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COMMITTEE D02 ON PETROLEUM PRODUCTS, LIQUID FUELS, AND LUBRICANTS

Issued: 11.20.2017

Reply to: Dan Worcester
Southwest Research Institute
6220 Culebra Rd.
San Antonio, TX 78238
Phone: 210.522.2405
Email: dworcester@swri.org

These are the unapproved minutes of the 11.16.2017 Sequence VI Meeting.

The meeting was called to order at 9:04 AM Central Time by Chair Greg Miranda.

Agenda

The Agenda is the included as Attachment 1.

1.0 Roll Call

The Attendance list is Attachment 2. The Motions and Actions list is Attachment 3.

2.0 Approval of Meeting minutes from 09.12.2017 Seq. VI SP meeting.

2.1 Greg Miranda made the motion and Adrian Alfonso seconded.

2.2 The minutes were approved unanimously.

2.3 Greg will leave as Panel Chair. He has recommended Andrew Stevens as the new VI Chair. This was approved.

3.0 Old Business

3.1 Seq. VIE/F Short Block Hardware Task Force Update Adrian Alfonso

3.1.1 Hardware availability update

The Task Force is approaching completion of their work. There will be a Build Workshop hosted by Intertek 01.17.2018. The build procedure will be included and updated in D8114, the Sequence VIE procedure and the VIF as well. The Build Procedure is posted on the TMC site. There was discussion about whether to allow rework if there is a problem with an engine. Labs will move to re-use of gears when the new parts are depleted.

http://www.astmtmc.cmu.edu/ftp/docs/gas/sequencevi/procedure_and_ils/VIE/VIEF%20Build%20GM%20Kits%20Build.pdf

Motion #1 – Sequence VI surveillance panel accepts the engine build procedure, as drafted by the Sequence VIE/F Short Block Hardware Task Force, to be added to the Sequence VIE and Sequence VIF ASTM test procedures as a replacement for Annex A17. Effective 11/16/17.
Adrian Alfonso / Charlie Leverett / Passed Unanimously 15 – 0 – 0

Motion #2 – Sequence VI surveillance panel allows the reuse of the fixed timing sprockets (p/n 12640985 and p/n 12640986), as long as they remain serviceable. Section 9.4.20 of the Sequence VIE and Sequence VIF ASTM test procedures will be revised to include the GM part numbers and to allow for the reuse of the fixed timing sprockets. Reuse of the fixed timing sprockets will commence at each laboratory once the lab's inventory of new fixed timing sprockets have been depleted.
Adrian Alfonso / Dan Worcester / Passed Unanimously 14 – 0 – 0

Motion #3 – Revise Section 6.2 of the Sequence VIE and Sequence VIF ASTM test procedures to include a comment to not allow alteration, modification or rework of the GM short block built engine, unless authorized by the by the Sequence VI surveillance panel.
Adrian Alfonso / Charlie Leverett / Passed Unanimously 15 – 0 – 0

Action Item #1 – Any laboratories interested in purchasing new exhaust fixed timing sprockets, are to contact Scott Stap at GM by 12/16/17.

3.2 Seq. VIE Severity Task Force Update Dan Worcester

See Attachment 4. There was a lot of discussion on this presentation. FEI 2 has shifted severe, but Lab F is on target. There were slides on possible fuel factors. The two San Antonio labs use fuel from Nixon, Texas. All others are supplied by the Michigan facility. Todd provided and discussed several of the slides. There may also be blowby and viscosity response especially for 542-2. There will be further discussion in the Task Force. Travis had some slides that indicated FEI 2 severity shift took place at the end of the Precision Matrix. See Attachment 5.

Action Item #2 – Haltermann to report to the Sequence VI surveillance panel the process for building the Texas and Michigan Lube Cert EEE fuel batches and for additizing the SEQ VI-E + DCA fuel. Include details on component sourcing for the Texas and Michigan locations (i.e. are the components for both locations obtained from the same source and from the same component batches, etc.). Include details on the additizing process for the Texas and Michigan locations (i.e. are the additives for both locations obtained from the same source and from the same batches, when is the Lube Cert EEE additized, etc.).

3.3 Lab Visit Summary: Sequence VIE Discrepancies Rich Grundza

See Attachment 6. Valve 150 F should be 150 E. There is also a question on which valve labs are using for 150C. The section for restarts needs to be added to the VIE and VIF procedures. 11.6.5.1 was dropped during revisions. There is a new coolant sensor and OHT supplied the part number.

Action Item #3– Laboratories to inspect their stands and report to Rich Grundza on what valves they have installed on each stand for 150C in Section 6.5.3 of the Sequence VIE and Sequence VIF ASTM test procedures.

Motion #4 – Add Section 11.6.5.1 from the Sequence VID (D7589) ASTM test procedure to the Sequence VIE (D8114) and Sequence VIF ASTM test procedures.
Rich Grundza / Adrian Alfonso / Passed Unanimously 15 – 0 – 0

Action Item – Rich Grundza to review the Sequence VIE and Sequence VIF ASTM test procedures for inclusion of the necessary sole source statements and to make recommendations, if needed, to the Sequence VI surveillance panel.

3.4 Seq. VIF Procedure Review: Prepare for balloting in new year All

The VIF procedure will need the GM Kit build procedure included. It will then move to ballot.

Action Item – Greg Miranda and Rich Grundza to provide all of the necessary information, to update the Sequence VIF test procedure draft, to Hap Thompson for the next and final procedure draft.

4.0 New Business

4.1 Seq. VIE & VIF LTMS PM Data: Engine hour adjusted results for Precision Matrix Data - Kevin O'Malley
This is on hold for further review. Labs will modify their reports for the 29 VIE and 18 VIF tests to be submitted again with those updates so the tests can be charted.

Action Item – Laboratories to re-upload their Sequence VIE and VIF precision matrix tests (29 VIE and 18 VIF tests) with the engine hour adjustment applied.

4.2 Monitoring of the Sequence VIE Procedure - Stats Group
- 4.2.1 5th Run Data
- 4.2.2 Test Severity & Engine Hour Adjustment
The Stat Group does not recommend a 5th run on each engine.

4.3 Short block build workshop: Update on scheduling – Bill Buscher
The Build Workshop will be the morning of 01.17.2018 for the VIE engines.

The meeting adjourned at 11:05 AM.

Sequence VI Surveillance Panel Face-to-Face Meeting Agenda
November 16, 2017 @ 09:00-11:00 CST

Audio Connection

Call-in Number: +1-415-655-0001
Conference Code: 197 029 153

Webex Meeting URL:
https://meetings.webex.com/collabs/#/meetings/detail?uuid=M0O6BVSIMZXREHEUM9377JBLXN-20XT&rnd=192477.25075

1. **Roll Call (start 09:05 CST)**

   1.1. SP Membership changes and additions

2. **Approval of Meeting minutes from September 12, 2017 Seq. VI SP meeting**

3. **Old Business**

3.1	Seq. VIE/F Short Block Hardware Task Force Update 3.1.1 Hardware update	Adrian Alfonso
3.2	Seq. VIE Severity Task Force Update	Dan Worcester
3.3	Lab Visit Summary: Sequence VIE Discrepancies	Rich Grundza
3.4	Seq. VIF Procedure Review: Prepare for balloting in new year	ALL

4. **New Business**

   4.1. Seq. VIE & VIF LTMS PM Data: Engine hour adjusted results for Precision Matrix Data - Kevin O'Malley

   4.2. Monitoring of the Sequence VIE Procedure - Stats Group
   - 4.2.1. 5th Run Data
   - 4.2.2. Test Severity & Engine Hour Adjustment

   4.3. Short block build workshop: Update on scheduling - Bill Buscher

5. **Next Meeting**

   5.1. TBD

6. **Meeting Adjourned**

ASTM SEQUENCE VI

Name	Email/Phone	Company	Attend
Adrian Alfonso **Voting Member**	Phone: (210) 838-0431 Adrian.Alfonso@intertek.com	Intertek	**ATTEND**
Jason Bowden **Voting Member**	Phone: (440) 354-7007 jhbowden@ohtech.com	OHT	**ATTEND**
Kevin Brodwater **Voting Member**	KBrodwater@chevron.com	Chevron	**ATTEND**
Tim Cushing **Voting Member**	Phone: (248) 881-3518 Timothy.Cushing@gm.com	GM	
Rich Grundza **Voting Member**	Phone: (412) 365-1034 reg@astmtmc.cmu.edu	TMC	**ATTEND**
Jeff Hsu **Voting Member**	Phone: (832) 419-3482 j.hsu@shell.com	Shell	**ATTEND**
Teri Kowalski **Voting Member**	Phone: (734) 995-4032 Teri.Kowalski@tema.toyota.com	Toyota	
Dan Lanctot **Voting Member**	Phone: (210) 690-1958 dlanctot@tei-net.com	TEI	**ATTEND**
Greg Miranda **Voting Member**	Phone: (440) 347-8516 Greg.Miranda@Lubrizol.com	Lubrizol	**ATTEND**
Katerina Pecinovsky **Voting Member**	Phone: Katerina.Pecinovsky@AftonChemical.com	Afton	**ATTEND**
Brianne Pentz **Voting Member**	Phone: Brianne.Pentz@bp.com	BP	
Andy Ritchie **Voting Member**	Phone: (908) 474-2097 Andrew.Ritchie@infineum.com	Infineum	
Ron Romano **Voting Member**	Phone: (313) 845-4068 rromano@ford.com	Ford	**ATTEND**
Clifford Salvesen **Voting Member**	Phone: (856) 224-2954 Clifford.r.Salvesen@exxonmobil.com	ExxonMobil	**ATTEND**
Amol Savant **Voting Member**	acsavant@valvoline.com	Valvoline	**ATTEND**
Haiying Tang **Voting Member**	Phone: (248) 512-0593 HT146@Chrysler.com	Chrysler	
Dan Worcester **Voting Member**	Phone: (210) 522-2405 Dan.Worcester@swri.org	SwRI	**ATTEND**

