A Program of ASTM International

Test Monitoring Center

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412-365-1000

Memorandum: 09-049

Date: October 22, 2009

To: Dave Glaenzer, Chairman, Sequence IIIF Surveillance Panel

From: Richard E. Grundza

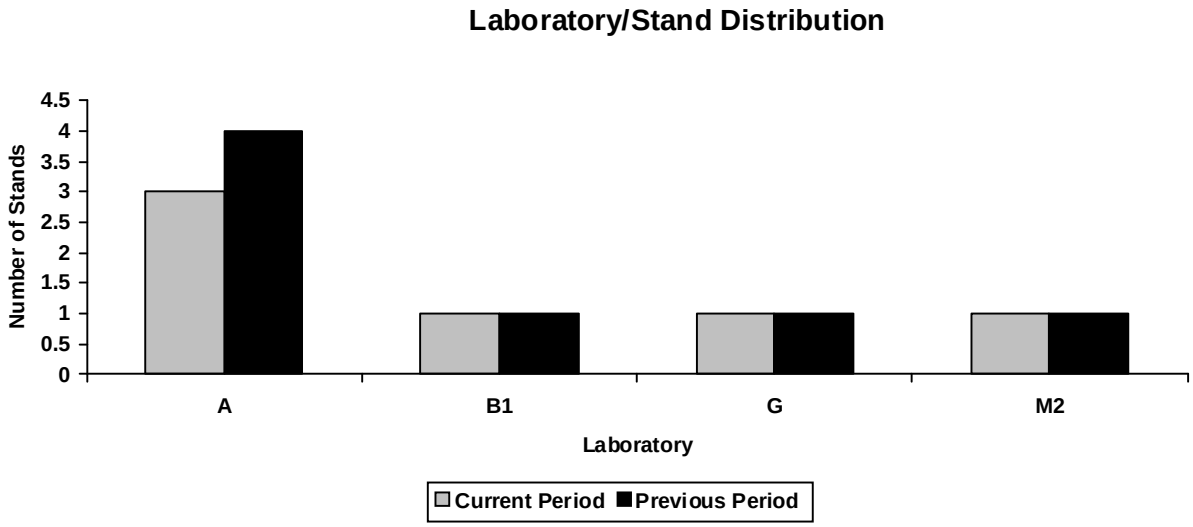
Subject: Sequence IIIF Semiannual Report: April 1, 2009 through September 30, 2009

The following is a summary of Sequence IIIF reference tests that were reported to the Test Monitoring Center during the period April 1, 2009 through September 30, 2009.

Lab/Stand Distribution

	Reporting Data	Calibrated as of September 30, 2009
Number of Laboratories:	4	4
Number of Test Stands:	6	5

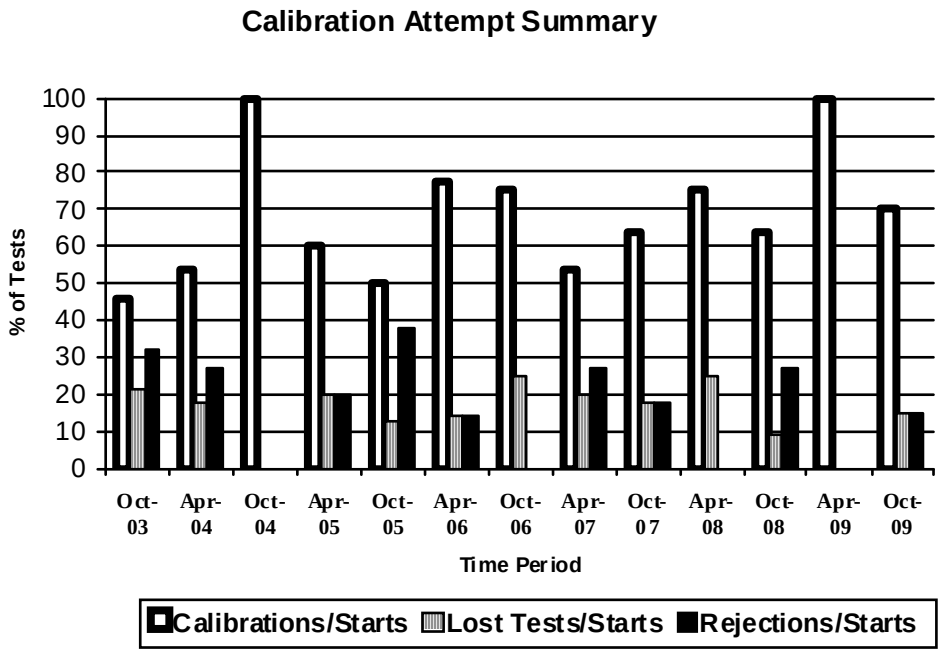
The following chart shows the laboratory/stand distribution:



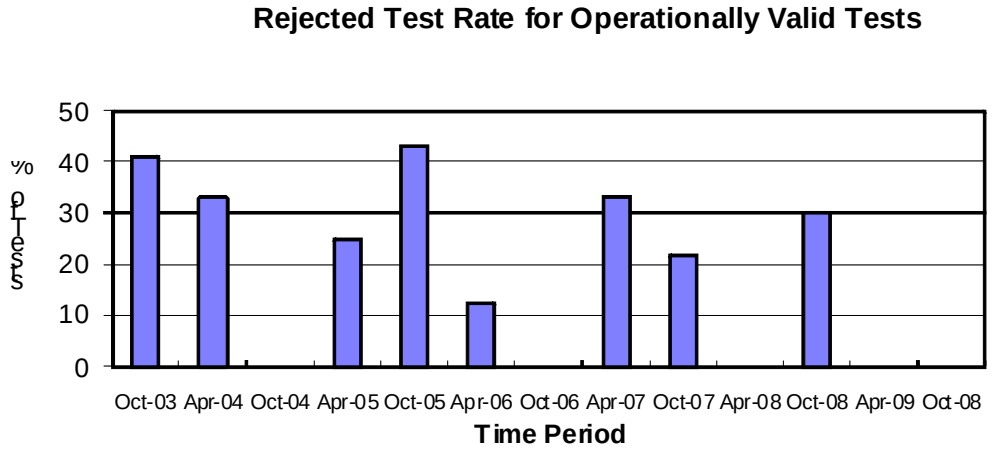
The following summarizes the status of the reference oil tests reported to the TMC:

Calibration Start Outcomes	TMC Validity Codes	No. of Tests
Operationally and Statistically Acceptable	AC	9
Aborted	XC	2
Operationally Invalid, Laboratory Determination	LC	2
Total		13

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



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



There were no rejected tests this report period.

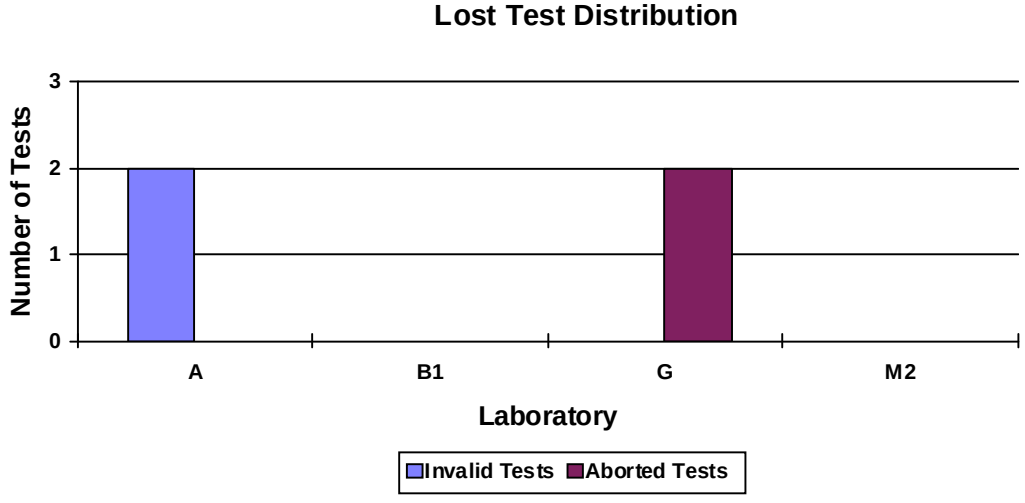
There were no LTMS Deviations written this period. There have been four deviations from the LTMS since its introduction in June of 2000.

