



## Test Monitoring Center

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

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

MEMORANDUM: 15-046  
DATE: November 23, 2015  
TO: Mike Birke,  
Chairman, Engine Oil Elastomer Compatibility Surveillance Panel  
FROM: Michael T. Kasimirsky *Michael T. Kasimirsky*  
SUBJECT: LDEOC Testing from April 1, 2015 through September 30, 2015

A total of 340 LDEOC tests were reported from 5 labs to the Test Monitoring Center during the period from April 1, 2015 through September 30, 2015.

Please find attached a summary of testing activity this period.

MTK/mtk/mem15-046.mtk.doc

cc: Frank Farber

Jeff Clark

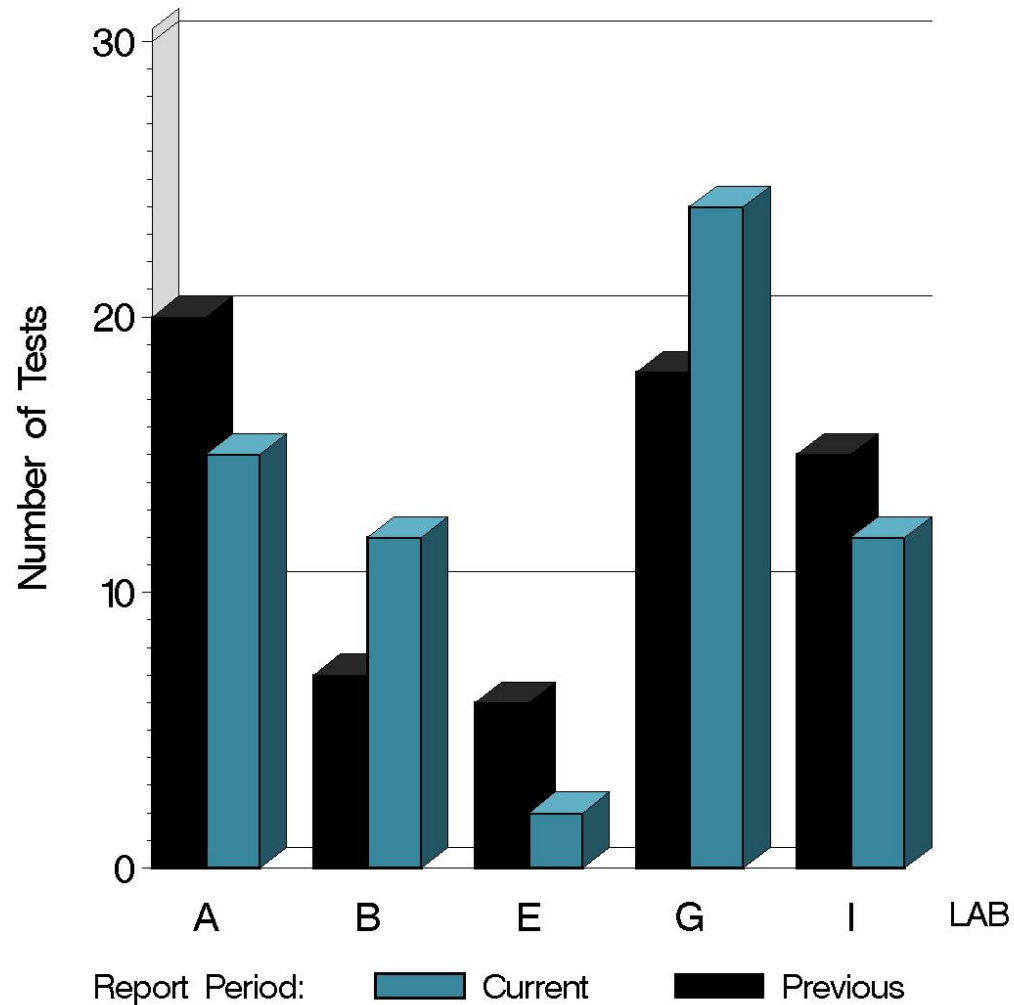
EOEC Surveillance Panel

<ftp://ftp.astmtmc.cmu.edu/docs/bench/ldeoc/semiannualreports/ldeoc-10-2015.pdf>

Distribution: email

# LDEOC (D 7216)

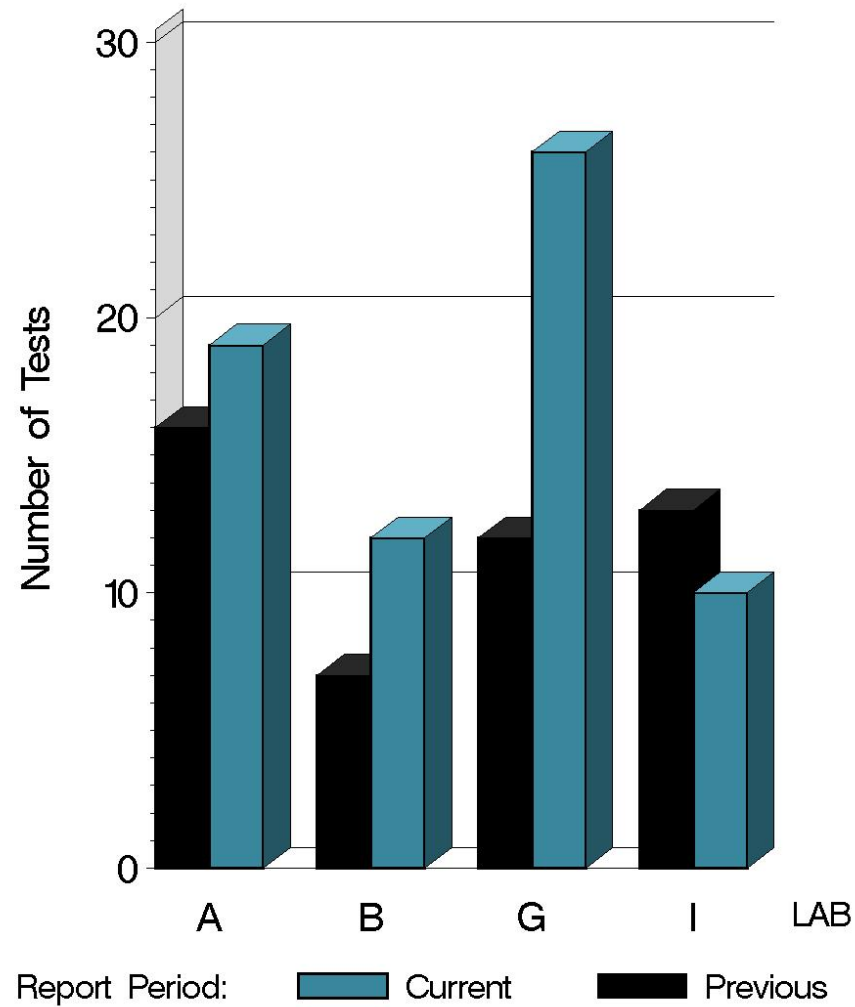
NUMBER OF ETHYLENE ACRYLATE TESTS  
REPORTED BY LAB AND REPORT PERIOD



14:40:36 20NOV2015

# LDEOC (D 7216)

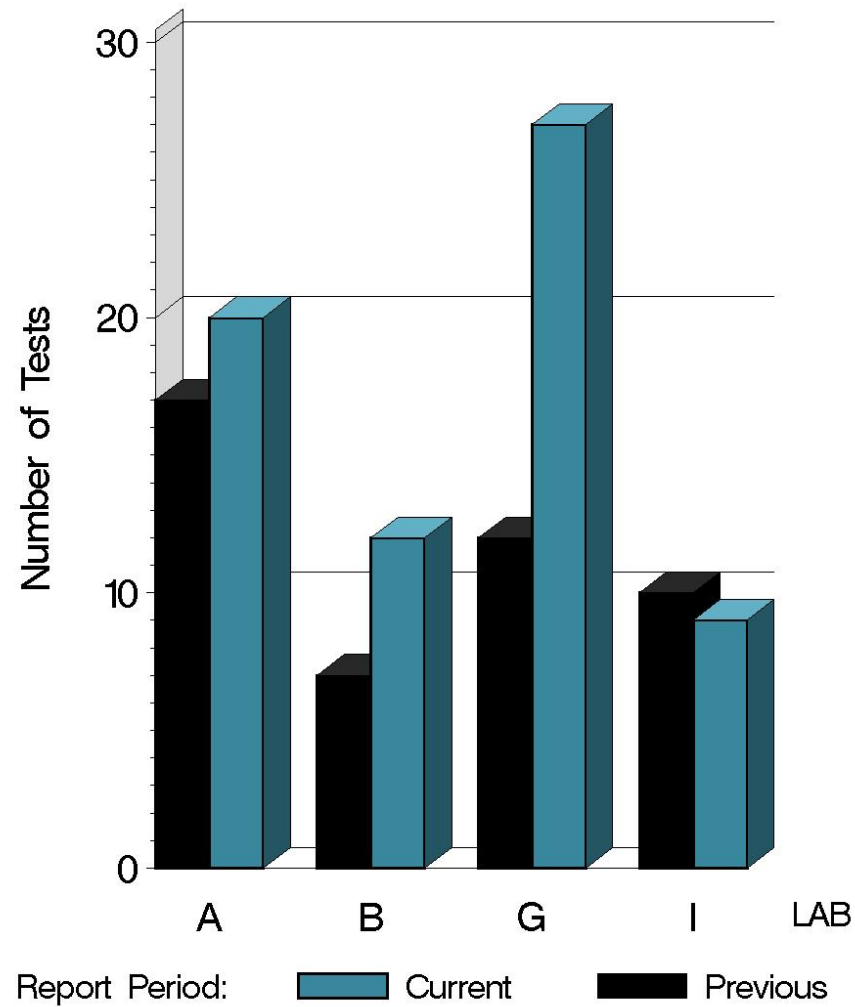
NUMBER OF FLUOROELASTOMER TESTS  
REPORTED BY LAB AND REPORT PERIOD



14:40:36 20NOV2015

# LDEOC (D 7216)

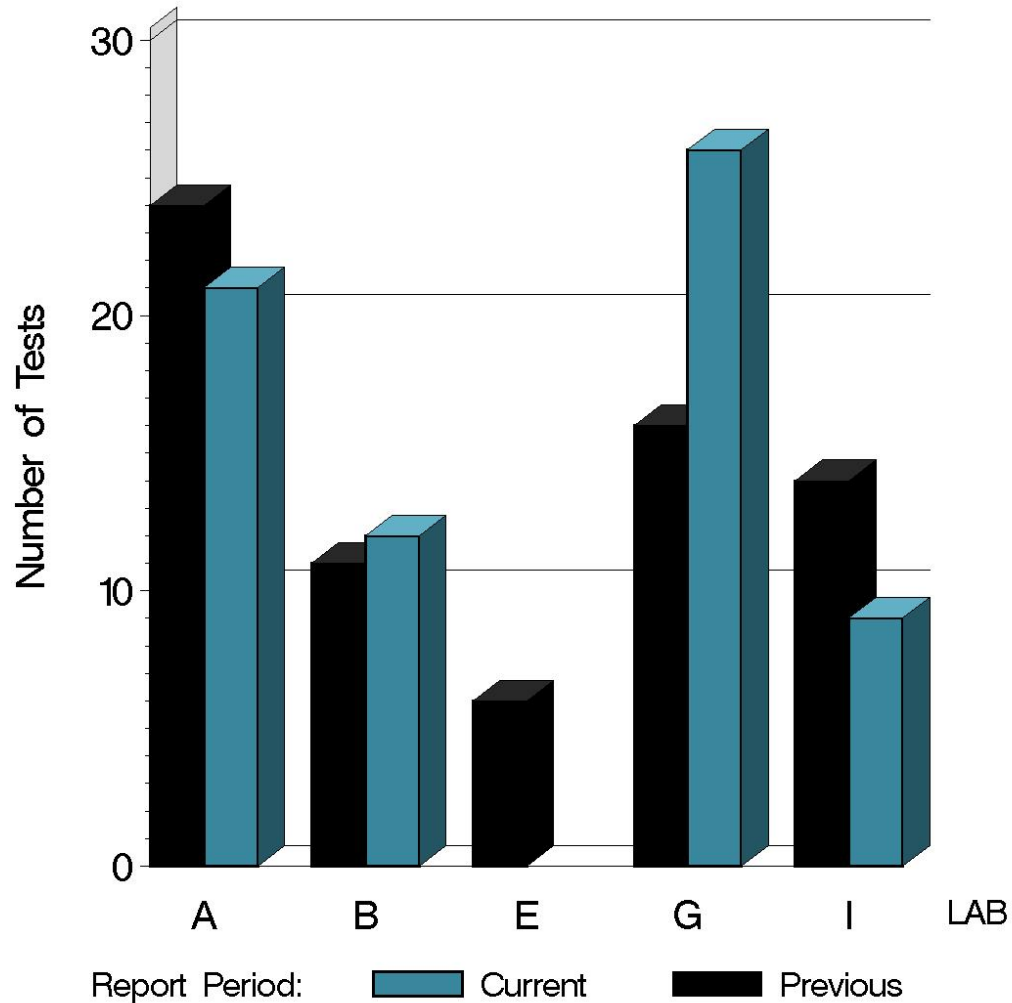
## NUMBER OF NITRILE TESTS REPORTED BY LAB AND REPORT PERIOD



11:17:08 23NOV2015

# LDEOC (D 7216)

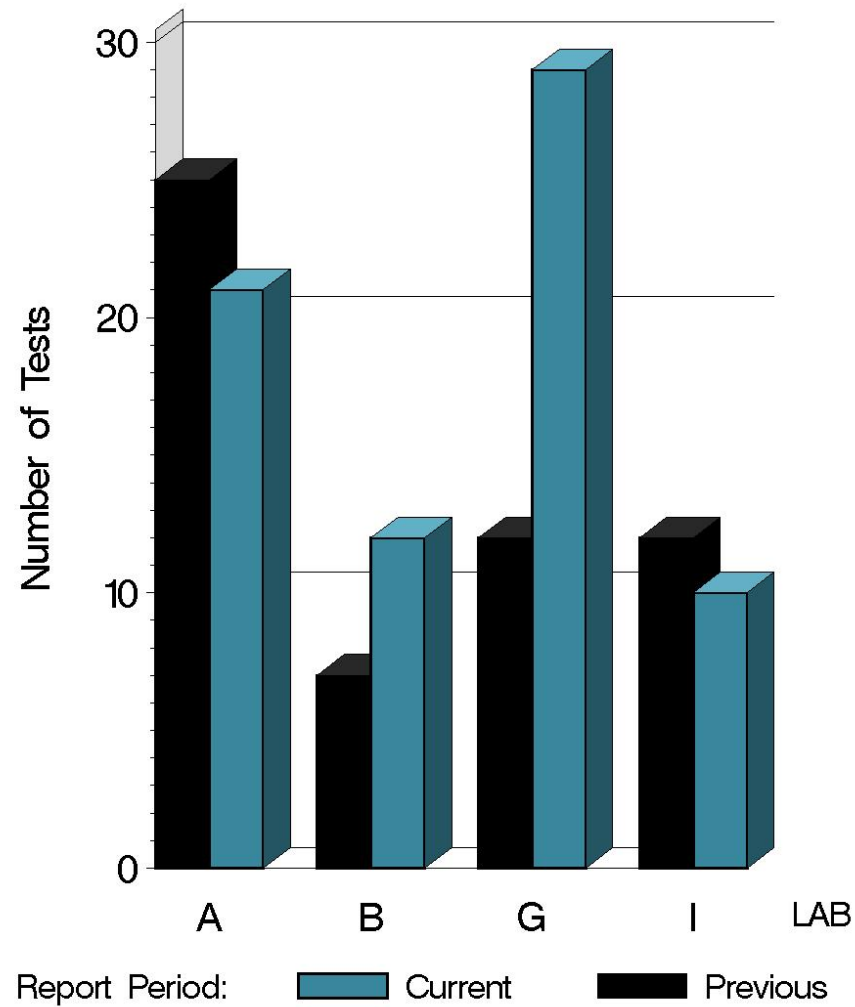
NUMBER OF POLYACRYLATE TESTS  
REPORTED BY LAB AND REPORT PERIOD



11:17:08 23NOV2015

# LDEOC (D 7216)

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



14:40:36 20NOV2015

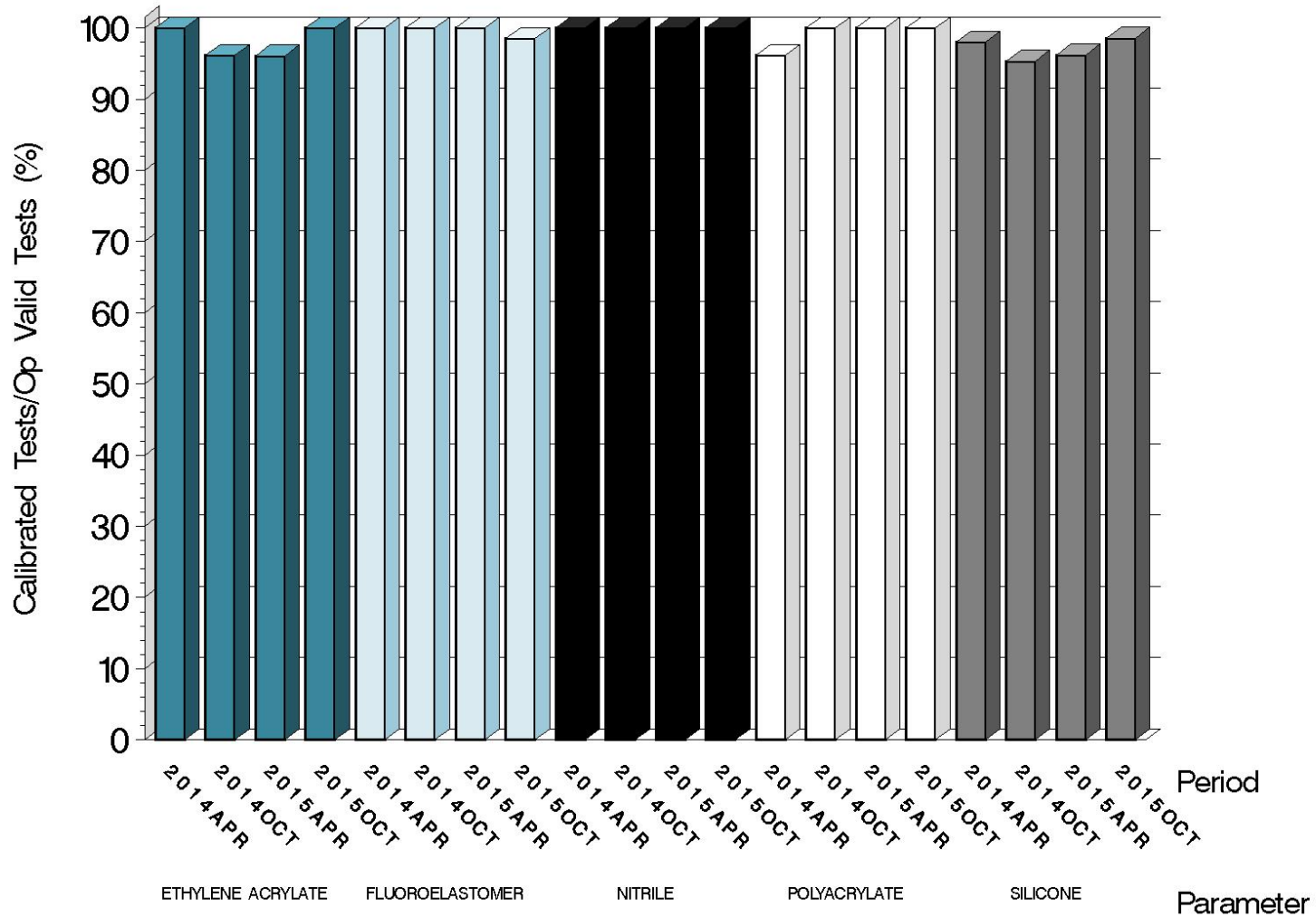
# LDEOC (D 7216)

## Test Distribution by Oil and Validity

		Ethylene Acrylate	Fluoroelastomer	Nitrile	Polyacrylate	Silicone	This Period	Last Period
Accepted for Calibration	AC	56	65	68	65	70	324	245
Rejected	OC	0	1	0	0	1	2	4
Acceptable Information Run	NI	0	0	0	0	0	0	22
Unacceptable Information Run	MI	0	0	0	0	0	0	2
Invalid Information Run (TMC)	RI	3	0	0	0	0	3	3
Operationally Invalid (lab)	LC	1	1	0	2	1	5	1
Operationally Invalid (lab/TMC)	RC	5	0	0	0	0	5	0
