43. D6082 High Temperature Foam Test LTMS Requirements

The following are the specific D6082 High Temperature Foam Test calibration requirements.

A. Reference Oils and Critical Parameters

The critical pass/fail parameters are Foam Tendency (immediately before air disconnect) Static Foam, ml, and Foam Stability (one-minute after air disconnect) Static Foam, ml. The reference oils, performance targets and acceptance criteria required for the test stand calibration with the TMC are listed in Table 1 and have been approved by the ASTM D02.B0.07 High Temperature Foam Surveillance Panel. Note that 'Option A' in the test method, specifically requiring the sample to be blended prior to testing, is mandatory and not an 'option' for TMC calibration or discrimination tests.

Table 1
D6082 (HT Foam) Reference Oil Targets and Acceptance Bands Effective 20080807

						Acceptance Bands*	
						95%	
Test	**Oil Code**	**Parameter**	**n**	**Mean**	**sR**	**Lower**	**Upper**
High Temp.	FOAMB18	Foam Tendency, ml	18	54	9	36	72
Foam	FOAMB18	Foam Stability, ml	18	0	0	0	0
By	1007	Foam Tendency, ml	28	66	19	29	103
D6082	1007	Foam Stability, ml	28	0	0	0	0
	66**	Foam Tendency, ml	--	---	---	>100	---
	66**	Foam Stability, ml		---	---	0	0

*95% Acceptance Bands = Mean +/- (1.960 x sR)
**Oil 66 is a severe performing foam tendency discrimination reference oil

B. Test Stand Defined

A test stand is defined as a bath (using heated air or oil medium) that is set up and approved for D6082 testing regardless of the number of individual cylinder openings. The bath (stand) may have multiple cylinder openings for testing multiple samples simultaneously or concurrently.

C. Acceptance Criteria

1. New Laboratory/Test Stand(s)

   a. The TMC calibration system calibrates individual test stands (individual temperature baths regardless of the number of cylinder openings) at individual laboratories. There are no special requirements to bring a LAB into TMC calibrated status, there are only requirements to bring individual test stands into TMC calibrated status, as follows:

b. A minimum of two (2) operationally valid tests (one calibration and one discrimination), both which meet the acceptance criteria for the oils assigned, are required to calibrate a stand for the first time. These must be concurrent runs on the same test stand.

c. Option A (requiring the test sample to be blended as specified in the test method) is mandatory for TMC calibration runs.

d. Passing a concurrent TMC calibration and discrimination places the new test stand in TMC calibrated status. Both tests must pass on operational and statistical criteria.

e. TMC calibrated status of a test stand is valid for no more than 90 days from date completed of a valid TMC calibration (that is, the day the sample is evaluated for static foam levels). To renew the calibration at the end of the calibration period, see Item 2 for Existing Laboratory/Test Stand(s).

2. Existing Laboratory/Test Stand(s)

a. An existing TMC calibrated test stand, or one where the TMC calibrated status had expired within the past 90 days, can renew its TMC calibrated status by demonstrating a successful calibration on another single TMC blind calibration audit. The test must pass on both operational and statistical criteria.

b. In addition to a calibration run, labs must also pass a discrimination run on the approved discrimination oil. The discrimination run is to be run concurrently with the calibration test sample. The discrimination run is valid for not more than 180 days from date completed. The discrimination run does not calibrate the instrument, but rather confirms that the discrimination oil test result can be discriminated from the calibration oil test result when run concurrently. Because the discrimination is due only once every 180 days, and concurrent with a TMC calibration, a discrimination run is due every other 90-day calibration cycle. For labs with multiple test stands, only one discrimination run is due every 180 days, but the discrimination runs must be rotated equally among the test stands. A failing discrimination run voids the concurrent calibration run and both runs must be repeated per Section 2 of this document.

c. Option A (requiring the sample to be blended as specified in the test method) is mandatory for TMC calibration and discrimination runs.

d. TMC calibrated status of an existing test stand is valid for no more than 90 days from date completed of a valid TMC calibration (that is, the day the sample is evaluated for static foam levels). Test stands that exceed these time/run specifications are considered to be out of calibration for TMC monitoring purposes.

e. A stand that has been out of TMC calibration for more than 90 days from the prior TMC calibration expiration date will require New Test Stand calibration as listed in C.1.b through C.1.e. of this document.

f. A stand must pass the TMC calibration within two operationally valid test runs. If a stand cannot produce a calibration test that falls into the acceptance bands for the assigned oil within two operationally valid runs, renewing calibration on that stand will require the two-test calibration as listed in C.1.b through C.1.d.

3. Tracking and Reporting Stand ID's

Tracking a stands calibration status will be effected by tracking and reporting to the TMC the instrument (bath) serial number. The cylinder position in a bath is not tracked by the TMC. Instrument ID shall be the instrument serial number and shall not change for the entire history of a TMC monitored test stand (instrument ID variations will be allowed for existing instruments that were calibrated prior to the serial number ID requirement).

