

HEAVY-DUTY ENGINE OIL CLASSIFICATION PANEL
OF
ASTM D02.B0.02
June 23, 2026
Hyatt Regency Chicago, IL

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ACTION ITEMS

MINUTES

1.0 Call to order

- 1.1 The Heavy-Duty Engine Oil Classification Panel (HDEOCP) was called to order by Chairman Shawn Whitacre at 1:30 P.M. on Tuesday, June 23, 2026, in the Hyatt Regency in Chicago, IL.
- 1.2 The attendance list is included as Attachment 2.

2.0 Agenda

- 2.1 The agenda circulated prior (included as Attachment 1) was not changed.

3.0 Minutes

- 3.1 Approval of minutes from December 2025
 - 3.1.1 Minutes are posted on the TMC website
 - 3.1.2 Minutes approved as written

4.0 Membership

- 4.1 There were no membership changes for this meeting, however expecting membership changes for the next meeting based on comments

5.0 Surveillance Panel and Taskforce Reports

- 5.1 DD13 – Robert Slocum - Lubrizol (**Attachment 3**)
 - 5.1.1 No activity this period
 - 5.1.2 ACC activity had 38 completed DD13 tests
 - 5.1.3 Reference activity: 2 tests completed
 - 5.1.4 Hardware has been easy to obtain as of late with everything available
 - 5.1.4.1 Part number change on bearings, no impact on bearing performance
 - 5.1.5 Reference oil supply: no issues
- 5.2 Cummins – Andrew Smith, Infineum on behalf of Joshua Ward - Intertek (**Attachment 4**)
 - 5.2.1 ISB Update
 - 5.2.1.1 The incorrect hardware numbers for ISB were shared during the meeting and in the attachment. The updated numbers are as follows:
 - 5.2.1.1.1 Camshaft Batch O: 206

- 5.2.1.1.2 Crosshead Batch H: 377
 - 5.2.1.1.3 Tappets Batch G: 178
 - 5.2.1.1.4 Pushrods Batch E: 642
 - 5.2.1.2 ISB BOI/VGRA Matrix expected to begin soon, with 3 stands participating
- 5.2.2 ISM Update
 - 5.2.2.1 Reference oil in good supply
 - 5.2.2.2 Hardware limiting factor is crossheads, and a new order is in process
 - 5.2.2.2.1 Will look to align with new valves at the same time
 - 5.2.2.3 Cummins and TEI working on acquiring engine blocks
- 5.2.3 ISB Viscosity Update
 - 5.2.3.1 Reference Oil 822-2 in need of replacement soon, will work with Mack/Volvo SP to replace this oil
 - 5.2.3.2 6 cSt parameter updates have been completed and are in the LTMS
 - 5.2.3.3 Test severity has shifted since development
 - 5.2.3.3.1 Engine age identified as likely driver
 - 5.2.3.3.2 A taskforce within the panel has been created to evaluate the effect of engine age on test severity and identify how to resolve the phenomenon
- 5.3 Mack/Volvo Surveillance Panel – Andrew Smith - Infineum **(Attachment 5)**
 - 5.3.1 No meetings this period
 - 5.3.2 Reference Oil 822-2 needs to be replaced, will work with Cummins SP to get a new re-blend
 - 5.3.3 Action Items for Panel:
 - 5.3.3.1 T13 new head part numbers to be introduced
 - 5.3.3.2 T8 Equivalency matrix, LTMS Action alarm to be reviewed, and reference oil re-blend to be discussed
 - 5.3.3.3 T-11 also in need of a reference oil re-blend
- 5.4 Caterpillar Surveillance Panel – Andrew Smith - Infineum on behalf of Jacob Goodale - Infineum **(Attachment 6)**
 - 5.4.1 1 Meeting this period covering COAT reference oil targets, suspension of 833-1 and discussing 831-5 reference oil introduction for C13
 - 5.4.2 No reference oil action items
 - 5.4.3 Hardware Update:
 - 5.4.3.1 C13 piston batch 1Y4106 delayed, expected to be delivered in July
 - 5.4.3.1.1 This could delay 831-5 reference oil introduction testing
 - 5.4.4 Current Panel Action Items:
 - 5.4.4.1 Monitor AAVE severity on the COAT
 - 5.4.4.2 C13 Reference Oil Re-blend introduction
 - 5.4.4.3 C13 Piston Batch Tracking
- 5.5 Ford Valvetrain Wear Test – Mike Deegan – Ford, Andrew Smith – Infineum **(Attachment 7)**
 - 5.5.1 Procedure line-by-line review completed, procedure to be finalized after LTMS data review, target setting, and precision statement is developed
 - 5.5.2 Critical parts list update ongoing, nearing finalization
 - 5.5.3 Outlier analysis being investigated for inclusion in the procedure
 - 5.5.4 LTMS updated to distinguish tests completed on the updated procedure versus earlier model years
 - 5.5.5 Batched hardware in good supply
 - 5.5.6 New reference oil re-blend being requested
 - 5.5.7 Reference Data in LTMS for stats review
 - 5.5.7.1 8 tests currently reported, 3 additional tests expected for a total of 11 tests to be included in the “matrix”
 - 5.5.7.2 Operational data review to be completed
 - 5.5.8 ACC Test Readiness reviewed and shown
- 5.6 D4485 Surveillance Panel – Laura Birnbaumer – Oronite **(Attachment 8)**

- 5.6.1 Ballots over the last semester were reviewed
 - 5.6.1.1 Most ballots around updating wording and tables for CL-4 and FB-4 inclusion
 - 5.6.1.2 These can all be reviewed in Attachment 8
 - 5.6.1.3 Discussion around Item 4 and Item 6: Update to Standard Deviation for Outlier Determination tables had incorrect values for the ISB Wear test
 - 5.6.1.3.1 This change could be editorial, Infineum to remove negatives after editorial changes
 - 5.6.1.3.2 Next steps to review with ASTM Editor to determine process for accepting editorial comments on ballots
 - 5.6.2 Next Semester ballots to include corrections identified within D4485 SP
- 6.0 Old Business
- 6.1 Fluoroelastomer Test Material Change – John Loop – TMC (**Attachment 9**)
 - 6.1.1 PC-12 development saw a change to the EOECF Test material
 - 6.1.1.1 Testing moved to OHTEOEC-FKM2-A
 - 6.1.1.2 Calibration data reviewed
 - 6.1.2 Calibration Test results using RO SL107 are in line with calibration test results that were completed with RO 1006-1 and RO 1006-2
 - 6.1.3 Volume change, Tensile Strength Change, and Elongation Change results for SL107/FKM2 align very well with the results found for tests conducted with FKM-22 through FKM-32 elastomer batch codes
 - 6.1.3.1 Hardness Change results for FKM2 are “on average” lower than most of the results found for the older FKM batch codes
 - 6.1.3.2 FKM2 results do not appear to be significantly different from the FKM results, but more concentrated in a range that fits within the ranges of the FKM Hardness responses
 - 6.1.4 EOEC Surveillance Panel has not determined final targets for the FKM2 batch
 - 6.1.4.1 Currently FKM2 targets are based upon the 30 round robin data points
 - 6.1.4.2 Final FKM2 targets will be established when additional calibration test data has been collected
 - 6.1.5 Based upon data collected to date, TMC has confidence that SL107/FKM2 calibration data is meeting the performance requirements for adjudicating bath run validity and test data is in alignment with historical FKM/1006 results
 - 6.2 FKM2 Recommendations – Laura Birnbaumer – Oronite (**Attachment 10**)
 - 6.2.1 From the TMC presentation, no need to change limits with the move to FKM2
 - 6.2.2 Laura Birnbaumer, Oronite, moves that the HDEOCP recommend to D02.B0 to adopt the same limits for FKM2 as exist for FKM and document those limits in D4485
 - 6.2.2.1 Table 3: CI-4
 - 6.2.2.2 Table 4: CJ-4
 - 6.2.2.3 Table 5: CK-4
 - 6.2.2.4 Table 6: FA-4
 - 6.2.2.5 Table 7: CL-4
 - 6.2.2.6 Table 8: FB-4
 - 6.2.2.7 Motion carries with 15 votes for, 3 abstained**
 - 6.2.3 Laura Birnbaumer, Oronite, moves that the HDEOCP recommend to D02.B0 that FKM2 be added to D4485 Annex A5 using the standard deviations developed during the ILS until February 2027 when they will use all the data available
 - 6.2.3.1 Motion Carries with 16 votes for, 3 abstained**
- 7.0 New Business
- 7.1 D6922 Presentation – Yong-Li McFarland – Southwest Research Institute (**Attachment 11**)
 - 7.1.1 Asking for this group to collect feedback on what to do about this bench test D6922 and how we would like to move forward
 - 7.1.2 This is an H&M test is a bench test that determines if a test oil is homogeneous and miscible when mixed with 6 reference oils after subjected to temperature cycles by color determinations and observations

- 7.1.3 The method has no monitoring or chair
- 7.1.4 Method is in GF4-GF7, API SJ and on and OEM specifications
- 7.1.5 TMC was alerted that the 6 reference oils will not be available for reblend by suppliers in estimated 3 years
- 7.1.6 Contact Yong-Li with feedback or for participation in the created task force
- 7.2 Request for D4485 Modification - Cory Koglin - Afton (**Attachment 12**)
 - 7.2.1 Motion by Cory Koglin, Afton: Add a footnote "A passing ISBV 156 h (TGA % Soot at 12.0 mm²/s increase, at 100 C, min) – 5.6 (first test), 5.5 (second test) and 5.4 (third test) can be used in place of an ISBV 108 h in the applicable categories. This is not intended to indicate equivalence."
 - 7.2.1.1 Motion carries with 14 for, 0 opposed, 2 abstain**
- 8.0 Motion to adjourn at 2:41 PM

AGENDA
D02.B0.02.1
Heavy-Duty Engine Oil Classification Panel
Tuesday, June 23, 2026 1:30pm CDT
McCormick Place Convention Center - Room W190B
Chicago, IL USA

- 1) Call to Order/Review Agenda/Anti-trust statement**
- 2) Minutes** – Approval of Minutes from December 9, 2025 Meeting in Houston, TX
- 3) Membership**
 - a) Review and update current panel membership
- 4) Surveillance Panel/Task Force Reports**
 - a) DD13 SP Report (Robert Slocum, Lubrizol)
 - b) Cummins SP Report (Andrew Smith, Infineum on behalf of Josh Ward, Intertek)
 - c) Volvo/Mack SP Report (Andrew Smith, Infineum)
 - d) CAT SP Report (Andrew Smith, Infineum on behalf of Jacob Goodale, Infineum)
 - e) Ford 6.7L VTW Test Update (Michael Deegan, Ford/Andrew Smith, Infineum)
 - f) PC-12 in D4485 and Other D4485 SP Topics (Laura Birnbaumer, Chevron Oronite)
- 5) Old Business**
 - a) none
- 6) New Business**
 - a) D6922 Homogeneity and Miscibility Test Status (Yong-Li McFarland, SwRI)
 - b) D4485 Modification Request – ISB-V (Cory Koglin, Afton)
- 7) HDEOCP Adjournment**

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**DD13 S.P.
Annual Report, June 2026
Presentation to Subcommittee D02.B0**

