



Test Monitoring Center

6555 Penn Avenue
Pittsburgh, PA 15206-4489
(412) 365-1000

MEMORANDUM: 03-041

DATE: April 23, 2003

TO: James McCord,
Chairman, Single Cylinder Diesel Surveillance Panel

FROM: Scott Parke

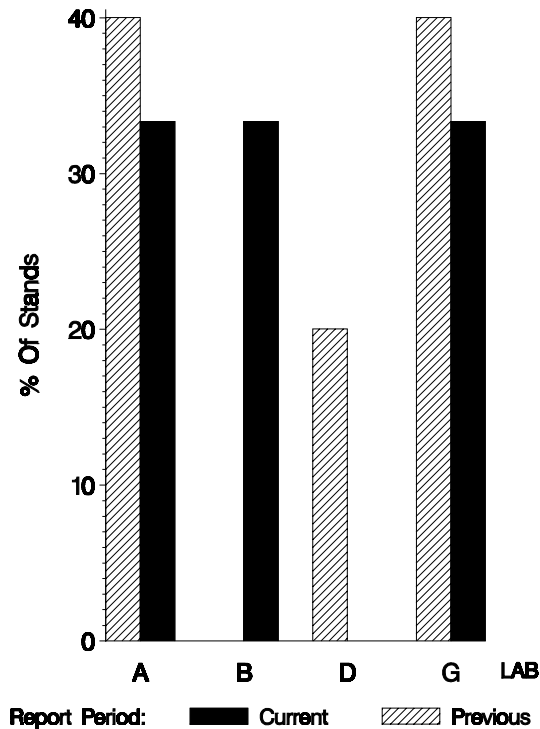
SUBJECT: 1K Testing from October 1, 2002 through March 31, 2003

Three calibration tests were reported to the Test Monitoring Center during the period from October 1, 2002 through March 31, 2003. The data from the operationally valid tests is shown on page 7. Following is a summary of testing activity this period.

| | Reporting Data | Calibrated on 3-31-03 |
|------------------|----------------|-----------------------|
| Number of Labs | 3 | 4 |
| Number of Stands | 3 | 7 |

Stands reporting data this period were distributed as shown below:

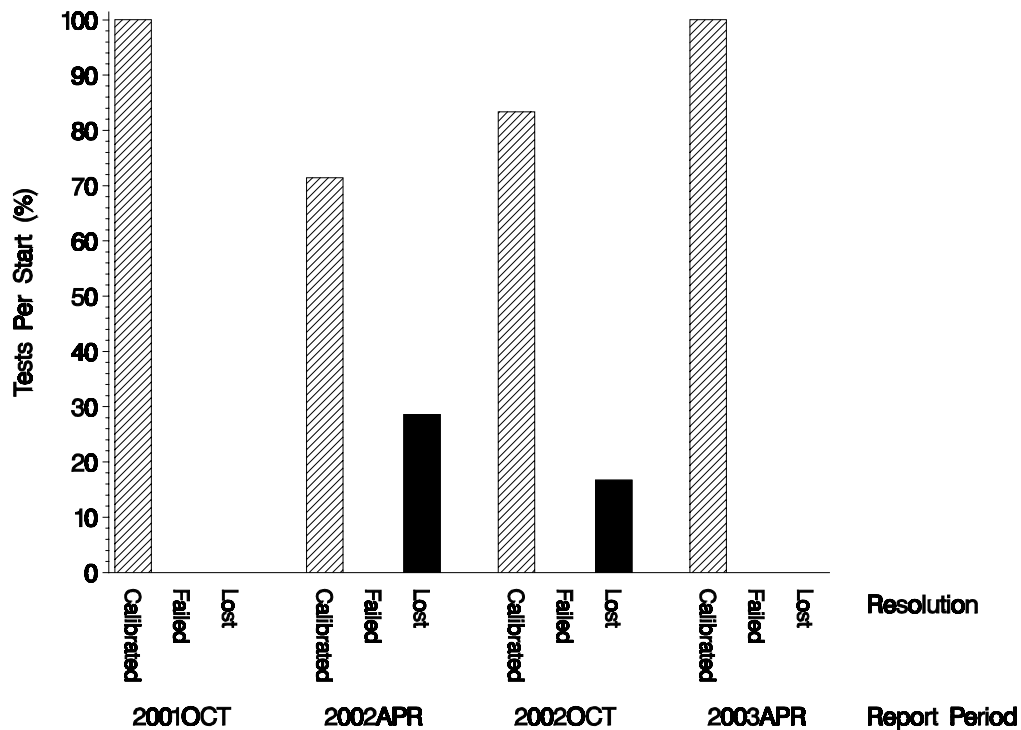
1K LABORATORY / STAND DISTRIBUTION



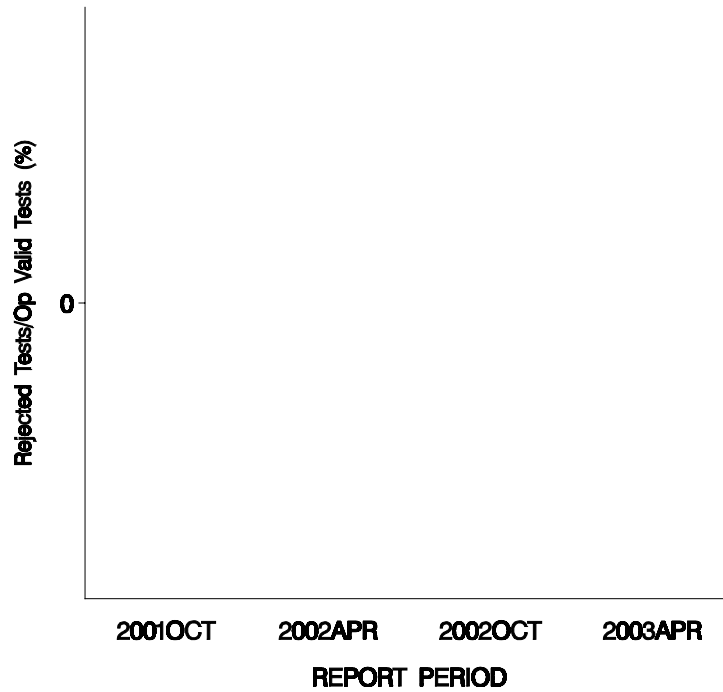
Test Distribution by Oil and Validity

| | | | | | | Totals | |
|---------------------------------|----|----------|----------|----------|-------------|-------------|--|
| | | 809-1 | 810-2 | 811-2 | Last Period | This Period | |
| Accepted for Calibration | AC | 2 | 0 | 1 | 5 | 3 | |
| Rejected Mild | OC | 0 | 0 | 0 | 0 | 0 | |
| Rejected Severe | OC | 0 | 0 | 0 | 0 | 0 | |
| Rejected for EWMA Precision | OC | 0 | 0 | 0 | 0 | 0 | |
| Rejected for Shewhart Precision | OC | 0 | 0 | 0 | 0 | 0 | |
| Operationally Invalid (lab) | LC | 0 | 0 | 0 | 0 | 0 | |
| Operationally Invalid (lab/TMC) | RC | 0 | 0 | 0 | 1 | 0 | |
| Aborted Calibration | XC | 0 | 0 | 0 | 0 | 0 | |
| Total | | 2 | 0 | 1 | 6 | 3 | |

1K CALIBRATION ATTEMPT SUMMARY



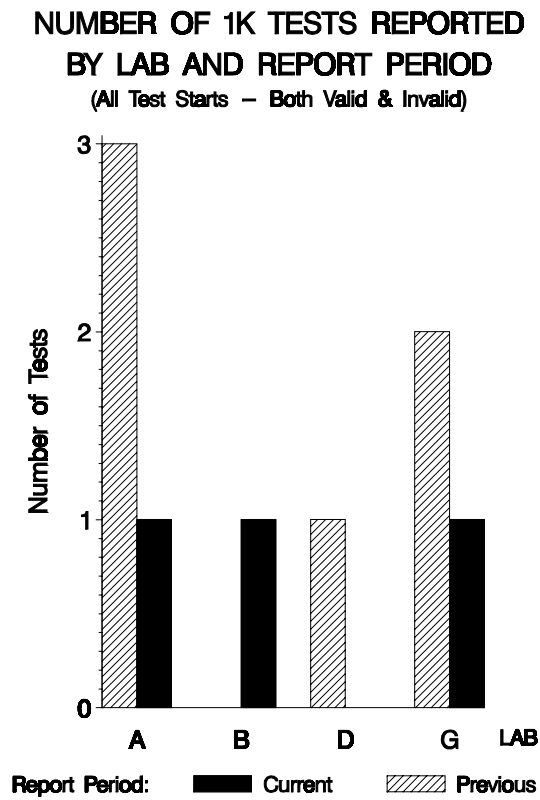
**OPERATIONALLY VALID 1K TESTS
FAILING ACCEPTANCE CRITERIA**



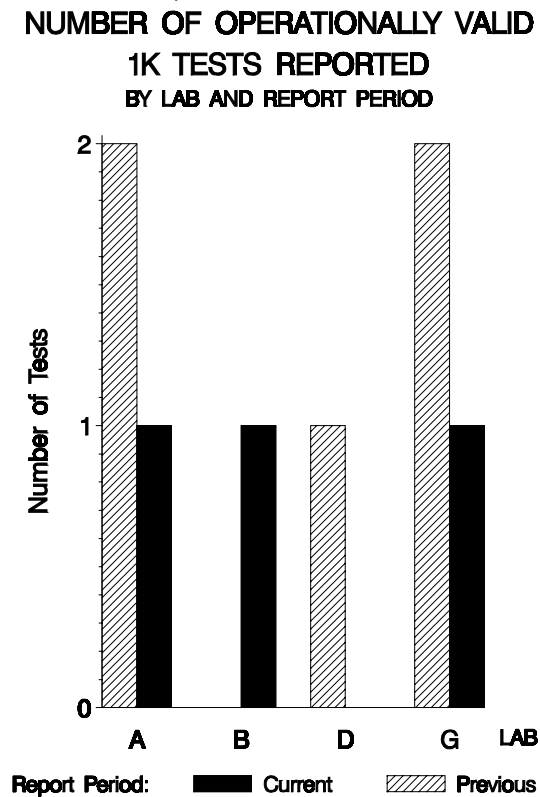
The above chart shows the percentage of failed but operationally valid tests. No tests failed to meet the LTMS criteria this or any of the last four periods.

No LTMS deviations were written this period (none have ever been written for the 1K test).

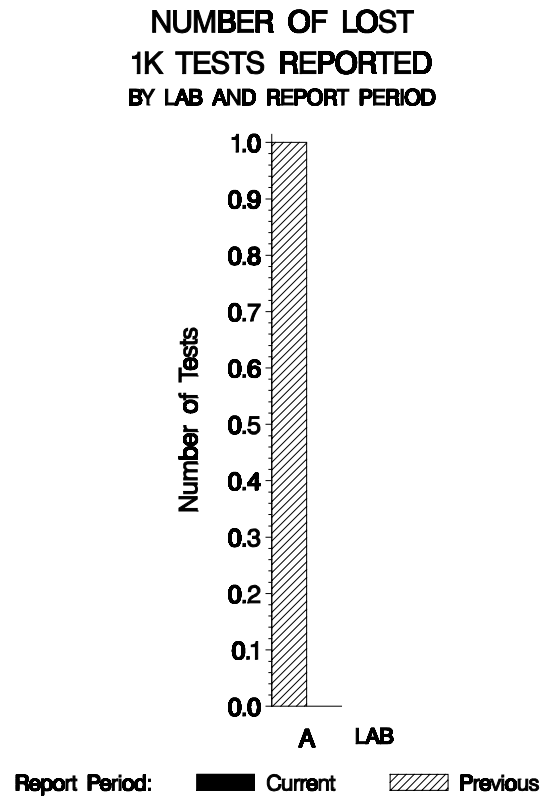
By lab, the tests run this report period were distributed as shown below:



With all operationally invalid tests removed, the distribution looks like this:



And the by-lab distribution of lost tests:



Lost Tests per Start by Oil and Lab

| Lab | 809-1 | | | 810-2 | | | 811-2 | | | Total | | |
|-------|-------|--------|---|-------|--------|---|-------|--------|---|-------|--------|---|
| | Lost | Starts | % | Lost | Starts | % | Lost | Starts | % | Lost | Starts | % |
| A | 0 | 1 | 0 | | | | | | | 0 | 1 | 0 |
| B | 0 | 1 | 0 | | | | | | | 0 | 1 | 0 |
| G | | | | | | | 0 | 1 | 0 | 0 | 1 | 0 |
| Total | 0 | 2 | 0 | | | | 0 | 3 | 0 | 0 | 3 | 0 |

Lost tests are those that were either aborted, rejected by lab, or operationally invalid.

