ASTM Engine Oil Gelation Test (EOGT) WK86363 Update

EOFT and EOWTT Surveillance Panel Meeting

Oct 15, 2024

Yong-Li McFarland, Chair

ASTM Antitrust and Recording Policy

ASTM International is a not-for-profit organization and developer of voluntary consensus standards. ASTMs leadership in international standards development is driven by the contributions of its members: more than 30,000 technical experts and business professionals representing 135 countries.

The purpose of antitrust laws is to preserve economic competition in the marketplace by prohibiting, among other things, unreasonable restraints of trade. In ASTM activities, it is important to recognize that participants often represent competitive interests. Antitrust laws require that all competition be open and unrestricted.

It is ASTMs policy, and the policy of each of its committees and subcommittees, to conduct all business and activity in full compliance with international, federal and state antitrust and competition laws. The ASTM Board of Directors has adopted an antitrust policy which is found in Section 19 of ASTM Regulations Governing Technical Committees. All members need to be aware of and compliant with this policy. The Regulations are accessible on the ASTM website http://www.astm.org/COMMIT/Regs.pdf).

Electronic recording of ASTM meetings is prohibited.

EOFT and EOWTT Surveillance Panel Membership

21 members

Beth Schwab, Afton Chemical
Michael Kunselman, Center for Quality Assurance
Robert Stockwell, Chevron Oronite
Quanchang Li, ExxonMobil
Michael Deegan, Ford
Melissa Chu, Infineum
Angela Willis, Infineum
Joe Franklin, Intertek
Karina Gil, Intertek
Michael Johnscher, ISP
Litchi Xie, Lubrizol Additive (Zhuhai) Co., Ltd.
Victoria Fein, Lubrizol
Jason Bowden, OH Technologies Inc
Greg Miiller, Savant Group
Maggie Smerdon, Savant Labs
Sean Alston, SGS North America
Jared Cavaliere, SwRI
Becky Grinfield, SwRI
Yong-Li McFarland*, SwRI
John Loop, TMC
Amy Ross, Valvoline

*Chair

New EOGT WK86363, ILS# 1854

- Ford request for a new Engine Oil Gelation Test (EOGT): request to add a new test filterability test to better screen oils for field issues
- Current status:
  - Method: 3 drafts (large volume (600g), small volume (200 g), and Afton method) uploaded on ASTM Collaboration Area
  - Oils: 11 potential reference oils offered; 17 oils received at TMC
  - Screening Tests and ILS: Screening Test and additional tests ongoing
  - Timing: ILS tests to be run by January, and test available in April 2025

Afton Method and Original EOGT Results

- Savant update: *check on status of recent Oil F and K tests (not ordered), did not see difference in 1 vs 3 day storage, continue to train other techs and have 3 able to run the method, videos to be uploaded to ASTM collaboration area*
- SwRI update: *tried running at 45C- gelling faster but still broke down in last 30 sec; try running with serrated tip and running at 10,000 rpm for 60 sec*
- Afton update: *tested at 40 & 45C, 45C better, 1 vs 3 day storage- no difference, serrated tool not as good as 18G where there was shearing out gel-suggest 18G; to run 10,000 rpm, check on which samples (recent) used, will take video, will send out updated procedure*
- ISP update: *none*
- Intertek update: *set up to run and will have data, photos/video of the runs next week*
- Valvoline update: *slides, Valvoline to analyze Oil F bottom layer composition-filtered to get some SEM info; if have time to try modified CO2 with adding additional water (10mL) and shearing to look for gel; ran latest version Afton at 45C and got 1ml/s for Oil F and made gel, questions on temp control, will review data in Root Cause group, want to discuss more on shearing tool used at ISP*

