



A Program of ASTM International

Test Monitoring Center

<http://astmtmc.cmu.edu>

ASTM D02.B2 Semi-Annual Report Heavy Duty Reference Oil Testing

Fall 2019

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Heavy Duty Testing

Executive Summary

- ▶ Reference Oils
 - No reference oil issues to report
- ▶ Test Issues
 - COAT test improvement finished. LTMS updates including reference oil targets and correction factors completed and test brought back online in May 2019. Test procedure re-write is in process and information letter will be forthcoming.

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Calibrated Labs and Stands*

Test	Labs	Stands
1K	2	2
1N	2	3
1M-PC	1	1
1P	2	2
1R	0	0
C13	3	3
ISB	2	4
ISM	3	3
EOAT	0	0
RFWT	1	1
T-8/E	2	2
T-11	3	5
T-12/T-12A	3/3	3/3
T-13	3	4
COAT	3	3
DD13	1	2

*As of 09/30/2019

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SCOTE 1K

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1 K Test Activity

Test Status	Validity Code	#
Acceptable Calibration Test	AC	1
Failed Calibration Test	OC	0
Operationally Invalid	LC	0
Aborted	XC	0
Total		1

1 K Failed Tests

Failed Parameter	Number of Tests
No failed tests	0
Total	0

1K Lost Tests*

Status	Cause	#
Invalid	No invalid tests	0
Aborted	No aborted tests	0
Total		0

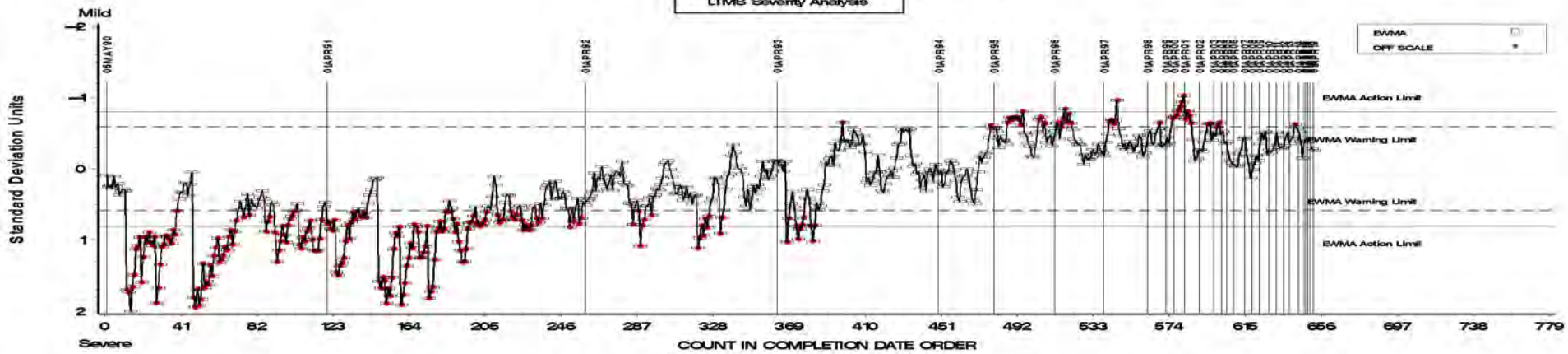
*Invalid and aborted tests

1 K Test Severity

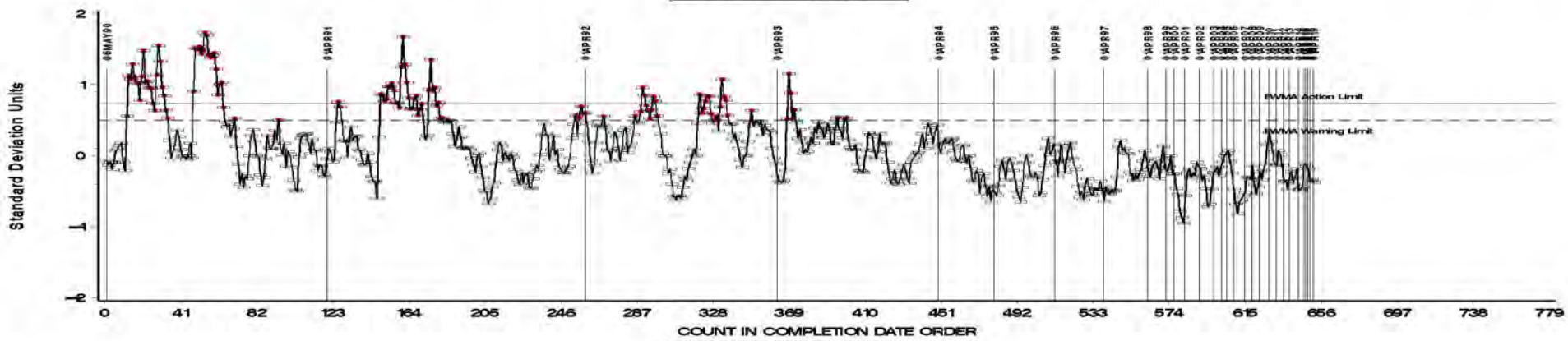
- ▶ TGF is in warning alarm in the mild direction
- ▶ BSOC is in action alarm in the mild direction
- ▶ WDK, TLHC and EOTOC are in control

FINAL Weighted Total Demerits

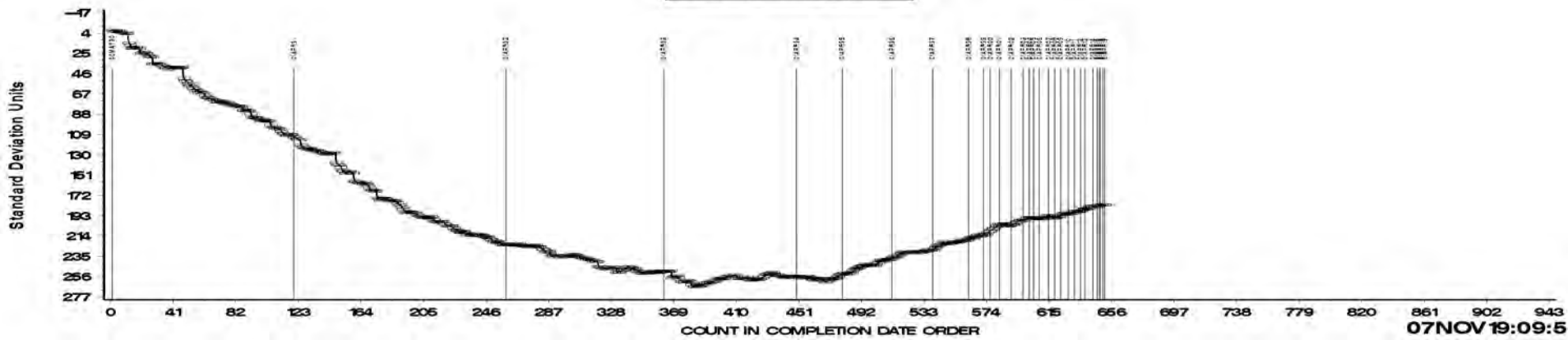
LTMS Severity Analysis



LTMS Precision Analysis



CUSUM Severity Analysis

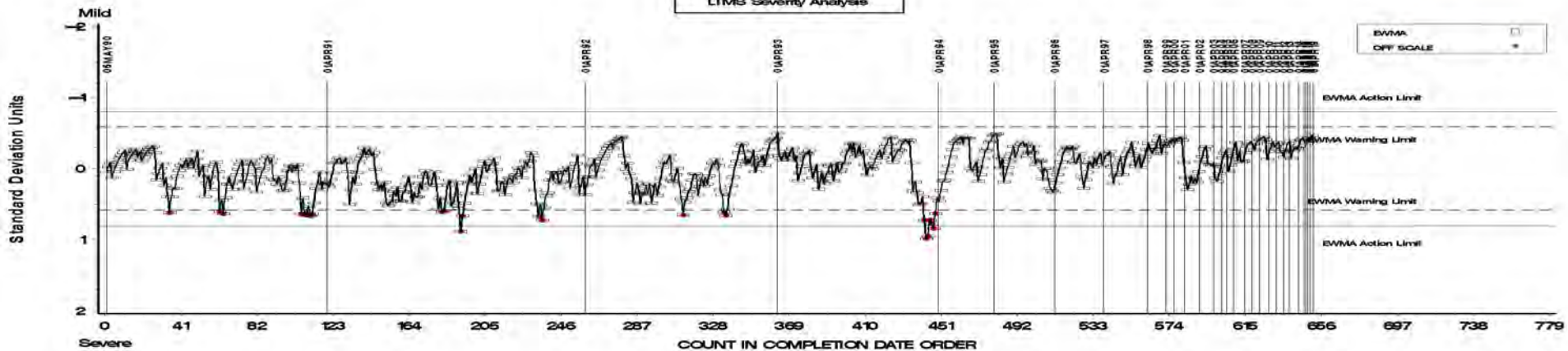


CATERPILLAR 1K INDUSTRY OPERATIONALLY VALID DATA

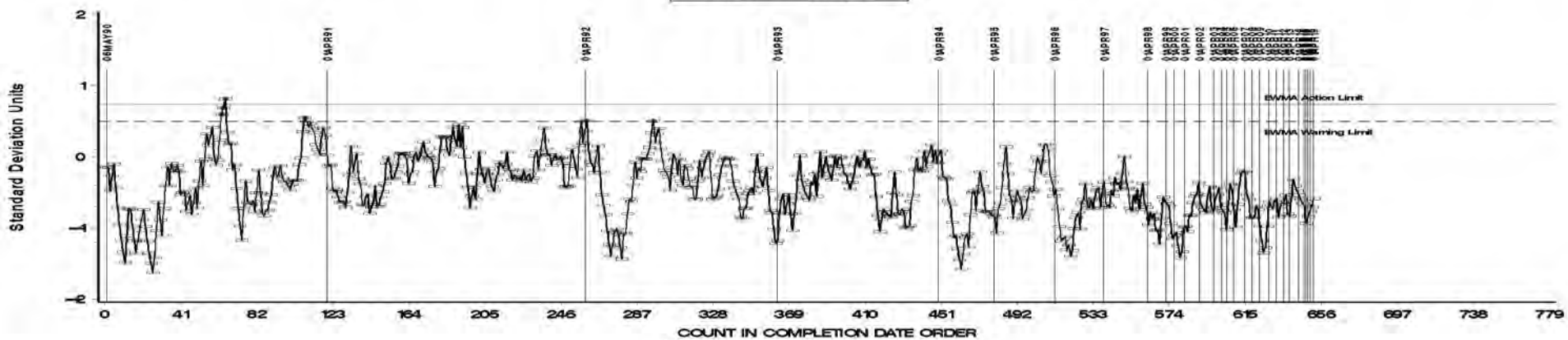


FINAL TLHC

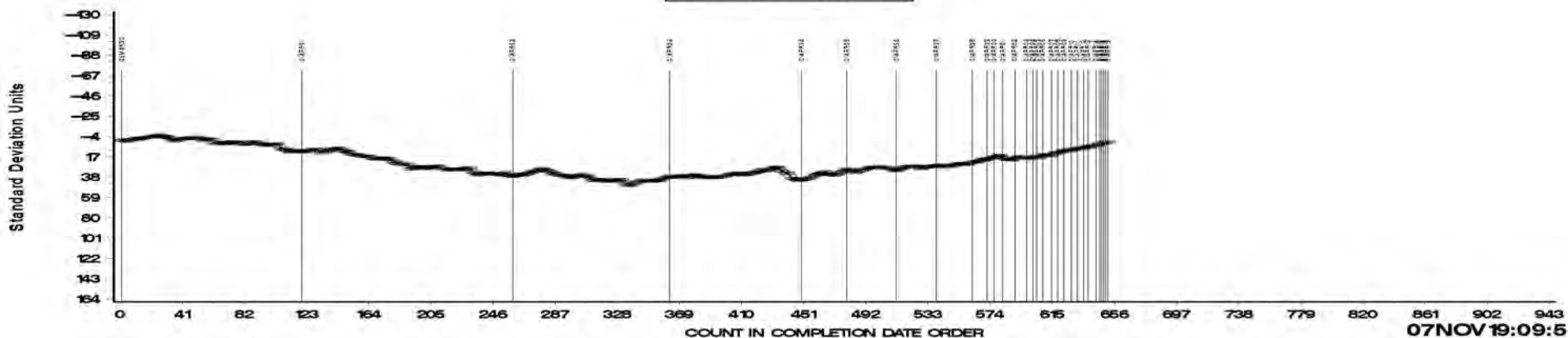
LTMS Severity Analysis



LTMS Precision Analysis



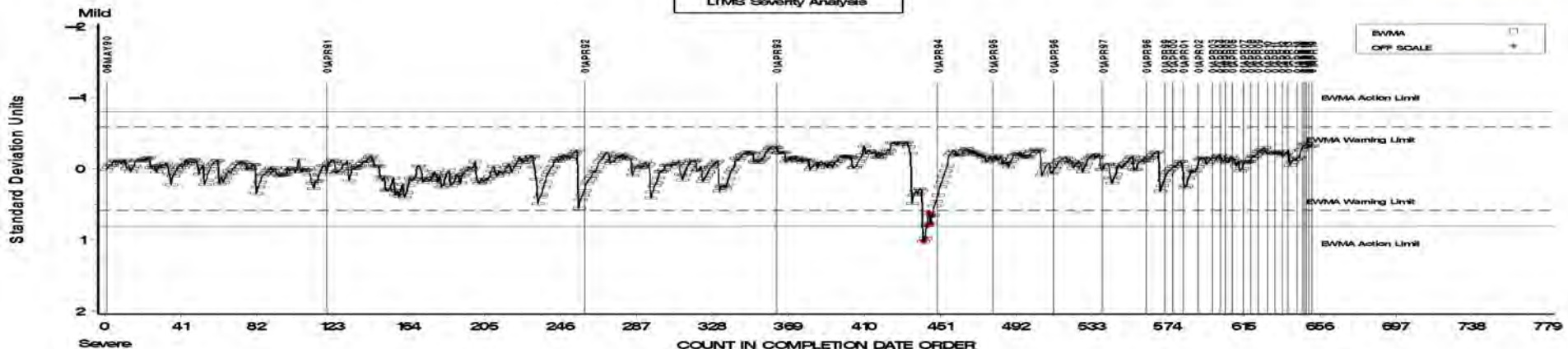
CUSUM Severity Analysis



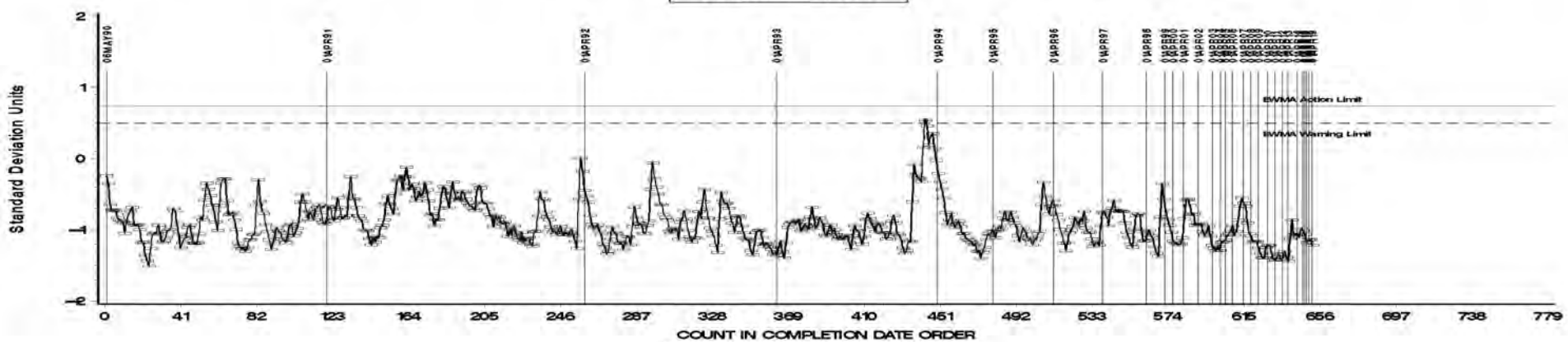
CATERPILLAR 1K INDUSTRY OPERATIONALLY VALID DATA

FINAL ETOC

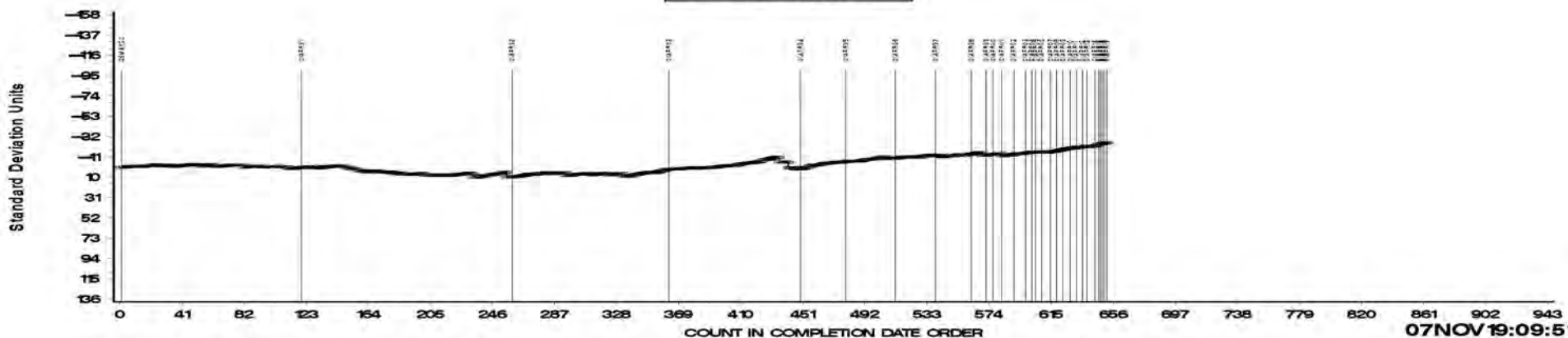
LTMS Severity Analysis



LTMS Precision Analysis



CUSUM Severity Analysis

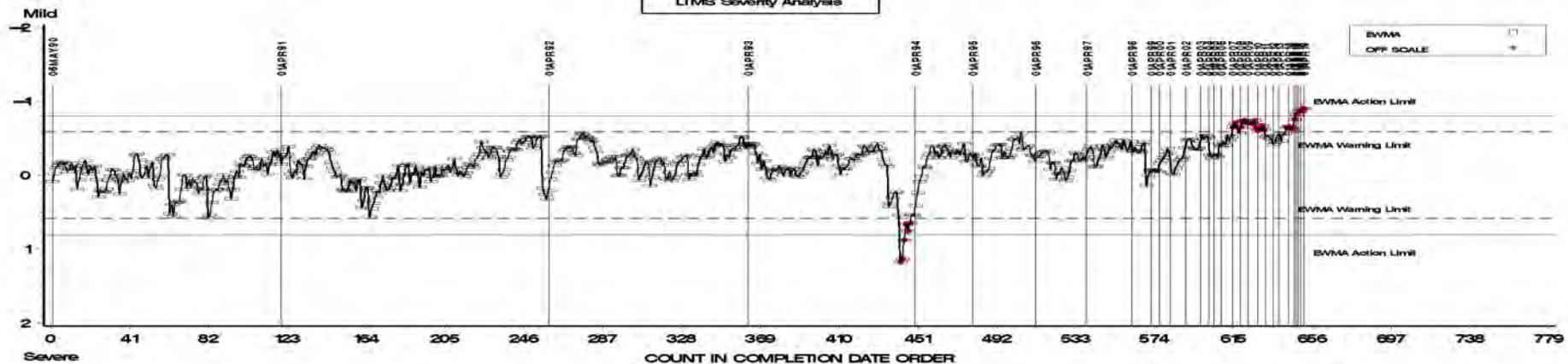


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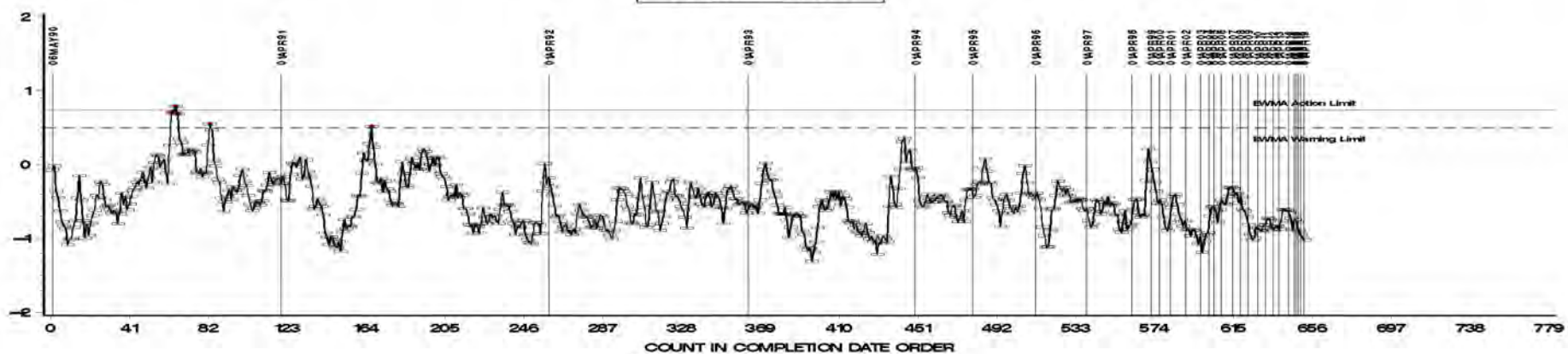


FINAL BSOC

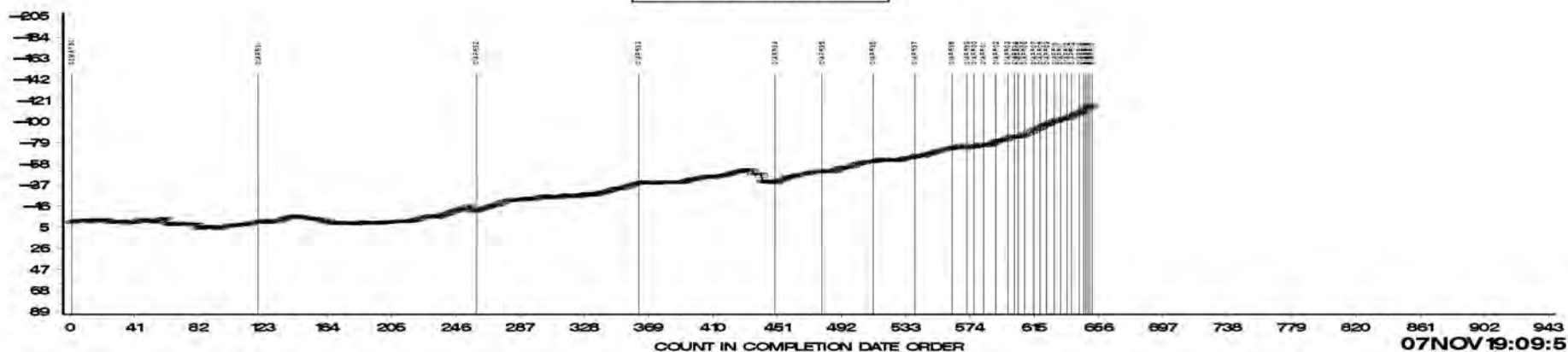
LTMS Severity Analysis



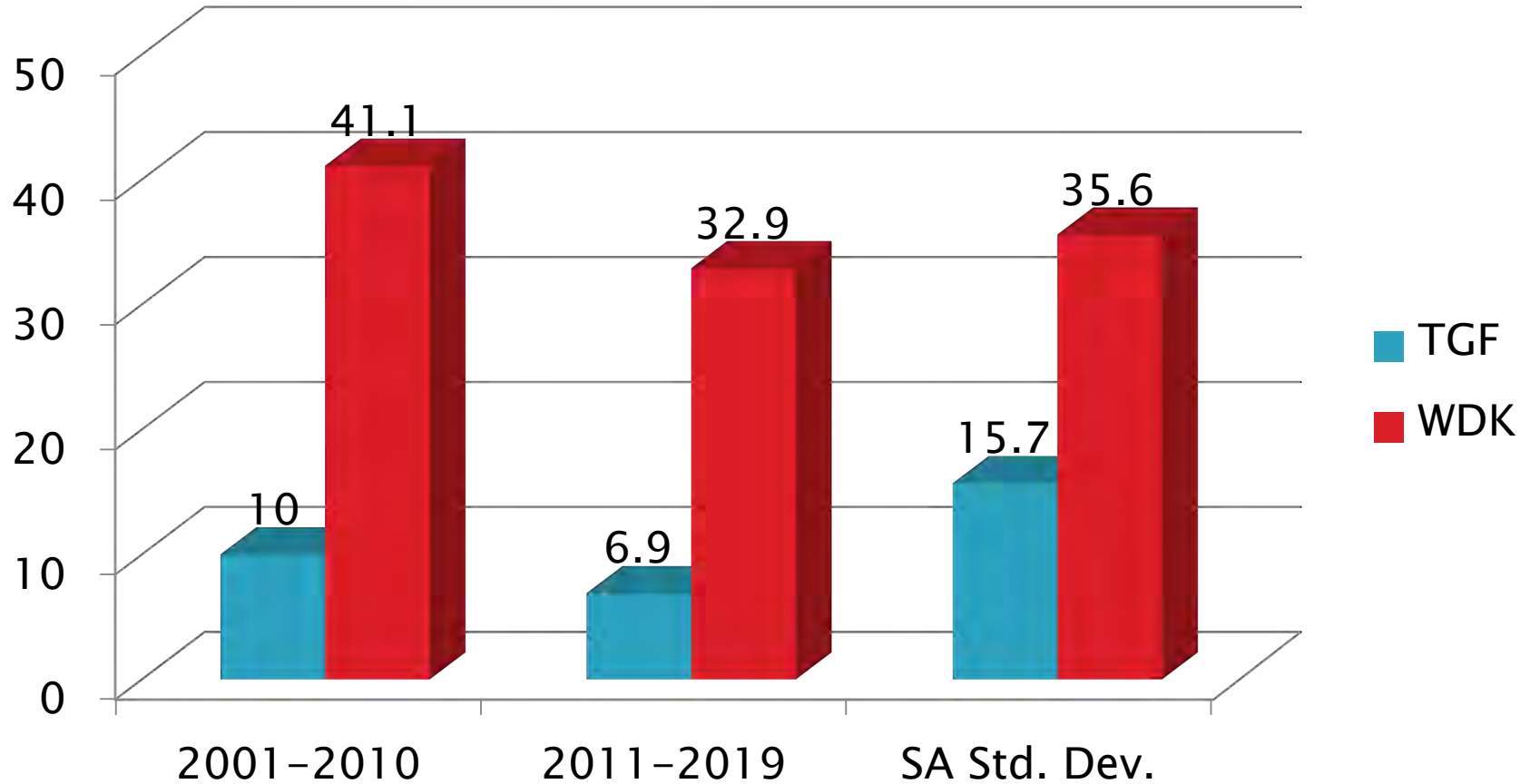
LTMS Precision Analysis



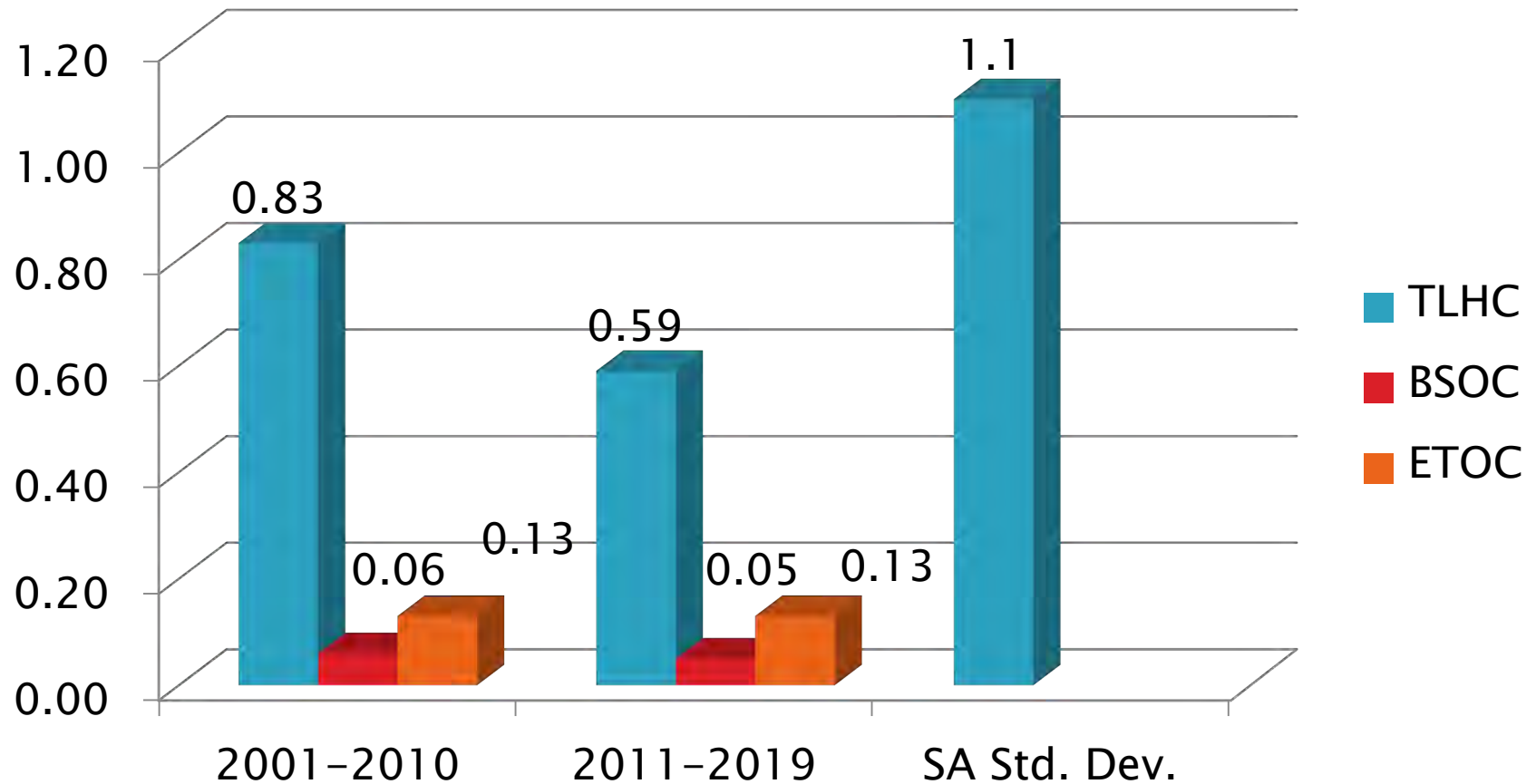
CUSUM Severity Analysis



1 K Precision Estimates



1 K Precision Estimates



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SCOTE 1N

»» October 2019

1 N Test Activity

Test Status	Validity Code	#
Acceptable Calibration Test	AC	1
Failed Calibration Test	OC	0
Operationally Invalid	LC	0
Aborted	XC	0
Informational	NN	0
Total		1

1 N Failed Tests

Failed Parameter	Number of Tests
No failed tests	0
Total	0

1 N Lost Tests*

Status	Cause	#
Invalid	No invalid tests	0
Aborted	No aborted tests	0
Total		0

*Invalid and aborted tests

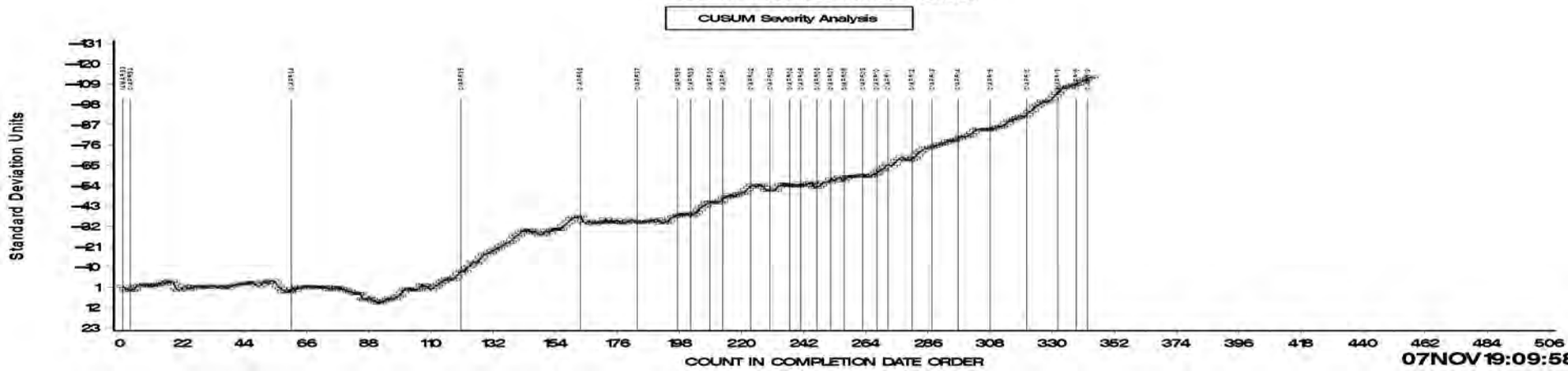
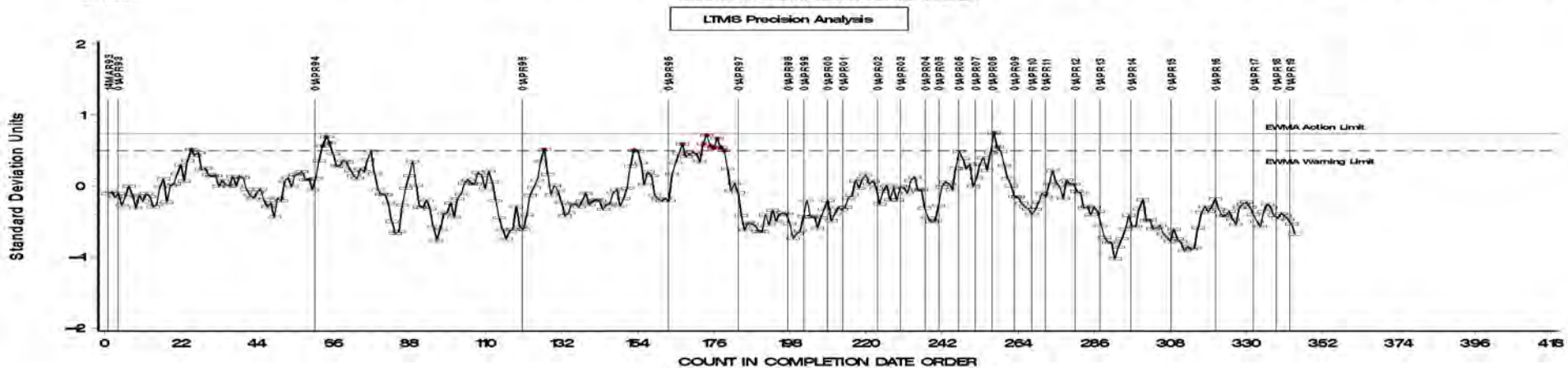
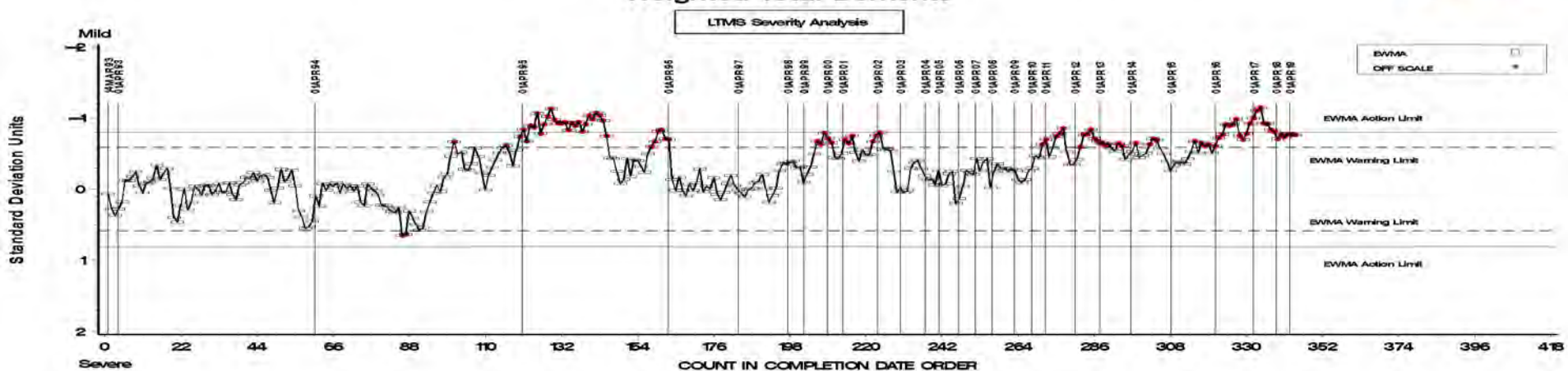
1 N Test Severity

- ▶ WDN and BSOC in severity warning alarm mild direction.
- ▶ TGF in precision warning alarm.
- ▶ TLHC in control
- ▶ Severity trends are being evaluated by surveillance panel

