

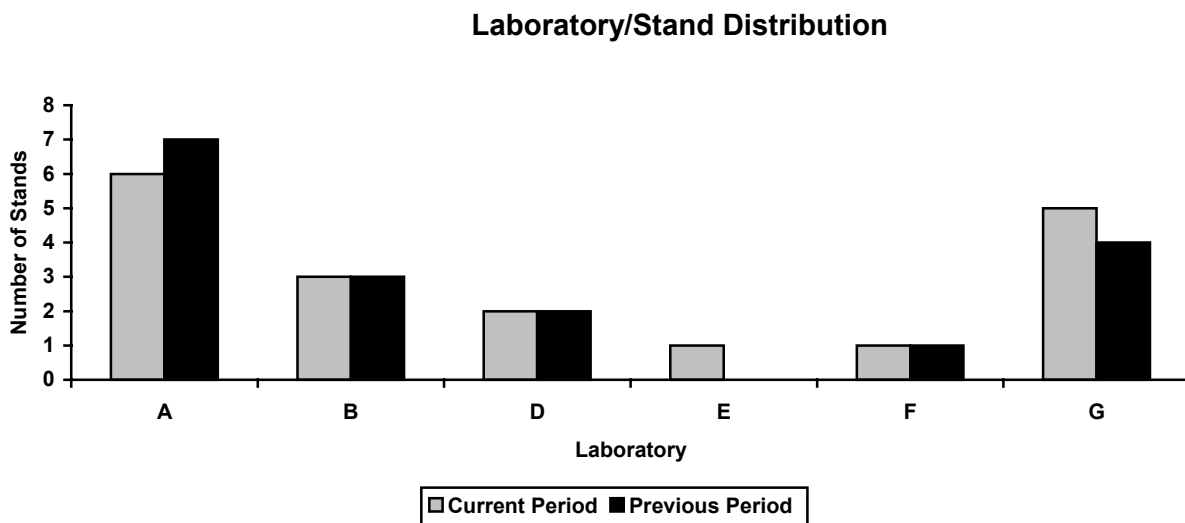
Memorandum: 04-039
 Date: May 3, 2004
 To: William M. Nahumck, Chairman, Sequence III Surveillance Panel
 From: Michael T. Kasimirsky *Michael T. Kasimirsky*
 Subject: Sequence IIIG Semiannual Report: October 1, 2003 through March 31, 2004

The following is a summary of Sequence IIIG reference tests that were reported to the Test Monitoring Center during the period October 1, 2003 through March 31, 2004.

Lab/Stand Distribution

	Reporting Data	Calibrated as of March 31, 2004
Number of Laboratories:	6	6
Number of Test Stands:	18	14

The following chart shows the laboratory/stand distribution:



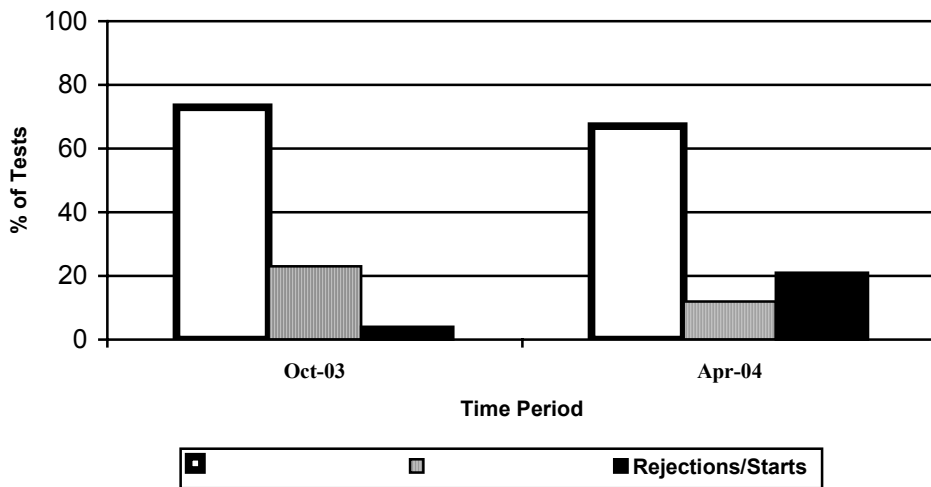
The following summarizes the status of the reference oil tests reported to the TMC:

Calibration Start Outcomes	TMC Validity Codes	No. of Tests
Operationally and Statistically Acceptable	AC	22
Failed Acceptance Criteria	OC	4
Operationally Invalid (Laboratory Judgment)	LC	3
Operationally Invalid (Lab & TMC Judgment)	RC	0
Stand Problem – Data Pulled from LTMS	MC	3
Aborted	XC	1
Total		33

Donated & Industry Support Outcomes	TMC Validity Codes	No. of Tests
Decoded Oil run on Potential New Hardware	NI	1
Total		1

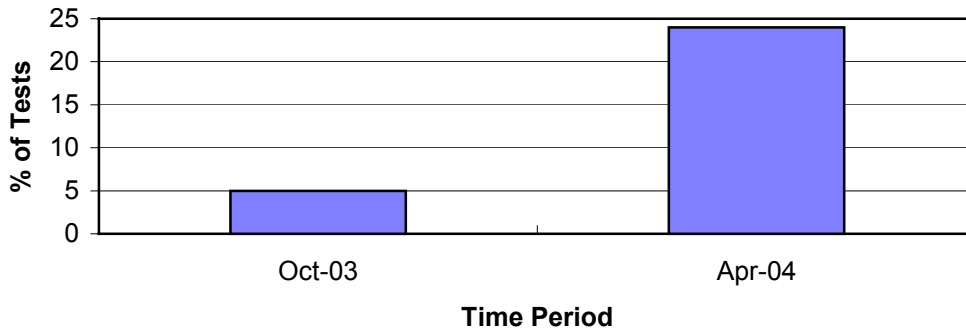
Calibrations per start, lost tests per start and rejection rates are summarized below:

Calibration Attempt Summary



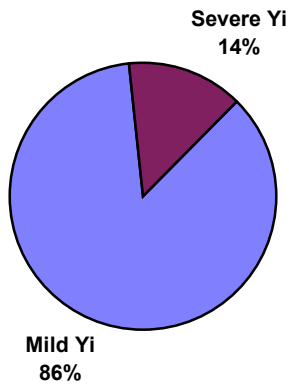
The calibration per start rate is slightly lower than last period. The lost test rate is lower than last period. The rejected test rate is higher than last period.

Rejected Test Rate for Operationally Valid Tests

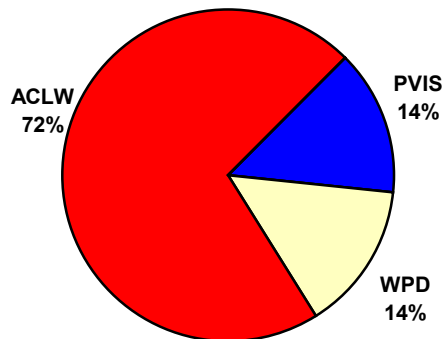


There were seven failing tests for the period. The following charts summarize the reasons and breakdown by parameter for the failed test:

Distribution of LTMS Stand Alarms



Distribution of Stand Alarms by Parameter



There were no LTMS Deviations written this period. There have been no deviations from the LTMS since its introduction in August of 2003.

