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 AND LUBRICANTS

Issued: January 26, 2009

Reply to: Dan Worcester
Southwest Research Institute
528 Tom Slick Ave
San Antonio, TX 78228
Phone: 210.522.2405
Fax: 210.684.7523
Email: dan.worcester@swri.org

Unapproved Minutes of the November 13, 2008 Sequence VID Surveillance Panel meeting.

The meeting was called to order at 1:00 PM by Chairman Charlie Leverett.

Agenda

The Agenda is Attachment 1. The attendance list is Attachment 2.

Bill Buscher is the Motions and Actions Recorder. The Motions and Actions are Attachment 3.

The minutes from the 10.21.2008 meeting are posted and were approved unanimously.

Action Item Review

A. The Statistical Group will review BL Shift (BLB vs. BLA) after the Precision Matrix Phase II is completed. Open pending Phase II of Precision Matrix

B. The Statistical Group will review outlier criteria after the Precision Matrix Phase II is completed. Open pending Phase II of Precision Matrix

C. George presented recommendation on excitation voltage at load cell. This is Attachment 4.

Motion – The excitation voltage to the load-cell shall vary no more than 0.01% from the nominal value during the course of a test (1mV for a 10v supply). Labs to record the voltage by capturing the voltage magnitude using an analog input channel and reporting the value along with the other test's general parameters.

George Szappanos / Dwight Bowden / Passed with 7 For, 0 Against, 4 Waive

Action Item – Motion listed above to be implemented at the independent labs prior to the start of phase 1 of the BOI/VGRA Precision Matrix and at the dependant labs prior to the start of phase 2 of the BOI/VGRA Precision Matrix.

Old Business

A. The BL2 oil should ship to labs the week of 11.20.2008, 27,000 gallons.

Action Item – Determine requirements for the next batch of BL by the next Surveillance Panel meeting.

B. The 20 engines built at the November 3-6 workshop have been shipped.

C. The 100 new engines should arrive by the end of the year.

D. The precision matrix memorandum of agreement is due 11.17.2008. The ASTM will then issue invoices.

New Business

A. The Scope and Objectives have been updated. This is Attachment 5.

B. The data dictionary is in beta testing, then will be released.

C. Jo Martinez gave a presentation on data provided by SwRI. This is Attachment 6. Based on the data review, SwRI was approved for testing for the precision matrix. This recommendation will pass forward to the PCEOCP.

Motion – Accept the Statistical Group's recommendation to move forward with the BOI/VGRA Precision Matrix, based upon the review of SwRI's prove-out testing, and forward the recommendation to the PCEOCP.

Charlie Leverett / Jim Linden / Passed Unanimously

D. There will be a survey of the labs for the number of available stands.

E. The precision matrix run order has been selected. Proposal 2 was recommended.

Motion – Accept the Statistical Group's Proposal 2 for the BOI/VGRA Precision Matrix run order and forward the proposal to the PCEOCP. The presentation is Attachment 7.

Mark Sutherland / Andy Ritchie / Passed Unanimously

F. The next meeting will be in the middle of the first portion of the precision matrix. The matrix will begin when the MOA is signed and all funds received. This is projected to be the end of the year.

The meeting was adjourned at 2:22 PM

ATTACHMENT

ONE

Sequence VI Surveillance Panel Meeting

November 13, 2008 (Thursday)
1:00 – 5:00
GM Tech Center Warren MI

Agenda

1.0) Roll Call

2.0) Approval of minutes

2.1) Approve the minutes from **10/21/08,** these are posted on the TMC web site.

3.0) Action Item Review

3.1.) The Statistical Group will review BL Shift (BLB vs. BLA) after the Precision Matrix Phase II is completed. Open pending Phase II of Precision Matrix

3.2.) The Statistical Group will review outlier criteria after the Precision Matrix Phase II is completed. Open pending Phase II of Precision Matrix

3.3) George to present recommendation on excitation voltage at load cell

4.) Old Business

4.1) Last update (11/06/08) from John Zalar is Blend 2 of Baseline should be shipped to the labs November 20th.

4.2) 20 engines were assembled at the workshop held at Intertek **November 3-6**.

4.3) OHT proposal on engine supply – Update from OHT on 100 engine purchase.

4.4) Review of ACC Template Update

4.5) Precision Matrix Update –

a. MOA to trade groups went out 11/12/08, I have not seen it but was told it is out. Return date 11/17/08, again this as heard. Can anyone confirm?

5.) New Business

5.1) VID Data Dictionary Release – In process estimated release to DCC group for beta testing 11/XX/08, with possible release date of November 20, 2008.

5.2.) Statistical Groups review of the SwRI Prove-out testing. **The VI SP needs to forward a recommendation to the PCEOCP to go forward or not with the precision matrix.**

Here is a presentation on the data review prepared by Jo Martinez;

Matrix V + SW Follow-up.ppt

5.3) Review of Sequence VI Scope & Objectives.

