Issued: May 08, 2012
Reply to: Dan Worcester
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These are the unapproved minutes of the 04.26.2012 Sequence VI Task Force call.

The meeting was called to order at 10:00 AM by Chairman Dave Glaenzer.

Agenda

The Agenda is the included as Attachment 1.

1.0 Roll Call

The Attendance list Attachment 2.

2.0) Approval of minutes

2.1 Approval of the minutes of the 03.26.2012 meeting.

Motion – Accept the minutes of the 03.26.2012 VID SP meeting. Unanimous. Charlie Leverett, Dave Glaenzer, second.

3.0) Action Item Review

3.1 Intertek to evaluate VID data for a particular stage to use for monitoring engine stabilization during break-in. DONE Chadwick See Attachments 3,4. Stage 3 is recommended, and a VIA format with 100 hours of break in followed by Stage 3 conditions for stabilization will be used.

3.2 Afton to run VIA type break-in on MY2012 GM engine. Underway
Afton is running break in to the VIA format. There was discussion on the temperatures selected, and they are running 105 oil temperature and 95 coolant temperature to more closely simulate field operations. It will cycle for 100 hours, then stabilize for 60 minutes of Stage 3 conditions and this

will be repeated until BSFC is stable [≤ 1% variation]. Break in operations between Stage 3 BSFC checks will be 10 hours.

3.3 SwRI to run BLB1 & BLB2 as normal, then re-run with 90 minute stabilization times. Worcester

SwRI is ran the comparision of BLB stages at 60 minutes then repeated with 90 minute stabilization. As the SwRI system controls well in all stages, no significant change was seen, although BLB1-2 delta was slightly more consistent. This is likely due to additional run time on the engine:

60 Minute Stabilization

		Total Fuel		Weighted	BLS (Total Fuel) Procedure	
BLB1						
	S1	3.126648	0.3	0.937994		
	S2	3.246824	0.032	0.103898		
	S3	2.358317	0.31	0.731078		
	S4	0.545529	0.174	0.094922		
	S5	0.650299	0.011	0.007153		
	S6	0.668398	0.172	0.114964		
		10.596015		1.990009		
BLB2						
	S1	3.117632	0.3	0.935290		
	S2	3.250672	0.032	0.104021		
	S3	2.346527	0.31	0.727423		
	S4	0.538631	0.174	0.093722		
	S5	0.651328	0.011	0.007165		
	S6	0.664062	0.172	0.114219		
		10.568852		1.981840	BLB1/BLB2	0.26%

90 Minute Stabilization

		Total Fuel		Weighted	BLS (Total Fuel) Procedure
BLB1					
	S1	3.100810	0.3	0.282020	
	S2	3.229232	0.032	0.293700	
	S3	2.339107	0.31	0.283700	
	S4	0.536170	0.174	0.734480	
	S5	0.650102	0.011	0.890550	
	S6	0.664208	0.172	0.456500	
		10.519629		1.973390	
BLB2					
	S1	3.107187	0.3	0.282600	
	S2	3.222415	0.032	0.293080	

S3	2.336386	0.31	0.283370		
S4	0.536309	0.174	0.734670		
S5	0.646525	0.011	0.885650		
S6	0.662898	0.172	0.455600		
	10.51172		1.974001	BLB1/BLB2	0.08%

3.4 TMC to evaluate data for oil pressure trends. Grundza See Attachment 5.

ACTION: Rich will contact labs to confirm oil line sizes used on pan and filters. ACTION: Dave will supply a list of fittings, hoses, and lines for the suction side. When these two lists are combined, standardization can move forward. The consensus is that oil pressure does affect test severity.

3.5 Intertek to share data on different coolant mixtures. Leverett See Attachments 6 and 7. Discussion was that this would make the test safer without affecting severity. There was also discussion on raising the coolant system pressure. GM recommended 15 psi. That was rounded to 100 kPa. Oil temperature does stabilize faster.

Motion – Recommend to Surveillance Panel to use 50/50 mixture of glychol and distilled water, and increase the system pressure to 100 kPa. Unanimous.
Robert Stockwell, Dan Worcester, second.

3.6 TMC to conduct engine coolant flow calibration round robin with meter supplied by Afton. Altman/Grundza

ACTION: Ed Altman to supply a turbine meter and procedure to begin the round robin. The procedure will be reviewed by the Task Force prior to initiation.

3.7 Oberg filter line size to be evaluated along with remainder of external oil line plumbing. This will be part of the oil system actions. There was discussion on the screen size. VIx uses 24, but VG and other possible new test types use 60 micron elements.

Motion – Recommend to Surveillance Panel to use 60 micron filters for 2012 engines [both filters]. Unanimous.
Charlie Leverett, Jason Bowden, second.

3.8 Lubrizol to run flush effectiveness study to evaluate Ca carryover. Brys

IAR and Afton have run the double flush method including BLA and stages. It does stabilize the calcium levels, but will require additional flush oil be produced should this be adopted. See Attachment 8.

3.9 ExxonMobil to generate list of ECM data that would be desirable to monitor and record. Mosher On-going.

3.) Old Business

3.1 None

4.) New Business

4.1 On many occasions we have been unable to complete meaningful analysis of test data as D7589 has minimal requirements for data logging frequency and/or data averaging. The only specifics are during 30 minute logging for BSFC values (Section 11.6.5), a note on Report Forms 8 & 9 and data dictionary calling for average data on Forms 10-18. GM felt one minute data should be recorded for evaluation, even during flushes. One second data was also discussed. Official BSFC should remain as it is. This will be a problem for some labs due to file sizes and control program limitations.

Motion – Recommend to Surveillance Panel to record one minute snapshot data for all stages including flushes [except BSFC] and save this data for two years. The VID procedure would continue to be followed for BSFC data. Unanimous.
Robert Stockwell, Mark Mosher, second.

Motion – Recommend to Surveillance Panel to record one second snapshot data for all stages including flushes starting with 2012 engine use, and save this data for two years. The VID procedure would continue to be followed for BSFC data.
Robert Stockwell, Rich Grundza, second.
This received two negative votes, and one waive. It was tabled for further discussion.

4.1 Is the test with 2012 engine a VID or VIE? This has been a question. On the GF-6 timeline there is a precision matrix and test development time, so this test will be declared the VIE.

6.) Next Meeting

At the call of the chairman.

7.) Meeting Adjourned

The meeting adjourned at 11:28 AM.

Dave Glaenzer, Tim Caudill, second. Unanimous.

Sequence VID Test Quality TF Teleconference

April 26, 2012

11:00 CDT

Call-in Number: 866-817-9787

Participant Passcode: 2158089

Non-Toll Free: 203-320-3489

Agenda

1) Attendance

2) Approval of minutes

2.1) Approve the minutes from March 27, 2012

3) Action Item Review from 03/27/2012

1. Intertek to evaluate VID data for a particular stage to use for monitoring engine stabilization during break-in. DONE Chadwick
2. Afton to run VIA type break-in on MY2012 GM engine. Underway
3. SwRI to run BLB1 & BLB2 as normal, then re-run with 90 minute stabilization times. Worcester
4. TMC to evaluate data for oil pressure trends. Grundza
5. Intertek to share data on different coolant mixtures. Leverett
6. TMC to conduct engine coolant flow calibration round robin with meter supplied by Afton. Altman/Grundza
7. Oberg filter line size to be evaluated along with remainder of external oil line plumbing. Open
8. Lubrizol to run flush effectiveness study to evaluate Ca carryover. Brys Additional data generated by Afton Glaenzer
9. ExxonMobil to generate list of ECM data that would be desirable to monitor and record. Mosher

5) New or Additional Areas of Concern

1. On many occasions we have been unable to complete meaningful analysis of test data as D7589 has minimal requirements for data logging frequency and/or data averaging. The only specifics are during 30 minute logging for BSFC values (Section 11.6.5), a note on

Report Forms 8 & 9 and data dictionary calling for average data on Forms 10-18.

6) Next Meeting

Teleconference on XX/XX/2012

7) Meeting Adjourned

TEST QUALITY T.F. 04/26/2012

ASTM SEQUENCE VI [redacted]

Name	Address	Phone/Fax/Email	Attendance
Jason Bowden Voting Member	OH Technologies, Inc. P.O. Box 5039 Mentor, OH 44061-5039	Phone: 440-354-7007 Fax: 440-354-7080 jhbowden@ohtech.com	✓
Timothy Caudill Voting Member	Ashland, Inc. 21st and Front Streets Ashland, KY 41101	Phone: 606-329-5708 Fax: 606-329-3009 Tlcaudill@ashland.com	✓
David Glaenzer Voting Member	Afton Research Center 500 Spring Street Richmond, VA 23218	Phone: 804-788-5214 Fax: 804-788-6358 Dave.Glaenzer@aftonchemical.com	✓
Rich Grundza Voting Member	ASTM TMC 6555 Penn Ave. Pittsburgh, PA 15206-4489	Phone: 412-365-1034 Fax: 412-365-1047 reg@astmtmc.cmu.edu	✓
Charlie Leverett Voting Member	Intertek Automotive Research 5404 Bandera Road San Antonio, TX 78238	Phone: 210-647-9422 Fax: 210-523-4607 charlie.leverett@intertek.com	✓
Jim Linden Voting Member	Toyota	lindenjim@hotmail.com	
Bruce Matthews Voting Member	GM Powertrain Engine Oil Group Mail Code: 483-730-472 823 Joslyn Rd	Pontiac, MI 48340 Phone: 248-830-9197 bruce.matthews@gm.com	✓
Timothy Miranda Voting Member	BP Castrol Lubricants USA 1500 Valley Road Wayne, NJ 07470	Phone: 973-305-3334 Timothy.Miranda@bp.com	
Nathaniel Moles Voting Member	Lubrizol 29400 Lakeland Blvd. Wickliffe, OH 44092	Phone: (440) 347-4472 Nathaniel.Moles@Lubrizol.com	
Mark Mosher Voting Member	ExxonMobil 600 Billingsport Road Paulsboro, NJ 08066	Phone: 856-224-2132 Fax: 856-224-3628 mark_r_mosher@exxonmobil.com	✓
Andy Ritchie Voting Member	Infineum 1900 East Linden Ave. Linden, NJ 07036-0735	Phone: 908-474-2097 Fax: 908-474-3637 Andrew.Ritchie@infineum.com	

