


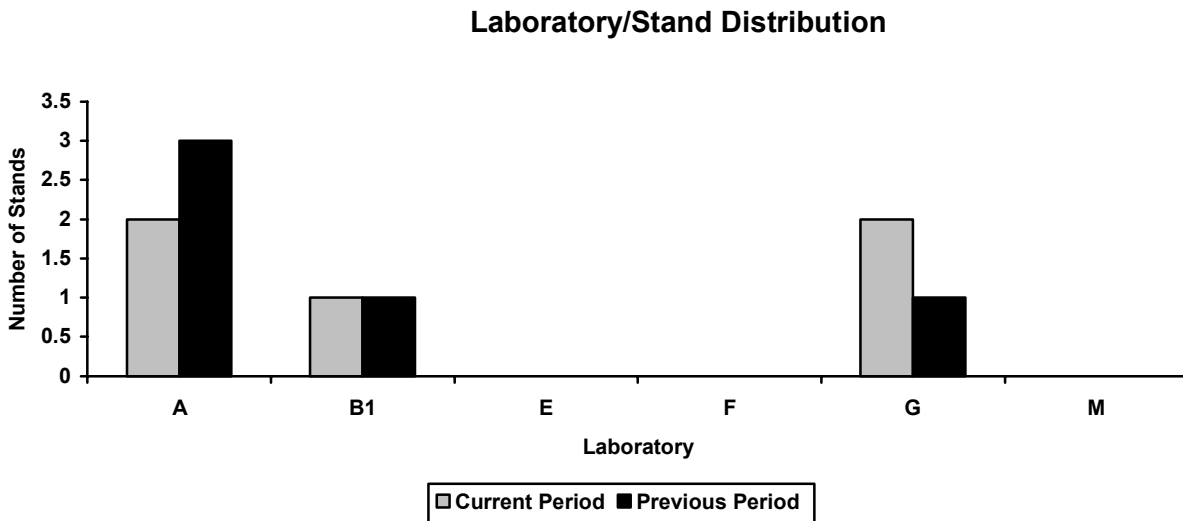
Memorandum: 05-014  
 Date: April 11, 2005  
 To: William M. Nahumck, Chairman, Sequence IIIF Surveillance Panel  
 From: Richard E. Grundza   
 Subject: Sequence IIIF Semiannual Report: October 1, 2004 through March 31, 2005

The following is a summary of Sequence IIIF reference tests that were reported to the Test Monitoring Center during the period October 1, 2004 through March 31, 2005.

Lab/Stand Distribution

	Reporting Data	Calibrated as of March 31, 2005
Number of Laboratories:	3	2
Number of Test Stands:	5	4

The following chart shows the laboratory/stand distribution:



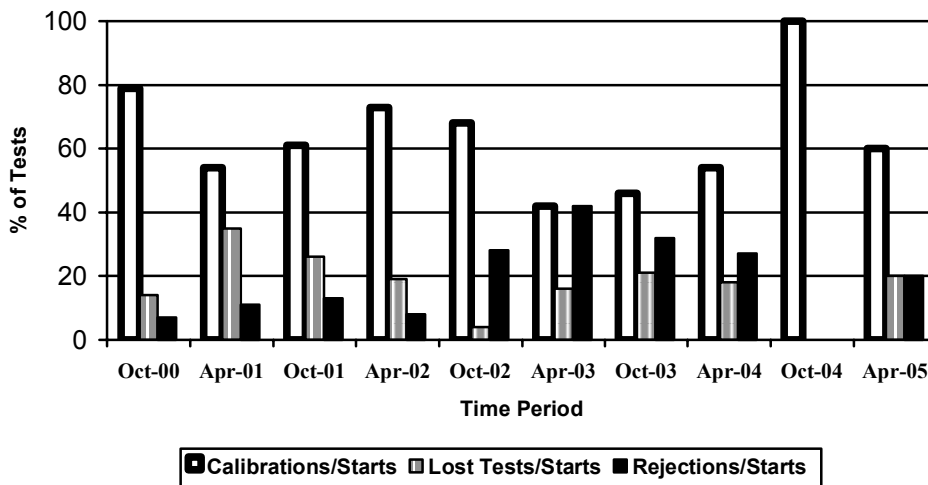
The following summarizes the status of the reference oil tests reported to the TMC:

Calibration Start Outcomes	TMC Validity Codes	No. of Tests
Operationally and Statistically Acceptable	AC	6
Failed Acceptance Criteria	OC	2
Operationally Invalid (Laboratory Judgment)	LC	1
Aborted	XC	1
Total		10

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

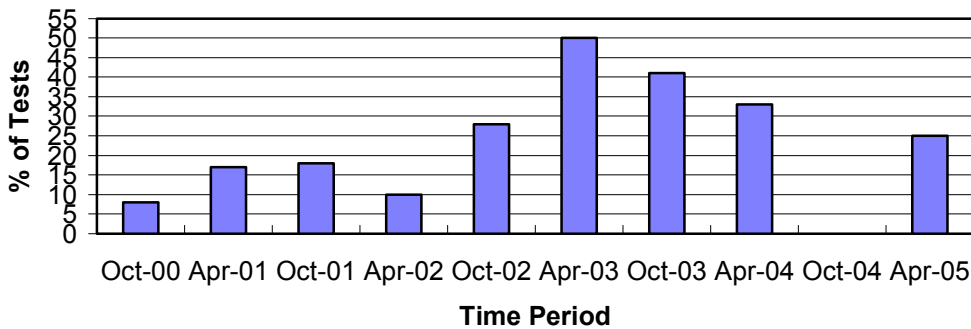
Calibrations per start, lost tests per start and rejection rates are summarized below:

### Calibration Attempt Summary



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

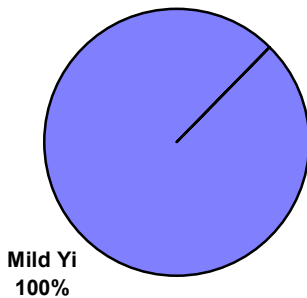
**Rejected Test Rate for Operationally Valid Tests**



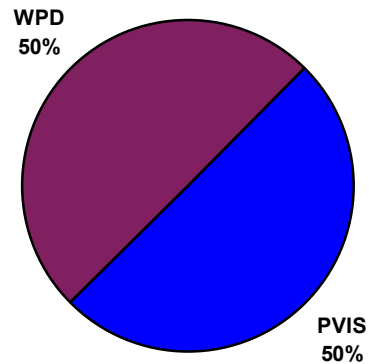
The rate of rejection of operationally valid tests has increased from last period.

