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Test Monitoring Center

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MEMORANDUM: 08-063

DATE: November 12, 2008

TO: Messrs. Ted Selby and Mark Devlin, Co-Chairs ASTM D02.B0.07

FROM: Tom Schofield

SUBJECT: TMC Bench Reference Test Monitoring Semiannual Report From April 1, 2008, through September 30, 2008, for Test Areas D6417, D5800, D6335 (TEOST), D7097 (MTEOS), D5133 (GI), D6082, D874 and ROBO

I respectfully submit the TMC's ASTM D02.B07 Bench Reference Test Monitoring Semiannual Report for Test Areas D6417, D5800, D6335 (TEOST), D7097 (MTEOS), D5133 (GI), D6082 D874 and ROBO, with statistical summaries broken down by test area (Attachment 1).

Calibration testing precision and severity are monitored by comparing a recent period of reference test performance to "target" performance (as determined by the surveillance panels), and to performance over previous periods. The TMC monitors test precision by a pooled standard deviation (pooled s), and test severity by mean Δ/s ("mean delta over s"), where:

Pooled s = Standard deviation pooled across labs and reference oils
(i.e., The pooled precision of the test this period.)
Δ/s = [(Single Test Result) - (Reference Oil's Target Mean Performance)] / (R.O.'s Target Precision)
(i.e., "How many standard deviations from the target mean is this test?")
Mean Δ/s = [Σ (Δ/s)] / n (across reference oils and labs, and over a period of time)
(i.e., "On average, how many standard deviations from the target mean are all the operationally Valid calibration tests for each period?")

Note that the period severity estimates (mean Δ/s) can be averaged across oils of different performance levels because the individual test results used to calculate mean Δ/s have all been normalized into standard deviations (Δ/s) for each corresponding reference oil. Using a pooled s for estimating precision simplifies the interpretation of precision across all reference oil performance levels. These two calculations (pooled s and mean Δ/s) allow all calibration performance levels to be combined into overall period precision and severity estimates for each test type, providing a means to compare current test performance (precision and severity) to target performance and to prior periods. Individual oil targets, and current performance summaries by oil, are also reported (Attachments 2 and 3).

The tables in Attachment 1, comparing current and previous period precision and severity, have become too large to conveniently show all prior report periods. Some of the oldest period comparison periods have been eliminated to keep the information succinct and relevant.

The blind lab codes in this report are cross-referenced, as they were in previous reports. That is, in this report, Lab A represents the same lab in each section, which is the same as Lab A in previous reports, and should remain the same lab in future reports. (The initial TMC PCEOCP Bench Test Report, of November 8, 1996, did not cross reference the labs.)

Prior to April 1, 2001, period precision and severity estimates were based on 12-months of data for some tests and six-months of data for other tests. Beginning with the report period April 1, 2001 through September 30, 2001, all test areas are analyzed over consecutive six-month intervals (a TMC report period). For more information on this decision, please refer to the TMC's web page:

ftp://ftp.astmtmc.cmu.edu/docs/bench/bo7semiannualreports/mem01-143.pdf

TMC semiannual monitoring reports for D6557 (BRT), D6795 (EOFT) and D6794 (EOWT) are being reported separately based on the division of assigned responsibilities within the TMC. (EEOC, CBT & HTCBT have always been reported separately.)

All operationally valid test data and severity plots are available on the TMC's website. Please contact the TMC if you require further information.

Attachments

c: D02.B07 Bench Test Mailing List
J. Zalar (TMC)
ftp://ftp.astmtmc.cmu.edu/docs/bench/bo7semiannualreports/mem08-063.pdf

Distribution: Email

Attachment 1

ASTM Test Monitoring Center

Semiannual Report

ASTM D02.B07 Bench Reference Test Monitoring
From April 1, 2008 through September 30, 2008

D6417, D5800, D6335 (TEOST), D7097 (MTEOS), D5133 (GI), D6082, D874 and ROBO

D6417: Estimation of Engine Oil Volatility by Capillary Gas Chromatography

MONITORED TESTING STATUS

Table 1 summarizes the reference tests reported to the TMC this period (6 labs reporting):

TABLE 1

	No. of Tests
Statistically Acceptable and Operationally Valid	14
Operationally Valid but Failed Acceptance Criteria	0
Operationally Invalid (initially reported as)	0
Operationally Invalid (after informed of failing calibration)	0
Total	**14**

Fail Rate of Operationally Valid Tests: 0.0%

Table 2 is a breakdown of the statistically unacceptable tests.

TABLE 2

Reason for Fail	No. of Tests
Area % Volatized @ 371°C Severe	0
Area % Volatized @ 371°C Mild	0

PRECISION AND SEVERITY

Table 3 shows the current Industry precision and severity for the Sample Area % Volatized @ 371°C test parameter for all operationally valid tests for the report period. (First TMC calibration test completed 10/5/00.)

TABLE 3

Area % Volatized @ 371°C	n	df	Pooled s	Mean Δ/s
Initial Round Robin Study	107	101	0.46	-----
4/1/05 through 9/30/05	17	14	0.61	-0.21
10/1/05 through 3/31/06	11	8	0.23	-0.58
4/1/06 through 9/30/06	12	9	0.45	0.36
10/1/06 through 3/31/07	12	9	0.54	-0.17
4/1/07 through 9/30/07	12	9	0.31	0.22
10/1/07 through 3/31/08	14	11	0.29	0.84
4/1/08 through 9/30/08	14	11	0.34	0.54

Table 4 shows the current severity for the Sample Area % Volatized @ 371°C parameter for each lab for all operationally valid tests for the report period.

TABLE 4

	n	Mean Δ/s
Lab A	4	0.77
Lab B	2	0.67
Lab D	2	0.53
Lab G	2	0.98
Lab H	2	0.90
Lab S	2	-0.81

INDUSTRY PERFORMANCE

D6417 reference testing is directionally less precise, as measured by pooled s, compared to the previous period but remains more precise than the target precision (Table 3). Overall performance is severe of targets at 0.54 standard deviations. Severity is represented graphically in Figure 1 with an overall severe trend developing since the 01JUL07 timeline, and a more notable increase in slope (severity) after the 01JAN08 timeline. There is a just a hint of recent leveling to on-target performance around the 01OCT08 timeline. However, Table 4 shows five of the six participating labs trending severe (same as last period).

While no tests were severe enough to be statistically unacceptable this period, there were four of fourteen tests more than one standard deviation severe of target and two tests more than one standard deviation mild. Three of the six tests that are more than 1 s from target are from Lab A. In looking closer at the history of calibration test results from Lab A, there appears to be a precision issue developing, with recent results on two instruments more often than not at more than 1 s severe or mild. The TMC has notified Lab A of the recent performance trends observed in their calibration data.

TMC MEMORANDA

There were no TMC technical memos issued this report period for the D6417 test method.

D5800: Evaporation Loss of Lubricating Oils by the Noack Method

MONITORED TESTING STATUS

Table 5 summarizes the reference tests reported to the TMC this period (9 labs reporting):

TABLE 5

	No. of Tests
Statistically Acceptable and Operationally Valid	35
Operationally Valid but Failed Acceptance Criteria	1
Operationally Invalid (initially reported as)	0
Operationally Invalid (after informed of failing calibration)	0
Total	**36**

Fail Rate of Operationally Valid Tests: 2.8%

Table 6 is a breakdown of the statistically unacceptable tests.

TABLE 6

Reason for Fail	No. of Tests
Sample Evaporation Loss Severe	1*
Sample Evaporation Loss Mild	0

*Procedure B

PRECISION AND SEVERITY

Table 7 shows the current Industry precision and severity for the Sample Evaporation Loss test parameter for all operationally valid tests for the report period. (First calibration test completed 5/1/96.)

TABLE 7

Sample Evaporation Loss, mass %	n	df	Pooled s	Mean Δ/s
New Targets Effective 7/21/2003	102	99	0.70	-----
4/1/06 through 9/30/06	35	32	0.62	0.54
10/1/06 through 3/31/07*	39	36	0.99	0.36
10/1/06 through 3/31/07*	38	35	0.61	0.51
4/1/07 through 9/30/07	36	33	0.50	0.92
10/1/07 through 3/31/08	34	31	0.50	0.75
4/1/08 through 9/30/08	36	33	0.54	0.82

*Period statistics with and without a single unusually mild result (-5.51 s) included

Table 8 shows statistical comparisons by procedure for all operationally valid tests for the report period.

TABLE 8

Sample Evaporation Loss, mass %	n	df	Pooled s	Mean Δ/s
Procedure A	0	0	---	---
Procedure B	33	30	0.52	0.93
Procedure C	3	1	0.21	-0.36

D5800: Evaporation Loss of Lubricating Oils by the Noack Method, continued

Table 9 shows the current severity for the Sample Evaporation Loss parameter for each lab for all operationally valid tests for the report period.

TABLE 9

	n	Mean Δ/s
Lab A	4	0.13
LAB AL	1	1.25
Lab B	8	1.19
Lab D	3	-0.36
Lab F	4	0.67
Lab G	4	0.15
Lab H	3	1.57
Lab I	5	1.52
Lab J	4	0.98

INDUSTRY PERFORMANCE

Effective September 26, 2000, the TMC began monitoring the three Noack procedures under the revised D5800 test method. Revised reference oil targets and acceptance bands for all three current reference oils (52, 55 and 58), based on 18-months of TMC reference data, became effective July 21, 2003.