T, F. 04/26/2012

ASTM SEQUENCE VI [redacted]

Name	Address	Phone/Fax/Email	Attendance
Ron Romano Voting Member	Ford Motor Company 21500 Oakwood Blvd POEE Bldg Rm DR 167 MD 44 Dearborn, MI 48121-2053	Phone: 313-845-4068 rromano@ford.com	✓
Mark Sutherland Voting Member	Chevron Oronite Company LLC 4502 Centerview Ste. 210 San Antonio, TX 78228	Phone: 210.731.5605 Fax: 210.731.5621 msut@chevrontexaco.com	
Haiying Tang Voting Member	Chrysler	HT146@Chrysler.com Tel: 248-512-0593	
Dan Worcester Voting Member	Southwest Research Institute (SwRI) 6220 Culebra Road San Antonio, TX 78228	Phone: 210.522.2405 dan.worcester@swri.org	✓

Guests

Ed Altman	ed.altman@aftonchemical.com	Afton	✓
Bob Campbell	Bob.Campbell@aftonchemical.com	Afton	✓
Todd Dvorak	todd.dvorak@aftonchemical.com	Afton	✓
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Kurt Knapp	knappka@cpchem.com	CP	
Jim Carter	jecarter@jhaltermann.com	Haltermann	
Doyle Boese	Doyle.boese@infineum.com	Infineum	
Jerry Brys	Jerome.brys@lubrizol.com	Lubrizol	✓
Jeff Kettman	Jeff.kettman@gm.com	GM	

T.F. 04/26/2012

ASTM SEQUENCE VI [redacted]

Name	Address	Phone/Fax/Email	Attendance
Don Smolenski	donald.j.smolenski@gm.com	GM	✓
Robert Stockwell	Robert.Stockwell@GM.com Phone: 210.563.0785	GM	✓
Angela Willis	angela.p.willis@gm.com	GM	✓
Matthew Snider	matthew.j.snider@gm.com	GM	✓
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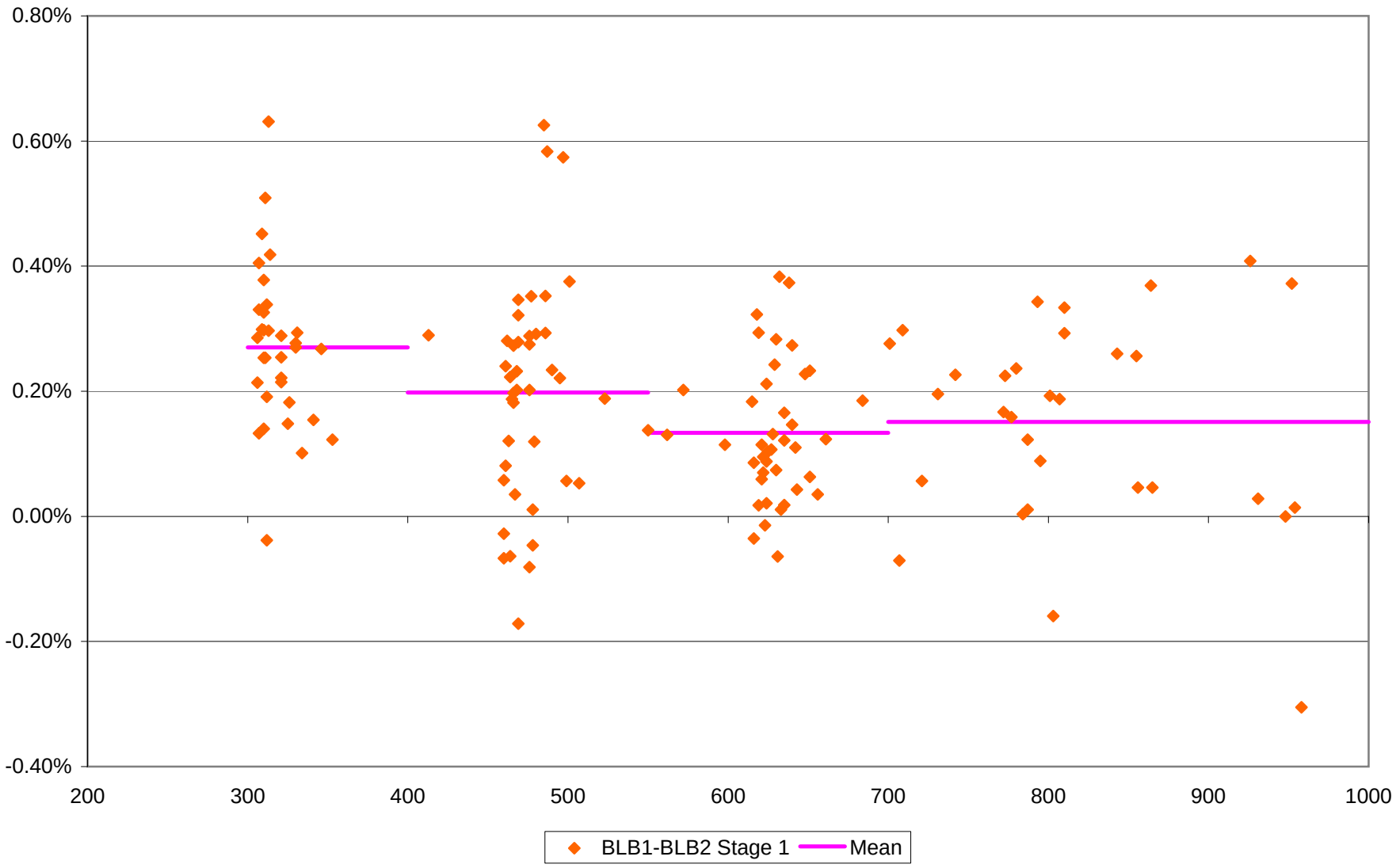
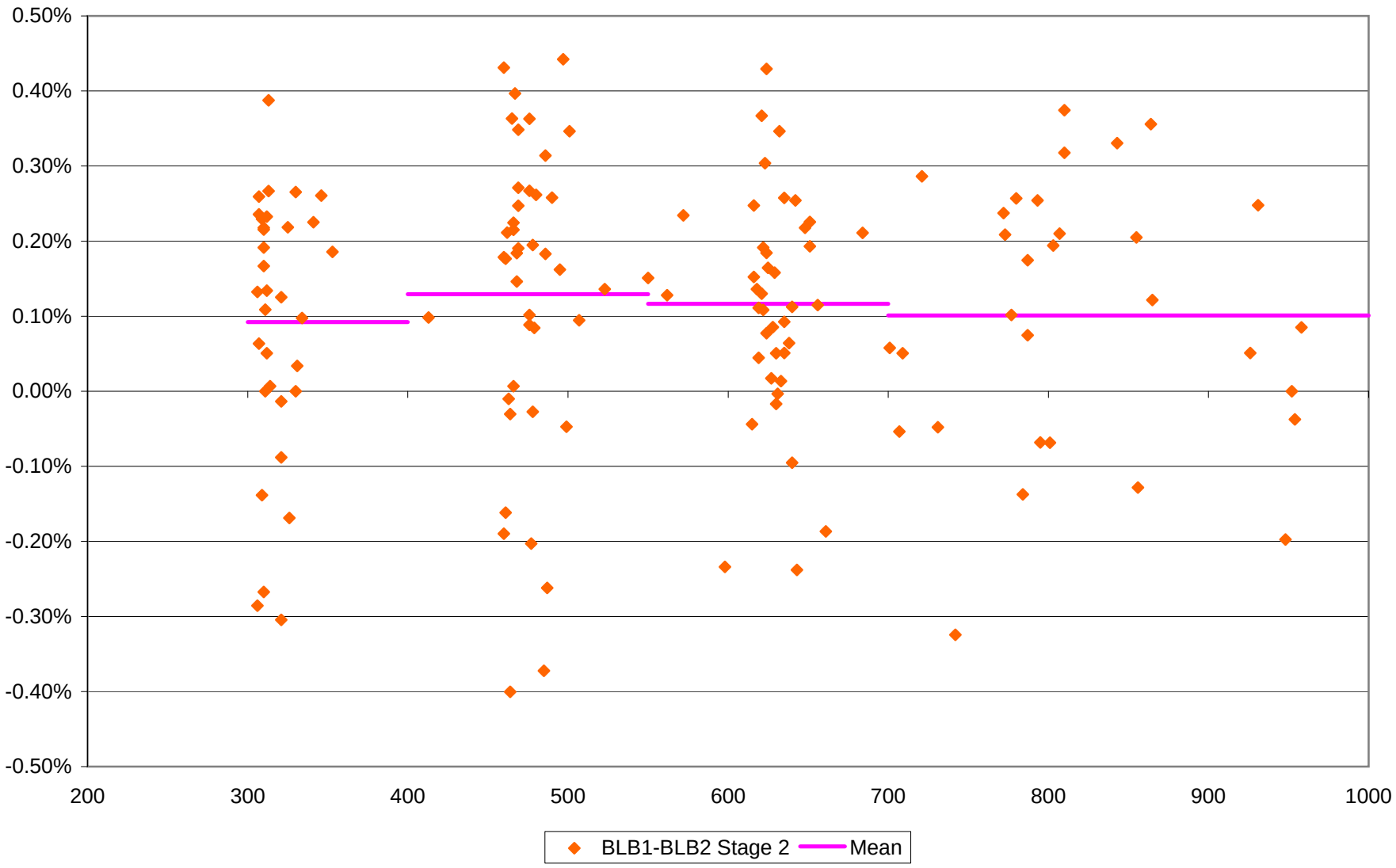
Dwight Bowden	dhbowden@ohtech.com	OHT	
Matt Bowden	mjbowden@ohtech.com	OHT	✓
Clayton Knight	cknight@tei-net.com	TEI	
Jeff Clark	jac@astmtmc.cmu.edu	TMC	
Guy Stubbs	Guy.Stubbs@swri.org	SwRI	
William Buscher	wbuscher@swri.edu	SwRI	