Two tests failed acceptance criteria this period. The following charts summarize the reasons and breakdown by parameter for the failed test:

**Distribution of LTMS Stand Alarms**



**Distribution of Stand Alarms by Parameter**



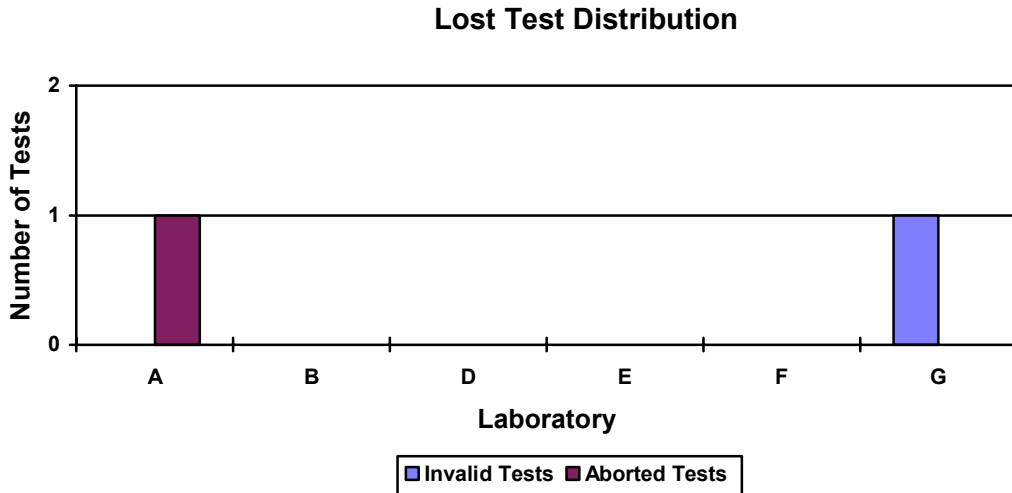
There were no LTMS Deviations written this period. There have been four deviations from the LTMS since its introduction in June of 2000.

No 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)
A	Lost Oil Charge	1	0/0/1
G	Engine Load Problems	1	1/0/0



Information Letters

Sequence IIIG Information Letter No. 04-3, Sequence No. 16 was issued during the period on November 4, 2004, and contained: Torque Specs for Powdered Metal Rods, New Front and Rear Main Seals, New Oil Pan Gasket, New Exhaust Valves, and Addressed Editorial Changes to the Precision Statements

Sequence IIIG Information Letter No. 05-1, Sequence No. 17, was issued during the period on January 7, 2005, and contained: Clarification of Solvent Specifications, Provisions for Reference Period Adjustment for Donated Oil Test Programs, Engine Build Worksheet, and Updated Precision Statements

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	0.802	0.025 (df=7)	120.1% Viscosity Increase <sup>1</sup>
APV	0.152	0.152 (df=7)	0.02 Merits
WPD	-0.037	0.776 (df=7)	-0.03 Merits
PV60 <sup>2</sup>	-0.737	0.153 (df=7)	-31.4% 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	1.10	-0.40	-0.97	-0.25
B1	0.94	1.12	1.04	-1.61
E	-	-	-	-
F	-	-	-	-
G	0.46	-0.45	-0.50	-0.19
M	-	-	-	-

#### *Percent Viscosity Increase (PVIS)*

The industry severity control charts began the period in control, but sounded a warning and two action alarms by the end of the period. The alarms occurred when results 2.839, 0.479 and 1.598  $\Delta/s$  from target were reported. The 2.839 and 0.479  $\Delta/s$  results were from the same lab and stand, and both ran reference oil 1008-1. Precision was in control for the period (see Figure 1). Industry performance was mild for the period, with an average  $\Delta/s$  value of 0.802 for the period (see Figures 1 & 5), which equates to a shift of 120.1% in reported units. Precision for the period has degraded significantly, effectively double the estimate of the previous period (see Figure 9).

#### *Weighted Piston Deposits (WPD)*

The industry was within limits on both severity and precision for the period (see Figure 2). Industry was on or near target for the period with an average  $\Delta/s$  value of -0.037, or -0.03 merits (see Figure 6). Precision for the period degraded with a pooled standard deviation of 0.776 (see Figure 10).

#### *Average Piston Skirt Varnish (APV)*

The industry was within limits on both severity and precision for the period (see Figure 3). The industry was 0.02 Merits mild for the period with an average  $\Delta/s$  value of 0.152 (see Figure 7). Precision has changed little with respect to the previous period and compares well with historical estimates (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  $\Delta/s$  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 IIIIF test and is used only in Sequence IIIIFHD 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 IIIIF Surveillance Panel. A review of Figure 4 shows that the industry began to trend severe near the end of the period, sounding two alarms.

#### 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

No significant hardware change occurred this report period

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 <sup>1</sup>
1006-2	4,719	1,179	8	~3+ years <sup>1</sup>
1007	474	118	11	Not currently used in IIIF <sup>2</sup>
1008	29	7	8	No longer shipped <sup>1</sup>
1008-1	1,584	396	9	~3+ years <sup>1</sup>
1009	834	208	12	Not currently used in IIIF <sup>1</sup>
432	118	29	12	Not currently used in IIIF
433	10	2	2	No longer shipped
433-1	475	143	11	~3+ years

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

<sup>2</sup> Not reblendable

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

REG/reg

Attachments

c: F. M. Farber, TMC

Sequence IIIF Surveillance Panel

<ftp://ftp.astmtmc.cmu.edu/docs/gas/sequenceiii/semiannualreports/IIIF-04-2005.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 IIF Timeline.

