



Test Monitoring Center

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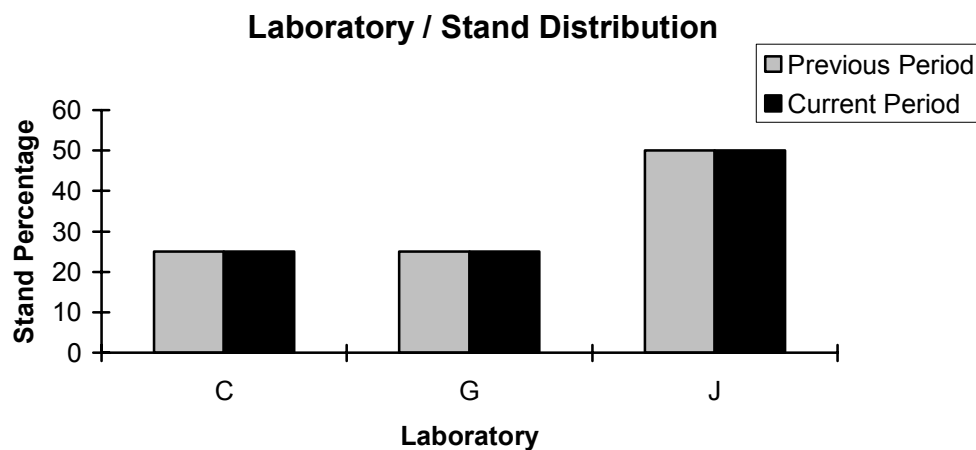
MEMORANDUM: 03-093
DATE: October 1, 2003
TO: Wim Van Dam, Chairman, Mack Test Surveillance Panel
FROM: Jeff Clark
SUBJECT: T-8 / T-8E Calibration Testing for the October 2003 ASTM Report Period

The following is a summary of T-8 / T-8E reference oil tests completed during the October 2003 ASTM report period, which began on April 1, 2003 and ended on September 30, 2003.

Lab / Stand Distribution:

	T-8 / T-8E Reporting Data	T-8 Calibrated as of 9/30/03	T-8E Calibrated as of 9/30/03
Number of Laboratories	3	3	3
Number of Stands	4	4	4

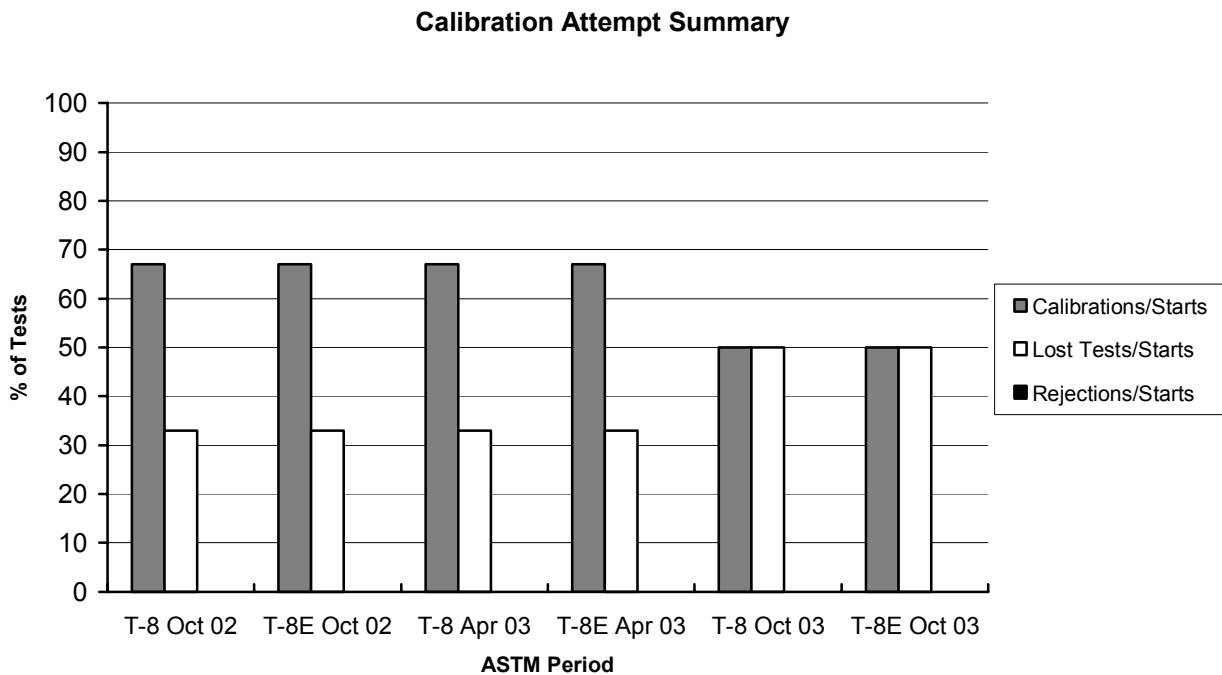
The figure below shows the T-8 / T-8E laboratory / stand distribution for tests completed this report period:



The table below summarizes the status of the reference oil tests reported to the TMC this ASTM report period:

Test Status	TMC Validity Code	Number of T-8 Tests	Number of T-8E Tests
Operationally and Statistically Acceptable	AC	4	4
Failed LTMS Acceptance Criteria	OC	0	0
Operationally Invalid, declared by lab	LC	1	1
Operationally Invalid, reported as valid	RC	1	1
Aborted	XC	2	2
Total		8	8