BSFC Shift for Charted Reference tests ith o BLB3 Run and 1 Hrs
0.80%
0.60%
0.40%
0.20%
0.00%
-0.20%
-0.40%
200
300
400
500
600
700
800
900
1000
BLB1-BLB2 Stage 1
Mean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0.40%
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0.20%
0.10%
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-0.20%
-0.30%
-0.40%
-0.50%
200
300
400
500
600
700
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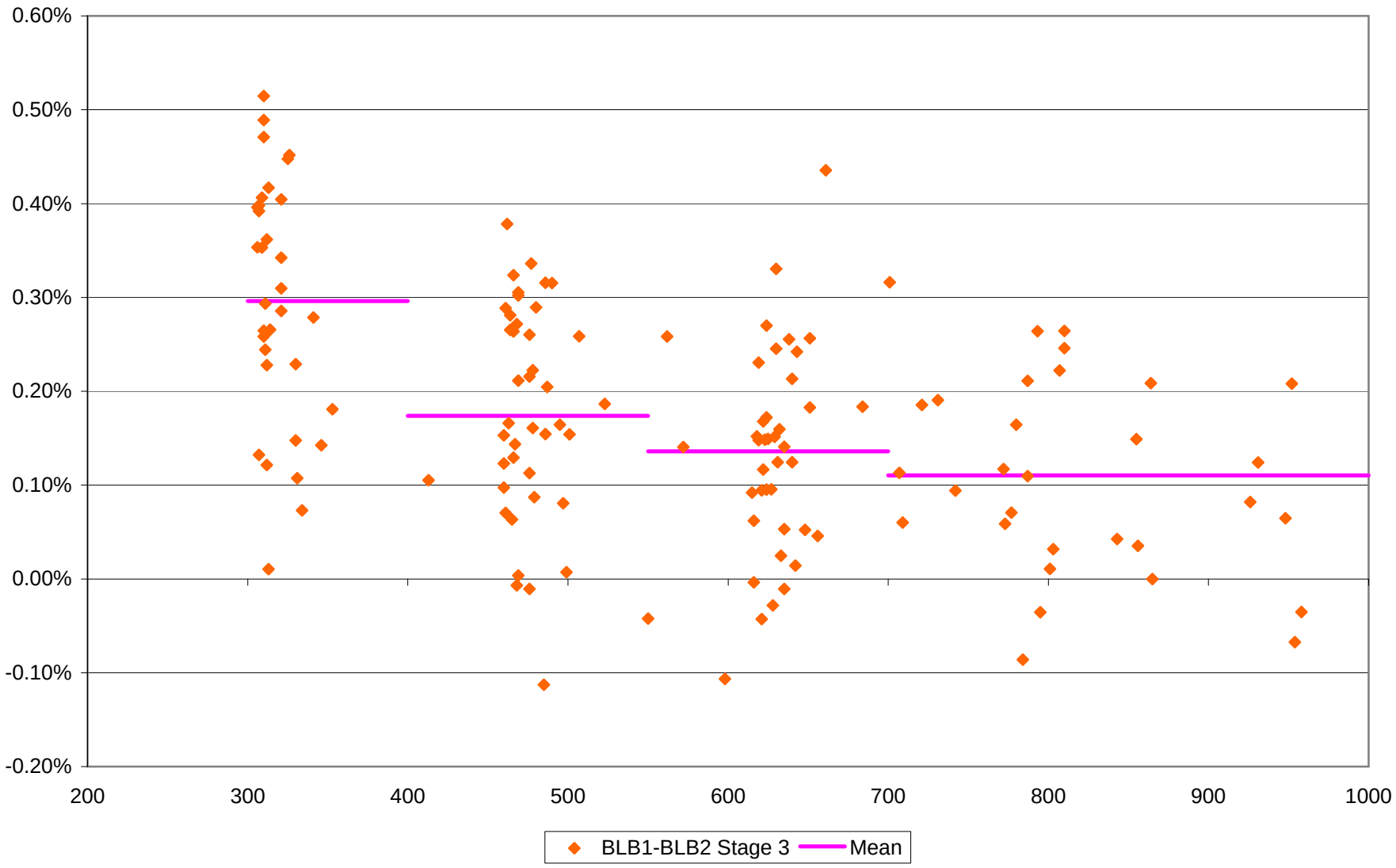
BLB1-BLB2 Stage 2
Mean


BSFC Shift for Charted Reference tests ith o BLB3 Run and 1 Hrs
0.60%
0.50%
0.40%
0.30%
0.20%
0.10%
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-0.10%
-0.20%
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600
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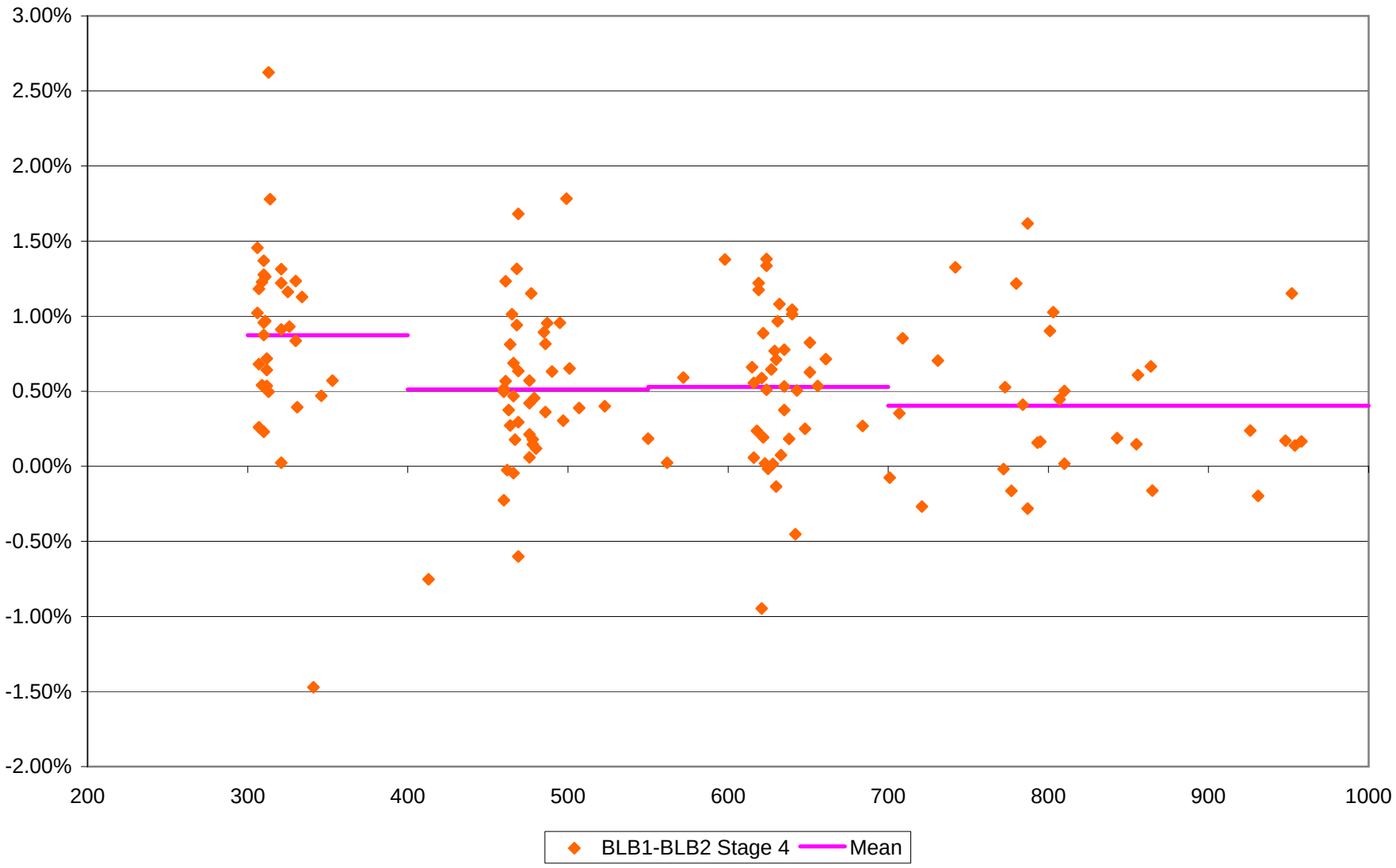
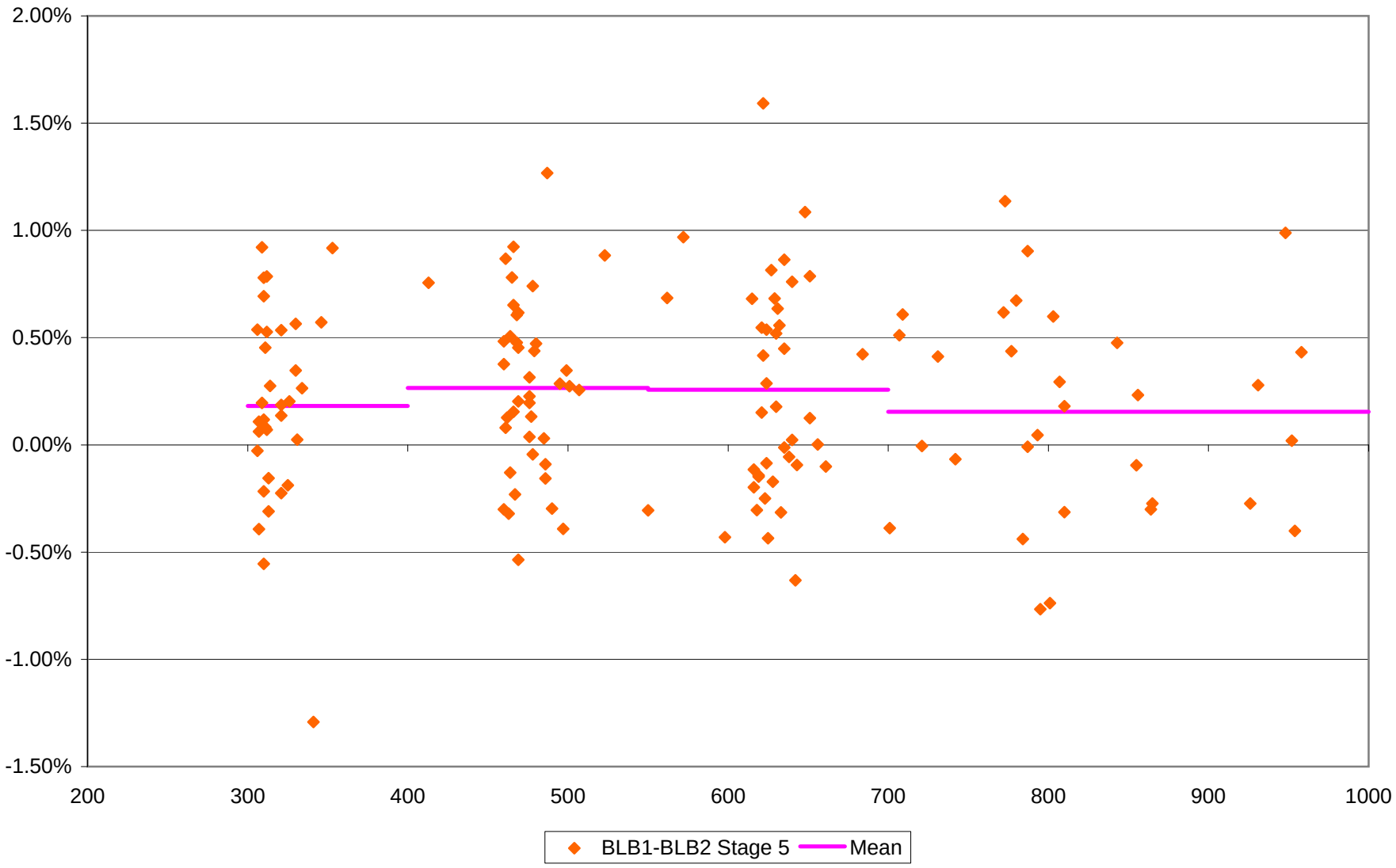
900
1000
BLB1-BLB2 Stage 3
Mean