Figure 1

# SEQUENCE IIIF INDUSTRY OPERATIONALLY VALID DATA

## VISCOSITY INCREASE FINAL ORIG UNIT RES

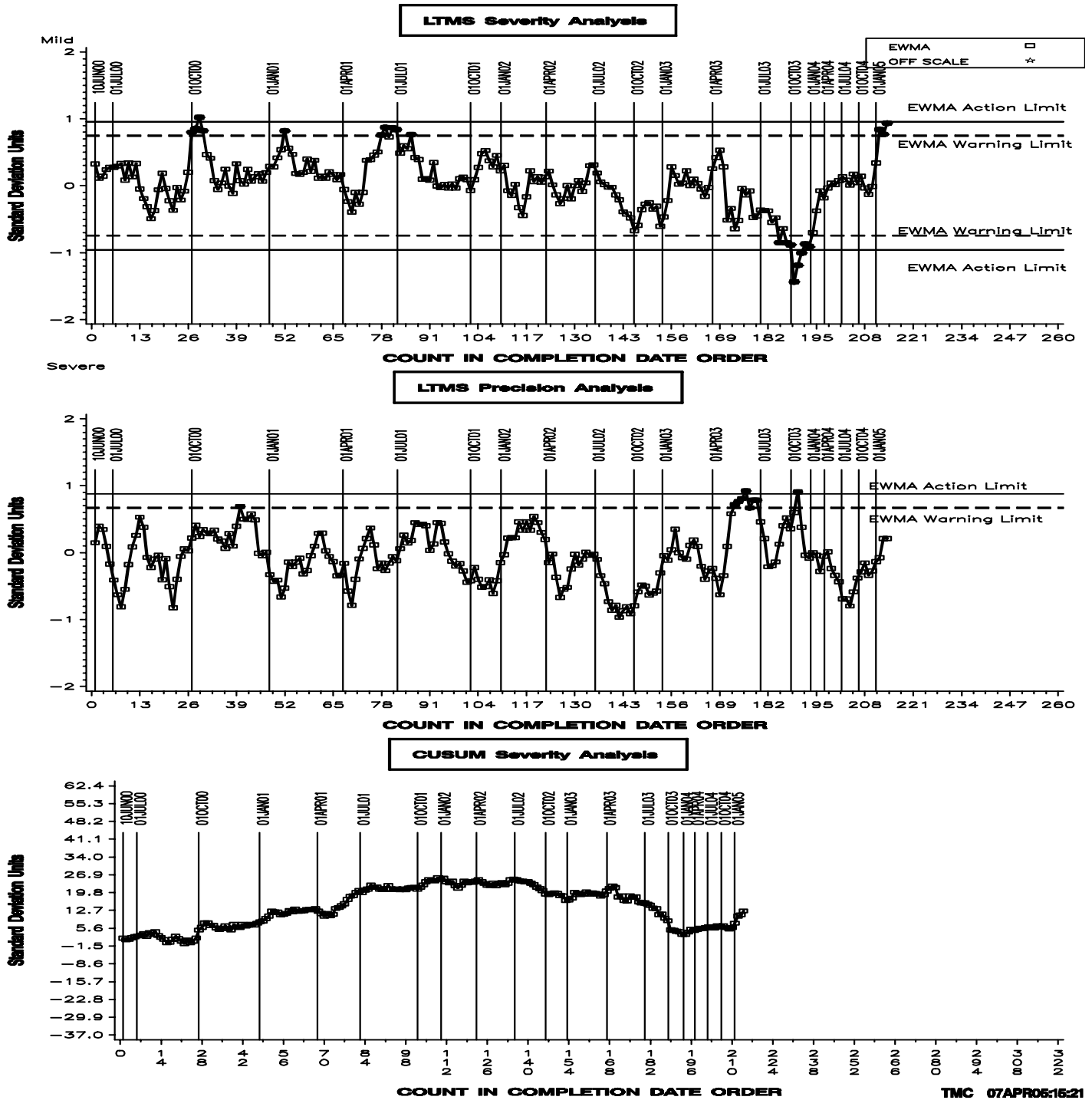




Figure 2

# SEQUENCE IIIF INDUSTRY OPERATIONALLY VALID DATA

## AVERAGE WEIGHTED PISTON DEPOSITS