CATERPILLAR IN INDUSTRY OPERATIONALLY VALID DATA

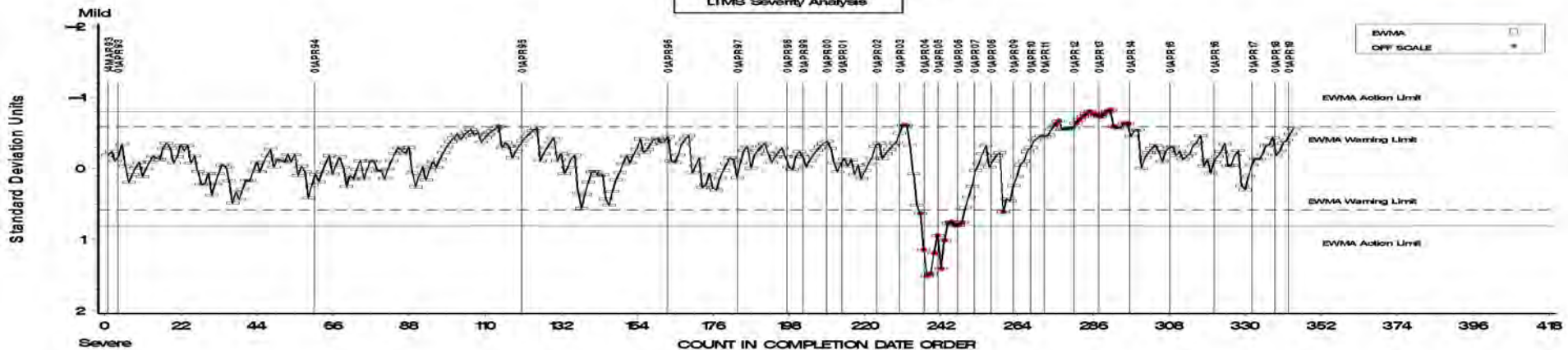


Weighted Total Demerits

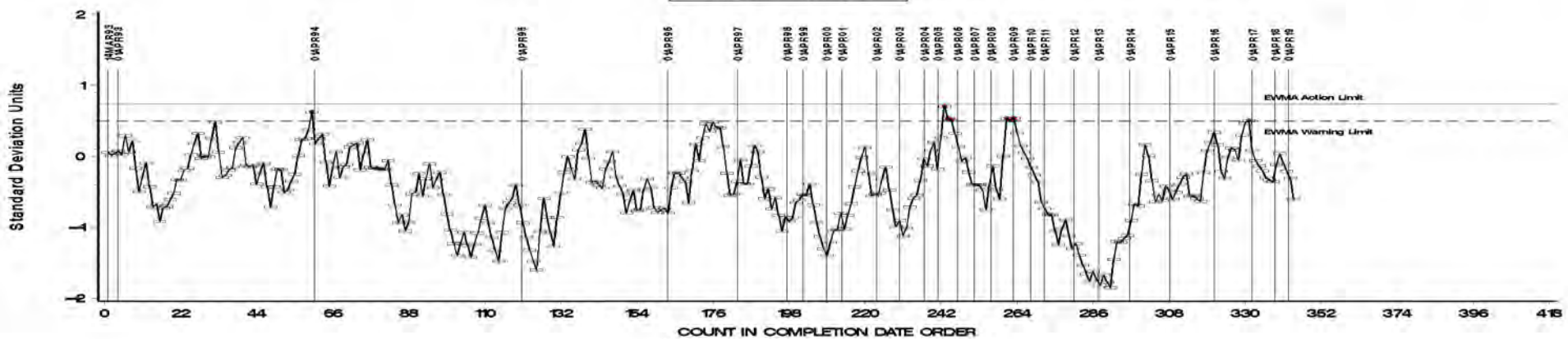


Top Land Heavy Carbon

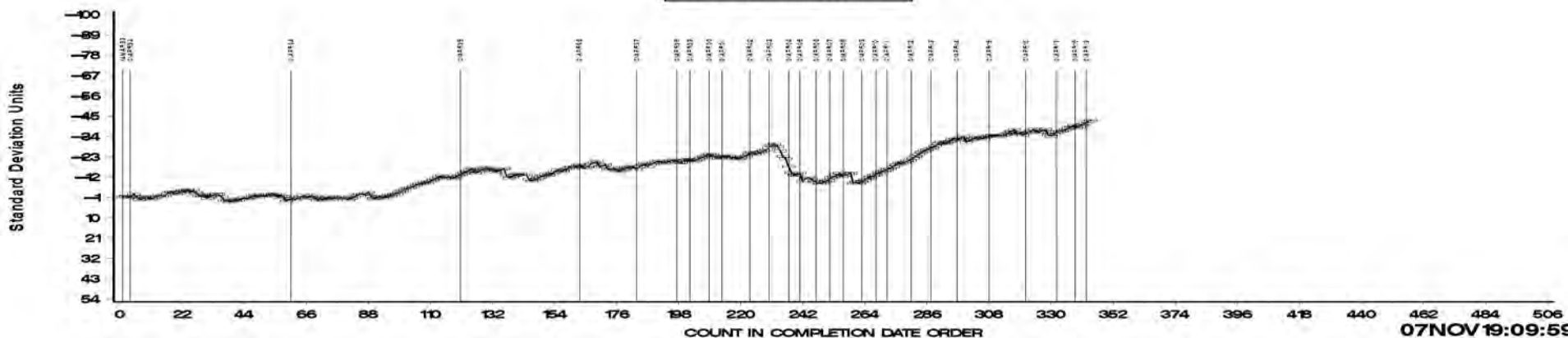
LTMS Severity Analysis



LTMS Precision Analysis



CUSUM Severity Analysis

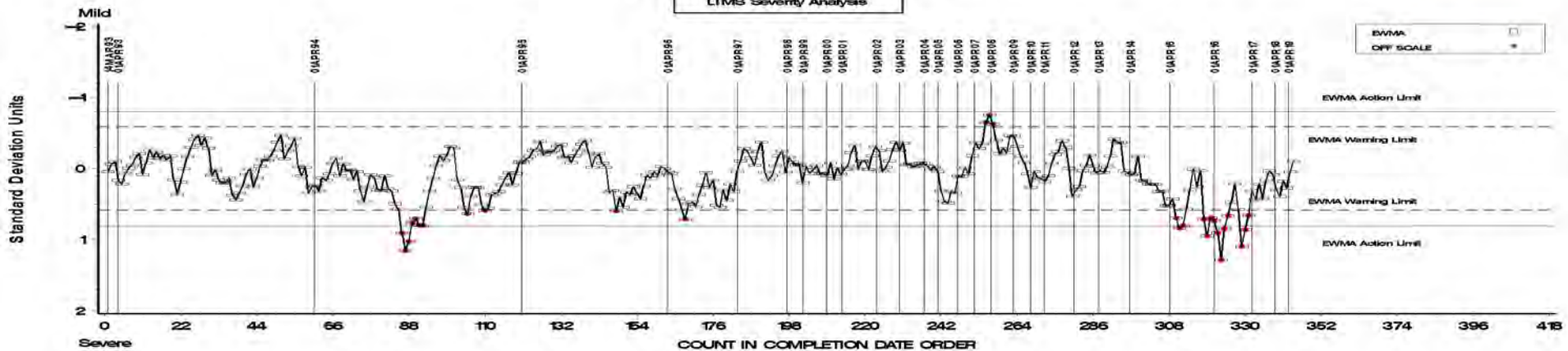


CATERPILLAR IN INDUSTRY OPERATIONALLY VALID DATA

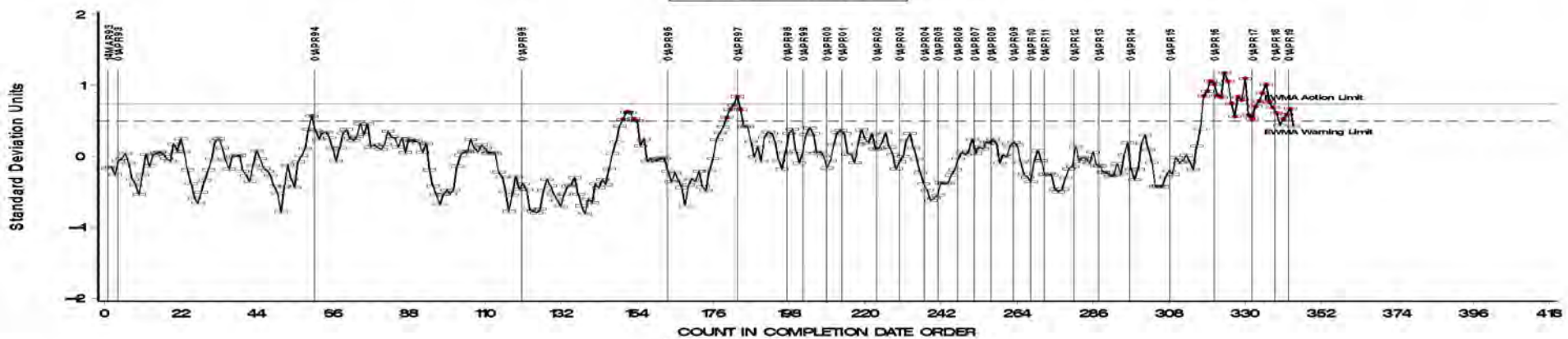


FINAL CORRECTED TGF

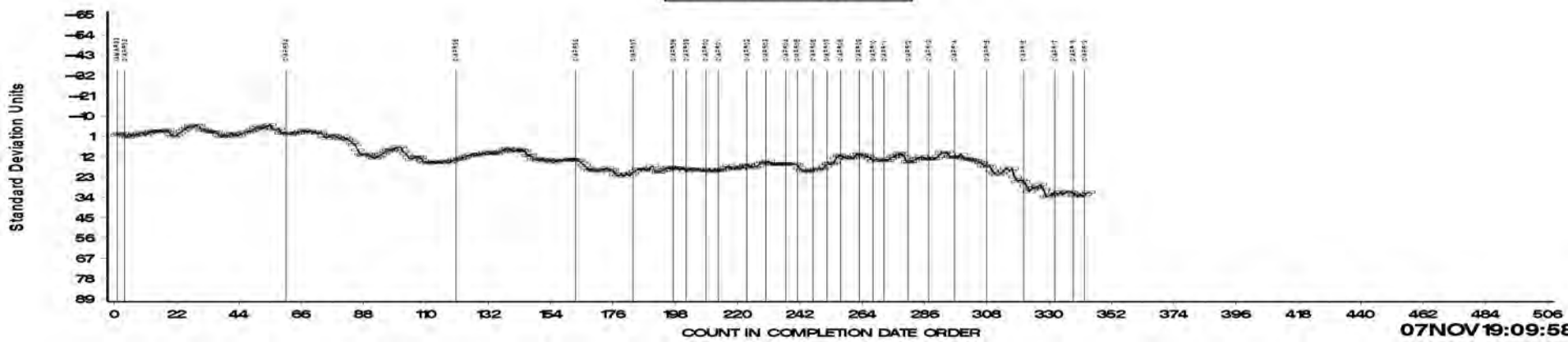
LTMS Severity Analysis



LTMS Precision Analysis



CUSUM Severity Analysis

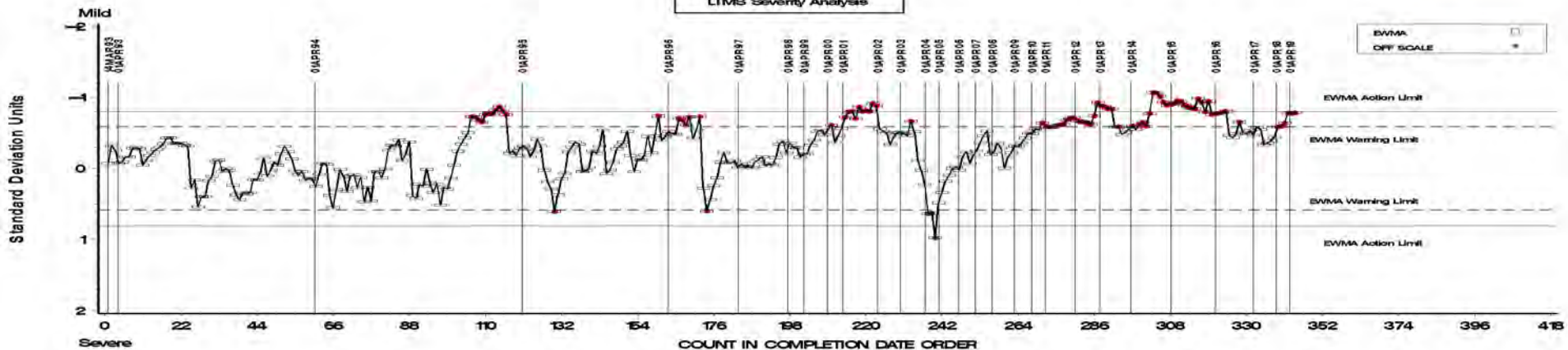


CATERPILLAR IN INDUSTRY OPERATIONALLY VALID DATA

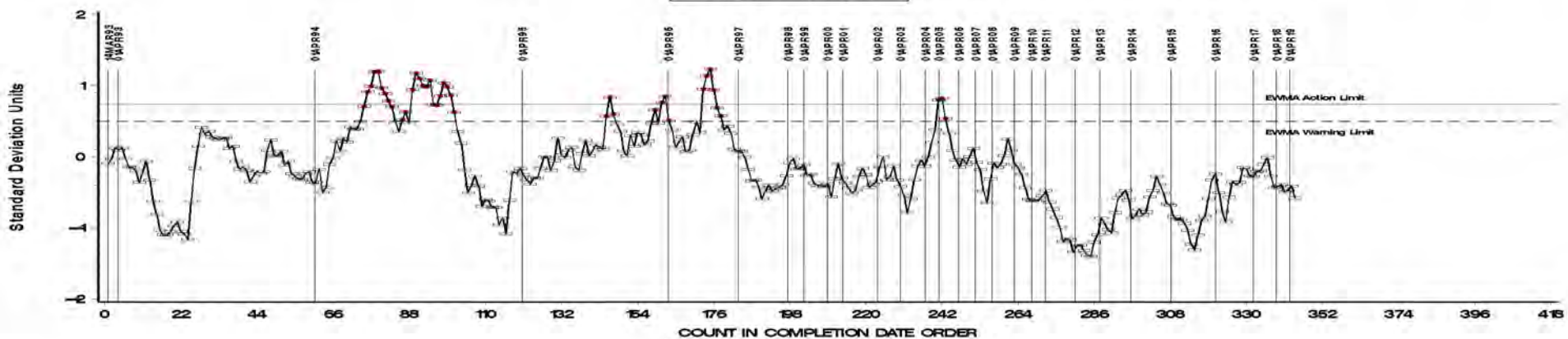


BSOC

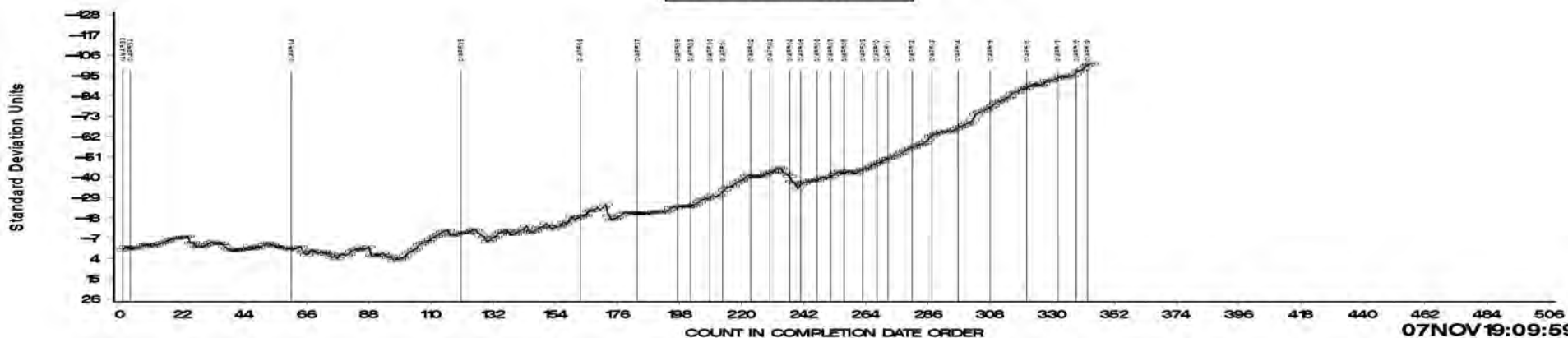
LTMS Severity Analysis



LTMS Precision Analysis

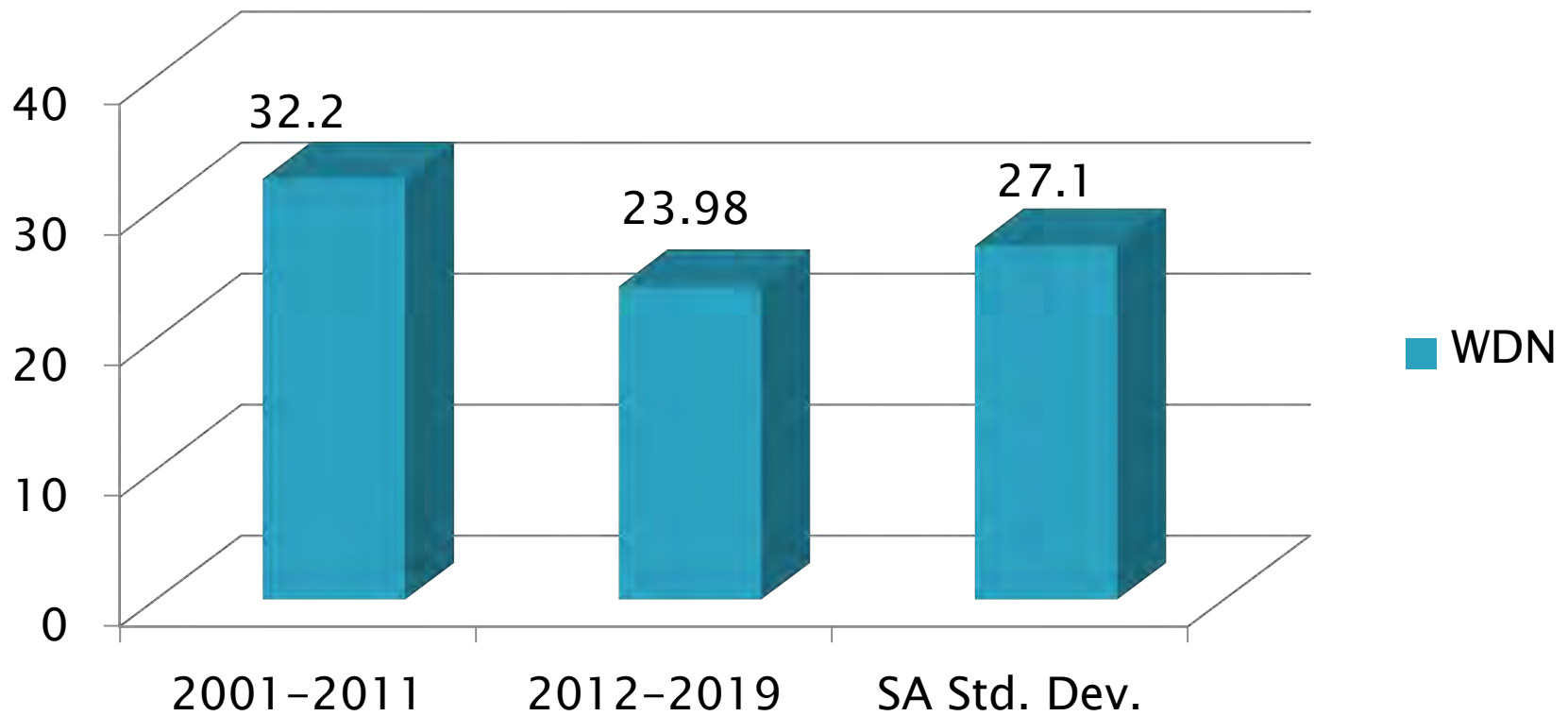


CUSUM Severity Analysis

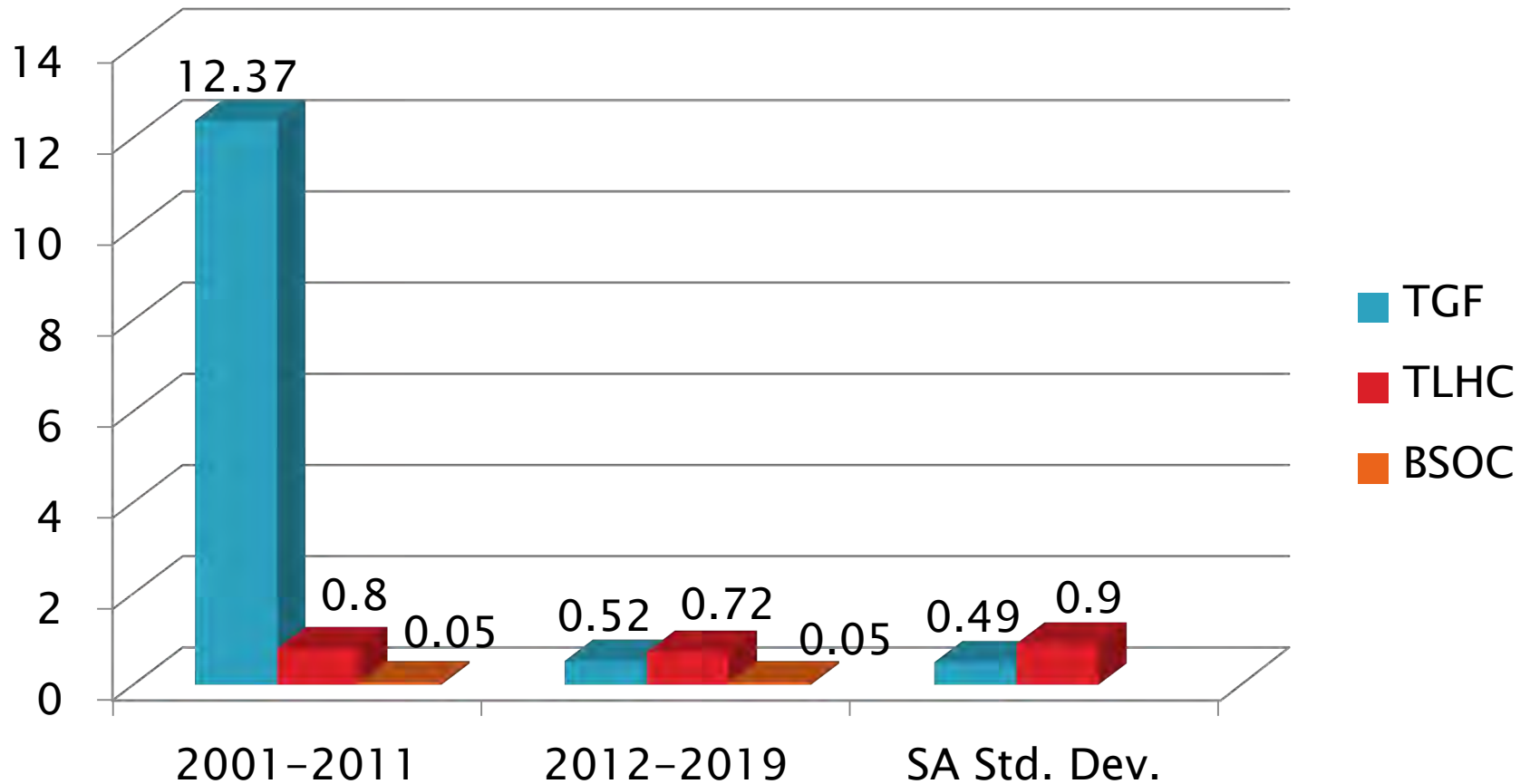


1 N Precision Estimates

WDN



1N Precision Estimates



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SCOTE 1 M-PC

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1 M-PC Test Activity

Test Status	Validity Code	#
Acceptable Calibration Test	AC	1
Failed Calibration Test	OC	0
Operationally Invalid	LC	0
Total		1

1 M-PC Failed Tests

Failed Parameter	Number of Tests
No Failed Test	0
Total	0

1 M-PC Lost Tests*

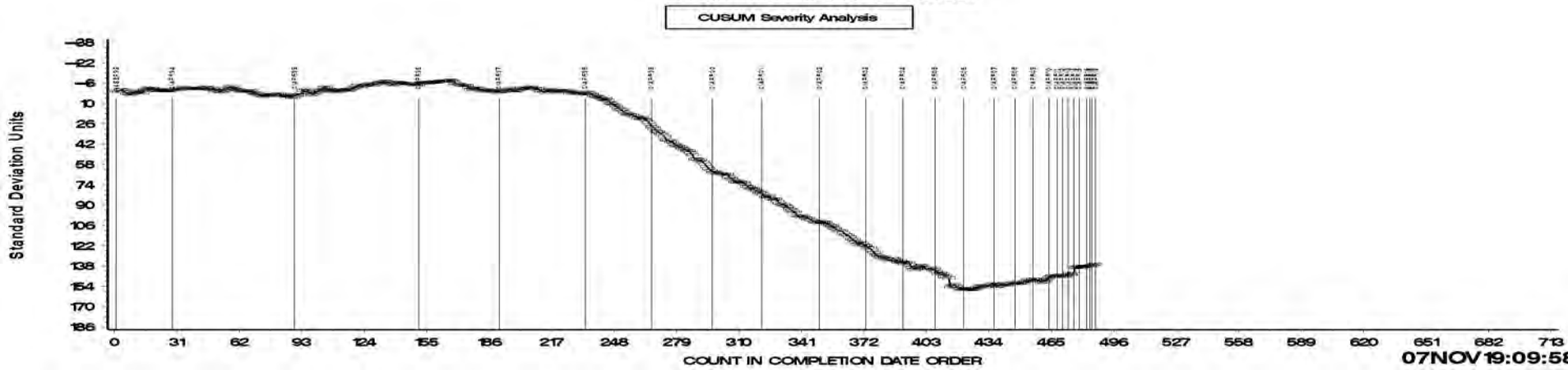
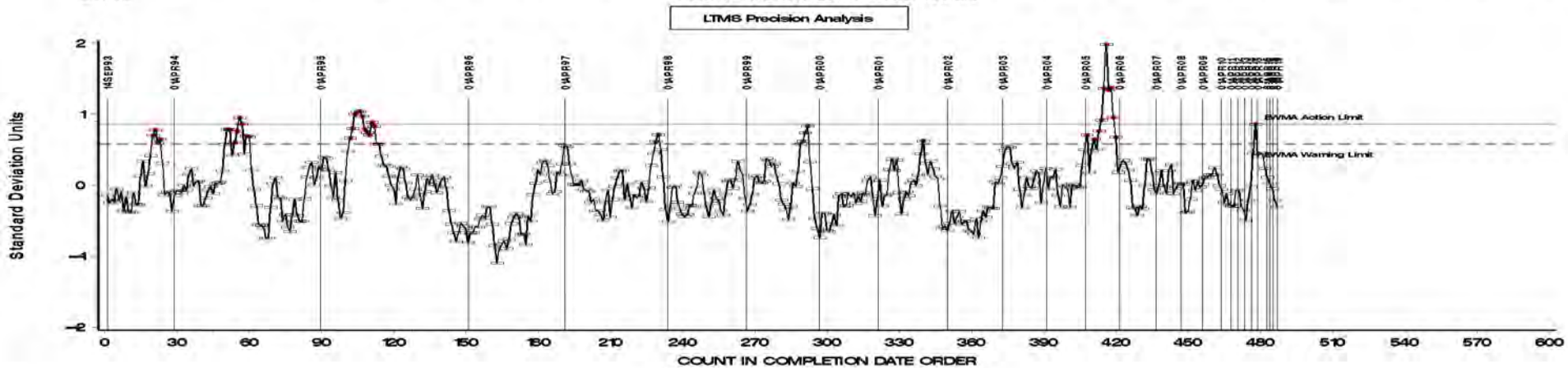
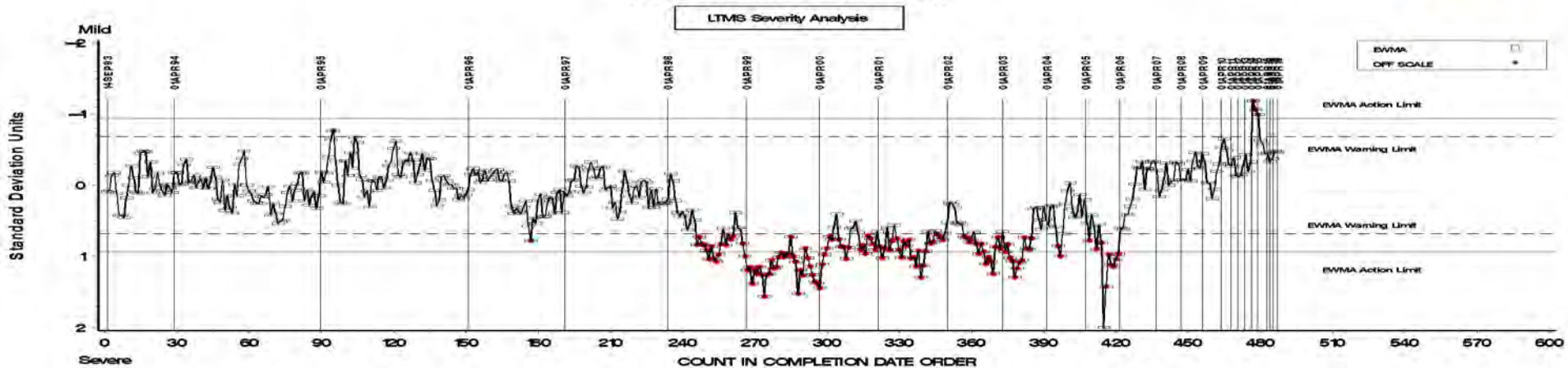
Status	Cause	#
Invalid	No invalid tests	0
Aborted	No aborted tests	0
Total		0

*Invalid and aborted tests

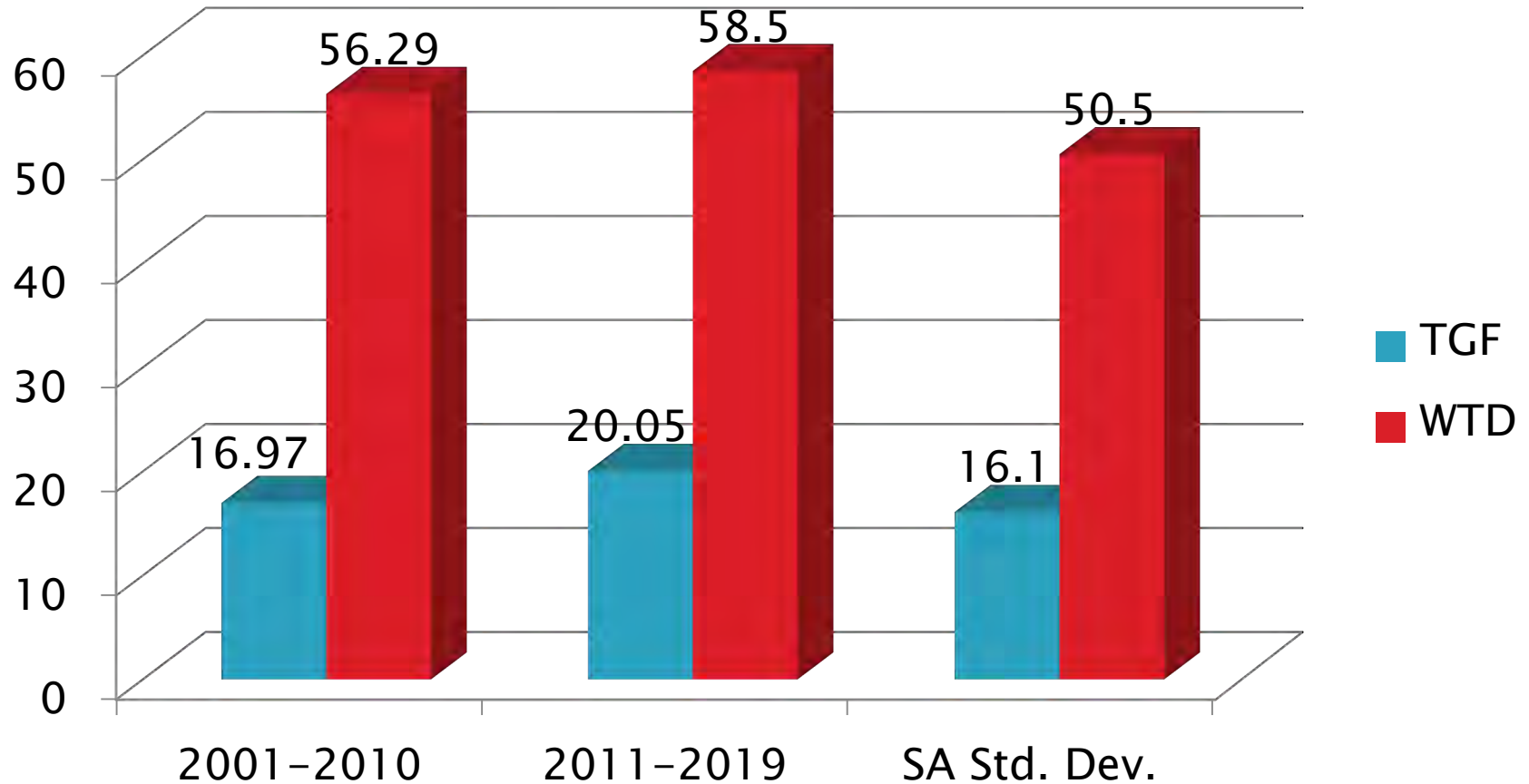
1 M-PC Test Severity

- ▶ TGF and WTD are in control.

Weighted Total Demerits



1 MPC Precision Estimates



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SCOTE 1 P

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1P Test Activity

Test Status	Validity Code	#
Acceptable Calibration Test	AC	2
Failed Calibration Test	OC	0
Operationally Invalid	LC	1
Aborted	XC	0
Donated	AG	0
Total		3

1 P Failed Tests

Failed Parameter	Number of Tests
No failed tests	0
Total	0

1 P Lost Tests*

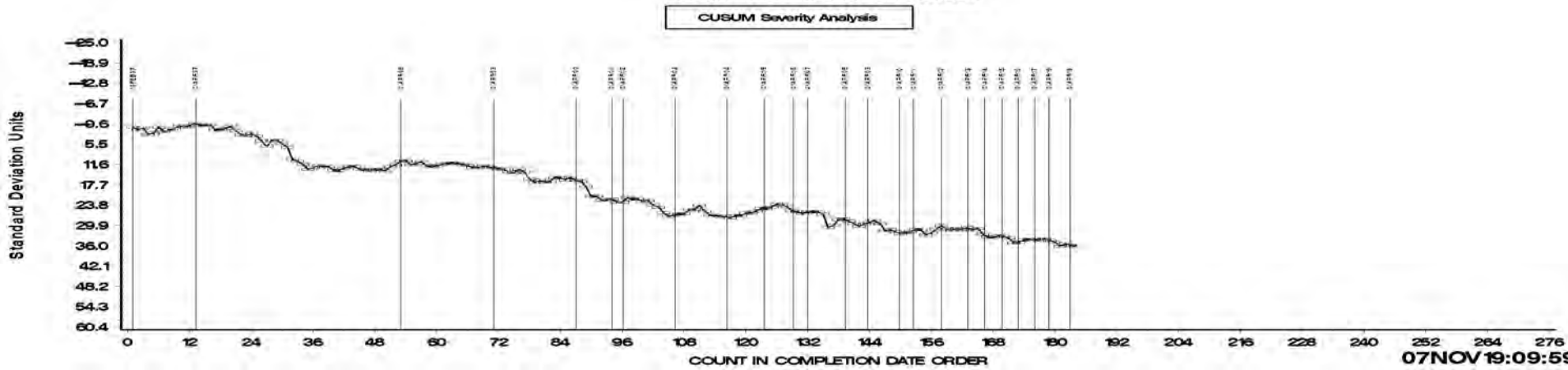
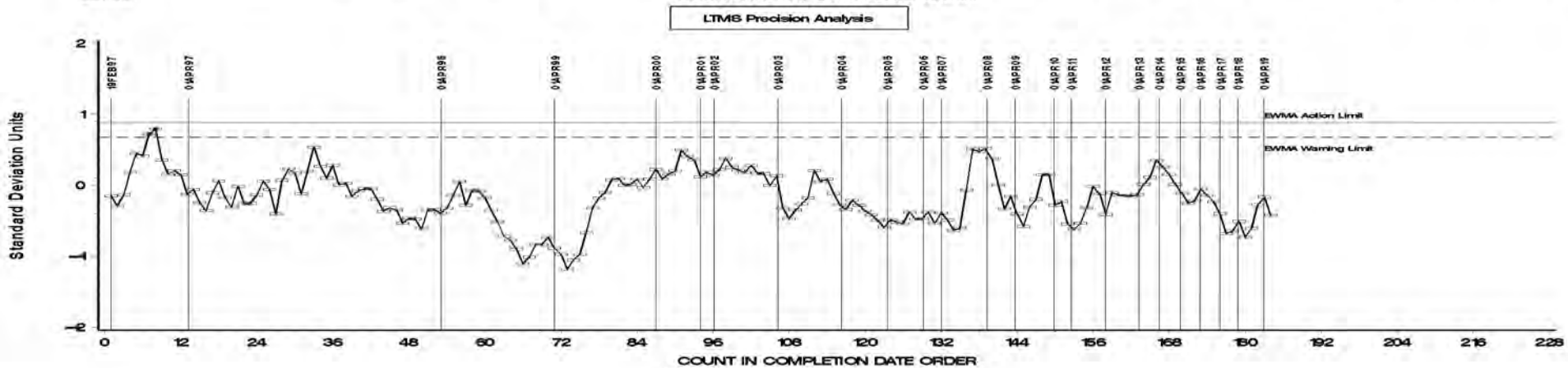
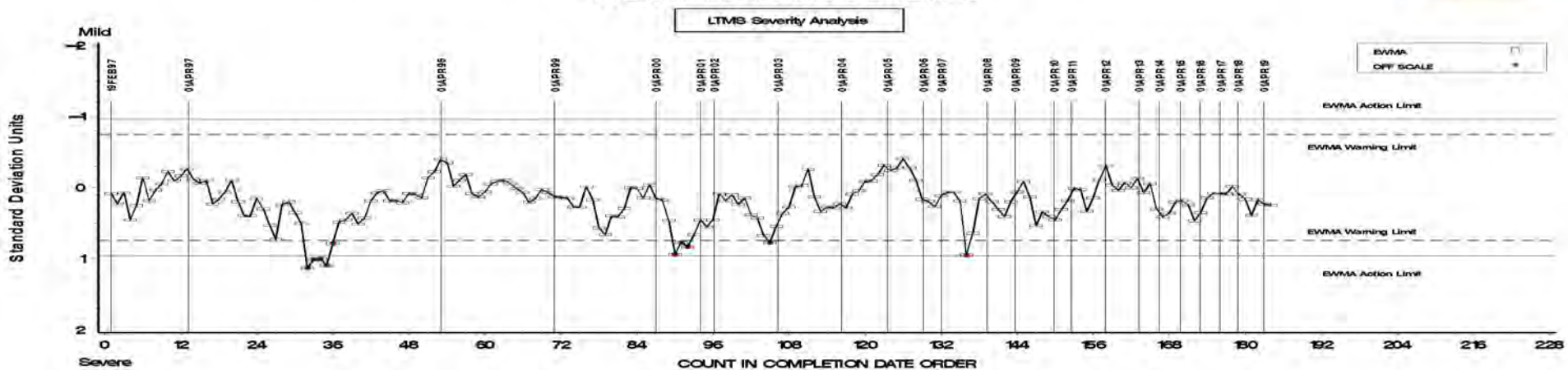
Status	Cause	#
Invalid	High oil consumption	1
Aborted	No aborted test	0
Total		1

*Invalid and aborted tests

1 P Test Severity

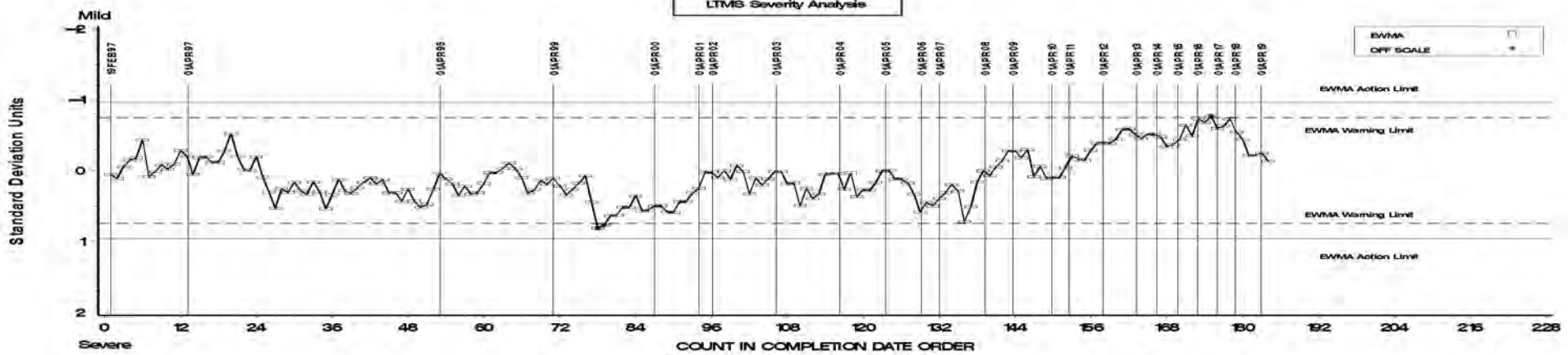
- ▶ WD, TGC, TLC and OC are in control
- ▶ ETOC in action alarm in the severe direction

