Volatility Surveillance Panel Update

ASTM July 23 2020   Amy Ross

Meeting Minutes - 2020723

- Membership List Review / Role Call

- Reviewed Antitrust Statement

- Reviewed and Approve meeting minutes from November 05, 2019 meeting
  - Motion to approve: Matt Schlaff; Second: Tom Schofield

- Reviewed abbreviated slides presented during D02.B0.07 Bench Tests Surveillance Panel meeting on 06/18/2020

- Full review of slides contained within Executive Summary
  - D6417
  - D5800

- Other items?
  - No other comments or questions from panel members at this time

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Meeting Minutes 05 Nov 2019 (emailed 05 Nov 2019)

- Review of Minutes from meeting 09/25/2019; Motion to accept – Shawn Dubecky; Second – Tom Schofield

- Presentation of Natural Log transform by Martin Chadwick (Slides appended)

  - The Natural Log more closely approximates the D5800 method precision than no transform

  - The Ln transform will allow for more accurate Severity Adjustments (SAs) to be assigned; the Ln transform adjusts mild candidate results less than severe candidate results when applying SAs, as compared to no transform

  - Performance near target (Noack result 15.0%) is impacted minimally

  - The Ln transform provides an advantage in that, changes which may happen independent of the actual Noack test (i.e. spec or limit changes, new fluids, etc.) will be more accurately estimated

  - The panel will continue to reevaluate test variability on a regular basis going forward (annually, at a minimum)

  - Panel member expressed concerns regarding the costs associated with updates to LIMS and other data management systems to accommodate the changes in data reporting; in addition, the need for a significant lead time to implement changes for both labs and TMC was expressed; an implementation date of February 07, 2020 was proposed to accommodate this request

  - Tom Schofield clarified that labs will not be required to recalculate previous results with the transform, as this will be completed by TMC

- Tom Schofield presented the relevant updates to the LTMS Guidelines, the Test Report and the Data Dictionary (Distributed to panel members prior to meeting)

  - LTMS Guidelines Updates:

    - 1A Reference Oils and Critical Parameters – including reference to natural log transformed units; updating critical parameters table

    - 3 Transitioning Instruments to EWMA Monitoring Using Transformed Units – description of process to transition population to natural log units

    - 5 Mandatory Daily QC Check Sample and Data Submission – no transform to daily QC results

    - 6 Zi Level 1 – application of SA, translation factor application procedure, calibration interval

- A motion was made by Greg Miiller to accept the effort to move forward with the natural log transform, along with the approval of the updated documents which includes the LTMS Guidelines, Test Report, and Data Dictionary; an implementation date of February 7, 2020 was set; a Second was offered by Robert Stockwell; an informal vote was conducted which resulted in only affirmative votes expressed, none opposed

Motion to approve: Matt Schlaff; Second – Tom Schofield

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Volatility Surveillance Panel Summary – D6417

Precision and Severity	✅ ❌ ✅	• more precise than target • Less precise than last period • CUSUM plot shows overall slight severe performance (0.09 s) with leveling to nearly on-target for last two periods
Test Status	✅	• 0% fail rate (17AC); 7 labs
Lab/Apparatus	❌	• Rigs AU and G severe, and furthest from on-target in comparison to rest of population
Calibration Oils	✅ ✅ ✅	• Oils 52, 55, and 58 all on target for mean value and precision; oil 55 much better precision than target for this period and last • All oils slightly severe performance but better than last two periods • Healthy supply of all fluids

Volatility Surveillance Panel Summary – D5800

Precision and Severity	❌ ✅ ➖	***All values now calculated in natural log scale*** • Less precise than updated target (0.0503 vs. 0.0465 target) • when compared on same scale, precision is better than last term • Performance is 0.54 s severe this period; less severe than last period but continued overall trend
Precision and Severity by Procedure	➖ ✅ ❌ ➖ ➖	• No Procedure C data this period; 1 NCK2; same number of NCK25G and NS2 rigs (24 and 7, respectively) • Proc B precision better than target (0.04) • Proc D precision worse than target (0.05) • Performance of Procedure B continues to be severe • Procedure D continues to be mild

Volatility Surveillance Panel Summary – D5800

Test Status	✅ ➖	• Fail rate 4%, compared to 10% last term; 6 OC on five rigs at four labs • Four tests held out of stats (new rigs failed to demonstrate passing initial calibration, MC; Lab J)
Lab/Apparatus	❌	• Rig G8 exceeded 3s target range on 2 tests (+3.4 and +3.0 s); Two results on two rigs for VOLC12 (+3.4s on G8 and -2.9s ON D6) could be influential wrt precision worse than target

Volatility Surveillance Panel Summary – D5800

Calibration Oils	❌	• All oils (VOLC12, D12 and E12) exceeded target mean; *rig G8 contributed two +3s results; all oils greater than mean for the last two terms
	❌	• Oils VOLC12 and D12 exceeded precision target
	✅	• Oil E12 was more precise than target
	❌	• VOLE12 performance is much less severe than last term (0.82 to 0.51)
	✅	• Supply is good for VOL C12, D12, E12 and D18; VOLD14 is diminishing (2.3 gallons) as it heads toward obsolescence

	VOLC12	VOLD12	VOLE12
Target Mean	2.6523	2.5264	2.8175
This period	2.6794	2.5511	2.8411

Volatility Surveillance Panel Summary – D5800

Method and LTMS Updates	• Transition to Natural Log scale effective 20200207; report packet revision notice D5800-20191112; all results now reported in natural log transformed units • D5800-20 standard update approved 20200501; Reference Oil references updated to NCO-12, diagram update and editorial changes

D6417: Estimation of Engine Oil Volatility by Capillary GC

- Precision (Pooled s) is less precise than prior period
  - More precise than target precision

- Performance (Mean Δ/s) is 0.09 s severe (on-target)

- CUSUM severity plot shows overall slight severe performance with leveling to nearly on-target the past two report periods.

D6417: Estimation of Engine Oil Volatility by Capillary GC

Test Status	Validity Code	No. Tests
Acceptable Calibration Test	AC	17
Failed Calibration Test	OC	0
Operationally Invalidated by Lab	LC, XC	0
Operationally Invalidated After Initially Reported as Valid	RC	0
Total		**17**

Number of Labs Reporting Data: 7 (8 labs last period)
Fail Rate of Operationally Valid Tests: 0%

D6417: Estimation of Engine Oil Volatility by Capillary GC

Statistically Unacceptable Tests (OC)	No. Of Tests
Volatility Loss Mild	0
Volatility Loss Severe	0

- There were no operationally or statistically invalid tests reported this period
    - All reported tests this period passed calibration (AC)

- No D6417 TMC technical updates were issued this report period.

- D6417 calibration requirement updates are issued as LTMS document updates

D6417: Estimation of Engine Oil Volatility by Capillary GC

Period Precision and Severity Estimates

Area % Volatized @ 371°C	n	df	Pooled s	Mean Δ/s
Initial Selected Oils from RR	54	51	0.39	-----
10/1/16 through 3/31/17	13	10	0.35	0.77
4/1/17 through 9/30/17	15	12	0.37	-0.01
10/1/17 through 3/31/18	15	12	0.26	0.14
4/1/18 through 9/30/18	16	13	0.36	0.15
10/1/18 through 3/31/19	19	16	0.43	0.35
4/1/19 through 9/30/19	19	16	0.18	0.10
10/1/19 through 3/31/20	17	14	0.30	0.09

D6417: Precision Estimates

Area % Volatized @ 371°C
Pooled s

	Target n=107	APR '17	OCT '17	APR '18	OCT '18	APR '19	OCT '19	APR '20
Value	0.39	0.35	0.37	0.26	0.36	0.43	0.18	0.30

D6417: Severity Estimates
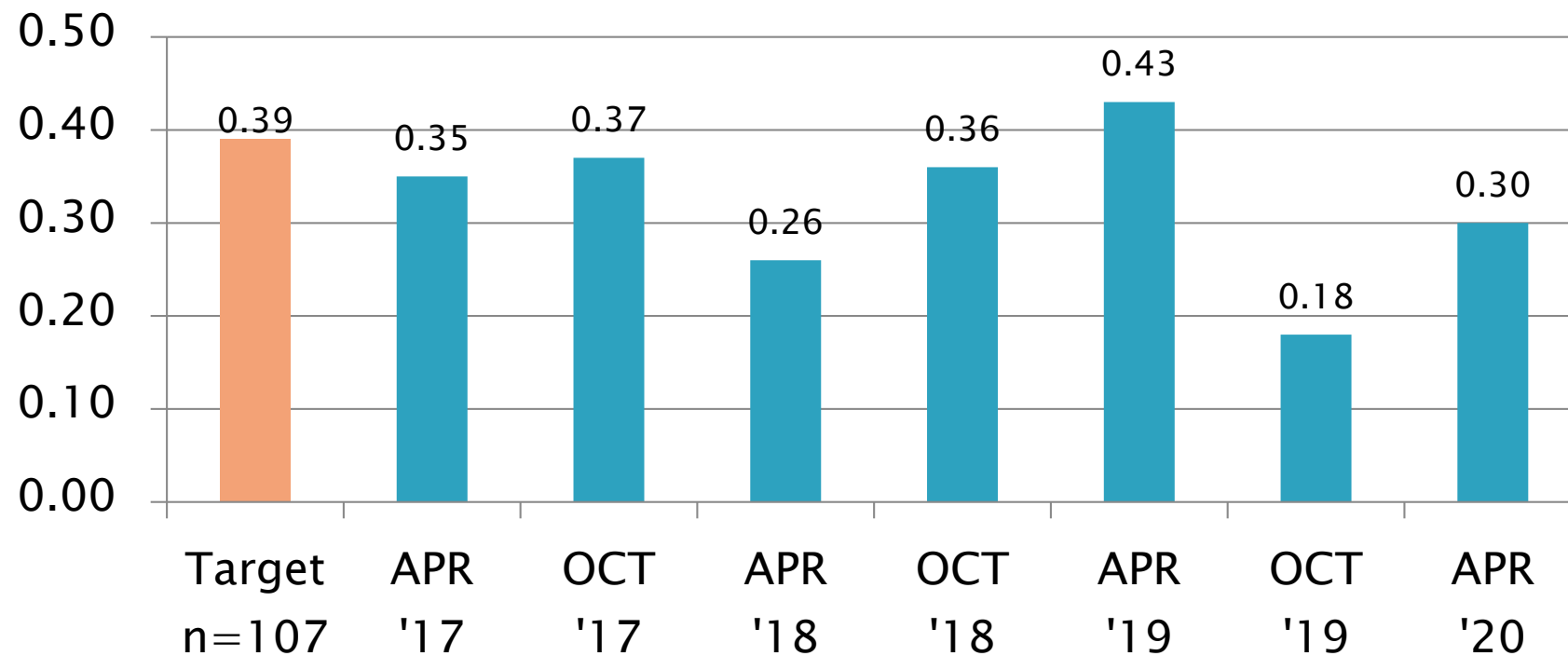
Area % Volatized @ 371°C