5.4) VID Test Stand Availability survey due in by 11/14

5.5) Review Statistical Groups recommended Precision Matrix Run Order

6.) Next Meeting

6.1) At the Call of the Chairman

7.) Meeting Adjourned

ATTACHMENT

TWO

ASTM SEQUENCE VI SURVEILLANCE PANEL

Name	Address	Phone/Fax/Email	Attendance
Bowden, Dwight Voting Member	OH Technologies, Inc. P.O. Box 5039 Mentor, OH 44061-5039	Phone: 440-354-7007 Fax: 440-354-7080 dhbowden@ohtech.com	
Jim Linden Voting Member	General Motors Research & Development 30500 Mound Rd./MC 480-106-160 Warren, MI 48090-9055	Phone: 586-986-1888 james.l.linden@gm.com	
Andy Ritchie Voting Member	Infineum 1900 East Linden Ave. Linden, NJ 07036-0735	Phone: 908-474- Fax: 908-474-3637	
Ron Romano Voting Member	Ford Motor Company ~~21500 Oakwood Blvd~~ 17000 FAIRLANE DR ~~POEE Bldg Rm DR 167 MD 44~~ ROOM 420 ~~Dearborn, MI 48121-2053~~ ALLEN PARK MI 48101	Phone: 313-845-4068 rromano@ford.com	
Lai, Patrick Voting Member	Imperial Oil Ltd. of Canada 453 Christina Street South Sarnia, N7T T8T8,	Phone: 519-336-5611 Fax: 519-339-5866 patrick.k.lai@esso.com	
Leverett, Charlie Voting Member	Intertek Automotive Research 5404 Bandera Road San Antonio, TX 78238	Phone: 210-647-9422 Fax: 210-523-4607 charlie.leverett@intertek.com	
Grunza, Rich Voting Member	ASTM TMC 6555 Penn Ave. Pittsburgh, PA 15206-4489	Phone: 412-365-1034 Fax: 412-365-1047 Dml@tmc.astm.cmri.cmu.edu	
Miranda, Timothy Voting Member	BP Castrol Lubricants USA 1500 Valley Road Wayne, NJ 07470	Phone: 973-305-3334 Timothy.Miranda@bp.com	OD Conference Call Phones
Mosher, Mark Voting Member	ExxonMobil 600 Billingsport Road Paulsboro, NJ 08066	Phone: 856-224-2132 Fax: 856-224-3628 mark_r_mosher@exxonmobil.com	
Caudill, Timothy Voting Member	Ashland, Inc. 21st and Front Streets Ashland, KY 41101	Phone: 606-329-~~5708~~ 1960 x5708 Fax: 606-329-3009 Tlcaudill@ashland.com	
Stubbs, Guy Voting Member	Southwest Research Institute (SwRI) 6220 Culebra Road San Antonio, TX 78228	Phone: 522-5913 Fax: gstubbs@swri.edu	For GCL45 at 1085
Szappanos, George Voting Member	Lubrizol 29400 Lakeland Blvd. Wickliffe, OH 44092	Phone: 440-347- Fax: 440-347-4096 George.Szappanos@lubrizol.com	GSZ
Glaenzer, David Voting Member	Afton Research Center 500 Spring Street Richmond, VA 23218	Phone: 804-788-5214 Fax: 804-788-6358 Dave_Glaenzer@ethyl.com	
Tracey King Voting Member	Chrysler	Phone: Fax: tek1@chrysler.com	
Sutherland, Mark Voting Member	Chevron Oronite Company LLC 4502 Centerview Ste. 210 San Antonio, TX 78228	Phone: 731-5605 Fax: 731-5621 msut@chevrontexaco.com	See attached
Robert Stockwell	ConocoPhillips Lubricants R&D Passenger Car Engine Oil	office 580-767-6894 Robert.T.Stockwell@conocophillips.com	

ASTM SEQUENCE VI SURVEILLANCE PANEL

Name	Address	Phone/Fax/Email	Attendance

Guest Present at meeting

JO MARTINEZ	CHEVRON 100 Chevron Way Richmond, CA	510 242 5863	
Gordon Farnsworth	Consultant 71 Buck Rd, Warrington Pa.	215-491-1216	GF
Doyle Boese	InFineum 1900 E. Linden Ave, Linden, NJ 07036	908-474-3176	DB
Jason Bowden	OH TECHNOLOGIES Inc. 9300 Progress Pkwy. / P.O. Box 5039 44061-5039	440.354.7007	JB
ADAM BOWDEN	OH TECHNOLOGIES, INC. P.O. BOX 5039 MENTOR OH 44061-5039	440.35.7007	ABB
FRANK FARBER	TMC 6555 PENN AVE, PITTSBURGH, PA 15206	412 365 1030	FF
BILL BUSCHER	SOUTHWEST RESEARCH INSTITUTE 6220 CULEBRA RD, SAN ANTONIO, TX 78228	210-522-6802 wbuscher@swri.edu	
PAT LANG	SwRI San Antonio	210-522-2820 plang@swri.org	PL
Bob Wilke	"	210-522-5911 BWilke@swri.org	
Bruce Matthews	GMPT 823 Joslyn Ave Pontiac, MI 48340	248-830-9197	BM
JIM CARTER	HALTERMANN 2296 HULETT RD. OKEMOS, MI 48864	517-347-4947 JECARTER@JHALTERMANN.com	
Sid Clark	50481 Peggy Lane Chesterfield MI. 48047	586-873-1055 SwRI Consultant	Sidney.L.Clark@SBCGlobal.net
MATTHEW J. SNIDER	GMPT 823 Joslyn Ave. Pontiac, MI 48340	248-672-3563 matthew.j.snider@gm.com	MJS
CHRIS CASTANEDA	Lubrizol 29400 LAKELAND WICKLIFFE OH 44092	440 347 2973 chris.castaneda@lubrizol.com	
Geo. Szappanos	"	440-347-2352	
LARRY HAMILTON	LUBRIZOL	440 347-2326 LARRY.HAMILTON@LUBRIZOL.COM	LDHA

ASTM SEQUENCE VI SURVEILLANCE PANEL

Name	Address	Phone/Fax/Email	Attendance
Phil Scinto	Lubrizol 29400 Lakeland Blvd. Wickliffe OH 44092	440-347-2161 phil.scinto@lubrizol.com	
MIKE MCMILLAN		MMCMILLAN133 at COMCAST.NET	
MARK SUTHERLAND	ORONITE	msut@chevron.com 804-788-5279	
Ed Altman	Afton Chemical	Ed.Altman@Aftonchemical.com	
Todd Dvorak	Afton Chemical	Todd.Dvorak@AftonChemical.com	
DAVID GLAENZER	Afton Chemical	DAVE.Glaenzer@Aftonchemical.com	
Jerry Wang	Oronite	jwdy@chevron.com	

ATTACHMENT

THREE

Sequence VIB/D Surveillance Panel
November 13, 2008
1:00PM – 5:00PM
GM Technical Center
Warren, MI

Motions and Action Items
As Recorded at the Meeting by Bill Buscher

1. Motion – The excitation voltage to the load-cell shall vary no more than 0.01% from the nominal value during the course of a test (1mV for a 10v supply). Labs to record the voltage by capturing the voltage magnitude using an analog input channel and reporting the value along with the other test's general parameters.

