Sequence VID LTMSv2 Working Group Conference Call Minutes
October 26, 2010 13:30 – 14:00 CDT
Minutes Prepared by: Martin Chadwick

Tentative Agenda

1. Review previous meeting minutes (attached).
2. Questions or concerns about LTMSv2.
3. Review updated suggested Appendix F (attached).
    a. The latest version of Appendix F includes limits for industry charts. We have not yet discussed industry charts. Please be prepared to discuss these limits.
4. Continue discussion on what this group intends to offer to the SP.
5. Next meeting?

Attendance

Martin Chadwick (Intertek), Jo Martinez (Chevron), Doyle Boese (Infineum), Allison Rajakumar (Lubrizol) Dave Glaenzer (Afton), Charlie Leverett (Intertek), Janet Buckingham (SWRI), Bill Buscher (SWRI) Dan Worcester (SWRI), Ron Romano (Ford), Bruce Mathews (GM), Matt Snider (GM), Art Andrews (ExxonMobil), Mark Mosher (ExxonMobil), and Rich Grundza (TMC)

Minutes

There were no comments on the meeting minutes from the previous meeting.

This meeting focused on reviewing the recommendation as formatted based on the latest recommendations from the LTMS TF STG.

It was commented that all sections except the reduced reference intervals and industry charts were as agreed in past VID LTMSv2 meetings.

The recommendations for reduced reference intervals as written were discussed and there were no objections.

The limits for industry charts were discussed and it was determined that these could be finalized in the SP meetings.

It was clarified that the ei limits included in the recommendation were the LTMS suggested default limits as calculated for a lambda of 0.3.

It was commented that the Sequence VI SP is expected to meet some time in January 2011 to begin the adoption process.

Doyle expressed concerns about where the LTMS requirements live; the test procedure or the LTMS document itself. He would like to see an effort made to make this uniform across all test types.

Several wording and numbering clarifications were made to the suggested LTMS document.

It was agreed with no objections that the VID Appendix F document should be sent on to the Sequence VI SP as a reasonable starting point for future discussions and potential adoption of a revised LTMS.

Next Meeting

This group has completed the assigned task and no additional meetings are currently planned.

Action Item Summary

1) Martin will forward the completed recommendation to Charlie Leverett, the Sequence VI Chair, to be distributed to the SP.

Meeting adjourned.

APPENDIX F
TEMPLATES FOR VERSION 2 LABORATORY AND STAND BASED LTMS

1. Sequence VID LTMS Requirements (A Stand-Engine Based Severity Adjustment System)

TEST METHOD PORTION

The following are the specific Sequence VID calibration test requirements.

A. Reference Oils and Parameters

The prediction error monitoring parameters are Fuel Economy Improvement at 16 hours (FEI1) and Fuel Economy Improvement at 100 hours (FEI2). The reference oils required for test stand-engine are reference oils accepted by the ASTM Sequence VID Surveillance Panel. The targets for the current reference oils for each parameter are presented below.

FUEL ECONOMY IMPROVEMENT AT 16 HOURS
Unit of Measure: Percent
PREDICTION ERROR MONITORING PARAMETER

Reference Oil	Target
540	1.32
541	0.87
542	1.49

FUEL ECONOMY IMPROVEMENT AT 100 HOURS
Unit of Measure: Percent
PREDICTION ERROR MONITORING PARAMETER

Reference Oil	Target
540	1.04
541	0.71
542	0.80

B. Acceptance Criteria

1. New stand-engine combination. A new stand-engine combination is defined as a stand-engine combination that has never previously achieved calibrated status.

a. A minimum of three (3) operationally valid reference and/or matrix tests with no level three e_i alarms (uninterrupted by nonreference oil tests) must be run on each new stand-engine combination.

- Note that industry matrix runs may be included, as well as reference runs, at the discretion of the surveillance panel.

b. Following the necessary tests, check the status of the control charts and follow the prescribed actions.

c. The first (3) tests must be conducted on reference oils 540 (GF5A), 541 (GF5D) and 542 (GF5X). These oils will be assigned in random order by the TMC.