D5800 reference testing precision, as measured by pooled s, is almost unchanged for the three most recent report periods and is more precise than the target precision. Overall performance is again severe this period with eight of the nine participating labs performing severe at some level and sixteen of thirty-six tests more than 1 s severe (only one test was more than 1 s mild); almost identical performance as the last report period. Severity is graphically represented in Figures 2A and 2B. Figure 2A shows an unexplained increase in severity since the 01JUL06 timeline, with an additional increase in severity since the 01JAN07 timeline. Lab D appeared to be the most severe performing lab last period, but is slightly mild this period. Labs H and I are the most severe performers this period. As with last report period, the strong overall severe trend is not predominantly attributable to any one lab, instrument or single anomalous result. Attachment 2 also shows oil 52 to be performing more severe, at 1.35 s for the period, than oil 55 (0.68 s severe) and oil 58 (0.44 s severe), again very similar to last period except results on oil 58 are a bit more severe this period.

With steady precision but a widely observed severe trend for the three report periods (18 months), D5800 Procedure B calibration testing seems to be trending rather severe since at least January 2007.

Table 8 compares the procedures for the period. There were no Procedure A calibration tests reported and three Procedure C calibration tests reported this period.

TMC MEMORANDA

There were no TMC technical memos issued this report period for the D5800 test method.

D5133: Low Temperature, Low Shear Rate, Viscosity/Temperature Dependence of Lubricating Oils Using a Temperature Scanning Technique (Gelation Index or GI)

MONITORED TESTING STATUS

Table 10 summarizes the reference tests reported to the TMC this period (5 labs reporting):

TABLE 10
Reference Tests

	No. of Tests
Statistically Acceptable and Operationally Valid	23
Operationally Valid but Failed Acceptance Criteria	4
Operationally Invalid (initially reported as)	1
Operationally Invalid (after informed of failing calibration)	0
Total	**28**

Fail Rate of Operationally Valid Tests: 14.8%

Table 11 is a breakdown of the statistically unacceptable tests.

TABLE 11

Reason for Fail	No. of Tests
Gelation Index Mild	3
Gelation Index Severe	1

PRECISION AND SEVERITY

Table 12 shows the current Industry precision and severity for the Gelation Index test parameter for all operationally valid tests for the report period. (First calibration test completed 4/20/96.)

TABLE 12

Gelation Index	n	df	Pooled s	Mean Δ/s
Revised Targets Effective 20030715 (Oils 58 & 62 targets unchanged, added oil 1009, dropped oils 52 & 53)	68	65	2.86	-----
10/1/03 through 3/31/04	37	34	5.86	1.73
4/1/04 through 9/30/04	27	24	3.05	0.40
10/1/04 through 3/31/05	34	31	2.51	0.40
4/1/05 through 9/30/05	22	19	3.44	-0.17
10/1/05 through 3/31/06	22	19	3.09	-0.16
4/1/06 through 9/30/06	29	26	3.76	-0.46
10/1/06 through 3/31/07	29	26	3.23	-0.68
4/1/07 through 9/30/07	24	21	3.35	-0.28
10/1/07 through 3/31/08	26	23	4.13	-0.31
4/1/08 through 9/30/08	27	24	3.54	0.18

D5133: Low Temperature, Low Shear Rate, Viscosity/Temperature Dependence of Lubricating Oils Using a Temperature Scanning Technique (Gelation Index or GI), continued

Table 13 shows the current severity for the Gelation Index for each lab for all operationally valid tests for the report period.

TABLE 13

	n	GI Mean Δ/s
Lab A	6	-0.21
Lab B	9	0.00
Lab G	4	0.66
Lab I	5	0.28
Lab S	3	0.72

INDUSTRY PERFORMANCE

Effective July 15, 2003, new D5133 reference oils, targets and acceptance bands were implemented for TMC calibration monitoring. The current GI reference oils are 58, 62 & 1009.

Effective March 8, 2006, TMC instrument calibration periods changed from 90-days to 60-days and a 480-day head calibration period was introduced for all successful calibrations completed March 8, 2006, or later (see TMC Technical Memo 06-004).

D5133 reference testing is more precise, as measured by pooled s, compared to last period but continues to be less precise than the target precision. Overall performance is directionally severe of targets. Severity is graphically represented in Figures 3A and 3B.

Lab G had notably mild overall performance for the prior three report periods, but Lab G's performance is only moderately severe this period.

Six tests this period are reported at more than 1 s mild (one of those at more than 3 s mild), and six tests were 1 s or more severe (one more than 5 s severe), so twelve of twenty-seven operationally valid tests reported this period were 1 s or more from target (severe or mild). Last period seventeen of twenty-six operationally valid tests reported this period were 1 s or more from target (severe or mild).

TMC MEMORANDA

There were no TMC technical memos issued this report period for the D5133 test method.

D6335: High Temperature Deposits by Thermo-Oxidation Engine Oil Simulation Test (TEOST)

MONITORED TESTING STATUS

Table 14 summarizes the reference tests reported to the TMC this period (3 labs reporting):

TABLE 14

	No. of Tests
Statistically Acceptable and Operationally Valid	10
Operationally Valid but Failed Acceptance Criteria	5
Operationally Invalid (initially reported as)	3
Operationally Invalid (after informed of failing calibration)	1
Total	**19**

Fail Rate of Operationally Valid Tests: 33.3%

Table 15 is a breakdown of the statistically unacceptable tests.

TABLE 15

Reason for Fail	No. of Tests
Total Deposits Mild	3
Total Deposits Severe	2

All three mild results were by Lab B on Oil 71, two on the same instrument.
Both severe results were also by Lab B, one on Oil 71 and the other on oil 72, two instruments.

PRECISION AND SEVERITY

Table 16 shows the current Industry precision and severity for the Total Deposits test parameter for all operationally valid tests for the report period. (First calibration test completed 2/13/96.)

TABLE 16

Total Deposits	n	df	Pooled s	Mean Δ/s
Initial Round Robin Study	54	52	4.18	-----
10/1/04 through 3/31/05	10	8	6.30	-0.32
4/1/05 through 9/30/05	11	9	4.13	-0.73
10/1/05 through 3/31/06	14	12	4.96	-0.29
4/1/06 through 9/30/06	10	8	5.11	-0.16
10/1/06 through 3/31/07*	12	10	8.66	0.14
10/1/06 through 3/31/07*	11	9	5.67	-0.45
4/1/07 through 9/30/07*	10	8	9.59	0.43
4/1/07 through 9/30/07*	9	7	8.08	-0.11
10/1/07 through 3/31/08	22	20	9.65	0.92
4/1/08 through 9/30/08	15	13	6.99	0.20

*Period statistics with and without a single unusually severe result included

D6335: TEOST, continued

Table 17 shows the current severity for the Total Deposits parameter for each lab for all operationally valid tests in the report period.

TABLE 17

	n	Mean Δ/s
Lab A	4	0.77
Lab B	9	-0.20
Lab G	2	0.84

INDUSTRY PERFORMANCE

Reference testing precision, as measured by pooled s, is improved compared the previous report period, but remains less precise than the overall target precision (Table 16). Performance is directionally severe. Severity is graphically represented in Figure 4 (attached) with a recent overall severe trend (mostly biased by two extreme test results), but also with very recent leveling to nearly on-target performance.

After three prior report periods of increasingly degraded precision, and an unprecedented fail rate (both statistically and operationally), a D6335 TEOST-33C and D7097 TEOST MHT workshop was held last April, led by Greg Miiller from Tannas Corporation, hosted by Becky Grinfield at Southwest Research Institute, and with participation by technicians from all three monitored labs, surveillance panel chair Sue Milczewski and the TMC's Tom Schofield. A number of operational discrepancies were uncovered at the workshop, and initial appearances were that a number of operator errors were addressed and fixed. And, based on calibration data since the workshop, this appears to be the case for Labs A and G. Indeed, the first four subsequent TMC calibrations reported, one from each lab (two from lab B) were all acceptable calibrations, including instruments that had previous repeated consecutive fails, giving all initial indications that the operational problems had been addressed by the workshop.

However, while Labs A and G seem to be performing normally again (if a little severe), Lab B continues to report numerous failing calibration attempts, both operationally and statistically. Of the twelve tests submitted by Lab B this report period (attempting to calibrate three instruments), three tests failed operationally and five additional tests failed statistically, with only four passing calibrations and as many as five consecutive fails on one instrument.

Last period the TMC reported that this test was clearly in trouble in that precision was markedly degraded, fail rates were at 50% (and substantially higher if operationally invalid tests are counted) and all three participating labs exhibited multiple consecutive failing tests (between three and six) that seemed to be instrument specific. Now, after the workshop, the problem of repeated failing calibration attempts appears to be isolated to Lab B.

A review of the rod batch indicates that three recent calibrations this period were on a new rod batch, H while all other tests were reported using rod batch G. Of the three calibrations on batch H rods, two were acceptable calibrations.

D6335: TEOST, continued

REFERENCE OILS

There has been renewed interest in the D6335 TEOST-33C test with respect to the ILSAC GF-5 engine oil classification discussions, resulting in numerous requests recently for TMC oils 71 and 72 for non-referencing related studies. The TMC's supply of these oils is quite scarce, just over one-gallon of each oil. Replacement blends of two-gallons of each oil have recently been donated to the TMC. The TMC is analyzing these oils now for quality assurance. The TMC has coded these replacement oils 71-1 and 72-1.

Oil 71-1 is purported to be the same formulation and batch as the original TMC oil 71 presently in use (formulated approximately 1995 and used in the original test development round robin). Oil 72-1 is purported to be a 1999 reblend of TMC oil 72 (~1995).

The TMC expects to continue using TMC oils 71 and 72 for TEOST monitoring purposes. Requests for additional oil for other studies will be carefully evaluated, and if found to be in the industry's best interests, will be allocated from the 71-1 and 72-1 portions in the smallest possible aliquots to meet the needs of the study, while preserving the "bulk" of the re-supplied oils. The remaining "bulk" will be held by the TMC in case they are needed to replace oils 71 or 72 for TMC TEOST monitoring. There may be a need for these additional quantities of oils as more labs become interested in participating in the TMC TEOST monitoring system if a D6335 specification is added to GF-5, placing more demands on the TMC's very limited inventories of these oils, and without prospect of additional resupply.

