



Test Monitoring Center

@ Carnegie Mellon University
6555 Penn Avenue, Pittsburgh, PA 15206, USA

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

MEMORANDUM: 19-021
DATE: April 30, 2019
TO: Mike Birke,
Chairman, Engine Oil Elastomer Compatibility Surveillance Panel
FROM: Michael T. Kasimirsky *Michael T. Kasimirsky*
SUBJECT: LDEOC Testing from October 1, 2018 through March 31, 2019

A total of 369 LDEOC tests were reported from 7 labs to the Test Monitoring Center during the period from October 1, 2018 through March 31, 2019.

Please find attached a summary of testing activity this period.

MTK/mtk/mem19-021.mtk.doc

cc: Frank Farber

Jeff Clark

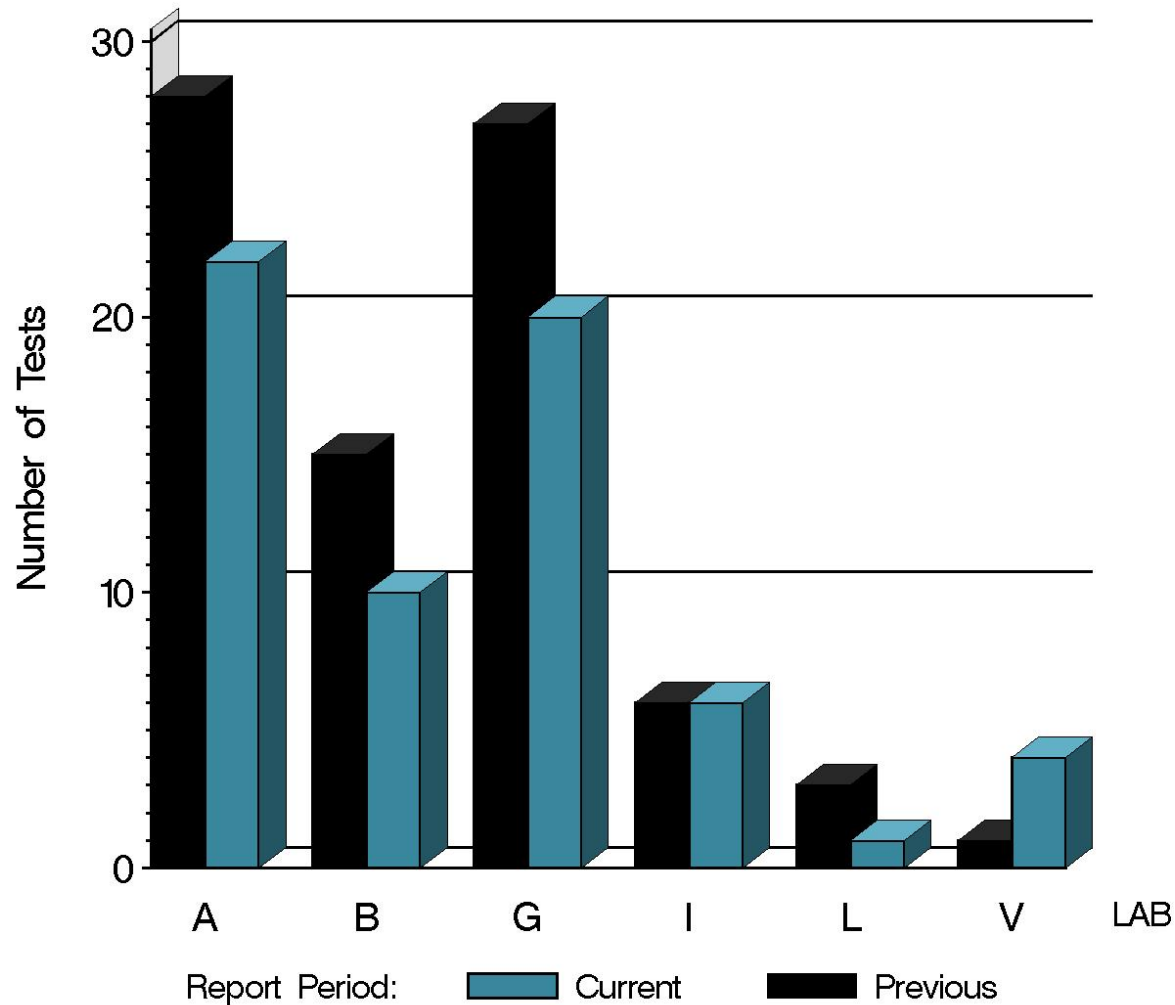
EOEC Surveillance Panel

<http://www.astmtmc.cmu.edu/docs/bench/ldeoc/semiannualreports/ldeoc-04-2019.pdf>

Distribution: email

LDEOC (D 7216)

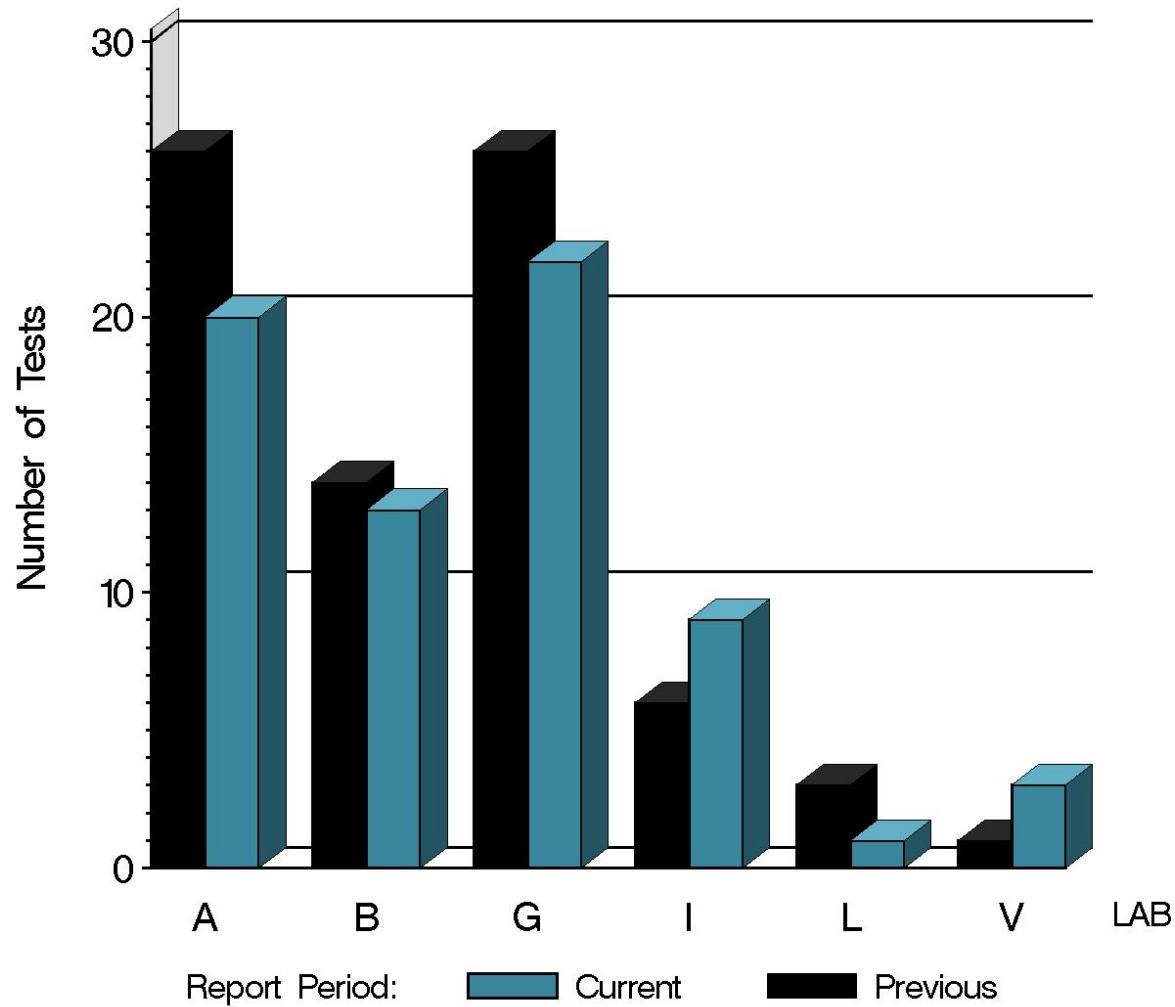
NUMBER OF ETHYLENE ACRYLATE TESTS
REPORTED BY LAB AND REPORT PERIOD



14:48:11 26APR2019

LDEOC (D 7216)

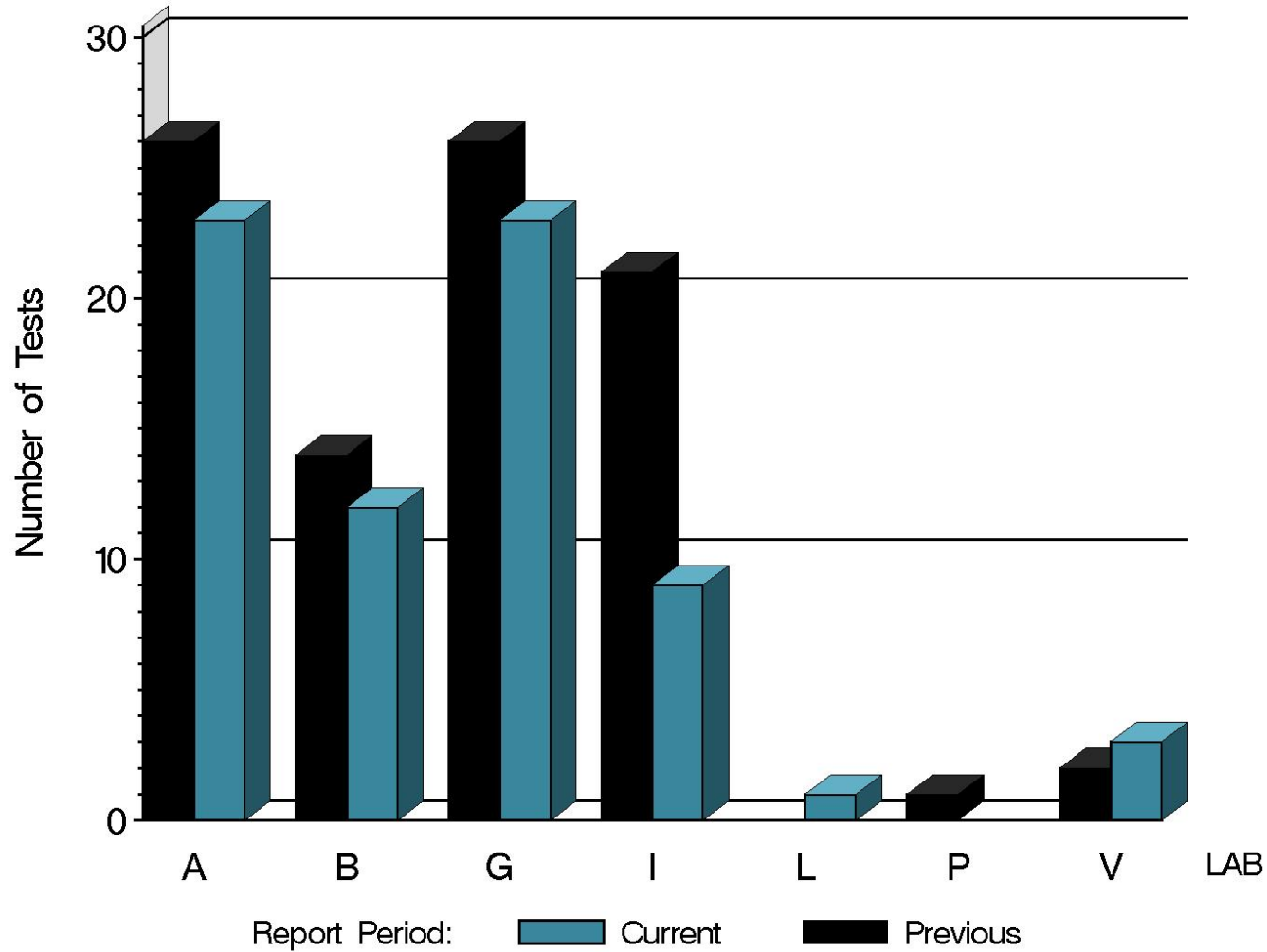
NUMBER OF FLUOROELASTOMER TESTS
REPORTED BY LAB AND REPORT PERIOD



14:48:11 26APR2019

LDEOC (D 7216)

