Lubricants Group Ballot – New PCMO Elastomer BOI/VGRA

The API Lubricants Group Standards (LGS) met in person, on December 11, 2024, during ASTM in Anaheim. At the meeting, the LGS agenda included a recommendation from the BOI/VGRA Task Force to consider updating the New PCMO Elastomer BOI/VGRA**,** in **Appendix E, E.4.2.11** and **Annex F, F.4.8.** Eric Kalberer, Chair BOI/VGRA TF, reviewed the industry and ACC data on New PCMO Elastomer BOI/VGRA Read Across. (Attachment 1). The analysis established the BOI/VGRA was equivalent with additional bracketing for New vs. Current Elastomers.

After the data presentation there was a Motion to Ballot New PCMO Elastomer BOI/VGRA. (Attachment 2)

The motion detail:

Motion	Motions: Ballot PCMO Elastomer BOI/VGRA according to the proposed language from the BOI/VGRA Task Force. ➢ Accept FKM-3 at the Elastomer current reads ➢ 2ACM-2, AEM-2, and AEM-3 with additional bracketing
Motion by:	Eric Kalberer
Second by:	Mike Alessi
Lubricants Group Voice Vote	Vote: Approve Votes = All Negative Votes = 0 Abstain Votes = 0 Result: **Approved by LGS to issue ballot.** API to issue Electronic Ballot

The Motion to ballot New PCMO Elastomer BOI/VGRA.

In support of the Lubricants Group Ballot the draft changes to API 1509 are below.

Add FKM-3 to Current Reads

E.4.2.11 PCMO Elastomer Compatibility Test (ASTM D7216 Annex A2)[2]

E.4.2.11.1 For the following elastomers

Polyacrylate Rubber (ACM-1)
Hydrogenated Nitril Rubber (NNBR-1)
Silicon rubber (VMQ-1)
Fluorocarbon Rubber (FKM-1 and FKM-3)
Ethylene Acrylic Rubber (AEM-1)

Same language in API 1509 with FKM-3 simply added to the list.

E.4.2.11.1.1 A passing PCMO Elastomer Compatibility Test (ASTM D7216 Annex A2) in the core data set (as defined in the ACC Code) run in Group II or Group III or a mix of Group II and Group III, can be read across to formulations using other Group II or Group III or a mix of Group II and Group III base stocks.

E.4.2.11.1.2 Additionally, there is no viscosity grade restriction if the read across is limited to 0W-20, 0W-30, 5W-20, 5W30, 10W-30 and 10W-40 viscosity grades.

E.4.2.11.1.3 When reading to a candidate using Group I base stocks, the PCMO Elastomer Compatibility Test (ASTM D7216 Annex A2) is not required if the base oil saturates and base oil sulfur content (within the precision of the tests) of the interchange base oil fall within the range of the base oil saturates and base oil sulfur content of the base oils in the original candidate oils (minimum two candidate oils) and the DI package is unchanged. An example of this guideline's application is provided in Table E-39.

ACM-2, AEM-2, and AEM-3 additional bracketing language

E.4.2.11.2 For the following elastomers

Polyacrylate Rubber (ACM-2)

Ethylene Acrylic Rubber (AEM-2 and AEM-3)

E.4.2.11.2.1 The PCMO Elastomer Compatibility Test (ASTM D7216 Annex A2) is not required if the base oil saturates and base oil viscosity index (within the precision of the tests) of the interchange base oil fall within the range of the base oil saturates and base oil viscosity index of the base oils in the original candidate oils (minimum two candidate oils) and the DI package is unchanged. An example of this guideline's application is provided in Table E-XX.

Example E.x.x

	Matrix Oil 1	Matrix Oil 2	Candidate Oil A	Candidate Oil B
Base Oil Saturates, mass%	85	99	88	96
Base Oil Viscosity Index	100	130	95	120
PCMO Elastomer Compatibility Test	Pass	Pass		
Test Required?			Yes	No
Reason			Base oil VI DOES NOT fall within matrix oil ranges	Base oil saturate and Base oil VI falls within matrix oil ranges

Add FKM-3 to Current Reads

F.4.8 PCMO ELASTOMER COMPATIBILITY TEST (ASTM D7216 ANNEX 2A A2)

F.4.8.1 For the following elastomers

Polyacrylate Rubber (ACM-1)

Hydrogenated Nitril Rubber (NNBR-1)

Silicon rubber (VMQ-1)

Fluorocarbon Rubber (FKM-1 and FKM-3)

Ethylene Acrylic Rubber (AEM-1)

Same language in API 1509 with FKM-3 simply added to the list and minor edit to the table shown.