TMC MEMORANDA

There was one TMC technical memo issued this report period for the D6335 test method:
Report Packet Revision Notice TEOST-20080812, August 28, 2008 (effective October 1, 2008)

D7097: Determination of Moderately High Temperature Piston Deposits by Thermo-oxidation Engine Oil Simulation Test (MTEOS or MHT-4 TEOST)

MONITORED TESTING STATUS

Table 18 summarizes the reference tests reported to the TMC this period (6 labs reporting):

TABLE 18

	No. of Tests
Statistically Acceptable and Operationally Valid	43
Operationally Valid but Failed Acceptance Criteria	3
Operationally Invalid (initially reported as)	6
Operationally Invalid (after informed of failing calibration)	0
Total	**52**

Fail Rate of Operationally Valid Tests: 6.5%

Table 19 is a breakdown of the statistically unacceptable tests.

TABLE 19

Reason for Fail	No. of Tests
Total Deposits Mild	0
Total Deposits Severe	3*

*All three severe fails were on TMC oil 432, the severest performing reference oil.

PRECISION AND SEVERITY

Table 20 shows the current Industry precision and severity for the Total Deposits test parameter for all operationally valid tests for the report period. (First calibration test completed 9/6/00.)

TABLE 20

Total Deposits	n	df	Pooled s	Mean Δ/s
Updated Targets Effective 1/12/05	30	27	3.42	-----
10/1/04 through 3/31/05	36	31	5.15	-0.11*
Updated Targets Effective 6/30/05	42	39	4.60	-----
4/1/05 through 9/30/05	39	36	6.36	-0.17*
10/1/05 through 3/31/06	40	37	6.68	-0.26
Updated Targets Effective 7/31/06	90	87	5.62	-----
4/1/06 through 9/30/06	43	40	5.99	-0.09*
10/1/06 through 3/31/07	47	44	7.53	-0.17
4/1/07 through 9/30/07	48	45	7.68	0.32
10/1/07 through 3/31/08	46	43	7.41	-0.21
4/1/08 through 9/30/08	46	43	6.09	0.01

* New oil performance targets and acceptance bands were implemented during the period; severity is estimated using the targets that were in effect at the time each test was reported.

D7097: Determination of Moderately High Temperature Piston Deposits by Thermo-oxidation Engine Oil Simulation Test (MTEOS or MHT-4 TEOST)

Table 21 shows the current severity for the Total Deposits parameter for each lab for all operationally valid tests in the report period.

TABLE 21

	n	Mean Δ/s	Pooled S
Lab A	12	-0.29	3.48
Lab AK	1	0.59	--.--
Lab B	14	-0.06	7.65
Lab D	6	-0.72	4.03
Lab G	11	0.72	5.82
Lab V	2	0.34	--.--

INDUSTRY PERFORMANCE

D7097 reference testing overall precision, as measured by pooled s, has improved compared to the prior report period but remains less precise than the updated target precision. Overall performance is on-target with Lab D performing overall mild and Lab G severe. There are nine operationally valid tests (out of forty-six) at more than 1 s mild of targets and seven tests more than 1 s severe, and this variability extends across all labs reporting more than two tests, though Lab B is the least precise lab, with four tests at more than 1 s mild balancing three tests at more than 1 s severe (one at 4.8 s severe) for an overall on-target lab severity estimate (-0.06 s), but with high variability. I've added a pooled s precision estimate by lab to Table 21 to illustrate: Lab A is the most precise and Lab B the least precise, with similar numbers of operationally valid tests (n).

All labs report using either catalyst batch 0511 or a new batch, 0804, for the period. Seven tests are reported using Rod Batch G, but most tests this period are reported to be using a new rod batch, H.

The MTEOS severity is graphically represented in Figures 5A & 5B, with Figure 5B showing when the new performance targets were implemented, when the monitored test method was changed and when new rod batches are introduced. Figure 5A shows the period severity with overall on-target performance for the report period.

TMC MEMORANDA

There was one TMC technical memo issued this report period for the D7097 test method:
Report Packet Revision Notice MTEOS-20080812, August 28, 2008 (effective October 1, 2008)

D6082: High Temperature Foaming Characteristics of Lubricating Oils

D6082 Monitoring Historical and Statistical References Affecting the Statistical Estimates in This Report

In June 2000, the High Temperature Foam Surveillance Panel had given approval for the TMC to stop collecting data for Total Volume Increase.

On June 18, 2001, the section agreed to suspend the use of the severe performing TMC oil 1002 as a D6082 reference oil due to ongoing calibration precision and severity problems with that oil and on June 17, 2002 the section voted to discontinue the use of 1002 altogether.

On July 21, 2003 a severe performing "discrimination oil", TMC oil 66, was introduced to the monitoring system to be run by each participating lab once every six-months to show that each lab can discriminate a GF-3/SL passing oil (foam tendency) from a failing oil in the D6082 test method. The first discrimination test using oil 66 was completed on August 13, 2003. Because of apparent poor reproducibility of the D6082 test method on severe performing oils (greater than 100 ml foam tendency) in general, it was agreed that oil 66 discrimination results would not be statistically summarized by the TMC other than a count of the tests that do and don't meet the acceptance criteria.

On March 28, 2006 the performance targets for oil 1007 were adjusted slightly by rounding the targets from a precision of 0.01 ml to 1 ml; this adjustment slightly changed the acceptance bands on oil 1007 (see TMC technical memo 06-08).

Note that TMC reference oil 1007 has a Foam Stability (one minute after disconnect) target mean performance of zero ml and a target precision (standard deviation) of zero ml. A negative (mild) result for this parameter is unlikely and a severity estimate for any positive result would be indeterminate in standard deviations (Δ/s). Therefore, for Foam Stability, only a count of non-zero occurrences is noted to flag any severity trends.

MONITORED TESTING STATUS

Table 22 summarizes the reference tests reported to the TMC this period (4 labs reporting):

TABLE 22

	No. of Tests
Statistically Acceptable and Operationally Valid	10
Operationally Valid but Failed Acceptance Criteria	0
Operationally Invalid (initially reported as)	0
Operationally Invalid (after informed of failing calibration)	0
Total	**10**

Fail Rate of Operationally Valid Tests: 0.0%

In addition to the calibration tests, there were four discrimination oil tests reported this period; all met the acceptance criteria for the discrimination oil.

D6082: High Temperature Foaming Characteristics of Lubricating Oils, continued

TMC 1007 PRECISION AND SEVERITY

Tables 23 and 24 show the current industry precision and severity for the Foam Tendency and Foam Stability test parameters for all operationally valid tests on oil 1007 for the report period. (First calibration test on TMC 1007 completed 4/12/99.)

TABLE 23

1007 Foam Tendency, ml	n	Mean	s	Mean Δ/s
Initial Round Robin Study (targets)	28	65.71	19.28	-----
10/1/04 through 3/31/05	12	72.9	16.30	0.37
4/1/05 through 9/30/05	10	62.0	25.30	-0.19
10/1/05 through 3/31/06*	11	102	70	1.87
10/1/05 through 3/31/06*	9	74	19	0.45
4/1/06 through 9/30/06	12	66	16	-0.01
10/1/06 through 3/31/07	9	61	12	-0.26
4/1/07 through 9/30/07	10	63	18	-0.16
10/1/07 through 3/31/08	10	64	16	-0.13
4/1/08 through 9/30/08	10	65	16	-0.05

*Period statistics with and without two extreme results included.

TABLE 24

1007 Foam Stability @ 1 min., ml	n	Mean	s	
Initial Round Robin Study	28	0.00	0.00	
10/1/04 through 3/31/05	12	No non-zero occurrences		
4/1/05 through 9/30/05	10	No non-zero occurrences		
10/1/05 through 3/31/06	11	No non-zero occurrences		
4/1/06 through 9/30/06	12	No non-zero occurrences		
10/1/06 through 3/31/07	9	No non-zero occurrences		
4/1/07 through 9/30/07	10	No non-zero occurrences		
10/1/07 through 3/31/08	10	No non-zero occurrences		
4/1/08 through 9/30/08	10	No non-zero occurrences		

Table 25 shows the current 1007 severity for the monitored result parameter for each lab for all operationally valid tests reported for the report period.

TABLE 25
TMC 1007

	n	Foam Tendency Mean Δ/s
Lab A	2	-0.58
Lab B	4	-0.18
Lab G	2	-0.32
Lab I	2	1.00

D6082: High Temperature Foaming Characteristics of Lubricating Oils, continued

INDUSTRY PERFORMANCE

The D6082 Foam Tendency precision (s) on TMC oil 1007 is the same as last report period and is more precise than the target precision. Overall performance is on-target (slight mild bias). There were no non-zero occurrences of Foam Stability on 1007 suggesting Foam Stability precision is as expected. Foam Tendency severity is graphically represented in Figure 6.

All operationally valid discrimination tests reported this period meet the acceptance criteria (that is, all reporting labs could discriminate oil 66 as a GF-4/SM failing oil for Foam Tendency).

TMC MEMORANDA

There were no TMC technical memos issued this report period for the D6082 test method.

D874 Sulfated Ash from Lubricating Oils and Additives

On June 18, 2007, D02.B0.07 gave the approval for TMC monitoring of D874 to commence per the request of the Heavy Duty Classification Panel. The current TMC reference oils are 90, 91 and 830-2.

