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

Memorandum: 08-015

Date: April 3, 2008

To: David Glaenzer, Chairman, Sequence III Surveillance Panel

From: Richard E. Grundza

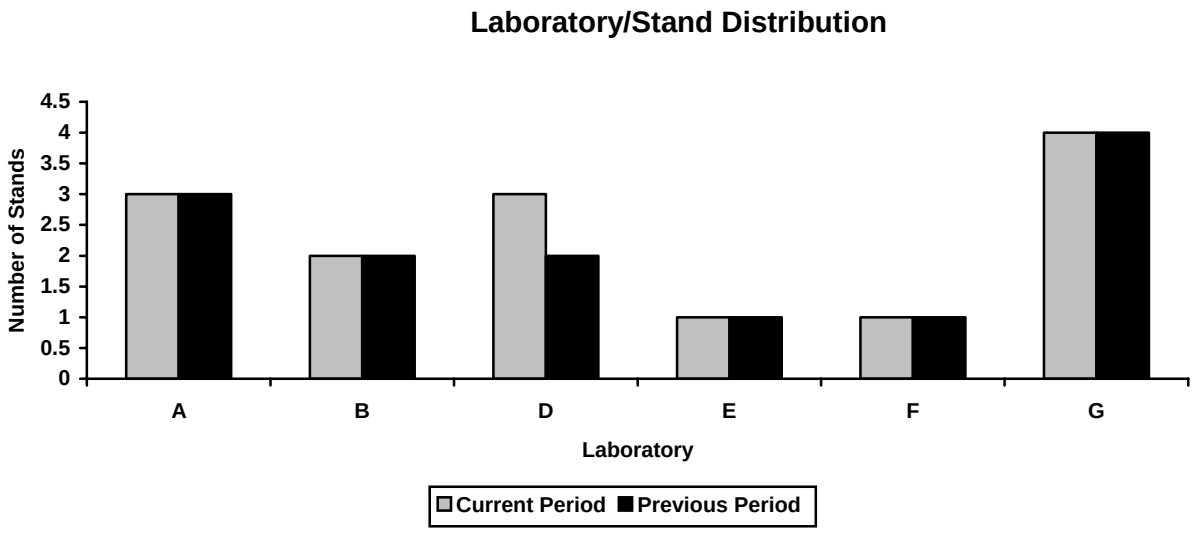
Subject: Sequence IIIG/IIIGA Semiannual Report: October 1, 2007 through March 31, 2008

The following is a summary of Sequence IIIG reference tests that were reported to the Test Monitoring Center during the period October 1, 2007 through March 31, 2008

Lab/Stand Distribution

	Reporting Data	Calibrated as of March 31, 2008
Number of Laboratories:	6	6
Number of Test Stands:	14	15

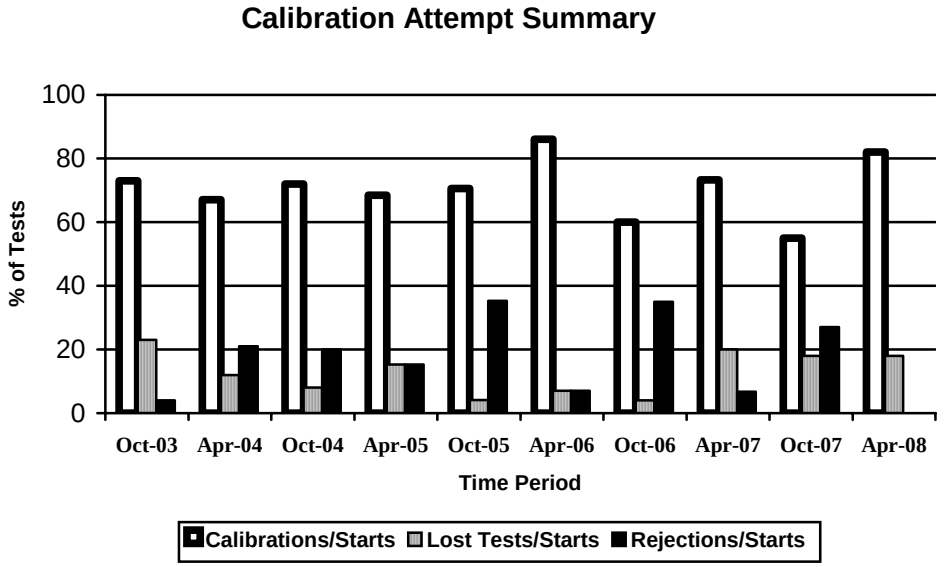
The following chart shows the laboratory/stand distribution:



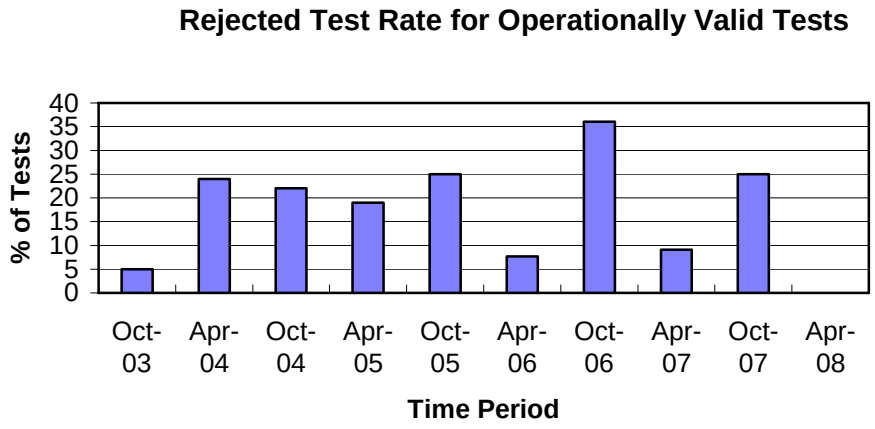
The following summarizes the status of the reference oil tests reported to the TMC:

Calibration Start Outcomes	TMC Validity Codes	No. of Tests
Operationally and Statistically Acceptable	AC	14
Failed Acceptance Criteria	OC	0
Operationally Invalid (Laboratory Judgment)	LC	2
Aborted	XC	1
Total		17

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



The calibration per start rate has increased with respect to last period. The lost test per start rate is the same and the rejected test per start rate has decreased with respect to the previous period.



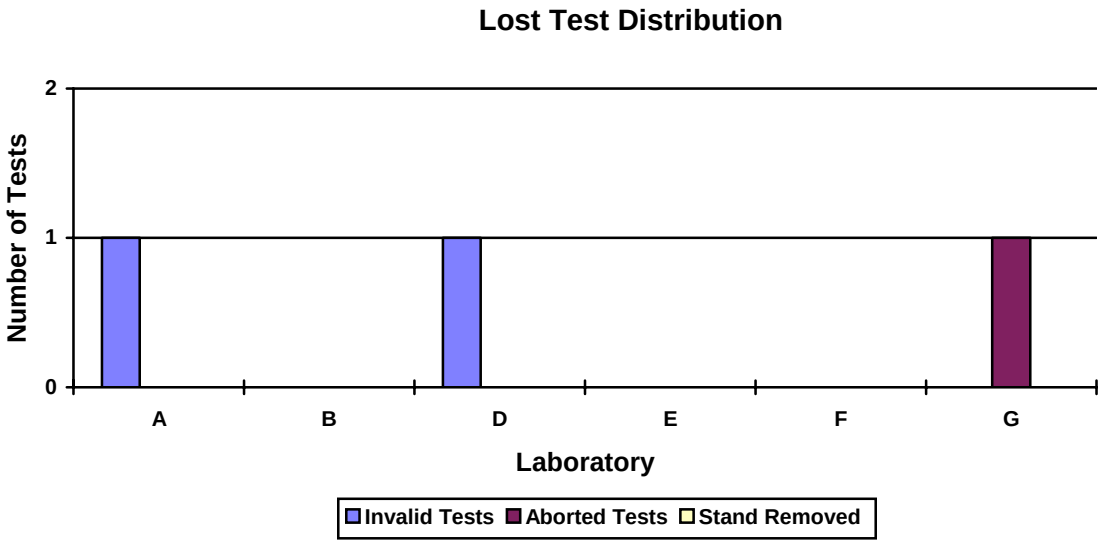
There were no rejected tests this report period.

