




Test Monitoring Center

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412-365-1000

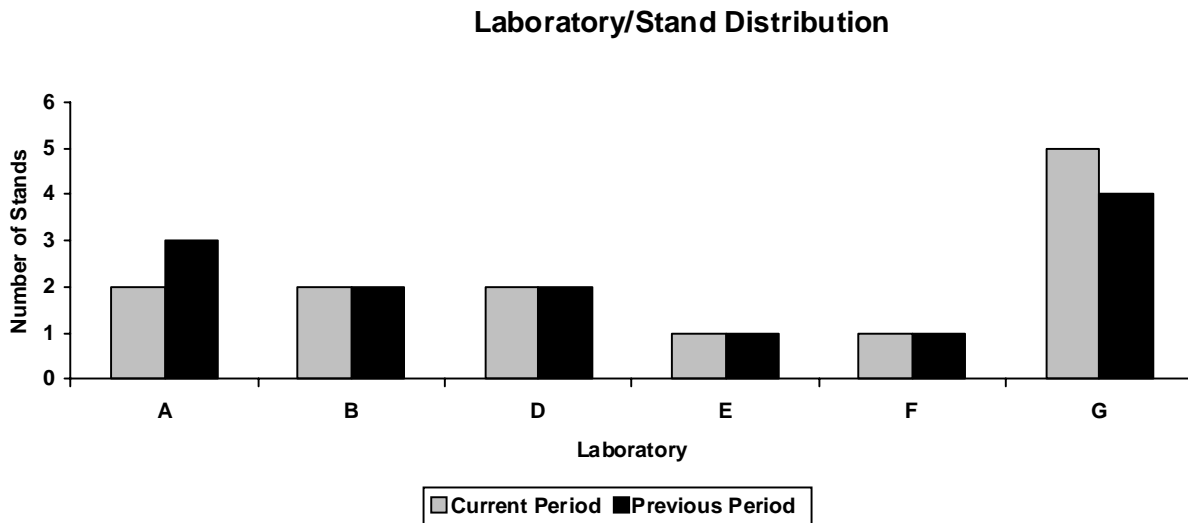
Memorandum: 09-012
Date: April 16, 2009
To: David Glaenzer, Chairman, Sequence III Surveillance Panel
From: Richard E. Grundza 
Subject: Sequence IIIG/AB Semiannual Report: October 1, 2008 through March 31, 2009

The following is a summary of Sequence IIIG reference tests that were reported to the Test Monitoring Center during the period October 1, 2008 through March 31, 2009.

Lab/Stand Distribution

	Reporting Data	Calibrated as of March 31, 2009
Number of Laboratories:	6	4
Number of Test Stands:	13	15

The following chart shows the laboratory/stand distribution:

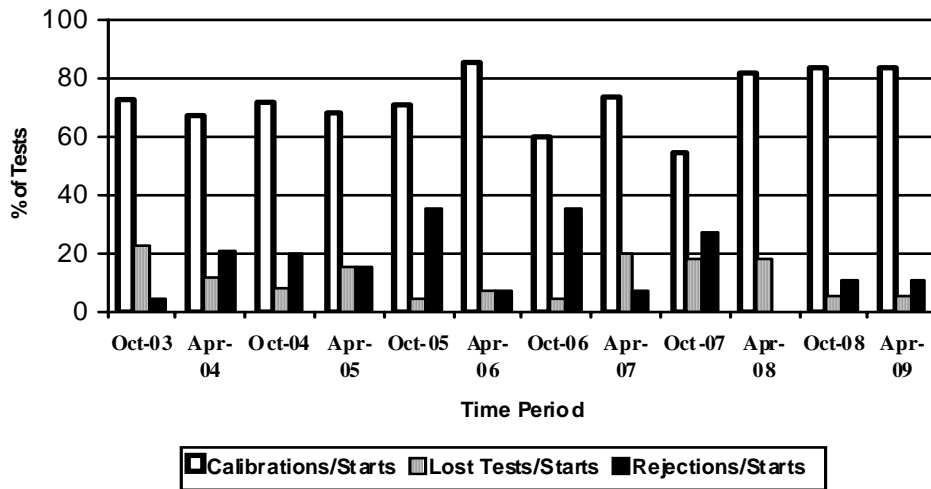


The following summarizes the status of the reference oil tests reported to the TMC:

Calibration Start Outcomes	TMC Validity Codes	No. of Tests
Operationally and Statistically Acceptable	AC	16
Failed Acceptance Criteria	OC	2
Operationally Invalid (Laboratory Judgment)	LC	1
Total		19

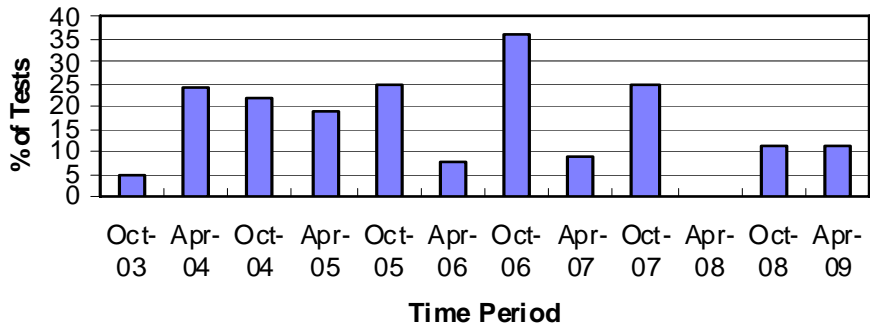
Calibrations per start, lost tests per start and rejection rates are summarized below:

Calibration Attempt Summary



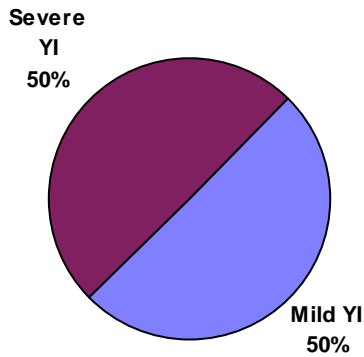
The calibration per start rate, lot test and rejected test per start rates have not changed with respect to the previous period.

Rejected Test Rate for Operationally Valid Tests

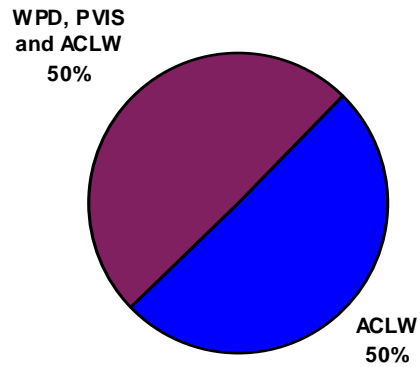


Two tests failed the acceptance criteria during the period. The following charts summarize the reasons and breakdown by parameter for the failed test:

Distribution of LTMS Stand Alarms



Distribution of Stand Alarms by Parameter

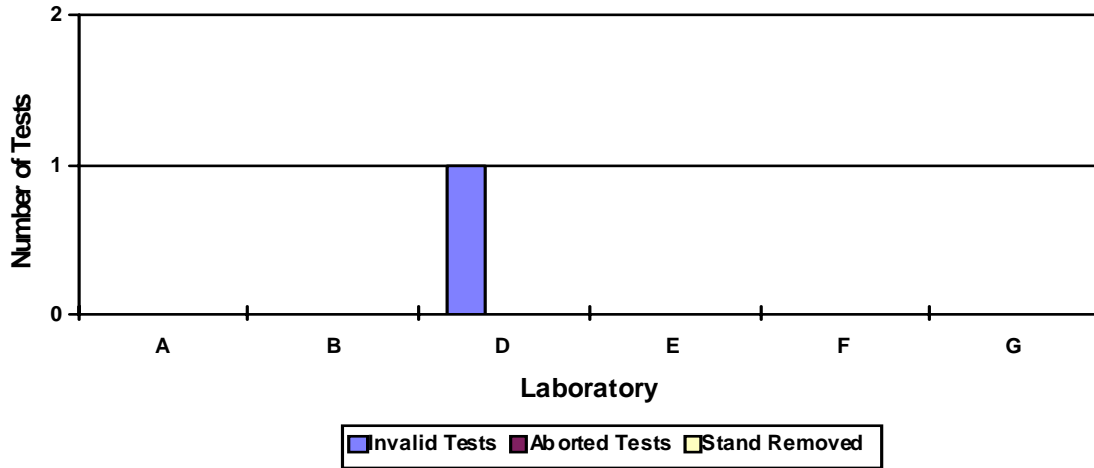


There were no LTMS Deviations written this period. There has been one deviation from the LTMS since its introduction in August of 2003.

One test was 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)
D	Humidity and exhaust backpressure out of specification	1	1/0/0/0

Lost Test Distribution



Information Letters

There were three information letters issued this report period. Information Letter 08-02, Sequence Number 18 was issued on November 6, 2008. Information Letter 08-3, Sequence Number 19 was issued November 24, 2008. Information Letter 09-1, Sequence Number 20, was issued March 9, 2009. Items changed with these information letters are documented in the IIIG/AB 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	0.181	0.639 (df=17)	18.4 % Viscosity Increase ¹
WPD	-0.940	0.302 (df=17)	-0.28 Merits
ACLW	-0.233	0.286 (df=17)	-3.9 μm^2
MRV ³	-0.565	0.099 (df=9)	N/A (no appropriate baseline) ⁴
PHOS ⁵	-0.193	2.611 (df=11)	N/A (no appropriate baseline) ⁶

¹ At the GF-4 Pass Limit of 150% Viscosity Increase

² At the GF-4 Pass Limit of 60 μm

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.