MONITORED TESTING STATUS

Table 26 summarizes the reference tests reported to the TMC this period (3 labs reporting):

TABLE 26
Reference Tests

	No. of Tests
Statistically Acceptable and Operationally Valid	6
Operationally Valid but Failed Acceptance Criteria	0
Operationally Invalid (initially reported as)	0
Operationally Invalid (after informed of failing calibration)	0
Total	**6**

Fail Rate of Operationally Valid Tests: 0.0%

Table 27 is a breakdown of the statistically unacceptable tests.

TABLE 27

Reason for Fail	No. of Tests
Sulfated Ash Mild	0
Sulfated Ash Severe	0

PRECISION AND SEVERITY

Table 28 shows the current Industry precision and severity for the Sulfated Ash Mass % test parameter for all operationally valid tests for the report period. (First calibration test completed 7/27/07.)

TABLE 28

Gelation Index	n	df	Pooled s	Mean Δ/s
Initial Round Robin Targets	81	79	0.07	-----
4/1/07 through 9/30/07	2	1	0.01	-0.50
10/1/07 through 3/31/08	5	2	0.11	-0.41
4/1/08 through 9/30/08	6	3	0.04	-0.62

Table 29 shows the current severity for Sulfated Ash Mass % for each lab for all operationally valid tests for the report period.

TABLE 29

	n	Mean Δ/s
Lab A	2	-0.81
Lab B	2	0.04
Lab G	2	-1.08

D874 Sulfated Ash from Lubricating Oils and Additives, continued

INDUSTRY PERFORMANCE

D874 testing is directionally more precise than the target precision and performance is mild of targets. Severity is graphically represented in Figure 7.

D6922 Determination of Homogeneity and Miscibility in Automotive Engine Oils

The TMC distributes six reference oils for D6922 testing. The TMC does not collect data or monitor any test results for this test at this time.

ROBO (Romaszewski Oil Bench Oxidation Test; Sequence IIIGA Replacement Test)

The first surveillance panel teleconference was held on March 29, 2007 where the panel organization was conducted and improvements to the test method draft were discussed. A number of regular panel teleconferences and meetings have followed, with quite a bit of progress toward a TMC monitored test. A test method is written, edited and has been approved by the surveillance panel. A robust blind round-robin has been conducted, providing precision estimates for the test method as well as data for the selection of reference oils. As of this writing, the specifics of a TMC monitoring system are under discussion, and a reporting packet, including a data dictionary is well under development. A TMC monitored ROBO test with TMC calibrated rigs appears to be close-at-hand.

REFERENCE OIL SUPPLIES

There is adequate supply of B0.07 Bench Test reference oils on hand at the TMC. Tables 30A – 30C list the bench test reference oils currently on hand at the TMC.

Table 30A
Current Reference Oils

Oil	For Tests	Quantity Left (gallons)	Quantity Used Last 12 Months (gallons)
52	D6417, D5800	65.7	0.9
55	D6417, D5800	70.7	0.8
58	D6417, D5800, GI	122.0	0.9
62	GI	1.3	0.1
66	D6082 (Discrimination)	97.4	0.8
71	TEOST	1.2	1.3
71-1	TEOST	2.0	0.0
72	TEOST	1.3	1.4
72-1	TEOST	2.0	0.0
74	MTEOS	0.6	0.2
90	D874 & D874 Daily Check	47.2	2.1
91	D874	4.7	0.1
**432	MTEOS	Adequate	-----
**434	MTEOS	Adequate	-----
**820-2	D874	Adequate	-----
*1007	D6082	Est. 20	-----
**1009	GI	Adequate	-----

*One drum of oil is set aside for bench calibration testing; the TMC has a larger supply of this oil.
**Five gallon aliquot set aside for bench testing; hard to get an inventory reading on amount set aside.

REFERENCE OIL SUPPLIES, continued

Table 30B
Obsolete or Test Development Reference Oils

Oil	For Tests	Quantity Left (gallons)	Quantity Used Last 12 Months (gallons)
^51	Obsolete Vol. & GI	94.6	0.0
^53	Obsolete Vol. & GI	96.8	0.0
^54	Obsolete Volatility	97.8	0.0
^57	Old Volatility Candidate	51.2	0.0
^83	ROBO (RR)	47.4	2.6
^84	ROBO (RR)	3.3	1.7
^85	ROBO (RR)	3.3	1.7
^**433	Obsolete MTEOS	Adequate	-----
^**434	ROBO (RR)	??	-----
^**435	ROBO (RR)	??	-----
^**438	ROBO (RR)	??	-----

^Not selected as reference oil; TMC holding for further instructions from Surveillance Panel.
**Five gallon aliquot set aside for bench testing; hard to get an inventory reading on amount set aside.

REFERENCE OIL SUPPLIES, continued

Table 30C
Homogeneity and Miscibility Reference Oils

Oil	For Tests	Quantity Left (gallons)	Quantity Used Last 12 Months (gallons)
HMA	H&M (D6922)	187.2	3.75
HMB	H&M (D6922)	191.2	3.75
HMC	H&M (D6922)	177.2	3.75
HMD	H&M (D6922)	185.2	3.75
HME	H&M (D6922)	170.2	3.75
HMF	H&M (D6922)	193.0	3.75

Shipping aliquots are:

D6417	1 ml
D5480	4 ml
D5800	100 ml
GI	25 ml
MTEOS	17 ml
TEOST	125 ml
D6082	525 ml
D874	32 ml
ROBO	300 ml
H&M	950 ml

MISCELLANEOUS

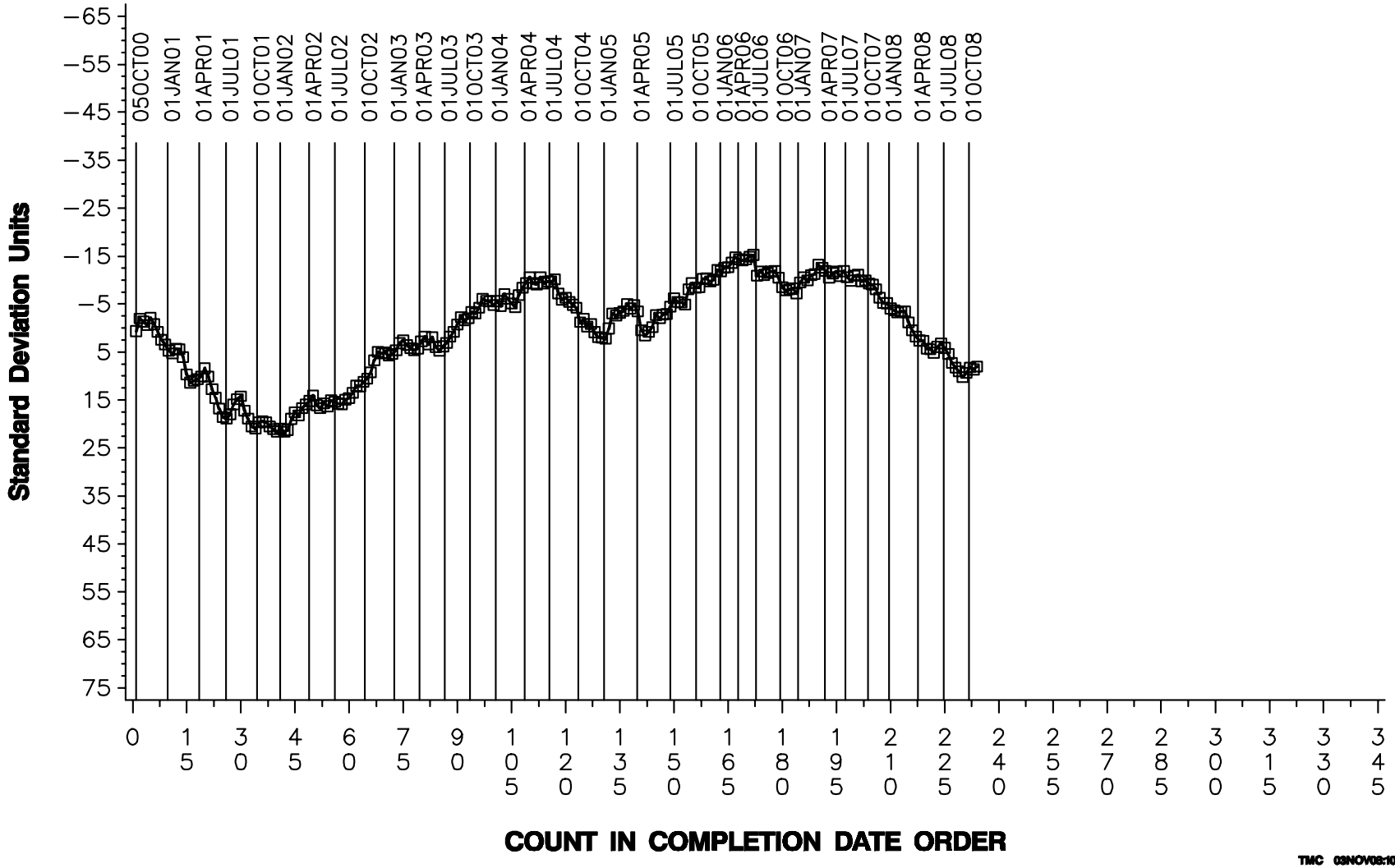
The TMC posts monitored bench test calibration data on the Internet. Selected parameters from all operationally valid reference tests are posted on the TMC's World-Wide-Web page in real time. Lab identifications are coded on the TMC's web site as they are on the previous pages of this report. Also posted are statistics, CUSUM plots, reporting forms, flatfile templates, data dictionaries and data from various round-robin matrix programs. The TMC encourages all interested parties to access and download the data, statistics and plots for individual studies and analyses. Likewise, you are encouraged to access the web site to download the most recent test reporting formats and data dictionaries. The TMC's web site address is www.astmtmc.cmu.edu.

