A Program of ASTM International

Test Monitoring Center

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

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

MEMORANDUM: 12-043

DATE: November 28, 2012

TO: Mike Birke,
Chairman, Engine Oil Elastomer Compatibility Surveillance Panel

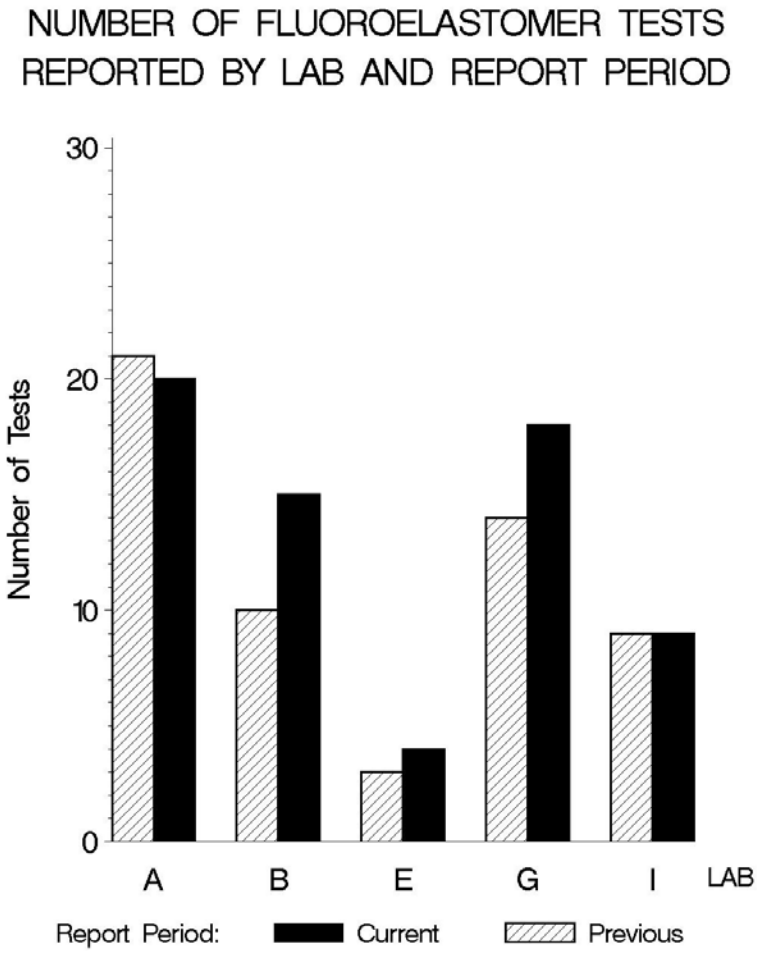
FROM: Michael T. Kasimirsky

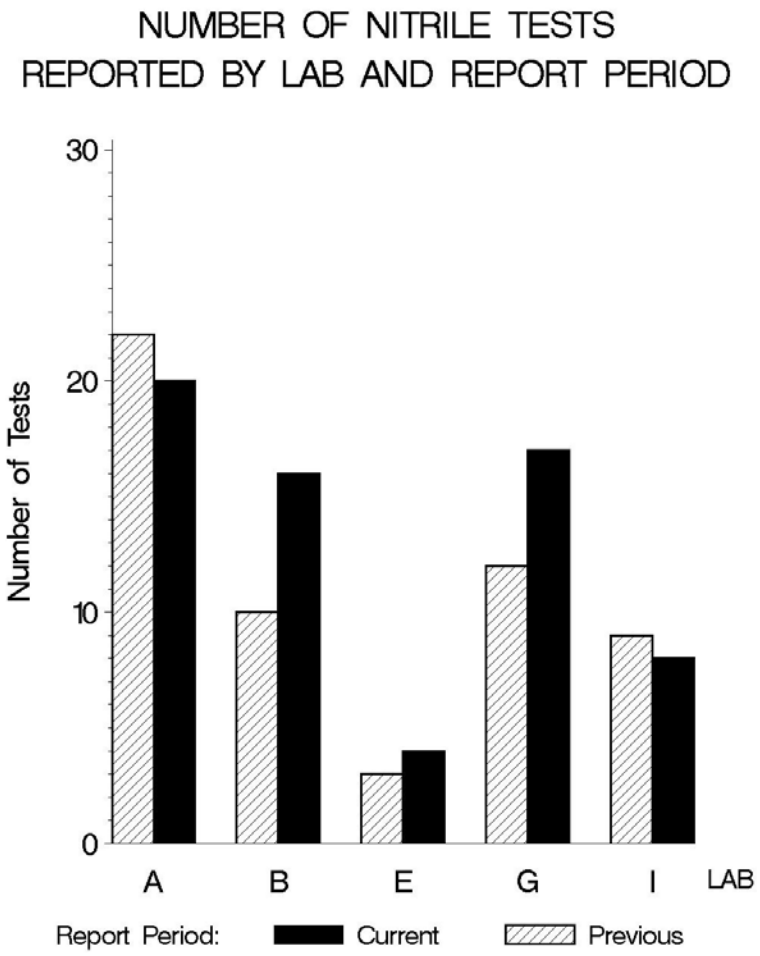
SUBJECT: LDEOC Testing from April 1, 2012 through September 30, 2012

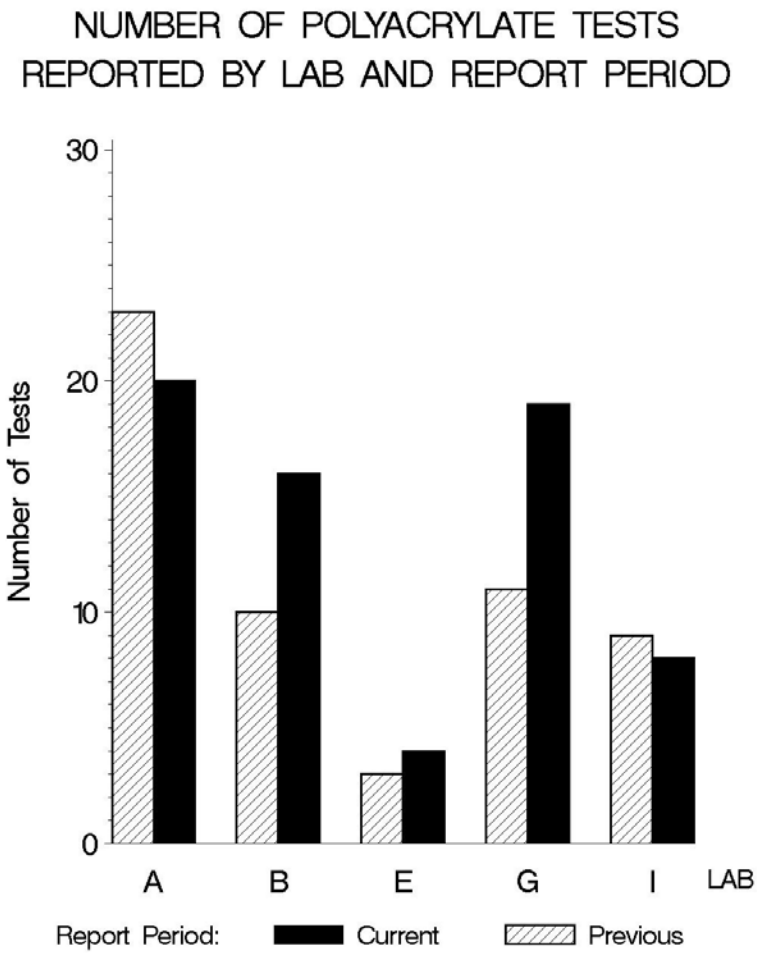
A total of 326 LDEOC tests were reported to the Test Monitoring Center during the period from April 1, 2012 through September 30, 2012. Following is a summary of testing activity this period.

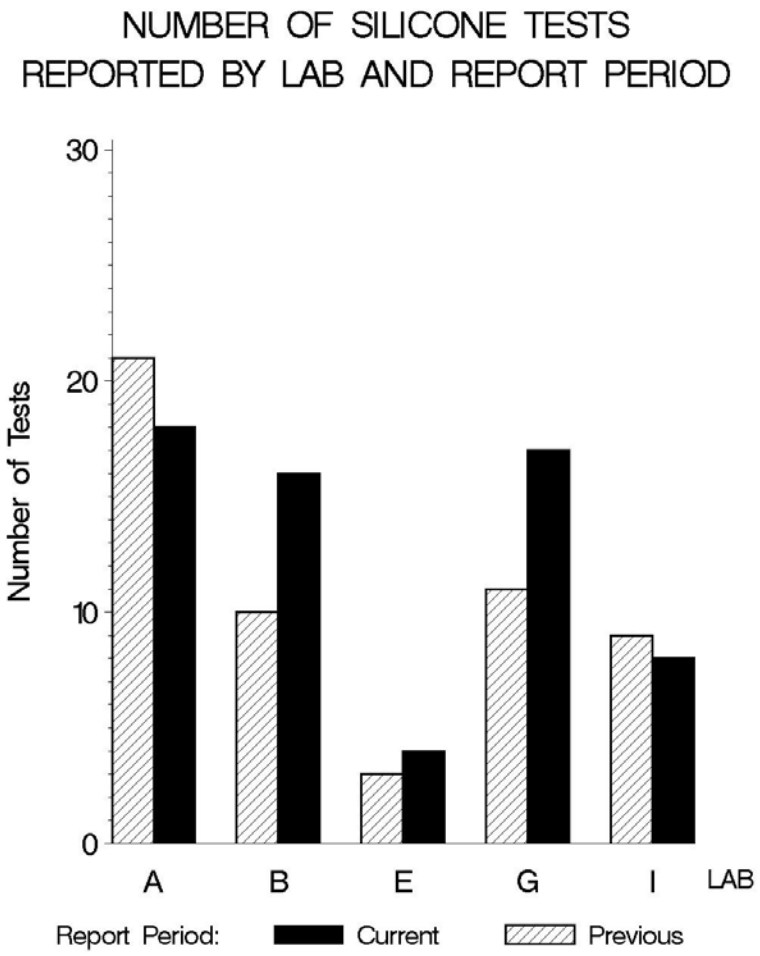
	Reporting Data
Number of Labs	5

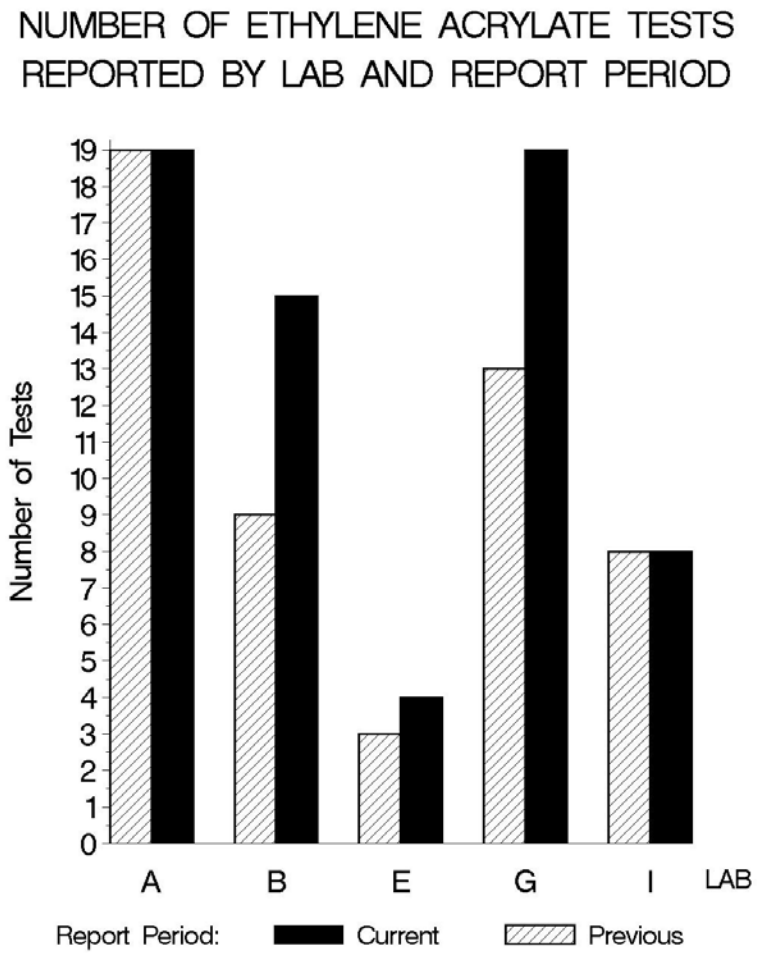
Tests reported this period were distributed as shown below:




NUMBER OF NITRILE TESTS
REPORTED BY LAB AND REPORT PERIOD
Number of Tests
30
20
10
0
A
B
E
G
I
LAB
Report Period:
Current
Previous