WEIGHTED TOTAL DEMERITS

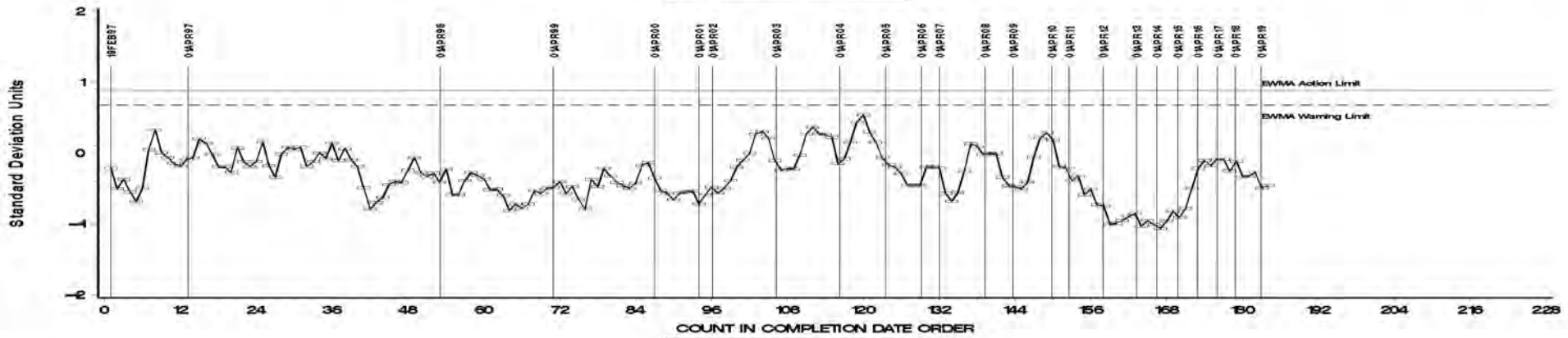


TOP LAND CARBON

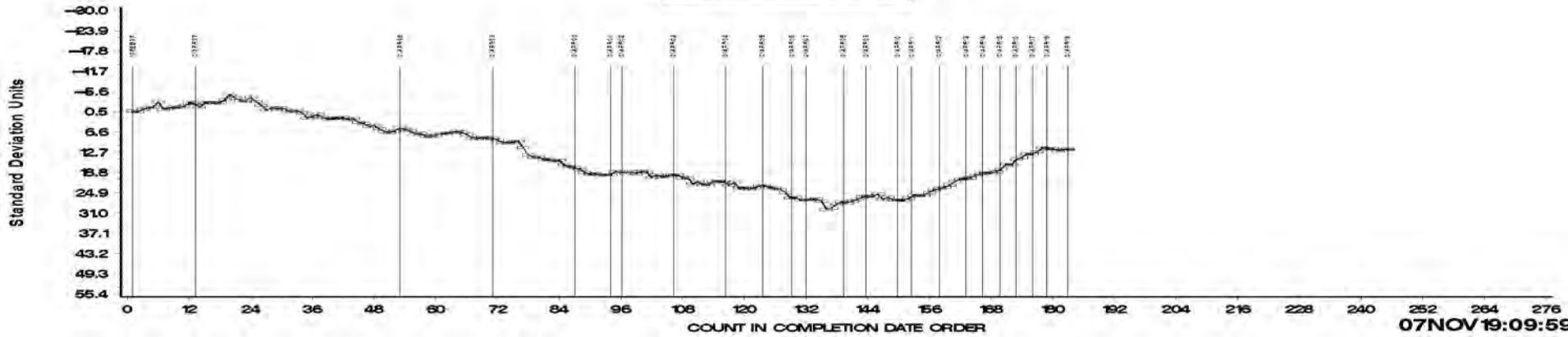
LTMS Severity Analysis



LTMS Precision Analysis

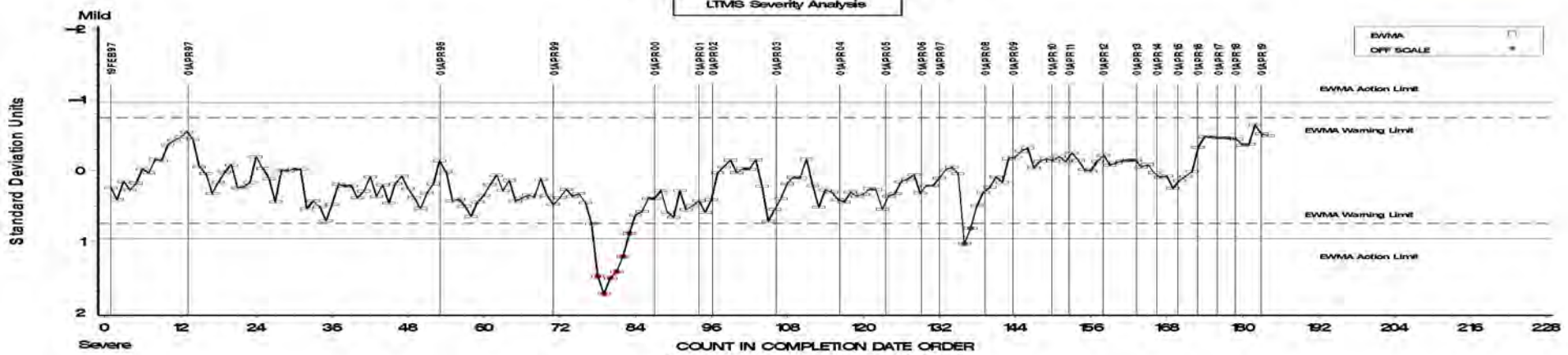


CUSUM Severity Analysis

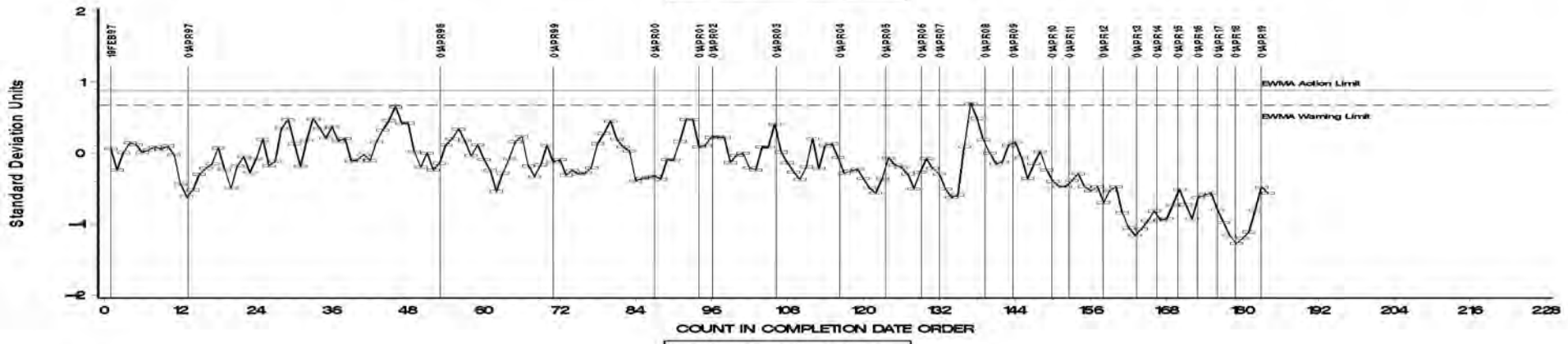


TOP GROOVE CARBON

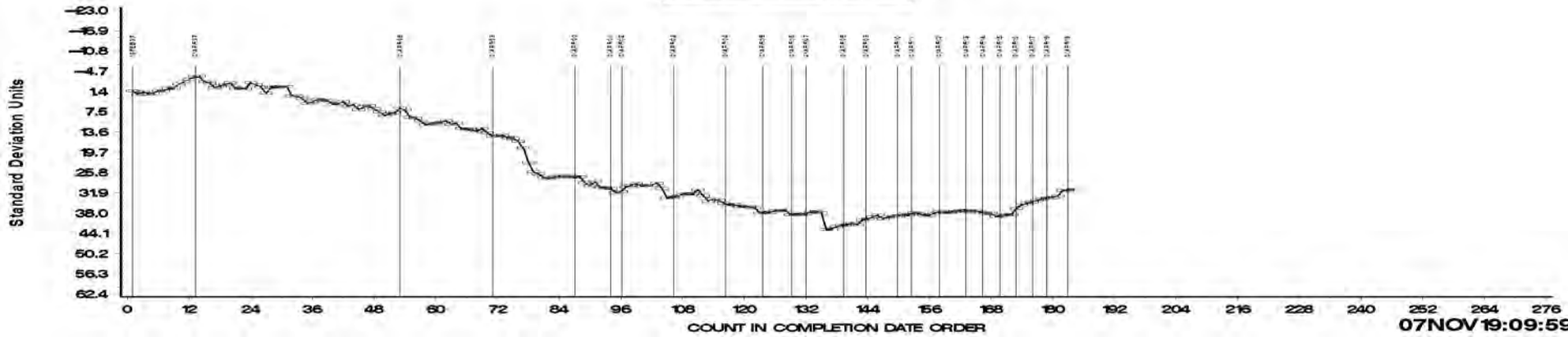
LTMS Severity Analysis



LTMS Precision Analysis

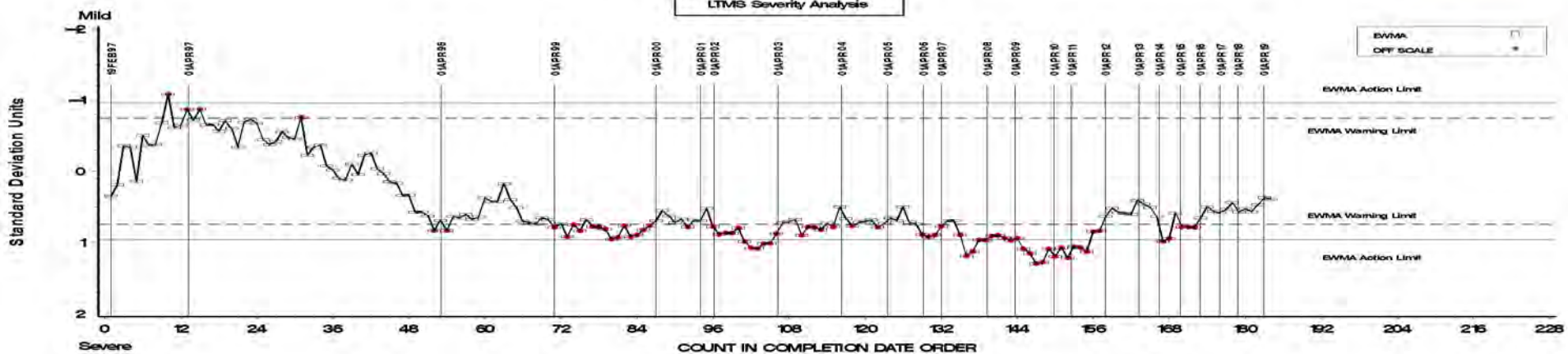


CUSUM Severity Analysis

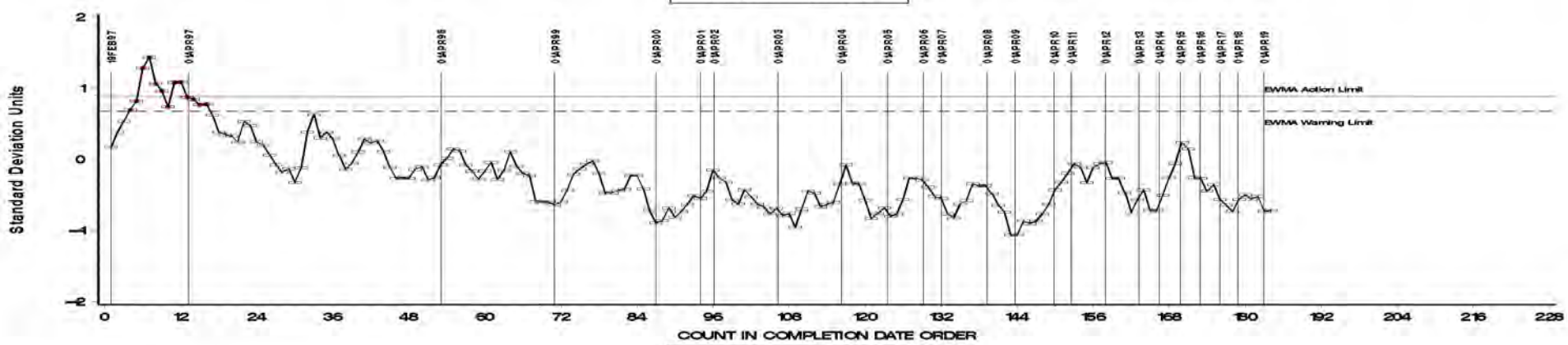


OIL CONSUMPTION

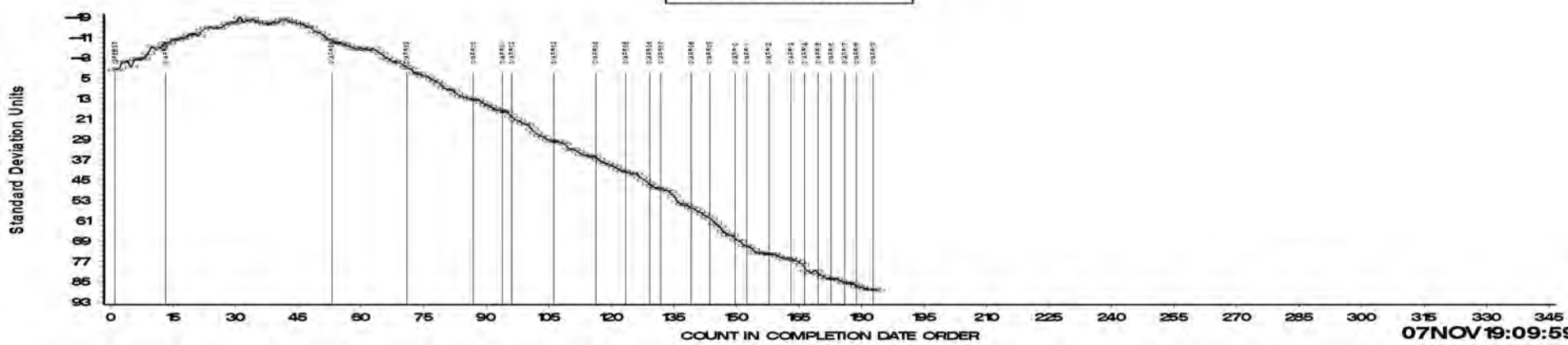
LTMS Severity Analysis



LTMS Precision Analysis



CUSUM Severity Analysis

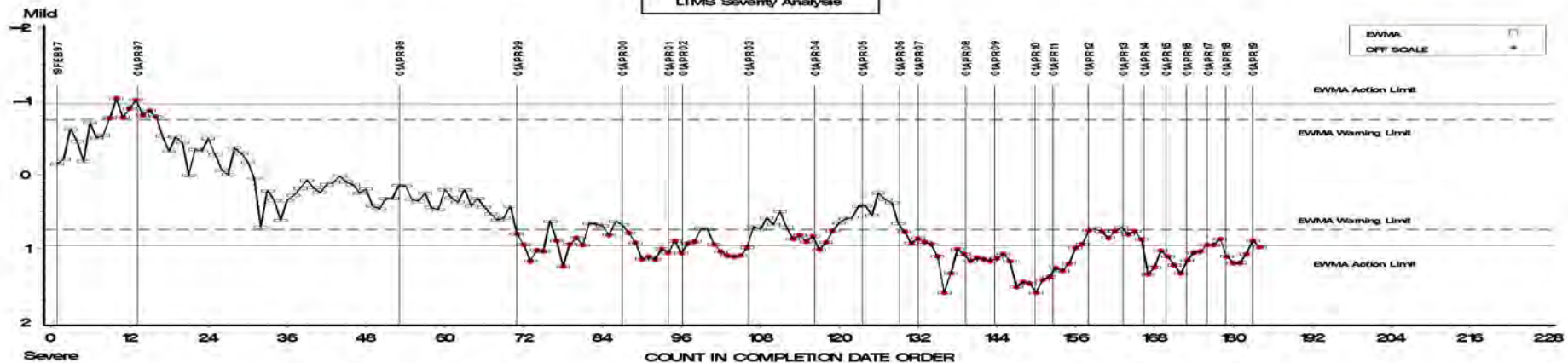


CATERPILLAR 1P INDUSTRY OPERATIONALLY VALID DATA

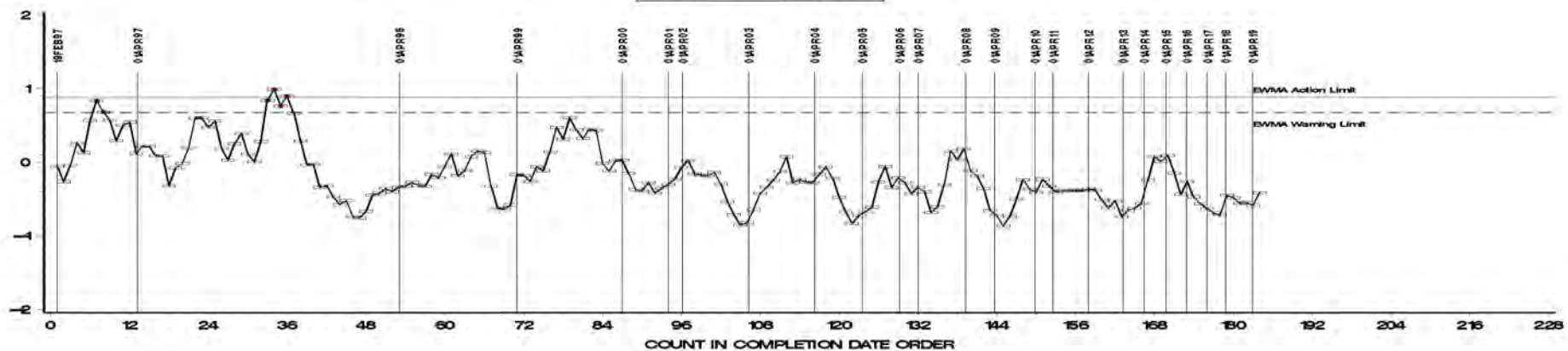


EOTOC

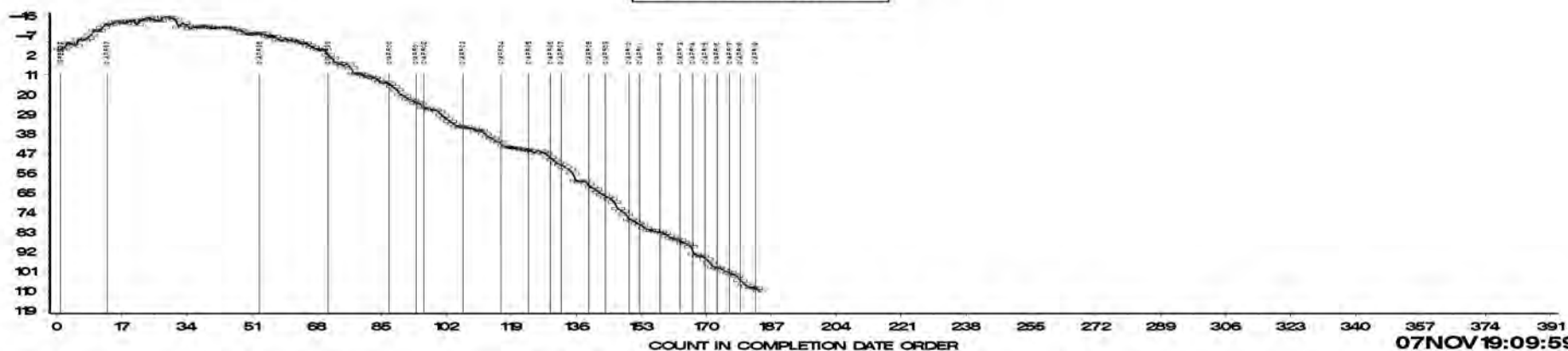
LTMS Severity Analysis



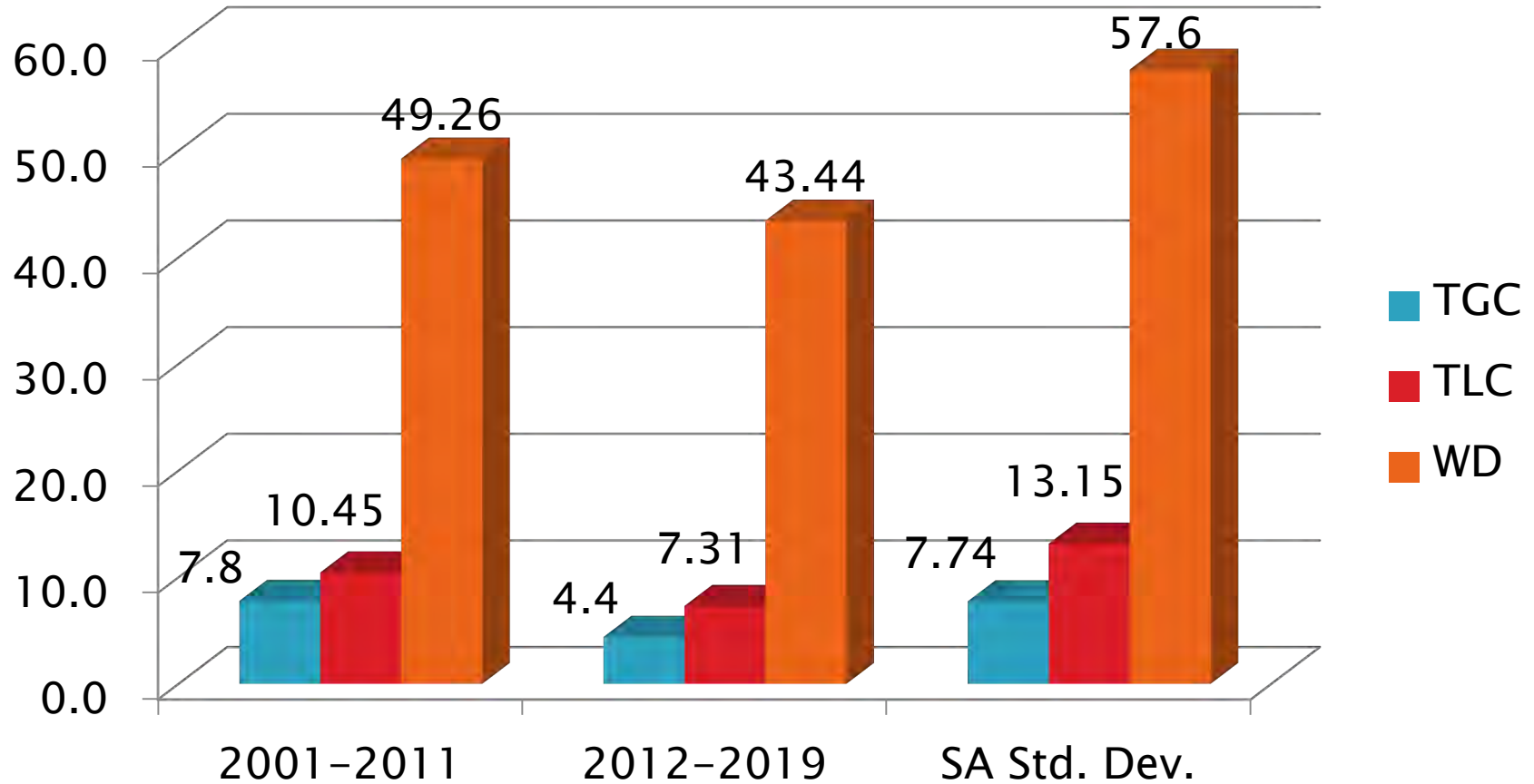
LTMS Precision Analysis



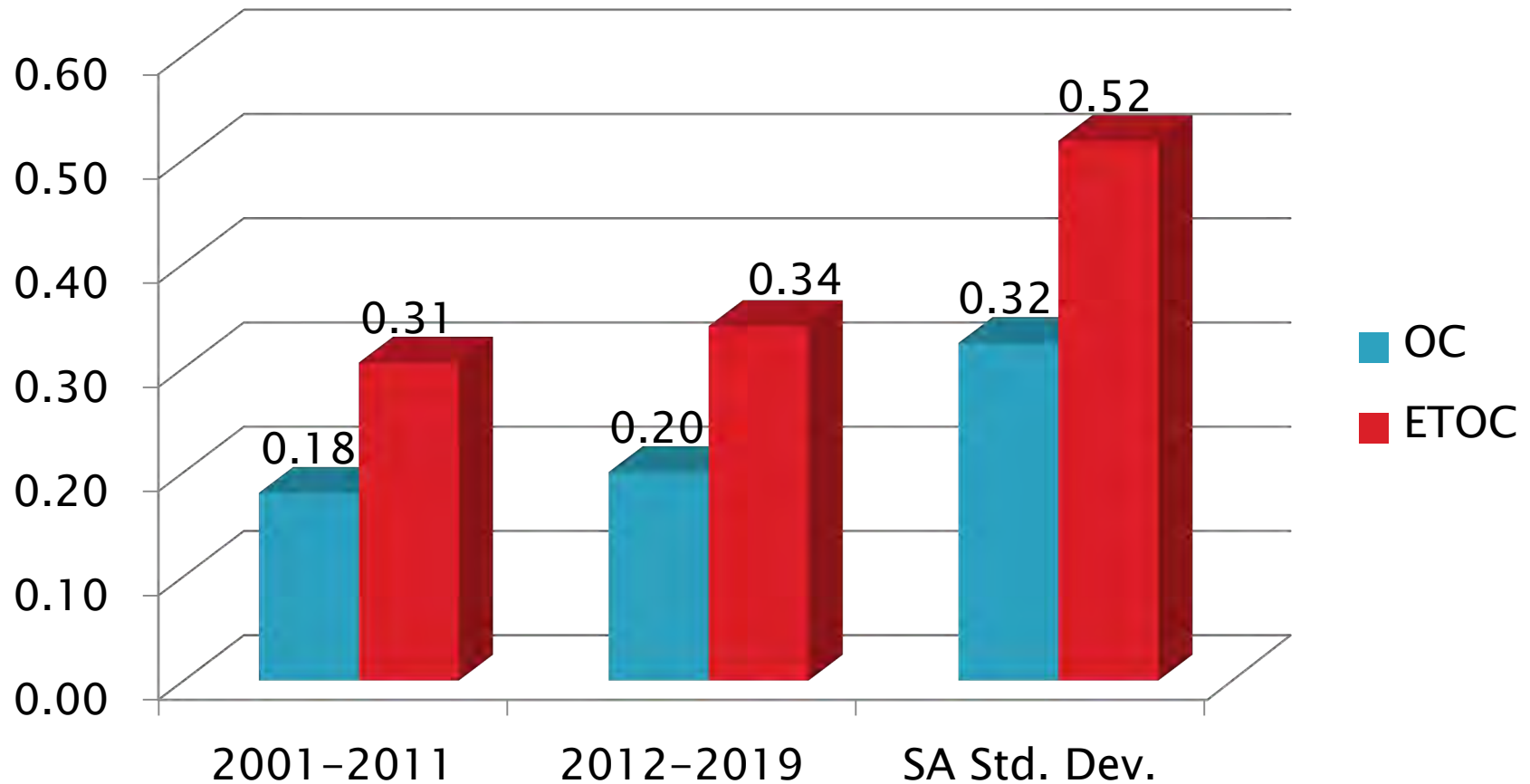
CUSUM Severity Analysis



1P Precision Estimates



1P Precision Estimates



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SCOTE 1 R

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1 R Test Activity

Test Status	Validity Code	#
Acceptable Calibration Test	AC	0
Failed Calibration Test	OC	0
Operationally Invalid	LC	0
Aborted	XC	0
Total		0

1 R Failed Tests

Failed Parameter	Number of Tests
No failed tests	0
Total	0

1 R Lost Tests*

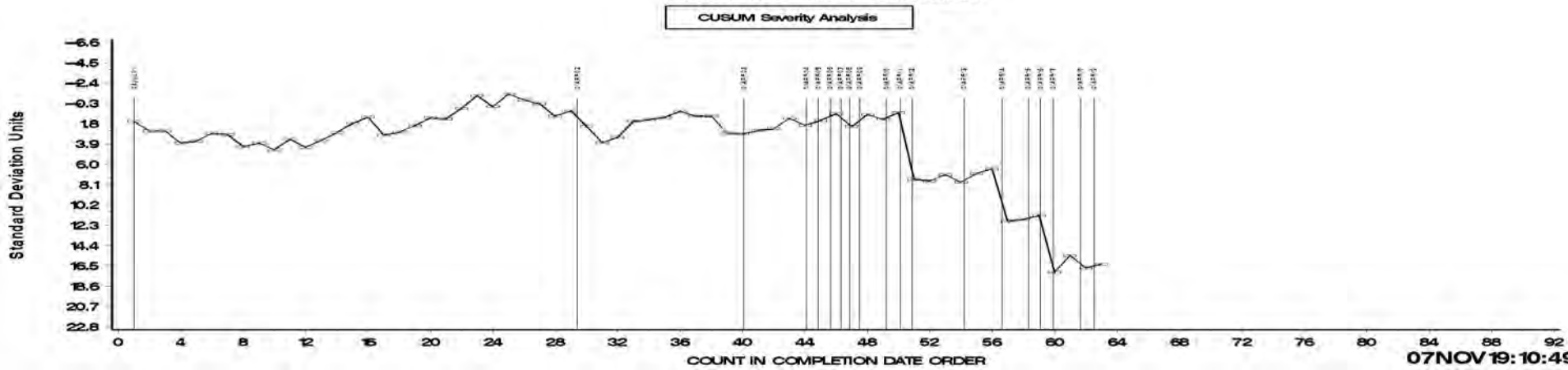
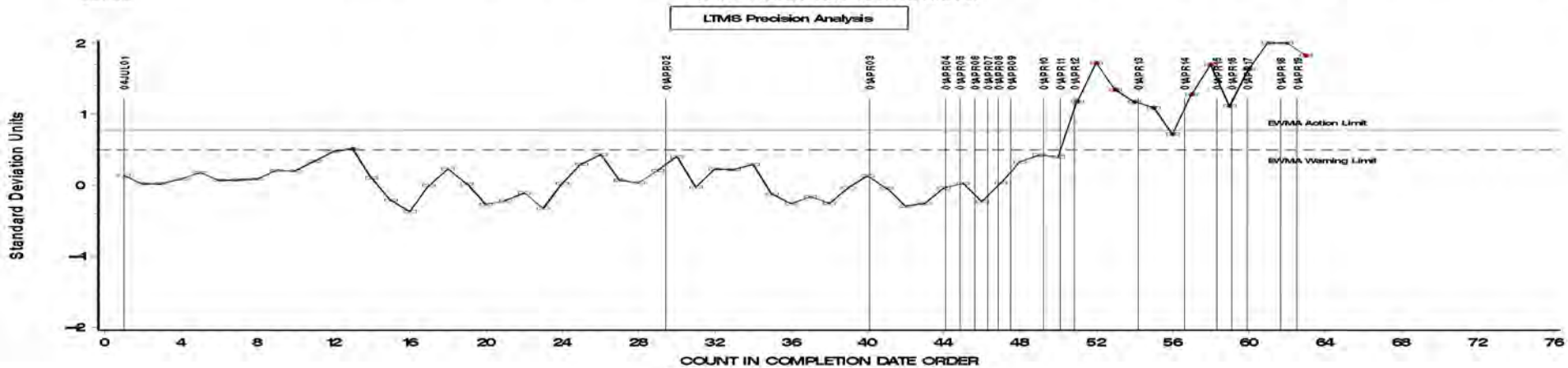
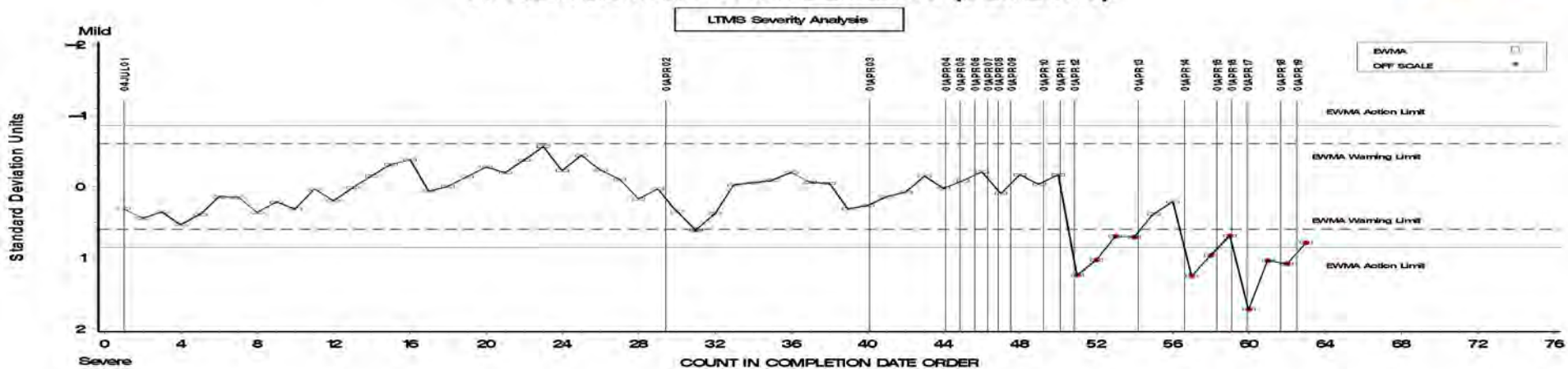
Status	Cause	#
Invalid	No invalid tests	0
Aborted	No aborted tests	0
Total		0

*Invalid and aborted tests

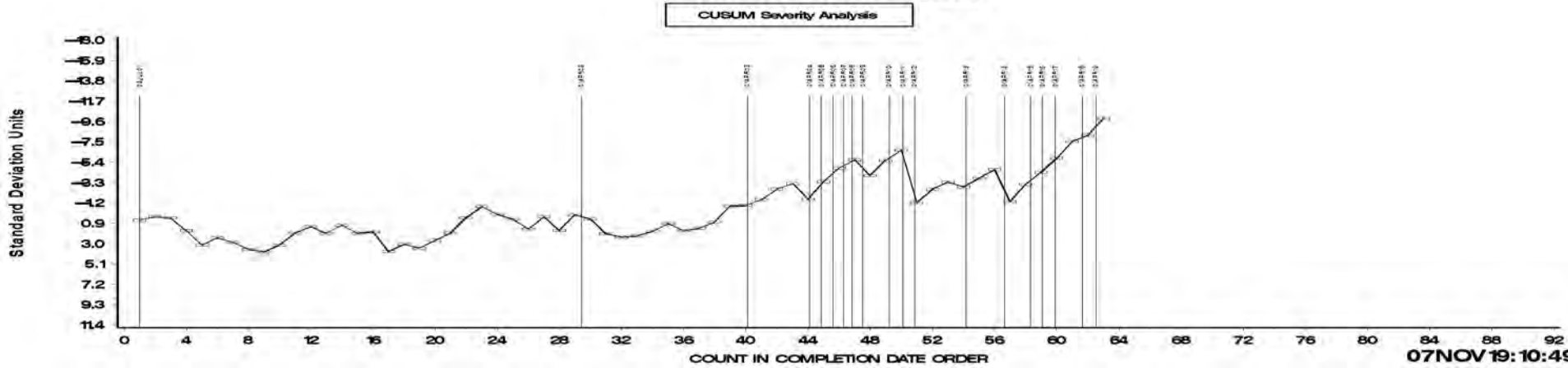
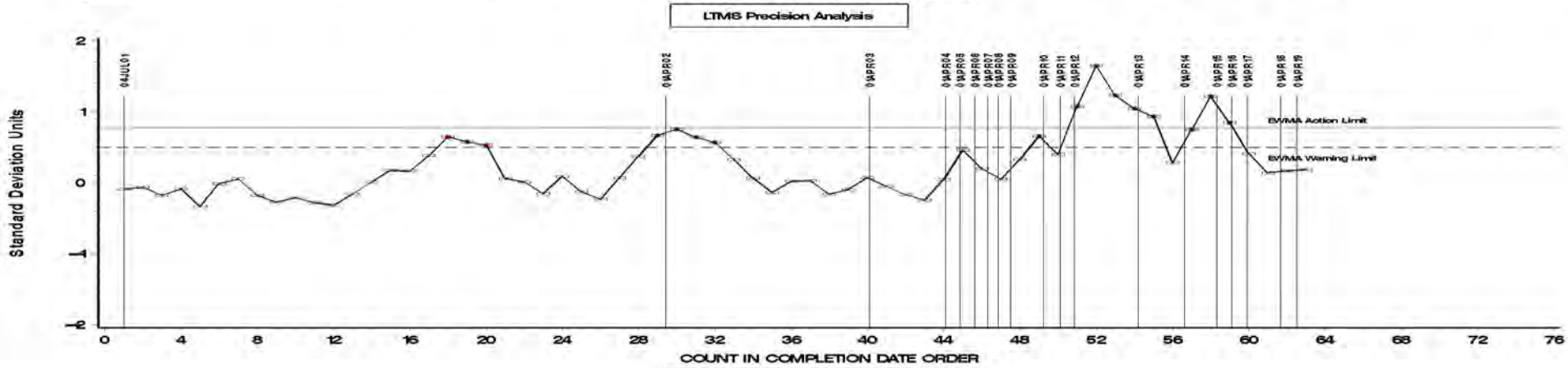
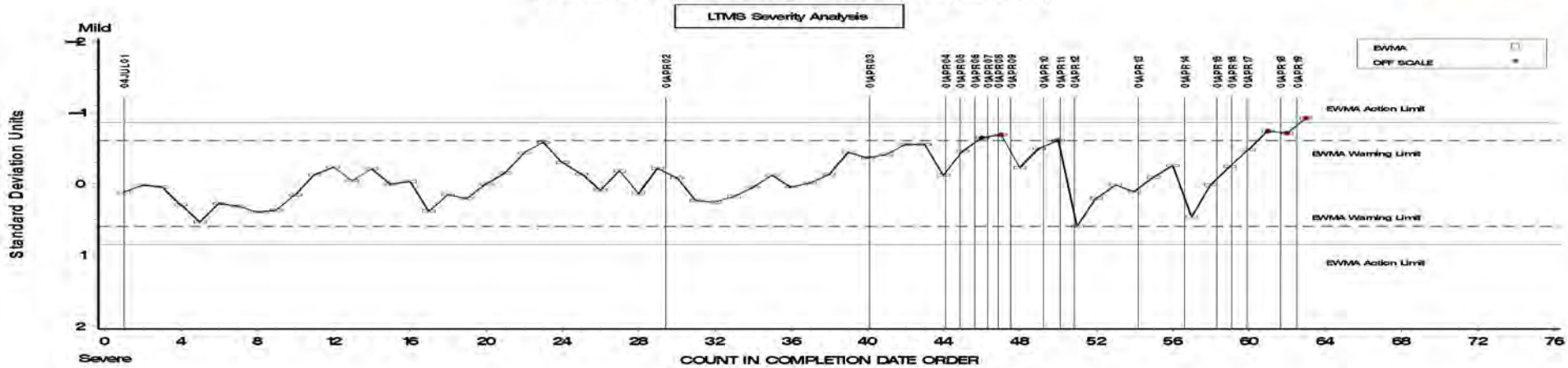
1R Test Severity

- ▶ As no 1R tests were run during this period no statement about test severity can be made.

FINAL WEIGHTED TOTAL DEMERITS (DEMERITS)



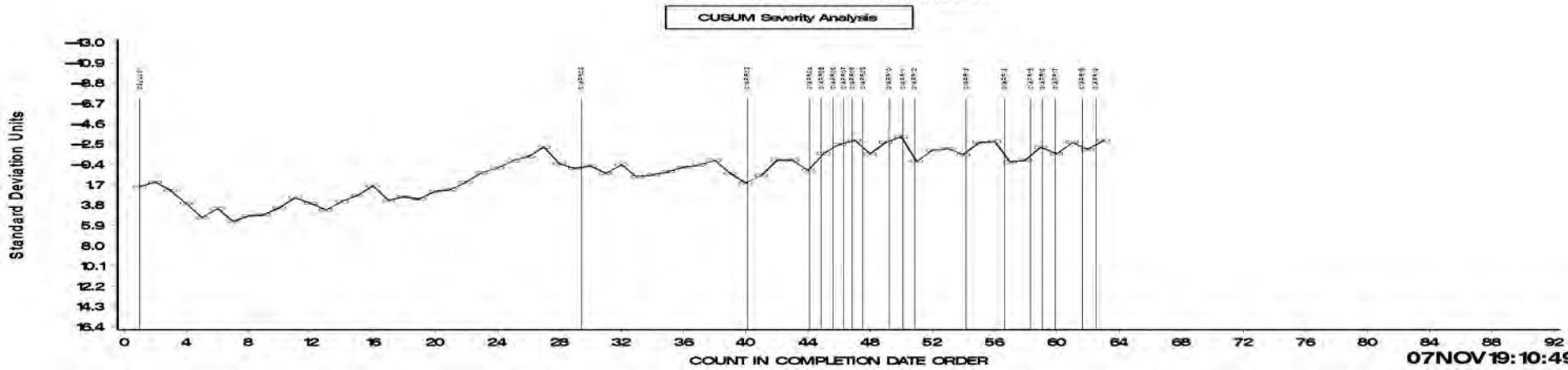
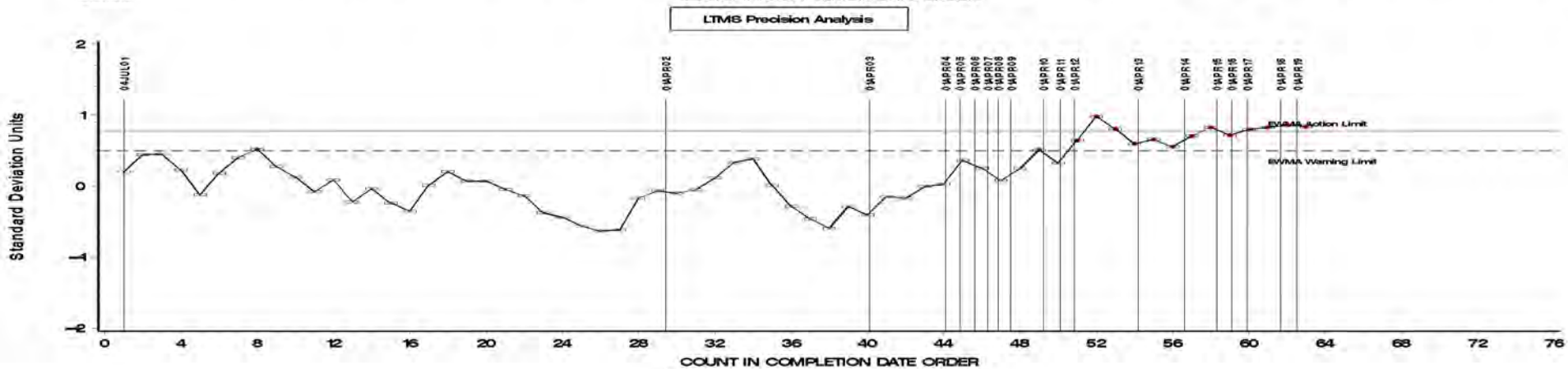
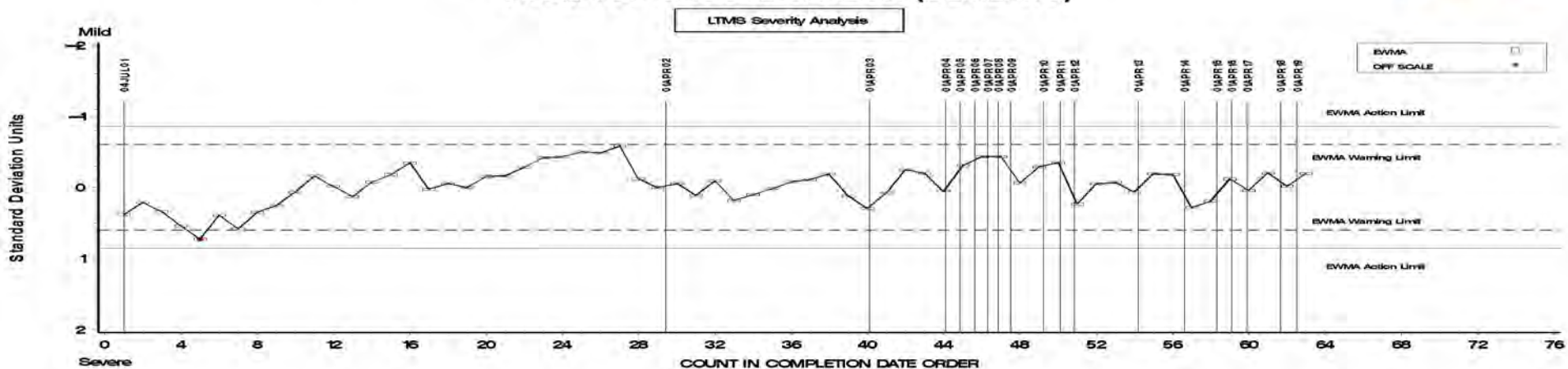
FINAL TOP LAND CARBON (DEMERITS)



CATERPILLAR 1R INDUSTRY OPERATIONALLY VALID DATA



FINAL TOP GROOVE CARBON (DEMERITS)

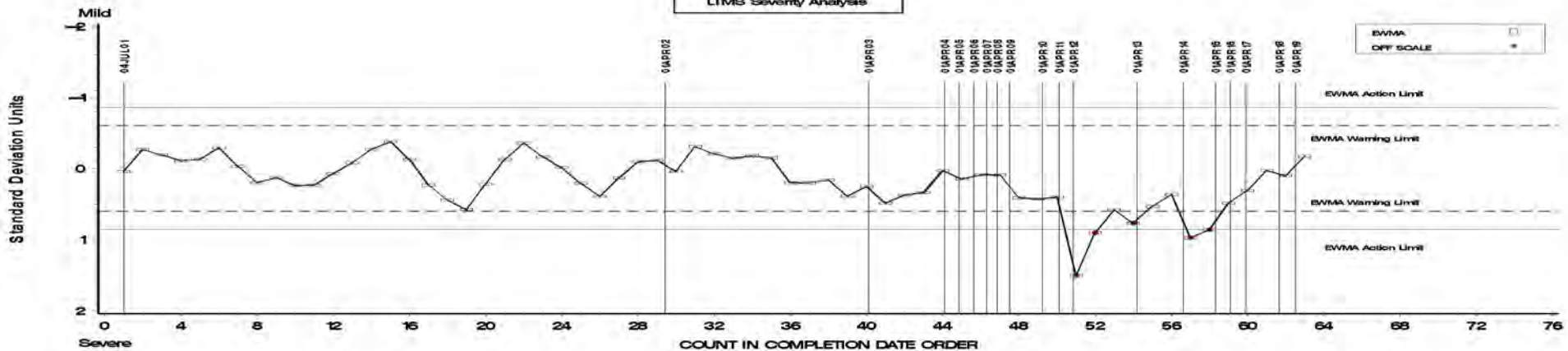


CATERPILLAR 1R INDUSTRY OPERATIONALLY VALID DATA

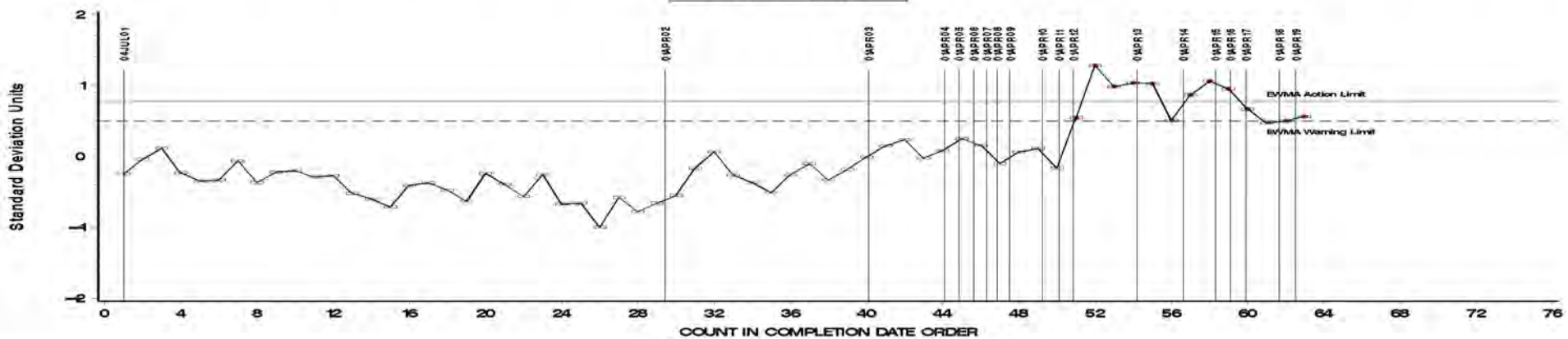


FINAL EOTOC (g/h)

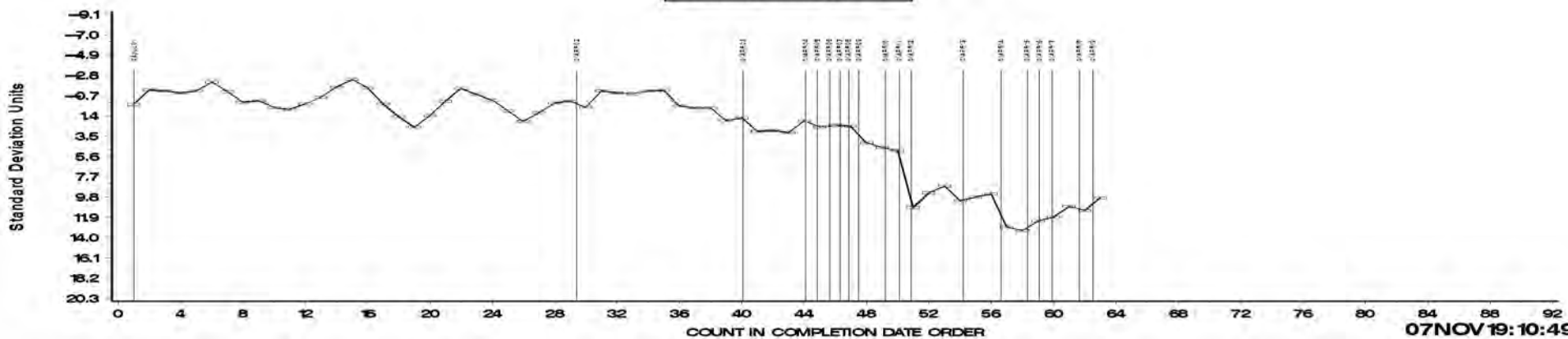
LTMS Severity Analysis



LTMS Precision Analysis



CUSUM Severity Analysis

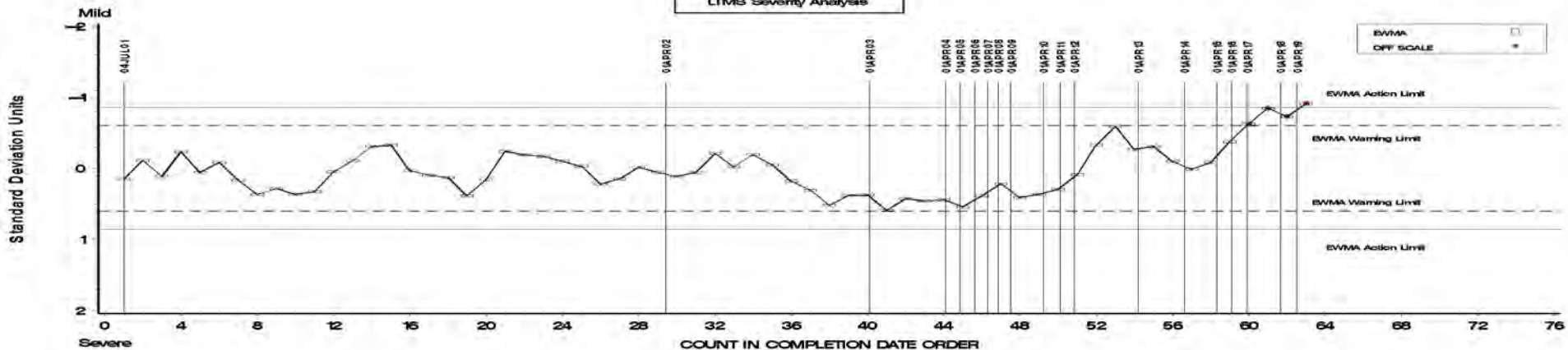


CATERPILLAR 1R INDUSTRY OPERATIONALLY VALID DATA

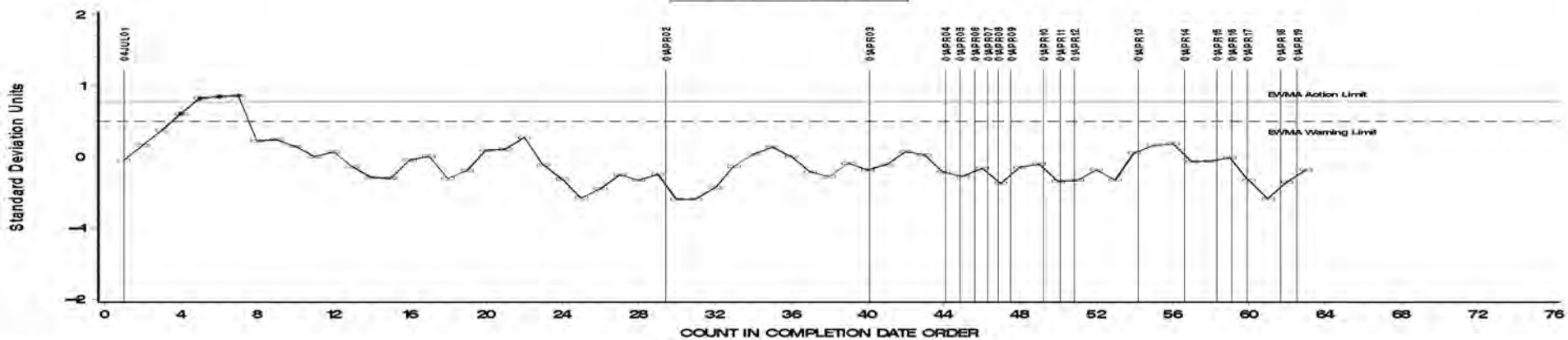


FINAL BOTOC

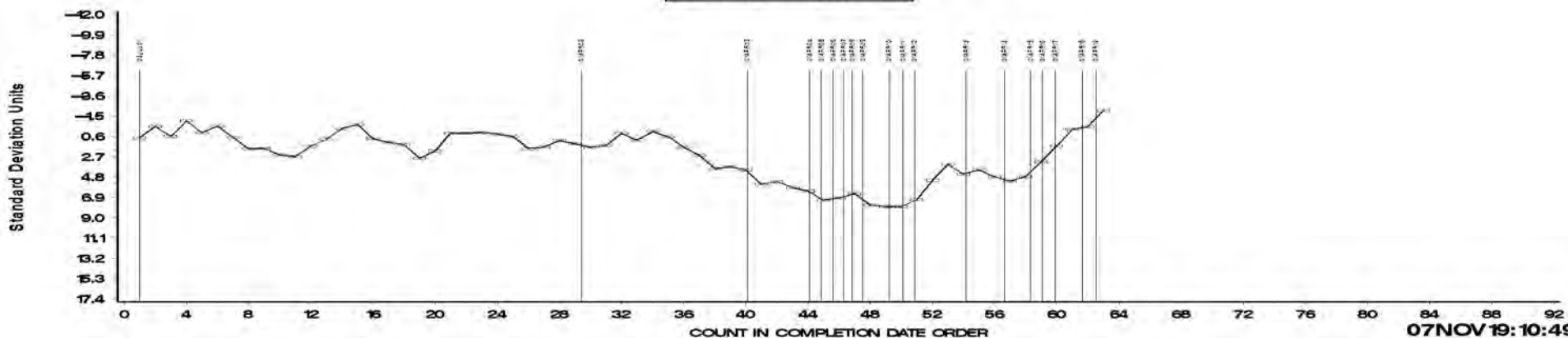
LTMS Severity Analysis



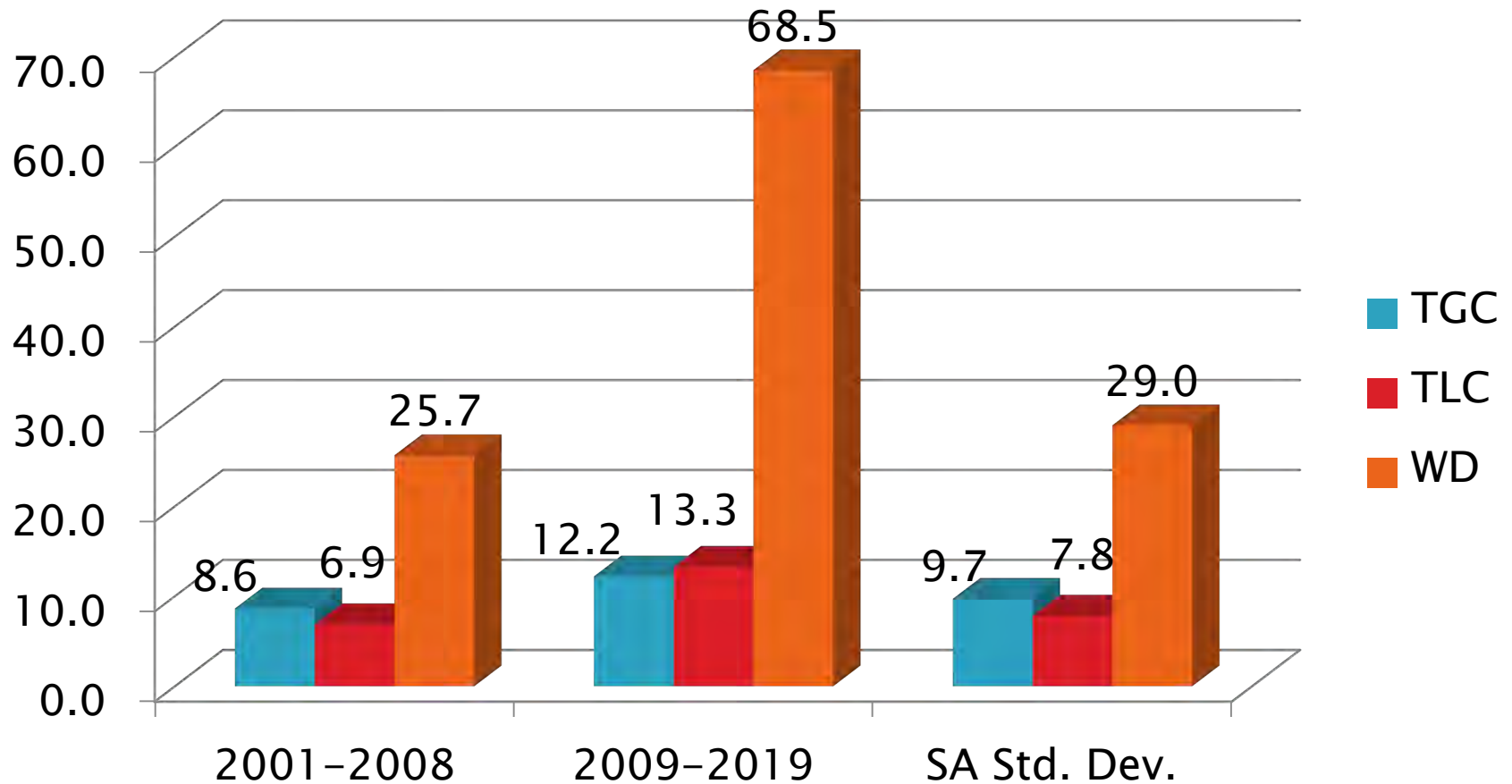
LTMS Precision Analysis



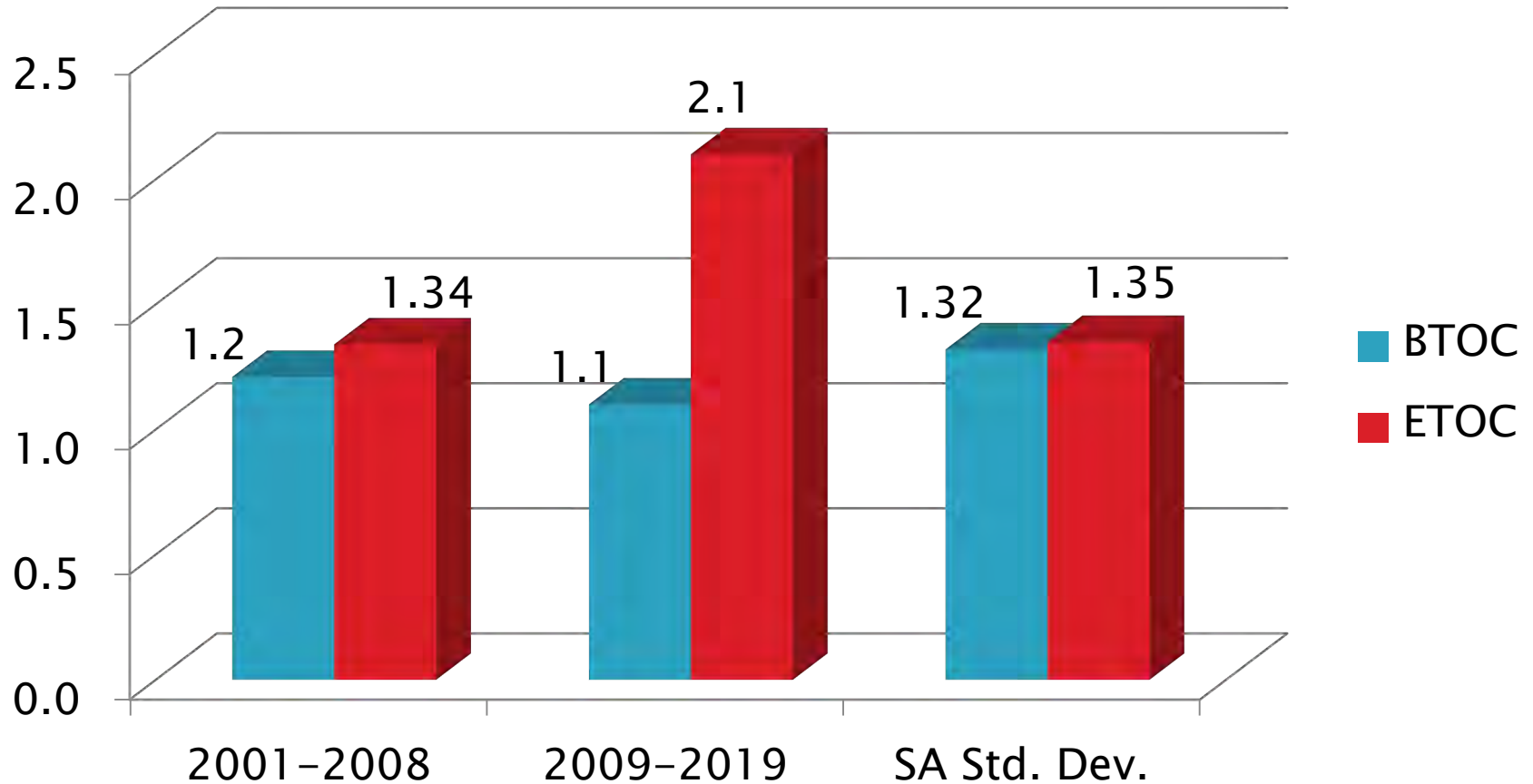
CUSUM Severity Analysis



1R Precision Estimates



1 R Precision Estimates



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CAT C13

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C13 Test Activity

Test Status	Validity Code	C13
Acceptable Calibration Test	AC	2
Failed Calibration Test	OC	0
Operationally Invalid	LC	0
Aborted	XC	0
Total		2

