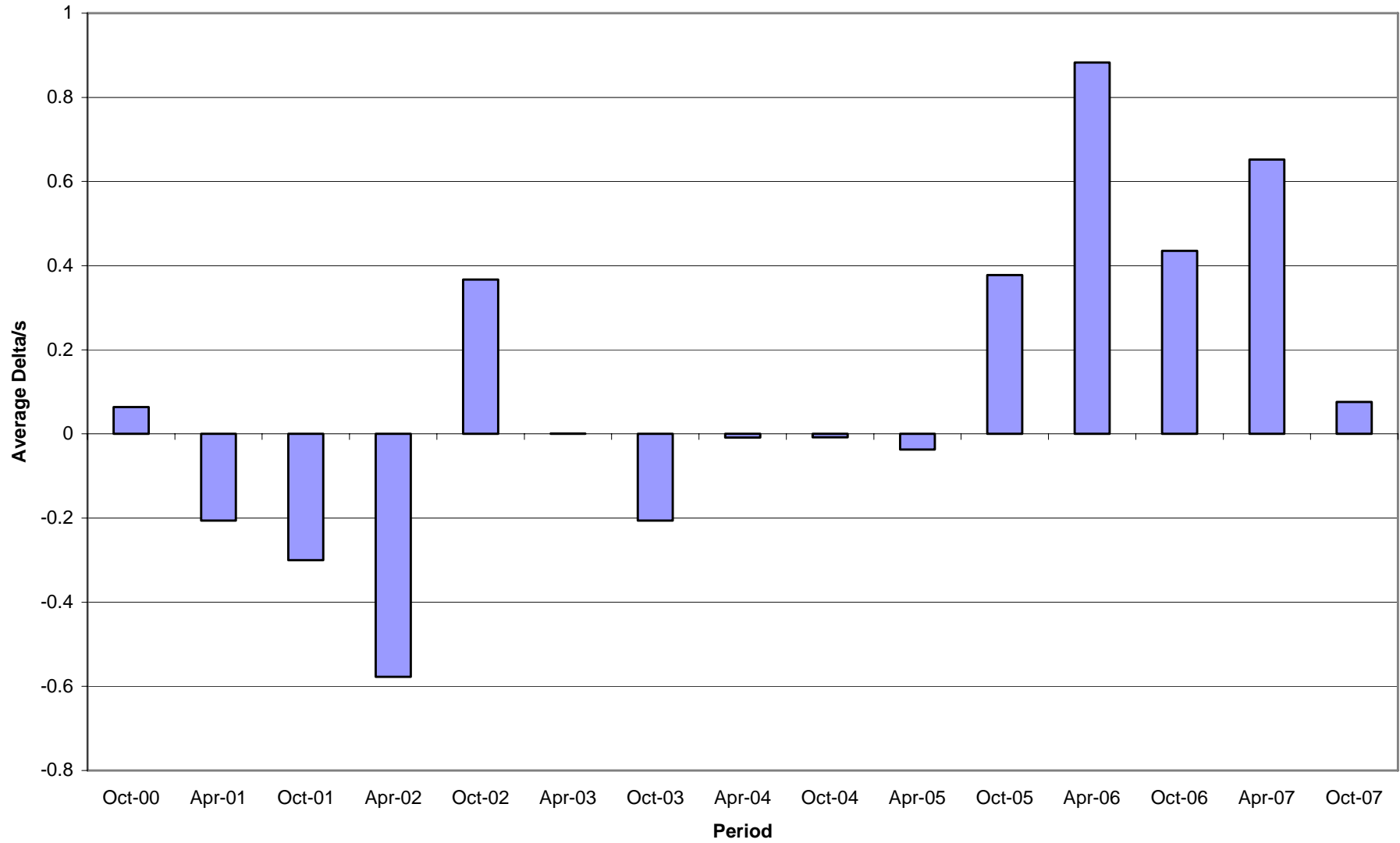


Figure 7 - Average