Test Monitoring Center

Carnegie Mellon University
6555 Penn Avenue, Pittsburgh, PA 15206, USA

A Program of ASTM International

http://astmtmc.cmu.edu
412-365-1000

MEMORANDUM: 11-001

DATE: January 10, 2011

TO: Passenger Car and Heavy Duty Surveillance Panel Chairs

FROM: Jeff Clark

SUBJECT: TMC Concerns on LTMS Version 2

Both the Seq. III and VID panel chairs have solicited concerns regarding LTMS Version 2 proposals. This memo documents the TMC's concerns in general about LTMS v2, and where noted, specific concerns about the existing proposals. Following an internal review of the LTMS v2 Draft and the VID and IIIG proposals, the TMC has several concerns as stated below. While this list is not comprehensive, it covers what are currently the priority issues the TMC feels are in need of further examination by the surveillance panels.

Change in testing philosophy

LTMS v2 introduces a change in testing philosophy that no longer puts a primary emphasis on test labs running at similar severity levels. The primary emphasis is to use Severity Adjustments to correct the bias between test labs. ***Recent industry exercises have shown that laboratory SAs might not be adequately accounting for lab differences.*** For example, the Seq. IIIG TMC 1010 results were severity adjusted and lab differences still existed.

LTMS v2 does not make a clear argument why standardized testing conditions (same oil, same fuel, same hardware, same timeframe, same test method) should produce different results between labs. More troubling is a reliance on the SAs as a solution to these differences when recent evidence suggests the SAs fall short of this goal. It seems a more prudent effort than introducing a new LTMS would be to investigate why the SA system may be performing inadequately and why labs are not running at similar severity levels.

Potential Increased in Error for Candidate Test Results

A major objective of both LTMS v1 and v2 is to ensure the proper use of candidate Severity Adjustments. LTMS v1 uses a combination of criteria (Y_i, R_i, Q_i) in this attempt, while LTMS v2 substitutes E_i criteria for the Y_i, R_i, and Q_i criteria of LTMS v1. In layman's terms, LTMS v2 looks for a change from where a lab has been previously running, while LTMS v1 looks at the severity of the current test (Y_i) as well as a change in severity from the previous test (R_i), and ongoing changes in severity (Q_i).

Solely relying on Ei potentially exposes candidate tests to increased error. A theoretical case as shown in **Attachment 1** illustrates this. The plot shows a lab running in a very stable manner (Yi and Zi at 1.0 std. dev.) until test 'i+1'. At this point the lab begins to bounce around the Zi curve by ± 1.7 std. deviations. If this variation were to continue on as shown, the average SA Error is approximately 1.9 std. deviations. LTMS v2 Ei criteria allows lab calibration in this scenario and thus exposes candidate tests to the SA Error. LTMS v1 criteria does not allow calibration in this scenario and thus does not expose candidates tests to the error. The theoretical example shows what would be possible with the use of LTMS v2.

A real data example of this same issue is shown in **Attachment 2**. The charts show lab data that, for a run of tests, the results stray from the Zi curve. LTMS v2 would grant calibration to several of these tests that LTMS v1 would not. The issue isn't that more reference tests would pass in LTMS v2. *The real concern, and this cannot be overstated, is that by allowing calibration in these instances, candidate test results are exposed to SAs that do not reflect where the lab was running at the time of the test*. Based on this example, the table below shows the potential magnitude of these errors had this occurred in any of several test types. *It is worth noting that the application of Yi, Ri, and Qi criteria would prevent the errors shown below.*

Test	Parameter	Pass / Fail Limit	Error
VID	FEI2 (%)	1.3	± 0.3
Seq. IIIG	WPD (merits)	4.0	± 1.3
VG	AES (merits)	8.0	± 1.0
T-12	Ring Weight Loss (Mack Merits)	105[A]	+ 200 / - 306[B]
T-11	Soot at 12 cSt (%)	6.0	± 0.5

[A]P/F shown is in mg, max allowable by T-12 merit system.

[B]Error is expressed in Mack Merits, at the Merit Anchor point of 70 mg. Error in mg is ± 53.5.

LTMS v2 Does Not Encourage On-target Results and Improved Precision

Encouraging on target results and improved precision is a stated goal of LTMS v2, see Section 1.A of the LTMS v2 Draft. Current proposals (IIIG and VID) have Zi limits for LTMS v2 at or beyond existing Yi limits of LTMS v1. These levels combined with Ei limits would allow a lab, on both individual tests and on an on-going basis, to operate further from target than is currently allowed. There is no way in which this can be stated to encourage on-target results and improve precision. It will likely do just the opposite and it runs completely counter to the stated goal of LTMS v2. *On-target results and improved precision can only be achieved by real improvements in testing practices, not by a change in control chart structure.* In layman's terms, changing the measuring stick doesn't improve the product; you need to actually improve the process.