2. Existing Stand-Engine in a Lab

a. For an existing stand-engine run one test

b. Following an operationally valid reference oil calibration test, check the status of the control charts and follow the prescribed actions.

3. Reference Oil Assignment

Once a test stand has been accepted into the system, the TMC will assign reference oils for continuing calibration according to the following reference oil mix:

- oils for continuing calibration according to the following reference oil mix:
  40% of the scheduled calibration tests should be conducted on reference oil 540 (GF5A), or subsequent approved reblends.
  20% of the scheduled calibration tests should be conducted on reference oil 541 (GF5D), or subsequent approved reblends.
  40% of the scheduled calibration tests should be conducted on reference oil 542 (GF5X), or subsequent approved reblends.

4. Chart Status

The following are the steps that must be taken in the case of exceeding chart limits. The steps are listed in order of priority, although charts should be studied simultaneously to determine the cause(s) of a problem. In the case of multiple alarms, contact the TMC for guidance. The laboratory always has the option of removing any stand or engine from the system.

a. Shewhart Chart of Prediction Error (e_i) for **prediction error monitoring parameters only**

- Level 3

  - Immediately conduct one additional reference test in the stand-engine that triggered the alarm. Do not update the control charts until the follow up reference test is completed and the Excessive Influence (ExI) analysis, per Section 4.c (below), has been performed.

- Level 2

  - Reduce the number of tests allowed in the calibration period in the stand that triggered the alarm to eight (8) full length tests or 1400 engine hours during the first three calibration intervals and six (6) full length tests or 1050 engine hours for subsequent calibration intervals.

- Level 1

  – The level 1 limit applies in situations that have been pre-determined by the surveillance panel to have a potential impact on test results. These situations may include the introduction of new critical parts, fuel batches, reference oil reblends, or other test components. When these conditions have been met and a level 1 alarm is triggered, immediately conduct one additional reference test in the stand that triggered the alarm.

  – The level 1 limit also applies to a previously calibrated stand-engine that has not run an acceptable reference in the past two years. The stand-engine can calibrate with one test if the level 1 limits are not exceeded. Otherwise, immediately conduct another reference test in the stand-engine.

  – Level 1 limits are used to judge only the first valid reference in situations where it is determined to apply. All subsequent references are judged against Level 2 and Level 3 limits unless otherwise indicated by the surveillance panel.

b. Reference entity EWMA of Standardized Test Result (Z_i) for **all parameters**

- Level 2

  – Immediately conduct one additional reference test in the stand-engine that triggered the alarm

- Level 1

  – The level 1 limit applies to all reference tests that are control charted, even when other alarms have been triggered. Level 1 uses Z_i to determine the laboratory severity adjustment (SA). Calculate the laboratory SA for each parameter as follows and confirm the calculation with the TMC:

    $SA = -Z_i \times s_{SA}$

    where s_{SA} = industry approved severity adjustment standard deviation

c. Excessive influence (ExI) Analysis for **prediction error monitoring parameters only**

- The ExI analysis is performed anytime that a lab e_i level 3 alarm is triggered. As prescribed in Section 4.a, Level 3, a follow up reference test is run. The following comparisons then determine whether the value of Y_i is modified to limit its influence on LTMS. Y_{i+1} is the next completed reference in the laboratory after the level 3 alarm

  i) If $|Y_i - Y_{i+1}| \leq e_i$ level 3 limit, then Y_i is equal to the value originally determined.
  ii) If $Y_i > Z_{i-1}$ and $Y_i - Y_{i+1} > e_i$ level 3 limit, then let
  $Y_i = e_i$ level 3 limit + Z_{i-1}.
  iii) If $Y_i \leq Z_{i-1}$ and $Y_i - Y_{i+1} < -e_i$ level 3 limit, then let
  $Y_i = -e_i$ level 3 limit + Z_{i-1}.
  iv) If none of i), ii), or iii) is true, then Y_i is equal to the value originally determined.

  Where: i = test that originally triggered level 3 alarm,
  i-1 = test prior to alarm trigger, and
  i+1 = test immediately following alarm trigger.

