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Test Monitoring Center

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ASTM D02.B1 Semiannual Report Passenger Car Reference Oil Testing

October 2014

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Passenger Car Engine Oil Testing Executive Summary

- ▶ Seq. IIIF
 - Hardened seat heads approved for use. Four labs successfully calibrated with these heads.
- ▶ Seq. IIIG
 - 7th and 8th run hardware approved for use.
 - Batch Code 10 rings approved for use
 - Re-blend of oil 434 is now available.

Passenger Car Engine Oil Testing Executive Summary

▶ Seq. IVA

- Three donated tests obtained on TMC reference oil 300.
- Three laboratories successfully calibrated with latest reground cam batch.

Passenger Car Engine Oil Testing Executive Summary

▶ Seq. VI

- Limited supply of 542 remains and another blend has been made and is expected in October. Panel will need to address introduction.

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Calibrated Labs and Stands*

Test	Labs	Stands
IIIF	4	5
IIIG/A/B	5	13
IVA	3	4
VG	4	6
VID	3	4
VIII	2	3

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*As of 9/30/2014

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Sequence III F

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Sequence IIF Activity

Test Status	Validity Code	#
Acceptable Calibration Test	AC	6
Failed Calibration Test	OC	2
Total		8

Sequence III F – Failed Tests

Test Status	Number of Tests
APV and WPD – Mild	1
Hours to 275% Vis. Inc. – Severe	1
Total	2

Sequence IIF Test Severity

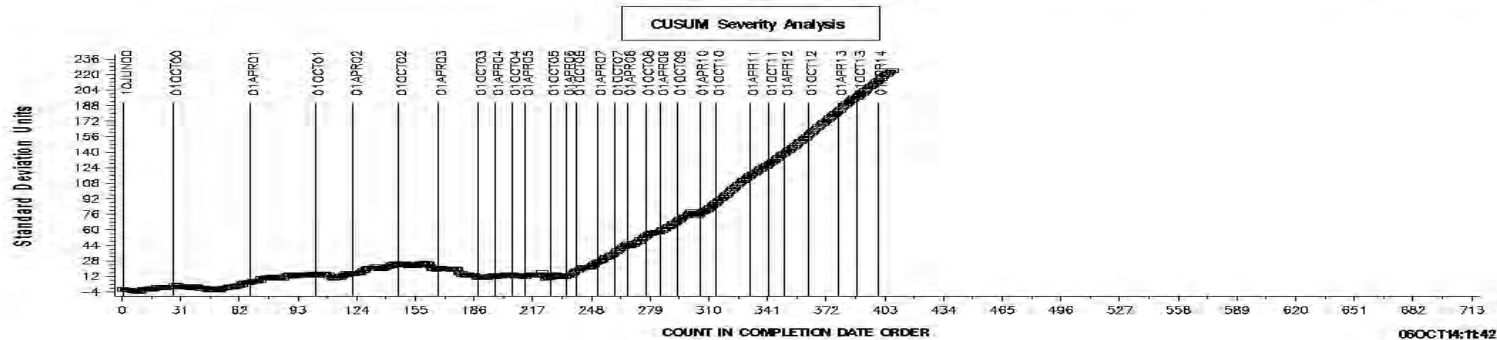
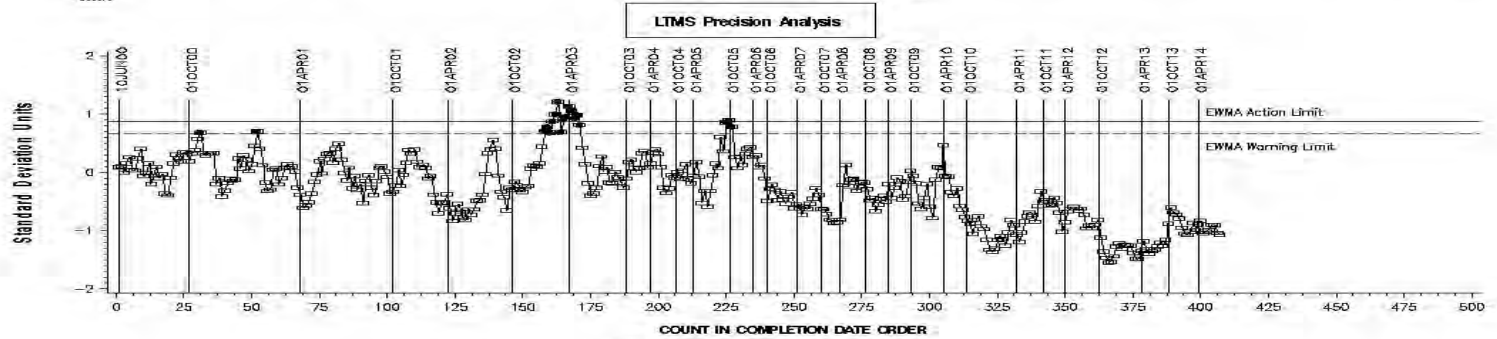
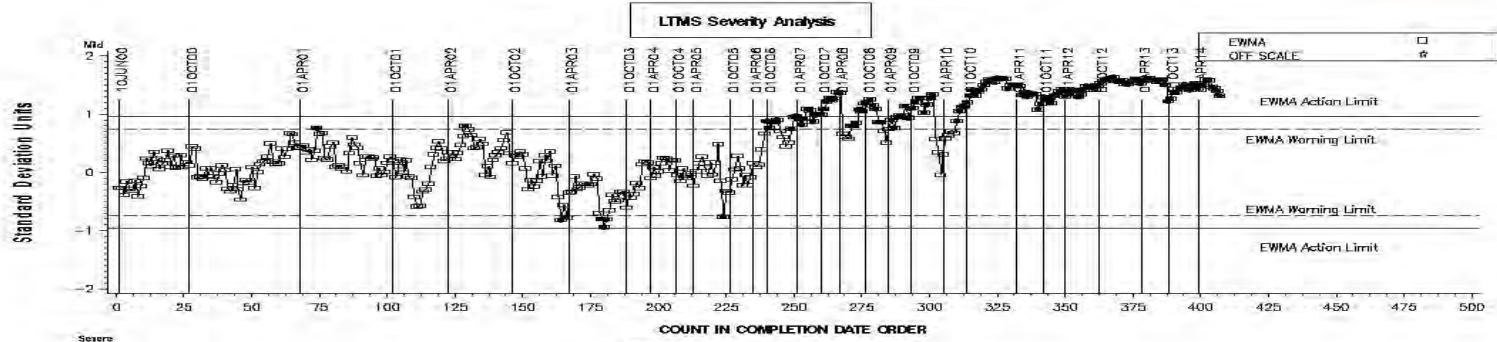
- APV
 - In severity action alarm, mild
 - Long-term mild trend continuing (Since October 2006)
- Hours to 275% Vis Increase and WPD in control
- PV60
 - In severity action alarm

SEQUENCE IIIF INDUSTRY OPERATIONALLY VALID DATA



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AVERAGE PISTON SKIRT VARNISH FINAL ORIG UNIT RES



06OCT14:14:42

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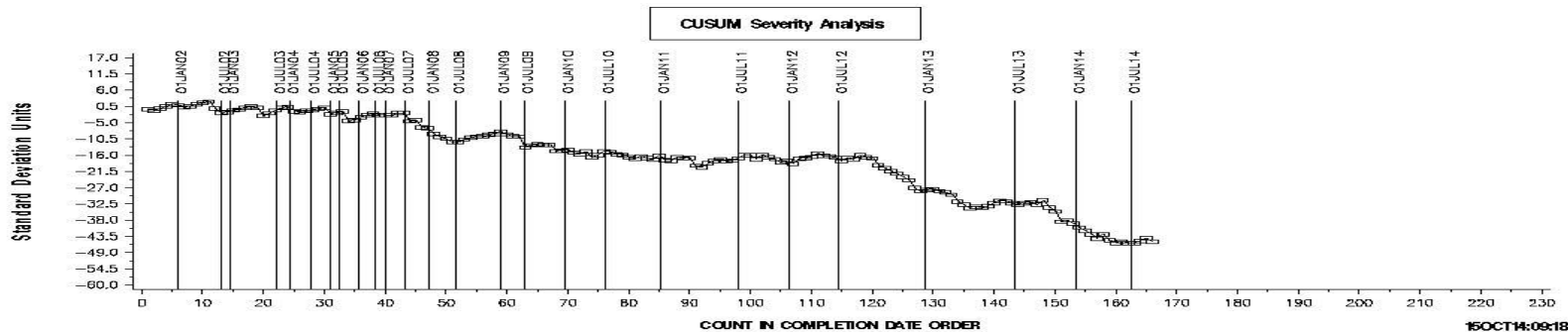
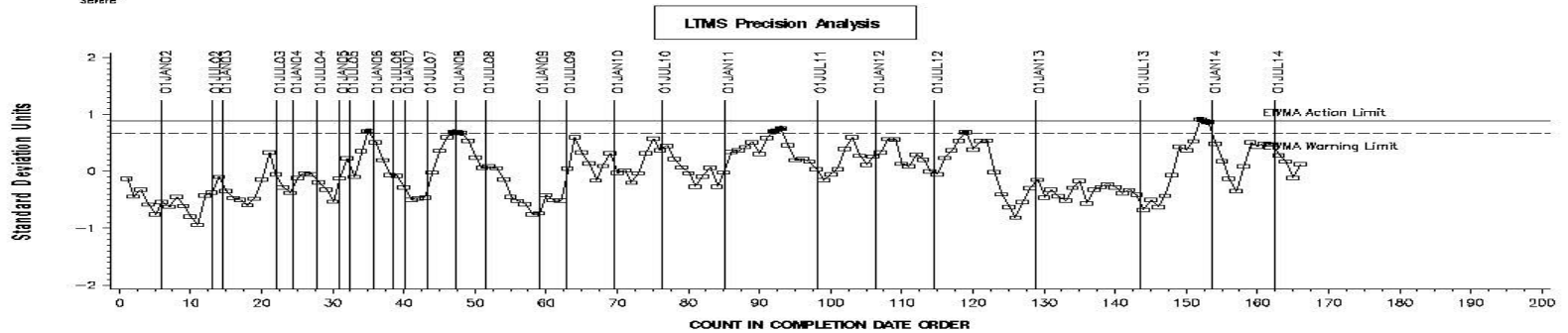
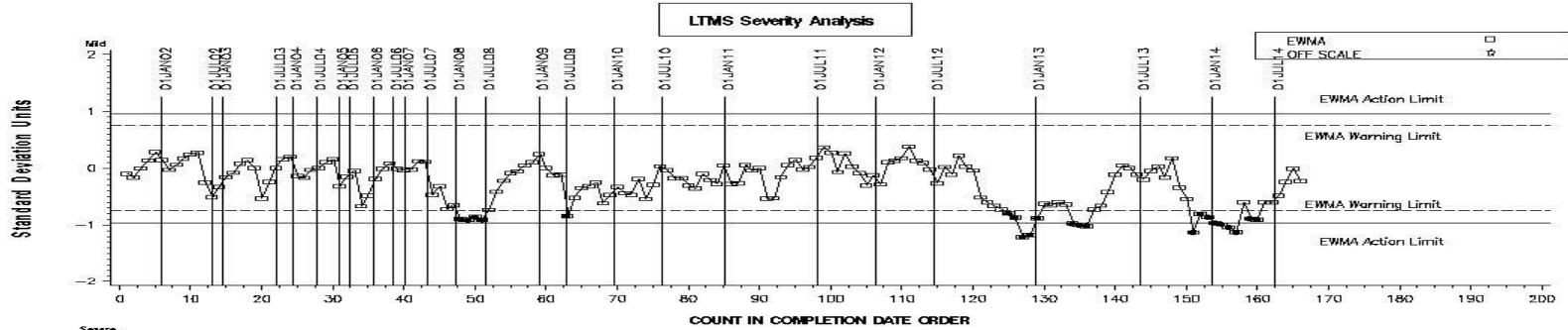
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SEQUENCE IIIF INDUSTRY OPERATIONALLY VALID DATA

HOURS to 275% VIS INCREASE (REFERENCE TESTS ONLY)



15OCT14:09:18

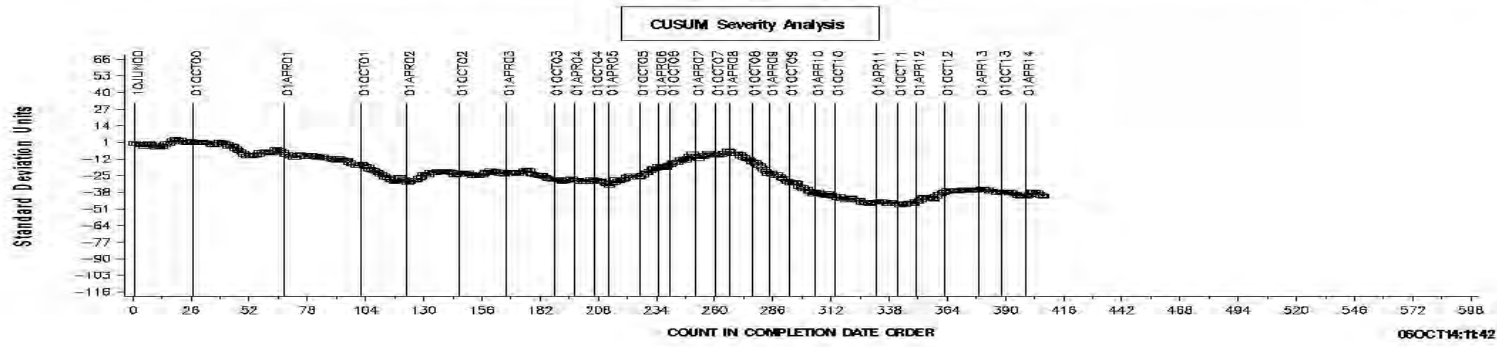
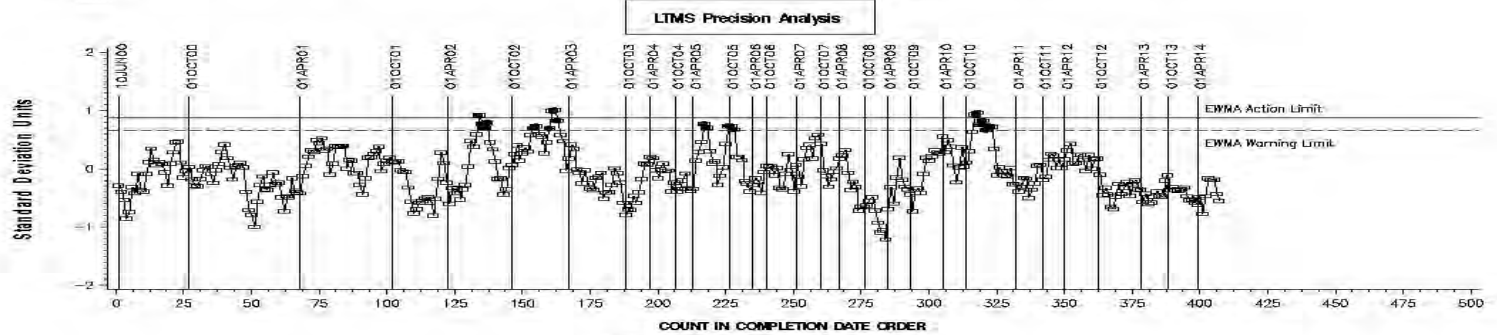
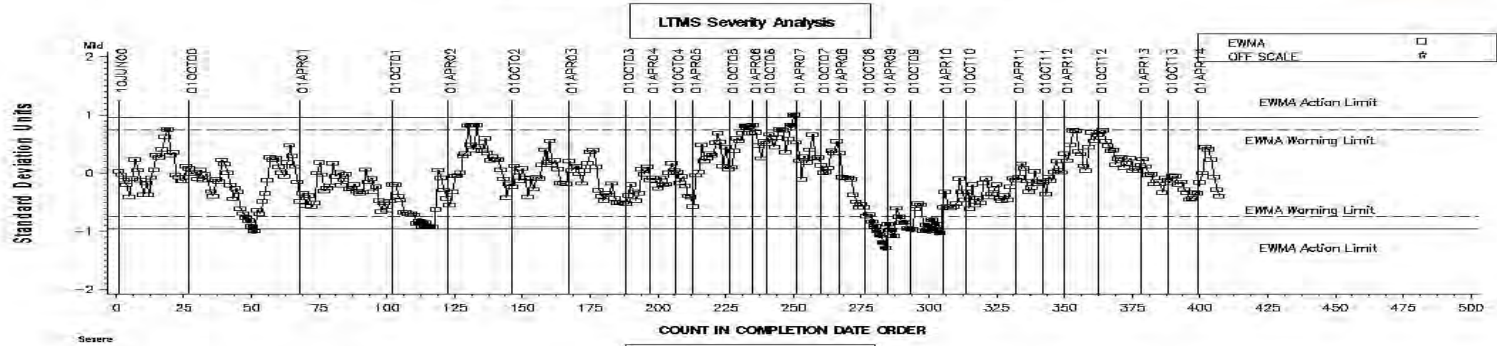


SEQUENCE IIIF INDUSTRY OPERATIONALLY VALID DATA



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AVERAGE WEIGHTED PISTON DEPOSITS FNL ORIG UNIT RES



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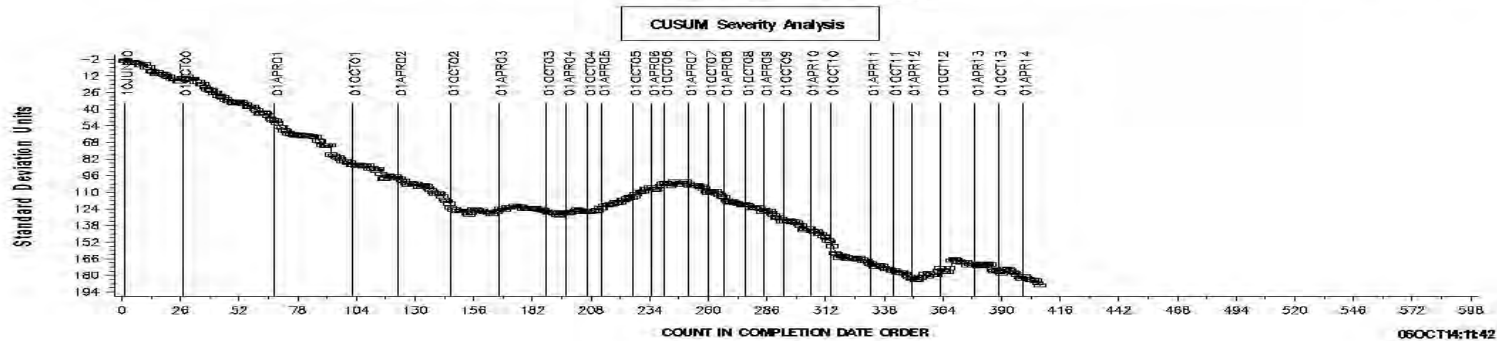
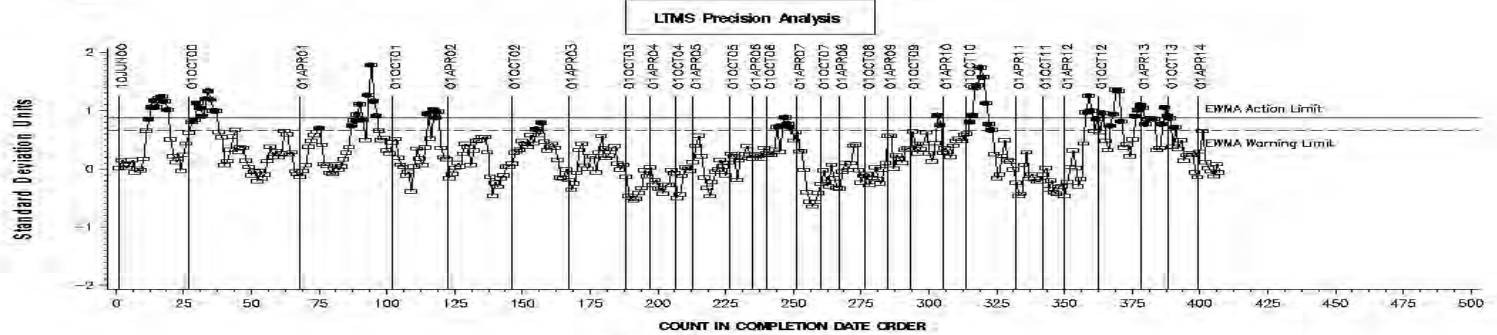
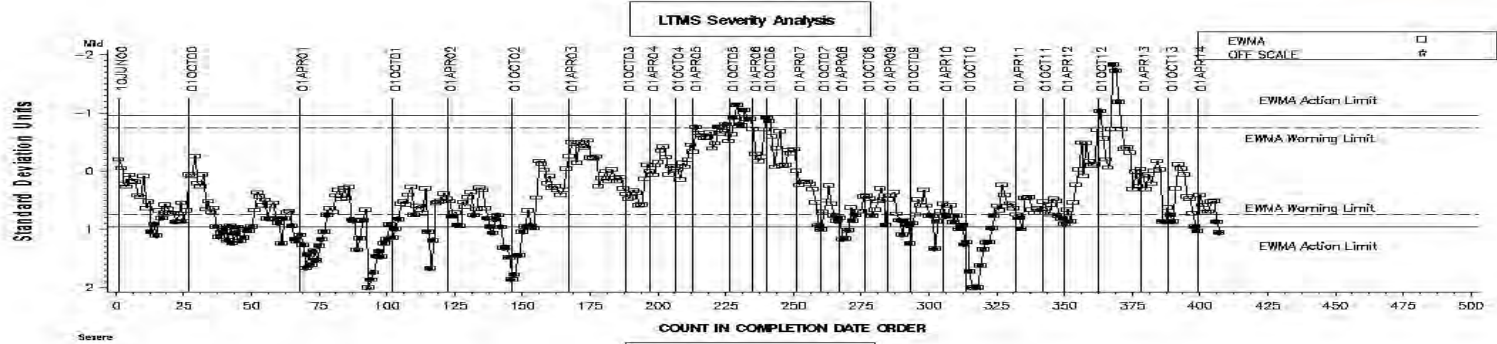


