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Test Monitoring Center

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412-365-1000

MEMORANDUM: 14-002

DATE: April 21, 2014

TO: L-60-1 Surveillance Panel

FROM: Scott Parke

SUBJECT: Updated data analysis for May 6, 2014 task force meeting

In preparation for the May 6, 2014 L-60-1 task force meeting, I have updated all of the various analyses that TMC has presented to the group over the past 18 months or so. This updated information follows. I will be prepared to review this information during the meeting and answer any questions.

Pages 3-7 show a comparison of the performance of the new (12-11) and old (11-00) gear batches. The means for various data groups are statistically compared.

Pages 8-19 give a graphical presentation of the information shown on pages 3-5. These plots show the data spread as well as bars indicating the mean and plus and minus one standard deviation. Statistically significant differences are indicated by red bars while the others are green.

Pages 20-24 show the industry control charts. Coloring indicates the various gear batches used over the years. The colors overlap where multiple gear batches were used simultaneously. Two red lines indicate the introduction dates for the two current reference oils.

Page 25 shows the current targets compared to targets computed using the first 30 tests and the most recent 30 tests in both transformed and original units.

Pages 26-30 show the industry control charts if targets from the first 30 tests on 148-1 and 151-2 are used.

Pages 31-35 show the industry control chart for 148-1 exclusively. These plots are shown to try to illustrate when (if ever) changes occurred in 148-1 results. These charts use updated targets but since only one oil is shown, the targets are irrelevant.

Pages 36-40 show the industry control chart for 151-2 exclusively. These plots are shown to try to illustrate when (if ever) changes occurred in 151-2 results. These charts use updated targets but since only one oil is shown, the targets are irrelevant.

SDP/sdp/mem14-002.sdp.doc

cc: Frank Farber
Jeff Clark
ftp://ftp.astmtmc.cmu.edu/docs/gear/l601/memos/mem14-002.pdf

Distribution: email

L-60-1 Gear Batch Comparisons
(April 2014 update)

GEAR batch (all data)
IND=148-1

	NEW	OLD
	23	200
ACVTI	1.317	1.282
ASLTI	0.635	0.658
PENTI	-0.525	-0.713
TOLTI	-0.647	-1.014
VISITI	3.689	3.704

N size for the group

Test parameter means

GEAR batch (all data)
IND=151-2

	NEW	OLD
	21	241
ACVTI	1.358	1.583
ASLTI	0.568	0.487
PENTI	0.818	0.702
TOLTI	0.343	0.214
VISITI	3.612	3.613

Highlighting indicates statistically significant difference at 95% confidence

L-60-1 Gear Batch Comparisons
(April 2014 update)

Restricting analysis to more recent data as was done for initial gear batch approval

GEAR batch (all data)
IND=148-1

	NEW	OLD
	23	200
ACVTI	1.317	1.282
ASLTI	0.635	0.658
PENTI	-0.525	-0.713
TOLTI	-0.647	-1.014
VISITI	3.689	3.704

GEAR batch (date >=20100101)
IND=148-1

	NEW	OLD
	23	66
ACVTI	1.317	1.304
ASLTI	0.635	0.614
PENTI	-0.525	-0.729
TOLTI	-0.647	-0.977
VISITI	3.689	3.698

GEAR batch (all data)
IND=151-2

	NEW	OLD
	21	241
ACVTI	1.358	1.583
ASLTI	0.568	0.487
PENTI	0.818	0.702
TOLTI	0.343	0.214
VISITI	3.612	3.613

GEAR batch (date >=20100101)
IND=151-2

	NEW	OLD
	21	68
ACVTI	1.358	1.554
ASLTI	0.568	0.422
PENTI	0.818	0.730
TOLTI	0.343	0.295
VISITI	3.612	3.620

L-60-1 Gear Batch Comparisons
(April 2014 update)

Considering only Lab D data.

GEAR batch (all data)
IND=148-1

	NEW	OLD
	23	200
ACVTI	1.317	1.282
ASLTI	0.635	0.658
PENTI	-0.525	-0.713
TOLTI	-0.647	-1.014
VISITI	3.689	3.704

GEAR batch (date >=20100101)
IND=148-1

	NEW	OLD
	23	66
ACVTI	1.317	1.304
ASLTI	0.635	0.614
PENTI	-0.525	-0.729
TOLTI	-0.647	-0.977
VISITI	3.689	3.698

GEAR batch (Lab D alldata)
IND=148-1

	NEW	OLD
	18	89
ACVTI	1.343	1.352
ASLTI	0.582	0.628
PENTI	-0.477	-0.560
TOLTI	-0.540	-0.878
VISITI	3.695	3.708

GEAR batch (all data)
IND=151-2

	NEW	OLD
	21	241
ACVTI	1.358	1.583
ASLTI	0.568	0.487
PENTI	0.818	0.702
TOLTI	0.343	0.214
VISITI	3.612	3.613

GEAR batch (date >=20100101)
IND=151-2

	NEW	OLD
	21	68
ACVTI	1.358	1.554
ASLTI	0.568	0.422
PENTI	0.818	0.730
TOLTI	0.343	0.295
VISITI	3.612	3.620

GEAR batch (Lab D alldata)
IND=151-2

	NEW	OLD
	15	99
ACVTI	1.283	1.509
ASLTI	0.620	0.528
PENTI	0.896	0.782
TOLTI	0.457	0.194
VISITI	3.608	3.630

L-60-1 Gear Batch Comparisons
(April 2014 update)

Considering only more recent Lab D data.

GEAR batch (all data)
IND=148-1

	NEW	OLD
	23	200
ACVTI	1.317	1.282
ASLTI	0.635	0.658
PENTI	-0.525	-0.713
TOLTI	-0.647	-1.014
VISITI	3.689	3.704

GEAR batch (date >=20100101)
IND=148-1

	NEW	OLD
	23	66
ACVTI	1.317	1.304
ASLTI	0.635	0.614
PENTI	-0.525	-0.729
TOLTI	-0.647	-0.977
VISITI	3.689	3.698

GEAR batch (Lab D alldata)
IND=148-1

	NEW	OLD
	18	89
ACVTI	1.343	1.352
ASLTI	0.582	0.628
PENTI	-0.477	-0.560
TOLTI	-0.540	-0.878
VISITI	3.695	3.708

GEAR batch (Lab D >=20100101)
IND=148-1

	NEW	OLD
	18	27
ACVTI	1.343	1.421
ASLTI	0.582	0.587
PENTI	-0.477	-0.562
TOLTI	-0.540	-0.701
VISITI	3.695	3.696

GEAR batch (all data)
IND=151-2

	NEW	OLD
	21	241
ACVTI	1.358	1.583
ASLTI	0.568	0.487
PENTI	0.818	0.702
TOLTI	0.343	0.214
VISITI	3.612	3.613

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IND=151-2

	NEW	OLD
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ACVTI	1.358	1.554
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ASLTI	0.620	0.528
PENTI	0.896	0.782
TOLTI	0.457	0.194
VISITI	3.608	3.630

GEAR batch (Lab D >=20100101)
IND=151-2

	NEW	OLD
	15	26
ACVTI	1.283	1.481
ASLTI	0.620	0.522
PENTI	0.896	0.852
TOLTI	0.457	0.487
VISITI	3.608	3.616

L-60-1 Gear Batch Comparisons

(April 2014 update)

GEAR batch (all data)
IND=148-1

	NEW	OLD
	23	200
ACVTI	1.317	1.282
ASLTI	0.635	0.658
PENTI	-0.525	-0.713
TOLTI	-0.647	-1.014
VISITI	3.689	3.704

GEAR batch (date >=20100101)
IND=148-1

	NEW	OLD
	23	66
ACVTI	1.317	1.304
ASLTI	0.635	0.614
PENTI	-0.525	-0.729
TOLTI	-0.647	-0.977
VISITI	3.689	3.698

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IND=148-1

	NEW	OLD
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VISITI	3.695	3.696

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IND=151-2

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	21	241
ACVTI	1.358	1.583
ASLTI	0.568	0.487
PENTI	0.818	0.702
TOLTI	0.343	0.214
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	21	68
ACVTI	1.358	1.554
ASLTI	0.568	0.422
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GEAR batch (Lab D alldata)
IND=151-2

	NEW	OLD
	15	99
ACVTI	1.283	1.509
ASLTI	0.620	0.528
PENTI	0.896	0.782
TOLTI	0.457	0.194
VISITI	3.608	3.630

GEAR batch (Lab D >=20100101)
IND=151-2

	NEW	OLD
	15	26
ACVTI	1.283	1.481
ASLTI	0.620	0.522
PENTI	0.896	0.852
TOLTI	0.457	0.487
VISITI	3.608	3.616

ORIGINAL UNITS Same analyses repeated for original units (no transformation)

GEAR batch (all data)
IND=148-1

	NEW	OLD
	23	200
ACV	7.883	7.805
ASL	9.465	9.476
PEN	0.600	0.516
TOL	0.539	0.386
VISI	40.217	40.685

GEAR batch (date >=20100101)
IND=148-1

	NEW	OLD
	23	66
ACV	7.883	7.836
ASL	9.465	9.453
PEN	0.600	0.495
TOL	0.539	0.400
VISI	40.217	40.424

GEAR batch (Lab D alldata)
IND=148-1

	NEW	OLD
	18	89
ACV	7.928	7.936
ASL	9.439	9.463
PEN	0.628	0.608
TOL	0.589	0.443
VISI	40.500	40.843

GEAR batch (Lab D >=20100101)
IND=148-1

	NEW	OLD
	18	27
ACV	7.928	8.048
ASL	9.439	9.441
PEN	0.628	0.582
TOL	0.589	0.507
VISI	40.500	40.296

GEAR batch (all data)
IND=151-2

	NEW	OLD
	21	241
ACV	7.938	8.238
ASL	9.429	9.377
PEN	2.310	2.049
TOL	1.495	1.300
VISI	37.190	37.166

GEAR batch (date >=20100101)
IND=151-2

	NEW	OLD
	21	68
ACV	7.938	8.204
ASL	9.429	9.337
PEN	2.310	2.118
TOL	1.495	1.399
VISI	37.190	37.382

GEAR batch (Lab D alldata)
IND=151-2

	NEW	OLD
	15	99
ACV	7.820	8.169
ASL	9.460	9.407
PEN	2.487	2.227
TOL	1.667	1.317
VISI	37.067	37.788

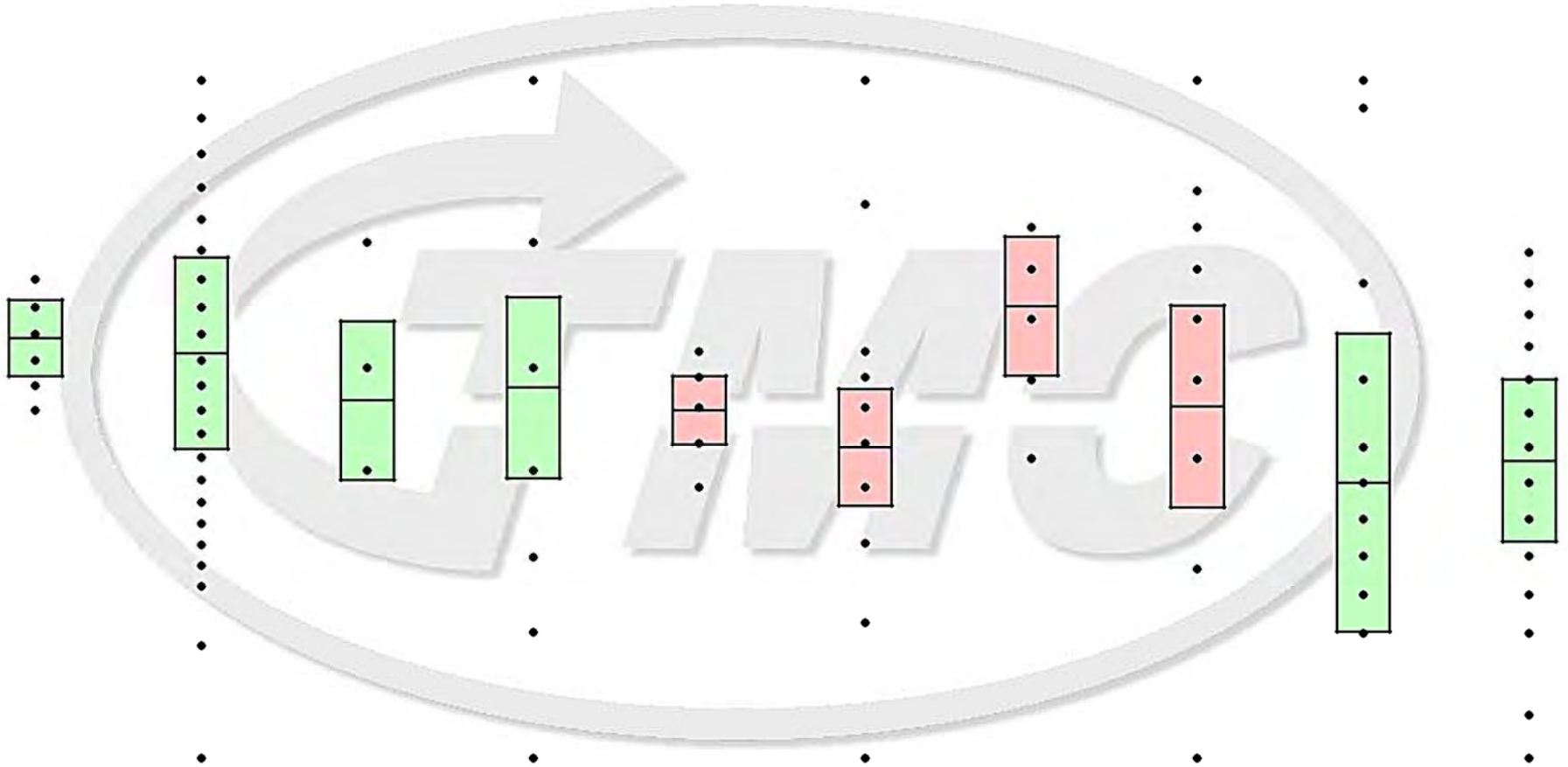
GEAR batch (Lab D >=20100101)
IND=151-2

	NEW	OLD
	15	26
ACV	7.820	8.127
ASL	9.460	9.404
PEN	2.487	2.415
TOL	1.667	1.689
VISI	37.067	37.281

L-60-1 New vs Old Gears

All Data

UNITS=TRANSFORMED IND=148-1



	ACVTI NEW	ACVTI OLD	ASLTI NEW	ASLTI OLD	PENTI NEW	PENTI OLD	TOLTI NEW	TOLTI OLD	VISITI NEW	VISITI OLD
N	23	200	23	200	23	200	23	200	23	200
Min	1.153	0.364	0.511	0	-0.92	-2.3	-1.2	-2.3	3.584	3.497
Max	1.45	1.901	0.916	1.204	-0.22	1.163	-0.36	0.182	3.97	3.85
Mean	1.317	1.282	0.635	0.658	-0.53	-0.71	-0.65	-1.01	3.689	3.704
Std	0.086	0.218	0.141	0.161	0.175	0.298	0.254	0.369	0.104	0.057

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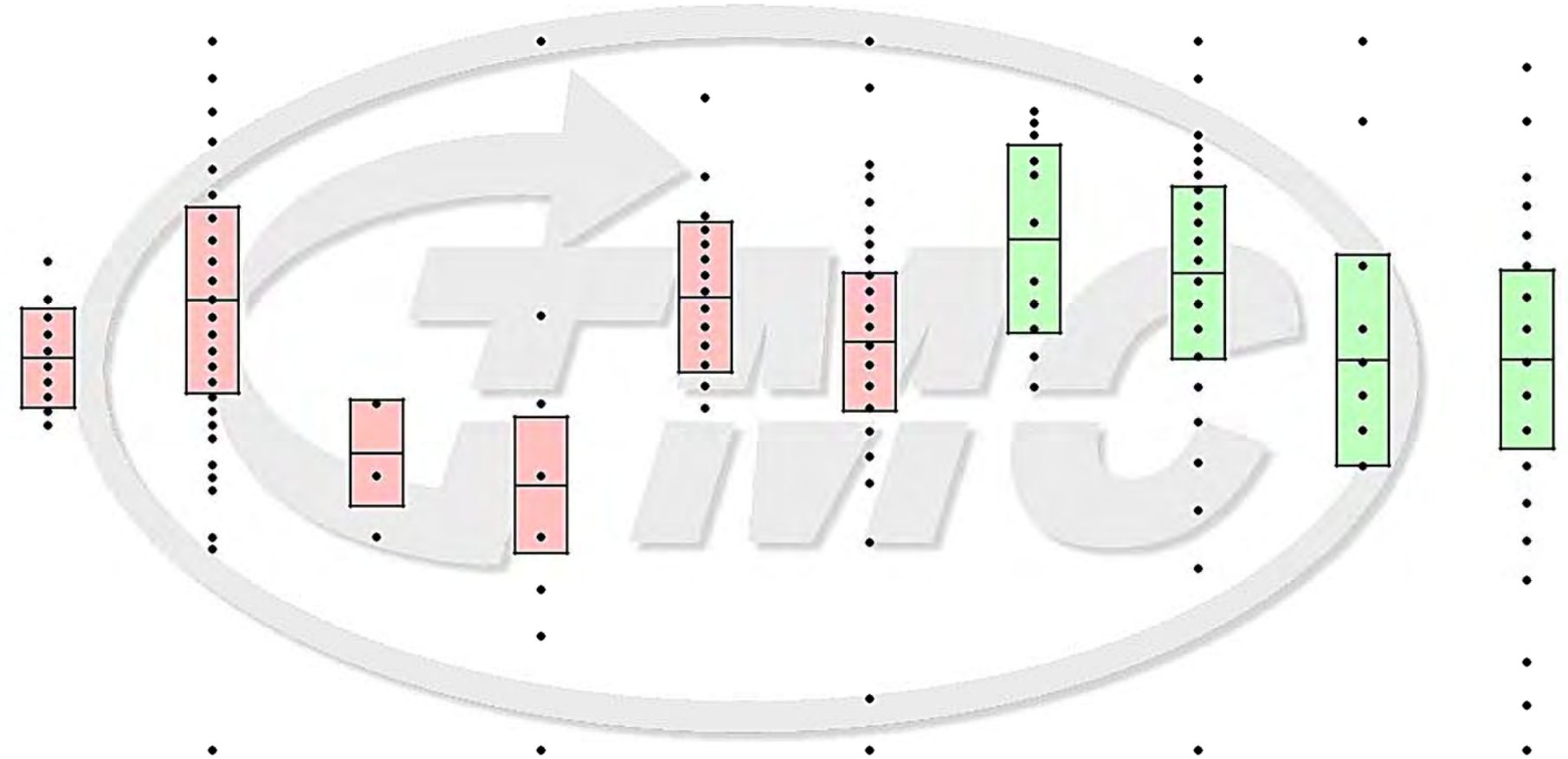
L-60-1 New vs Old Gears

All Data

UNITS=TRANSFORMED IND=151-2



	ACVTI NEW	ACVTI OLD	ASLTI NEW	ASLTI OLD	PENTI NEW	PENTI OLD	TOLTI NEW	TOLTI OLD	VISITI NEW	VISITI OLD
N	21	241	21	241	21	241	21	241	21	241
Min	1.099	-0.16	0.357	-0.18	0.531	-0.36	-0.22	-1.61	3.526	3.296
Max	1.735	2.587	0.693	1.609	1.335	1.482	0.833	1.099	3.871	3.85
Mean	1.358	1.583	0.568	0.487	0.818	0.702	0.343	0.214	3.612	3.613
Std	0.193	0.362	0.134	0.172	0.195	0.179	0.359	0.33	0.086	0.073

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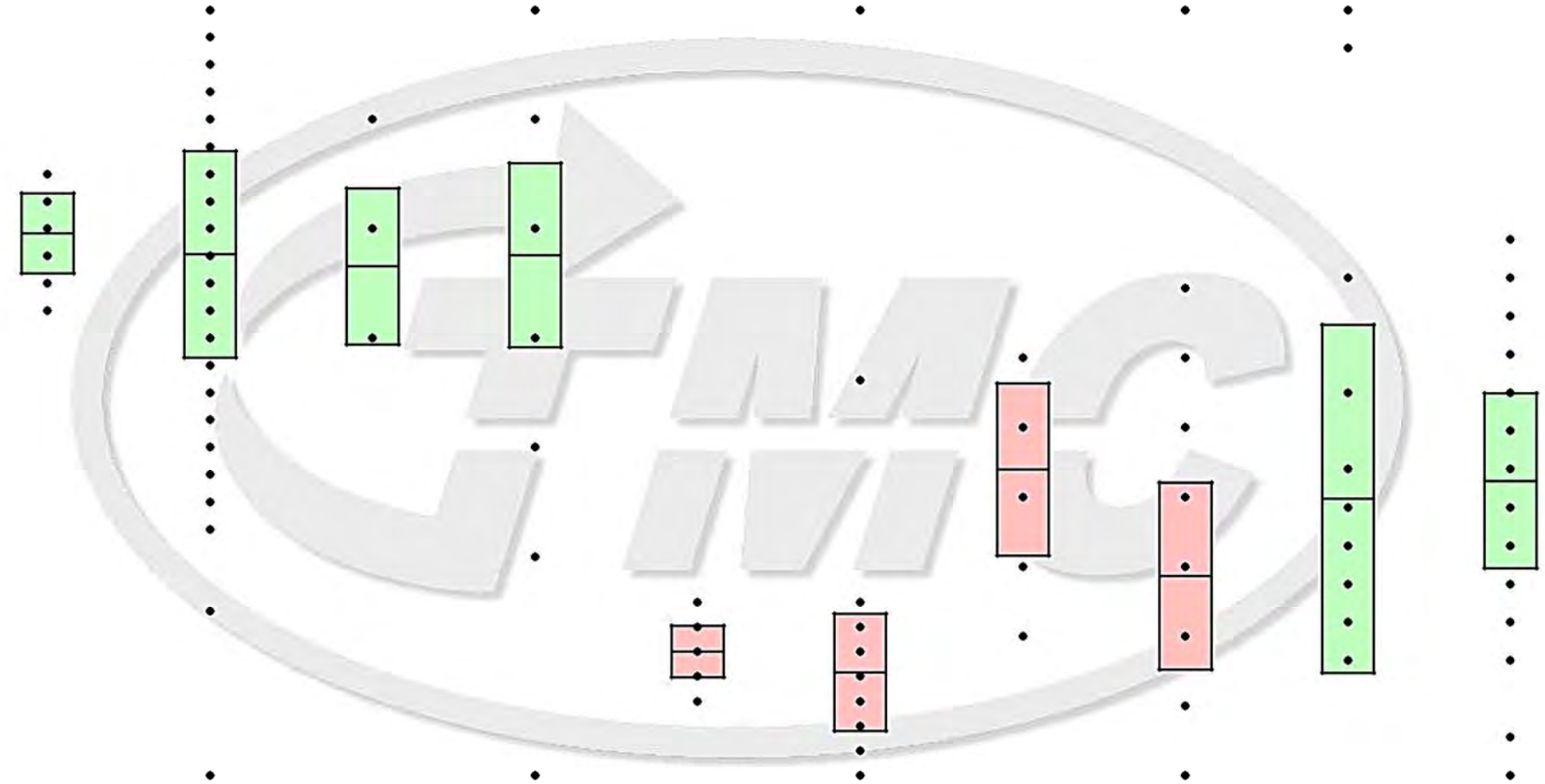
L-60-1 New vs Old Gears

All Data

UNITS=ORIGINAL IND=148-1



	ACV NEW	ACV OLD	ASL NEW	ASL OLD	PEN NEW	PEN OLD	TOL NEW	TOL OLD	VISI NEW	VISI OLD
N	23	200	23	200	23	200	23	200	23	200
Min	7.6	5.9	9.4	9	0.4	0.1	0.3	0.1	36	33
Max	8.1	8.7	9.6	9.7	0.8	3.2	0.7	1.2	53	47
Mean	7.883	7.805	9.465	9.476	0.6	0.516	0.539	0.386	40.22	40.69
Std	0.147	0.379	0.071	0.084	0.104	0.238	0.123	0.134	4.542	2.285

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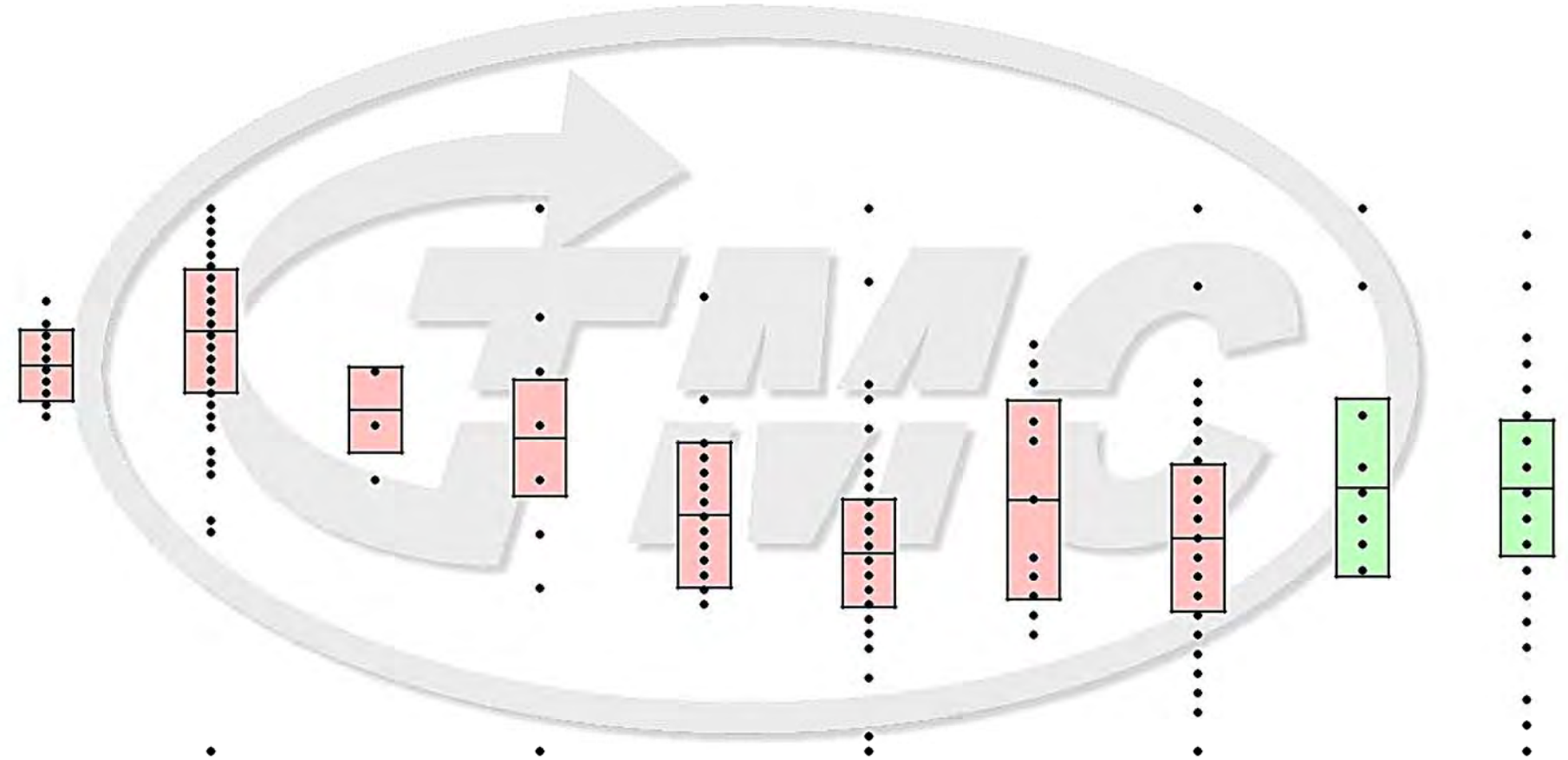
L-60-1 New vs Old Gears