⁵ Sequence IIIGB Test Parameter only

⁶ PHOS does not have a specific GF-4 Pass Limit, will be included in GF-5

Average Δ/s Results, by Laboratory					
Laboratory	PVIS	WPD	ACLW	MRV ¹	PHOS
A	0.46	-1.14	0.34	-0.798	0.156
B	0.32	-0.62	0.09	0.052	0.689
D	-0.39	0.07	-1.11	-0.739	0.530
E	0.60	-0.36	1.05	---	1.351
F	-0.25	0.49	-1.13	-1.563	-1.294
G	-0.48	-0.86	-1.23	-0.268	-0.995

¹ Reference oil 435 data excluded from calculations

Percent Viscosity Increase (PVIS)

With the exception of an action and two warning alarms, industry severity charts were in control for the period (see Figure 1). With the exception of two warning alarms, industry precision charts were in control for the period. The average Δ/s value for the period, 0.181 is severe of target (see Figure 4). The pooled standard deviation for the period, 0.639, has degraded with respect to the previous period (see Figure 7). The alarm events in both the severity and precision charts appear to have been caused by one result which was 5.962 Δ/s from target.

Weighted Piston Deposits (WPD)

Severity charts have been in warning or action alarm the entire period. Precision charts were in control for the period (see Figure 2). The average Δ/s value for the period, -0.940 severe, is more severe than the previous period (see Figure 5). The pooled standard deviation for the period, 0.302 has improved compared to last period, and compares well with historical estimates (see Figure 8).

Average Camshaft-plus-Lifter Wear (ACLW)

ACLW severity began the period in action alarm which cleared after five tests and, with the exception of two warning alarms, has been in control for the rest of the period (see Figure 3). Severity was mild with an average Δ/s value for the period of -0.233 (see Figure 6). With the exception of three warning alarms, the precision charts were in control for the period. The pooled standard deviation for the period, 0.286 has degraded slightly 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. With the exception of three warning alarms each, the severity and precision control charts have been in control for the period. The average Δ/s value for the period, -0.565, trended mild for the period and is shown in Figure 11. The pooled standard deviation for the period, 0.099, has improved, when compared to the last period and is shown in Figure 12.

Phosphorus Retention (PHOS)

Figure 13 plots the industry summation Δ/s for Phosphorus Retention. This parameter was added with the IIIGB test procedure, which was included as part of Test Method D7320 by Information Letter 08-2. These summation Δ/s plots are currently for information only, as the targets being used to calculation summation Δ/s were generated prior to the inclusion of the test procedure into Test Method D7320. Figure 13 shows the industry trending mild for the period.

QI Deviations

There were no QI Deviations written this period. A total of five QI Deviations written since the test was introduced in August of 2003.

Hardware

No hardware changes were noted this report period.

Reference Oils

Oil	TMC Inventory, in gallons	TMC Inventory, in tests (4 gal/test)	Laboratory Inventory, in tests	Estimated life
434	9	2	4	<1 year
434-1	549	137	3	~10 years
435	69	17	5	~ 2 years
435-1	658	164	0	~10 years
438	498	124	4	~10 years

One lab visit was 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-04-2009.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 a summation delta/s chart for IIIGB Phosphorus retention.
- Figure 14 is the Sequence IIIG/AB Timeline.

Figure 1

SEQUENCE IIG INDUSTRY OPERATIONALLY VALID DATA

VISCOSITY INCREASE

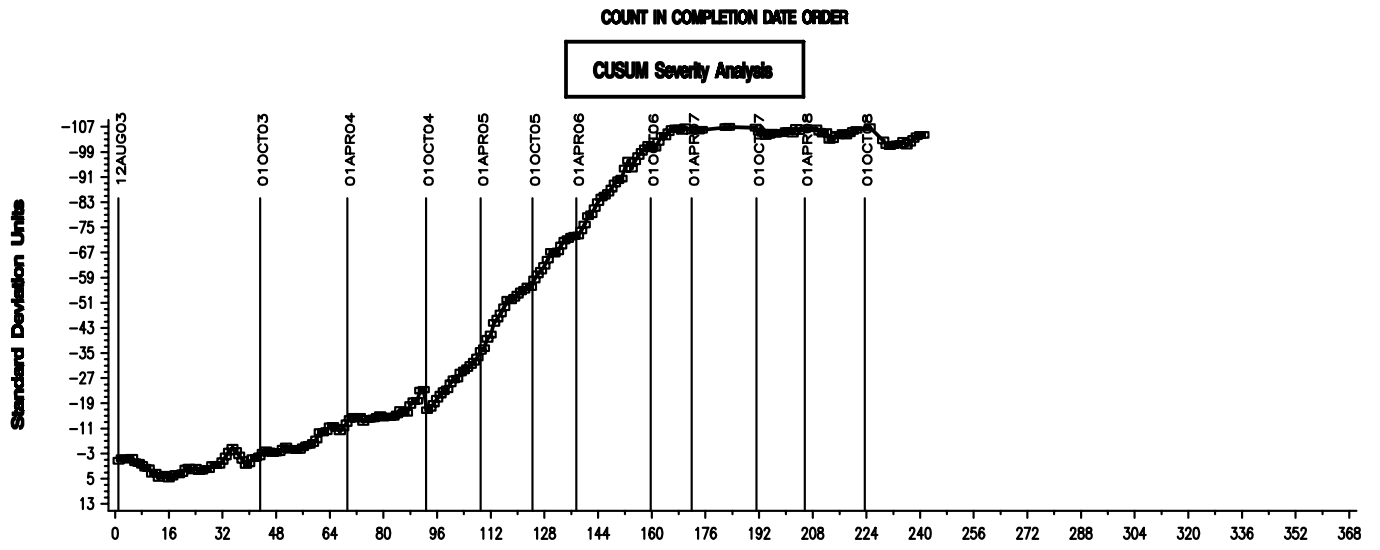
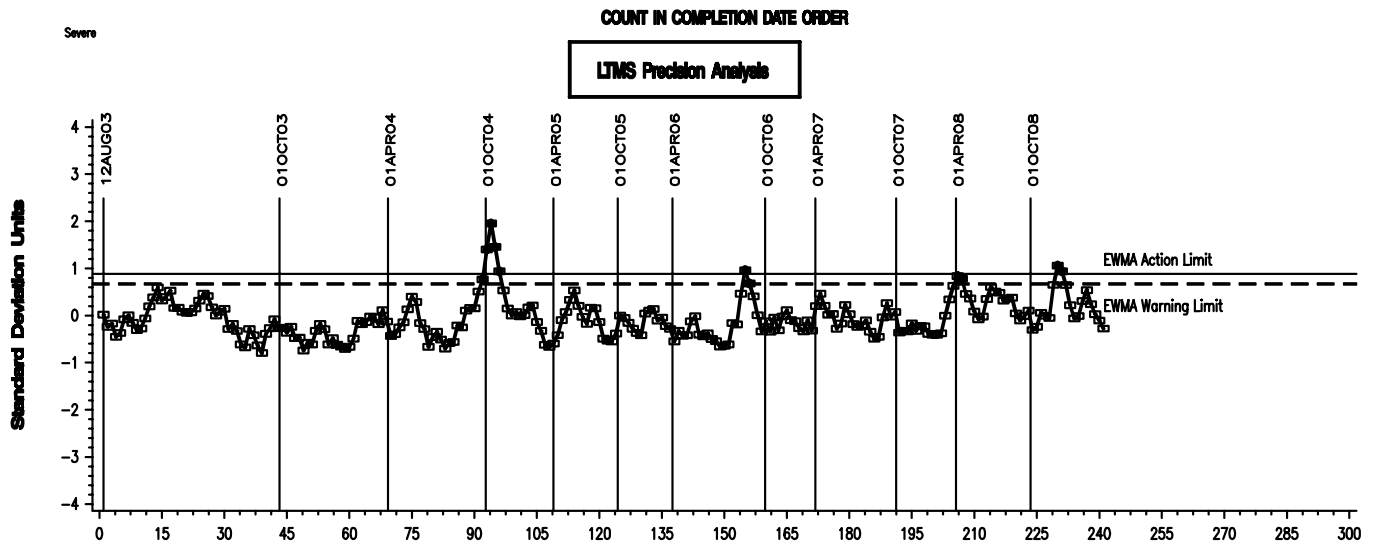
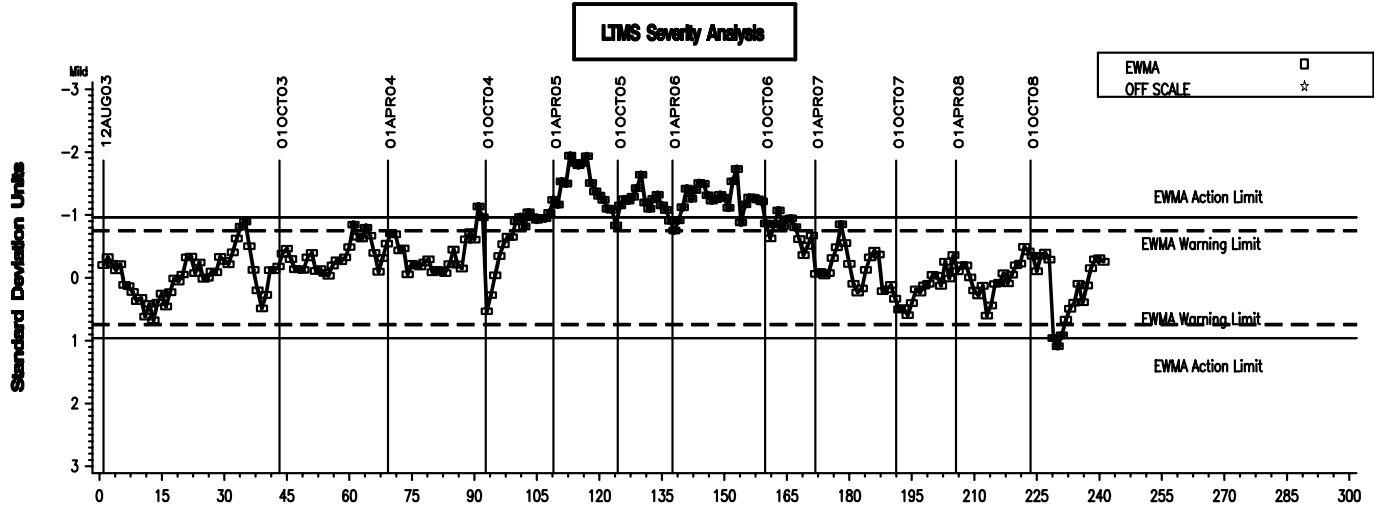


