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Committee D02 on PETROLEUM PRODUCTS AND LUBRICANTS

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Originally Issued: December 1, 2009

Reply to: Jeff Clark
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412-365-1032
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Unapproved Minutes of the November 18, 2009 Sequence III Surveillance Panel Meeting

The meeting was called to order at 1:00 pm, at GM Research & Development, in Warren, MI by Chairman Dave Glaenzer. The attendance is show in **Attachment 1**.

Meeting Minutes

The minutes of the May 5, 2009 meeting, and the July 16, 2009 and September 17, 2009 teleconferences were approved.

CPD Report

Jason Bowden, of OHT, gave the CPD report which is included as **Attachment 2**. The panel approved the report without comments or questions.

GM Motorsports Report

Scott Stap gave the report for GM Motorsports, which is included as **Attachment 3**. The bulk of the report discussion centered on scratches seen on the cylinder heads. Pat Lang of SwRI mentioned that they had filled a scratch with epoxy and seen no problems. Charlie Leverett stated that Interek ran a head with a scratch and saw no problems. Labs were asked to check their inventories for scratches.

> **ACTION ITEM: Test labs** are to inspect cylinder heads for scratches and report their findings.

Test Longevity Report

Dave Glaenzer presented a test longevity report, which is included as **Attachment 4**. Based on the estimates presented, there should be enough parts to support testing through the end of 2015.

Fuel Supplier Report

Jim Carter presented the fuel supplier report, which is included as **Attachment 5**. Due to a recent fire, blending was temporarily moved to a different location. Blending has since resumed at the normal facility.

AFR Measurement and Control with EGO Sensors

George Szappanos reported for the ailing Greg Seman. The new system has been successfully tried by all test labs. The next step for the group will be to have a conference call to discuss.

> **ACTION ITEM: Greg Seman** to lead a conference call on the AFR measurement system.

EEE Fuel Analysis and Potential Spec Tightening

Todd Dvorak presented his fuel analysis report, which is included as **Attachment 6**. The analysis failed to find evidence that suggests that the fuel age has effect on the EEE fuel batch performance properties. After brief discussion, consensus was reach that the panel would not be able to reasonably pursue any specification tightening.

Additional Condition for Oil Filter Replacement

Dave Glaenzer presented for Greg Seman; the proposed wording is included as **Attachment 7**. A motion was made (Szappanos, Altman) to accept the proposed wording for both the IIIF & IIIG. After discusion, the motion was tabled, with the request that the wording be tightened up before being included into the test procedures.

> **ACTION ITEM: Dave Glaenzer / Greg Seman** to rework the wording for the additional condition for oil filter replacement.

Engine Build Considerations

Charlie Leverett led a discussion on two items: the harmonic balancer bolt torque specification; and the use of Teflon tape. After some discussion of the feasibility of the bolt torque spec, consensus was reached that the spec would be left as it currently exists and that test labs are expected to follow the spec accordingly.

Discussion followed regarding the use of Teflon tape, at the conclusion of which the following motion was made **(Leverett, Lang): Teflon tape can be used as long as it does not come into contact with test oil. The motion passed unanimously.**

> **ACTION ITEM: TMC** to issue Information Letter modifying the test method(s) to allow the use of Teflon tape.

WPD Task Force Report & Severity Issue

Pat Lang, Phil Scinto, and Jim Rutherford all presented; their presentations are included as **Attachments 8, 9, and 10**, respectively. Pat summarized the history and current test status. Phil presented the LTMS Task Force Stats Group recommendations. This led to a teaching opportunity for Jim Rutherford to cover and explain some components of the soon-to-be proposed new LTMS system. At the conclusion of lengthy discussion, consensus was reach that no immediate action would be taken by the Seq. III panel. It is expected that the panel will resume the discussion once the new LTMS has been released to the industry. It was noted that the LTMS TF and TGC will be meeting soon and hope to release the LTMS to the industry in early winter 2010.

Use of 1/16" Thermocouples and Condenser Temperature Quality Index Constants

Mark Mosher presented (**Attachment 11**) a request to allow the use of 1/16" thermocouples due to issues XOM has seen in controlling condenser temperature. After discussion regarding durability, signal filtering, and response time, the following **motion (Mosher, Ritchie) was made: to allow the use of 1/16" thermocouples. The motion passed 4-0-7.** It was noted that any lab the chooses to change from 1/8" to 1/16" should do so with a reference test.

> **ACTION ITEM: TMC** to issue Information Letter modifying the test method(s) to allow the use of 1/16" thermocouples.

Ed Altman the raised concern that the U & L constants for condenser temperature were too tight and that it is the parameter that is the most difficult to control. A **motion was made (Altman, Lang) to change the U/L +/- for condenser temperature from 0.23 to 0.46. The motion passed 3-0-8**.

> **ACTION ITEM: TMC** to issue Information Letter modifying the test method(s) to reflect the new U/L for condenser temperature.

Ring Batch Results

Rich Grundza presented (**Attachment 12**) a comparison of results on Batch 9 and Batch 10 rings, which were made by two different manufacturers. A trend appears to start in the middle of Batch 9. It was noted that some labs felt that the trending may be due to Batch 7 valve springs, which have been recalled by OHT. To investigate potential hardware effects, OHT has provided hardware (Batch 8 valve springs, Batch 10 rings, Batch 23 pistons) to the independent labs. The panel is awaiting the results. At the time of the meeting, one test was close to finishing and the other was expected to start soon.

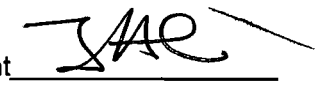
WPD Severity Shift

Bill Buscher presented (**Attachment 13**) SwRI's concerns over the current WPD severity issues. After some discussion, no action was taken by the panel.

There being no further business, the meeting adjourned at 5:10 pm.

Attachment 1

Name/Address	Phone/Fax/Email		Signature
Ed Altman Afton Chemical Corporation P.O. Box 2158 Richmond, VA 23218-2158 USA	804-788-5279 804-788-6358 ed.altman@aftonchemical.com	Voting Member	Present
Zack Bishop Test Engineering, Inc. 12718 Cimarron Path San Antonio, TX 78249-3423 USA	210-877-0223 210-690-1959 zbishop@tei-net.com	Non-Voting Member	Present
Doyle Boese Infineum 1900 E. Linden Avenue Linden, NJ 07036 USA	908-474-3176 908-474-3637 doyle.boese@infineum.com	Non-Voting Member	Present
Adam Bowden OH Technologies, Inc. 9300 Progress Parkway P.O. Box 5039 Mentor, OH 44061-5039 USA	440-354-7007 440-354-7080 adbowden@ohtech.com	Non-Voting Member	Present
Jason Bowden OH Technologies, Inc. 9300 Progress Parkway P.O. Box 5039 Mentor, OH 44061-5039 USA	440-354-7007 440-354-7080 jhbowden@ohtech.com	Voting Member	Present
Dwight H. Bowden OH Technologies, Inc. 9300 Progress Parkway P.O. Box 5039 Mentor, OH 44061-5039 USA	440-354-7007 440-354-7080 dhbowden@ohtech.com	Non-Voting Member	Present
Bill Buscher III Southwest Research Institute 6220 Culebra Road P.O. Box 28510 San Antonio, TX 78228 USA	210-522-6802 210-684-7523 william.buscher@swri.org	Non-Voting Member	Present
Bob Campbell Afton Chemical	804 788 5340 x6358 BB.campbell@aftonchemical.com	Non	RLC

Name/Address	Phone/Fax/Email		Signature
James Carter Haltermann Products 3520 Okemos Rd. Suite #6-176 Okemos, MI USA	517-347-3021 517-347-1024 jecarter@jhaltermann.com	Voting Member	Present 
Chris Castanien The Lubrizol Corporation 29400 Lakeland Boulevard Wickliffe, OH 44092 USA	440-347-2973 440-944-8112 cca@lubrizol.com	Non-Voting Member	Present
Timothy L. Caudill Ashland Oil Inc. 22nd & Front Streets Ashland, KY 41101 USA	606-329-1960 x5708 606-329-2044 tlcaudill@ashland.com	Voting Member	Present (by phone)
Martin Chadwick Intertek Automotive Research 5404 Bandera Road San Antonio, TX 78238 USA	210-706-1543 210-684-6074 martin.chadwick@intertek.com	Non-Voting Member	Present
Jeff Clark Sequence III Secretary ASTM Test Monitoring Center 6555 Penn Avenue Pittsburgh, PA 15206 USA	412-365-1032 412-365-1047 jac@atc-erc.org	Non-Voting Member	Present 
Sid Clark Southwest Research 50481 Peggy Lane Chesterfiled, MI 48047 USA	586-873-1255 Sidney.L.Clark@sbcglobal.net	Non-Voting Member	Present 
Johnny M De La Zerda Intertek Automotive Research 5404 Bandera Road San Antonio, TX 78238 USA	210-523-4621 210-523-4607 johnny.delazerda@intertek.com	Non-Voting Member	Present

Name/Address	Phone/Fax/Email		Signature
Todd Dvorak Afton Chemical Corporation P.O. Box 2158 Richmond, VA 23218-2158 USA	804-788- 6367 804-788- 6388 todd.dvorak@aftonchemical.com	Non-Voting Member	Present
Frank Farber ASTM Test Monitoring Center 6555 Penn Avenue Pittsburgh, PA 15206 USA	412-365-1030 412-365-1047 fmf@astmtmc.cmu.edu	Non-Voting Member	Present
Gordon R. Farnsworth Infineum RR # 5 Box 211 Montrose, PA 18801 USA	570-934-2776 570-934-0141 gordon.farnsworth@infineum.com	Non-Voting Member	Present
Joe Franklin Intertek Automotive Research 5404 Bandera Road San Antonio, TX 78238 USA	210-523-4671 210-523-4607 joe.franklin@intertek.com	Non-Voting Member	Present
David L. Glaenzer Afton Chemical Corporation 500 Spring Street P.O. Box 2158 Richmond, VA 23218-2158 USA	804-788-5214 804-788-6358 dave.glaenzer@aftonchemical.com **Surveillance Panel Chairman**	Non-Voting Member	Present
Irwin L. Goldblatt Castrol Americas 240 Centennial Avenue Piscataway, NJ 08854-3910 USA	732-980-3606 973-686-4224 irwin.goldblatt@cnacm.com	Voting Member	Present
Richard Grundza ASTM Test Monitoring Center 6555 Penn Avenue Pittsburgh, PA 15206 USA	412-365-1031 412-365-1047 reg@astmtmc.cmu.edu	Voting Member	Present
Larry Hamilton The Lubrizol Corporation 29400 Lakeland Boulevard Wickliffe, OH 44092 USA	440-347-2326 440-347-4096 ldha@lubrizol.com	Non-Voting Member	Present

Name/Address	Phone/Fax/Email		Signature
Tracey King Chrysler LLC 800 Chrysler Drive CIMS 482-00-13 Auburn Hills, MI 48326-2757 USA	248-576-7500 248-576-7490 tek1@chrysler.com	Voting Member	Present
Clayton Knight Test Engineering, Inc. 12718 Cimarron Path San Antonio, TX 78249-3423 USA	210-690-1958 210-690-1959 cknight@tei-net.com	Voting Member	Present
Patrick Lang Southwest Research Institute 6220 Culebra Road P.O. Box 28510 San Antonio, TX 78228 USA	210-522-2820 210-684-7523 plang@swri.edu	Voting Member	Present
Charlie Leverett Intertek Automotive Research 5404 Bandera Road San Antonio, TX 78238 USA	210-647-9422 210-523-4607 charlie.leverett@intertek.com	Voting Member	Present
Josephine G. Martinez Chevron Oronite Company LLC 100 Chevron Way Richmond, CA 94802 USA	510-242-5563 510-242-3173 jogm@chevrontexaco.com	Non-Voting Member	Present
Bruce Matthews GM Powertrain Mail Code 483-730-472 823 Jocyln Avenue Pontiac, MI 48340 USA	248-830-9197 248-857-4441 bruce.matthews@gm.com **Test Sponsor Representative**	Voting Member	Present
Timothy Miranda BP Castrol Lubricants USA 1500 Valley Road Wayne, NJ 07470 USA	973-305-3334 973-686-4039 Timothy.Miranda@bp.com	Voting Member	Present ON PHONE

Name/Address	Phone/Fax/Email		Signature
Mark Mosher ExxonMobil Technology Co. Billingsport Road Paulsboro, NJ 08066 USA	856-224-2132 856-224-3628 mark.r.mosher@exxonmobil.com	Voting Member	Present
Allison Rajakumar The Lubrizol Corporation Drop 152A 29400 Lakeland Blvd. Wickliffe, OH 44092 USA	440-347-4679 440-347-2014 Allison.Rajakumar@Lubrizol.com	Non-Voting Member	Present AMR
Andrew Ritchie Infineum 1900 East Linden Avenue P.O. Box 735 Linden, NJ 07036 USA	908-474-2097 908-474-3637 Andrew.Ritchie@Infineum.com	Voting Member	Present AR
Ron Romano Ford Motor Company Diagnostic Service Center II Room 410. 1800 Fairlane Drive Allen Park, MI 48101 USA	313-845-4068 313-32-38042 rromano@ford.com	Voting Member	Present
Jim Rutherford Chevron Oronite Company LLC 100 Chevron Way Richmond, CA 94802 USA	510-242-3410 510-242-3173 jaru@chevrontexaco.com	Non-Voting Member	Present
Philip R. Scinto The Lubrizol Corporation 29400 Lakeland Boulevard Wickliffe, OH 44092 USA	440-347-2161 440-347-9031 prs@lubrizol.com	Non-Voting Member	Present
Greg Seman not present The Lubrizol Corporation 29400 Lakeland Boulevard Wickliffe, OH 44092 USA	440-347-2153 440-347-4096 greg.seman@lubrizol.com	Voting Member	Present

George Szappanos voting for, on 11/18/09

Name/Address	Phone/Fax/Email		Signature
Matt J. Snider GM Powertrain General Motors Corporation MC - 483-730-~~822~~ 472 823 Joslyn Rd. Pontiac, MI ~~48090-9055~~ 48340-2920 USA	248-672-3563 248-857-4441 mathew.j.snider@gm.com	Non-Voting Member	Present
Thomas Smith Valvoline P.O. Box 14000 Lexington, KY 40512-1400 USA	859-357-2766 859-357-7084 trsmith@ashland.com PCEOCP Chair	Voting Member	Present
Mark Sutherland Chevron Oronite Company LLC 4502 Centerview Drive Suite 210 San Antonio, TX 78228 USA	210-731-5621 210-731-5699 msut@chevrontexaco.com	Voting Member	Present
Ben O. Weber Southwest Research Institute 6220 Culebra Road P.O. Box 28510 San Antonio, TX 78228 USA	210-522-5911 210-684-7530 bweber@swri.edu **Sub-Committee D02.B01 Chair**	Non-Voting Member	Present
Joe Vujica The Lubrizol Corporation 29400 Lakeland Boulevard Wickliffe, OH 44092 USA	440-347-2058 440-347-4096 jsvu@lubrizol.com	Non-Voting Member	Present
Jerry Wang Chevron Oronite Company LLC 7080 Colchester Lane Ypsilanti, MI 48197	734-48- 3806 none jwdy@chevron.com	Non-Voting Member	Present
Art Andrews	908 730 3069 arthur.t.andrews@exxonmobil.com		
Bob Olree	248-689-3078 visitor olree@netzero.net		
Scott Stap	810 239-2672 Scott.stap@Tgidirect.com	GM Rep	
Jeff Kathman	313-667-0493 jeff.kathman@gm.com		
BILL MAXWELL EXXONMOBIL RES. & ENG. CO.	856-224-3220	BILL.L.MAXWELL@EXXONMOBIL.COM VISITOR	

Don Smolenski
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ATTACHMENT 2

CENTRAL PARTS DISTRIBUTOR REPORT
OH Technologies, Inc.

Sequence III Surveillance Panel Meeting
GM Research, Warren, MI
November 18, 2009

1) Rejections from 5/06/09 to 11/17/09:

ITEM	DESCRIPTION	REASON REJECTED	QTY	REPLACED	DATE REPLACED
OHT3F-008-8	CAMSHAFT, SPECIAL TEST, IIIG	KEYWAY DEFECT	1	YES	6/23/2009
OHT3F-011-2	PLATE, CAMSHAFT THRUST	CRACKED	13	YES	11/12/2009
OHT3F-014	PIN, PISTON WRIST	RUST	12	YES	9/30/2009
3F028-10	BUSHING, CAM, POSITION 2 & 3	CHROME PEELED	1	YES	7/20/2009
OHT3F-029-3	LIFTER, TEST, ACI W/ FLAT	SCRATCH ON FOOT	1	YES	10/14/2009
OHT3F-055-1	PISTON, GRADE 56	SCRATCH	1	YES	6/19/2009
OHT3F-055-1	PISTON, GRADE 56	CASTING FLAW (PIT)	1	YES	7/21/2009
OHT3F-059-5	SPRING, VALVE (COLOR CODE YELLOW)	SQUARENESS	444	RECALLED	10/29/2009
OHT3G-088-1	COVER, REAR	MACHINING DEFECT	1	YES	4/1/2009

2) Technical Memos Issued

8/21/09

Seq. III CPD Technical Memo 17
OHT3F-061-1 Exhaust Valve Stem Seals (Batch Code 3) / No Paint Stripe

3) Batch Code Changes

IIIF	Batch Code	Date Introduced	IIIG	Batch Code	Date Introduced
Arm, Rocker	BC 14	12/22/08	Arm, Rocker	BC 14	10/05/09
Piston Grade 12	BC 23		Piston Grade 12	BC 23	9/08/09
Piston Grade 34	BC 23		Piston Grade 34	BC 23	9/17/09
Oil Cooler Plating	090413	5/14/09	Oil Cooler Plating	090413	5/12/09
	090722	7/31/09		090722	7/31/09
	090811	8/12/09		090811	8/12/09
	090901	10/21/09		090901	9/28/09
	091106	11/06/09		091106	091106
Cam Bushing	BC 17	11/05/09	Cam Bushing	BC 17	11/06/09
Intake Seal	BC 4	8/10/09	Intake Seal	BC 4	8/12/09
Exhaust Seal	BC 3	8/28/09	Exhaust Seal	BC 3	8/26/09

GM Oil Test Components

ATTACHMENT 3

Compiled November 2nd 2009

Current Inventory

		In stock	At storage	In process	Total
12593374	connecting rods	1,191	23,143		24,334
24502168	crankshaft	173	490		663
24502286	cylinder block	75	558		633
24502260B	cylinder heads	40	6,918	240	7,198

Head Bolts

- 25533811 Bolt, Head – Short 1428 pcs in stock
- All current short bolt stock has sealant on it (30,000 on order w/o sealant)
- 25527831 Bolt, Head – Long 29,800 pcs in stock w/o sealant
- Some Long bolts w/sealant may be shipped due to a expected return of an overshipment.
- Bolts will now be sold as singles due to some lab comments about wanting to order as singles.