Causes for Lost Tests

| Lab | Cause | Oil | | | Validity | | | | Loss Rate | | |
|-----|------------------------------------|-------|-------|-------|----------|----|----|----|-----------|--------|----|
| | | 809-1 | 810-2 | 811-2 | LC | RC | XC | MC | Lost | Starts | % |
| | No 1K tests were lost this period. | | | | | | | | 0 | 3 | 0% |
| | Lost | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| | Starts | 0 | 0 | 0 | 3 | 3 | 3 | 3 | | | |
| | % | 0% | 0% | 0% | 0% | 0% | 0% | 0% | | | |

| Average Δ /s by Lab | | | | | | |
|----------------------------|---|--------|--------|--------|--------|--------|
| Lab | n | TGF | WDK | TTLHC* | BSOC | EOTOC |
| A | 1 | -0.541 | -0.685 | 0.080 | -0.331 | -0.283 |
| B | 1 | -0.541 | 0.933 | 0.080 | -0.400 | -0.313 |
| G | 1 | -1.042 | -1.088 | -0.175 | -1.000 | -0.288 |
| Industry | 3 | -0.708 | -0.280 | -0.005 | -0.577 | -0.295 |
| 809/809-1 | 2 | -0.541 | 0.124 | 0.080 | -0.366 | -0.298 |

* Transformed TLHC

DATA FROM ALL OPERATIONALLY VALID TESTS REPORTED THIS PERIOD:

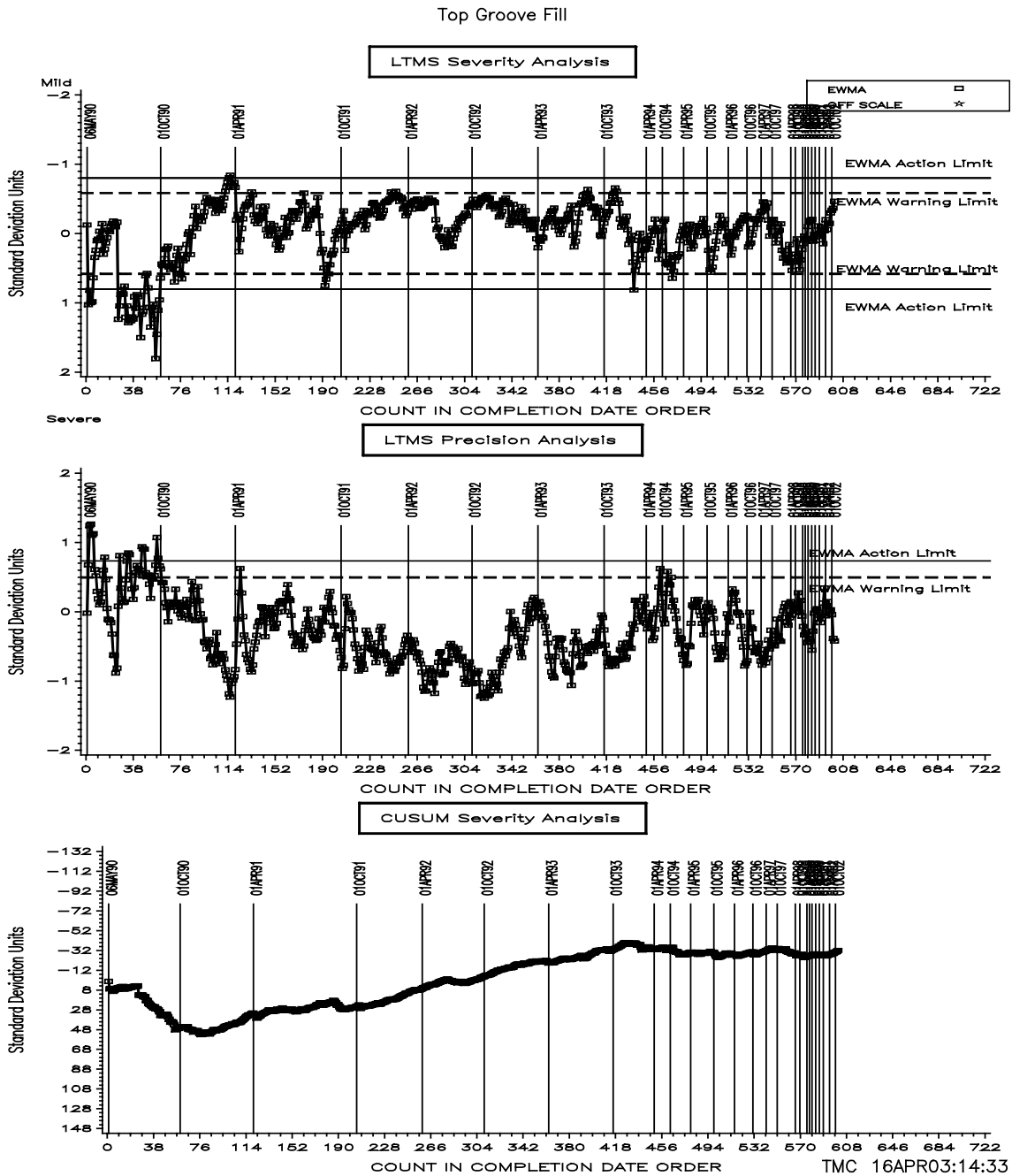
LTMS

| DATE | LAB | STAND | OIL | TG | WD | TL | OC | ETOC | TGYI | WDYI | TLYI | OCYI | ETOCYI |
|----------|-----|-------|-------|----|-------|----|------|------|--------|--------|--------|--------|--------|
| 20021008 | A | 10 | 809-1 | 9 | 192.0 | 1 | 0.22 | 0.19 | -0.541 | -0.685 | 0.080 | -0.331 | -0.283 |
| 20030107 | B | 12A | 809-1 | 9 | 249.6 | 1 | 0.21 | 0.18 | -0.541 | 0.933 | 0.080 | -0.400 | -0.313 |
| 20030324 | G | 6 | 811-2 | 10 | 266.9 | 1 | 0.17 | 0.18 | -1.042 | -1.088 | -0.175 | -1.000 | -0.288 |

