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Test Monitoring Center

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http://astmtmc.cmu.edu
412-365-1000

MEMORANDUM: 11-003

DATE: April 28, 2011

TO: Andrew Ritchie, Chairman, Sequence VG Surveillance Panel

FROM: Richard E. Grundza

SUBJECT: Sequence VG Reference Test Status from October 1, 2010 through March 31, 2011

The following is a summary of Sequence VG reference tests that were completed during the period October 1, 2010 through March 31, 2011
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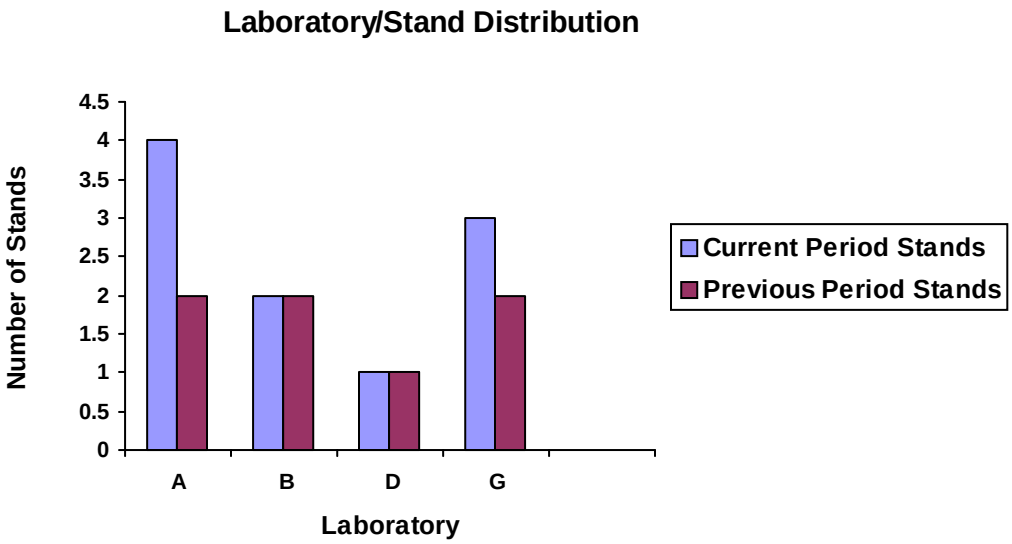
Lab/Stand Distribution

	Reporting Data	Calibrated as of 3/31/11
Number of Laboratories	4	4
Number of Stands	10	9*

*Two stands had calibration periods extended due to unavailability of new fuel.

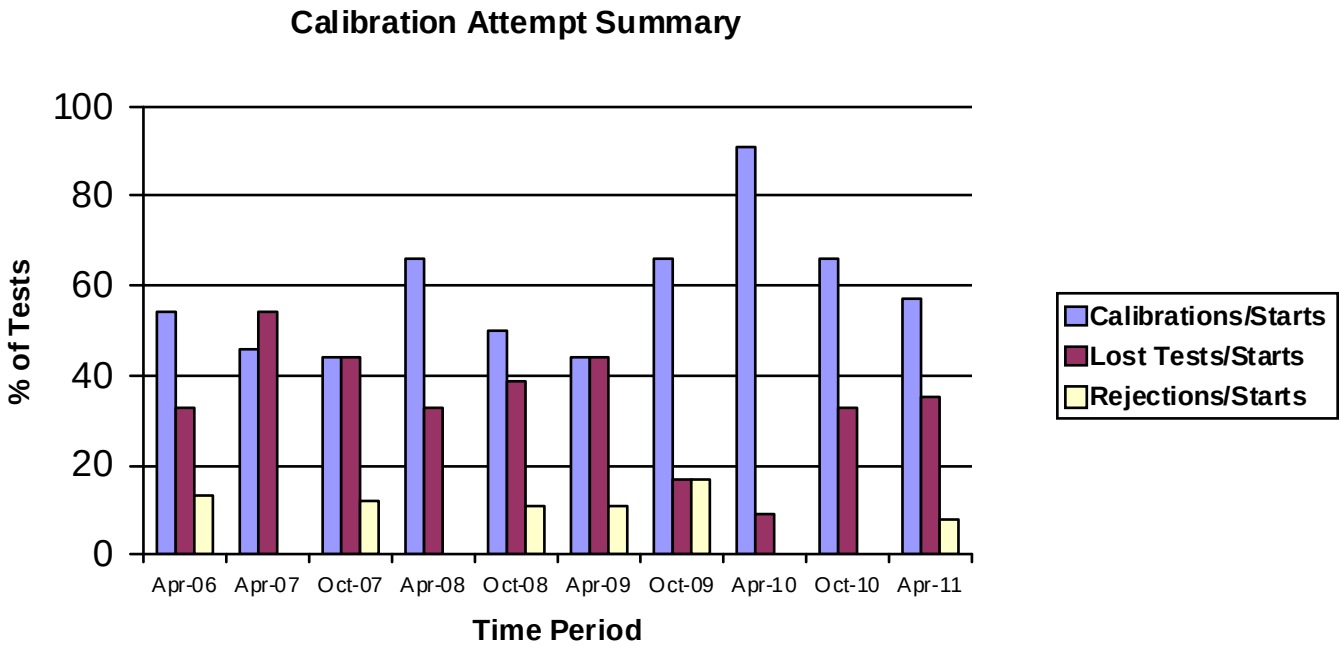
The following chart shows the laboratory/stand distribution:



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

	TMC Validity Codes	No. of Tests
Operationally and Statistically Acceptable	AC	8
Operationally Invalid, Lab Judgment	LC	2
Aborted	XC	1
Stand Abandoned	MC	2
Operationally Valid, Failed Acceptance Criteria	OC	1
Aborted Fuel Approval test	XF	1
Unacceptable Fuel Approval Test	RF	14
Total		29

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



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

One LTMS deviation was written this report period. A total of eight LTMS deviations have been written to date.

There was one rejected, operationally valid test was due to severe AEV and APV.

