



Address 100 Barr Harbor Drive
PO Box C700
W. Conshohocken, PA
19428-2959 | USA

Phone 610.832.9500
Fax 610.832.9666
Web www.astm.org

COMMITTEE D02 ON PETROLEUM PRODUCTS, LIQUID FUELS, AND LUBRICANTS

CHAIRMAN: RANDY F JENNINGS, TENNESSEE DEPT OF AGRIC, P O Box 40627, NASHVILLE, TN 37204, UNITED STATES (615) 837-5327, FAX: (615) 837-5335, E-MAIL: RANDY.JENNINGS@TN.GOV
FIRST VICE CHAIRMAN: JAMES J SIMNICK, BP AMERICA, 150 W WARRENVILLE RD, NAPERVILLE, IL 60563, UNITED STATES (630) 420-5936, FAX: (630) 420-4831, E-MAIL: SIMNICJJ@BP.COM
SECOND VICE CHAIRMAN: MICHAEL A COLLIER, PETROLEUM ANALYZER CO LP, 21114 HWY 113, CUSTER PARK, IL 60481, UNITED STATES (815) 458-0216, FAX: (815) 458-0216, E-MAIL: MICHAEL.COLLIER@PACLP.COM
SECOND SECRETARY: HIND M ABI-AKAR, CATERPILLAR INC, BLDG H3000, OLD GALENA ROAD, MOSSVILLE, IL 61552, UNITED STATES (309) 578-9553, E-MAIL: ABI-AKAR_HIND@CAT.COM
SECRETARY: SCOTT FENWICK, NATIONAL BIODIESEL BOARD, PO BOX 104848, JEFFERSON CITY, MO 65110-4898, UNITED STATES (800) 841-5849, FAX: (537) 635-7913, E-MAIL: SFENWICK@BIODIESEL.ORG
STAFF MANAGER: ALYSON FICK, (610) 832-9681, FAX: (610) 832-9668, E-MAIL: AFICK@ASTM.ORG

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Reply to: Richard Grundza
ASTM Test Monitoring Center
6555 Penn Avenue
Pittsburgh, PA 15206
Phone: 412-365-1031
Fax: 412-365-1047
Email: reg@astmtmc.cmu.edu

Unapproved Minutes of the November 15, 2017
Sequence IV Surveillance Panel Meeting.

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The meeting was called to order by Chairman Buscher at 2:00 PM Central Time.

A list of attendees is included as attachment 1.

A copy of the agenda is included as attachment 2.

Minutes from the October 3, 2017, October 12, 2017, and October 16, 2017 meetings were approved by voice vote.

Action Items from Previous Meeting

A review of the status of action items from the previous meeting was under taken. The action items and their disposition are included as attachment 3. Action items marked as completed will be removed from the list.

IVA Update

There are currently 4 stands in three labs and there appears to be sufficient hardware for approximately two years. One lab indicated they may no longer run the IVA test after the current calibration period is up, and another lab indicated they may attempt to calibrate a stand. The laboratory which will drop IVA testing will advise the panel of hardware quantities they may be able to make available to the industry.

TMC Report

The section(s) from the TMC D02.B01 semi- annual report pertaining to IVA were reviewed. The complete report can be found at:

<http://www.astmtmc.cmu.edu/ftp/docs/gas/B01SemiAnnualReports/semiannualreports/B01%20SemiAnnualReport%20-%20OCT%202017.pdf>

Fuel Supplier Report

There is currently one batch of fuel being used for both the IVA and IVB and is being blended in 50, 000 gallon batches at the IVB sulfur specification. All labs are currently using the same batch.

IVB Matrix Status and Timeline

The panel reviewed tests completed to date and anticipated matrix completion, which is included as attachment 4. Considerable discussion took place regarding anticipated matrix completion and analysis of data with presentation to AOAP the week of February 8, 2018. Also discussed was what to do with matrix engines open completion. Jason Bowden reminded the panel that the engines were on “consignment” from OHT and were not to be used for any candidate work post matrix. Bill Buscher indicated he may run an additional test on reference oil 300. A review of the proposed timeline for Matrix2 completion, analysis and vote for inclusion into the next category is included as attachment 5.

IVB Operational Review

The panel reviewed operational plots from nine matrix tests, included as attachment 6. There were several concerns expressed about operations in certain labs/test and are summarized as follows:

Blowby coolant out temperature and its possible impact on severity.

Blowby flow rate was considerably different on test 102-0-62, the lab will follow up on potential blowby flow meter issues during the test.

There was some variability in coolant out temperature in one lab that needs further investigation.

Differences in oil gallery temperature were noted and may be traced to tuning.

The impact of oil sump temperature needs to be better understood.

There were some oddities in both engine speed and coolant temperature in one lab that need further investigation.

D3525 Capillary Column

Due to lack of time, this item will be addressed during a conference call on a later date. Labs are to review the presentation (attachment 7) with their personnel in anticipation of the upcoming call.

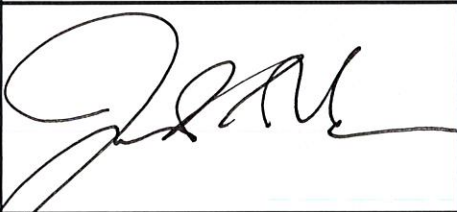
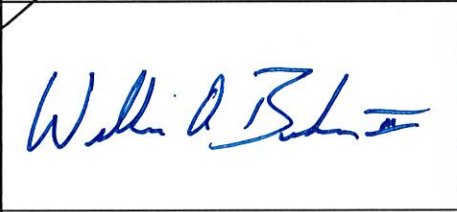

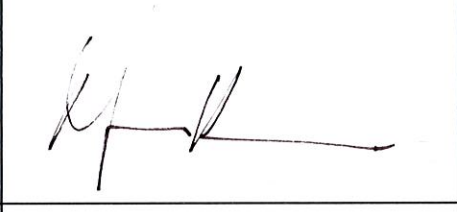

Alternate Suppliers Statement

The panel heard a brief presentation from Pat Lang, TGC Chair, regarding proposed changes/implementation of an updated alternate supplier approval protocol. See attachment 8.

The meeting was adjourned at 5:11 PM.




**MEMBERSHIP
SEQUENCE IV SURVEILLANCE PANEL**

November 15, 2017

NAME	COMPANY-ADDRESS-PHONE-FAX-EMAIL	SIGNATURE
Bowden, Jason	OH Technologies, Inc. 9300 Progress Parkway P.O. Box 5039 Mentor, OH 44061-5039 Phone No.: 440-354-7007 Fax No.: 440-354-7080 Email: jhbowden@ohtech.com	
Buscher III, William	Intertek Automotive Research 5404 Bandera Road San Antonio, TX 78238 Phone No.: 210-647-9489 or 210-240-8990 cell Fax No.: 210-684-6074 Email: william.buscher@intertek.com	
Buscher, Jr., William	Buscher Consulting Services P.O. Box 112 Hopewell Jct., NY 12533 Phone No.: 914-897-8069 Fax No.: 914-897-8069 Email: buschwa@aol.com	
Grundza, Rich	ASTM Test Monitoring Center 6555 Penn Avenue Pittsburgh, PA 15206 Phone No.: 412-365-1031 Fax No.: 412-365-1047 Email: reg@astmtmc.cmu.edu	
Hopp, Meryn	GM Powertrain Mail Code 483-730-322 823 Joslyn Rd. Pontiac, MI 48340-2920 Phone No.: 248. 318. 7303 Fax No.: Email: Meryn.hopp@gm.com	
Hosseini, Mahboobeh	Chevron Oronite Company LLC 100 Chevron Way, 71-7548 P.O. Box 1627 Richmond, CA 94802-0627 Phone No.: 510-242-3462 Fax No.: Email: Mahboob.Hosseini@chevron.com	
Hsu, Jeffery	Shell Global Solutions 3333 Highway 6 South Houston, TX 77082 Phone No.: 281-544-8619 Fax No.: 281-544-8150 Email: j.hsu@shell.com	
Kowalski, Teri	Toyota Motor North America, Inc. 1555 Woodridge Ann Arbor, MI 48105 Phone No.: 734- 995-4032 or 734-355-8082 cell Fax No.: 734- 995-9049 Email: teri.kowalski@tema.toyota.com	



**MEMBERSHIP
SEQUENCE IV SURVEILLANCE PANEL**

November 15, 2017

NAME	COMPANY-ADDRESS-PHONE-FAX-EMAIL	SIGNATURE
Lanctot, Dan	Test Engineering, Inc. 12718 Cimarron Path San Antonio, TX 78249 Phone No.: Fax No.: Email: DLanctot@tei-net.com	
Mileti, Chris	Lubrizol Corporation 29400 Lakeland Blvd. Wickliffe, OH 44092 Phone No.: 440-347-2521 Fax No.: 440-347-4096 Email: christopher.mileti@Lubrizol.com	
Overaker, Mark	Haltermann Solutions 15635 Jacintoport Blvd. Houston, TX 77345 Phone No.: 832-376-2202 Fax No.: Email: mhoveraker@jhaltermann.com	
Pecinovsky, Katerina	Afton Chemical Corporation 500 Spring Street P.O. Box 2158 Richmond, VA 23217-2158 Phone No.: 804-788- Fax No.: 804-788- Email: Katerina.Pecinovsky@AftonChemical.com	
Rais, Khaled	Southwest Research Institute 6220 Culebra Road P.O. Drawer 28510 San Antonio, TX 78228-0510 Phone No.: 210-522-3842 Fax No.: 210-684-7523 Email: khaled.rais@swri.org	
Rieth, Ryan	Infineum USA L.P. 1900 E. Linden Avenue Linden, NJ 07036-0536 Phone No.: 908-474-7377 Fax No.: 908-474-3637 Email: Ryan.Rieth@Infineum.com	
Romano, Ron	Ford Motor Company 1800 Fairlane Drive Allen Park, MI 48101 Phone No.: 313-845-4068 Fax No.: 313-323-8042 Email: rromano@ford.com	
Sagawa, Takumaru	Nissan Motor Co., Ltd. 560-2, Okatsukoku, Atsugi city Kanagawa 243-0192 Phone No.: 046-270-1515 Fax No.: 046-270-1585 Email: t-sagawa@mail.nissan.co.jp	



**MEMBERSHIP
SEQUENCE IV SURVEILLANCE PANEL**

November 15, 2017

NAME	COMPANY-ADDRESS-PHONE-FAX-EMAIL	SIGNATURE
Salvensen, Cliff	ExxonMobil Research & Engineering Co. 600 Billingsport Road P.O. Box 480 Paulsboro, NJ 08066-0480 Phone No.: 856-224-2954 Fax No.: Email: clifford.r.salvesen@exxonmobil.com	
Savant, Amol	Valvoline 22 nd & Front Streets Ashland, KY 41114 Phone No.: Fax No.: Email: ACSavant@valvoline.com	
Tang, Haiying	Chrysler Group LLC 800 Chrysler Drive Auburn Hills, MI Phone No.: Fax No.: Email: haiying.tang@fcagroup.com	
Tarry, Preston	BP 1500 Valley Road Wayne, NJ 07470 Phone No.: Fax No.: Email: Preston.Tarry@bp.com	
	Phone No.: Fax No.: Email:	
	Phone No.: Fax No.: Email:	
	Phone No.: Fax No.: Email:	
	Phone No.: Fax No.: Email:	





**NON-MEMBER MAILING LIST
SEQUENCE IV SURVEILLANCE PANEL**

November 15, 2017

NAME	COMPANY-ADDRESS-PHONE-FAX-EMAIL	SIGNATURE
Adams, Mark	Tribology Testing Labs Phone No.: 989-980-4418 Fax No.: Email: mark@tribologytesting.com	
Affinito, Ricardo	Chevron Oronite Company LLC Phone No.: Fax No.: Email: Ricardo.Affinito@chevron.com	
Altman, Ed	Afton Chemical Corporation 500 Spring Street P.O. Box 2158 Richmond, VA 23217-2158 Phone No.: 804-788-5279 Fax No.: 804-788-6358 Email: ed.altman@aftonchemical.com	
Bean, Nathan	Valvoline Phone No.: Fax No.: Email:	
Boese, Doyle	Infineum USA L.P. 1900 E. Linden Avenue Linden, NJ 07036-0536 Phone No.: 908-474-3176 Fax No.: 908-474-3637 Email: doyle.boese@infineum.com	
Bowden, Dwight	OH Technologies, Inc. 9300 Progress Parkway P.O. Box 5039 Mentor, OH 44061-5039 Phone No.: 440-354-7007 Fax No.: 440-354-7080 Email: dhbowden@ohtech.com	
Bowden, Matt	OH Technologies, Inc. 9300 Progress Parkway P.O. Box 5039 Mentor, OH 44061-5039 Phone No.: 440-354-7007 Fax No.: 440-354-7080 Email: mbowden@ohtech.com	
Brys, Jerome	Lubrizol Corporation 29400 Lakeland Blvd. Wickliffe, OH 44092 Phone No.: 440-347-2631 / 440-943-1200 Fax No.: 440-943-9013 Email: jabs@lubrizol.com	




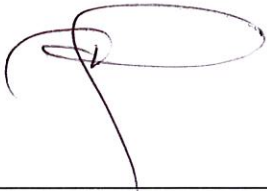


**NON-MEMBER MAILING LIST
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NAME	COMPANY-ADDRESS-PHONE-FAX-EMAIL	SIGNATURE
Campbell, Bob	Afton Chemical Corporation 500 Spring Street P.O. Box 2158 Richmond, VA 23217-2158 Phone No.: 804-788- Fax No.: 804-788-6358 Email: bob.campbell@aftonchemical.com	
Castanien, Chris	Neste Phone No.: Fax No.: Email: Chris.Castanien@nesteoil.com	
Clark, Sid	Southwest Research Institute 50481 Peggy Lane Chesterfield, MI 48047 Phone No.: 586-873-1255 Email: sidney.clark@swri.org	
Clark, Jeff	ASTM Test Monitoring Center 6555 Penn Avenue Pittsburgh, PA 15206 Phone No.: 412-365-1032 Fax No.: 412-365-1047 Email: jac@astmtmc.cmu.edu	
Coker, Carlton	Intertek Automotive Research 5404 Bandera Road San Antonio, TX 78238-1993 Phone No.: 210-647-9473 or 210-643-1817 cell Fax No.: 210-523-4607 Email: carlton.coker@intertek.com	
Collins, Chet	Southwest Research Institute 6220 Culebra Road P.O. Drawer 28510 San Antonio, TX 78228-0510 Phone No.: 210-522- Fax No.: Email: chet.collins@swri.org	
Dvorak, Todd	Afton Chemical Corporation 500 Spring Street P.O. Box 2158 Richmond, VA 23217-2158 Phone No.: 804-788- Fax No.: 804-788-6358 Email: todd.dvorak@aftonchemical.com	
Farnsworth, Gordon	Infineum USA L.P. 1900 E. Linden Avenue Linden, NJ 07036-0536 Phone No.: 570-934-2776 Fax No.: 908-474-3637 Email: gordon.farnsworth@infineum.com	




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SEQUENCE IV SURVEILLANCE PANEL**

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NAME	COMPANY-ADDRESS-PHONE-FAX-EMAIL	SIGNATURE
Haumann, Karin	Shell Global Solutions Phone No.: 281-544-6986 Fax No.: Email: Karin.Haumann@shell.com	
Hirano, Satoshi	Toyota Phone No.: Fax No.: Email: satoshi_hirano_aa@mail.toyota.co.jp	
Knight, Clayton Dan Lanctot	Test Engineering, Inc. 12718 Cimarron Path San Antonio, TX 78249 Phone No.: 210-862-5987 cell Fax No.: 210-690-1959 Email: cknight@tei-net.com	
Kostan, Travis	Southwest Research Institute 6220 Culebra Road P.O. Drawer 28510 San Antonio, TX 78228-0510 Phone No.: 210-522-2407 Fax No.: 210-684-7523 Email: travis.kostan@swri.org	
Lang, Patrick	Southwest Research Institute 6220 Culebra Road P.O. Drawer 28510 San Antonio, TX 78228-0510 Phone No.: 210-522-2820 or 210-240-9461 cell Fax No.: 210-684-7523 Email: patrick.lang@swri.org	
Leverett, Charlie	Infineum Phone No.: 210-444-5448 Fax No.: Email: charlie.leverett@yahoo.com	
Linden, Jim	Linden Consulting LLC 673 Campus Road Rochester Hills, MI 48309 Phone No.: 248-321-5343 Fax No.: Email: lindenjim@jlindenconsulting.com	
Lochte, Michael	Southwest Research Institute 6220 Culebra Road P.O. Drawer 28510 San Antonio, TX 78228-0510 Phone No.: 210-522-5430 Fax No.: 210-684-7523 Email: michael.lochte@swri.org	



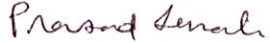
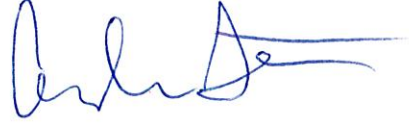
**NON-MEMBER MAILING LIST
SEQUENCE IV SURVEILLANCE PANEL**

November 15, 2017

NAME	COMPANY-ADDRESS-PHONE-FAX-EMAIL	SIGNATURE
Lopez, Al	Intertek Automotive Research 5404 Bandera Road San Antonio, TX 78238-1993 Phone No.: 210-647-9465 or 210-862-7935 cell Fax No.: 210-523-4607 Email: al.lopez@intertek.com	
Martinez, Jo	Chevron Oronite Company LLC 100 Chevron Way, 71-7548 P.O. Box 1627 Richmond, CA 94802-0627 Phone No.: 510-242-5563 Fax No.: 510-242-1930 Email: jomartinez@chevron.com	
Matasic, James	Lubrizol Corporation 29400 Lakeland Blvd. Wickliffe, OH 44092 Phone No.: 440-347-2487 Fax No.: Email: James.Matasic@Lubrizol.com	
McMillan, Mike	5019 Deer Creek Cir N Washington, MI 48094 Phone No.: 586-677-9198 Fax No.: Email: mmcmillan123@comcast.net	
Meier, Adam	ExxonMobil Phone No.: Fax No.: Email: adam.r.meier@exxonmobil.com	
O'Malley, Kevin	Lubrizol Corporation 29400 Lakeland Blvd. Wickliffe, OH 44092 Phone No.: 440-347-4141 Fax No.: Email: Kevin.OMalley@lubrizol.com	
Pastor, Jofran	Infineum Phone No.: Fax No.: Email: jofran.pastor@infineum.com	
Porter, Christian	Afton Chemical Corporation 500 Spring Street P.O. Box 2158 Richmond, VA 23217-2158 Phone No.: 804-788-5837 Fax No.: 804-788-6358 Email: christian.porter@aftonchemical.com	





**NON-MEMBER MAILING LIST
SEQUENCE IV SURVEILLANCE PANEL**

November 15, 2017

NAME	COMPANY-ADDRESS-PHONE-FAX-EMAIL	SIGNATURE
Ritchie, Andrew	Infineum USA L.P. 1900 E. Linden Avenue Linden, NJ 07036-0536 Phone No.: 908-474-2097 Fax No.: 908-474-3637 Email: andrew.ritchie@infineum.com	
Smolenski, Don	Evonik Phone No.: Fax No.: Email:	
Stockwell, Robert	Chevron Oronite Company LLC Phone No.: Fax No.: Email: Robert.Stockwell@chevron.com	
Sutherland, Mark	Test Engineering, Inc. 12718 Cimarron Path San Antonio, TX 78249 Phone No.: 210-867-8357 Fax No.: 210-690-1959 Email: msutherland@tei-net.com	
Taylor, Chris	VP Racing Fuels Phone No.: 210-710-4627 Fax No.: Email: chris.taylor@vpracing-fuels.com	
Thompson, Hap	ASTM Facilitator Phone No.: 904-287-9596 Fax No.: Email: Hapjthom@aol.com	
Tumati, Prasad	Haltermann Phone No.: (313) 300-8300 Fax No.: Email: ptumati@jhaltermann.com	
Andrew Stevens	Phone No.: 440-347-4020 Fax No.: Email: andrew.stevens@lubrizol.com	

**NON-MEMBER MAILING LIST
SEQUENCE IV SURVEILLANCE PANEL**

November 15, 2017

NAME	COMPANY-ADDRESS-PHONE-FAX-EMAIL	SIGNATURE
<p>Jim CARTER</p>	<p>GAGE PRODUCTS 821 WANDA AVE. FERNDALE, MI 48220 Phone No.: 517-896-1150 Fax No.: Email: JCARTER@GAGEPRODUCTS.COM</p>	
<p>Lisa Dingwell</p>	<p>Afton Chemical Phone No.: 804-788-5051 Fax No.: Email: lisa.dingwell@aftonchemical.com</p>	
<p>Scott Stap</p>	<p>Phone No.: Fax No.: Email: Scott.Stap@GM.COM</p>	
<p>Mike Raney</p>	<p>Phone No.: Fax No.: Email: michael.p.raney@gm.com</p>	
	<p>Phone No.: Fax No.: Email:</p>	
	<p>Phone No.: Fax No.: Email:</p>	
	<p>Phone No.: Fax No.: Email:</p>	
	<p>Phone No.: Fax No.: Email:</p>	

Attachment 2
Sequence IV Surveillance Panel
San Antonio, TX
Southwest Research Institute
November 15, 2017
2:00 p.m. - 5:00 p.m.

A G E N D A

1. Chairman comments
2. Attendance sign-in sheet distribution
3. Membership changes
4. Motion and action recorder
5. Approval of minutes for October 3, 2017, October 12, 2017
And October 16, 2017
6. Action item review
7. TMC report
8. Fuel supplier report – KA24E Green fuel
9. Sequence IVA update
10. Prove-out and precision matrix testing update
11. Precision matrix testing operational data analysis review
12. Sequence IVB timeline review
13. D3525 capillary column chromatography
14. TGC alternate supplier protocol
15. Review scope & objectives
16. Old business
17. New business
18. Motion and action item review

19. Next meeting
20. Adjourn

Sequence IV Surveillance Panel
June – November, 2017
Open Action Items

Open Action Items

As Recorded at the Meeting by Bill Buscher

1. Action Item – Revise Sequence IVB data dictionary and report forms accordingly for the change from Engine Coolant In Temperature to Engine Coolant Out Temperature control point. Also include other revisions that been on hold until after the original Sequence IVB precision matrix completed. Expedite revisions and implementation prior to the restart of the Sequence IVB precision matrix.
In process, and close to completion.
2. Action Item – Revisit and amend the 10% volume acceptance with respect to mixing the new fuel batch. Strongly recommend that tanks be de-inventoried prior to receiving newly adjusted batch of KA24E Green fuel.
In process.
3. Action Item – OHT to design and supply a clutch alignment tool.
In process. Design completed.
4. Action Item – OHT to design and supply a timing chain wedge (timing chain holding tool).
In process.
5. Action Item – OHT to design and supply an engine rotation locking tool.
In process.
6. Action Item – SwRI and Intertek to draft Section 4 of the Sequence IVB Engine Assembly Manual (Engine disassembly, cleaning and reassembly after camshaft lobe failure), if needed.
In process.
7. Action Item – Lubrizol to investigate oil sampling valve effect on aeration of the drawn oil sample.
Completed.
8. Action Item – Once the design of the additional oil pan modifications has been finalized and approved by this surveillance panel, all labs are to return their OHT modified oil pans (p/n OHTIVB-022-1) to OHT for the additional modifications to be performed, free of charge.
Completed.
9. Action Item – At conclusion of the prove-out testing the Sequence IV surveillance panel will set an oil consumption validity limit.
Pending the completion of the precision matrix.

10. Action Item – OHT to evaluate the potential to add a thermal barrier ceramic coating to the exterior surfaces of the OHT modified front cover, OHT tensioner access plate and OHT modified oil pan.
In process.
11. Action Item – SwRI and Intertek to swap EOT oil samples from their ASTM REO 300 and 1012 prove-out tests and perform D5185 Metals, D6304 Karl Fischer H₂O Content, D3525 Fuel Dilution, D664 Total Acid Number and D4739 Total Base Number analysis for a lab-to-lab oil analysis comparison.
In process. Samples swapped, analysis complete, to compile date.
12. Action Item – Perform a sectional Rockwell hardness test on a test intake camshaft.
Completed.
13. Action Item – Ask the supplier of IVB-LFO-1 if the directional performance between prove-out tests, of the intake lifter wear, can be shared with the surveillance panel.
In process.
14. Action Item – Surveillance panel chair to collect the individual Intake Lifter Average Volume Loss results from the two ASTM REO 1012 and the seven ASTM REO 300 prove-out tests and forward to the industry statisticians group for statistical analysis by individual lifter.
In process.
15. Action Item – Labs to compare intake lifter profile traces to volume loss results from their ASTM REO 1012 and ASTM REO 300 prove-out tests.
In process.
16. Action Item – SwRI and Intertek to share their PDI profile traces from their ASTM REO 1012 and ASTM REO 300 prove-out tests for comparison and review.
In process.
17. Action Item – Intertek to provide a procedure for adding a chilled water booster pump and a blower to the engine oil temperature control system.
Completed.
18. Action Item – Re-evaluate the engine oil gallery temperature Qi targets and limits using the operational data from the latest prove-out and precision matrix tests.
Pending the completion of the precision matrix.
19. Action item – Afton to provide operational data plots of their engine coolant flow and RAC coolant flow for comparison to the operational data plots from the other labs.
In process.
20. Action Item – Lab to provide 1 hour, test hour 101 to 102 (NOTE: if an unscheduled shutdown occurred between test hour 101 and 102, then obtain data from the next full hour of test time without any scheduled or unscheduled shutdowns), of operational data, using the updated operational data review Excel template, from any additional prove-out tests and the Row 1 precision matrix tests, to the TMC for posting, so that an additional operational data analysis can be performed by Rich Grundza and Kevin OMalley. A total of 3 additional prove-out tests and 5 precision matrix tests to be

included. Labs to have data uploaded by 11/1/17. A follow-up conference call to be scheduled for 11/7/17.

Completed.

21. Action Item – Lab to complete and submit test reports to the TMC for any previously or recently completed Sequence IVB reference oil tests.

In process.

22. Action Item – Utilize the final prove-out and precision matrix tests to identify which controlled parameters have a significant influence test severity and re-evaluate the Qi targets and windows for those parameters at the conclusion of the precision matrix.

Pending the completion of the precision matrix.

23. Action Item – Create a database of the temperature parameters that have a significant influence test severity, including the different temperatures and their corresponding test results, and have the industry statisticians group to perform a statistical analysis to identify correlations.

Pending the completion of the precision matrix.

24. Action Item – Histogram

Chris Mileti to provide details.

25. Action Item – Labs to work together to investigate, understand and possibly correct difference in CAN data.

In process.

26. Action Item – Analyze blowby coolant out temperature to water content and test results to see if there is any correlation.

In process.

27. Action item – Intertek to draft a blowby flow meter cleaning procedure to add to the Sequence IVB test procedure.

In process.

28. Action Item – Surveillance panel chair to update the Sequence IVB timeline based on the current status of the precision matrix labs

Completed.

29. Action Item – Intertek and SwRI to provide 1 hour, test hour 101 to 102 (NOTE: if an unscheduled shutdown occurred between test hour 101 and 102, then obtain data from the next full hour of test time without any scheduled or unscheduled shutdowns), of operational data, using the updated operational data review Excel template, from the Row 2 precision matrix tests, with the exception of SwRI Stand 1, to the TMC for posting, so that an additional operational data analysis can be performed by Rich Grundza and Kevin OMalley. A total of 4 precision matrix tests to be included. Labs to have data uploaded by end of business on 11/9/17.

Completed.

30. Action item – For review at the 11/15/17 face-to-face Sequence IV surveillance panel meeting, Rich Grundza and Kevin OMalley to perform an operational data analysis on

the 9 available precision matrix tests only. Do not include any prove-out tests in this analysis.

Completed.