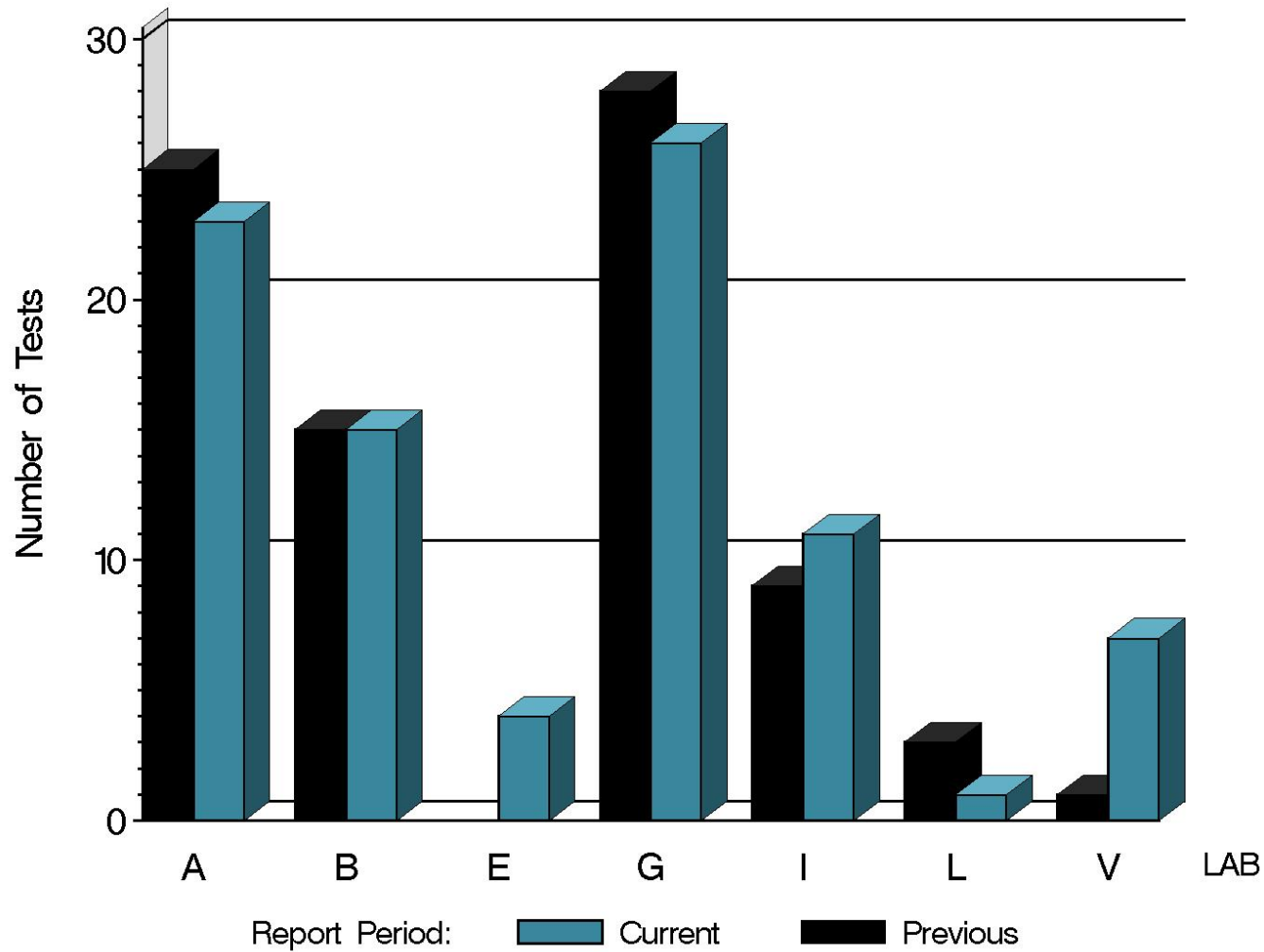
NUMBER OF NITRILE TESTS REPORTED BY LAB AND REPORT PERIOD



14:48:11 26APR2019

LDEOC (D 7216)

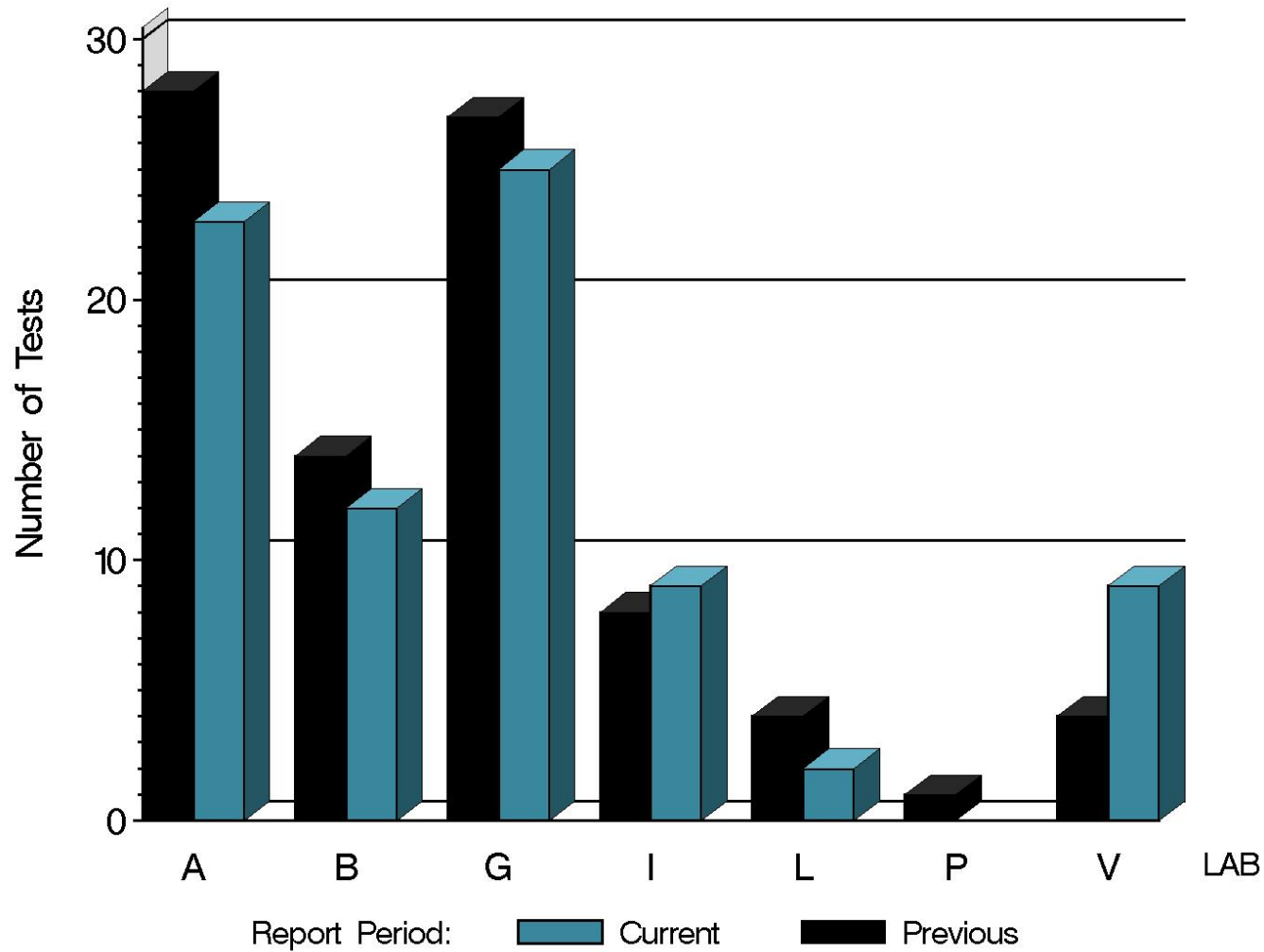
NUMBER OF POLYACRYLATE TESTS REPORTED BY LAB AND REPORT PERIOD



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LDEOC (D 7216)

NUMBER OF SILICONE TESTS REPORTED BY LAB AND REPORT PERIOD



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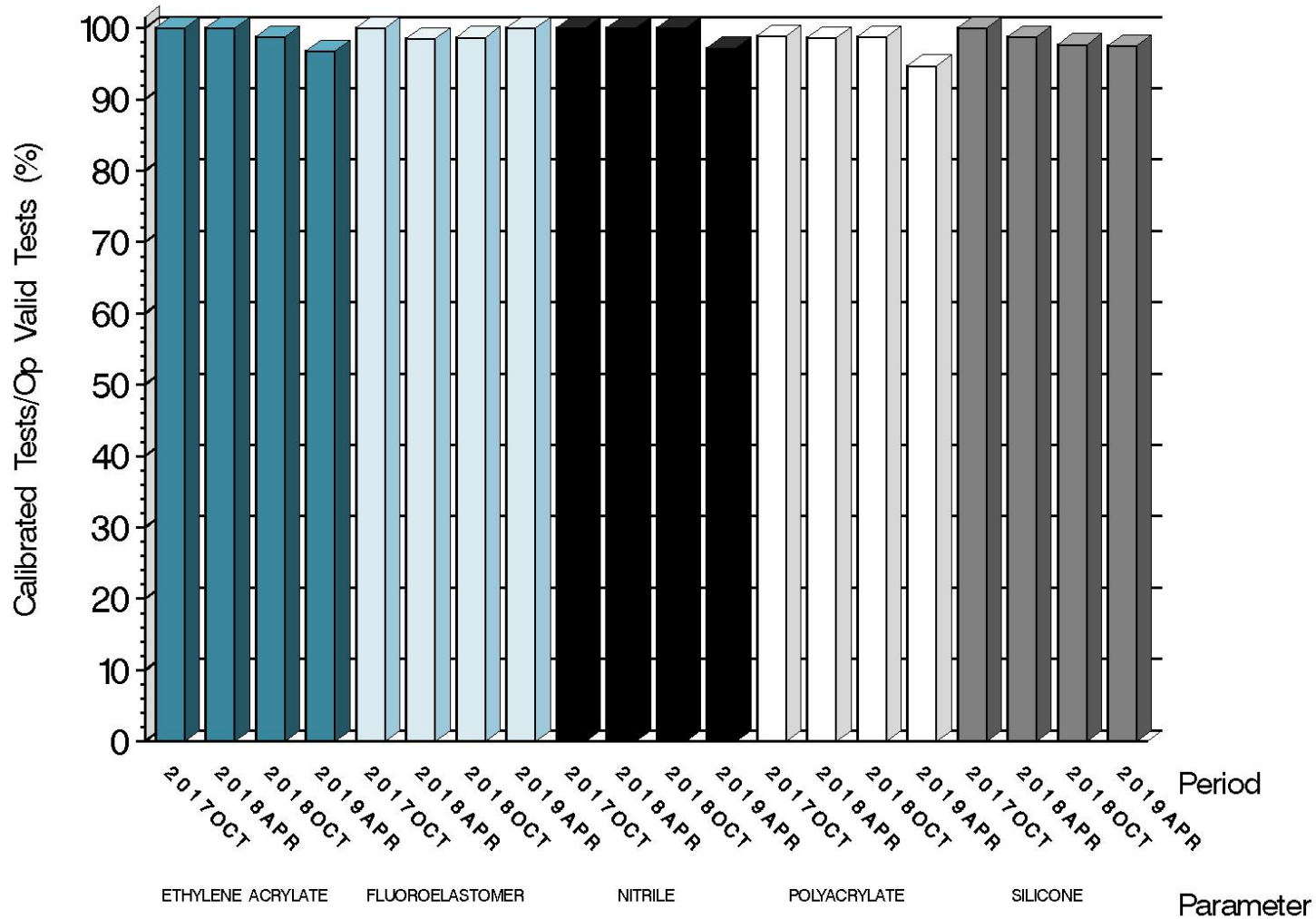
LDEOC (D 7216)

Test Distribution by Oil and Validity

		Ethylene Acrylate	Fluoroelastomer	Nitrile	Polyacrylate	Silicone	This Period	Last Period
Accepted for Calibration	AC	60	67	69	71	78	345	405
Rejected	OC	2	0	2	2	2	8	5
Acceptable Information Run	NI	0	0	0	12	0	12	0
Unacceptable Information Run	MI	0	0	0	0	0	0	0
Invalid Information Run (TMC)	LI	0	0	0	0	0	0	0
Invalid Information Run (TMC)	RI	0	0	0	0	0	0	0
Operationally Invalid (TMC)	RC	0	1	0	1	0	2	2
Aborted Information Run	XI	0	0	0	1	0	1	0
Aborted Calibration	XC	1	0	0	0	0	1	0
Total		63	68	71	87	80	369	412

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OPERATIONALLY VALID TESTS MEETING ACCEPTANCE CRITERIA



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LOST TESTS PER START BY LAB AND ELASTOMER TYPE

Lab	Ethylene Acrylate			Fluoroelastomer			Nitrile			Polyacrylate			Silicone			Total		
	Lost	Starts	%	Lost	Starts	%	Lost	Starts	%	Lost	Starts	%	Lost	Starts	%	Lost	Starts	%
A	0	22	0	0	20	0	0	23	0	0	23	0	0	23	0	0	111	0
B	1	10	10	1	13	7.7	0	12	0	1	15	6.7	0	12	0	3	62	4.8
E	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	4	0
G	0	20	0	0	22	0	0	22	0	0	26	0	0	25	0	0	116	0
I	0	6	0	0	9	0	0	9	0	0	11	0	0	9	0	0	44	0
L	0	1	0	0	1	0	0	1	0	0	1	0	0	2	0	0	6	0
P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
V	0	4	0	0	3	0	0	3	0	0	7	0	0	9	0	0	26	0
Total	1	63	1.6	1	68	1.5	0	71	0	1	87	1.1	0	80	0	3	369	0.8

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CAUSES FOR LOST TESTS

Lab	Cause	Elastomer					Validity			Loss Rate		
		Ethylene Acrylate	Fluoroelastomer	Nitrile	Polyacrylate	Silicone	LC	RC	XC	Lost	Starts	%
		B	No Tensile Data Reported	0	1	0	1	0	2	0	2	62
	Equipment Failure	1	0	0	0	1	0	0	1	62	1.6	
	Lost	1	1	0	1	1	2	0				
	Starts	63	68	71	87	369	369	369				
	%	1.6	1.5	0	1.1	0.3	0.5	0				

Lost tests are calibration attempts that were either aborted or operationally invalid