BSFC Shift for Charted Reference tests ith o BLB3 Run and 1 Hrs
3.00%
2.50%
2.00%
1.50%
1.00%
0.50%
0.00%
-0.50%
-1.00%
-1.50%
-2.00%
200
300
400
500
600
700
800
900
1000
BLB1-BLB2 Stage 4
Mean


BSFC Shift for Charted Reference tests ith o BLB3 Run and 1 Hrs
2.00%
1.50%
1.00%
0.50%
0.00%
-0.50%
-1.00%
-1.50%
200
300
400
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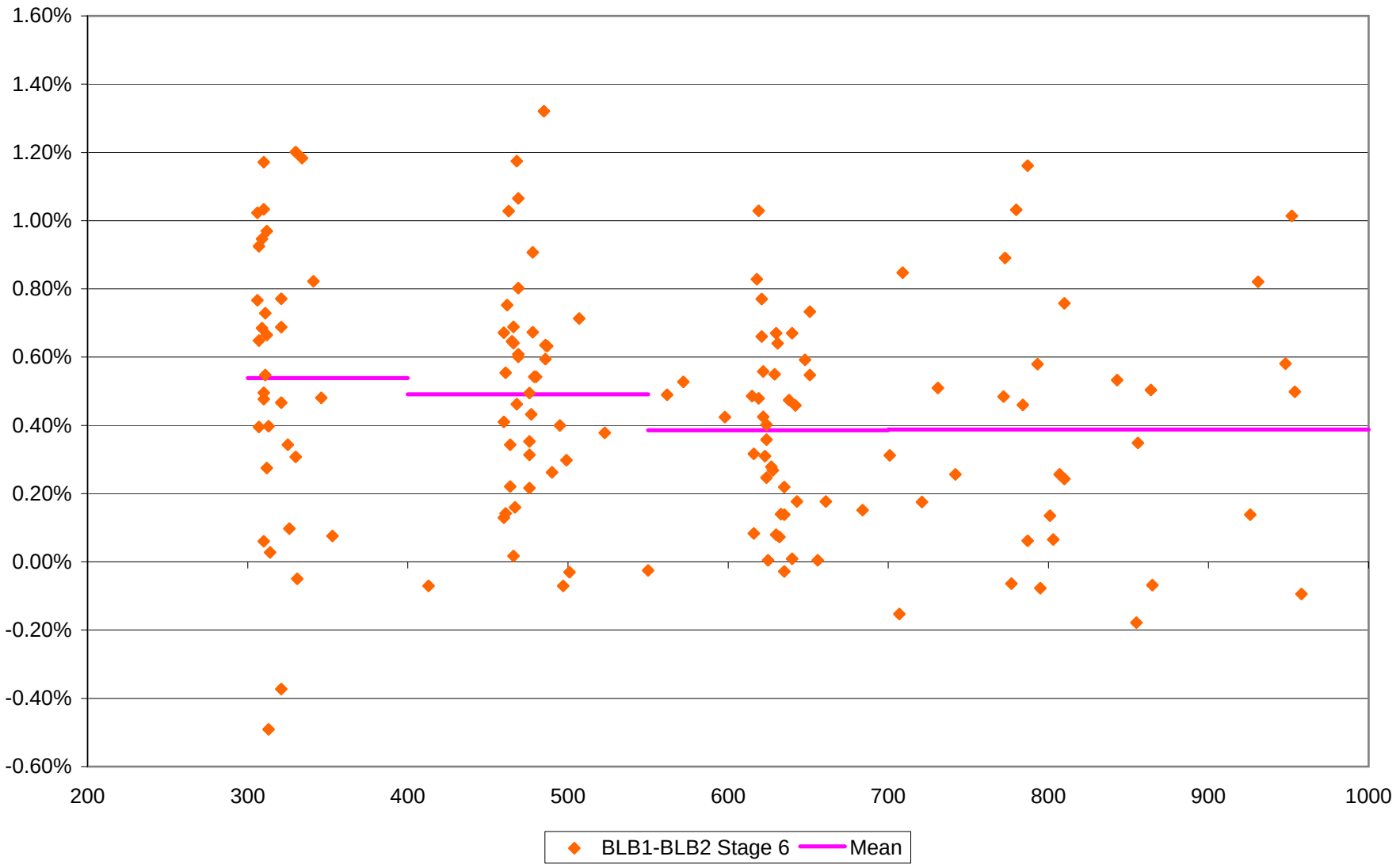
700
800
900
1000
BLB1-BLB2 Stage 5
Mean


BSFC Shift for Charted Reference tests ith o BLB3 Run and 1 Hrs
1.60%
1.40%
1.20%
1.00%
0.80%
0.60%
0.40%
0.20%
0.00%
-0.20%
-0.40%
-0.60%
200
300
400
500
600
700
800
900
1000
BLB1-BLB2 Stage 6
Mean

Martin has reviewed the stages we may want to select for the VIA type of break-in and here is his summary:

Based on my review I recommend selecting stage three conditions to evaluate break-in.

For this review I looked at the BLB1 to BLB2 shift on charted reference tests that did not have a BLB3 run and had less than 1000 engine hours (n=146). I excluded the runs with BLB3 as the number of tests was small (n=17) and to avoid the complication caused by including a different comparison. After reviewing the data I identified two primary items of interest. The first was the variability of the stage and the second was evidence that the stage might change as the engine was breaking in. Lower variability was desired to improve the chances of identifying any change caused by breaking in the engine; this eliminated the low speed stages (3-6) as they are more variable than the high speed stages (1-3). I also looked for some evidence that the stage response changed as the engine broke in; both stage one and three showed more evidence that they change as the engine ages than stage two. I recommend stage three over stage one due to slightly greater separation between the first run engines and later runs indicating it might more effectively identify break-in effects.

I don't believe any meaningful criteria can be developed to determine if an engine has completed break-in at this time unless the intent is to flush in new BL oil before each stage three run. If we intend to run the stage three conditions on the BL oil aged during break-in I believe we will need to collect break-in data over time so we can evaluate the impact that aging the BL has on the BSFC performance.

Please let me know if you need any additional information.

Thank you.