**SEQUENCE IVB
UPDATE**

November 2017



GF-6 TEST STATUS




Test	Test Development Complete	Precision Matrix Complete	Test Accepted By AOAP/PCEOCP	LTMS Established	Registration Started	GF-5 Equivalency Limits Established	BOI/VGRA Established
IIIH	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	IIIF - Proposed IIIG - <input checked="" type="checkbox"/>	Waiting for BC 5 Hardware
IVB	<input checked="" type="checkbox"/>	Currently Running	Expected Feb-18	Expected Feb-18	Expected Feb-18	IVA - TBD	Expected Q1 2018
VH	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Expected Nov-17	VG - Proposed	Expected Q1 2018
VIE	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	VID - Proposed	Expected Q1 2018
VIF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	VID - Proposed	Expected Q1 2018
VIII	N/A	N/A	N/A	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
IX	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	N/A	Expected Q1 2018
X	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Expected Dec-17	Expected Dec-17	Expected Dec-17	N/A	Expected Q1 2018

PROVE-OUT AND PRECISION MATRIX STATUS



PROVE-OUT TESTING						
Run Order	Required				Supplemental	
	IAR Stand 1	IAR Stand 2	SwRI Stand 1	SwRI Stand 2	Lubrizol	ExxonMobil
1	300	IVB-LFO-1	1012	IVB-LFO-1	300	300
2	1012		300	IVB-LFO-2	1012	1012
3		300	300	300		

 = Completed
 = Running

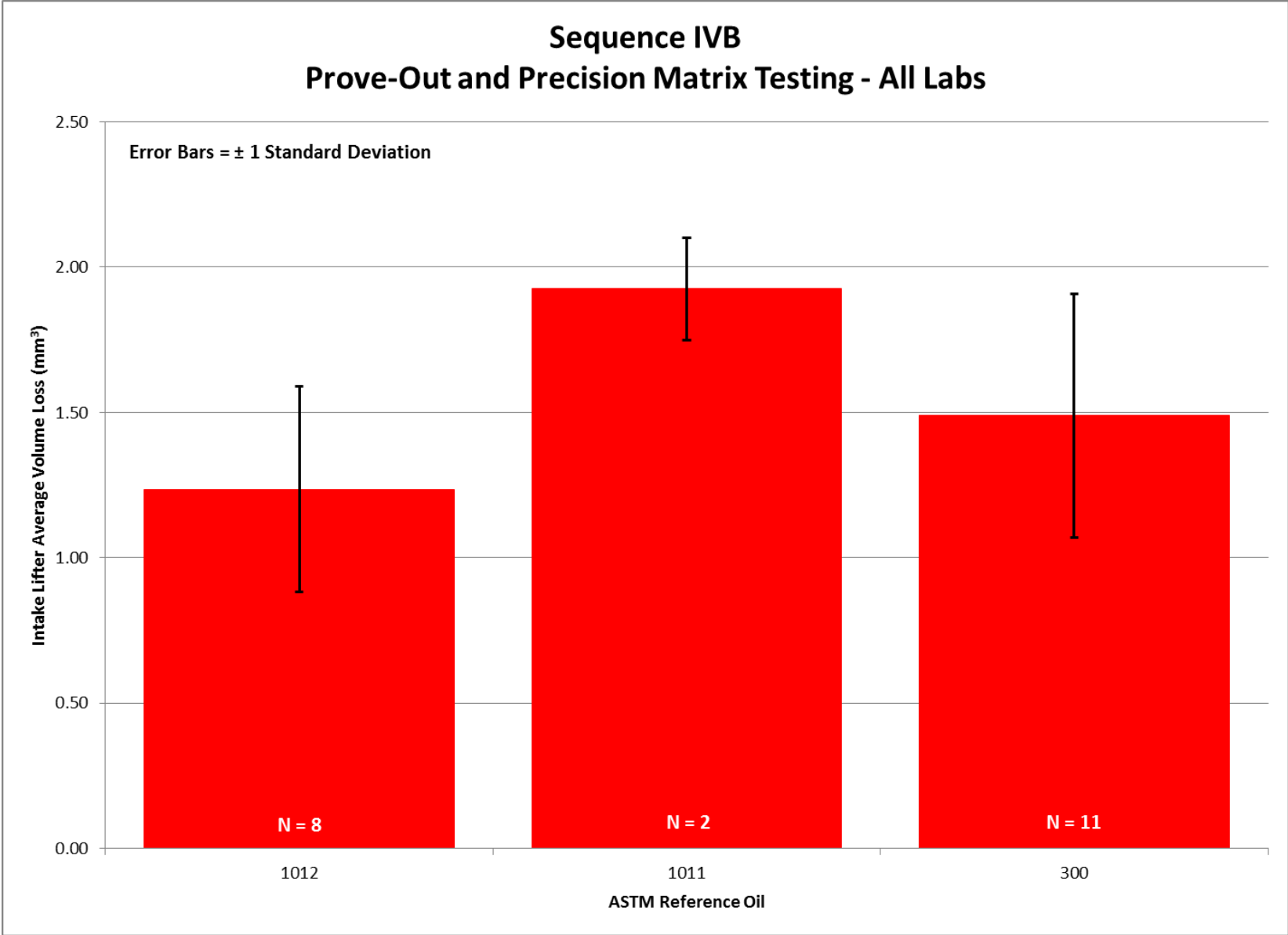
PRECISION MATRIX								
Run Order	Precision Matrix					Supplemental		
	IAR Stand 1	IAR Stand 2	IAR Stand 3	SwRI Stand 1	SwRI Stand 2	Lubrizol	ExxonMobil	Afton
1	1012	300	1011	300	1012	1012	300	1011
2	1011	1012	1012	1011	300	300	1011	1012
3	300	1011	300	1012	1011	1012	300	1011
4	1012	300	1011	300	1012			

PROVE-OUT AND PRECISION MATRIX TEST DATA

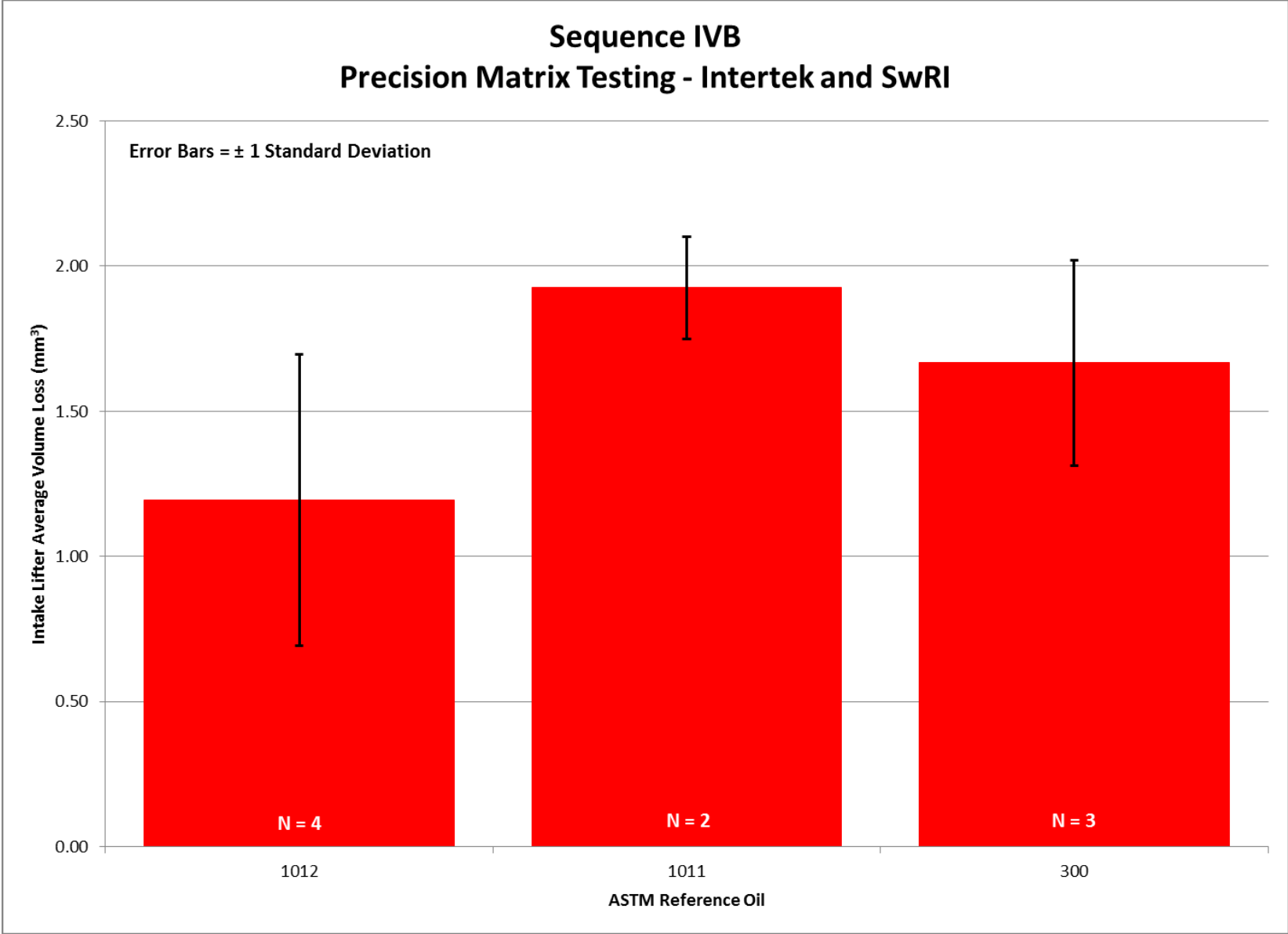


Run Order	Purpose	Lab	Stand	Oil	Intake Lifter Average Volume Loss mm ³
1	prove-out test 1	Intertek	102	300	1.79
2	prove-out test 1	SwRI	18	1012	1.01
3	prove-out test 2	SwRI	18	300	1.16
4	prove-out test 2	Intertek	102	1012	1.32
5	prove-out test 2	Intertek	165	300	2.26
6	prove-out test 3	SwRI	18	300	1.15
7	prove-out test 3	SwRI	20	300	1.50
8	prove-out test 1	ExxonMobil	3109	300	1.53
9	prove-out test 1	Lubrizol	347	300	1.10
10	prove-out test 2	Lubrizol	347	1012	1.46
11	precision matrix test 1	Intertek	100	1012	1.55
12	precision matrix test 1	Intertek	101	300	1.78
13	precision matrix test 1	Intertek	102	1011	1.80
14	prove-out test 2	ExxonMobil	3109	1012	1.31
15	precision matrix test 1	SwRI	20	1012	0.71
16	precision matrix test 2	Intertek	100	1011	2.05
17	precision matrix test 2	Intertek	101	1012	1.70
18	precision matrix test 2	Intertek	102	1012	0.82
19	precision matrix test 1	SwRI	18	300	1.95
20	prove-out test 1	SwRI	19	300	0.89
21	precision matrix test 2	SwRI	20	300	1.27

PROVE-OUT AND PRECISION MATRIX VOLUME LOSS PLOT



PRECISION MATRIX VOLUME LOSS PLOT



TIMELINE



Task	5-Stand Precision Matrix
Complete Test Fuel Blending	DONE
Complete Test Hardware Procurement and Preparation	DONE
Complete Preparation for Prove-out Testing	DONE
Complete Row 1 Prove-out Tests	DONE
Complete Row 2 Prove-out Tests	DONE
Complete Procedure Update	DONE
Complete Precision Matrix Lab Audits	DONE
Seq. IV Surveillance Panel Meeting	DONE
Complete 5 ASTM REO 300 Prove-out Tests	DONE
Complete Preparation for Precision Matrix	DONE
Seq. IV Surveillance Panel Conference Call - 10/12/17	DONE
Seq. IV Surveillance Panel Conference Call - 10/16/17	DONE
Restart Precision Matrix (Start Row 1 Tests)	DONE
Complete Row 1 Precision Matrix Tests	DONE
Complete Row 1 Precision Matrix Operational Review	DONE
Complete Precision Matrix	12/15/2017
Complete Final Precision Matrix Operational Review	12/22/2017
Start Statistical Analysis of Precision Matrix	1/2/2018
Complete Statistical Analysis of Precision Matrix	2/2/2018
Complete Development and Approve LTMS	
PCEOCP/AOAP Vote for Test Acceptance	2/8/2018
Stand Calibration Starts	2/9/2018

WILLIAM A BUSCHER III - IVB



(210) 240-8990



william.buscher@intertek.com



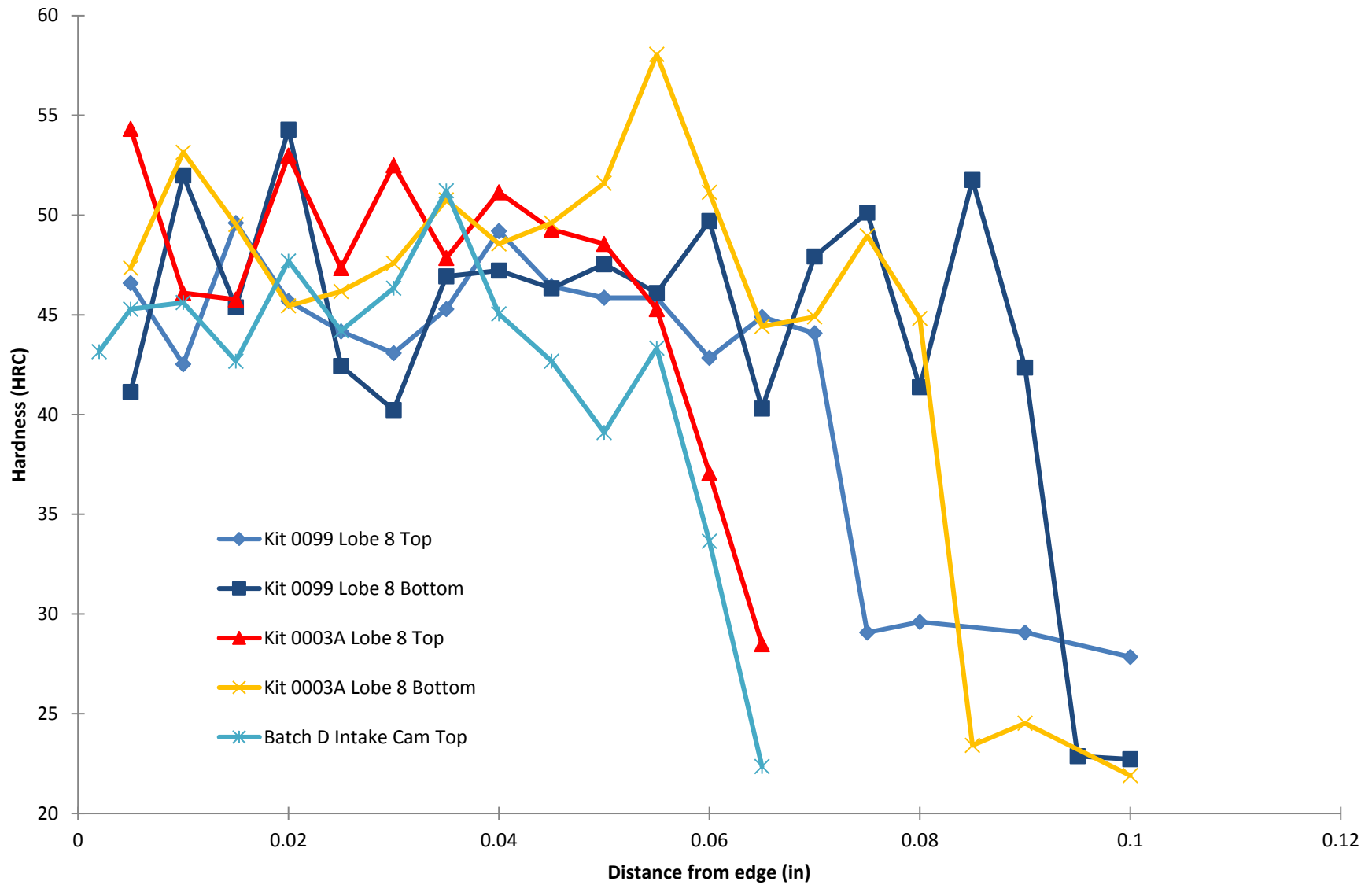
intertek.com/automotive/lubricants-fuel-systems/



intertek

Total Quality. Assured.

Measured Cam Lobe Hardness



Sequence IVB Timeline/Deadlines

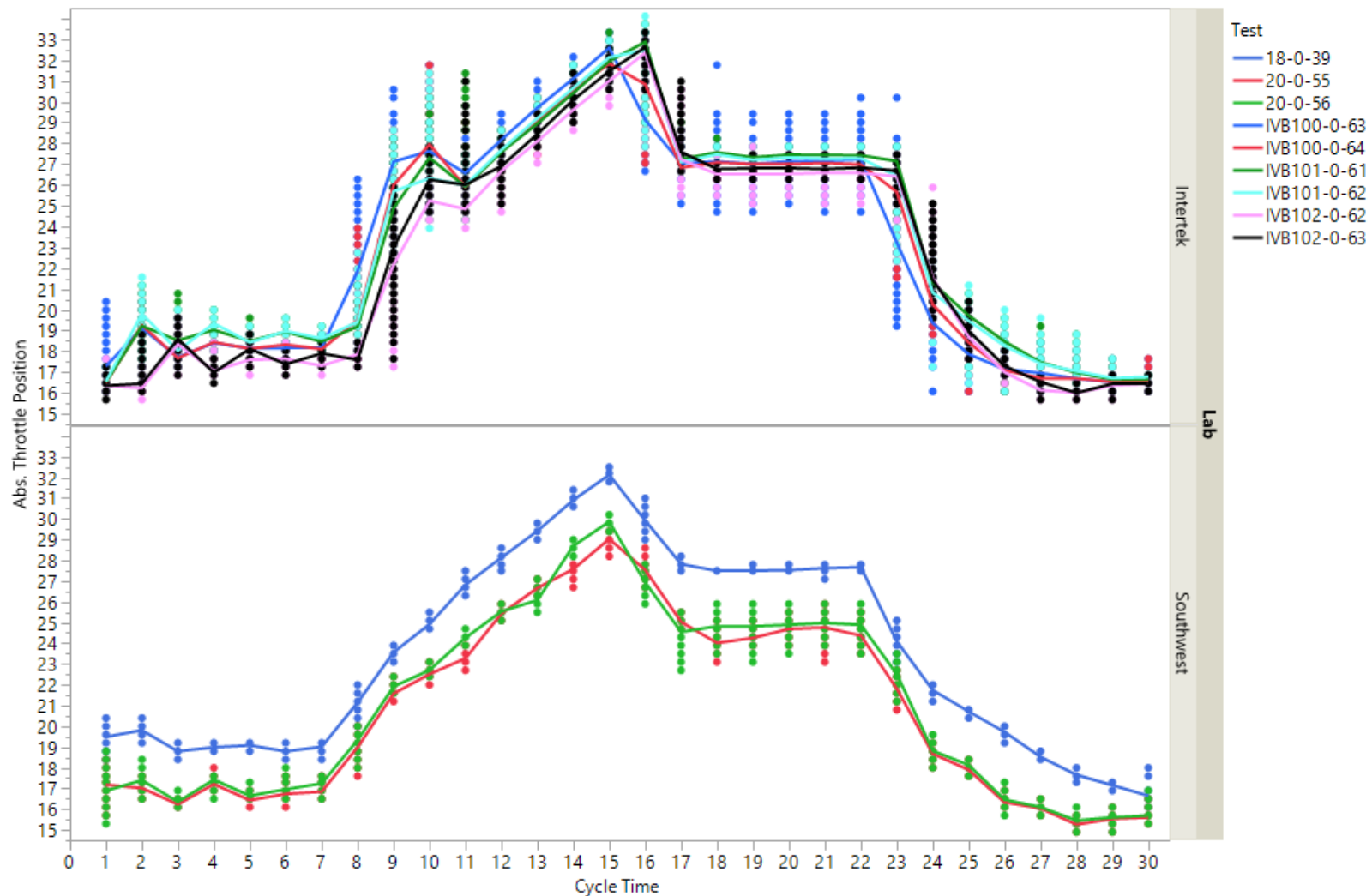
Task	5-Stand Precision Matrix
Complete Test Fuel Blending	DONE
Complete Test Hardware Procurement and Preparation	DONE
Complete Preparation for Prove-out Testing	DONE
Complete Row 1 Prove-out Tests	DONE
Complete Row 2 Prove-out Tests	DONE
Complete Procedure Update	DONE
Complete Precision Matrix Lab Audits	DONE
Seq. IV Surveillance Panel Meeting	DONE
Complete 5 ASTM REO 300 Prove-out Tests	DONE
Complete Preparation for Precision Matrix	DONE
Seq. IV Surveillance Panel Conference Call - 10/12/17	DONE
Seq. IV Surveillance Panel Conference Call - 10/16/17	DONE
Restart Precision Matrix (Start Row 1 Tests)	DONE
Complete Row 1 Precision Matrix Tests	DONE
Complete Row 1 Precision Matrix Operational Review	DONE
Complete Precision Matrix	12/11/2017
Complete Final Precision Matrix Operational Review	12/18/2017
Start Statistical Analysis of Precision Matrix	12/19/2017
Complete Statistical Analysis of Precision Matrix	1/19/2018
Seq. IV Surveillance Panel Meeting: Review Statistical Analysis	1/23/2018
Seq. IV Surveillance Panel Meeting: Approve LTMS	1/24/2018
PCEOCP/AOAP Vote for Test Acceptance	2/8/2018
Stand Calibration Starts	2/9/2018

IVB Operational Data Review 9 Matrix Tests

Prepared by: Kevin O'Malley

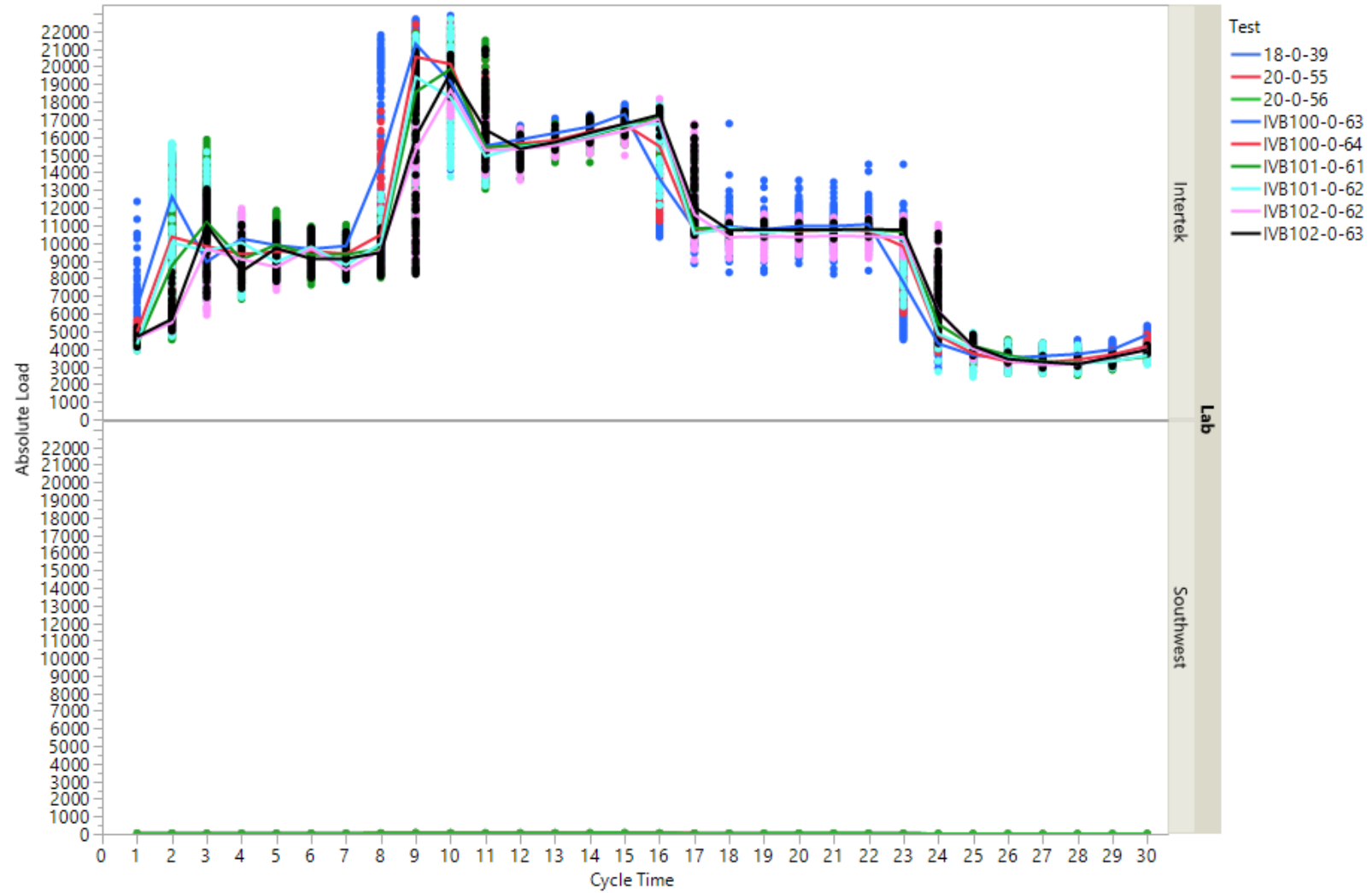
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Graph Builder



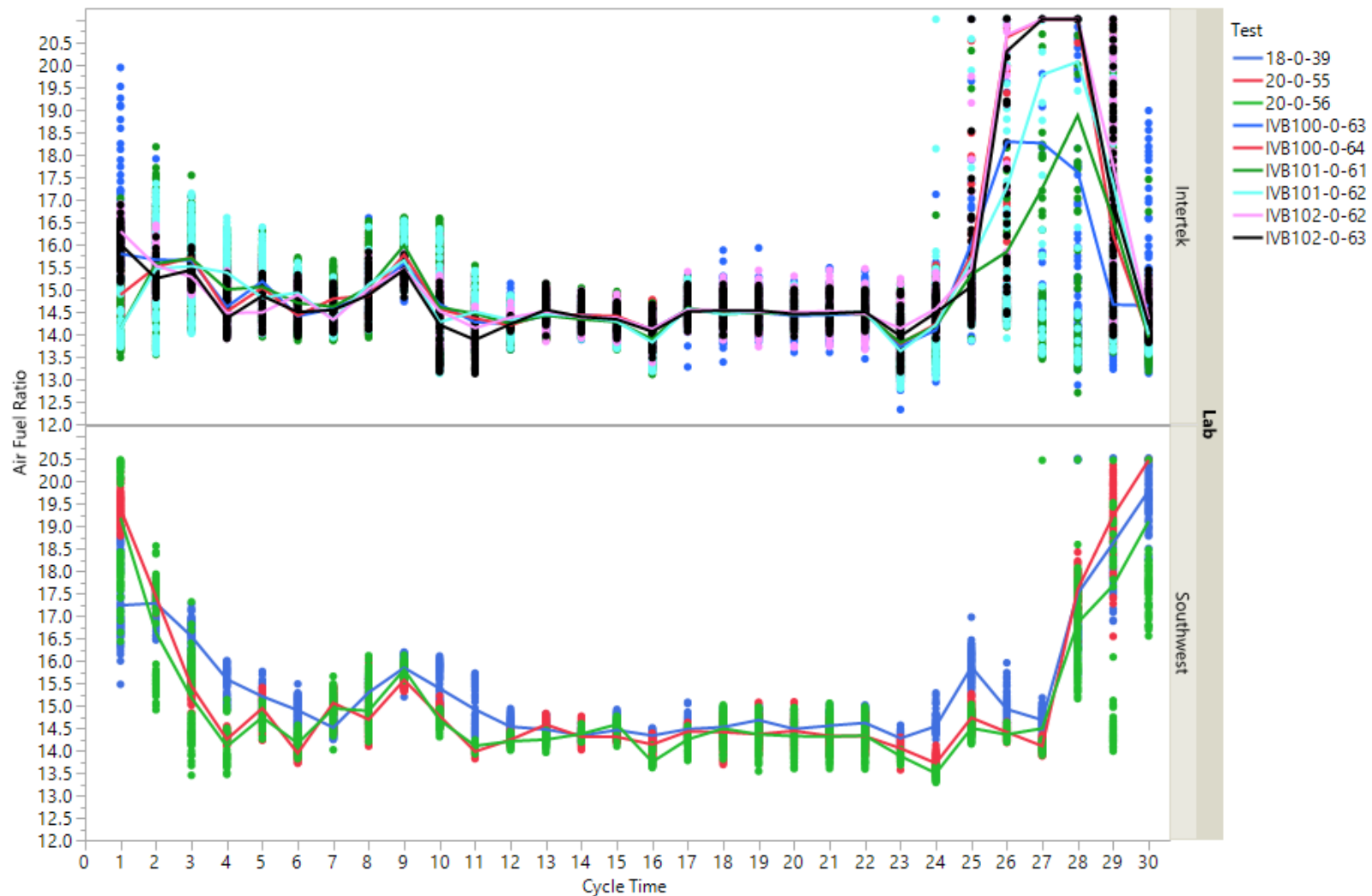
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Graph Builder