ASTM SEQUENCE VI

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Lisa Dingwell	Lisa.Dingwell@AftonChemical.com	Afton	ATTEND
Todd Dvorak	Todd.Dvorak@aftonchemical.com	Afton	ATTEND
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Scott Rajala	srajala@ILAcorp.com	Idemitsu	
Dave Passmore	dpassmore@imtsind.com	IMTS	

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Joe Gleason	Jog1@lubrizol.com	Lubrizol	
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Ian Elliot	IanElliott@chevron.com	Oronite	
Jo Martinez	jogm@chevron.com	Oronite	ATTEND
Robert Stockwell	rsto@chevron.com	Oronite	ATTEND
Travis Kostan	Travis.Kostan@swri.org	SwRI	
Patrick Lang	Patrick.Lang@swRI.org Phone: (210) 522-2820	SwRI	ATTEND
Michael Lochte	mlochte@swri.org	SwRI	
Khalid Rais	Khalid.Rais @swri.org	SwRI	ATTEND
Karen Haumann	Karen.Haumann@shell.com	Shell	
Scott Stap	Scott.Stap@tgdirect.com	TG Direct	ATTEND
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Jim Linden	lindenjim@jlindenconsulting.com Phone: (248) 321-5343	Toyota	ATTEND
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Tom Smith		Valvoline	
Hap Thompson	Hapjthom@aol.com	VIx Facilitator	
Chris Taylor	Chris.Taylor@vpracingfuels.com	VP Racing Fuels	
Andrew Stephens	Andrew.Stephens@lubrizol.com	Lubrizol	ATTEND
Mike Noriega	Mike.Noriega@intertek.com	Intertek	ATTEND
Jim Carter	jcarter@gageproducts.com	Gage Products	ATTEND
Meryn Hopp	Meryn.Hopp@GM.com	GM	ATTEND

ASTM SEQUENCE VI

Name	Email/Phone	Company	Attend

MOTION:	**BUILD PACK**	**REUSE GEARS**	**REWORK**	
Adrian Alfonso **Voting Member**	APPROVE	APPROVE	APPROVE	
Jason Bowden **Voting Member**	APPROVE	APPROVE	APPROVE	
Kevin Brodwater **Voting Member**	APPROVE	APPROVE	APPROVE	
Tim Cushing **Voting Member**	APPROVE	APPROVE	APPROVE	
Rich Grundza **Voting Member**	APPROVE	APPROVE	APPROVE	
Jeff Hsu **Voting Member**	APPROVE	APPROVE	APPROVE	
Teri Kowalski **Voting Member**				
Dan Lanctot **Voting Member**	APPROVE	APPROVE	APPROVE	
Greg Miranda **Voting Member**	APPROVE	APPROVE	APPROVE	
Katerina Pecinovsky **Voting Member**	APPROVE	APPROVE	APPROVE	
Brianne Pentz **Voting Member**				
Andy Ritchie **Voting Member**				
Ron Romano **Voting Member**	APPROVE		APPROVE	
Clifford Salvesen **Voting Member**	APPROVE	APPROVE	APPROVE	
Amol Savant **Voting Member**	APPROVE	APPROVE	APPROVE	
Haiying Tang **Voting Member**				
Dan Worcester **Voting Member**	APPROVE	APPROVE	APPROVE	
VOTES	15 Y, 0 N, 0 W	14 Y, 0 N, 0 W	15 Y, 0 N, 0 W	

ASTM SEQUENCE VI

Name	Email/Phone	Company	Attend

MOTION:				
Adrian Alfonso **Voting Member**				
Jason Bowden **Voting Member**				
Kevin Brodwater **Voting Member**				
Tim Cushing **Voting Member**				
Rich Grundza **Voting Member**				
Jeff Hsu **Voting Member**				
Teri Kowalski **Voting Member**				
Dan Lanctot **Voting Member**				
Greg Miranda **Voting Member**				
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Ron Romano **Voting Member**				
Clifford Salvesen **Voting Member**				
Amol Savant **Voting Member**				
Haiying Tang **Voting Member**				
Dan Worcester **Voting Member**				
VOTES				

ASTM SEQUENCE VI

Name	Email/Phone	Company	Attend

MOTION:				
Adrian Alfonso **Voting Member**				
Jason Bowden **Voting Member**				
Kevin Brodwater **Voting Member**				
Tim Cushing **Voting Member**				
Rich Grundza **Voting Member**				
Jeff Hsu **Voting Member**				
Teri Kowalski **Voting Member**				
Dan Lanctot **Voting Member**				
Greg Miranda **Voting Member**				
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Ron Romano **Voting Member**				
Clifford Salvesen **Voting Member**				
Amol Savant **Voting Member**				
Haiying Tang **Voting Member**				
Dan Worcester **Voting Member**				
VOTES				

Sequence VI Surveillance Panel
November 16, 2017
9:00AM – 11:00AM
Southwest Research Institute
San Antonio, TX

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

1. Motion – Sequence VI surveillance panel accepts the engine build procedure, as drafted by the Sequence VIE/F Short Block Hardware Task Force, to be added to the Sequence VIE and Sequence VIF ASTM test procedures as a replacement for Annex A17. Effective 11/16/17.
   Adrian Alfonso / Charlie Leverett / Passed Unanimously 15 – 0 – 0

2. Motion – Sequence VI surveillance panel allows the reuse of the fixed timing sprockets (p/n 12640985 and p/n 12640986), as long as they remain serviceable. Section 9.4.20 of the Sequence VIE and Sequence VIF ASTM test procedures will be revised to include the GM part numbers and to allow for the reuse of the fixed timing sprockets. Reuse of the fixed timing sprockets will commence at each laboratory once the lab's inventory of new fixed timing sprockets have been depleted.
   Adrian Alfonso / Dan Worcester / Passed Unanimously 14 – 0 – 0

3. Action Item – Any laboratories interested in purchasing new exhaust fixed timing sprockets, are to contact Scott Stap at GM by 12/16/17.

4. Motion – Revise Section 6.2 of the Sequence VIE and Sequence VIF ASTM test procedures to include a comment to not allow alteration, modification or rework of the GM short block built engine, unless authorized by the by the Sequence VI surveillance panel.
   Adrian Alfonso / Charlie Leverett / Passed Unanimously 15 – 0 – 0

5. Action Item – Haltermann to report to the Sequence VI surveillance panel the process for building the Texas and Michigan Lube Cert EEE fuel batches and for additizing the SEQ VI-E + DCA fuel. Include details on component sourcing for the Texas and Michigan locations (i.e. are the components for both locations obtained from the same source and

from the same component batches, etc.). Include details on the additizing process for the Texas and Michigan locations (i.e. are the additives for both locations obtained from the same source and from the same batches, when is the Lube Cert EEE additized, etc.).

6. Action Item – Laboratories to inspect their stands and report to Rich Grundza on what valves they have installed on each stand for 150C in Section 6.5.3 of the Sequence VIE and Sequence VIF ASTM test procedures.

7. Motion – Add Section 11.6.5.1 from the Sequence VID (D7589) ASTM test procedure to the Sequence VIE (D8114) and Sequence VIF ASTM test procedures.
   Rich Grundza / Adrian Alfonso / Passed Unanimously 15 – 0 – 0

8. Action Item – Rich Grundza to review the Sequence VIE and Sequence VIF ASTM test procedures for inclusion of the necessary sole source statements and to make recommendations, if needed, to the Sequence VI surveillance panel.

9. Action Item – Greg Miranda and Rich Grundza to provide all of the necessary information, to update the Sequence VIF test procedure draft, to Hap Thompson for the next and final procedure draft.

10. Action Item – Laboratories to re-upload their Sequence VIE and VIF precision matrix tests (29 VIE and 18 VIF tests) with the engine hour adjustment applied.