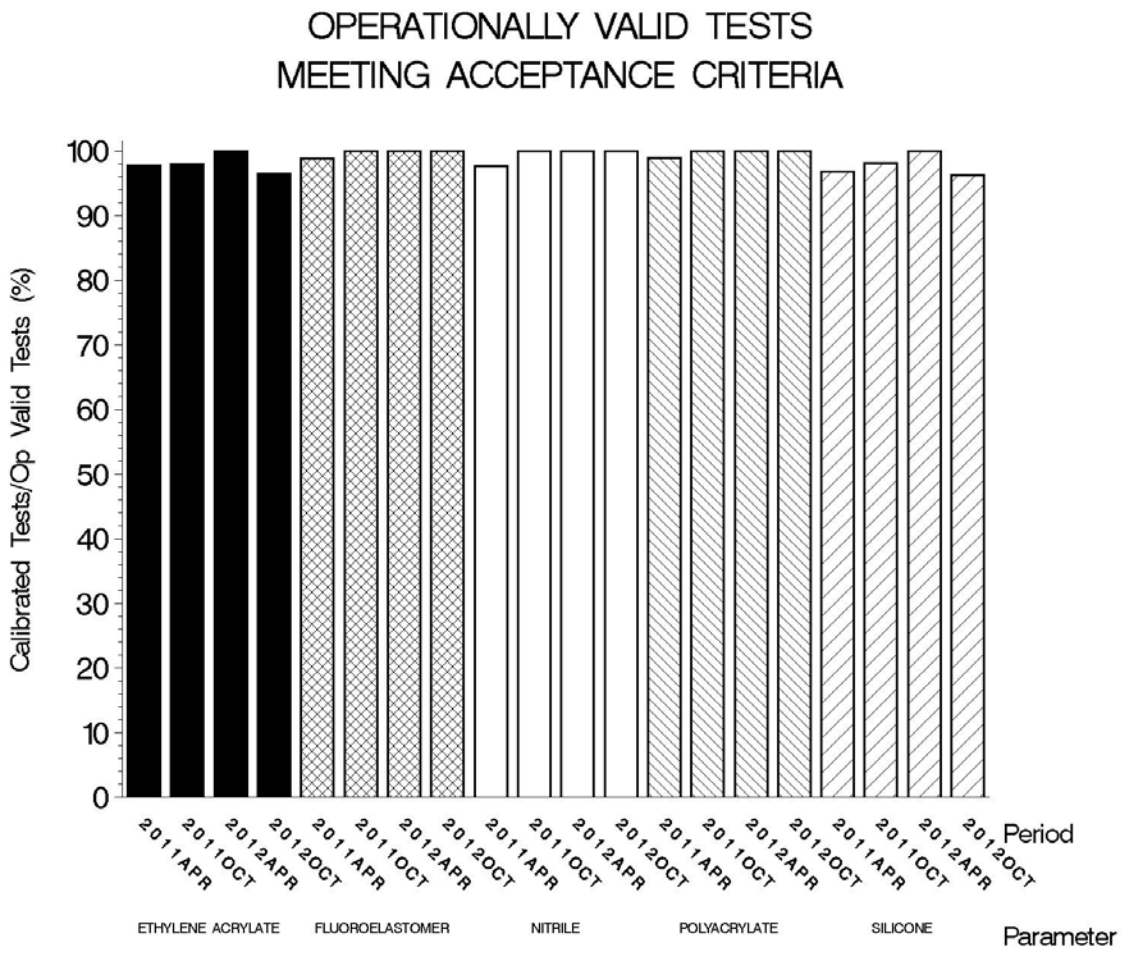

NUMBER OF POLYACRYLATE TESTS
REPORTED BY LAB AND REPORT PERIOD
Number of Tests
30
20
10
0
A
B
E
G
I
LAB
Report Period:
Current
Previous


NUMBER OF SILICONE TESTS
REPORTED BY LAB AND REPORT PERIOD
Number of Tests
30
20
10
0
A
B
E
G
I
LAB
Report Period:
Current
Previous


NUMBER OF ETHYLENE ACRYLATE TESTS
REPORTED BY LAB AND REPORT PERIOD
Number of Tests
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
A
B
E
G
I
LAB
Report Period:
Current
Previous

Test Distribution by Oil and Validity

		Ethylene Acrylate	Fluoroelastomer	Nitrile	Polyacrylate	Silicone	Totals	
							This Period	Last Period
Accepted for Calibration	AC	54	56	55	56	50	271	214
Rejected	OC	2	0	0	0	2	4	0
Acceptable Donated Test	NI	7	9	10	11	9	46	59
Unacceptable Donated Test	MI	2	0	0	0	2	4	0
Operationally Invalid (lab)	LC	0	0	0	0	0	0	1
Operationally Invalid (lab/TMC)	RC	0	0	0	0	0	0	0
Aborted Calibration	XC	0	1	0	0	0	1	1
Total		65	66	65	67	63	326	275



The above chart shows the percentage of accepted operationally valid tests. This period four tests failed to meet the acceptance criteria.

Lost Tests per Start by Lab and Elastomer Type

	Ethylene Acrylate			**Fluoroelastomer**			**Nitrile**			**Polyacrylate**			**Silicone**			Total		
Lab	Lost	Starts	%	Lost	Starts	%	Lost	Starts	%	Lost	Starts	%	Lost	Starts	%	Lost	Starts	%
A	0	19	0	0	20	0	0	20	0	0	20	0	0	18	0	0	97	0
B	0	15	0	0	15	0	0	16	0	0	16	0	0	16	0	0	78	0
E	0	4	0	0	4	0	0	4	0	0	4	0	0	4	0	0	20	0
G	0	19	0	0	18	0	0	17	0	0	19	0	0	17	0	0	90	0
I	0	8	0	1	9	11	0	8	0	0	8	0	0	8	0	1	41	2
Total	0	65	0	1	66	2	0	65	0	0	67	0	0	63	0	1	326	0.3

Lost tests are those that were aborted or operationally invalid.

Causes for Lost Tests

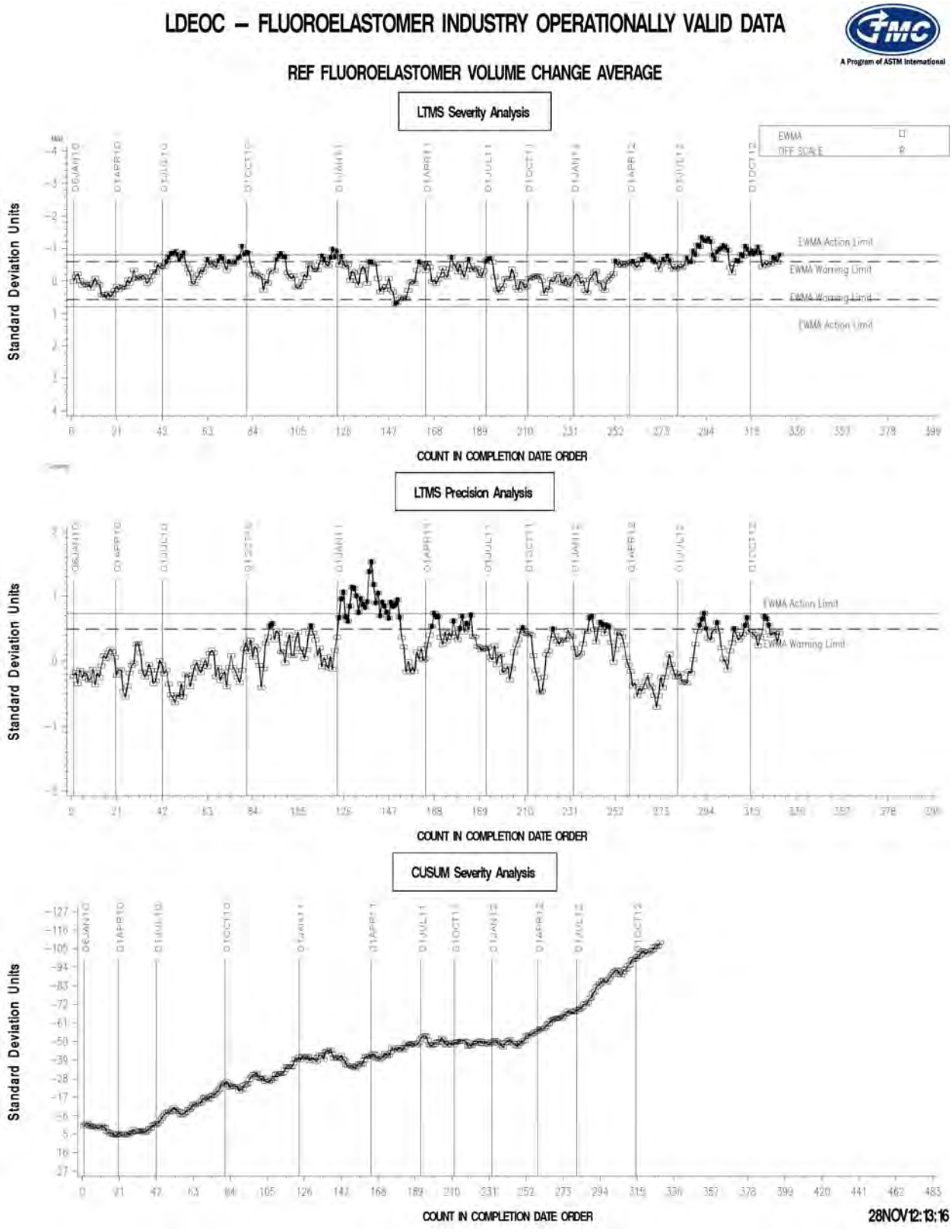
Lab	Cause		Elastomer					Validity			Loss Rate		
			Fluoroelastomer	Nitrile	Polyacrylate	Silicone	Ethylene Acrylayte	LC	RC	XC	Lost	Starts	%
I	Bath Failure		●							●	1	326	0.3
		Lost	1	0	0	0	0	0	0	1			
		Starts	65	66	65	67	63	326	326	326			
		%	2	0	0	0	0	0	0	0.3			

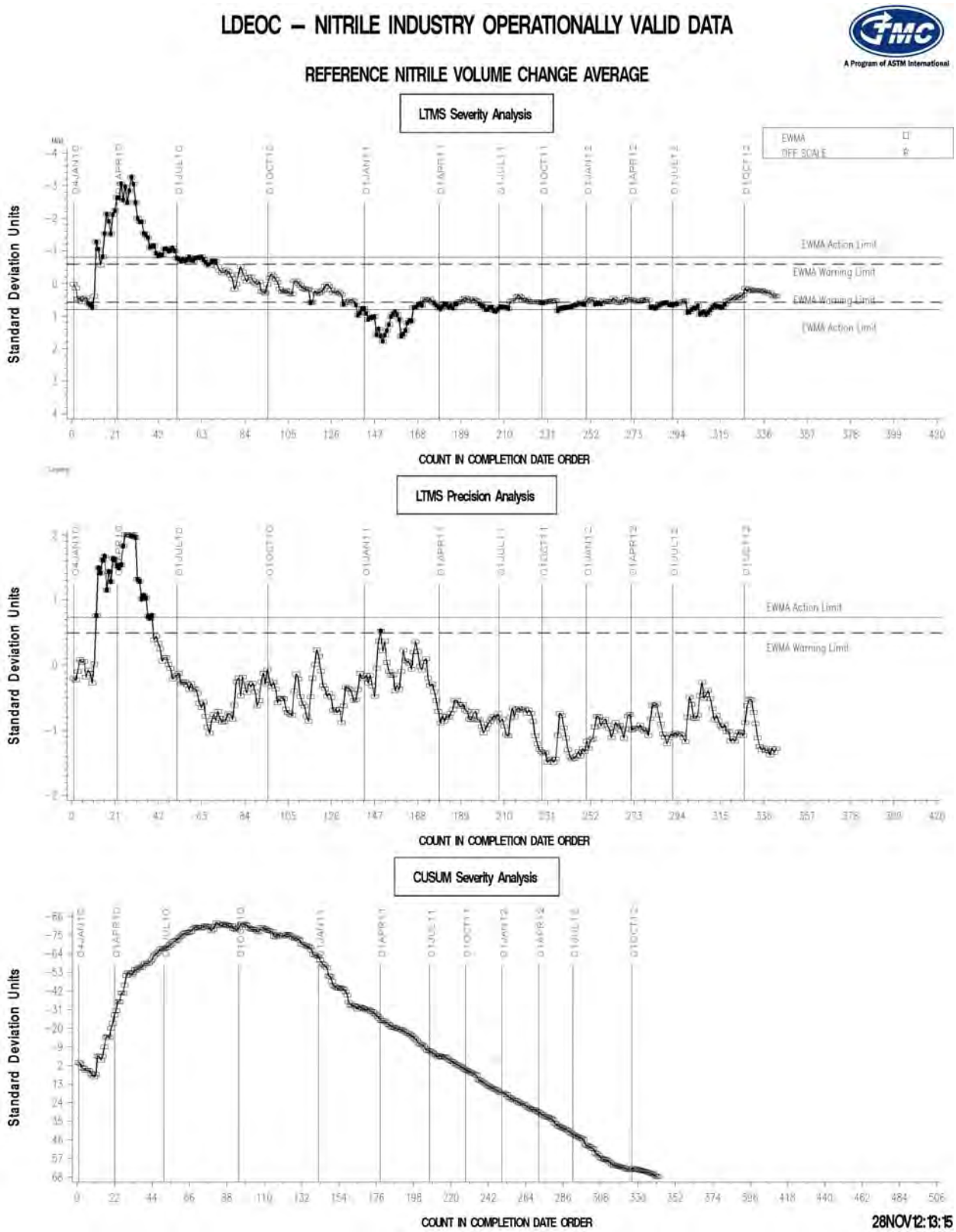
Average Δ/s by Lab					
Elastomer	Lab	n	VOLCYI	HARDYI	TENSYI
Ethylene Acrylate	A	17	0.186	-2.242	0.298
	B	12	1.306	-2.549	-0.467
	E	2	-0.909	-3.923	0.202
	G	18	1.719	-0.687	-0.490
	I	7	0.573	-2.353	-0.218
	Industry	56	0.928	-1.882	-0.187
Fluoroelastomer	A	18	-0.367	0.800	-0.615
	B	13	-1.713	-0.085	0.594
	E	2	-1.067	-0.960	0.373
	G	16	-0.737	-0.465	0.639
	I	7	-0.010	0.666	0.861
	Industry	56	-0.765	0.153	0.244
Nitrile	A	18	0.473	-0.658	-0.384
	B	11	0.356	0.068	0.121
	E	2	0.483	-1.552	-0.007
	G	17	0.626	0.510	-0.182
	I	7	1.452	-0.649	0.251
	Industry	55	0.622	-0.183	-0.126
Polyacrylate	A	18	-0.901	-1.019	-0.783
	B	11	-1.037	-0.589	-0.663
	E	2	-0.462	-1.416	-1.062
	G	18	-1.194	0.713	-1.132
	I	7	0.535	-0.395	-0.928
	Industry	56	-0.827	-0.314	-0.900
Silicone	A	15	-1.816	-0.085	1.842
	B	11	0.270	-0.127	1.390
	E	2	0.092	-0.706	-0.297
	G	17	0.924	1.341	0.967
	I	7	-0.239	-0.216	0.246
	Industry	52	-0.193	0.331	1.163

