Test Monitoring Center

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

A Program of ASTM International

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

MEMORANDUM: 13-034

DATE: May 21, 2013

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

FROM: Michael T. Kasimirsky

SUBJECT: EOEC Testing from October 1, 2012 through March 31, 2013

        A total of 228 EOEC tests were reported to the Test Monitoring Center during the period from
October 1, 2012 through March 31, 2013. Following is a summary of testing activity this period.
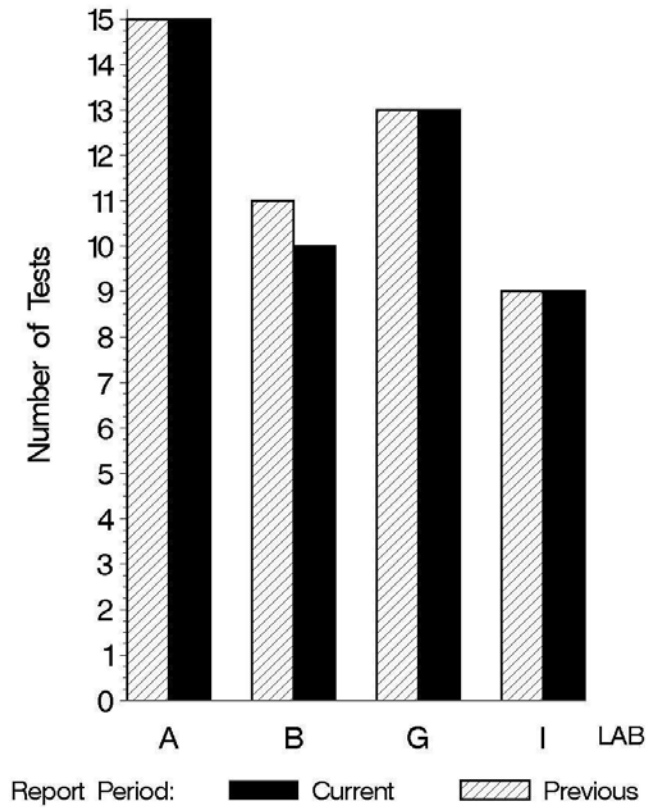
	Reporting Data
Number of Labs	4

Tests reported this period were distributed as shown below:

NUMBER OF FLUOROELASTOMER TESTS REPORTED BY LAB AND REPORT PERIOD
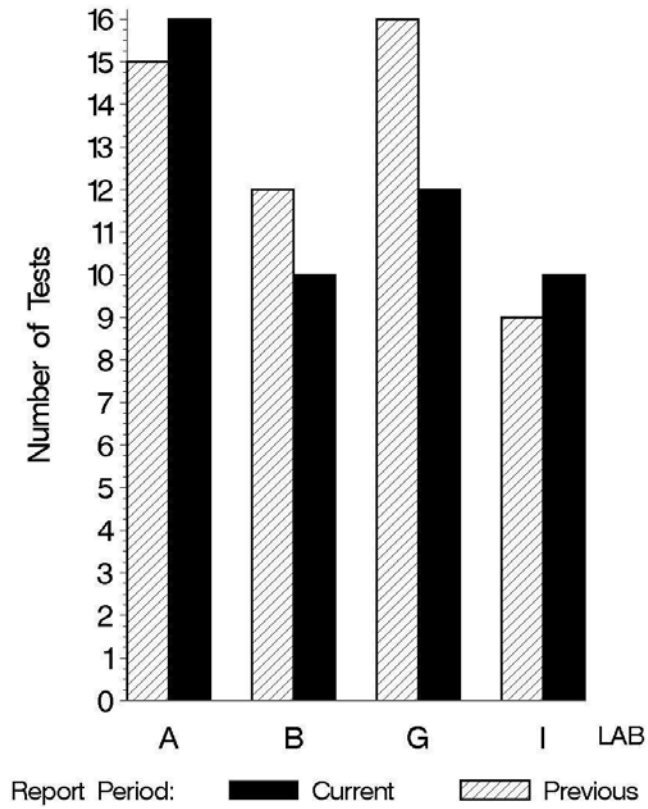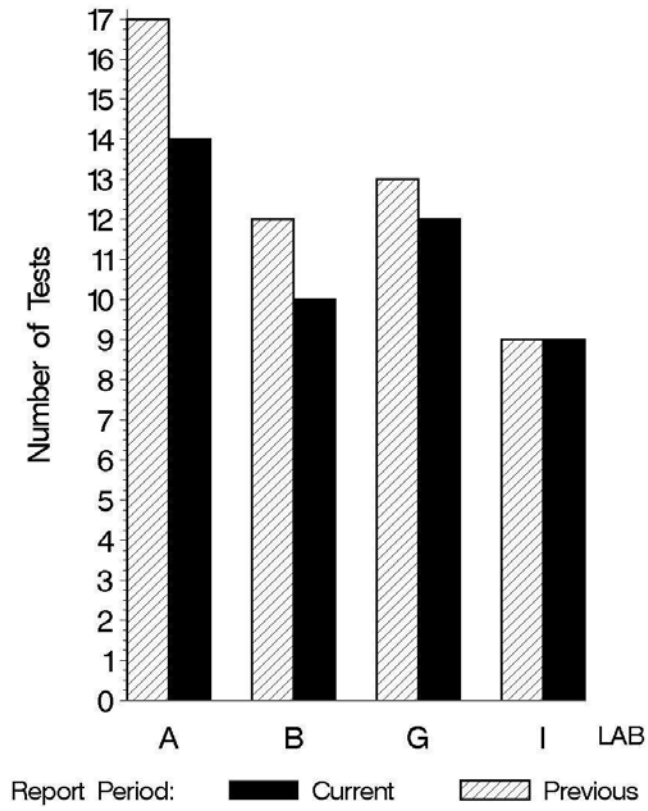

Report Period: ■ Current   ▨ Previous
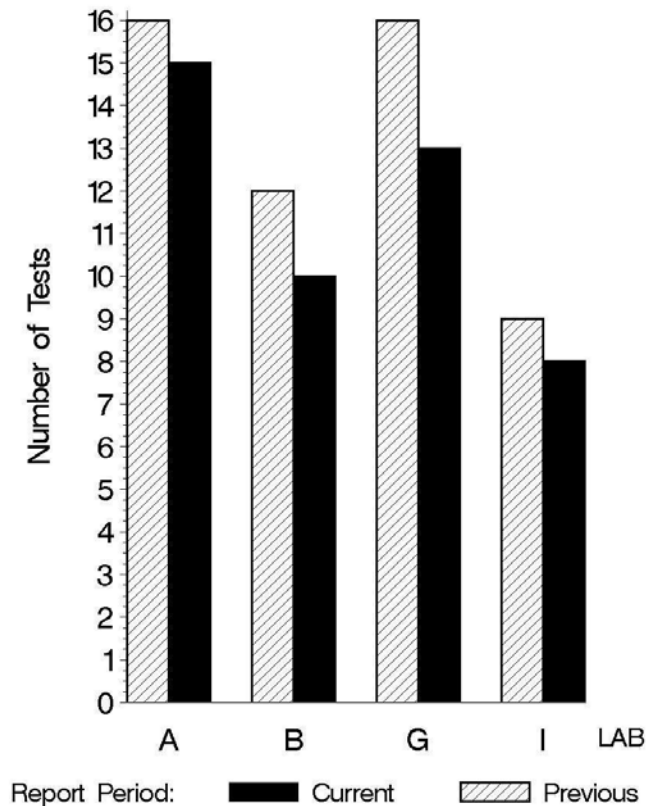
NUMBER OF NITRILE TESTS
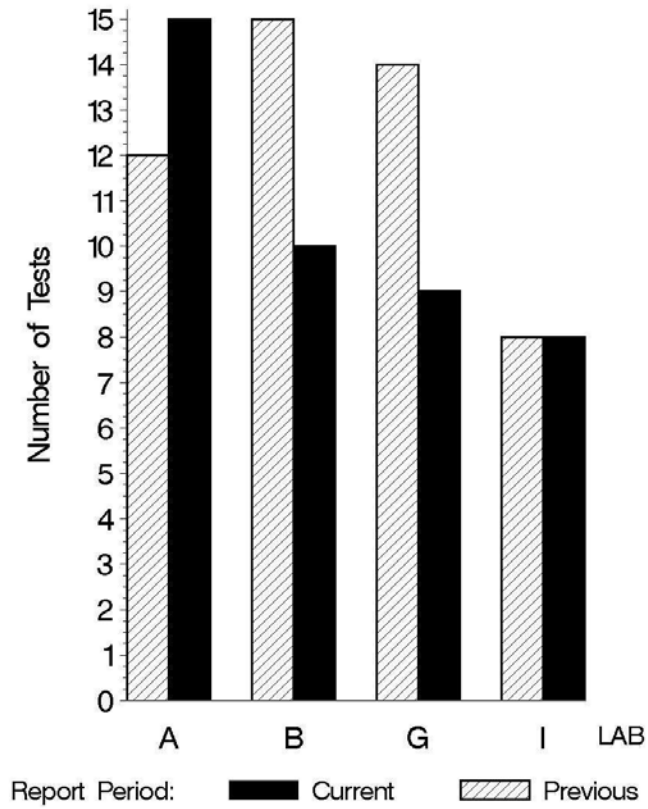## REPORTED BY LAB AND REPORT PERIOD

NUMBER OF POLYACRYLATE TESTS
REPORTED BY LAB AND REPORT PERIOD

## NUMBER OF SILICONE TESTS
REPORTED BY LAB AND REPORT PERIOD

NUMBER OF VAMAC TESTS
REPORTED BY LAB AND REPORT PERIOD

Test Distribution by Oil and Validity

Totals

		Fluoroelastomer	Nitrile	Polyacrylate	Silicone	Vamac	This Period	Last Period
Accepted for Calibration	AC	45	45	48	45	42	225	245
Rejected	OC	0	0	0	0	0	0	2
Information Run (not for calibration)	NI	0	0	0	0	0	0	4
Operationally Invalid (lab)	LC	1	2	0	0	0	3	1
Operationally Invalid (lab/TMC)	RC	0	0	0	0	0	0	0
Aborted Calibration	XC	0	0	0	0	0	0	1
Total		46	47	48	45	42	228	253

OPERATIONALLY VALID TESTS
MEETING ACCEPTANCE CRITERIA
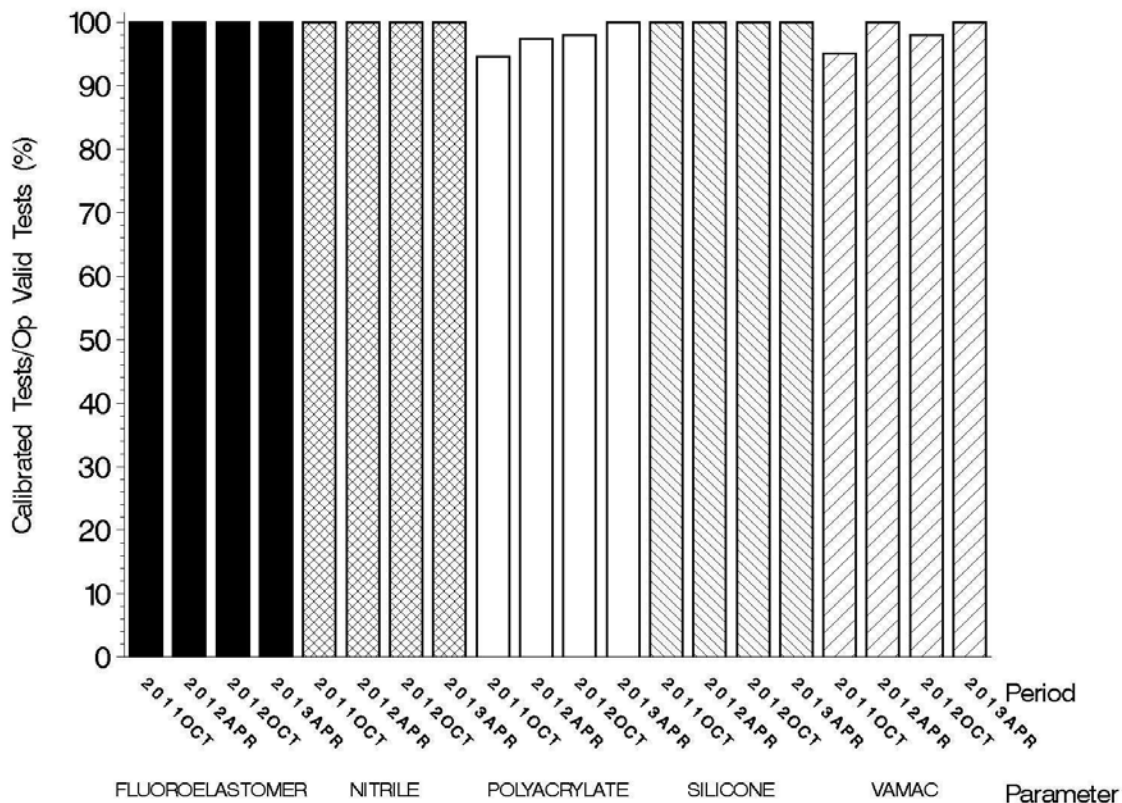
The above chart shows the percentage of accepted operationally valid tests. This period no tests failed to meet the acceptance criteria.

Lost Tests per Start by Lab and Elastomer Type

Lab	Fluoroelastomer			Nitrile			Polyacrylate			Silicone			Vamac			Total		
	Lost	Starts	%	Lost	Starts	%	Lost	Starts	%	Lost	Starts	%	Lost	Starts	%	Lost	Starts	%
A	0	15	0	0	15	0	0	16	0	0	14	0	0	15	0	0	75	0
B	0	10	0	0	10	0	0	10	0	0	10	0	0	10	0	0	50	0
G	1	13	8	2	13	15	0	12	0	0	12	0	0	9	0	3	59	5
I	0	8	0	0	9	0	0	10	0	0	9	0	0	8	0	0	44	0
Total	1	46	2	2	47	4	0	48	0	0	45	0	0	42	0	3	228	1

Lost tests are those that were aborted or operationally invalid.

Causes for Lost Tests

Lab	Cause	Elastomer					Validity			Loss Rate		
		Fluoroelastomer	Nitrile	Polyacrylate	Silicone	VAMAC	LC	RC	XC	Lost	Starts	%
G	Wrong Temperature		●				●			1	228	0.4
	Wrong Material Run	●	●				●			2	228	0.8
	Lost	1	2	0	0	0	3	0	0			
	Starts	46	47	48	45	42	228	228	228			
	%	2	4	0	0	0	1	0	0			

Average Δ/s by Lab						
Elastomer	Lab	n	VOLCYI	HARDYI	TENSYI	ELONYI
Fluoroelastomer	A	15	-0.212	0.530	-0.522	-0.997
	B	10	0.149	0.545	0.069	-0.849
	G	12	-0.512	-0.553	0.127	-0.447
	I	8	0.802	0.091	-0.064	-0.374
	Industry	45	-0.032	0.167	-0.136	-0.707
Nitrile	A	15	1.410	1.203	0.019	-0.588
	B	10	1.775	1.599	0.390	-0.173
	G	11	1.053	1.316	-0.576	-0.634
	I	9	1.886	1.191	-0.301	-0.909
	Industry	45	1.499	1.316	-0.108	-0.571
Polyacrylate	A	16	0.742	0.249	-0.176	1.197
	B	10	1.220	0.394	0.223	0.926
	G	12	0.900	1.533	0.240	1.124
	I	10	1.592	0.561	-0.956	0.749
	Industry	48	1.058	0.665	-0.152	1.029
Silicone	A	14	-0.202	-0.187	0.346	0.782
	B	10	0.778	0.146	-1.300	1.089
	G	12	1.516	1.306	-0.868	0.749
	I	9	0.486	-0.187	-1.632	0.070
	Industry	45	0.611	0.285	-0.739	0.699
VAMAC	A	15	-0.148	-2.065	0.213	0.217
	B	10	0.505	-1.137	-0.178	-0.024
	G	9	0.267	-0.158	0.633	-0.075
	I	8	0.541	-1.505	-0.397	-1.179
	Industry	42	0.228	-1.329	0.094	-0.169

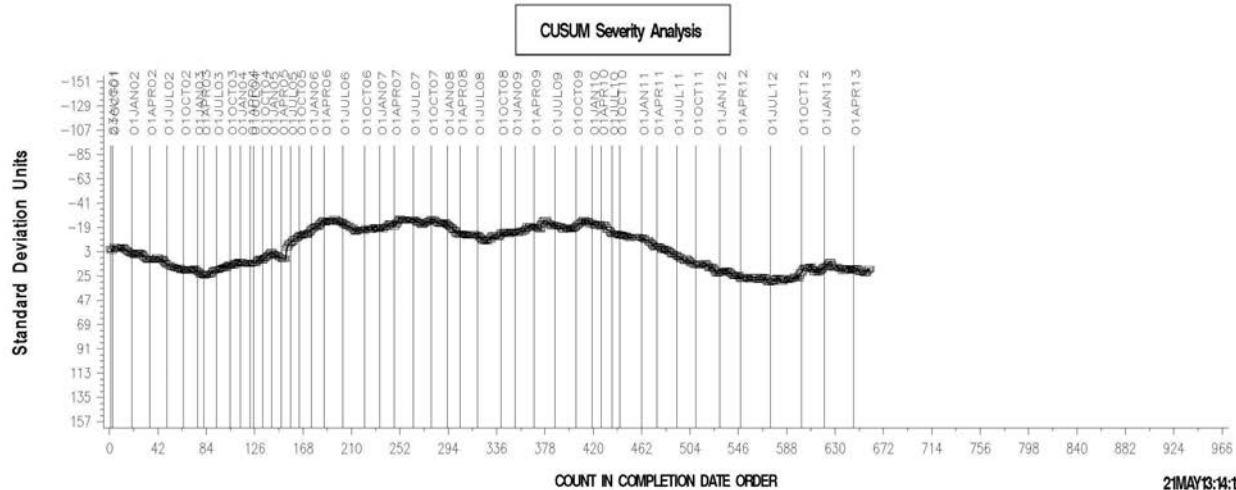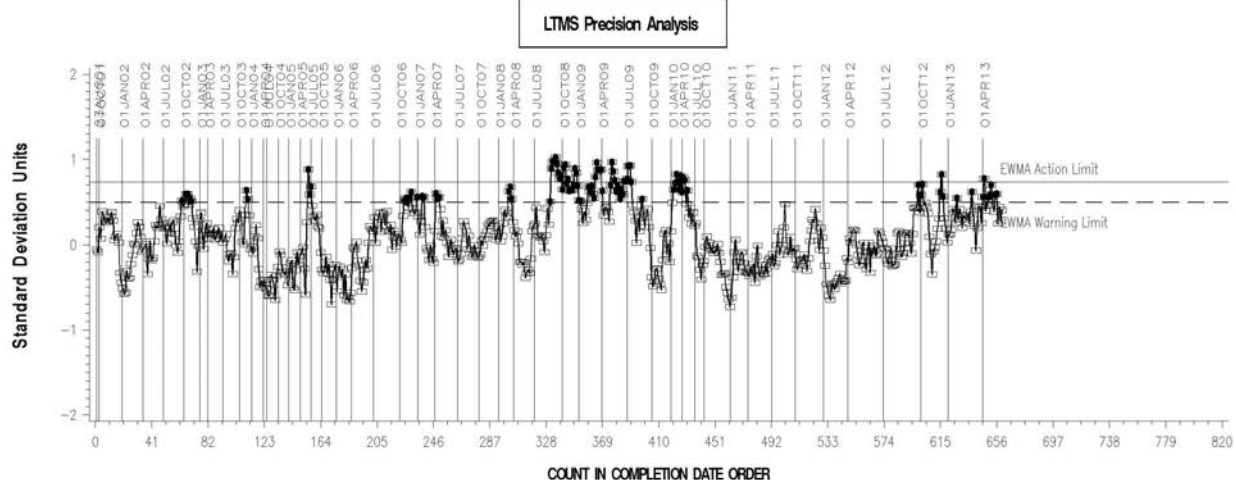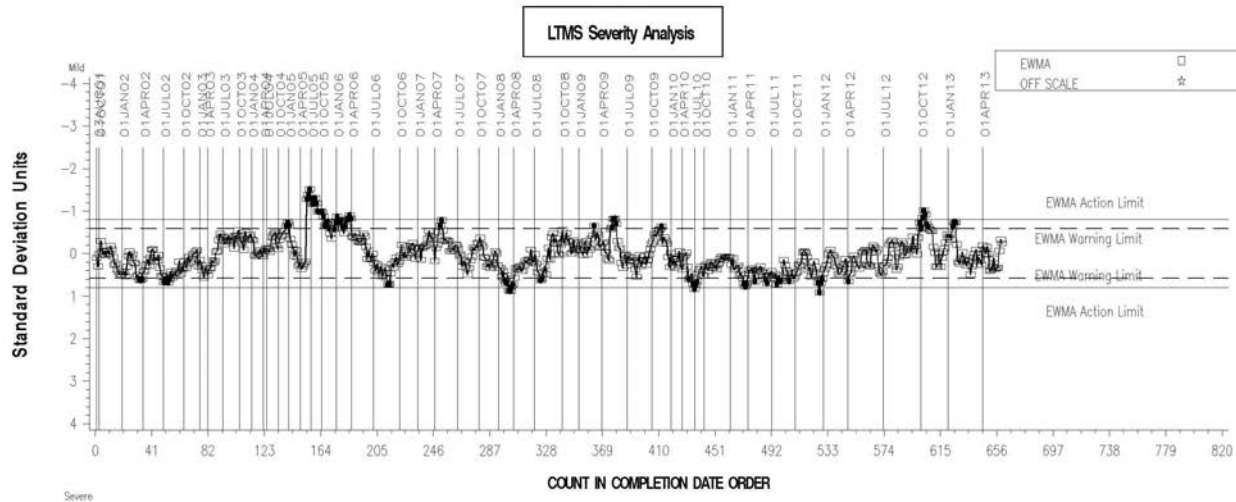Individual test results can be viewed at the links shown in the following table:

Links to Individual Test Result Data	
Elastomer Type	**Web Link to Data**
Fluoroelastomer	ftp://ftp.astmtmc.cmu.edu/refdata/bench/eoecf/data/
Nitrile	ftp://ftp.astmtmc.cmu.edu/refdata/bench/eoecn/data/
Polyacrylate	ftp://ftp.astmtmc.cmu.edu/refdata/bench/eoecp/data/
Silicone	ftp://ftp.astmtmc.cmu.edu/refdata/bench/eoecs/data/
VAMAC	ftp://ftp.astmtmc.cmu.edu/refdata/bench/eoecv/data/

LTMS CONTROL CHARTS
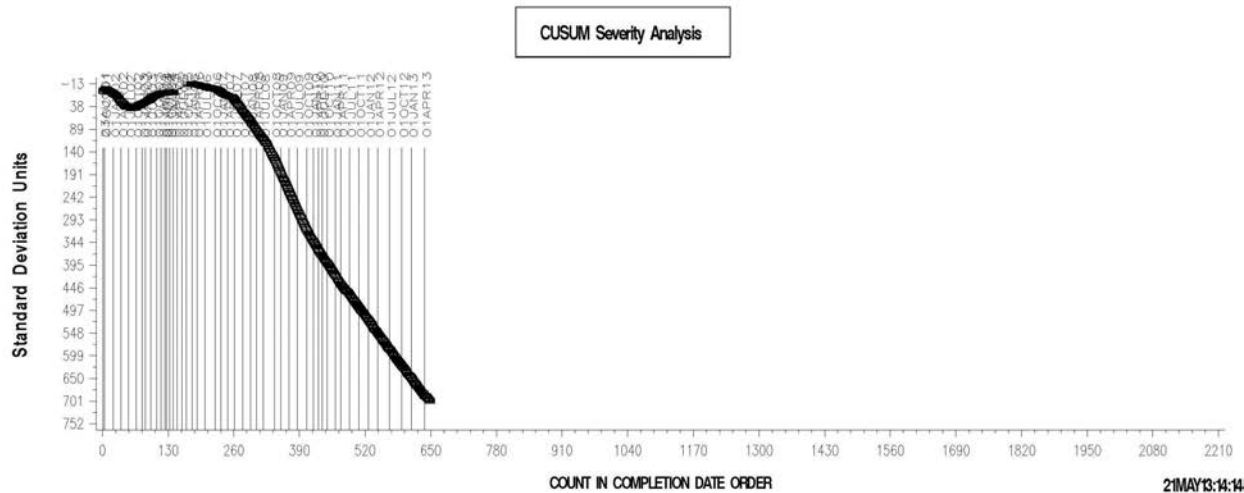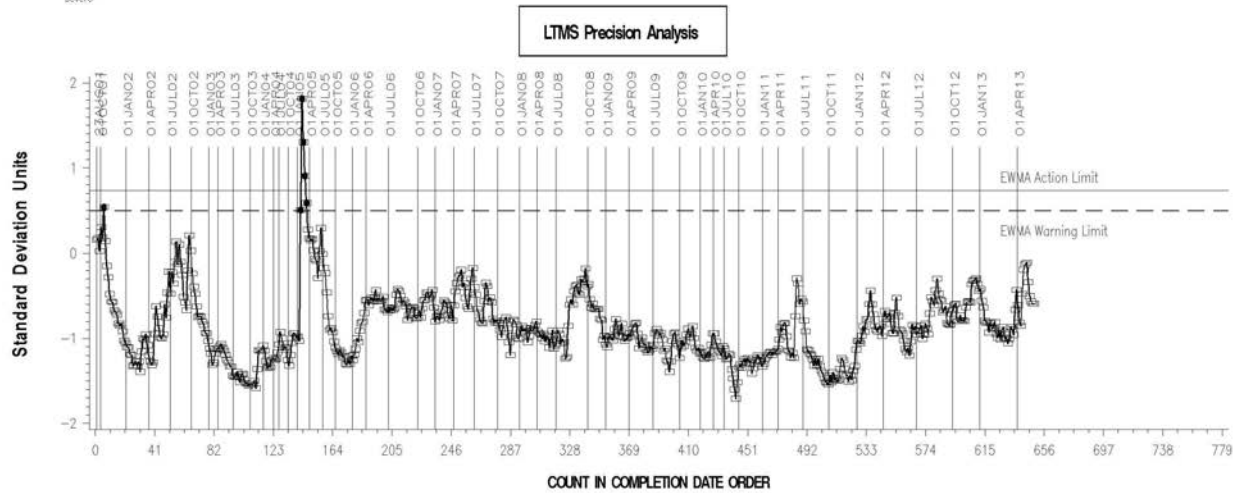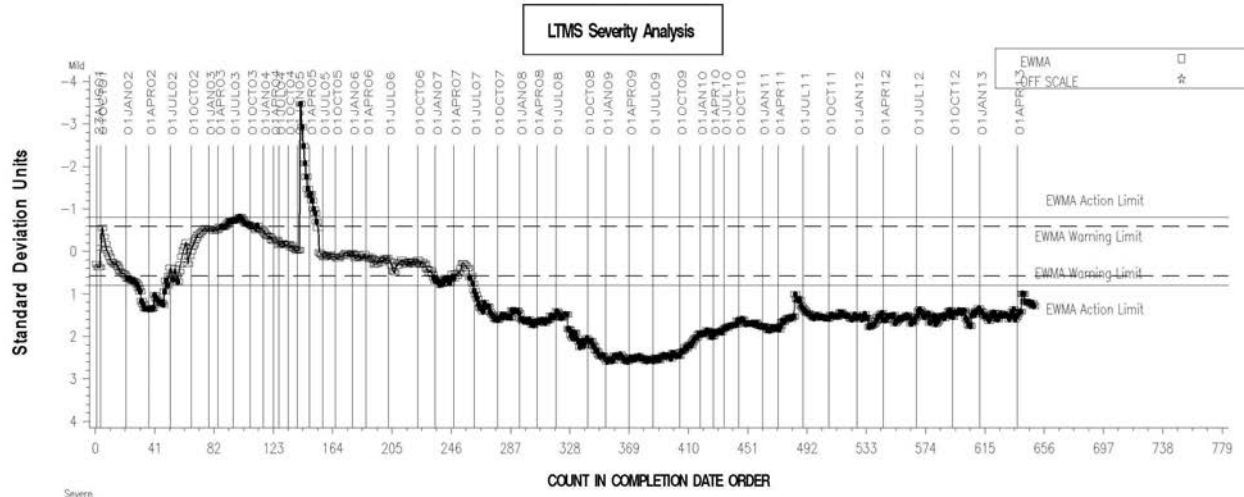

EOEC – FLUOROELASTOMER INDUSTRY OPERATIONALLY VALID DATA

FLUOROELASTOMER VOLUME CHANGE AVG.

EOEC – NITRILE INDUSTRY OPERATIONALLY VALID DATA

REFERENCE NITRILE VOLUME CHANGE AVERAGE

LTMS Severity Analysis

LTMS Precision Analysis

CUSUM Severity Analysis

21MAY13:14:14

EOEC — POLYACRYLATE INDUSTRY OPERATIONALLY VALID DATA

REFERENCE POLYACRYLATE VOLUME CHANGE AVERAGE

LTMS Severity Analysis

LTMS Precision Analysis

CUSUM Severity Analysis

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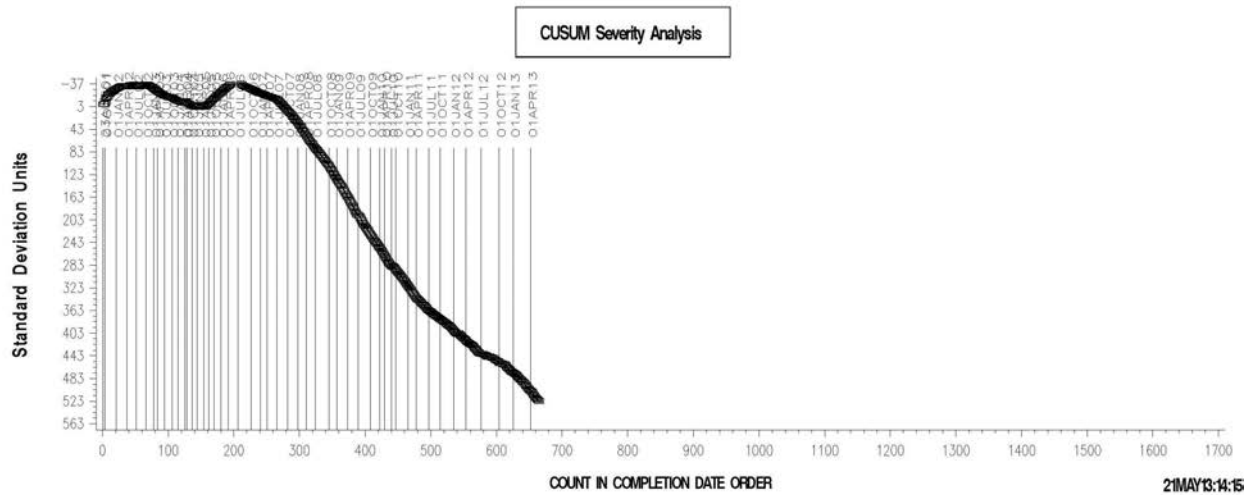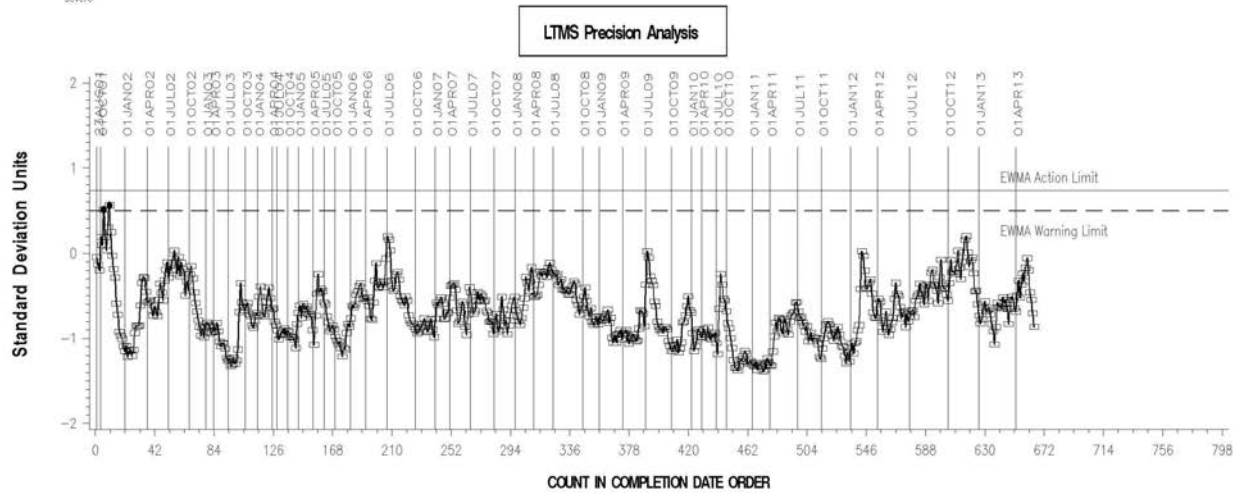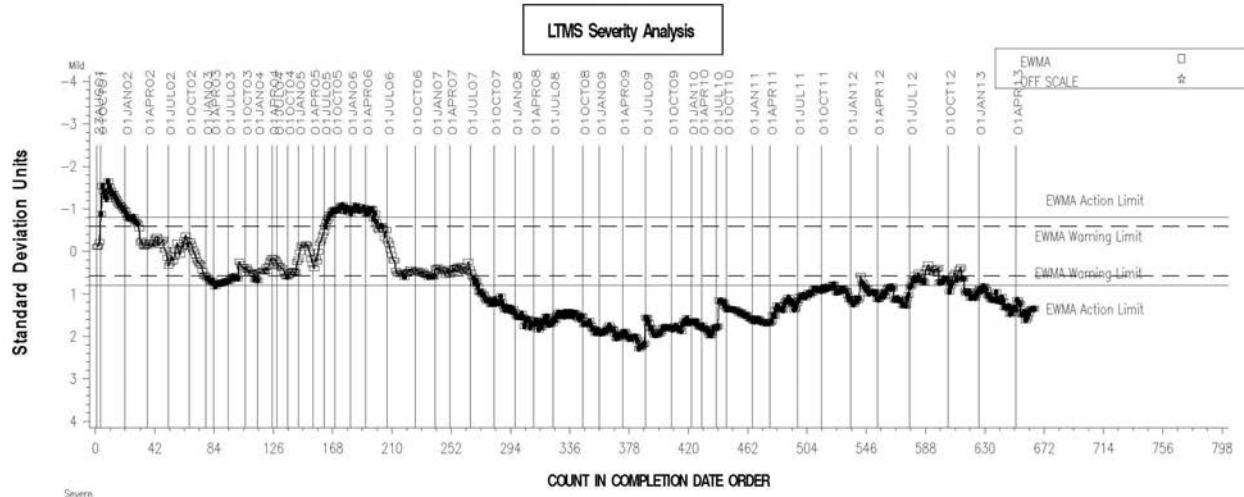
EOEC – SILICONE INDUSTRY OPERATIONALLY VALID DATA

REFERENCE SILICON VOLUME CHANGE AVERAGE
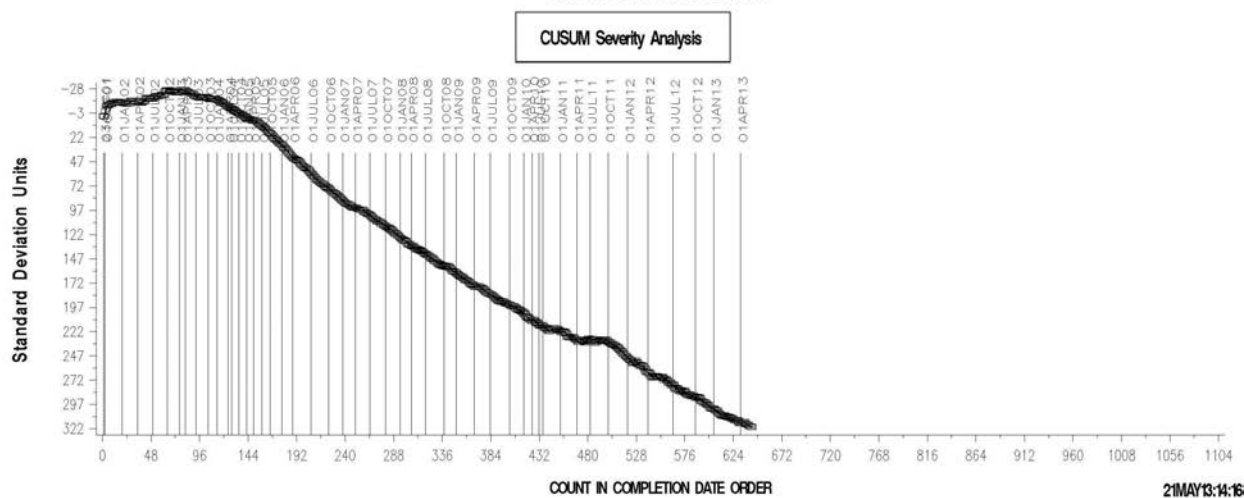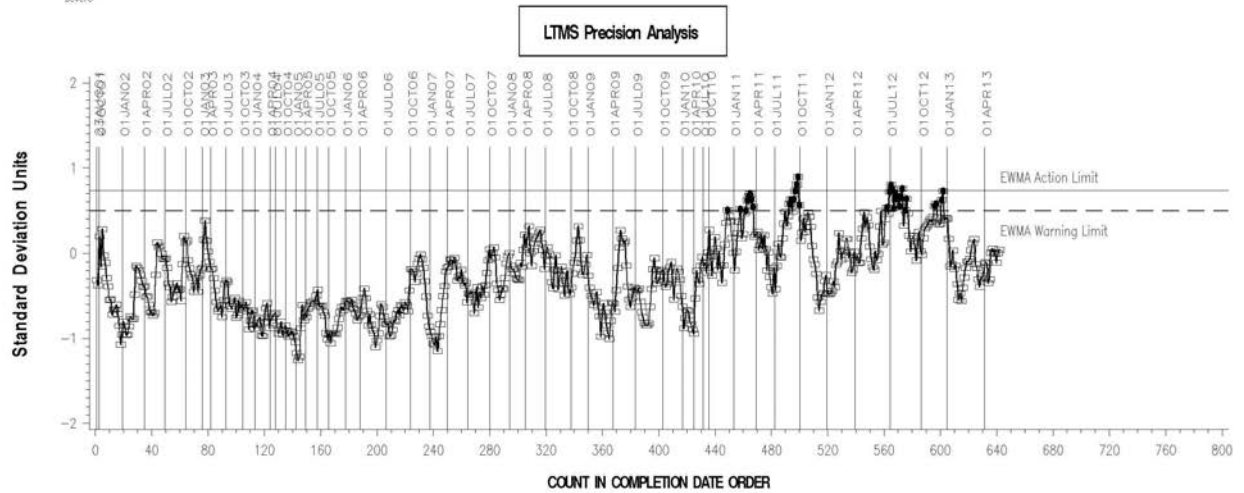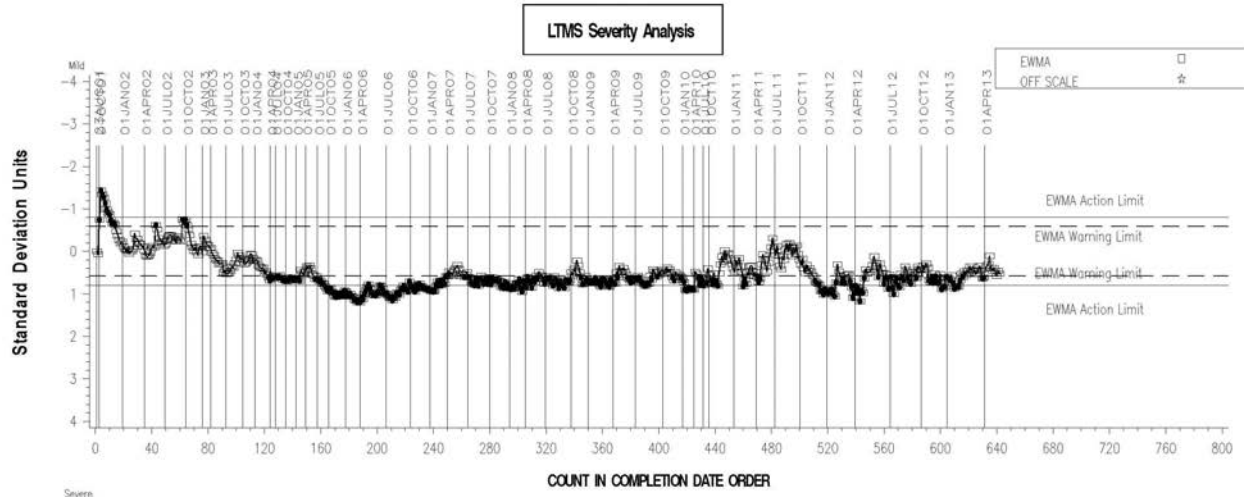
EOEC — VAMAC INDUSTRY OPERATIONALLY VALID DATA