   George Szappanos / Dwight Bowden / Passed with 7 For, 0 Against, 4 Waive

2. Action Item – Motion listed above to be implemented at the independent labs prior to the start of phase 1 of the BOI/VGRA Precision Matrix and at the dependant labs prior to the start of phase 2 of the BOI/VGRA Precision Matrix.

3. Action Item – Determine requirements for the next batch of BL by the next Surveillance Panel meeting.

4. Motion – Accept the Statistical Group's recommendation to move forward with the BOI/VGRA Precision Matrix, based upon the review of SwRI's prove-out testing, and forward the recommendation to the PCEOCP.

   Charlie Leverett / Jim Linden / Passed Unanimously

5. Motion – Accept the Statistical Group's Proposal 2 for the BOI/VGRA Precision Matrix run order and forward the proposal to the PCEOCP.

   Mark Sutherland / Andy Ritchie / Passed Unanimously

6. Action Item – Chairman to issue a letter to the PCEOCP addressing the two motions listed above.

7. Action Item – Chairman to schedule the next Surveillance Panel meeting midway into phase 1 of the BOI/VGRA Precision Matrix.

ATTACHMENT

FOUR

Seq VI Load-Cell excitation voltage specification recommendation

Monday, November 10, 2008

Why is a specification needed?

- The type of strain gage (load cell) specified by the seq-VI procedure requires a power supply to provide excitation voltage (10vdc)
- The output of the strain gage is a function of not only the load (strain) on the device, but also the excitation voltage
- Output sensitivity is specified as “X” mv per V of excitation; typically on order of about 3mV/V
- Therefore, the output is DIRECTLY proportional to the power supply voltage – any fluctuation translates directly into an error in the measurement of load
- This is unlike *amplified* load transducers or pressure transducers that can accommodate a very wide range of input voltage with no effect on output

What is important in the power supply spec

- “accuracy” (how close to set voltage) is non-issue since it’s calibrated out
- line/load regulation not significant due to constant load
- Ripple is averaged out
- Repeatability is primary issue.
- Temperature has the largest impact on the output of the power supply (like most instrumentation)
- Known as “temperature coefficient” – how much %change per degree C
- A typical “run of the mill” power supply, such as what might be used for pressure transducers or PCM power can have a temperature coefficient as high as 0.1% per ºC. Again, that translates directly into measurement error.
- A 5 degree shift can have a ½% effect on Torque!

Seq VI precedents…

- There are currently specifications on temperature variation allowance for…
  - the load cell
    - Temp sensitivity allowance is 0.001% per ºC (6.4.2.1)
    - ±6ºC (12º delta) temperature variation allowance (6.4.2.3)
    - Therefore, acceptable deviation is **0.012% of torque reading**
  - the fuel meter
    - temp sensitivity is 0.0002% per ºC (per Micromotion spec sheet)
    - 4ºC temperature variation allowance (Table 3)
    - Therefore, acceptable deviation is **0.0008% of fuel reading**
- Therefore, the load-cell power supply should have a specification on par with these
  - The worst of the two is 0.012%
  - What the heck, let's round it to 0.01% (still pretty darn tight)
  - Translates to 1mV tolerance on 10 volts

Typical values for precision power supplies

Acopian Series A Linear Regulated	0.0150% per ºC	0.7ºC
Sorensen XG, XTR series	0.0100% per ºC	1.0ºC
Analog Devices strain gage module	0.0025% per ºC	4.0ºC
Dataforth 5B strain gage module	0.0015% per ºC	7.0ºC
Linear Technologies precision reference	0.0005% per ºC	20.0ºC

To produce no more than a 0.01% error, the temperature allowance for each power supply is shown in red.

For power supplies exposed to large ambient temperature fluctuations (non air-conditioned environments), most of the above supplies would not meet the 0.01% specification.

Motion -

- The excitation voltage to the load-cell shall vary no more than 0.01% from the nominal value during the course of a test (1mV for a 10v supply)
- Labs to record the voltage by capturing the voltage magnitude using an analog input channel and reporting the value along with the other test's general parameters

ATTACHMENT

FIVE

'

ASTM Sequence VIB Surveillance Panel Scope and Objectives

Scope:

The Sequence VI Surveillance Panel is responsible for the surveillance and continued improvement of the Sequence VI test documented in the current ASTM Standard D6837 for the VIB and the VID as each is updated by the Information Letter System. Improvements in test operation test monitoring and test validation will be accomplished through continual communication with the Test Sponsor, ASTM Test Monitoring Center, Central Parts Distributor, ASTM B.O1, and the Passenger Car Engine Oil Classification Panel. Actions to improve the process will be recommended when deemed appropriate based on input from the aforementioned. The panel will review development and correlation of updated test procedures with previous test procedures. This process will provide the best possible test procedure for evaluating automotive lubricant performance with respect to the lubricant's ability to provide fuel economy benefits.

Objectives Target Date

Review of VID Precision Matrix Data	February 2009
Issue VID ASTM Research Report	June 2009
Blend 3 of Baseline and Baseline Flush oils	June 2009
Work with ASTM Facilitator to complete ASTM Standard for VID	November 2009