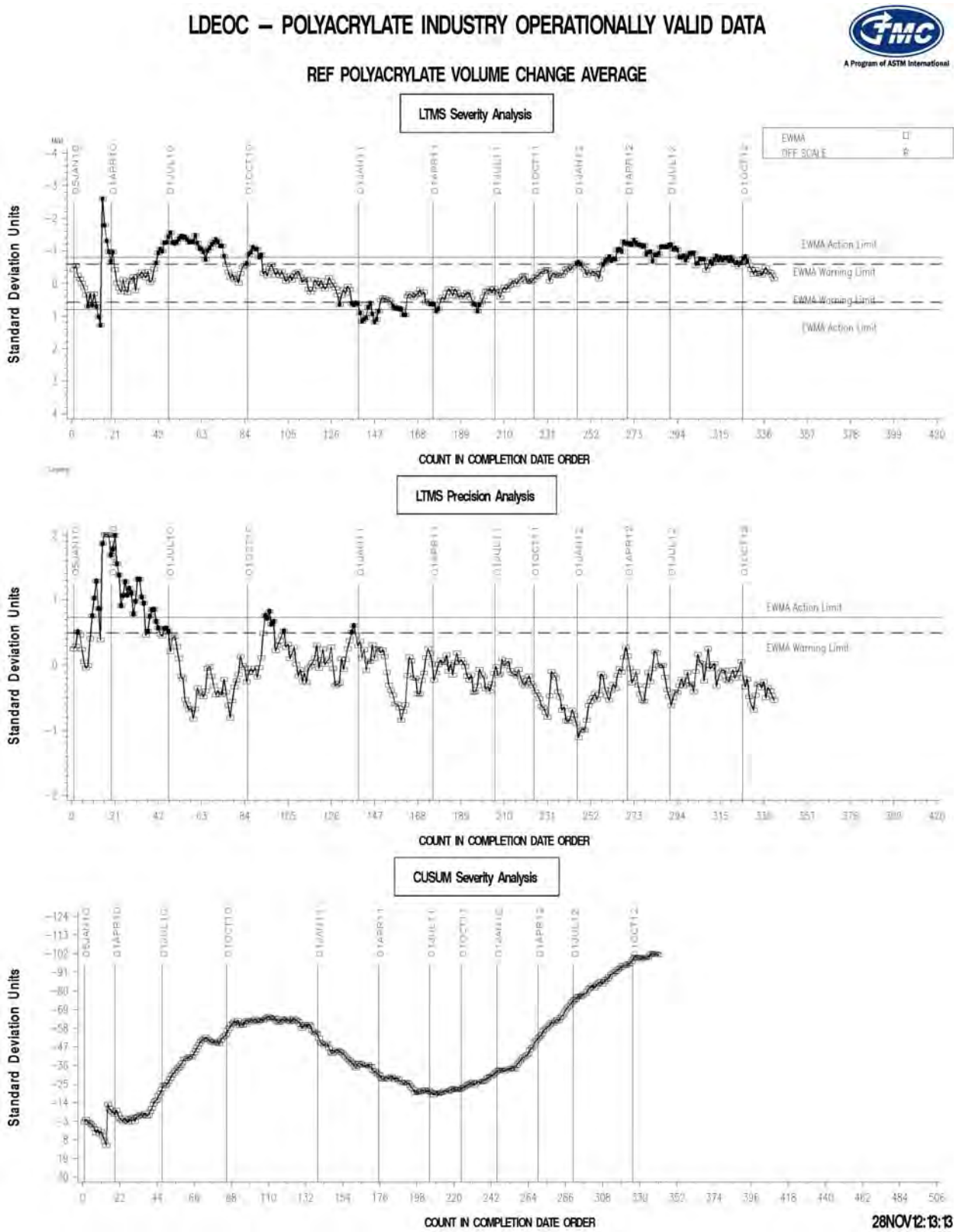
Individual test results can be viewed at the links shown in the following table:

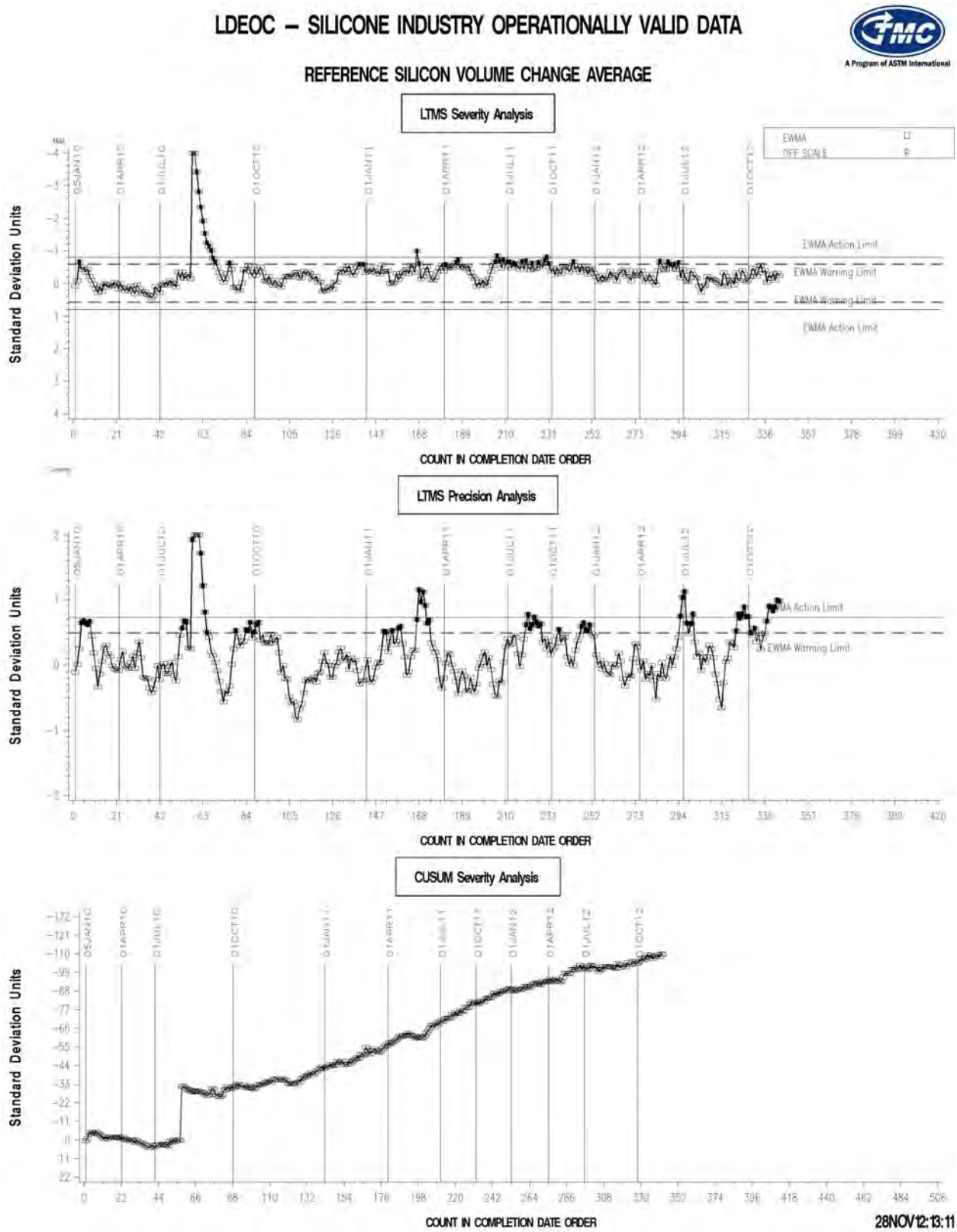
Links to Individual Test Result Data	
Elastomer Type	**Web Link to Data**
Fluoroelastomer	ftp://ftp.astmtmc.cmu.edu/refdata/bench/ldeocf/data/
Nitrile	ftp://ftp.astmtmc.cmu.edu/refdata/bench/ldeocn/data/
Polyacrylate	ftp://ftp.astmtmc.cmu.edu/refdata/bench/ldeoep/data/
Silicone	ftp://ftp.astmtmc.cmu.edu/refdata/bench/ldeocs/data/
Ethylene Acrylate	ftp://ftp.astmtmc.cmu.edu/refdata/bench/ldeoea/data/

