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MEMORANDUM: 01-036

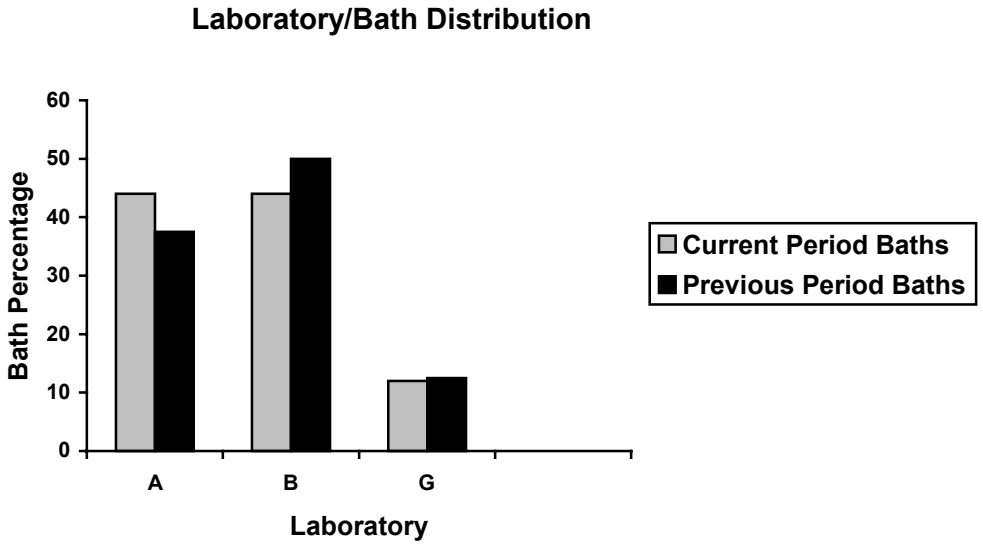
DATE: April 16, 2001

TO: Jerry Wang, Chairman, CBT Surveillance Panel

FROM: Richard E. Grundza

SUBJECT: High Temperature Corrosion Bench Test Status from October 1, 2000 through March 31, 2001

A total of 93 High Temperature Corrosion Bench Test results from nine baths in three labs were reported to the TMC during the period from October 1, 2000 through March 31, 2001. The following chart shows the distribution by laboratory.



The following summarizes the status of the reference oil tests reported to the TMC:

	TMC Validity Codes	No. of Tests
Operationally and Statistically Acceptable	AC	83
Failed Acceptance Criteria	OC	4
Operationally Invalid, Lab Judgement	LC	1
Aborted	XC	5
Total		93