FNL ORIG UNIT RES

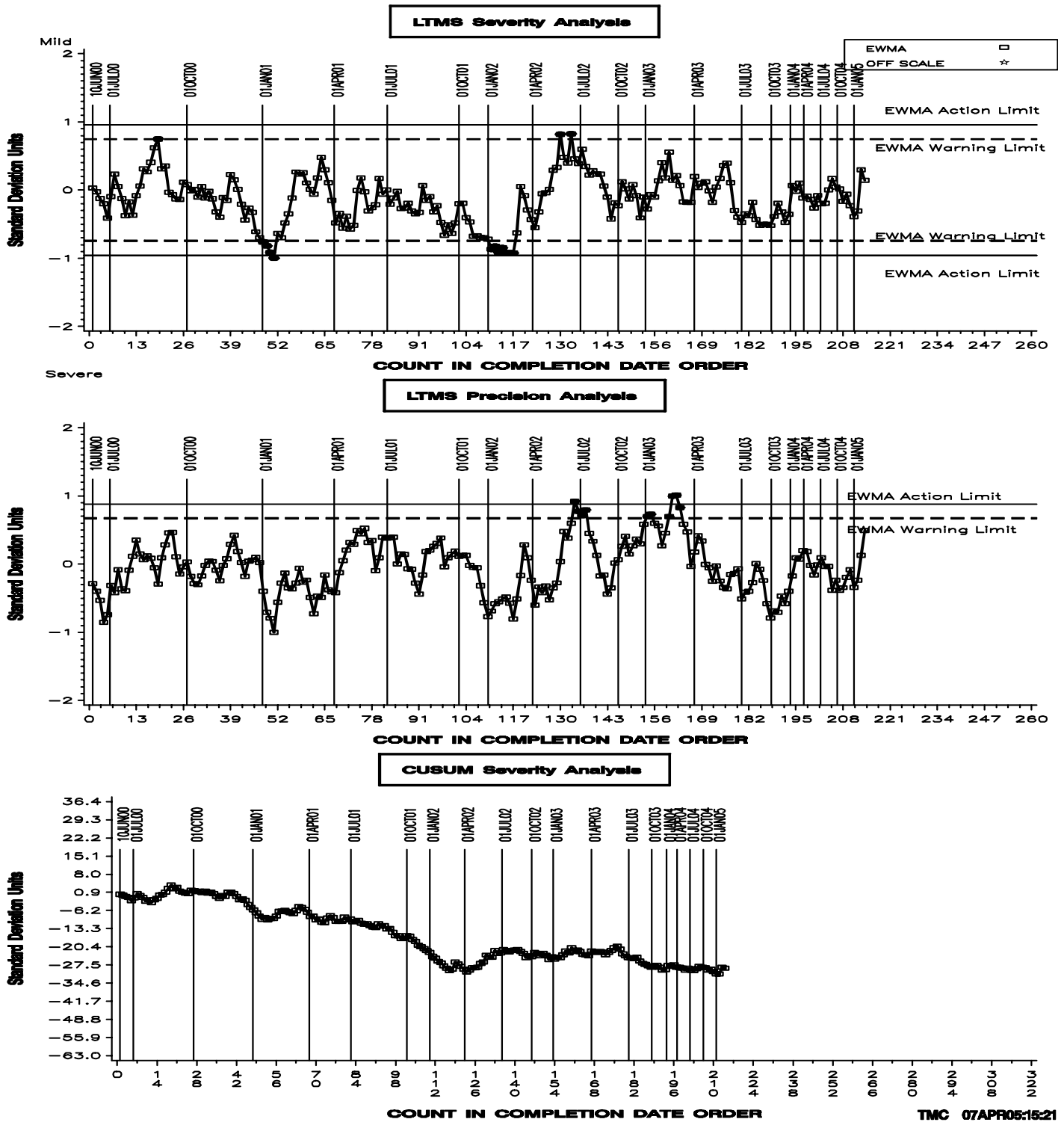


Figure 3

# SEQUENCE IIIF INDUSTRY OPERATIONALLY VALID DATA

## AVERAGE PISTON SKIRT VARNISH FINAL ORIG UNIT RES

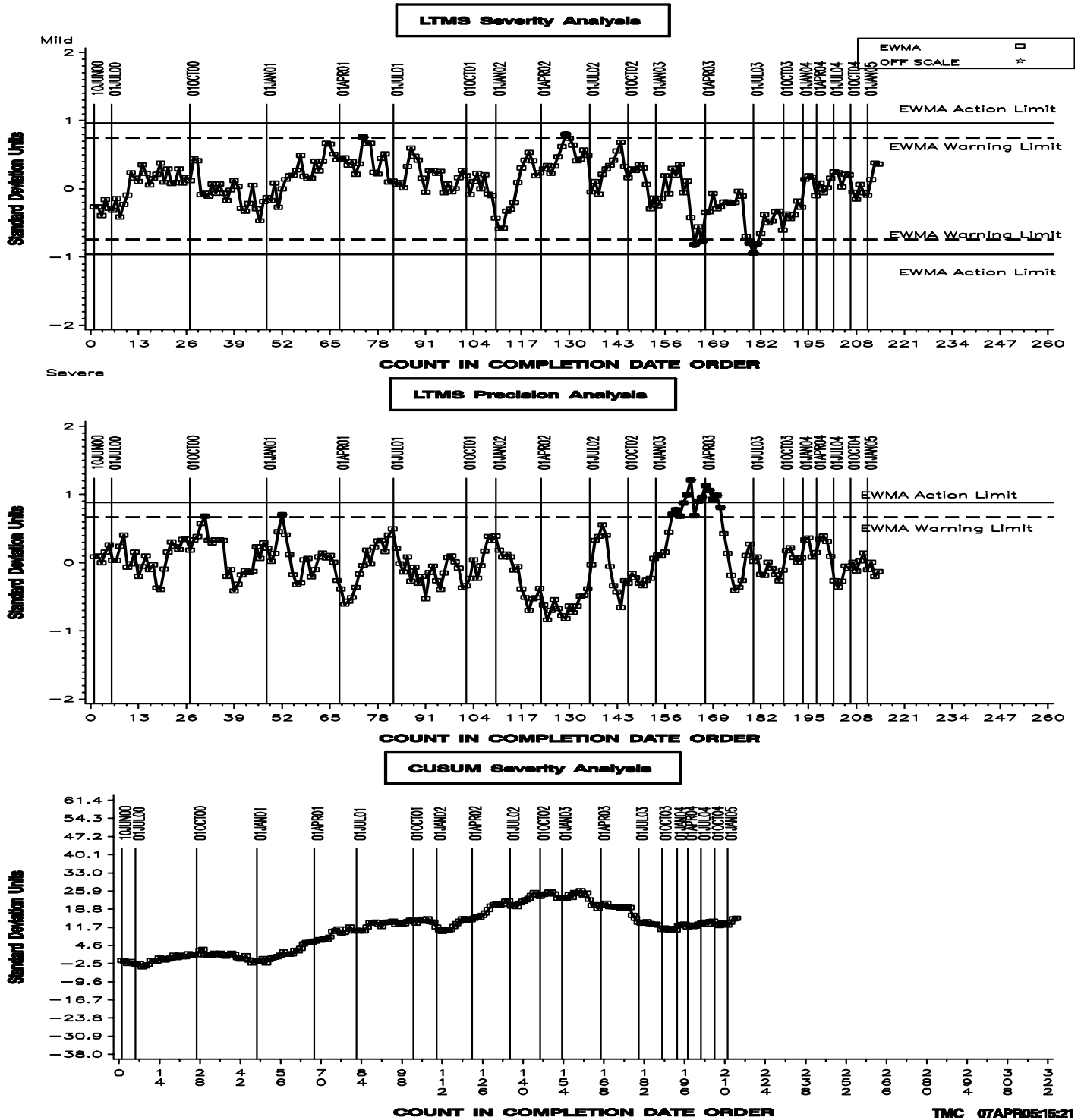


Figure 4