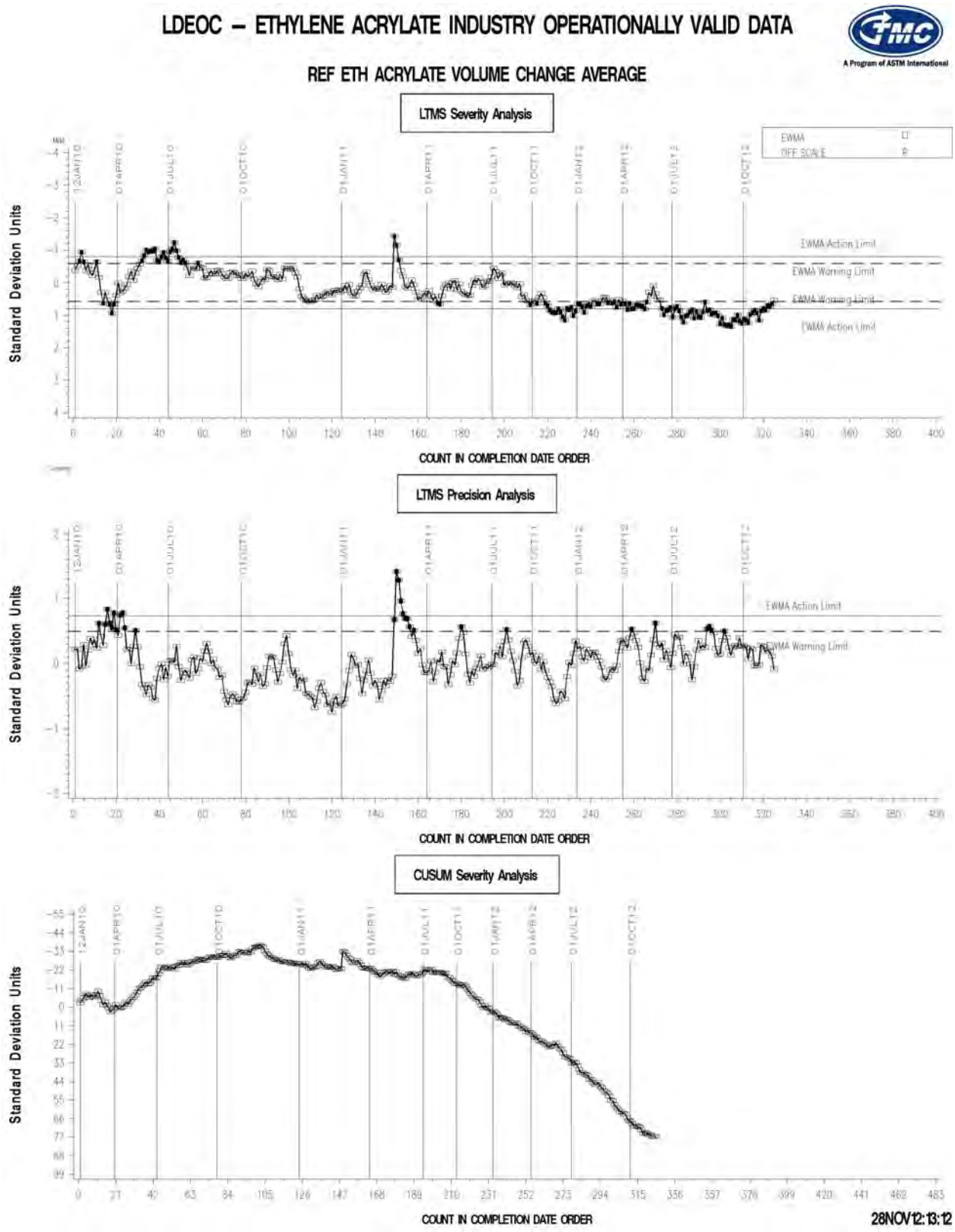
LTMS CONTROL CHARTS

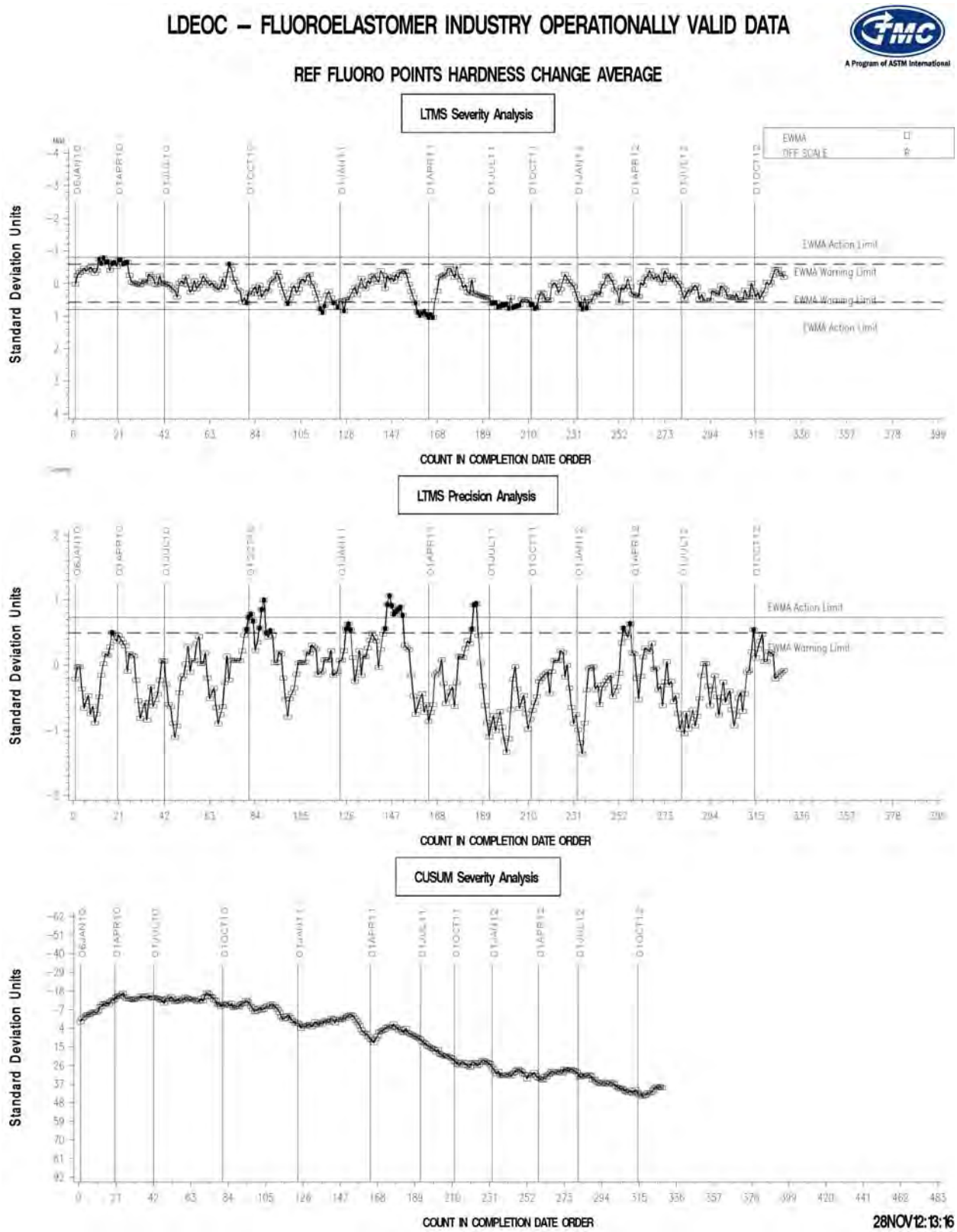


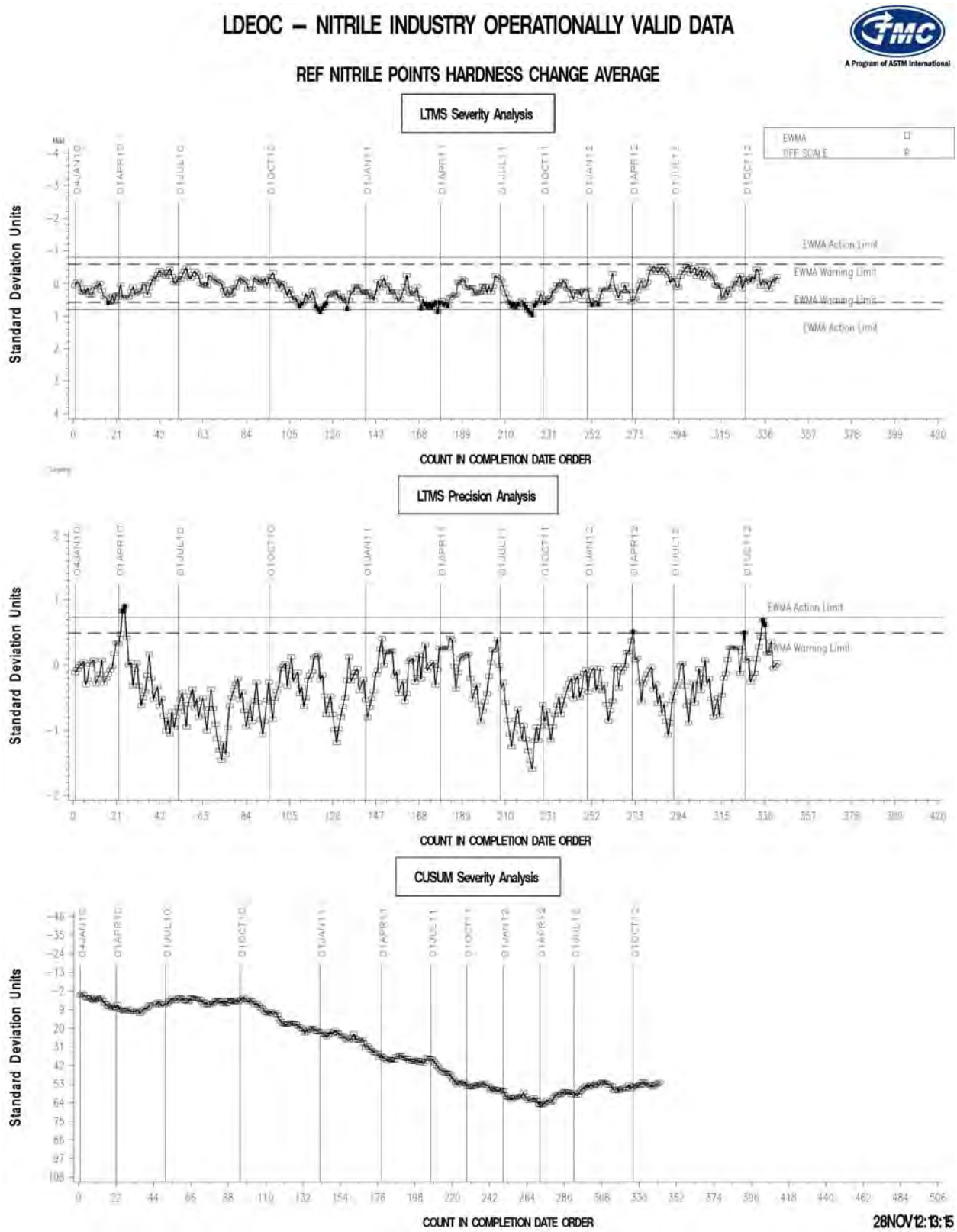

LDEOC – NITRILE INDUSTRY OPERATIONALLY VALID DATA
A Program of ASTM International
REFERENCE NITRILE VOLUME CHANGE AVERAGE
LTMS Severity Analysis
EWMA
OFF SCALE
EWMA Action Limit
EWMA Warning Limit
EWMA Warning Limit
EWMA Action Limit
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
LTMS Precision Analysis
EWMA Action Limit
EWMA Warning Limit
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
CUSUM Severity Analysis
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
28NOV12:13:15

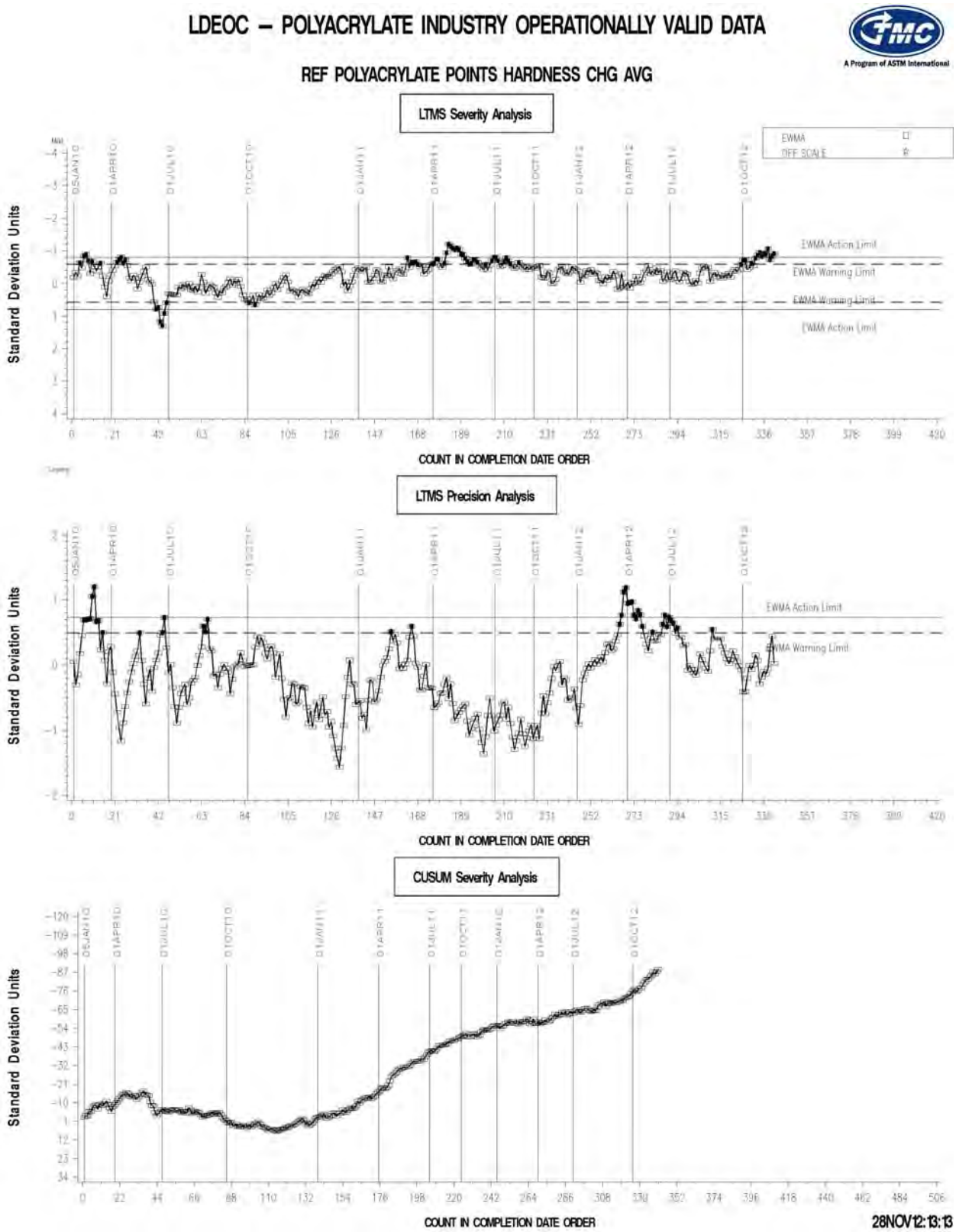

LDEOC – POLYACRYLATE INDUSTRY OPERATIONALLY VALID DATA
A Program of ASTM International
REF POLYACRYLATE VOLUME CHANGE AVERAGE
LTMS Severity Analysis
EWMA
OFF SCALE
EWMA Action Limit
EWMA Warning Limit
EWMA Warning Limit
EWMA Action Limit
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
LTMS Precision Analysis
EWMA Action Limit
EWMA Warning Limit
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
CUSUM Severity Analysis
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
28NOV12:13:13