Production Part Approval
Dimensional Test Results

DAIMLERCHRYSLER Ford GM

ORGANIZATION: KAMAX L.P. 005354907
SUPPLIER / VENDOR CODE: Z0558
INSPECTION FACILITY:

PART NUMBER: 25527831-MOD
PART NAME: BOLT-HEX FLG HD RED BODY
DESIGN RECORD CHANGE LEVEL: M/P
ENGINEERING CHANGE DOCUMENTS:

ITEM	DIMENSION / SPECIFICATION	SPECIFICATION / LIMITS	TEST DATE	ORGANIZATION MEASUREMENT RESULTS (DATA)	OK	NOT OK
1	Flange Diameter	0.83		.801 .800 .802	X	
2	Hex Across Corners	.618 min		.632 .632 .634	X	
3	Hex Across Flats	.551-.563		.559 .558 .558	X	
4	Hex Height	.246min		.265 .264 .265	X	
5	Wrenching Height	.172 min		.238 2.35 .235	X	
6	Shoulder Diameter	.430-.438		.433 .433 .433	X	
7	Body Diameter	0.390		.389 .389 .389	X	
8	Shoulder Angle	60°max		44° 45° 45°	X	
9	End of Chamfer Diameter	.282-.303		.301 .302 .301	X	
10	Thread Length	2.25		2.27 2.26 2.27	X	
11	7/16-14 2A Thread	Gage		Ok to 7/16-2A Gages	X	
	Major Diameter	.4258-.4361		.4325 .4320 .4327	X	
	Pitch Diameter	.3850-.3897		.3875 .3879 .3876	X	
12	Straightness	0.19 max		.003 .004 .003	X	
13	Overall Head Height	.33-.40		.393 .393 .391	X	
14	Shoulder Length	0.26		.258 .257 .258	X	
15	Flange Thickness	.05 min		.088 .082 .087	X	
16	Length Under Flange	3.16-3.24		3.194 3.190 3.201	X	
17	Circular Runout	0.06 max		.005 .003 .003	X	
18	Radius on Edge of Flange	0.10-0.25		.020 .022 .022	X	
19	Radius Hex to Flange	0.3		.029 .030 .029	X	
20	Radius Under Flange	0.09-0.19		.010 .011 .011	X	
21	Flange Angle	25°		25° 25° 25°	X	
22	Undercut Depth	0.06-0.13		.010 .011 .010	X	
23	Bearing Surface Concave	0°-1°		0.45° 0.38° 0.39°	X	
24	Undercut Diameter	.562 max		.557 .556 .557	X	
25	Bearing Surface Diameter	.74 min		.757 .755 .758	X	

Blanket statements of conformance are unacceptable for any test results.

SIGNATURE TITLE DATE
11/3/2009

Production Part Approval
Material Test Results

GM
DAIMLERCHRYSLER Ford

ORGANIZATION: KAMAX L.P.	PART NUMBI 25527831-MOD
SUPPLIER / VENDOR CODE: Z0558	PART NAME: 7/16-14X3.240 BOLT HFH
MATERIAL SUPPLIER: KAMAX LP	DESIGN RECORD CHANGE LEVEL ECL
*CUSTOMER SPECIFIED SUPPLIER / VENDOR CODE:	ENGINEERING CHANGE DOCUMENTS:
*If source approval is req'd, include the Supplier (Source) & Customer assigned code.	NAME of LABORATORY: KAMAX LP

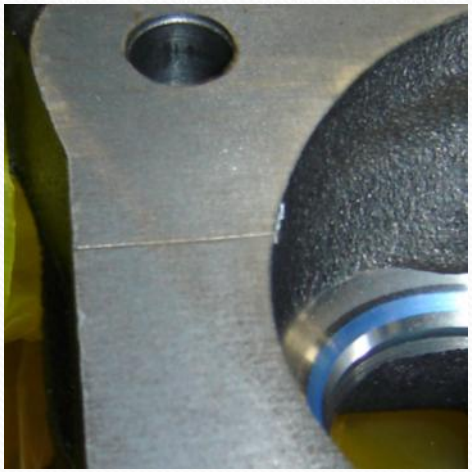
MATERIAL SPEC. NO. / REV / DATE	SPECIFICATION / LIMITS	TEST DATE	QTY. TESTED	SUPPLIER TEST RESULTS (DATA)	OK	NOT OK
GM300M Modified 04-01-1989	C 0.26-0.55	10/18/2009	1	0.38	x	
GM300M Modified 04-01-1989	P 0.040 max.	10/18/2009	1	0.008	x	
GM300M Modified 04-01-1989	S 0.045 max.	10/18/2009	1	0.013	x	
Yield Strength per print	When tested to G.M. product specification 24502102 is 15,000 LBS +/-1000 LBS	11/2/2009	12	14453, 14784, 14949, 14949 15039, 14949, 15114, 15099 15024, 14994, 15089, 15024	x	
Core hardness Modified	HRC 36.5-38.5 Ref.	10/26/2009	5	37.4, 37.5, 37.5, 37.3, 37.7	x	
Surface hardness Modified	HR15N 79.8 max. Ref.	10/26/2009	5	78.8, 79.0, 78.5, 79.0, 78.6	x	
Per print	No carburization permitted in shank or threads	10/30/2009	1	No carburization found in shank or threads	x	
GM6104M 4-1-2004	Class 2/3H decarburization	10/30/2009	1	Conforms to class 2/3H decarb	x	
GM6102M 4-1-2004	Discontinulties	10/29/2009	1	Parts are within limits	x	
GM4435-M CODE A 03-01-2007	Finish	N/A	N/A	See attached Curtis certification	x	
GM4435-M CODE A 03-01-2007	Salt spray 72 hours	N/A	N/A	Pass-See attached Curtis cert.	x	
GMW3059 05-01-2007	Restricted & reportable substances	N/A	N/A	IMDS # 121654276	x	
Lot # 09-85782.0000						

Blanket statements of conformance are unacceptable for any test results.

SIGNATURE	TITLE	DATE
	Metallurgist	11/5/09

Head Scratch - issue

- Some 3800 cylinder heads have been discovered with scratches on the deck face apparently due to a machining issue at the factory.
- While the scratches have been in small lots there are no date codes that they can be confined to.
- GM Powertrain is working with engineers and gasket manufacturers to determine allowable tolerance



Head Scratch – next steps

- Head deck face is now being inspected up to four times during the course of machining the heads.
- Effective immediately, all heads will be inspected at the GM Racing warehouse before shipping for final machining operations.
- Intent is to set aside questionable heads and determine action plan for rework or scrapping.
- Impact of how many heads are affected is unknown at this time.

ATTACHMENT 4
Summary of Key Test Component Inventory

Sequence III Surveillance Panel
Warren, Michigan
November 18, 2009
D. Glaenzer, Sequence III SP Chairman

Key Test Components

- 12593374 Connecting Rods
- 24502168 Crankshaft
- 24502286 Cylinder Case (Block)
- 24502260B Cylinder Head

- Inventory at GM Racing and Test Labs

Component Inventory

- 12593374 Connecting Rods
  - GM Racing 24,334 pieces
  - Labs 1215 pieces
  - Total 25,549 pieces (**4258** runs)

    Based on 6 pieces per run

- 24502168 Crankshaft
  - GM Racing 663 pieces
  - Labs 62 pieces
  - Total 725 pieces (**4350** runs)

    Based on 6 runs per crankshaft

Component Inventory (cont.)

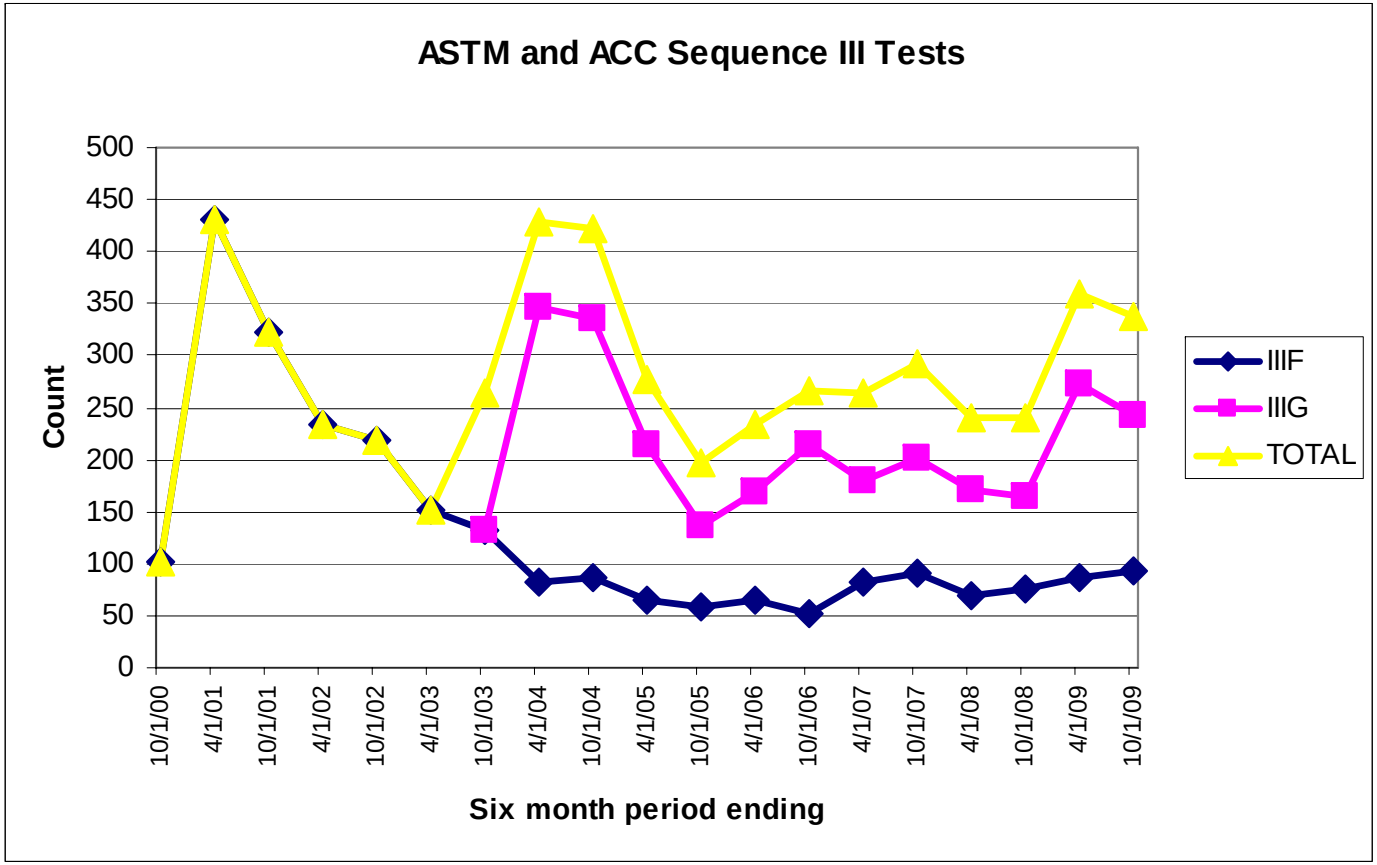
- 24502286 Cylinder Case (Block)
  - GM Racing 633 pieces
  - Labs 41 pieces
  - Total 674 pieces (**4044** runs)

    Based on 6 runs per block

- 24502260B Cylinder Head
  - GM Racing 7198 pieces
  - Labs 451 pieces
  - Total 7649 pieces (**3824** runs)

    Based on 2 heads per run

Sequence III Test Activity



Sequence III Test Longevity

With ~4000 runs available, we should be OK through 2015.

Estimates

2010	1000
2011	800
2012	600
2013	500
2014	500
2015	400
TOTAL	3800

Attachment 5

PRODUCT: **EEE-Lube Cert Gasoline Seq. III & VI**

PRODUCT CODE: **HF0003**

HALTERMANN

Batch No.:	XH3121LT10	XI2121GO01	XI2221GP02
TMO No.:	MTS	MTS	MTS
Tank No.:	110	8	52
Analysis Date:	10/22/2009	9/29/2009	9/28/2009

TEST	METHOD	UNITS	HALTERMANN Specs			RESULTS	RESULTS	RESULTS
			MIN	TARGET	MAX			
Distillation - IBP	ASTM D86	°C	23.9		35.0	31.5	33.1	33.8
5%		°C				45.3	45.4	44.7
10%		°C	48.9		57.2	53.1	52.2	51.6
20%		°C				64.6	64.0	63.1
30%		°C				77.5	77.5	76.4
40%		°C				92.8	93.5	93.1
50%		°C	93.3		110.0	104.9	105.6	105.7
60%		°C				112.7	111.7	111.9
70%		°C				119.7	118.3	118.5
80%		°C				131.8	129.3	129.9
90%		°C	151.7		162.8	159.1	158.2	157.4
95%		°C				167.2	167.4	166.0
Distillation - EP		°C			212.8	191.6	198.3	196.2
Recovery		vol %		Report		96.9	97.6	97.2
Residue		vol %		Report		1.0	0.8	0.8
Loss		vol %		Report		2.1	1.6	2.0
Gravity @ 60°F/60°F	ASTM D4052	°API	58.7		61.2	59.0	59.0	59.1
Density @ 15° C	ASTM D4052	kg/l	0.734		0.744	0.742	0.743	0.742
Reid Vapor Pressure	ASTM D5191	kPa	60.1		63.4	63.2	61.7	62.6
Carbon	ASTM D3343	wt fraction		Report		0.8648	0.8655	0.8648
Carbon	ASTM E191	wt fraction		Report		0.8636	0.8540	0.8619
Hydrogen	ASTM E191	wt fraction		Report		0.1319	0.1331	0.1328
Hydrogen/Carbon ratio	ASTM E191	mole/mole		Report		1.819	1.856	1.836
Oxygen	ASTM D4815	wt %			0.05	<0.01	<0.01	<0.01
Sulfur	ASTM D5453	mg/kg	3		15	3	3	3
Lead	ASTM D3237	mg/l			2.6	<0.01	<0.01	<0.10
Phosphorous	ASTM D3231	mg/l			1.3	<0.1	<0.1	<0.1
Composition, aromatics	ASTM D1319	vol %	26.0		32.5	27.8	29.1	27.9
Composition, olefins	ASTM D1319	vol %			10.0	1.0	0.2	0.2
Composition, saturates	ASTM D1319	vol %		Report		71.2	70.7	71.9
Particulate matter	ASTM D5452	mg/l			1	0.5	0.5	0.3
Oxidation Stability	ASTM D525	minutes	1000			1000+	1000+	1000+
Copper Corrosion	ASTM D130				1	1a	1a	1a
Gum content, washed	ASTM D381	mg/100mls			5.0	<0.5	<0.5	0.5
Fuel Economy Numerator/C Density	ASTM E191		2401		2441	2434	2428	2430
C Factor	ASTM E191			Report		0.9969	0.9922	0.9993
Research Octane Number	ASTM D2699		96.0			96.9	97.0	97.2
Motor Octane Number	ASTM D2700			Report		88.0	88.2	88.8
Sensitivity			7.5			8.9	8.8	8.4
Net Heating Value, btu/lb	ASTM D3338	btu/lb		Report		18489	18470	18486
Net Heating Value, btu/lb	ASTM D240	btu/lb		Report		18577	18383	18438
Color	VISUAL	1.75 ptb		Red		Red	Red	Red

PRODUCT: **EEE-Lube Cert Gasoline Seq. III & VI**

PRODUCT CODE: **HF0003**

HALTERMANN

Batch No.:	XI0921GP02	XH1521LT10	XH3121GP10
TMO No.:	MTS	MTS	MTS
Tank No.:	8	105	8
Analysis Date:	9/14/2009	8/6/2009	9/8/2009

