



# Test Monitoring Center

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MEMORANDUM: 01-158  
DATE: November 19, 2001  
TO: Warren Totten, Chairman, Cummins Surveillance Panel  
FROM: Jeff Clark  
SUBJECT: M11EGR Calibration Testing for the October 2001 ASTM Report Period

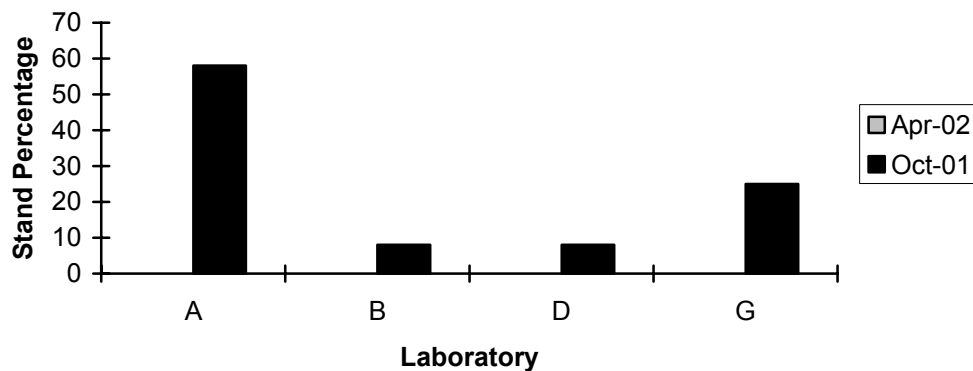
The following is a summary of M11EGR reference oil tests completed during the October 2001 ASTM report period, which began on April 1, 2001 and ended on September 30, 2001. Note, this summary also covers all PC-9 matrix tests, some of which completed prior to this summary period.

### Lab / Stand Distribution:

	Reporting Data	Calibrated as of 9/30/01
Number of Laboratories	4	4
Number of Stands	12	12

The figure below shows the M11EGR laboratory / stand distribution for tests completed this report period:

### Laboratory / Stand Distribution

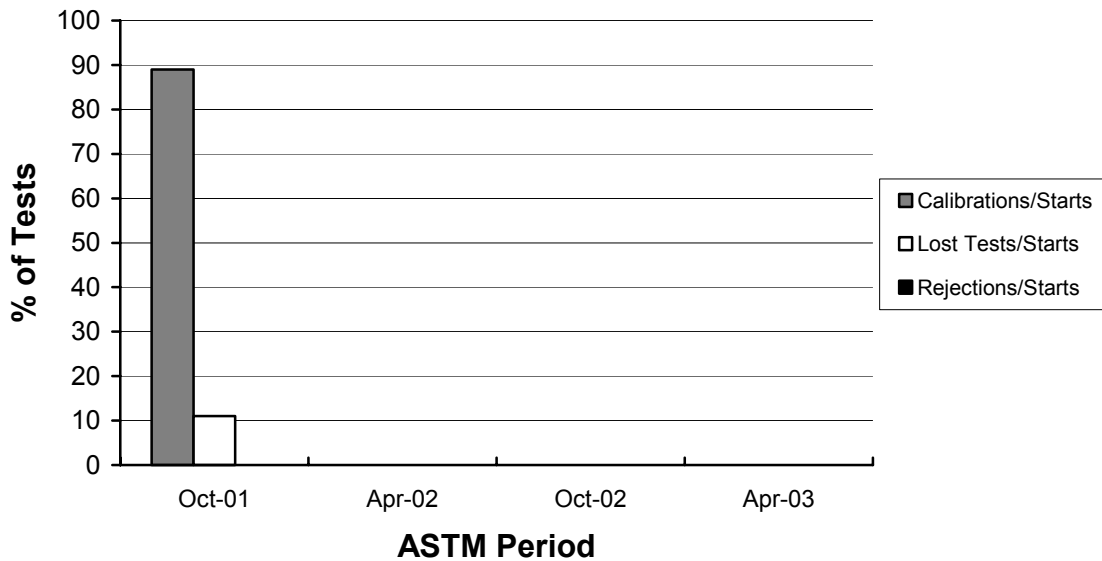


The table below summarizes the status of the reference oil tests reported to the TMC this ASTM report period:

Test Status	TMC Validity Code	Number of Tests
Acceptable Calibration Test	AC	8
Acceptable Matrix Test	AO	18
Failed Calibration Test (LTMS Criteria)	OC	0
Failed Matrix Test (Matrix Analysis)	OO	7
Operationally Invalid Matrix Test	LO	1
Operationally Invalid Calibration Test	LC	1
Aborted Calibration Test	XC	0
Aborted Matrix Test	XO	2
Total		37