There were no LTMS Deviations written this period. There has been one deviation from the LTMS since its introduction in August of 2003.

Lost Test Summary

Three 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	Excessive downtime	1	1/0/0/0
D	Oil temperature control	1	1/0/0/0
G	High oil consumption	1	0/0/1/0



Information Letters

There was one information letter issued this report period. Information Letter 07-03, Sequence Number 16 was issued on December 13, 2007. Items changed with this information letter are documented in the IIIG/A 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 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	-0.050	0.349 (df=13)	-2.6 % Viscosity Increase[1]
WPD	-0.499	0.472 (df=13)	-0.24 Merits
ACLW	-0.160	0.243 (df=13)	-2.3 μm^2
MRV[3]	0.201	0.439 (df=9)	N/A (no appropriate baseline)[4]

[1] At the GF-4 Pass Limit of 150% Viscosity Increase
[2] At the GF-4 Pass Limit of 60μm
[3] Sequence IIIGA Test Parameter only; Reference Oil 435 data excluded from calculations
[4] MRV does not have a specific GF-4 Pass Limit; Pass Limit is lack of Yield Stress.

Average Δ/s Results, by Laboratory				
Laboratory	PVIS	WPD	ACLW	MRV[1]
A	0.27	-0.43	-0.30	0.72
B	-1.08	-1.18	0.14	-0.67
D	-0.10	-0.56	0.57	0.30
E	-1.78	1.72	-0.71	---
F	0.02	0.79	-2.64	0.20
G	0.67	-1.04	0.00	0.41

[1] Reference oil 435 data excluded from calculations

Percent Viscosity Increase (PVIS)

Industry severity and precision charts were in control for the period (see Figure 1). The average Δ/s value for the period, -0.050 is on or near target (see Figure 4). Overall, severity has trended mild since the completion of the matrix. The pooled standard deviation for the period, 0.349, has improved with respect to the previous period (see Figure 7).

Weighted Piston Deposits (WPD)

Severity charts began the period with a series of three warning alarms. The severity charts are in control for two tests before sounding another three warning alarms. After the second series of alarms, the charts are in control for the remainder of the period. There may be some lab influence in these charts, as the two alarm events appear to be the result of two tests from one lab. A one test, -1.515 Δ/s from target, causes the first alarm to sound, while a second test, -1.354 Δ/s from target, causes the next alarm event. Precision charts were in control for the period (see Figure 2). The average Δ/s value for the period, -0.499 severe, is slightly more severe than the previous period (see Figure 5). The pooled standard deviation for the period, 0.472 has not changed when compared to last period, and compares well with historical estimates (see Figure 8).

Average Camshaft-plus-Lifter Wear (ACLW)

With the exception of one mild warning alarm, ACLW severity has been in control for the period.(see Figure 3). Average Δ/s value for the period, -0.160, is not as mild as the previous period and is shown in Figure 6. The precision charts were in control for the period. The pooled standard deviation for the period, 0.243 has improved when compared to the last period and is shown in Figure 9.

Mini Rotary Viscometer (MRV)

The MRV control charts are shown for informational purposes in Figure 10. The severity and precision control charts have been in control for the period. The average Δ/s value for the period, 0.201, trended slightly severe for the period and is shown in Figure 11. The pooled standard deviation for the period, 0.439, has improved, when compared to the last period and is shown in Figure 12.

QI Deviations

No QI Deviations were written this period. There have been a total of four QI Deviations written since the test was introduced in August of 2003.

Hardware

There were no significant hardware changes this report period.

Reference Oils

Oil	TMC Inventory, in gallons	TMC Inventory, in tests (4 gal/test)	Laboratory Inventory, in tests	Estimated life
434	21	5	6	<1 year
435	130	32	8	~ 3 years
438	564	141	5	~10 years

A reblend of reference oil 434 is being pursued and should be available in 3- 4 months

No lab visits were conducted during this report period

REG/reg

Attachments

c: F. M. Farber, TMC
Sequence III Surveillance Panel
ftp://ftp.astmtmc.cmu.edu/docs/gas/sequenceiii/semiannualreports/IIIG-04-2008.pdf

Distribution: Electronic Mail

List of Figures

- Figures 1, 2, and 3 are EWMA severity and precision control charts and also the CUSUM Δ/s plots of PVIS, WPD, and ACLW, annotated with date lines, using the same data set as the EWMA severity and precision control charts. Transformed units are used, when appropriate.

- Figures 4, 5, and 6 are bar charts of average Δ/s, by report period, for PVIS, WPD, and ACLW.

- Figures 7, 8, and 9 are bar charts of pooled standard deviation, by report period, for PVIS, WPD, and ACLW.

- Figure 10 is EWMA severity and precision control charts and also the CUSUM Δ/s plots of MRV, annotated with date lines, using the same data set as the EWMA severity and precision control charts. Transformed units are used.

- Figure 11 is a bar chart of average Δ/s, by report period, for MRV.

- Figure 12 is a bar chart of pooled standard deviation, by report period, for MRV.

- Figure 13 is the Sequence IIIG/IIIGA Timeline.

