ASTM New Engine Oil Gelation Test (EOGT) WK86363 Update

EOFT and EOWTT Surveillance Panel Meeting

February 26, 2024

Yong-Li McFarland, Chair

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EOFT and EOWTT Surveillance Panel Membership

20 members

Beth Schwab, Afton Chemical
Michael Kunselman, Center for Quality Assurance
Robert Stockwell, Chevron Oronite
Quanchang Li, ExxonMobil
Michael Deegan, Ford
Ron Shah, 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: 2 drafts (large volume (600g) and small volume (200 g)) uploaded on ASTM Collaboration Area, email Jared with procedure questions
  - Oils: 11 potential reference oils offered; 17 oils received at TMC
  - Screening Tests, Pilot Study, and ILS: Screening Test completed, start additional Proposal testing
  - Timing: Pilot Study tests run by May, ILS tests to be run by September, and final method ballot in November or December 2024

Testing Status – updated Nov 16

EOGT report form Rev 6

Test Phase	Description	Status	Comments
1. Screening Tests	-4 tests; 2 oils: low performance oil in duplicate, high performance oil in duplicate; 6 labs -Run LV method -Intent: check labs can run test as set up	All 6 labs submitted data	Run SOT & 14 day EOT only. **-REVIEW data**
2. Pilot Study	-? Tests; ? Oils; 4 labs -Run SV and LV methods, all intervals -Intent: determine samples, method, and intervals for procedure and ILS	Waiting to determine samples: -Plan to include either 6 or 10 oils including 2 performance oils, and then each of the other oil participants select 1 or 2 “borderline” oil for total of 6 or 10 oils to run. “Borderline” is something that would fall in-between the 2 performance oils (less Ca than Oil F?) -Pros/cons: 6 oils – shorter to run, but may not find a borderline reference and may need another Pilot run; 10 oils-longer to run, but more likely to find a borderline reference	**Group to decide as we move forward**
3. Interlaboratory Study (ILS)	-? Tests; ? Oils; 6 labs -Run _ method -Intent: generate repeatability and reproducibility data on samples, determine at least 2 reference oils	Waiting to determine samples	

Proposal Experiments (1 of 2) – updated Feb 9

Proposal Experiments	Lab(s)	Status	Next Step
1. Sediment-only Filterability	Afton	Completed	GROUP to make comments on if this is helpful – no feedback to use
2. Include 0 Hr filterability	ISP	Completed	No need to include 0 Hr filterability currently
3. Run EOGT on Ref Oil 79 and 77-3	ISP and Afton	ISP: Completed Afton: Completed	Group to make comments
4. Run EOGT with 8% water	Savant and Intertek	Savant: Completed Intertek: Completed	No need to use 8% water
5. Characterize gel	Savant and Valvoline	Savant: Completed IR – ran on ATR Valvoline: completed IR, microscopy did not work	Group to review data, Savant and Valvoline to add any data related to 870 wavelength, Ford to give feedback on how useful IR maybe in EOGT-No comments, ISP to possibly provide IR for previous EOT samples
6. Centrifuge sample before filterability	SwRI	Completed	
7. No homogenizing before filterability	Intertek	Completed	GROUP to make comments on if this is helpful- no feedback to use
8. Run EOGT with 4 hr CO2 bubbling and heating (run with 2 flow tubes)	SwRI	Completed	Additional CO2 not necessary, running with 2 tubes helps, gel not sticking to plastic jars compared to sticking to glass

Proposal Experiments (2 of 2) – updated Feb 23

Proposal Experiments	Lab(s)	Status	Next Step
9. Run EOGT with 1 CO2 tube, plastic jars for storage, and dispersing tool to report Change in filtering rate results on 2 performance oils	Afton	Completed Feb 9	(Include IR on fresh oil, top layer, sediment layer, and mixed EOT spectra) Results didn't show sufficient differentiation between the 2 oils using the 1 CO2 tube, dispersing tool, and plastic jars.
10. Run EOGT with 2 CO2 tubes, plastic jars for storage, and waring blender setup to report Change in filtering rate results on 2 performance oils	ISP	Completed Feb 16	(Include IR on fresh oil, top layer, sediment layer, and mixed EOT spectra)
11. Afton to help write an IR detection method for calcite	Afton	Currently working on procedure and will share when ready.	

Notes 2-26-24:

-Previously FTIR on filter was looked at – Ford to check if there's method on how IR was done

-Concern about variation in results due to different extraction processes

-Is XRF/XRD possible?

-Was Ca sulfonate grease used in previous system? - Ford to check

10. ISP EOGT with Waring Blender

		Change in Filterability		
	CMIR	Run 1	Run 2	Average
EOGT – F	185167	-8.62%	-5.69%	-7.16%
EOGT – K	185168	-3.12%	-7.22%	-5.17%

Run EOGT with 2 CO2 tubes, plastic jars for storage, and waring blender setup, 600 g volume

EOGT-F 336hr sample

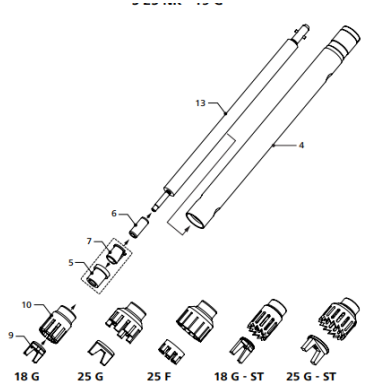
EOGT-K 336hr sample

Notes 2-26-24: ISP will be completing IR and overlay with previous result, and include raw data (times for runs)

Previous data

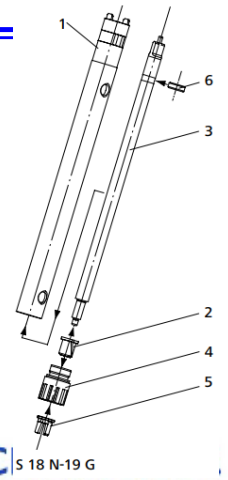
- 9. Afton EOGT with dispersing tool (IKA T25 Digital Ultra-Turrax ID0003725001, IKA S25N - 18G ID0000593400 (rotor and stator gap: 0.3mm)), 1 CO_2 tube, and plastic jars for storage, 600 g volume