4. Reference Oil Assignment:

Of the two tests required to bring a new stand into TMC calibrated status, the calibration test shall be conducted on either reference oil 1007 or oil FOAMB18, and the discrimination run on oil 66, or reblends, or new formulations, as approved by the surveillance panel. Once a stand has attained TMC calibrated status (existing test stand), 100% of the scheduled calibration tests shall be conducted on an assigned blind reference oil sample from the currently accepted set of calibration oils, and the discrimination run on an approved TMC discrimination oil.

5. Calibration Test Evaluation:

The calibration status of the stands will be based on a review of operational parameters for compliance with the test method, followed by a statistical evaluation of the critical parameters test result against the acceptance ranges in Section A (commonly referred to as a Shewhart severity evaluation). Unless otherwise noted, the acceptance bands in Section A are based on a 95% confidence treatment of round robin test results with data exclusions as approved by the surveillance panel. Due to poor test precision on oils above 100 ml Foam Tendency, the severe performing discrimination oil results are not charted but must exceed 100 ml Foam Tendency and have 0 (zero) ml Foam Stability. (The Foam Tendency lower limit is set match the maximum allowable GF-5/6 limit for Foam Tendency, after establishing by round robin and ongoing testing that the oil performance should always exceed that limit.)

6. Removal of Test Stands from the System

The laboratory must notify the TMC when removing a stand from the system. No reference oil data shall be removed from the TMC's data base of prior TMC calibrations or calibration attempts. Return of the stand to the system will be evaluated based on section C.1.b through C.1.e above.

7. Introduction of New or Re-Blended Reference Oils

Introduction of new or replacement reference oils will be conducted at the discretion of the surveillance panel. Participating laboratories may be asked to donate tests on the new oil(s) to establish baseline performance in the D6082 test. The number of tests requested will be sufficient to rigorously evaluate the oil's performance. Preliminary statistical performance targets and acceptance criteria will be established by the surveillance panel, and those values will be re-assessed as the TMC collects additional calibration data.

44. D6335 (TEOST) Thermo-Oxidation Engine Oil Simulation Test LTMS Requirements

The following are the specific D6335 Determination of High Temperature Deposits by Thermo-Oxidation Engine Oil Simulation Test calibration requirements.

A. Reference Oils and Critical Parameters

The critical pass/fail parameter is Total Deposit Weight, in mg. The reference oils, performance targets and acceptance criteria required for the test stand calibration with the TMC are listed in Table 1 and have been approved by the ASTM D02.B0.07 TEOST Surveillance Panel.

Table 1
D6335 (TEOST) Reference Oil Targets and Acceptance Bands Effective 20130415

						Acceptance Bands* 95%	
Test	**Oil Code**	**Parameter**	**n**	**Mean**	**sR**	**Lower**	**Upper**
TEOST by	75	Total Deposit wt. (mg)	30	53.66	6.56	40.8	66.5
D6335	435-2	Total Deposit wt. (mg)	30	28.71	4.76	19.4	38.0

*95% Acceptance Bands = Mean +/- (1.960 x sR)

B. Acceptance Criteria

1. New Laboratory/Test Stand(s)

   a. The TMC calibration auditing system calibrates individual test stands (instruments) at individual laboratories. There are no special requirements to bring a LAB into TMC calibrated status, there are only requirements to bring individual test stands into TMC calibrated status, as follows:

   b. A minimum of two (2) operationally valid calibration tests which fall within the acceptance bands for the oils assigned are required to calibrate a stand for the first time. These must be back-to-back consecutive runs on the same test stand, though exceptions can be made at the sole discretion of the TMC for operational fails for reasons that would be considered to have had no bearing on the operational performance of the test stand for subsequent tests (for example, a power failure)

   c. Passing two back-to-back consecutive TMC calibrations places the new test stand in TMC calibrated status. Both tests must pass on operational and statistical criteria.

   d. TMC calibrated status of a test stand is valid for no more than 90 days from date completed of a valid TMC calibration (that is, the end of the test's 24-hour

oxidation heating cycle. To renew the calibration at the end of the calibration period, see Item 2 for Existing Laboratory/Test Stand(s).

2. Existing Laboratory/Test Stand(s)

    a. An existing TMC calibrated test stand, or one where the TMC calibrated status had expired within the past 90 days, can renew its TMC calibrated status by demonstrating a successful calibration on another single TMC blind calibration audit. The test must pass on both operational and statistical criteria.

    b. TMC calibrated status of an existing test stand is valid for no more than 90 days from date completed of a valid TMC calibration (that is, the end of the test's 24--hour oil oxidation heating cycle. Test stands that exceed these time/run specifications are considered to be out of calibration for TMC monitoring purposes.

    c. A stand that has been out of TMC calibration for more than 90 days from the prior TMC calibration expiration date will require New Test Stand calibration as listed in B.1.b through B.1.d. of this document.

    d. A stand must pass the TMC calibration within two operationally valid test runs. If a stand cannot produce a calibration test that falls into the acceptance bands for the assigned oil within two operationally valid runs, renewing calibration on that stand will require the two test calibration as listed in B.1.b through B.1.d.