Prepared By: Robert Slocum, S.P. Chair June 2026

DD13 S.P. Report Panel Activity

- No SP activity this period

DD13 S.P. Report

ACC Activity YTD

<u>Test Type</u>	<u>Part A Count</u>	<u>Part B Count</u>	<u>Completed Count</u>	<u>Sponsor Cancelled Count</u>
DD13	45	43	38	0

DD13 S.P. Report

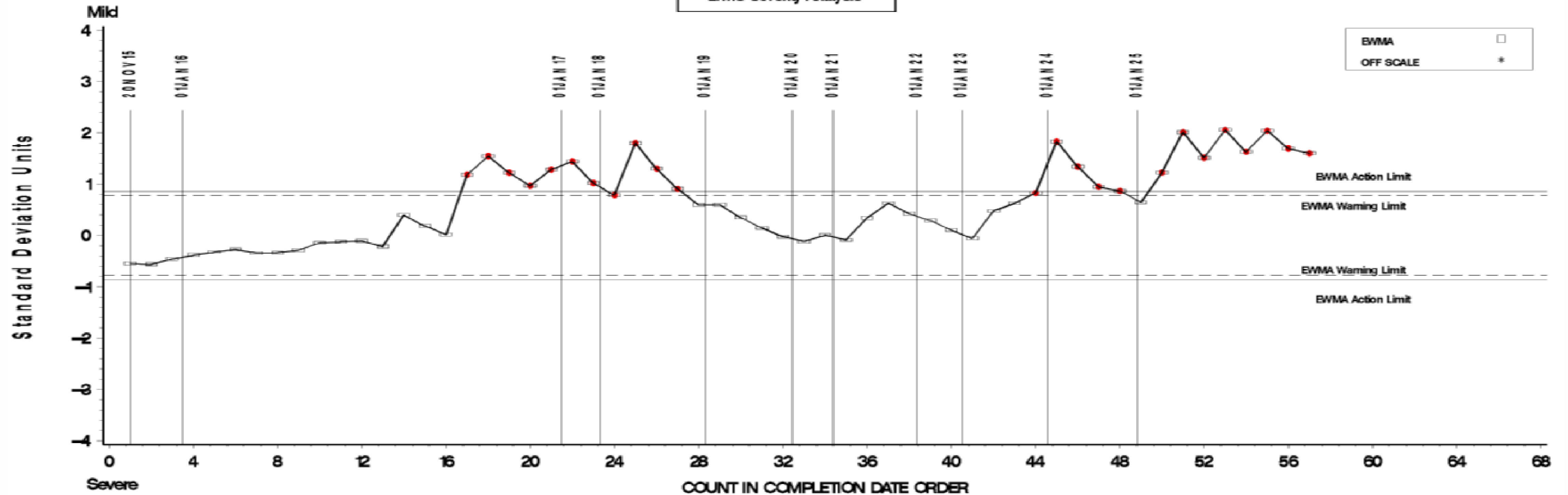
Reference Test Activity

Test Status	Validity Code	#
Acceptable Calibration Test	AC	2
Failed Calibration Test	OC	0
Operationally Invalid	LC	0
Aborted	XC	0
Total		2

Control Charting

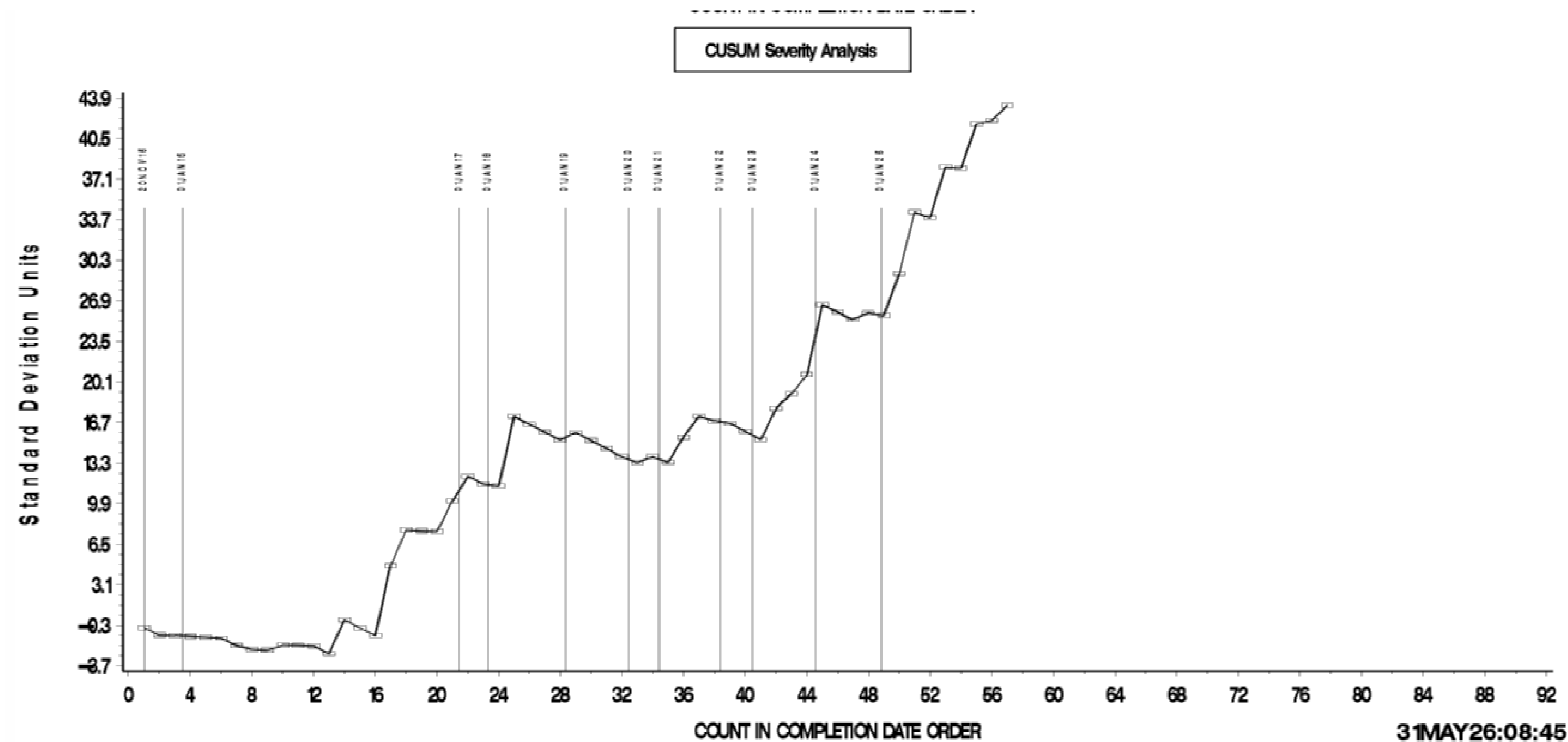
FNL. ORIG. UNIT HOURS TO SCUFF

LTMS Severity Analysis



- ▶ HRS2 is in severity action alarm in the mild direction.

Control Charting



DD 13 S.P. Report Hardware

- There haven't been any difficulties getting parts lately, everything has been readily available.
- Part number change in the main bearings recently
 - Oval vs. round hole
 - Daimler Bearing engineer comments:
 - No impact on bearing performance
 - Introduced to ensure compatibility with both legacy engine blocks and the newer Gen6 engine design

DD 13 S.P. Report Hardware

Part	Batch	Quantity	Kits Remaining	Years Remaining*
Top Ring	C	1272	212	4.8
Second Ring	B	1009	168	3.8
Oil Ring	B	449	75	1.7
Piston	B	1020	170	3.9
Liner	D	498	83	1.9

*Based on Last 12 months of sales

DD 13 S.P. Report

Reference Oil Inventory Estimated Life

<u>Oil</u>	<u>Year</u>	<u>Test</u>	<u>Blend Quantity</u>	<u>TMC Inventory</u>	<u>Estimated Life</u>
864-1	2016	DD13	1576	112	1.5
864-2	2023	DD13	1491	1459	>5

DD 13 S.P. Report Next S.P. Meeting

- When: TBD if needed
- Topics
 - Need to keep next batch of liners on the radar
 - Other?

Cummins

ISB (ASTM D7484) ISM (ASTM D7468)

ISBVIS (ASTM D8617)

Surveillance Panel Update

June 2026

Prepared by: Joshua Ward, S.P. Chairman

Cummins SP Report

ISB Test Status

- 4 labs, 5 test stands are currently calibrated on current hardware batch
 - Critical Parts Inventory
 - Camshaft Batch O: **88 Kits**, 439 cams in stock but experiencing 80% rejection rate
 - Tappets Batch G: 510 Kits
 - Crossheads Batch H: 409 Kits
 - Push Rods Batch E: 691 Kits
- Reference Oil Update:
 - Approximately 355 gallons of RO835 remaining

Cummins SP Report

ISB Test Status

- ISB BOI/VGRA matrix expected to begin in July with three test stands participating

Cummins SP Report

ISM Test Status

- 3 labs, 3 tests stands are calibrated on current hardware
 - Critical Parts Inventory
 - Adjusting Screw Batch F: 308 Kits
 - Crossheads Batch H: 70 Kits
 - Push Rods Batch D: 169 Kits
 - Exhaust Valve Batch G: 85 Kits
 - Intake Valves Batch G: 94 Kits
- Reference Oil Update:
 - Approximately 5 Year Supply of 830-3 at current usage rate

Cummins SP Report

ISM Test Status

- Coordinated referencing on new batch of hardware was completed and the panel accepted the hardware for use
- Order for next batch of crossheads is in process
- Cummins and TEI in process of purchasing engine blocks

Cummins SP Report

ISBV Test Status

- 4 labs, 8 test stands are currently calibrated
- Critical Parts Inventory
 - Uses low volume of ISB wear test hardware
- Reference Oil
 - ISBV108 RO834-1 1499 gallons approximately 6 years supply
 - ISBV156 RO822-2 196 gallons approximately 1 year supply