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SEQUENCE IIIF INDUSTRY OPERATIONALLY VALID DATA



% VISCOSITY INCREASE @ 060 HOURS



Test Monitoring Center

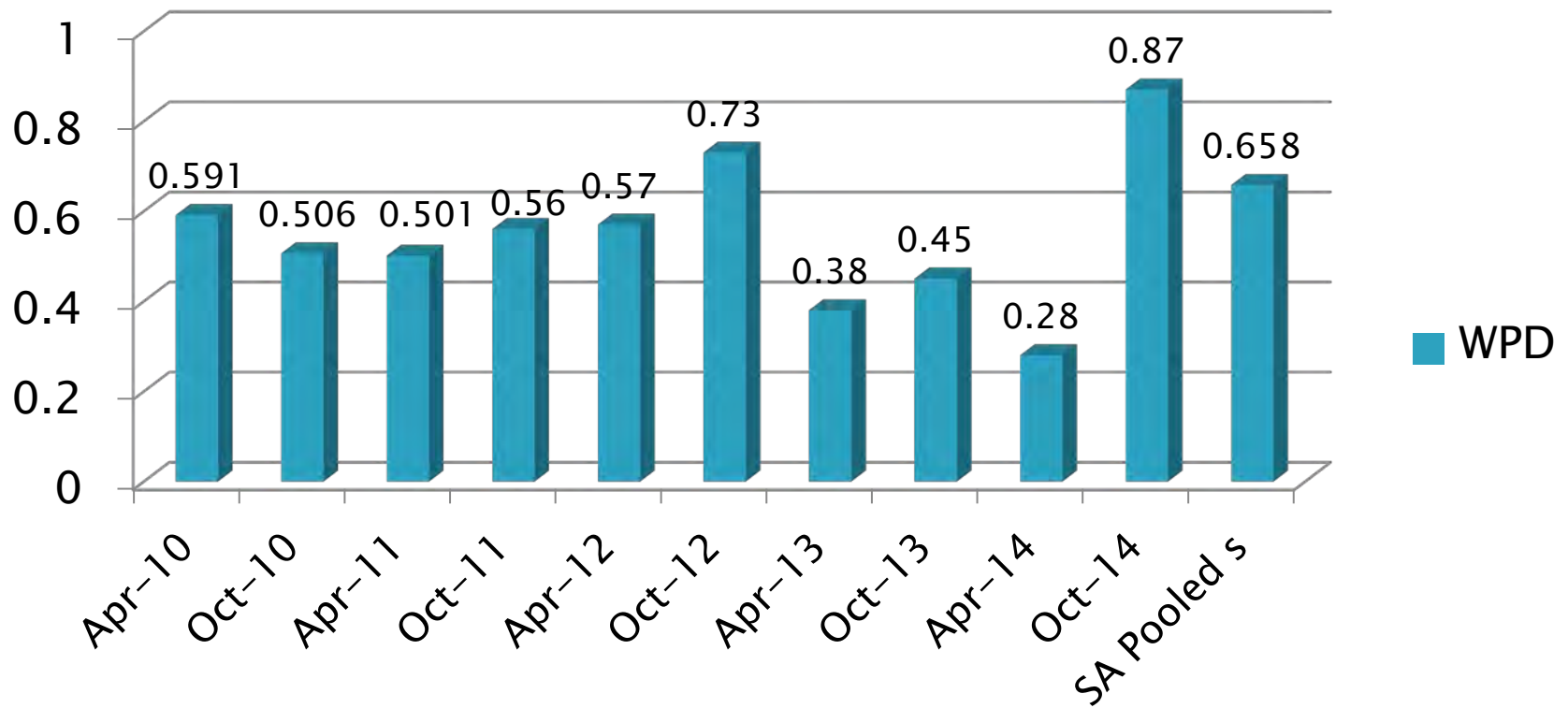
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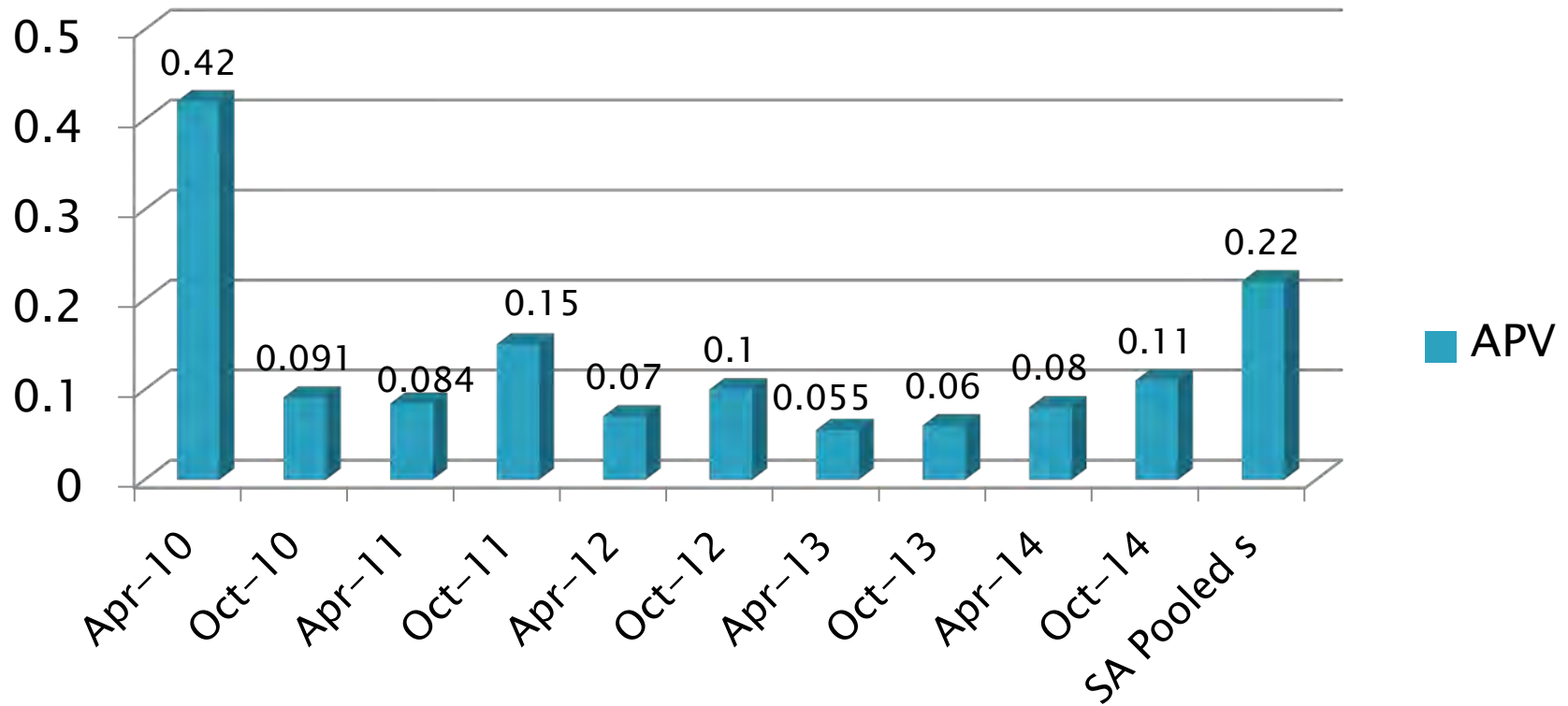
IIIF Precision Estimates

WPD



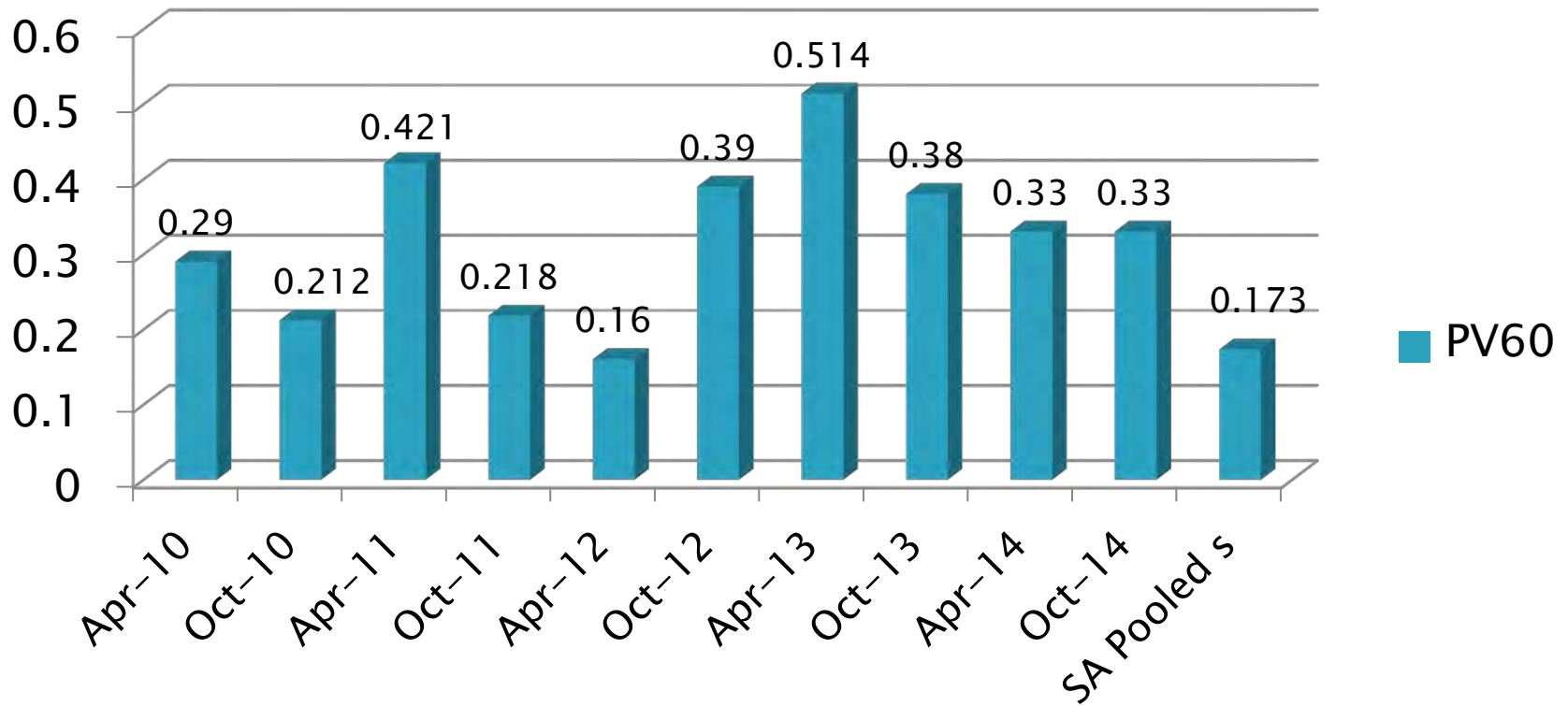
IIIF Precision Estimates

APV



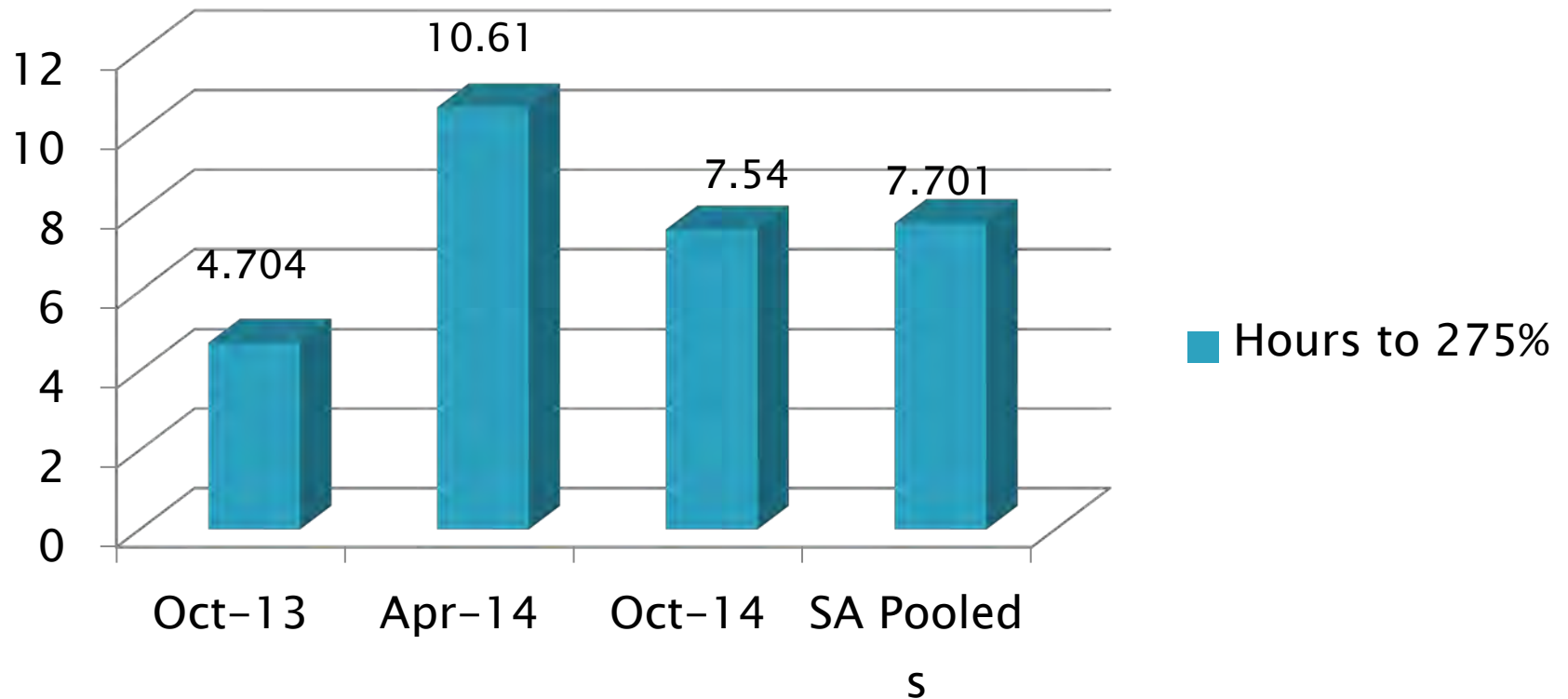
IIIF Precision Estimates

PV60



IIIF Precision Estimates

Hours to 275%



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Sequence IIIG/A/B

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Sequence IIIG Activity

Test Status	Validity Code	#
Acceptable Calibration Test	AC	8
Failed Calibration Test	OC	1
Aborted	XC	1
Donated, Hardware Approval	AH	8
Total		18

Sequence IIIG – Failed Tests

Test Status	Number of Tests
Severe PVIS	1
Total	1

Sequence IIIG – Lost Tests*

Test Status	Cause	#
Aborted	Coolant Leak	1
Totals		1

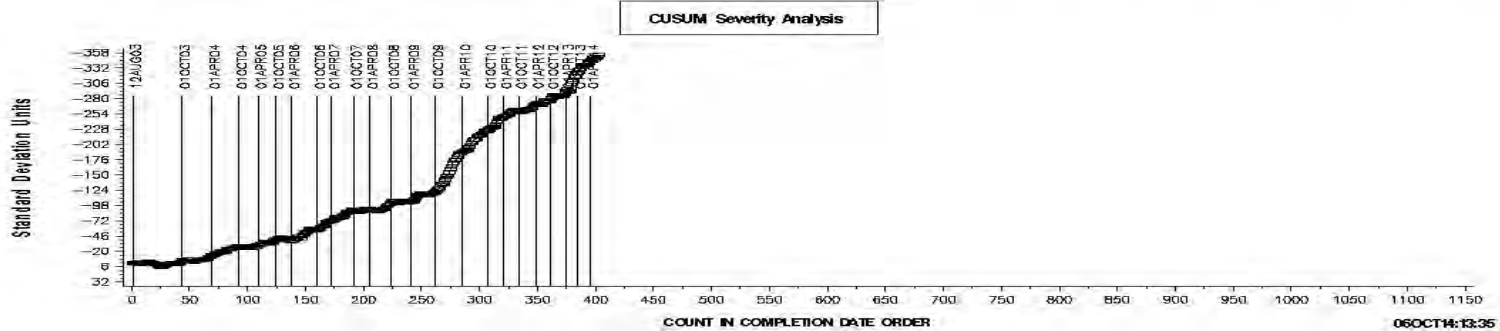
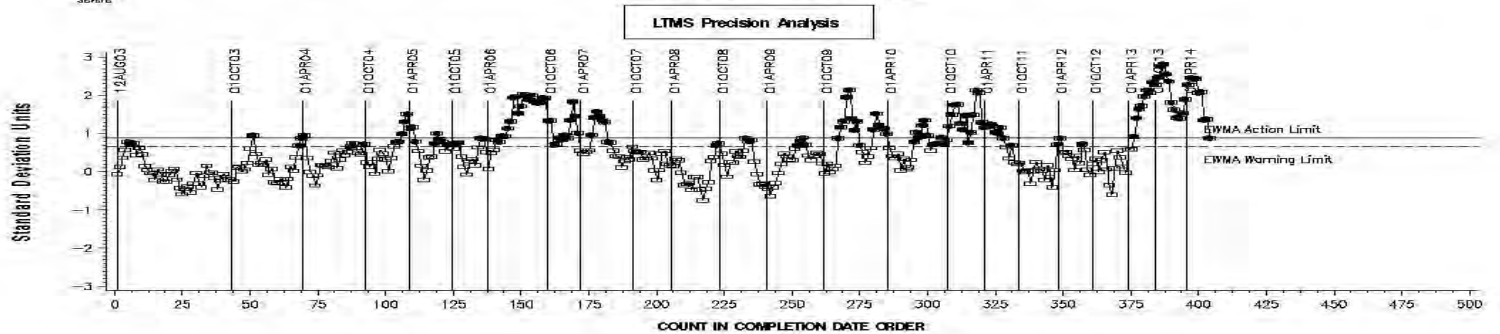
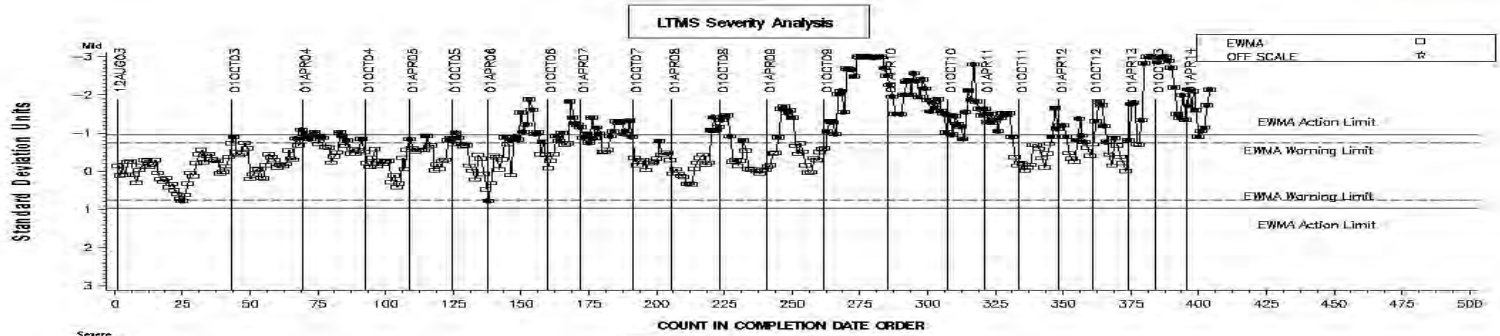
*Invalid and aborted tests