Aborted Calibration	XC	0	0	0	1	0	1	9
<b>Total</b>		<b>65</b>	<b>67</b>	<b>68</b>	<b>68</b>	<b>72</b>	<b>340</b>	<b>286</b>

# LDEOC (D 7216)

## OPERATIONALLY VALID TESTS MEETING ACCEPTANCE CRITERIA



11:17:08 23NOV2015



# LDEOC (D 7216)

## 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	2	15	13	0	19	0	0	20	0	1	21	5	0	21	0	3	96	3
B	0	12	0	0	12	0	0	12	0	0	12	0	0	12	0	0	60	0
E	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0
G	2	24	8	1	26	4	0	27	0	2	26	7	1	29	3	6	132	5
I	2	12	17	0	10	0	0	9	0	0	9	0	0	10	0	2	50	4
Total	6	65	9.2	1	67	1.5	0	68	0	3	68	4.5	1	72	1.4	11	340	3.2

# LDEOC (D 7216)

## CAUSES FOR LOST TESTS

Lab	Cause	Elastomer					Validity			Loss Rate		
		Ethylene Acrylate	Fluoroelastomer	Nitrile	Polyacrylate	Silicone	LC	RC	XC	Lost	Starts	%
A	Bad Elastomer Batch	3	0	0	0	0	3	0	3	70	4.3	
	Wrong Material Used	0	0	0	1	0	0	1	1		1.4	
G	Bath Failure	1	1	0	1	1	4	0	0	4	132	3.0
	Wrong Material Used	0	0	0	1	0	1	0	0	1		0.8
I	Bad Elastomer Batch	2	0	0	0	0	2	0	0	2	50	4.0
Lost		6	1	0	3	1	7	3	1			
Starts		65	67	68	68	72	340	340	340			
%		9.2	1.5	0	4.4	1.4	2.1	0.9	0.3			

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

# LDEOC (D 7216)

Average $\Delta$ 's by Lab					
Elastomer	Lab	n	VOLCYI	HARDYI	TENSYI
Ethylene Acrylate	A	12	1.274	-1.300	1.085
	B	12	-0.534	-1.451	-0.510
	E	0	-	-	-
	G	22	0.398	-0.110	0.613
	I	10	-1.242	-0.756	-0.189
	Industry	56	0.093	-0.768	0.330
Fluoroelastomer	A	19	0.379	0.473	-0.619
	B	12	-1.000	-0.053	0.420
	E	0	-	-	-
	G	25	-1.288	0.248	0.131
	I	10	-0.487	0.228	0.912
	Industry	66	-0.634	0.255	0.086
Nitrile	A	20	1.542	-0.862	-0.418
	B	12	1.021	-0.115	-0.175
	E	0	-	-	-
	G	27	0.157	0.513	-0.788
	I	9	-0.272	-0.338	0.087
	Industry	68	0.660	-0.115	-0.455
Polyacrylate	A	20	1.420	-0.701	-0.780
	B	12	0.741	-1.307	-1.128
	E	0	-	-	-
	G	24	-0.136	0.992	-0.578
	I	9	0.842	0.027	-1.526
	Industry	65	0.640	-0.087	-0.873
Silicone	A	21	-0.670	-0.893	1.823
	B	12	0.370	-0.297	1.601
	E	0	-	-	-
	G	28	1.117	-0.216	1.192
	I	10	-1.037	0.029	0.491
	Industry	71	0.159	-0.395	1.349