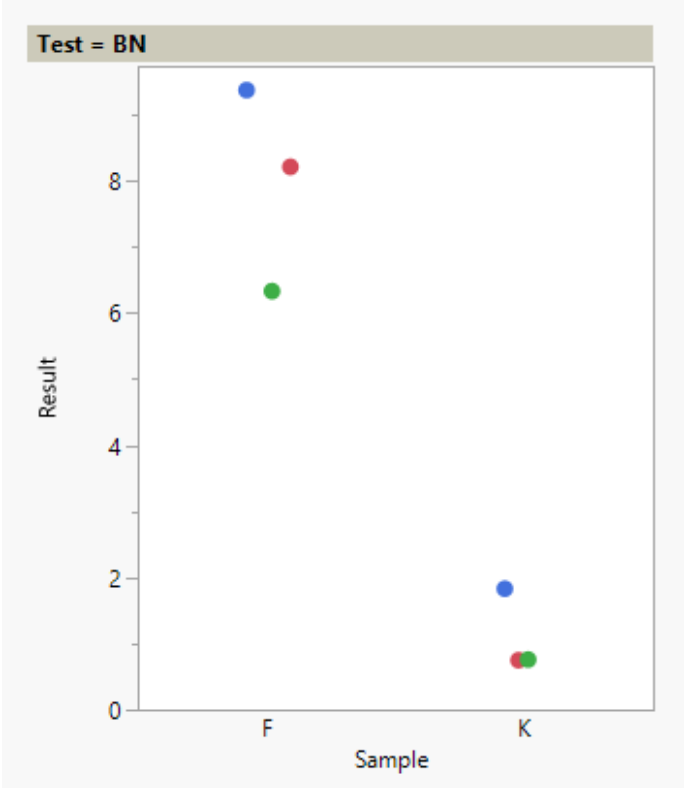
- *Yong-Li to upload minutes to ASTM Collaboration area*
- *Labs to share volumes, flow rates at times for Oil F and K as more tests are run*

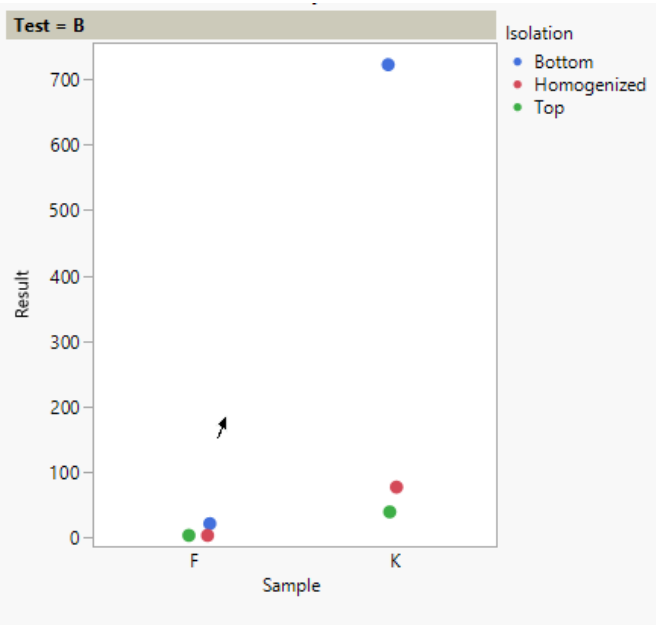
Valvoline EOGT Root Cause – Follow-up BN analyses 20240917