Revised 11/13/08

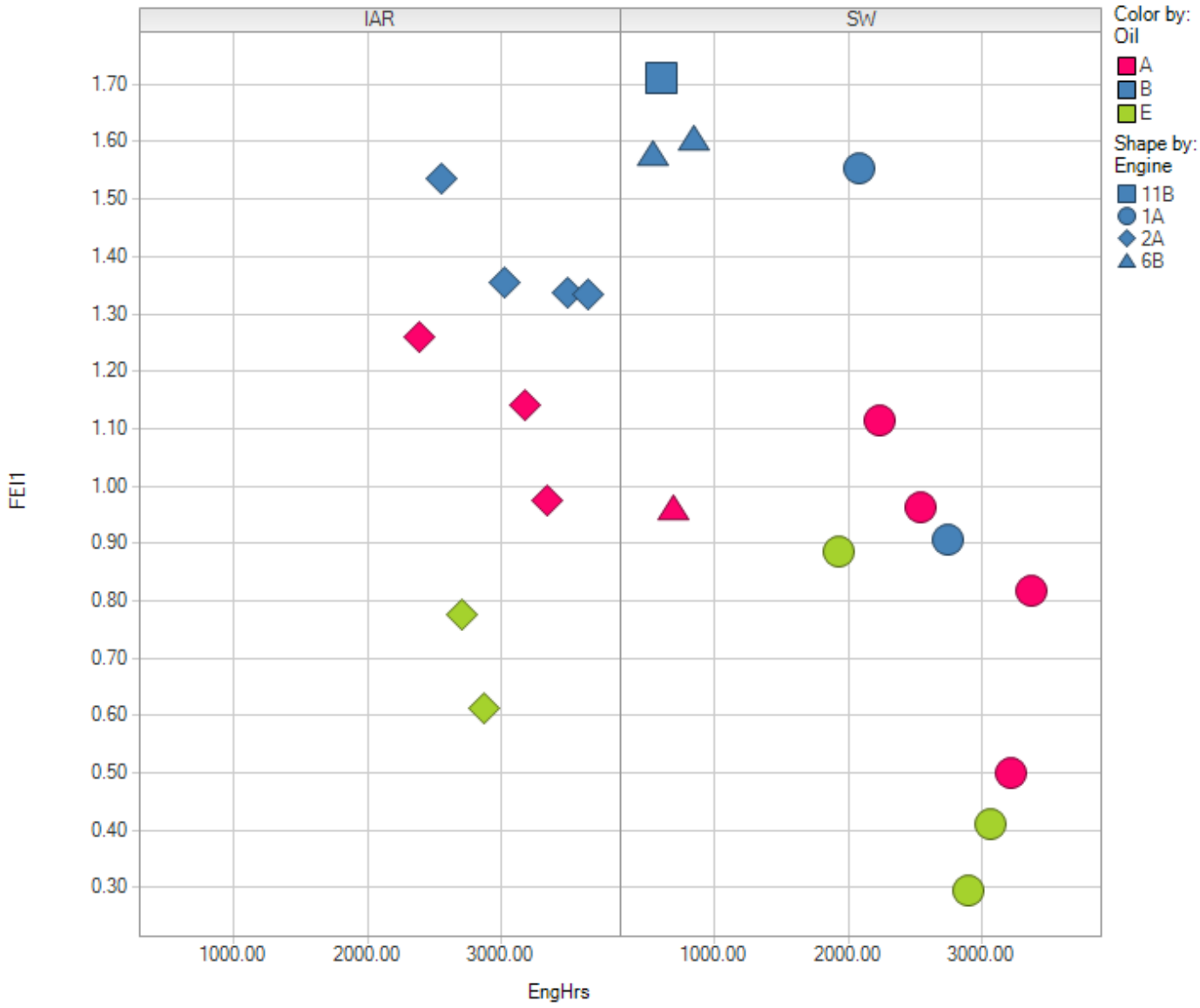
ATTACHMENT

SIX

Observations

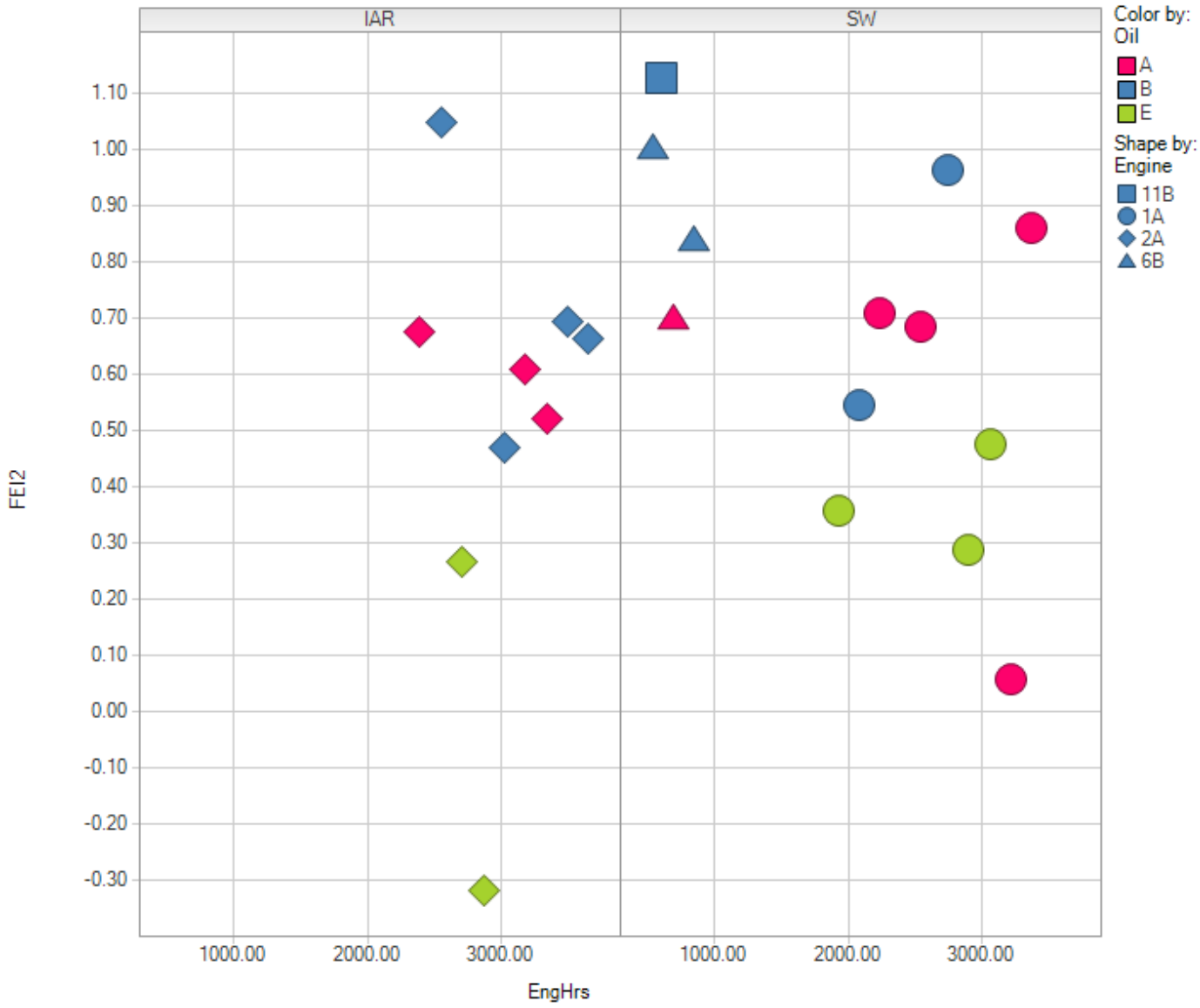
- Two oil B runs in 6B engine are on the average similar to the FEI1 of the 1st Oil B runs in Matrix V both in IAR and SW
- Looks like FEI1 discrimination between oils A and B is maintained
- BLB Shift is within the limits of -0.2% and 0.4%
- BL Fuel consumed standard deviation reduced in half at stages 7, 8 & 9 and are close to IAR standard deviation, about 40% improvement at stages 3, 4 & 5 for BL Before and about no improvement at stages 3, 4 & 5 for BL After