Mean Δ/s

D6417: Lab Severity Estimates

Area % Volatized @ 371ºC

Mean Δ/s

0.11	0.97	0.27	−0.53	−0.42	1.40	−0.19
Lab A	Lab AU	Lab AY	Lab B	Lab D	Lab G	LAB S
n=4	n=1	n=2	n=2	n=4	n=2	n=2

D6417 VOLATILITY BY GC INDUSTRY OPERATIONALLY VALID DATA
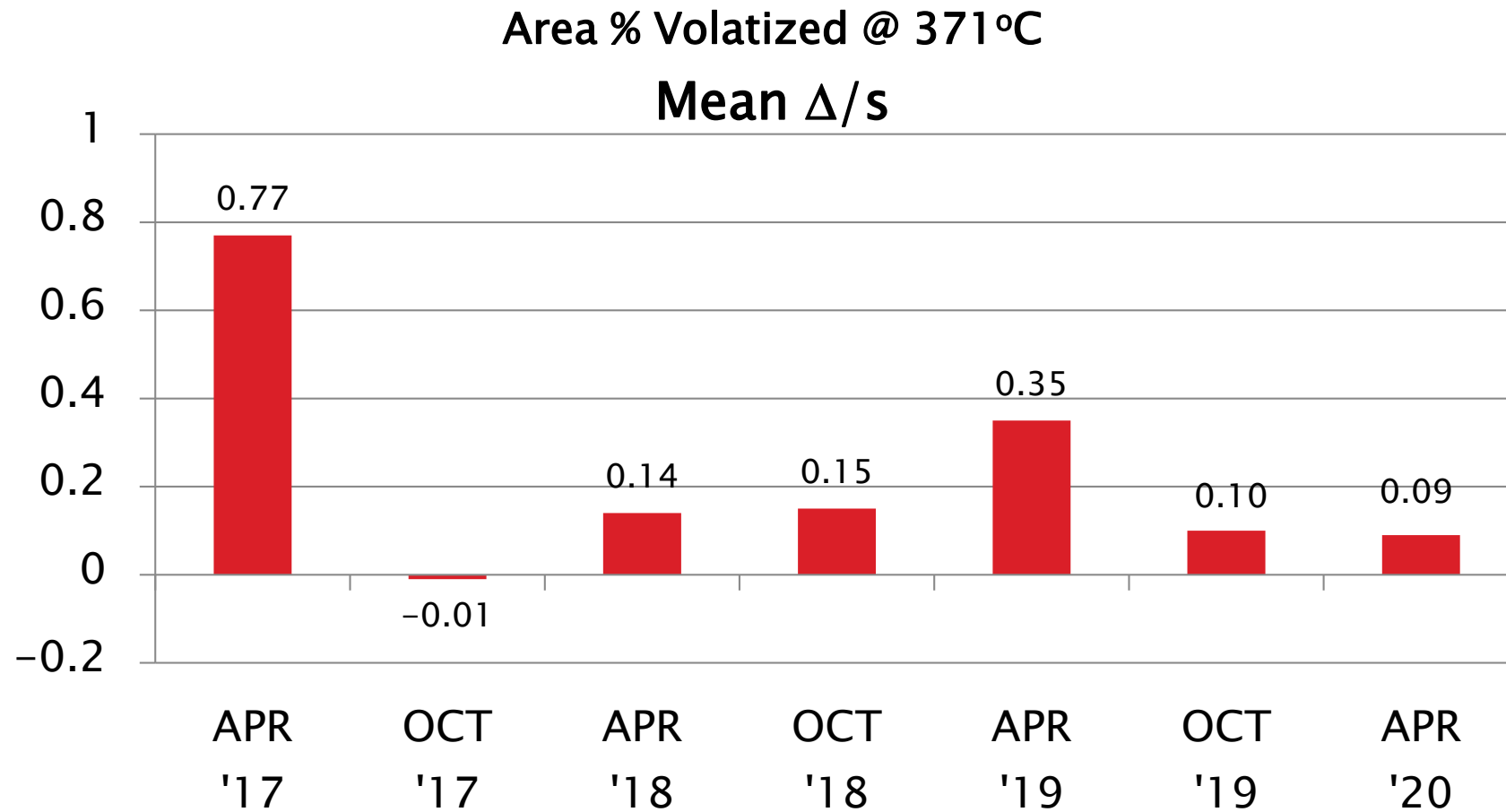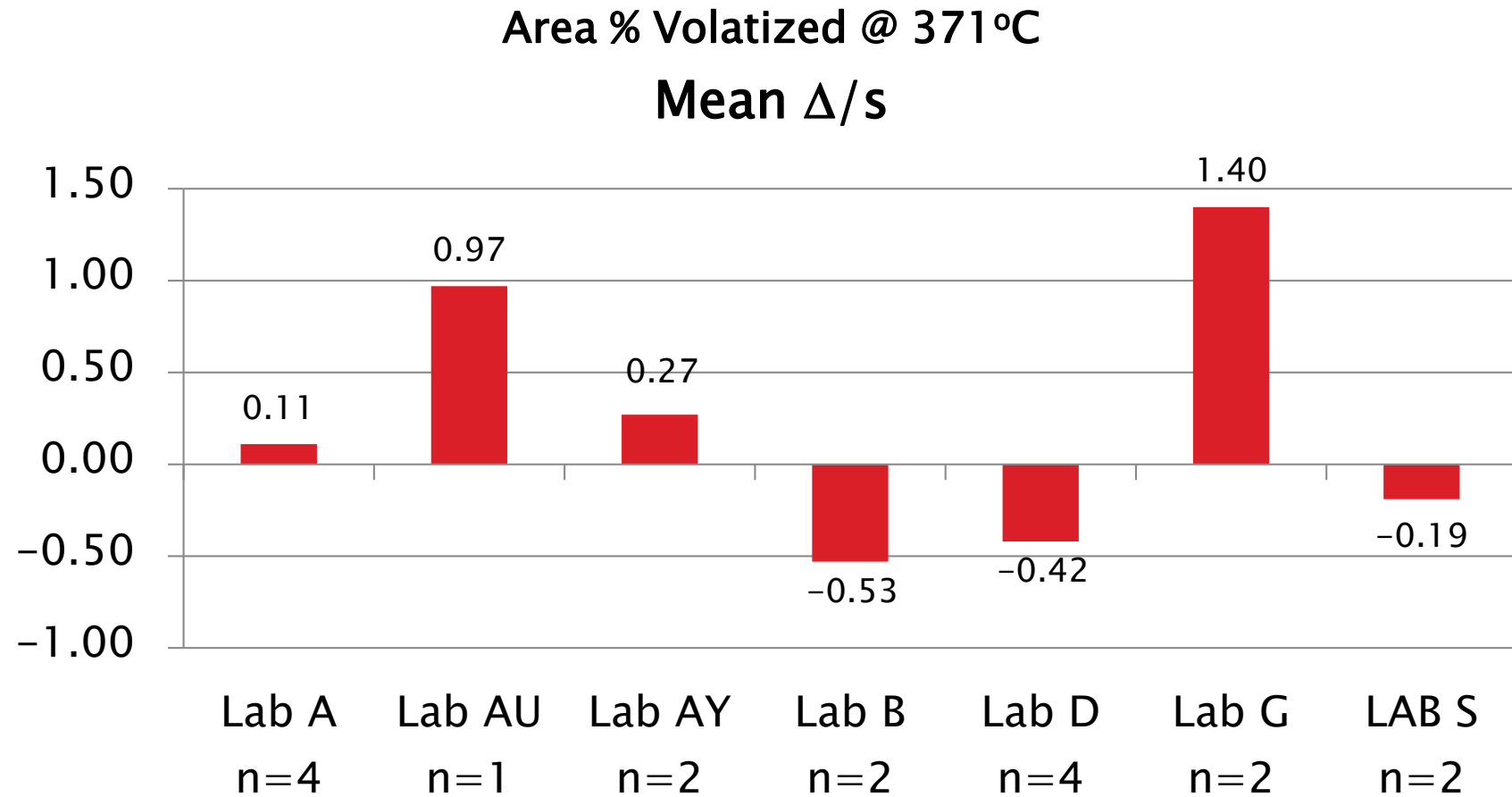
SAMPLE AREA % VOLATIZED