Cummins SP Report

ISBV Test Status

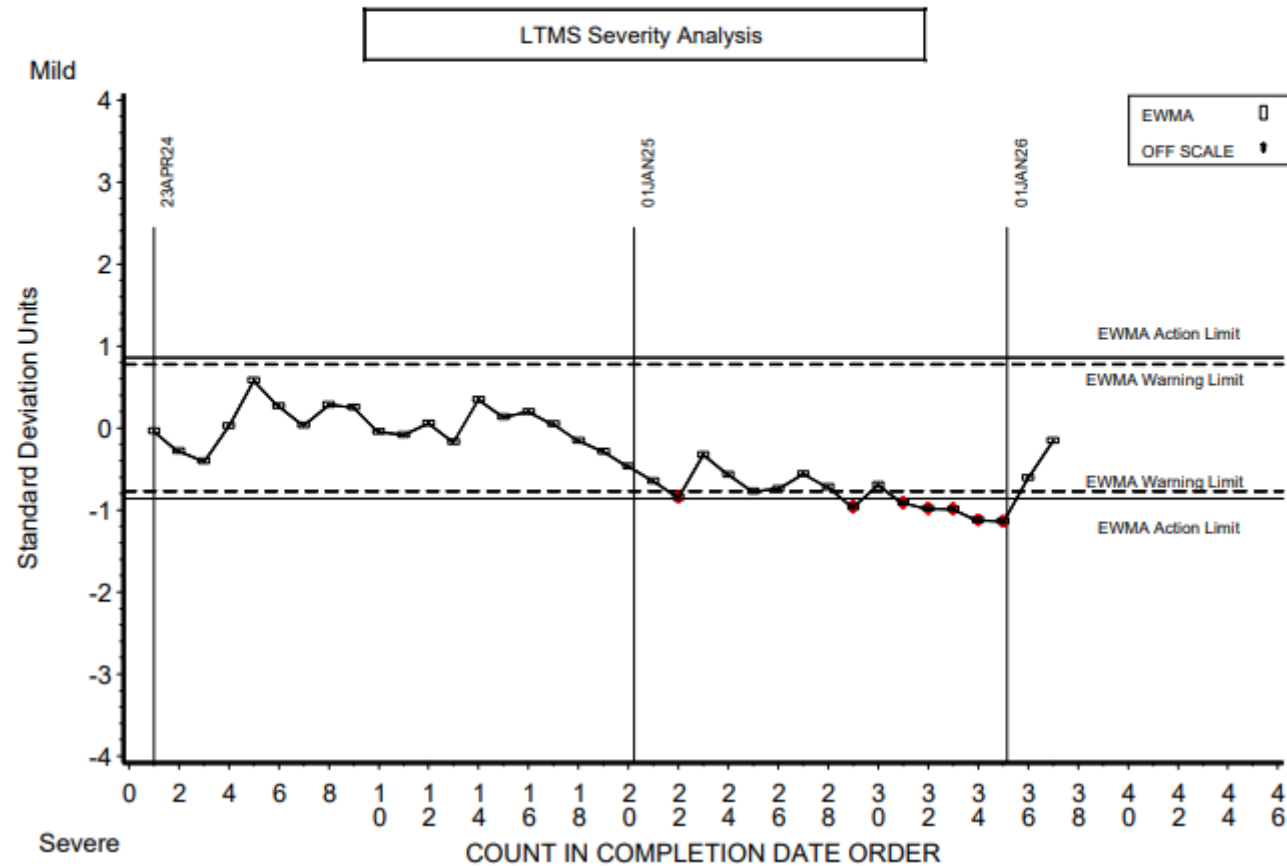
- Addition of the 6 cSt parameter has been completed
- Test severity has shifted since development
 - Engine age identified as a likely driver
 - A taskforce panel has been established to evaluate the effect of engine life on test severity and identify possible resolutions. First meeting planned for early July.

Cummins SP Report

ISBV Test Status

CUMMINS ISB VISCOSITY TEST 156 HR INDUSTRY OPERATIONALLY VALID |

FINAL SOOT % AT 12 cSt [$>$]



Cummins SP Report

- 4 Surveillance Panel Meetings this period
- 1st Meeting
 - ISM Hardware Batch Change
 - Continue ISBV 6 cSt Discussion
 - Continue ISBV Severity Discussion
 - Update on ISB ECM's

Motion:The panel directs TMC to add the 6 cSt parameter in the ISBV156 and ISBV108 report forms and test procedure. The 6 cSt will be non-critical for referencing as the panel evaluates data. The panel also directs TMC to update the LTMS document to reflect this motion by adding the 6 cSt parameter and panel approved 6 cSt targets shown below at n=11. Labs will then need to resubmit references and candidate data with proper severity adjustments.

		Soot @6 cSt	
Oil	n	mean	s
822-2	11	4.38	0.315
	24	4.25	0.288

		Soot @6 cSt	
Oil	n	mean	s
834	11	4.07	0.219
	24	4.05	0.200

Cummins SP Report

- 2nd Meeting

- ISBV Report Form Changes for 6 cSt
- ISM New Hardware Timeline

Motion: The Cummins Surveillance Panel instructs the TMC to adjust reference periods in the following manner to support the introduction of Batch F Injector Screw Hardware;

- For labs donating a run for non-calibration purposes, add one candidate run to the current reference interval.
 - For labs with more time and runs available than Batch E hardware, allow for no net-gain/net loss for those stands.
 - For labs with a stand expiring soon and needing to reference prior to the coordinated runs, allow for the extension of the current reference interval until the coordinated F-batch IAS runs, with payback of the extension on the following reference period.
 - Upon completion, the panel will review the results in order to accept the hardware.
- References on Batch F Injector Screws should target being started by April 17th, 2026.

Cummins SP Report

- 3rd Meeting
 - ISBV Report Test Numbering Errors on Re-Reports
 - ISM Coordinated Referencing Status Update

Motion: Update section 9.5.1 of the ISB Viscosity procedure to replace the last sentence to read “If the stand is not calibrated for that version (ISBV108 or ISBV156) of the test, report the value as 9999.” This update is effective as of 5/6/2026.

Cummins SP Report

- 4th Meeting
 - Review ISM Coordinated Reference Results
 - Review ISBV latest reference results
 - ISB BOI/VGRA Matrix timing and reference status
 - ISM batched hardware inventory

Motion: The panel accepts the batch F Injector Adjusting screws with no change to correction factors, effective 6/4/2026. Stands that participated in the coordinated reference that are pending hardware approval will be considered calibrated starting 6/4/2026.

Motion: Change the definition of rebuild hours to be ISB viscosity hours after rebuild at start of test and reset with each rebuild. ISB wear hours on the block do not count as rebuild hours. Block hours include both ISB wear and ISB viscosity hours. For example, an ISB block that ran 4500 hours of wear testing will have a block hours value of 4500 but a rebuild hours value of 0 as it has not run an ISB viscosity test yet.

Cummins SP Report

- Questions?

Mack / Volvo Surveillance Panel Update

June 23, 2026

Andrew Smith - SP Chair

Meetings

- No activity this period
- Information Letters
 - None this period

Reference Oil Inventory

Test	Reference Oil	TMC Inventory from Semi-Annual Report (Gallons)	Supply
Mack T-8	TMC 1005-5	83	<1 years
	TMC 1005-7	911	5+ years
Mack T-11	TMC 822-2	196	1 Years
Mack T-12	TMC 821-4	1700	5+ Years
Volvo T-13	TMC 823-1	750	5+ Years
	TMC 824	625	5+ Years

T8

- CLOG initiative for T8E – ISB
Viscosity 108 Equivalency Matrix
 - Funding request submitted
 - ASTM Agreement to fund 50% of the matrix if the rest is agreed to be funded
 - API funding request ongoing
- Reference oil re-blend to be introduced (1005-7)
- Current action items
 - Review Test Severity

- Test Severity

- Viscosity Increase at 3.8% Soot still in Action Alarm to be reviewed
 - Will ask for statistician review now that more data available
- RV48 and RV2 are in control

Test Status	Validity Code	#	Cause
Acceptable Calibration Test	AC	1	
Failed Calibration Test	OC	0	
Aborted	XC	2	High Soot
Total		3	

Labs	Referenced Stands
2	2

- Currently running last batch of hardware, no issues at this time

T11

- Reference Oil re-blend upcoming
- Test Severity
 - MRV Precision Warning Alarm to be monitored with additional data
 - Soot4 Action Alarm (has been in action alarm since 2016)
 - Deemed non-critical, little variation
 - Soot and Soot5 under control
- Currently running last batch of hardware, no issues at this time

Test Status	Validity Code	#	Cause
Acceptable Calibration Test	AC	2	
Failed Calibration Test	OC	0	
Aborted	XC	1	
Total		3	

Labs	Referenced Stands
2	2

T12

- No updates this period
- Test Severity
 - CLW, OC, PB, PB2, TRWL all under control

Test Status	Validity Code	#	Cause
Acceptable Calibration Test	AC	1	
Failed Calibration Test	OC	0	
Aborted	XC	2	
Invalid	LC	1	
Total		4	

Labs	Referenced Stands
3	1

- Currently running last batch of hardware, no issues at this time

T13

- New Head part number
 - Panel reviewing what/if any changes there are to the new heads and how to implement into tests

- Test Severity
 - IRPH and KV40 under control with the updated ICF

Test Status	Validity Code	#
Acceptable Calibration Test	AC	4
Failed Calibration Test	OC	0
Invalid	LC	0
Aborted	XC	0
Total		4

Labs	Referenced Stands
4	5

Panel Action Items

- T13
 - New Head Part Number Discussions
- T-8
 - Equivalency Matrix
 - Action Alarm
 - Reference Oil Re-Blend
- T-11
 - Reference Oil Re-blend

Mack/Volvo SP Update

- Questions?

Caterpillar Surveillance Panel Update

Created By: Jacob Goodale Surveillance Panel Chair

Presented By: Andrew Smith

June 23rd, 2026

Meetings

- 1 Meeting April 19th
 - Review of COAT reference oil targets
 - Suspension of additional reference on 833-1
 - C13 Deposit test reference periods aligned for 831-5 introduction
- Information Letters
 - None this period

Reference Oils

Test	Reference Oil	Supply
1K, 1N	TMC 809-1	1,846 Gallons
	TMC 811-2	690 Gallons
1R	TMC 822-2	196 Gallons
	TMC 1005-5	83 Gallons
1P	TMC 1005-5	254 Gallons
	TMC 1005-7	911 Gallons
COAT	TMC 832-1	1,214 Gallons
	TMC 832-2	514 Gallons
	TMC 833-1	54 Gallons
	TMC 833-2	801 Gallons
	TMC 1005-6	238 Gallons
C13	TMC 831-4	82 Gallons
	TMC 831-5	1,722 Gallons

Updates:
TMC 832-1 and 832-2 suspended by SP due to lack of discrimination

COAT

- Stats review for 833-2 referencing indicated no need for target updates
- Test Severity
 - AAVE in Level 2 Alarm in severe direction
- Hardware
 - 108 Batch B filters remaining
 - 2 years supply based on current run rates

Test Status	Validity Code	#	Cause
Acceptable Calibration Test	AC	2	
Failed Calibration Test	OC	0	
Aborted	XC	0	
Total		3	

Labs	Referenced Stands
3	3

C13

- Reference Oil 831-5 introduction planned Q3 2026 through coordinated referencing
- Test Severity
 - No tests in this period
- Hardware
 - 1Y4106 Test piston batch delayed
 - Delivery expected in July
 - Piston supply could delay 831-5 referencing

Test Status	Validity Code	#	Cause
Acceptable Calibration Test	AC	0	
Failed Calibration Test	OC	0	
Aborted	XC	0	
Total		0	

Labs	Referenced Stands
4	5

1K/1N

- 1K: No activity in this period

1N

- Severity
 - TGF in Precision Action Alarm
 - All other parameters in control

1N Test Status	Validity Code	#	Cause
Acceptable Calibration Test	AC	2	
Failed Calibration Test	OC	0	
Aborted	XC	0	
Total		2	

Labs	Referenced Stands
2	2

- Severity
 - EOTOC in severity action alarm in severe direction
 - All other parameters in control

Test Status	Validity Code	#	Cause
Acceptable Calibration Test	AC	1	
Failed Calibration Test	OC	0	
Aborted	XC	0	
Total		1	

Labs	Referenced Stands
1	1

Panel Action Items

- COAT
 - Monitor AAVE severity
- C13
 - Reference Oil Re-blend
 - Piston Batch Tracking
- SCOTE

Caterpillar SP Update

- Questions?