FEI 1 – Matrix V + SW Follow-up



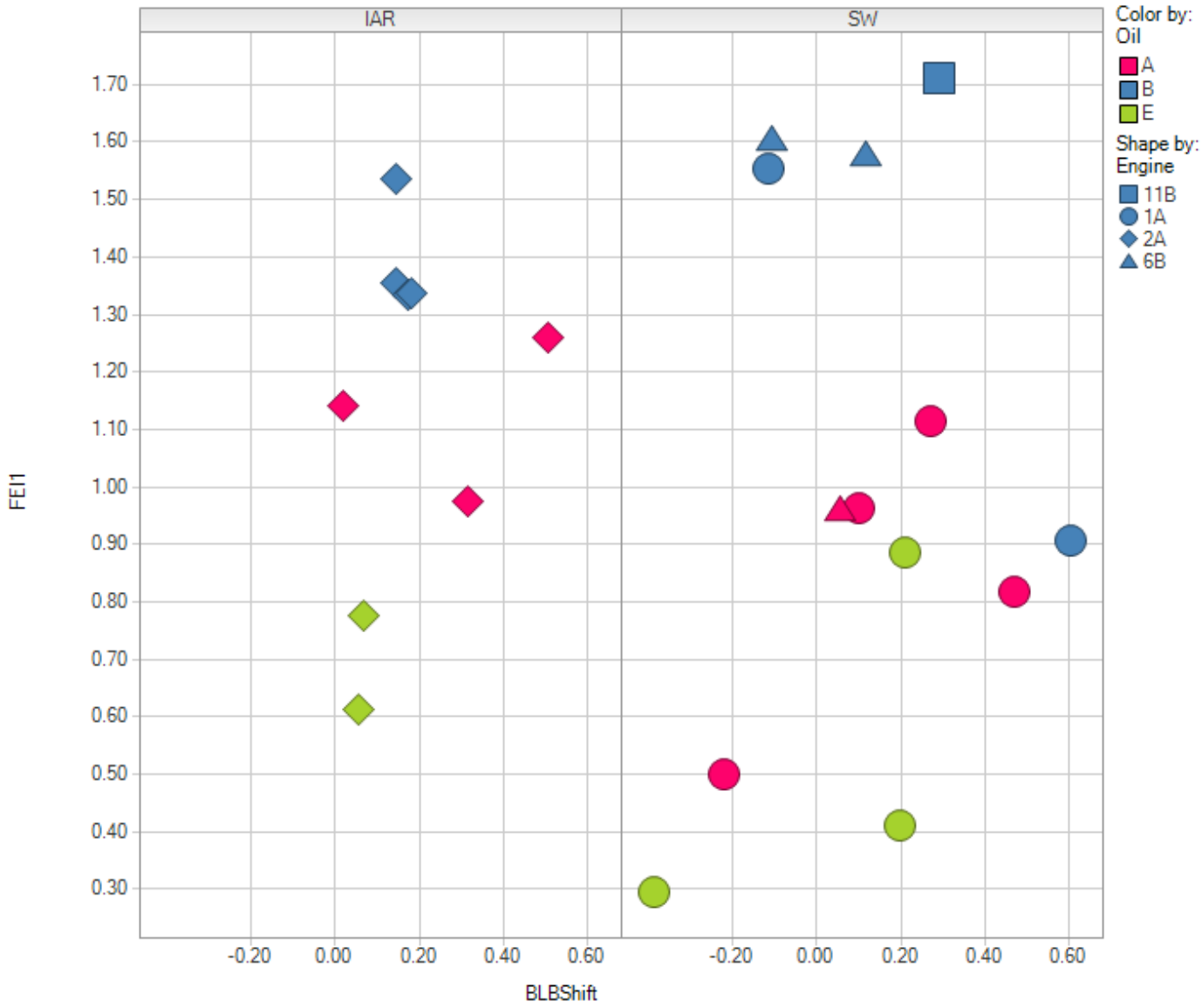
Assigned 1A and 2A as Matrix V engines for SW and IAR, resp.