3. Conversion of 'Dual' Instruments between TEOST-33C and MHT TEOST

    A single instrument can be considered TMC calibrated for only one test method at a time (either D6335 or D7097, never for both simultaneously). If a TMC calibrated instrument is converted for use to or from another test method, the current calibration becomes void at the moment that the physical instrument conversion begins. Renewing calibration on the newly converted stand will require a two-test calibration as listed in B.1.b through B.1.d.

4. Tracking and Reporting Stand Runs

    a. Tracking a stands calibration status by run number will be effected by tracking and reporting Instrument ID and Run Number to the TMC. Run Number shall be a consecutive integer count of test starts. Instrument ID and Run Number are separate fields on the approved data dictionary. An example is:

        Instrument ID: 1234567
        Run Number: 1234

    Instrument ID shall be the instrument serial number and shall not change for the entire history of a TMC monitored test stand (instrument ID variations will be allowed for existing instruments that were calibrated prior to the serial number ID requirement).

Run Number shall be increased incrementally by one (1) for each new test start, regardless of whether or not the test runs to completion, or whether or not the run is a TMC calibration attempt.

5. Reference Oil Assignment:

Of the two tests required to bring a new stand into TMC calibrated status, the tests shall be conducted on reference oil 432 and 434, or reblends as approved by the surveillance panel, assigned in random order. Once a stand has attained TMC calibrated status (existing test stand), 100% of the scheduled calibration tests should be conducted on an assigned blind reference oil from the currently accepted set. A preference for assignment shall be as follows:

Oil	% assigned by instrument
75	50%
435-2	50%

6. Removal of Test Stands from the System

The laboratory must notify the TMC when removing a stand from the system. No reference oil data shall be removed from the TMC's data base of prior TMC calibrations or calibration attempts. Return of the stand to the system will be evaluated based on section B.1.b through B.1.d above.

7. Introduction of New or Re-Blended Reference Oils

Introduction of new or replacement reference oils will be conducted at the discretion of the surveillance panel. Participating laboratories may be asked to donate tests on the new oil(s) to establish baseline performance in the D6335 (TEOST) test. The number of tests requested will be sufficient to rigorously evaluate the oil's performance (typically a minimum of 12 tests total among all the participating labs). Preliminary statistical performance targets and acceptance criteria will be established by the surveillance panel, and those values will be re-assessed as the TMC collects additional calibration data.

45. D6417 Volatility by Gas Chromatography Test LTMS Requirements

The following are the specific D6417 Volatility by Gas Chromatography Test calibration requirements.

A. Reference Oils and Critical Parameters

The critical pass/fail parameter is Area % Volatility Loss at 371°C. The reference oils, performance targets and acceptance criteria required for the test stand calibration with the TMC are listed in Table 1 and have been approved by the ASTM D02.B0.07 Volatility Surveillance Panel.

Table 1
D6417 (Volatility by GC) Reference Oil Targets and Acceptance Bands Effective 20001002

						Acceptance Bands* 95%	
Test	**Oil Code**	**Parameter**	**n**	**Mean**	**sR**	**Lower**	**Upper**
GC Volatility	52	Area % Volatility Loss	18	6.97	0.31	6.4	7.6
By	55	Area % Volatility Loss	18	11.68	0.51	10.7	12.7
D6417	58	Area % Volatility Loss	18	5.61	0.30	5.0	6.2

*95% Acceptance Bands = Mean +/- (1.960 x sR)

B. Test Stand Defined

1. A test stand is defined as a single channel on a Gas Chromatograph (GC) instrument. If labs wish to calibrate multiple channels in an instrument, each channel must be registered with the TMC as a separate test stand.
2. Tracking and Reporting Stand ID's

   Tracking a stands calibration status will be effected by tracking and reporting to the TMC the instrument serial number and, for instruments with multiple channels, an "F" (Front) or "B" (Back) as a suffix to uniquely identify each channel. Instrument ID shall be the instrument serial number and shall not change for the entire history of a TMC monitored test stand (instrument ID variations will be allowed for existing instruments that were calibrated prior to the serial number ID requirement).

C. Acceptance Criteria

1. New Laboratory/Test Stand(s)
   a. The TMC calibration system calibrates individual test stands (single GC channel) at individual laboratories. There are no special requirements to bring a LAB into TMC calibrated status, there are only requirements to bring individual test stands into TMC calibrated status, as follows:

b. A minimum of two (2) operationally valid calibration tests which fall within the acceptance bands for the oils assigned are required to calibrate a stand for the first time. These must be back-to-back consecutive runs on the same test stand, though exceptions can be made at the sole discretion of the TMC for operational fails for reasons that would be considered to have had no bearing on the operational performance of the test stand for subsequent tests (for example, a power failure).

c. Passing two back-to-back consecutive TMC calibrations places the new test stand in TMC calibrated status. Both tests must pass on operational and statistical criteria.

d. TMC calibrated status of a test stand is valid for no more than 90 days from date completed of a valid TMC calibration (that is, the end of the full elution of the test sample). To renew the calibration at the end of the calibration period, see Item 2 for Existing Laboratory/Test Stand(s).