Martin Chadwick

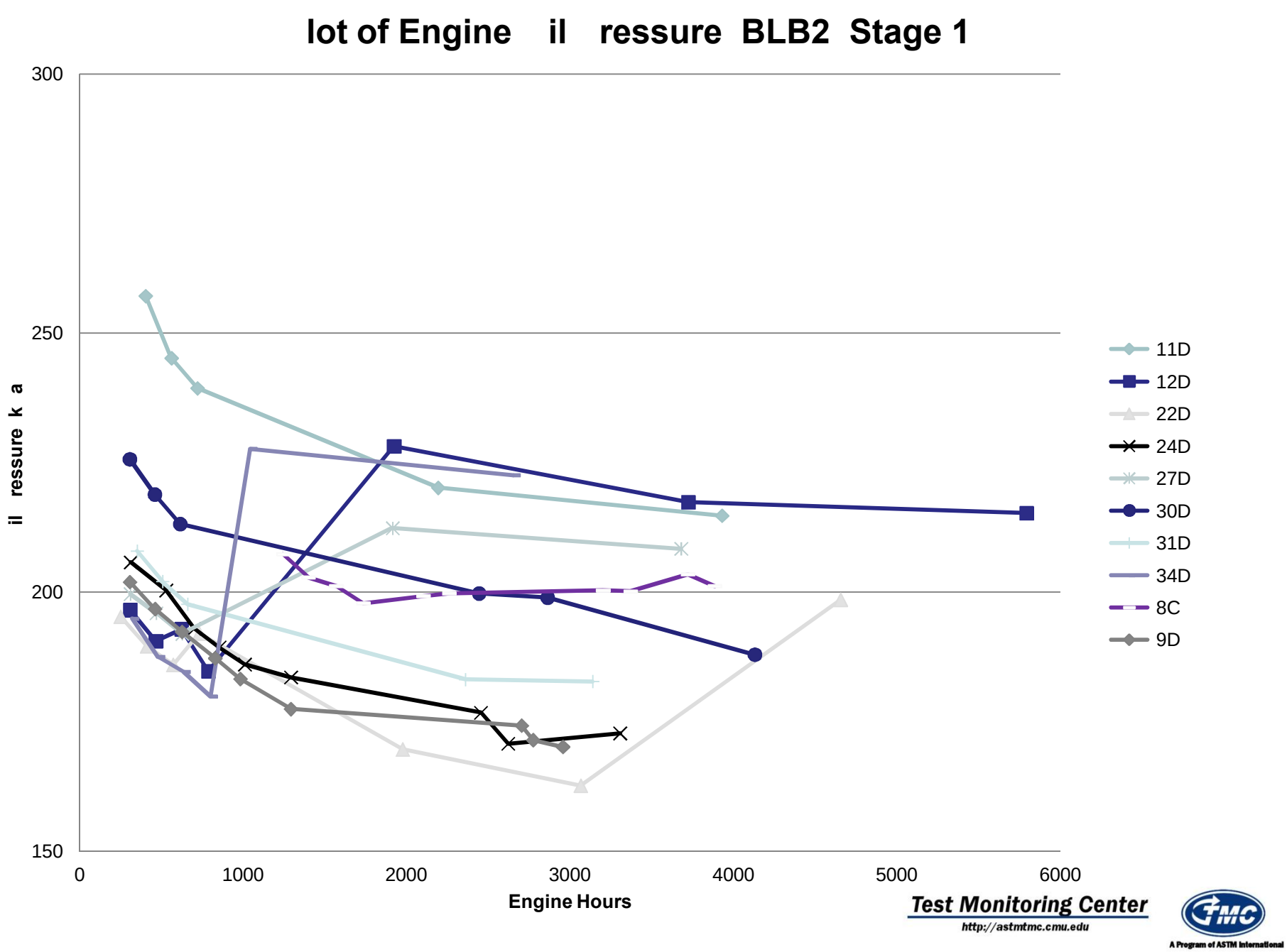
Oil Pressure Study

Sequence VID Task Force

April 26, 2012

Summary of Results

- 10 engines studied from six labs
- Increases in oil pressure in 22D, 27D and 34D due to changes to Aeroquip #10 and fitting changes
- Changes in oil pressure (decrease over time) tend to ñmimicò engine hour correction.



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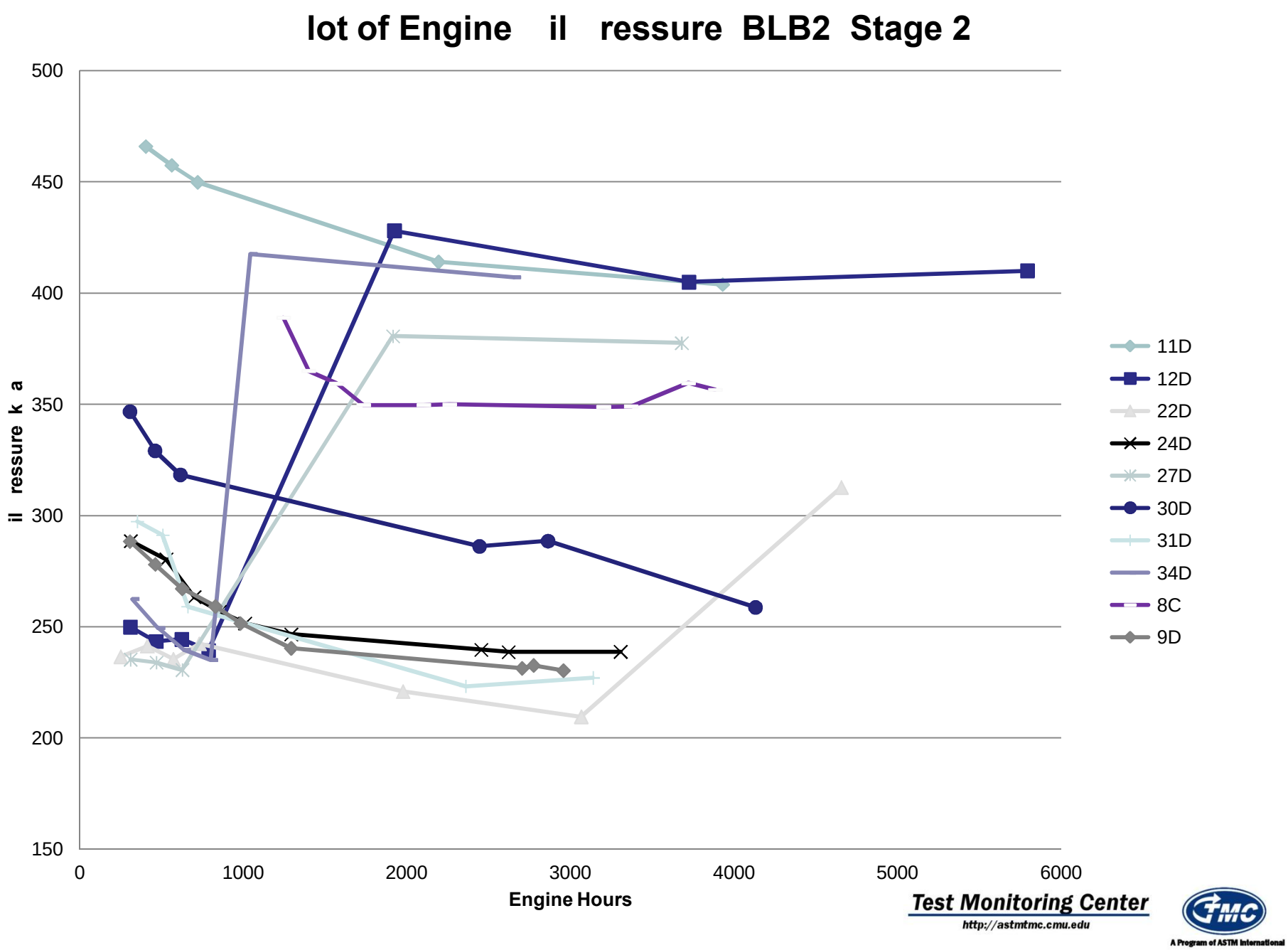

