

# C13A MATRIX TESTING RESULTS UPDATE / REVIEW

December 18, 2014

Performance you can rely on.



## FTP directory /refdata/diesel/coat/data/matrix op data/ at ftp.astmtmc.cmu.edu.

New data since last update on 12/3:

- SW Test 9, 10 (Oil H, L respectively)
- LZ Test 7, 8, 9  
(Oil H, J, L respectively)
- EG Test 4, 7, 8, 9, 10, 11  
(Oil J, G, L, H, J, K respectively)
- EG revised files for: Test 1, 2, 3, 5, 6  
(Oil G, I, K, H, L respectively)

30 tests total posted as of afternoon of 12/17/14.

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<DIR> ..
12/03/14 02:53PM [GMT] 16,955 CAT Aeration Data Template.xlsx
11/19/14 01:20PM [GMT] 9,142,177 Lubrizol Test#1 CMIR#104081 \(i R1 Repeat\).xlsx
11/19/14 01:20PM [GMT] 8,711,519 Lubrizol Test#2 CMIR#103459 \(k R1\).xlsx
11/19/14 01:22PM [GMT] 8,849,810 Lubrizol Test#3 CMIR#103625 \(g R1\).xlsx
12/02/14 01:47PM [GMT] 9,466,330 Lubrizol Test#4 CMIR#103957 \(l R1\).xlsx
12/02/14 01:47PM [GMT] 9,623,934 Lubrizol Test#5 CMIR#103465 \(j R1\).xlsx
12/02/14 01:47PM [GMT] 9,912,453 Lubrizol Test#6 CMIR#103452 \(h R1\).xlsx
12/11/14 10:09AM [GMT] 9,994,023 Lubrizol Test#7 CMIR#103453 \(h R2\).xlsx
12/11/14 10:10AM [GMT] 10,232,770 Lubrizol Test#8 CMIR#103466 \(j R2\).xlsx
12/12/14 01:38PM [GMT] 10,393,965 Lubrizol Test#9 CMIR#103958 \(l R2\).xlsx
12/04/14 07:09AM [GMT] 9,271 Matrix Oil Codes.xlsx
11/18/14 11:17AM [GMT] 6,216,000 SwRI Oil G Run 1 CMIR-103623 \(TMC Template\).xlsx
11/24/14 02:01PM [GMT] 6,620,378 SwRI Oil H Run 1 CMIR-103450 \(TMC Template\).xlsx
12/11/14 10:13AM [GMT] 8,164,223 SwRI Oil H Run 2 CMIR-103451 \(TMC Template\).xlsx
12/02/14 02:19PM [GMT] 6,851,146 SwRI Oil I Run 1 CMIR-104079 \(TMC Template\).xlsx
12/03/14 10:25AM [GMT] 7,768,659 SwRI Oil I Run 2 CMIR-104079 \(TMC Template\).xlsx
11/18/14 11:17AM [GMT] 5,829,532 SwRI Oil J Run 1 CMIR-103463 \(TMC Template\).xlsx