Piston Varnish, Average Delta/s

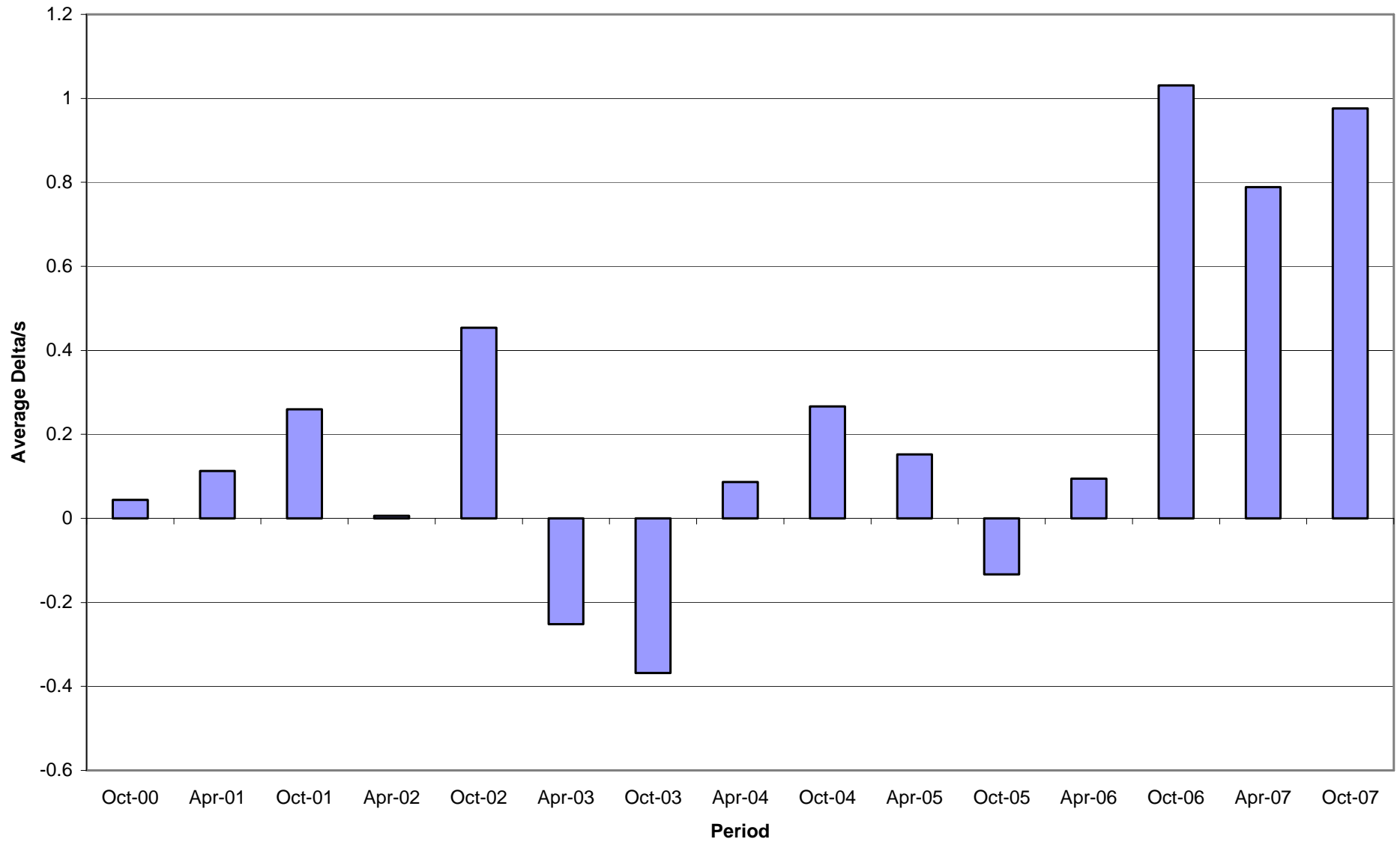
