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Committee D02 on PETROLEUM PRODUCTS AND LUBRICANTS

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Originally Issued: April 2, 2012
Revised : April 10, 2012

Reply to: Richard Grundza
ASTM Test Monitoring Center
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Unapproved Minutes of the March 29, 2012 Sequence VG Surveillance Panel Meeting held in Corpus Christi, TX

The meeting was called to order at 1:00 pm by Dave Glaenzer, who was the acting chair for this meeting.

A list of attendees is included as attachment 1. Also in attendance, by phone were; Matt Snider, GM, Haiying Tang, Chrysler and Gordon Farnsworth, Infineum. Gordon was the voting member for Infineum in Andy's absence.

Agenda Review
Bill Buscher is Action & Motion recorder.

The Agenda was accepted as shown on Attachment 2.

Sequence VG Meeting Minutes
April 2, 2012
Corpus Christi, TX

Membership Changes

Two changes to the membership were made. Haiying Tang replaces Tracy King as the Chrysler representative and Terry Kowalski of Toyota was added as a new member.

Meeting Minute Status

The meeting minutes from the May 24, 2011 Conference Call were approved by the surveillance panel.

Review of Action Items from Last Meeting

Motions and Action Items

As Recorded at the Meeting by Bill Buscher

1. Action Item – Ford to investigate alternate suppliers for piston rings. If aftermarket rings from an alternate supplier are available for one or more of the Sequence VG piston/bore sizes, then Ford will acquire some of these piston rings for comparison to the current Sequence VG piston rings. Completed, to be discussed during Test Sponsors Report.

2. Action Item – Labs to use fuel tanks for the fuel approval matrix tests that have been drained of all Haltermann SVGM2 fuel from a previous fuel batch or that have been thoroughly cleaned if the previous fuel was something other than SVGM2 fuel. Completed

3. Action Item – Sequence VG needs a replacement for RO 925-3 as soon as possible. Panel members to solicit oil suppliers for a potential replacement failing reference oil. To be discussed under new business.

4. Action Item – Consider accepting RO 1010 for calibration purposes in the Sequence VG as a replacement for RO 1007, freeing up RO 1007 for exclusive use in the Sequence IVA. Remains open, introduction of 1010 to be addressed after introduction of 925-3 replacement.

5. Action Item – Surveillance panel members to provide input for the TGC Best Practices in Lubricant Test Development document by 8/1/11 to the panel chairman and the TMC. The chairman will distribute material as it comes in to the panel members for review. A face-to-face meeting for all interested will be scheduled prior to the next panel meeting and input for the document will be compiled for review at the next panel meeting. Completed, no response.

Sequence VG Meeting Minutes
April 2, 2012
Corpus Christi, TX

Test Sponsor Report

Ron Romano did not have a formal report, but did update the panel on a couple of items. Ron has managed to get the original piston supplier to make additional pistons and rings. Labs have provided orders to Ron for additional pistons and rings. Ron had no dates for the arrival of these parts. Status of other parts orders was also discussed and some labs have received partial orders of the ancillary parts. Ron Romano was assigned an action item to follow up with FCS on the status of the pistons and rings from the current industry hardware order and report back to the test labs. Ron also gave an update on VH development. Some testing has started but attempts to tune transitions are currently being undertaken. The VH will continue to have three stages and Ron expects to begin testing on reference oils shortly.

Test Monitoring Center Report

A copy of the TMC report can be obtained from the TMC website. Rich Grundza presented highlights from his report, which have been included as attachment 3. There were no questions or comments regarding the TMC report. Dave Glaenzer commented that the improvements in precision seen this period may be the result of the lab standardization undertaken during the last fuel approval program.

ACC Monitoring Agency Report

Do to the timing of the meeting, there was no ACC report available for the current period.

Fuel Supplier Report

Mark Overaker advised the panel that Haltermann had made two RVP adjustments to the batch since it was placed into storage. Originally, Haltermann had concerns about high usage of this fuel, but usage has slowed the past couple of months. Fuel purchases had been about 20,000 gal/month starting around July of last year, but are now at about 12,000 gal/month. This projects a need for a new fuel batch in the 4th quarter of 2012. When there is about 70,000 gal remaining of the current fuel batch, the fuel supplier will begin the process of putting together a new batch. Additional discussions about segregation of fuel batches for future testing at labs was also discussed. A copy of the fuel suppliers report is included as attachment 4. Also included in the fuel supplier report is analytical results on the fuel in storage at the laboratories.

Operations and Hardware

A source for line boring of cylinder heads to accept cam bearings is still an open issue. The panel needs to identify a source for line boring the F1 F4 heads obtained from Bishop. Ron Romano was tasked with contacting Ford's Remanufacturing Engineering group to obtain guidelines and potential sources for line boring the heads and replacing valve guides, etc. TEI was also tasked with contacting the bearing supplier to identify any recommendations for line boring the F1 F4 heads. There was some discussion regarding the use of Bishop blocks and several labs have successfully completed tests with these blocks. Front covers, intake manifolds and other reusable parts remain available from sources other than Ford Component Sales. There were no concerns about other hardware.

Sequence VG Meeting Minutes
April 2, 2012
Corpus Christi, TX

Old and New Business

Under new business, the panel agreed to accept a failing reference oil as a replacement for reference oil 925-3, which cannot be reblended. Bill Buscher made a motion to accept the replacement oil which was seconded by Ed Altman and approved unanimously. The TMC presentation regarding performance of this oil relative to 925-3 is included as attachment 5. The TMC will contact the supplier to obtain sufficient quantities of this oil. This was also included as an action item for this panel. The introduction of this oil will be further discussed in a future conference call, to be conducted once the oil has been obtained by the TMC.

Scope and Objectives

Since Andy Ritchie, Sequence V Surveillance Panel Chair, was not available for the meeting, a review of the scope and objectives was not conducted.

A listing of Motions and Action items recorded during the meeting is included as attachment 6.

The meeting was adjourned at 2:38 pm.

Attachment 1

ASTM SEQUENCE VG SP MEETING
CORPUS CHRISTI, TX 03/29/2017

NAME	AFFILIATION
DAVID GLAENZER	Afton Chemical
BILL BUSCHER	SwRI
PAT LANG	SwRI
Karin Haunmann	SwRI
Eric Zile	SwRI
CHRISTIAN PORTER	AFTON CHEMICAL
Raham Kirkwood	SwRI
Ron Romano	FORD
Ed Altman	Afton
AL LOPEZ	INTERTEK
Teri Kowalski	Toyota
Doyle Boese	Infineum
MARK OVERAKER	HALTERMANN SOLUTIONS
CLAYTON KNIGHT	TEI
JERRY BRYS	LUBRITOL
Geo. Szappanos	LZ
KURT KNAPP	CHEVRON PHILLIPS FUELS
Bruce Matthews	Bruce Matthews
JASON BOWDEN	OHT
MATT BOWDEN	OHT
DWIGHT BOWDEN	OHT
JO MARTINEZ	ORONITE
MARK SUTHERLAND	ORONITE
Jeff Clark	TMC
SEAN MOYER	TMC
Rich Grunden	TMC
ROBERT STOCKWELL	GM

Attachment 2

Agenda
Sequence VG Surveillance Panel
March 29th 2012 1.00 - 4.00 P.M
Corpus Christi TX

1. Chairman comments.
2. Attendance sign-in distribution.
3. Membership changes.
4. Motion and Action recorders.
5. Approval of minutes for 9/7/11
6. Review action items from 6/1/11 meeting.
7. Test Sponsor report.
8. TMC Report.
9. Fuel supplier report
10. Operational and Hardware Items.
11. Review Scope and Objectives.
12. Old business
13. New business
14. Adjourn

Attachment 3

Test Monitoring Center

http://astmtmc.cmu.edu

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ASTM D02.B1 Semi-Annual Report Passenger Car Reference Oil Testing

April 2012

Passenger Car Engine Oil Testing Executive Summary

- VIB
  - No test activity this period.
- VID
  - Targets Updated in December for reference oil 1010.
  - Results reported on new blend of 541
- VIII
  - No significant monitoring issues.

Calibrated Labs and Stands*

Test	Labs	Stands
IIIF	4	4
IIIG/A/B	6	16
IVA	3	4
VG	4	8
VIB	0	0
VID	6	12
VIII	2	3

*As of 3/23/2012

Test Activity Levels

- October 1, 2011 – March 31, 2012

Sequence Tests (cont.)

Test Status	Validity Code	VG	VID	VIII
Acceptable Calibration Test	AC	8	25	4
Failed Calibration Test	OC	0	1	3
Operationally Invalid	LC	0	1	0
Aborted	XC	0	0	0
Abandon Stand/Eng	MC	0	2	0
Decoded/Donated	NN/AG	1	10	0
Assigned, not completed		0	1	1
Total		**9**	**40**	**8**

Test Severity

- October 1, 2011 – March 31, 2012

Test Severity (cont)

- IVA
  - ACW in mild action alarm
  - Trending mild for most of the report period
    - Charts shown in Appendix 1.c.
- VG
  - RAC, AEV, APV and OSCR are in control.
  - AES in warning alarm, mild direction.
    - Milder this period than previous periods.
    - Charts shown in Appendix 1.d.