11/18/14 11:18AM [GMT] 5,281,983 SwRI Oil K Run 1 CMIR-103457 \(TMC Template\).xlsx
12/03/14 10:57AM [GMT] 7,143,343 SwRI Oil K Run 2 CMIR-103456 \(TMC Template\).xlsx
11/18/14 11:39AM [GMT] 6,353,424 SwRI Oil L Run 1 CMIR-103955 \(TMC Template\).xlsx
12/16/14 02:28PM [GMT] 8,635,271 SwRI Oil L Run 2 CMIR-103956 \(TMC Template\).xlsx
12/02/14 10:02PM [GMT] 4,377,273 TMC EG11 STRUN12 SOT141124.xlsx
12/11/14 02:15PM [GMT] 5,262,778 TMC EG12 STRUN14 SOT141204 Revised.xlsx
12/09/14 06:35PM [GMT] 4,971,665 TMC EG13 STRUN8 SOT141105 revised.xlsx
11/25/14 11:14AM [GMT] 3,138,046 TMC EG13 STRUN8 SOT141105.xlsx
12/10/14 05:05PM [GMT] 5,640,880 TMC EG2 STRUN11 SOT141114 revised.xlsx
12/02/14 10:23PM [GMT] 5,347,865 TMC EG2 STRUN11 SOT141114.xlsx
12/11/14 02:56PM [GMT] 4,769,315 TMC EG3 STRUN15 SOT141206 Revised.xlsx
12/10/14 12:06PM [GMT] 4,796,092 TMC EG4 STRUN9 SOT141107 revised.xlsx
11/25/14 11:12AM [GMT] 3,502,125 TMC EG4 STRUN9 SOT141107.xlsx
12/17/14 09:46AM [GMT] 4,760,410 TMC EG5 STRUN17 SOT141212 Revised.xlsx
12/10/14 02:39PM [GMT] 4,921,896 TMC EG6 STRUN10 SOT141111 revised.xlsx
12/17/14 09:59AM [GMT] 4,948,256 TMC EG7 STRUN16 SOT141209 revised.xlsx
12/08/14 05:57PM [GMT] 4,645,423 TMC EG8 STRUN7 SOT141029 revised.xlsx
11/25/14 11:12AM [GMT] 3,254,695 TMC EG8 STRUN7 SOT141029.xlsx
12/11/14 11:19AM [GMT] 4,403,200 TMC EG9 STRUN13 SOT141201 revised.xlsx
12/08/14 03:28PM [GMT] 4,301,231 TMC EG9 STRUN13 SOT141201.xlsx
    
```

# Aeration results - summary table



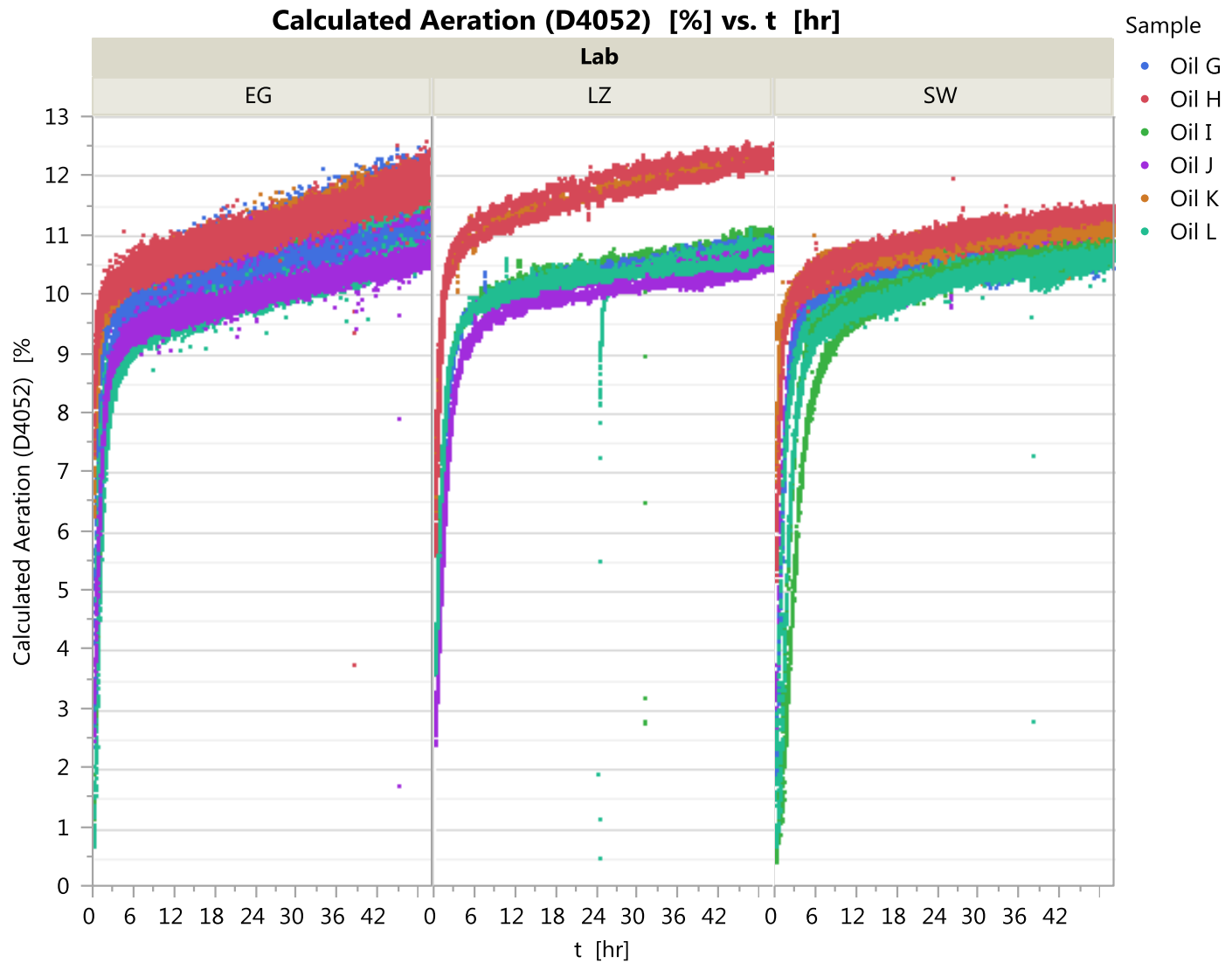
Sample\Lab	SW	LZ	EG
<b>Oil G</b>	10.53	10.70	11.72**, 10.73
<b>Oil H</b>	11.09, 11.25	11.99, 12.27	11.70, 11.47
<b>Oil I</b>	10.61, 10.60	10.78	11.14
<b>Oil J</b>	10.81	10.26, 10.50	10.88, 10.38
<b>Oil K</b>	10.49*, 11.08	12.15	11.68, 11.11
<b>Oil L</b>	10.56, 10.51	10.64, 10.47	10.97, 10.39

Aeration values are 30-50 hr averages in %.