Ford VTWT Update

June 23, 2025

Test Status

- Procedure “line-by-line” review completed
 - Procedure finalization pending precision statement after LTMS data review and target setting
 - Critical parts list update ongoing, nearing finalization
 - Outlier Analysis being investigated to possibly be added to procedure
 - Report Form updates agreed upon, more may change as final details completed
 - Will be completed after procedure finalization
 - LTMS updated to distinguish tests completed to the latest procedure for statistical consideration
- Batched hardware in good supply
- New Reference Oil Re-Blend being requested

Reference Data

- 8 Tests currently reported on reference oil between 3 labs
- 3 additional data points expected
 - Lab B to report last reference
 - Lab D adding 2 reference tests
- Referencing expected to be completed by the end of the month
- Operational data review expected upon completion of final reference

Lab	Stand	Reference Oil	Rocker Arm Wear Average, mg
A	4	FVTW3	120.5
G	2	FVTW3	94.7
A	2	FVTW3-1	117.1
A	4	FVTW3-1	135.4
A	4	FVTW3-1	111.3
B	2	FVTW3-1	138.4
A	2	FVTW3-1	139.4
G	1	FVTW3-1	106.6

Action Items Review

- Outlier Analysis consideration
 - Statisticians actioned to review
- Update Report Forms
- Statistics review for reference oil target and precision statement after completion of last reference tests
- Critical Parts List Finalization
- Timing: Expected completion of all action items in August, at which time we will work to ballot the procedure

ACC Engine Test Readiness Reviewed

	Criteria	Remarks (more than yes/no)	Timing	Status
1	Have the Project Management Principles as outlined in ACC PAPTG's Test Development Considerations been reviewed by the Test Development Team? Is there alignment with the Team?	Yes, principles have been reviewed.		Complete
2	Test Discrimination confirmed and statistics published? (Proof of Concept complete)	Yes, HWO and BLO demonstrate	Completed	Confirmed on MY23 engine at 175 hrs.
3	Capable of evaluating all relevant viscosity grades?	Yes, including low phos oils.	Completed	Completed
4	Test Precision Matrix Plan Defined including target precision?	Yes, in process	Aug-26	(4) labs and (11) tests. Statisticians working.
5	Written Test Procedure Available? Is a Facilitator involved? Is the Test Procedure stable so that all labs are running the same procedure?	Yes, facilitator finalizing.	Aug-26	All labs are capable of running the procedure.

ACC Engine Test Readiness Reviewed

6	Test Precision Defined? (Matrix testing completed and analysis performed)	Yes, matrix defined and testing and analysis in process	Sep-26	Completeion of tests by August 2026, with statisticians completing by Sept.
7	Demonstrate performance parameters of test are not redundant to existing engine tests (unless test is developed as a replacement to another test)	Not redundant, believe that this test will set formulations needs for all wear tests	Sep-26	Review required with SP to confirm.
8	Reference Oils Selected? Is there commitment to make the reference oil available long term?	Yes, borderline oil rebrend requested	Sep-26	Supplier working on rebrend
9	Do selected reference oils reflect current formulation technology?	Yes, HWO=FA-4, BLO= FA-4	Complete	
10	Hardware availability plan created and does it take into account usage for life of category, as well as other non-API category usage?	Yes, parts availability for (5) years.	Sep-26	Evaulation for additional buy in process.
11	Critical features on critical hardware defined, as well as a plan to qualify to those critical features?	Yes, updates may be needed once PM completed	Sep-26	90% complete.
12	Parts batches from Precision Matrix available for how long after the PM?	Yes, (5) yrs.	Complete	Longer term parts verification required.

ACC Engine Test Readiness Reviewed

13	Test Fuel Selected and fuel specification defined?	Yes, PC-10 and D975 specified	Complete	D975 Summer fuel only
14	Rating & Reporting of Results Defined?	Yes, BOI/VGRA expected to be similar to ISB.	Sep-26	
15	Test validity requirements defined and included in procedure?	Yes, validity requirements have been defined	Sep-26	Will confirm with completion of PM review
16	Calibration, Monitoring and Surveillance Actions Defined?	Yes, Updates to the Report Form required.	Sep-26	
17	LTMS In Place?	Yes		
18	Is a suitable system in place to handle repeat tests on a candidate oil (MTEP-Multiple Test Evaluation Procedure)?	Yes		
19	BOI/VGRA Plan in Place?	Yes		

Ford VTWT Update

- Questions?

ASTM D4485

Laura Birnbaumer
Heavy Duty Engine Oil Class Panel
Chicago
June 23, 2026



Ballots over the last Semester

- D.02.B0 (25-04) Ballot to add Tables 7 CL-4 and 8 FB-4
 - Passed with lots of comments especially around missing Annex A8 for MTEP Outliers.



Ballots over the last Semester

- Main Committee Ballot D02 (26-05)
 - Item 3 Annex A5 Procedure for Deriving Elastomer Compatibility Adjusted Specification Limits for Diesel Engine Oil Categories
 - Updated for CL-4 and FB-4 new Hydrogenated Nitrile (HNBR) elastomer. Initial standard deviation from 2024 ILS; starting in February 2027, will be included in the annual calculation with rolling 24 months of data.
 - Mike Birke and Robert Legg of Southwest commented the unit for Tensile Strength should be % and not mPa in Table A5.1.
 - Thank you



Ballots over the last Semester

- Item 4 Update to Section A7.1 Standard Deviation for Outlier Determination
 - A7.1 is for CK-4 and FA-4 ; when creating A8.1 for PC-12, recognized standard deviation for T-13 and ISB had changed from what was listed in the current D4485.
 - Angela Willis of Infineum voted negative. She found that the numerical values for the ISB Slider Tappet Mass Loss and ISM Cam Lobe Wear had been flipped and a digit was missing from the Cam Lobe Wear value.
 - Thank Infineum for their careful review of the ballot; adjudicated tomorrow; hope to have it ruled editorial



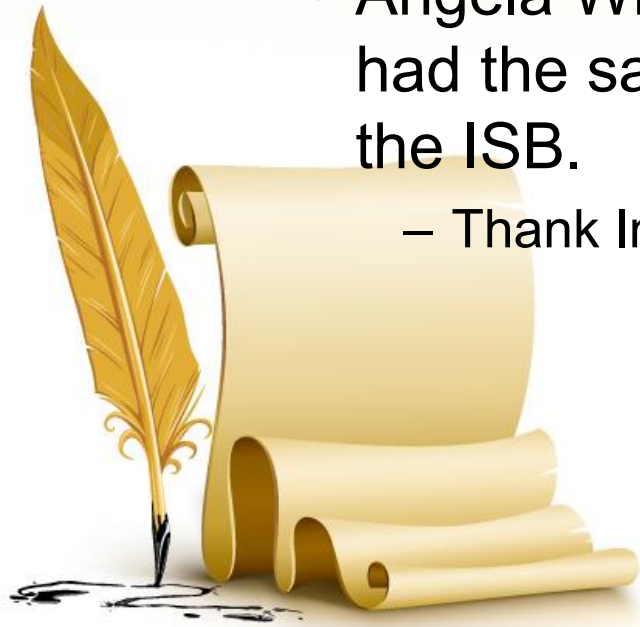
Ballots over the last Semester

- Item 5 Updating Overall Document for PC-12 Section 6.10
 - Reviewed new language at HDEOCP last December



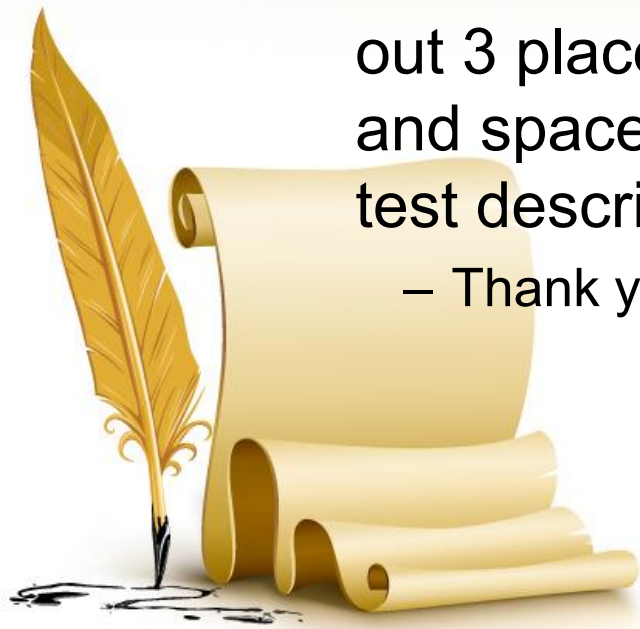
Ballots over the last Semester

- Item 6 Creation of Section A8.1 Standard Deviation for Outlier Determination and the C13/ISM Merit Rating System
 - Creation of this Annex was an action item for the acceptance of Tables 7 and 8.
 - Angela Willis of Infineum commented this Annex had the same errors as the updated Annex 7.1 for the ISB.
 - Thank Infineum for their careful review of the ballot;



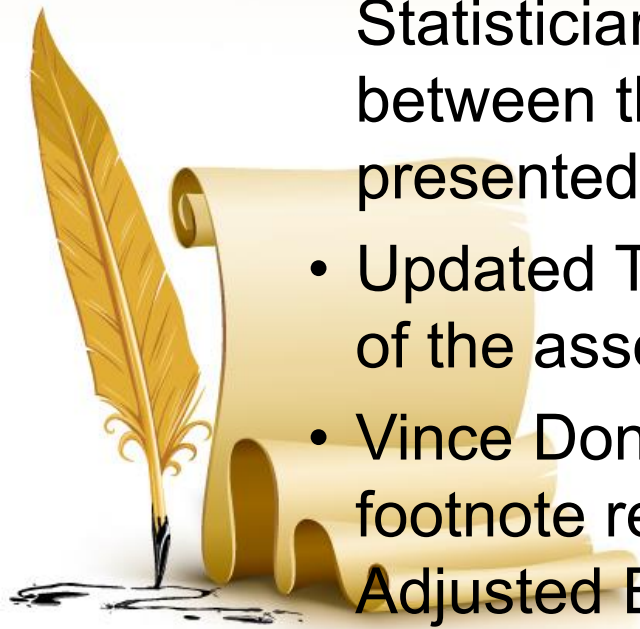
Ballots over the last Semester

- Item 7 Updating Overall Document for PC-12 Section 4.1.7
 - Reviewed new language at HDEOCP last December.
 - John Pettinato of Guidant Measurement pointed out 3 places where there needs to be a comma and space added between the D number and the test description.
 - Thank you for the detailed review of the ballot



Ballots over the last Semester

- Main Committee Ballot D02 (26-06)
 - Item 1 Annex A5 Equivalency Between the Caterpilliar Oil Aeration Test and the Engine Oil Aeration Test
 - Caterpillar Surveillance Panel with Industry Statisticians with testing determined the equivalence between the EOAT and COAT. This work was presented and approved at a past HDEOCP.
 - Updated Tables 2: CH-4, 3: CI-4 and 4:CJ-4 and all of the associated standard deviation annexes.
 - Vince Donndelinger of Lubrizol commented the footnote referring to the Annex to calculate the Adjusted Elastomer Limits needed to be updated.