Figure 1

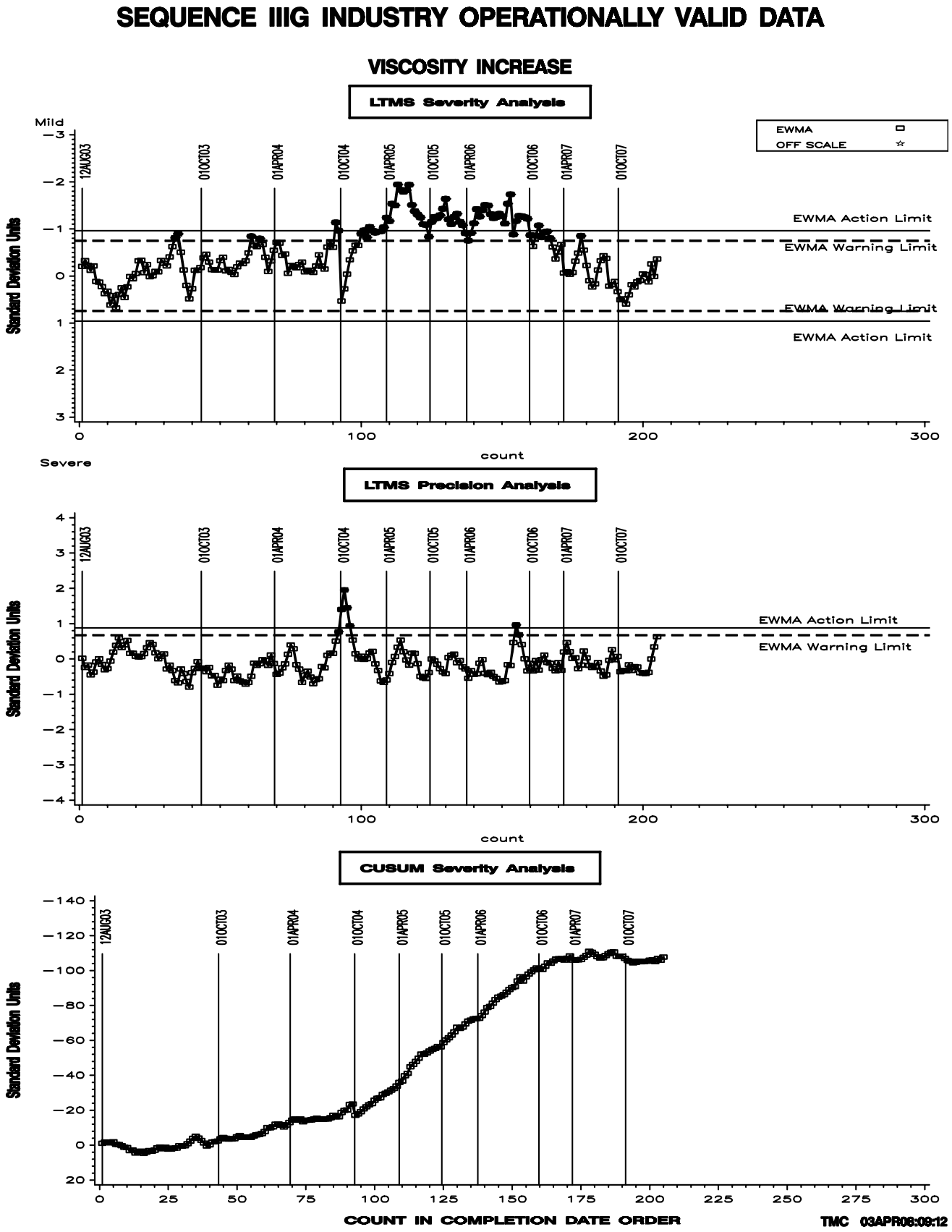

SEQUENCE IIIG INDUSTRY OPERATIONALLY VALID DATA
VISCOSITY INCREASE
LTMS Severity Analysis
Mild
Severe
Standard Deviation Units
EWMA
OFF SCALE
EWMA Action Limit
EWMA Warning Limit
EWMA Warning Limit
EWMA Action Limit
12AUG03
01OCT03
01APR04
01OCT04
01APR05
01OCT05
01APR06
01OCT06
01APR07
01OCT07
count
LTMS Precision Analysis
CUSUM Severity Analysis
COUNT IN COMPLETION DATE ORDER
TMC 03APR08:09:12

Figure 2

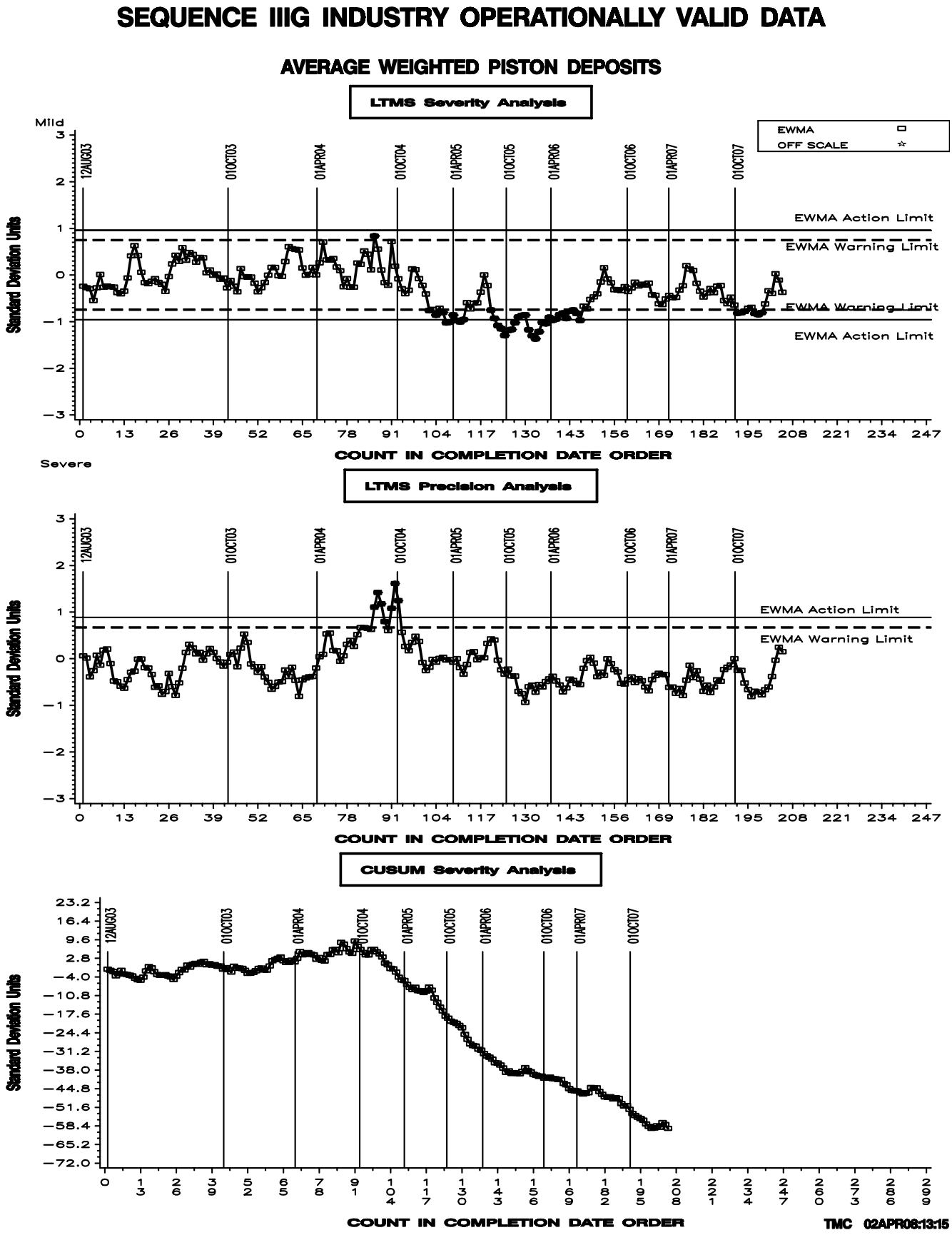

SEQUENCE IIIG INDUSTRY OPERATIONALLY VALID DATA
AVERAGE WEIGHTED PISTON DEPOSITS
LTMS Severity Analysis
Mild
EWMA
OFF SCALE
12AUG03
01OCT03
01APR04
01OCT04
01APR05
01OCT05
01APR06
01OCT06
01APR07
01OCT07
EWMA Action Limit
EWMA Warning Limit
EWMA Warning Limit
EWMA Action Limit
Standard Deviation Units
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
TMC 02APR08:13:15