2. Existing Laboratory/Test Stand(s)

a. An existing TMC calibrated test stand, or one where the TMC calibrated status had expired within the past 90 days, can renew its TMC calibrated status by demonstrating a successful calibration on another single TMC blind calibration audit. The test must pass on both operational and statistical criteria.

b. TMC calibrated status of an existing test stand is valid for no more than 90 days from date completed of a valid TMC calibration (that is, the end of the full test sample elution). Test stands that exceed these time/run specifications are considered to be out of calibration for TMC monitoring purposes.

c. A stand that has been out of TMC calibration for more than 90 days from the prior TMC calibration expiration date will require New Test Stand calibration as listed in C.1.b through C.1.d. of this document.

d. A stand must pass the TMC calibration within two operationally valid test runs. If a stand cannot produce a calibration test that falls into the acceptance bands for the assigned oil within two operationally valid runs, renewing calibration on that stand will require the two-test calibration as listed in C.1.b through C.1.d.

e. Changing the injector flow controller, changing the electronic pneumatic control (EPC) module or changing the flame ionization detector (FID) on a stand for any reason voids the current TMC calibrated status. Renewing calibration on that stand will require a two-test calibration as listed in C.1.b through C.1.d.

3. Reference Oil Assignment

a. Of the two tests required to bring a new stand into TMC calibrated status, the tests shall be conducted on reference oil 55 and either oils 52 or 58, or reblends as approved by the surveillance panel, assigned in random order. Once a stand has attained TMC calibrated status (existing test stand), 100% of the scheduled calibration tests shall be conducted on an assigned blind reference oil sample from the currently accepted set of reference oils. There shall be no preference for

any one reference oil in blind calibration runs, and each shall be assigned for approximately 1/3 of the passing runs on each stand.

4. Mandatory Daily QC Check Sample

   a. All TMC-monitored instruments must utilize TMC reference oil 58 to comply with the Reference Materials section of the ASTM D6417 test method. TMC reference oil 58 is to be run daily, or immediately prior to each session of D6417 runs on each test stand to confirm performance of the test stand before commencing with TMC blind reference, candidate or non-reference runs. The daily QC reference material run must meet the acceptance bands shown in Table 1 for TMC oil 58. If the result falls outside those approved bands, the problem must be resolved, and additional TMC oil 58 runs performed as needed to confirm that the daily QC check sample reliably meets the acceptance range in Table 1. The successful Reference Material run result for the session that includes the TMC blind calibration run is to be reported to the TMC with the blind calibration data using the approved TMC reporting format.

   b. Four-ounce aliquots of TMC oil 58, for use as a D6417 daily QC check fluid, are available for purchase from the TMC.

5. Removal of Test Stands from the System

   The laboratory must notify the TMC when removing a stand from the system. No reference oil data shall be removed from the TMC's data base of prior TMC calibrations or calibration attempts. Return of the stand to the system will be evaluated based on section C.1.b through C.1.d above.

6. Introduction of New or Re-Blended Reference Oils

   Introduction of new or replacement reference oils will be conducted at the discretion of the surveillance panel. Participating laboratories may be asked to donate tests on the new oil(s) to establish baseline performance in the D6417 GC test. The number of tests requested will be sufficient to rigorously evaluate the oil's performance. Preliminary statistical performance targets and acceptance criteria will be established by the surveillance panel, and those values will be re-assessed as the TMC collects additional calibration data.

46. D7097 (MTEOS) Determination of Moderately High Temperature Piston Deposits by Thermo-Oxidation Engine Oil Simulation Test LTMS Requirements

The following are the specific D7097 Determination of Moderately High Temperature Piston Deposits by Thermo-Oxidation Engine Oil Simulation Test calibration requirements.

A. Reference Oils and Critical Parameters

The critical pass/fail parameter is Total Deposit Weight, in mg. The reference oils, performance targets and acceptance criteria required for the test stand calibration with the TMC are listed in Table 1 and have been approved by the ASTM D02.B0.07 TEOST Surveillance Panel.

Table 1
D7097 (MTEOS) Reference Oil Targets and Acceptance Bands Effective 20060731

						Acceptance Bands* 95%	
Test	**Oil Code**	**Parameter**	**n**	**Mean**	**sR**	**Lower**	**Upper**
MTEOS by	432	Total Deposit wt. (mg)	30	47.04	4.50	38.2	55.9
D7097	434	Total Deposit wt. (mg)	30	27.37	6.57	14.5	40.2

*95% Acceptance Bands = Mean +/- (1.960 x sR)

B. Acceptance Criteria

1. New Laboratory/Test Stand(s)

a. The TMC calibration auditing system calibrates individual test stands (instruments) at individual laboratories. There are no special requirements to bring a LAB into TMC calibrated status, there are only requirements to bring individual test stands into TMC calibrated status, as follows:

b. A minimum of two (2) operationally valid calibration tests which fall within the acceptance bands for the oils assigned are required to calibrate a stand for the first time. These must be back-to-back consecutive runs on the same test stand, though exceptions can be made at the sole discretion of the TMC for operational fails for reasons that would be considered to have had no bearing on the operational performance of the test stand for subsequent tests (for example, a power failure)

c. Passing two back-to-back consecutive TMC calibrations places the new test stand in TMC calibrated status. Both tests must pass on operational and statistical criteria.

d. TMC calibrated status of a test stand is valid for no more than 90 days from date completed of a valid TMC calibration (that is, the end of the test's 24-hour

oxidation heating cycle. To renew the calibration at the end of the calibration period, see Item 2 for Existing Laboratory/Test Stand(s).