**Test Monitoring Center**

<http://astmtmc.cmu.edu>



A Program of ASTM International

# LDEOC (D 7216)

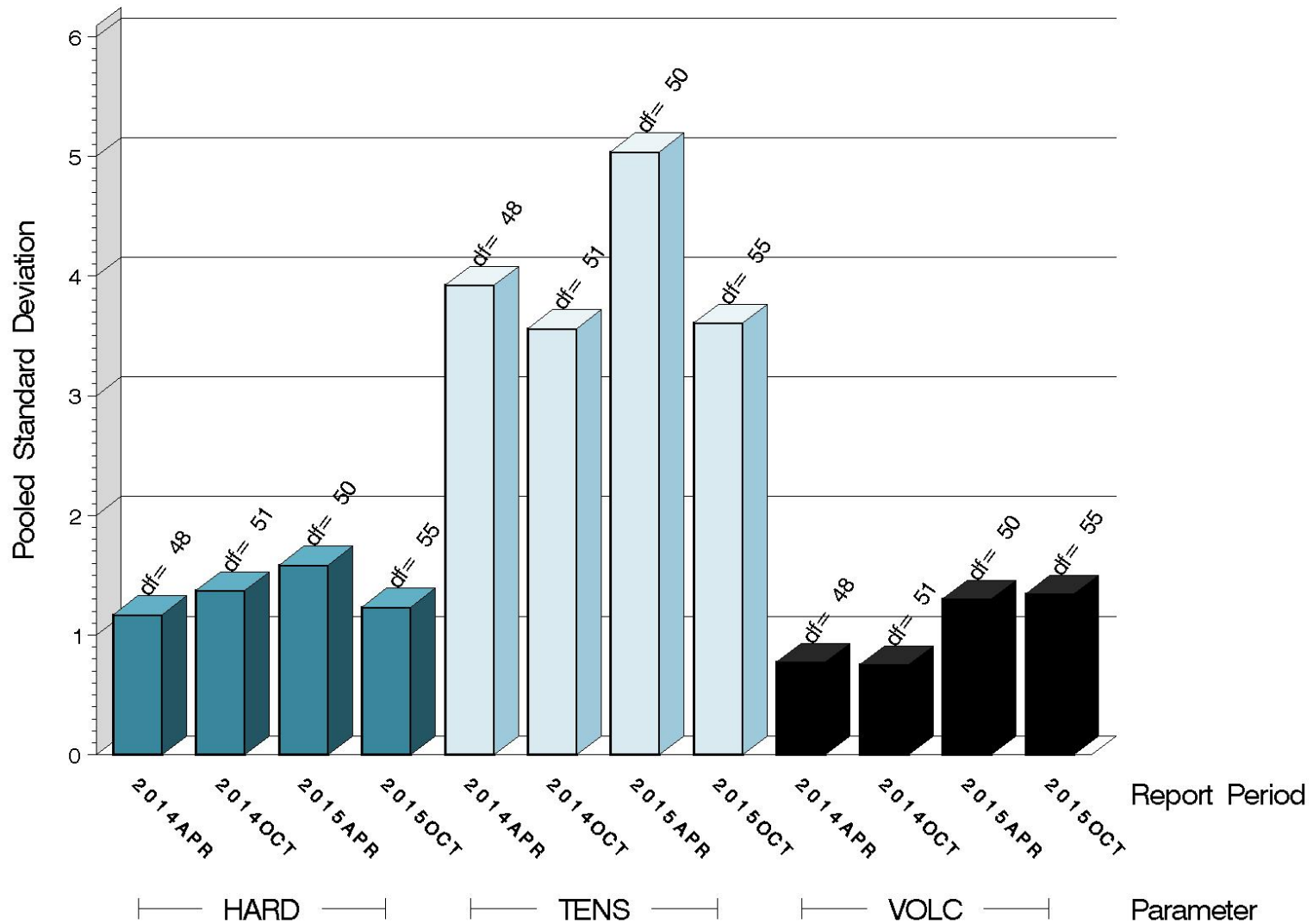
Individual test results can be viewed at the links shown in the following table:

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

# LDEOC (D 7216)

## ETHYLENE ACRYLATE TEST PRECISION

POOLED STANDARD DEVIATION BY SIX-MONTH ASTM REPORT PERIOD

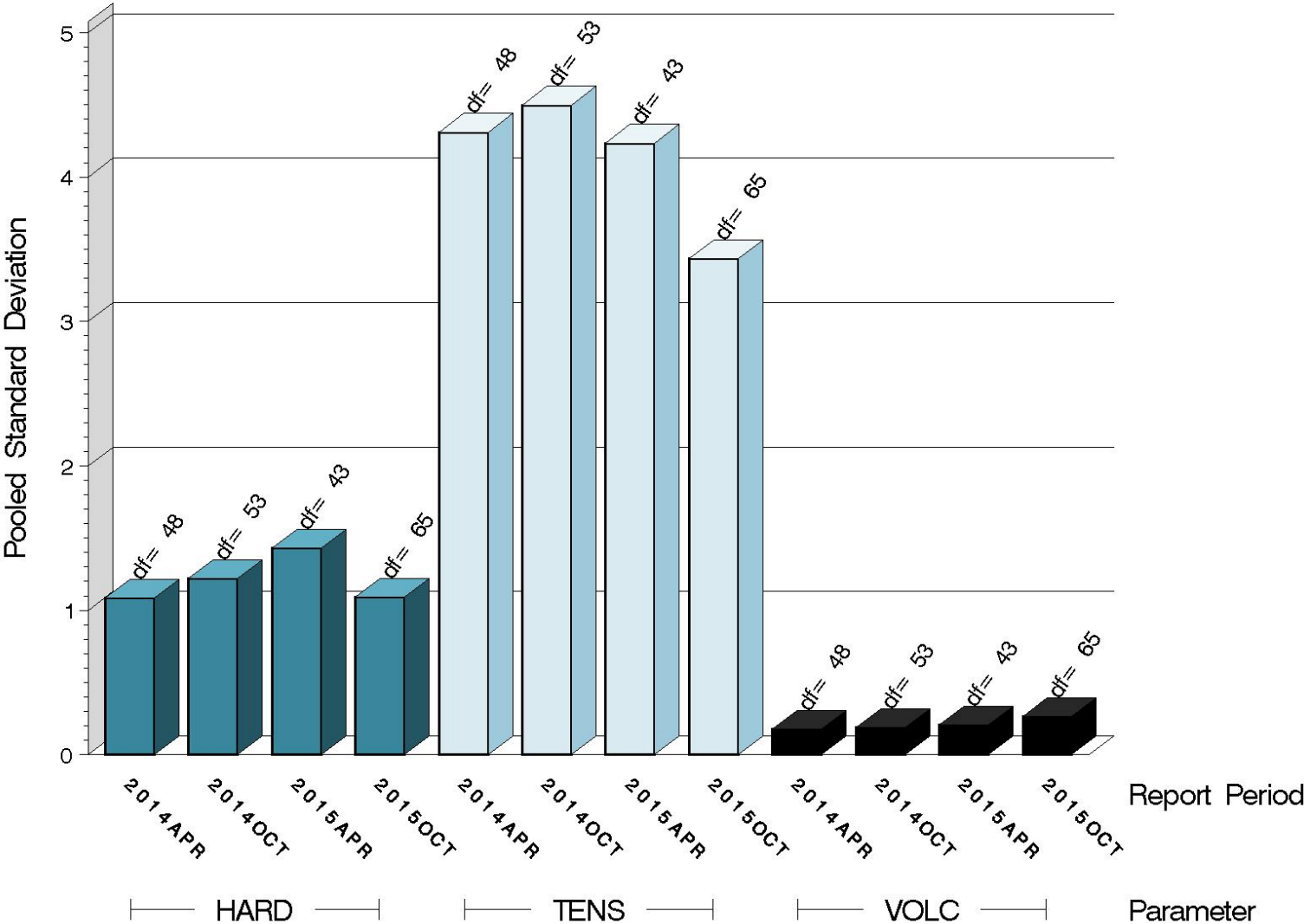


14:40:36 20NOV2015

# LDEOC (D 7216)

## FLUOROELASTOMER TEST PRECISION

POOLED STANDARD DEVIATION BY SIX-MONTH ASTM REPORT PERIOD



14:40:36 20NOV2015

**Test Monitoring Center**

<http://astmtmc.cmu.edu>

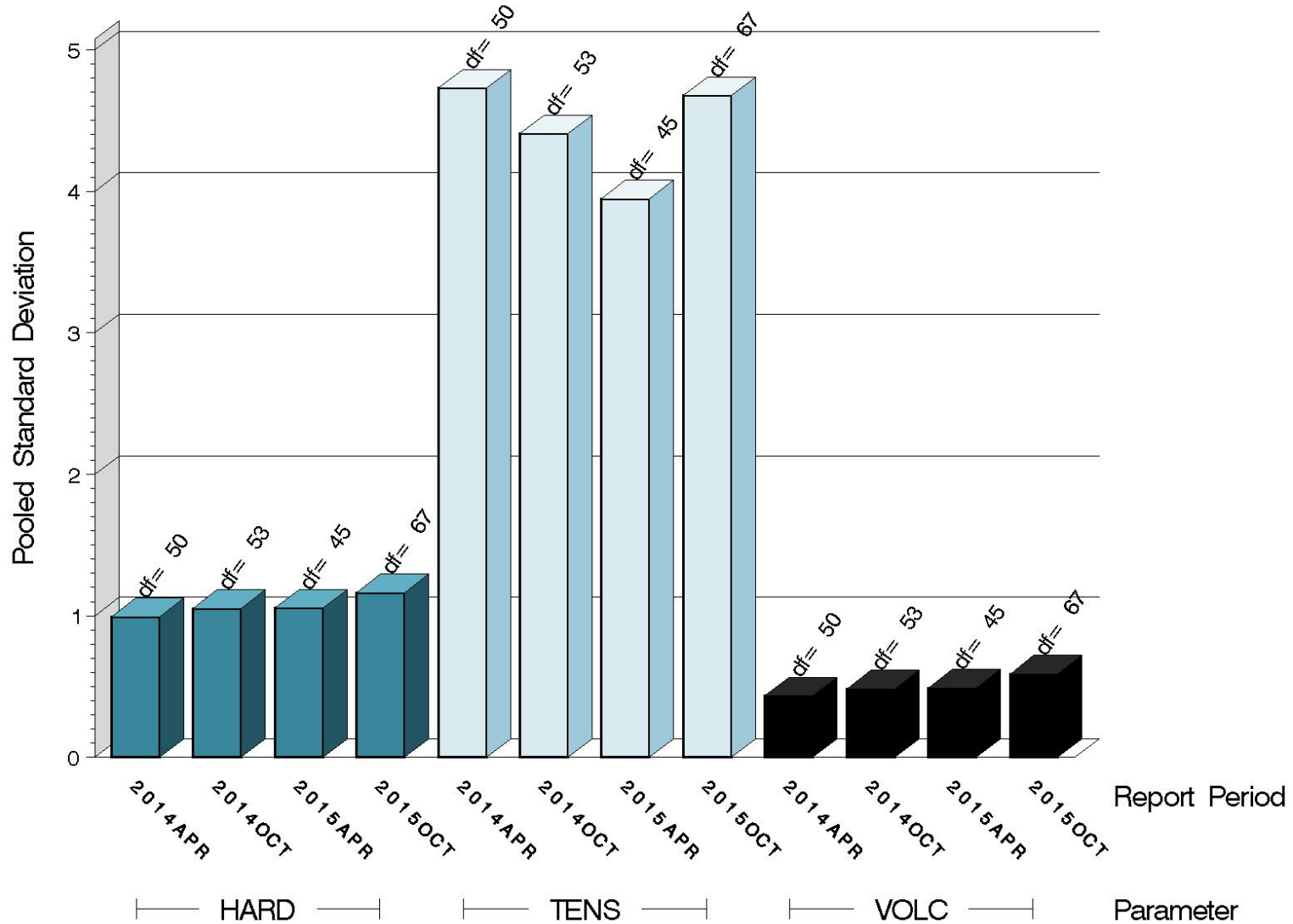


A Program of ASTM International

# LDEOC (D 7216)

## NITRILE TEST PRECISION

POOLED STANDARD DEVIATION BY SIX-MONTH ASTM REPORT PERIOD

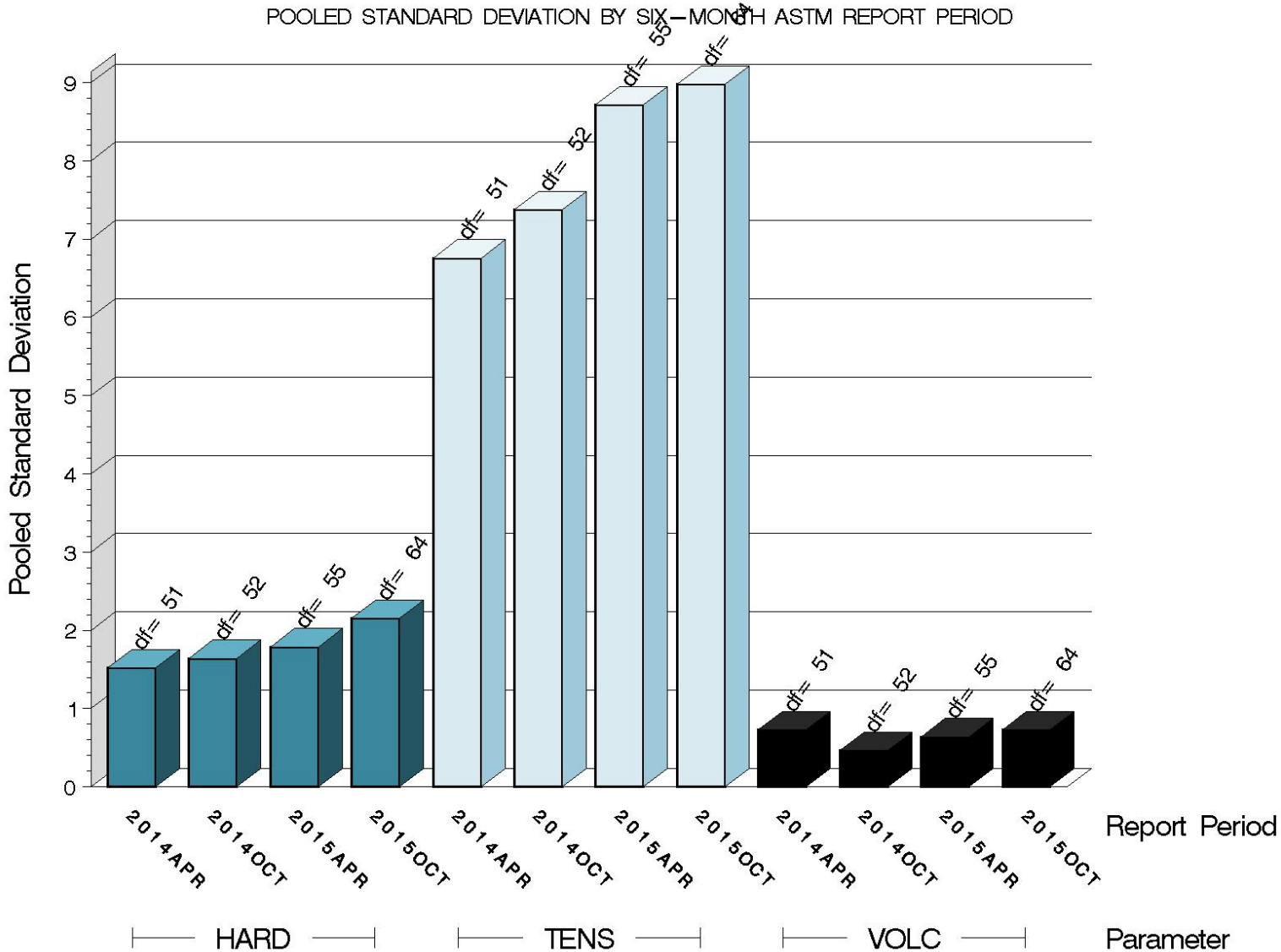


11:17:08 23NOV2015

# LDEOC (D 7216)

## POLYACRYLATE TEST PRECISION

POOLED STANDARD DEVIATION BY SIX-MONTH ASTM REPORT PERIOD



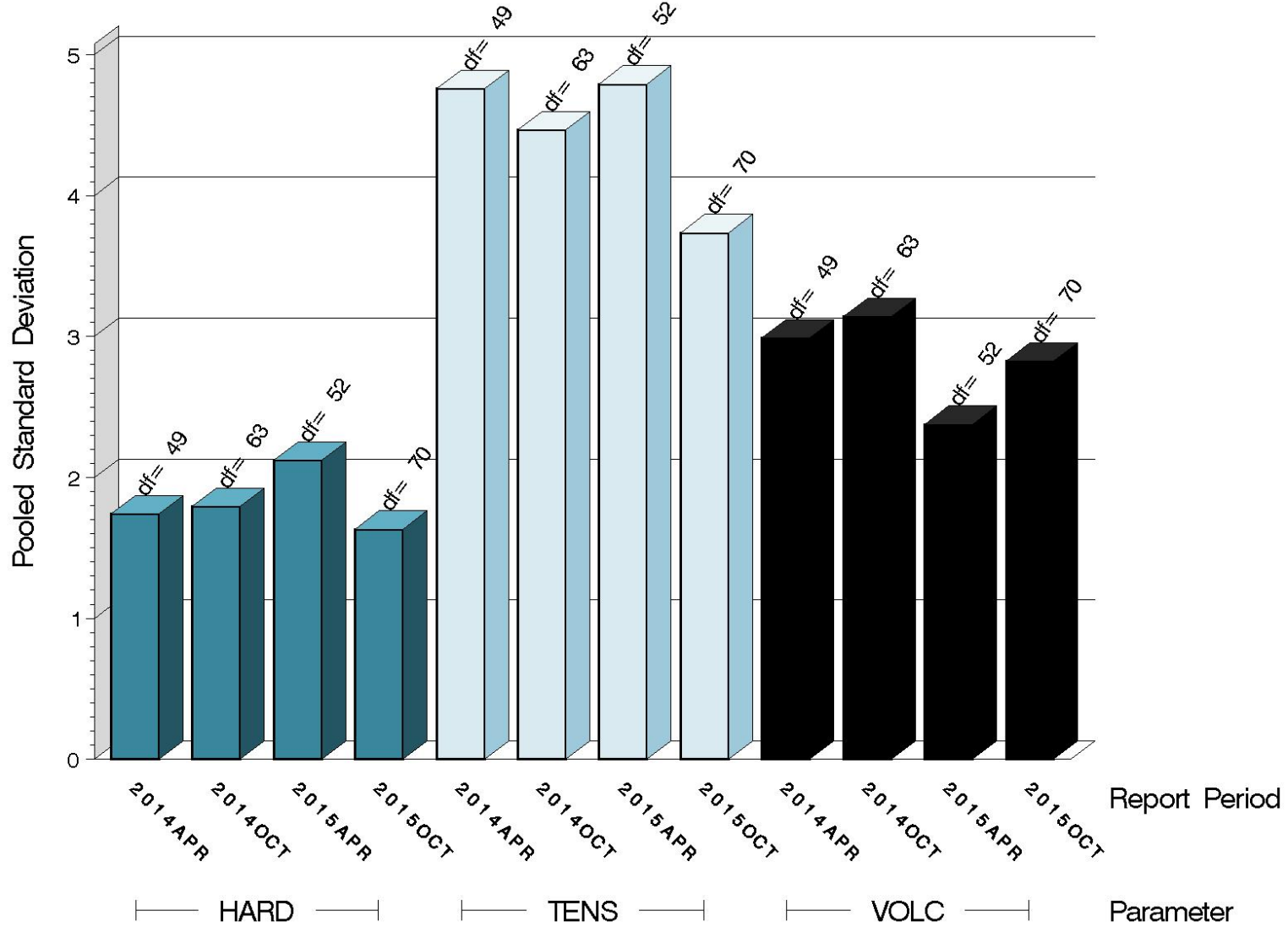
11:17:08 23NOV2015



# LDEOC (D 7216)

## SILICONE TEST PRECISION

POOLED STANDARD DEVIATION BY SIX-MONTH ASTM REPORT PERIOD



14:40:36 20NOV2015

# LDEOC (D 7216)

## SUMMARY OF SEVERITY & PRECISION

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

# LDEOC (D 7216)

## SUMMARY OF SEVERITY & PRECISION (continued)

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

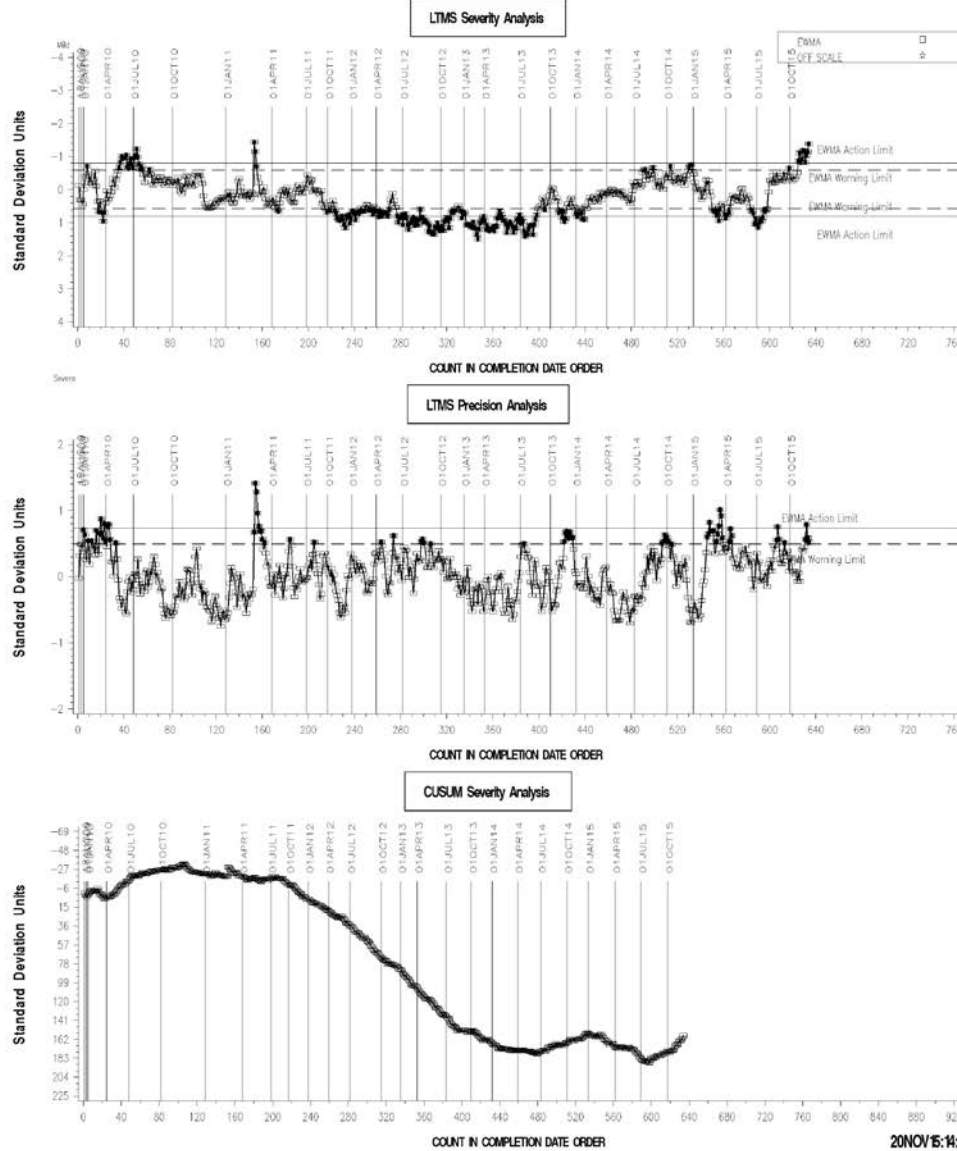
Industry control charts follow.