Figure 3

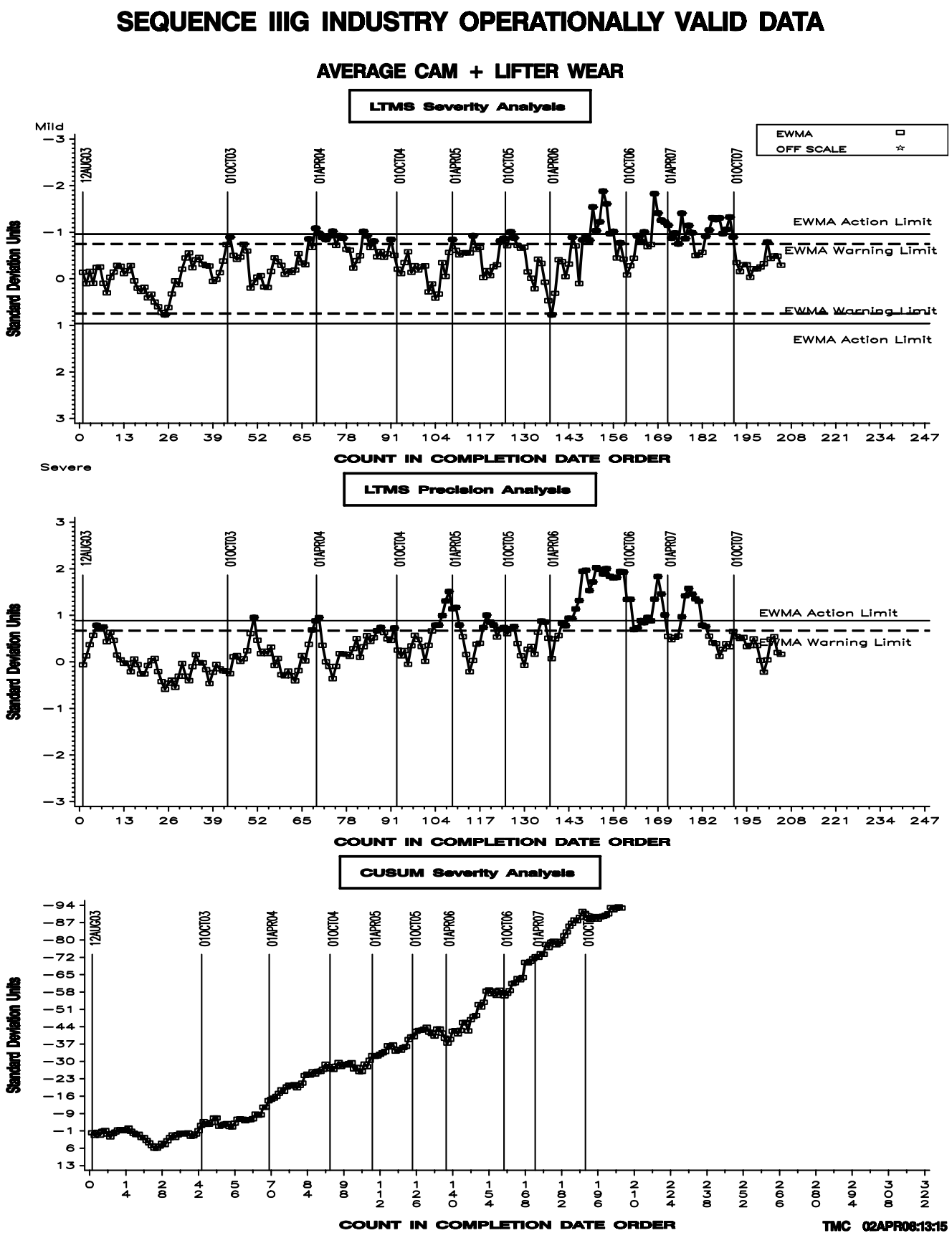

SEQUENCE IIIG INDUSTRY OPERATIONALLY VALID DATA
AVERAGE CAM + LIFTER WEAR
LTMS Severity Analysis
Mild
Severe
EWMA
OFF SCALE
EWMA Action Limit
EWMA Warning Limit
EWMA Warning Limit
EWMA Action Limit
Standard Deviation Units
12AUG03
01OCT03
01APR04
01OCT04
01APR05
01OCT05
01APR06
01OCT06
01APR07
01OCT07
COUNT IN COMPLETION DATE ORDER
LTMS Precision Analysis
CUSUM Severity Analysis
TMC 02APR08:13:15