2. Existing Laboratory/Test Stand(s)

   a. An existing TMC calibrated test stand, or one where the TMC calibrated status had expired within the past 90 days, can renew its TMC calibrated status by demonstrating a successful calibration on another single TMC blind calibration audit. The test must pass on both operational and statistical criteria.

   b. TMC calibrated status of an existing test stand is valid for no more than 90 days from date completed of a valid TMC calibration (that is, the end of the test's 24--hour oil oxidation heating cycle. Test stands that exceed these time/run specifications are considered to be out of calibration for TMC monitoring purposes.

   c. A stand that has been out of TMC calibration for more than 90 days from the prior TMC calibration expiration date will require New Test Stand calibration as listed in B.1.b through B.1.d. of this document.

   d. A stand must pass the TMC calibration within two operationally valid test runs. If a stand cannot produce a calibration test that falls into the acceptance bands for the assigned oil within two operationally valid runs, renewing calibration on that stand will require the two test calibration as listed in B.1.b through B.1.d.

3. Conversion of 'Dual' Instruments between TEOST-33C and MHT TEOST

   A single instrument can be considered TMC calibrated for only one test method at a time (either D6335 or D7097, never for both simultaneously). If a TMC calibrated instrument is converted for use to or from another test method, the current calibration becomes void at the moment that the physical instrument conversion begins. Renewing calibration on the newly converted stand will require a two-test calibration as listed in B.1.b through B.1.d.

4. Tracking and Reporting Stand Runs

   Tracking a stands calibration status by run number will be effected by tracking and reporting Instrument ID and Run Number to the TMC. Run Number shall be a consecutive integer count of test starts. Instrument ID and Run Number are separate fields on the approved data dictionary. An example is:

   Instrument ID: 1234567

   Run Number: 1234

   Instrument ID shall be the instrument serial number and shall not change for the entire history of a TMC monitored test stand (instrument ID variations will be allowed for existing instruments that were calibrated prior to the serial number ID requirement).

   Run Number shall be increased incrementally by one (1) for each new test start, regardless of whether or not the test runs to completion, or whether or not the run is a TMC calibration attempt.

5. Reference Oil Assignment:

   Of the two tests required to bring a new stand into TMC calibrated status, the tests shall be conducted on reference oil 432 and 434, or reblends as approved by the surveillance panel, assigned in random order. Once a stand has attained TMC calibrated status (existing test stand), 100% of the scheduled calibration tests should be conducted on an assigned blind reference oil from the currently accepted set. A preference for assignment shall be as follows:

Oil	% assigned by instrument
432	50%
434	50%

6. Removal of Test Stands from the System

   The laboratory must notify the TMC when removing a stand from the system. No reference oil data shall be removed from the TMC's data base of prior TMC calibrations or calibration attempts. Return of the stand to the system will be evaluated based on section B.1.b through B.1.d above.

7. Introduction of New or Re-Blended Reference Oils

   Introduction of new or replacement reference oils will be conducted at the discretion of the surveillance panel. Participating laboratories may be asked to donate tests on the new oil(s) to establish baseline performance in the D7097 (MTEOS) test. The number of tests requested will be sufficient to rigorously evaluate the oil's performance (typically a minimum of 12 tests total among all the participating labs). Preliminary statistical performance targets and acceptance criteria will be established by the surveillance panel, and those values will be re-assessed as the TMC collects additional calibration data.

47. D7528 ROBO Test LTMS Requirements

The following are the specific D7528 ROBO Test calibration requirements.

A. Reference Oils and Critical Parameters

1. The critical pass/fail parameter is MRV Apparent Viscosity of the aged oil in transformed units. The reference oils, performance targets and acceptance criteria required for the test stand calibration with the TMC are listed in Table 1 and have been approved by the ASTM D02.B0.07 ROBO Surveillance Panel.