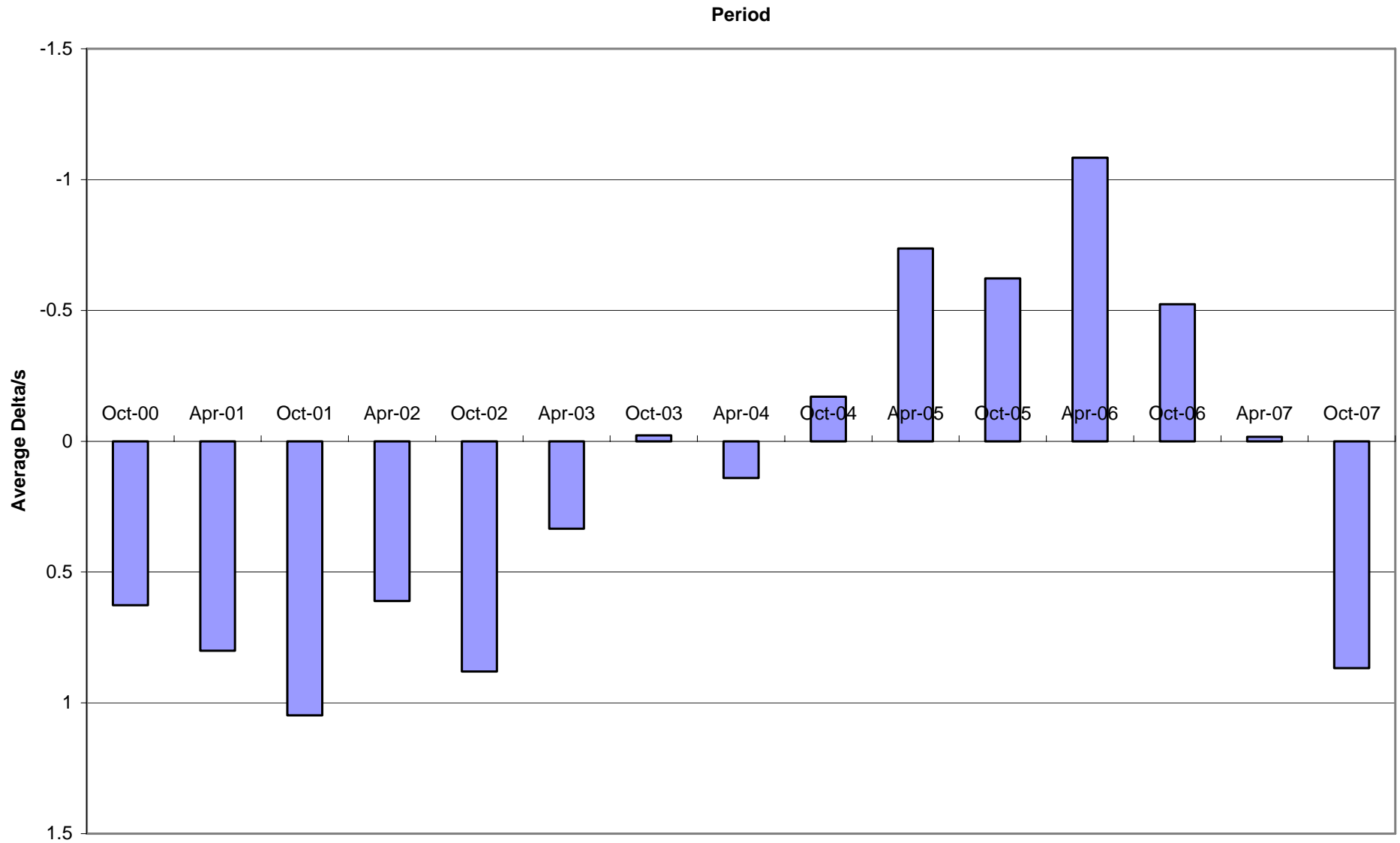