All currently monitored bench test data dictionaries and report form packages have been beta tested by the ASTM Data Communications Committee (DCC) and approved for electronic data transfer. Please contact Tom Schofield at (412) 365-1011 for more information.

D6417 VOLATILITY BY GC INDUSTRY OPERATIONALLY VALID DATA

SAMPLE AREA % VOLATIZED @ 371'C ... 700'F

CUSUM Severity Analysis

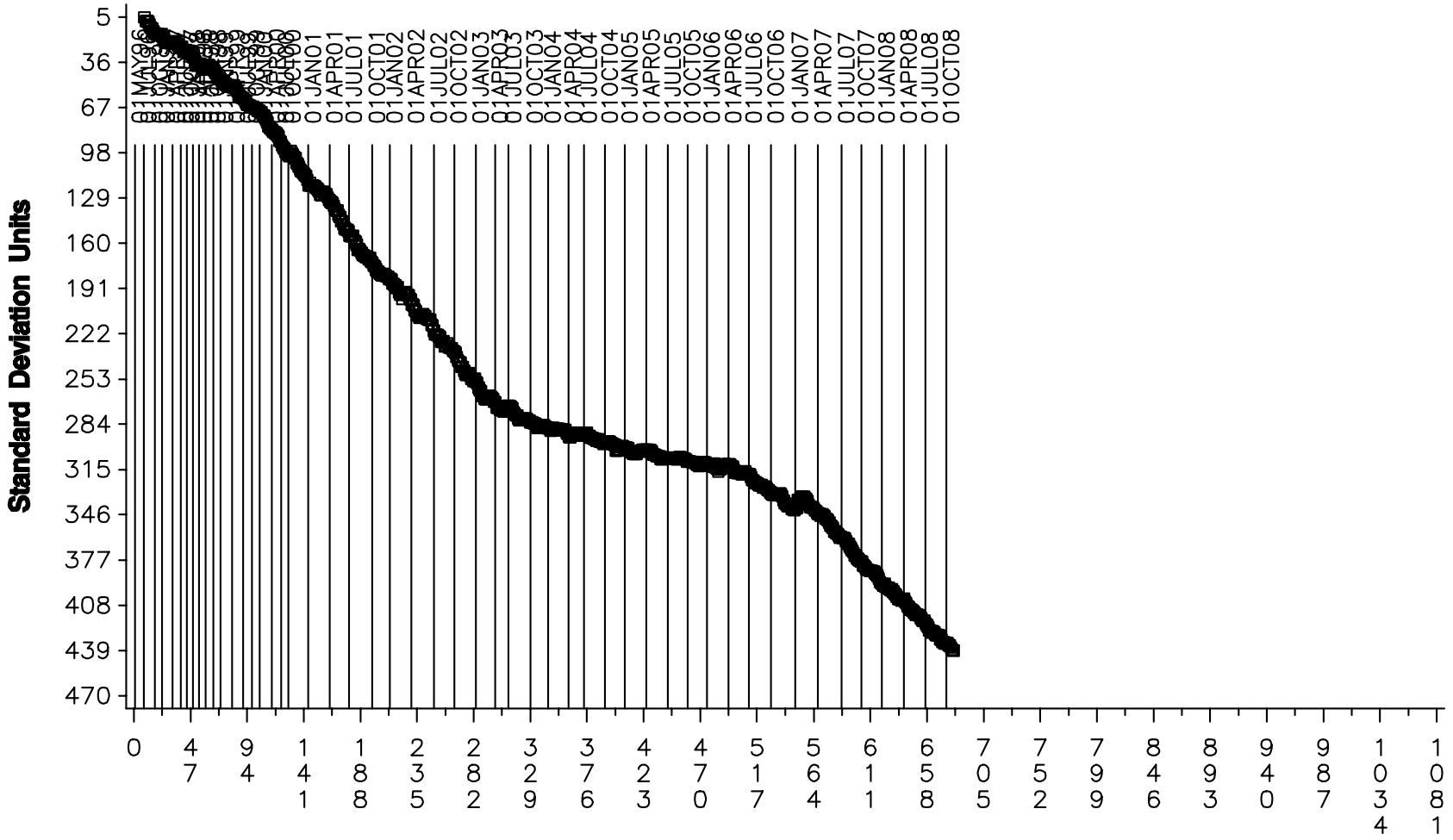


TMC 03NOV08:10:04

D5800 VOLATILITY BY NOACK INDUSTRY OPERATIONALLY VALID DATA

TEST OIL SAMPLE EVAPORATION LOSS,MASS%

CUSUM Severity Analysis



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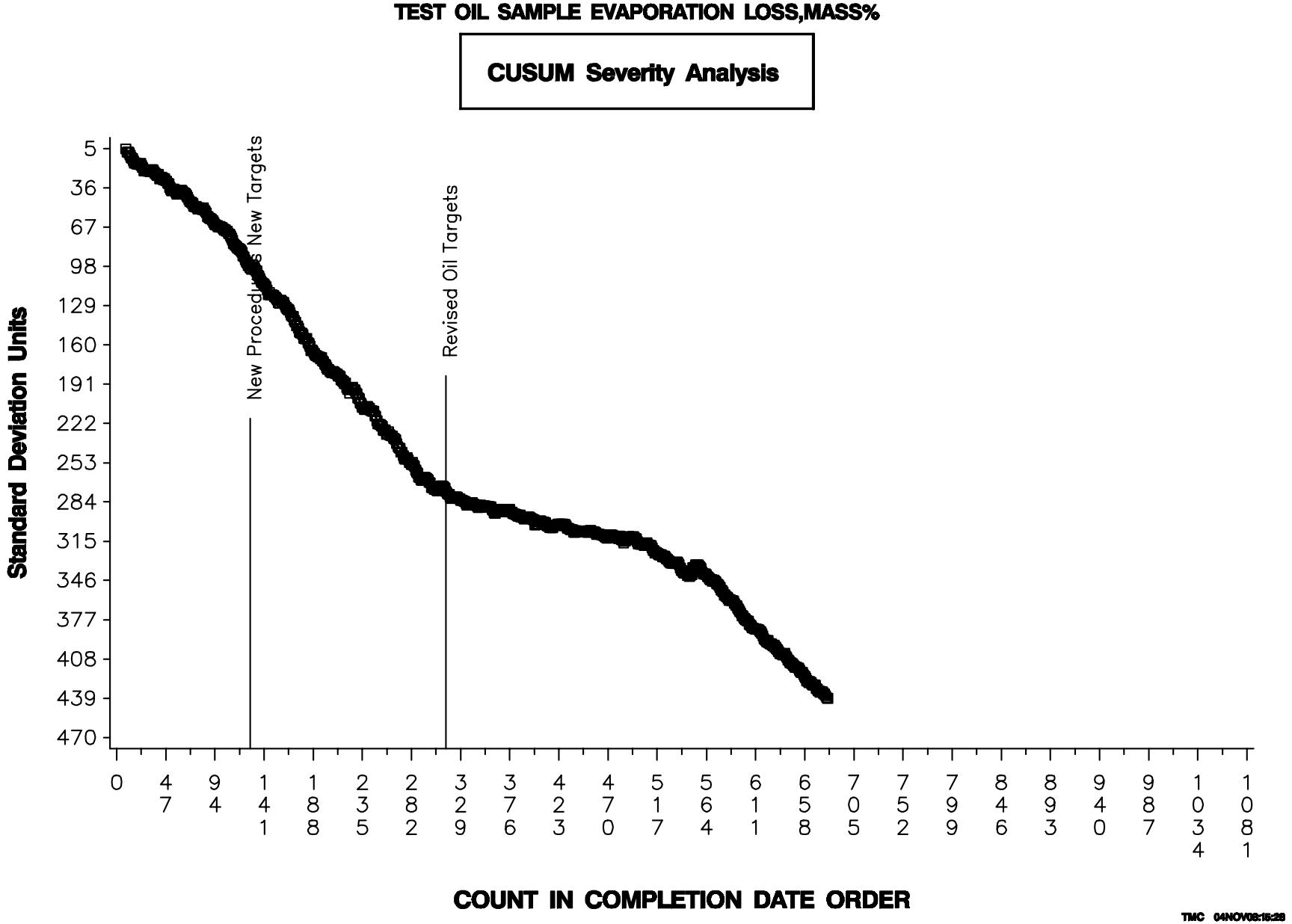
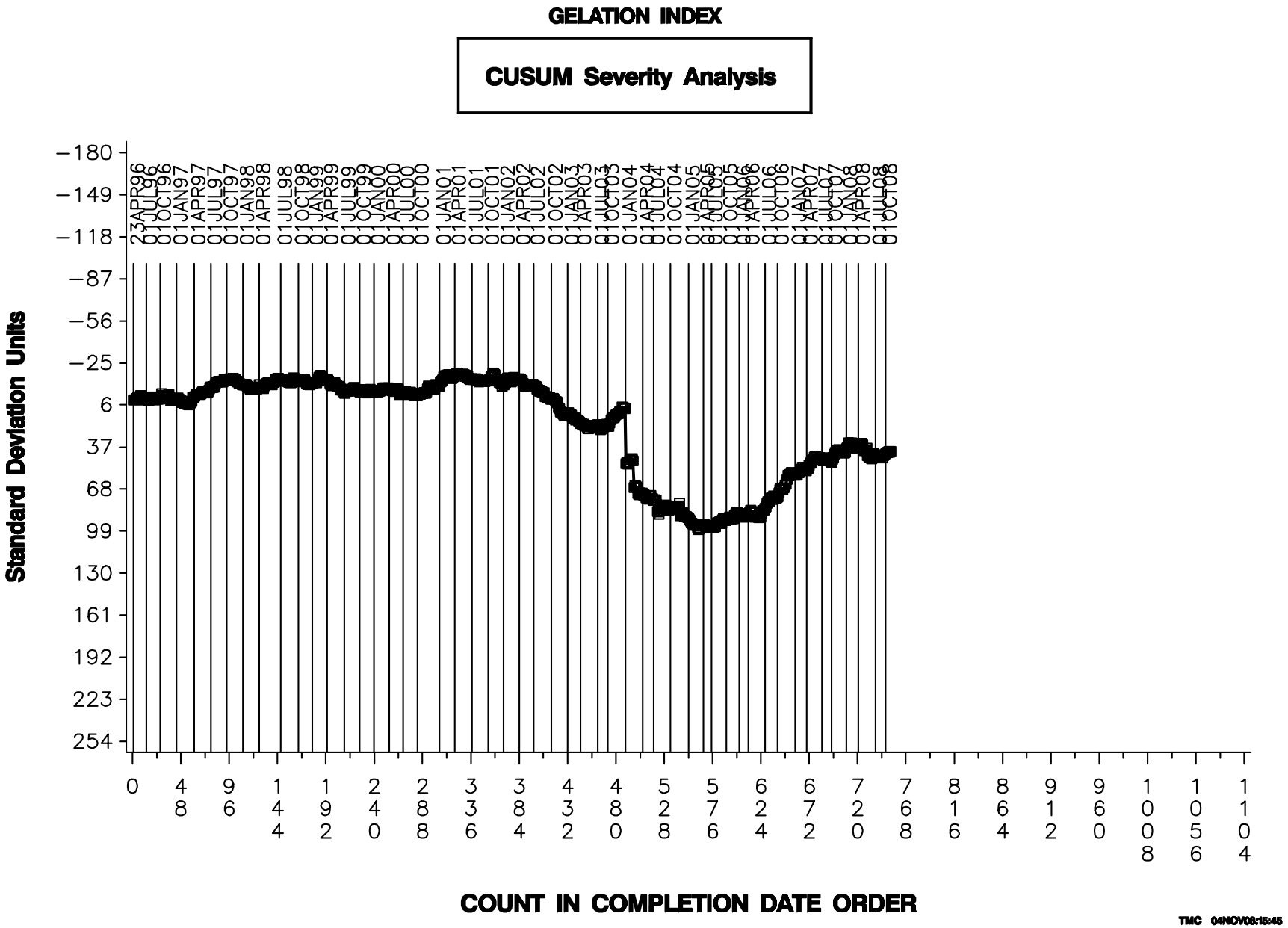
D5800 VOLATILITY BY NOACK INDUSTRY OPERATIONALLY VALID DATA