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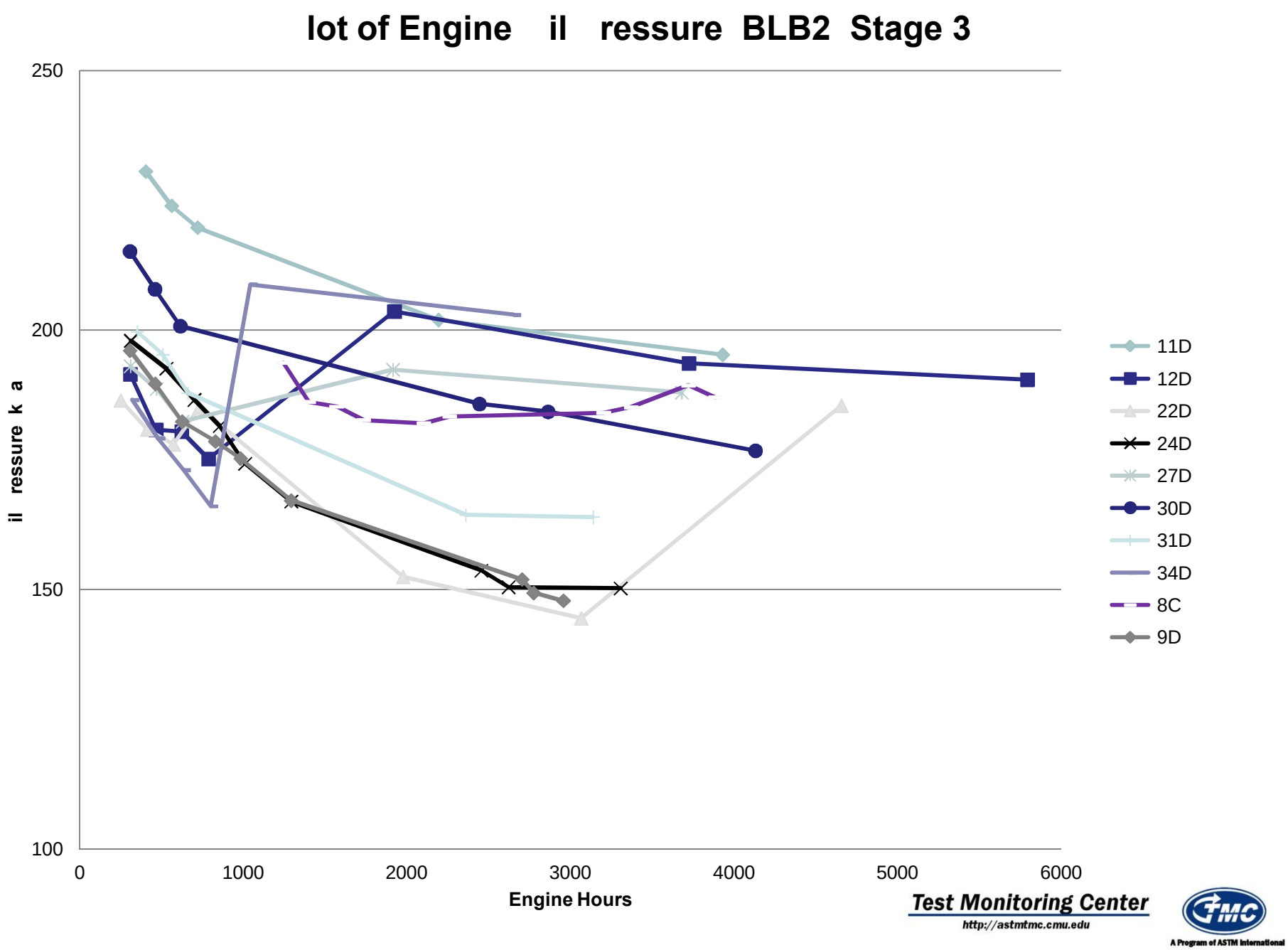
lot of Engine il ressure BLB2 Stage 3
250
200
150
100
il ressure k a
0
1000
2000
3000
4000
5000
6000
Engine Hours
11D
12D
22D
24D
27D
30D
31D
34D
8C
9D
Test Monitoring Center
http://astmtmc.cmu.edu
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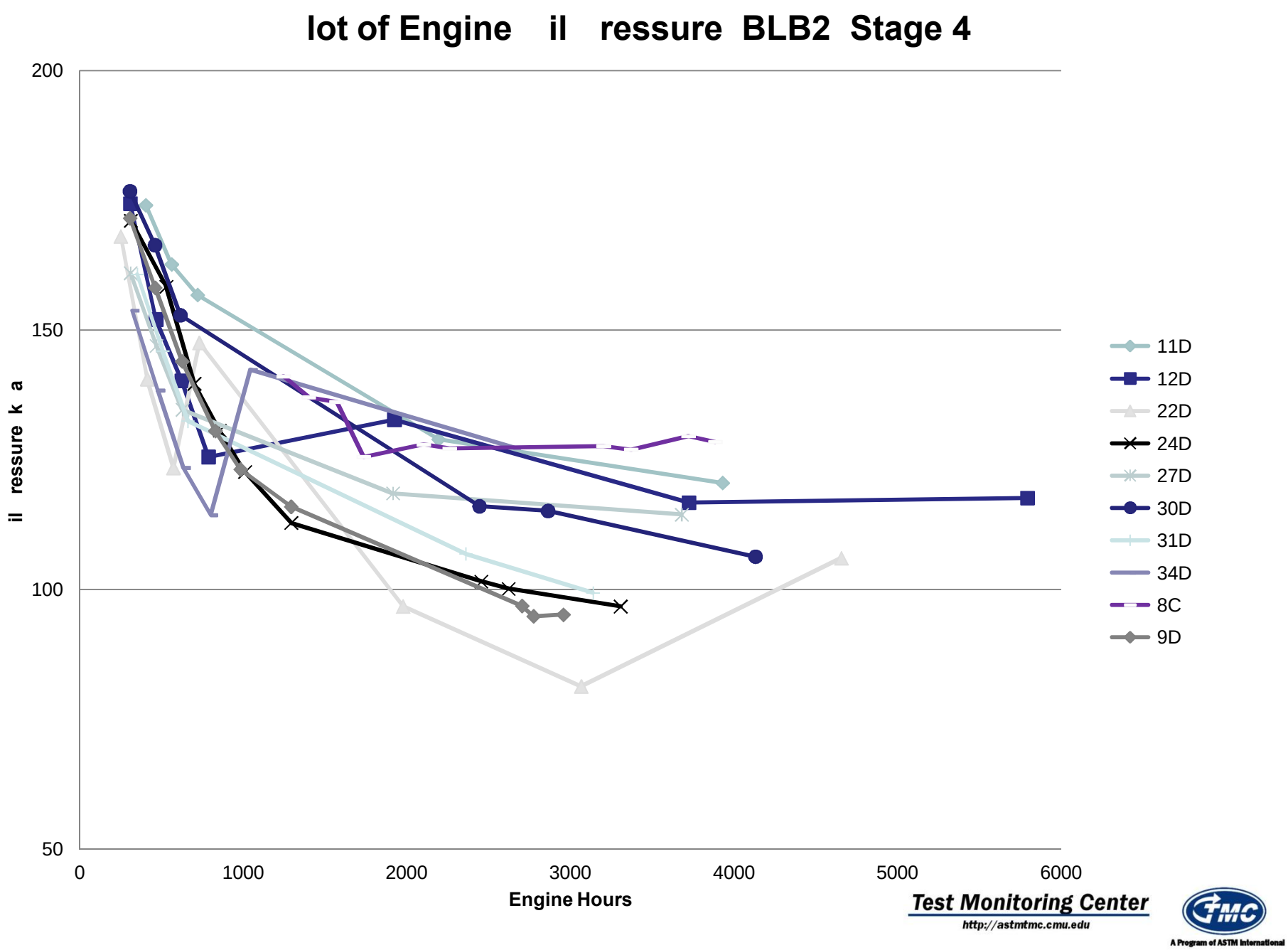
lot of Engine il ressure BLB2 Stage 4
200
150
100
50
il ressure k a
0
1000
2000
3000
4000
5000
6000
Engine Hours
11D
12D
22D
24D
27D
30D
31D
34D
8C
9D
Test Monitoring Center
http://astmtmc.cmu.edu
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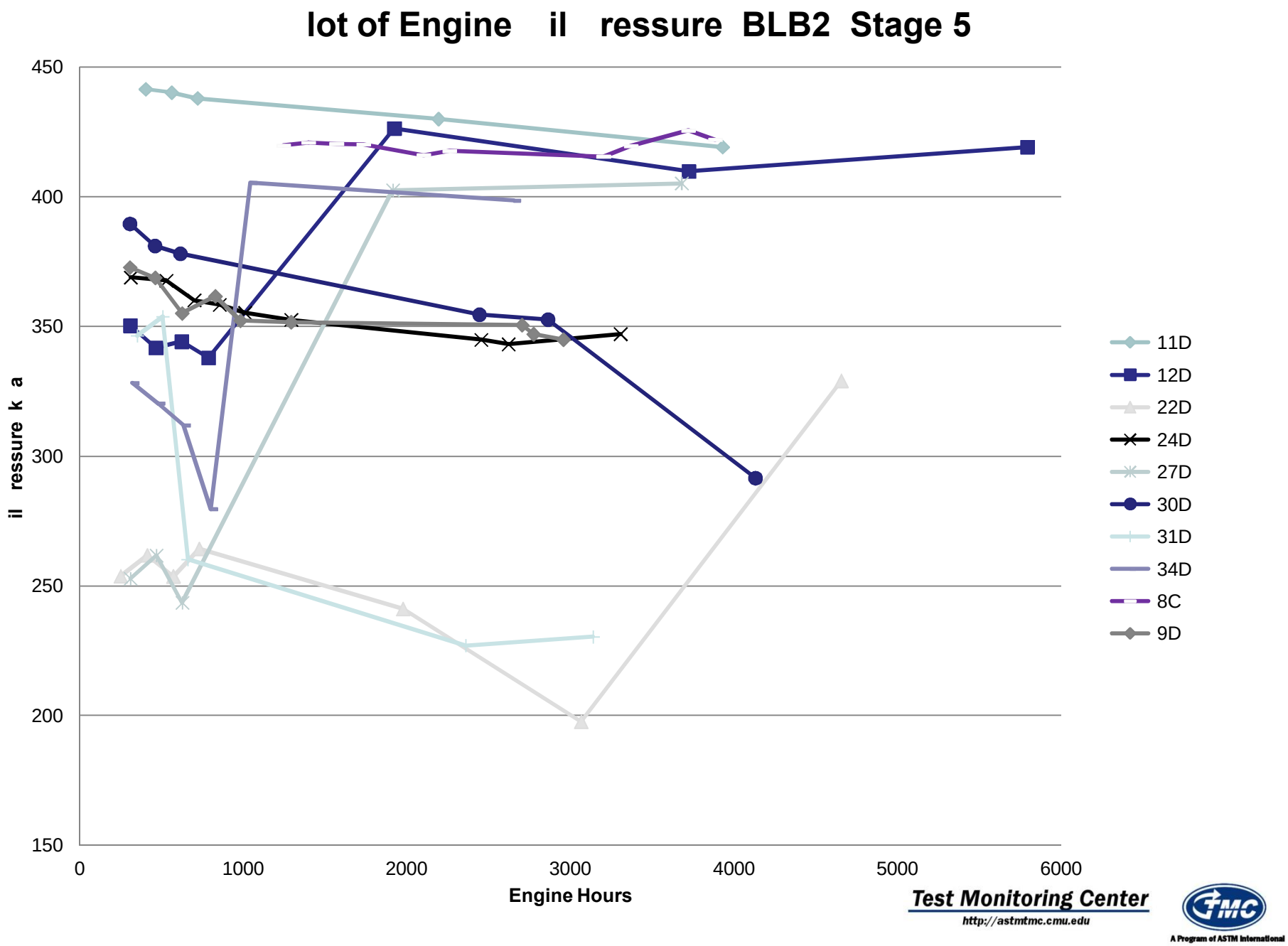
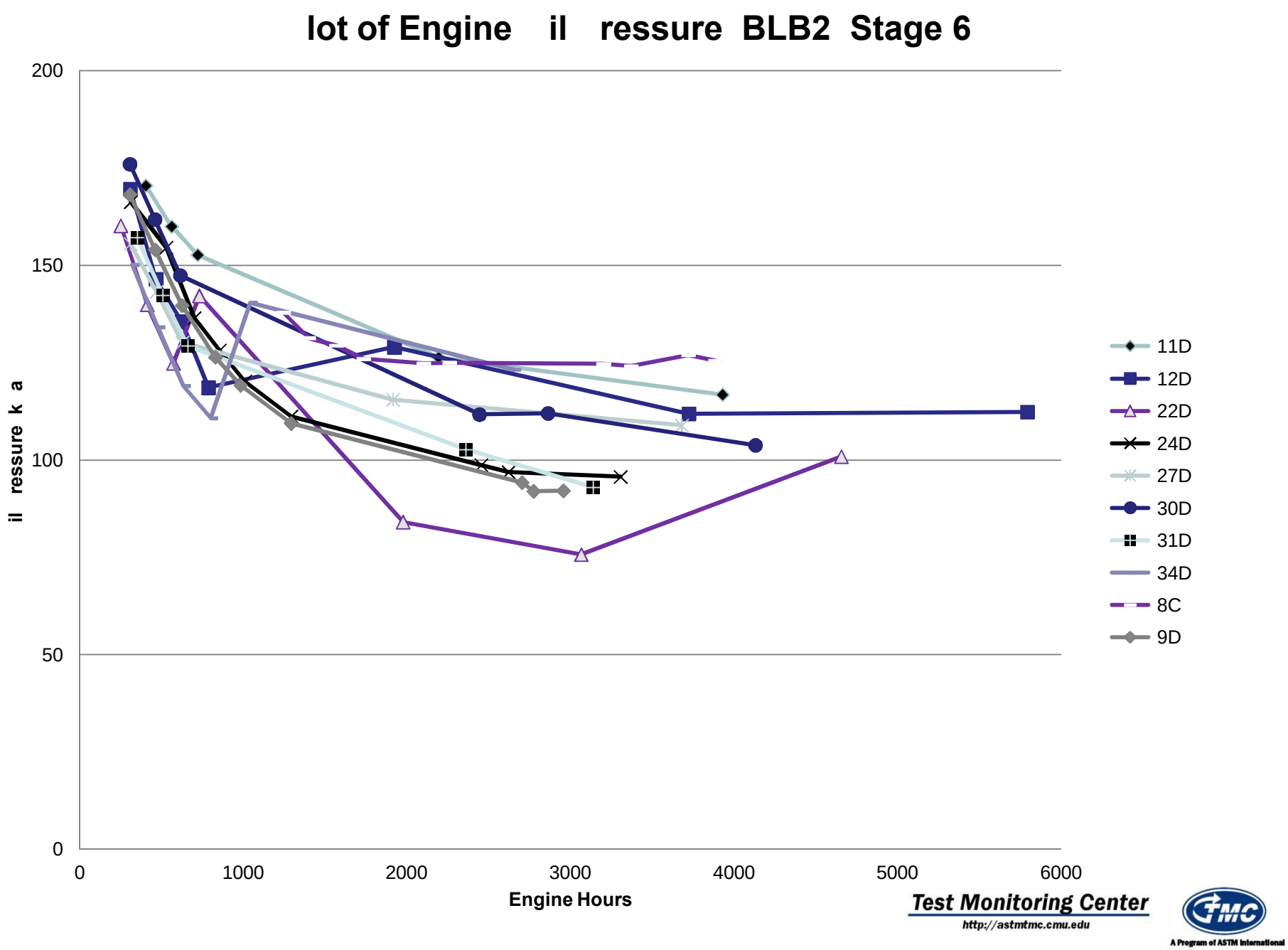