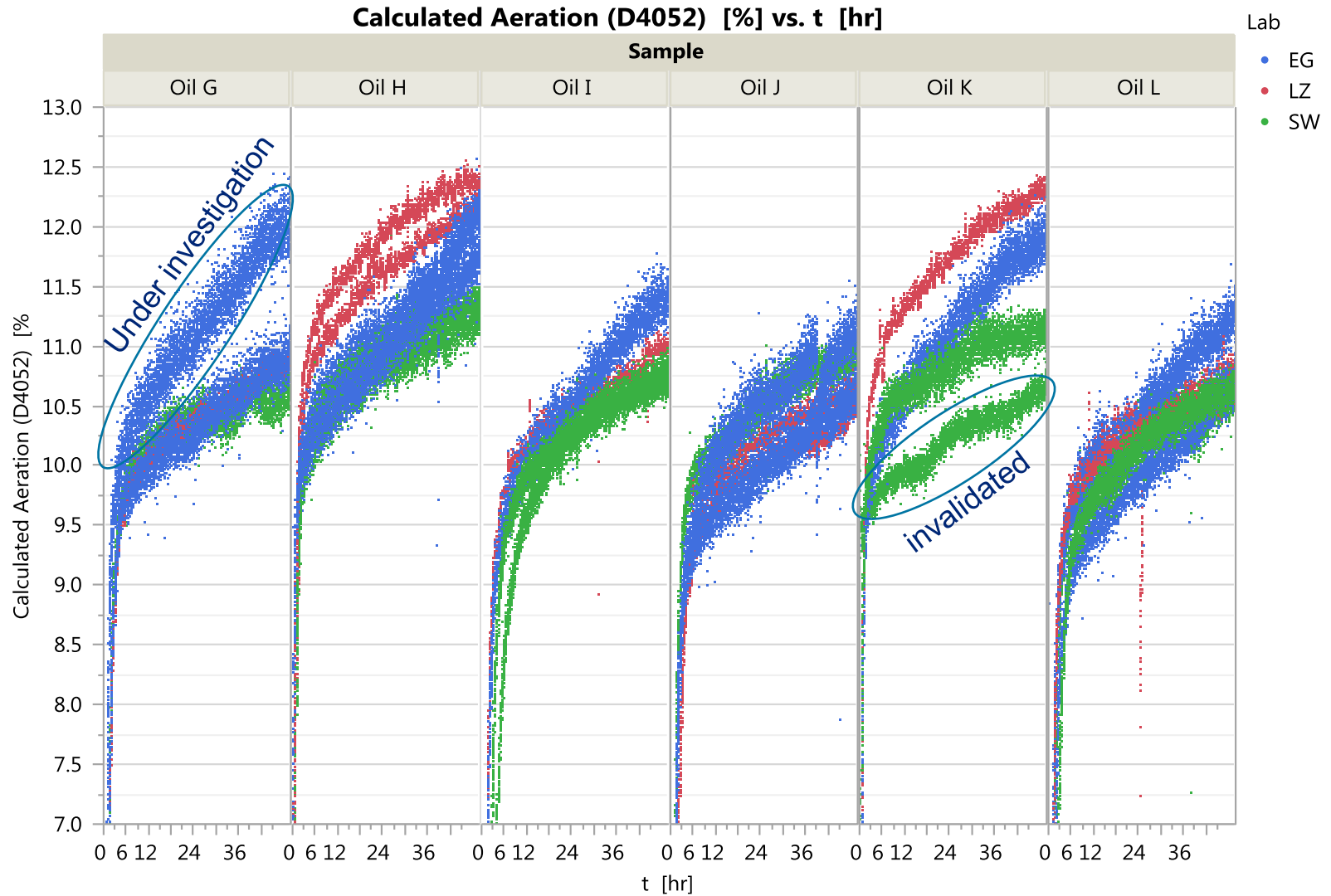
\* = invalidated. High pump speed signal output and low starting POILG profile.