# LDEOC (D 7216)

LDEOC – ETHYLENE ACRYLATE INDUSTRY OPERATIONALLY VALID DATA



## REF ETH ACRYLATE VOLUME CHANGE AVERAGE

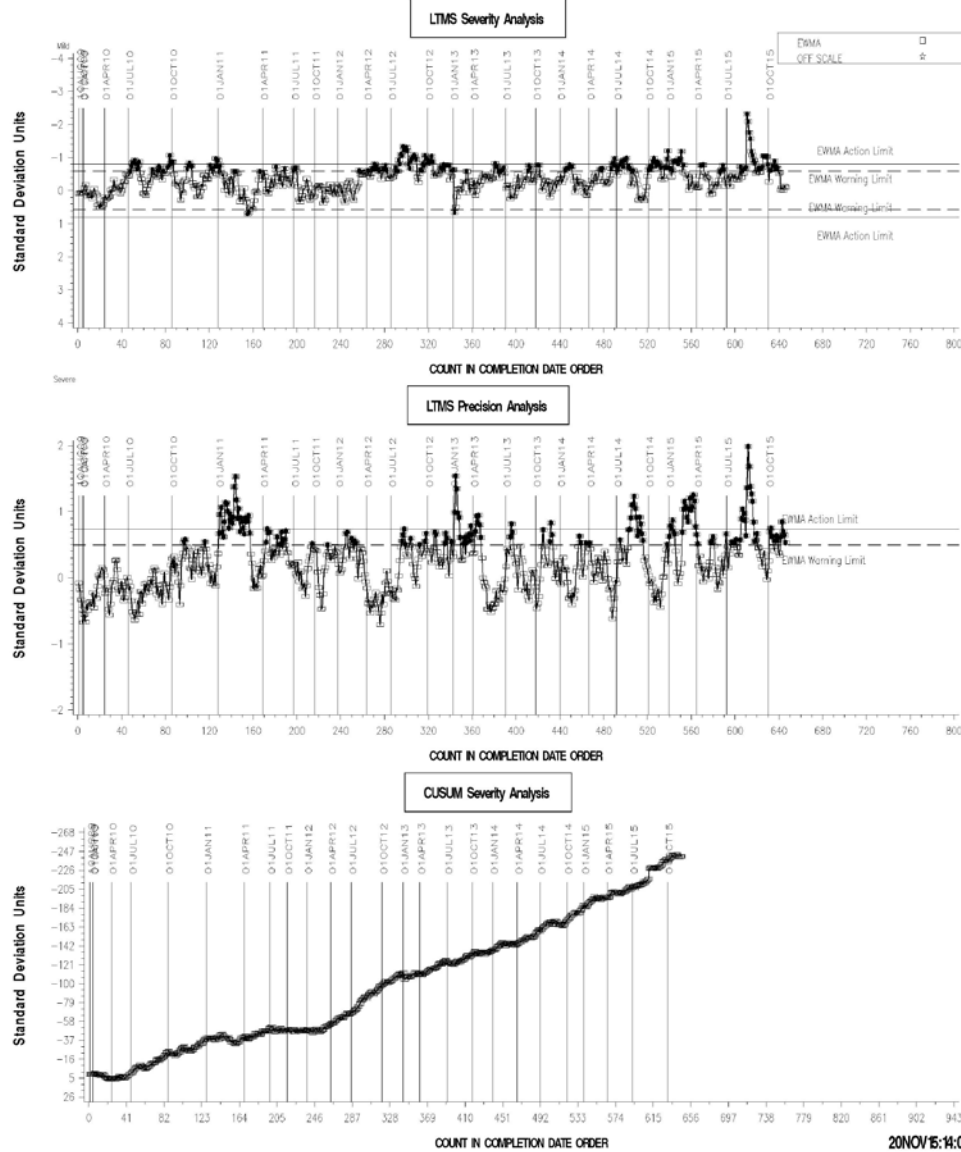


# LDEOC (D 7216)

LDEOC – FLUOROELASTOMER INDUSTRY OPERATIONALLY VALID DATA



## REF FLUOROELASTOMER VOLUME CHANGE AVERAGE

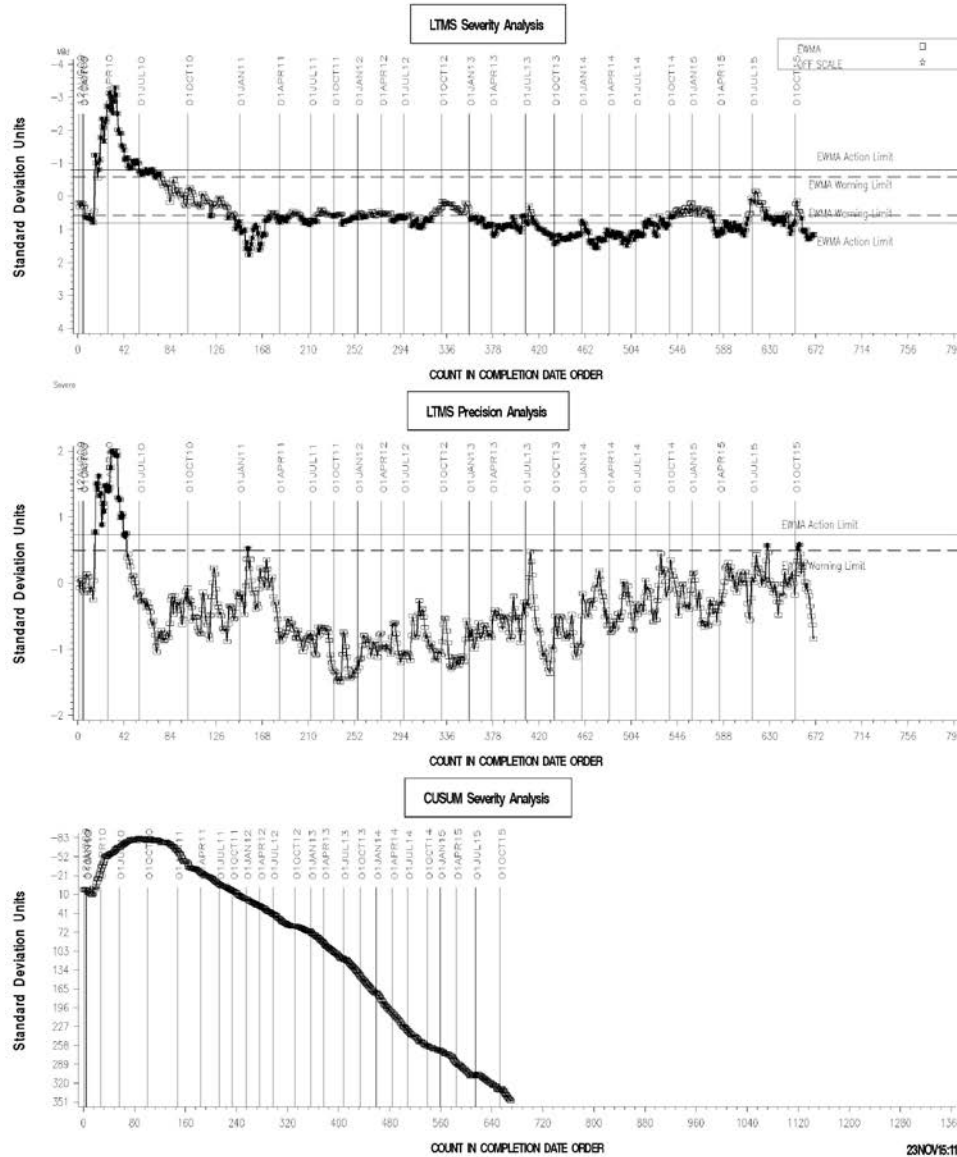


# LDEOC (D 7216)

LDEOC – NITRILE INDUSTRY OPERATIONALLY VALID DATA



REFERENCE NITRILE VOLUME CHANGE AVERAGE

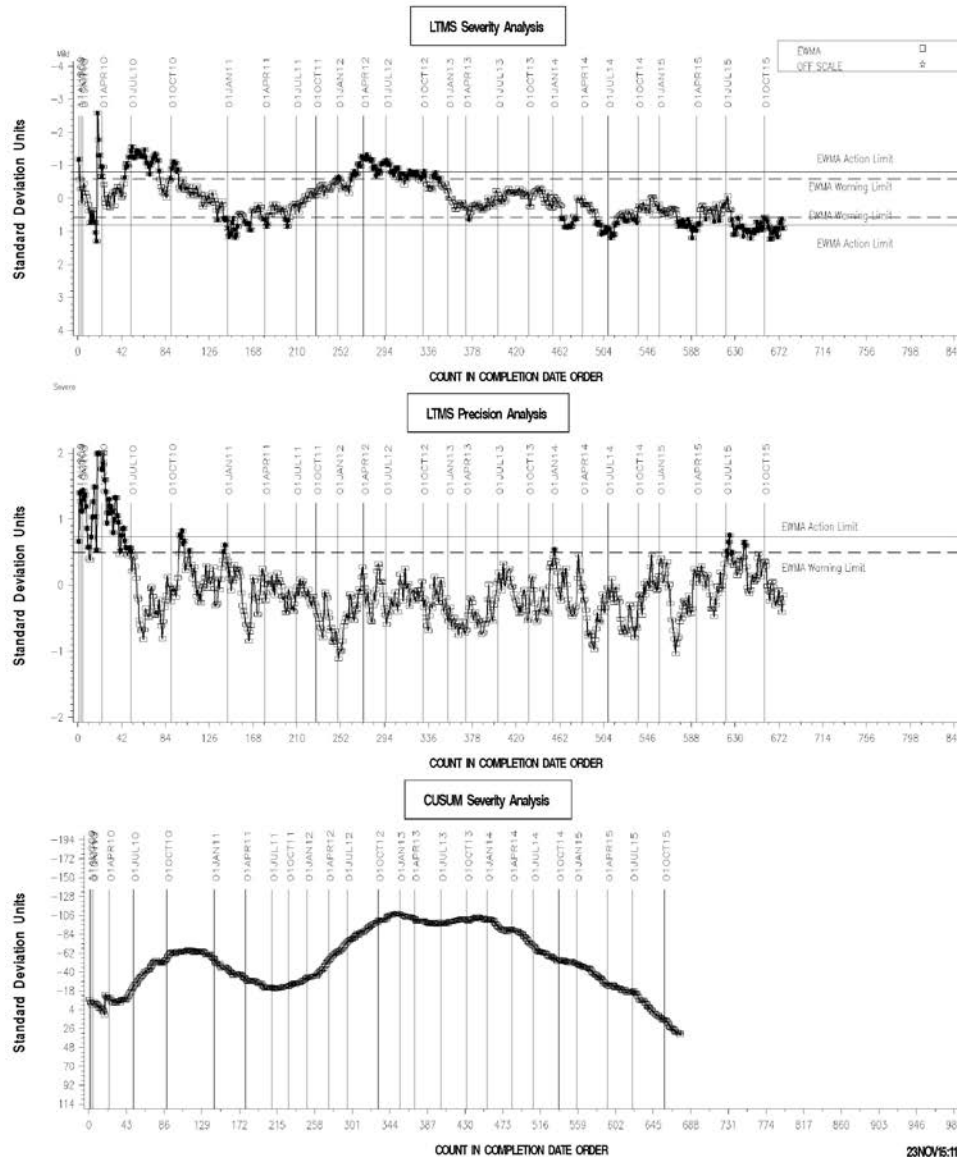


# LDEOC (D 7216)

LDEOC – POLYACRYLATE INDUSTRY OPERATIONALLY VALID DATA



REF POLYACRYLATE VOLUME CHANGE AVERAGE

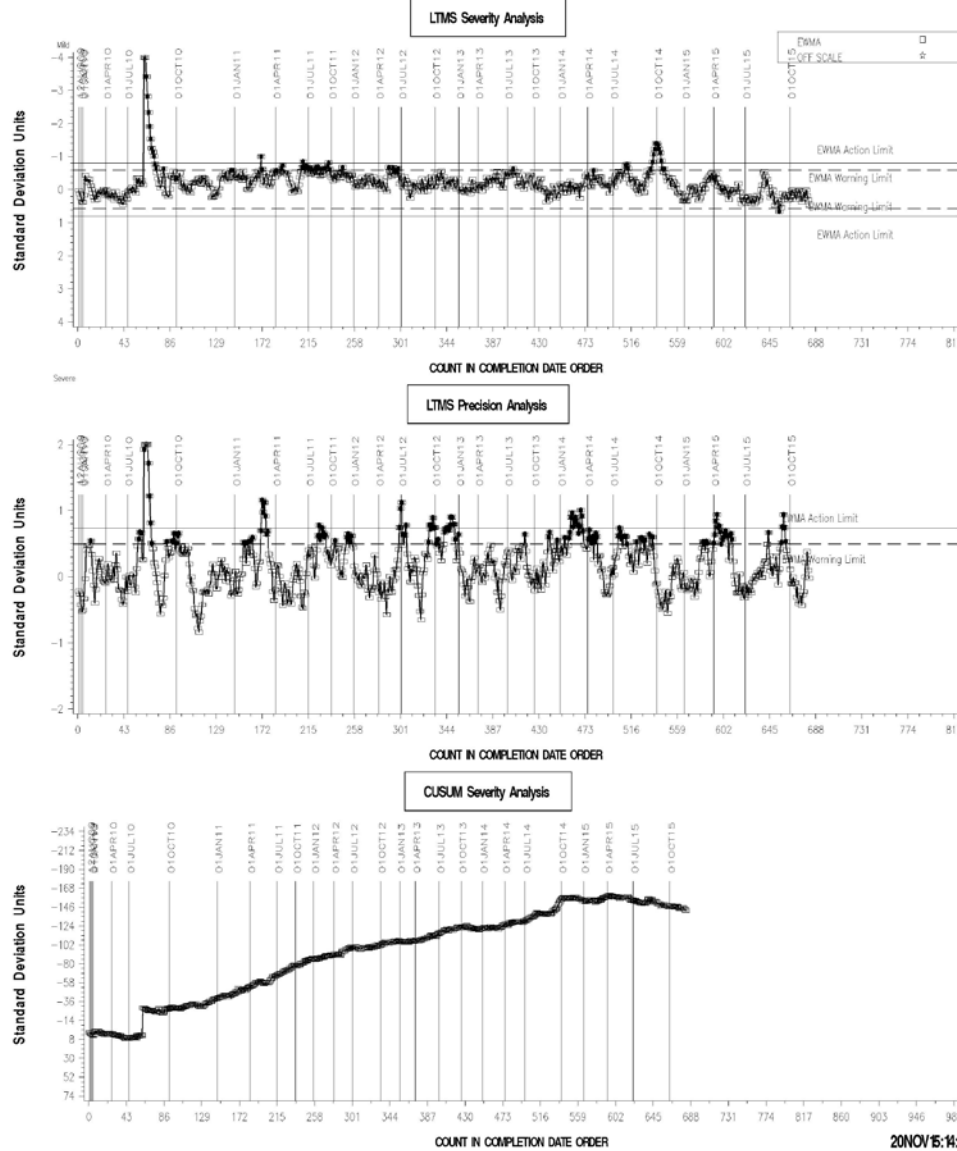


# LDEOC (D 7216)

LDEOC – SILICONE INDUSTRY OPERATIONALLY VALID DATA



## REFERENCE SILICON VOLUME CHANGE AVERAGE



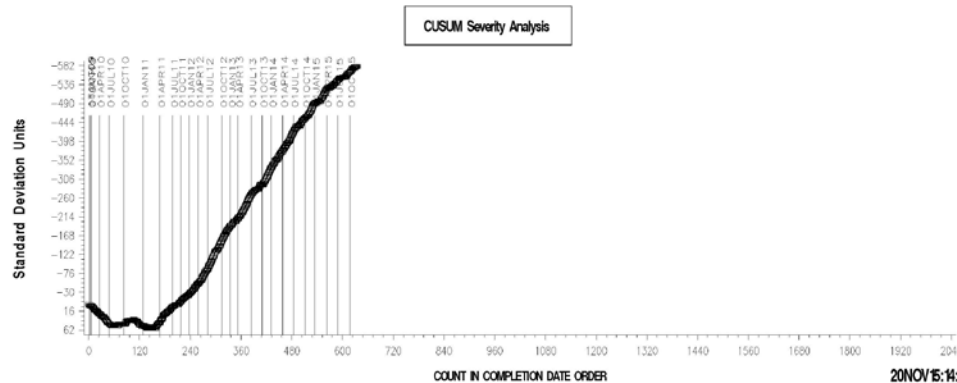
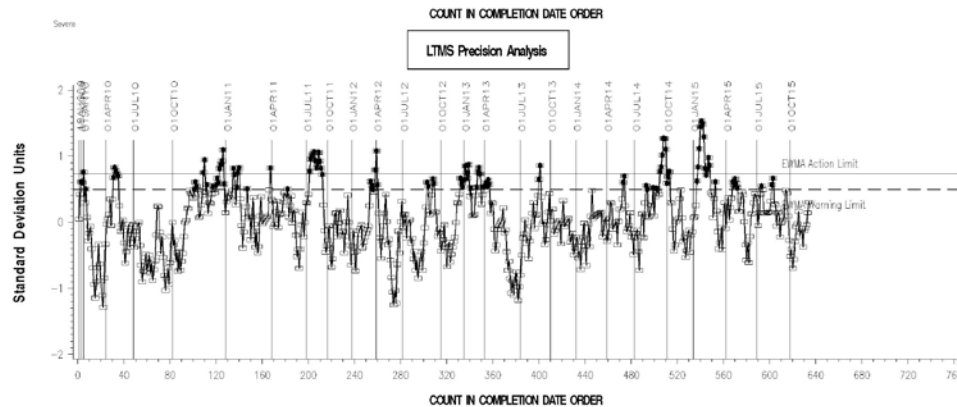
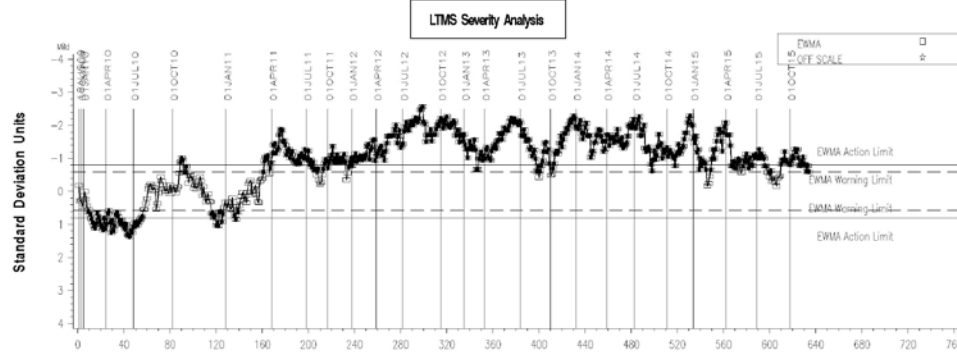