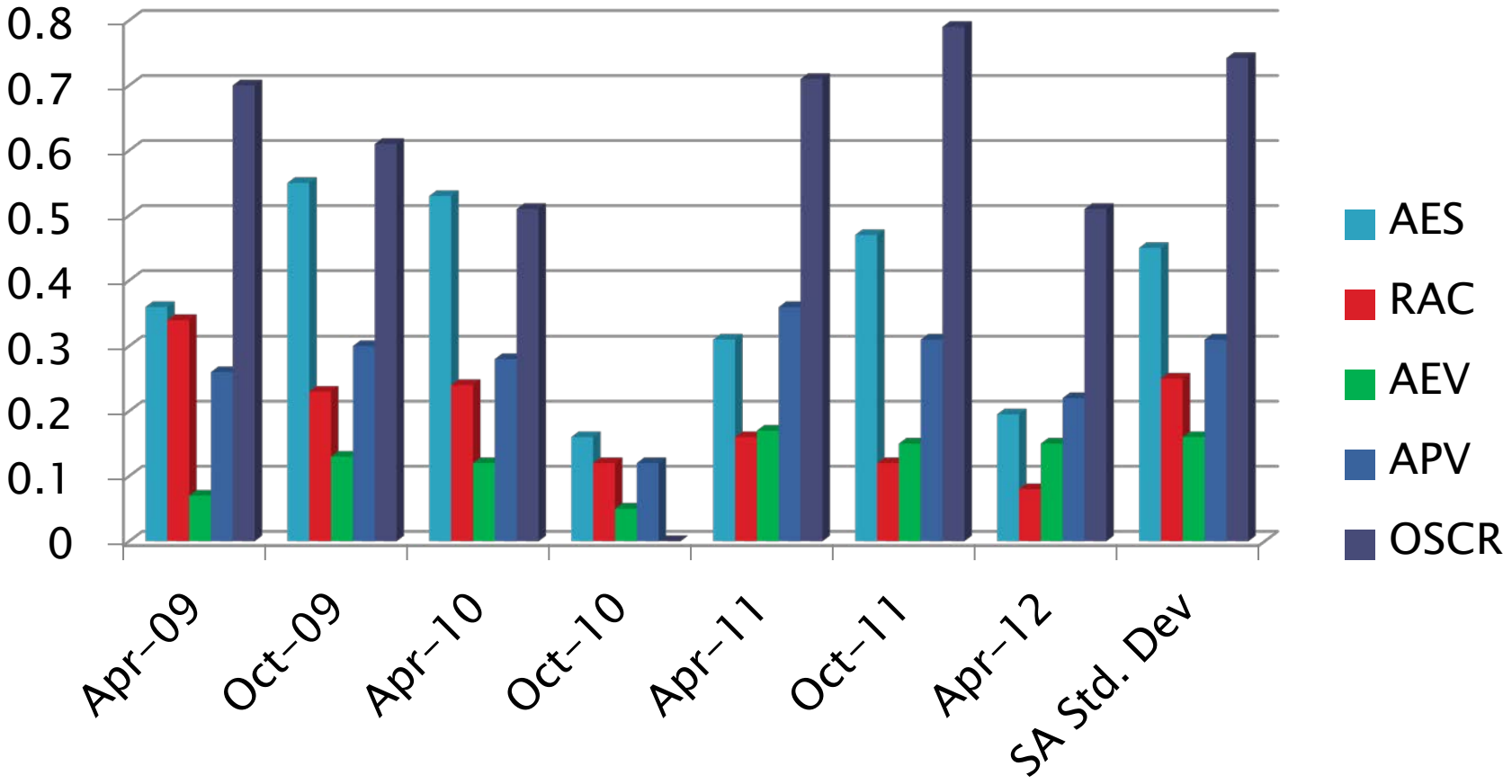
Test Precision

- October 1, 2011 – March 31, 2012

Test Precision Estimates

- Presented on an six month basis.
- Data presented for past four years.

Sequence VG Precision Estimates



Reference Oil Inventory

- Actions, Re-blends, Inventories and Estimated Life

Reference Oil Re-blends

- Oils with ~ 2 years or less supply
  - Re-blends no longer available
  - Oils Affected
    - 925-3 and 1007
    - A replacement oil for 925-3 is being pursued and will be addressed during next meeting
    - 1007 to be replaced with 1006-2 in IVA

Reference Oil Inventory Estimated Life

Oil	Tests	Original Blend Amount	Quantity Shipped in last 6 months	TMC Inventory	Lab Inventory	Estimated Life
433-1	IIIF	1045	40	198	48	2.5 years
434	IIIG	550	0	5	12	<1 year
434-1	IIIG	660	0	254	24	5+ years
435	IIIG	550	0	2	4	<1 year
435-2	IIIG	550	37	437	28	5+ years
438	IIIG	990	24	712	32	5+ years
540	VID	1100	25	463	40	5+ years
541	VID	550	35	5	45	<1 year

Reference Oil Inventory Estimated Life

Oil	Tests	Original Blend Amount	Quantity Shipped in last 6 months	TMC Inventory	Lab Inventory	Estimated Life
541-1	VID	550	25	515	20	5+ years
542	VID	1100	85	358	65	5+ years
704-1	VIII	897	12	206	10	5+ years
925-3	VG	975	0	10	6	<1 year
1006-2	IVA, VG, VIII	5500	91	3772	63	5+ years
1007	IVA, VG	1968	40	21	41	<1 year
1009	IVA, VG	1100	34	379	33	5+ years
1010	IIIG, VID	1100	55	712	60	5+ years

LTMS Deviations

- October 1, 2011 – March 31, 2012

LTMS Deviations

- One IVA LTMS Deviation in Current Period
  - Test sounded a stand precision EWMA Alarm, cleared after one test
  - Alarm due to change in hardware and oil selection
  - Stand calibrated with out additional tests

Historical Count of PCEO LTMS Deviations

Test	LTMS Deviations
IIIF	5
IIIG	5
IVA	6
VG	8
VID	1
VIII	3

Quality Index Deviations

- October 1, 2011 –
  March 31, 2012

Quality Index Deviations

- One PCEO Quality Index Deviations this period
  IIIG Deviation issued for EBP and Load Control problem.

Historical Count of PCEO Quality Index Deviations

Test	Quality Index Deviations
IIIF	25
IIIG	11
IVA	27
VG	38

TMC Laboratory Visits

- October 1, 2011 –
  March 31, 2012

TMC Lab Visits

- Two III lab visits this period.

  No issues at one lab, identified discrepancies in fuel injector flow measurements

- Two VID lab visits this period.

  No issues identified during visits.

Test Area Timelines

- October 1, 2011 – March 31, 2012

Test Area Timeline Additions

Test	Date	Topic	IL
IIIG	20111129	Added provisions for strainers in coolant system Updated tolerances for cam and lifter measurement devices	11-3
IIIG	20111212	Added First-in, First-out criteria for specific hardware and corrected harmonic balancer p/n	11-4
VID	20120111	Clarified procedure for oil additions during new engine break-in	12-1
IVA	20120204	Reintroduced reference oil 1006-2, targets with N = 4	
IVA	20120209	Updated standard deviation for severity adjustments	

*As of 3/31/2012

Additonal Information

- October 1, 2011 – March 31, 2012

Additional Information

- Available on TMC Website:
  - Live Reference Test Data Bases
  - Surveillance Panel Meeting Minutes
  - Test Area Alarm Logs
  - Complete Test Area Timelines
  - LTMS Manual

- www.astmtmc.cmu.edu

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Appendix 1
PCMO Reference Oil Testing Control Charts