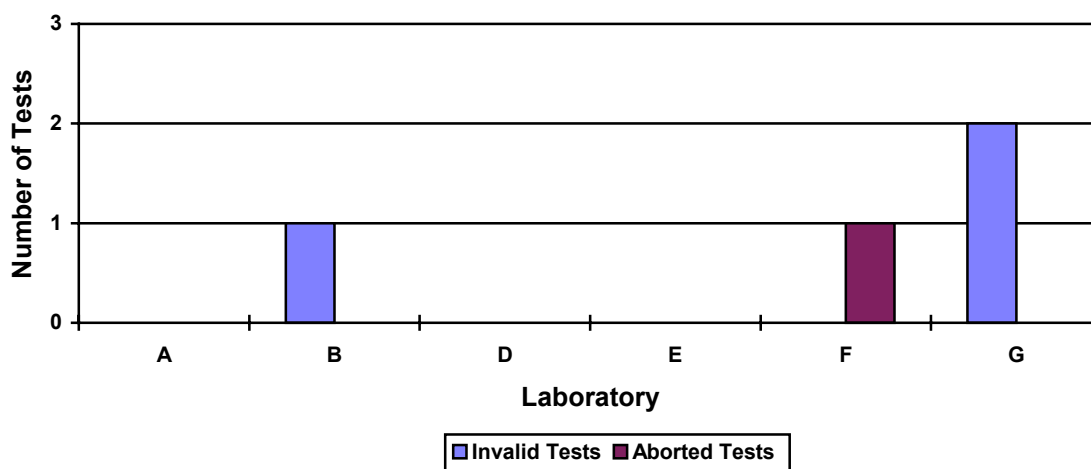
No Sequence IIIG lab visits were performed this period.

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)
B	Erratic Fuel Pressure	1	1/0/0
F	Coolant Temperature & Flow Problem	1	0/0/1
G	Oil Filter Block QI	1	2/0/0
	Coolant Flow Offset	1	

Lost Test Distribution



Information Letters

Sequence IIIG Information Letter No. 03-4, Sequence No. 4, was issued during the period on November 17, 2003, and contained: Revised Fuel Pressure Specification, Automatic Parts Washing Machine Maintenance Requirement, Revised Main Bearing Bore Mandrel Procedure, Piston Ring Cleaning Requirements, Additional Allowable RTV Sealing Compound, Main Bearing Cap Bolt Replacement Specification, Revised Camshaft Measurement Procedure, Revised Camshaft Lubrication & Installation Procedure, Revised Oil Consumption Reporting Procedure, Fluid Conditioning Module Equipment Specifications, Revised Camshaft Measurement Equipment Specifications, Rating Workshop Attendance Requirement, Editorial Corrections, and Creation of Sequence IIIGA Test Annex.

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	-0.407	0.261 (df=23)	-15.1% Viscosity Increase ¹
WPD	0.100	0.571 (df=23)	0.06 Merits
ACLW	-0.391	0.236 (df=23)	-5.3 μm^2

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

² At the proposed GF-4 Pass Limit of 60 μm

Average Δ/s Results, by Laboratory			
Laboratory	PVIS	WPD	ACLW
A	-0.57	0.35	-0.39
B	-0.88	0.63	0.24
D	-0.42	-1.04	0.04
E	0.65	-0.12	-0.35
F	-1.15	1.54	0.67
G	-0.42	-0.21	-1.04

Percent Viscosity Increase (PVIS)

The industry was within limits for both severity and precision during the period, with the exception of two single-point severity alarms (see Figure 1). The average Δ/s value for the period, -0.407, is milder than last period and is shown in Figure 4. The pooled standard deviation for the period, 0.261, is better than last period and is shown in Figure 7.

Weighted Piston Deposits (WPD)

The industry was within limits for both severity and precision during the period (see Figure 2), but has exceeded the B1 limit for precision with the most recent data point. This precision condition seems to have been driven by the test prior to the one exceeding the limit as it generated Y_i results of 2.48 on WPD. The average Δ/s value for the period, 0.100, is milder than last period and is shown in Figure 5. The pooled standard deviation for the period, 0.571, is better than last period and is shown in Figure 8.

Average Camshaft-plus-Lifter Wear (ACLW)

The industry has exceeded the EWMA Severity Mild Warning Limit twice during the period and currently remains beyond that limit (see Figure 1). This alarm seems to be driven primarily by two test results, on one stand, both on reference oil 435 ($-3.08Y_i$ and $-2.73Y_i$ respectively). A third test, on another stand in that same laboratory, had a result of $-1.97Y_i$ on reference oil 435 and may also be driving the alarm. ACLW performance at other laboratories seems to be on target at this time. The average Δ/s value for the period, -0.391, is milder than last period and is shown in Figure 6. The pooled standard deviation for the period, 0.236, is worse than last period and is shown in Figure 9.

QI Deviations

There were no QI Deviations written this period. There have been no QI Deviations written since the test was introduced in August of 2003.

Hardware

No hardware changes were made this period.

Reference Oils

Oil	TMC Inventory, in gallons	TMC Inventory, in tests (4 gal/test)	Laboratory Inventory, in tests	Estimated life
434	282	70	16	~ 4 years
435	368	92	11	~ 5 years
438	784	196	15	~10 years

The test targets for the three reference oils were updated during the period. The new targets are shown below:

Reference Oil 434 Test Targets (N=20)		
Parameter	Mean	Standard Deviation
PVIS	4.7040	0.3877
WPD	4.73	1.01
ACLW	3.4872	0.2061
MRV	10.7378	0.40442

Reference Oil 434 Test Targets (N=19)		
Parameter	Mean	Standard Deviation
PVIS	5.2903	0.2852
WPD	3.53	0.47
ACLW	3.5596	0.1960
MRV	N/A *	N/A *

*ACLW results for 438 are not transformed, unlike the results for other Sequence IIIG reference oils.

Reference Oil 438 Test Targets (N=22)		
Parameter	Mean	Standard Deviation
PVIS	4.5707	0.1953
WPD	3.22	0.36
ACLW	2.8902	0.1946
MRV	9.8351	0.17518

All the targets listed above are effective for all tests completed on or after February 1, 2004.

During the period, the panel also approved a revision to the pooled standard deviation used for calculation of ACLW Severity Adjustments. The new pooled s value is shown below:

ACLW SA Pooled Standard Deviation	0.1903
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The new pooled s value is effective for all tests completed on or after January 21, 2004.

MTK/mtk

Attachments

c: F. M. Farber, TMC
Sequence III Surveillance Panel
<ftp://ftp.astmtmc.cmu.edu/docs/gas/sequenceiii/semiannualreports/IIIG-04-2004.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 the Sequence IIIG Timeline.