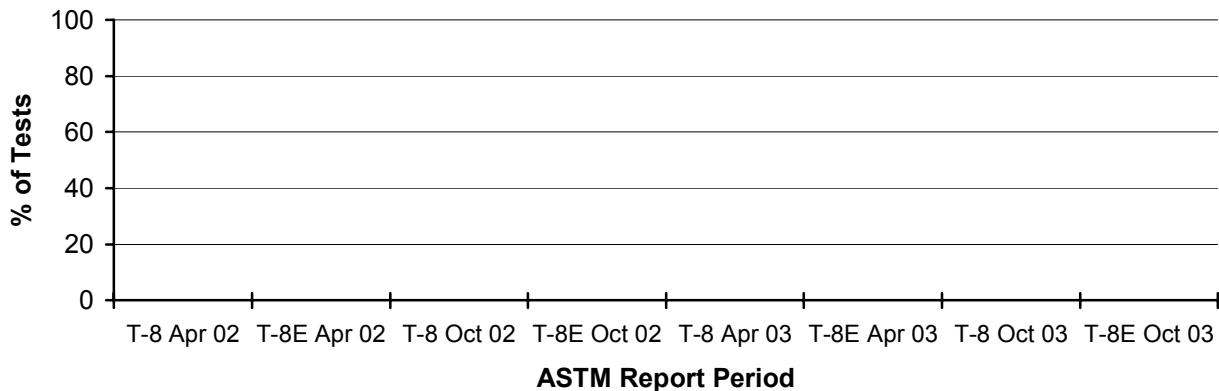
Calibrations per start, lost tests per start and rejections per start rates are summarized in the figure below:



The calibration per start, lost test per start, and the rejection per start rates this period show some slight degradation compared to previous periods. A detailed list of reasons tests failed the acceptance criteria is shown in Table 1. Table 2 lists the operationally invalid tests and Table 3 lists the aborted tests.

LTMS Acceptance Criteria / Stand Alarms:

The following figure shows the percentage of operationally valid tests that failed the LTMS acceptance criteria (TMC validity code = OC) for recent ASTM report periods:

Tests Failing LTMS Acceptance Criteria

There were no LTMS stand alarms for the current period. No LTMS deviations were issued this period. A total of two LTMS deviations have been issued during the history of the T-8 / T-8E.

Severity and Precision:

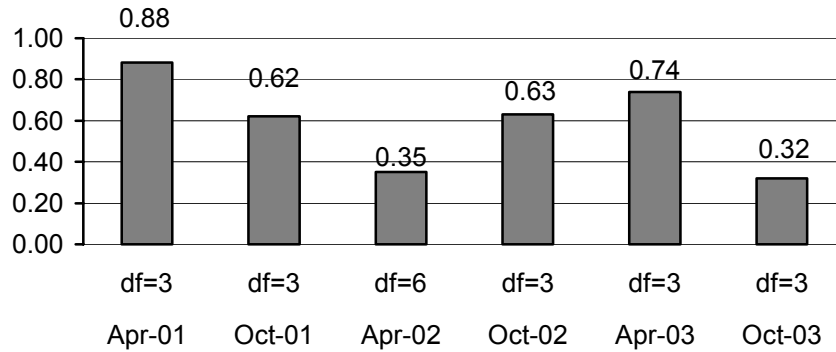
Figure 1 (attached) shows the current industry EWMA severity, EWMA precision, and cusum charts for Viscosity Increase at 3.8% TGA Soot (VI38). VI38 is currently in an industry warning alarm for EWMA severity, in the mild direction. For this period, VI38 is trending an average of 1.10 Δ/s mild. This is equivalent to 0.99 cSt. Figure 2 (attached) shows the industry charts for the most recent twenty-five tests. For a history of VI38 industry alarms, refer to the industry alarm log shown in Table 4.

Figure 3 (attached) shows the current industry EWMA severity, EWMA precision, and cusum charts for Relative Viscosity at 4.8% TGA Soot, 50% Din Shear Loss (RV48). RV48 is currently in control. For this period, RV48 is trending an average of 1.00 Δ/s mild. This is equivalent to 0.26 relative viscosity units. Figure 4 shows the industry charts for the most recent twenty-five tests. For a history of RV48 industry alarms, refer to the industry alarm log shown in Table 5.

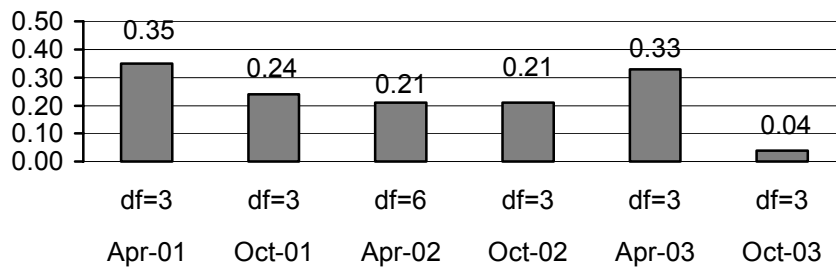
Figure 5 (attached) shows the current industry EWMA severity, EWMA precision, and cusum charts for Relative Viscosity at 4.8% TGA Soot, 100% Din Shear Loss (RV2). RV2 is currently in control. For this period, RV2 is trending an average of 0.79 Δ/s mild. This is equivalent to 0.17 relative viscosity units. Figure 6 shows the industry charts for the most recent twenty-five tests. For a history of RV2 industry alarms, refer to the industry alarm log shown in Table 6.

Precision, as estimated by the pooled standard deviation, is shown in the following figures. For comparison purposes, the TMC will continue to report precision by ASTM period.

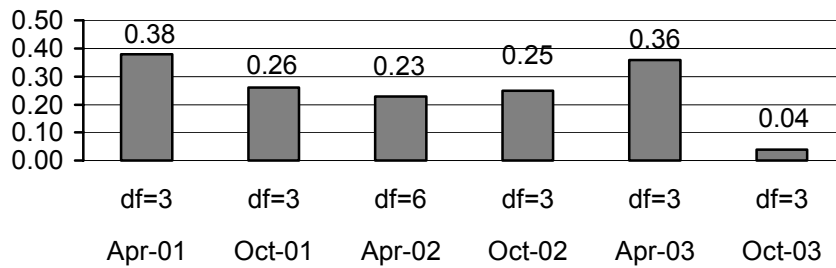
VI38 Pooled Precision



RV48 Pooled Precision



RV2 Pooled Precision



The October '03 precision estimates for all three parameters show improvement in comparison to recent periods. It is difficult to determine if the precision improvement is real or a byproduct of low-test activity. Please note, that the degrees of freedom (df) equals $\Sigma(n \text{ observations per oil} - 1)$.

Reference Oils:

The current T-8 / T-8E reference oil test targets are shown below:

Oil	n	Parameter	Mean (cSt)	s
1004-3	30	VI38	4.57	0.90
		RV48	2.07	0.26
		RV2	2.21	0.27

Information Letters:

No information letters were issued this report period.