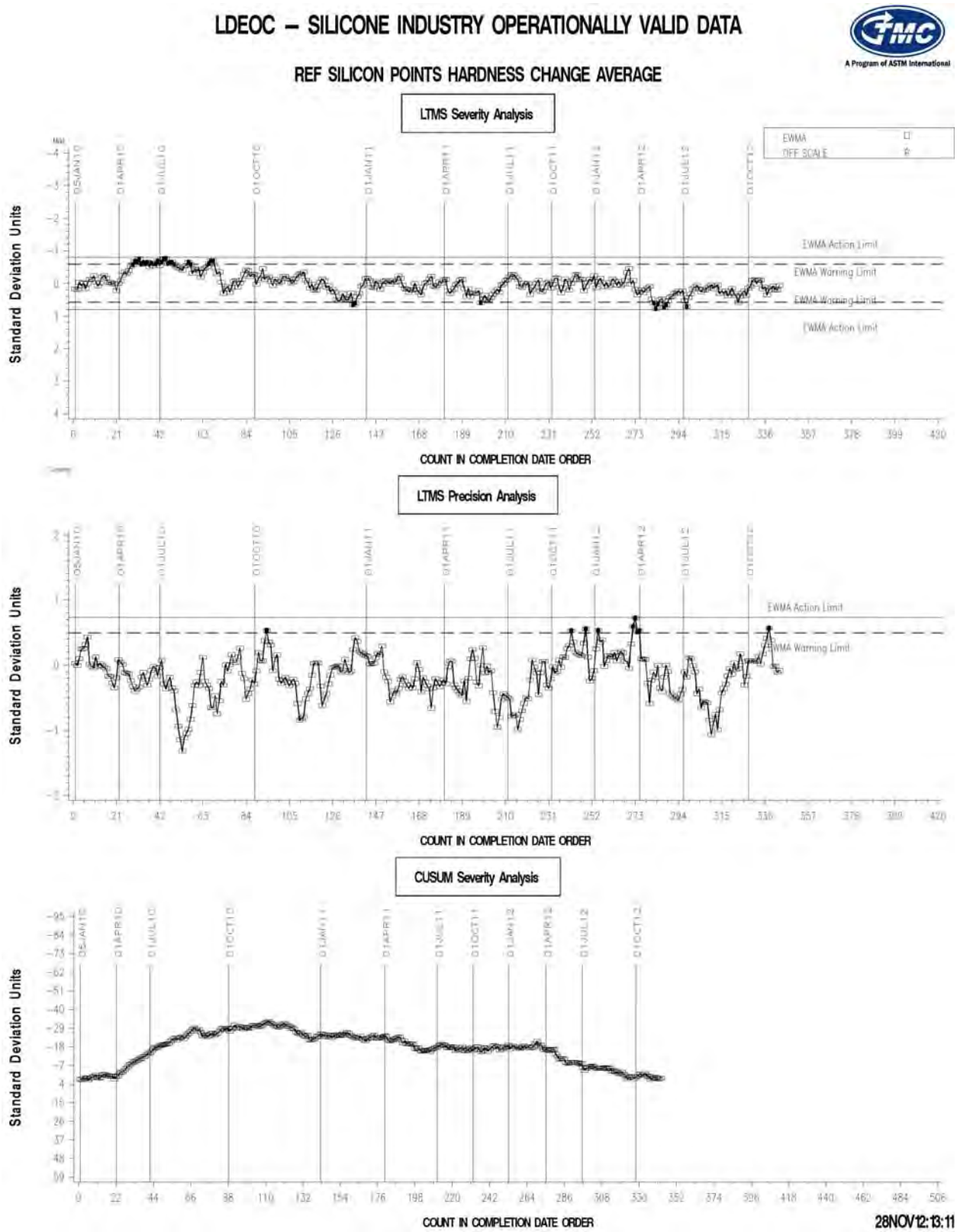

LDEOC – SILICONE INDUSTRY OPERATIONALLY VALID DATA
A Program of ASTM International
REFERENCE SILICON VOLUME CHANGE AVERAGE
LTMS Severity Analysis
EWMA
OFF SCALE
EWMA Action Limit
EWMA Warning Limit
EWMA Warning Limit
EWMA Action Limit
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
LTMS Precision Analysis
EWMA Action Limit
EWMA Warning Limit
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
CUSUM Severity Analysis
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
28NOV12:13:11

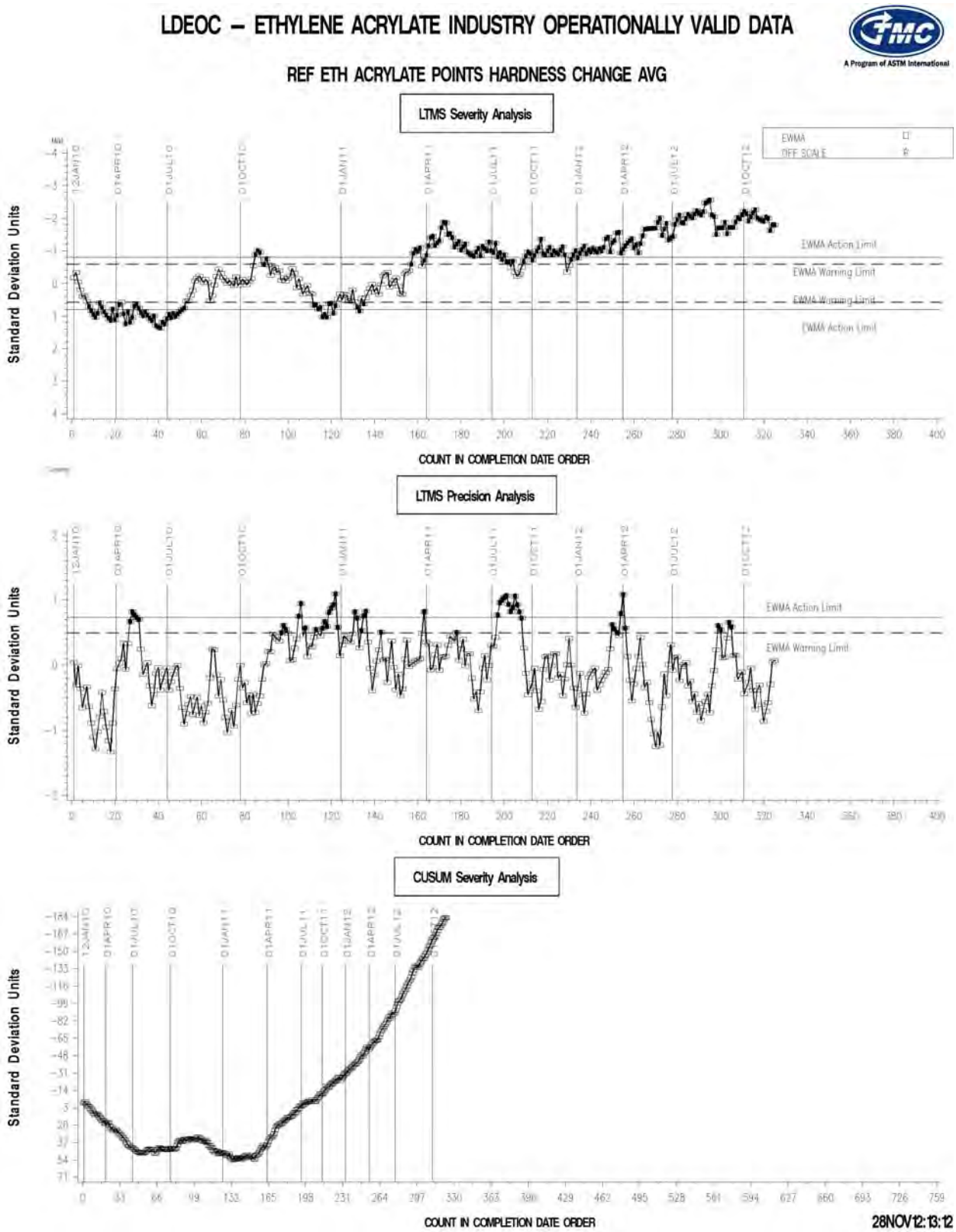

LDEOC – ETHYLENE ACRYLATE INDUSTRY OPERATIONALLY VALID DATA
A Program of ASTM International
REF ETH ACRYLATE VOLUME CHANGE AVERAGE
LTMS Severity Analysis
EWMA
OFF SCALE
EWMA Action Limit
EWMA Warning Limit
EWMA Warning Limit
EWMA Action Limit
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
LTMS Precision Analysis
EWMA Action Limit
EWMA Warning Limit
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
CUSUM Severity Analysis
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
28NOV12:13:12

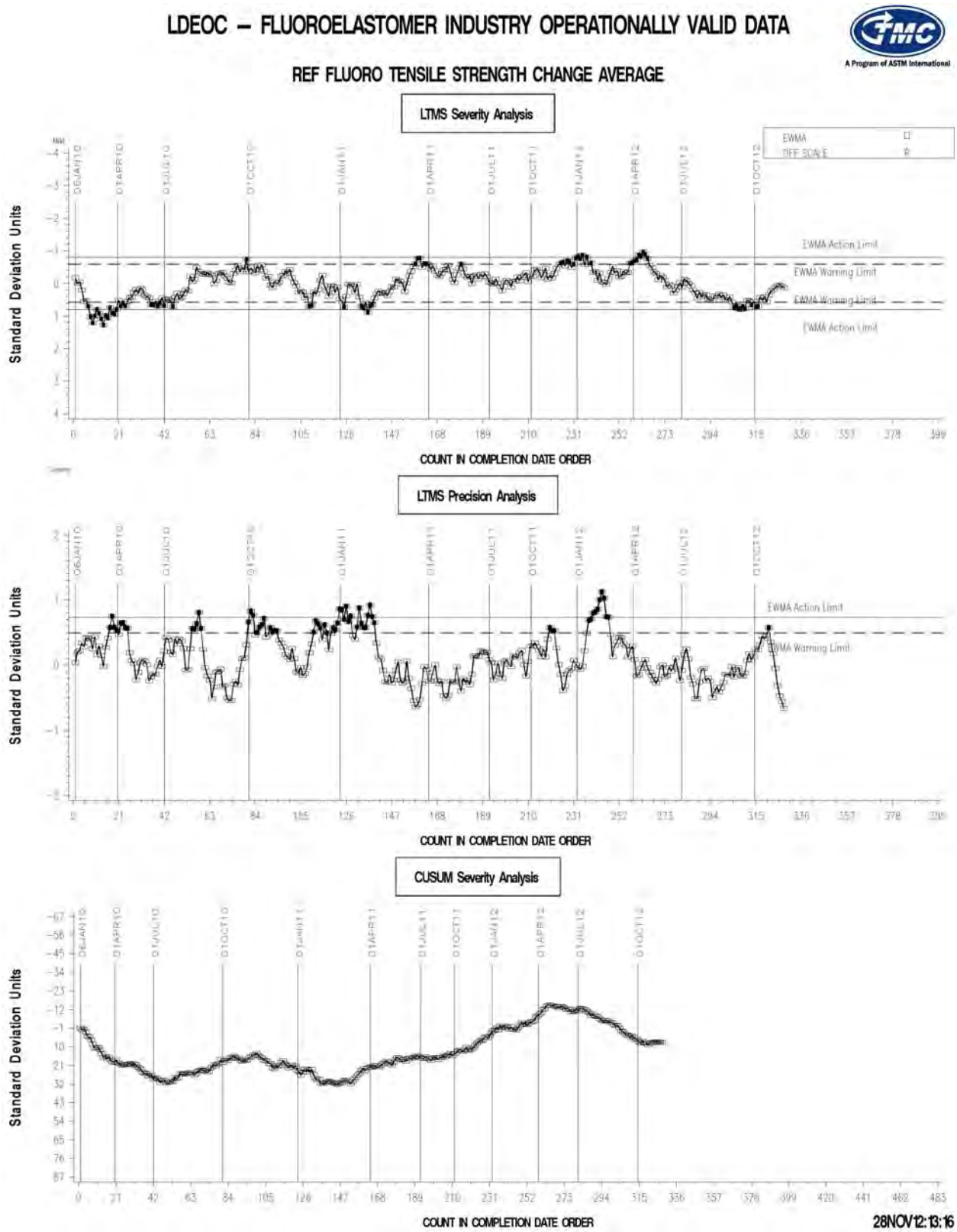

LDEOC – FLUOROELASTOMER INDUSTRY OPERATIONALLY VALID DATA
A Program of ASTM International
REF FLUORO POINTS HARDNESS CHANGE AVERAGE
LTMS Severity Analysis
EWMA
OFF SCALE
EWMA Action Limit
EWMA Warning Limit
EWMA Warning Limit
EWMA Action Limit
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
LTMS Precision Analysis
EWMA Action Limit
EWMA Warning Limit
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
CUSUM Severity Analysis
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
28NOV12:13:16