Figure 8 - Percent Viscosity Increase @ 60 Hours (Sequence IIFHD), Average Delta/s



**Figure 9 - Percent Viscosity Increase, Pooled Standard Deviation**

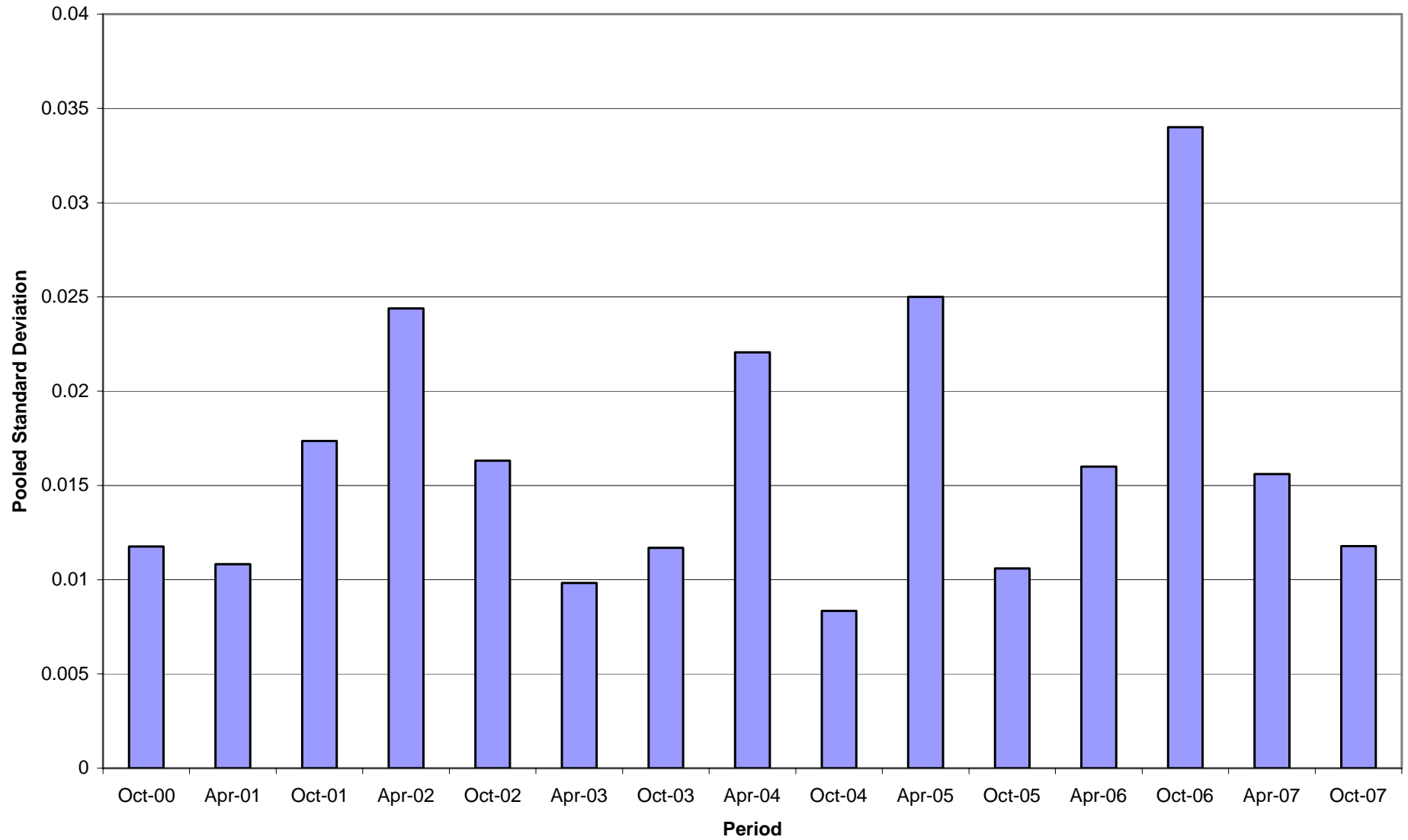




Figure 10 - Weighted Piston Deposits, Pooled Standard Deviation

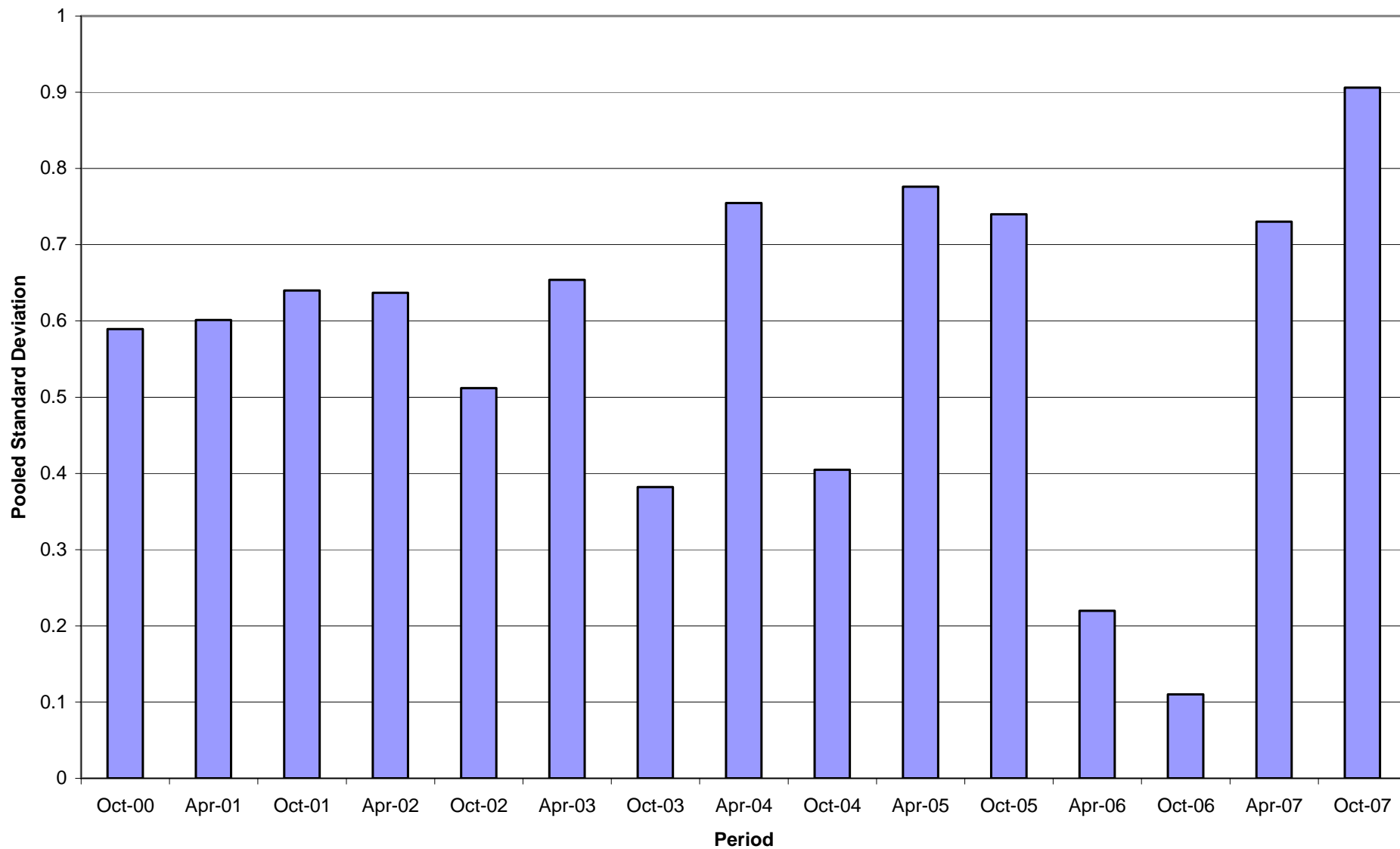


Figure 11 - Average Piston Skirt