Table 1
MRV VISCOSITY
Unit of Measure: LN(MRV)

D7528 (ROBO) Aged Oil MRV Acceptance Bands, mPa·s and ln(mPa·s)

Oil	n	Natural Log Transformed Mean (ln)	Mean in Original Units	s.d. (ln)	95% band in mPa·s Min[2]	95% band in mPa·s Max[2]	95% Bands Min (ln)	95% Bands Max (ln)
434-1	13	10.6599	42,612	0.1672	30,706	59,136	10.3322	10.9876
434-2	36	10.9284	55,737	0.1551	41,126	76,008	10.6244	11.2386
435	15	11.4895	97,685	0.2932	[1]60,000	173,546	[1]11.0021	12.0642
435-1	22	11.0416	62,420	0.20295	[3]44570	92910	[3]10.7048	11.4394
438	14	10.2676	28,785	0.2037	19,308	42,912	9.8683	10.6669

[1] The minimum value for Reference oil 435 is fixed at 60,000 (11.0021 in transformed units) and not a true 95% minimum as calculated from the statistics.
[2] 95% bands in mPa·s are listed for information purposes only, the transformed values will be used to judge acceptance in all cases.
[3]The minimum value for reference oil 435-1 is based on -1.66 standard deviations from the target mean (to match the range previously approved for oil 435 min), so is not actually a 95% confidence range. A 95% confidence range would use 1.96 standard deviations from target mean.

2. EOT MRV (MRVEOT) viscosity values >400,000 mPa·s shall be reported as >400000.
3. EOT volatiles (VOLEOT) for the reference oils, in a properly run test, should never reach or exceed 60%. Tests with EOT volatility >= 60% will be declared operationally invalid.
4. EOT yield stress (MRVYSEOT) for the reference oils, in a properly run test, should always be <35 Pa. Tests with EOT yield stress measured or reported at anything other than <35 will be declared operationally invalid.

B. Acceptance Criteria

1. New Test Stands

a. A minimum of two (2) operationally valid calibration tests which fall within the acceptance bands for the oils assigned are required to calibrate a stand for the first time. These must be back-to-back consecutive runs on the same test stand, though exceptions can be made at the sole discretion of the TMC for operational fails for reasons that would be considered to have had no bearing

on the operational performance of the test stand for subsequent tests (for example, a power failure)

b. Passing two back-to-back consecutive TMC calibrations places the new test stand in TMC calibrated status. Both tests must pass on operational and statistical criteria.

c. TMC calibrated status of a test stand is valid for no more than 50 days from date completed of a valid TMC calibration (that is, the end of the test's 40-hour oil oxidation heating cycle), or no more than 15 subsequent test starts on the stand (as counted sequentially by run number; see Item 3), whichever comes first. To renew the calibration at the end of the calibration period, see Item 2 for Existing Laboratory/Test Stand(s).

2. Existing Test Stands

a. An existing TMC calibrated test stand, or one where the TMC calibrated status had expired within the past 150 days, can renew its TMC calibrated status by demonstrating a successful calibration on another single TMC blind calibration audit. The test must pass on both operational and statistical criteria.

b. TMC calibrated status of an existing test stand is valid for no more than 50 days from date completed of a valid TMC calibration (that is, the end of the test's 40-hour oil oxidation heating cycle), or no more than 15 subsequent test starts (as counted sequentially by run number) on the stand, whichever comes first. Test stands that exceed these time/run specifications are considered to be out of calibration for TMC monitoring purposes.

c. A stand that has been out of TMC calibration for more than 150 days from the prior TMC calibration expiration date will require New Test Stand calibration as listed in B.1.b through B.1.d. of this document.

d. A stand must pass the TMC calibration within two operationally valid test runs. If a stand cannot produce a calibration test that falls into the acceptance bands for the assigned oil within two operationally valid runs. Renewing calibration on that stand will require the two test calibration as listed in B.1.b through B.1.d.

e. Changing the vacuum control valve set point, exchanging the reactor vessel or the vacuum pump, or changing the heating voltage setting by more than ± 1 volt on a stand for any reason voids any current TMC calibrated status. Renewing calibration on that stand will require the two test calibration as listed in B.1.b through B.1.d.

3. Tracking and Reporting Stand Runs

a. Tracking a stands calibration status by run number will be effected by tracking and reporting Instrument ID and Run Number to the TMC. Run Number shall be a consecutive integer count of test starts. Instrument ID and Run Number are separate fields on the approved data dictionary. An example is:

Instrument ID: 1

Run Number: 1234

Instrument ID shall not change for the entire history of a TMC monitored test stand.

Run Number shall be increased incrementally by one (1) for each new test start, regardless of whether or not the test runs to completion, or whether or not the run is a TMC calibration attempt.

b. Track reactor vessels within a lab by assigning a unique 3 digit (alpha and/or numeric) ID to each vessel.

4. Reference Oil Assignment:

Of the two tests required to bring a new stand into TMC calibrated status, the tests shall be conducted on reference oil 434-1 or 438, and 435-1, assigned in random order. Once a stand has attained TMC calibrated status (existing test stand), 100% of the scheduled calibration tests should be conducted on a semi-randomly assigned reference oil from the currently accepted set. A preference for assignment shall be as follows:

Oil	% assigned*
434-1 or 434-2	25%
435-1	50%
438	25%

5. Removal of Test Stands from the System

The laboratory must notify the TMC when removing a stand from the system. No reference oil data shall be removed from the TMC's data base of prior TMC calibrations or calibration attempts. Return of the stand to the system will be evaluated based on section B.1.b through B.1.d above.

