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Test Monitoring Center

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

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

MEMORANDUM: 16-045

DATE: November 14, 2016

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

FROM: Michael T. Kasimirsky

SUBJECT: LDEOC Testing from April 1, 2016 through September 30, 2016

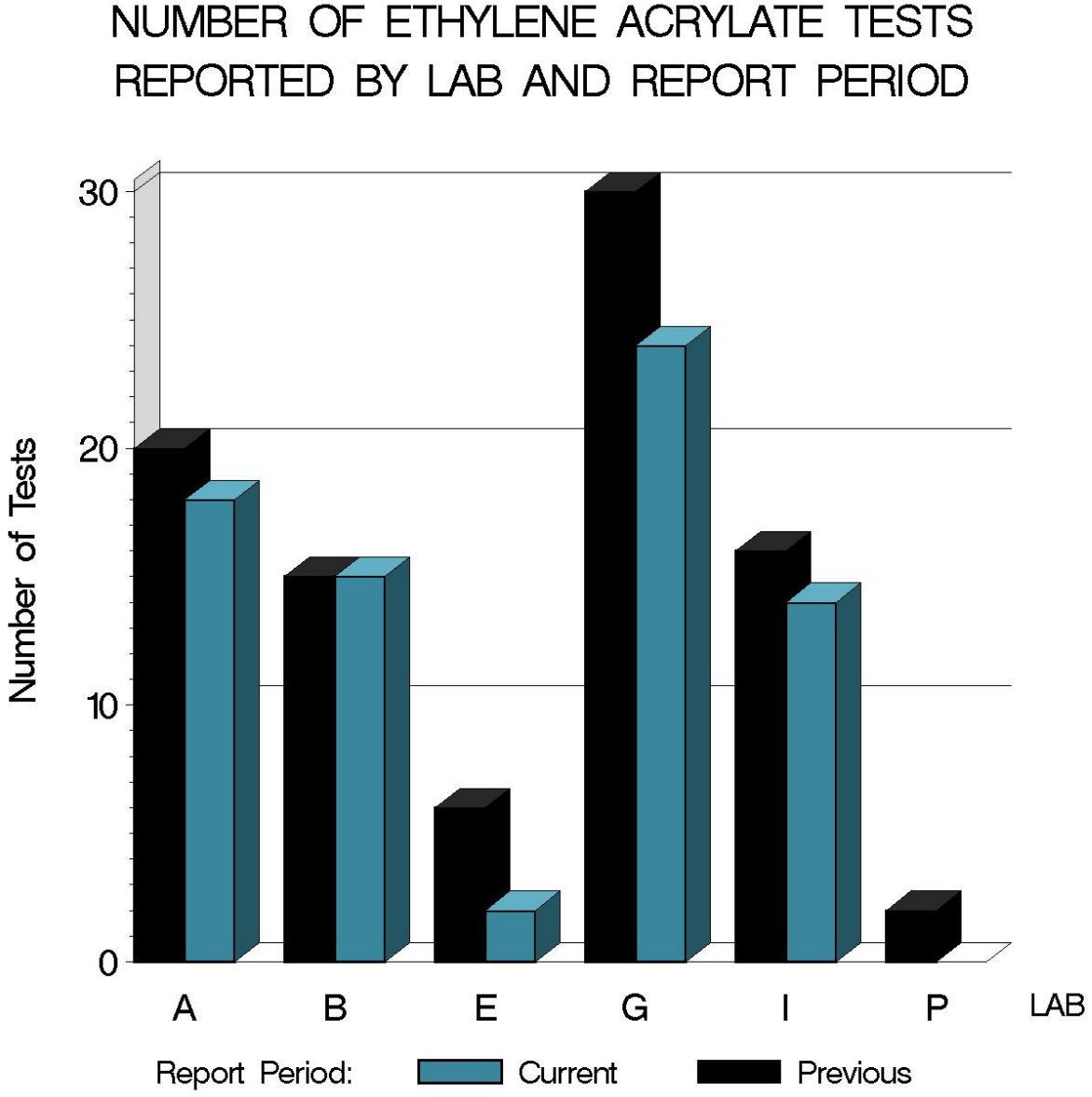
A total of 457 LDEOC tests were reported from 6 labs to the Test Monitoring Center during the period from April 1, 2016 through September 30, 2016.

Please find attached a summary of testing activity this period.

MTK/mtk/mem16-045.mtk.doc
cc: Frank Farber
Jeff Clark
EOEC Surveillance Panel
ftp://ftp.astmtmc.cmu.edu/docs/bench/ldeoc/semiannualreports/ldeoc-10-2016.pdf

Distribution: email

LDEOC (D 7216)



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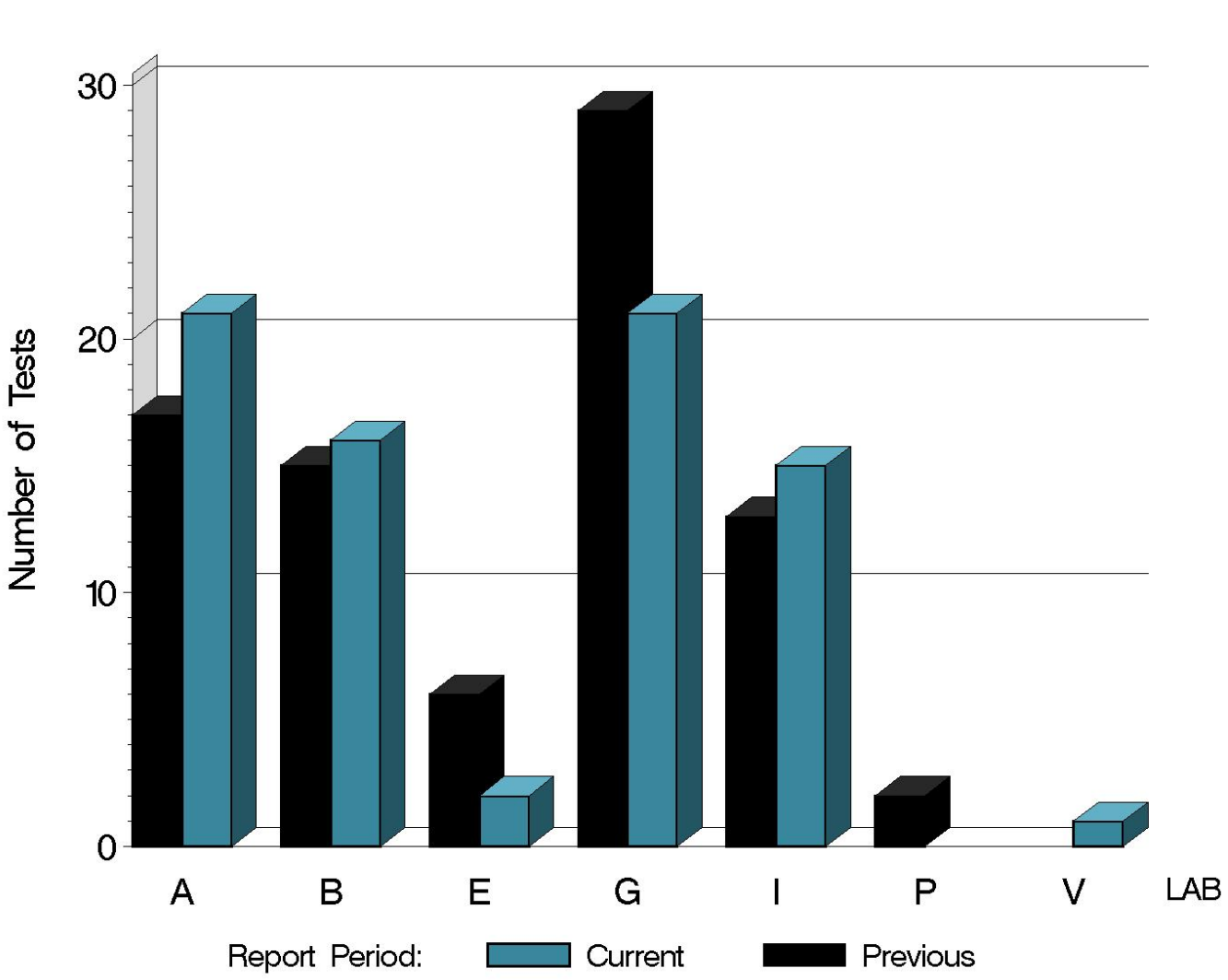
LDEOC (D 7216)



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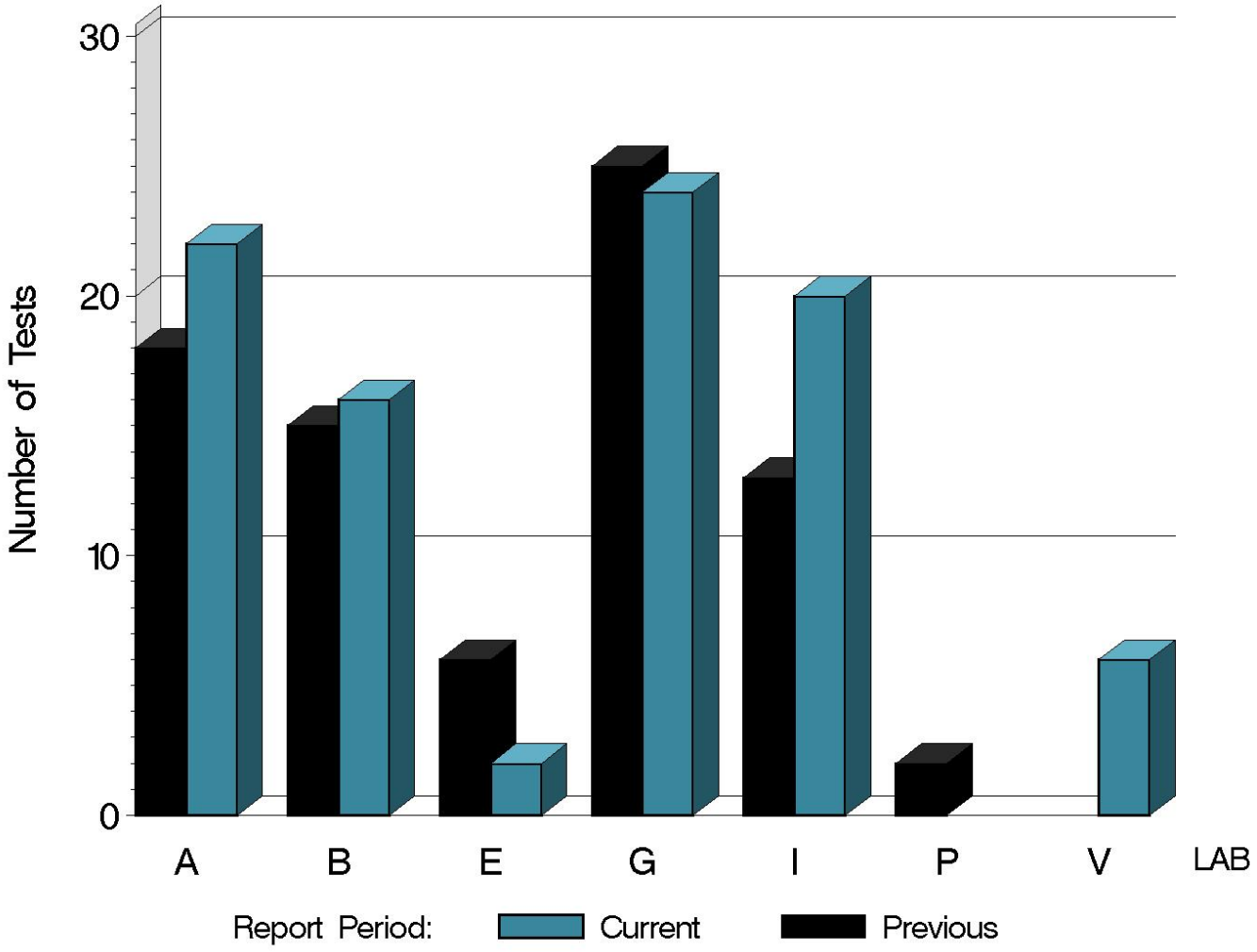
LDEOC (D 7216)



