

LDEOC/EOEC SURVEILLANCE PANEL

A LDEOC/EOEC conference call was held on 2-2-23, at 9 am Central Standard Time. The following esteemed members were on the call:

Mike Birke – SwRI
Vince Donndelinger - Lubrizol
Robert Stockwell – Oronite
Laura Birnbaumer - Oronite
Becky Grinfield – SwRI
Joe Franklin - Intertek
Kimberly Gutierrez - Intertek
Olivia Schmitz - SwRI
Jason Bowden – OHT
Charles Nystrom – SwRI
Maggie Smerdon – Savant
Matt Bowden – OHT
Adam Ramos - SwRI
Greg Müller - Savant

The purpose of the meeting was to review the SL107 within lab and between lab standard deviations and compare them to 1006 data (presentation attached). The consensus was the data was comparable. Joe Franklin mentioned that prior to 2008 the standard deviations used to be updated and we need to reinstate the process. Joe made a motion to accept the SL107 standard deviations as presented, as well as to reinstate the process of updating them annually. There was a second to the motion by Robert Stockwell, and the motion passed unanimously. The standard deviations will be updated February 1st of each year as a two year rolling average. John Loop will provide the TMC link to the deviations once available. Laura Birnbaumer will have the link added to D4485 and the expectation is the new deviations will go into effect after the 2023 June ASTM meeting. Meanwhile John will work on updating the report forms. Mike Birke and John will also be working offline to update the D7216 procedure. Vince Donndelinger asked if D7216 should be added to the LTMS. Evidently this process has already been started, so John will continue working on it.

There was no new business, and the meeting adjourned at 9:20 am.



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Test Monitoring Center

<https://www.astmtmc.org>

SL107 Elastomer Data: Standard Deviations

Data Collected up to LTMS Date 20221231

TMC: JGL

UPDATED: 2 FEBRUARY 2023

Background

- ▶ ASTM D 4485 ANNEX A4
- ▶ Procedure for Deriving Adjusted Specification Limits for Elastomer Compatibility
 - Method to account for the inherent test variability in the elastomer compatibility method which arises in part because batch-to-batch, sheet-to-sheet and within-sheet variations in the properties of the reference elastomers can be sufficiently large that they complicate making a decision as to whether or not a candidate oil has passed the elastomer compatibility requirements.

TABLE A4.1 Unadjusted Specification Limits for the Elastomer Test Method as Part of the CI-4 Engine Oil Category

Elastomer	Volume Change, %	Hardness Change, Points	Tensile Strength Change, MPa	Elongation at Break Change, %
Nitrile (NBR)	(+5, -3)	(+7, -5)	(+10, -TMC 1006)	(+10, -TMC 1006)
Silicone (VMQ)	(+TMC 1006, -3)	(+5, -TMC 1006)	(+10, -45)	(+20, -30)
Polyacrylate (ACM)	(+5, -3)	(+8, -5)	(+18, -15)	(+10, -35)
Fluoroelastomer (FKM)	(+5, -2)	(+7, -5)	(+10, -TMC 1006)	(+10, -TMC 1006)

Background (continued)

Adjusted Specification Limit Standard Deviations Effective: March 1, 2008

Elastomer	Parameter	Within Lab STD	Overall STD	Total Individual Determinations
FLUOROELASTOMER	Volume	0.16	0.18	1719
FLUOROELASTOMER	Hardness	1.45	2.04	1665
FLUOROELASTOMER	Tension	4.77	5.31	1723
FLUOROELASTOMER	Elongation	7.75	10.22	1705
NITRILE	Volume	0.76	0.79	1748
NITRILE	Hardness	1.47	1.72	1696
NITRILE	Tension	8.96	9.3	1735
NITRILE	Elongation	6.99	7.07	1742
POLYACRYLATE	Volume	0.76	0.79	1768
POLYACRYLATE	Hardness	1.67	1.68	1718
POLYACRYLATE	Tension	10.09	10.12	1733
POLYACRYLATE	Elongation	11.2	11.28	1742
SILICONE	Volume	1.84	2.06	1733
SILICONE	Hardness	1.25	2.23	1661
SILICONE	Tension	6.99	7.04	1711
SILICONE	Elongation	9.87	10.02	1732
VAMAC	Volume	2.04	2.29	918
VAMAC	Hardness	1.17	1.17	898
VAMAC	Tension	8.74	9.1	900
VAMAC	Elongation	11.05	11.63	911