Sequence
VIE FEI 2 Response Shift Task Force

SOUTHWEST RESEARCH INSTITUTE®

11.16.2017

Task Force Members

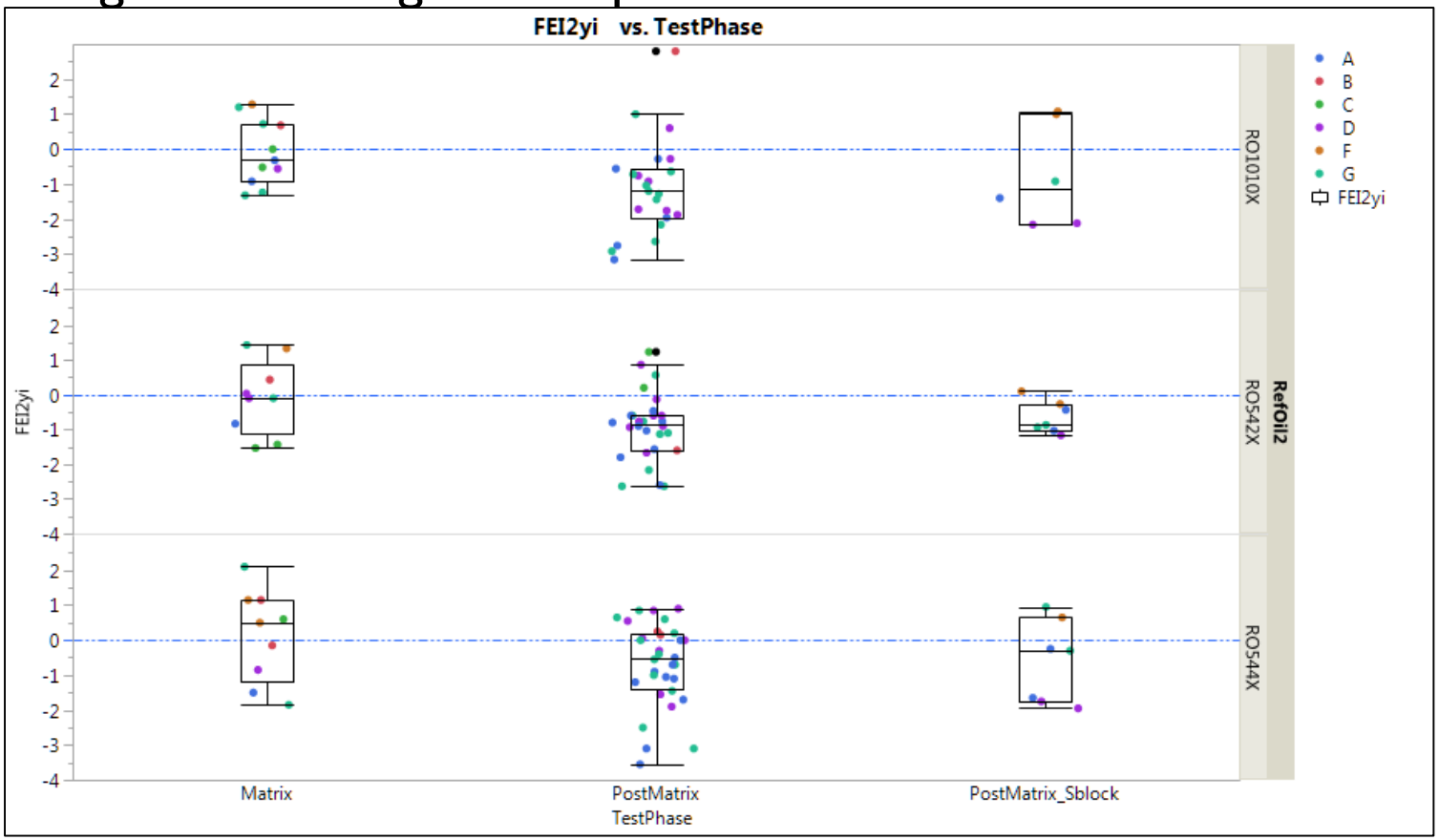
Adrian Alfonso	Intertek
Jerry Brys	Lubrizol
Bill Buscher	Intertek
Todd Dvorak	Afton
Rich Grundza	TMC
Charlie Leverett	Infineum
Greg Miranda	Lubrizol
Katerina Pecinovsky	Afton
Cliff Salvesen	ExxonMobil
Amol Savant	Valvoline
Dan Worcester	SwRI

Task Force Scope

The Task Force will review data, chemical analysis for the 109 hour aging, and other factors for the VIE test looking for a root cause for a response shift affecting FEI 2.

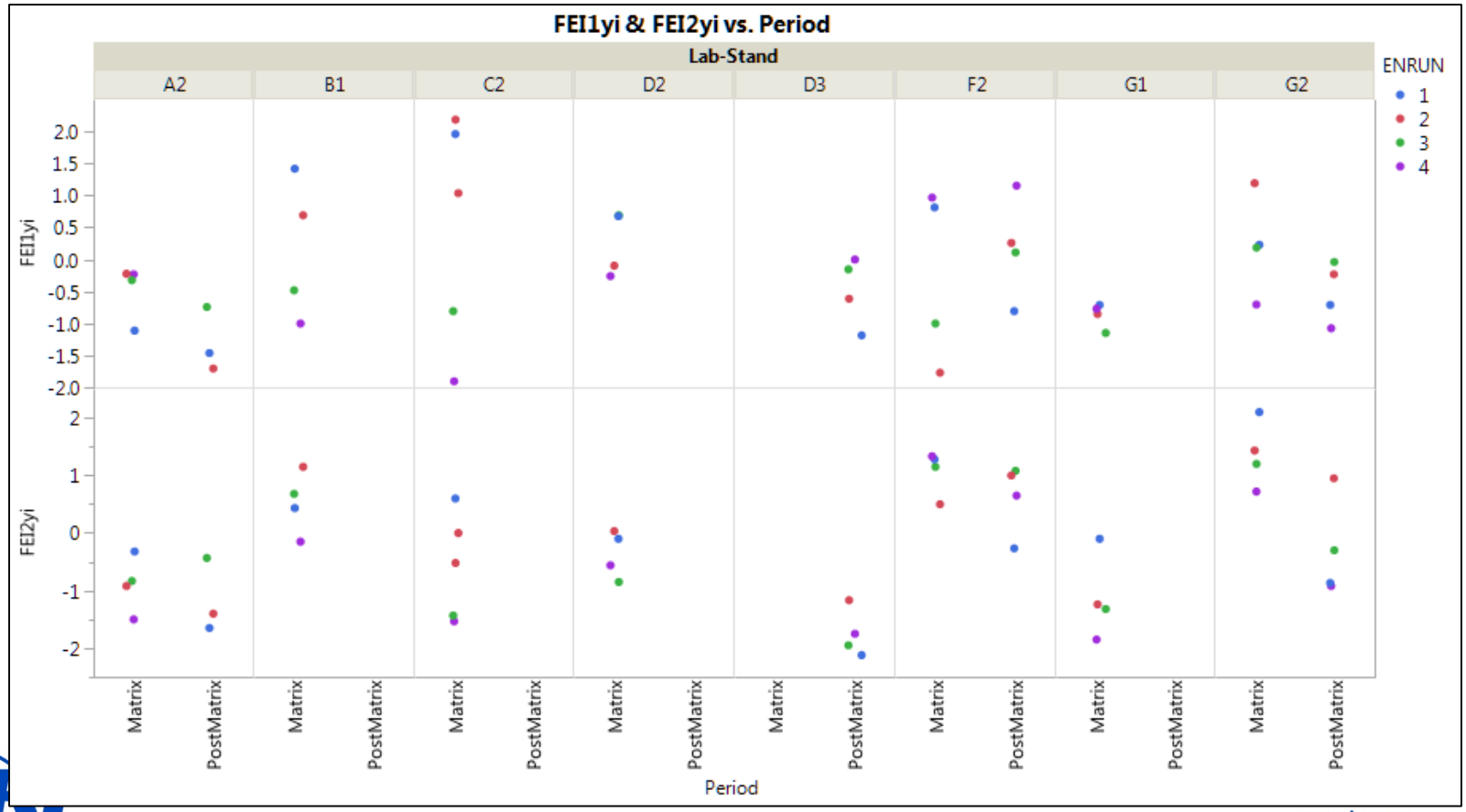
Review of VIE Data

- Plot of VIE $FEI2Y_i$ Chart provided by Todd Dvorak
  - Data suggests that the $FEI2Y_i$ performance has shifted severe of target - following the VIE precision matrix.



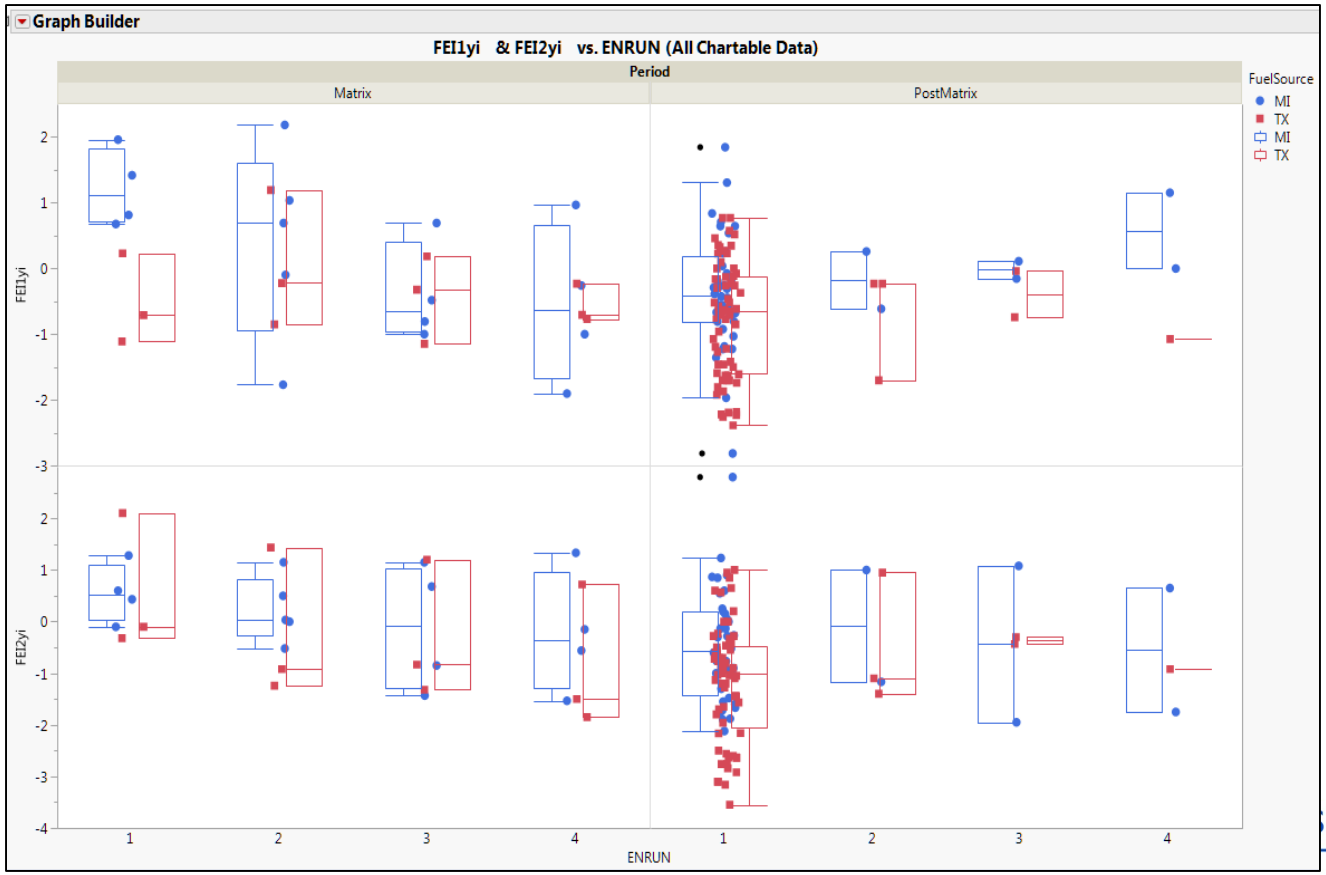
Lab-Stand Comparison of PM and PPM Test Severity