Varnish, Pooled Standard Deviation

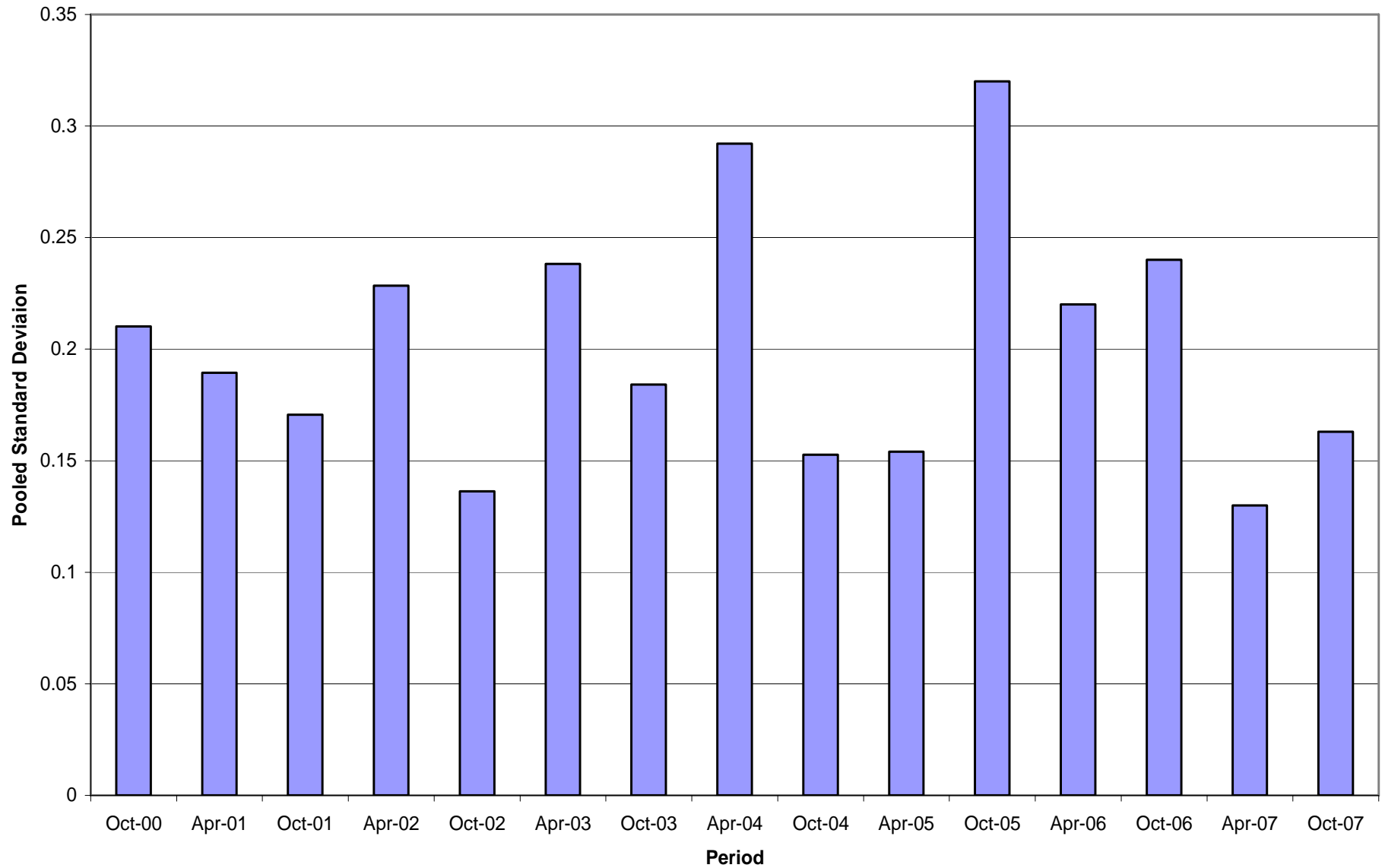


Figure 12 - Percent Viscosity Increase @ 60 Hours (Sequence III FHD), Pooled Standard Deviation