April 2012

Appendix 1.a
IIIF Control Charts

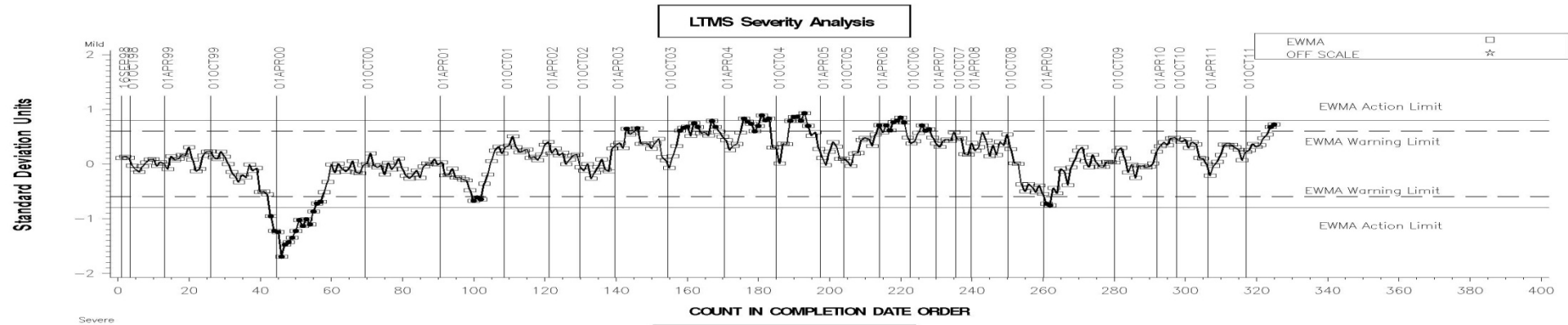
- Severity, Precision, and CuSum

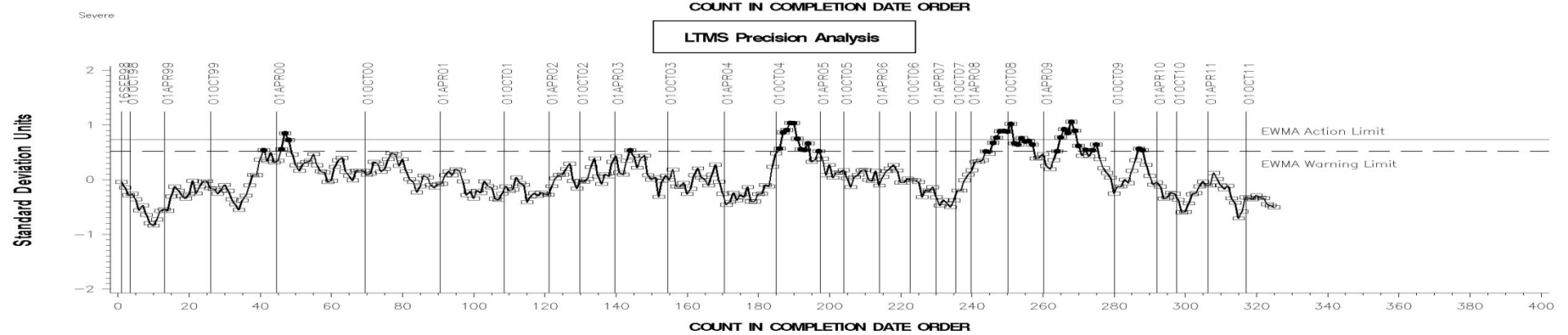
Appendix 1.d
Sequence VG Control Charts

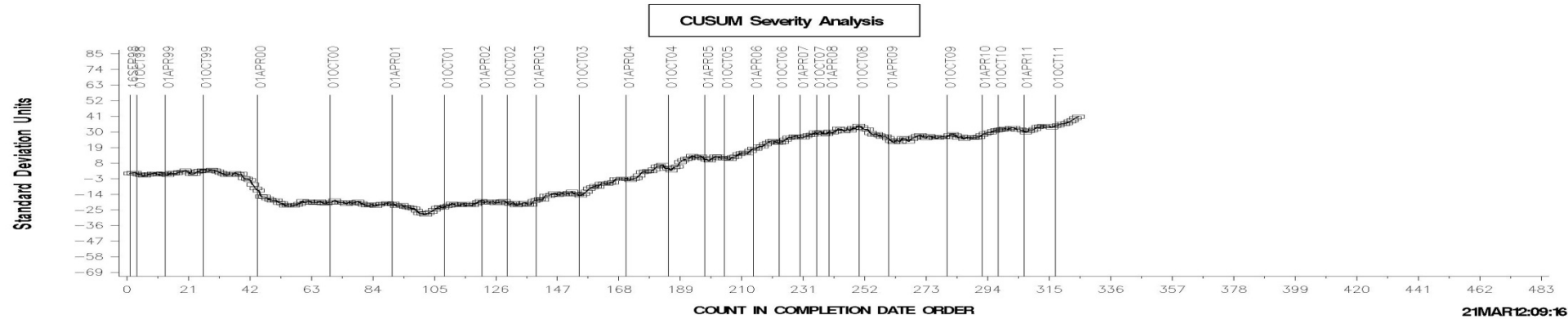
- Severity, Precision, and CuSum

SEQUENCE VG INDUSTRY OPERATIONALLY VALID DATA

AVERAGE ENGINE SLUDGE







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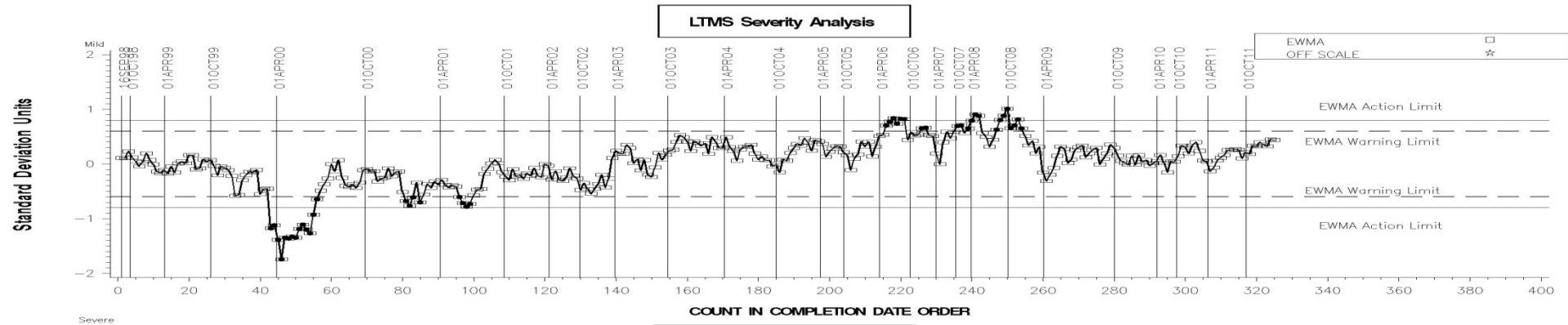
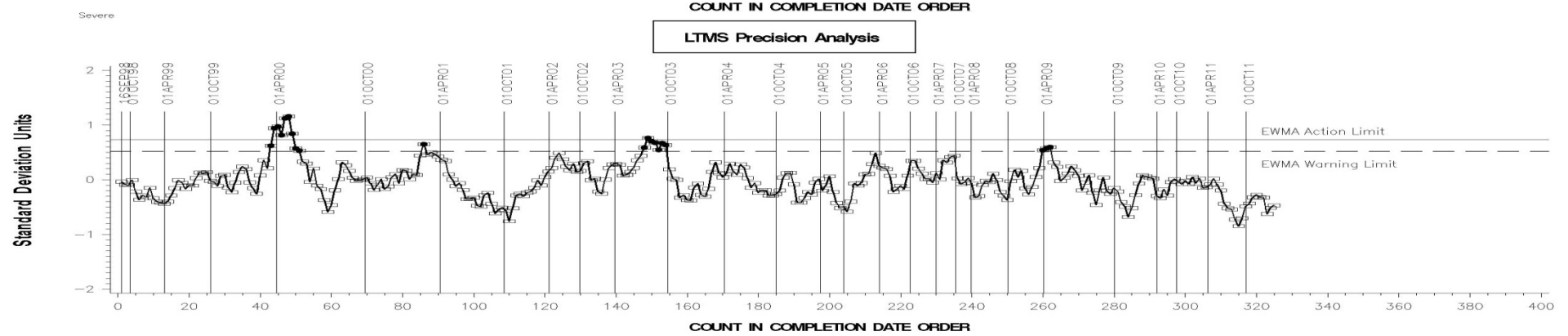
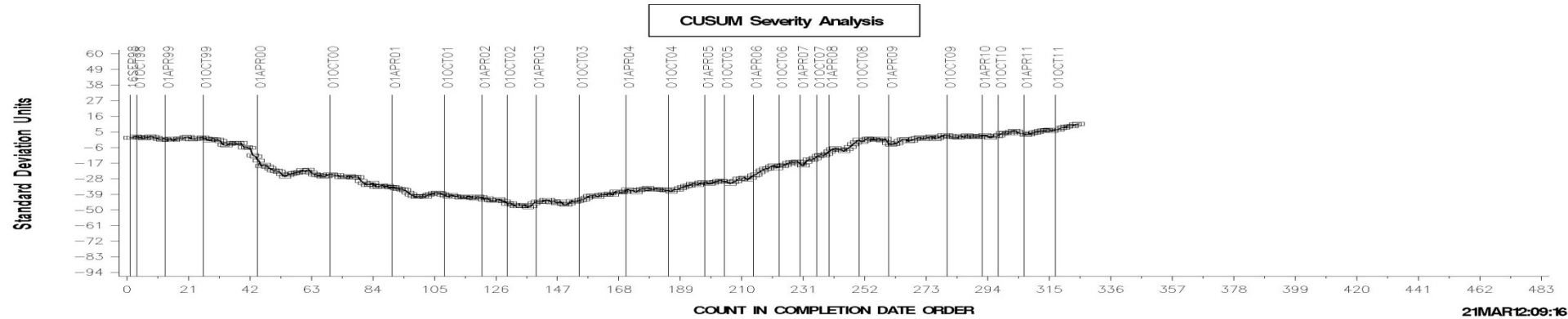
SEQUENCE VG INDUSTRY OPERATIONALLY VALID DATA