Sequence IIIG Test Severity

- PVIS in precision warning alarm
- ACLW in severity action alarm, mild and in precision warning alarm
 - Long-term mild trend
- WPD is in control
 - Long-term severe trend continuing
- MRV is in control
- PHOS in control



AVERAGE CAM + LIFTER WEAR



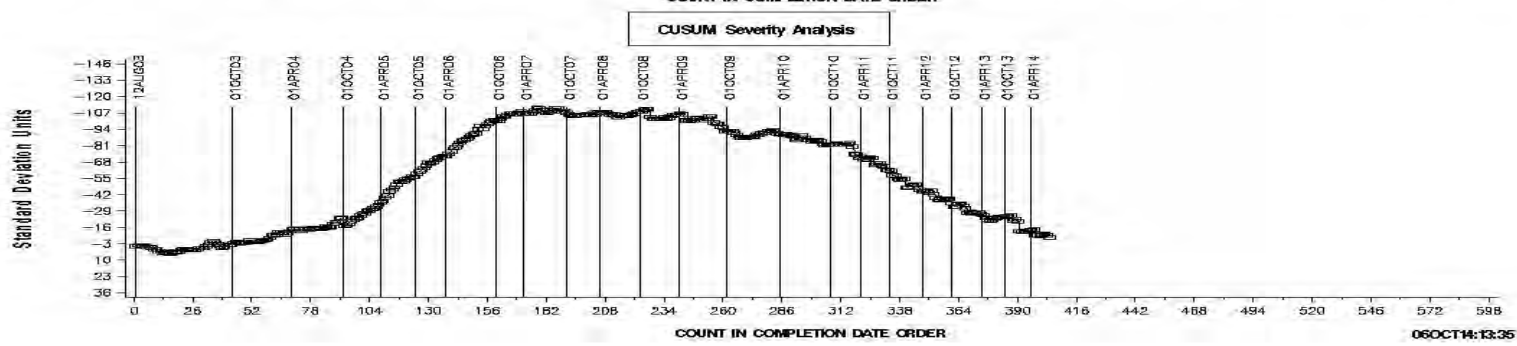
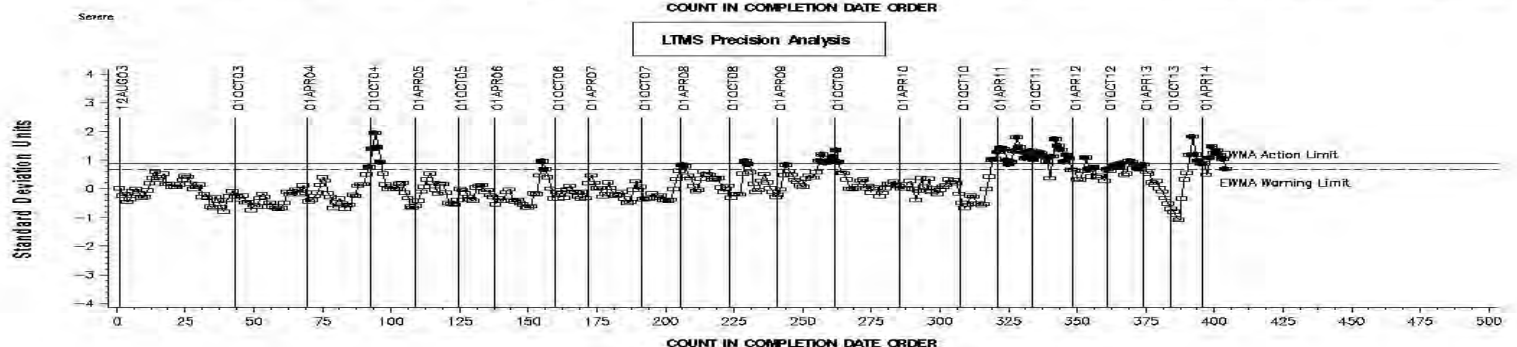
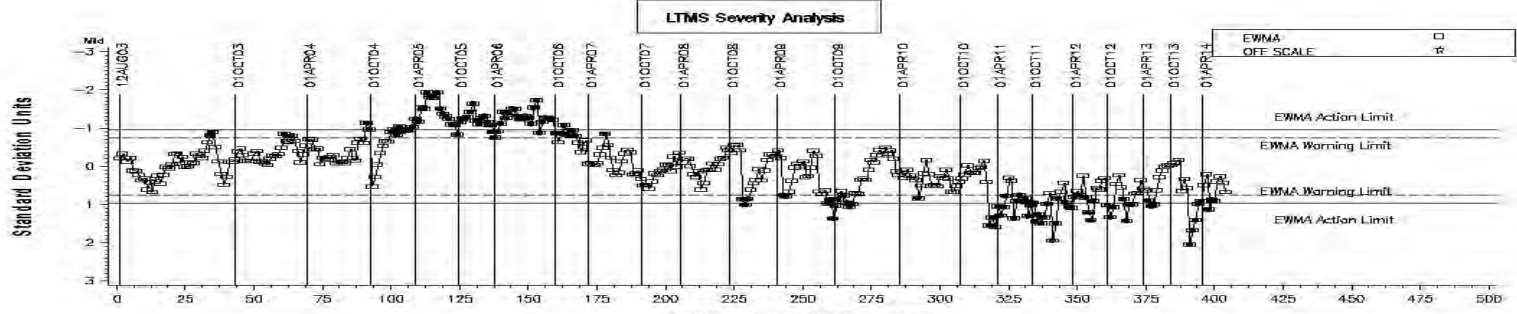
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SEQUENCE IIIG INDUSTRY OPERATIONALLY VALID DATA



VISCOSITY INCREASE

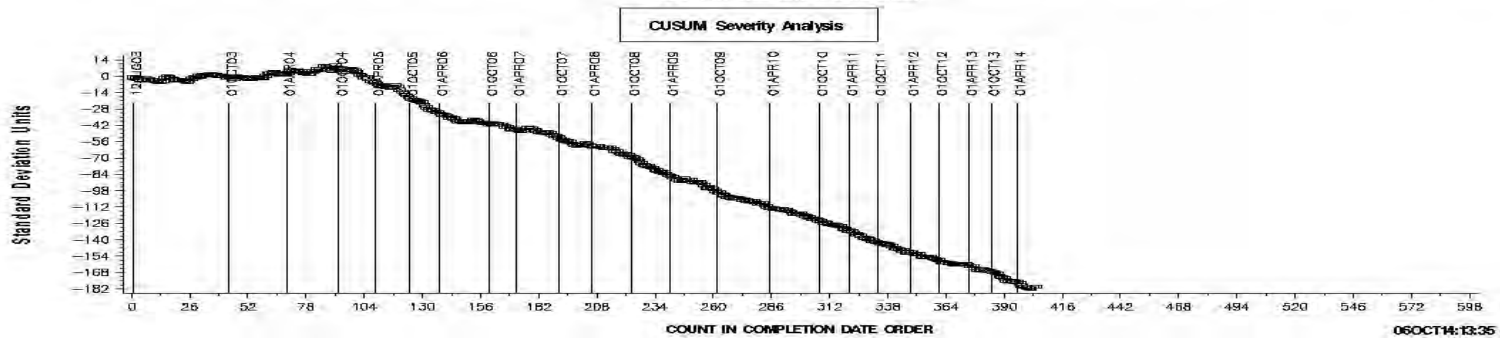
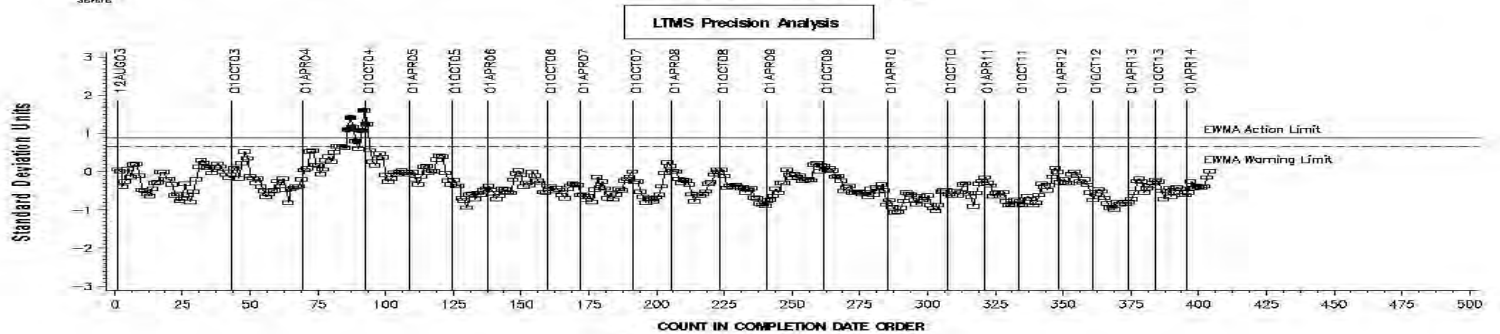
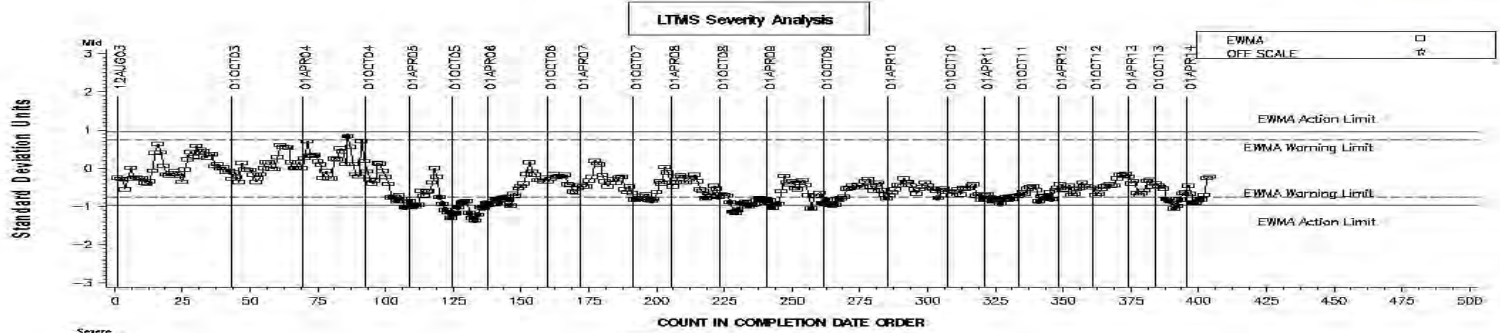


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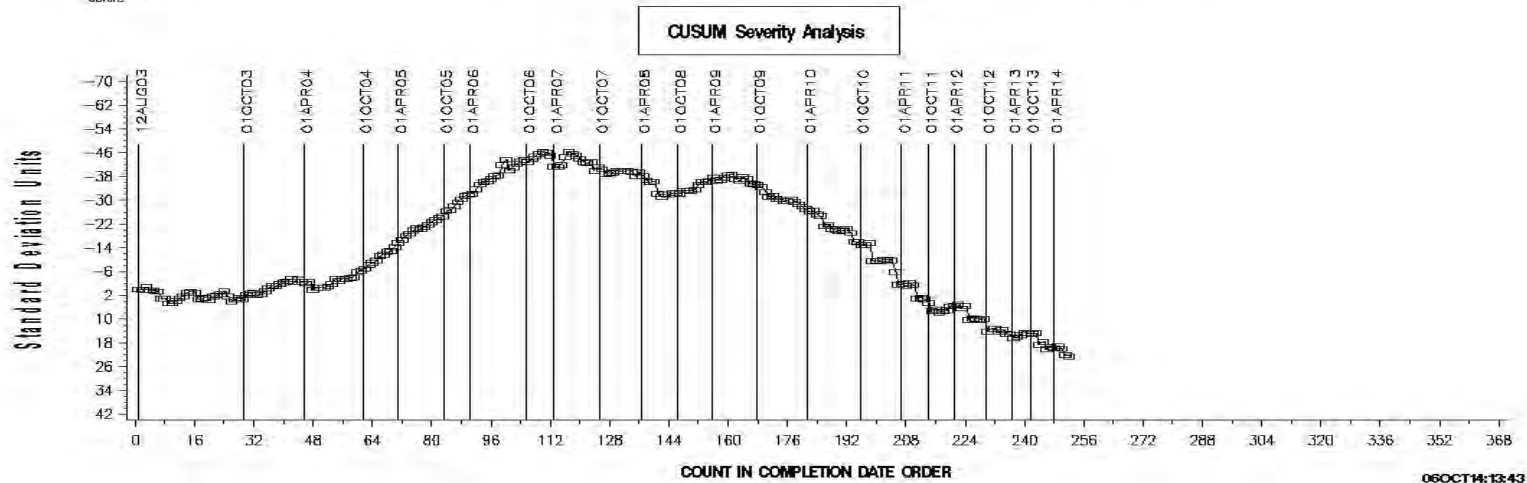
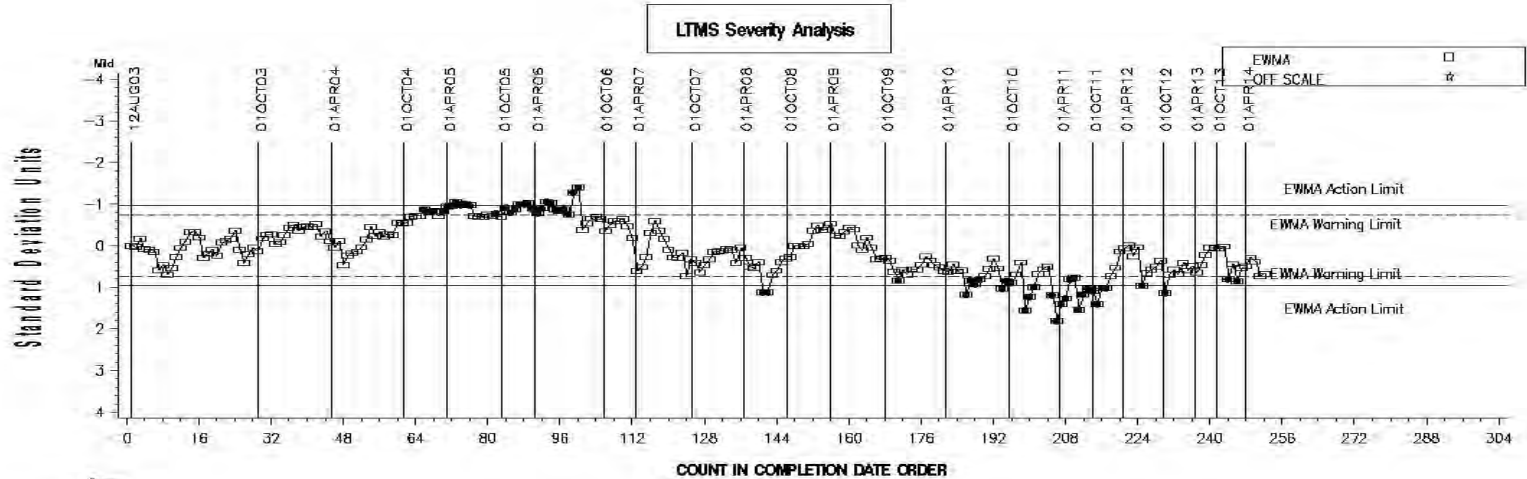


AVERAGE WEIGHTED PISTON DEPOSITS





MRV VISCOSITY RESULT

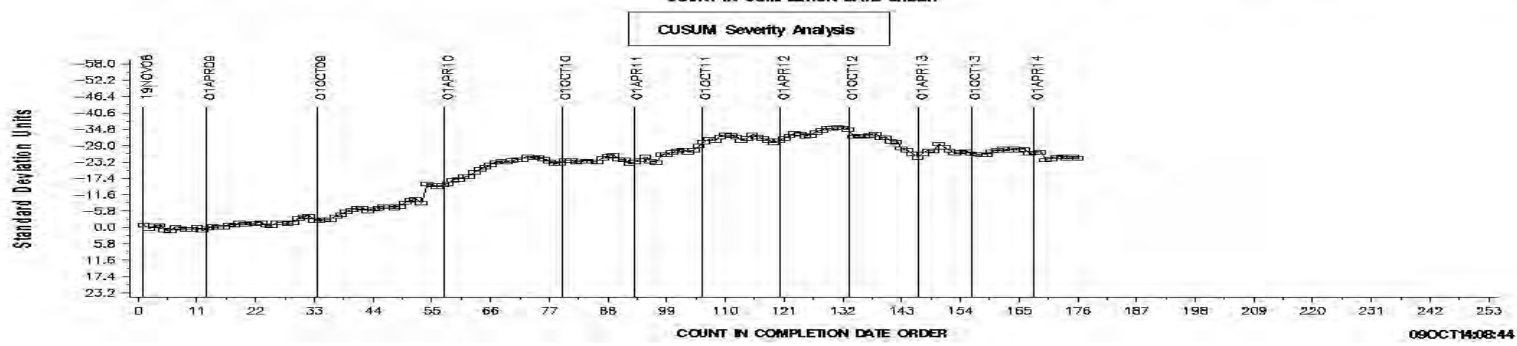
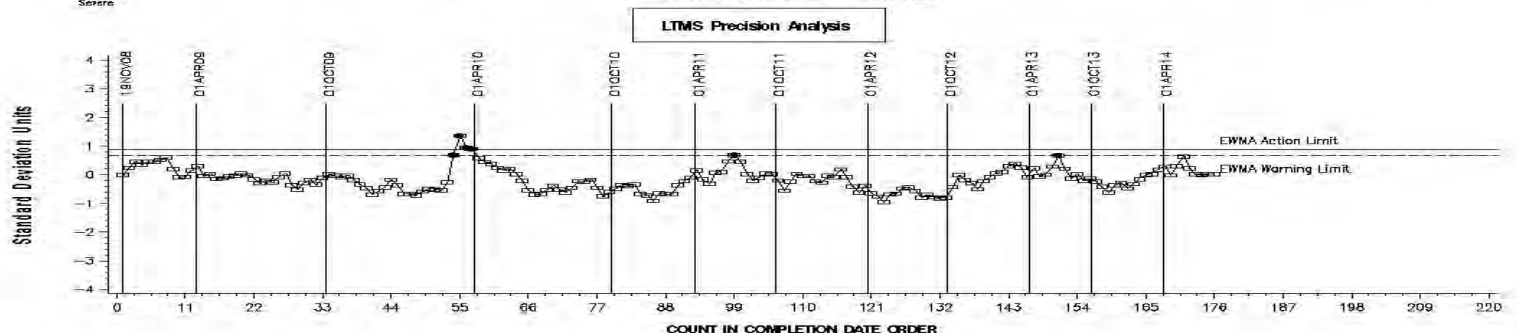
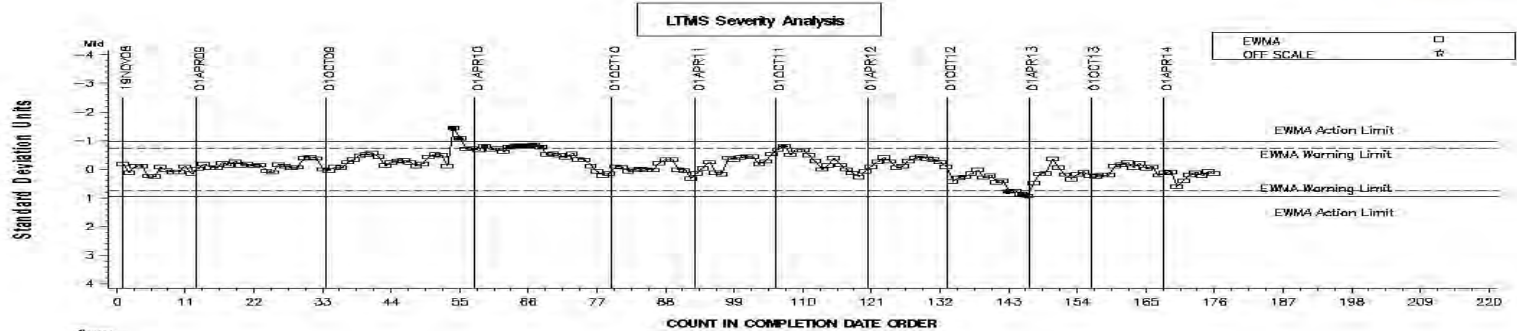