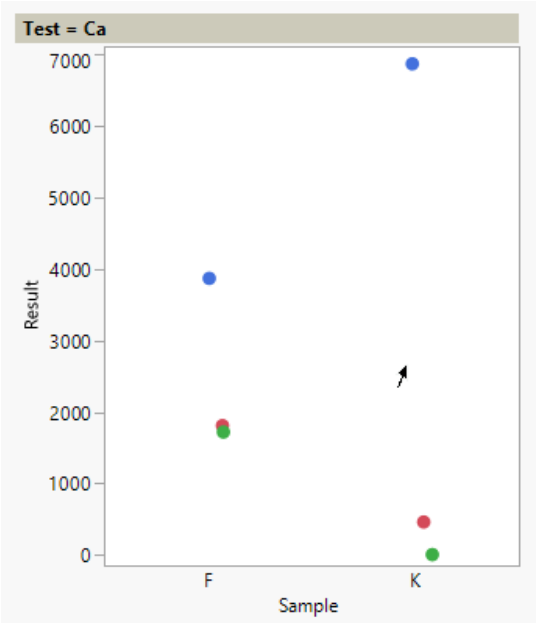
Sample	Isolation	BN	B	Ca	Mg	P	Zn
182155+182156 (K)	Top	0.76	38	9	119	694	635
182155+182156 (K)	Bottom	1.83	723	6862	3062	561	1670
182155+182156 (K)	Homogenized	0.75	76	464	316	711	729

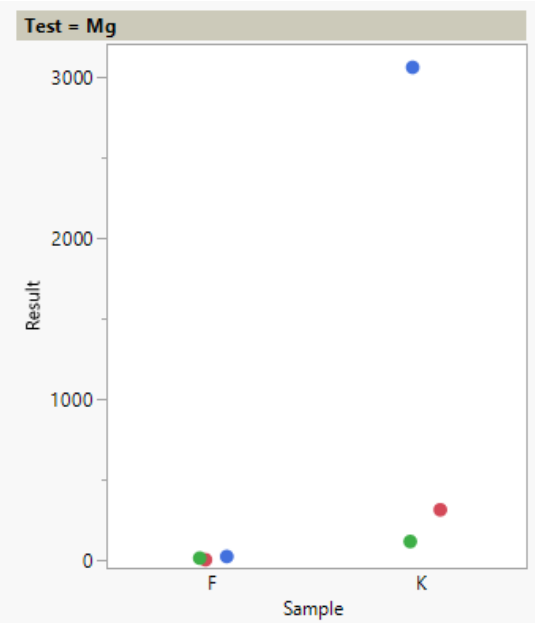
Sample	Isolation	BN	B	Ca	Mg	P	Zn
182157+182158 (F)	Top	6.33	2	1720	16	850	984
182157+182158 (F)	Bottom	9.37	20	3866	26	591	709
182157+182158 (F)	Homogenized	8.21	2	1810	6	817	929

Notes 9-30-24: to verify sample ID, also provide SOT TBN results









- BN differentiation observed between fluids
- Oil K bottom isolations consistently showed significantly higher amounts of detergent/dispersant analytes (B, Ca, Mg) than top/homogenized samples

EOGT Root Cause – Follow-up BN analyses 20241008

BN D4739

	Fresh Oil:	5.4	
K	Top	0.8	*water
	bottom	4.3	
	hom	1.1	

	Fresh Oil:	7.3	
F	Top bottom	6.4	*gritty texture
	bottom	7.7	
	hom	6.6	

IKA dispersing tool 18G and 18G-ST

S 25 N - 18 G - ST
Dispersing tool

PRICE
USD 2,695.00

Ident. No. 0004447300

S 25 KD - 18 G Dispersing tool

PRICE
USD 2,950.00

Ident. No. 0020002971

Volume range min. (H2O)	0.01 l	0.01 l
Volume range max. (H2O)	1.5 l	1.5 l
Stator diameter	18 mm	18 mm
Rotor diameter	13.4 mm	12.7 mm
Gap between rotor and stator	0.25 mm	0.3 mm
allowable Speed max.	25000 rpm	25000 rpm
Circumferential speed max.	17.5 m/s	16.6 m/s
Immersion depth min.	40 mm	40 mm
Immersion depth max.	165 mm	185 mm
Shaft length	194 mm	194 mm
Material in contact with medium	PTFE, AISI 316L	AISI 316L / PTFE / FFPM
pH min.	2	2
pH max.	13	13