\*\* = under investigation; potentially severe result due to high delta temp across MM

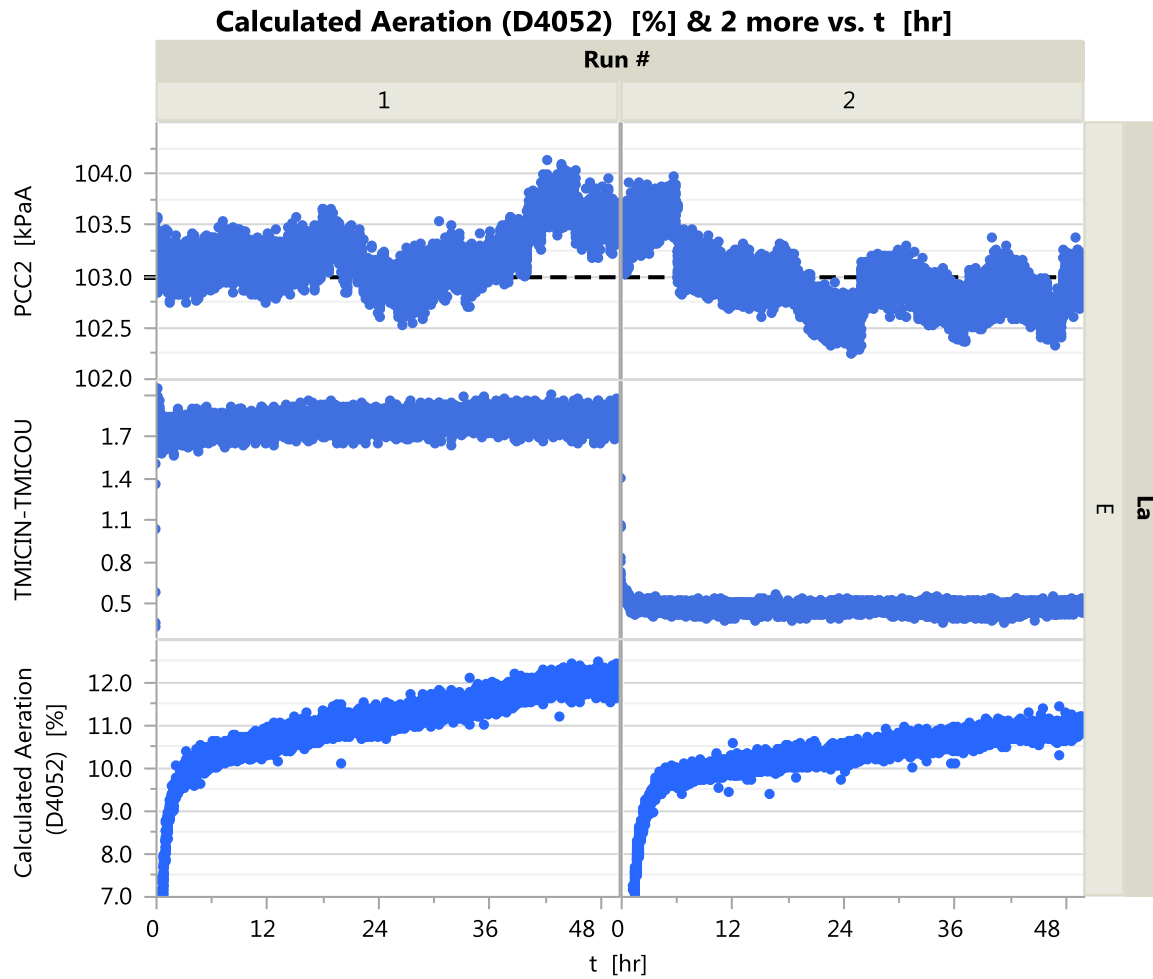
# Aeration plots by lab



# Aeration plots by sample