All Data

UNITS=ORIGINAL IND=151-2



	ACV NEW	ACV OLD	ASL NEW	ASL OLD	PEN NEW	PEN OLD	TOL NEW	TOL OLD	VISI NEW	VISI OLD
N	21	241	21	241	21	241	21	241	21	241
Min	7.5	4.6	9.3	8.8	1.7	0.7	0.8	0.2	34	27
Max	8.5	9.3	9.5	9.8	3.8	4.4	2.3	3	48	47
Mean	7.938	8.238	9.429	9.377	2.31	2.049	1.495	1.3	37.19	37.17
Std	0.309	0.533	0.078	0.107	0.494	0.369	0.512	0.38	3.444	2.623

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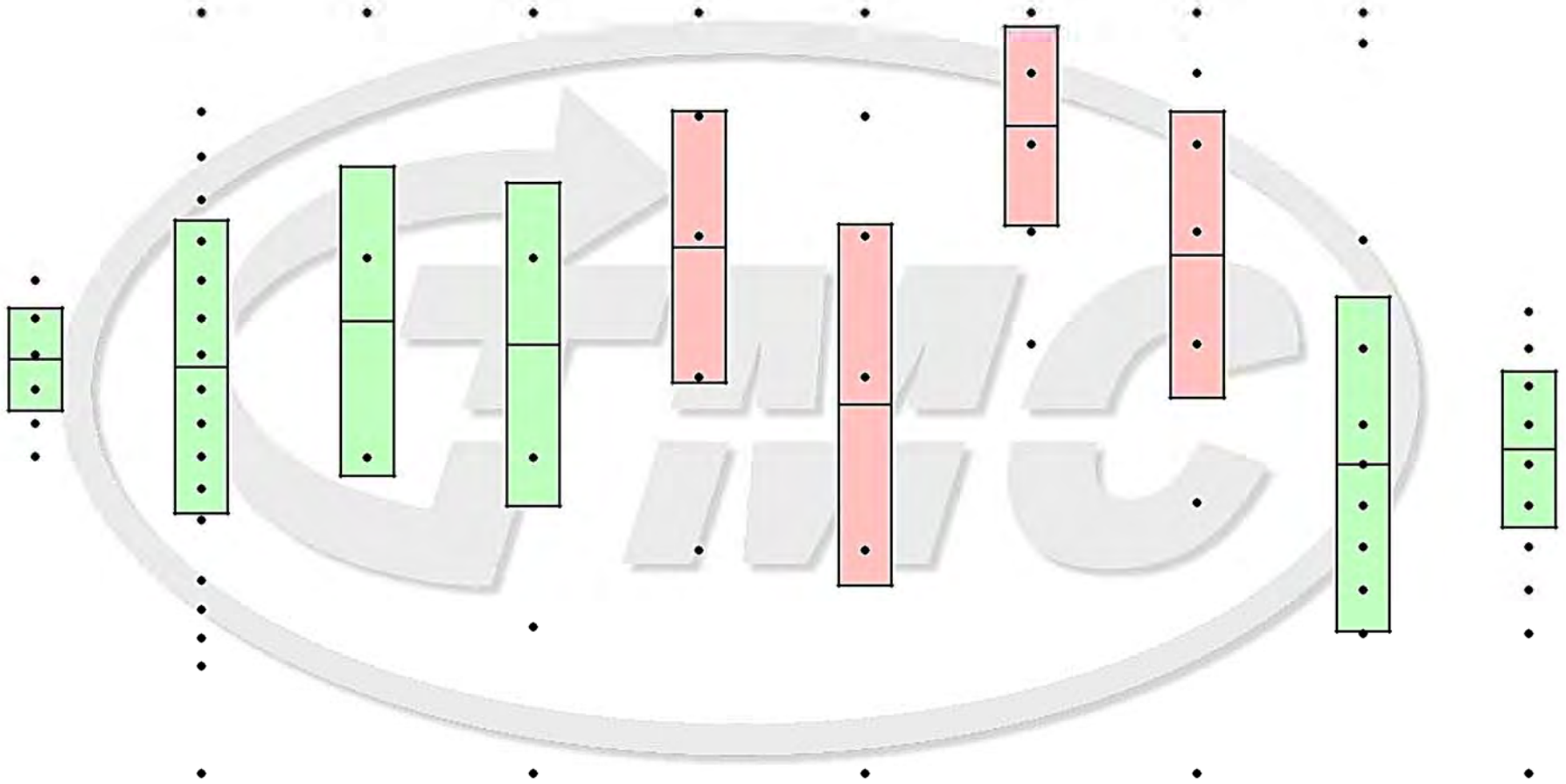
L-60-1 New vs Old Gears

Date >=20100101

UNITS=TRANSFORMED IND=148-1



	ACVTI NEW	ACVTI OLD	ASLTI NEW	ASLTI OLD	PENTI NEW	PENTI OLD	TOLTI NEW	TOLTI OLD	VISITI NEW	VISITI OLD
N	23	66	23	66	23	66	23	66	23	66
Min	1.153	0.619	0.511	0.223	-0.92	-1.2	-1.2	-2.3	3.584	3.497
Max	1.45	1.901	0.916	0.916	-0.22	-0.22	-0.36	-0.36	3.97	3.784
Mean	1.317	1.304	0.635	0.614	-0.53	-0.73	-0.65	-0.98	3.689	3.698
Std	0.086	0.247	0.141	0.147	0.175	0.233	0.254	0.366	0.104	0.049

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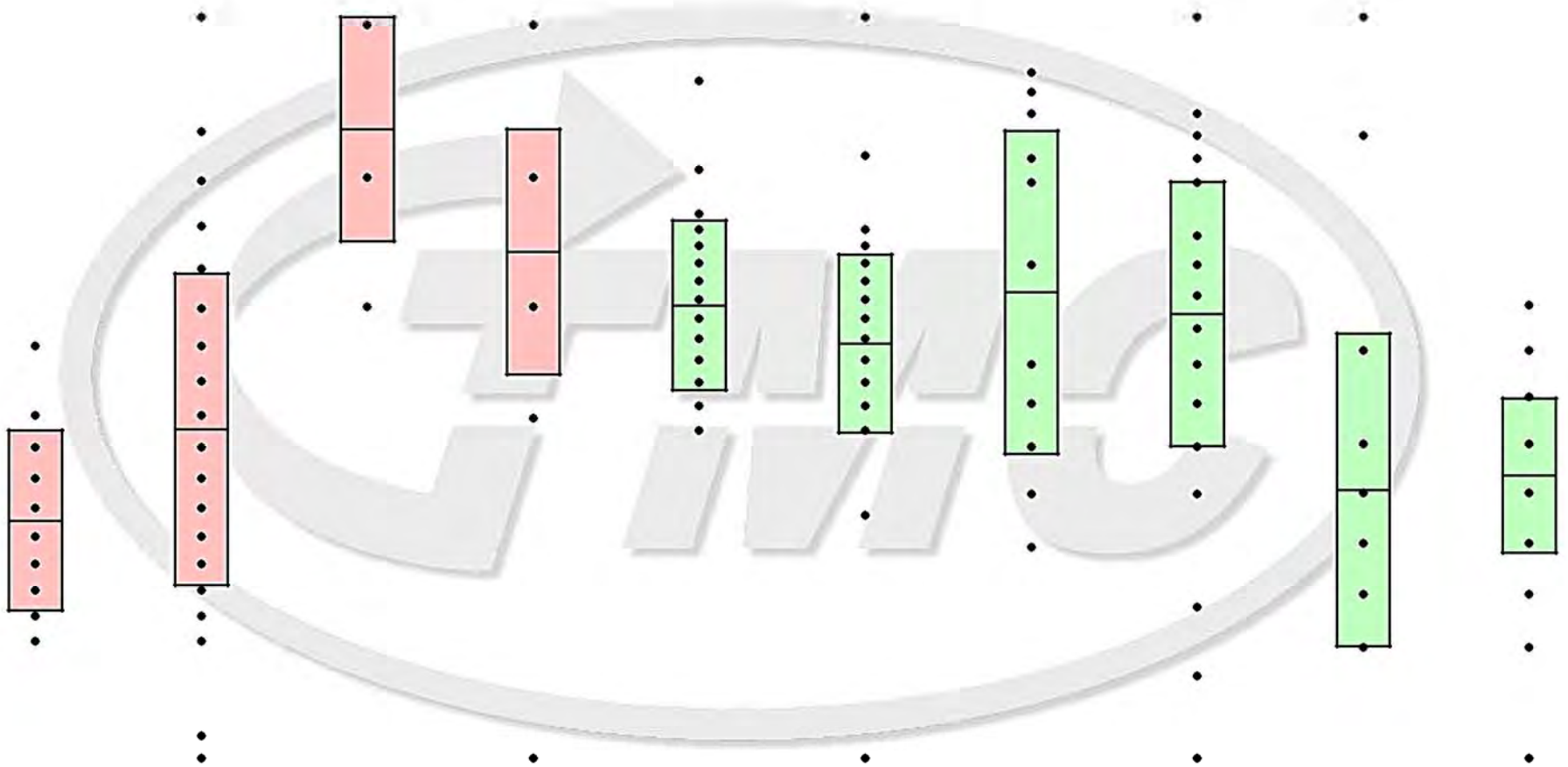
L-60-1 New vs Old Gears

Date >=20100101

UNITS=TRANSFORMED IND=151-2



	ACVTI NEW	ACVTI OLD	ASLTI NEW	ASLTI OLD	PENTI NEW	PENTI OLD	TOLTI NEW	TOLTI OLD	VISITI NEW	VISITI OLD
N	21	68	21	68	21	68	21	68	21	68
Min	1.099	0.847	0.357	-0.18	0.531	-0.22	-0.22	-0.69	3.526	3.466
Max	1.735	2.442	0.693	0.693	1.335	1.482	0.833	0.956	3.871	3.714
Mean	1.358	1.554	0.568	0.422	0.818	0.73	0.343	0.295	3.612	3.62
Std	0.193	0.335	0.134	0.146	0.195	0.205	0.359	0.294	0.086	0.042

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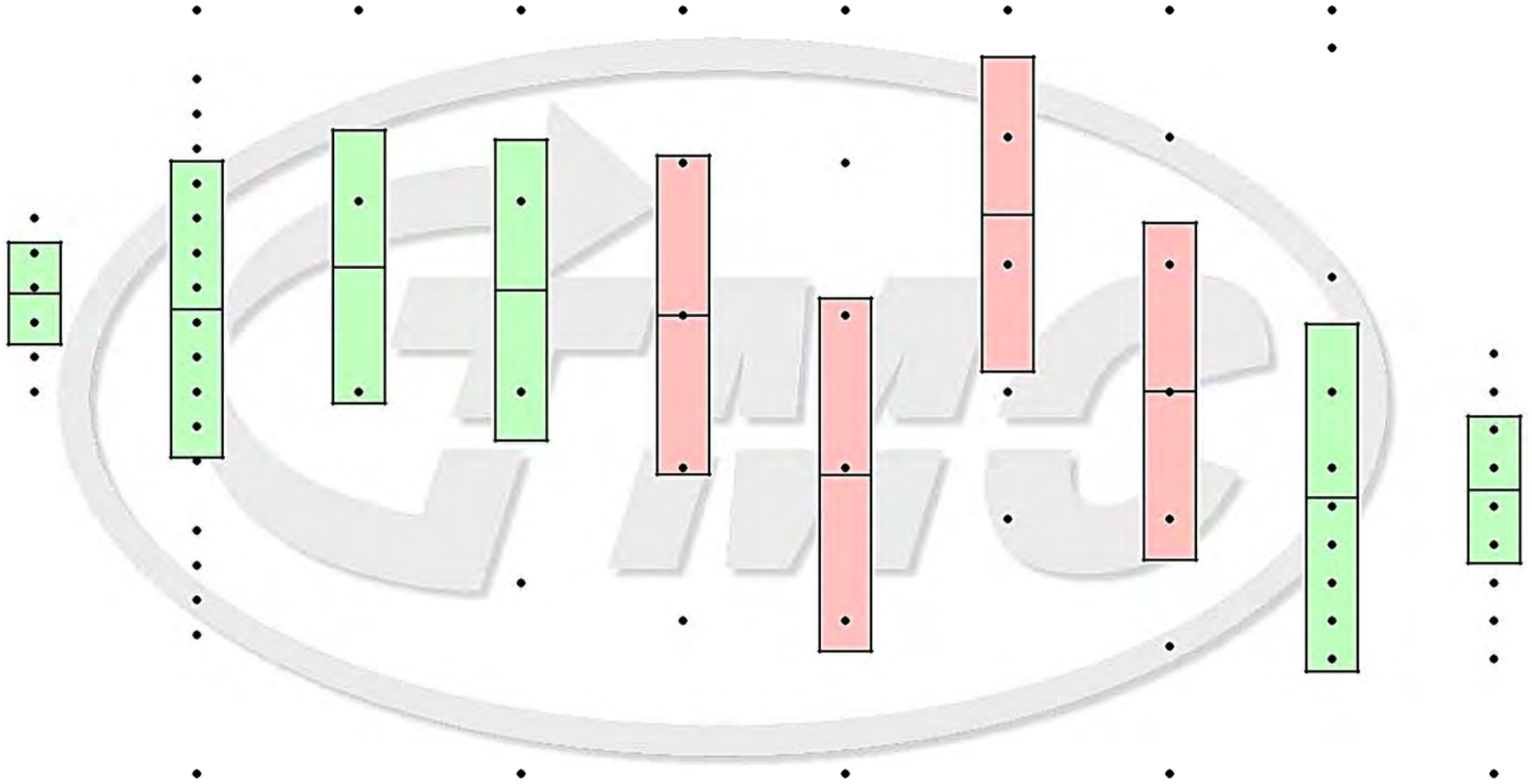
L-60-1 New vs Old Gears

Date >=20100101

UNITS=ORIGINAL IND=148-1



	ACV NEW	ACV OLD	ASL NEW	ASL OLD	PEN NEW	PEN OLD	TOL NEW	TOL OLD	VISI NEW	VISI OLD
N	23	66	23	66	23	66	23	66	23	66
Min	7.6	6.5	9.4	9.2	0.4	0.3	0.3	0.1	36	33
Max	8.1	8.7	9.6	9.6	0.8	0.8	0.7	0.7	53	44
Mean	7.883	7.836	9.465	9.453	0.6	0.495	0.539	0.4	40.22	40.42
Std	0.147	0.427	0.071	0.079	0.104	0.116	0.123	0.132	4.542	1.914

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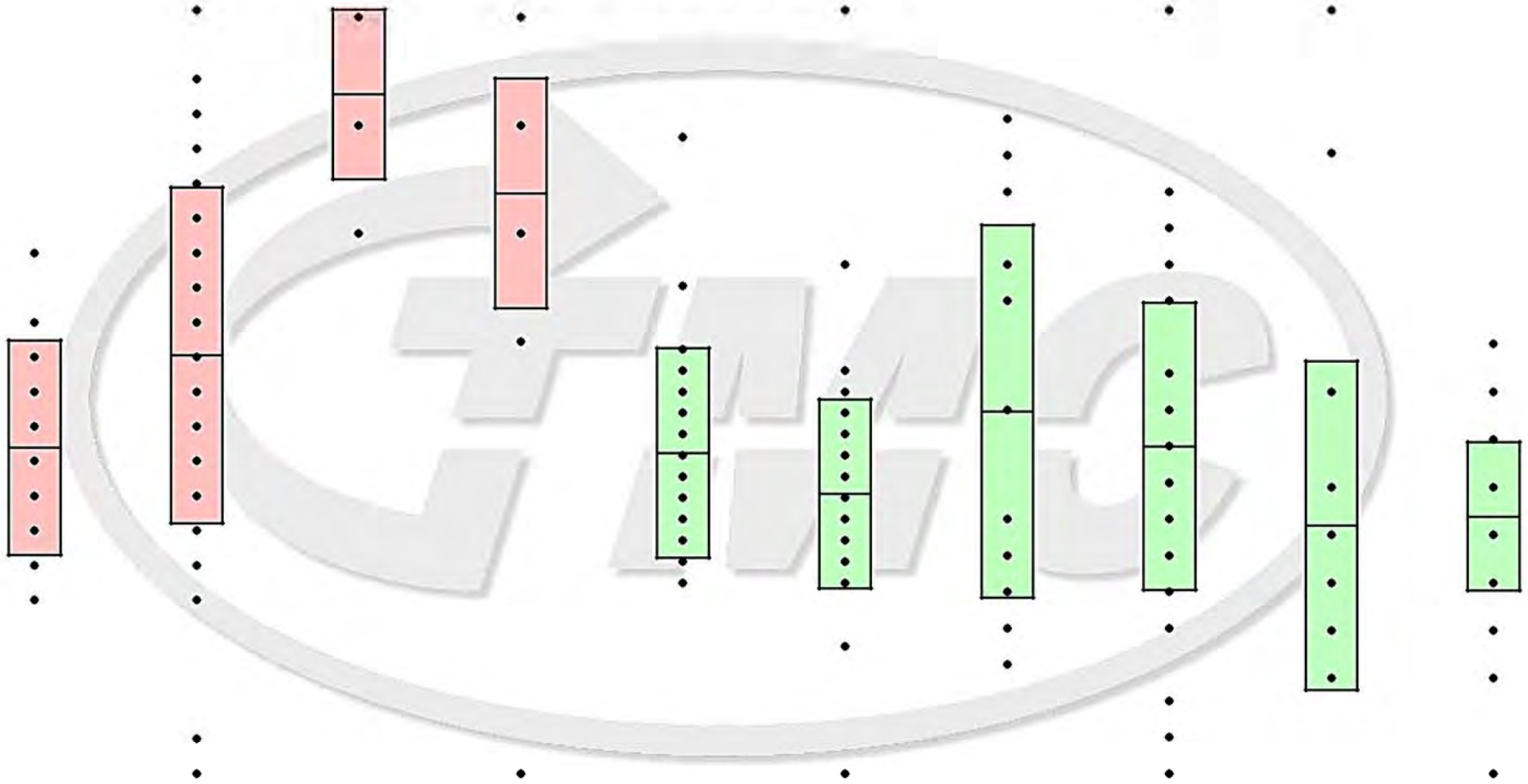
L-60-1 New vs Old Gears

Date >=20100101

UNITS=ORIGINAL IND=151-2



	ACV NEW	ACV OLD	ASL NEW	ASL OLD	PEN NEW	PEN OLD	TOL NEW	TOL OLD	VISI NEW	VISI OLD
N	21	68	21	68	21	68	21	68	21	68
Min	7.5	7	9.3	8.8	1.7	0.8	0.8	0.5	34	32
Max	8.5	9.2	9.5	9.5	3.8	4.4	2.3	2.6	48	41
Mean	7.938	8.204	9.429	9.337	2.31	2.118	1.495	1.399	37.19	37.38
Std	0.309	0.484	0.078	0.106	0.494	0.446	0.512	0.395	3.444	1.555

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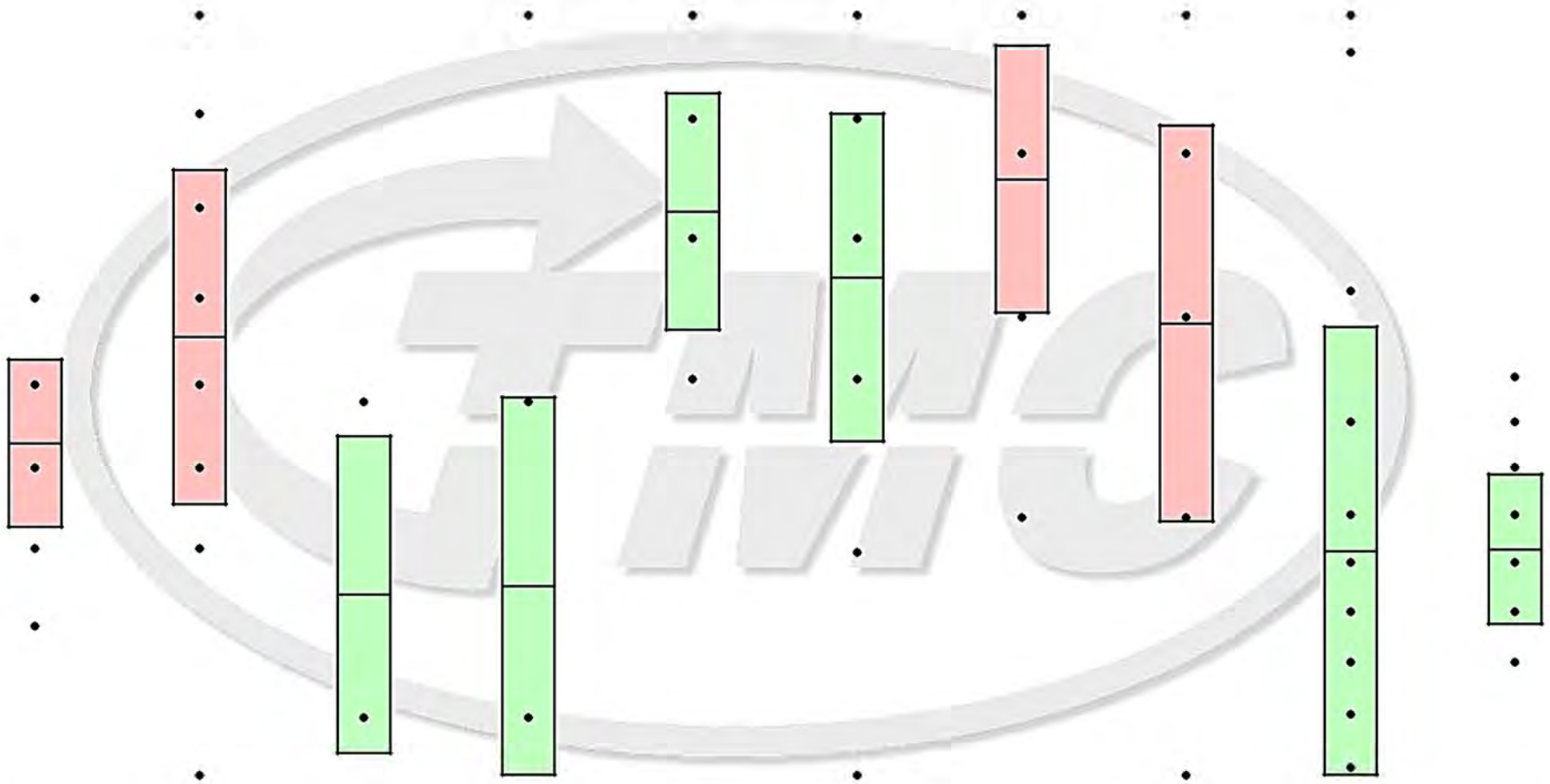
L-60-1 New vs Old Gears

Lab D Date >=20100101

UNITS=TRANSFORMED IND=148-1



	ACVTI NEW	ACVTI OLD	ASLTI NEW	ASLTI OLD	PENTI NEW	PENTI OLD	TOLTI NEW	TOLTI OLD	VISITI NEW	VISITI OLD
N	18	27	18	27	18	27	18	27	18	27
Min	1.208	1.099	0.511	0.511	-0.69	-1.2	-0.92	-1.2	3.584	3.638
Max	1.45	1.658	0.693	0.916	-0.22	-0.22	-0.36	-0.36	3.97	3.784
Mean	1.343	1.421	0.582	0.587	-0.48	-0.56	-0.54	-0.7	3.695	3.696
Std	0.061	0.123	0.091	0.109	0.153	0.211	0.149	0.221	0.115	0.038

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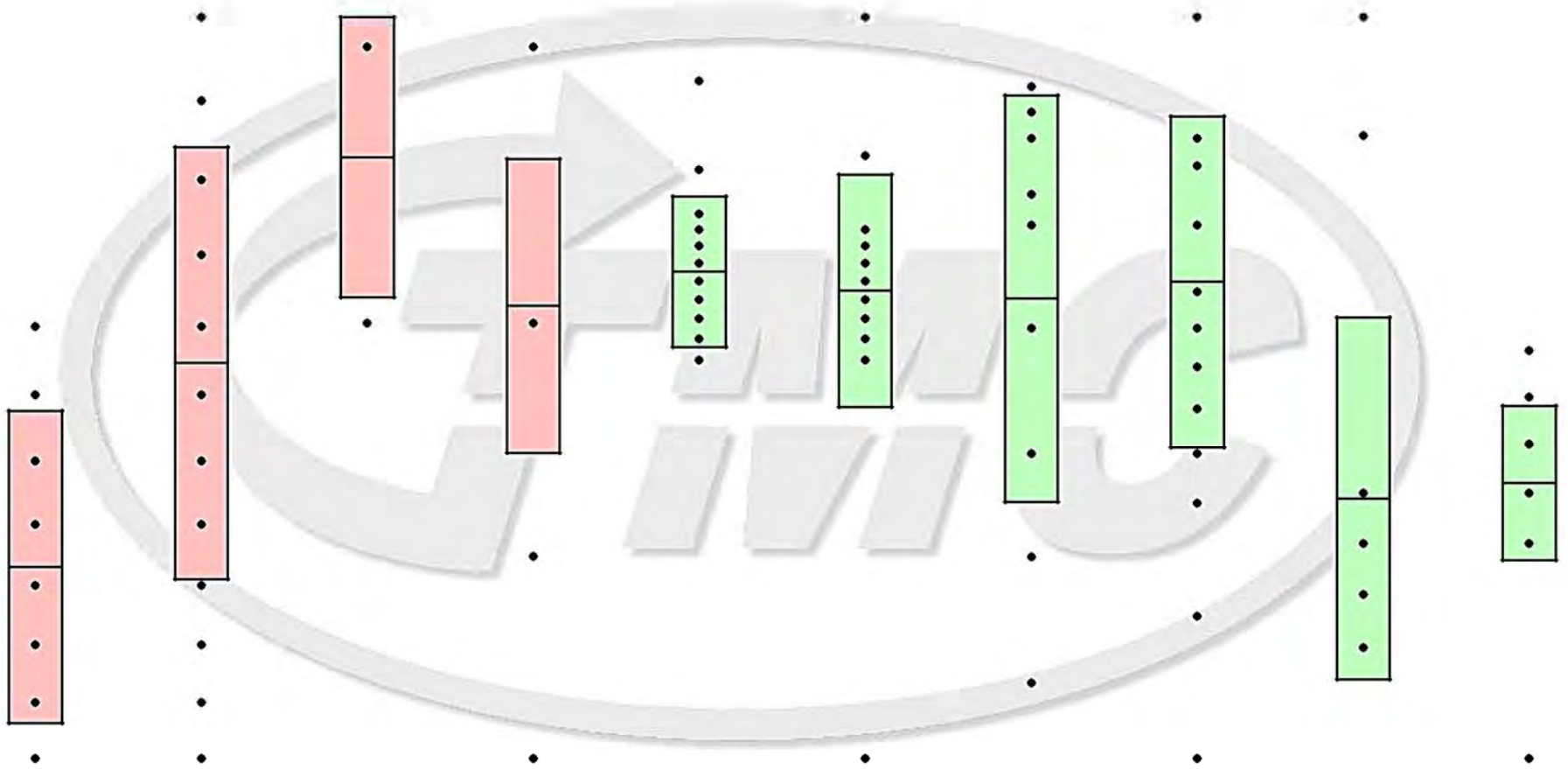
L-60-1 New vs Old Gears

