

16. C13 LTMS Requirements

The following are the specific C13 calibration test requirements.

A. Reference Oils and Parameters

The critical parameters are Top Groove Carbon, Top Land Carbon, Oil Consumption Delta, and Second Ring Top Carbon. The reference oils required for test stand and test laboratory calibration are reference oils accepted by the ASTM C13 Surveillance Panel. The mean and standard deviation for the current reference oils for test parameters are presented below.

TOP GROOVE CARBON

Unit of Measure: Demerits
Normal K Value

Reference Oil	Mean	Standard Deviation
831	46.02	5.90
831-1	46.02	5.90
831-2	46.02	5.90

TOP LAND CARBON

Unit of Measure: Demerits
Normal K Value

Reference Oil	Mean	Standard Deviation
831	21.87	7.89
831-1	21.87	7.89
831-2	21.87	7.89

OIL CONSUMPTION DELTA

Unit of Measure: SQRT (g/h)
Normal K Value

Reference Oil	Mean	Standard Deviation
831	5.5089	0.7141
831-1	5.5089	0.7141
831-2	5.5089	0.7141

SECOND RING TOP CARBON
Unit of Measure: LN (Demerits)
Expanded K Value

Reference Oil	Mean	Standard Deviation
831	2.8828	0.2900
831-1	2.8828	0.2900
831-2	2.8828	0.2900

B. Acceptance Criteria

1. New Test Stand

a. First Test Stand in a Laboratory

- A minimum of two (2) operationally valid calibration tests with no stand Shewhart severity alarms, must be conducted on any approved reference oil.

b. All Subsequent New Test Stands in a Laboratory

- One operationally valid test with no stand Shewhart severity alarms must be conducted on any approved reference oil.

2. Existing Test Stand

- The test stand must have been previously accepted into the system by meeting LTMS calibration requirements.
- One operationally valid test with no stand Shewhart severity alarms must be conducted on any approved reference oil.

3. Reference Oil Assignment

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

- 100% of the scheduled calibration tests should be conducted on reference oil 831 (or subsequent approved reblends).

4. Control Charts

In Section 1, the construction of the four control charts that constitute the Lubricant Test Monitoring System is outlined. The constants used for the construction of the control charts for the C13, and the response necessary in the case of control chart limit alarms, are depicted below.

LUBRICANT TEST MONITORING SYSTEM CONSTANTS

			EWMA Chart				Shewhart Chart	
			LAMBDA		K		K	
Chart Level	Parameters	Limit Type	Precision	Severity	Precision	Severity	Precision	Severity
Stand	Normal K	Action	0.3	0.3	1.80	2.10	1.80	2.00
Stand	Expanded K	Action	0.3	0.3	1.80	2.10	1.80	3.00
Industry	Normal K & Expanded K	Warning	0.2	0.2	1.74	2.05	--	--
		Action	0.2	0.2	2.58	2.81	--	--

The following are the steps that must be taken in the case of exceeding control chart limits.

- Exceed Shewhart test stand chart limit for severity
 - Conduct an additional calibration test.

The following industry issues are handled by the TMC and do not require individual laboratory action.

- Exceed EWMA industry chart action limit
 - TMC to notify test developer, surveillance panel chairman, and ACC Monitoring Agency. Meeting of TMC, test developer, and surveillance panel required to determine course of action.
- Exceed EWMA industry chart warning limit
 - TMC to notify test developer, surveillance panel chairman, and ACC Monitoring Agency. Coordination of TMC, test developer, and surveillance panel chairman required to discuss potential problem.

APPENDIX B (continued)
HISTORY OF INDUSTRY CORRECTION FACTORS

Test Area	Effective		Condition	Description
	From	To		
1M-PC	None		All Tests	None
1K	None		All Tests	None
1N	May 1, 2004	September 27, 2005	All Tests	Add -1.135 to ln(TLHC+1)
	September 28, 2005	***	All Tests	Add -0.451 to ln(TLHC+1)
1P	None		All Tests	None
1R	None		All Tests	None
C13	None		All Tests	None
ISB	April 21, 2011	***	All tests using batch B tappets with batch E, F, and G cams	Multiply ATWL by 0.637; Add -9.5 to ACSW
ISB	December 11, 2011	November 12, 2012	All tests using batch C Tappets with batch H cams	Multiply ATWL by 0.637; Add -9.5 to ACSW
ISB	November 13, 2012	***	All tests using batch C tappets with batch H and J cams	Multiply ATWL by 0.711; Add -5.6 to ACSW
ISM	June 28, 2007	***	All Tests	Add +1.7 to Crosshead Wear At 3.9% Soot Add +19.1 to Injector Adjusting Screw Wear At 3.9% Soot
	March 4, 2010	***	All Tests	Add +1.3 to Crosshead Wear At 3.9% Soot
	April 30, 2011	***	All Tests	Add +2.5 to Crosshead Wear At 3.9% Soot
	November 19, 2013	***	All Tests	Add -0.200 to ln(SAIAS)
	October 1, 2014	***	All Tests	Add 4 kPa to Oil Filter Delta Pressure
T-8	September 17, 2011	***	All Tests	Add +0.40 to Viscosity Increase at 3.8% Soot
T-8E	September 17, 2011	***	All Tests	Add +0.08 to Relative Viscosity at 4.8% Soot (50% DIN Shear Loss) Add +0.09 to relative Viscosity at 4.8% Soot (100% DIN Shear Loss)
T-10A	None		All Tests	None