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Committee D02 on PETROLEUM PRODUCTS AND LUBRICANTS

Issued: Feb. 20, 2013

Reply to: Dan Worcester
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These are the unapproved minutes of the 02.13.2013 Sequence VI Surveillance Panel meeting.

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

Agenda

The Agenda is the included as Attachment 1.

1.0 Roll Call

The Attendance list Attachment 2.
Jo Martinez will now be the voting member for Oronite.

2.0 Approval of minutes

2.1 Approval of the minutes of the 09.26.2012 meeting.

Motion – Accept the minutes of the 09.26.2012 VID SP CC.
Charlie Leverett, Dan Worcester, second. Unanimous.

3.0 Action Item Review

3.1 OHT to report VIx engine usage.
There are 36 2009 and 147 2012 engines in inventory. Six 2012 engines have been purchased by labs as of this meeting.

3.2 A Task Force is reviewing the VIE Draft Procedure. Dave Glaenzer is the Chair.
The procedure first review is complete, and work continues on the modified version. There are some action items that will be completed and reviewed at the next SP meeting.

3.3 Identify a list of ancillary components needed to last the life of the Sequence VID test with both the MY2009 and MY2012 engines and provide to GM.
Jerry Brys will work on this list with representatives from other test labs.
Jason Bowden stated a resistor replacement would not work for the knock sensor. They are coordinating with Bosch for a life order for the current knock sensor and the E77 ECM with the VID code [Revision 3]. OHT will also purchase more MAF sensors from GM.

4.0 Old Business

4.1 Resolve oil charge for VIE, as a reminder GM did state the 2012 engine does require and additional 500 ml of oil due to the design change of the 2012 blocks internal oil gallery.
OHT was given an action to modify the displacement block but the consensus was that a better solution was to increase the oil charge. There have already been tests with 1200 ml oil consumption, and more oil is now outside the engine with the larger #12 and #10 lines.

Motion – Increase the oil charge to 5.9 litres on the 2012 VIE engine.
Andy Richie / Dan Worcester / This was tabled for further discussion. There was concern that the increased oil charge should also include a longer aging period. There was information review that oxidation [DIR 5.8] was not affected by oil charge. See Attachment 4.

4.2 Resolve the Aging hrs for the VIE. Afton gave a presentation on aging included as Attachment 5 that recommended 100 hours of aging remain in the VIE test. Jim Linden requested the oil charge and aging be combined in a single motion.

Motion – Increase the oil charge to 5.9 litres and aging to 125 hours.
Robert Stockwell / Jim Linden / There was one negative vote and one waive; the motion passed.

4.2 Update on 541-1 targets - We are at 16 tests and the means are within 0.25 std dev of targets and the std dev have not improved or degraded.

4.3 The knock sensor has been discontinued. A resistor was suggested.
OHT has talked to Bosch and their response was that the resistor will not work. Bosch has confirmed that the current knock sensor and ECU (we will have them flash them to the current revision) can be acquired through a one-time purchase.

4.4 New blend of BC & FO The new blends will ship the week of 02.18.2013.

4.5 Burnt Valves – Lubrizol has had another experience with a burnt valve even after incorporating the 5000 rpm runs. IAR, LZ and SwRI have experienced burned valves. LZ pulled their heads and GM is performing a review. They were run with the 5000 RPM for 5 minutes each test. GM will report.

5.0 New Business

5.1 SwRI Presentation from Dan on Load Cells This action came from the VIE procedure review. The first motion updates the load cell specifications to metric parameters, and two devices from Interface are included that meet the specifications. See Attachment 7.

- **Motion –** Recommend to VID panel:
- Modify Section 6.4.2.1 as follows:
- 6.4.2.1 *Dynamometer Load Cell*—Measure the dynamometer torque by a load cell of (0 to 45) kg. The dyno load cell is required to have the following features:
- *(1)* Good temperature stability:
- Zero ≤ 0.0036 % Rated Output/ºCelsius - MAX
- Span ≤ 0.0036 % Rated Output/ºCelsius - MAX
- *(2)* Nonlinearity ≤ 0.05 % Rated Output.
- *(3)* Temperature compensation over range expected in laboratory (21 to 40) °C. A Lebow Model 3397, Interface 1500ASK, Interface SSM load cells (see X1.5) have been found suitable for this application.
- Effective date of 02.13.2013.

Dan Worcester/Dave Glaenzer Passed unanimous.