Figure 4 - Percent Viscosity Increase, Average Delta/s

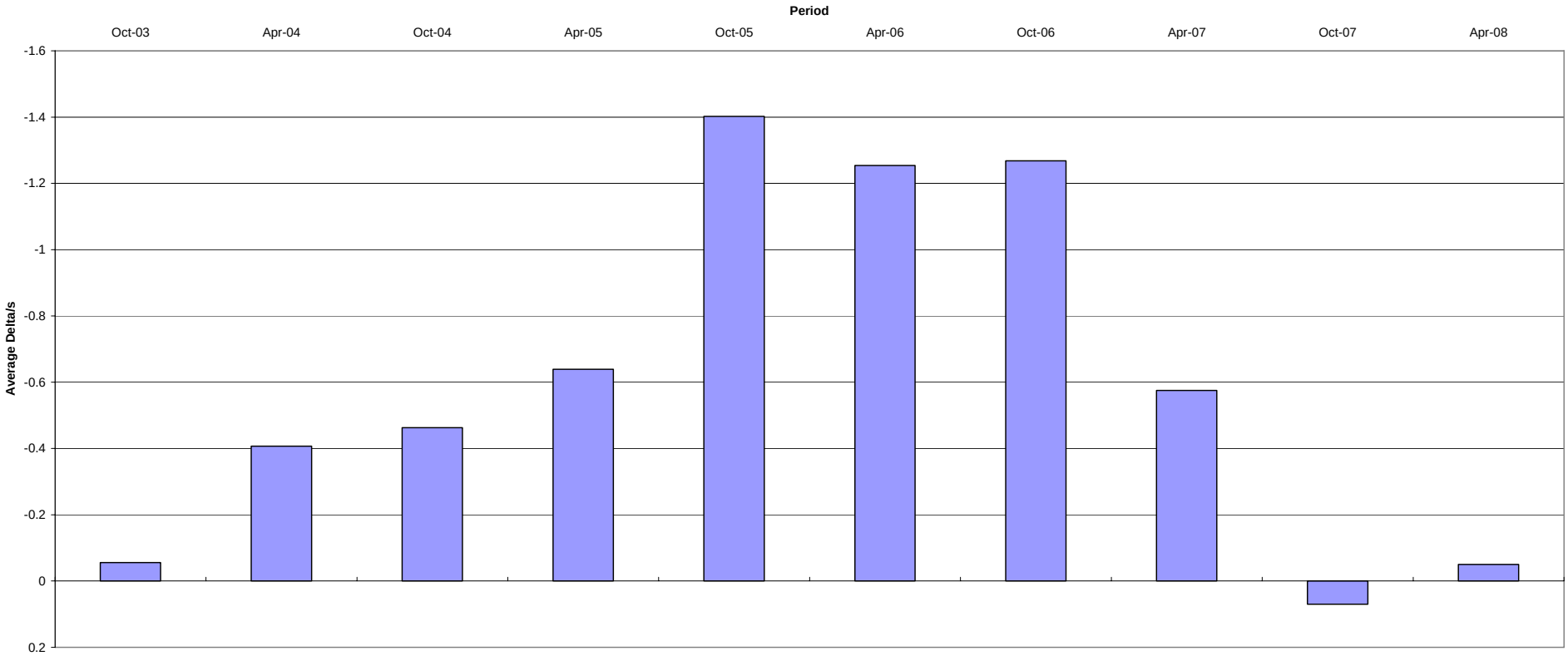


Figure 5 - Weighted Piston Deposits, Average Delta/s

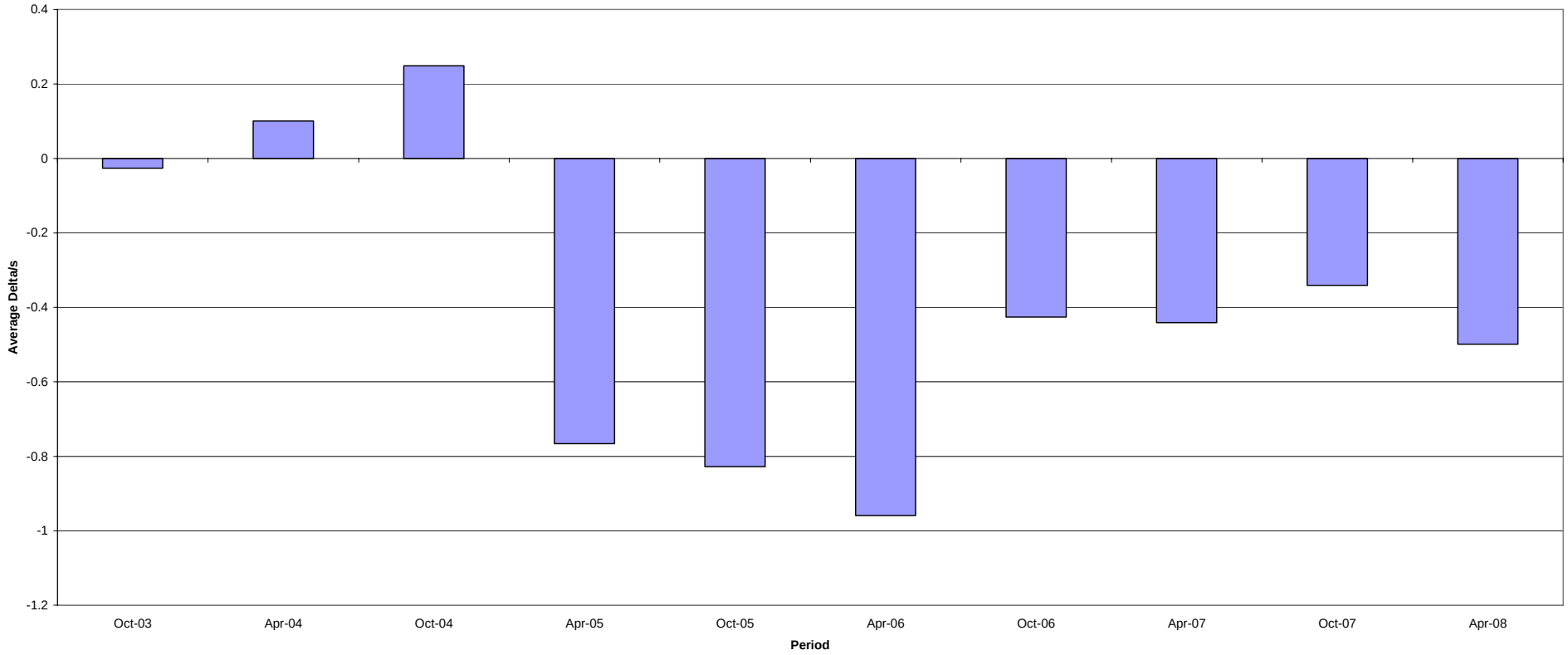


Figure 6 - Average Camshaft plus Lifter Wear, Average Delta/s

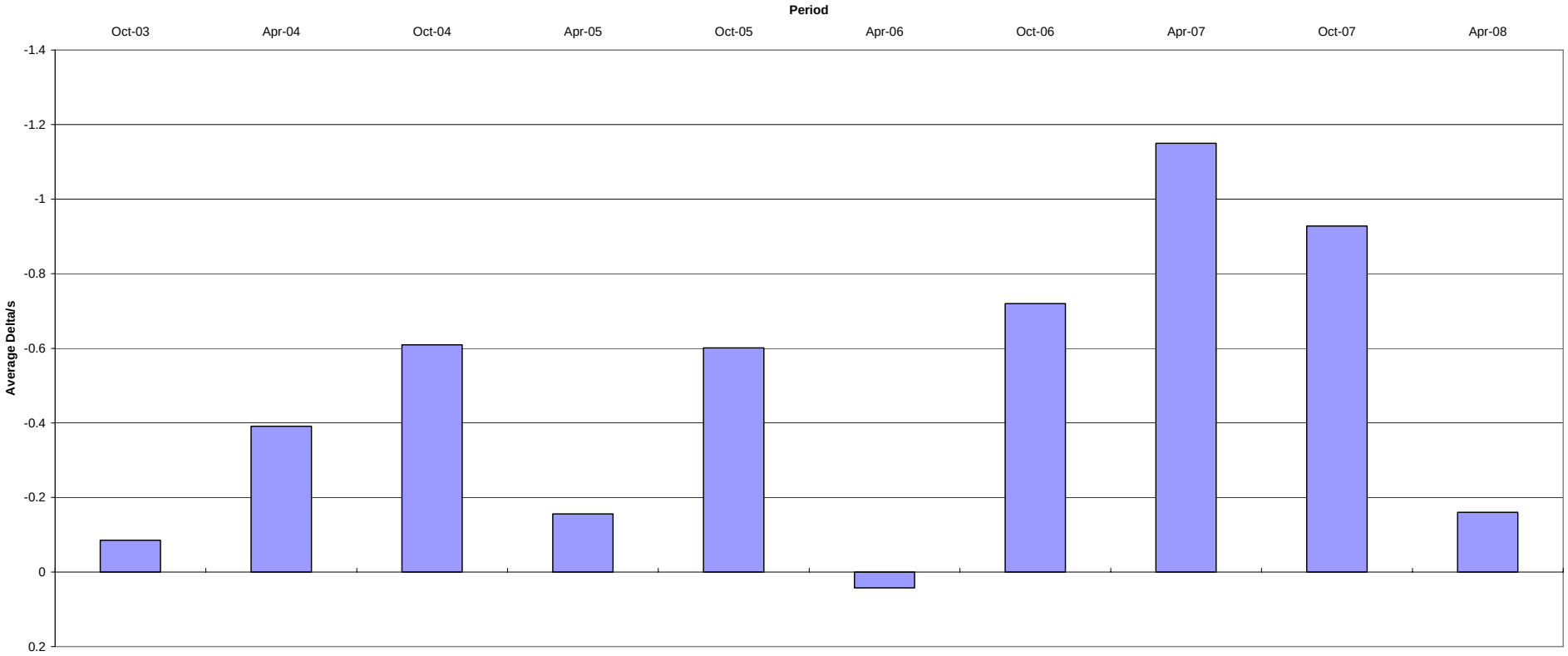


Figure 7 - Percent Viscosity Increase, Pooled Standard Deviation