No Clear Benefit

Any implementation of LTMS v2 must bring with it a clear benefit to engine oil testing in order for it to be justified. The TMC has concerns, as stated above, that the industry will be taking on significant risk to by adopting LTMS v2 as it is now drafted. Additionally, in the opinion of the TMC, the current proposals do not add benefit to the industry testing and the TMC is concerned that implementation will actually damage testing quality.

Please contact me if you have any questions regarding the TMC's concerns about LTMS v2.
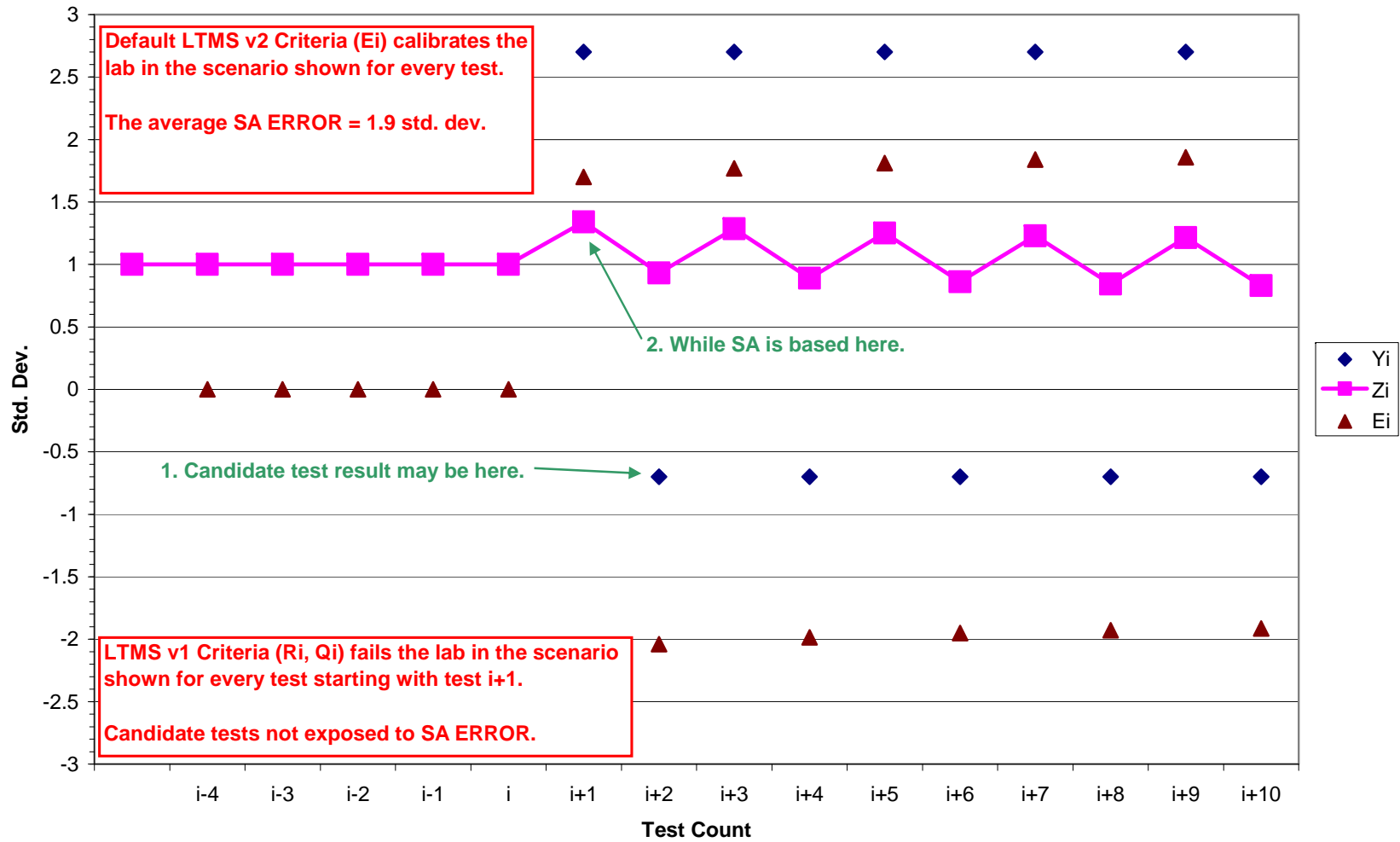
JAC/jac