- **Motion –** Recommend to VID panel:
- Modify Section 6.4.2.3 as follows:
- 6.4.2.3 *Dynamometer Load Cell Temperature Control*—Control the load cell temperature. Enclose the dynamometer load cell to protect it from the variability of laboratory ambient temperatures. Mount the enclosure to the minimize vibration effects on the load cell. Plumbing the engine intake air supply to the enclosure has been found to be a good method for temperature control. A band heater is optional as supplementary control. Maintain air in the enclosure within the operating temperature range of 29 ± 6 °C. Control temperature by a means that does not cause uneven temperatures on the body of the load cell.

Dan Worcester/ This motion was tabled as there was concern a specification range on load cell temperature might not work at all labs. The motion will be modified to only include plumbing engine intake air to the enclosure.

5.2 Reference Oils for the VIE.

No new reference oils have been provided at this time.

6.0 Next Meeting or Conference Call

Dave's VIE Procedure Task Force should be ready to report out in mid March, I will work with Dave to arrange this meeting.

6.0 Meeting Adjourned

The meeting adjourned at 2:36 PM.

Charlie Leverett, Rich Grundza, second. Unanimous.

Sequence VI SP Conference Call
Feb. 13, 2012 at 1:00 CT
Call-in#: 800-391-9177
Pass Code#: 4875645502

Agenda

1.) Roll Call

2.) Membership Changes?

3.) **Approval of minutes from 09-26-2012.** *Dan, Have your received any comments?*

4.) Action Items:

4.1) OHT to report VI engine usage 2009 & 2012.

4.2) A Task Force will be setup prepare the Draft Procedure for the VIE. Dave has agreed to chair the Task Force. In Process

4.3) Identify a list of ancillary components needed to last the life of the Sequence VID test with both the MY2009 and MY2012 engines and provide to GM. Jerry Brys agreed to work on this list with representatives from other test labs.

5.0) Old Business

5.1) Resolve oil charge for VIE, as a reminder GM did state the 2012 engine does require and additional 500 ml of oil due to the design change of the 2012 blocks internal oil gallery.

5.2) Resolve the Aging hrs for the VIE.

5.3) Update on 541-1 targets - We are at 16 tests and the means are within 0.25 std dev of targets and the std dev have not improved or degraded.

5.4) We had some discussion in the last call on the large demand for the knock sensor and there was no inventory and no currently available replacement part. The GM part number has been discontinued. IAR had tried remote mounting without success, ***so a resistor may be the best solution*** *as the ECM still detects the knock sensor and Lubrizol has a presentation that a failure in this area will affect ignition timing. Their wiring*

harness failed, rather than the sensor itself. A heat insulator boot will help with this problem.

OHT has talked to Bosch and their response was that the resistor will not work. Bosch has confirmed that the current knock sensor and ECU (we will have them flash them to the current revision) can be acquired through a one-time purchase.

5.5) New blend of BC & FO – Labs should have received their orders soon.

6.0) New Business

6.1 SwRI Presentation from Dan on Load Cells

6.2 Reference Oils for the VIE.

6.3) Any additional new business?

6.4) Afton Presentation from Greg/Dave

7.0) Next Meeting or Conference Call

7.1) Dave's VIE Procedure Task Force should be ready to report out in mid March, I will work with Dave to arrange this meeting.

Meeting Adjourn

ASTM SEQUENCE VI

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

ASTM SEQUENCE VI

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

Guests

Ed Altman	ed.altman@aftonchemical.com	Afton	
Bob Campbell	Bob.Campbell@aftonchemical.com	Afton	YES
Todd Dvorak	todd.dvorak@aftonchemical.com	Afton	
Christian Porter	Christian.porter@aftonchemical.com	Afton	YES
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	Phone: 210.563.0785		
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Scott Stap	Scott.stap@tgdirect.com	TG Direct	
Dwight Bowden	dhbowden@ohtech.com	OHT	
Matt Bowden	mjbowden@ohtech.com	OHT	YES
Clayton Knight	cknight@tei-net.com	TEI	
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Guy Stubbs	Guy.Stubbs@swri.org	SwRI	
William Buscher	wbuscher@swri.edu	SwRI	
Jessica Buchanan	Jessica.Buchanan@Lubrizol.com	Lubrizol	YES
Teri Kowalski	teri.kowalski@tema.toyota.com	Toyota	
Bob Olree	olree@netzero.net	Consultant	YES
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Mike McMillan	mmcmillan123@comcast.net	Infineum	YES
Chris Castanien	Chris.Castanien@lubrizol.com	Lubrizol	YES
Jeremy Styer	Jeremy.styer@aftonchemical.com	Afton	YES

