



Test Monitoring Center

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

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

MEMORANDUM: 10-065

DATE: December 1, 2010

TO: Becky Grinfield,
Chairman, Engine Oil Elastomer Compatibility Surveillance Panel

FROM: Michael T. Kasimirsky *Michael T. Kasimirsky*

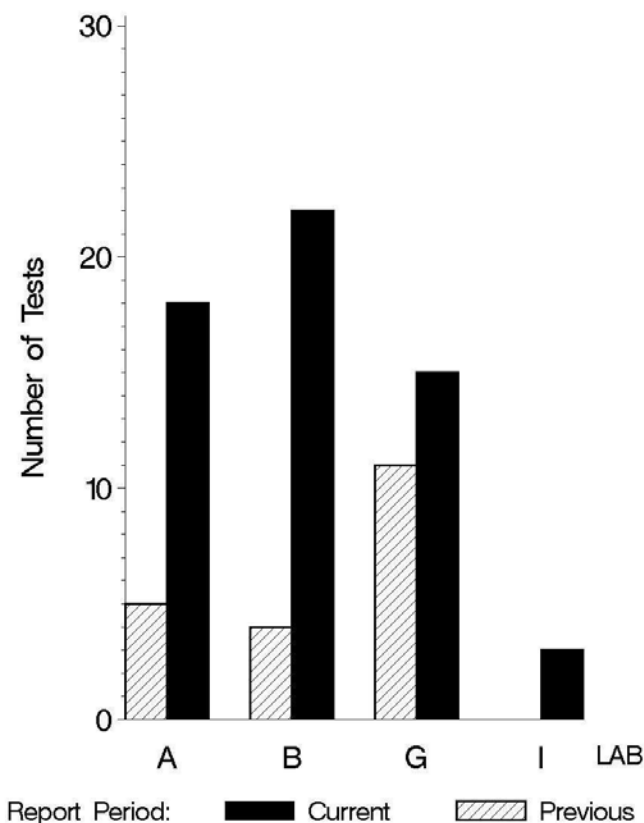
SUBJECT: LDEOC Testing from April 1, 2010 through September 30, 2010

A total of 323 LDEOC tests were reported to the Test Monitoring Center during the period from April 1, 2010 through September 30, 2010. Following is a summary of testing activity this period.

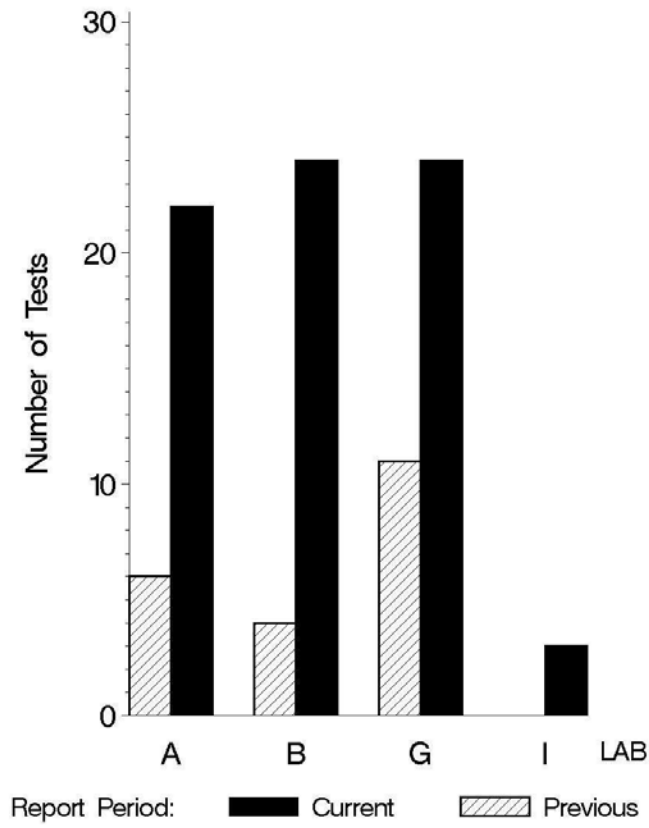
	Reporting Data
Number of Labs	4

Tests reported this period were distributed as shown below:

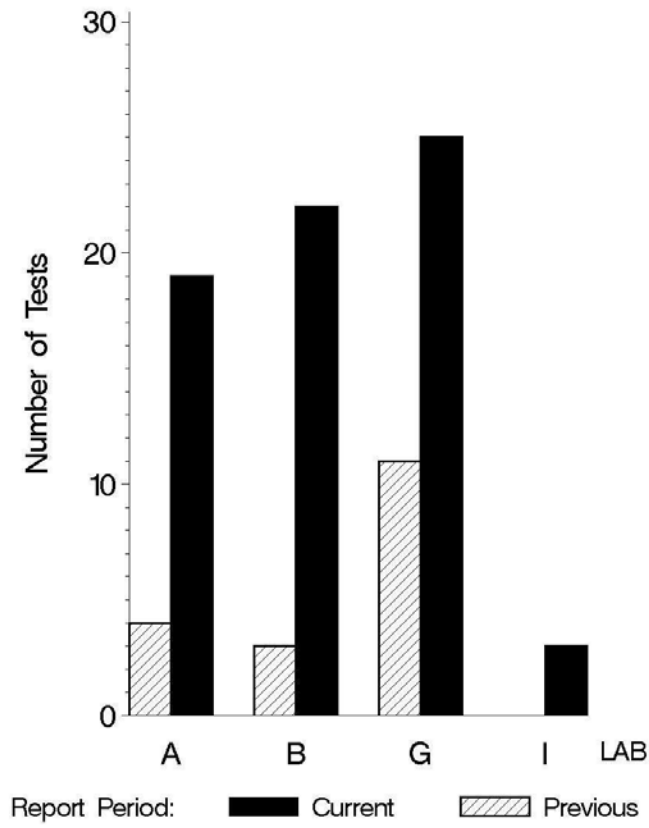
NUMBER OF FLUOROELASTOMER TESTS REPORTED BY LAB AND REPORT PERIOD



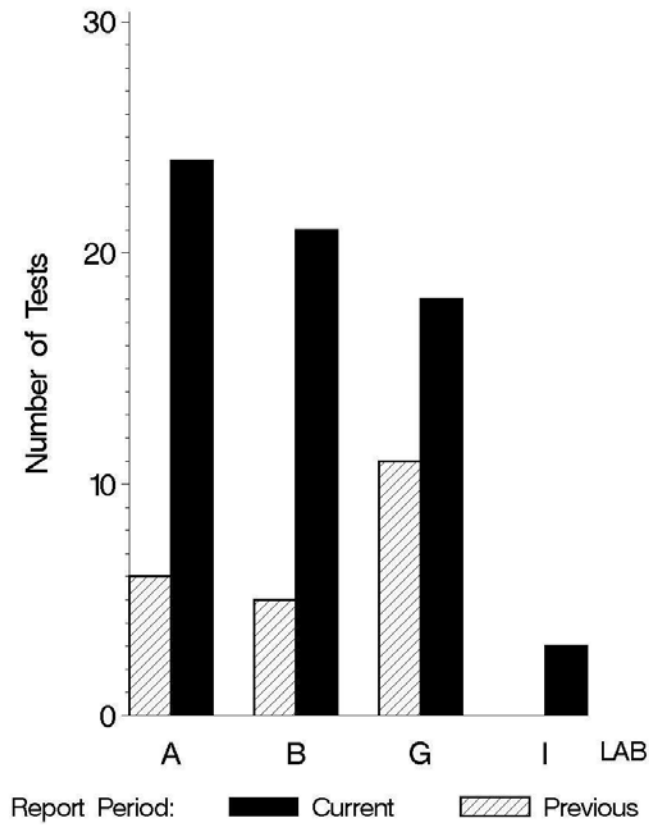
NUMBER OF NITRILE TESTS REPORTED BY LAB AND REPORT PERIOD



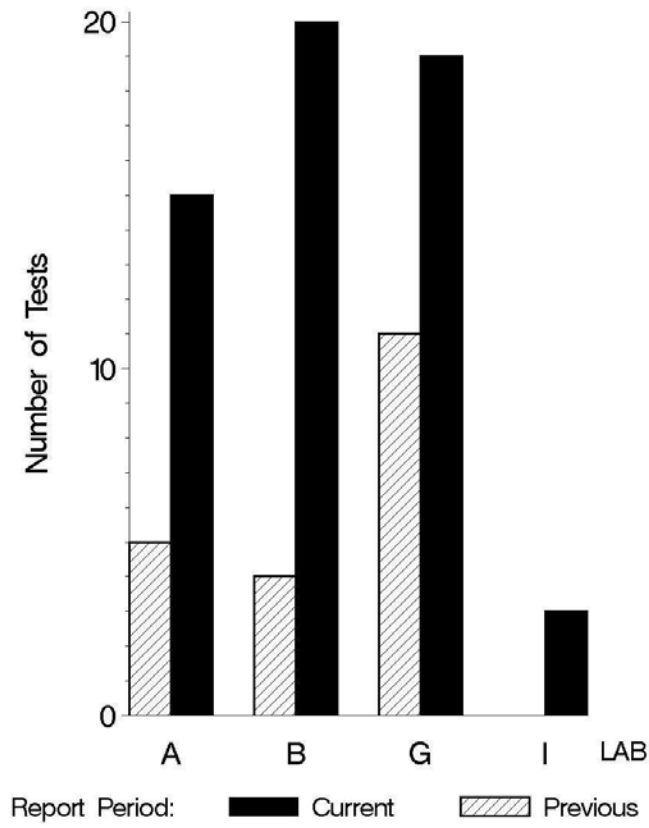
NUMBER OF POLYACRYLATE TESTS REPORTED BY LAB AND REPORT PERIOD



NUMBER OF SILICONE TESTS REPORTED BY LAB AND REPORT PERIOD



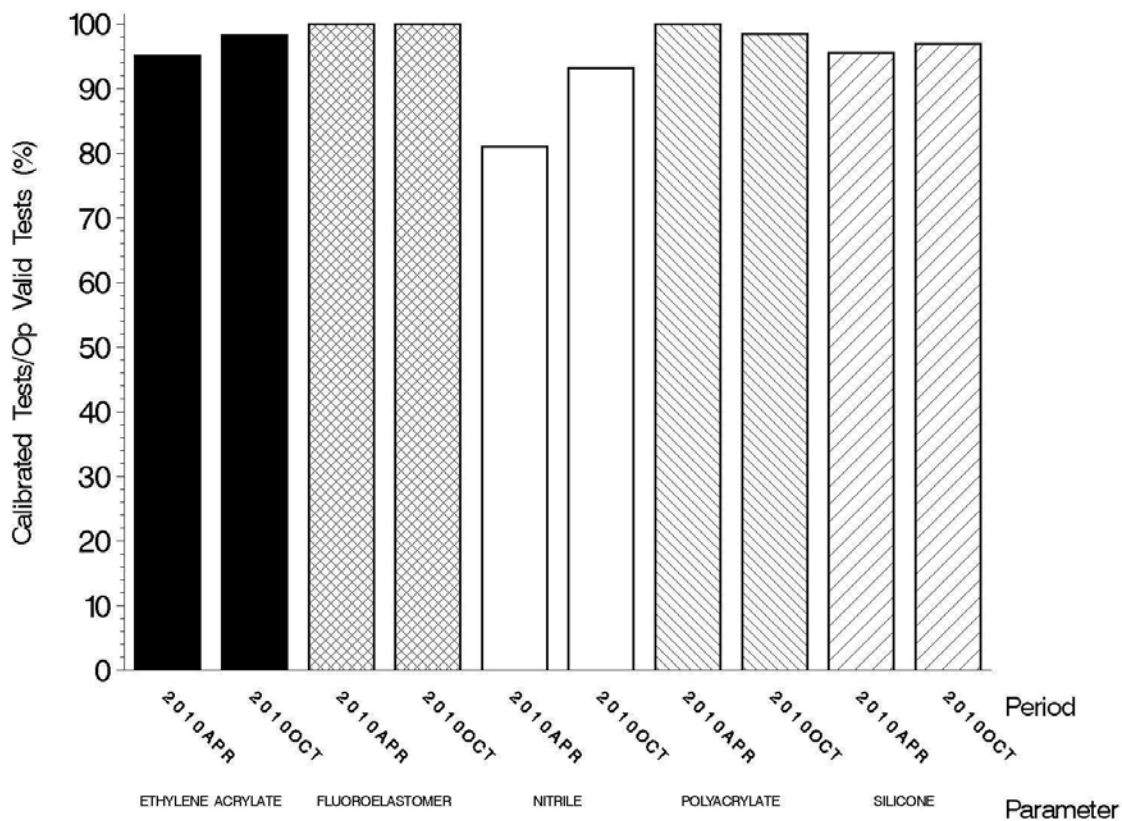
NUMBER OF ETHYLENE ACRYLATE TESTS REPORTED BY LAB AND REPORT PERIOD



Test Distribution by Oil and Validity

		Ethylene Acrylate	Fluoroelastomer	Nitrile	Polyacrylate	Silicone	Totals	
							This Period	Last Period
Accepted for Calibration	AC	55	58	68	64	63	308	95
Rejected	OC	1	0	5	1	2	9	6
Information Run (not for calibration)	NI	0	0	0	0	0	0	0
Operationally Invalid (lab)	LC	0	0	0	0	0	0	0
Operationally Invalid (lab/TMC)	RC	0	0	0	1	0	1	0
Aborted Calibration	XC	1	0	0	3	1	5	0
Total		57	58	73	69	66	323	101

**OPERATIONALLY VALID TESTS
MEETING ACCEPTANCE CRITERIA**



The above chart shows the percentage of accepted operationally valid tests. This period two silicone tests, one ethylene acrylate test, five nitrile tests, and one polyacrylate test failed to meet the acceptance criteria.

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	15	0	0	18	0	0	22	0	0	19	0	0	24	0	0	98	0
B	0	20	0	0	22	0	0	24	0	0	22	0	0	21	0	0	109	0
G	1	19	5	0	15	0	0	24	0	4	25	16	1	18	6	6	101	6
I	0	3	0	0	3	0	0	3	0	0	3	0	0	3	0	0	15	0
Total	1	57	2	0	58	0	0	73	0	4	69	6	1	66	2	6	323	2

Lost tests are those that were aborted or operationally invalid.