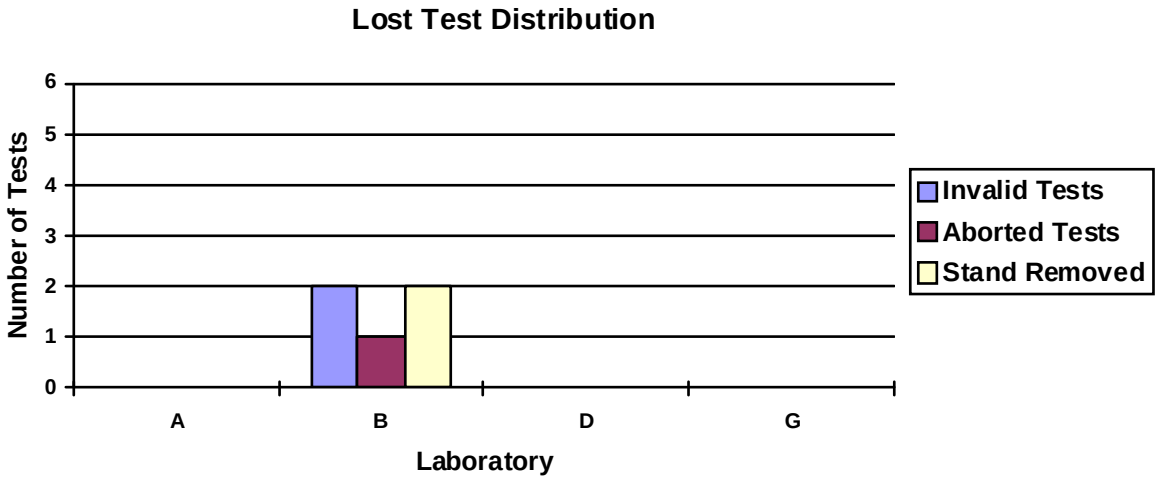
Two tests were declared operationally invalid by the laboratory. The reasons for operational validity are tabulated below:

Reason	Number of Tests
Failed Cam Position Sensor	1
Improper Cleaning	1

One calibration test was aborted. This test was aborted because the stand was being abandoned due to precision issues.

A fuel approval test was aborted when it was discovered that the oil lines were installed improperly. The remaining fourteen tests were deemed unacceptable for mild sludge performance.

Aborted and operationally invalid tests by laboratory are summarized with the following chart:



Severity and Precision

Below is a summary of the average delta/s values, pooled standard deviation, and average delta in reported units for tests reported during this period.

Variable	Pooled s All Oils	Mean Delta/s	Based on	Delta in Reported Units
RAC	0.16	0.23	8.0	0.04
AES	0.31	0.02	7.8	0.01
APV	0.36	-0.94	7.5	-0.10
AEV	0.17	-0.80	8.9	-0.14
OSCR	0.71	-0.10	20	-1.4

Average Engine Sludge (AES)

Industry control charts for AES show severity and precision in control for the period (see Figure 1). The industry summation Δ/s plot for AES shows industry results were on or near target for the period. Figure 6 shows the pooled standard deviation of 0.31, has degraded when compared with the previous period.

Rocker Cover Sludge (RAC)

The industry control charts for RAC severity and precision were in control for the period (see Figure 2). The industry summation Δ/s plot for RAC shows severity trended slightly mild for the period. Figure 6 shows the standard deviation, 0.16, is essentially unchanged with regards to the previous period.

Oil Screen Clogging (OSCR)

With the exception of one warning alarm early in the period, severity was in control for the period. Precision charts were in control for the period (see Figure 3). The summation delta/s plot shows severity trending near target for the period. Figure 6 shows the pooled standard deviation, 0.72 compares well with historical rates.

Average Engine Varnish (AEV)

AEV severity began the period in control but sounded two alarms before ending the period in warning alarm (see Figure 4). The summation Δ/s plot for AEV shows severity trending severe for the period. Industry precision chart was in control for the period. Figure 7 shows the standard deviation, 0.17, has degraded with respect to the previous period.

Average Piston Varnish (APV)

APV severity began the period in control, but has been in warning or action alarm since the third test reported in the period. With the exception of two warning alarms, APV precision was in control for the period (see Figure 5). The summation Δ/s plot shows severe results for the period. Figure 7 shows APV precision, with a pooled standard deviation of 0.36, has degraded, when compared to the previous periods.

Fuels and Reference Oils

Reference oil quantities available at the laboratories and TMC as well as estimated life of these oils, are tabulated below. ***Please note, 925-3 cannot be resupplied and the surveillance panel needs to immediately identify a suitable replacement oil.***

Oil	Original Blend, in gallons	TMC Inventory, in gallons	Quantity Used past six months	TMC Inventory, in tests	Laboratory Inventory, in tests	Estimated life
925-3	930	25	25	8	5	<1 year
1006	5500	38	0	13	2	< 1 year
1006-2	5500	3860	93	1317	8	3+ years
1007	2200	105	95	35	4	3+ years
1009	1100	448	60	149	5	3+ years

Note: Oils 1006, 1006-2, 1007 and 1009 are used across multiple test areas, TMC inventory represents total amount of that oil on hand. A GF-5 category reference oil, 1010 is available for introduction.

Information Letters

No information letters were issued during this report period.

QI Deviations

There were no QI deviations reviewed by the Test Monitoring Center for this report period. A total of 38 QI deviations have been generated to date.

Lab Visits

As a result of the Task Force formed to attempt to identify reasons for variability at laboratories, the TMC participated in four joint visits. Items identified during these visits are identified in the group's report, which can be found in the minutes of the 3-22-2011 VG Fuel Task Force meeting, available at the TMC website.

REG/reg

Attachments

c: Sequence VG Surveillance Panel
J. A. Clark
F. M. Farber
ftp://ftp.astmtmc.cmu.edu/docs/gas/sequencev/semiannualreports/vg-04-2011.pdf