# SEQUENCE IIIF INDUSTRY OPERATIONALLY VALID DATA

## % VISCOSITY INCREASE @ 060 HOURS

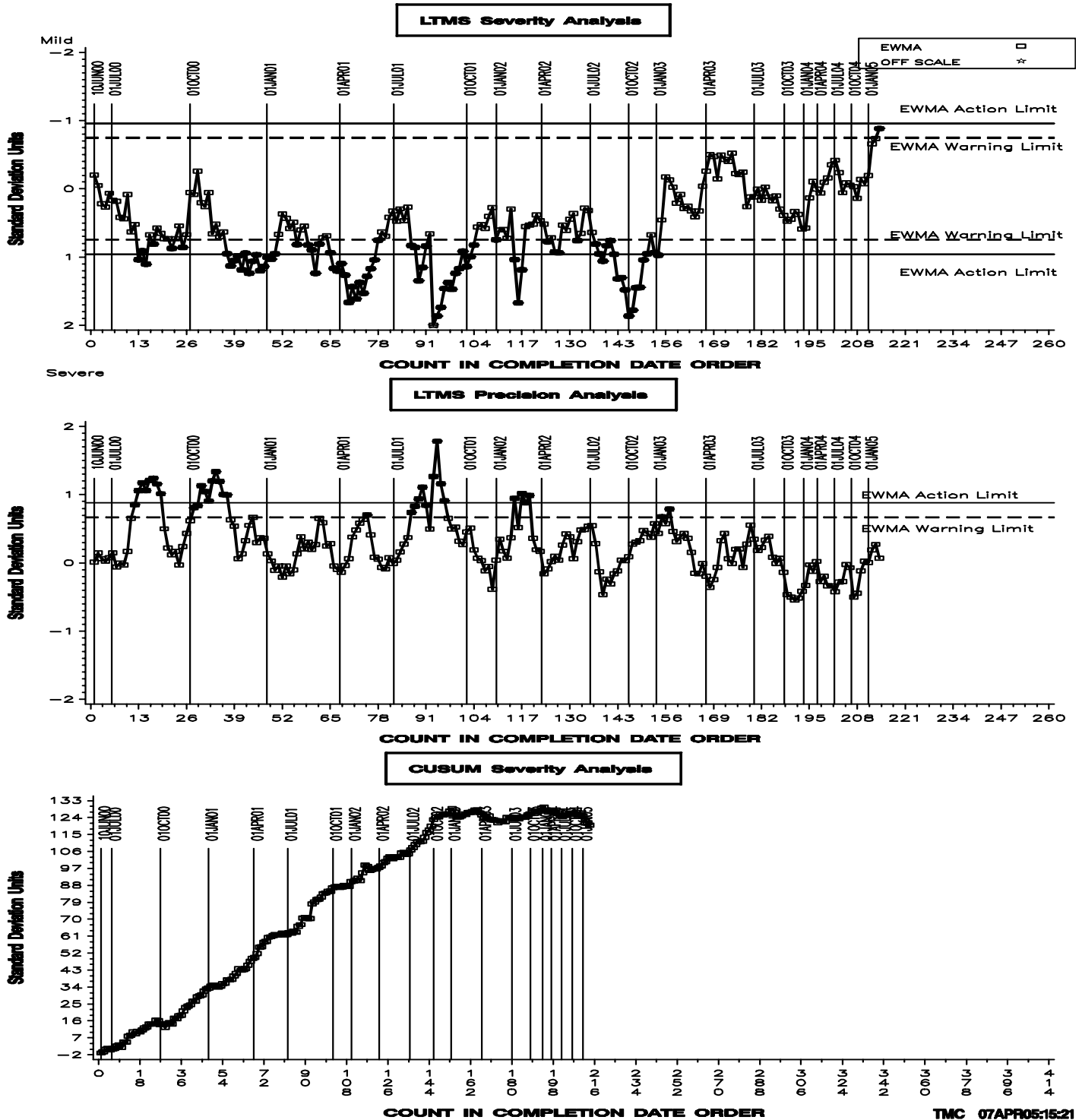


Figure 5 - Percent Viscosity Increase, Average Delta/s

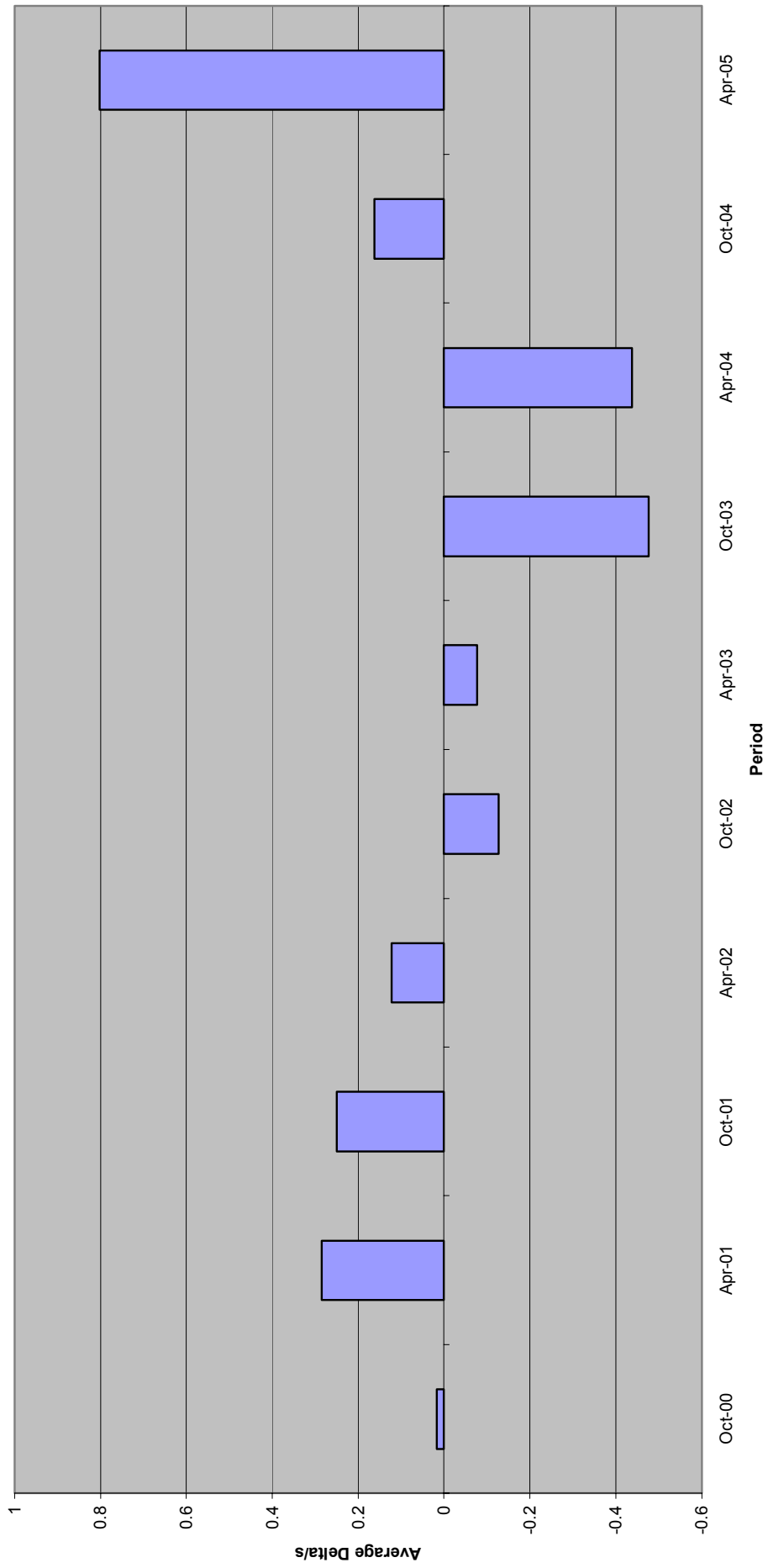


Figure 6 - Weighted Piston Deposits, Average Deltas/s