- Plot of Precision Matrix and Short Block Post Matrix data by Lab-Stand combination
  - General trend of test being more severe during PostMatrix



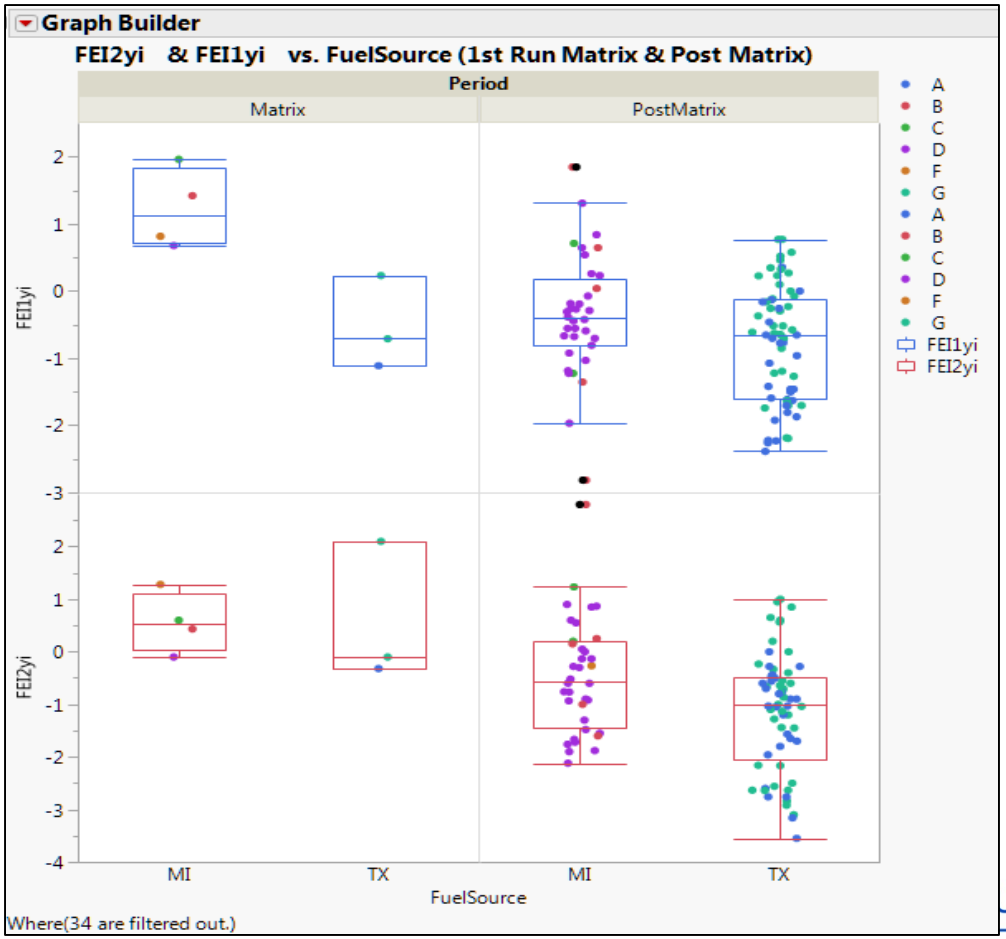
VIE Analysis of Fuel Source Analysis

- Plot of all chartable FEI_Yi data by test run, period (Matrix vs. PostMatrix) and fuel source (Texas vs. Michigan)
  - Plot may suggest difference in FEI2_Yi during PostMatrix)



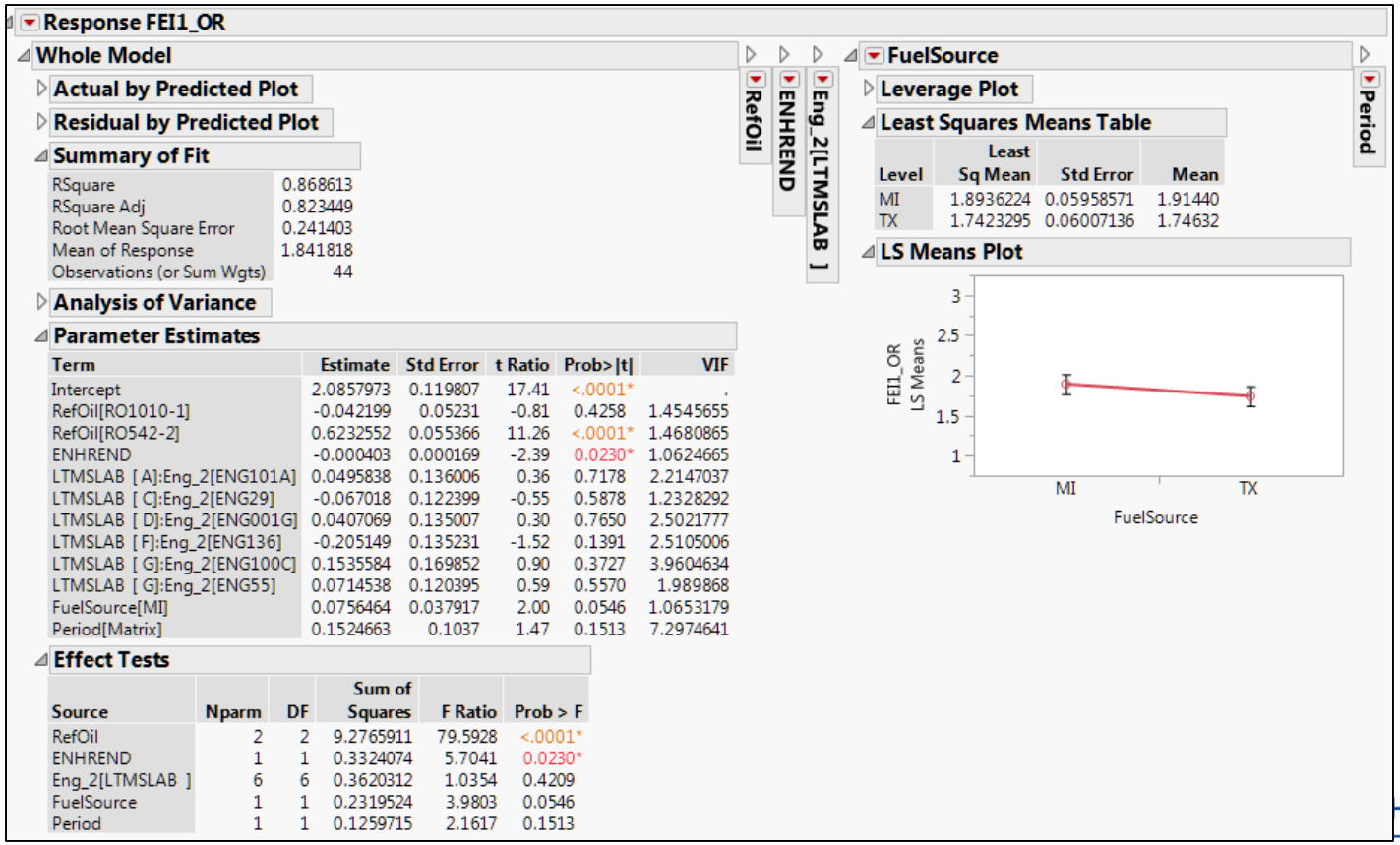
VIE Analysis of Fuel Source Analysis

- Plot of all chartable FEI_Yi 1st run data by Fuel Source and Period



VIE Analysis of Fuel Source Analysis

- Analysis of FEI1 chartable PM and SBM data
  - Analysis suggests fuel source is significant.
    - Fuel source confounded with test laboratory



Response FEI1_OR

Whole Model

Actual by Predicted Plot

Residual by Predicted Plot

Summary of Fit

RSquare	0.868613
RSquare Adj	0.823449
Root Mean Square Error	0.241403
Mean of Response	1.841818
Observations (or Sum Wgts)	44

Analysis of Variance

Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob>|t|	VIF
Intercept	2.0857973	0.119807	17.41	<.0001*	.
RefOil[RO1010-1]	-0.042199	0.05231	-0.81	0.4258	1.4545655
RefOil[RO542-2]	0.6232552	0.055366	11.26	<.0001*	1.4680865
ENHREND	-0.000403	0.000169	-2.39	0.0230*	1.0624665
LTMSLAB [A]:Eng_2[ENG101A]	0.0495838	0.136006	0.36	0.7178	2.2147037
LTMSLAB [C]:Eng_2[ENG29]	-0.067018	0.122399	-0.55	0.5878	1.2328292
LTMSLAB [D]:Eng_2[ENG001G]	0.0407069	0.135007	0.30	0.7650	2.5021777
LTMSLAB [F]:Eng_2[ENG136]	-0.205149	0.135231	-1.52	0.1391	2.5105006
LTMSLAB [G]:Eng_2[ENG100C]	0.1535584	0.169852	0.90	0.3727	3.9604634
LTMSLAB [G]:Eng_2[ENG55]	0.0714538	0.120395	0.59	0.5570	1.989868
FuelSource[MI]	0.0756464	0.037917	2.00	0.0546	1.0653179
Period[Matrix]	0.1524663	0.1037	1.47	0.1513	7.2974641

Effect Tests

Source	Nparm	DF	Sum of Squares	F Ratio	Prob > F
RefOil	2	2	9.2765911	79.5928	<.0001*
ENHREND	1	1	0.3324074	5.7041	0.0230*
Eng_2[LTMSLAB]	6	6	0.3620312	1.0354	0.4209
FuelSource	1	1	0.2319524	3.9803	0.0546
Period	1	1	0.1259715	2.1617	0.1513

RefOil | ENHREND | Eng_2[LTMSLAB] | Period

FuelSource

Leverage Plot

Least Squares Means Table

Level	Least Sq Mean	Std Error	Mean
MI	1.8936224	0.05958571	1.91440
TX	1.7423295	0.06007136	1.74632

LS Means Plot

VIE Analysis of Fuel Source Analysis

- Analysis of FEI2 chartable PM and SBM data
  - Analysis suggests fuel source is not significant.