Causes for Lost Tests

		Elastomer					Validity			Loss Rate		
Lab	Cause	Fluoroelastomer	Nitrile	Polyacrylate	Silicone	Ethylene Acrylate	LC	RC	XC	Lost	Starts	%
G	Power Failure			•	•	•			•	4	323	1
	Test Aborted - No Longer Needed			•					•	1	323	0.3
	Missing Volume Change Sample			•				•		1	323	0.3
	Lost	0	0	4	1	1	0	1	5			
	Starts	57	58	73	69	66	323	323	323			
	%	0	0	5	1	1	0	0.3	1			

Average Δ /s by Lab					
Elastomer	Lab	n	VOLCYI	HARDYI	TENSYI
Ethylene Acrylate	A	15	-1.547	0.058	0.125
	B	20	-0.375	0.801	0.222
	G	18	0.149	0.745	-0.217
	Industry	3	-0.922	-1.359	-0.491
Fluoroelastomer	A	56	-0.550	0.468	0.017
	B	18	-0.148	0.922	-1.005
	G	22	-0.948	-0.002	0.203
	Industry	15	0.103	-0.678	0.848
Nitrile	A	3	-2.022	-0.795	-0.320
	B	58	-0.484	0.069	-0.032
	G	22	-0.403	-0.410	0.020
	Industry	24	-0.573	0.021	0.306
Polyacrylate	A	24	-1.278	0.260	-0.583
	B	3	-1.783	-0.594	-0.600
	G	73	-0.803	-0.056	-0.109
	Industry	19	-1.088	0.001	0.330
Silicone	A	22	-0.591	-0.253	0.594
	B	21	-0.468	0.698	-0.229
	G	3	-1.479	0.320	0.421
	Industry	65	-0.738	0.155	0.243

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
Fluoroelastomer	ftp://ftp.astmtmc.cmu.edu/refdata/bench/1deocf/data/
Nitrile	ftp://ftp.astmtmc.cmu.edu/refdata/bench/1deocn/data/
Polyacrylate	ftp://ftp.astmtmc.cmu.edu/refdata/bench/1deoep/data/
Silicone	ftp://ftp.astmtmc.cmu.edu/refdata/bench/1deocs/data/
Ethylene Acrylate	ftp://ftp.astmtmc.cmu.edu/refdata/bench/1deoea/data/

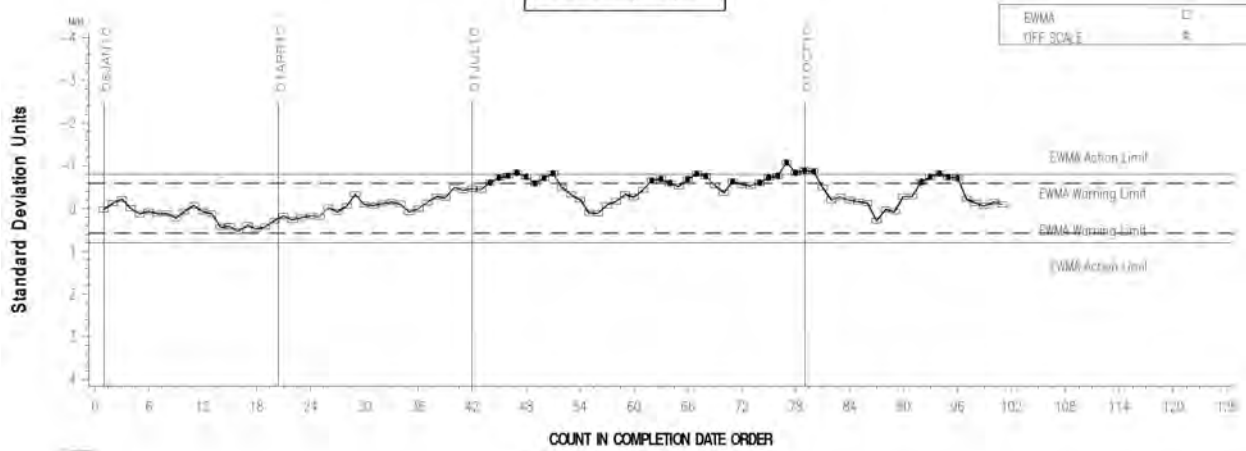
LTMS CONTROL CHARTS

LDEOC – FLUOROELASTOMER INDUSTRY OPERATIONALLY VALID DATA

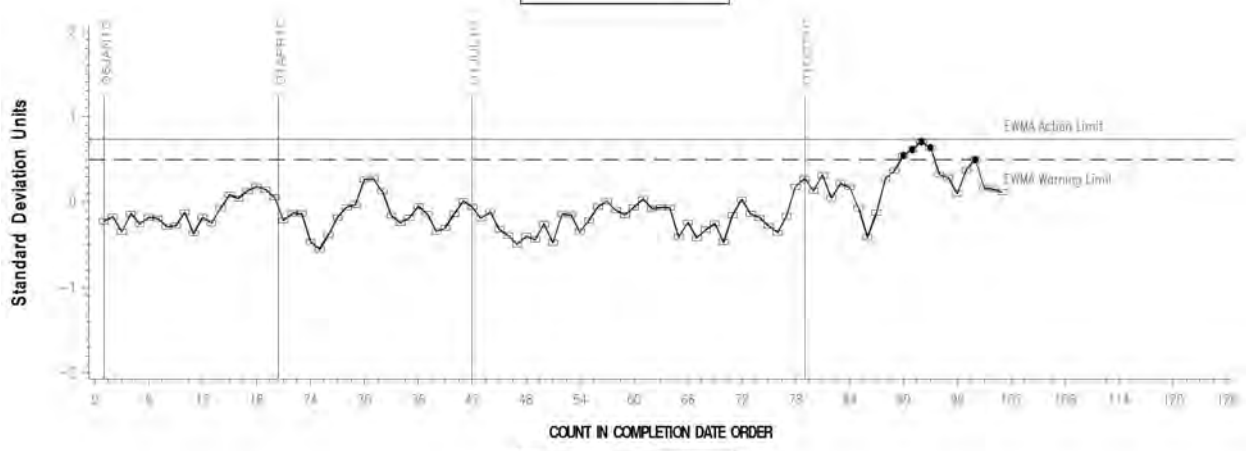


REF FLUOROELASTOMER VOLUME CHANGE AVERAGE

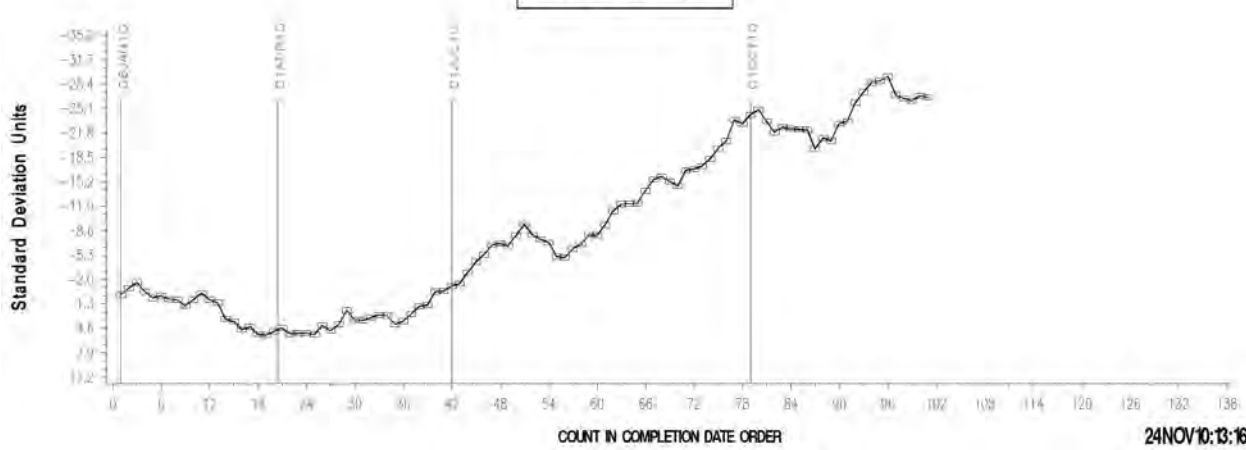
LTMS Severity Analysis



LTMS Precision Analysis



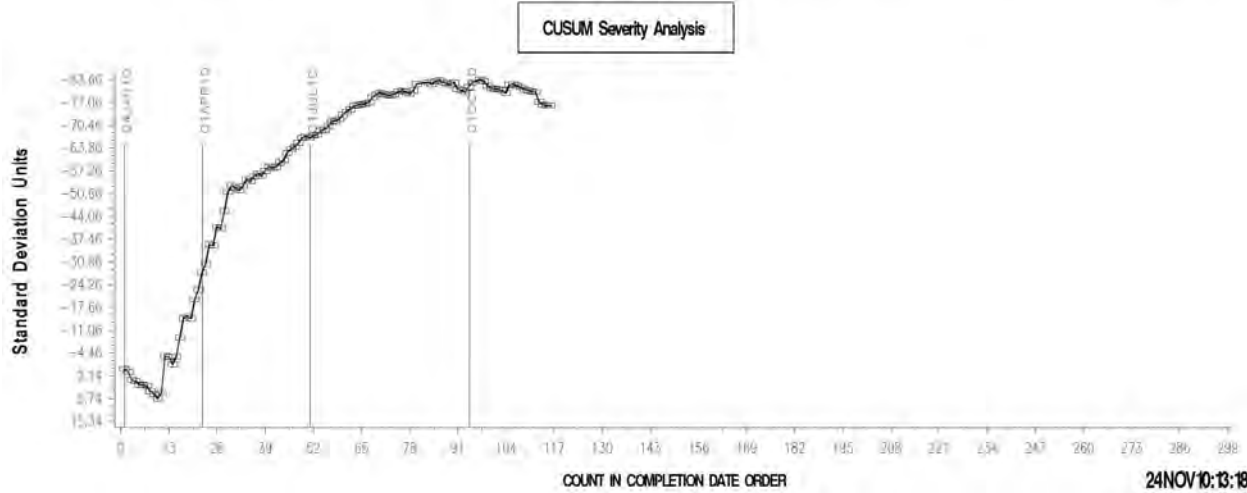
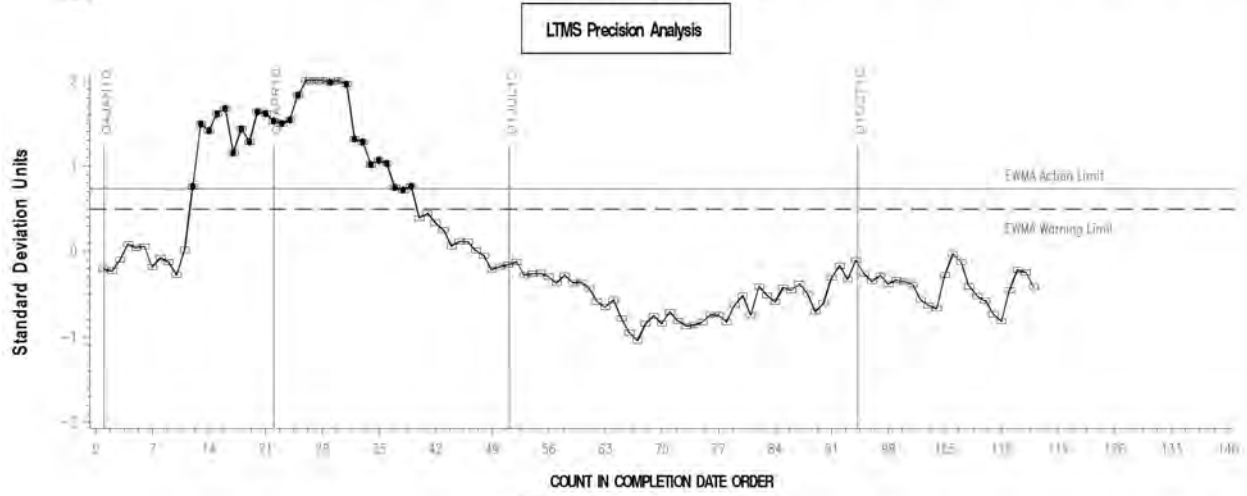
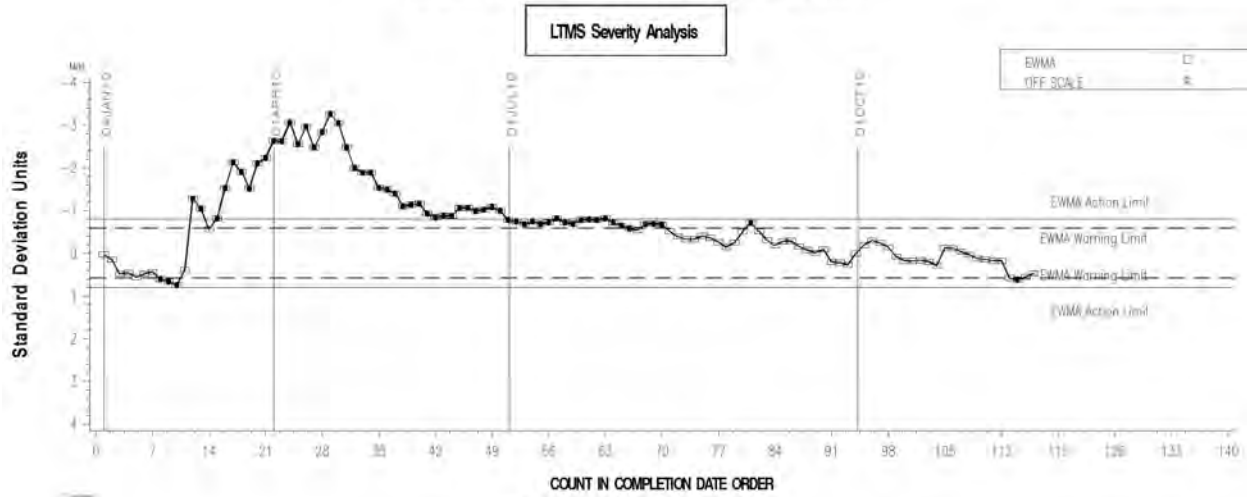
CUSUM Severity Analysis