Next Semester

- Ballot with the corrections identified by the D4485 Surveillance Panel and others.
- Sections 2.1 and 5.1 approved at last meeting
- Appendix X.2 API Descriptions
 - X.2.14 API CL-4
 - X.2.15 API FB-4
 - to align with updated API 1509
- Any new updates, corrections, changes



Next Steps

- Need to meet with ASTM Editor and learn process for accepting editorial comments to ballots.
- Issue D4485-26 with all passing ballots to date
 - Information about Adjusted Elastomer Limits
 - COAT/EOAT Equivalency





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Fluoroelastomer (EOECF) Test Material Change

John G. Loop

Senior Project Chemist



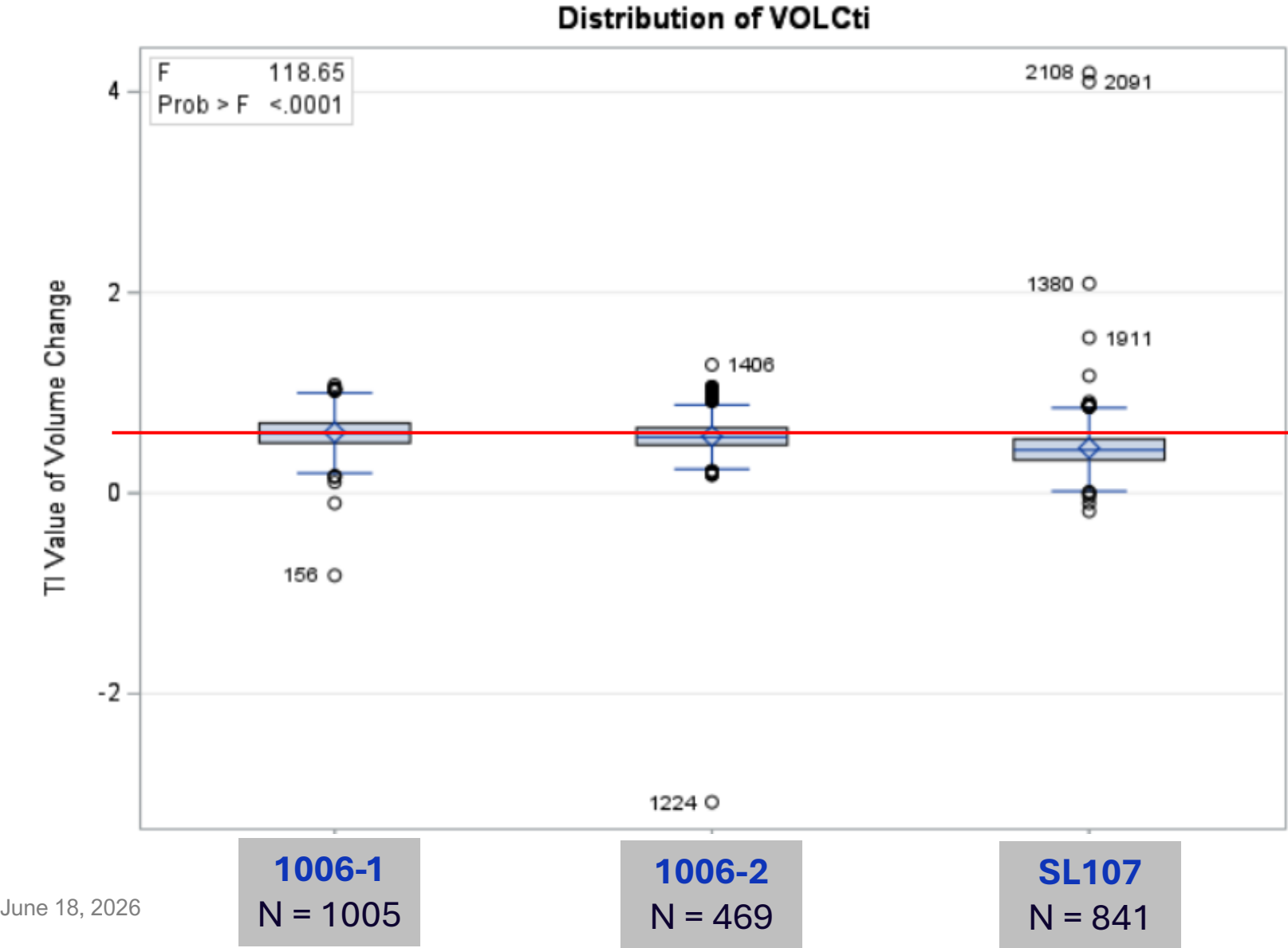
A NEW Fluoroelastomer Test Batch Material: FKM2

- During the development of PC-12, there was a change to the EOECF (Fluoroelastomer) Test Material
- OHTEOEC-FKM-A became unavailable. Testing moved to OHTEOEC-FKM2-A
- The change affects both Calibration Testing and Candidate Testing
- TMC is providing data from EOECF Calibration Tests to provide insight on FKM2 performance in relation to historical FKM performance

TMC 1006 and SL107 Reference Oils

- Elastomer test parameters are adjudicated based upon the Reference Oil results.
 - Original acceptance bands were based upon TMC 1006. Recent tests use SL107.
- SL107 Round Robin for testing EOECF was conducted in Q3 2019
 - 17 test results were used to establish the initial mean and standard deviation targets for the FKM/SL107 combination
 - Final FKM/SL107 targets were established on 30SEPT2025 using 30 test results
- EOECF (Fluoroelastomer) Calibration Test Results using Reference Oil SL107 are in line with calibration test results that were completed with Reference Oil 1006-1 and Reference Oil 1006-2
 - Plots shown on the following four slides confirm that calibration test averages and standard deviations align well with test targets established for the three reference oils.
- The following four plots summarize calibration data by reference oil type (no distinction regarding elastomer batch code).
 - Plots looking at specific batches of EOECF elastomer are presented in subsequent slides

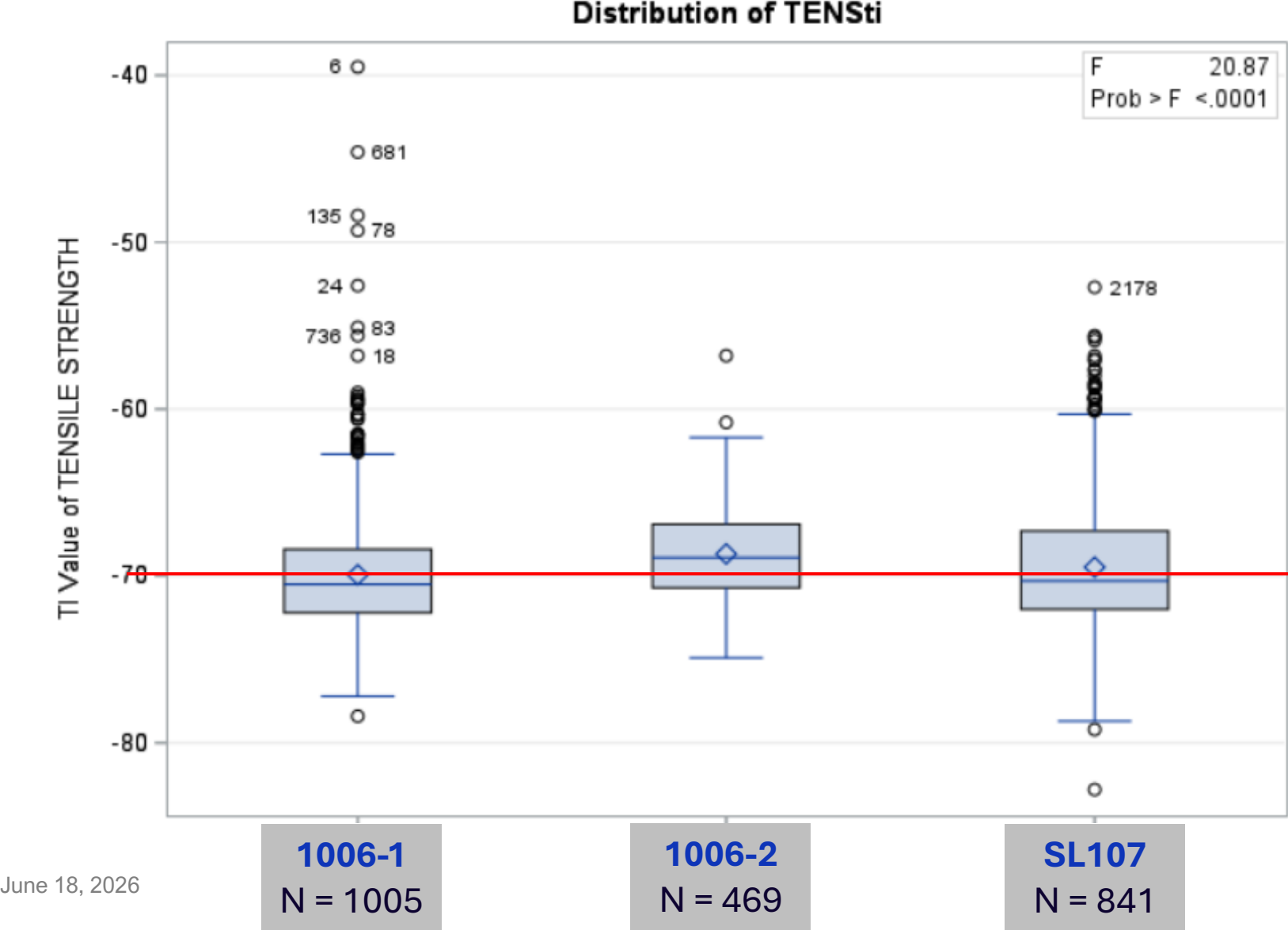
EOECF: Volume Change. 1006-1, 1006-2 and SL107



DATA	EOECF Volume	
Ref Oil	Mean	STDEV
1006-1	0.61	0.17
1006-2	0.57	0.23
SL107	0.45	0.26

TARGETS	EOECF Volume	
Ref Oil	Mean	STDEV
1006-1	0.61	0.15
1006-2	0.61	0.15
SL107	0.53	0.21