CUSUM Severity Analysis

COUNT IN COMPLETION DATE ORDER

24APR20:15:51

18
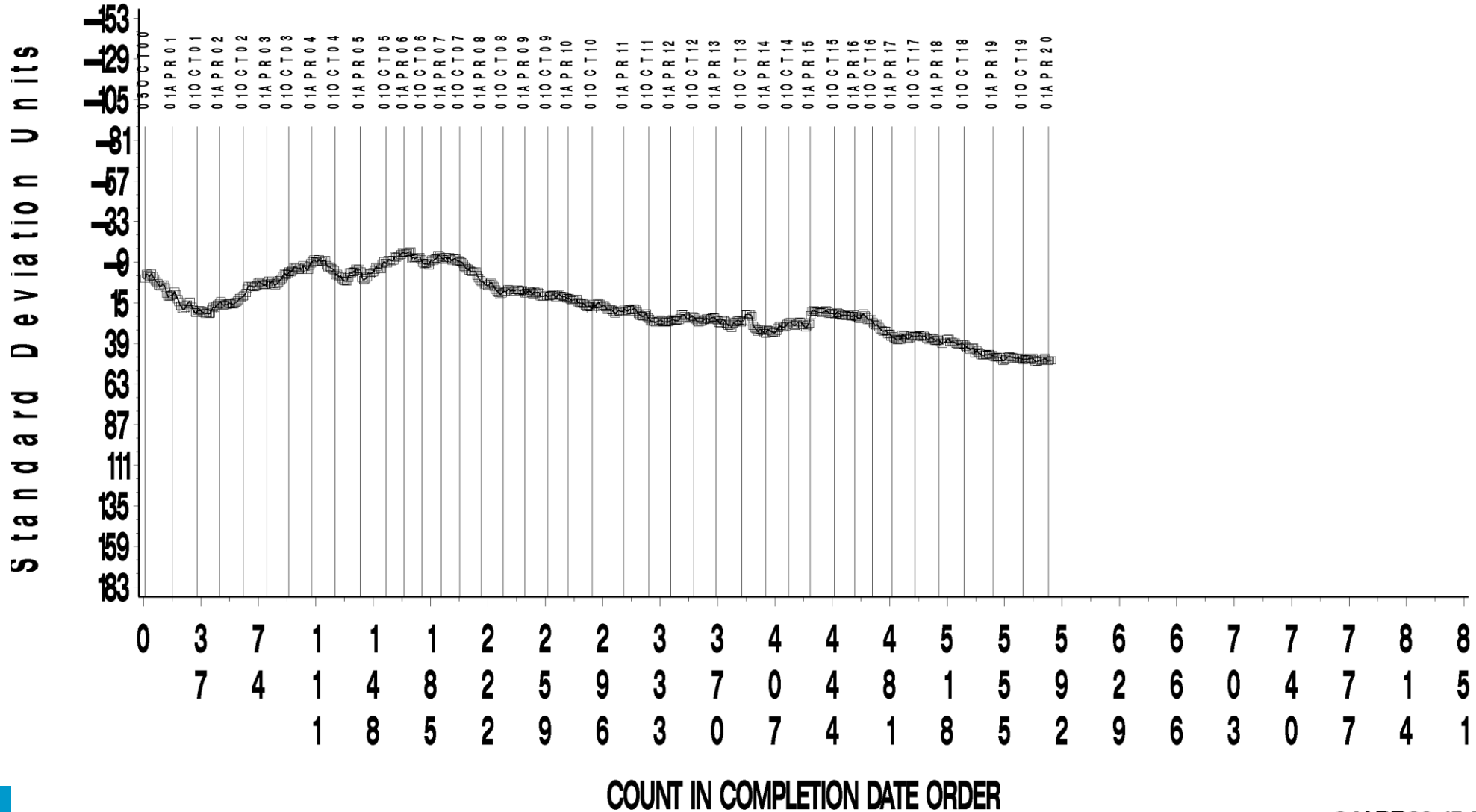
D6417: Performance by Oil

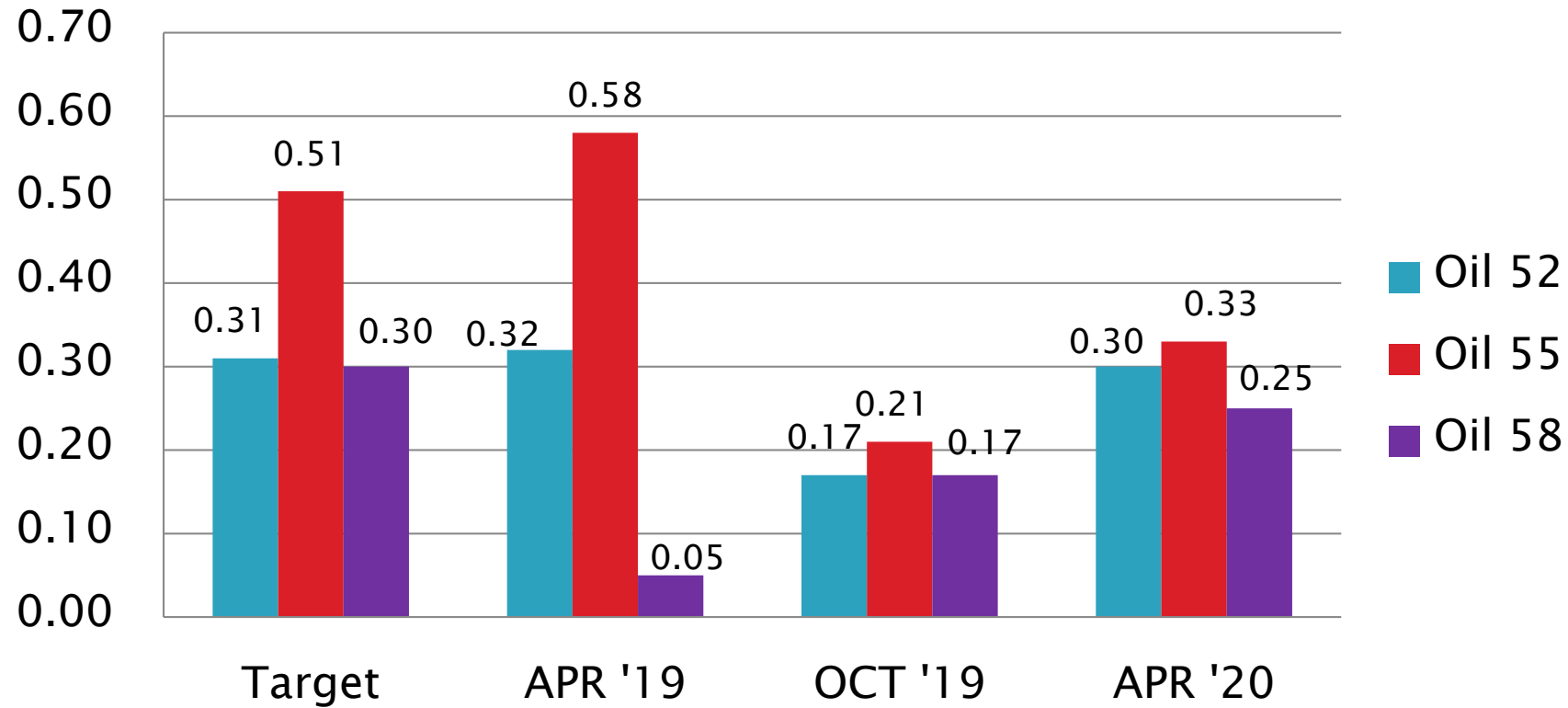## Area % Volatized @ 371°C
Mean
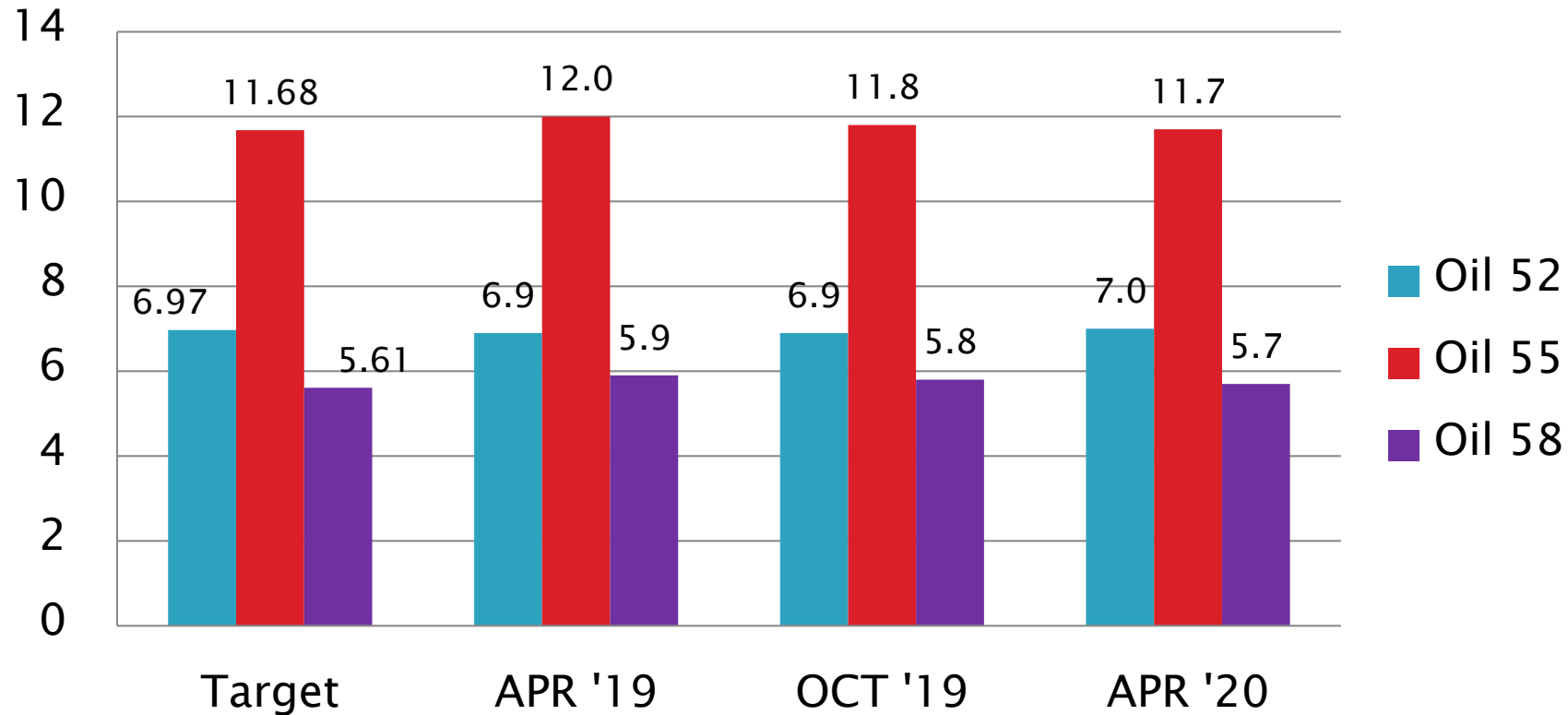
D6417: Performance by Oil