Lab D Date >=20100101

UNITS=TRANSFORMED IND=151-2



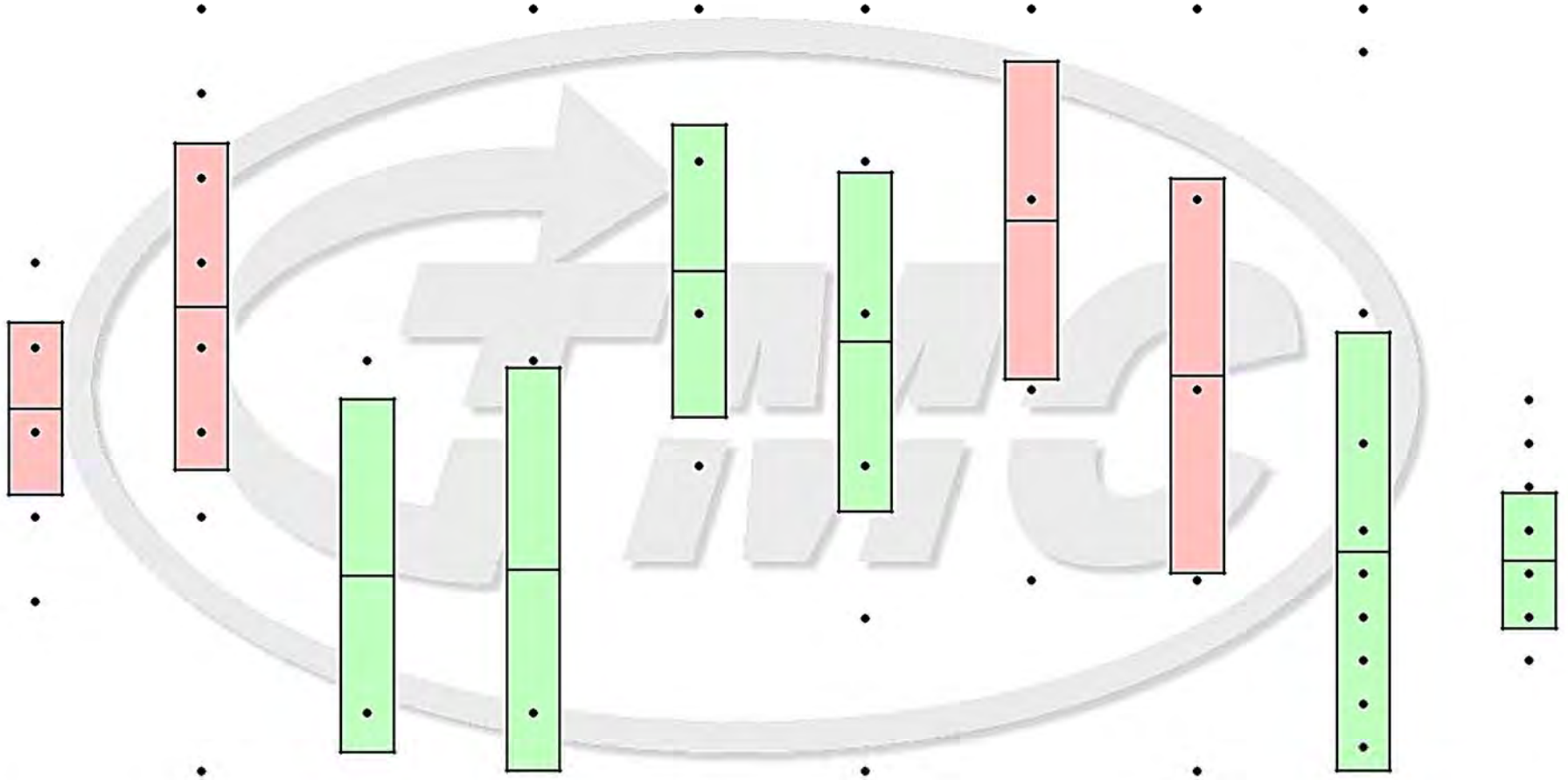
	ACVTI NEW	ACVTI OLD	ASLTI NEW	ASLTI OLD	PENTI NEW	PENTI OLD	TOLTI NEW	TOLTI OLD	VISITI NEW	VISITI OLD
N	15	26	15	26	15	26	15	26	15	26
Min	1.099	1.099	0.511	0.223	0.693	-0.22	-0.22	-0.36	3.526	3.466
Max	1.516	1.815	0.693	0.693	1.335	1.482	0.833	0.956	3.871	3.689
Mean	1.283	1.481	0.62	0.522	0.896	0.852	0.457	0.487	3.608	3.616
Std	0.151	0.209	0.092	0.097	0.173	0.268	0.36	0.293	0.099	0.042

10:08:21 11APR2014

L-60-1 New vs Old Gears

Lab D Date >=20100101

UNITS=ORIGINAL IND=148-1



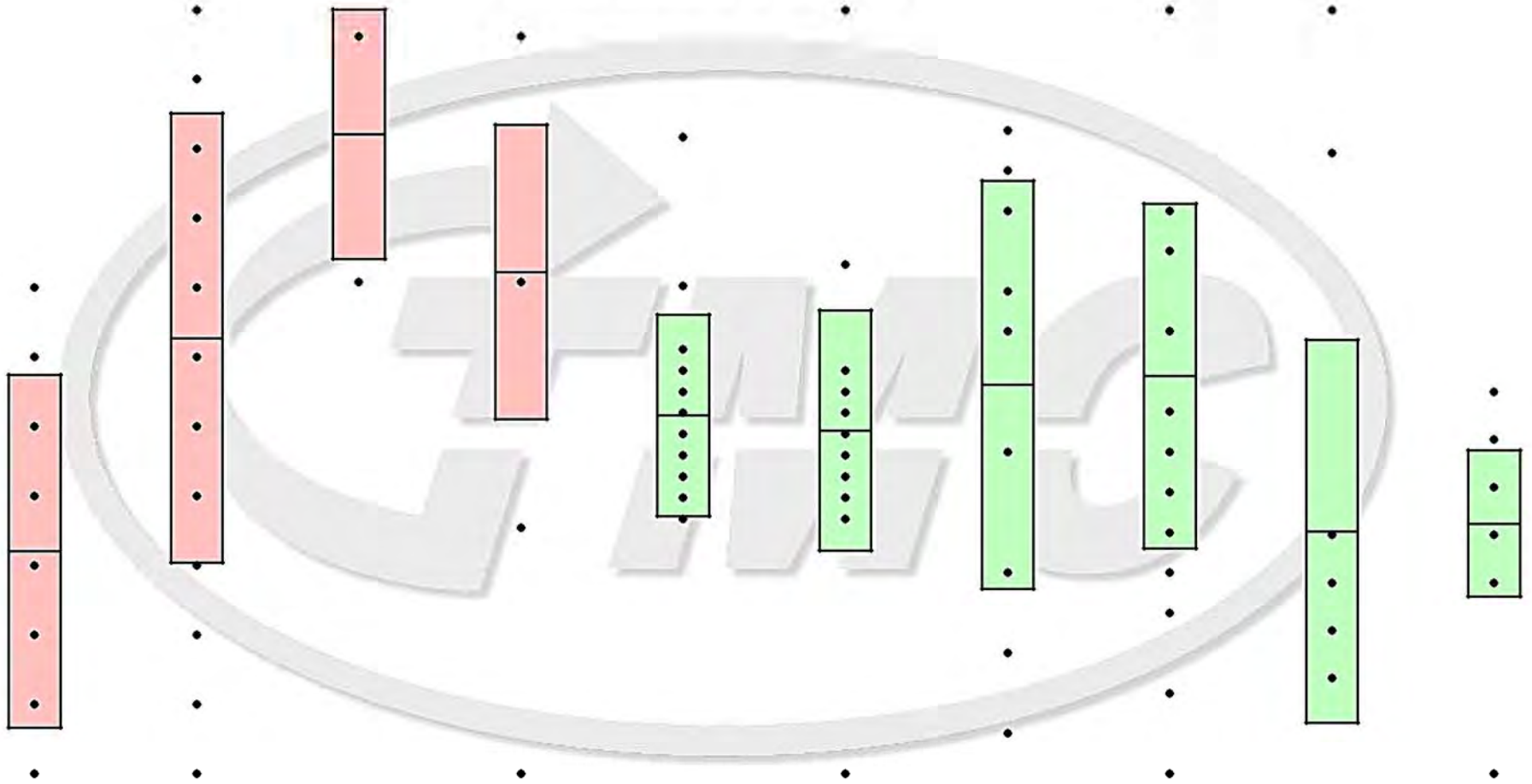
	ACV NEW	ACV OLD	ASL NEW	ASL OLD	PEN NEW	PEN OLD	TOL NEW	TOL OLD	VISI NEW	VISI OLD
N	18	27	18	27	18	27	18	27	18	27
Min	7.7	7.5	9.4	9.4	0.5	0.3	0.4	0.3	36	38
Max	8.1	8.4	9.5	9.6	0.8	0.8	0.7	0.7	53	44
Mean	7.928	8.048	9.439	9.441	0.628	0.581	0.589	0.507	40.5	40.3
Std	0.102	0.193	0.05	0.057	0.096	0.111	0.083	0.104	5.044	1.564

10:08:21 11APR2014

L-60-1 New vs Old Gears

Lab D Date >=20100101

UNITS=ORIGINAL IND=151-2

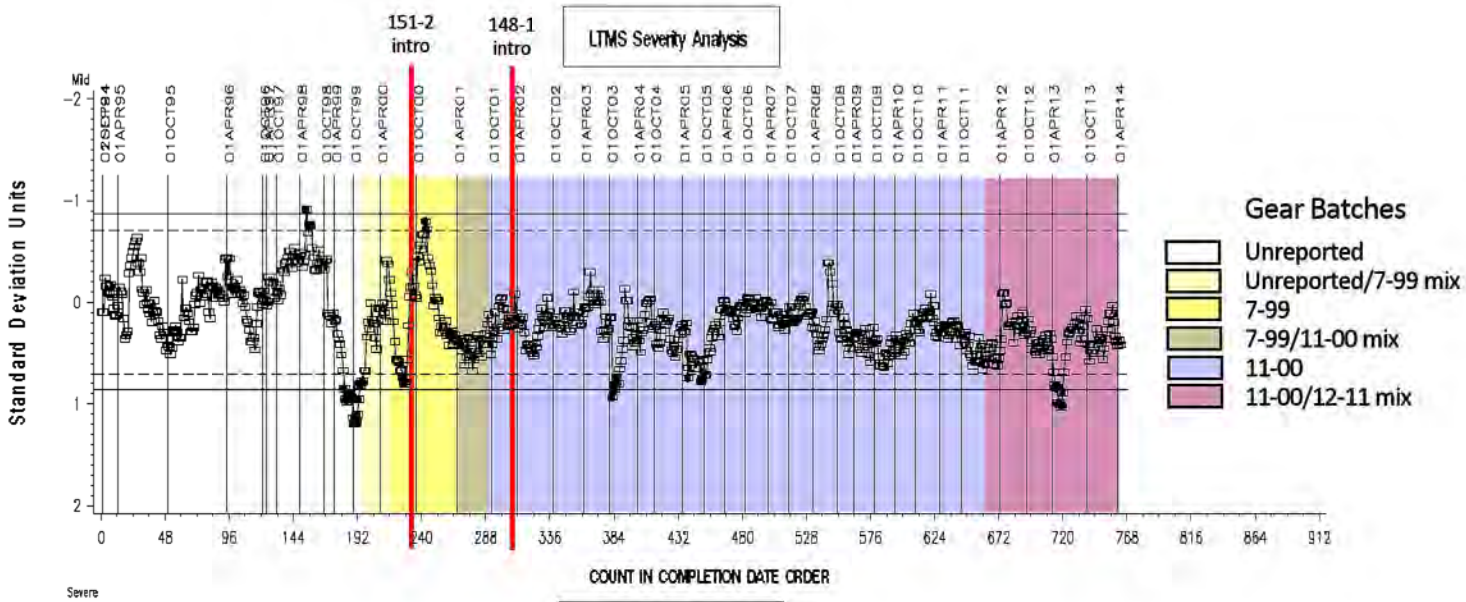


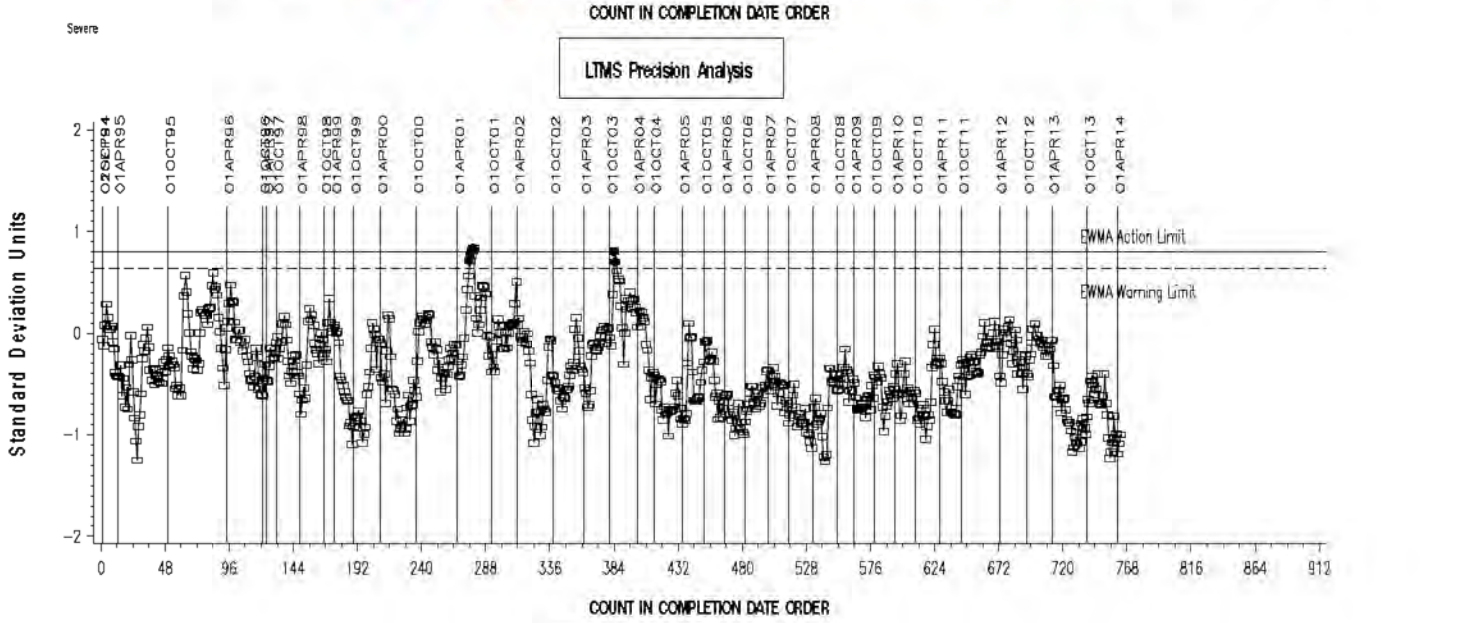
	ACV NEW	ACV OLD	ASL NEW	ASL OLD	PEN NEW	PEN OLD	TOL NEW	TOL OLD	VISI NEW	VISI OLD
N	15	26	15	26	15	26	15	26	15	26
Min	7.5	7.5	9.4	9.2	2	0.8	0.8	0.7	34	32
Max	8.2	8.6	9.5	9.5	3.8	4.4	2.3	2.6	48	40
Mean	7.82	8.127	9.46	9.404	2.487	2.415	1.667	1.688	37.07	37.23
Std	0.254	0.323	0.051	0.06	0.475	0.566	0.508	0.428	4.008	1.531

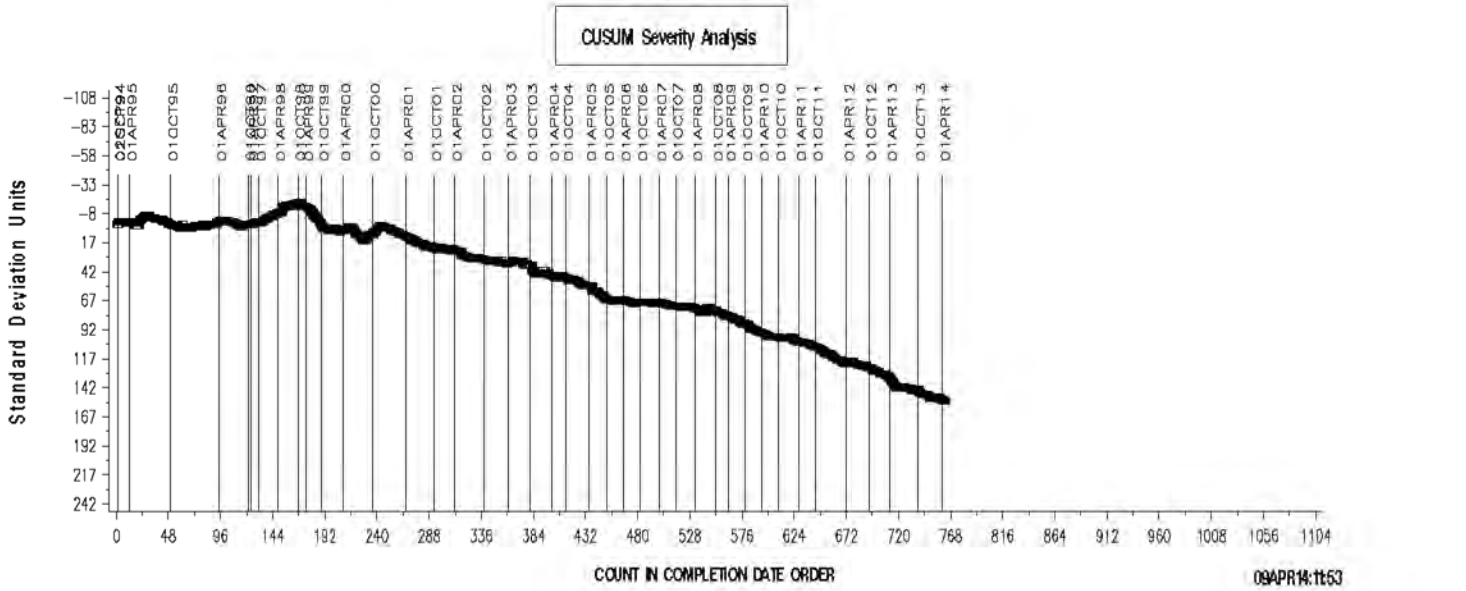
10:08:21 11APR2014

L-60-1 INDUSTRY OPERATIONALLY VALID DATA

REF. FINAL PENTANE INSOLUBLES







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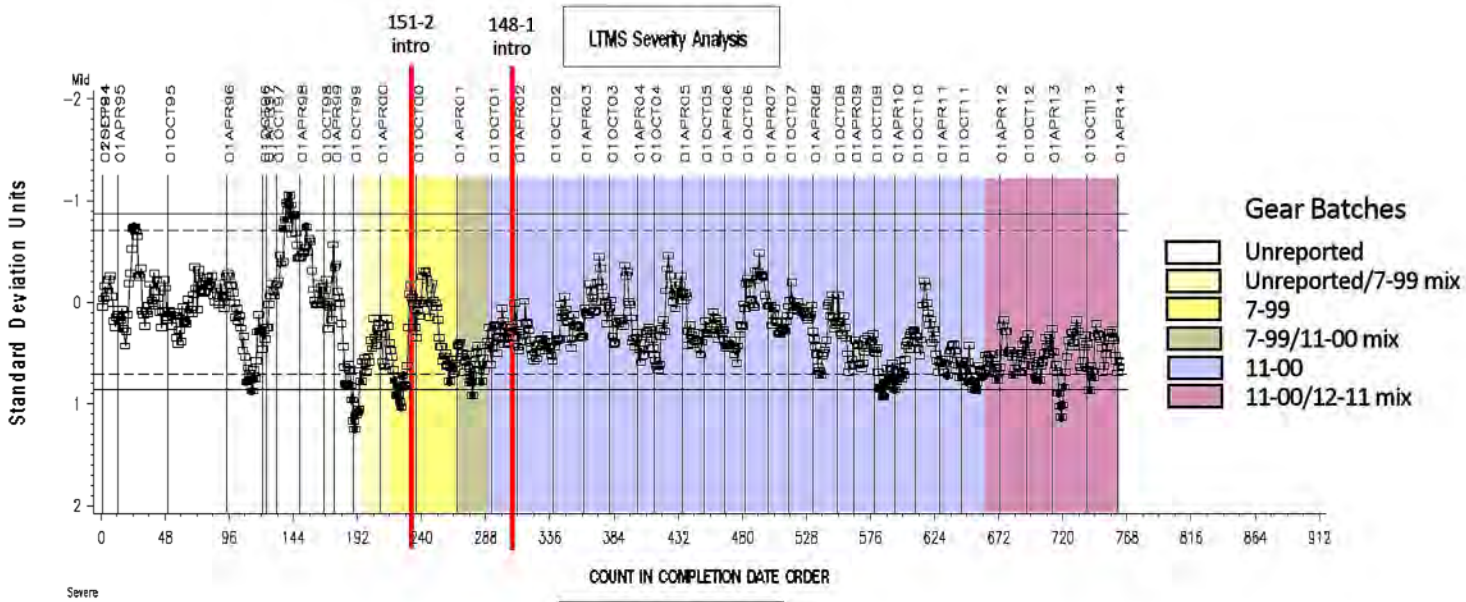
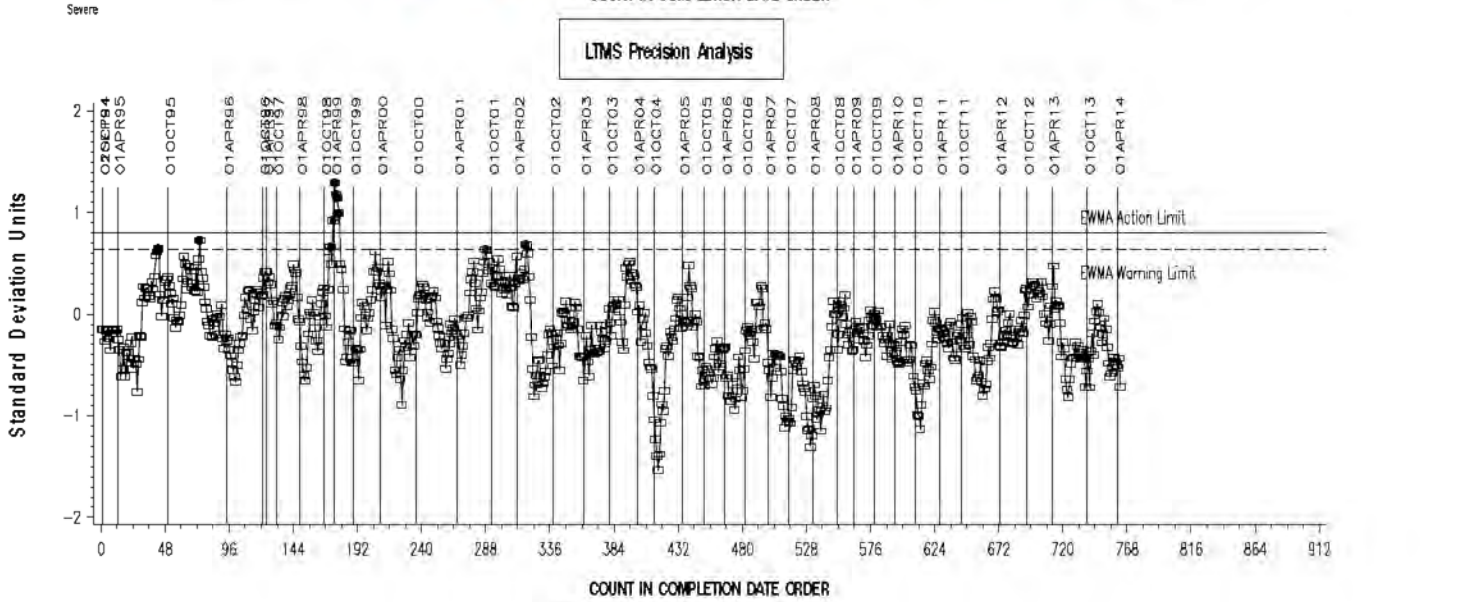
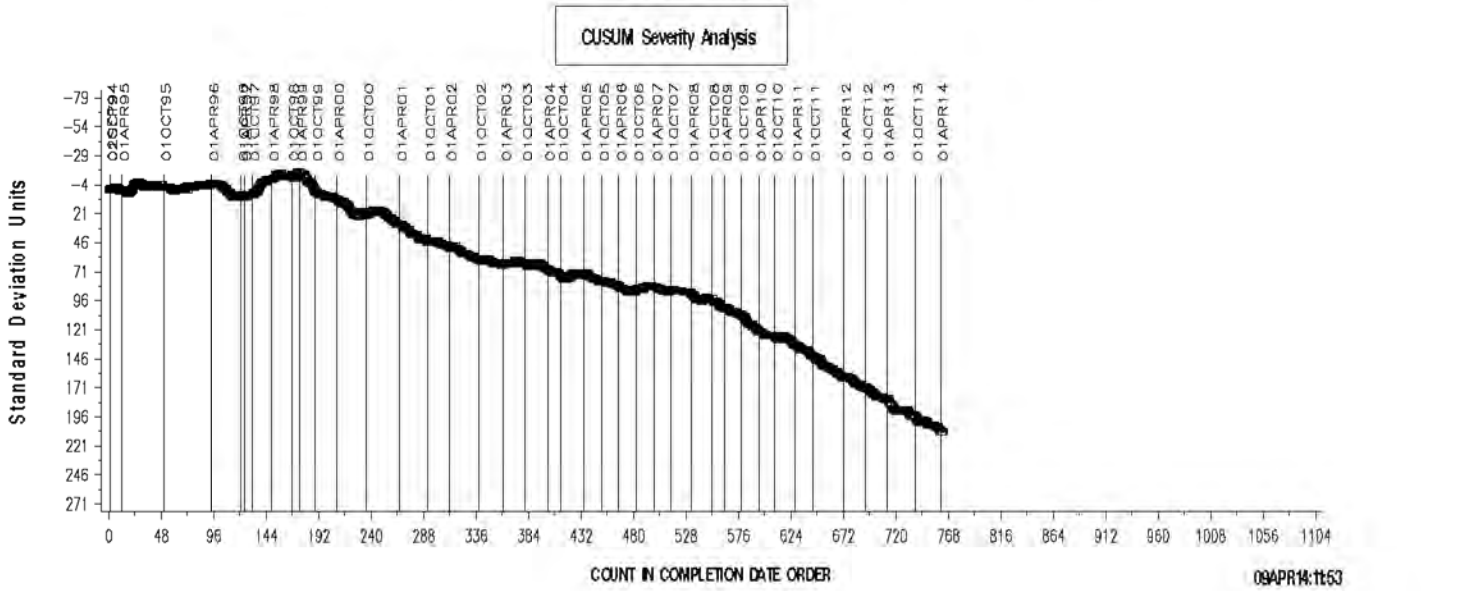
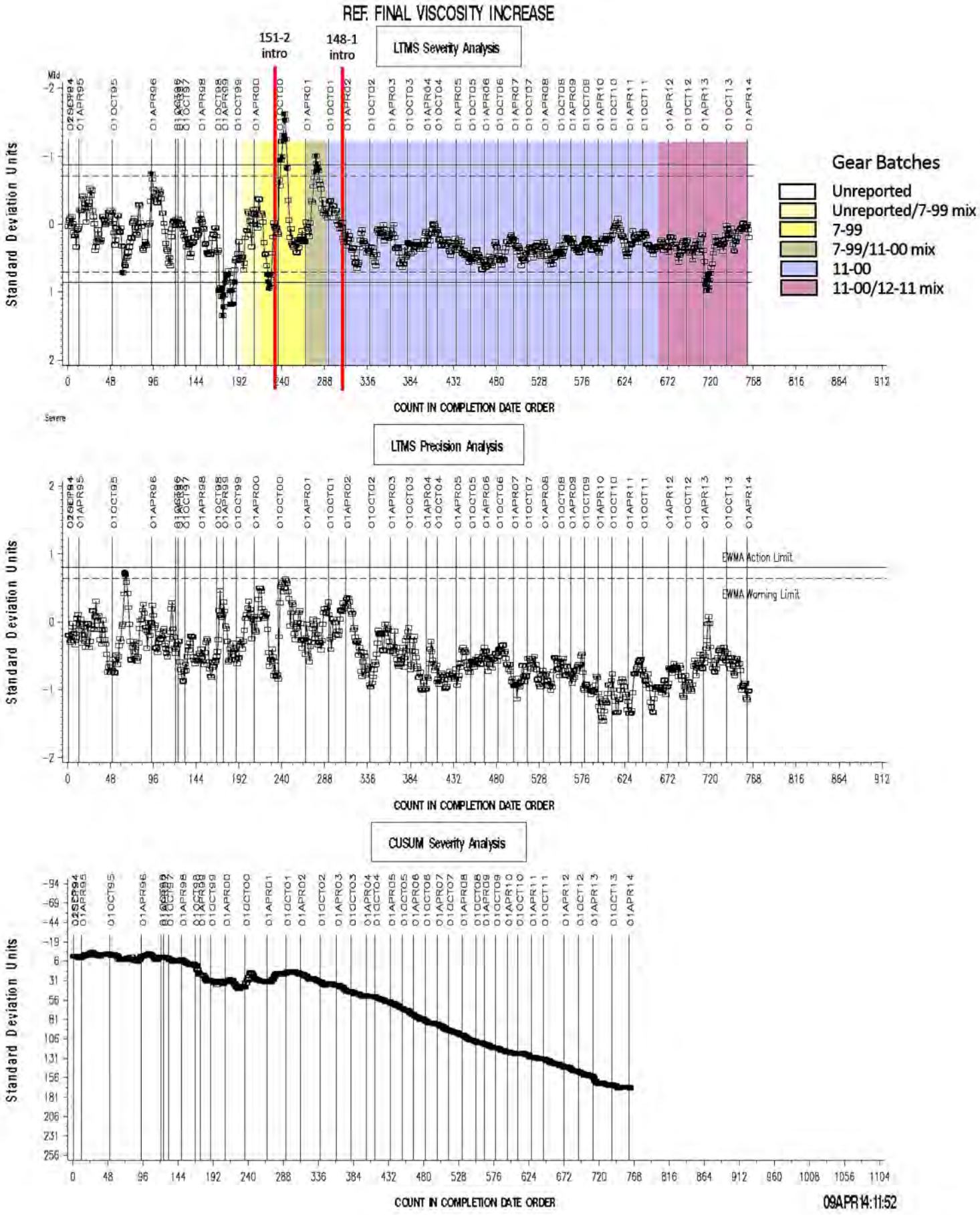