One lab visit was performed this period. No discrepancies were noted during this visit.

Lost Test Summary

Four 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)
G	Loss of oil, high consumption	2	0/0/2/0
A	Excessive cam bearing wear. Potential build problem	1	1/0/0/0
	Lost test data, stand computer hard drive failed	1	1/0/0/0



Information Letters

Sequence IIIF Information letter 09-1 No. 28, was issued during the period on September 1, 2009. The subject of this information can be found in the industry timeline, Figure 13.

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, 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	-0.504	0.032 (df=7)	237% Viscosity Increase[1]
APV	1.203	0.199 (df=7)	0.24 Merits
WPD	-0.731	0.590 (df=7)	-0.43 Merits
PV60[2]	0.912	0.295 (df=7)	92.0 % 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	-0.0766	0.758	-0.854	0.348
B1	0.0256	1.662	-1.108	0.023
G	-1.577	1.383	-1.112	2.282
M2	-1.130	1.704	1.272	2.211

Percent Viscosity Increase (PVIS)

The industry severity control charts started the period in control, but ended the period with a warning alarm. Industry performance was severe for the period, with an average Δ/s value of -0.504 for the period (see Figures 1 & 5), which equates to a shift of 237 % in reported units. The precision chart was in control for the period, and has degraded with respect to the previous period (see Figure 9).

Weighted Piston Deposits (WPD)

With the exception of one test, severity control charts were in warning or action alarm the entire period (see Figure 2). Industry was -0.43 merits severe for the period with an average Δ/s value of -0.731 (see Figure 6). Industry precision chart was in control for the period. Precision has degraded with respect to the previous period with a standard deviation of 0.590 (see Figure 10).

Average Piston Skirt Varnish (APV)

Industry severity has been in warning or action alarm the entire period (see Figure 3). Industry precision was in control for the period. Industry was mild for the period with an average Δ/s value of 1.201 or 0.24 merits (see Figure 7). Precision for the period has degraded when compared with the previous period with a pooled standard deviation of 0.199 (see Figure 11).

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

No failing results for ACLW/SACLW were reported this period.

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 IIIF test and is used only in Sequence IIIFHD 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 IIIF Surveillance Panel. A review of Figure 4 shows that severity began the period in control, but was in action or warning alarm for most of the period. Precision was in control for 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

Sequence IIIF Valve Springs OHT3F-059-5/Batch Code 7 were found to exceed the specification for squareness, and this material will be scrapped and replaced. Laboratories have been instructed to return these valve springs to the supplier. One laboratory experienced higher oil consumption with Batch Code 4 intake and Batch Code 3 exhaust valve seals. The CPD had material and dimensional properties of these batches verified and all parameters were found to be in specification.

Reference Oils

Oil	TMC Inventory, in gallons	TMC Inventory, in tests (4 gal/test)	Laboratory Inventory, in tests	Estimated life
1006-2	4,050	1012	3	~3+ years[1]
1008-1	1100	275	4	~3+ years[1]
433-1	423	105	5	~3+ years

[1] Multiple test area reference oil; total TMC inventory shown

REG/reg

Attachments

c: J. A. Clark, TMC
F. M. Farber, TMC
Sequence IIIF Surveillance Panel
ftp://ftp.astmtmc.cmu.edu/docs/gas/sequenceiii/semiannualreports/IIIF-10-2009.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 IIIF Timeline.

Figure 1

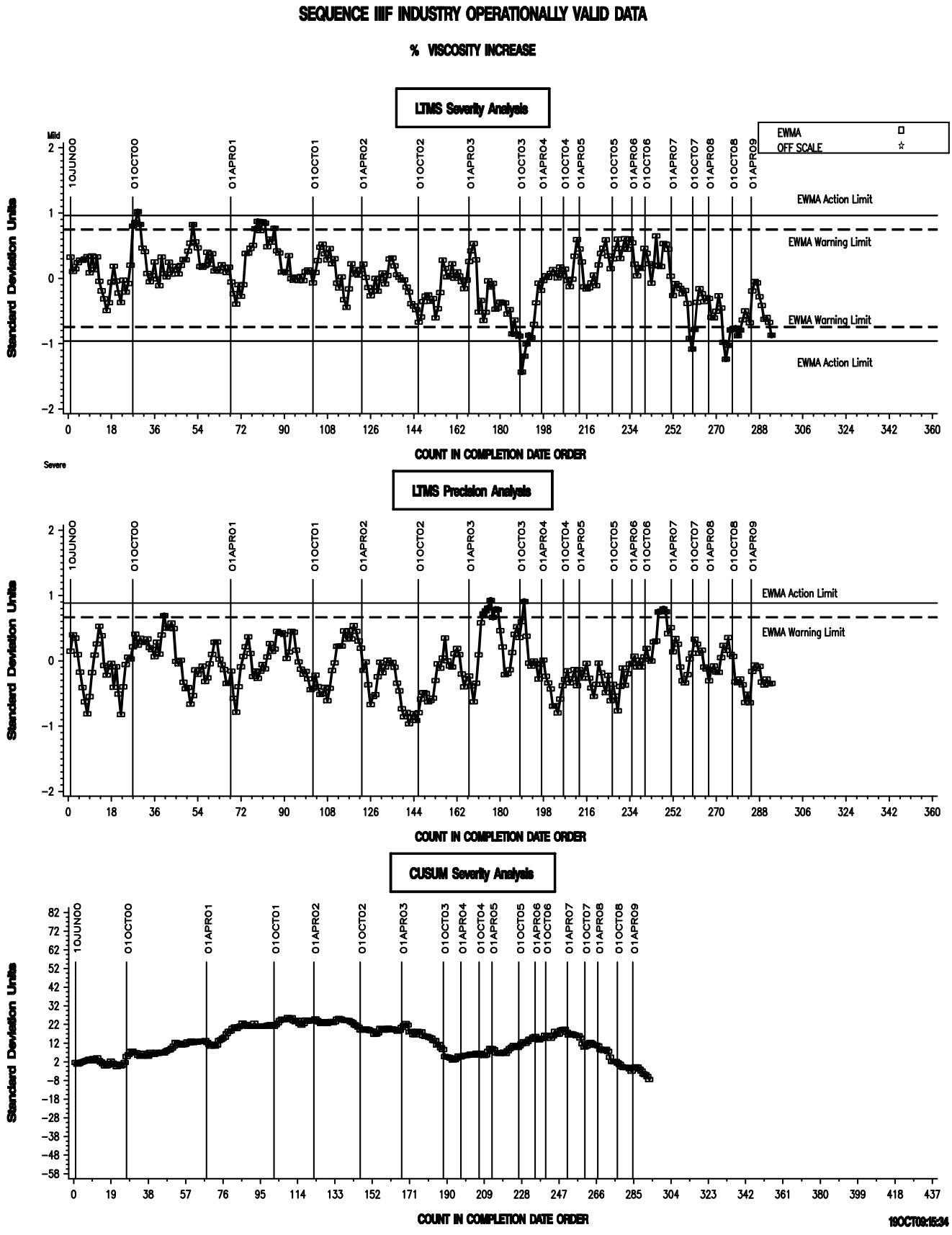

SEQUENCE IIIF INDUSTRY OPERATIONALLY VALID DATA
% VISCOSITY INCREASE
LTMS Severity Analysis
Mild
Standard Deviation Units
EWMA
OFF SCALE
EWMA Action Limit
EWMA Warning Limit
EWMA Warning Limit
EWMA Action Limit
10JUN00
01OCT00
01APR01
01OCT01
01APR02
01OCT02
01APR03
01OCT03
01APR04
01OCT04
01APR05
01OCT05
01APR06
01OCT06
01APR07
01OCT07
01APR08
01OCT08
01APR09
COUNT IN COMPLETION DATE ORDER
Severe
LTMS Precision Analysis
Standard Deviation Units
EWMA Action Limit
EWMA Warning Limit
COUNT IN COMPLETION DATE ORDER
CUSUM Severity Analysis
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
19OCT09:15:34