Figure 2

SEQUENCE III G INDUSTRY OPERATIONALLY VALID DATA

AVERAGE WEIGHTED PISTON DEPOSITS

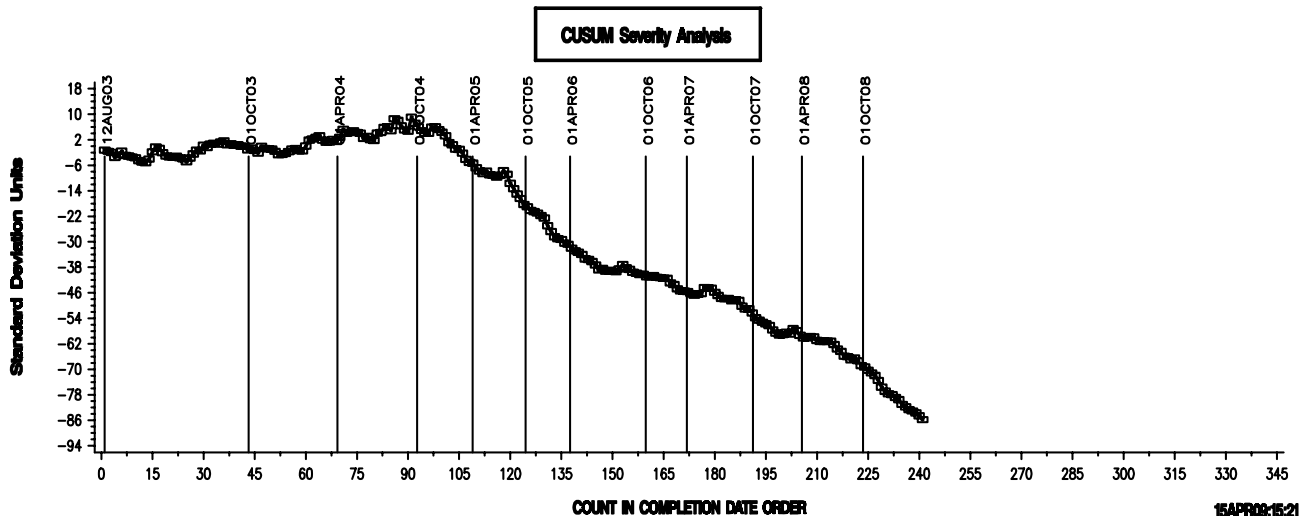
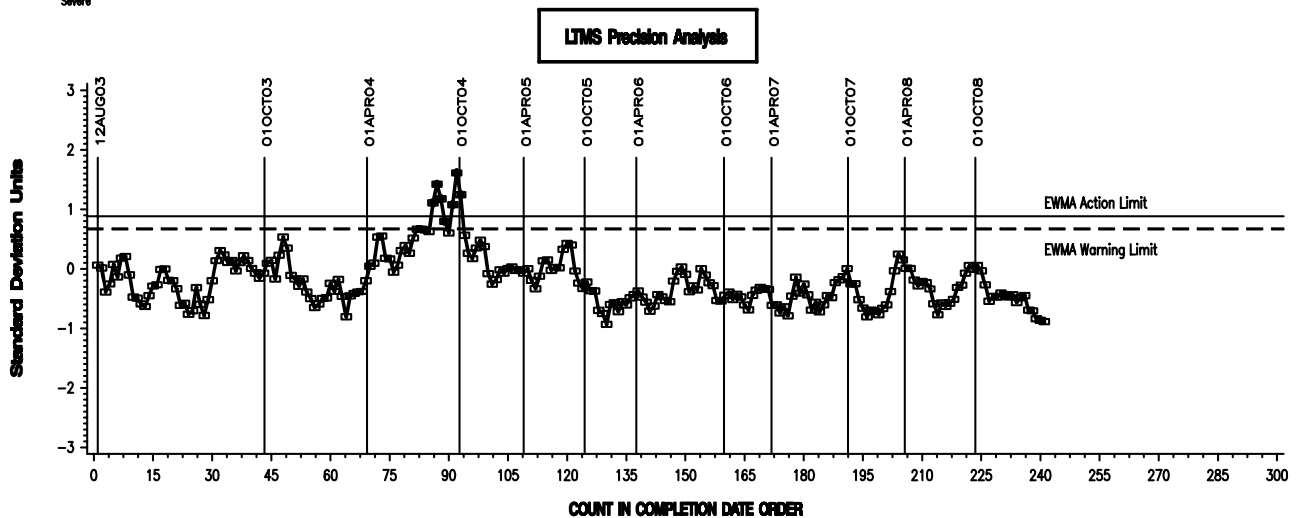
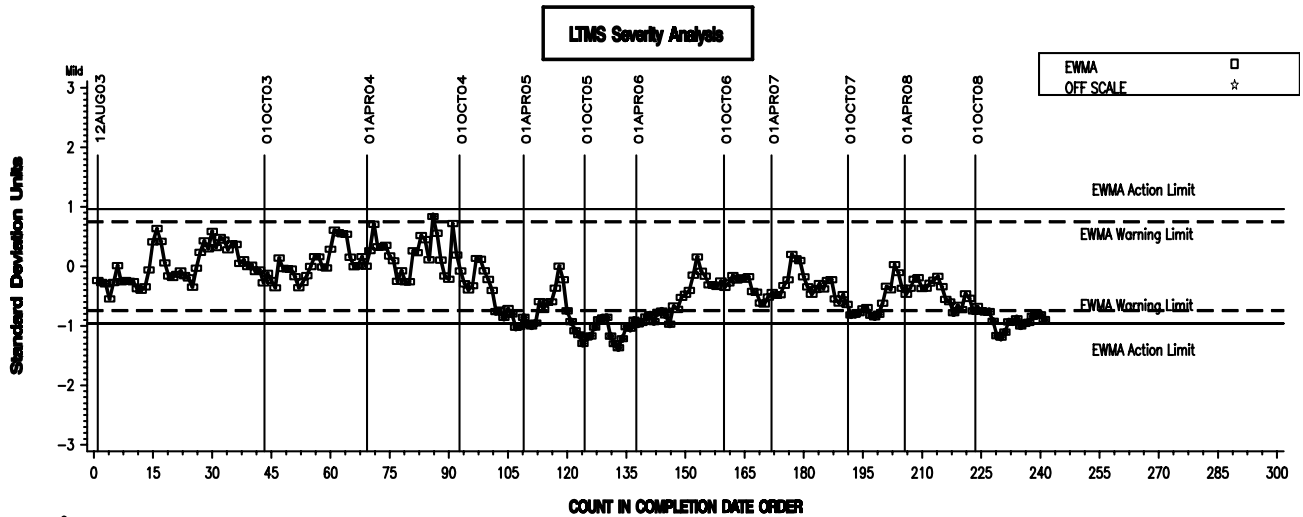