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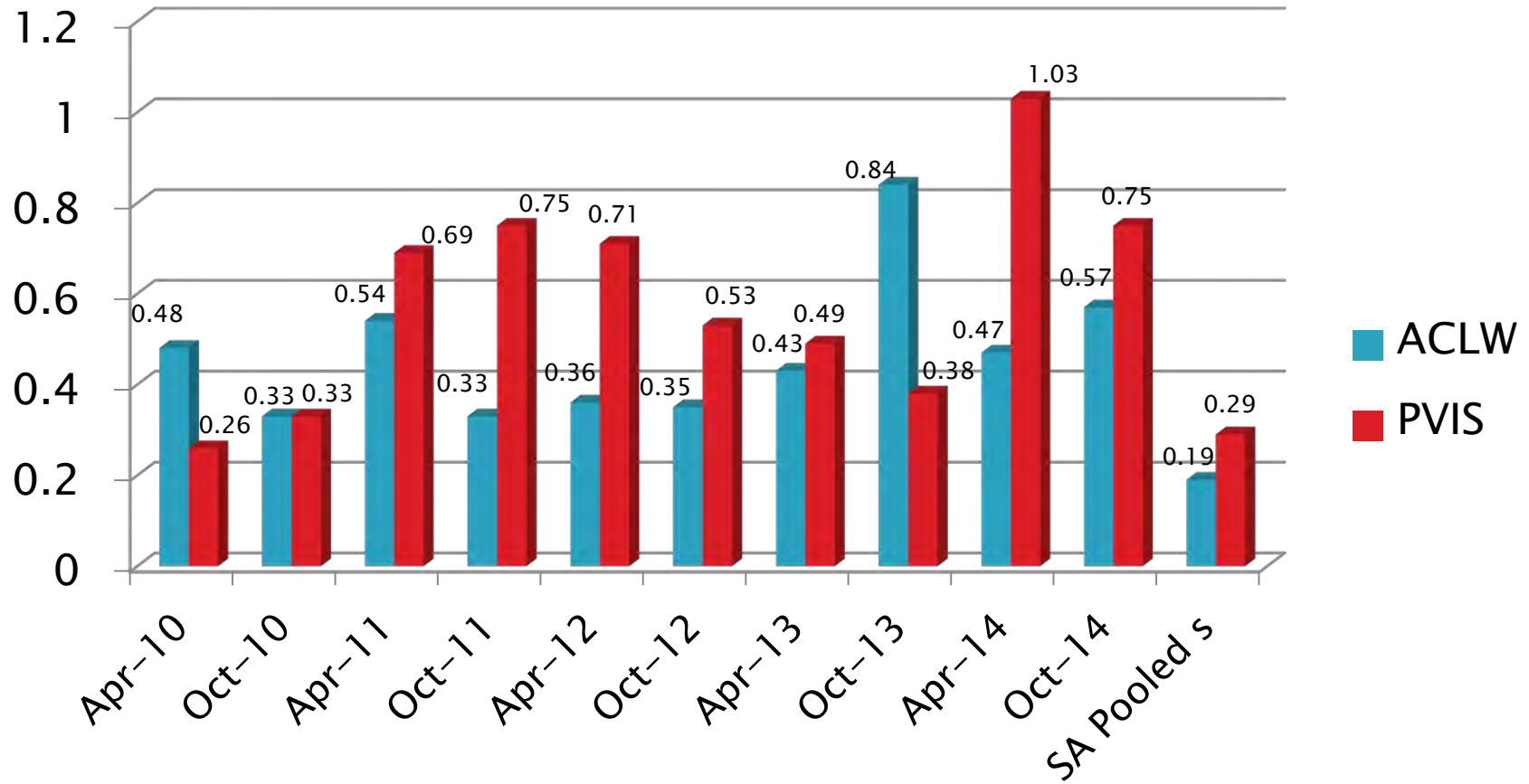
PHOS RETENTION



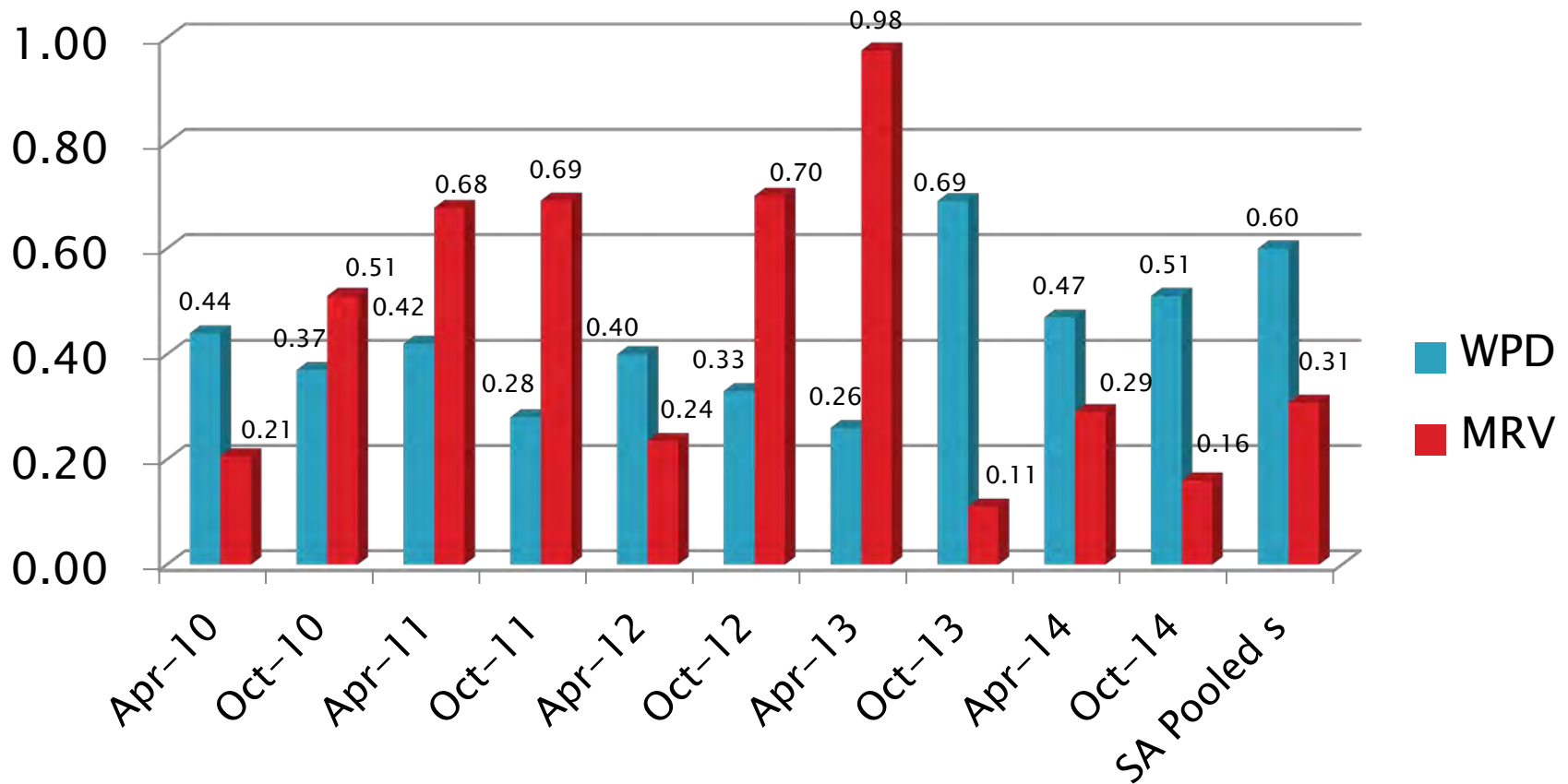
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IIIG Precision Estimates

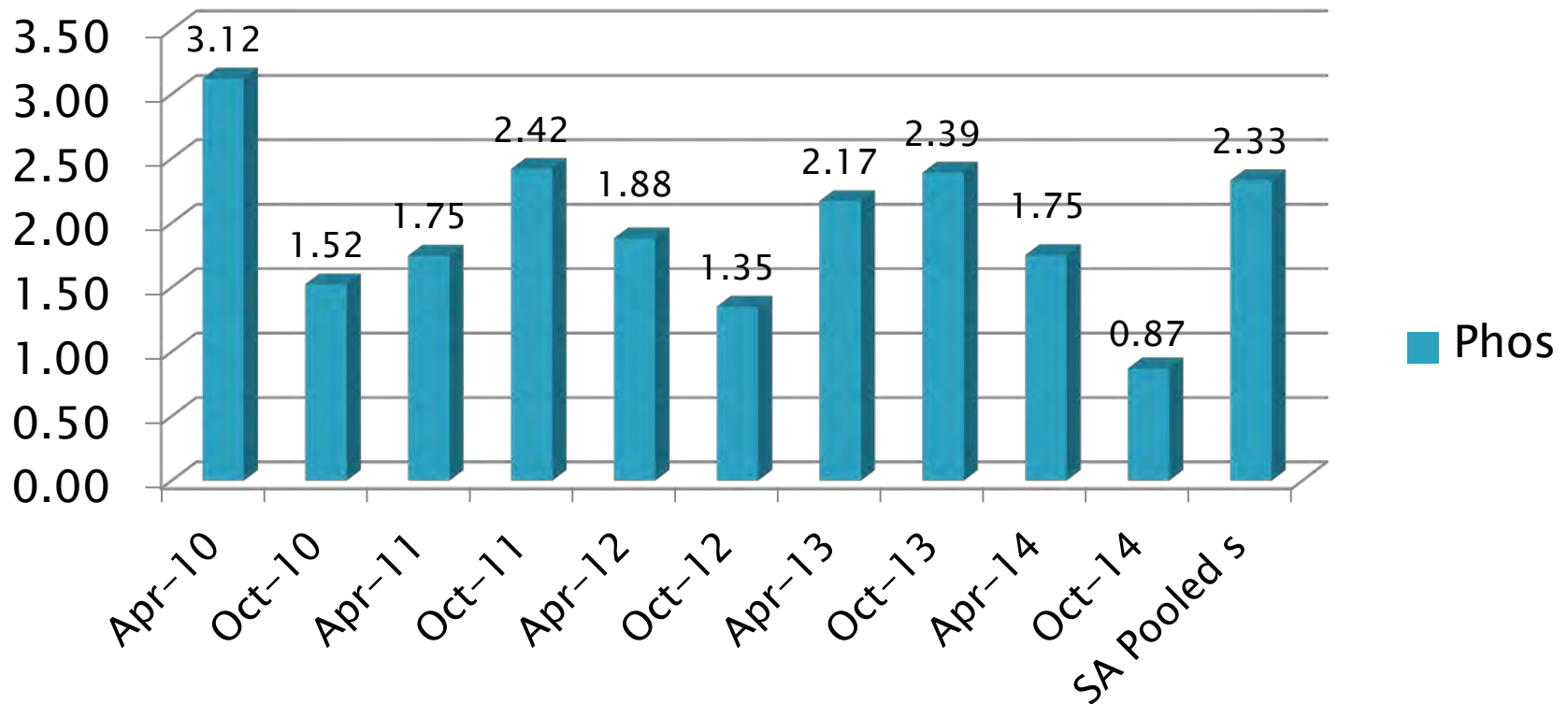


IIIG Precision Estimates



IIIG Precision Estimates

Phos



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Sequence IVA

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Sequence IVA Activity

Test Status	Validity Code	#
Acceptable Calibration Test	AC	4
Failed Calibration Test	OC	1
Aborted	XC	1
Test Stand Removed from LTMS	MC	2
Decoded/Donated	NI/AG	4
Total		12

Sequence IVA – Failed Tests

Test Status	Number of Tests
ACW Mild	1
Total	1

Sequence IVA – Lost Tests*

Test Status	Cause	#
Aborted	Oil Leak	1
Totals		1

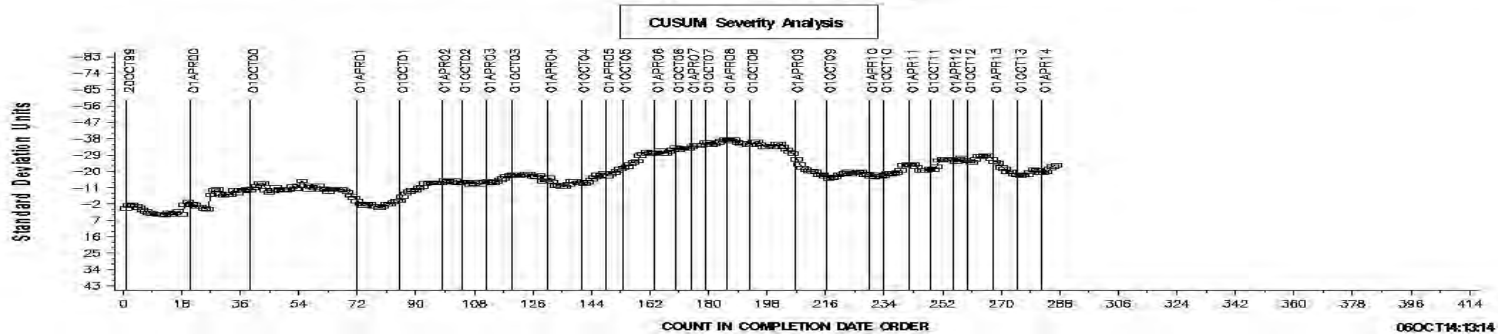
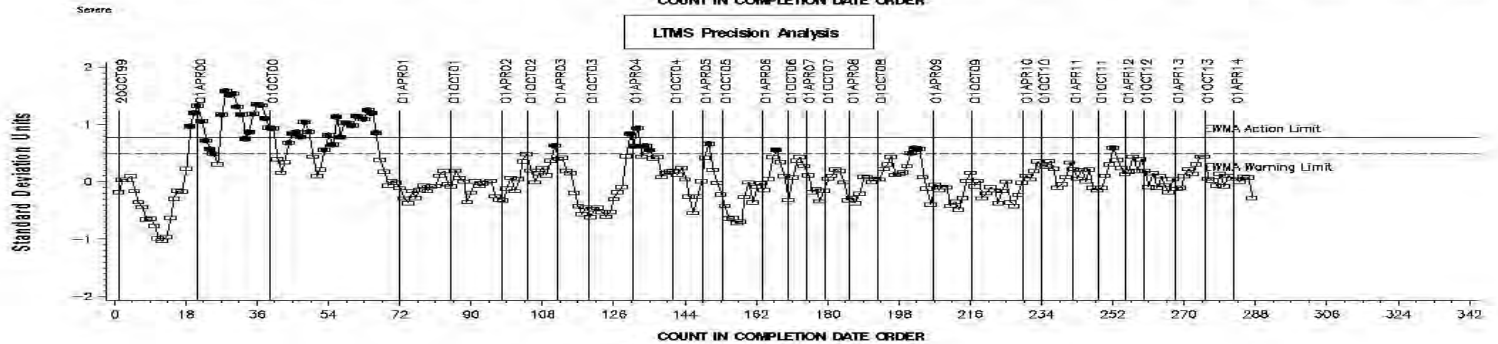
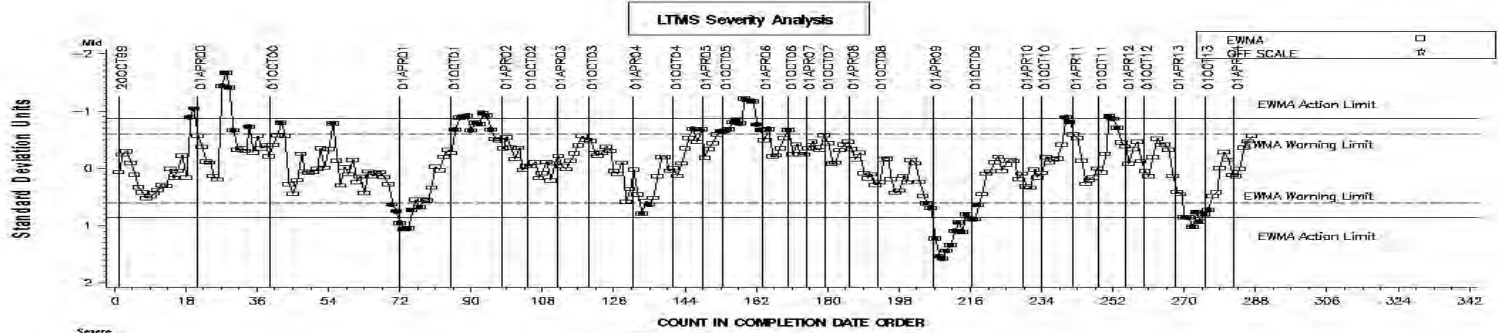
*Invalid and aborted tests

Sequence IVA Test Severity

- ACW in control.