Afton EOGT	Blending Tool (Average Change in Filterability)	Dispersing Tool (Run 1 Change in Filterability)
Oil F 182143, 182329	-6.25% (previously listed at -16.67%)	-17.77%
Oil K 182141, 182328	-8.33% (previously listed at -12.5%)	-7.22%



- ISP dispersing tool: IKA T18 Digital Ultra-Turrax ID0003720001, IKA S18N-19G ID000L (rotor and stator gap: 0.25 mm)
- 8. SwRI 2 CO_2 tube data, blending tool

SwRI EOGT	Run 1 Change in Filterability	Run 1 Change in Filterability	Average Change in Filterability
Oil F	-12.02	-5.69	-8.86
Oil K	-8.78	-7.51	-8.14



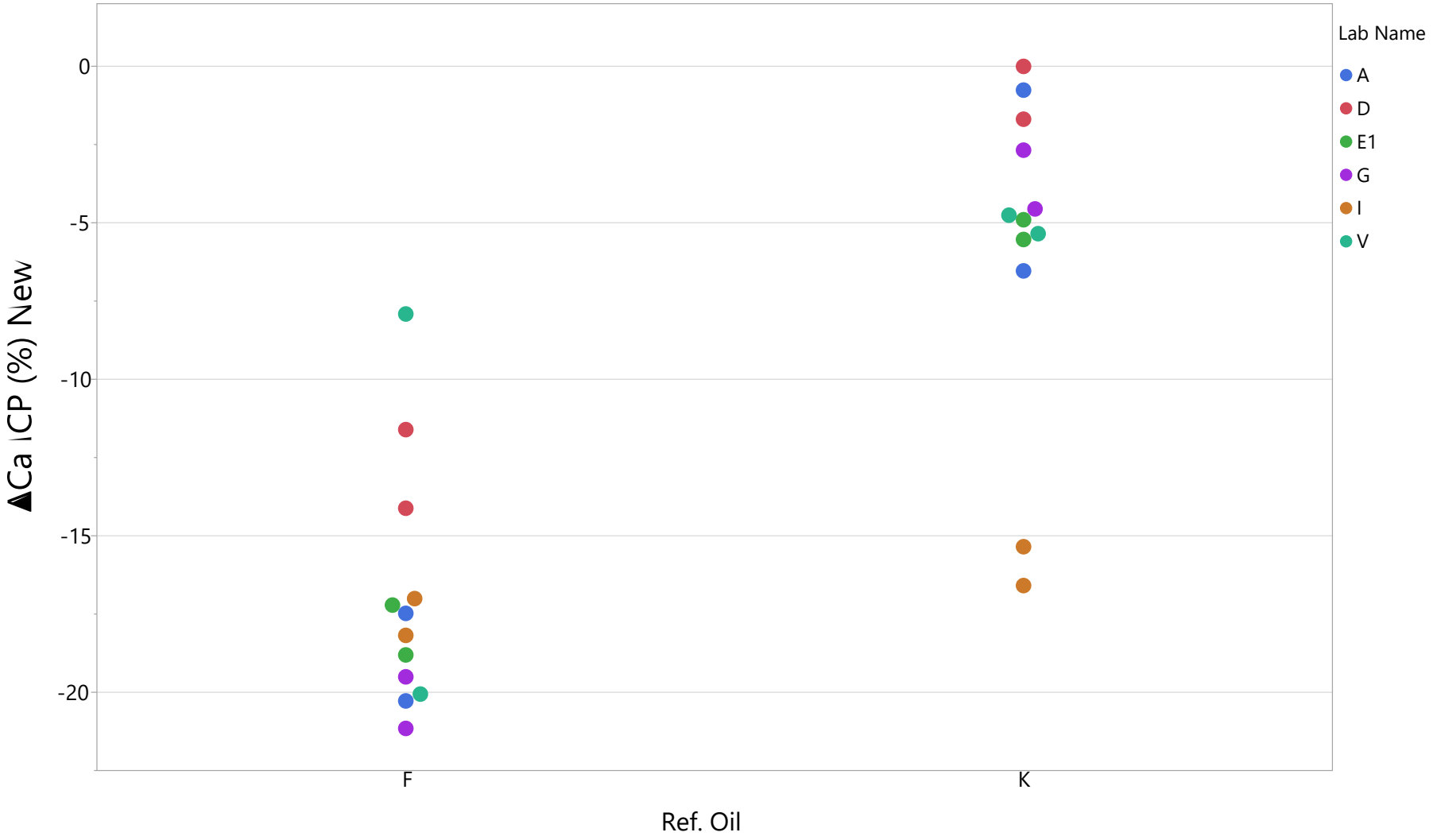
Other updates

- Review of % Change in ICP and KV40 data and Excel
- What is the next step?
  - Run EOGT with 2 CO_2 tubes, dispersing tool (IKA S18N-19G), and plastic jars, 600 g volume on 2 performance oils in US lab- SwRI can run this, can anyone else?
    - Discuss with ISP on how dispersing is done.
    - Any other labs that can run, please let Yongli know
    - Group agreed to go forward with this run
  - Notes: Labs have reviewed water types, CO_2 sources, and as many variables of the EOGT test and have tried to determine what would make results more similar to ISP lab results. Without more direction from OEMs, there aren't any other actions to take (other than wait for ISP results).