TBN Results Oct 14

Lab	Method	Sample	TBN D4739 SOT	TBN D4739 EOT (homogenous sample)
Afton	Afton	F (gel)	7.61	4.4
		K	5.6	3.23
ISP	Original	F (clog or gel)	7.4, 7.6, 7.5	6.3, 6.2, 6.0 (Hand mixed to be homogenous)
		K	5.5, 5.7, 5.7	5.1, 5.1, 5.0
ISP	Afton	F (no gel)	7.4	4.3
		K	5.5	3.2
Savant	Afton	F (gel?)	7.546	3.91, 3.72
SwRI	Afton	F (gel)	7.48	2.71, 4.46
		F (no gel)	7.39, 7.58, 7.67	4.39, 4.36, 4.48, 4.50
		K	5.68, 5.75, 5.66, 5.57	3.29, 3.44, 3.28, 3.32, 3.19
Intertek	Original + 11 months storage + 1 wk cold storage	F (clog or gel)	6.89, 6.95	6.19, 6.18
		K	5.30, 5.41	1.02, 1.79
Valvoline	Original	F (no gel)	7.3	6.6
		K	5.4	1.1

Notes: phase transition from non-crystalline to crystalline calcium carbonate

TMC Oil K and Oil F

		Boron, ppm	Calcium, ppm	Magnesium, ppm	Molybdenum, ppm	Phosphorus, ppm	Silicon, ppm	Sodium, ppm	Zinc, ppm
EOGT-K	7/2023 AVERAGE	200	1016	552	79	757	5	6	825
	10/2024 RESULT (1 can)	198	995	546	77	748	3	<5	808
EOGT-F	7/2023 AVERAGE	<1	2152	10	29	878	7	5	989
	10/2024 AVERAGE (2 cans)	<1	2076	11	28	864	5	<5	952

- Oil F: 6.7 gallons remaining, waiting on Supplier
- Oil K: 2.5 gallons remaining, Supplier agreed to supply more

EOGT Workshop

- Attendees:
  - Valvoline: 1 in-person and 1online
  - Intertek: 3 In-person
  - Afton: 2 in-person
  - Chevron Oronite: 1in-person
  - SwRI: multiple in-person
  - Ford: 1 In-person?

- Savant: 2 online
- Lubrizol: 2 online
-Infineum: 1 online?

- Where: SwRI, San Antonio, TX
- When: Oct 28-29, 2024
- What: Review Afton EOGT method
- To Do: participants to let Yong-li know names of attending and participating individuals; Yongli to send out location/hotel info/map

EOGT Workshop Tentative Agenda

- Saturday Oct 26: SwRI prep acetic acid solution
- Sunday Oct 27: SwRI mix ? Oil F and acid solutions
- Oil F samples to order ?

Date/time	Item
Monday 8:30 AM	Introductions – B171 LCR
9:00 AM	Afton show sample prep – Lab
9:45 AM	Afton show shearing using Oct 27 samples - Lab
10:30 AM	Review data – B171 LCR
11:30 AM	Lunch
12:30	Participants try sample prep / review steps – Lab
2:00 PM	Participants practice shearing – Lab
3:30 PM	Finish

Date/time	Item
Tuesday 9:00 AM	Afton show sample prep – Lab
9:45 AM	Afton show shearing using Oct 28 samples - Lab
10:30 AM	Review data – B171 LCR
11:30AM	Lunch
12:30	Participants try sample prep / review steps – Lab
2:00 PM	Participants practice shearing – Lab
3:00 PM	Finish

ILS Planning

- Criteria for Afton method to moving forward to ILS: Root cause group to finalize method, specifically on shearing details; Ford to give recommendation to move forward
- Sample volume: 120 mL for duplicate run per oil
- Labs participating: Afton, Savant, SwRI, Valvoline, Intertek, ISP?, Infineum?
  - Others?