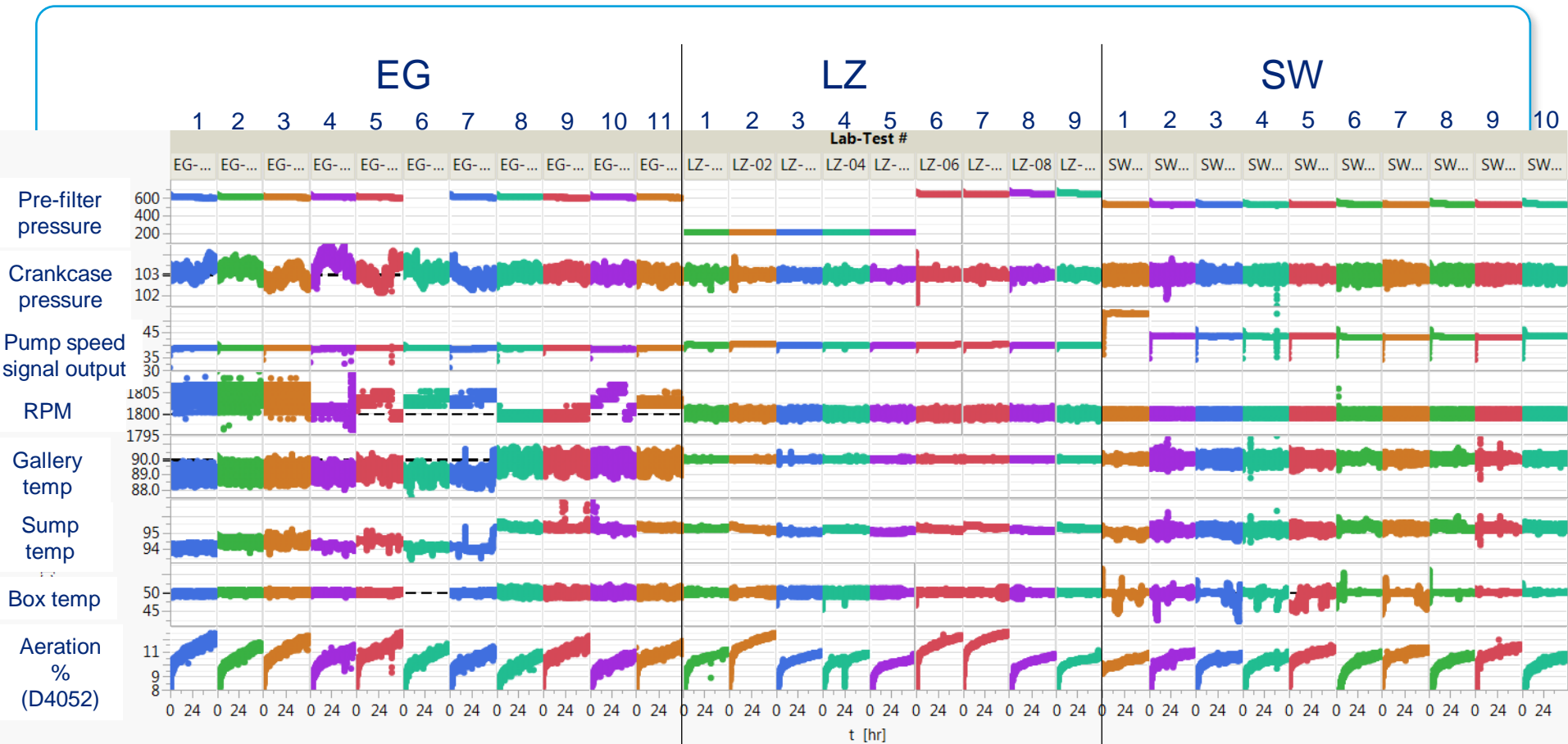


# Oil G runs at EG lab



Should 1<sup>st</sup> run be invalidated?  
Repeated?

# Selected operational parameters by run



Control of some parameters has improved.