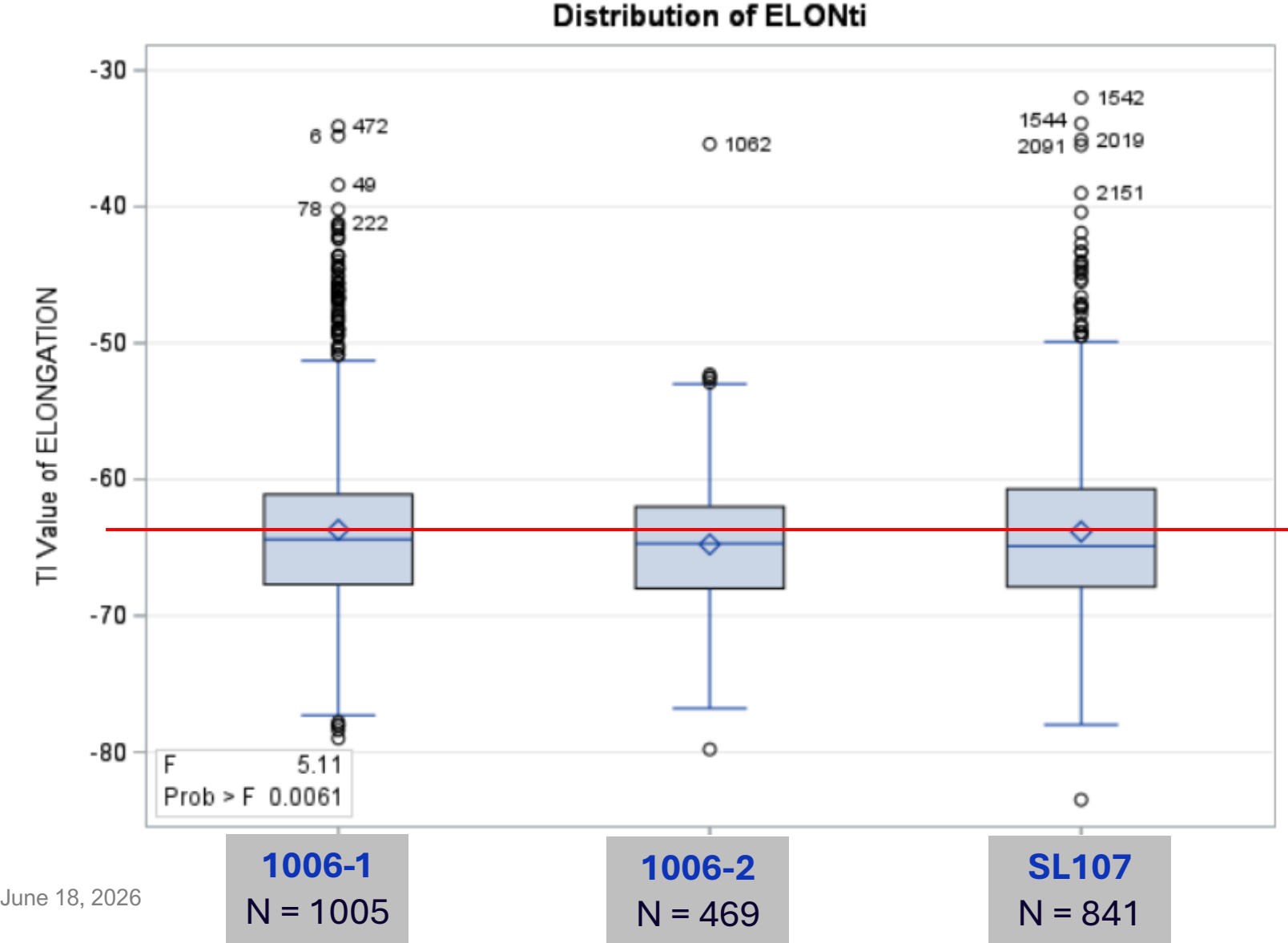
EOECF: Tensile Strength Change. 1006-1, 1006-2 and SL107



DATA	EOECF Tensile	
Ref Oil	Mean	STDEV
1006-1	-69.93	3.49
1006-2	-68.68	2.62
SL107	-69.47	3.83

TARGETS	EOECF Tensile	
Ref Oil	Mean	STDEV
1006-1	-69.28	5.35
1006-2	-69.28	5.35
SL107	-69.52	3.91

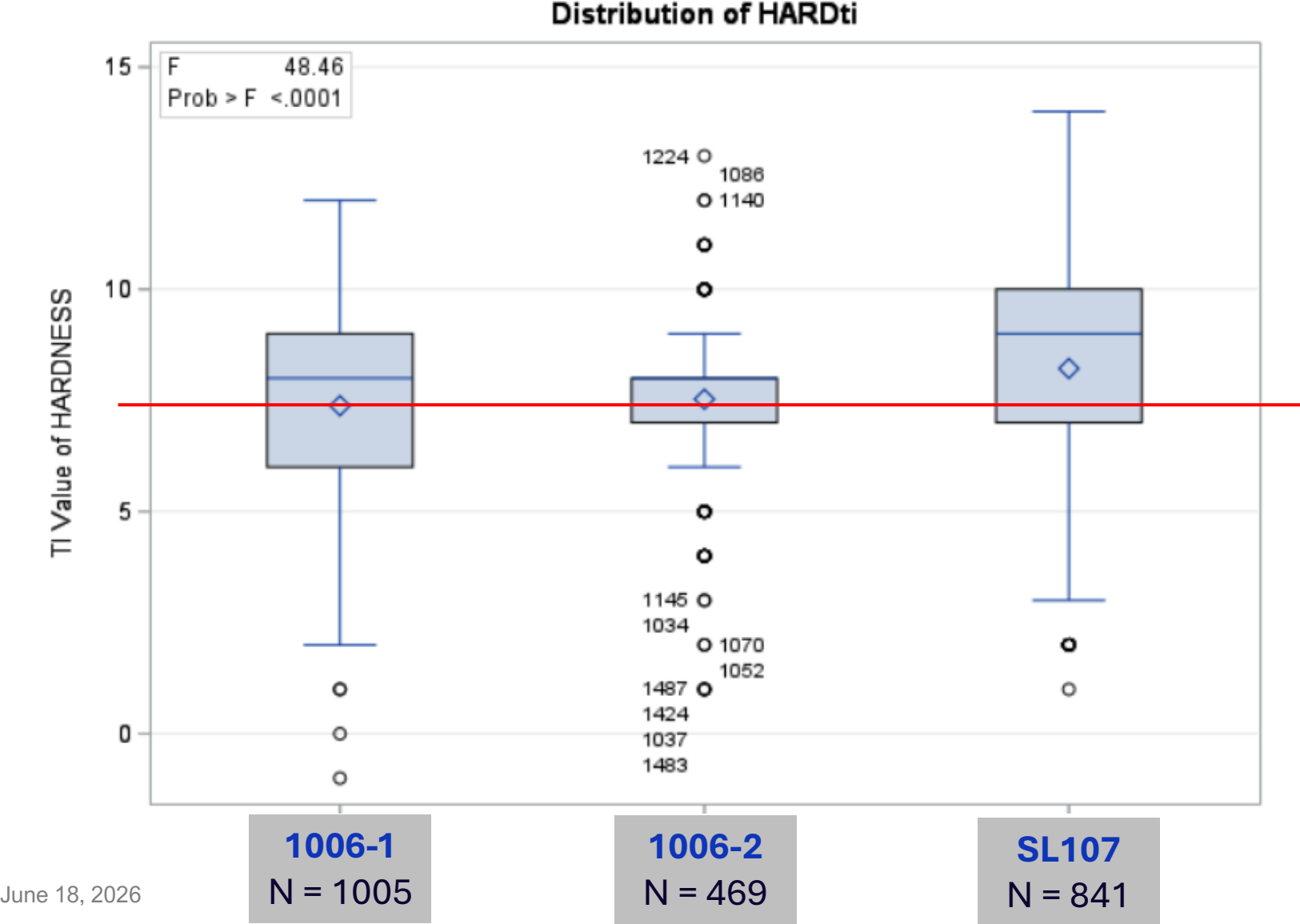
EOECF: Elongation Change. 1006-1, 1006-2 and SL107



DATA	EOECF Elongation	
Ref Oil	Mean	STDEV
1006-1	-63.71	6.56
1006-2	-64.77	4.73
SL107	-63.83	6.31

TARGETS	EOECF Elongation	
Ref Oil	Mean	STDEV
1006-1	-58.69	8.99
1006-2	-58.69	8.99
SL107	-64.89	5.05

EOECF: Hardness Change. 1006-1, 1006-2 and SL107



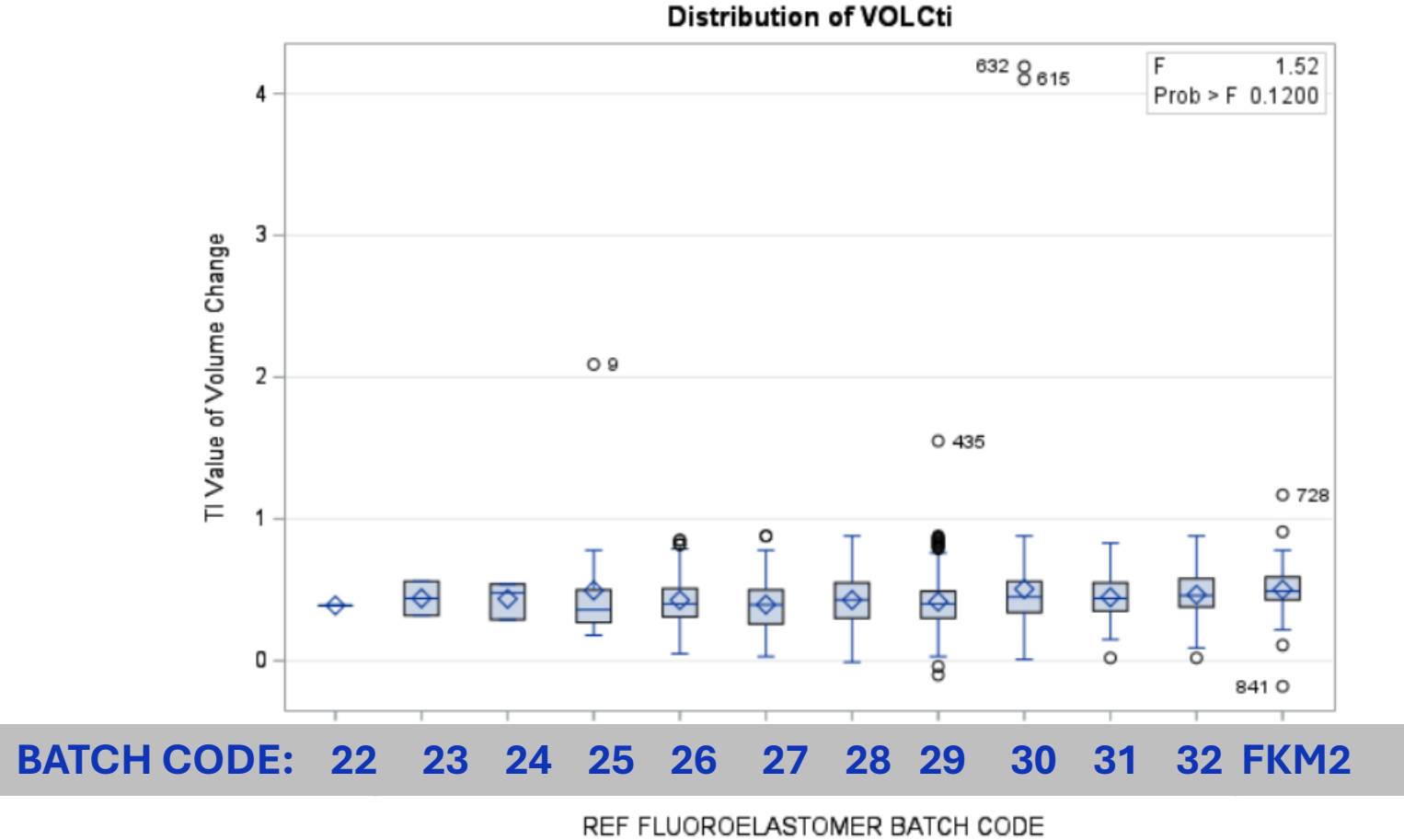
DATA	EOECF Hardness	
Ref Oil	Mean	STDEV
1006-1	7.38	1.75
1006-2	7.53	1.63
SL107	8.22	2.14