FEI 2 – Matrix V + SW Follow-up

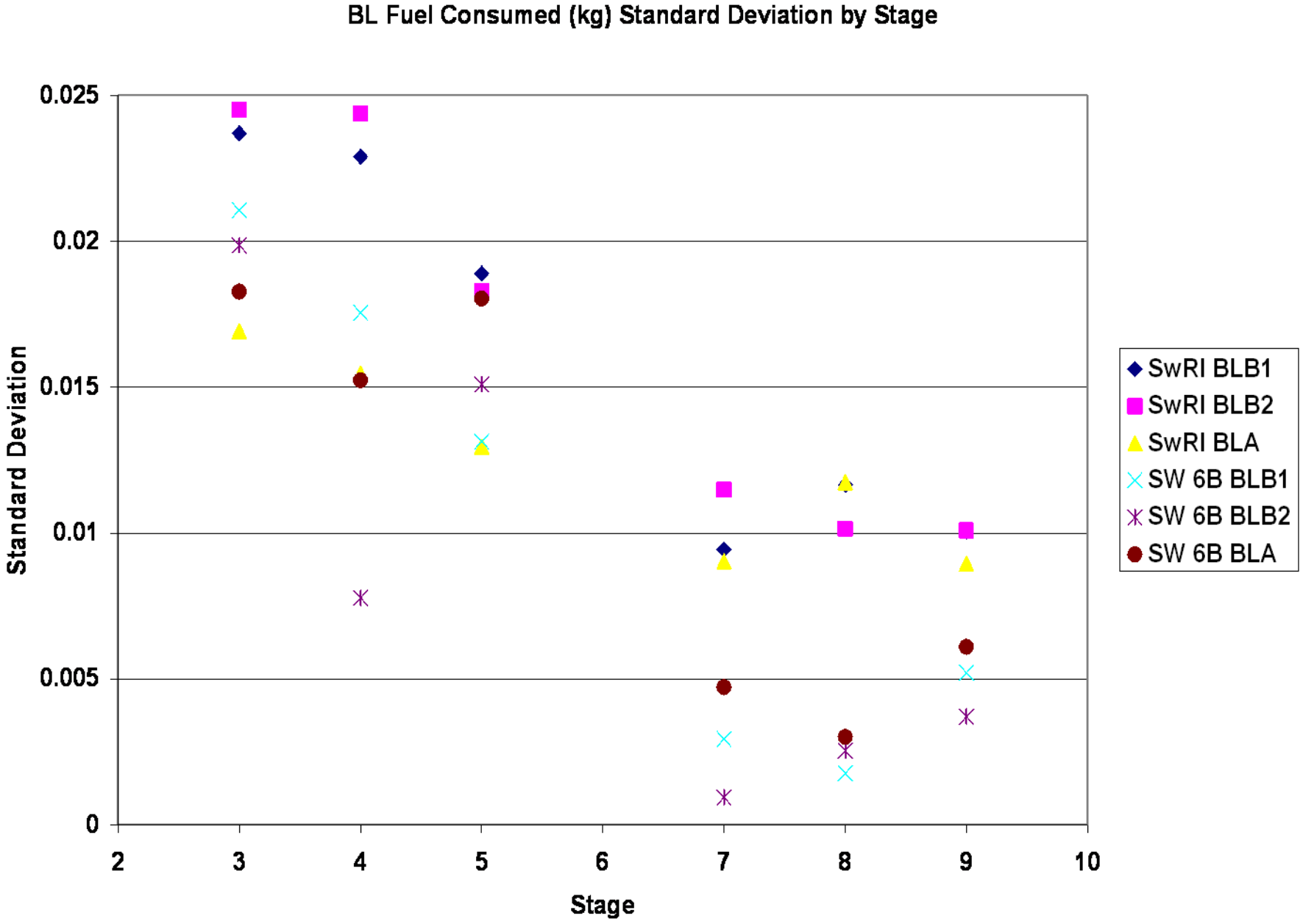


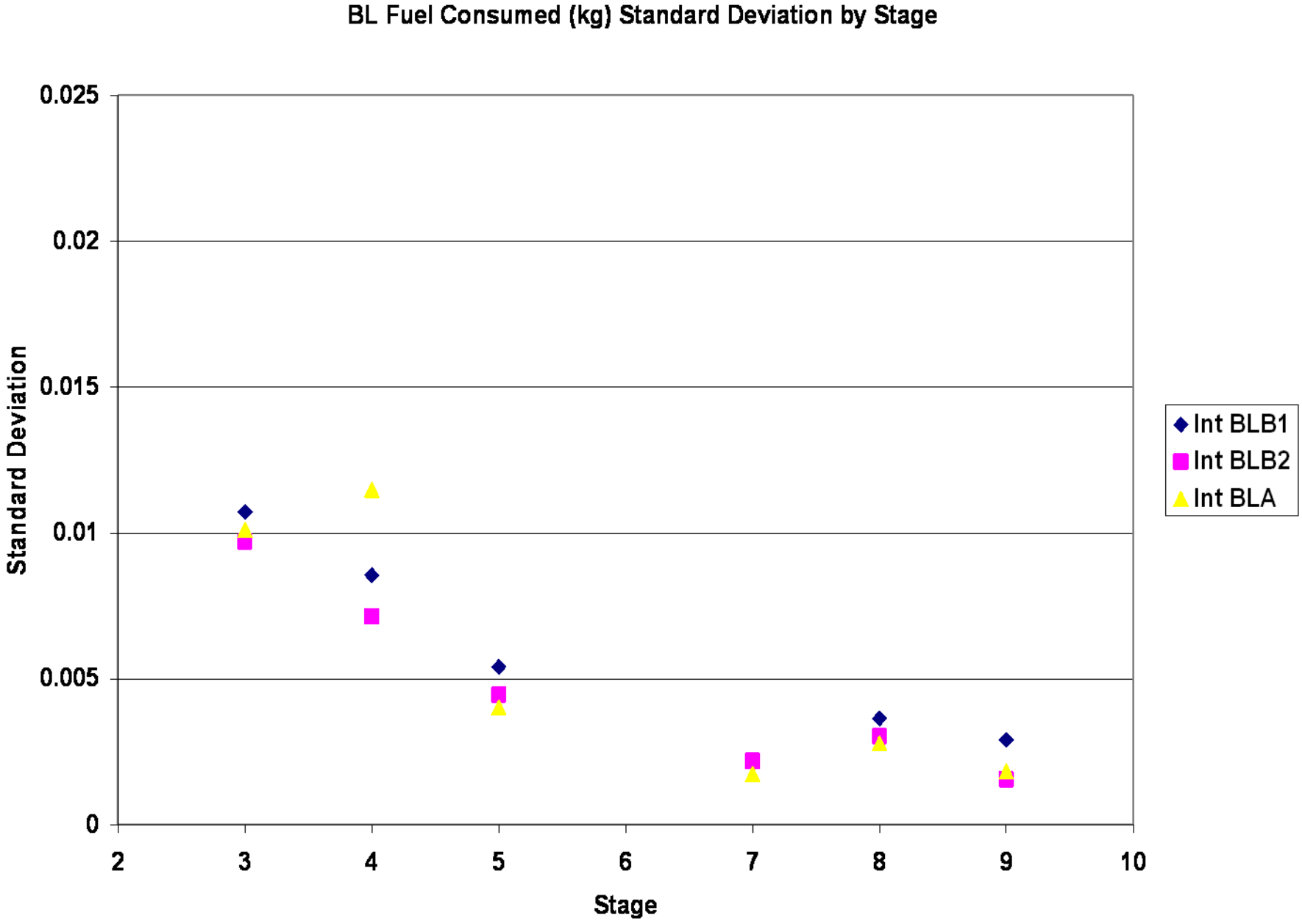
Assigned 1A and 2A as Matrix V engines for SW and IAR, resp.