Background (continued)

- ▶ Initial Adjustments were based upon data from TMC 1006 Reference Oil
 - Between 898 and 1768 “individual” observations were analyzed for the various elastomer/parameter combinations to establish STD DEV for the adjustment calculations
 - Reference Oil 1006 is no longer available from TMC
 - Labs that have a few TMC1006 samples have been notified and advised to discard these
- ▶ Elastomer Testing now uses Reference Oil SL107
 - No TMC1006 samples will be assigned or used for future Elastomer Calibrations
- ▶ TMC will provide support through an analysis of SL107 Reference Oil test runs.
 - Data on SL107 EOEC Elastomer Reference Oil runs up through 31Dec2022

Calculation Method

- ▶ The Calculation Method
 - Everything in Yellow is Fixed
 - Everything in Blue depends on the TMC result

EOEC CALCULATIONS						
			Lower	Upper	20080308	
NBR (NITRILE)						
Fixed	Volume	0.65	5.65	-3.65	0.79	
	Hardness	1	8	-6	1.72	
	Tensile	7.6	17.6	-37.4	9.3	
	Elongation	5.8	15.8	-58.7	7.07	<u>TMC Ref Result</u>
Variable	Tensile	10.2		-37.4	8.96	-27.2
	Elongation	8.0		-58.7	6.99	-50.7
ACM (POLYACRYLATE)						
Fixed	Volume	0.65	5.65	-3.65	0.79	
	Hardness	1	9	-6	1.68	
	Tensile	8.3	26.3	-23.3	10.12	
	Elongation	9.2	19.2	-44.2	11.28	
FKM (VITON)						
Fixed	Volume	0.15	5.15	-2.15	0.18	
	Hardness	2	9	-7	2.04	
	Tensile	4.3	14.3	-80.3	5.31	
	Elongation	8.3	18.3	-74.2	10.22	<u>TMC Ref Result</u>
Variable	Tensile	5.5		-80.3	4.77	-74.8
	Elongation	8.9		-74.2	7.75	-65.3
VMQ (SILICONE)						
Fixed	Volume	1.68	27.60	-4.7	2.06	
	Hardness	2	7	-23	2.23	
	Tensile	5.7	15.7	-50.7	7.04	
	Elongation	8.2	28.2	-38.2	10.02	<u>TMC Ref Result</u>
Variable	Volume	2.1	27.60		1.84	25.5
	Hardness	1.4		-23	1.25	-22
VAMAC						
Fixed	Volume	1.87	21.86	-4.87	2.29	
	Hardness	1	6	-12	1.17	
	Tensile	7.4	17.4	-20	9.1	
	Elongation	9.5	19.5	-36	11.63	<u>TMC Ref Result</u>
Variable	Volume	2.33	21.86		2.04	19.53
	Hardness	1		-12	1.17	-11
	Tensile	10.0		-20	8.74	-10.2
	Elongation	12.6		-36	11.05	-23.6

TMC-1006: Summary

Adjusted Specification Limit Standard Deviations Effective: March 1, 2008 (TMC-1006)					TMC-1006 All Data		
Elastomer	Parameter	Within Lab STD	Overall STD	Total Individual Determinations	Within Lab STD	Overall STD	Total Test Runs
FLUOROELASTOMER	Volume	0.16	0.18	1719	0.19	0.19	1319
FLUOROELASTOMER	Hardness	1.45	2.04	1665	1.29	1.62	1319
FLUOROELASTOMER	Tensile Strength	4.77	5.31	1723	2.31	2.84	1319
FLUOROELASTOMER	Elongation	7.75	10.22	1705	4.20	5.11	1319
NITRILE	Volume	0.76	0.79	1748	0.66	0.67	1314
NITRILE	Hardness	1.47	1.72	1696	1.10	1.19	1314
NITRILE	Tensile Strength	8.96	9.30	1735	6.08	6.22	1314
NITRILE	Elongation	6.99	7.07	1742	4.86	4.92	1314
POLYACRYLATE	Volume	0.76	0.79	1768	0.42	0.44	1327
POLYACRYLATE	Hardness	1.67	1.68	1718	1.20	1.37	1327
POLYACRYLATE	Tensile Strength	10.09	10.12	1733	6.37	6.41	1327
POLYACRYLATE	Elongation	11.20	11.28	1742	8.57	8.67	1327
SILICONE	Volume	1.84	2.06	1733	1.93	2.56	1290
SILICONE	Hardness	1.25	2.23	1661	1.51	1.84	1290
SILICONE	Tensile Strength	6.99	7.04	1711	4.82	5.17	1290
SILICONE	Elongation	9.87	10.02	1732	5.94	6.31	1290
VAMAC	Volume	2.04	2.29	918	1.09	1.16	1256
VAMAC	Hardness	1.17	1.17	898	1.15	1.21	1256
VAMAC	Tensile Strength	8.74	9.10	900	3.94	4.10	1256
VAMAC	Elongation	11.05	11.63	911	6.04	6.48	1256