DISCUSSION OF INDUSTRY PERFORMANCE OVER THIS PERIOD

TGF:

During this report period the industry average TGF Y_i (shown in the table on the previous page) was mild at -0.708. Using 809-1's test target standard deviation of 15.7 to compute an average Δ yields 11% TGF mild.
CATERPILLAR 1K INDUSTRY OPERATIONALLY VALID DATA



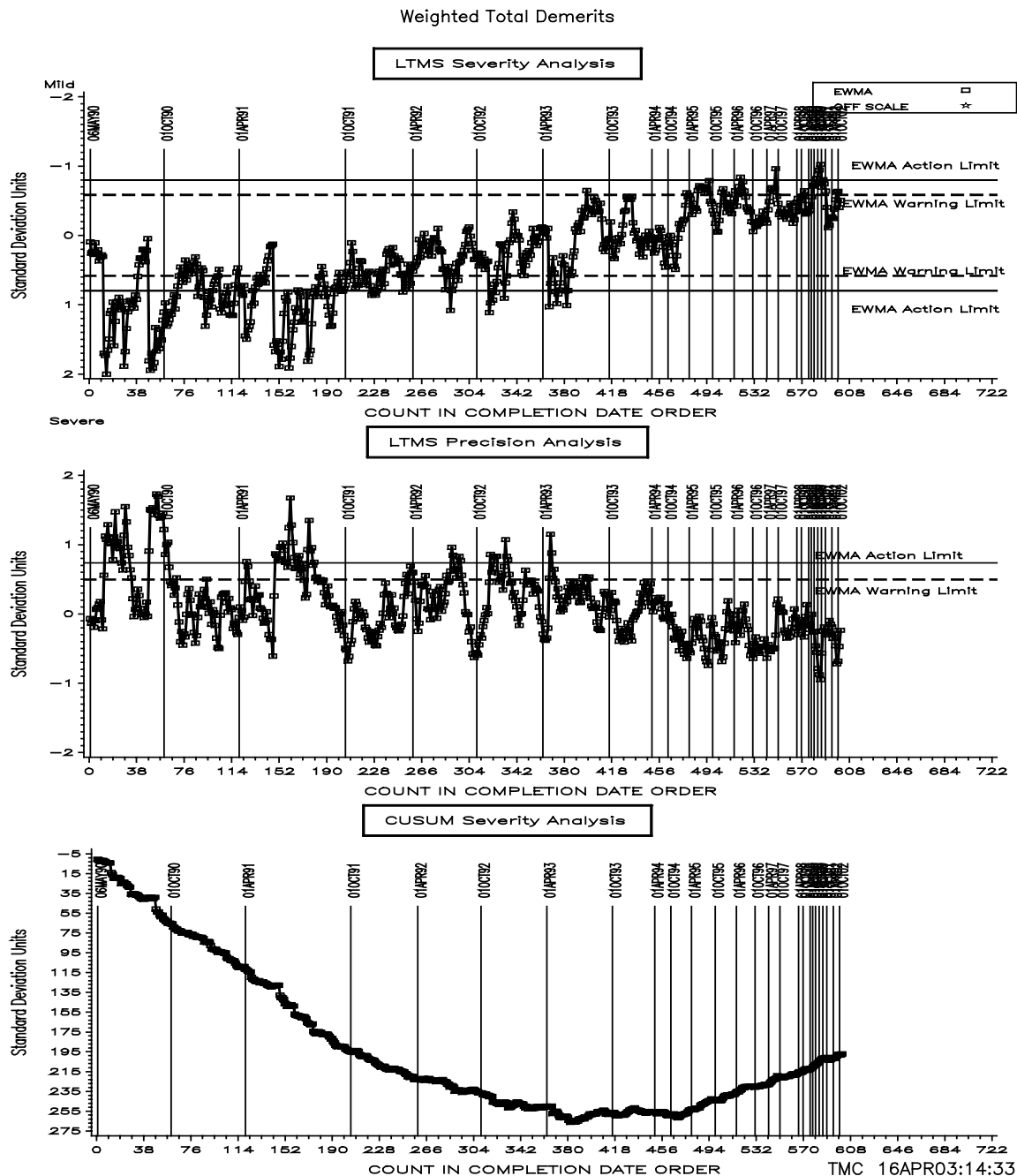
Shown above is the LTMS/Cusum plot for TGF. Over this report period, TGF was mild but remained within both severity and precision LTMS limits.

The CUSUM plot for TGF is also unremarkable and has been virtually flat since January of 1994.

WDK:

As has generally been the case since October of 1994, WDK recorded mild results this period. Industry average Y_i for this period was -0.280 (see table on page 7). Using the target standard deviation for 809-1 (35.6) converts this to 10.0 demerits mild. The LTMS/Cusum plot is shown below. WDK precision remains well within limits.