LDEOC – NITRILE INDUSTRY OPERATIONALLY VALID DATA



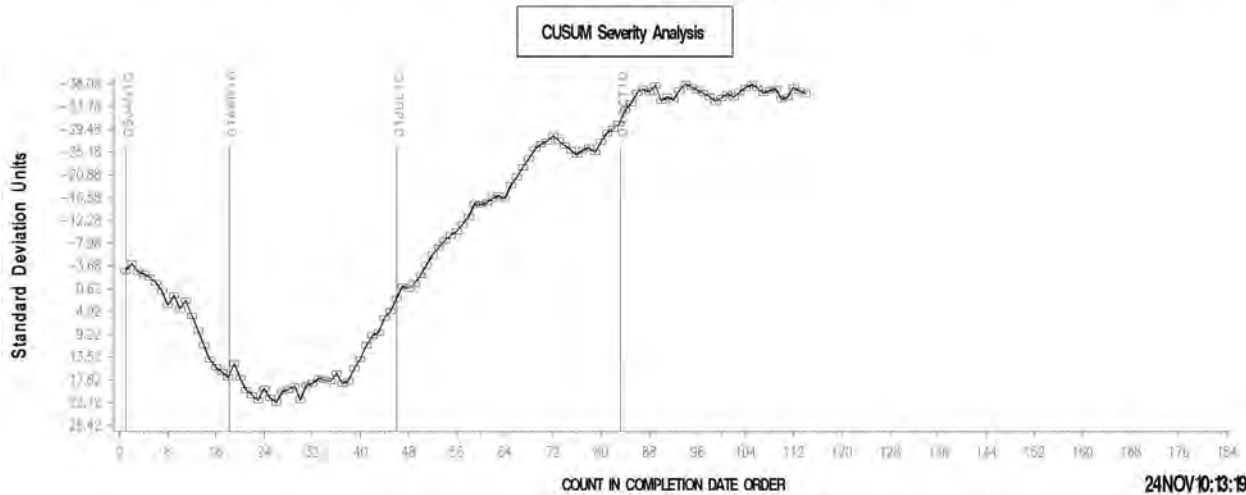
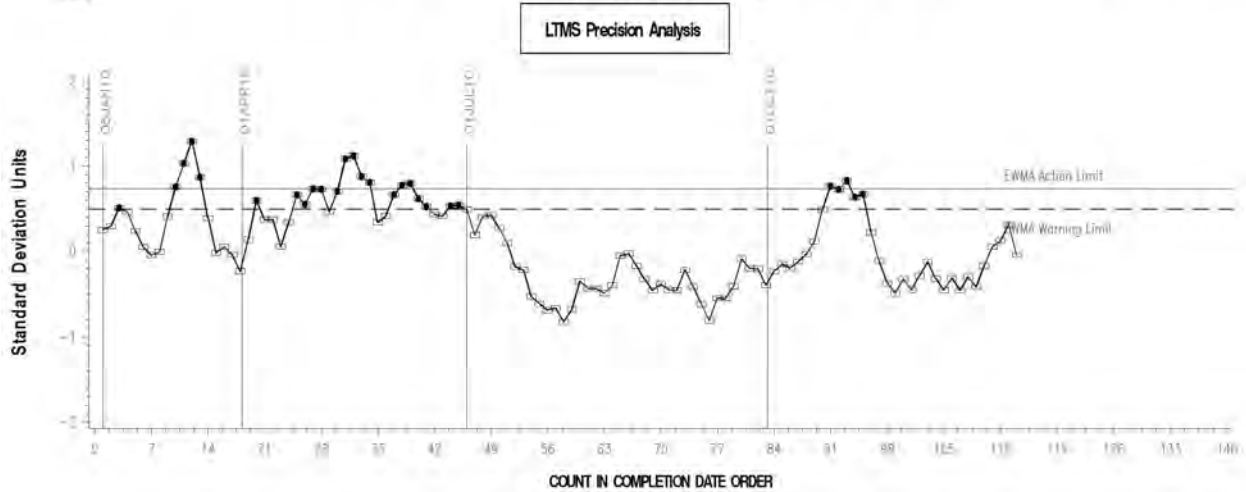
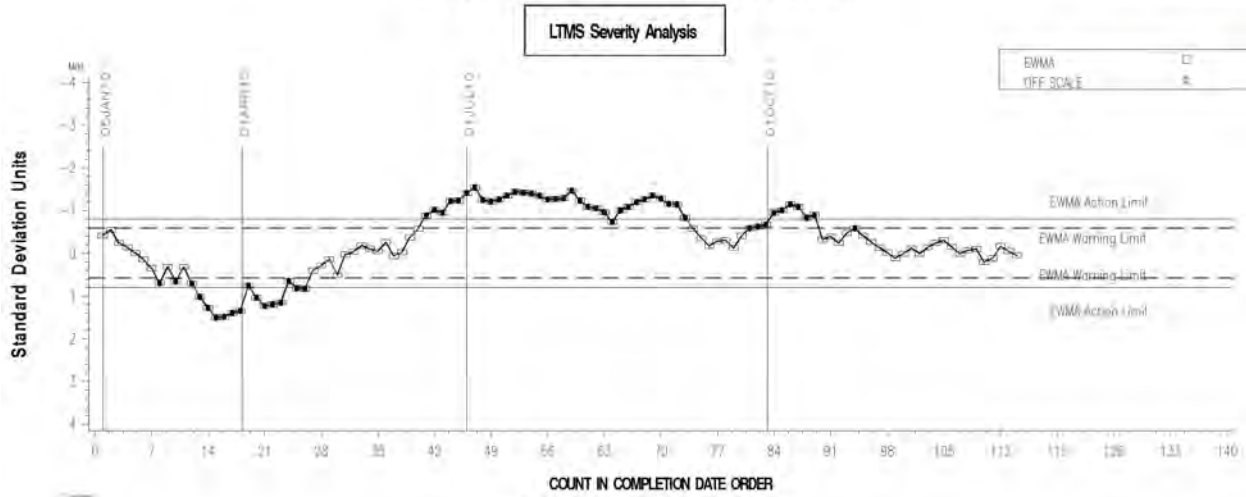
REFERENCE NITRILE VOLUME CHANGE AVERAGE



LDEOC – POLYACRYLATE INDUSTRY OPERATIONALLY VALID DATA



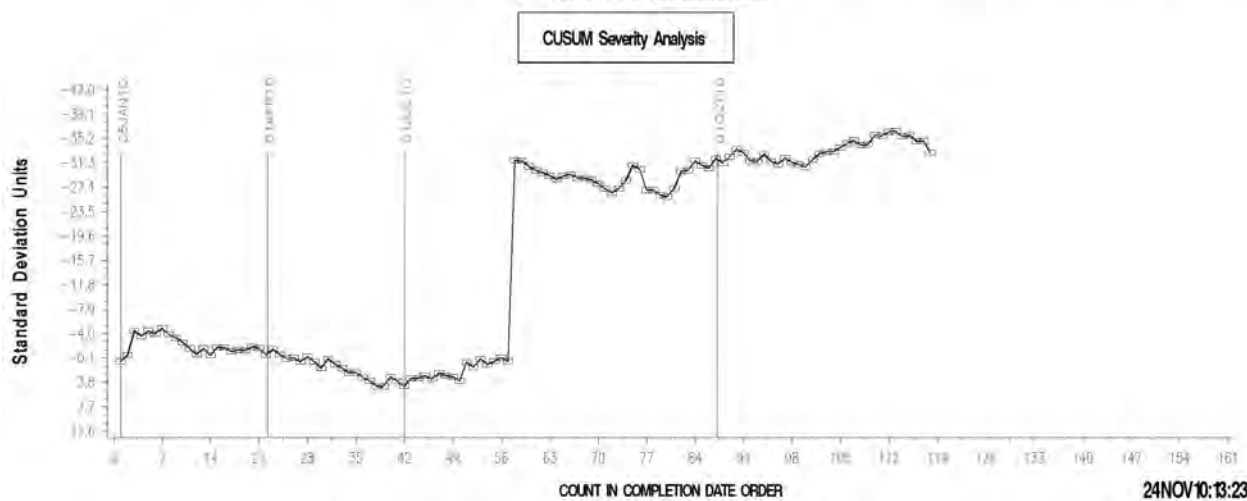
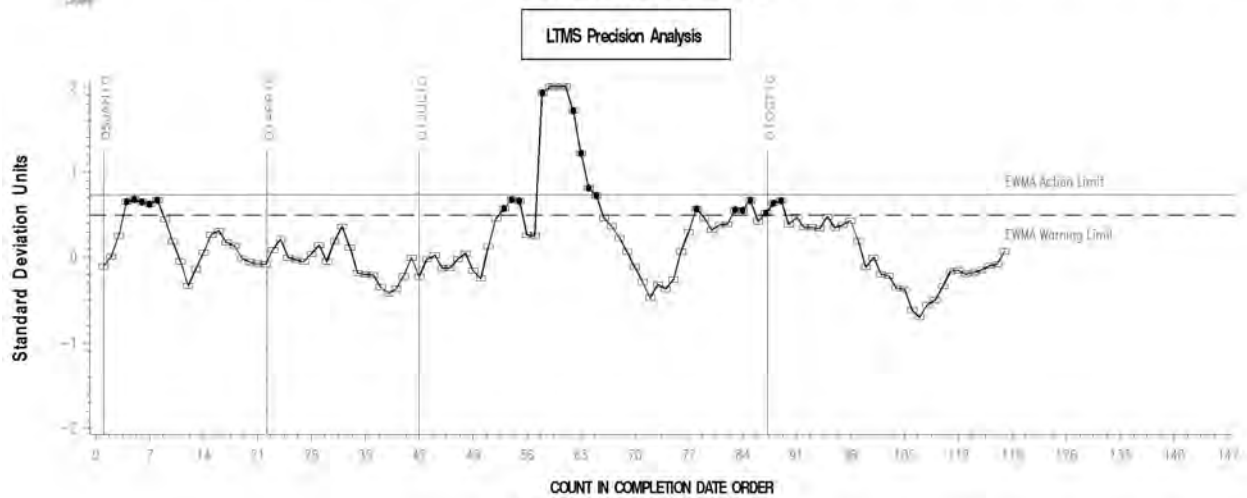
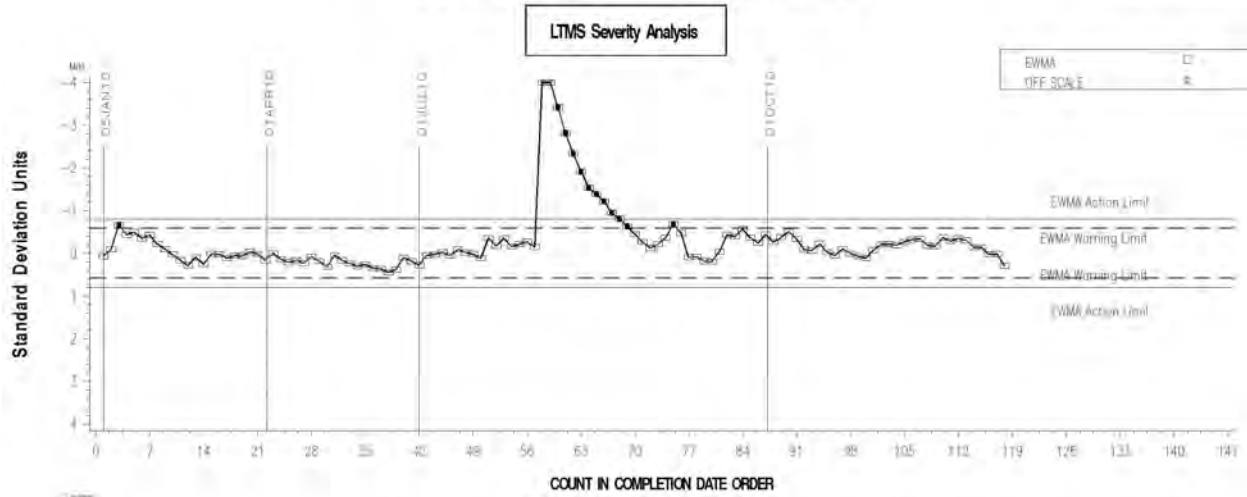
REF POLYACRYLATE VOLUME CHANGE AVERAGE



LDEOC – SILICONE INDUSTRY OPERATIONALLY VALID DATA



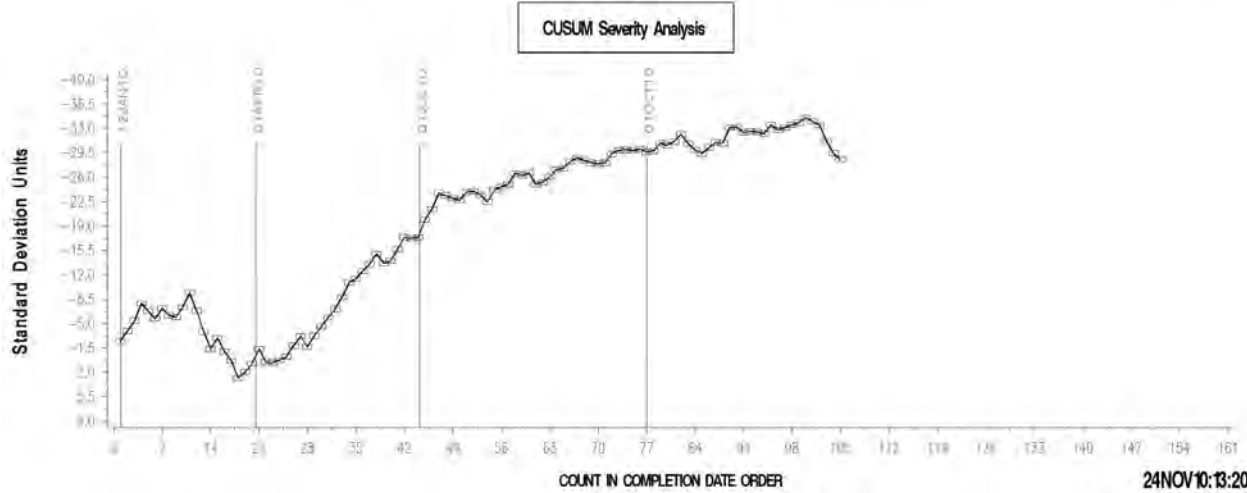
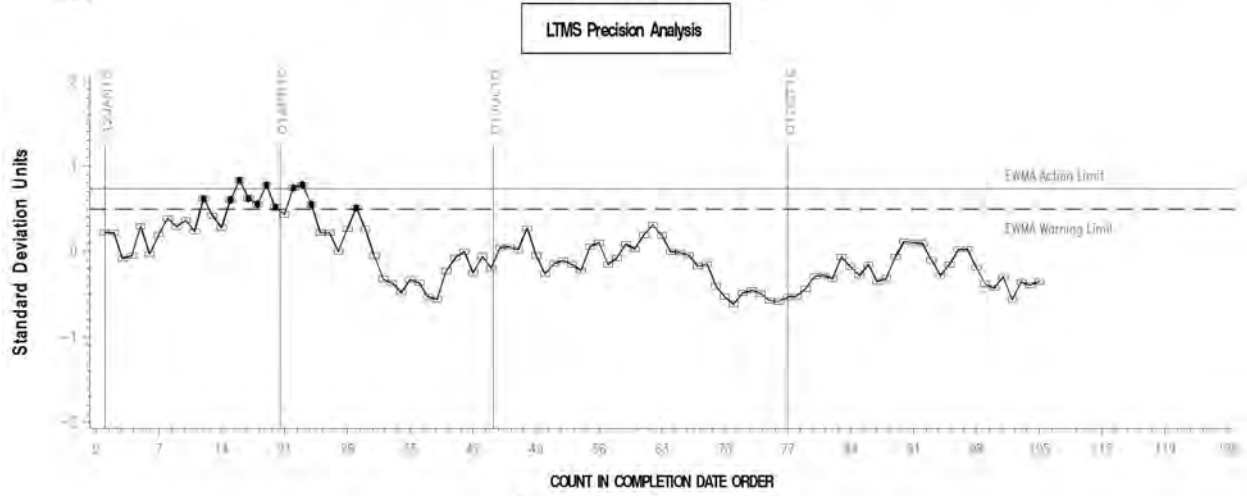
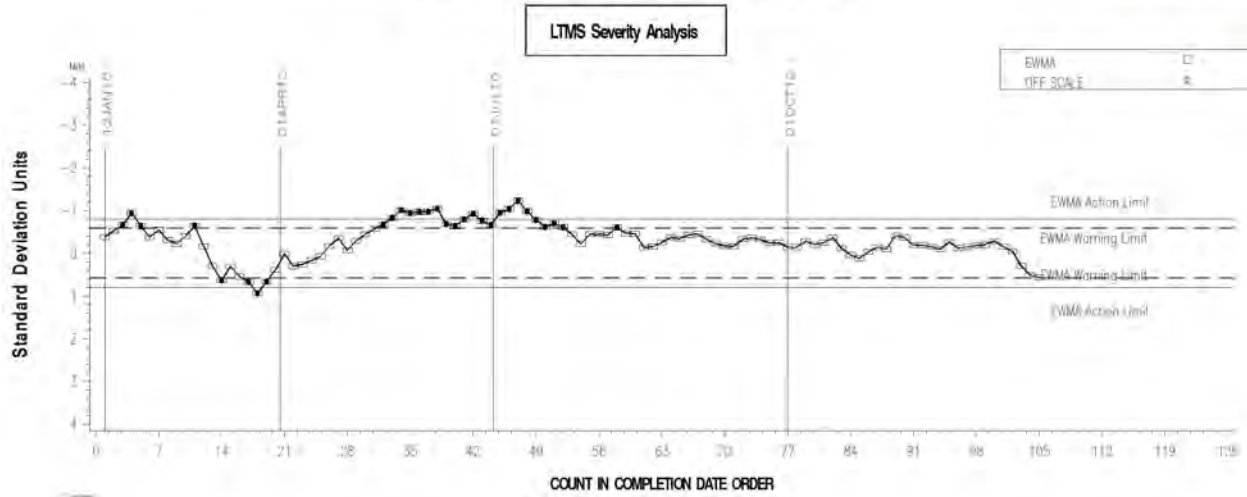
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LDEOC – ETHYLENE ACRYLATE INDUSTRY OPERATIONALLY VALID DATA



