

48. D6794 Engine Oil Water Tolerance Test (EOWT) LTMS Requirements

The following are the specific Engine Oil Water Tolerance Test calibration test requirements.

A. Calibration Details

The Engine Oil Water Tolerance Test is calibrated at the laboratory level. No individual instruments are identified in the test method. The test can be run at one of four water treatment rates (0.6%, 1.0%, 2.0%, or 3.0%). Tests targets are maintained by water treatment rate, with each water treatment rate being evaluated separately.

B. Reference Oils and Critical Parameters

The critical parameter is the 20 – 25 mL Average Change in Flow Rate, reported in milliliters per second. The reference oils required for instrument calibration are the reference oils accepted by the ASTM EOWT Surveillance Panel. The mean, standard deviation, and acceptance band for the current reference oils for Average Change in Flow Rate are presented below.

20 – 25 mL AVERAGE CHANGE IN FLOW RATE (CFA)

Unit of Measure: mL/s

0.6% Water Treatment Rate			
Reference Oil	Mean	Standard Deviation	Acceptance Band ^A
77-3	-10.23	2.78	-15.68 to -4.78
79	15.64	4.98	5.89 to 25.40

^ATest results are compared to the Acceptance Bands

1.0% Water Treatment Rate			
Reference Oil	Mean	Standard Deviation	Acceptance Band ^A
77-3	-7.82	2.34	-12.41 to -3.23
79	13.74	4.84	4.25 to 23.24

^ATest results are compared to the Acceptance Bands

2.0% Water Treatment Rate			
Reference Oil	Mean	Standard Deviation	Acceptance Band ^A
77-3	-8.80	2.47	-13.65 to -3.95
79	10.16	5.81	-1.23 to 21.55

^ATest results are compared to the Acceptance Bands

3.0 % Water Treatment Rate			
Reference Oil	Mean	Standard Deviation	Acceptance Band ^A
77-3	-10.15	2.21	-14.49 to -5.82
79	7.83	5.45	-2.85 to 18.52

^ATest results are compared to the Acceptance Bands

C. Acceptance Criteria

1. New Laboratory

- 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 laboratory for the first time. These must be simultaneous or consecutive runs, 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 laboratory for subsequent tests.
- b) Passing two back-to-back consecutive TMC calibrations places the laboratory's EOWT process in TMC calibrated status. Both tests must pass on operational and statistical criteria.
- c) TMC calibrated status of a laboratory's EOWT process is valid for no more than 30 days from the completion date of a valid TMC calibration. To renew the calibration at the end of the calibration period, see Section 2 (Existing Laboratory).

2. Existing Laboratory

- a) An existing TMC calibrated laboratory, or one where the TMC calibration status had expired within the past 30 days, can renew its TMC calibrated status by demonstrating a successful calibration on another single TMC calibration audit. The test must pass on both operational and statistical criteria.
- b) TMC calibrated status of an existing laboratory is valid for no more than 30 days from date completed of a valid TMC calibration. Laboratories that exceed the 30-day grace period are considered to be Out of Calibration for TMC monitoring purposes.
- c) A laboratory that has been Out of Calibration for more than 30 days from the prior TMC calibration expiration date will require New Laboratory calibration as listed in C.1.a through C.1.c. of this document.
- d) A laboratory must pass the TMC calibration within two operationally valid test runs. If a laboratory cannot produce a calibration test that falls into the acceptance bands for the assigned oil within two operationally valid runs, renewing calibration will require the two-test calibration as listed in C.1.a through C.1.c.

3. Calibration Status Tracking and Reporting Lab ID's

Calibration status will be tracked using a laboratory's two letter Lab ID, Date Completed and the results of calibration test assignments.

4. Reference Oil Assignment

Once a laboratory has been accepted into the system, the TMC will assign reference oils evenly distributed between 77-3 and 79, or subsequent approved rebLENds, for continuing calibration at each water treatment rate.

4. Control Charts

In Section 1, the construction of the control charts that constitute the Lubricant Test Monitoring System is outlined. The constants used for the construction of the control charts for the Engine Oil Water Tolerance Test, and the response necessary in the case of control chart limit alarms, are depicted below. The Shewhart Chart is used to initially determine the Acceptance Band on a new reference oil, prior to rounding those results to establish the official Acceptance Band for that reference oil.

LUBRICANT TEST MONITORING SYSTEM CONSTANTS

		EWMA Chart				Shewhart Chart	
		LAMBDA		K		K	
Chart Level	Limit Type	Precision	Severity	Precision	Severity	Precision	Severity
Stand	Action	--	--	--	--	--	1.96

The following are steps that must be taken in the case of a result outside the Acceptance Band.