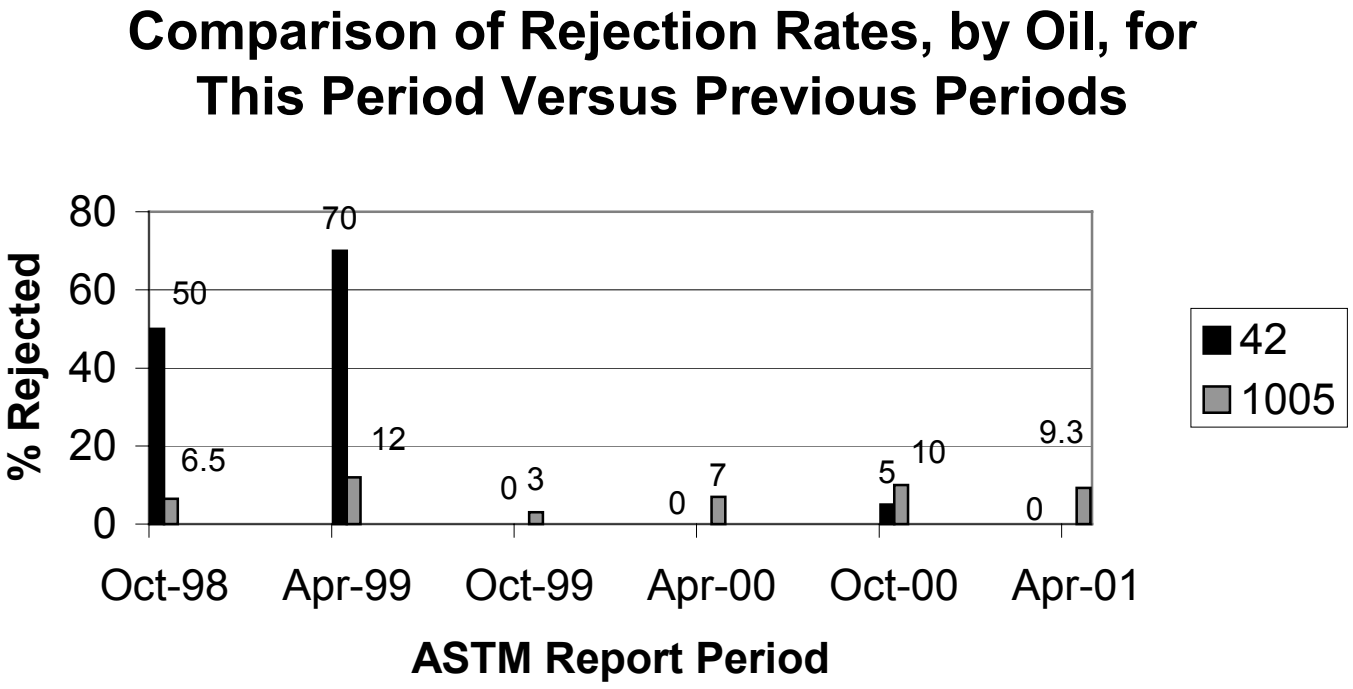
The following tabulates the statistically unacceptable tests

Reason	Number of Tests
Mild Copper, Severe Lead (Reference oil 1005)	1
Severe Copper (Reference oil 1005)	3

A total of 44 operationally valid results run on reference oil 42 of which 0 failed (0% fail rate).
A total of 43 operationally valid results were run on reference oil 1005 of which 4 failed (9.3% fail rate).

Three of the aborted tests were due to client request. The fourth aborted test was because of temperature control problems and a fifth test was aborted due to operator error. The operationally invalid test was due to contamination of the oil.

The following presents the fail rate for this period with the fail rates of previous periods, by reference oil.