Figure 1

SEQUENCE IIIIG INDUSTRY OPERATIONALLY VALID DATA

VISCOSITY INCREASE

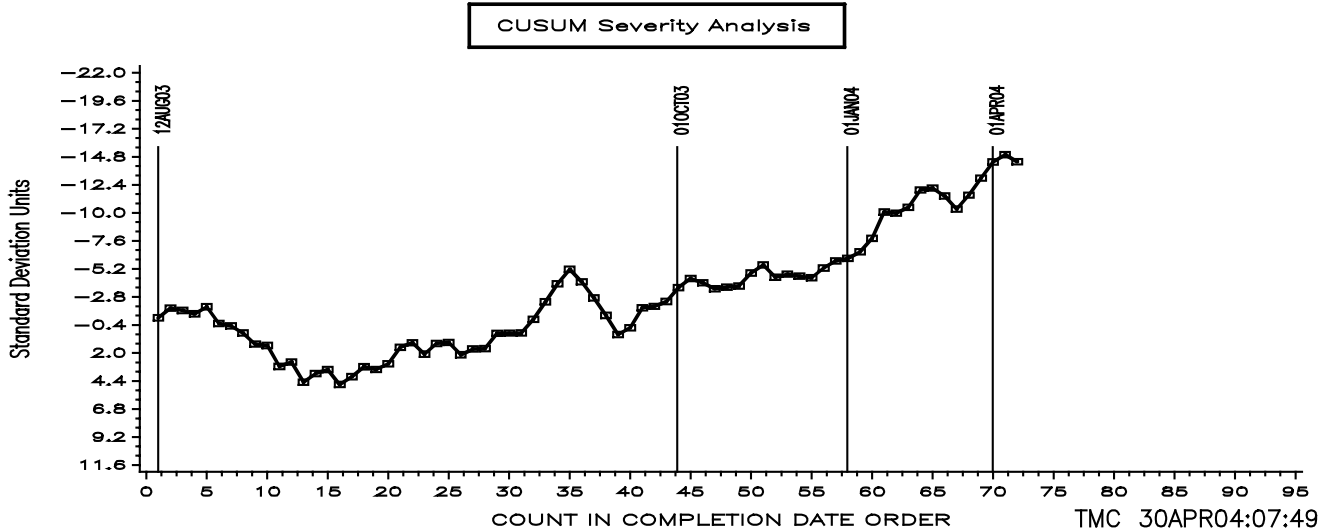
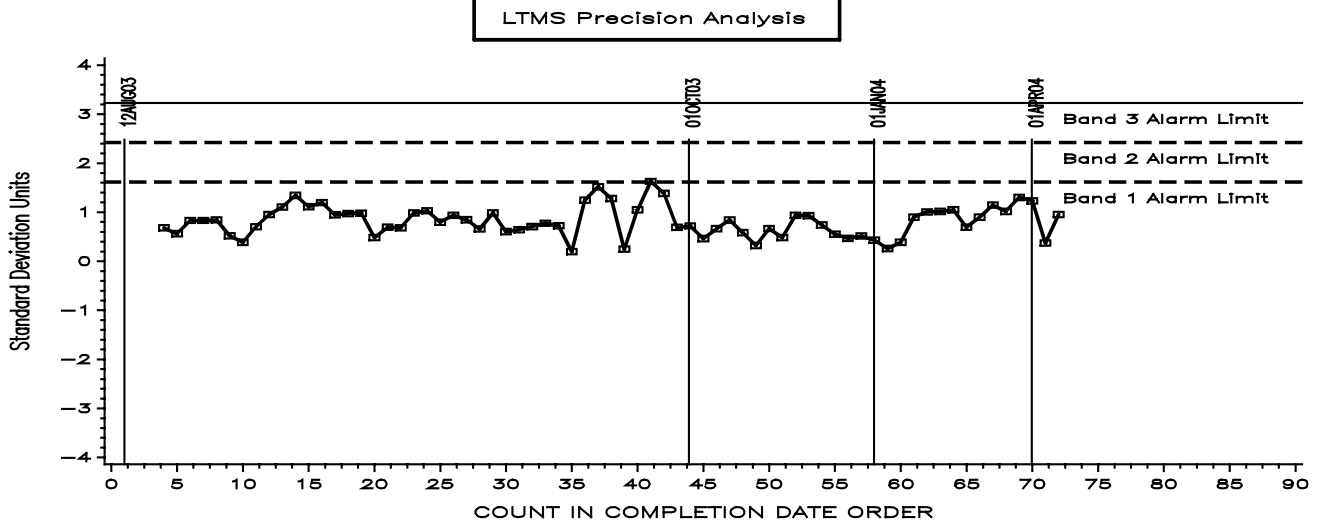
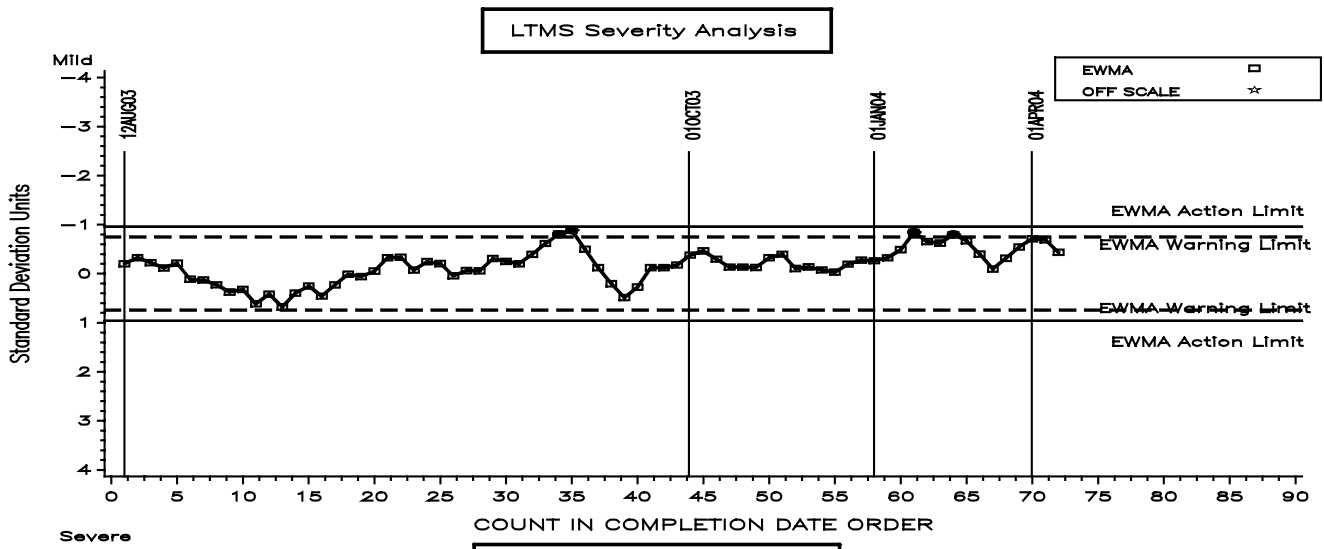