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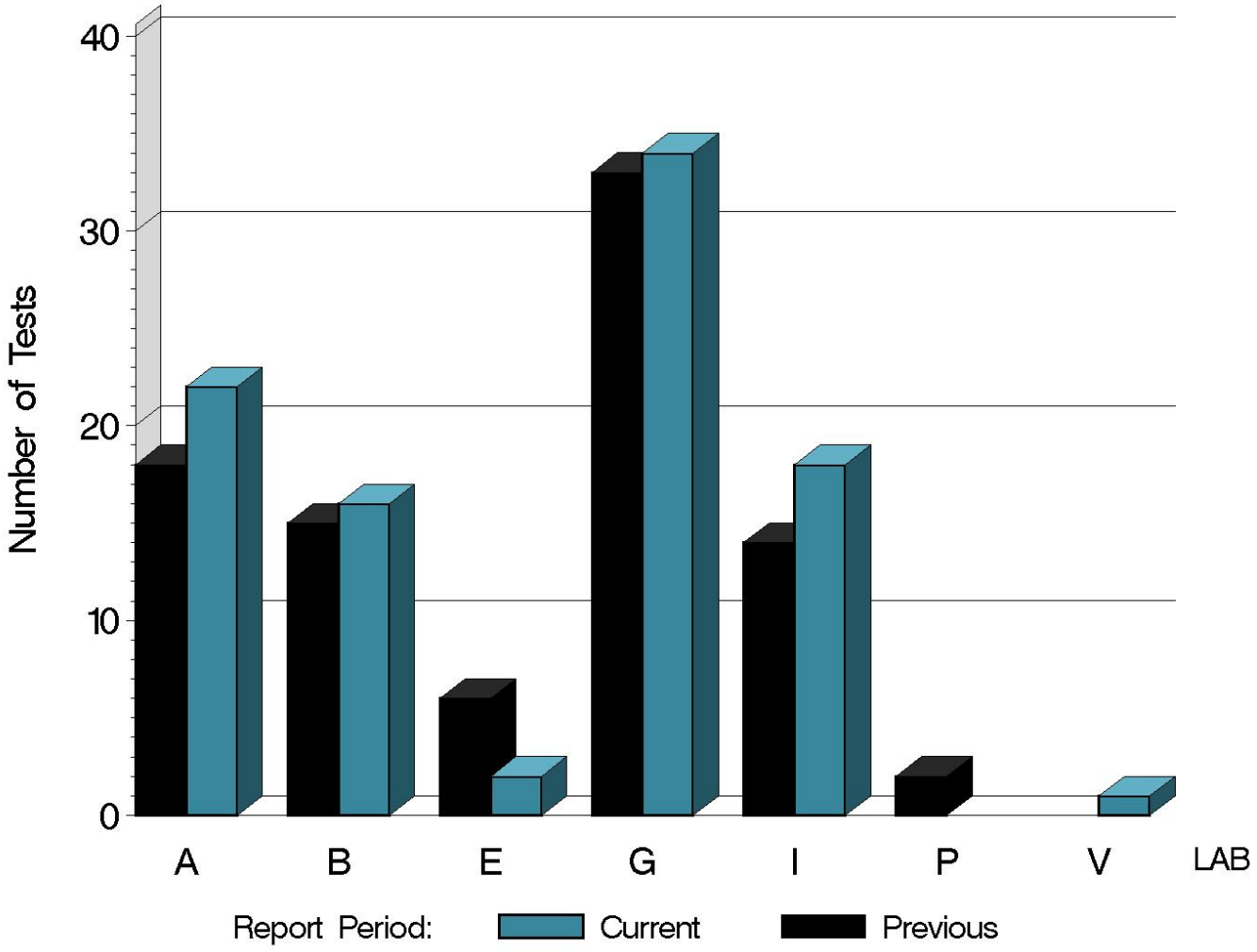
LDEOC (D 7216)



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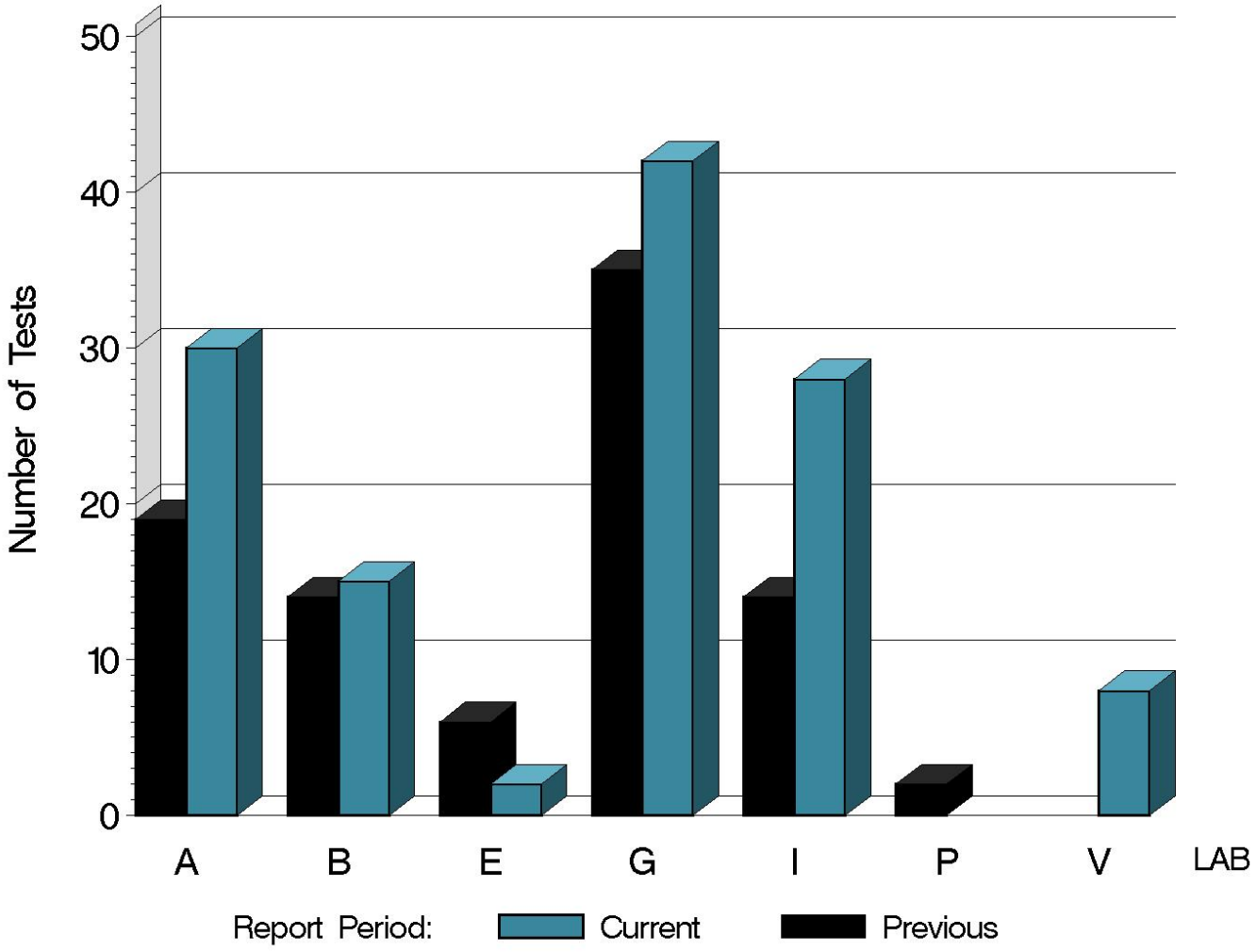
LDEOC (D 7216)



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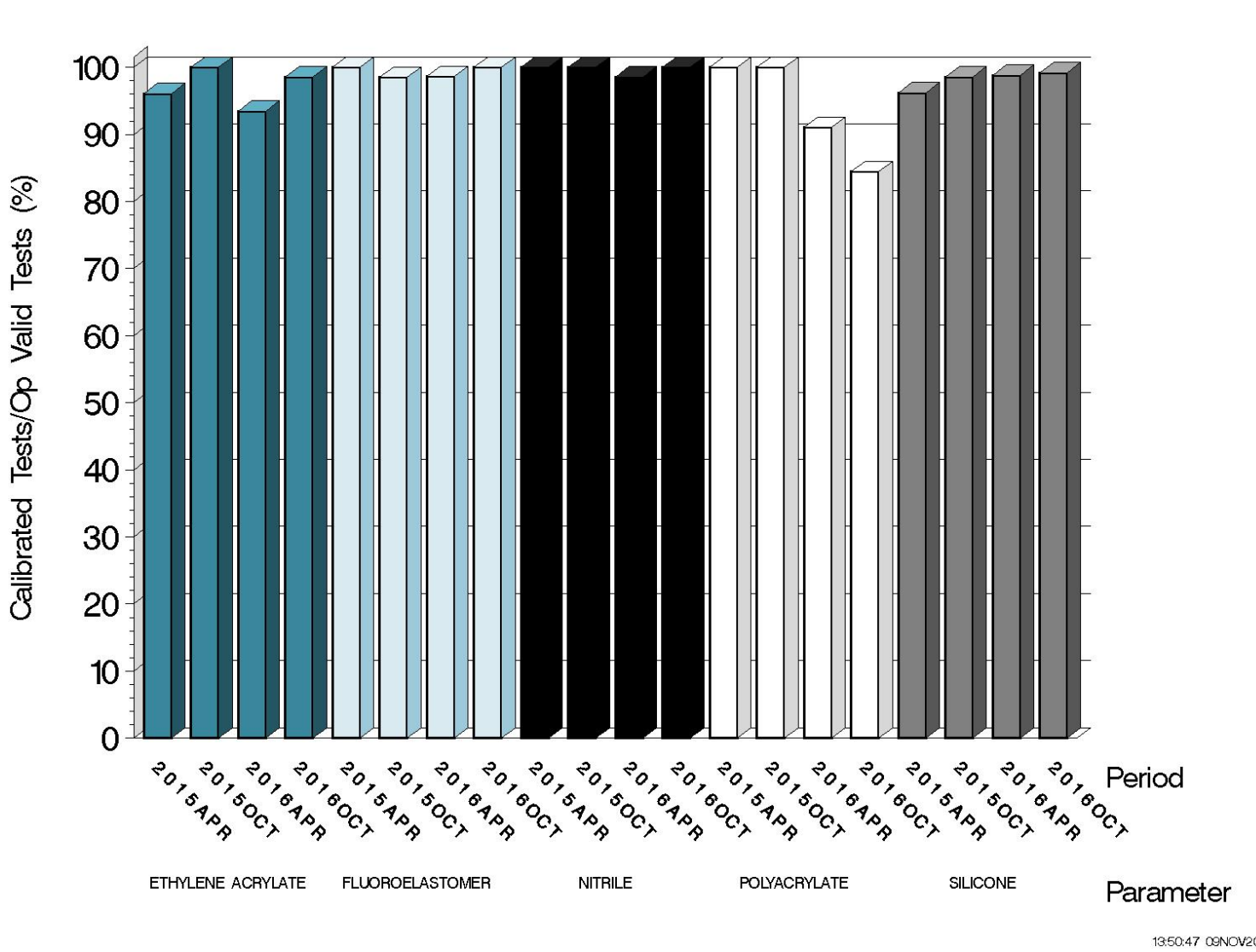
LDEOC (D 7216)

Test Distribution by Oil and Validity

		Ethylene Acrylate	Fluoroelastomer	Nitrile	Polyacrylate	Silicone	This Period	Last Period
Accepted for Calibration	AC	70	73	87	76	120	426	367
Rejected	OC	1	0	0	14	1	16	15
Acceptable Information Run	NI	2	2	2	0	2	8	35
Unacceptable Information Run	MI	0	0	0	2	0	2	0
Invalid Information Run (TMC)	LI	0	0	0	0	0	0	1
Invalid Information Run (TMC)	RI	0	0	0	0	0	0	0
Operationally Invalid (lab)	LC	0	0	0	0	0	0	0
Acceptable Shakedown Run	AS	0	1	1	1	1	4	0
Aborted Calibration	XC	0	0	0	0	1	1	4
Total		73	76	90	93	125	457	422

LDEOC (D 7216)



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LDEOC (D 7216)

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	18	0	0	21	0	0	22	0	0	22	0	1	30	3.3	1	113	0.9
B	0	15	0	0	16	0	0	16	0	0	16	0	0	15	0	0	78	0
E	0	2	0	0	2	0	0	2	0	0	2	0	0	2	0	0	10	0
G	0	24	0	0	24	0	0	24	0	0	34	0	0	42	0	0	145	0
I	0	14	0	0	20	0	0	20	0	0	18	0	0	28	0	0	95	0
P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
V	0	0	0	0	1	0	0	6	0	0	1	0	0	8	0	0	16	0
Total	0	73	0	0	76	0	0	90	0	0	93	0	1	125	0.8	1	457	0.2

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	Bath Failure		0	0	0	0	1	0	0	1	1	113	0.9
		Lost	0	0	0	0	0	0	0	1			
		Starts	73	76	90	93	125	457	457	457			
		%	0	0	0	0	0.8	0	0	0.2			

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

LDEOC (D 7216)

Average Δ/s by Lab					
Elastomer	Lab	n	VOLCYI	HARDYI	TENSYI
Ethylene Acrylate	A	18	-1.152	-0.598	0.046
	B	15	-1.423	-0.879	0.408
	E	2	-1.617	-3.407	0.429
	G	24	0.074	1.447	0.196
	I	12	-0.400	-0.659	-1.049
	P	0	-	-	-
	V	0	-	-	-
	Industry	71	-0.681	-0.056	-0.001
Fluoroelastomer	A	21	-0.333	1.138	-0.667
	B	16	-0.429	-0.094	0.252
	E	2	-1.100	-1.455	0.480
	G	21	-0.495	-0.277	0.429
	I	13	-0.354	-0.237	0.729
	P	0	-	-	-
	V	0	-	-	-
	Industry	73	-0.426	0.145	0.130
Nitrile	A	22	1.246	-0.037	-0.520
	B	16	1.266	-0.690	-0.062
	E	2	1.417	-0.977	0.296
	G	24	1.119	0.651	-0.348
	I	18	1.512	0.172	-0.585
	P	0	-	-	-
	V	5	1.157	-0.747	-1.133
	Industry	87	1.269	0.014	-0.418

