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Test Monitoring Center

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ASTM D02.B1 Semiannual Report Passenger Car Reference Oil Testing

April 2015

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Passenger Car Engine Oil Testing Executive Summary

▶ Seq. IIIG

- New re-blend of oil 434 is now available, two successful calibration tests completed on oil 434-2.

▶ Seq. IVA

- Three additional donated tests obtained on TMC reference oil 300.

Passenger Car Engine Oil Testing Executive Summary

- ▶ Seq. VI
 - 542-2 has been introduced this period.
 - 541-1 has been depleted at the TMC, 4 gallons remain and this oil can not be re-blended.

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Calibrated Labs and Stands*

Test	Labs	Stands
IIIF	4	4
IIIG/A/B	5	12
IVA	3	4
VG	3	5
VID	4	7
VIII	2	3

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*As of 3/31/2015

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Sequence IIIF

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Sequence IIF Activity

Test Status	Validity Code	#
Acceptable Calibration Test	AC	6
Failed Calibration Test	OC	1
Stand Abandoned	MC	1
Aborted Calibration Test	XC	1
Total		9

Sequence III F – Failed Tests

Test Status	Number of Tests
Hours to 275% Vis. Inc. – Severe	1
Total	1

Sequence IIIF – Lost Tests*

Test Status	Cause	#
Aborted	High Oil Consumption	1
Totals		1

*Invalid and aborted tests

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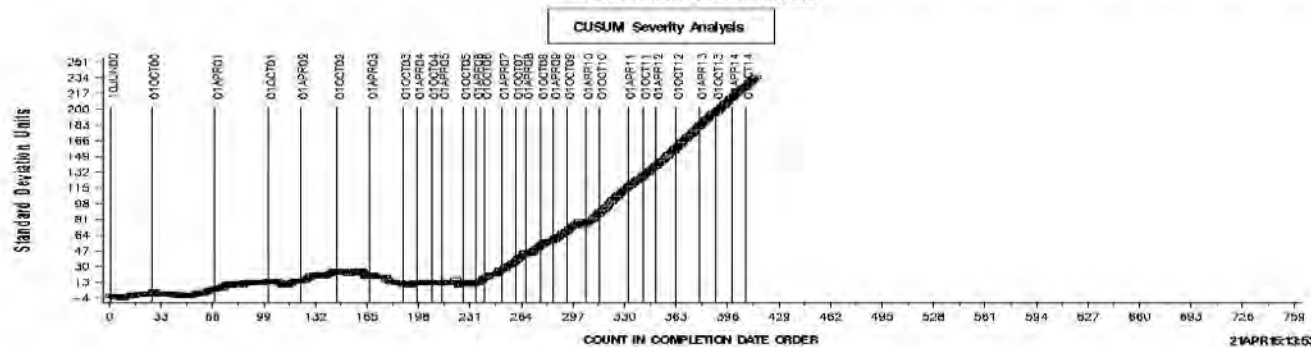
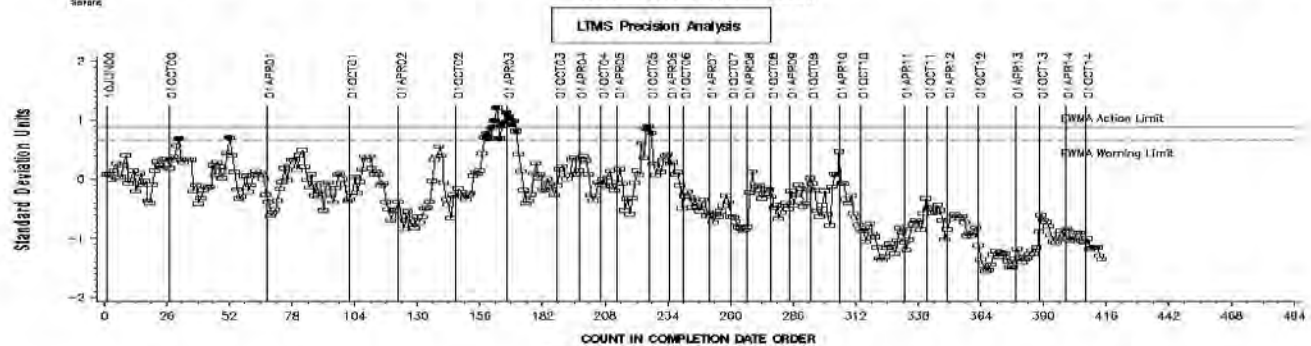
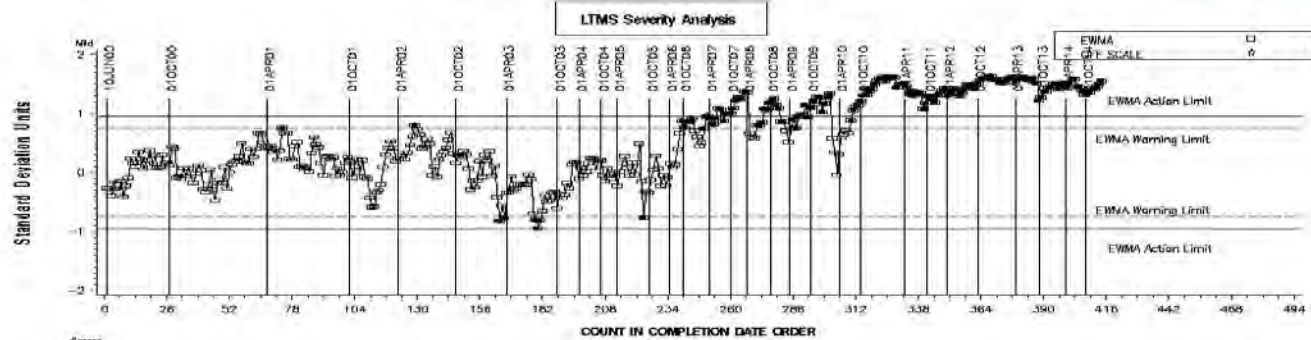
Sequence IIF Test Severity

- 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 precision action alarm

SEQUENCE IIIF INDUSTRY OPERATIONALLY VALID DATA



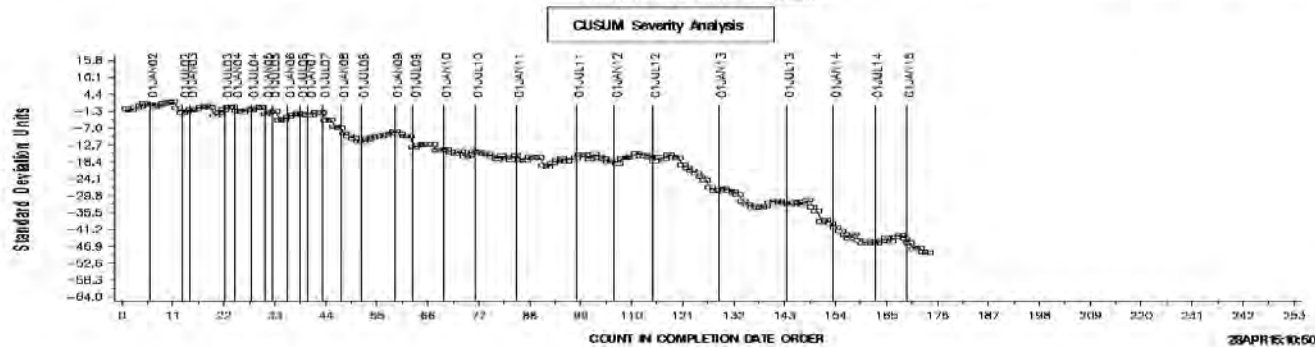
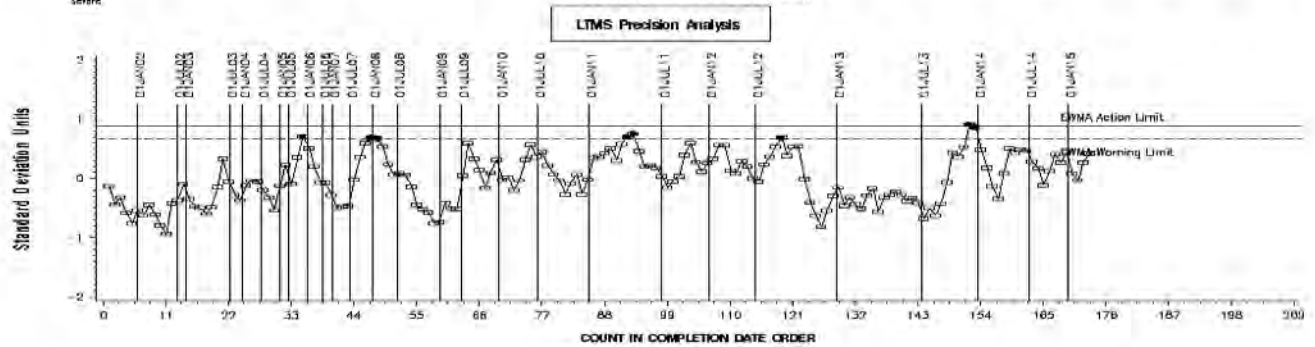
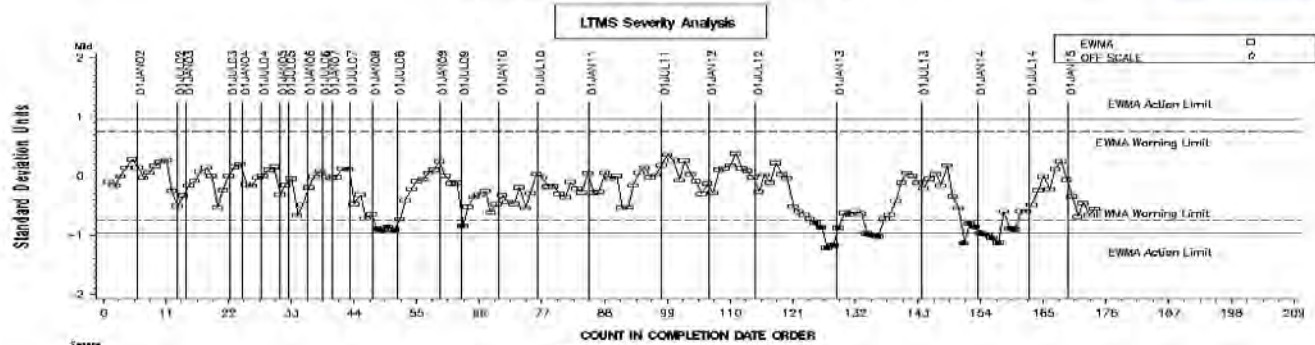
AVERAGE PISTON SKIRT VARNISH FINAL ORIG UNIT RES



SEQUENCE IIIIF INDUSTRY OPERATIONALLY VALID DATA



HOURS FINAL ORIG RES (REFERENCE TESTS ONLY)

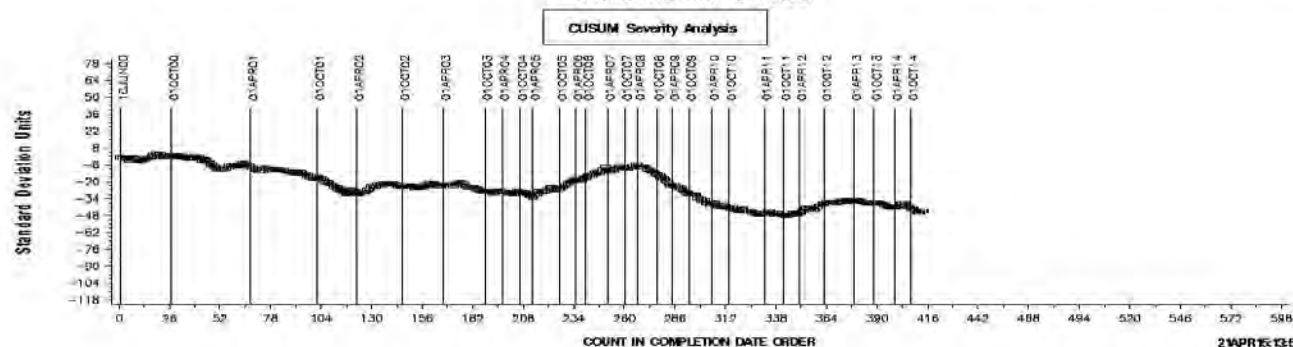
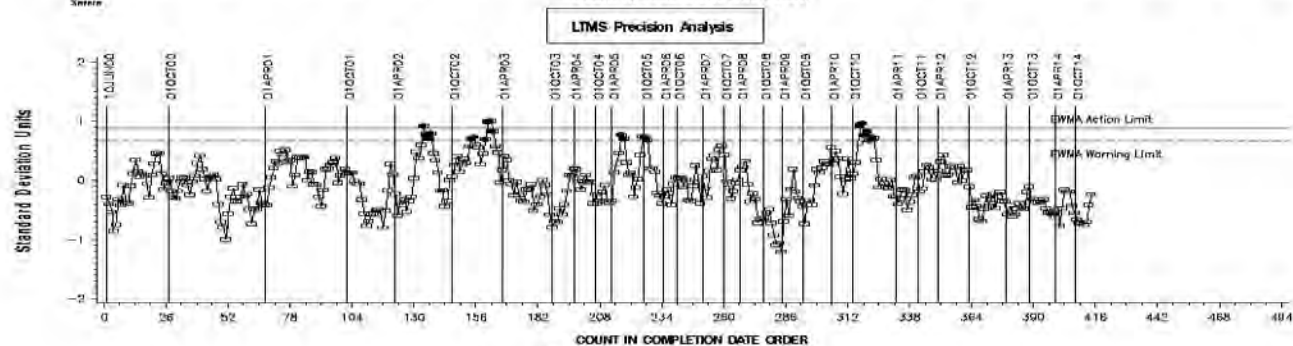
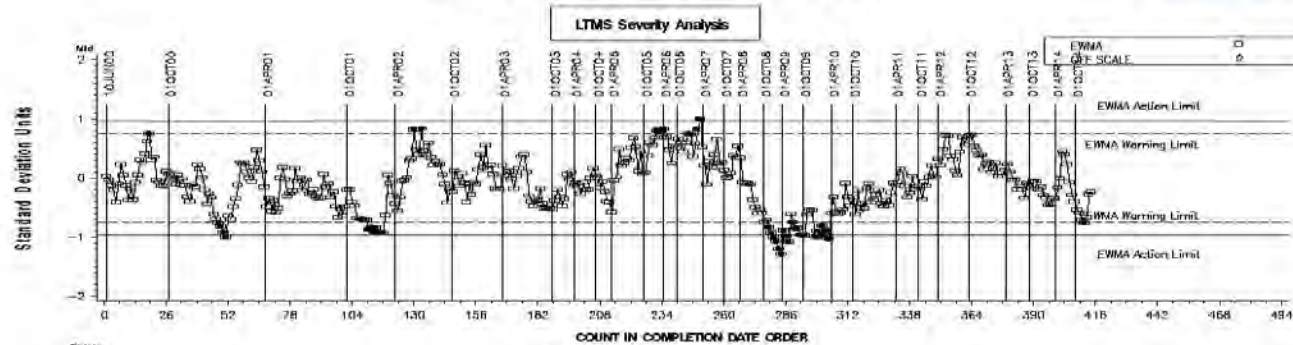


SEQUENCE IIIF INDUSTRY OPERATIONALLY VALID DATA



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AVERAGE WEIGHTED PISTON DEPOSITS FNL ORKS UNIT RES



21 APR 13:53

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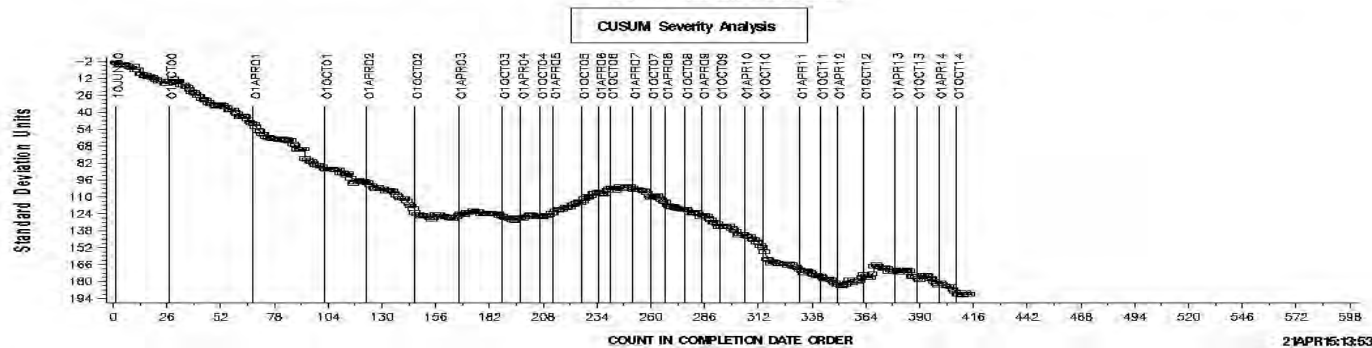
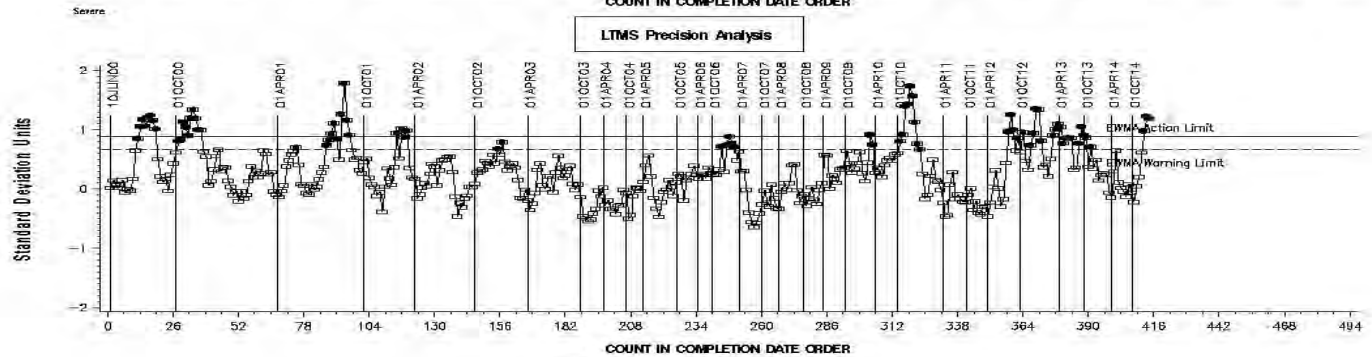
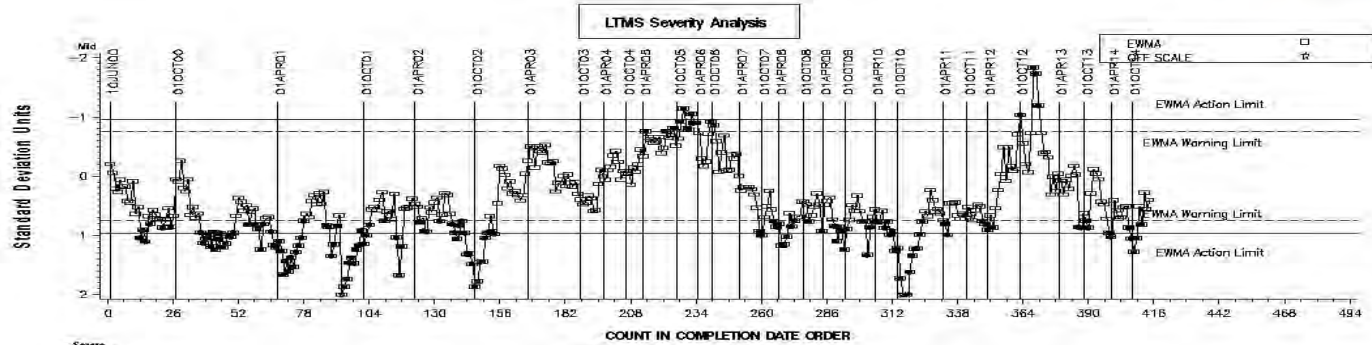