- Will EOGT be TMC monitored (like EOFT D6795) or not (like D7563)?
  - *Yes needs to be TMC monitored like D6795 with a quantitative result/acceptance limit on reference oil, based on ACC code of practice and/or Test Readiness requirements. may need to be run in duplicate for reference oil. Method will include TMC inclusion and LTMS will include reference criteria for this test. Will wait on referencing period once more data comes in.*

ILS Planning

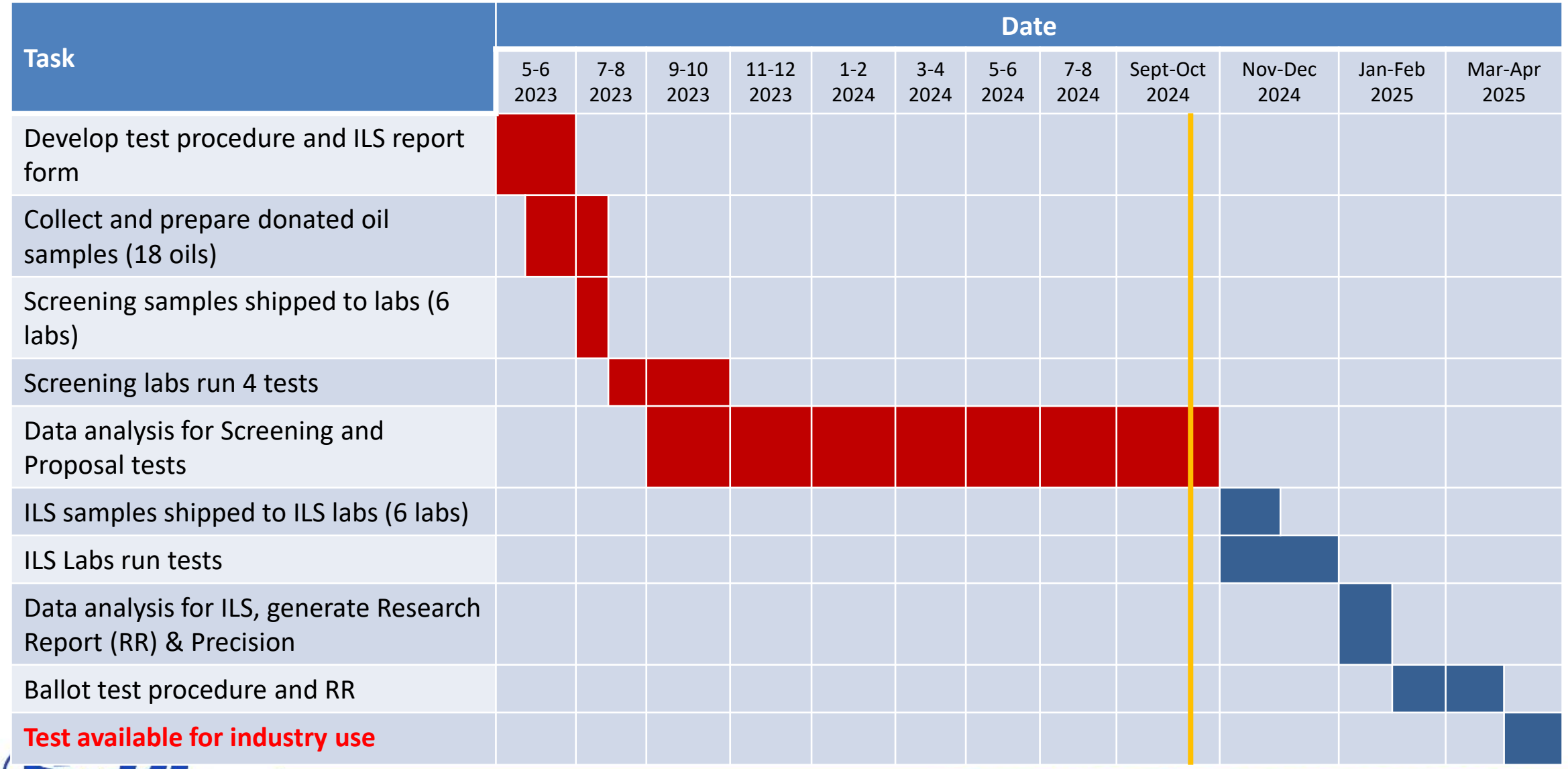
- Goals: Establish precision (repeatability and reproducibility) statement with different levels of performance and different operators
- ILS: Assume 6 labs, 6 oils, each lab runs 12 tests total (each oil run twice, consider more repeats?)
- We have 11 oils eligible as reference oils and 6 additional oils at TMC
  - Ask oil participants to select down to 6 fluids total. Optimal: 2 good, 2 bad, 2 borderline oils.
  - Consider send out 17 offered oils to 3 labs to run 1 test each and determine if there's any borderline fluids to include in ILS. Propose each lab to run Oil F and 5 samples and then group to select down to 2 good, 2 fail, 2 borderline (if possible). There will be some lab bias.
- Travis to come up final test matrix once oils are determined
- Procedure notes:
  - All labs should prove they can gel (2?) poor oils before being included in ILS
  - Take sample and report every 15 sec volume up to 180 sec and then determine what to report
  - Include range of Vis grade samples, check with TMC on info supplied
  - Consider combine ILS with BOI-VGRA matrix: three technologies from at least 2 companies in different vis grades and base oils