LDEOC (D 7216)

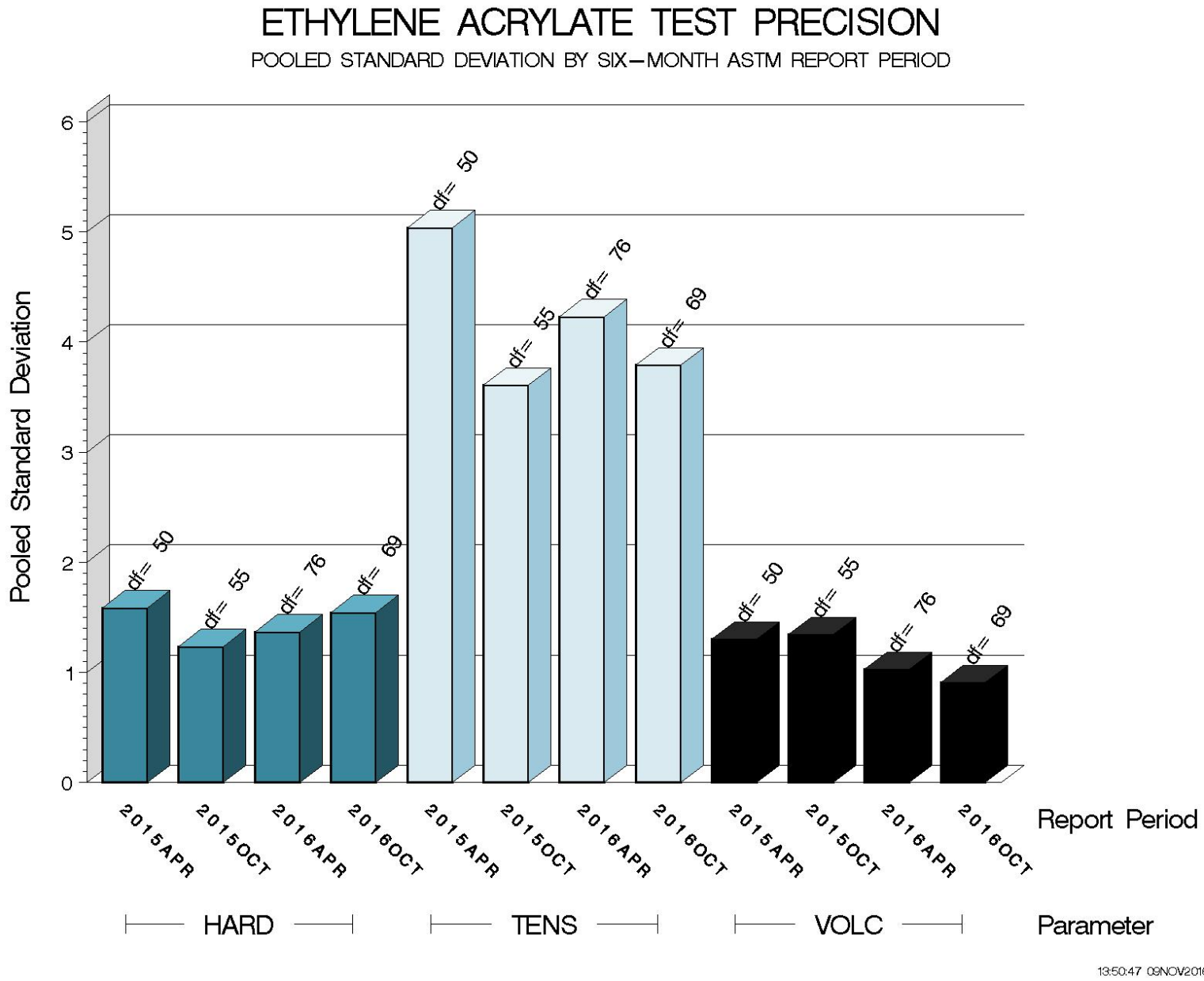
Average Δ/s by Lab					
Elastomer	Lab	n	VOLCYI	HARDYI	TENSYI
Polyacrylate	A	22	2.638	-0.648	-0.800
	B	16	1.498	-0.726	-1.044
	E	2	3.136	-0.117	-0.586
	G	34	3.194	0.895	-0.970
	I	16	1.431	0.492	-1.513
	P	0	-	-	-
	V	0	-	-	-
	Industry	90	2.442	0.136	-1.030
Silicone	A	29	0.087	-0.402	2.027
	B	15	0.233	-0.346	1.687
	E	2	0.200	0.029	1.197
	G	42	1.035	-0.764	0.927
	I	26	-0.656	-0.517	0.953
	P	0	-	-	
	V	7	0.103	-0.986	1.916
	Industry	121	0.277	-0.572	1.352

LDEOC (D 7216)

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**
Ethylene Acrylate	ftp://ftp.astmtmc.cmu.edu/refdata/bench/ldeoca/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/ldeocp/data/
Silicone	ftp://ftp.astmtmc.cmu.edu/refdata/bench/ldeocs/data/

LDEOC (D 7216)



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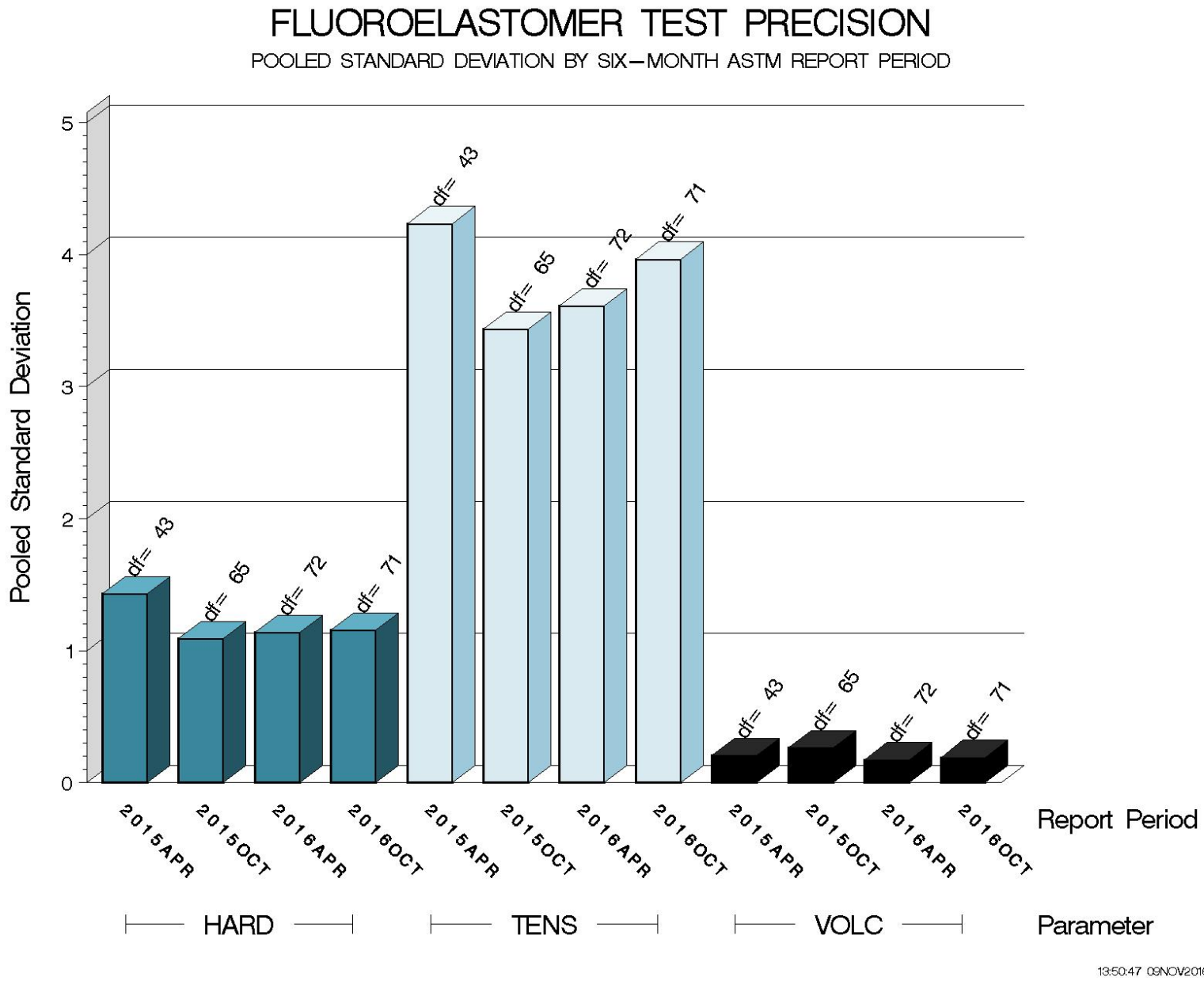
LDEOC (D 7216)



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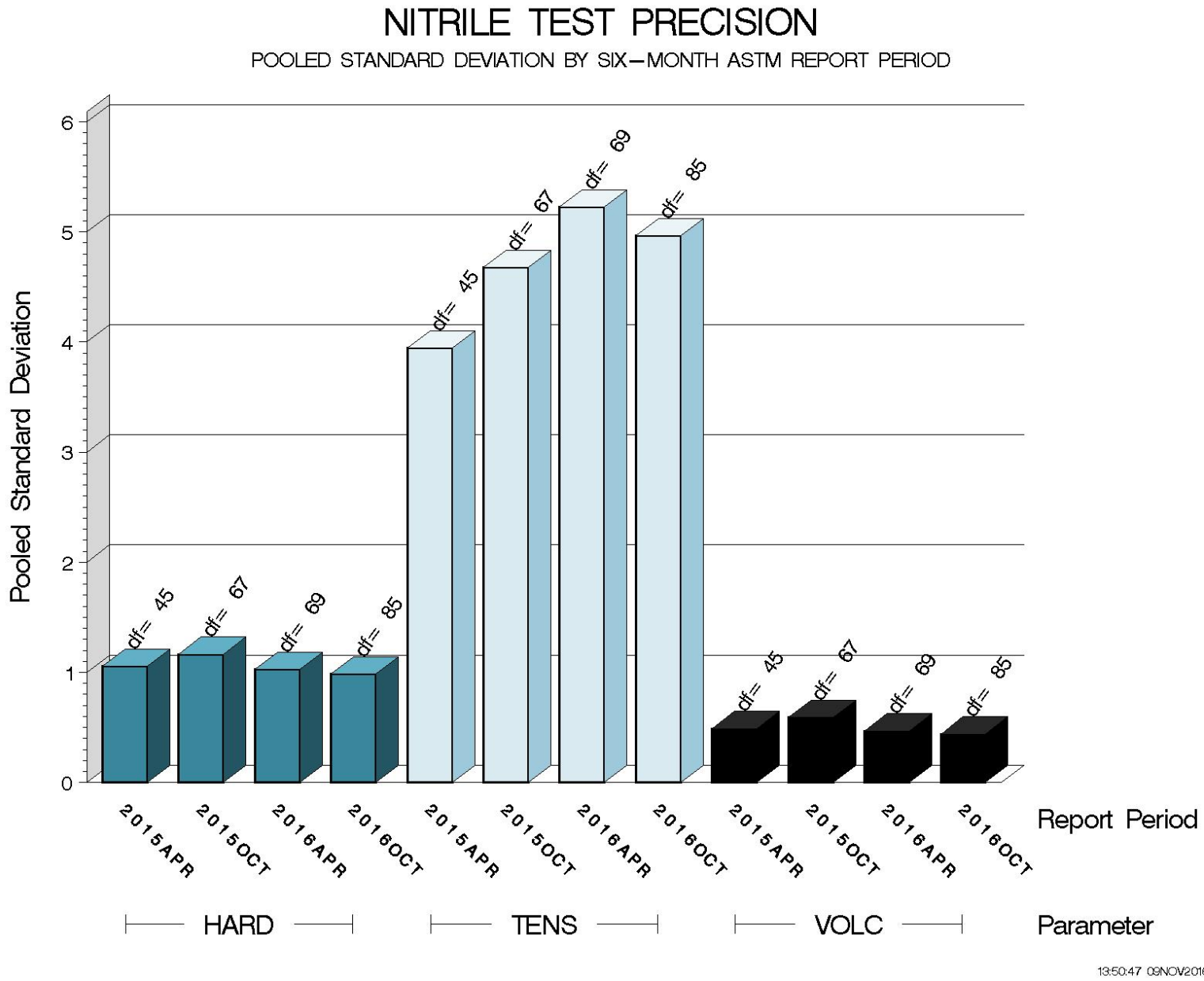