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SEQUENCE IIIF INDUSTRY OPERATIONALLY VALID DATA



% VISCOSITY INCREASE @ 060 HOURS

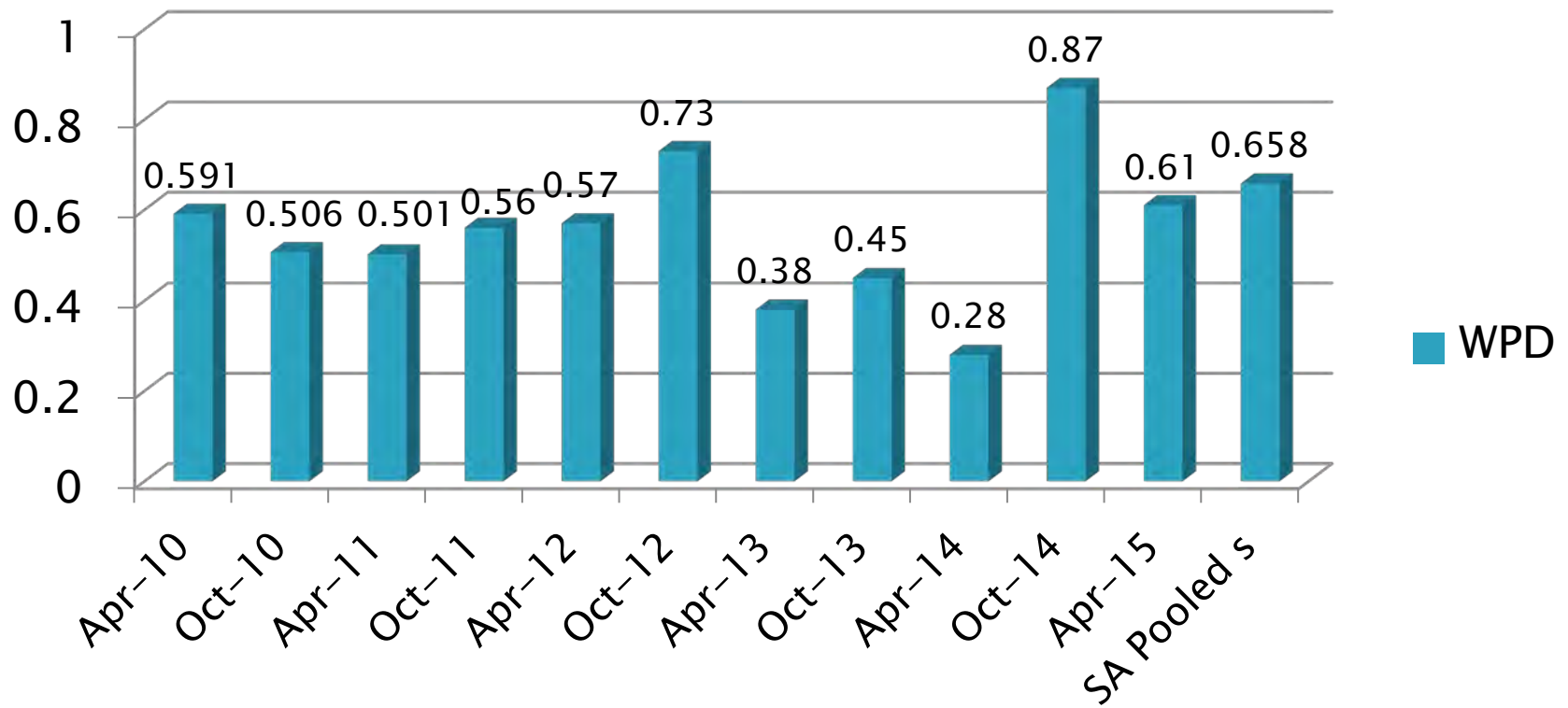


21 APR 15:13:53



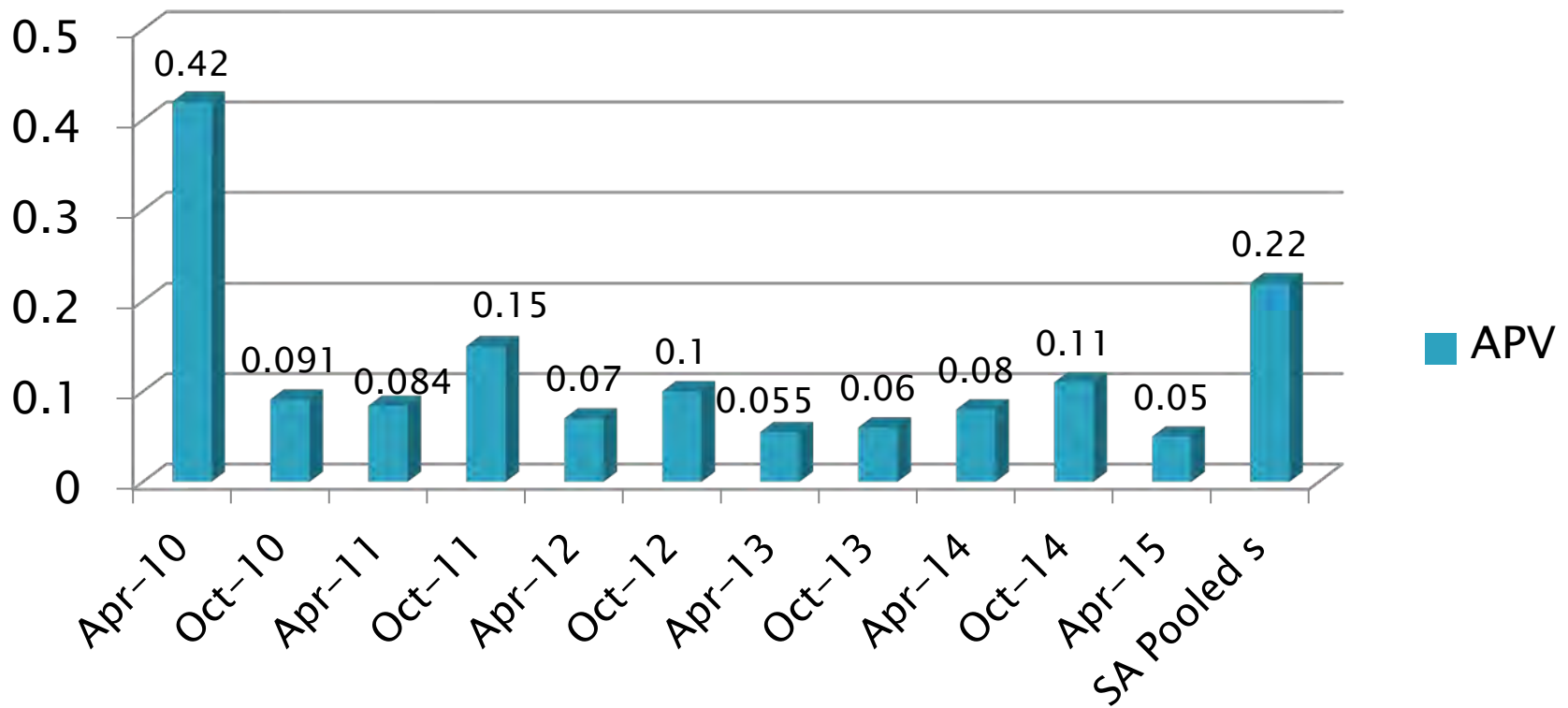
IIIF Precision Estimates

WPD



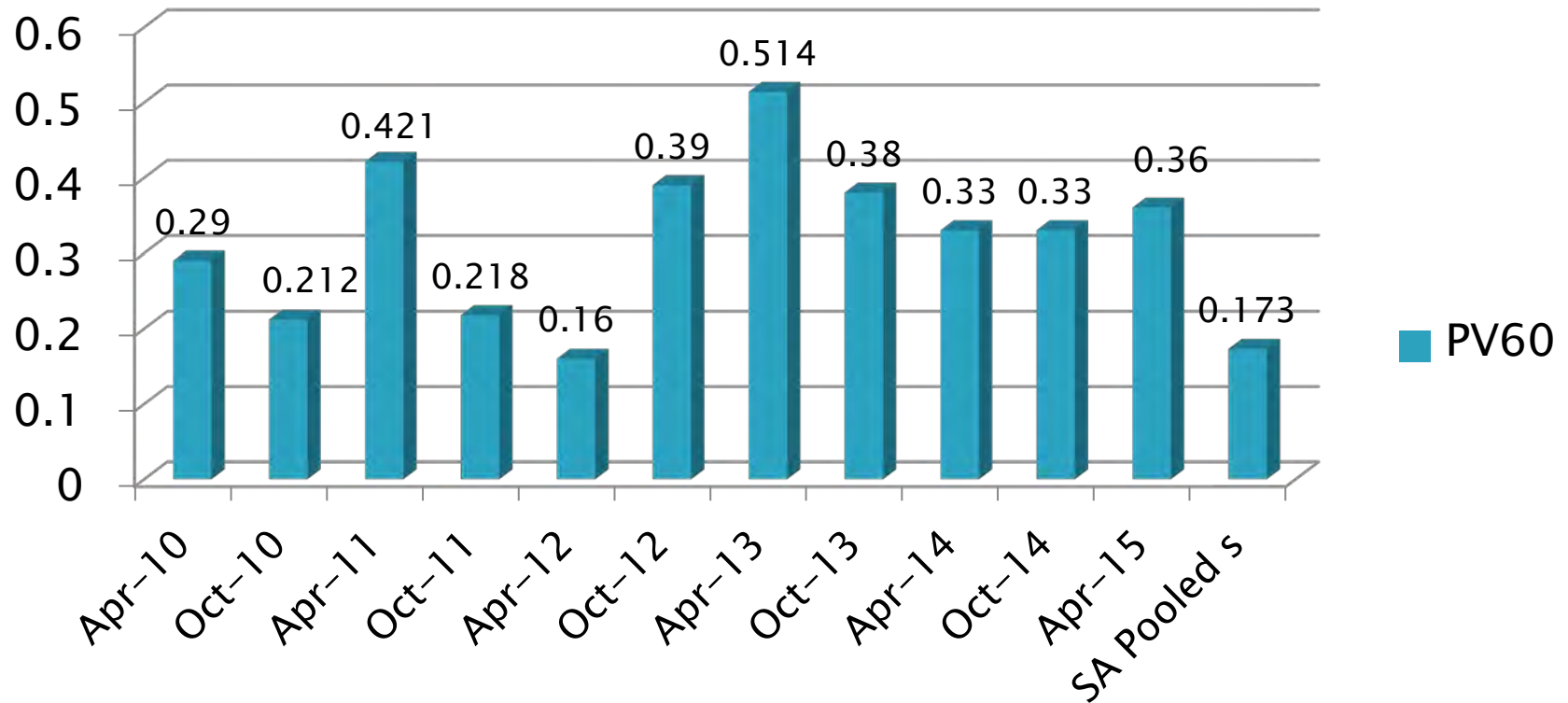
IIIF Precision Estimates

APV



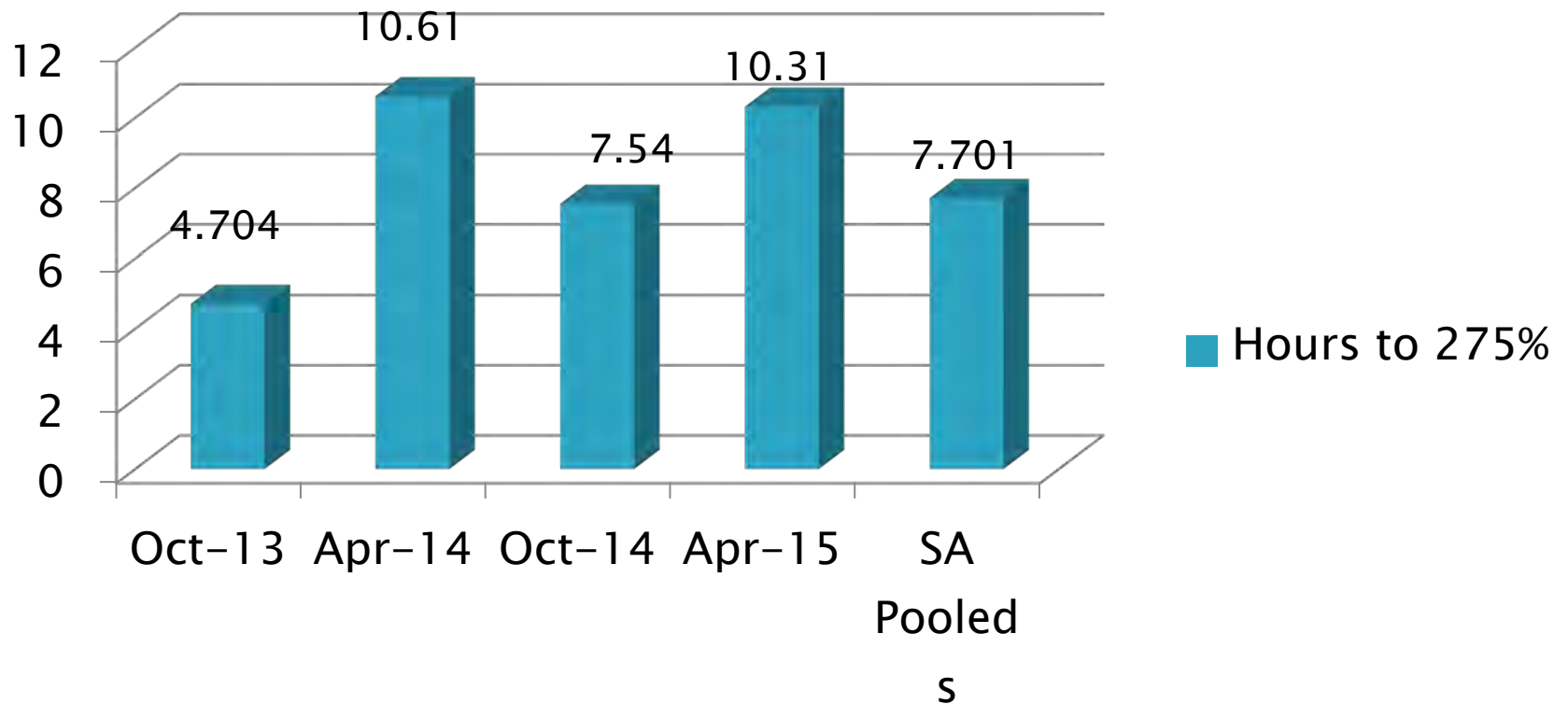
IIIF Precision Estimates

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	9
Failed Calibration Test	OC	3
Aborted	XC	2
Total		14

Sequence IIIG – Failed Tests

Test Status	Number of Tests
Severe PVIS	3
Total	3

Sequence IIIG – Lost Tests*

Test Status	Cause	#
Aborted	Bearing Failure	1
Aborted	Head Gasket Failure	1
Totals		2

*Invalid and aborted tests

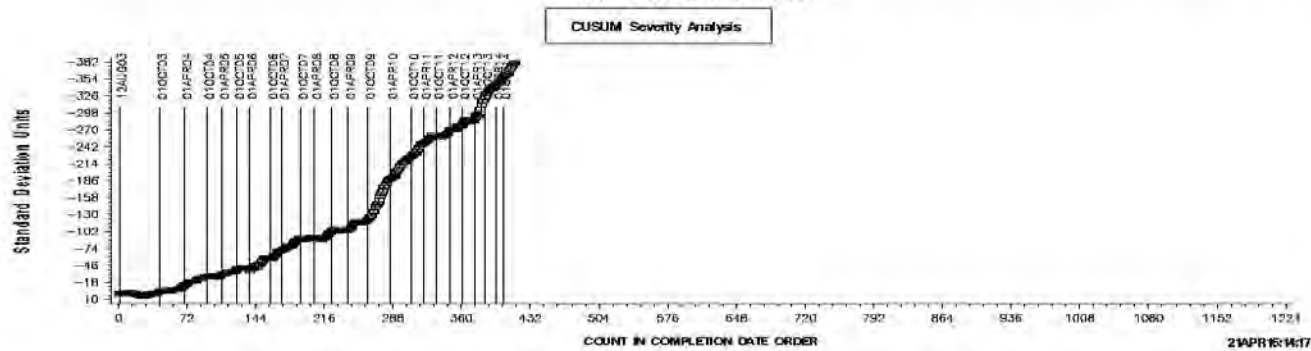
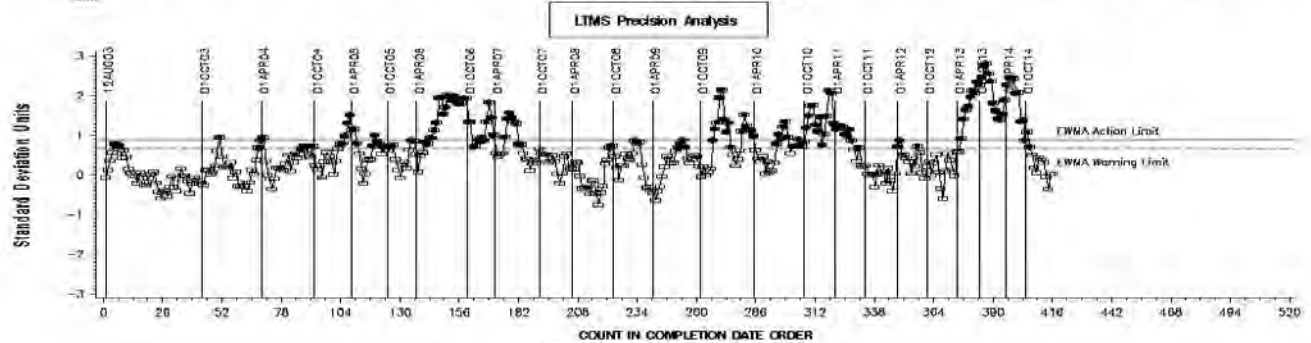
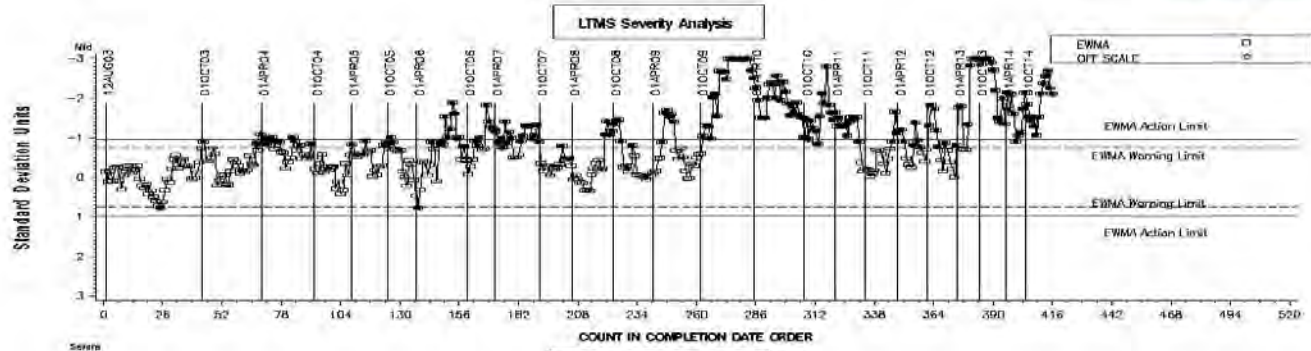
Sequence IIIG Test Severity