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Average Δ 's by Lab					
Elastomer	Lab	n	VOLCYI	HARDYI	TENSYI
Ethylene Acrylate	A	22	-1.345	-0.360	0.477
	B	9	-1.212	-0.049	-0.175
	E	-	-	-	-
	G	20	-1.147	0.659	-0.599
	I	6	-1.299	1.905	0.452
	L	1	-2.961	2.637	1.119
	P	-	-	-	-
	V	4	-1.364	-1.484	-1.047
	Industry	62	-1.284	0.209	-0.055
Fluoroelastomer	A	20	-0.880	1.218	0.001
	B	12	-1.456	0.195	0.470
	E	-	-	-	-
	G	22	-0.018	0.300	0.666
	I	9	-0.600	0.525	1.045
	L	1	0.067	0.525	-0.440
	P	-	-	-	-
	V	3	-1.600	0.855	-1.502
	Industry	67	-0.681	0.613	0.370
Nitrile	A	23	2.332	-0.627	-1.176
	B	12	2.236	-0.977	-0.464
	E	-	-	-	-
	G	23	1.730	0.622	-0.507
	I	9	2.094	-0.849	-1.095
	L	1	1.217	-0.977	-0.630
	P	-	-	-	-
	V	3	1.894	-1.360	-1.352
	Industry	71	2.057	-0.346	-0.828

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Average Δ/s by Lab					
Elastomer	Lab	n	VOLCYI	HARDYI	TENSYI
Polyacrylate	A	21	-0.263	-0.426	-0.371
	B	11	-0.158	-0.530	-0.425
	E	2	-0.227	-0.766	-0.261
	G	24	0.781	-0.415	-0.353
	I	9	1.269	-0.117	-0.981
	L	1	-0.576	-0.117	0.331
	P	-	-	-	-
	V	5	-1.394	-1.156	-0.629
	Industry	73	0.204	-0.455	-0.454
	Silicone	A	23	0.154	-1.068
B		12	-0.065	-0.583	1.252
E		-	-	-	-
G		25	1.860	-0.569	0.432
I		9	-1.892	0.275	0.869
L		2	-0.710	1.500	4.004
P		-	-	-	-
V		9	0.222	-1.577	2.470
Industry		80	0.410	-0.681	1.364

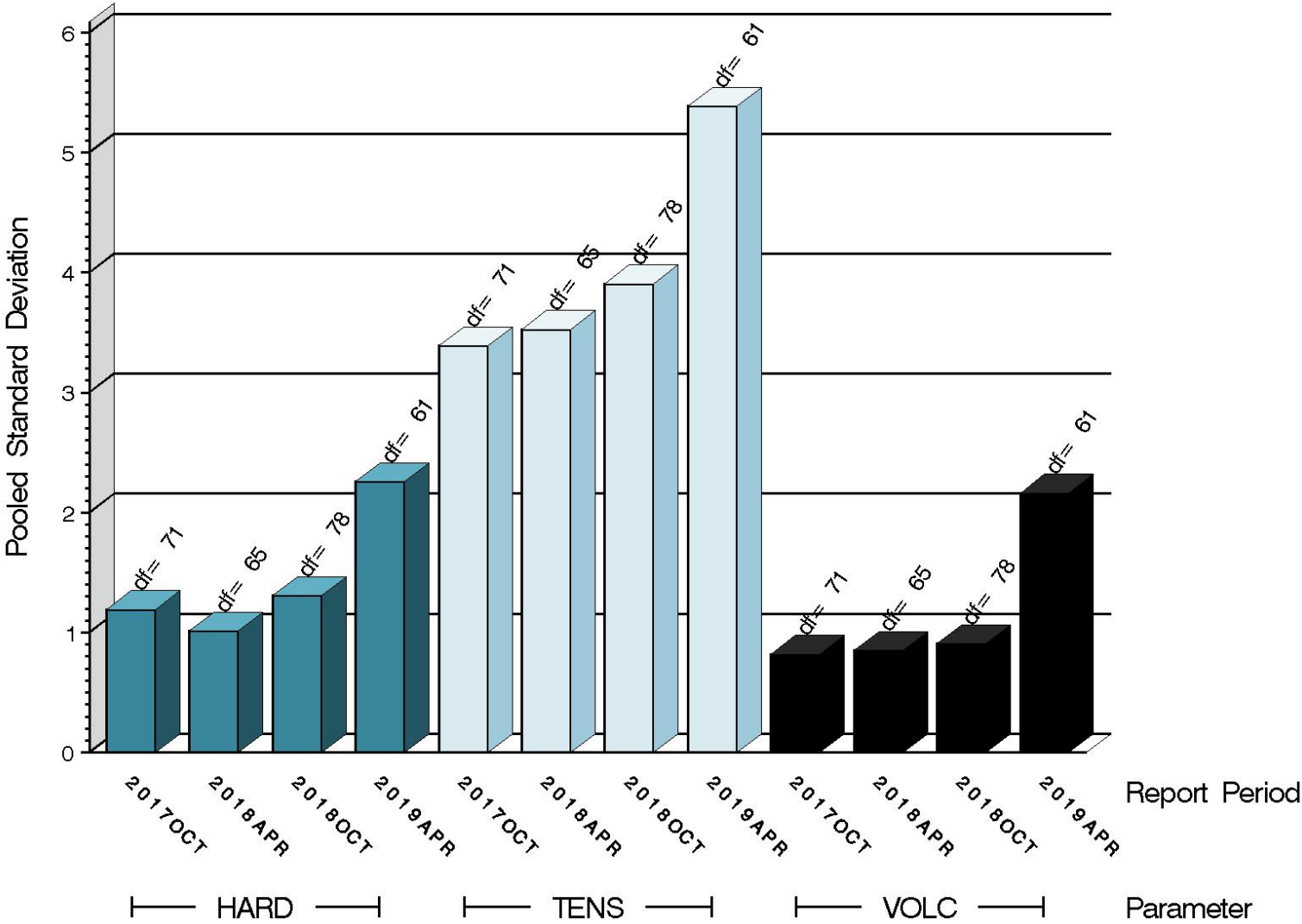
LDEOC (D 7216)

Individual test results can be viewed at the links shown in the following table:

<i>Links to Individual Test Result Data</i>	
Elastomer Type	Web Link to Data
Ethylene Acrylate	http://www.astmtmc.cmu.edu/ftp/refdata/bench/ldeoca/data/
Fluoroelastomer	http://www.astmtmc.cmu.edu/ftp/refdata/bench/ldeocf/data/
Nitrile	http://www.astmtmc.cmu.edu/ftp/refdata/bench/ldeocn/data/
Polyacrylate	http://www.astmtmc.cmu.edu/ftp/refdata/bench/ldeocp/data/
Silicone	http://www.astmtmc.cmu.edu/ftp/refdata/bench/ldeocs/data/

LDEOC (D 7216)

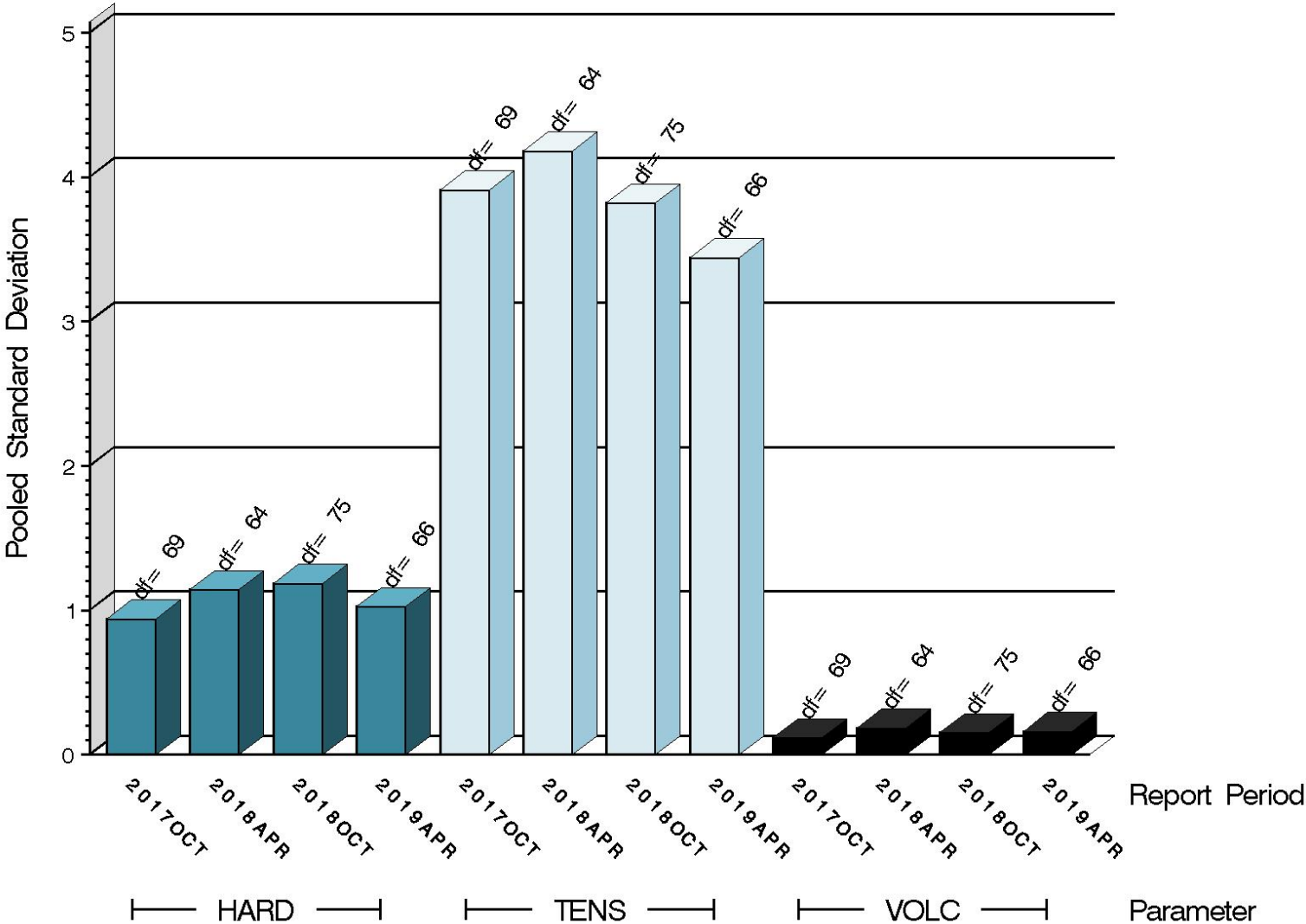
ETHYLENE ACRYLATE TEST PRECISION
 POOLED STANDARD DEVIATION BY SIX-MONTH ASTM REPORT PERIOD



14:48:11 26APR2019

LDEOC (D 7216)

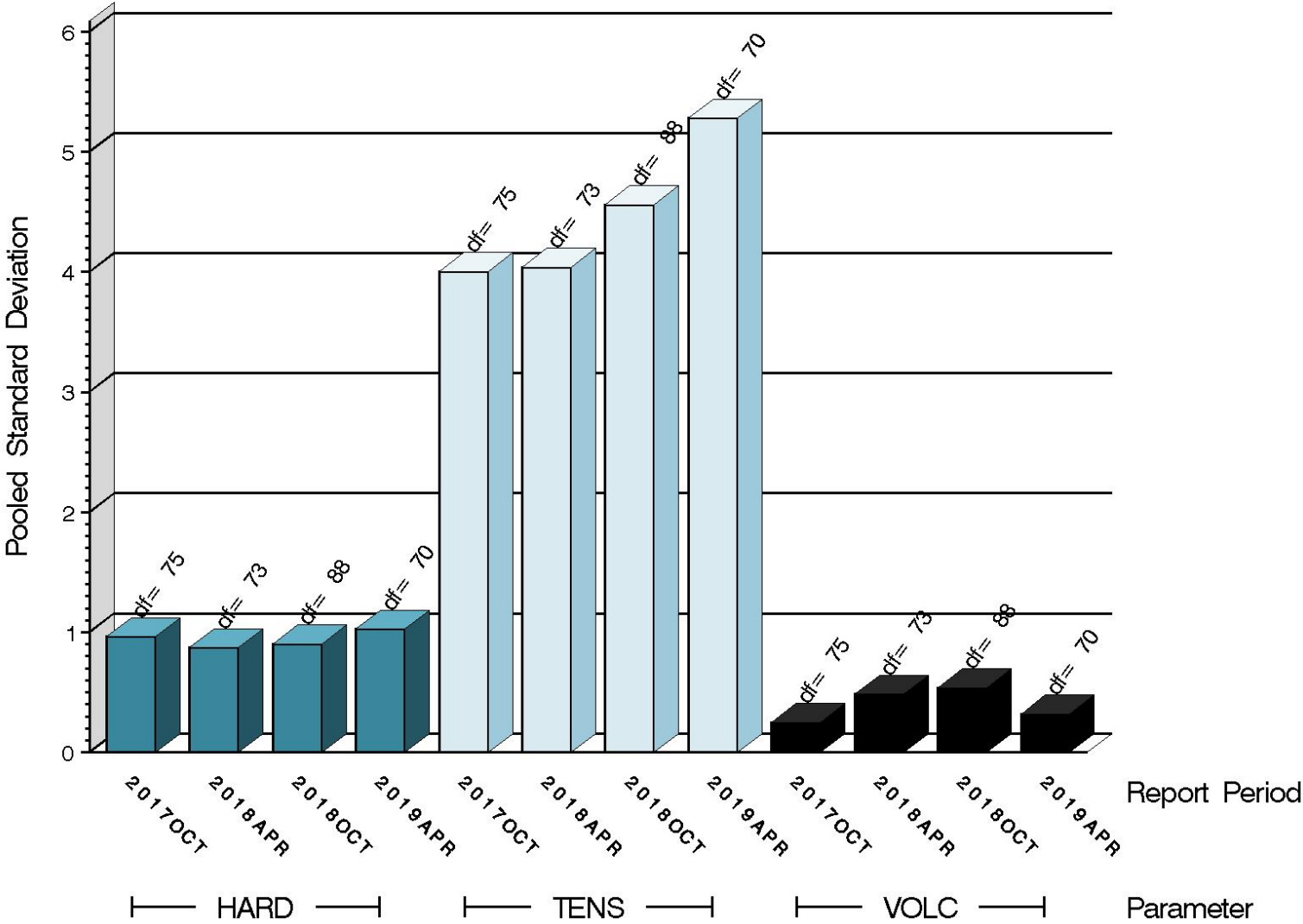
FLUOROELASTOMER TEST PRECISION
 POOLED STANDARD DEVIATION BY SIX-MONTH ASTM REPORT PERIOD