Distribution: Email

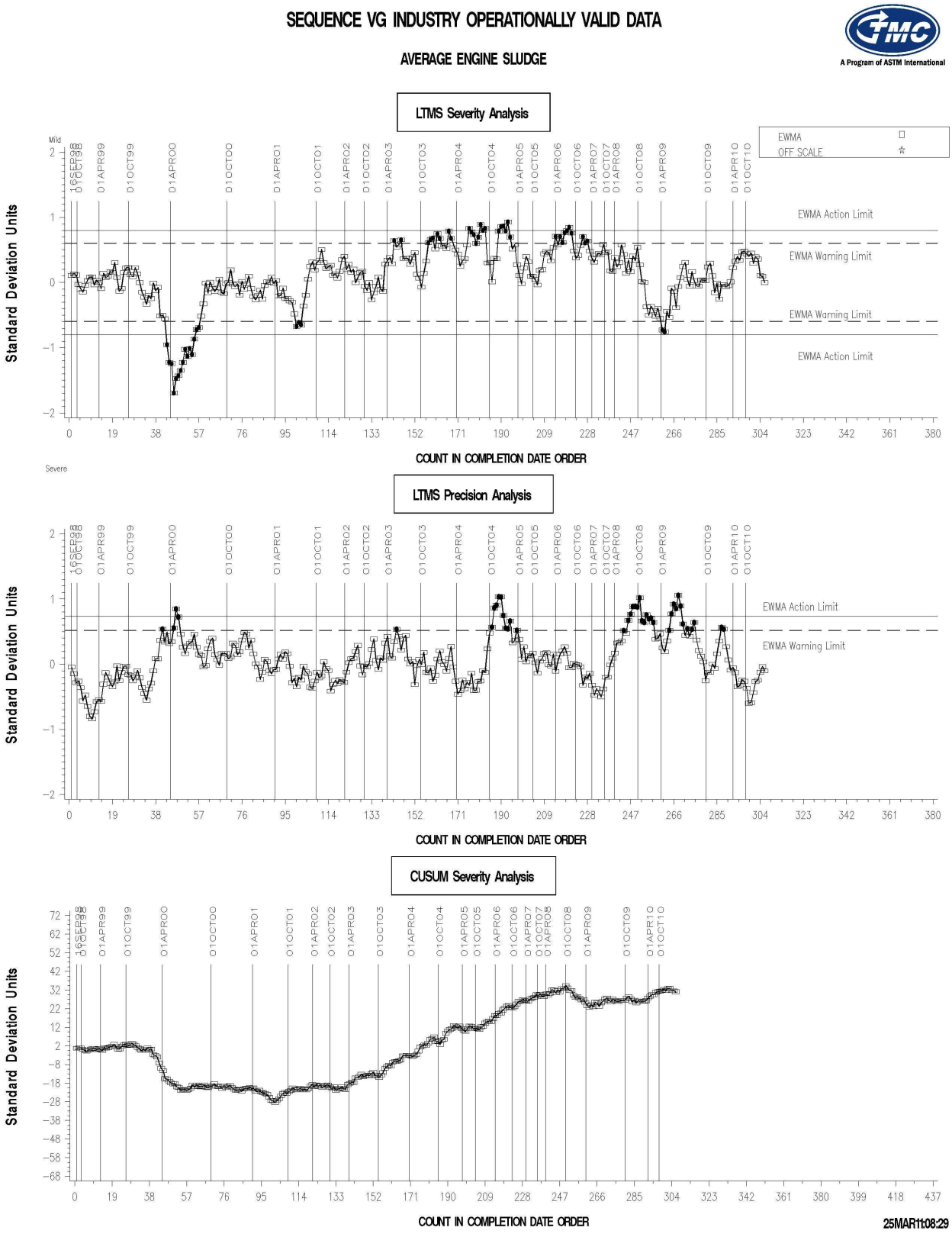
Listing of Tables and Figures Included as Part of This Report to the Sequence VG Surveillance Panel

Figures 1 through 5 are the Industry control charts for AES, RAC, OSCR, AEV and APV.

Figures 6 and 7 compare pooled precision estimates from this report period with previous periods.

Figure 8 is the Industry Timeline.

Figure 1


SEQUENCE VG INDUSTRY OPERATIONALLY VALID DATA
AVERAGE ENGINE SLUDGE
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LTMS Severity Analysis
Mild
Severe
EWMA
OFF SCALE
EWMA Action Limit
EWMA Warning Limit
EWMA Warning Limit
EWMA Action Limit
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
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 2

SEQUENCE VG INDUSTRY OPERATIONALLY VALID DATA

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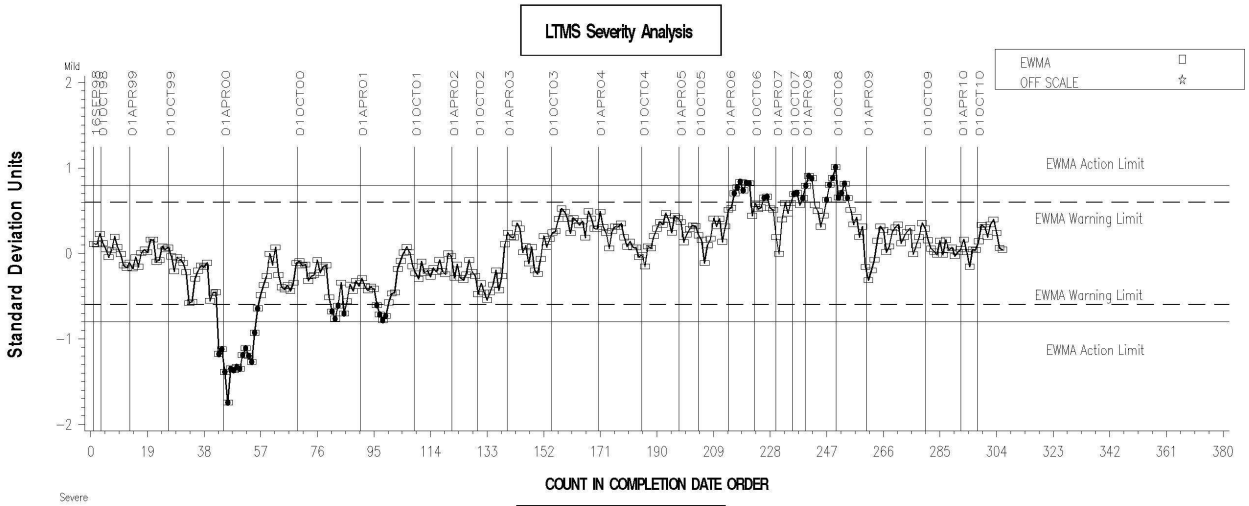
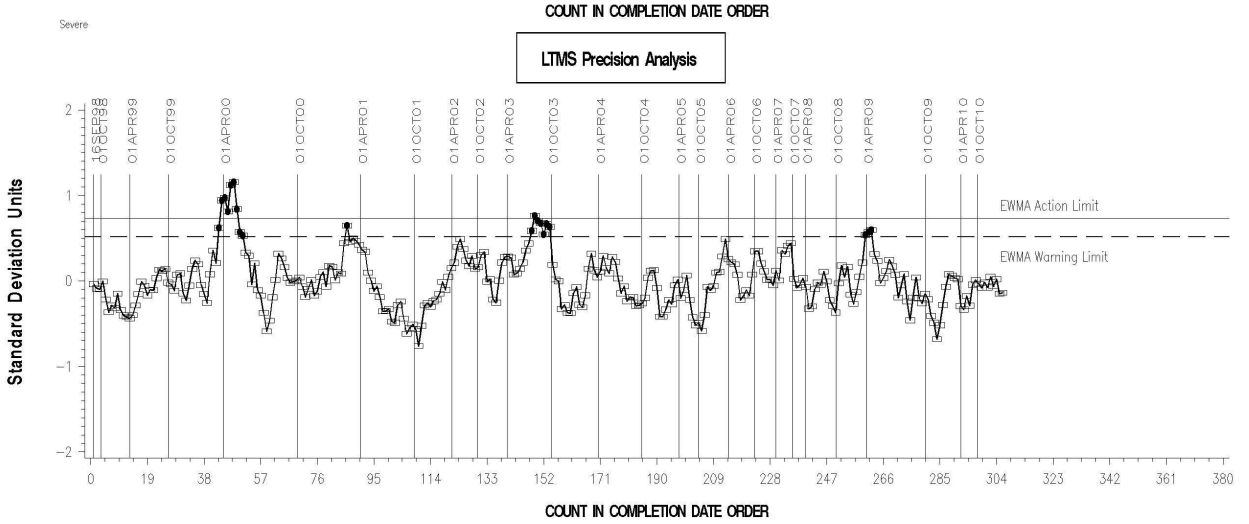
AVERAGE ROCKER COVER SLUDGE