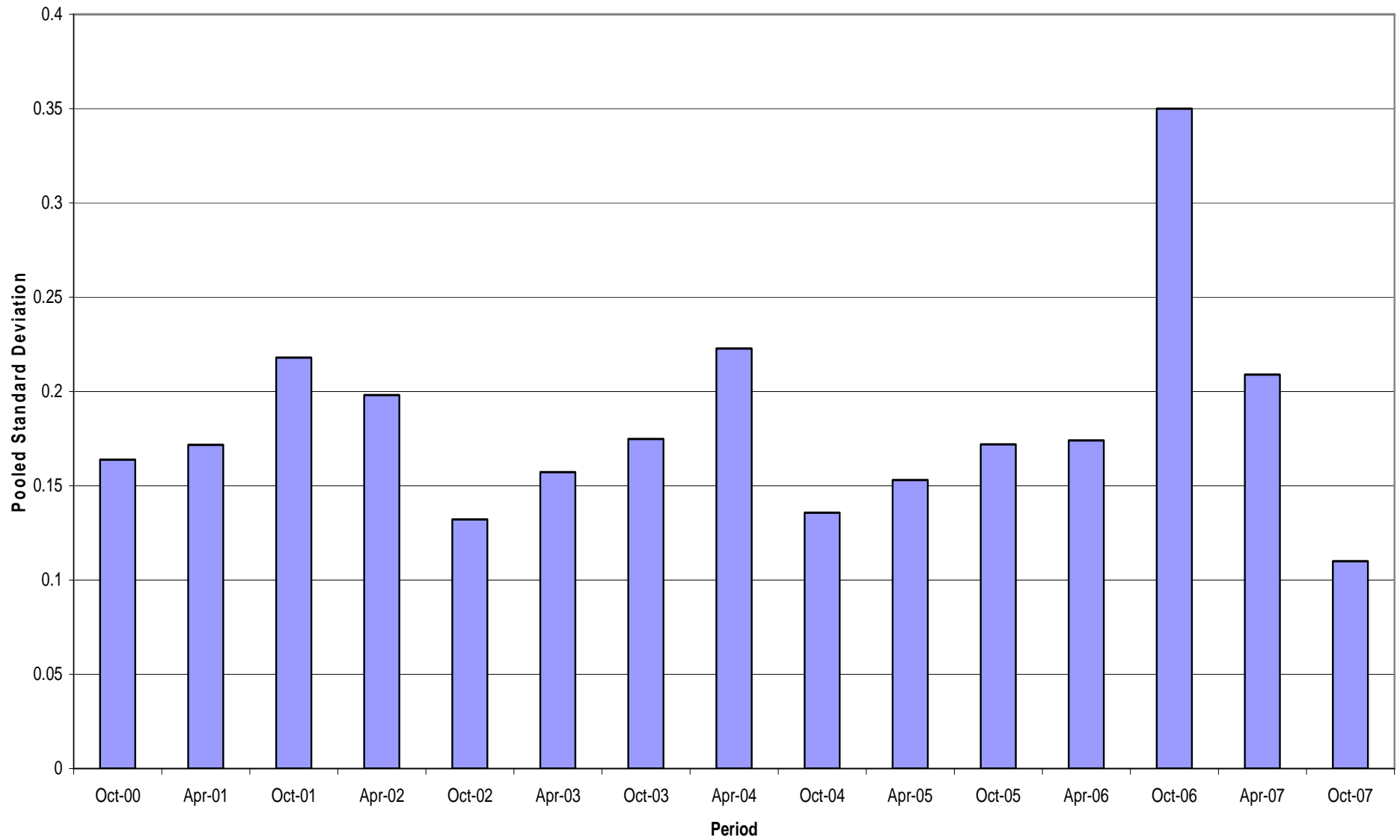


Figure 13 – Sequence IIIF Timeline

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
11/4/2004	Torque Specs for Powered Metal Rods	04-3
11/4/2004	Editorial Changes to Precision Statements	04-3

11/4/2004	New Front and Rear Main Seals	04-3
11/4/2004	New Exhaust Valves	04-3
11/4/2004	New Oil Pan Gasket	04-3
1/7/2005	Updated Precision Statements	05-1
1/7/2005	Engine Build Worksheets	05-1
1/7/2005	Clarification of Solvent Specifications	05-1
1/7/2005	Provisions for Adjustment to Calibration Period for Donated Oil Test Programs	05-1
8/10/2005	Corrections to Table A7.1	05-2
12/16/2006	Revised Rating Workshop Attendance Requirements	05-3
12/16/2006	Acceptance of Torque Wrench ETW-E180	05-3
4/4/2006	Added requirements for fuel monitoring and revised aromatic content in fuel specification	06-1
8/18/2006	Procedural enhancements from unified engine build	06-2
8/18/2006	Revised Table A4 to clarify methods and measurement units	06-2
10/3/2006	Change to PMNS connecting rods	06-3
11/7/2006	Change in rater calibration requirements	06-4
3/19/2007	Added IIIFVIS test procedure	07-1
4/1/2007	Revised Cylinder head torqueing procedure in engine assembly manual	
6/5/2007	Changed designation of IIIFVIS procedure to IIIFVS	07-2
6/5/2007	Changed values in Table A4 to metric	07-2