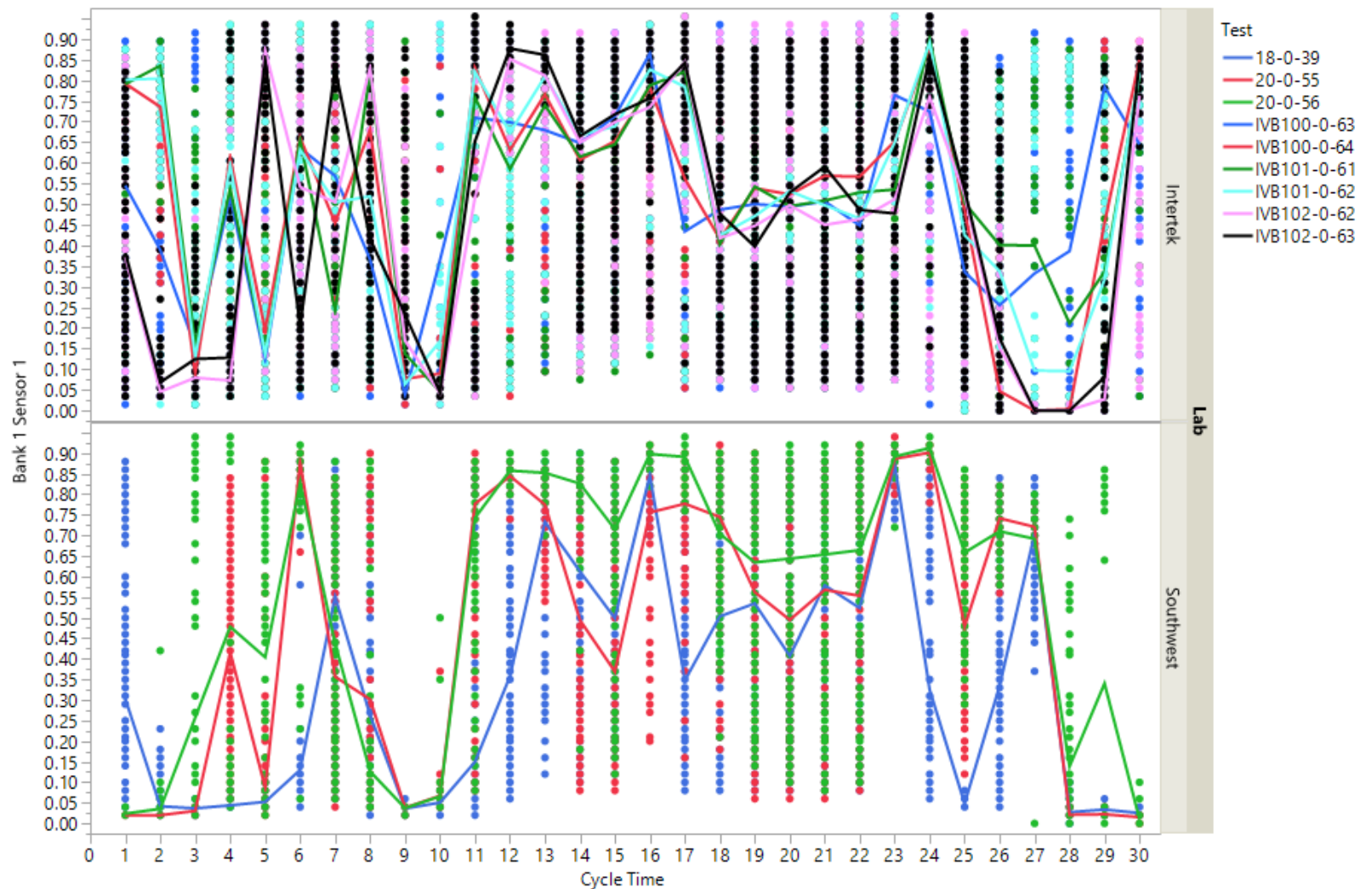
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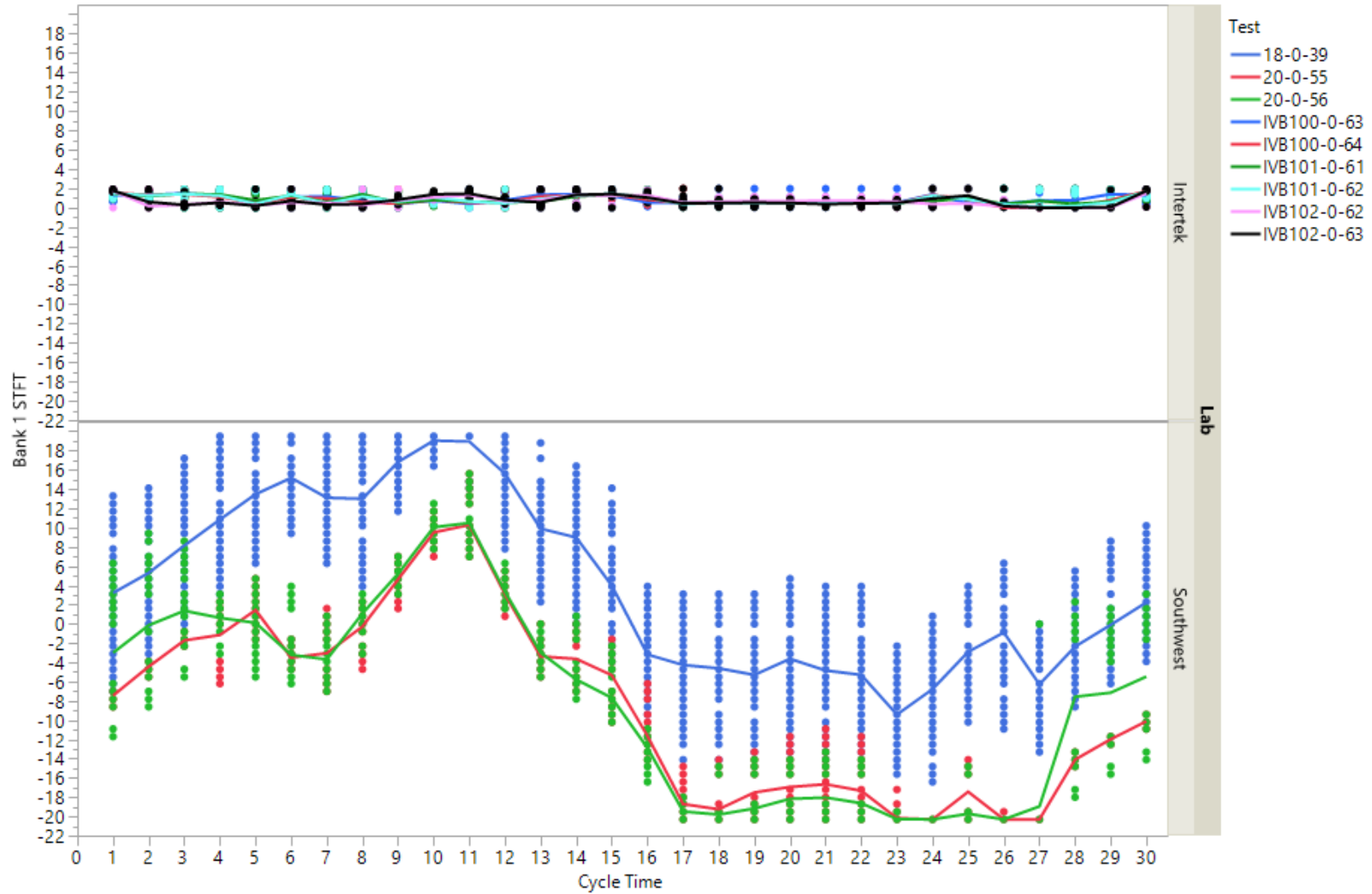
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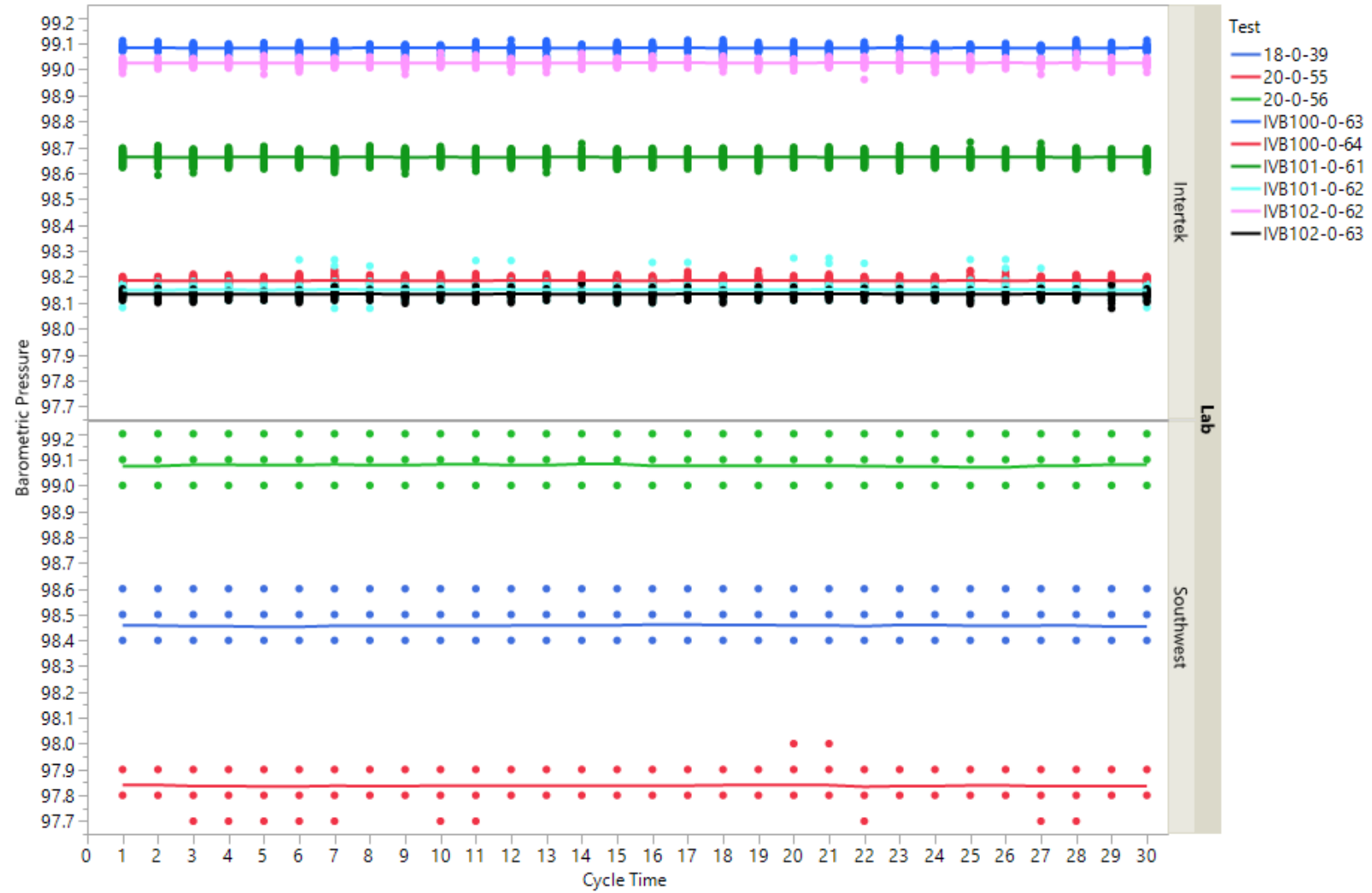
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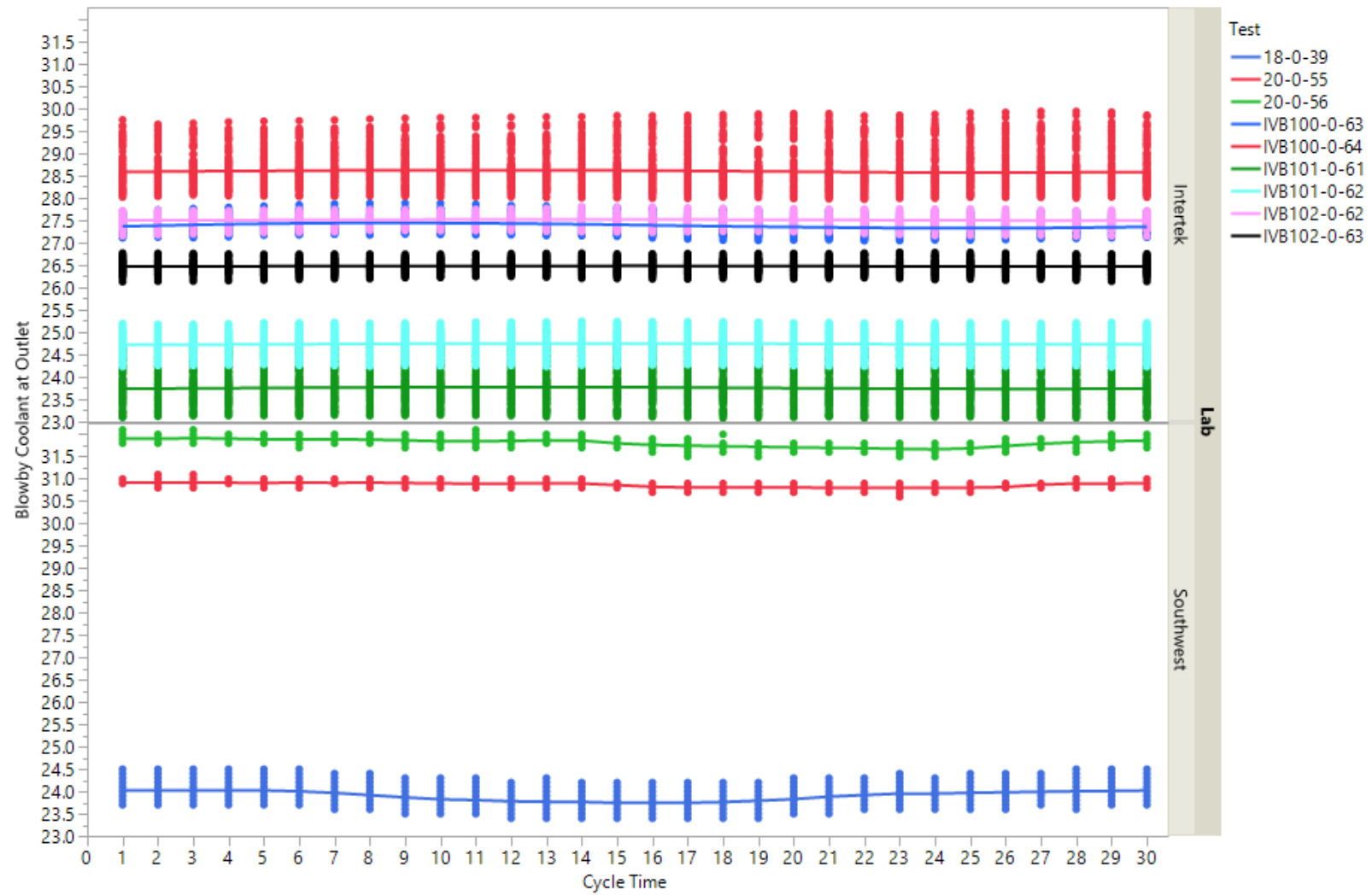
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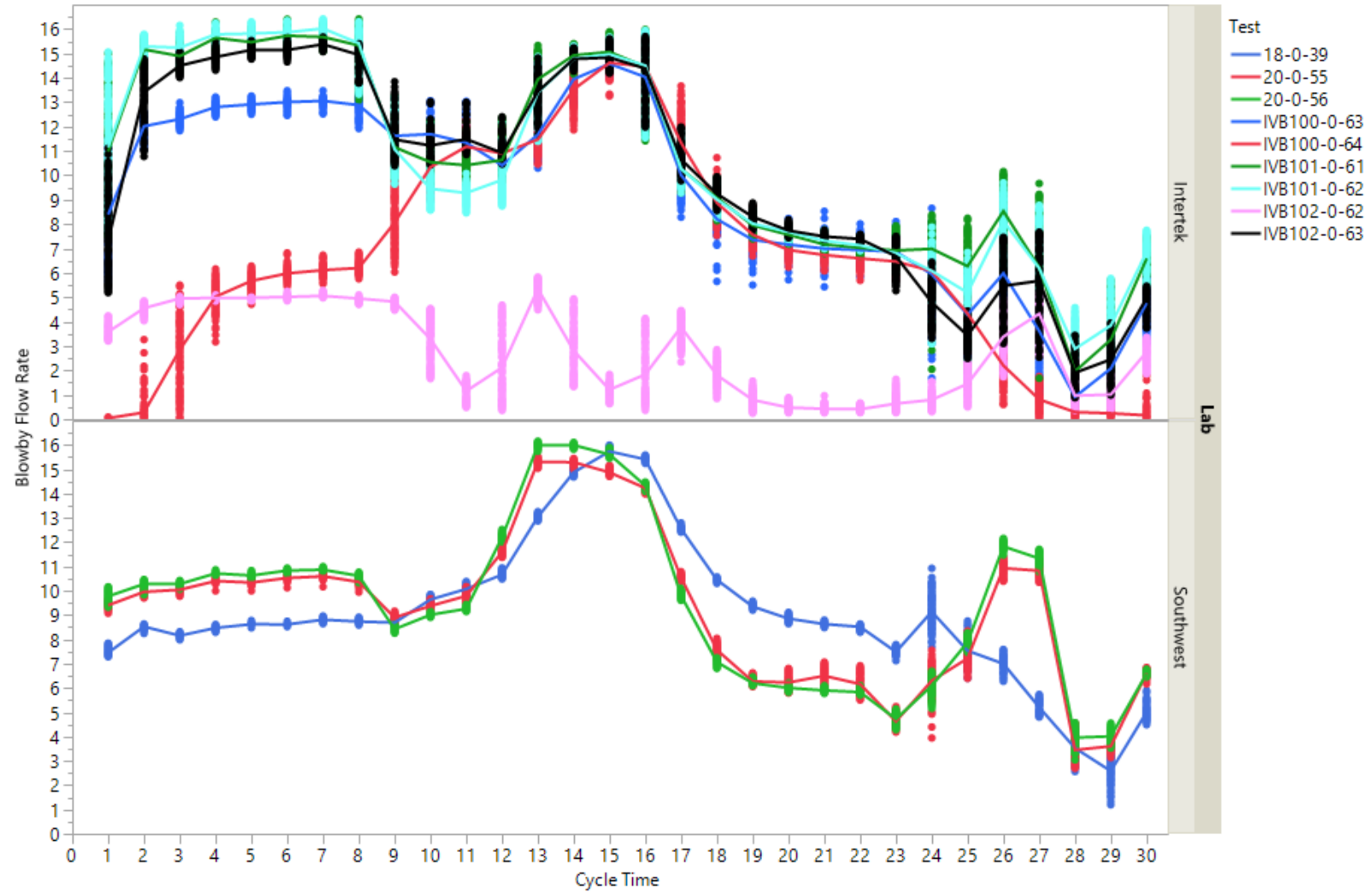
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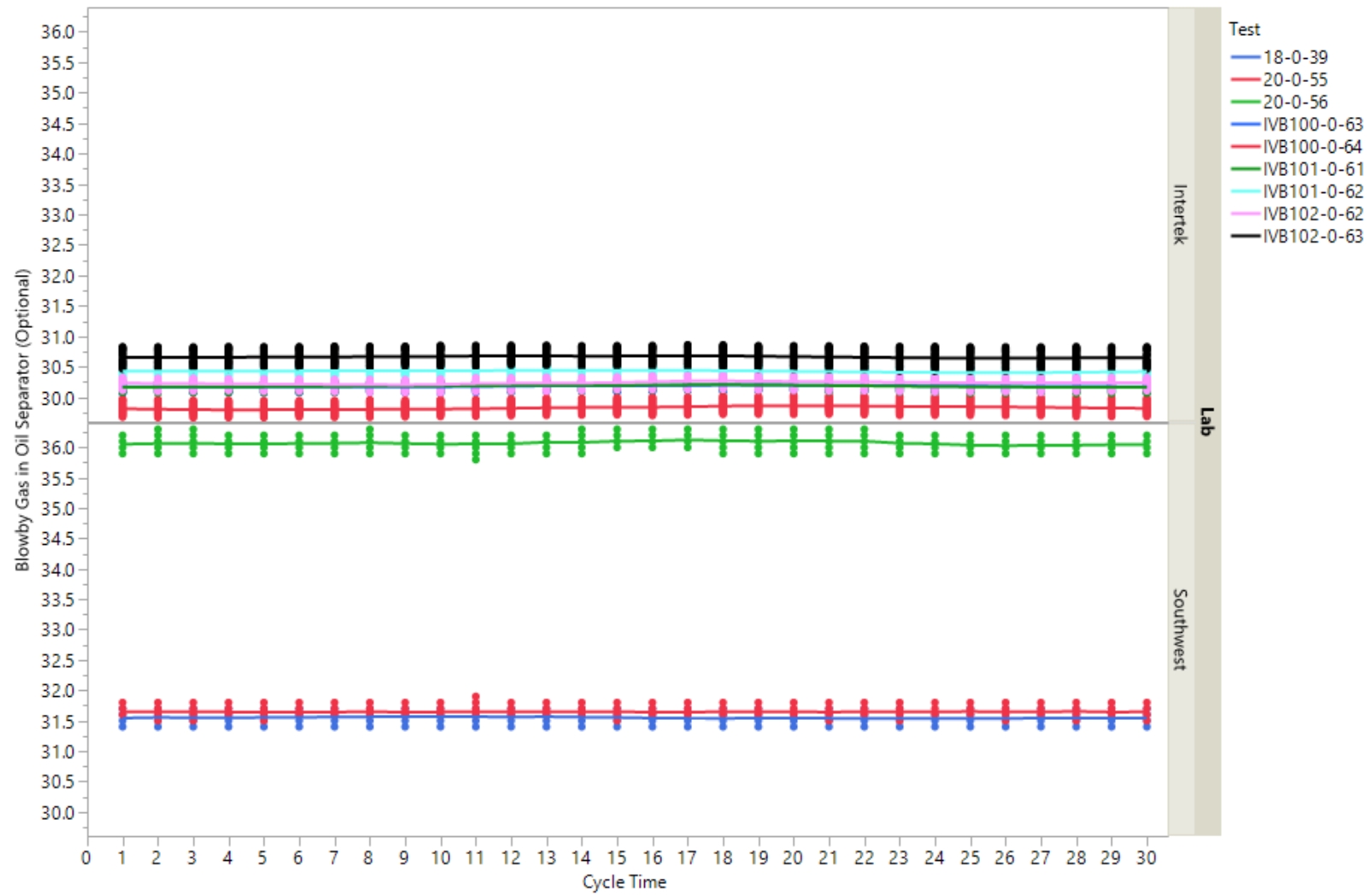
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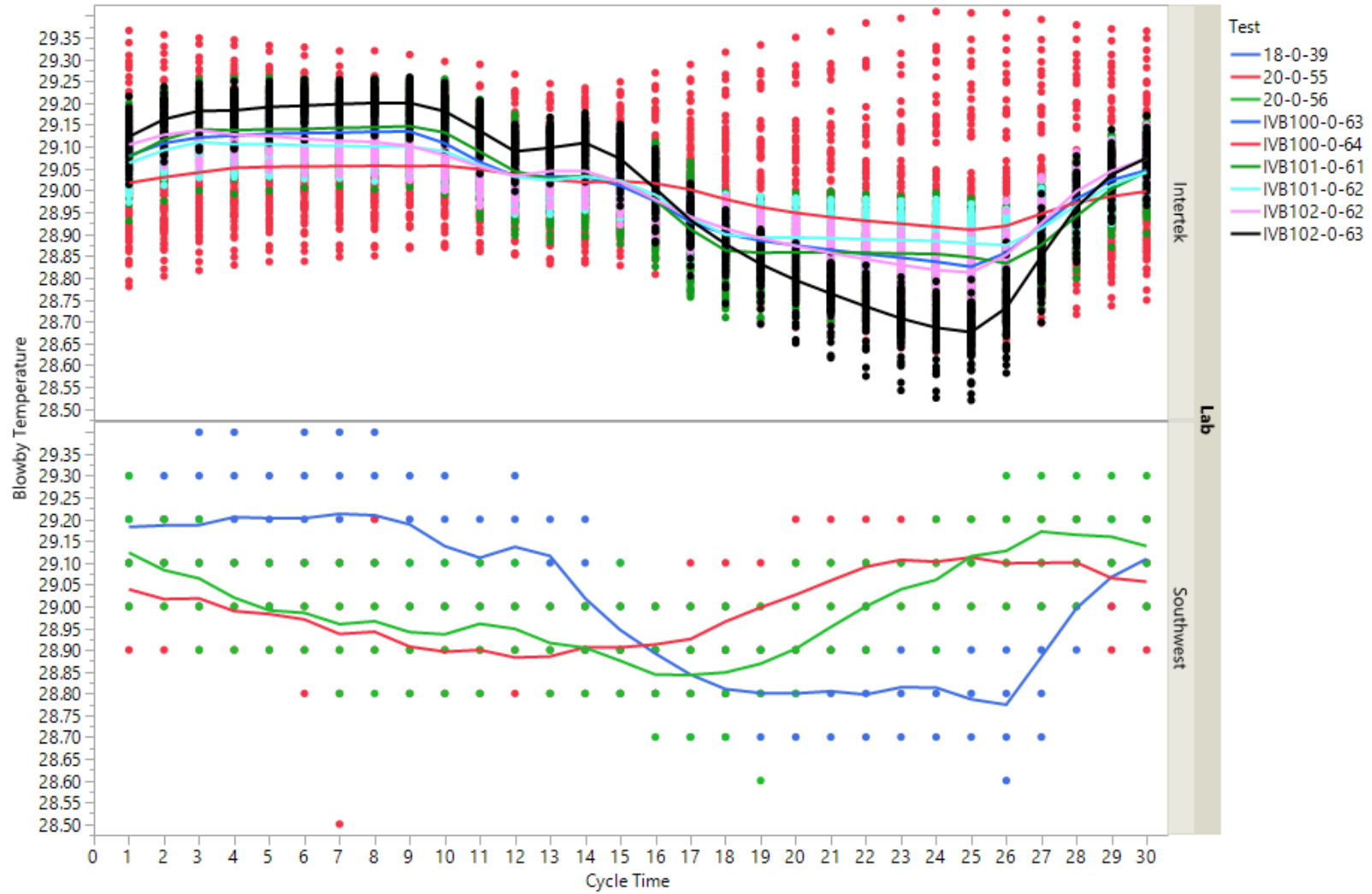
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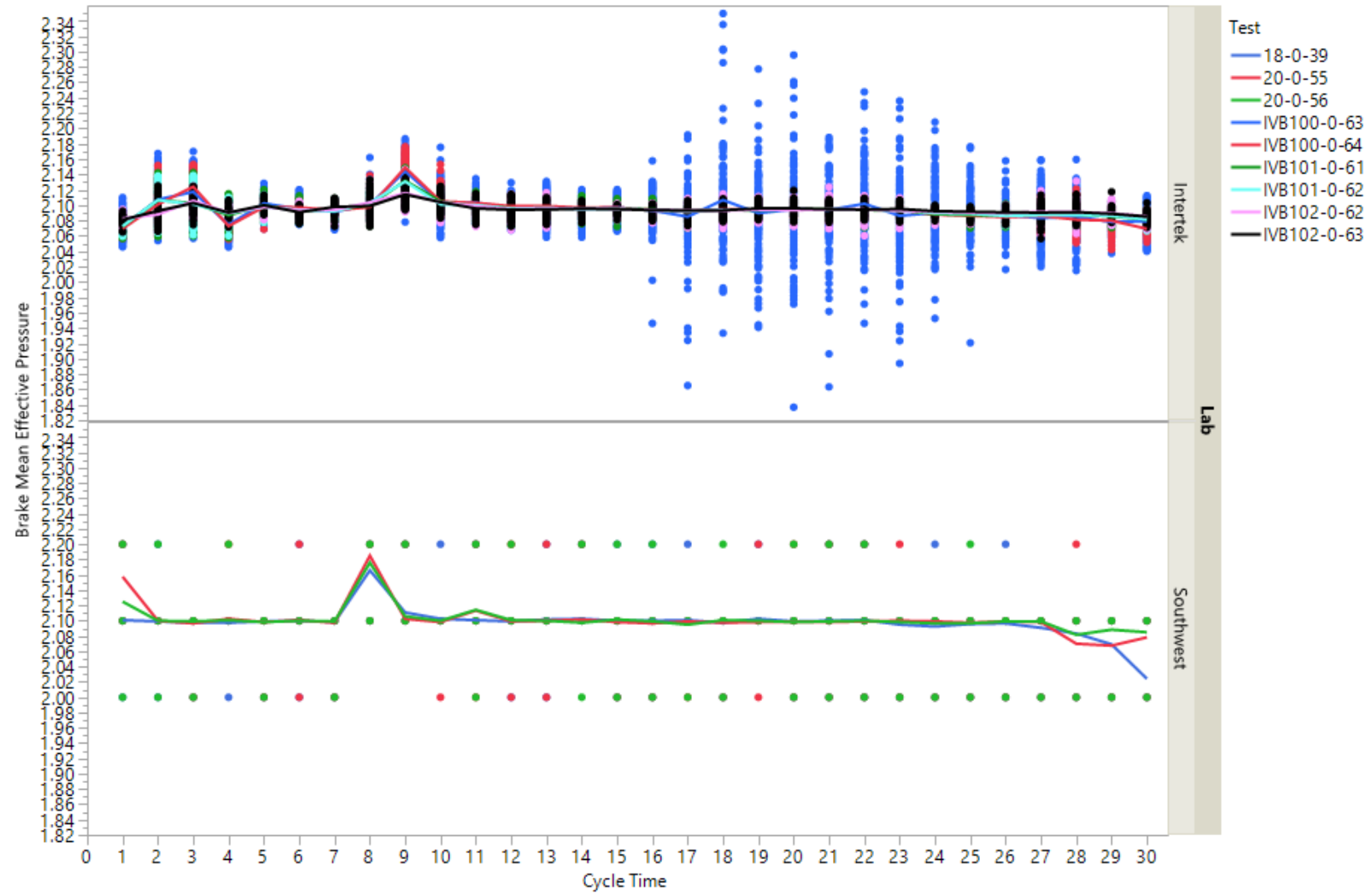
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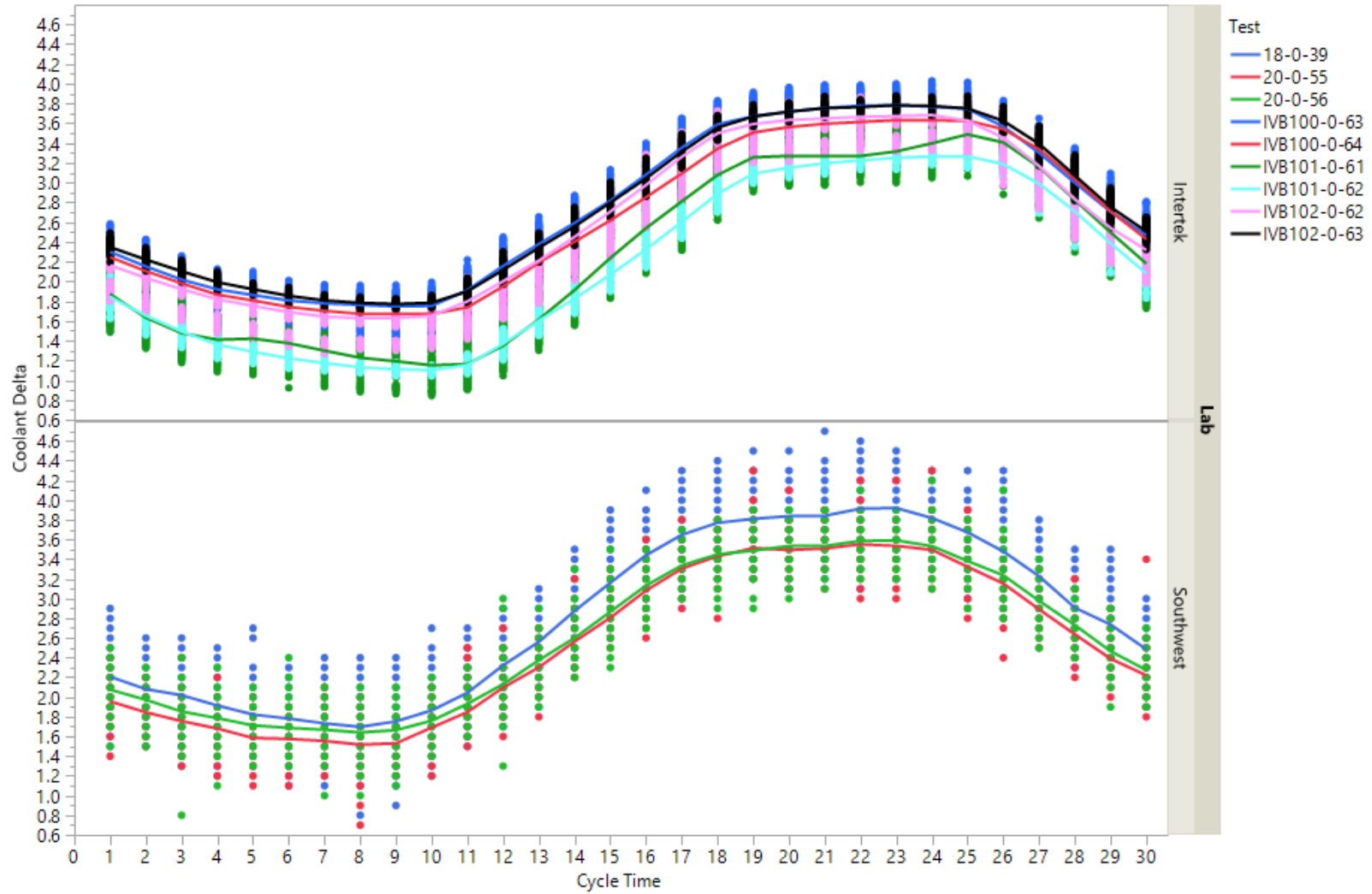