Figure 2

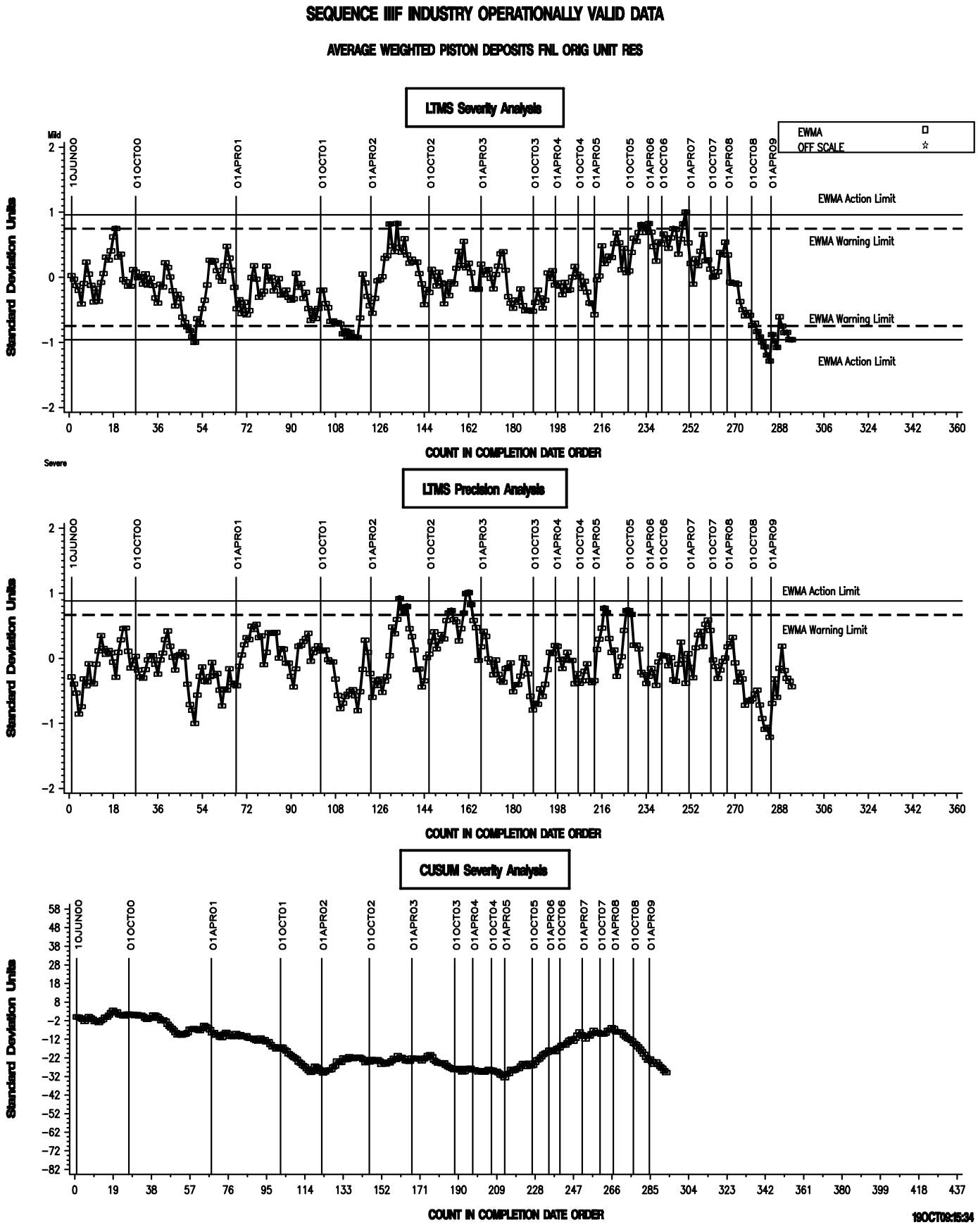

SEQUENCE IIIF INDUSTRY OPERATIONALLY VALID DATA
AVERAGE WEIGHTED PISTON DEPOSITS FNL ORIG UNIT RES
LTMS Severity Analysis
Mild
EWMA
OFF SCALE
EWMA Action Limit
EWMA Warning Limit
EWMA Warning Limit
EWMA Action Limit
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
Severe
LTMS Precision Analysis
CUSUM Severity Analysis
10JUN00
01OCT00
01APR01
01OCT01
01APR02
01OCT02
01APR03
01OCT03
01APR04
01OCT04
01APR05
01OCT05
01APR06
01OCT06
01APR07
01OCT07
01APR08
01OCT08
01APR09
19OCT09:15:34

