

LDEOC/EOEC SURVEILLANCE PANEL

A LDEOC/EOEC conference call was held on 3-20-20, at 9 am Central Standard Time. The following esteemed members were on the call:

Joe Franklin - Intertek
Mike Birke – SwRI
Jason Bowden – OHT
Doyle Boese – Infineum
Vince Donndelinger - Lubrizol
Robert Stockwell – Oronite
Becky Grinfield – SwRI
Nicola Boyer - ISP
Tom Schofield – TMC
Gefei Wu – Valvoline
Kimberly Gutierrez - Intertek

The purpose of the call was to discuss the results of the EOEC batch 25/28 (ACM) round robin. The round robin was conducted to determine whether the new processing aid used in batch 28 has any effect on the results. Doyle presented his analysis (attached), and the conclusion is that the only parameter that was statistically significantly different was the volume change. Doyle suggested we implement a correction factor like the one that is currently used in the light duty polyacrylate. Mike Birke put forth a motion that a correction factor for volume change batch 28 EOEC be implemented. Vince Donndelinger approved the motion. There was no opposition, so the motion carried. Tom Schofield then mentioned that we need to clarify whether we will be using the correction factor for batch 29 and subsequent batches. Jason Bowden suggested we continue to use the correction factor for subsequent batches and reconvene the surveillance panel if batch 29 results vary significantly from batch 28. Mike Birke withdrew the original motion and put forth another motion that a correction factor of 0.19 be applied to EOEC batch 28 and all subsequent batches. Vince Donndelinger approved the motion, and there was no opposition, so the motion carried. Tom Schofield will be working with TMC to generate a new data dictionary, flat file, and report form template. The proposed report form (attached) was sent out to the group earlier in the week for review. There were no comments for the group on the format. Tom will then forward the forms and files to the data communication committee, which will have two weeks to beta test the new forms. From there Tom will issue an information letter with report form update. The labs will then have two weeks to get their report forms updated. Since the correction factor was generated with SL107, TMC will only be assigning SL107 for batch 28 EOEC testing. If any lab runs batch 28 before the new report forms are implemented, the lab will need to report the average values with the correction factor and make a note in the comments to that effect. Once the new report forms are ready, the tests will have to be re-reported. Jason Bowden mentioned that they will soon be shipping batch 24 ACM-1 material for round robin testing. Mike Birke will notify the labs when it ships.

There were no other comments, and no new business.

The meeting adjourned at 9:45 am.

EOEC – New ACM Process Aid

D. Boese

March 9, 2020

Performance you can rely on.