Figure 2

SEQUENCE IIIIG INDUSTRY OPERATIONALLY VALID DATA

AVERAGE WEIGHTED PISTON DEPOSITS

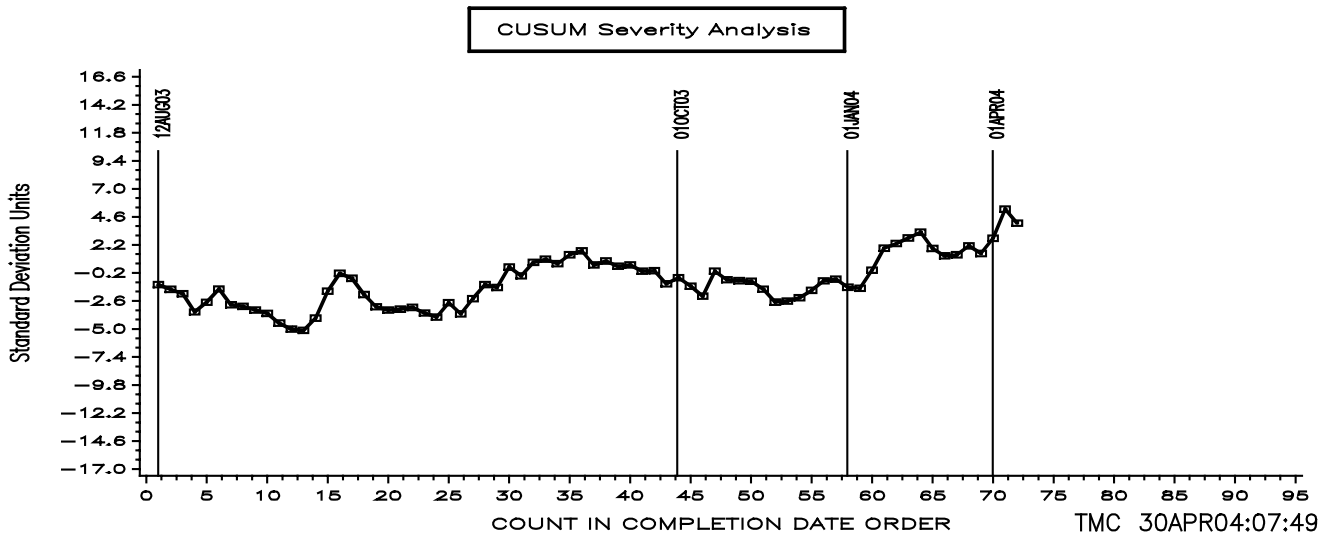
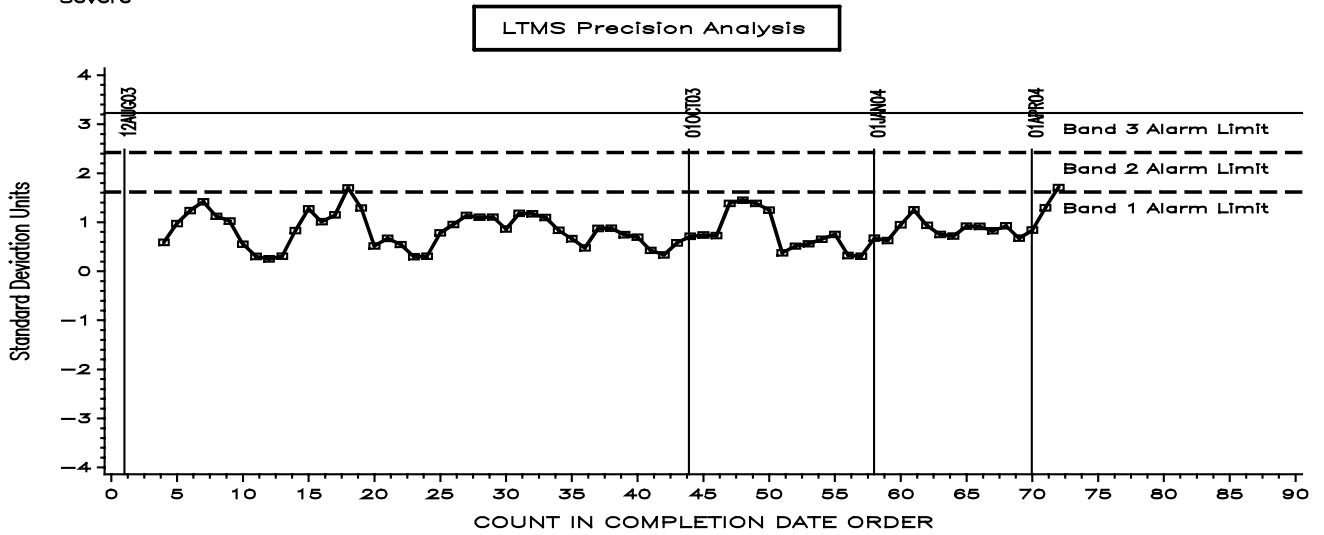
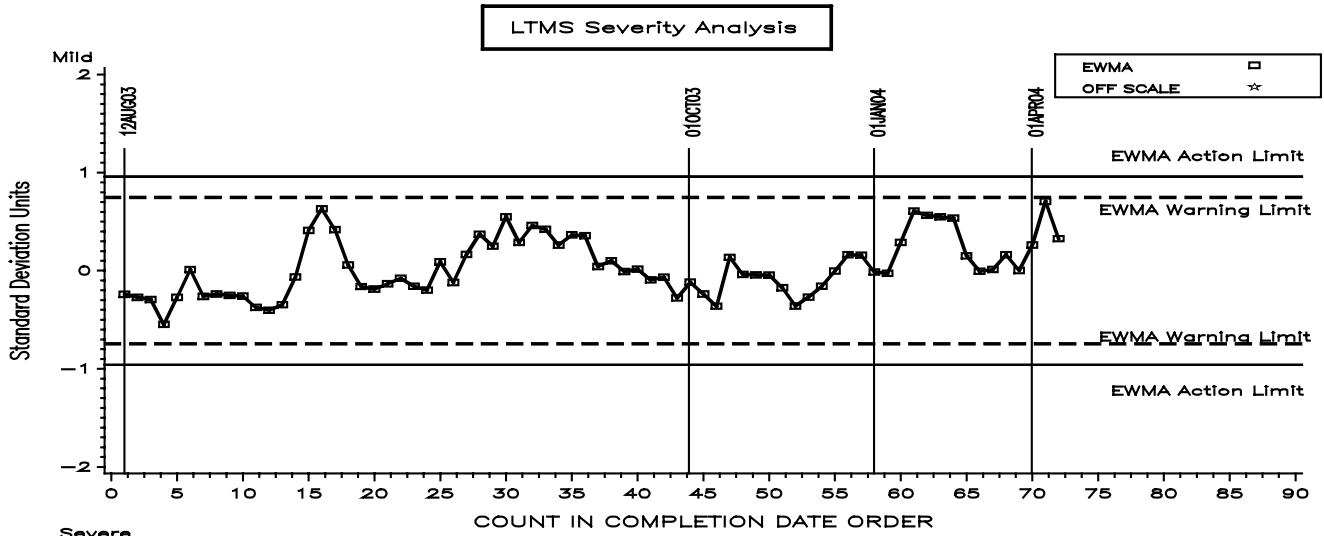