IAR VID Aging Experiment

9/14/2012

	Test Number	CMIR	DIR 5.8	DIR 6.1	KV40	KV100	OC
New							
Normal Oil Charge	3-131-2012A-4	89842	--	--	45.18	8.021	--
+500 ml Oil Charge	2-153-GM1-5	89841	--	--	44.75	7.944	--
75 Hours							
Normal Oil Charge	3-131-2012A-4	89842	6	6	43.50	7.694	500
+500 ml Oil Charge	2-153-GM1-5	89841	5	5	45.04	7.942	600
100 Hours							
Normal Oil Charge	3-131-2012A-4	89842	**7**	7	44.25	7.771	700
+500 ml Oil Charge	2-153-GM1-5	89841	**7**	7	45.90	8.026	800
125 Hours							
Normal Oil Charge	3-131-2012A-4	89842	9	9	45.09	7.905	700
+500 ml Oil Charge	2-153-GM1-5	89841	9	10	46.76	8.132	1200
150 Hours							
Normal Oil Charge	3-131-2012A-4	89842	11	12	46.23	8.002	800
+500 ml Oil Charge	2-153-GM1-5	89841	11	14	47.75	8.245	1300

Original GM Vehicle Oil C Averages							
2k Miles			5	--	42.52	7.67	--
6.5k Miles			**11**	--	45.26	7.89	--

Sequence VID to Sequence VIE Aging Comparison

Information for consideration at the February 13, 2013
Sequence VID Surveillance Panel teleconference

Analysis Date: February 8, 2013

Passion for Solutions™

Information in Presentation

- **Summary of Consortium Vehicle Data**
  - Matrix Test Oils and Test Car Summary
  - Matrix Oil Aging Data
    - Oxidation, Viscosity Change, Volatile Oil Consumption
- **Comparisons of Sequence 2008 LY7 Engine to 2012 LY7 Under Standard Sequence VID Aging Conditions**
  - SAE 5W-20 test oil
  - SAE 5W-30 test oil
- **Recommendations**

Sequence VID Consortium Background Data

- **43 Usable Data Points from 8 vehicles**
  - Data found on the TMC website
- **0-mile data on each oil used to baseline for fresh oil**

Test Oil Information

Supplier	Oil Code	Properties
1	A	5W-20 – No FM
1	B	A + Organic FM
1	C	A + Moly @ 200 ppm
1	D	A as 5W-30 (no FM)
1	E	A as 10W-30 (no FM)
1	F	Z + 5X detergent (flush oil)
1	L	A as 0W-20 (no FM)
1	Z	Baseline 20W-30
2	G	5W-30 (no FM)
2	H	G + Organic FM
2	I	G + Moly @ 600 ppm
3	J	0W-20 + Moly @ 1000 ppm
3	K	5W-20 + Moly @ 1000 ppm

Test Car Information

Vehicle	Number
Buick LaCrosse	2
Pontiac G6	2
Chevrolet SSR	1
Saab 9.5 Aero	1
Cadillac DHS	1
Nissan	1

Average Results from Vehicles

- **Data summarized by Oil Code and Supplier**
- **IR Oxidation, KV40 Viscosity Change, and Percent Calcium Change***

* Percent Ca change represents the amount of volatile oil consumption

OIL	Vis Grade	Supplier	N	Oxidation	KV40 Change, %	Ca Change, %
A	5W-20	1	8	11.0	-1.8	2.6
B	5W-20	1	4	13.5	3.9	10.3
C	5W-20	1	8	10.5	-0.5	4.5
D	5W-30	1	5	12.4	-5.9	4.8
G	5W-30	2	4	12.3	-10.8	-0.5
H	5W-30	2	3	10.3	-9.6	3.6
I	5W-30	2	5	11.4	-9.6	-2.5
J	0W-20	3	5	11.4	-3.5	1.8
K	5W-20	3	1	16.0	17.3	-2.1

Supplier	Vis Grade	Oxidation	KV40 Change, %	Ca Conc. Change, %
Supplier 1	5W-20	11.7	0.5	5.8
Supplier 1	5W-30	12.4	-5.9	4.8
Supplier 2	5W-30	11.3	-10.0	0.2

Conclusions:

- Oxidation performance very similar between oils
- Viscosity Change is Supplier and vis-grade dependent
- Volatile oil consumption as determined by calcium concentration change is supplier dependent

Note: Not all test cars tested all oils, explaining some of the variation in results.