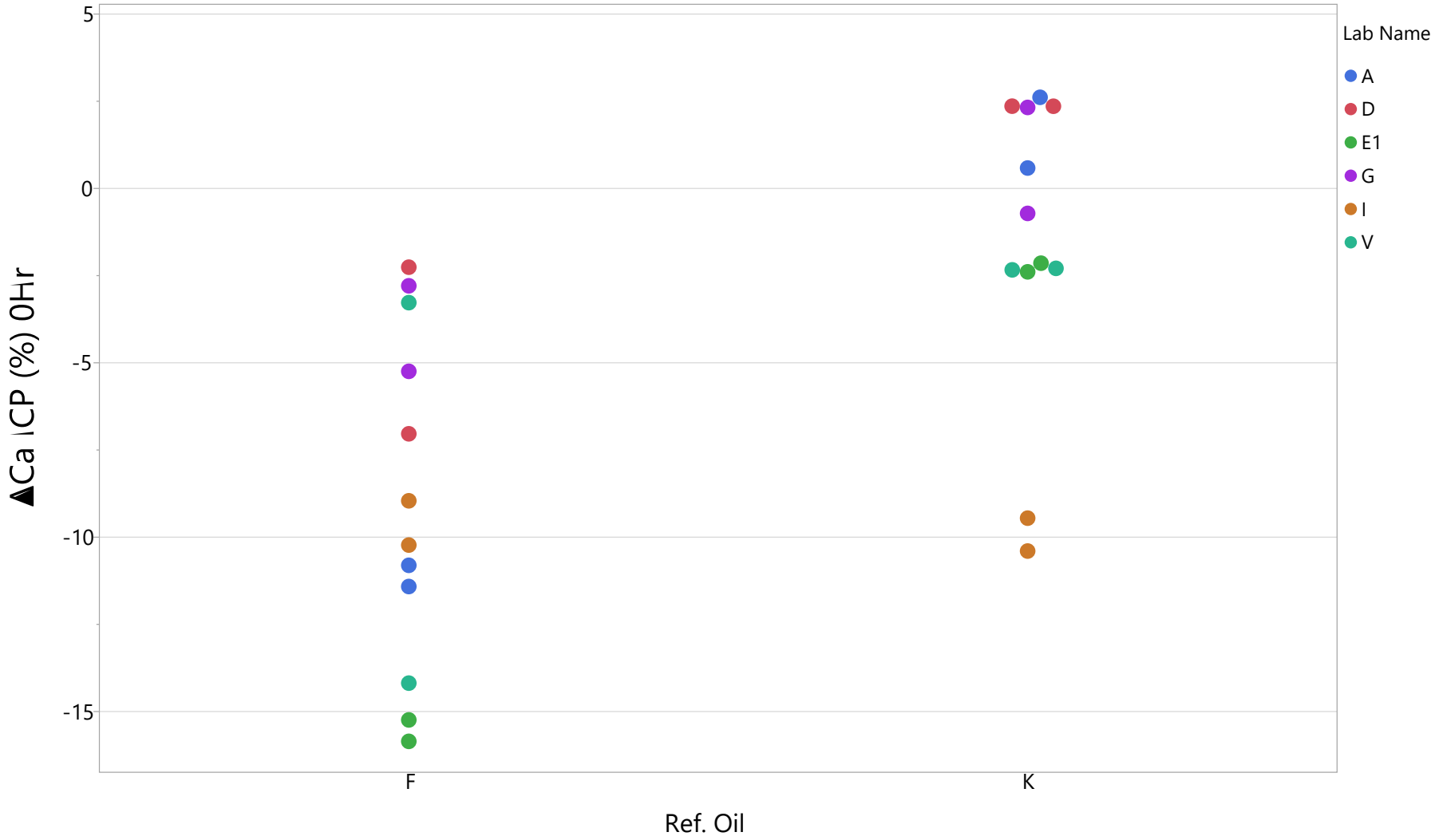
EOGT Plots
(data from Screening Tests)