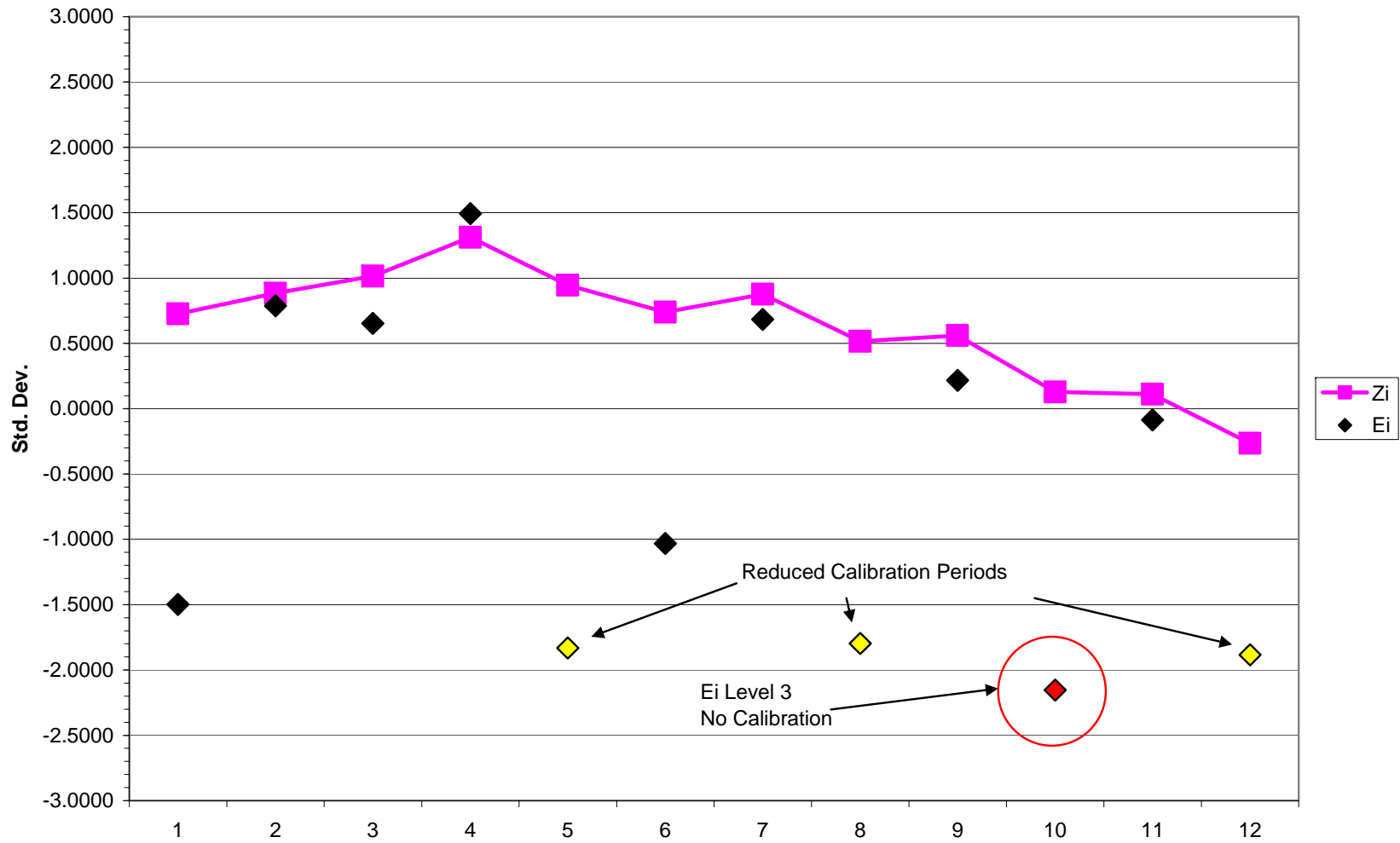Attachments

c: F. M. Farber, TMC
    TMC Engineers
    ftp://ftp.astmtmc.cmu.edu/docs/LTMS v2 Task Force Documents/TMC Concerns.pdf