TMC Laboratory Visits:

Two T-8 TMC laboratory visits were conducted this ASTM period. The table below summarizes the deficiencies that were noted.

Deficiency	Number of Labs
Coolant showing debris or discoloration	2
Instrumentation calibration ranges not bracketing operating range	2

Additional Information:

Figure 7 is a plot of TGA soot versus test hours for all operationally valid calibration tests on TMC oil 1004-3.

Table 7 contains the T-8 / T-8E Timeline which details changes to the test since January 1, 1993.

The T-8 / T-8E database, for operationally valid calibration tests, can be accessed on the TMC's homepage. If you have any questions on how to access this information, contact the TMC.

JAC/jac/mem03-093.jac.doc

Attachments

c: J.L. Zalar, TMC
 F.M. Farber, TMC
 Mack Surveillance Panel
<ftp://ftp.astmtmc.cmu.edu/docs/diesel/mack/semiannualreports/T8-10-2003.pdf>

Distribution: Email

Table 1
Summary of Reasons for Rejected Tests

	No. of T-8 Tests	No. of T-8E Tests
No rejected tests	-	-

Table 2
Summary of Reasons for Invalid Tests

	No. of T-8 Tests	No. of T-8E Tests
Severe oil pressure fluctuations (LC validity)	1	1
Missed soot window; originally declared valid (RC validity)	1	1