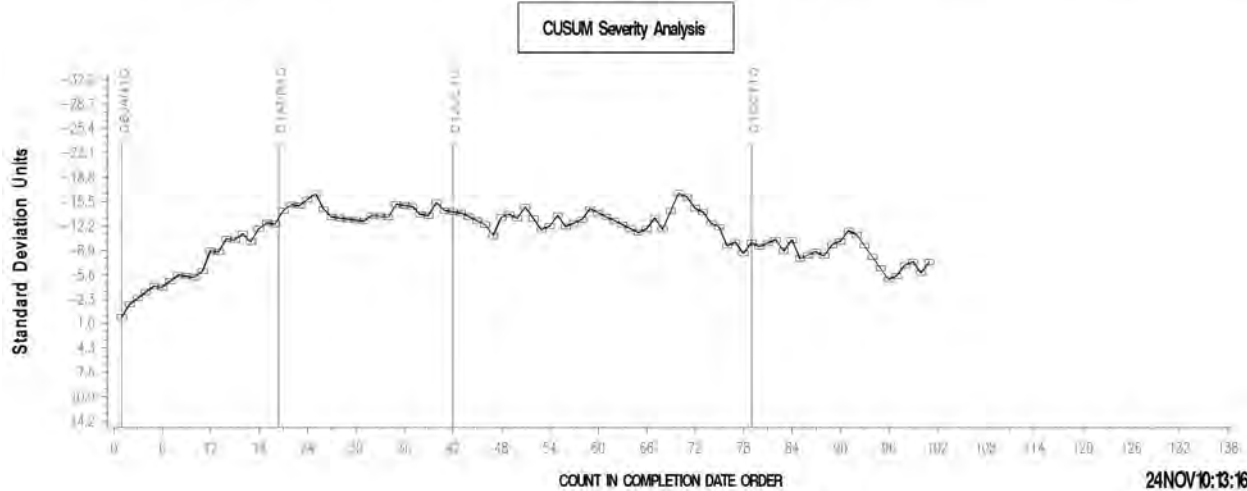
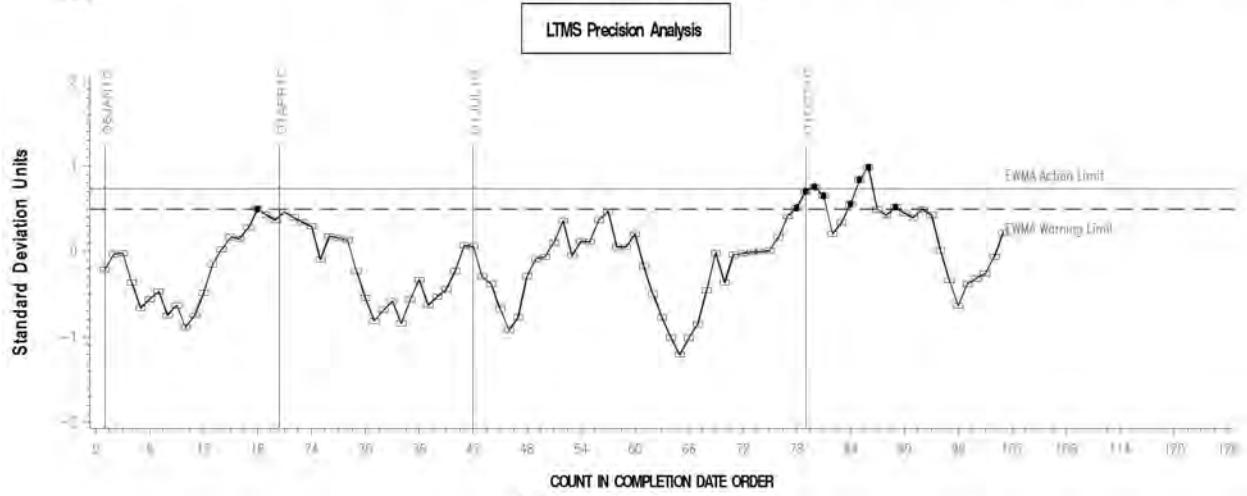
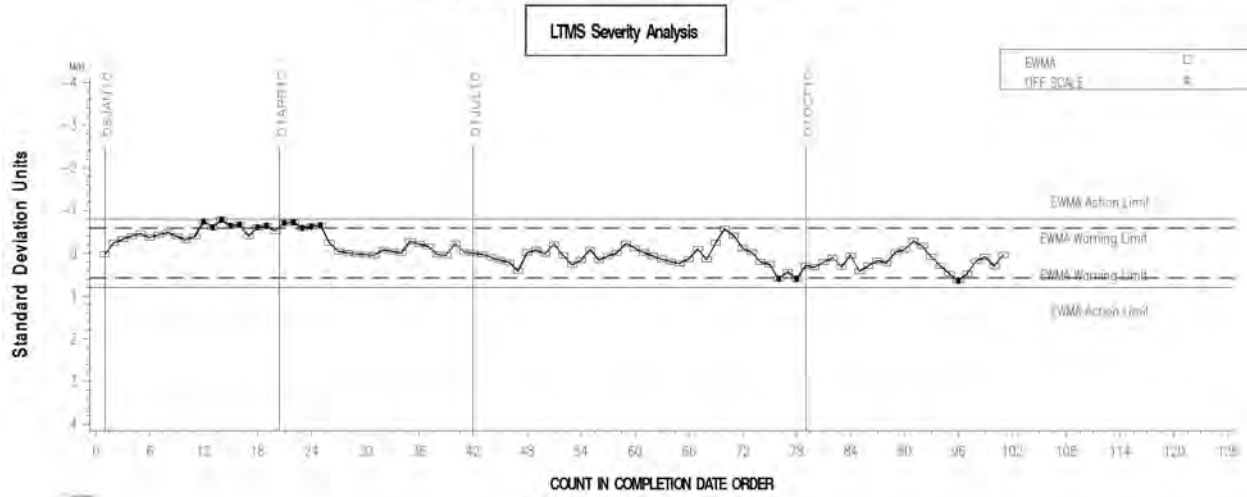
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LDEOC - FLUOROELASTOMER INDUSTRY OPERATIONALLY VALID DATA



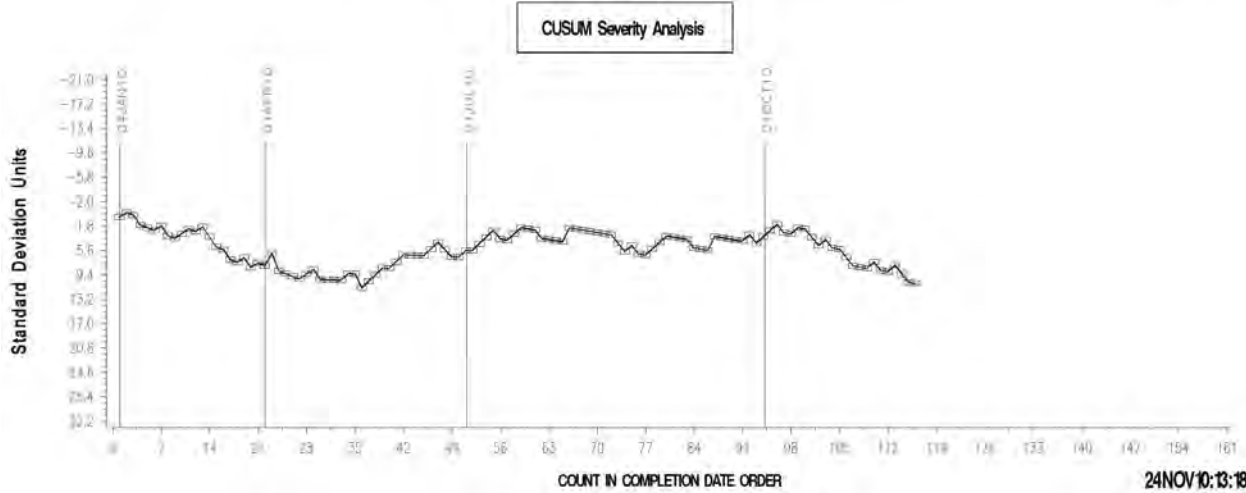
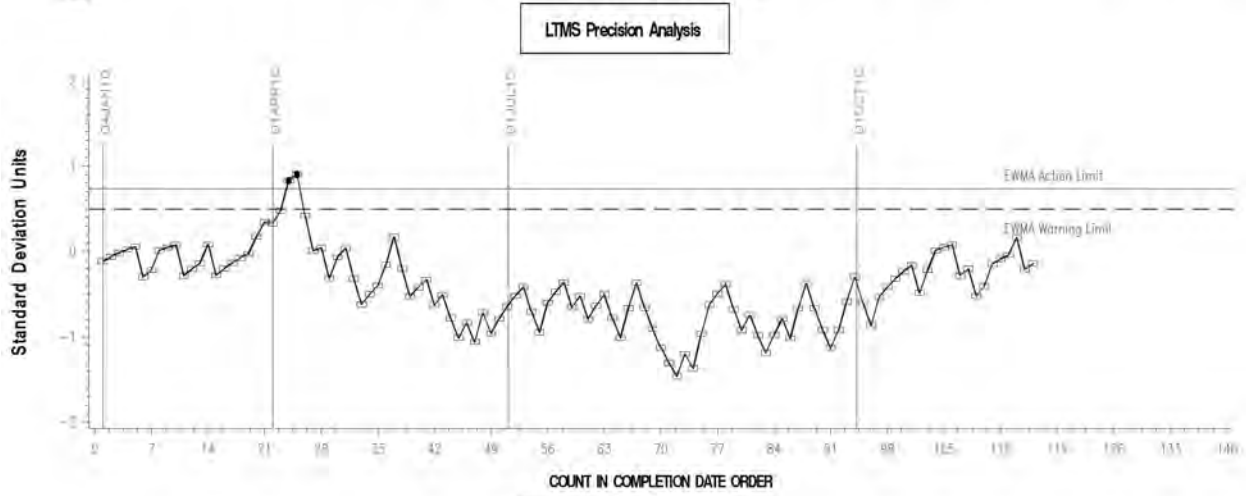
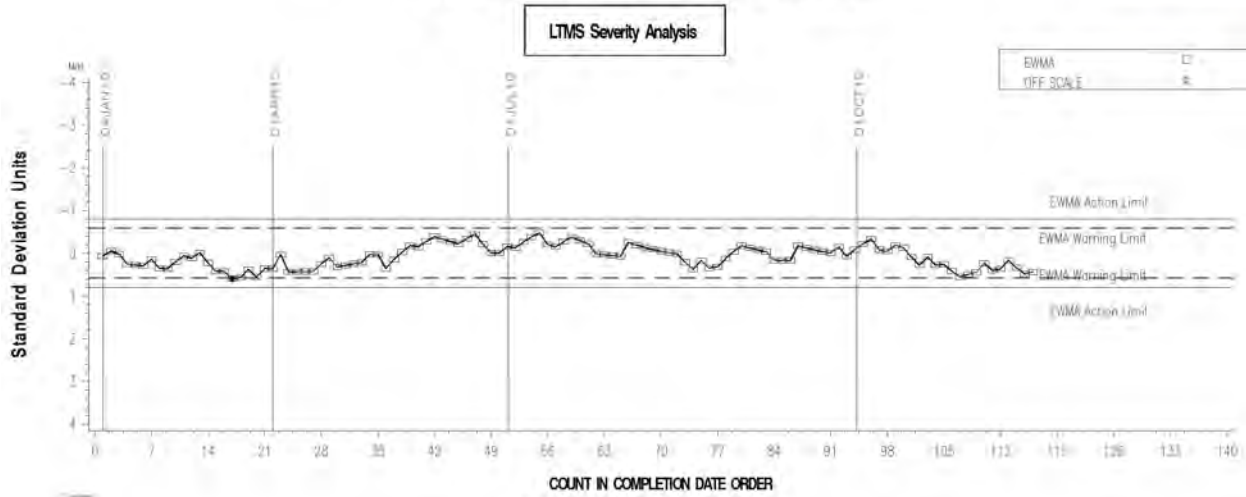
REF FLURO POINTS HARDNESS CHANGE AVERAGE



LDEOC – NITRILE INDUSTRY OPERATIONALLY VALID DATA



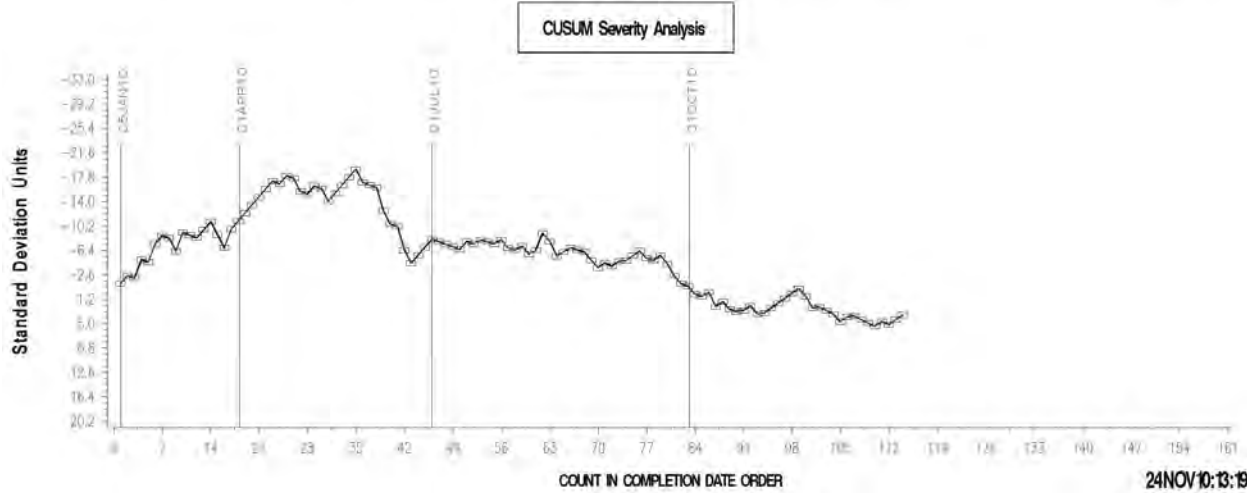
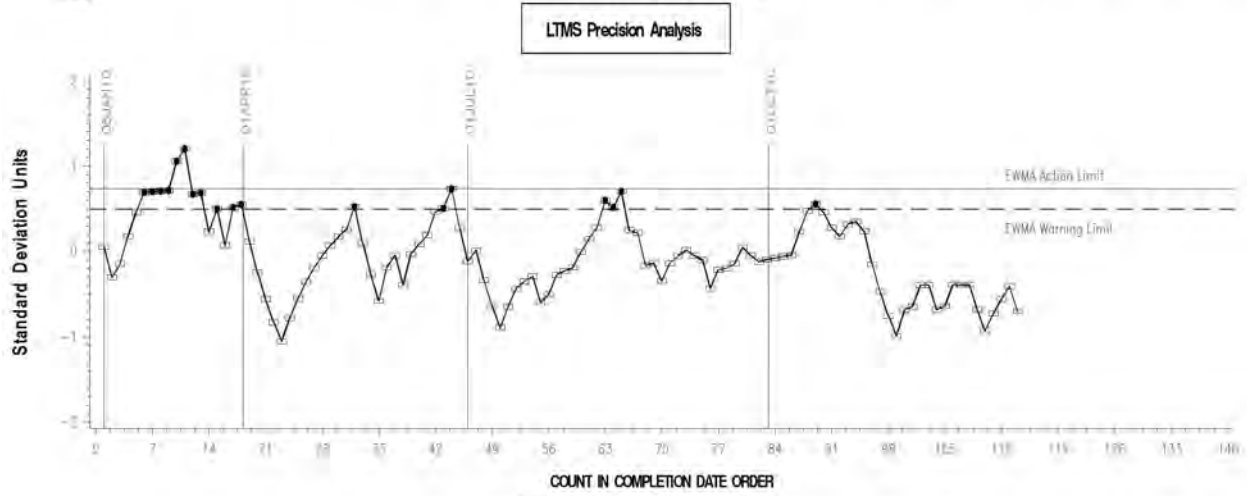
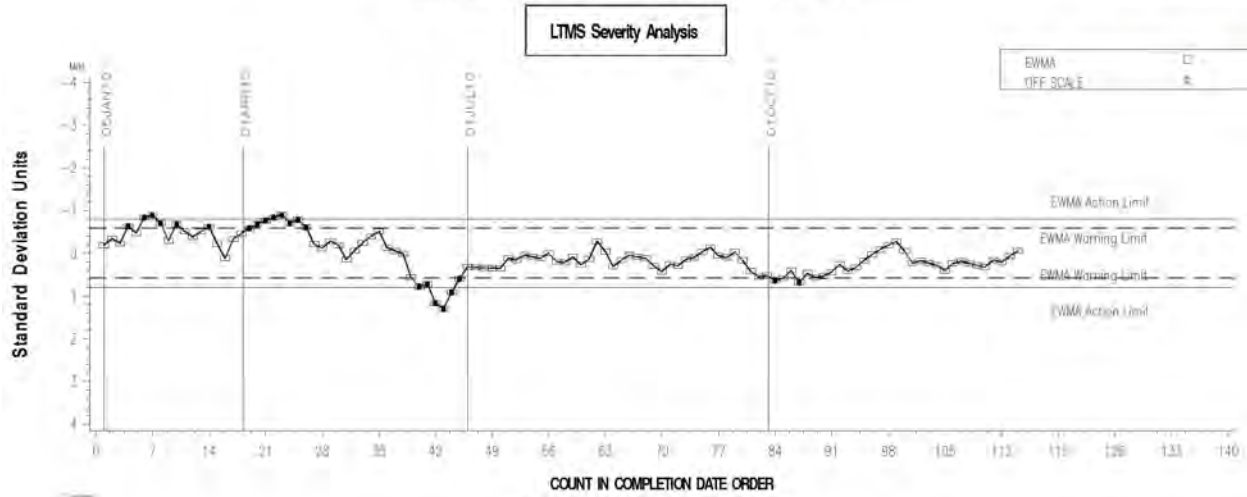
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LDEOC – POLYACRYLATE INDUSTRY OPERATIONALLY VALID DATA