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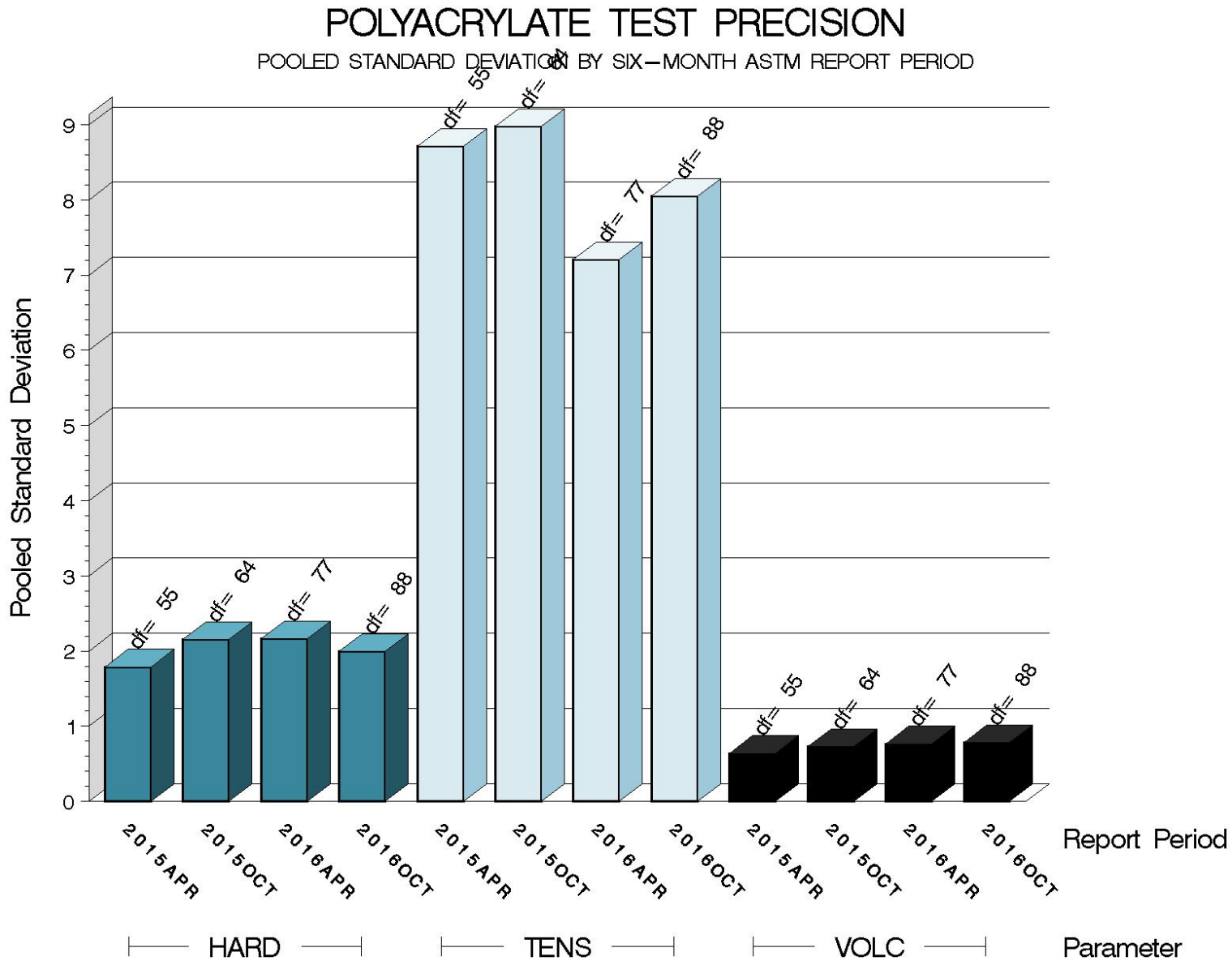

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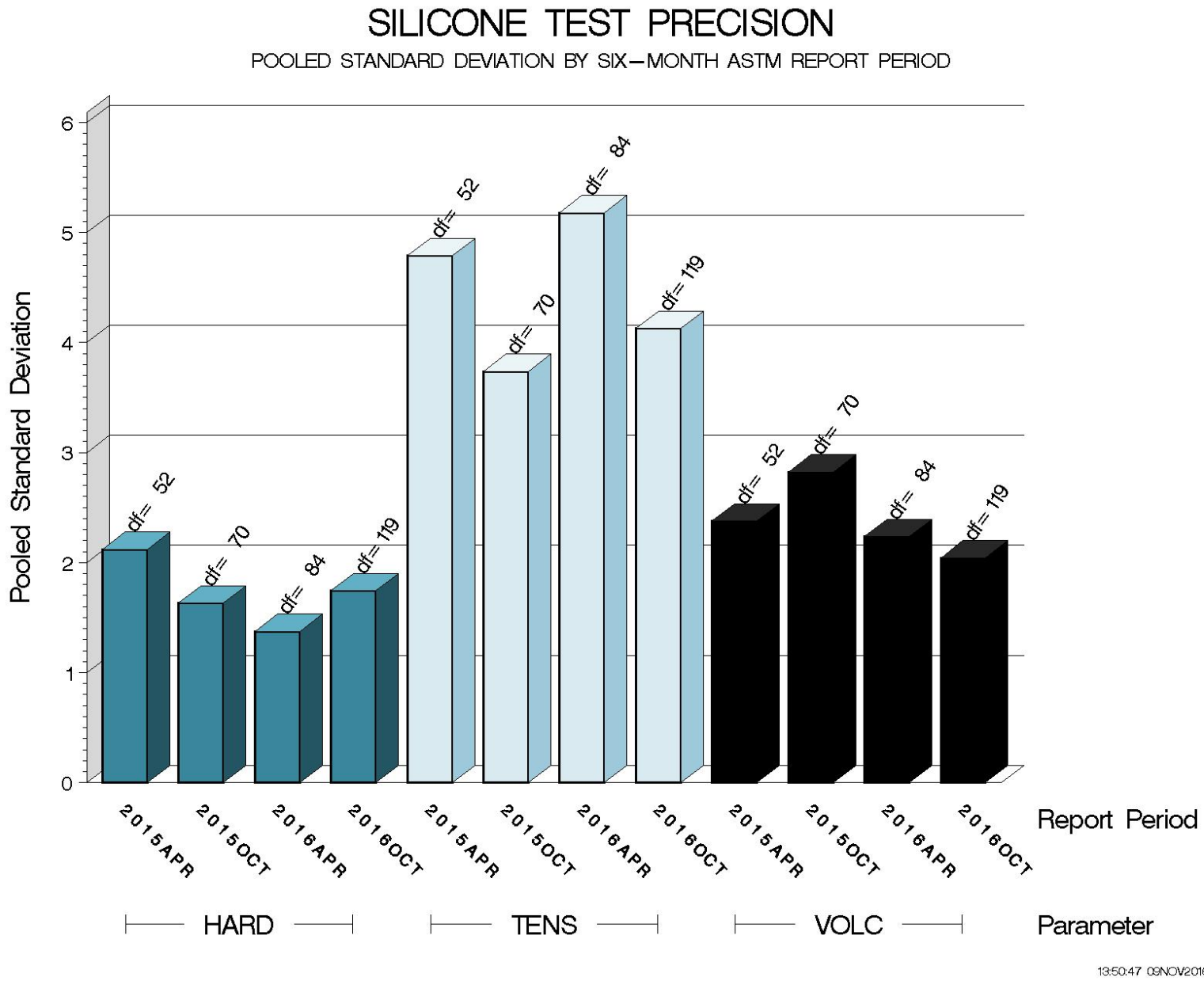

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LDEOC (D 7216)

SUMMARY OF SEVERITY & PRECISION

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

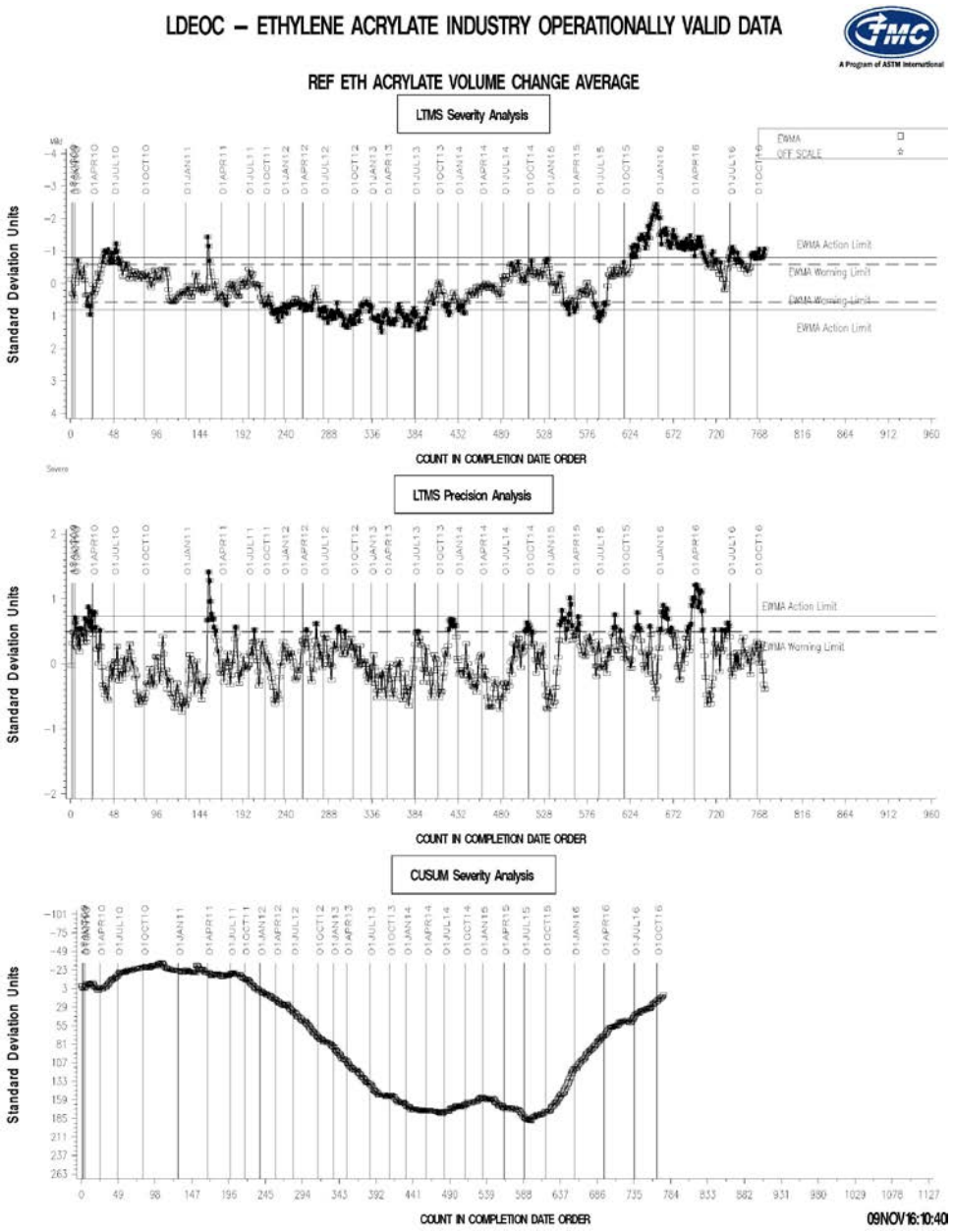
LDEOC (D 7216)

SUMMARY OF SEVERITY & PRECISION (continued)

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

Industry control charts follow.