Figure 3

SEQUENCE IIIIG INDUSTRY OPERATIONALLY VALID DATA

AVERAGE CAM + LIFTER WEAR

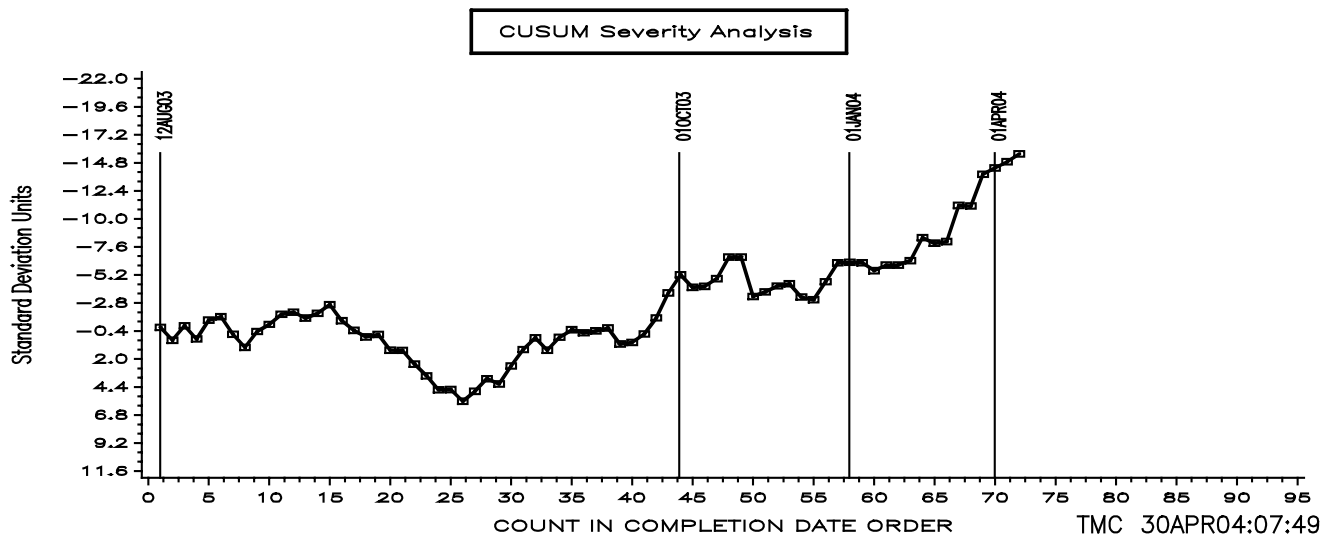
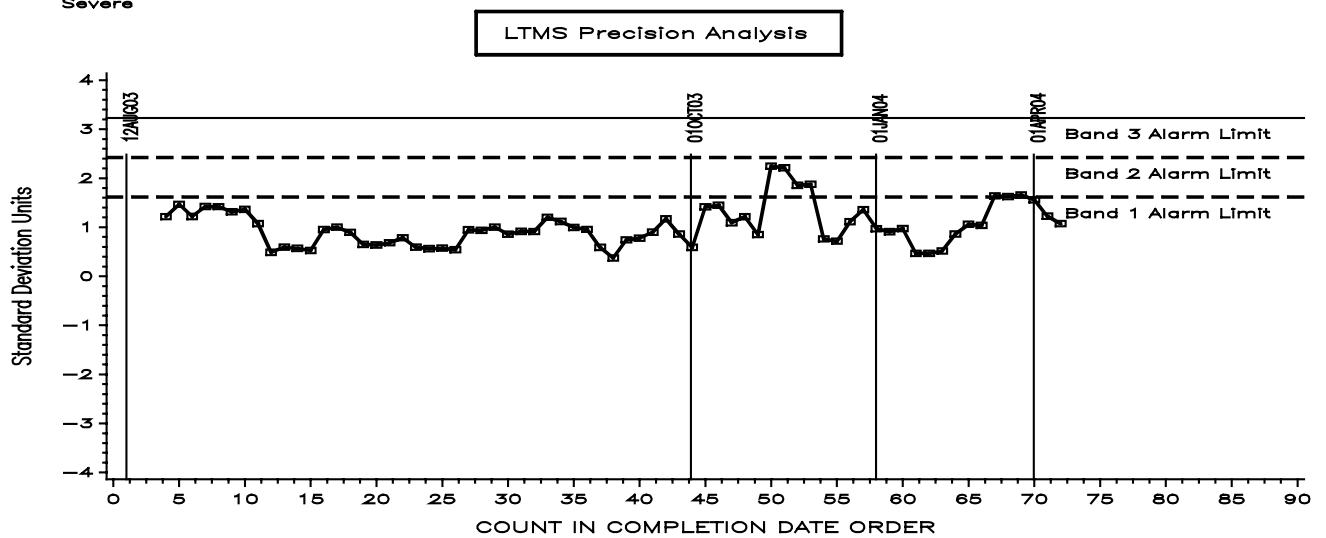
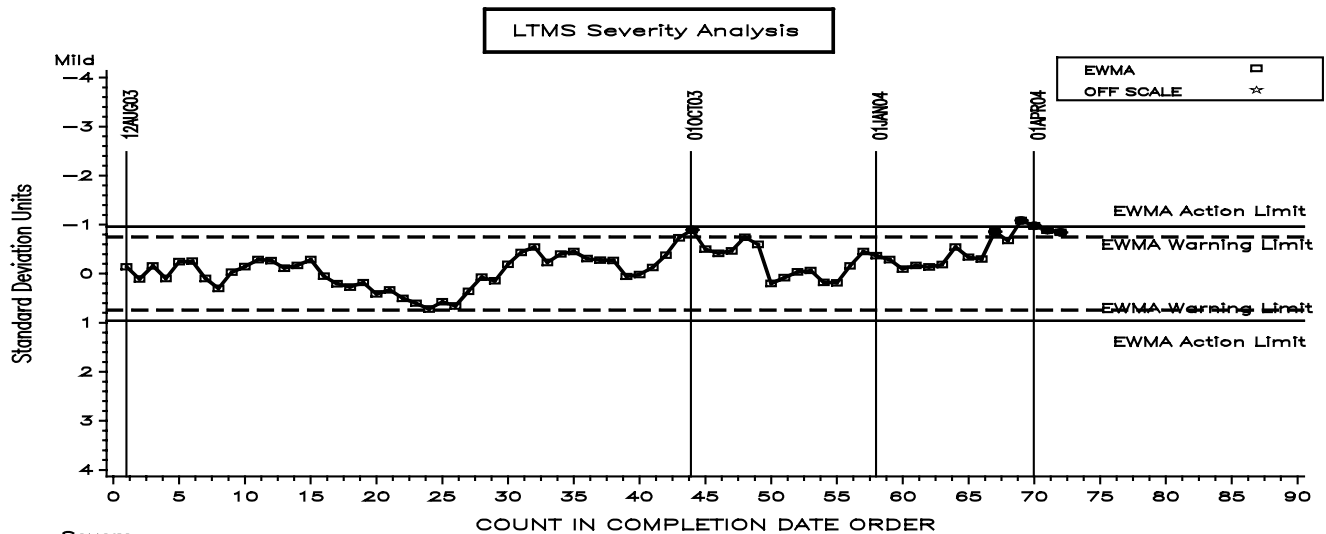