lot of Engine il ressure BLB2 Stage 5
il ressure k a
450
400
350
300
250
200
150
0
1000
2000
3000
4000
5000
6000
Engine Hours
11D
12D
22D
24D
27D
30D
31D
34D
8C
9D
Test Monitoring Center
http://astmtmc.cmu.edu
A Program of ASTM International


lot of Engine il ressure BLB2 Stage 6
il ressure k a
200
150
100
50
0
0
1000
2000
3000
4000
5000
6000
Engine Hours
11D
12D
22D
24D
27D
30D
31D
34D
8C
9D
Test Monitoring Center
http://astmtmc.cmu.edu
A Program of ASTM International

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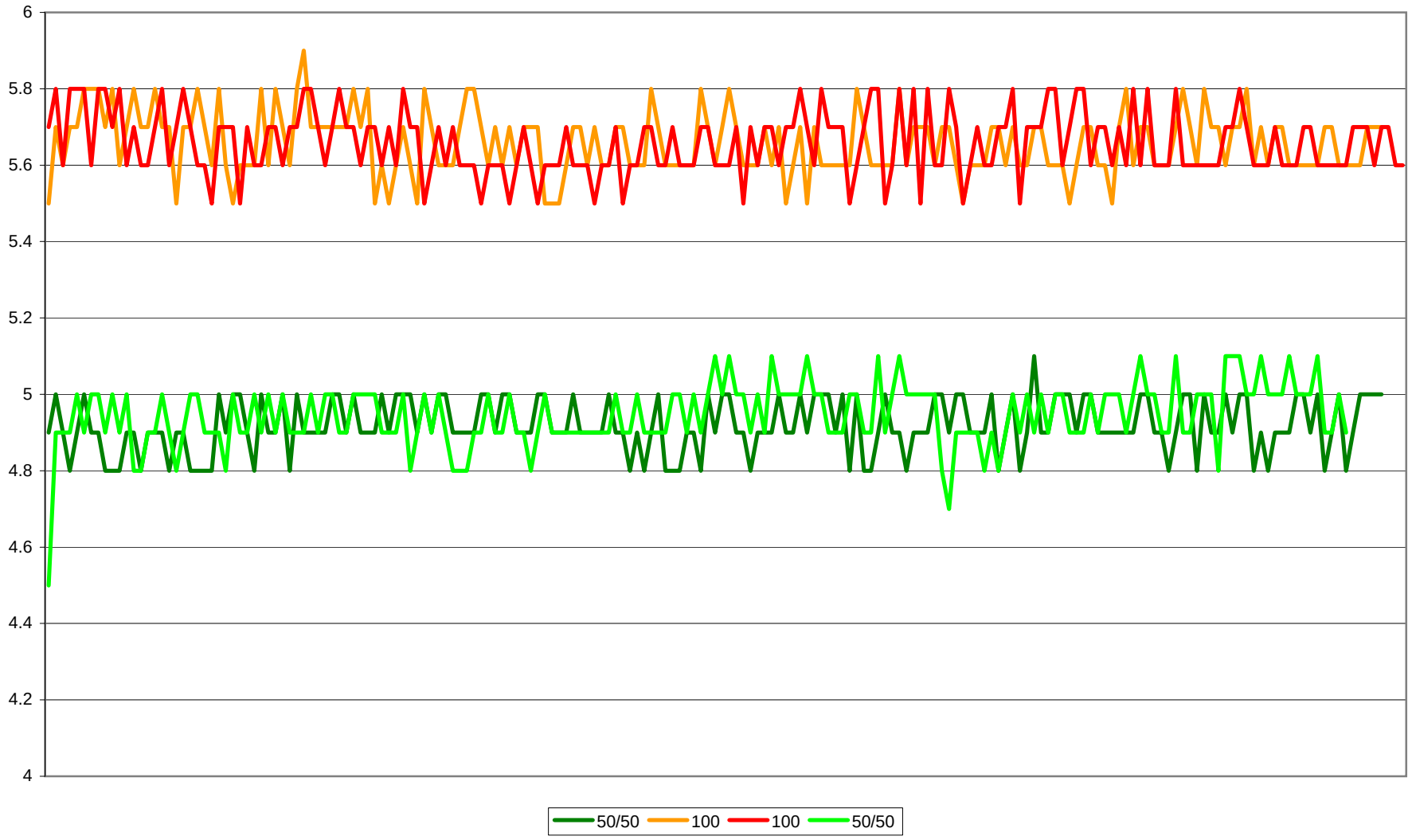
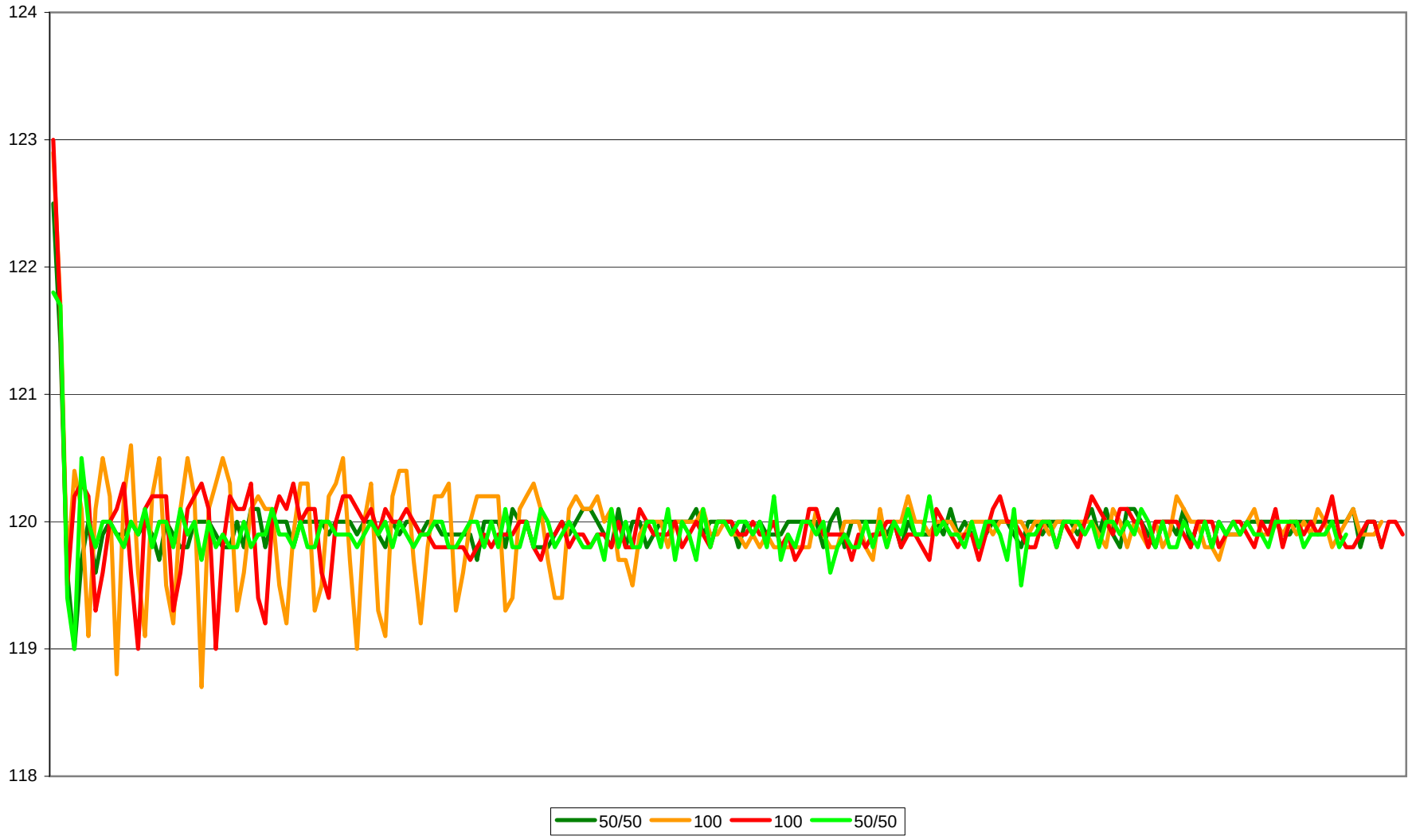
IAR VID Coolant Mix Runs Aging
Coolant Delta Tem