- Result outside the Acceptance Band (all parameters)
 - Conduct an additional calibration test(s) as needed to meet the calibration requirements as described in Sections C.1 and C.2.

5. 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 D6794 EOWT test. The number of tests requested will be sufficient to rigorously evaluate the oil's performance (typically a minimum of 3 tests per lab per treat rate, 12 tests in total, for 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.

49. D6795 Engine Oil Filterability Test (EOFT) LTMS Requirements

The following are the specific Engine Oil Filterability Test calibration test requirements.

A. Calibration Details

The Engine Oil Filterability Test is calibrated at the laboratory level. No individual instruments are identified in the test method.

B. Reference Oils and Critical Parameters

The critical parameter is the 20 – 25 mL Average Change in Flow Rate, reported in milliliters per second. The reference oils required for instrument calibration are the reference oils accepted by the ASTM EOFT Surveillance Panel. The mean, standard deviation, and acceptance band for the current reference oil for Average Change In Flow Rate are presented below.

20 – 25 mL AVERAGE CHANGE IN FLOW RATE (CIFA)
Unit of Measure: mL/s

Reference Oil	Mean	Standard Deviation	Acceptance Band ^A
79	36.58	4.56	27.64 – 45.51

^ATest results are compared to the Acceptance Bands

C. Acceptance Criteria

1. New Laboratory

- 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 laboratory for the first time. These must be simultaneous or consecutive runs, 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 laboratory for subsequent tests.
- b) Passing two back-to-back consecutive TMC calibrations places the laboratory's EOFT process in TMC calibrated status. Both tests must pass on operational and statistical criteria.
- c) TMC calibrated status of a laboratory's EOFT process is valid for no more than 30 days from the completion date of a valid TMC calibration. To renew the calibration at the end of the calibration period, see Section 2 (Existing Laboratory).

2. Existing Laboratory

- e) An existing TMC calibrated laboratory, or one where the TMC calibration status had expired within the past 30 days, can renew its TMC calibrated status by demonstrating a successful calibration on another single TMC calibration audit. The test must pass on both operational and statistical criteria.

- f) TMC calibrated status of an existing laboratory is valid for no more than 30 days from date completed of a valid TMC calibration. Laboratories that exceed the 30-day grace period are considered to be Out of Calibration for TMC monitoring purposes.
- g) A laboratory that has been Out of Calibration for more than 30 days from the prior TMC calibration expiration date will require New Laboratory calibration as listed in C.1.a through C.1.c. of this document.
- h) A laboratory must pass the TMC calibration within two operationally valid test runs. If a laboratory cannot produce a calibration test that falls into the acceptance bands for the assigned oil within two operationally valid runs, renewing calibration will require the two-test calibration as listed in C.1.a through C.1.c.

5. Calibration Status Tracking and Reporting Lab ID's

Calibration status will be tracked using a laboratory's two letter Lab ID, Date Completed and the results of calibration test assignments.

6. Reference Oil Assignment

Once a laboratory has been accepted into the system, the TMC will assign reference oil 79, or subsequent approved reblend, for continuing calibration.

5. Control Charts

In Section 1, the construction of the control charts that constitute the Lubricant Test Monitoring System is outlined. The constants used for the construction of the control charts for the Engine Oil Filterability Test, and the response necessary in the case of control chart limit alarms, are depicted below. The Shewhart Chart is used to initially determine the Acceptance Band on a new reference oil, prior to rounding those results to establish the official Acceptance Band for that reference oil.

LUBRICANT TEST MONITORING SYSTEM CONSTANTS

		EWMA Chart				Shewhart Chart	
		LAMBDA		K		K	
Chart Level	Limit Type	Precision	Severity	Precision	Severity	Precision	Severity
Stand	Action	--	--	--	--	--	1.96

The following are steps that must be taken in the case of a result outside the Acceptance Band.

- Result outside the Acceptance Band (all parameters)
 - Conduct an additional calibration test(s) as needed to meet the calibration requirements as described in Sections C.1 and C.2..

5. 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 D6795 EOFT. The number of tests requested will be sufficient to rigorously evaluate the oil's performance (typically a minimum of 3 tests per participating lab). 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.