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LDEOC (D 7216)

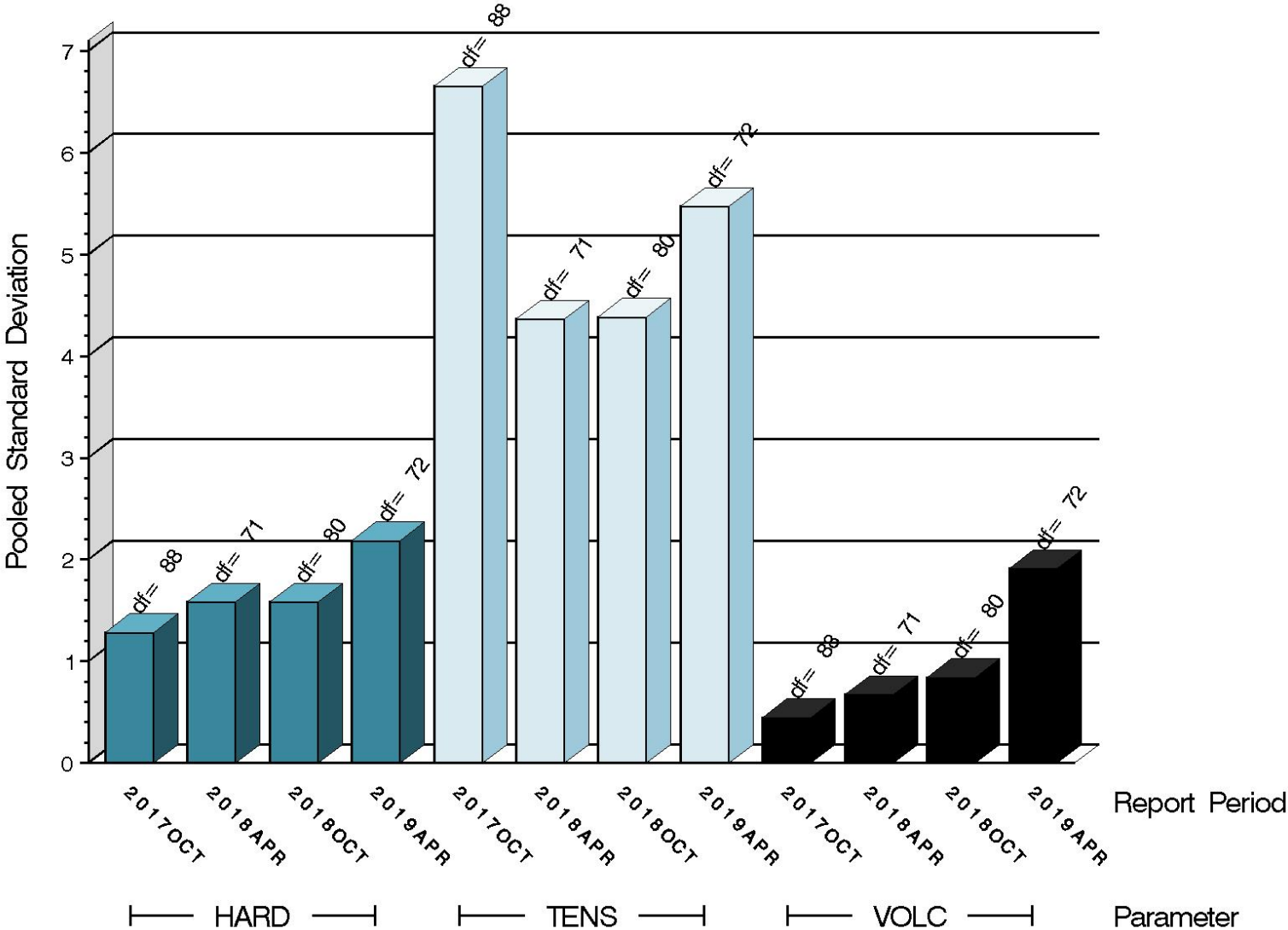
NITRILE TEST PRECISION
 POOLED STANDARD DEVIATION BY SIX-MONTH ASTM REPORT PERIOD



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LDEOC (D 7216)

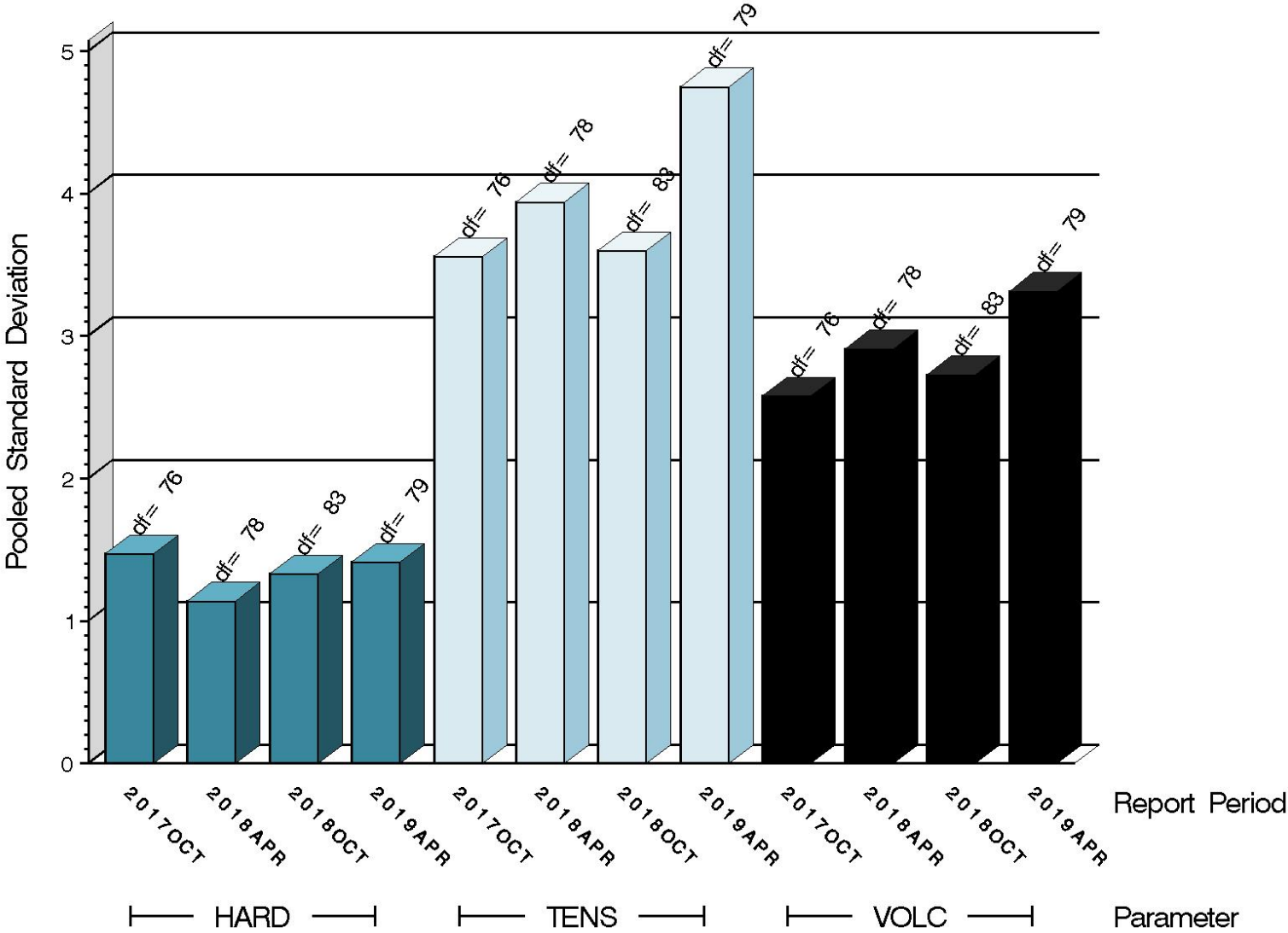
POLYACRYLATE TEST PRECISION
 POOLED STANDARD DEVIATION BY SIX-MONTH ASTM REPORT PERIOD



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LDEOC (D 7216)

SILICONE TEST PRECISION
 POOLED STANDARD DEVIATION BY SIX-MONTH ASTM REPORT PERIOD



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LDEOC (D 7216)

SUMMARY OF SEVERITY & PRECISION

Summary of Severity as Measured by LTMS Control Charting			
Elastomer	VOLC	HARD	TENS
Ethylene Acrylate	Within limits	Mild	Within limits
Fluoroelastomer	Within limits	Within limits	Within limits
Nitrile	Severe	Within limits	Within limits
Polyacrylate	Within limits	Within limits	Within limits
Silicone	Severe	Mild	Severe

LDEOC (D 7216)

SUMMARY OF SEVERITY & PRECISION (continued)

Summary of Precision as Measured by LTMS Control Charting			
Elastomer	VOLC	HARD	TENS
Ethylene Acrylate	Within limits	Action Alarm	Within limits
Fluoroelastomer	Within limits	Within limits	Within limits
Nitrile	Within limits	Within limits	Within limits
Polyacrylate	Within limits	Within limits	Within limits
Silicone	Warning Alarm	Within limits	Warning Alarm

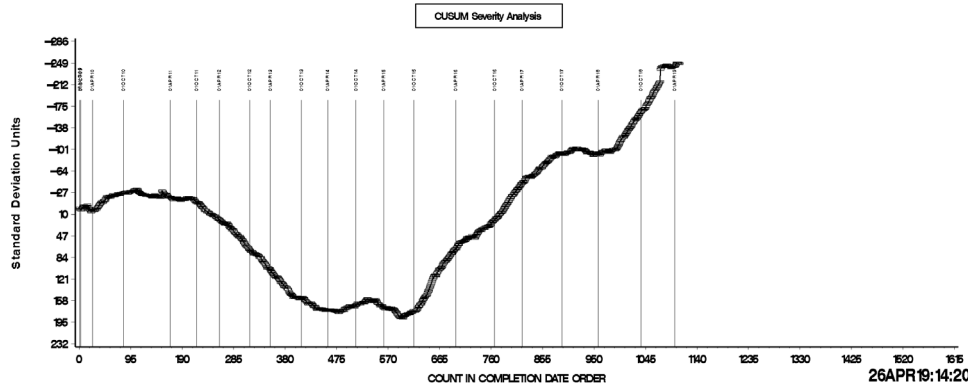
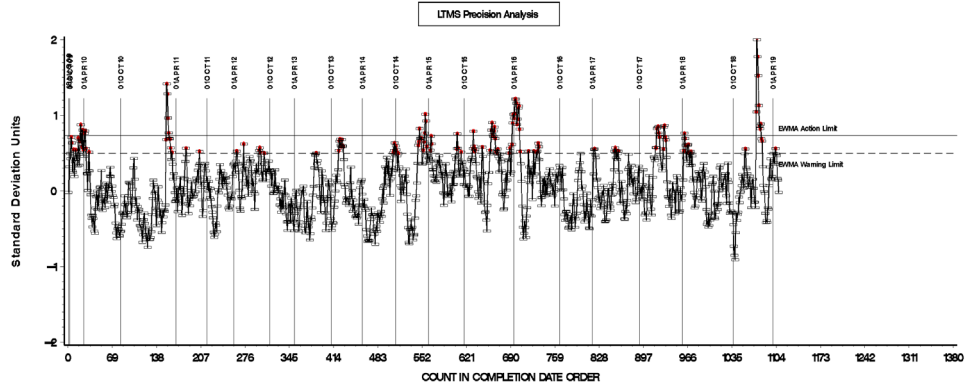
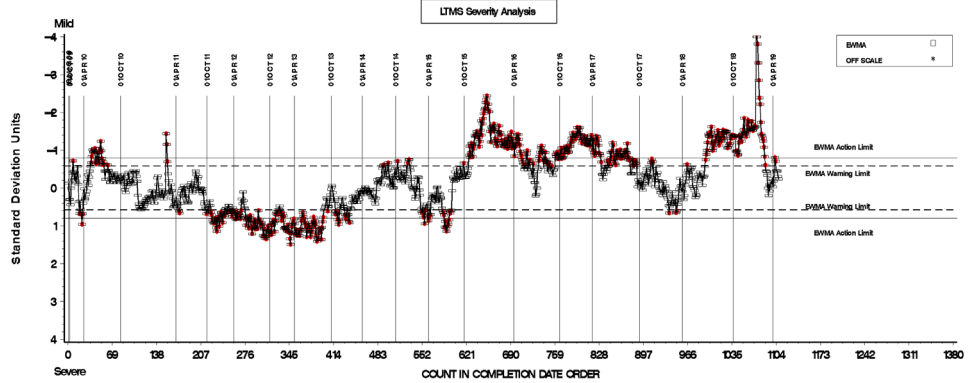
Industry control charts follow.