L-60-1 INDUSTRY OPERATIONALLY VALID DATA



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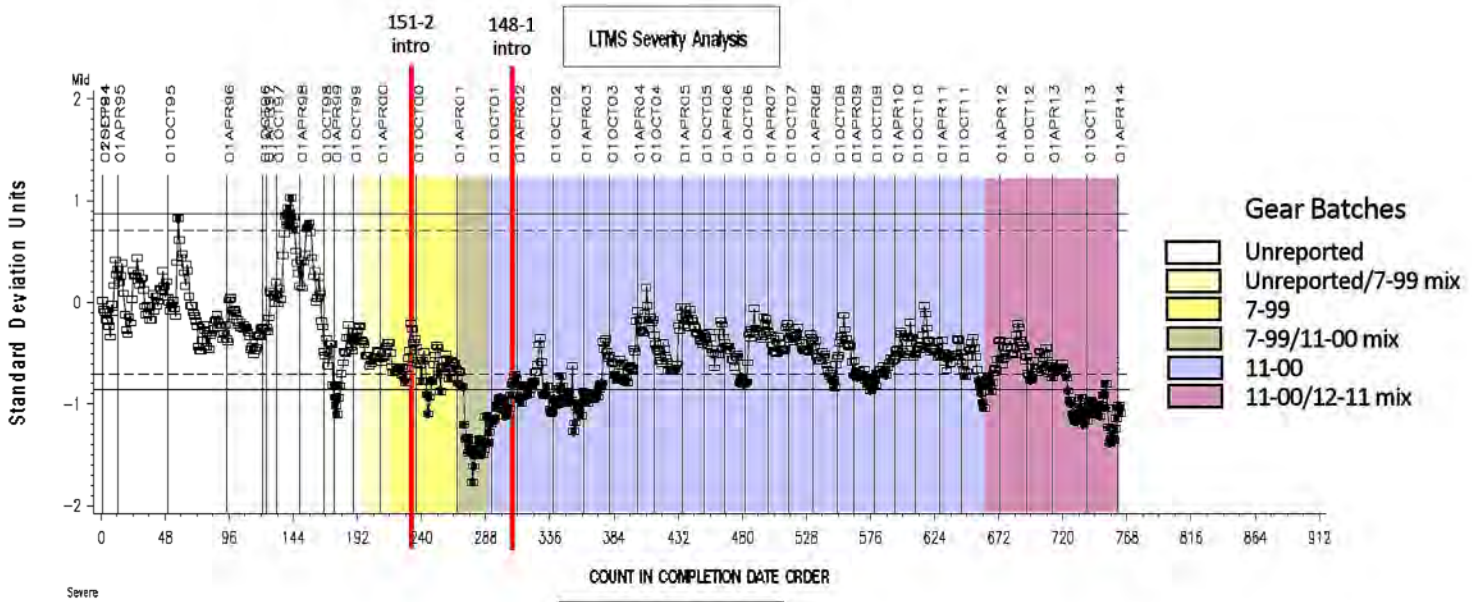
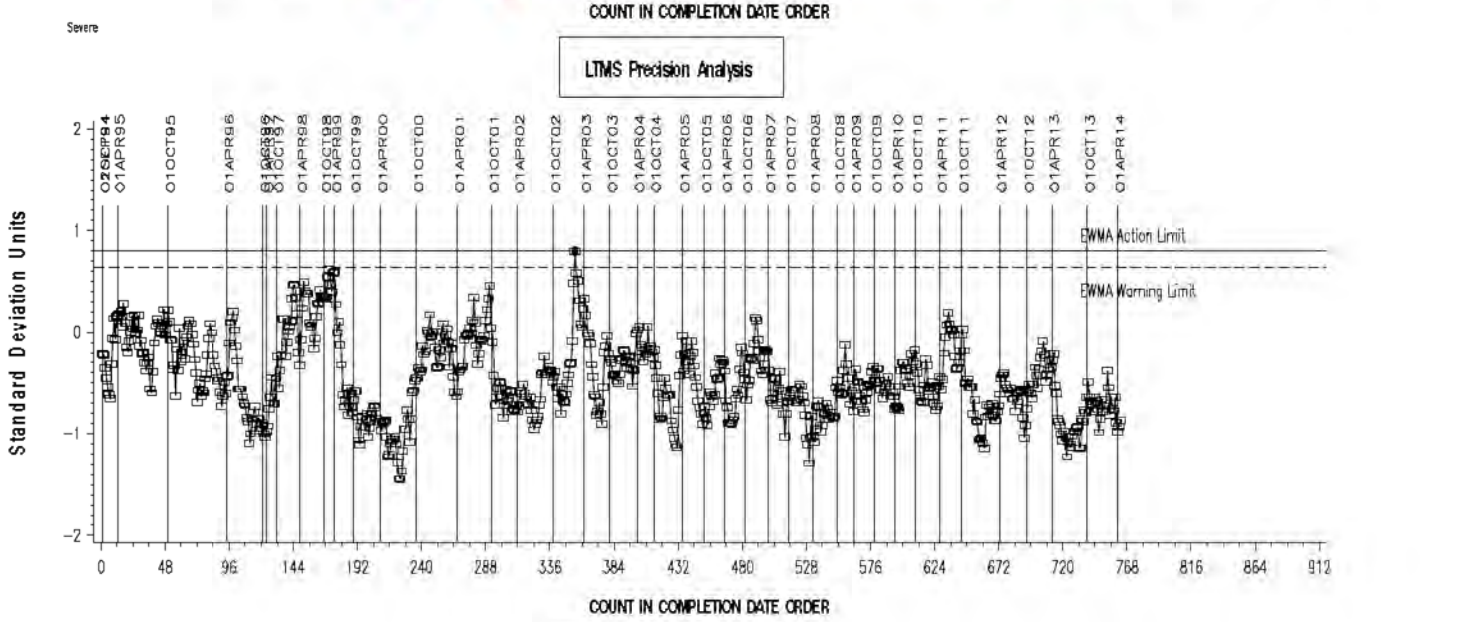
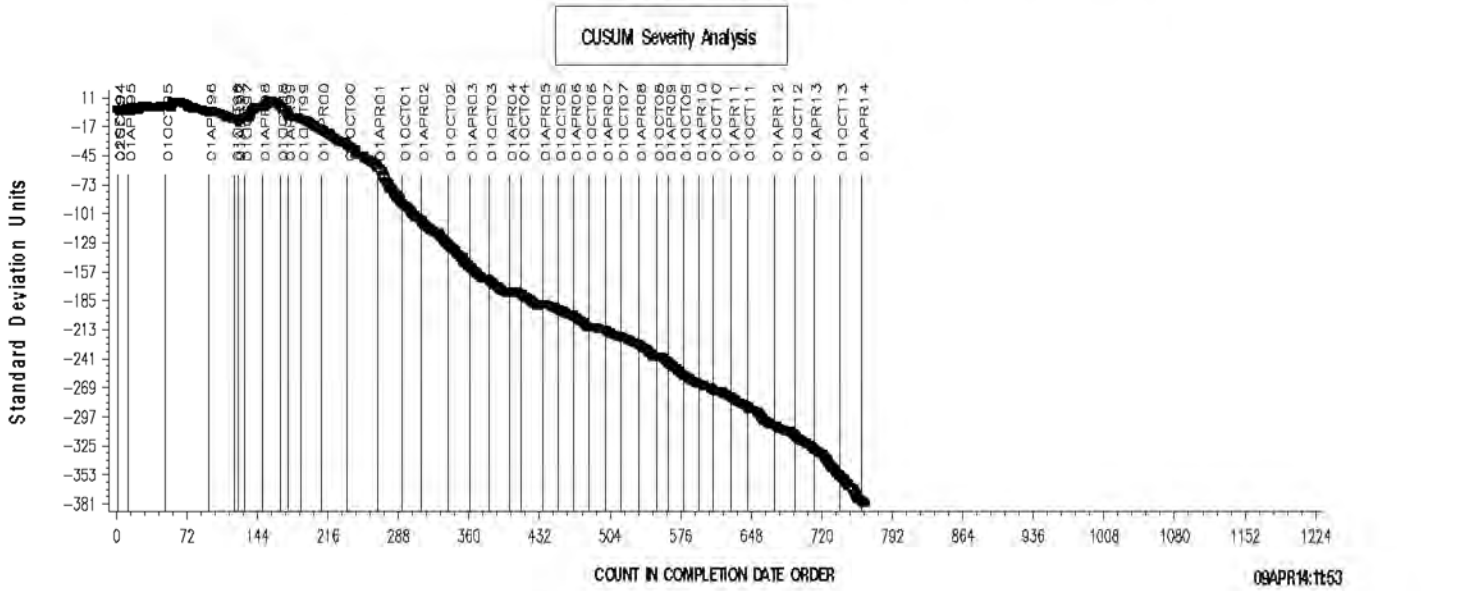
REF. FINAL AVERAGE CARBON/ VARNISH







L-60-1 INDUSTRY OPERATIONALLY VALID DATA

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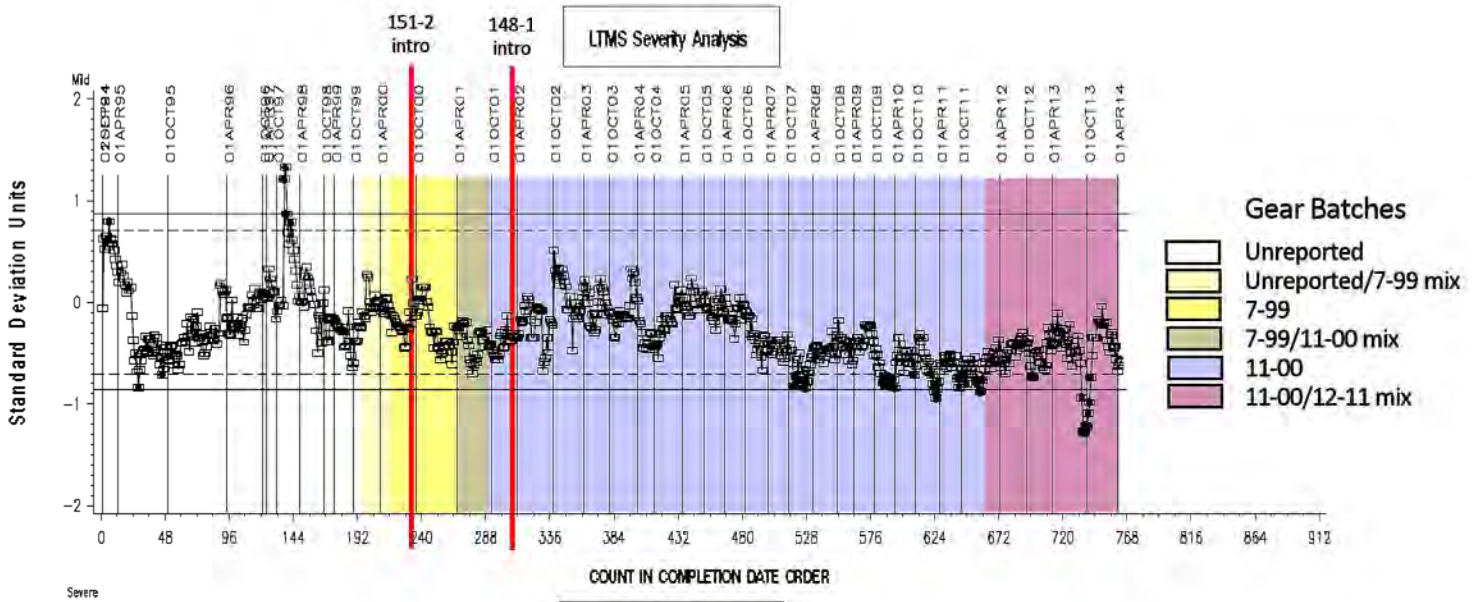

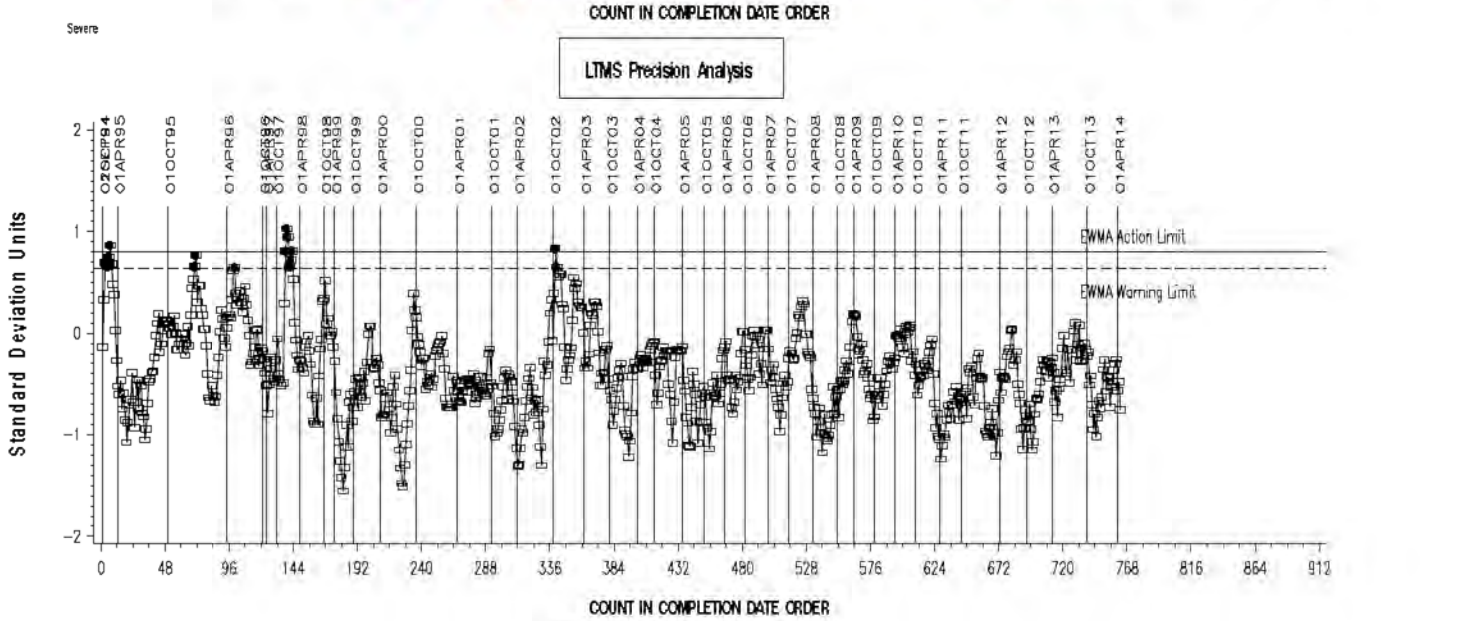

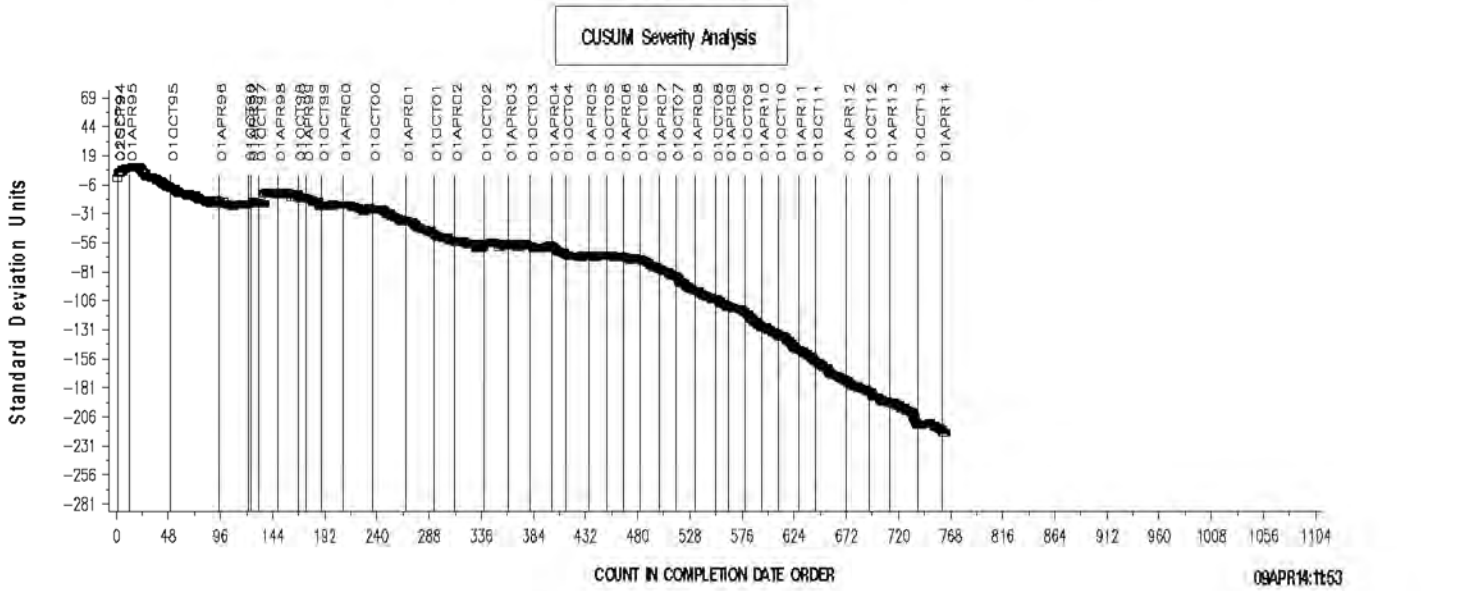

		VISI	PEN	TOL	ACV	ASL	VISIti	PENti	TOLti	ACVti	ASLti	VISIyi	PENyi	TOLyi	ACVyi	ASLyi
target 148-1	mean						3.61	-0.95	-1.36	1.59	0.76					
(30 148 tests, ca. 1994)	std						0.15	0.39	0.49	0.47	0.19					
first 30 148	mean	38.27	0.45	0.30	8.15	9.49	3.64	-0.88	-1.29	1.53	0.70	0.19	0.17	0.14	-0.12	-0.32
09-1994 to 03-1996	std	4.38	0.15	0.12	0.61	0.09	0.11	0.45	0.49	0.41	0.21	0.73	1.16	1.00	0.88	1.13
first 30 148-1	mean	40.97	0.50	0.35	7.53	9.50	3.71	-0.73	-1.12	1.12	0.71	0.66	0.57	0.49	-0.99	-0.28
03-2002 to 08-2003	std	3.43	0.13	0.12	0.43	0.12	0.08	0.28	0.46	0.21	0.20	0.56	0.72	0.94	0.46	1.04
last 30 148-1	mean	41.50	0.54	0.45	7.90	9.46	3.72	-0.65	-0.86	1.34	0.62	0.75	0.76	1.02	-0.54	-0.73
03-2012 to 07-2013	std	3.81	0.13	0.15	0.33	0.08	0.09	0.25	0.37	0.20	0.15	0.58	0.65	0.75	0.42	0.79
target 151-2	mean						3.62	0.75	0.26	1.81	0.54					
(9 tests, ca. 2000)	std						0.15	0.37	0.50	0.40	0.23					
first 30 151-2	mean	35.07	1.95	1.35	7.98	9.36	3.55	0.66	0.27	1.41	0.46	-0.46	-0.24	0.03	-1.00	-0.35
10-2000 to 10-2001	std	3.68	0.22	0.29	0.61	0.09	0.11	0.12	0.23	0.38	0.14	0.72	0.32	0.45	0.94	0.59
last 30 151-2	mean	37.70	2.15	1.37	8.14	9.39	3.63	0.74	0.26	1.50	0.50	0.05	-0.04	0.01	-0.77	-0.18
03-2012 to 08-2013	std	2.97	0.51	0.43	0.42	0.09	0.07	0.25	0.32	0.30	0.15	0.50	0.69	0.63	0.74	0.63

L-60-1 INDUSTRY OPERATIONALLY VALID DATA

USING FIXED (UPDATED) TARGETS

REF. FINAL AVERAGE CARBON/ VARNISH

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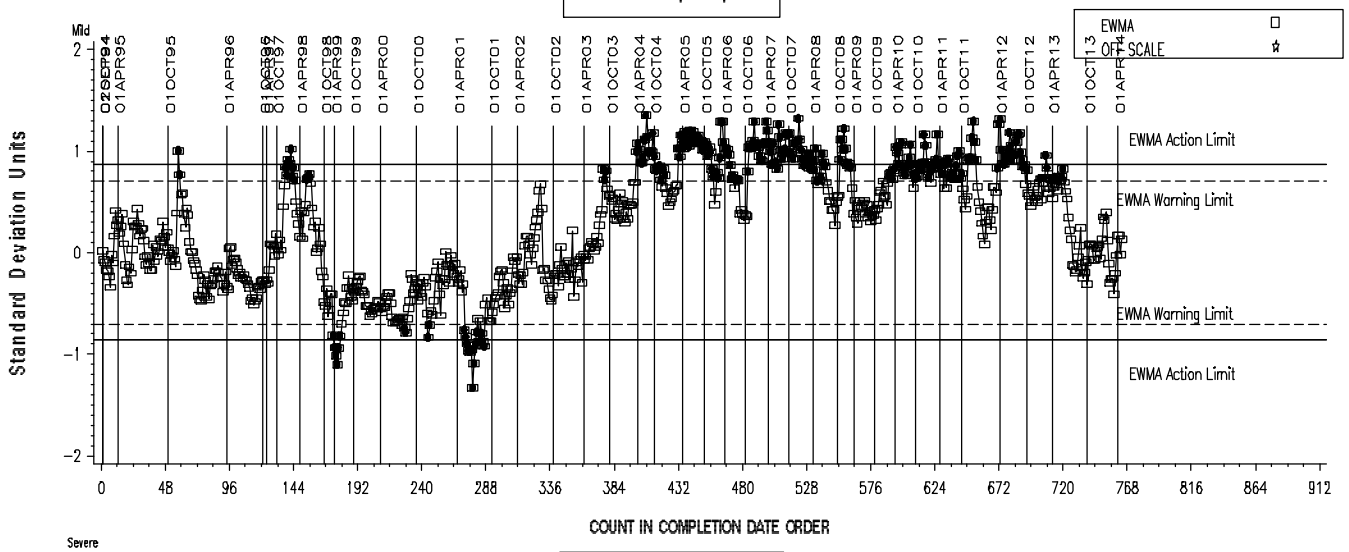
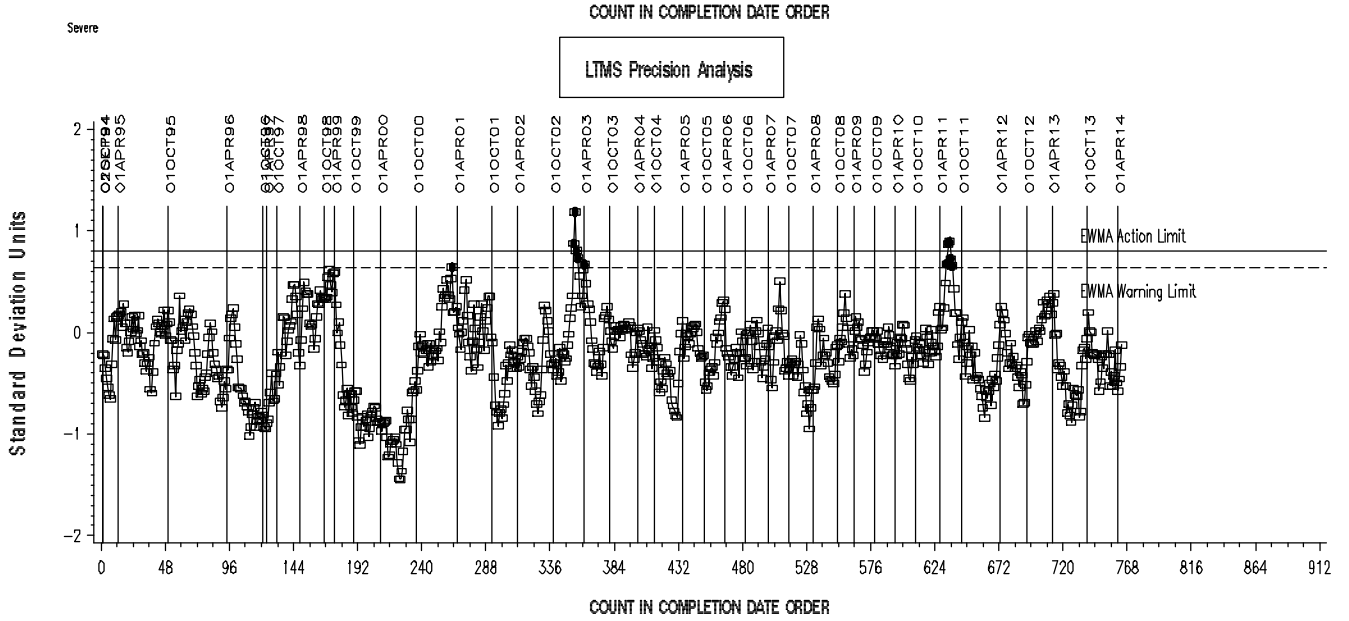
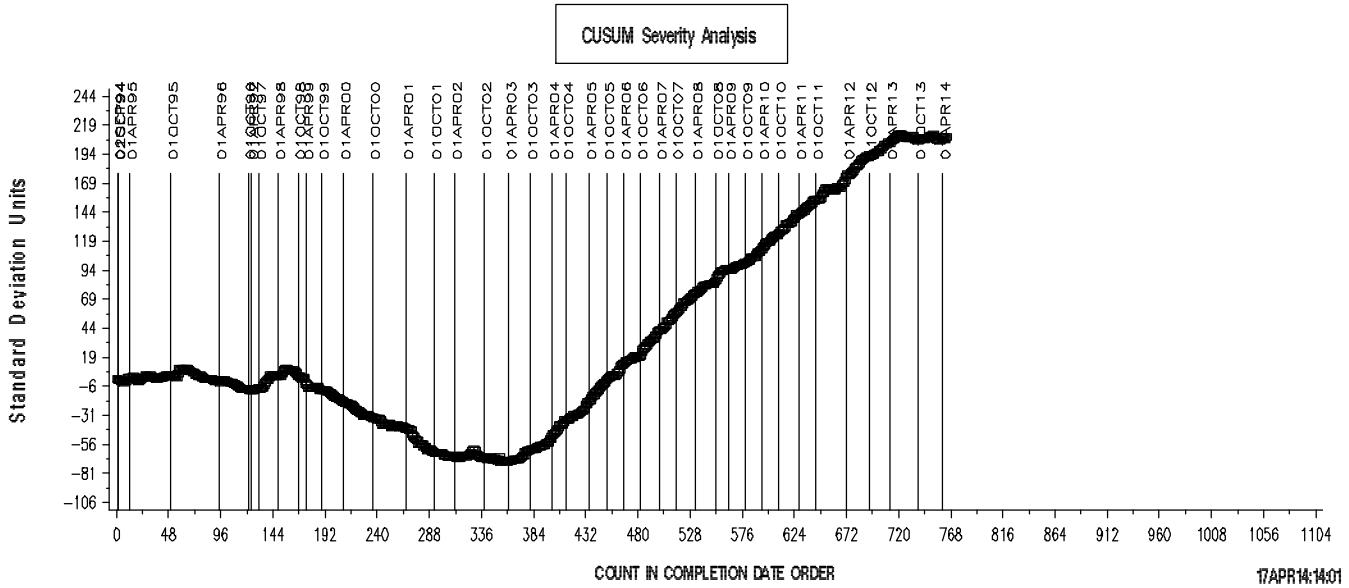
LTMS Severity Analysis