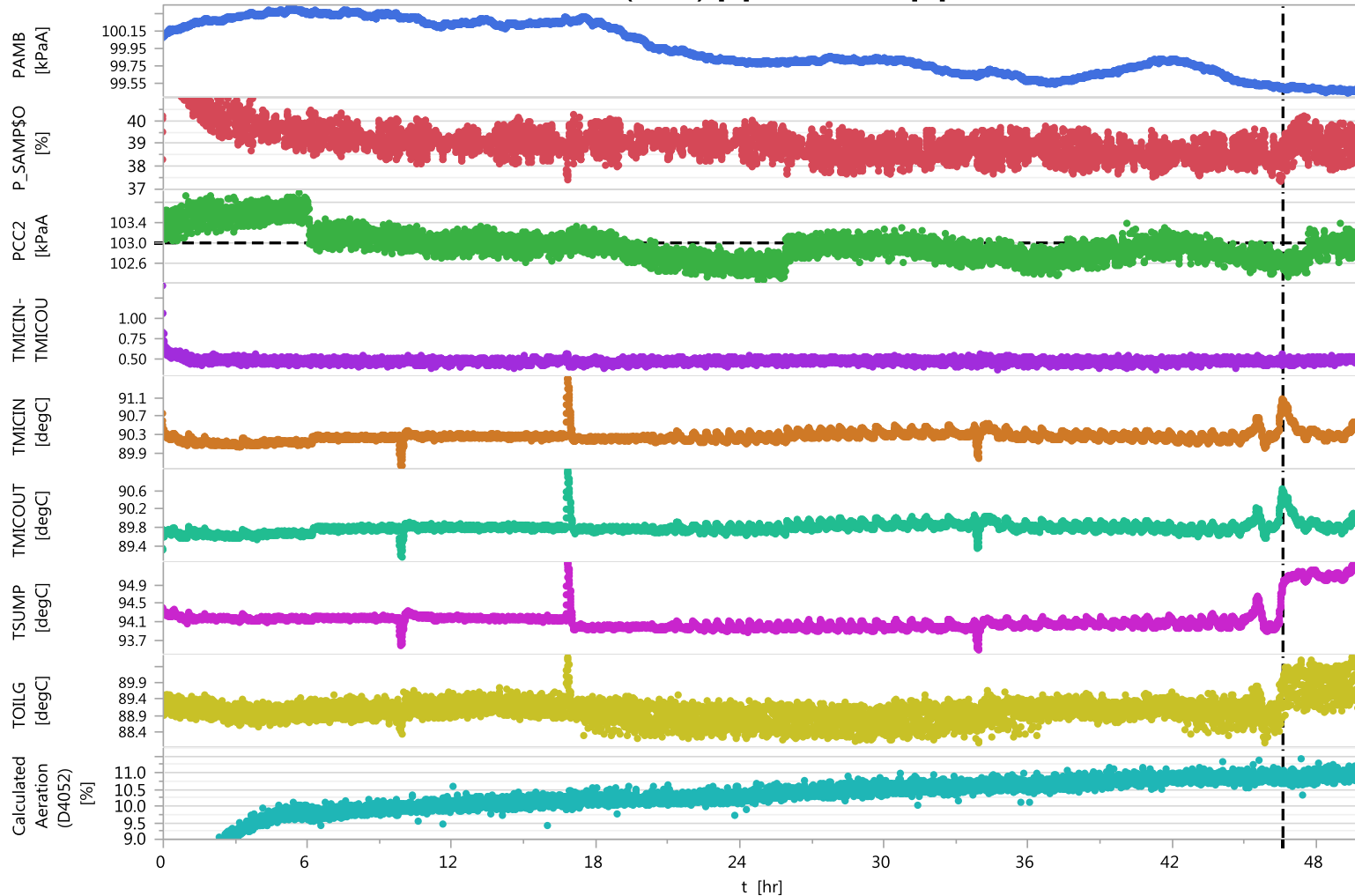
Pressures in kPa, Temps in deg C, signal output in %.