Calibrations per start, lost tests per start and rejections per start rates (post-matrix only) are summarized in the figure below:

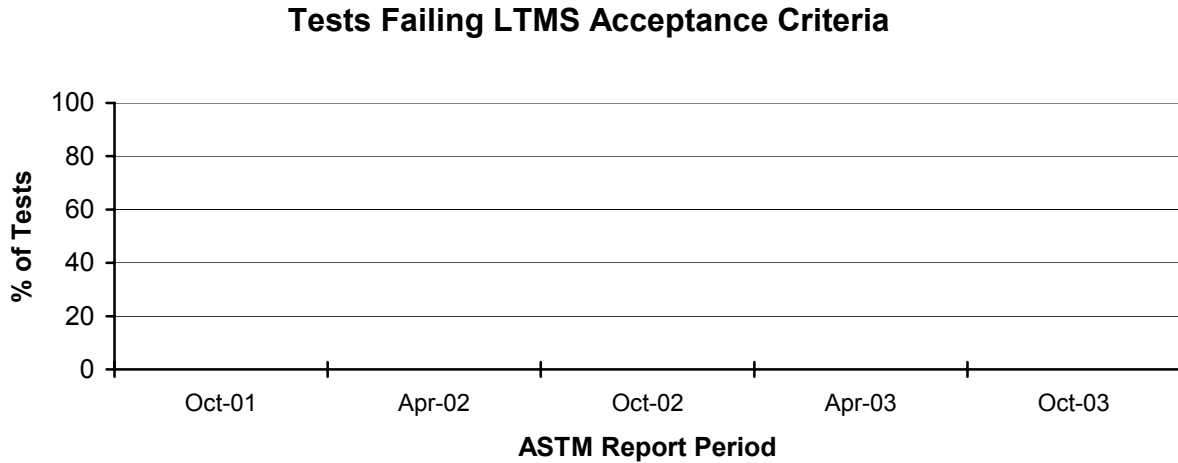
### Calibration Attempt Summary



A detailed list of reasons tests failed the acceptance criteria (OC and OO validities) is shown in Table 1. Table 2 lists the operationally invalid tests (LC and LO validities) and Table 3 lists the aborted tests (XC and XO validities).

LTMS Acceptance Criteria / Stand Alarms:

LTMS was implemented on August 20, 2001. 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:



There were no LTMS stand alarms for the current period. No LTMS deviations were issued this period. No LTMS deviations have been issued during the history of the M11EGR.

Severity and Precision:

Figure 1 (attached) shows the current industry EWMA severity, EWMA precision, and cusum charts for Crosshead Weight Loss (CWL). CWL is currently in control. For this period, CWL is trending an average of 0.38  $\Delta$ /s mild. This is equivalent to 1.41 mg. For a history of CWL industry alarms, refer to the industry alarm log shown in Table 4.

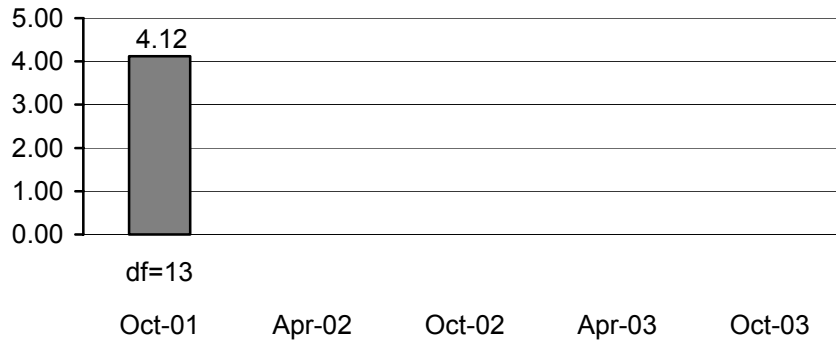
Figure 2 (attached) shows the current industry EWMA severity, EWMA precision, and cusum charts for Average Sludge Rating (ASR). ASR is currently in control. For this period, ASR is trending an average of 0.48  $\Delta$ /s mild. This is equivalent to 0.18 merits. For a history of ASR industry alarms, refer to the industry alarm log shown in Table 5.

Figure 3 (attached) shows the current industry EWMA severity, EWMA precision, and cusum charts for Filter Plugging Delta P (FPD). FPD is currently in control and on target. For a history of FPD industry alarms, refer to the industry alarm log shown in Table 6.