AVERAGE ROCKER COVER SLUDGE







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SEQUENCE VG INDUSTRY OPERATIONALLY VALID DATA

AVG. ENG. VARN. 3—PART APV + BAFFLES

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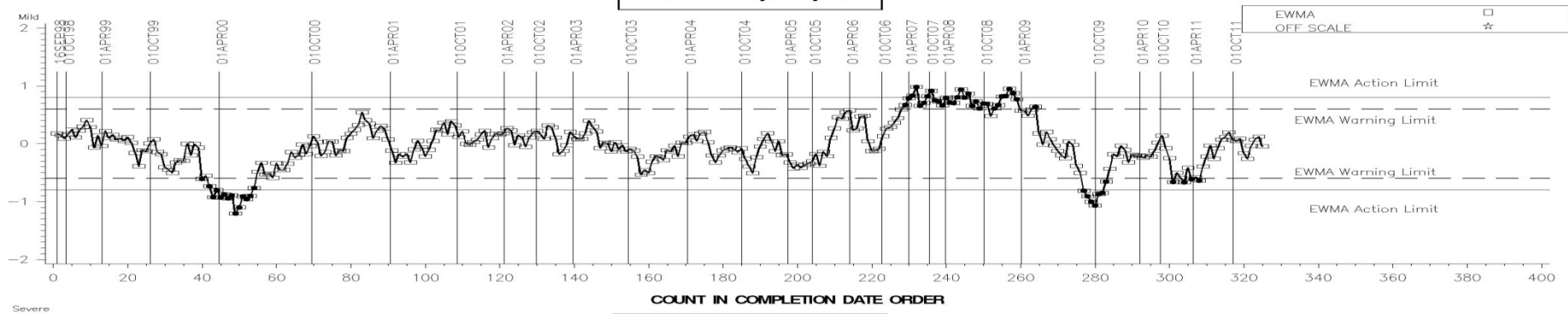
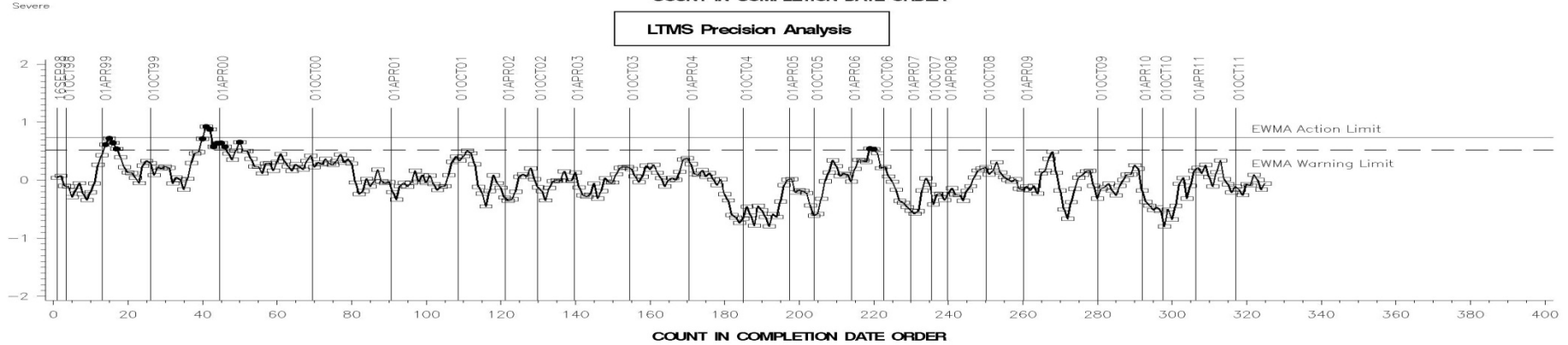
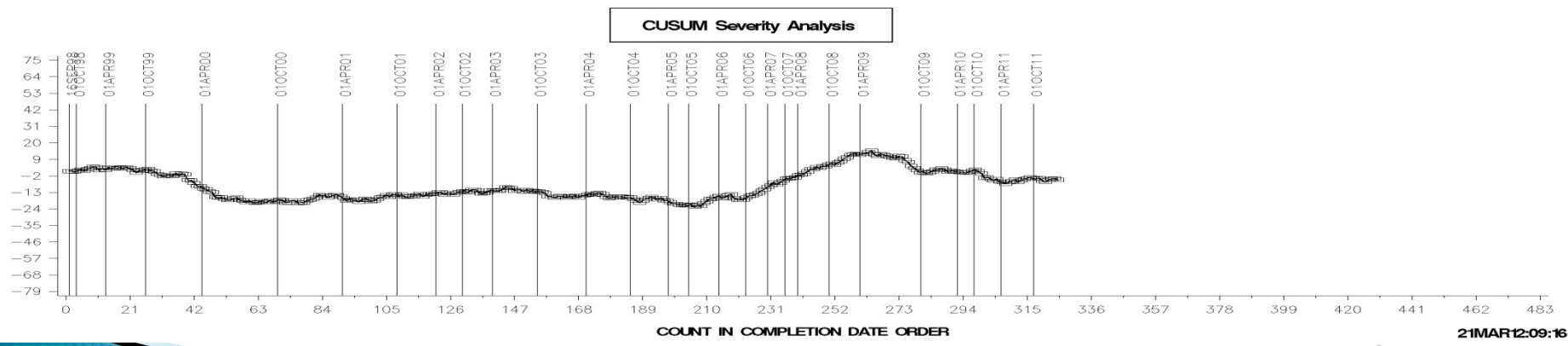
LTMS Severity Analysis



LTMS Precision Analysis



CUSUM Severity Analysis



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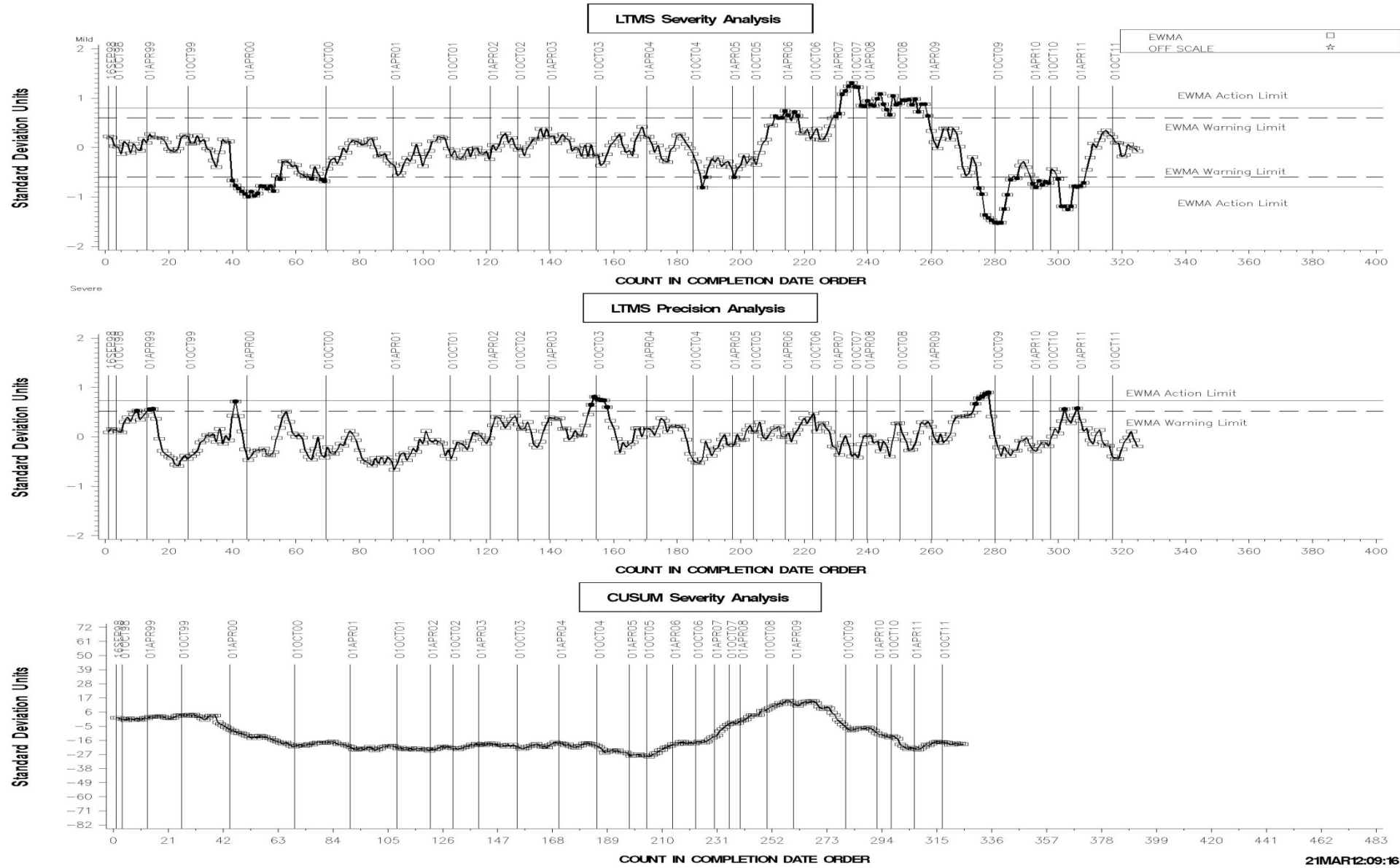
SEQUENCE VG INDUSTRY OPERATIONALLY VALID DATA