REFERENCE VAMAC G VOLUME CHANGE AVERAGE

LTMS Severity Analysis

LTMS Precision Analysis

CUSUM Severity Analysis

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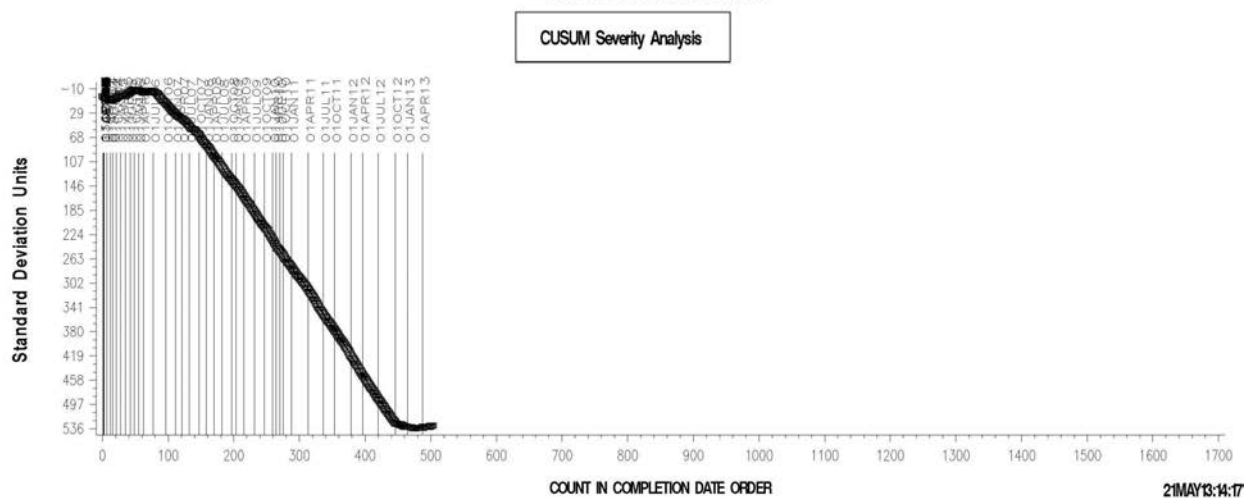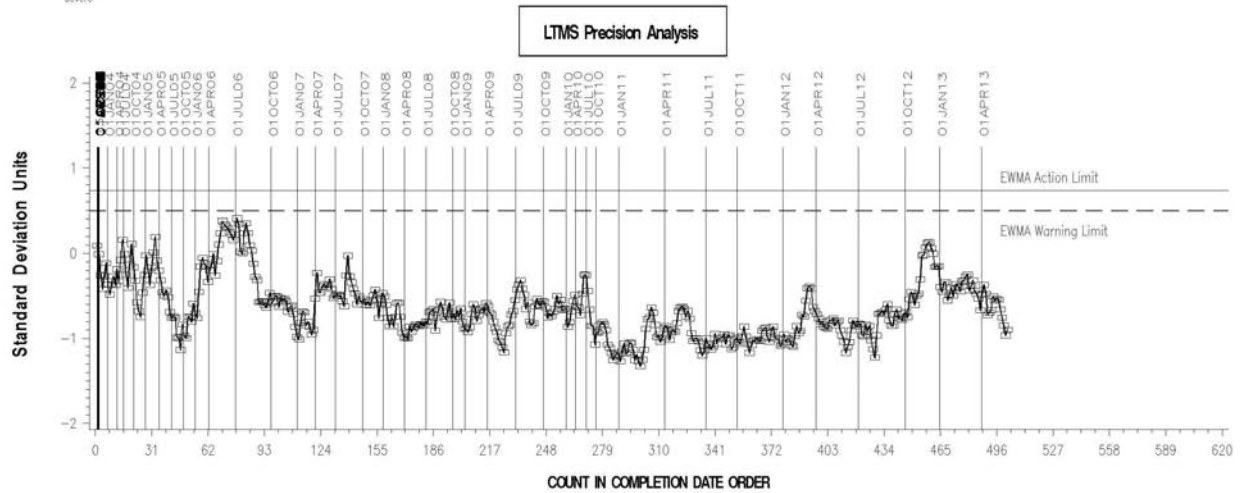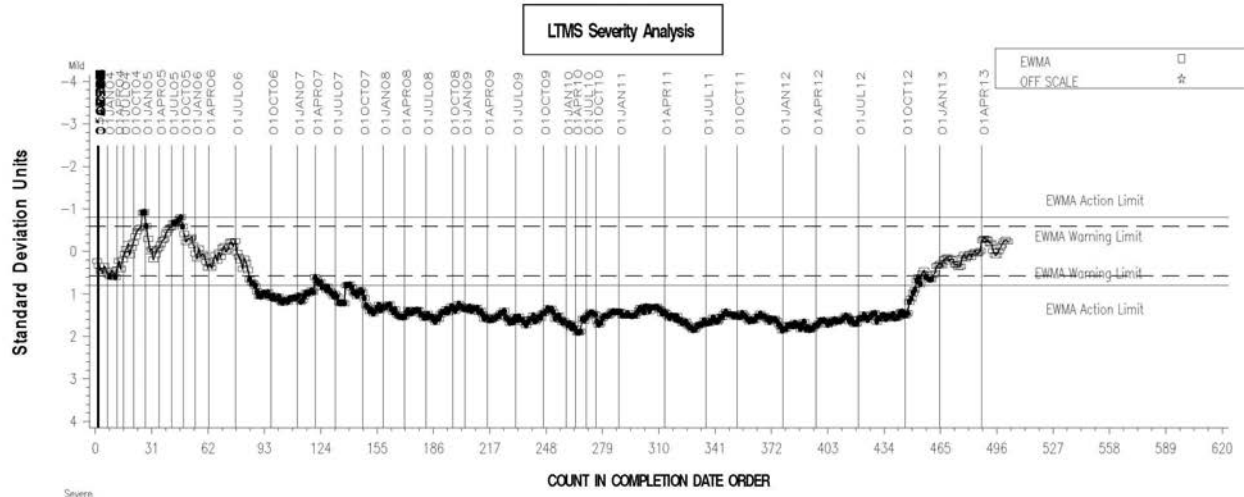
EOEC – FLUOROELASTOMER INDUSTRY OPERATIONALLY VALID DATA