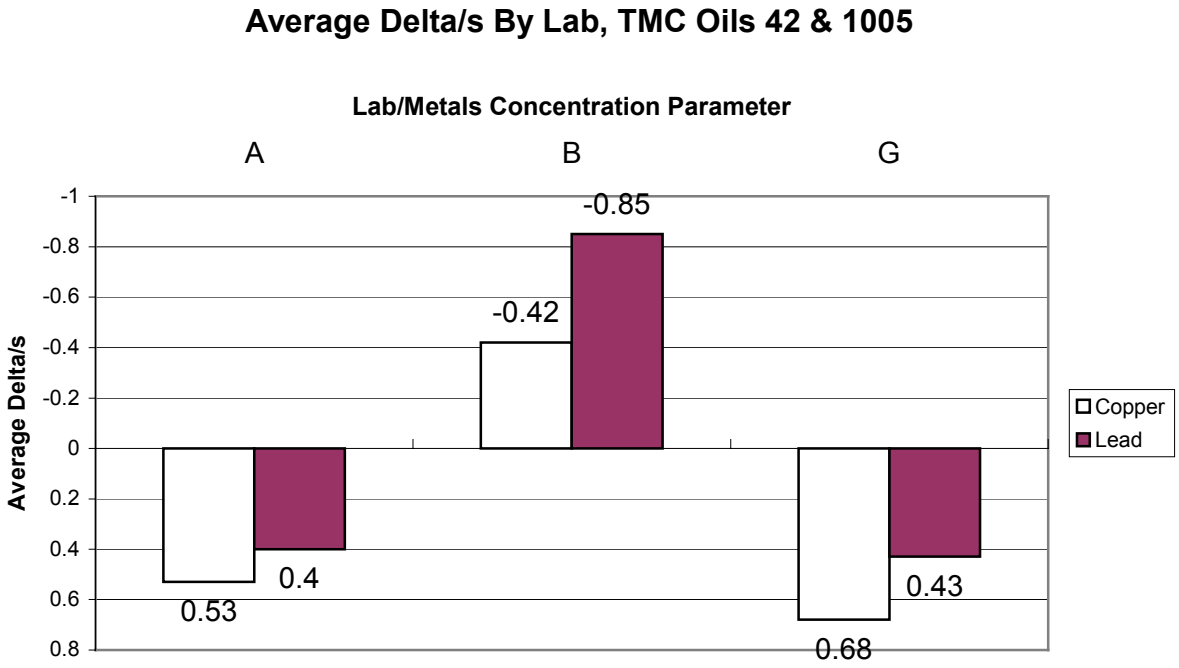


Industry Severity and Precision

The current severity for the change in metals concentration parameters on all operationally valid tests, for the current and previous periods, is tabulated below.

Period	n	□ Cu Mean □/s	□ Pb Mean □/s
10/1/98 through 3/31/99	98	-0.76	0.98
4/1/99 through 9/30/99	63	-0.16	0.16
10/1/99 through 3/31/00	84	-0.40	-0.27
4/1/00 through 9/30/00	99	-0.05	-0.24
10/1/00 through 3/31/01	87	0.02	-0.29

Figures 1 and 2 plot the Summation delta/s from target for both change in copper and change in lead, respectively. Figure 1 shows copper change on or near target for the period. Figure 2 shows lead change severity trending mild during the period. There is a one test interruption in the mild trend, caused by one result which was 15.87 standard deviations from target severe. Laboratory severity for both reference oils 1005 and 42 is depicted below.



Industry Severity by Reference Oil

The industry performance (severity and precision) for reference oil 42, comparing the current period with the previous ASTM report periods, is tabulated below. Values in parentheses are in transformed (natural log) units

Period	n	□ Cu mean	□ Cu s	□ Cu Mean □/s	□ Pb mean	□ Pb s	□ Pb Mean □/s
10/1/98 to 3/31/99	55	25.5 (3.240)	(0.600)	-2.23	106.4	25.08	0.77
4/1/99 to 9/30/99	32	24.3 (3.189)	(0.264)	-0.06	115.6	11.68	0.33
10/1/99 to 3/31/00	42	20.1 (2.999)	(0.273)	-0.39	104.1	16.03	-0.16
4/1/00 to 9/30/00	48	19.7 (2.981)	(0.424)	-0.42	104.9	25.10	-0.12
10/1/00 to 3/31/01	44	25.4 (3.236)	(0.263)	0.02	97.75	12.51	-0.42