LDEOC (D 7216)

LDEOC —ETHYLENE ACRYLATE INDUSTRY OPERATIONALLY VALID DATA



REF ETH ACRYLATE VOLUME CHANGE AVERAGE

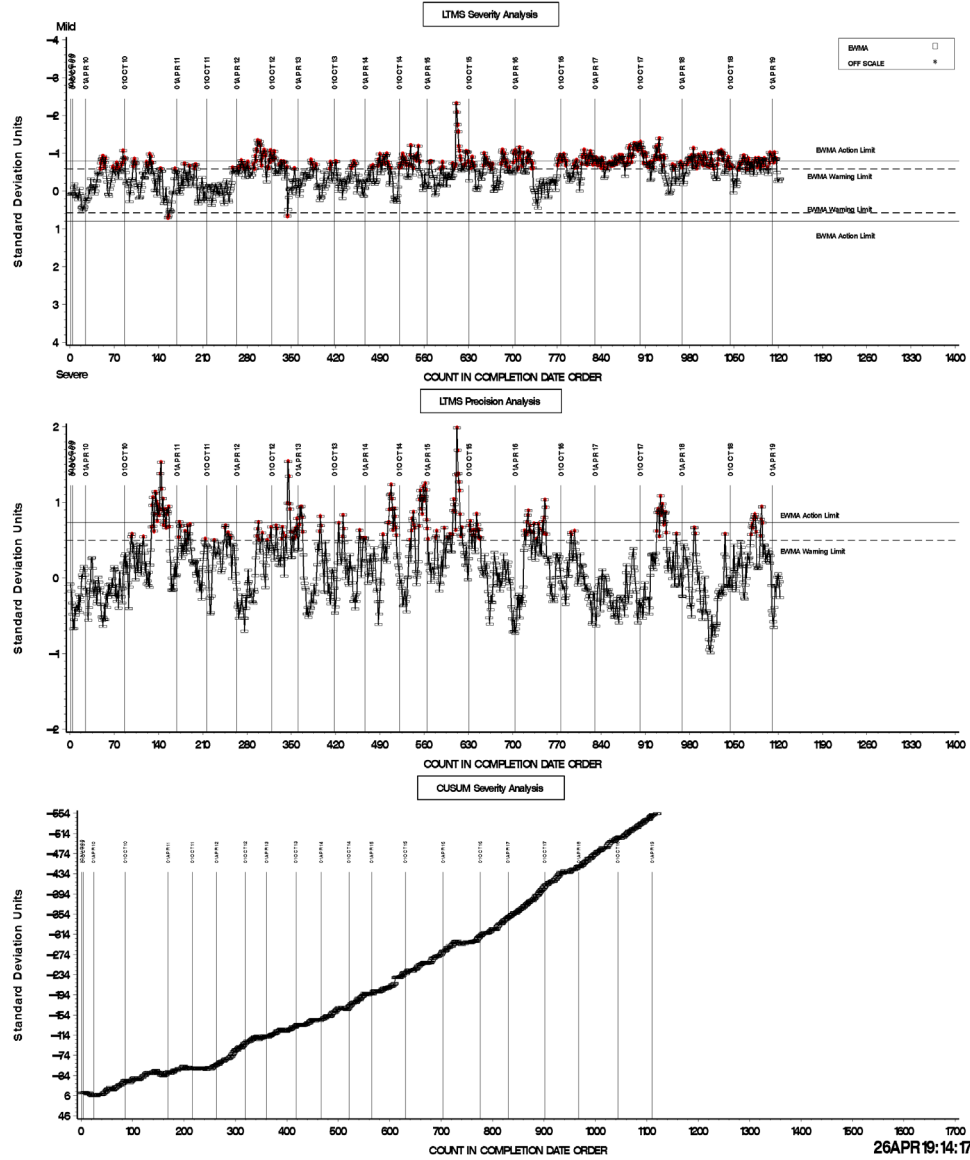


LDEOC (D 7216)

LDEOC —FLUOROELASTOMER INDUSTRY OPERATIONALLY VALID DATA



REF FLUOROELASTOMER VOLUME CHANGE AVERAGE

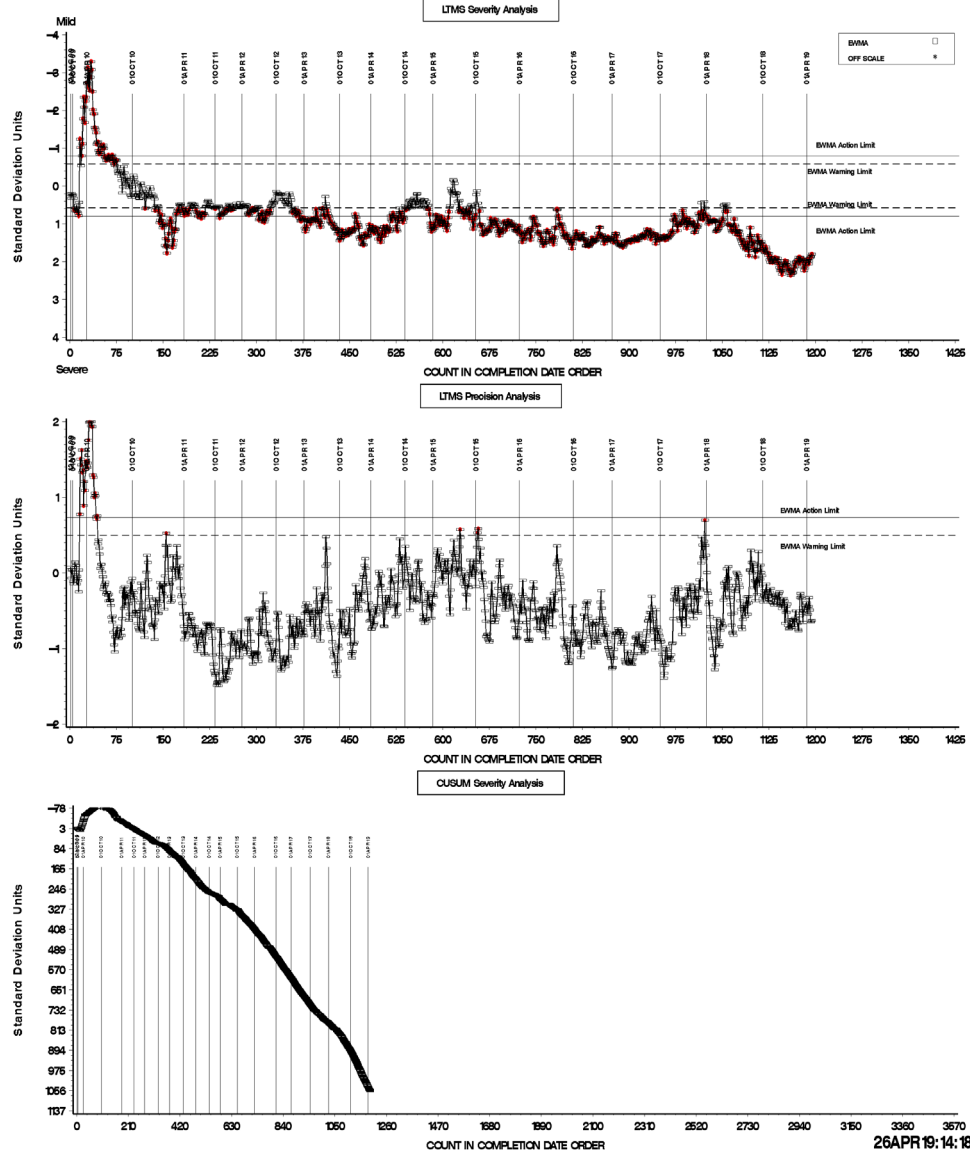


LDEOC (D 7216)

LDEOC —NITRILE INDUSTRY OPERATIONALLY VALID DATA



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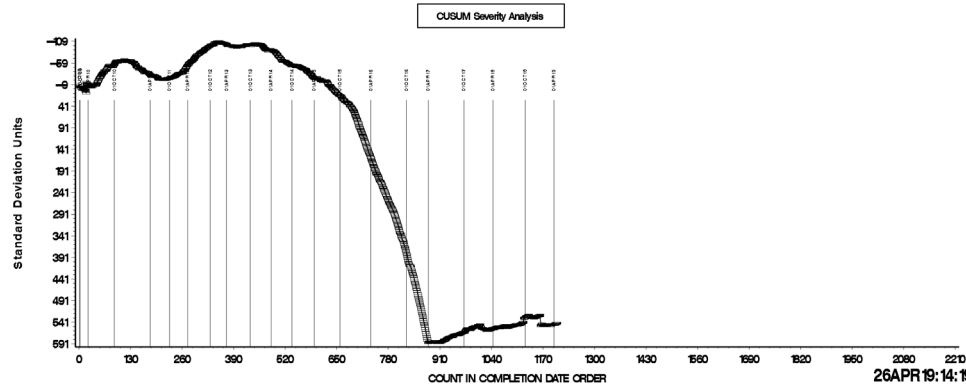
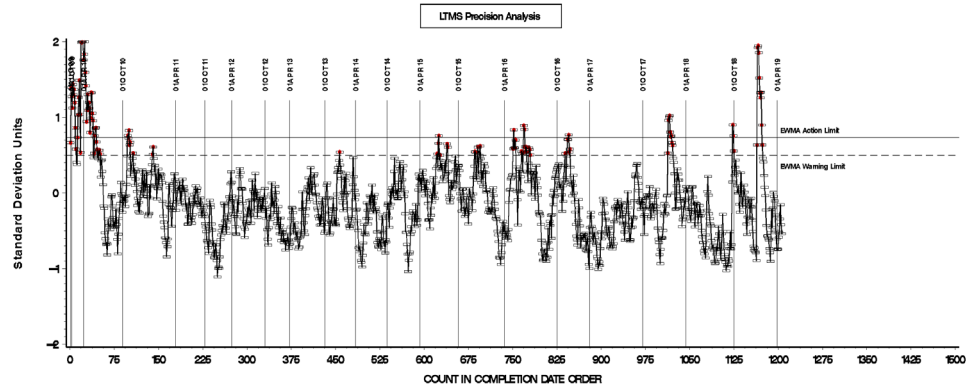
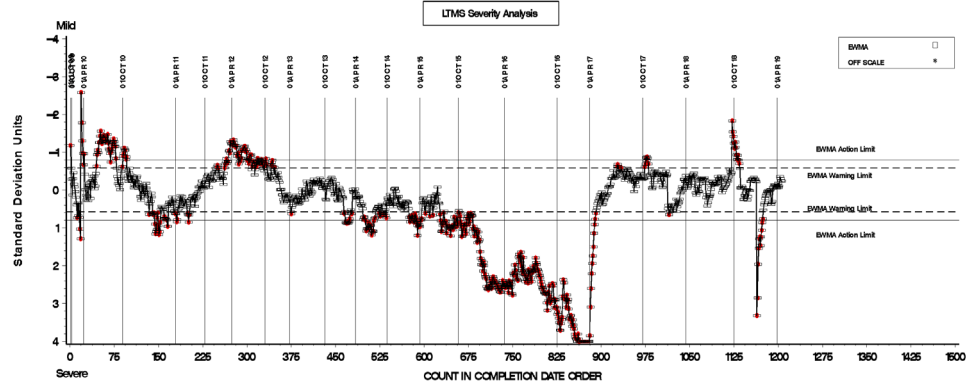