Afton CHEMICAL

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2008 LY7 and 2012 LY7 Comparison Data

- **Data from two oils run in 2008 and 2012 LY7 engines at standard Sequence VID conditions**
  - GF-5 Oil (SAE 5W-20)

Test Engine	N	Oxidation	KV40, % Change	Ca Cond. Change, %
2008 LY7	3	8.18	-3.9%	6.1%
2012 LY7	3	7.83	-8.7%	0.3%

  - GF-6 Concept Oil, SAE 5W-30
    - Meets GF-6 proposed engine-protection limits by ILSAC using GF-5 engine tests

LY7 Engine	N	Oxidation	KV40, % Change	Ca Cond. Change, %
2008	3	10.12	-7.59%	7.64%
2012	3	8.67	-12.07%	-0.15%

Conclusions from 5W-20:

- 2012 LY7 engine is slightly milder on oxidation but produces PVIS and volatile oil consumption that is similar to Supplier 2 data in test vehicles

Conclusions from SAE 5W-30

- 2012 LY7 engine is milder on oxidation but produces PVIS and volatile oil consumption that is similar to Supplier 2 data.

Recommendations to Sequence VID Panel

- **The Surveillance Panel needs clear direction from ILSAC regarding oil-aging targets**
  - Should the aging conditions with the 2012 LY7 produce used-oil properties that are comparable to the Sequence VID?

    or
  - Should the aging conditions with the 2012 LY7 produce used-oil properties that are comparable to the Consortium vehicles?

- **Afton supports the use of standard Sequence VID aging conditions for the 2012 LY7 engine.**
  - These conditions produce oil aging properties that are more consistent with the Consortium vehicles for which the Sequence VI test is meant to correlate.

VID LOAD CELLS

SECTIONs 6.4.2.1, 6.4.2.3

LEBOW 3397 SPECIFICATIONS

- 6.4.2.1 *Dynamometer Load Cell*—Measure the dynamometer torque by a load cell of (0 to 45) kg. The dyno load cell is required to have the following features:
- *(1)* Good temperature stability:
- Zero $\leq$ 0.0036 % Rated Output/ºCelsius - MAX
- Span $\leq$ 0.0036 % Rated Output/ºCelsius - MAX
- *(2)* Nonlinearity $\leq$ 0.05 % Rated Output.

HONEYWELL SPECIFICATIONS

- Honeywell still in °F
- *(1)* Good temperature stability:
- Zero $\leq$ 0.002 % Rated Output/ºF
- Span $\leq$ 0.002 % Reading/ºF
- *(2)* Nonlinearity $\leq$ 0.05 % Rated Output.

INTERFACE SPECIFICATIONS

- Zero $\leq$ 0.0015 % Rated Output/ºCelsius - MAX
- Span $\leq$ 0.0027 % Rated Output/ºCelsius - MAX
- *(2)* Nonlinearity $\leq$ 0.05 % Full Scale.

SURVEILLANCE PANEL MOTION

- Recommend to VID panel:
- Modify Section 6.4.2.1 as follows:
- 6.4.2.1 *Dynamometer Load Cell*—Measure the dynamometer torque by a load cell of (0 to 45) kg. The dyno load cell is required to have the following features:
- *(1)* Good temperature stability:
- Zero $\leq$ 0.0036 % Rated Output/ºCelsius - MAX
- Span $\leq$ 0.0036 % Rated Output/ºCelsius - MAX
- *(2)* Nonlinearity $\leq$ 0.05 % Rated Output.
- *(3)* Temperature compensation over range expected in laboratory (21 to 40) °C. A Lebow Model 3397, Interface 1500ASK, Interface SSM load cells (see X1.5) have been found suitable for this application.
- Effective date of 02.13.2013.
- Add Interface to X1.5

SURVEILLANCE PANEL MOTION

- Recommend to VID and VIE panel:
- Modify Section 6.4.2.3 as follows:
- 6.4.2.3 *Dynamometer Load Cell Temperature Control*— Control the load cell temperature. Enclose the dynamometer load cell to protect it from the variability of laboratory ambient temperatures. Mount the enclosure to the minimize vibration effects on the load cell. Plumbing the engine intake air supply to the enclosure has been found to be a good method for temperature control. A band heater is optional as supplementary control. Maintain air in the enclosure within the operating temperature range of 29 ± 6 °C. Control temperature by a means that does not cause uneven temperatures on the body of the load cell.
- Effective date of next panel meeting.