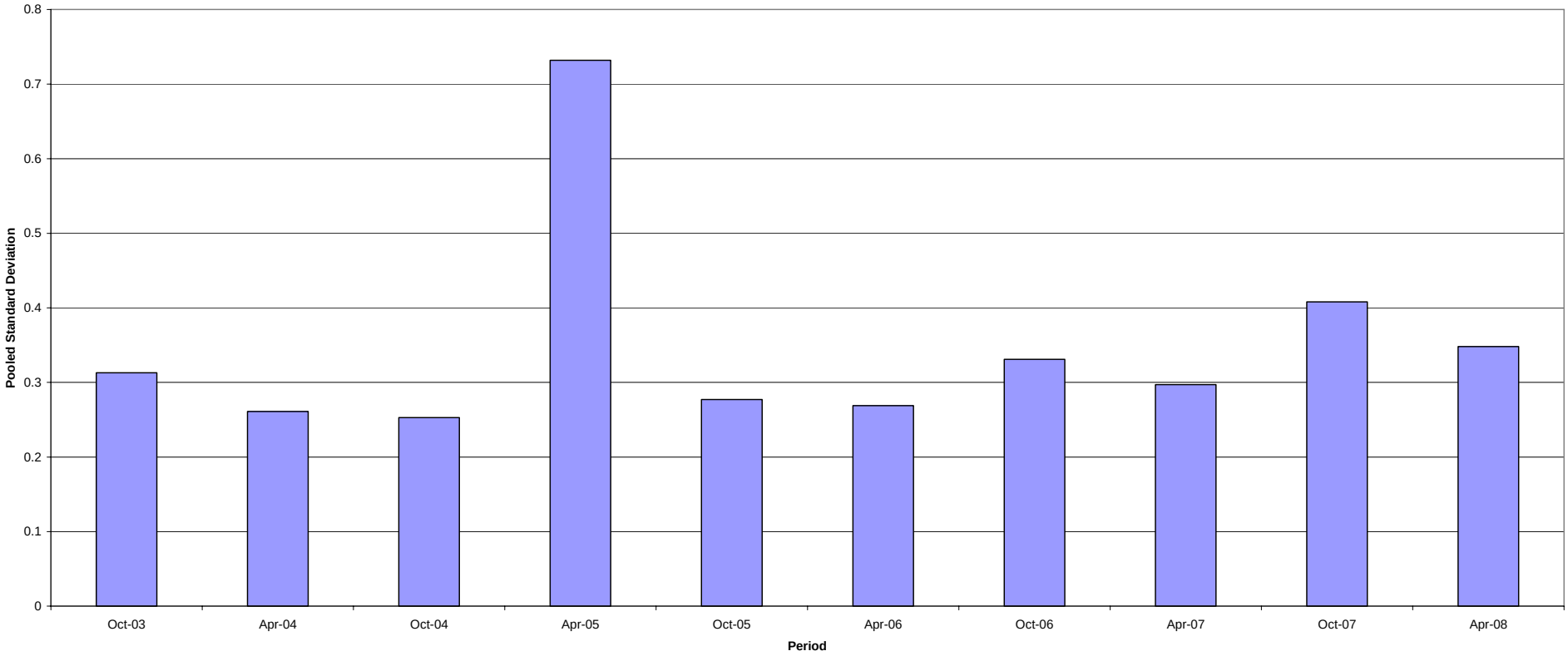


Figure 8 - Weighted Piston Deposits, Pooled Standard Deviation

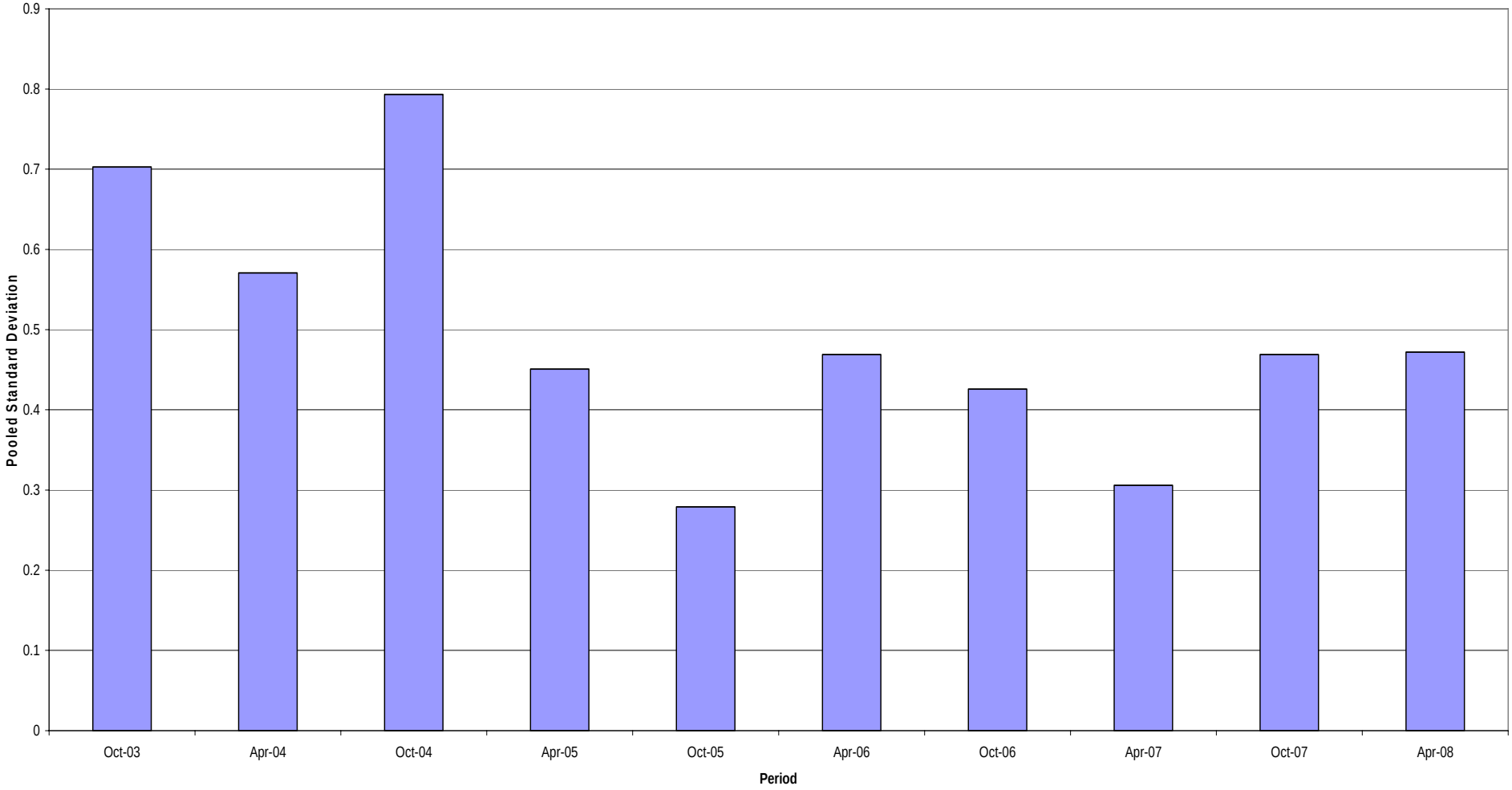


Figure 9 - Average Camshaft plus Lifter Wear, Pooled Standard Deviation

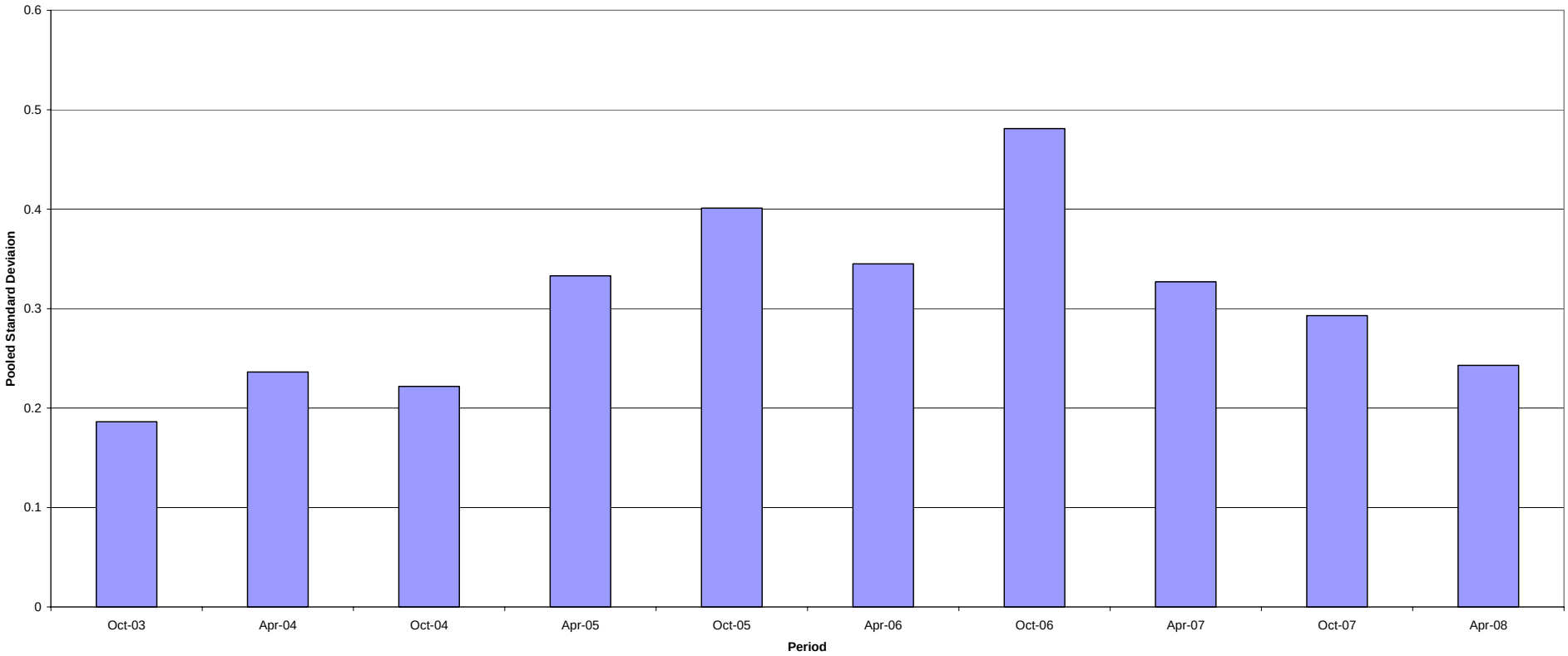


Figure 10

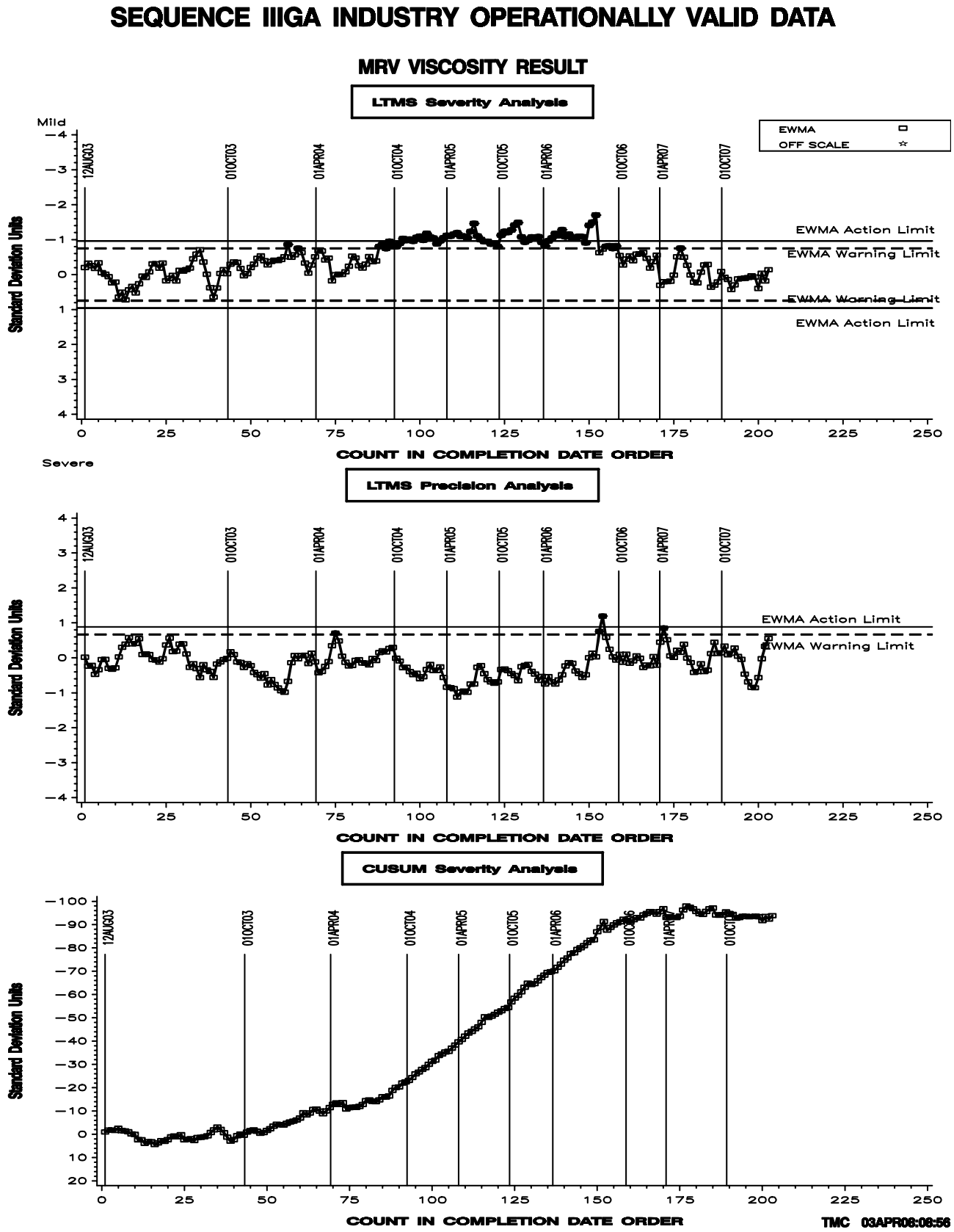

SEQUENCE IIIGA INDUSTRY OPERATIONALLY VALID DATA
MRV VISCOSITY RESULT
LTMS Severity Analysis
Mild
Severe
EWMA
OFF SCALE
EWMA Action Limit
EWMA Warning Limit
EWMA Warning Limit
EWMA Action Limit
Standard Deviation Units
12AUG03
01OCT03
01APR04
01OCT04
01APR05
01OCT05
01APR06
01OCT06
01APR07
01OCT07
COUNT IN COMPLETION DATE ORDER
LTMS Precision Analysis
CUSUM Severity Analysis
TMC 03APR08:08:56