Area % Volatized @ 371°C

S_R

D6417: Performance by Oil

Area % Volatized @ 371°C

Mean Δ/s

Legend:
- Oil 52
- Oil 55
- Oil 58

Values — APR '19: Oil 52 = −0.23, Oil 55 = 0.59, Oil 58 = 0.88
OCT '19: Oil 52 = −0.31, Oil 55 = 0.19, Oil 58 = 0.51
APR '20: Oil 52 = 0.02, Oil 55 = 0.09, Oil 58 = 0.17
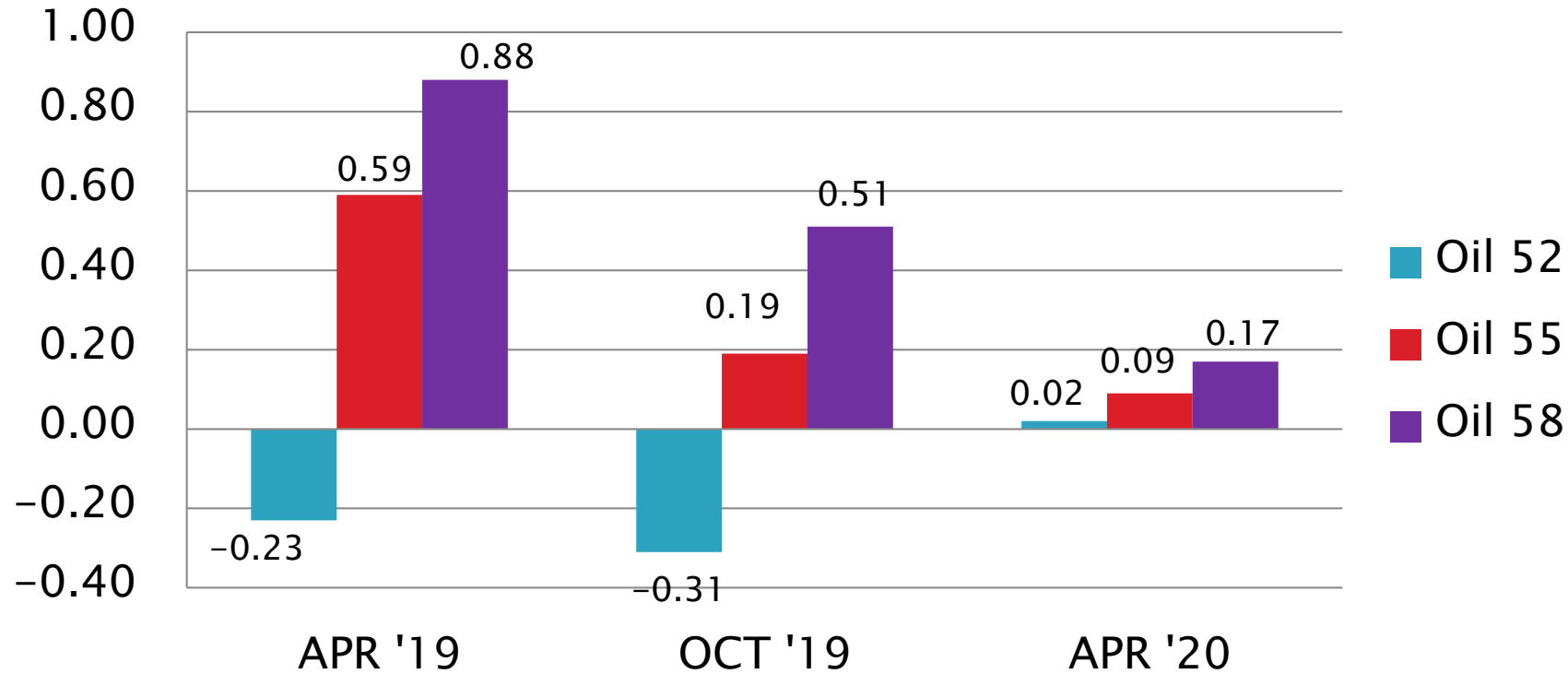
D5800: Evaporation Loss of Lubricating Oil by Noack Method

- Precision (Pooled s) is less precise than the updated target precision, now in natural log transformed units.

- Performance (Mean Δ/s) is 0.54 s severe.

- Two tests exceeded 3 s from targets this period
  - Both on rig G8, +3.4 s and +3.0 s

- CUSUM severity plots shows a continuing overall severe trend with reference testing.

D5800: Evaporation Loss of Lubricating Oil by Noack Method

Test Status	Validity Code	No. Tests
Acceptable Calibration Test	AC	140
Failed Calibration Test	OC	6
Operationally Invalidated by Lab	LC, XC	0
Operationally Invalidated After Initially Reported as Valid	RC	6
Non-Blind Instrument Shakedown	NN	20
Held out of statistics (new rig, failed to calibrate)	MC	4
Total		**176**

Number of Labs Reporting Data: 12
Fail Rate of Operationally Valid Tests: 4% (last period 10%)

D5800: Evaporation Loss of Lubricating Oil by Noack Method

Statistically Unacceptable Tests (OC)	No. Of Tests
Ei Level 3 Precision Alarm Mild	1
Ei Level 3 Precision Alarm Severe	3
Zi Level 2 Severity Severe	2
Zi Level 2 Severity Mild	0

- The 6 OC tests were on five different rigs at four labs.
    - No tests triggered both Ei L3 and Zi L2 alarms
    - Rig I6 had two consecutive Ei L3 alarms before alarm cleared on the third attempt.

- Six operationally invalid calibration runs reported this period:
    - All six reported off-spec QC results on the day of the calibration run, invalidated by the TMC (RC).
        - Four were on two new rigs at lab J.

D5800: Evaporation Loss of Lubricating Oil by Noack Method

- Non-calibration tests reported for the period:
  - Twenty non-blind shakedown runs to troubleshoot instrument performance (NN).
  - Four tests held out of statistics; new rigs that failed to demonstrate a passing initial calibration (MC; Lab J)

- LTMS update issued, effective 20200207, to transform test results to natural log before applying instrument severity adjustments.
  - TMC monitoring of mass% evaporation loss is now done on natural log transformed test results.
  - Report packet revision notice D5800-20191112 was issued to accommodate these changes.

- Technical memo 20-006 was issued on 20200204 advising of test method update to D5800-19a

- D5800 calibration requirement updates are issued as LTMS document updates

D5800: Evaporation Loss of Lubricating Oil by Noack Method

Period Precision and Severity Estimates

Sample Evaporation Loss, mass %	n	df	Pooled s	Mean Δ/s
Targets Effective 02/07/20[1]	78	75	0.0465	-----
4/1/17 through 9/30/17[2]	147	144	1.13	0.56
4/1/17 through 9/30/17[2]	146	143	0.84	0.47
10/1/17 through 3/31/18	133	130	0.81	0.15
4/1/18 through 9/30/18[2]	149	146	0.82	0.40
4/1/18 through 9/30/18[2]	148	145	0.76	0.44
10/1/18 through 3/31/19	151	148	0.81	0.51
4/1/19 through 9/30/19	164	161	0.81	0.65
10/1/19 through 3/31/20[1]	146	143	0.0503	0.54

[1]Began monitoring natural log transformed test results on 20200207 making logarithmic scale changes for target and period precision estimates starting April 2020 report period.

[2]Extreme OC result included and excluded

D5800: Evaporation Loss of Lubricating Oil by Noack Method

Performance Comparison by Procedure & Model
Sample Evaporation Loss, Mass %

Procedure	n	df	Pooled s	Mean Δ/s
Procedure B	108	105	0.04	0.83
Procedure C	No Procedure C tests reported this period.			
Procedure D	38	35	0.05	-0.27

Model	n	df	Pooled s	Mean Δ/s
NCK2	6	3	0.02	0.23
NCK25G	102	99	0.04	0.86
NS2	38	35	0.05	-0.27

1 Procedure B NCK2 Rig
24 Procedure B NCK25G Rigs
7 Procedure D NS2 Rigs
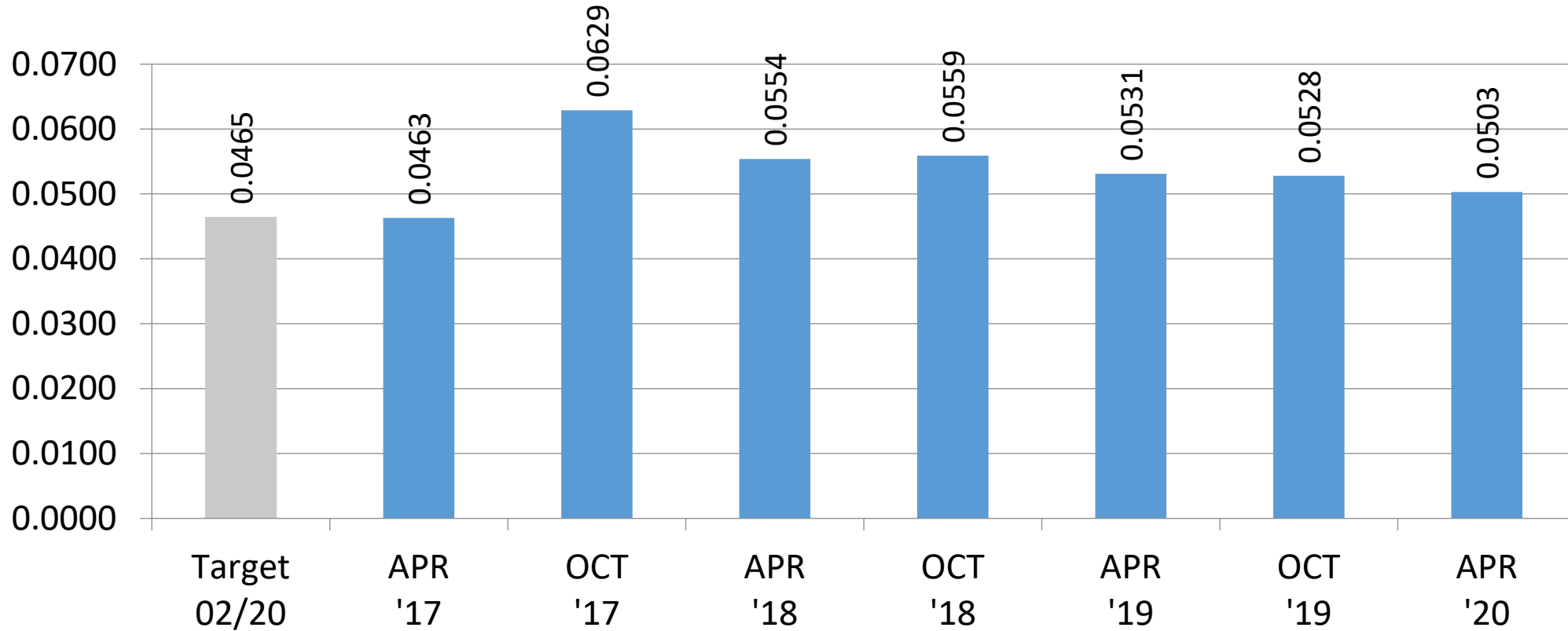
D5800: Precision Estimates