Figure 4 - Percent Viscosity Increase, Average Delta/s

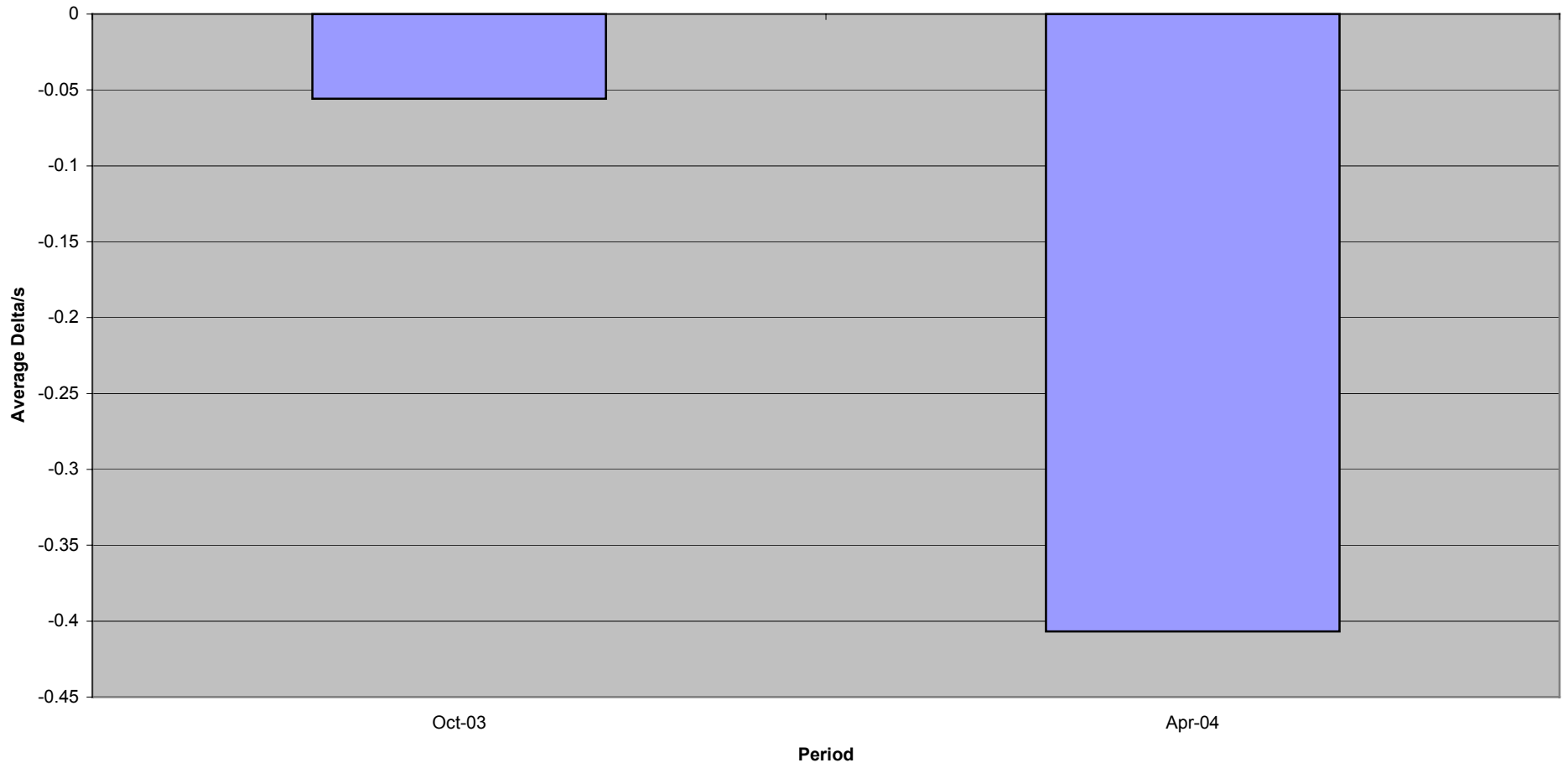


Figure 5 - Weighted Piston Deposits, Average Delta/s

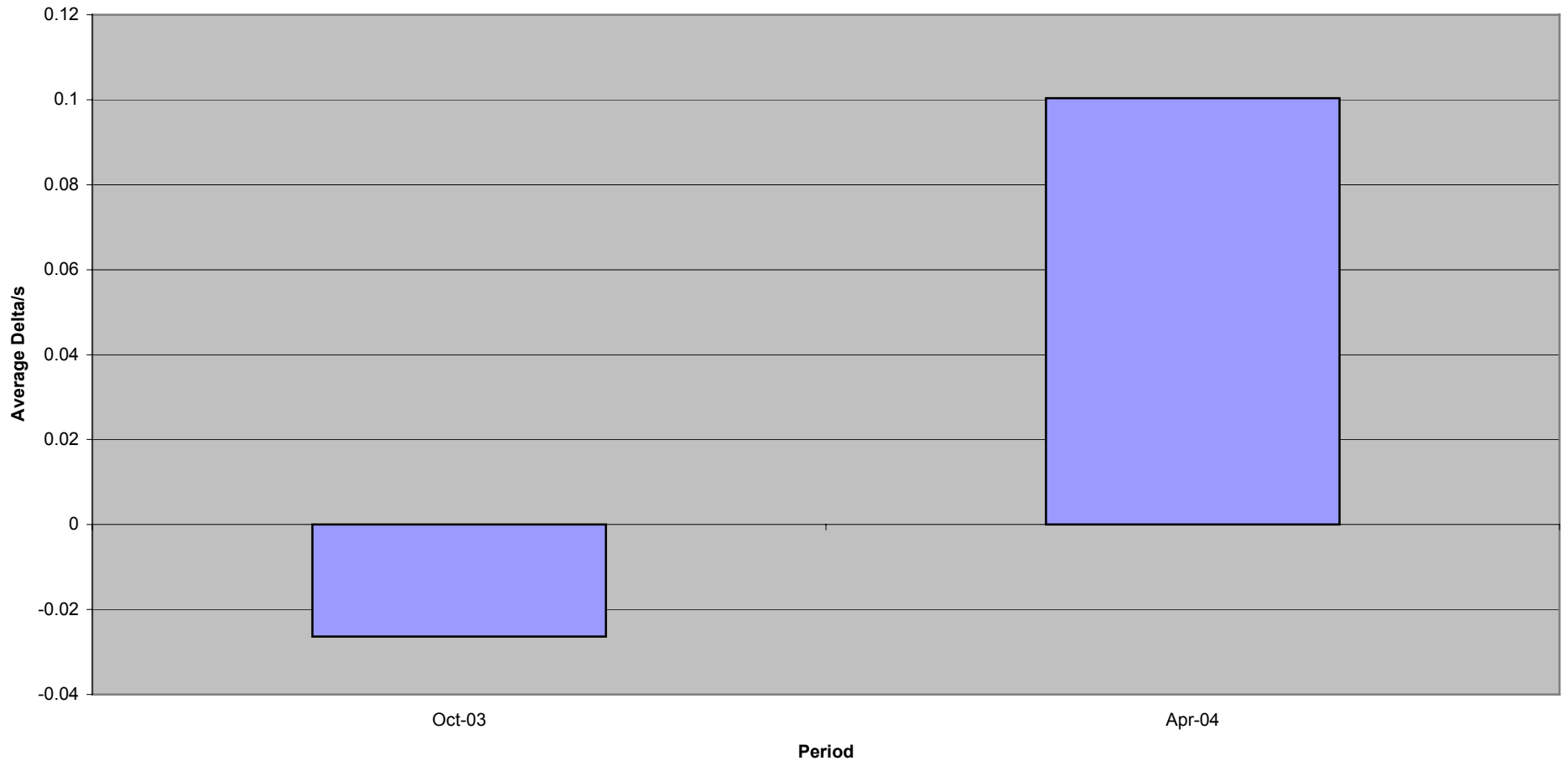


Figure 6 - Average Camshaft plus Lifter Wear, Average Delta/s