LDEOC (D 7216)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EWMA Warning Limit
EWMA Warning Limit
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Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
LTMS Precision Analysis
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EWMA Warning Limit
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CUSUM Severity Analysis
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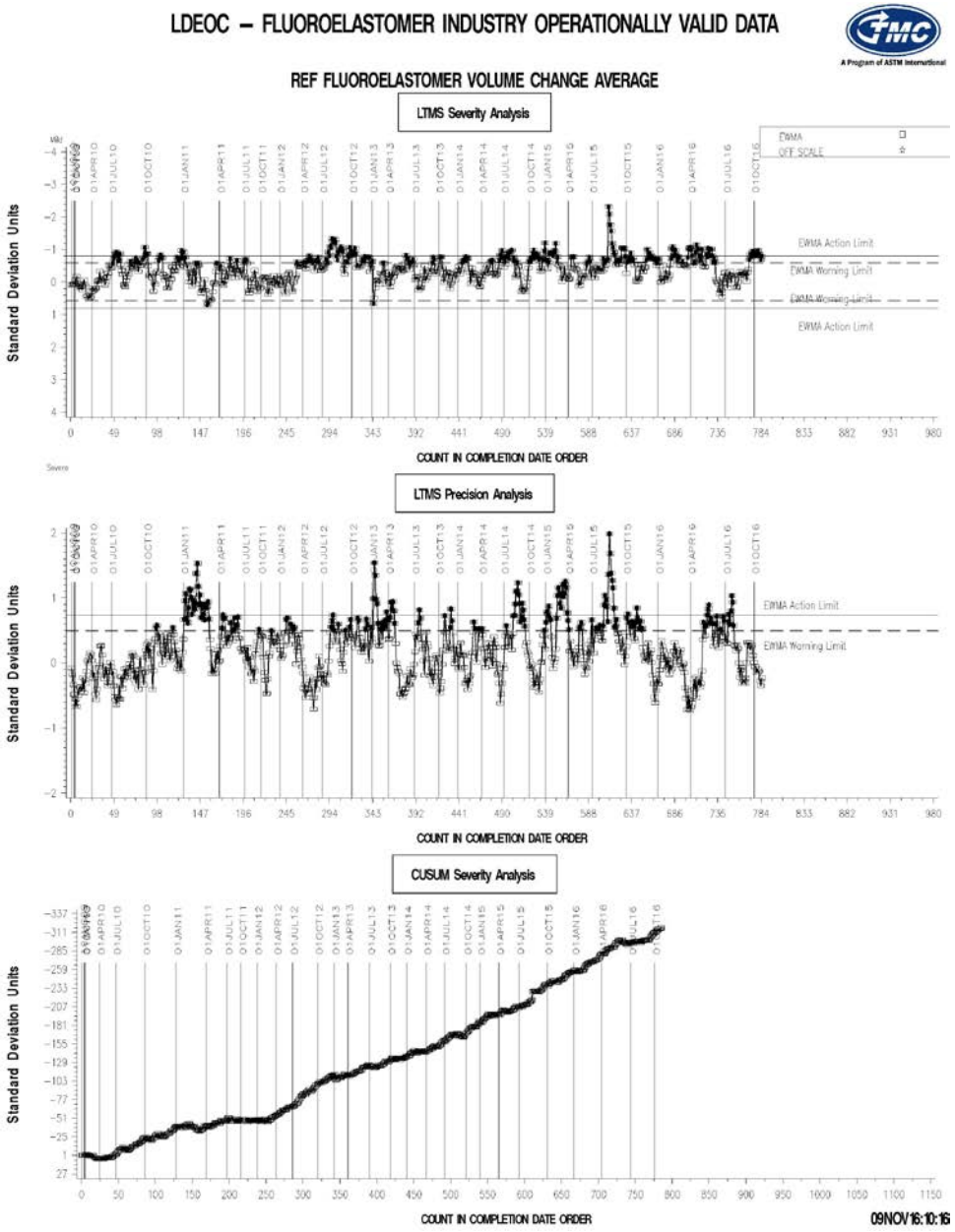
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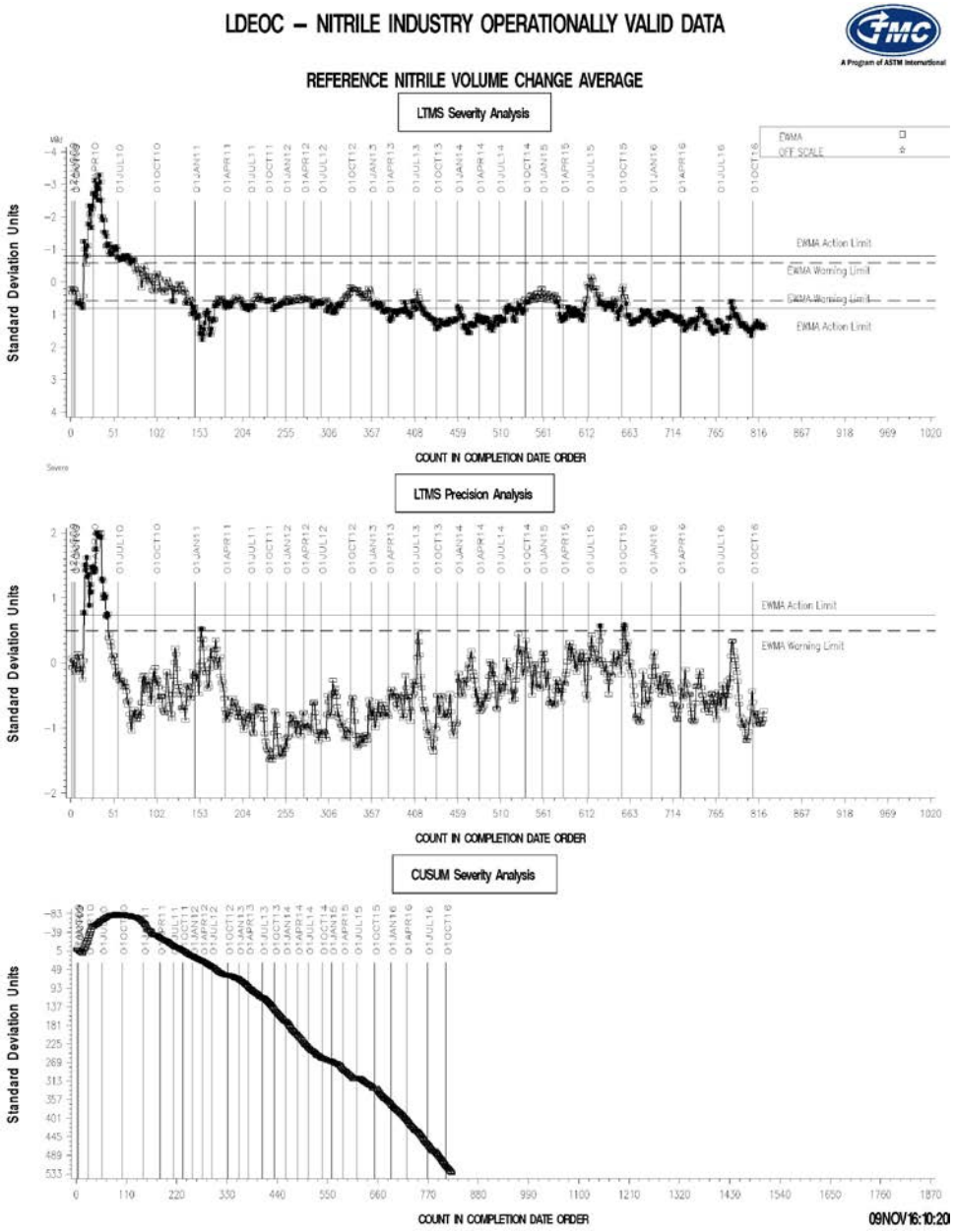