# LDEOC (D 7216)

LDEOC – ETHYLENE ACRYLATE INDUSTRY OPERATIONALLY VALID DATA



REF ETH ACRYLATE POINTS HARDNESS CHANGE AVG

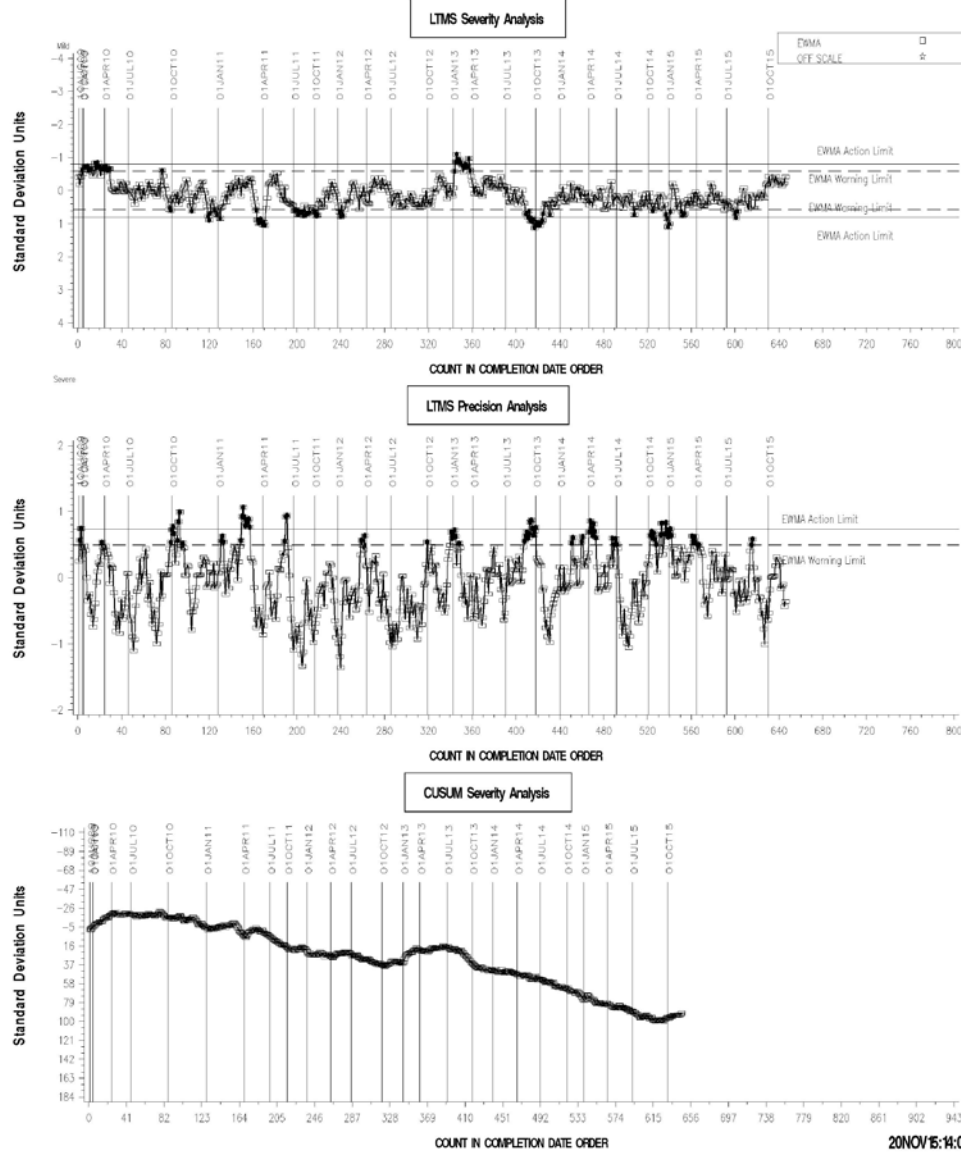


# LDEOC (D 7216)

LDEOC – FLUOROELASTOMER INDUSTRY OPERATIONALLY VALID DATA



## REF FLURO POINTS HARDNESS CHANGE AVERAGE

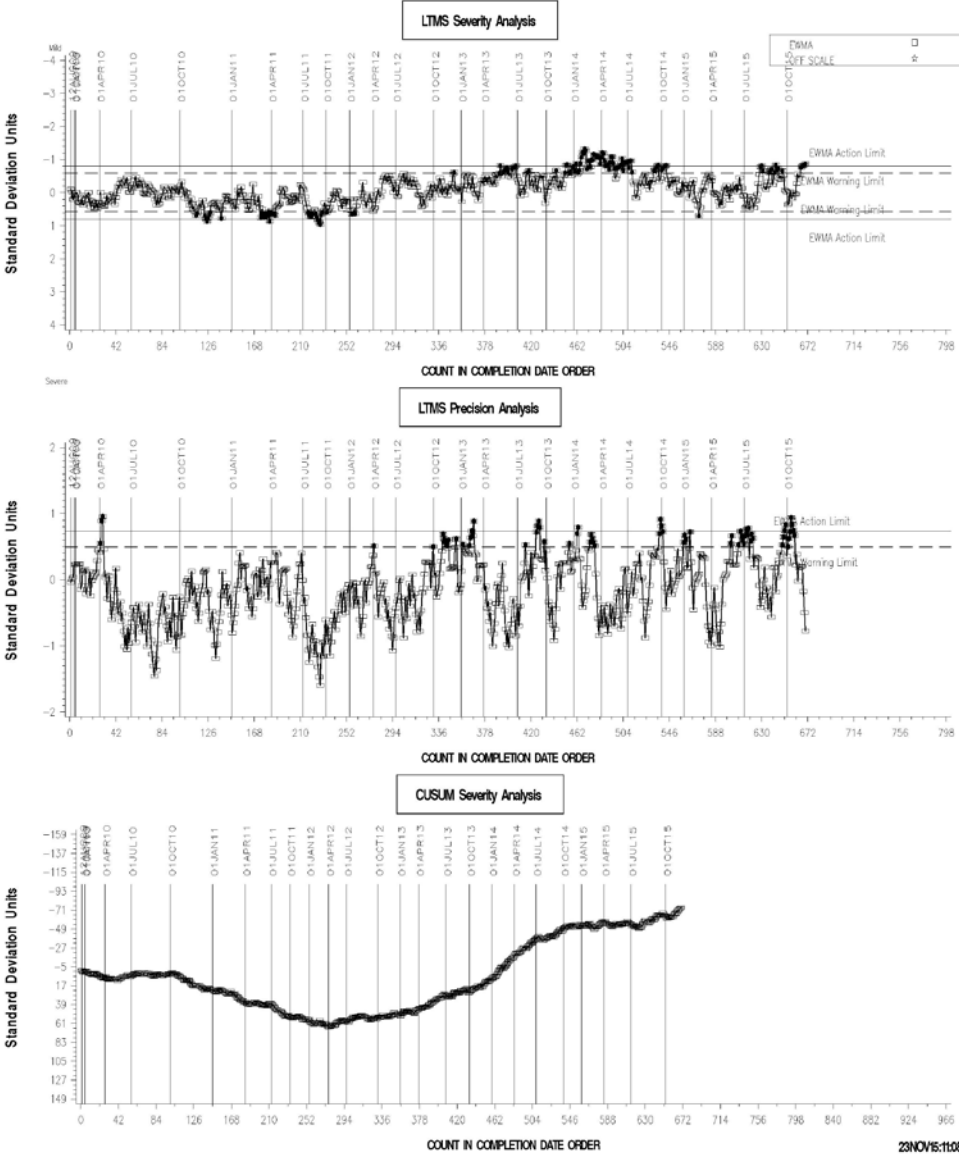


# LDEOC (D 7216)

LDEOC – NITRILE INDUSTRY OPERATIONALLY VALID DATA



REF NITRILE POINTS HARDNESS CHANGE AVERAGE

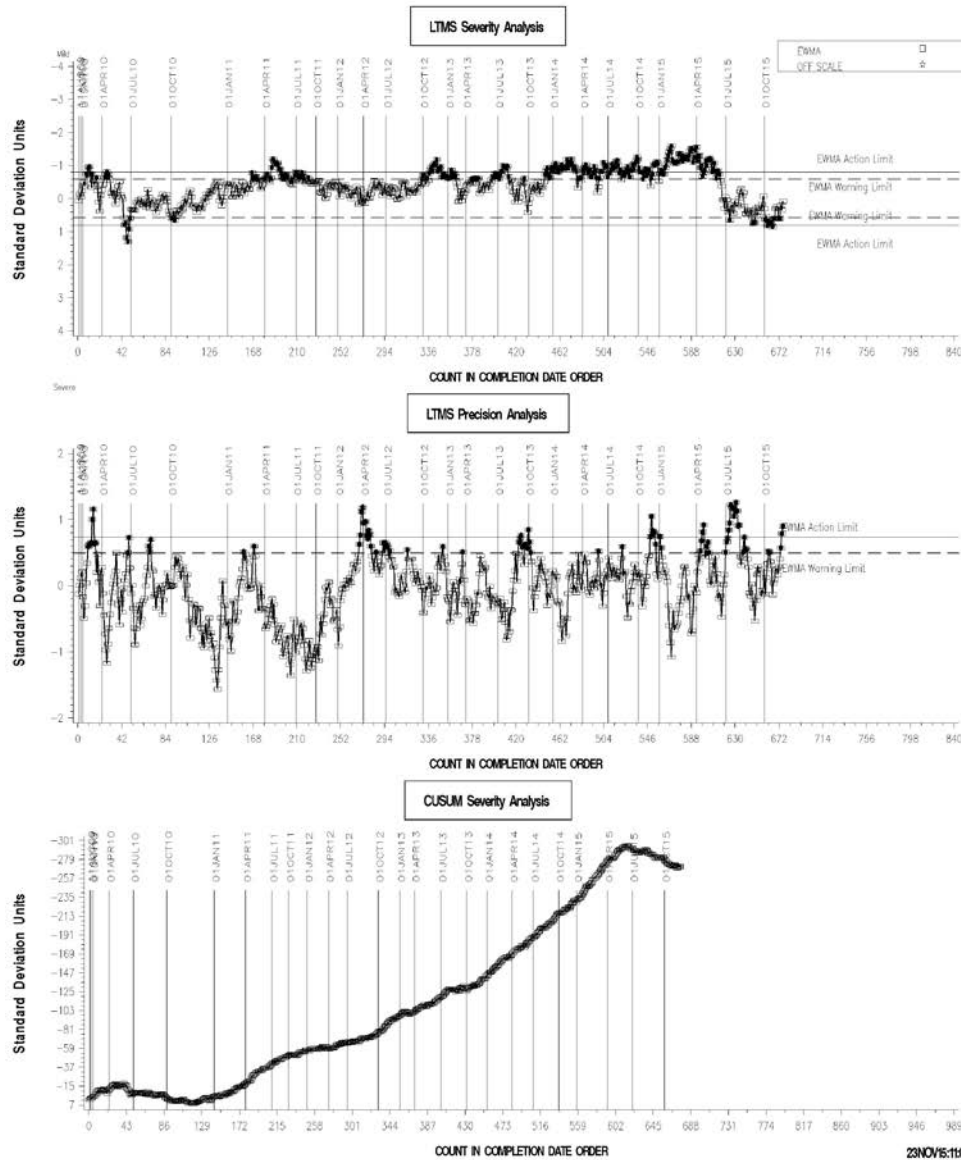


23NOV6:11:08