LTMS Precision Analysis



CUSUM Severity Analysis



17APR14:14:01

L-60-1 INDUSTRY OPERATIONALLY VALID DATA

USING FIXED (UPDATED) TARGETS

REF. FINAL AVERAGE SLUDGE

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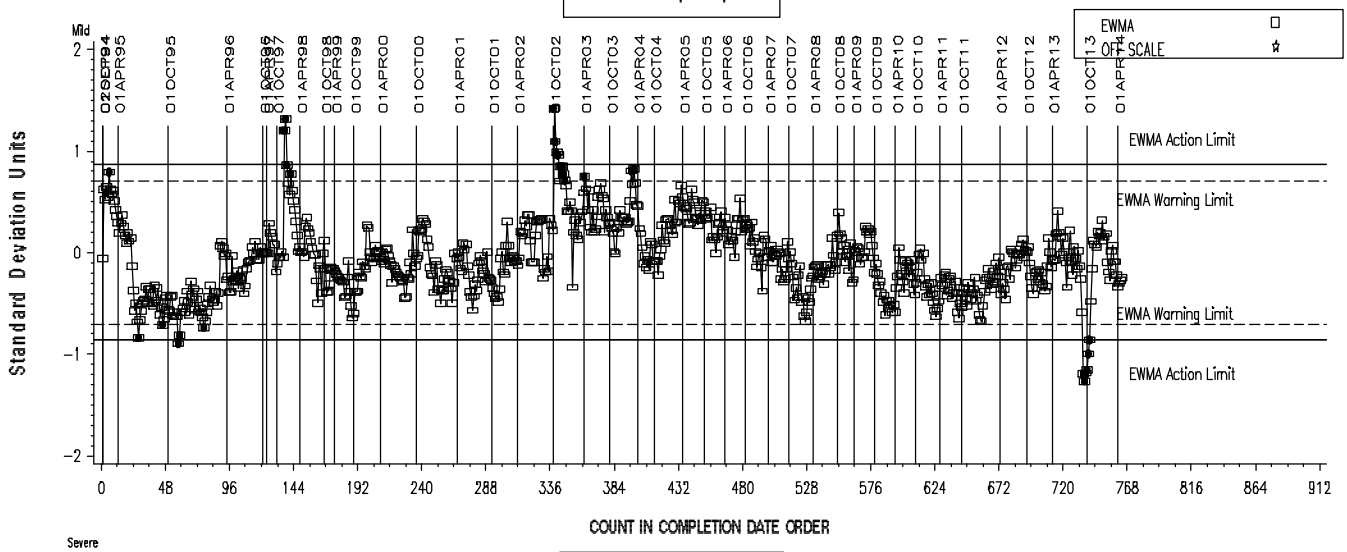
LTMS Severity Analysis



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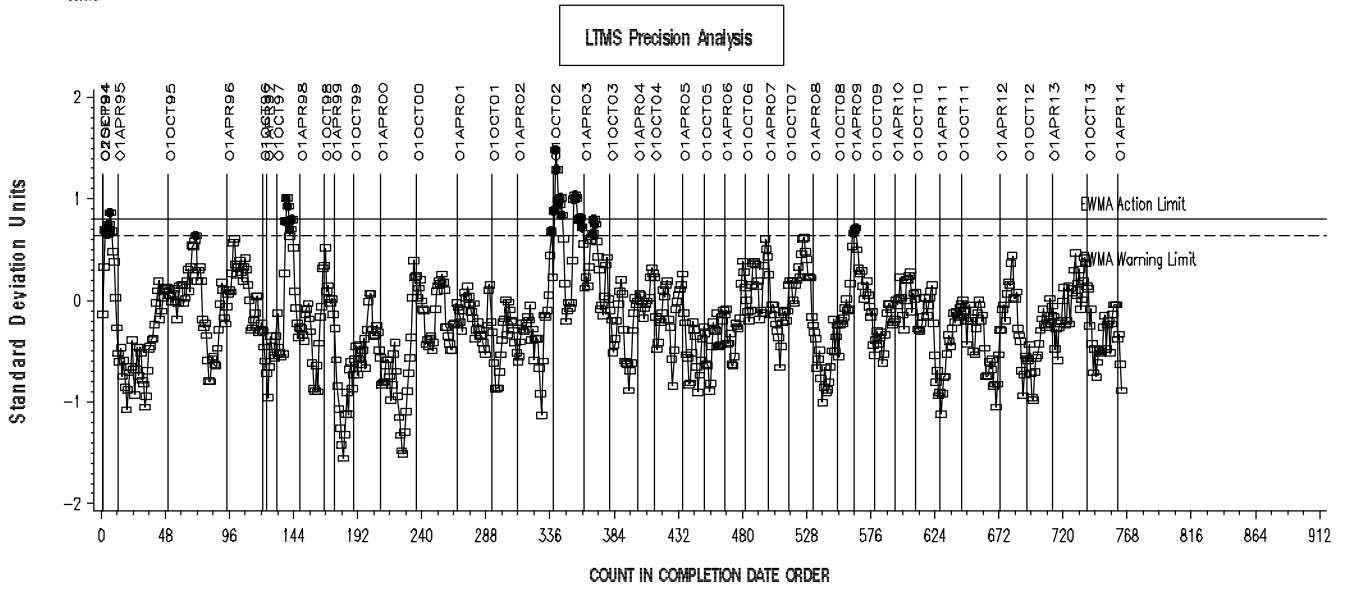

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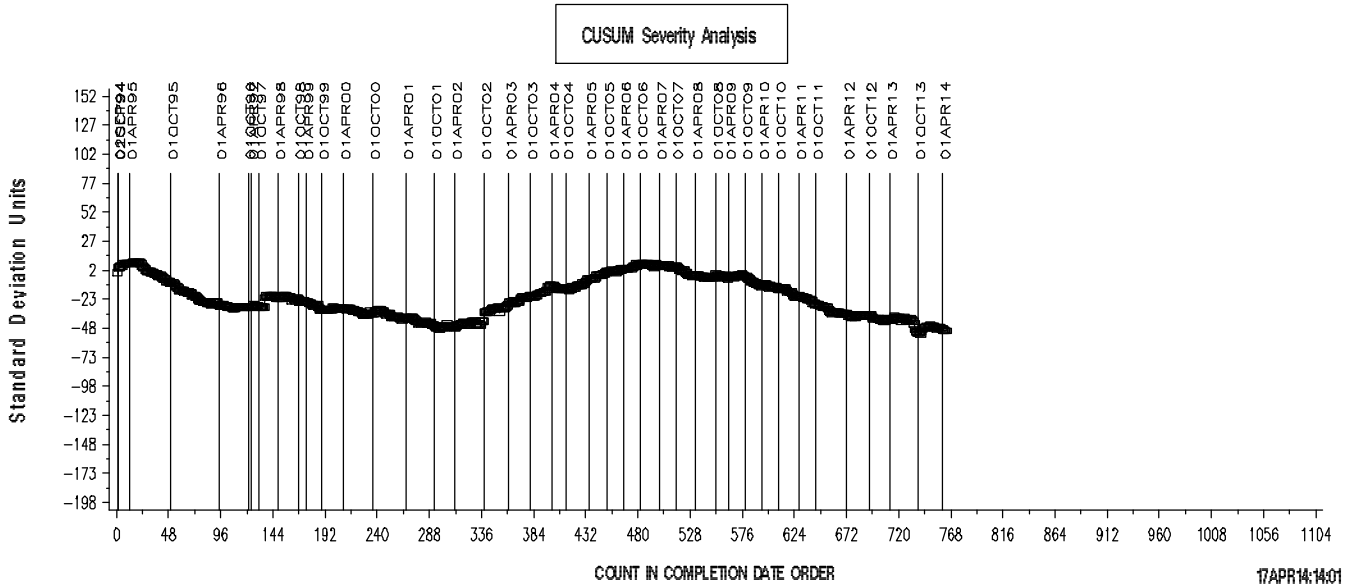

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L-60-1 INDUSTRY OPERATIONALLY VALID DATA

USING FIXED (UPDATED) TARGETS

REF. FINAL PENTANE INSOLUBLES

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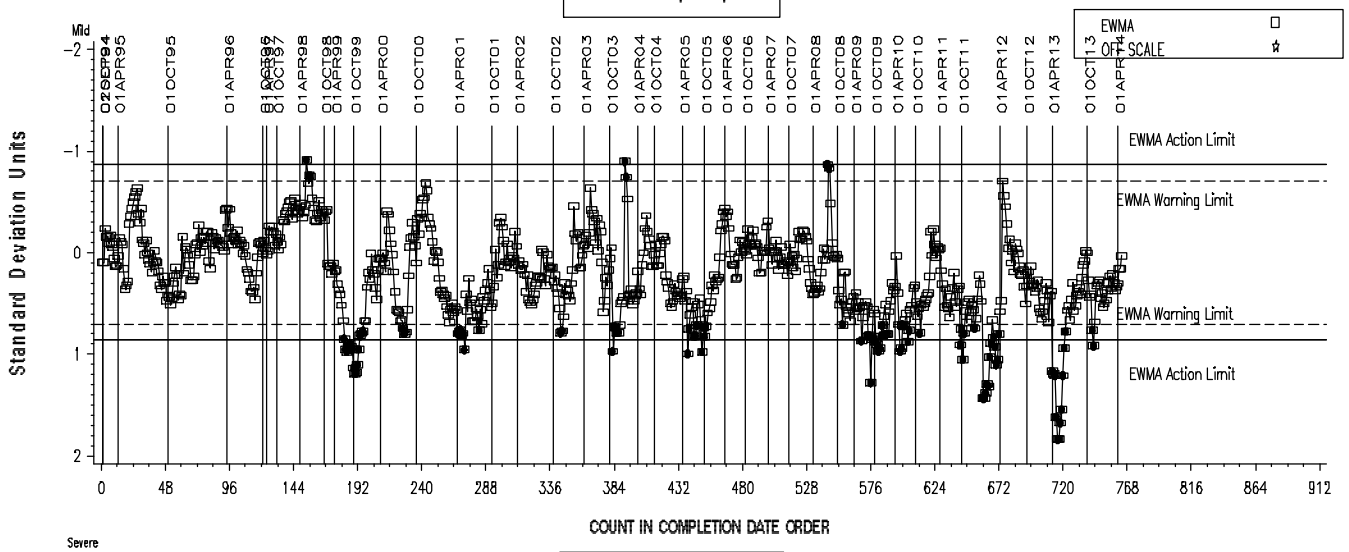
LTMS Severity Analysis



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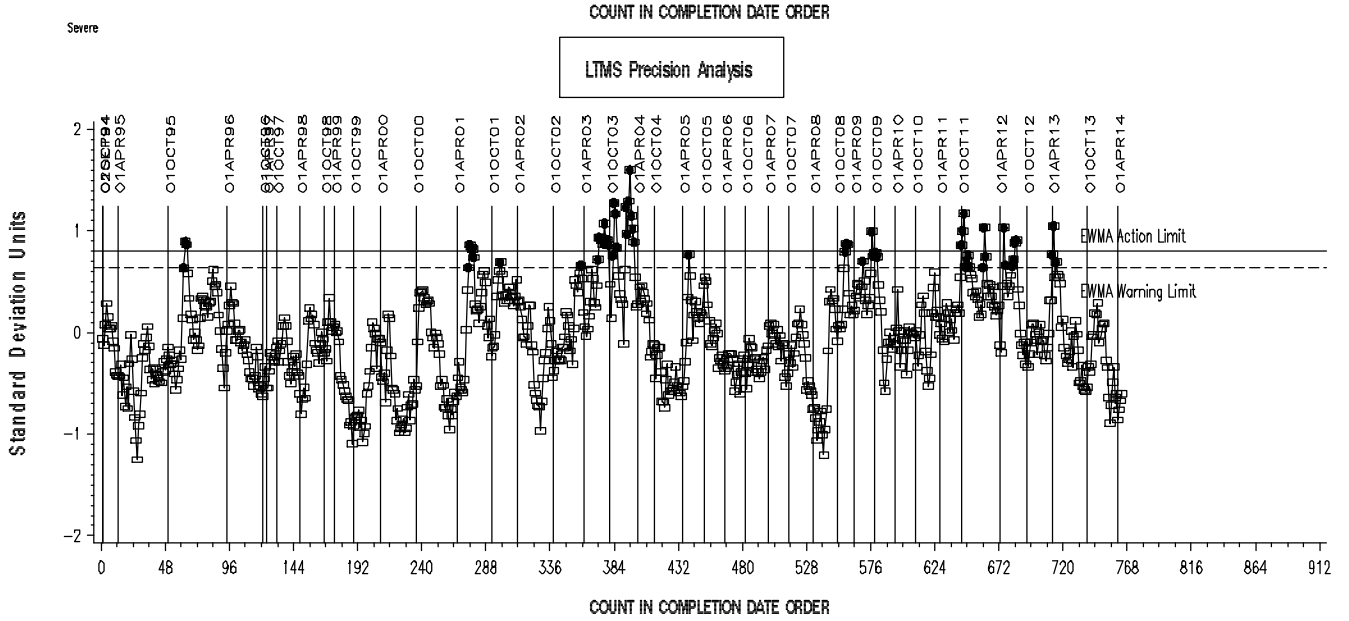

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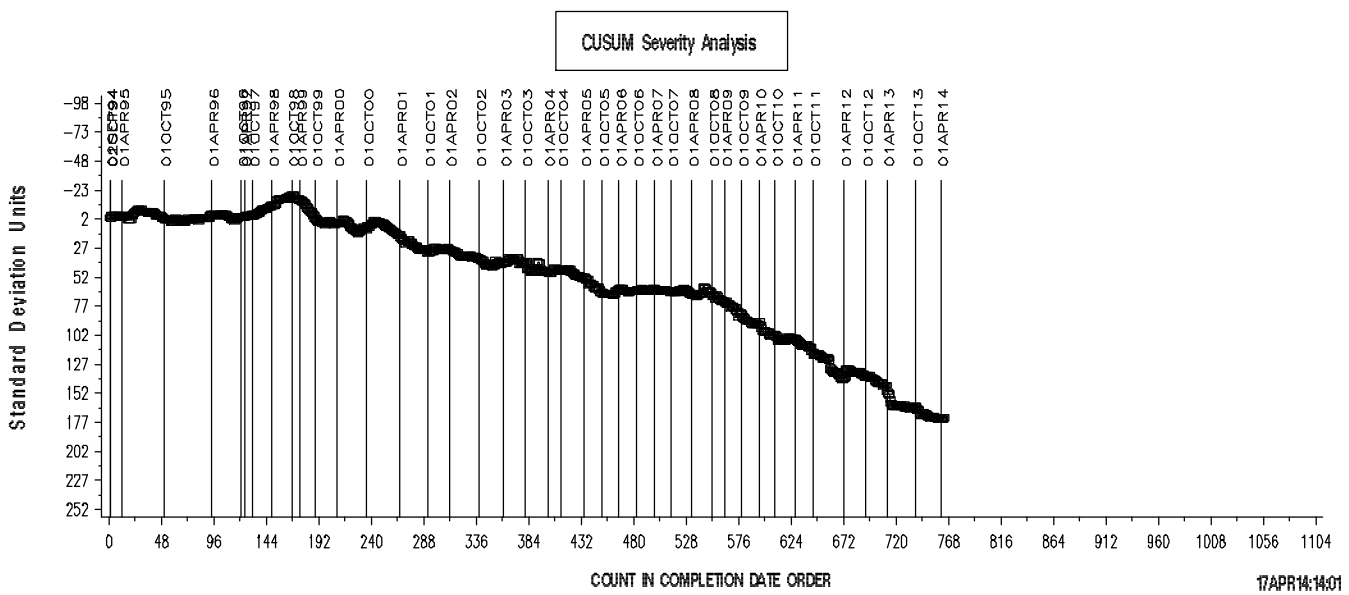

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L-60-1 INDUSTRY OPERATIONALLY VALID DATA

USING FIXED (UPDATED) TARGETS

REF. FINAL TOLUENE INSOLUBLES

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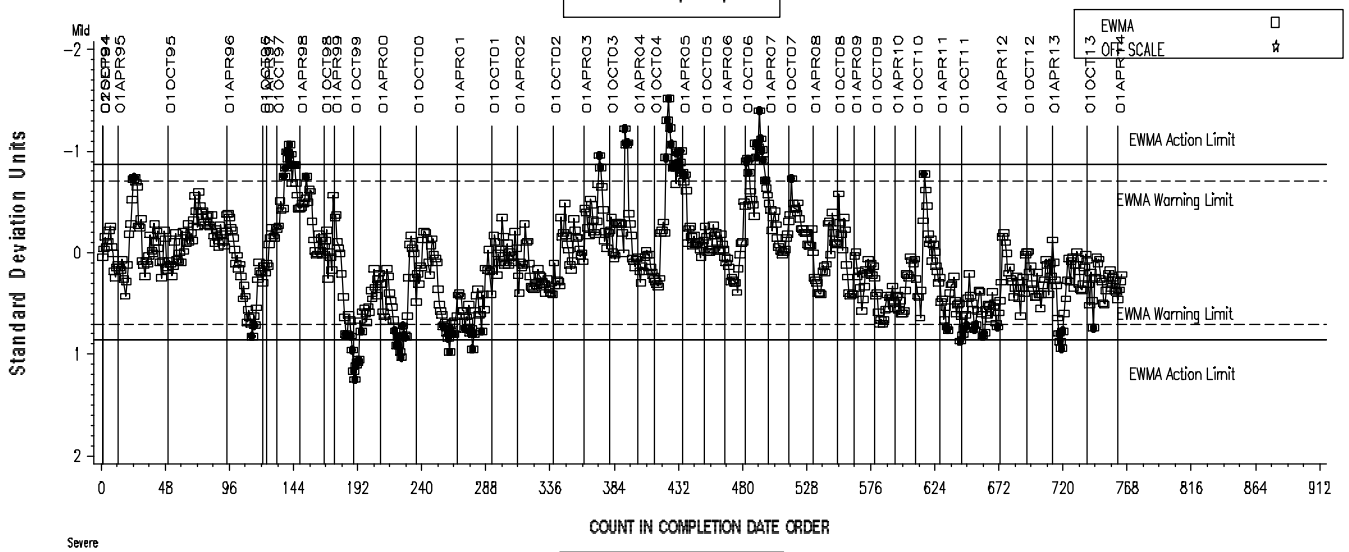
LTMS Severity Analysis



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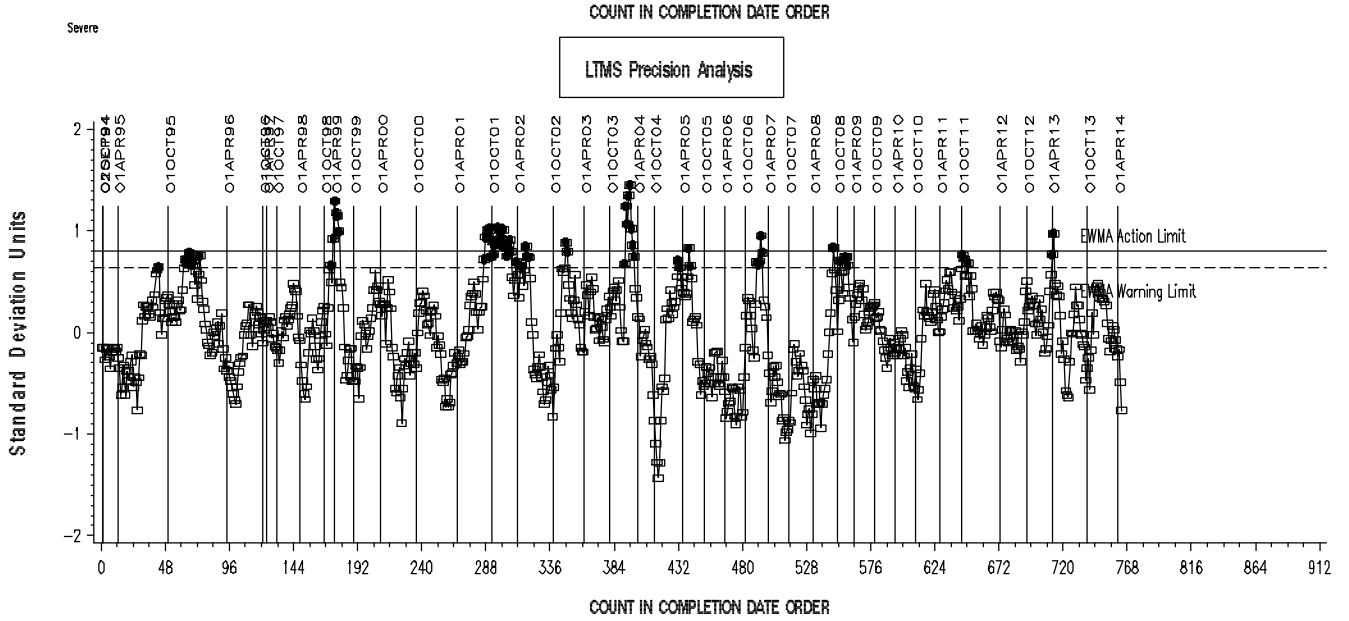

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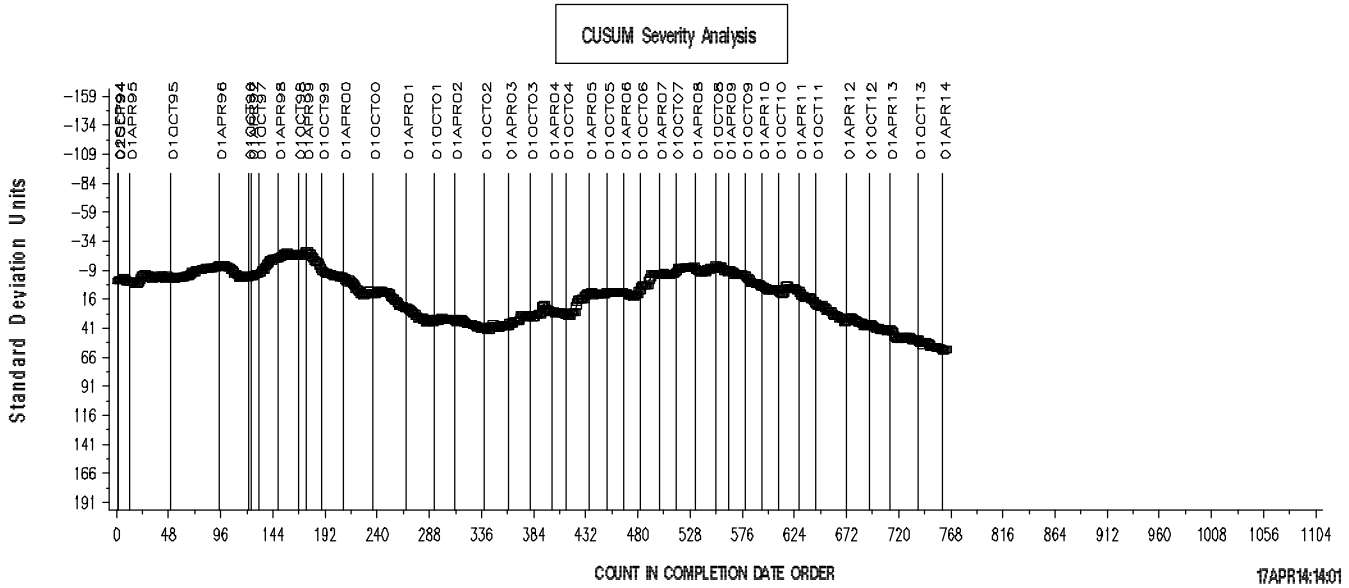

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L-60-1 INDUSTRY OPERATIONALLY VALID DATA

USING FIXED (UPDATED) TARGETS

REF. FINAL VISCOSITY INCREASE

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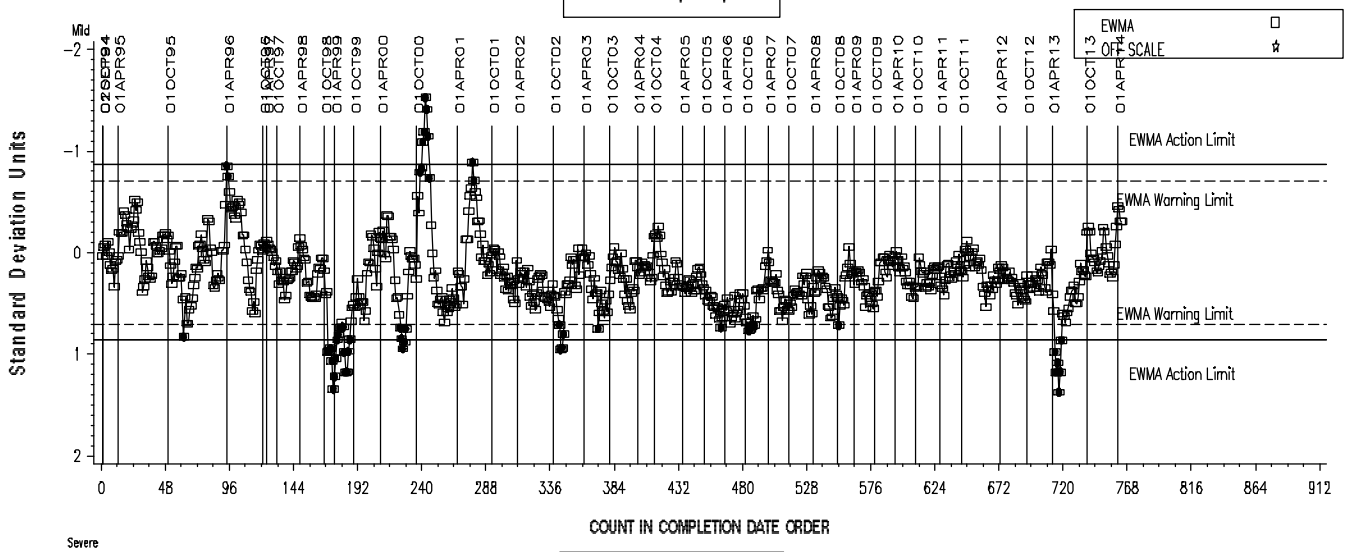
LTMS Severity Analysis