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

SEQUENCE III G INDUSTRY OPERATIONALLY VALID DATA



AVERAGE CAM + LIFTER WEAR

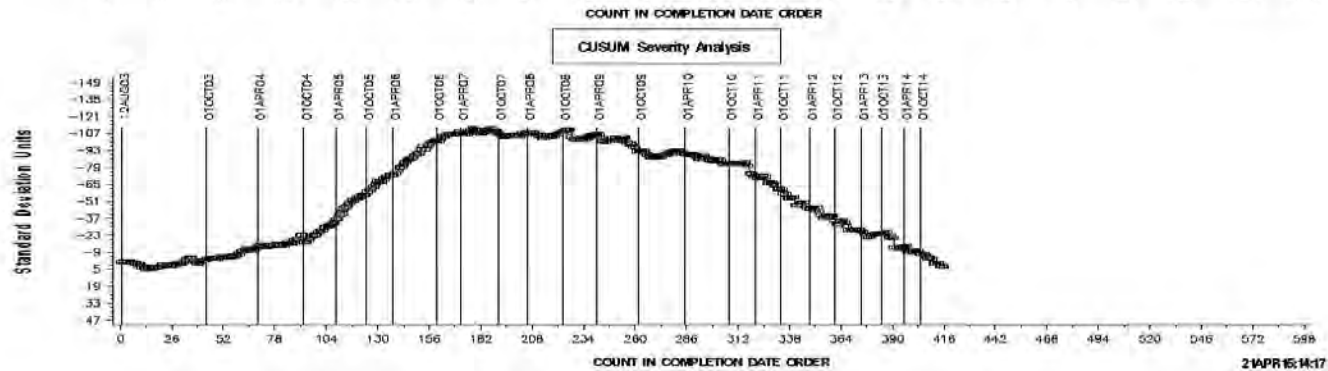
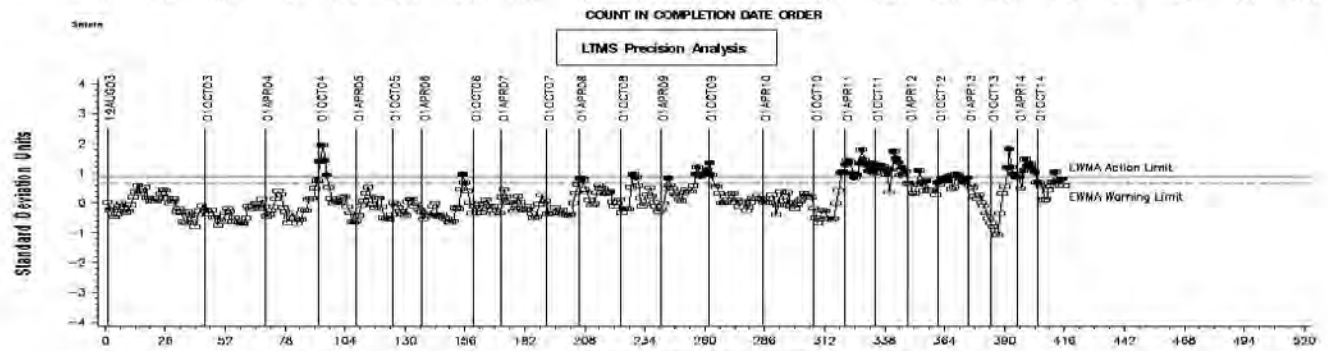
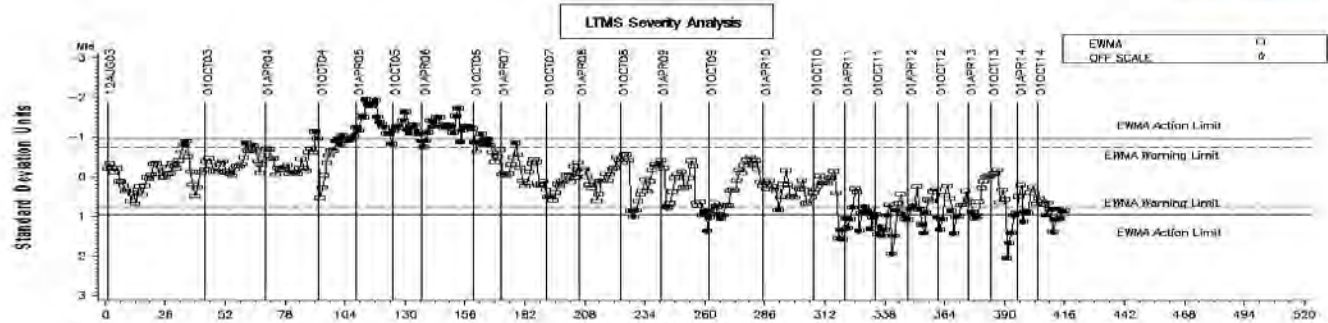


SEQUENCE IIIJ INDUSTRY OPERATIONALLY VALID DATA



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VISCOSITY INCREASE



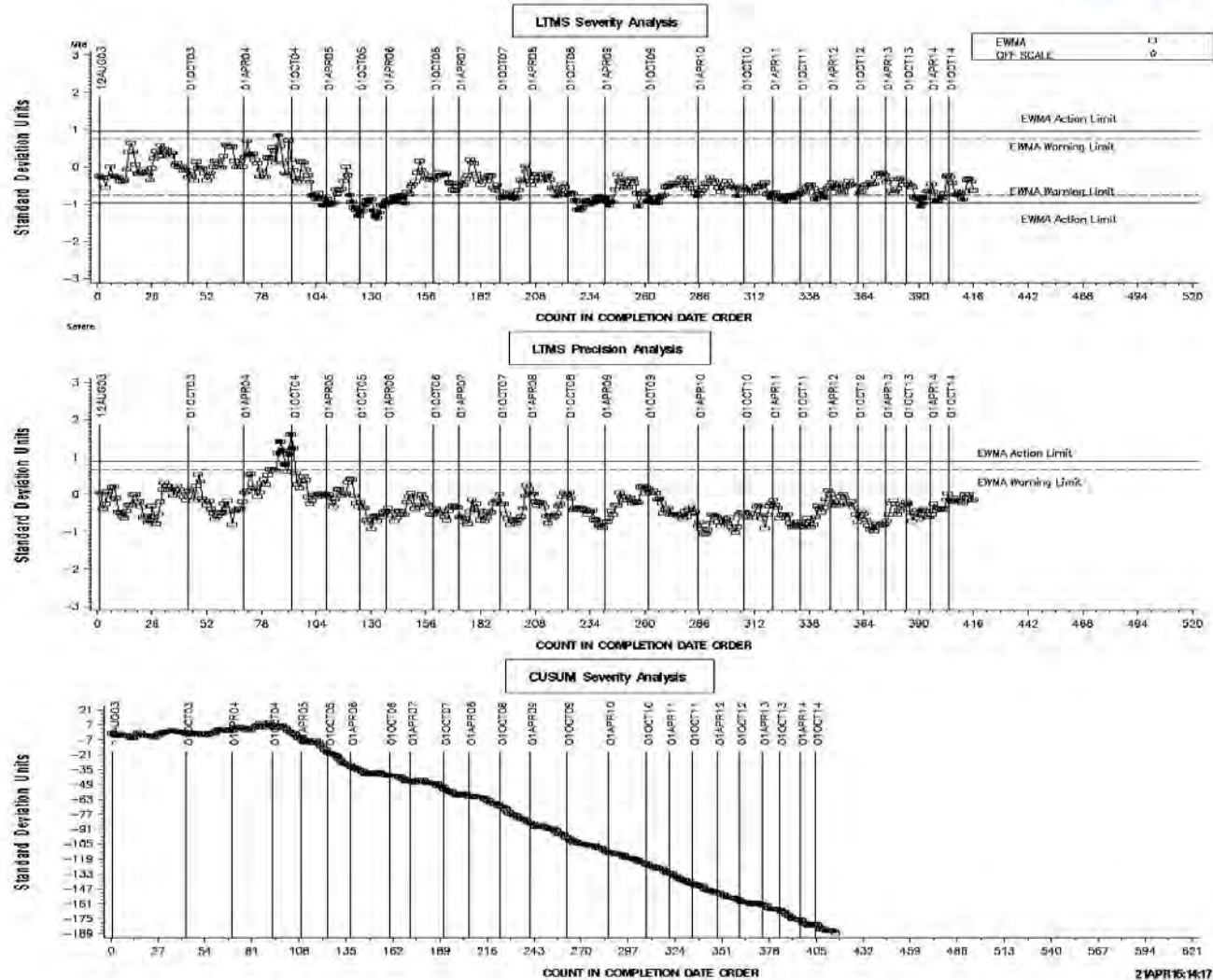
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SEQUENCE III G INDUSTRY OPERATIONALLY VALID DATA

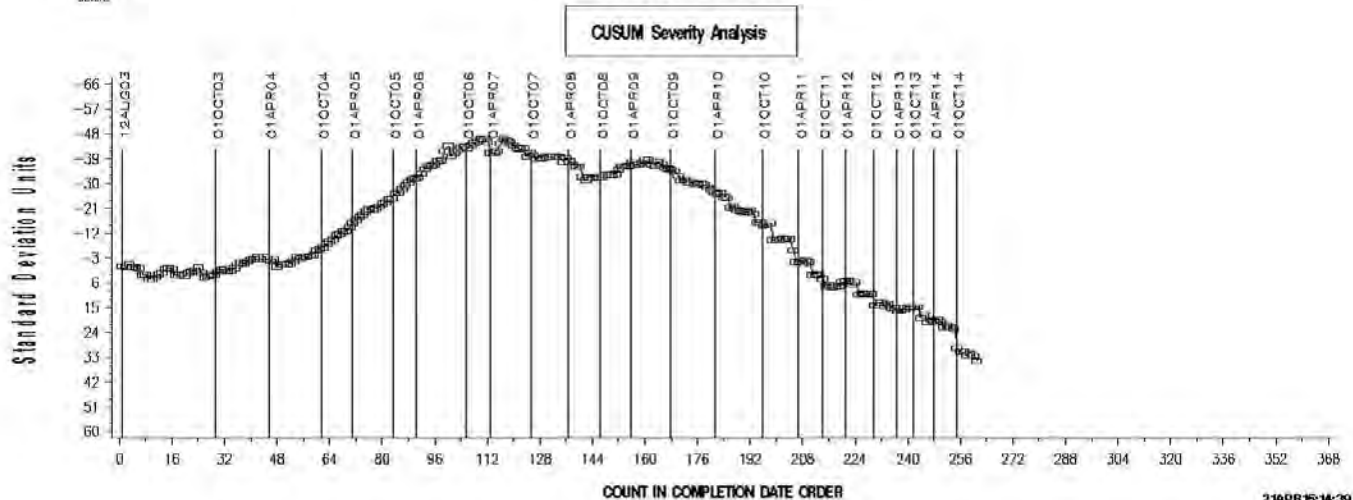
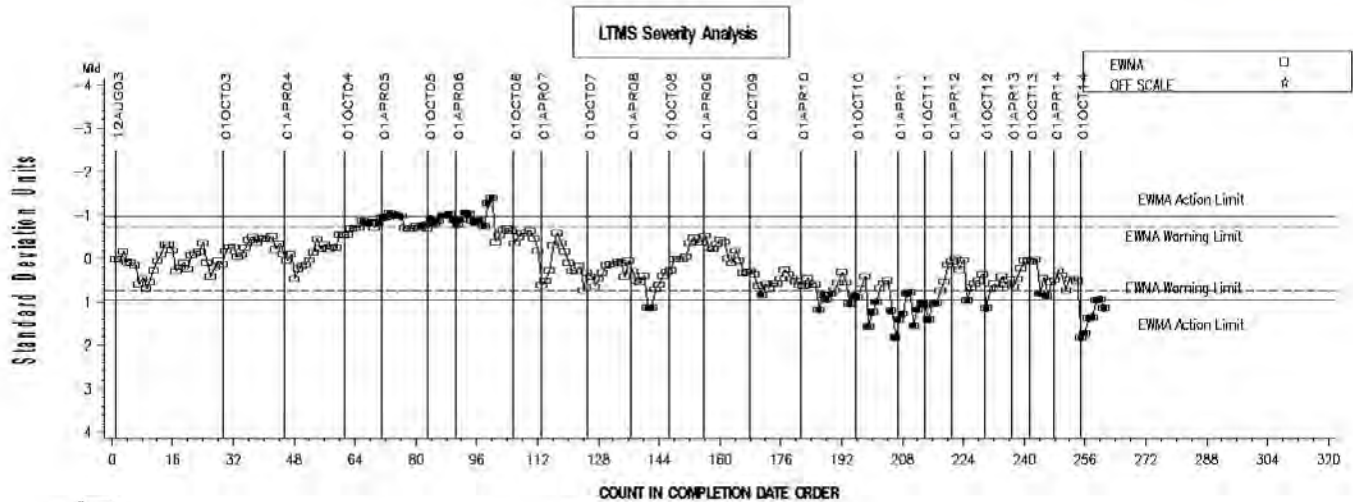


AVERAGE WEIGHTED PISTON DEPOSITS





MRV VISCOSITY RESULT



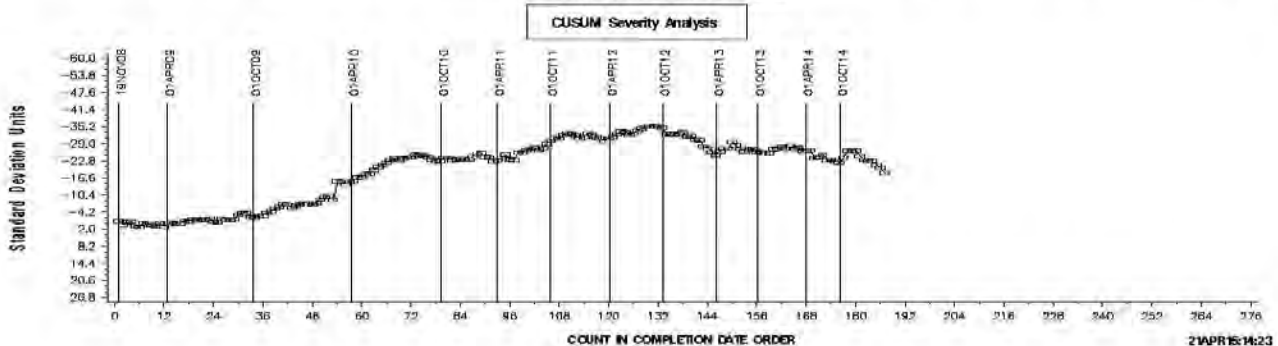
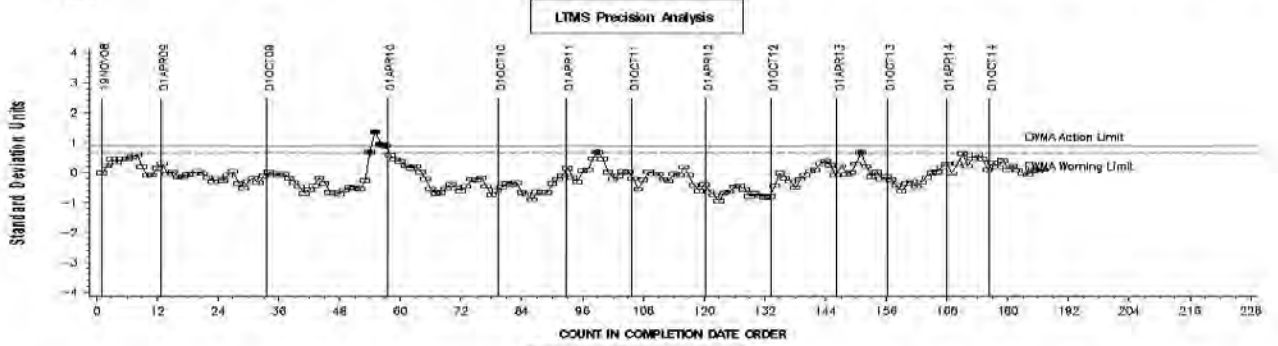
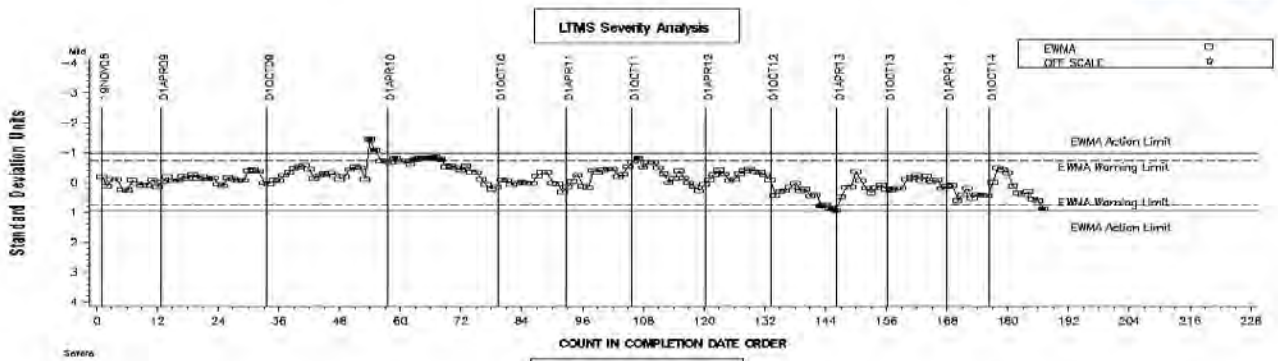
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SEQUENCE IIIGB INDUSTRY OPERATIONALLY VALID DATA