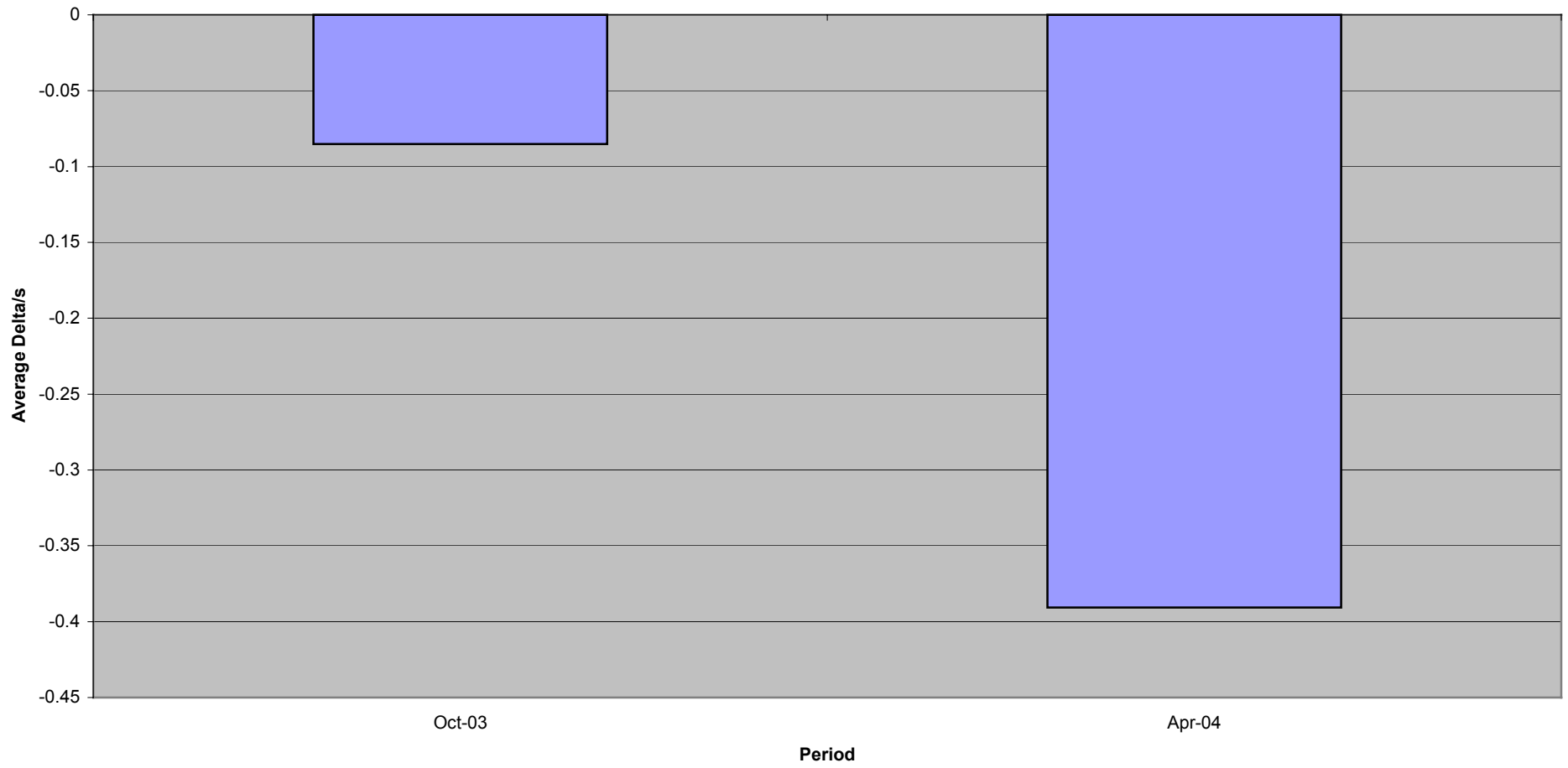


Figure 7 - Percent Viscosity Increase, Pooled Standard Deviation

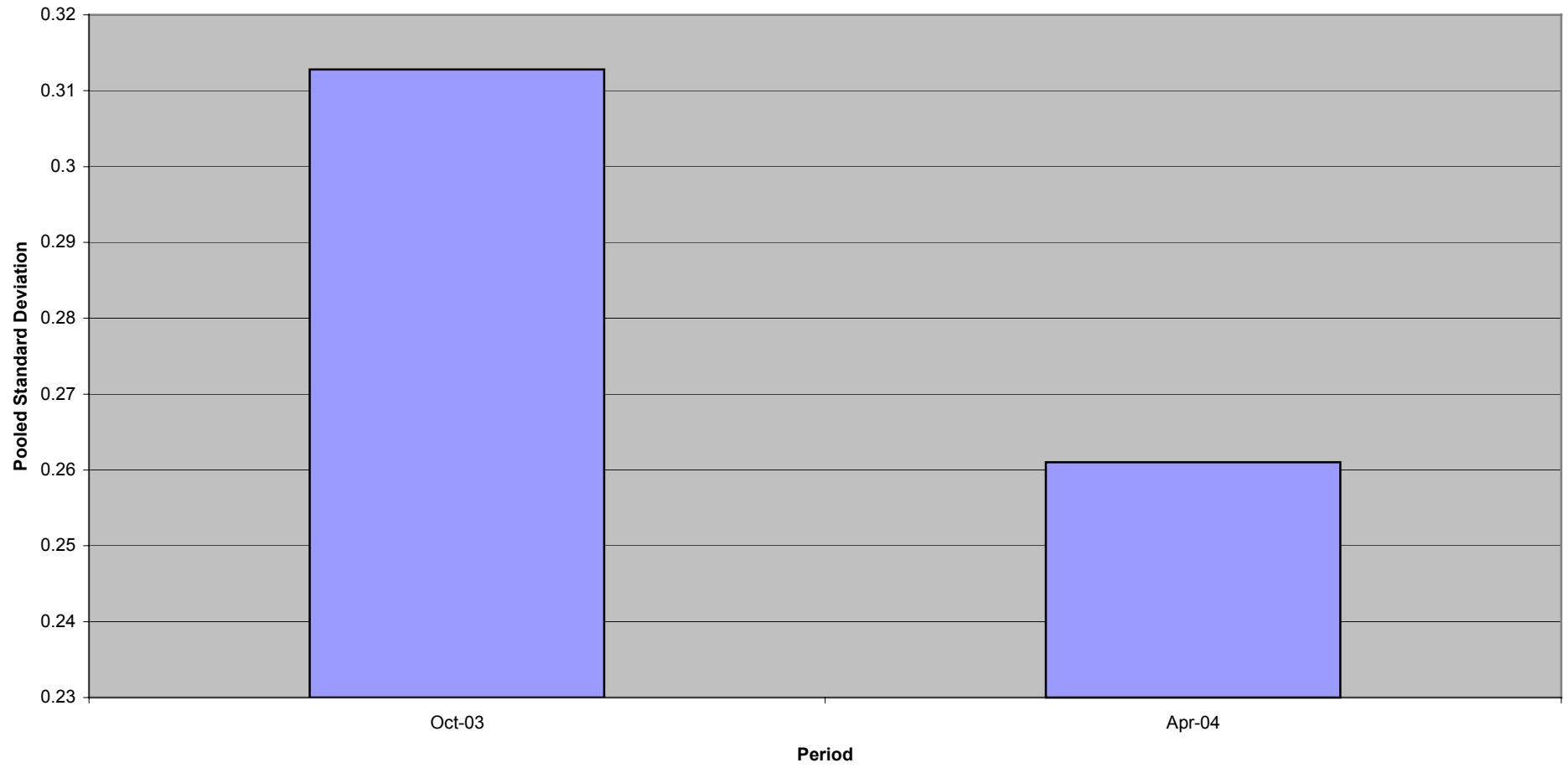


Figure 8 - Weighted Piston Deposits, Pooled Standard Deviation