AVERAGE CAM WEAR

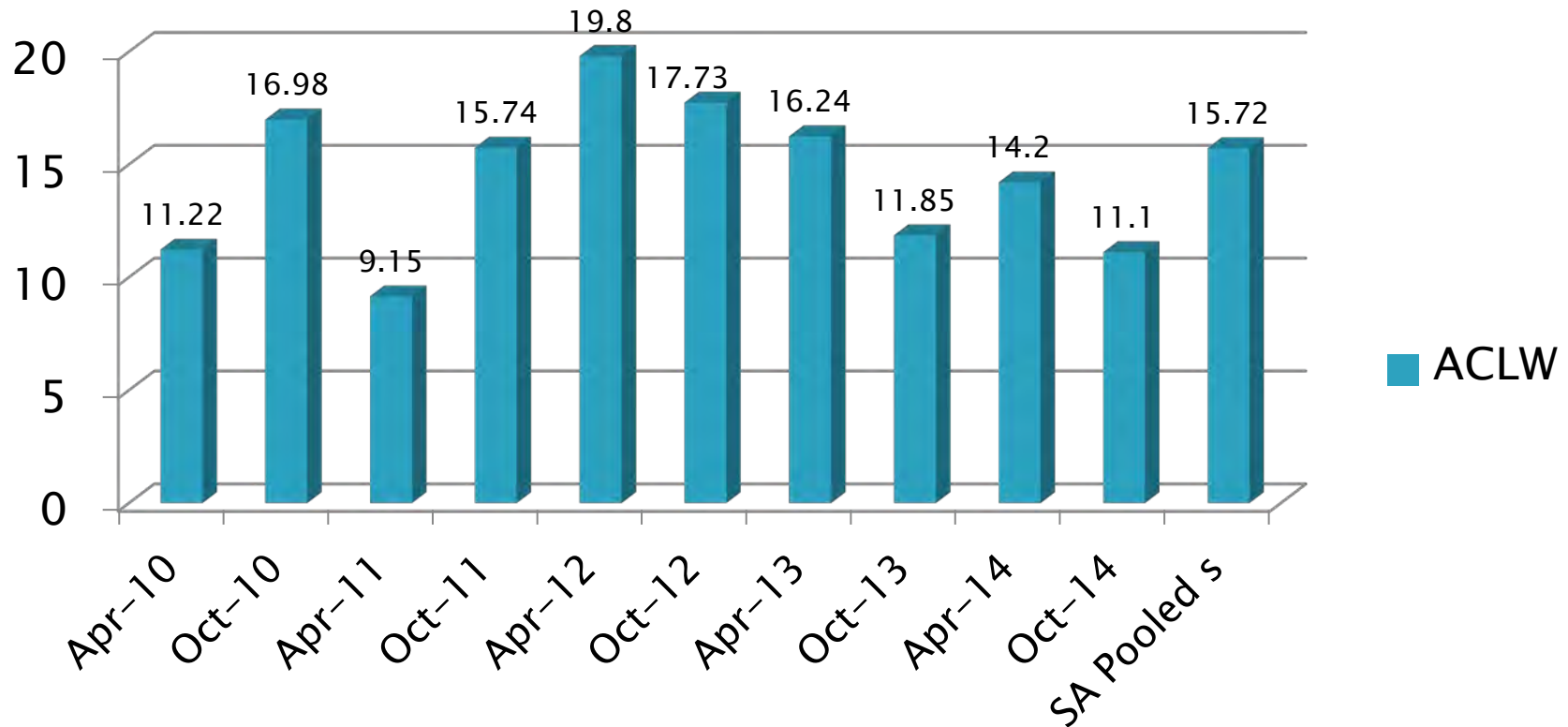


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Sequence IVA Precision Estimates

ACW



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Sequence VG

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Sequence VG Activity

Test Status	Validity Code	#
Acceptable Calibration Test	AC	6
Operationally Invalid	LC	2
Total		8

Sequence VG – Lost Tests*

Test Status	Cause	#
Invalid	Coolant Temperature Control Valve Failure	1
Invalid	High Blowby	1
Totals		2

*Invalid and aborted tests

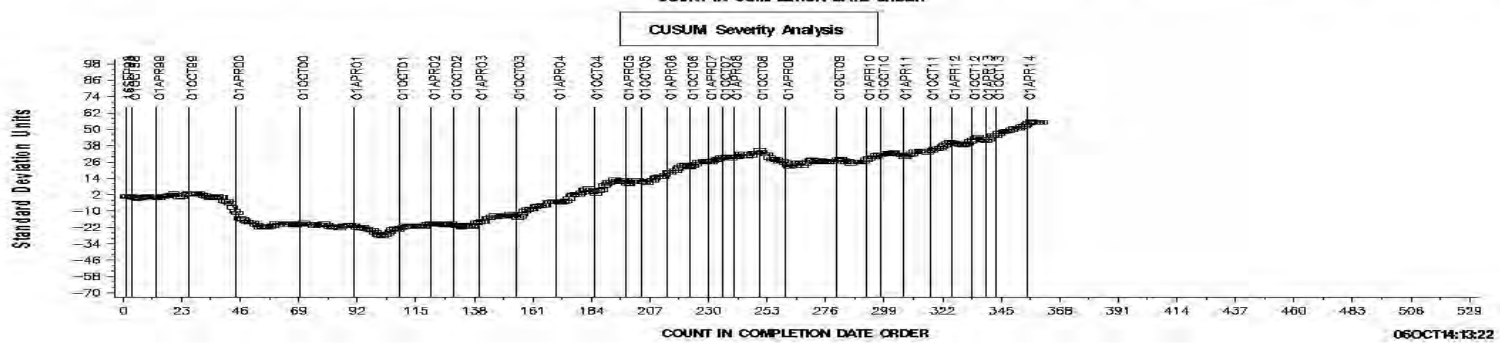
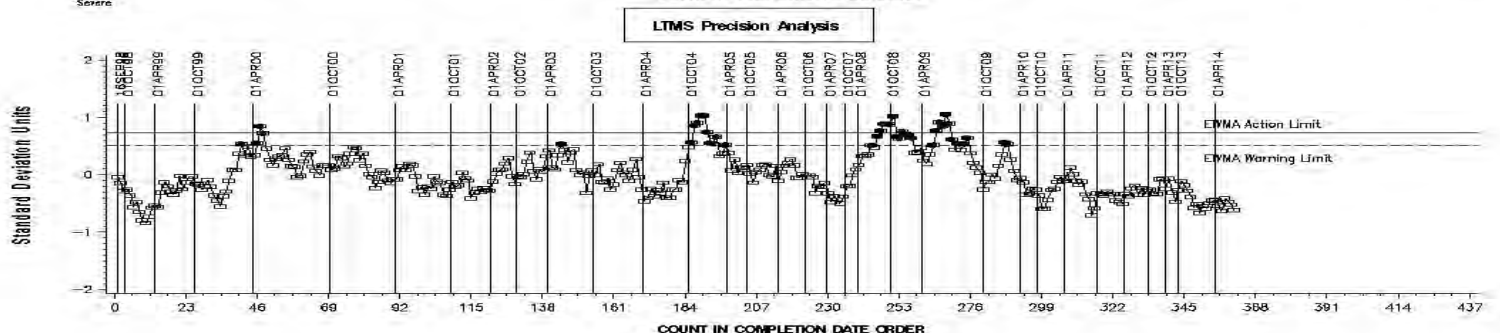
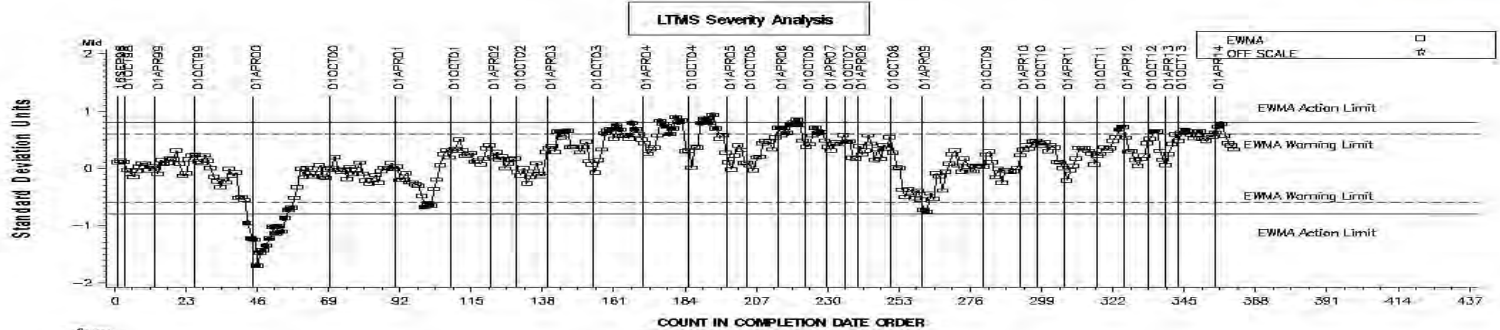
Sequence VG Test Severity

- All parameters in control.

SEQUENCE VG INDUSTRY OPERATIONALLY VALID DATA



AVERAGE ENGINE SLUDGE



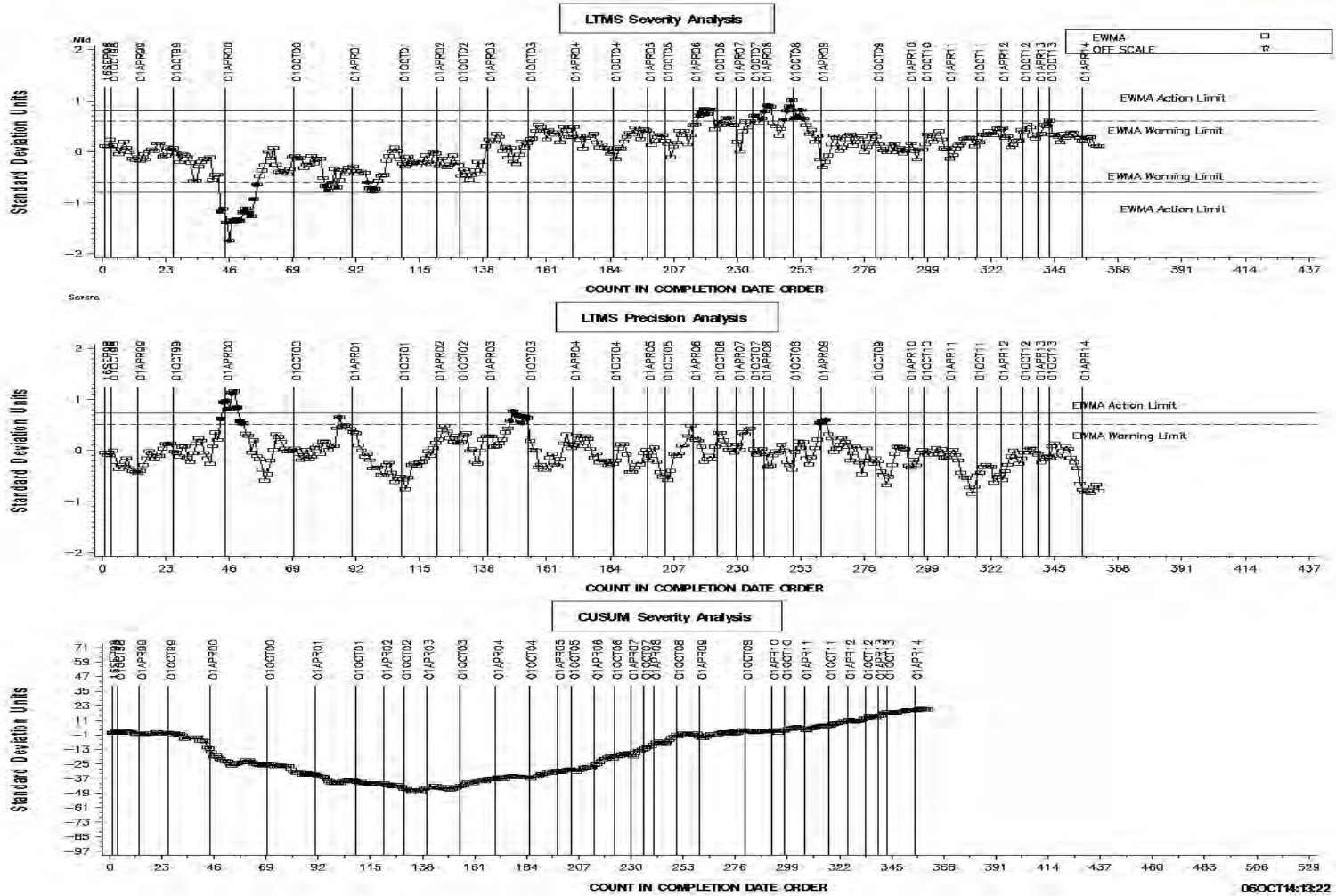
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SEQUENCE VG INDUSTRY OPERATIONALLY VALID DATA



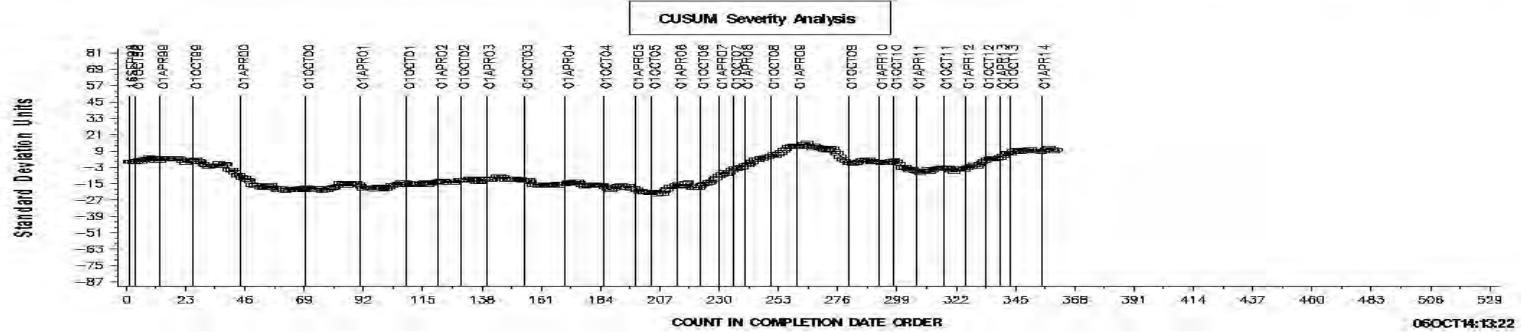
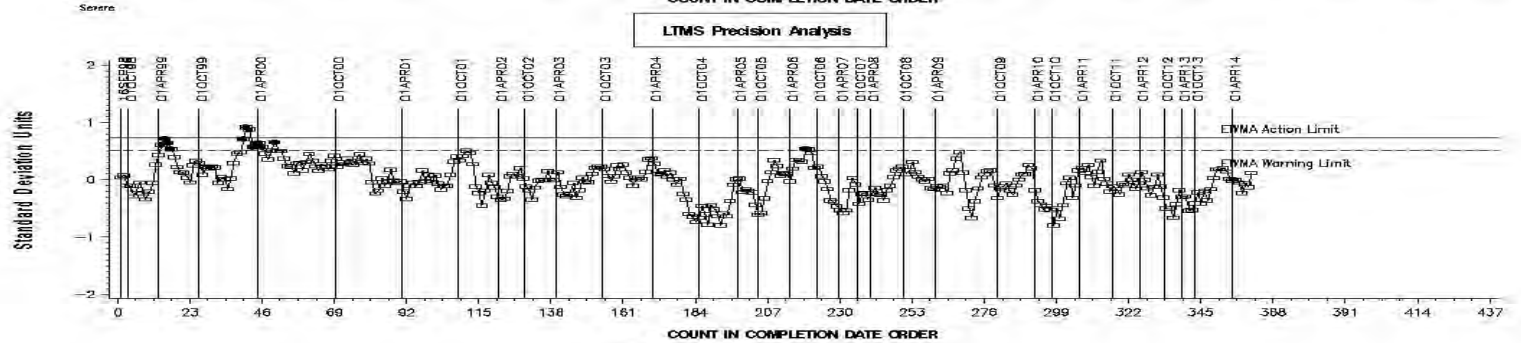
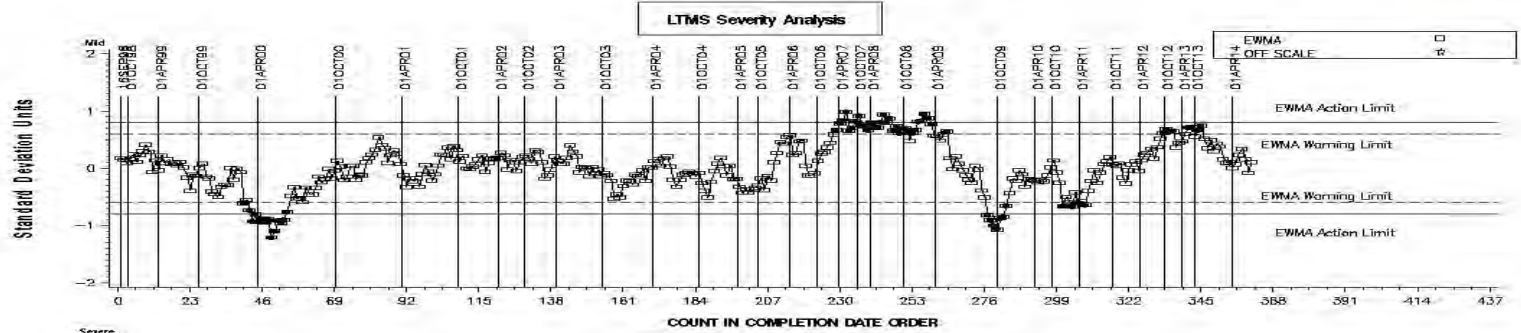
AVERAGE ROCKER COVER SLUDGE



SEQUENCE VG INDUSTRY OPERATIONALLY VALID DATA

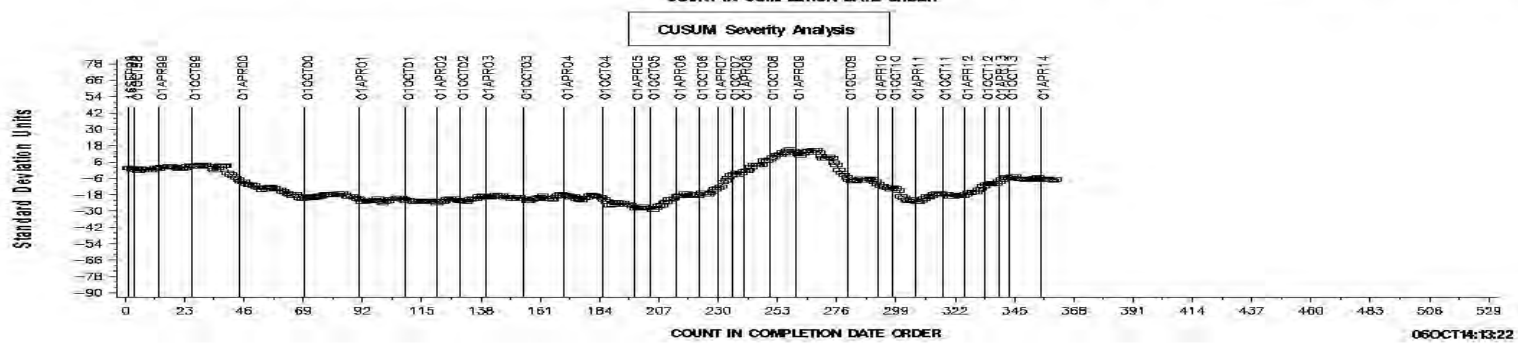
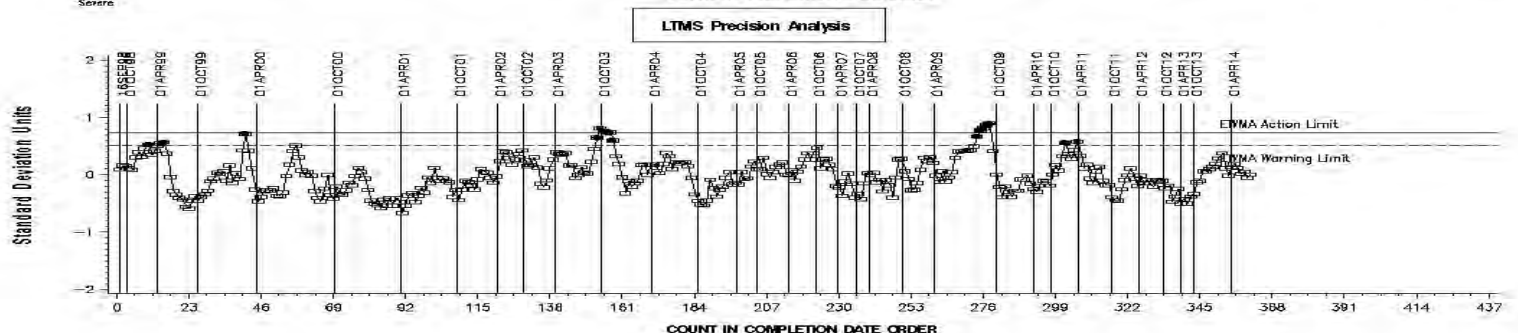
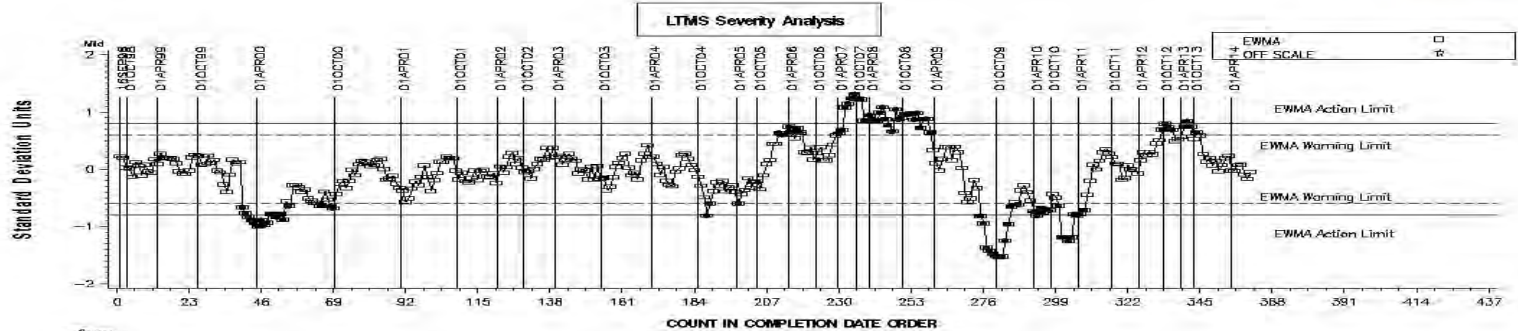