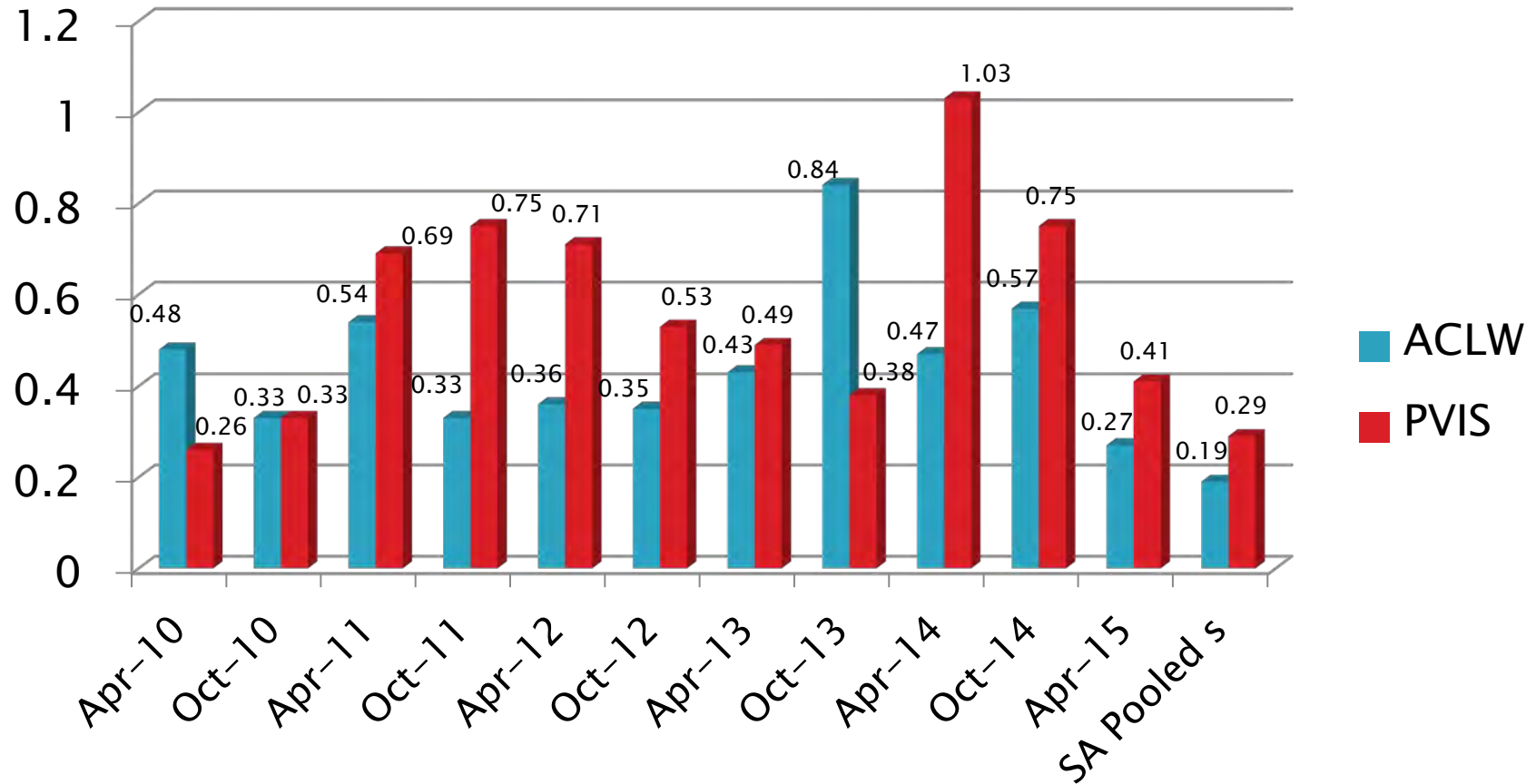
PHOS RETENTION



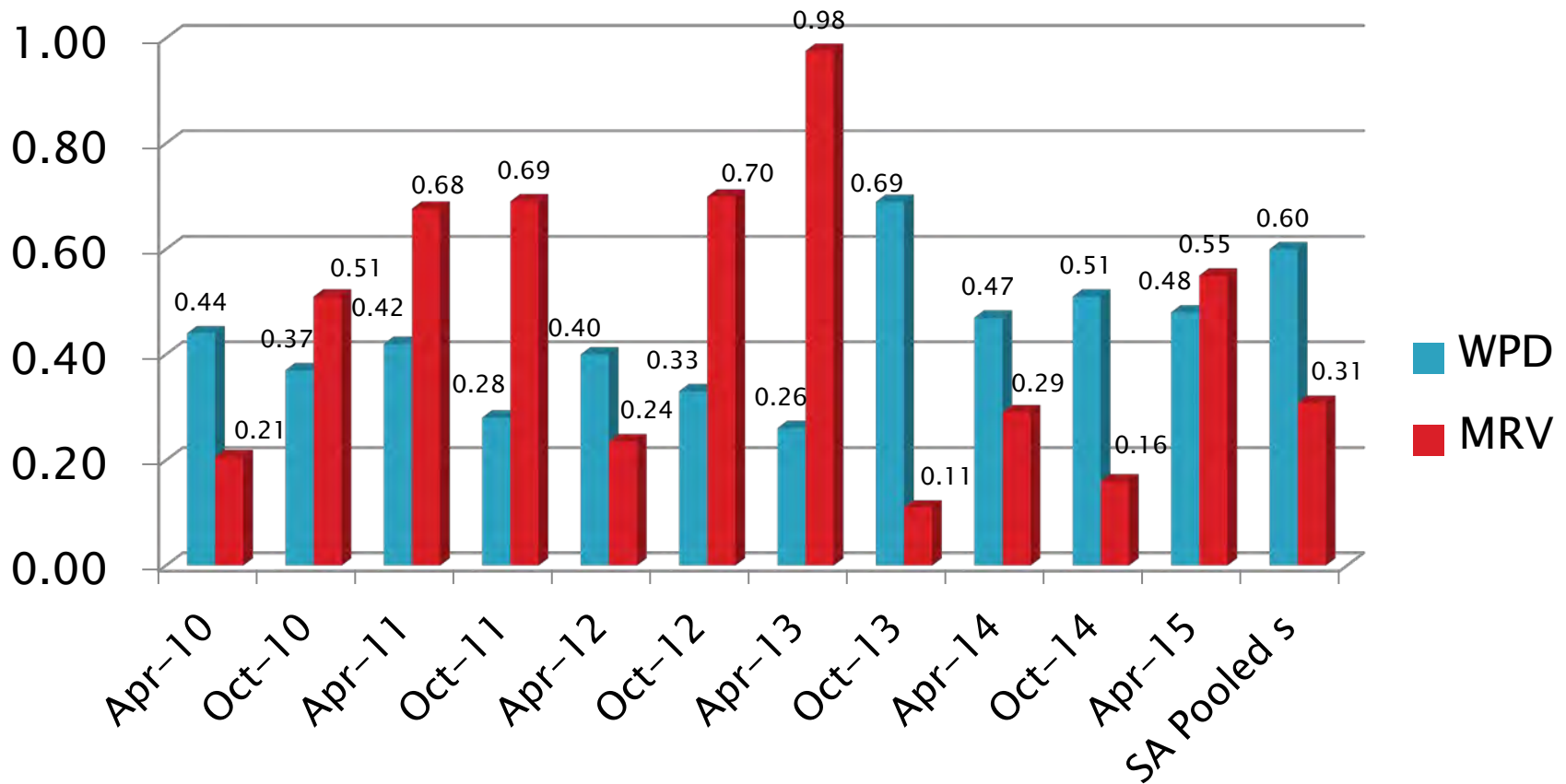
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IIIG Precision Estimates

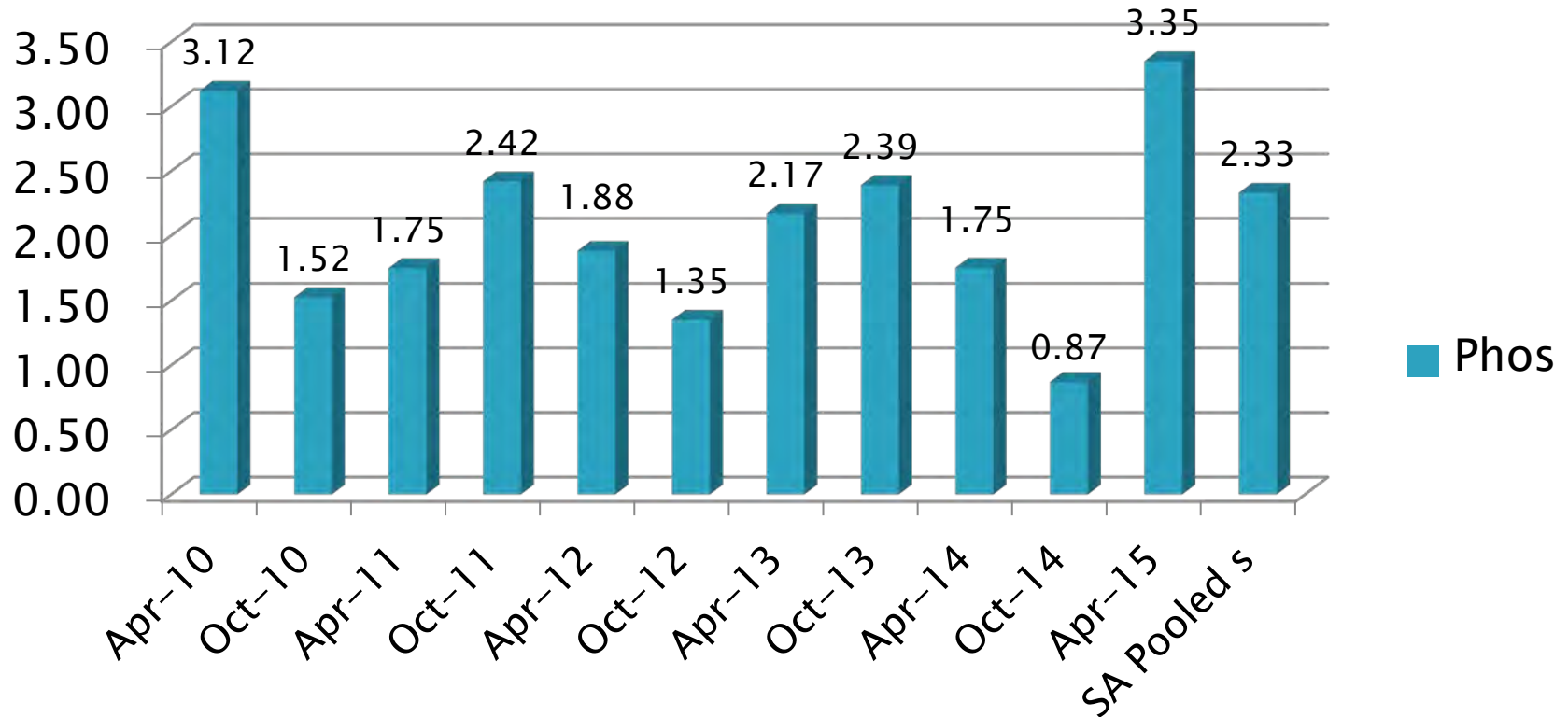


IIIG Precision Estimates



IIIG Precision Estimates

Phos



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Sequence IVA

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Sequence IVA Activity

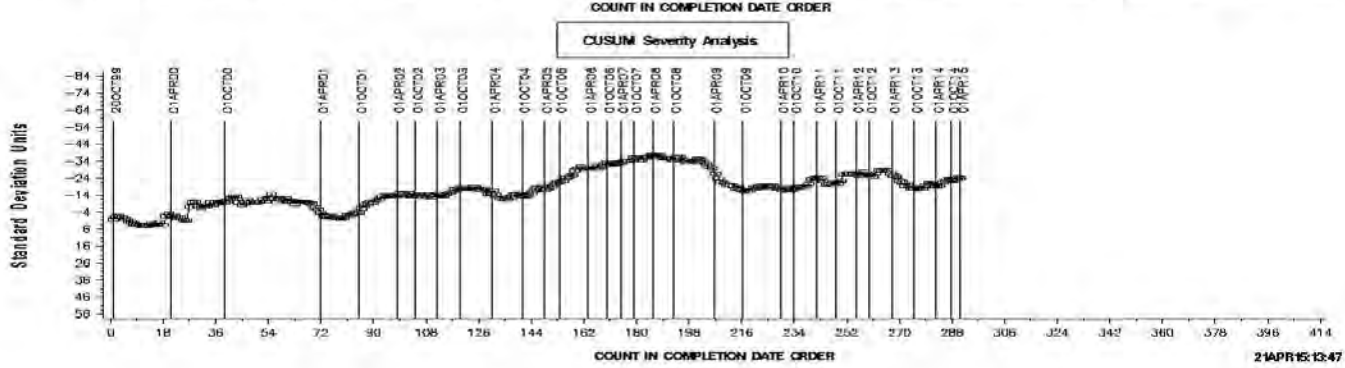
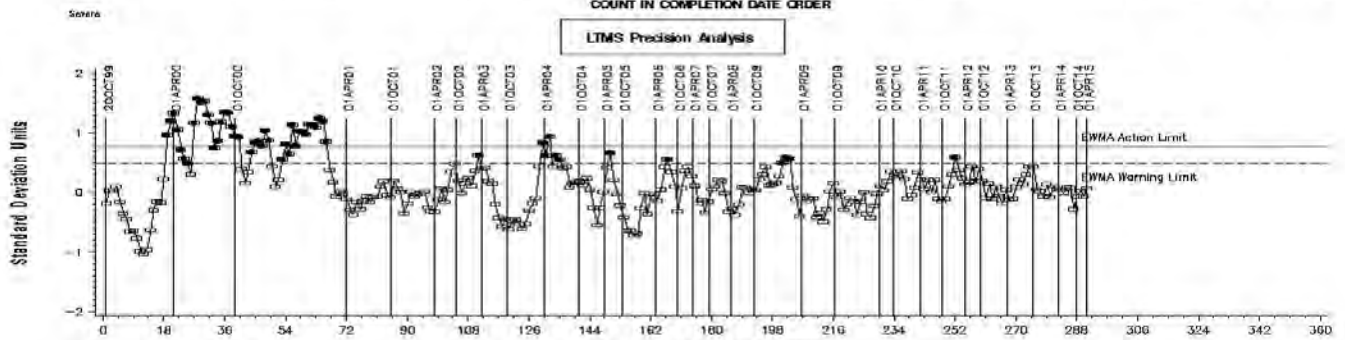
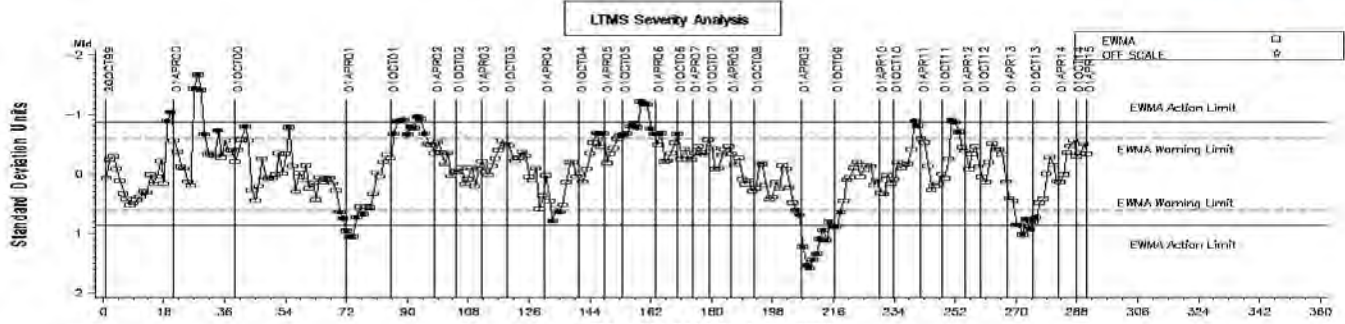
Test Status	Validity Code	#
Acceptable Calibration Test	AC	3
Decoded/Donated	AG	3
Total		6

Sequence IVA Test Severity

- ACW in control.



AVERAGE CAM WEAR

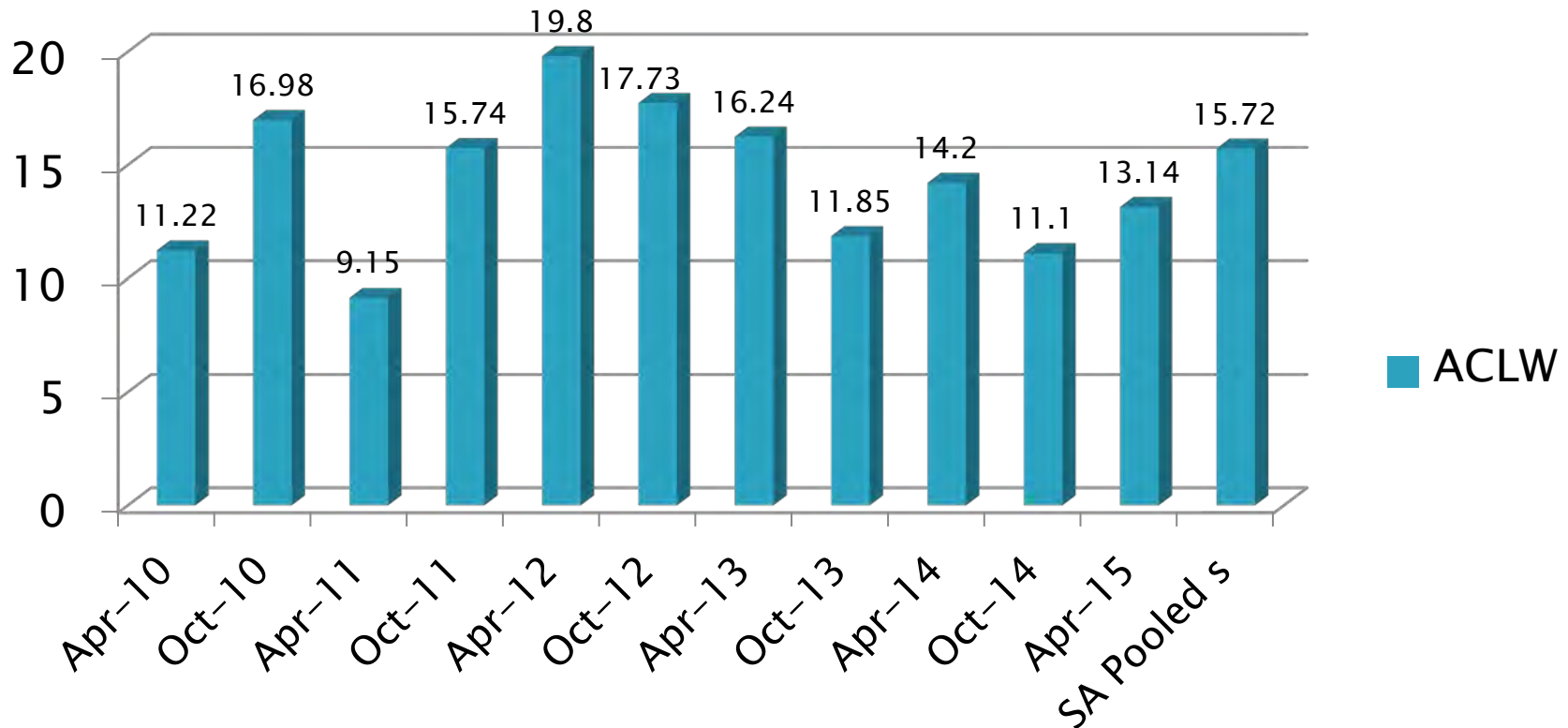


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Sequence IVA Precision Estimates