Figure 3

SEQUENCE III G INDUSTRY OPERATIONALLY VALID DATA

AVERAGE CAM + LIFTER WEAR

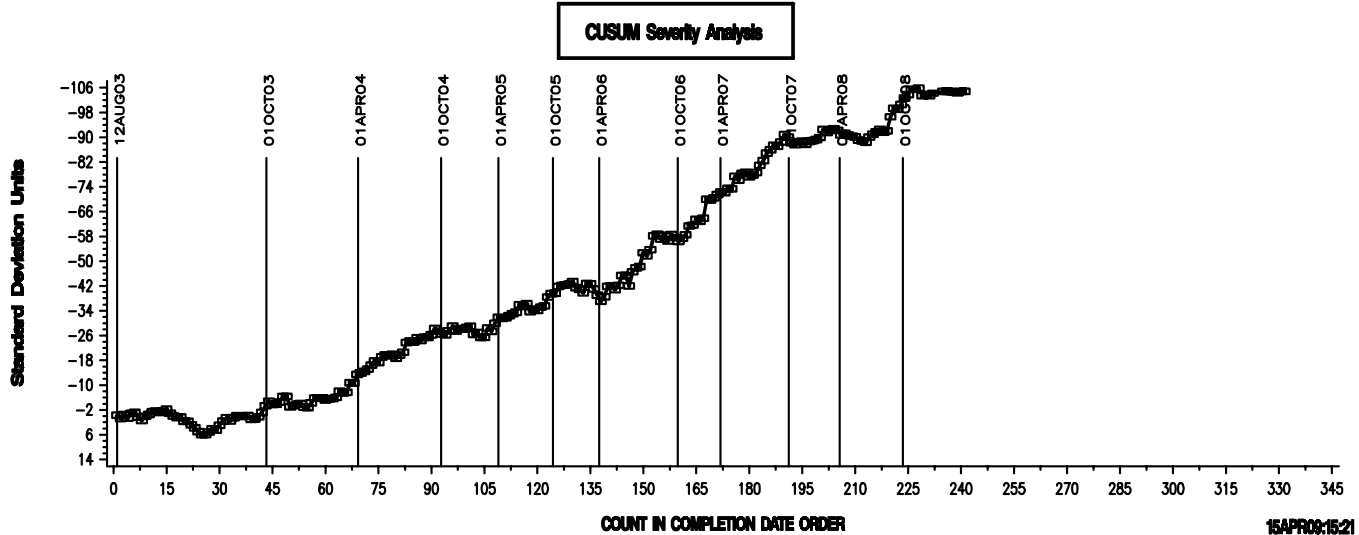
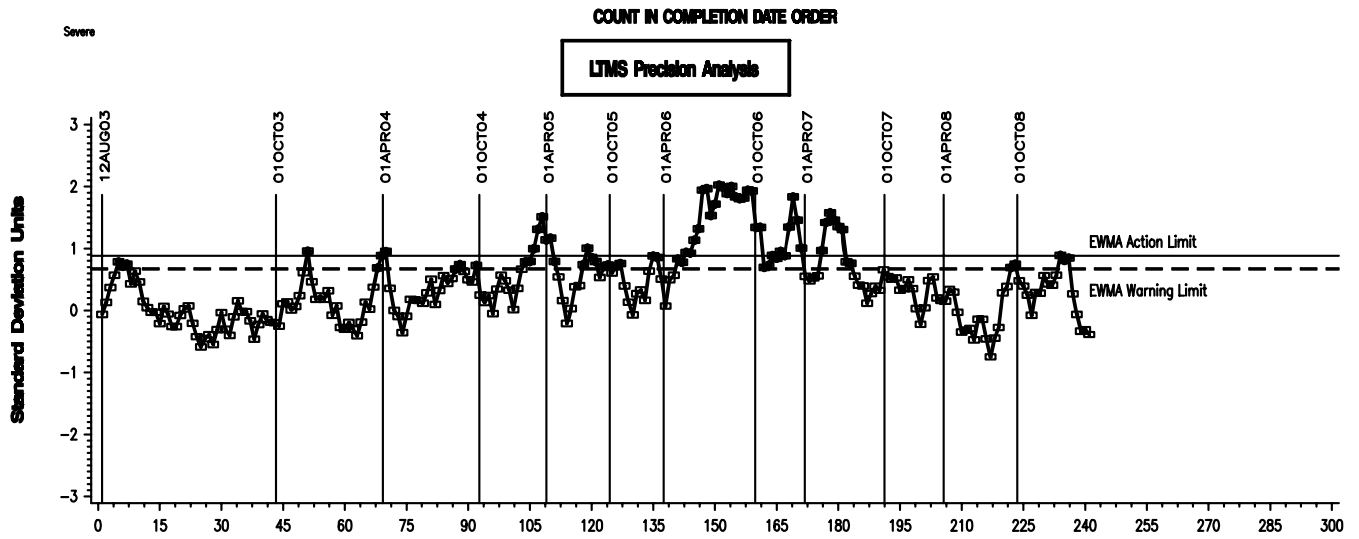
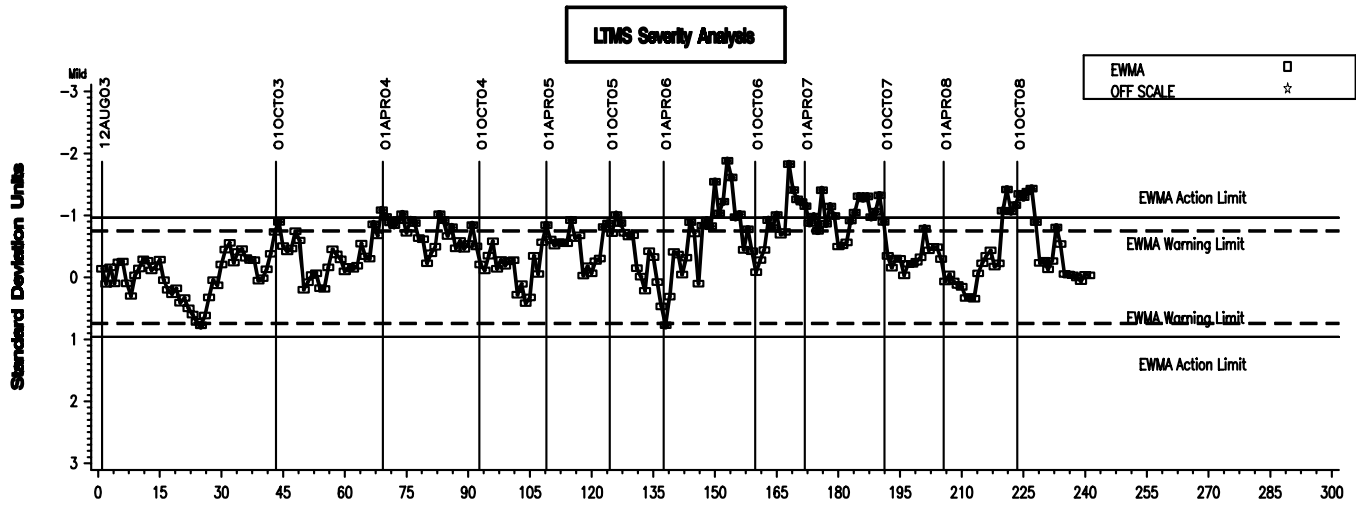