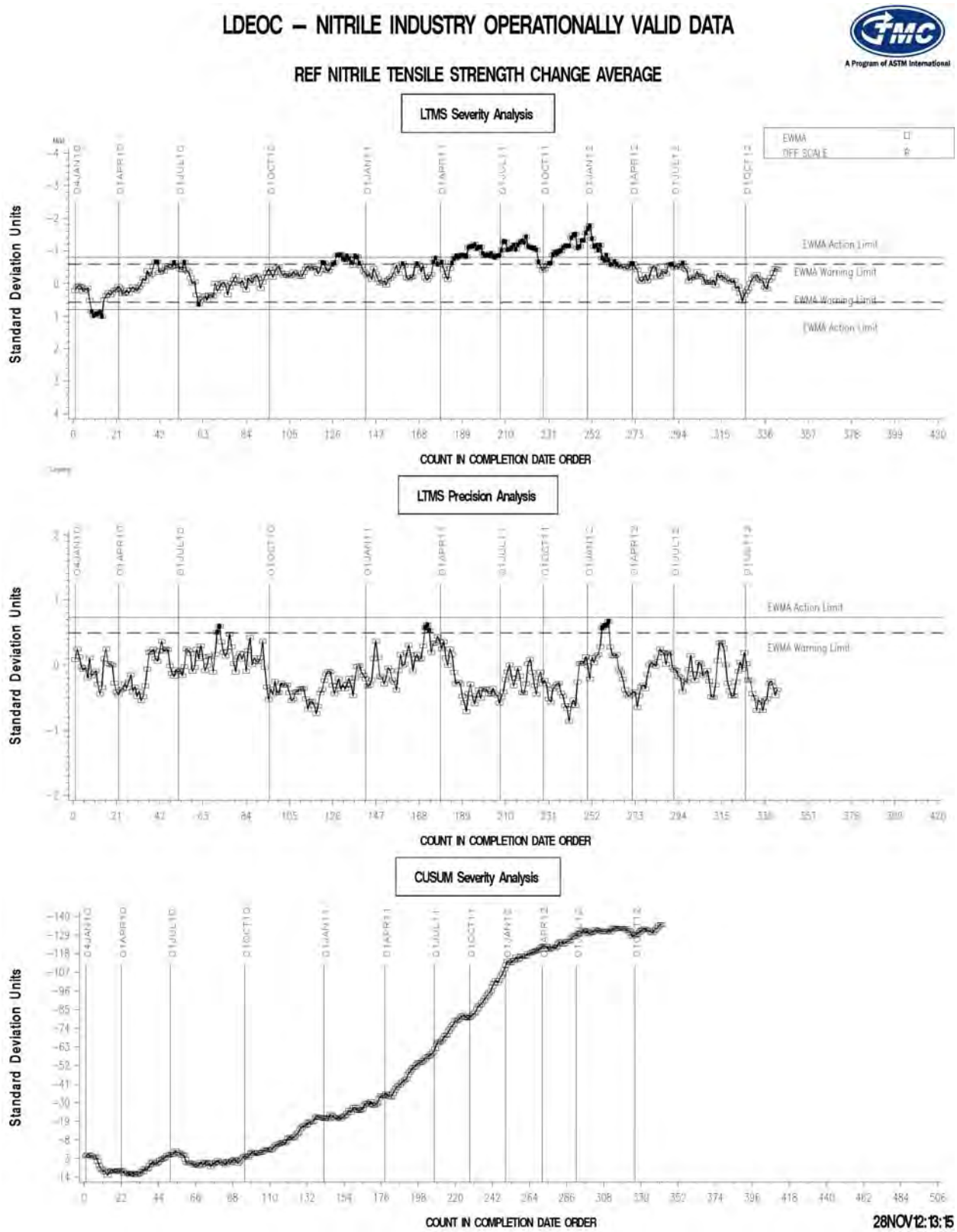

LDEOC – NITRILE INDUSTRY OPERATIONALLY VALID DATA
A Program of ASTM International
REF NITRILE POINTS HARDNESS CHANGE AVERAGE
LTMS Severity Analysis
EWMA
OFF SCALE
EWMA Action Limit
EWMA Warning Limit
EWMA Warning Limit
EWMA Action Limit
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
LTMS Precision Analysis
EWMA Action Limit
EWMA Warning Limit
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
CUSUM Severity Analysis
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
28NOV12:13:15

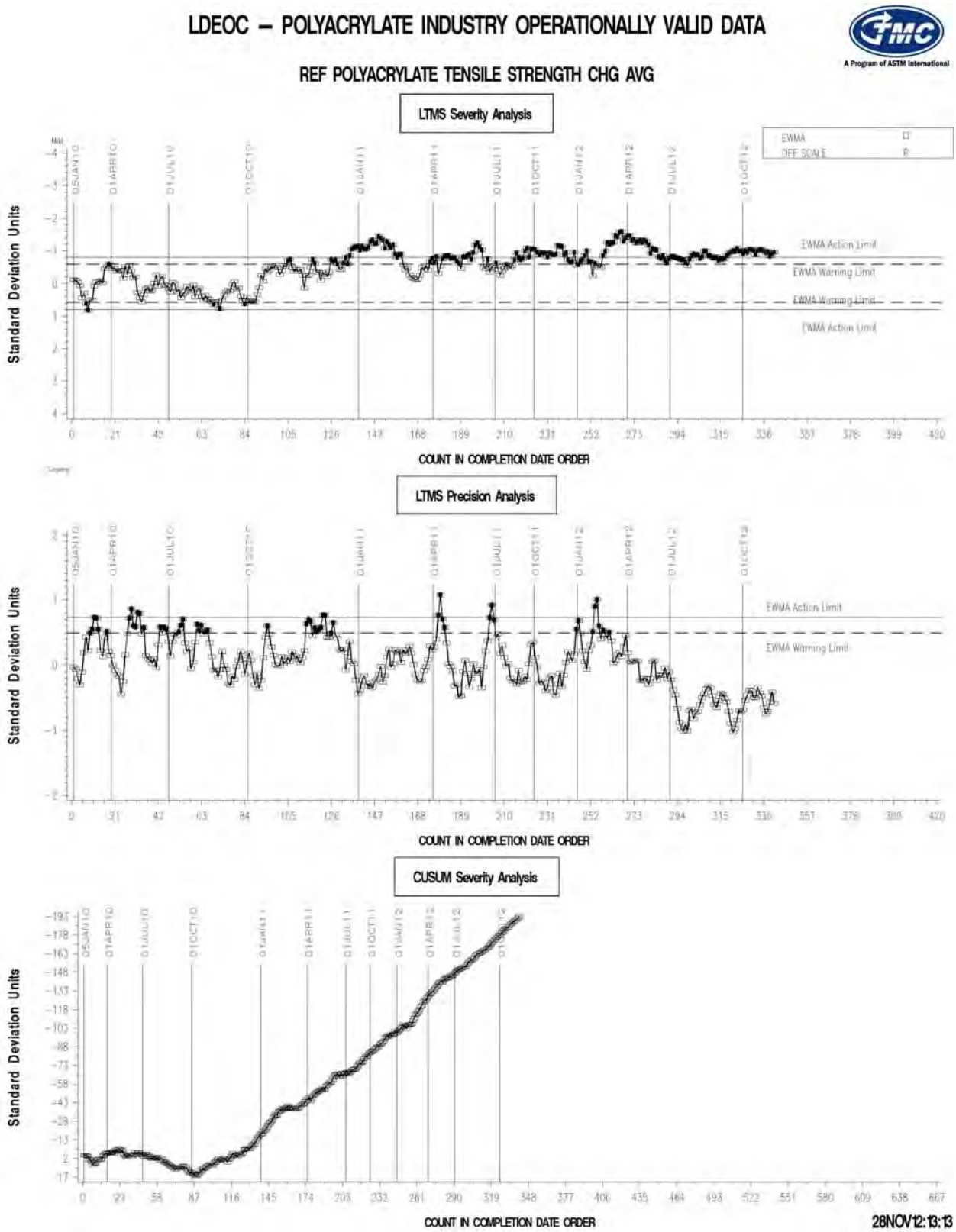

LDEOC – POLYACRYLATE INDUSTRY OPERATIONALLY VALID DATA
A Program of ASTM International
REF POLYACRYLATE POINTS HARDNESS CHG AVG
LTMS Severity Analysis
EWMA
OFF SCALE
EWMA Action Limit
EWMA Warning Limit
EWMA Warning Limit
EWMA Action Limit
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
LTMS Precision Analysis
EWMA Action Limit
EWMA Warning Limit
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
CUSUM Severity Analysis
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
28NOV12:13:13

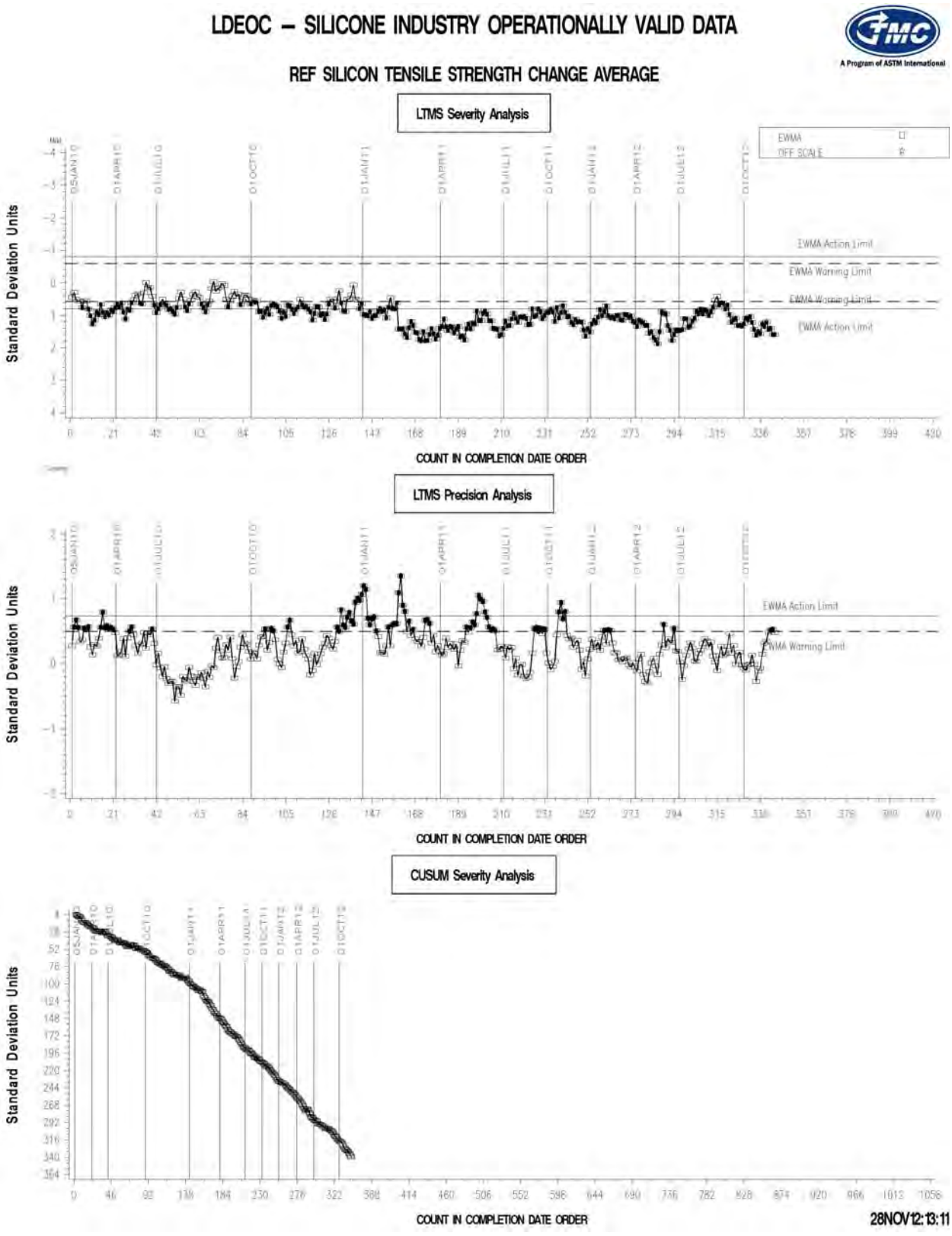

LDEOC – SILICONE INDUSTRY OPERATIONALLY VALID DATA
A Program of ASTM International
REF SILICON POINTS HARDNESS CHANGE AVERAGE
LTMS Severity Analysis
EWMA
OFF SCALE
EWMA Action Limit
EWMA Warning Limit
EWMA Warning Limit
EWMA Action Limit
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
LTMS Precision Analysis
EWMA Action Limit
EWMA Warning Limit
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
CUSUM Severity Analysis
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
28NOV12:13:11