C13 Failed Tests

Failed Parameter	Number of Tests
No Failed Tests	0
Total	0

C13 Lost Tests*

Status	Cause	#
Invalid	No invalid tests	0
Aborted	No aborted tests	0
Total		0

*Invalid and aborted tests

C13 Test Severity

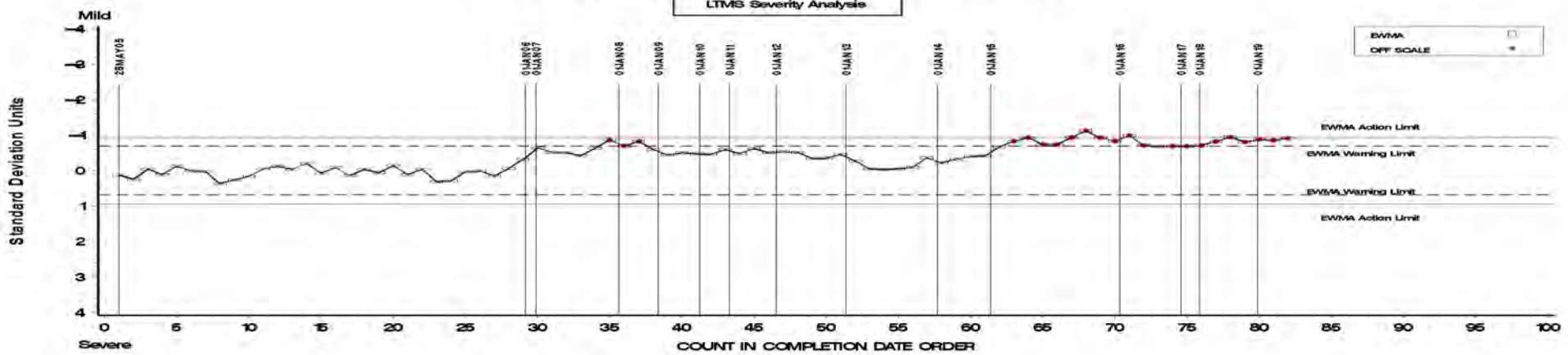
- ▶ TGC and OC are in control
- ▶ R2TC and TLC in severity warning alarm in the mild direction

C13 INDUSTRY OPERATIONALLY VALID DATA

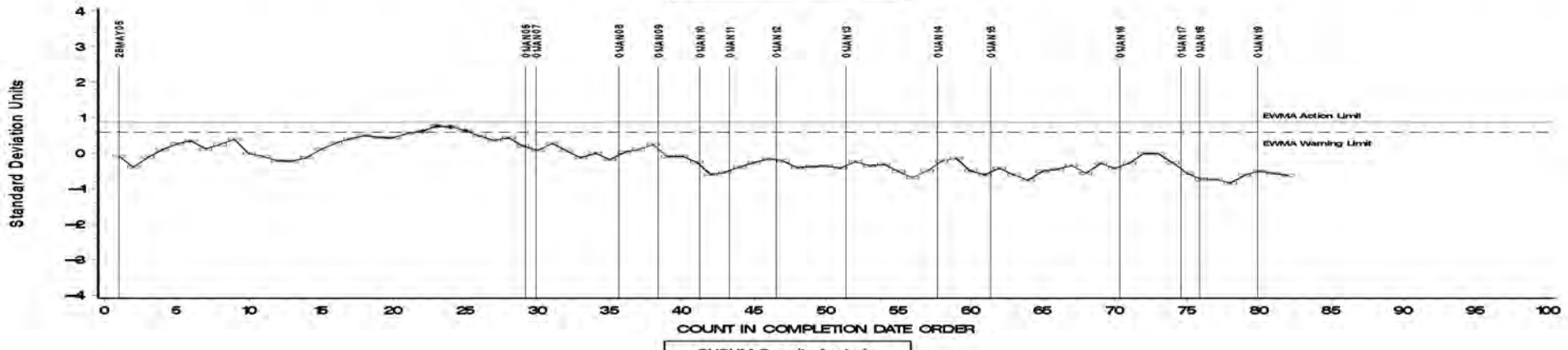


TOP LAND CARBON AVG. — FINAL RESULT

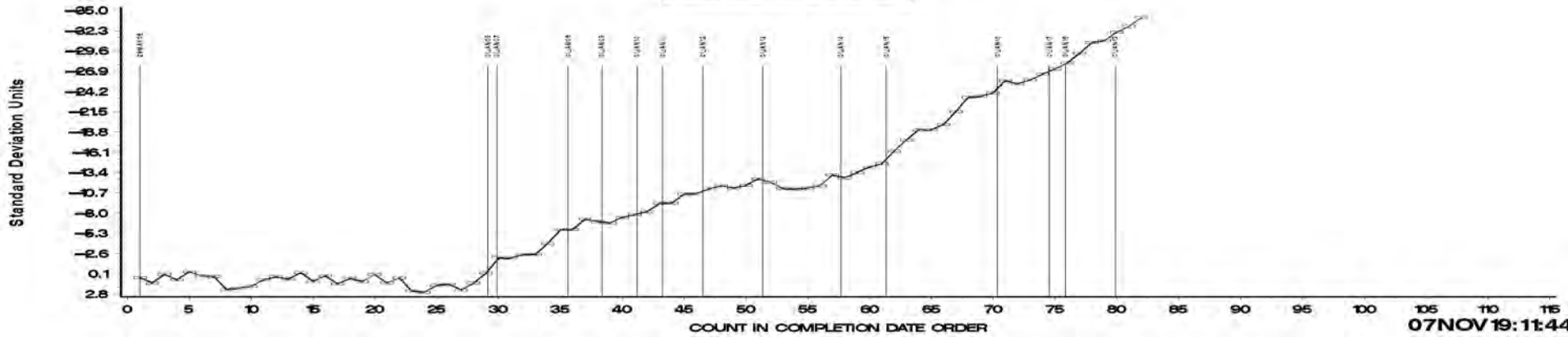
LTMS Severity Analysis



LTMS Precision Analysis



CUSUM Severity Analysis

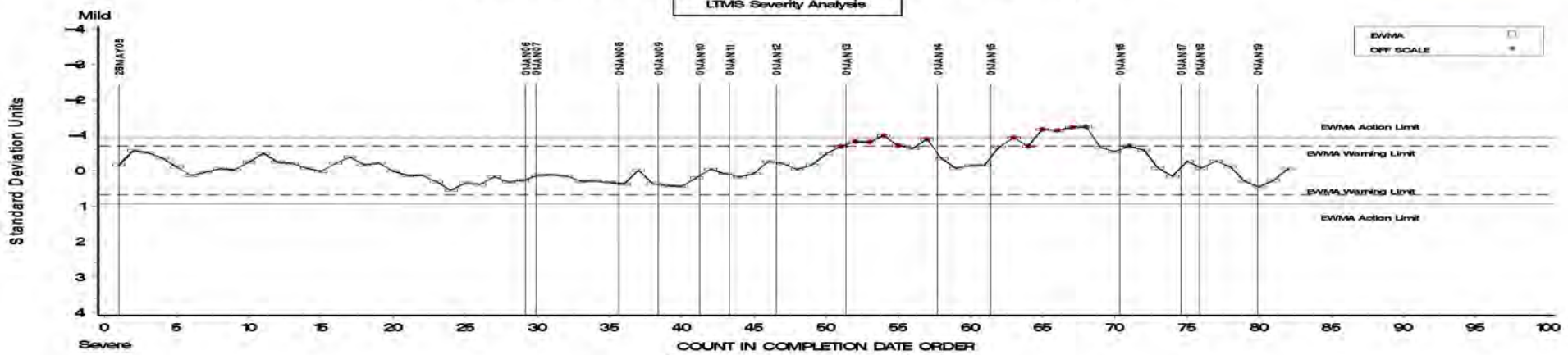


C13 INDUSTRY OPERATIONALLY VALID DATA

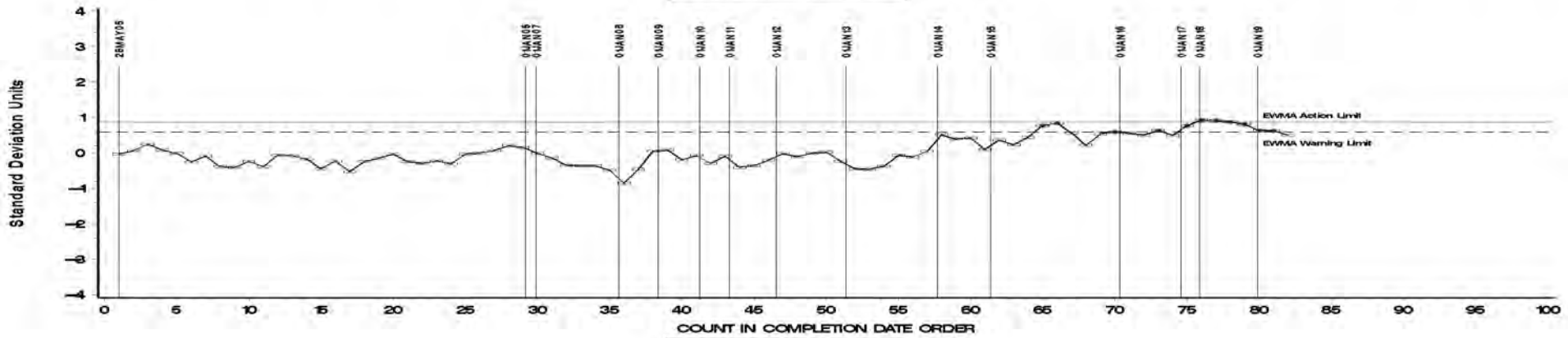


TOP GROOVE CARBON AVG — FINAL RESULT

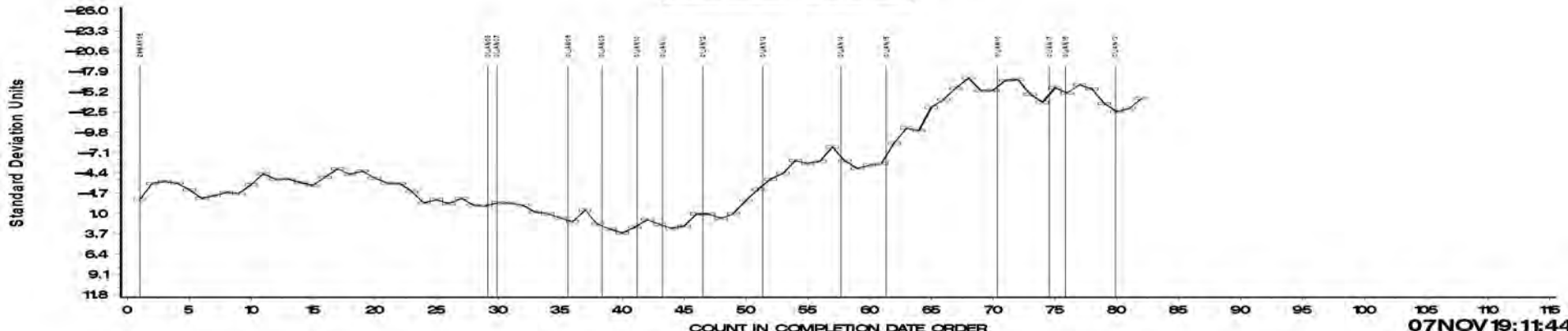
LTMS Severity Analysis



LTMS Precision Analysis



CUSUM Severity Analysis

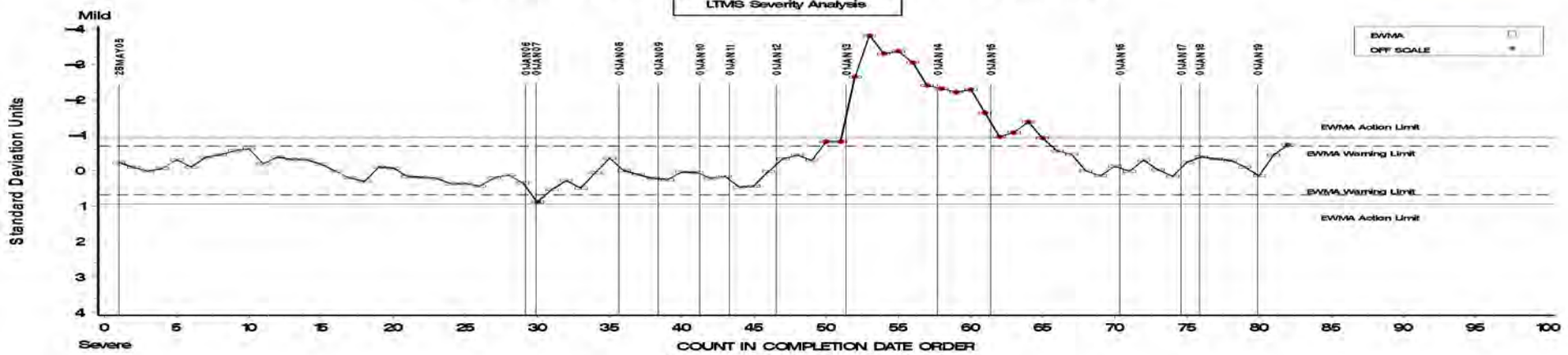


C13 INDUSTRY OPERATIONALLY VALID DATA

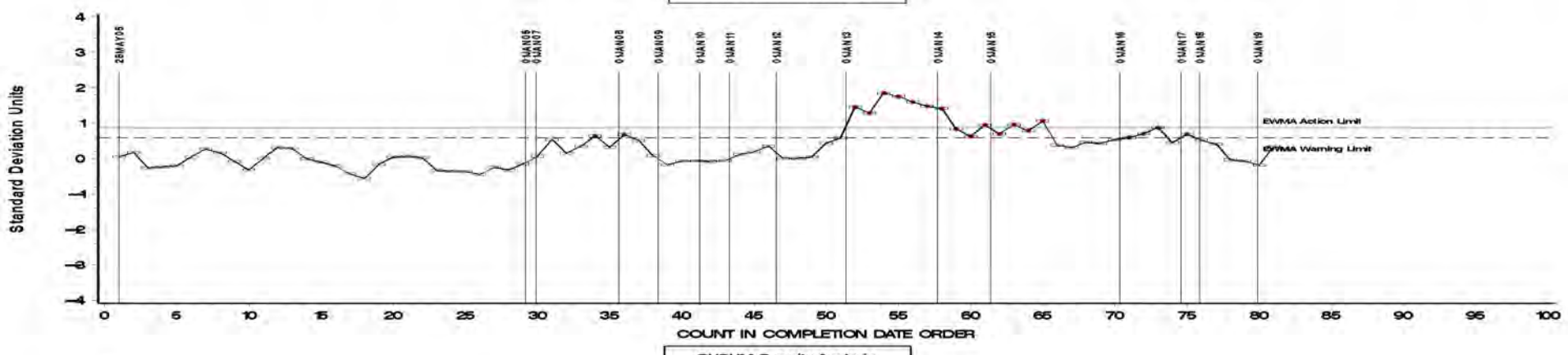


2ND RING TOP CARBON AVG. — FINAL RESULT

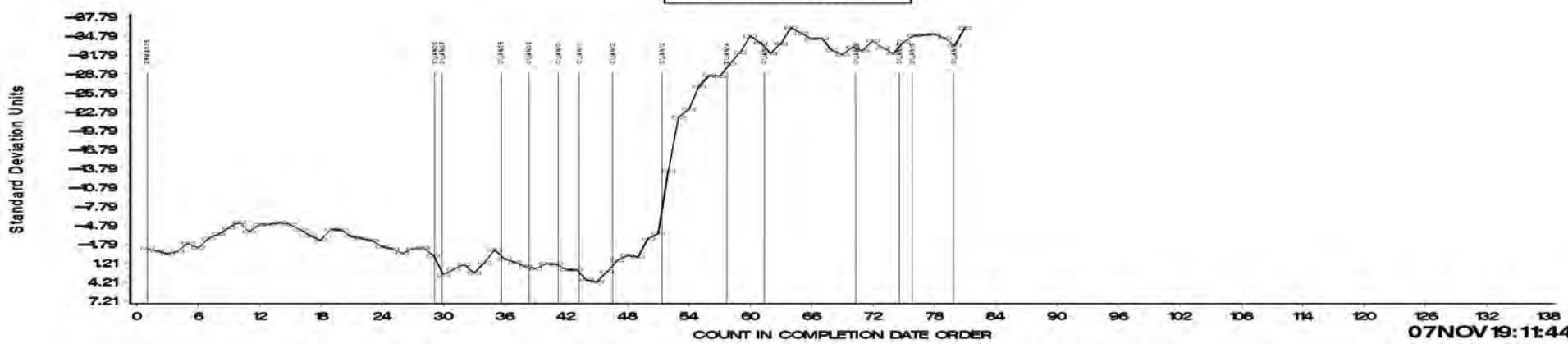
LTMS Severity Analysis



LTMS Precision Analysis



CUSUM Severity Analysis

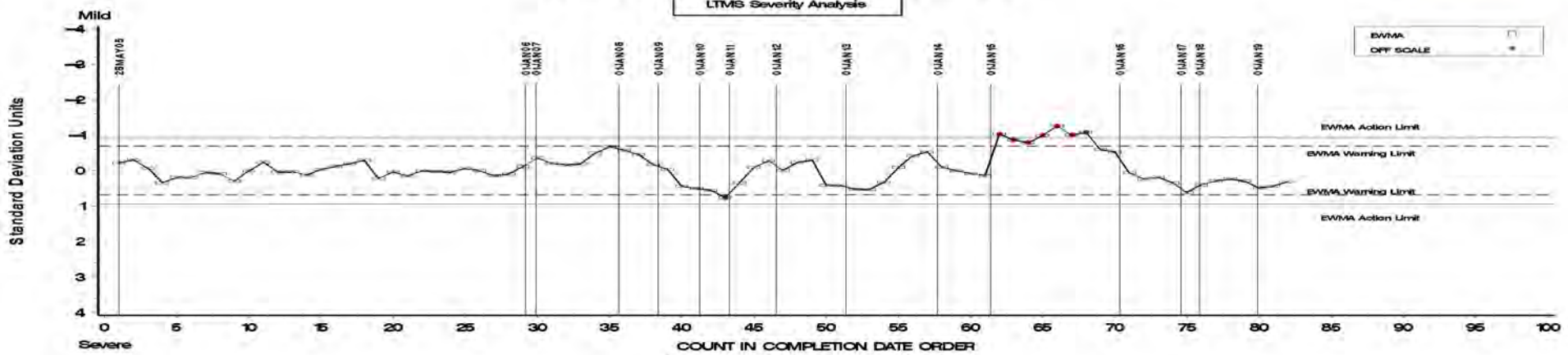


C13 INDUSTRY OPERATIONALLY VALID DATA

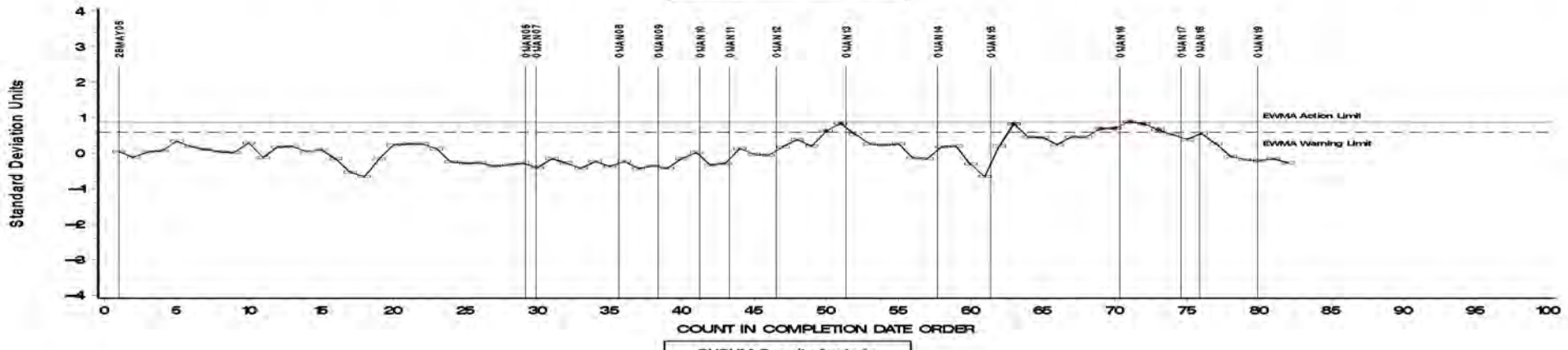


OIL CONS. DELTA — FINAL RESULT

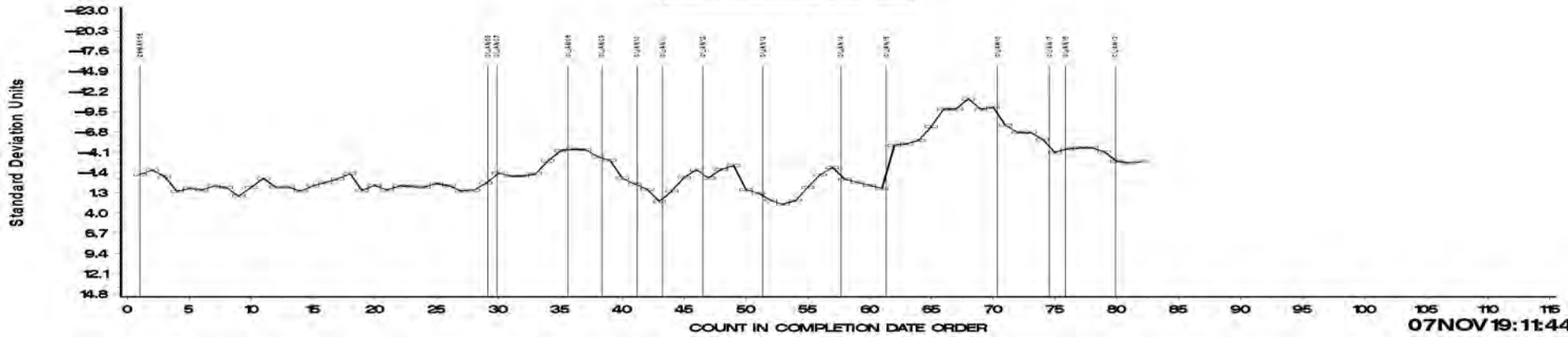
LTMS Severity Analysis



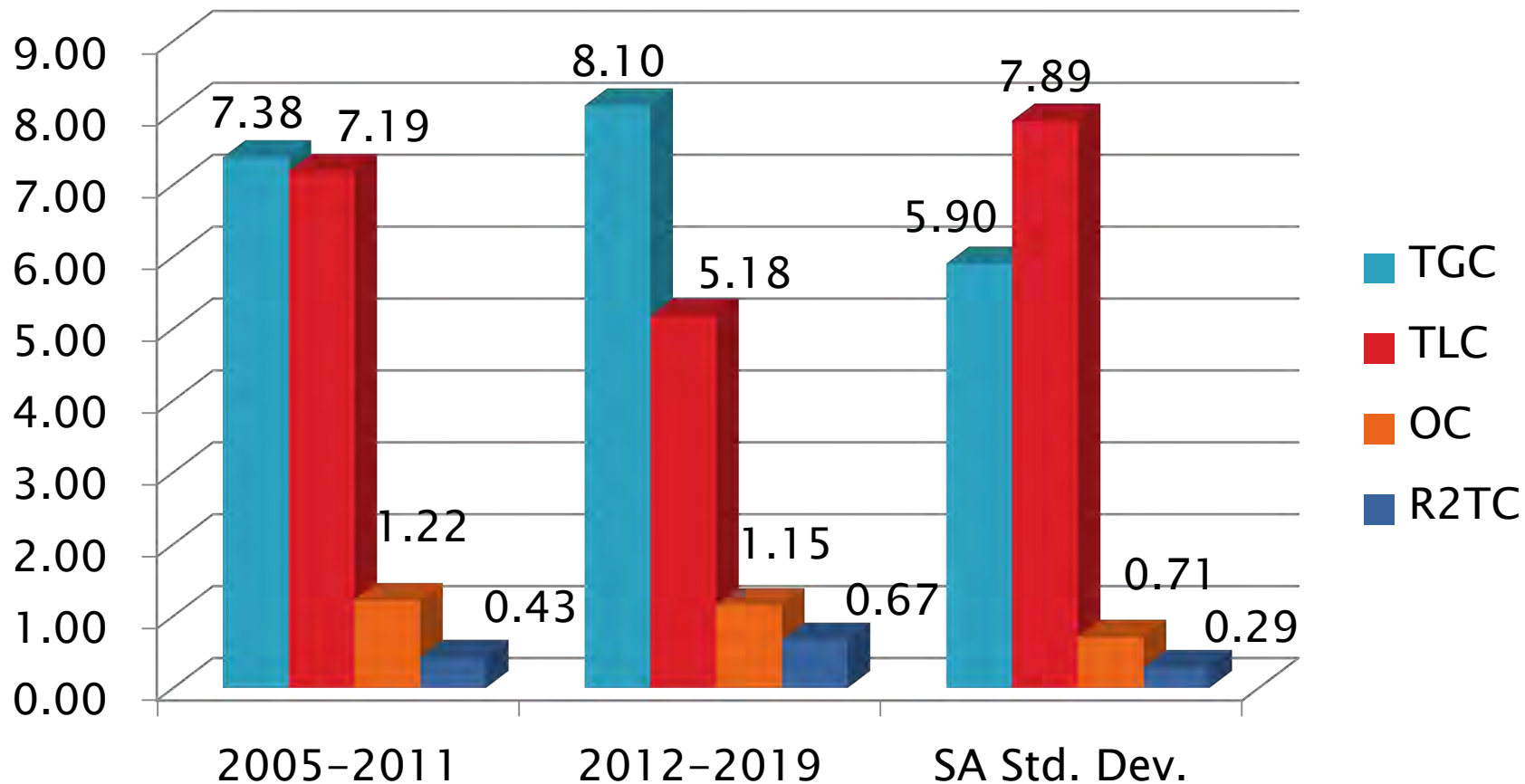
LTMS Precision Analysis



CUSUM Severity Analysis



C13 Precision Estimates



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C13 Oil Aeration (COAT)

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COAT Test Activity

Test Status	Validity Code	COAT
Acceptable Calibration Test	AC	0
Failed Calibration Test	OC	0
Operationally Invalid	LC	0
Aborted	XC	0
Informational Run	NN	0
Total		0

COAT Failed Tests

Failed Parameter	Number of Tests
No failed tests	0
Total	0

COAT Lost Tests*

Status	Cause	#
Invalid	No invalid tests	0
Aborted	No aborted tests	0
Total		0

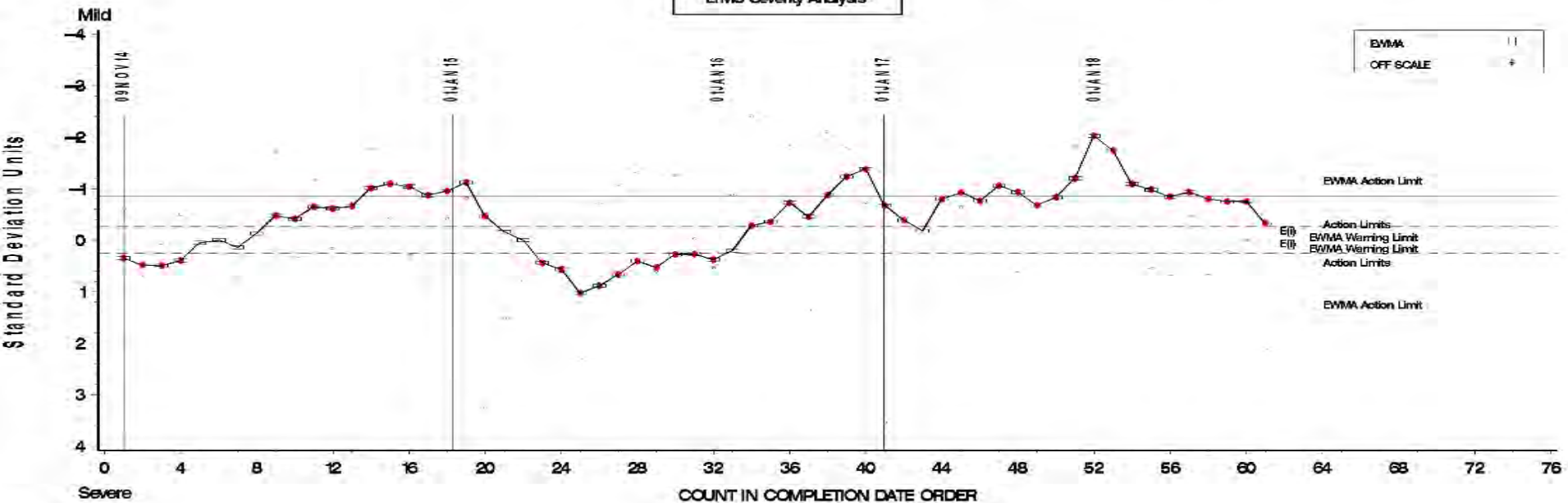
*Invalid and aborted tests

COAT Test Severity

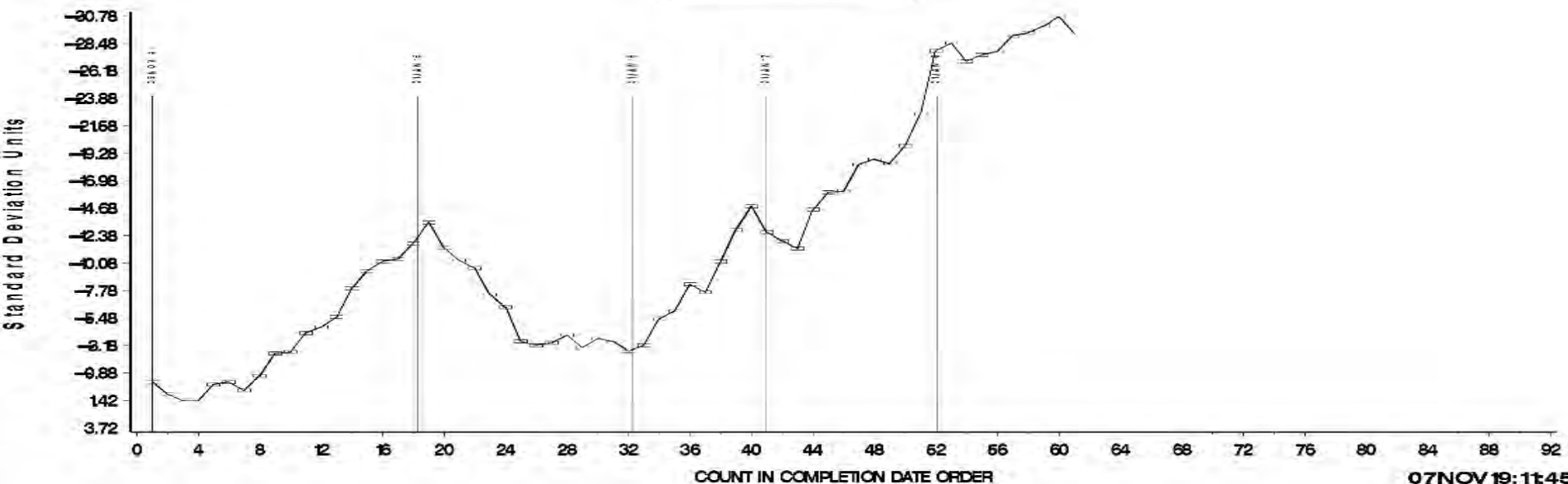
- ▶ As no chartable COAT tests were run during this period no statement about test severity can be made.

FINAL AVERAGE OIL AERATION OVER TEST HOURS 40-50

LTMS Severity Analysis

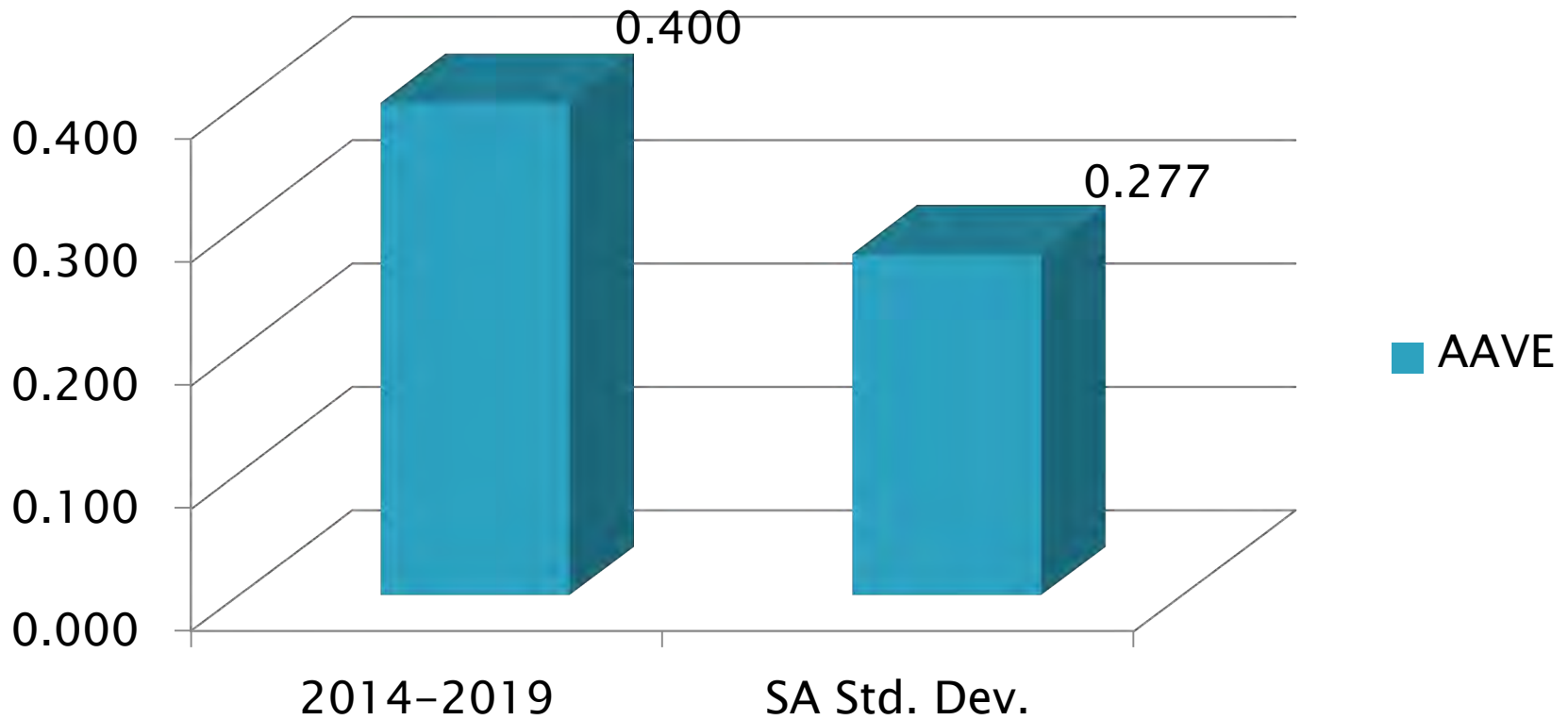


CUSUM Severity Analysis



COAT Precision Estimates

AAVE



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Daimler DD13 Scuffing Test

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Test Monitoring Center

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A Program of ASTM International

DD13 Test Activity

Test Status	Validity Code	COAT
Acceptable Calibration Test	AC	2
Failed Calibration Test	OC	1
Operationally Invalid	LC	0
Donated Test	AG	1
Total		4

DD13 Failed Tests

Failed Parameter	Number of Tests
Hours to Scuff Mild	1
Total	0

DD13 Lost Tests*

Status	Cause	#
Invalid	No invalid tests	0
Aborted	No aborted tests	0
Total		0

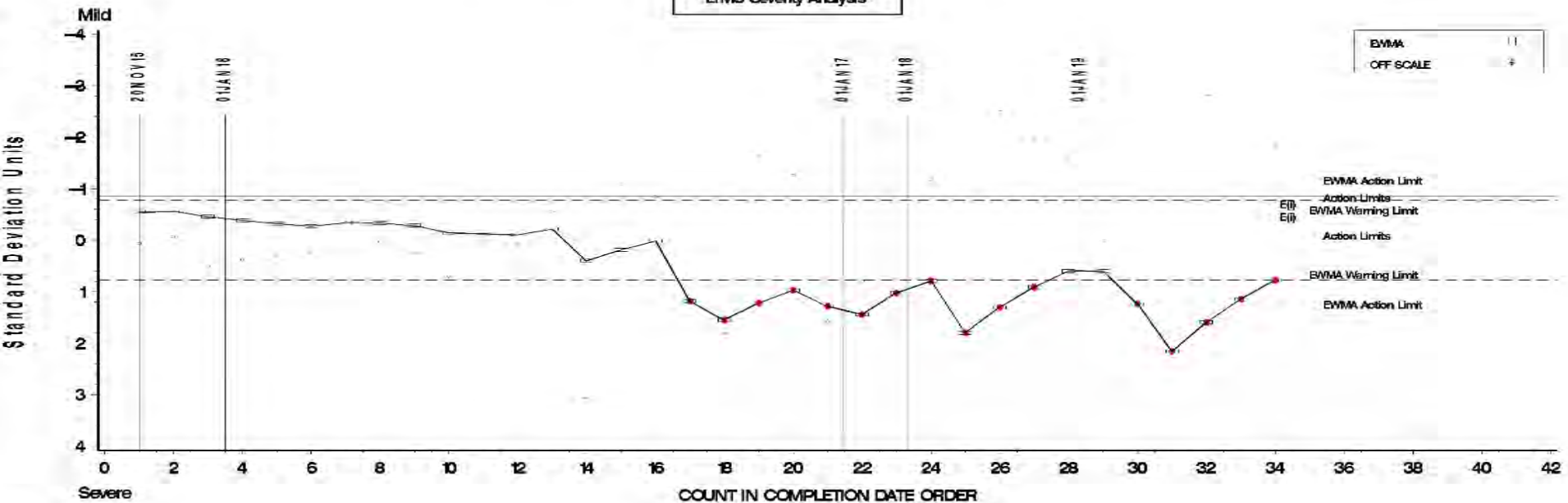
*Invalid and aborted tests

DD13 Test Severity

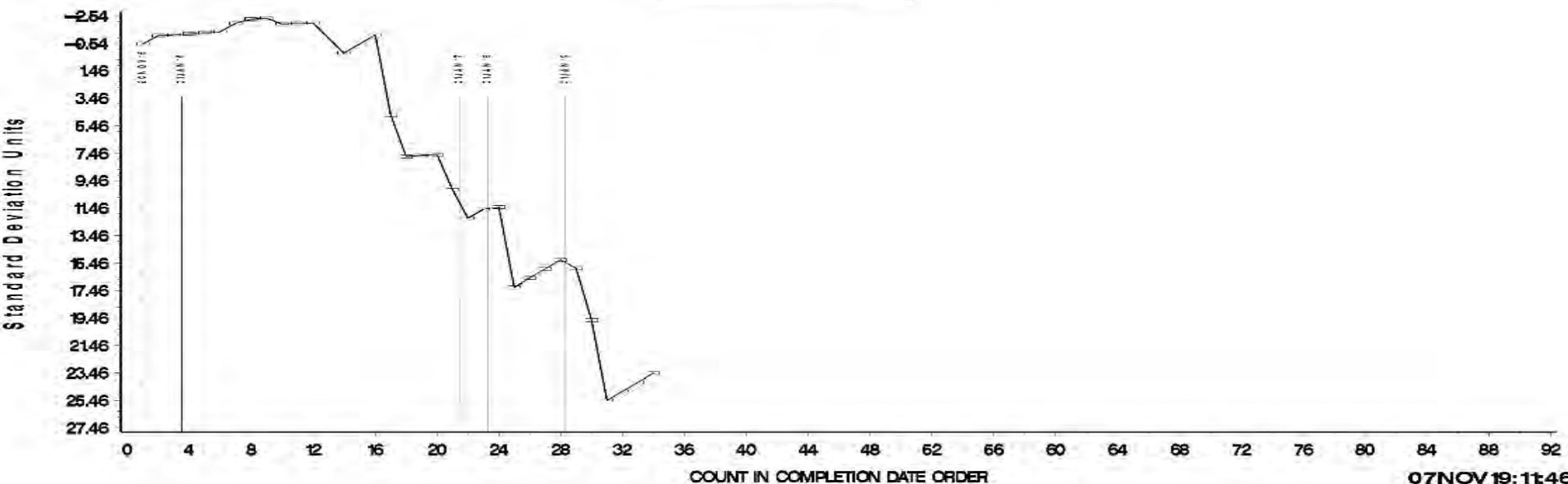
- ▶ HRS2 is in Level 1 Zi alarm.