Oil Matrix –updated Oct 6

Participants	Potential Reference Oils Offered	Oil Sample Received at TMC	Comments
Ford	2 oils (low and high known performance oils) - eligible to be reference oils	2 oil samples received	
Toyota	**2 oils - not eligible to be reference oil**	2 oil samples received	Offer 2 field samples for later testing; Awaiting some Physical and Chemical data
Afton	4 oils– eligible to be reference oils	4 oil samples received	
Lubrizol	4 oils – eligible to be reference oils	4 oil samples received	
Infineum	1 oil – eligible to be reference oil	1 oil sample received	
Oronite	**3 oils –not eligible to be reference oils**	3 oil samples received	Awaiting Physical and Chemical data
Subaru	**1 oil – not eligible to be reference oil**	1 oil sample received	Offer 1 field sample for later testing
Total Oils	**11 potential reference oils confirmed**	**17 oils received**	

John Loop to manage Sample Information

Draft Timeline – updated Oct 14, 2024



Action Items and Next Meeting

- Root Cause group to consider if pH was root cause for lack of differentiation in original EOGT method; ask labs to run pH or TBN on fresh EOT sample (ISP, Intertek)
- Group to review TBN results on fresh and EOT samples
- Any other labs wanting to participate in ILS, please let Yong-Li know
- Jacob/ Afton to update Afton Method procedure
- Afton and Savant to request new Oil F and K from TMC and repeat Afton method and report volumes and flow rates
- SwRI, Intertek, and Valvoline to run additional Afton Method tests and report volumes and flow rates
- Savant, SwRI, Afton to share videos of blending step, starting after water addition
- Savant to upload video on ASTM Collaboration Area
- Yong-Li to upload meeting presentations on ASTM Collaboration Area
- Interested parties to email Yong-Li names and citizenship of those attending in-person, who will be observing and who will be participation for workshop in San Antonio October 28-29.
- Yong-Li to send out workshop info and look into online workshop options.

- Next Meeting: Thursday Oct 31 at 1:30 PM CDT for 1.5 hr

Thank you for your support!

Participants		
Method Development (11)	Oil Donations (9)	Testing Labs (7)
Afton ExxonMobil Ford Infineum Intertek ISP Lubrizol Oronite Savant SwRI TMC	Afton Ford Infineum Lubrizol OH Technologies (donate filters only) Oronite Subaru TMC (collection, shipping only) Toyota	Afton Intertek ISP Savant SwRI TMC (monitoring system only) Valvoline