BLB Shift – Matrix V + SW Follow-up



Assigned 1A and 2A as Matrix V engines for SW and IAR, resp.


BL Fuel Consumed (kg) Standard Deviation by Stage
Standard Deviation
0.025
0.02
0.015
0.01
0.005
0
2
3
4
5
6
7
8
9
10
Stage
SwRI BLB1
SwRI BLB2
SwRI BLA
SW 6B BLB1
SW 6B BLB2
SW 6B BLA


BL Fuel Consumed (kg) Standard Deviation by Stage
Standard Deviation
0.025
0.02
0.015
0.01
0.005
0
2
3
4
5
6
7
8
9
10
Stage
Int BLB1
Int BLB2
Int BLA

ATTACHMENT

SEVEN

VID BOI/VGRA Precision Matrix – Run Order

Nov. 4, 2008

The Matrix Design – Step 1

Stand 1	Stand 2	Stand 3	Stand 4
A	B	C	D
E	F	G	H
I	J	K	L
M	N	O	P
Q	R	S	T
X	X	X	X
A	A	C	C
D	B	B	D

- **Two independent labs / 2 stands each**
- **Oils A-T & X are the 21 Oils from the BOI/VGRA Test Oil Matrix**
- **Oil X part of the BOI-VGRA matrix and is run on all 4 stands**
- **Oils A-D & X will be pre-selected to represent all 5 viscosity grades**
- **Run order to be established**
- **Provides Data for:**
  - **Establishing BOI/VGRA, within stand & stand to stand comparisons, Lab to Lab comparisons**

The Matrix Design – Step 2

Stand 1	Stand 2	Stand 3	Stand 4
R1	R2	R1	R2
R2	R1	R2	R1
R3	R3	R3	R3

- To enhance the statistics, 3 of the 5 oils A, B, C, D, & X will be tested 4 more times. This gives a minimum of 7 runs on the 3 selected oils.
- The 3 oils are being called R1, R2 and R3 for Step 2.
  - R1, R2 & R3 will represent 0W, 5W, & 10W-30 in order to give better discrimination for VGRA.
  - One or more of these 3 oils will likely be selected as Sequence VID calibration/reference oil(s).
- These additional runs are required to establish future reference oil identity, reference oil means, & reference oil standard deviations. Run order to be established.
- Additional reference oil data will come from non-matrix lab/stand calibration runs. (Supplemental data from additional labs & stands deemed ready by ASTM will be included in development of the precision statement unless identified and confirmed as a statistical outlier by the industry statistician team, assuming the last test of part of the data submission has started by the end of step 2.)

Oil Mapping

ORIG. MATRIX DESIGNATION	Technology 1	Technology 2	Technology 3
ILSAC Technology Supplier Choice	**1**	**3**	**2**
ILSAC Level	**GF-4**	**GF-5**	**GF-4**
0W-20		IIIA=K, **IIIB=X**	IIIA=Q, IIIB=L
5W-20	**IIA=A**, IIIA=E	IIIA=M	
0W-30	**IIIA=B,** IIIB=F		IIIA=R
5W-30	IIA=G, IIB=H, IIIA=I, IIIB=J	IIA=N, **IIB=C**, IIIA=O	
10W-30		IIIA=P	IIA=S, **IIB=D**, IIIA=T

Original Step 1 Run Order

OIL	VISGRADE	BO	ILSAC TECHNOLOGY	STAND	LAB
A	5w20	IIA	1	1	IAR
E	5w20	IIIA	1	1	IAR
I	5w30	IIIA	1	1	IAR
M	5w20	IIIA	3	1	IAR
Q	0w20	IIIA	2	1	IAR
X	0w20	IIIB	3	1	IAR
A	5w20	IIA	1	1	IAR
D	10w30	IIB	2	1	IAR
B	0w30	IIIA	1	2	IAR
F	0w30	IIIB	1	2	IAR
J	5w30	IIIB	1	2	IAR
N	5w30	IIA	3	2	IAR
R	0w30	IIIA	2	2	IAR
X	0w20	IIIB	3	2	IAR
A	5w20	IIA	1	2	IAR
B	0w30	IIIA	1	2	IAR
C	5w30	IIB	3	3	SW
G	5w30	IIA	1	3	SW
K	0w20	IIIA	3	3	SW
O	5w30	IIIA	3	3	SW
S	10w30	IIA	2	3	SW
X	0w20	IIIB	3	3	SW
C	5w30	IIB	3	3	SW
B	0w30	IIIA	1	3	SW
D	10w30	IIB	2	4	SW
H	5w30	IIB	1	4	SW
L	0w20	IIIB	2	4	SW
P	10w30	IIIA	3	4	SW
T	10w30	IIIA	2	4	SW
X	0w20	IIIB	3	4	SW
C	5w30	IIB	3	4	SW
D	10w30	IIB	2	4	SW