Table 3
Summary of Reasons for Aborted Tests

	No. of Tests
Projected to miss soot window	2

Figure 1

T-8/T-8E INDUSTRY OPERATIONALLY VALID DATA

VISCOSITY INCREASE AT 3.8% SOOT

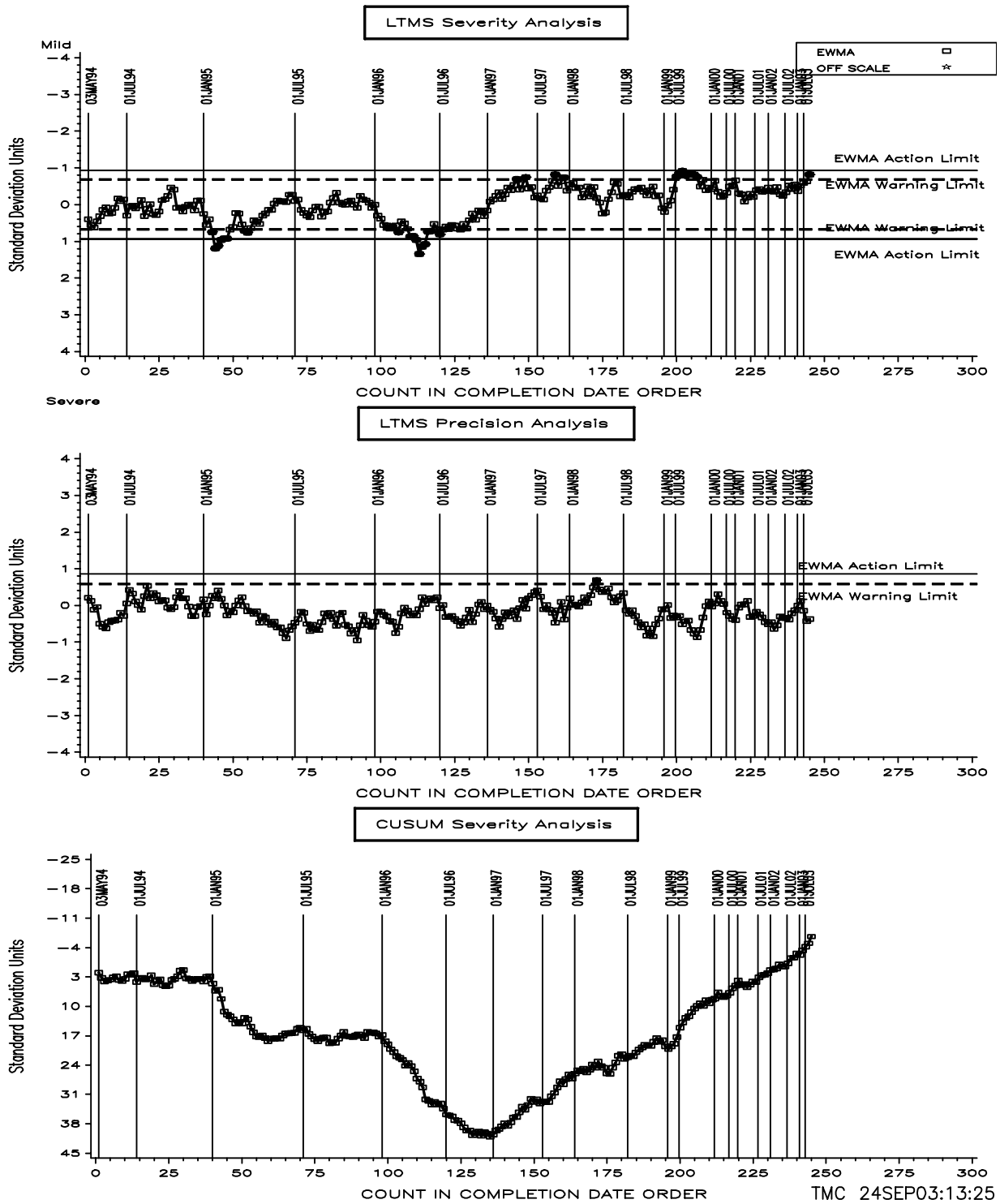


Figure 2

T-8/T-8E INDUSTRY OPERATIONALLY VALID DATA

VISCOSITY INCREASE AT 3.8% SOOT

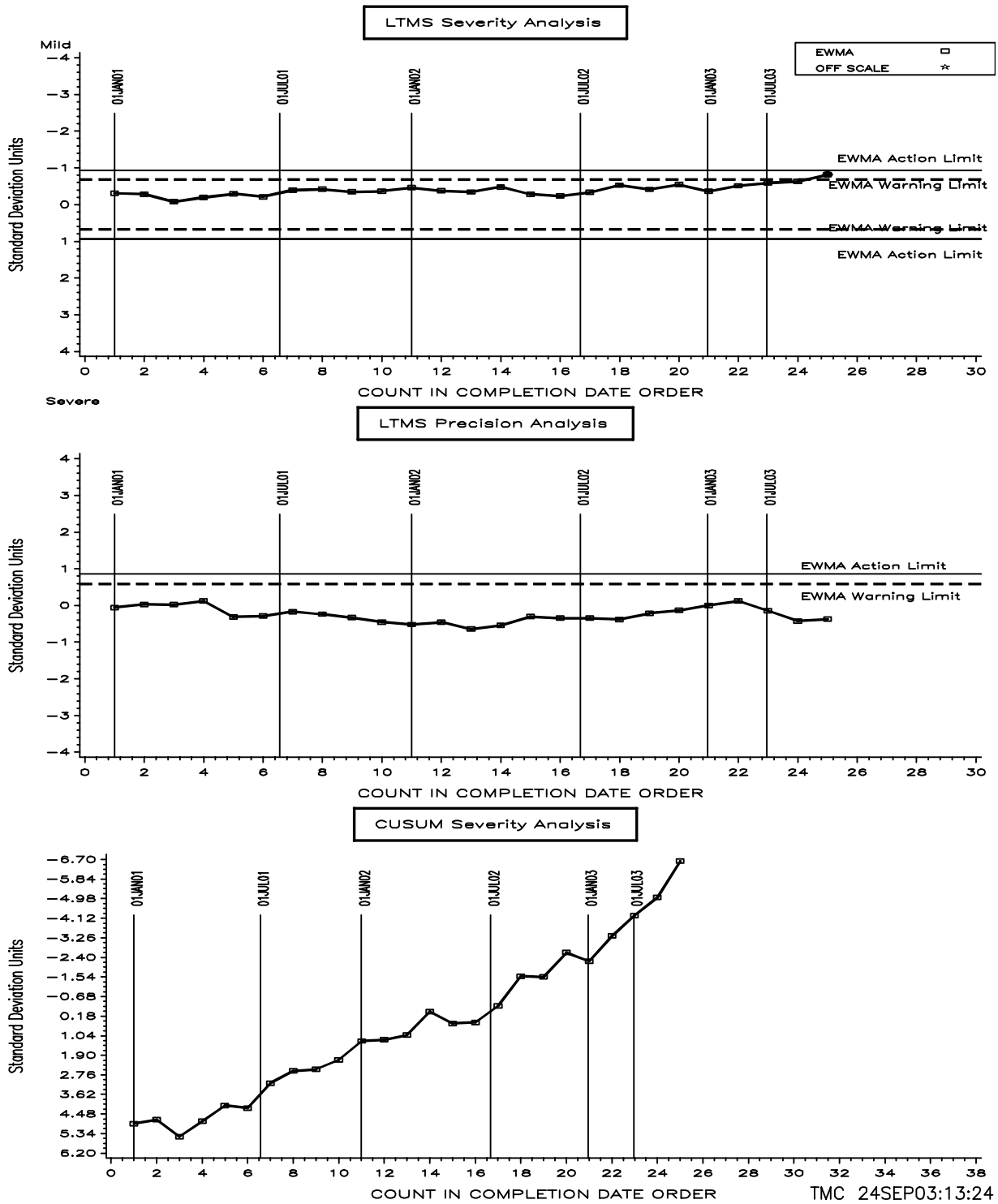


Table 4

T-8 / T-8E VISCOSITY INCREASE AT 3.8% SOOT INDUSTRY ALARM LOG

January 21, 1995 to March 14, 1995 (Severity, Severe direction)

Surveillance investigated effects of fuel batches at April and June 1995 meetings. No cause was identified.

February 3, 1996 to October 25, 1996 (Severity, Severe direction)

Surveillance investigated alarms at June and September 1996 meetings. Alarms believed to be caused by the test trending mild on soot. Concerned that existing test targets did not represent true test performance, the Surveillance Panel adopted new targets on September 5, 1996. Alarms cleared on October 25, 1996.

May 6, 1997 to June 4, 1997 (Severity, Mild direction)

Industry mild trend believed to be caused by one laboratory's data.

August 17, 1997 to November 28, 1997 (Severity, Mild direction)

Industry mild trend believed to be caused by one laboratory's data.

March 23, 1998 to March 24, 1998 (Precision)

A one-test excursion occurs. No industry related problem.

September 1, 1999 to November 25, 1999 (Severity, Mild direction)

A series of mild tests triggered an industry warning. No causes were identified and the Surveillance Panel took no action.

September 21, 2003 to Data (Severity, Mild direction)

A one-test excursion has occurred. No indication yet if this is a true industry alarm.

Updated 9/24/03

Figure 3

T-8/T-8E INDUSTRY OPERATIONALLY VALID DATA
RELATIVE VISCOSITY AT 4.8% (50% LOSS)