D5133 GELATION INDEX INDUSTRY OPERATIONALLY VALID DATA



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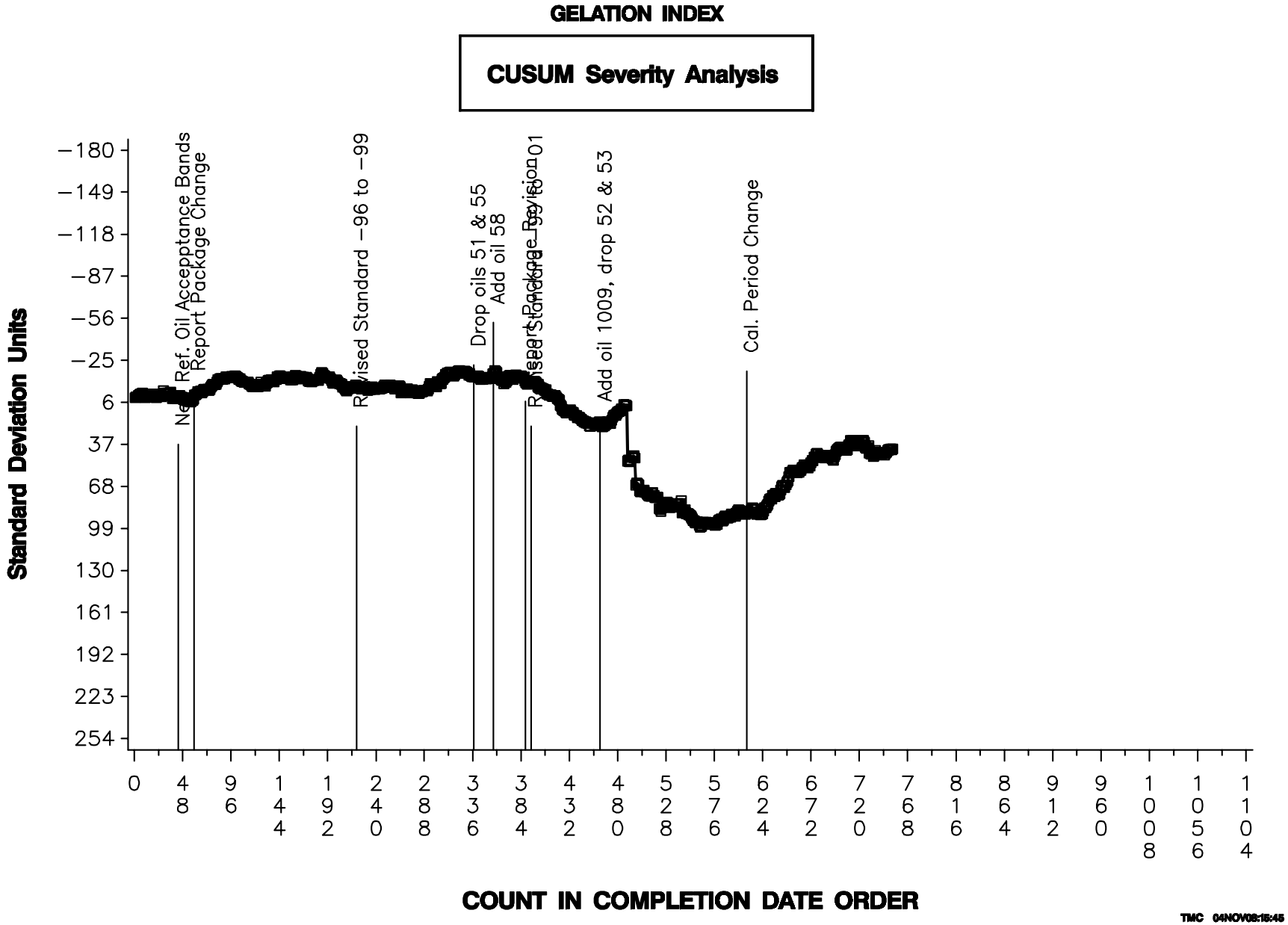