ACW



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Sequence VG

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Sequence VG Activity

Test Status	Validity Code	#
Acceptable Calibration Test	AC	5
Aborted	XC	1
Fuel Approval	PF	3
Total		9

Sequence VG – Lost Tests*

Test Status	Cause	#
Invalid	High Blowby	1
Totals		1

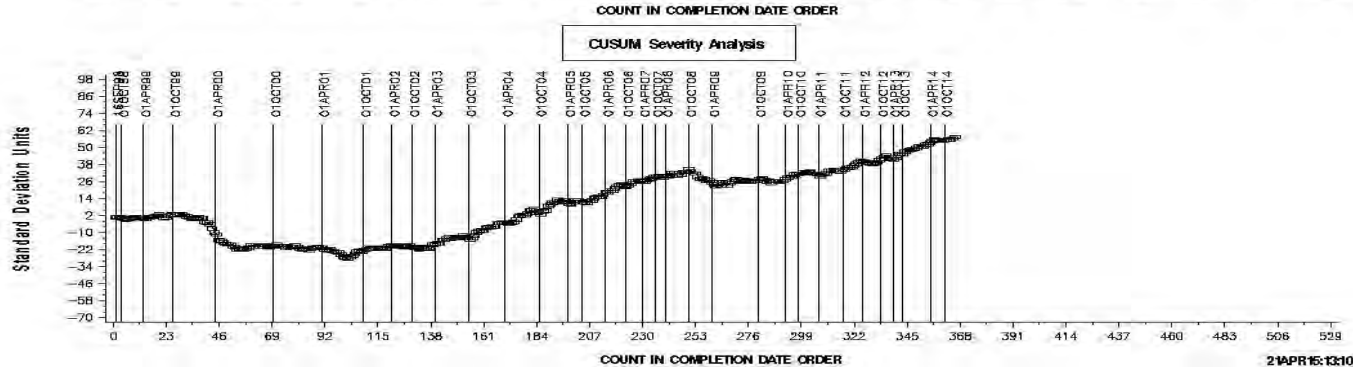
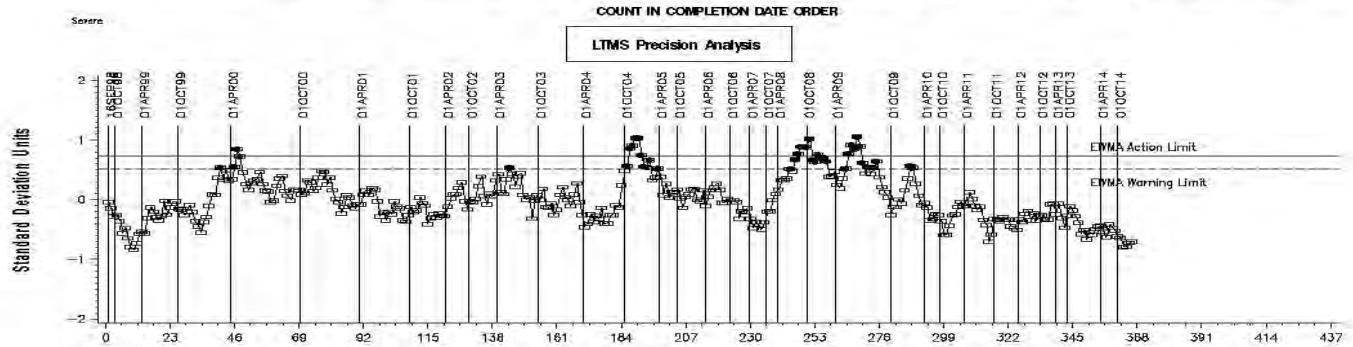
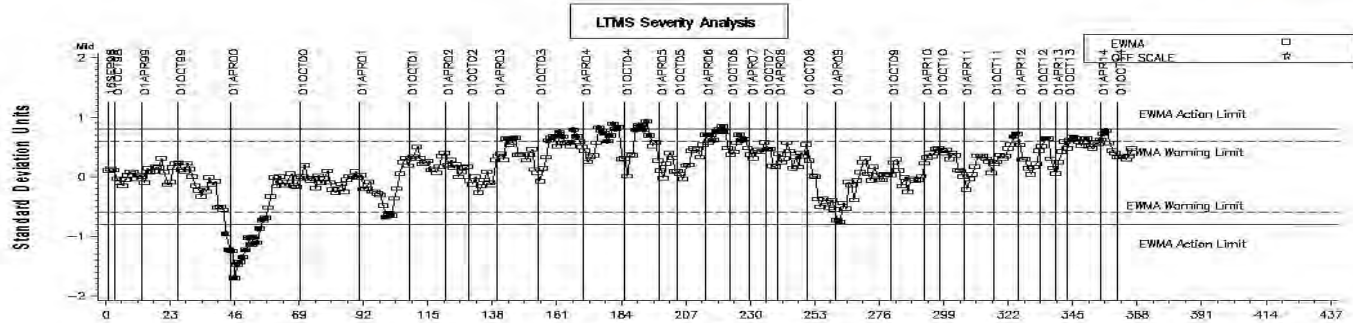
*Invalid and aborted tests

Sequence VG Test Severity

- All parameters in control.



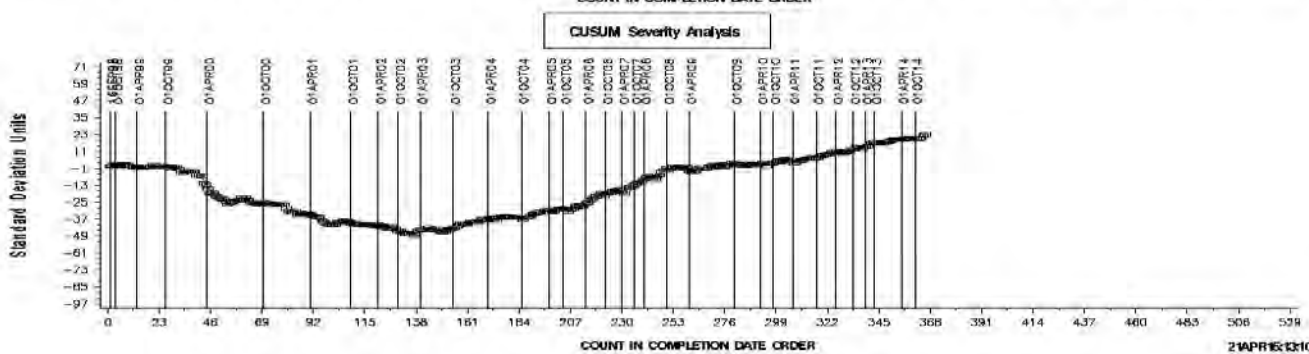
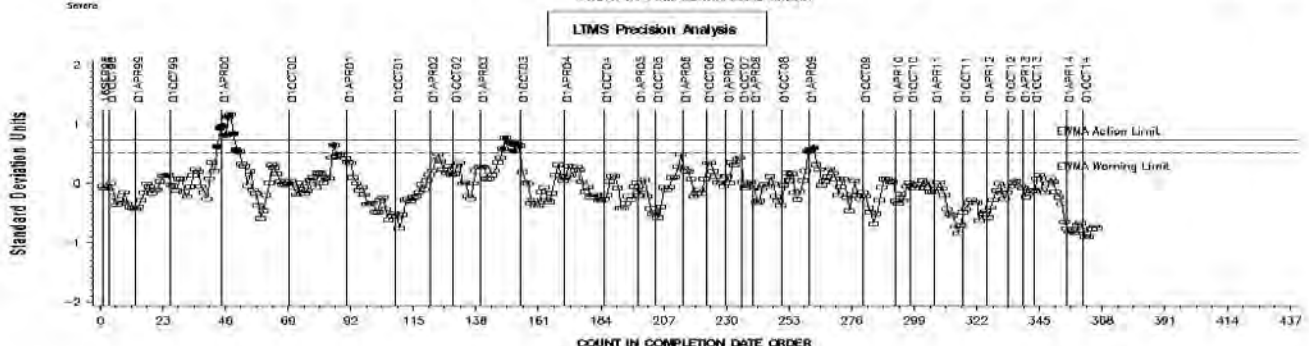
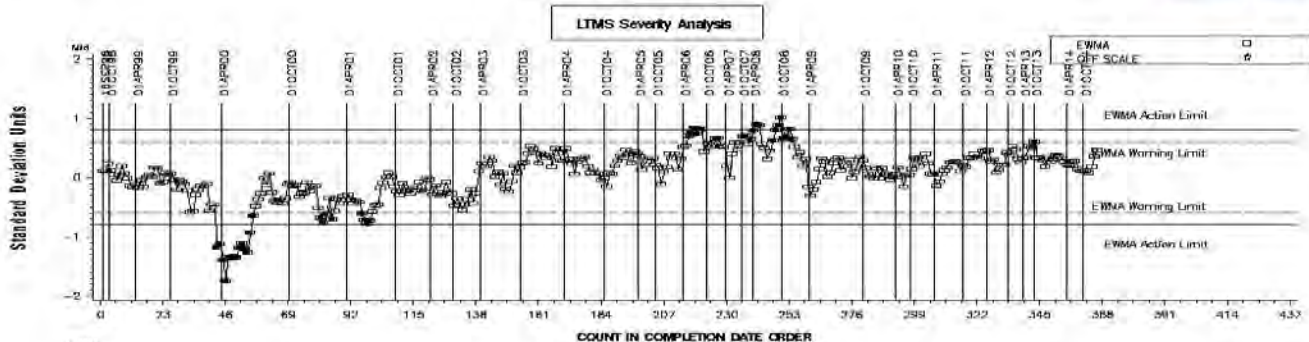
AVERAGE ENGINE SLUDGE



SEQUENCE VG INDUSTRY OPERATIONALLY VALID DATA



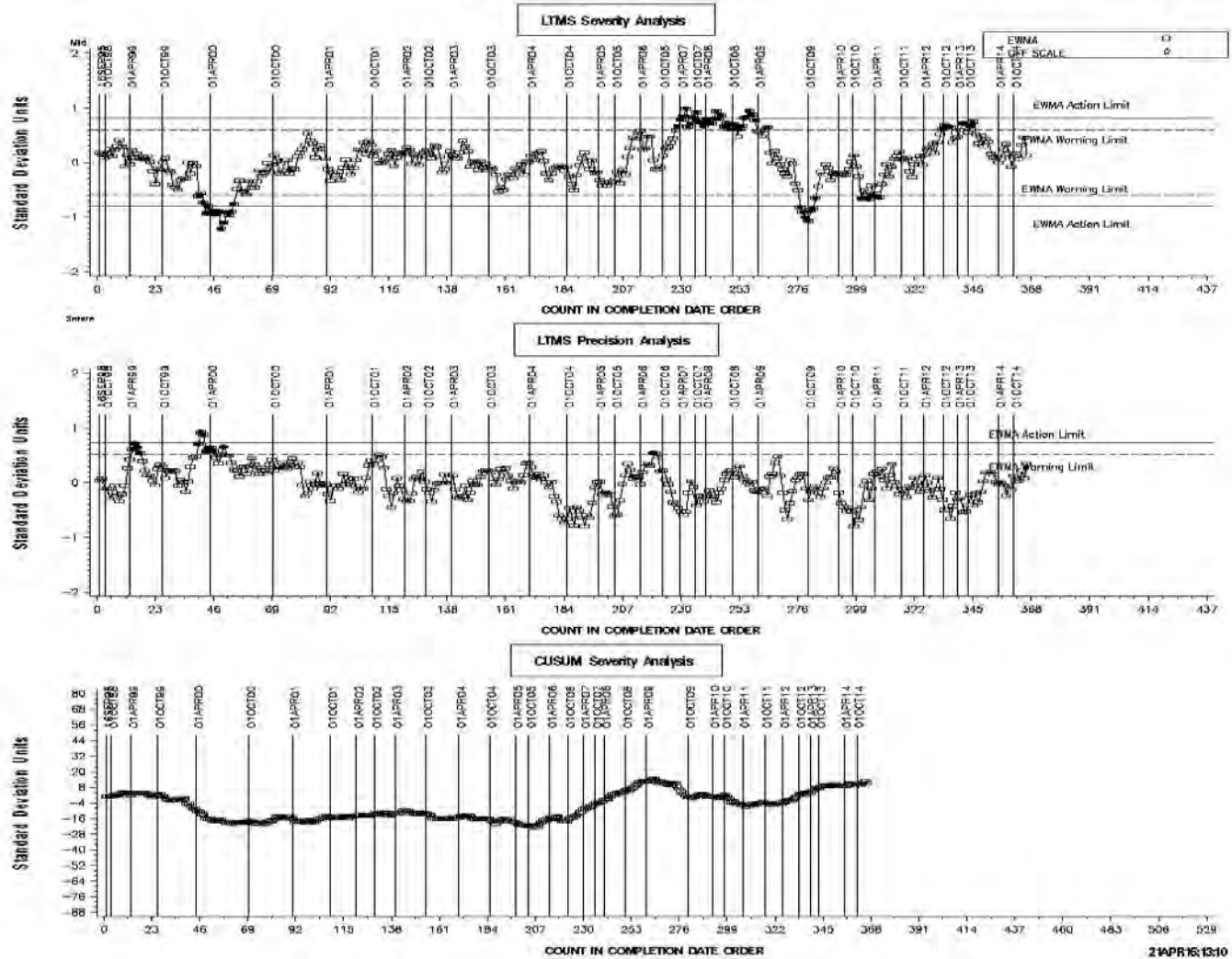
AVERAGE ROCKER COVER SLUDGE



SEQUENCE VG INDUSTRY OPERATIONALLY VALID DATA



AVG. ENG. VARN. 3-PART APV + BAFFLES



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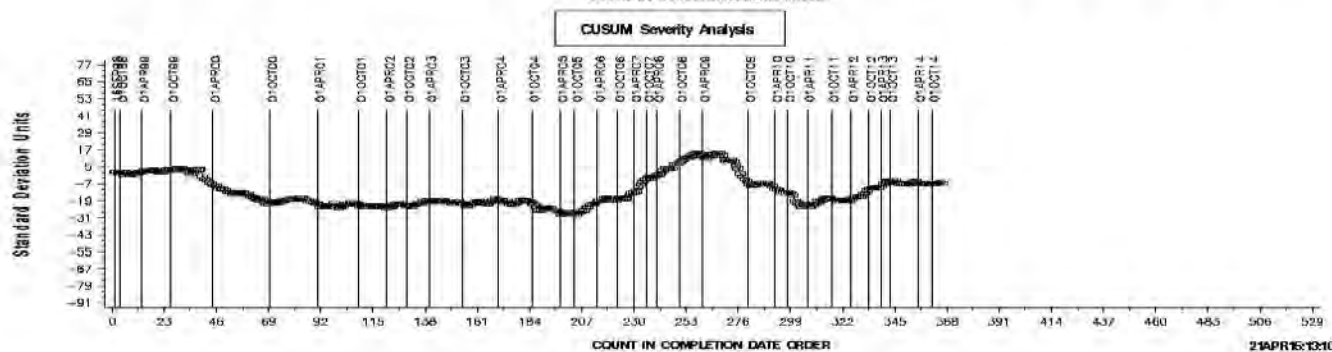
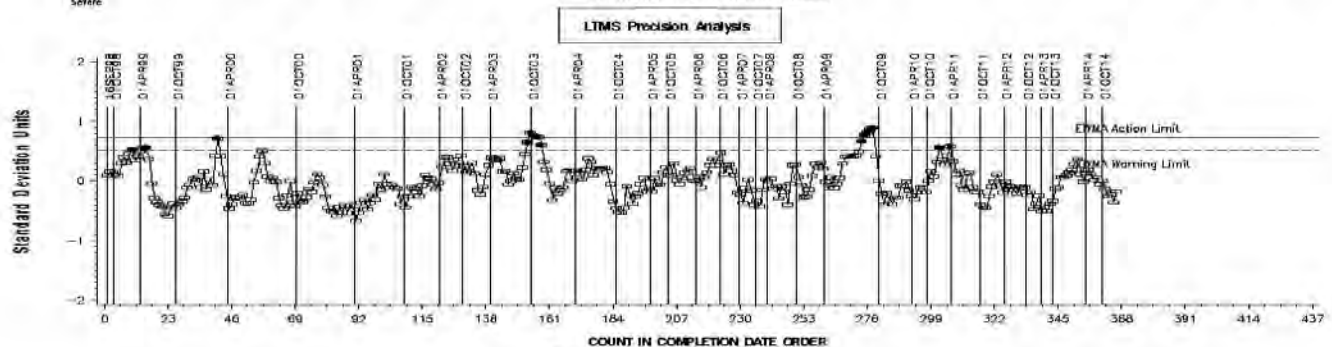
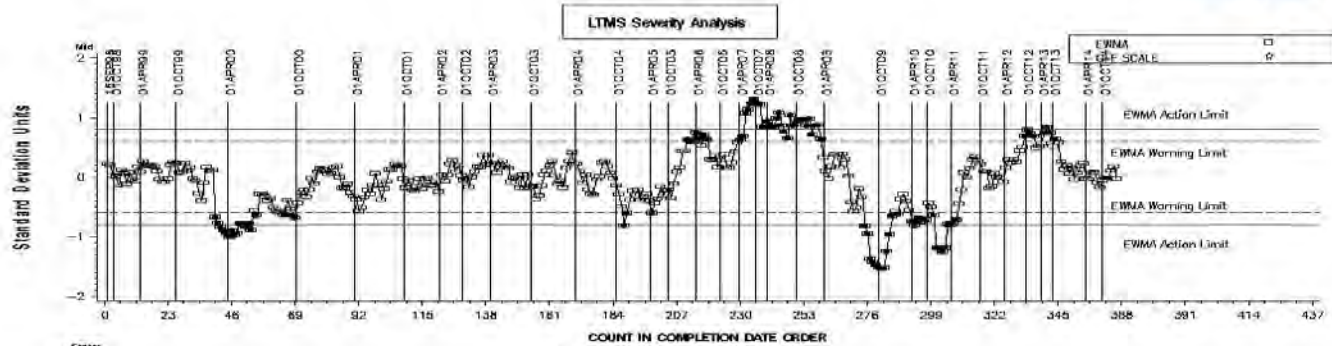