Response FEI2_OR

Whole Model

Actual by Predicted Plot

Residual by Predicted Plot

Summary of Fit

RSquare	0.634647
RSquare Adj	0.509057
Root Mean Square Error	0.223663
Mean of Response	1.601364
Observations (or Sum Wgts)	44

Analysis of Variance

Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob>|t|	VIF
Intercept	1.7865754	0.111003	16.09	<.0001*	.
RefOil[RO1010-1]	0.1591073	0.048466	3.28	0.0025*	1.4545655
RefOil[RO542-2]	0.0498451	0.051298	0.97	0.3385	1.4680865
ENHREND	-0.000311	0.000156	-1.99	0.0555	1.0624665
LTMSLAB [A]:Eng_2[ENG101A]	0.0891297	0.126011	0.71	0.4845	2.2147037
LTMSLAB [C]:Eng_2[ENG29]	-0.200763	0.113404	-1.77	0.0862	1.2328292
LTMSLAB [D]:Eng_2[ENG001G]	-0.071605	0.125086	-0.57	0.5710	2.5021777
LTMSLAB [F]:Eng_2[ENG136]	-0.043949	0.125294	-0.35	0.7281	2.5105006
LTMSLAB [G]:Eng_2[ENG100C]	0.0383168	0.15737	0.24	0.8092	3.9604634
LTMSLAB [G]:Eng_2[ENG55]	0.2709102	0.111548	2.43	0.0210*	1.989868
FuelSource[MI]	0.0347819	0.03513	0.99	0.3296	1.0653179
Period[Matrix]	0.0971397	0.09608	1.01	0.3196	7.2974641

Effect Tests

Source	Nparm	DF	Sum of Squares	F Ratio	Prob > F
RefOil	2	2	1.0083526	10.0785	0.0004*
ENHREND	1	1	0.1976136	3.9503	0.0555
Eng_2[LTMSLAB]	6	6	0.9441128	3.1455	0.0154*
FuelSource	1	1	0.0490376	0.9803	0.3296
Period	1	1	0.0511350	1.0222	0.3196

RefOil | ENHREND | Eng_2[LTMSLAB] | Period

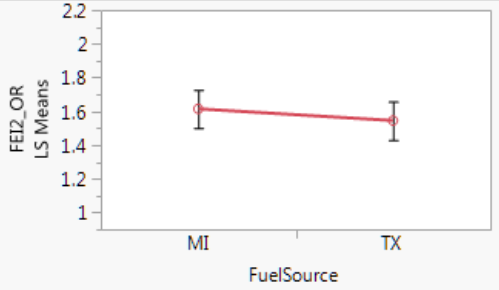
FuelSource

Leverage Plot

Least Squares Means Table

Level	Least Sq Mean	Std Error	Mean
MI	1.6148582	0.05520690	1.61520
TX	1.5452943	0.05565686	1.58316

LS Means Plot



Review of VIE Data

Analysis of VIE Reference Oil Viscosity Data

- KV40 EOT Oil Analysis (PM n = 28[1] & n = 16 SBM)
  - Analysis suggests significant increase in KV40 EOT viscosity between the 2 test phases (PM-EOT-KV40 < SBM-EOT-KV40)

Response V40EOT

Whole Model

- Actual by Predicted Plot
- Effect Summary
- Residual by Predicted Plot

Summary of Fit

RSquare	0.922923
RSquare Adj	0.902523
Root Mean Square Error	1.008013
Mean of Response	46.99795
Observations (or Sum Wgts)	44

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	9	413.67368	45.9644	45.2356
Error	34	34.54704	1.0161	Prob > F
C. Total	43	448.22072		<.0001*

Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob>|t|
Intercept	43.813023	0.481718	95.10	<.0001*
LTMSLAB[A]	2.0196939	0.340631	5.95	<.0001*
LTMSLAB[B]	-0.206296	0.461477	-0.45	0.6577
LTMSLAB[C]	-0.057277	0.410235	-0.14	0.8919
LTMSLAB[D]	-0.857541	0.340012	-2.52	0.0165*
LTMSLAB[F]	-0.49091	0.363791	-1.35	0.1878
TestPhase2[Matrix]	[illegible]	[illegible]	-3.12	0.0037*
BatchOil[[illegible]]	-3.12965	0.214111	-14.60	<.0001*
BatchOil[[illegible]]	-0.419712	0.220494	-1.90	0.0657
ENDTREND	0.002206	0.00067	3.29	0.0023*

Effect Tests

Source	Nparm	DF	Sum of Squares	F Ratio	Prob > F
LTMSLAB	5	5	41.88179	8.2495	<.0001*
TestPhase2	1	1	9.89202	9.7359	0.0037*
BatchOil	2	2	316.06649	155.5389	<.0001*
ENDTREND	1	1	11.02711	10.8526	0.0023*

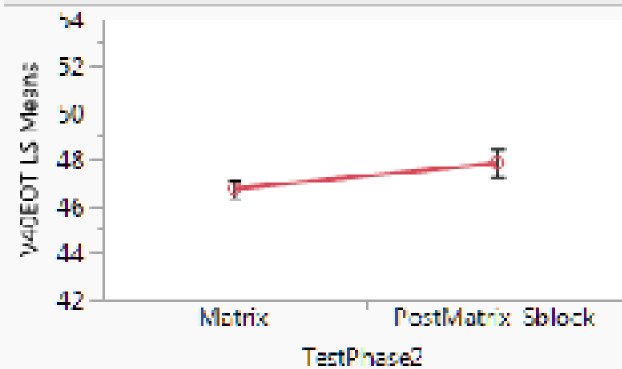
TestPhase2

- Leverage Plot

Least Squares Means Table

Level	Least Sq Mean	Std Error	Mean
Matrix	46.744931	0.19680592	46.3550
PostMatrix_Sblock	47.839677	0.28854523	48.1231

LS Means Plot



Note 1: One observation missing PM EOT viscosity data

Afton Chemical

Passion for Solutions™

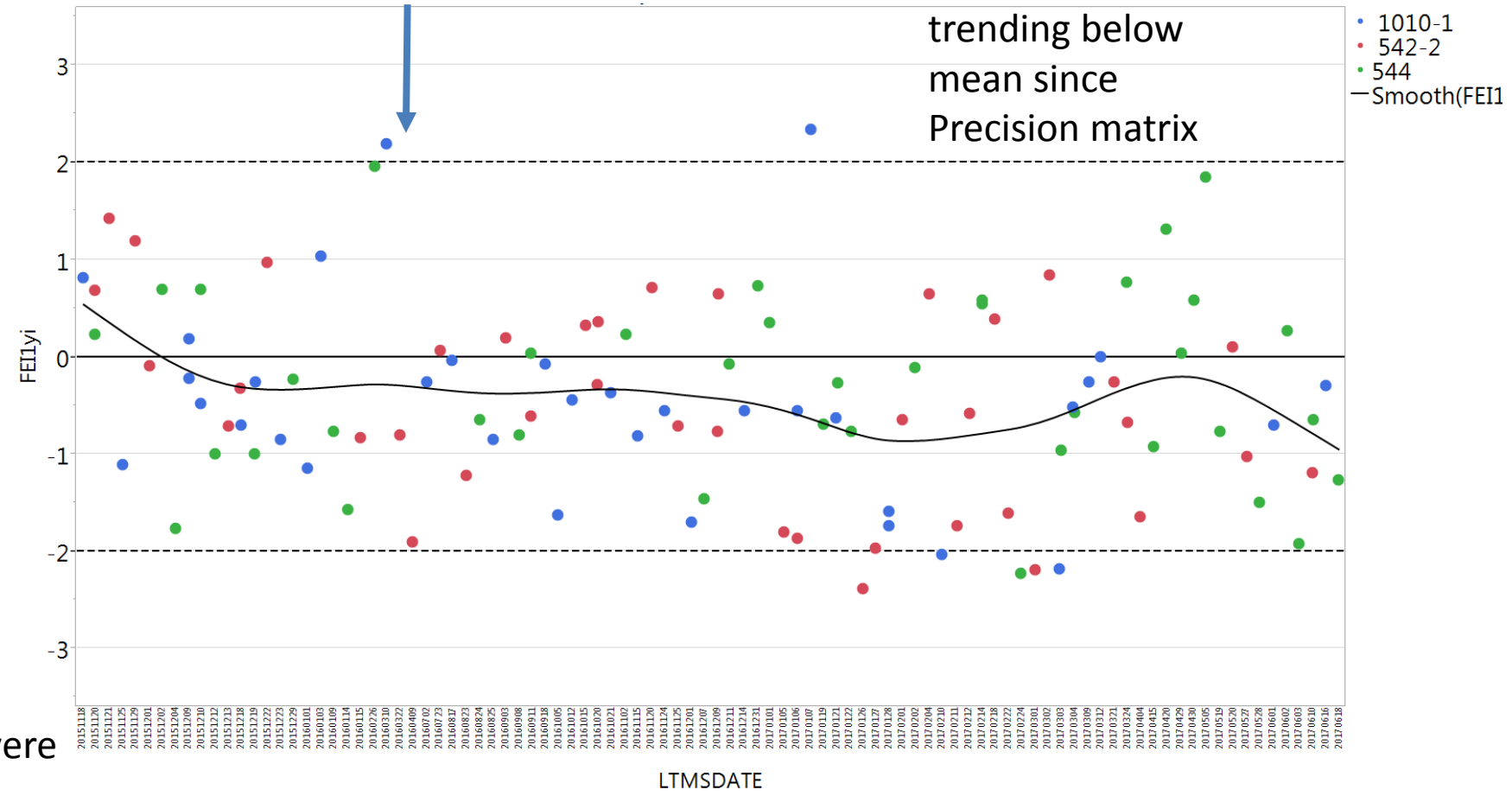
FEI I Yi

Except for one result, all 1010-1 results have been severe (below centerline) since precision matrix.