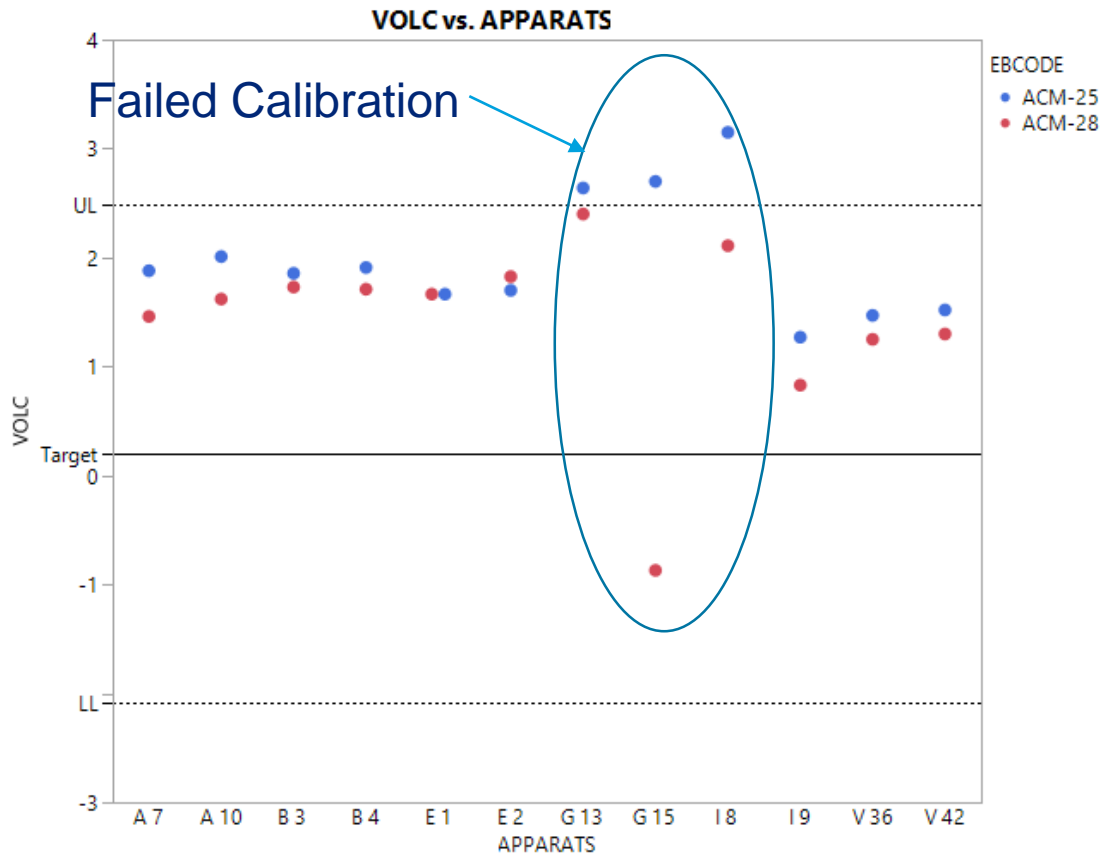


Summary / Recommendations

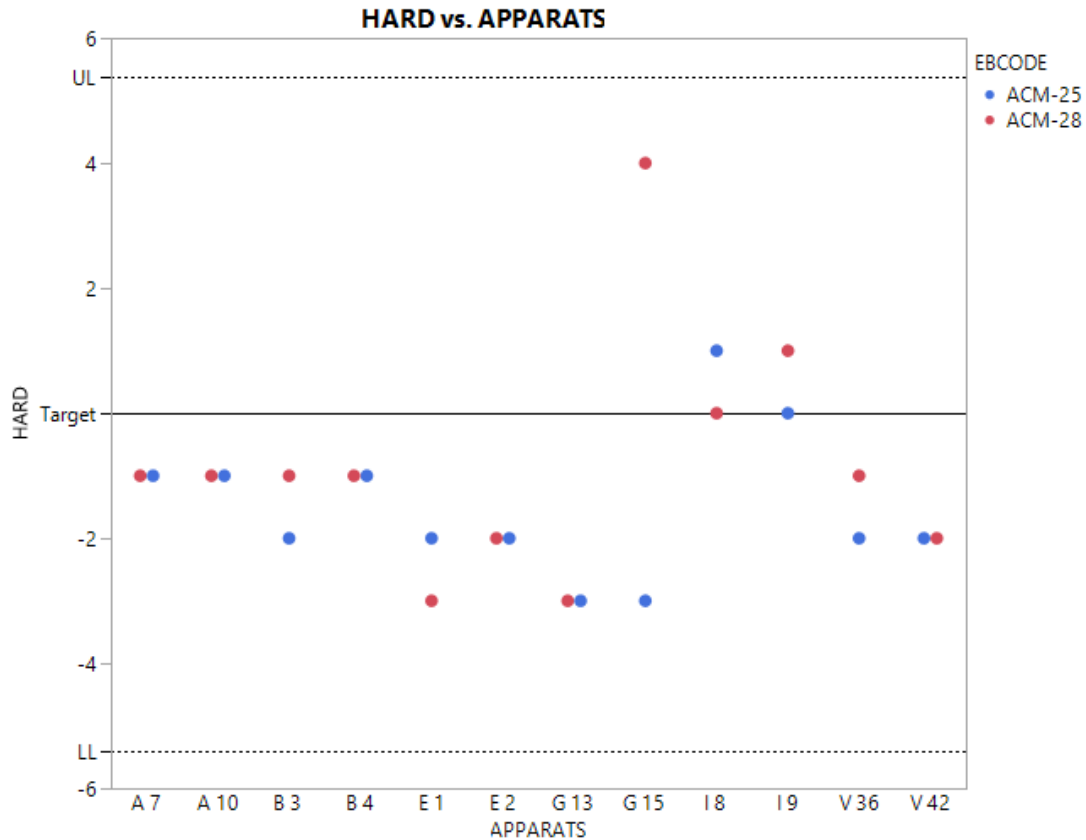


- VOLC is the only parameter for which the estimated Correction Factor is statistically significant.
- Recommend that a Correction Factor of 0.19 be added to VOLC results from tests using test material of batches incorporating the new process aid.