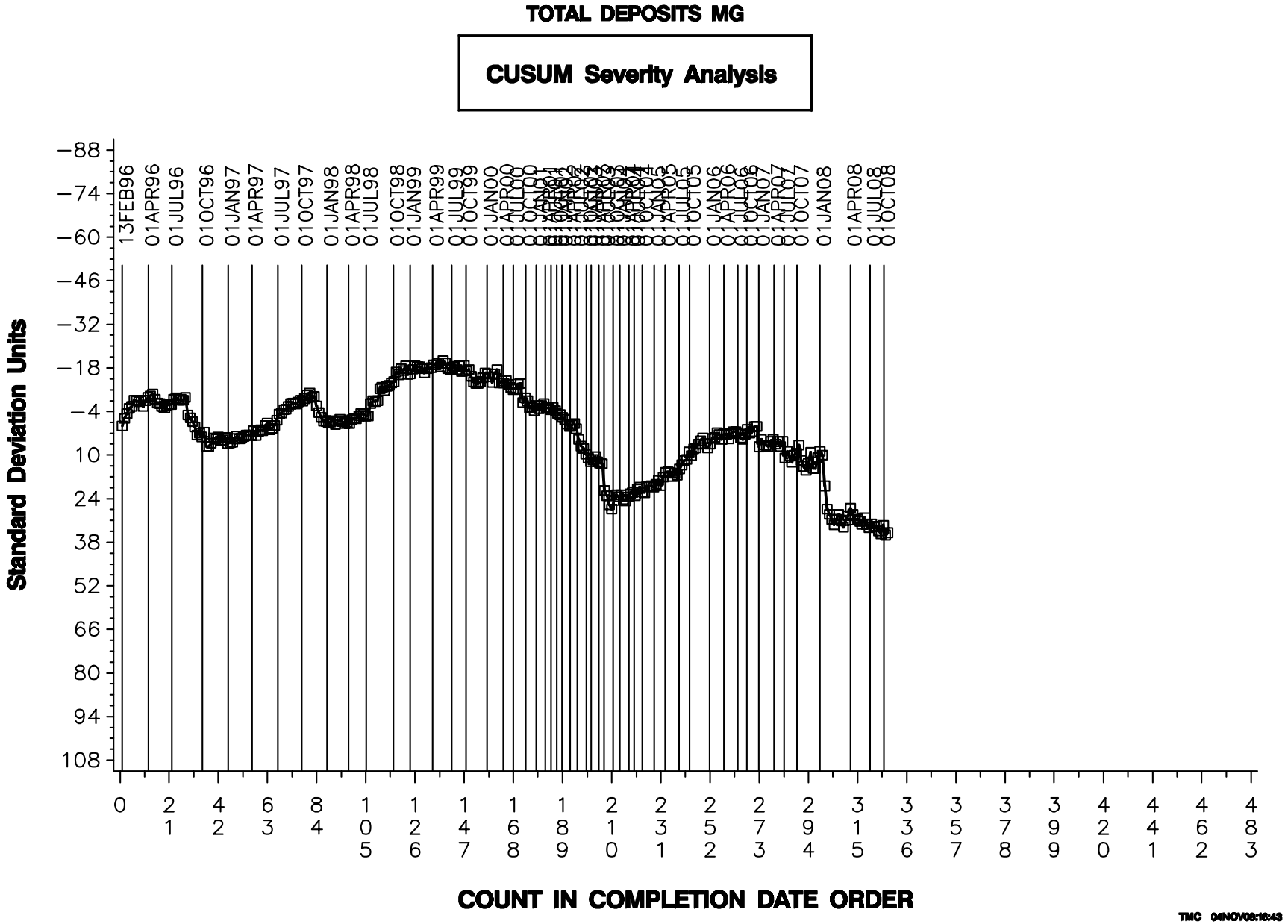
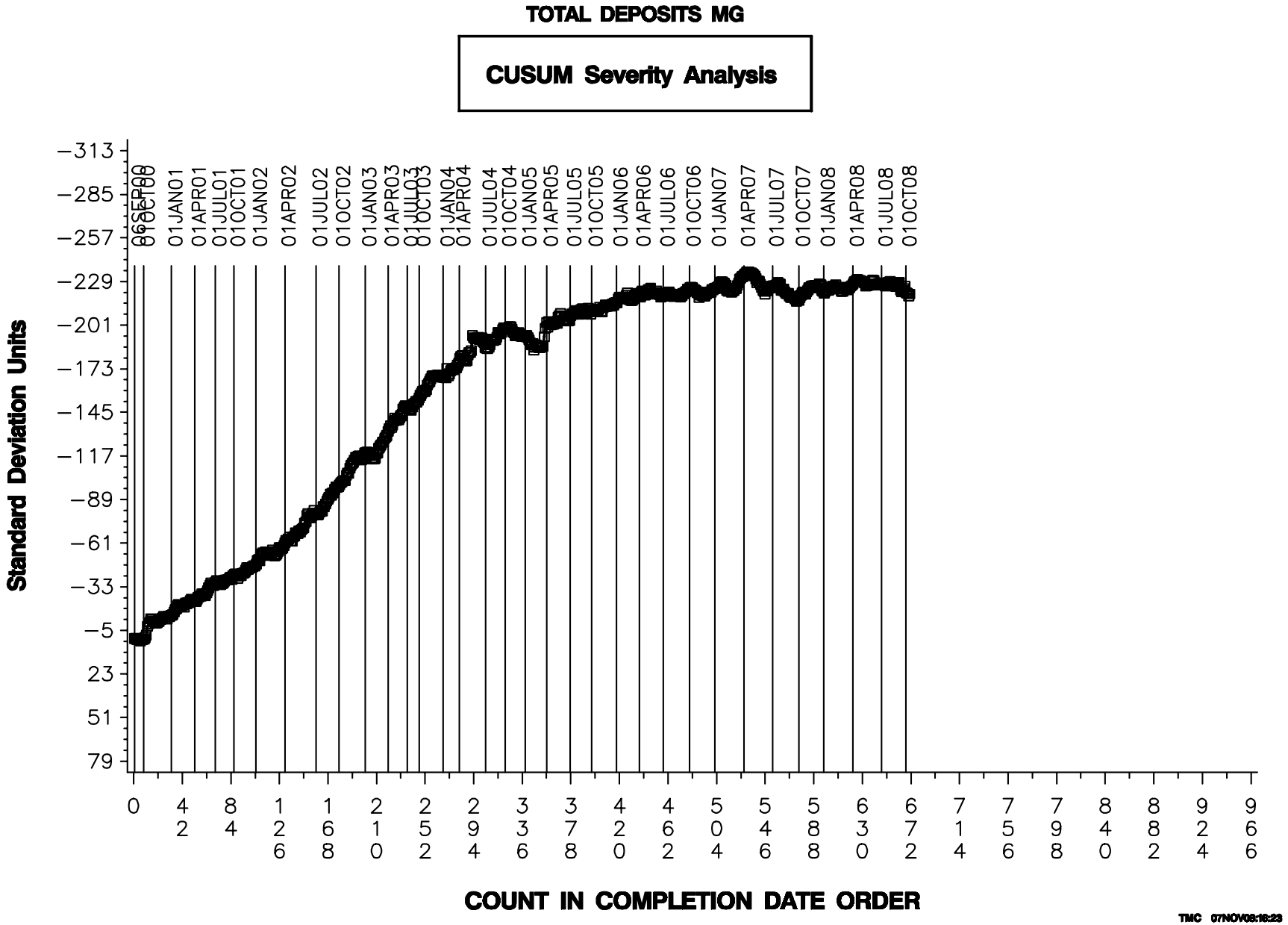
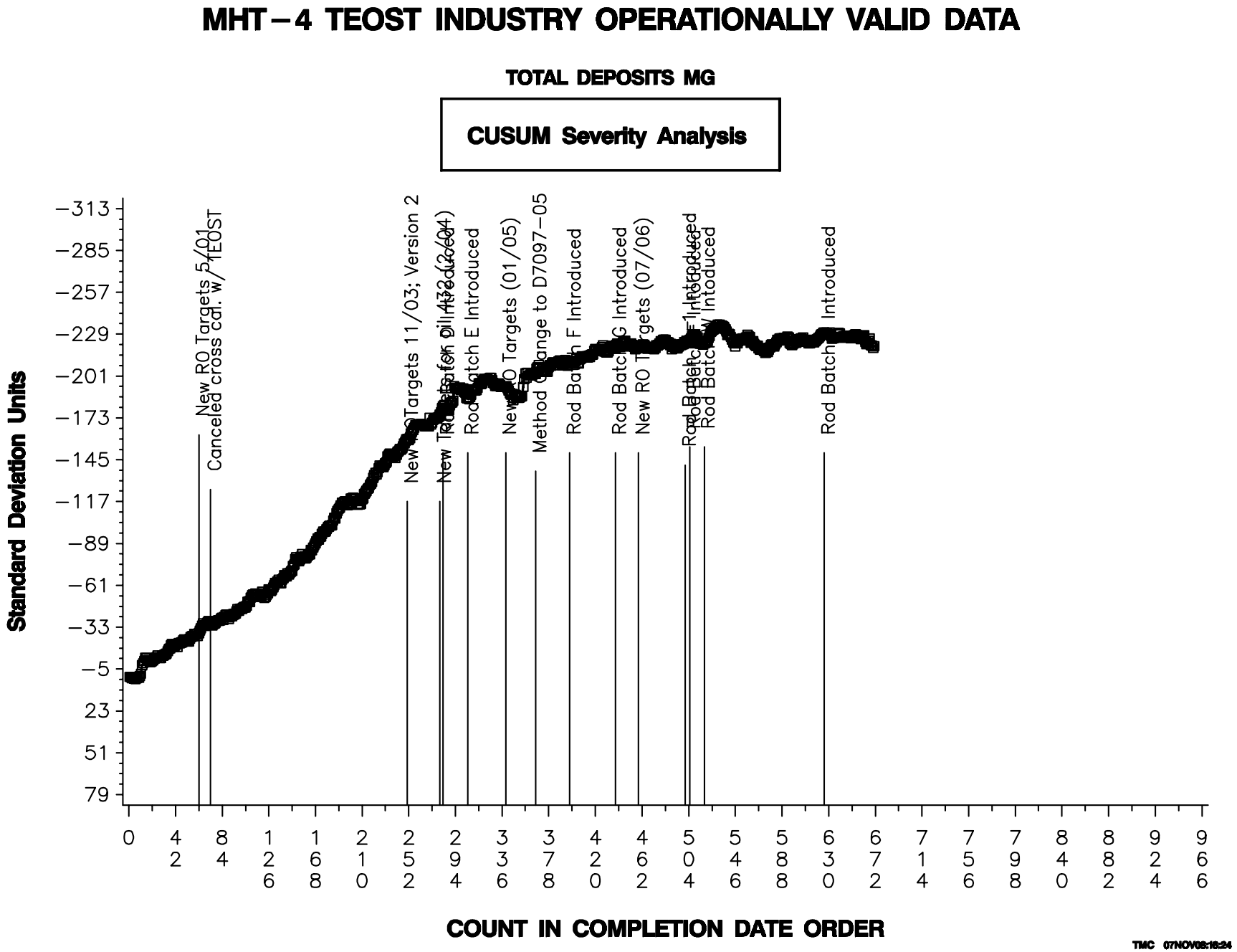