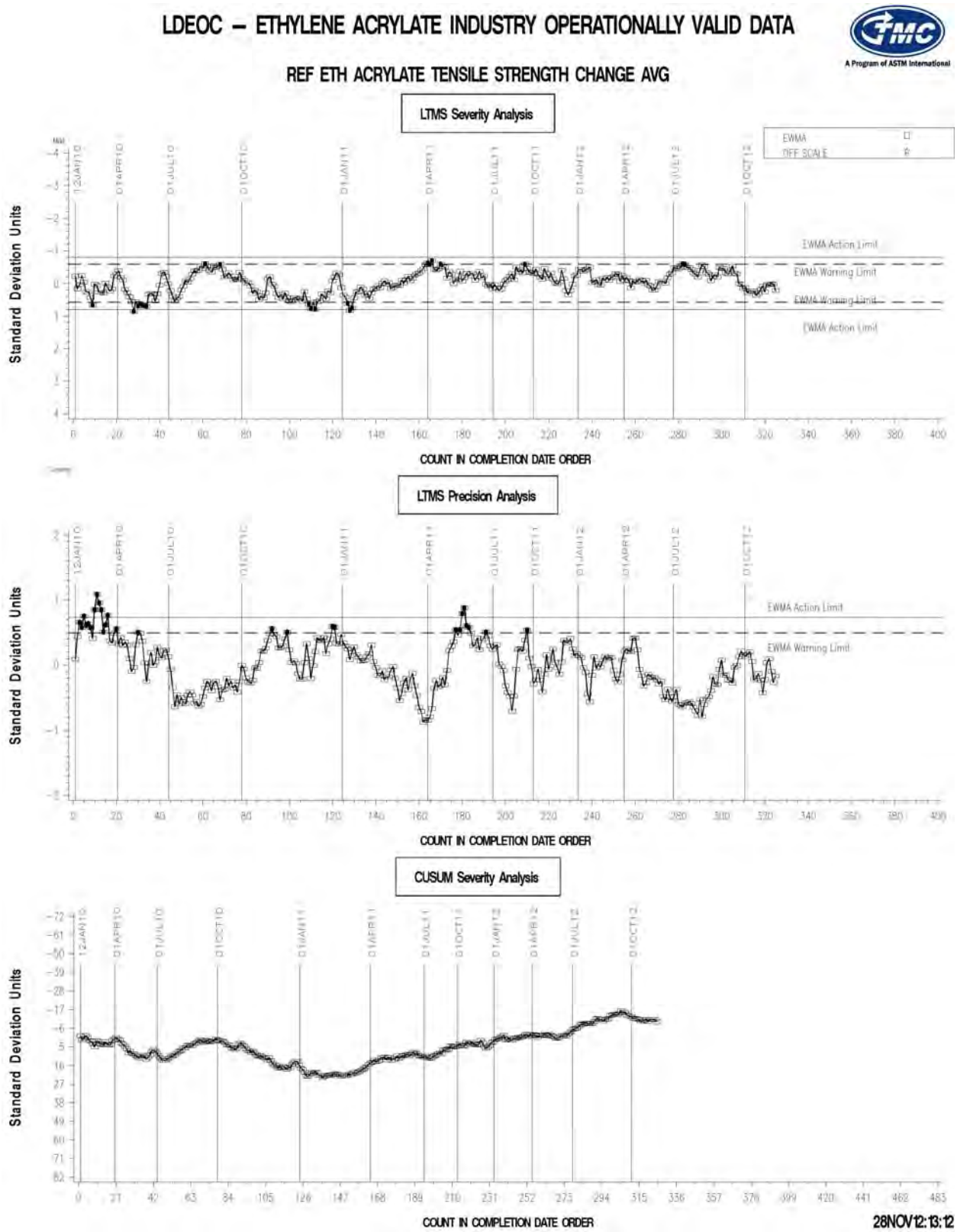

LDEOC – ETHYLENE ACRYLATE INDUSTRY OPERATIONALLY VALID DATA
A Program of ASTM International
REF ETH ACRYLATE POINTS HARDNESS CHANGE AVG
LTMS Severity Analysis
EWMA
OFF SCALE
EWMA Action Limit
EWMA Warning Limit
EWMA Warning Limit
EWMA Action Limit
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
LTMS Precision Analysis
EWMA Action Limit
EWMA Warning Limit
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
CUSUM Severity Analysis
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
28NOV12:13:12


LDEOC – FLUOROELASTOMER INDUSTRY OPERATIONALLY VALID DATA
A Program of ASTM International
REF FLUORO TENSILE STRENGTH CHANGE AVERAGE
LTMS Severity Analysis
EWMA
OFF SCALE
EWMA Action Limit
EWMA Warning Limit
EWMA Warning Limit
EWMA Action Limit
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
LTMS Precision Analysis
EWMA Action Limit
EWMA Warning Limit
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
CUSUM Severity Analysis
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
28NOV12:13:16


LDEOC – NITRILE INDUSTRY OPERATIONALLY VALID DATA
A Program of ASTM International
REF NITRILE TENSILE STRENGTH CHANGE AVERAGE
LTMS Severity Analysis
EWMA
OFF SCALE
EWMA Action Limit
EWMA Warning Limit
EWMA Warning Limit
EWMA Action Limit
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
LTMS Precision Analysis
EWMA Action Limit
EWMA Warning Limit
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
CUSUM Severity Analysis
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
28NOV12:13:15

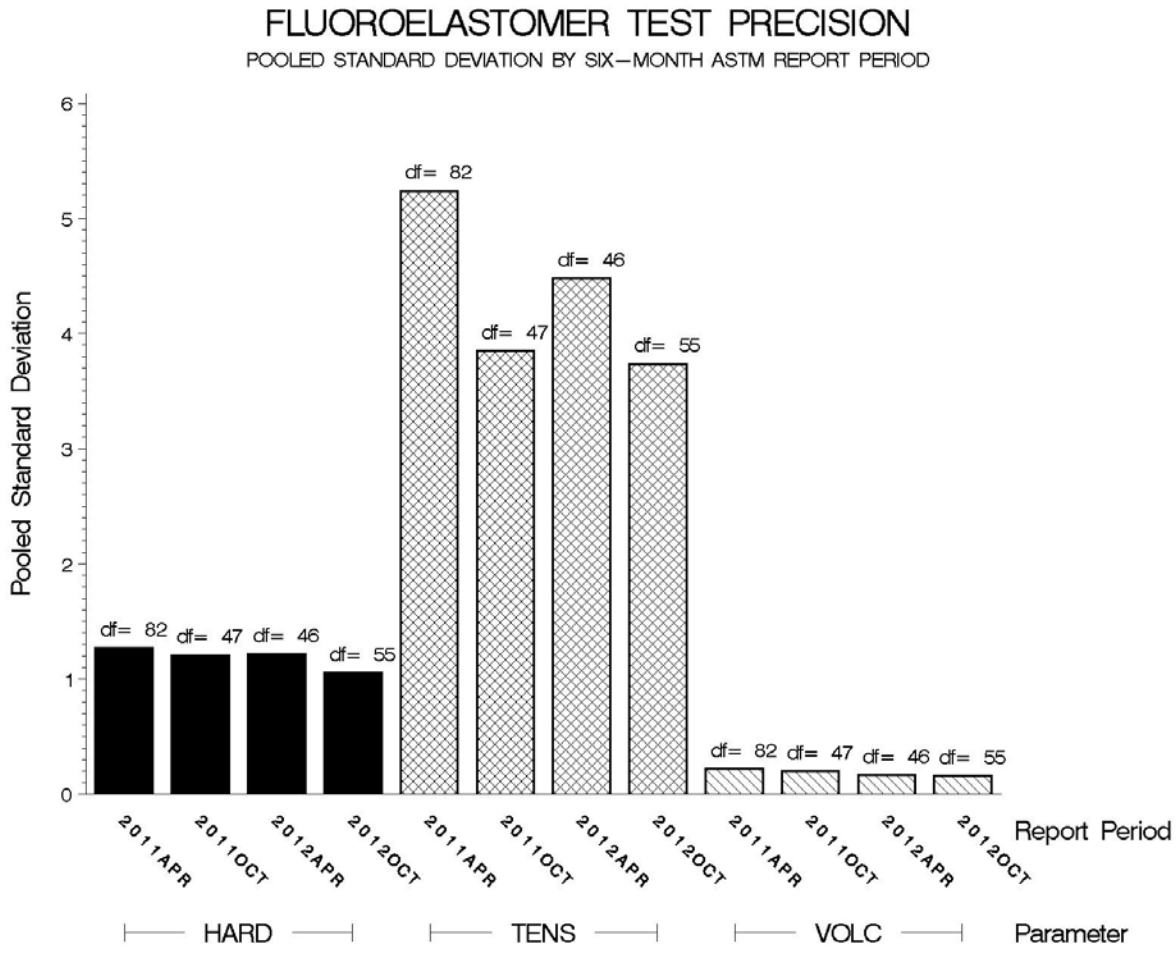

LDEOC – POLYACRYLATE INDUSTRY OPERATIONALLY VALID DATA
A Program of ASTM International
REF POLYACRYLATE TENSILE STRENGTH CHG AVG
LTMS Severity Analysis
EWMA
OFF SCALE
EWMA Action Limit
EWMA Warning Limit
EWMA Warning Limit
EWMA Action Limit
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
LTMS Precision Analysis
EWMA Action Limit
EWMA Warning Limit
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
CUSUM Severity Analysis
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
28NOV12:13:13

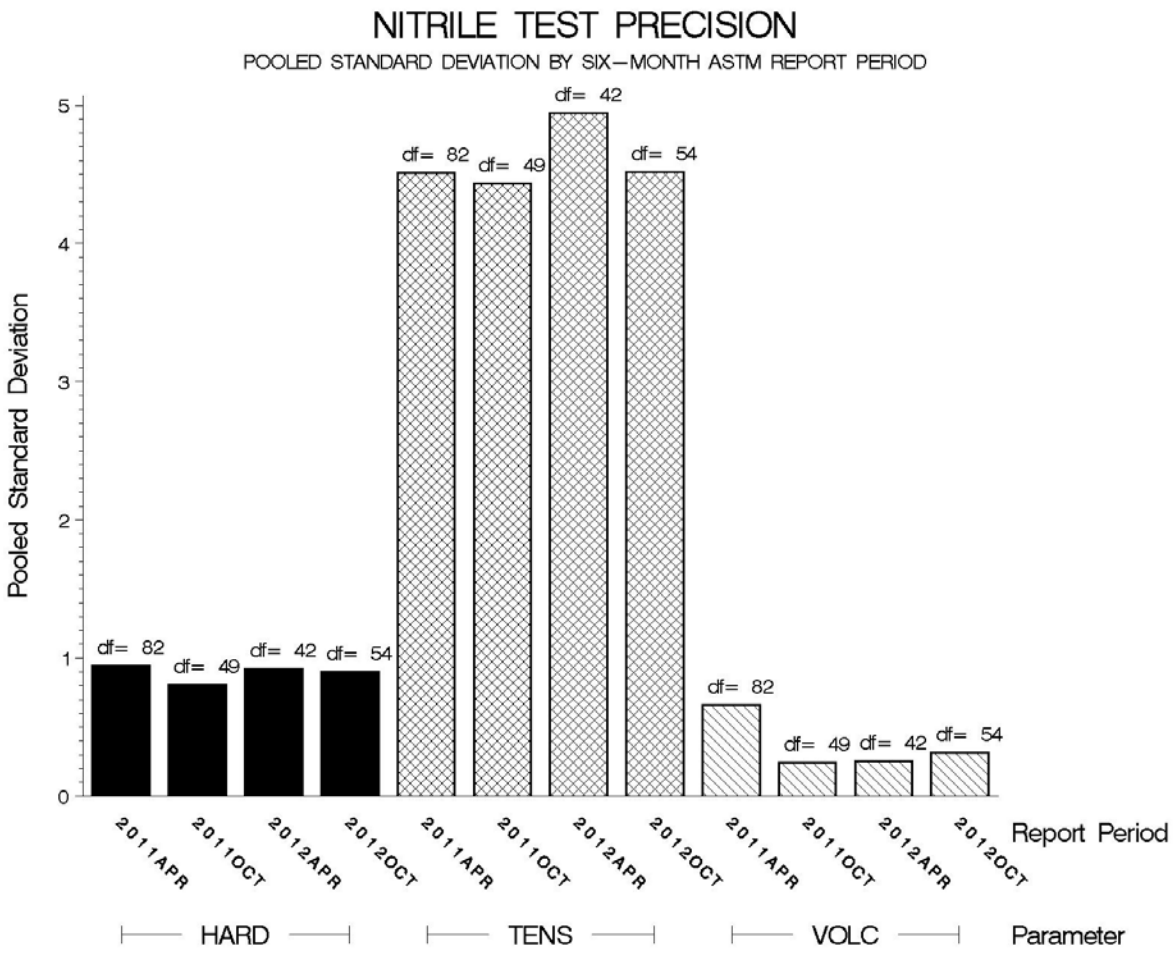

LDEOC – SILICONE INDUSTRY OPERATIONALLY VALID DATA
A Program of ASTM International
REF SILICON TENSILE STRENGTH CHANGE AVERAGE
LTMS Severity Analysis
EWMA
OFF SCALE
EWMA Action Limit
EWMA Warning Limit
EWMA Warning Limit
EWMA Action Limit
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
LTMS Precision Analysis
EWMA Action Limit
EWMA Warning Limit
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
CUSUM Severity Analysis
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
28NOV12:13:11

