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

MEMORANDUM: 06-038

DATE: May 24, 2006

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

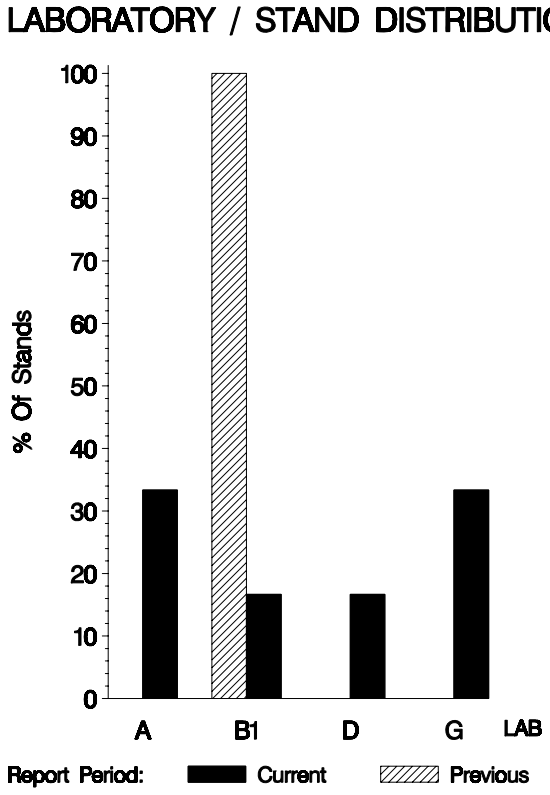
FROM: Scott Parke

SUBJECT: 1N Testing from October 1, 2005 through March 31, 2006

Eight calibration tests were reported to the Test Monitoring Center during the period from October 1, 2005 through March 31, 2006. The data from the operationally valid tests is shown on page 8. Following is a summary of testing activity this period.

	Reporting Data	Calibrated on 3-31-06
Number of Labs	4	3
Number of Stands	6	4

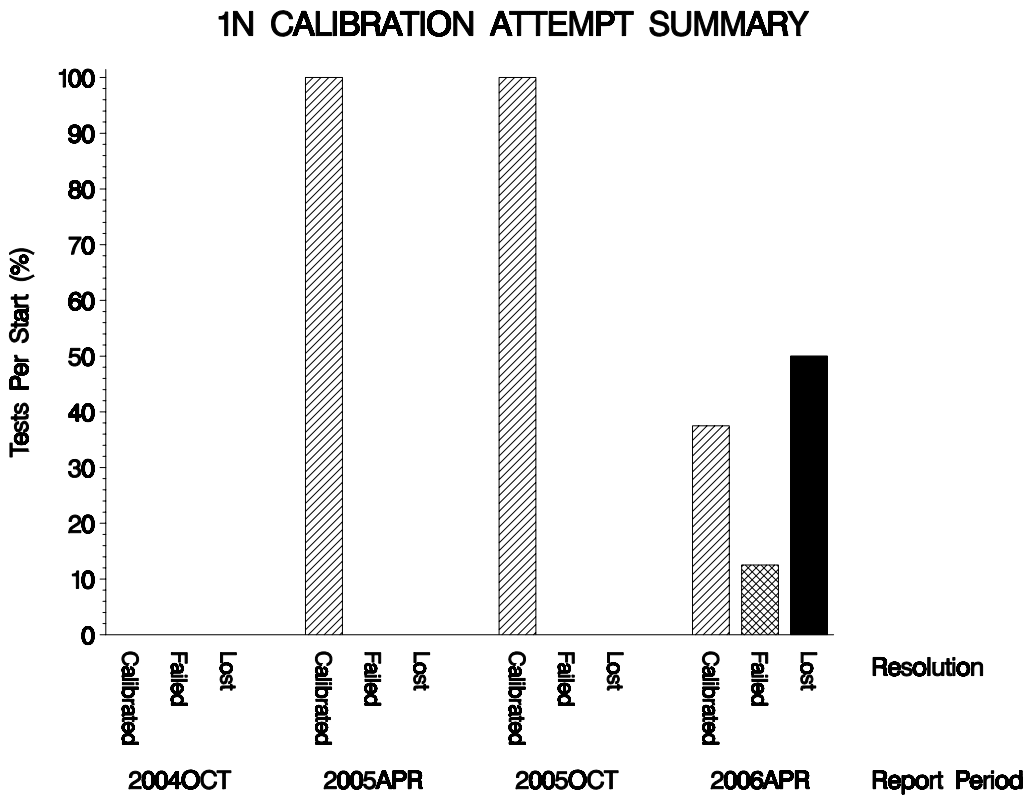
Stands reporting data this period were distributed as shown below:

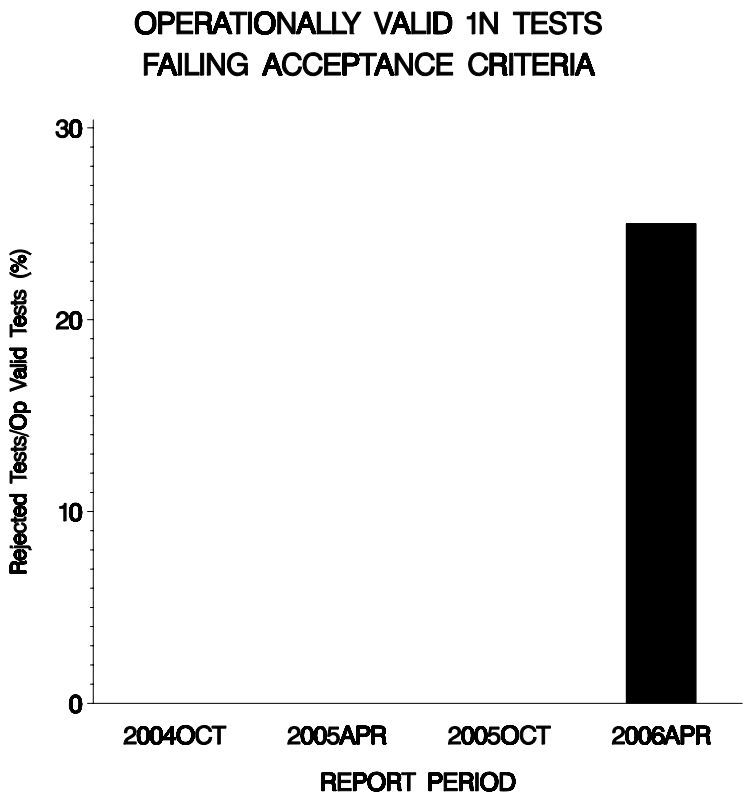


Test Distribution by Oil and Validity

		1004-2	1004-3	809-1	810-2	811-1	Totals Last Period	Totals This Period
Accepted for Calibration	AC	0	0	3	0	0	1	3
Rejected Mild	OC	0	0	0	0	0	0	0
Rejected Severe	OC	0	0	1	0	0	0	1
*Rejected for EWMA Precision	OC	0	0	0	0	0	0	0
*Rejected for Shewhart Precision	OC	0	0	0	0	0	0	0
Operationally Invalid (lab)	LC	0	0	1	0	0	0	1
Operationally Invalid (lab/TMC)	RC	0	0	0	0	0	0	0
Aborted Calibration	XC	0	0	3	0	0	0	3
Total		0	0	8	0	0	1	8

*During a January 23, 2006 teleconference, the Surveillance Panel elected to remove precision as a rejection criteria. Instead, the test report will now include a checkbox for use in instances where a candidate test was run in a stand that produced a precision alarm on its reference run.





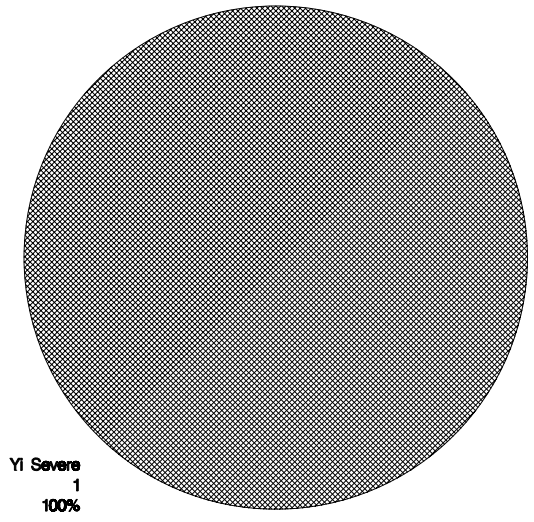
One test failed this report period (severe WDN). It is the first 1N to fail to meet acceptance criteria since August of 2001.

No LTMS deviations were written this period.

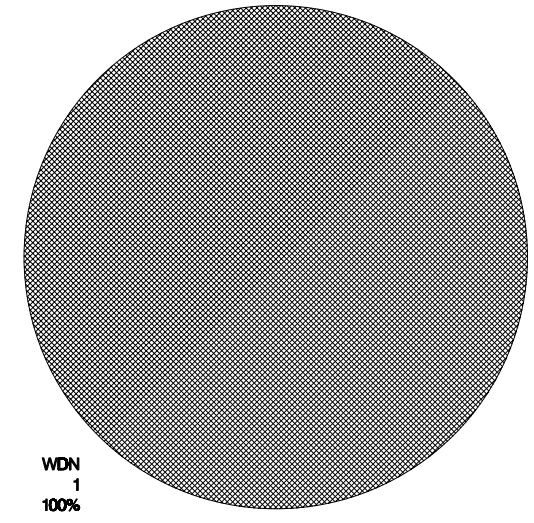
Reduced-K criteria was not used in the calibration of any stands this period.

Shown below is the distribution by type and parameter of the alarms causing the failures for this period.