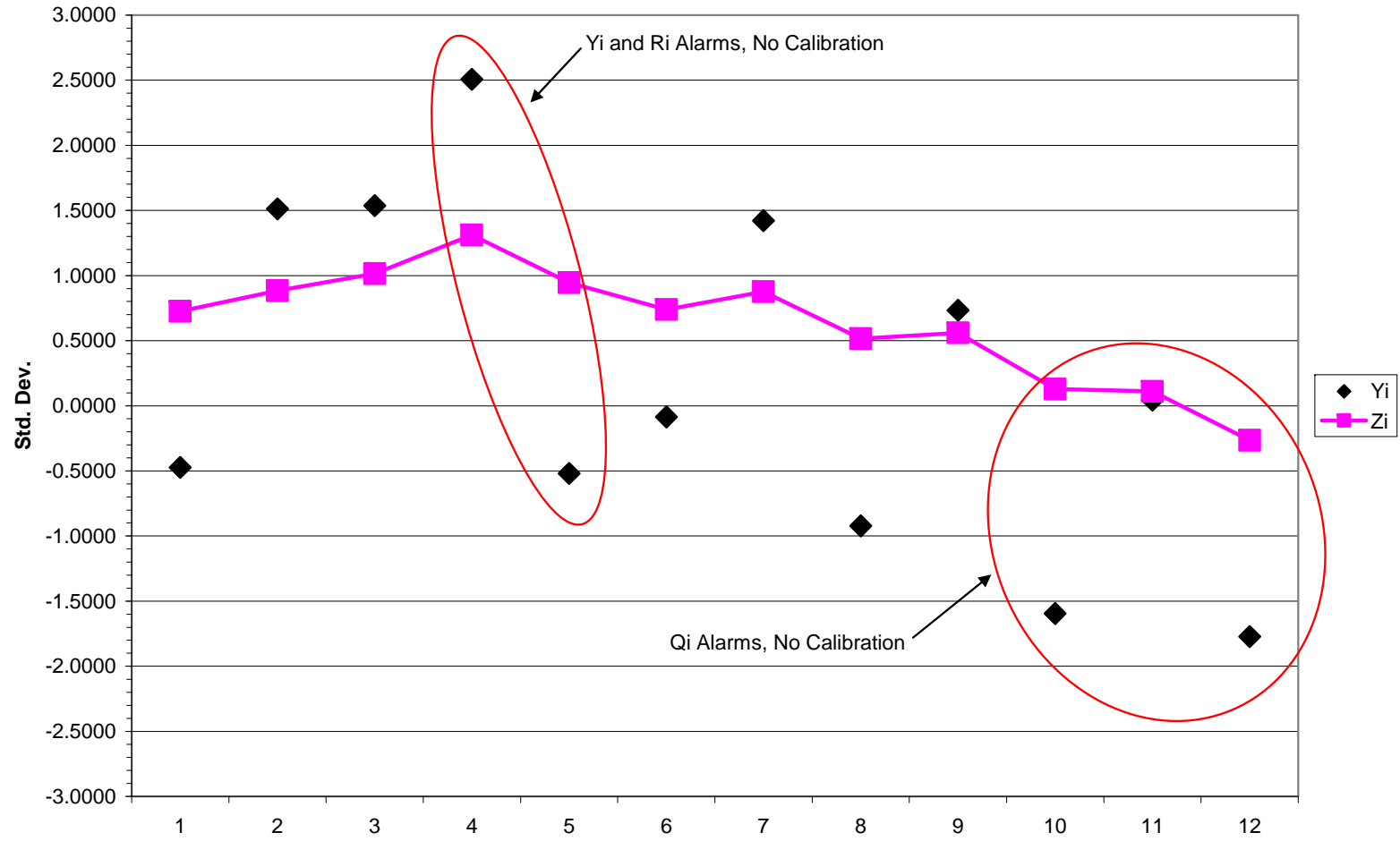Distribution: Email

Attachment 1

Theoretical Data

Attachment 2

LTMS v2 Ei Alarms

LTMS v1 Severity & Precision Alarms

Attachment 2
Real Test Data Example

Yi	Zi	Ri	Qi	Ei	v1 Cal?	v2 Cal?	Potential SA Error
-0.4728	0.7259	-1.0118	-0.6548	-1.4983	y	y	-0.7871
1.5130	0.8833	1.0581	-0.1409	0.7871	y	y	-0.6533
1.5366	1.0140	-1.9597	-0.6866	0.6533	y	y	-1.4919
2.5059	1.3123	0.0373	-0.4694	1.4919	n	y	1.8324
-0.5201	0.9459	1.8523	0.2271	-1.8324	n	y - reduced	1.0321
-0.0862	0.7394	-0.7459	-0.0648	-1.0321	y	y	-0.6830
1.4224	0.8760	0.6232	0.1416	0.6830	y	y	1.7980
-0.9220	0.5164	1.3513	0.5045	-1.7980	y	y - reduced	-0.2164
0.7328	0.5597	0.7629	0.5820	0.2164	y	y	2.1545
-1.5948	0.1288	1.3381	0.8088	-2.1545	n	n	0.0857
0.0431	0.1117	0.7472	0.7903	-0.0857	n	y	1.8847
-1.7730	-0.2653	0.9102	0.8263	-1.8847	n	y - reduced	-0.2653

Max SA Error =

2.1545