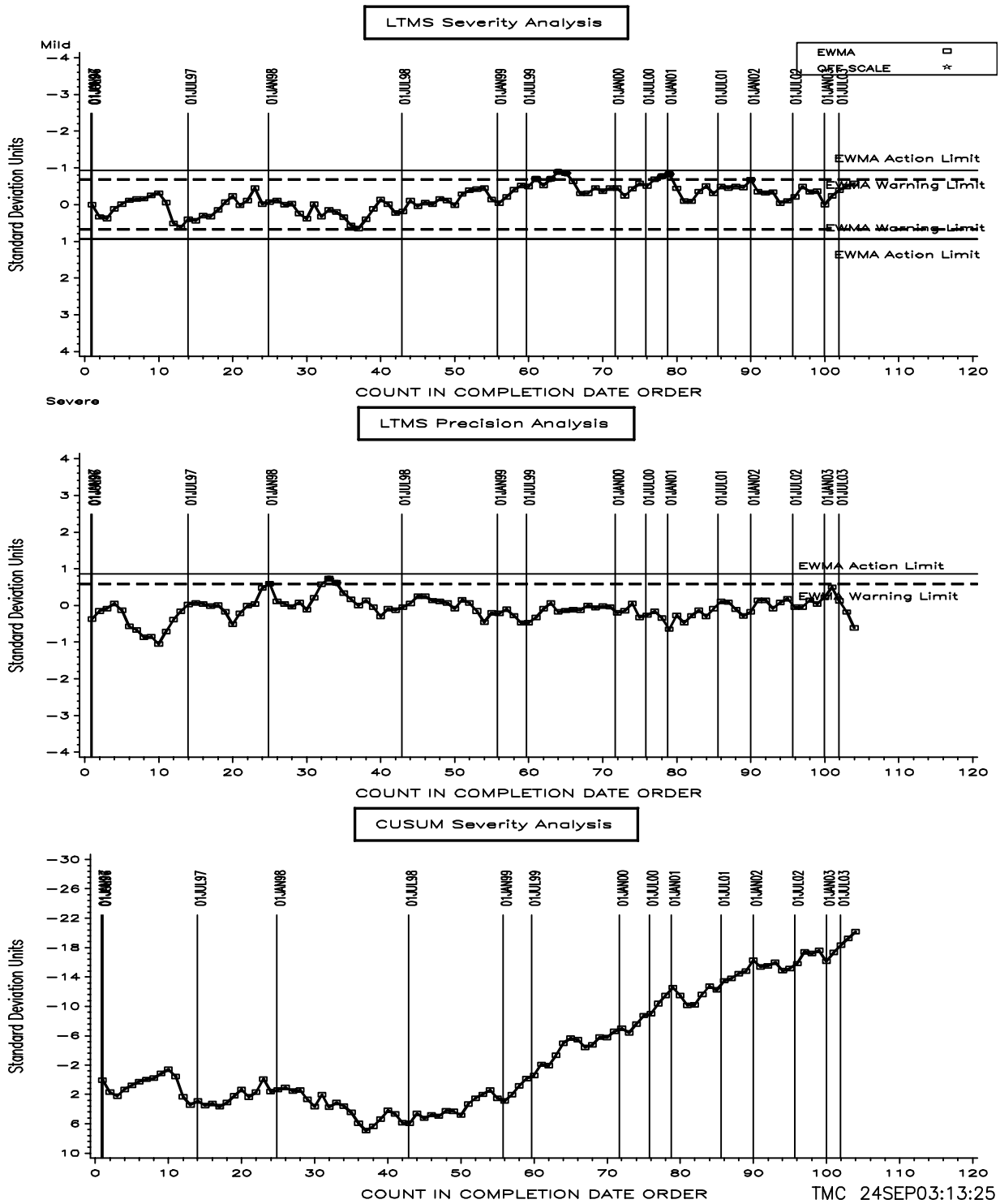


Figure 4

T-8/T-8E INDUSTRY OPERATIONALLY VALID DATA

RELATIVE VISCOSITY AT 4.8% (50% LOSS)

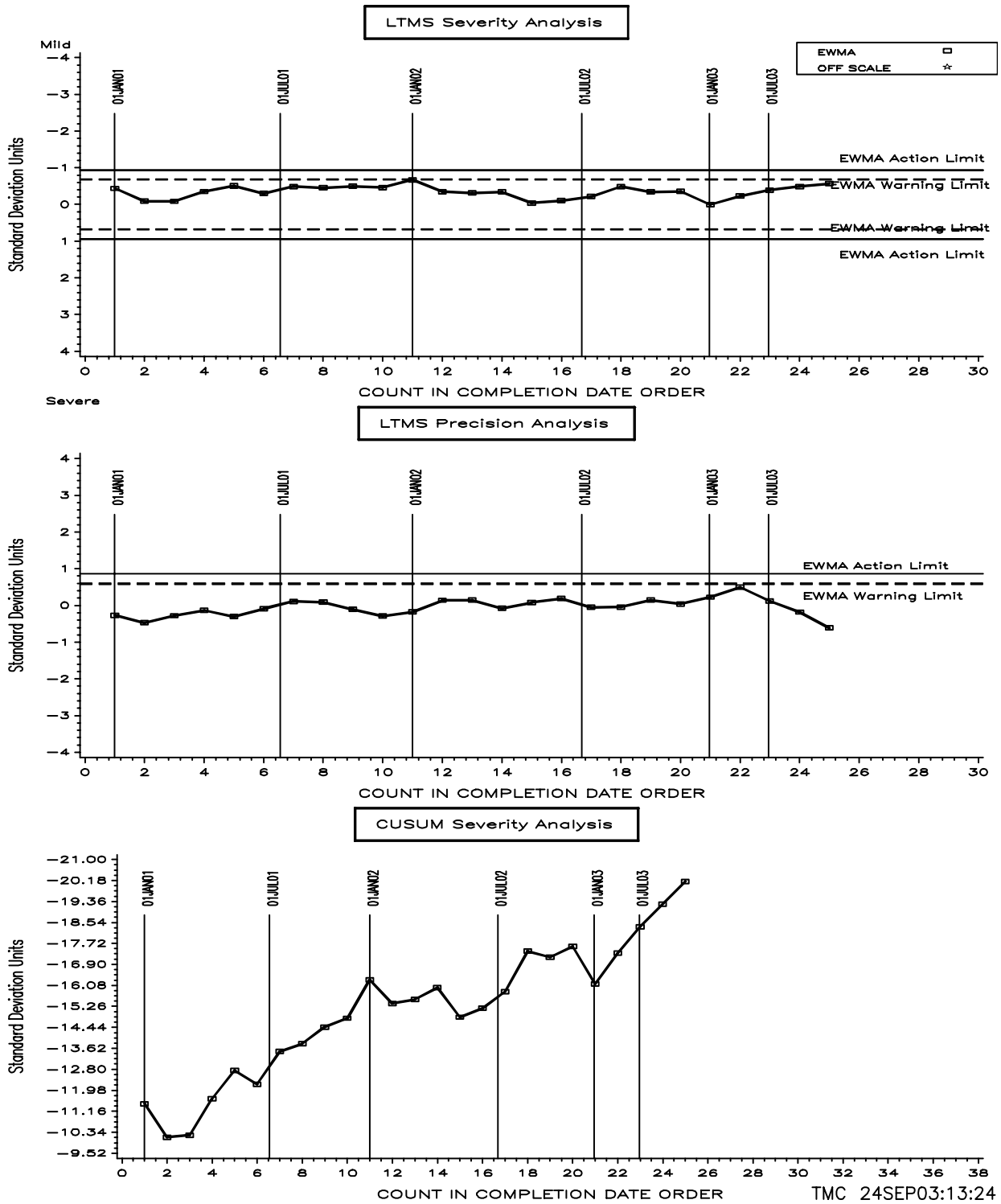


Table 5

T-8E RELATIVE VISCOSITY AT 4.8% SOOT INDUSTRY ALARM LOG

February 1, 1998 to February 12, 1998 (Precision)

A one-test excursion occurs. No industry related problem.