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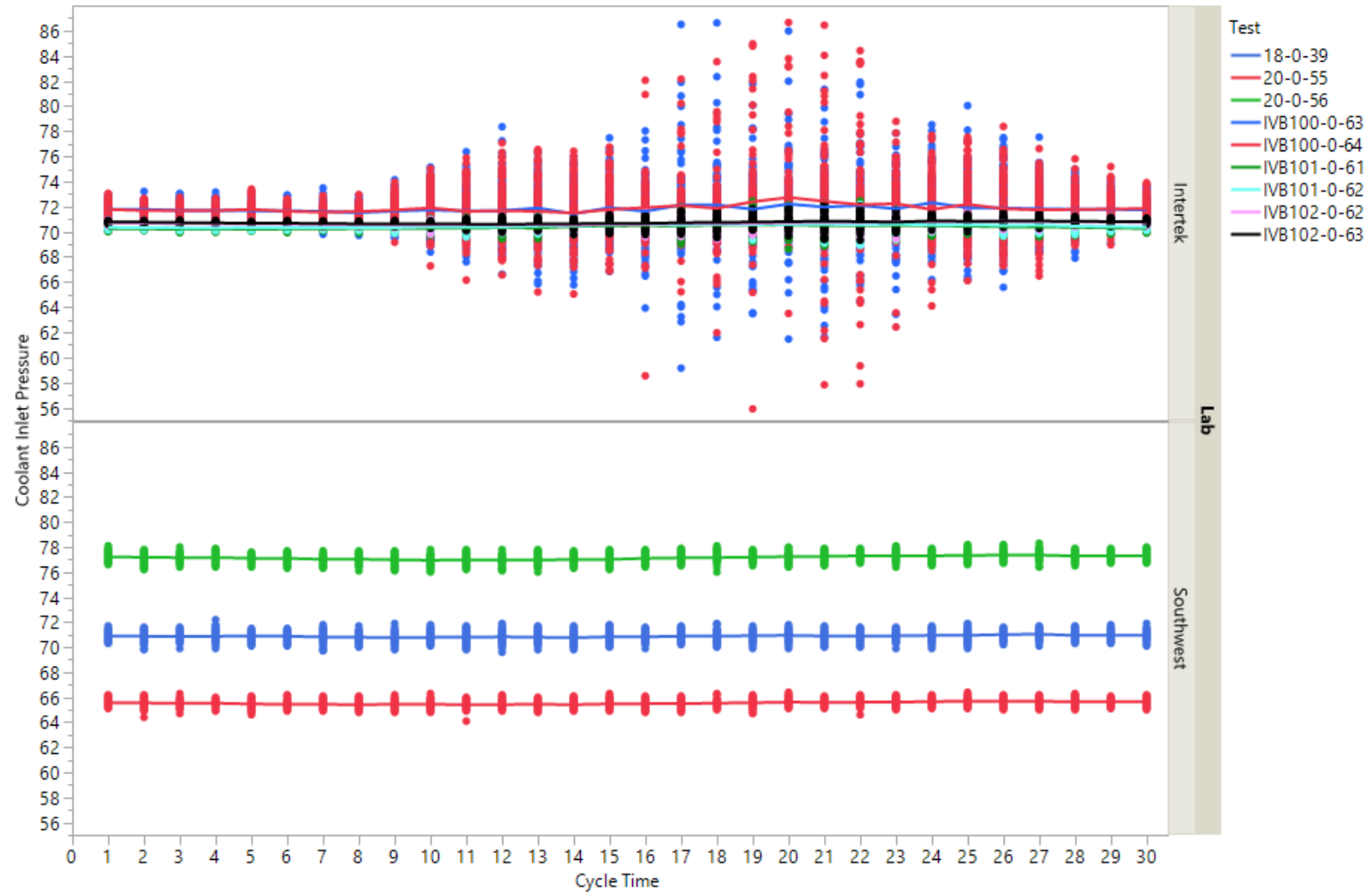
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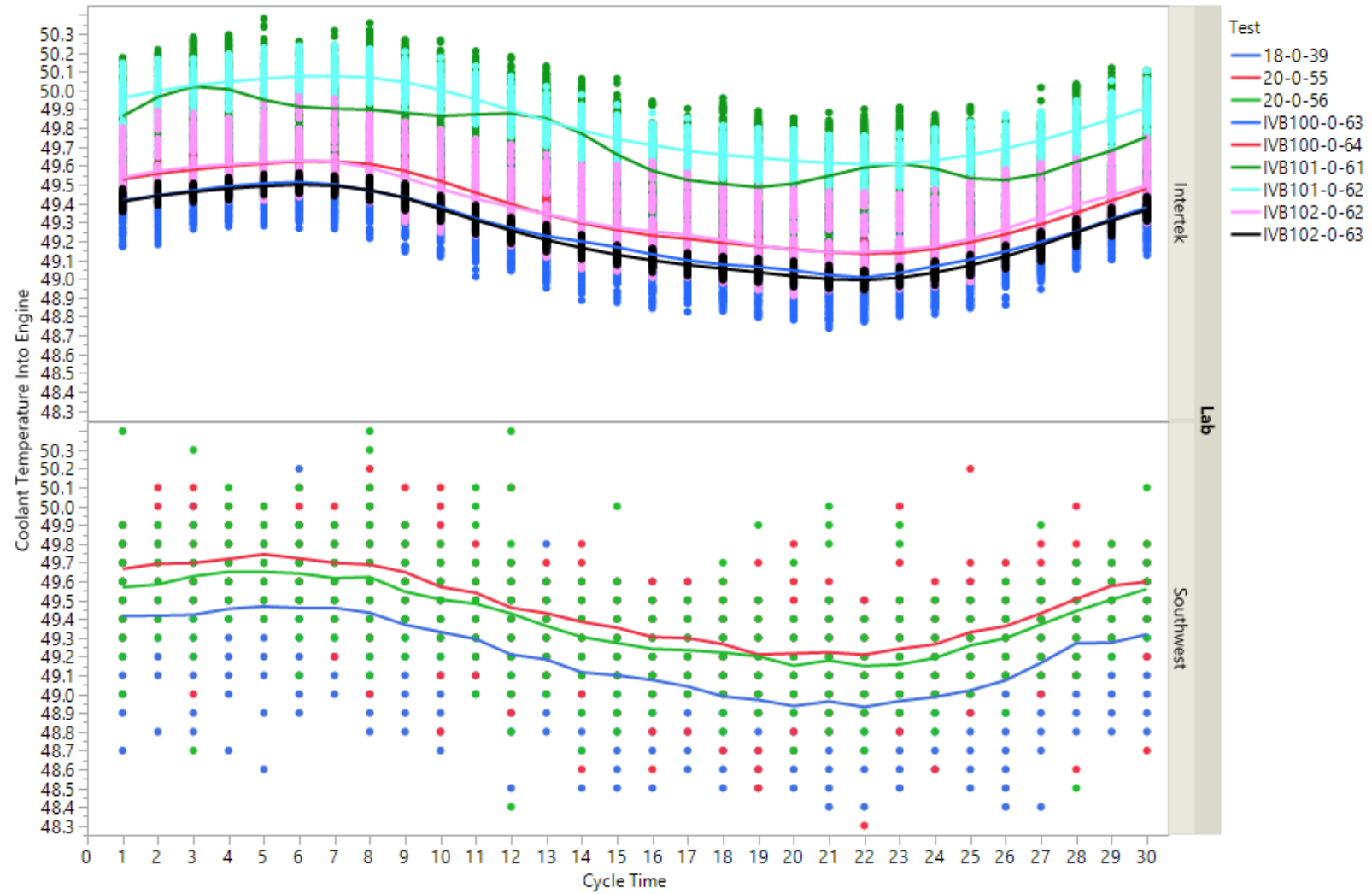
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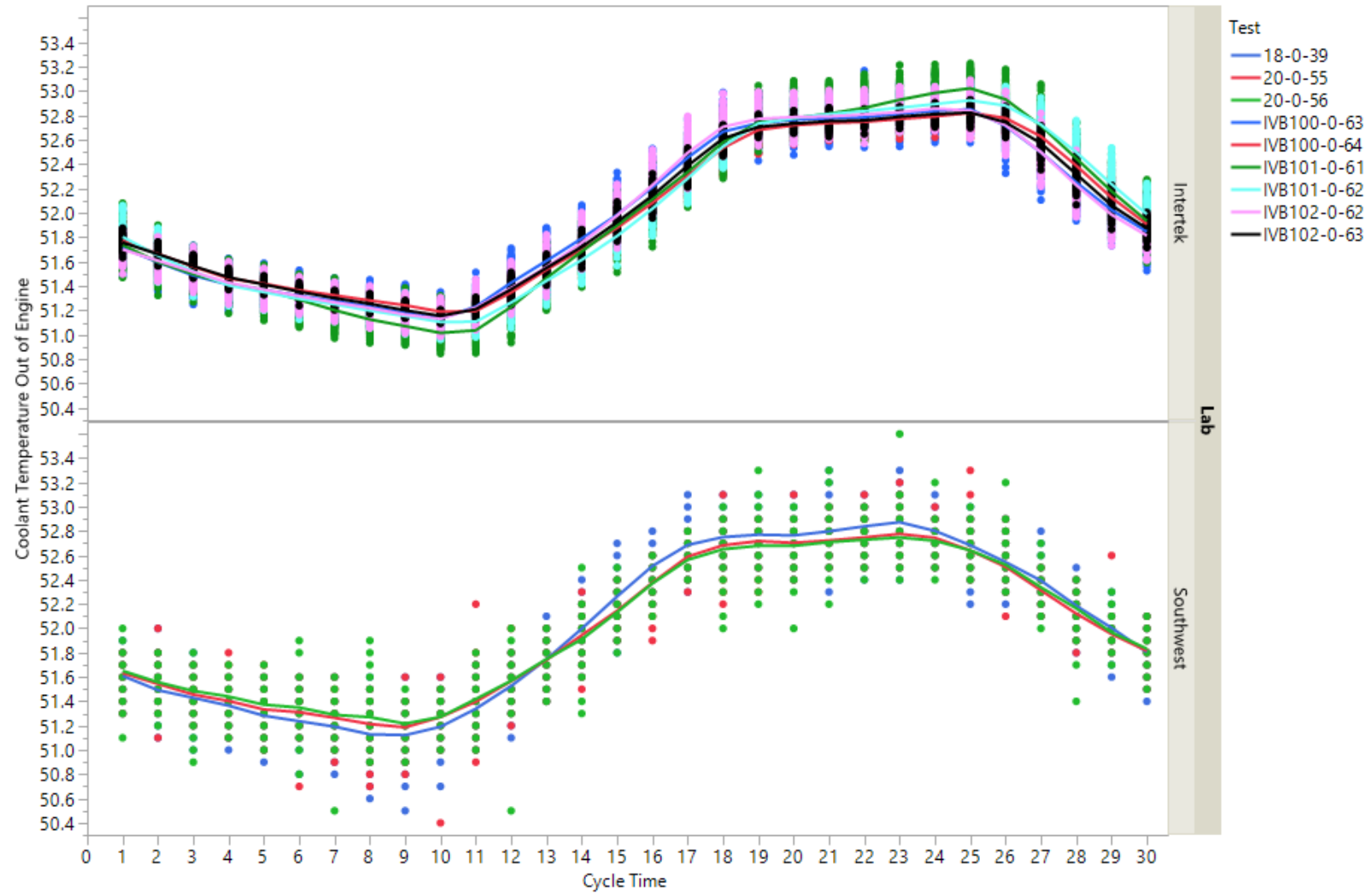
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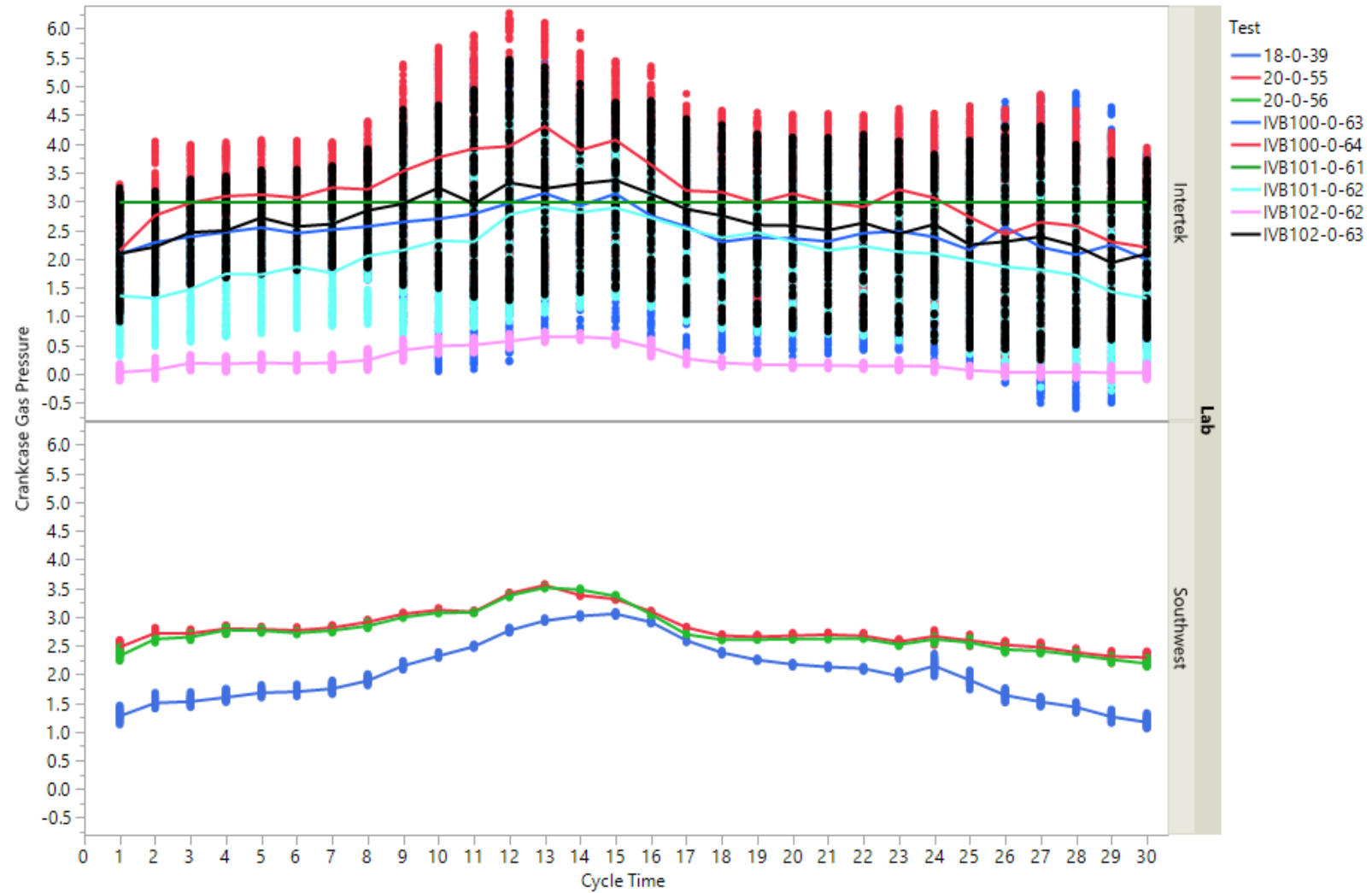
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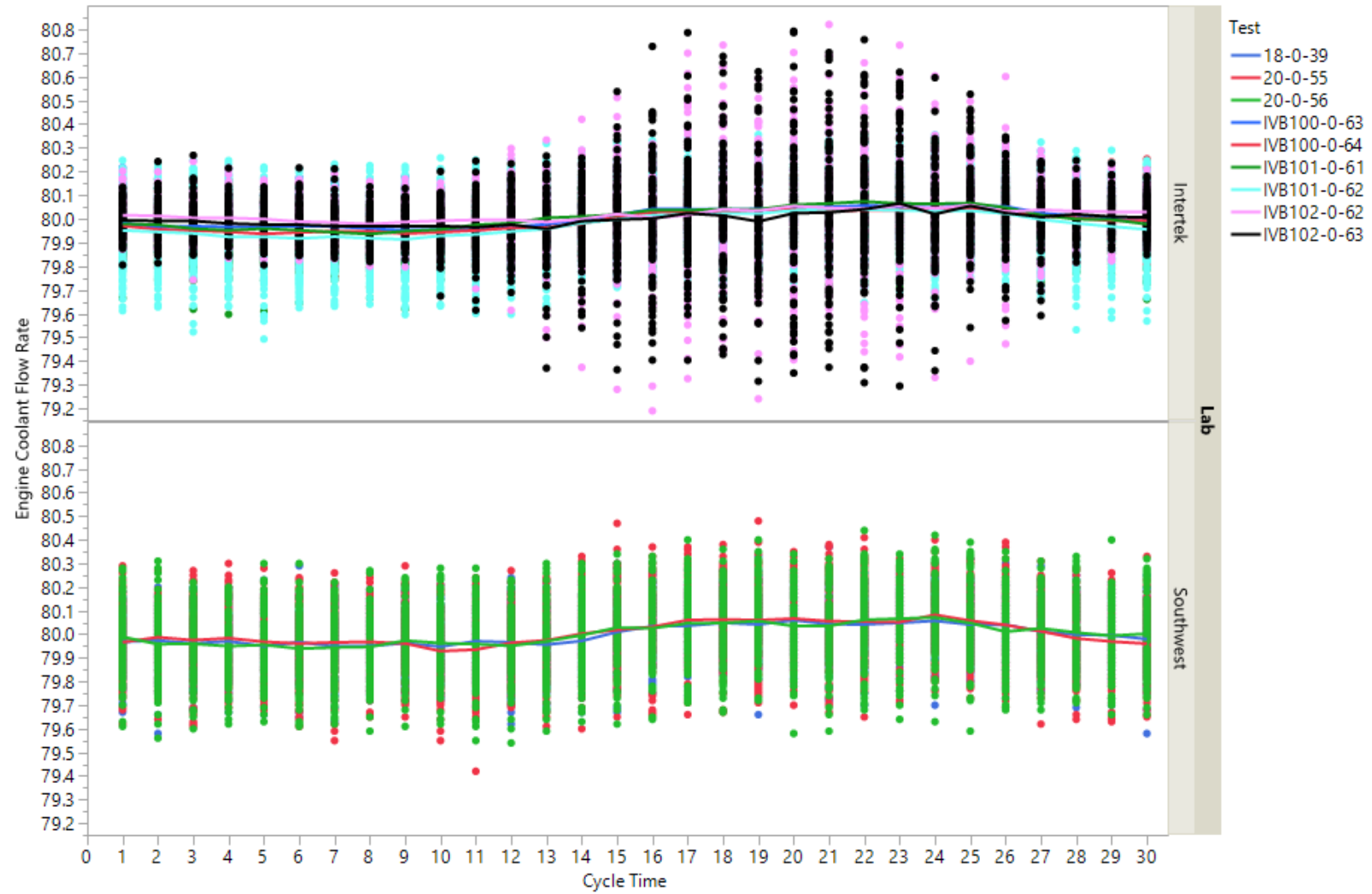
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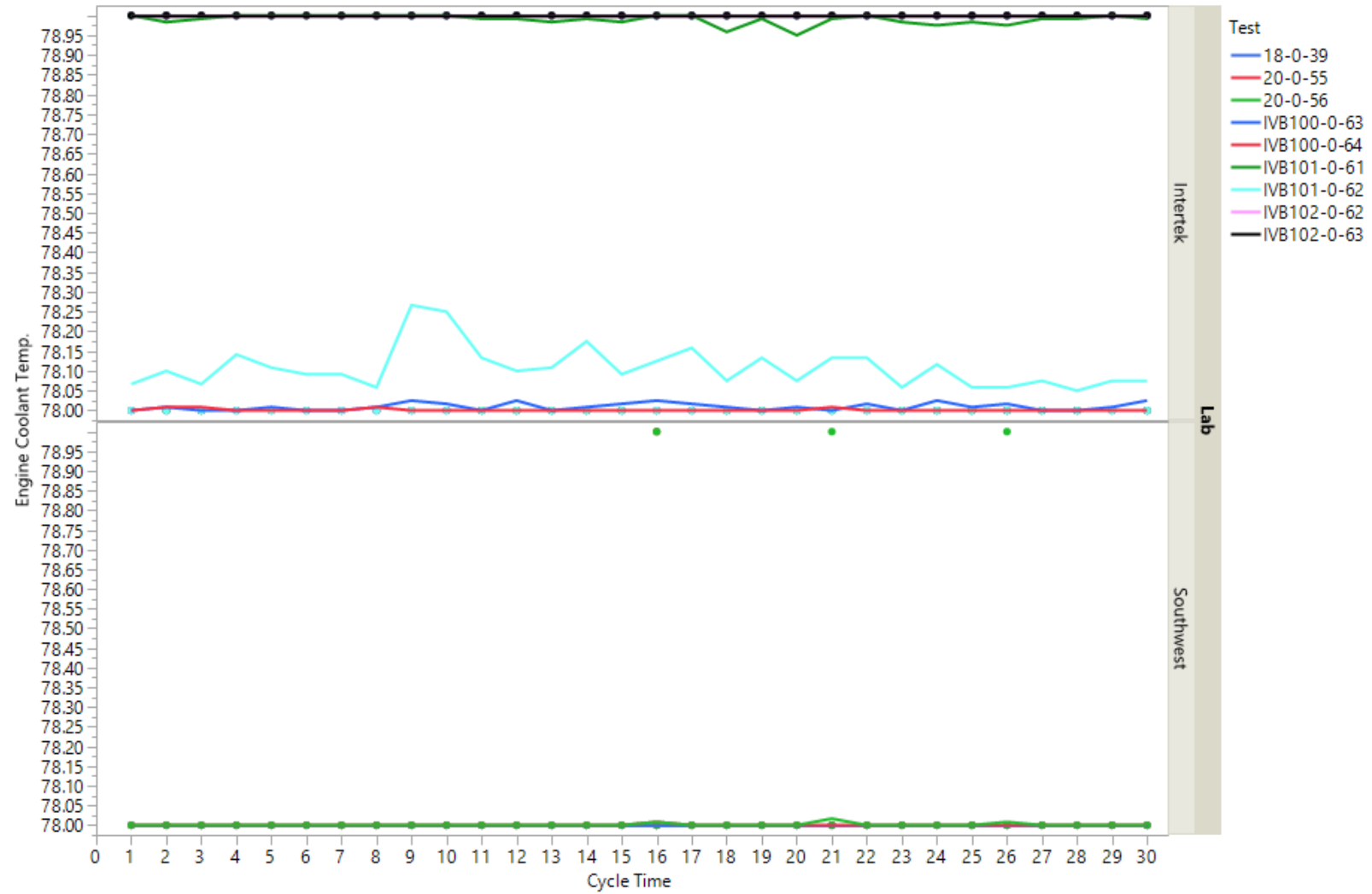
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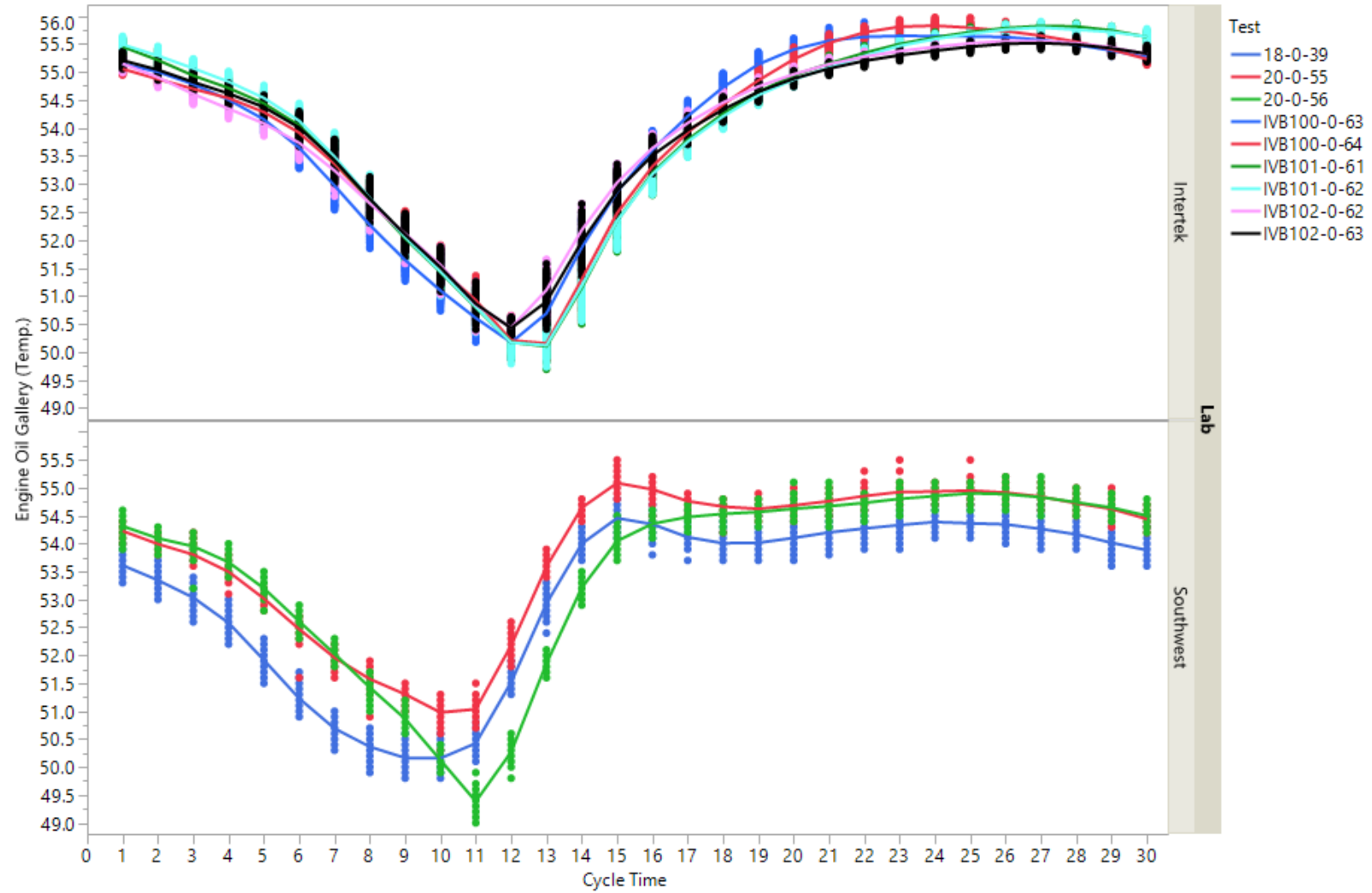
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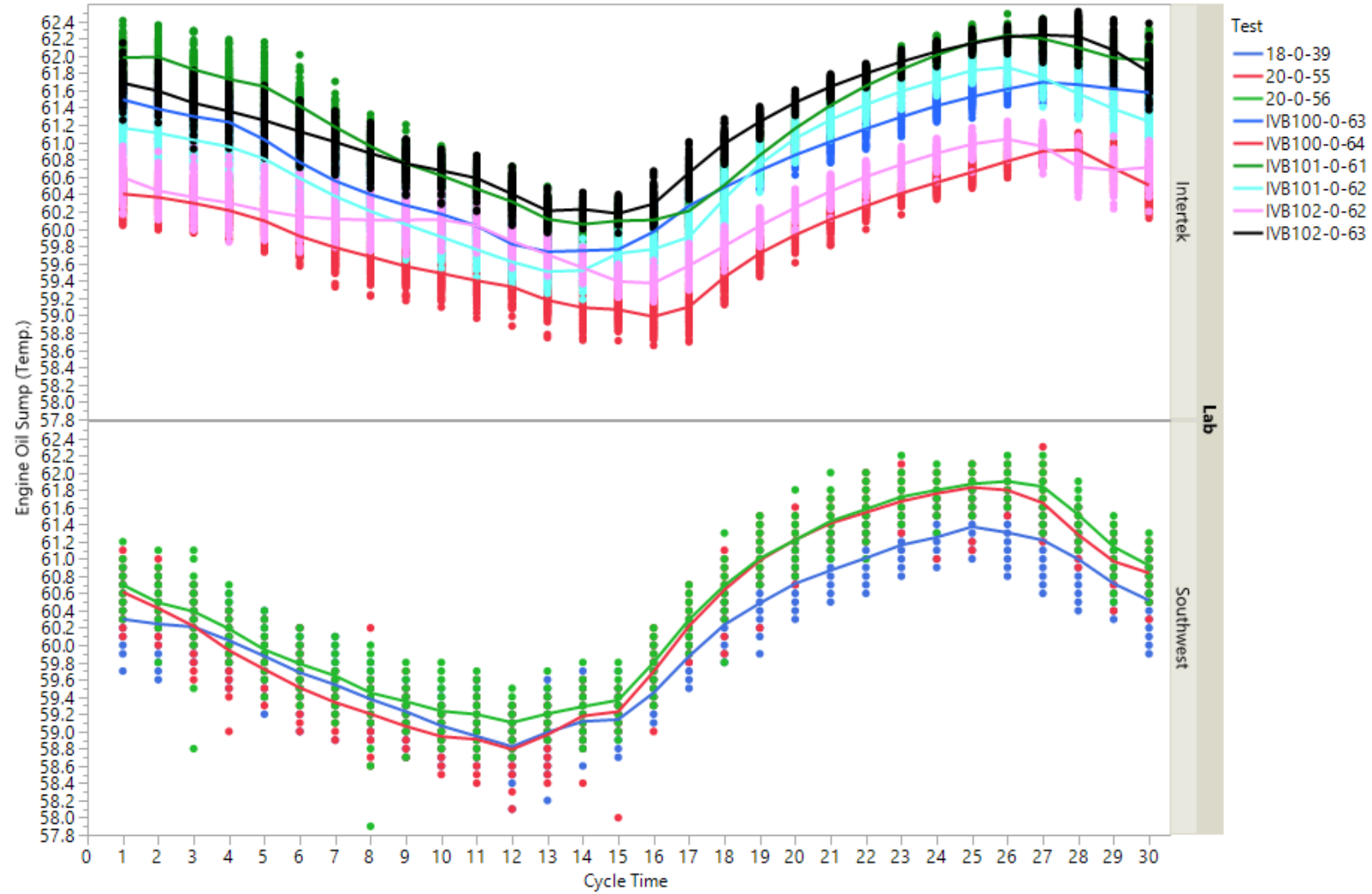
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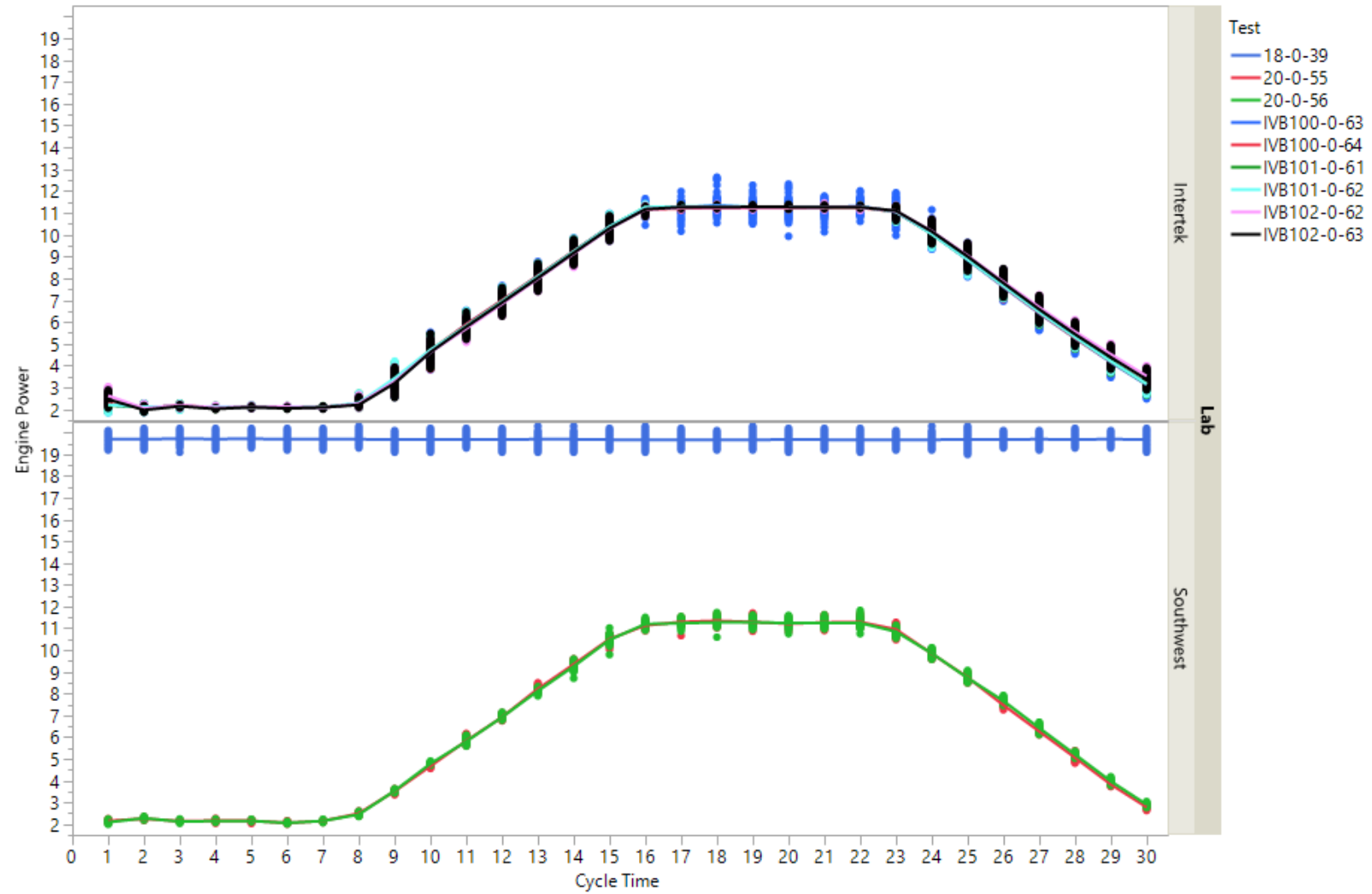