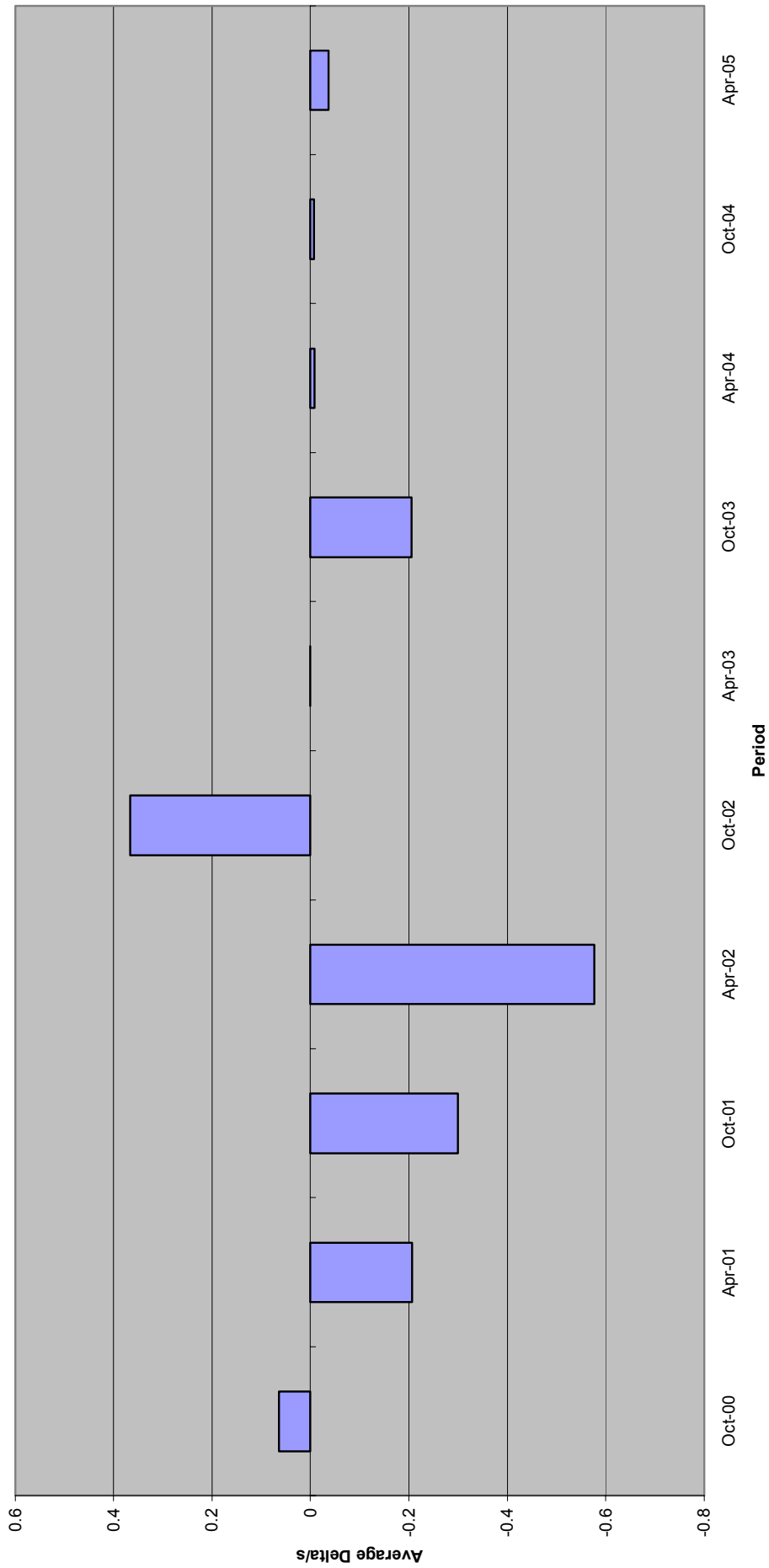


Figure 7 - Average Piston Varnish, Average Delta/s

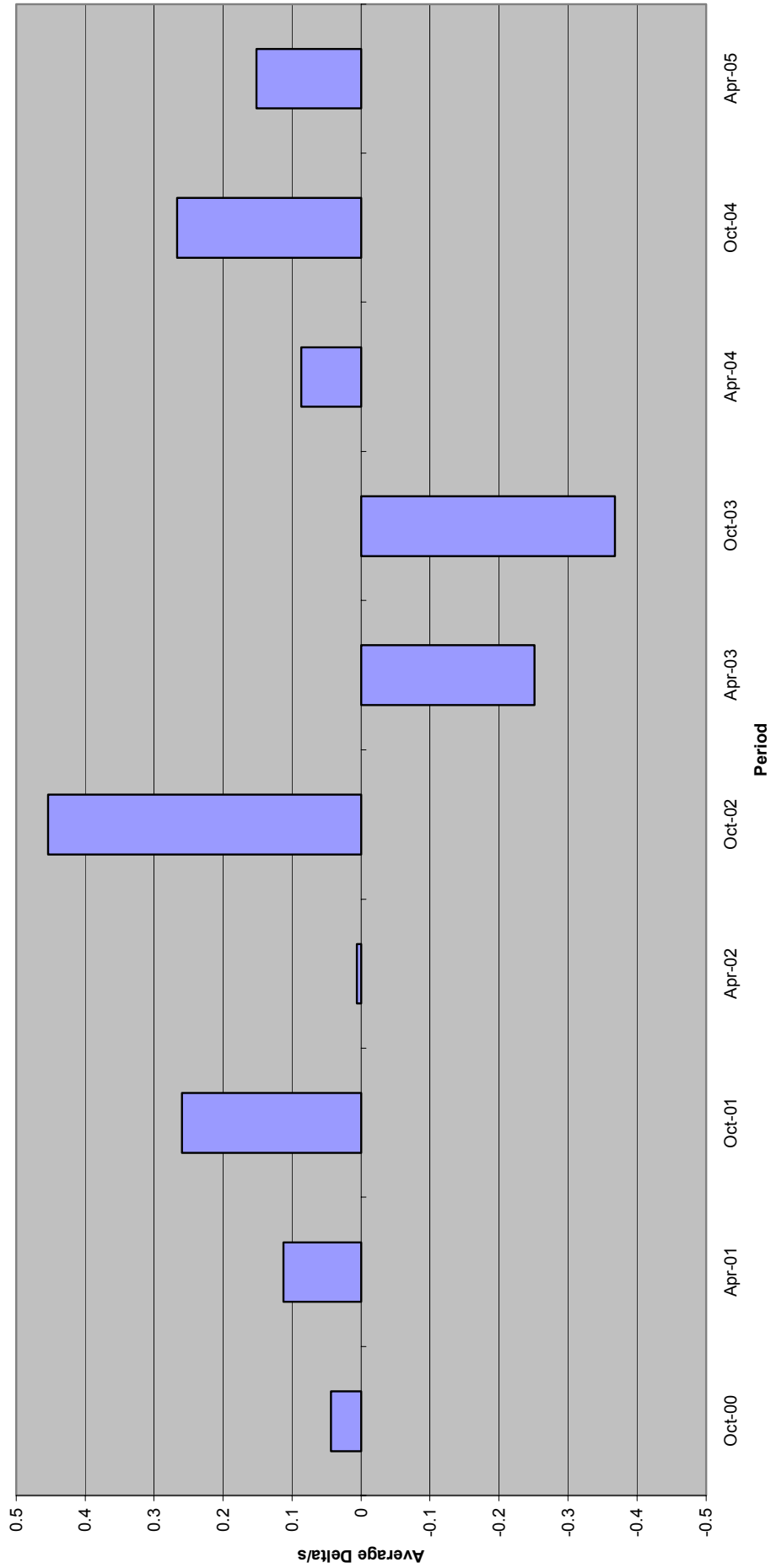


Figure 8 - Percent Viscosity Increase @ 60 Hours (Sequence IIFHD), Average Delta/s