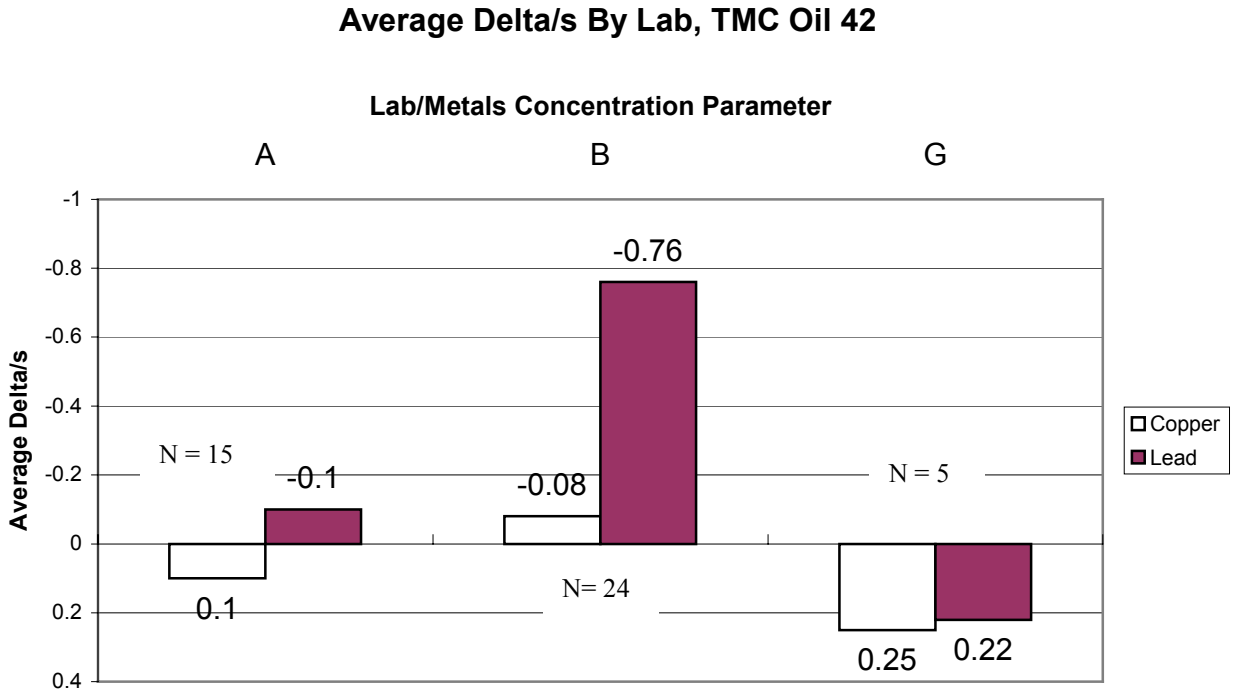
The industry performance (severity and precision) for reference oil 1005, comparing the current period with the previous ASTM report periods, is tabulated below. Values in parentheses are in transformed (natural log) units.

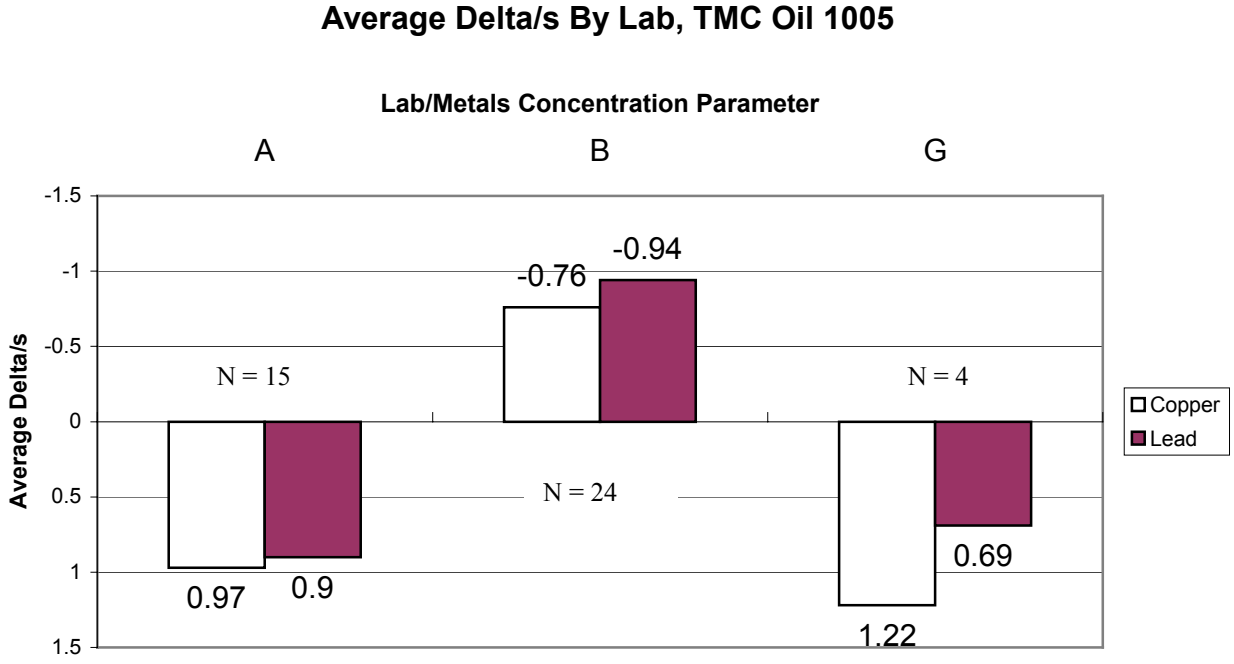
Period	n	□ Cu mean	□ Cu s	□ Cu Mean □/s	□ Pb mean	□ Pb s	□ Pb Mean □/s
10/1/98 to 3/31/99	51	9.5 (2.251)	(0.151)	0.60	33.4	15.2	1.18
4/1/99 to 9/30/99	31	9.2 (2.219)	(0.128)	-0.26	32.1	12.01	-0.1
10/1/99 to 3/31/00	42	9.0 (2.197)	(0.154)	-0.42	27.2	6.76	-0.39
4/1/00 to 9/30/00	51	9.9 (2.297)	(0.380)	0.29	27.7	12.27	-0.35
10/1/00 to 3/31/01	43	9.6 (2.258)	(0.190)	0.02	30.3	33.5	-0.15