FNL. ORIG. UNIT HOURS TO SCUFF

LTMS Severity Analysis

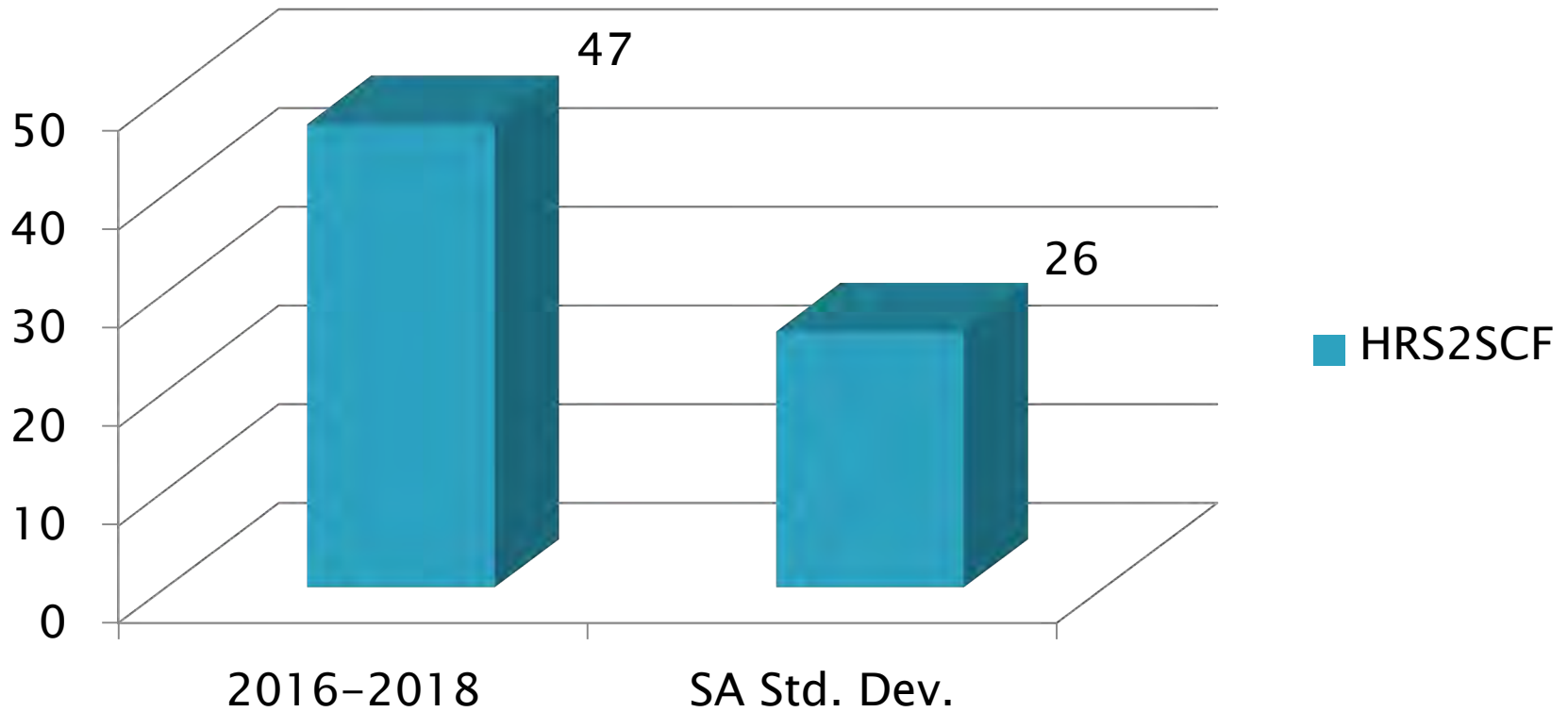


CUSUM Severity Analysis



DD13 Precision Estimates

HRS2SCF



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Cummins ISB

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ISB Test Activity

Test Status	Validity Code	#
Acceptable Calibration Test	AC	4
Failed Calibration Test	OC	1
Operationally Invalid	LC	1
Aborted	XC	0
Total		6

ISB Failed Tests

Failed Parameter	Number of Tests
ACSW severe	1
Total	1

ISB Lost Tests*

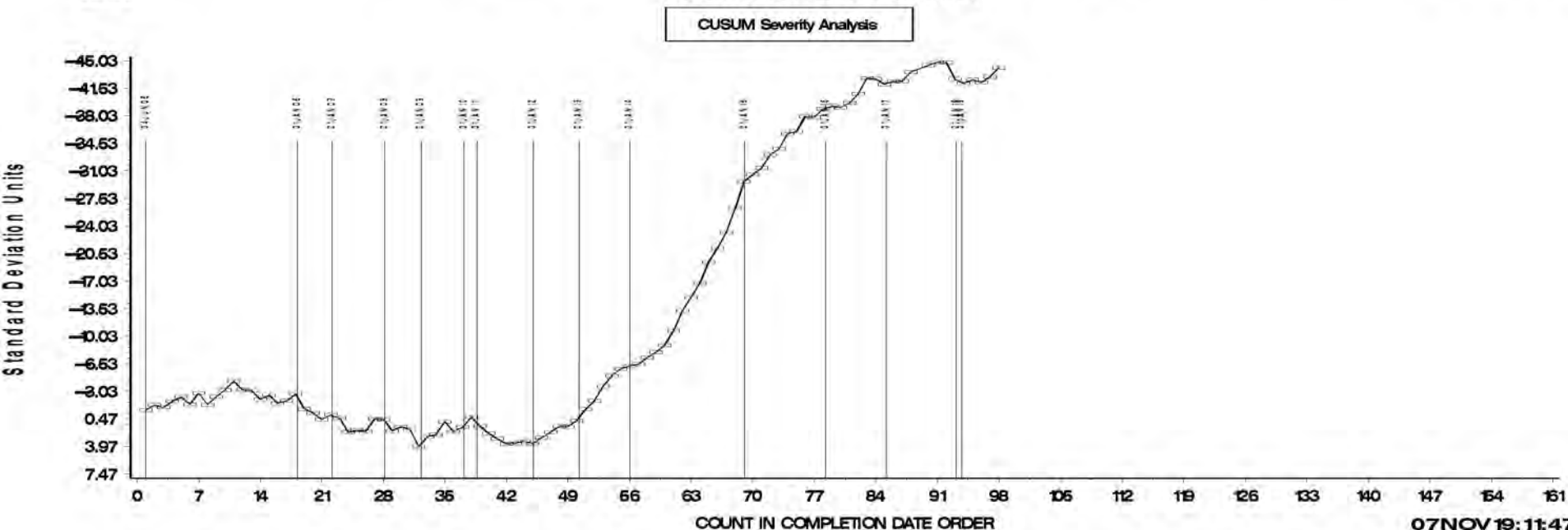
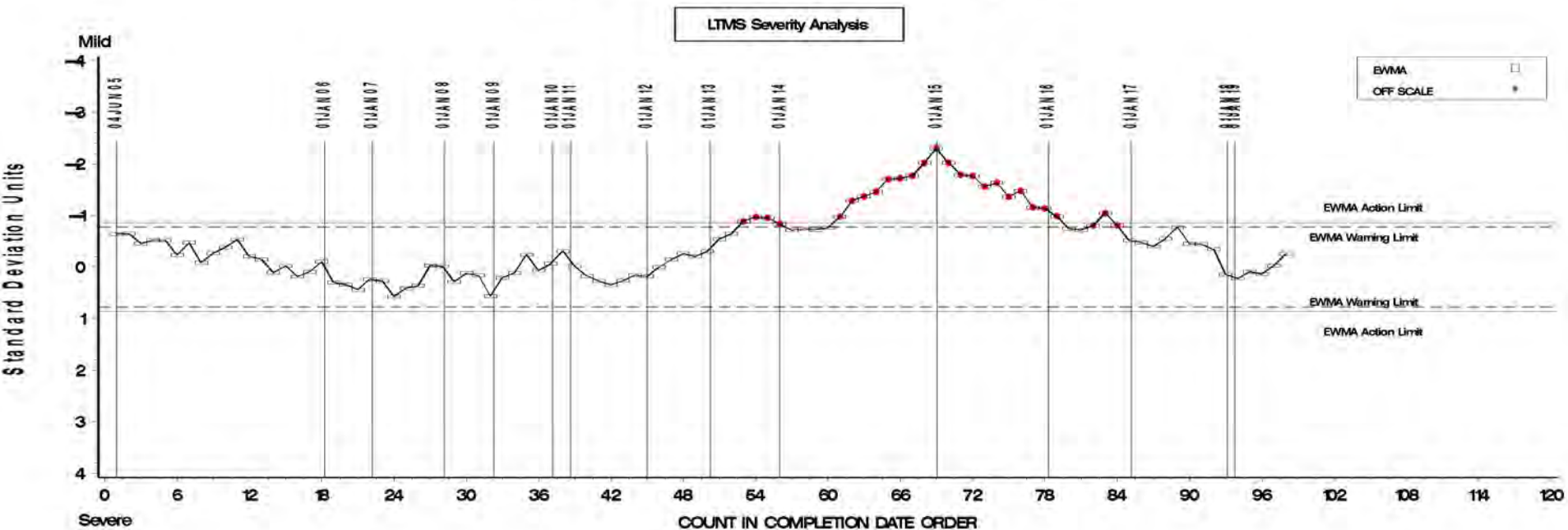
Status	Cause	#
Invalid	Faulty injectors	1
Aborted	No Aborted Tests	0
Total		1

*Invalid and aborted tests

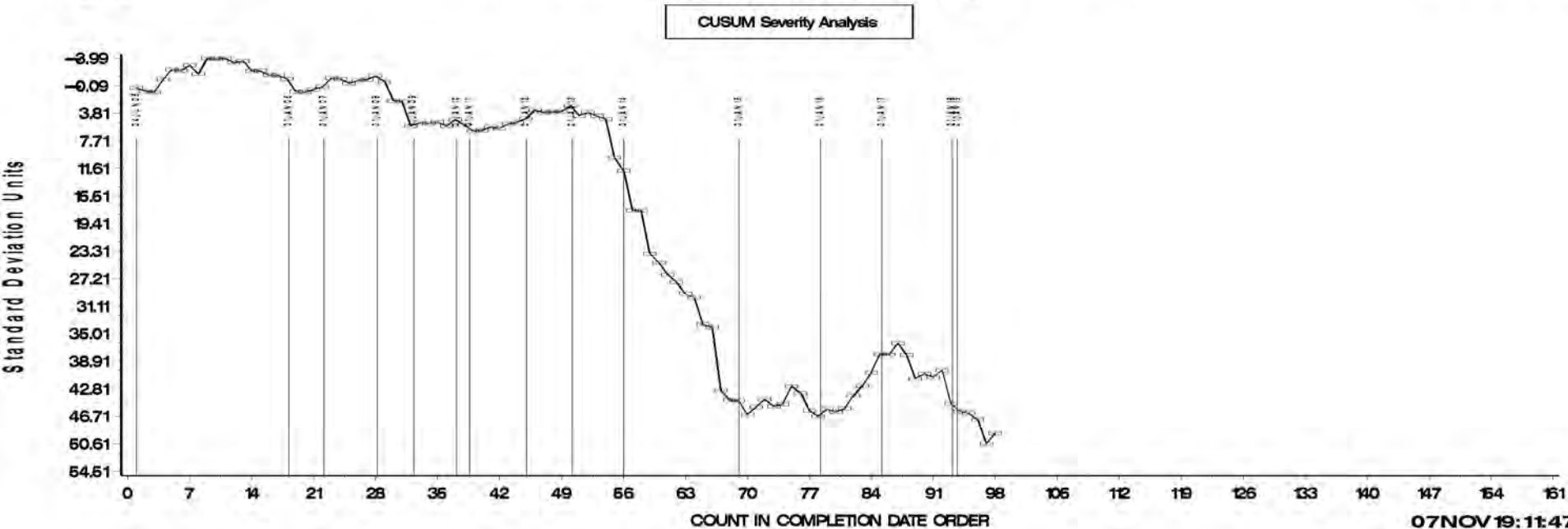
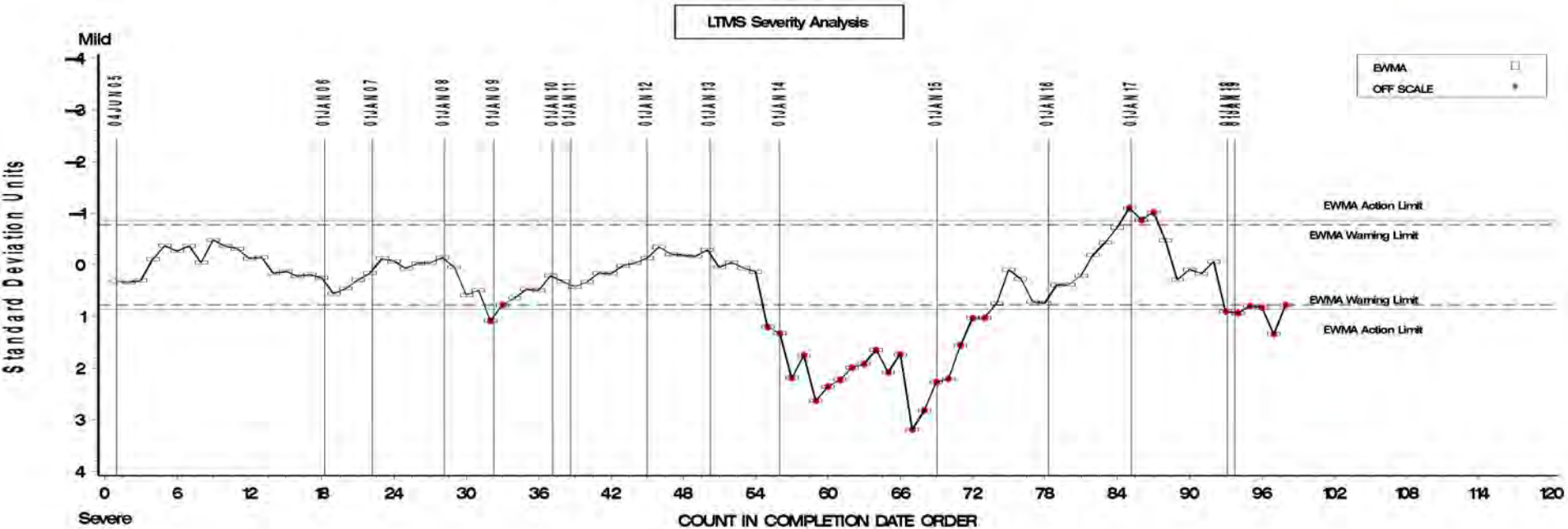
ISB Test Severity

- ▶ ATWL is in control.
- ▶ ACSW is in Level 1 Zi alarm.

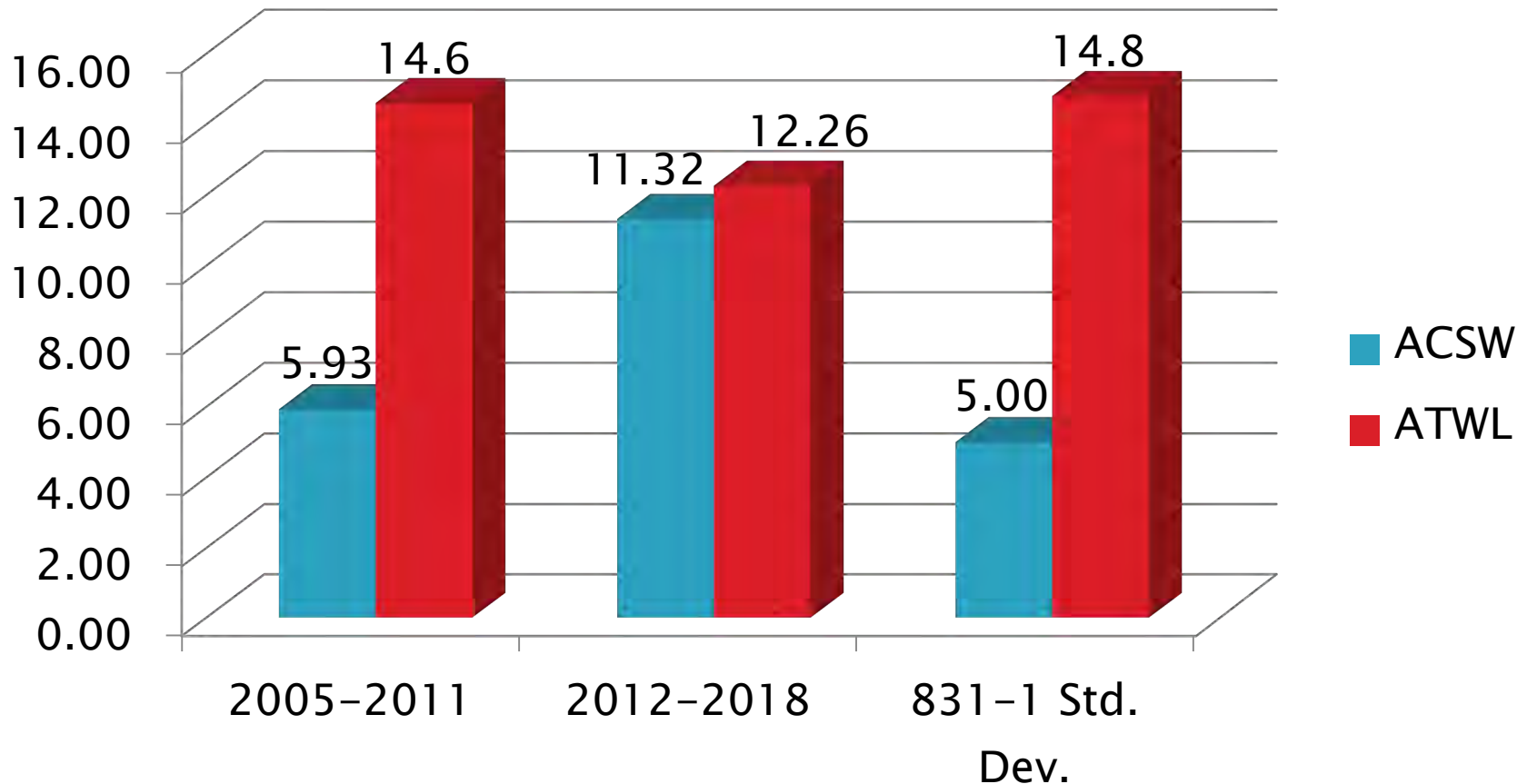
AVERAGE TAPPET WEIGHT LOSS



AVERAGE CAMSHAFT WEAR



ISB Precision Estimates



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Cummins ISM

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Test Monitoring Center

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ISM Test Activity

Test Status	Validity Code	#
Acceptable Calibration	AC	0
Failed Calibration	OC	0
Operationally Invalid	LC	0
Aborted	XC	0
Donated	AG	0
Total		0

ISM Failed Tests

Failed Parameter	Number of Tests
No failed tests	0
Total	0

ISM Lost Tests*

Status	Cause	#
Invalid	No Invalid Tests	0
Aborted	No Aborted Tests	0
Total		0

*Invalid and aborted tests

ISM Test Severity

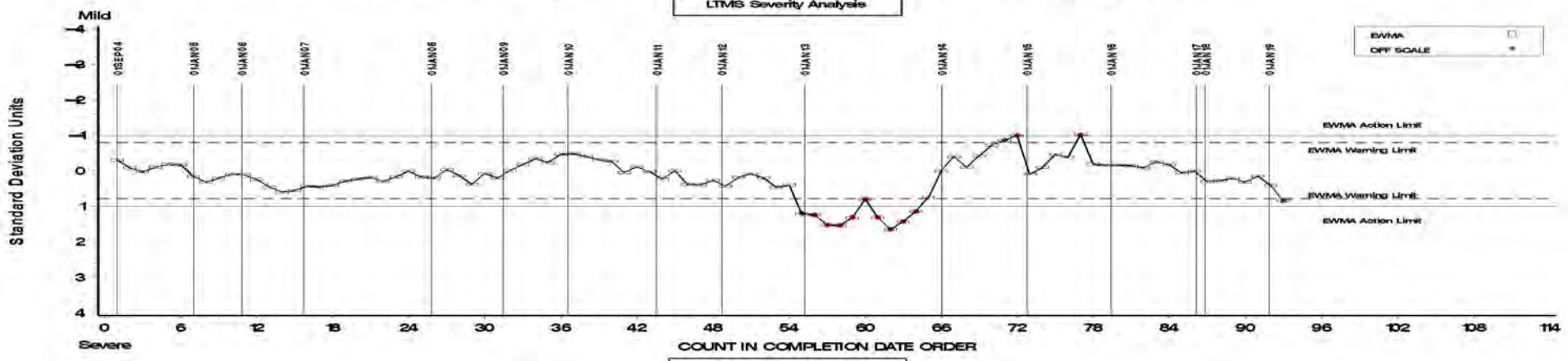
- ▶ As no ISM tests were run during this period no statement about test severity can be made.

ISM INDUSTRY OPERATIONALLY VALID DATA

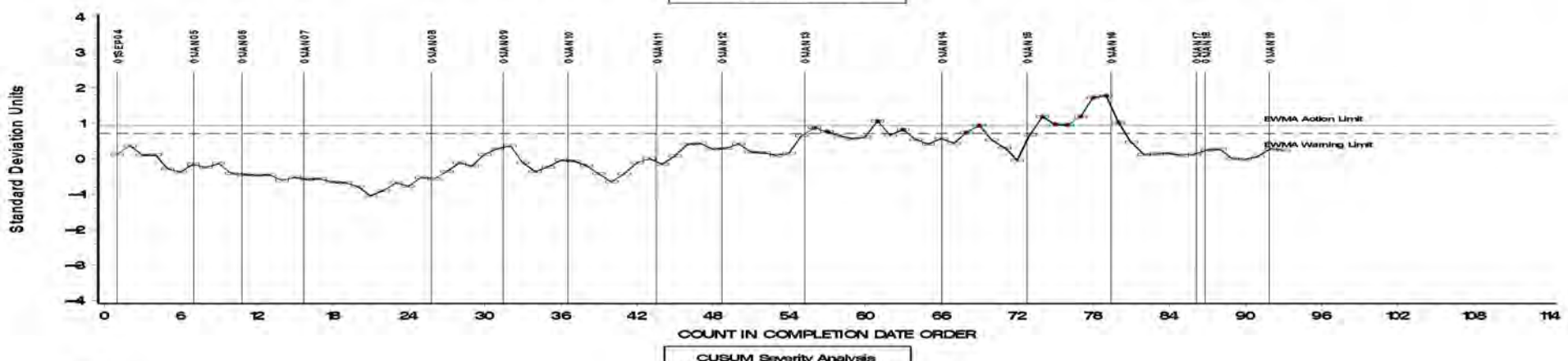


INJECTOR SCREW WEIGHT LOSS ADJUSTED TO 3.9% SOOT

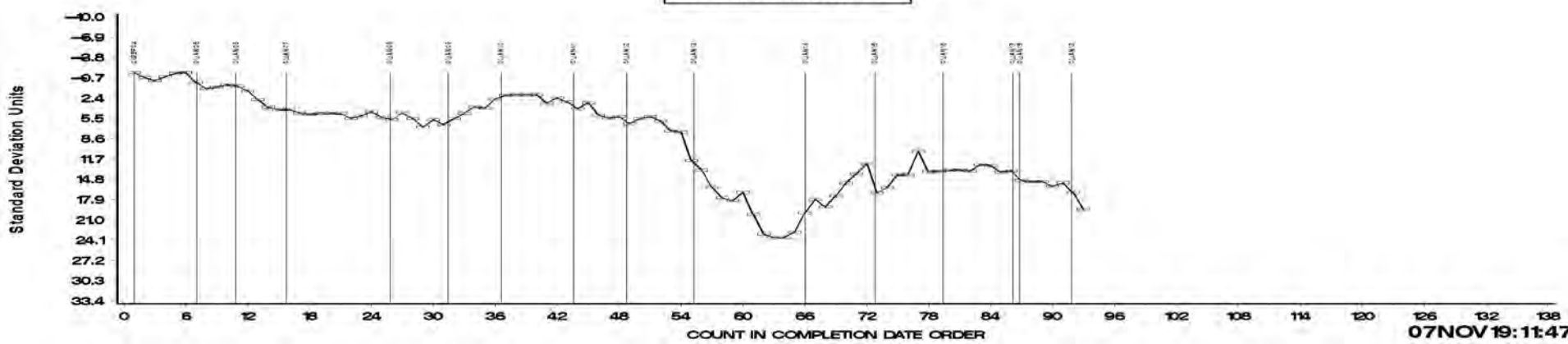
LTMS Severity Analysis



LTMS Precision Analysis



CUSUM Severity Analysis

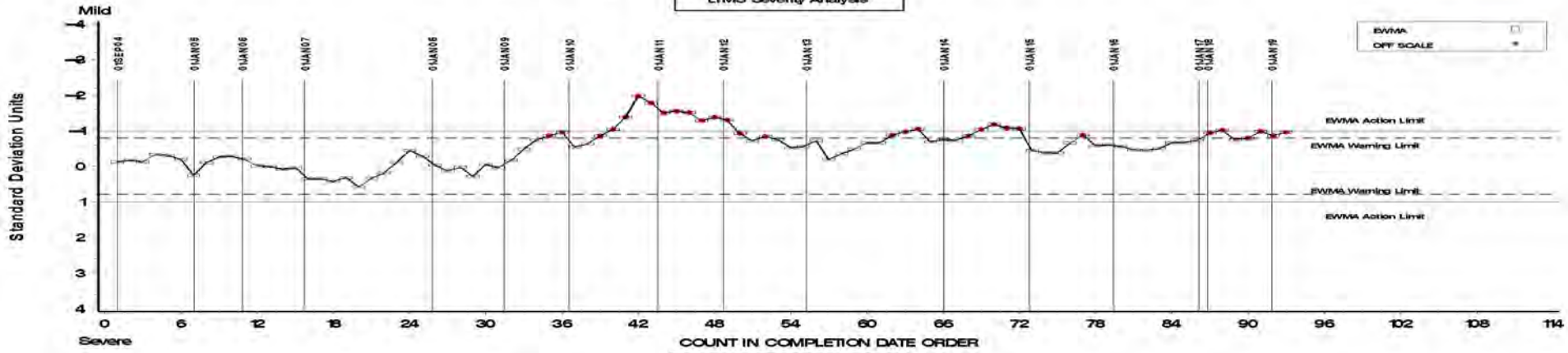


ISM INDUSTRY OPERATIONALLY VALID DATA

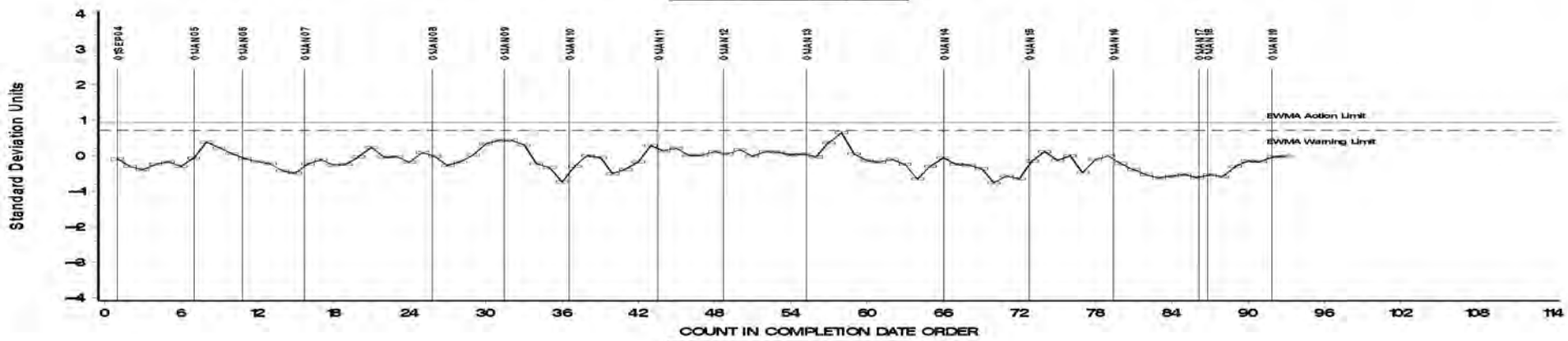


FILTER PLUGGING DELTA P

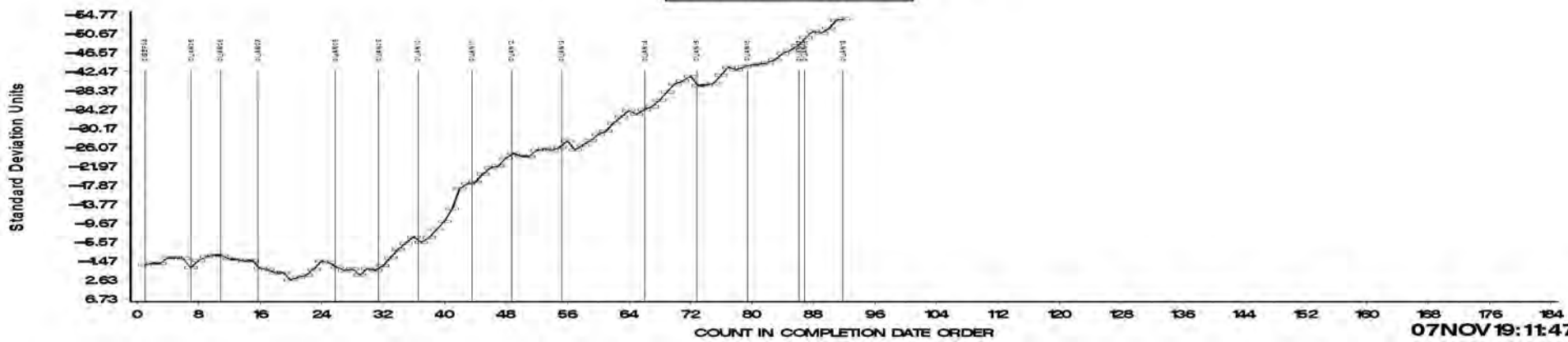
LTMS Severity Analysis



LTMS Precision Analysis



CUSUM Severity Analysis

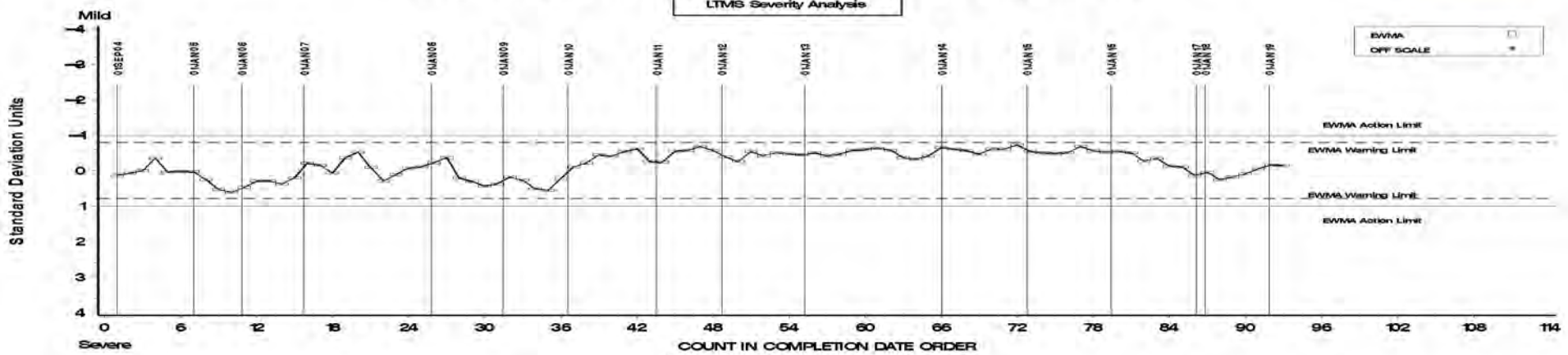


ISM INDUSTRY OPERATIONALLY VALID DATA

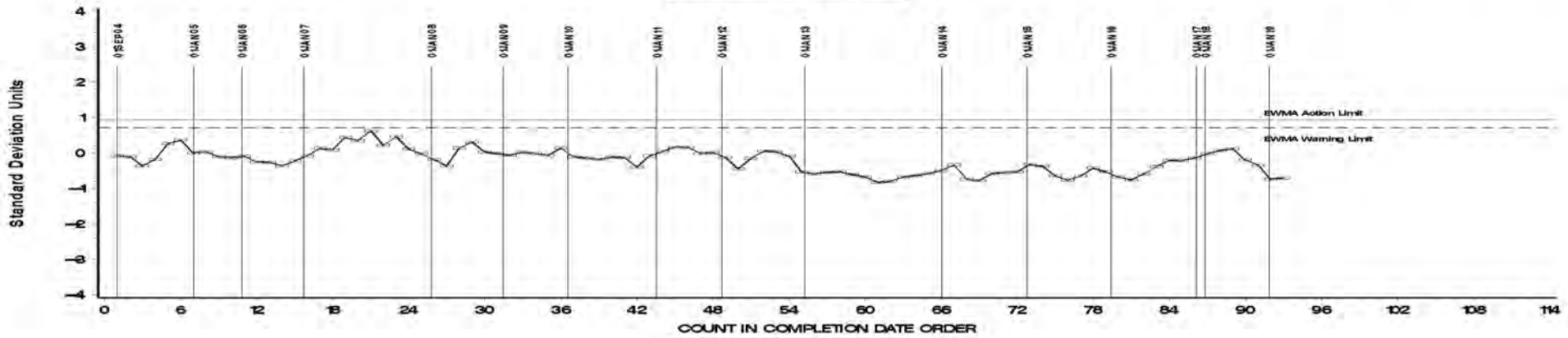


CROSSHEAD WEIGHT LOSS ADJUSTED TO 3.9 % SOOT

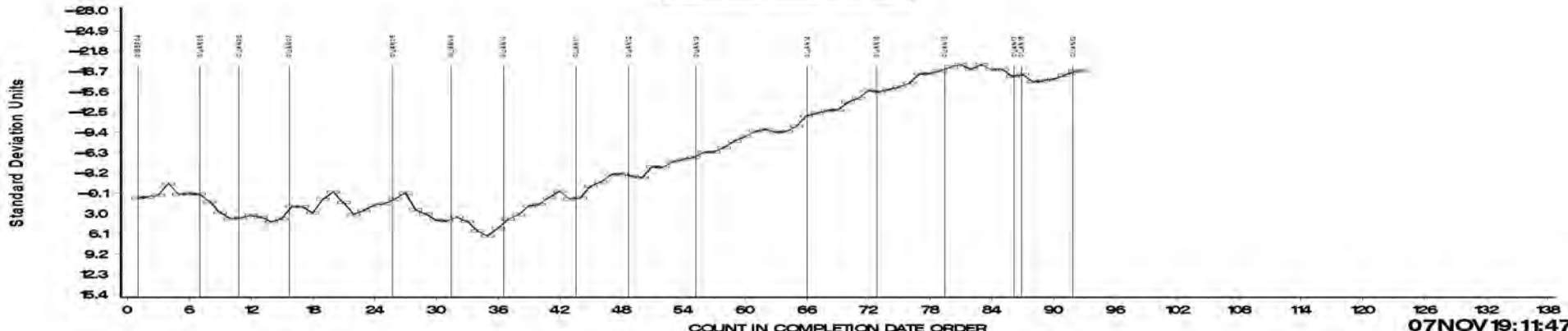
LTMS Severity Analysis



LTMS Precision Analysis



CUSUM Severity Analysis



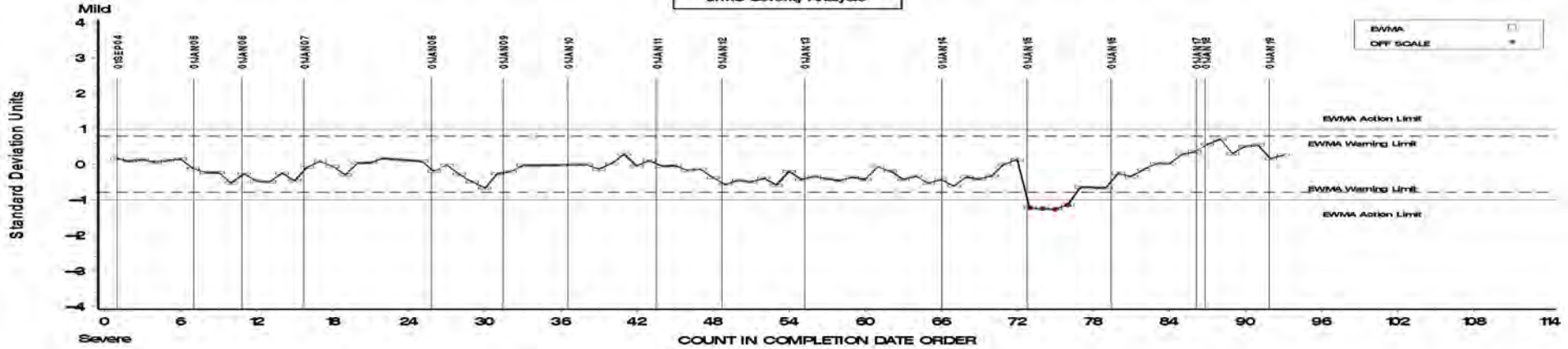
ISM INDUSTRY OPERATIONALLY VALID DATA



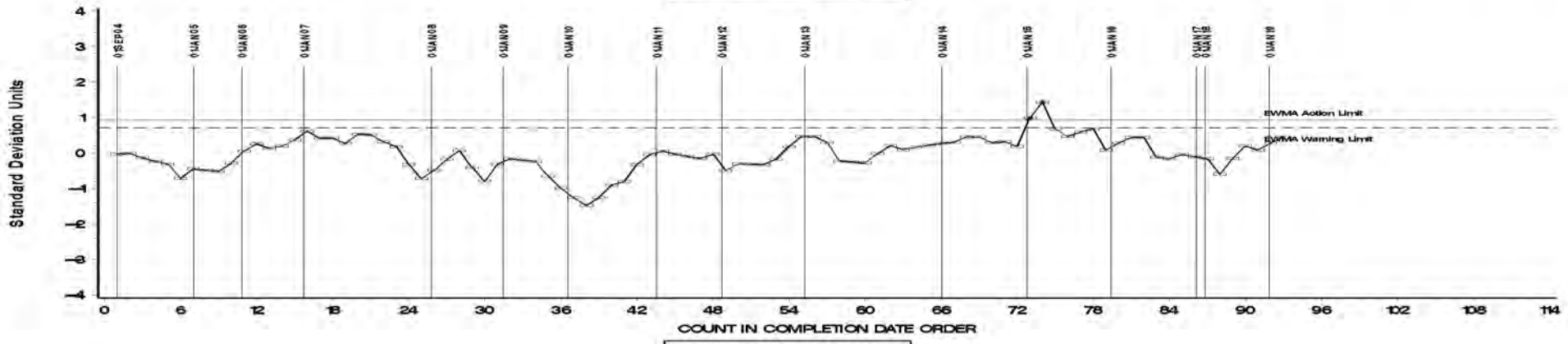
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AVERAGE SLUDGE RATING

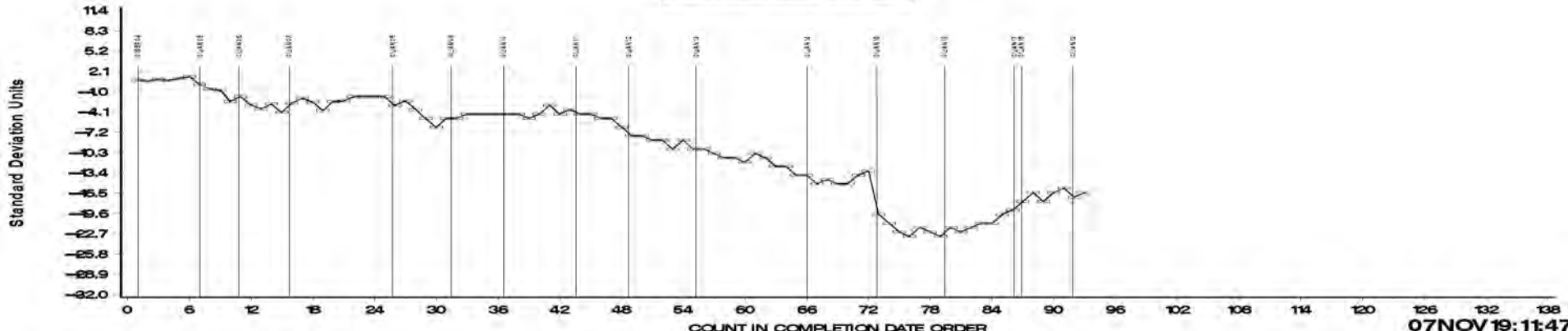
LTMS Severity Analysis



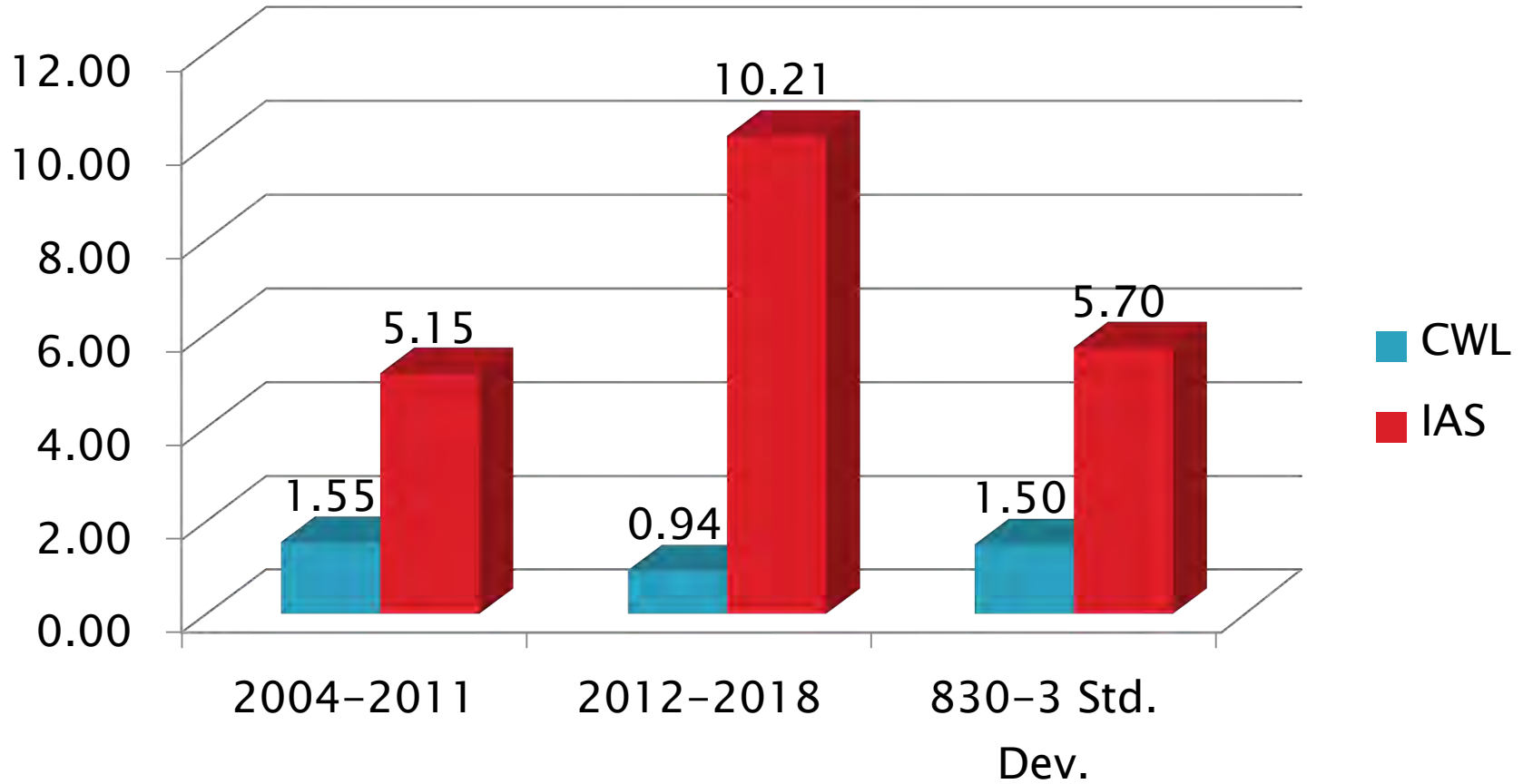
LTMS Precision Analysis



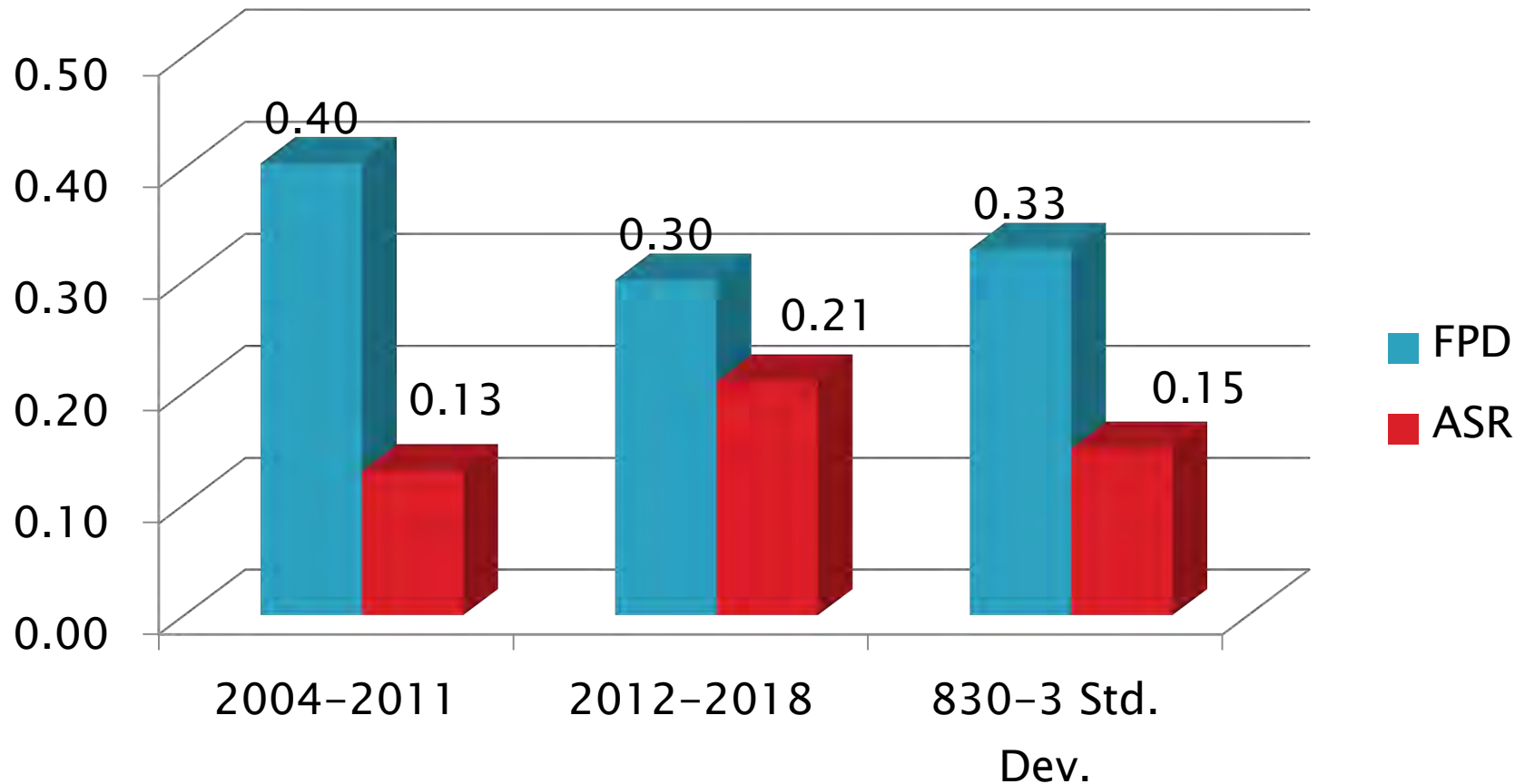
CUSUM Severity Analysis



ISM Precision Estimates



ISM Precision Estimates



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EOAT

»» October 2019

EOAT Test Activity

Test Status	Validity Code	#
Acceptable Calibration Test	AC	0
Failed Calibration Test	OC	0
Operationally Invalid	LC	0
Aborted	XC	0
Total		0

EOAT Failed Tests

Failed Parameter	Number of Tests
No failed tests	0
Total	0

EOAT Lost Tests*

Status	Cause	#
Invalid	No invalid tests	0
Aborted	No aborted tests	0
Total		0

*Invalid and aborted tests

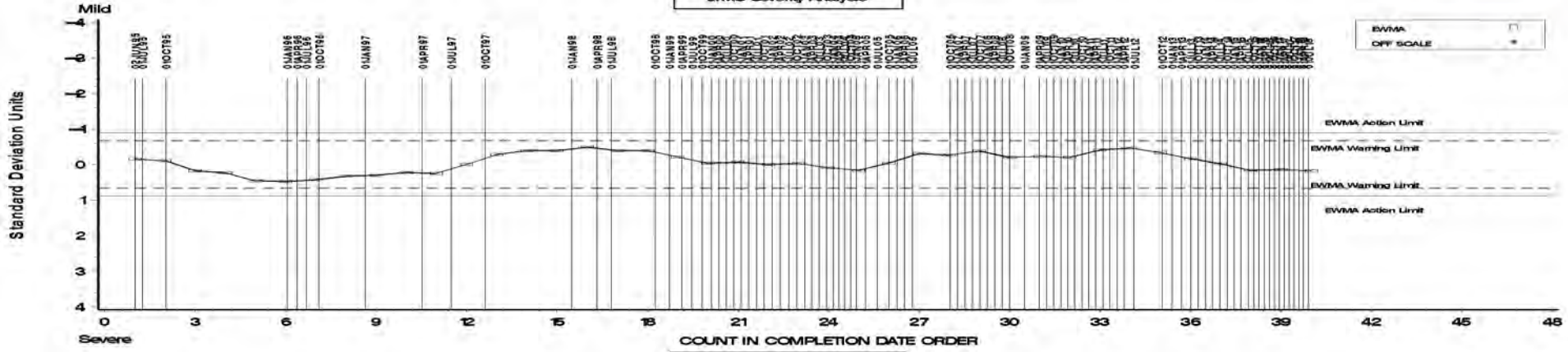
EOAT Test Severity

- ▶ As no EOAT tests were run during this period no statement about test severity can be made.