Sample Evaporation Loss, mass %
Pooled s
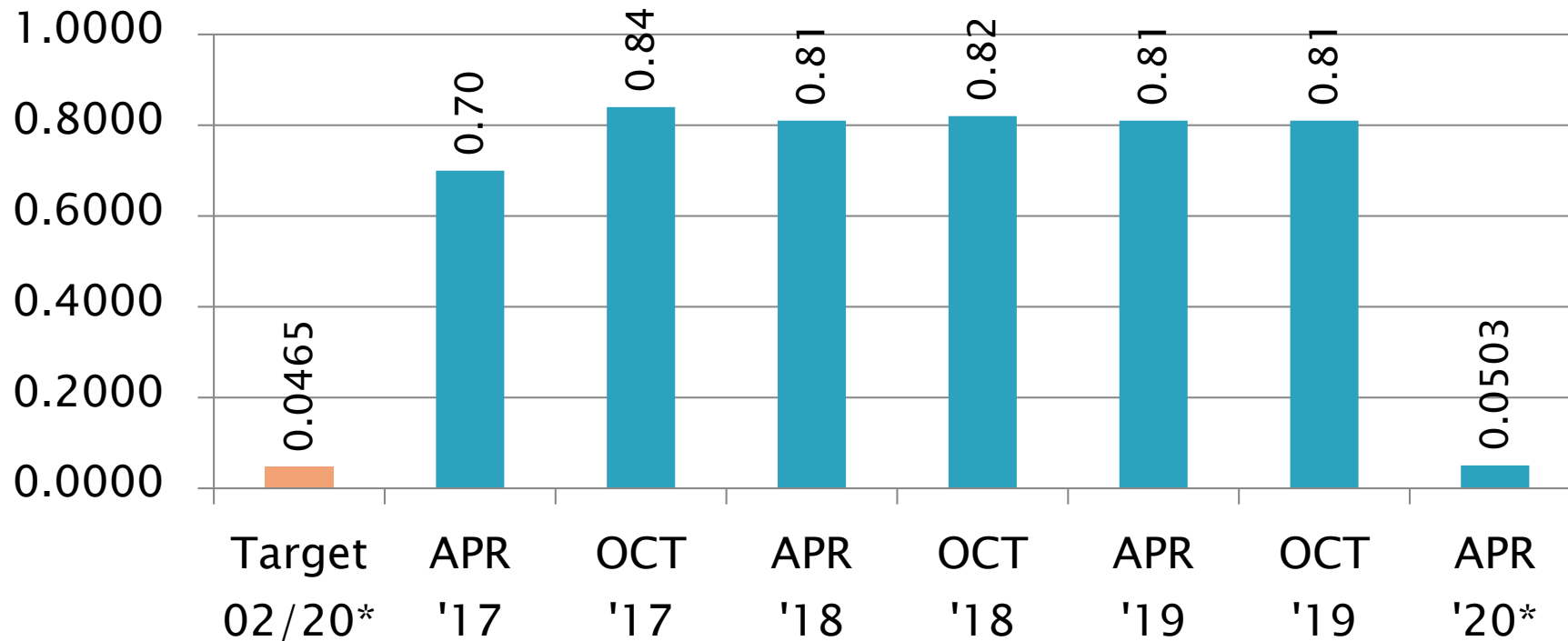
*Began monitoring natural log transformed test results on 20200207 making logarithmic scale changes for target and period precision estimates starting April 2020 report period.
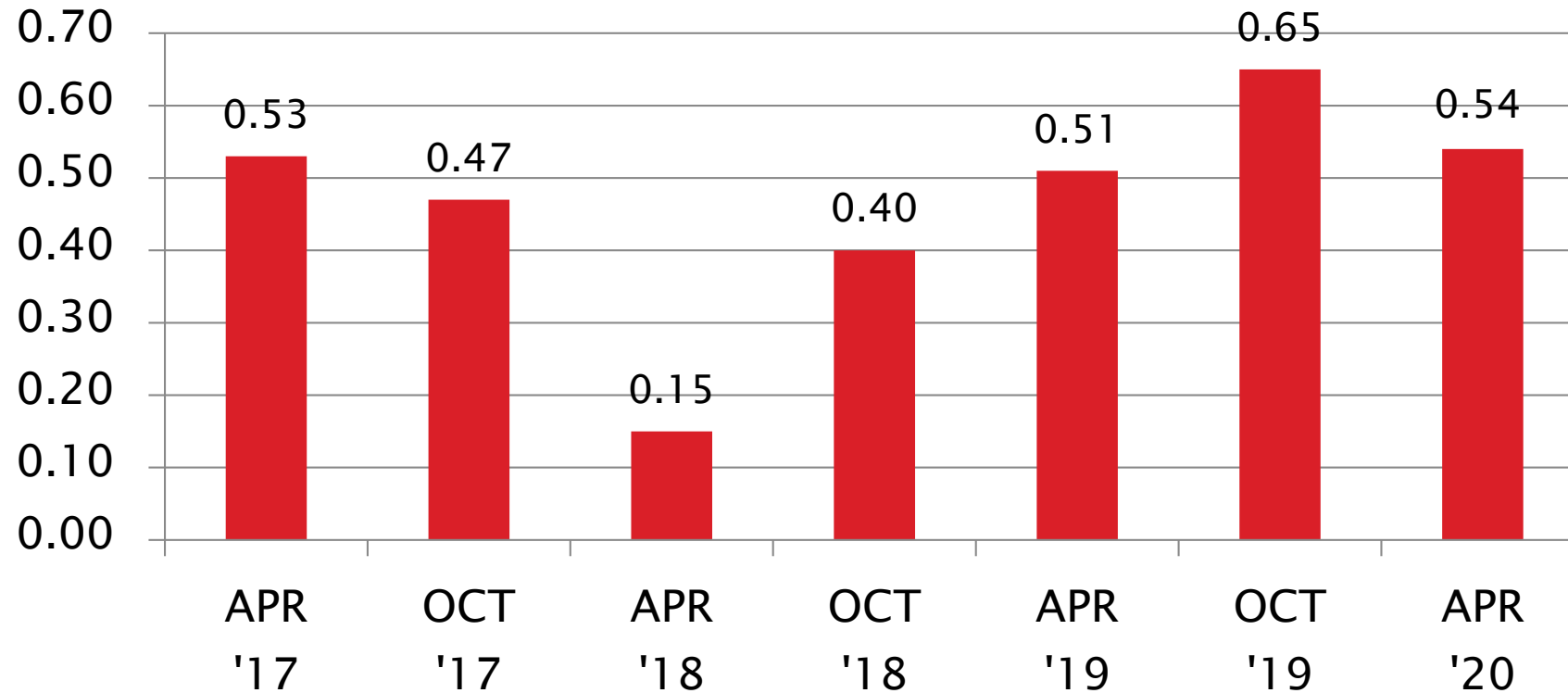
Sample Evaporation Loss, mass %
Pooled s

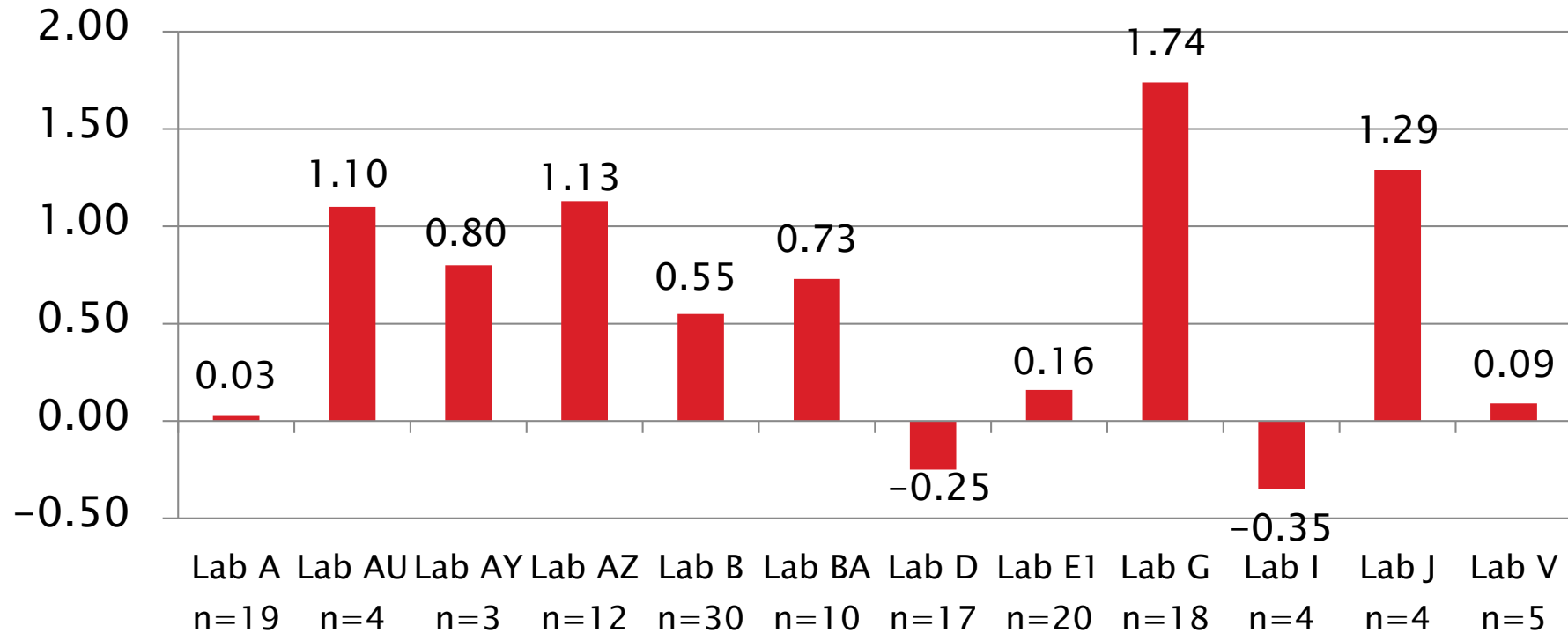|	Target 02/20	APR '17	OCT '17	APR '18	OCT '18	APR '19	OCT '19	APR '20
Value	0.0465	0.0463	0.0629	0.0554	0.0559	0.0531	0.0528	0.0503