02/23/2024

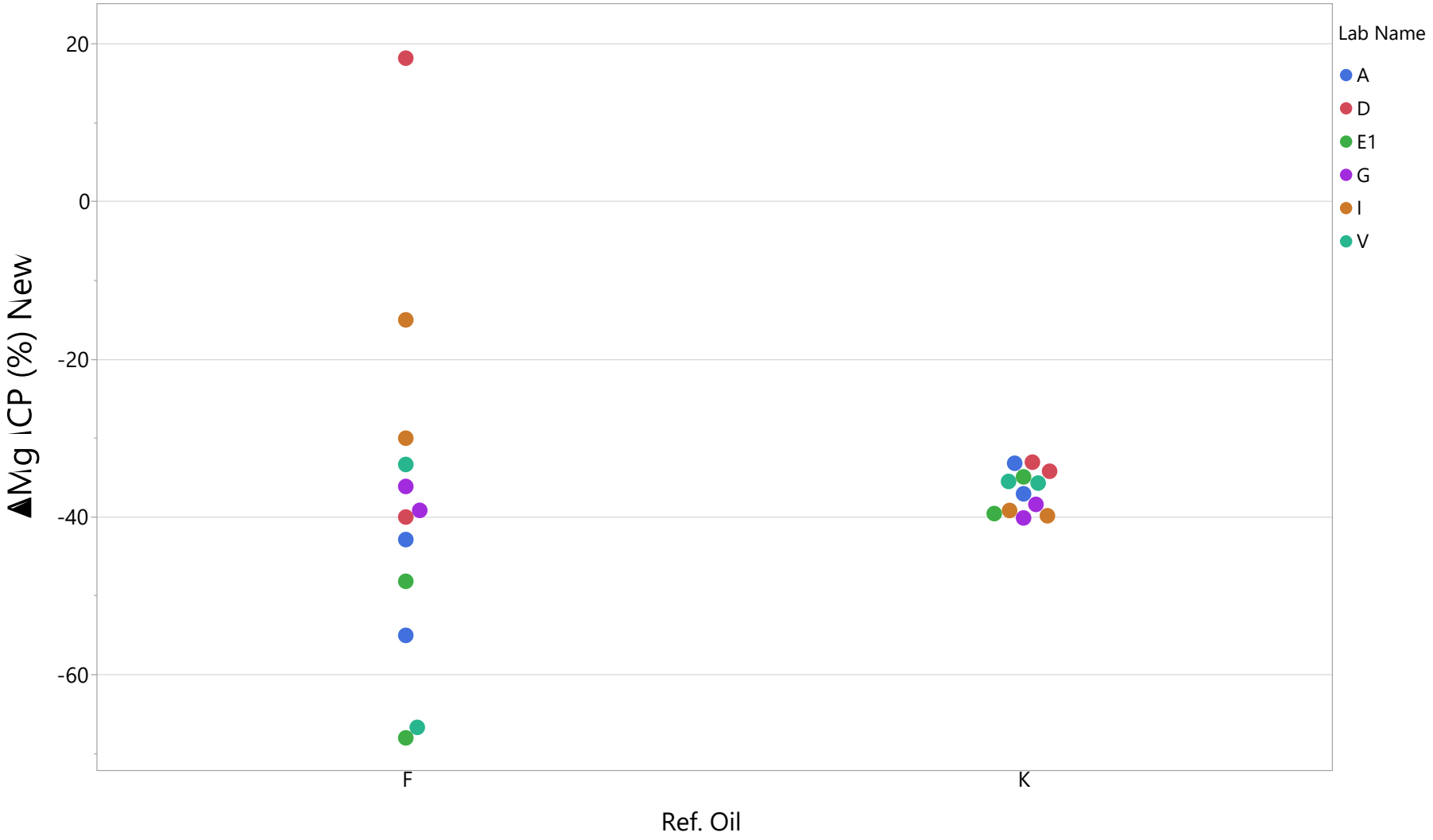
Delta Ca (%) New



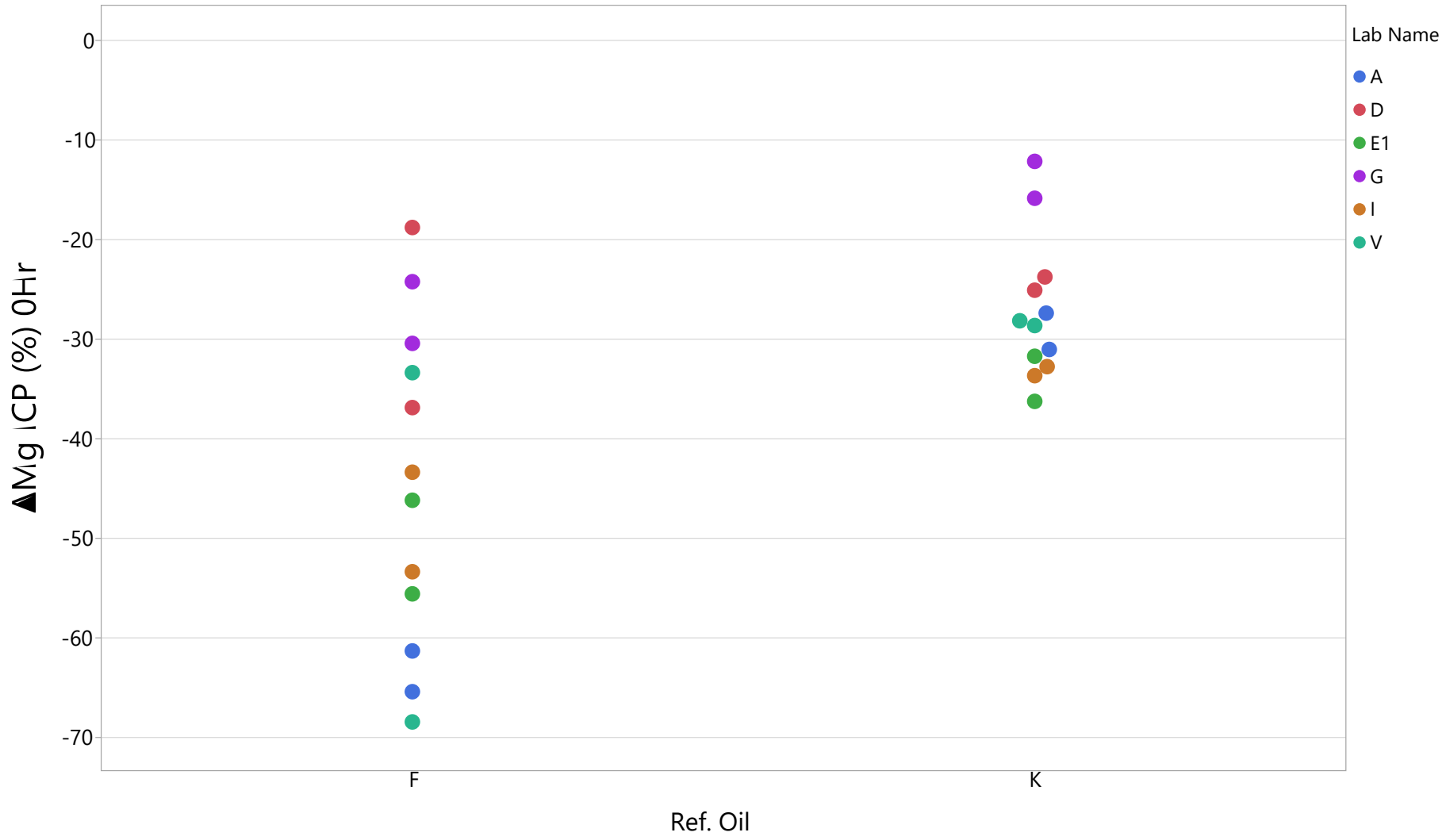
Delta Ca (%) 0 Hour



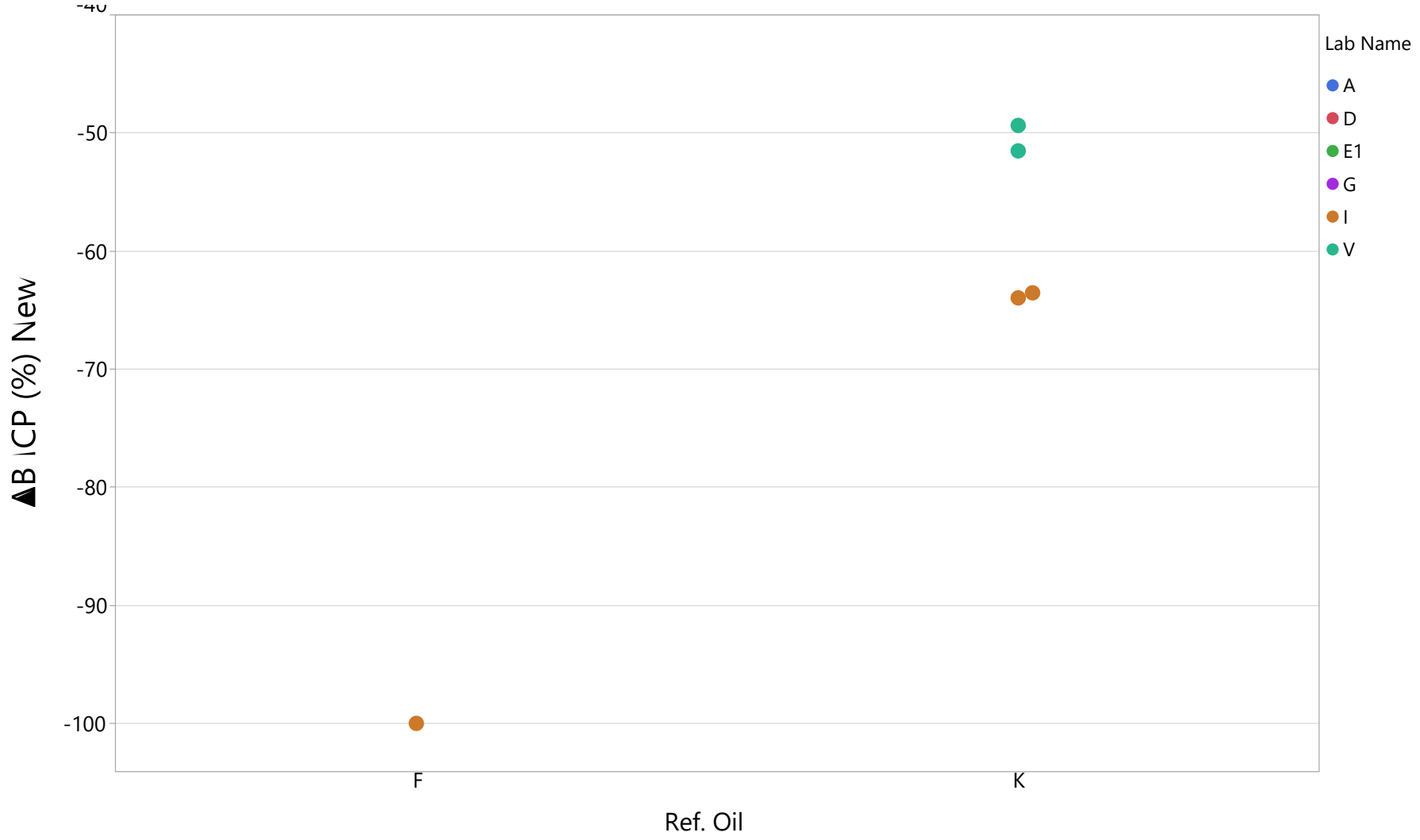
Delta Mg (%) New



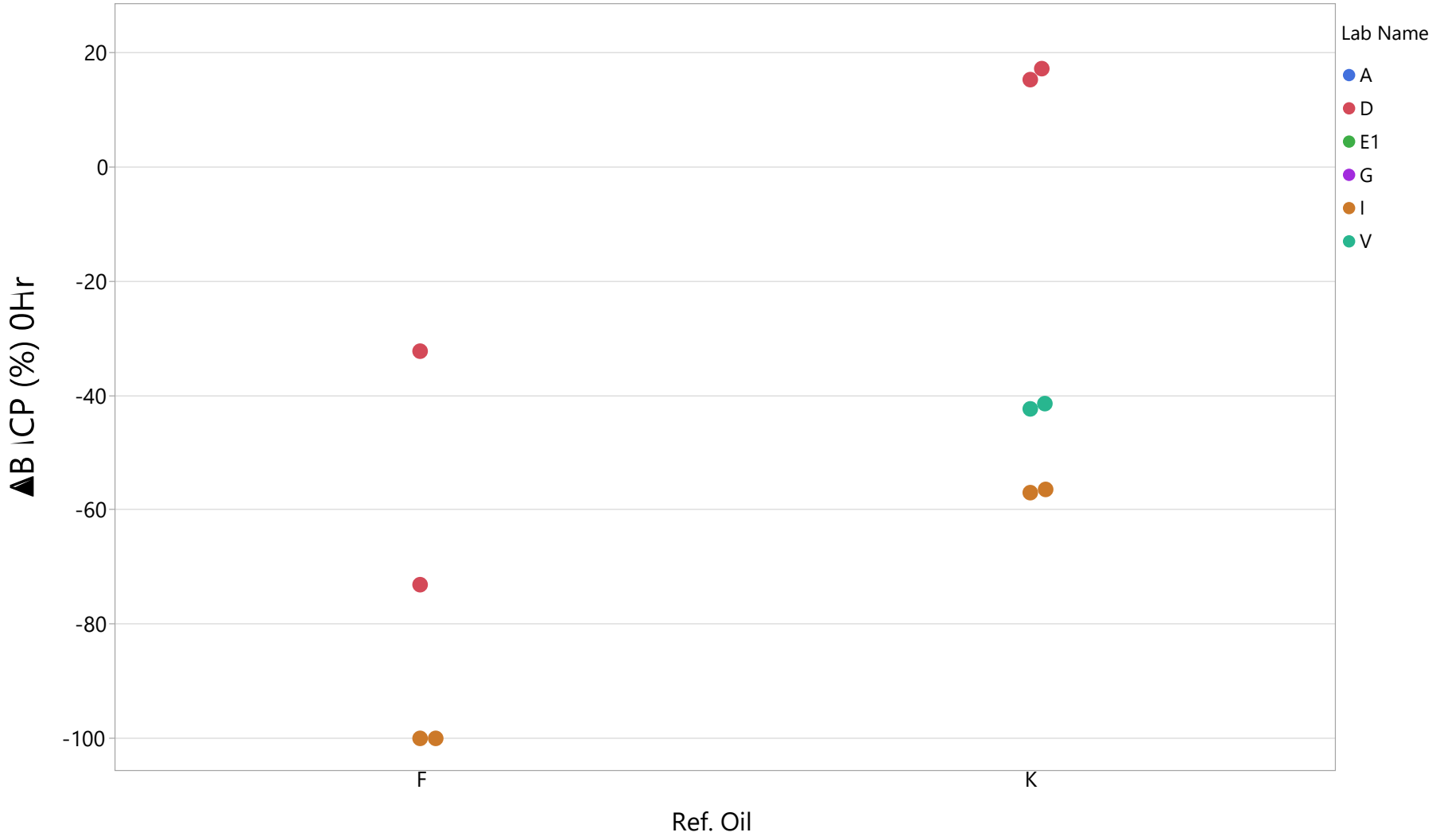
Delta Mg (%) 0 Hour



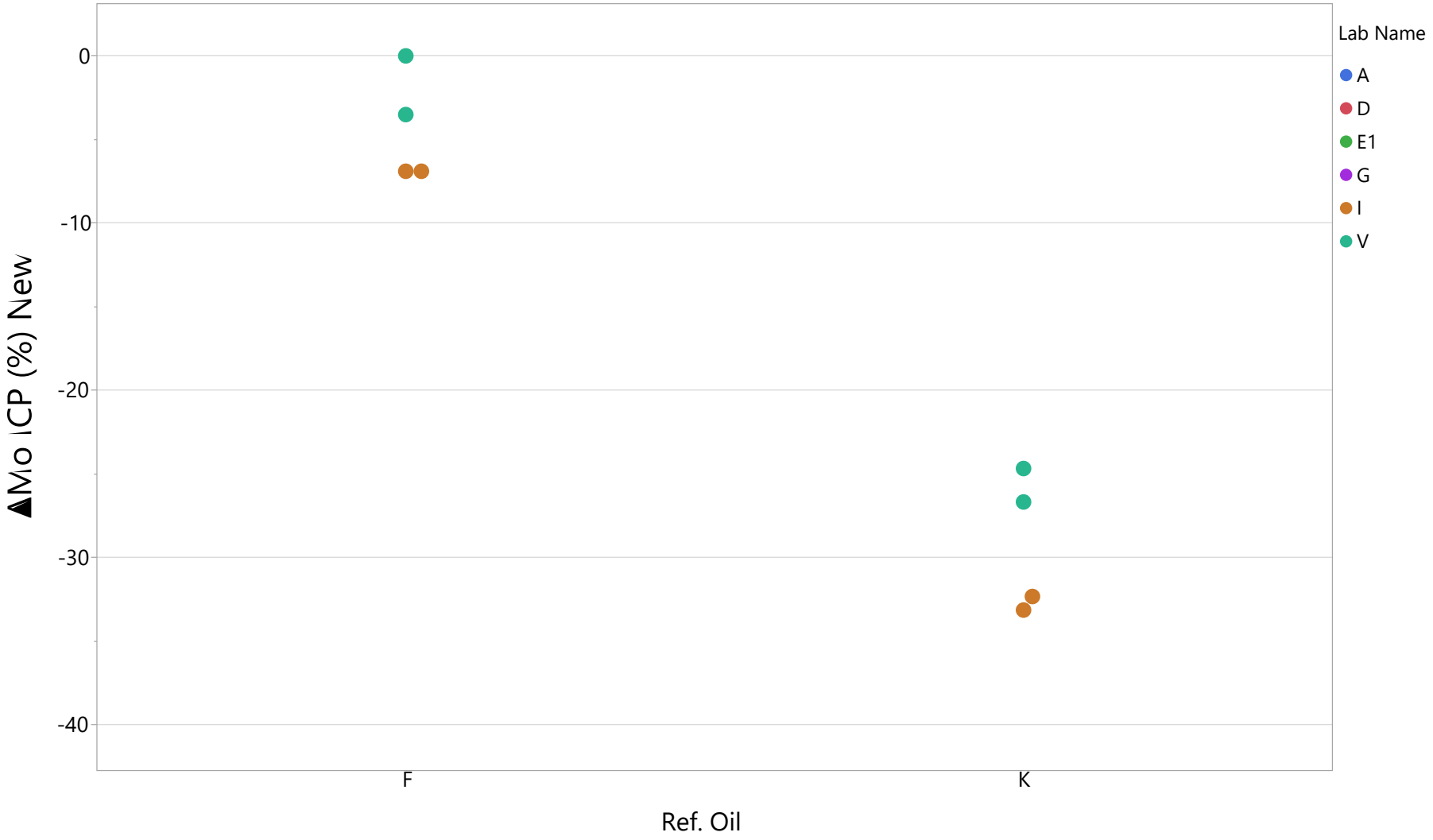
Delta B (%) New



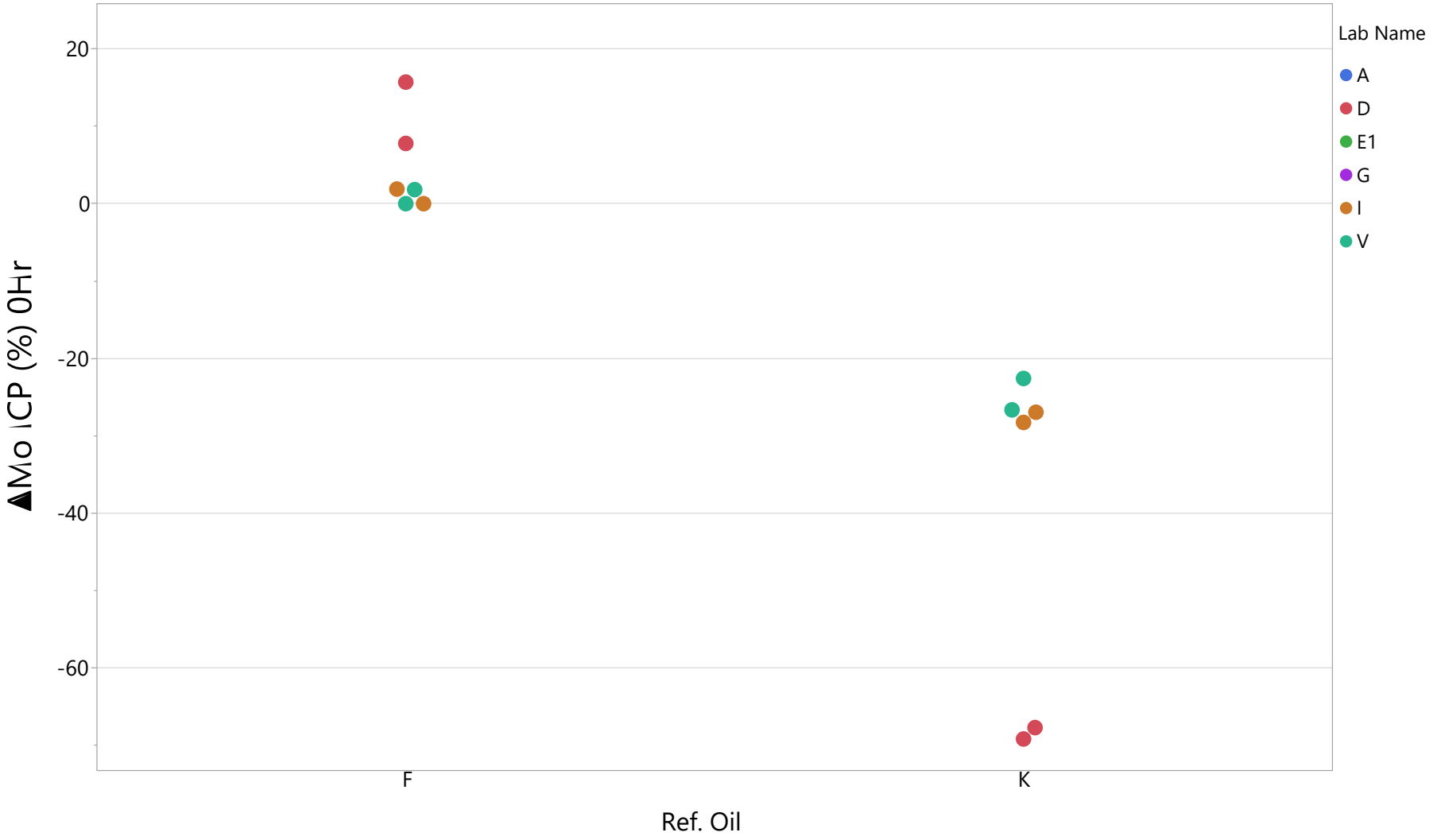
Delta B (%) 0 Hour



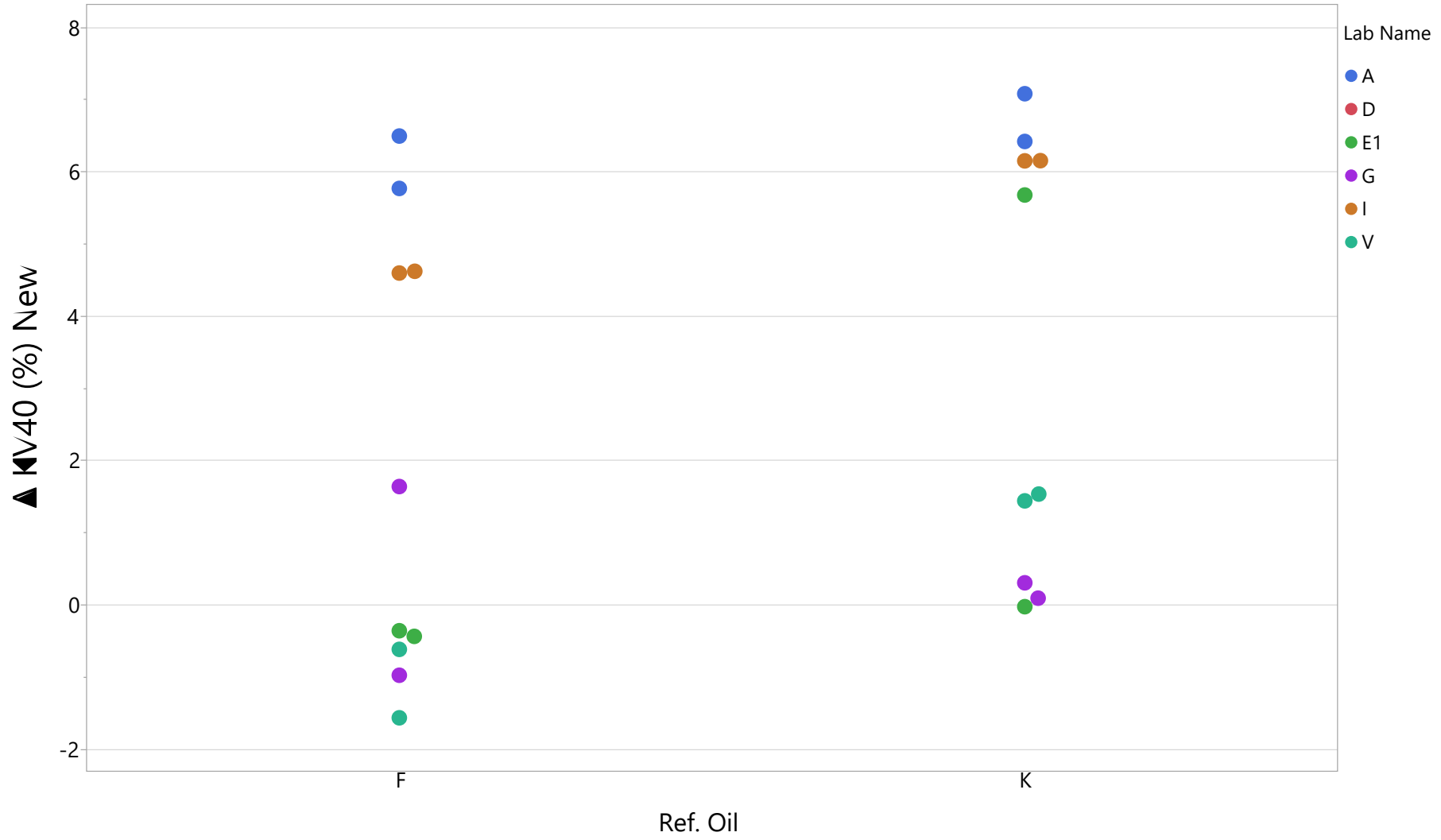
Delta Mo (%) New