March 21, 1998 to March 24, 1998 (Precision)

A two-test excursion occurs. No industry related problem.

September 16, 1999 to October 21, 1999 (Severity, Mild direction)

Four of five tests trigger a warning alarm. No causes were identified and the Surveillance Panel took no action.

November 6, 2000 to February 22, 2001 (Severity, Mild direction)

A two-test excursion occurs. No industry related problem.

Updated 9/24/03

Figure 5

T-8/T-8E INDUSTRY OPERATIONALLY VALID DATA
REFERENCE RELATIVE VISCOSITY AT 4.8% (100% LOSS)

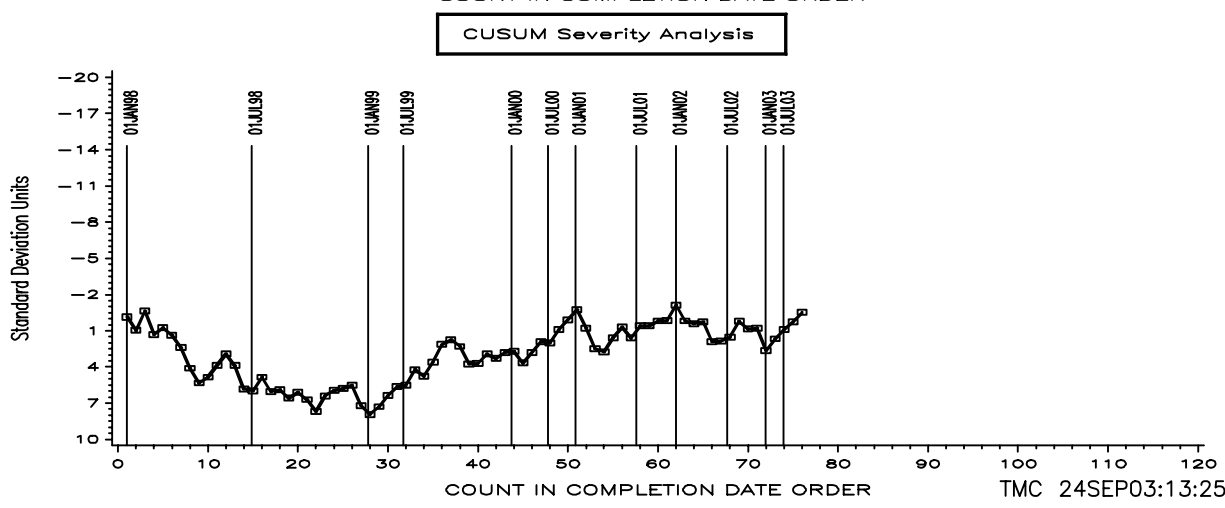
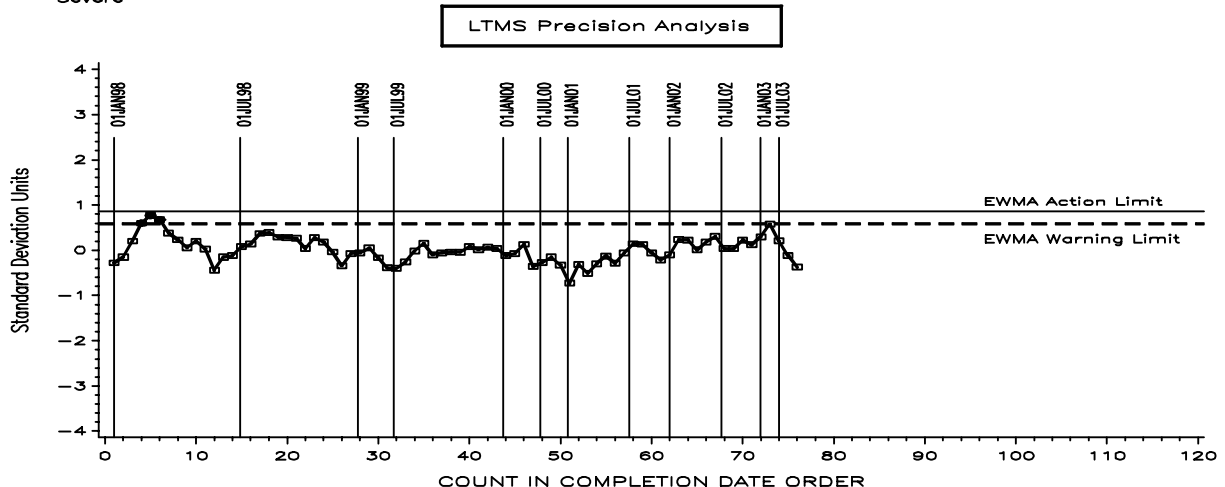
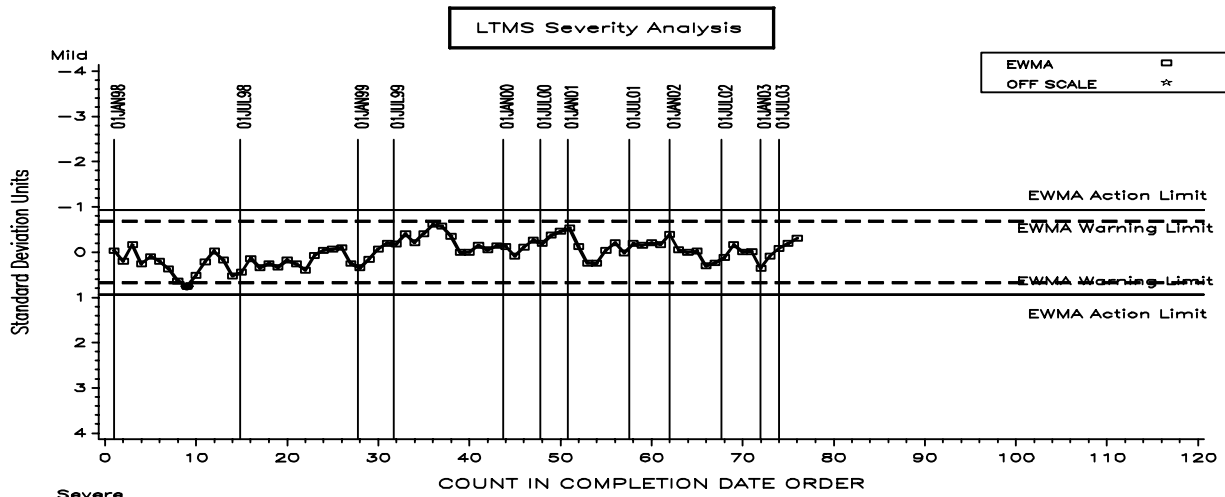