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LDEOC —POLYACRYLATE INDUSTRY OPERATIONALLY VALID DATA



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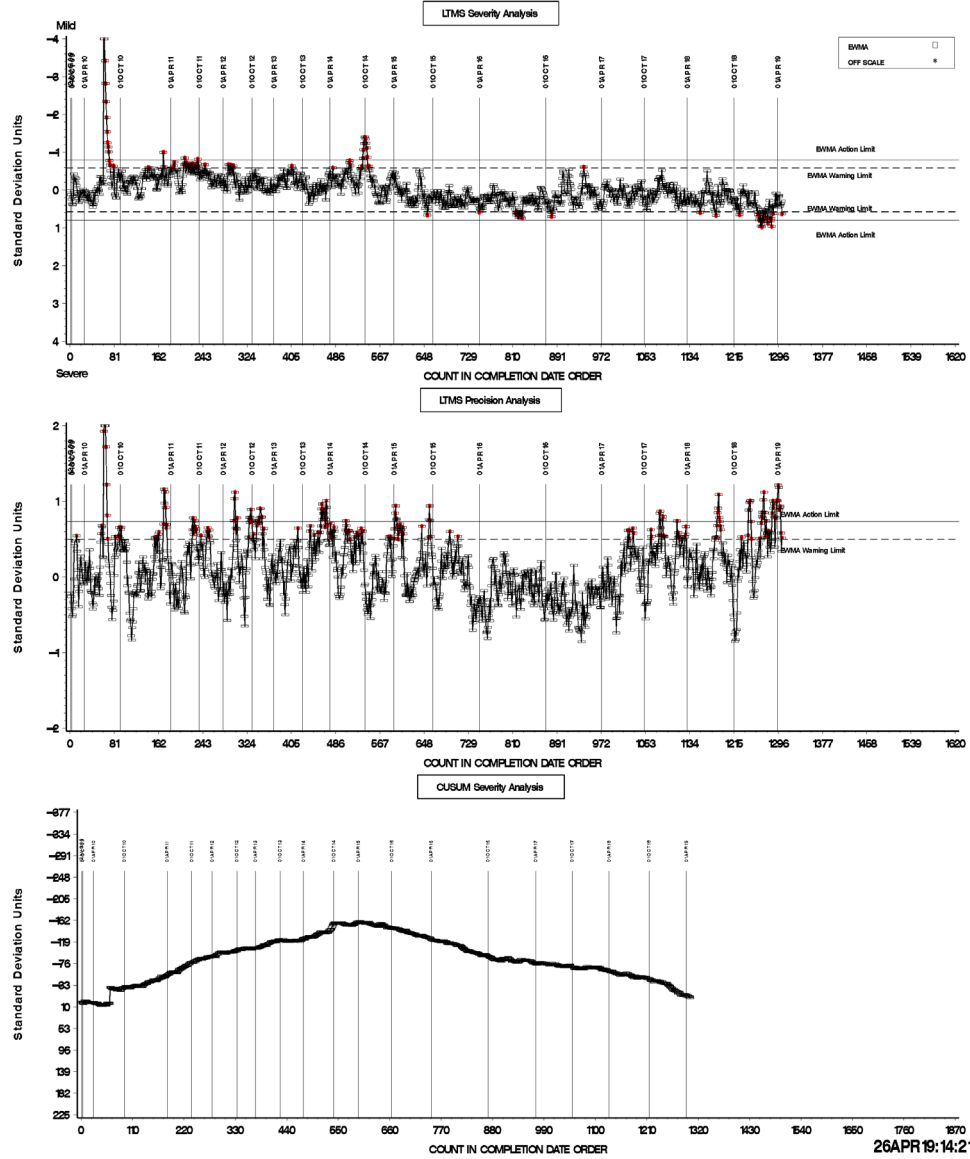


LDEOC (D 7216)

LDEOC — SILICONE INDUSTRY OPERATIONALLY VALID DATA



REFERENCE SILICON VOLUME CHANGE AVERAGE



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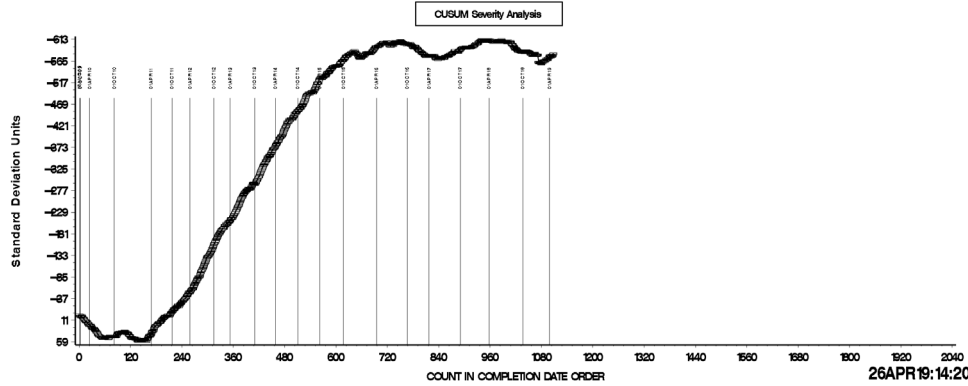
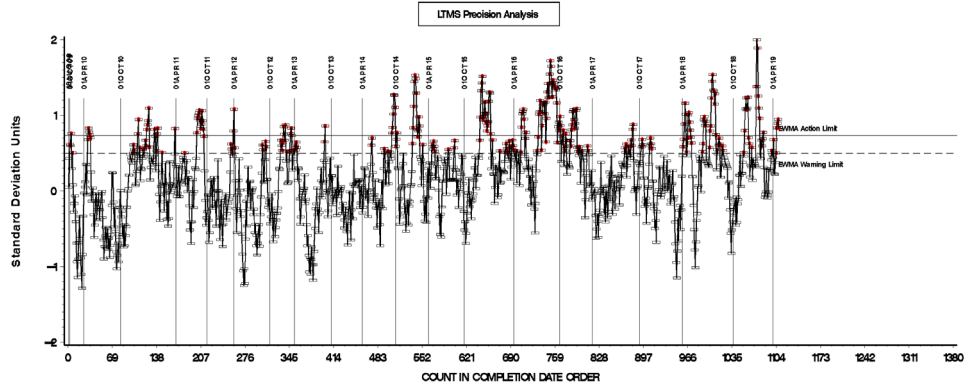
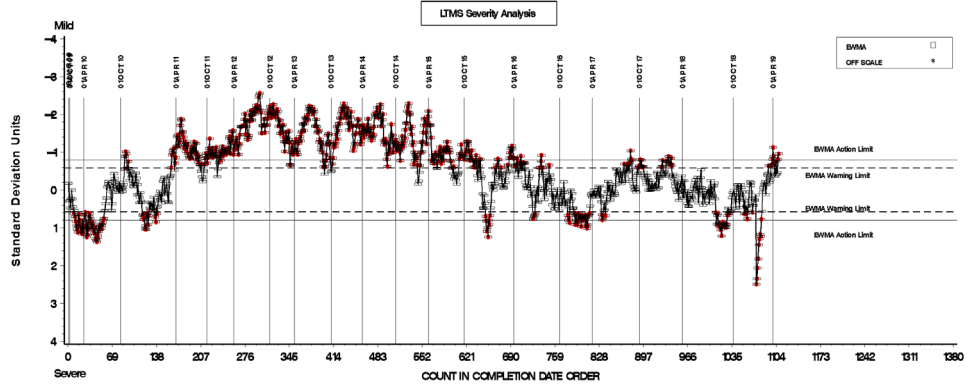
LDEOC (D 7216)

LDEOC —ETHYLENE ACRYLATE INDUSTRY OPERATIONALLY VALID DATA



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REF ETH ACRYLATE POINTS HARDNESS CHANGE AVG



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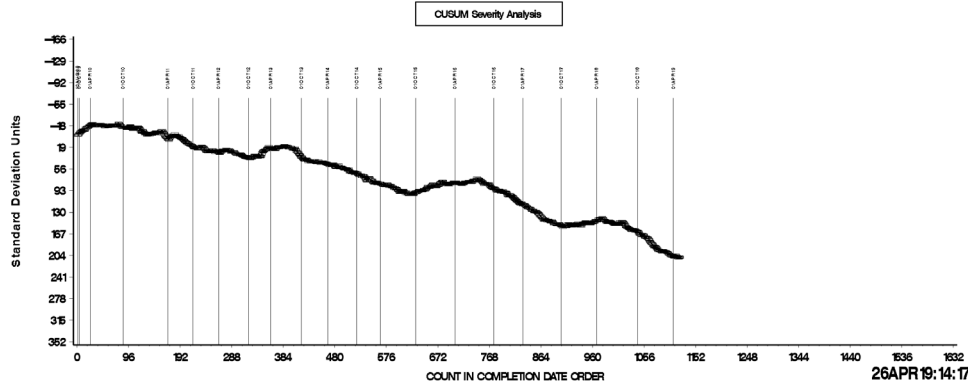
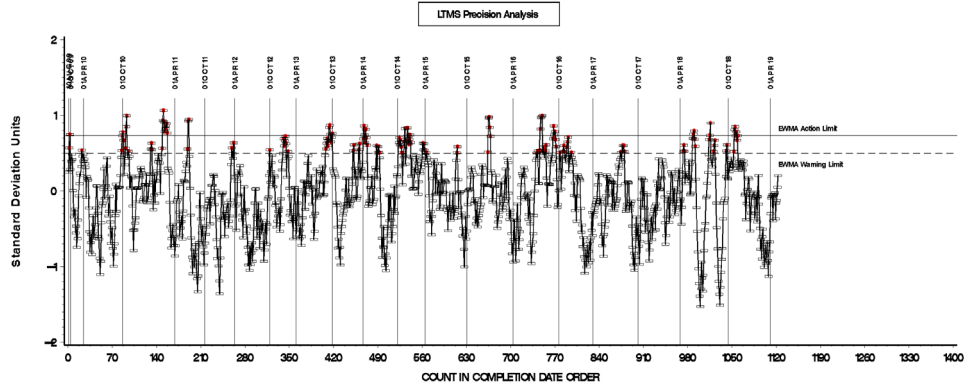
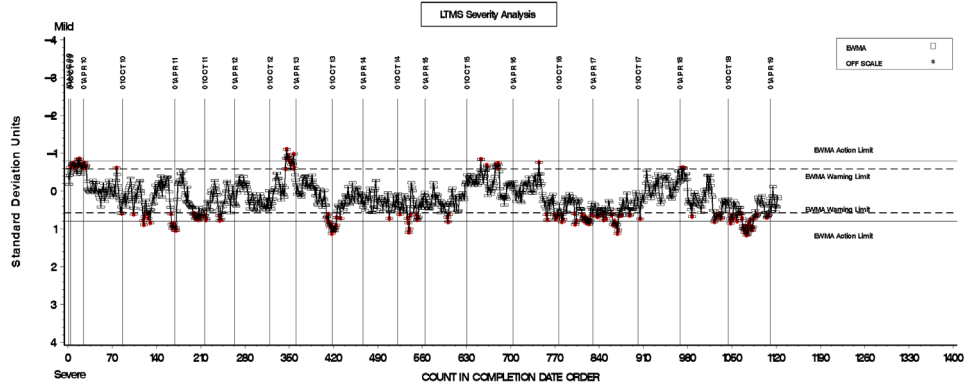
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LDEOC —FLUOROELASTOMER INDUSTRY OPERATIONALLY VALID DATA



REF FLURO POINTS HARDNESS CHANGE AVERAGE

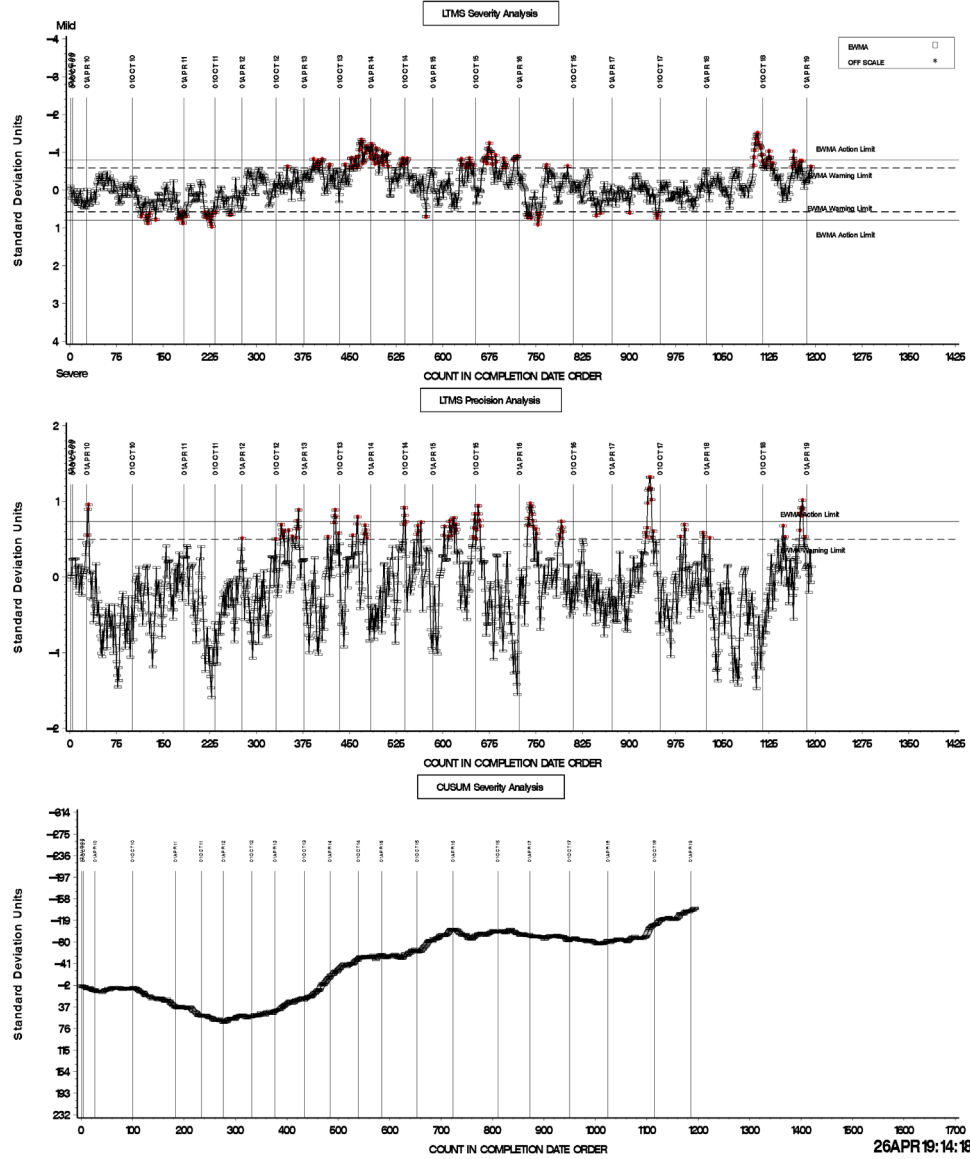


LDEOC (D 7216)