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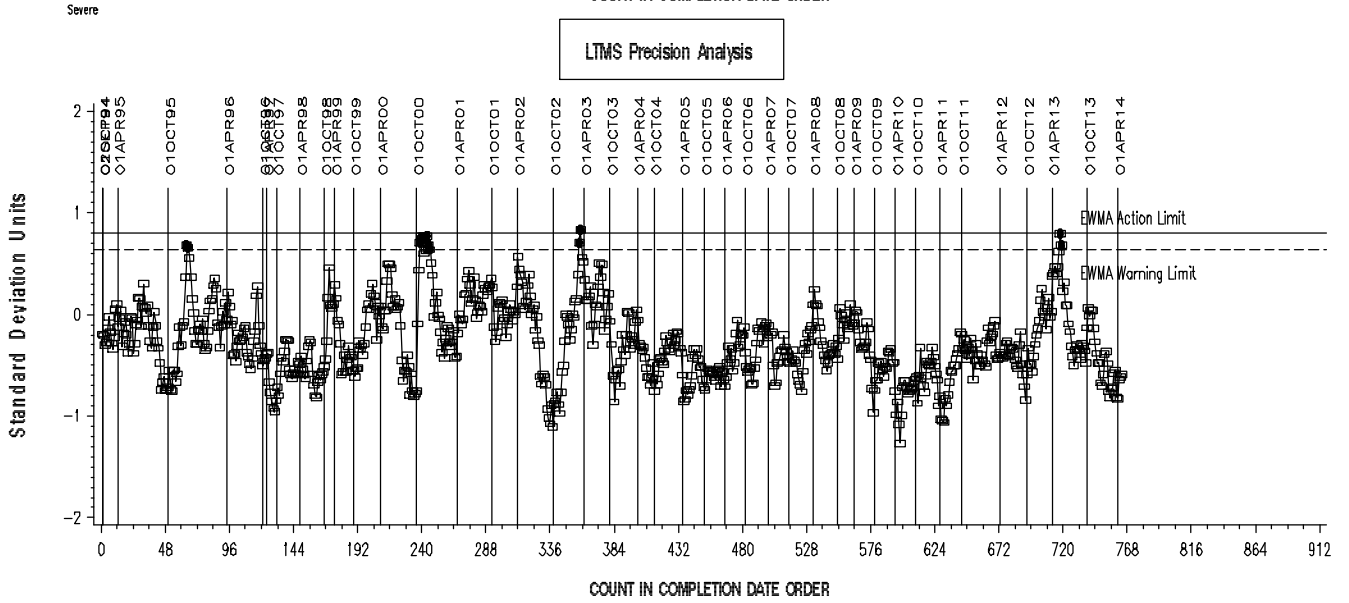

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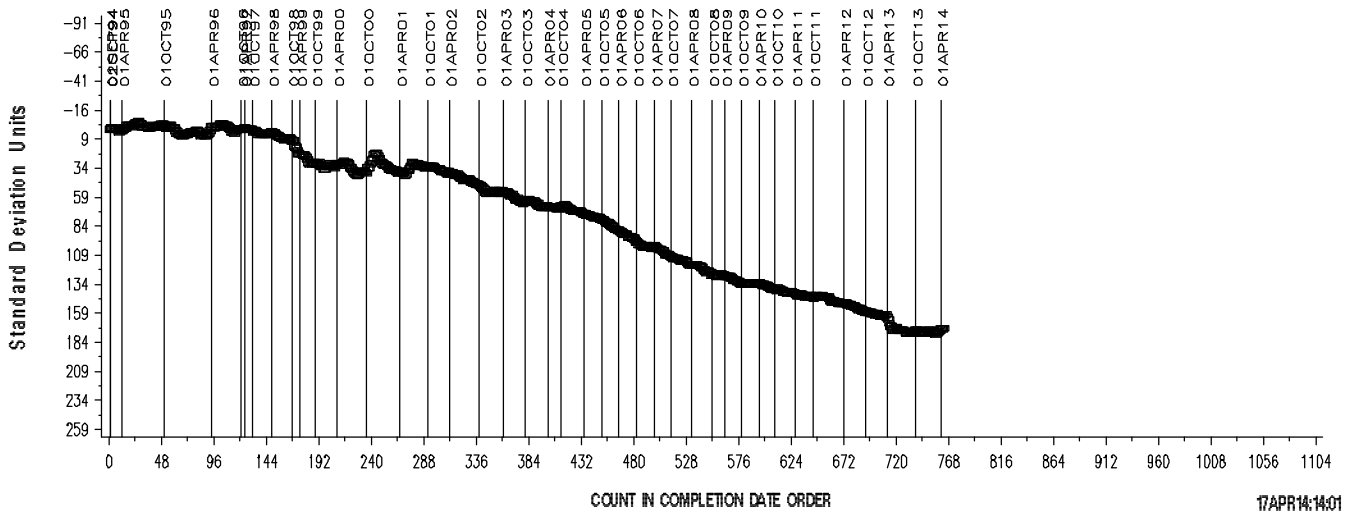

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L-60-1 INDUSTRY OPERATIONALLY VALID DATA

IND = '148-1' (and updated targets)

REF. FINAL AVERAGE CARBON/ VARNISH

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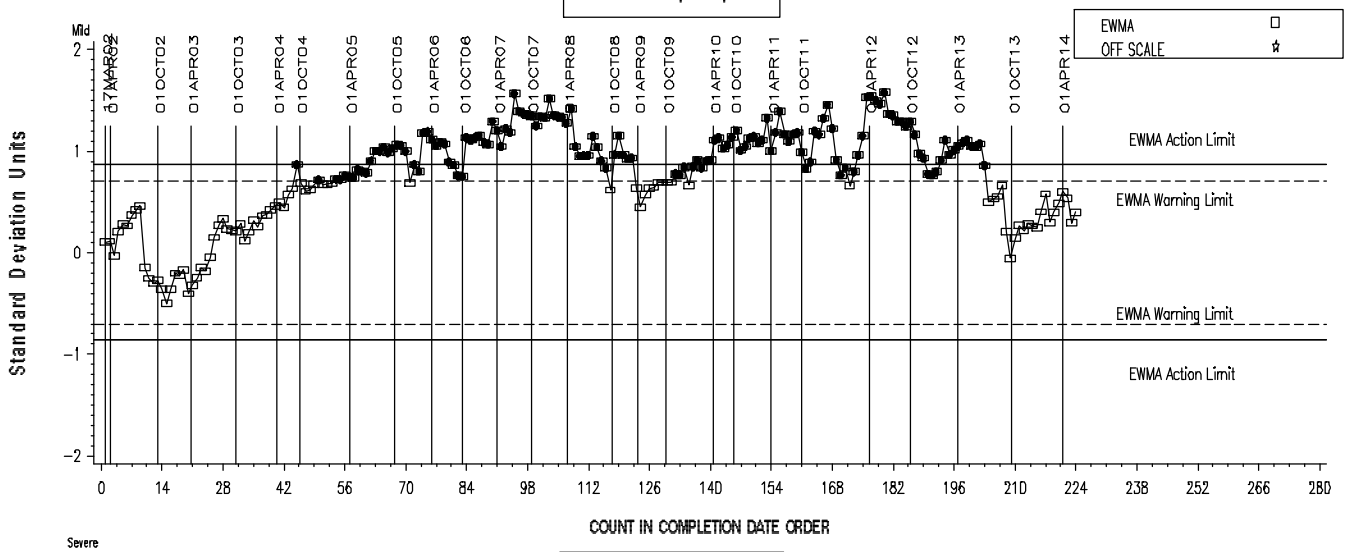
LTMS Severity Analysis



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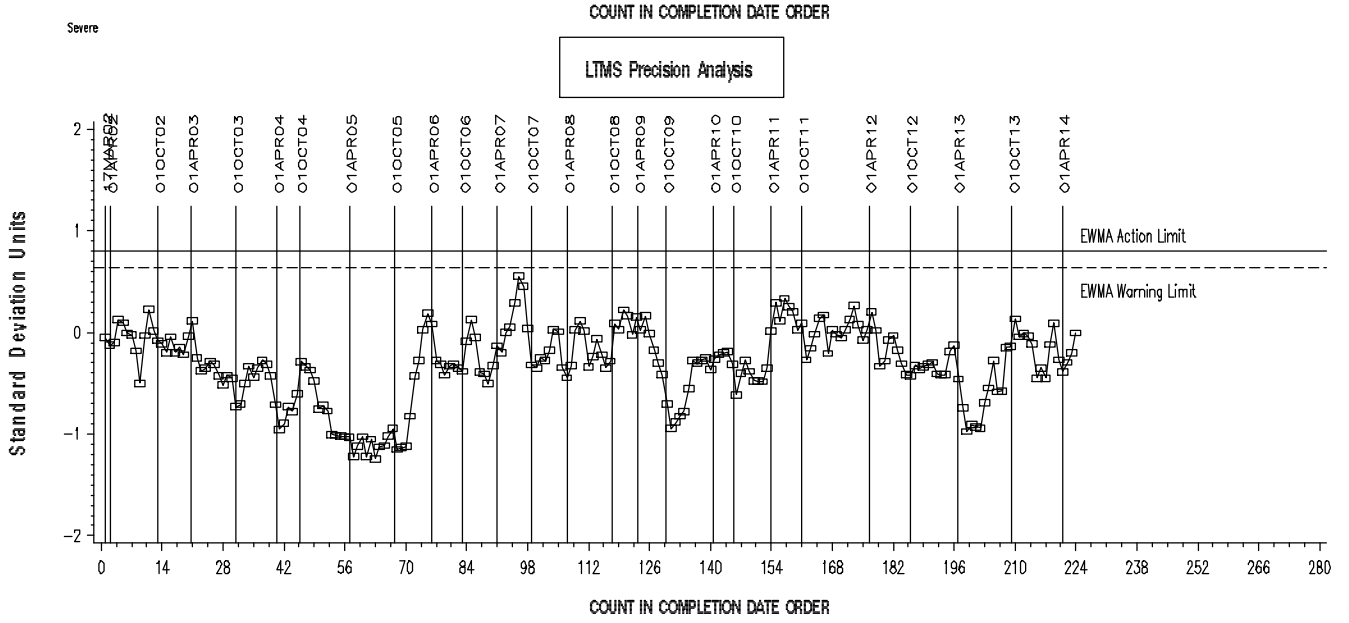

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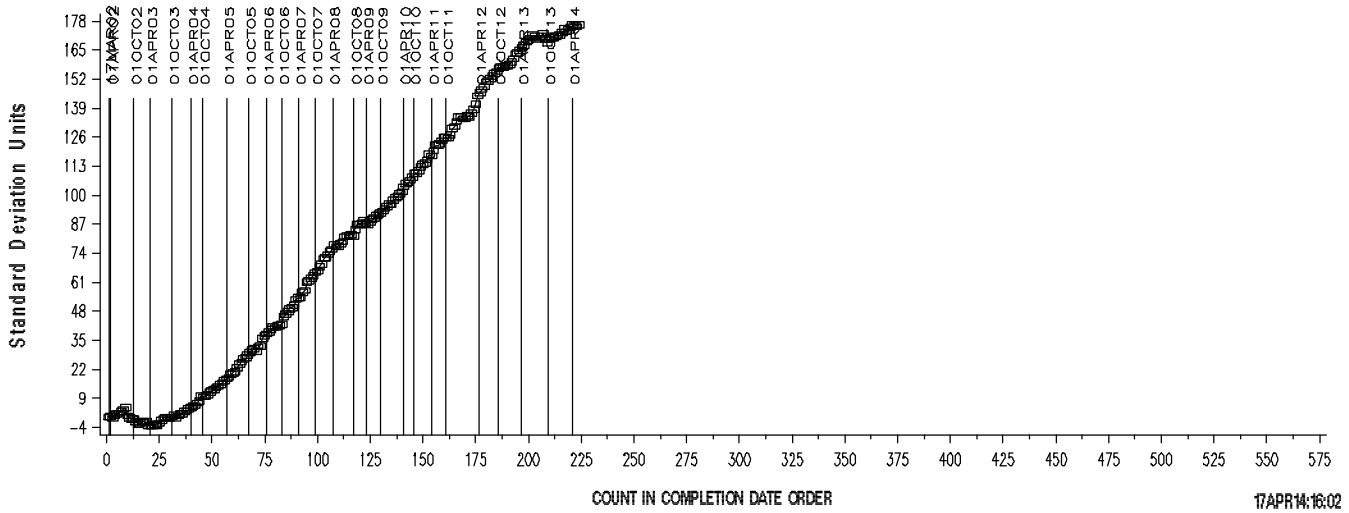

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IND = '148-1' (and updated targets)

REF. FINAL AVERAGE SLUDGE

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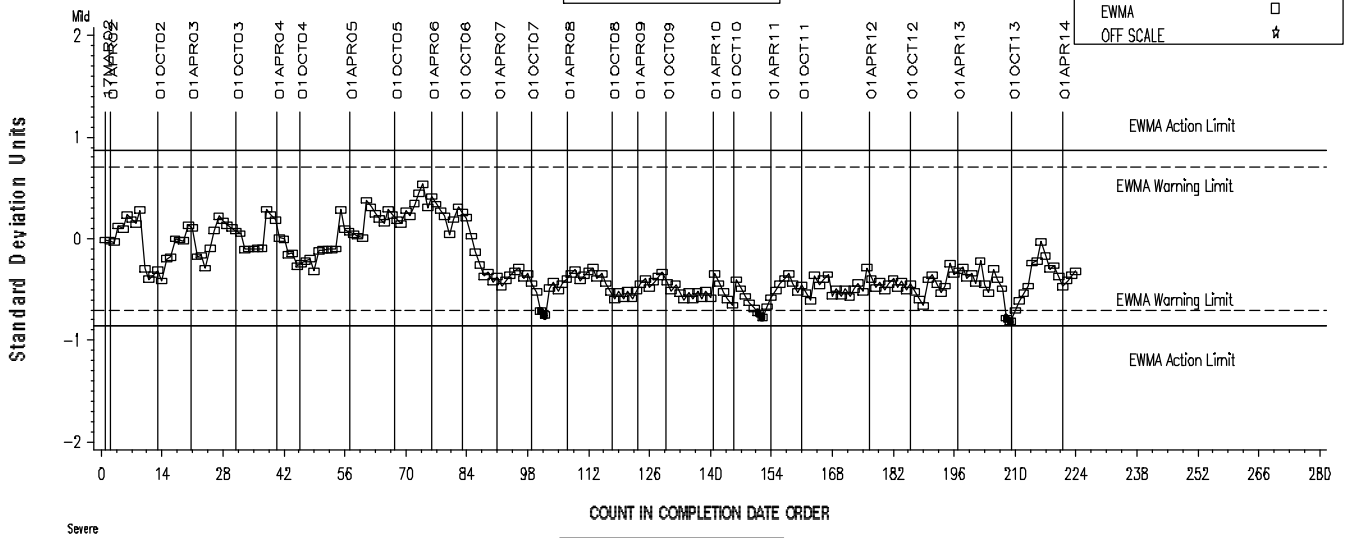
LTMS Severity Analysis



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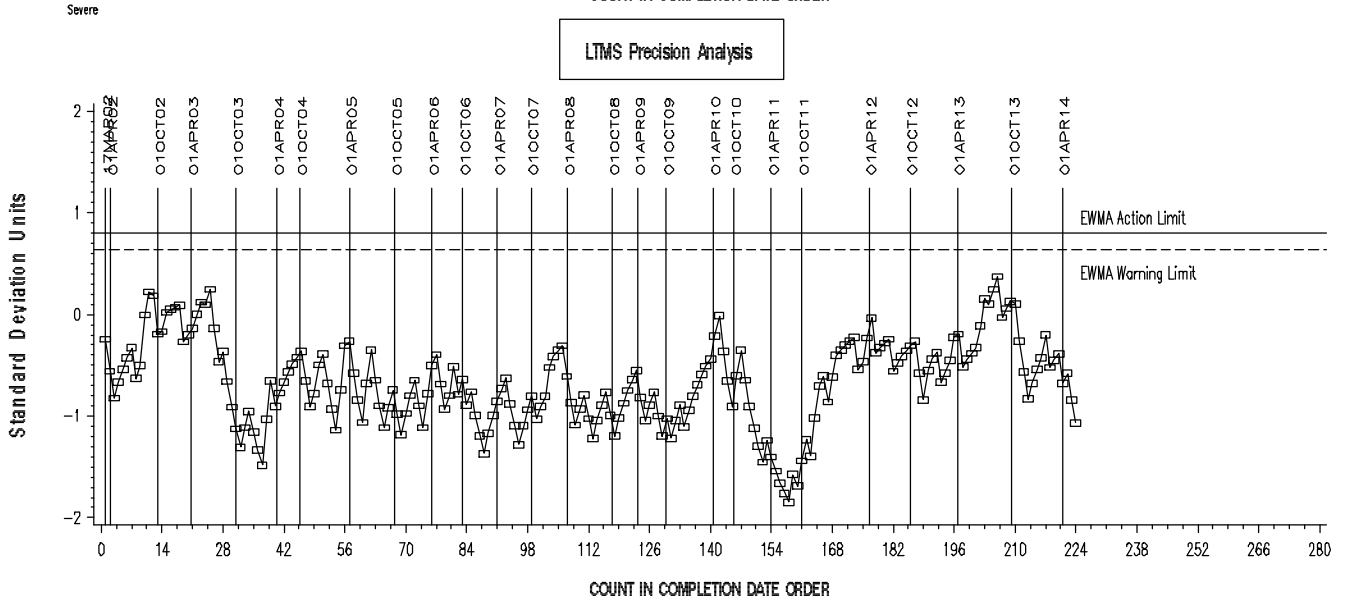

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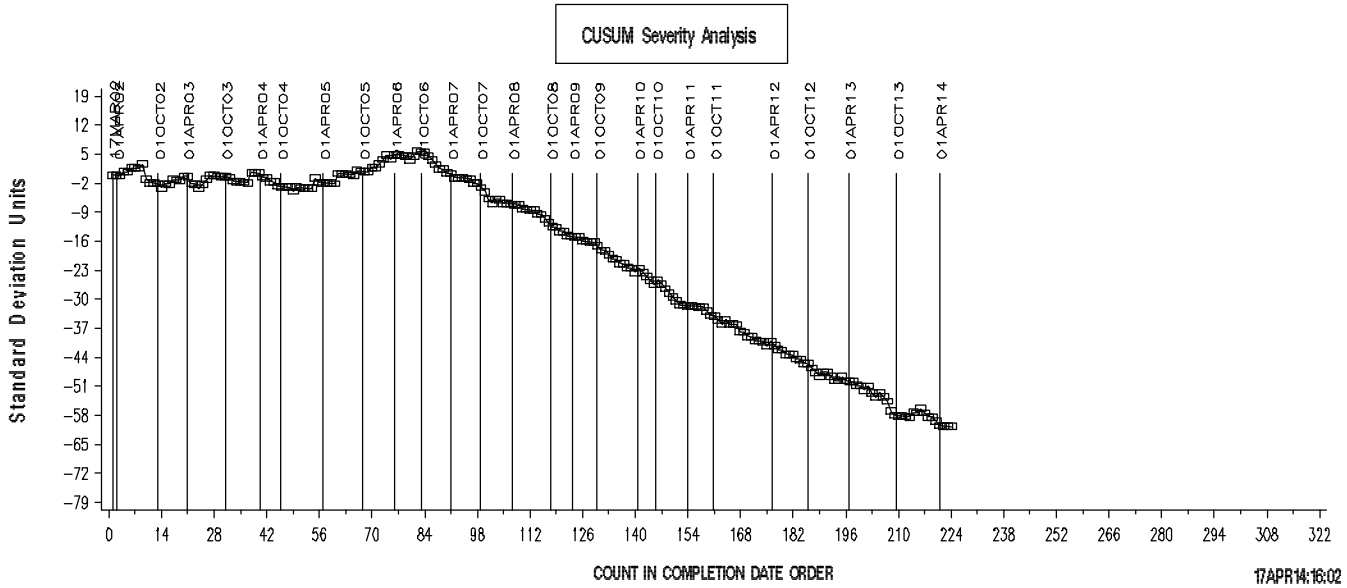

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L-60-1 INDUSTRY OPERATIONALLY VALID DATA

IND = '148-1' (and updated targets)

REF. FINAL PENTANE INSOLUBLES

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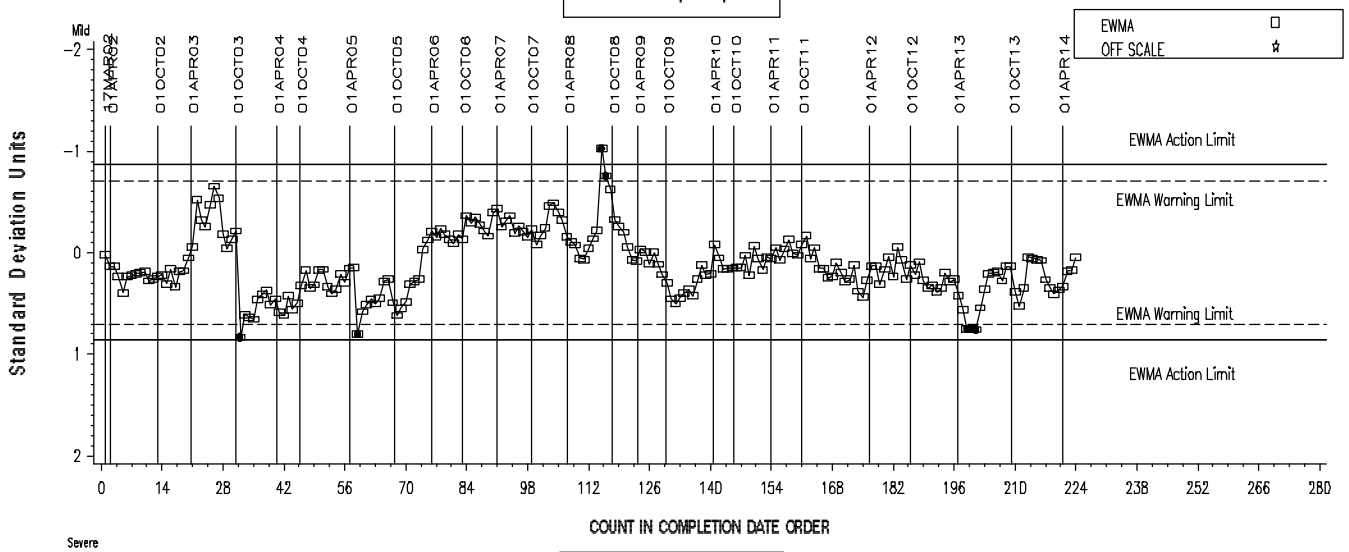
LTMS Severity Analysis



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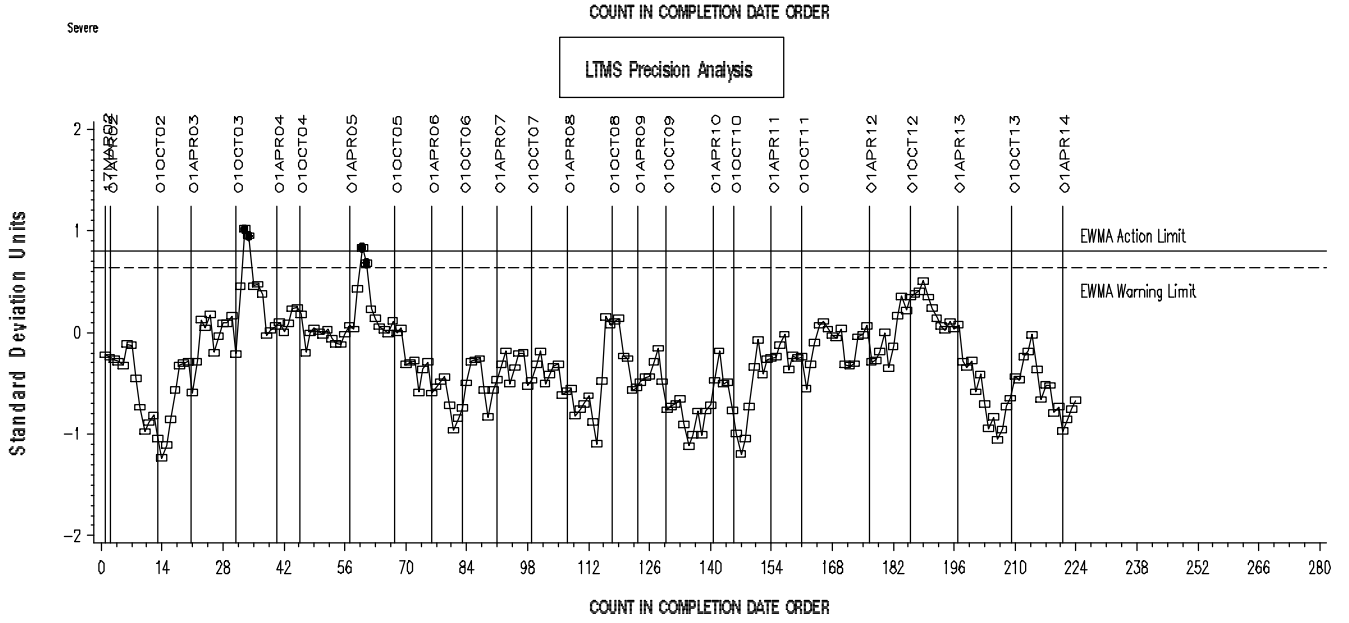

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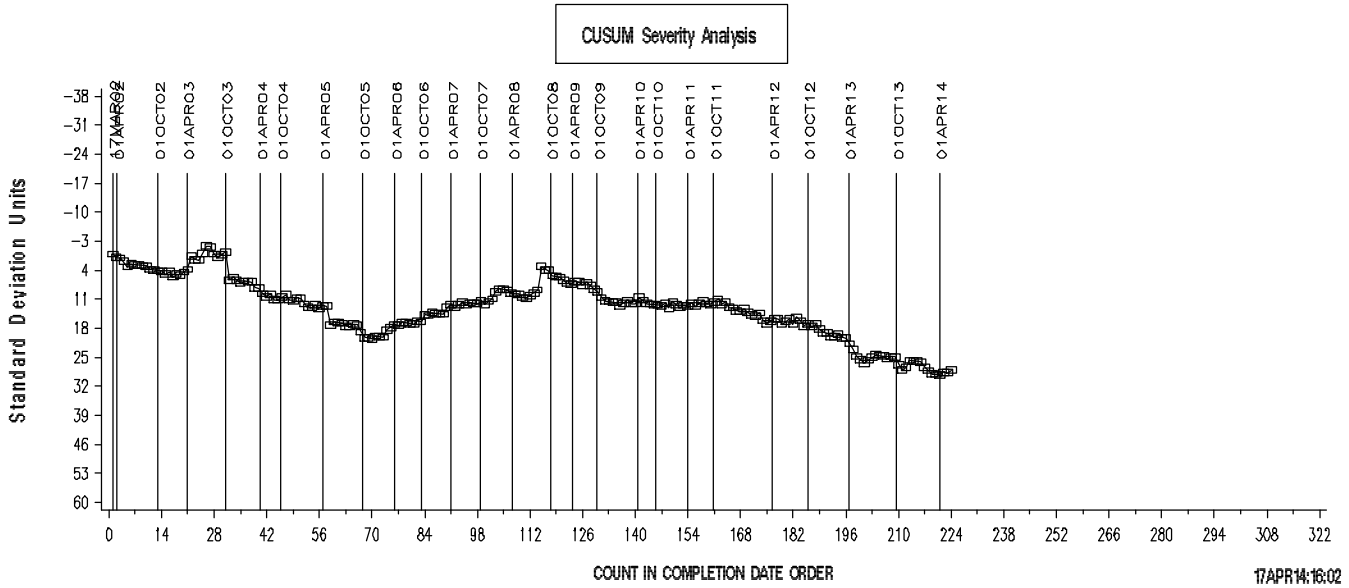