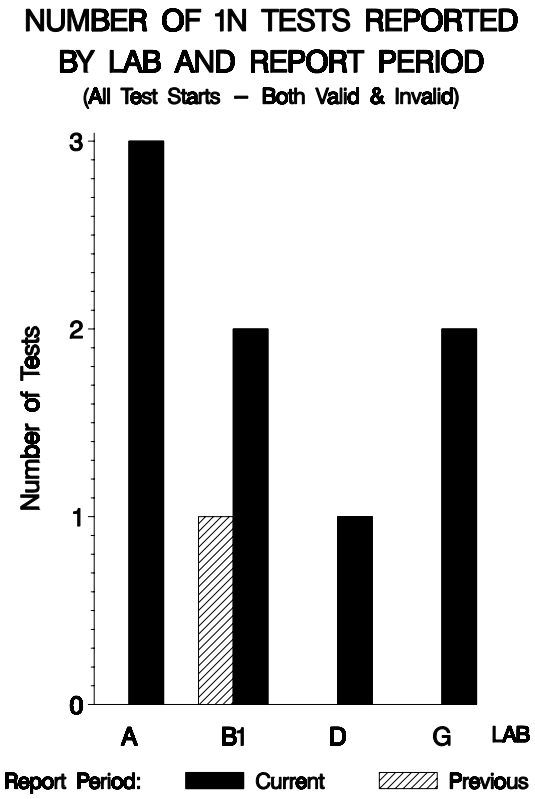
DISTRIBUTION OF 1N
LTMS STAND ALARMS
(By Alarm Type)



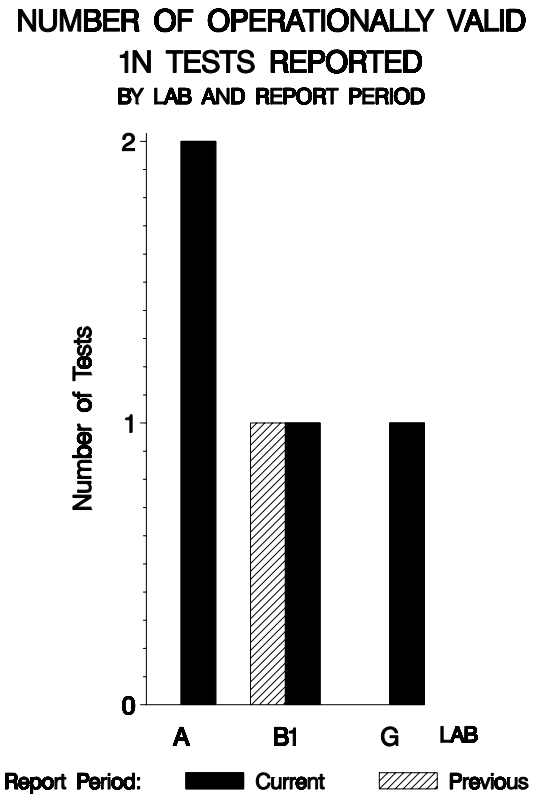
DISTRIBUTION OF 1N
LTMS STAND ALARMS
(By Test Parameter)



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



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



Lost Tests per Start by Oil and Lab

	1004-2			1004-3			809-1			810-2			811-1			Total		
Lab	Lost	Starts	%	Lost	Starts	%	Lost	Starts	%	Lost	Starts	%	Lost	Starts	%	Lost	Starts	%
A							1	3	33							1	3	33
B1							1	2	50							1	2	50
D							1	1	100							1	1	100
G							1	2	50							1	2	50
Total							4	8	50							4	8	50

Lost tests are those that were either aborted, rejected by lab, or operationally invalid. No lost tests were reported this period.

Causes for Lost Tests

		Oil					Validity			Loss Rate		
Lab	Cause	1004-2	1004-3	809-1	810-2	811-1	LC	RC	XC	Lost	Starts	%
A	High oil consumption at 103 hours.			●					●	1	3	33%
B1	Injector failure at 50 hours.			●					●	1	2	50%
D	High oil consumption at 182 hours.			●					●	1	1	100%
G	Post-test inspection of statistically acceptable test discovered that test was run with fuel cut-off out of spec.			●			●			1	2	50%
	Lost	0	0	4	0	0	1	0	3			
	Starts	0	0	8	0	0	8	8	8			
	%	0%	0%	50%	0%	0%	13%	0%	38%			

Average Δ/s by Lab					
Lab	n	TGF	WDN	TTLHC*	BSOC
A	2	-0.385	0.860	0.016	-0.255
B1	1	-1.020	-0.453	0.241	-0.549
G	1	0.298	-0.202	-1.649	-0.745
Industry	4	-0.373	0.266	-0.344	-0.451