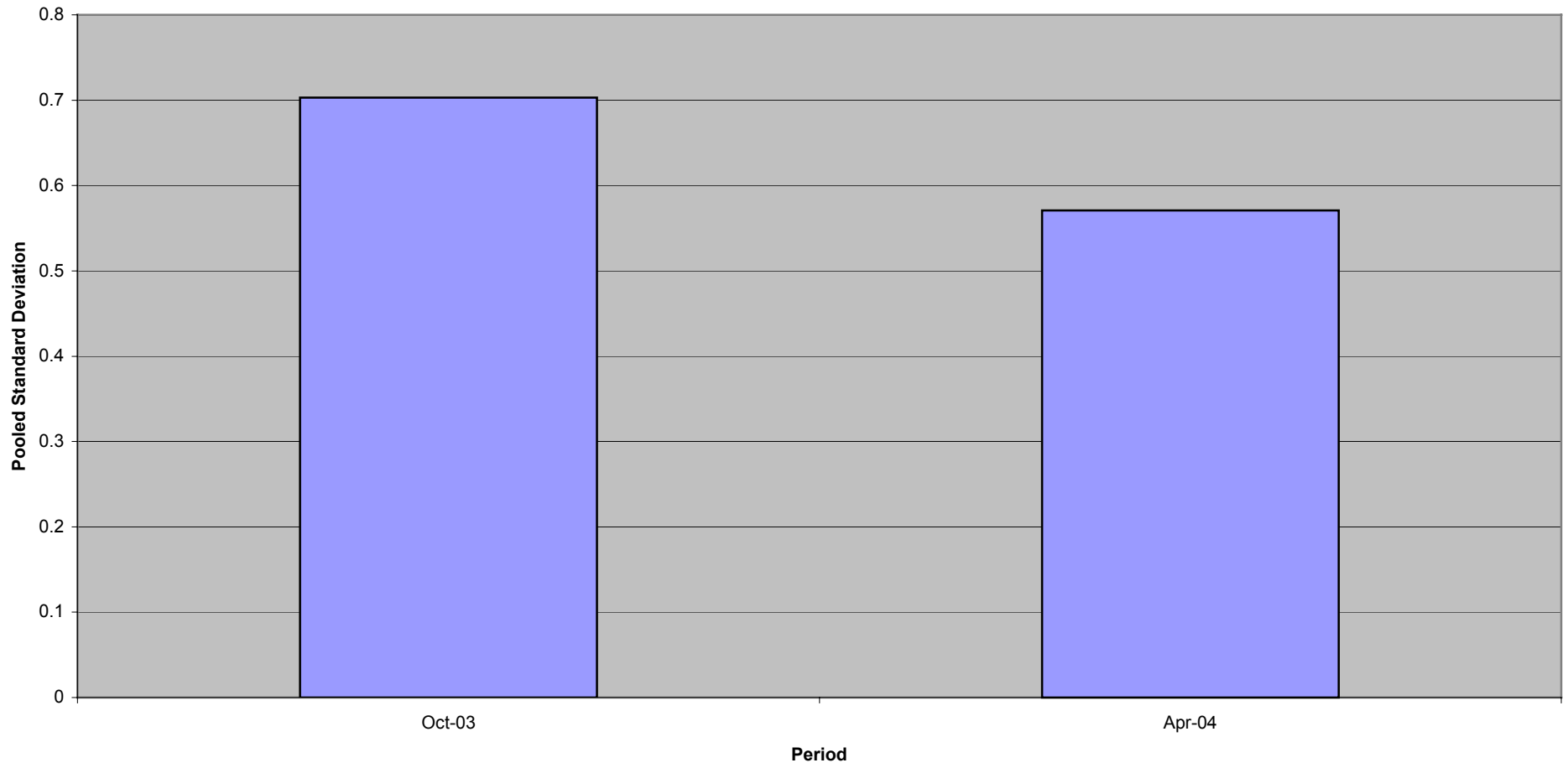


Figure 9 - Average Camshaft plus Lifter Wear, Pooled Standard Deviation

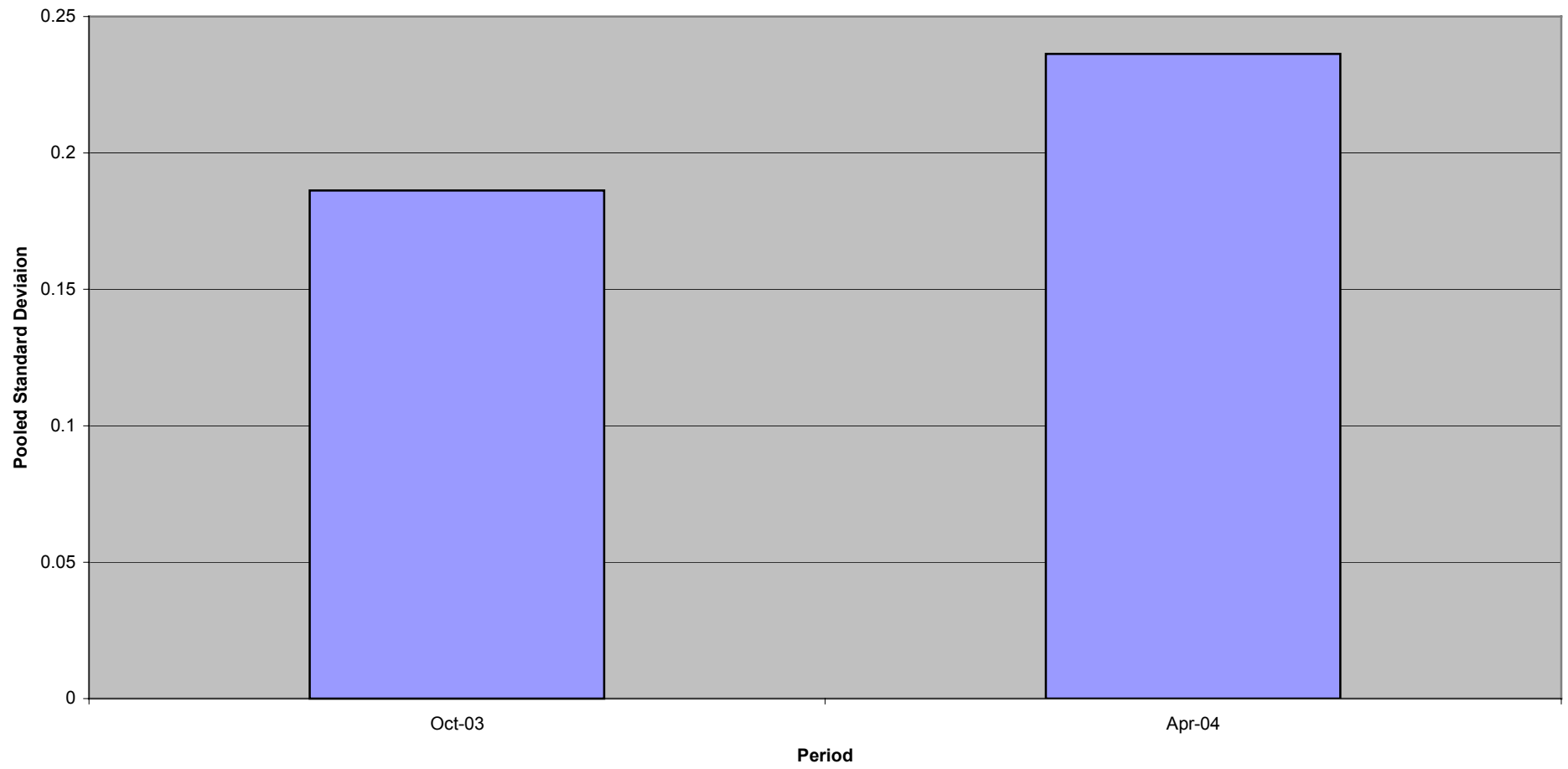


Figure 10 – Sequence IIIG Timeline

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