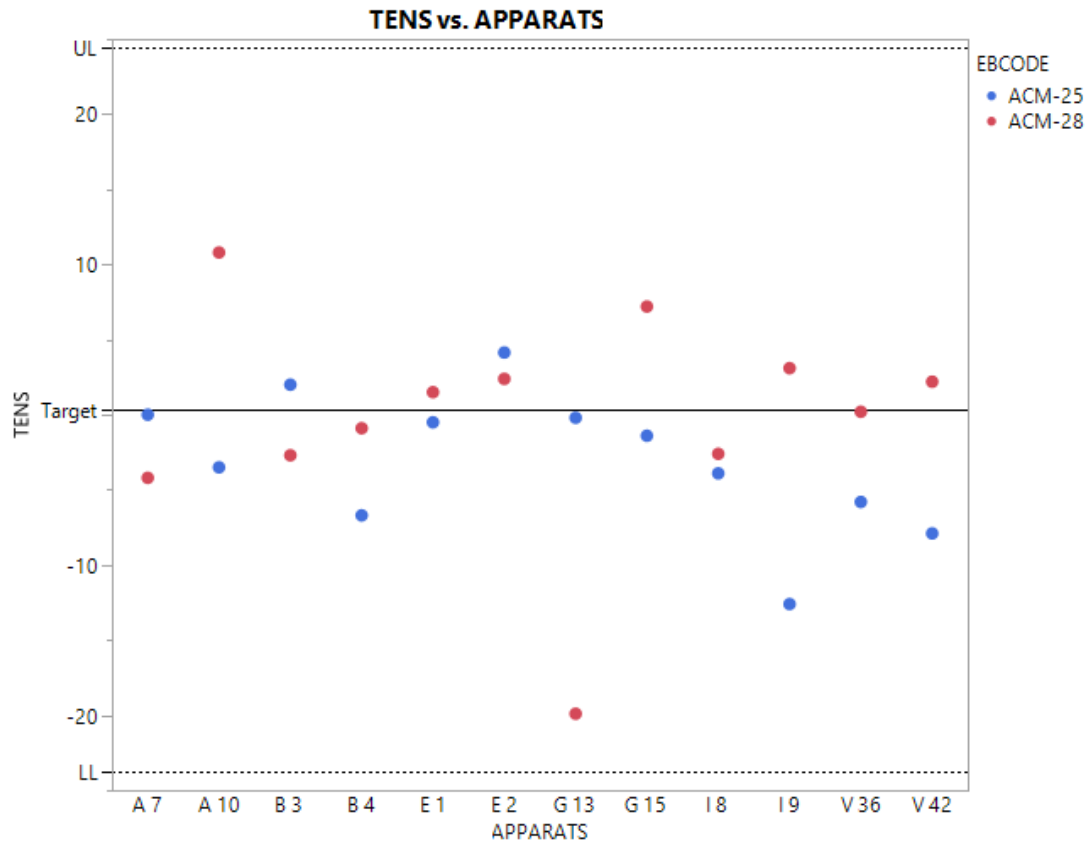
- The processing aid for the EOEC ACM material has changed.
- A Round Robin was run to establish a correction factor (CF) for the new material.
- Six labs participated by providing pairs of results (Batch 25 and 28) from two different baths.
- For each bath, the Batch 25 (previous process aid) and Batch 28 (new process aid) samples were tested simultaneously.
- For tests performed in three baths (G 13, G 15 and I 8) the Batch 25 VOLC results failed calibration and therefore those results (both Batch 25 and 28) in those baths were omitted.
- The plots on subsequent slides include Targets and Limits for Batch 25.
- Correction Factors are estimated by regressing the results of each of the four parameters on the Batch Code (EBCODE) and Test Bath (APPARATS).
- Note that statistical significance is relative to within Lab variability.
- Significance level used in this analysis is 0.05.