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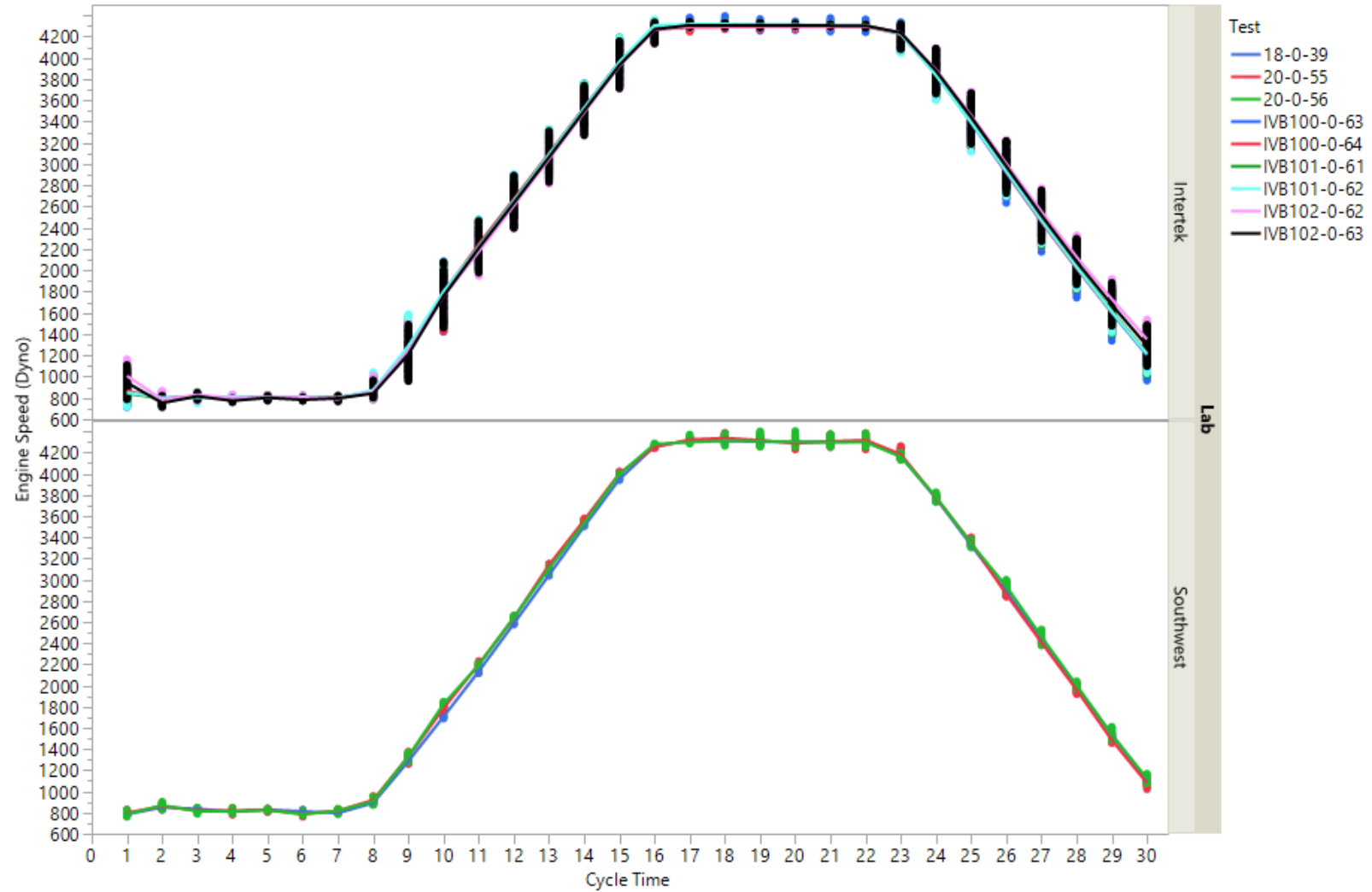
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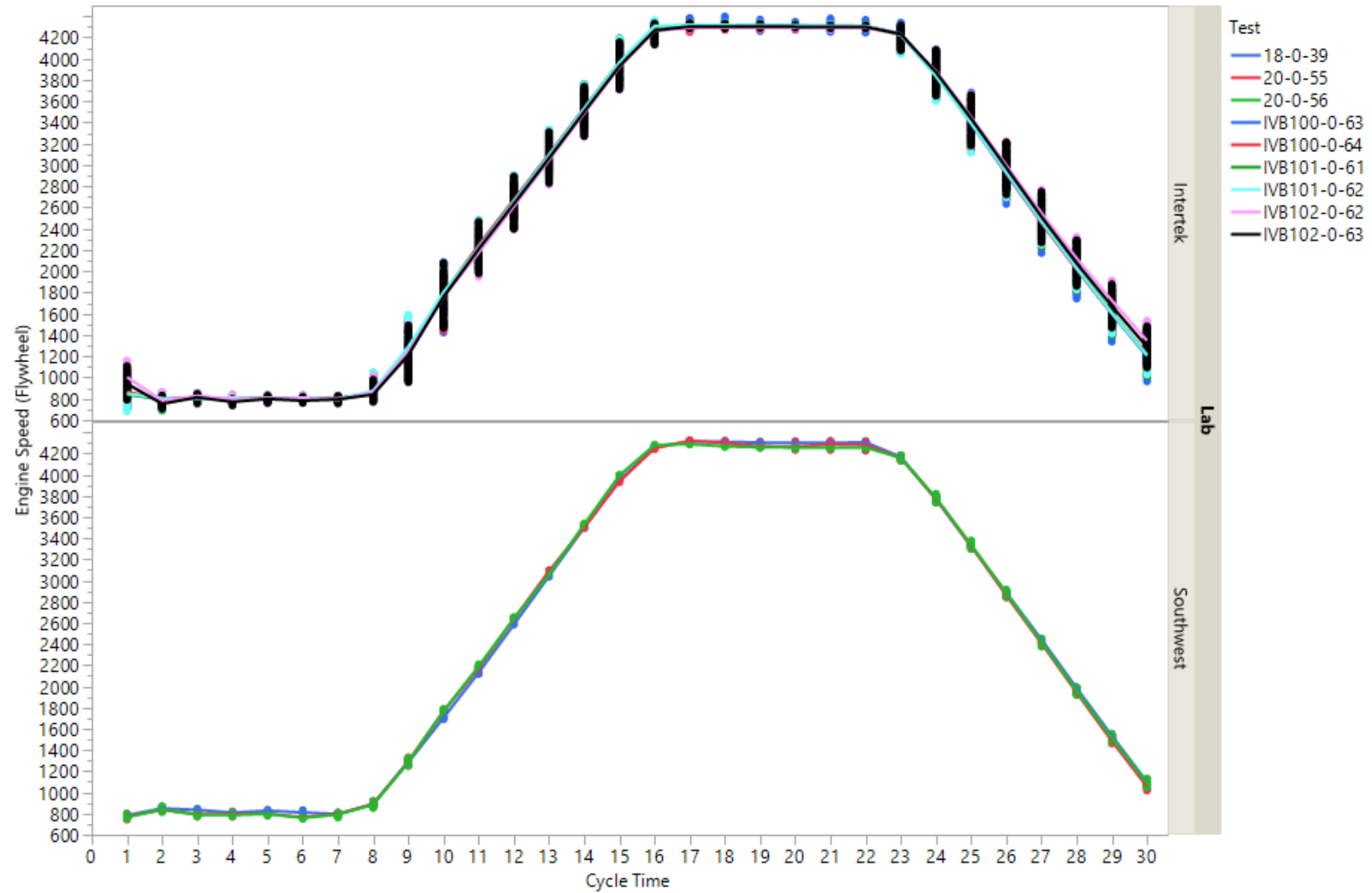
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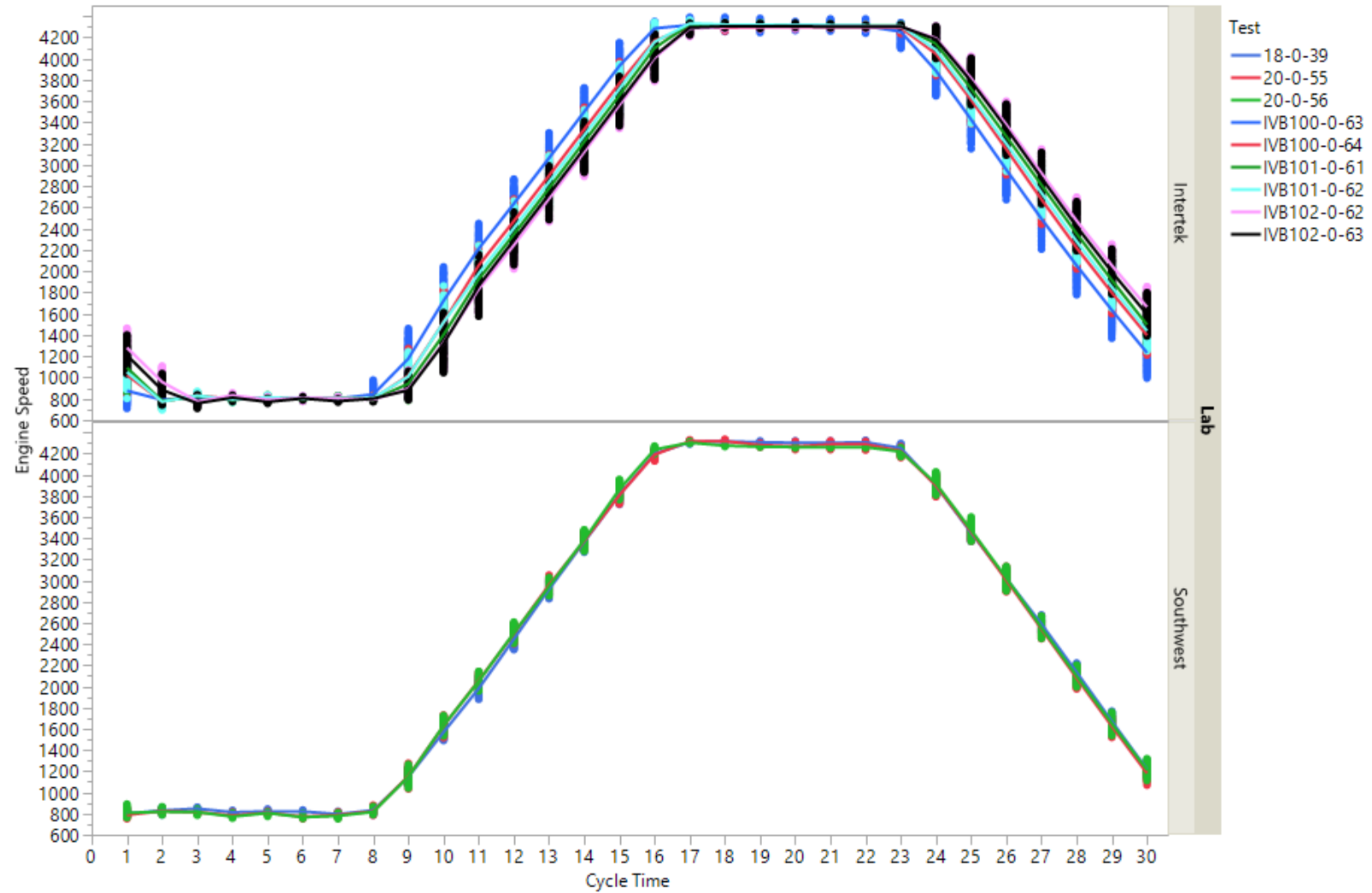
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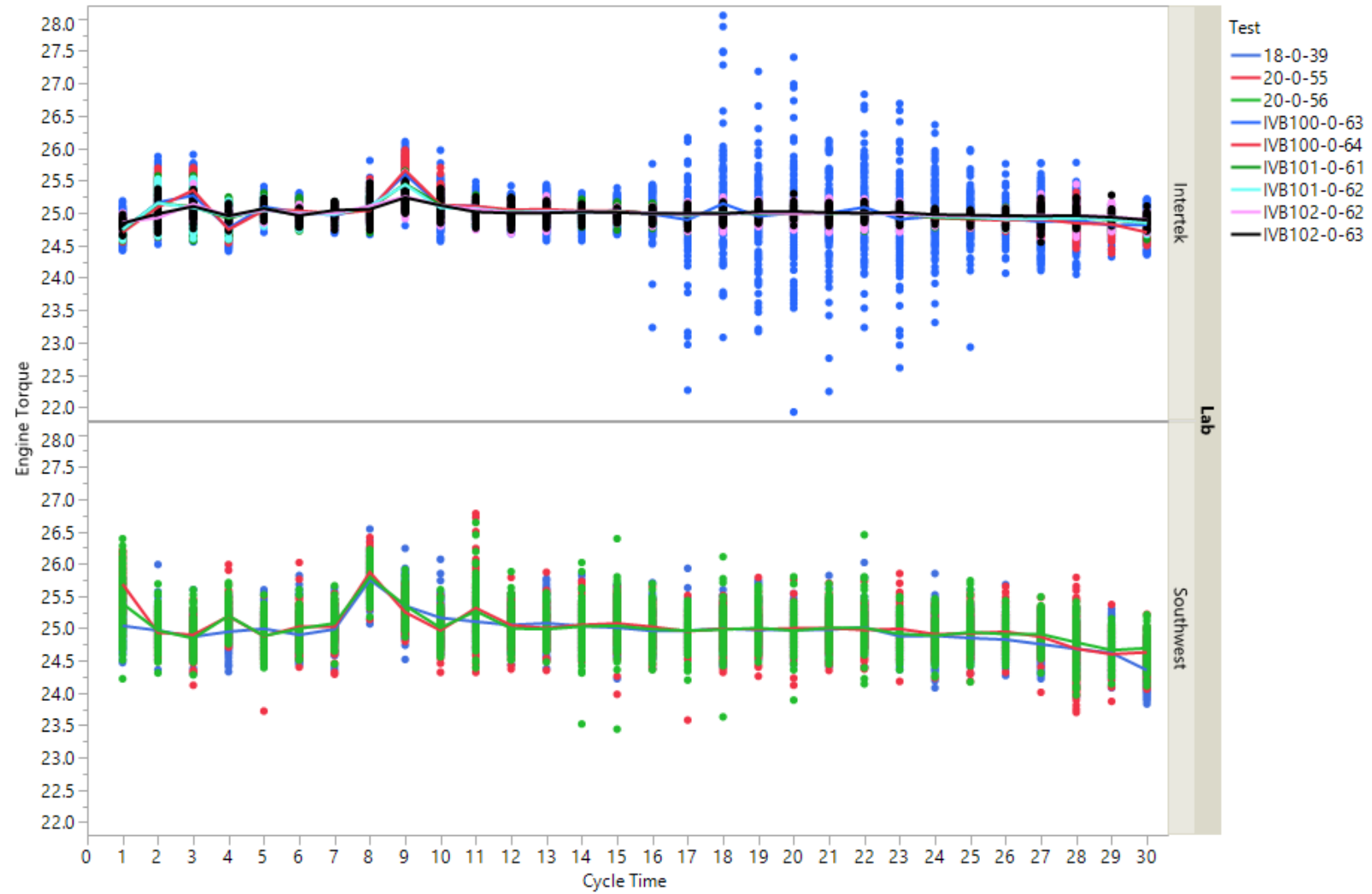
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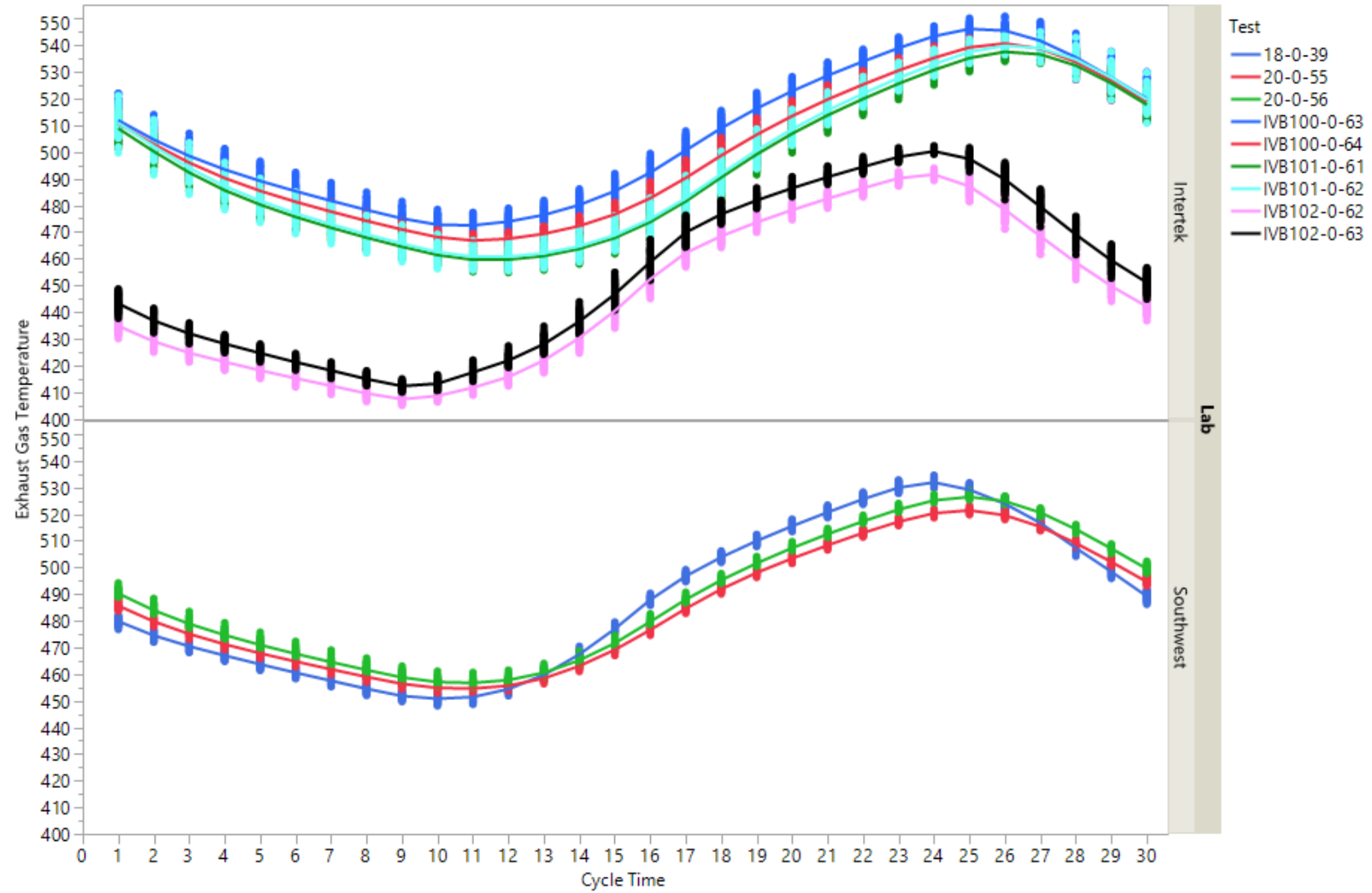
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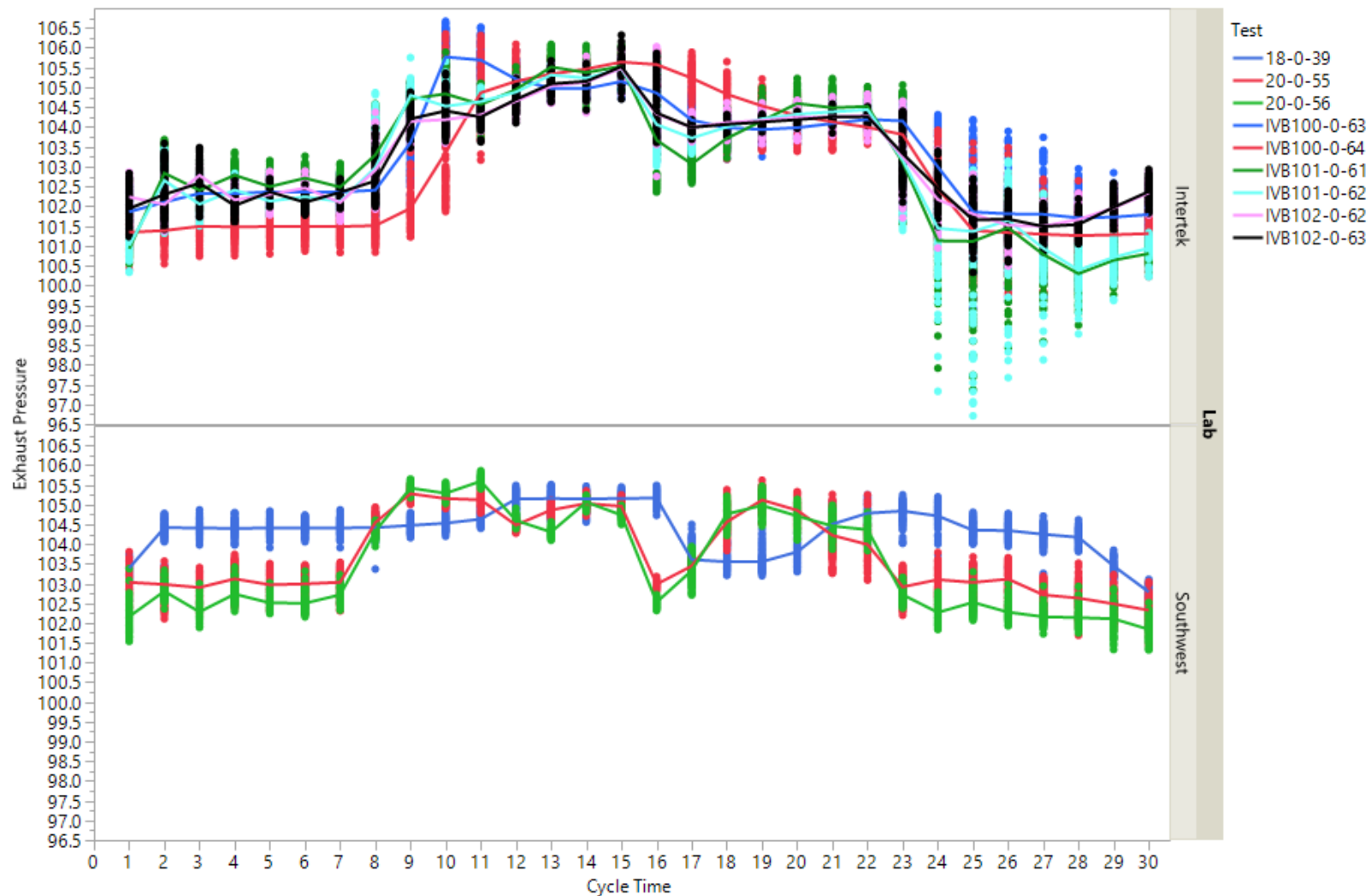
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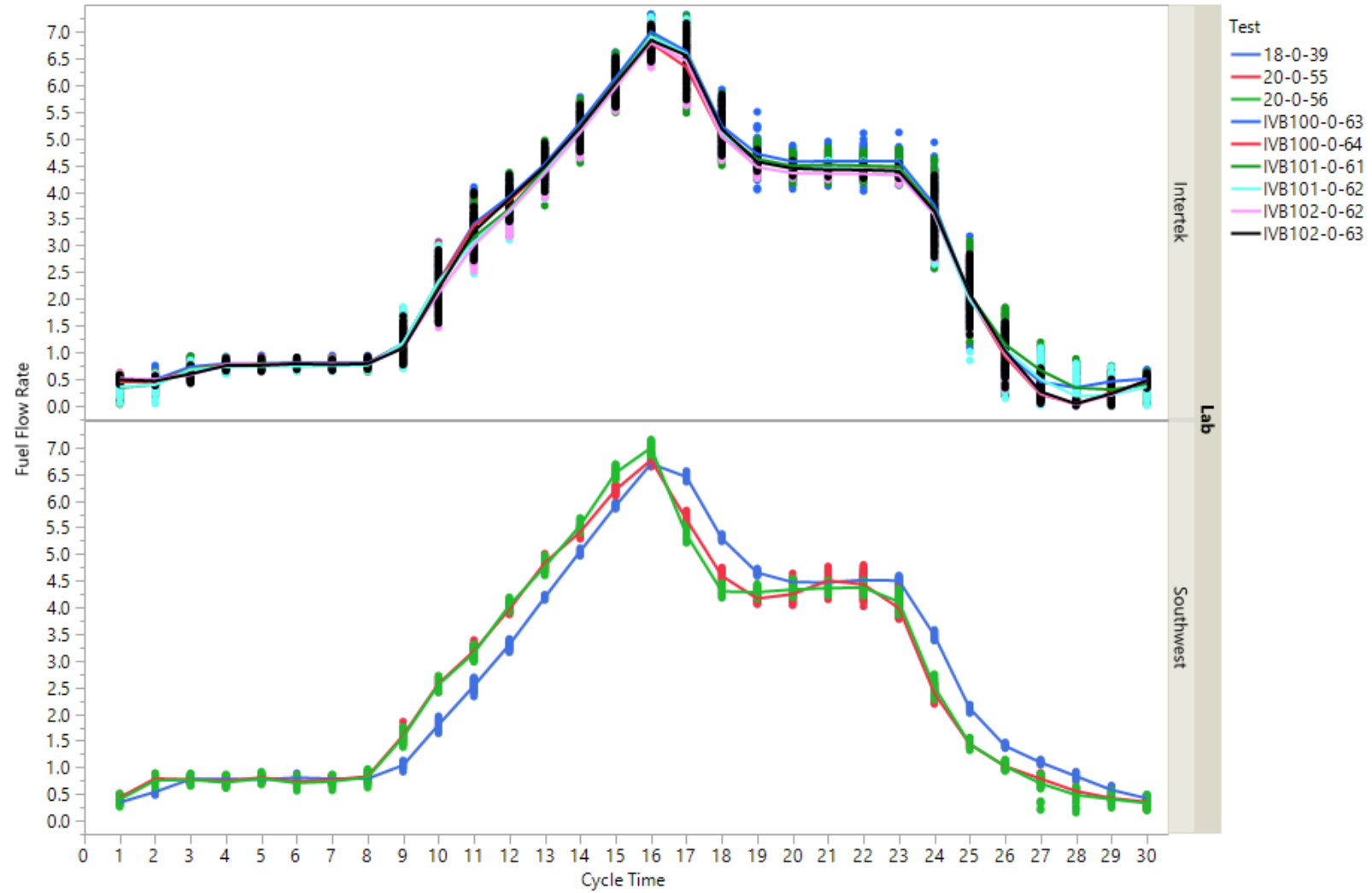
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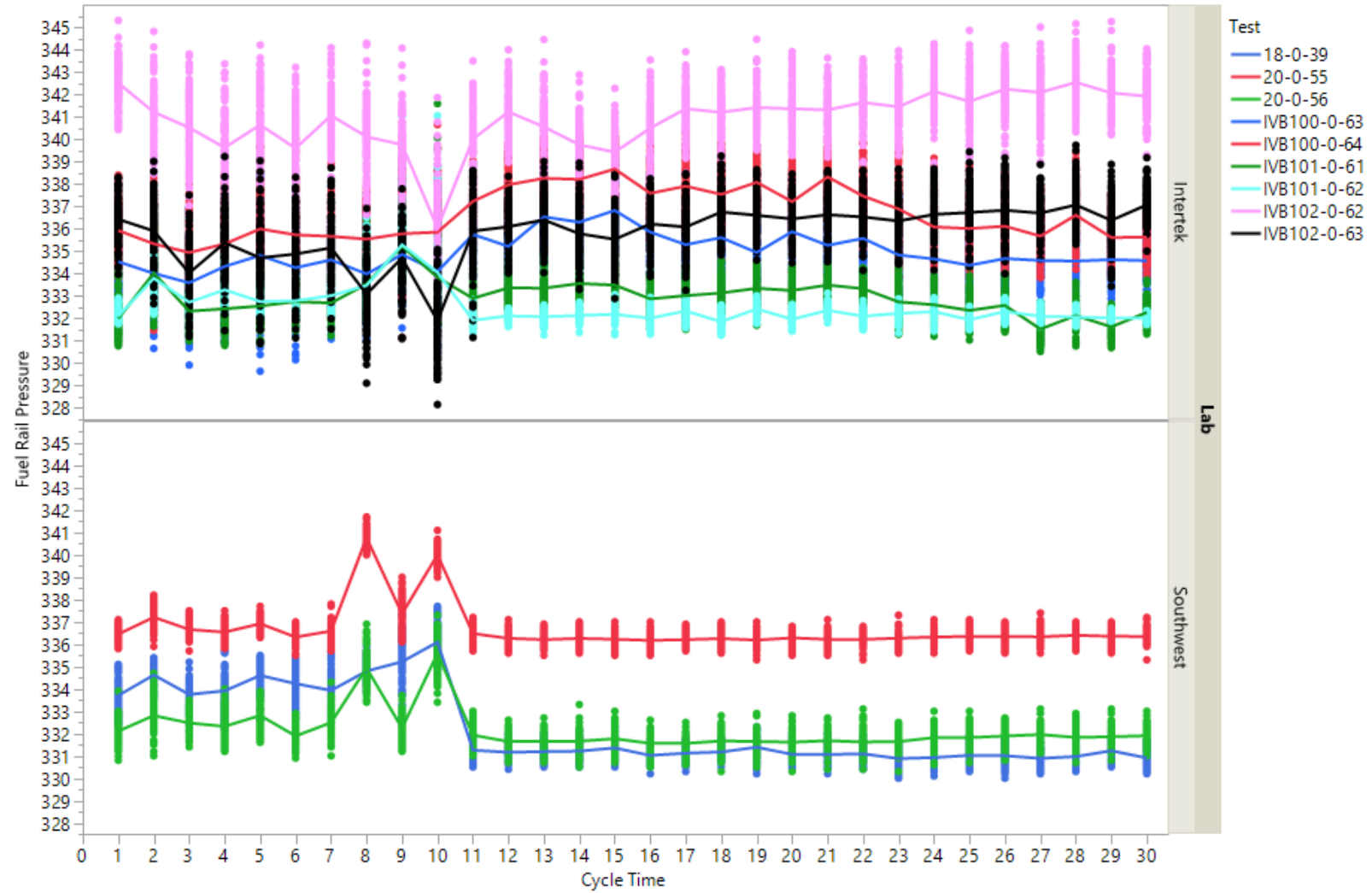
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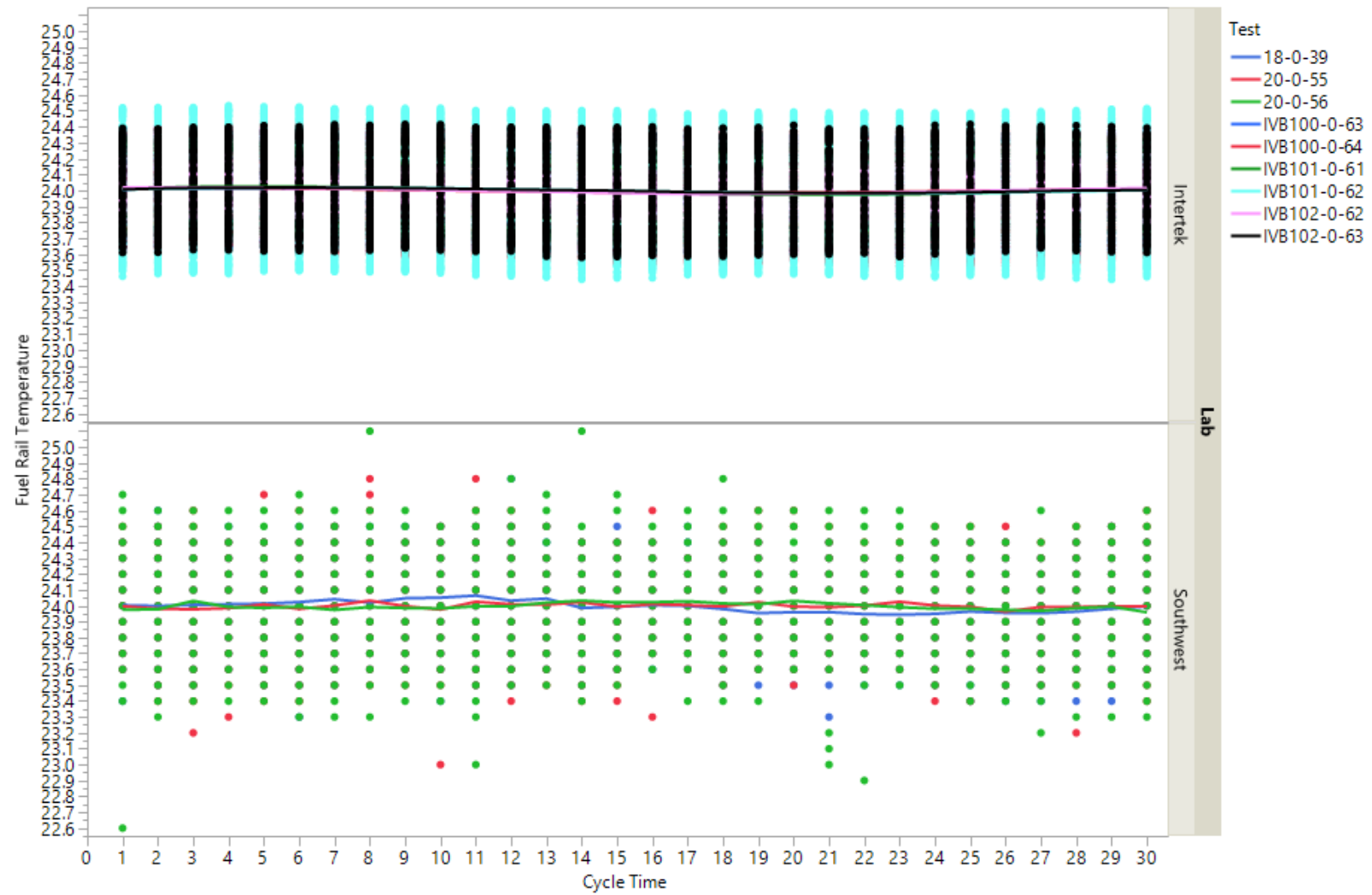