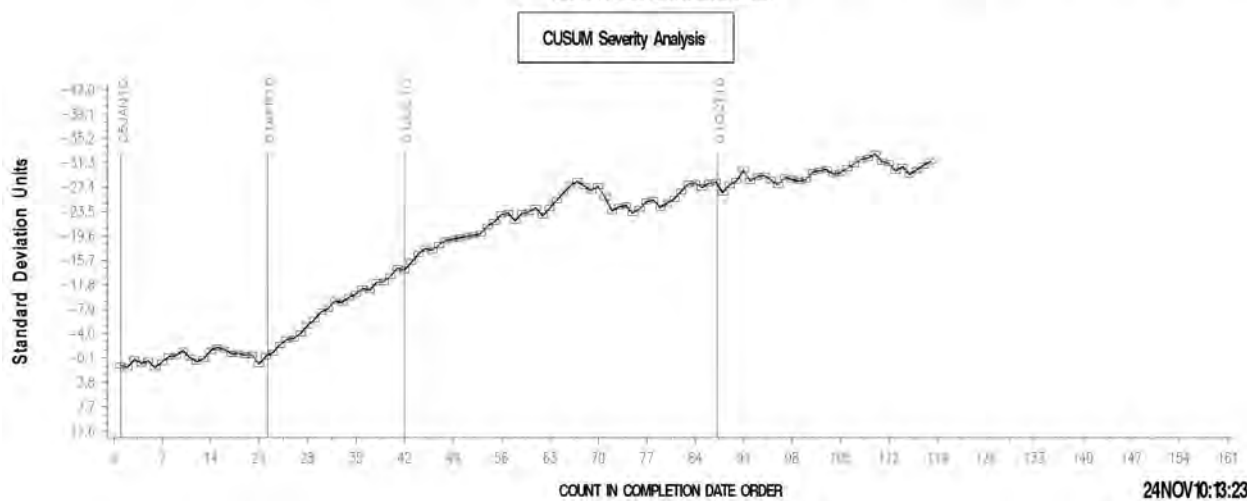
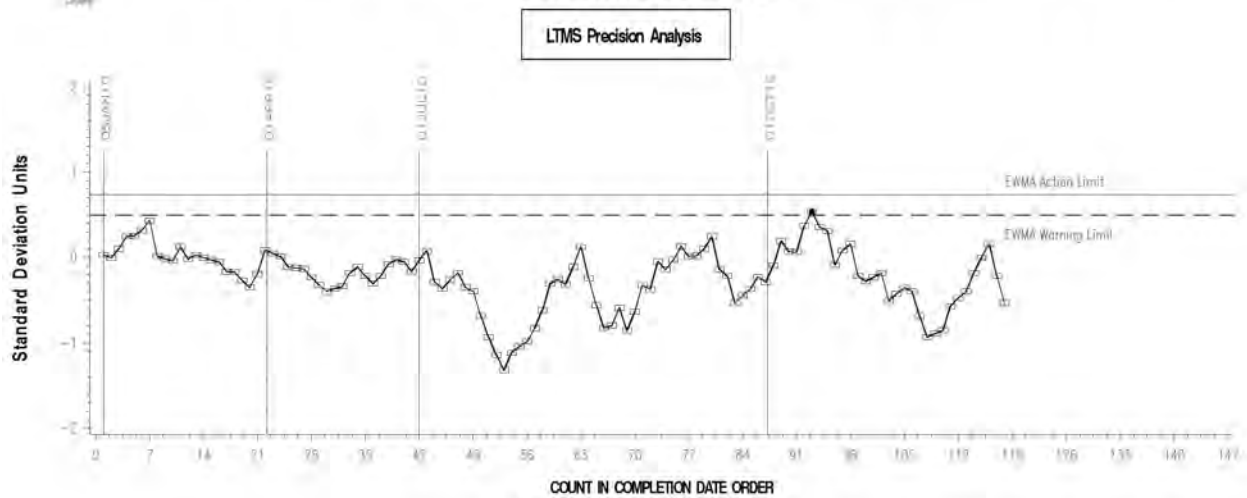
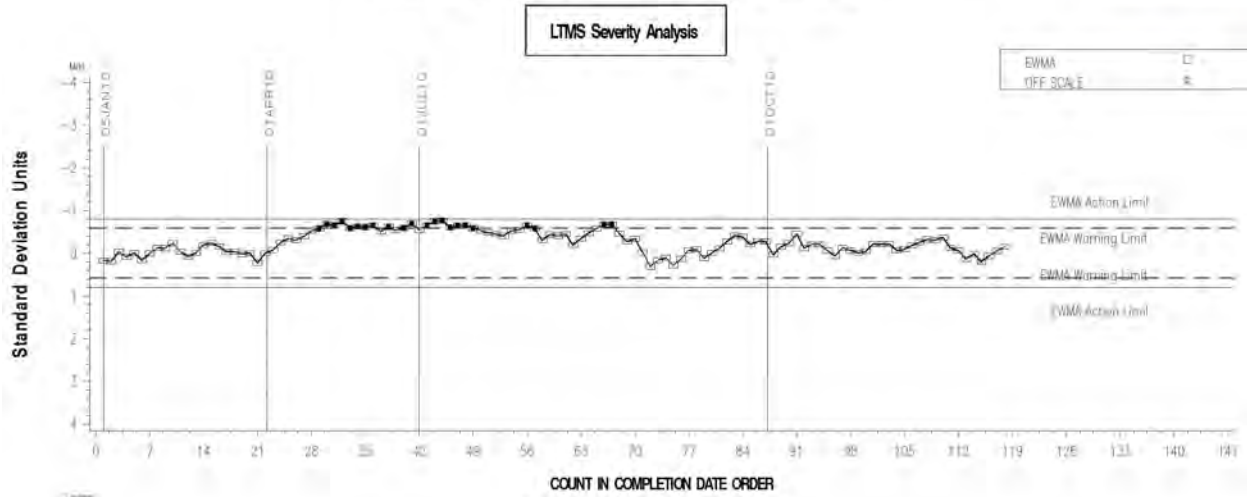
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LDEOC – SILICONE INDUSTRY OPERATIONALLY VALID DATA



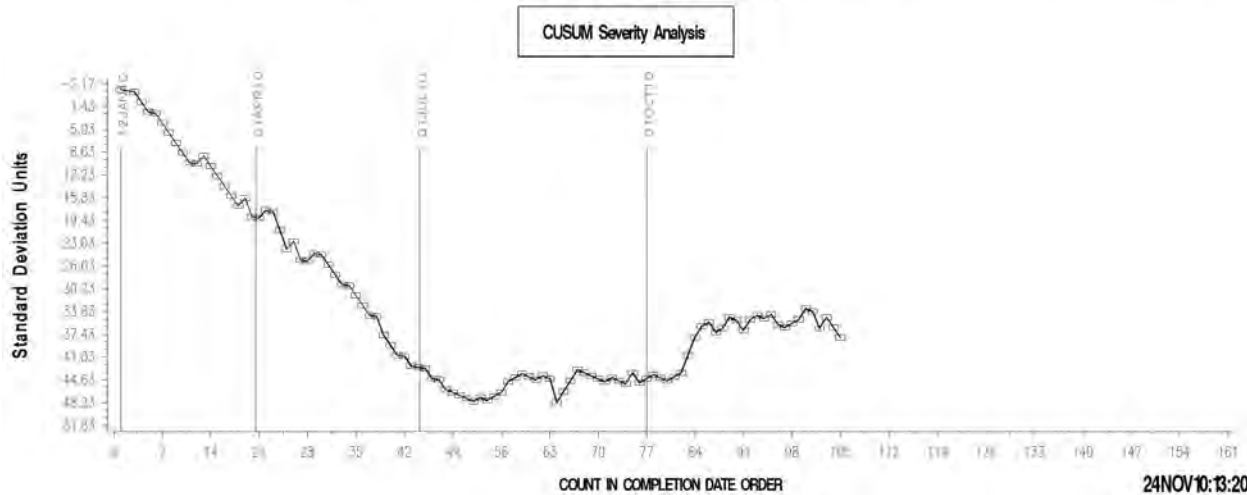
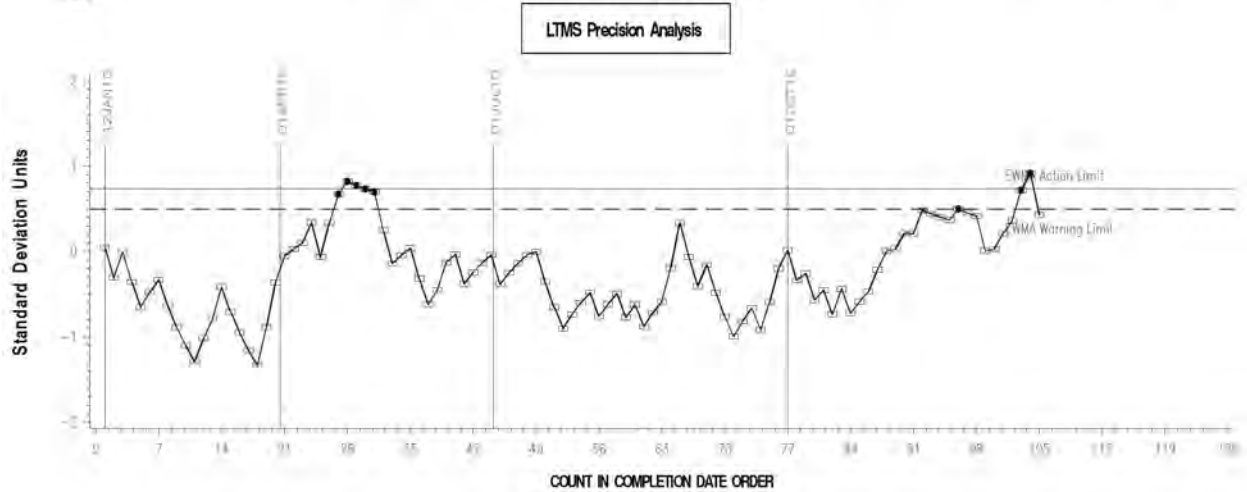
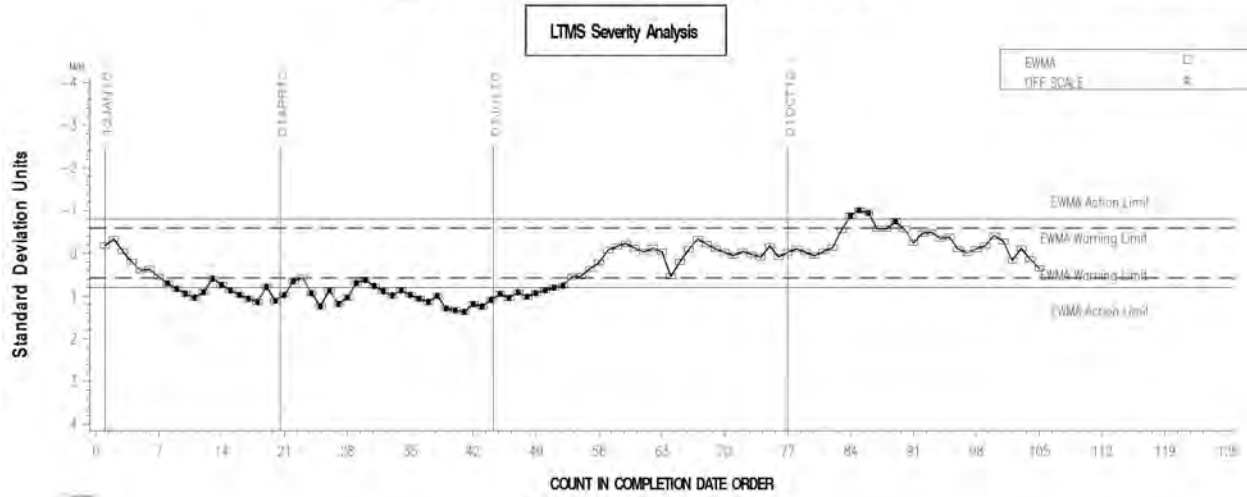
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LDEOC – ETHYLENE ACRYLATE INDUSTRY OPERATIONALLY VALID DATA