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L-60-1 INDUSTRY OPERATIONALLY VALID DATA

IND = '148-1' (and updated targets)

REF. FINAL TOLUENE INSOLUBLES

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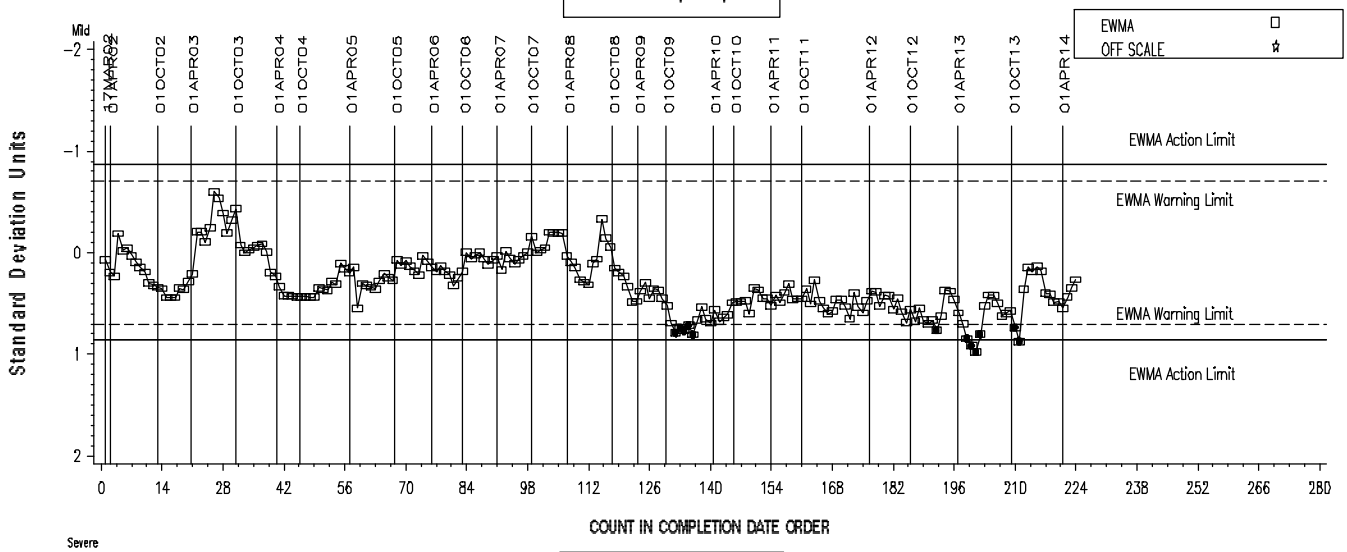
LTMS Severity Analysis



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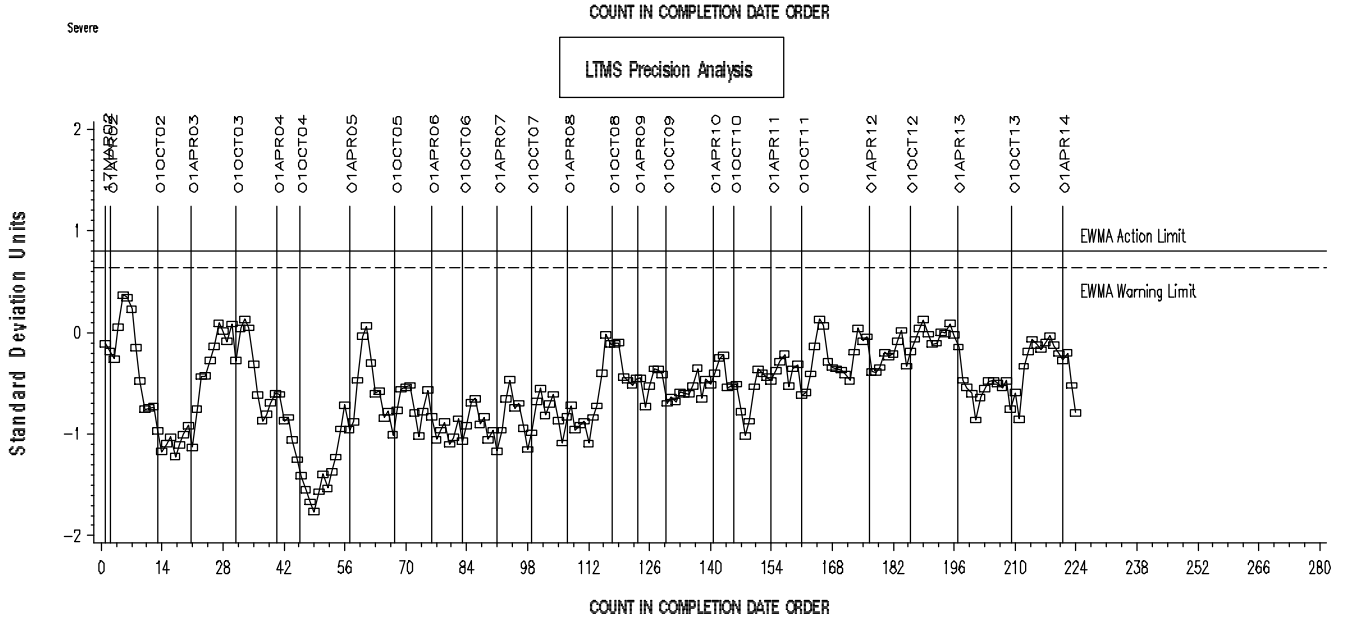

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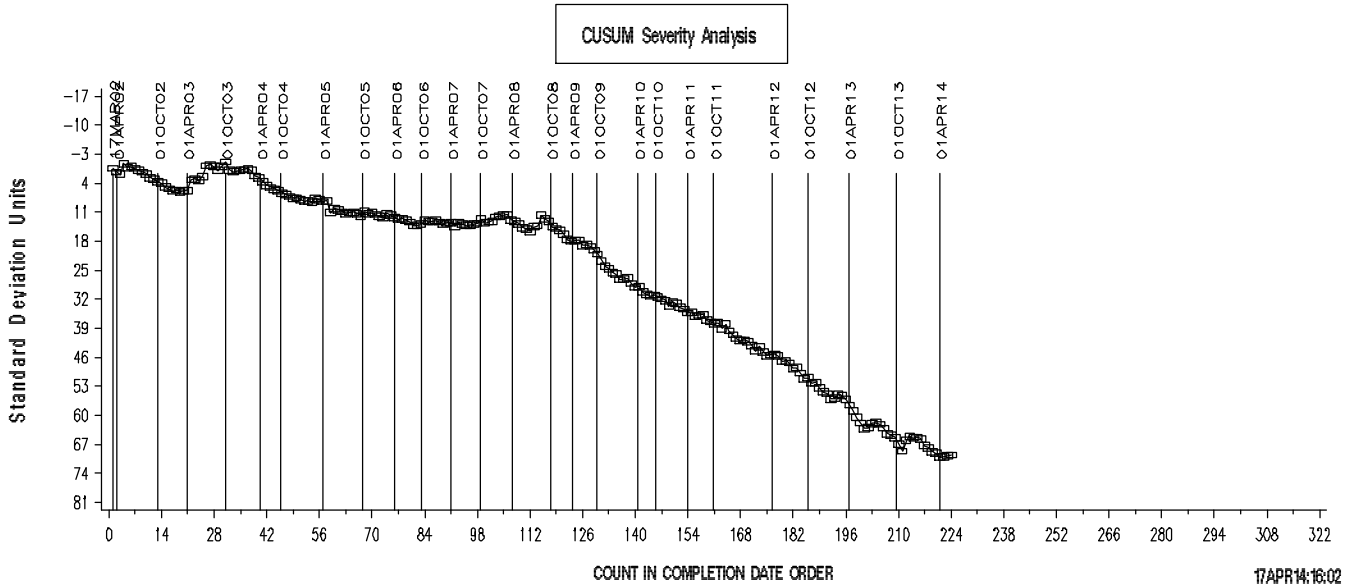

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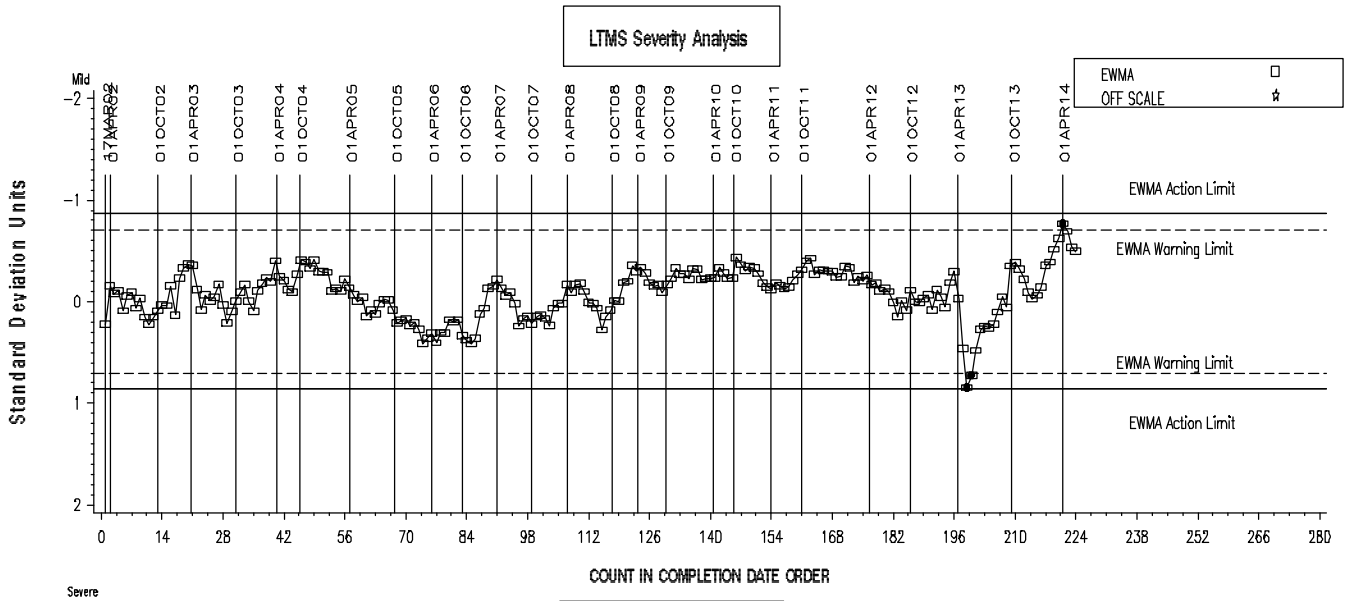
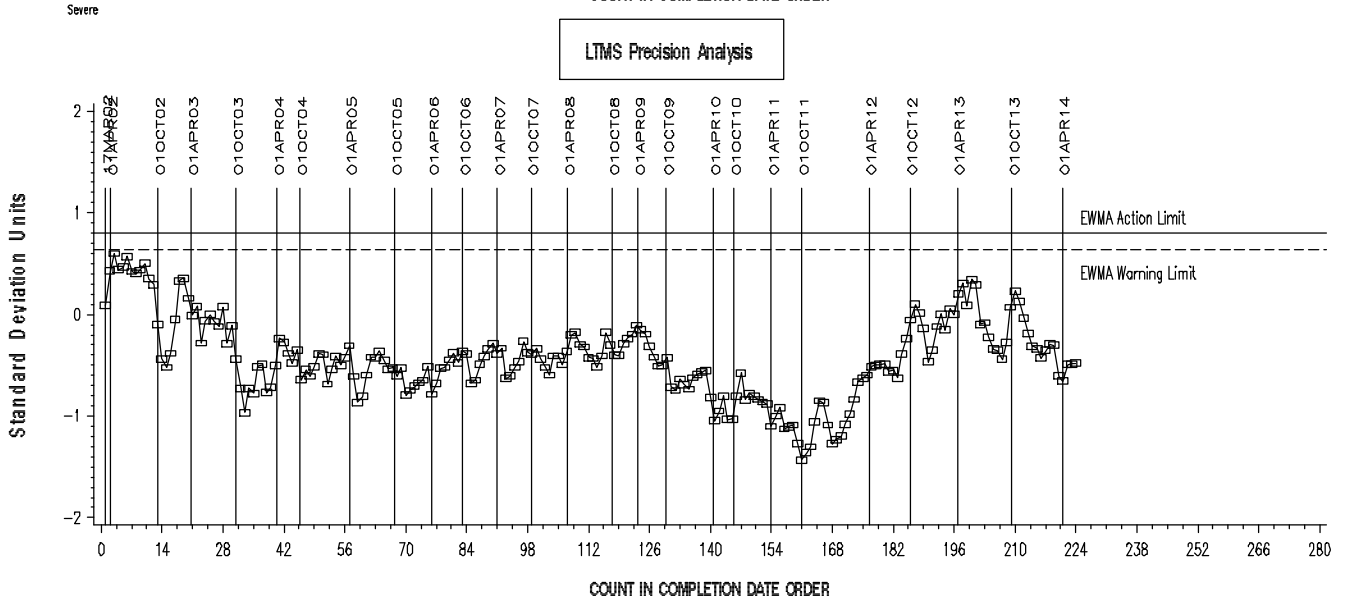
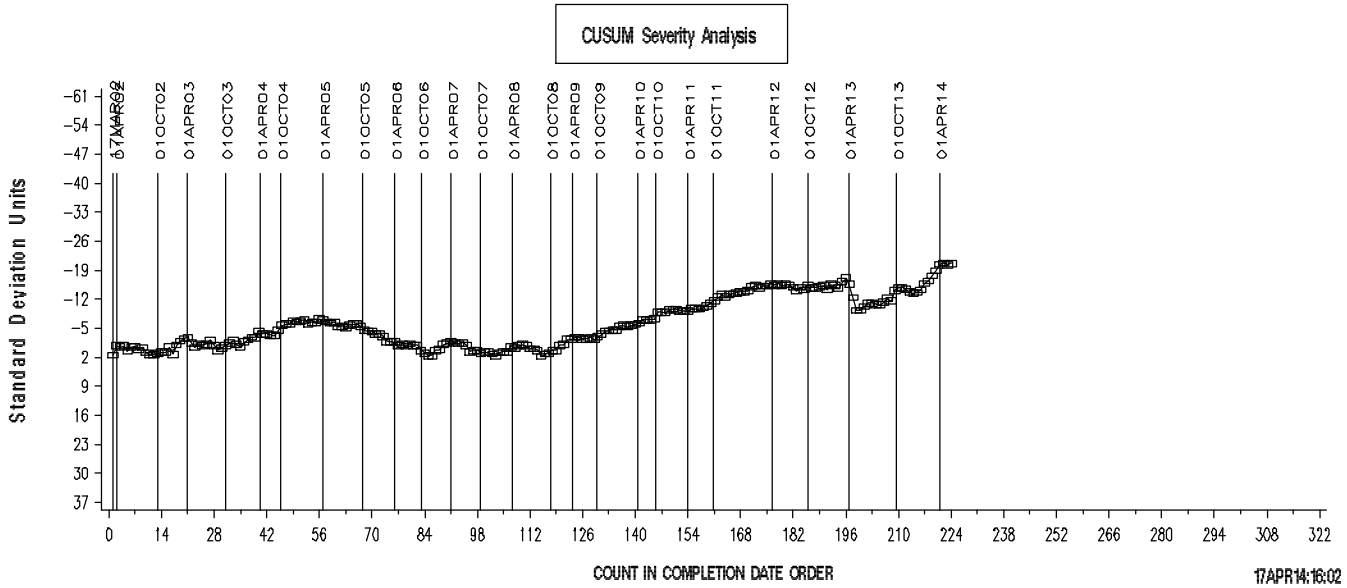
L-60-1 INDUSTRY OPERATIONALLY VALID DATA

IND = '148-1' (and updated targets)

REF. FINAL VISCOSITY INCREASE







17APR14:16:02

L-60-1 INDUSTRY OPERATIONALLY VALID DATA

IND = '161-2' (and updated targets)

REF. FINAL AVERAGE CARBON/ VARNISH

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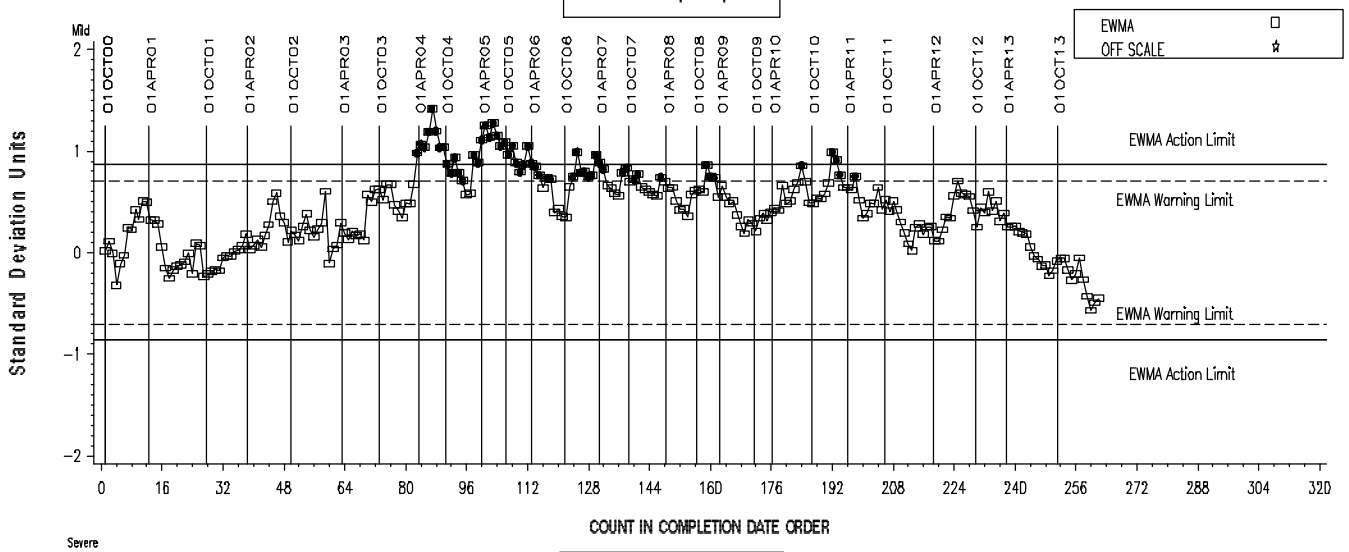
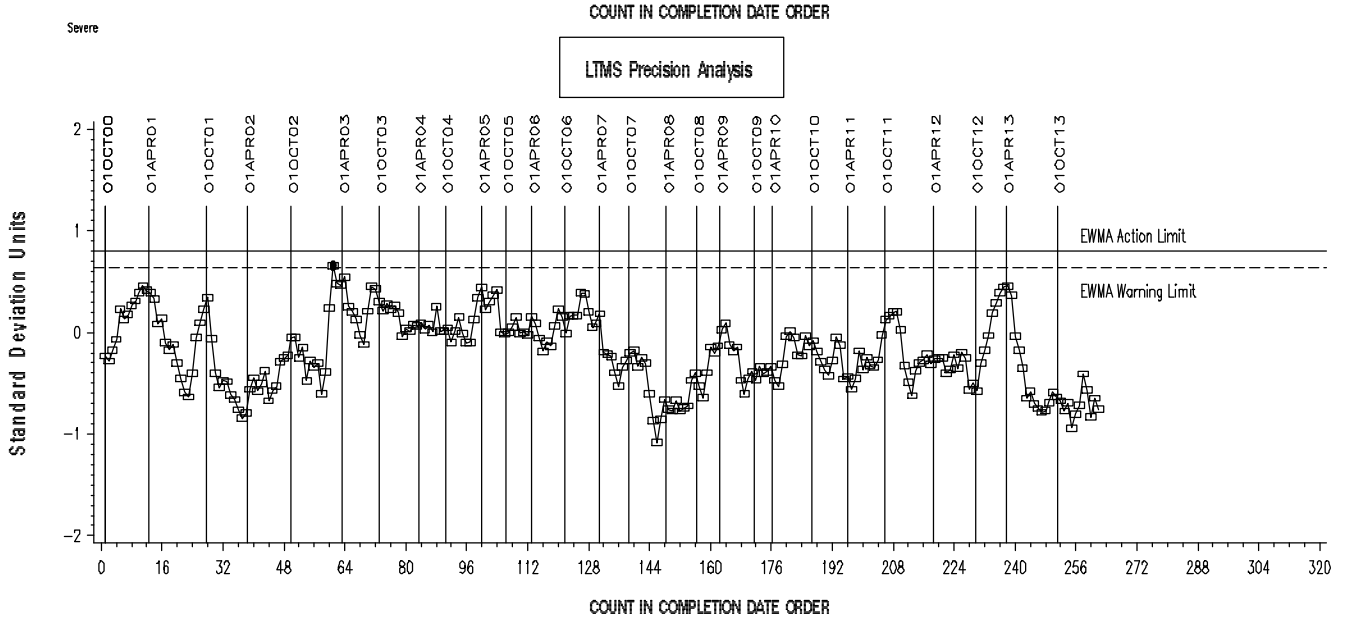
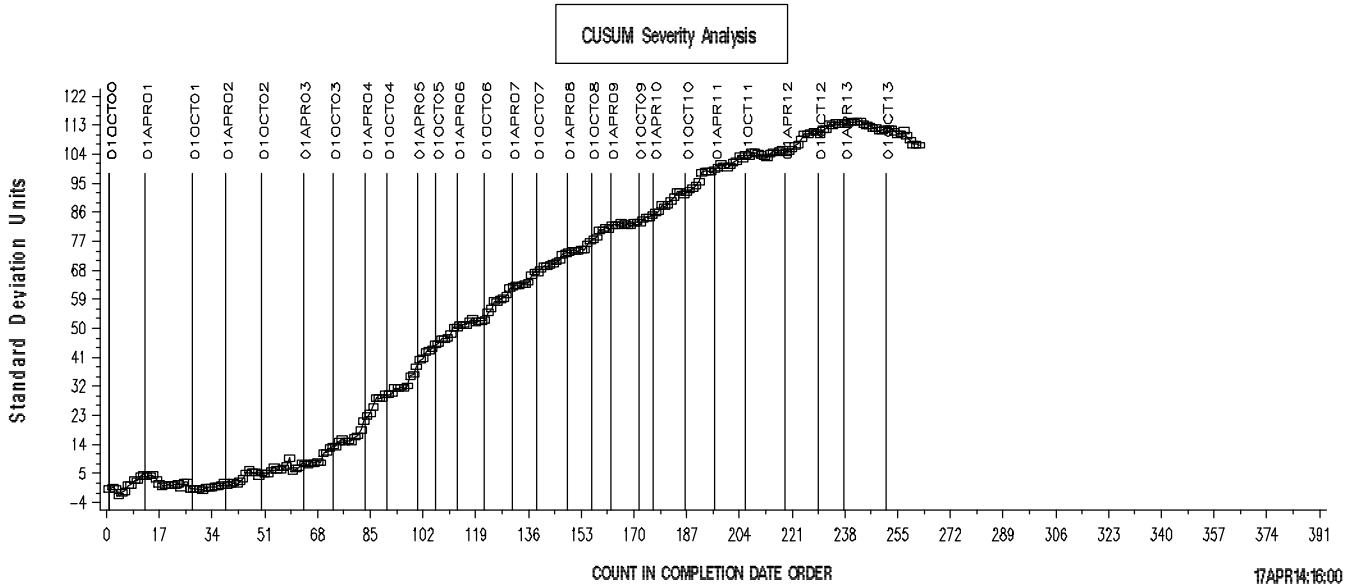
LTMS Severity Analysis



LTMS Precision Analysis



CUSUM Severity Analysis



17APR14:16:00

L-60-1 INDUSTRY OPERATIONALLY VALID DATA

IND = '151-2' (and updated targets)