With the exception of Pb using reference oil 1005, precision has shown significant improvement with respect to the previous period for both oils and parameters. The degradation in Pb precision with reference oil 1005 can be traced to one result which was 15.87 standard deviations from target. With this result removed from the calculation, the standard deviation becomes 8.17, which would be an improvement with respect to the previous period. Precision compares well with historical rates for all other oils/parameters. Copper severity for both oils was on or near target, while lead severity was mild for both oils this period. In both cases, Cu and Pb severity was closer to target than the previous period.

Laboratory Severity by Oil

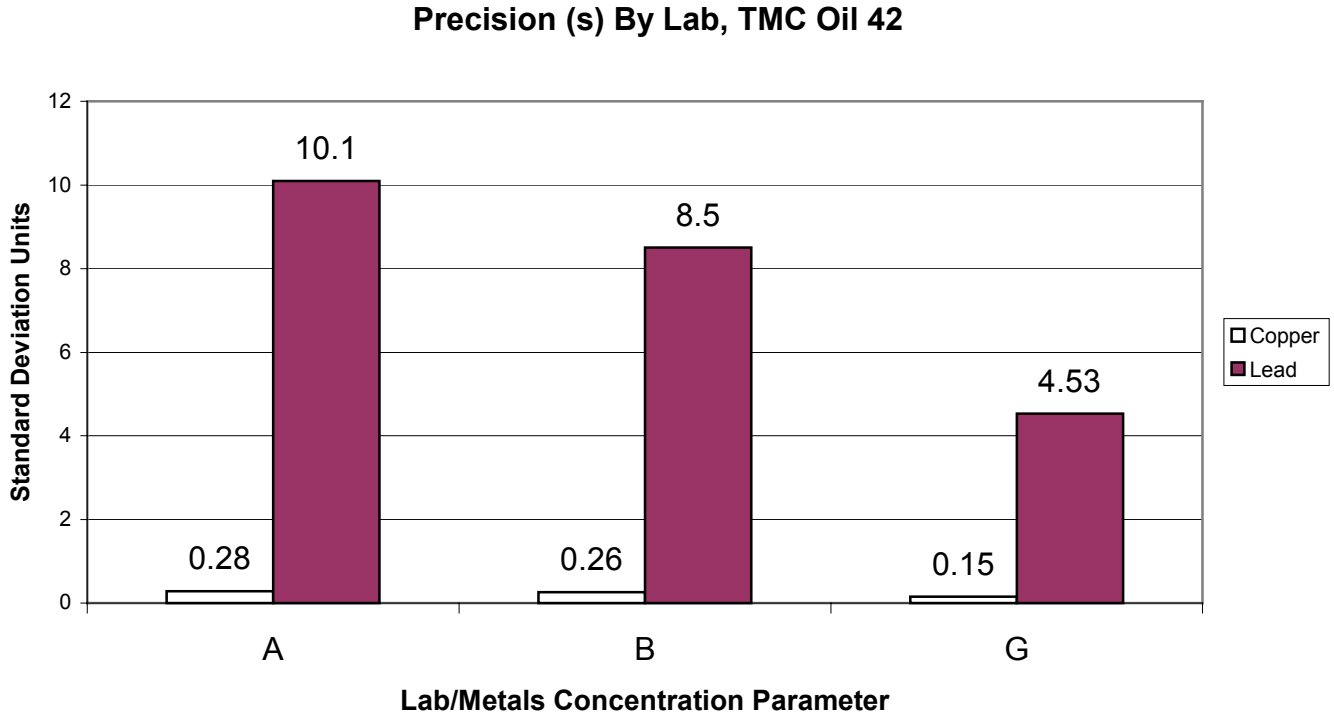
Severity by laboratory on each of the approved reference oils is plotted below.