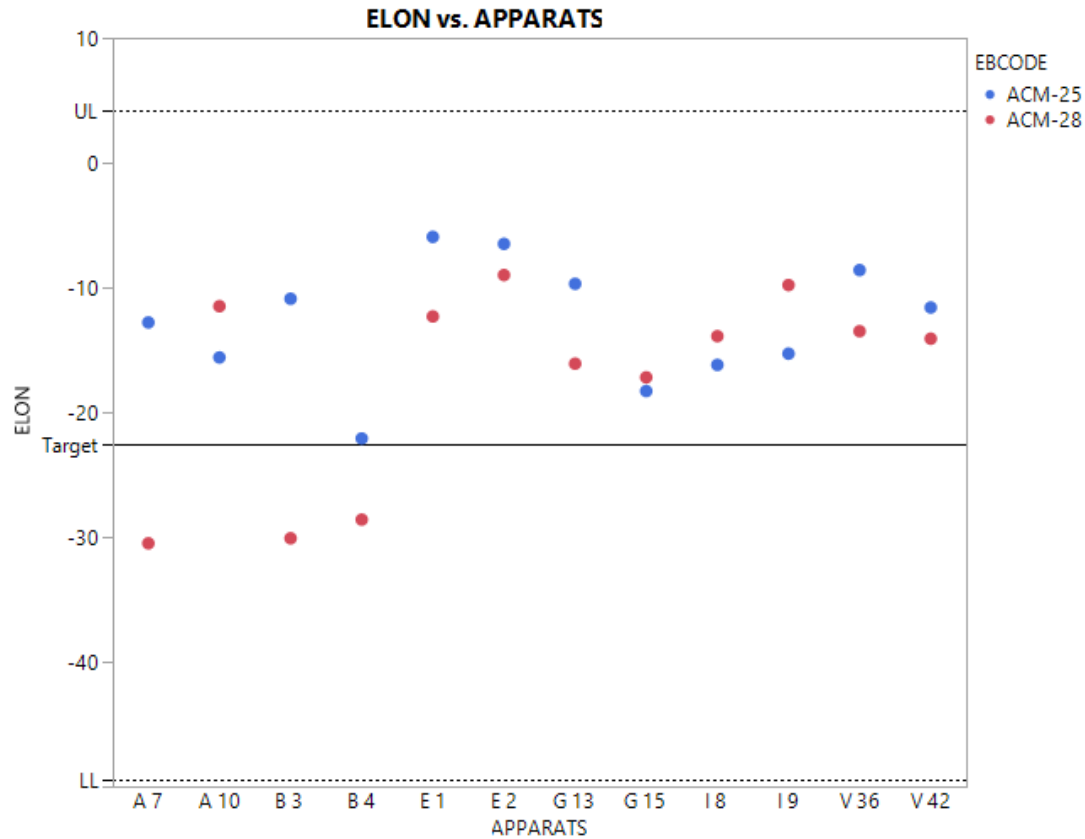
- For most of the pairs, VOLC of ACM-25 is higher than that of ACM-28.
- The difference between the pairs may differ by Lab.



- For most of the results from calibrated tests, the HARD for the pair is equal and for the rest is 1 unit different.



- For most of the pairs, TENS of Batch 28 is slightly higher than for Batch 25.



- For most of the pairs, Batch 25 has slightly higher ELON.

Estimated Correction Factors

EOEC ACM Correction Factors

Parameter	Correction Factor	p-Value
VOLC	0.19	0.0243
HARD	-0.22	0.3466
TENS	-4.81	0.0943
ELON	5.56	0.0833

- The only parameter for which the Correction Factor is statistically significant is VOLC.

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D 7216 – Engine Oil Elastomer Compatibility Form 1 – Validity Declaration

Version: EOEC VERSION 20060725
 Conducted for: TSTSPON1
 TSTSPON2

LABVALID	V = Valid
	I = Invalid

Elastomer Type	Bath Number	Elastomer Batch	Oilcode	CMIR	SOT Date	SOT Time	EOT Date	EOT Time
Nitrile	NBTHNUM	NEBCODE	OILCODE	NCMIR	NSDATE	NSTIME	NDTCOMP	NEOTTIME
Polyacrylate	PBTHNUM	PEBCODE		PCMIR	PSDATE	PSTIME	PDTCOMP	PEOTTIME
Fluoroelastomer	FBTHNUM	FEBCODE		FCMIR	FSDATE	FSTIME	FDTCOMP	FEOTTIME
Silicon	SBTHNUM	SEBCODE		SCMIR	SSDATE	SSTIME	SDTCOMP	SEOTTIME
Vamac	VBTHNUM	VEBCODE		VCMIR	VSDATE	VSTIME	VDTCOMP	VEOTTIME

Alternate Codes:	ALTCODE1	ALTCODE2	ALTCODE3
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In my opinion this test OPVALID been conducted in accordance with Test Method D 7216 and the appropriate amendments through the information letter system. The remarks on Form 7 describe any anomalies associated with this test.