TEST	METHOD	UNITS	HALTERMANN Specs			RESULTS	RESULTS	RESULTS
			MIN	TARGET	MAX			
Distillation - IBP	ASTM D86	°C	23.9		35.0	32.5	28.4	34.5
5%		°C				47.2	42.4	47.5
10%		°C	48.9		57.2	53.3	50.2	53.4
20%		°C				64.9	62.5	64.8
30%		°C				79.1	76.4	79.0
40%		°C				94.8	92.7	94.9
50%		°C	93.3		110.0	105.5	104.7	105.9
60%		°C				111.6	111.4	111.6
70%		°C				117.7	118.5	118.5
80%		°C				129.4	131.6	130.7
90%		°C	151.7		162.8	159.8	159.0	159.4
95%		°C				168.2	166.4	167.2
Distillation - EP		°C			212.8	199.4	194.6	196.2
Recovery		vol %		Report		98.0	97.1	98.6
Residue		vol %		Report		1.1	1.0	1.0
Loss		vol %		Report		0.9	1.9	0.4
Gravity @ 60°F/60°F	ASTM D4052	°API	58.7		61.2	58.9	59.3	59.0
Density @ 15° C	ASTM D4052	kg/l	0.734		0.744	0.743	0.742	0.743
Reid Vapor Pressure	ASTM D5191	kPa	60.1		63.4	60.8	62.2	60.8
Carbon	ASTM D3343	wt fraction		Report		0.8649	0.8655	0.8649
Carbon	ASTM E191	wt fraction		Report		0.8615	0.8543	0.8605
Hydrogen	ASTM E191	wt fraction		Report		0.1353	0.1333	0.1317
Hydrogen/Carbon ratio	ASTM E191	mole/mole		Report		1.871	1.859	1.8240
Oxygen	ASTM D4815	wt %			0.05	<0.01	<0.01	<0.01
Sulfur	ASTM D5453	mg/kg	3		15	3	3	3
Lead	ASTM D3237	mg/l			2.6	<0.10	<0.10	<1.0
Phosphorous	ASTM D3231	mg/l			1.3	<0.1	<0.1	<0.1
Composition, aromatics	ASTM D1319	vol %	26.0		32.5	28.0	29.2	28.2
Composition, olefins	ASTM D1319	vol %			10.0	0.4	0.6	0.4
Composition, saturates	ASTM D1319	vol %		Report		71.6	70.2	71.4
Particulate matter	ASTM D5452	mg/l			1	0.1	0.5	0.3
Oxidation Stability	ASTM D525	minutes	1000			1000+	1000+	1000+
Copper Corrosion	ASTM D130				1	1a	1a	1a
Gum content, washed	ASTM D381	mg/100mls			5.0	0.5	0.5	0.5
Fuel Economy Numerator/C Density	ASTM E191		2401		2441	2426	2424	2434
C Factor	ASTM E191			Report		1.0008	0.9917	0.9971
Research Octane Number	ASTM D2699		96.0			97.1	97.0	97.0
Motor Octane Number	ASTM D2700			Report		88.5	88.8	88.7
Sensitivity			7.5			8.6	8.2	8.3
Net Heating Value, btu/lb	ASTM D3338	btu/lb		Report		18486	18470	18485
Net Heating Value, btu/lb	ASTM D240	btu/lb		Report		18390	18387	18462
Color	VISUAL	1.75 ptb		Red		Red	Red	Red

PRODUCT: **EEE-Lube Cert Gasoline Seg. III & VI**

PRODUCT CODE: **HF0003**

HALTERMANN

Batch No.:	XH1721LT10	XF0521LT10
TMO No.:	MTS	MTS
Tank No.:	110	110
Analysis Date:	8/20/2009	7/29/2009

TEST	METHOD	UNITS	HALTERMANN Specs			RESULTS	RESULTS
			MIN	TARGET	MAX		
Distillation - IBP	ASTM D86	°C	23.9		35.0	29.0	29.0
5%		°C				42.2	42.2
10%		°C	48.9		57.2	49.9	49.9
20%		°C				61.4	61.4
30%		°C				76.3	76.3
40%		°C				93.1	93.1
50%		°C	93.3		110.0	104.8	104.8
60%		°C				111.4	111.4
70%		°C				118.1	118.1
80%		°C				129.9	129.9
90%		°C	151.7		162.8	158.5	158.5
95%		°C				166.9	166.9
Distillation - EP		°C			212.8	194.4	194.4
Recovery		vol %		Report		97.1	97.1
Residue		vol %		Report		1.0	1.0
Loss		vol %		Report		1.9	1.9
Gravity @ 60°F/60°F	ASTM D4052	°API	58.7		61.2	58.7	59.0
Density @ 15° C	ASTM D4052	kg/l	0.734		0.744	0.744	0.743
Reid Vapor Pressure	ASTM D5191	kPa	60.1		63.4	61.9	62.7
Carbon	ASTM D3343	wt fraction		Report		0.8654	0.8652
Carbon	ASTM E191	wt fraction		Report		0.8613	0.8613
Hydrogen	ASTM E191	wt fraction		Report		0.1360	0.1360
Hydrogen/Carbon ratio	ASTM E191	mole/mole		Report		1.881	1.881
Oxygen	ASTM D4815	wt %			0.05	<0.01	<0.01
Sulfur	ASTM D5453	mg/kg	3		15	3	3
Lead	ASTM D3237	mg/l			2.6	<0.10	<0.10
Phosphorous	ASTM D3231	mg/l			1.3	<0.1	<0.1
Composition, aromatics	ASTM D1319	vol %	26.0		32.5	28.4	28.4
Composition, olefins	ASTM D1319	vol %			10.0	0.6	0.6
Composition, saturates	ASTM D1319	vol %		Report		71.0	71.0
Particulate matter	ASTM D5452	mg/l			1	0.8	0.8
Oxidation Stability	ASTM D525	minutes	1000			>1000	>1000
Copper Corrosion	ASTM D130				1	1a	1a
Gum content, washed	ASTM D381	mg/100mls			5.0	<0.5	<0.5
Fuel Economy Numerator/C Density	ASTM E191		2401		2441	2427	2423
C Factor	ASTM E191			Report		1.0021	1.0015
Research Octane Number	ASTM D2699		96.0			97.0	97.0
Motor Octane Number	ASTM D2700			Report		88.8	88.8
Sensitivity			7.5			8.2	8.2
Net Heating Value, btu/lb	ASTM D3338	btu/lb		Report		18472	18476
Net Heating Value, btu/lb	ASTM D240	btu/lb		Report		18357	18357
Color	VISUAL	1.75 ptb		Red		Red	Red

ATTACHMENT 6

EEE Fuel Analysis:

An analysis was performed to examine the possible effects of fuel aging on the measured fuel properties. For this analysis, there were two separate sets of fuel property data. The first EEE fuel property data set is based on the C of A provided by Haltermann, the fuel supplier. The second EEE fuel property data set is based on an analysis of the EEE fuel batch performed at Core Labs. (Afton routinely submits fuel samples to Core Labs to check the fuel properties for each EEE fuel delivery.) The age of the fuel batch is the number of days between the fuel batch production date and the date that a sample was taken and sent to Core labs for analysis.

An analysis was performed on the below estimated parameter for each of the fuel batches that was sent for analysis to Core Labs:

(Change in fuel properties) = (Elapsed Days)

(Core_Lab_Result – Halt_Lab_Result) = (Core_Lab_Sample_Date – Halt_Production_Date)

The analysis failed to find evidence that suggests that the fuel age has effect on the EEE fuel batch performance properties.

ATTACHMENT 7

Issue Information Letters modifying the Sequence IIIF and IIIG procedures:

6.10.5 The oil cooler, oil filter, or both can be replaced once each test if the oil filter pressure differential is greater than 100 kPa during test operations or if bypass operation is detected.

6.10.5.1 The oil filter can be replaced if erratic pressure delta is noted. The phenomenon can be detected by monitoring the difference between oil filter and engine oil pressure (Oil filter pressure – Engine oil pressure = Oil Pressure Delta). If the oil pressure delta slowly climbs as test hours are accumulated and is dramatically reduced over a very short time period (< ~1min), the filter can be changed.

6.10.5.2 The oil cooler, oil filter, or both can be replaced only once each test (that is, if a filter is replaced at 30 h, the cooler cannot be replaced at 50 h).

6.10.5.3 If the oil filter is replaced during the test, drain any oil contained in the old oil filter into the new oil filter before installing it on the test engine.

6.10.5.4 Do not add new test oil to the engine as a result of oil filter or oil cooler replacement. Consider as oil consumption any oil lost as a result of oil filter or oil cooler replacement.

6.10.5.5 If the oil cooler, oil filter, or both are replaced during a test, place a note in the test report detailing what components were replaced and when they were replaced. If the filter is replaced due to erratic oil pressure differential, notify the TMC and submit a plot of the pressure differential.

ATTACHMENT 8
Sequence III WPD Task Force Update

November 18, 2009

Warren, MI

Chairman: Pat Lang

Task Force Activities

- The task force was formed at the May 5, 2009 Sequence III SP Meeting in Warren, Michigan
- Initial conference call held on May 21, 2009
  - Chairman Lang provided a summary of the WPD trend and a brief review of what has been done to date to understand the issue.

May Conf. Call Cont'd

- Excerpts from previous statistical studies were reviewed
- Identified the long list of batch code changes that have taken place during the problem period
- Process changes
- Part configuration changes

Conclusions

- Since the release of the IIIG test there have been multiple hardware changes, fuel batch changes and a major process change implemented.
- To date we have not been able to attribute the WPD severity trend with one specific item.
- WPD performance is likely a melding of all of these changes throughout the years.

Next Action

- Group agreed that we would probably not be able to identify the root cause of the problem.
- Agreed that the way forward was to look one more time towards a statistical solution.

July 14, 2009 Conf Call

- A second conference call was held and additional statistical studies were reviewed
- Group felt that the additional studies still did not offer the ideal solution
- Action item from the call was to have the LTMS group discuss the Sequence III WPD issue

Stats Group Recommendation

- Final recommendation from LTMS group forwarded to the WPD Task Force and Sequence III Surveillance Panel Early November 2009.
- Recommendation to be discussed at November 17, 2009 meeting.

ATTACHMENT 9
IIIG WPD Then to Now

What was Happening?
What is Happening?
Can it be Fixed?
Should it be Fixed?
What Should we Do?

November 12, 2009

Executive Summary

- IIIG WPD Severity Compared
  - Pre-Hone Data
    - BC2/BC3/BC3A Rings; Old Hone; Cast
  - Current Data
    - BC6/BC7 Rings; New Hone; PMNS
- WPD Severity Shift Depends on Oil
- Bad Situation of Unequal Shift in Severity Can be Made Better by Adopting the Following Recommendations
  - Use Current Test Targets (no Transforms for WPD)
  - Update Standard Deviations
    - Recalculate Charts from October 8, 2006 on Next Reference Test
  - Remove or Reduce Reference Oils that Do Not Behave as Candidates
  - Chart and Base Actions on EWMA and e_i ONLY as in the New Proposed LTMS

Executive Summary

- Logic and Data Drove The Conclusions
- Outcome of Analysis was Different from Expected
  - Expected All Oils to Have Shifted Very Differently
  - Expected a Transformation to Help WPD More than Indicated by Analysis
- Analysis Supported by the WPD Task Force Statistics Subgroup
  - Afton, Infineum, Intertek, LZ, Oronite, SwRI, TMC, XOM

So What Do We Do

- Data Used in Analysis
  - BC6/BC7 Rings; New Hone; PMNS
  - 106 Data Points Since October 8, 2006 Through October 21, 2009 (PMNS)
  - 98 Data Points (Excluding Lab E) Since October 8, 2006 Through October 21, 2009

So What Do We Do

- Use Current Test Targets (no Transforms)
  - Even Though Lab G and Lab E were Very Different from Other Labs (in the Dataset Used in Setting Targets), the Targets are the Targets; Good or Bad, Right or Wrong
  - Remember this Lesson for the Future
    - Get it Right Before Accepting the Test
    - Gather Sufficient Data from Labs to Make Assessment

So What Do We Do

- Update Standard Deviations
- WPD Shift for Oils 434 and 435 from Targets is Approximately the Same in Updated Standard Deviation Units
  - ~ 1.1 to 1.4 standard deviation units
- Updated Standard Deviations
  - Recalculate Charts from October 8, 2006 on Next Reference Test
  - Oil 434 s = 0.61 (alternative s = 0.63)
  - Oil 435 s = 0.25 (alternative s = 0.23)
  - Oil 438 s = 0.22 (alternative s = 0.23)
    - Standard Deviation for Severity Adjustments = 0.47
      - Pooled for Oil 434 and Oil 435

So What Do We Do

- Remove Reference Oils that Do Not Behave as Candidates
- Recommendations for Oil 438
  - Drop It or at Least Reduce Frequency to 5%
    - Reasons For
      - Not Chemically Like Candidate Oils
        - » Does not Meet GF-4/GF-5 Phos Limit (Not Like Candidates?)
        - » Not the Most Representative Oil for the IIIGB
      - Not at the GF-4/GF-5 Pass Limit
        - » At the Lowest Boundary of Performance
        - » Very Difficult for Oil to Move in the Severe Direction
      - Shift in Oil 438 WPD Severity is Small Compared to the Shift for Reference Oils 434 and 435 (in terms of standard deviation units)
      - More Consistent WPD LTMS Charts for Labs
        - » Lab Charts will not be Dependent on Oil Selection
        - » THIS IS BIG (COST, CONFUSION)
      - Leaves Room to Introduce GF-5 Reference Oil
    - Reasons Against
      - Not Easily Defined

So What Do We Do

- Chart and Base Actions on EWMA and e_i ONLY as in the New Proposed LTMS
  - Statisticians are Trying to Arrange a Meeting with the Full LTMS TF and the ASTM Technical Guidance Committee to Reach Agreement on the New Proposed LTMS
  - What the Heck is this e_i?
    - Shewhart Control Chart of the Difference Between the Lab EWMA Chart and the Most Recent Reference Test
      - Care about where the Lab IS Versus where it has BEEN
      - Everything is Relative; Labs not at the Mercy of Hypothetical Stake

So What Do We Do

- If We Update Standard Deviations for WPD, Shouldn’t we Consider Updating Standard Deviations for LN(PVIS) and LN(ACLW)?
  - Yes

So What Do We Do

- Updated Standard Deviations
  - There are 2 Options for Updating Standard Deviations
    - Option 1: Calculate via Residuals
      - Listed on Top on Next Chart
    - Option 2: Model each Oil Individually
      - Listed on Bottom on Next Chart

So What Do We Do

- Summary of Targets and Updated Standard Deviations

	LN(PVIS) Target	LN(PVIS) s	LN(ACLW) Target	LN(ACLW) s	WPD Target	WPD s
434	4.7269	0.760121 0.808290	3.4657	0.376551 0.386990	4.80	0.61 0.63
435	5.1838	0.215995 0.217849	3.4985	0.218952 0.225764	3.59	0.25 0.23
438	4.5706	0.182384 0.182349	2.8814	0.273546 0.281844	3.20	0.22 0.23
Pooled s (434&435)		0.56 0.59		0.31 0.32		0.47 0.47

Final Summary

- We Can Make the Best Out of a Bad Situation
  - Use Current Test Targets (no Transforms for WPD)
  - Update Standard Deviations
  - Remove or Reduce Reference Oils that Do Not Behave as Candidates
  - Chart and Base Actions on EWMA and e_i ONLY as in the New Proposed LTMS
- We Can Also Remember this Lesson for the Future

Background Data and Analysis

Homogeneous Dataset

- Strive to Arrive at a Homogeneous Dataset to Set Reference Oil Targets
  - This is NOT Throwing Out Data
  - Homogeneous Dataset Necessary
    - Logical Targets that Make Sense
    - Targets that Stand the Test of Time
    - The Needs of the Many Outweigh the Needs of the Few

Pre-Hone Interaction Problem

- Pre-Hone Data
  - BC2/BC3/BC3A Rings; Old Hone; Cast
- Oil Performance Depends on Lab
  - With or Without Transformation
- Can we Pinpoint the Source?
  - Yes

Pre-Hone Interaction Problem

Analysis of Variance for WPD, using Adjusted SS for Tests

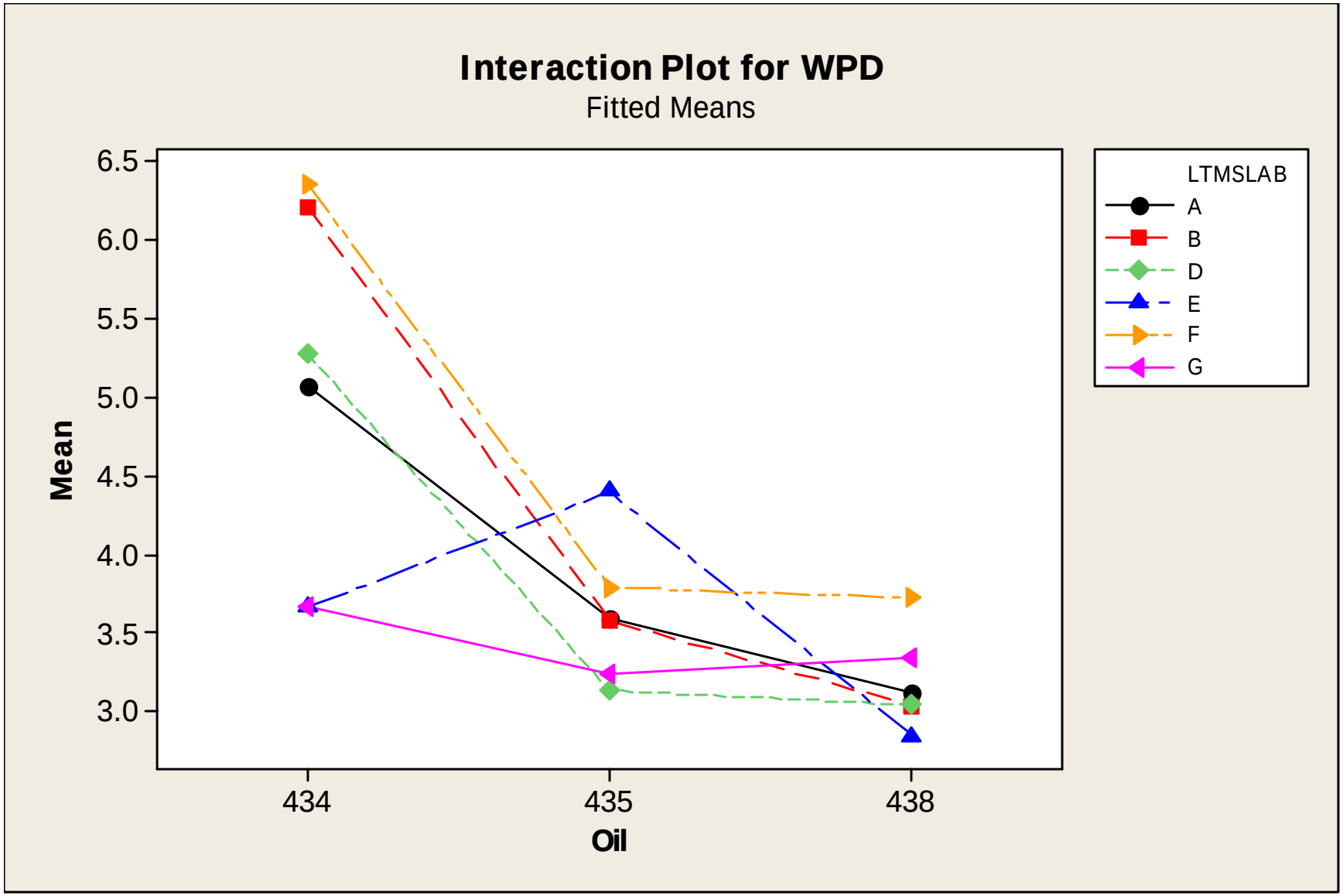
Source	DF	Seq SS	Adj SS	Adj MS	F	P
LTMSLAB	5	4.7230	5.9530	1.1906	6.83	0.000
Oil	2	25.5459	17.8849	8.9425	51.26	0.000
LTMSLAB*Oil	10	10.8562	10.8562	1.0856	6.22	**0.000**
Error	32	5.5821	5.5821	0.1744		
Total	49	46.7073				