REF. FINAL AVERAGE SLUDGE

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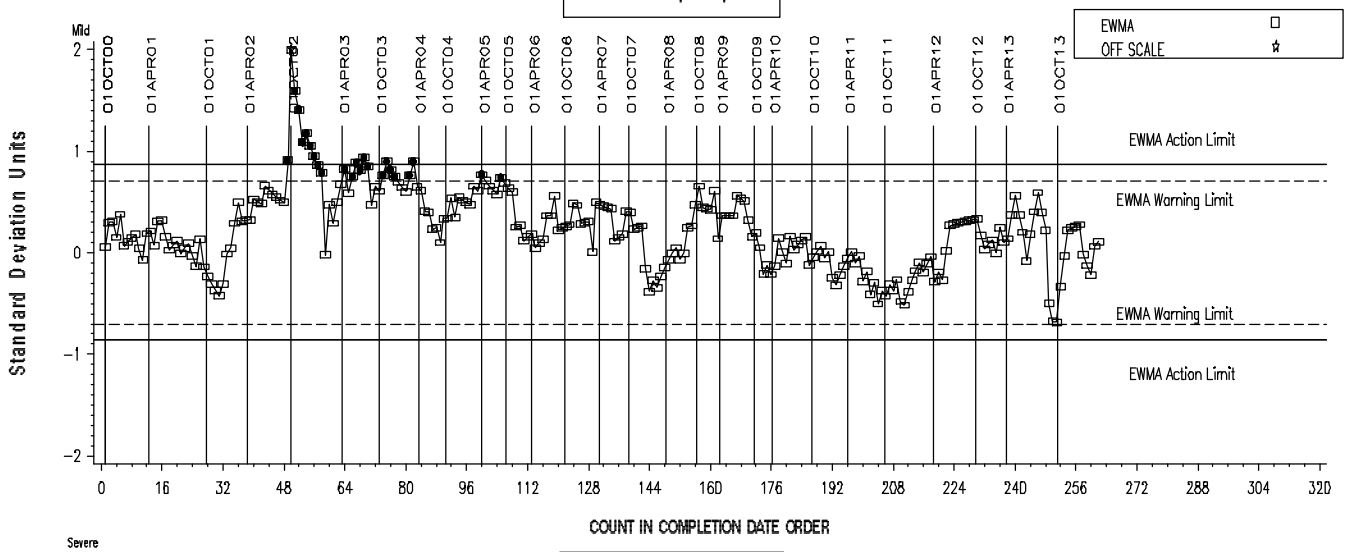
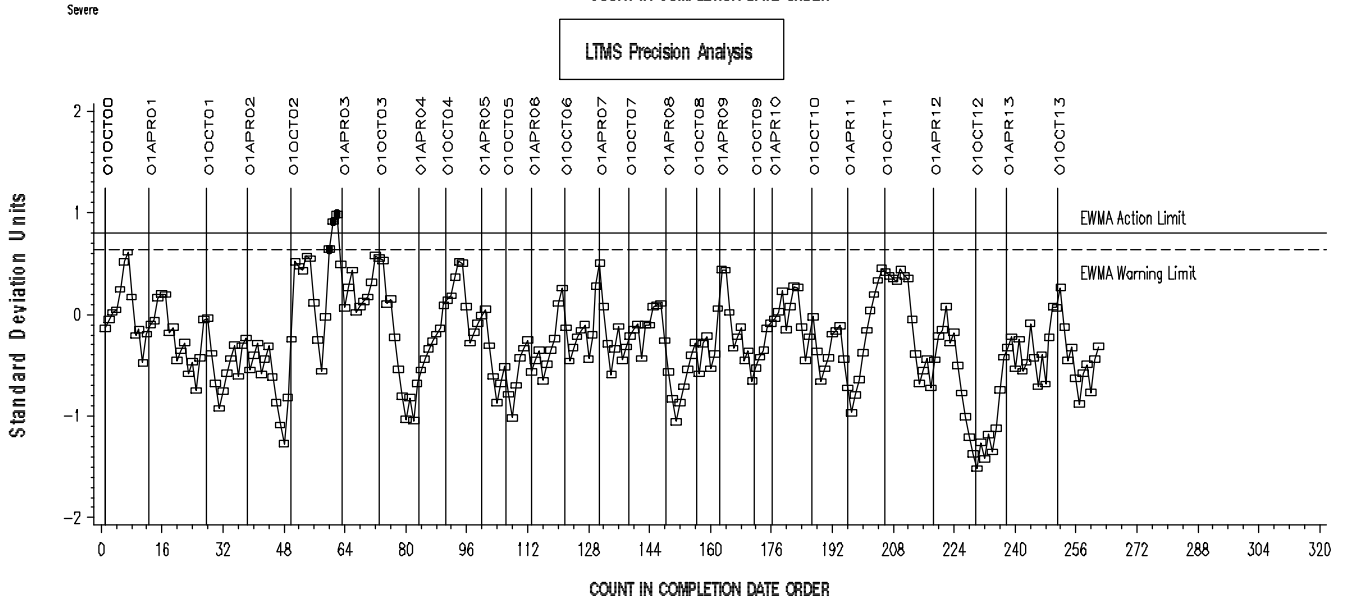
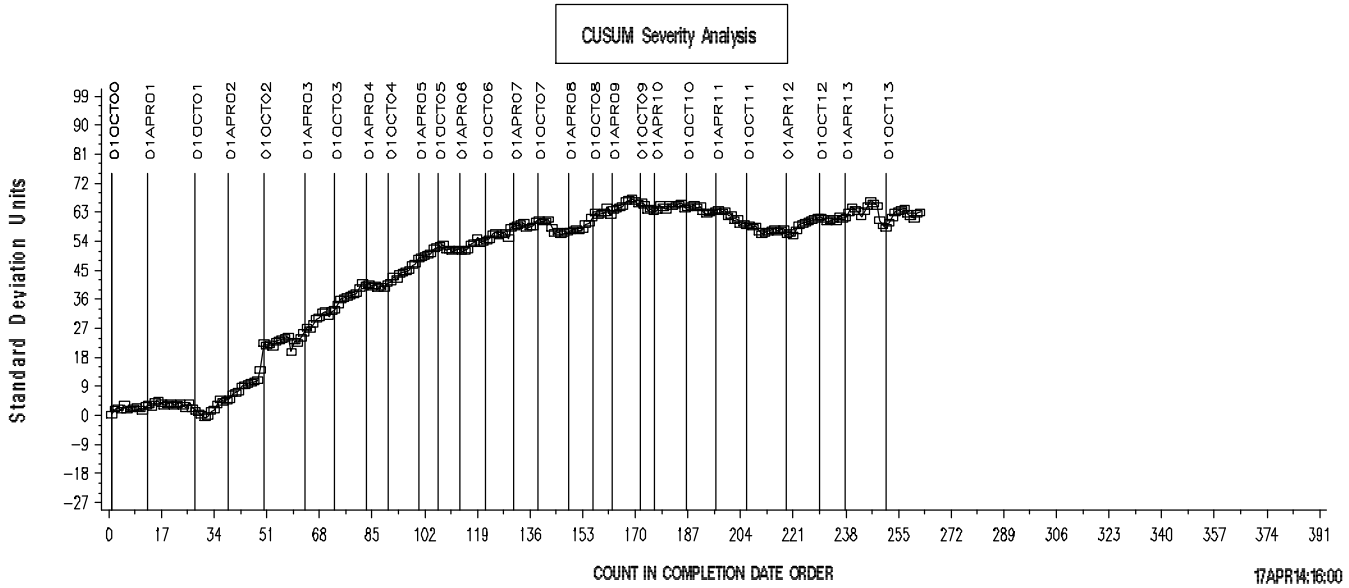
LTMS Severity Analysis



LTMS Precision Analysis



CUSUM Severity Analysis



17APR14:16:00

L-60-1 INDUSTRY OPERATIONALLY VALID DATA

IND = '151-2' (and updated targets)

REF. FINAL PENTANE INSOLUBLES

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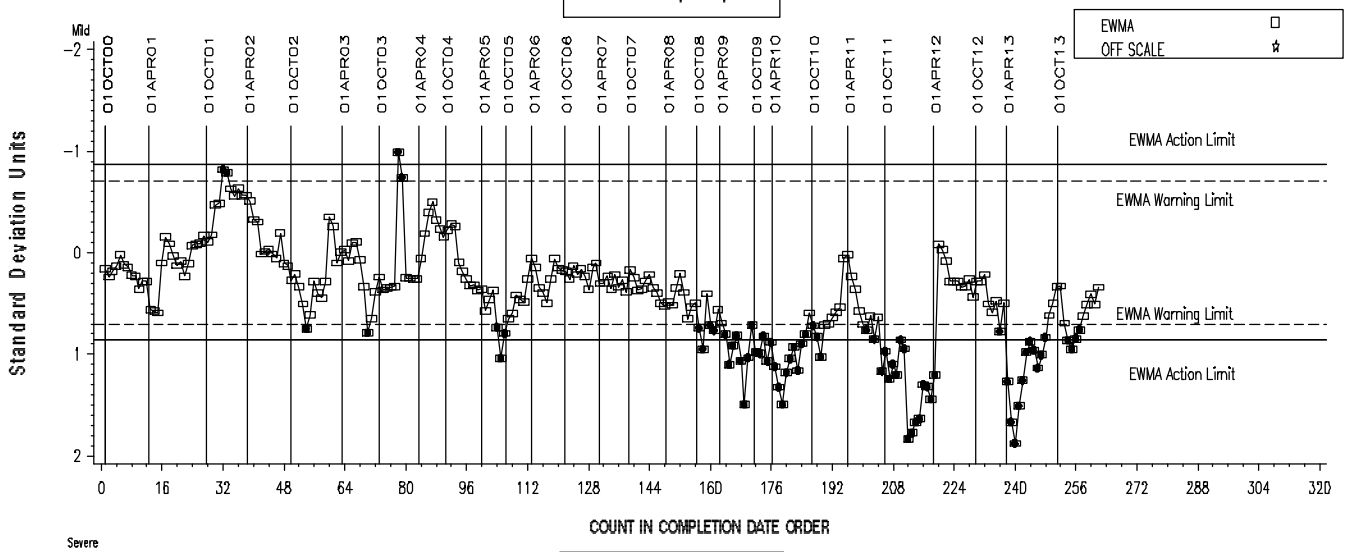
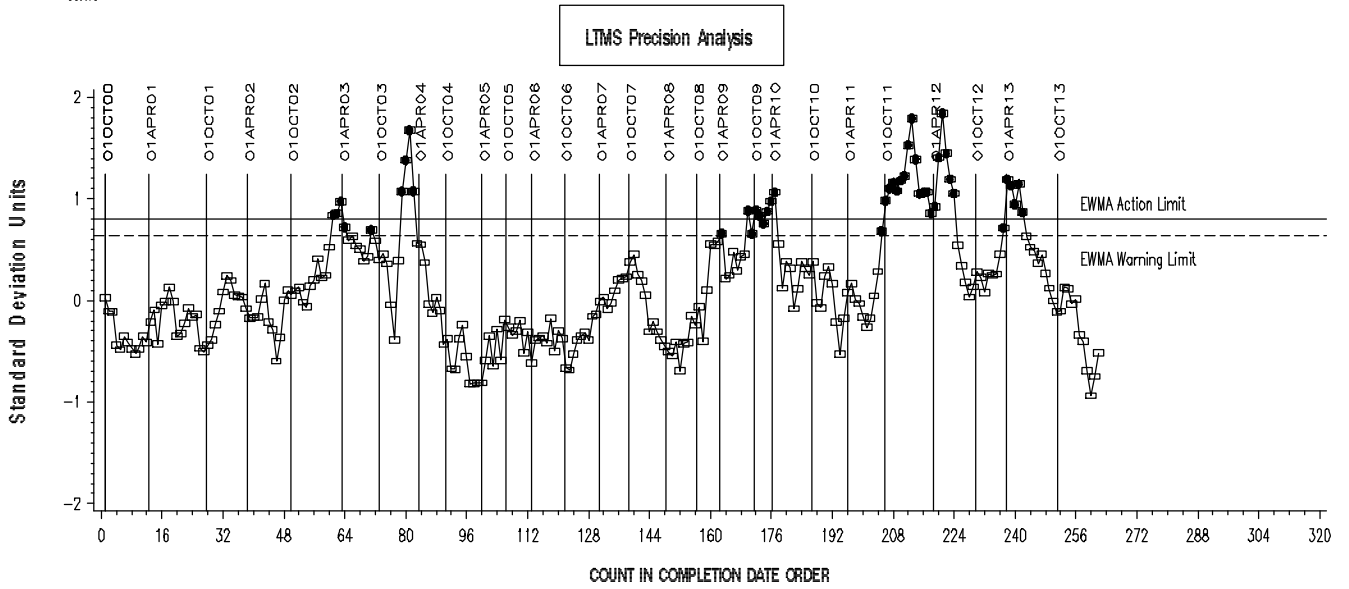
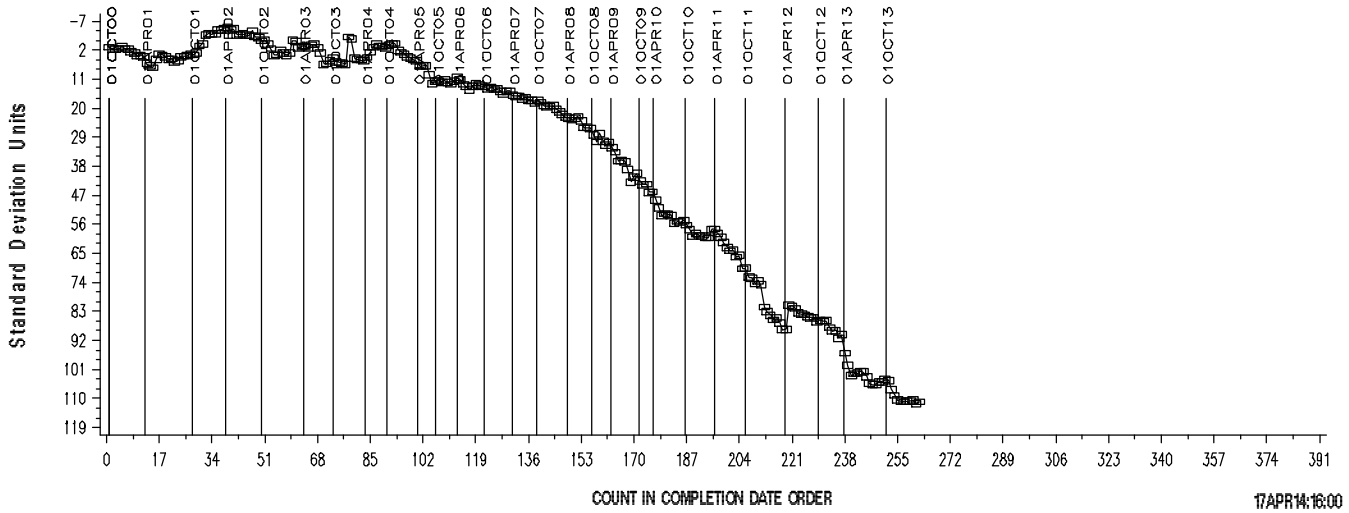
LTMS Severity Analysis



LTMS Precision Analysis



CUSUM Severity Analysis



17APR14:16:00

L-60-1 INDUSTRY OPERATIONALLY VALID DATA

IND = '151-2' (and updated targets)

REF. FINAL TOLUENE INSOLUBLES

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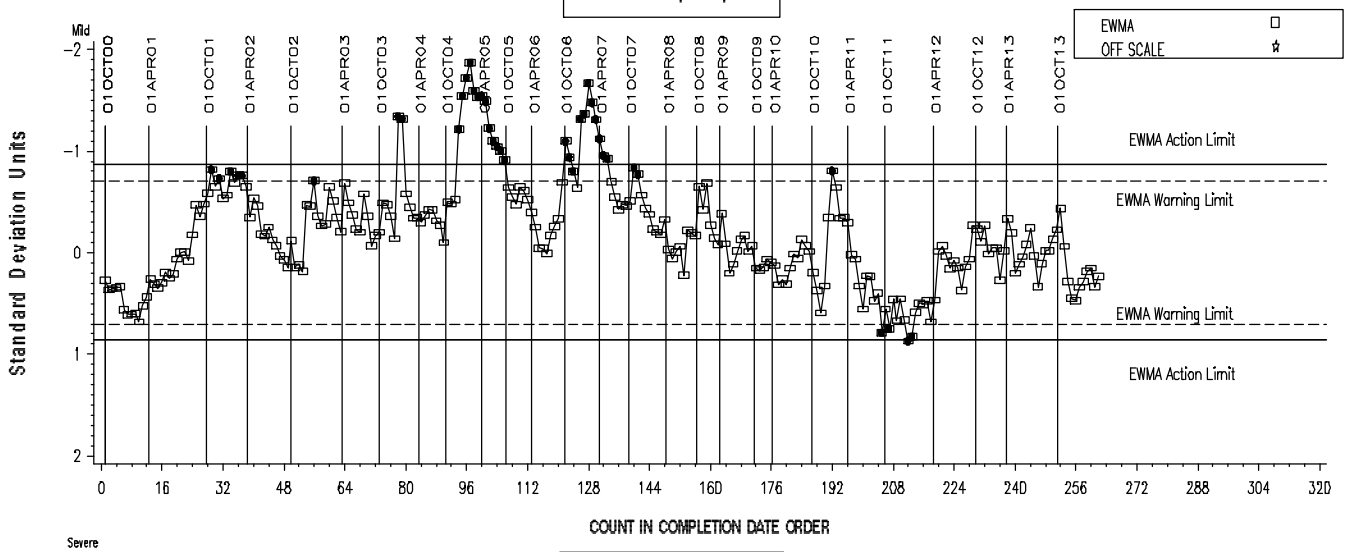
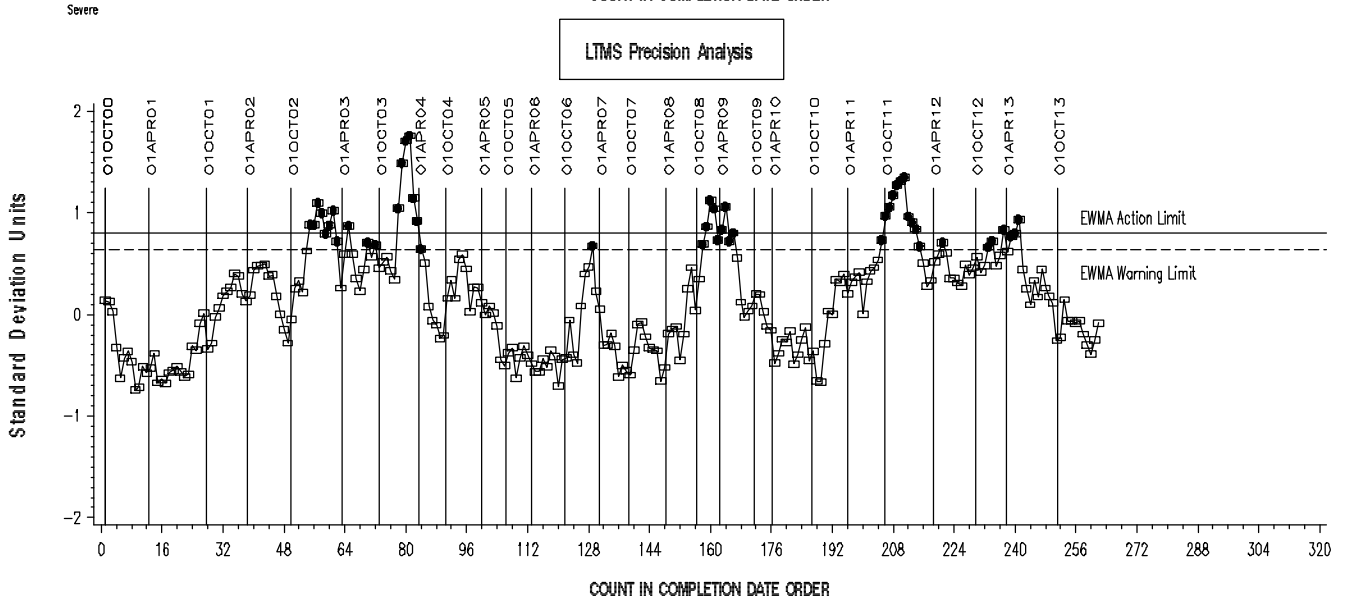
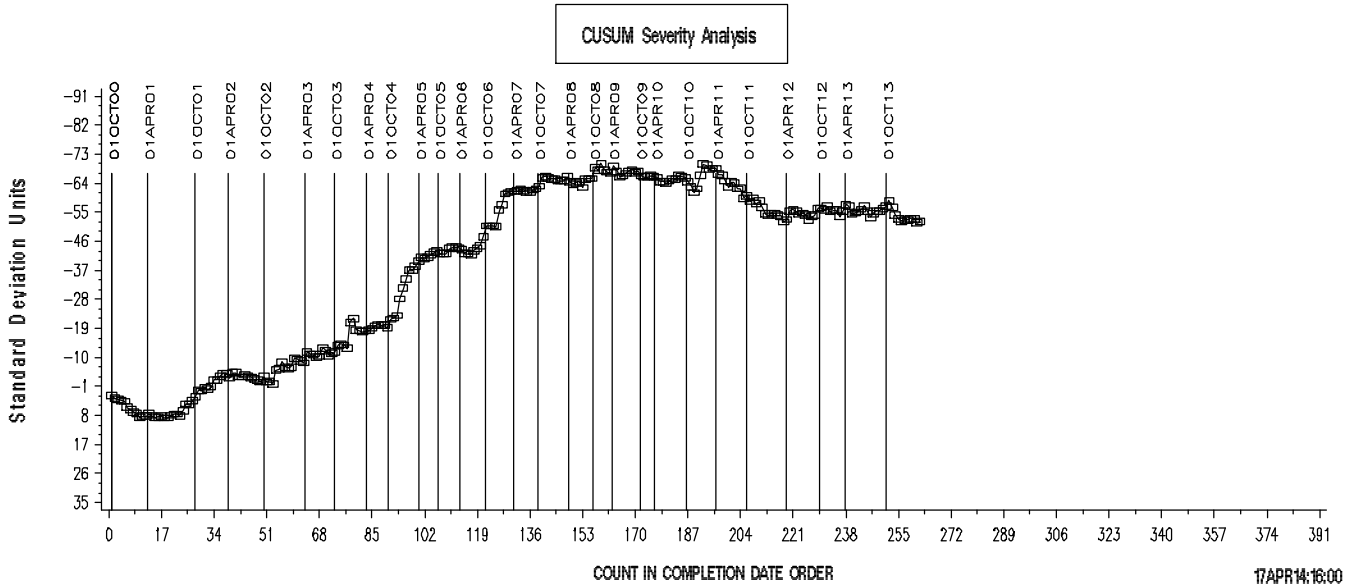
LTMS Severity Analysis



LTMS Precision Analysis



CUSUM Severity Analysis



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L-60-1 INDUSTRY OPERATIONALLY VALID DATA

IND = '151-2' (and updated targets)

REF. FINAL VISCOSITY INCREASE

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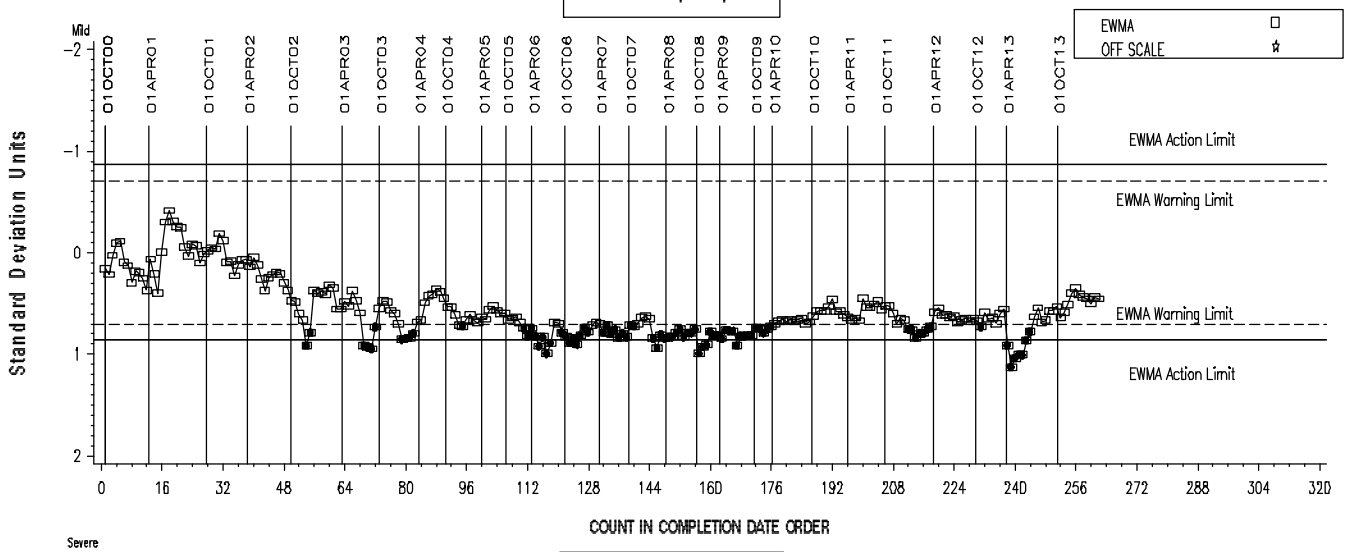
LTMS Severity Analysis



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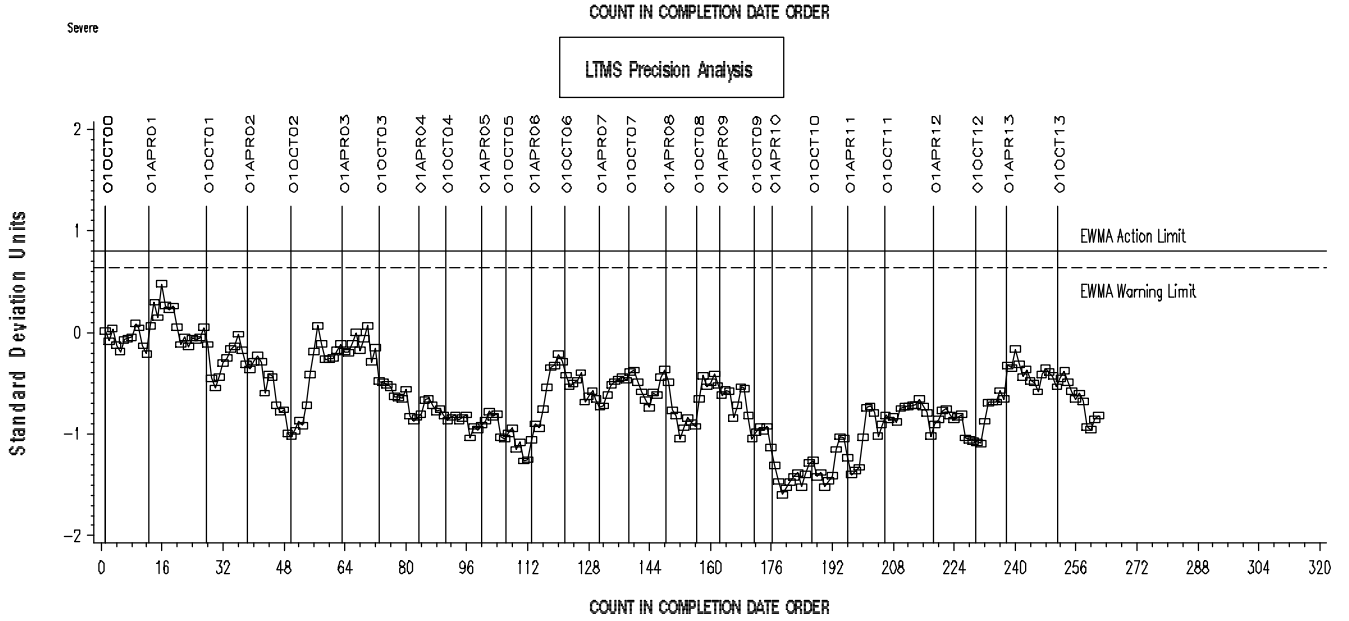
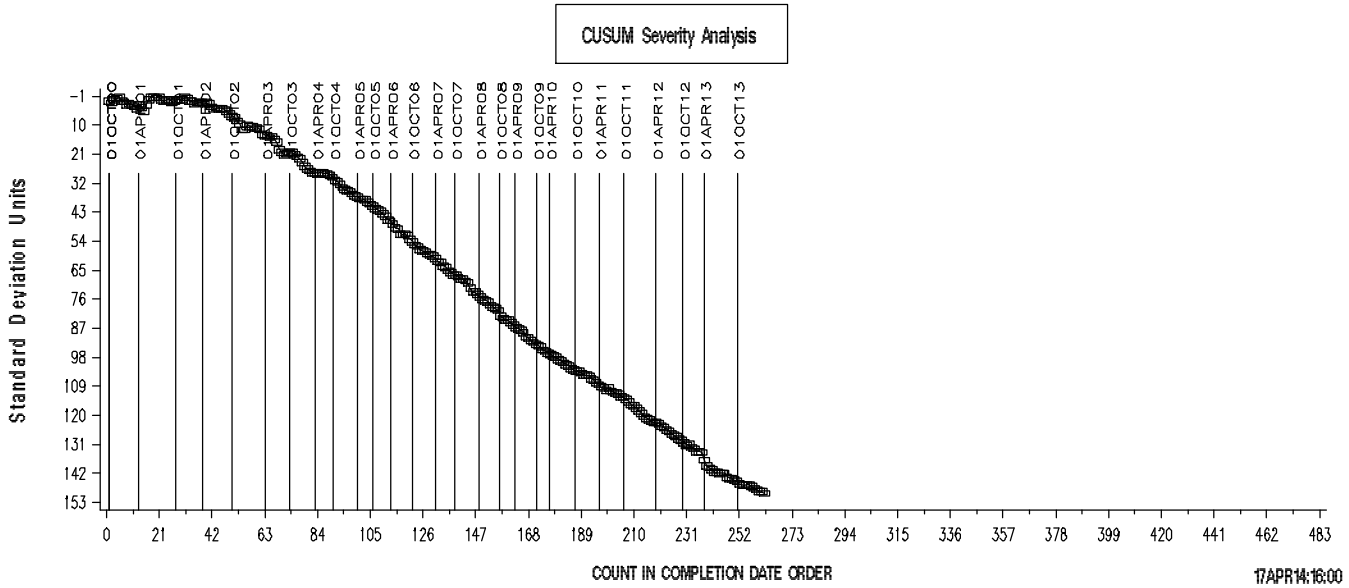


CUSUM Severity Analysis



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