AVG PISTON SKIRT RATING



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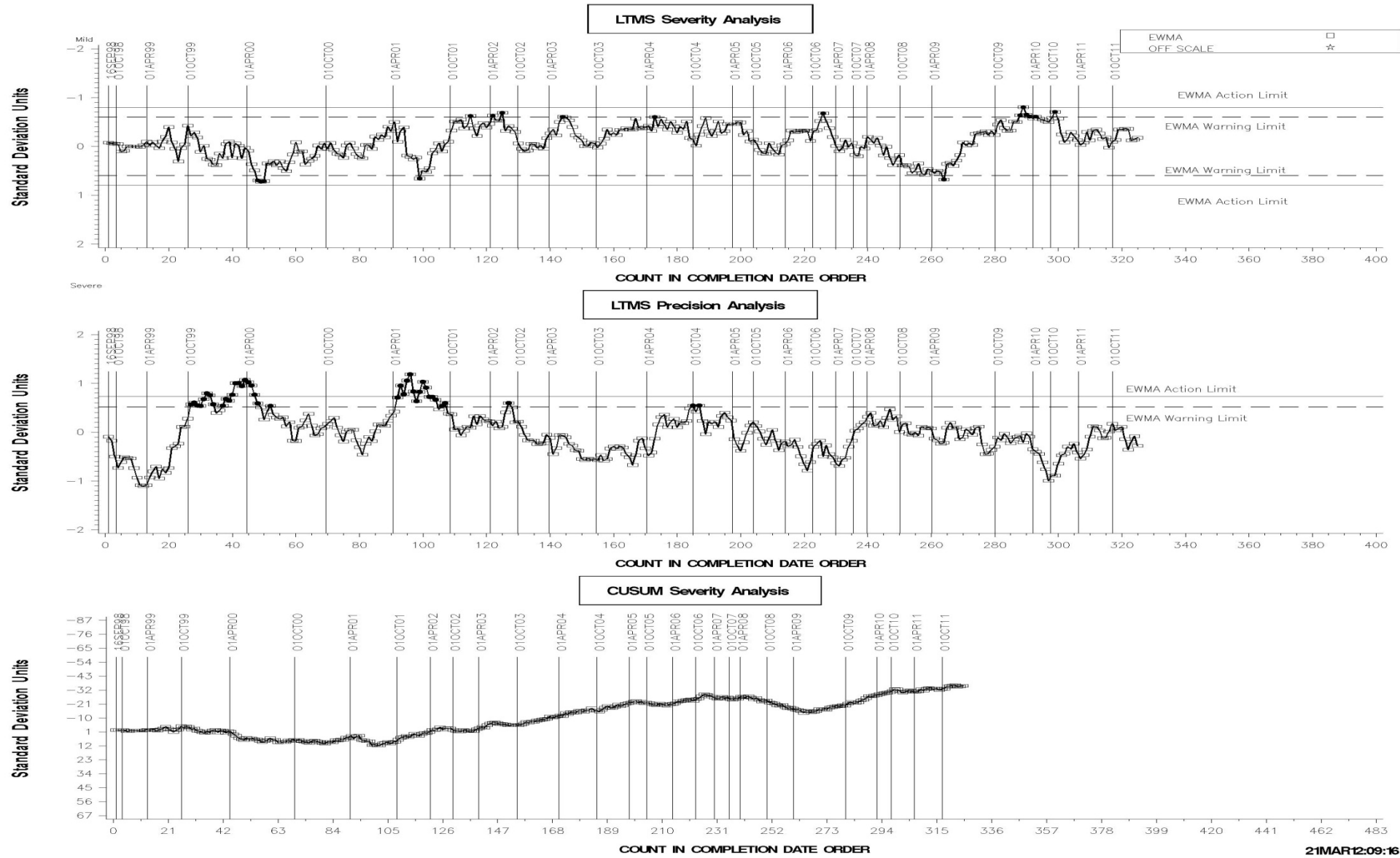
SEQUENCE VG INDUSTRY OPERATIONALLY VALID DATA

OIL SCREEN SLUDGE



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Return

Attachment 4

haltermannsolutions

SVGMII Fuel Report

Confidential Do Not Share

Mark Overaker
Director of Manufacturing and Supply Chain
Haltermann Products
March 29, 2012

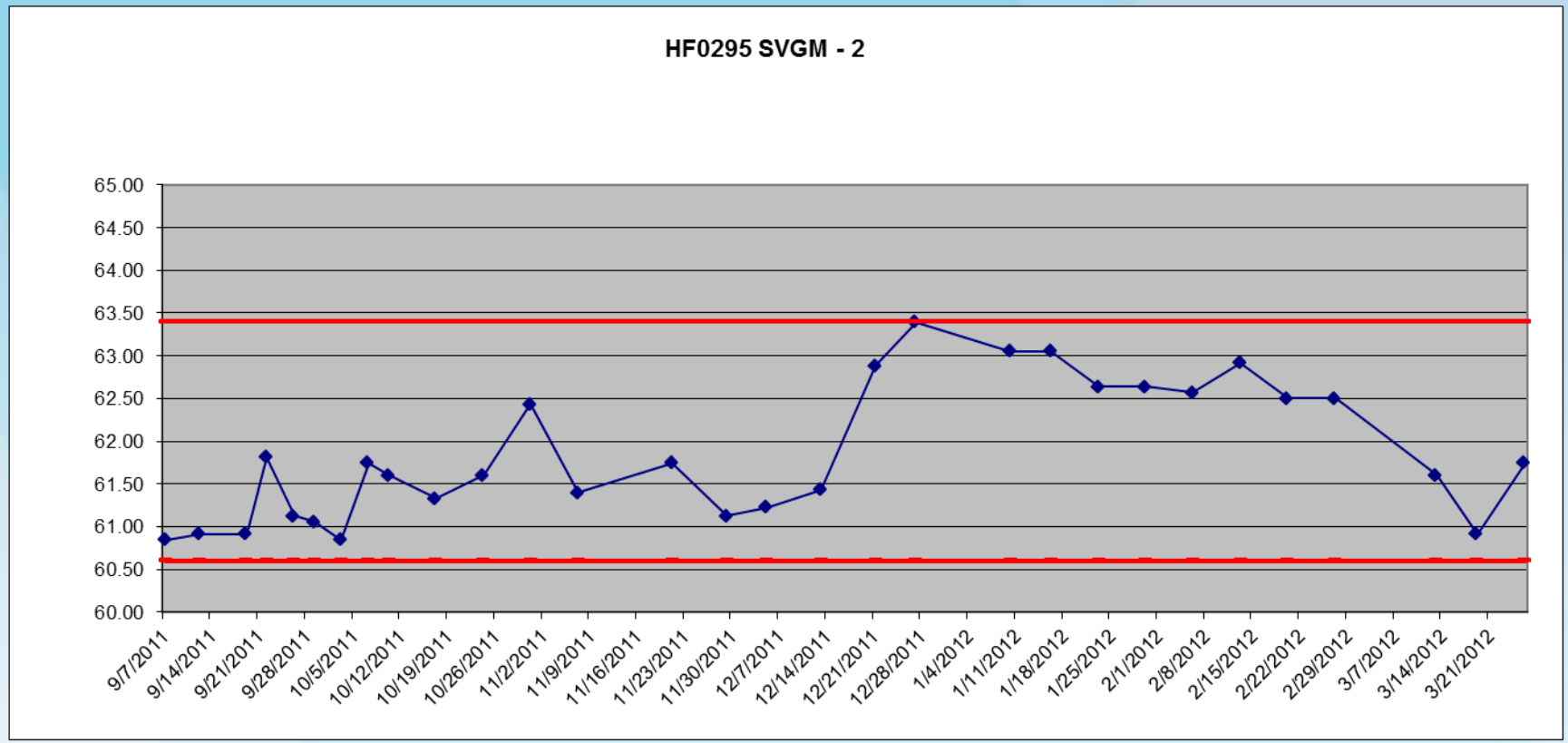
Agenda

- Fuel adjustments – Tank History
  - Excel file submitted
- Fuel – Tank Survey
  - Excel File submitted
- Current inventory
- Consumption rate
- Timeframe to next batch
- VH needs
- Failing oil status