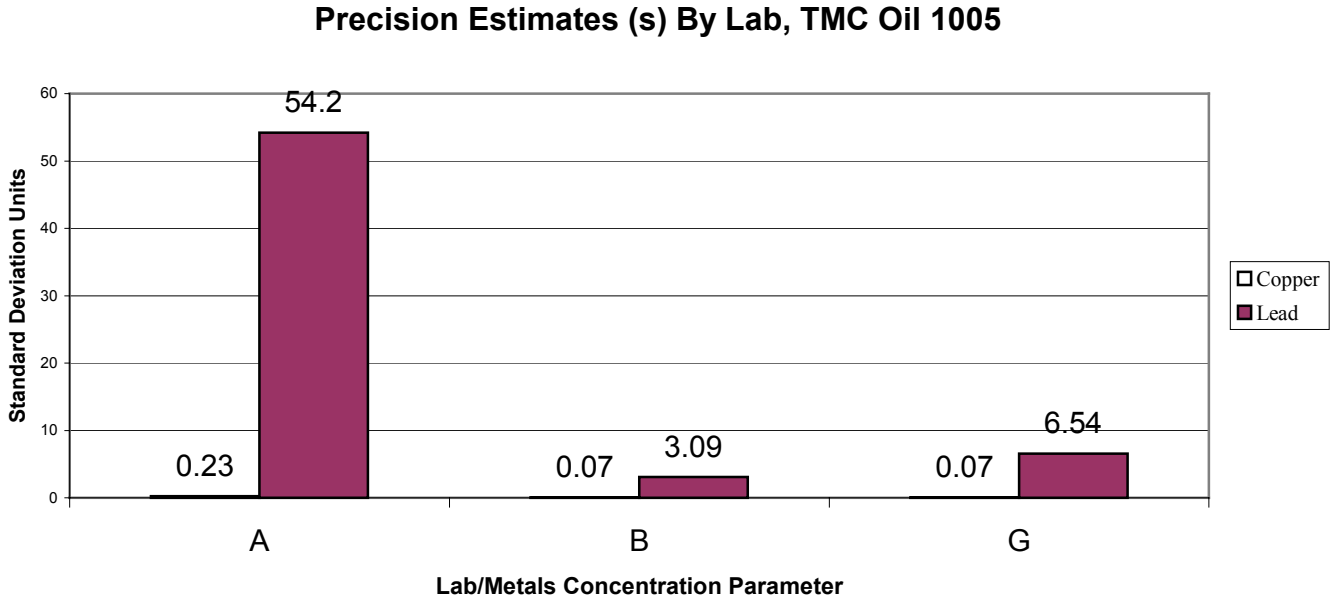




Both charts illustrate some laboratory differences, with lab B showing mild results on both oils. Lab A was on or near target with reference oil 42, but was severe with reference oil 1005. Lab G was severe on both reference oils.

The following plots show the precision for this period, by lab and oil.





Copper standard deviations were calculated in transformed (natural log, ln) units. Lead variability was significantly higher in lab A, with reference oil 1005, and appears to have been caused by an anomalous result. There also appears to be a difference in lead precision between labs A and G with reference oil 42. Copper variability with reference oil 1005 appears to be higher in Lab A versus the other labs.

The following also tabulates the lab data provided in the previous plots and also gives the mean performance of each parameter. Values in parenthesis are in transformed (natural log, ln) units.