Figure 4 - Percent Viscosity Increase, Average Delta/s

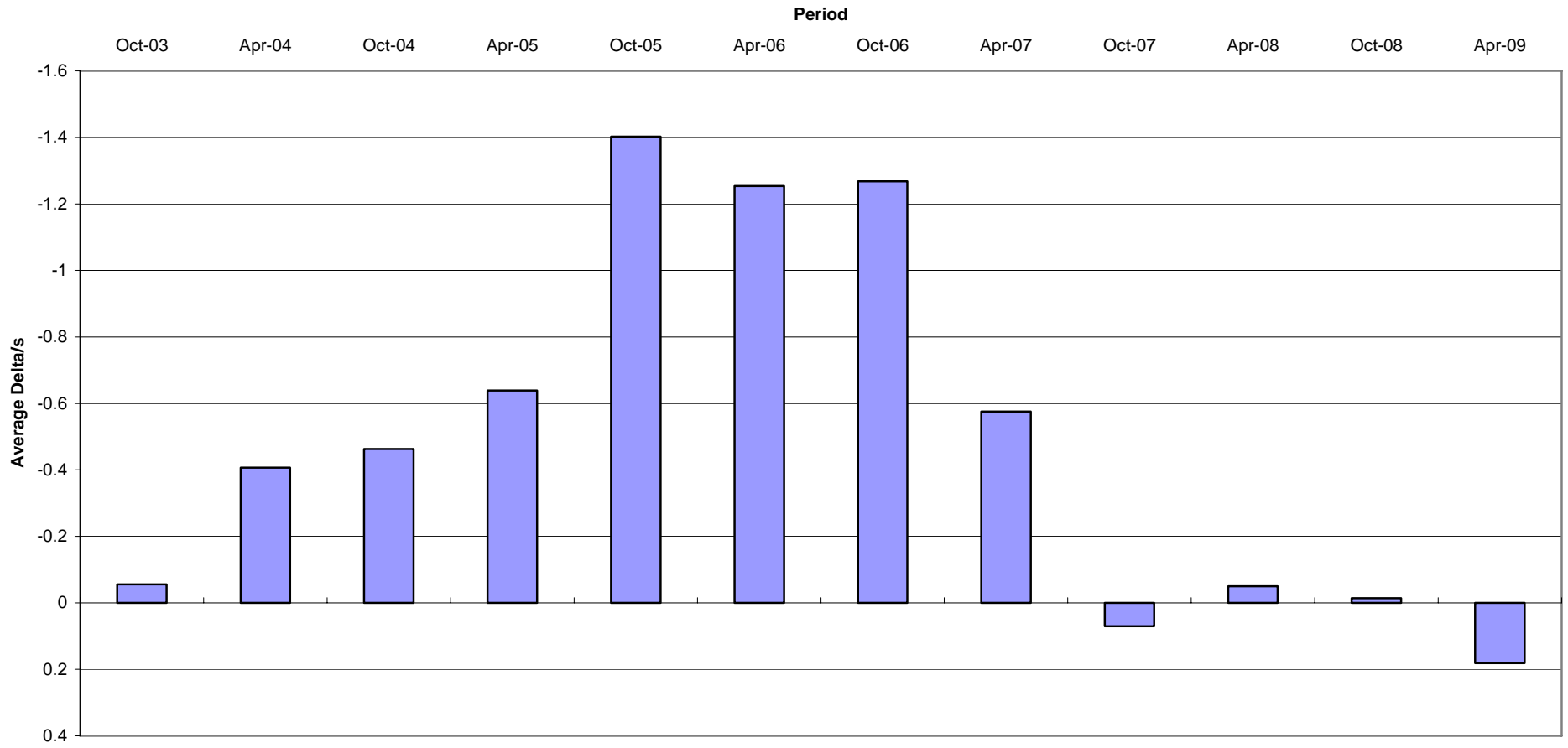


Figure 5 - Weighted Piston Deposits, Average Delta/s

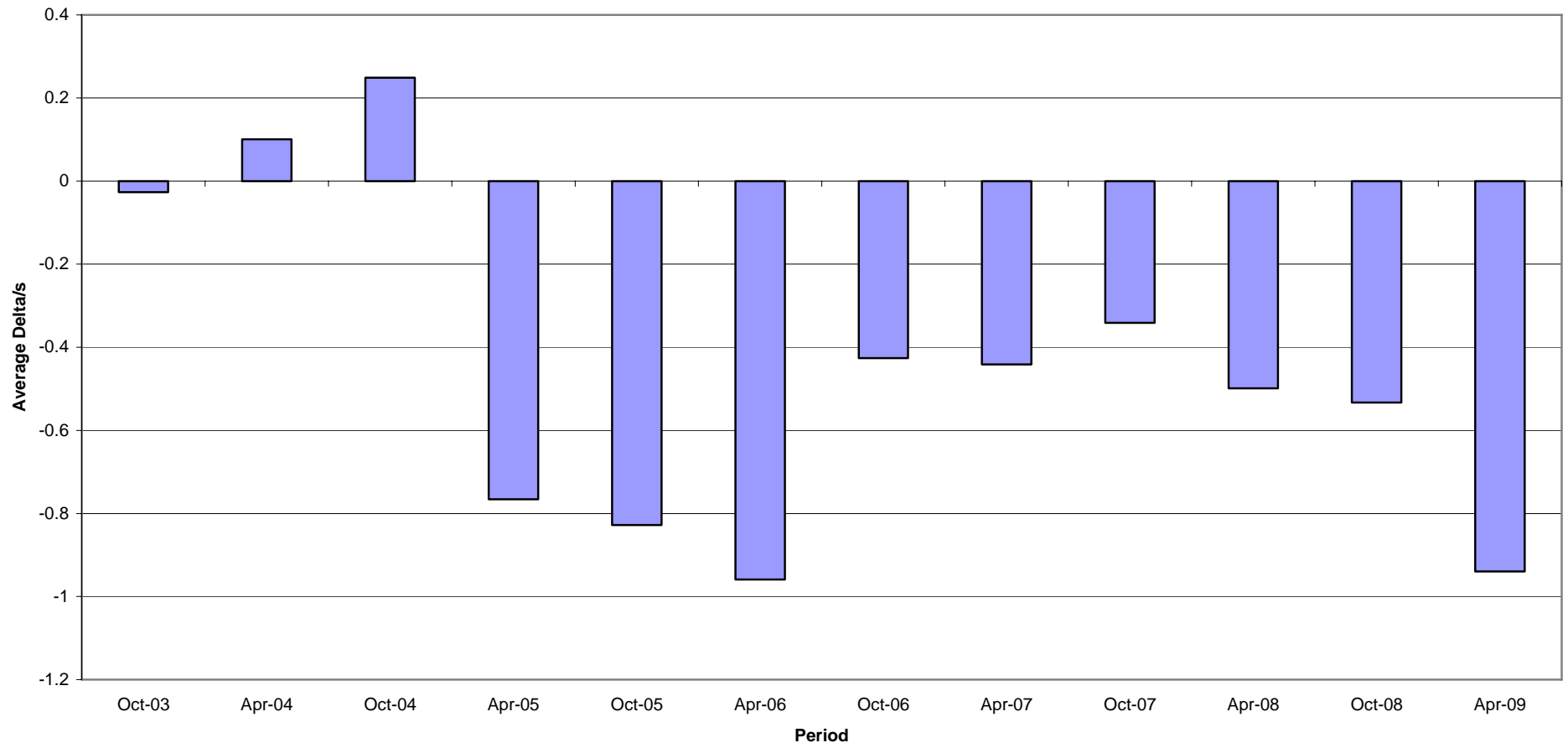


Figure 6 - Average Camshaft plus Lifter Wear, Average Delta/s

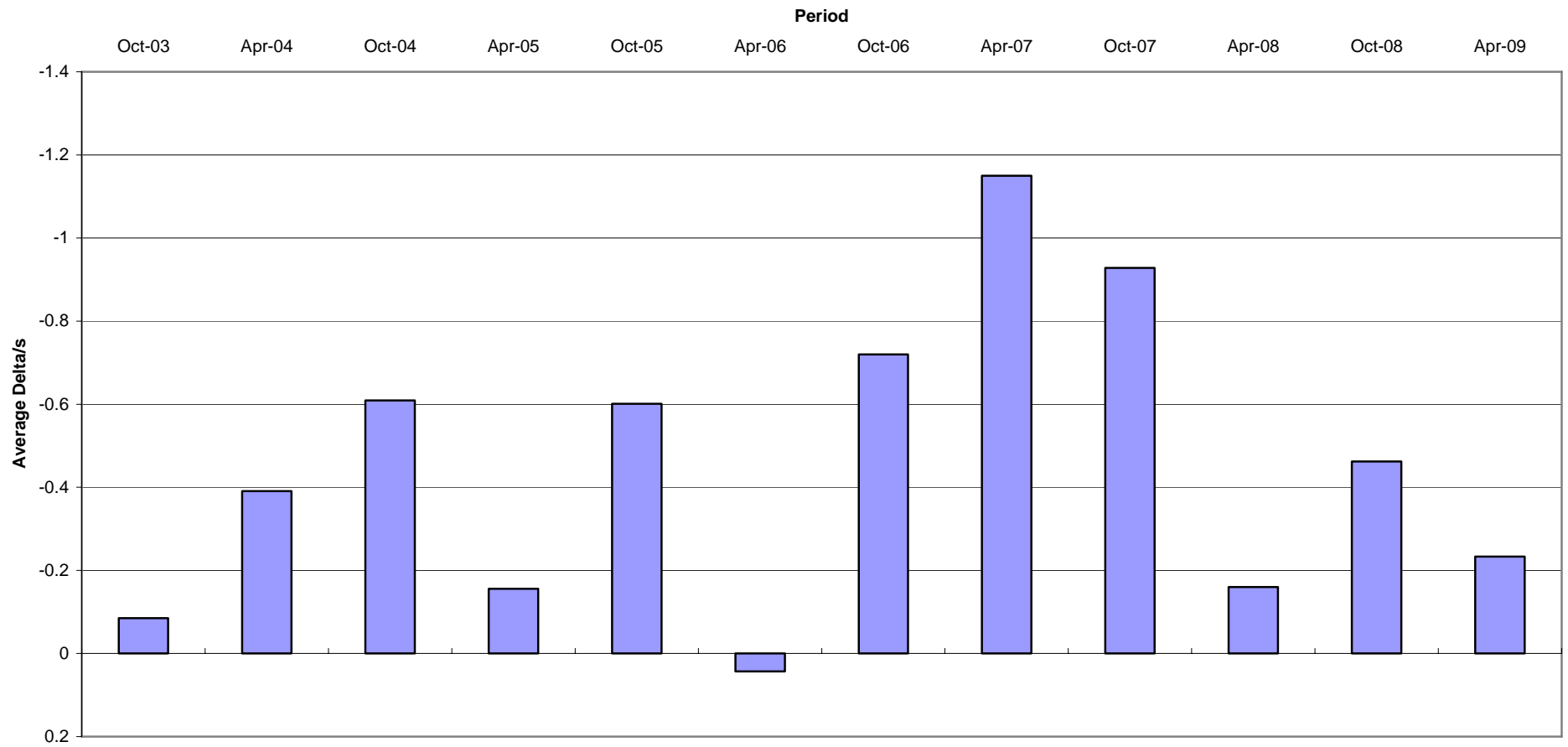


Figure 7 - Percent Viscosity Increase, Pooled Standard Deviation