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SEQUENCE VG INDUSTRY OPERATIONALLY VALID DATA



AVG PISTON SKIRT RATING



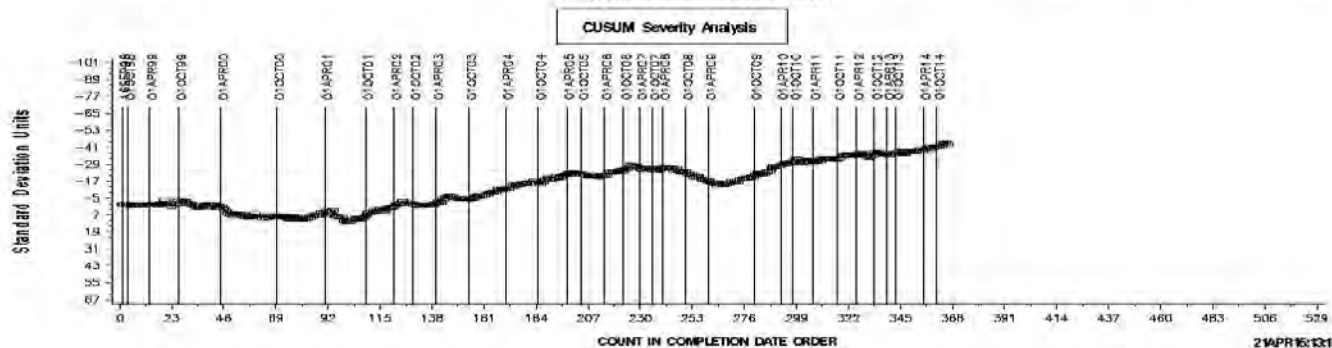
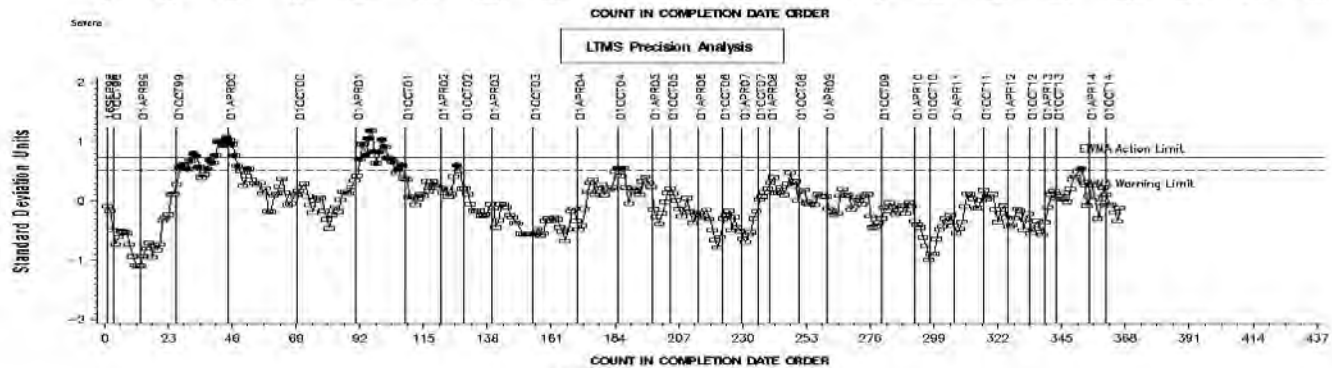
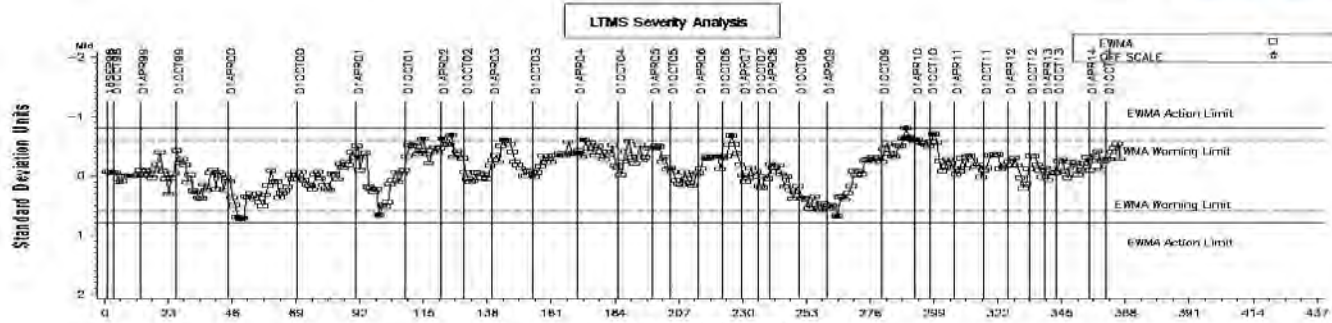
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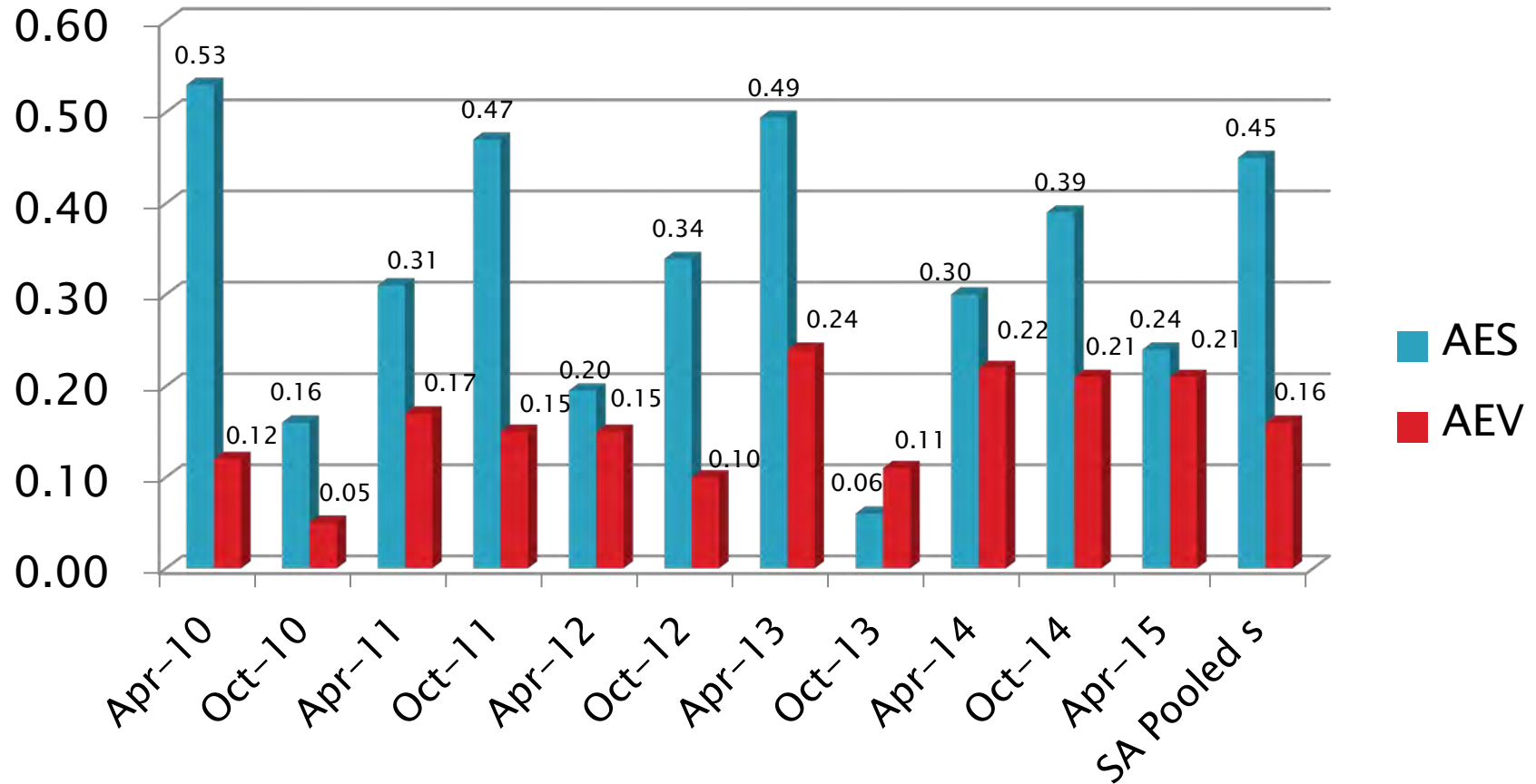
SEQUENCE VG INDUSTRY OPERATIONALLY VALID DATA



OIL SCREEN SLUDGE

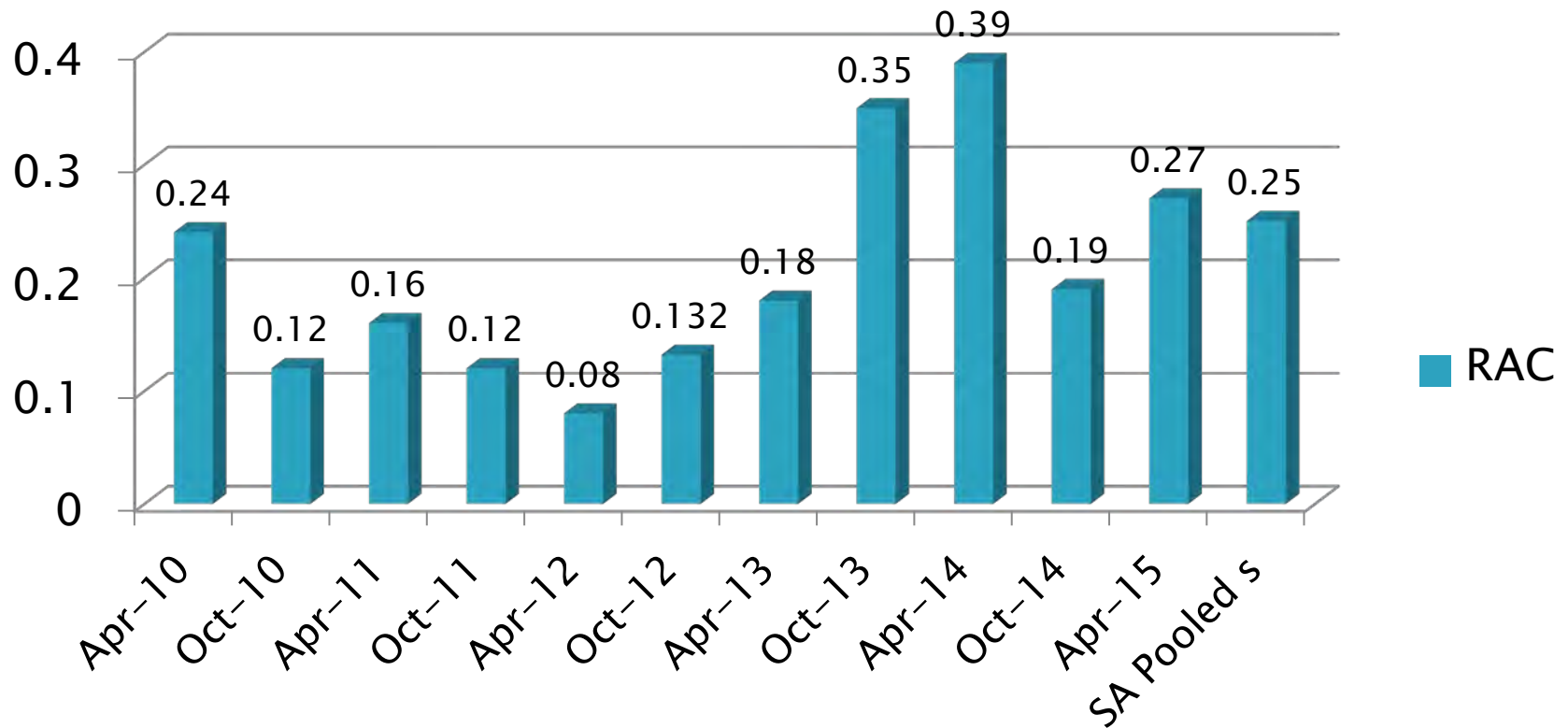


Sequence VG Precision Estimates

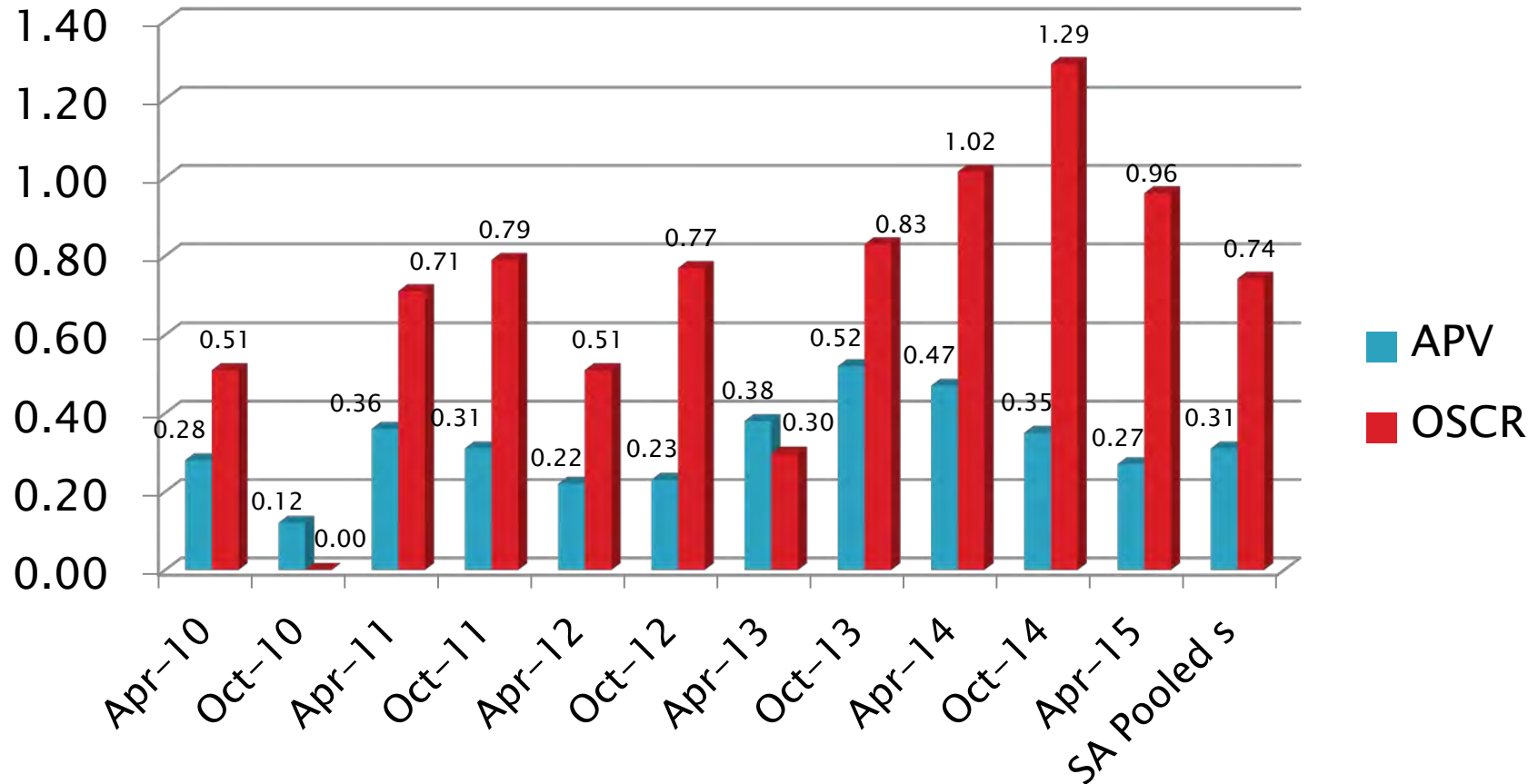


Sequence VG Precision Estimates

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	30
Failed Statistically	OC	7
Operationally Invalid	LC	2
Aborted	XC	2
Engine Abandoned, would not Calibrated	MC	9
Total		50

Sequence VID – Failed Tests

Test Status	Number of Tests
Severe FEI1	1
Severe FEI2	1
Mild FEI1	2
Mild FEI2	1
Severe FEI1 and FEI2	1
Mild FEI1 and FEI2	1
Total	7

Sequence VID – Lost Tests*

Test Status	Cause	#
Invalid	Dyno Failure	1
Invalid	Load Cell Controller Failure	1
Aborted	Load Cell Calibration Not Performed Prior to Test Start	1
Aborted	BL Before Baseline shift greater than 0.4	1
Totals		4

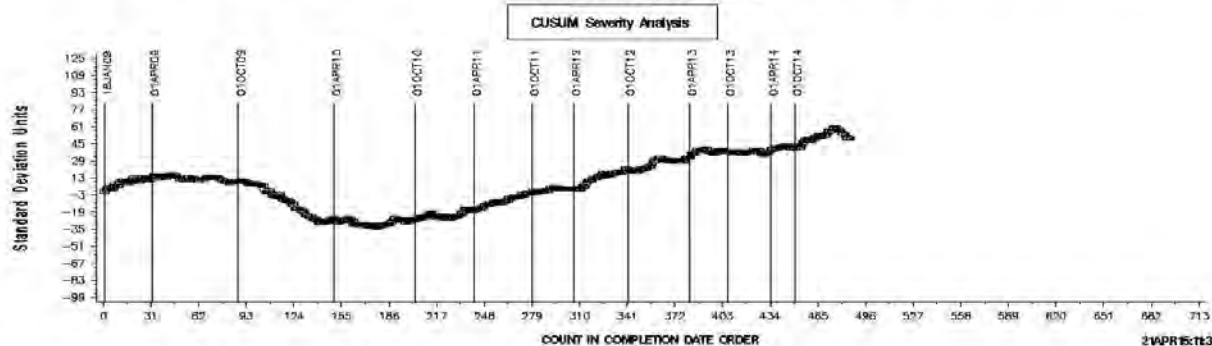
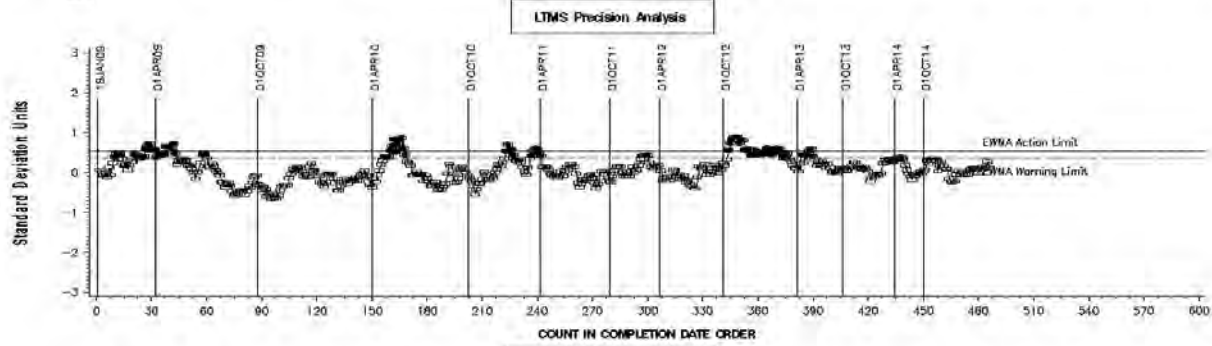
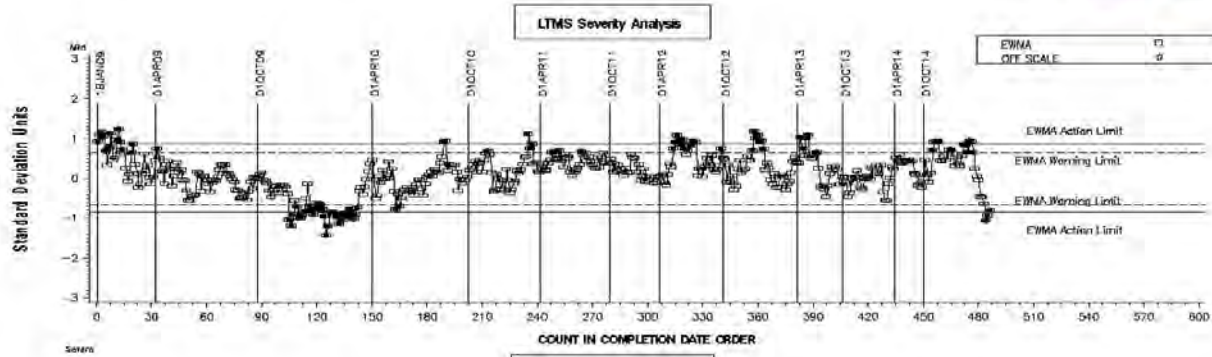
*Invalid and aborted tests

Sequence VID Test Severity

- FEI1 in Severity Action alarm
- FEI2 in Severity Warning and Precision Action alarm.