Figure 3

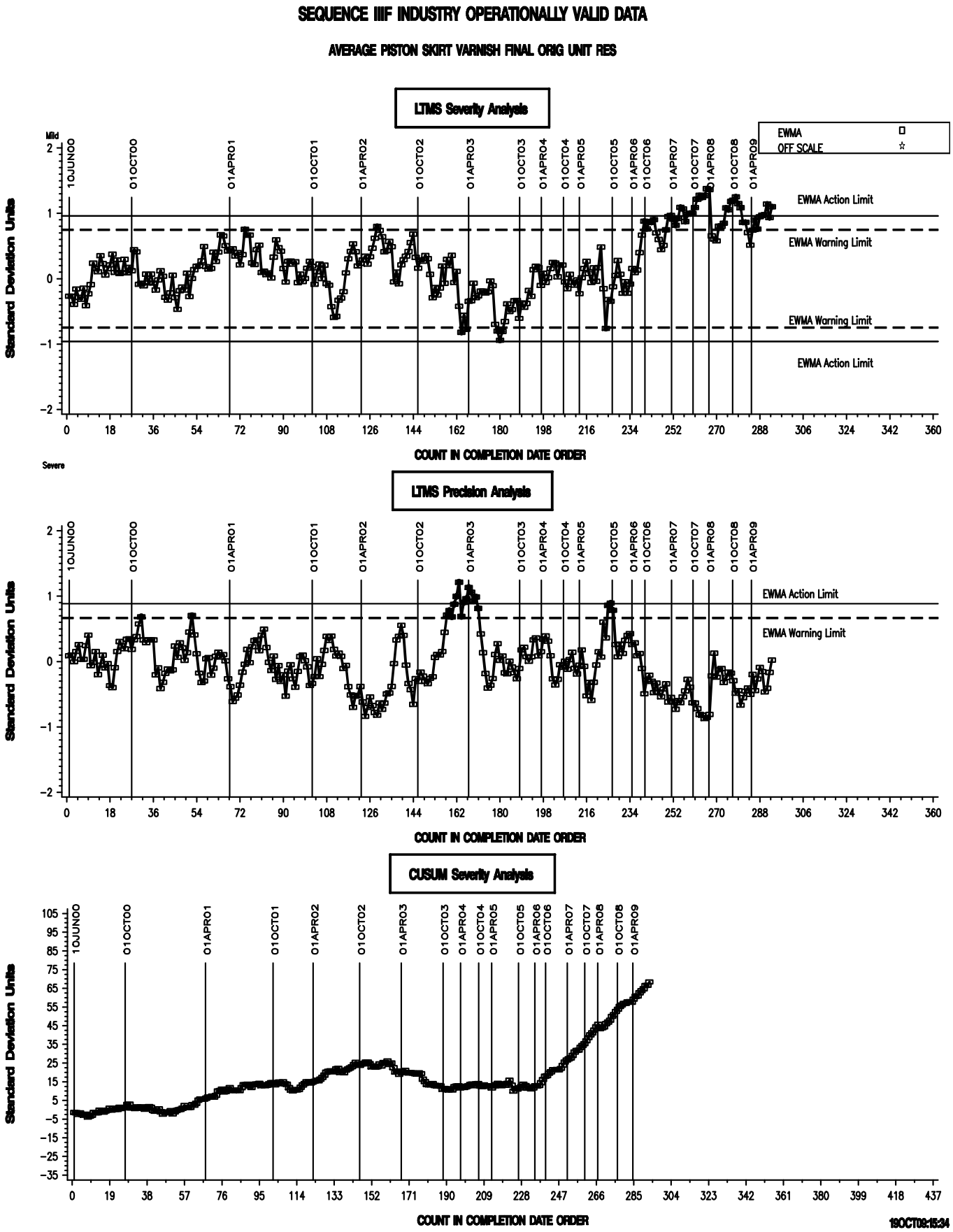

SEQUENCE IIIF INDUSTRY OPERATIONALLY VALID DATA
AVERAGE PISTON SKIRT VARNISH FINAL ORIG UNIT RES
LTMS Severity Analysis
Mild
Standard Deviation Units
EWMA
OFF SCALE
EWMA Action Limit
EWMA Warning Limit
EWMA Warning Limit
EWMA Action Limit
10JUN00
01OCT00
01APR01
01OCT01
01APR02
01OCT02
01APR03
01OCT03
01APR04
01OCT04
01APR05
01OCT05
01APR06
01OCT06
01APR07
01OCT07
01APR08
01OCT08
01APR09
COUNT IN COMPLETION DATE ORDER
Severe
LTMS Precision Analysis
Standard Deviation Units
EWMA Action Limit
EWMA Warning Limit
COUNT IN COMPLETION DATE ORDER
CUSUM Severity Analysis
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
19OCT09:15:34

Figure 4

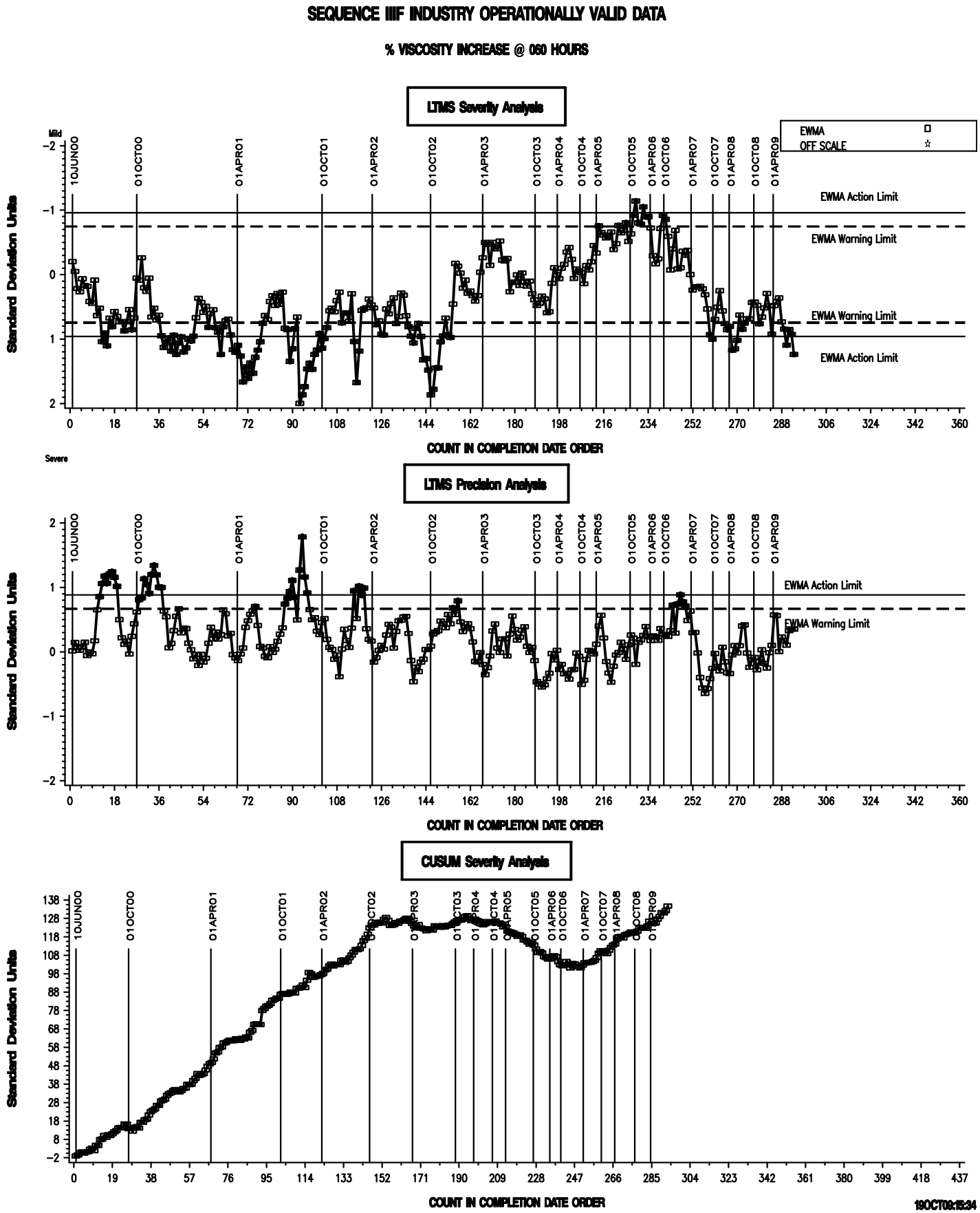

SEQUENCE IIIF INDUSTRY OPERATIONALLY VALID DATA
% VISCOSITY INCREASE @ 060 HOURS
LTMS Severity Analysis
Mild
EWMA
OFF SCALE
EWMA Action Limit
EWMA Warning Limit
EWMA Warning Limit
EWMA Action Limit
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
Severe
LTMS Precision Analysis
EWMA Action Limit
EWMA Warning Limit
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
CUSUM Severity Analysis
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
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Figure 5 - Percent Viscosity Increase, Average Delta/s