S = 0.417661 R-Sq = 88.05% R-Sq(adj) = 81.70%

Pre-Hone Interaction Problem

- Can we Pinpoint the Source?
  - Yes
- The Problem Arises from 2 Labs
  - Lab G
    - This Lab Exhibited Several Problems Early and Solved Some of them with the New Hone
  - Lab E
    - Based on Limited Data

Pre-Hone Interaction Problem



Pre-Hone Interaction Problem

- The Problem Arises from 2 Labs
  - Lab G
    - This Lab Exhibited Several Problems Early and Solved Some of them with the New Hone
  - Lab E
    - Based on Limited Data
- Remove Labs G and E from the Analysis
  - Why?
    - They are NOT Like the Others

Pre-Hone Interaction Problem

Analysis of Variance for WPD, using Adjusted SS for Tests

Source	DF	Seq SS	Adj SS	Adj MS	F	P
LTMSLAB	3	1.4854	1.7893	0.5964	5.16	0.008
Oil	2	32.7915	23.0539	11.5270	99.73	0.000
LTMSLAB*Oil	6	1.9445	1.9445	0.3241	2.80	0.037
Error	21	2.4272	2.4272	0.1156		
Total	32	38.6486				

S = 0.339974 R-Sq = 93.72% R-Sq(adj) = 90.43%

Labs G and E Removed from the Analysis

Pre-Hone Interaction Problem

- Remove G and E
  - This Helps a Little with the Interaction
- However, Labs are Still Different
  - Is this a Problem?
    - NO, If Interaction Patterns are Similar
    - NO, If Use Continuous SA
    - YES, If Interaction with Oil (Dissimilar Patterns)
    - YES, If Do Not Use Continuous SA
      - Why? LS Mean may be Biased Toward Labs that are Different with Relatively Little Data

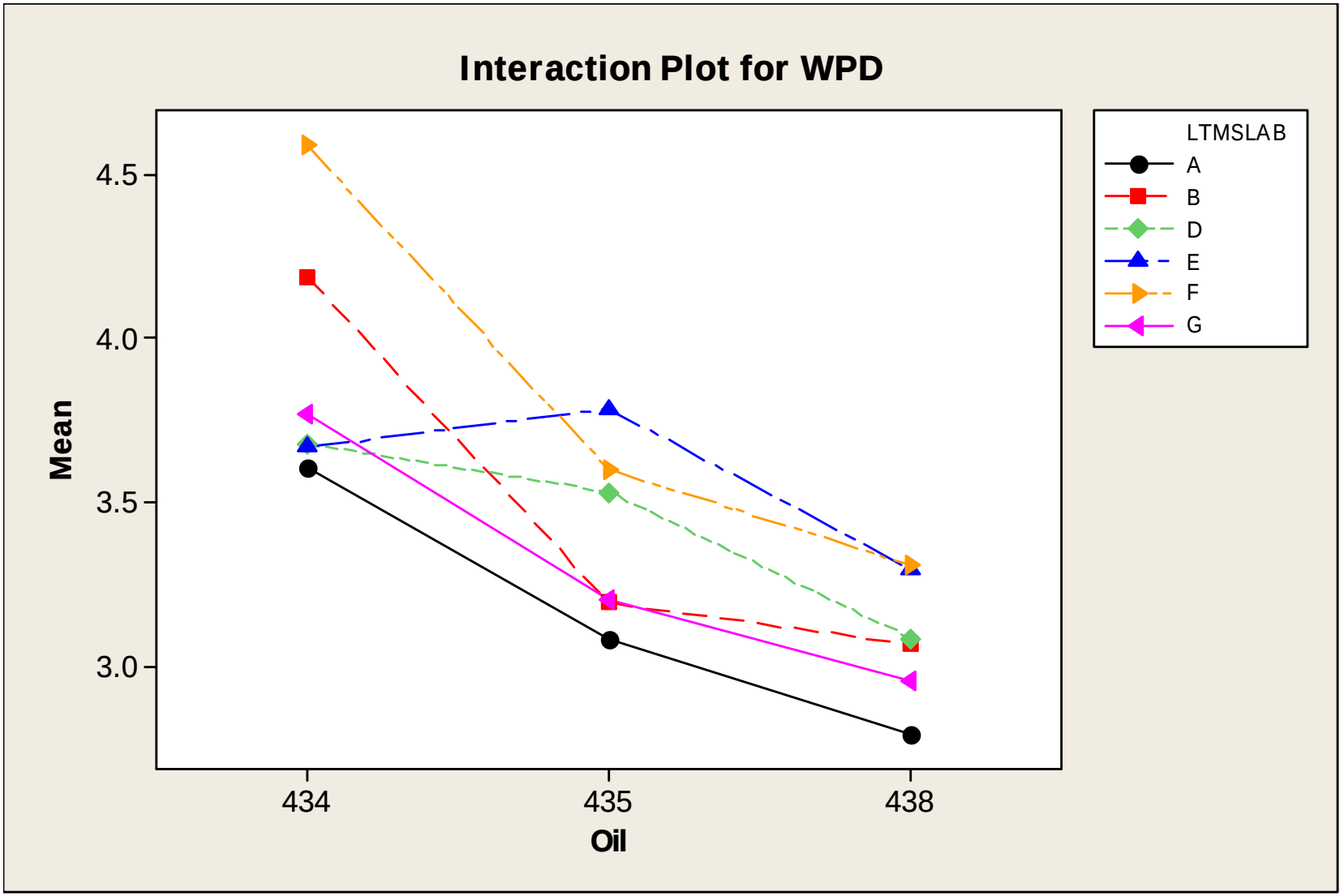
Current Data

- Fast Forward to the Current Data
  - BC6/BC7 Rings; New Hone; PMNS
    - 106 Data Points Since October 8, 2006
- Oil Performance Depends on Lab
  - Several Analyses Performed With or Without Transformation
- Can we Pinpoint the Source?
  - Yes

Current Data

- Can we Pinpoint the Source?
  - Yes
- The Problem Arises from 1 Lab
  - Lab E
    - The Same Lab we Saw from the Pre-Hone Era
    - The Same Pattern as Well
    - Very Different from the Other Labs
- Note that Lab D Could be a Problem
  - Pattern is Deviating from Hockey Stick

Current Data



Current Data

- The Problem Arises from 1 Lab
  - Lab E
    - The Same Lab we Saw from the Pre-Hone Era
- Remove Lab E from the Analysis
  - Yes
  - Lab E was Different from the Other Labs and Still is Different

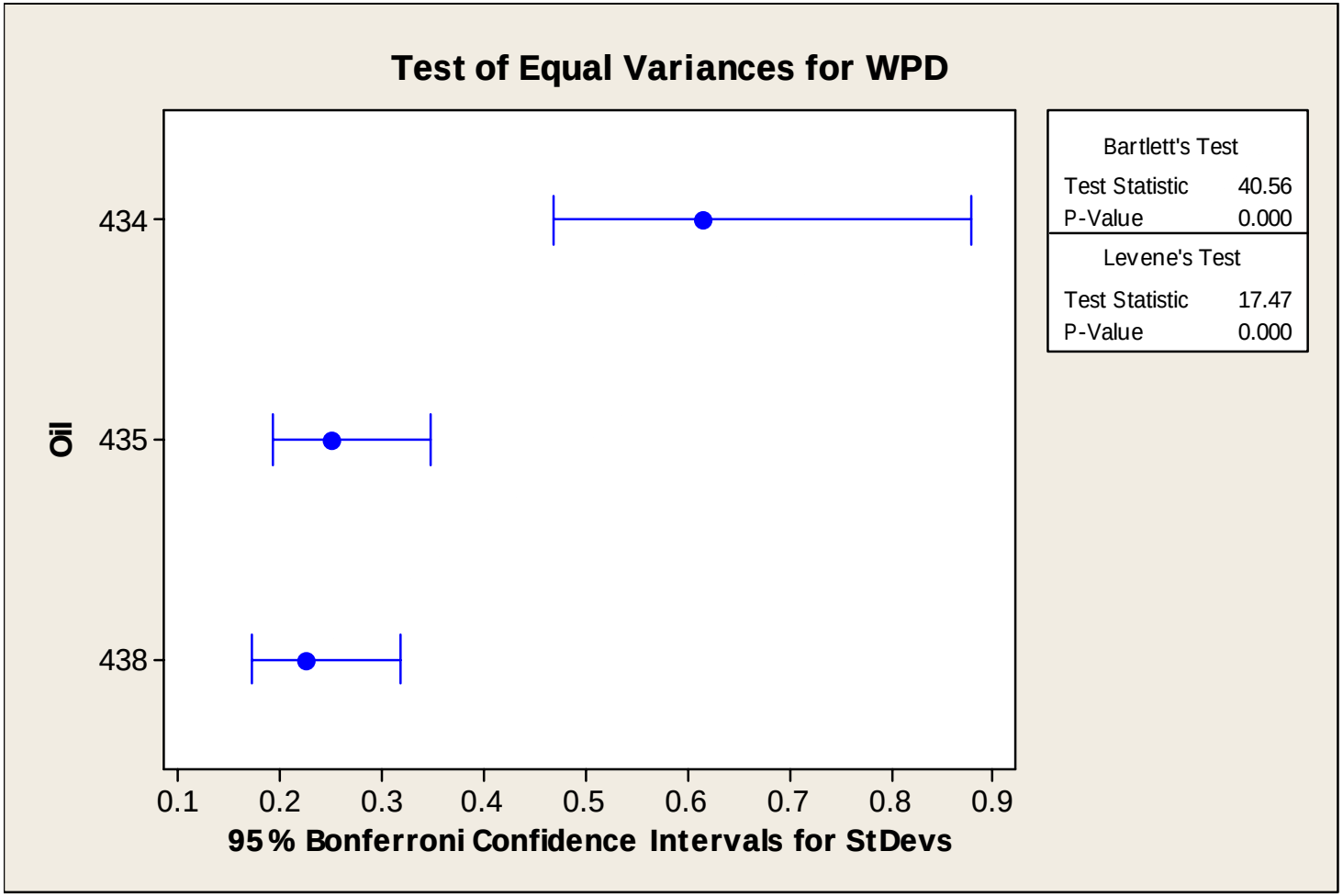
Current Data

- What About the Variances of the Current Data
  - Remove Lab E from the Dataset
  - Remove Lab Effects and Test for Homogeneity of Variance Across Reference Oils for Residuals
  - Variances are not Equal and Different from Past Data

95% Bonferroni confidence intervals for standard deviations

Oil	N	Lower	StDev	Upper
434	31	0.468394	0.614510	0.879953
435	35	0.192592	0.249012	0.347753
438	32	0.171327	0.223900	0.318455

Current Data



WPD Severity Change

- Is There a Severity Shift from Pre-Hone Period to Current Period?
  - Analysis with Lab Removal
    - Lab E Removed from Current Data
    - Labs G and E Removed from Pre-Hone Data
- YES☹ Severity Change Depends on Oil

WPD Severity Change

Source	DF	Seq SS	Adj SS	Adj MS	F	P
LTMSLAB	4	3.8350	4.5108	1.1277	6.93	0.000
Oil	2	35.3139	46.3384	23.1692	142.31	0.000
PASTvsPRESENT	1	8.6531	9.5520	9.5520	58.67	0.000
Oil*PASTvsPRESENT	2	9.5804	9.5804	4.7902	29.42	0.000
Error	121	19.6999	19.6999	0.1628		
Total	130	77.0824				

S = 0.403496 R-Sq = 74.44% R-Sq(adj) = 72.54%

Least Squares Means for WPD

Oil*PASTvsPRESENT	Mean	SE Mean
434 0	5.554	0.13343
434 1	3.948	0.07369
435 0	3.667	0.13343
435 1	3.315	0.06924
438 0	3.222	0.11800
438 1	3.042	0.07227

WPD Severity Change

- Where is the Biggest Impact on Unequal Severity Shift
  - Compare Current Data Against Original, Current Targets
  - Lab E Removed in Calculating Current Data Means

Oil	Current Data LS Mean	Target Mean
434	3.944	4.80
435	3.313	3.59
438	3.041	3.20

WPD Severity Change

- Biggest Impact
  - Compare Current Data Against Current LTMS Targets
    - Even Though Lab G and Lab E Should Not Have Been Used in Setting Targets, the Targets are the Targets; Good or Bad, Right or Wrong
      - Test Would be Relatively More Severe Today if Labs G and E were Removed from Target Dataset
    - Lab E Removed from Current data
- Severity Change Depends on Oil
  - Oil 434 ~ 0.86 merits severe
    ~ 1.4 standard deviation units
  - Oil 435 ~ 0.28 merits severe
    ~ 1.1 standard deviation units
  - Oil 438 ~ 0.16 merits severe
    ~ 0.7 standard deviation units

WPD Severity Change

- Whether we Transform or Not, there is Still a Difference in WPD Severity Shift for Each Reference Oil

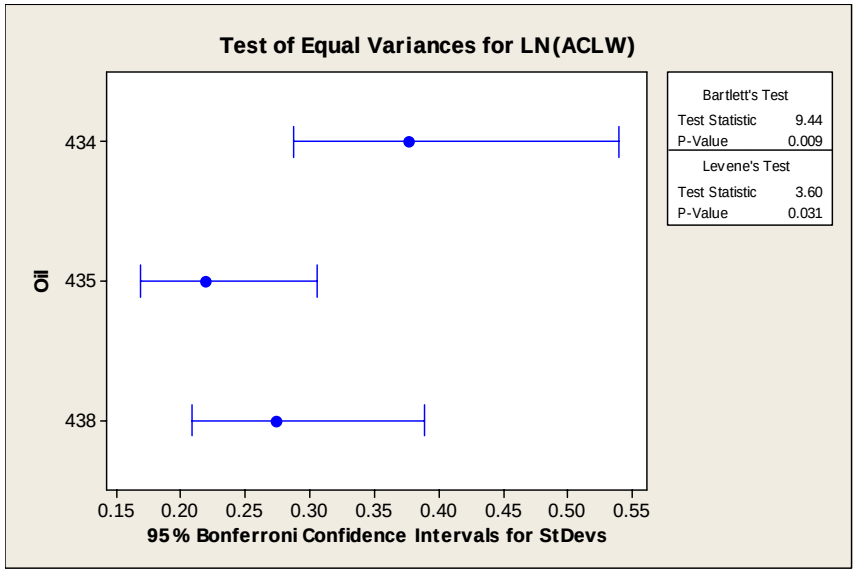
Problem NOT Solved

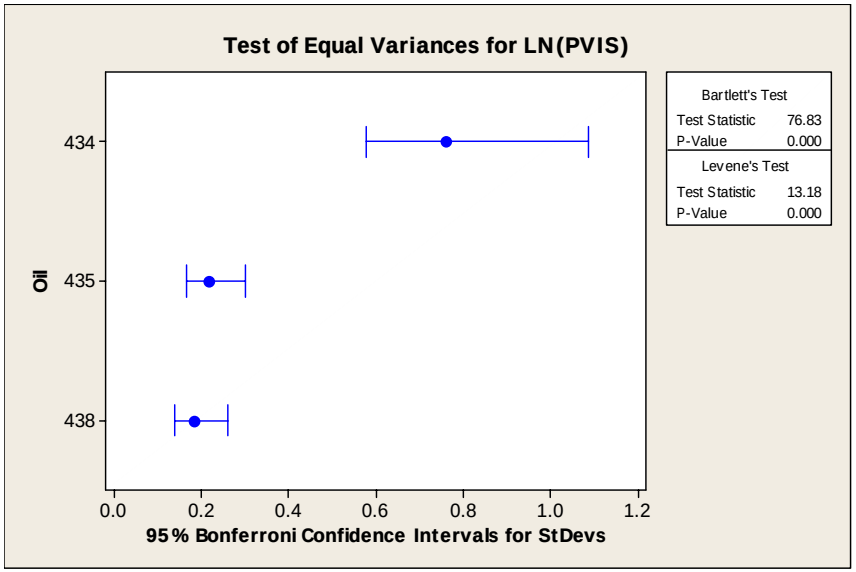
- There has been an Obvious WPD Shift from Pre-Hone Period to the Current Period
  - The Shift is Actually More Severe than the Current Targets would Indicate
  - The Shift Depends on the Oil
    - Biggest Discrepancy Lies with Oil 438
- The Original Test Targets were Set Incorrectly
  - Labs G and E Should have been Removed from the Homogeneous Dataset
  - Lab E is STILL not Like the Other Labs
- A Transformation Does Not Solve the Problems Above