Submitted By: SUBLAB
Testing Laboratory

SUBSIGIM
Signature

SUBNAME
Typed Name

SUBTITLE
Title

**D 7216 – Engine Oil Elastomer Compatibility
Form 2 – Candidate Data**

Sample Code: OILCODE Test Method-Version: METHVER	Lab: LAB	EOT Date: DTCOMP Test Length: TESTLEN
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Elastomer Identification	TMC Identification	Parameter	Specification Limit	Acceptance Limits			Reference Result	Candidate Result
				Updated on:	NTMCDATE			
Type:	Industry Oil:	Volume Change	+5% to -3%	NVLLIMIT1	To	NVLLIMIT2	RNVLFNL	NVLFNL
Nitrile	NIND	Hardness	+7 pts to -5 pts	NPHLIMIT1	To	NPHLIMIT2	RNPWFNL	NPHFNL
Batch:	CMIR:	Tensile Strength	+10% to -TMC 1006	NTSLIMIT1	To	NTSLIMIT2	RNTSFNL	NTSFNL
NEBCODE	NCMIR	Elongation	+10% to -TMC 1006	NELLIMIT1	To	NELLIMIT2	RNELFNL	NELFNL

Elastomer Identification	TMC Identification	Parameter	Specification Limit	Acceptance Limits			Reference Result	Candidate Result
				Updated on:	PTMCDATE			
Type:	Industry Oil:	Volume Change	+5% to -3%	PVLLIMIT1	to	PVLLIMIT2	RPVLFNL	PVLFNL
Polyacrylate	PIND	Hardness	+8 pts to -5 pts	PPHLIMIT1	to	PPHLIMIT2	RPPWFNL	PPHFNL
Batch:	CMIR:	Tensile Strength	+18% to -15%	PTSLIMIT1	to	PTSLIMIT2	RPTSFNL	PTSFNL
PEBCODE	PCMIR	Elongation	+10% to -35%	PELLIMIT1	to	PELLIMIT2	RPELFNL	PELFNL

Elastomer Identification	TMC Identification	Parameter	Specification Limit	Acceptance Limits			Reference Result	Candidate Result
				Updated on:	FTMCDATE			
Type:	Industry Oil:	Volume Change	+5% to -2%	FVLLIMIT1	to	FVLLIMIT2	RFVLFNL	FVLFNL
Fluoroelastomer	FIND	Hardness	+7 pts to -5 pts	FPHLIMIT1	to	FPHLIMIT2	RFPWFNL	FPHFNL
Batch:	CMIR:	Tensile Strength	+10% to -TMC 1006	FTSLIMIT1	to	FTSLIMIT2	RFTSFNL	FTSFNL
FEBCODE	FCMIR	Elongation	+10% to -TMC 1006	FELLIMIT1	to	FELLIMIT2	RFELFNL	FELFNL

Elastomer Identification	TMC Identification	Parameter	Specification Limit	Acceptance Limits			Reference Result	Candidate Result
				Updated on:	STMCDATE			
Type:	Industry Oil:	Volume Change	+TMC 1006 to -3%	SVLLIMIT1	to	SVLLIMIT2	RSVLFNL	SVLFNL
Silicon	SIND	Hardness	+5 pts to -TMC 1006	SPLIMIT1	to	SPLIMIT2	RSPWFNL	SPHFNL
Batch:	CMIR:	Tensile Strength	+10% to -45%	STSLIMIT1	to	STSLIMIT2	RSTSFNL	STSFNL
SEBCODE	SCMIR	Elongation	+20% to -30%	SELLIMIT1	to	SELLIMIT2	RSELFNL	SELFNL

Elastomer Identification	TMC Identification	Parameter	Specification Limit	Acceptance Limits			Reference Result	Candidate Result
				Updated on:	VTMCDATE			
Type:	Industry Oil:	Volume Change	+TMC1006 to -3	VVLLIMIT1	to	VVLLIMIT2	RVVLFNL	VVLFNL
Vamac	VIND	Hardness	+5 to -TMC1006	VPHLIMIT1	to	VPHLIMIT2	RVPHFNL	VPHFNL
Batch:	CMIR:	Tensile Strength	+10 to -TMC1006	VTSLIMIT1	to	VTSLIMIT2	RVTSFNL	VTSFNL
VEBCODE	VCMIR	Elongation	+10 to -TMC1006	VELLIMIT1	to	VELLIMIT2	RVELFNL	VELFNL