LDEOC —NITRILE INDUSTRY OPERATIONALLY VALID DATA



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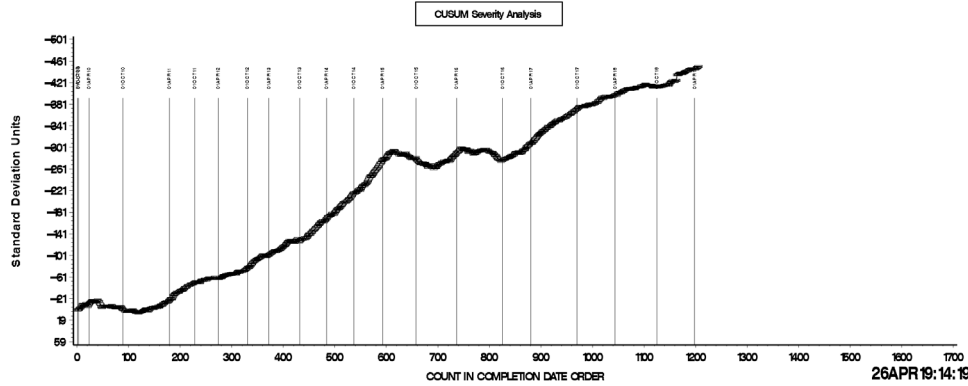
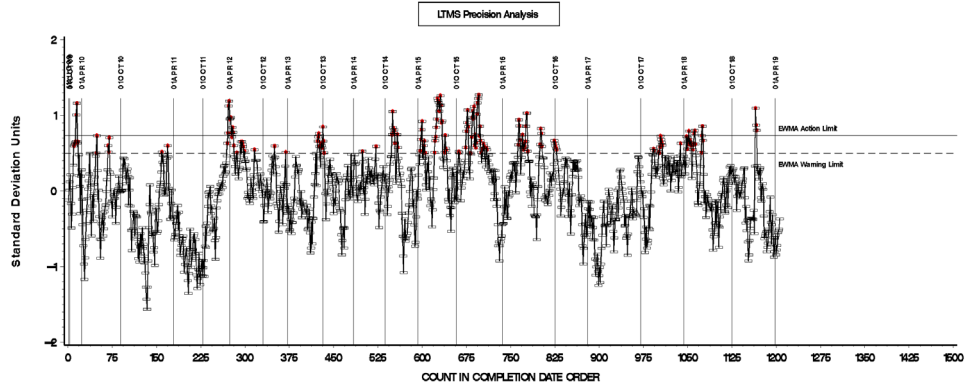
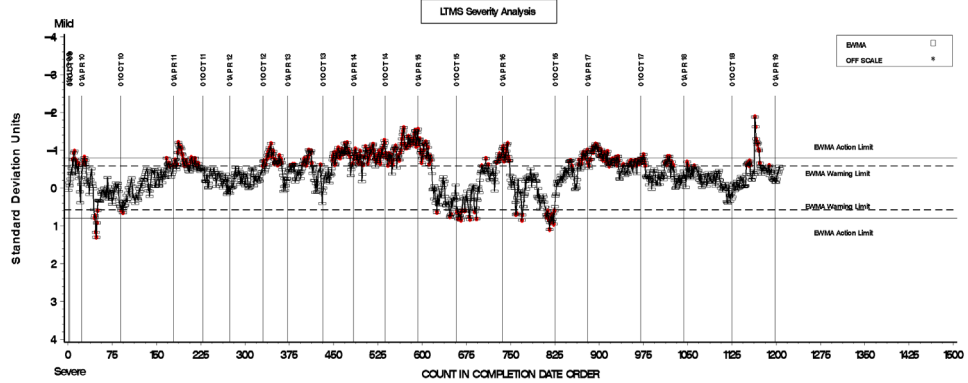


LDEOC (D 7216)

LDEOC —POLYACRYLATE INDUSTRY OPERATIONALLY VALID DATA



REF POLYACRYLATE POINTS HARDNESS CHG AVG



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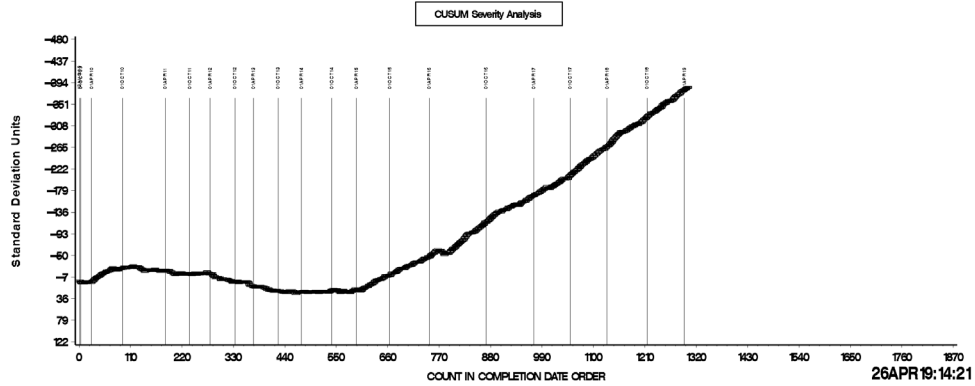
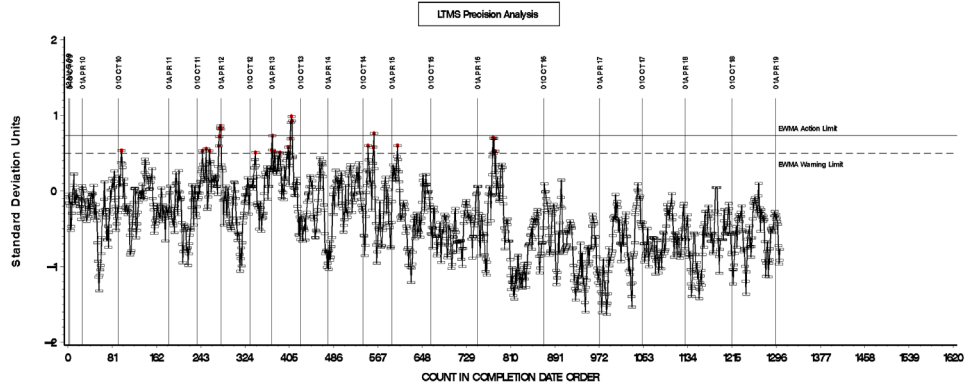
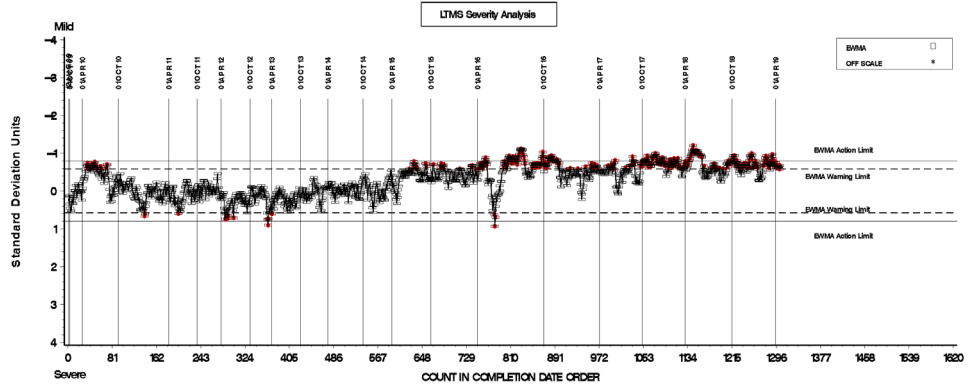
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LDEOC — SILICONE INDUSTRY OPERATIONALLY VALID DATA



REF SILICON POINTS HARDNESS CHANGE AVERAGE



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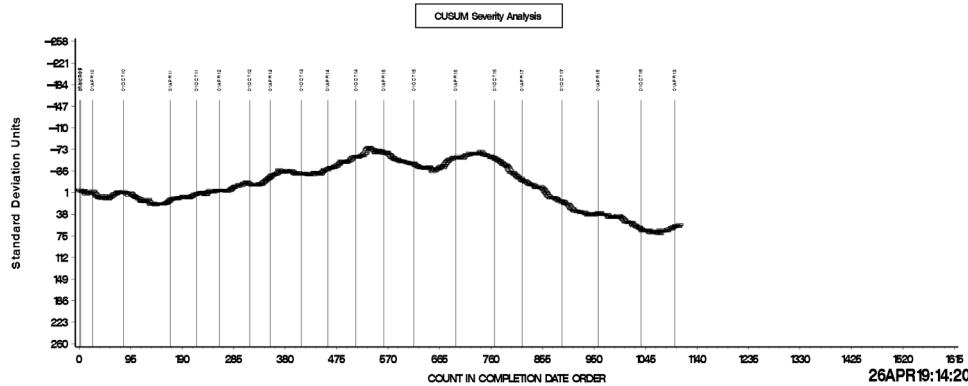
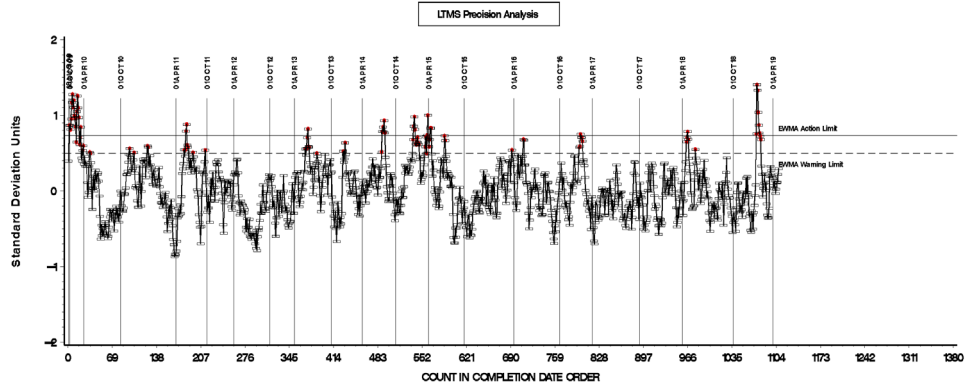
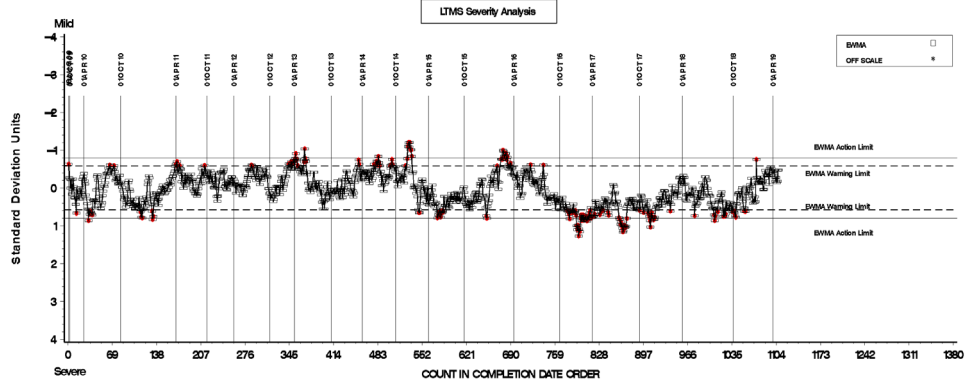
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LDEOC —ETHYLENE ACRYLATE INDUSTRY OPERATIONALLY VALID DATA



REF ETH ACRYLATE TENSILE STRENGTH CHANGE AVG

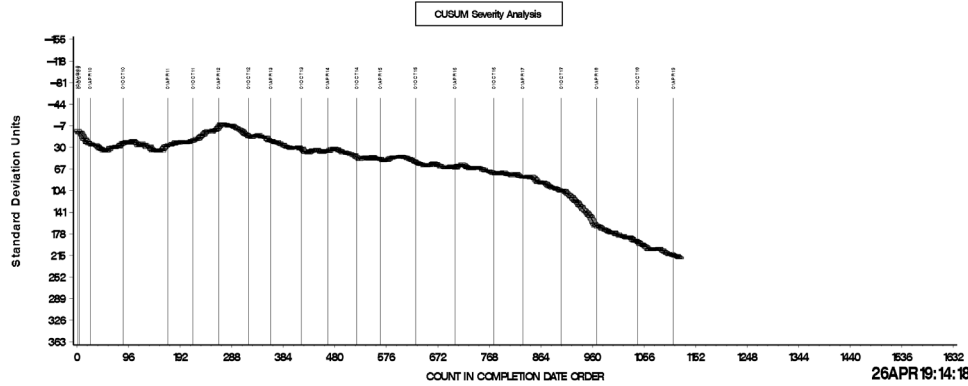
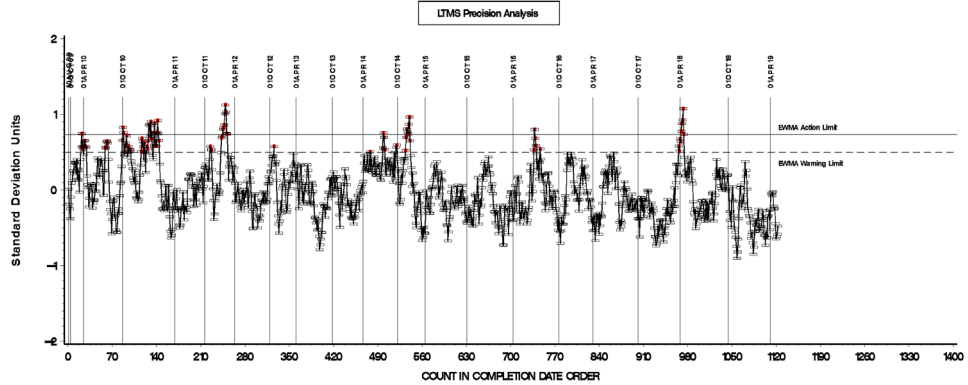
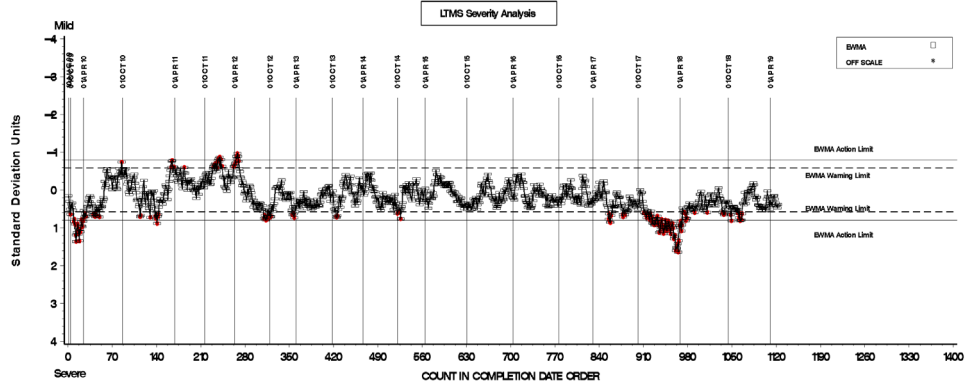