D5800: Severity Estimates

Sample Evaporation Loss, mass %

Mean Δ/s

D5800: Lab Severity Estimates

Sample Evaporation Loss, mass %
Mean Δ/s

D5800 VOLATILITY BY NOACK INDUSTRY OPERATIONALLY VALID DATA

EVAPORATION LOSS, MASS%

CUSUM Severity Analysis

24APR20:14:16

CUSUM Severity Analysis

24APR20:14:36

D5800 VOLATILITY BY NOACK INDUSTRY OPERATIONALLY VALID DATA
DTCOMP> = '20161019'
EVAPORATION LOSS, MASS%

LTMS Severity Analysis

Mild

Severe

COUNT IN COMPLETION DATE ORDER

34

24APR20:15:54
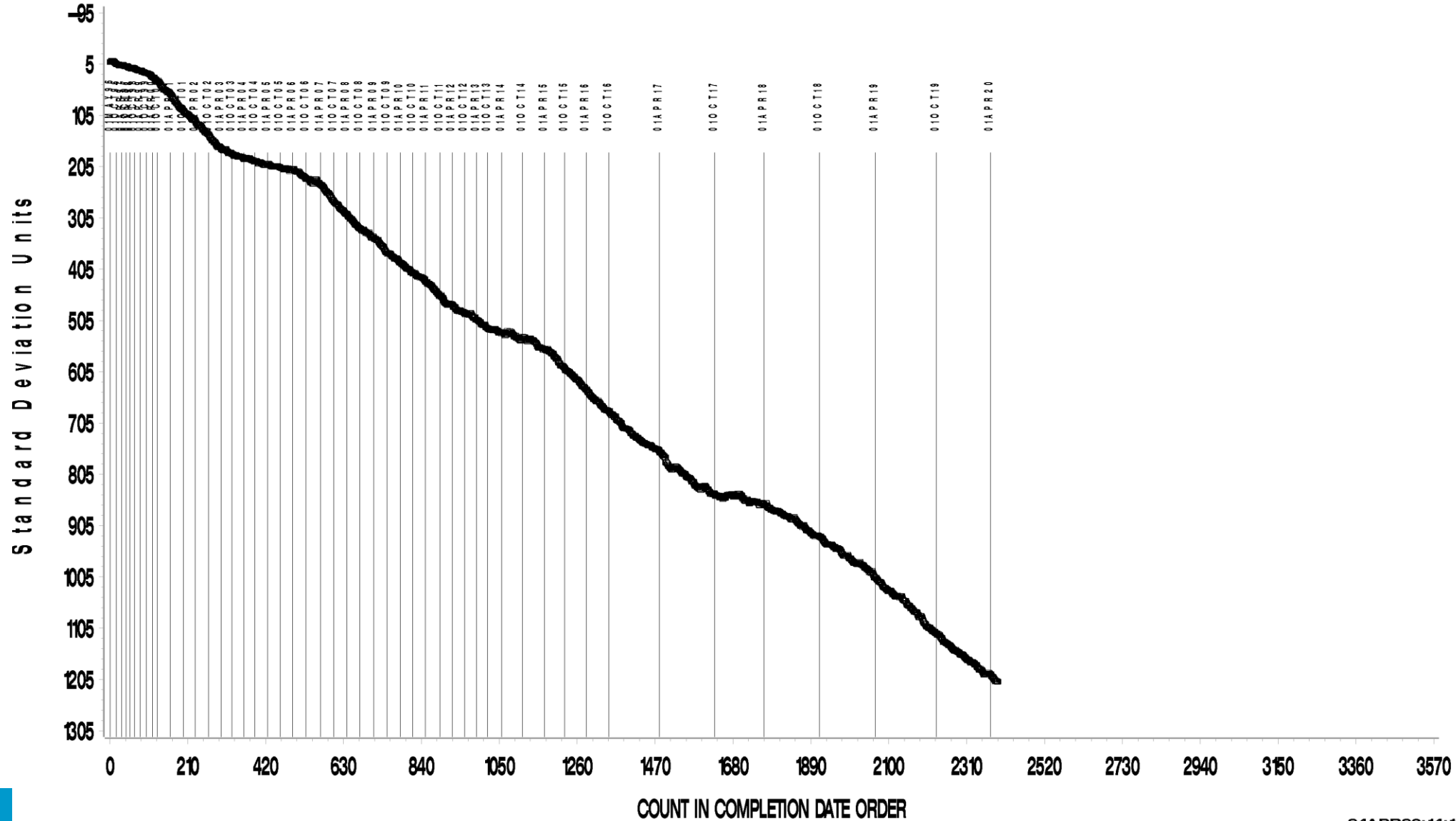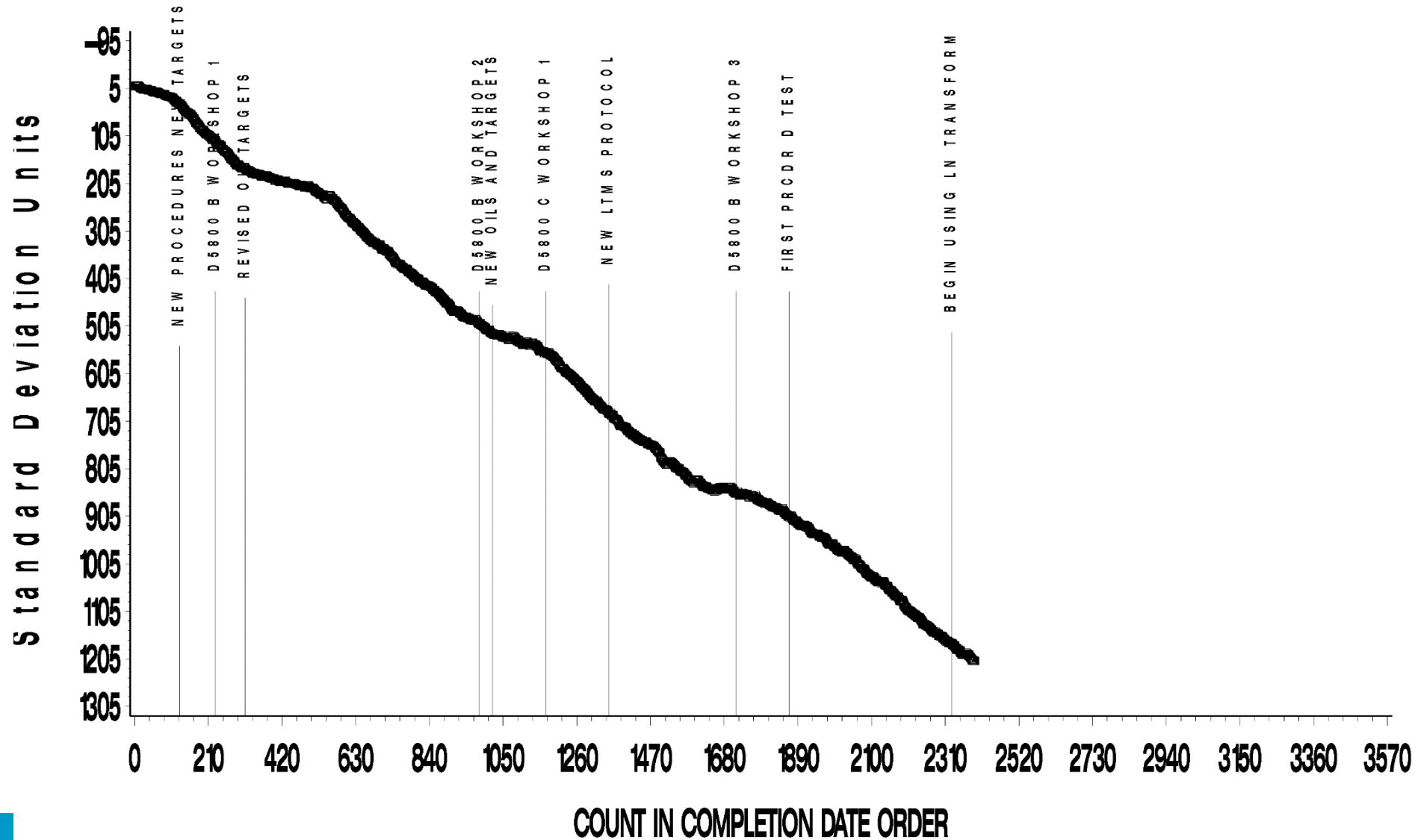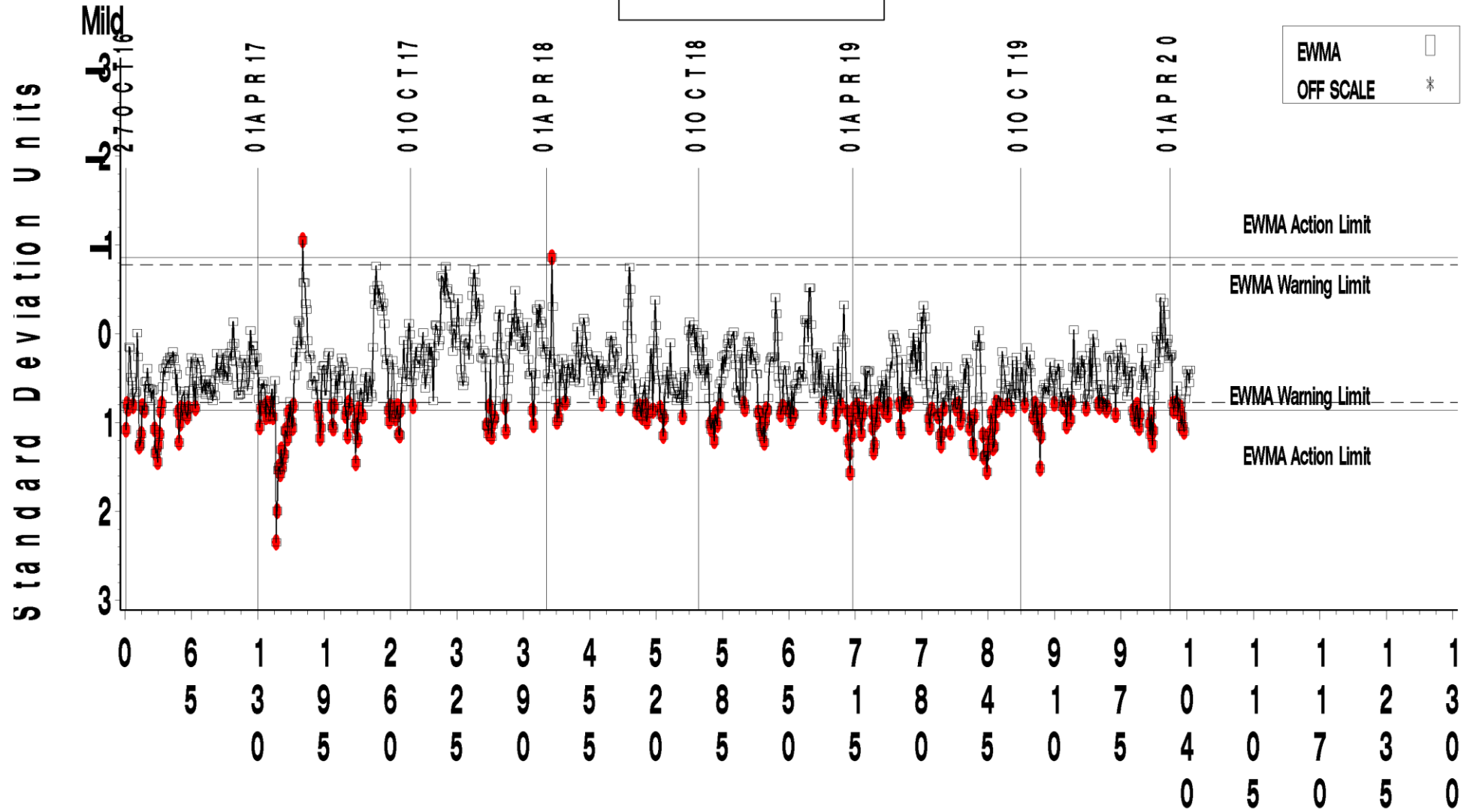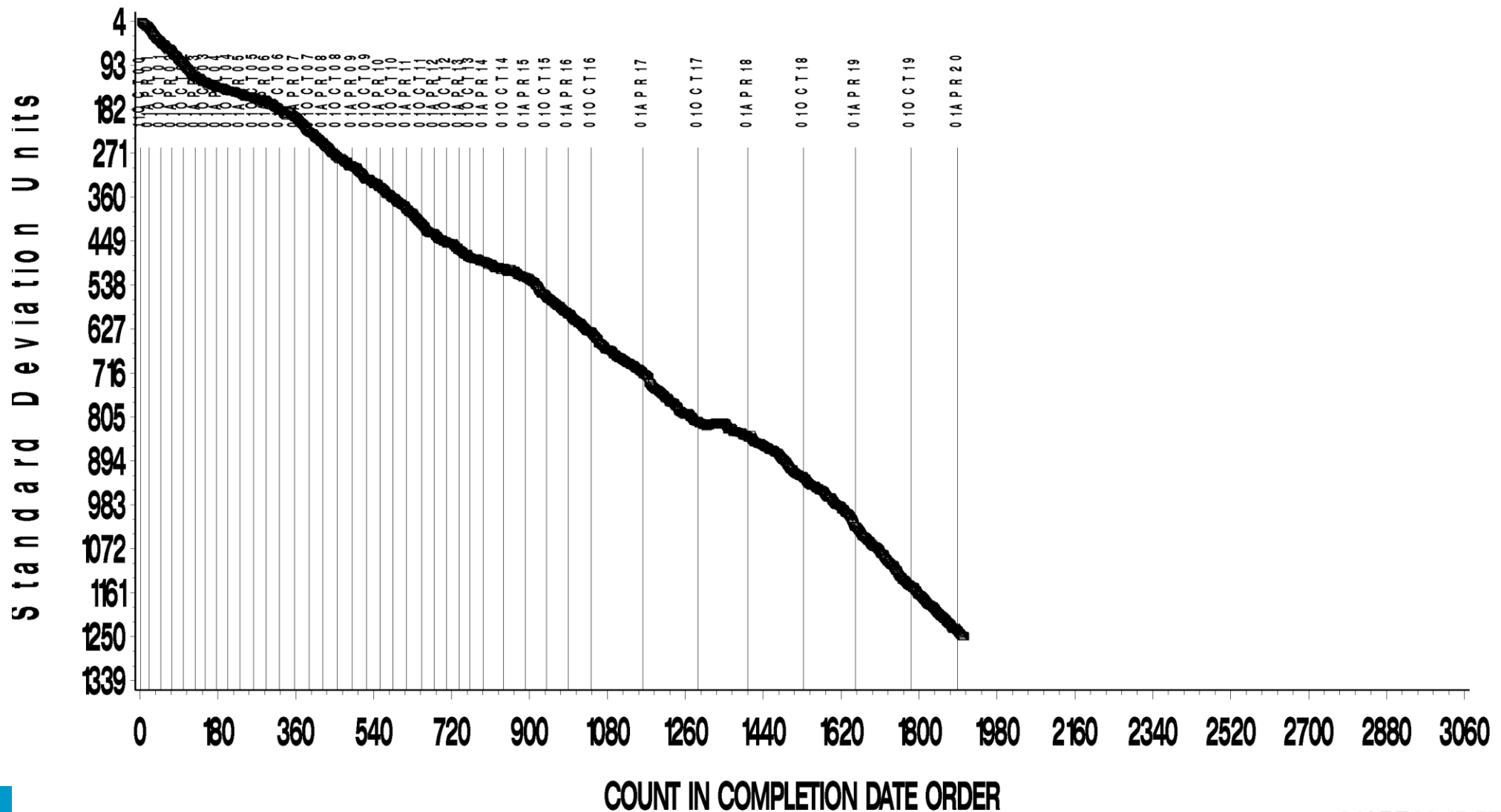
D5800 VOLATILITY BY NOACK INDUSTRY OPERATIONALLY VALID DATA
PRCDR='B'
EVAPORATION LOSS, MASS%

CUSUM Severity Analysis
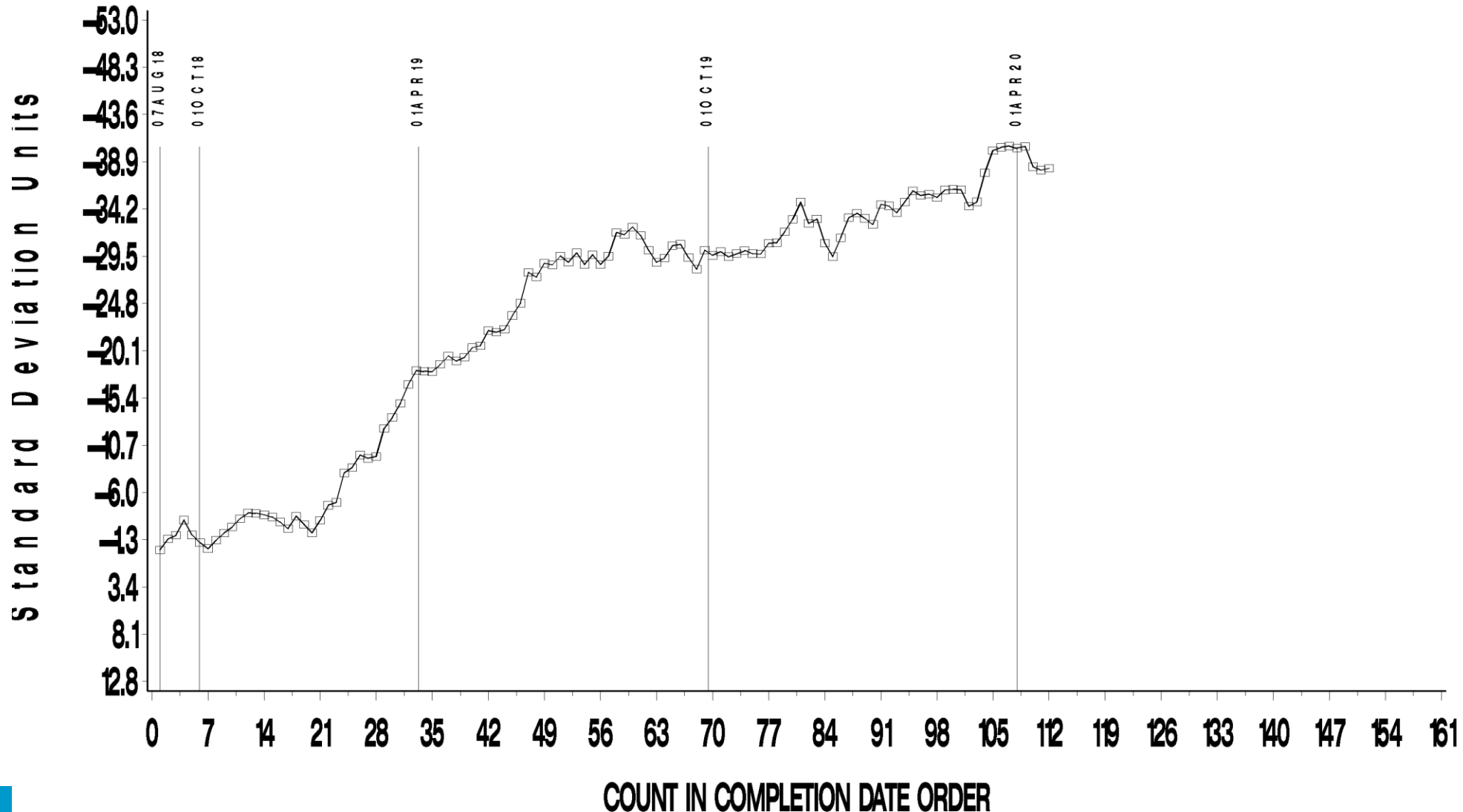
Standard Deviation Units