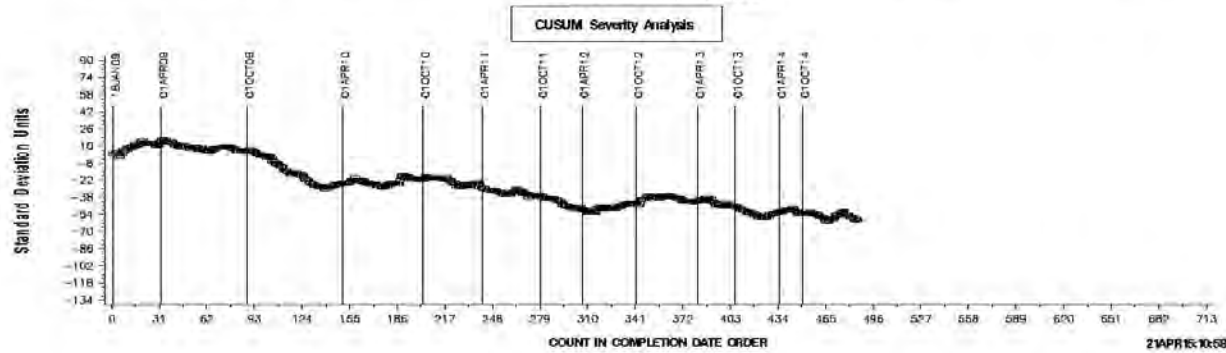
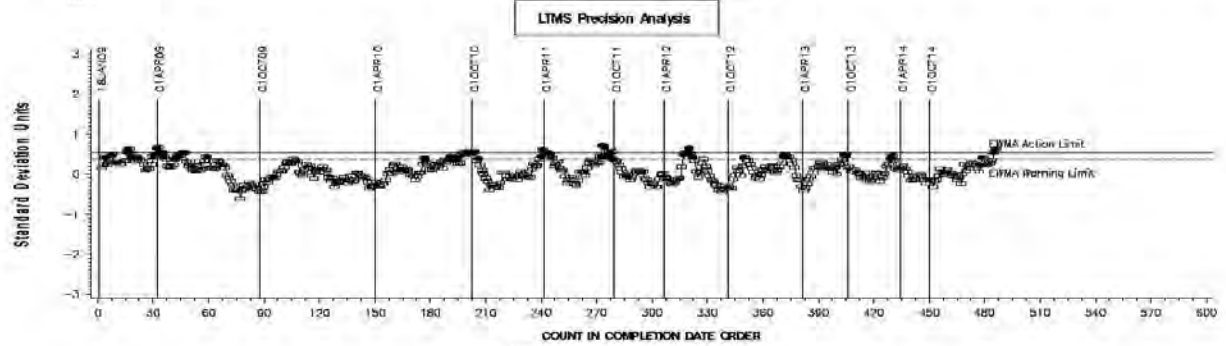
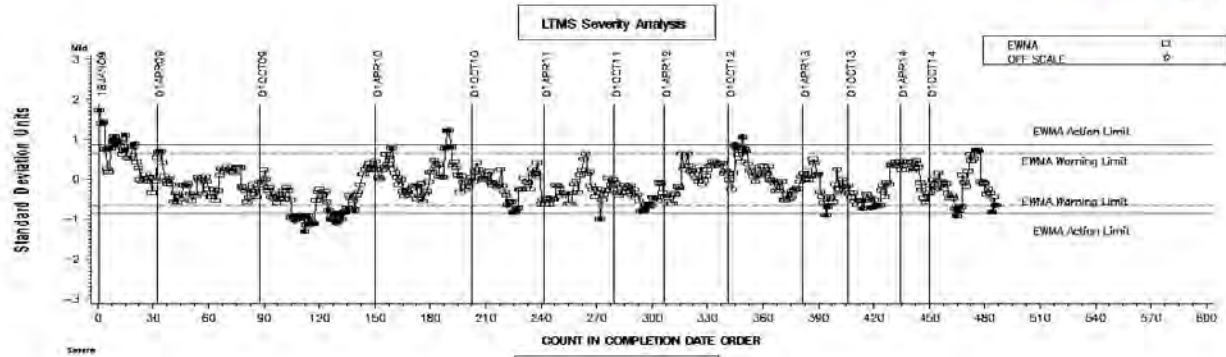
FEI FINAL RESULT PHASE I



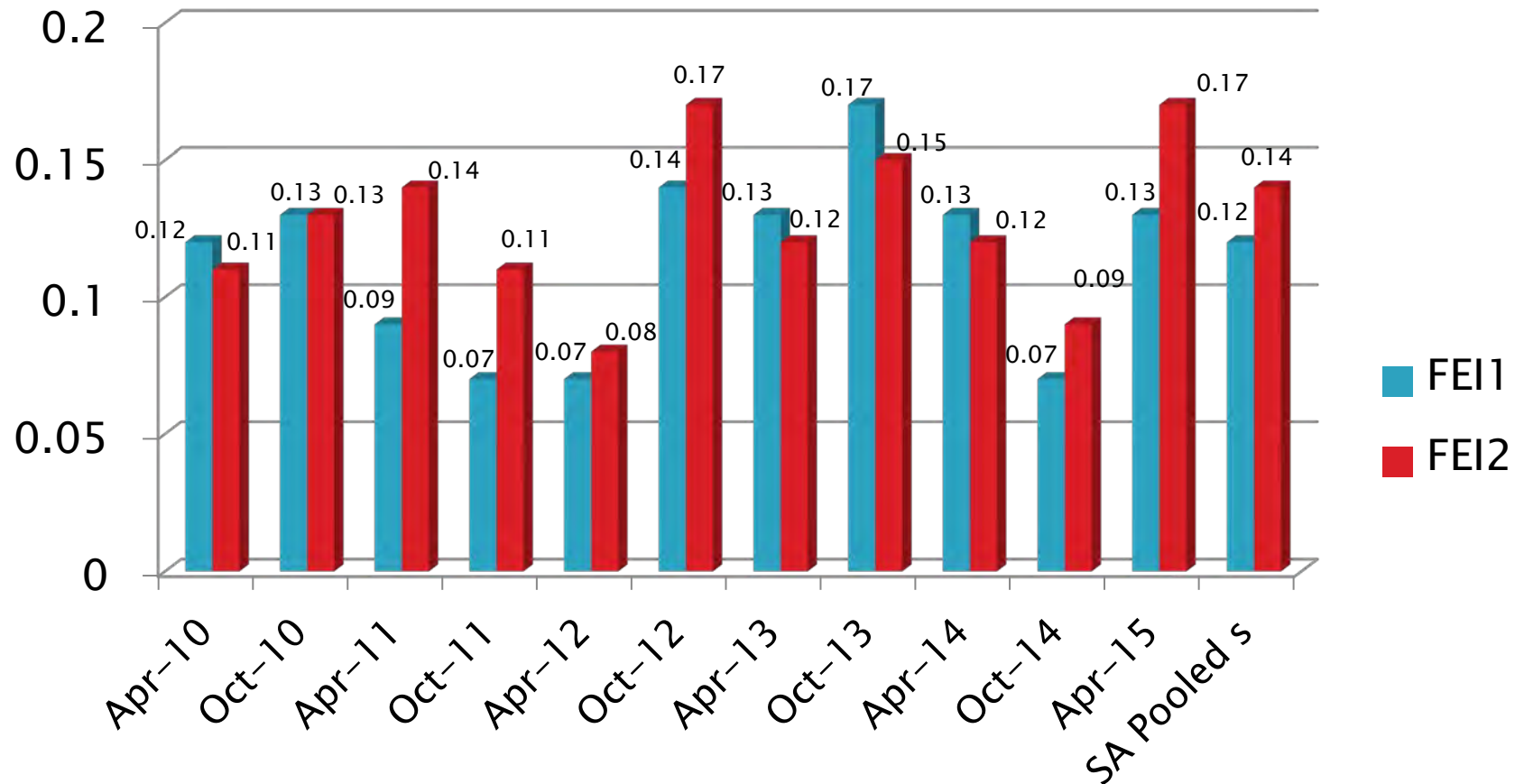
SEQUENCE VID INDUSTRY OPERATIONALLY VALID DATA



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	6
Failed Statistically	OC	3
Operationally Invalid, Lab Judgement	LC	4
Operationally Invalid, Lab and TMC Judgement	RC	1
Stand Shakedown	NN	1
Total		15

Sequence VIII – Failed Tests

Test Status	Number of Tests
Severe SVIS	1
SVIS Precision Shewhart Alarm	1
BWL Precision Shewhart Alarm	1
Total	3

Sequence VIII – Lost Tests*

Test Status	Cause	#
Invalid	Excessive Mechanical Wear	2
Invalid	Exceeded Oil Gallery Temperature Deviation Percentage	1
Invalid	Exceeded Fuel Flow Deviation Percentage	1
Invalid	Exceeded Coolant Out Temperature Deviation Percentage	1
Totals		5

*Invalid and aborted tests

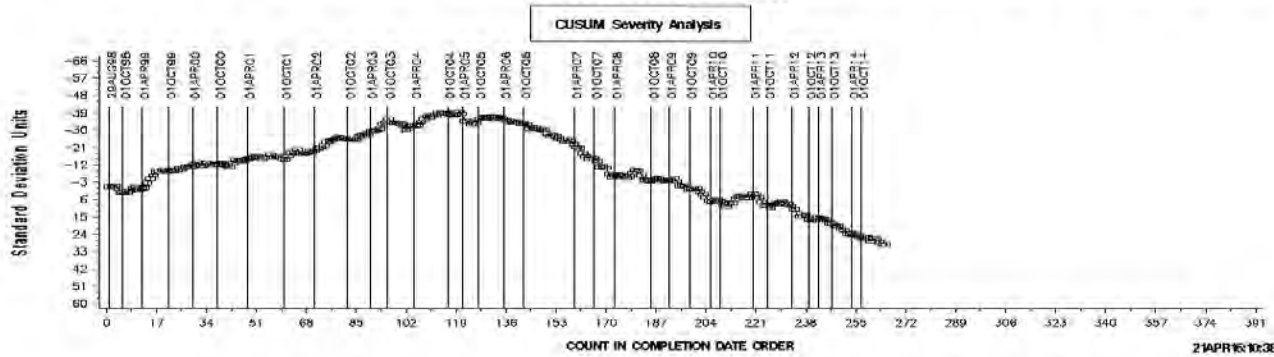
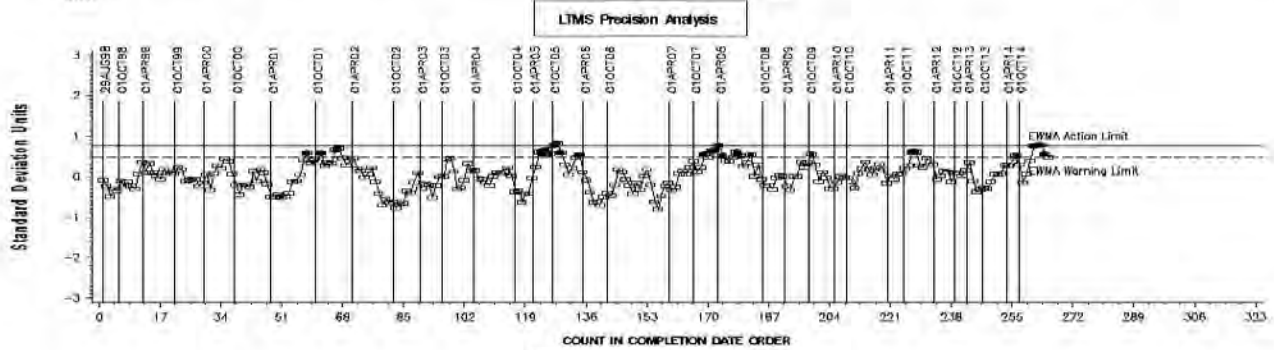
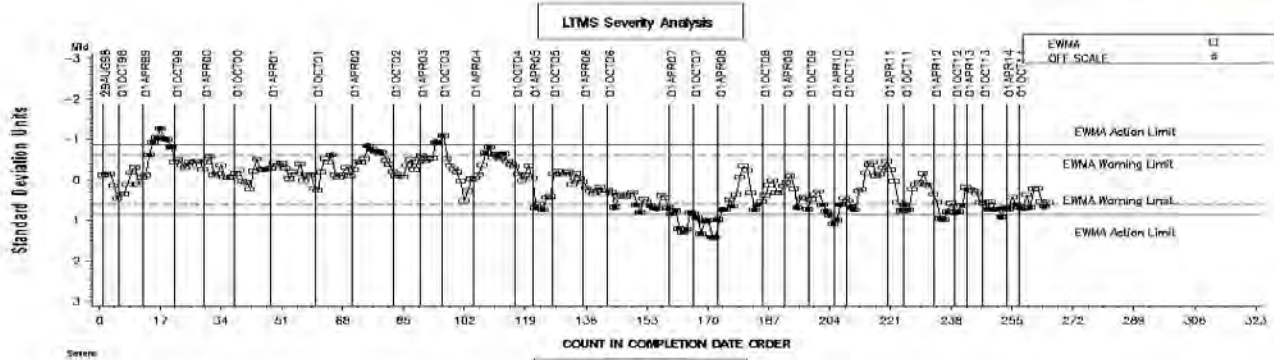
Sequence VIII Test Severity

- Bearing Weight Loss is in precision warning alarm.
- Stripped Viscosity is in control.

SEQUENCE VIII INDUSTRY OPERATIONALLY VALID DATA



FINAL BEARING WEIGHT LOSS



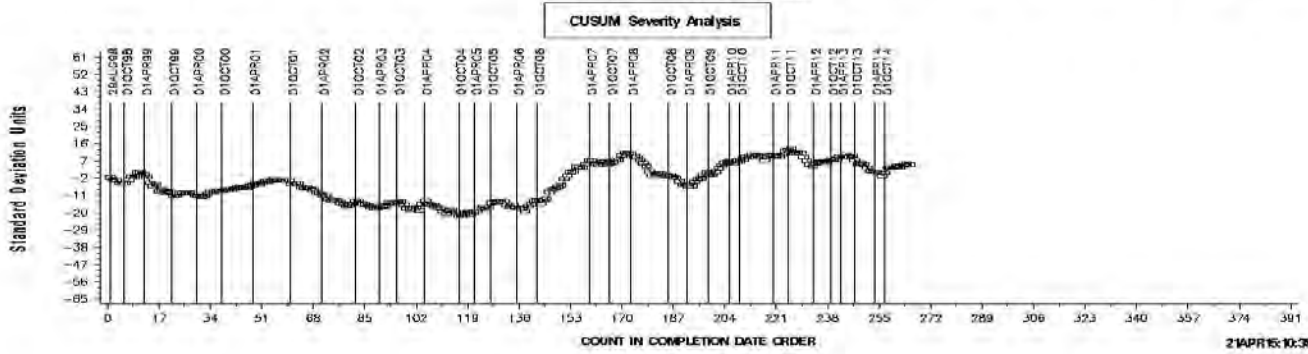
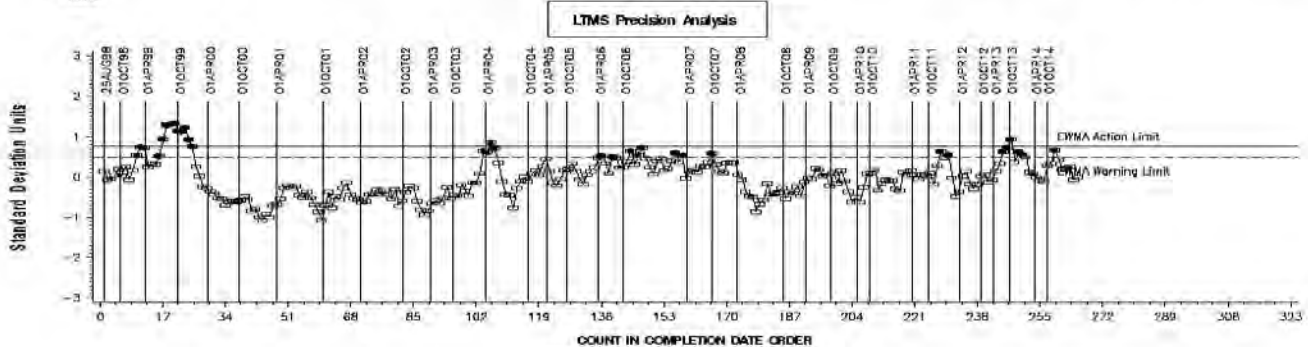
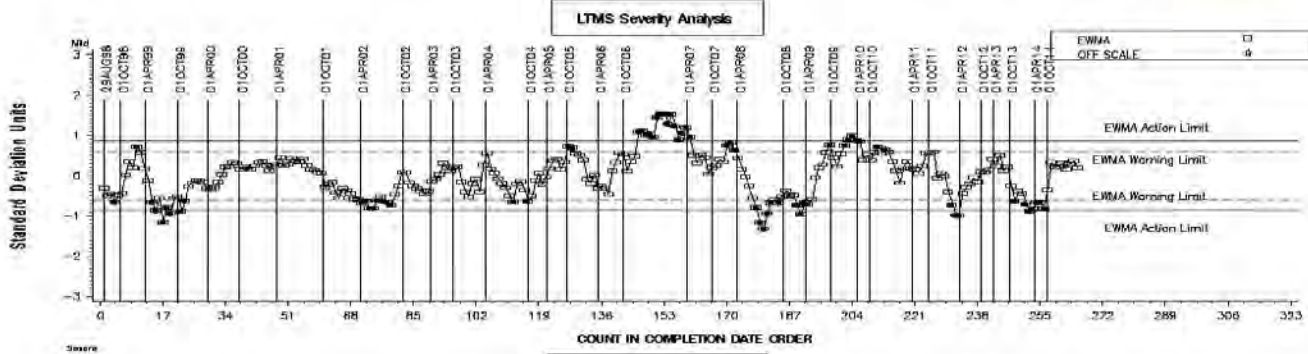
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SEQUENCE VIII INDUSTRY OPERATIONALLY VALID DATA