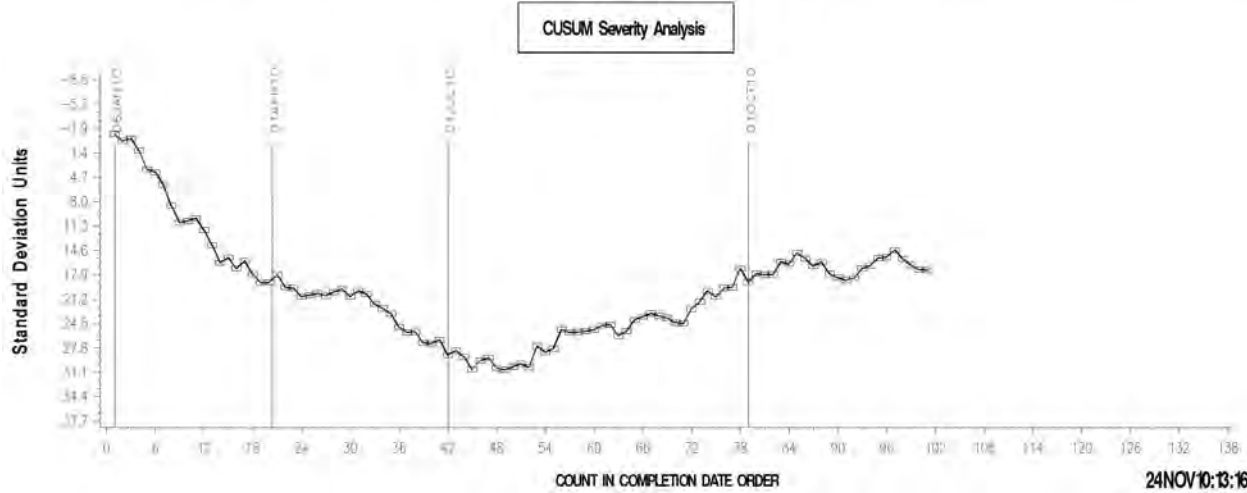
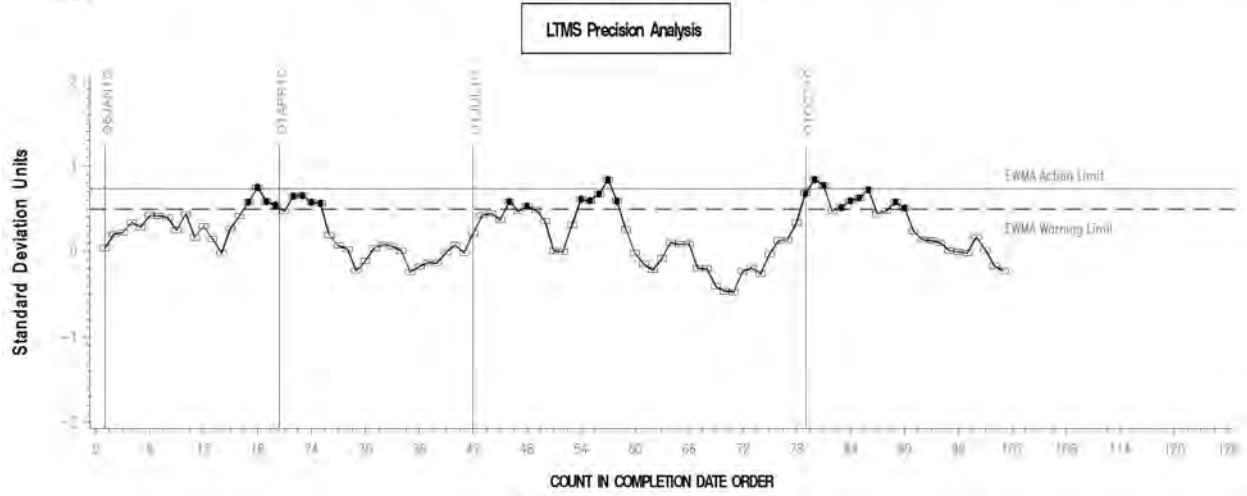
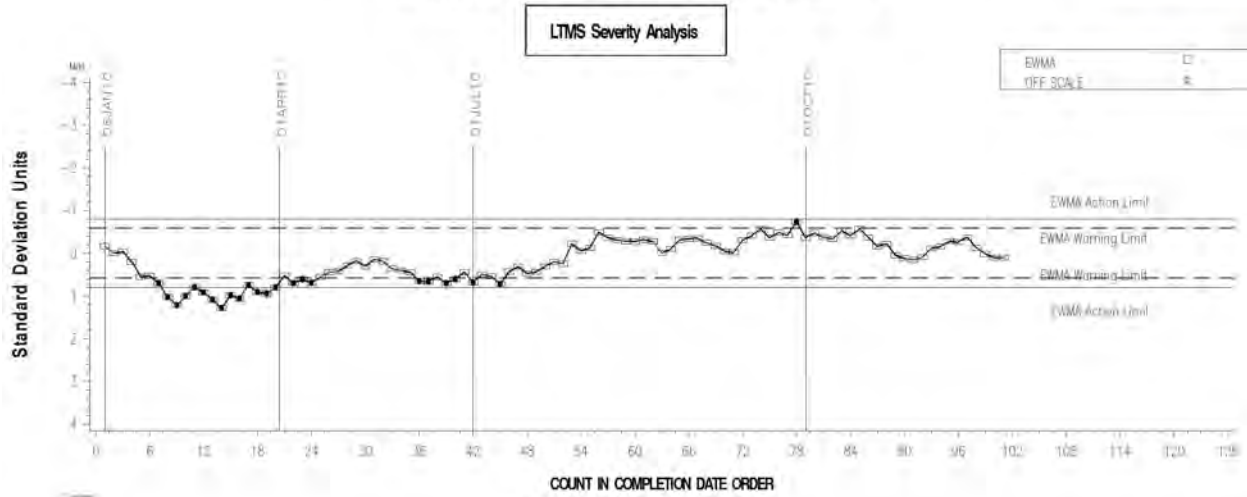
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LTDEC - FLUOROELASTOMER INDUSTRY OPERATIONALLY VALID DATA



REF FLUORO TENSILE STRENGTH CHANGE AVERAGE

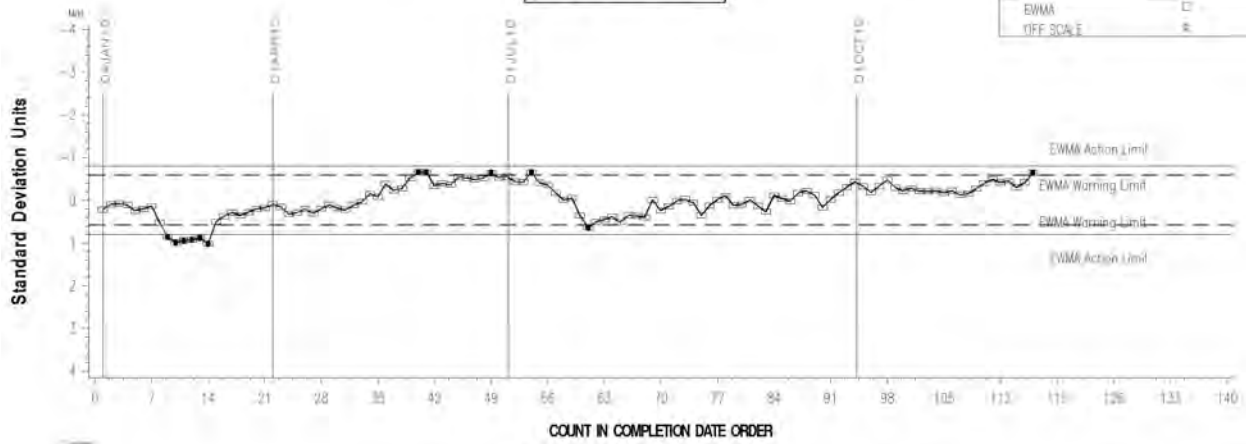


LDEOC – NITRILE INDUSTRY OPERATIONALLY VALID DATA

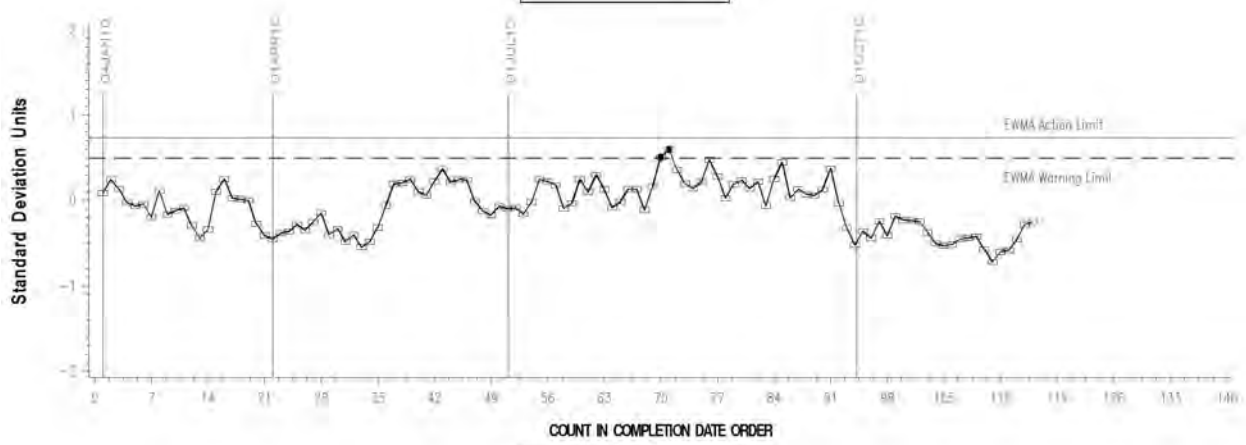


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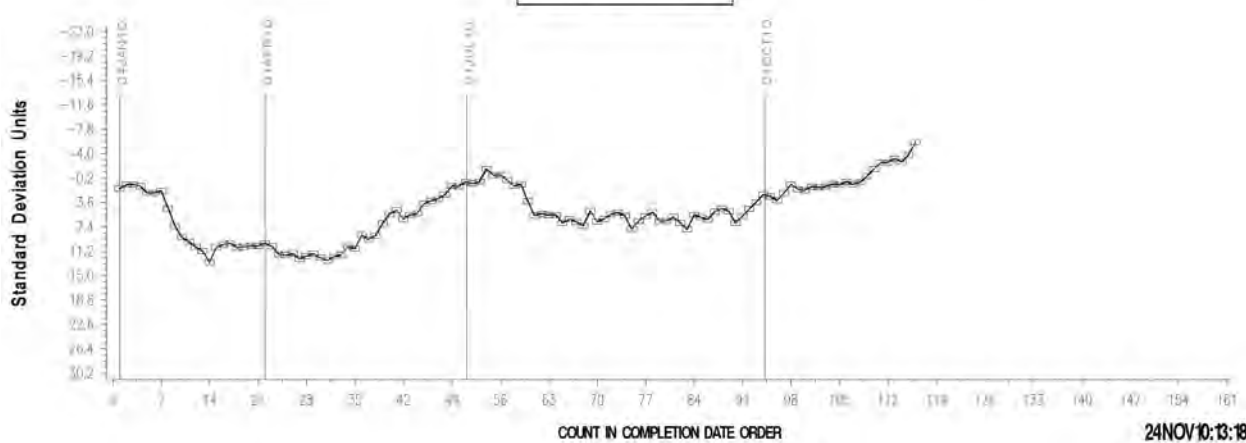
LTMS Severity Analysis



LTMS Precision Analysis



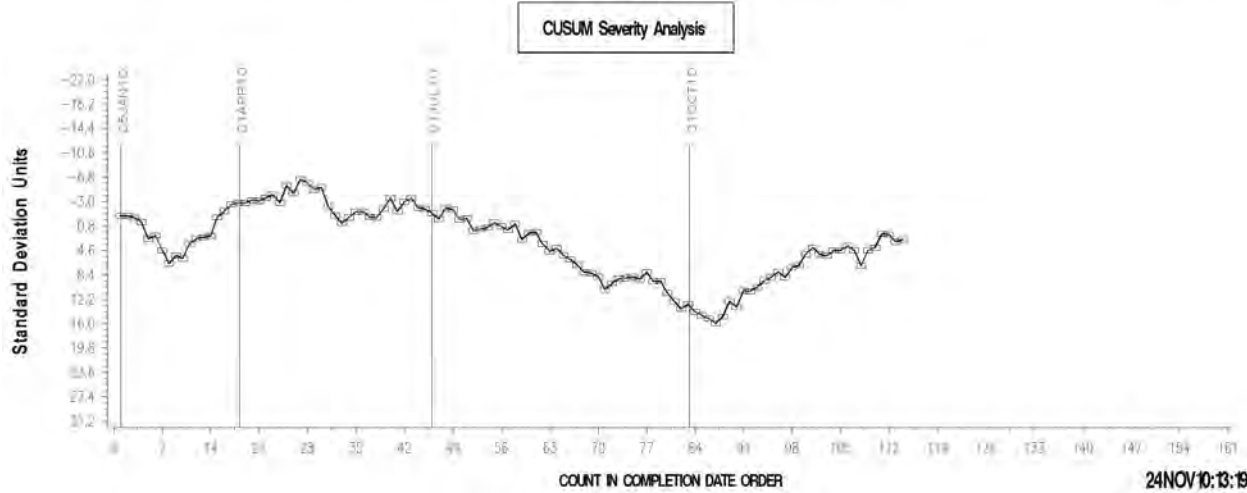
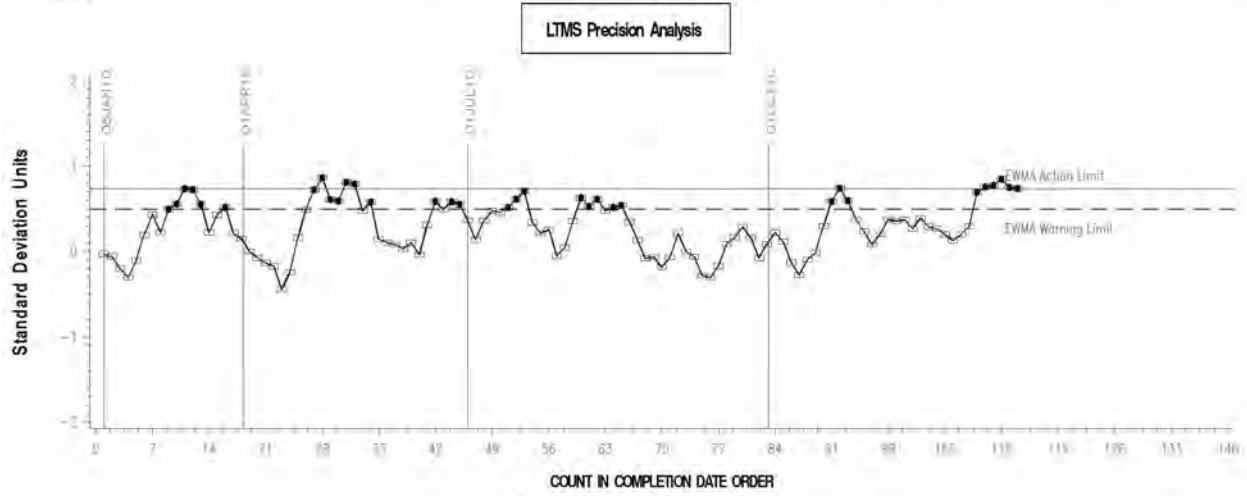
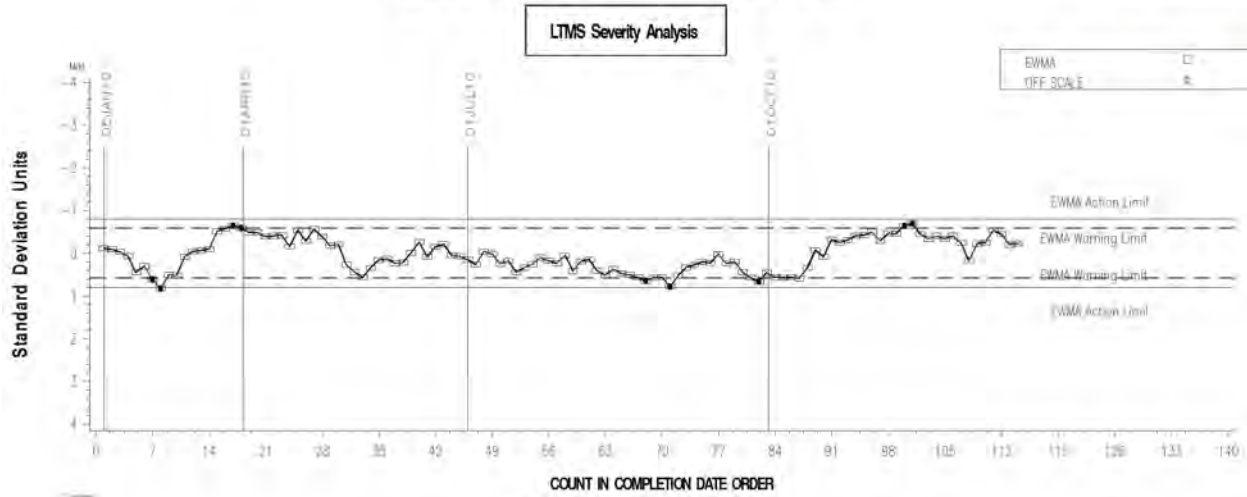
CUSUM Severity Analysis