Mild

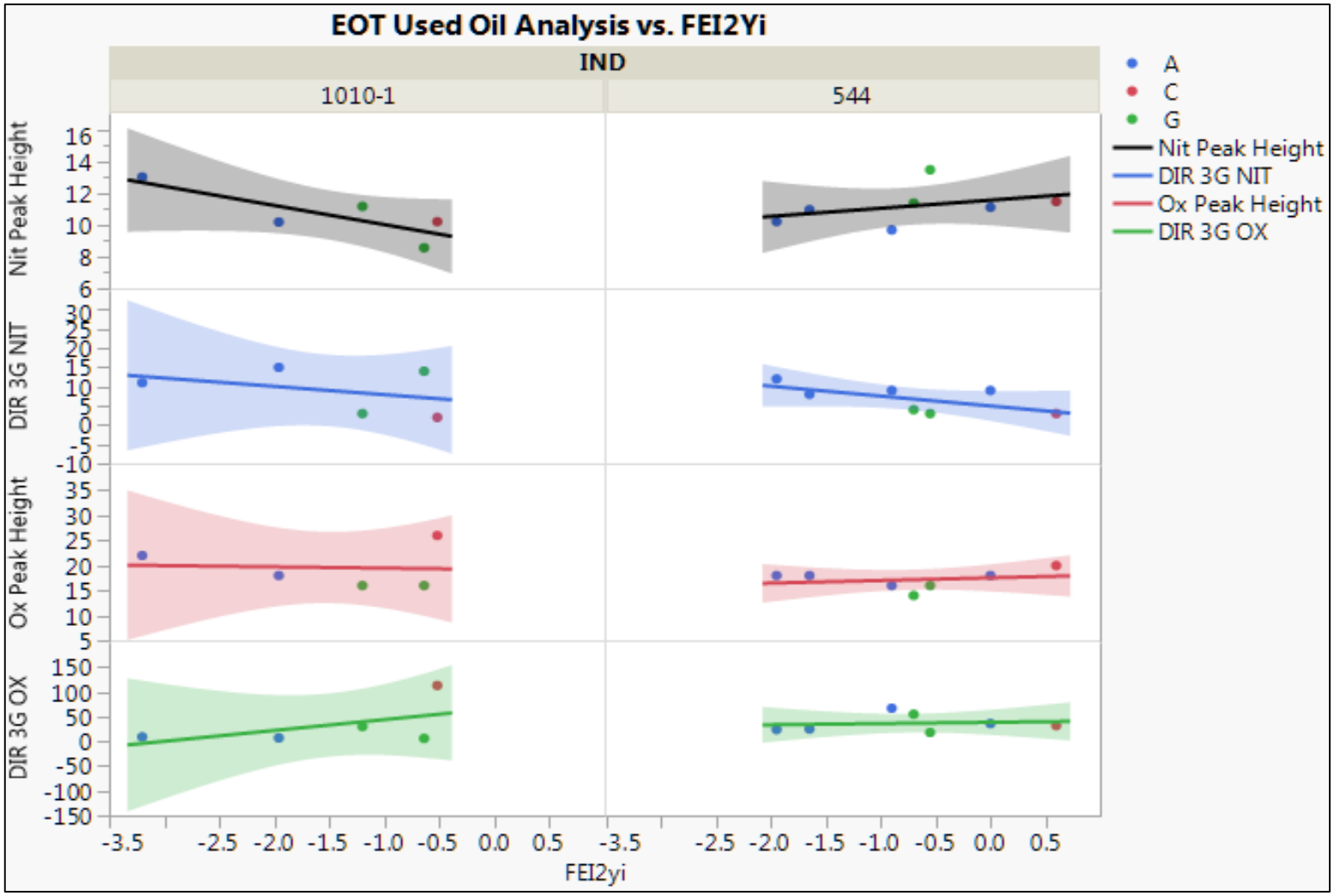
Precision Matrix End

Average Yi has been trending below mean since Precision matrix

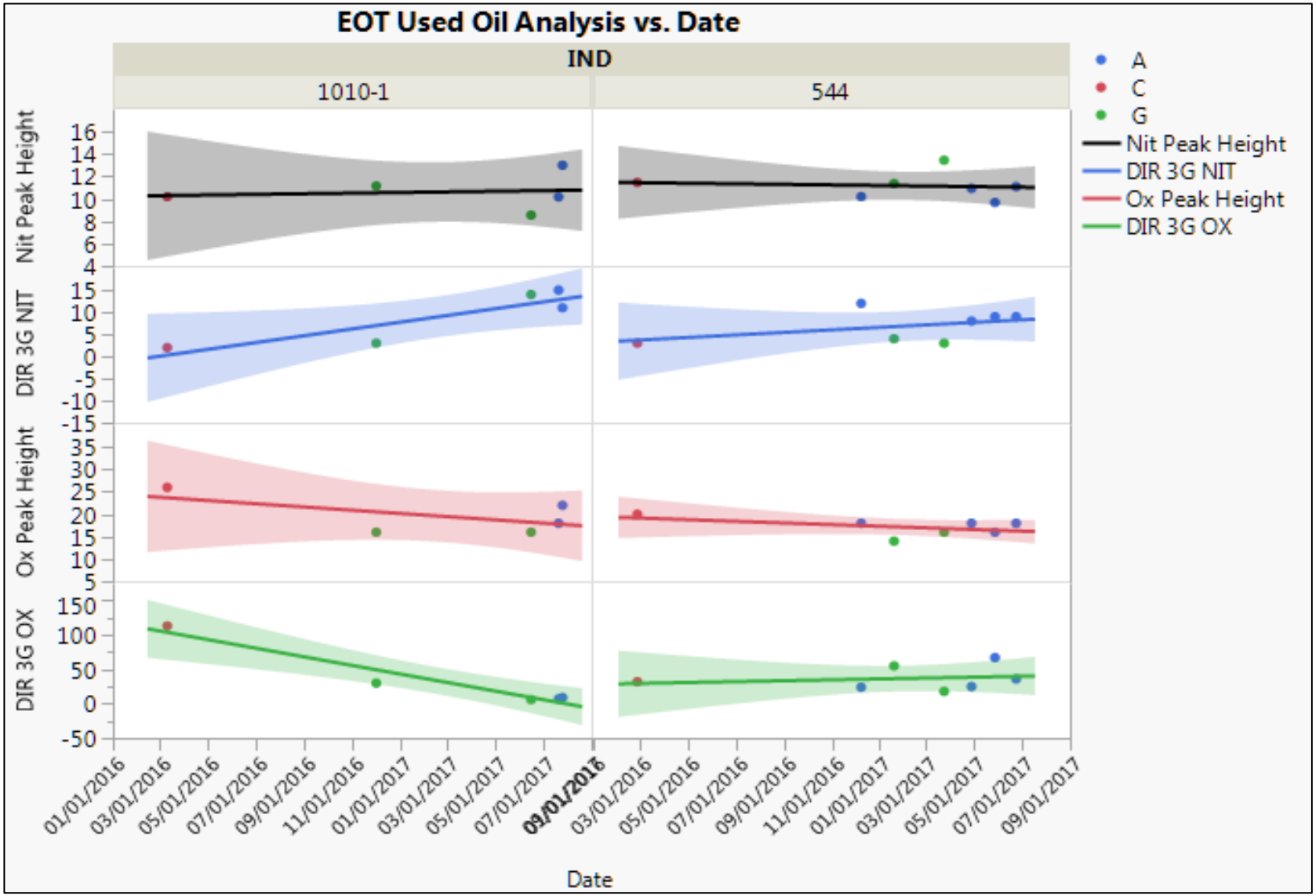


Severe

FEI 2Yi CHEM DATA



EOT CHEM DATA by OIL



Engines

- OHT-1 engines were used for the Precision Matrix.
- Labs moved to OHT-2 engines in 2016.
- GM Short Block Kit engines are approved, and labs are running.
- All Labs will switch over this Fall.

Fuel Batches

- Batches D and E were used for the Precision Matrix.
- Most labs are on Batch F.
- Batch G will be available this fall.