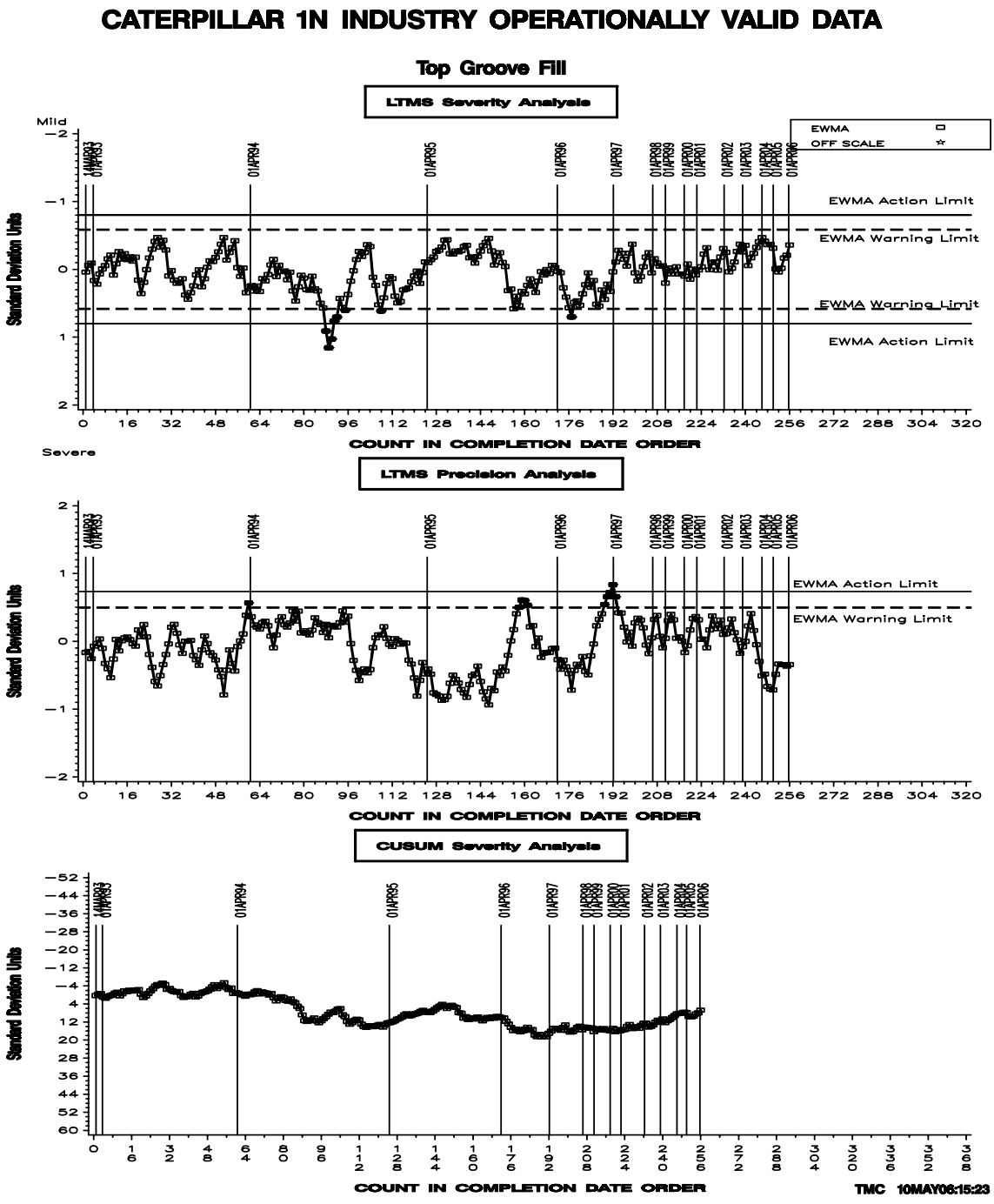
* Transformed TLHC

DATA FROM ALL OPERATIONALLY VALID TESTS REPORTED THIS PERIOD:

LTMS DATE	LAB	STAND	OIL	TG	WD	TL	OC	TGYI	WDYI	TLYI	OCYI
20051106	G	8	809-1	40	191.4	0.000	0.17	0.298	-0.202	-1.649	-0.745
20051118	A	3	809-1	27	163.8	1.000	0.25	-0.337	-1.036	-0.650	-0.353
20051202	B1	3A	809-1	13	183.1	7.000	0.21	-1.020	-0.453	0.241	-0.549
20060128	A	12	809-1	25	289.3	12.000	0.29	-0.434	2.755	0.683	-0.157

DISCUSSION OF INDUSTRY PERFORMANCE OVER THIS PERIOD

TGF:
The average TGF Yi this period (shown in the table on the previous page) was –0.373 mild. Using 1004-1's test target standard deviation of 14.6 to compute a Δ yields 5% TGF.