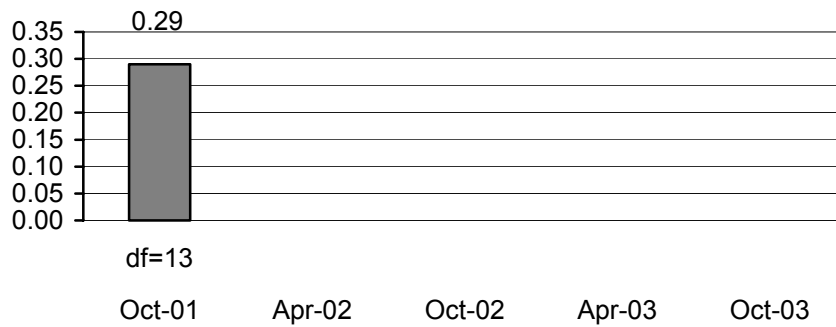
Figure 4 (attached) shows the current industry EWMA severity, EWMA precision, and cusum charts for Top Ring Weight Loss (TRWL). TRWL is currently in control and on target. For a history of TRWL industry alarms, refer to the industry alarm log shown in Table 7.

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.

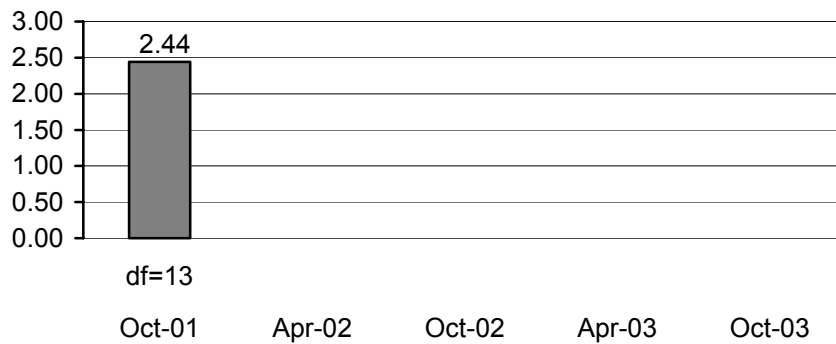
### Crosshead Weight Loss Pooled Precision



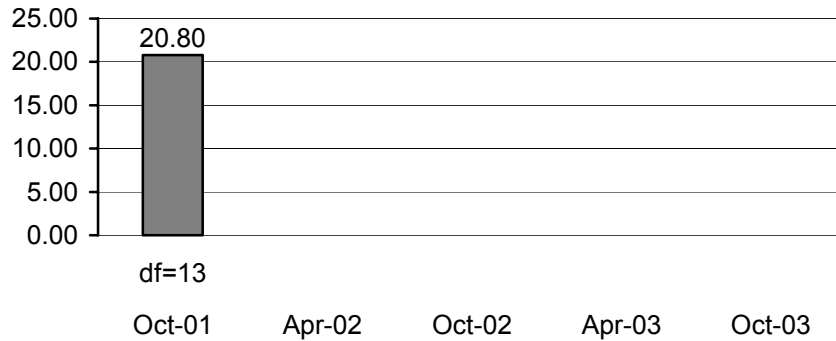
### Average Sludge Rating Pooled Precision



### Filter Plugging Delta P Pooled Precision



**Top Ring Weight Loss Pooled Precision**



Please note, that the degrees of freedom (df) equals  $\Sigma(n \text{ observations per oil} - 1)$ .

Reference Oils:

The current reference oil test targets are shown below:

Oils	Parameter	N*	Mean (cSt)	S
PC-9E	CWL	-	17.3	3.7
	ASR	-	8.50	0.38
	FPD	-	11.7164	2.7000
	TRWL	-	131.7	22.9

\* Targets determined from PC-9 Matrix data.

Information Letters:

No information letters were issued this ASTM period.

TMC Laboratory Visits:

No TMC laboratory visits were conducted this ASTM period.

Quality Index:

Quality Index has not yet been implemented for the M11EGR. The TMC will be finishing an industry capability study shortly, at which time a QI proposal will be brought to the panel for consideration.

Additional Information:

Table 8 contains the M11EGR Timeline which details changes to the test since its inception.

Memo 01-158

Page 6

The M11EGR database can be accessed on the TMC's homepage. If you have any questions on how to access this information, contact the TMC.