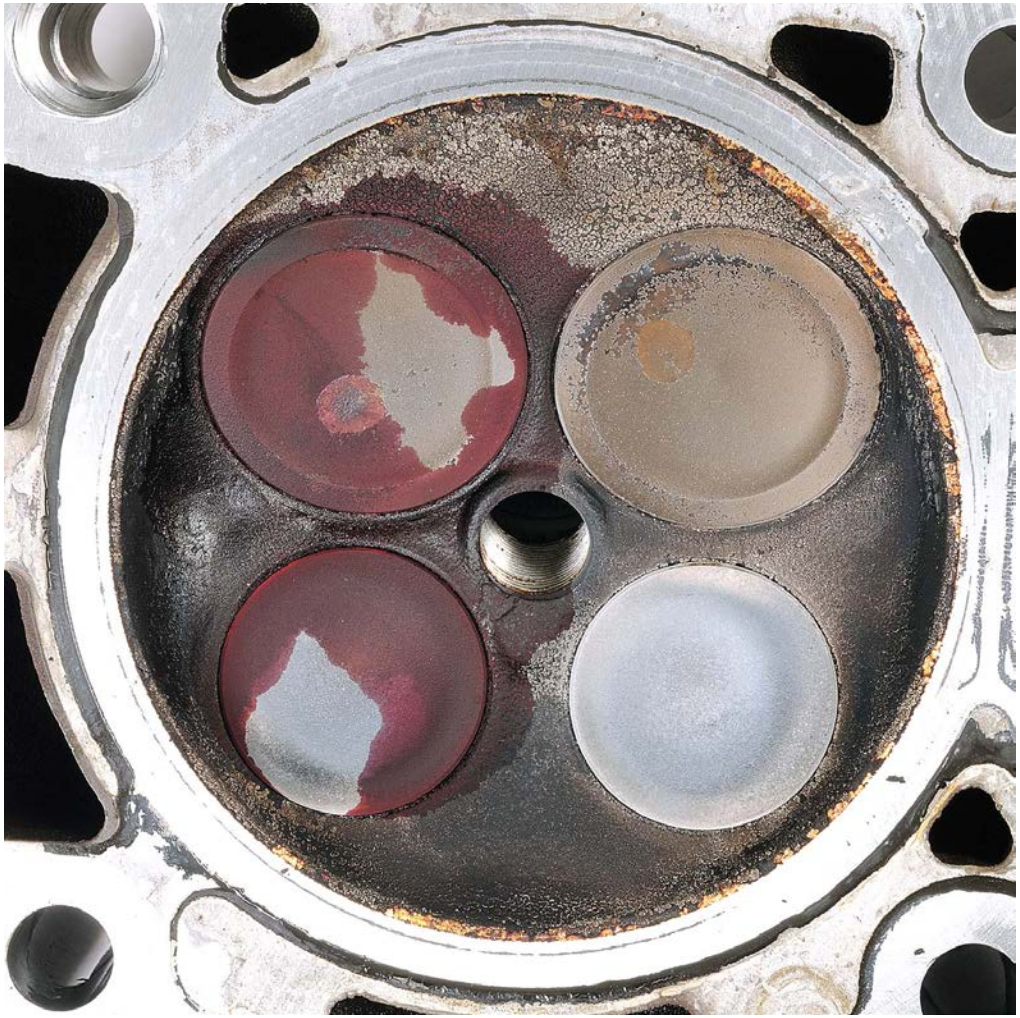
Action

- Amol has created Power Points comparing a pass and a fail engine.
- Those are posted at:
  - http://www.astmtmc.cmu.edu/ftp/refdata/gas/VIE/plots/