Reference Oil 42

Lab	N	□ Cu mean	□ Cu s	□ Cu mean □/s	□ Pb mean	□ Pb s	□ Pb mean □/s
A	15	26.7 (3.283)	(0.289)	0.102	105.5	10.1	-0.099
B	24	24.0 (3.179)	(0.257)	-0.760	89.8	8.5	-0.077
G	5	29.0 (3.368)	(0.151)	0.248	113.0	4.5	0.217

Reference Oil 1005

Lab	N	□ Cu mean	□ Cu s	□ Cu mean □/s	□ Pb mean	□ Pb s	□ Pb mean □/s
A	15	10.9 (2.392)	(0.231)	0.966	44.0	54.2	0.903
B	24	8.6 (2.148)	(0.067)	-0.765	20.0	3.1	-0.942
G	4	11.3 (2.428)	(0.065)	1.222	41.2	6.5	0.686

Procedure Status

TMC Memorandum 01-012 was issued on January 25, 2001, advising the panel that the High Temperature Corrosion Bench Test is now available as Test Method D6594-00, through ASTM Headquarters.

Reference Oil Supply

Reference oil quantities available at the laboratories and TMC, as well as estimated life of these oils, is tabulated below.

Oil	TMC Inventory, in gallons	TMC Inventory, in tests	Laboratory Inventory, in tests	Estimated life
42	14.67	469	19	4+ years
1005	43.42	1389	22	>5 years

Information Letters and Memorandum

Information Letter 01-1 was issued on February 7, 2001. This information letter made report forms and data dictionary changes, as documented in version 20010117.

TMC Memo 00-182 was issued on December 13, 2000. This memo distributed the 20001114 version of the report forms and data dictionary.

Summary

□ Cu was on or near target for the period, while □ Pb trended mild this report period. With the exception of □ Pb precision with reference oil 1005, which has degraded, precision for all other oils/parameters compares well with the previous period and historical rates. The degradation in □ Pb may be the result of one result which was 15.87 standard deviations severe. Rejection levels with both oils compare favorably with historical rates.

REG/reg

c: HTCBT Surveillance Panel
ftp://www.tmc.astm.cmri.cmu.edu/docs/bench/htcbt/semiannualreports/htcbt-4-2001
J. L. Zalar
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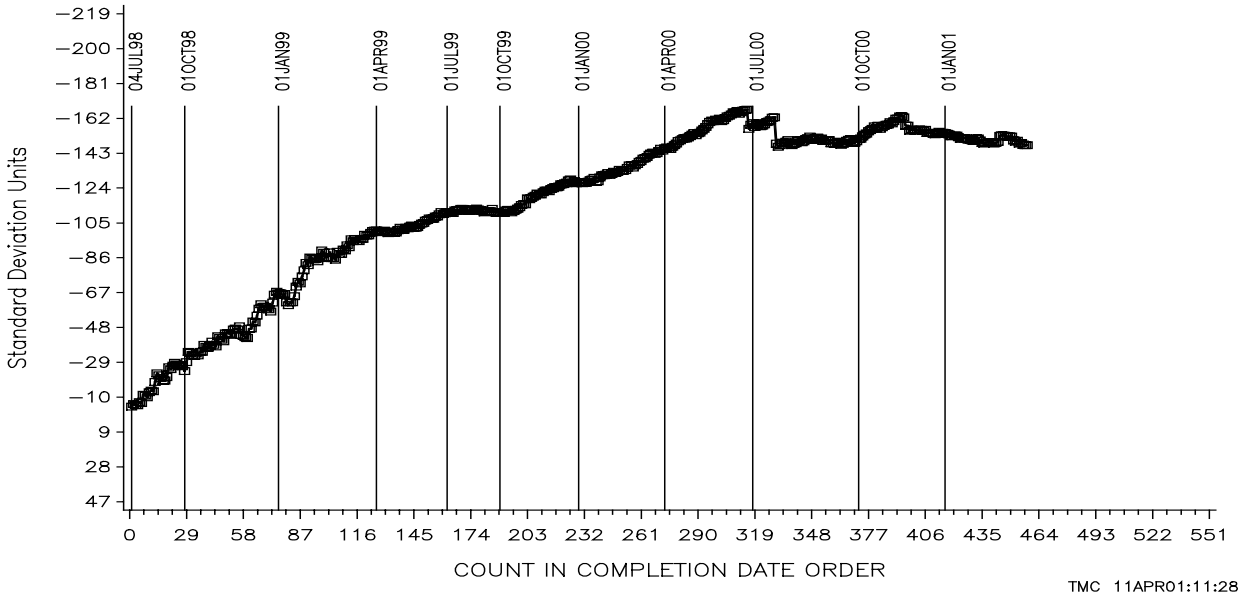
HIGH TEMP CBT INDUSTRY OPERATIONALLY VALID DATA