D 7216 – Engine Oil Elastomer Compatibility

Form 3 – Results Summary – Non-Reference Oil

Sample Code: OILCODE	Lab: LAB
Lab Oil Code: LABOCODE	

Elastomer Type: NETYPE		Elastomer Batch Code: NEBCODE			
SOT Time: NSTIME	EOT Time: NEOTTIME				
SOT Date: NSDATE	EOT Date: NDTCOMP	Bath Number: NBTHNUM			
Test Temperature, °C	Test Duration, Hours	Volume Change, %	Hardness Change, Points	Tensile Strength Change, %	Elongation Change, %
NTSTTMP	NTESTLEN	NVL_R001	NPH_R001	NTS_R001	NEL_R001
		NVL_R002	NPH_R002	NTS_R002	NEL_R002
		NVL_R003	NPH_R003	NTS_R003	NEL_R003
		NVL_R004	NPH_R004	NTS_R004	NEL_R004
		NVL_R005	NPH_R005	NTS_R005	NEL_R005
		NVL_R006	NPH_R006	NTS_R006	NEL_R006
Average		NVLAVG	NPHAVG	NTSAVG	NELAVG
Correction Factor		NVLCOR	NPHCOR	NTSCOR	NELCOR
Corrected Average		NVLFNL	NPHFNL	NTSFNL	NELFNL
Standard Deviation		NVSTDEV	NHSTDEV	NTSTDEV	NESTDEV

Elastomer Type: PETYPE		Elastomer Batch Code: PEBCODE			
SOT Time: PSTIME	EOT Time: PEOTTIME				
SOT Date: PSDATE	EOT Date: PDTCOMP	Bath Number: PBTHNUM			
Test Temperature, °C	Test Duration, Hours	Volume Change, %	Hardness Change, Points	Tensile Strength Change, %	Elongation Change, %
PTSTTMP	PTESTLEN	PVL_R001	PPH_R001	PTS_R001	PEL_R001
		PVL_R002	PPH_R002	PTS_R002	PEL_R002
		PVL_R003	PPH_R003	PTS_R003	PEL_R003
		PVL_R004	PPH_R004	PTS_R004	PEL_R004
		PVL_R005	PPH_R005	PTS_R005	PEL_R005
		PVL_R006	PPH_R006	PTS_R006	PEL_R006
Average		PVLAVG	PPHAVG	PTSAVG	PELAVG
Correction Factor		PVLCOR	PPHCOR	PTSCOR	PELCOR
Corrected Average		PVLFNL	PPHFNL	PTSFNL	PELFNL
Standard Deviation		PVSTDEV	PHSTDEV	PTSTDEV	PESTDEV

Elastomer Type: FETYPE		Elastomer Batch Code: FEBCODE			
SOT Time: FSTIME	EOT Time: FEOTTIME				
SOT Date: FSDATE	EOT Date: FDTCOMP	Bath Number: FBTHNUM			
Test Temperature, °C	Test Duration, Hours	Volume Change, %	Hardness Change, Points	Tensile Strength Change, %	Elongation Change, %
FTSTTMP	FTESTLEN	FVL_R001	FPH_R001	FTS_R001	FEL_R001
		FVL_R002	FPH_R002	FTS_R002	FEL_R002
		FVL_R003	FPH_R003	FTS_R003	FEL_R003
		FVL_R004	FPH_R004	FTS_R004	FEL_R004
		FVL_R005	FPH_R005	FTS_R005	FEL_R005
		FVL_R006	FPH_R006	FTS_R006	FEL_R006
Average		FVLAVG	FPHAVG	FTSAVG	FELAVG
Correction Factor		FVLCOR	FPHCOR	FTSCOR	FELCOR
Corrected Average		FVLFNL	FPHFNL	FTSFNL	FELFNL
Standard Deviation		FVSTDEV	FHSTDEV	FTSTDEV	FESTDEV

D 7216 – Engine Oil Elastomer Compatibility
Form 4 – Results Summary – Non-Reference Oil—~~Vamae~~

Sample Code: OILCODE	Lab: LAB
Lab Oil Code: LABOCODE	

Elastomer Type: SETYPE		Elastomer Batch Code: SEBCODE			
SOT Time: SSTIME		EOT Time: SEOTTIME			
SOT Date: SSDATE		EOT Date: SDTCOMP		Bath Number: SBTHNUM	
Test Temperature, °C	Test Duration, Hours	Volume Change, %	Hardness Change, Points	Tensile Strength Change, %	Elongation Change, %
STSTTMP	STESTLEN	SVL_R001	SPH_R001	STS_R001	SEL_R001
		SVL_R002	SPH_R002	STS_R002	SEL_R002
		SVL_R003	SPH_R003	STS_R003	SEL_R003
		SVL_R004	SPH_R004	STS_R004	SEL_R003
		SVL_R005	SPH_R005	STS_R005	SEL_R003
		SVL_R006	SPH_R006	STS_R006	SEL_R003
Average		SVLAVG	SPHAVG	STSAVG	SELAVG
Correction Factor		SVLCOR	SPHCOR	STSCOR	SELCOR
Corrected Average		SVLFNL	SPHFNL	STSFNL	SEELFNL
Standard Deviation		SVSTDEV	SHSTDEV	STSTDEV	SESTDEV