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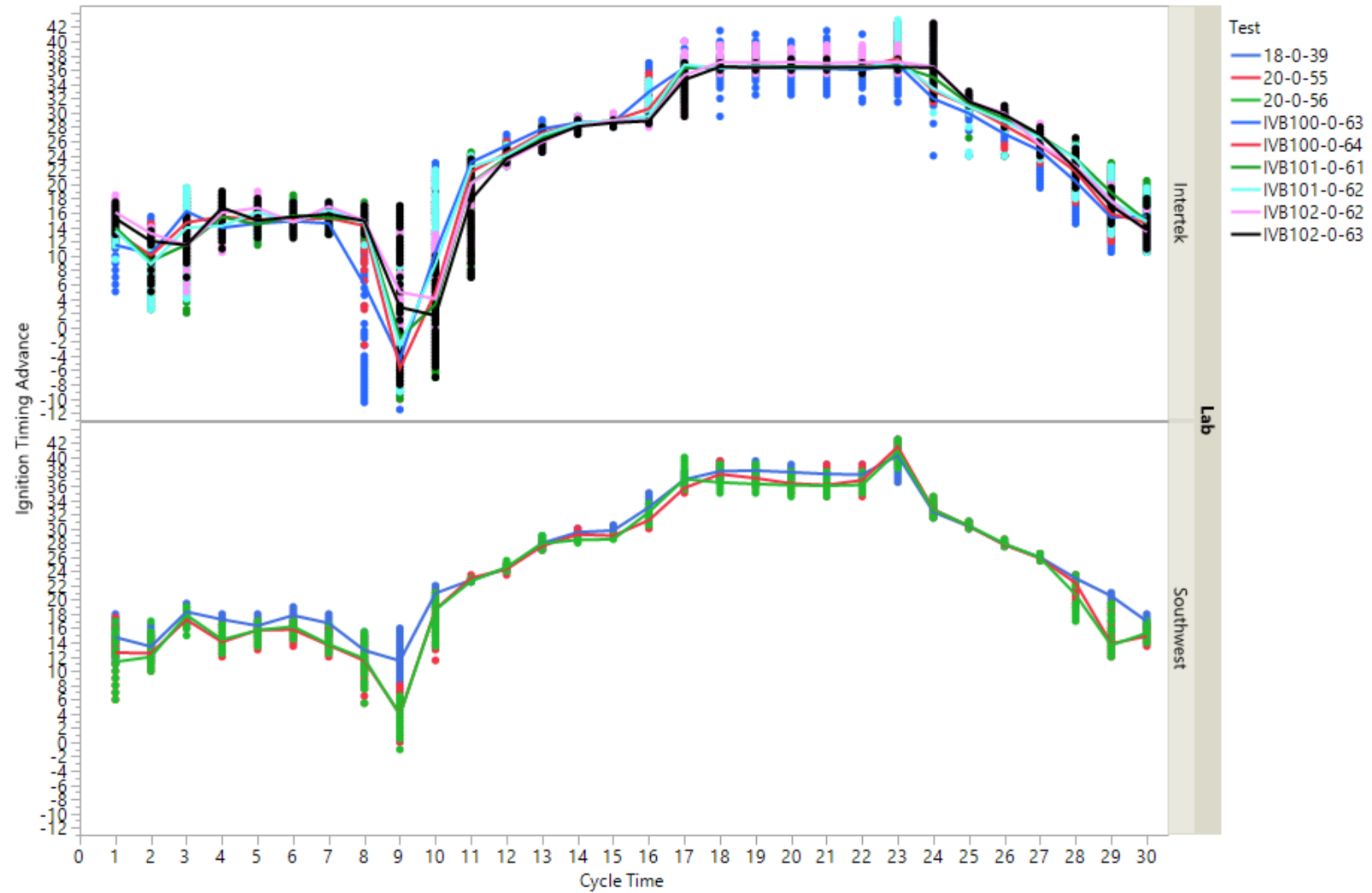