TARGETS	EOECF Hardness	
Ref Oil	Mean	STDEV
1006-1	7.30	2.20
1006-2	7.30	2.20
SL107	6.72	1.09

EOECF Testing with Reference Oil SL107 broken out by Batch Code

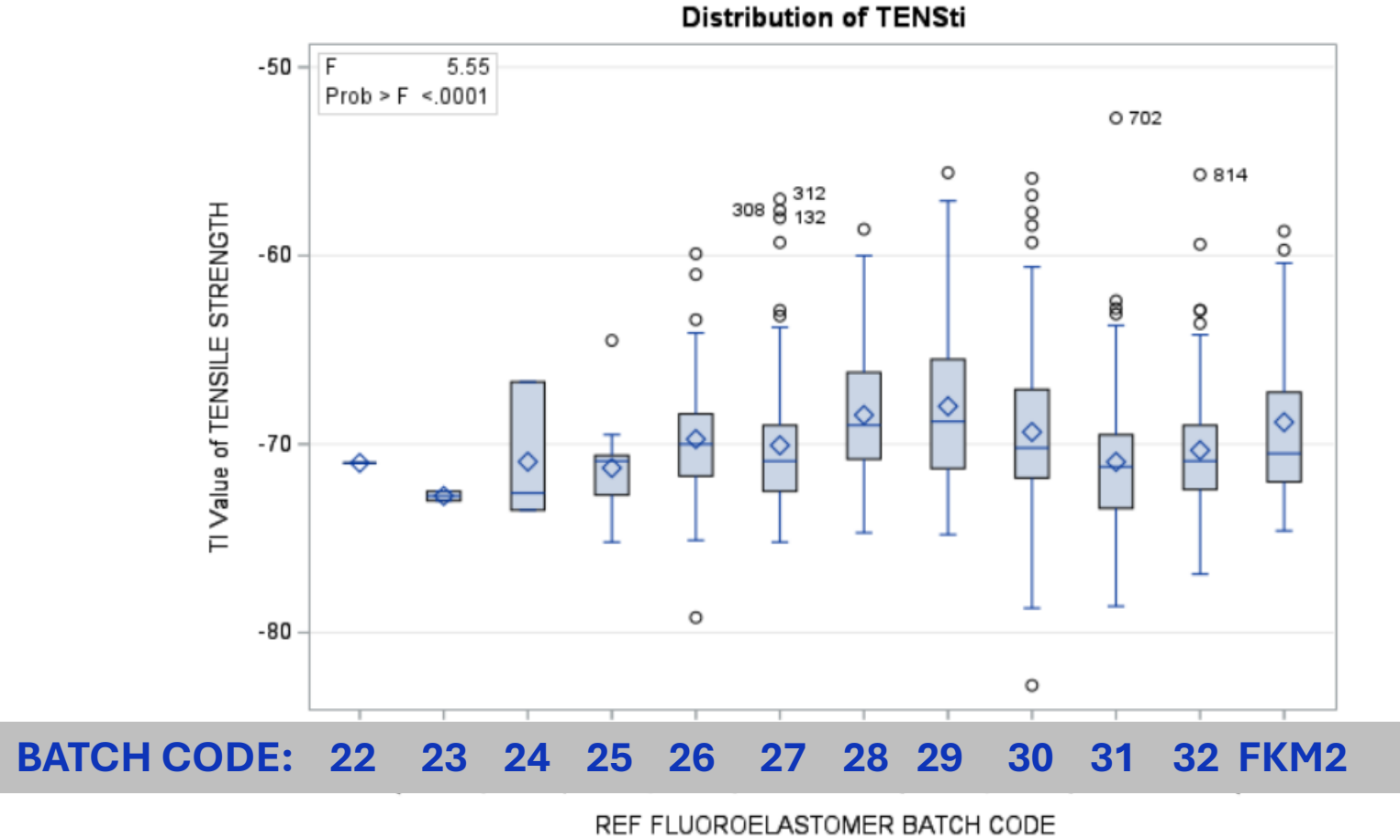
- The following four plots summarize Calibration Data based upon EOECF tests using Reference Oil SL107
- Volume Change, Tensile Strength Change and Elongation Change results for SL107/FKM2 align very well with the results found for tests conducted with FKM-22 through FKM-32 elastomer batch codes
- Hardness Change results for the new FKM2 batch code are “on average” lower than most of the results found for the older FKM batch codes. However, the FKM2 results do not appear to be significantly different from the FKM results, but rather more concentrated in a range that fits within the ranges of the FKM Hardness Responses
- A summary of the Hardness Calibration Test Performance of the last three fluoroelastomer batches is provided here.
 - FKM-31 Hardness Results Range: MEAN = 8.535 STDEV = 1.6466 MIN = 3 MAX = 11
 - FKM-32 Hardness Results Range: MEAN = 8.757 STDEV = 2.2451 MIN = 2 MAX = 13
 - FKM2-1 Hardness Results Range: MEAN = 6.271 STDEV = 1.1437 MIN = 4 MAX = 9

EOECF: Volume Change: Results by Batch Code



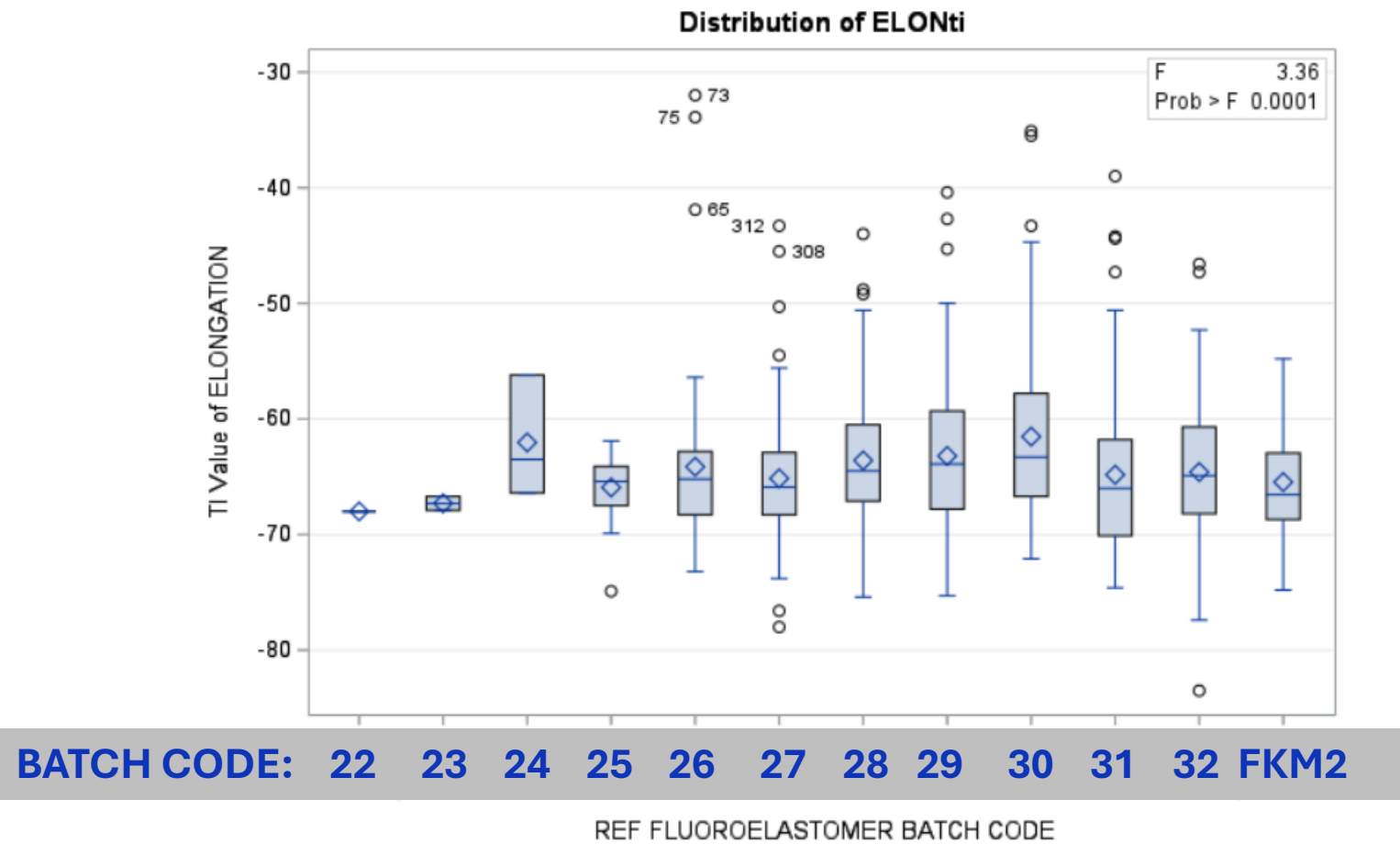
FKM2-1 elastomer batch calibration test results align well with calibration test results that were run with elastomer batch codes FKM-22 through FKM-32 for the Volume Change Parameter. All data shown in the plot are calibration tests using SL107 reference oil.