TMC-1006 (all) vs SL107 (thru 2022)

Elastomer	Parameter	TMC-1006 All Data				SL107 STD's Initial Data Up to 31DEC2022			
		Within Lab STD	Overall STD	MEAN	Total Test Runs	Within Lab STD	Overall STD	MEAN	Total Test Runs
FLUOROELASTOMER	Volume	0.19	0.19	0.59	1319	0.19	0.19	0.42	318
FLUOROELASTOMER	Hardness	1.29	1.62	7.44	1319	1.62	2.21	7.97	318
FLUOROELASTOMER	Tensile Strength	2.31	2.84	-69.56	1319	2.63	3.46	-69.26	318
FLUOROELASTOMER	Elongation	4.20	5.11	-64.59	1319	4.74	5.85	-64.25	318
NITRILE	Volume	0.66	0.67	2.02	1314	0.56	0.57	1.85	340
NITRILE	Hardness	1.10	1.19	3.18	1314	1.31	1.39	2.92	340
NITRILE	Tensile Strength	6.08	6.22	-31.56	1314	4.72	4.87	-2.69	340
NITRILE	Elongation	4.86	4.92	-53.47	1314	5.39	5.38	-35.42	340
POLYACRYLATE	Volume	0.42	0.44	1.92	1327	0.41	0.41	1.81	332
POLYACRYLATE	Hardness	1.20	1.37	-1.30	1327	1.52	1.61	-1.22	332
POLYACRYLATE	Tensile Strength	6.37	6.41	0.05	1327	7.00	7.01	-2.12	332
POLYACRYLATE	Elongation	8.57	8.67	-12.11	1327	10.00	10.18	-19.09	332
SILICONE	Volume	1.93	2.56	30.93	1290	1.43	3.08	33.82	302
SILICONE	Hardness	1.51	1.84	-20.44	1290	1.31	2.03	-23.64	302
SILICONE	Tensile Strength	4.82	5.17	-25.17	1290	4.11	4.97	-32.27	302
SILICONE	Elongation	5.94	6.31	-23.19	1290	5.99	7.23	-25.35	302
VAMAC	Volume	1.09	1.16	21.01	1256	1.50	1.67	18.80	307
VAMAC	Hardness	1.15	1.21	-10.24	1256	1.36	1.45	-8.43	307
VAMAC	Tensile Strength	3.94	4.10	-13.65	1256	5.35	5.39	-14.69	307
VAMAC	Elongation	6.04	6.48	-25.81	1256	5.95	6.50	-36.47	307

Within Lab STD: Modeling with Batch Code and Lab Factors
 Overall STD: Modeling with Batch Code Factor (only)

Comments on Std Dev's

- ▶ Standard Deviations for TMC1006 were mostly “smaller” for All Data vs the subset data from March 2008 (Slide 6).
 - Individual Determinations = 6 rubber samples/run!?
 - Less labs running Elastomer testing than historic
- ▶ Standard Deviations between TMC1006 and SL107 are very comparable for most test parameters (Slide 7).
 - However, there are some parameters with “noticeable” differences in Standard Deviation and Mean values that may need further investigation
 - Analyses performed on Final Test Results from each run
 - Final Test Results are an Average of Six Rubber samples

Data Location

- ▶ The data used to establish Standard Deviations for EOEC Adjustments may be found here:

<https://www.astmtmc.org/ftp/docs/bench/eoec/memos/>



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