CATERPILLAR 1K INDUSTRY OPERATIONALLY VALID DATA

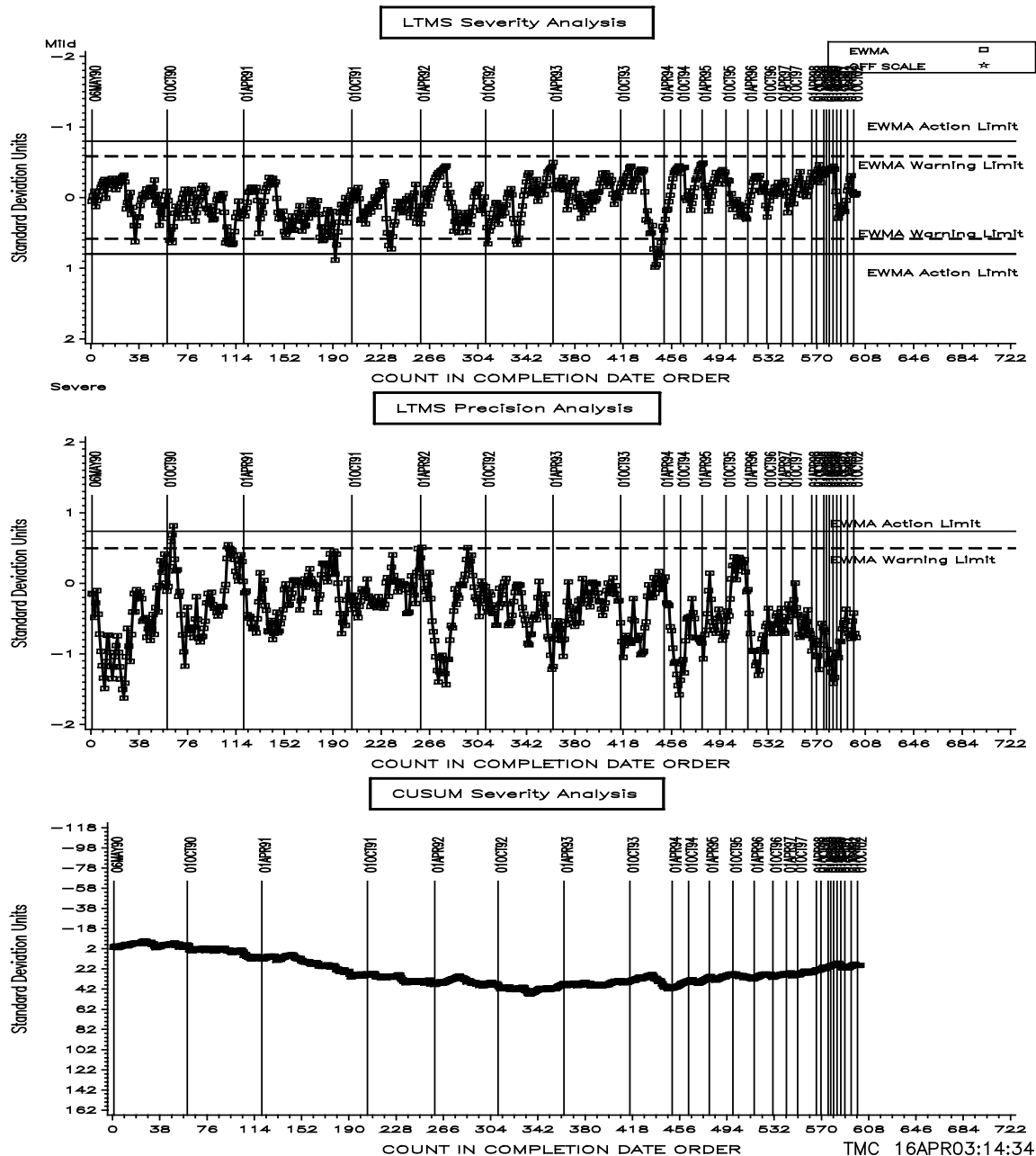


TLHC:

The average transformed TLHC Y_i for this report period was -0.005 mild (see table on page 7). Using the test target standard deviation of 1.1 from oil 809-1 to compute an average transformed delta yields 0.006. Back-transforming this value gives <1% TLHC mild. Overall, this parameter has exhibited on-target performance for the life of this test.

CATERPILLAR 1K INDUSTRY OPERATIONALLY VALID DATA

Top Land Heavy Carbon



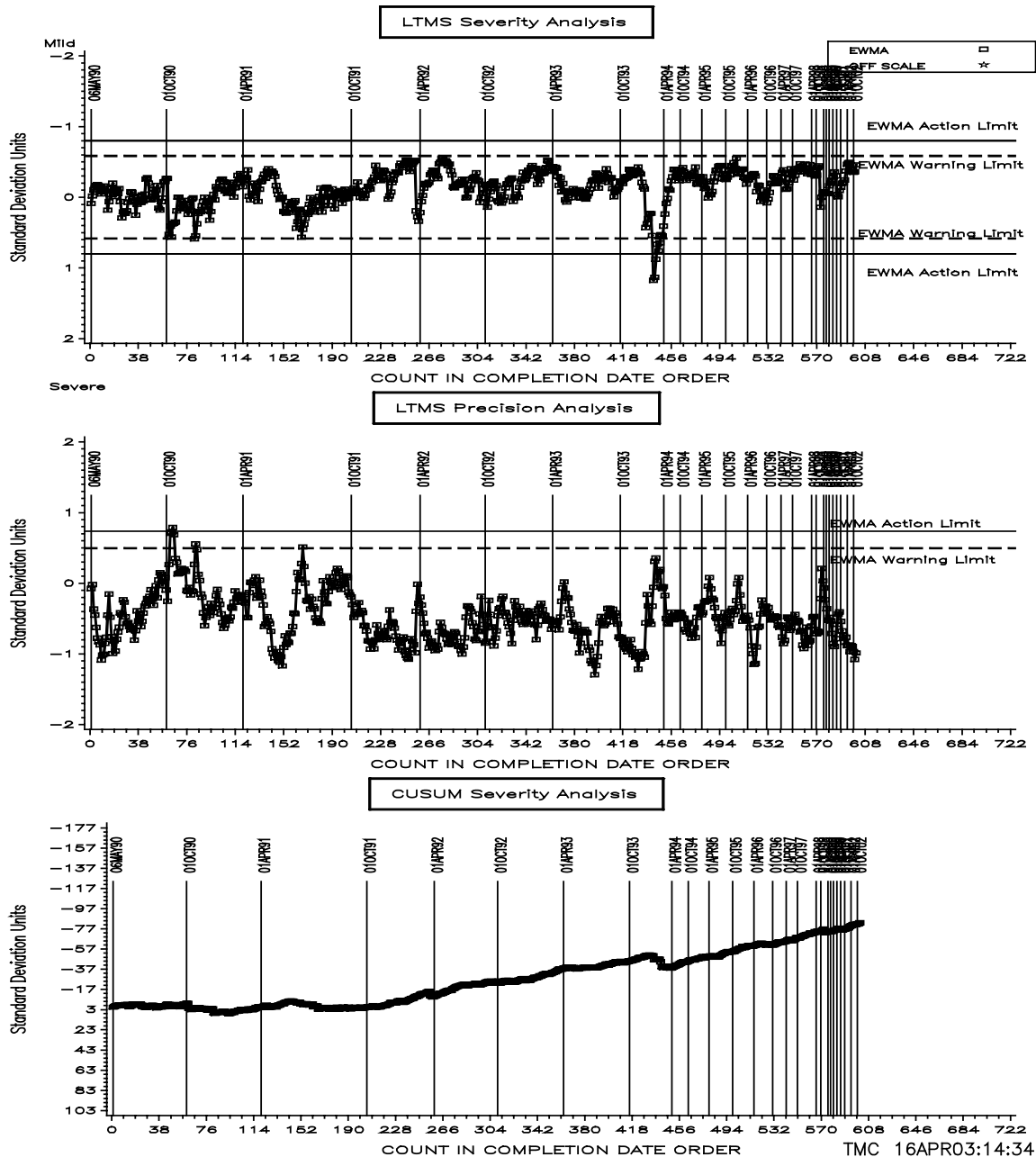
The LTMS/Cusum plot for transformed TLHC is shown above. Precision and severity were both within limits throughout this report period.