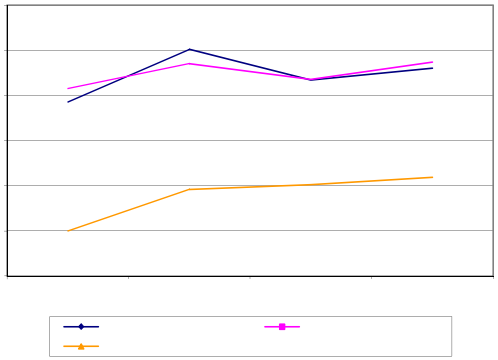


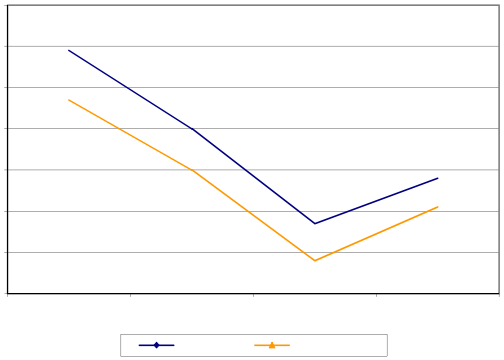
IAR VID Coolant Mix Runs Aging
il Tem

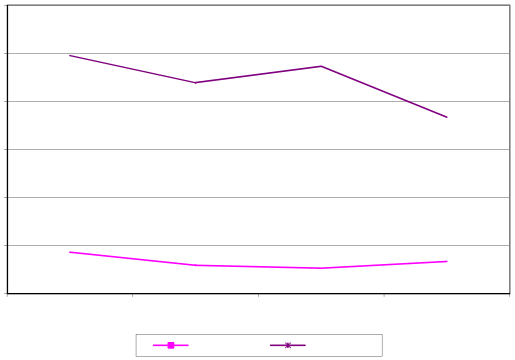


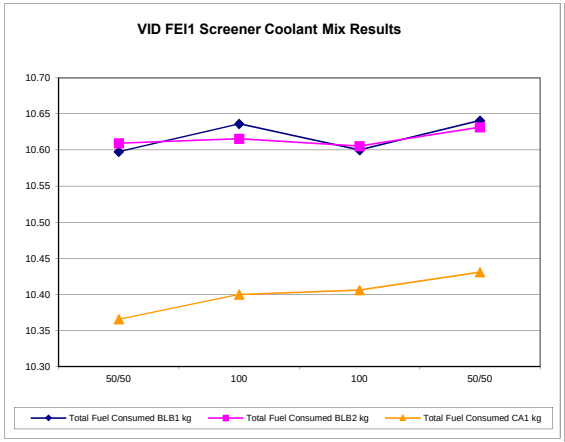
Sequence VID Coolant Mix Screeners

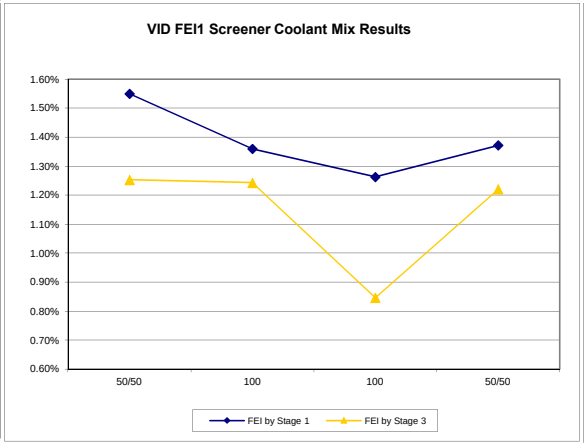
DexCool Mix	Weighted Fuel Consumed BLB1 kg	Weighted Fuel Consumed BLB2 kg	Weighted Fuel Consumed CA1 kg	FEI1 vs. BLB2	FEI1 Hour Adjustment	Hour Adjusted FEI1	Total Fuel Consumed BLB1 kg	Total Fuel Consumed BLB2 kg	Total Fuel Consumed CA1 kg	BLB1 to BLB2 Shift	FEI by Stage 1	FEI by Stage 2	FEI by Stage 3	FEI by Stage 4	FEI by Stage 5	FEI by Stage 6
50/50	1.978542	1.981491	1.949976	1.59%	-0.12%	1.47%	10.597625	10.609232	10.365411	-0.11%	1.55%	2.86%	1.25%	3.00%	6.95%	1.41%
100	1.990188	1.987038	1.959211	1.40%	-0.10%	1.30%	10.636257	10.615397	10.399906	0.20%	1.36%	2.59%	1.24%	0.93%	6.39%	1.72%
100	1.983372	1.983564	1.960268	1.17%	-0.09%	1.08%	10.599959	10.605262	10.405747	-0.05%	1.26%	2.53%	0.85%	1.46%	6.73%	0.72%
50/50	1.986039	1.987395	1.961885	1.28%	-0.07%	1.21%	10.640743	10.631334	10.430950	0.09%	1.37%	2.67%	1.22%	-0.83%	5.67%	1.14%
50/50 Avg	1.982291	1.984443	1.955931	1.44%	-0.10%	1.34%	10.619184	10.620283	10.398181	-0.01%	1.46%	2.77%	1.24%	1.08%	6.31%	1.27%
100 Avg	1.986780	1.985301	1.959740	1.29%	-0.10%	1.19%	10.618108	10.610330	10.402827	0.07%	1.31%	2.56%	1.04%	1.20%	6.56%	1.22%

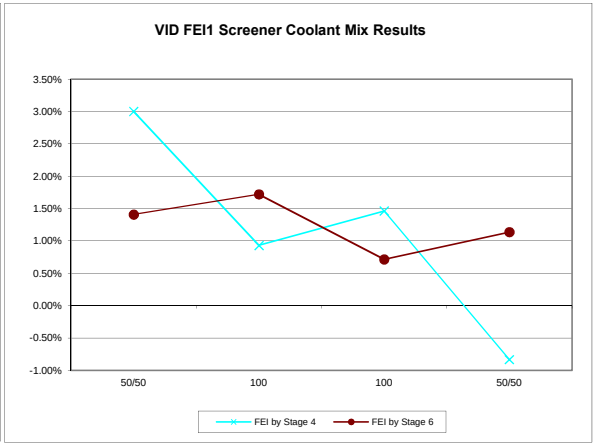












	Total Fuel	Weighted		BLS (Total Fuel) Procedure	BLS (Weighted)
BLB1	**10.47376**	1.964613			
BLB2	**10.43856**	1.957267	BLB1 / BLB2	0.34%	0.37%
BLA	**10.46267**	1.962431	**BLB2 / BLA**	**-0.23%**	-0.26%
BLA2	**10.438373**	1.960143	**BLB2 / BLA2**	**0.00%**	-0.15%

	ICP Calcium ppm
BLA Sample (End of Stage 6 BSFC Routine)	**2351**
BLA2 Sample (Beginning of Stage 1 Stabilization)	**2109**
BLA2 Sample (End of Stage 6 BSFC Routine)	**2123**
Batch BL2 (New)	**~2100**