FLUOROELASTOMER POINTS HARDNESS CHANGE
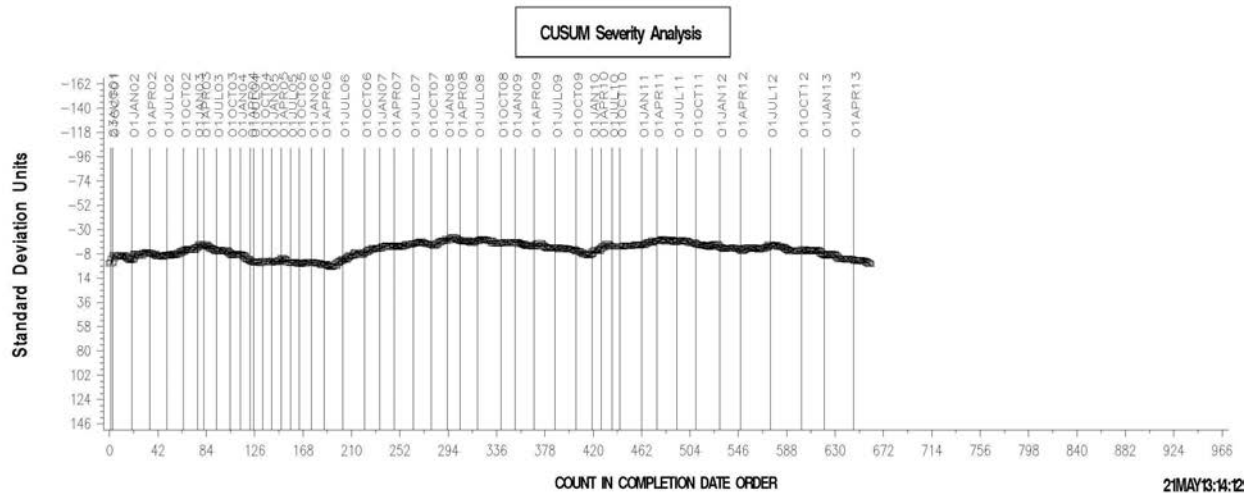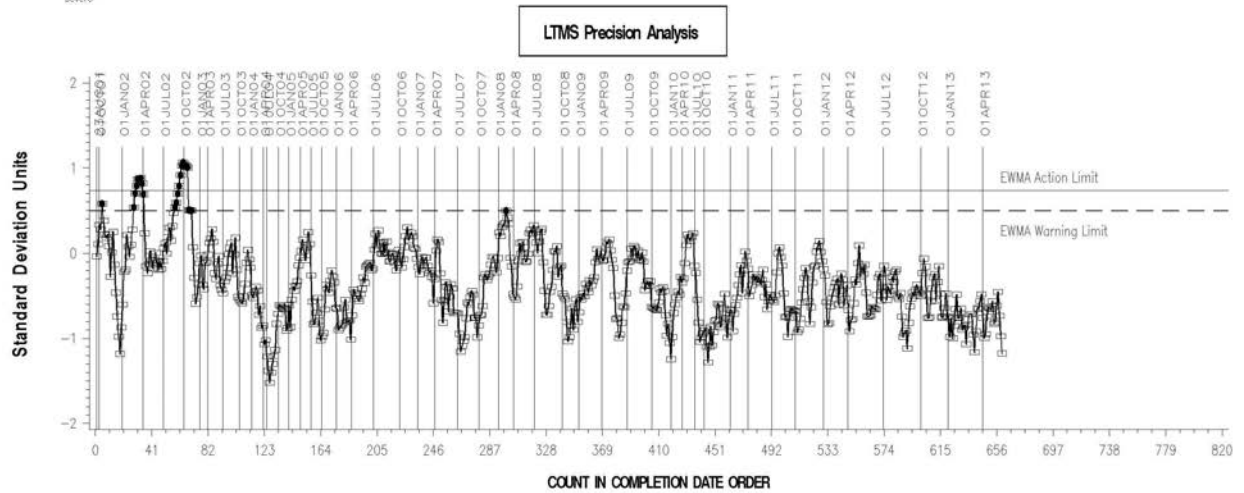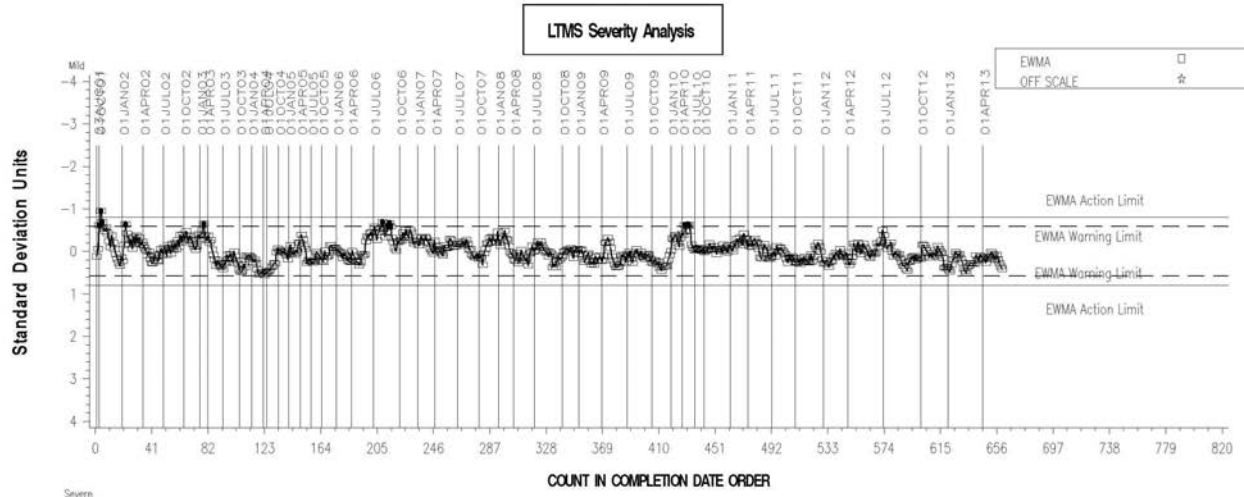
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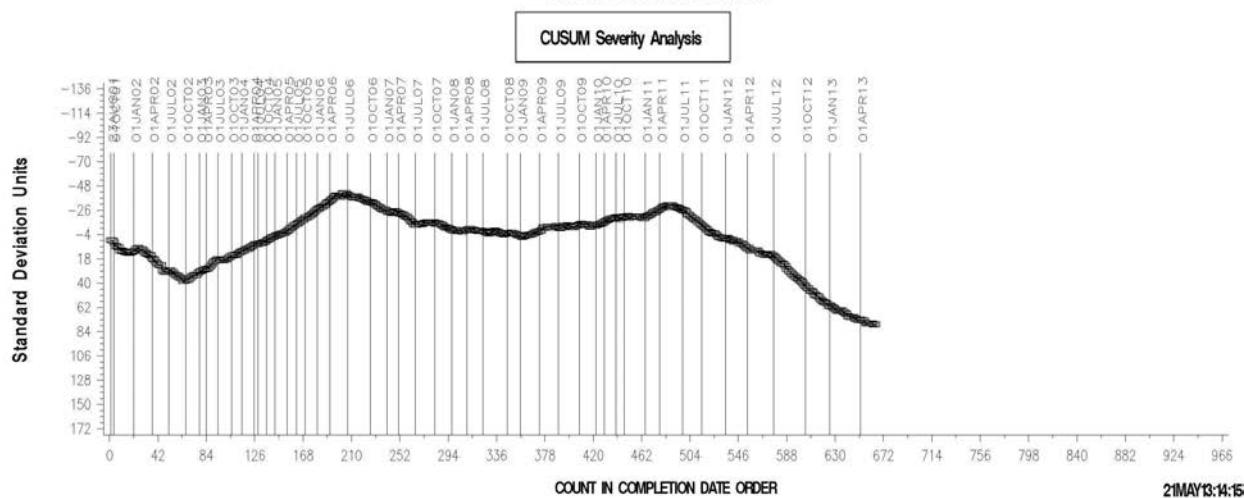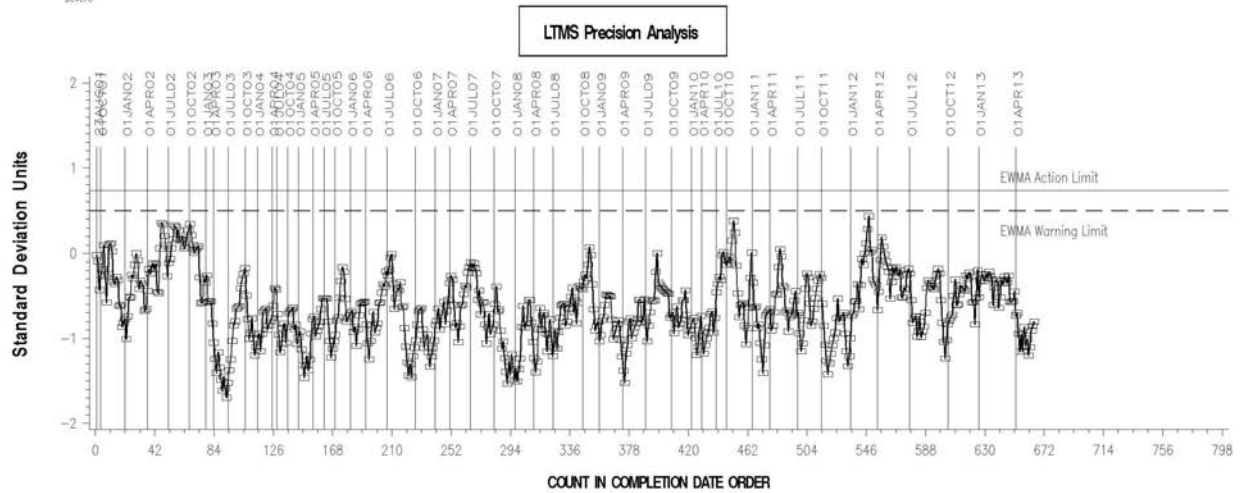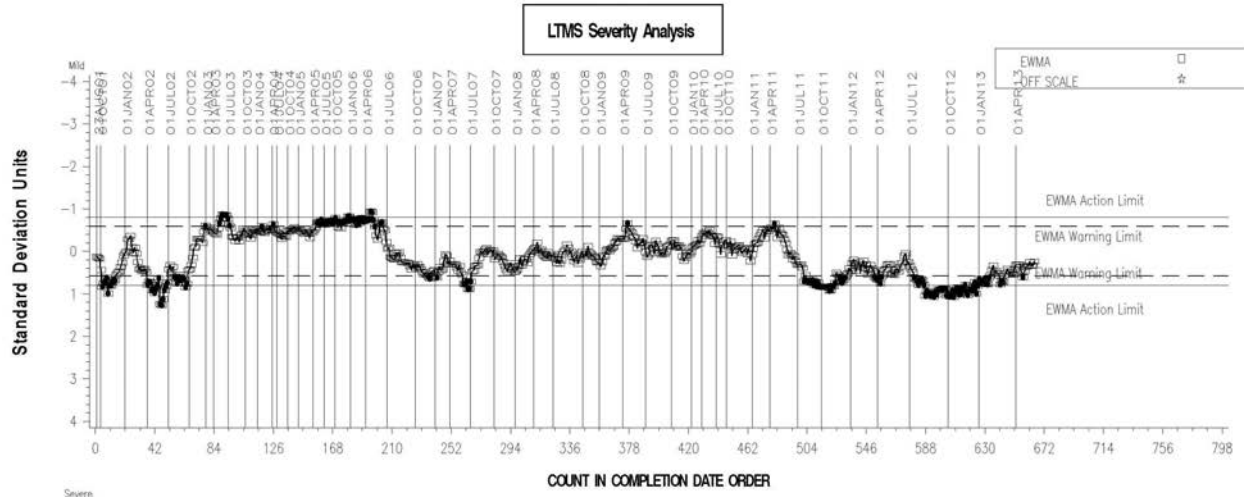
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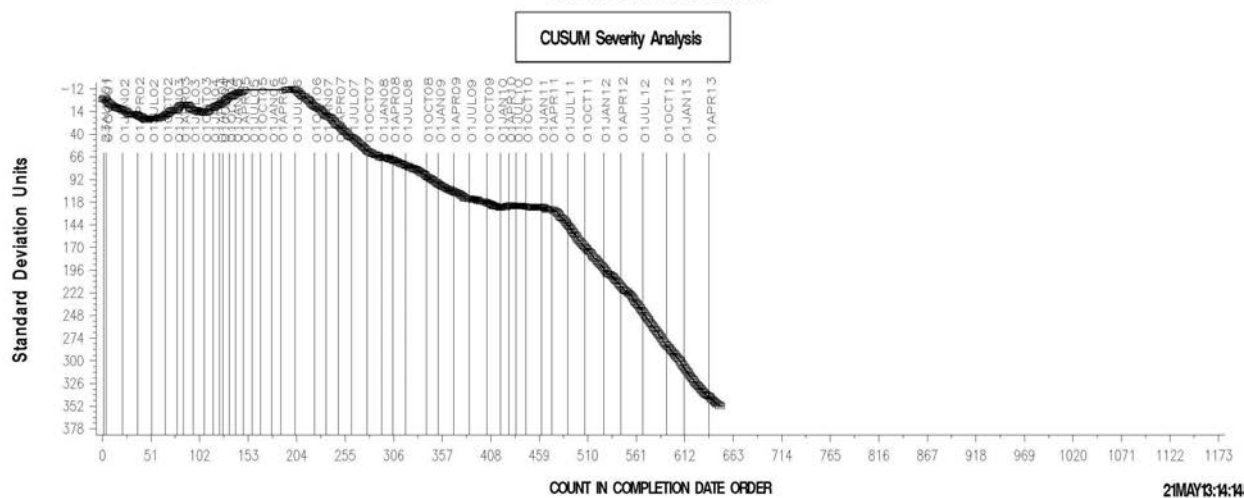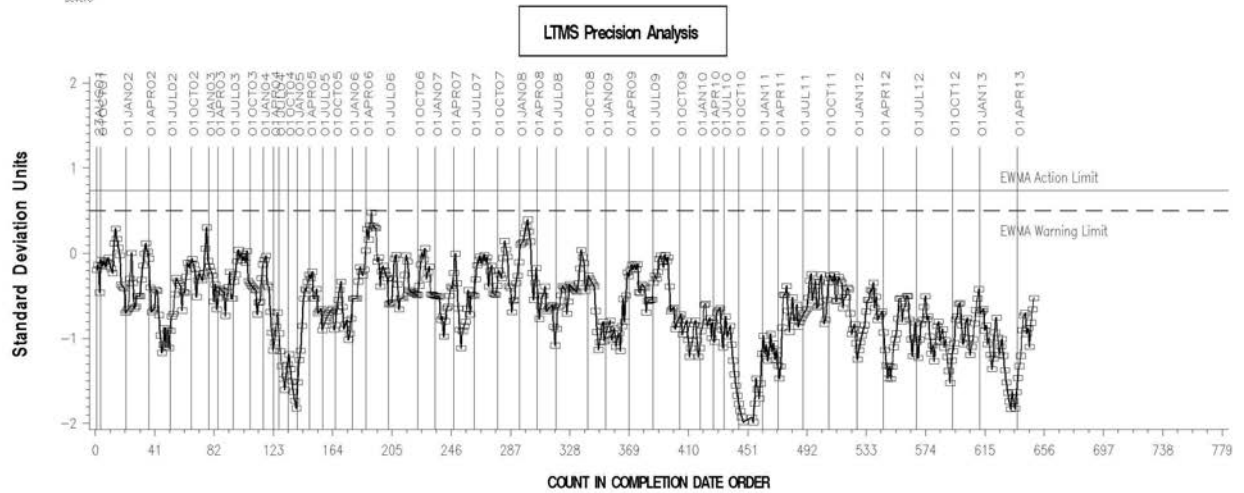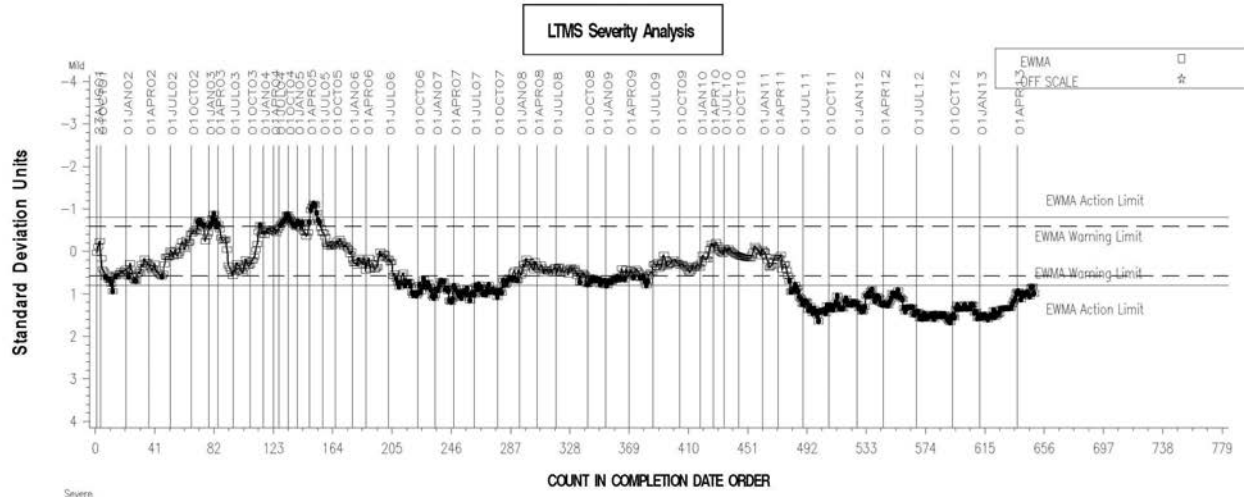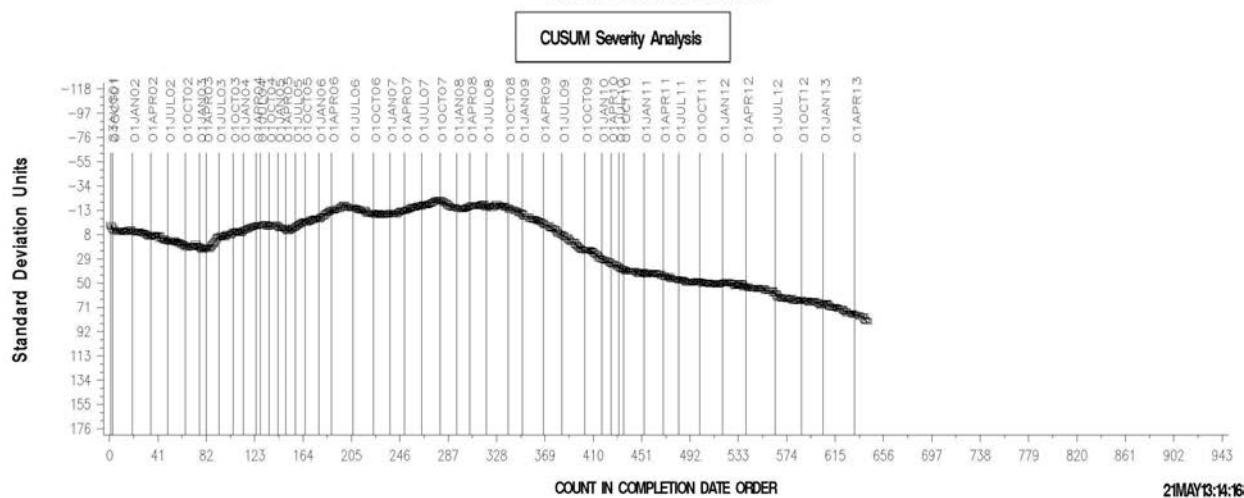
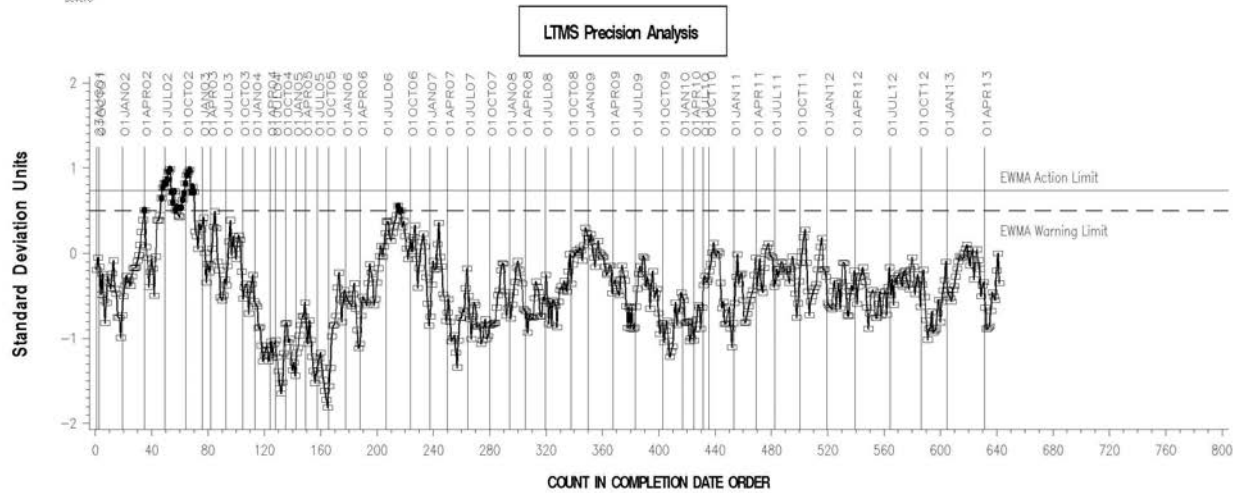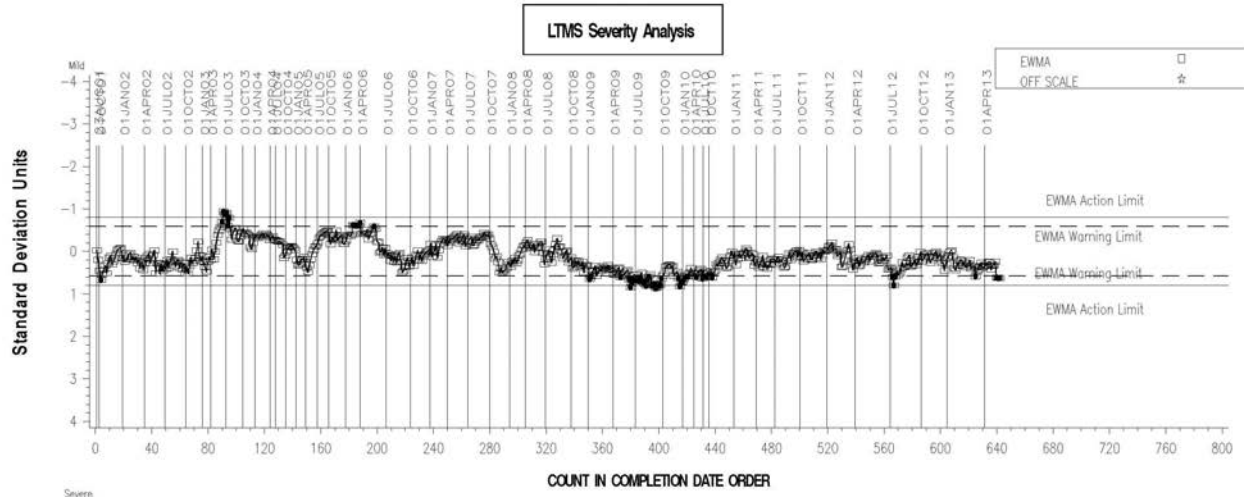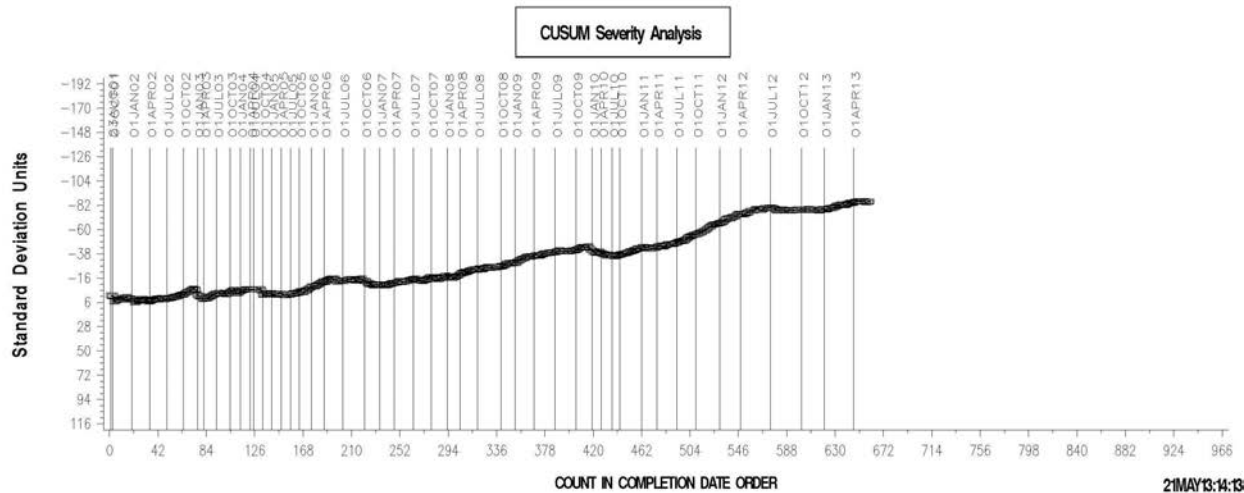EOEC — POLYACRYLATE INDUSTRY OPERATIONALLY VALID DATA

REFERENCE POLYACRYLATE POINTS HARDNESS CHANGE AVER

EOEC – SILICONE INDUSTRY OPERATIONALLY VALID DATA

REFERENCE SILICON POINTS HARDNESS CHANGE AVERAGE

LTMS Severity Analysis

LTMS Precision Analysis

CUSUM Severity Analysis

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EOEC — VAMAC INDUSTRY OPERATIONALLY VALID DATA

REFERENCE VAMAC G POINTS HARDNESS CHANGE AVERAGE

LTMS Severity Analysis

LTMS Precision Analysis

CUSUM Severity Analysis

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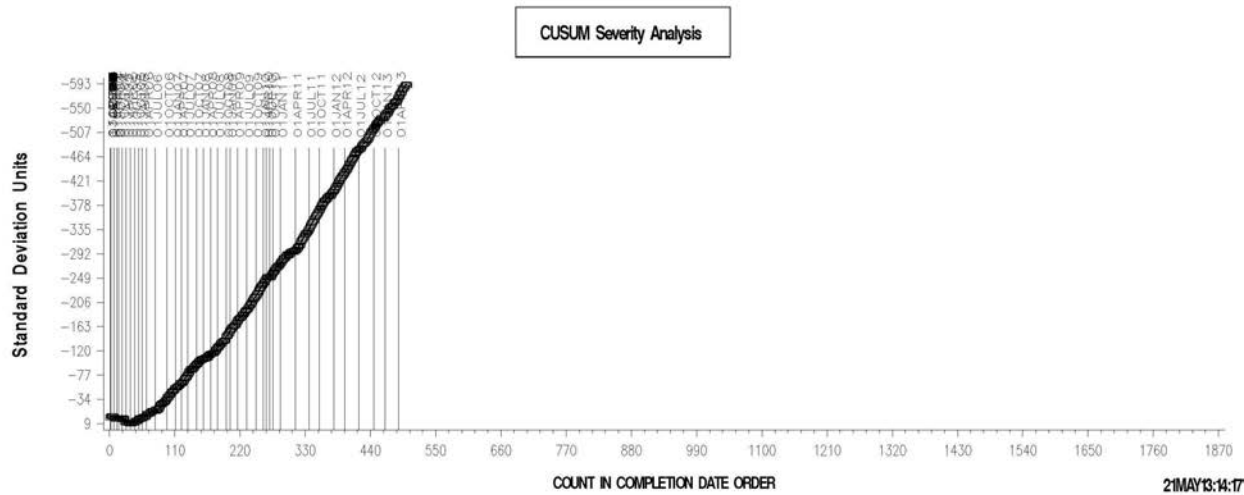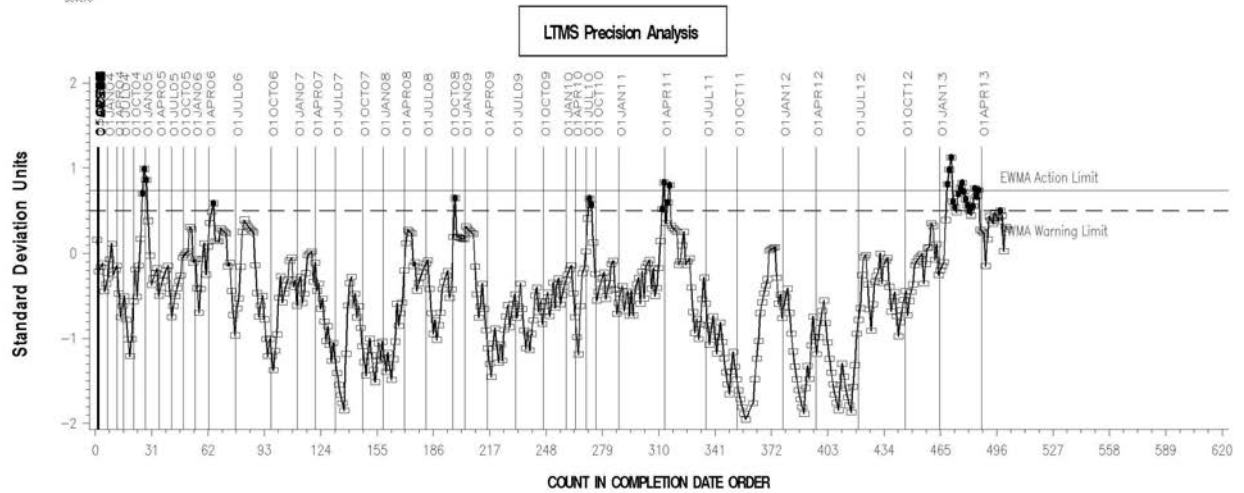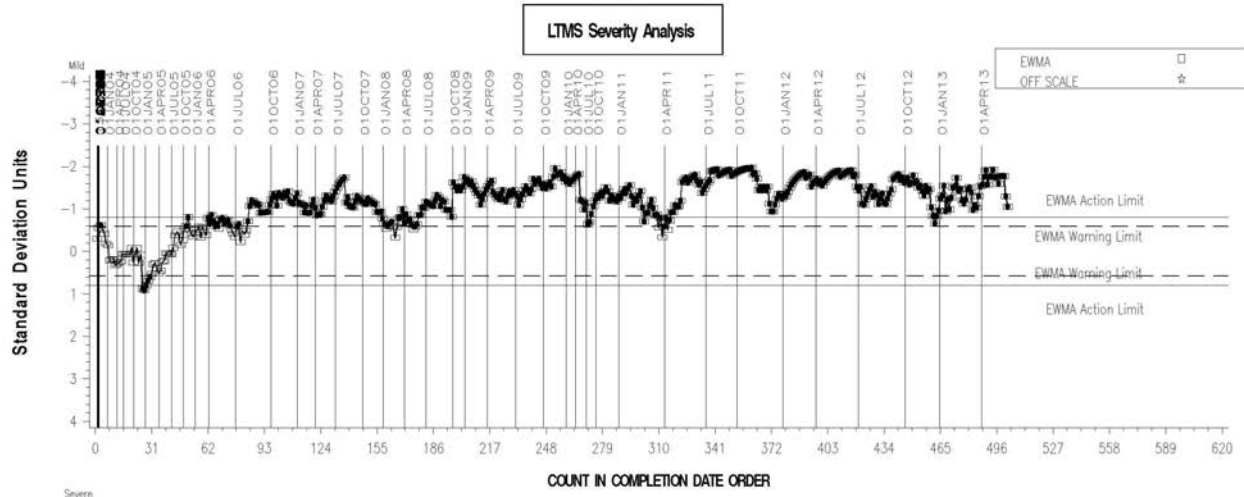
EOEC – FLUOROELASTOMER INDUSTRY OPERATIONALLY VALID DATA