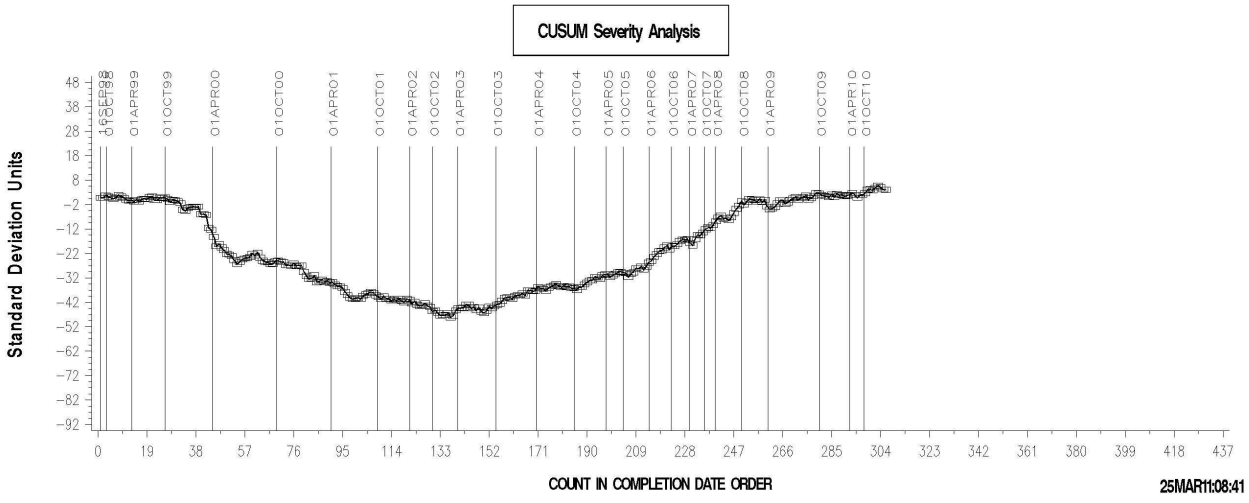


Figure 3

SEQUENCE VG INDUSTRY OPERATIONALLY VALID DATA

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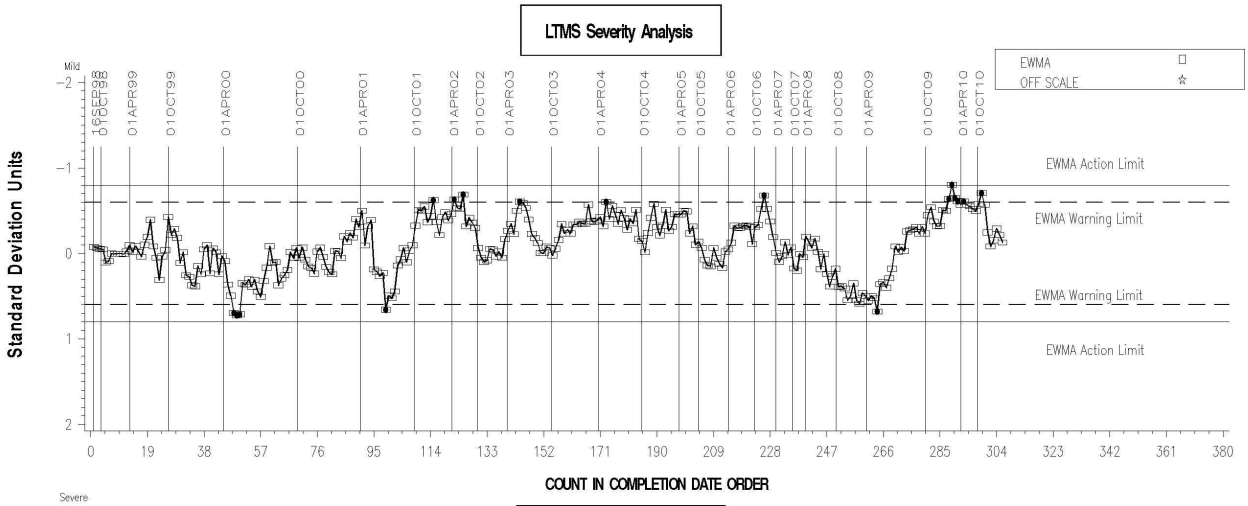
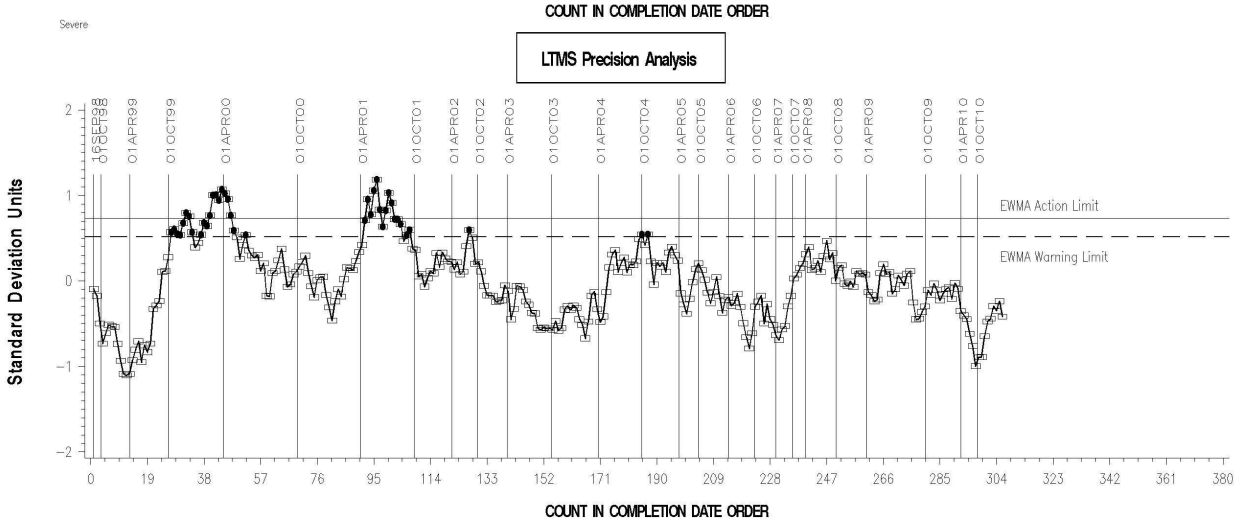
OIL SCREEN SLUDGE