Elastomer Type: VETYPE		Elastomer Batch Code: VEBCODE			
SOT Time: VSTIME		EOT Time: VEOTTIME			
SOT Date: VSDATE		EOT Date: VDTCOMP		Bath Number: VBTHNUM	
Test Temperature, °C	Test Duration, Hours	Volume Change, %	Hardness Change, Points	Tensile Strength Change, %	Elongation Change, %
VTSTTMP	VTESTLEN	VVL_R001	VPH_R001	VTS_R001	VEL_R001
		VVL_R002	VPH_R002	VTS_R002	VEL_R002
		VVL_R003	VPH_R003	VTS_R003	VEL_R003
		VVL_R004	VPH_R004	VTS_R004	VEL_R004
		VVL_R005	VPH_R005	VTS_R005	VEL_R005
		VVL_R006	VPH_R006	VTS_R006	VEL_R006
Average		VVLAVG	VPHAVG	V TSAVG	VELAVG
Correction Factor		VVLCOR	VPHCOR	VTSCOR	VELCOR
Corrected Average		VVLFNL	VPHFNL	VTSFNL	VEELFNL
Standard Deviation		VVSTDEV	VHSTDEV	VTSTDEV	VESTDEV

**D 7216 – Engine Oil Elastomer Compatibility
Form 5 – Results Summary – Reference Oil**

Lab Oil Code: LABOCODE	Lab: LAB
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CMIR: NCMIR		TMC Industry Oil Code: NIND			
Elastomer Type: RNETYPE		Elastomer Batch Code: RNEBCODE			
SOT Time: RNSTIME	EOT Time: RNEOTIME				
SOT Date: RNSDATE	EOT Date: RNDTCOMP	Bath Number: RNBTHNUM			
Test Temperature, °C	Test Duration, Hours	Volume Change, %	Hardness Change, Points	Tensile Strength Change, %	Elongation Change, %
RNTSTTMP	RNTSTLEN	RNVLR001	RNPHR001	RNTSR001	RNELR001
		RNVLR002	RNPHR002	RNTSR002	RNELR002
		RNVLR003	RNPHR003	RNTSR003	RNELR003
		RNVLR004	RNPHR004	RNTSR004	RNELR004
		RNVLR005	RNPHR005	RNTSR005	RNELR005
		RNVLR006	RNPHR006	RNTSR006	RNELR006
Average		RNVLAVG	RNPHAVG	RNTSAVG	RNELAVG
Correction Factor		RNVLCOR	RNPHCOR	RNTSCOR	RNELCOR
Corrected Average		RNVLFNL	RNPHFNL	RNTSFNL	RNELFNL
Standard Deviation		RNVSTDEV	RNHSTDEV	RNTSTDEV	RNESTDEV

CMIR: PCMIR		TMC Industry Oil Code: PIND			
Elastomer Type: RPETYPE		Elastomer Batch Code: RPEBCODE			
SOT Time: RPSTIME	EOT Time: RPEOTIME				
SOT Date: RPSDATE	EOT Date: RPDTCOMP	Bath Number: RPBTHNUM			
Test Temperature, °C	Test Duration, Hours	Volume Change, %	Hardness Change, Points	Tensile Strength Change, %	Elongation Change, %
RPTSTTMP	RPTSTLEN	RPVLR001	RPPHR001	RPTSR001	RPELR001
		RPVLR002	RPPHR002	RPTSR002	RPELR002
		RPVLR003	RPPHR003	RPTSR003	RPELR003
		RPVLR004	RPPHR004	RPTSR004	RPELR004
		RPVLR005	RPPHR005	RPTSR005	RPELR005
		RPVLR006	RPPHR006	RPTSR006	RPELR006
Average		RPVLAVG	RPPHAVG	RPTSAVG	RPELAVG
Correction Factor		RPVLCOR	RPPHCOR	RPTSCOR	RPELCOR
Corrected Average		RPVLFNL	RPPHFNL	RPTSFNL	RPELFNL
Standard Deviation		RPVSTDEV	RPHSTDEV	RPTSTDEV	RPESTDEV