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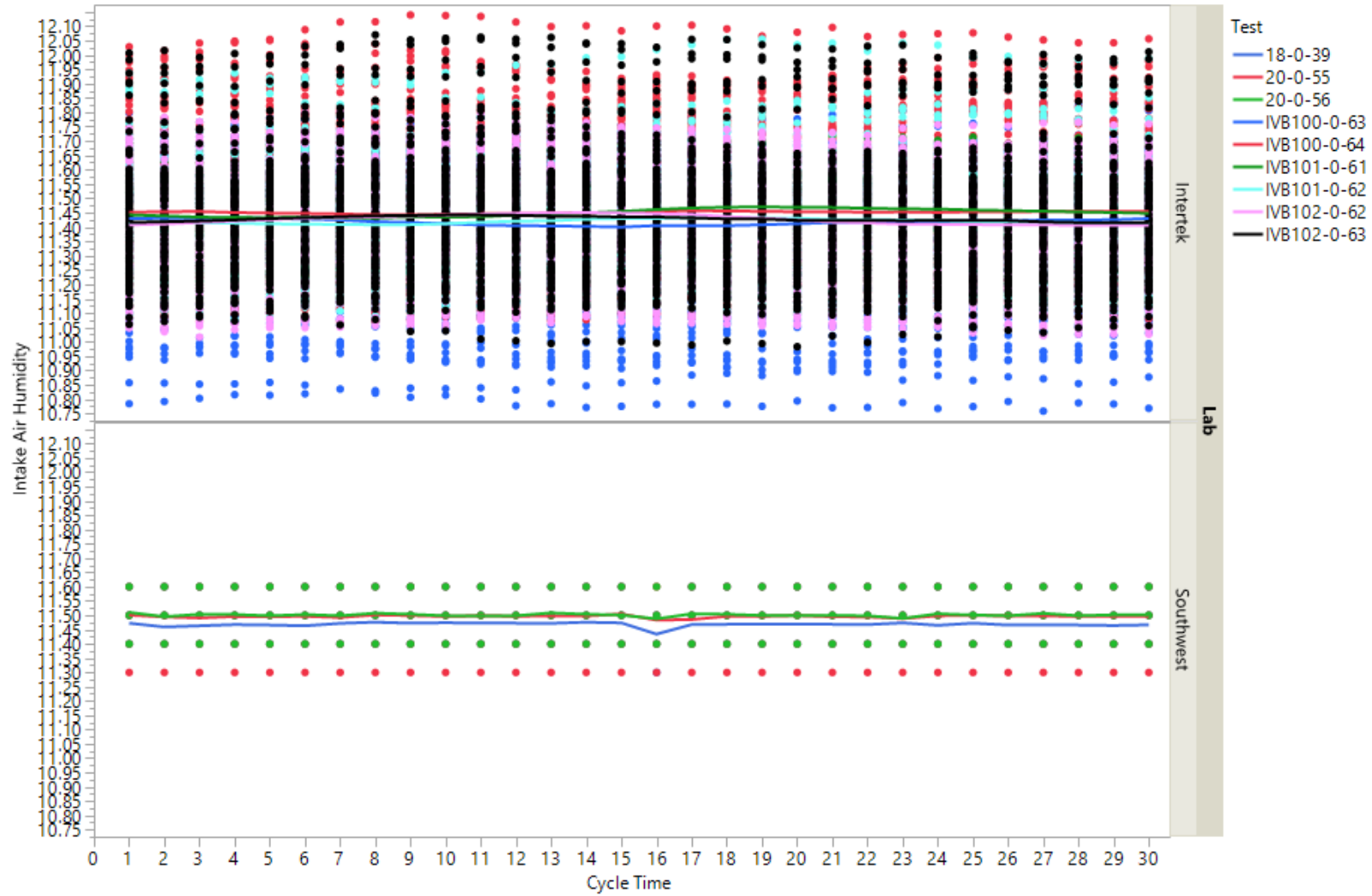
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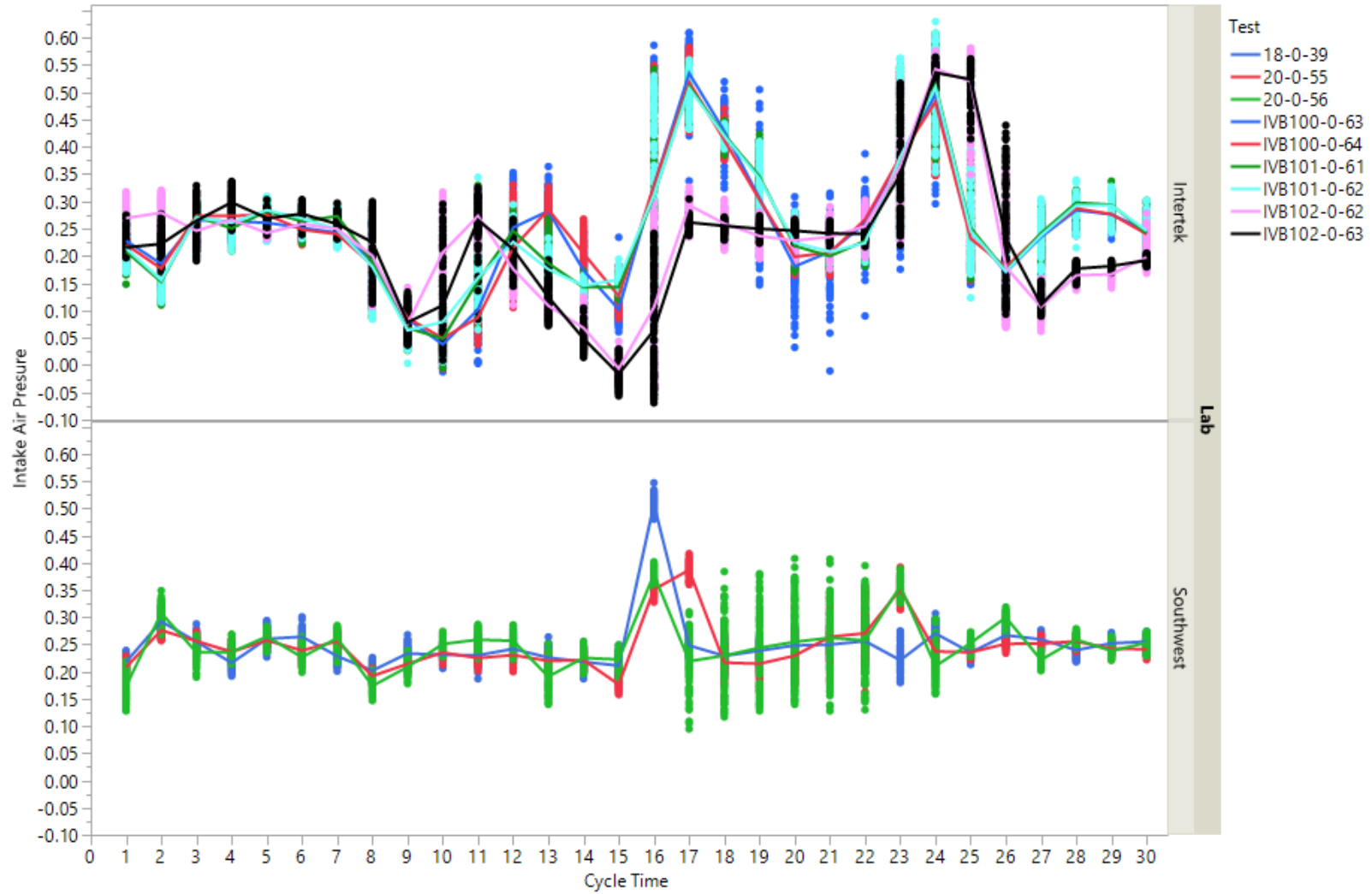
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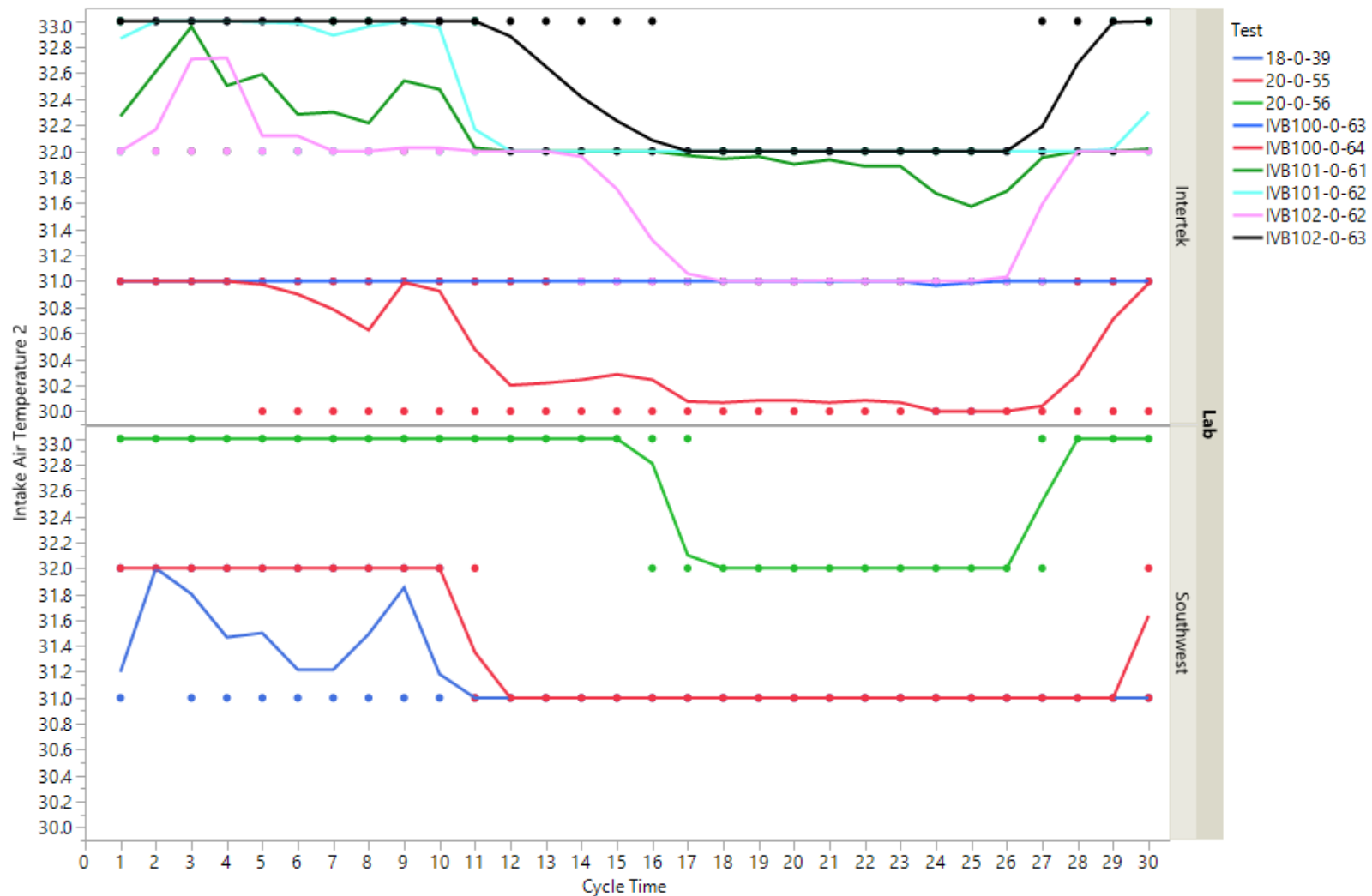
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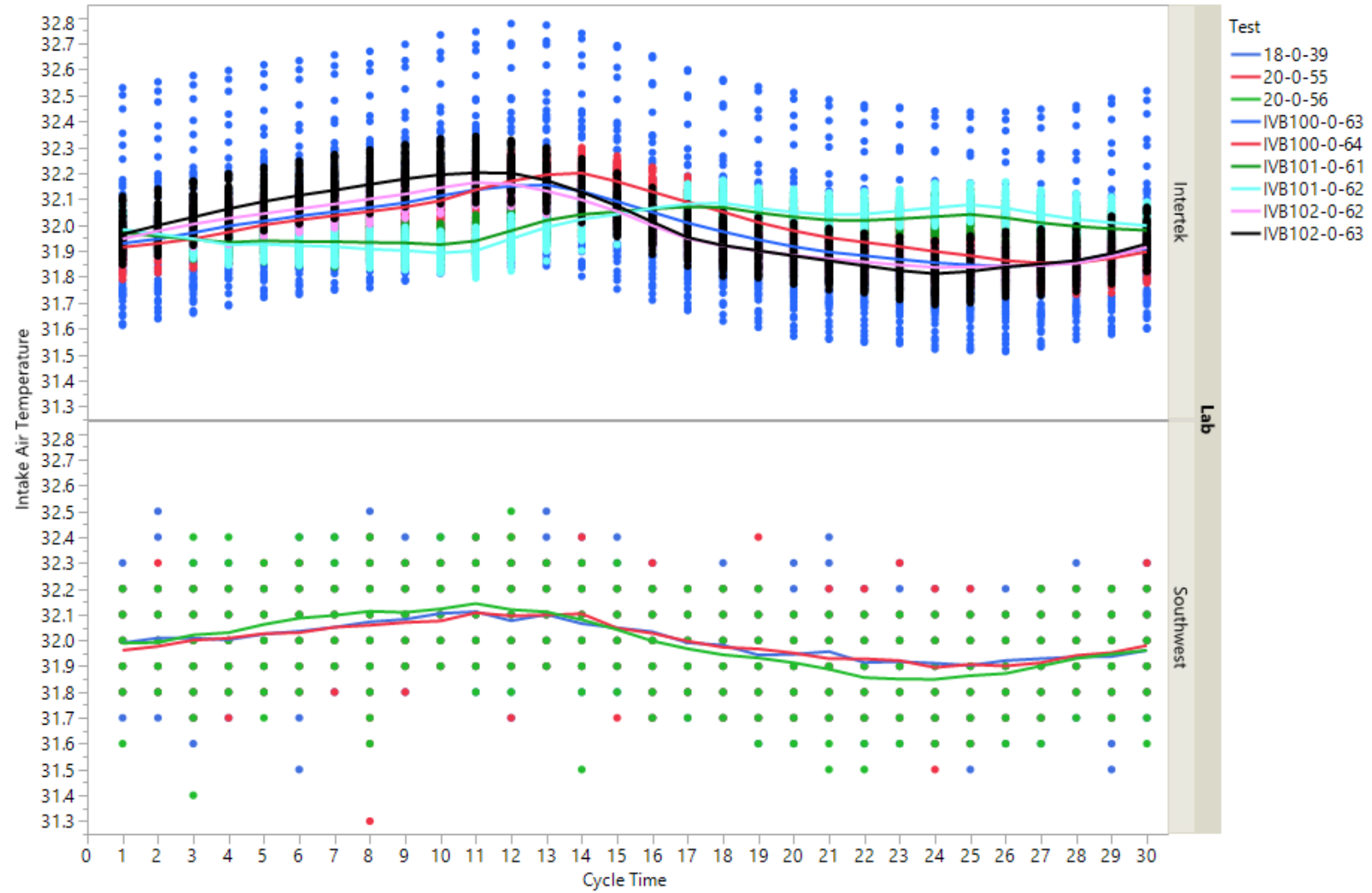
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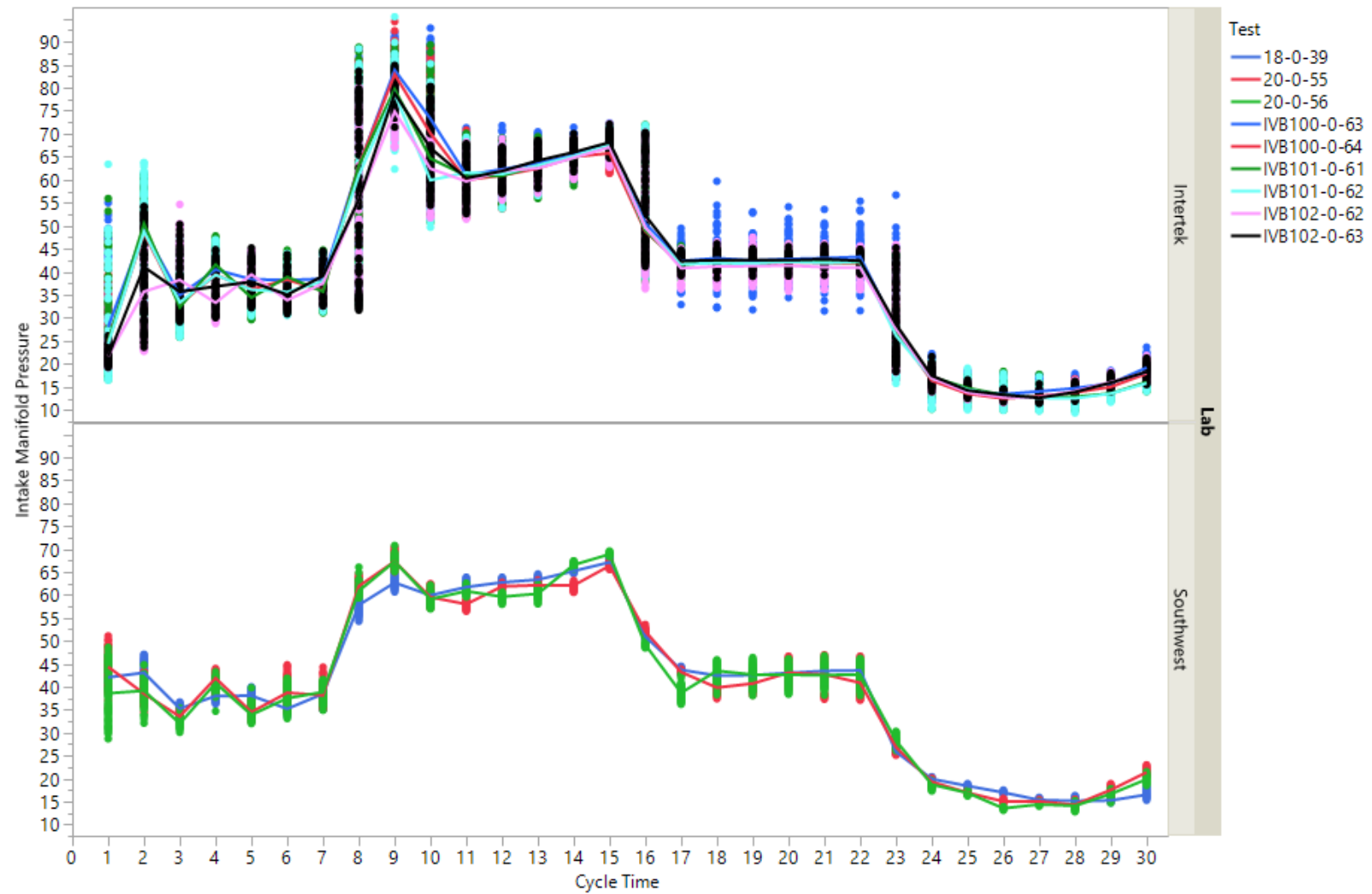
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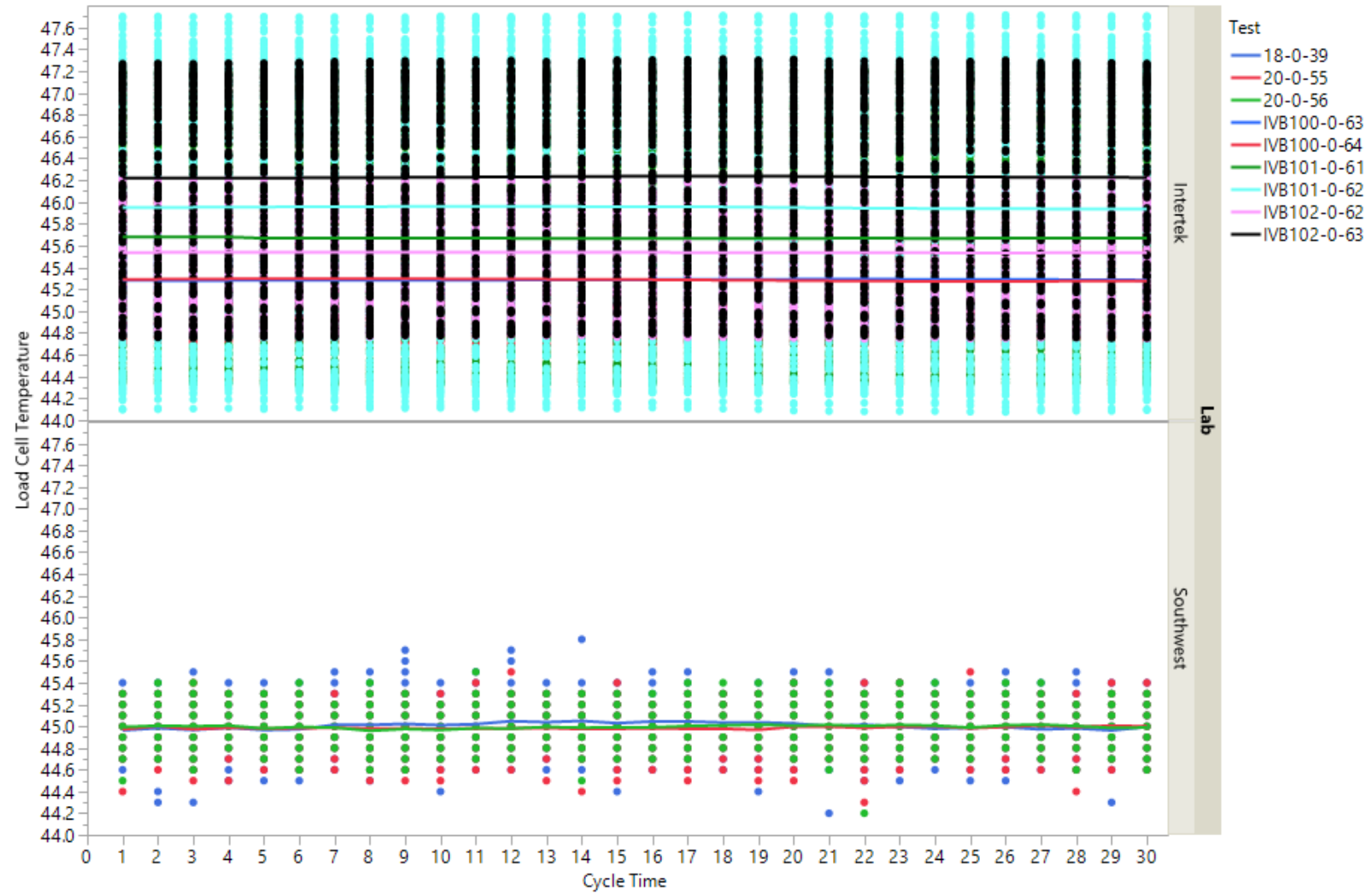
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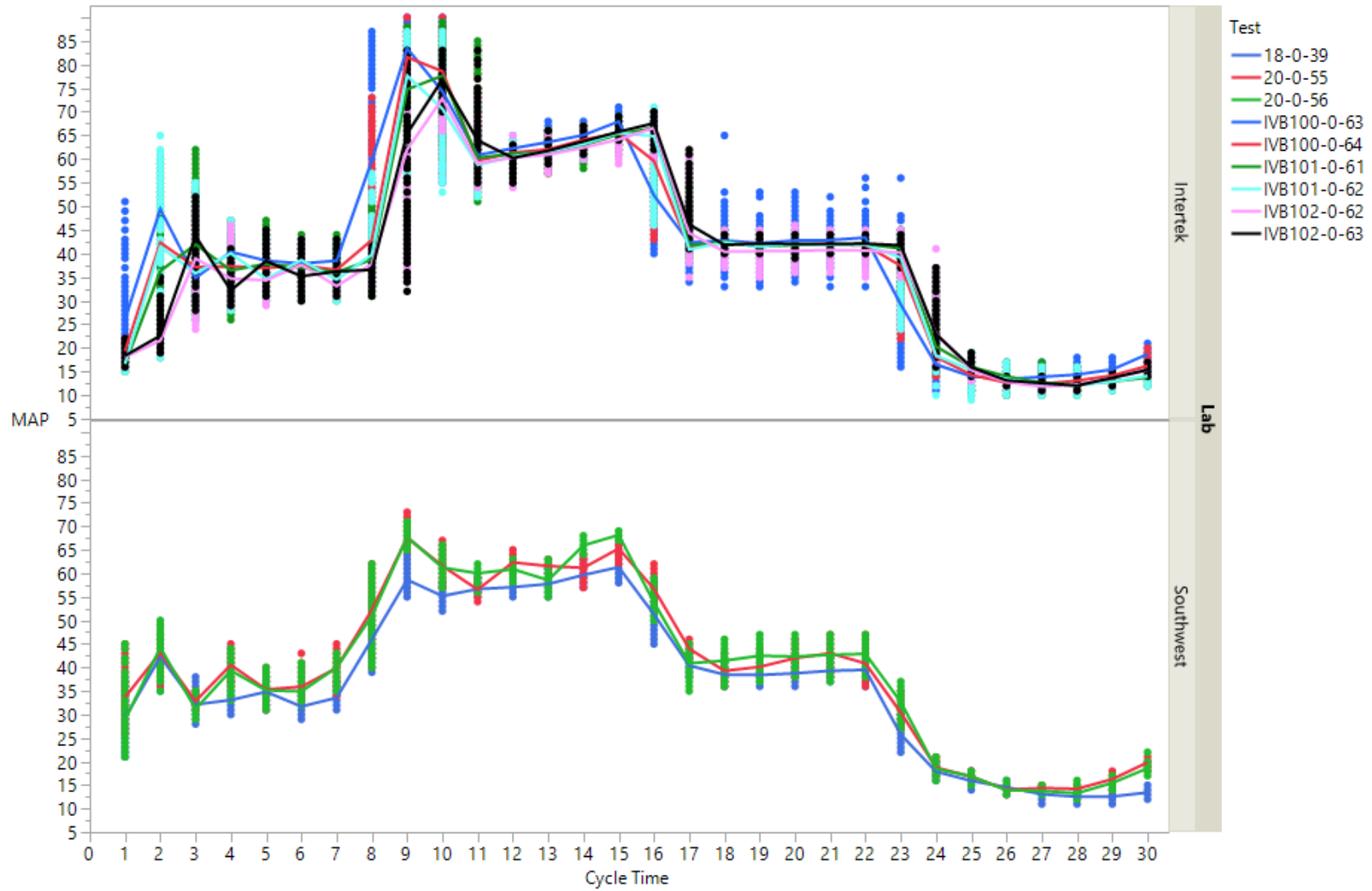
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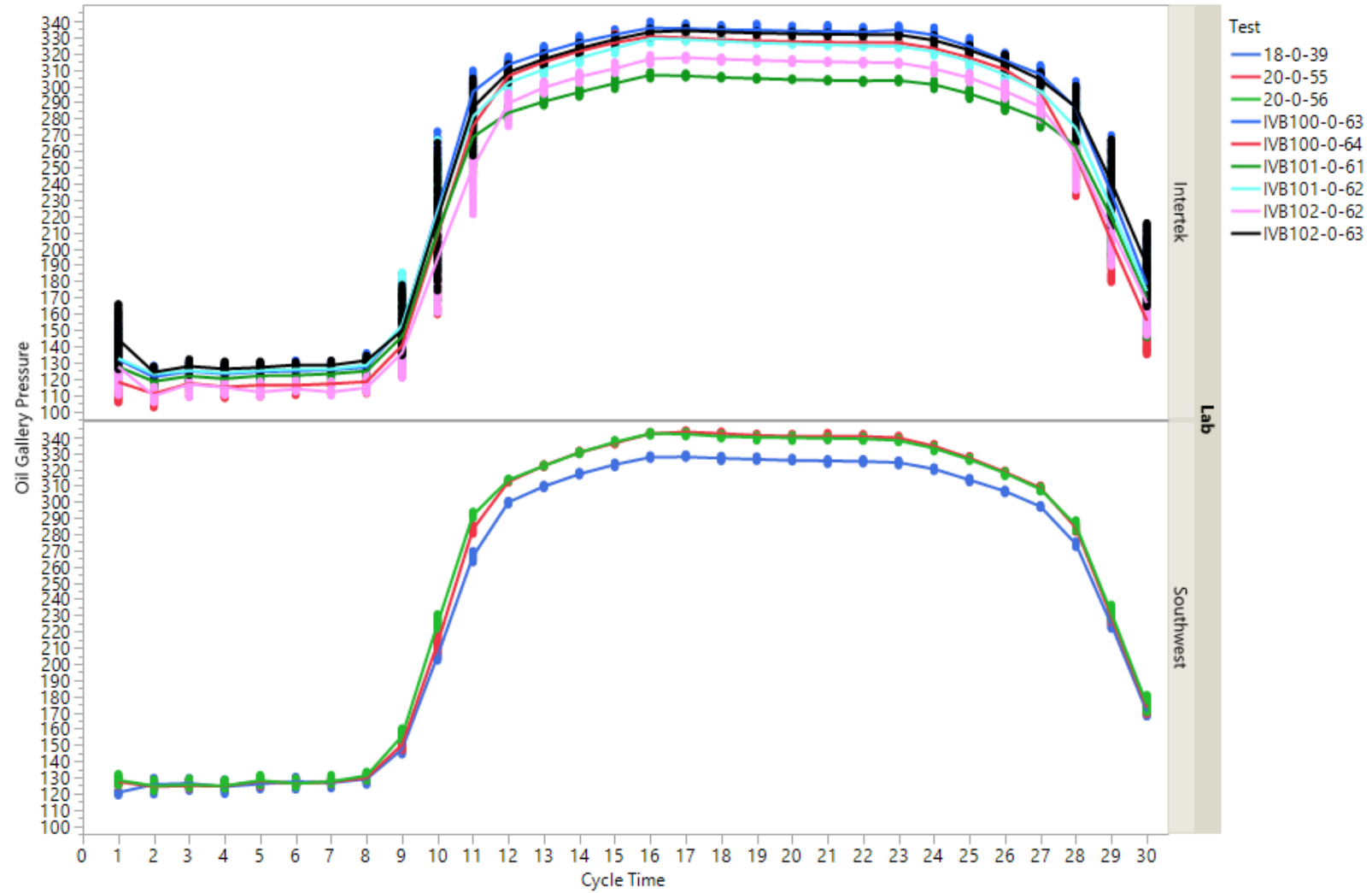
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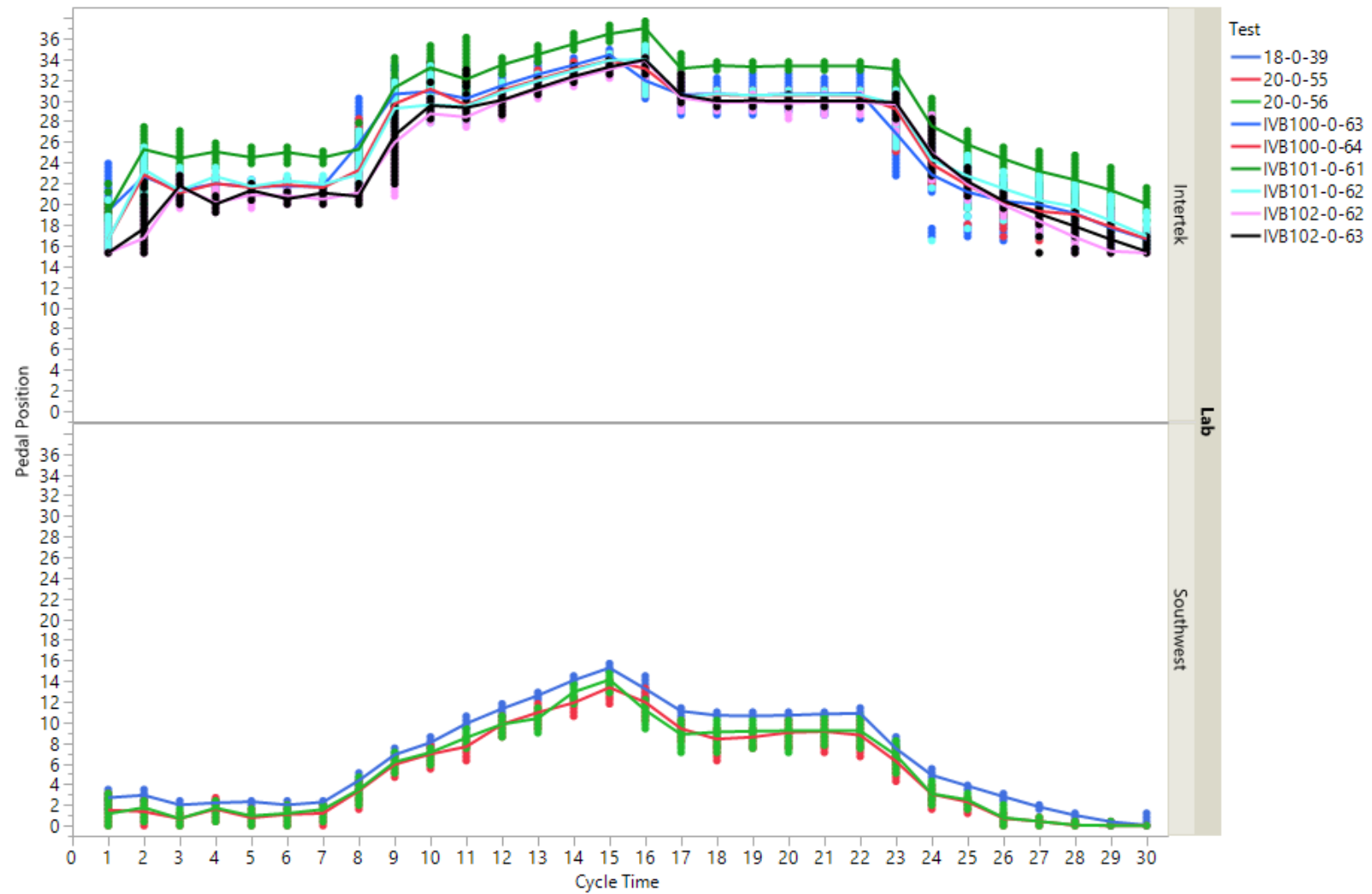
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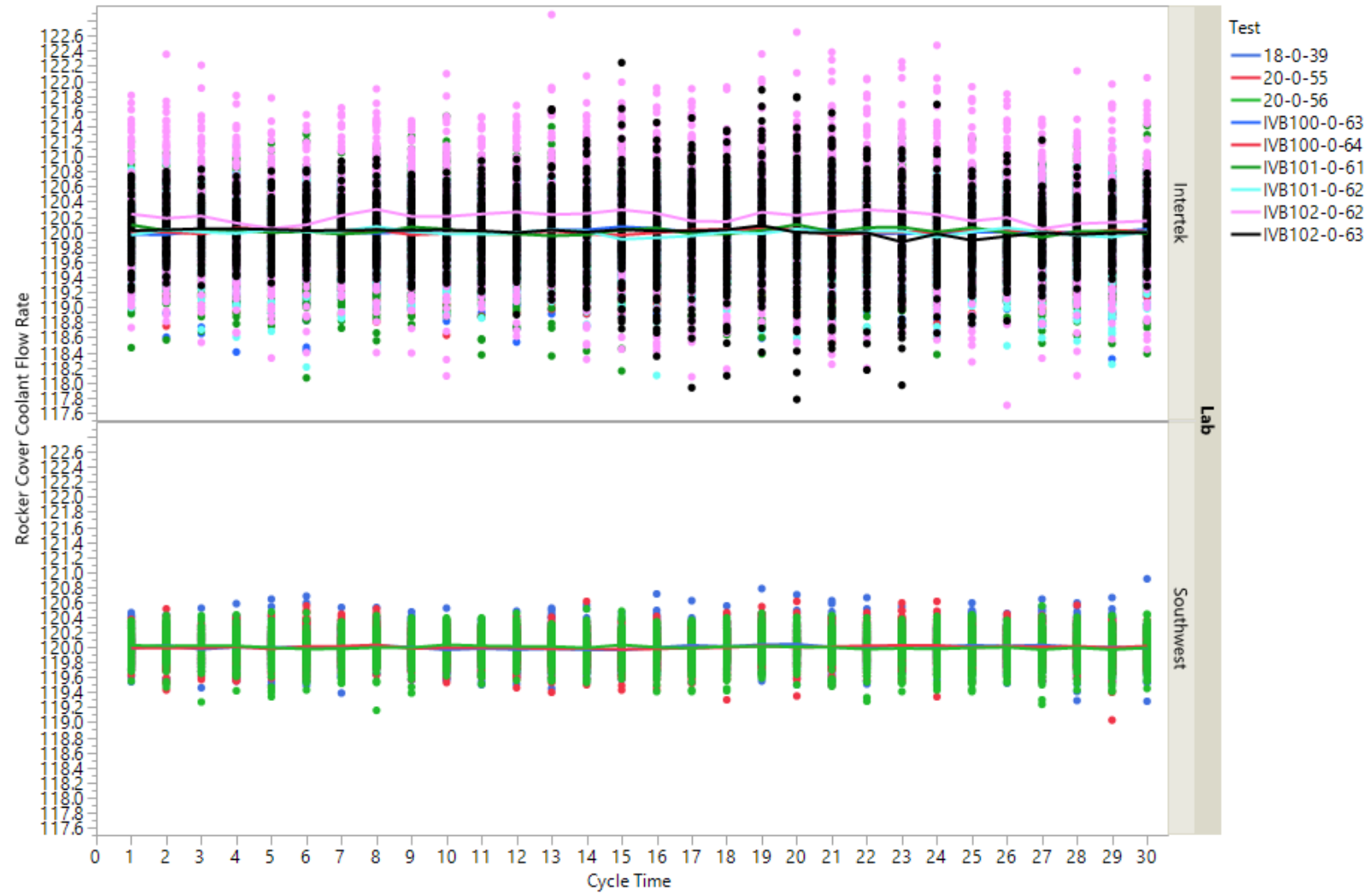
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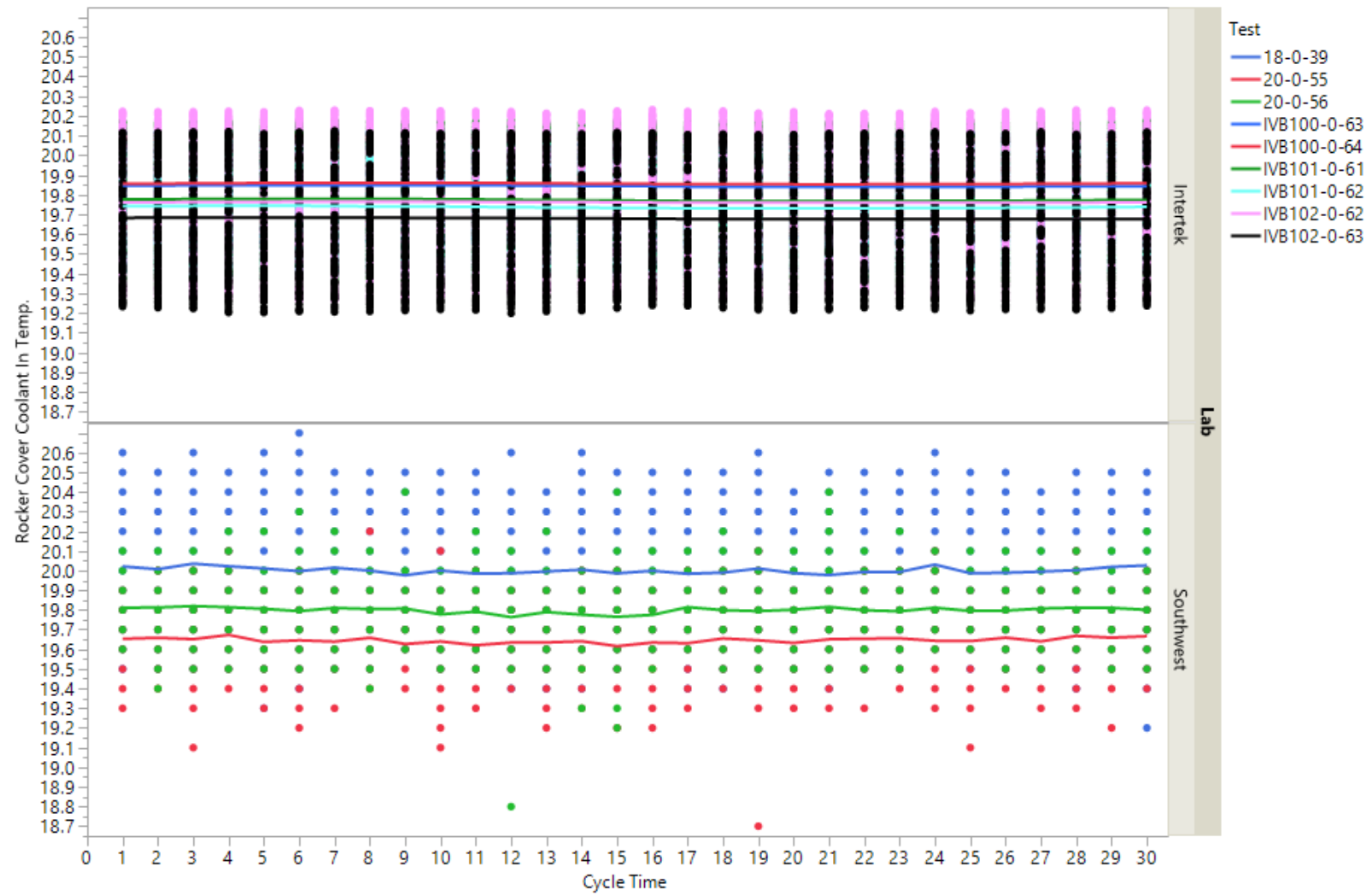
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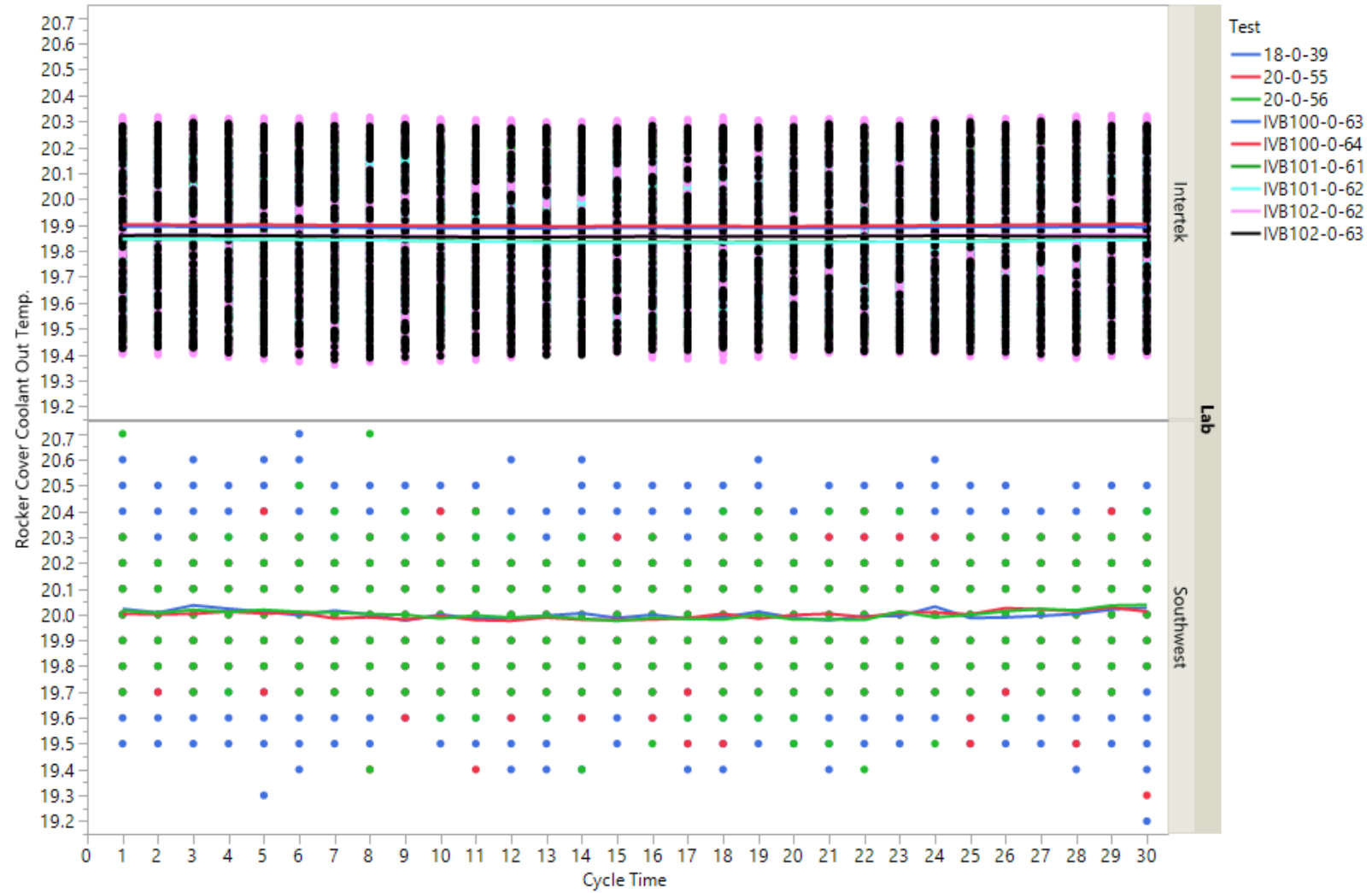
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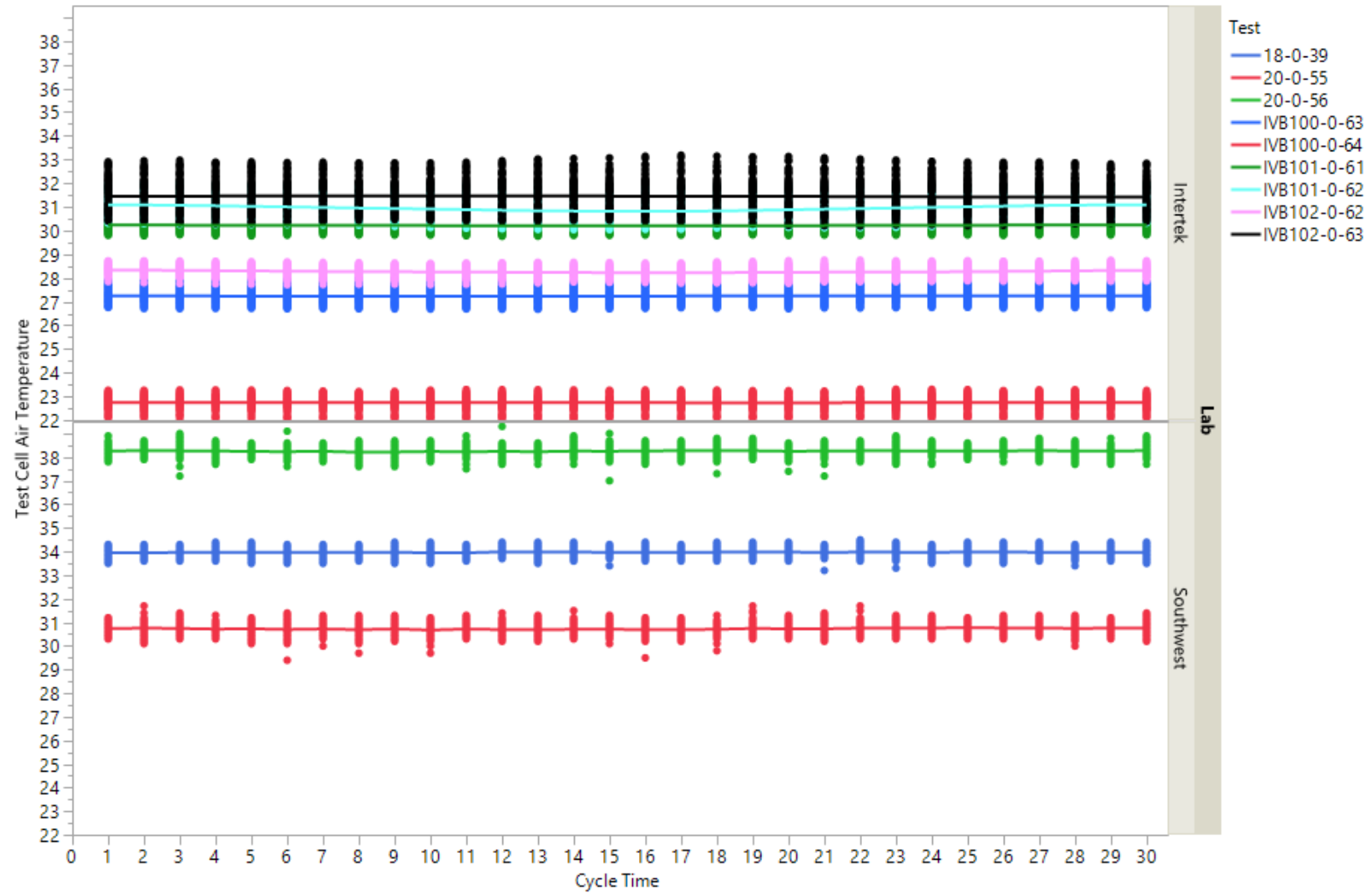
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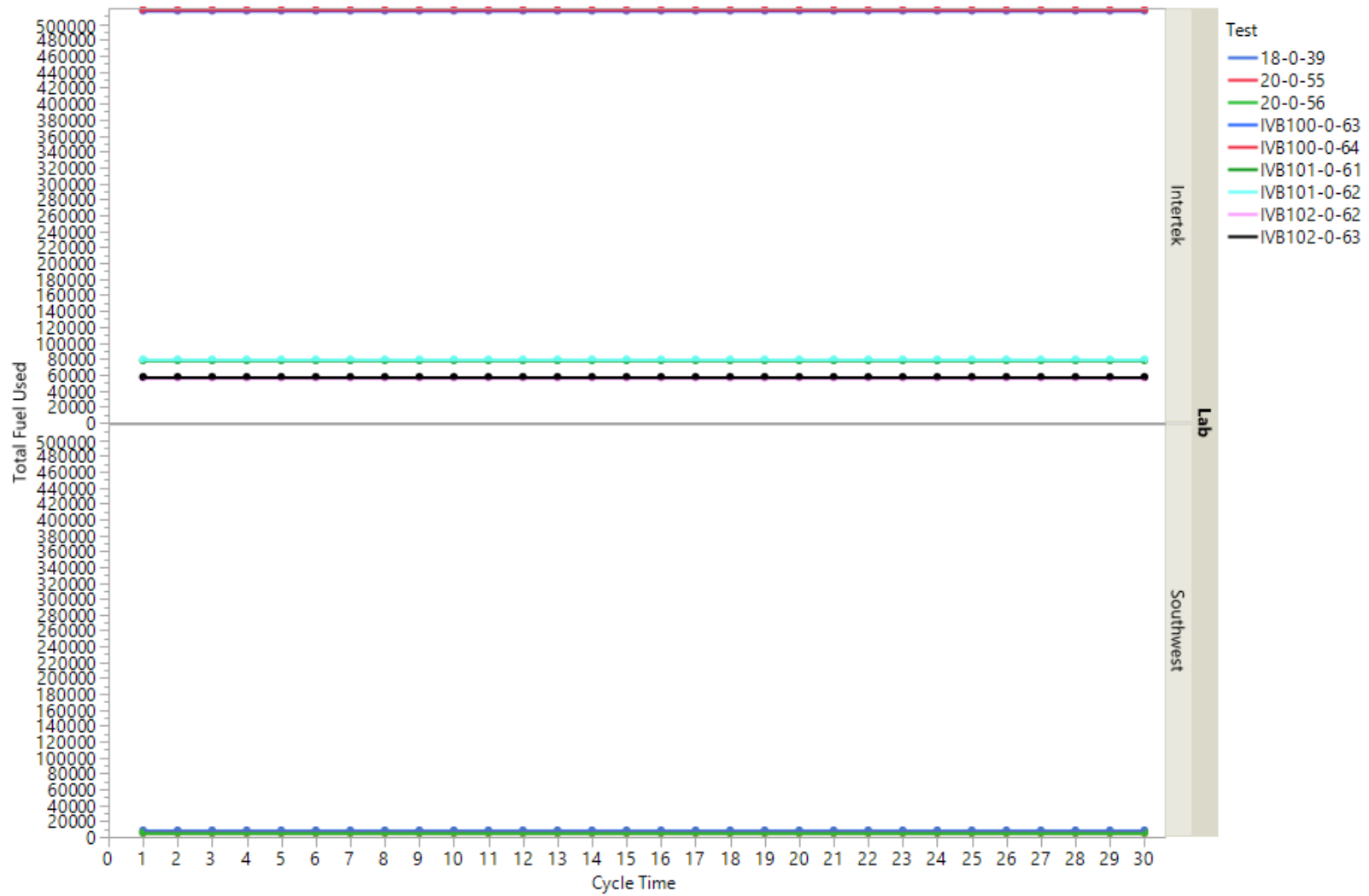
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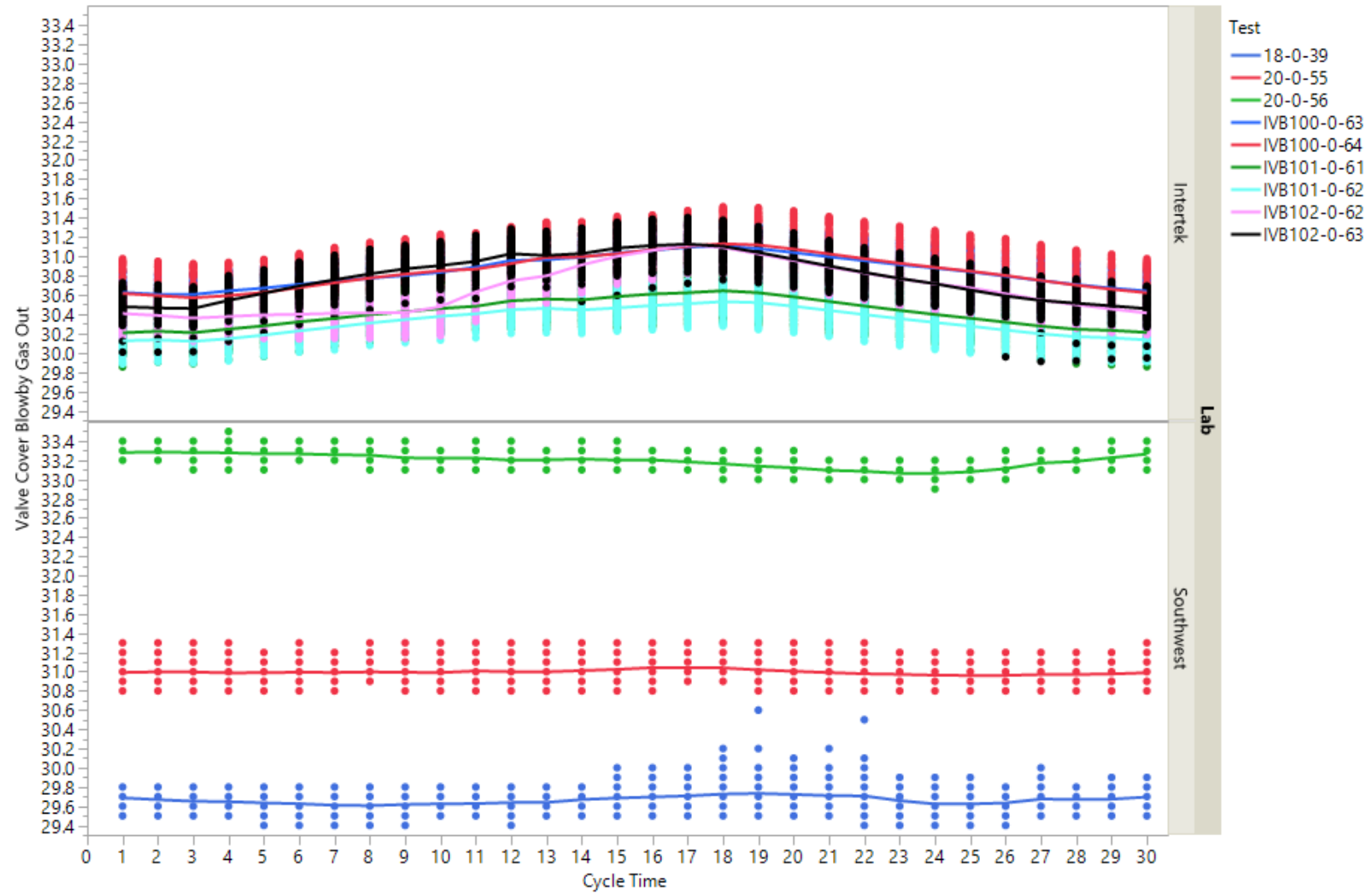
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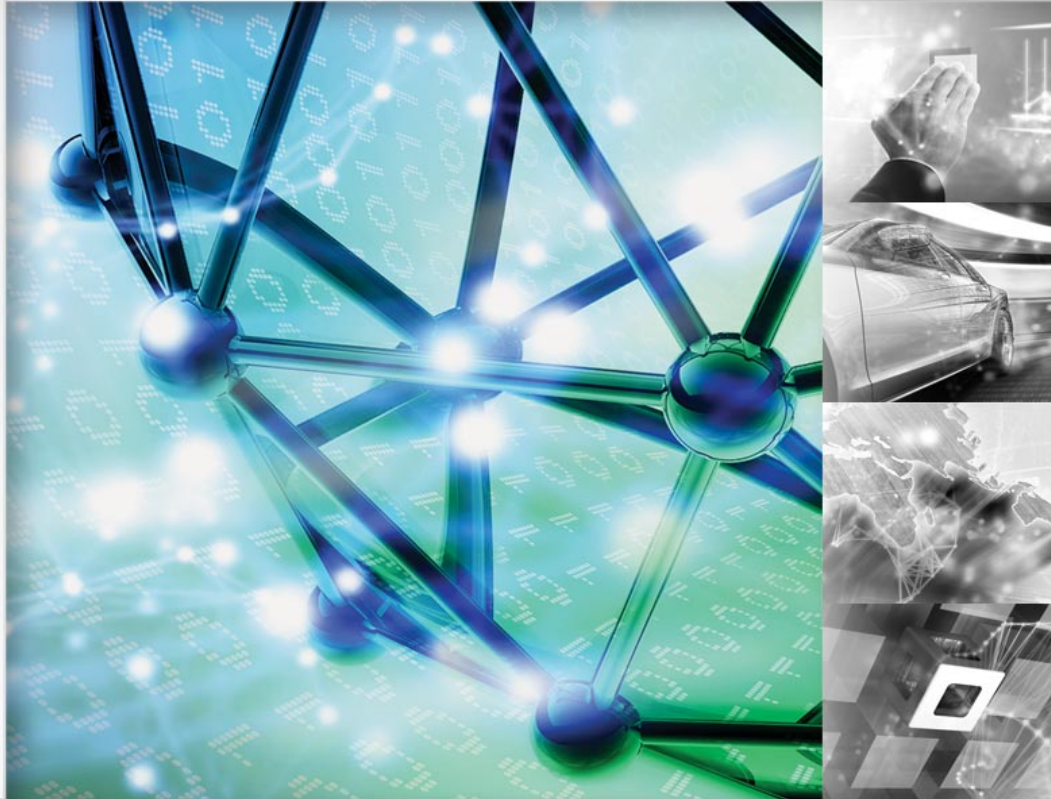