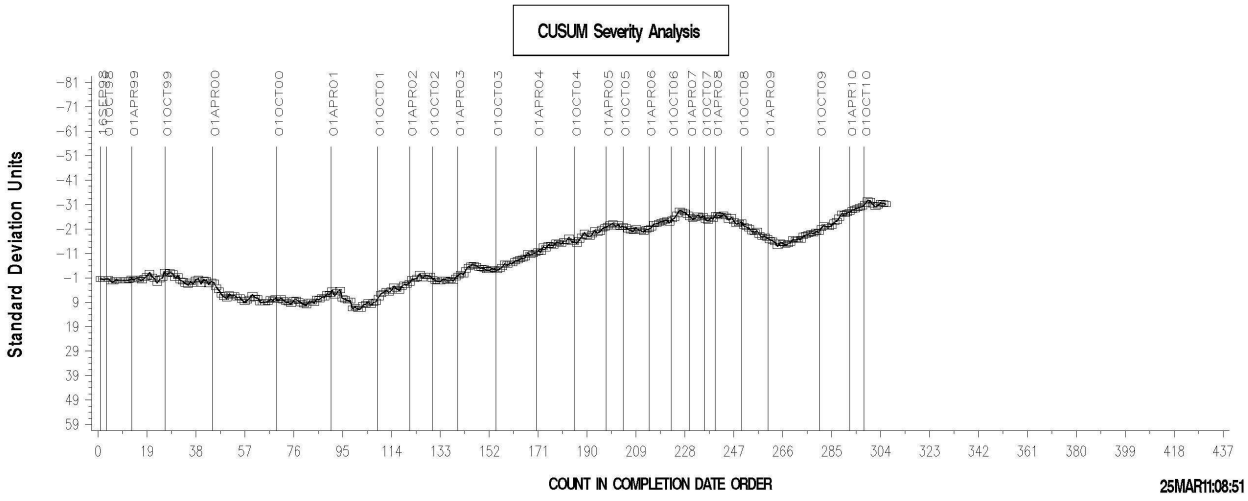


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Figure 4

SEQUENCE VG INDUSTRY OPERATIONALLY VALID DATA

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AVG. ENG. VARN. 3–PART APV + BAFFLES