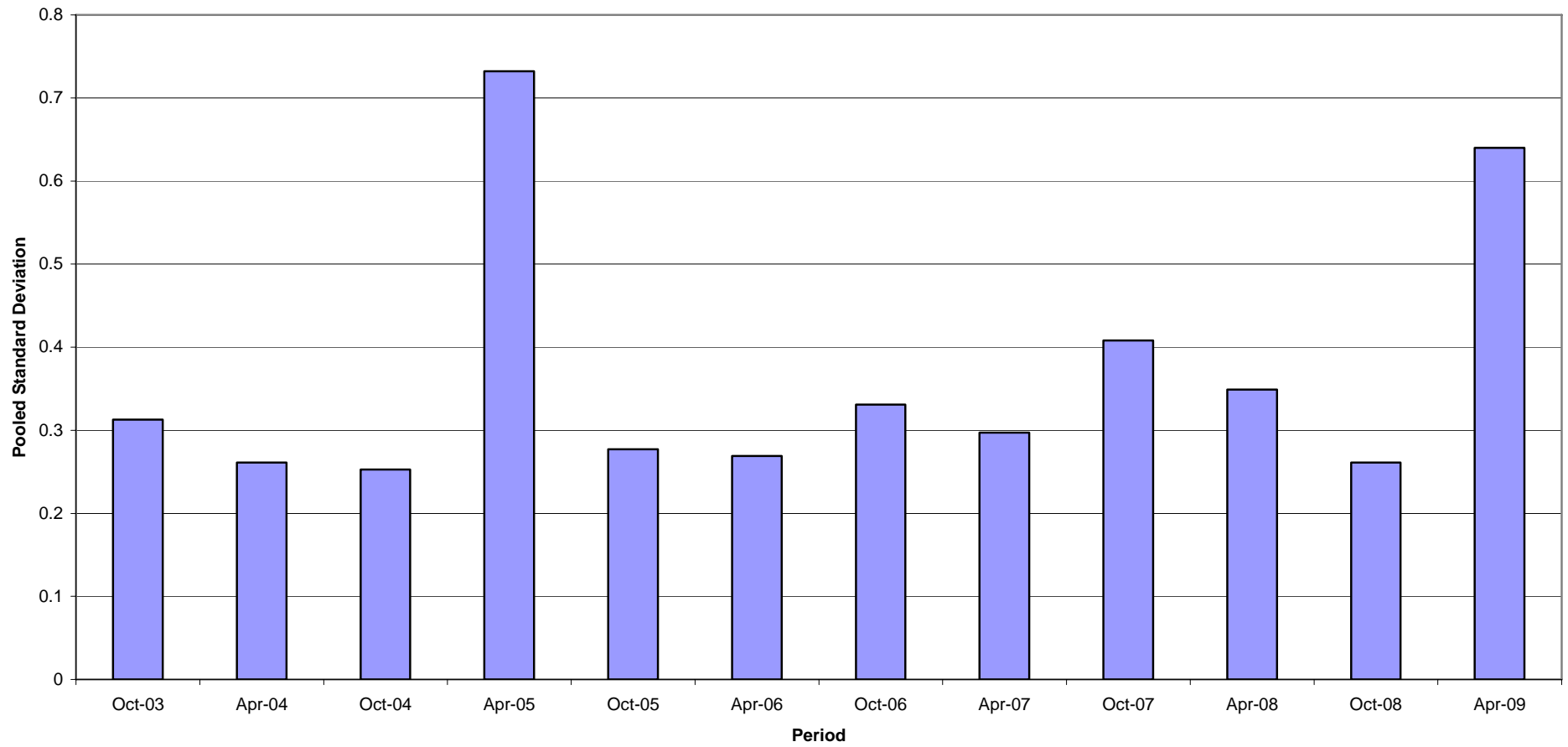


Figure 8 - Weighted Piston Deposits, Pooled Standard Deviation

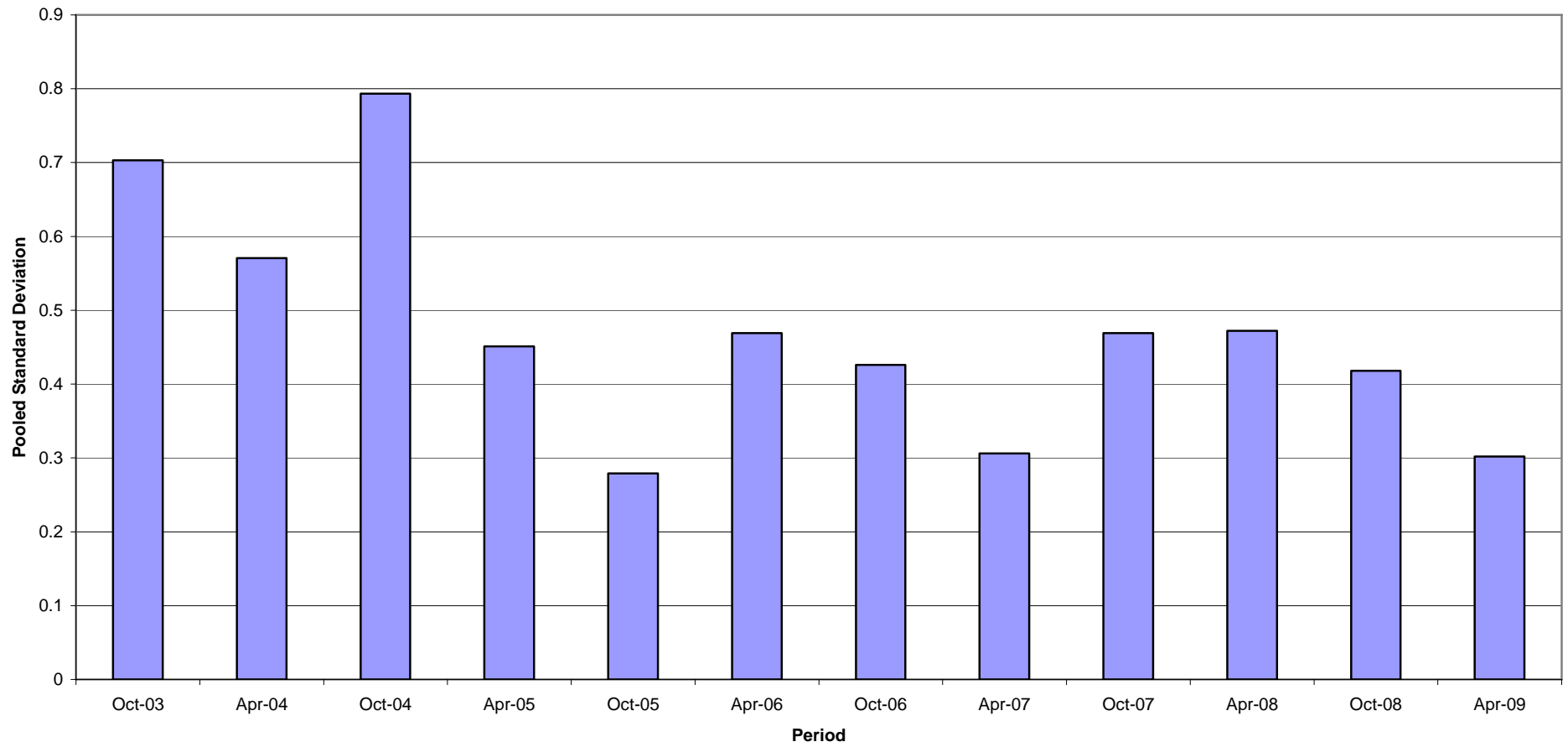


Figure 9 - Average Camshaft plus Lifter Wear, Pooled Standard Deviation

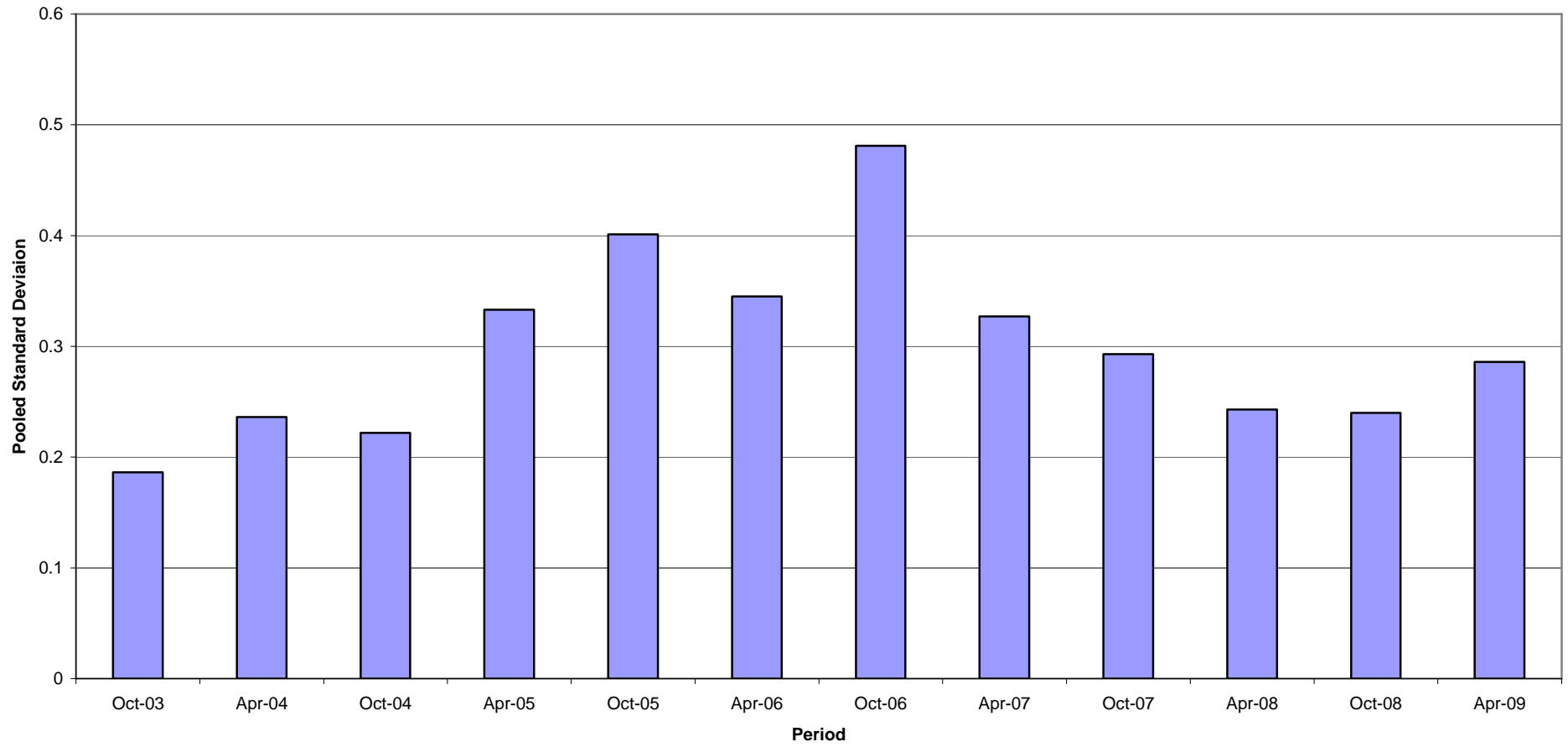
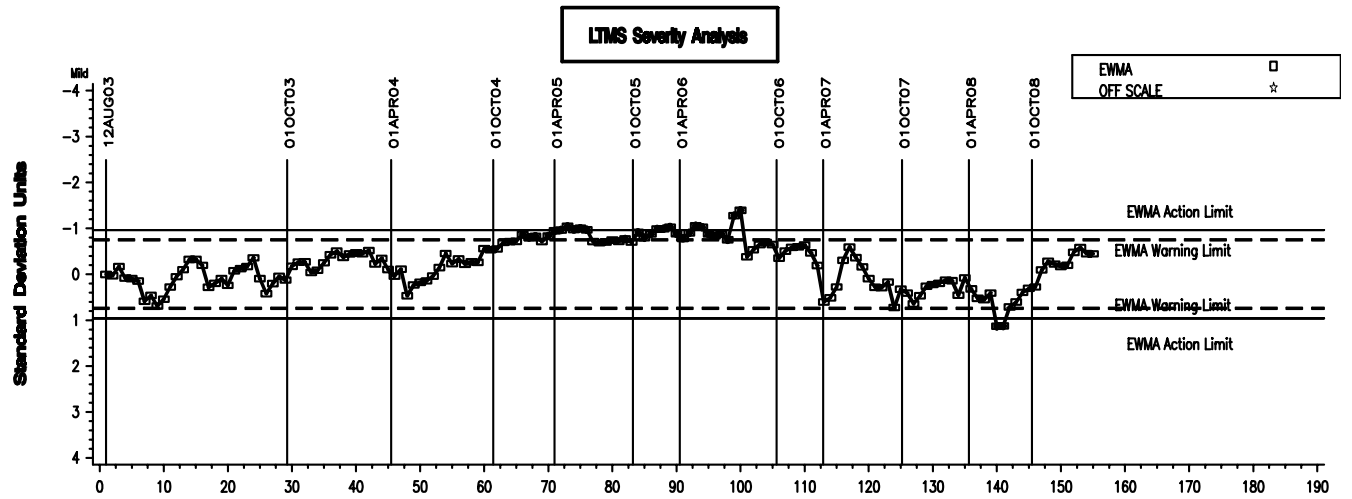