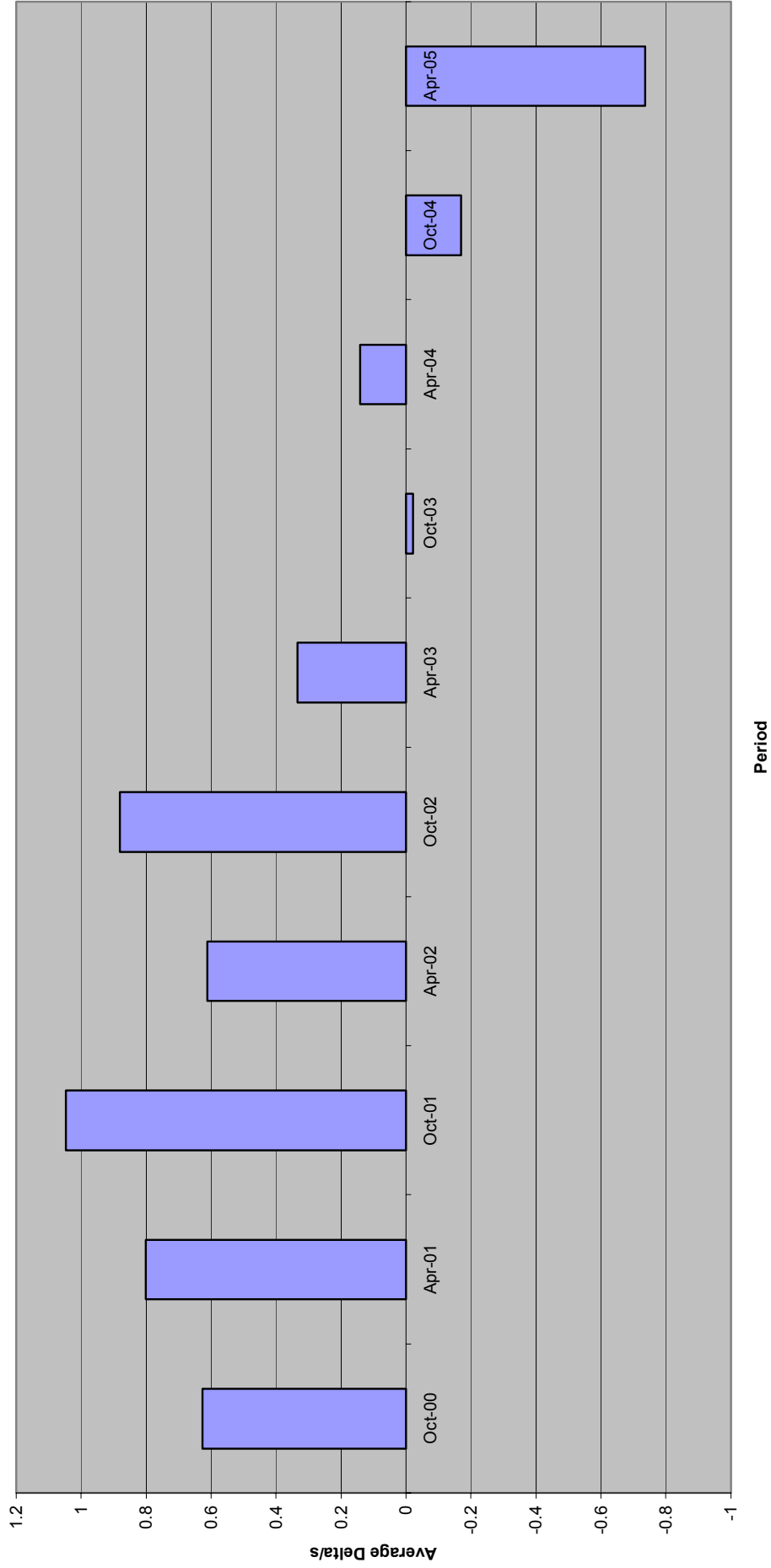


Figure 9 - Percent Viscosity Increase, Pooled Standard Deviation

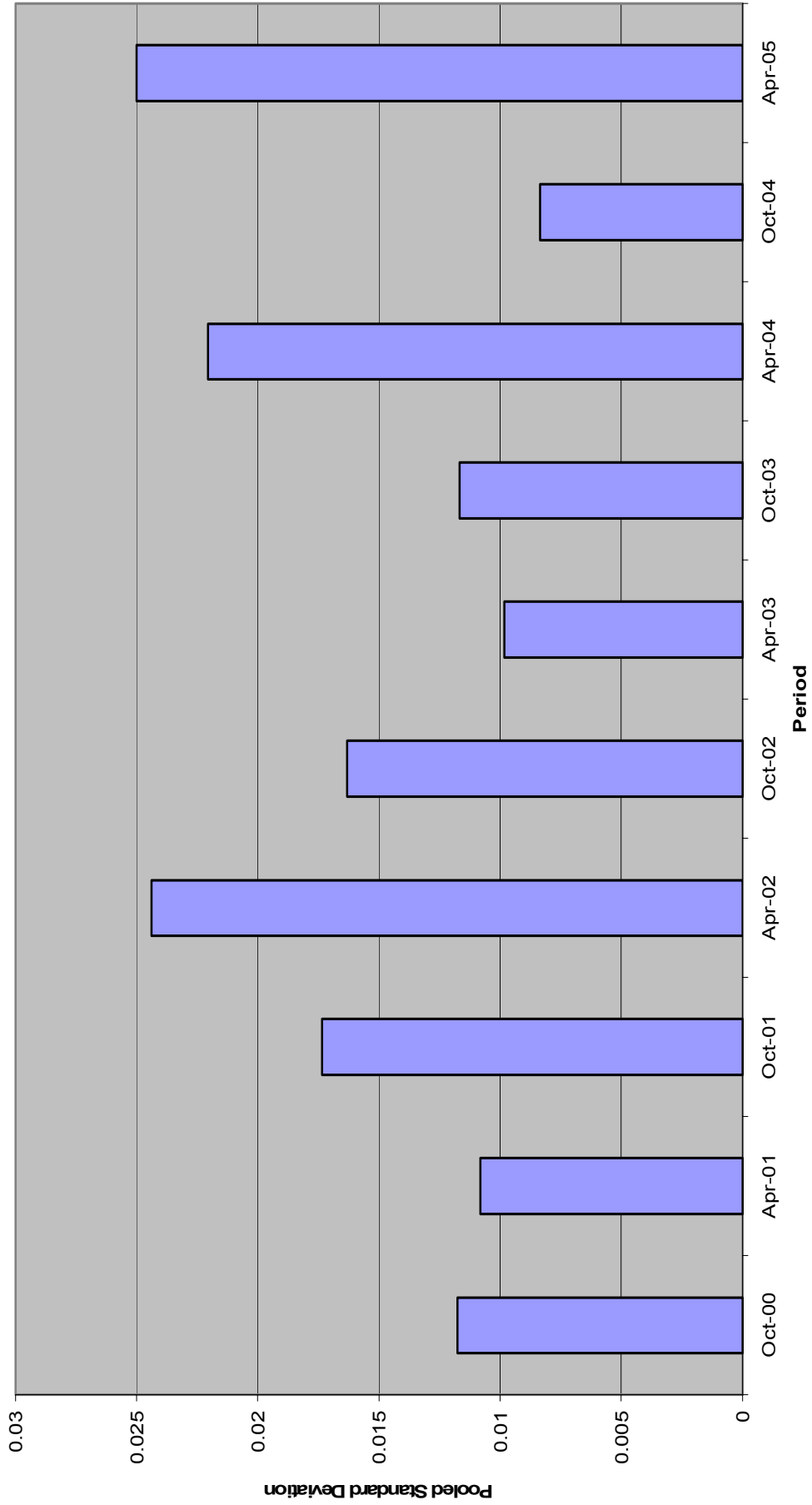




Figure 10 - Weighted Piston Deposits, Pooled Standard Deviation

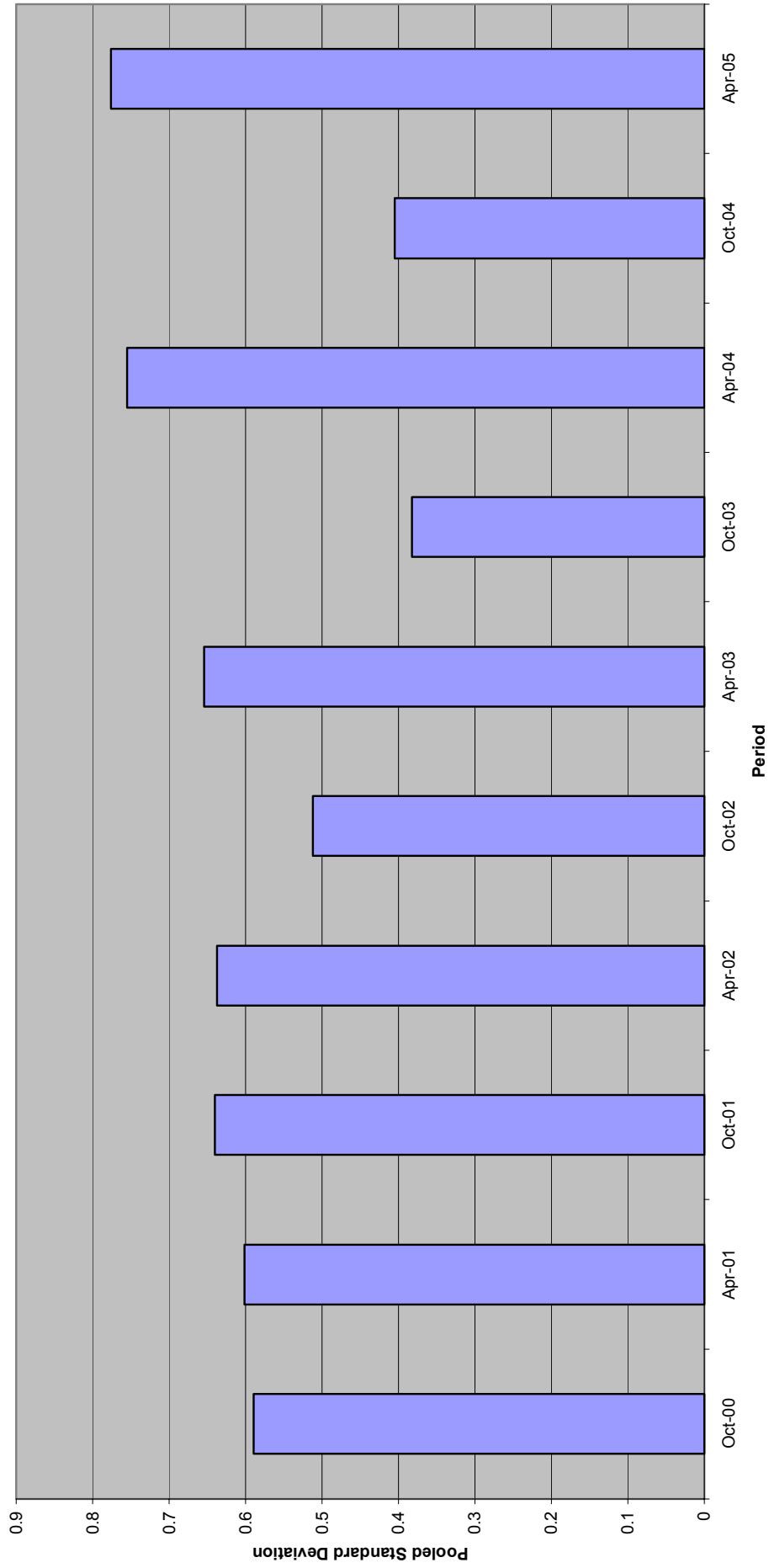


Figure 11 - Average Piston Skirt Varnish, Pooled Standard Deviation