Figure 11 - Mini Rotary Viscometer result, Average Delta/s

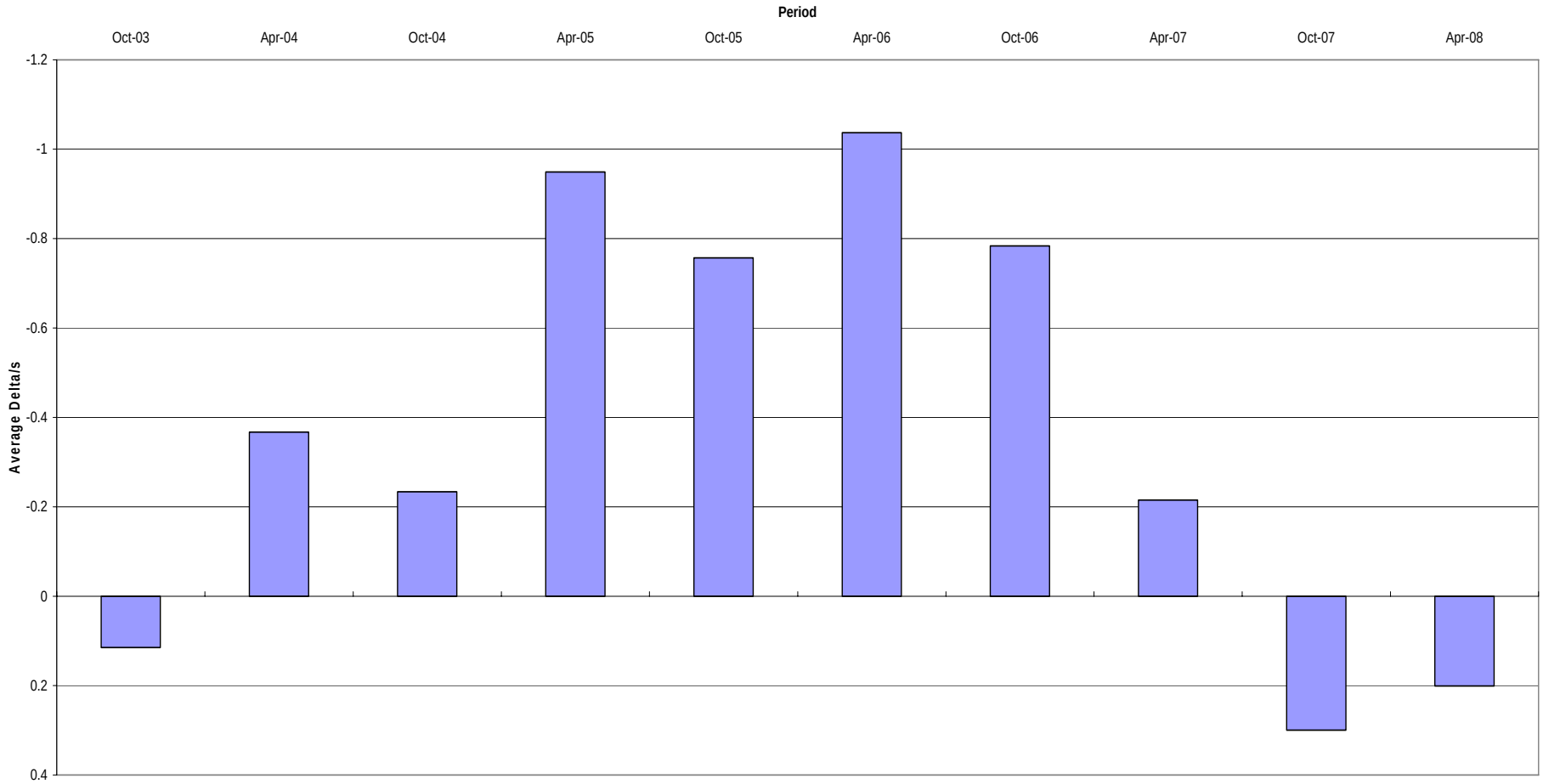


Figure 12 -Mini Rotary Viscometer result, Pooled Standard Deviation

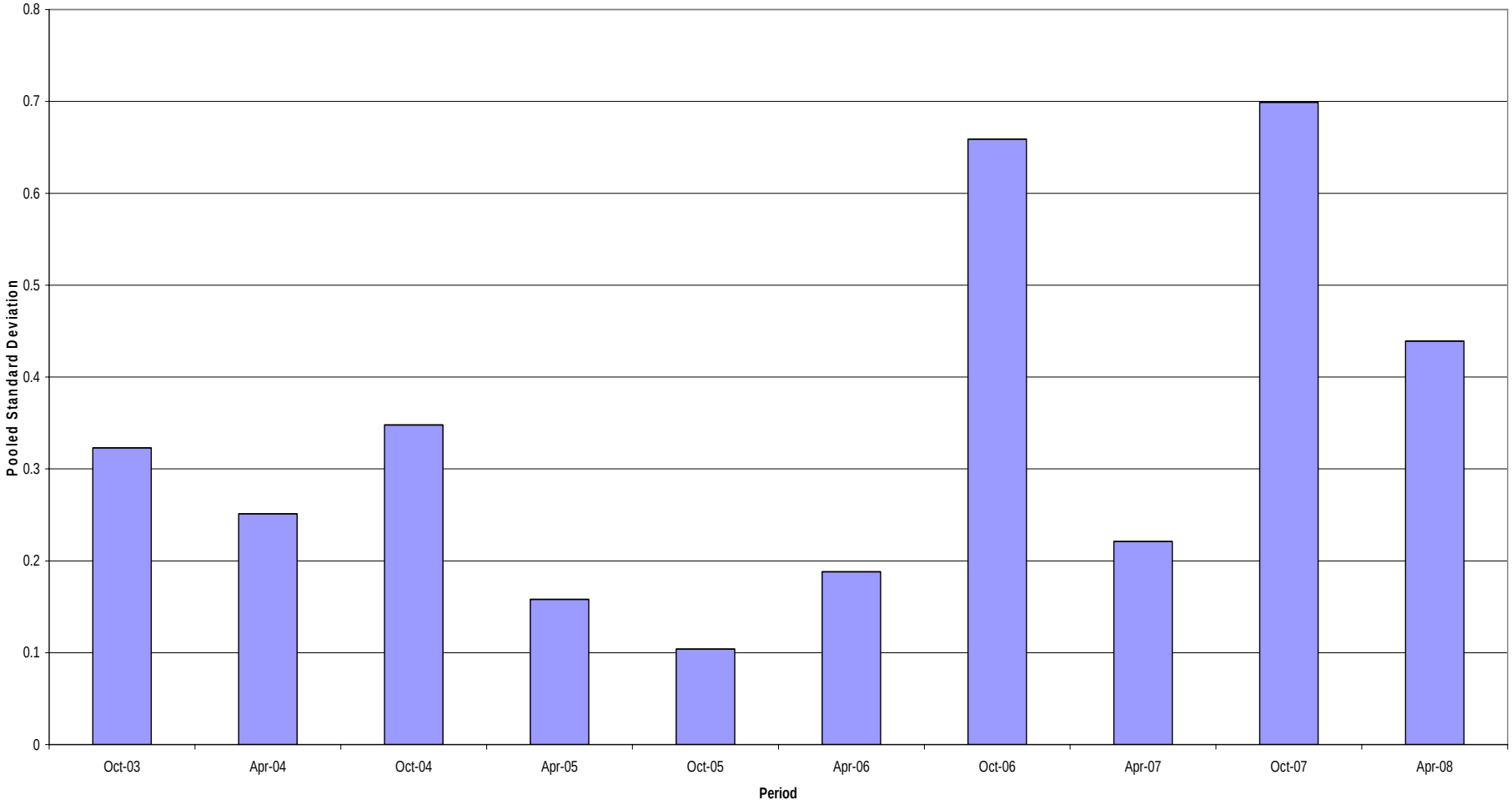


Figure 13 – Sequence IIIG/IIIGA Timeline

Effective Date	Topic	Info Letter
8/19/2003	Draft Sequence IIIG Test Procedure Issued	03-1
9/9/2003	Revised Valve Spring Load Specifications	03-2
9/23/2003	Revised Test Numbering Methodology	03-3
10/29/2003	Revised Fuel Pressure Specification	03-4
10/29/2003	Automatic Parts Cleaning Machine Maintenance Requirements Added	03-4
10/29/2003	Main Bearing Bore Mandrel Made Optional	03-4
10/29/2003	Piston Ring Cleaning Requirements	03-4
10/29/2003	Additional Allowable RTV Sealing Compound Allowed	03-4
10/29/2003	Main Bearing Cap Bolt Replacement Specifications	03-4
10/29/2003	Revised Camshaft Measurement Procedure	03-4
10/29/2003	Revised Camshaft Lubrication & Installation Procedure	03-4
10/29/2003	Revised Oil Consumption Reporting Procedure	03-4
10/29/2003	Fluid Conditioning Module Equipment Specifications	03-4
10/29/2003	Revised Camshaft Measurement Equipment Specifications	03-4
10/29/2003	Rating Workshop Attendance Requirement	03-4
11/4/2003	Elimination of CCS & MRV from IIIG test (creation of IIIGA test)	03-4
12/15/2003	New Honing Technique approved and added to Assembly Manual	
1/20/2004	Elimination of transform from ACLW results on oil 438 in LTMS; other oils still transformed	
1/20/2004	New Pooled s for ACLW SA calculation, based upon 434 and 435 only	
3/23/2004	Transform put back on 438 ACLW results, for all data. Control charts recalculated and effective today	
4/2/2004	Revised Intake Manifold Gasket	04-1
4/2/2004	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	Editorial Corrections to Draft 2D	04-2
5/12/2004	MRV Reporting	04-2
5/12/2004	Amount of Oil Used for Camshaft & Lifter Lubrication	04-2
8/4/2004	First Occurrence of Powdered Metal Rods	
8/22/2004	First Occurrence of BC-4 rings	
11/4/2004	Powdered Metal Connecting Rod Torque Specifications	04-3
11/4/2004	New Front and Rear Main Seals	04-3
11/4/2004	New Oil Pan Gaskets	04-3
11/4/2004	New Exhaust Valves	04-3
11/4/2004	Editorial Change to Precision Statements	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
8/8/2005	First occurrence of BC-5 rings	
11/29/2005	Revision to requirements for attendance to rater workshops	05-2
11/29/2005	Allows the use of torque wrench ETW-E180	05-2
3/29/2006	First occurrence of BC-6 rings	
04/04/2006	Added requirement to monitor fuel at lab and revised aromatic content in fuel specification	06-1
08/18/2006	Procedure changes as a result of UEB and revised Table A4 to clarify units and test methods	06-2
10/03/06	Change in connecting rod (PMNS) and updated part numbers	06-3

10/008/06	First occurrence of powdered metal non-slotted connecting rods (PMNS)	
11/06/06	Changes in rater calibration requirements	06-4
3/19/07	Added IIIGVIS procedure to test method	07-1
4/01/07	Start of new cylinder head torquing procedures	
6/05/07	Revised designation of IIIGVIS to IIIGVS	07-2
6/05/07	Changed values in Table A4 to metric	07-2
6/05/07	Revised ring gap delta values and revised stand instrumentation calibration requirements	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
12/13/2007	Revised instrumentation calibration requirements	07-3