COUNT IN COMPLETION DATE ORDER

24APR20:15:57

35

D5800 VOLATILITY BY NOACK INDUSTRY OPERATIONALLY VALID DATA
PRCDR='D'
EVAPORATION LOSS, MASS%

CUSUM Severity Analysis

COUNT IN COMPLETION DATE ORDER

24APR20:15:59

36

D5800: Performance by Oil

Sample Evaporation Loss, mass %
Mean

Legend:
- Oil VOLC12
- Oil VOLD12
- Oil VOLE12

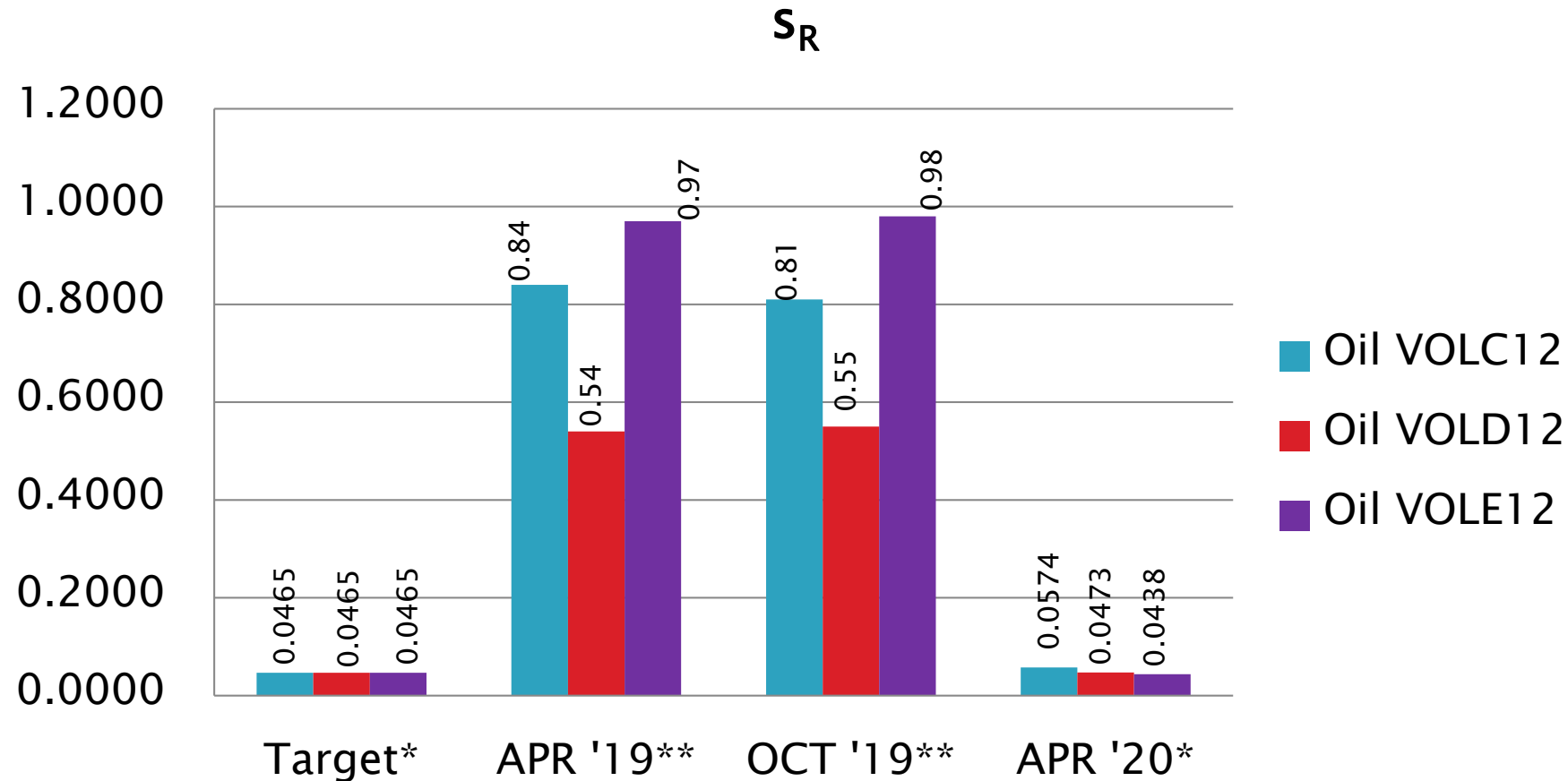|	Target*	APR '19**	OCT '19**	APR '20*
Oil VOLC12	2.6523	14.6	14.7	2.6794
Oil VOLD12	2.5264	12.9	12.8	2.5511
Oil VOLE12	2.8175	17.0	17.3	2.8411

*Results transformed to natural log per updated LTMS 20200207
**Results in original units as monitored at the time

D5800: Performance by Oil

Sample Evaporation Loss, mass %

S_R
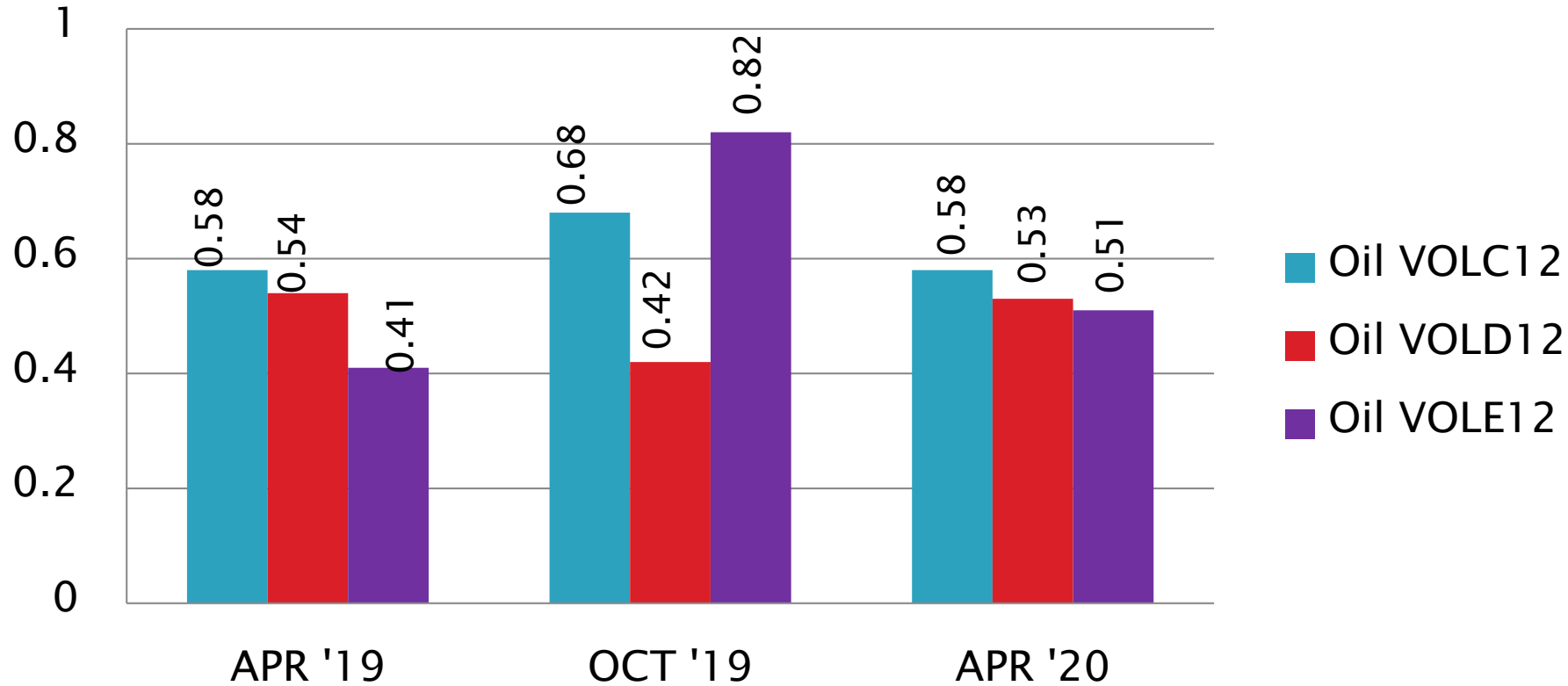
*Results transformed to natural log per updated LTMS 20200207
**Results in original units as monitored at the time

D5800: Performance by Oil

Sample Evaporation Loss, mass %
Mean Δ/s

Other Items?