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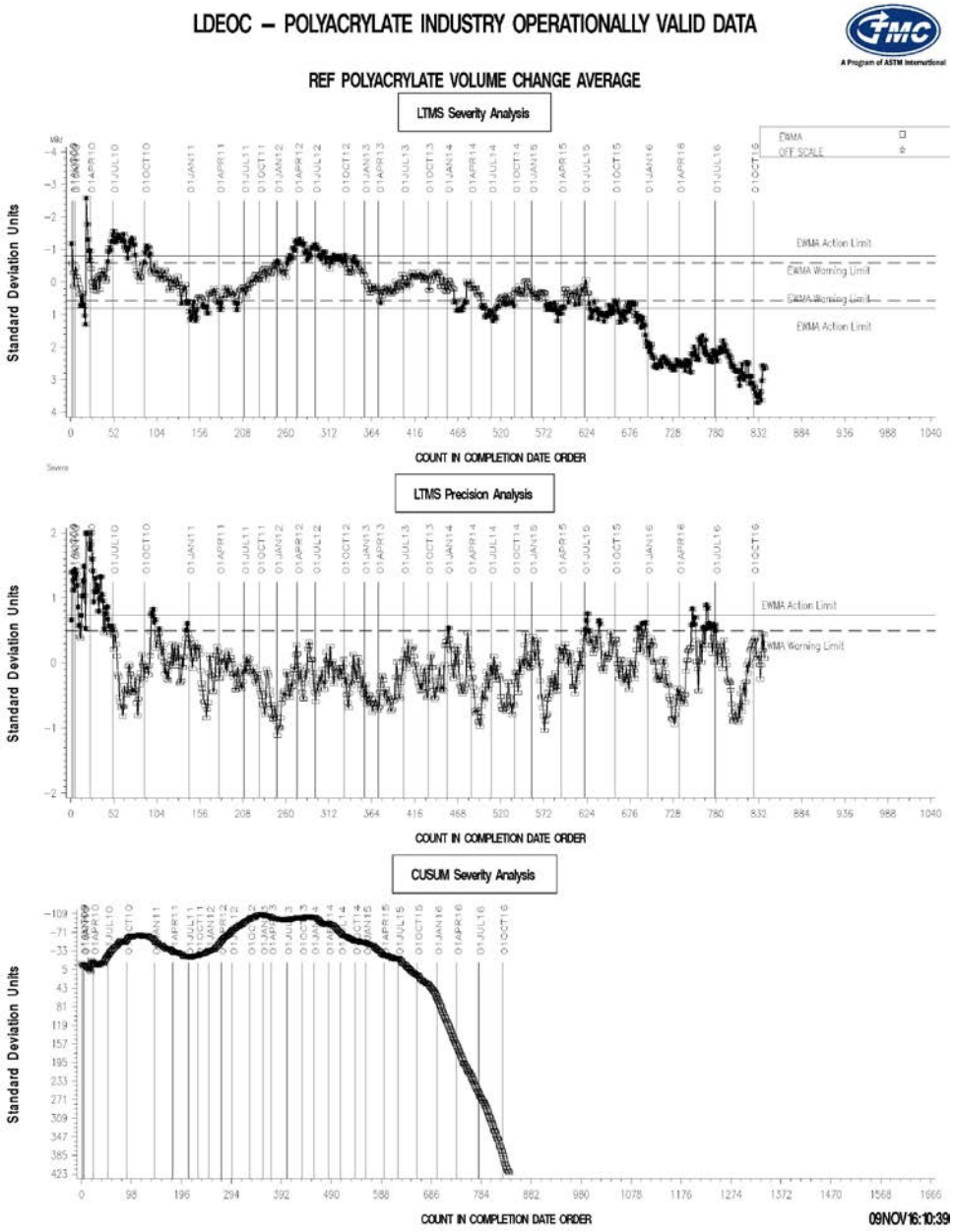
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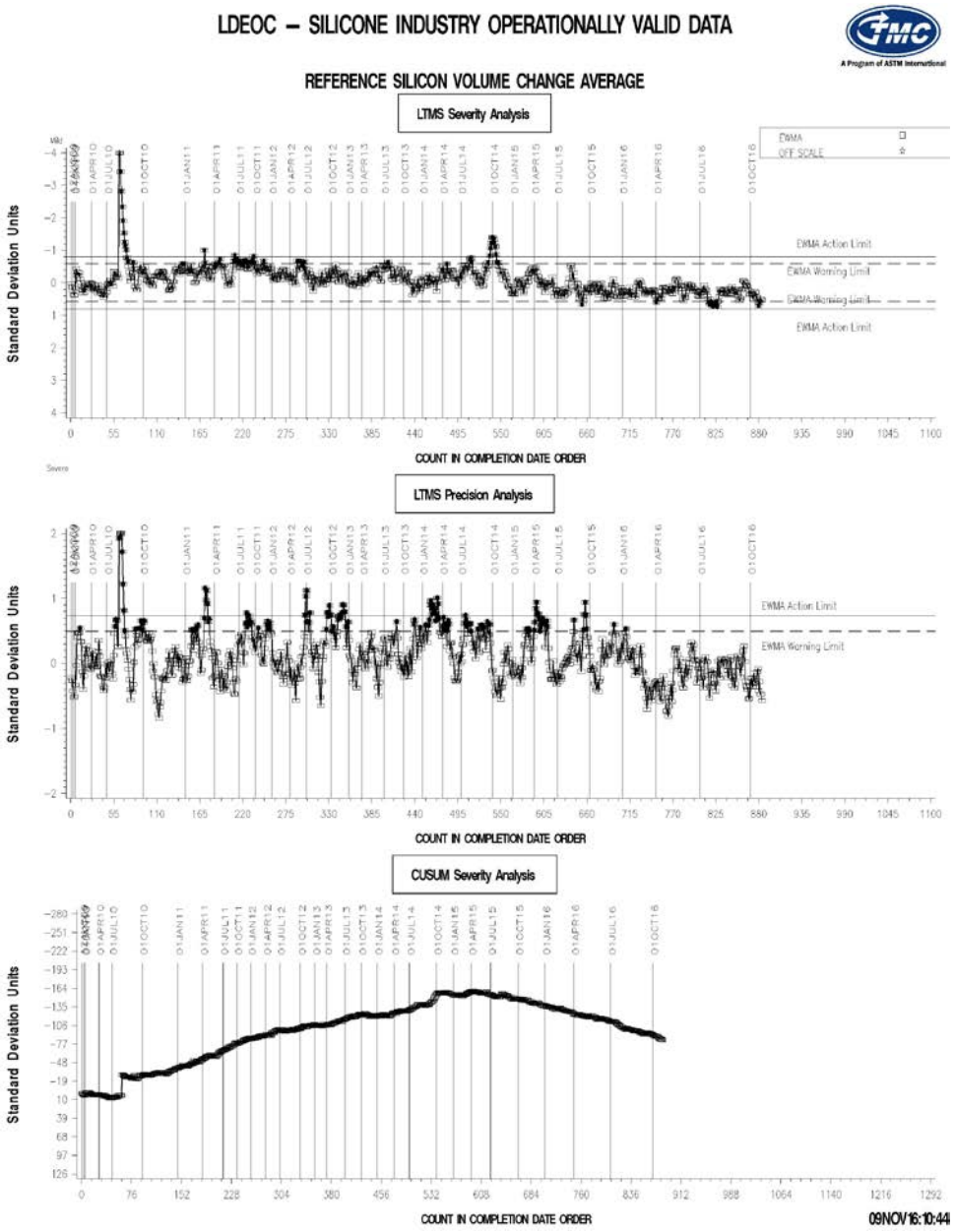
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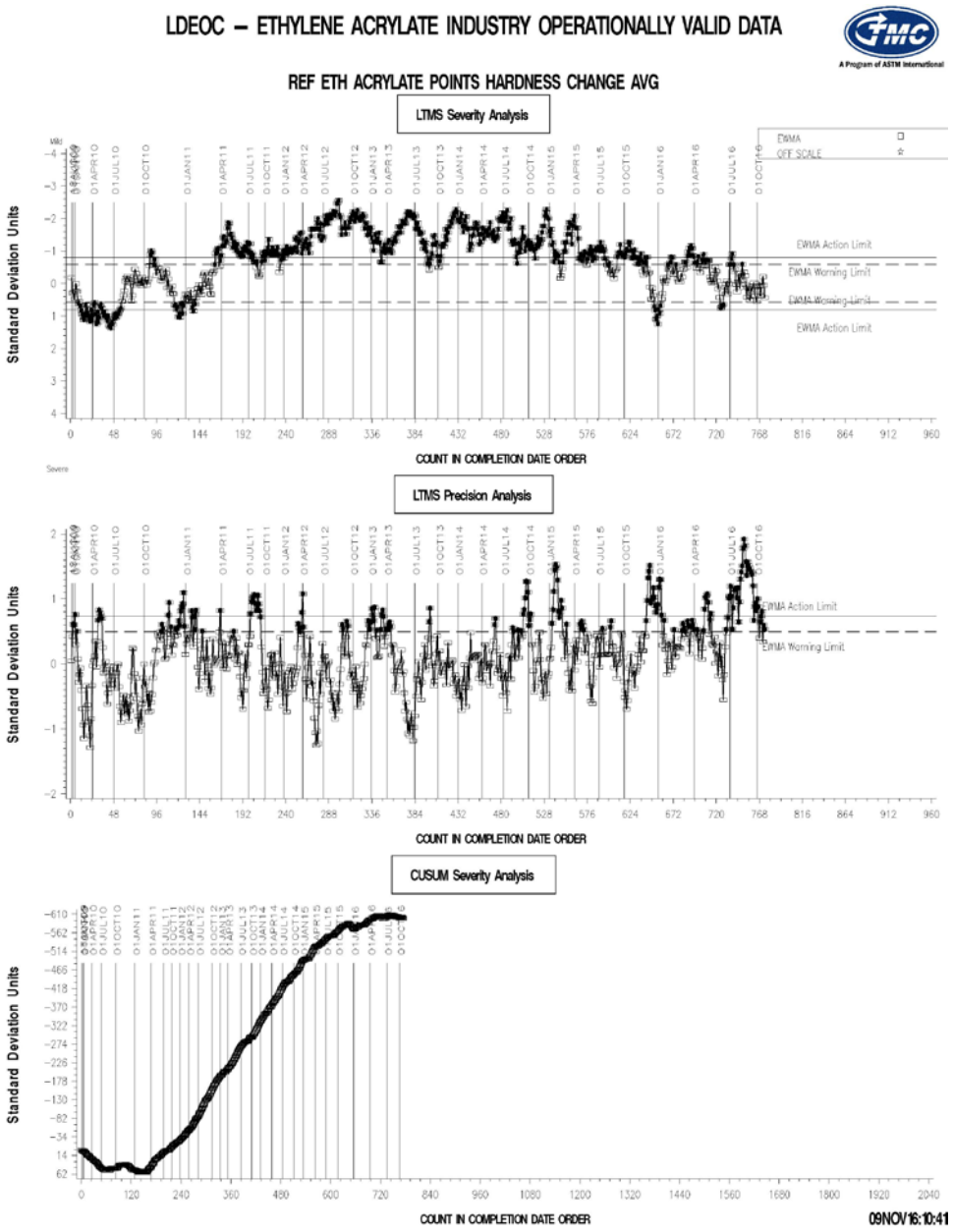
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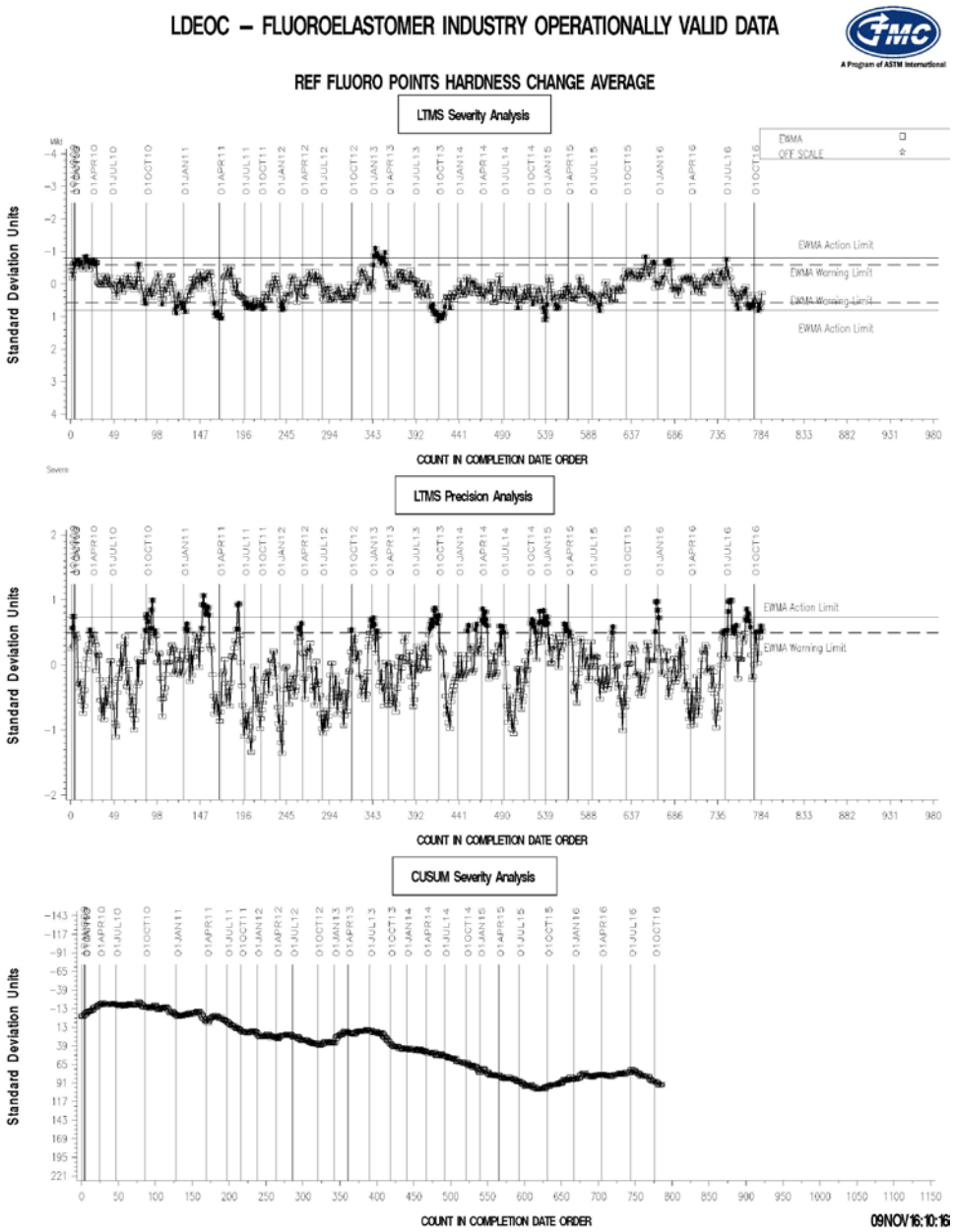
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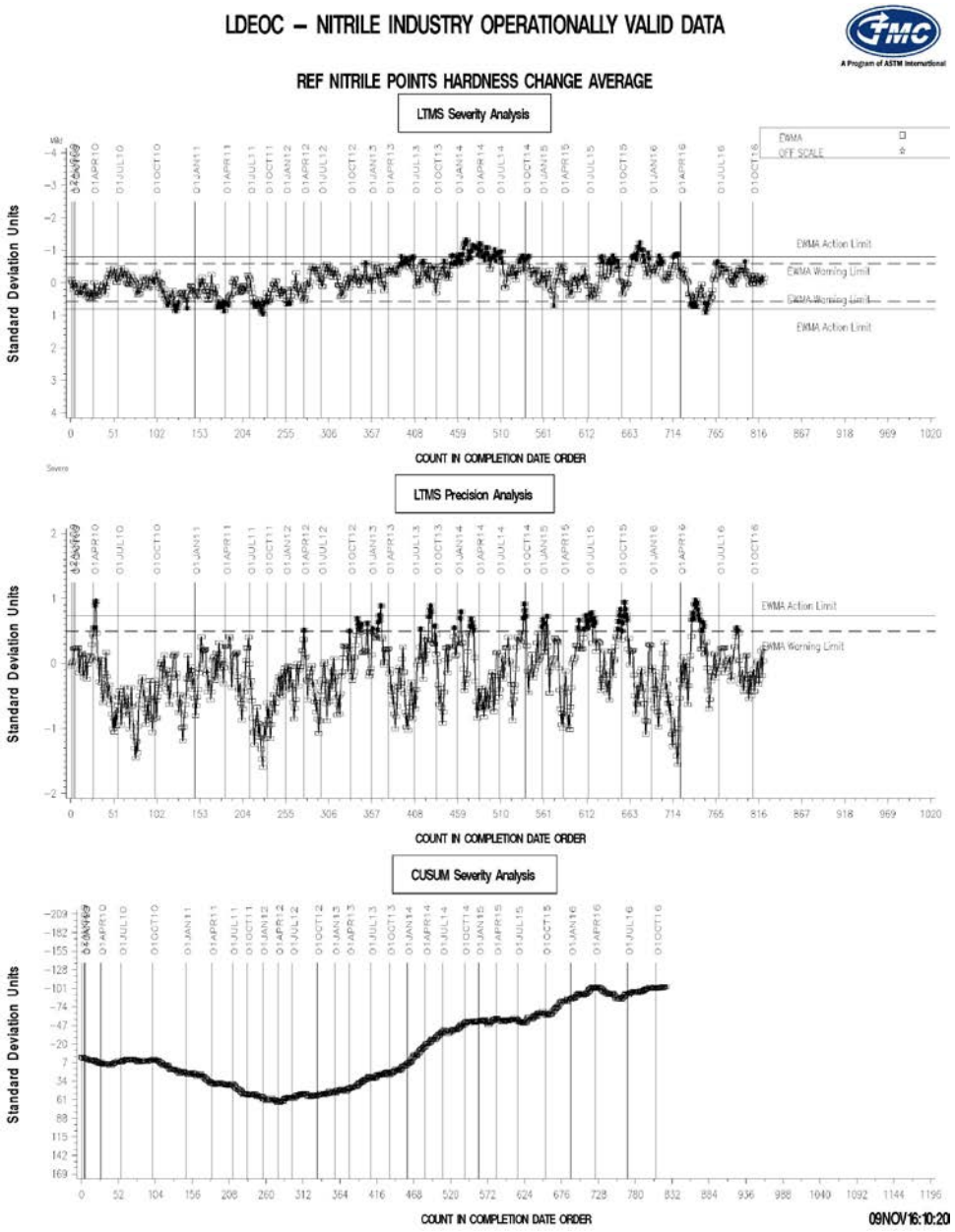
LDEOC (D 7216)