# LDEOC (D 7216)

LDEOC – POLYACRYLATE INDUSTRY OPERATIONALLY VALID DATA

REF POLYACRYLATE POINTS HARDNESS CHG AVG

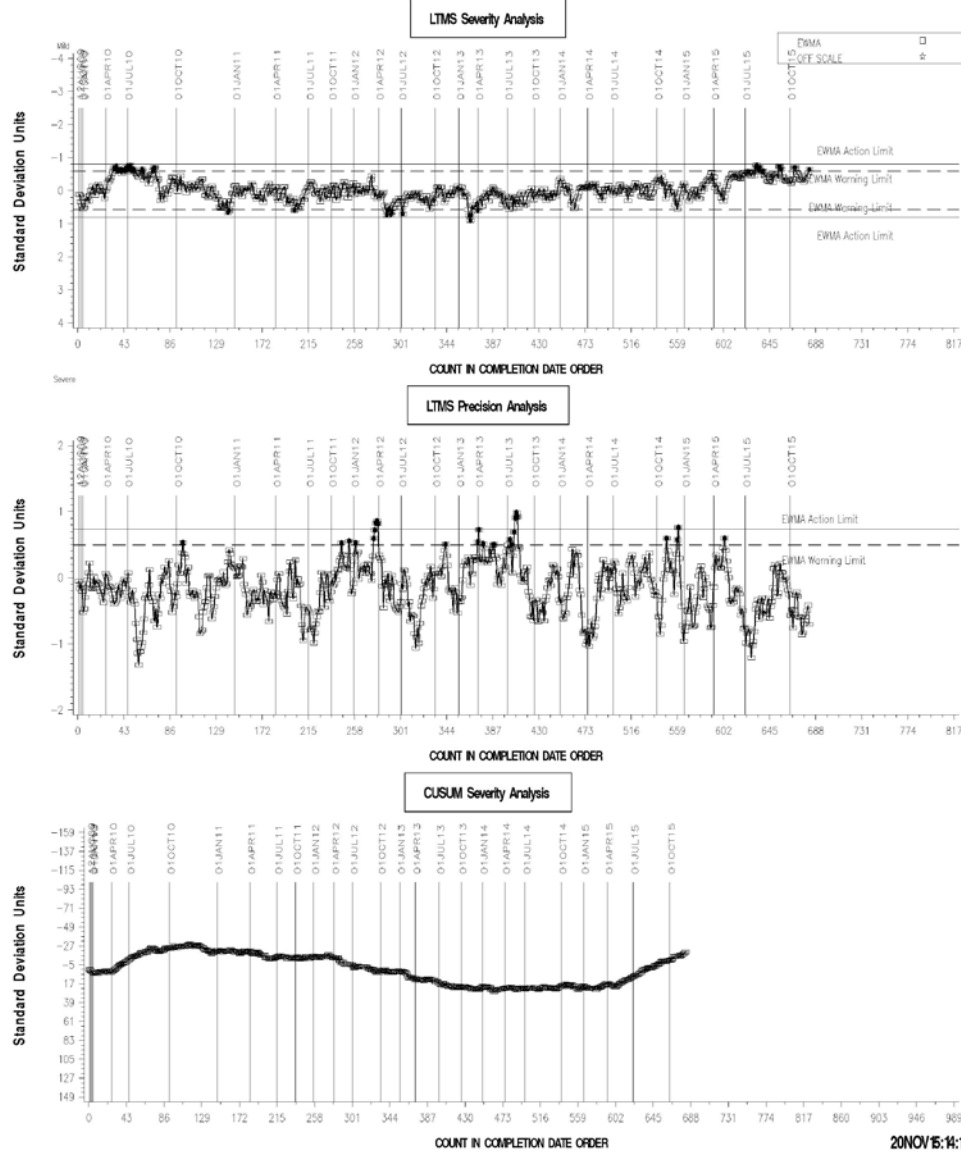


# LDEOC (D 7216)

LDEOC – SILICONE INDUSTRY OPERATIONALLY VALID DATA



## REF SILICON POINTS HARDNESS CHANGE AVERAGE

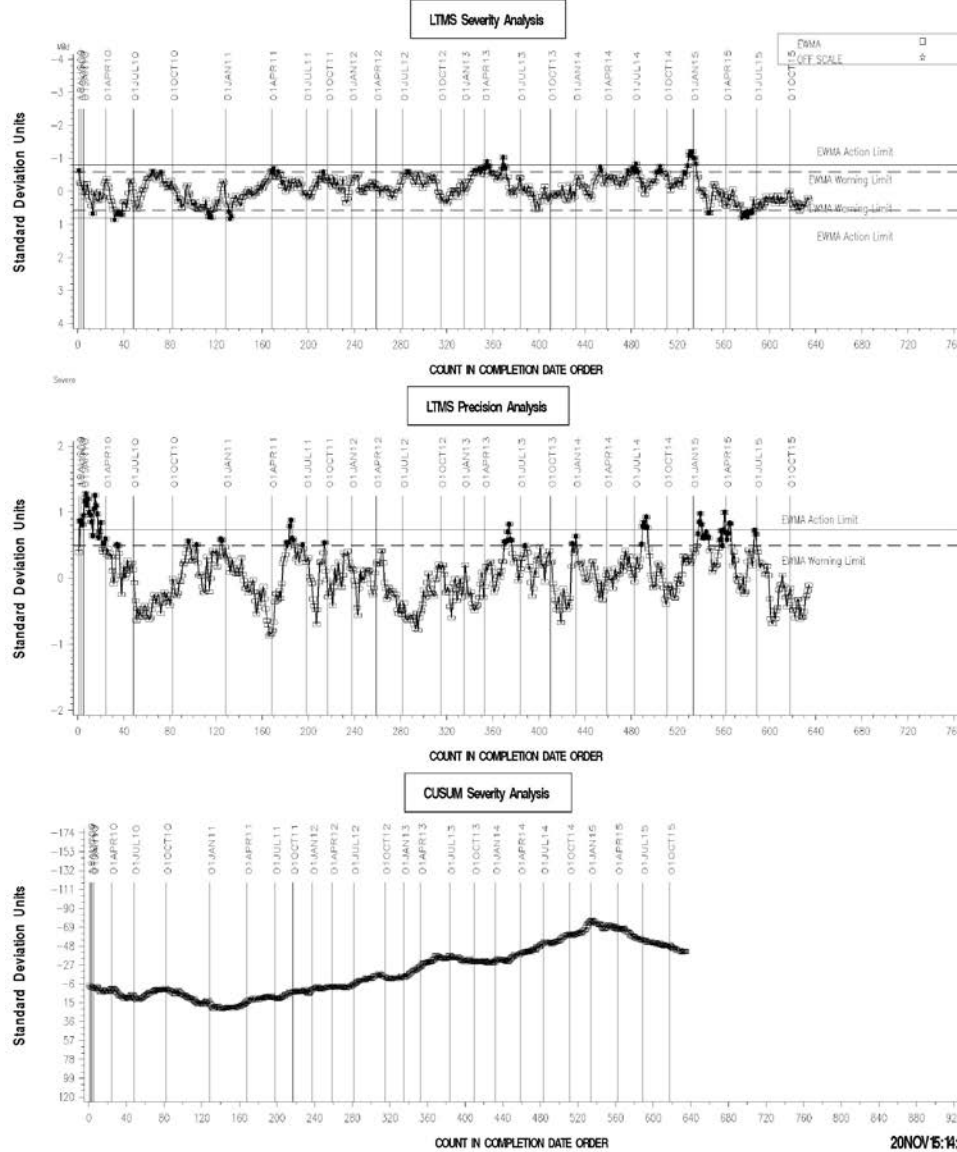


# LDEOC (D 7216)

LDEOC – ETHYLENE ACRYLATE INDUSTRY OPERATIONALLY VALID DATA



## REF ETH ACRYLATE TENSILE STRENGTH CHANGE AVG

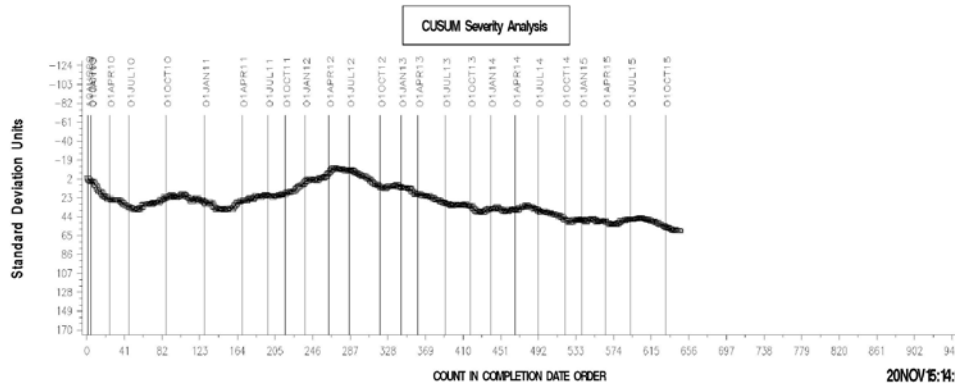
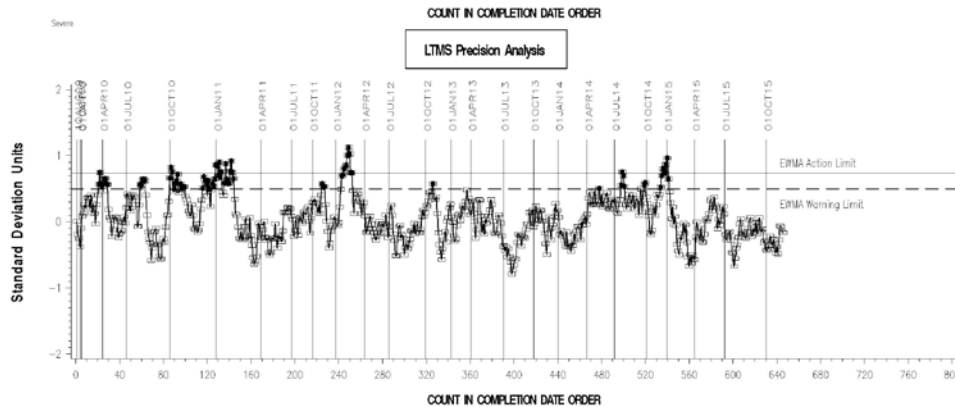
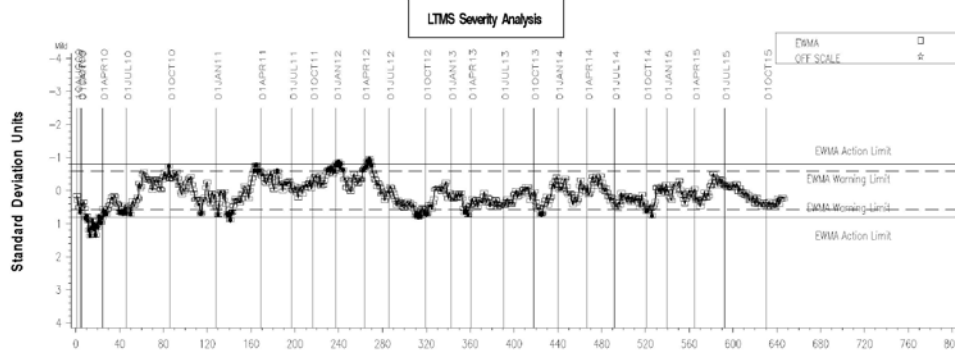