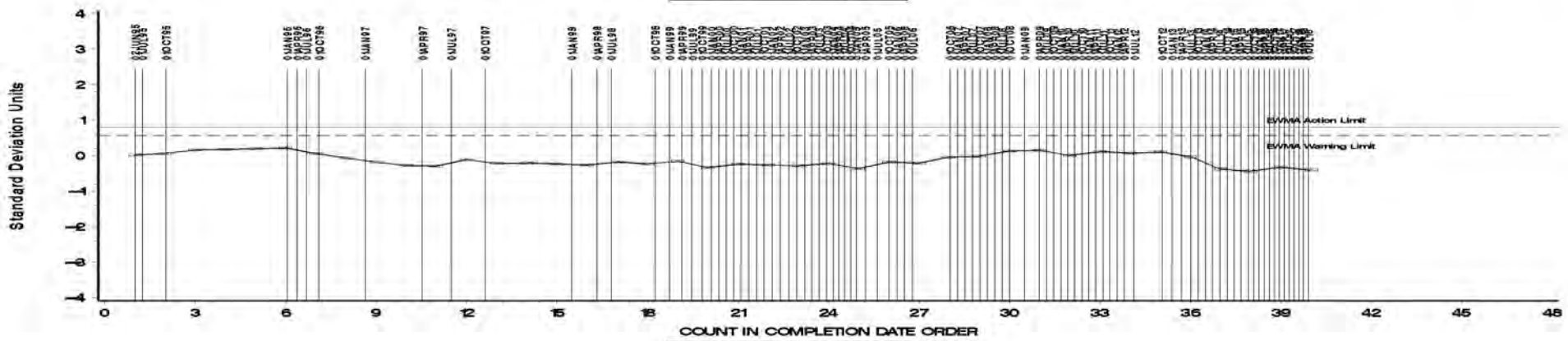
EOAT INDUSTRY OPERATIONALLY VALID DATA

ENGINE OIL AERATION

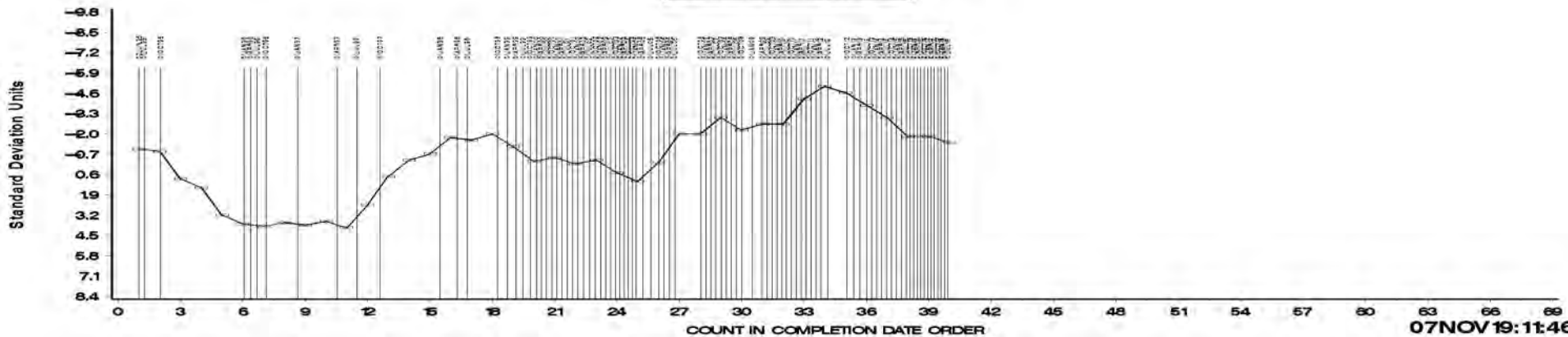
LTMS Severity Analysis



LTMS Precision Analysis

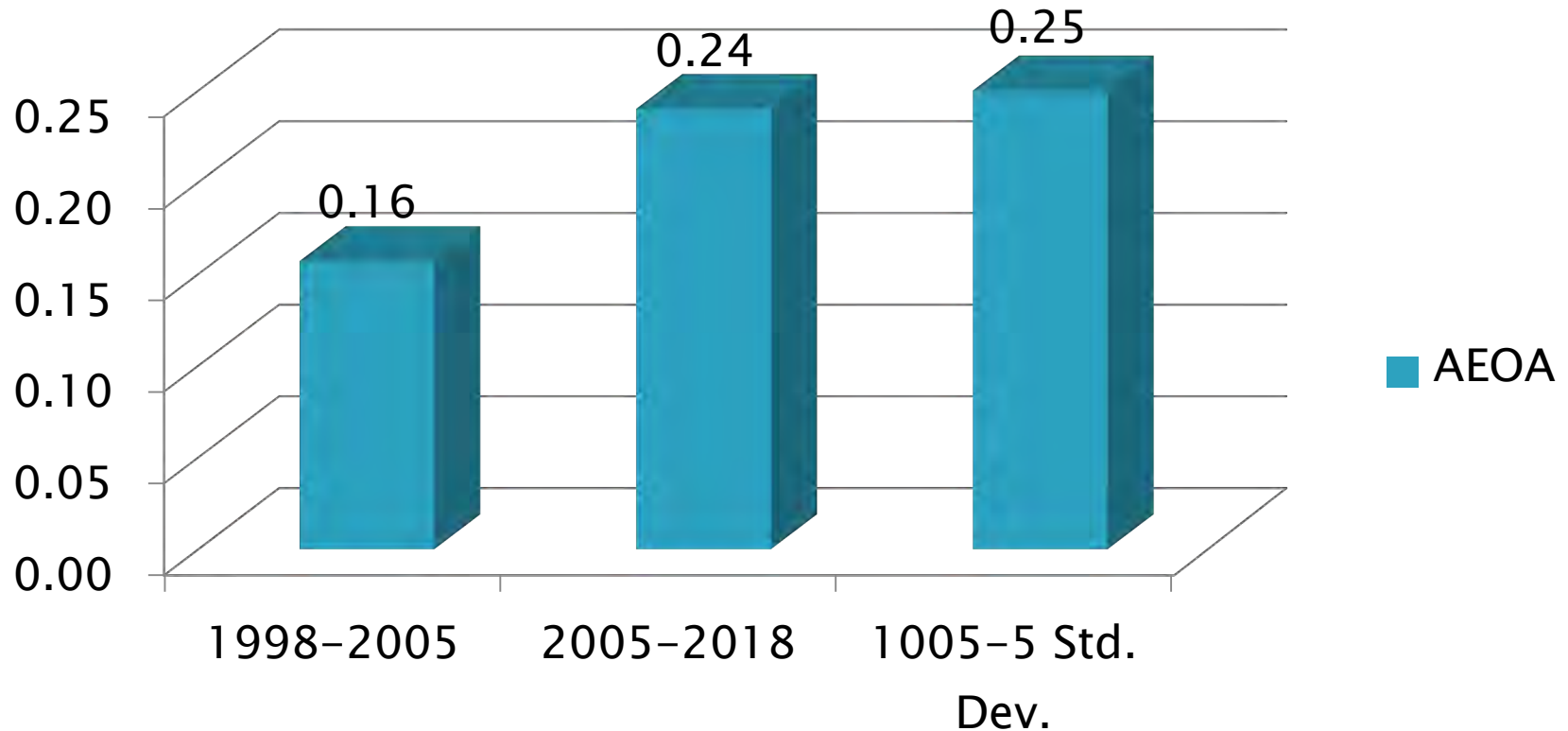


CUSUM Severity Analysis



EOAT Precision Estimates

AEOA



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RFWT

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Test Monitoring Center

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RFWT Test Activity

Test Status	Validity Code	#
Acceptable Calibration Test	AC	0
Failed Calibration Test	OC	0
Operationally Invalid	LC	0
Aborted	XC	0
Total		0

RFWT Failed Tests

Failed Parameter	Number of Tests
No failed tests	0
Total	0

RFWT Lost Tests*

Status	Cause	#
Invalid	No invalid tests	0
Aborted	No aborted tests	0
Total		0

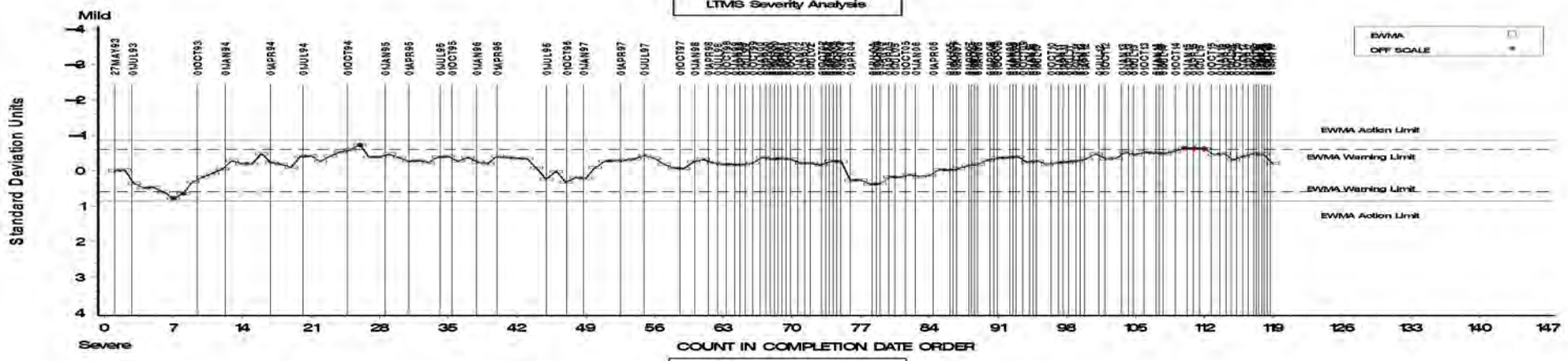
*Invalid and aborted tests

RFWT Test Severity

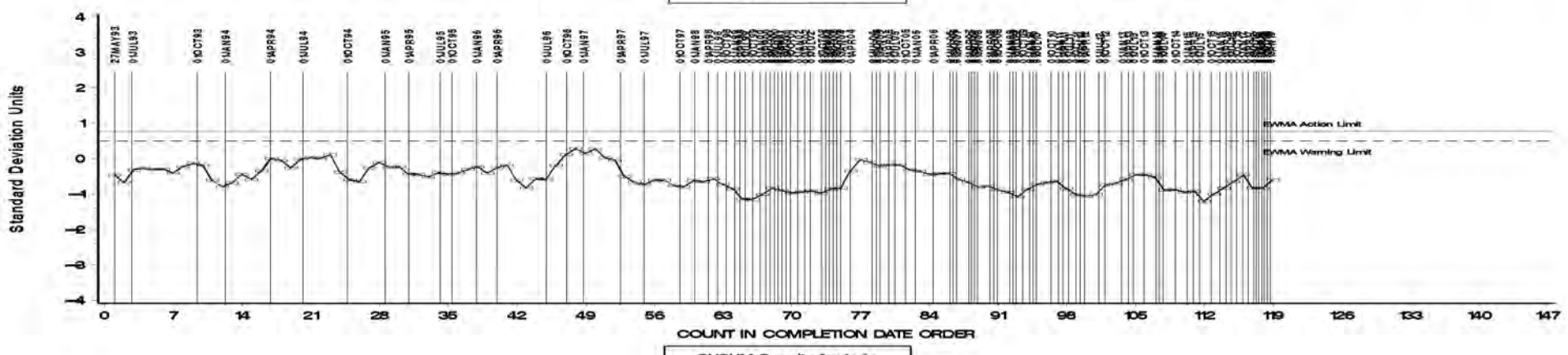
- ▶ As no RFWT tests were run during this period no statement about test severity can be made.

Average Follower Wear

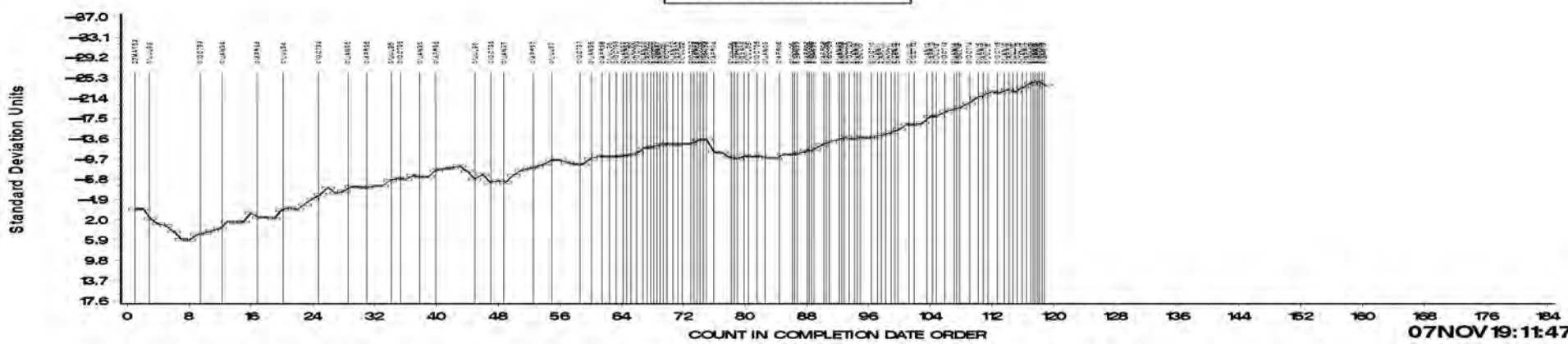
LTMS Severity Analysis



LTMS Precision Analysis

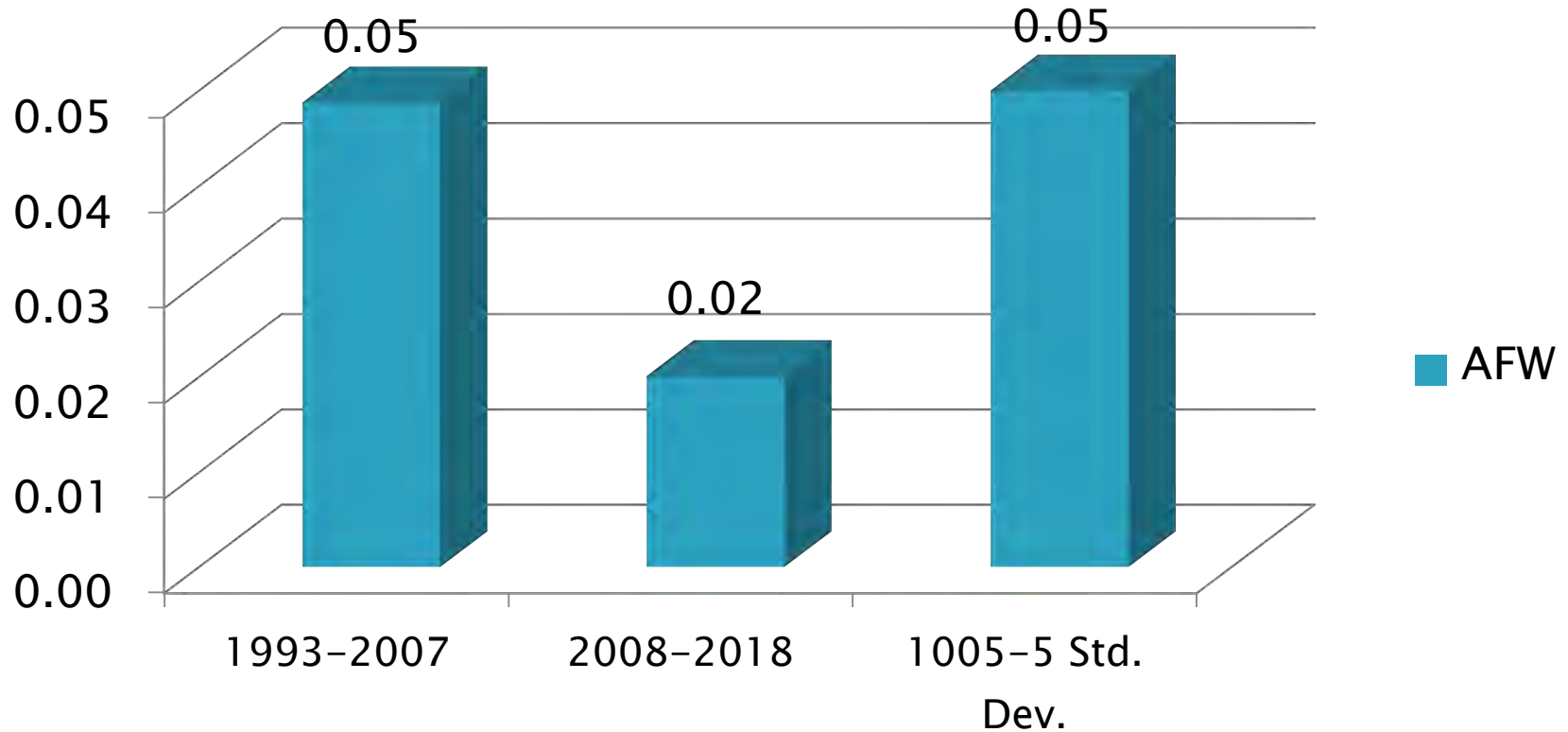


CUSUM Severity Analysis



RFWT Precision Estimates

AFW



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Mack T-8/T-8E

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T-8/T-8E Test Activity

Test Status	Validity Code	#
Acceptable Calibration Test	AC	1
Failed Calibration Test	OC	0
Operationally Invalid	LC	0
Aborted	XC	0
Total		1

T-8/T8-E Failed Tests

Failed Parameter	Number of Tests
No failed tests	0
Total	0

T-8/T8-E Lost Tests*

Status	Cause	#
Invalid	No invalid tests	0
Aborted	No aborted tests	0
Total		0

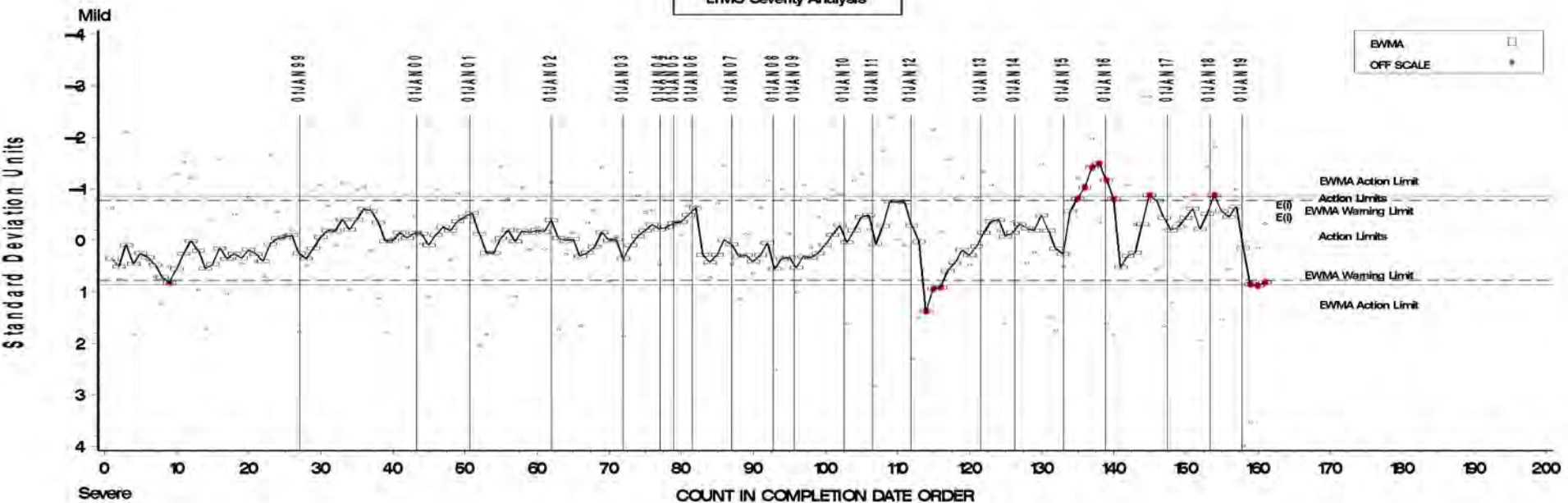
*Invalid and aborted tests

T-8/T-8E Test Severity

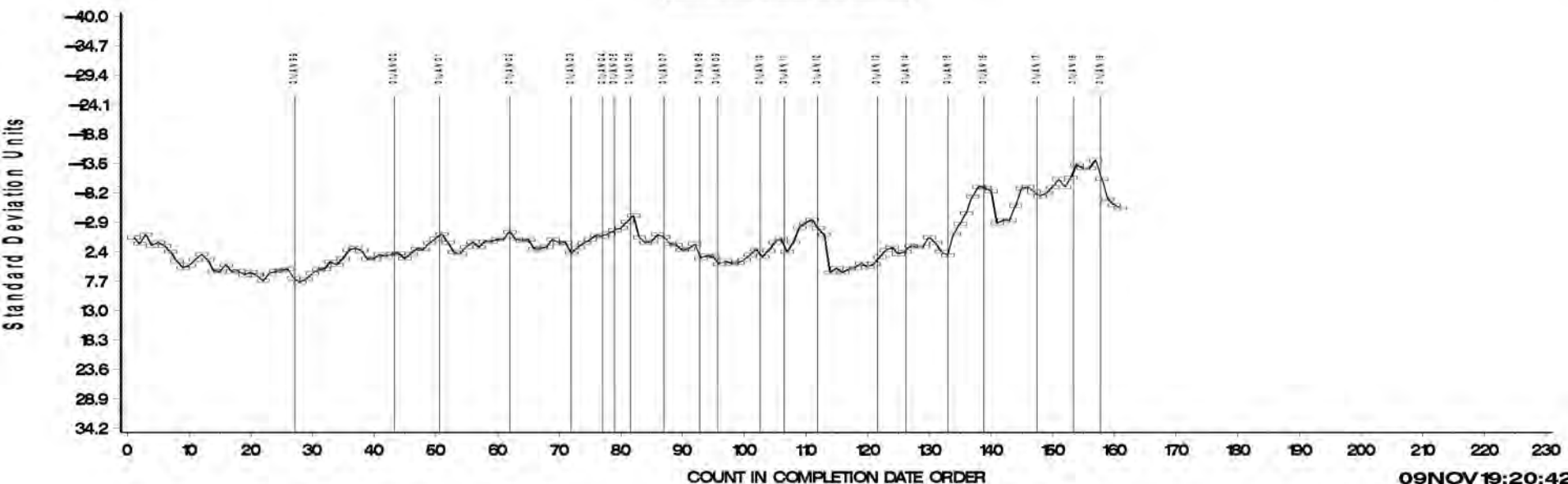
- ▶ VI38 is in control.
- ▶ RV48 is in Level 2 Zi alarm in severe direction.
- ▶ RV2 is in Level 1 Zi alarm in severe direction.

RELATIVE VISCOSITY @ 4.8% (100% LOSS)

LTMS Severity Analysis

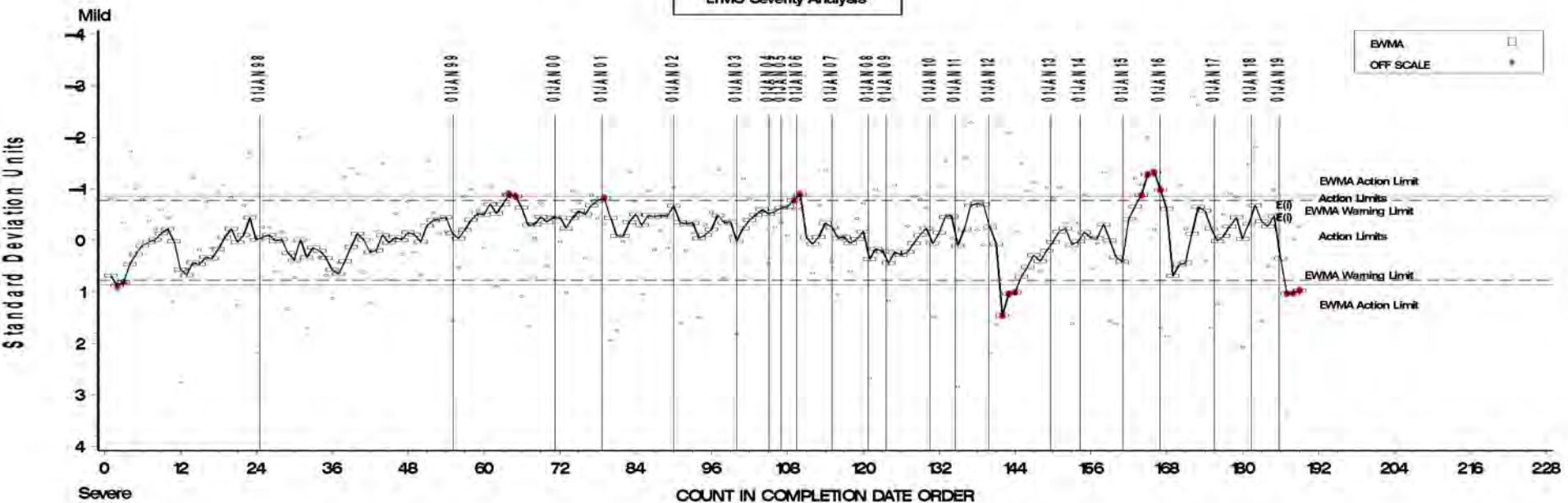


CUSUM Severity Analysis

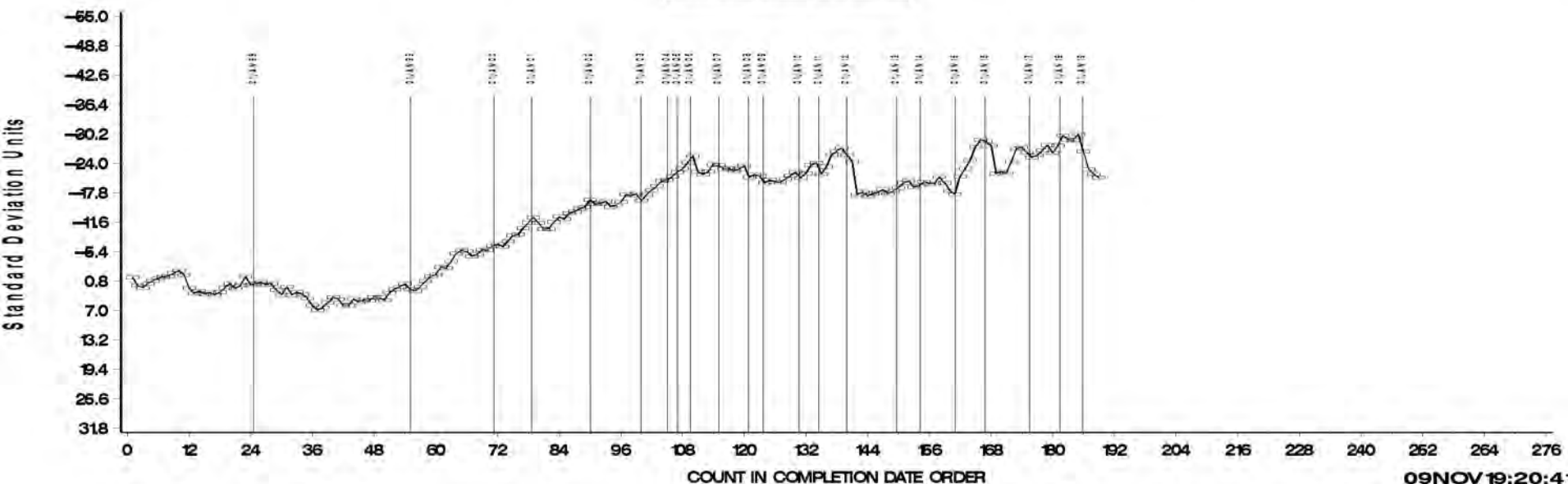


RELATIVE VISCOSITY @ 4.8% (50% LOSS)

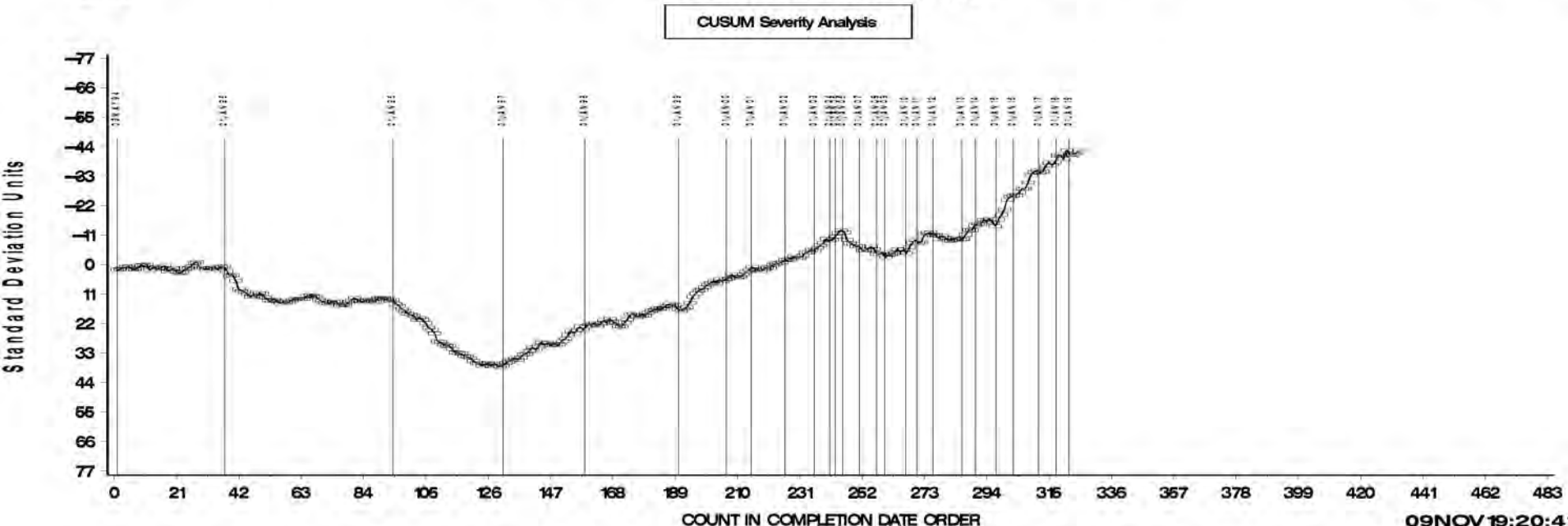
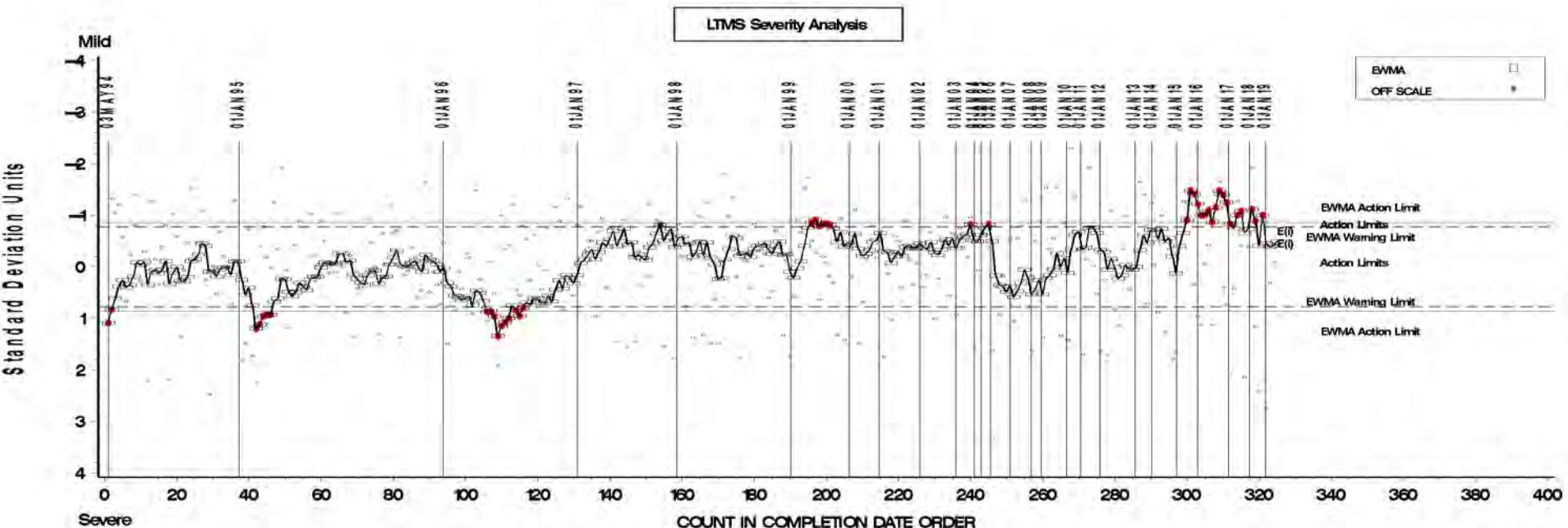
LTMS Severity Analysis



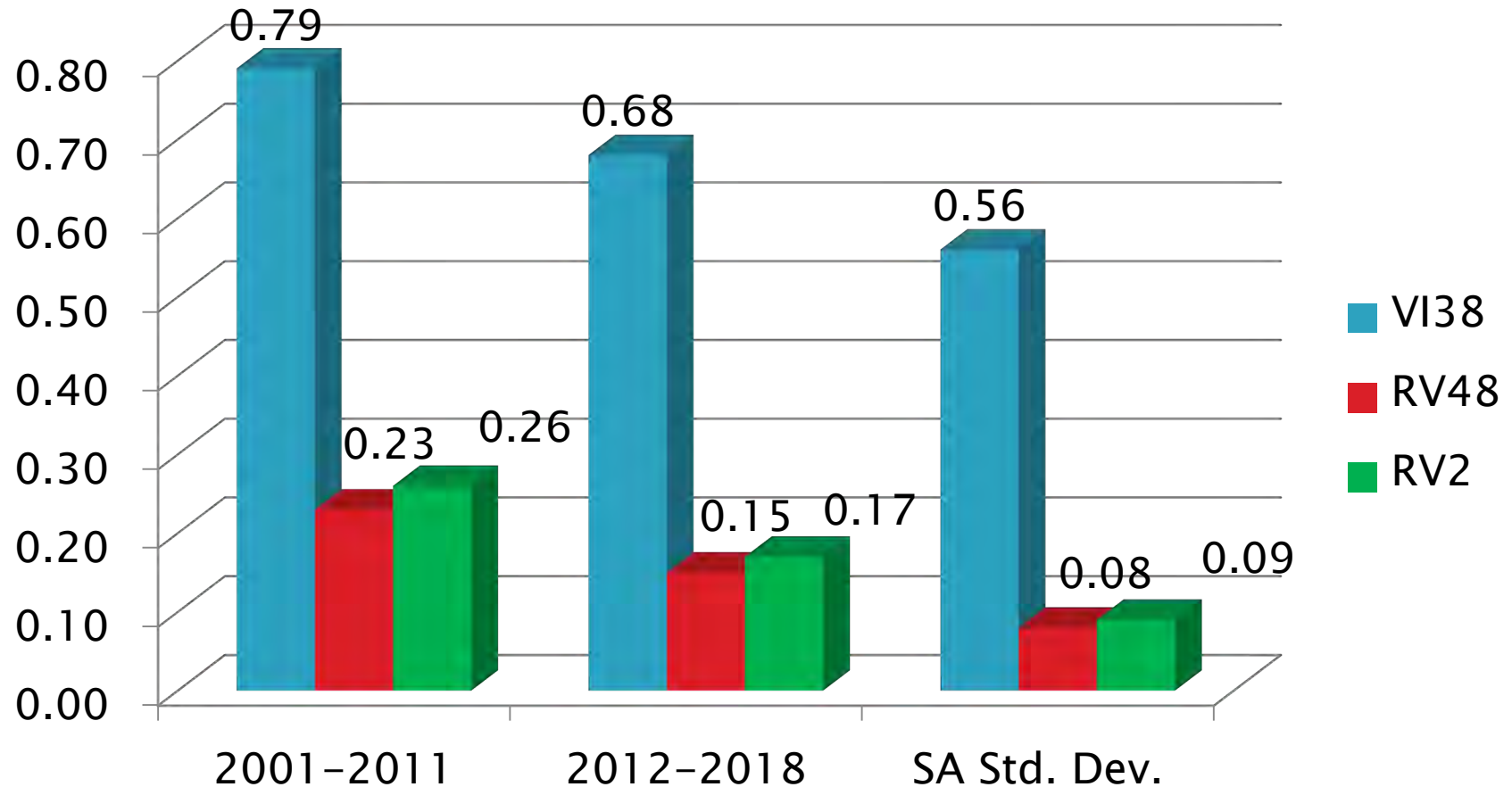
CUSUM Severity Analysis



VISCOSITY INCR @ 3.8% SOOT



T-8/E Precision Estimates



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Mack T-11

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T-11 Test Activity

Test Status	Validity Code	#
Acceptable Calibration Test	AC	5
Failed Calibration Test	OC	0
Operationally Invalid	LC	0
Aborted	XC	0
Total		5

T-11 Failed Tests

Failed Parameter	Number of Tests
No failed tests	0
Total	0

T-11 Lost Tests*

Status	Cause	#
Invalid	No invalid tests	0
Aborted	No aborted tests	0
Total		0

*Invalid and aborted tests

T-11 Test Severity

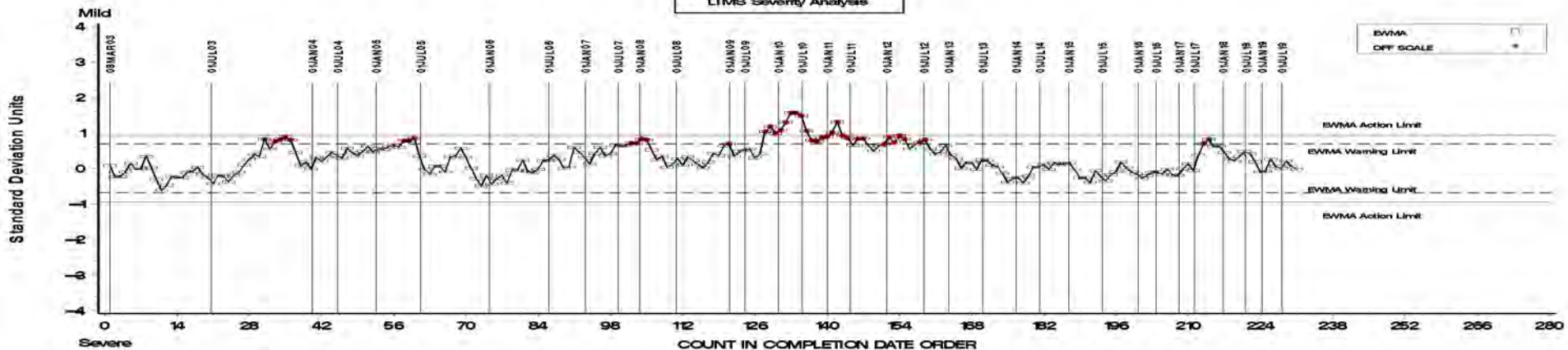
- ▶ SOOT and SOOT5 are in control.
- ▶ SOOT4 and MRV are in severity action alarm in the severe direction.
- ▶ MRV is in precision action alarm.