AVG. ENG. VARN. 3—PART APV + BAFFLES





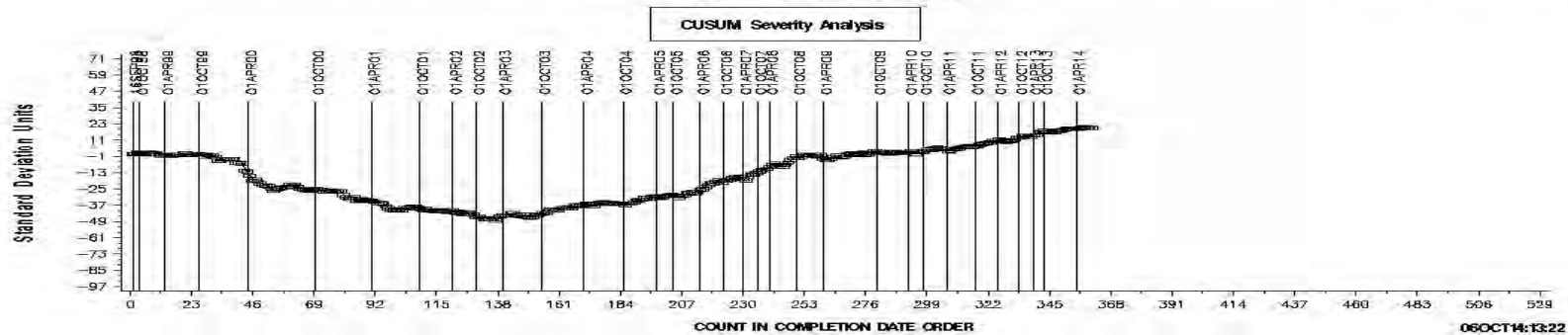
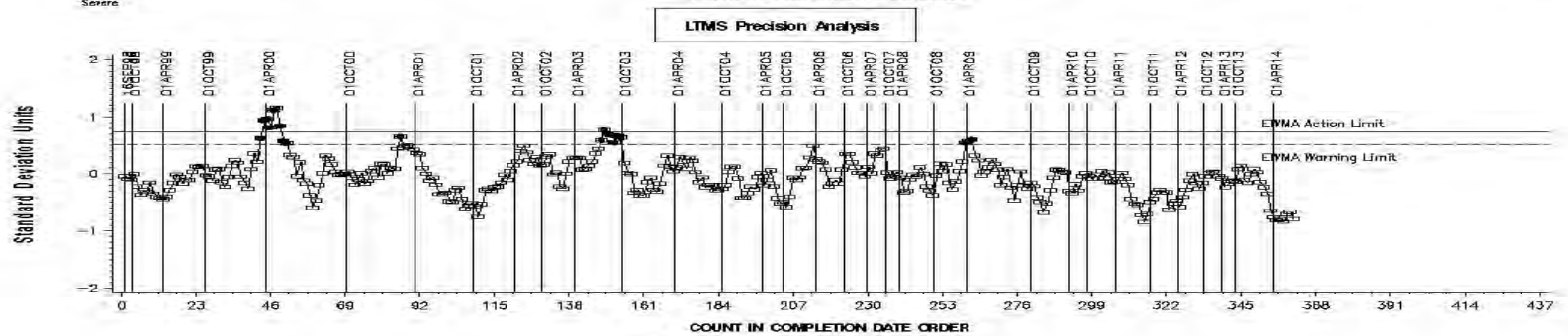
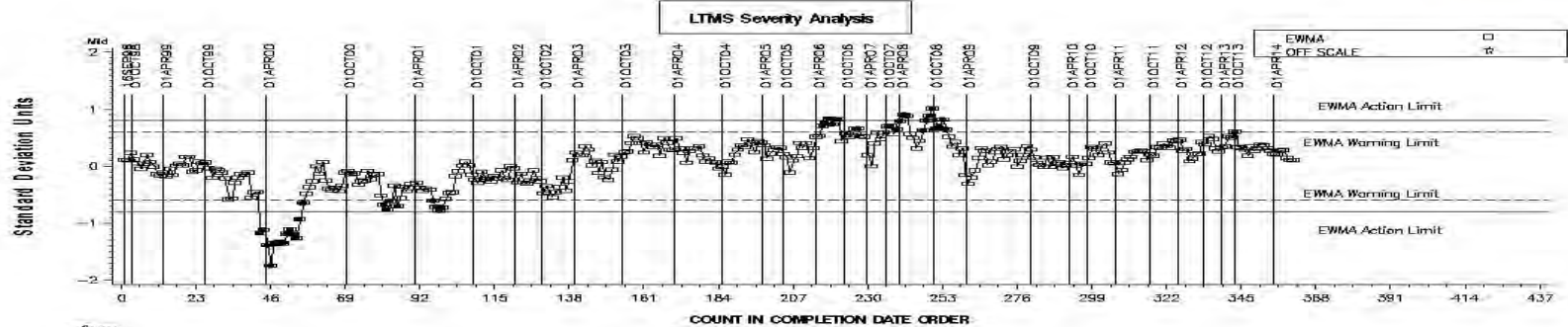
AVG PISTON SKIRT RATING



SEQUENCE VG INDUSTRY OPERATIONALLY VALID DATA



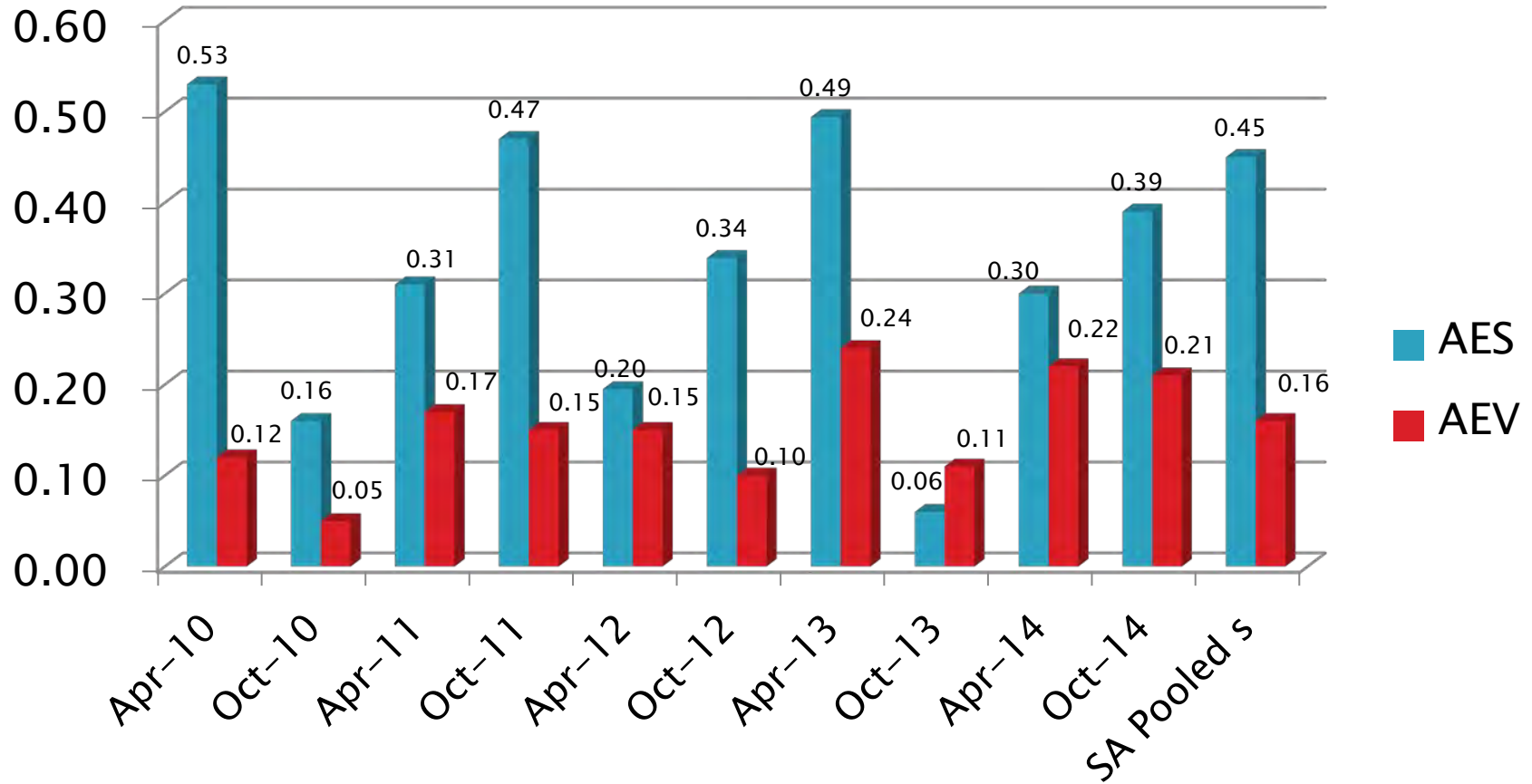
AVERAGE ROCKER COVER SLUDGE



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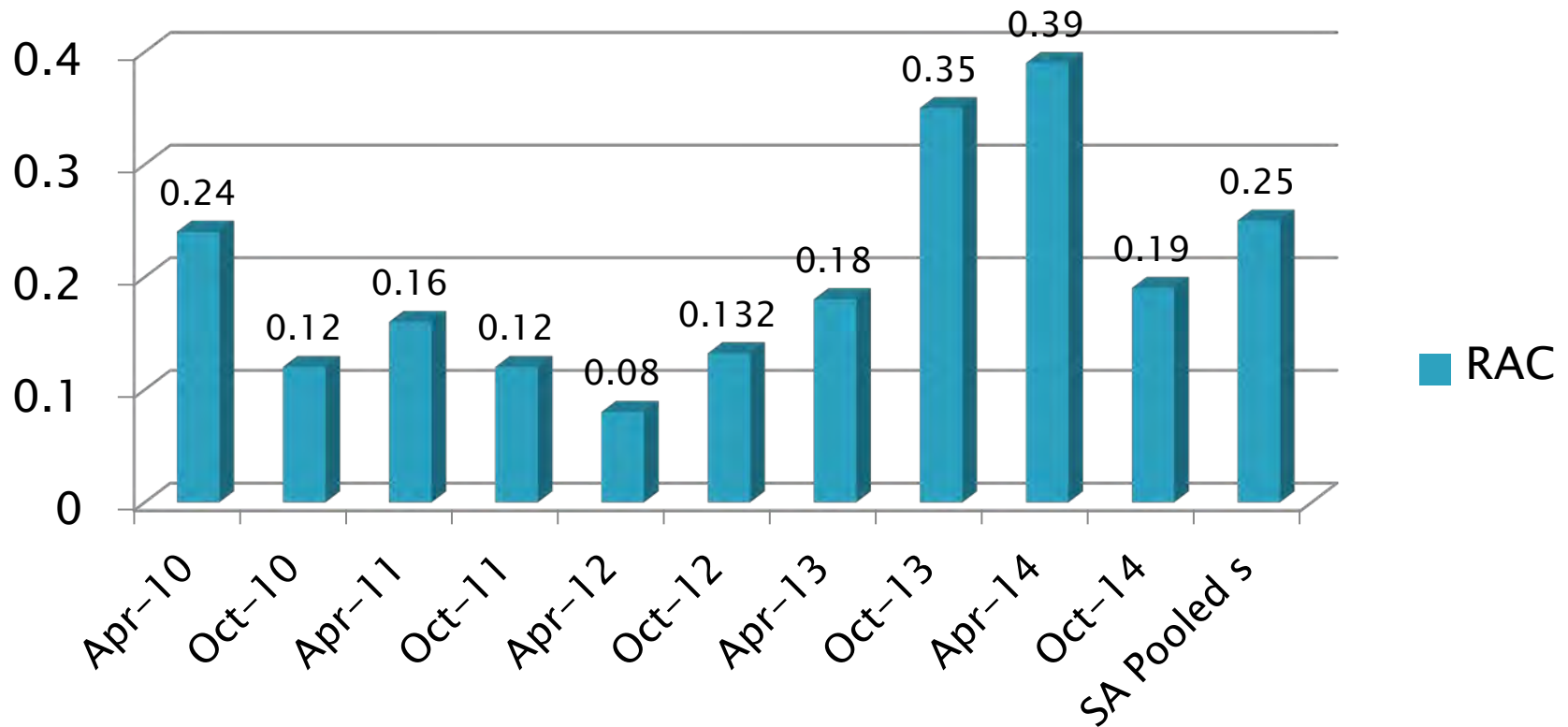


Sequence VG Precision Estimates

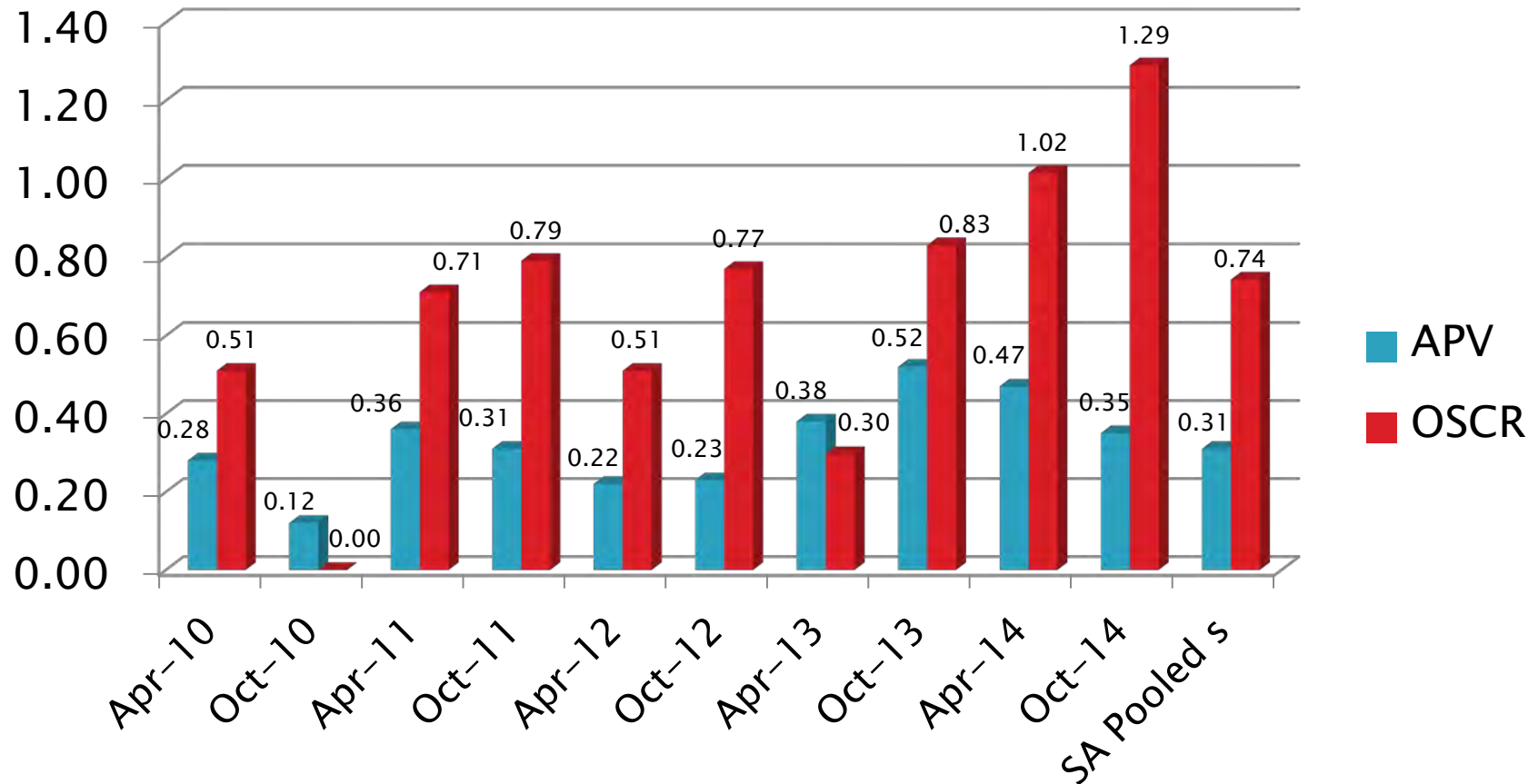


Sequence VG Precision Estimates

RAC



Sequence VG Precision Estimates



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Sequence VID

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Sequence VID Activity

Test Status	Validity Code	#
Acceptable Calibration Test	AC	16
Operationally Invalid	LC	2
Total		18

Sequence VID – Lost Tests*

Test Status	Cause	#
Invalid	Exceeded maximum number of downtime occurrences	1
Invalid	Oil Contamination	1
Totals		2

*Invalid and aborted tests

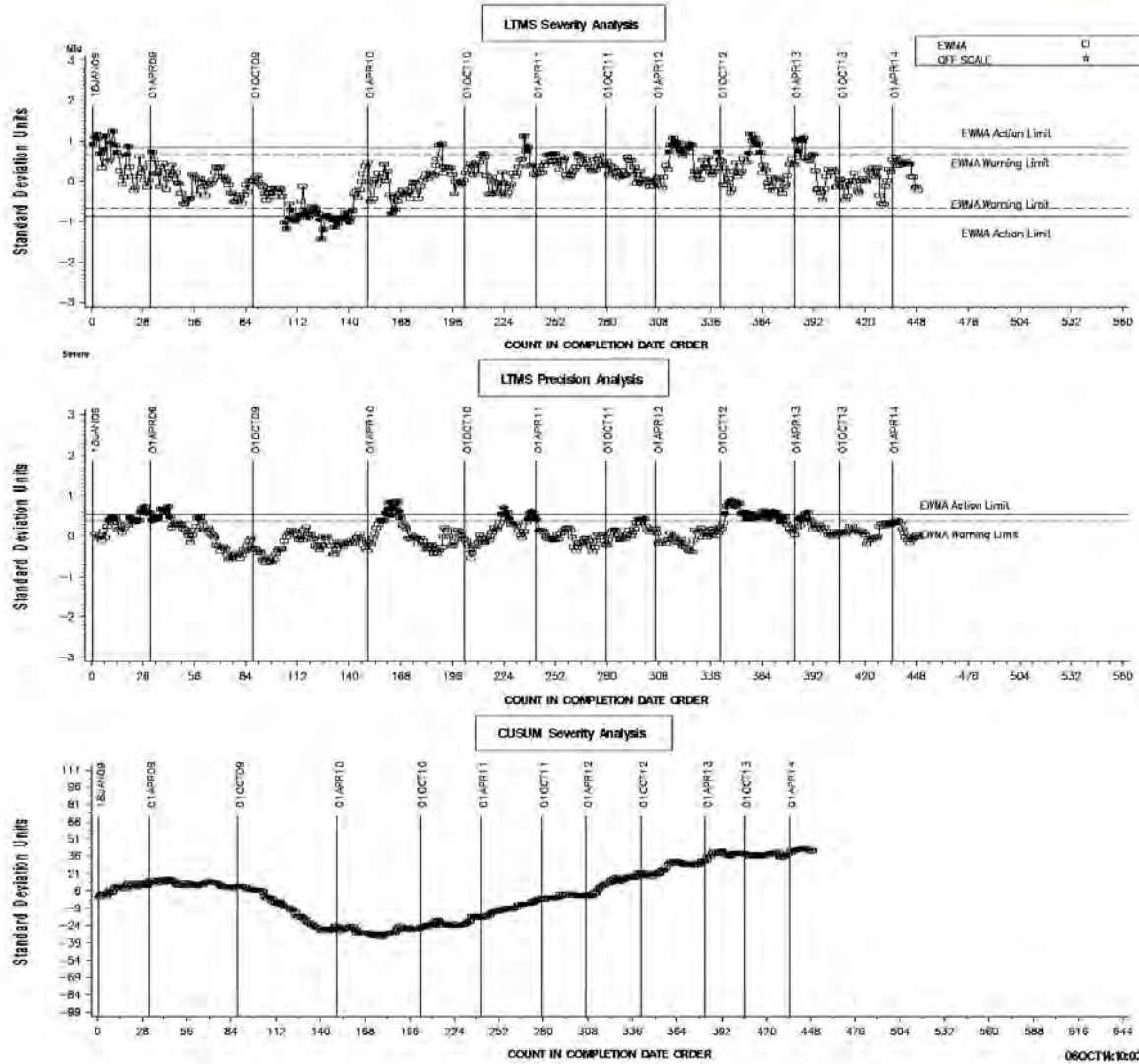
Sequence VID Test Severity

- FEI1 and FEI2 are in control.