6. Introduction of New or Re-Blended Reference Oils

Introduction of new or replacement reference oils will be conducted at the discretion of the surveillance panel. Participating laboratories may be asked to donate tests on the new oil(s) to establish baseline performance in the ROBO test. The number of tests requested will be sufficient to rigorously evaluate the oil's performance (typically a minimum of 12 tests total among all the participating labs). Preliminary statistical performance targets and acceptance criteria will be established by the surveillance panel, and those values will be re-assessed as the TMC collects additional calibration data.

APPENDIX H
TEST RUN NUMBERING

TESTTYPE	TESTNUM	Component 1	Component 2	Component 3	Component 4	Component 5	Rerun Designation
IIIF	STAND--STRUN-LABRUN	STAND	STRUN	LABRUN			
		Alphanumeric Stand Name	Incremental count of runs on Stand	Incremental count of runs in lab			Alphabetic letter appended to LABRUN
IIIG	STAND--STRUN-LABRUN	STAND	STRUN	LABRUN			
		Alphanumeric Stand Name	Incremental count of runs on Stand	Incremental count of runs in lab			Alphabetic letter appended to LABRUN
IIIH	STAND--STRUN-TOTSRUN	STAND	STRUN	TOTSRUN			
		Alphanumeric Stand Name	Incremental count of runs since reference	Incremental count of runs on Stand			Alphabetic letter appended to TOTSRUN
IVA	STAND--STRUN-TOTSRUN	STAND	STRUN	TOTSRUN			
		Alphanumeric Stand Name	Incremental count of runs since reference	Incremental count of runs on Stand			Alphabetic letter appended to TOTSRUN
IVB	STAND--CALCOUNT-TOTSRUN	STAND	CALCOUNT	TOTSRUN			
		Alphanumeric Stand Name	Incremental count of runs since reference	Incremental count of runs on Stand			Alphabetic letter appended to TOTSRUN
IX	STAND-STRUN-ENGNO-ENRUN	STAND	STRUN	ENGNO	ENRUN		
		Alphanumeric Stand Name	Incremental count of runs on Stand	Alphanumeric Engine Name	Incremental count of runs on Engine		Increment STRUN and ENRUN
X	STAND--CALCOUNT-TOTSRUN	STAND	CALCOUNT	TOTSRUN			
		Alphanumeric Stand Name	Incremental count of runs since reference	Incremental count of runs on Stand			Alphabetic letter appended to TOTSRUN

APPENDIX H
TEST RUN NUMBERING

TESTTYPE	TESTNUM	Component 1	Component 2	Component 3	Component 4	Component 5	Rerun Designation
VH	STAND--CALCOUNT-TOTSRUN	STAND	CALCOUNT	TOTSRUN			
		Alphanumeric Stand Name	Incremental count of runs since reference	Incremental count of runs on Stand			Alphabetic letter appended to TOTSRUN
VIE	STAND-STRUN-ENGNO-ENRUN	STAND	STRUN	ENGNO	ENRUN		
		Alphanumeric Stand Name	Incremental count of runs on Stand	Alphanumeric Engine Name	Incremental count of runs on Engine		Alphabetic letter appended to ENRUN
VIF	STAND-STRUN-ENGNO-ENRUN	STAND	STRUN	ENGNO	ENRUN		
		Alphanumeric Stand Name	Incremental count of runs on Stand	Alphanumeric Engine Name	Incremental count of runs on Engine		Alphabetic letter appended to ENRUN
VIII	STAND-ENGINE-ENRUNSR-TOTENRUN	STAND	ENGINE	ENRUNSR	TOTENRUN		
		Alphanumeric Stand Name	Alphanumeric Engine Name	Incremental count of runs since reference	Incremental count of runs on Engine		Alphabetic letter appended to TOTENRUN
1K/1N	STAND-ENRUN	STAND	ENRUN				
		Alphanumeric Stand Name	Incremental count of test runs				Alphabetic letter appended to ENRUN
1MPC	STAND-ENRUN	STAND	ENRUN				
		Alphanumeric Stand Name	Incremental count of test runs				Alphabetic letter appended to ENRUN
1P	STAND-ENRUN	STAND	ENRUN				
		Alphanumeric Stand Name	Incremental count of test runs				Alphabetic letter appended to ENRUN