LDEOC (D 7216)

LDEOC —FLUOROELASTOMER INDUSTRY OPERATIONALLY VALID DATA



REF FLURO TENSILE STRENGTH CHANGE AVERAGE

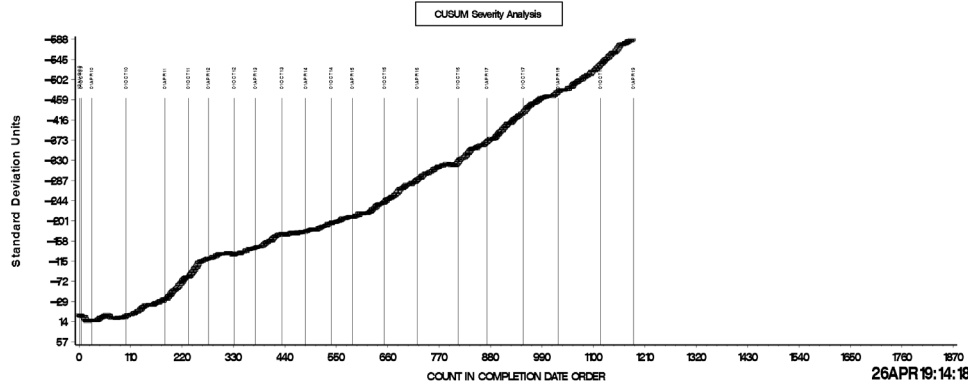
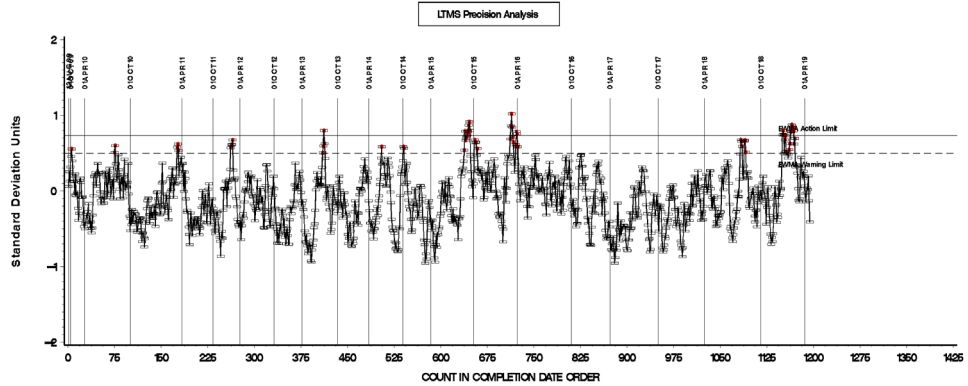
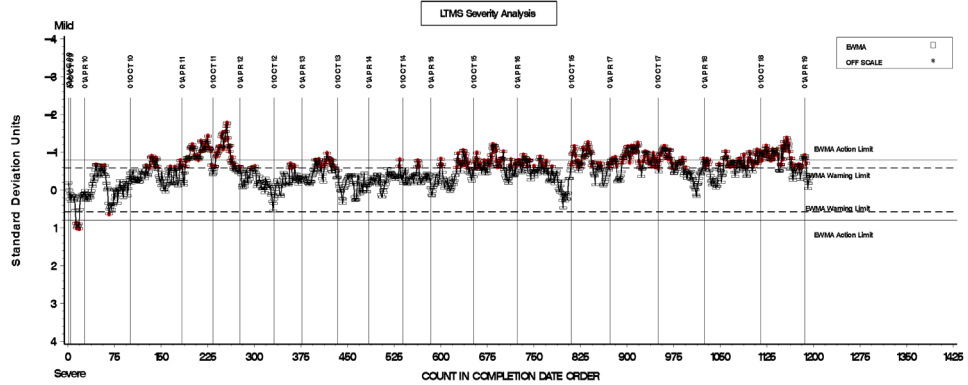


LDEOC (D 7216)

LDEOC —NITRILE INDUSTRY OPERATIONALLY VALID DATA



REF NITRILE TENSILE STRENGTH CHANGE AVERAGE

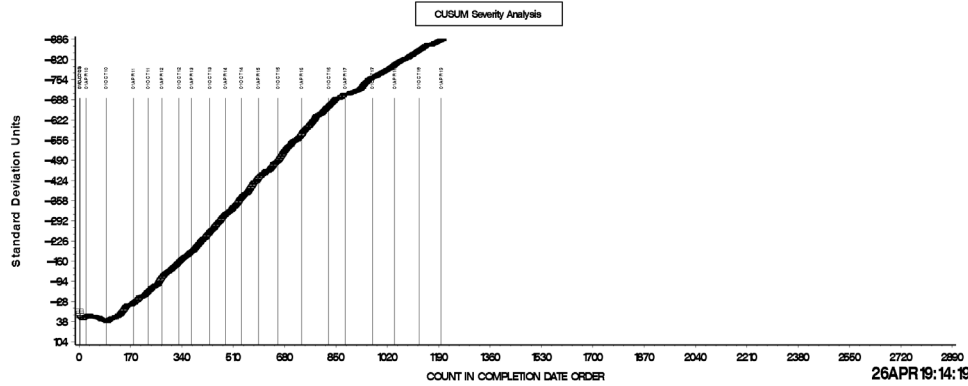
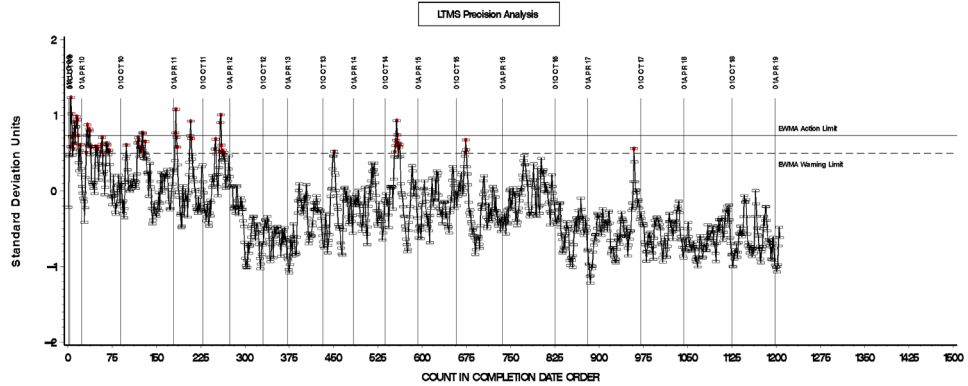
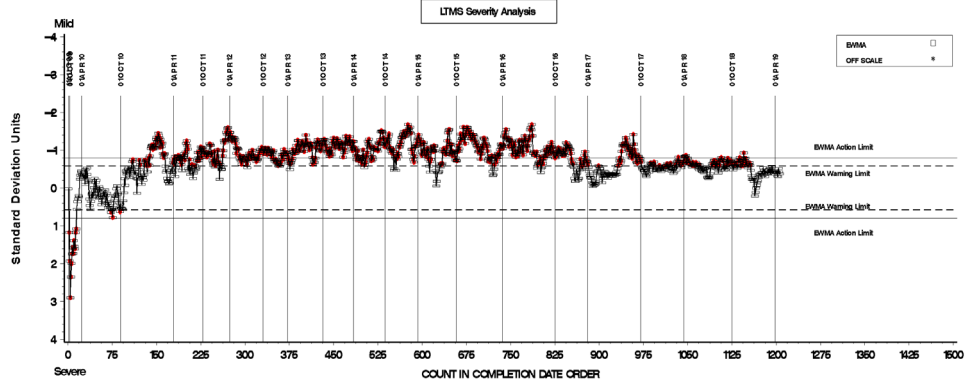


LDEOC (D 7216)

LDEOC —POLYACRYLATE INDUSTRY OPERATIONALLY VALID DATA



REF POLYACRYLATE TENSILE STRENGTH CHG AVG



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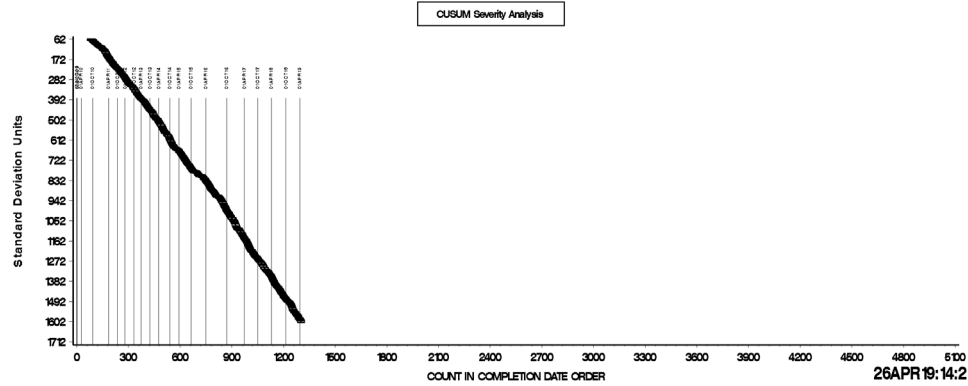
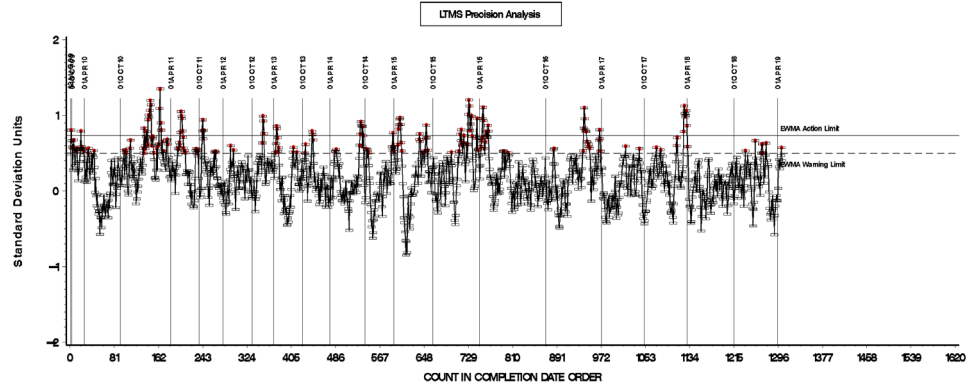
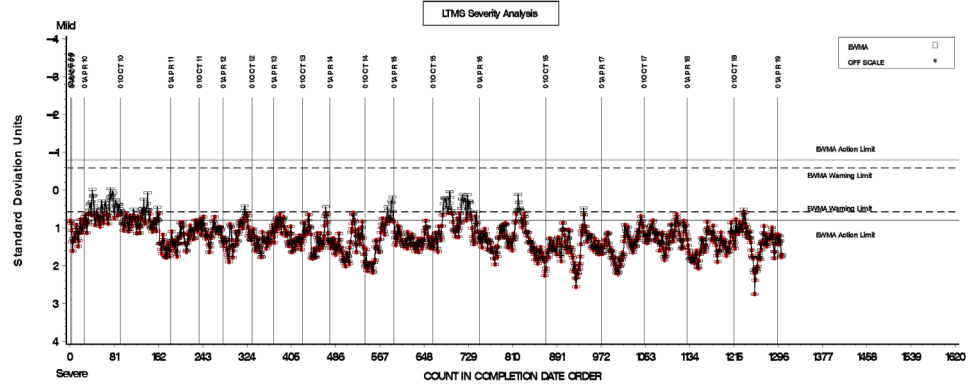
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LDEOC (D 7216)

LDEOC — SILICONE INDUSTRY OPERATIONALLY VALID DATA



REF SILICON TENSILE STRENGTH CHANGE AVERAGE



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LDEOC (D 7216)

INFORMATION LETTERS

EOEC Information Letter 19-1, Sequence No. 10, dated March 26, 2019.

- Light Duty Polyacrylate Elastomer Correction Factor for Volume Change

LDEOC (D 7216)

STATUS OF REFERENCE OIL SUPPLY

Oil	Samples @ Labs	@ TMC	
		Samples (750 mL)	Gallons
1006-1	42	0	0
1006-2	226	3,315	657
Total	268	3,315	657

The TMC inventory of oil 1006-1 is depleted.

Reference Oil 1006-2 has been approved for LDEOC testing, using the existing test targets for reference oil 1006-1.