EOECF: Elongation Change: Results by Batch Code



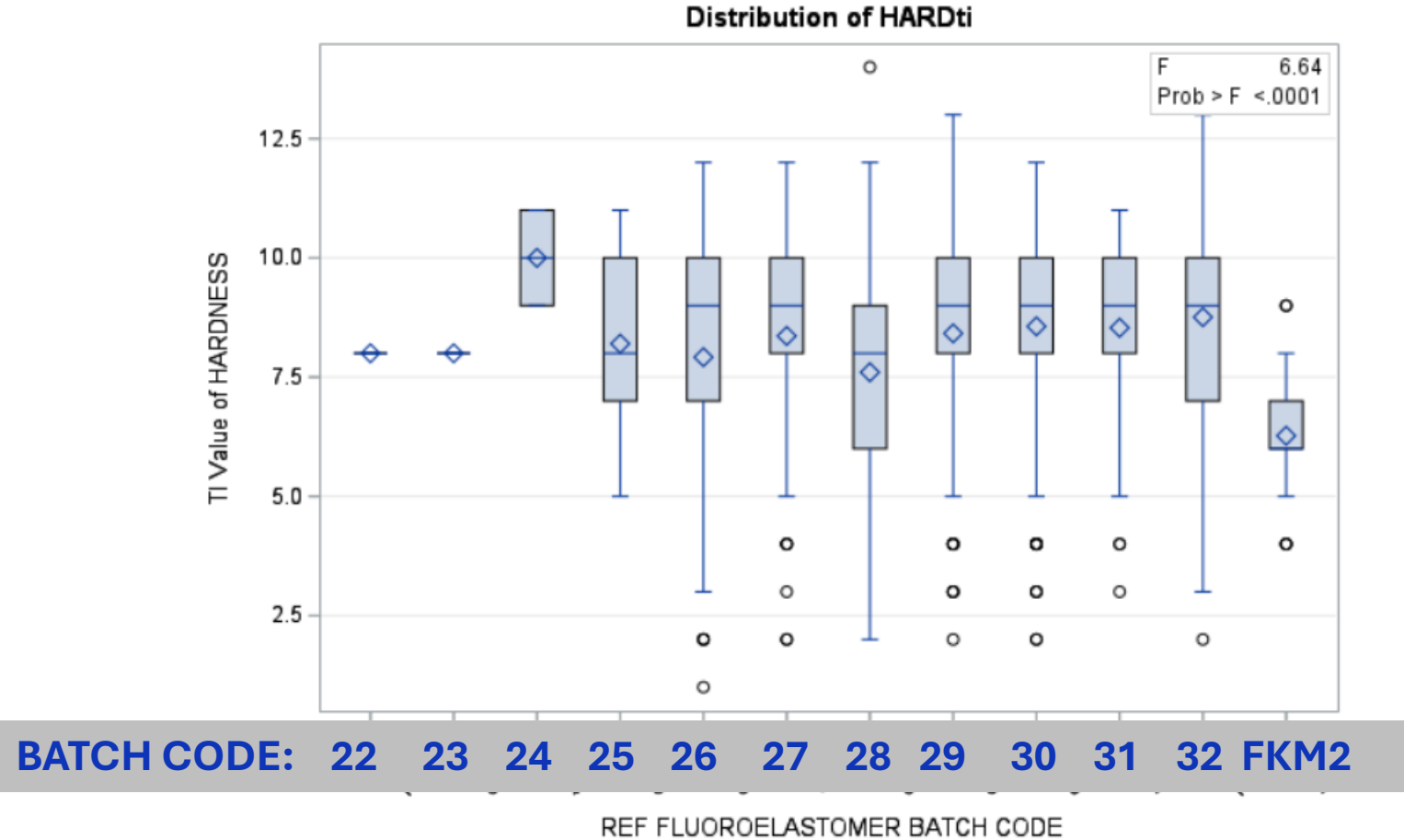
FKM2-1 elastomer batch calibration test results align well with calibration test results that were run with elastomer batch codes FKM-22 through FKM-32 for the Elongation Change Parameter. All data shown in the plot are calibration tests using SL107 reference oil.

EOECF: Elongation Change: Results by Batch Code



FKM2-1 elastomer batch calibration test results align well with calibration test results that were run with elastomer batch codes FKM-22 through FKM-32 for the Tensile Strength Change Parameter. All data shown in the plot are calibration tests using SL107 reference oil.

EOECF: Hardness Change: Results by Batch Code



FKM2-1 elastomer batch calibration test results are directionally lower compared with calibration test results that were run with elastomer batch codes FKM-22 through FKM-32 for the Hardness Change Parameter. However, FKM2-1 results do not fall outside of the range of test results observed for other FKM-X elastomer batches. All data shown in the plot are calibration tests using SL107 reference oil.

EOECF: Comparison of last three Fluoroelastomer batch code data



Batch Code FKM-31					
Variable	N	Mean	Std Dev	Minimum	Maximum
Volume	101	0.447	0.1630	0.02	0.83
Hardness	101	8.535	1.6466	3	11
Tensile	101	-70.94	3.8268	-78.6	-52.7
Elongation	101	-64.83	6.7156	-74.6	-39.0
Batch Code FKM-32					
Variable	N	Mean	Std Dev	Minimum	Maximum
Volume	111	0.466	0.1582	0.02	0.88
Hardness	111	8.757	2.2451	2	13
Tensile	111	-70.33	3.3513	-76.9	-55.7
Elongation	111	-64.59	6.1808	-83.5	-46.6
Batch Code FKM2-1					
Variable	N	Mean	Std Dev	Minimum	Maximum
Volume	48	0.502	0.2008	-0.18	1.17
Hardness	48	6.271	1.1437	4	9
Tensile	48	-68.84	4.3346	-74.6	-58.7
Elongation	48	-65.46	4.9879	-74.8	-54.8

FKM-31
Start: 20240622 End: 20250911

FKM-32
Start: 20250131 End: N/A

FKM2-1
Round Robin Start: 20250131 End: 20250903 n = 30
Calibrations Start: 20260525 End: N/A n = 18

Final Comments

- Not all laboratories have run a candidate test with the FKM2 elastomer batch as of 17JUNE2026
 - 6 LTMS laboratories donated 5 FKM2 runs each to create the 30 Round Robin results
- EOEC Surveillance Panel has not determined final targets for the FKM2 batch.
 - Currently, FKM2 targets are based upon the 30 Round Robin data points.
 - Final FKM2 targets will be established when additional calibration test data has been collected.
- Only 18 FKM2 Calibration runs have been processed by TMC. TMC assumes that candidate oil formulations were run with these 18 calibration tests.
- Based upon data collected to date, TMC has confidence that SL107/FKM2 calibration data is meeting the performance requirements for adjudicating bath run validity and test data is in alignment with historical FKM/1006 results.
- The dataset used for this presentation is available from TMC upon request.



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Thank you.

Questions? Please contact:

John Loop

jgl@astmtmc.org



Oronite

Fluroelastomer Replacement (FKM2) Recommendations

Laura Birnbaumer

ASTM D02.B0 Heavy Duty Engine Oil Class Panel

Chicago

June 23, 2026

Fluroelastomer FKM2 Replacement Recommendations

No need to change limits with move to FKM2

From the TMC presentation

- Volume Change, Tensile Strength Change and Elongation Change results for SL107/FKM2 align very well with the results found for tests conducted with FKM-22 through FKM-32 elastomer batch codes
- Hardness Change results for the new FKM2 batch code are “on average” lower than most of the results found for the older FKM batch codes. However, the FKM2 results do not appear to be significantly different from the FKM results, but rather more concentrated in a range that fits within the ranges of the FKM Hardness Responses

Fluroelastomer FKM2 Replacement Recommendations

No need to change limits with move to FKM2

Because SL107/FKM2's behavior either “aligns very well” or “more concentrated” to SL107/FKM and TMC “assumes candidate tests are running with FKM2”

- Oronite moves that the HDEOCP recommend to D02.B0 to adopt the same limits for FKM2 as exist for FKM and document those limits in D4485
 - Table 3: CI-4
 - Table 4: CJ-4
 - Table 5: CK-4
 - Table 6: FA-4
 - Table 7: CK-4
 - Table 8: FB-4
- Oronite also moves that the HDEOCP recommend to D02.B0 that FKM2 be added to D4485 Annex A5 using the standard deviations developed during the ILS until February 2027 when they will use all the data available

ASTM D6922 Homogeneity and Miscibility Test Status

June 22, 2026

Hyatt Regency McCormick Place Chicago

Yong-Li McFarland

D02.B0.07 Chair



ADVANCED SCIENCE. APPLIED TECHNOLOGY.

Background

- D6922-2025 H&M test is a bench test that determines if a test oil is homogeneous and miscible when mixed with 6 reference oils after subjected to temperature cycles by color determinations and observations
- TMC provides reference oils HMA through HMF in IL samples
- Method under D02.B0.07 with no monitoring nor chair
- Method listed in GF4-GF7 specifications, API SJ and on, and OEM specifications
 - Criteria: remain homogeneous and miscible
- TMC alerted the 6 reference oils will not be available for reblend by suppliers in estimated 3 years
- Without reference oils, test no longer available to run.
- In March 2026, emailed Subcommittee B asking for industry feedback on developing new set of reference oils or withdrawing the method.

Industry Feedback

- Limited responses
- 4 individuals interested in developing new reference oils
- Considerations for new reference oil development:
 - Create a Task Force
 - Coordinate and complete ILS
 - Method updates
 - No chemical info on current 6 oils, suppliers may have more info historically
 - What criteria would determine if it's a suitable replacement? Current technology?
 - How would replacement ref oil be tested?
 - Do we need 6 oils or can we do with less?
- Contact Yong-Li for participation or additional feedback

D6922 test details

- Very similar to FED-STD-791/3470.1
- 23 mm of test oil are mixed with 31 mm of reference oil for 6 jars and 1 test oil undiluted
- No precision statement
- Test steps
 - RT samples heated to 46C, then cooled to RT
 - Pour point determined on all jars. Thawed until cloudiness disappears and record observatives
 - RT samples heated to 232C then cooled to RT
 - Store samples at test oil pour point for 18-24 hrs. Warm until cloudiness disappears and record observations.
 - Warm to RT and record observations
- Observations:

Evidence of Separation

D – Definite
N – None

Location

T – Near top
B – Near bottom
F – Filament
U – Uniformly distributed

Color

w – White or very light
y – Yellow
b – Black

Particle Size

s – Small, as in cloud or haze
s_p – Specks or larger particles

Visual Appearance of the Oil

d – Too dark to see through
m – Transparent but dark
l – Light

Operator: _____



D4485 Modification Request

June 2026

ASTM D4485 Request

- Request adding the highlighted footnote below Table 8 in ASTM D4485

TABLE 8 Diesel Engine Oil Category FB-4					
Required Test Method	Engine Test Method	Rated or Measured Parameter	Primary Performance Criteria		
			One-test	Two-test	Three-test
T-13 (D8048)	D8048	IR Peak at EOT, Abs., cm ⁻¹ , max	80	87	90
		Kinematic Viscosity Increase at 40 °C, % max	50	58	62
		Avg. Oil Consumption, 48 h to 192 h, g/h	Report	Report	Report
ISB Soot Viscosity (D8617 at 108 h ^E OR D8617 Annex A9 ISBV108)	D8617 at 108 h ^E OR D8617 Annex A9 ISBV108	TGA % Soot at 12.0 mm ² /s increase, at 100 °C, min	4.8	4.7	4.6

^E A 108 h result from a 156 h test can support an FB-4 claim IF that stand is also calibrated per D8617 Annex A9

^F A passing ISBV 156 h (TGA % Soot at 12.0 mm²/s increase, at 100 °C, min) – 5.6 (first test), 5.5 (second test) and 5.4 (third test) can be used in place of an ISBV 108 h in the applicable categories. This is not intended to indicate equivalence.

Precedence in Table 3, CI-4 footnote B



D4485 – 24

TABLE 3 Diesel Engine Oil Category CI-4

Ext. T-8E (D5967) ^B	D5967	Relative viscosity at 4.8 % soot ^C	1.8	1.9	2.0

^B A passing T-11 (TGA % soot at 12.0 mm²/s increase, at 100 °C, min)—6.00 (first test), 5.89 (second test), and 5.85 (third test)—can be used in place of a T-8E in the applicable categories. This is not intended to indicate equivalence.

Rationale

- Passing the ISB-V 156 hour API CL-4 requirement is more stringent and a higher performance bar than the ISB-V 108 API FB-4 requirement
- Therefore, if a technology passes the 156 hour requirement it should be allowed to be substituted for the 108 hour API FB-4 requirement.