COUNT per Variable	Stand	1	2	3	4	Stands 1,2	Stands 3,4	Stands 1,3	Stands 2,4
						IAR	SW	IAR	SW
Base Oil	IIA	2	2	2		4	2	4	2
	IIB	1		2	4	1	6	3	4
	IIIA	4	3	3	2	7	5	7	5
	IIIB	1	3	1	2	4	3	2	5
VisGrade	0w20	2	1	2	2	3	4	4	3
	0w30		4	1		4	1	1	4
	10w30	1		1	4	1	5	2	4
	5w20	4	1			5	0	4	1
	5w30	1	2	4	2	3	6	5	4
ILSAC Technology	1	4	5	2	1	9	3	6	6
	2	2	1	1	4	3	5	3	5
	3	2	2	5	3	4	8	7	5

Proposal 1: Step 1 Run Order

OIL	VISGRADE	BO	ILSAC TECHNOLOGY	STAND	LAB
A	5w20	IIA	1	1	IAR
O	5w30	IIIA	3	1	IAR
Q	0w20	IIIA	2	1	IAR
N	5w30	IIA	3	1	IAR
M	5w20	IIIA	3	1	IAR
X	0w20	IIIB	3	1	IAR
A	5w20	IIA	1	1	IAR
D	10w30	IIB	2	1	IAR
B	0w30	IIIA	1	2	IAR
T	10w30	IIIA	2	2	IAR
H	5w30	IIB	1	2	IAR
L	0w20	IIIB	2	2	IAR
P	10w30	IIIA	3	2	IAR
X	0w20	IIIB	3	2	IAR
A	5w20	IIA	1	2	IAR
B	0w30	IIIA	1	2	IAR
C	5w30	IIB	3	3	SW
J	5w30	IIIB	1	3	SW
S	10w30	IIA	2	3	SW
E	5w20	IIIA	1	3	SW
I	5w30	IIIA	1	3	SW
X	0w20	IIIB	3	3	SW
C	5w30	IIB	3	3	SW
B	0w30	IIIA	1	3	SW
D	10w30	IIB	2	4	SW
R	0w30	IIIA	2	4	SW
G	5w30	IIA	1	4	SW
F	0w30	IIIB	1	4	SW
K	0w20	IIIA	3	4	SW
X	0w20	IIIB	3	4	SW
C	5w30	IIB	3	4	SW
D	10w30	IIB	2	4	SW

COUNT per Variable	Stand	1	2	3	4	Stands 1,2	Stands 3,4
						IAR	SW
Base Oil	IIA	3	1	1	1	4	2
	IIB	1	1	2	3	2	5
	IIIA	3	4	3	2	7	5
	IIIB	1	2	2	2	3	4
VisGrade	0w20	2	2	1	2	4	3
	0w30		2	1	2	2	3
	10w30	1	2	1	2	3	3
	5w20	3	1	1		4	1
	5w30	2	1	4	2	3	6
ILSAC Technology	1	2	4	4	2	6	6
	2	2	2	1	3	4	4
	3	4	2	3	3	6	6

More balanced in terms of Technologies, Visgrades and Base Oils tested in each Stand and Lab.

Proposal 2: Step 1 Run Order

RUN	OIL	VISGRADE	BO	ILSAC TECHNOLOGY	STAND	LAB
1	A	5w20	IIA	1	1	IAR
2	R	0w30	IIIA	2	1	IAR
3	J	5w30	IIIB	1	1	IAR
4	K	0w20	IIIA	3	1	IAR
5	P	10w30	IIIA	3	1	IAR
6	C	5w30	IIB	3	1	IAR
7	A	5w20	IIA	1	1	IAR
8	D	10w30	IIB	2	1	IAR
1	B	0w30	IIIA	1	2	IAR
2	N	5w30	IIA	3	2	IAR
3	T	10w30	IIIA	2	2	IAR
4	L	0w20	IIIB	2	2	IAR
5	O	5w30	IIIA	3	2	IAR
6	C	5w30	IIB	3	2	IAR
7	A	5w20	IIA	1	2	IAR
8	B	0w30	IIIA	1	2	IAR
1	X	0w20	IIIB	3	3	SW
2	I	5w30	IIIA	1	3	SW
3	S	10w30	IIA	2	3	SW
4	E	5w20	IIIA	1	3	SW
5	Q	0w20	IIIA	2	3	SW
6	C	5w30	IIB	3	3	SW
7	X	0w20	IIIB	3	3	SW
8	B	0w30	IIIA	1	3	SW
1	D	10w30	IIB	2	4	SW
2	G	5w30	IIA	1	4	SW
3	F	0w30	IIIB	1	4	SW
4	H	5w30	IIB	1	4	SW
5	M	5w20	IIIA	3	4	SW
6	C	5w30	IIB	3	4	SW
7	X	0w20	IIIB	3	4	SW
8	D	10w30	IIB	2	4	SW

COUNT per Variable	Stand	1	2	3	4	Stands 1,2 IAR	Stands 3,4 SW
Base Oil	IIA	2	2	1	1	4	2
	IIB	2	1	1	4	3	5
	IIIA	3	4	4	1	7	5
	IIIB	1	1	2	2	2	4
VisGrade	0w20	1	1	3	1	2	4
	0w30	1	2	1	1	3	2
	10w30	2	1	1	2	3	3
	5w20	2	1	1	1	3	2
	5w30	2	3	2	3	5	5
ILSAC Technology	1	3	3	3	3	6	6
	2	2	2	2	2	4	4
	3	3	3	3	3	6	6

-More balanced in terms of Technologies, Viscosity Grades and Base Oils tested in each Stand and Lab.

-All stands see all Technologies, Viscosity Grades and Base Oils