CMIR: FCMIR		TMC Industry Oil Code: FIND			
Elastomer Type: RFETYPE		Elastomer Batch Code: RFEBCODE			
SOT Time: RFSTIME	EOT Time: RFEOTIME				
SOT Date: RFSDATE	EOT Date: RFDTCOMP	Bath Number: RFBTHNUM			
Test Temperature, °C	Test Duration, Hours	Volume Change, %	Hardness Change, Points	Tensile Strength Change, %	Elongation Change, %
RFTSTTMP	RFTSTLEN	RFVLR001	RFPHR001	RFTSR001	RFELR001
		RFVLR002	RFPHR002	RFTSR002	RFELR002
		RFVLR003	RFPHR003	RFTSR003	RFELR003
		RFVLR004	RFPHR004	RFTSR004	RFELR004
		RFVLR005	RFPHR005	RFTSR005	RFELR005
		RFVLR006	RFPHR006	RFTSR006	RFELR006
Average		RFVLAVG	RFPHAVG	RFTSAVG	RFELAVG
Correction Factor		RFVLCOR	RFPHCOR	RFTSCOR	RFELCOR
Corrected Average		RFVLFNL	RFPHFNL	RFTSFNL	RFELFNL
Standard Deviation		RFVSTDEV	RFHSTDEV	RFTSTDEV	RFESTDEV

D 7216 – Engine Oil Elastomer Compatibility
Form 6 – Results Summary – Reference Oil –~~Vamae~~

Lab Oil Code: LABOCODE	Lab: LAB
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CMIR: SCMIR		TMC Industry Oil Code: SIND			
Elastomer Type: RSETYPE		Elastomer Batch Code: RSEBCODE			
SOT Time: RSSTIME		EOT Time: RSEOTIME			
SOT Date: RSSDATE		EOT Date: RSDTCOMP		Bath Number: RSBTHNUM	
Test Temperature, °C	Test Duration, Hours	Volume Change, %	Hardness Change, Points	Tensile Strength Change, %	Elongation Change, %
RSTSTTMP	RSTSTLEN	RSVLR001	RSPHR001	RSTSR001	RSELR001
		RSVLR002	RSPHR002	RSTSR002	RSELR002
		RSVLR003	RSPHR003	RSTSR003	RSELR003
		RSVLR004	RSPHR004	RSTSR004	RSELR004
		RSVLR005	RSPHR005	RSTSR005	RSELR005
		RSVLR006	RSPHR006	RSTSR006	RSELR006
Average		RSVLAVG	RSPHAVG	RSTSAVG	RSELAVG
Correction Factor		RSVLCOR	RSPHCOR	RSTSCOR	RSELCOR
Corrected Average		RSVLFNL	RSPHFNL	RSTSFNL	RSELFNL
Standard Deviation		RSVSTDEV	RSHSTDEV	RSTSTDEV	RSESTDEV

CMIR: VCMIR		TMC Industry Oil Code: VIND			
Elastomer Type: RVETYPE		Elastomer Batch Code: RVEBCODE			
SOT Time: RVSTIME		EOT Time: RVEOTIME			
SOT Date: RVSDATE		EOT Date: RVDTCOMP		Bath Number: RVBTHNUM	
Test Temperature, °C	Test Duration, Hours	Volume Change, %	Hardness Change, Points	Tensile Strength Change, %	Elongation Change, %
RVTSTTMP	RVTSTLEN	RVVLR001	RVPHR001	RVTSR001	RVELR001
		RVVLR002	RVPHR002	RVTSR002	RVELR002
		RVVLR003	RVPHR003	RVTSR003	RVELR003
		RVVLR004	RVPHR004	RVTSR004	RVELR004
		RVVLR005	RVPHR005	RVTSR005	RVELR005
		RVVLR006	RVPHR006	RVTSR006	RVELR006
Average		RVVLAVG	RVPHAVG	RVTSAVG	RVELAVG
Correction Factor		RVVLCOR	RVPHCOR	RVTSCOR	RVELCOR
Corrected Average		RVVLFNL	RVPHFNL	RVTSFNL	RVELFNL
Standard Deviation		RVVSTDEV	RVHSTDEV	RVTSTDEV	RVESTDEV

**D 7216 – Engine Oil Elastomer Compatibility
Form 7 – Comments**

Sample Code: OILCODE	Lab: LAB	EOT Date: DTCOMP
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Number of comment lines: TOTCOM	
OCOMR001	
OCOMR002	
OCOMR003	
OCOMR004	
OCOMR005	
OCOMR006	
OCOMR007	
OCOMR008	
OCOMR009	
OCOMR010	
OCOMR011	
OCOMR012	
OCOMR013	
OCOMR014	
OCOMR015	
OCOMR016	
OCOMR017	
OCOMR018	
OCOMR019	
OCOMR020	
OCOMR021	
OCOMR022	
OCOMR023	
OCOMR024	
OCOMR025	
OCOMR026	
OCOMR027	
OCOMR028	
OCOMR029	