Table F-20—Groups II and III Viscosity Read-Across: PCMO Elastomer Compatibility Test4 (ASTM D 7216 Annex 2A A2)[4]

	Can Be "Read-Across" to:					
Test Run on	0W-20	0W-30	5W-20	5W-30	10W-30	10W-40
0W-20	NA	X	X	X	X	X
0W-30	X	NA	X	X	X	X
5W-20	X	X	NA	X	X	X
5W-30	X	X	X	NA	X	X
10W-30	X	X	X	X	NA	X
10W-40	X	X	X	X	X	NA

For viscosity grades not listed in the table above, bracketing two passing formulations for a given technology may be used to waive additional testing. VGRA is allowed if the candidate's base oil viscosity at100°C falls within the range of the base oil viscosity at 100°C of the 2 passing formulations.

Annex F Recommendation 2

ACM-2, AEM-2, and AEM-3 additional bracketing language

F.4.8.2 For the following elastomers

Polyacrylate Rubber (ACM-2)

Ethylene Acrylic Rubber (AEM-2 and AEM-3)

For all viscosity grades, bracketing passing formulations for a given technology may be used to waive additional testing. VGRA is allowed if the candidate's base oil viscosity at 100°C and Finished Oil Kinematic Viscosity at 100°C falls within the range of the base oil viscosity at 100°C and Finished Oil Kinematic Viscosity at 100°C of the passing formulations.

Example F.x.x if LG wants to incorporate

	Matrix Oil 1	Matrix Oil 2	Candidate Oil A	Candidate Oil B
Base Oil Viscosity at 100°C	4.5	9	4.2	8
Finished Oil Kinematic Viscosity at 100°C	9.3	15	9.5	14
PCMO Elastomer Compatibility Test	Pass	Pass		
Test Required?			Yes	No
Reason			Base oil viscosity at 100°C DOES NOT fall within matrix oil ranges	Base oil viscosity and Finished oil viscosity fall within matrix oil ranges

Lubricants Group Members should use the API Ballot System to cast their vote and make comments. The Ballot Link is: http://Ballots.api.org. The LG votes will be counted, and all comments reviewed and considered before the ballot may be considered passing.

Non-Lubricants Group Members may comment using the API Ballot system. The Ballot Link is: http://Ballots.api.org .

This LG Ballot will close on Thursday, February 6, 2025. All votes and comments must be received by the ballot closing data.

ATTACHMENT 1

API BOI-VGRA TF Recommendation for GF-7 PCMO Elastomer Compatibility

December 11, 2024

Anaheim, Ca

Background

- For the coming GF7/SQ category upgrades 4 new elastomers have been added for compatibility testing.
  - AEM2, AEM3, ACM2, and FKM3

- A request was made by the API BOI/VGRA TF for industry data to assess the new version of these elastomers of the existing elastomer chemical types.

- ACC as well as the ASTM TMC provided viable data sets for the API BOI/VGRA TF to review and assess for a recommendation of guidelines to adopt into Annex E and Annex F.

- This presentation contains the recommendation.

GF-7 Elastomers

- Based on what ACC and the ASTM TMC submitted for review, there was compelling data to support incorporation of BOI and VGRA guidelines for all 4 of the new elastomers.

  - FKM-3 performance aligned with what is known for the existing Elastomers and can be incorporated in the existing PCMO elastomers guidelines for BOI and VGRA in Annex E and Annex F.

  - AEM-2, AEM-3, and ACM-2 each indicated slightly different effects than existing Elastomers and a bracketing approach is recommended as the most robust approach for these materials.

Recommendations

- The following recommendations for API 1509 language are made with section/cataloguing numbers included. This may need editing for accuracy when incorporated into the existing document.

Annex E Recommendation 1:

Add FKM-3 to Current Reads

E.4.2.11 PCMO Elastomer Compatibility Test (ASTM D7216 Annex A2)[2]

E.4.2.11.1 For the following elastomers

Polyacrylate Rubber (ACM-1)

Hydrogenated Nitril Rubber (NNBR-1)

Silicon rubber (VMQ-1)

Fluorocarbon Rubber (FKM-1 and FKM-3)

Ethylene Acrylic Rubber (AEM-1)

Same language in API 1509 with FKM-3 simply added to the list.

E.4.2.11.1.1 A passing PCMO Elastomer Compatibility Test (ASTM D7216 Annex A2) in the core data set (as defined in the ACC Code) run in Group II or Group III or a mix of Group II and Group III, can be read across to formulations using other Group II or Group III or a mix of Group II and Group III base stocks.