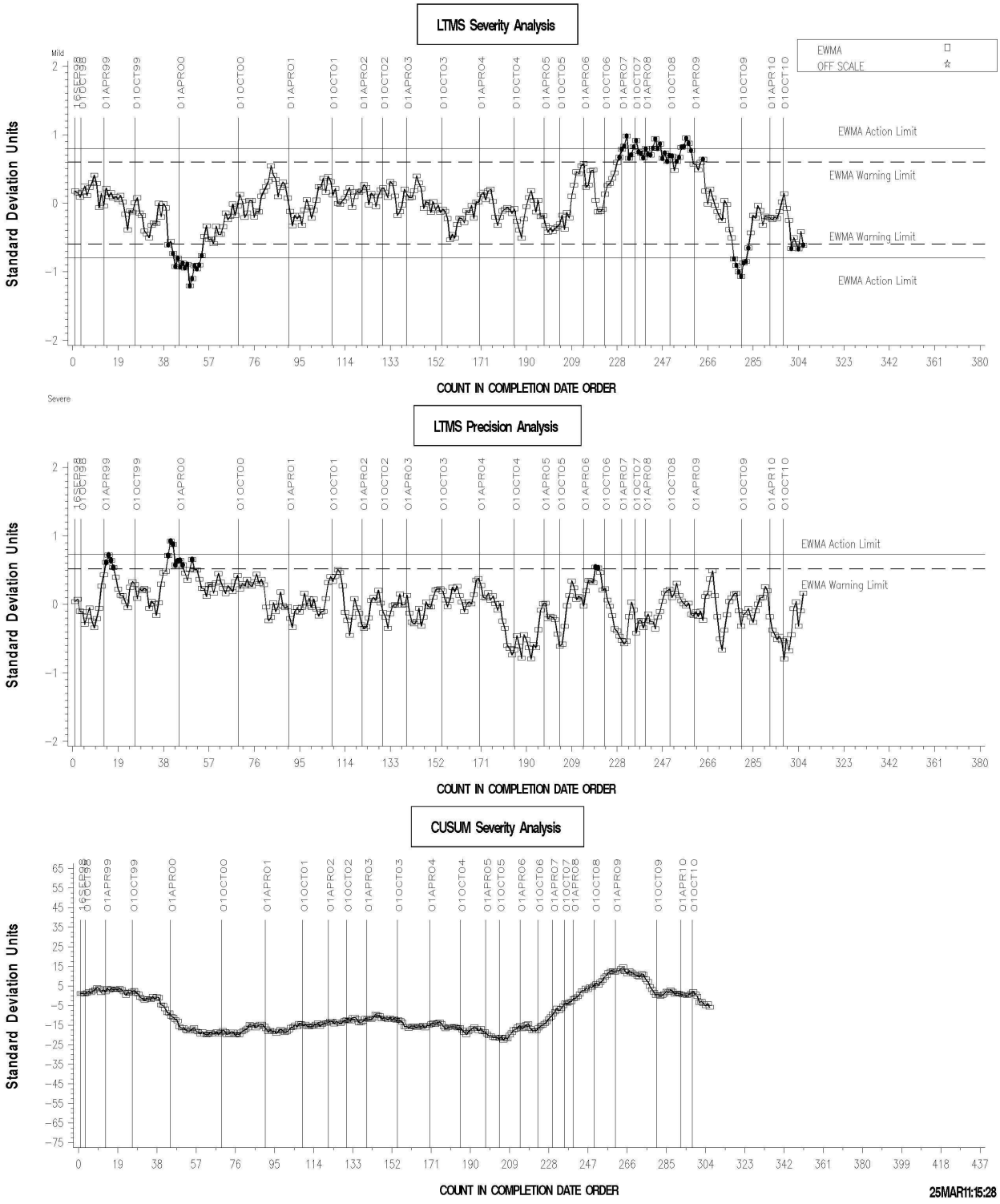

Figure 5

SEQUENCE VG INDUSTRY OPERATIONALLY VALID DATA

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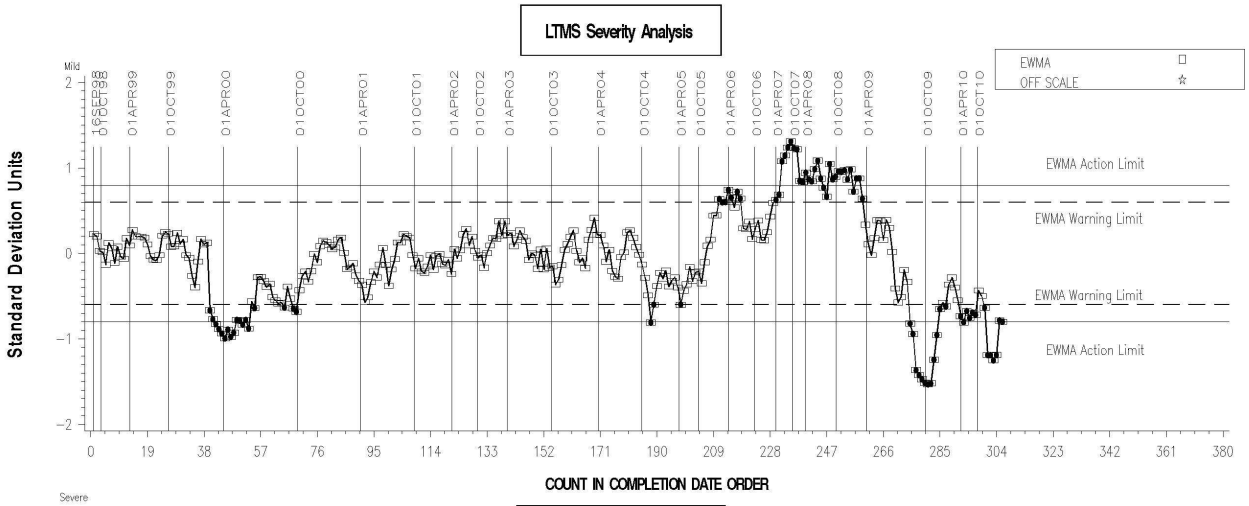
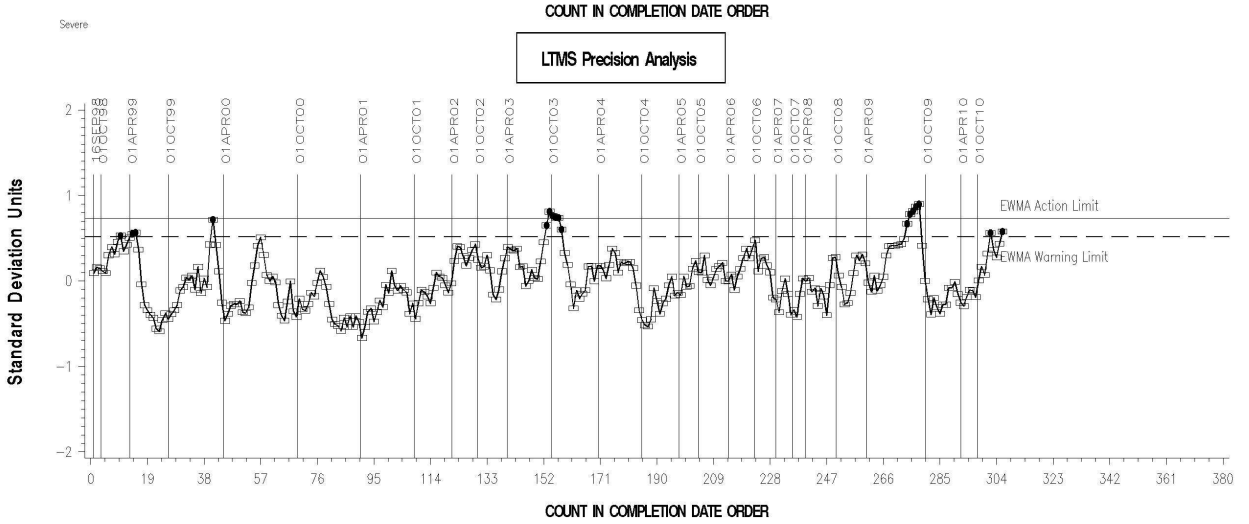
AVG PISTON SKIRT RATING