FLUOROELASTOMER TENSILE STRENGTH CHANGE

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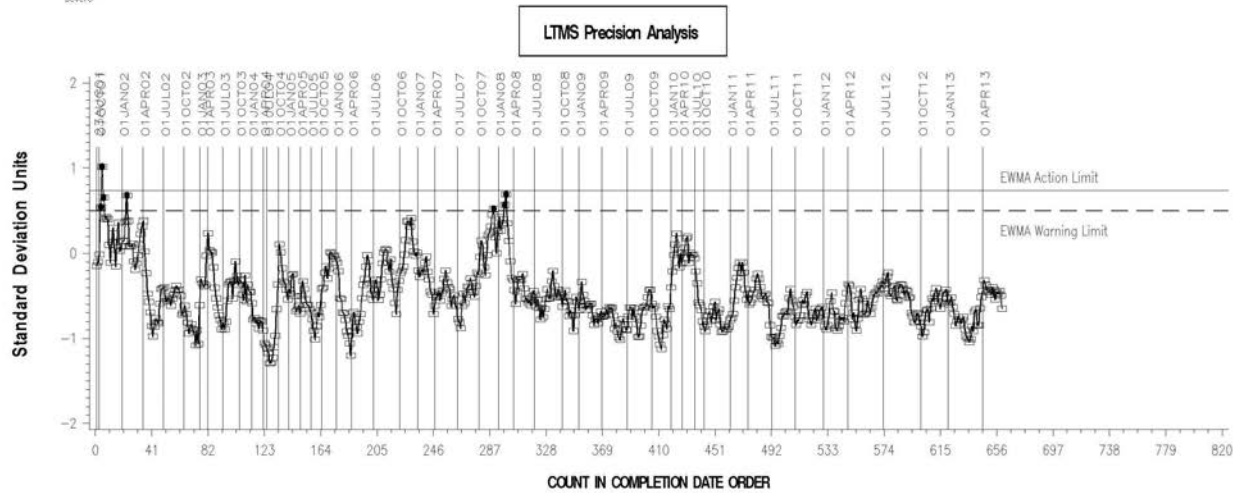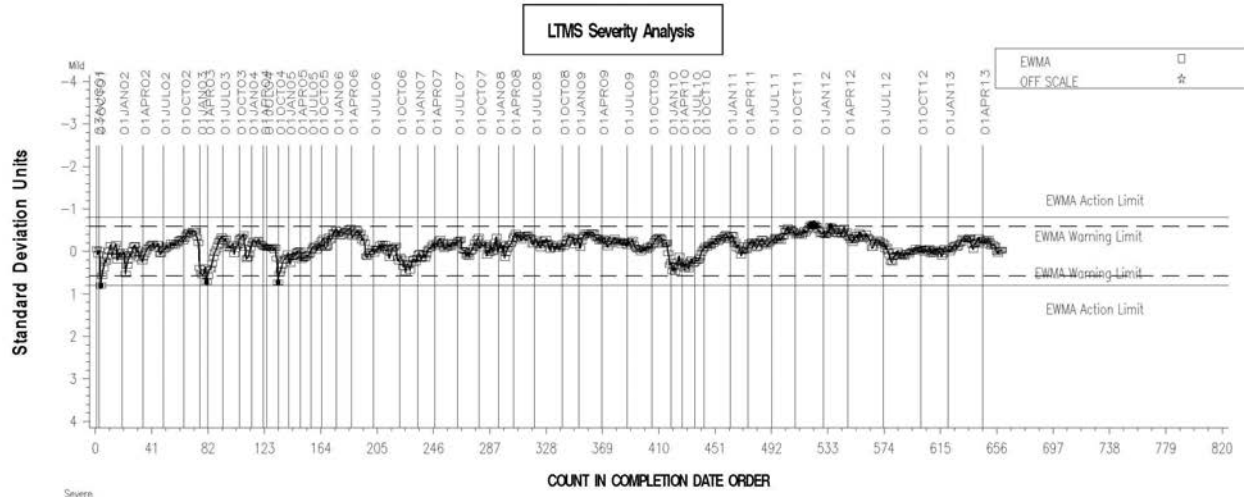
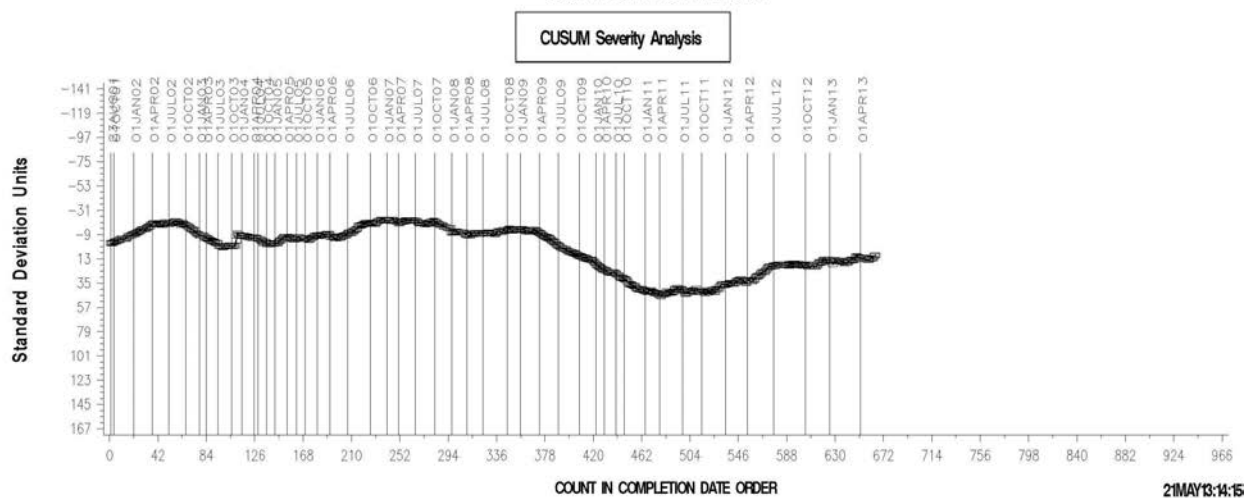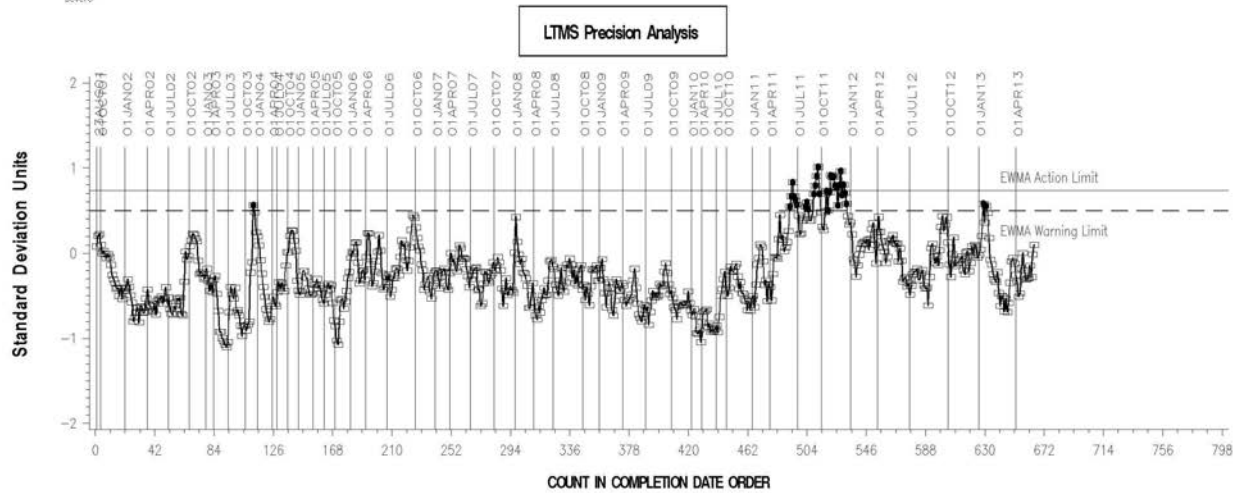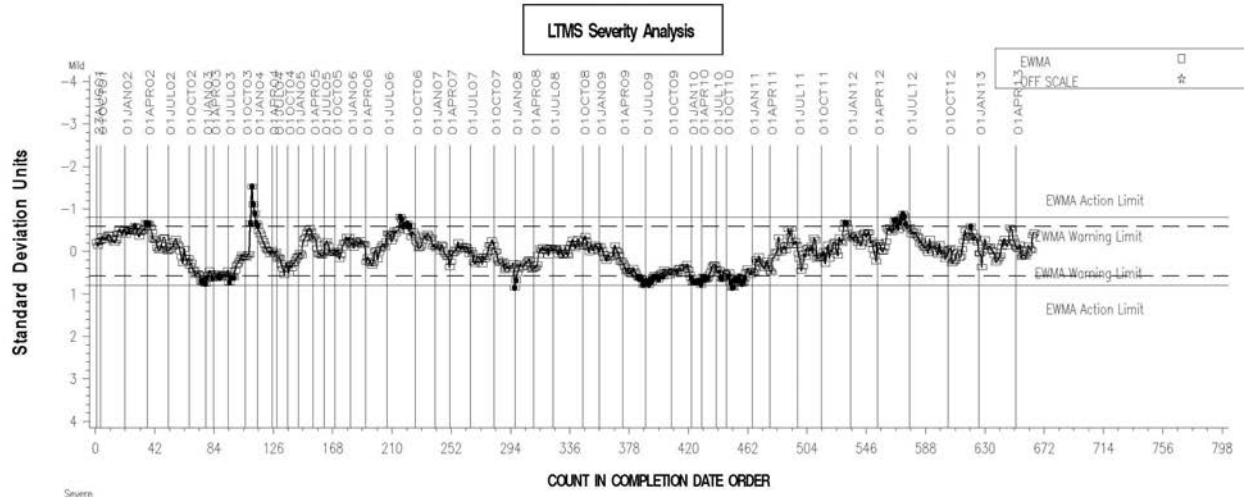EOEC — NITRILE INDUSTRY OPERATIONALLY VALID DATA

REFERENCE NITRILE TENSILE STRENGTH CHANGE AVERAGE
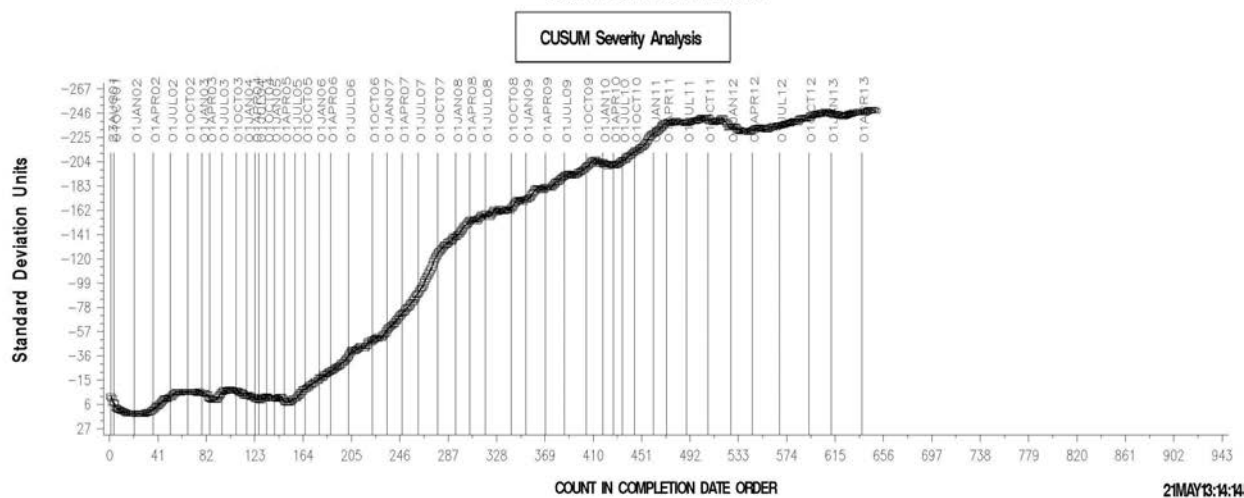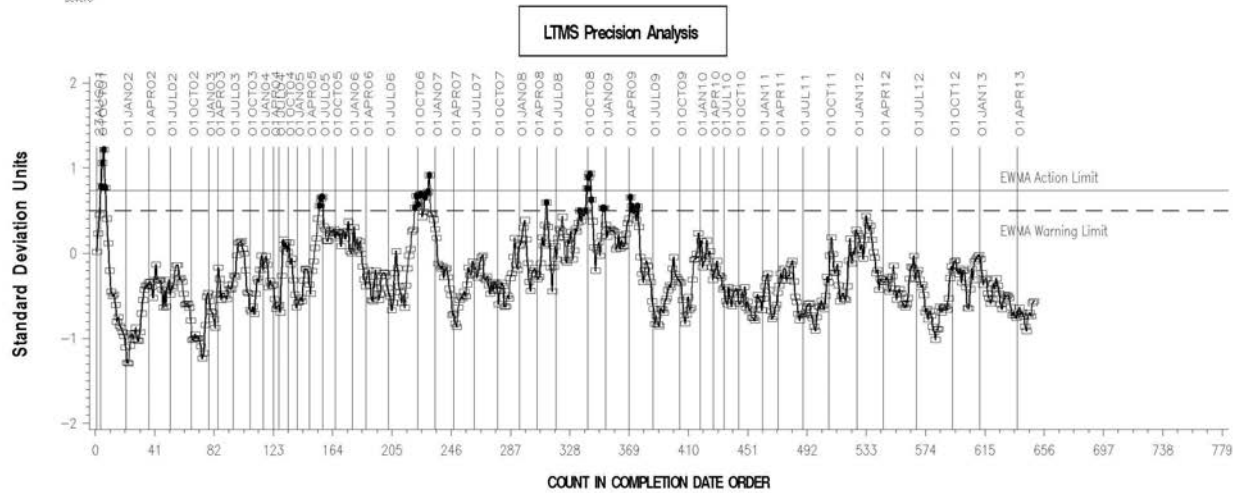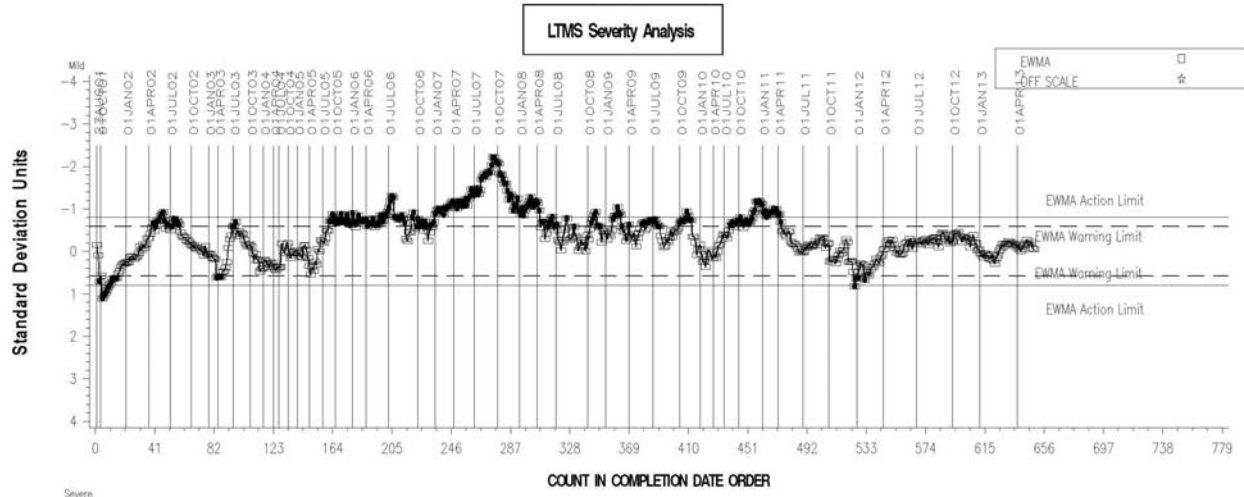
EOEC — POLYACRYLATE INDUSTRY OPERATIONALLY VALID DATA