T-11 INDUSTRY OPERATIONALLY VALID DATA

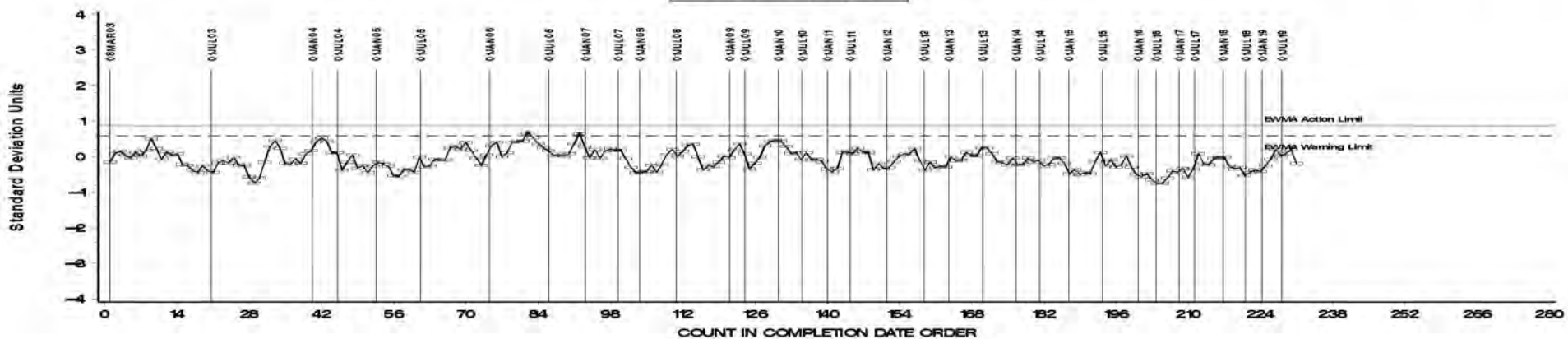


SOOT AT 12 cSt

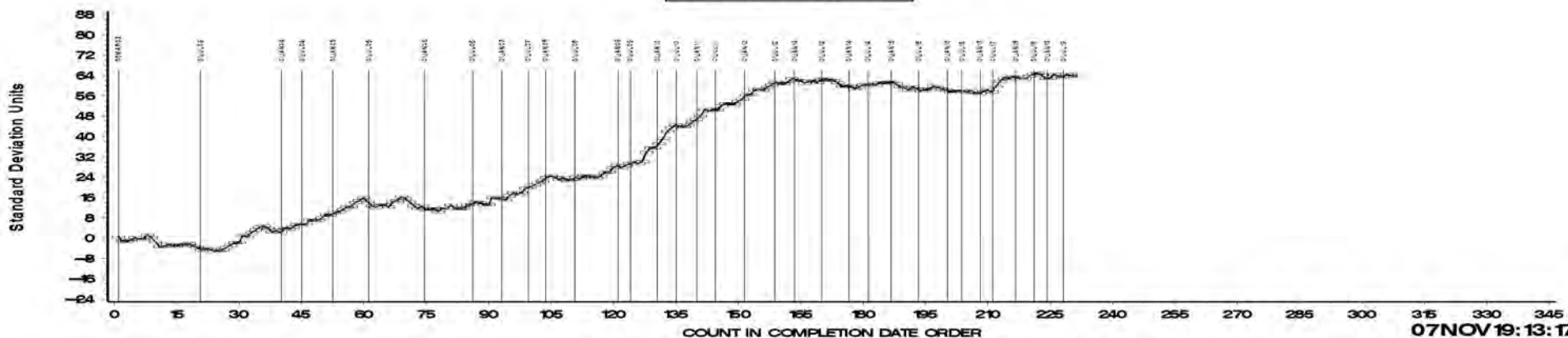
LTMS Severity Analysis



LTMS Precision Analysis



CUSUM Severity Analysis

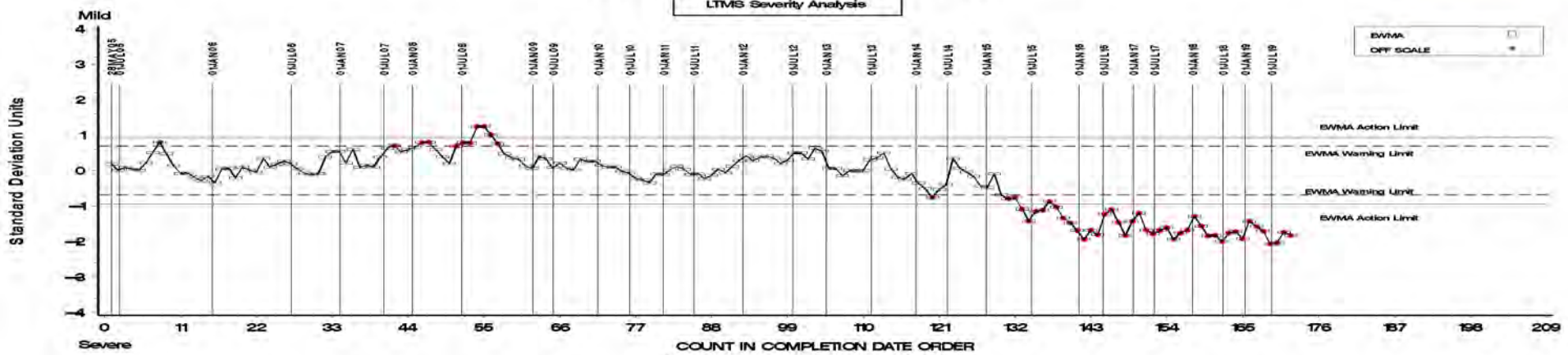


T-11 INDUSTRY OPERATIONALLY VALID DATA

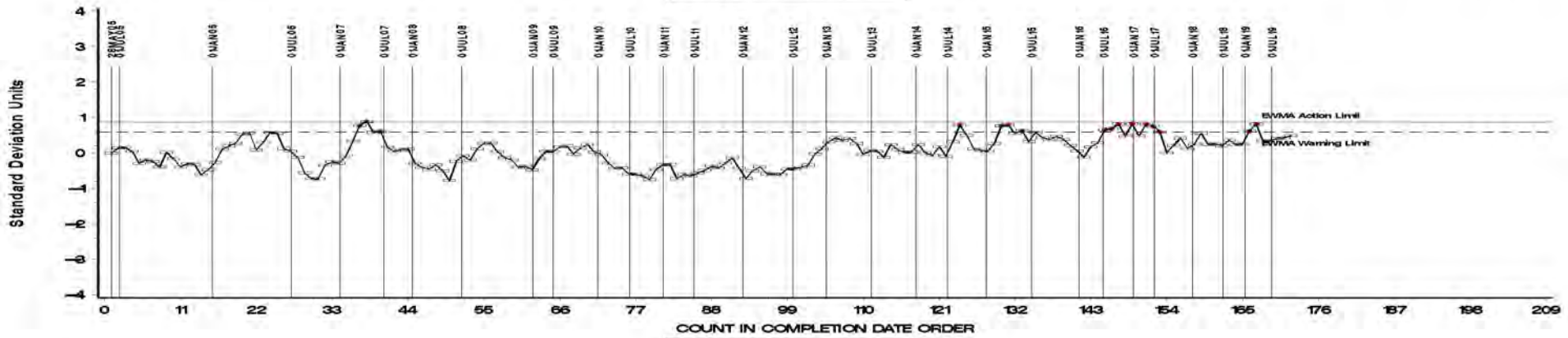


SOOT @ 4 cSt — FINAL RESULT

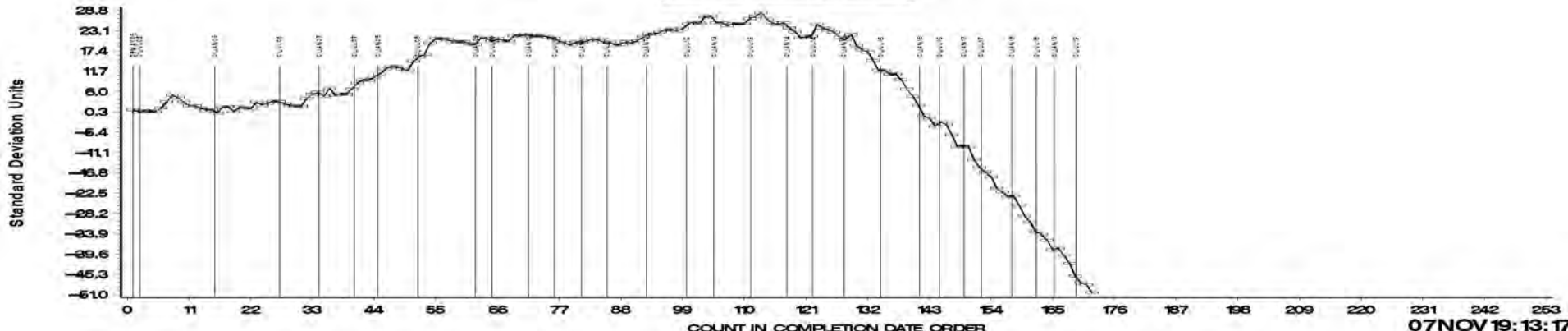
LTMS Severity Analysis



LTMS Precision Analysis



CUSUM Severity Analysis

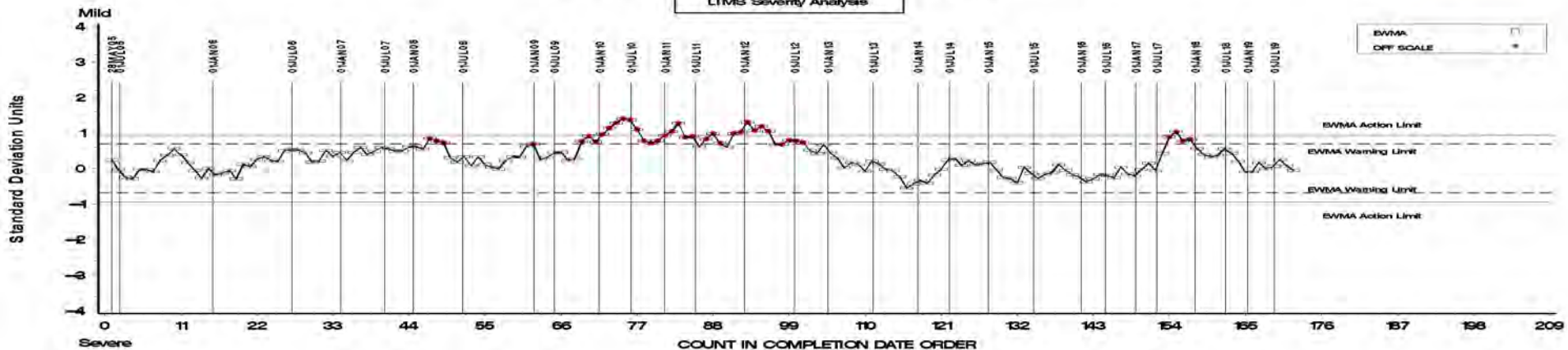


T-11 INDUSTRY OPERATIONALLY VALID DATA

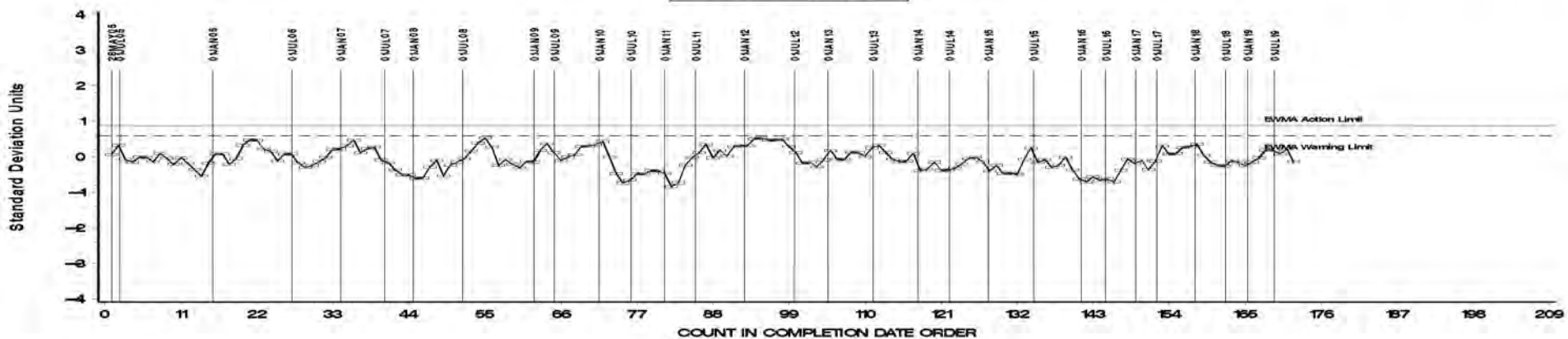


SOOT @ 15 cSt — FINAL RESULT

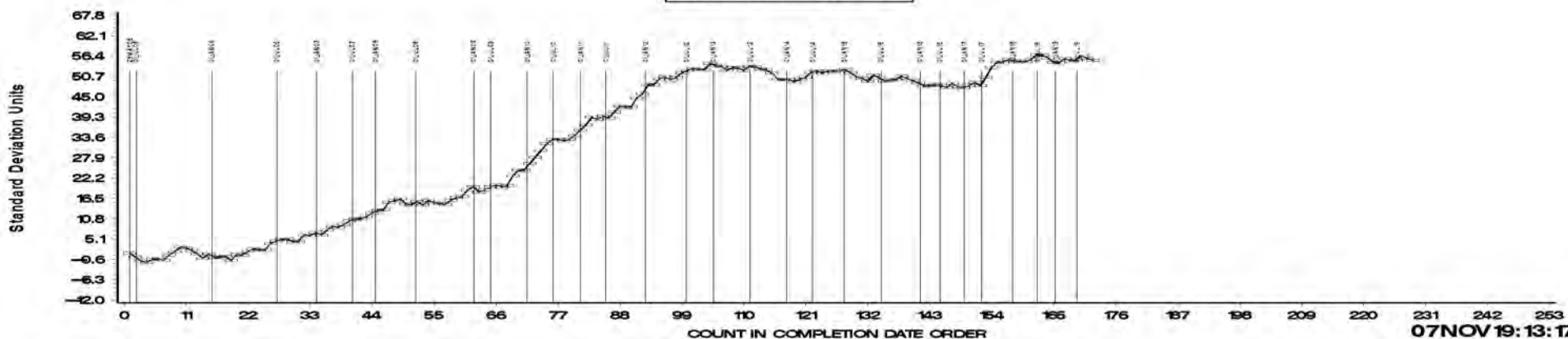
LTMS Severity Analysis



LTMS Precision Analysis



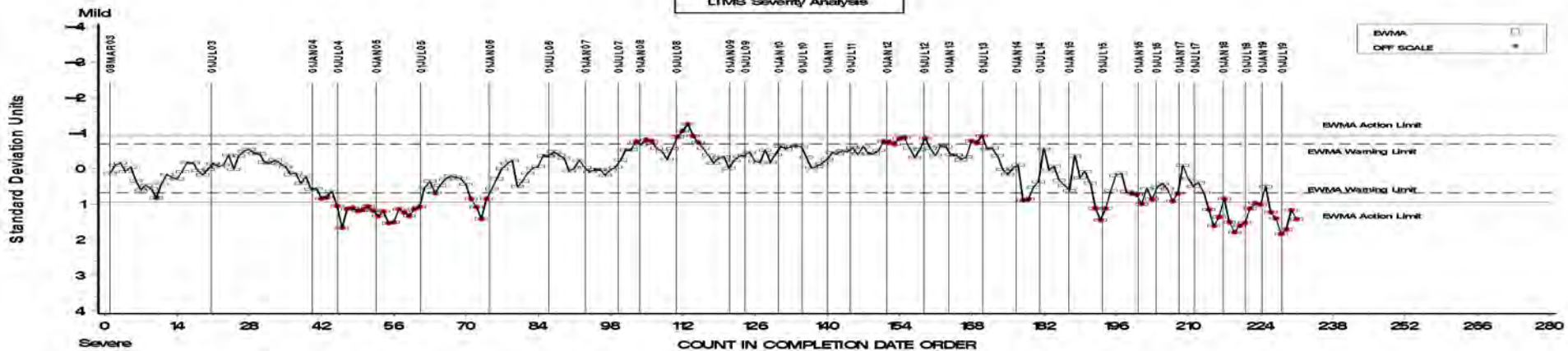
CUSUM Severity Analysis



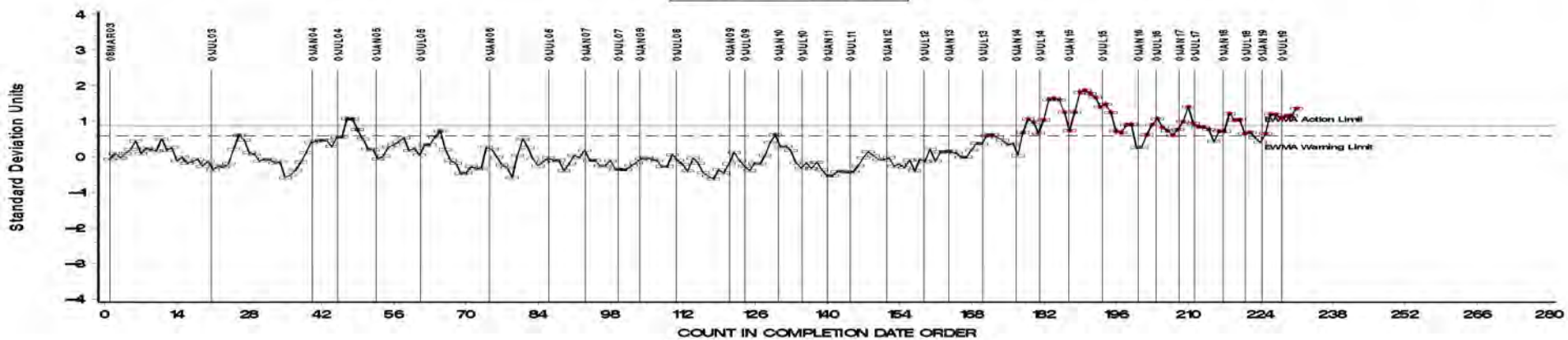
T-11 INDUSTRY OPERATIONALLY VALID DATA

MRV VISCOSITY

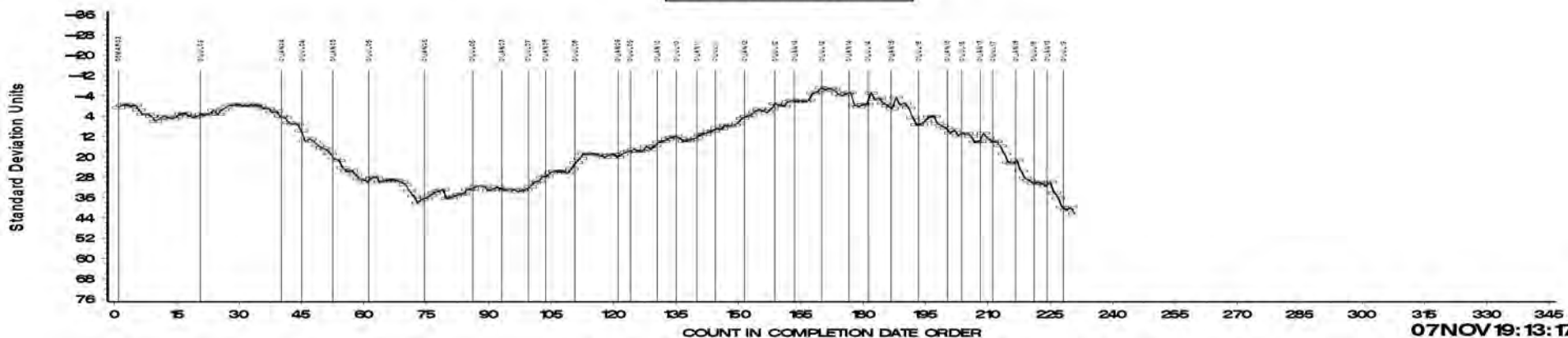
LTMS Severity Analysis



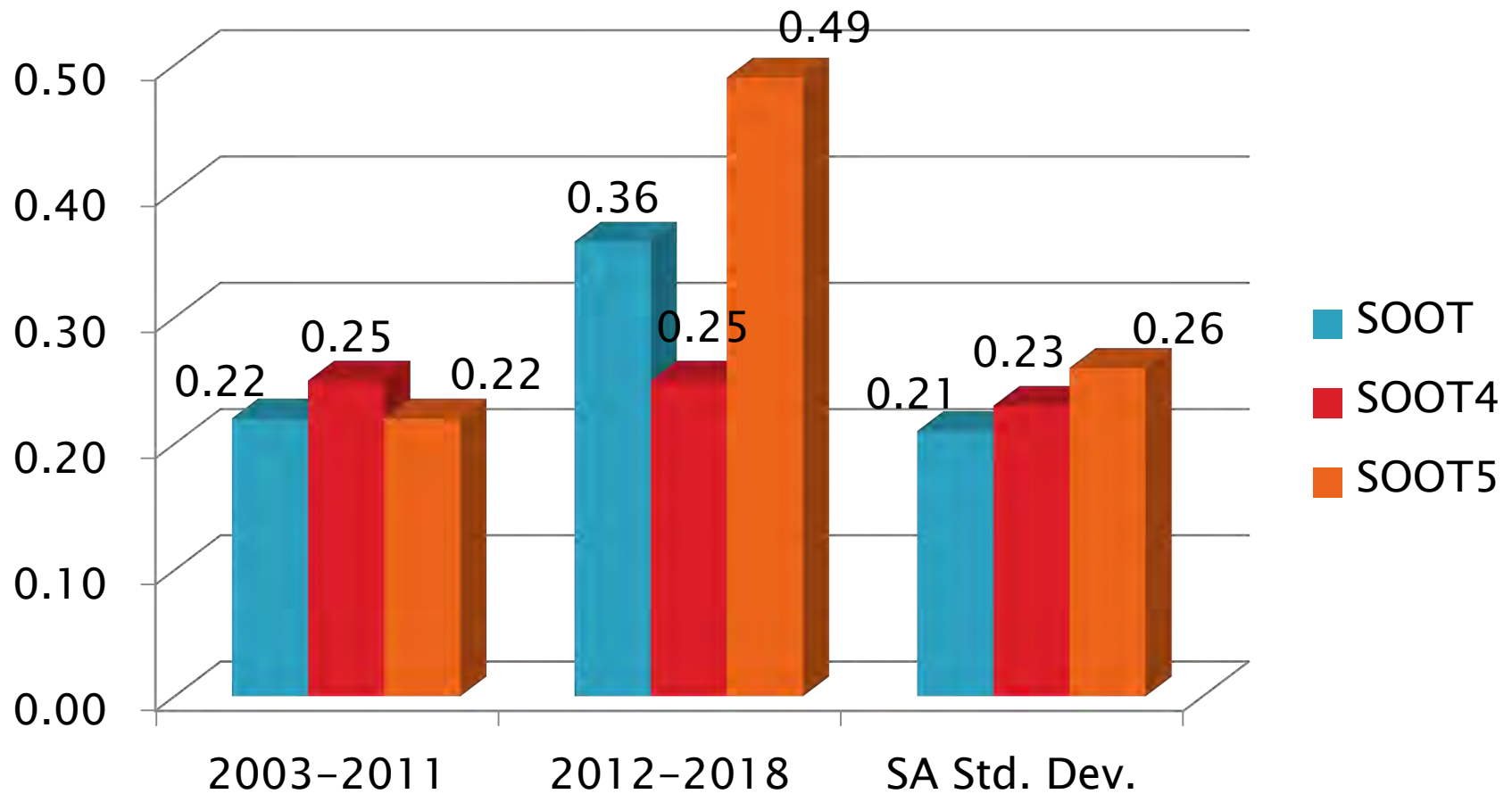
LTMS Precision Analysis



CUSUM Severity Analysis

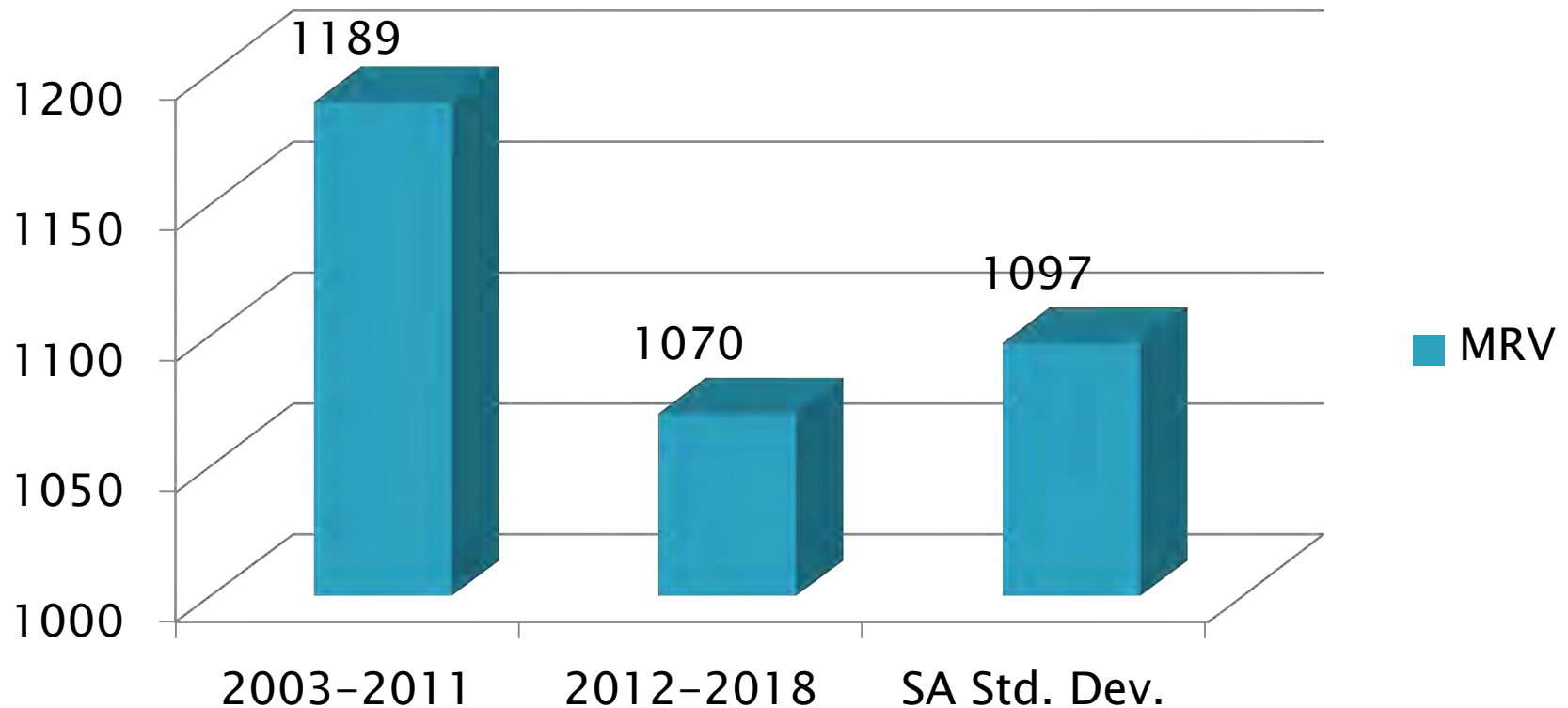


T-11 Precision Estimates



T-11 Precision Estimates

MRV



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Mack T-12

»» October 2019

Test Monitoring Center

<http://astmtmc.cmu.edu>



A Program of ASTM International

T-12 Test Activity

Test Status	Validity Code	#
Acceptable Calibration Test	AC	3
Failed Calibration Test	OC	0
Operationally Invalid	LC	0
Aborted	XC	0
Total		3

T-12 Failed Tests

Failed Parameter	Number of Tests
No failed tests	0
Total	0

T-12 Lost Tests*

Status	Cause	#
Invalid	No invalid tests	0
Aborted	No aborted tests	0
Total		0

*Invalid and aborted tests

T-12 Test Severity

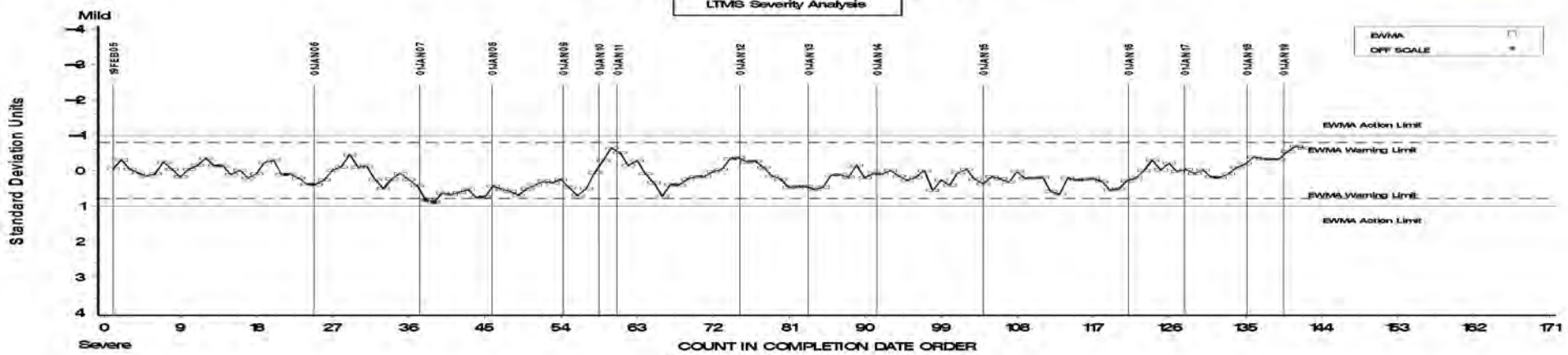
- ▶ CLW, Pb, Pb2, TRWL and OC are in control.

MACK T-12 INDUSTRY OPERATIONALLY VALID DATA

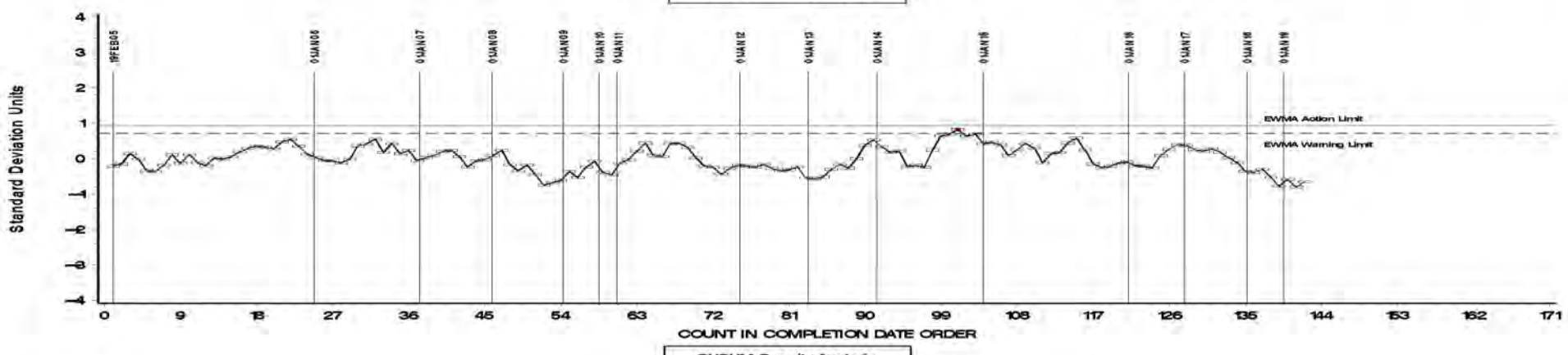


AVG. CYLINDER LINER WEAR (CLW)

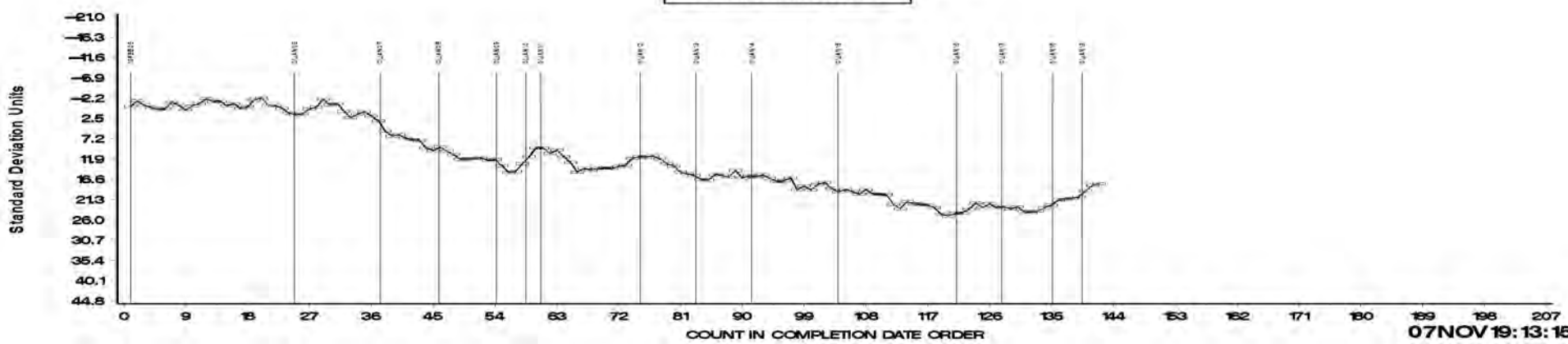
LTMS Severity Analysis



LTMS Precision Analysis

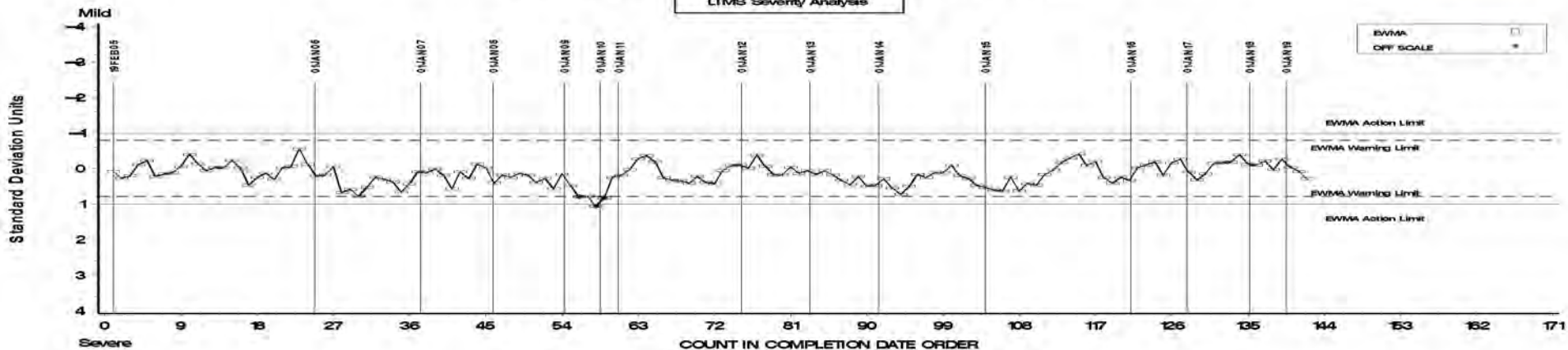


CUSUM Severity Analysis

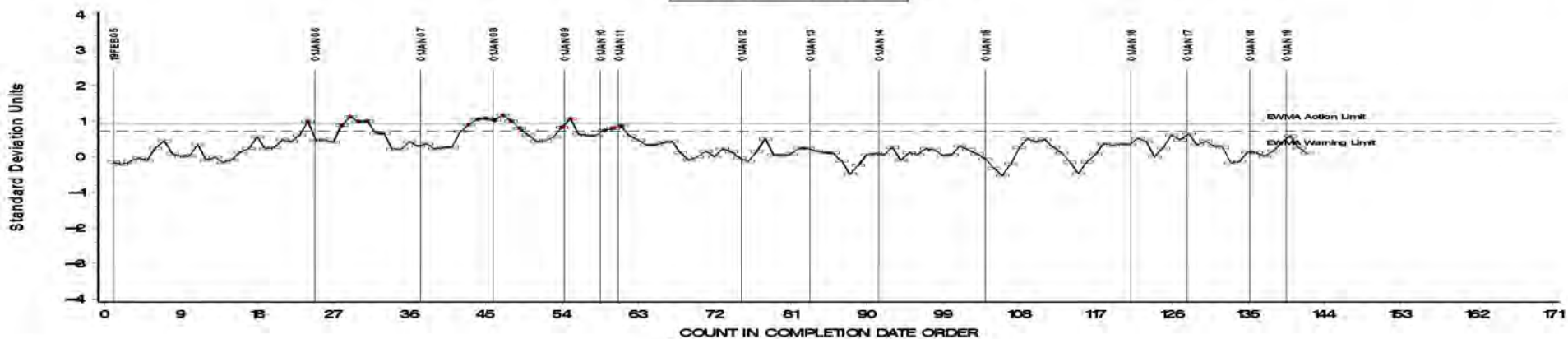


FINAL TRANS. RES. OIL CONSUMPTION

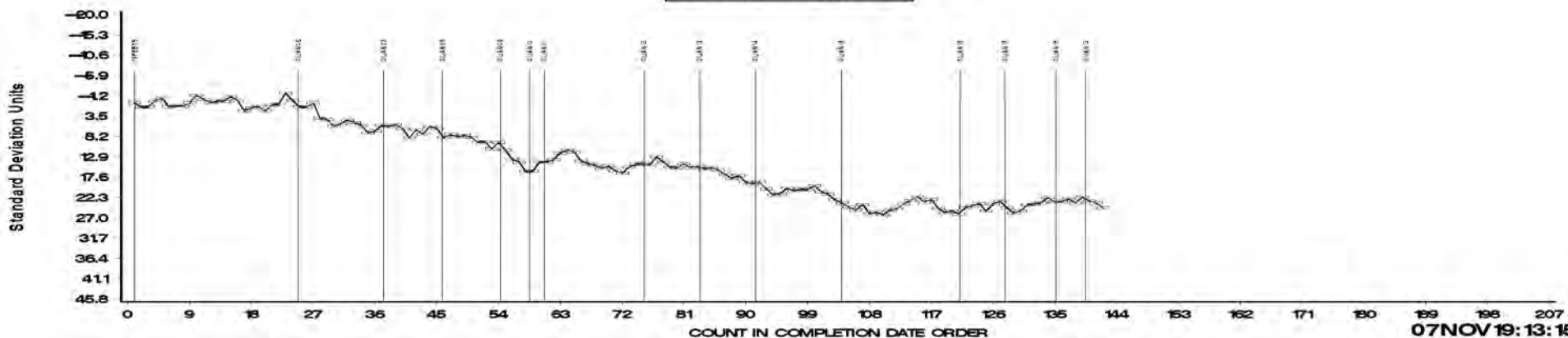
LTMS Severity Analysis



LTMS Precision Analysis



CUSUM Severity Analysis

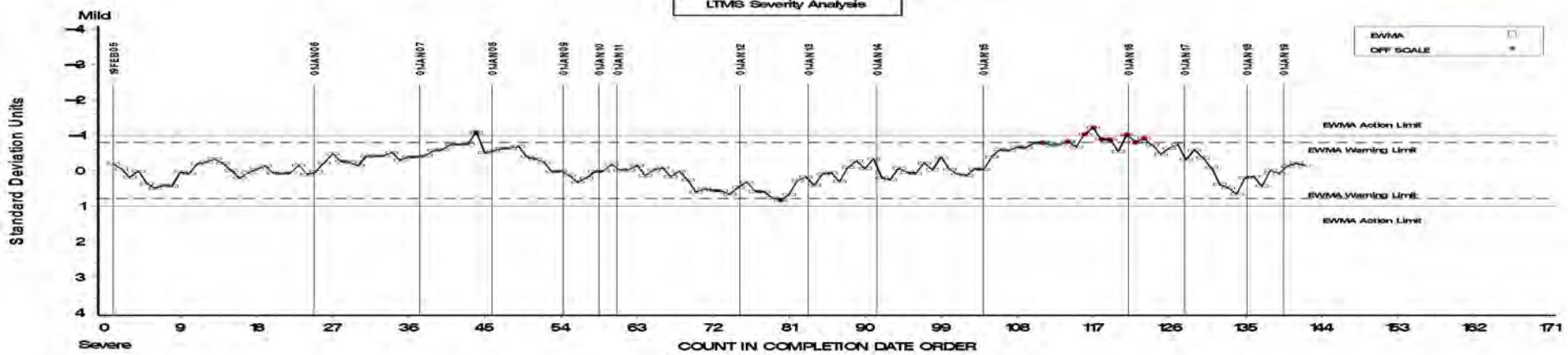


MACK T-12 INDUSTRY OPERATIONALLY VALID DATA

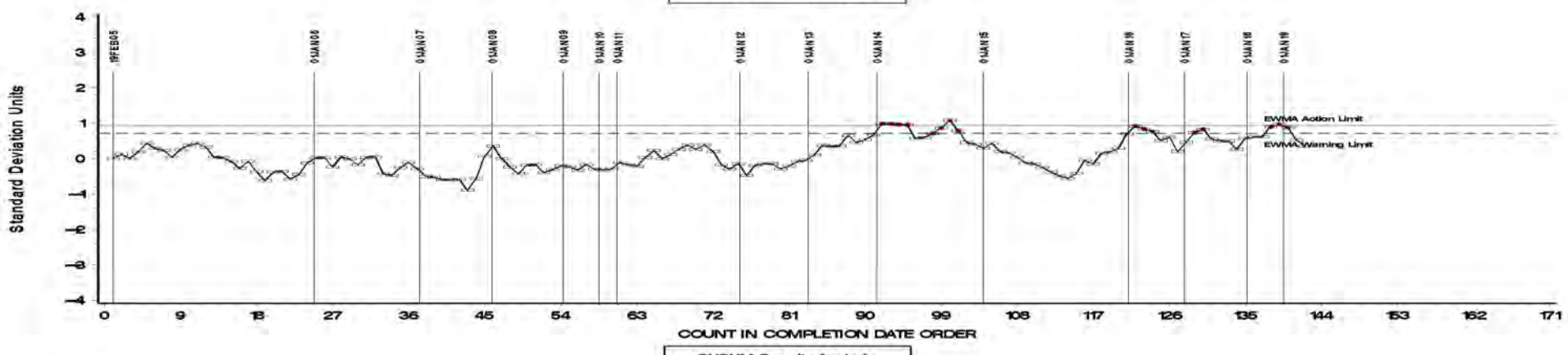


FINAL TRANS. RES. DELTA PB @ EOT

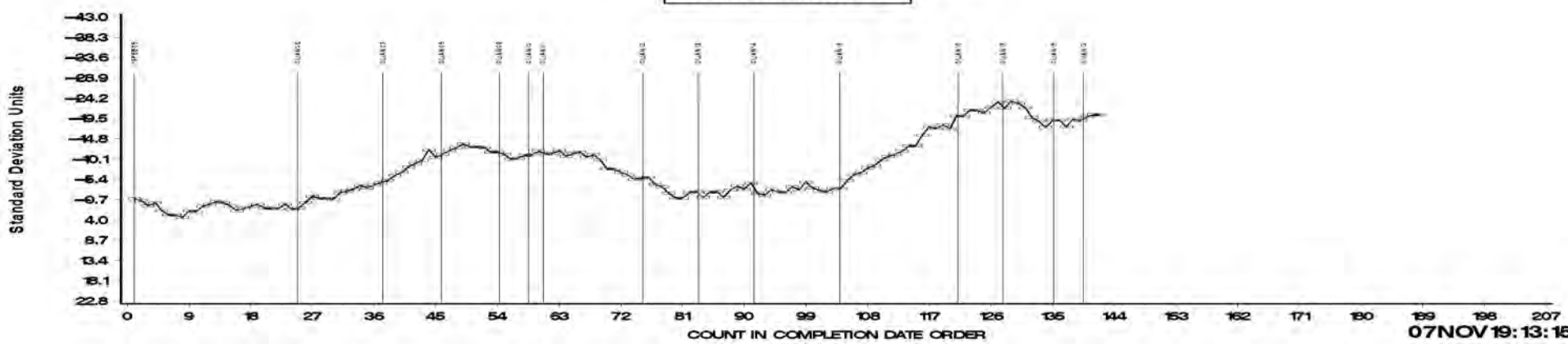
LTMS Severity Analysis



LTMS Precision Analysis



CUSUM Severity Analysis

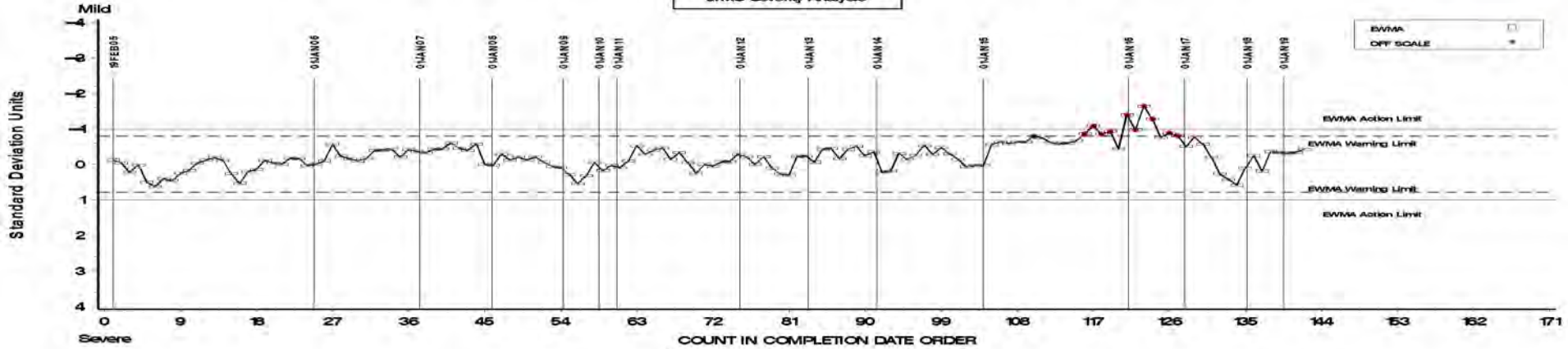


MACK T-42 INDUSTRY OPERATIONALLY VALID DATA

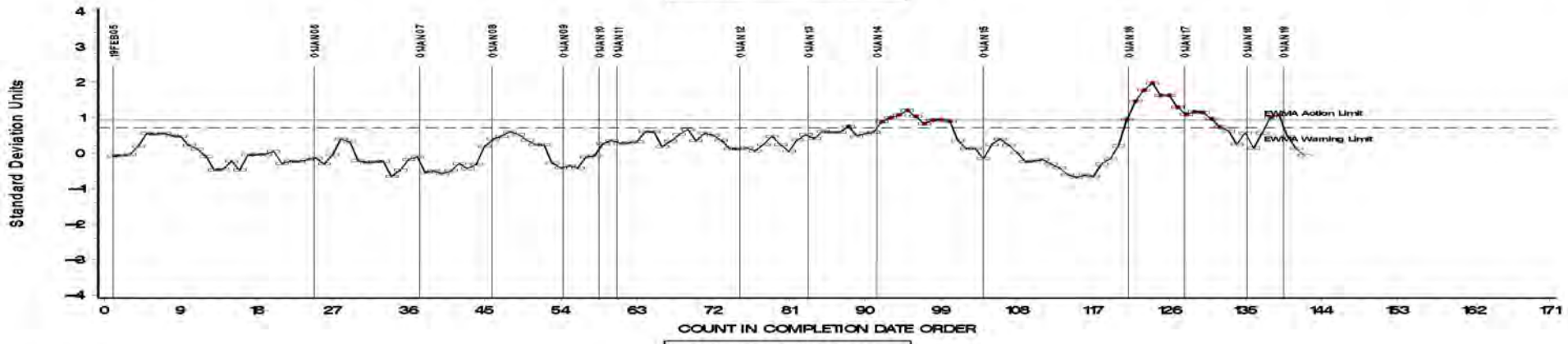


FINAL TRANS. RES. DELTA PB 250-300H

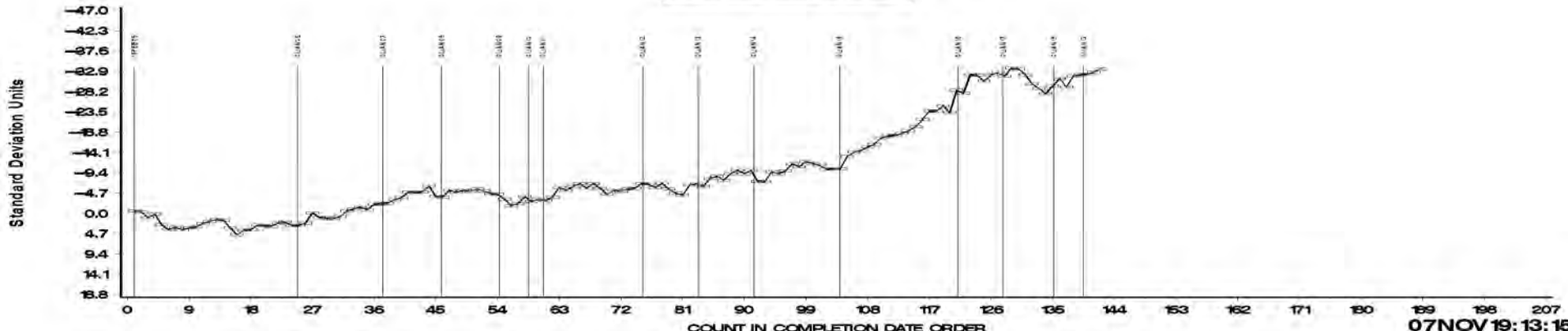
LTMS Severity Analysis



LTMS Precision Analysis



CUSUM Severity Analysis

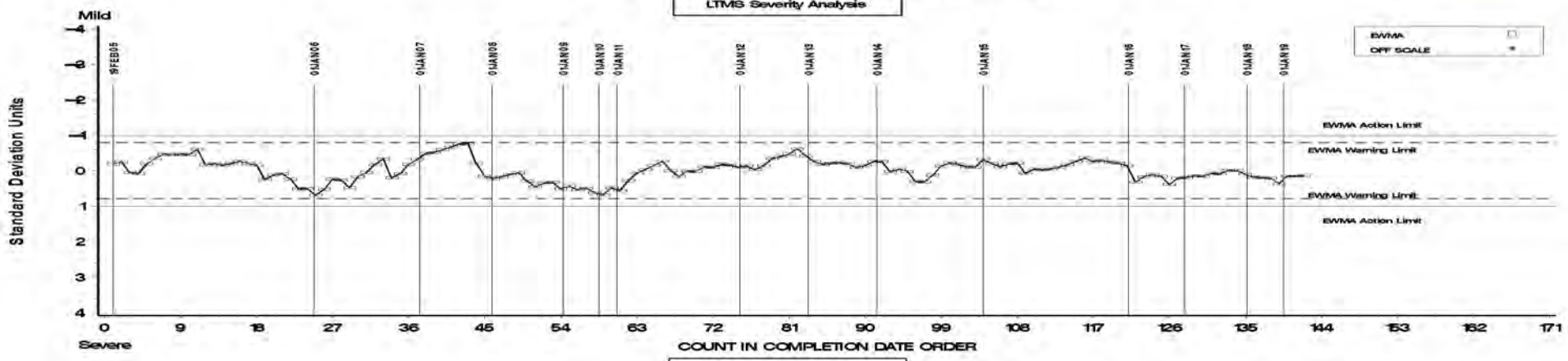


MACK T-12 INDUSTRY OPERATIONALLY VALID DATA

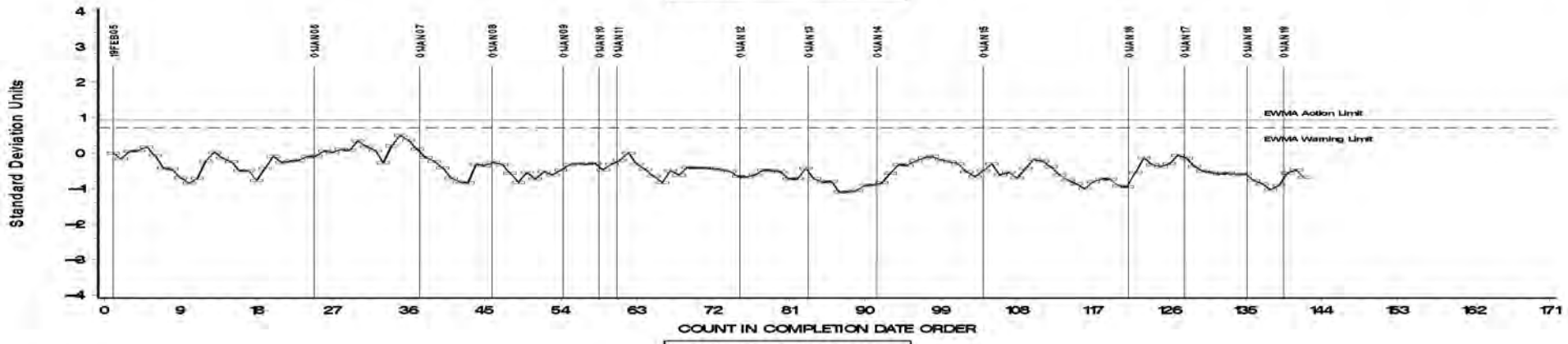


AVG. TOP RING WEIGHT LOSS (TRWL)

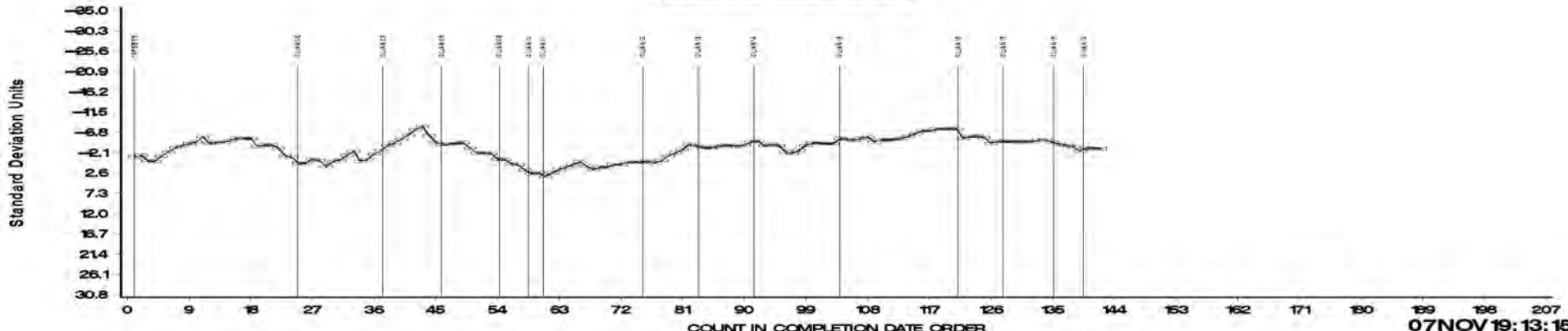
LTMS Severity Analysis



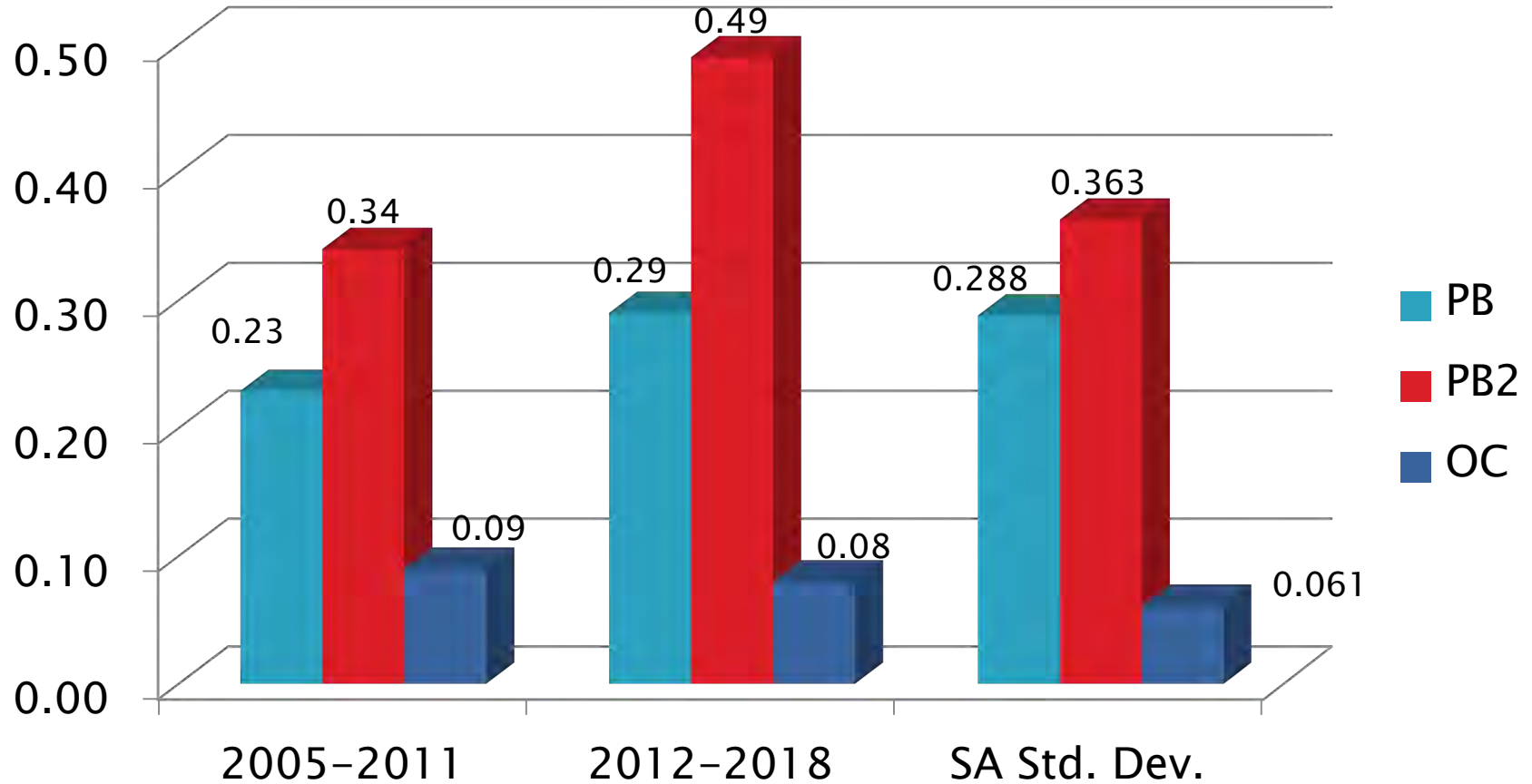
LTMS Precision Analysis



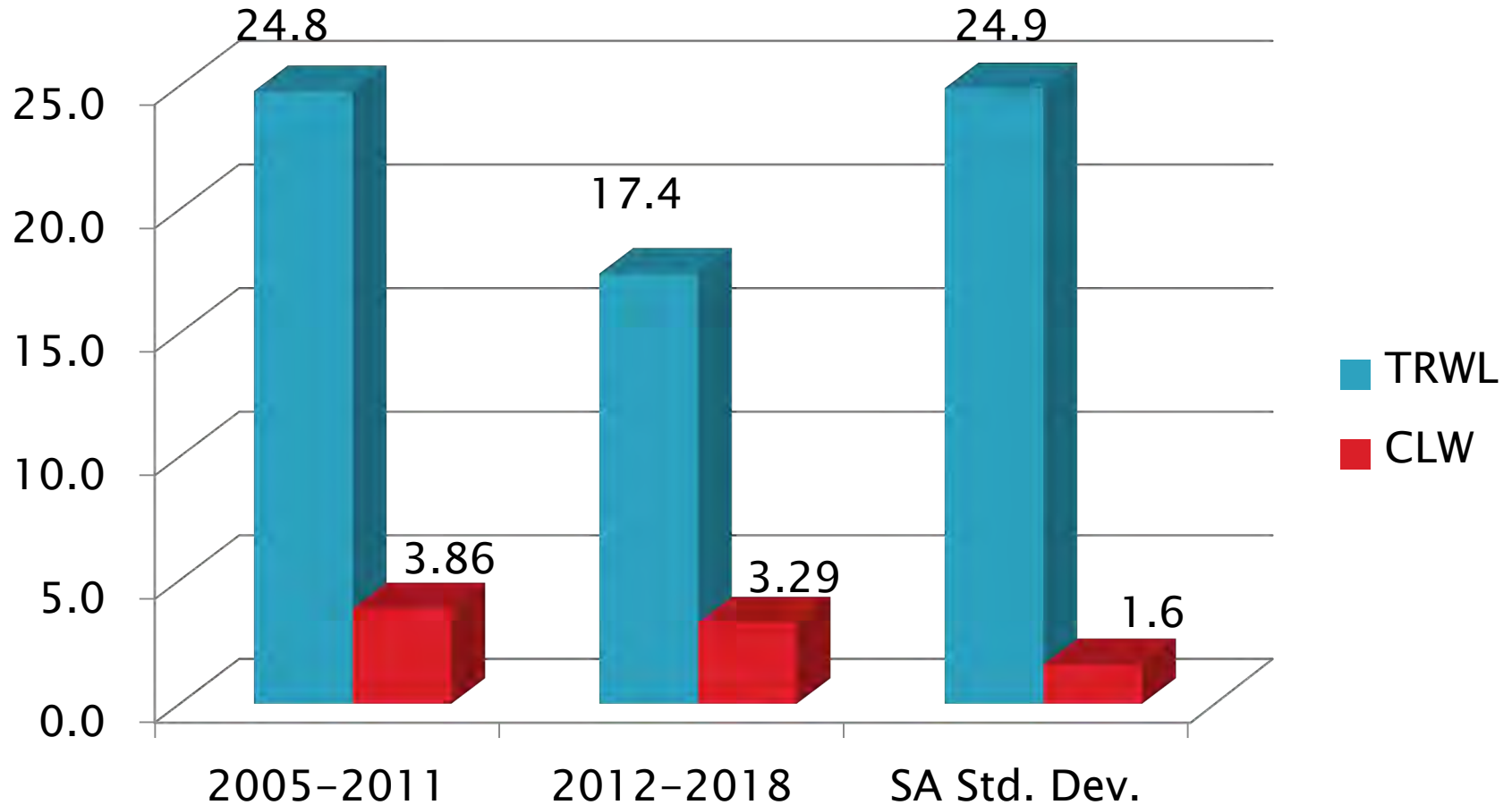
CUSUM Severity Analysis



T-12 Precision Estimates



T-12 Precision Estimates



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Mack T-12A

»» October 2019

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T-12A Test Activity

Test Status	Validity Code	#
Acceptable Calibration Test	AC	3
Failed Calibration Test	OC	0
Operationally Invalid	LC	0
Aborted	XC	0
Total		3