# LDEOC (D 7216)

LDEOC – FLUOROELASTOMER INDUSTRY OPERATIONALLY VALID DATA



## REF FLURO TENSILE STRENGTH CHANGE AVERAGE



20NOV15:14:08

**Test Monitoring Center**  
<http://astmtmc.cmu.edu>

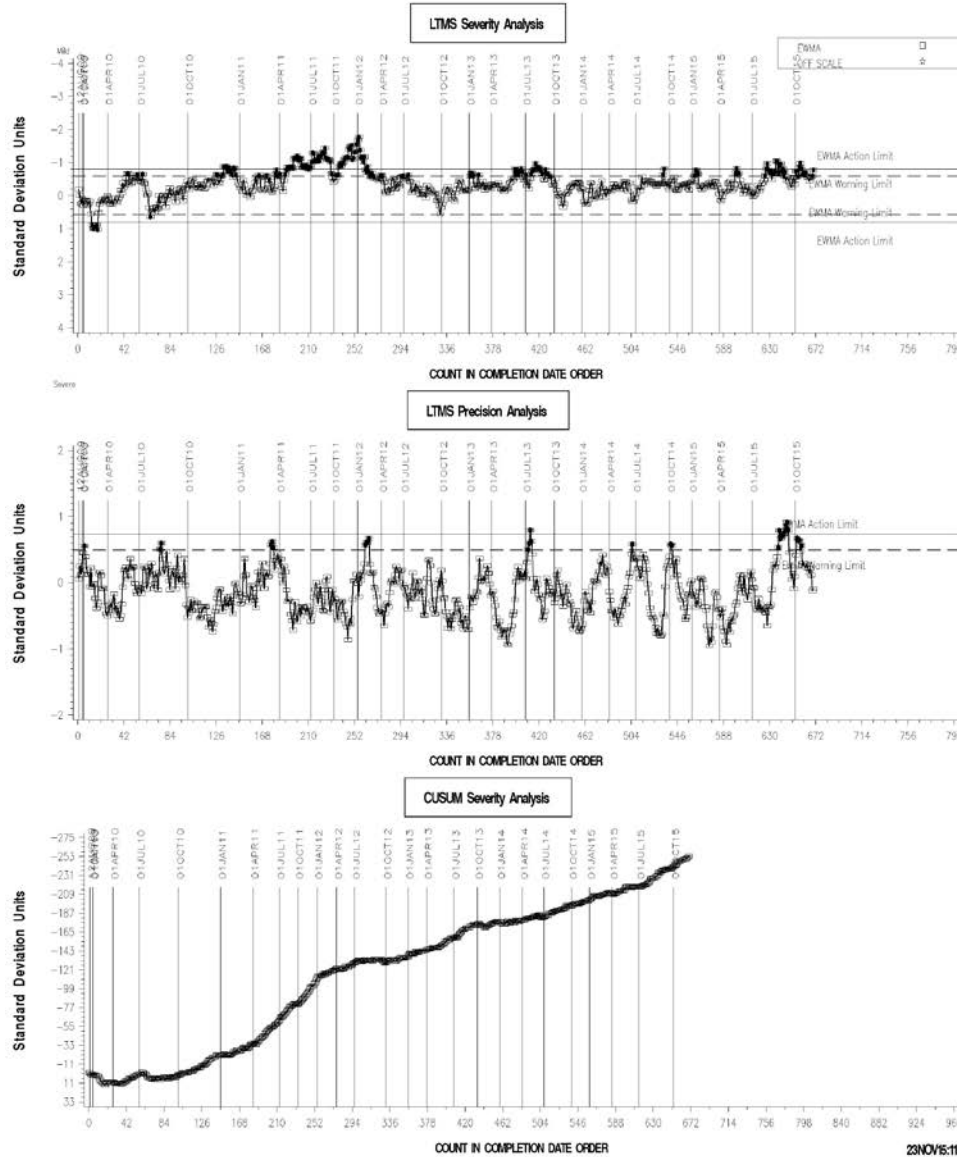


A Program of ASTM International

# LDEOC (D 7216)

LDEOC – NITRILE INDUSTRY OPERATIONALLY VALID DATA

REF NITRILE TENSILE STRENGTH CHANGE AVERAGE

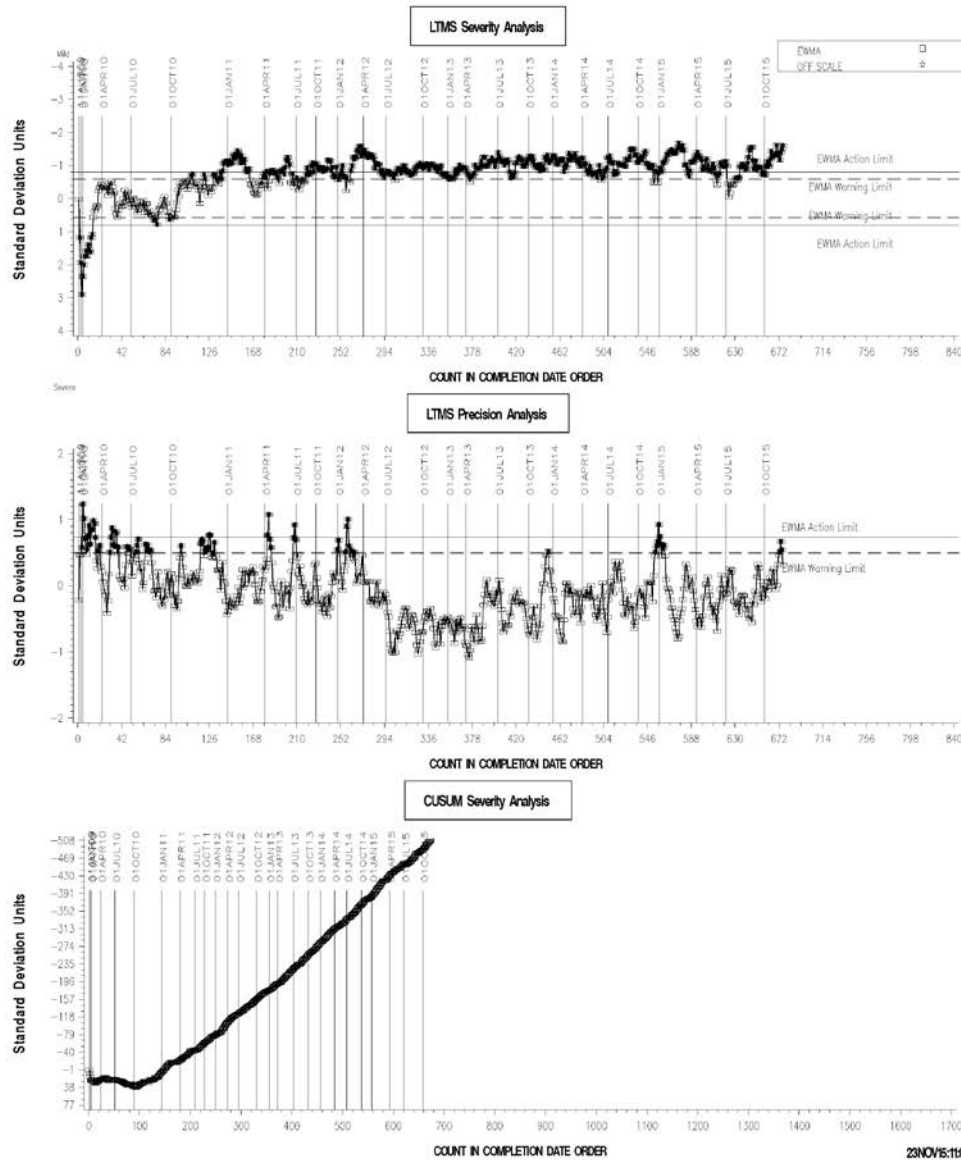




# LDEOC (D 7216)

LDEOC – POLYACRYLATE INDUSTRY OPERATIONALLY VALID DATA

REF POLYACRYLATE TENSILE STRENGTH CHG AVG

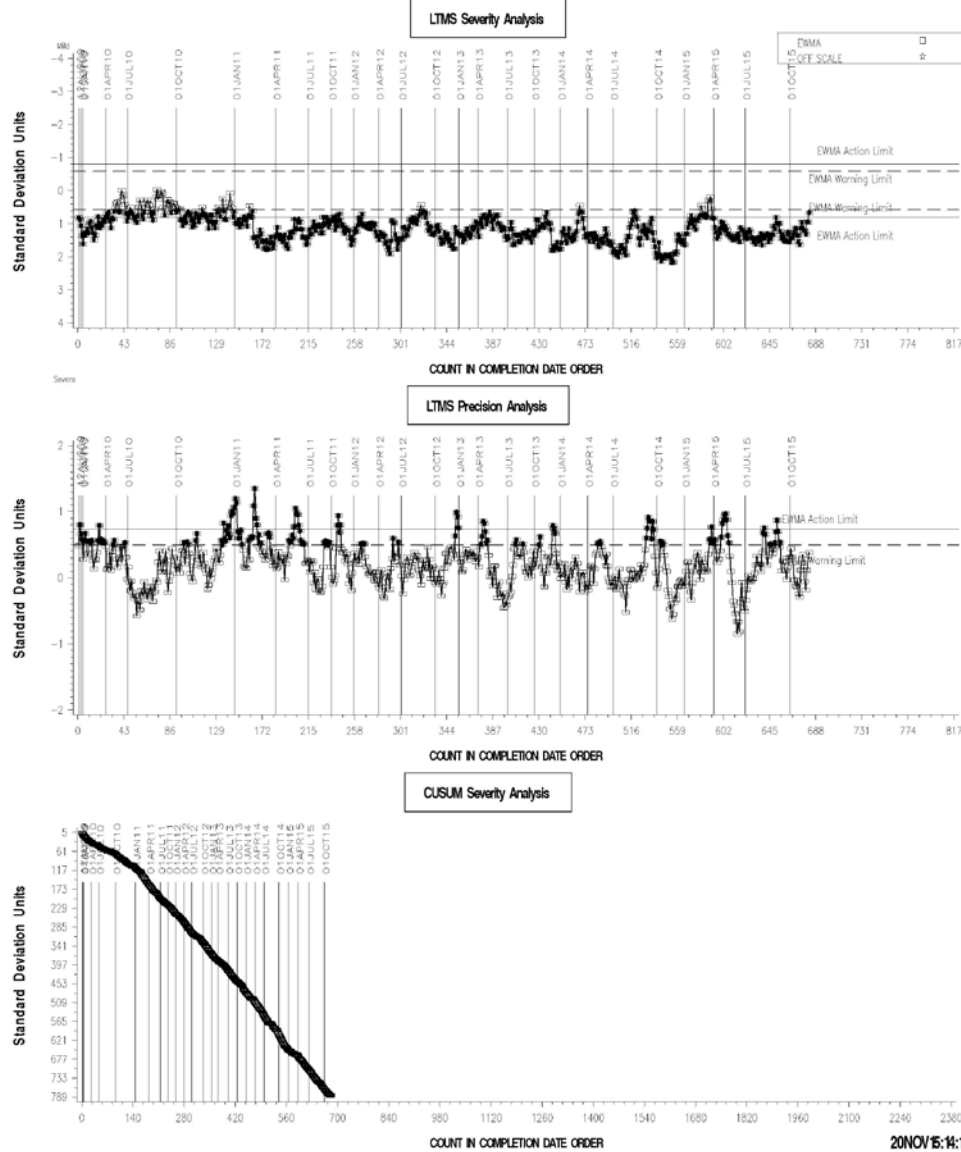


# LDEOC (D 7216)

LDEOC – SILICONE INDUSTRY OPERATIONALLY VALID DATA



## REF SILICON TENSILE STRENGTH CHANGE AVERAGE



# LDEOC (D 7216)

## INFORMATION LETTERS

No Information Letters were issued this period.

# LDEOC (D 7216)

## STATUS OF REFERENCE OIL SUPPLY

Oil	Samples @ Labs	@ TMC	
		Samples (750 mL)	Gallons
1006-1	160	802	159
Total	160	802	159

The TMC inventory of oil 1006-1 is nearly depleted.

**At current usage rates, oil 1006-1 will be depleted in approximately 4 months.**

The TMC has 2,000 gallons of Reference Oil 1006-2 available, but it has not been approved for LDOEC testing at this time.