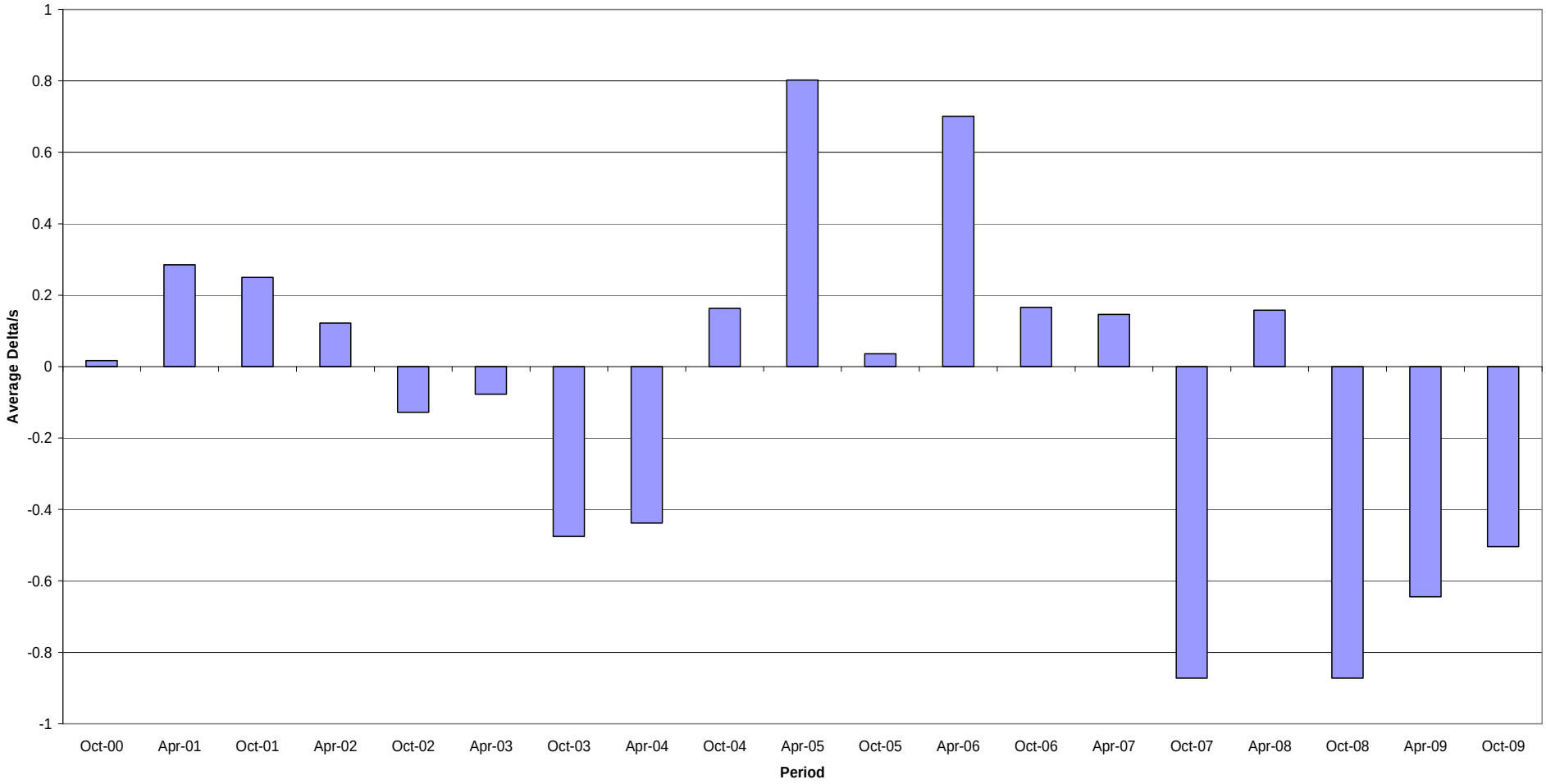

Figure 6 - Weighted Piston Deposits, Average Delta/s

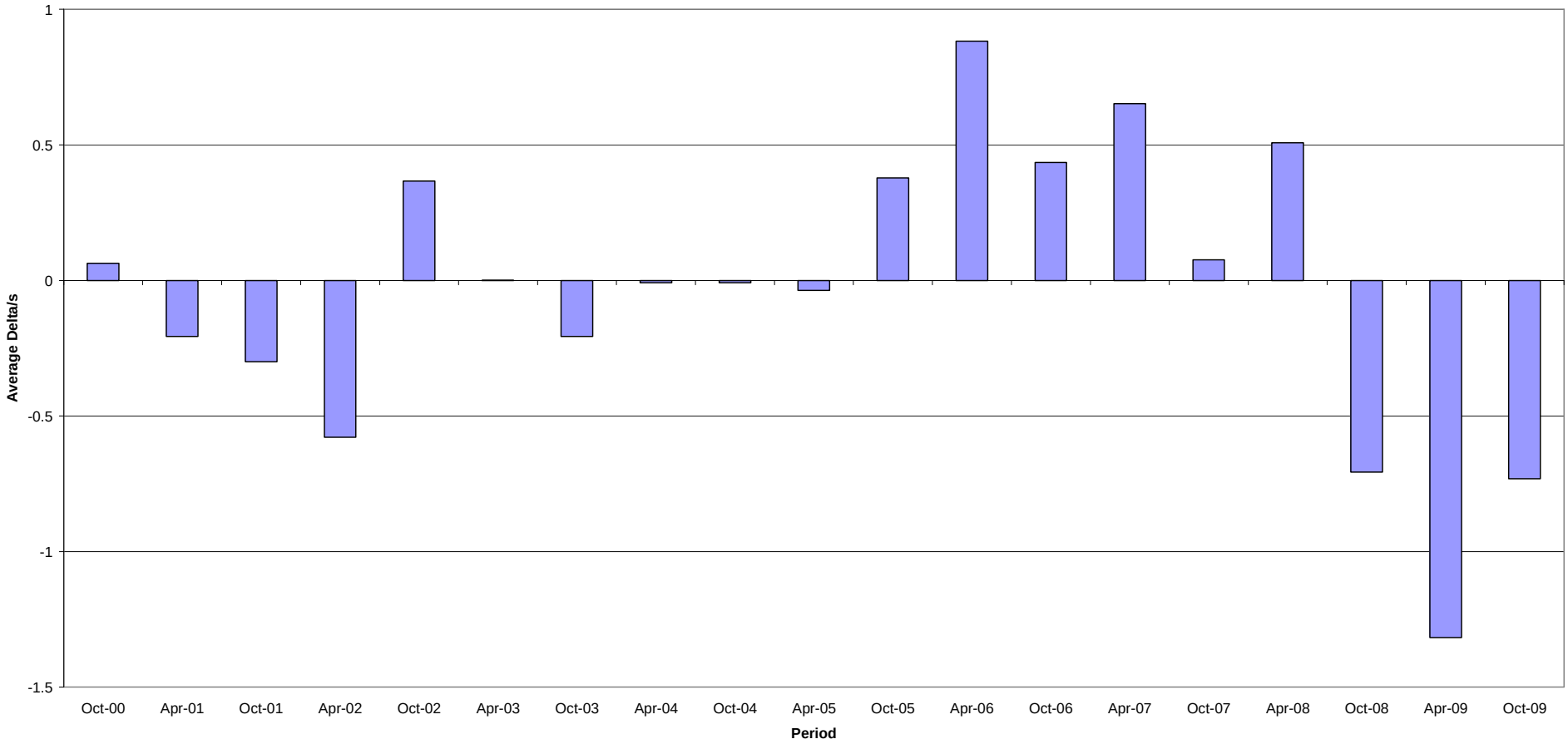

Figure 7 - Average Piston Varnish, Average Delta/s

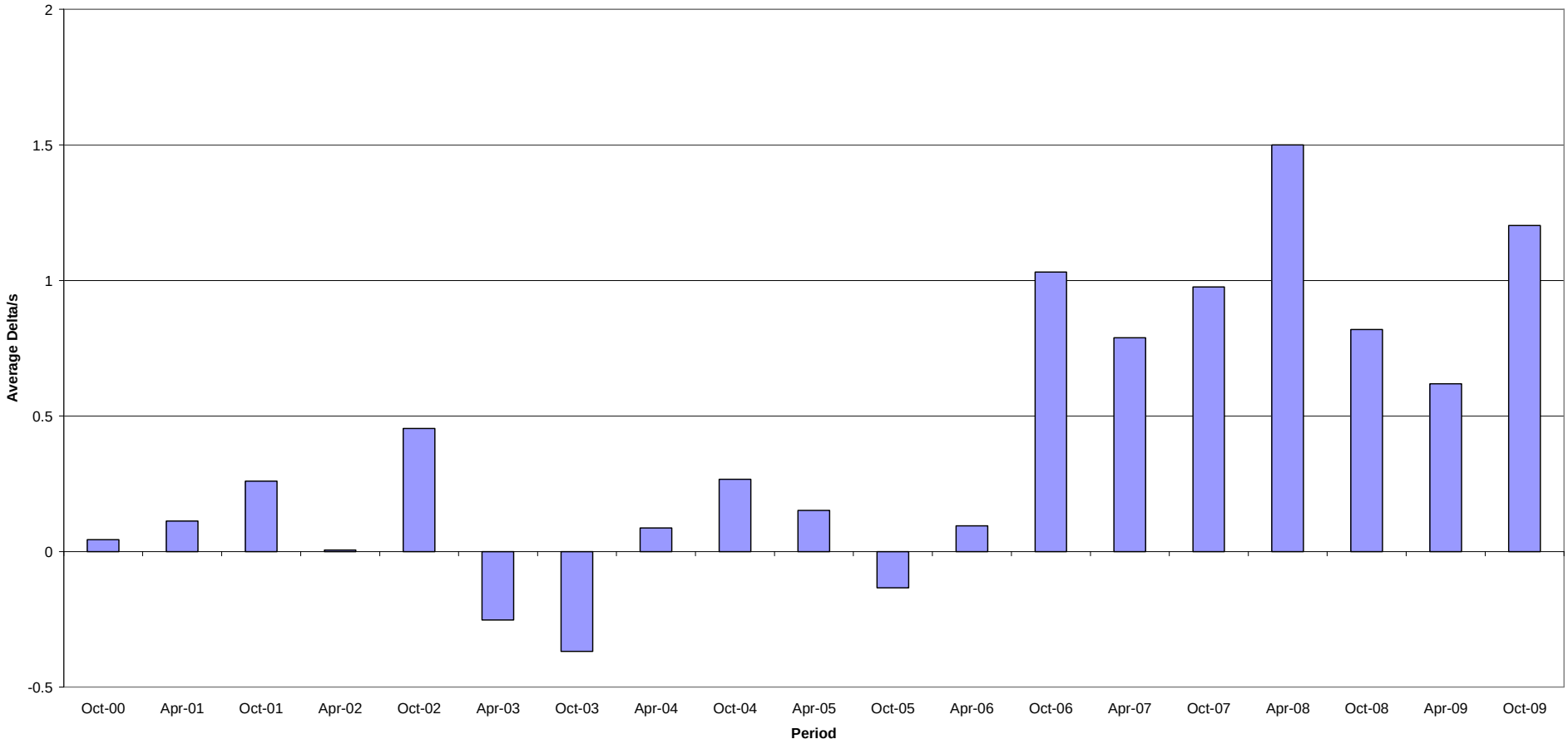

Figure 8 - Percent Viscosity Increase @ 60 Hours (Sequence IIIFHD), Average Delta/s