Tank Adjustments

PRODUCT:	SVGM2				Batch No.:	YJ0621NX10-1	YJ0621NX10-1	YJ0621NX10-1	XC2721NX10
HALTERMANN						RVP bump	RVP bump		
PRODUCT CODE:	HF0295				Tank No.:	62	62	62	62
Seq. VG					Date:	12/20/2011	10/6/2011	6/24/2011	3/31/2009
TEST	METHOD	UNITS		SPECIFICATIONS		RESULTS	RESULTS	RESULTS	RESULTS
			MIN	TARGET	MAX				
Distillation - IBP	ASTM D86	°C	23.9		35.0			31.2	28.9
5%		°C						45.8	44.1
10%		°C	48.9		57.2			52.9	51.3
20%		°C						64.6	64.6
30%		°C						79.4	80.7
40%		°C						97.5	98.6
50%		°C	98.9		115.6			108.0	108.3
60%		°C						115.2	114.4
70%		°C						124.0	123.4
80%		°C						144.8	145.3
90%		°C	162.8		176.6			173.7	175.4
95%		°C						183.8	192.8
Distillation - EP		°C	196.1		212.8			210.2	208.6
Recovery		vol %		Report				98.7	98.0
Residue		vol %			2.0			0.7	1.1
Loss		vol %		Report				0.6	0.9
Gravity	ASTM D4052	°API		Report		57.9	57.9	57.9	57.6
Specific Gravity	ASTM D4052			Report				0.7473	0.7474
Reid Vapor Pressure	ASTM D5191	kPa	60.6		63.4	62.9	62.5	62.0	62.7
Carbon	ASTM E191	wt fraction	0.8580		0.8690			0.8616	0.8632
Hydrogen	ASTM E191	wt fraction						0.1333	0.1321
Carbon	ASTM D3343	wt fraction		Report				0.8676	0.8664
Oxygen	ASTM D4815	wt %			0.05			None Detected	<0.01
Sulfur	ASTM D5453	mg/kg			200			53	<17.0
Lead	ASTM D3237	mg/l			2.6			None Detected	<2.5
Phosphorous	ASTM D3231	mg/l			1.3			None Detected	<0.2
Composition, aromatics	ASTM D1319	vol %			35.0			32.8	30.4
Composition, olefins	ASTM D1319	vol %	5.0		10.0			6.9	5.9
Composition, saturates	ASTM D1319	vol %		Report				60.4	63.8
Oxidation Stability	ASTM D525	minutes	1440					1440+	>1440
Copper Corrosion	ASTM D130				1			1a	1a
Existent gum, washed	ASTM D381	mg/100mls			3.0			<0.5	<0.5
Research Octane Number	ASTM D2699		96.0		98.0			97.7	98.0
Motor Octane Number	ASTM D2700			Report				88.3	89.2
R+M/2	D2699/2700			Report				93.0	93.6
Sensitivity	D2699/2700		7.5					9.4	9.2
Net Heat of Combustion	ASTM D240	Btu/lb		Report				18314	18395
Additive, Ethyl antioxidant	calculated	ptb		Report				3.5	3.5