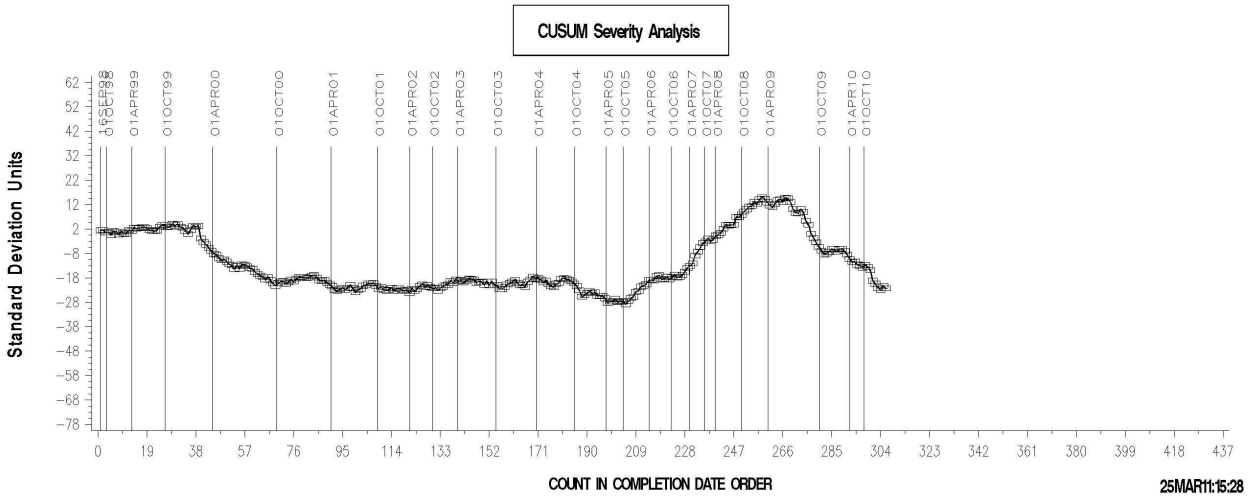


Figure 6

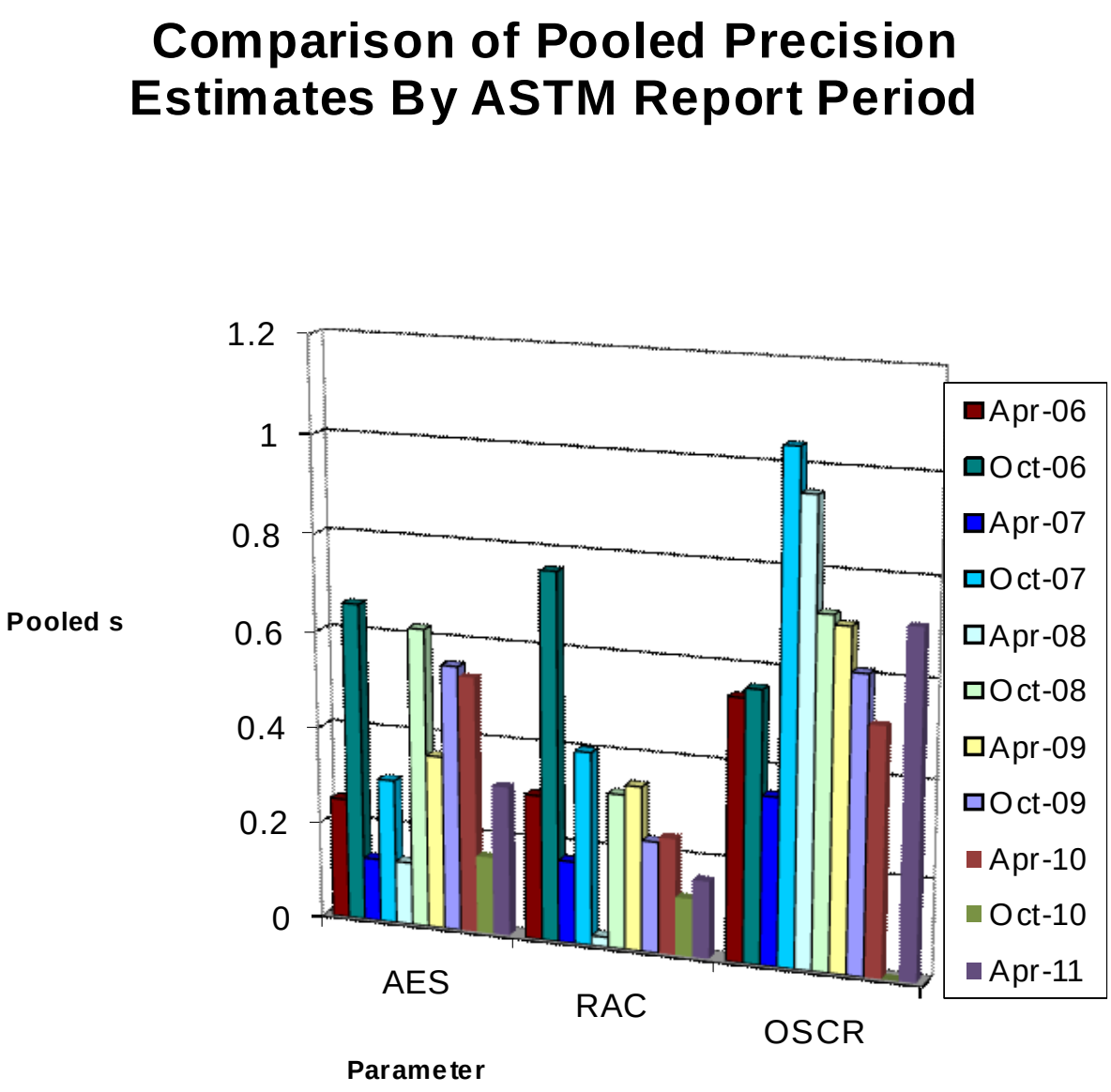

Comparison of Pooled Precision Estimates By ASTM Report Period
Pooled s
1.2
1
0.8
0.6
0.4
0.2
0
AES
RAC
OSCR
Parameter
Apr-06
Oct-06
Apr-07
Oct-07
Apr-08
Oct-08
Apr-09
Oct-09
Apr-10
Oct-10
Apr-11

Figure 7

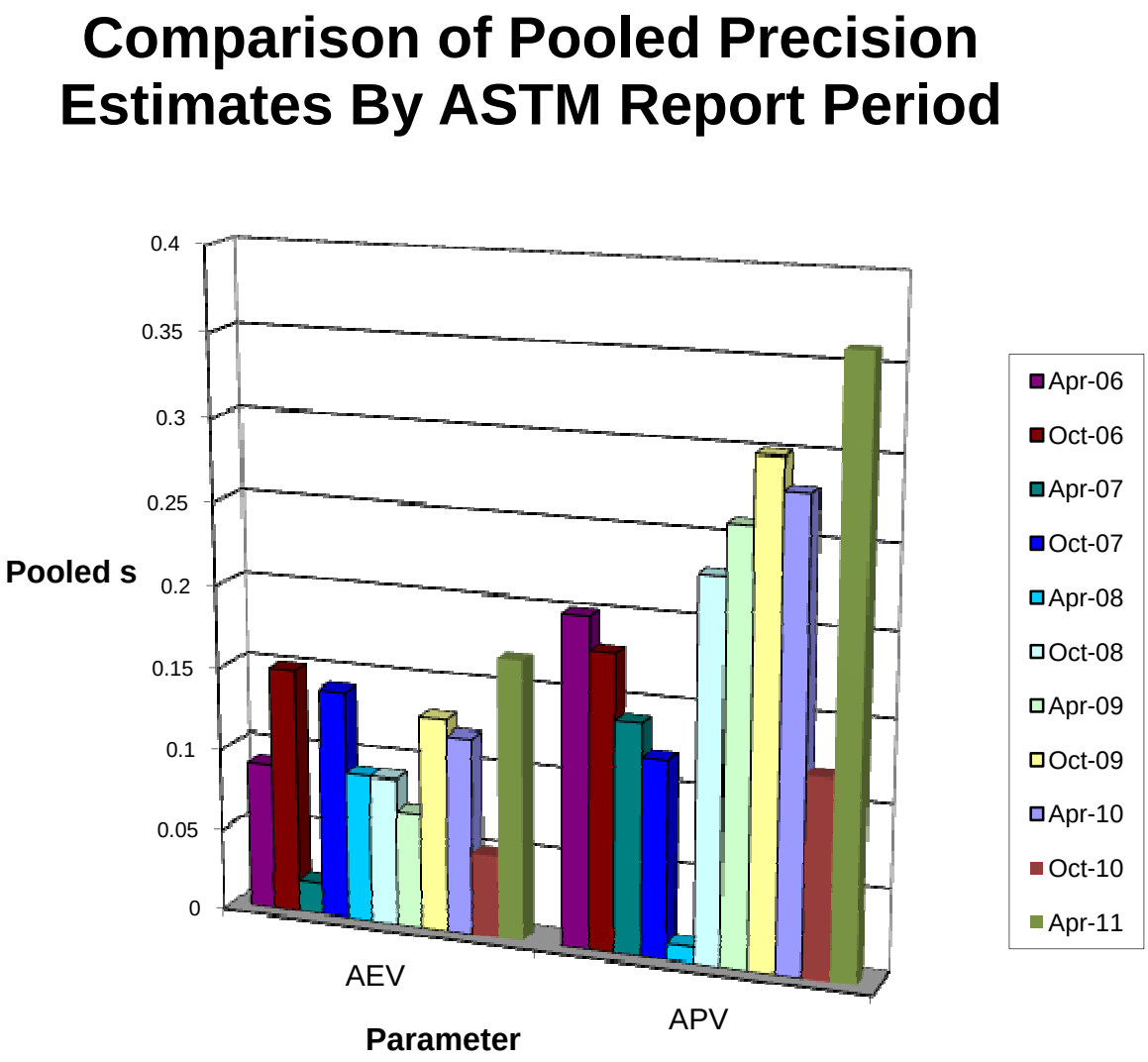

Comparison of Pooled Precision Estimates By ASTM Report Period
Pooled s
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
AEV
APV
Parameter
Apr-06
Oct-06
Apr-07
Oct-07
Apr-08
Oct-08
Apr-09
Oct-09
Apr-10
Oct-10
Apr-11