- Oil G
- Oil H
- Oil I
- Oil J
- Oil K
- Oil L

# EG Test 7 – Oil G

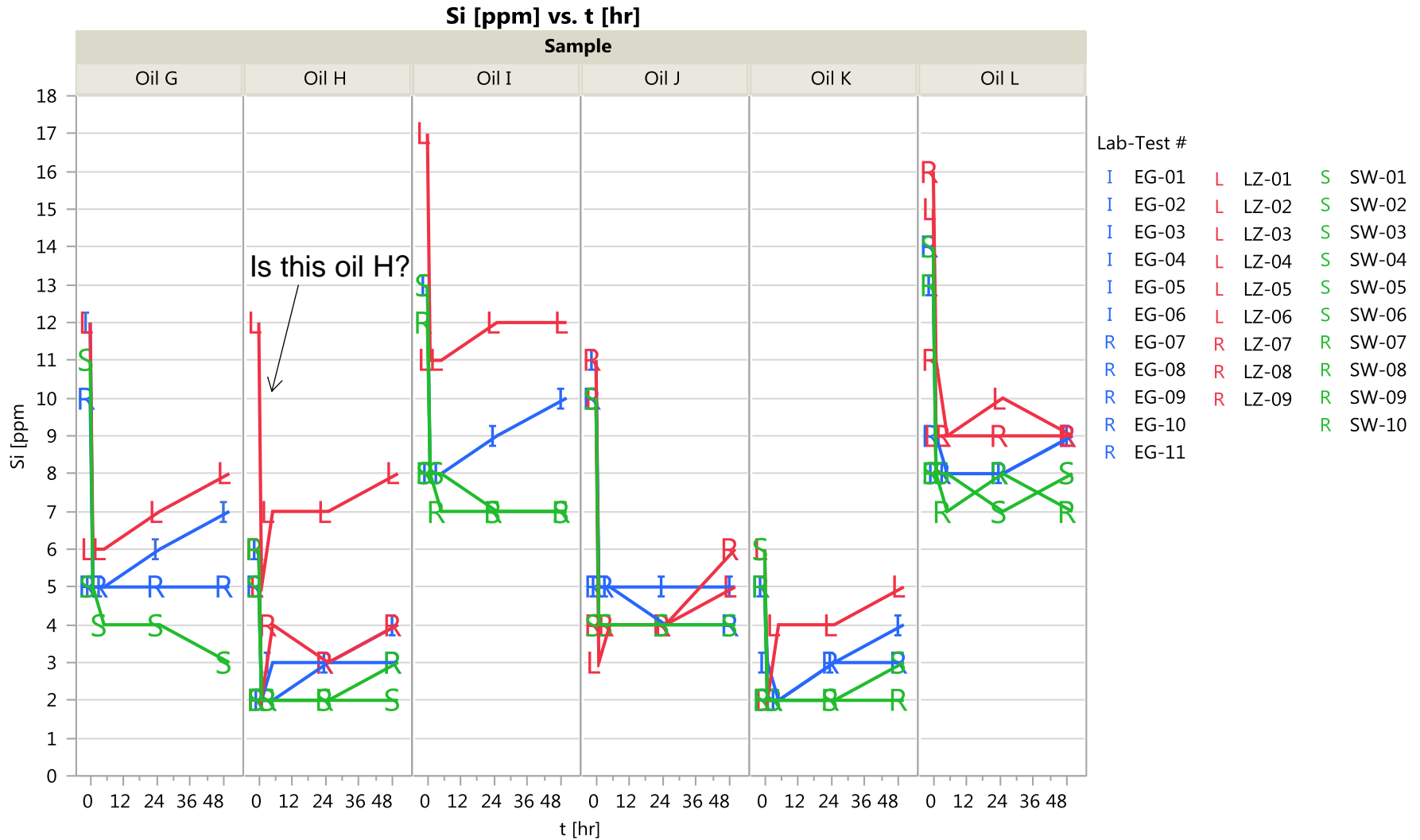


Calculated Aeration (D4052) [%] & 8 more vs. t [hr]

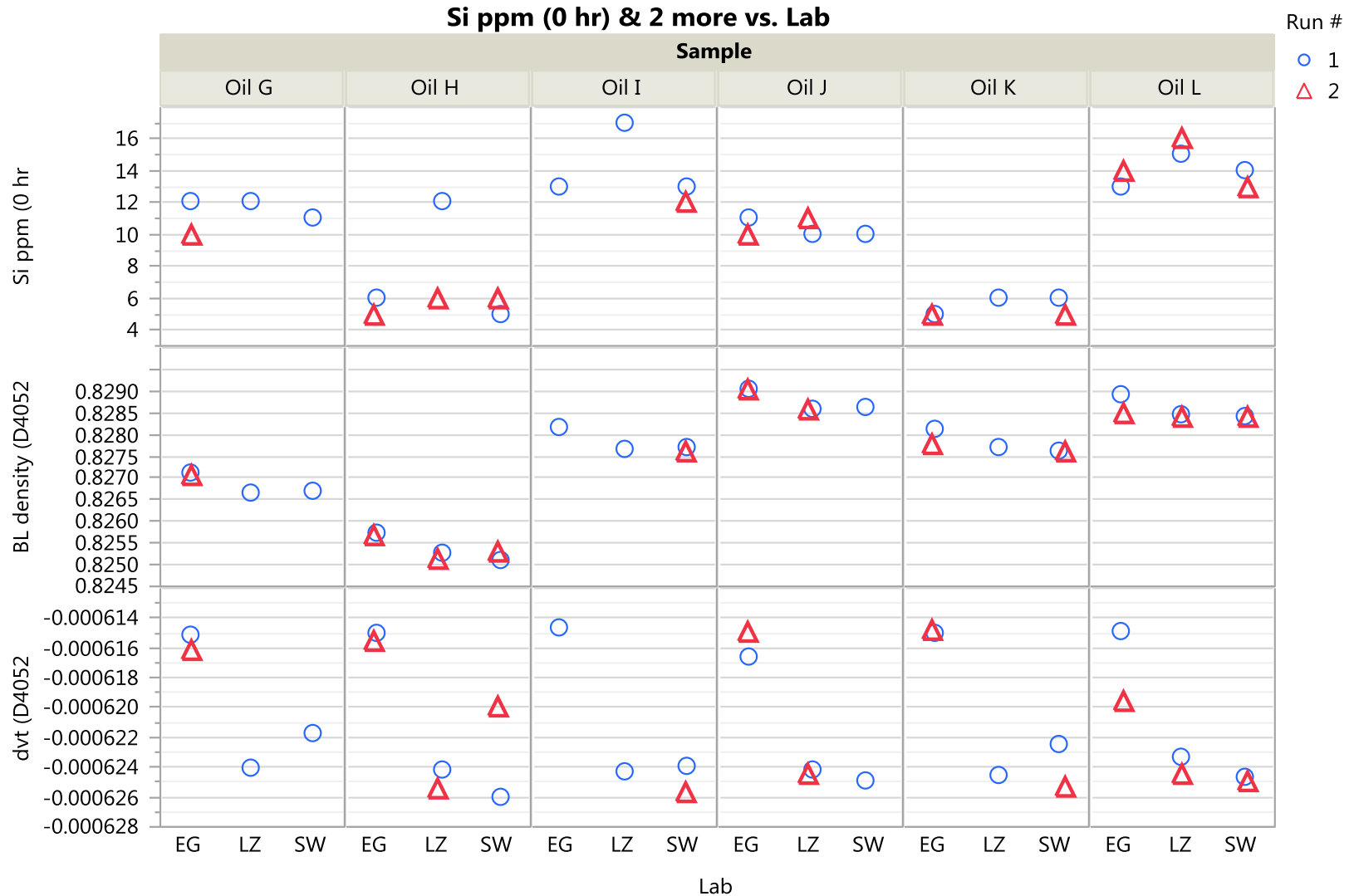




# Si data



# D4052 and Si ICP data



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# Test comments



Lab	EG	LZ	SW
Test 1	G: MM TCs replaced and depths readjusted after this test	I: 31 hrs, shutdown for 44 min.	K: No shutdowns.
Test 2	I: No shutdowns.	K: No shutdowns.	J: 25.8 hrs, shutdown for 1 hr 26 min
Test 3	K: No shutdowns.	G: No shutdowns.	G: No shutdowns. SOT @ 22.33?
Test 4	J: 38.8 hrs, shutdown for <30 min due to coolant temp TC high limit fault tripped. 45.1 hrs, shutdown for over 4 hrs due to computer malfunction	L: 24.3 hrs, shutdown for 2 hrs 33 min	L: 37.8 hrs, shutdown for 6 hrs.
Test 5	H: 38.6 hrs, shutdown due to coolant temp TC fault . Extended downtime for replacement	J: No shutdowns.	H: No shutdowns.
Test 6	L: No shutdowns.	H: 1.1 hrs, shutdown for 4 min	I: No shutdowns.
Test 7	G: No shutdowns. Before 16.8 hrs, coolant temp overcooling. Gallery temp was raised by 1 deg C for the last 2.5 hours of the test.	H: No shutdowns.	K: No shutdowns.
Test 8	L: No shutdowns. Starting with this run, gallery temp raised 1 deg C to reach 90 deg C.	J: No shutdowns.	I: No shutdowns.
Test 9	H: No shutdowns.	L: No shutdowns.	H: No shutdowns.
Test 10	J: No shutdowns. Added additional day tank to eliminate fueling spikes.	G	L: No shutdowns.
Test 11	K: No shutdowns.	K	G
Test 12	I	I	J
Test 13	G		K