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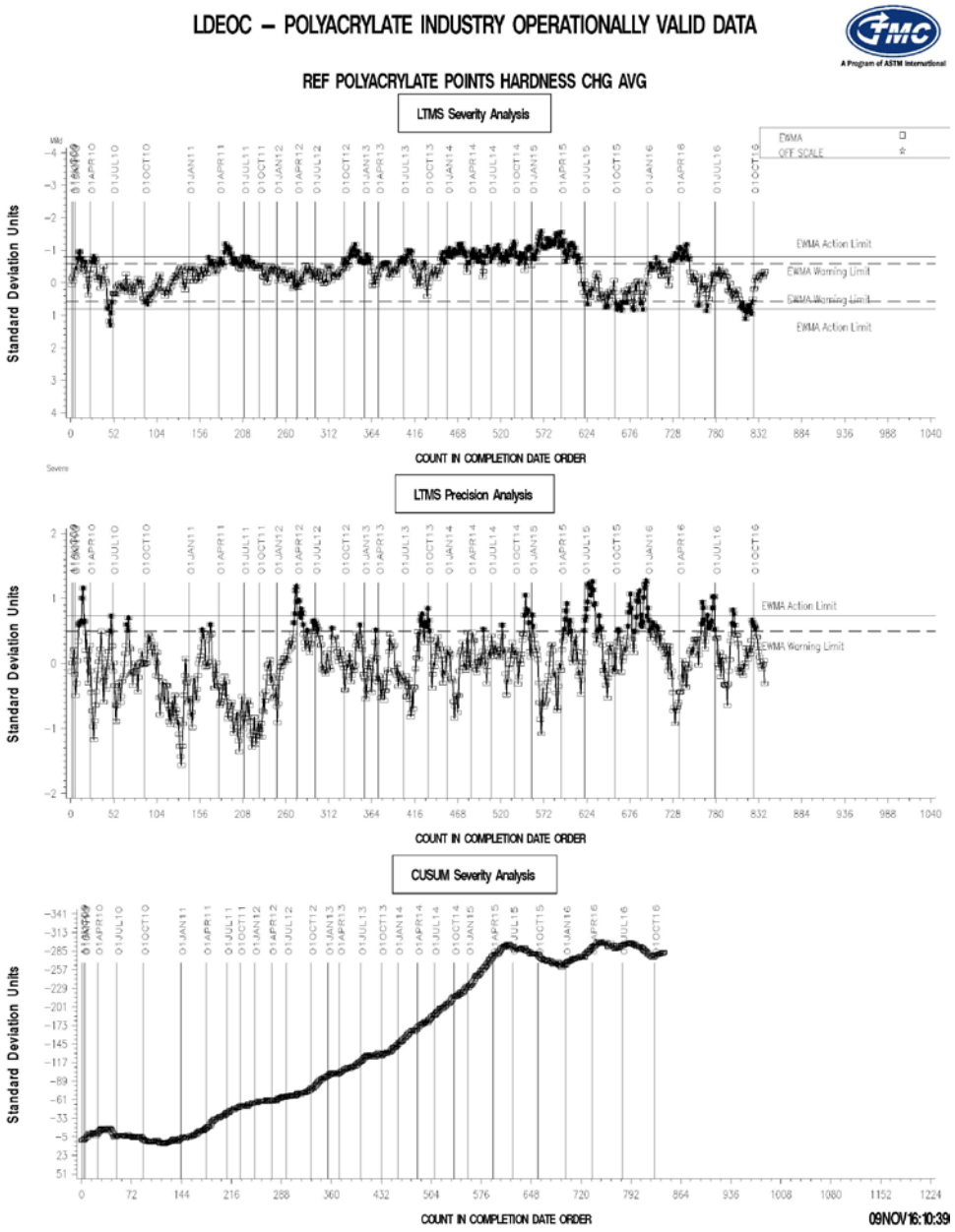
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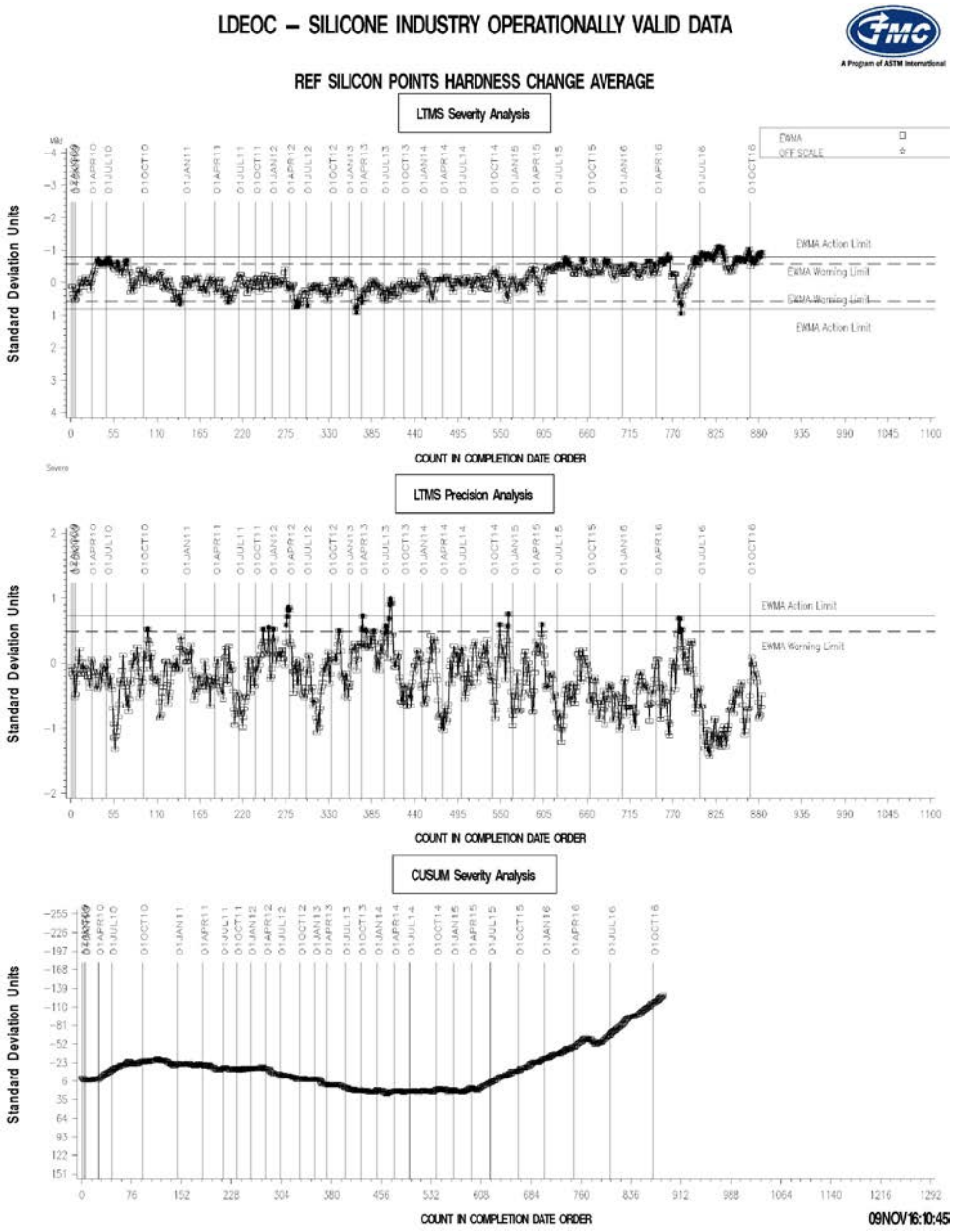
LDEOC (D 7216)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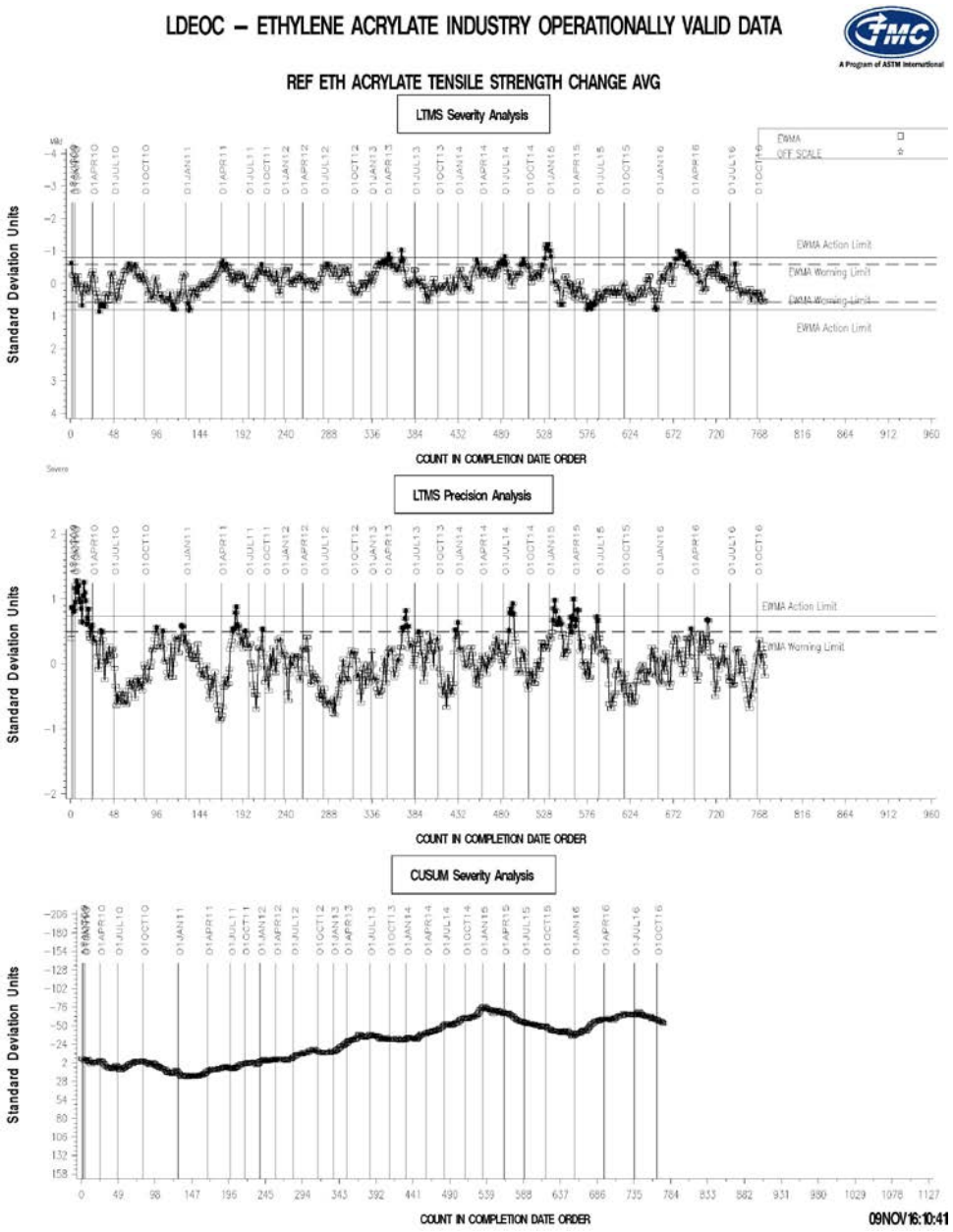
LDEOC (D 7216)