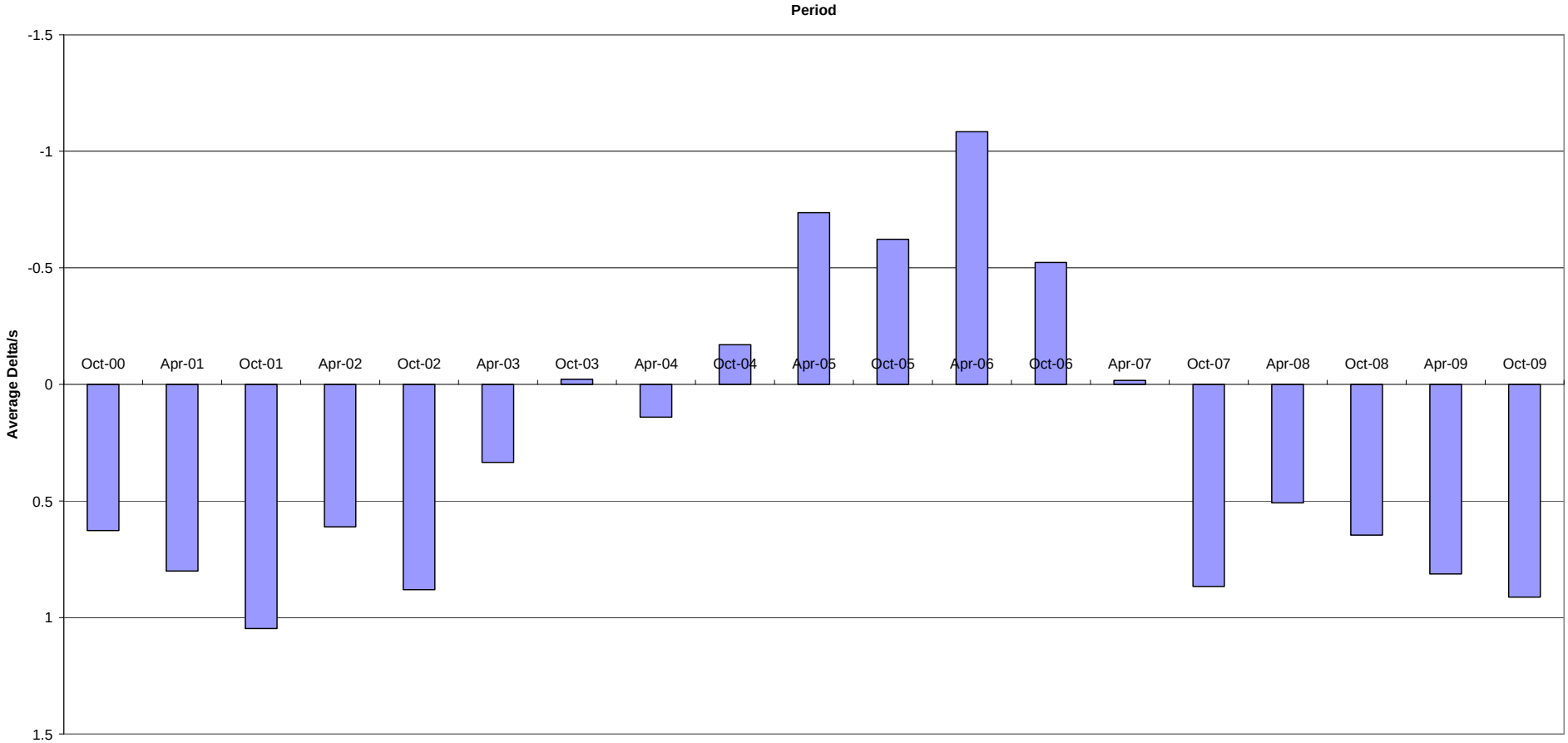

Figure 9 - Percent Viscosity Increase, Pooled Standard Deviation

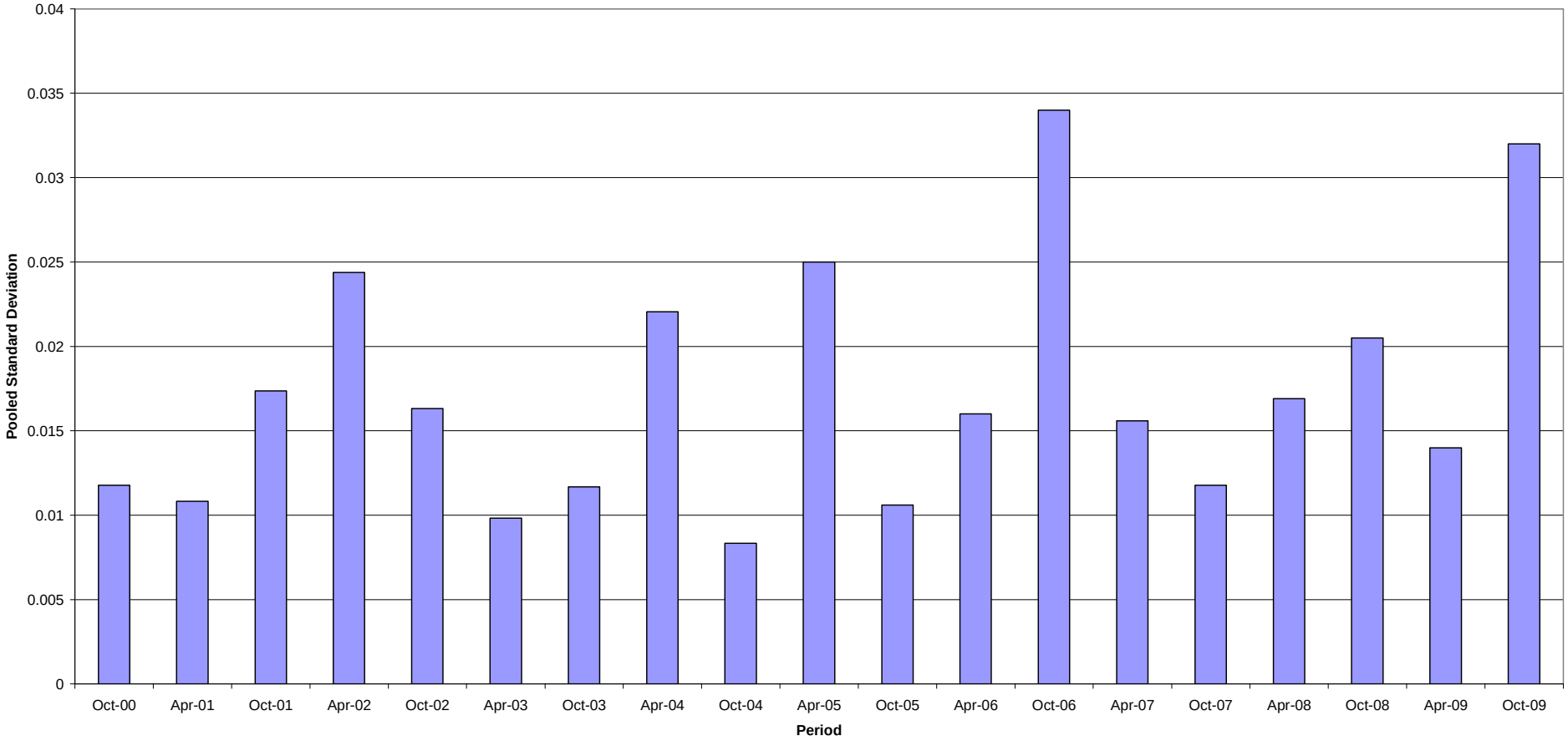

Figure 10 - Weighted Piston Deposits, Pooled Standard Deviation

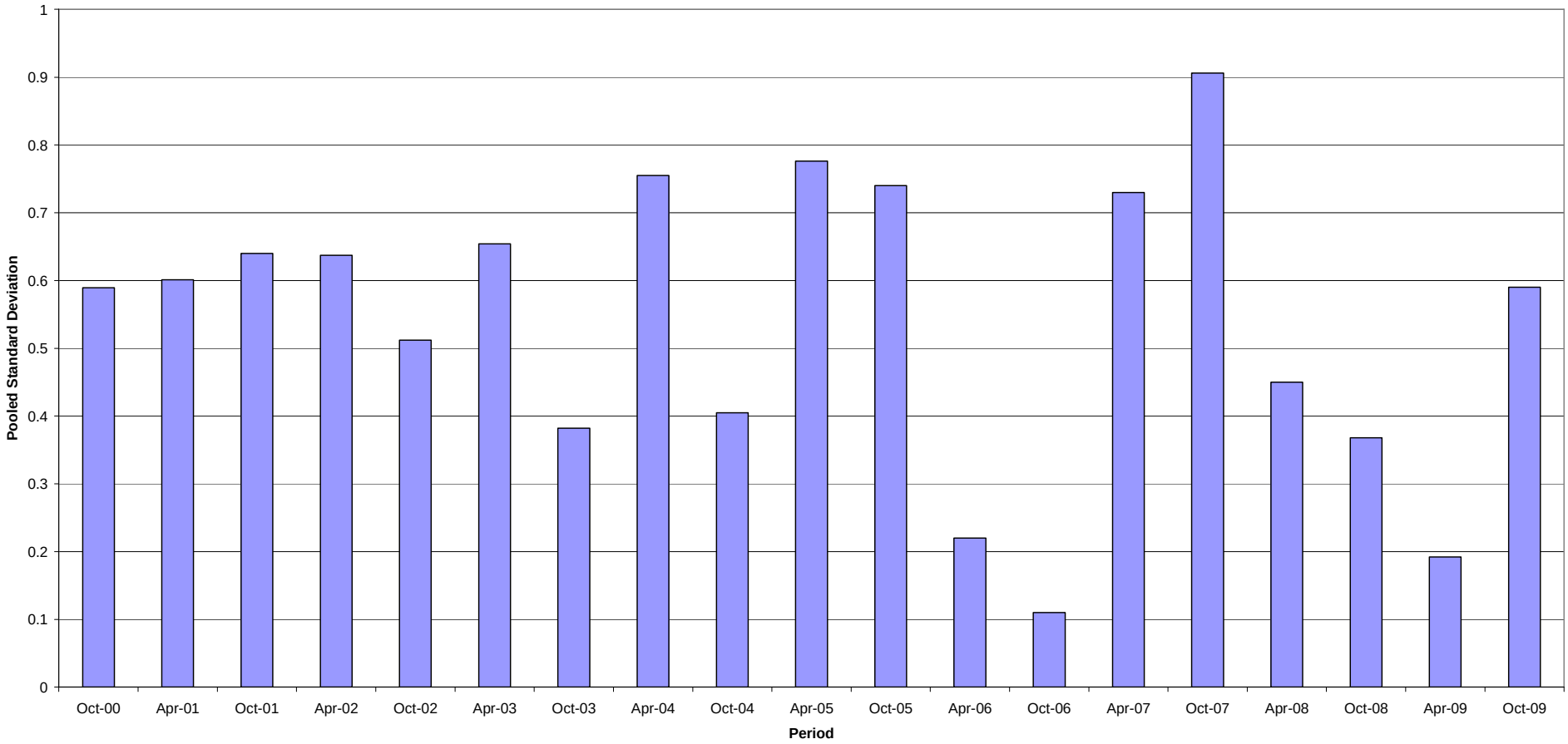

Figure 10 - Weighted Piston Deposits, Pooled Standard Deviation

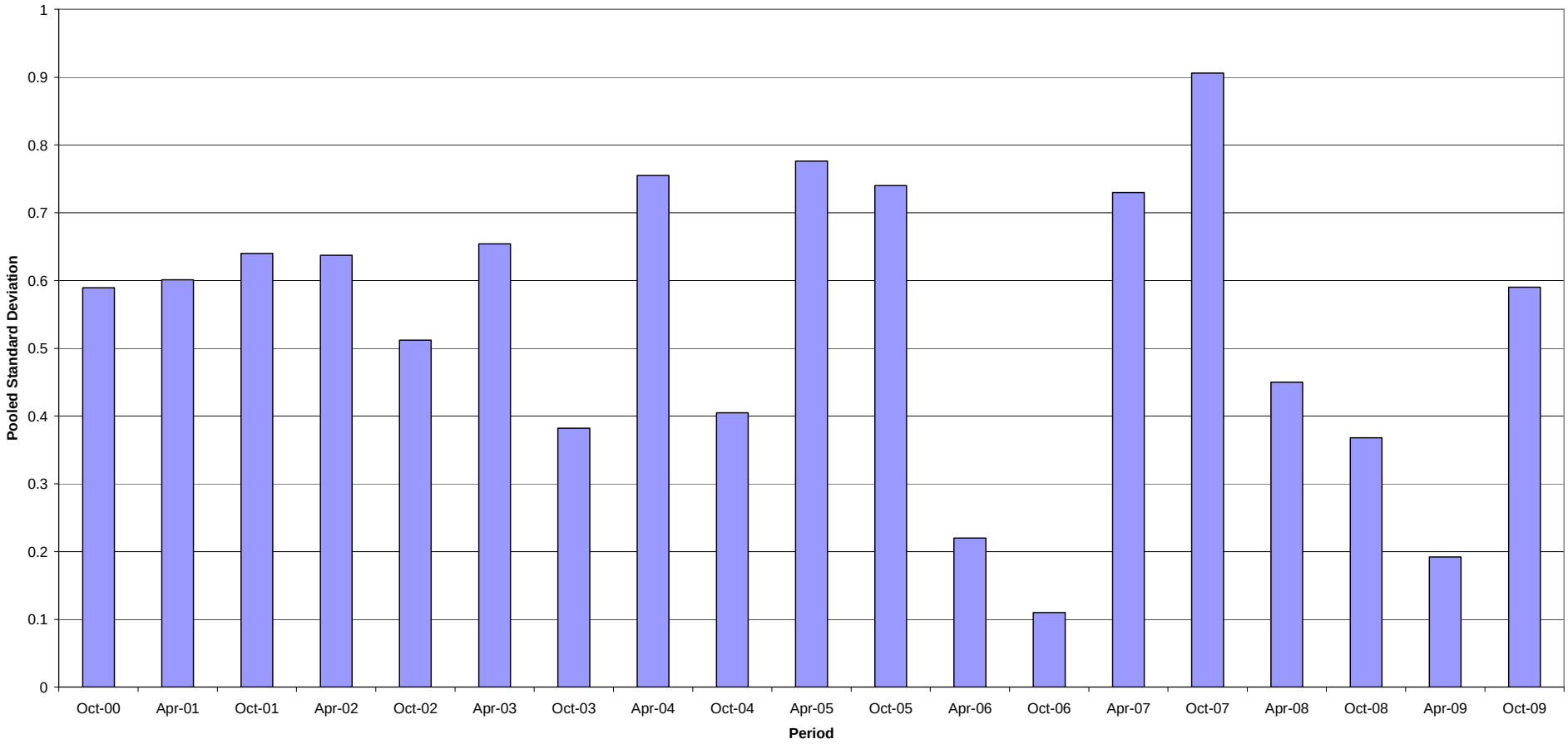