D5133 (GI) Test Reference Oil Targets					
Oil	n	Effective Dates		Gelation Index	
		From ¹	To ²	$\bar{X}$	s
1009	16	20030715	***	7.3	0.68
51	10	19960401	19961231	65.4	12.6
51	35	19970101	20010702	63.3	12.01
52	11	19960401	19961231	4.4	0.20
52	35	19970101	20030714	4.5	0.24
53	11	19960401	19961231	45.3	3.70
53	37	19970101	20030714	44.7	4.64
55	10	19960401	19961231	22.6	5.10
55	36	19970101	20010702	22.3	4.84
58	17	20011024	20200930	5.8	0.69
58 ³	17	20201001	***	<6.0	N/A
62	10	19960401	19961231	15.7	4.70
62	35	19970101	20231108	17.0	3.90
GIA17	18	20190409	***	19.0	1.87
GIC18	13	20221027	20240521	10.3	1.21
GIC18	76	20240522	***	11.0	1.69

¹ Effective for all tests completed on or after this date.

² *** = currently in effect.

³ Discrimination Oil

D5800 Volatility by Noack Test Reference Oil Targets					
Oil	n	Effective Dates		Sample Evaporation Loss	
		From ¹	To ²	$\bar{X}$	s
51	NA	***	20000925	18.13	0.42
52	NA	***	20000925	13.39	0.40
	59	20000926	20030720	13.61	0.49
	33	20030721	20131011	13.75	0.61
53	NA	***	20000925	22.30	0.55
54	NA	***	20000925	23.54	0.67
55	NA	***	20000925	16.21	0.48
	60	20000926	20030720	16.39	0.66
	32	20030721	20131011	17.09	0.76
58	59	20000926	20030720	14.46	0.52
	37	20030721	20131011	15.20	0.72
VOLC12	24	20130918	20191104	14.19	0.73 ³
VOLD12	27	20130918	20191104	12.52	0.73 ³
VOLE12	27	20130918	20191104	16.74	0.73 ³
VOLC12	24	20191105	***	2.6523 ⁴	0.0465
VOLD12	27	20191105	***	2.5264 ⁴	0.0465
VOLE12	27	20191105	***	2.8175 ⁴	0.0465

1 Effective for all tests completed on or after this date.

2 *** = currently in effect.

3 based on a pooled standard deviation of data from 2014-2016.

4 D5800 moved to EWMA calibration management with natural log transformation of Evaporative Loss Results.

D6082 High Temperature Foam Test Reference Oil Targets							
Oil	n	Effective Dates		Foam Tendency		Foam Stability	
		From ¹	To ²	$\bar{X}$	s	$\bar{X}$	s
1002	32	19000101	20020617	410.63	58.78	37.81	45.41
1007	28	19981112	20060327	65.71	19.28	0	0
	28	20060328	***	66	19	0	0
FOAMB18	18	20180807	20240602	54	9	0	0
FOAMB18	131	20240603	***	48.8	7.4	0	0
66 ³		20030721	***	>100		0	

1 Effective for all tests completed on or after this date.

2 *** = currently in effect.

3 Discrimination oil

D6335 (TEOST) Thermo-Oxidation Engine Oil Simulation Test Reference Oil Targets					
Oil	N	Effective Dates		Total Deposits	
		From ¹	To ²	$\bar{X}$	s
71	27	19900101	20130414	51.79	4.79
71-1 ³		20090113	20130414	51.79	4.79
72	27	19000101	20130414	26.72	3.46
72-1 ⁴		20090113	20130414	26.72	3.46
75	14	20110108	20130414	55.16	5.68
75	30	20130415	20210831	53.66	6.56
75-1	16	20190404	20211102	56.9	5.02
75-1	51	20211103	***	54.8	6.75
75-2 ⁵		20240901	***	54.8	6.75
435-2	15	20110108	20130414	26.95	2.86
435-2	30	20130415	***	28.71	4.76

1 Effective for all tests completed on or after this date.

2 *** = currently in effect.

3 Targets carried over from oil 71

4 Targets carried over from oil 72

5 Targets carried over from oil 75

D874 Test Reference Oil Targets					
Oil	n	Effective Dates		Sulfated Ash, mass %	
		From ¹	To ²	$\bar{X}$	s
90	27	20070206	***	1.07	0.080
91	27	20070726	***	0.82	0.050
92	20	20250514	***	1.02	0.053
830-2	27	20070726	***	1.57	0.080

1 Effective for all tests completed on or after this date.

2 *** = currently in effect.

History of Industry Correction Factors
Appendix B

Test Area	Effective		Condition	Description
	From	To		
D5800	None		All Tests	None
D6082	None		All Tests	None
D6335 (TEOST)	None		All Tests	None
D6417	None		All Tests	None
D6557 (BRT)	None		All Tests	None
D6594 (HTCBT)	None		All Tests	None
D6794 (EOWT)	None		All Tests	None
D6795 (EOFT)	None		All Tests	None
D7097 (MTEOS)	None		All Tests	None
D7528 (ROBO)	None		All Tests	None