APPENDIX H
TEST RUN NUMBERING

TESTTYPE	TESTNUM	Component 1	Component 2	Component 3	Component 4	Component 5	Rerun Designation
1R	STAND-ENRUN	STAND	ENRUN				
		Alphanumeric Stand Name	Incremental count of test runs				Alphabetic letter appended to ENRUN
C13	STAND-STRUN	STAND	STRUN				
		Alphanumeric Stand Name	Incremental count of runs on Stand				Alphabetic letter appended to STRUN
COAT	STAND-STRUN-ENGINE-ENRUN	STAND	STRUN	ENGINE	ENRUN		
		Alphanumeric Stand Name	Incremental count of runs on Stand	Engine Serial Number	Incremental count of runs on Engine		Alphabetic letter appended to STRUN
ISB	STAND-STRUN-ENGINE-ENHOURS	STAND	STRUN	ENGINE	ENHOURS		
		Alphanumeric Stand Name	Incremental count of runs on Stand	Engine Serial Number	Number of test hours on engine block at start of test		Alphabetic letter appended to STRUN
ISM	STAND-ENGINE-STRUN	STAND	ENGINE	STRUN			
		Alphanumeric Stand Name	Engine Serial Number	Incremental count of runs on Stand			Alphabetic letter appended to STRUN
DD13	STAND-STRUN-ENGINE-ENHOURS-ENKITID	STAND	STRUN	ENGINE	ENHOURS	ENKITID	
		Alphanumeric Stand Name	Incremental count of runs on Stand	Engine Serial Number	Number of test hours on engine block at start of test	TEI Engine Kit ID number	Alphabetic letter appended to STRUN
EOAT	STAND-STRUN-ENGINE-ENRUN	STAND	STRUN	ENGINE	ENRUN		
		Alphanumeric Stand Name	Incremental count of runs on Stand	Engine Serial Number	Number of test hours on engine block at start of test		not defined in procedure

APPENDIX H
TEST RUN NUMBERING

TESTTYPE	TESTNUM	Component 1	Component 2	Component 3	Component 4	Component 5	Rerun Designation
T8	STAND-STRUN-ENGINE-ENHOURS	STAND	STRUN	ENGINE	ENHOURS		
		Alphanumeric Stand Name	Incremental count of runs on Stand	Engine Serial Number	Number of test hours on engine block since last reference		Alphabetic letter appended to STRUN
T11	STAND-STRUN-ENGINE-ENHOURS	STAND	STRUN	ENGINE	ENHOURS		
		Alphanumeric Stand Name	Incremental count of runs on Stand	Engine Serial Number	Number of accumulated test hours since last reference test		Alphabetic letter appended to STRUN
T12/T12A	STAND-STRUN-ENGINE-ENHOURS	STAND	STRUN	ENGINE	ENHOURS		
		Alphanumeric Stand Name	Incremental count of runs on Stand	Engine Serial Number	Number of accumulated test hours since last reference test		Alphabetic letter appended to STRUN
T13	STAND-STRUN-ENGINE-ENKITID	STAND	STRUN	ENGINE	ENKITID		
		Alphanumeric Stand Name	Incremental count of runs on Stand	Engine Serial Number	TEI Engine Kit ID number		Alphabetic letter appended to STRUN
RFWT	STAND-STRUN-ENGINE-ENRUN	STAND	STRUN	ENGINE	ENRUN		
		Alphanumeric Stand Name	Incremental count of runs on Stand	Engine Kit Number	Number of runs on ENGINE		Alphabetic letter appended to STRUN
L331	SBOXNUM-SBOXRUN	SBOXNUM	SBOXRUN				
		Alphanumeric Stand Name	Incremetal count of runs on Stand				None

APPENDIX H
TEST RUN NUMBERING

TESTTYPE	TESTNUM	Component 1	Component 2	Component 3	Component 4	Component 5	Rerun Designation
L37	STAND-STRUN	STAND	STRUN				
		Alphanumeric Stand Name	Incremetal count of runs on Stand				None
L371	STAND-STRUN	STAND	STRUN				
		Alphanumeric Stand Name	Incremetal count of runs on Stand				None
L42	STAND-STRUN	STAND	STRUN				
		Alphanumeric Stand Name	Incremetal count of runs on Stand				None
L601	STAND-STRUN	STAND	STRUN				
		Alphanumeric Stand Name	Incremetal count of runs on Stand				None
HTCT	STAND-STRUN	STAND	STRUN				
		Alphanumeric Stand Name	Incremetal count of runs on Stand				None
OSCT	None						
							None
EOEC	None						
							None
LDEOC	None						
							None
BRT	SHKTBLID-TESTRUNNO	SHKTBLID	TESTRUNNO				
		Alphanumeric Stand Name	Incremetal count of runs on Stand				None

APPENDIX H
TEST RUN NUMBERING

TESTTYPE	TESTNUM	Component 1	Component 2	Component 3	Component 4	Component 5	Rerun Designation
CBT	BTHNO-BTHRUNNO	BTHNO	BTHRUNNO				
		Alphanumeric Stand Name	Incremetal count of runs on Stand				None
HTCBT	BTHNO-BTHRUNNO	BTHNO	BTHRUNNO				
		Alphanumeric Stand Name	Incremetal count of runs on Stand				None
EOWT	TSTNO	TSTNO					
		Test number					None
EOFT	TSTNO	TSTNO					
		Test number					None
D5800 (NOACK)	Refer to appropriate section for run numbering details						
D6082	Refer to appropriate section for run numbering details						
D6335 (TEOST)	Refer to appropriate section for run numbering details						
D6417	Refer to appropriate section for run numbering details						
D7097 (MTEOS)	Refer to appropriate section for run numbering details						
D7828 (ROBO)	Refer to appropriate section for run numbering details						