Industry Correction for WPD

- What About an Industry Correction for WPD
- Reasons For
  - Obvious WPD Shift from Then to Now
  - Build Out Set of Parts
  - Possible Reduction in Shewhart Severity Alarms
  - Assist Severe Labs without SA
- Reasons Against
  - Not All of Shift is Due to Parts
  - Not All Labs Have not Shifted Equally
  - Not All Oils Have Shifted Equally
  - Will Still Have LTMS Problems

So What Do We Do





Chevron Oronite

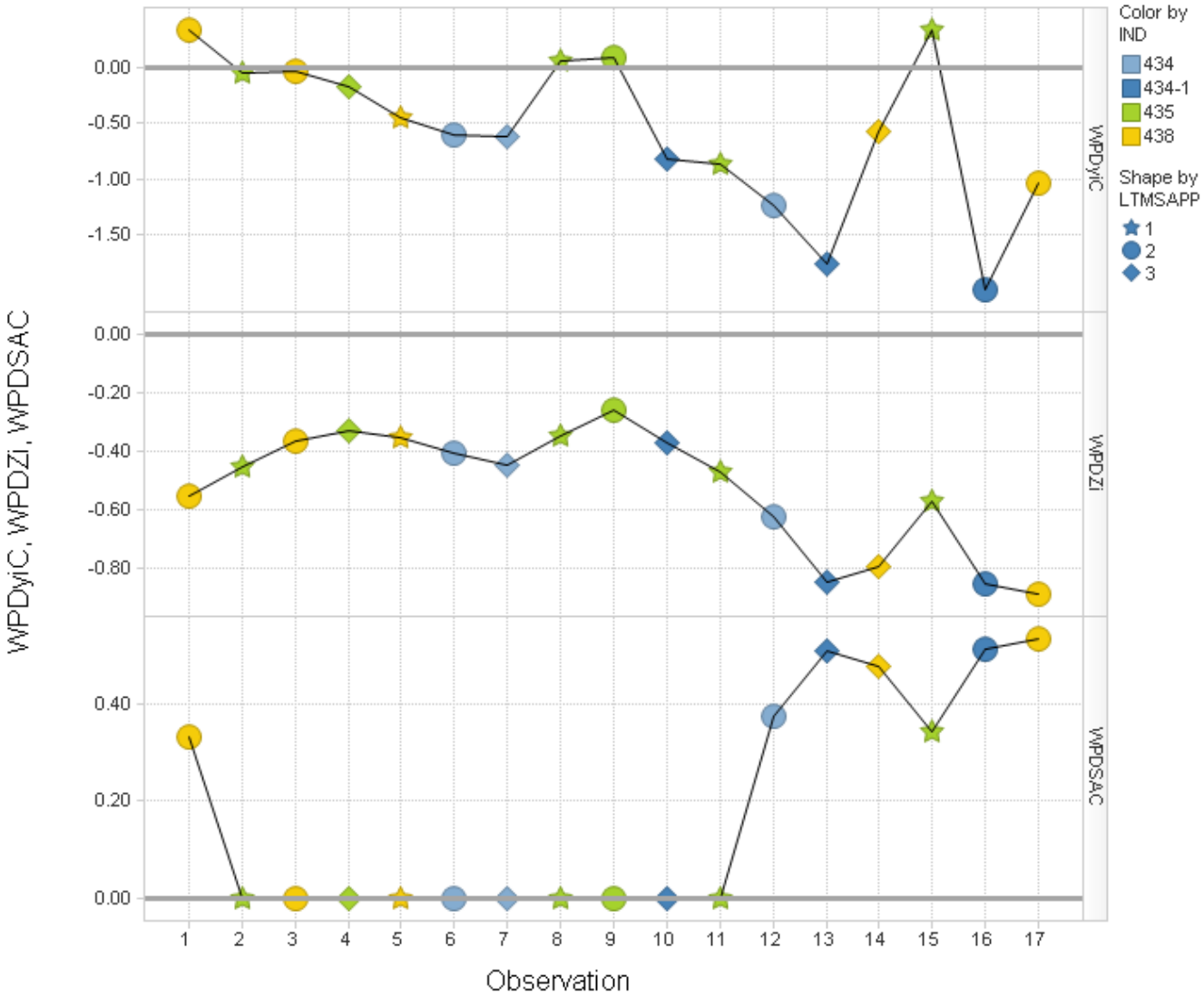
ATTACHMENT 10

LTMS for IIIG
Second edition stuff
Examples of current versus something like what might have happened

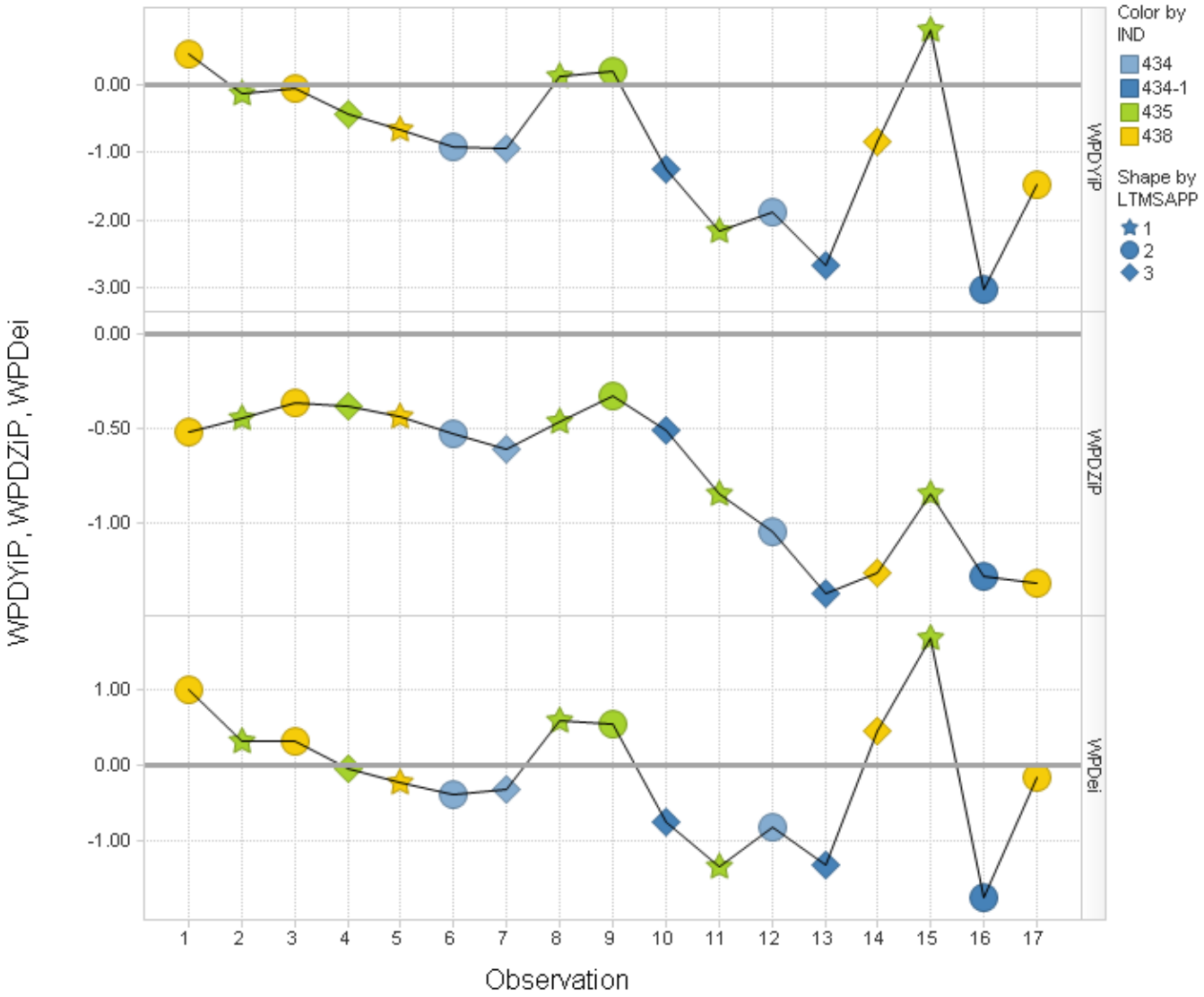
Jim Rutherford

18 November 2009

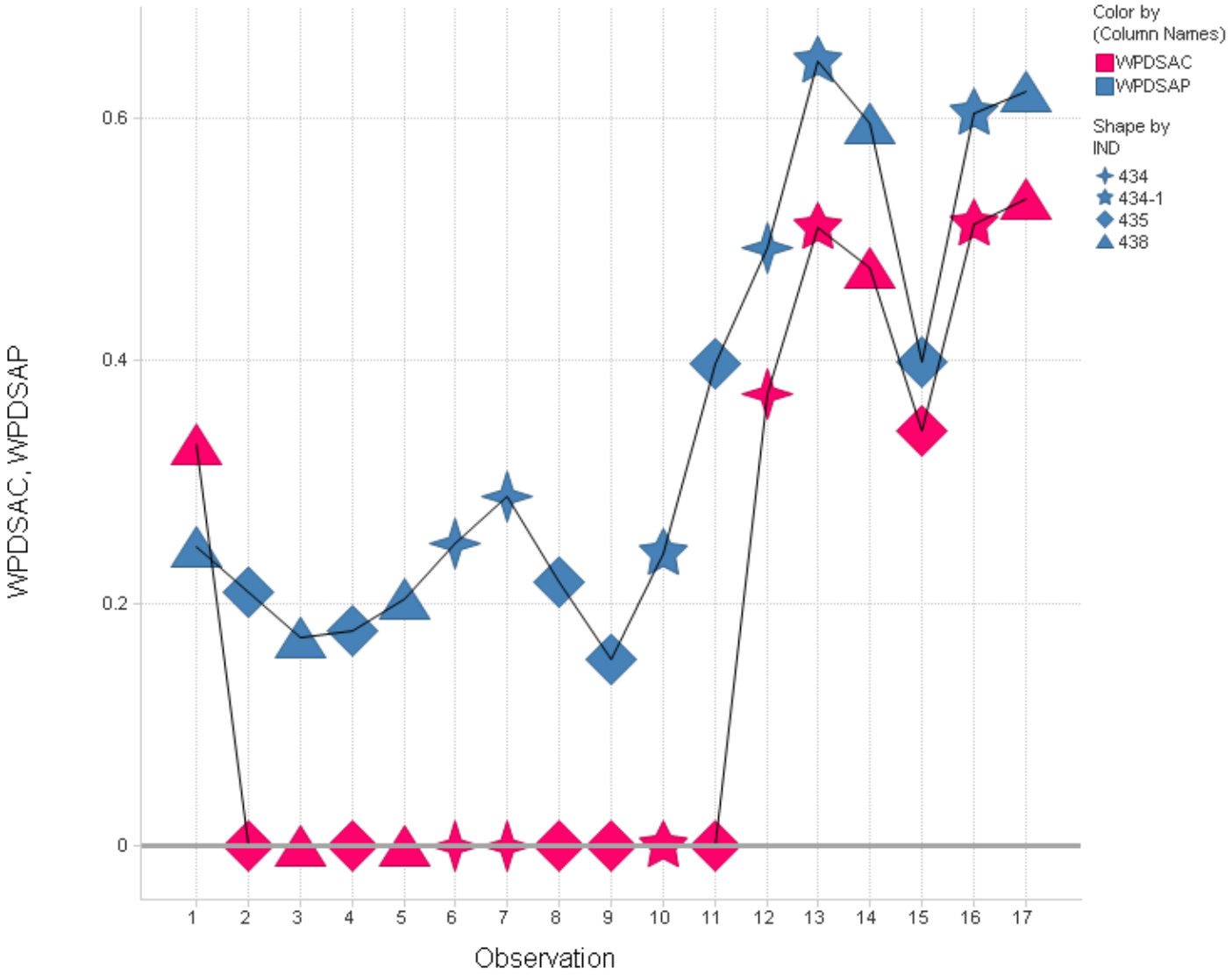
What happened with the current system at one lab