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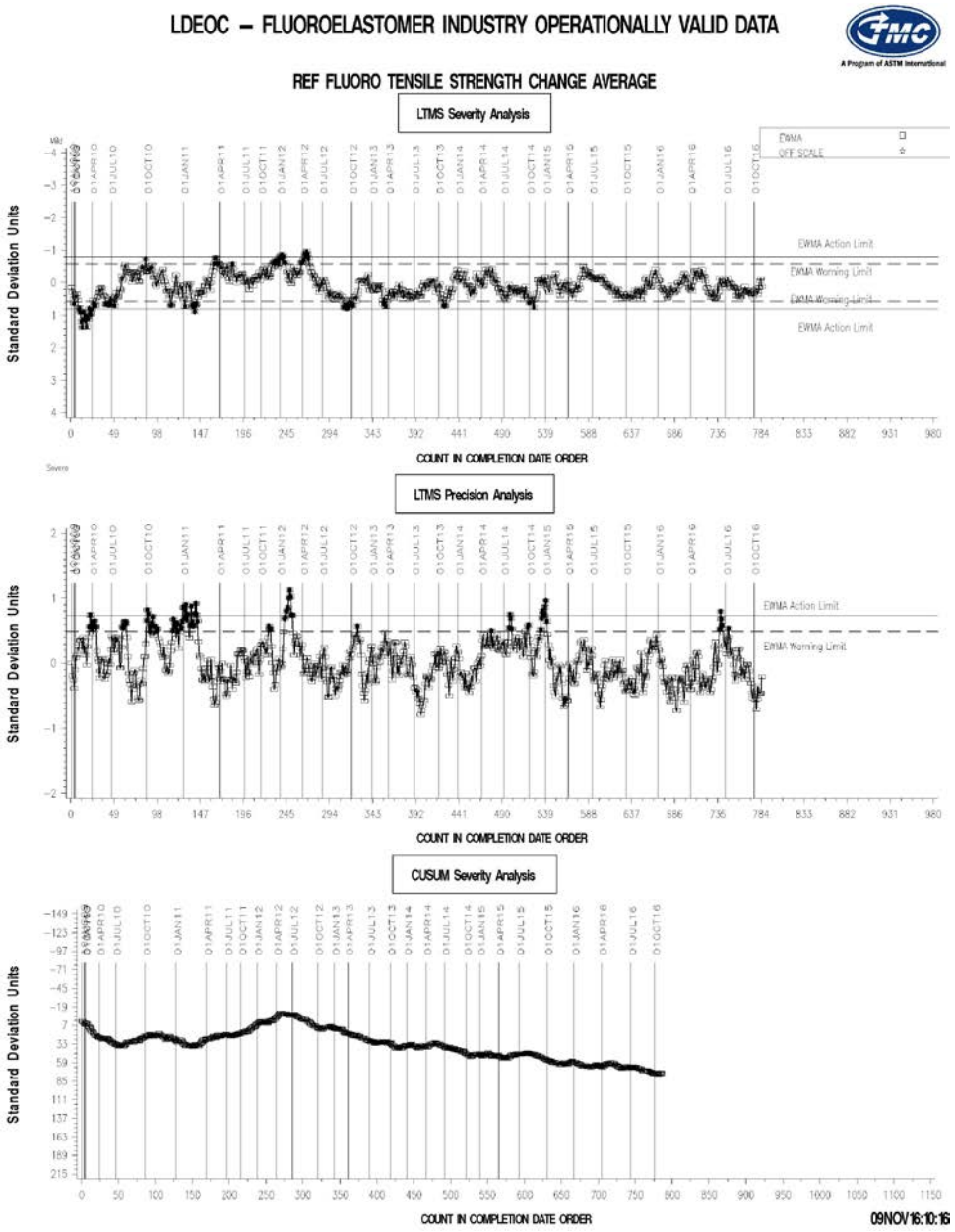
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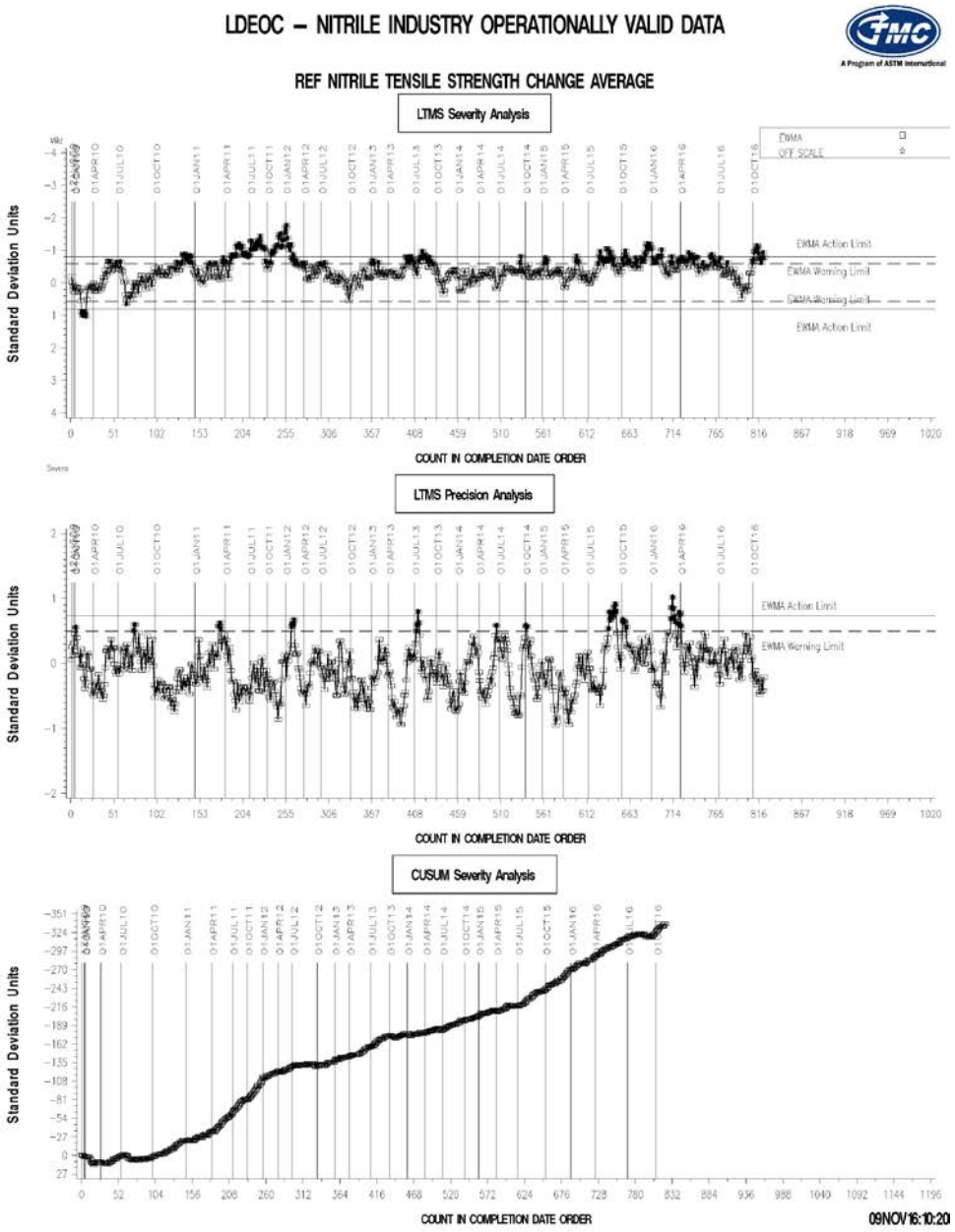
LDEOC (D 7216)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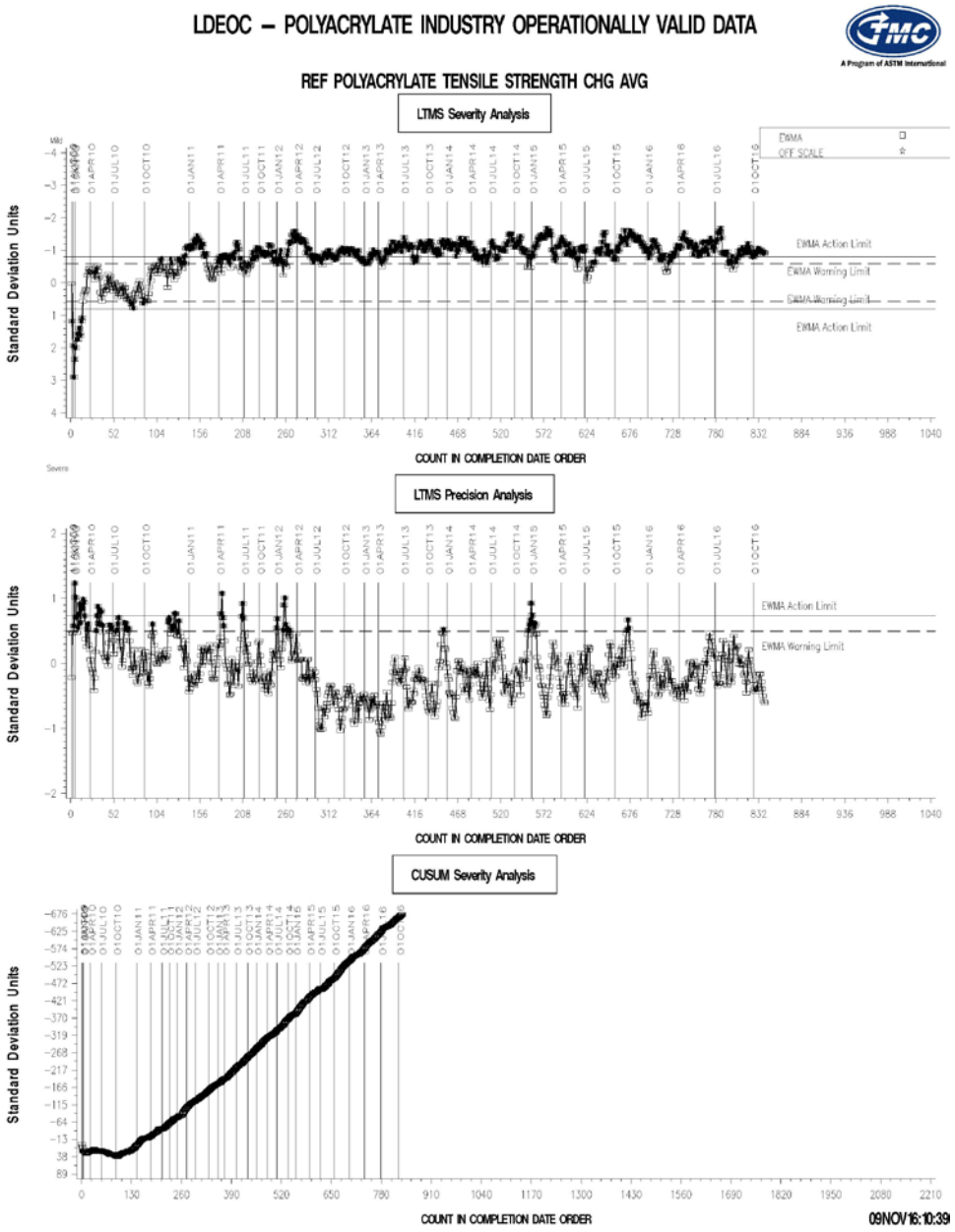
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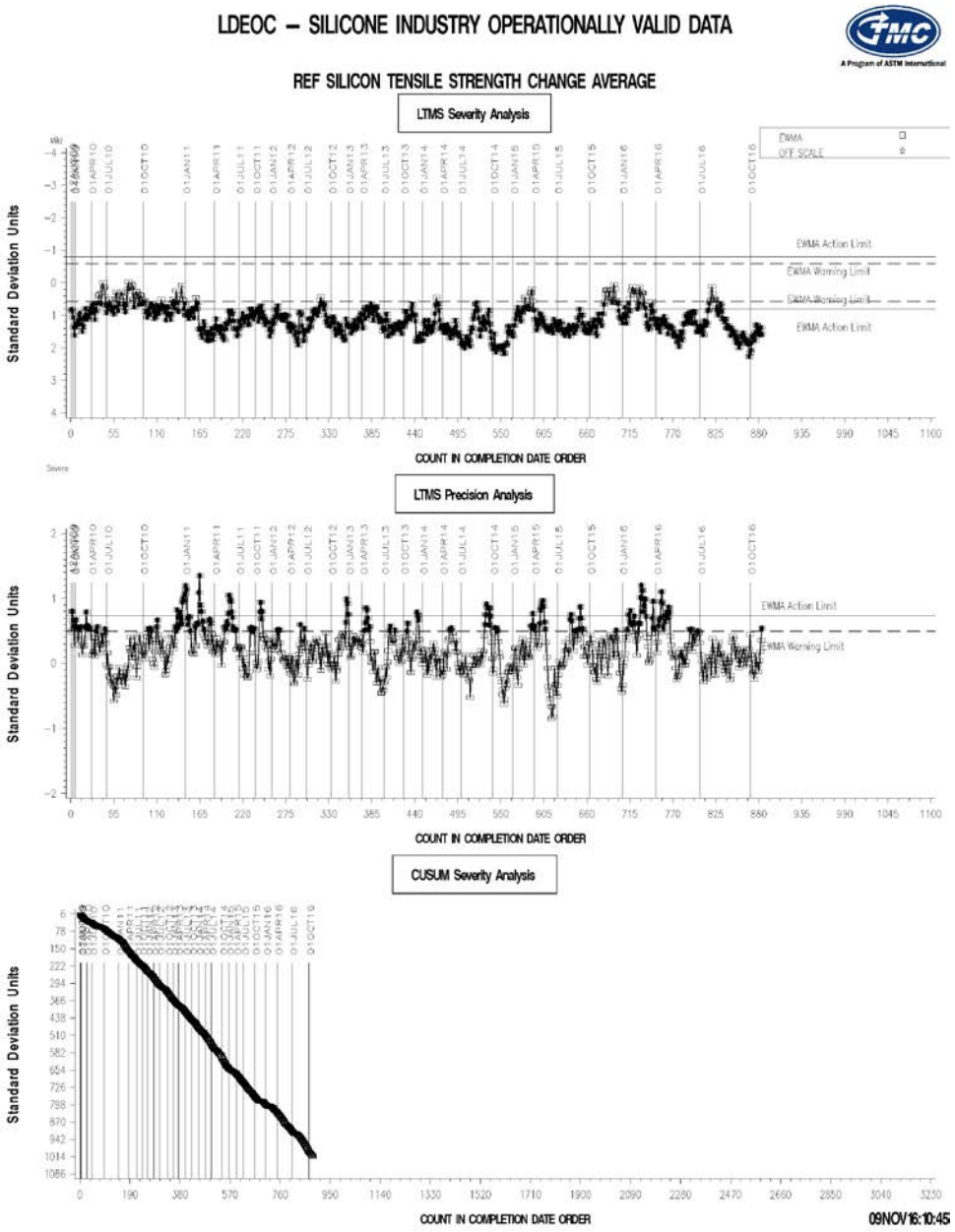
EWMA Warning Limit
EWMA Action Limit
COUNT IN COMPLETION DATE ORDER
LTMS Precision Analysis
Standard Deviation Units
EWMA Action Limit
EWMA Warning Limit
COUNT IN COMPLETION DATE ORDER
CUSUM Severity Analysis
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
09NOV16:10:39

LDEOC (D 7216)


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
09NOV16:10:45

LDEOC (D 7216)

INFORMATION LETTERS
No Information Letters were issued this period.

LDEOC (D 7216)

STATUS OF REFERENCE OIL SUPPLY

		@ TMC	
Oil	Samples @ Labs	Samples (750 mL)	Gallons
1006-1	89	0	0
1006-2	192	11,132	2206
Total	281	11,132	2206

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. These will be evaluated after 30 data points on each elastomer type are available.