  Once the proper Y_i value has been determined, update the charts. Confirm calculations with the TMC. The laboratory and the TMC maintain a record of the modification.

d. Industry EWMA of Standardized Test Result (Z_i) for **all parameters**

- Level 2
  - TMC informs the surveillance panel that the limit has been exceeded. The surveillance panel then investigates and pursues resolution of the alarm.
- Level 1
  - The TMC investigates whether severity adjustments are adequately addressing the trend, investigates the possible causes, and communicates as appropriate with industry.

TMC COMPENDIUM PORTION

The following are the specific Sequence VID calibration test requirements.

A. Reference Oils and Parameters

The prediction error monitoring parameters are Fuel Economy Improvement at 16 hours (FEI1) and Fuel Economy Improvement at 100 hours (FEI2). The reference oils required for test stand and test laboratory calibration are reference oils accepted by the ASTM Sequence VID Surveillance Panel. The standard deviations for the current reference oils for each parameter are presented below.

FUEL ECONOMY IMPROVEMENT AT 16 HOURS
Unit of Measure: Percent
PREDICTION ERROR MONITORING PARAMETER

Reference Oil	Standard Deviation
540	0.12
541	0.12
542	0.12

FUEL ECONOMY IMPROVEMENT AT 100 HOURS
Unit of Measure: Percent
PREDICTION ERROR MONITORING PARAMETER

Reference Oil	Standard Deviation
540	0.14
541	0.14
542	0.14

B. Acceptance Criteria

Adjustment (Z_i) and Monitoring (e_i) Charts

The constants used for the construction of the control charts for the Sequence VID, and the adjustment and monitoring chart limits, are shown below.

Stand-Engine Shewhart Limits for Prediction Error Monitoring Parameters

FUEL ECONOMY IMPROVEMENT AT 16 HOURS	
Shewhart Chart of Prediction Error $e_i = Y_i - Z_{i-1}$	
Limit Type	Limit
Level 3	2.126
Level 2	1.784
Level 1	1.390

FUEL ECONOMY IMPROVEMENT AT 100 HOURS	
Shewhart Chart of Prediction Error $e_i = Y_i - Z_{i-1}$	
Limit Type	Limit
Level 3	2.126
Level 2	1.784
Level 1	1.390

Stand-Engine EWMA Limits for Each Severity Adjustment Parameter

FUEL ECONOMY IMPROVEMENT AT 16 HOURS		
EWMA of Standardized Test Result $Z_i = \lambda(Y_i) + (1 - \lambda)Z_{i-1}$		
Limit Type	λ	Limit
Level 2 Upper Limit	0.3	2.5
Level 2 Lower Limit	0.3	-2.5
Level 1	0.3	0

FUEL ECONOMY IMPROVEMENT AT 100 HOURS		
EWMA of Standardized Test Result $Z_i = \lambda(Y_i) + (1 - \lambda)Z_{i-1}$		
Limit Type	λ	Limit
Level 2 Upper Limit	0.3	2.5
Level 2 Lower Limit	0.3	-2.5
Level 1	0.3	0

Stand-Engine Severity Adjustment Standard Deviation for Each Severity Adjustment Parameter

PARAMETER	s_{SA}
FUEL ECONOMY IMPROVEMENT AT 16 HOURS	0.12
FUEL ECONOMY IMPROVEMENT AT 100 HOURS	0.14

Industry EWMA Limits for Each Severity Adjustment Parameter

FUEL ECONOMY IMPROVEMENT AT 16 HOURS		
EWMA of Standardized Test Result $Z_i = \lambda(Y_i) + (1 - \lambda)Z_{i-1}$		
Limit Type	λ	Limit
Level 2 Upper Limit	0.2	TBD by SP Input
Level 2 Lower Limit	0.2	TBD by SP Input
Level 1	0.2	TBD

FUEL ECONOMY IMPROVEMENT AT 100 HOURS		
EWMA of Standardized Test Result $Z_i = \lambda(Y_i) + (1 - \lambda)Z_{i-1}$		
Limit Type	λ	Limit
Level 2 Upper Limit	0.2	TBD by SP Input
Level 2 Lower Limit	0.2	TBD by SP Input
Level 1	0.2	TBD