What sort of might have happened with proposed changes

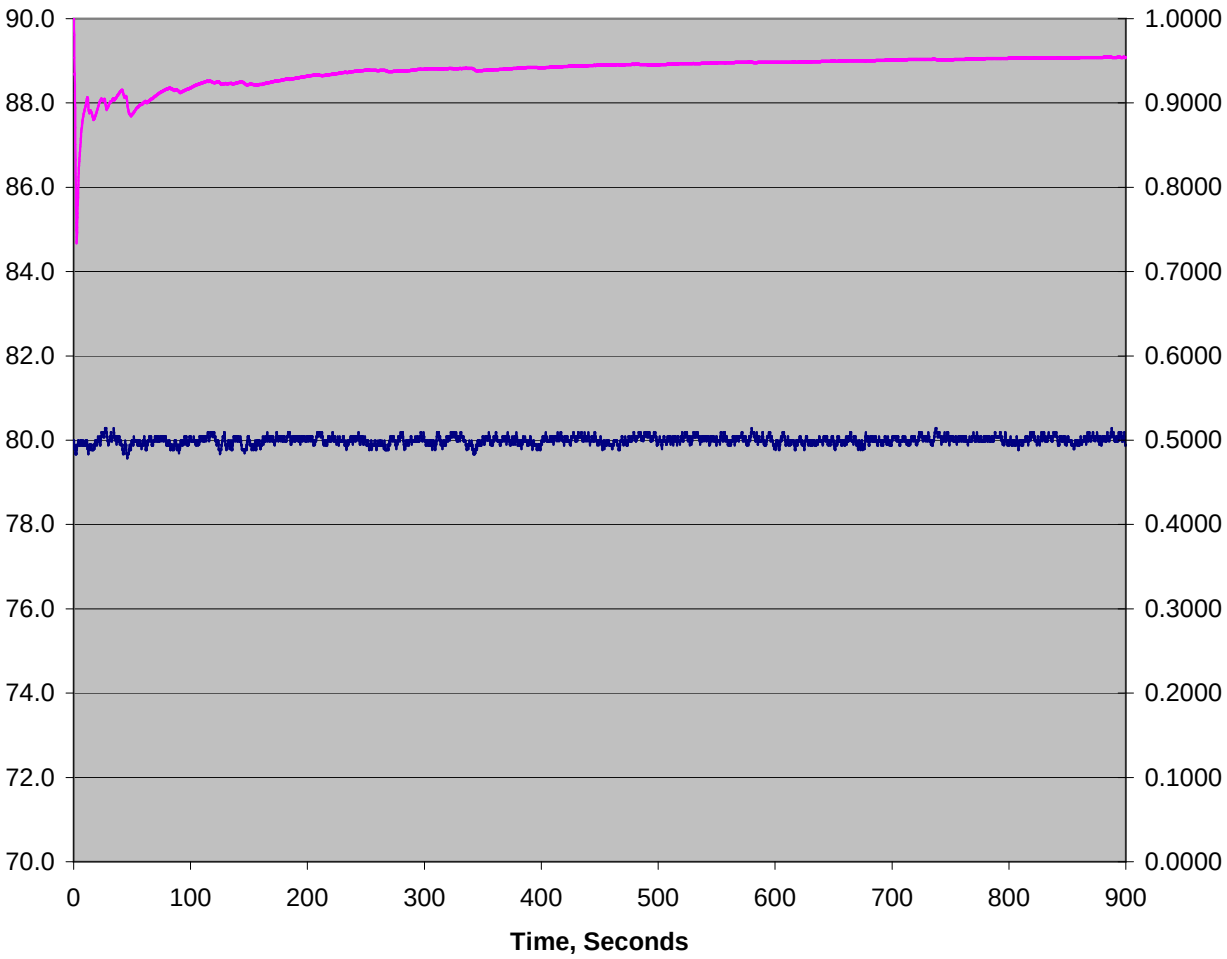


Severity adjustments as they happened versus sort of what might have happened



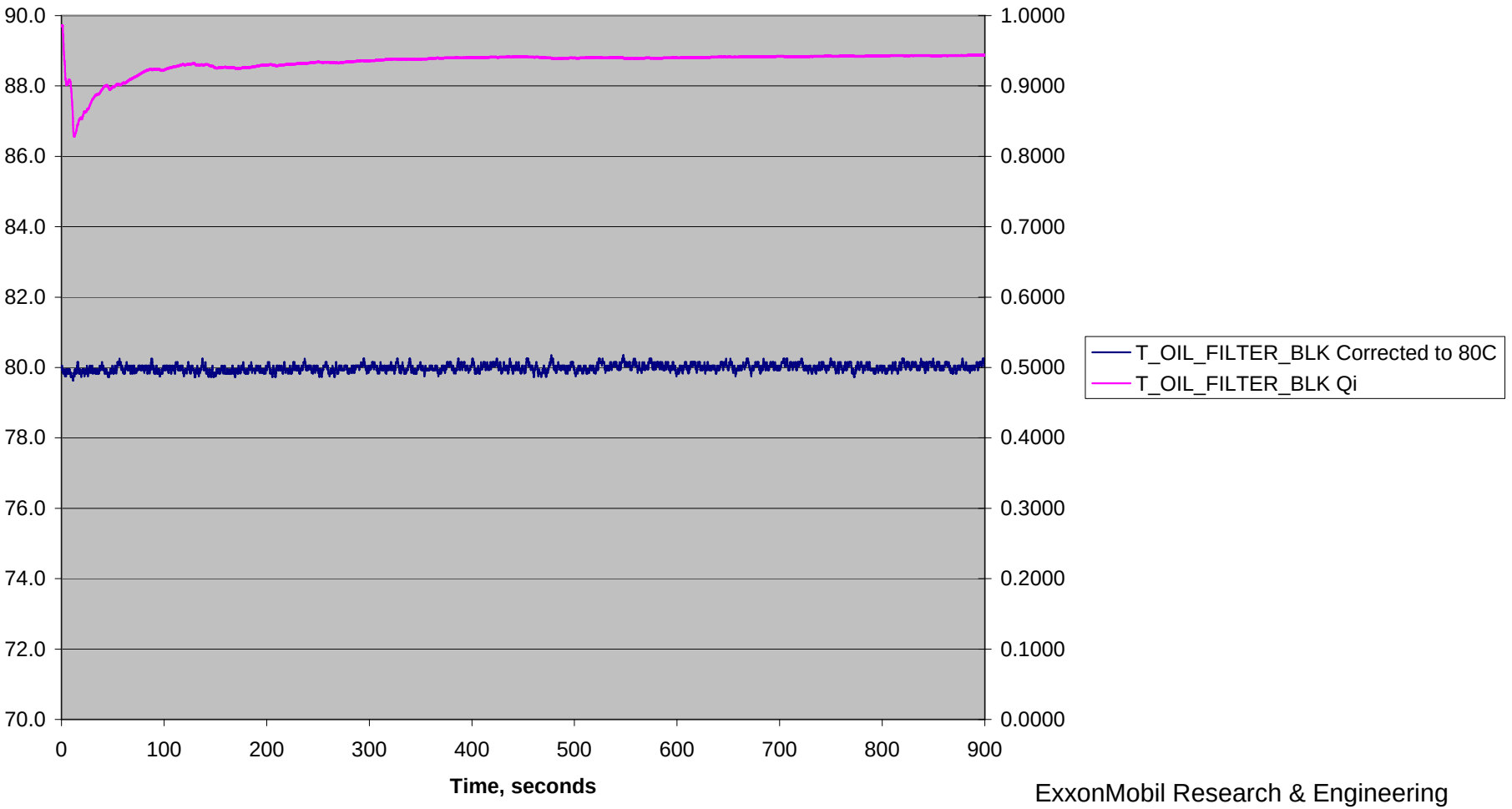
Attachment 11

T_Coolant
1/16th Thermocouple
Time Constant = 2.2 seconds

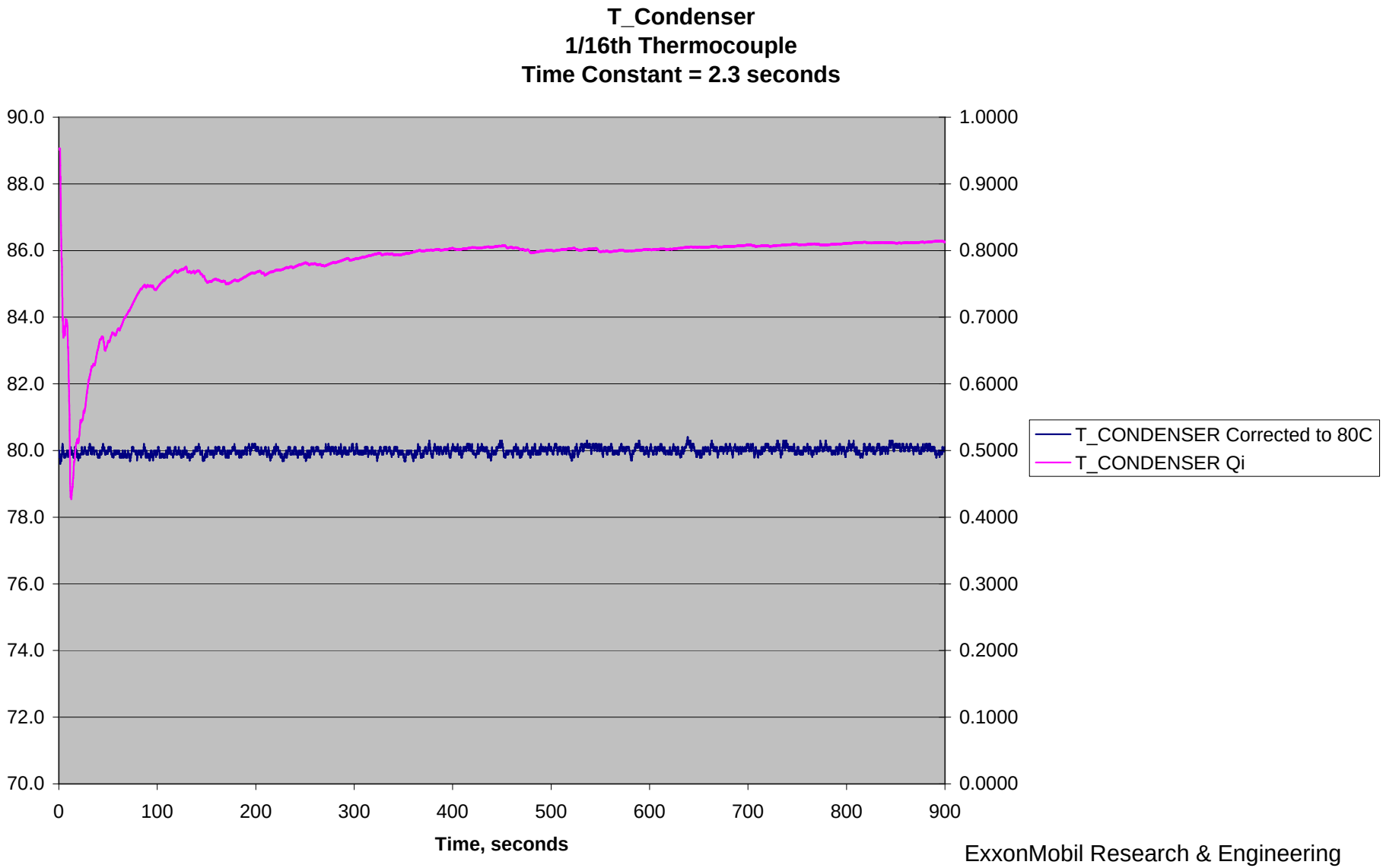


ExxonMobil Research & Engineering

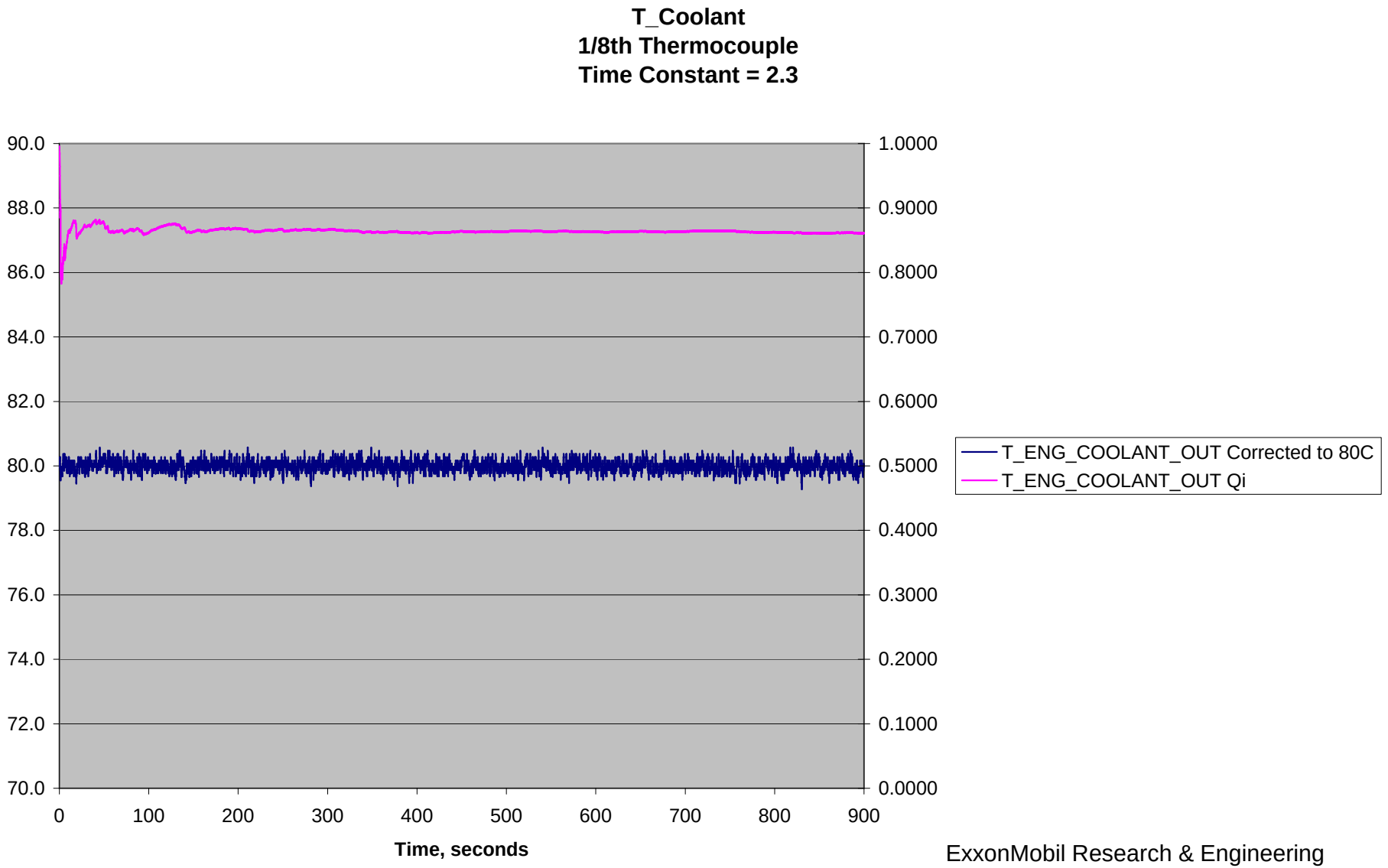
T_Oil
1/16th Thermocouple
Time Constant = 2.2 seconds