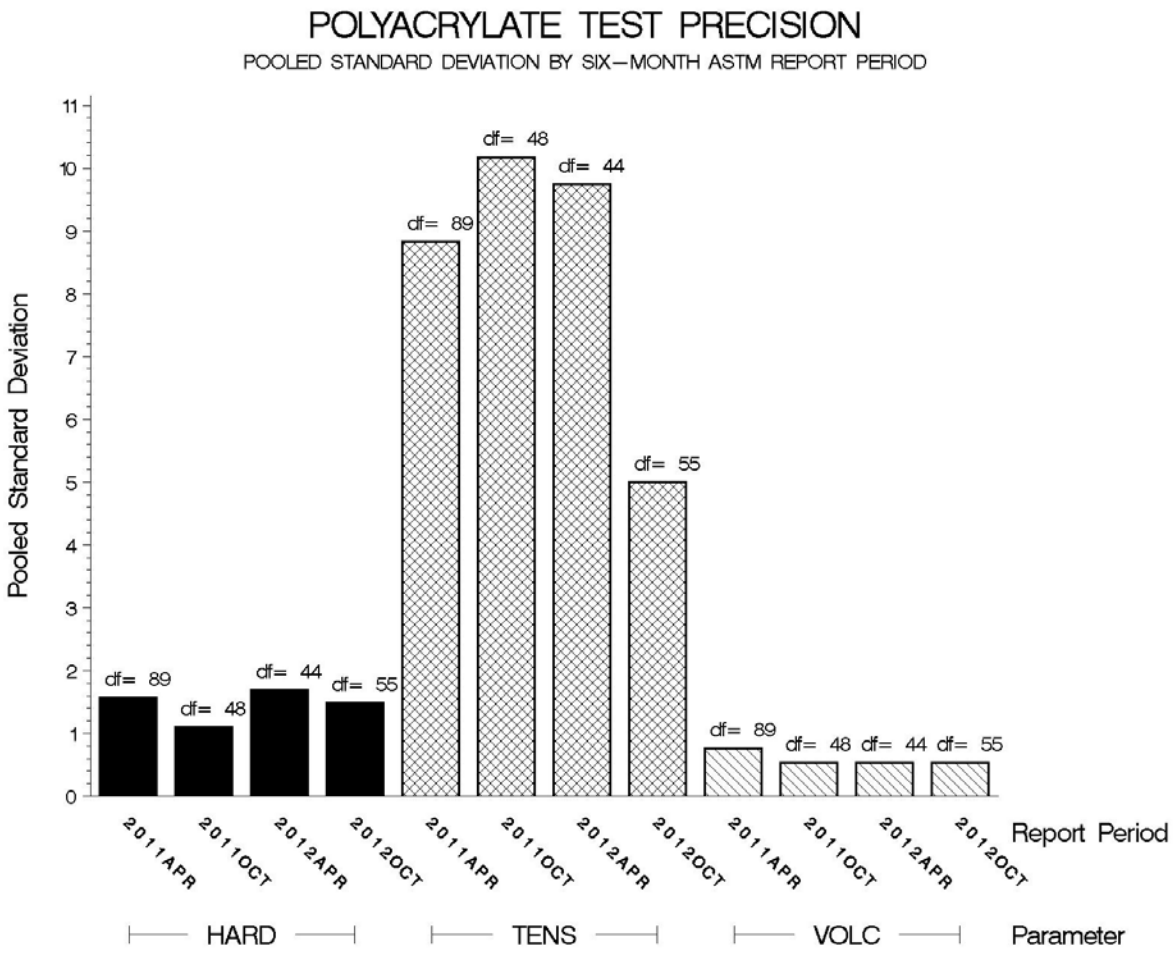

LDEOC – ETHYLENE ACRYLATE INDUSTRY OPERATIONALLY VALID DATA
A Program of ASTM International
REF ETH ACRYLATE TENSILE STRENGTH CHANGE AVG
LTMS Severity Analysis
EWMA
OFF SCALE
EWMA Action Limit
EWMA Warning Limit
EWMA Warning Limit
EWMA Action Limit
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
LTMS Precision Analysis
EWMA Action Limit
EWMA Warning Limit
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
CUSUM Severity Analysis
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
28NOV12:13:12

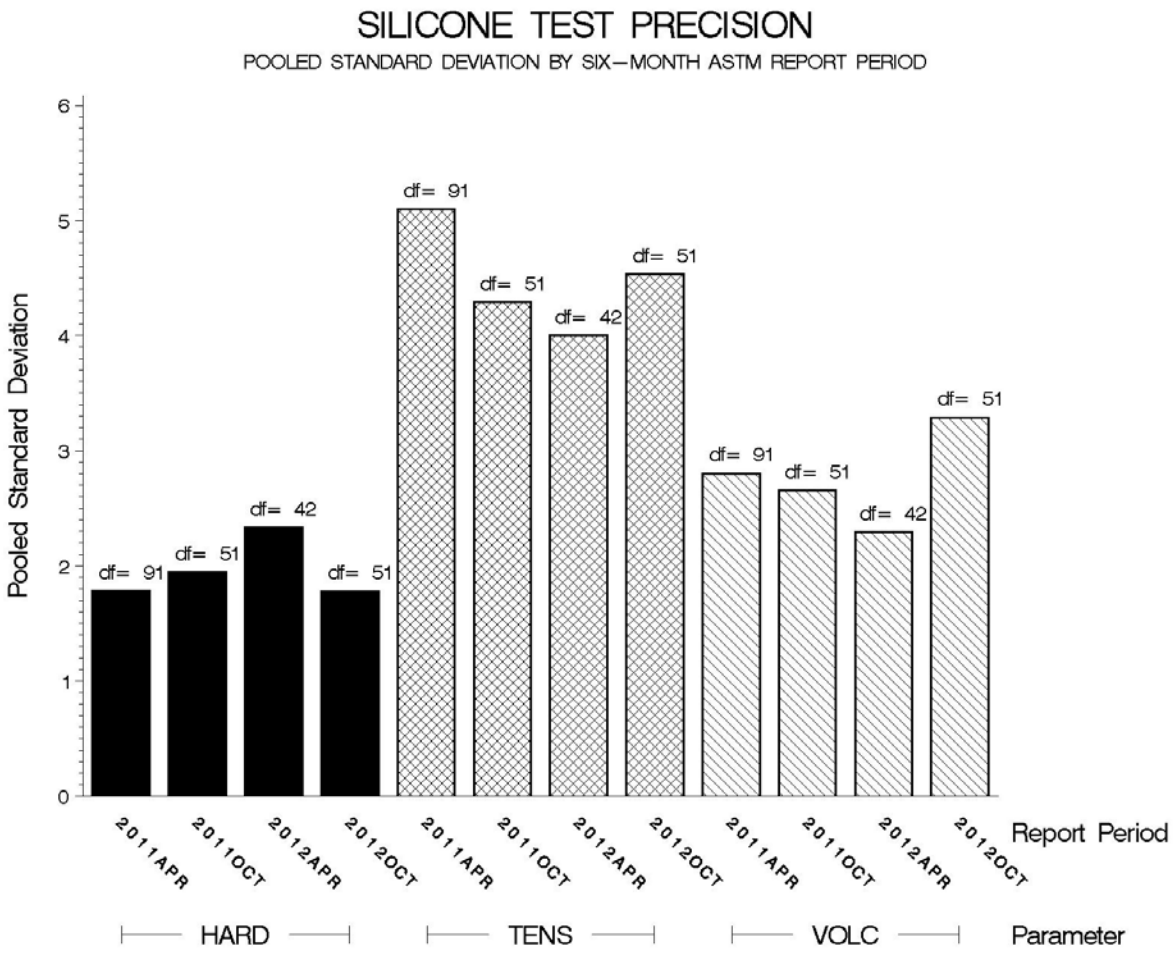
POOLED S:

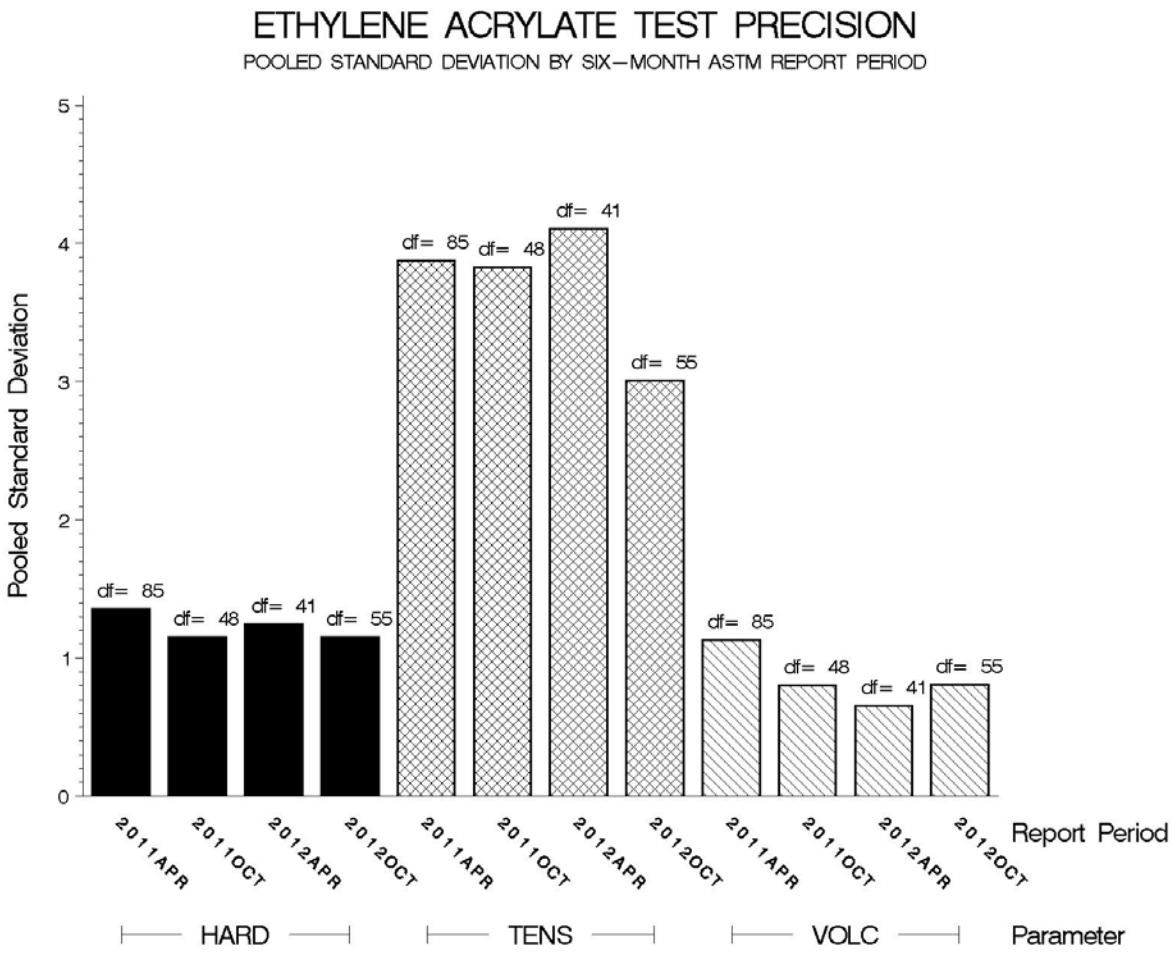
Shown below are bar charts comparing the pooled s values for the LDEOC test parameters over the last four report periods.




NITRILE TEST PRECISION
POOLED STANDARD DEVIATION BY SIX–MONTH ASTM REPORT PERIOD
Pooled Standard Deviation
0
1
2
3
4
5
df= 82
df= 49
df= 42
df= 54
df= 82
df= 49
df= 42
df= 54
df= 82
df= 49
df= 42
df= 54
df= 82
df= 49
df= 42
df= 54
2011APR
2011OCT
2012APR
2012OCT
2011APR
2011OCT
2012APR
2012OCT
2011APR
2011OCT
2012APR
2012OCT
Report Period
HARD
TENS
VOLC
Parameter


POLYACRYLATE TEST PRECISION
POOLED STANDARD DEVIATION BY SIX–MONTH ASTM REPORT PERIOD
Pooled Standard Deviation
0
1
2
3
4
5
6
7
8
9
10
11
df= 89
df= 48
df= 44
df= 55
df= 89
df= 48
df= 44
df= 55
df= 89
df= 48
df= 44
df= 55
2011APR
2011OCT
2012APR
2012OCT
2011APR
2011OCT
2012APR
2012OCT
2011APR
2011OCT
2012APR
2012OCT
Report Period
HARD
TENS
VOLC
Parameter


SILICONE TEST PRECISION
POOLED STANDARD DEVIATION BY SIX–MONTH ASTM REPORT PERIOD
Pooled Standard Deviation
0
1
2
3
4
5
6
df= 91
df= 51
df= 42
df= 51
df= 91
df= 51
df= 42
df= 51
df= 91
df= 51
df= 42
df= 51
2011APR
2011OCT
2012APR
2012OCT
2011APR
2011OCT
2012APR
2012OCT
2011APR
2011OCT
2012APR
2012OCT
Report Period
HARD
TENS
VOLC
Parameter


ETHYLENE ACRYLATE TEST PRECISION
POOLED STANDARD DEVIATION BY SIX–MONTH ASTM REPORT PERIOD
Pooled Standard Deviation
0
1
2
3
4
5
df= 85
df= 48
df= 41
df= 55
df= 85
df= 48
df= 41
df= 55
df= 85
df= 48
df= 41
df= 55
2011APR
2011OCT
2012APR
2012OCT
2011APR
2011OCT
2012APR
2012OCT
2011APR
2011OCT
2012APR
2012OCT
Report Period
HARD
TENS
VOLC
Parameter

STATUS OF REFERENCE OIL SUPPLY:

At the end of this report period, the testing oil supply stood as outlined in the following table:

		@ TMC	
Oil	Cans @ Labs	Cans	Gallons
1006-1	195	6308	1250
Total	195	6308	1250

Be aware that this table presumes that all of each of these oils is dedicated to the LDOEC test area. This is not the case, as oil 1006-1 is also used in several other test areas.

INFORMATION LETTERS:

No Information Letters were issued this period.

SUMMARY

Summary of Severity
as Measured by LTMS Control Charting

Elastomer	VOLC	HARD	TENS
Fluoroelastomer	**Mild**	Within limits	Within limits
Nitrile	Within limits	Within limits	Within limits
Polyacrylate	Within limits	**Mild**	**Mild**
Silicone	Within limits	Within limits	**Severe**
Ethylene Acrylate	Within limits	**Mild**	Within limits

Summary of Precision
as Measured by LTMS Control Charting

Elastomer	VOLC	HARD	TENS
Fluoroelastomer	Within limits	Within limits	Within limits
Nitrile	Within limits	Within limits	Within limits
Polyacrylate	Within limits	Within limits	Within limits
Silicone	**Action**	Within limits	Within limits
Ethylene Acrylate	Within limits	Within limits	Within limits

MTK/mtk/astm1012.doc/mem12-043.mtk.doc

c: F. M. Farber
J. A. Clark
EOEC Surveillance Panel
tp://ftp.astmtmc.cmu.edu/docs/bench/ldeoc/semiannualreports/ldeoc-10-2012.pdf

Distribution: email