JAC/jac/mem01-158.jac.doc

Attachments

c: J.L. Zalar, TMC  
F.M. Farber, TMC  
Cummins Surveillance Panel  
<ftp://tmc.astm.cmri.cmu.edu/docs/diesel/m11/semiannualreports/M11EGR-10-2001.pdf>

**Table 1**  
**Summary of Reasons for Rejected Tests**

	No. of Tests
Average Sludge Rating, Severe	3
Crosshead Weight Loss, Severe	1
Crosshead Weight Loss, Mild	3

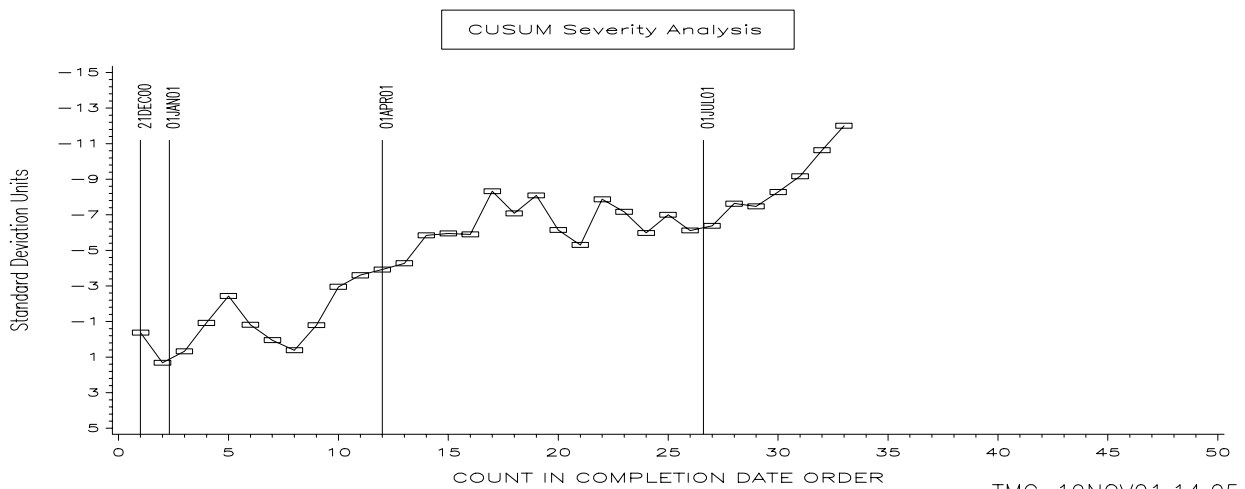
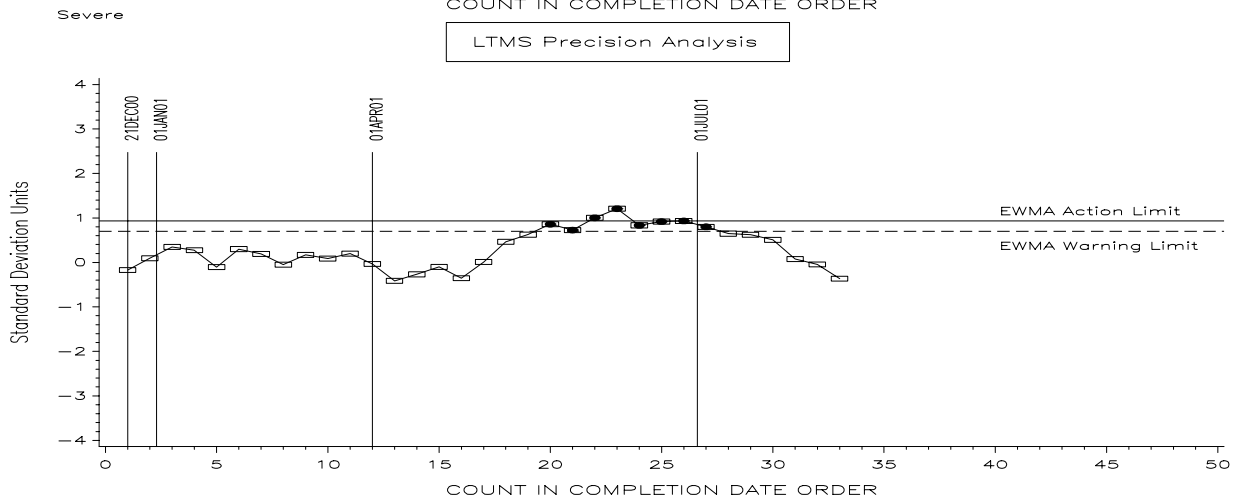
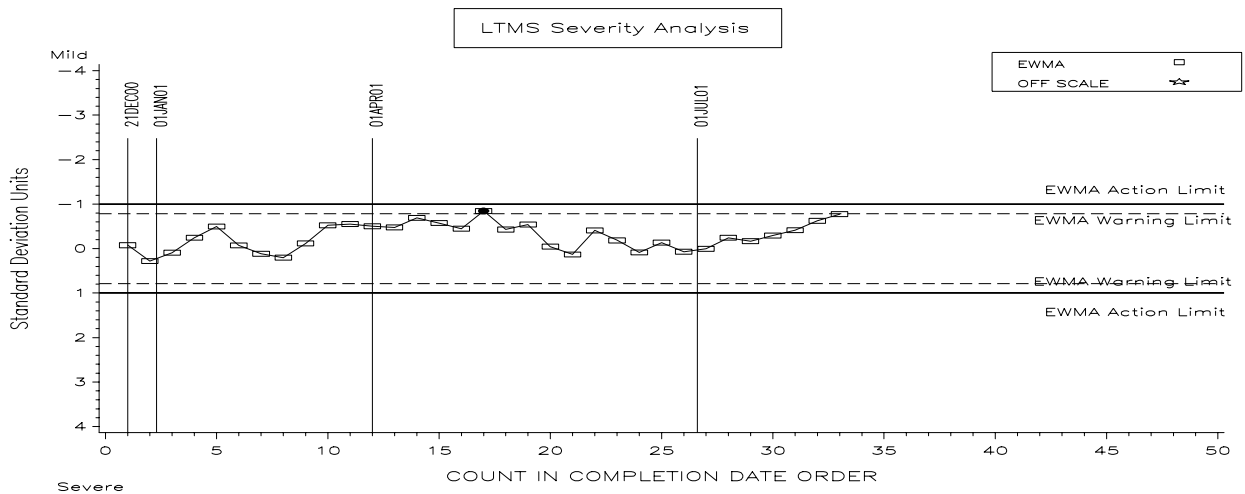
**Table 2**  
**Summary of Reasons for Invalid Tests**