BSOC:

Over the current report period, average BSOC Y_i was -0.577. Computing an average delta using the test target standard deviation of 0.145 for oil 809-1 gives 0.08 g/kWh. The LTMS/Cusum plot for BSOC is shown below. The Cusum plot indicates a slight but continuous mild trend throughout the life of the test.

CATERPILLAR 1K INDUSTRY OPERATIONALLY VALID DATA

BSOC

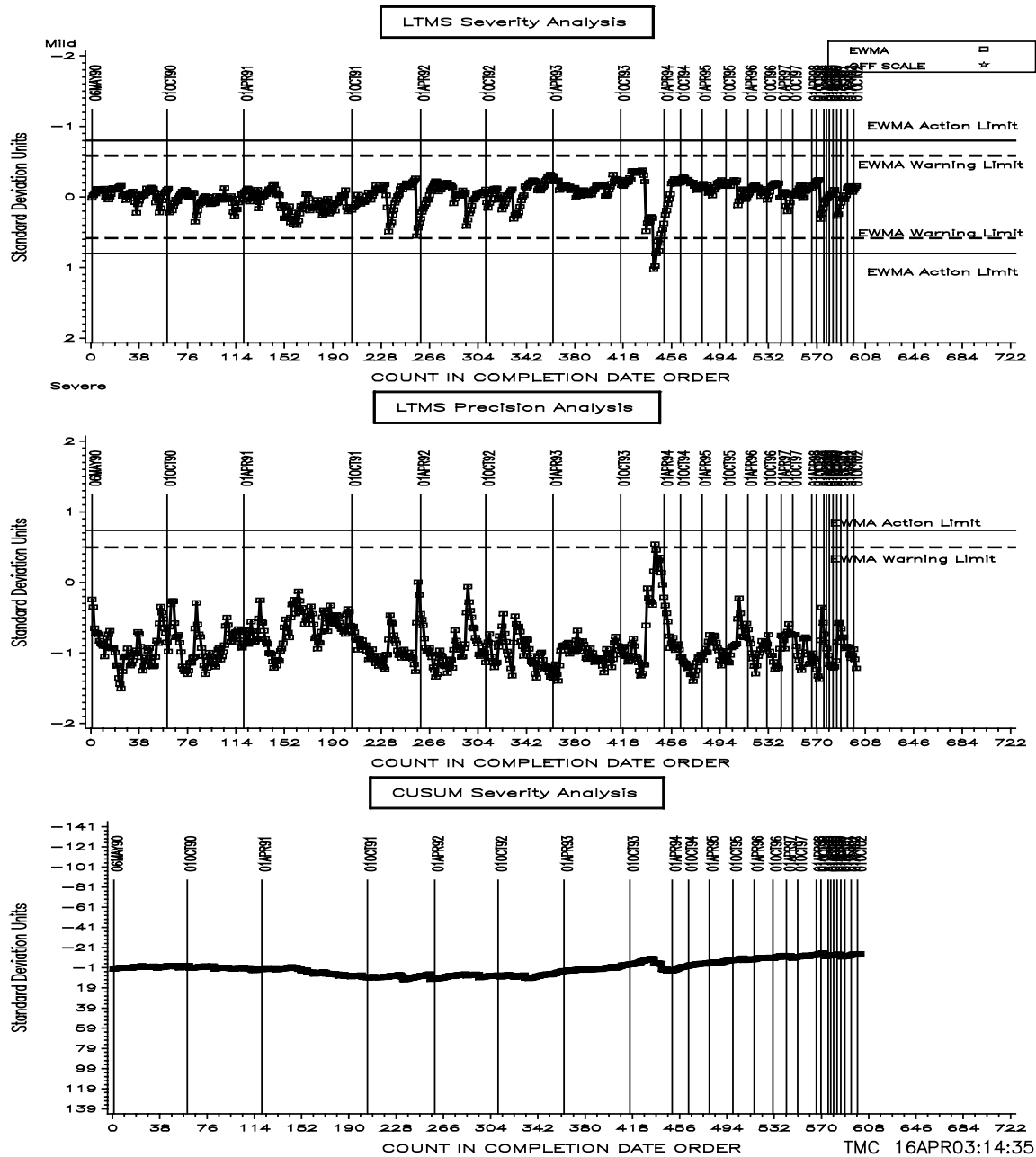


EOTOC:

As usual, EOTOC closely mirrors BSOC. Over the current report period, EOTOC had an average Y_i of -0.295. Multiplying by the target standard deviation for 809-1 (0.332 g/kWh) gives an equivalent EOTOC of 0.10 g/kWh. The LTMS/Cusum plot for EOTOC is shown below.