Figure 11 - Average Piston Skirt Varnish, Pooled Standard Deviation

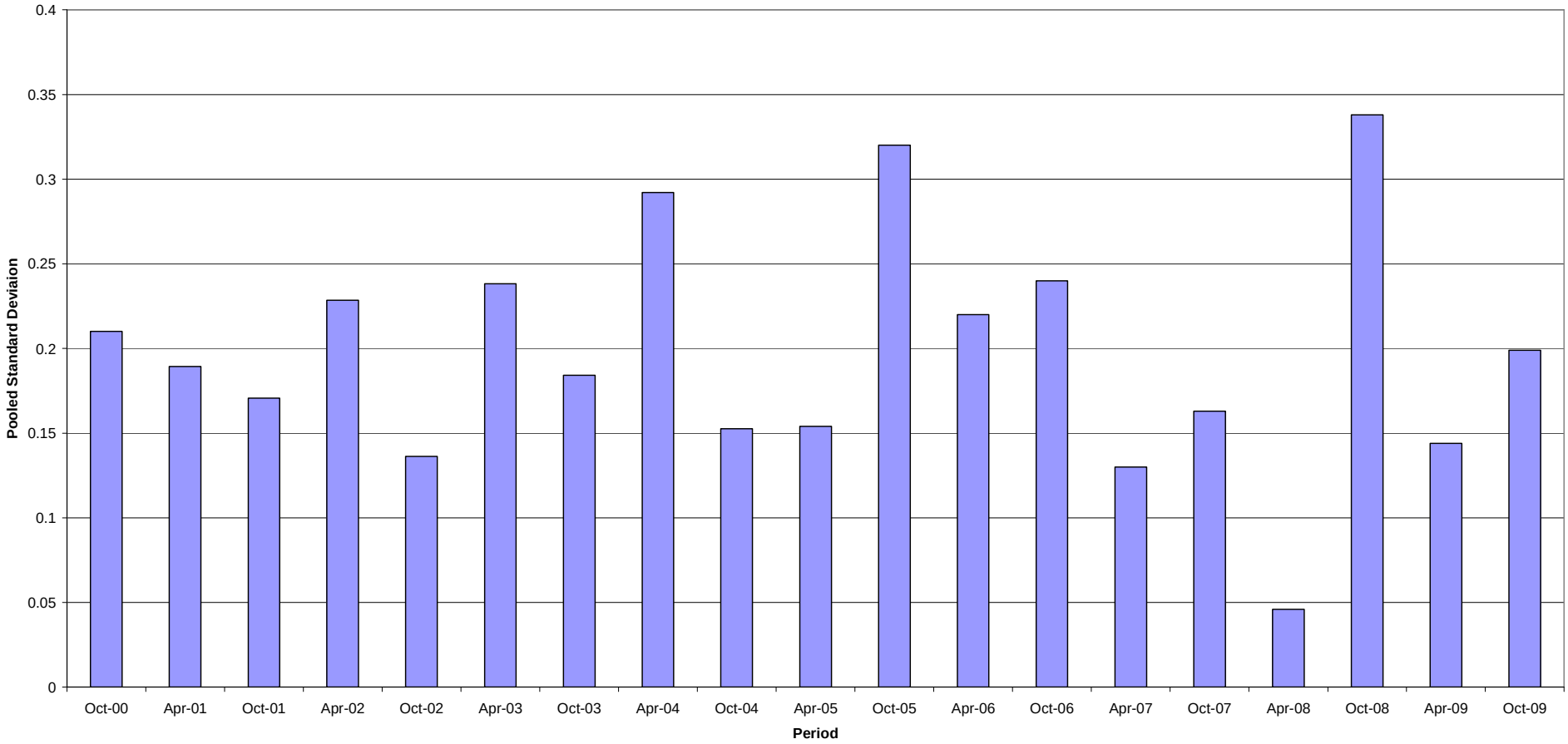

Figure 12 - Percent Viscosity Increase @ 60 Hours (Sequence IIIFHD), Pooled Standard Deviation

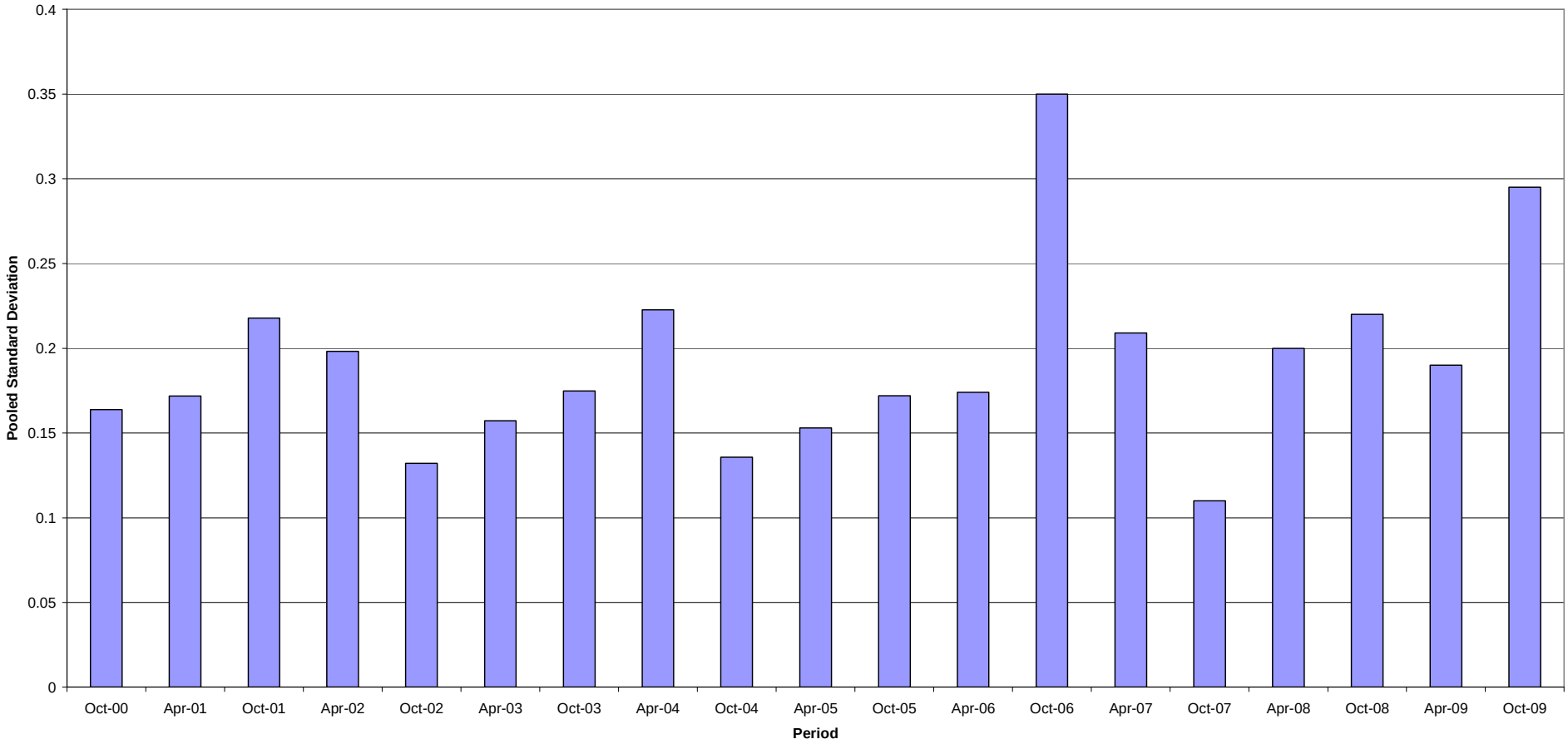

Figure 13 – Sequence IIIF Timeline

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
12/13/2007	Added substitute Rocker Cover Bushing to Test Method	07-3
12/13/2007	Change name of Rater Calibration workshop	07-3
12/13/2007	Added provisions to allow test stand to be calibrated as IIIF and IIIG	07-3
9/1/2009	Deleted requirement to send hard copy final report to TMC	09-1
10/1/2009	BC7 Valve springs to be scrapped	