	No. of Tests
Missed EOT soot window	1
Oil contamination due to coolant leak	1

**Table 3**  
**Summary of Reasons for Aborted Tests**

	No. of Tests
Low oil gallery pressure	1
P-tube melted during break-in	1

**FIGURE 1**  
M11EGR INDUSTRY OPERATIONALLY VALID DATA  
FINAL ORIG UNIT ADJ AVG CROSSHEAD MASS LOSS





**TABLE 4**  
**CROSSHEAD WEIGHT LOSS INDUSTRY ALARM LOG**

**April 28, 2001 to May 4, 2001 (Severity, mild direction)**

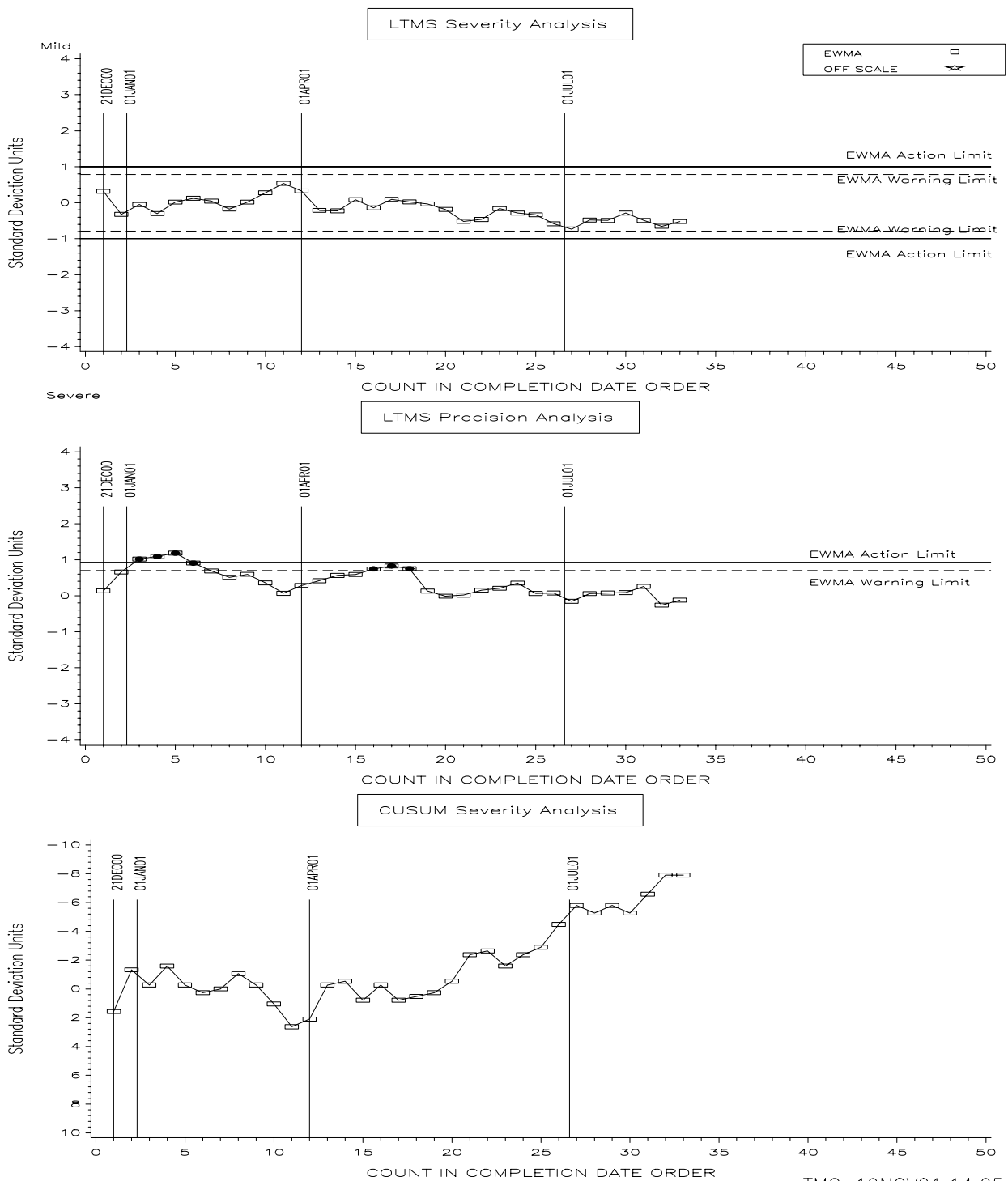
One test exceeds the warning limit. This test was run as part of the PC-9 matrix and prior to LTMS monitoring. No action was taken by the Surveillance Panel.