REFERENCE POLYACRYLATE TENSILE STRENGTH CHANGE AVE

LTMS Severity Analysis

LTMS Precision Analysis

CUSUM Severity Analysis

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EOEC — SILICONE INDUSTRY OPERATIONALLY VALID DATA

REFERENCE SILICON TENSILE STRENGTH CHANGE AVERAGE

LTMS Severity Analysis

LTMS Precision Analysis

CUSUM Severity Analysis
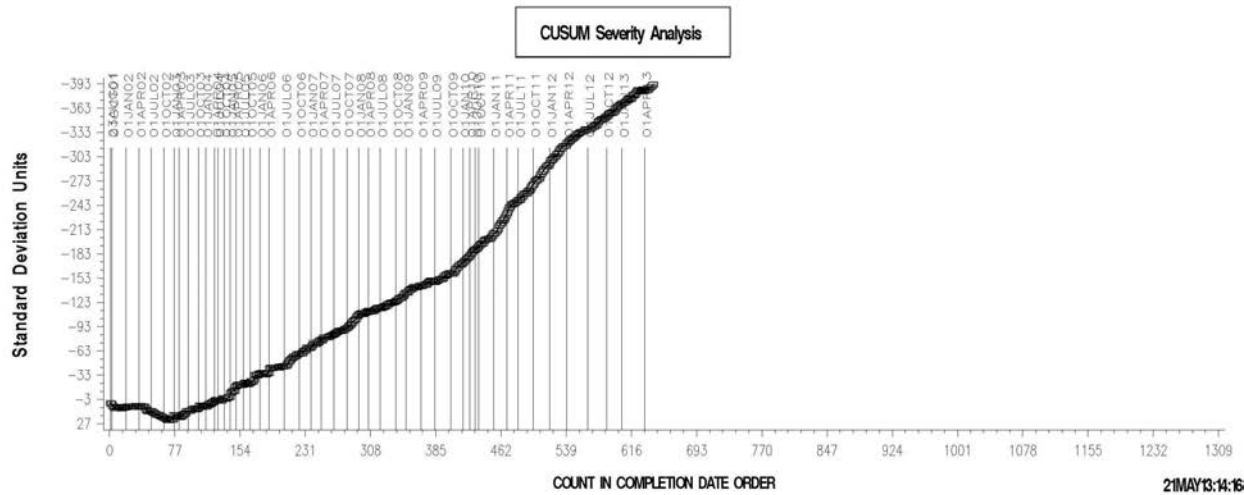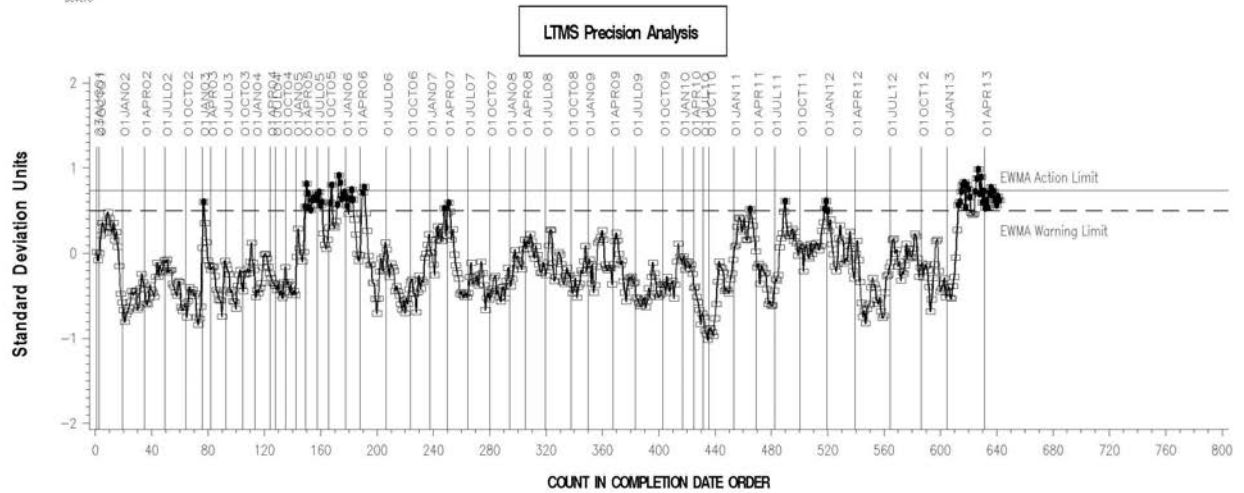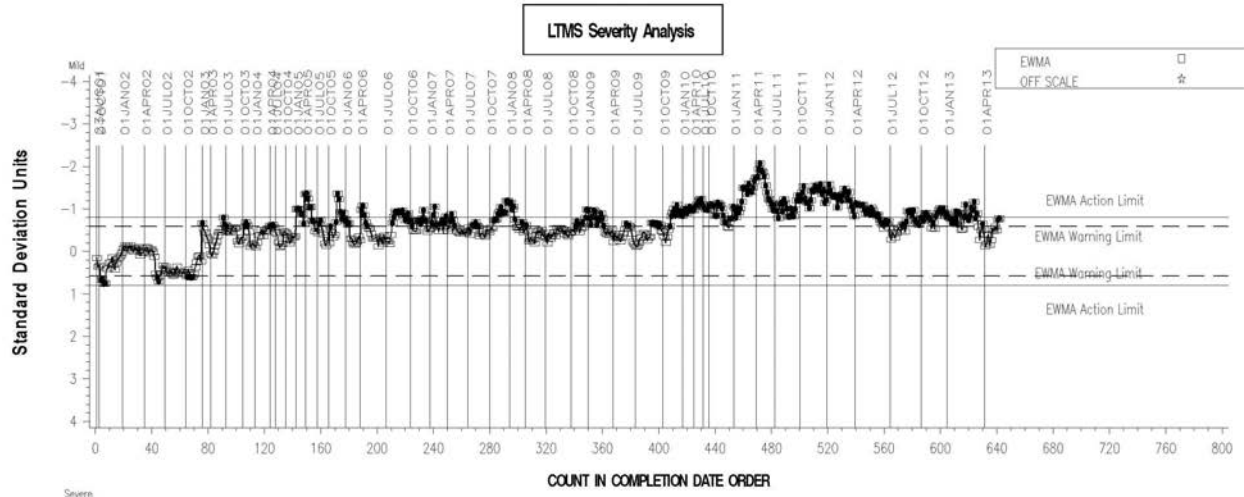
EOEC – VAMAC INDUSTRY OPERATIONALLY VALID DATA

REFERENCE VAMAC G TENSILE STRENGTH CHANGE AVERAGE

LTMS Severity Analysis
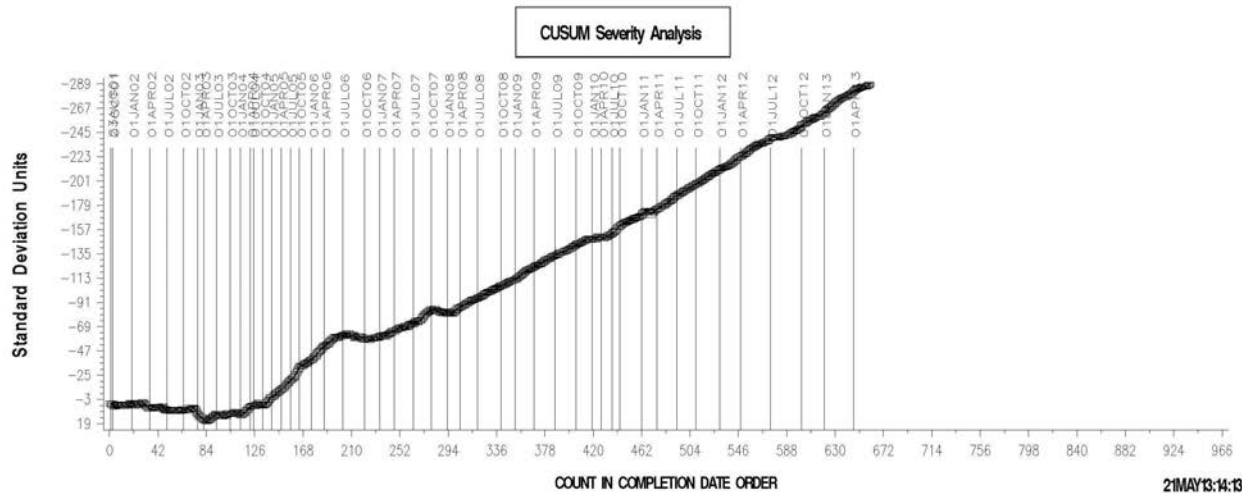

LTMS Precision Analysis

CUSUM Severity Analysis

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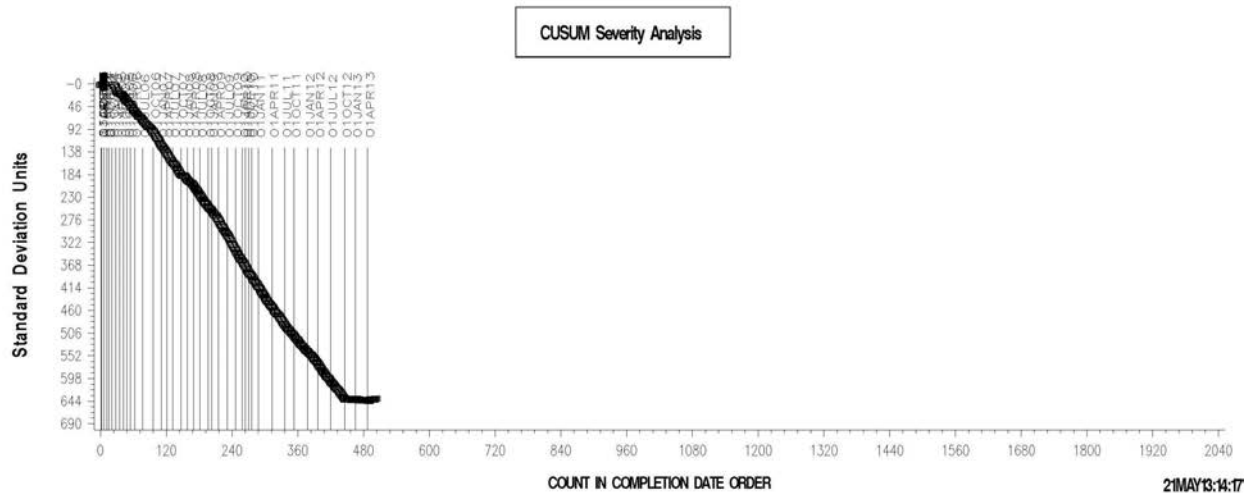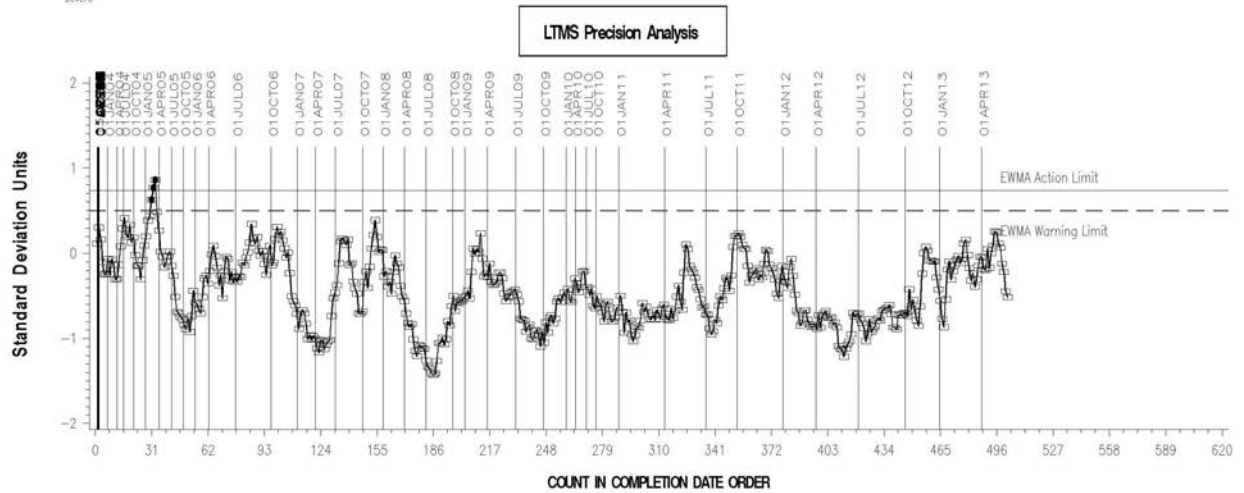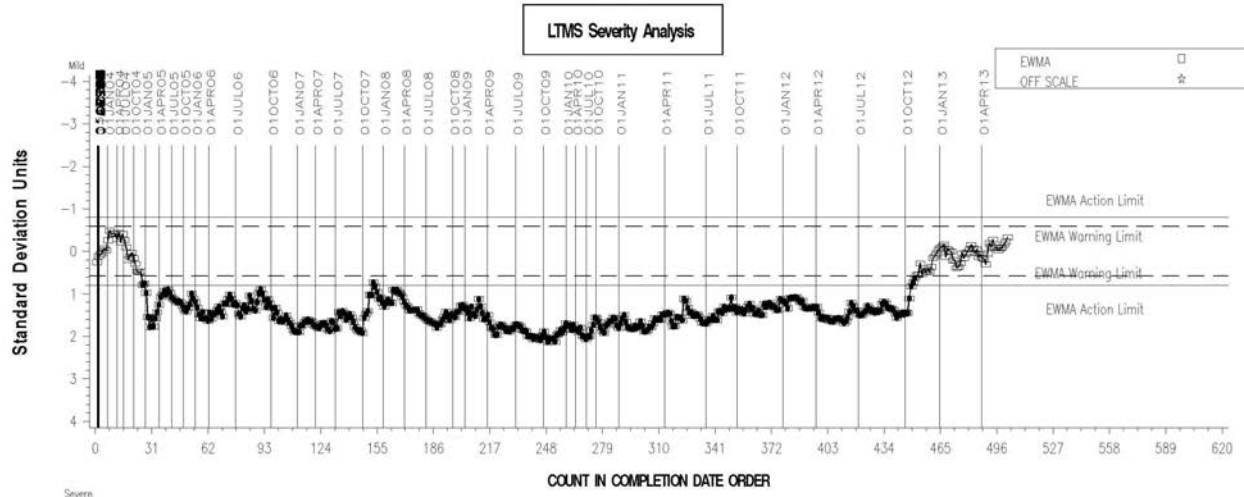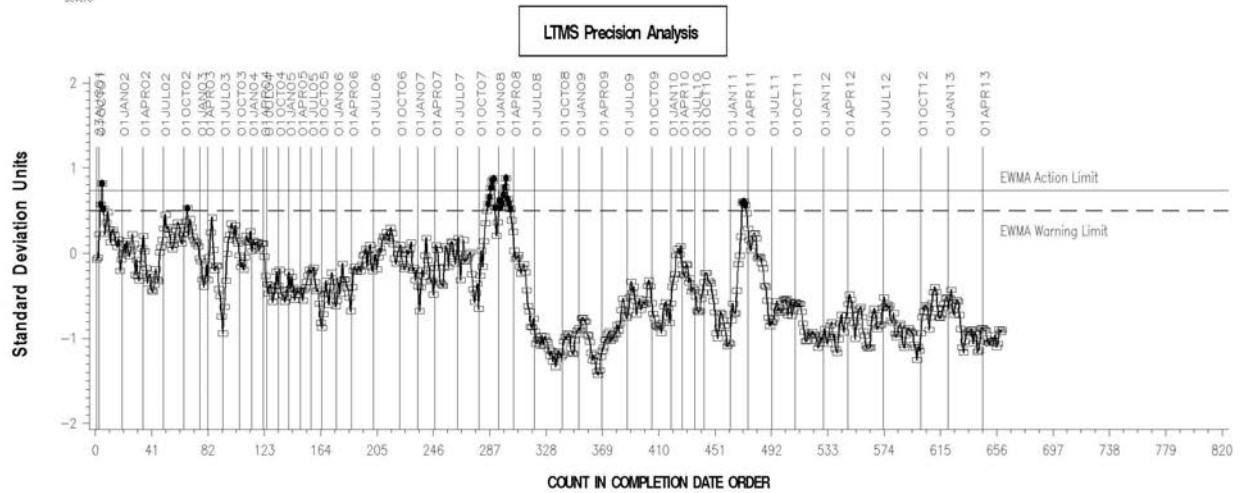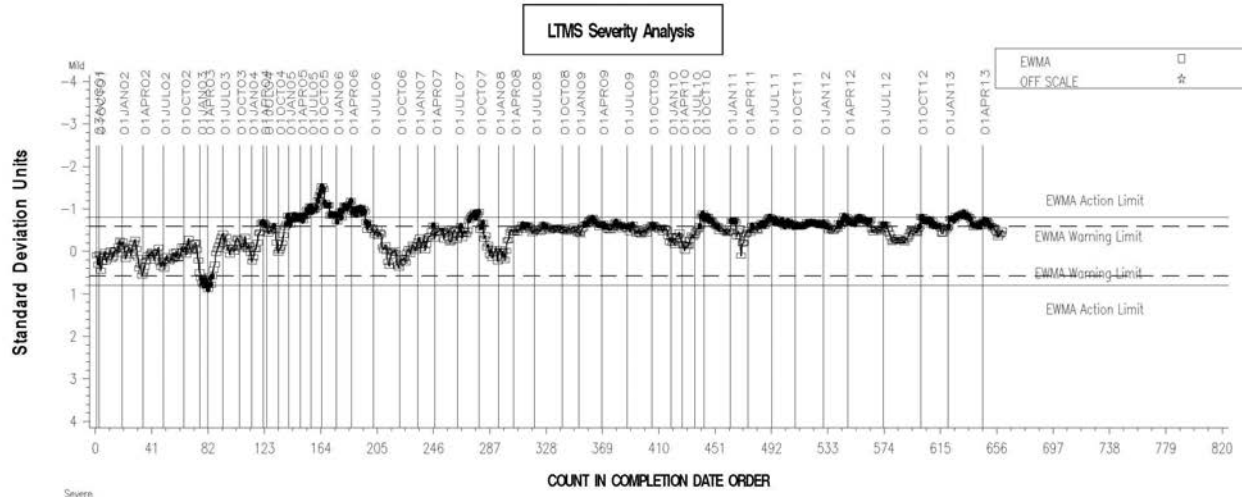
EOEC – FLUOROELASTOMER INDUSTRY OPERATIONALLY VALID DATA

FLUOROELASTOMER ELONGATION CHANGE AVG.