Figure 1

REF. COPPER CHANGE IN CONCENTRATION [<](ppm)

CUSUM Severity Analysis



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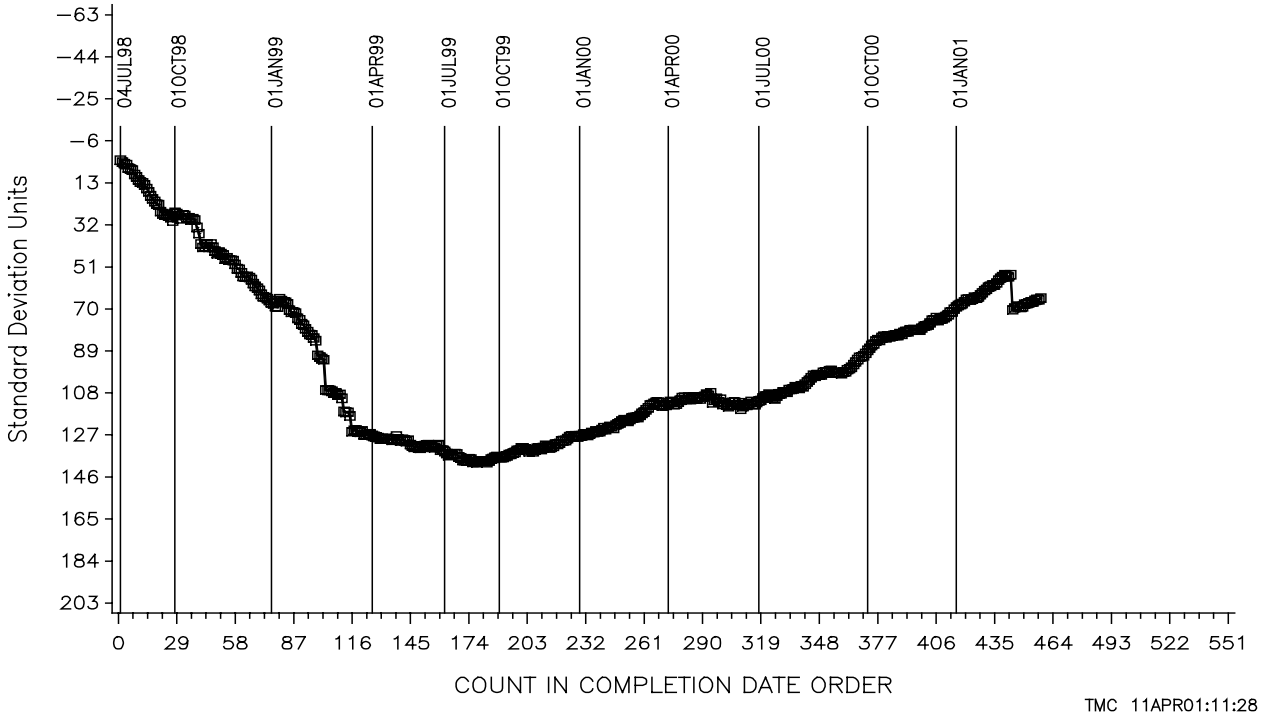
HIGH TEMP CBT INDUSTRY OPERATIONALLY VALID DATA

Figure 2

REF. LEAD CHANGE IN CONCENTRATION [<](ppm)

CUSUM Severity Analysis



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