SVGMII RVP maintenance tracking on Tank 62 – Nixon, TX

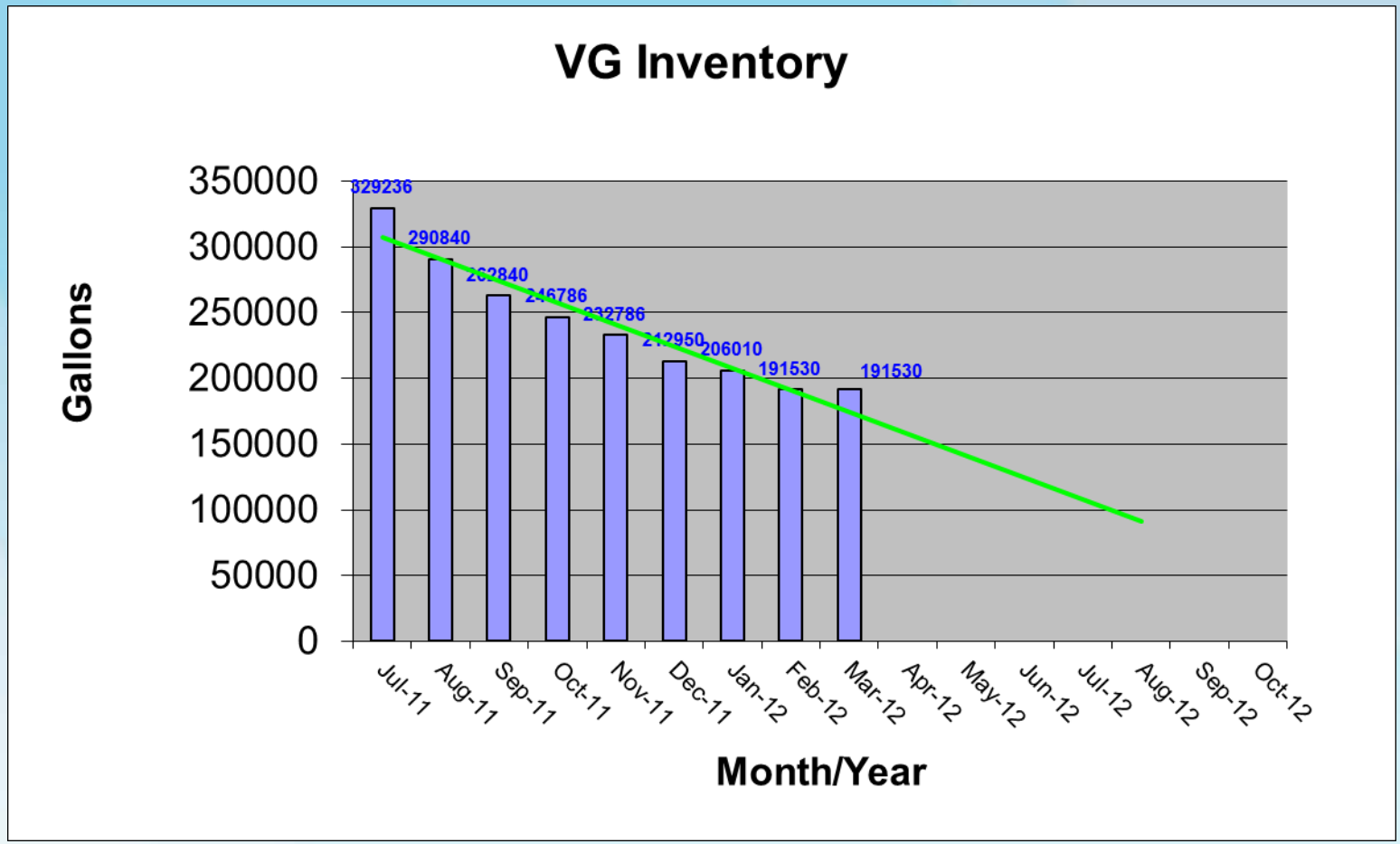


RVP apparatus calibrated week of 03/19 and returned to service 3/26/2012

Fuel Survey – 2012 results

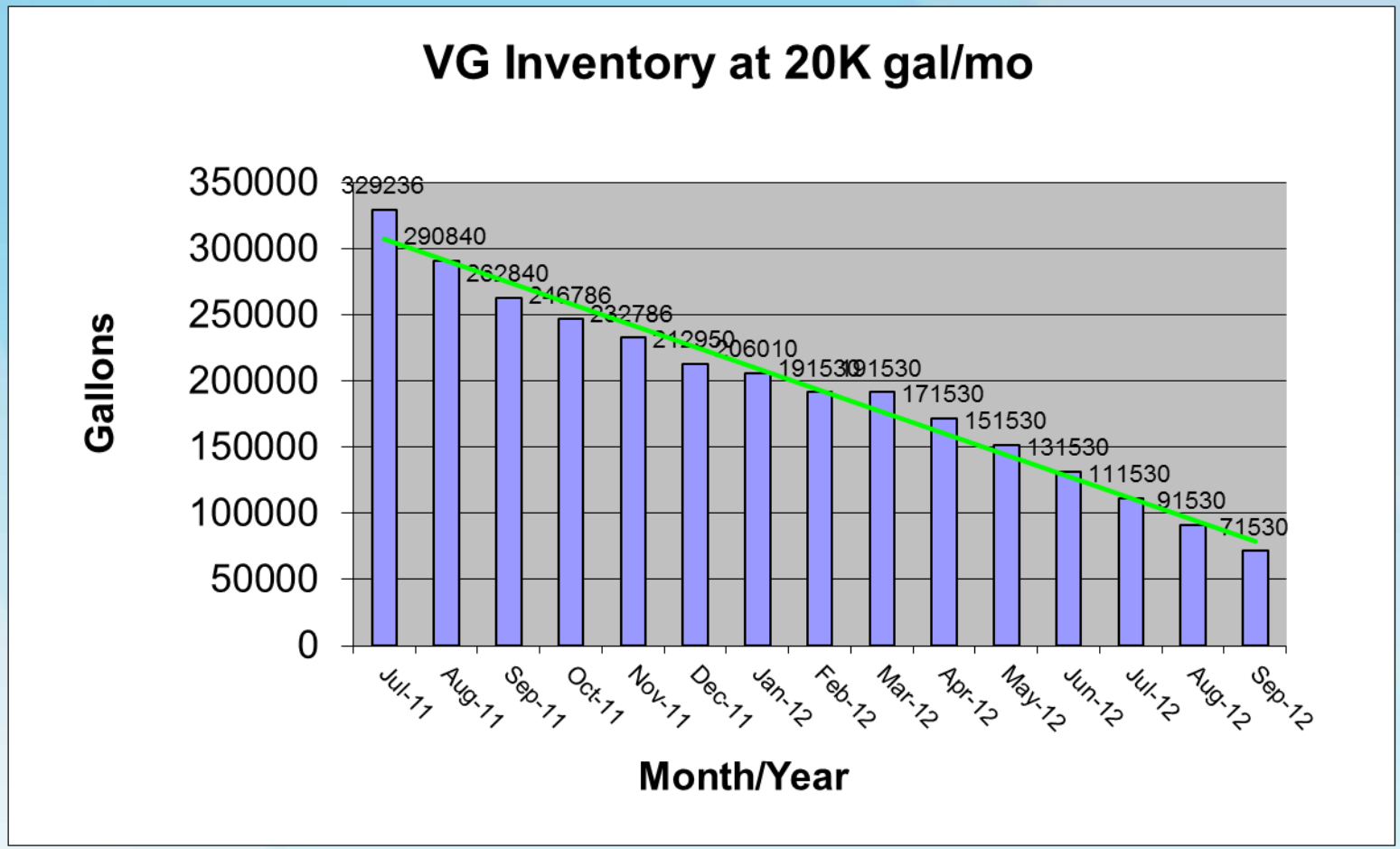
					Date received:	3/16/2012	3/16/2012	3/16/2012	3/16/2012	3/12/2012	2/28/2012	2/24/2012	2/20/2012	2/20/2012	2/10/2012	1/20/2012	1/20/2012	1/11/2012	1/9/2012	1/4/2012
					Analysis date:	3/20/2012	3/19/2012	3/20/2012	3/19/2012	3/13/2012	2/28/2012	2/27/2012	2/20/2012	2/20/2012	2/10/2012			1/11/2012	1/9/2012	1/5/2012
TEST	METHOD	UNITS		SPECIFICATIONS		Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results
			MIN	TARGET	MAX															
Distillation - IBP	ASTM D86	°C	23.9		35.0	28.4	29.6	29.2	30.8	28.6	28.3	28.7	28.6	28.7	30.9	30.0	28.7	30.4	30.3	28.9
5%		°C				42.7	43.8	45.0	47.8	41.5	41.3	41.8	41.4	43.4	43.9	44.5	43.9	41.6	41.9	43.2
10%		°C	48.9		57.2	50.6	51.4	53.6	55.5	49.6	49.5	50.0	49.6	52.3	51.6	51.8	52.0	49.5	49.6	51.2
20%		°C				63.9	64.2	67.7	68.8	62.1	62.2	62.6	62.3	66.1	63.9	64.3	66.0	61.9	62.2	64.0
30%		°C				80.5	80.5	84.5	85.0	77.7	77.9	77.9	78.3	83.1	79.1	79.8	82.6	77.3	77.8	79.3
40%		°C				99.2	99.2	101.2	101.3	96.9	97.2	96.5	97.5	99.0	97.2	98.3	99.9	96.0	96.8	97.6
50%		°C	98.9		115.6	110.5	110.5	110.0	110.2	109.0	109.6	108.8	109.5	109.9	109.4	109.9	109.6	109.1	109.4	109.4
60%		°C				117.7	117.5	115.8	116.2	116.0	116.1	115.8	116.0	116.0	116.4	116.7	115.6	116.0	116.1	116.3
70%		°C				128.3	128.3	124.1	124.0	124.6	124.8	124.6	124.7	123.6	125.1	125.2	123.5	124.7	124.9	125.1
80%		°C				151.8	152.8	144.2	142.7	146.3	146.3	145.7	145.7	142.9	146.0	146.2	142.9	145.5	145.6	146.8
90%		°C	162.8		176.7	174.6	175.4	173.2	172.8	173.9	173.8	173.7	173.6	173.0	174.0	173.8	173.3	172.8	173.6	174.0
95%		°C				185.3	187.3	185.6	183.8	185.0	185.5	184.7	185.0	185.4	185.5	184.8	184.9	184.6	185.2	185.2
Distillation - EP		°C	196.1		212.8	210.8	211.8	213.1	208.4	211.2	211.8	210.3	212.0	213.0	213.1	208.8	212.9	212.2	211.3	211.5
Recovery		vol %		Report		97.9	98	98.1	99.2	97.1	97.1	97.3	96.9	97.6	97.3	98.6	97.9	96.9	96.9	97.6
Residue		vol %			2.0	1.1	1.1	1.1	0.8	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Loss		vol %		Report		1.0	0.9	0.8	0.0	1.8	1.8	1.6	2.0	1.3	1.6	0.3	0.1	2.0	2.0	1.3
Gravity	ASTM D4052	°API		Report			56.7		56.7	57.5	56.9	57.1	56.9	56.6	57.3	57.3	56.7	57.0	57.2	56.9
Specific Gravity	ASTM D4052	-		Report			0.752		0.7519	0.7479	0.7511	0.7501	0.7509	0.7523	0.7496	0.7495	0.7521	0.75	0.7498	0.7512
Reid Vapor Pressure	ASTM D5191	kPa					62.6		60.5	61.9	60.7	59.9	61.6	60.4	60.7	61.6	60.4	60.5	60.1	60.6
Existent gum, unwashed	ASTM D381	mg/100mls		Report			1.5		0.5	<0.5	3.5	<0.5	<0.5	<0.5	1.0	<0.5	<0.5	<0.5	1.0	<0.5
Existent gum, washed	ASTM D381	mg/100mls			3.0		<0.5		0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
					ANALYST	JJB	JJB	JJB	JJB	JJB	JJB	JJB	JAM	JAM	JJB	JJB	JJB	JJB	JJB	JJB

Current Inventory
191530 gallons



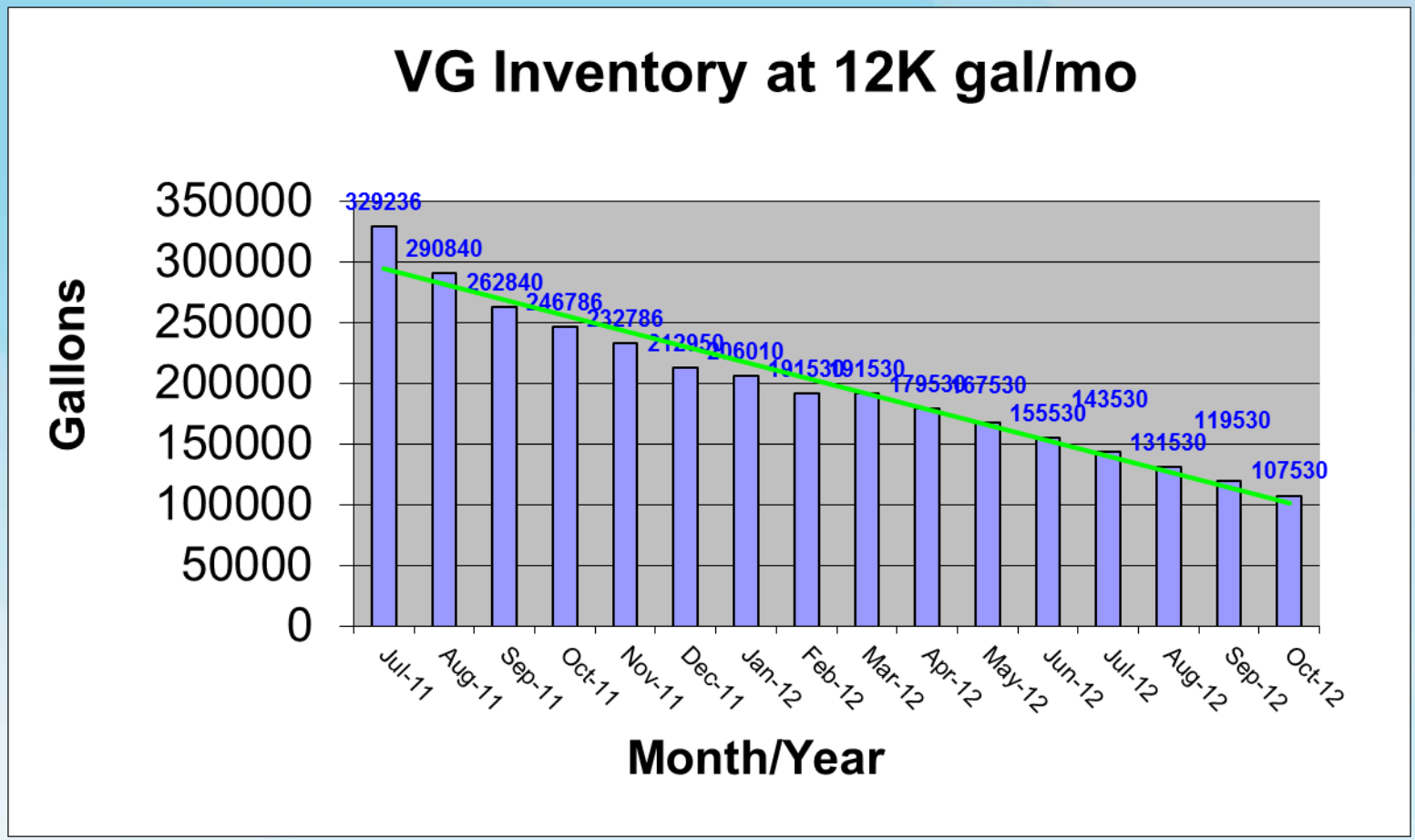
Actual usage rate suggests September 2012 rebuild
Action level approx. 70K gallons

Rebuild assuming 20K gallon rate from March 2012



20K gallon rate suggests Sept. 2012 rebuild
Action level approx. 70K gallons

Rebuild assuming 12K gal rate from March 2012



12K gallon rate suggests Dec. 2012 rebuild
Action level approx. 70K gallons

VH needs

- Fuel for VH testing
  - How much is needed
  - Which labs
- Accounting for fuel
  - Haltermann to supply fuel for the study
  - Segregated storage at labs

Failing Oil Status - 925 inventory

- 925 in short supply
- Has an alternate oil been identified
- Is this still an issue