E.4.2.11.1.2 Additionally, there is no viscosity grade restriction if the read across is limited to 0W-20, 0W-30, 5W-20, 5W30, 10W-30 and 10W-40 viscosity grades.

E.4.2.11.1.3 When reading to a candidate using Group I base stocks, the PCMO Elastomer Compatibility Test (ASTM D7216 Annex A2) is not required if the base oil saturates and base oil sulfur content (within the precision of the tests) of the interchange base oil fall within the range of the base oil saturates and base oil sulfur content of the base oils in the original candidate oils (minimum two candidate oils) and the DI package is unchanged. An example of this guideline's application is provided in Table E-39.

Annex E Recommendation 2:

ACM-2, AEM-2, and AEM-3 additional bracketing language

E.4.2.11.2 For the following elastomers

Polyacrylate Rubber (ACM-2)

Ethylene Acrylic Rubber (AEM-2 and AEM-3)

E.4.2.11.2.1 The PCMO Elastomer Compatibility Test (ASTM D7216 Annex A2) is not required if the base oil saturates and base oil viscosity index (within the precision of the tests) of the interchange base oil fall within the range of the base oil saturates and base oil viscosity index of the base oils in the original candidate oils (minimum two candidate oils) and the DI package is unchanged. An example of this guideline's application is provided in Table E-XX.

See Example proposed on next slide

Example E.x.x

	Matrix Oil 1	Matrix Oil 2	Candidate Oil A	Candidate Oil B
Base Oil Saturates, mass%	85	99	88	96
Base Oil Viscosity Index	100	130	95	120
PCMO Elastomer Compatibility Test	Pass	Pass		
Test Required?			Yes	No
Reason			Base oil VI DOES NOT fall within matrix oil ranges	Base oil saturate and Base oil VI falls within matrix oil ranges

Annex F Recommendation 1:

Add FKM-3 to Current Reads

F.4.8 PCMO ELASTOMER COMPATIBILITY TEST (ASTM D7216 ANNEX 2A A2)

F.4.8.1 For the following elastomers

Polyacrylate Rubber (ACM-1)

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Silicon rubber (VMQ-1)

Fluorocarbon Rubber (FKM-1 and FKM-3)

Ethylene Acrylic Rubber (AEM-1)

Same language in API 1509 with FKM-3 simply added to the list and minor edit to the table shown.

Table F-20—Groups II and III Viscosity Read-Across: PCMO Elastomer Compatibility Test4 (ASTM D 7216 Annex ~~2A~~ A2)[4]

	Can Be "Read-Across" to:					
Test Run on	0W-20	0W-30	5W-20	5W-30	10W-30	10W-40
0W-20	NA	X	X	X	X	X
0W-30	X	NA	X	X	X	X
5W-20	X	X	NA	X	X	X
5W-30	X	X	X	NA	X	X
10W-30	X	X	X	X	NA	X
10W-40	X	X	X	X	X	NA

For viscosity grades not listed in the table above, bracketing two passing formulations for a given technology may be used to waive additional testing. VGRA is allowed if the candidate's base oil viscosity at100°C falls within the range of the base oil viscosity at 100°C of the 2 passing formulations.

Annex F Recommendation 2

ACM-2, AEM-2, and AEM-3 additional bracketing language

F.4.8.2 For the following elastomers

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For all viscosity grades, bracketing passing formulations for a given technology may be used to waive additional testing. VGRA is allowed if the candidate's base oil viscosity at 100°C and Finished Oil Kinematic Viscosity at 100°C falls within the range of the base oil viscosity at 100°C and Finished Oil Kinematic Viscosity at 100°C of the passing formulations.

Example F.x.x if LG wants to incorporate

	Matrix Oil 1	Matrix Oil 2	Candidate Oil A	Candidate Oil B
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PCMO Elastomer Compatibility Test	Pass	Pass		
Test Required?			Yes	No
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ATTACHMENT 2

New PCMO Elastomer BOI/VGRA

Lubricants Group Motion and Vote

Motion and Lubricants Group Vote

Motions: Ballot PCMO Elastomer BOI/VGRA according the proposed language from the BOI/VGRA Task Force.

- Accept FKM-3 at the Elastomer current reads
- 2ACM-2, AEM-2, and AEM-3 with additional bracketing

Motion by: Eric Kalberer

Second by: Mike Alessi

Vote:

- Affirmative - All
- Negative - 0
- Abstain - 0