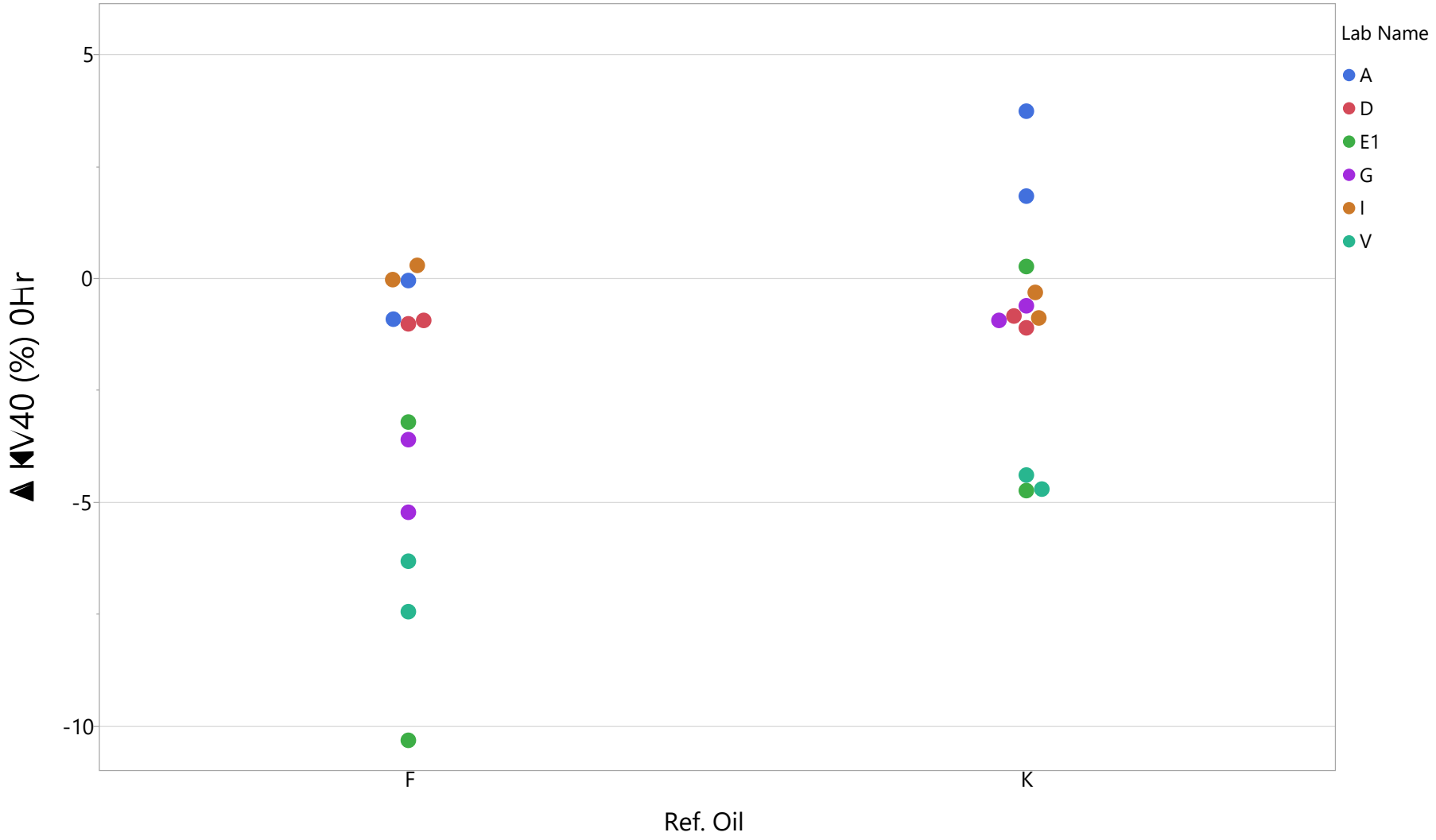
Delta Mo (%) 0 Hour



Delta KV40 (%) New



Delta KV40 (%) 0 Hour



Draft Timeline – updated Feb 9

Task	Date									
	May-Jun 2023	Jul-Aug 2023	Sept-Oct 2023	Nov-Dec 2023	Jan-Feb 2024	Mar-Apr 2024	May-Jun 2024	Jul-Aug 2024	Sept-Oct 2024	Nov-Dec 2024
Develop test procedure and report form (ILS)										
Collect and prepare donated oil samples (18 oils)										
Screening samples shipped to labs (6 labs)										
Screening labs run 4 tests										
Data analysis for Screening and Proposal tests										
Pilot Study samples shipped to labs (4 labs)										
Pilot Study labs run ? tests										
Data analysis for Pilot Study										
ILS samples shipped to ILS labs (6 labs)										
ILS Labs run tests										
Data analysis for ILS, generate Research Report (RR) & Precision										
Ballot test procedure and RR										
Generate pass/fail limits [Outside this Surveillance Panel]										

Action Items and Next Meeting

- Group to let Yongli know on direction for EOGT
- Group to review existing data and share any comments for next meeting
- Afton to send additional IR data.
- ISP to send additional IR data and flow time data.
- Ford to get back on filter IR method details.
- Ford to check if calcium sulfonate grease was used in vehicles where issues previously occurred.
- Labs to let Yongli know if they can run EOGT with specific dispersing tool.
- All to review Excel data that has been cleaned up and give Yongli any comments.

- Next Meeting: Monday March 18 at 8:30AM CDT

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 (Screening, Pilot, and ILS) Intertek (Screening, Pilot, and ILS) ISP (Screening, Pilot, and ILS) Savant (Screening and ILS) SwRI (Screening, Pilot, and ILS) TMC (monitoring system only) Valvoline (Screening and ILS)