T-12A Failed Tests

Failed Parameter	Number of Tests
No failed tests	0
Total	0

T-12A Lost Tests*

Status	Cause	#
Invalid	No invalid tests	0
Aborted	No aborted tests	0
Total		0

*Invalid and aborted tests

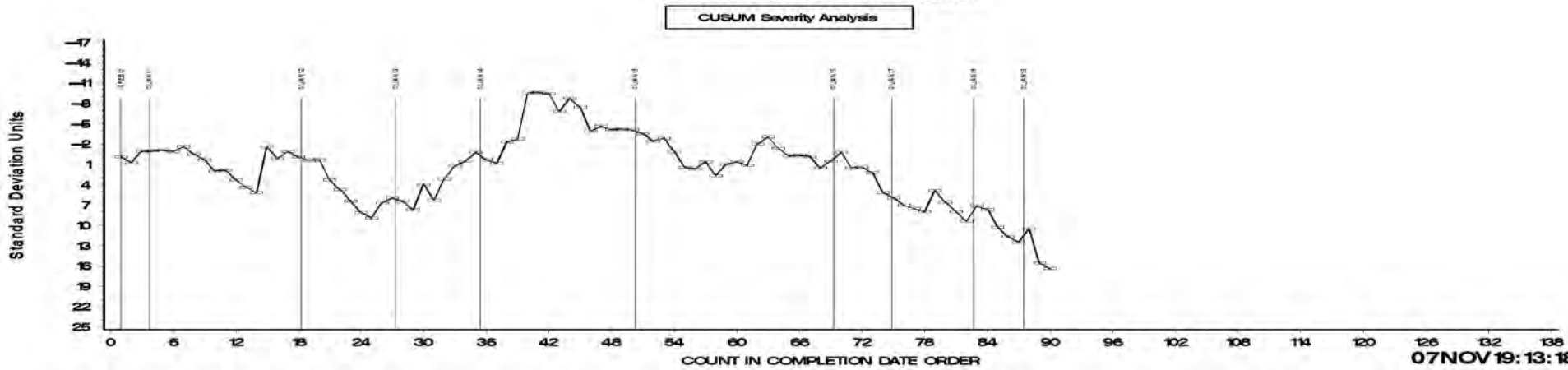
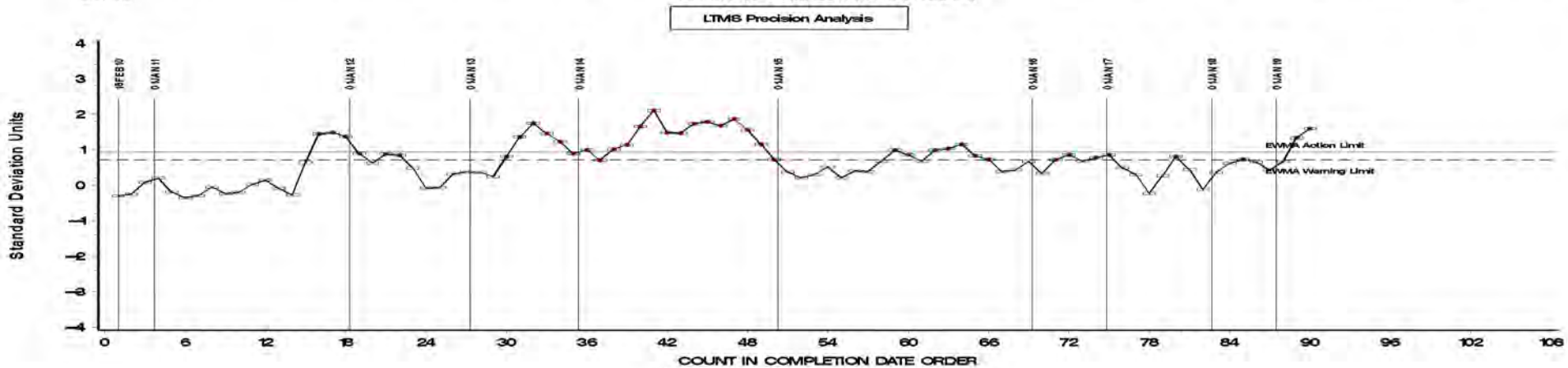
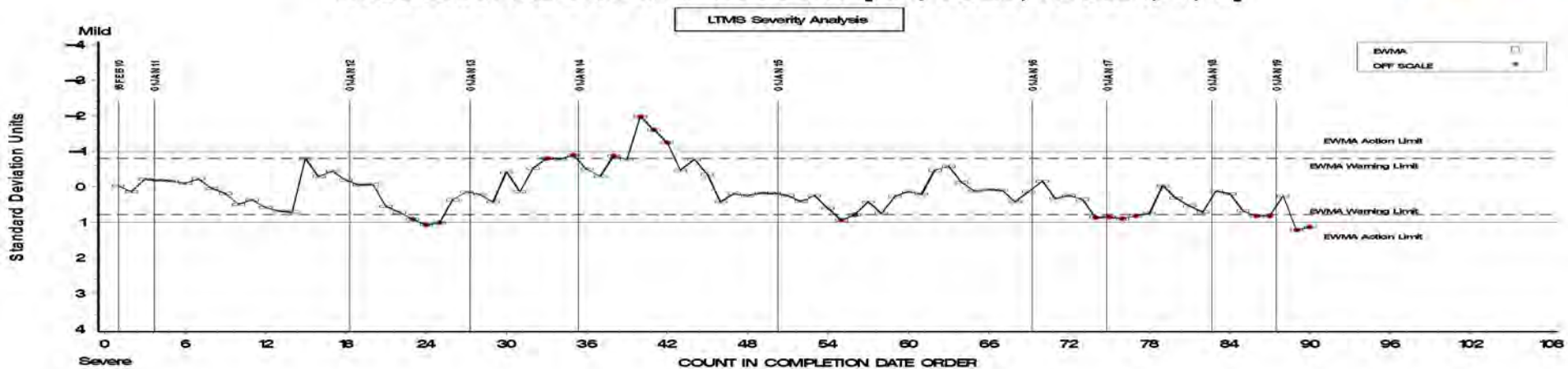
T-12A Test Severity

- ▶ MRV is in severity and precision action alarm.

MACK T-2A INDUSTRY OPERATIONALLY VALID DATA

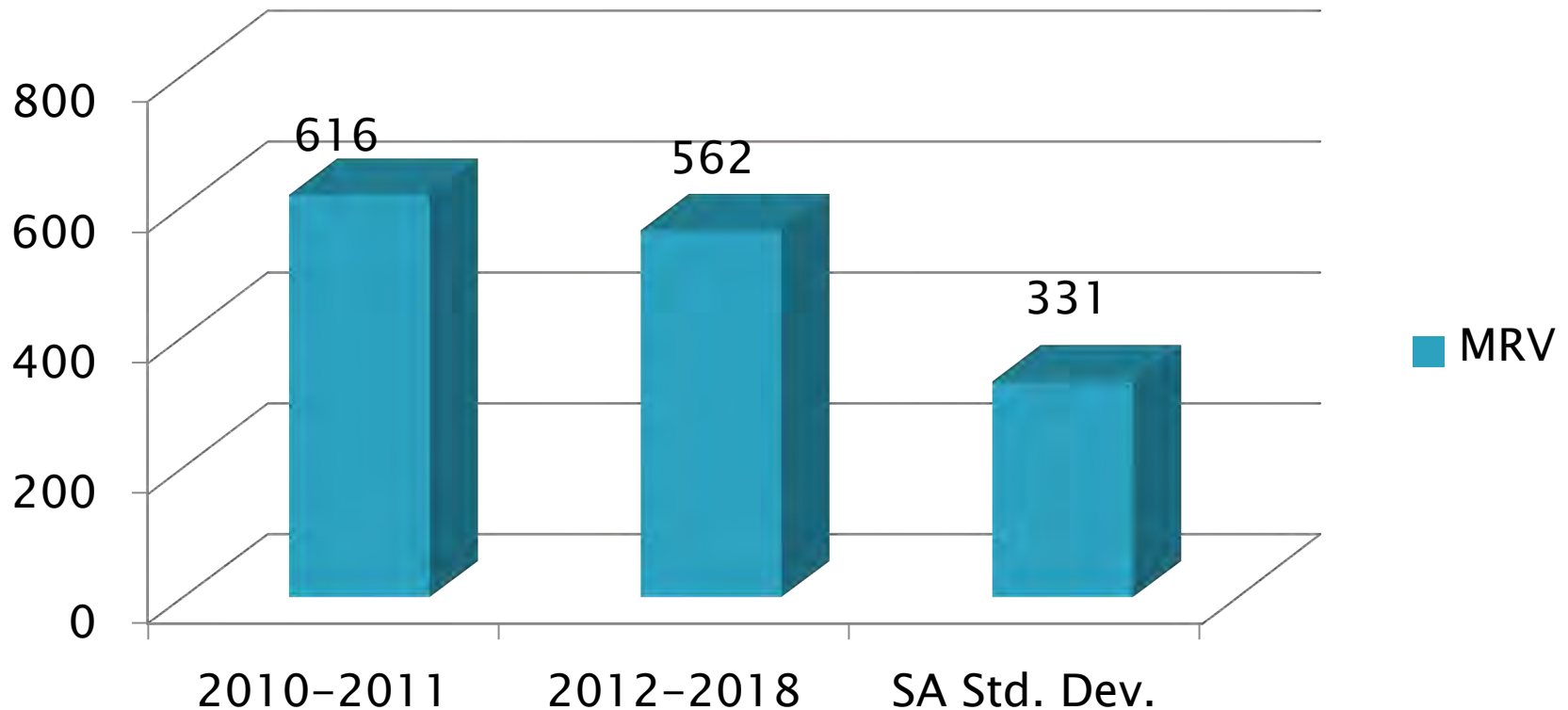


FINAL ORIGINAL UNIT MRV VISCOSITY [NM, SOLID, FROZEN, <, >]



T-12A Precision Estimates

MRV



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Mack T-13

»» October 2019

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T-13 Test Activity

Test Status	Validity Code	#
Acceptable Calibration Test	AC	4
Failed Calibration Test	OC	0
Operationally Invalid	LC	1
Aborted	XC	0
Total		5

T-13 Failed Tests

Failed Parameter	Number of Tests
No failed tests	0
Total	0

T-13 Lost Tests*

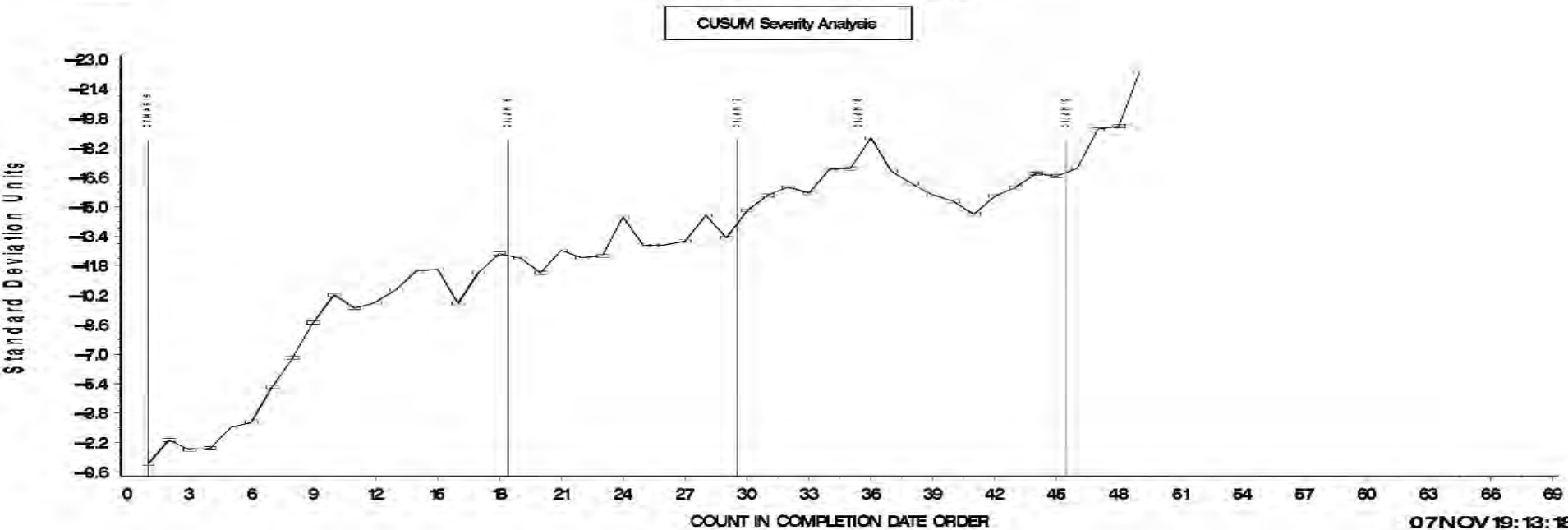
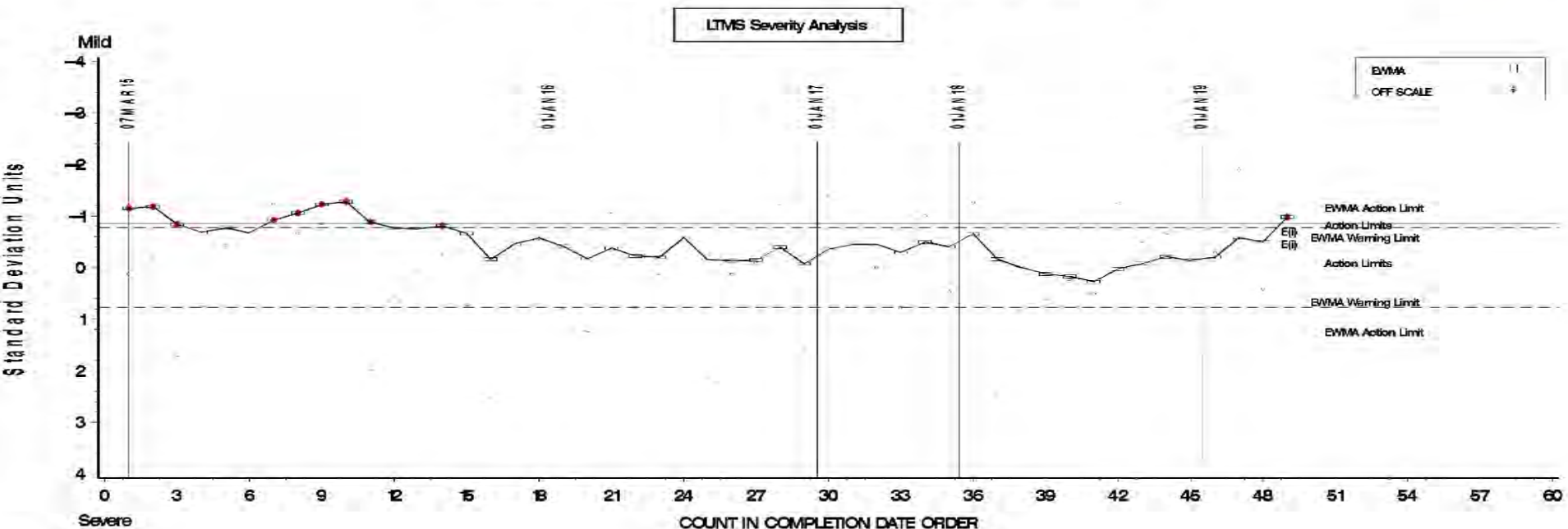
Status	Cause	#
Invalid	Bad intake air transducer calibration	1
Aborted	No aborted tests	0
Total		1

*Invalid and aborted tests

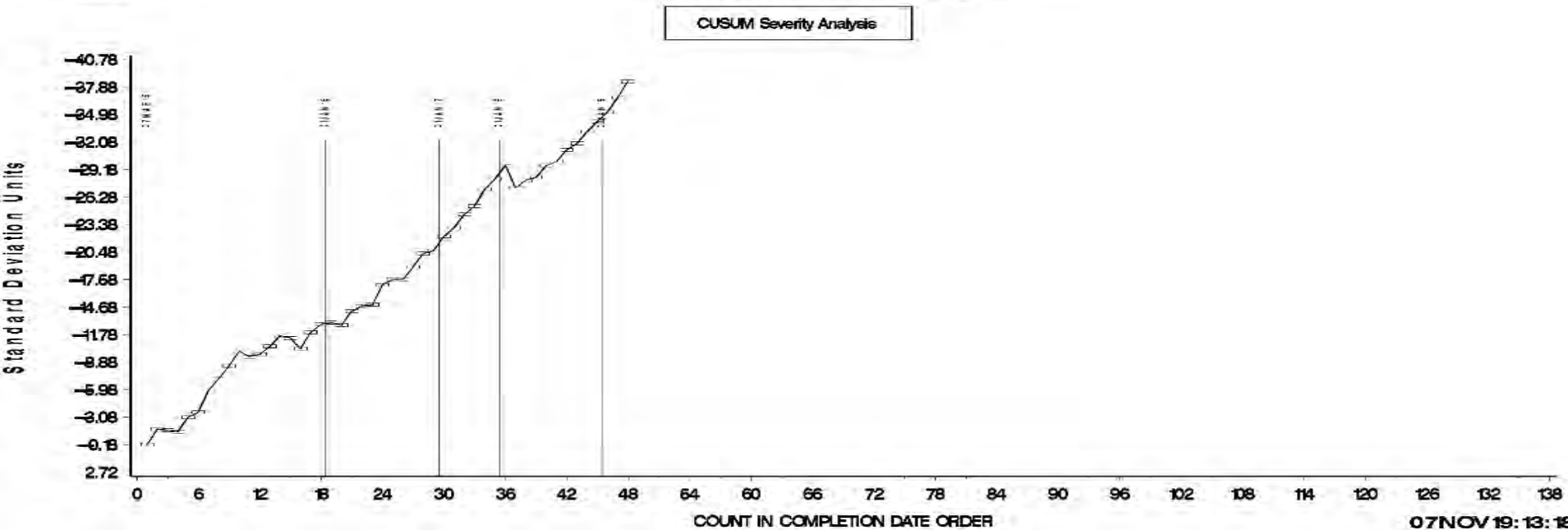
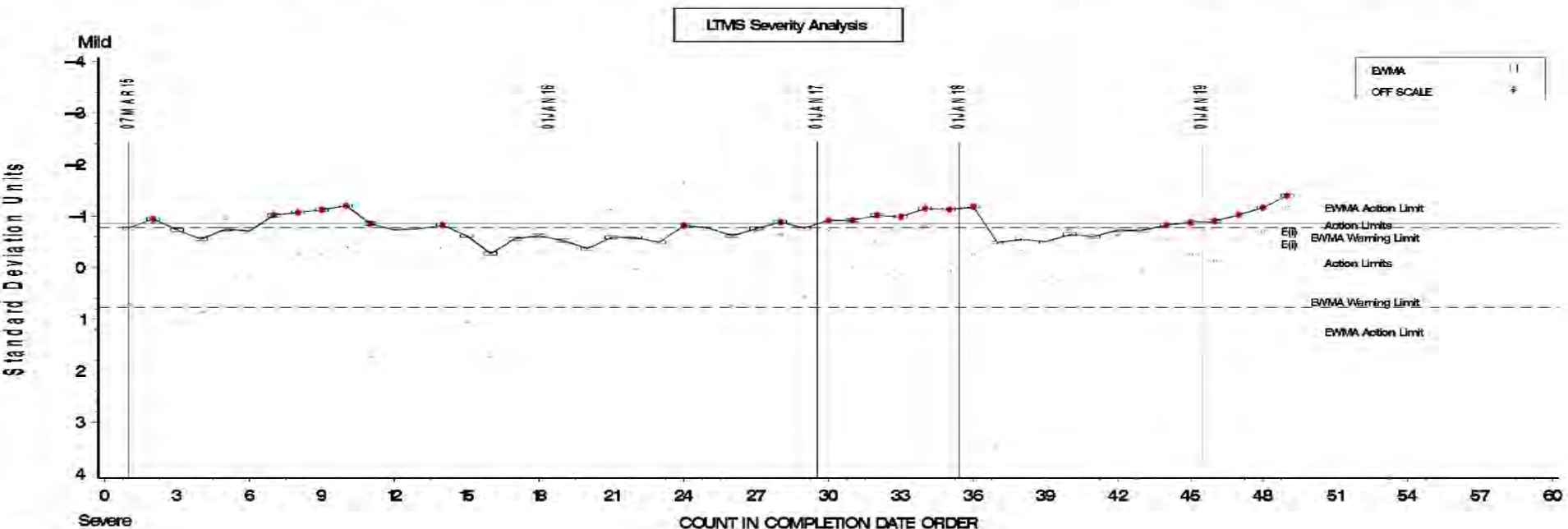
T-13 Test Severity

- ▶ IRPH and KV40 are in Level 2 Zi alarm.

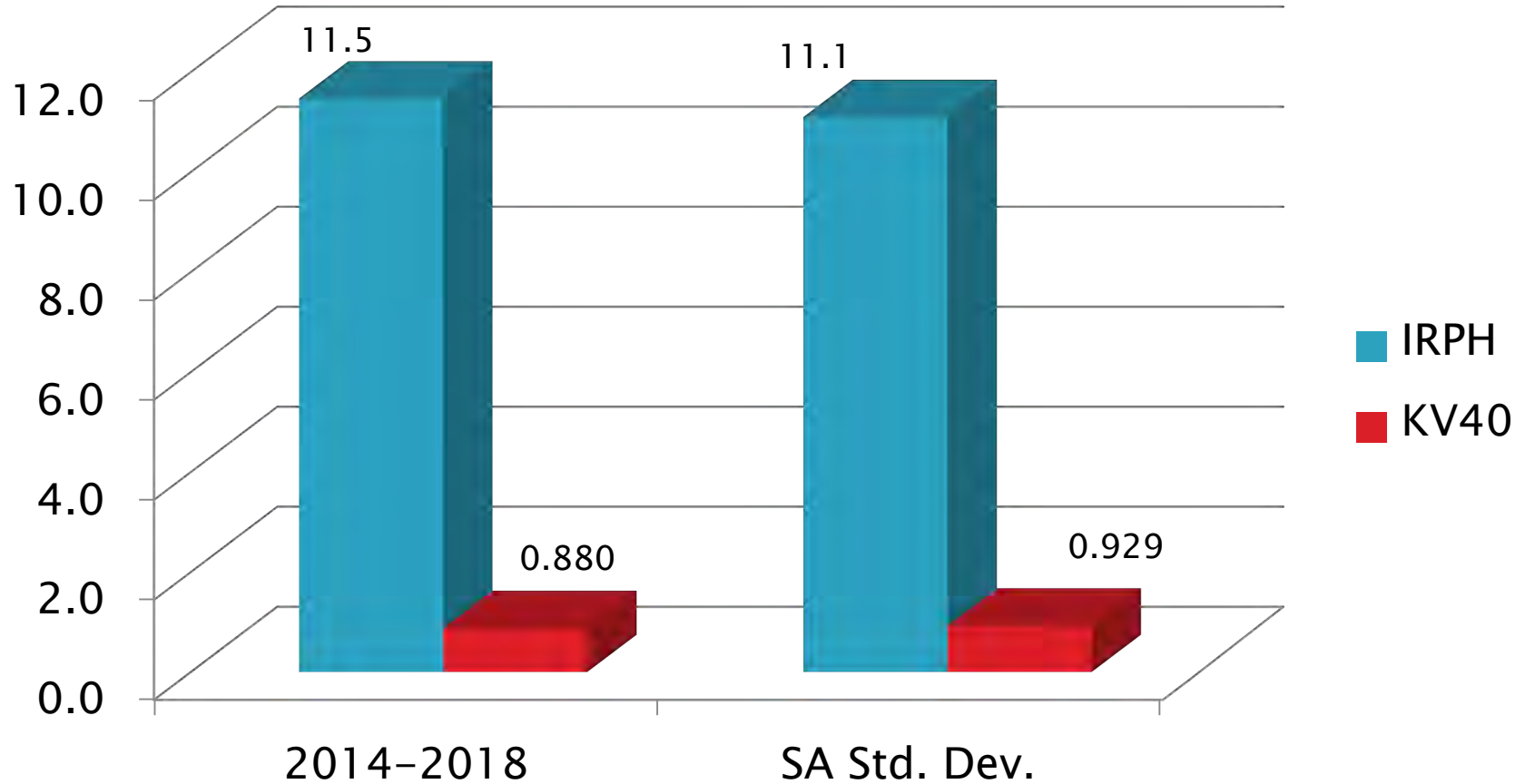
FINAL ORIGINAL PEAK HEIGHT IR AT EOT



FNL. ORIG. UNIT KINEMATIC VISCOSITY AT 40 DEG C % CHANGE 300-360 HRS



T-13 Precision Estimates



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Information Letters

»» April 1, 2019 –
September 30, 2019

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Information Letters*

Test	Date	IL	Topic
ISB	4/29/2019	19-1	Fuel Specifications for TMC-Monitored Tests
ISM	4/29/2019	19-1	Fuel Specifications for TMC-Monitored Tests
T-8	6/3/2019	19-1	Fuel Specification moved to TMC-Monitored Tests Fuels Document
T-11	6/3/2019	19-1	Fuel Specification moved to TMC-Monitored Tests Fuels Document
T-12	6/3/2019	19-1	Fuel Specification moved to TMC-Monitored Tests Fuels Document
T-13	6/3/2019	19-1	Fuel Specification moved to TMC-Monitored Tests Fuels Document

*Available from TMC Website

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Memos

»» April 1, 2019 –
September 30, 2019

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Memos*

Date	Number	Topic
5/21/2019	19-025	Temporary T-12 Piston Skirt Re-use

*Available from TMC Website

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Reference Oil Inventory

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

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Reference Oil Reblends

- ▶ No re-blends in this reporting period

Reference Oil Inventory Estimated Life

Oil	Tests	Original Blend Amount	Quantity Shipped in last 6 months	TMC Inventory	Lab Inventory	Estimated Life
809-1	1K, 1N	9134	40	2058	136	5+ years
811-2	1K, 1N	1732	30	865	50	5+ years
821-4	T-12	4495	50	2625	125	5+ years
822-2	1R, T-11	4386	112	2590	112	3+ years
823	T-13	1796	100	678	160	2.5 years
830-3	ISM	2891	0	2791	75	5+ years
831-4	C13, ISB	1699	110	1386	135	5+ years

Reference Oil Inventory Estimated Life

Oil	Tests	Original Blend Amount	Quantity Shipped in last 6 months	TMC Inventory	Lab Inventory	Estimated Life
832-1	COAT	1951	168	1557	140	5+ years
833-1	COAT	1248	168	856	168	4+ years
864-1	DD13	1576	75	918	150	2+ years
873-2	1M-PC	1650	10	26	10	1 years
1005-5	1P, 1R, EOAT, RFWT, T-8/E	3826	306	1803	313	2 years

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LTMS Deviations

»» April 1, 2019 –
September 30, 2019

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LTMS Deviations

- No LTMS Deviations in Current Period

Historical Count of HD LTMS Deviations

Test	LTMS Deviations
1M-PC	2
1N	2
T-8/E	2
T-10A	1
T-12	1

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Quality Index Deviations

»» April 1, 2019 –

September 30, 2019

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Quality Index Deviations

- ▶ No Quality Index deviations during this period

Quality Index Deviations

Historical Count of HD Quality Index Deviations

Test	Qi Deviations
1P	15
1R	1
ISM	3
C13	2
T-10A	1
T-11	3
T-12	6
T-13	2
COAT	4

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TMC Laboratory Visits

»» April 1, 2019 –
September 30, 2019

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TMC Lab Visits

- ▶ No lab visits were conducted during this period

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Test Area Timelines

»» April 1, 2019 –
September 30, 2019

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Test Area Timeline Additions*

Test	Date	IL/Memo	Topic
ISM	4/29/2019	19-1	FUEL SPECIFICATIONS FOR TMC-MONITORED TESTS
ISB	4/29/2019	19-1	FUEL SPECIFICATIONS FOR TMC-MONITORED TESTS
COAT	5/10/2019		COAT DECLARED AVAILABLE FOR TESTING AGAIN
T12	5/20/2019		TEMPORARY T-12 PISTON SKIRT RE-USE
ISB	6/11/2019		CAM LOBE TAPER SPEC INCREASED FROM 0.015 MM TO 0.030 MM

*As of 9/30/2019

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Test Area Timeline Additions*

Test	Date	IL/Memo	Topic
T-8	6/3/2019	19-1	Fuel Specification moved to TMC-Monitored Tests Fuels Document
T-11	6/3/2019	19-1	Fuel Specification moved to TMC-Monitored Tests Fuels Document
T-12	6/3/2019	19-1	Fuel Specification moved to TMC-Monitored Tests Fuels Document
T-13	6/3/2019	19-1	Fuel Specification moved to TMC-Monitored Tests Fuels Document

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*As of 9/30/2019

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Rating Workshop Data



2019 Heavy Duty Workshop

Test Monitoring Center

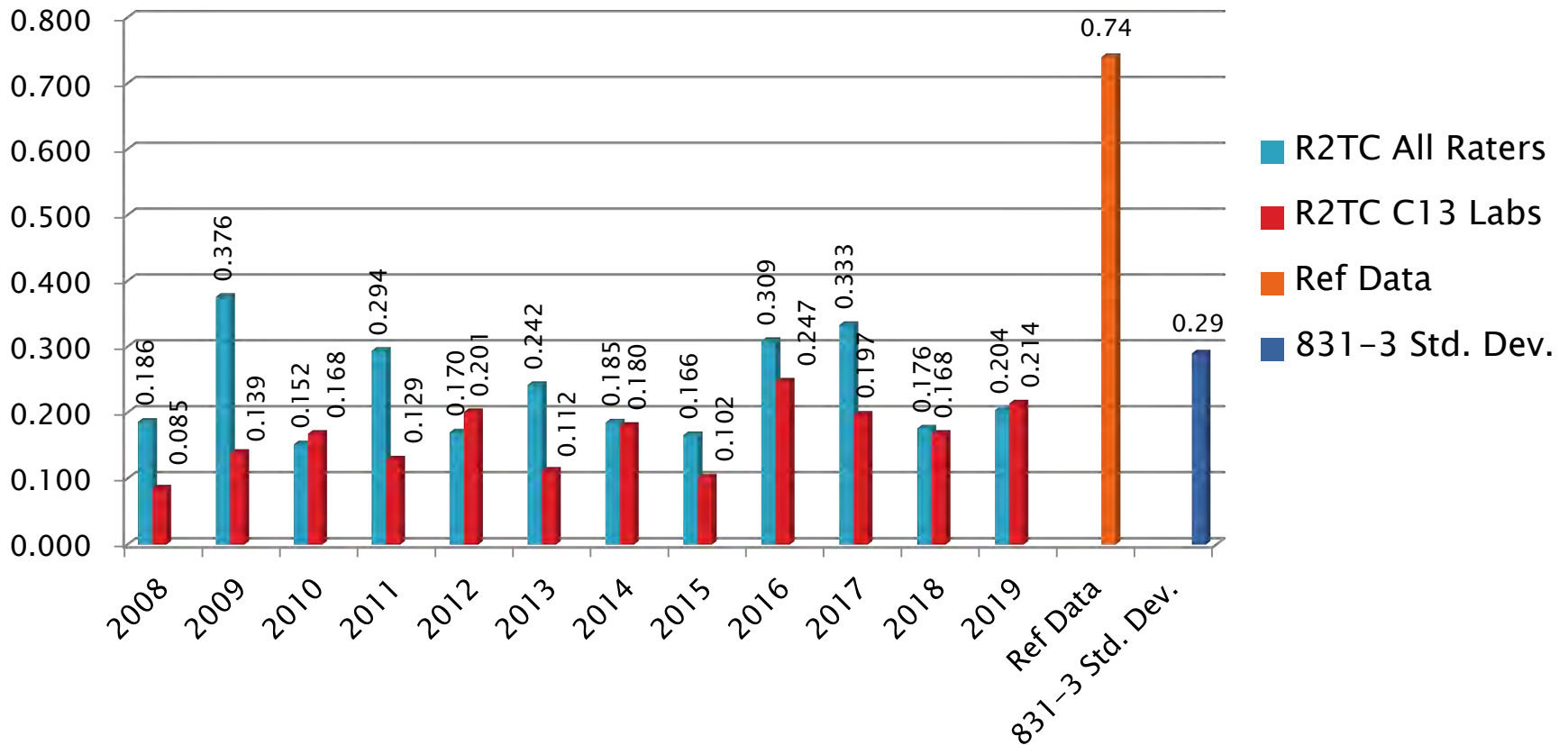
<http://astmtmc.cmu.edu>



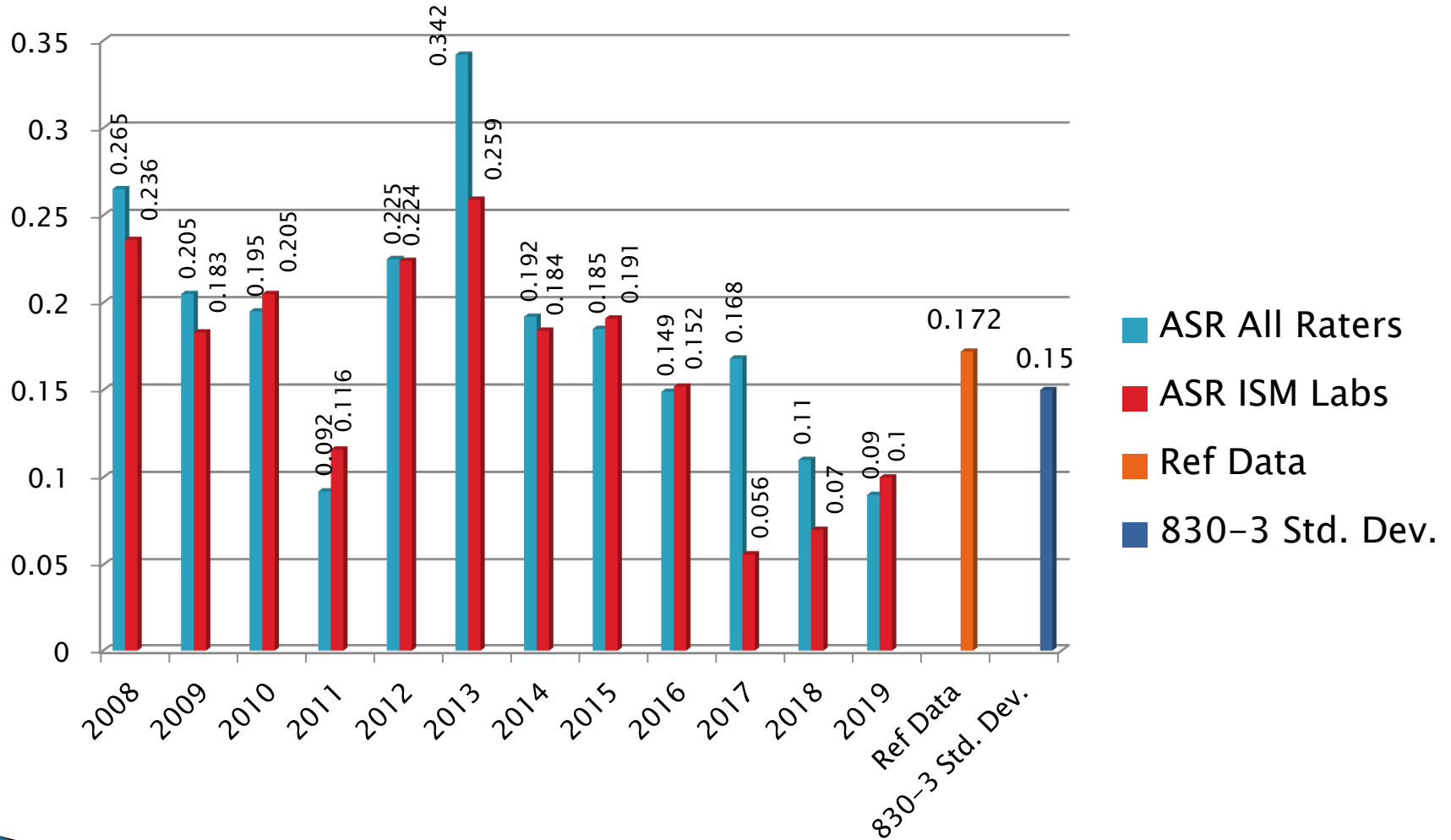
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C13 2nd Ring Carbon Precision – Rating Workshop Data

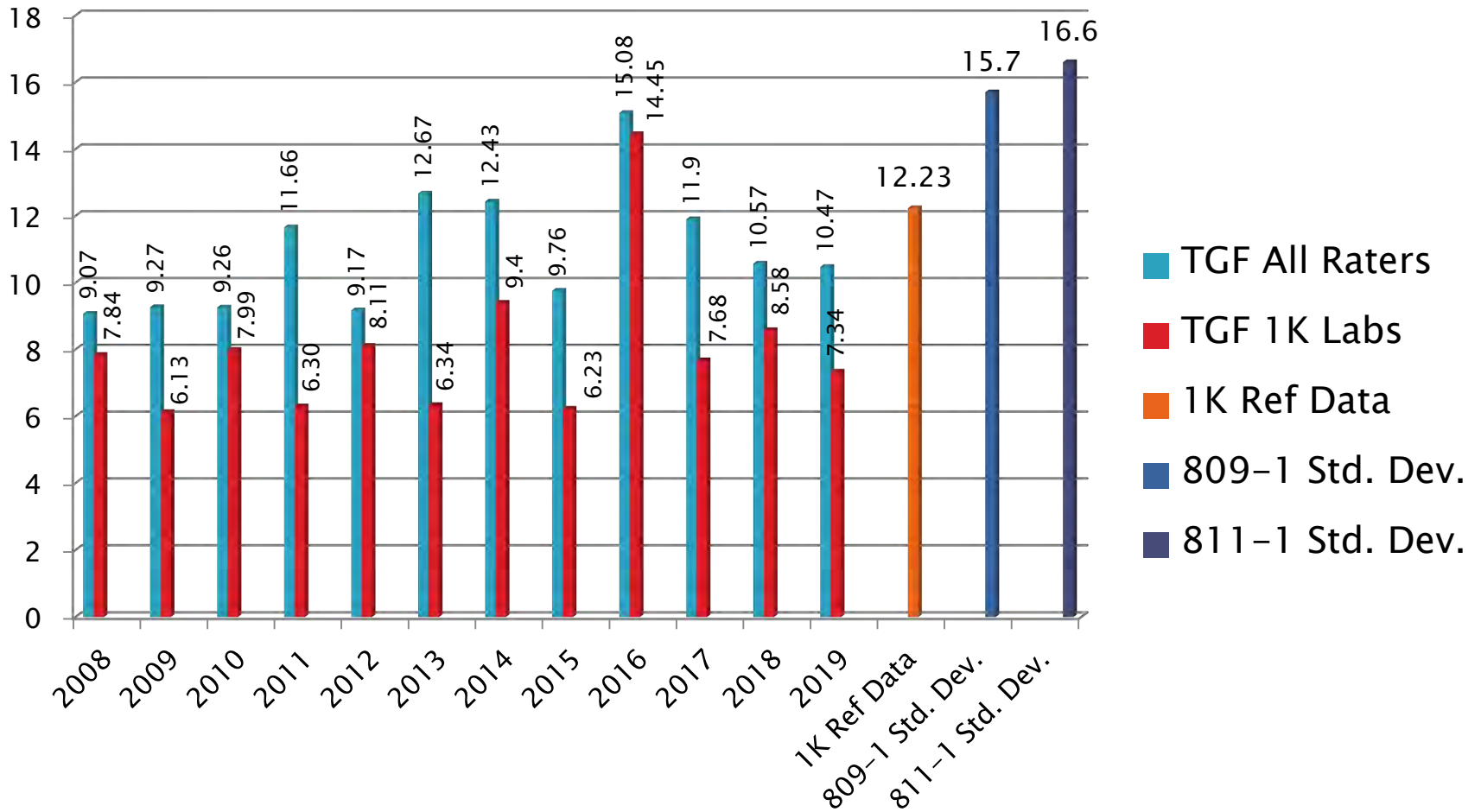
R2TC



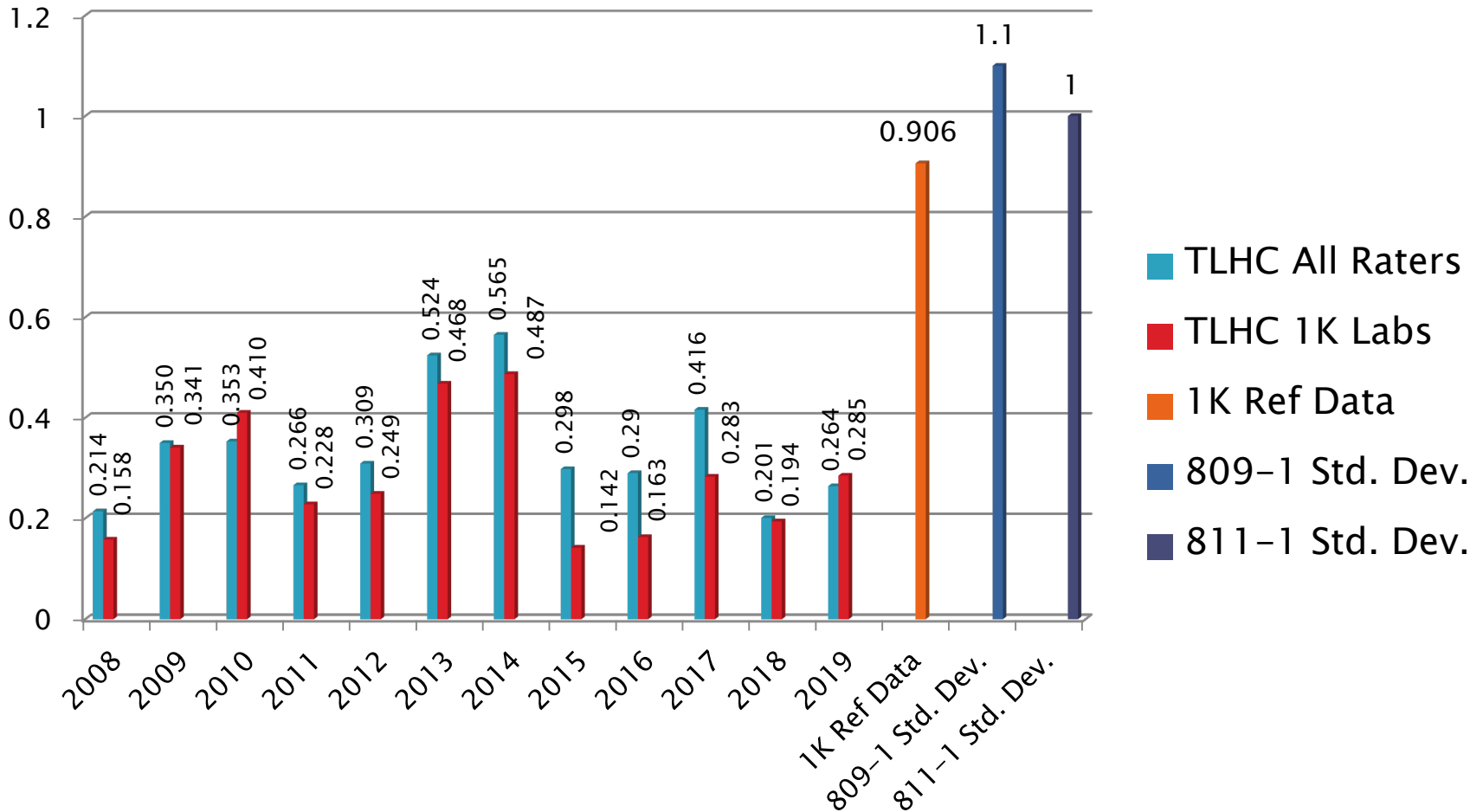
ISM Sludge Rating Precision - Rating Workshop Data



Deposit Rating Precision - Rating Workshop Data



Deposit Rating Precision - Rating Workshop Data



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Miscellaneous Information

- ▶ Available on TMC Website:
 - Oil Assignment Request and Test File Upload
 - 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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