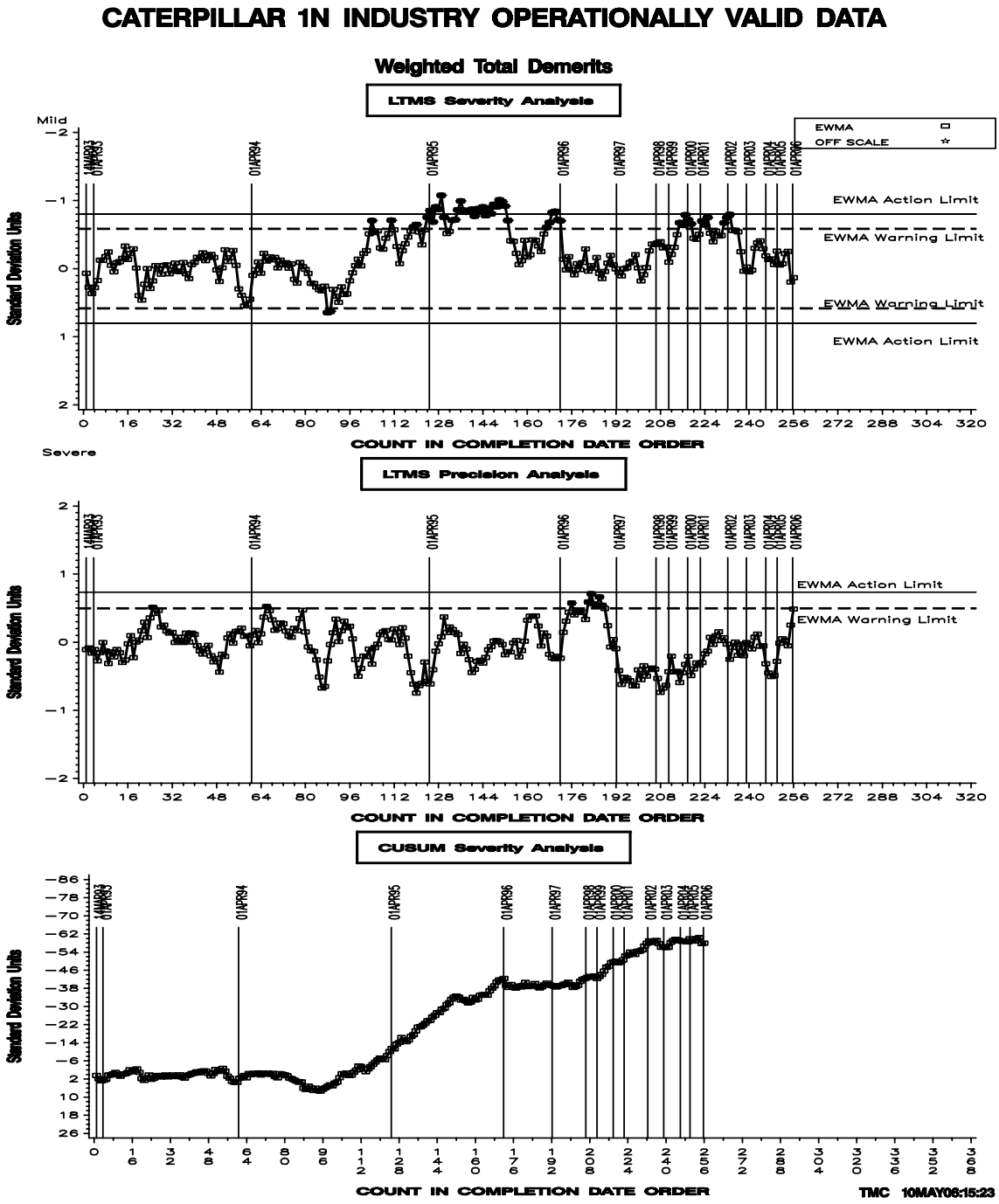


The LTMS/Cusum plot for TGF is shown above. TGF severity and precision remained within limits this period.

WDN:

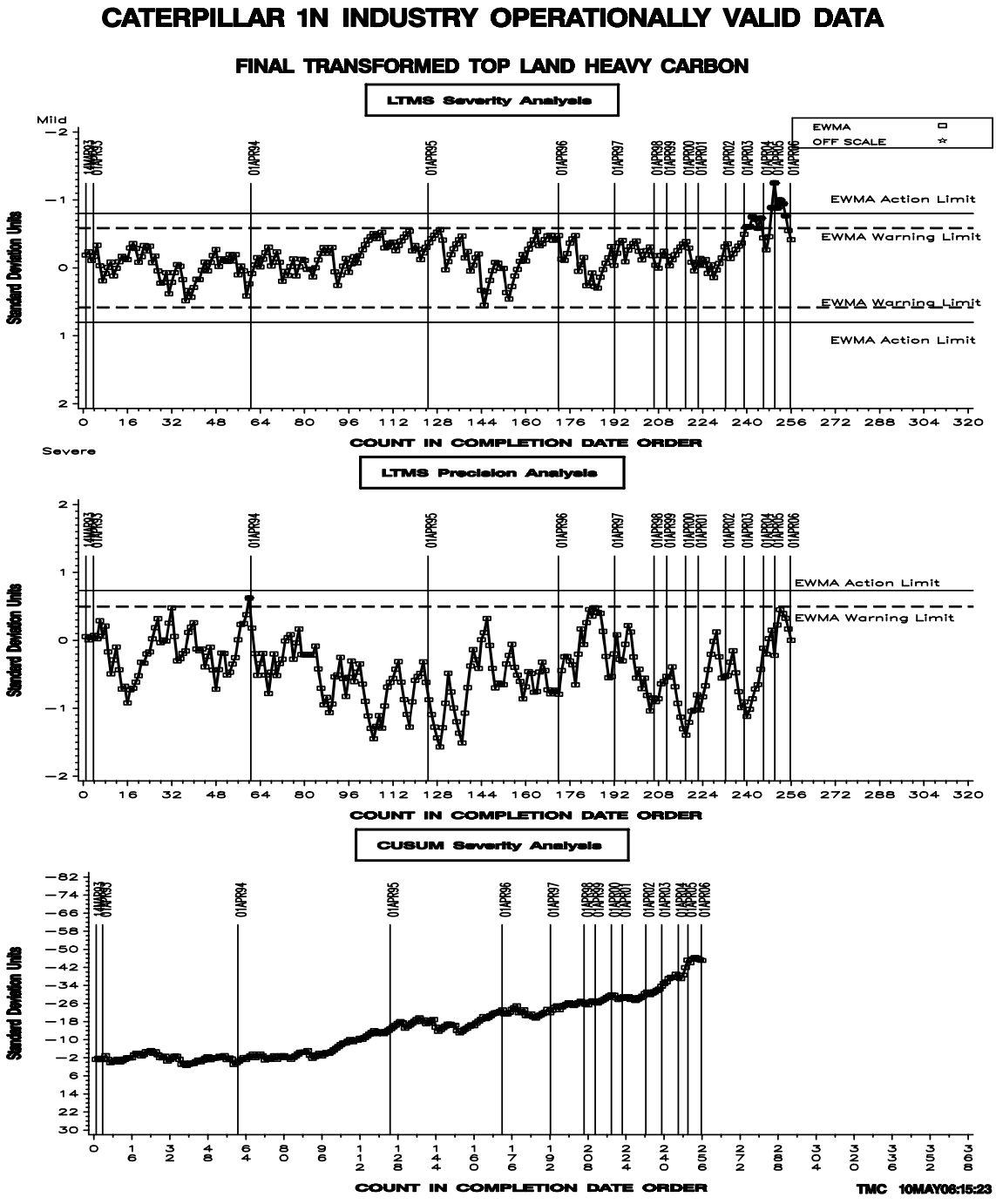
The average WDN Yi reported this period was 0.266 severe (see table on page 8). This translates to 7.2 demerits when multiplied by the target standard deviation for 1004-1 (27.1).

The LTMS/Cusum plot is shown below.



TLHC:

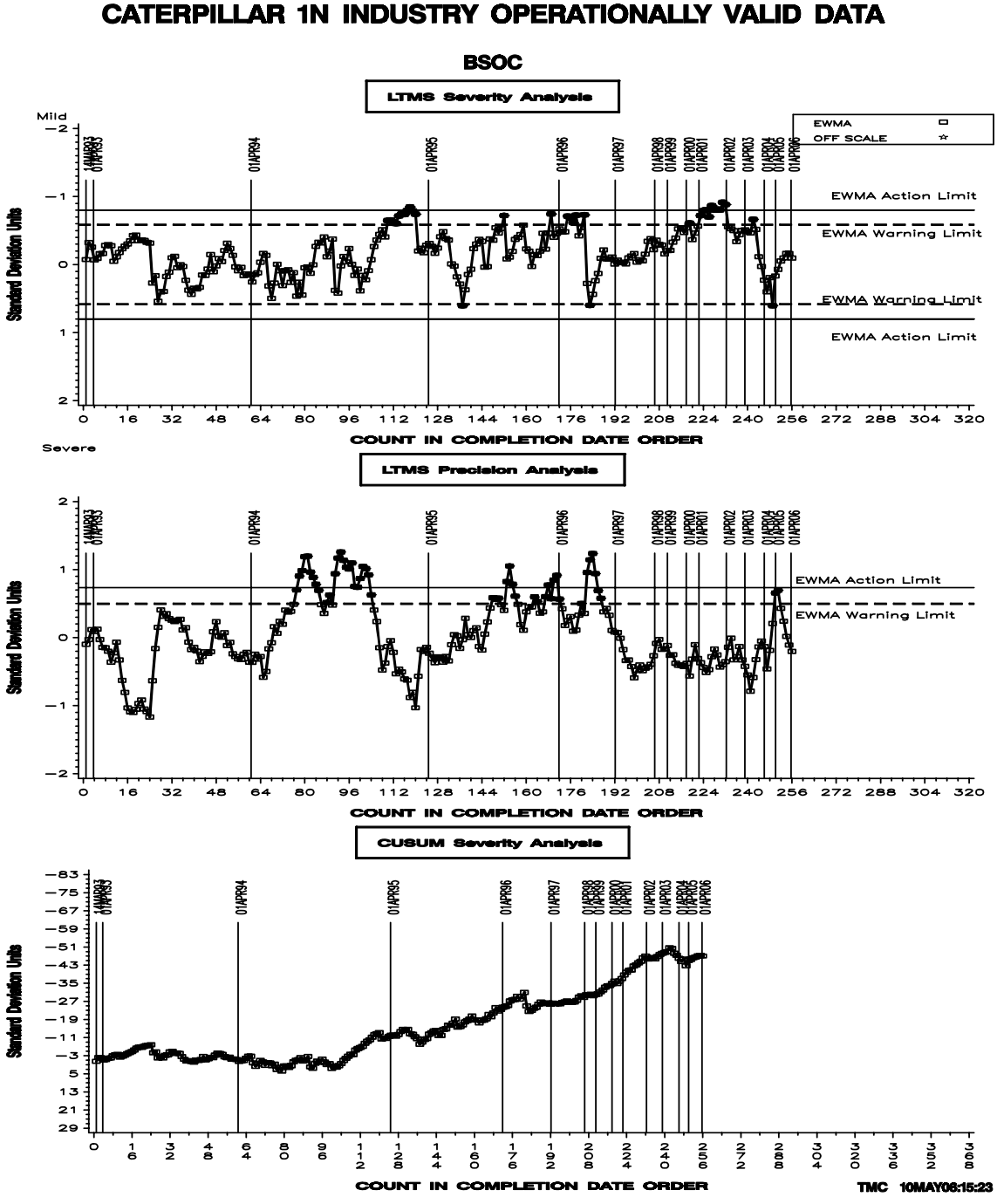
The average TLHC Yi reported this period was –0.344 mild (see table on page 8). All runs reported this period used the 1Y3998 liner and so have had the industry correction factor of –0.451 applied. Using the test target standard deviation of 0.9 from oil 1004-1 to compute a transformed delta yields 0.3096. Back-transforming this value gives <1% TLHC.



The LTMS/Cusum plot for transformed TLHC is shown above.

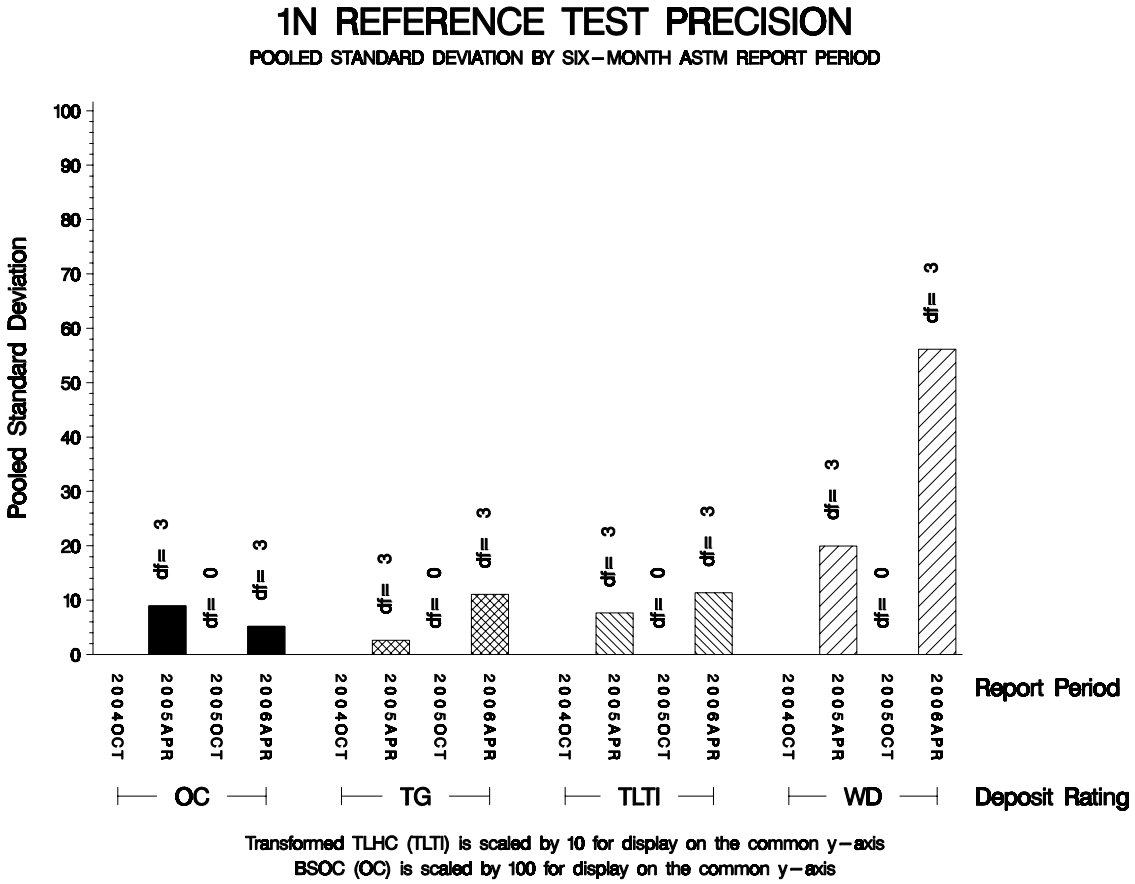
BSOC:

The average BSOC Yi reported this period was –0.451 or, computing a delta using the test target standard deviation of 0.045 for oil 1004-1 gives 0.02g/kW mild. The LTMS/Cusum plot for BSOC is shown below.



POOLED S:

Shown below is a bar chart comparing the pooled s values for the 1N 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 have been multiplied by 100 to allow these parameters to be shown on the same plot as the other parameters. Where degrees of freedom equal zero, no bars are shown. This will occur where only one test was reported or where multiple tests are reported but all are on different oils. Periods showing no information had no tests reported (October 2004).



STATUS OF REFERENCE OIL SUPPLY:

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

		@ TMC	
Oil	Cans @ Labs	Cans	Gallons
809-1	4	287	2878
810-2	2	360	3605
811-1	10	0	9
811-2	2	166	1662
1004-1	3	0	0
1004-2	0	3	38
1004-3	5	18	181
Total	26	834	8373

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

Be aware that the above table presumes that *all* of each of these oils is dedicated to the 1N test area. 809-1 is used in several other test areas; 810-2 and 811-*x* are used in the 1K test area; and 1004-*x* is used in several of the other diesel test areas.

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

Effective Date	Info Letter	
19910710	2	INDUSTRY CORRECTION FACTORS FOR CANDIDATE TESTING
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
19930629		FIRST USE OF 1004
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		1Y3555 DEADLINE
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
19940129		START OF EXCLUSIVE USE OF 1004-X OILS
19940205		FIRST USE OF 1004-1
19940226		LAST USE OF 1004
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
19950401		FIRST LTMS TEST
19950605		811-1 RETURN TO SYSTEM
19950811		FIRST USE OF 1004-2
19950918		809-1 RETURN TO SYSTEM
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)
19961025		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

TIMELINE (continued):

Effective Date	Info Letter	
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
20020321	02-1	1K/1N DATA DICTIONARY AND REPORT FORMS (VERSION=20020107)
20040223	04-1	1K/1N DATA DICTIONARY AND REPORT FORMS (VERSION=20040205) DD AND FORMS SEPARATED FROM THE STANDARD
20040314		FIRST 1Y3998 LINER RUN
20040314	04-2	INTRODUCTION OF TLHC CORRECTION FACTOR FOR 1Y3998 LINER RUNS
20041117		FIRST PC-9 FUEL RUN
20041117	05-1	INTRODUCTION OF TGF AND BSOC CORRECTION FACTOR FOR 1Y3998 LINER RUNS
20050928	05-2	UPDATE TO TLHC CORRECTION FACTOR FOR 1Y3998 LINER RUNS AND REMOVAL OF TGF AND BSOC CF

RATING:

No re-rates were requested during this report period. The table below summarizes the re-rates for this report period:

Rating Re-rate Summary

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
Total number of re-rates requested	0

LAB VISITS:

No 1N lab visits were completed during this period.

INFORMATION LETTERS:

Information Letter 05-2 was issued this report period. It revised the TLHC industry correction factor for 1Y3998 liners and removed the industry correction factors for TGF and BSOC.

FUEL BATCH APPROVAL:

During this period, no new fuel batches were approved for testing.

1Y3998 LINERS AND CORRECTION FACTORS:

This report period continued the introduction of 1Y3998 liners into 1N testing. Data analyses conducted thus far indicate that this hardware will shift TLHC severe. To compensate, the surveillance panel has implemented a correction factor on this parameter for tests using 1Y3998 liners. Up until this report period, all 1Y3998 tests have been run on oil 1004-3. To investigate whether or not the severity shift holds for all oils, the surveillance panel requested that the most recent round of reference oil tests be run on oil 809-1.

SUMMARY

- The introduction of 1Y3998 liners is continuing as is the dyed Phillips PC-9 fuel introduction. These variables make drawing conclusions from results produced recently difficult. Further testing will be necessary before anything definitive can be said of the impact of these variables.

- Precision for all parameters remained within limits throughout this report period.

SDP/sdp/astm0406.doc/mem06-038.sdp.doc
c: J. L. Zalar
F. M. Farber
Britt Pulley, Caterpillar
Single Cylinder Diesel Surveillance Panel
ftp://ftp.astmtmc.cmu.edu/docs/diesel/scote/semiannualreports/1n-04-2006.pdf

Distribution: email