Figure 6

T-8/T-8E INDUSTRY OPERATIONALLY VALID DATA
 REFERENCE RELATIVE VISCOSITY AT 4.8% (100% LOSS)

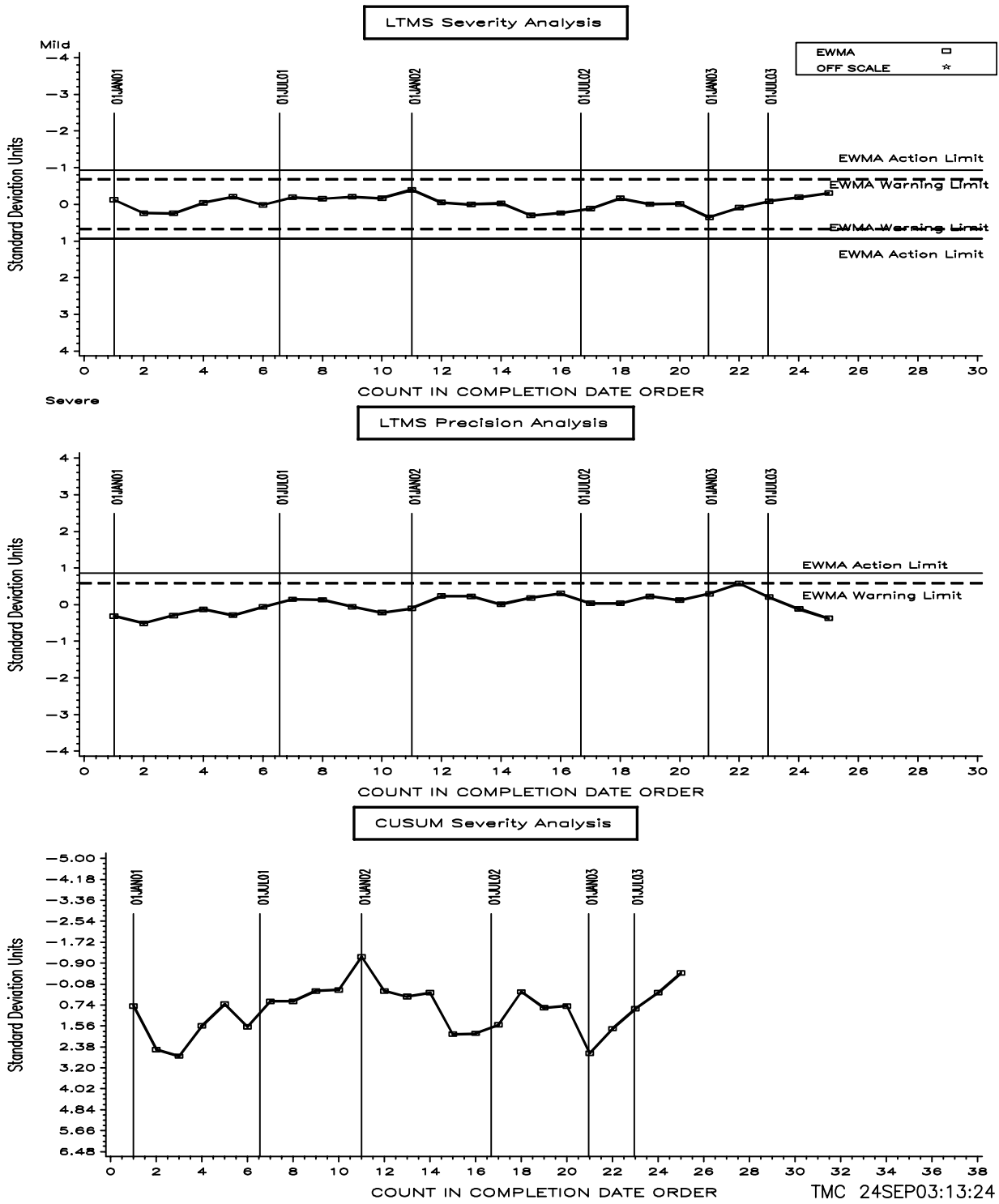


Table 6

T-8E RELATIVE VISCOSITY AT 4.8% SOOT (100% LOSS) INDUSTRY ALARM LOG

Any alarms prior to March 6, 2002 occurred prior to the monitoring of this parameter.

No alarms have occurred since monitoring began.