LDEOC – POLYACRYLATE INDUSTRY OPERATIONALLY VALID DATA



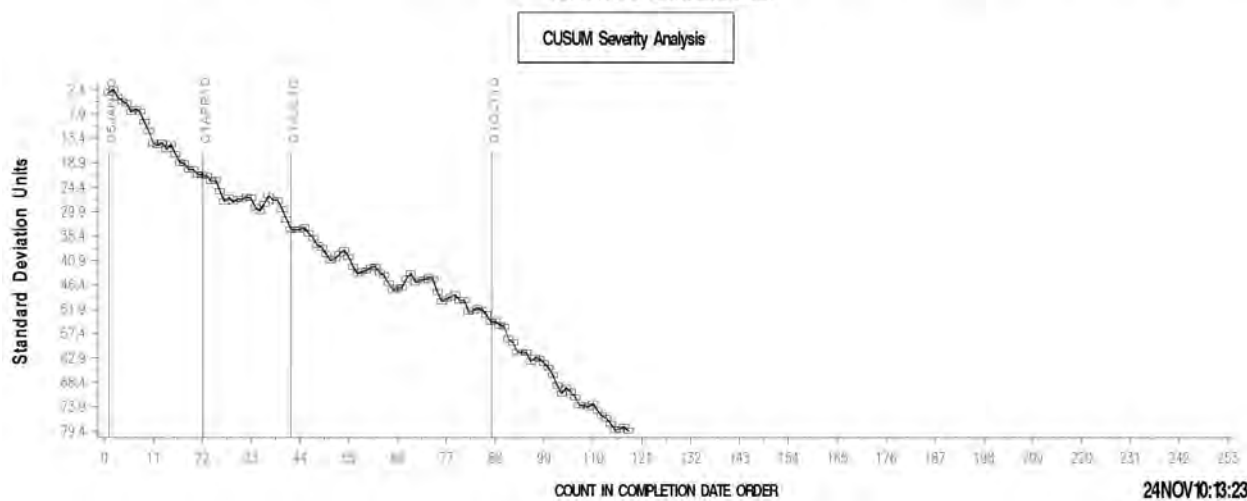
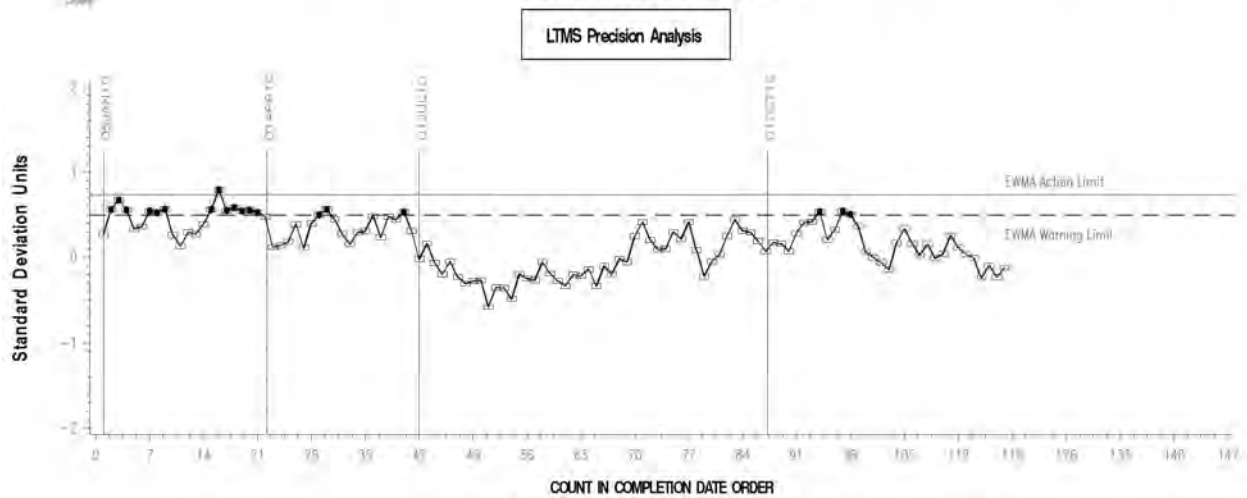
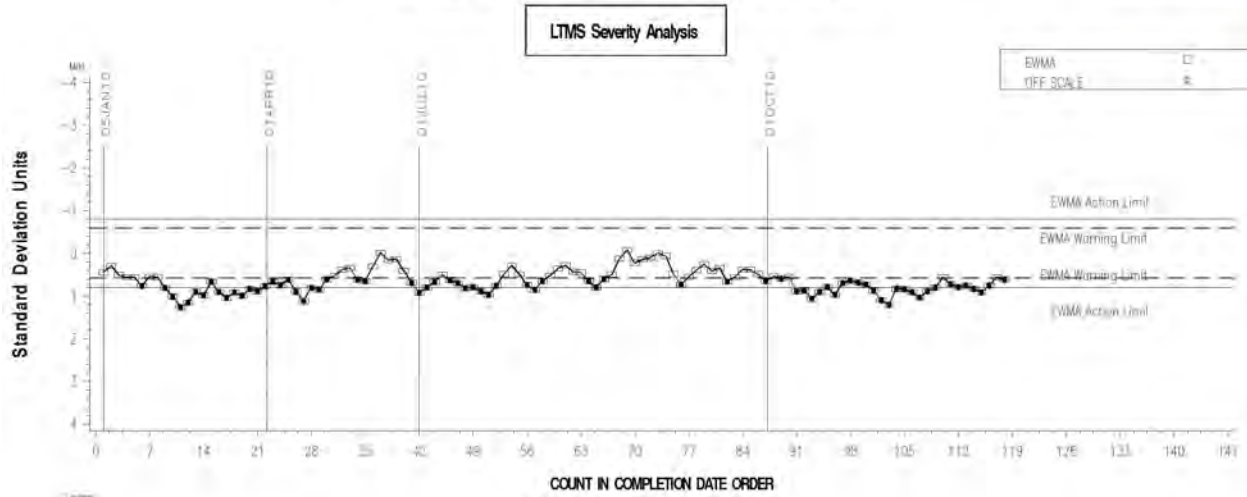
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LDEOC – SILICONE INDUSTRY OPERATIONALLY VALID DATA



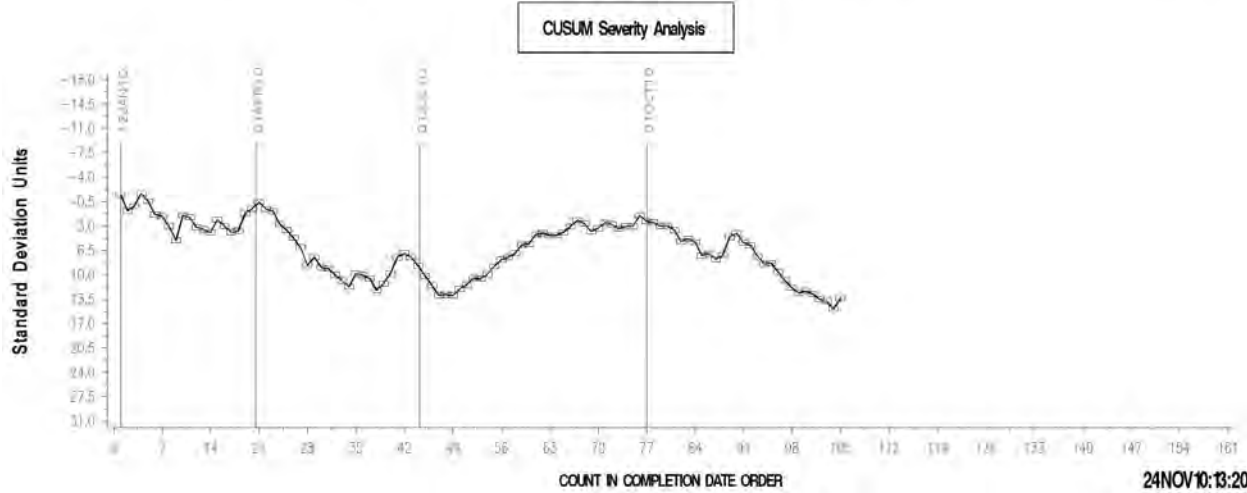
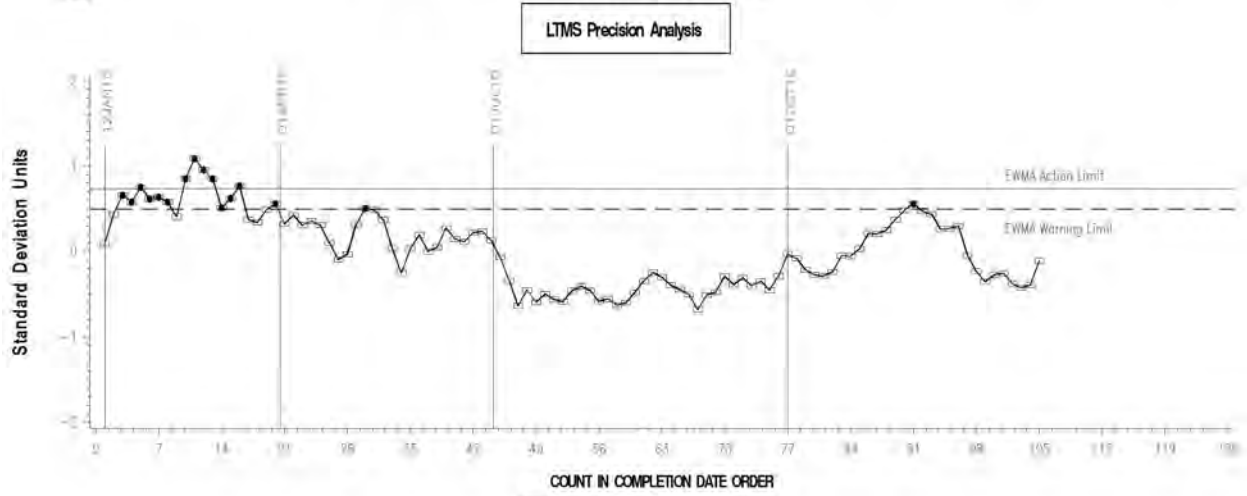
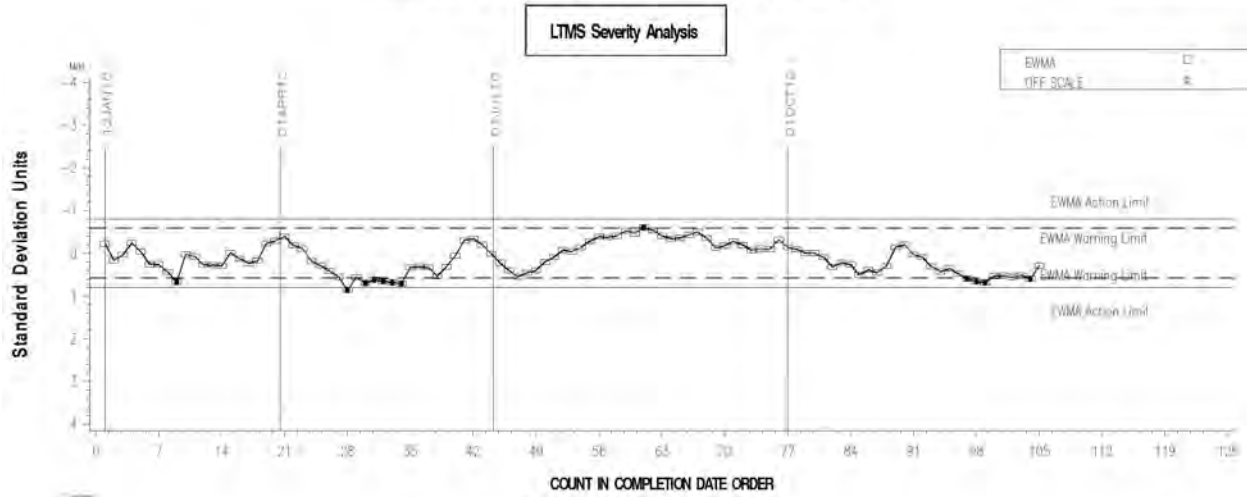
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LDEOC – ETHYLENE ACRYLATE INDUSTRY OPERATIONALLY VALID DATA