**May 14, 2001 to September 1, 2001 (Precision)**

Two tests exceed the action limit and six tests exceed the warning limit. The first six of these tests were run as part of the PC-9 matrix and prior to LTMS monitoring. The alarm cleared without action from the Surveillance Panel.

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**FIGURE 2**  
M11EGR INDUSTRY OPERATIONALLY VALID DATA  
FINAL ORIG UNIT AVG SLUDGE RATING



**TABLE 5**  
**AVERAGE SLUDGE RATING INDUSTRY ALARM LOG**

**January 26, 2001 to March 6, 2001 (Precision)**

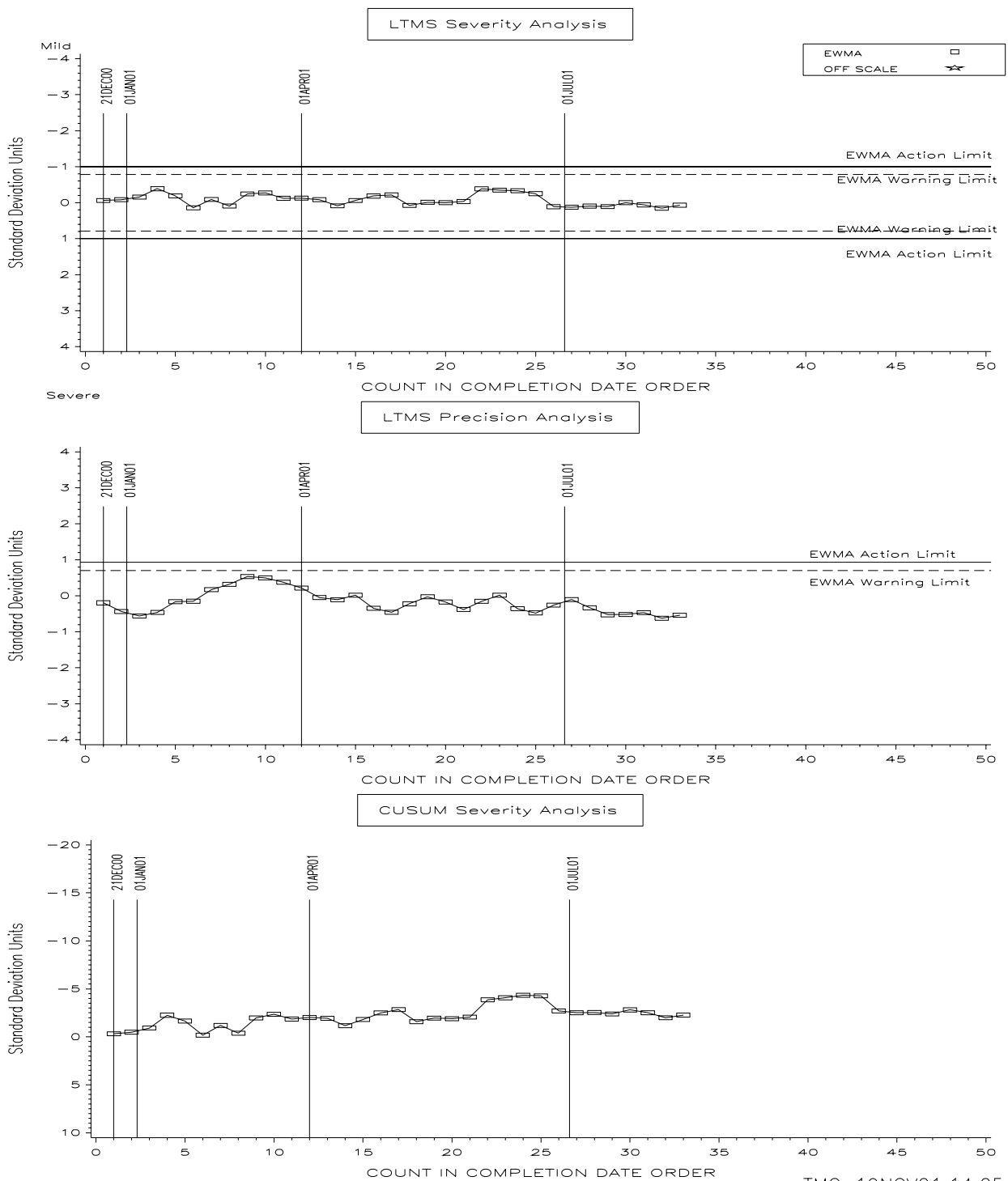
Three tests exceed action limit and one test exceeds the warning limit. These tests were run as part of the PC-9 matrix and prior to LTMS monitoring. No action was taken by the Surveillance Panel.