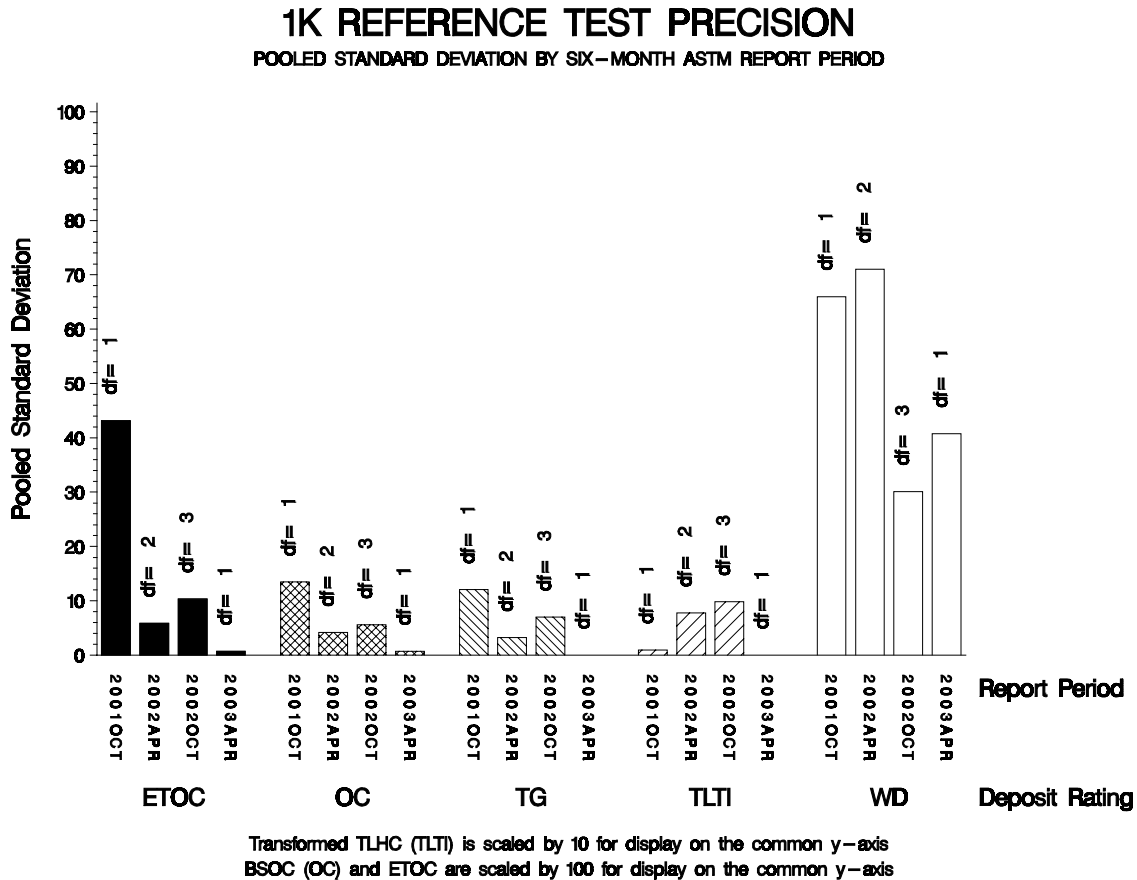
CATERPILLAR 1K INDUSTRY OPERATIONALLY VALID DATA

EOTOC



POOLED S:

Shown below is a bar chart comparing the pooled s values for the 1K test parameters over the last four report periods. Please note that the values for TLHC have been multiplied by 10 and the values for BSOC and EOTOC have been multiplied by 100 to allow these parameters to be shown on the same plot as the other parameters.



STATUS OF REFERENCE OIL SUPPLY:

At the end of this report period, the testing oil supply stood as outlined in the following table:

| Oil | Cans @ Labs | @ TMC | |
|--------------|-------------|------------|-------------|
| | | Cans | Gallons |
| 809 | 3 | 0 | 0 |
| 809-1 | 14 | 301 | 3016 |
| 810-2 | 9 | 360 | 3605 |
| 811-1 | 9 | 2 | 20 |
| 811-2 | 4 | 168 | 1682 |
| Total | 39 | 831 | 8323 |

* Future reblends of oils marked with an asterisk are *not* obtainable by TMC.

Be aware that this table presumes that *all* of each of these oils is dedicated to the 1K test area. All of these oils are also used in the 1N test area and 809-1 is used in several other test areas.

TIMELINE OF SIGNIFICANT EVENTS IN THE LIFE OF THE 1K TEST:

| Effective Date | Info Letter | |
|----------------|-------------|---|
| 19891002 | | START OF 1K TESTING |
| 19900506 | | FIRST TEST FOR 1K CALIBRATION |
| 19901215 | | FIRST USE OF 811-1 |
| 19910220 | | FIRST USE OF 810-1 |
| 19910407 | | LAST USE OF 811 |
| 19910710 | 2 | INDUSTRY CORRECTION FACTORS FOR CANDIDATE TESTING |
| 19910723 | | LAST USE OF 810 |
| 19910816 | | FIRST USE OF 809-1 |
| 19910927 | 1 | INFORMATION LETTER 1 - REWRITTEN PROCEDURE |
| 19911015 | 3 | COOLING SYSTEM MODIFICATION |
| 19911015 | 3 | COOLANT BYPASS VALVE |
| 19911015 | 3 | CYLINDER LINER WEAR MEASUREMENT DEVICE |
| 19911015 | 3 | TEST FUEL NAME CHANGE |
| 19911015 | 3 | REPORT FORMS |
| 19920601 | 4 | CLOSED COOLING SYSTEM |
| 19920601 | 4 | PISTON PACKAGING FOR REFEREE RATING |
| 19920601 | 4 | MINERAL FREE WATER - DEFINITION |
| 19920601 | 5 | FLUSHING CART FLOW DIAGRAM |
| 19920731 | 6 | TEMPERATURE; PRESSURE AND SPEED STANDARD CALIBRATION TRACEABILITY |
| 19920731 | 6 | HUMIDITY MONITORING SYSTEM |
| 19921015 | 7 | FUEL INJECTION PUMP TIMING USING THE BUBBLE METHOD |
| 19921015 | 7 | PISTON RATER CALIBRATION |
| 19921015 | 7 | OIL SAMPLING FREQUENCY FOR USED OIL ANALYSIS |
| 19930324 | 8 | INTERNAL ENGINE PAINT AND SUPPLIER |
| 19930702 | 9 | CATERPILLAR BRAND COOLANT |
| 19930708 | 10 | PROCEDURE DISCLAIMER |
| 19930708 | 10 | CYLINDER HEAD COOLANT PASSAGE CLEANING |
| 19930708 | 10 | CRANKCASE PRESSURE INCREASE DURING BLOWBY MEASUREMENT |
| 19930708 | 10 | ACCEPTABLE CYLINDER HEAD/JUG ASSEMBLIES |
| 19930708 | 10 | RING GAP MEASUREMENT - FEELER GAUGES/TAPER GAUGE |
| 19930708 | 10 | PISTON POSITION DURING DOWNTIME |
| 19930708 | 10 | OIL CONSUMPTION CALCULATIONS |
| 19930708 | 10 | OIL CONSUMPTION CALCULATION AFTER SHUTDOWN |
| 19930708 | 10 | MISSING OR BAD TEST DATA |
| 19930708 | 10 | TYPOGRAPHICAL ERROR IN TABLE A12 |
| 19940101 | 11 | TEST RUN NUMBERING |
| 19940101 | 11 | PISTON PHOTOGRAPHS |
| 19940101 | 11 | USE OF AN ALIGNMENT FIXTURE IN P-TUBE AIMING |
| 19940101 | 11 | LOCATION OF LINER SURFACE FINISH MEASUREMENTS |
| 19940101 | 11 | LOCATION OF LINER BORE DIAMETER MEASUREMENTS |
| 19940101 | 11 | ENGINE ROTATION SPEED DURING FLUSHING |
| 19940101 | 11 | ACCEPTABLE CYLINDER LINER PART NUMBERS |
| 19940101 | 11 | CALIBRATION FREQUENCY |
| 19940102 | | CATERPILLAR COOLANT DEADLINE |
| 19940301 | 12 | OUTLIERS AS A TEST VALIDITY CRITERIA |
| 19940301 | 12 | INSTRUMENTATION CALIBRATION TOLERANCES AND TIME CONSTANTS |
| 19940316 | 13 | FUEL DILUTION AS AN OPERATIONAL VALIDITY CRITERION |
| 19950403 | | LAST USE OF 809 |
| 19950531 | | LAST NON-DISCRIMINATION RUN ON 810-X |
| 19950907 | | FIRST LTMS TEST |
| 19960510 | 96-1 | 1K/1N DATA DICTIONARY AND REPORT FORMS (VERSION=19960304) |
| 19960913 | 96-2 | BETA TESTED 1K/1N DATA DICTIONARY AND REPORT FORMS (VERSION=19960913) |
| 19961217 | | FIRST 810-X DISCRIMINATION RUN |
| 19970320 | 97-1 | USE OF LOW SULFUR FUEL FOR THE 1N TEST |
| 19970320 | 97-1 | ADDITION OF END OF TEST OIL CONSUMPTION (EOTOC) AS A REPORTED PARAMETER |
| 19970320 | 97-1 | ENGINE PARTS WARRANTY CLAIM PROCEDURE CHANGE |
| 19970320 | 97-1 | LTMS REQUIREMENTS FOR CALIBRATION |
| 19970320 | 97-1 | CLARIFICATION OF SPECIFICATION FOR HUMIDITY CALIBRATION |
| 19970320 | 97-1 | CLARIFICATION OF WHEN REFEREE RATINGS ARE REQUIRED |
| 19970320 | 97-1 | ADDITION OF DATA DICTIONARY AND REPORT FORMS TO THE PROCEDURE |
| 19970320 | 97-1 | TEST REPORTING DEADLINES |
| 19970320 | 97-1 | EXAMPLES FOR SEVERAL OF THE REPORT FORMS |
| 19980101 | 98-1 | FUEL SUPPLIER NAME CHANGE |
| 19980101 | 98-1 | FUEL SAMPLING REQUIREMENTS |
| 19980101 | 98-1 | REVISED ENGINE PARTS WARRANTY PROCEDURE & FORM |
| 19980101 | 98-1 | 810-2 DISCRIMINATION RUNS RETURNED TO LTMS/CAL RUNS, CAL PD = 1YR |
| 19980828 | 98-2 | RATING WORKSHEET ADDED TO TEST REPORT AS FORM 4A |
| 19981111 | 98-3 | ADDED AREAS FOR CLEAN TO RATING SHEETS 5 & 5A |
| 19990419 | 99-1 | TEST STAND INSTRUMENTATION CALIBRATION REQUIREMENTS |
| 19990419 | 99-1 | COOLANT SYSTEM FLUSHING REQUIREMENTS |
| 19990419 | 99-1 | UPDATED INTAKE AIR FILTER REQUIREMENTS |
| 19990419 | 99-1 | VISUAL INSPECTION OF INTAKE AIR BARRELS |
| 19990419 | 99-1 | RE-CALIBRATION REQUIREMENTS WHEN CRANK IS REMOVED |
| 19990419 | 99-1 | USE OF MOBIL EF-411 AS BUILD-UP/FLUSHING OIL |
| 19990419 | 99-1 | TIME ZONE FOR USE IN EOT REPORTING |
| 19990419 | 99-1 | EDITORIAL |
| 20000101 | 00-1 | 810-X RUNS WILL OCCUR VOLUNTARILY ONCE PER YEAR |

TIMELINE (continued):

| Effective Date | Info Letter | |
|----------------|-------------|---|
| 20020321 | 02-1 | 1K/1N DATA DICTIONARY AND REPORT FORMS (VERSION=20020107) |
| 20030324 | | FIRST 811-2 TEST |

RATING:

During this report period, no second referee ratings were requested. The table below summarizes the re-rates for this report period:

| Rating Re-rate Summary | |
|--|----------|
| Total number of re-rates requested | <u>0</u> |
| Number of tests where lab rating was changed | 0 |
| Number of tests where referee rating was changed | 0 |
| Number of tests where no changes were made | 0 |

LAB VISITS:

No lab visits were completed this report period.

INFORMATION LETTERS:

No information letters were issued this report period.

FUEL BATCH APPROVAL:

During this period, the following fuel batches were approved for testing: QJ3121LS01, QL2321LS11, RA2421LS02, and RC1421LS03.

SUMMARY

- TGF, TLHC, BSOC, and EOTOC severity all remained within acceptable limits this period. As has generally been the case since October of 1994, WDK results were slightly mild.
- Precision for all parameters remained within acceptable limits throughout this report period.

SDP/sdp/astm0403.doc/mem03-041.sdp.doc

c: J. L. Zalar
F. M. Farber
Abdul Cassim
Single Cylinder Diesel Surveillance Panel
<ftp://ftp.astmtmc.cmu.edu/docs/diesel/scote/semiannualreports/1k-04-2003.pdf>

Distribution: internet