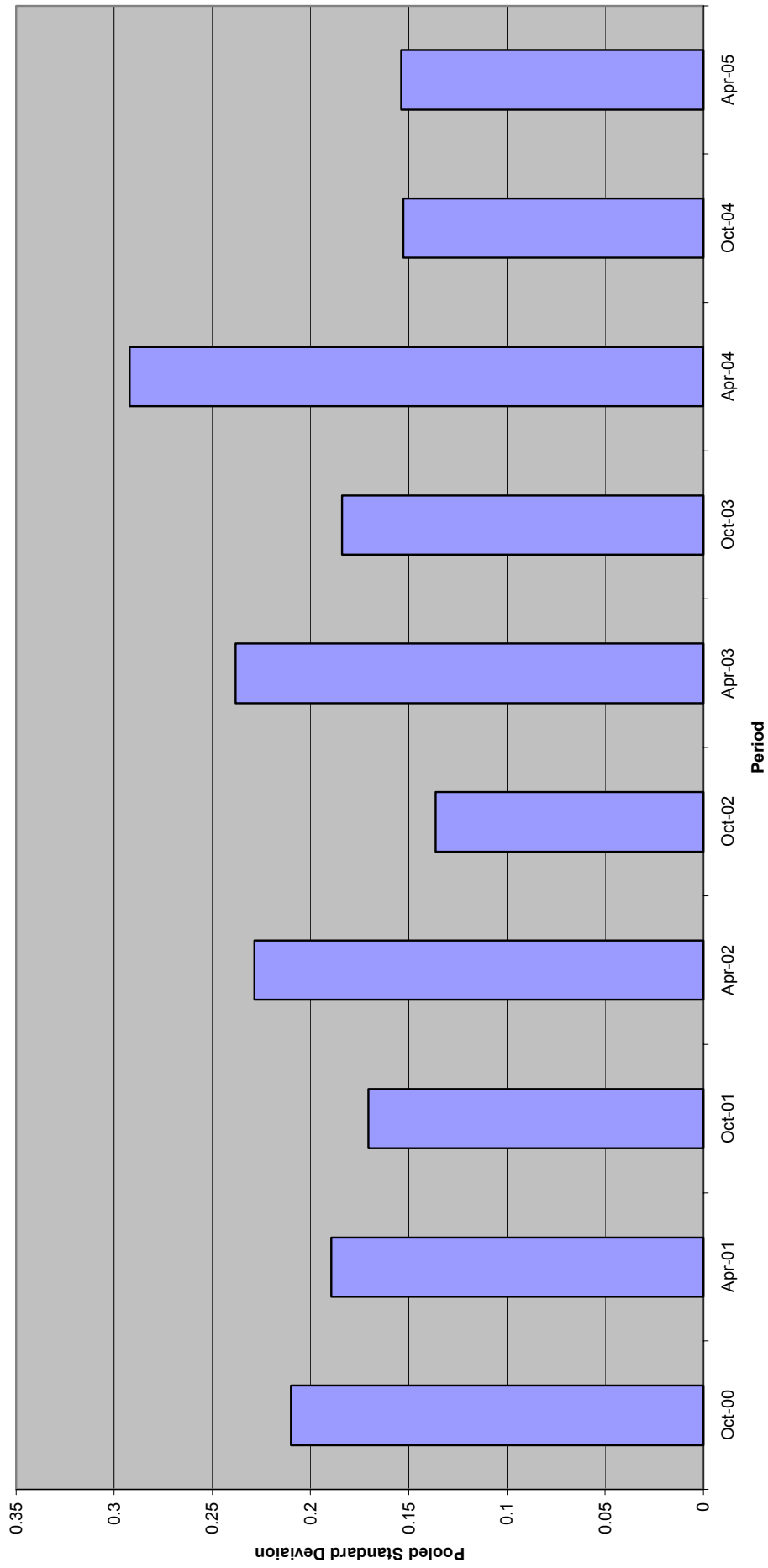


Figure 12 - Percent Viscosity Increase @ 60 Hours (Sequence IIIIFHD), Pooled Standard Deviation

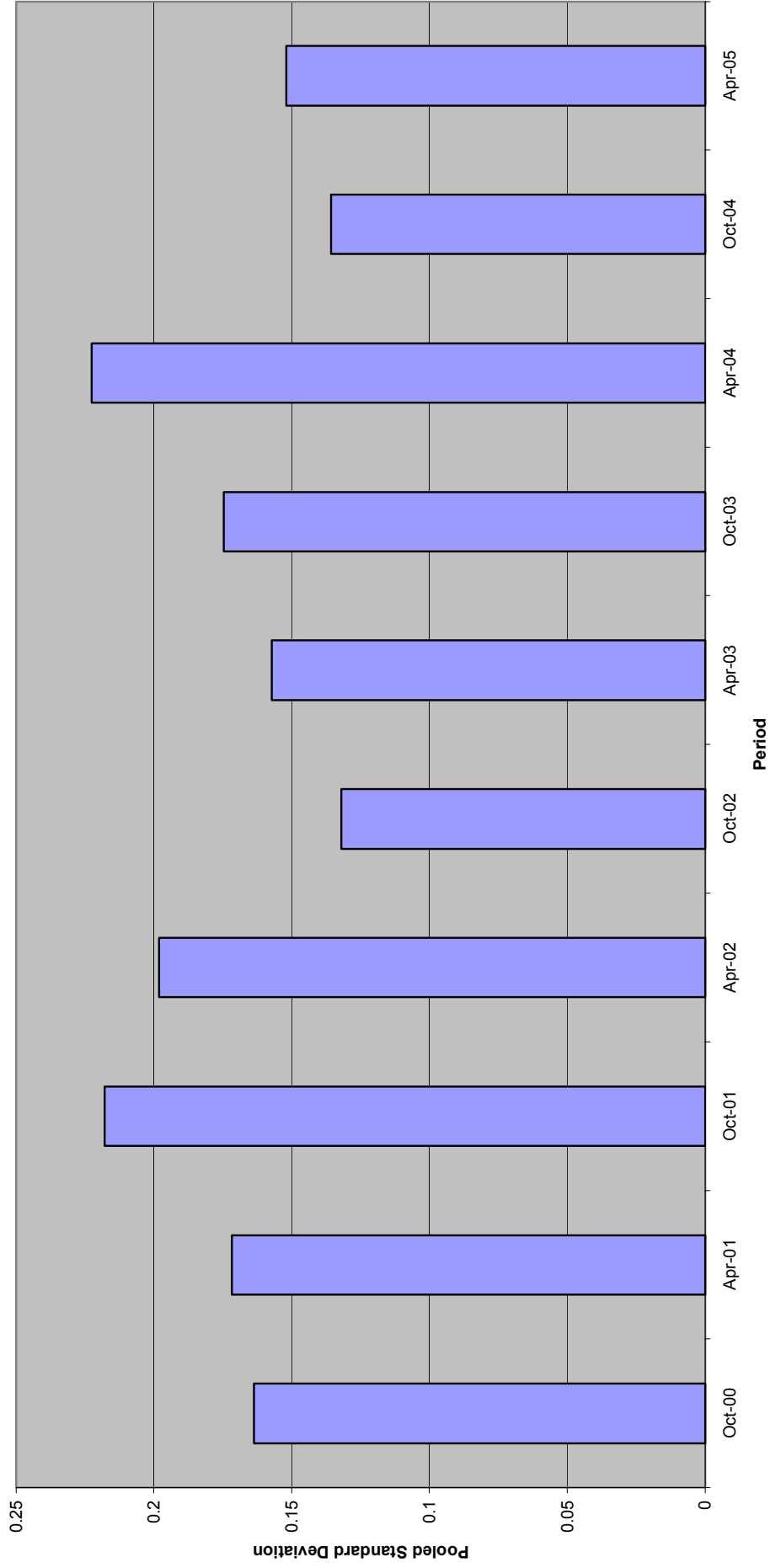


Figure 13 – Sequence IIIF Timeline

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