Figure 8

Date	Item Changed	Information Letter
19980901	Matrix testing begins	
19990211	Sequence VG Test approved, matrix stands charted and calibrated where applicable	
19990503	Information Letter 99-1 issued, adding ring weight loss, bore wear and pin wear measurements; as well as other procedural changes	99-1
19990615	Numerous procedure updates as identified in Information Letter 99-2	99-2
19990830	In conjunction with approval of VG fuel batch 996416, new test targets were published for oils 1006 and 1007	
19990830	Batch 996416 was approved for qualified testing at 8/13/99 Surveillance Panel meeting	
19991025	Revised Exhaust Backpressure limits for stages I and II to 102 and 106 kPa, respectively	99-3
19991025	Deleted rating of Underside of Block sludge and revised report forms and data dictionary accordingly	99-3
19991025	Added Section 11 to document stand referencing requirements	99-3
19991025	Added Section 16 and Annex A14, which give precision and bias statements	99-3
19991025	Updated listing of kit parts given in Sections 7.2 and 7.3 and Annex A5	99-3
19991025	Revised the type of oil filter and screen size, Sections 7.4.9 and 8.3.2.2 and A3.8 changed to reflect this	99-3
19991115	Update reference oil targets for oils 1006 and 1007 (n=10), also revised severity adjustment standard deviation	
20000215	Revised Exhaust Backpressure Limits for stages I and II to 104 and 107 kPa, respectively	00-1
20000215	Deleted varnish ratings for cam baffles, oil pan, timing chain cover and rear seal housing	00-1
20000215	Revised Form 8 to not allow value to be entered for oil added at cycle 54 and deleted form 7	00-1
20000802	Added Oil Ring Clogging Rating, changed follower pin wear measurement from all 8 cylinders to cylinder 8 only.	00-2
20000802	Changed bore wear measurements from all cylinders to cylinders 1 and 8.	00-2
20000802	Changed from ring weight loss to ring gap increase on cylinders 1 & 8.	00-2
20000802	Added transformation for oil screen clogging. Deleted photos for cam baffles, timing chain cover rear seal housing varnish.	00-2
20000802	Report forms and Data dictionary changes, version 20000713	00-2
20001101	Revised Section 13.4.1 Report forms and Data dictionary changes, version 20000831	00-3
20010115	Changed analysis method for water in fuel	01-1
	Deleted 7.1.1, Changed D1744 to D6304. Clarified procedures for bore wear, follower pin wear, oil screen clogging and top ring gap increase.	01-1
20010115	Revised stage III rocker cover inlet temp ramp.	01-1
20010115	Deleted ring groove chamfer measurement. Revised dipstick calibration. Revised temperature and pressure calibration frequency, changed dipstick calibration procedure, dropped stage I blowby measurement. Dropped 0.5% O_2 calibration gas.	01-1
20010115	Modified fuel injector flow requirements and deleted Appendix X2.	01-1
20010320	Information Letter written to incorporate information letters not incorporated into Test Method D6593	01-2
20010320	Dropped requirement to measure Benzene in fuel, defined a process for consensus rating and no longer requires analysis of used oil for TBN, vis@100 °C and pentane insolubles	01-3
20011114	Dropped NOx measurements, monitor Power QI, addressed rating changes recommended by Light Duty Rating Task Force and allowed adjustments to	02-1

	blowby flow rates during 1st 48 hours of the test	
20020301	Replaced, CO, CO_2 and O_2 measurements with Lambda	02-2
20020408	Revised references to CRC manuals 12 and 14 to manual 20	02-3
20020515	Allowed use of power supply for EEC and Lambda sensors, revised calibration frequency for Lambda sensor and dropped requirement to measure bore wear Dropped rating of RAC covers for varnish and added Cam baffle varnish ratings	02-4
20020809	Initial targets (n=3) for reference oil 1009	
20021023	Initial targets (n=5) for reference oil 1009	
20021025	Removed remedial statements and made other editorial changes	02-5
20030128	Target Update (n=10) for reference oil 1006-2	
20030327	Removed requirement to include photographs in final report	03-1
20030410	Deleted exhaust gas values for stages I and II	03-2
20030515	Target Update (n=10) for reference oil 1009	
20030905	Corrected Section 16.1.2.1 and revised Section A7.1 to include ACC Conformance Statement. Procedure changes to address processes necessary to use Romeo Engines for calibrated testing Replaced Aliphatic Naphtha with ASTM D235 Type II, Class C solvent	03-3
20040105	Target Update (n=20) for reference oil 1006-2	
20040109	Increased last non reference oil start date from 171 to 180 days Editorial changes to precision statements	04-1
20040207	Target Update (n=20) for reference oil 1009	
20040513	Revised U & L values for MAP and EBP Allowed removal of piston staining	04-2
20040701	Revised section 12.1.5 to allow ring gap adjustments during 1st 48 hours of test	04-3
20041103	Target Update (n=30) for reference oil 1006-2 Target Update (n=30) for reference oil 1009 Target Update (n=22) for reference oil 925-3	
20041214	Revised section 7.1.1 to require degreasing solvent that meets requirements of D235 for Aromatics, color and flash point and require a Certificate of analysis for each batch	04-4
20050101	Revised standard deviation for severity adjustment calculation for all parameters	
20050601	Deleted ring gap increase and follower pin wear, clarified Oil screen rating, updated precision statement, added limits for lost test data, editorial changes	05-1
20050719	Approved fuel batch TA1921LS15, with correction factors for AES, RAC, AEV and APV	05-2
20050726	Changed fuel batch designation from TA1921LS15 to TF2221LS20	05-3
20051209	Allowed use of an alternate AFR measuring device	05-4
20051209	Added tolerance to location of AFR measuring device sensor	05-4
20051209	Required raters to attend Rating Workshop on an annual basis	05-4
20060616	Allowed camshafts to be run for 4 tests	06-1
20061107	Changes to rater calibration requirements	06-2
20071212	Updated Industry Correction Factors	07-1
20071212	Revised name for Rating Workshop	07-1
20080213	Revised cam baffle cleaning technique	08-1
20080213	Additional throttle body	08-1
20080305	Closed loop AFR control	08-2
20080515	Added ring gap increase and follower pin wear measurements	08-3
20090603	Approved fuel batch XC2721NX10 and associated correction factors	09-1
20090603	Added requirement to report the results of all tests run to completion, regardless of validity	09-1
20091002	Updated Industry Correction Factors for APV and AEV	09-2
20100707	Clarification of Non-Reference Oil Tests Counted towards a Stand's Calibration Period	10-1