Figure 10

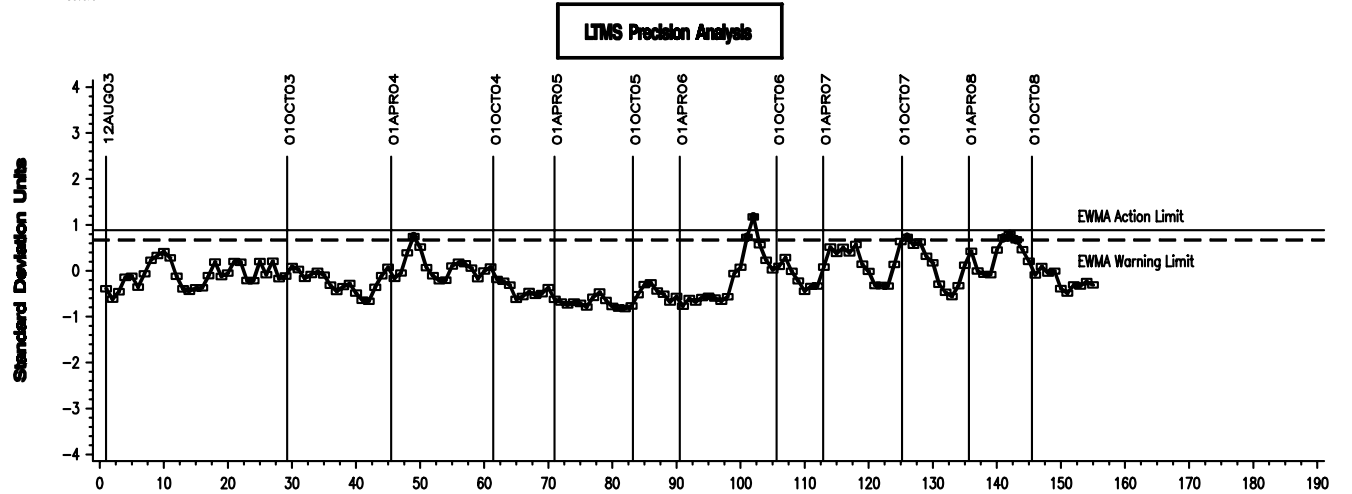
SEQUENCE IIIA INDUSTRY OPERATIONALLY VALID DATA

MRV VISCOSITY RESULT

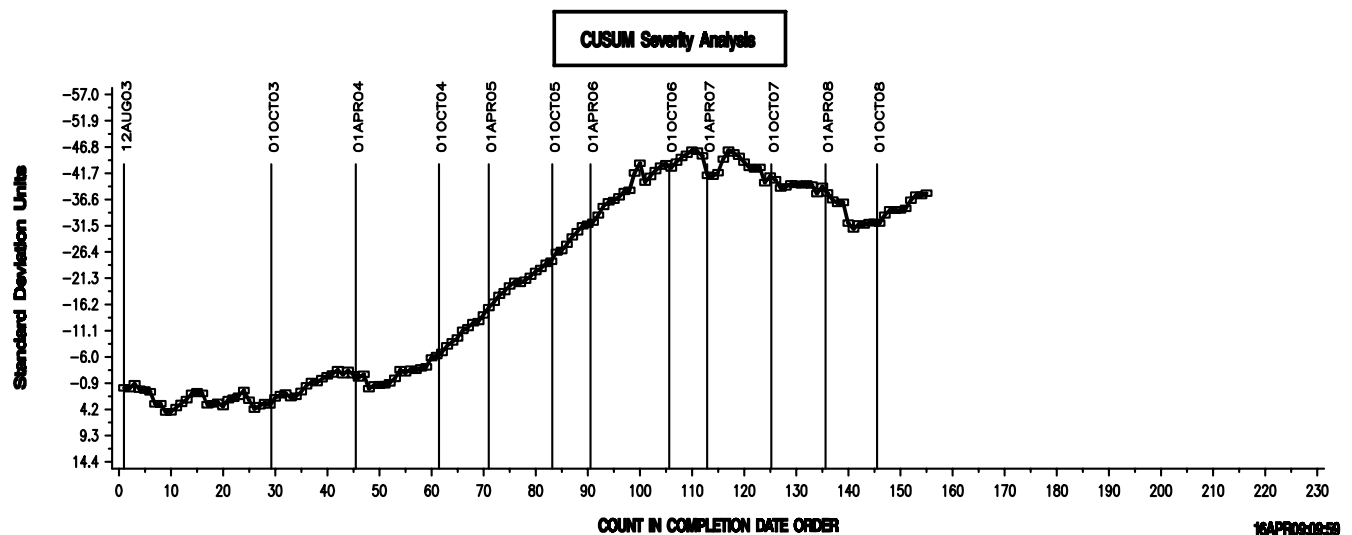


Severe

COUNT IN COMPLETION DATE ORDER



COUNT IN COMPLETION DATE ORDER



COUNT IN COMPLETION DATE ORDER

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

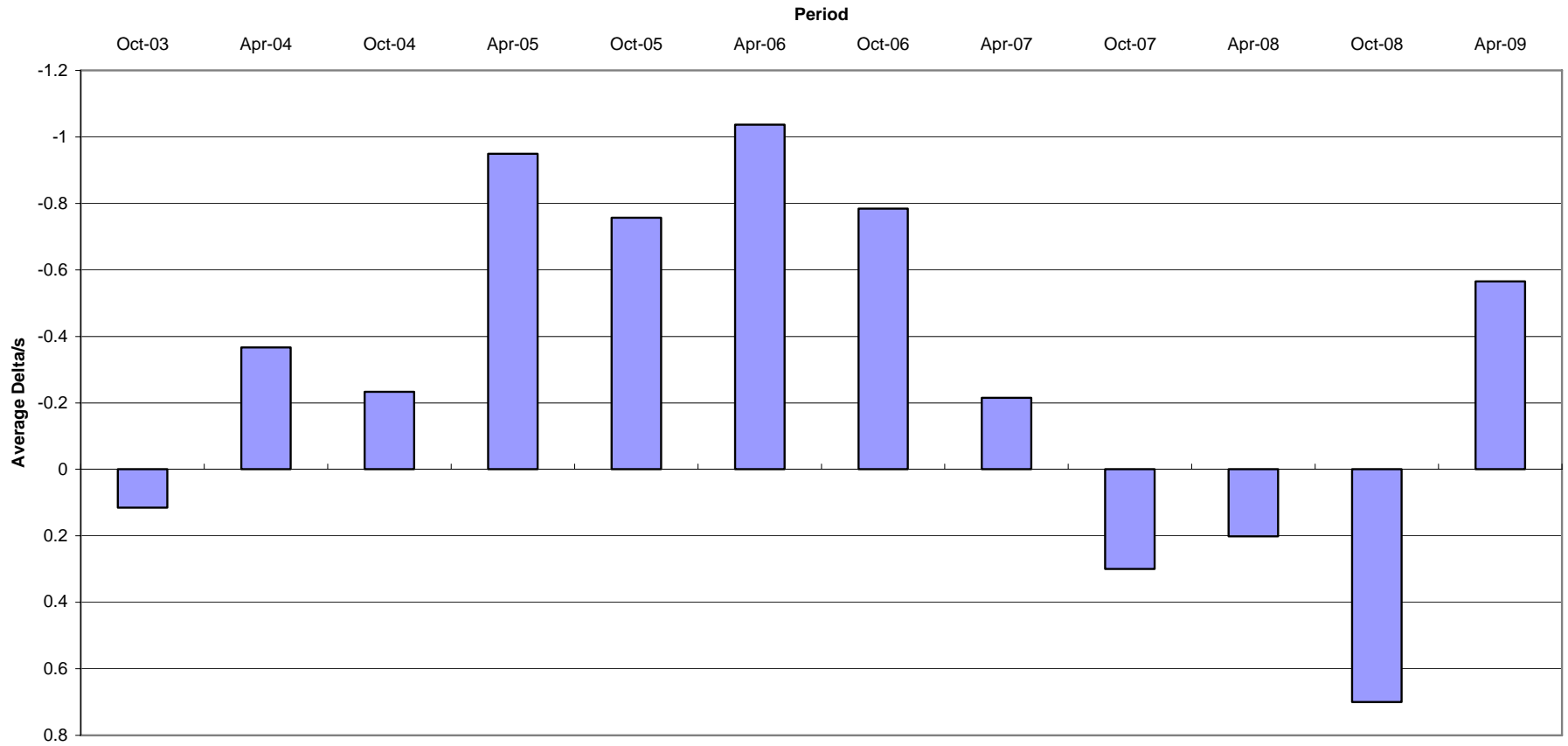


Figure 12 -Mini Rotary Viscometer result, Pooled Standard Deviation

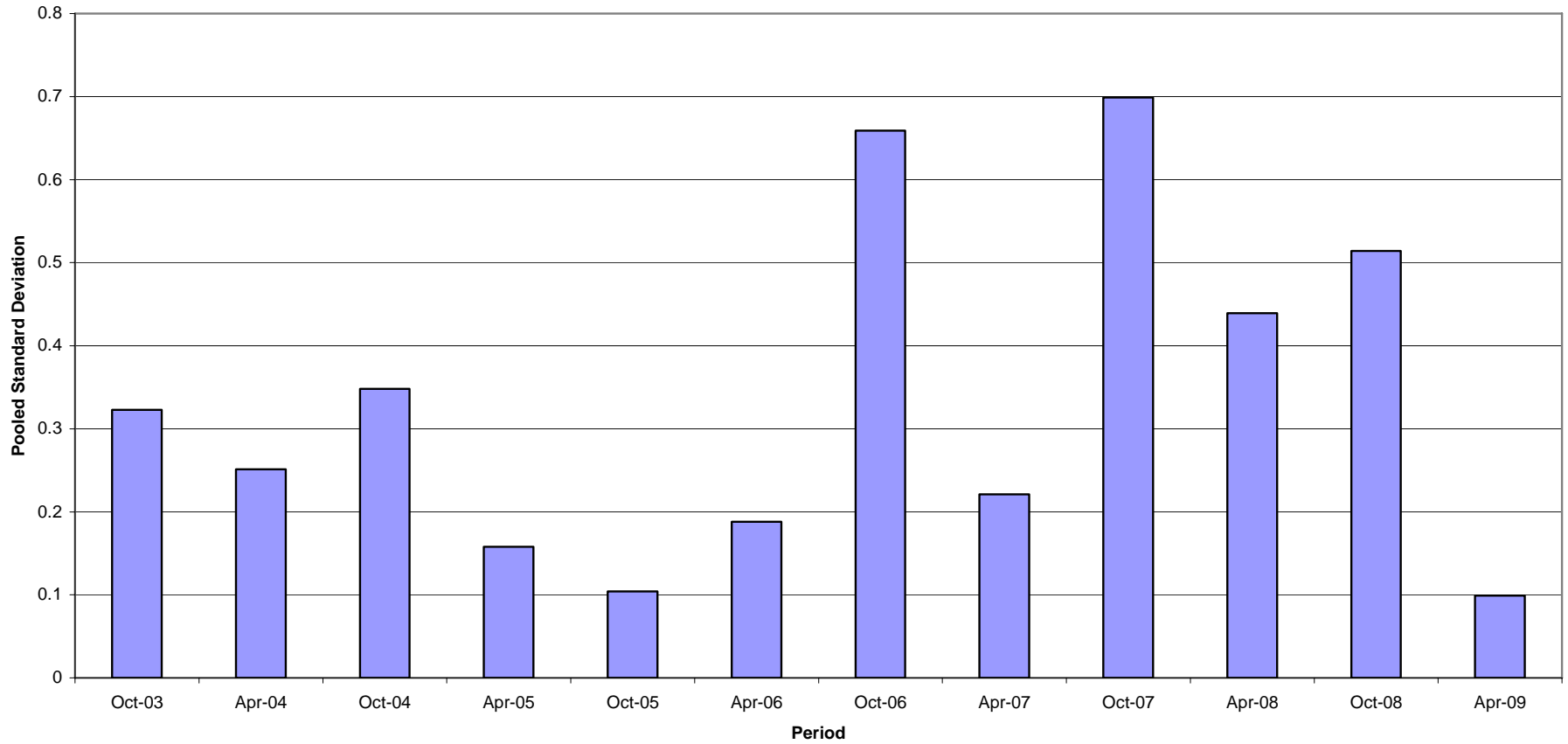


Figure 13

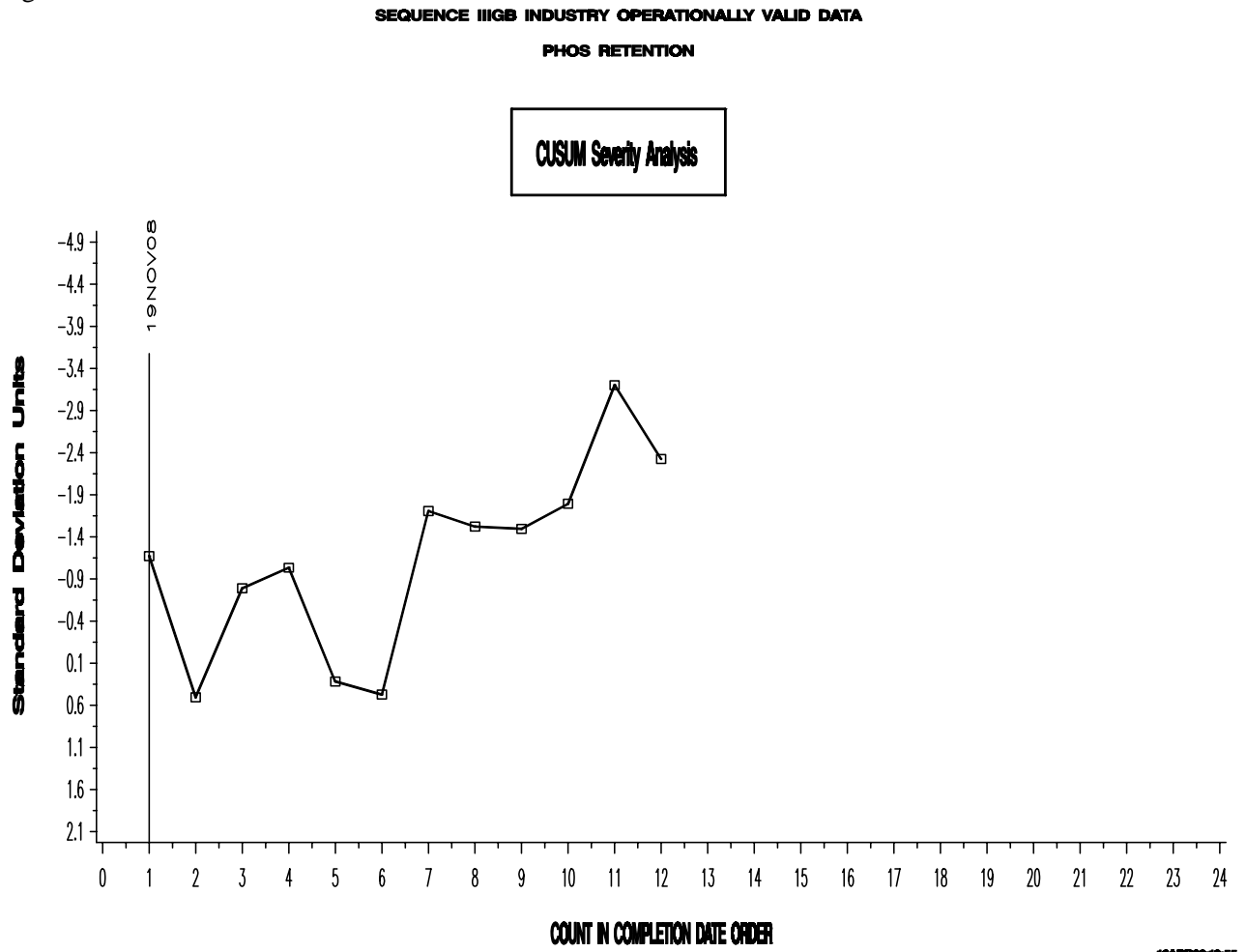


Figure 14 – Sequence IIIG/AB Timeline

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
5/20/2008	Clarified definition of downtime during oil leveling and sampling	08-1
6/08/2008	1 st occurrence of BC-7 rings	
11/06/2008	Added IIIGB test procedure to test method	08-2
11/24/2008	Added Snap on torque wrench to test method	08-3
11/24/2008	Updated source of Perfect seal number 4 gasket sealer	08-3
11/24/2008	Addressed several editorial changes	08-3
3/09/2009	Added section addressing oil filter and cooler replacement	09-1
3/09/2009	Corrected conversion error in dry bulb temperature	09-1