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EOEC – NITRILE INDUSTRY OPERATIONALLY VALID DATA

REFERENCE NITRILE ELONGATION CHANGE AVERAGE

LTMS Severity Analysis

LTMS Precision Analysis

CUSUM Severity Analysis

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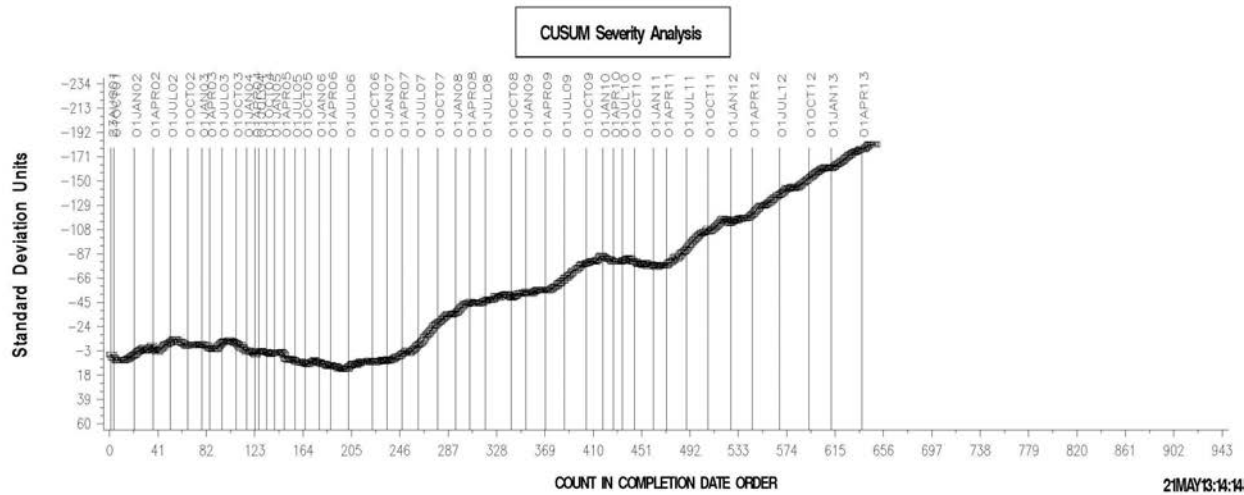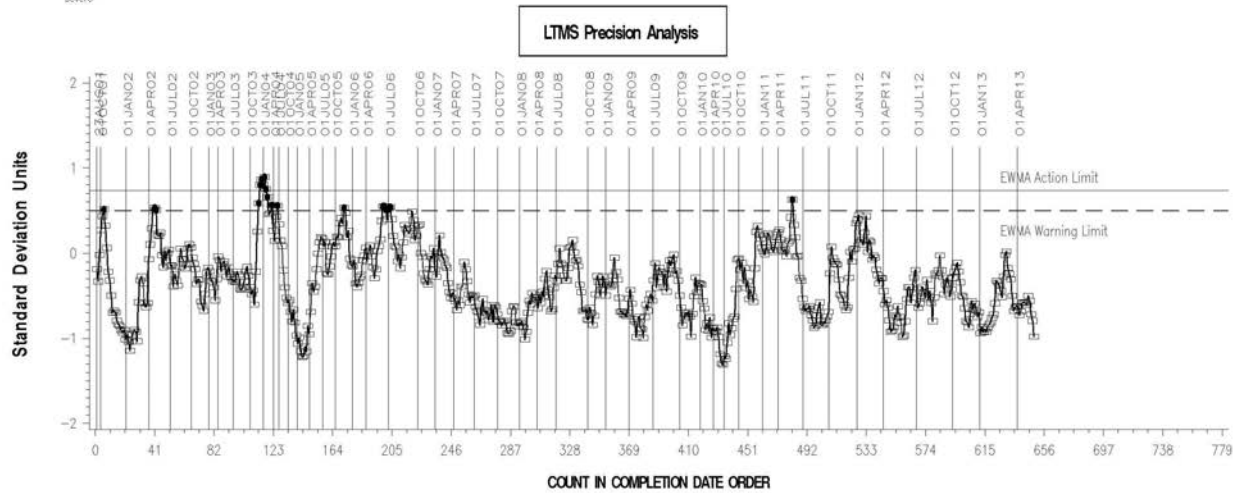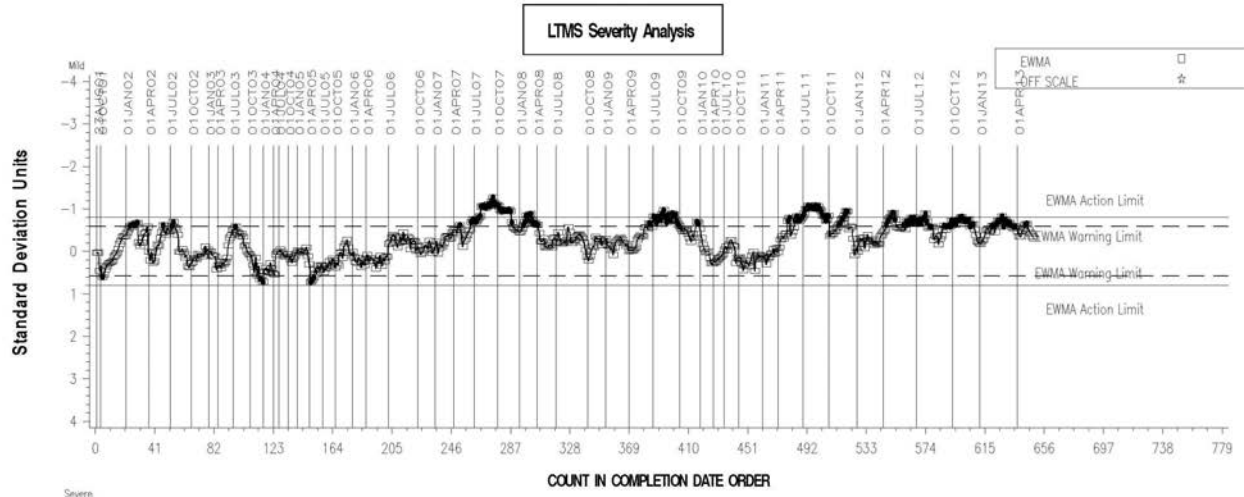
EOEC – POLYACRYLATE INDUSTRY OPERATIONALLY VALID DATA

REFERENCE POLYACRYLATE ELONGATION CHANGE AVERAGE

LTMS Severity Analysis

LTMS Precision Analysis

CUSUM Severity Analysis

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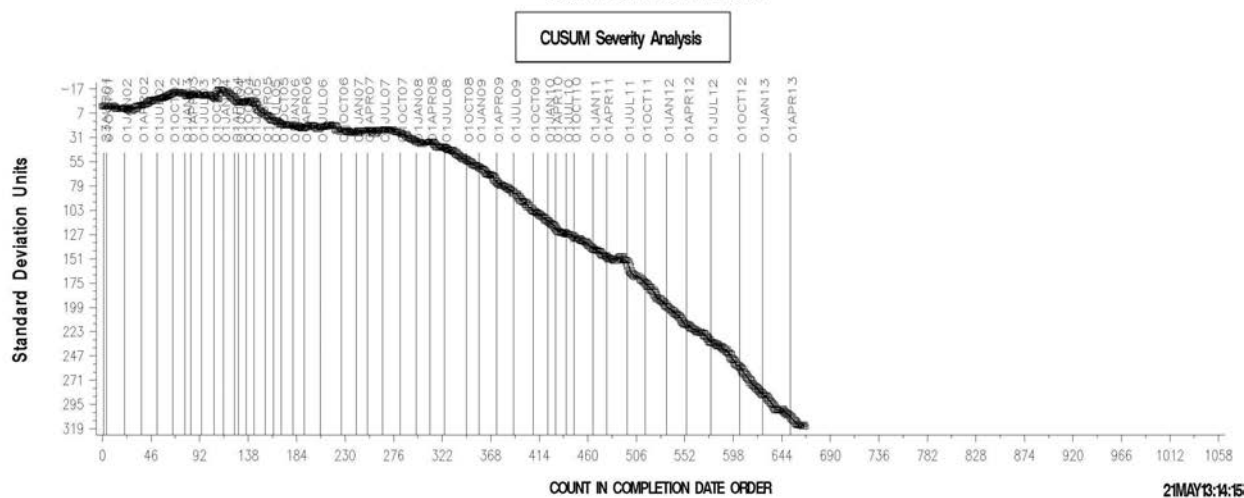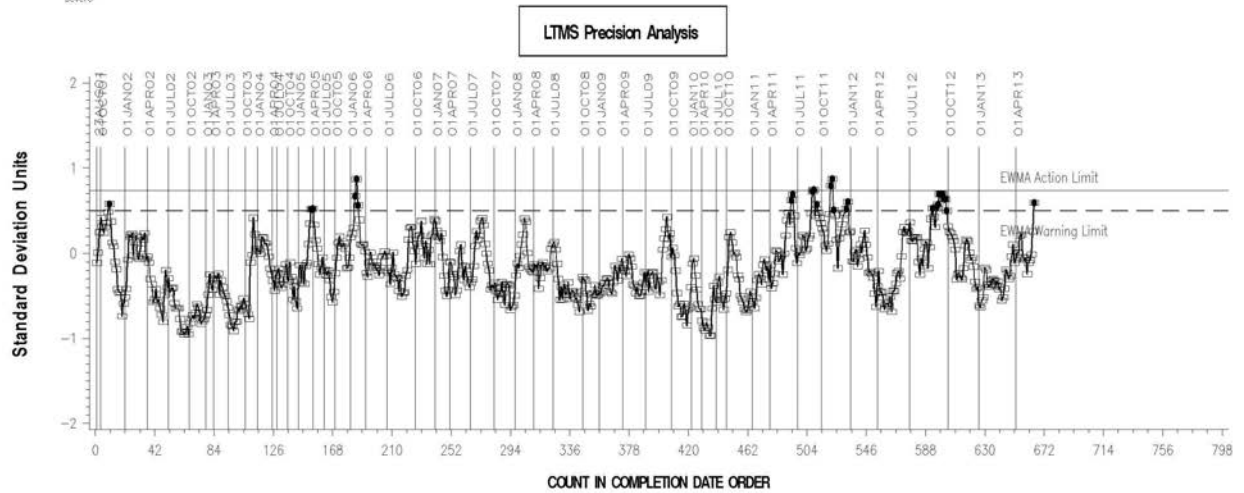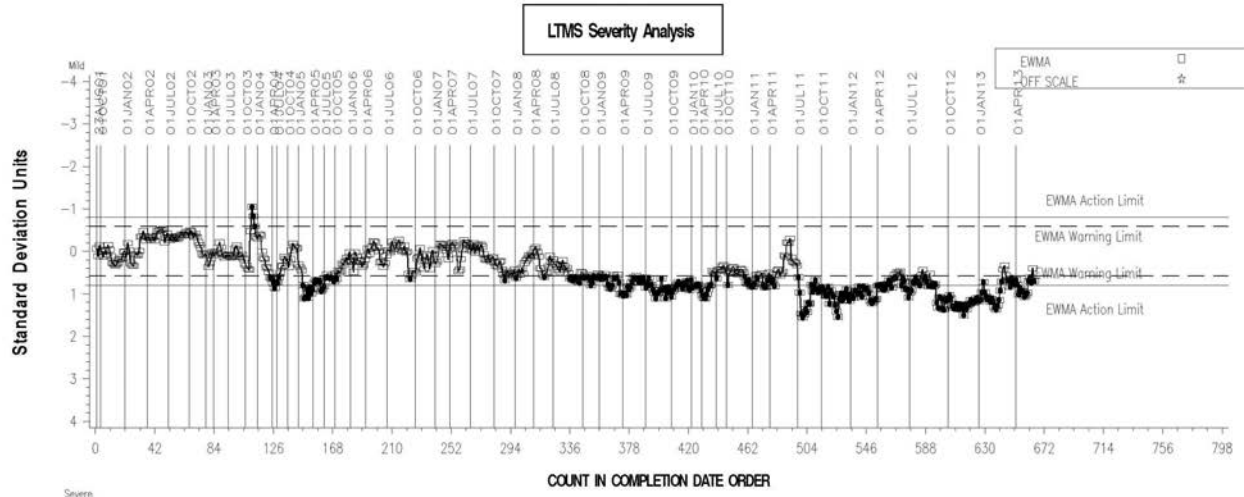
EOEC — SILICONE INDUSTRY OPERATIONALLY VALID DATA

REFERENCE SILICON ELONGATION CHANGE AVERAGE

LTMS Severity Analysis

LTMS Precision Analysis

CUSUM Severity Analysis

21MAY13:14:16
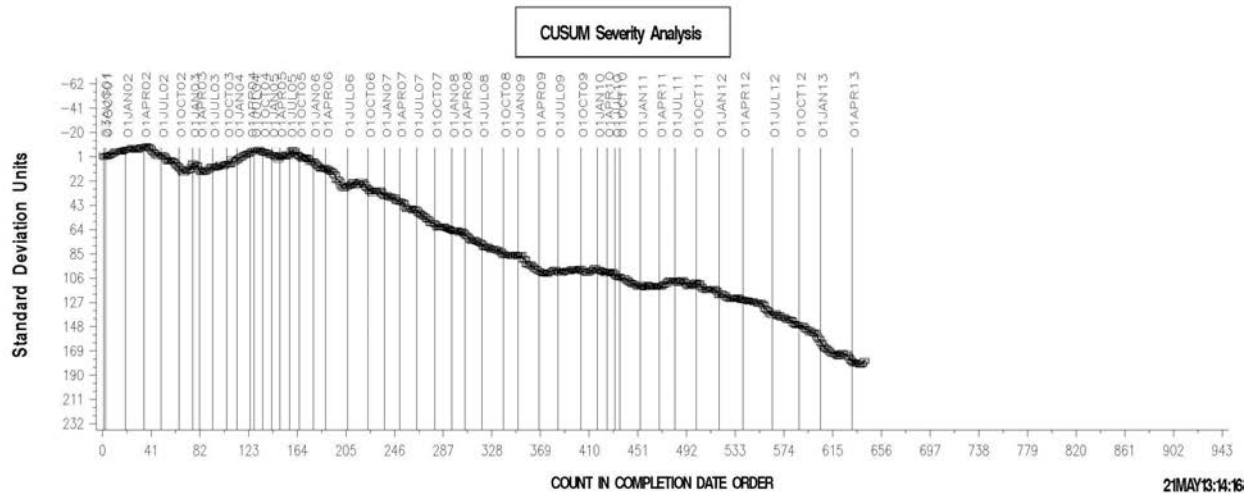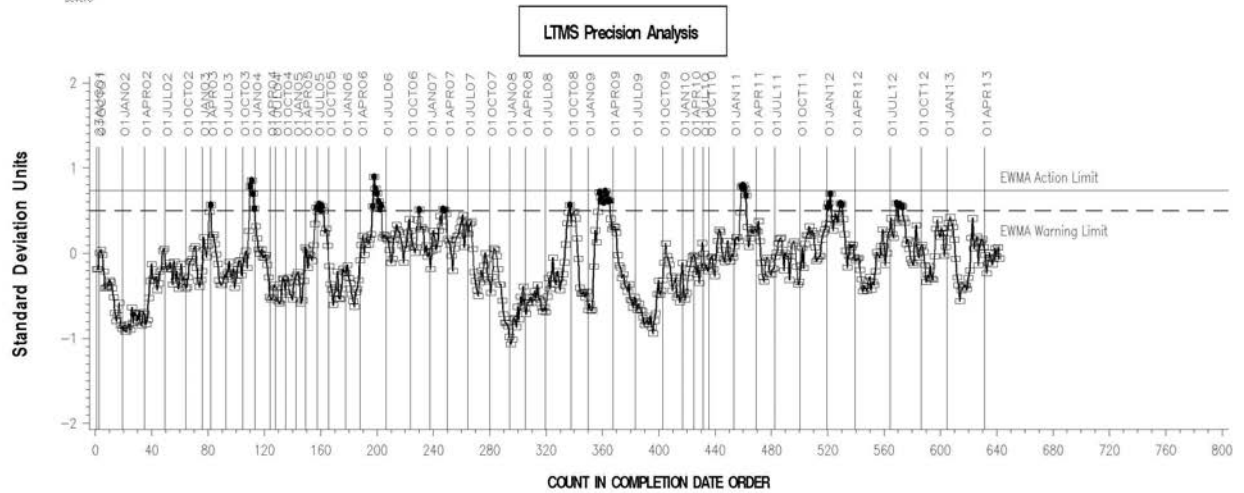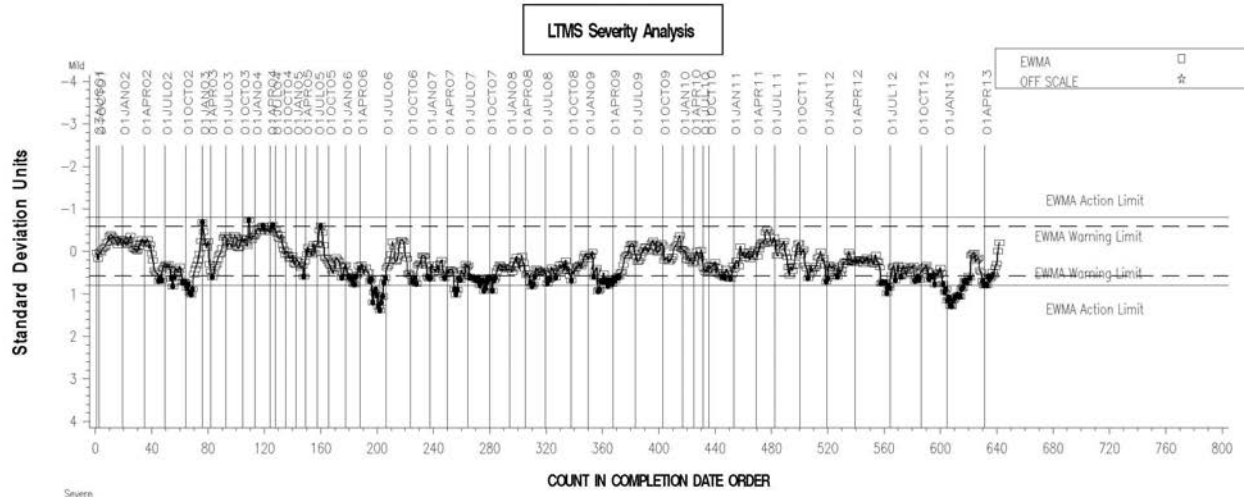
EOEC — VAMAC INDUSTRY OPERATIONALLY VALID DATA

REFERENCE VAMAC G ELONGATION CHANGE AVERAGE
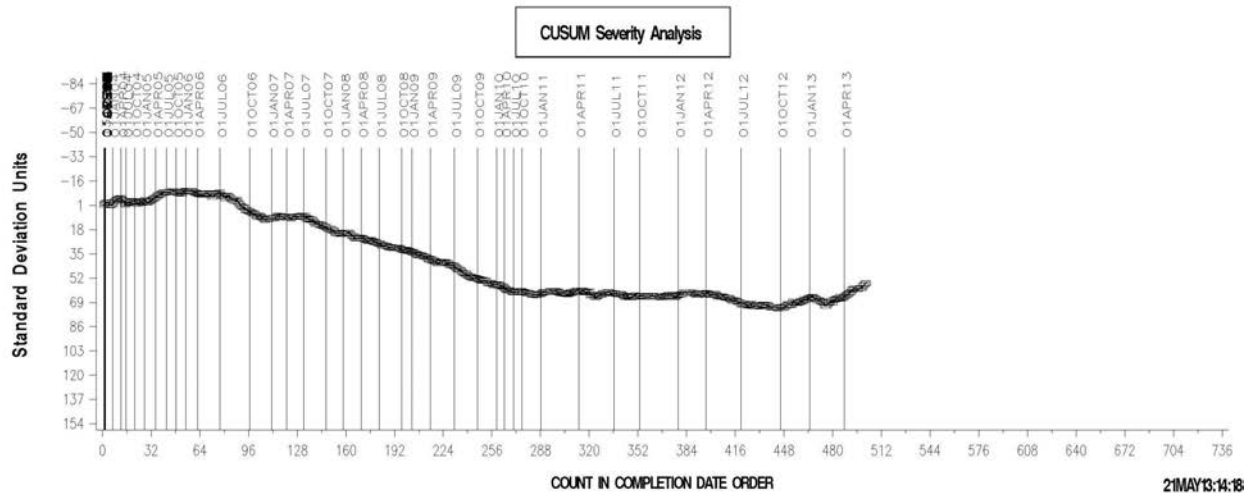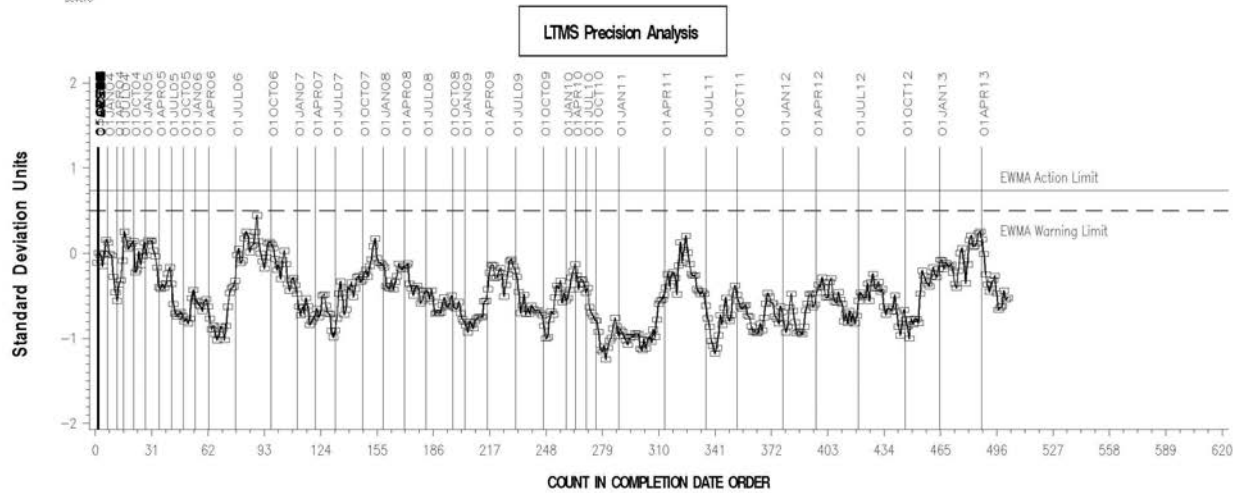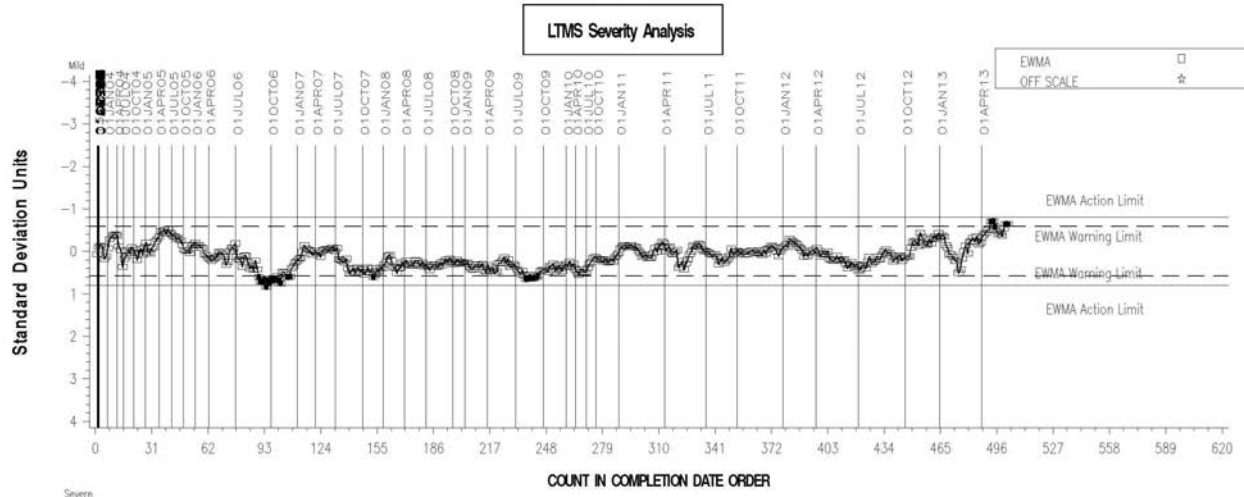
POOLED S:

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

FLUOROELASTOMER TEST PRECISION
POOLED STANDARD DEVIATION BY PERIOD
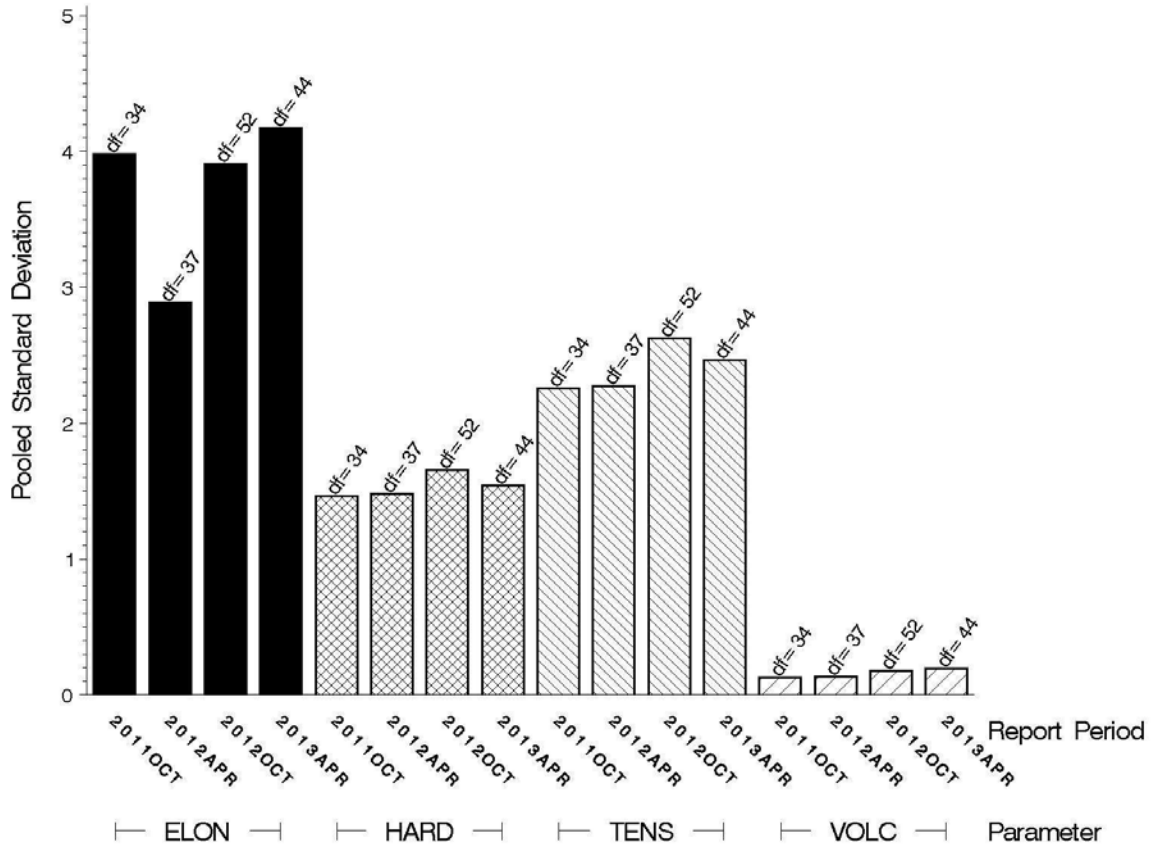
NITRILE TEST PRECISION
POOLED STANDARD DEVIATION BY PERIOD
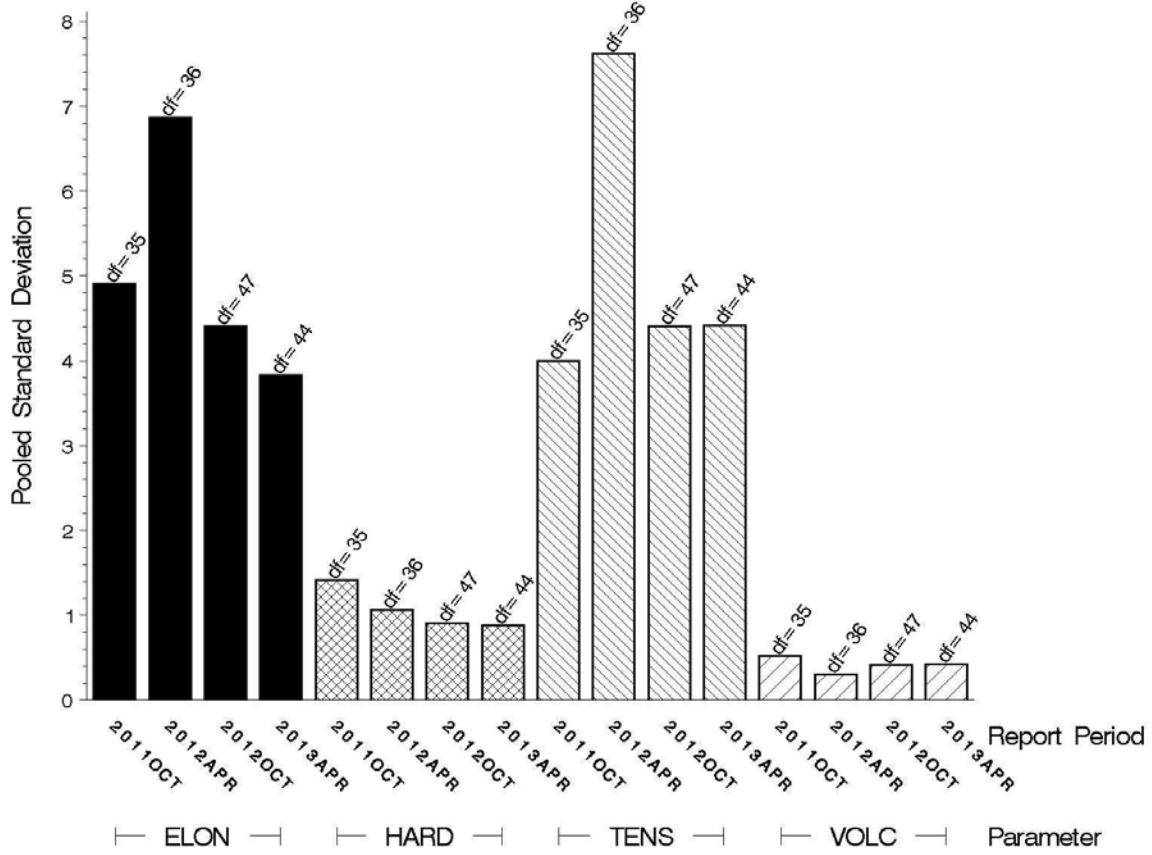
POLYACRYLATE TEST PRECISION
POOLED STANDARD DEVIATION BY PERIOD
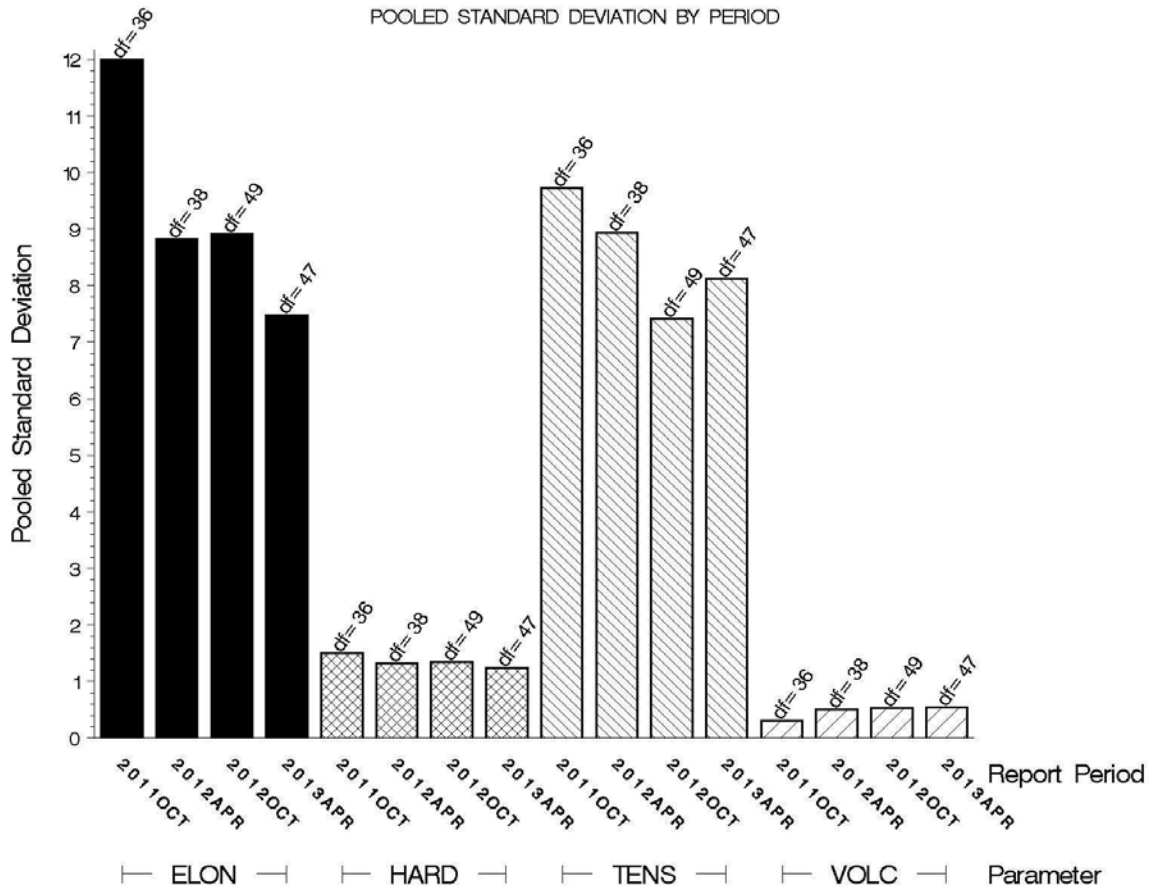
SILICONE TEST PRECISION
POOLED STANDARD DEVIATION BY PERIOD
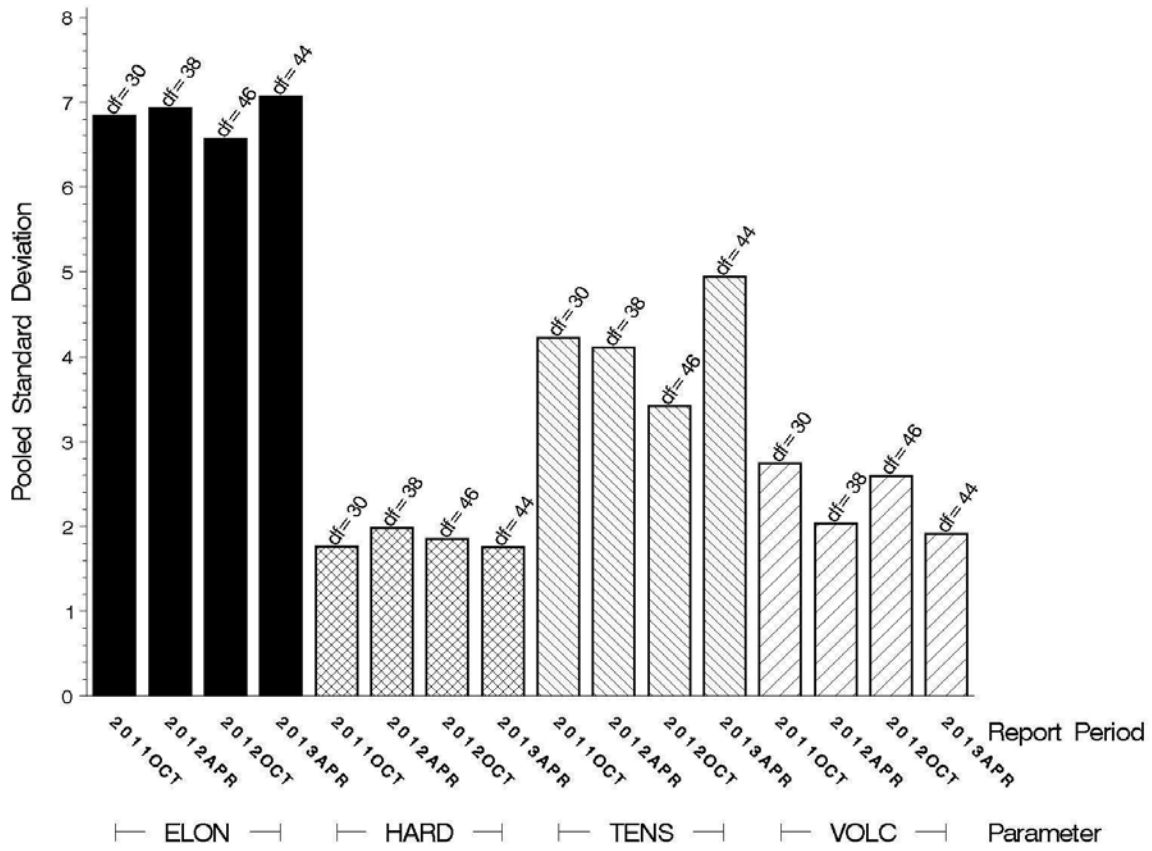
VAMAC TEST PRECISION
POOLED STANDARD DEVIATION BY PERIOD
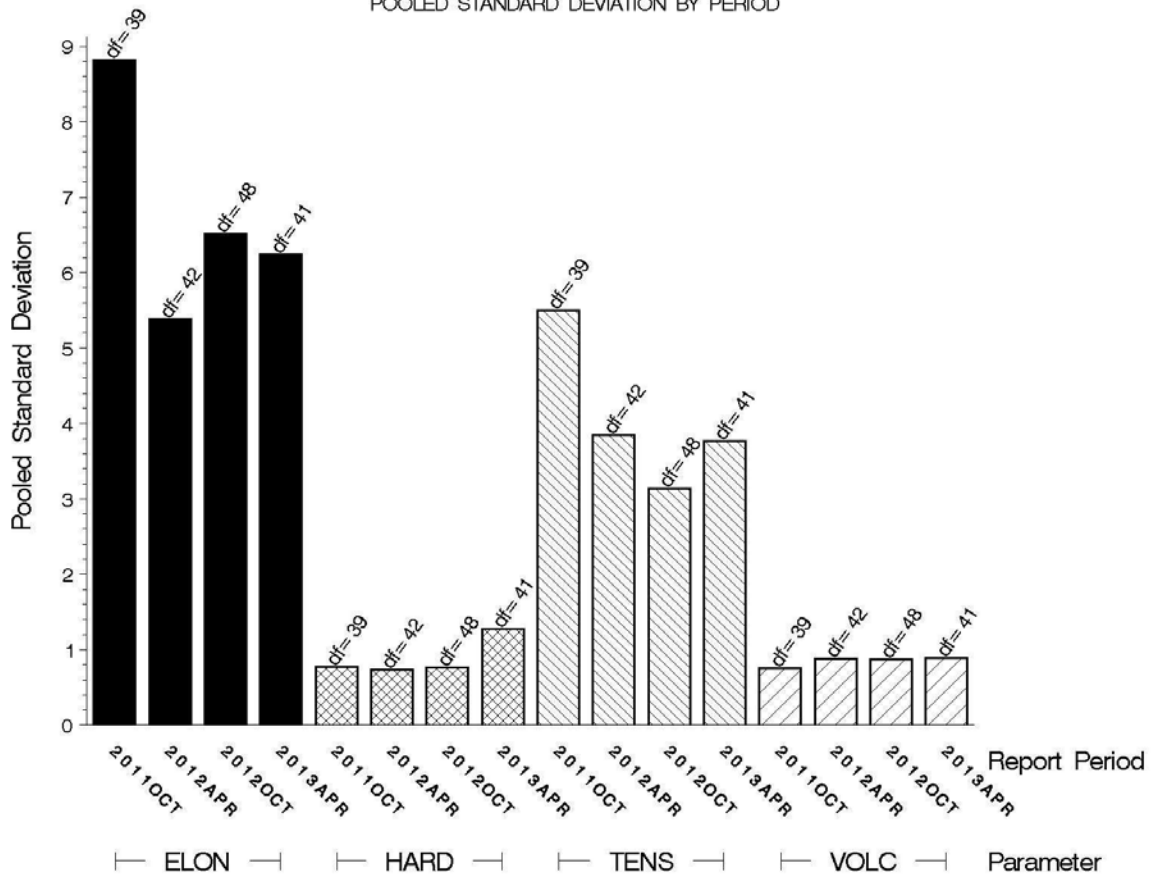
STATUS OF REFERENCE OIL SUPPLY:

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	208	5813	1152
Total	208	5813	1152

Be aware that this table presumes that all of each of these oils is dedicated to the EOEC 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**	**ELON**
Fluoroelastomer	Within limits	Within limits	Within limits	Within limits
Nitrile	**Severe**	**Severe**	Within limits	Within limits
Polyacrylate	**Severe**	Within limits	Within limits	Within limits
Silicone	Within limits	**Severe**	**Mild**	Within limits
VAMAC	Within limits	**Mild**	Within limits	**Mild**

Summary of Precision as Measured by LTMS Control Charting				
Elastomer	**VOLC**	**HARD**	**TENS**	**ELON**
Fluoroelastomer	Within limits	Within limits	Within limits	Within limits
Nitrile	Within limits	Within limits	Within limits	Within limits
Polyacrylate	Within limits	Within limits	Within limits	**Warning**
Silicone	Within limits	Within limits	**Warning**	Within limits
VAMAC	Within limits	Within limits	Within limits	Within limits

MTK/mtk/astm0413.doc/mem13-034.mtk.doc

c: F. M. Farber
        J. A. Clark
        EOEC Surveillance Panel
        ftp://ftp.astmtmc.cmu.edu/docs/bench/eoec/semiannualreports/eoec-04-2013.pdf

Distribution: email