TEOST – 33C INDUSTRY OPERATIONALLY VALID DATA



MHT−4 TEOST INDUSTRY OPERATIONALLY VALID DATA



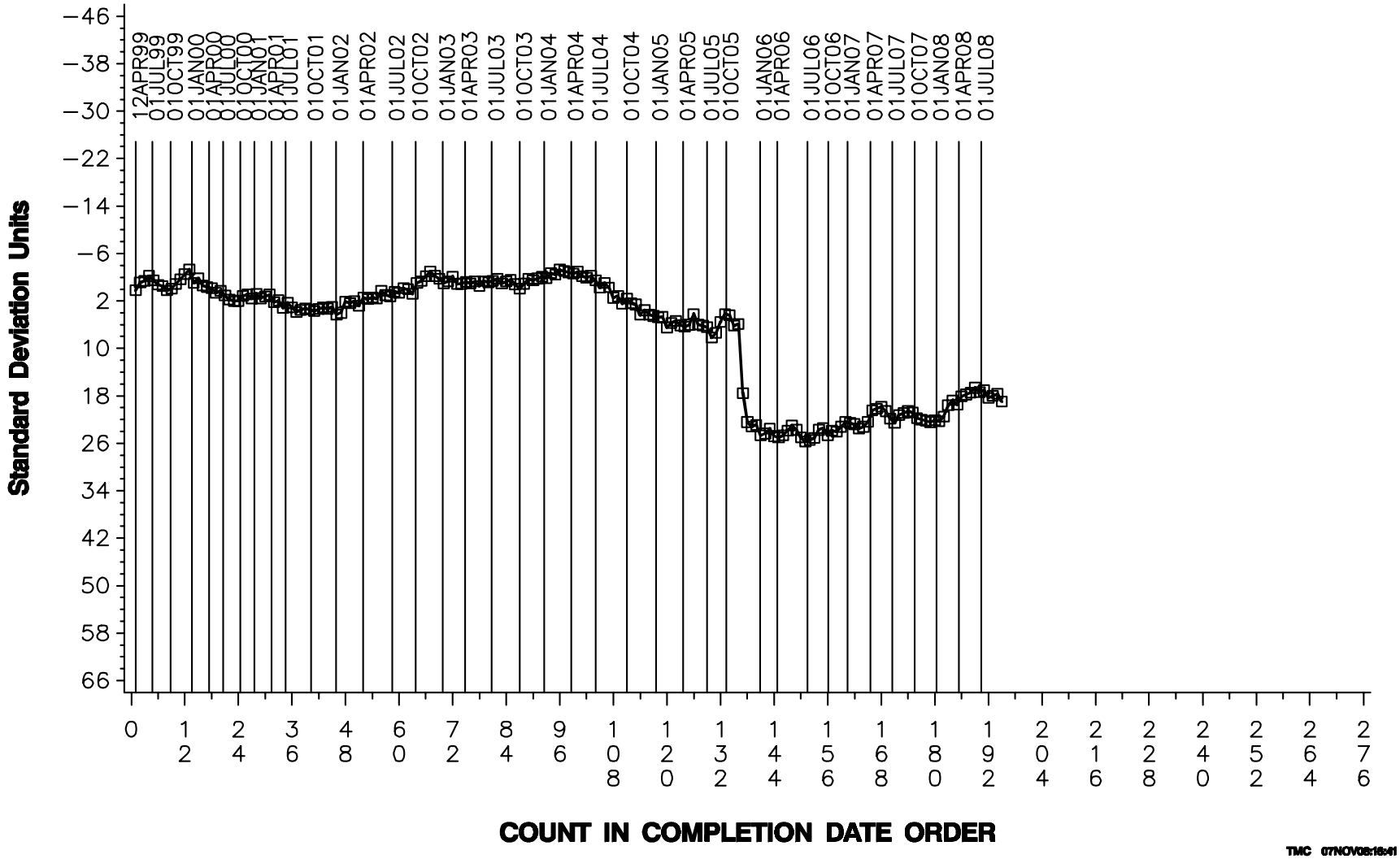

MHT−4 TEOST INDUSTRY OPERATIONALLY VALID DATA
TOTAL DEPOSITS MG
CUSUM Severity Analysis
Standard Deviation Units
−313
−285
−257
−229
−201
−173
−145
−117
−89
−61
−33
−5
23
51
79
New RO Targets 5/01
Canceled cross cal. w/TEOST
New RO Targets 11/03; Version 2
Rod Batch E Introduced
New RO Targets (01/05)
Method Change to D7097−05
Rod Batch F Introduced
Rod Batch G Introduced
New RO Targets (07/06)
Rod Batch Introduced
Rod Batch Introduced
Rod Batch Introduced
0 42 84 126 168 210 252 294 336 378 420 462 504 546 588 630 672 714 756 798 840 882 924 966
COUNT IN COMPLETION DATE ORDER
TMC 07NOV08:10:24

D6082 HIGH TEMPERATURE FOAM INDUSTRY OPERATIONALLY VALID DATA

IND=1007

FOAM TENDENCY, IMMEDIATELY BEFORE DISCONNECT STATI

CUSUM Severity Analysis



TMC 07NOV08:16:41

D874 INDUSTRY OPERATIONALLY VALID DATA

TEST SAMPLE PERCENT SULFATED ASH [<]

CUSUM Severity Analysis

TMC Monitored Bench Tests
Reference Oil Test Targets and Acceptance Bands

						Acceptance Bands *	
						95%	
Test	**Oil Code**	**Parameter**	**n**	**Mean**	**sR**	**Lower**	**Upper**
D6417	52	area % volatility loss	18	6.97	0.31	6.4	7.6
	55	area % volatility loss	18	11.68	0.51	10.7	12.7
	58	area % volatility loss	18	5.61	0.30	5.0	6.2
D5800	52	mass % volatility loss	33	13.75	0.61	12.6	14.9
New Targets	55	mass % volatility loss	32	17.09	0.76	15.6	18.6
7/21/2003	58	mass % volatility loss	37	15.20	0.72	13.8	16.6
TEOST by	71	Total Deposit wt. (mg)	27	51.79	4.79	42.4	61.2
D6335	72	Total Deposit wt. (mg)	27	26.72	3.46	19.9	33.5
MTEOS by	74	Total Deposit wt. (mg)	30	12.85	5.59	1.9	23.8
D7097	432	Total Deposit wt. (mg)	30	47.04	4.50	38.2	55.9
New Targets	434	Total Deposit wt. (mg)	30	27.37	6.57	14.5	40.2
20060731							
GI by	58	Gelation Index	17	5.8	0.69	4.4	7.2
D5133	62	Gelation Index	35	17.0	3.90	9.4	24.6
New Targets	1009	Gelation Index	16	7.3	0.68	6.0	8.6
7/15/2003							
D6082	1007	Tendency (ml)	28	66	19	29	103
(HT FOAM)	1007	Stability (ml)	28	0	0	0	0
D6082	66 (DISCRIM)	Tendency (ml)	--	-----	-----	>100	-----
(HT FOAM)	66 (DISCRIM)	Stability (ml)	--	-----	-----	0	0
D874	90	mass % Sulfated Ash	27	1.07	0.08	0.91	1.23
	91	mass % Sulfated Ash	27	0.82	0.05	0.72	0.92
	820-2	mass % Sulfated Ash	27	1.57	0.08	1.40	1.73

TMC Monitored Bench Tests – Individual Reference Oil Statistics
(Operationally Valid Tests Only)

Test	Oil Code	Parameter	Targets			4/1/07 - 9/30/07				10/1/07 - 3/31/08				4/1/08 - 9/30/08			
			n	Mean	sR	n	Mean	sR	Mean Δ/s	n	Mean	sR	Mean Δ/s	n	Mean	sR	Mean Δ/s
D6417	52	Area % Volatized	18	6.97	0.31	5	7.1	0.31	0.48	4	7.1	0.13	0.50	4	6.9	0.28	-0.31
	55	Area % Volatized	18	11.68	0.51	3	12.0	0.35	0.56	4	12.0	0.44	0.73	6	12.0	0.46	0.66
	58	Area % Volatized	18	5.61	0.30	4	5.5	0.28	-0.37	6	6.0	0.24	1.13	4	6.0	0.10	1.22
D5800	52	% volatility loss	33	13.75	0.61	12	14.3	0.45	0.94	12	14.6	0.46	1.37	12	14.6	0.43	1.35
**	55	% volatility loss	32	17.09	0.76	13	18.0	0.51	1.24	10	17.6	0.58	0.72	12	17.6	0.73	0.68
	58	% volatility loss	37	15.20	0.72	11	15.6	0.52	0.53	12	15.3	0.46	0.15	12	15.5	0.39	0.44
TEOST	71	Deposit wt. (mg)	27	51.79	4.79	4	50.6	10.89	-0.24	11	44.5	8.01	-1.53	8	49.6	9.06	-0.45
(D6335)	72	Deposit wt. (mg)	27	26.72	3.46	6	29.8	8.72	0.88	11	38.4	11.04	3.37	7	30.0	3.19	0.94
MTEOS	432	Deposit wt. (mg)	30	47.04	4.50	20	48.7	5.87	0.38	13	46.7	5.31	-0.08	19	49.1	7.34	0.47
(D7097)	434	Deposit wt. (mg)	30	27.37	6.57	14	30.4	10.59	0.46	21	26.6	9.21	-0.12	10	24.5	6.52	-0.44
***	74	Deposit wt. (mg)	30	12.85	5.59	14	13.4	6.45	0.09	12	10.1	5.42	-0.49	17	11.5	3.90	-0.24
GI	58	Gelation Index	17	5.8	0.69	9	6.2	0.75	0.64	7	6.3	0.65	0.72	10	6.5	1.39	1.00
(D5133)	62	Gelation Index	35	17.0	3.90	8	13.2	5.71	-0.96	10	13.5	6.54	-0.89	9	16.2	5.85	-0.22
****	1009	Gelation Index	16	7.30	0.68	7	6.8	0.67	-0.69	9	7.0	0.75	-0.47	8	7.0	1.17	-0.39
D6082	1007	Tendency (ml)	28	65	19	10	63	18	-0.16	10	64	16	-0.13	10	65	16	-0.05
D874	820-2	Sulfated Ash m%	--	--	--	--	--	--	--	2	1.52	0.02	-0.56	2	1.54	0.02	-0.31
	90	Sulfated Ash m%	--	--	--	2	0.80	0.01	-0.50	2	1.02	0.15	-0.56	2	1.00	0.02	-0.94
	91	Sulfated Ash m%	--	--	--	--	--	--	--	1	0.83	--	0.20	2	0.79	0.06	-0.60

**D5800 Targets Adjusted 10/2/00; new oils selected; new procedures approved; targets adjusted again 7/21/03
***MTEOS Targets Adjusted: 6/1/01 (matrix); 11/1/03 (SC9 RR2); 2/18/04 (add 432); 1/12/05 (add 434, drop 433 & 1006); 6/30/05 (Batch E ref. data); 6/31/06 (updated ref. data n=30)
****GI: Added oil 1009 and dropped oils 52 & 53 10/15/03; added oil 58 10/24/01; dropped oils 51 & 55 7/2/01