SEQUENCE VID INDUSTRY OPERATIONALLY VALID DATA



FEI FINAL RESULT PHASE I



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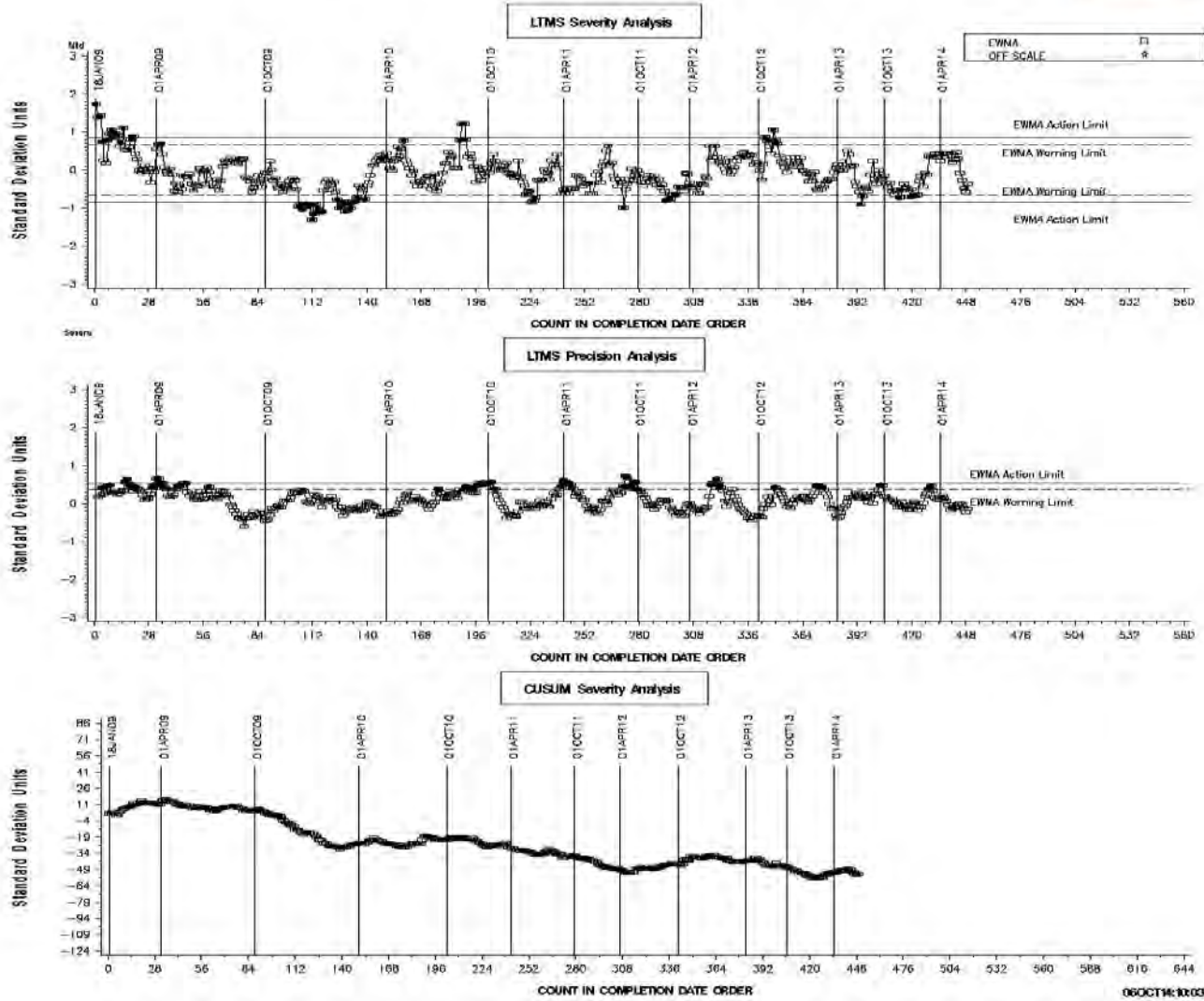


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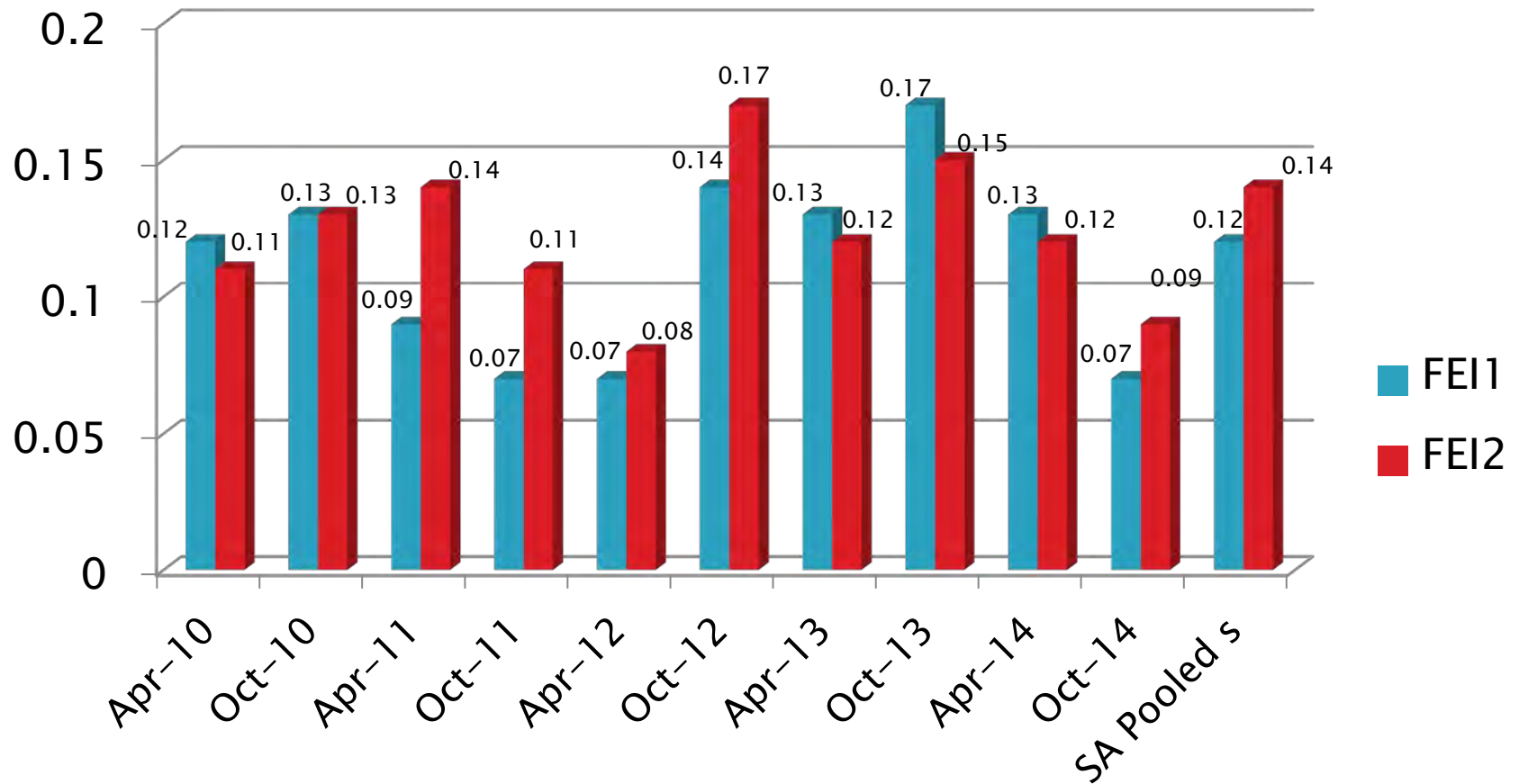
SEQUENCE VID INDUSTRY OPERATIONALLY VALID DATA



FEI FINAL RESULT PHASE II



Sequence VID Precision Estimates



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Sequence VIII

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Sequence VIII Activity

Test Status	Validity Code	#
Acceptable Calibration Test	AC	3
Aborted	XC	1
Total		4

Sequence VIII – Lost Tests*

Test Status	Cause	#
Aborted	Exceeded Downtime Limit	1
Totals		1

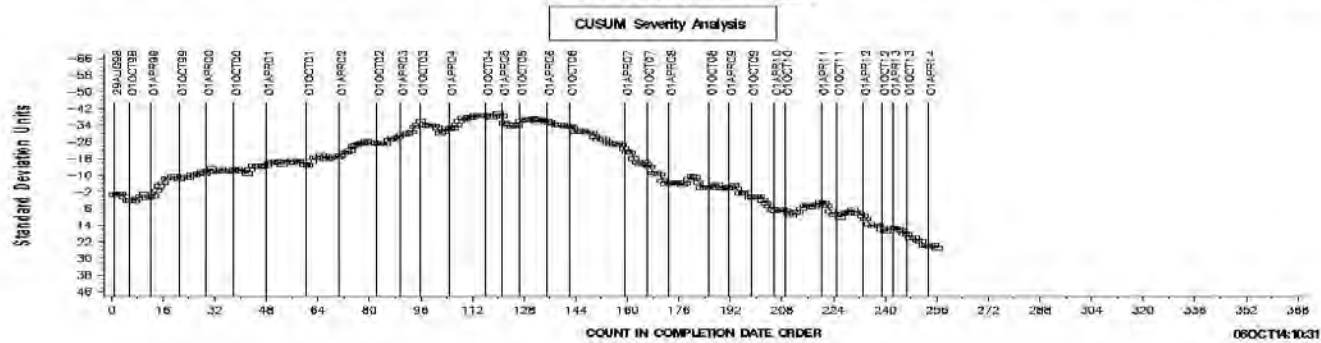
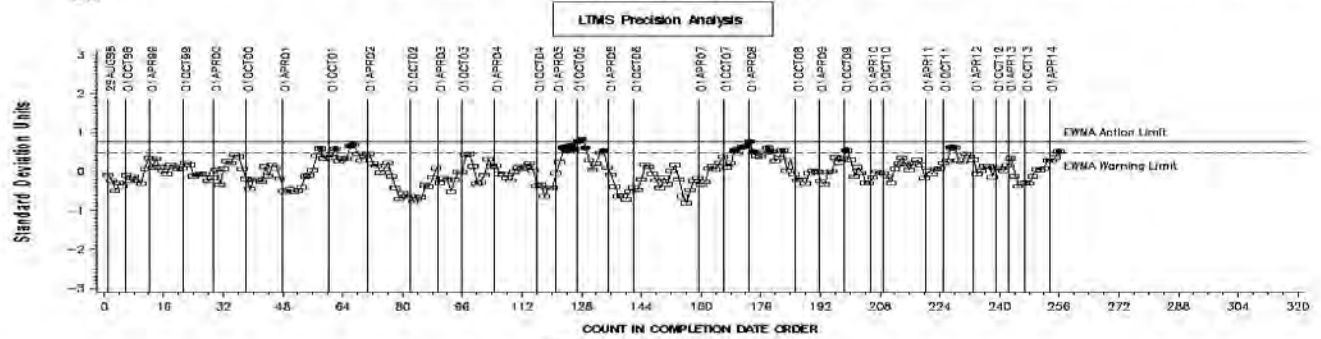
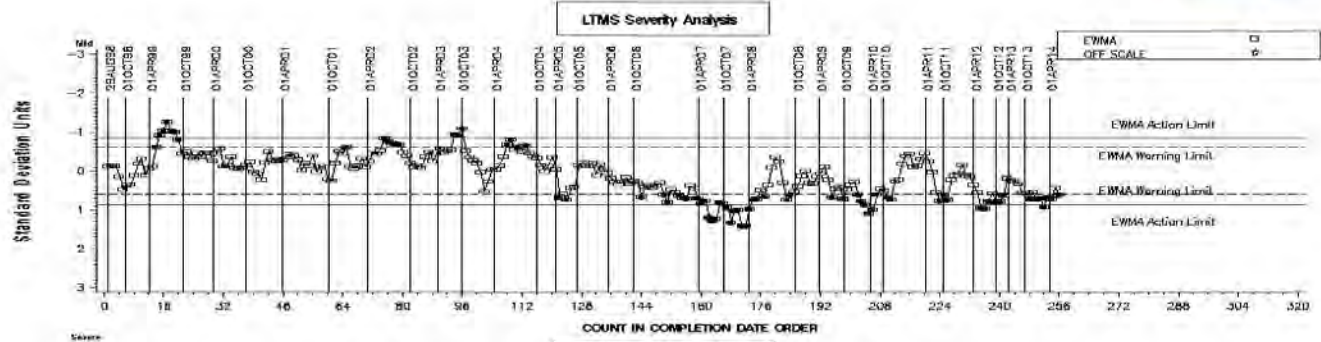
*Invalid and aborted tests

Sequence VIII Test Severity

- Bearing Weight Loss in EWMA severity and precision warning alarms.
- Stripped Viscosity is in EWMA severity warning alarm.

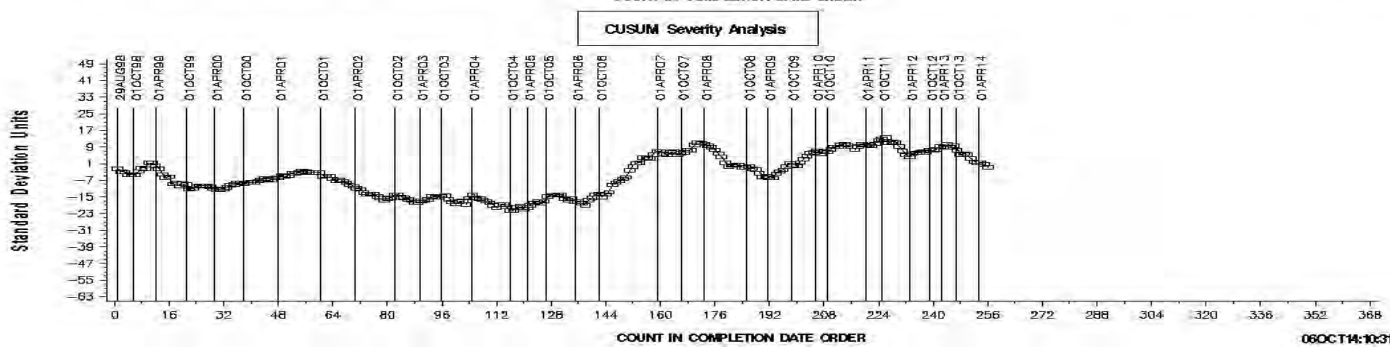
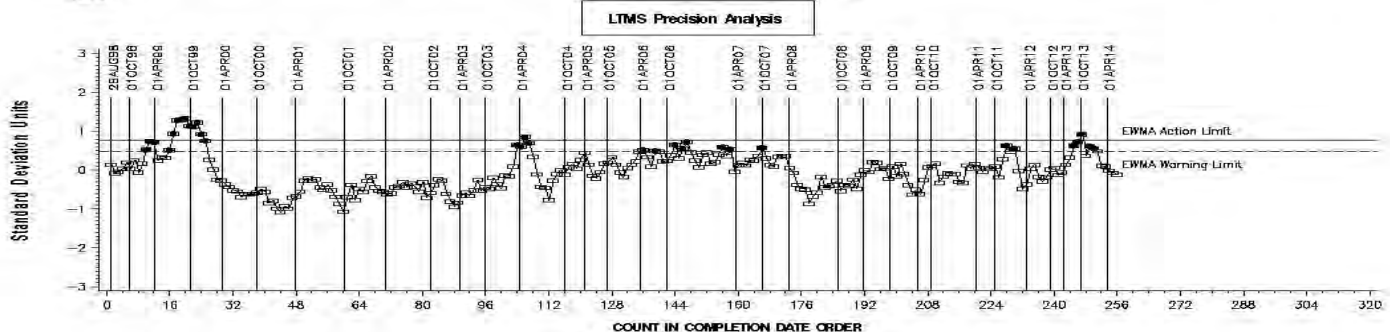
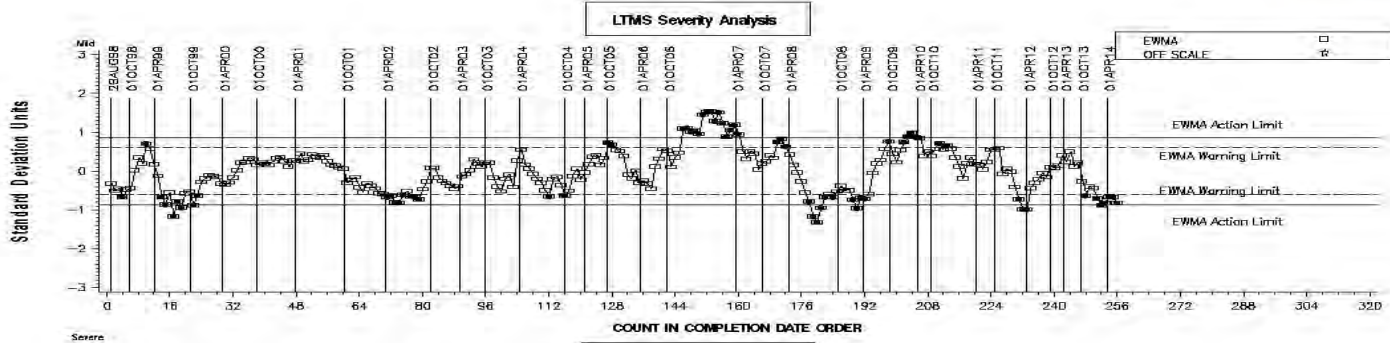