ExxonMobil Research & Engineering

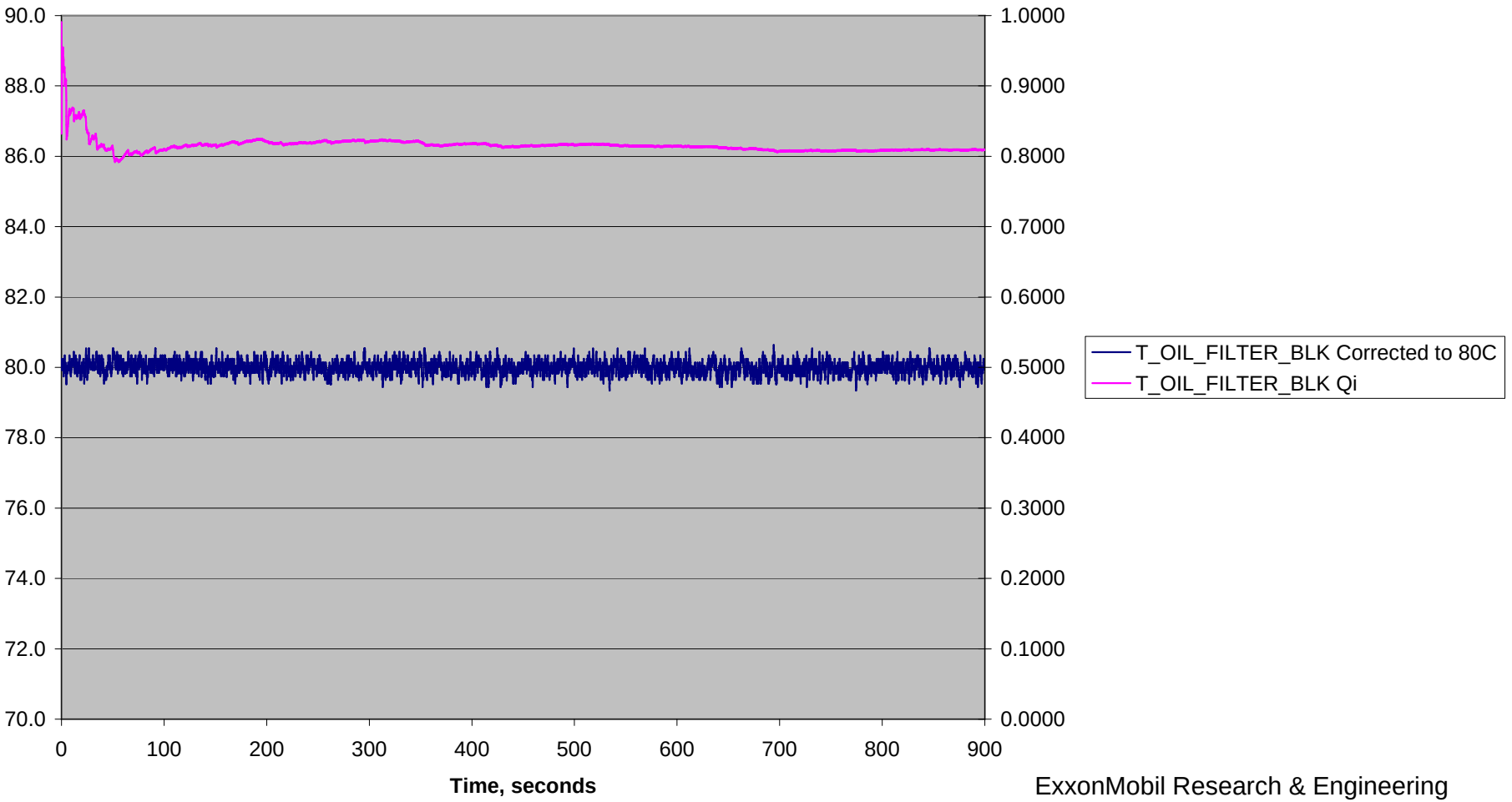


ExxonMobil Research & Engineering



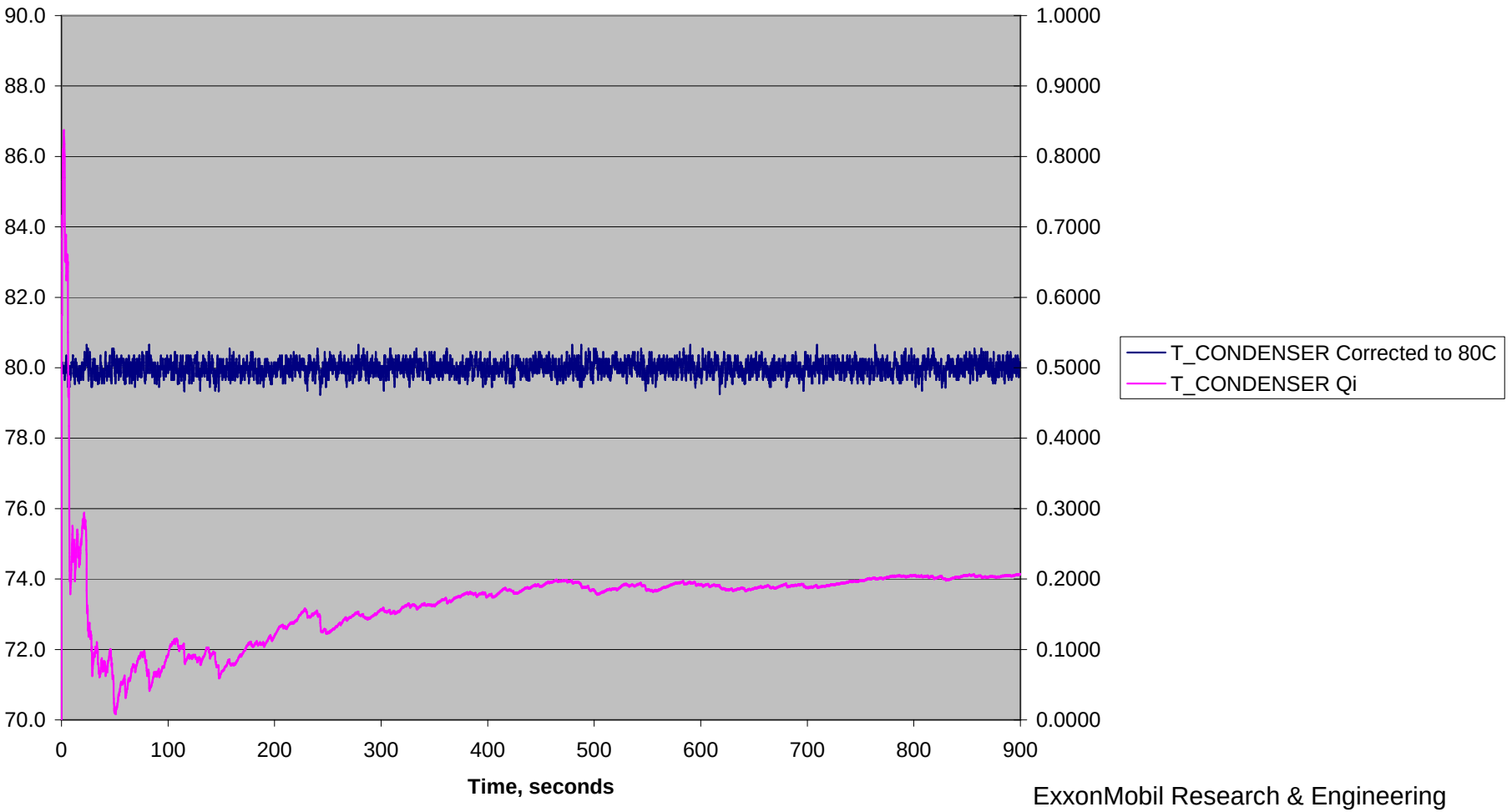
ExxonMobil Research & Engineering

T_Oil
1/8th Thermocouple
Time Constant = 2.3 seconds



ExxonMobil Research & Engineering

T_Condenser
1/8th Thermocouple
Time Constant = 2.3 seconds



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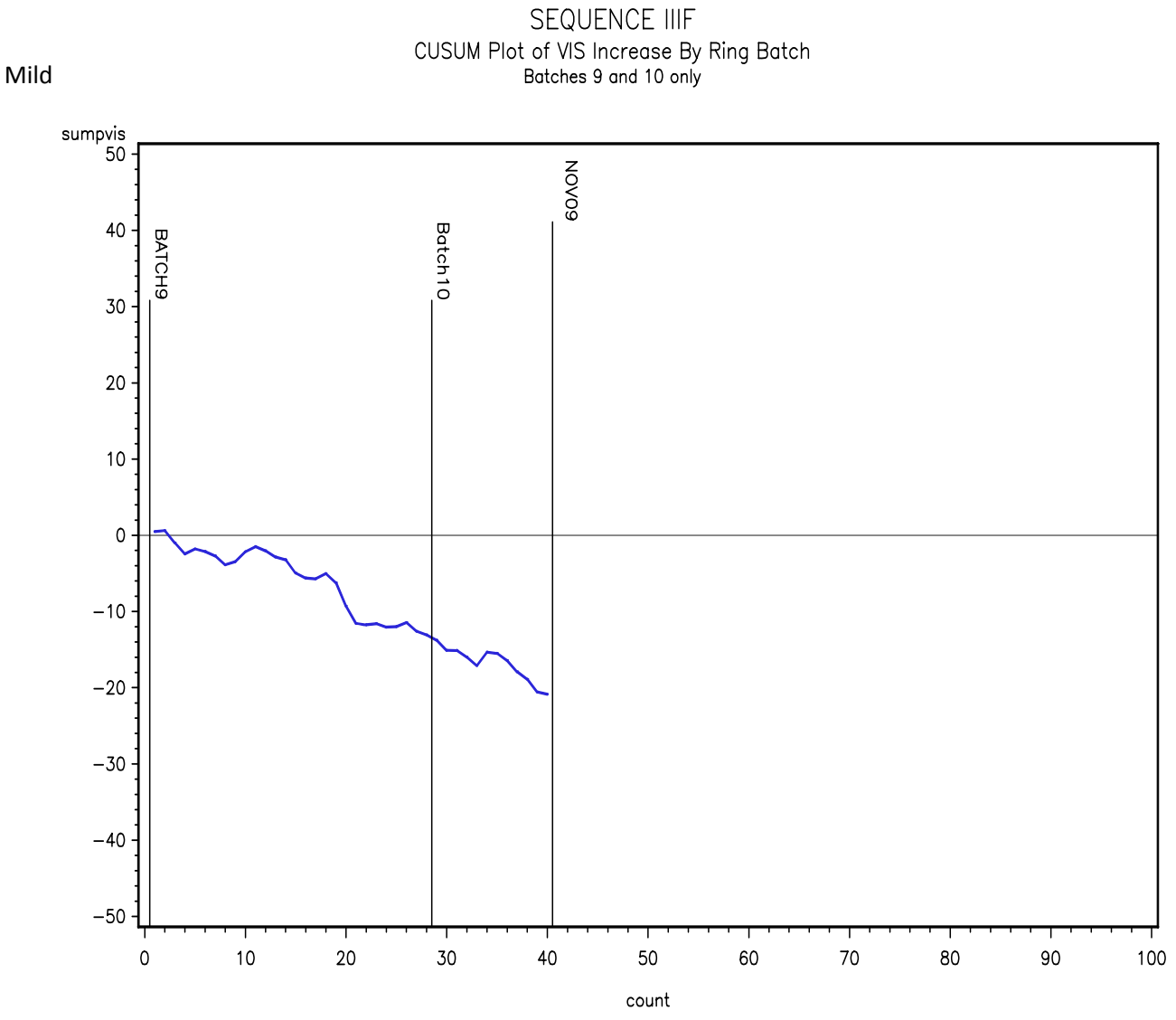
ATTACHMENT 12

TMC Analysis of Ring Batch Results

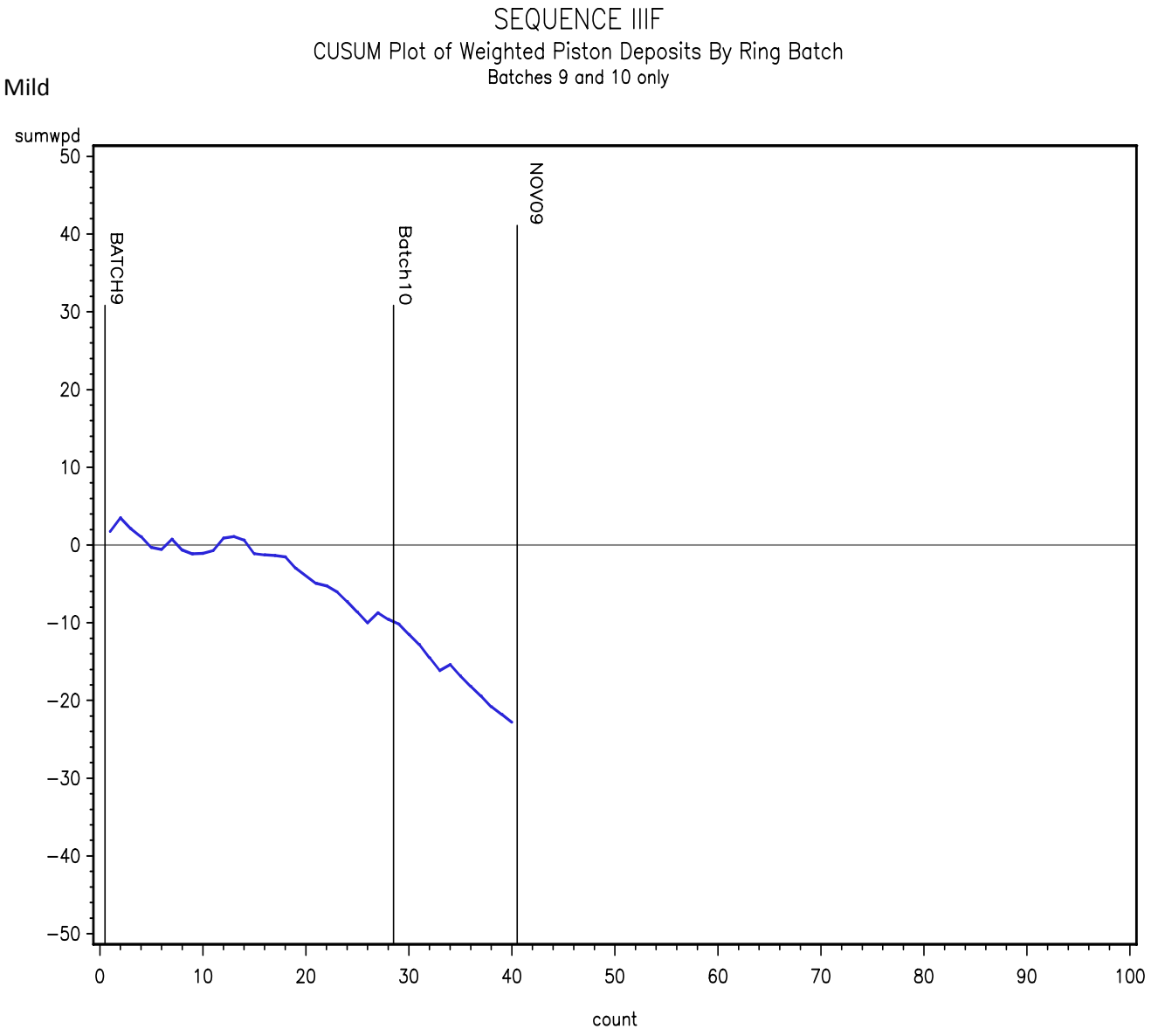
In support of an upcoming conference call, a request was made of the TMC to analyze the Batch Code 10 ring results and compare to other batches or other variables. The following plots the summation delta/s of batch 9 and 10 rings, in date order by ring batch. Similar trends have been noted in viscosity increase severity with both ring batches. Please note that there are 12 operationally valid results on batch 10 rings and 28 results on batch 9 rings.

FIGURE 1



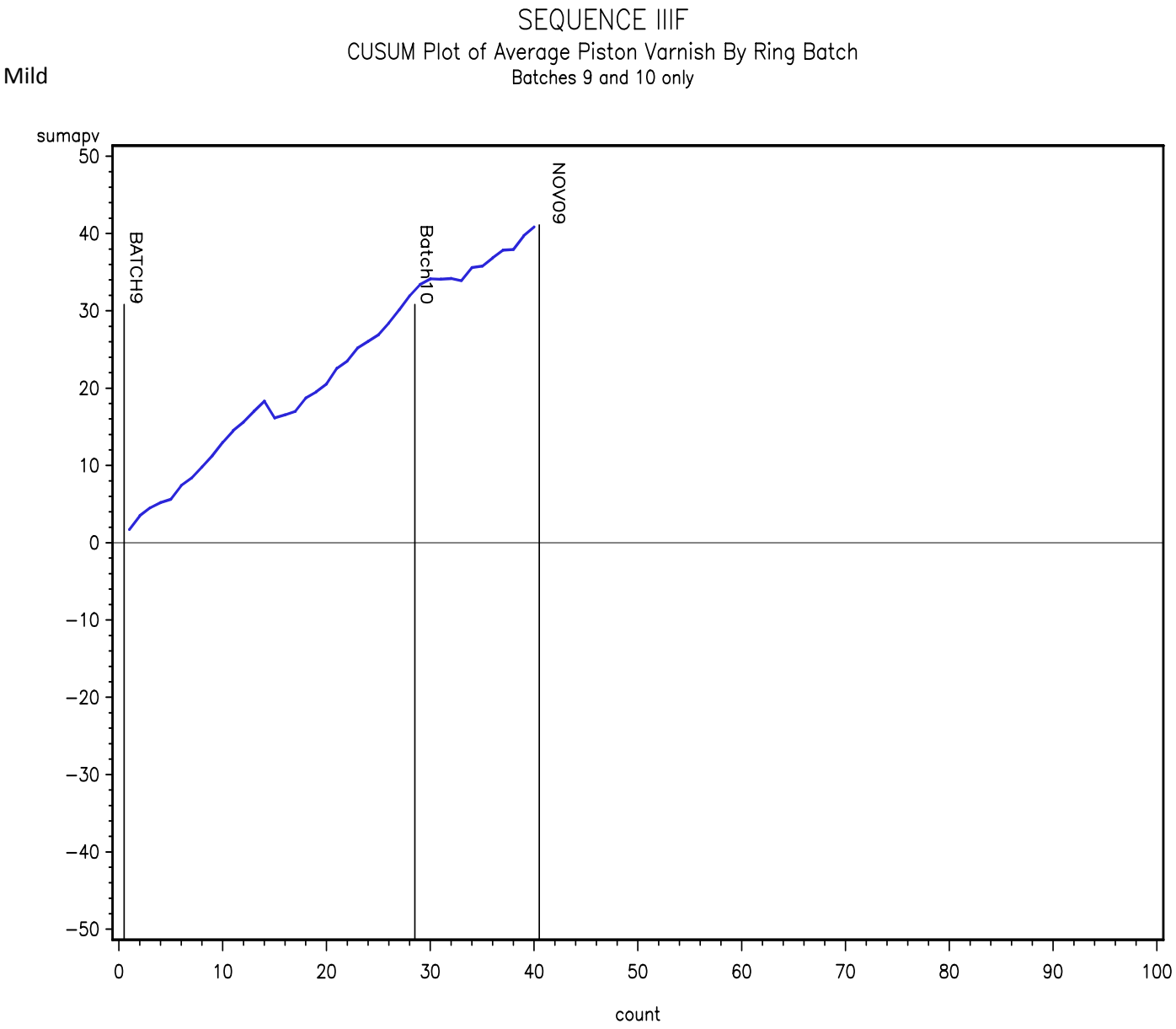
Below is a similar plot for WPD. This plot shows a severe shift mid way through the batch 9 data which continues through batch 10.

FIGURE 2

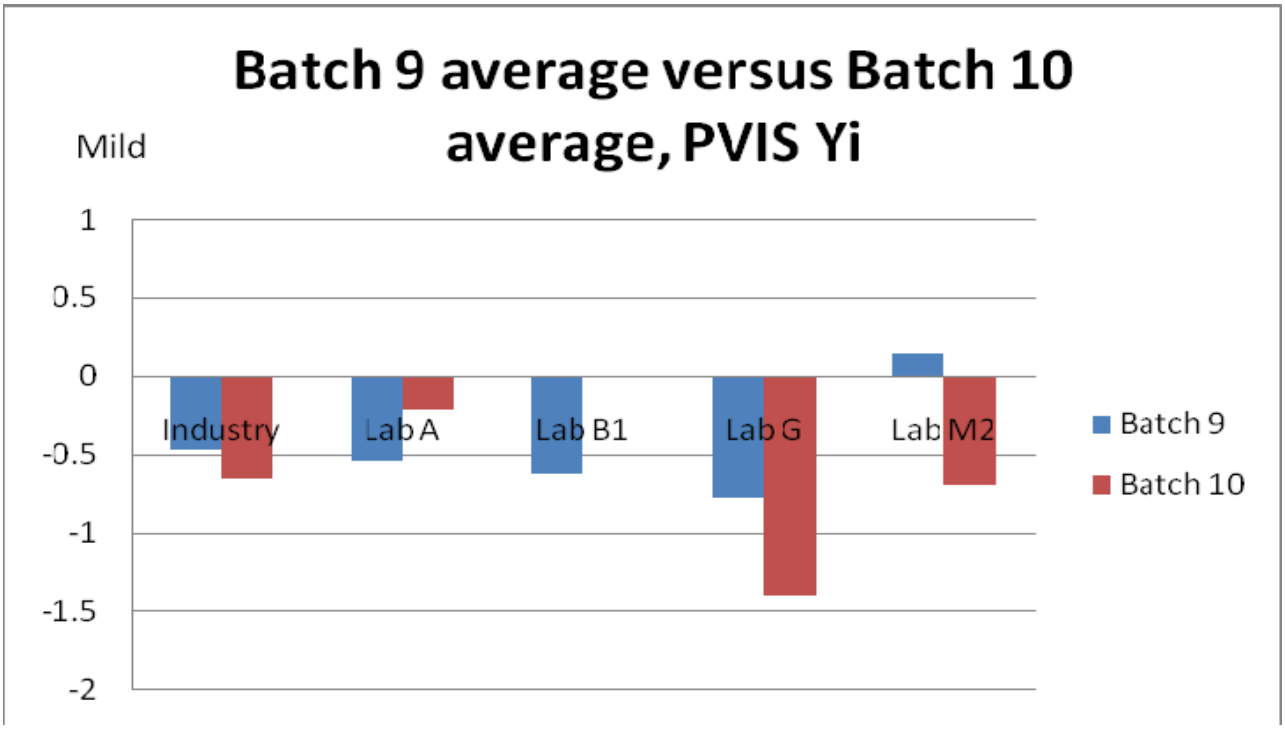


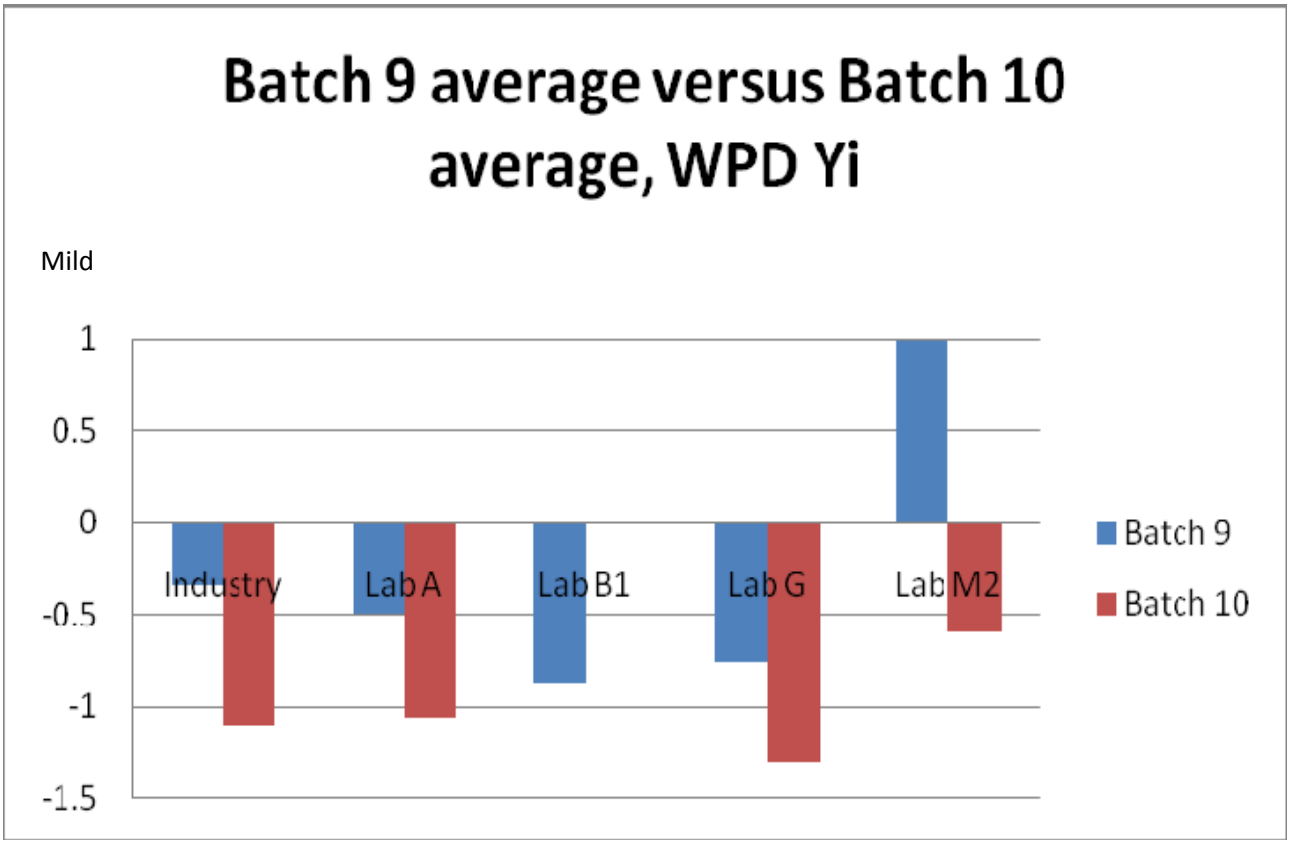
Also plotted are the APV summation delta trends for APV. As with the previous parameters, the trend noted in the batch 9 results continues at about the same level for the batch 10 results.