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Graph Builder



Where(50400 rows excluded)



D3525 Capillary Column Chromatography

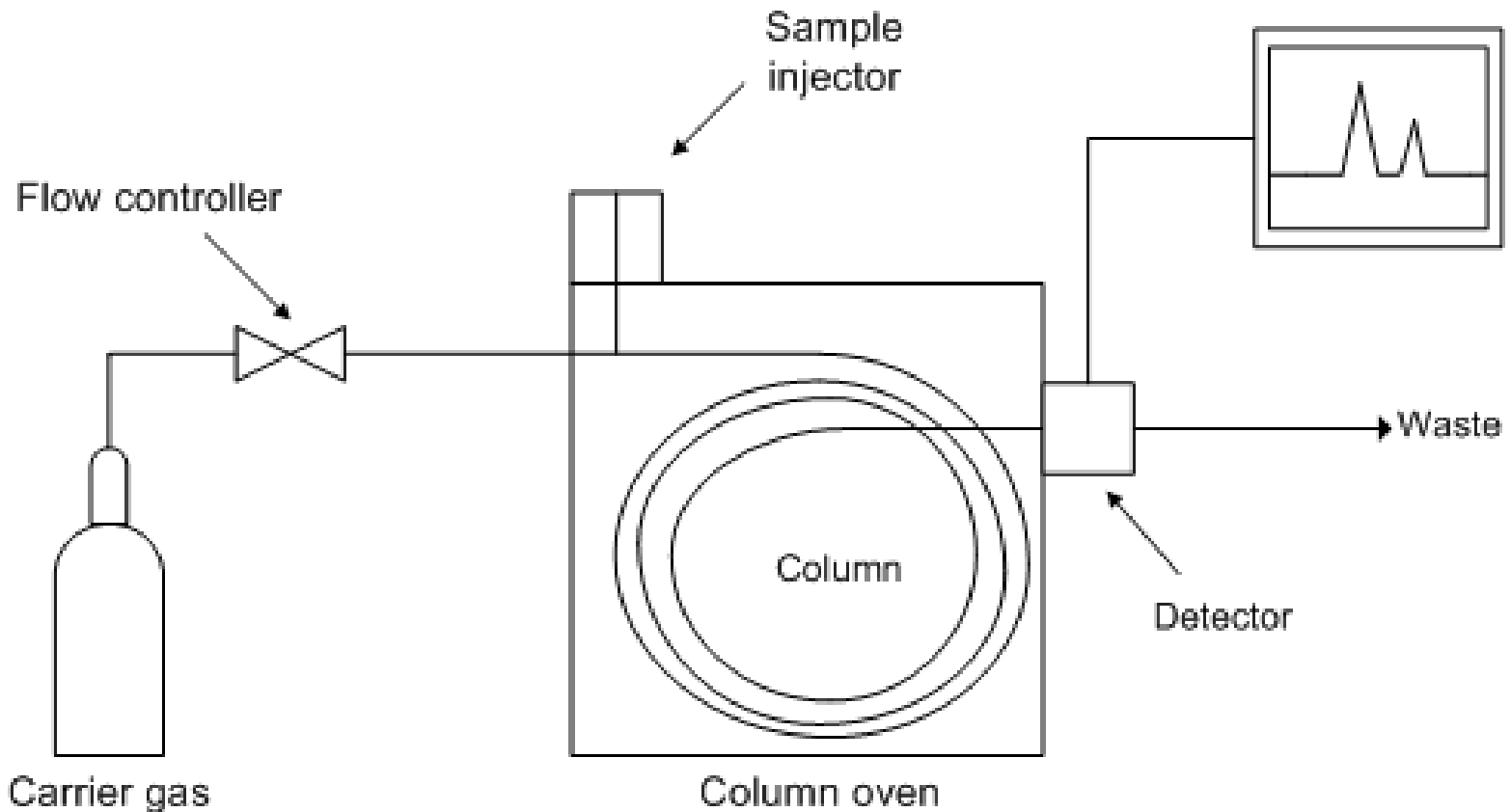
A Better Approach

November 2017

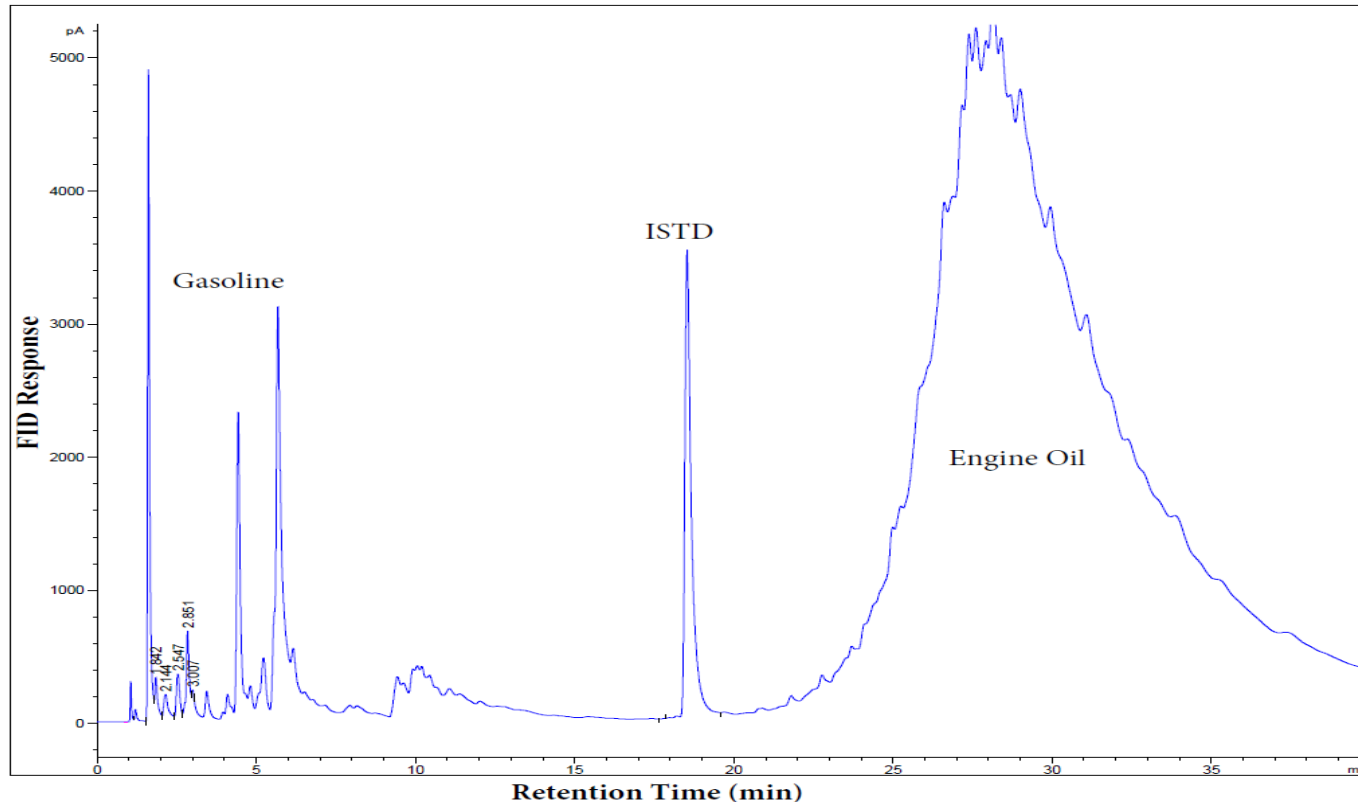
- D3525 Determines Gasoline Fuel Dilution in used engine oils by Gas Chromatography (GC).
- Fuel Dilution lowers the Viscosity of the Engine Oil.
- D3525 is a Child or Subtest of Gasoline Engine Testing Methods:
 - D6891 (Sequence IVA)
 - D6593 (Sequence VG)

Gas Chromatography (GC) – Background

Gas Chromatography Separates Components of a Mixture



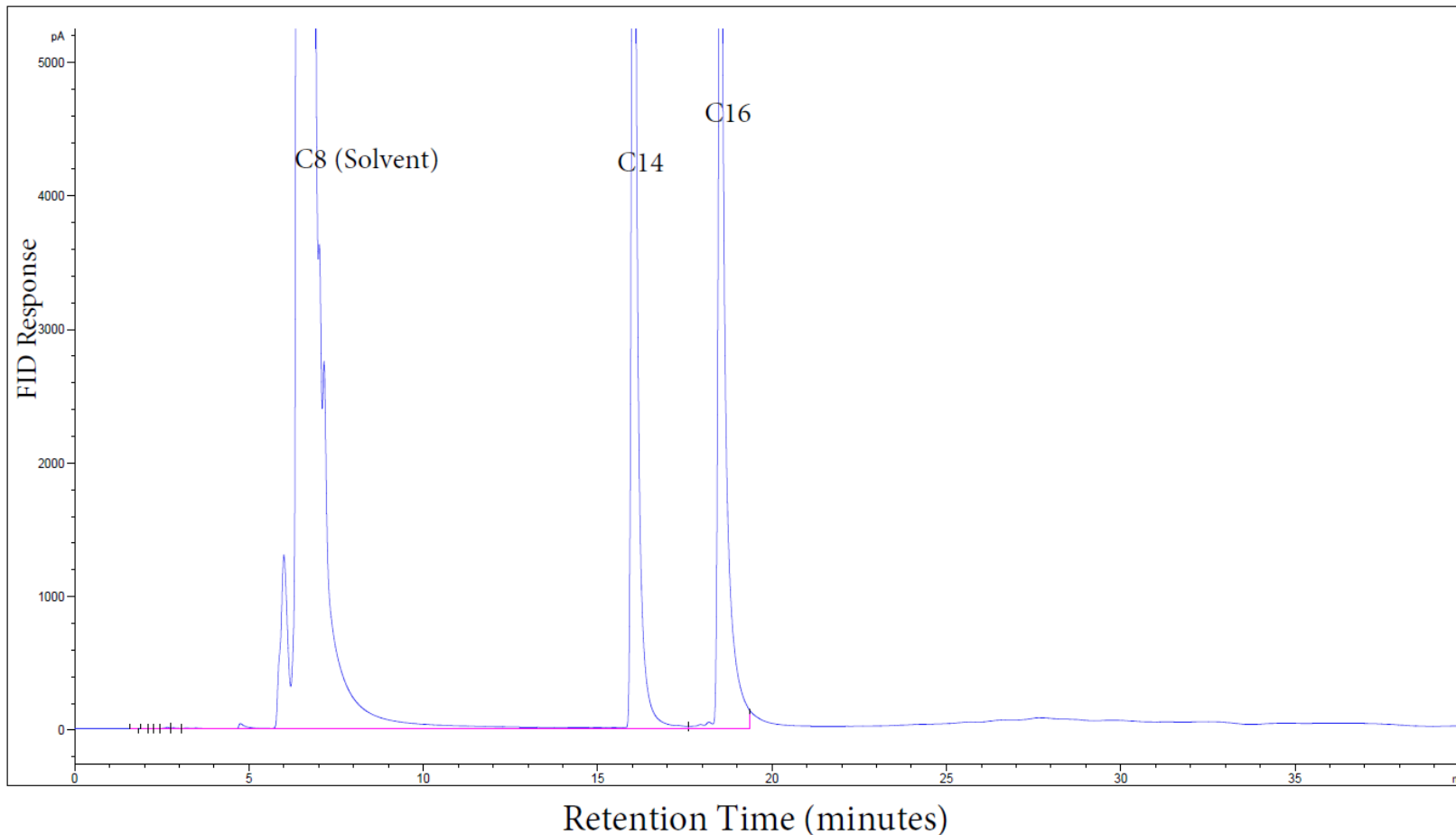
D3525 Chromatogram – 8% Gasoline in Engine Oil



D6593 & D6891 Specify a Different Internal Standard

- Parent Engine Tests specify **C16** n-Alkane
- D3525 Child Drain Test specifies **C14** n-Alkane
- This Internal Standard (ISTD) modification defines a *different* Chromatographic Window (different analyte):

C14 vs. C16 n-alkane Internal Standard



Different ISTD define Different chromatographic Analytes!

- Efforts are currently underway to modify D3525 to specify the C16 n-Alkane Internal Standard
 - Work Item WK59475
 - Task Group being formed
 - ILS being organized

D6593 & D6891 Specify Packed Columns

- Parent Engine Tests limit the subtest to Packed Columns.
- D3525 allows both Packed and Capillary Columns.
- What's the difference?

See It – D3525 Packed vs. Capillary GC Columns

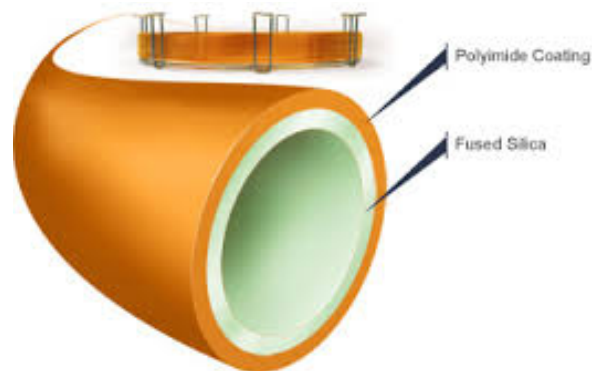
Packed Columns

- 1/4" (3.2 mm) SS Tubes
- ~ 6 - 10 Feet long
- Packed with coated beads (Stationary Phase)



Capillary Columns

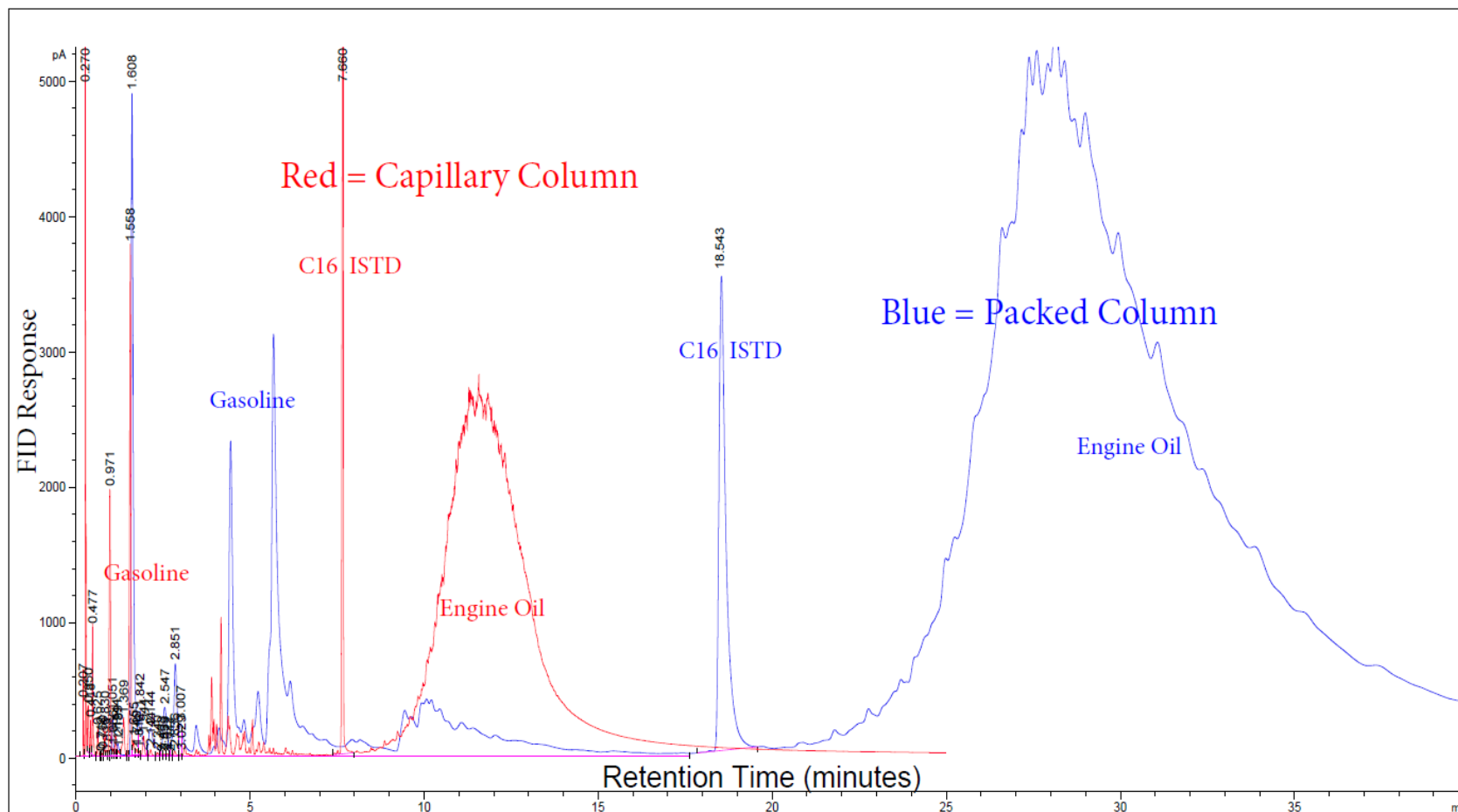
- 0.53 mm Open Tubes made of Fused Silica
- ~ 5 - 30 meters long
- Stationary Phase is coated on the inside of the tube



D3525 Packed vs. Capillary Columns



8% Gasoline in Engine Oil



Capillary Column GC is Better!



- **Capillary Columns** outperform Packed Columns:
 - Better Resolution
 - Faster
 - More Consistent (better precision)
- NOTE: The *Injection Volume* for the Capillary Column is *Smaller*.
 - Consequently, the Gasoline, C16 ISTD, and Engine Oil profiles are all *smaller* in the Capillary Chromatogram.
 - However, the *ratio* of Gasoline to C16 ISTD peak areas is the same as on the Packed Column giving the same calculated concentration.

Appeal to Sequence IV & V Surveillance Panels



- Either Specify or Allow the use of Capillary Columns when specifying Fuel Dilution in used oil samples by Gas Chromatography in D6891 and D6593.

My contact information:

Vince Donndelinger

Lubrizol / Wickliffe, OH

Vince.Donndelinger@Lubrizol.com

1-440-347-6589



Working together, achieving great things

When your company and ours combine energies, great things can happen. You bring ideas, challenges and opportunities. We'll bring powerful additive and market expertise, unmatched testing capabilities, integrated global supply and an independent approach to help you differentiate and succeed.

Draft of the wording that was generated during the August 30, 2017 Technical Guidance Committee Meeting Conference Call:

Alternate Supplier Protocol

ASTM International policy is to encourage the development of test procedures based on generic equipment. It is recognized that there are occasions where critical/sole-source equipment has been approved by the technical committee (surveillance panel/task force) and is required by the test procedure. The technical committee that oversees the test procedure is encouraged to clearly identify if the part is considered critical in the test procedure. If a part is deemed to be critical, ASTM encourages alternate suppliers to be given the opportunity for consideration of supplying the critical part/component providing they meet the approval process set forth by the technical committee.

An alternate supplier can start the process by initiating contact with the technical committee (current chairs shown on ASTM TMC website). The supplier should advise on the details of the part that is intended to be supplied. The technical committee will review the request and determine feasibility of an alternate supplier for the requested replacement critical part. In the event that a replacement critical part has been identified and proven equivalent the sole-source supplier footnote shall be removed from the test procedure.