FINAL BEARING WEIGHT LOSS



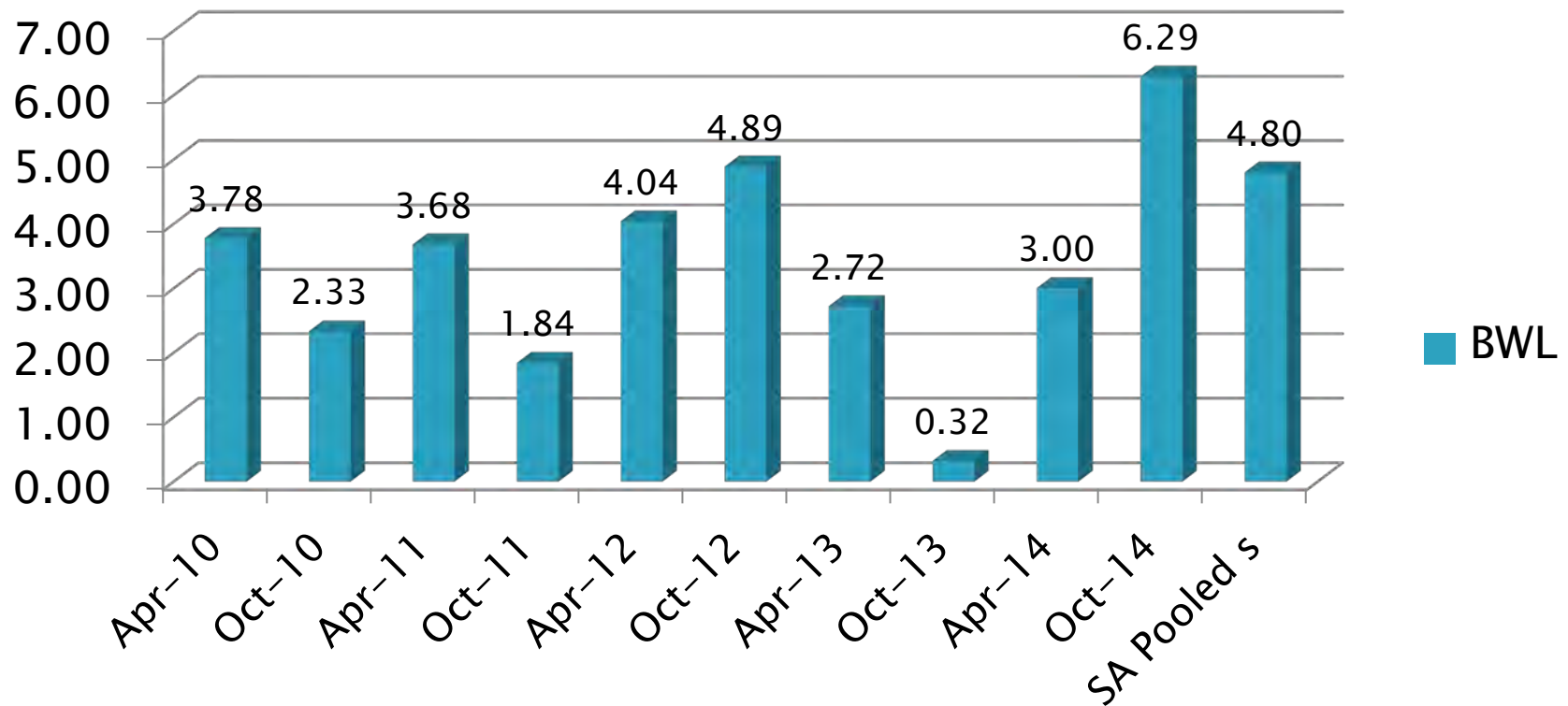


STRIPPED VIS. @ 100 DEG C



Sequence VIII Precision Estimates

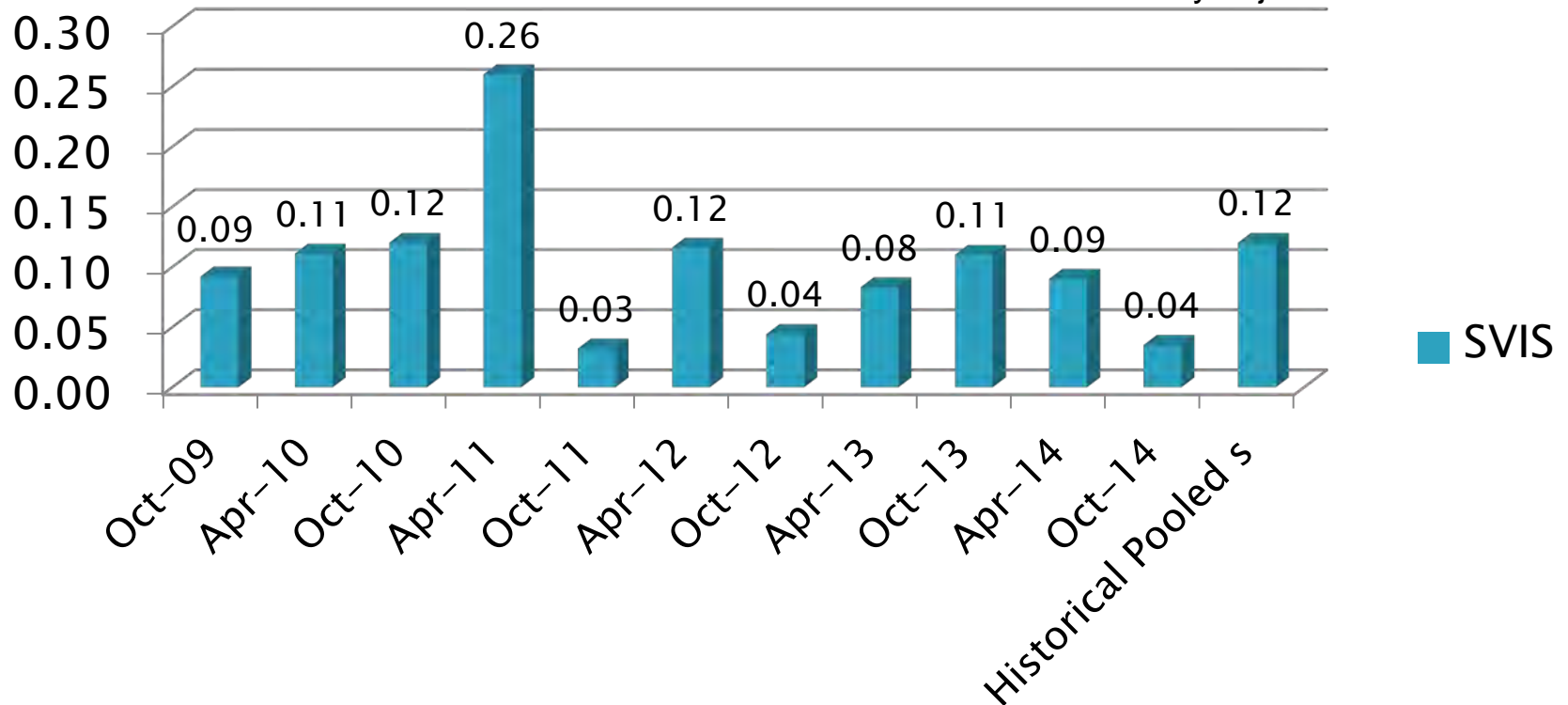
BWL



Sequence VIII Precision Estimates

SVIS

Historical Pooled s used for comparison purposes, parameter is not severity adjusted.



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Information Letters

»» April 1, 2014 –
September 30, 2014

Test Monitoring Center

<http://astmtmc.cmu.edu>



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Information Letters*

Test	Date	IL	Topic
IIIF	20140605	14-2	Approved the use of an Ultrasonic parts cleaner for Sequence IIIF testing.
IIIG	20140605	14-3	Approved the use of an Ultrasonic parts cleaner for Sequence IIIG testing.
VG	20140402	14-3	Returned calibration period to 180 days 15 tests.
VG	20140606	14-4	Removed follower pin wear and ring gap increase parameters from VG test.
VIII	20140630	14-2	Corrected errors in Sections 11.1.7.2 and 11.1.7.3

*Available from TMC Website

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Reference Oil Inventory

»» Actions, Re-blends, Inventories
and Estimated Life

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Reference Oil Re-blends

➤ TMC 434

- New re-blend, 434-2, is now available

➤ TMC 541-1, 542-1 and 1010

- Reblend obtained for 542, expected in October
- Reblend in process for 1010.
- 541-1 cannot be reblended.

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Reference Oil Inventory Estimated Life

Oil	Tests	Original Blend Amount	Quantity Shipped in last 6 months	TMC Inventory	Lab Inventory	Estimated Life
300	IVA	330	24	301	0	5+ years
433-1	IIIF	1045	0	0	8	<1 year
433-2	IIIF	500	8	424	32	3+ years
434	IIIG	550	0	<1	12	<1 year
434-1	IIIG	660	43	56	40	1.5 years
434-2	IIIG	495	32	472	24	4+ years
435	IIIG	550	0	2	4	<1 year
435-2	IIIG	550	0	236	44	3+ years
438	IIIG	990	34	105	36	2 years
540	VID	1100	35	330	30	4+ years
541	VID	550	0	0	0	<1 year

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Reference Oil Inventory Estimated Life

Oil	Tests	Original Blend Amount	Quantity Shipped in last 6 months	TMC Inventory	Lab Inventory	Estimated Life
541-1	VID	550	5	70	75	~1 year
542	VID	1100	22	17	25	<1 year
542-1	VID	275	105	3	40	0 years
704-1	VIII	897	16	164	14	5+ years
925-3	VG	975	0	10	6	<1 year
940	VG	560	36	390	24	5+ years
1006-2	IVA, VG, VIII	5500	104	3034	91	5+ years
1007	IVA, VG	1968	0	0	30	<1 year
1009	VG	1100	74	131	43	5+ years
1010	IIIG, VID	1100	5	232	49	2+ years

LTMS Deviations

»» April 1, 2014 –
September 30, 2014

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LTMS Deviations

- No LTMS Deviations in Current Period

LTMS Deviations

Historical Count of PCEO LTMS Deviations

Test	LTMS Deviations
IIIF	6
IIIG	6
IVA	7
VG	8
VID	2
VIII	3

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Quality Index Deviations

»» April 1, 2014 –

September 30, 2014

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Quality Index Deviations

- Two Quality Index Deviations this Report Period.
 - IIIG - Oil filter block temperature control.
 - VG - RAC flow control.

Historical Count of PCEO Quality Index Deviations

Test	Quality Index Deviations
IIIF	25
IIIG	13
IVA	28
VG	41

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TMC Laboratory Visits

»» April 1, 2014 –

September 30, 2014

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TMC Lab Visits

Test	Number of Labs Visited
III	4
IVA	2
VID	3
VIII	1

TMC Lab Visits

- Four discrepancies noted during visits
 - IIIG - Vacuum checks on assembled heads were not performed in accordance with the Engine Build Manual.
 - IVA – Exhaust Gas calibration not performed and/or documented.
 - VG – Fuel Flow calibration not performed and/or documented.
 - VID – Fuel Flow calibration not performed and/or documented.

In three cases, laboratories have responded with corrective action and a fourth is due to respond by

10/15/14

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Test Area Timelines

»» April 1, 2014 –
September 30, 2014

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Test Area Timeline Additions*

Test	Date	Topic	IL
VG	20140402	Returned calibration period to 180 days 15 tests.	14-3
IIIF	20140605	Approved the use of an Ultrasonic parts cleaner for Sequence IIIF testing.	14-2
IIIF	20140605	Approved the use of an Ultrasonic parts cleaner for Sequence IIIG testing.	14-3
VG	20140605	Removed requirement to measure follower pin wear and ring gap increase	14-4
VIII	20140630	Corrected errors in Sections 11.1.7.2 and 11.1.7.3	14-2

*As of 09/30/2014

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Rating Workshop Data

»» 2014 Light Duty Workshop

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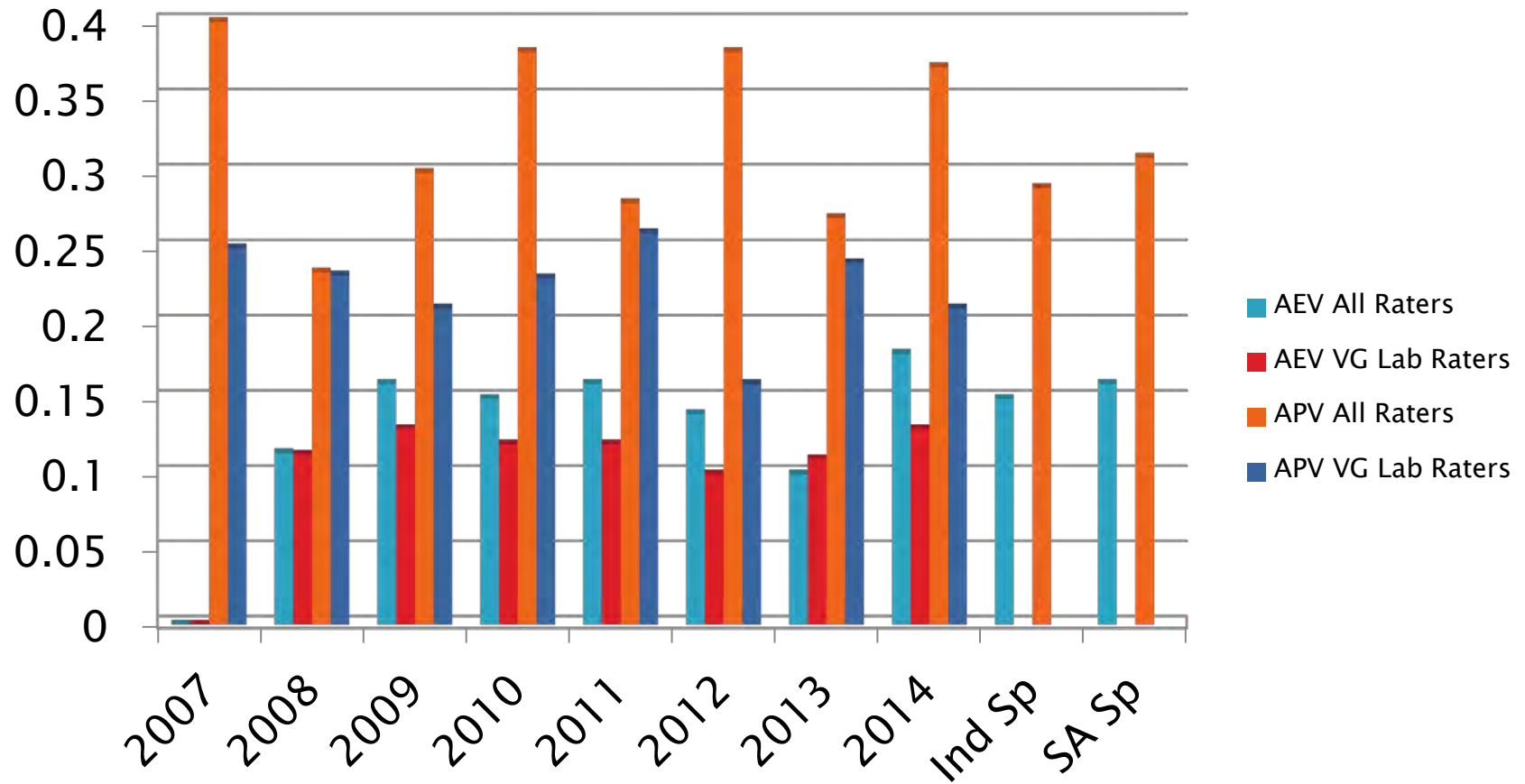
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Rating Workshop Data

- ▶ Summary of Precision Data From Light Duty Rating workshops:
 - VG Average Piston and Average Engine Varnish.
 - IIIG WPD

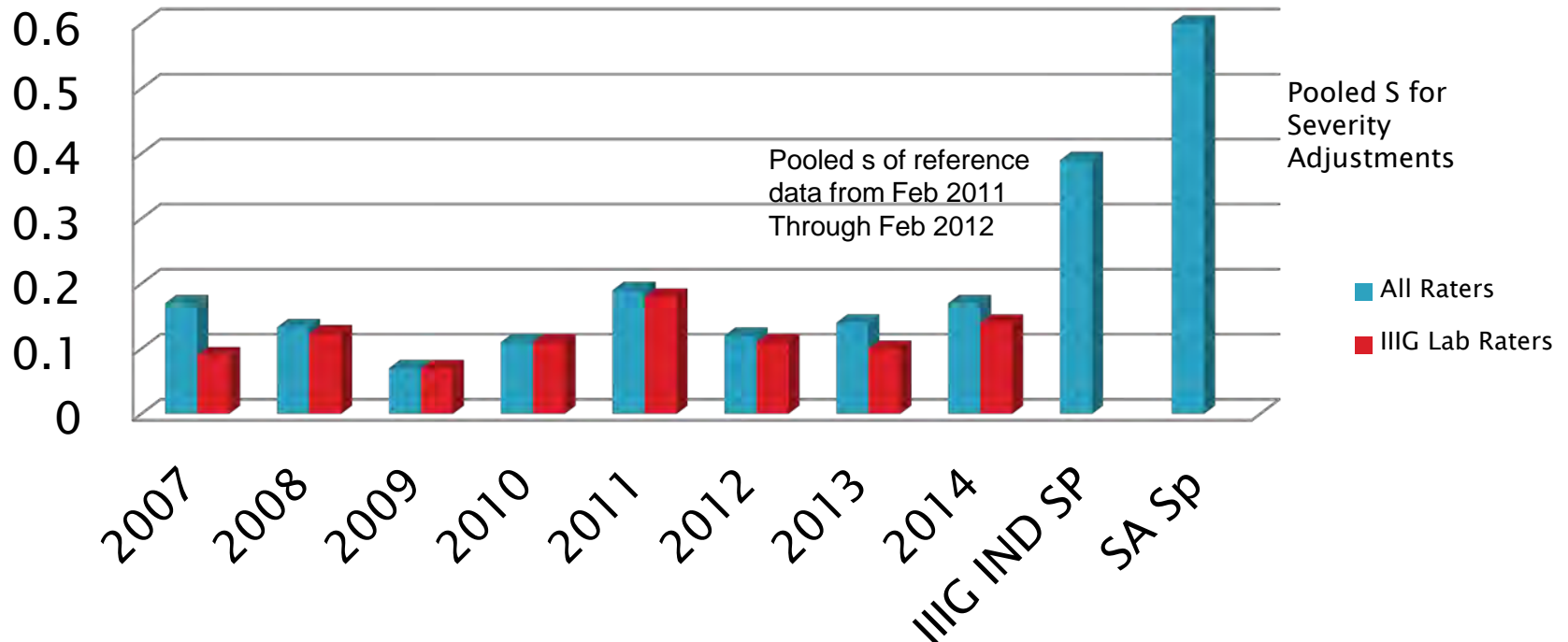
Sequence VG Precision-Rating Workshop Data

Workshop Data for VG Varnish



Sequence IIIG Precision – Rating Workshop Data

Comparison of Workshop Pooled Standard Deviations with Industry Pooled Standard Deviations



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Miscellaneous Information

- ▶ Available on TMC Website:
 - Live Reference Test Data Bases
 - Surveillance Panel Meeting Minutes
 - Test Area Alarm Logs
 - Complete Test Area Timelines
 - LTMS Manual

- ▶ www.astmtmc.cmu.edu

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