Updated 9/24/03

Figure 7
TGA Soot vs. Test Hours
TMC Oil 1004-3

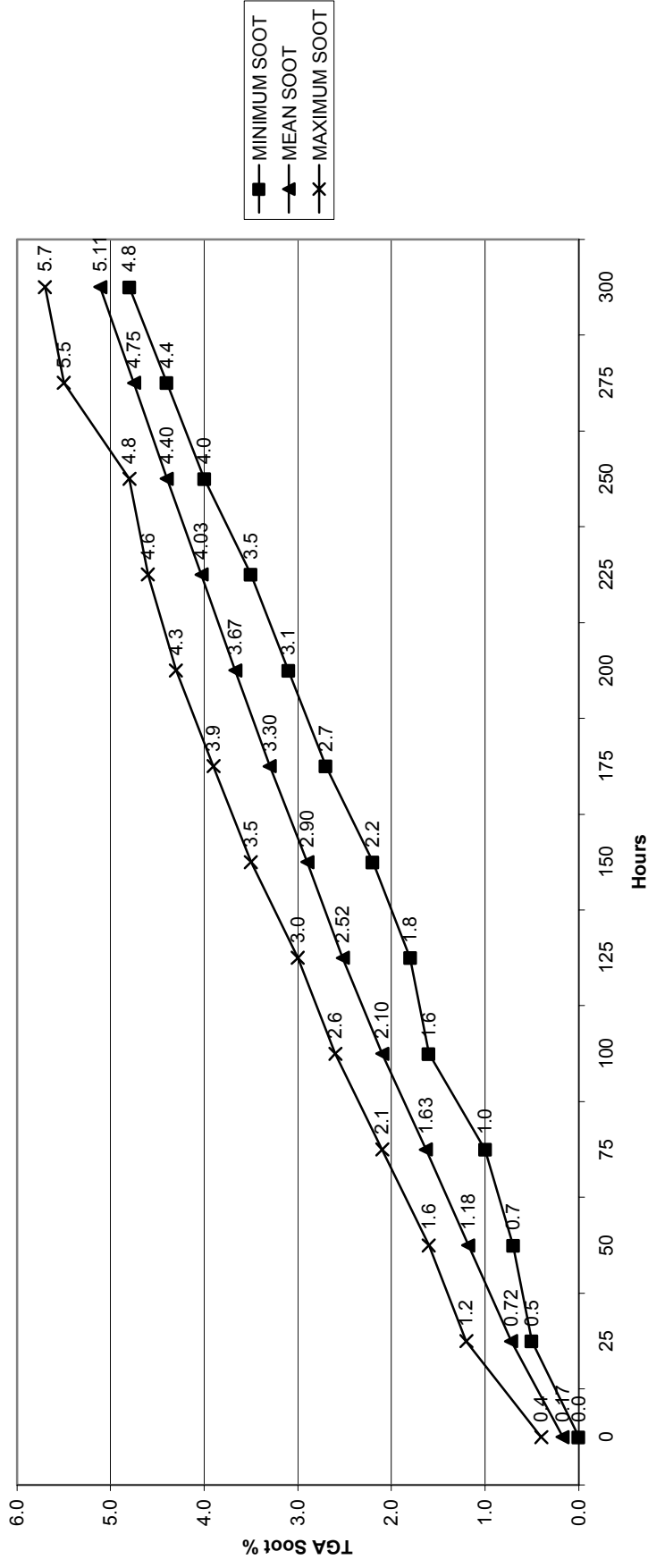


TABLE 7

T8 Timeline

09:57 Monday, September 29, 2003 1

Obs	effective_date	info_letter_number	event
1	19940316	94-1	End of Test Soot Window set to 4.0% - 4.6% for oil 1004-1
2	19940401		Oil 1004-1 Thirty-test Targets
3	19940401	94-1	Acceptance Bands with Shewhart Severity k=1.75
4	19940602	94-1	Kinematic Viscosity at 100° C Measurement procedure added to test procedure
5	19940602	94-1	Enhanced Detroit Diesel TGA Soot Procedure added to test procedure
6	19940727	94-1	Data Dictionary and Report Form Revisions - Version 19940615
7	19940811		Viscosity measurement both soak window changed to ± 30 seconds
8	19950101	95-1	LTMS used for test acceptance
9	19950101	95-1	Post Test flush oil specified as Bulldog Premium Oil
10	19950101	95-1	Post Test Solvent Wash - oil pan is to be solvent cleaned
11	19950603	95-1	Data Dictionary and Report Form Revisions - Version 19950321
12	19950614	95-2	End of Test Soot Window set to 4.0% - 4.8% for oil 1004-2
13	19950619		Oil 1004-2 Ten-test Targets uses std. dev from 1004-1 of 1.19
14	19951101		Oil 1004-2 Twenty-test Targets uses std. dev. from 1004-1 of 1.19
15	19960201		Oil 1004-2 Thirty-test Targets uses std. dev. from 1004-1 of 1.19
16	19960628	96-1	Correction to Oil Consumption calculation
17	19960815	96-1	Data Dictionary and Report Form Revisions - Version 19960122
18	19961001		Oil 1004-2 Fifty-Nine Test Targets uses std. dev. of 0.93 from oil 1004-2
19	19970407	97-1	Reference test length increased to 300 hours.
20	19970407	97-1	Calibration period increased to 3000 hours.
21	19971001	97-1	Data Dictionary and Report Form Revisions - Version 19970702
22	19971208	98-1	T-8E incorporated into Test Method D 5967
23	19980303	98-2	Oil samples at 25, 75, and 125 h are mandatory for reference oil tests, optional for non-reference oil tests. These samples are not used for calculation of VI38 and RV48.
24	19980316	98-1	Data Dictionary and Report Form Revisions - Version 19980122
25	19980501		Oil 1004-3 Ten-test Targets
26	19980622	98-3	Mack primary and secondary filters specified for fuel system.
27	19980622	98-3	DIN Test Method number changed from D 3945 to D 6278.
28	19980622	98-3	Viscosity measurement procedure revised.
29	19980803	98-2	Data Dictionary and Report Form Revisions - Version 19980624
30	19980914		Oil 1004-3 Twenty-two test Targets
31	19980928	98-3	Data Dictionary and Report Form Revisions - Version 19980818
32	19981001	98-4	Critical parts list redefined, critical parts to be obtained from TEI
33	19981211	98-5	T-8A incorporated into Test Method D 5967
34	19990129	98-5	Data Dictionary and Report Form Revisions - Version 19981027
35	19990201		Oil 1004-3 Thirty test targets
36	20011203	02-1	100% Din Shear Loss Relative Viscosity added to T-8E
37	20020215		Data Dictionary and Report Form Revisions - Version 20020107

T8 Timeline

Obs	effective_date	info_letter_number	event
38	20020306		100% Din Shear Loss Relative Viscosity monitoring begins for T-8E (severity adjustments only)
39	20020801		Rotational Viscosity Measurements to be taken for all tests.
40	20020917		Data Dictionary and Report Form Revisions - Version 20020917