**April 25, 2001 to May 12, 2001 (Precision)**

Three tests exceed the warning limit. These tests were run as part of the PC-9 matrix and prior to LTMS monitoring. No action was taken by the Surveillance Panel.

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**FIGURE 3**  
M11EGR INDUSTRY OPERATIONALLY VALID DATA  
FINAL ORIG UNIT FILTER PLUGGING DELTA P

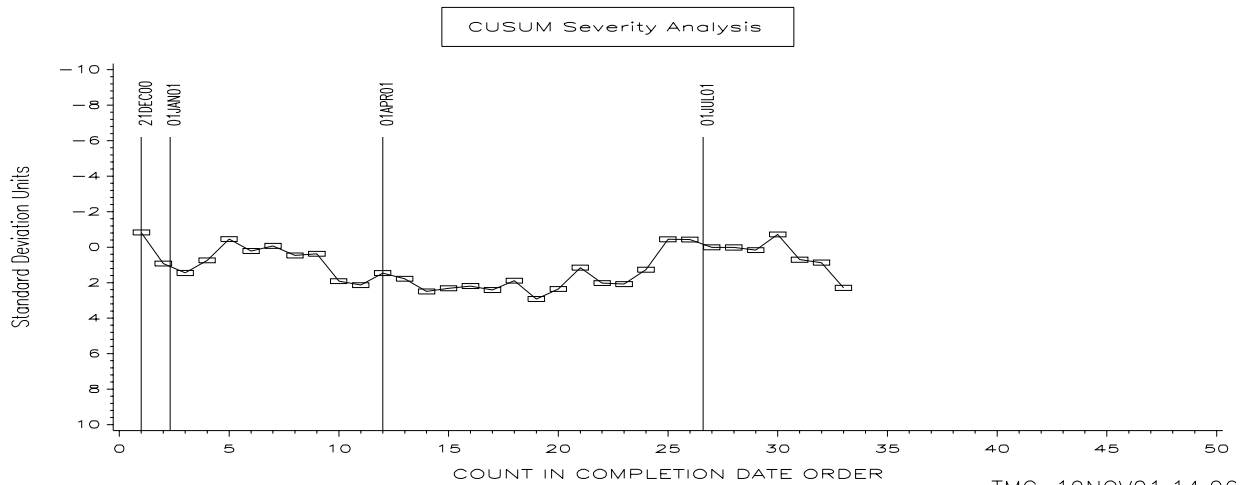
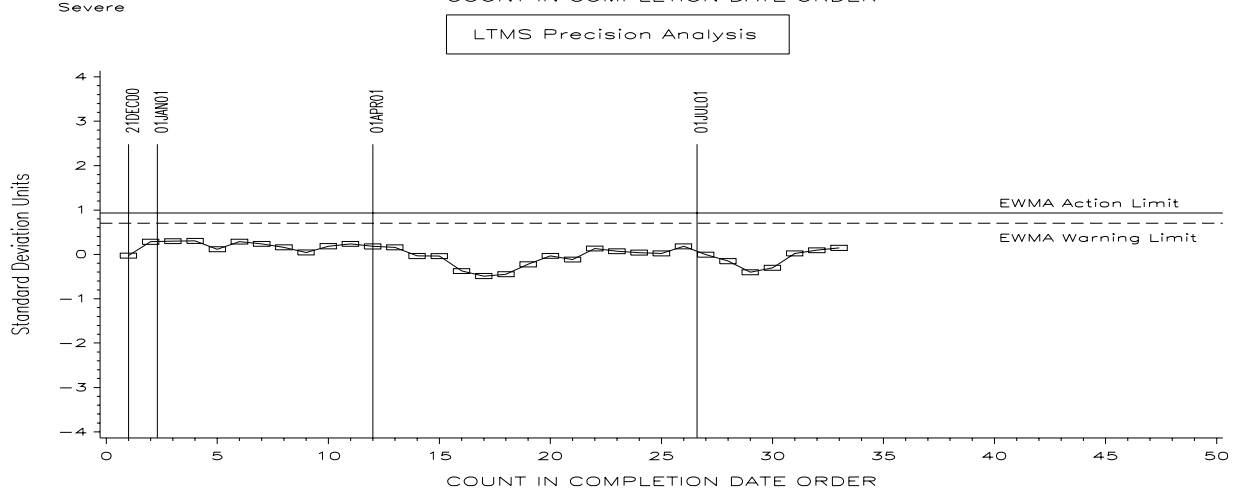
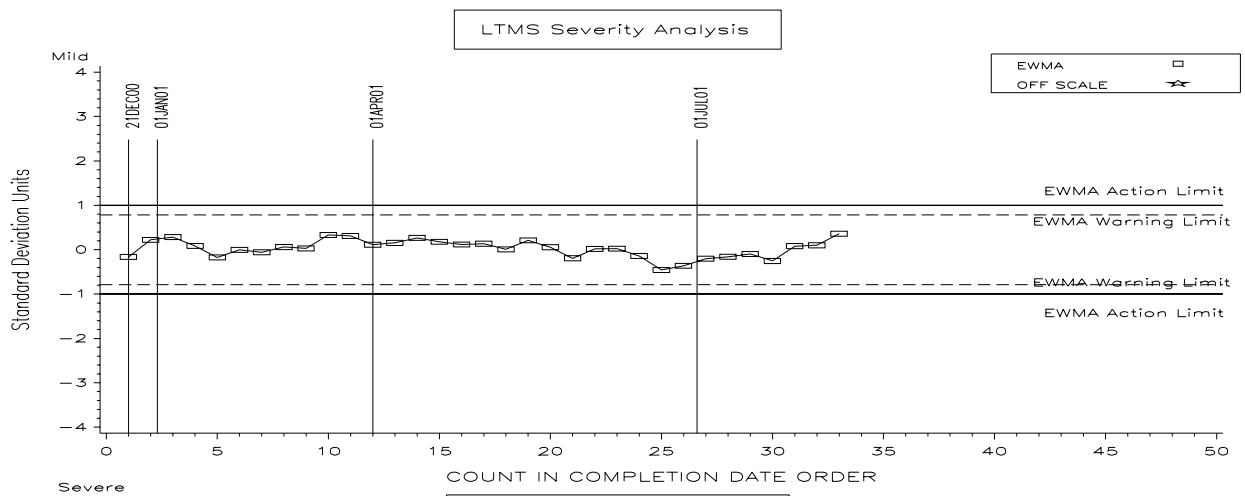


**TABLE 6**  
**FILTER PLUGGING DELTA P INDUSTRY ALARM LOG**

No alarms have occurred.

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**FIGURE 4**  
M11EGR INDUSTRY OPERATIONALLY VALID DATA  
FINAL AVG. TOP RING MASS LOSS



**TABLE 7**  
**TOP RING WEIGHT LOSS INDUSTRY ALARM LOG**

No alarms have occurred.

Updated 11/19/01

**TABLE 8**  
**M11EGR TIMELINE**

<b>Date</b>	<b>, IL No., Topic</b>
20001207,	BEGINNING OF PC-9 MATRIX
20010618,	INTRODUCTION OF OIL FILTERS WITH HOT MELT BEAD
20010623,	COMPLETION OF PC-9 MATRIX
20010820,	LTMS IMPLEMENTED