APPENDIX

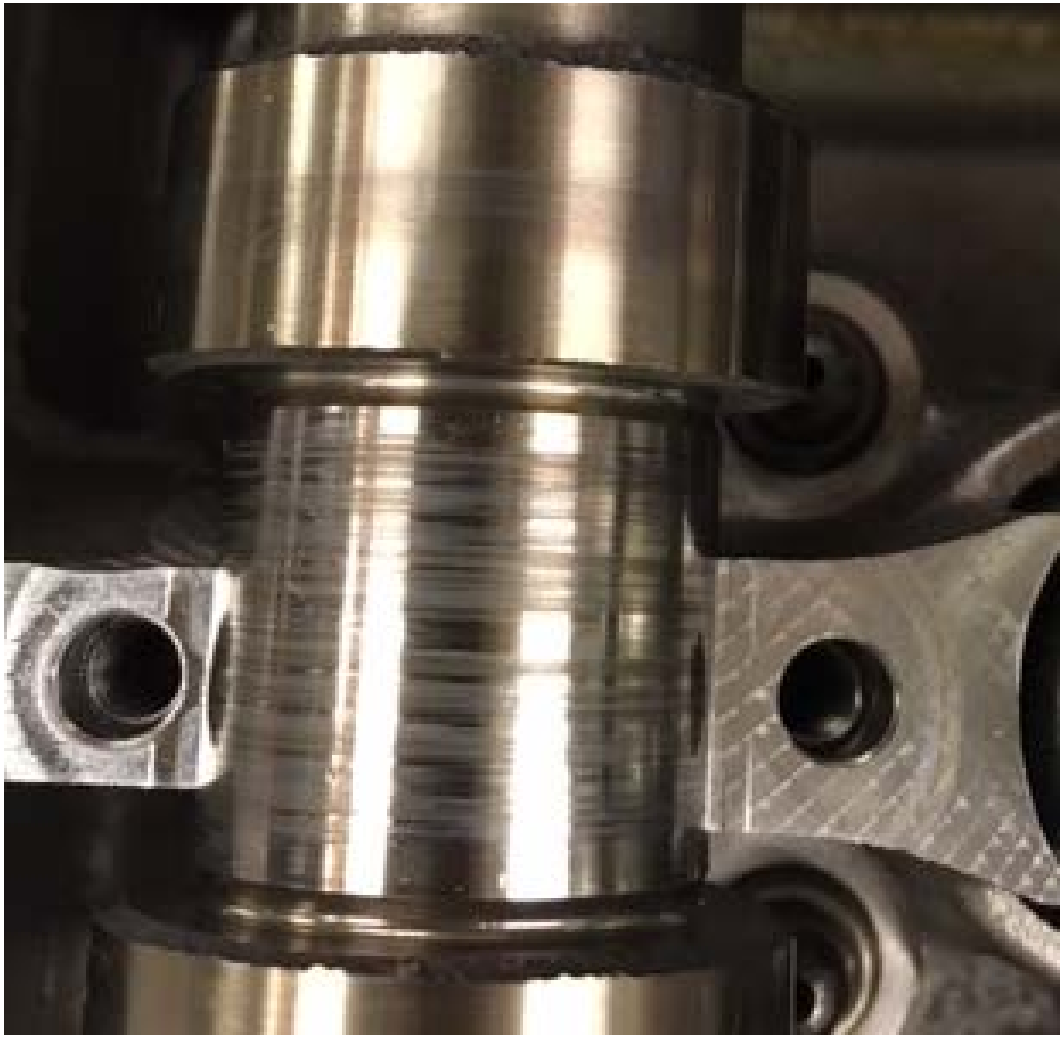
PHOTOS

VIE SwRI Valves



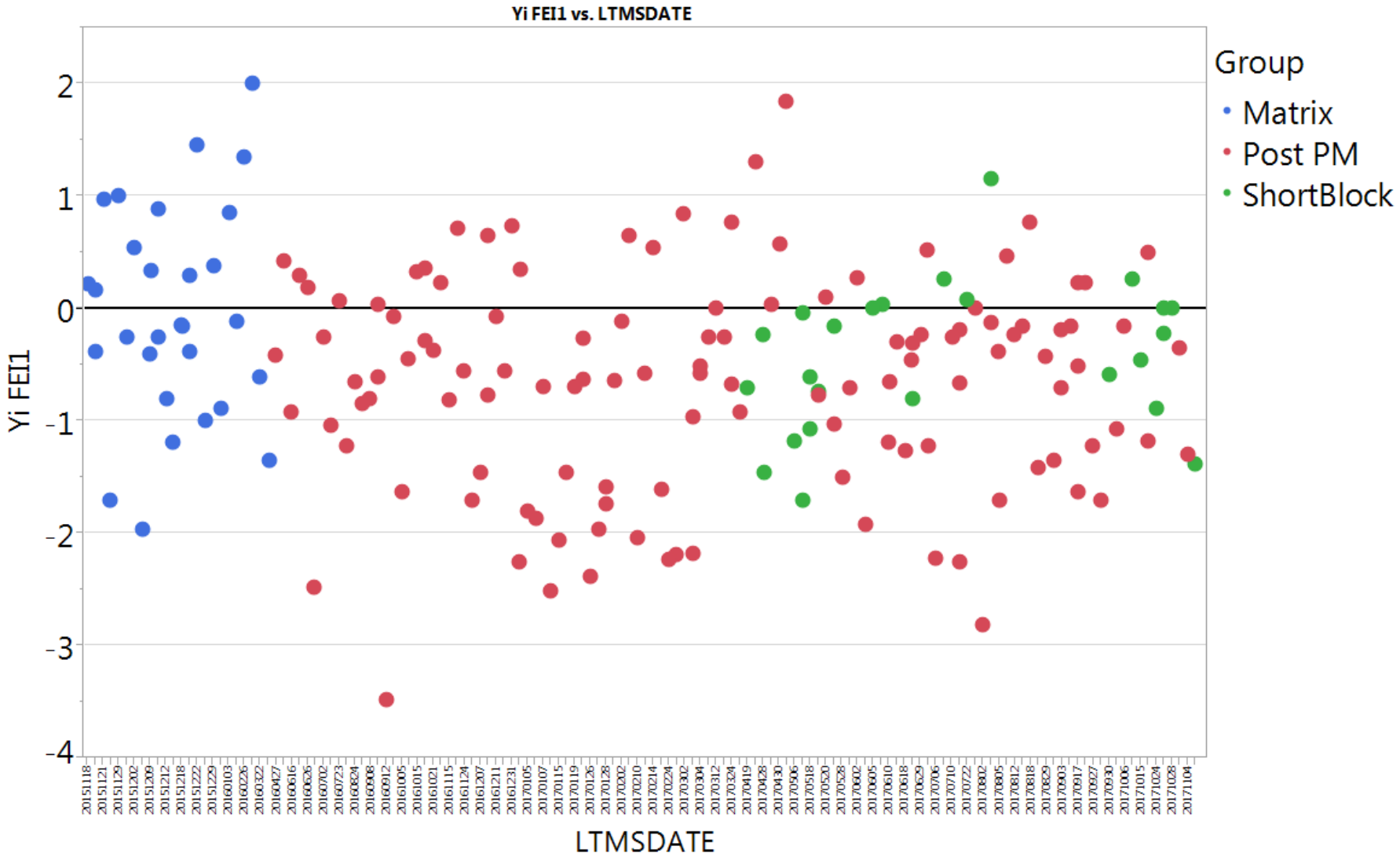
VIE IAR Piston Deposits

VIE Afton Journal Wear

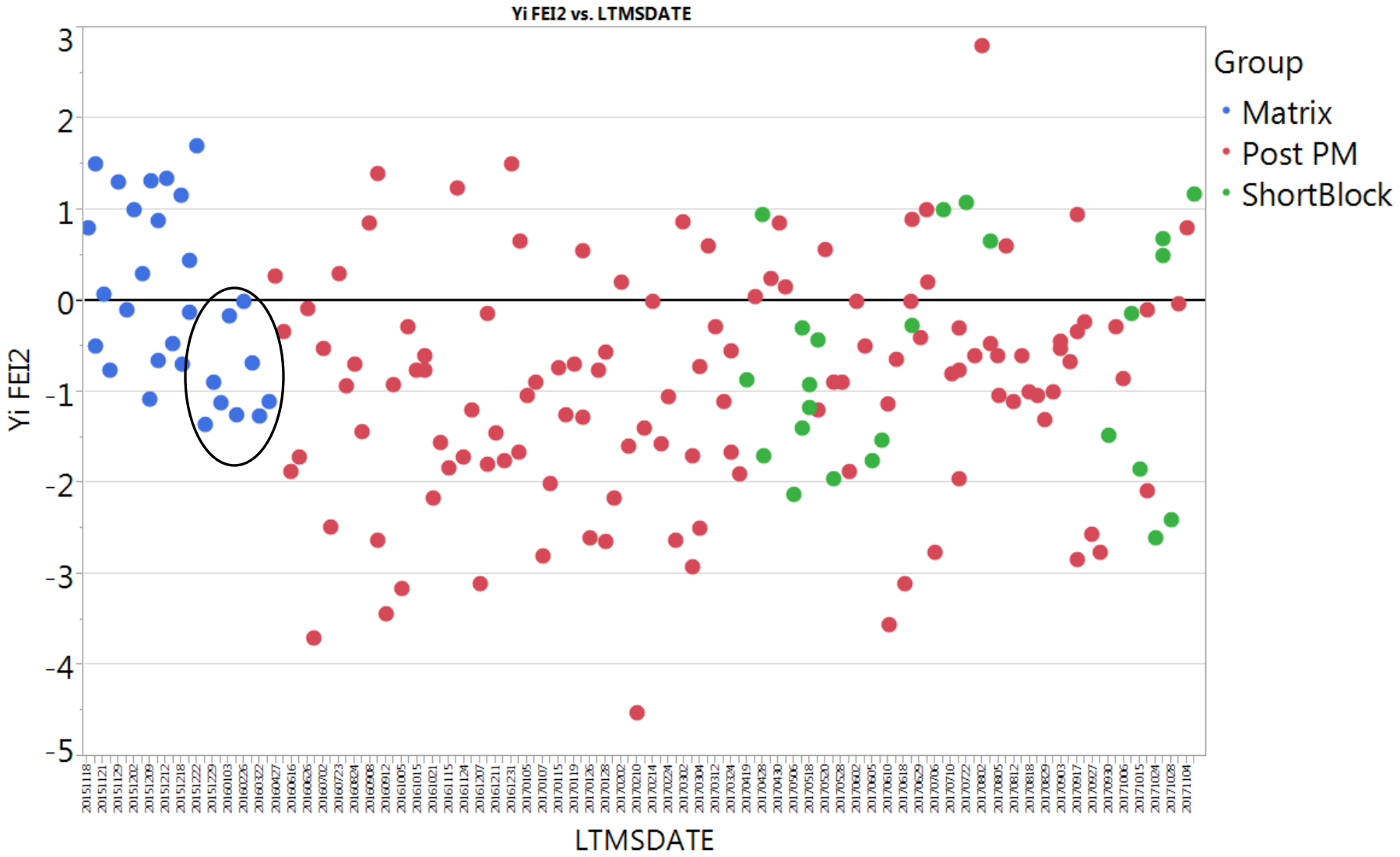


VIE Valvoline Bore Polish

FEI1 engine hour adjusted Yi, ordered by date

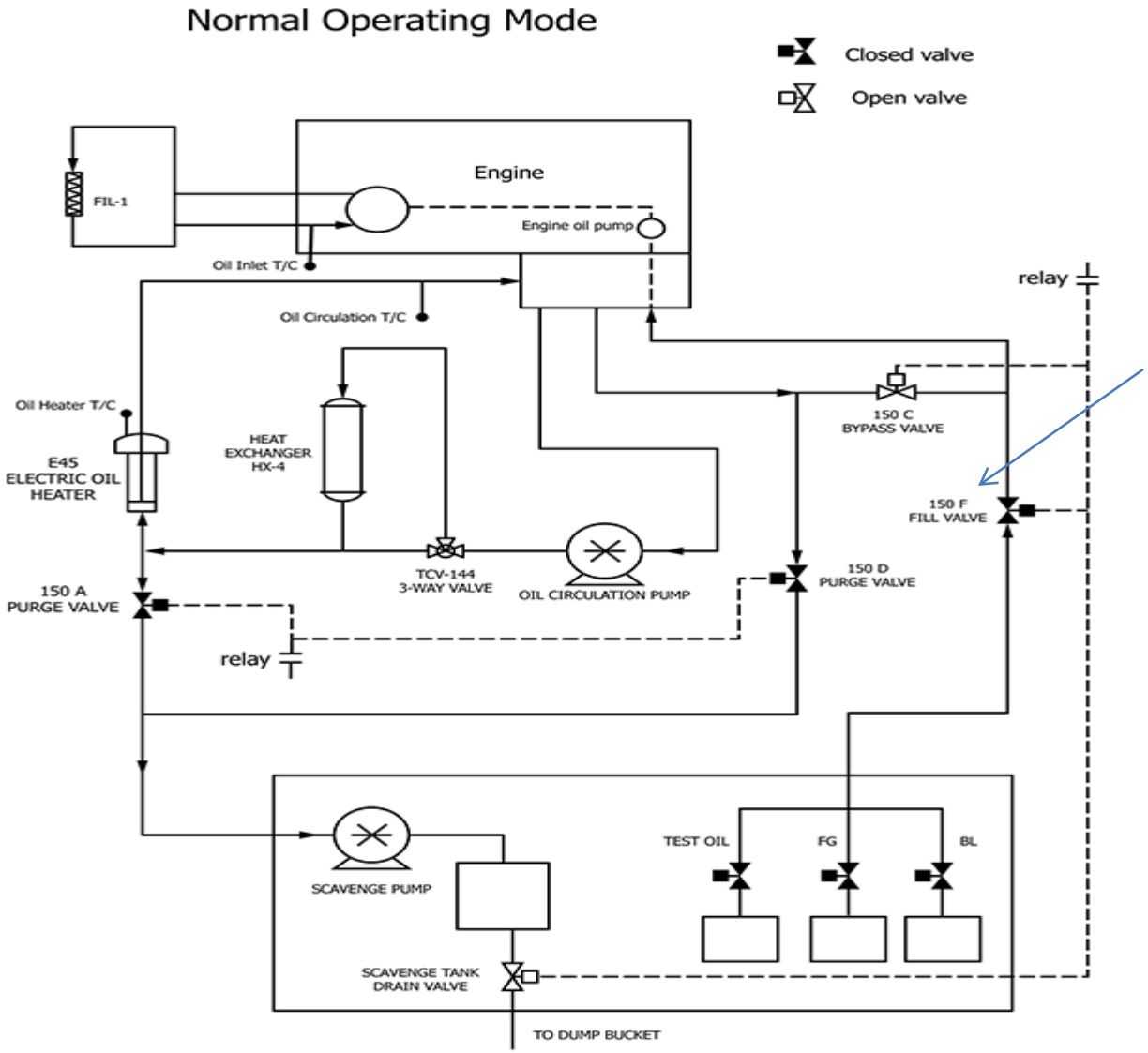


FEI2 engine hour adjusted Yi, ordered by date



Procedural Discrepancies notd during lab visits

Figure A5.6 Discrepancy



Mislabeled, should be 150E

Oil System

- From D8114 -FCV-150C is to be Burkert Type 2000 with 13 mm orifice and 50 mm actuator. Additionally, flexible hoses to and from FCV-150C are to be size #12 and the internal diameter of all fittings on the suction side of the engine driven oil pump shall be equal to or greater than 0.50 in. Hose lines to and from FIL-2 are to be size #10.
- From D7589 - FCV-150C is a Burkert Type 251 piston-operated valve used with a Type 312 solenoid valve (or a Burkert Type 2000 piston-operated valve used with a Type 311, 312 or 330 solenoid valve) for actuation of air supply to the piston valve, solenoid valve direct-coupled to the piston valve, normally open, explosion proof (left to the discretion of the laboratory) and watertight, $^{1}/_{2}$ in., 2-way, stainless steel NPT fitting.

Section 11.6.5.1 not in D8114

- From D7589 - 11.6.5.1 During the BSFC measurement cycle of a test, a stage restart may be conducted for any stage provided the average of any critical parameter, as detailed in Table 3, is projected to be out of the specified range for that stage, and provided the sixth reading of that stage has not been completed. If the sixth reading of any stage is completed, do not conduct a stage restart for that stage. Additionally, if the sixth reading of any stage is completed and a critical parameter average is out of the specified range for that stage, the test is considered invalid. Only one stage restart per stage as shown in Table 5 and no more that 4 stage restarts within a test are allowed. Document each stage restart in the comments section.

Sole Source Items

- Excerpt from an email from a facilitator:

Frank,

While reviewing the I.L. for D8114, I noted an interesting “supply source story”.

For example, in 6.6.4.1, a Viking pump is required with reference to the supply source in X1.13.

X1.13 is located in the Appendix (Non-mandatory Information) in subsection X1., titled Useful Information .

In A18.1 Procurement of Test Materials, that just precedes Appendix X1. is the statement that “If substitutions are deemed appropriate for the specified suppliers, permission in writing must be obtained from the TMC before such will be considered to be equivalent.”

So, while this Viking pump and supply source is listed in the non-mandatory section of the test method, if there is an interest in purchasing it from another source, it’s mandatory to get the TMC blessing first.

In essence, this is a “sole supply source” situation and the TMC takes the place of Subcommittee D02.B0.

Were you aware of the TMC “approval” role in this test method?

Footnotes within the main test method are very limited. The standard ASTM ‘sole source’ footnote is used only for the fuel source.

Most of these footnotes need to be added for specified equipment.