STRIPPED VIS. @ 100 DEG C

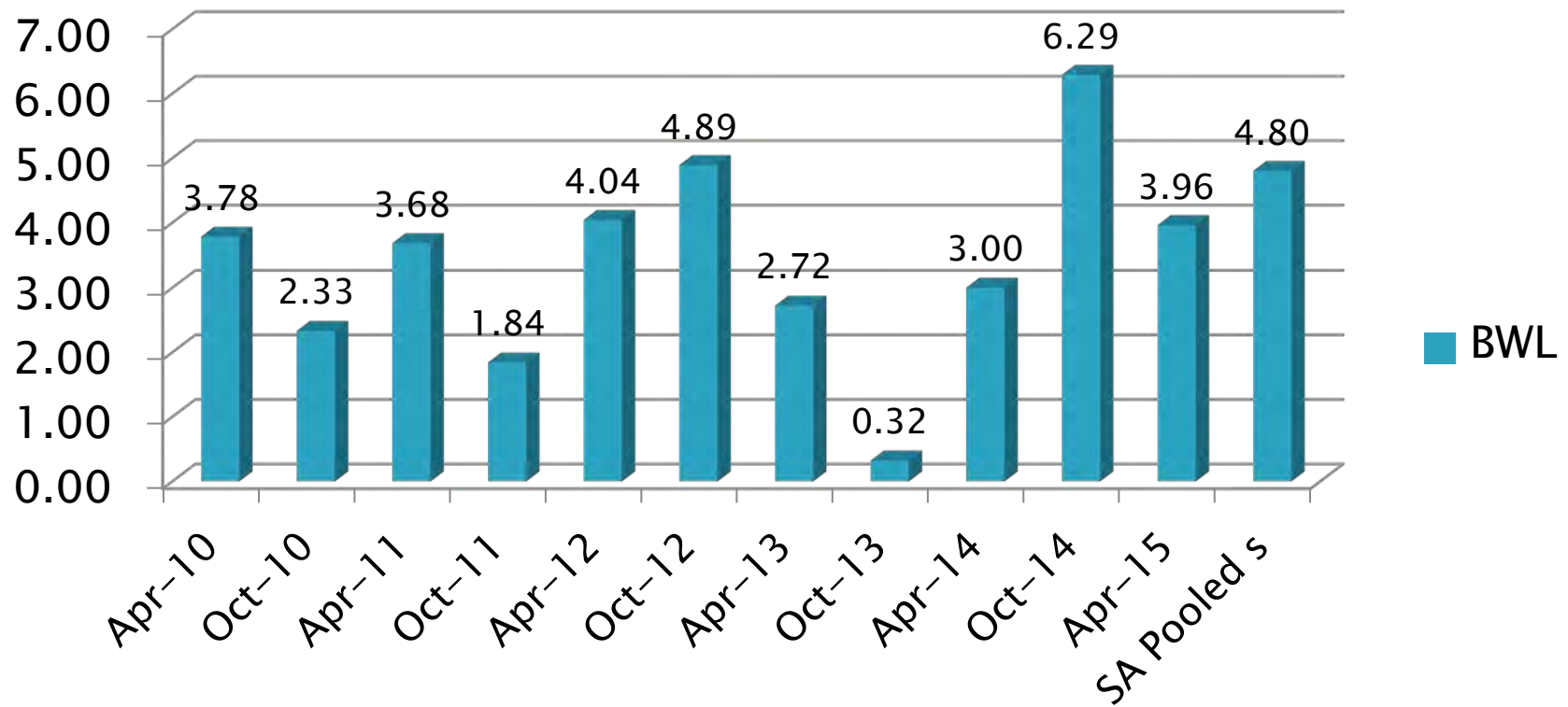


21APR10:38



Sequence VIII Precision Estimates

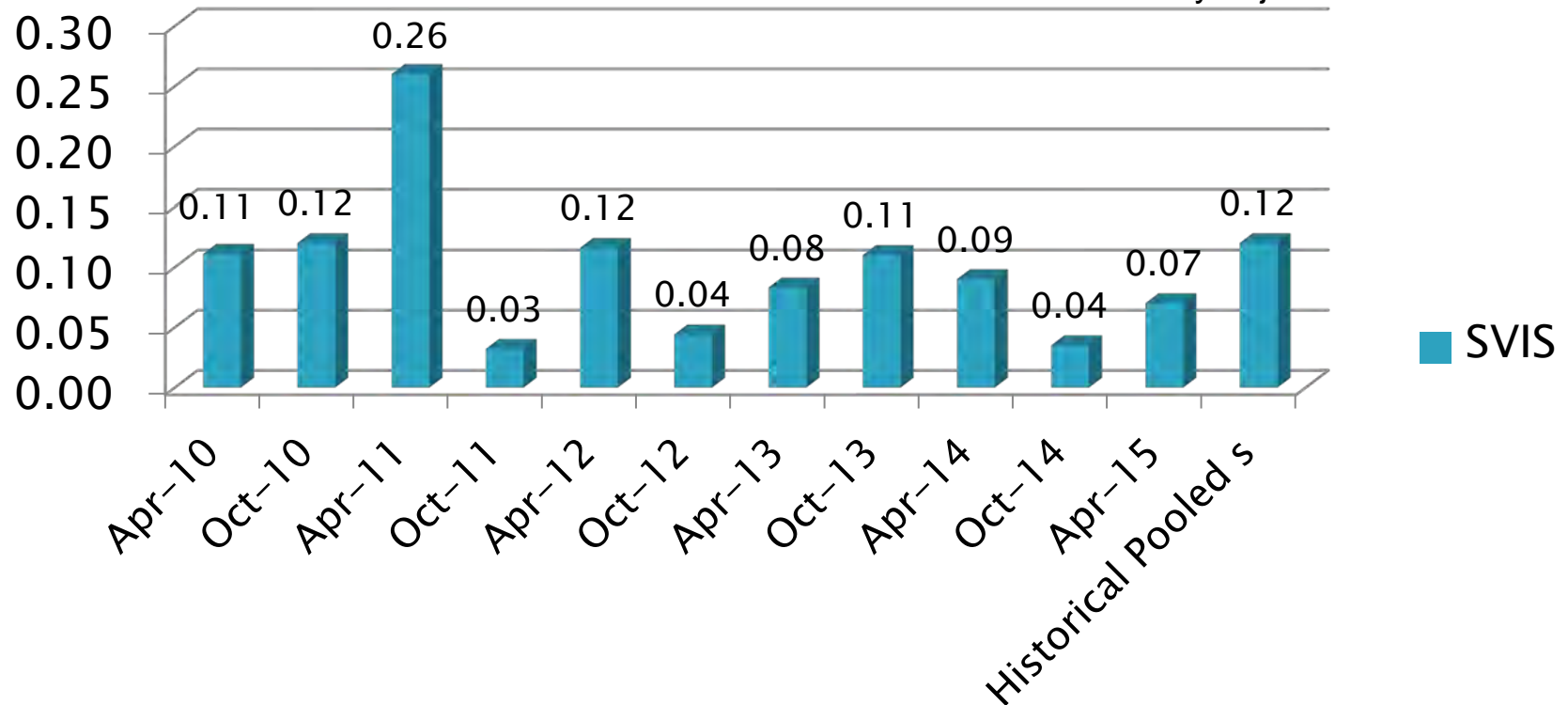
BWL



Sequence VIII Precision Estimates

SVIS

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



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Information Letters

»» October 1, 2014 –
March 31, 2014

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Information Letters*

Test	Date	IL	Topic
IIIF	20141201	14-3	Included an updated description of the role of the Test Monitoring Center.
IIIF	20150122	15-1	Approved the use of hardened seat cylinder heads for multiple tests.
IIIG	20141114	14-4	Included an updated description of the role of the Test Monitoring Center.
IIIG	20150122	15-1	Approved the use of hardened seat cylinder heads for multiple tests.

*Available from TMC Website

Test Monitoring Center

<http://astmtmc.cmu.edu>



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Information Letters*

Test	Date	IL	Topic
IVA	20141112	14-2	Included an updated description of the role of the Test Monitoring Center.
VG	20141110	14-5	Included an updated description of the role of the Test Monitoring Center.
VID	20141104	14-2	Included an updated description of the role of the Test Monitoring Center.
VIII	20141110	14-3	Included an updated description of the role of the Test Monitoring Center.

*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

- Re-blend 434-2 distributed, two successful calibration attempts completed

➤ TMC438-1

- Re-blend available; will be used for IIIH.

➤ TMC 541-1, 542-1 and 1010

- Re-blends of 542 and 1010 Obtained
- 542-2 Introduced, targets being evaluated
- 1010-1 at TMC, some released for new category work, to be introduced during next report period

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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	15	296	0	5+ years
433-1	IIIF	1045	0	0	8	<1 year
433-2	IIIF	500	44	380	36	3+ years
434	IIIG	550	0	<1	12	<1 year
434-1	IIIG	660	43	56	32	1.5 years
434-2	IIIG	495	100	357	16	4+ years
435	IIIG	550	0	2	4	<1 year
435-2	IIIG	550	24	210	32	3+ years
438	IIIG	990	28	76	36	2 years
540	VID	1100	65	255	35	4+ years
541-1	VID	550	0	4	35	<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
542	VID	1100	16	0	5	<1 year
542-1	VID	275	105	3	10	0 years
542-2	VID	1000	235	765	25	3 years
704-1	VIII	897	14	150	10	5+ years
925-3	VG	975	0	10	6	<1 year
940	VG, VH	560	18	373	27	5+ years
1006-2	IVA, VG, VIII	5500	88	2946	87	5+ years
1007	IVA, VG	1968	0	0	30	<1 year
1009	VG, VIII	1100	20	112	33	5+ years
1010	IIIG, VID	1100	166	56	65	<1 year
1010-1	IIIG, VID	1980	36	1944	0	5 years

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LTMS Deviations

»» October 1, 2014 –
March 31, 2015

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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

»» October 1, 2014 –
March 31, 2015

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Quality Index Deviations

- Two Quality Index Deviations this Report Period.
 - IIIF – Exhaust backpressure control.
 - IIIG – Intake air pressure control.

Historical Count of PCEO Quality Index Deviations

Test	Quality Index Deviations
IIIF	26
IIIG	14
IVA	28
VG	41

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TMC Laboratory Visits

»» October 1, 2014 –

March 31, 2015

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TMC Lab Visits

Test	Number of Labs Visited
III	2
IVA	2
VG	2
VID	2
VIII	2

TMC Lab Visits

- One discrepancy noted during visits
 - VIII – Valve did not have any identification, making it impossible to verify correct valve was installed.

The laboratory has responded with corrective action.

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Test Area Timelines

»» October 1, 2014 –
March 31, 2015

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Test Area Timeline Additions*

Test	Date	Topic	IL
IIIF	20141201	Included an updated description of the role of the Test Monitoring Center.	14-3
IIIF	20150122	Allowed the use of stellite seat heads for multiple tests.	15-1
IIIG	20141114	Included an updated description of the role of the Test Monitoring Center.	14-4
IIIG	20150122	Allowed the use of stellite seat heads for multiple tests.	15-1
VG	20141110	Included an updated description of the role of the Test Monitoring Center.	14-5
VID	20141104	Included an updated description of the role of the Test Monitoring Center.	14-2
VIII	20141110	Included an updated description of the role of the Test Monitoring Center.	14-3

*As of 03/31/2015

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Rating Workshop Data

»» 2014 Light Duty Workshop

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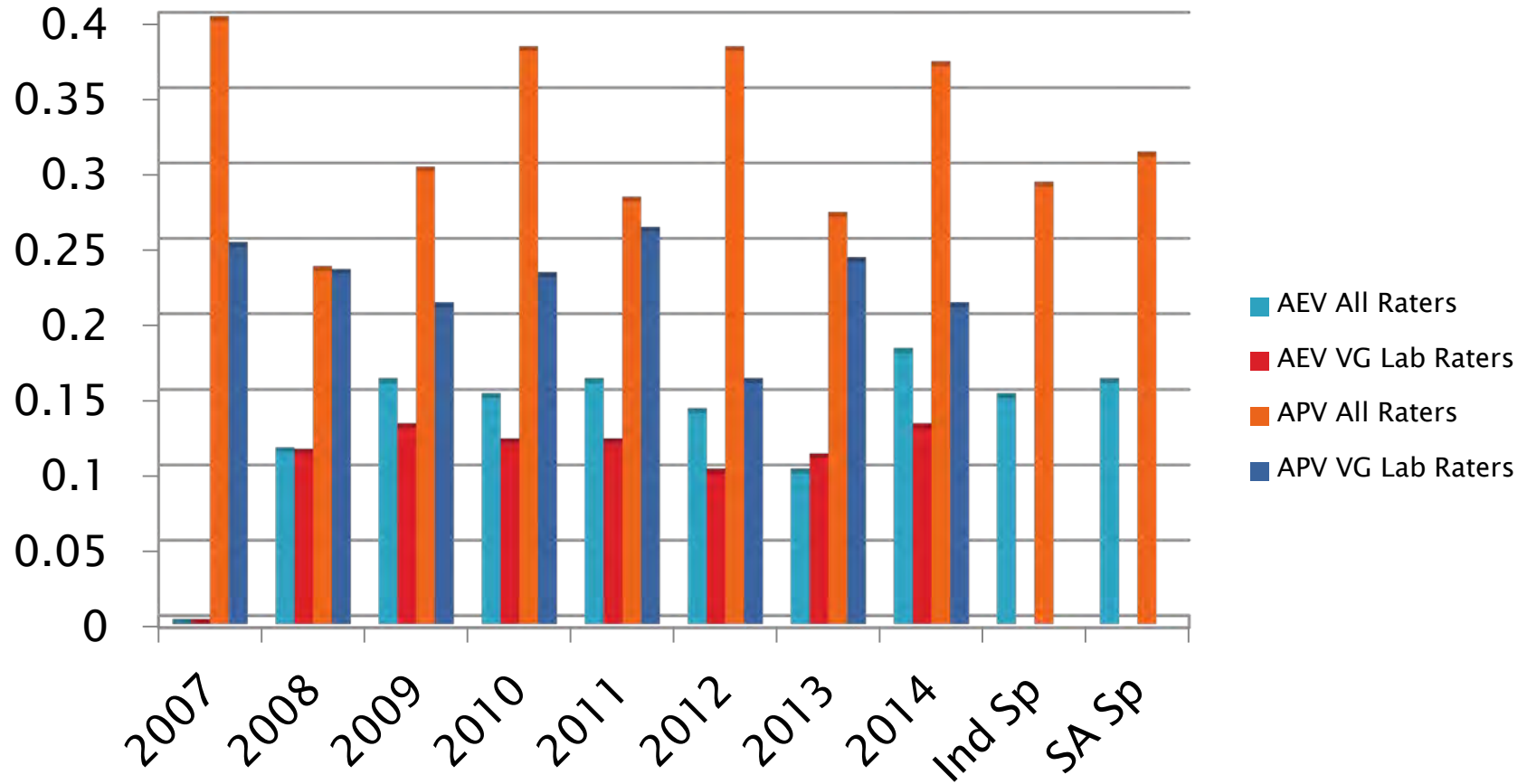
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Rating Workshop Data

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

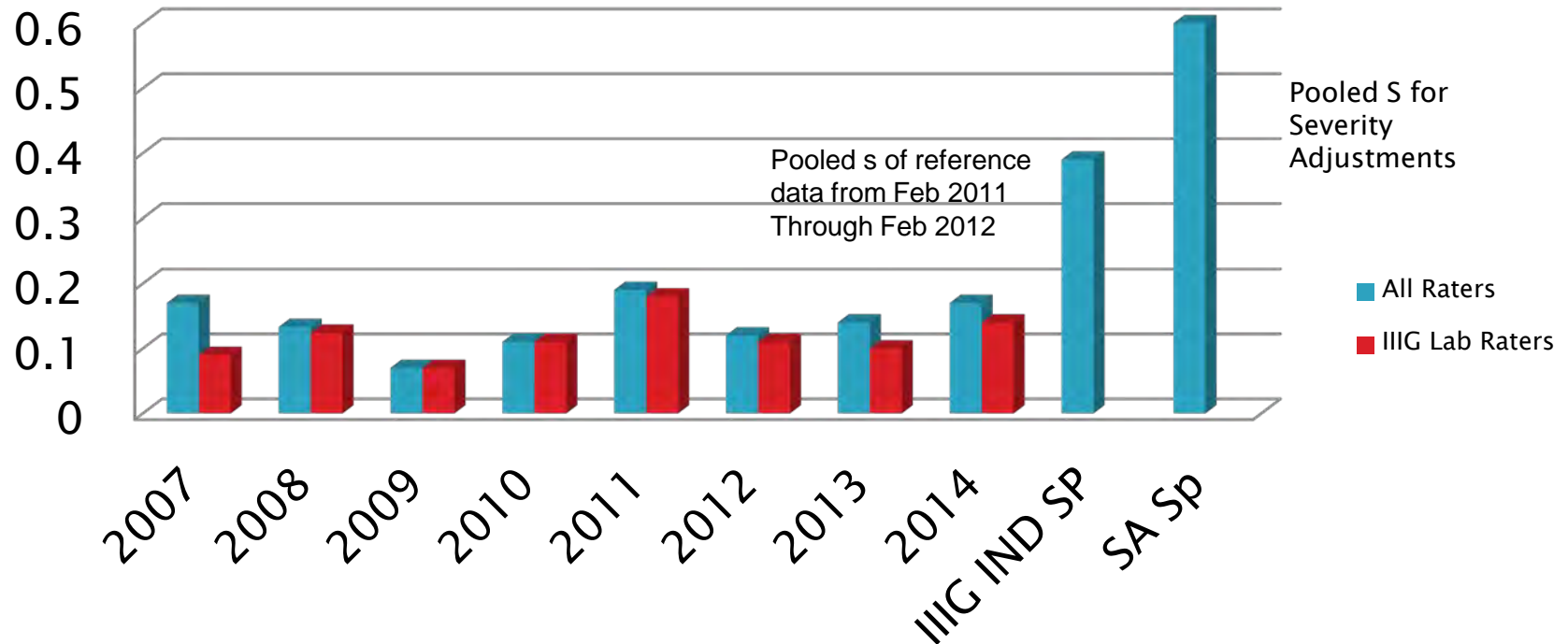
Sequence VG Precision-Rating Workshop Data

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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