PRODUCT: **SVGM2**
HALTERMANN
PRODUCT CODE: **HF0295**
Seq. VG

Batch No.:	YJ0621NX10-1	YJ0621NX10-1	YJ0621NX10-1	XC2721NX10
	RVP bump	RVP bump		
Tank No.:	62	62	62	62
Date:	12/20/2011	10/6/2011	6/24/2011	3/31/2009

TEST	METHOD	UNITS	SPECIFICATIONS			RESULTS	RESULTS	RESULTS	RESULTS
			MIN	TARGET	MAX				
Distillation - IBP	ASTM D86	°C	23.9		35.0			31.2	28.9
5%		°C						45.8	44.1
10%		°C	48.9		57.2			52.9	51.3
20%		°C						64.6	64.6
30%		°C						79.4	80.7
40%		°C						97.5	98.6
50%		°C	98.9		115.6			108.0	108.3
60%		°C						115.2	114.4
70%		°C						124.0	123.4
80%		°C						144.8	145.3
90%		°C	162.8		176.6			173.7	175.4
95%		°C						183.8	192.8
Distillation - EP		°C	196.1		212.8			210.2	208.6
Recovery		vol %		Report				98.7	98.0
Residue		vol %			2.0			0.7	1.1
Loss		vol %		Report				0.6	0.9
Gravity	ASTM D4052	°API		Report		57.9	57.9	57.9	57.6
Specific Gravity	ASTM D4052			Report				0.7473	0.7474
Reid Vapor Pressure	ASTM D5191	kPa	60.6		63.4	62.9	62.5	62.0	62.7
Carbon	ASTM E191	wt fraction	0.8580		0.8690			0.8616	0.8632
Hydrogen	ASTM E191	wt fraction						0.1333	0.1321
Carbon	ASTM D3343	wt fraction		Report				0.8676	0.8664
Oxygen	ASTM D4815	wt %			0.05			None Detected	<0.01
Sulfur	ASTM D5453	mg/kg			200			53	<17.0
Lead	ASTM D3237	mg/l			2.6			None Detected	<2.5
Phosphorous	ASTM D3231	mg/l			1.3			None Detected	<0.2
Composition, aromatics	ASTM D1319	vol %			35.0			32.8	30.4
Composition, olefins	ASTM D1319	vol %	5.0		10.0			6.9	5.9
Composition, saturates	ASTM D1319	vol %		Report				60.4	63.8
Oxidation Stability	ASTM D525	minutes	1440					1440+	>1440
Copper Corrosion	ASTM D130				1			1a	1a
Existent gum, washed	ASTM D381	mg/100mls			3.0			<0.5	<0.5
Research Octane Number	ASTM D2699		96.0		98.0			97.7	98.0
Motor Octane Number	ASTM D2700			Report				88.3	89.2
R+M/2	D2699/2700			Report				93.0	93.6
Sensitivity	D2699/2700		7.5					9.4	9.2
Net Heat of Combustion	ASTM D240	Btu/lb		Report				18314	18395
Additive, Ethyl antioxidant	calculated	ptb		Report				3.5	3.5

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Test Monitoring Center

http://astmtmc.cmu.edu

Replacement Oil for 925-3

Sequence V Surveillance Panel

March 29, 2011

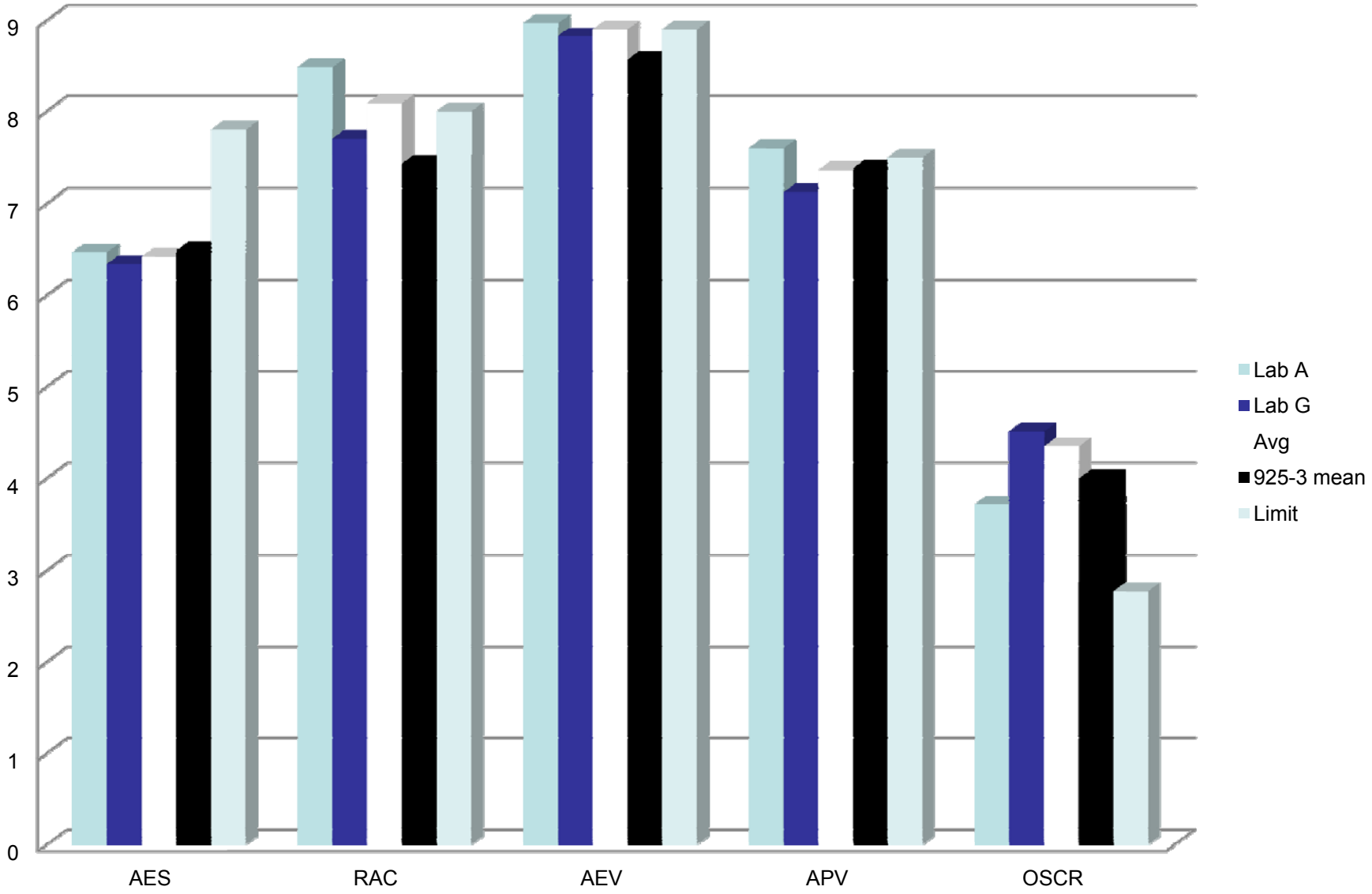
Summary of Results

- 2 tests reported from different labs
- Test run in January of this year, completed within 2 weeks of each other.
- Summary in next few slides

Summary of Test Results

Lab	AES	RAC	AEV	APV	OSCR	OSCRTi
A	6.47	8.48	8.97	7.6	40	3.7136
G	6.34	7.7	8.82	7.12	90	4.5109
925	6.49	7.43	8.56	7.38	53	3.997

Potential 925 Replacement Results Compared to 925-3, all parameters



All results severity adjusted, where appropriate.

Test Monitoring Center
http://astmtmc.cmu.edu
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Summary

- Based on Results:
- Oil's AES performance is comparable to 925-3
- RAC is milder and appears to be borderline
- AEV performance is borderline, somewhat milder than 925-3
- APV performance is similar to 925-3
- OSCR is a fail and similar to 925-3

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Sequence VG Surveillance Panel
March 29, 2012
1:00PM – 5:00PM
Omni Corpus Christi Hotel, Bayfront Tower
Corpus Christi, TX

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

1. Action Item – Keep previous action item addressing RO 1010 introduction into the VG test open.

2. Action Item – Ron Romano to follow up with FCS on the status of the pistons and rings from the current industry hardware order and report back to the test labs.

3. Action Item – Haltermann to set SVGM2 rebuild trigger at 70,000 gallons, Haltermann and surveillance panel to monitor and consider starting discussion on rebuild during summer 2012.

4. Action Item – TEI to inquire with camshaft bearing supplier (Durabond) about the availability of the line boring tool or a procedure to machine the VG cylinder heads for the Durabond camshaft bearing inserts.

5. Action Item – Ron Romano to contact Ford 4.6L remanufacturing engineers to obtain information on line boring the VG cylinder heads.

6. Motion – Accept the RO 925-3 replacement oil as a failing VG reference oil and continue with introduction of this reference oil. The surveillance panel instructs the TMC to contact the oil supplier about procurement of this reference oil.

   Bill Buscher / Ed Altman / Passed 10-0-0

7. Action Item – The RO 925-3 replacement oil introduction to be completed prior to the introduction of the next SVGM2 fuel batch, and as soon as possible for VH development use.