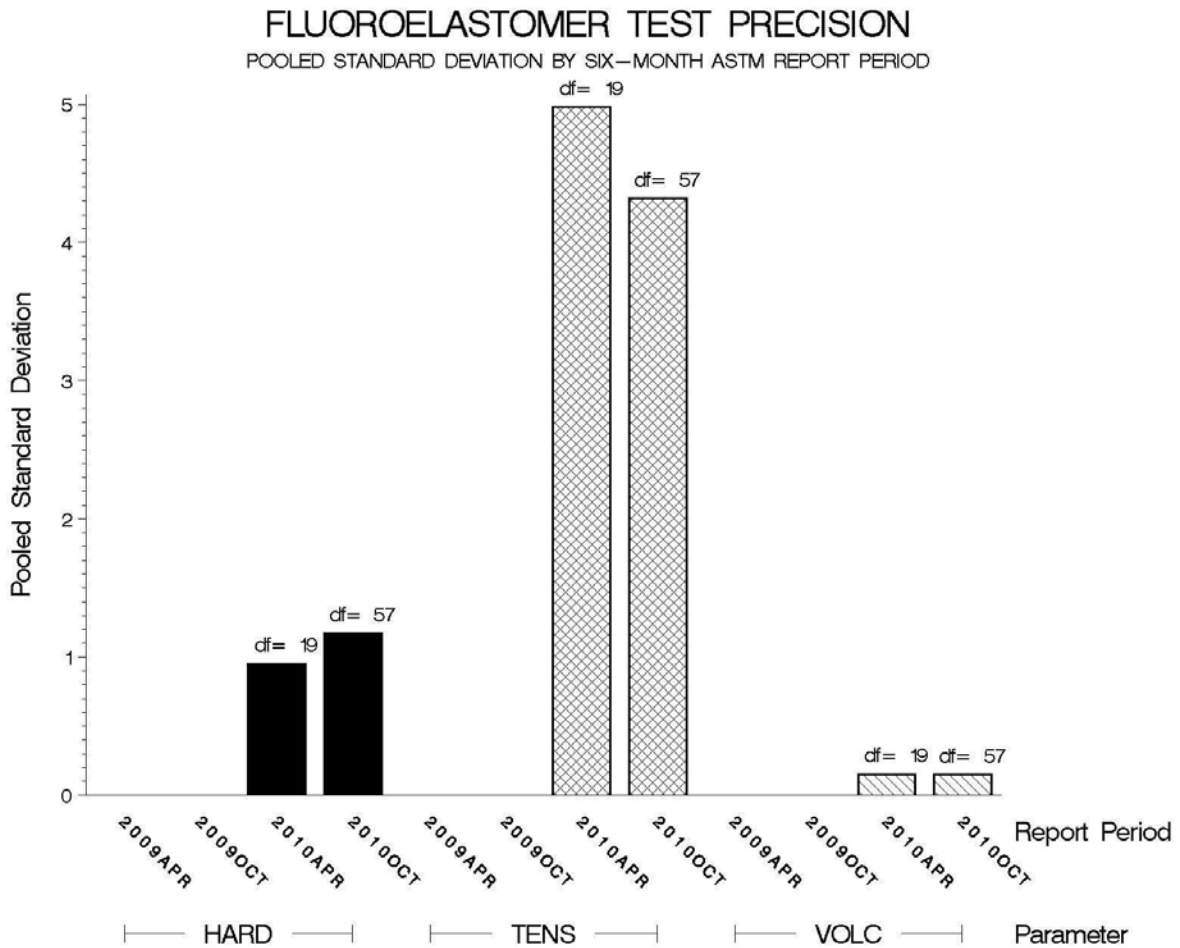


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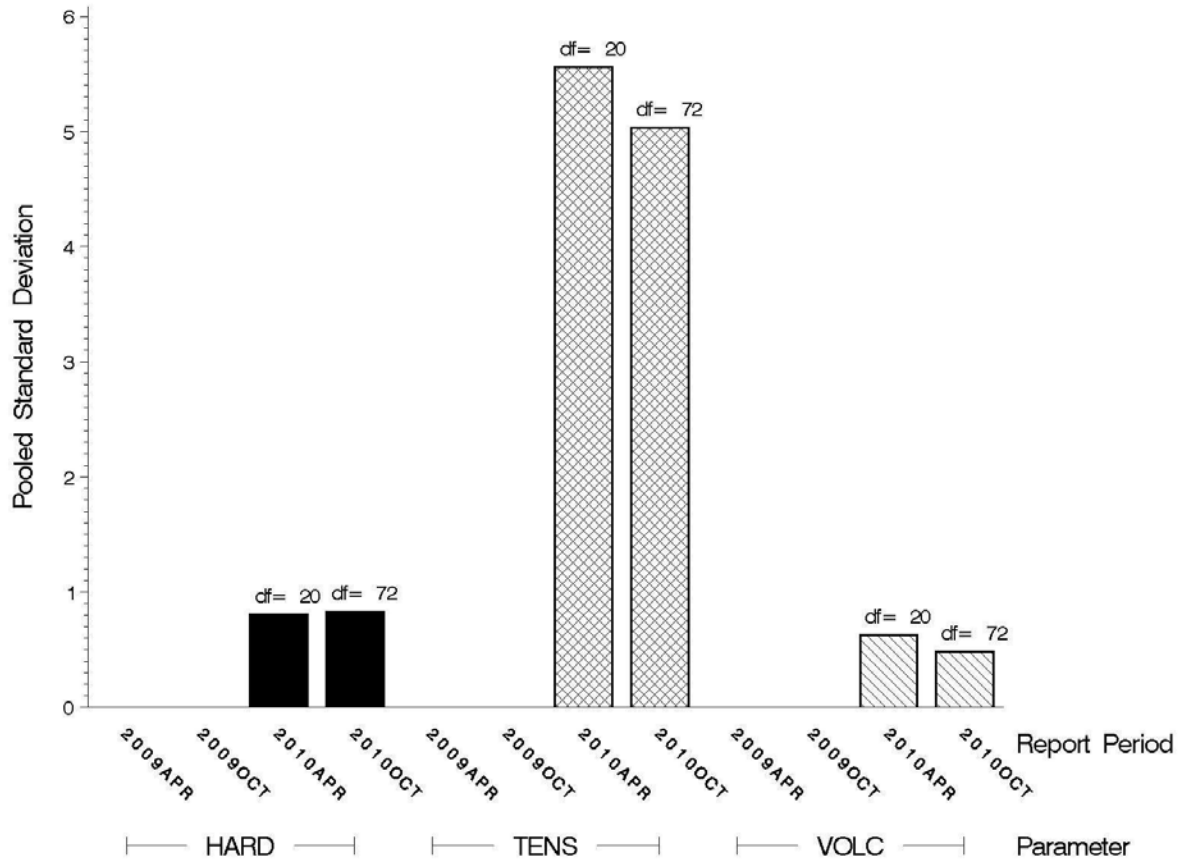
POOLED S:

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



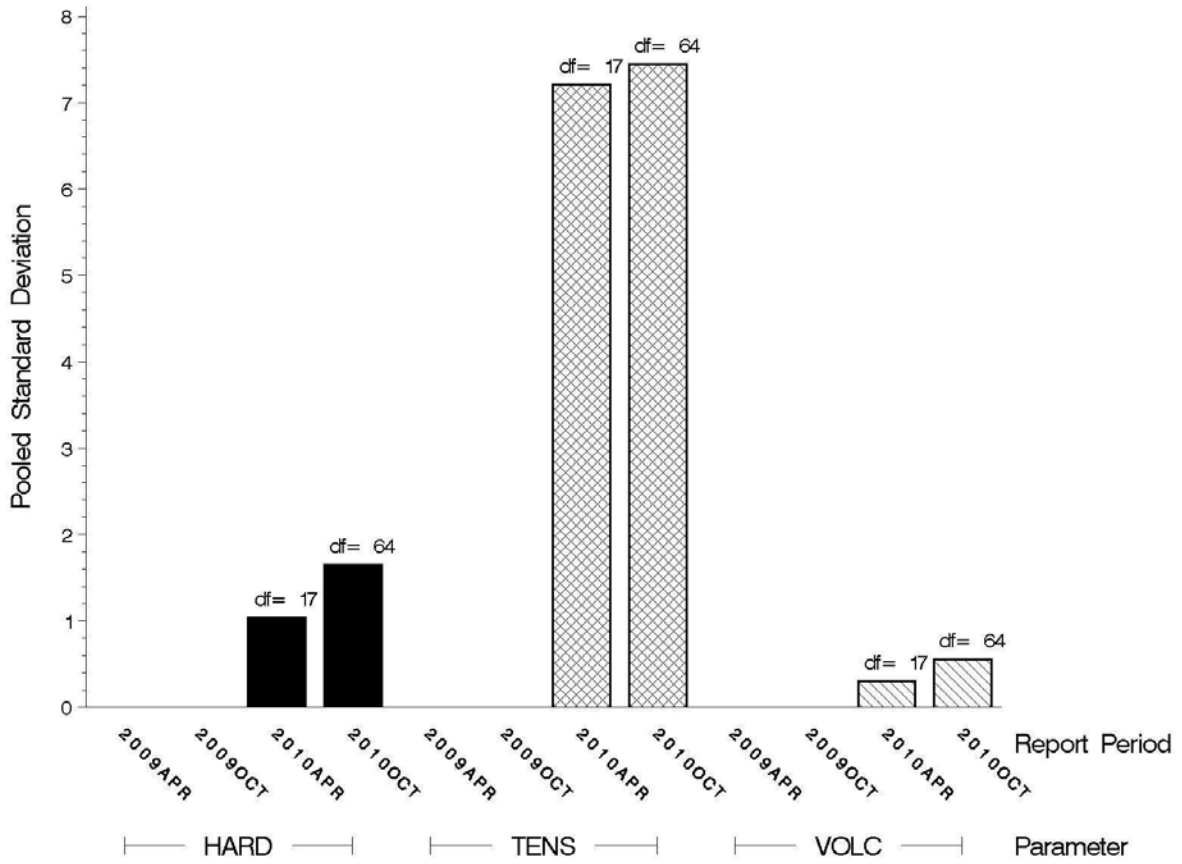
NITRILE TEST PRECISION

POOLED STANDARD DEVIATION BY SIX-MONTH ASTM REPORT PERIOD



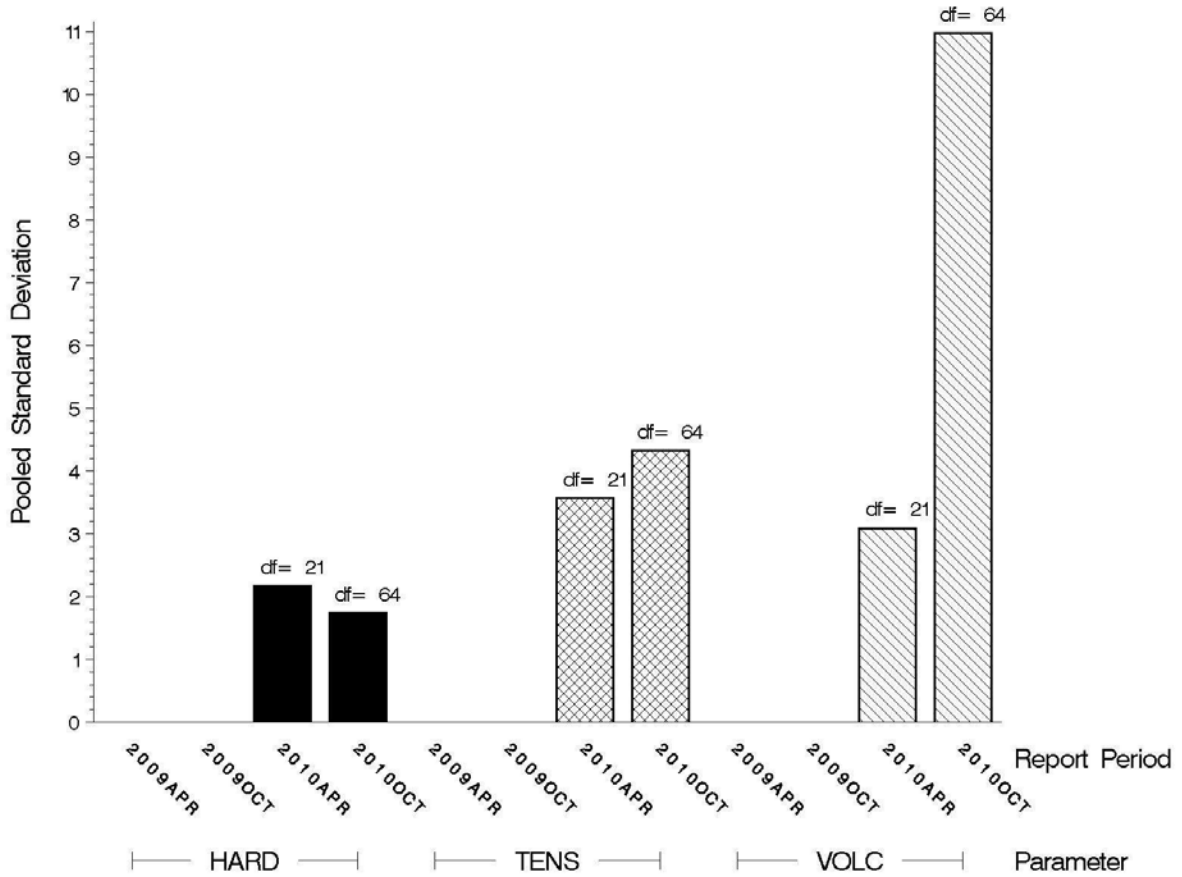
POLYACRYLATE TEST PRECISION

POOLED STANDARD DEVIATION BY SIX-MONTH ASTM REPORT PERIOD



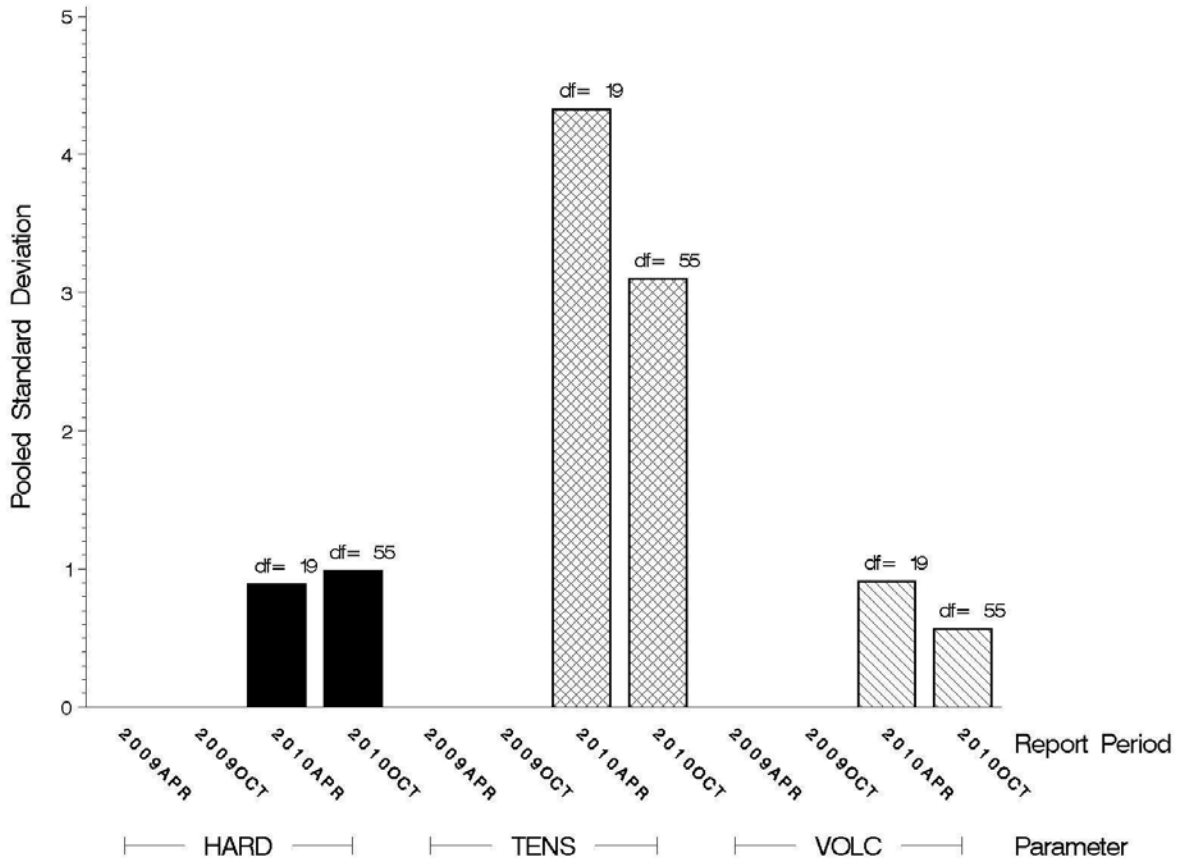
SILICONE TEST PRECISION

POOLED STANDARD DEVIATION BY SIX-MONTH ASTM REPORT PERIOD



ETHYLENE ACRYLATE TEST PRECISION

POOLED STANDARD DEVIATION BY SIX-MONTH ASTM REPORT PERIOD



STATUS OF REFERENCE OIL SUPPLY:

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

Oil	Cans @ Labs	@ TMC	
		Cans	Gallons
1006-1	346	9891	1960
Total	346	9891	1960

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

When the EOEC Surveillance Panel approved the introduction of the light duty elastomer materials into the EOEC test as the LDEOC, the panel approved a target update after six months as part of that action. These updated test targets are shown in Table A, below:

Table A: LDEOC Reference Oil 1006-1 Updated Test Targets			
Elastomer	Parameter	Mean	Standard Deviation
Hydrogenated Nitrile (N=48)	Volume Change, %	1.11	0.60
	Hardness Change, pts.	-1.15	0.87
	Tensile Strength Change, %	-2.08	4.87
Polyacrylate (N=42)	Volume Change, %	4.21	0.32
	Hardness Change, pts.	-5.33	1.03
	Tensile Strength Change, %	-4.82	6.85
Fluoroelastomer (N=38)	Volume Change, %	0.69	0.15
	Hardness Change, pts.	3.47	1.01
	Tensile Strength Change, %	-52.28	4.34
Silicone (N=39)	Volume Change, %	32.99	2.67
	Hardness Change, pts.	-21.56	2.04
	Tensile Strength Change, %	-38.06	3.79
Ethylene Acrylate (N=42)	Volume Change, %	24.85	0.77
	Hardness Change, pts.	-12.43	0.91
	Tensile Strength Change, %	-15.30	3.87

These targets were effective on July 15, 2010.

INFORMATION LETTERS:

No Information Letters were issued this period.

SUMMARY

**Summary of Severity
as Measured by LTMS Control Charting**

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

MTK/mtk/astm1010.doc/mem10-065.mtk.doc

c: F. M. Farber
 J. A. Clark
 EOEC Surveillance Panel
<ftp://ftp.astmtmc.cmu.edu/docs/bench/ldeoc/semiannualreports/ldeoc-10-2010.pdf>

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