FIGURE 3

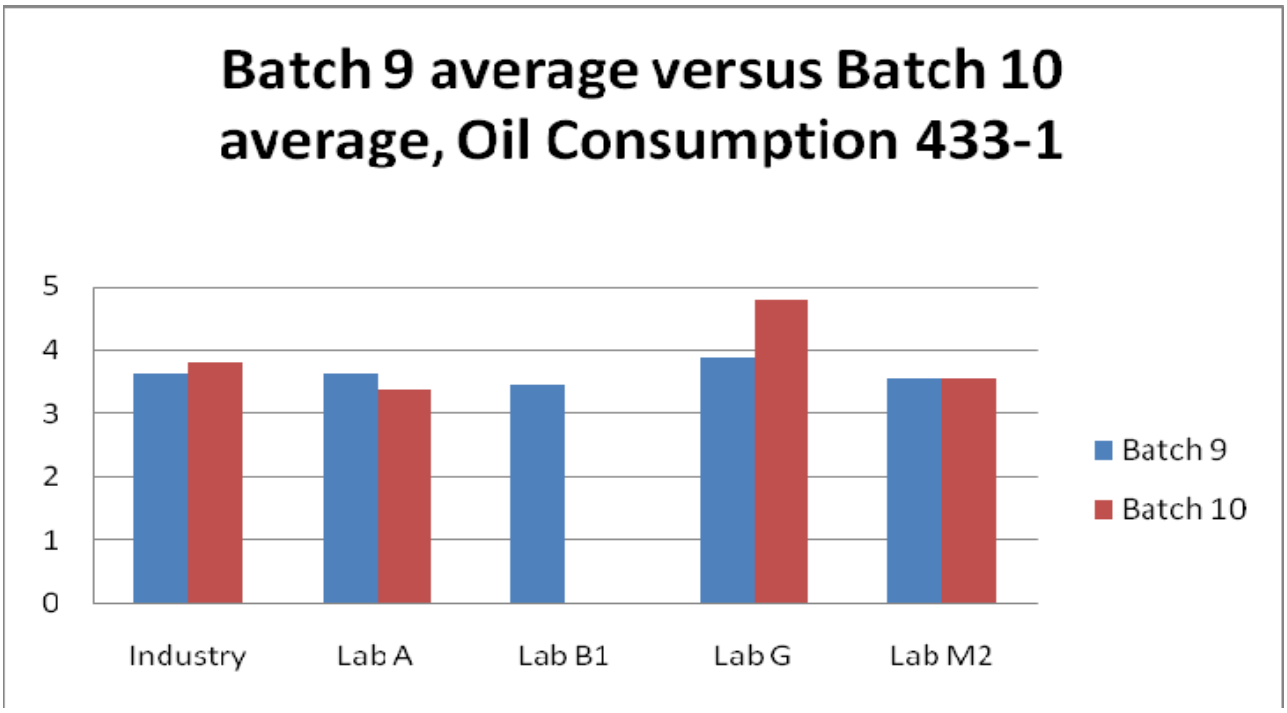


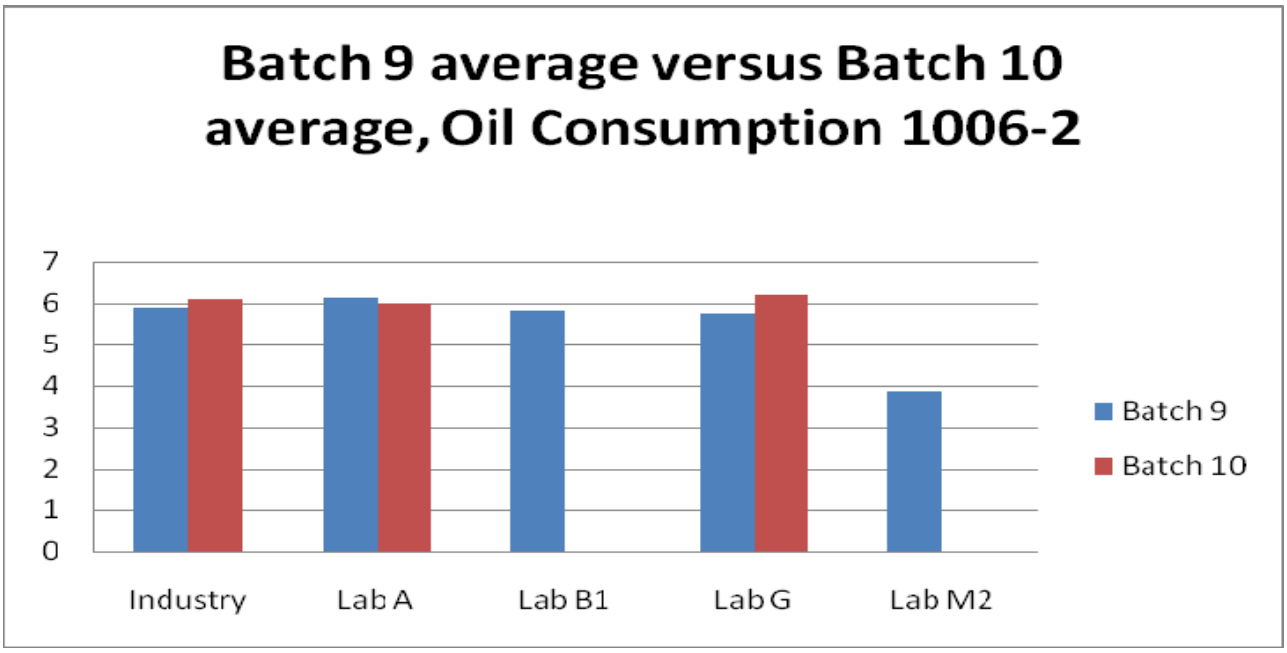
Though not presented, PV60 trends are very similar to the viscosity increase trends shown in figure 1. The following bar charts show industry and lab trends between batches 9 and 10. The charts show that not all labs have run both batches. Labs G and M2 appear to be more severe on batch 10 rings, while lab A appears to be slightly milder on batch 10. Lab B1 has 8 results, all on batch 9. WPD is more severe on batch 10 compared to batch 9, a trend that is also apparent for labs A, M2 and G.


Batch 9 average versus Batch 10 average, PVIS Yi
Mild
1
0.5
0
-0.5
-1
-1.5
-2
Industry
Lab A
Lab B1
Lab G
Lab M2
Batch 9
Batch 10


Batch 9 average versus Batch 10 average, WPD Yi
Mild
1
0.5
0
-0.5
-1
-1.5
Industry
Lab A
Lab B1
Lab G
Lab M2
Batch 9
Batch 10

Oil consumption plots both reference oils 433-1 and 1006-2 are shown below.





Lab A shows slightly higher oil consumptionn with Batch 9 on both oils, while lab G shows higher oil consumption with 433-1 and somewhat higher with 1006-2. M2 shows no difference between the batches on oil 433-1 and has only batch 9 results on 1006-2.

Southwest Research Institute

ATTACHMENT 13

Sequence IIIG

Severe WPD Severity Shift

Prepared by:

William A. Buscher III

Patrick M. Lang

November 18, 2009

Warren, Michigan

Presentation Outline

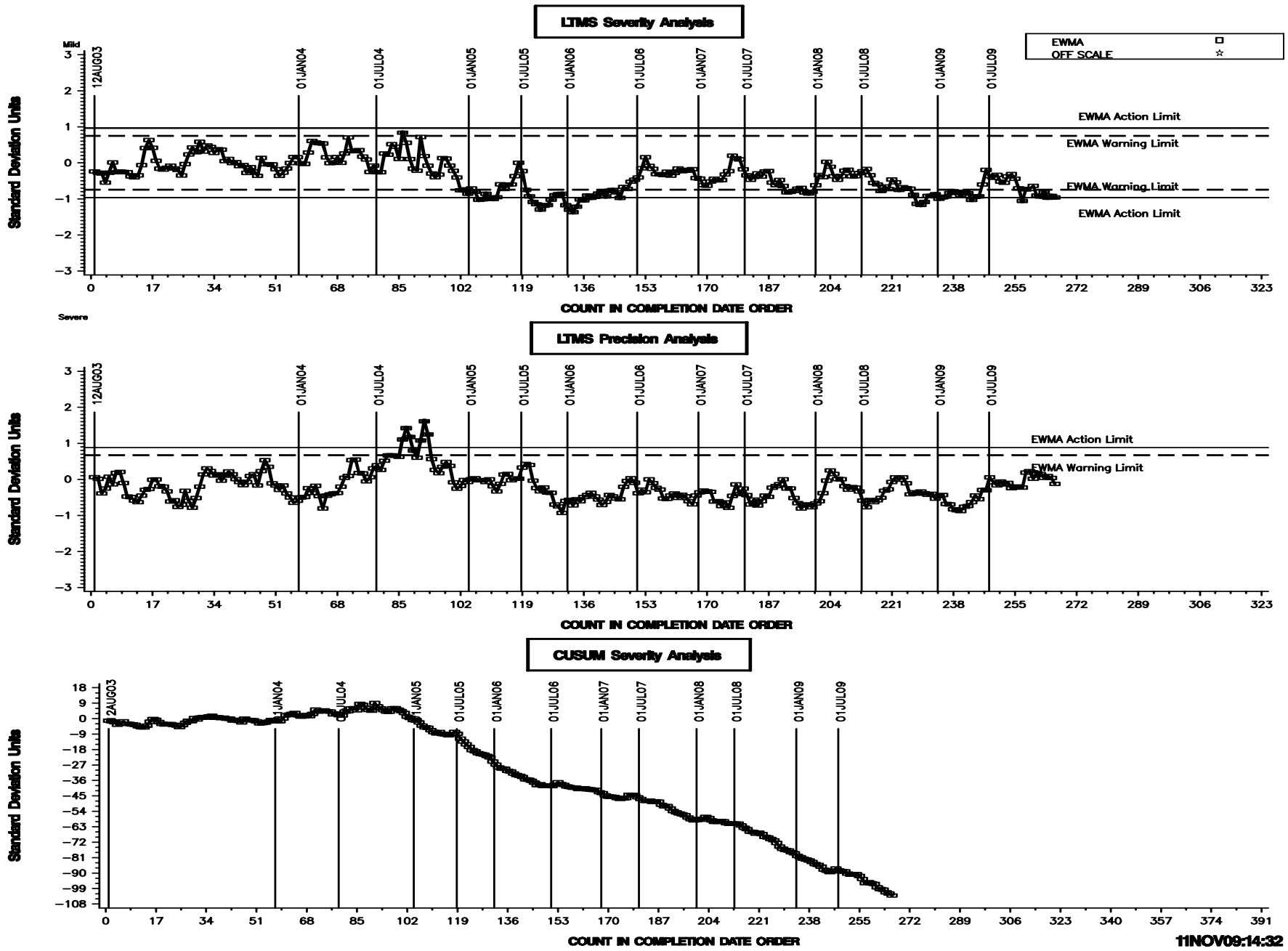
- Statement of Problem
- Historical Timeline
- Summary
- Proposal
- Task Force Objectives

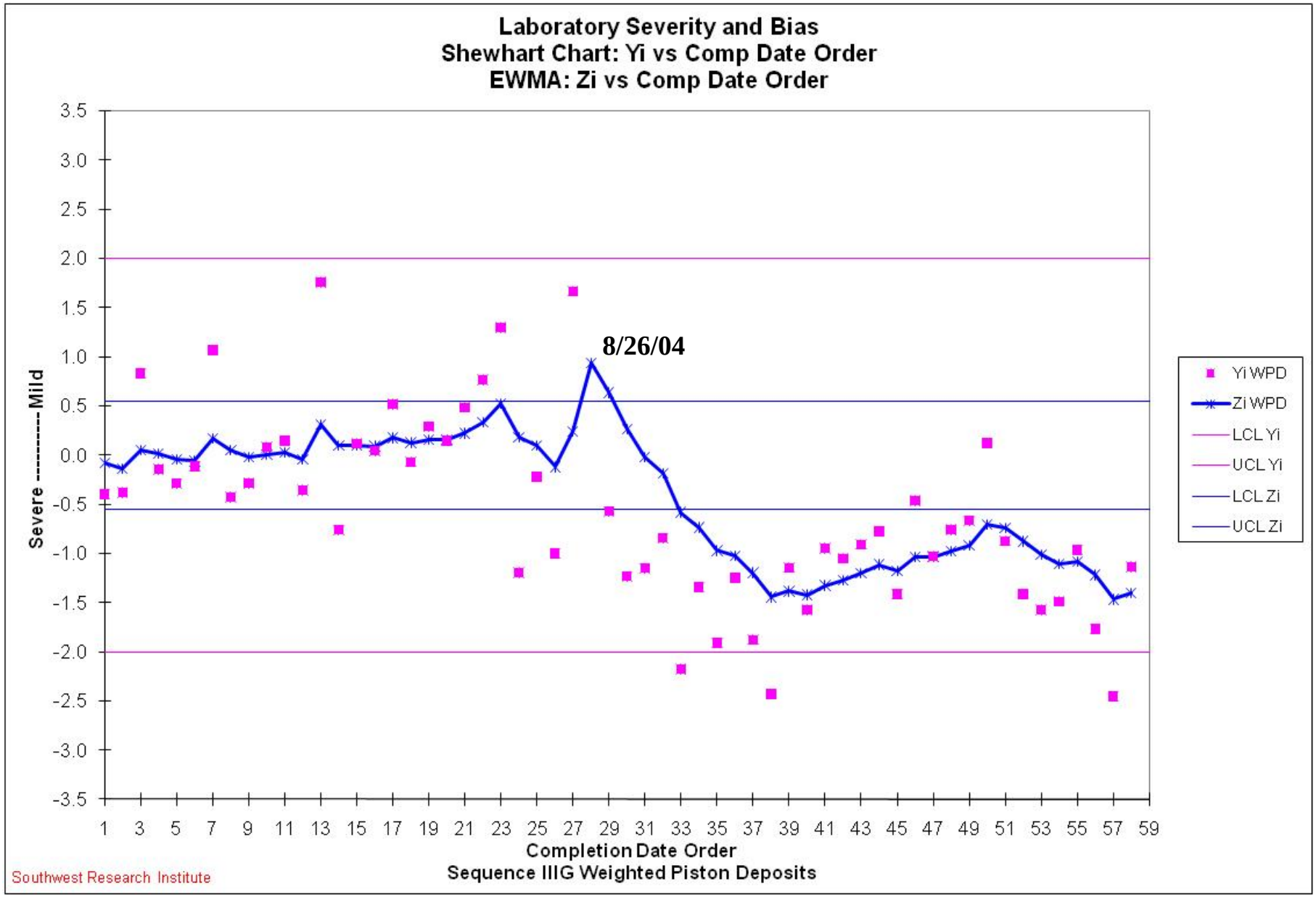
Statement of Problem

- WPD severity has trended severe starting in mid 2004
  - WPD severity shift has existed for 5+ years
  - Evident at the industry level
  - Evident with reference oil data
  - Evident with candidate oil data
- Significant lab bias exists for WPD
  - Lab bias has existed for 1+ years
  - Not evident with reference oil data
  - Evident with candidate oil data

SEQUENCE IIIG INDUSTRY OPERATIONALLY VALID DATA

AVERAGE WEIGHTED PISTON DEPOSITS




Laboratory Severity and Bias
Shewhart Chart: Yi vs Comp Date Order
EWMA: Zi vs Comp Date Order
Severe ---------- Mild
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
-3.0
-3.5
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55 57 59
8/26/04
Yi WPD
Zi WPD
LCL Yi
UCL Yi
LCL Zi
UCL Zi
Completion Date Order
Sequence IIIG Weighted Piston Deposits
Southwest Research Institute

Historical Timeline

- SwRI market share significantly declines starting mid 2007
- Mid 2008 customers indicate that SwRI is more severe than competition on WPD
- SwRI investigates WPD severity running full length tests with official test parts and a GF-4 5W-30 candidate oil
  - Evaluated numerous aspects of engine build, stand set-up and operations
  - 14 tests conducted
  - Unable to identify any significant influence on WPD severity

Historical Timeline

- Proof of performance testing conducted on oils from multiple additive suppliers confirms that WPD is approximately 0.5+ merits severe at SwRI
- WPD Task Force formed in attempt to identify root cause of WPD shift at the industry level, May 2009
- SwRI conducted internal engine build workshop and complete laboratory operations audit with Sid Clark, summer and fall 2009

Historical Timeline

- Recent TMC lab visit at SwRI, October 2009, did not reveal any discrepancies

Summary

- To-date WPD severity task force has not been able to identify the root cause for severe WPD severity shift
- To-date WPD severity task force has concluded that a WPD transformation or correction factor will unlikely solve the problem
- A change in LTMS is still under consideration, but unclear if it would help solve the problem

Summary

- In the past year a significant lab bias for WPD has developed with candidate oils
- To-date SwRI has not been able to identify any stand set-up, operational, build or hardware changes that significantly influences WPD severity

Proposal

- SwRI proposes that the WPD severity task force take the following action:
  - Conduct IIIG lab visits at all IIIG testing labs, in similar fashion to the VID development consortium lab reviews and the IVA lab visits that were performed in January 2009
  - Meet for brainstorming session and review of findings from lab visits, in similar fashion to the IVA severity task force meeting in January 2009
  - Conduct an engine build workshop or “unified engine” build if necessary

Task Force Objectives

- Solve the severe WPD severity shift seen at the industry level
- Eliminate lab bias for WPD
- Make recommendations to the surveillance panel
- Accomplish prior to core GF-5 test activity