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## **Committee D02 on PETROLEUM PRODUCTS AND LUBRICANTS**

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These are the unapproved minutes of the 08.20.2013 Sequence VI Surveillance Panel meeting.

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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**.  
There were no membership changes.

## 2.0 Approval of minutes

2.1 Approval of the minutes of the 04.03.2013 meeting.

**Motion** – Accept the minutes of the 09.26.2012 VID SP CC.  
Dan Worcester, Jason Bowden, second. Unanimous.

## 3.0 Action Item Review

- 3.1 OHT to report VIX engine usage.  
**There are 29 2009 and 147 2012 engines in inventory.**
- 3.2 A Task Force is reviewing the VIE Draft Procedure. Dave Glaenzer is the Chair.  
**There will be a final report in Old Business.**
- 3.3 A new Task Force with Christian Porter as Chair was formed for VI Engine Refresh.  
**There will be a report in New Business.**
- 3.4 Additized VIX fuel.

## 4.0 Old Business

4.1 VIE Standard Update [Dave Glaenzer]

**There were recommendations to control load cell temperature, lengthen calibration periods for the longer test times, and increase shut down limits.**

**As Task Force Chairman, I would like to offer the following motion:**

*The changes detailed in the following paragraphs be incorporated into the Sequence VIE procedure.*

*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 dynamometer base to minimize vibration effects on the load cell. A band heater is optional as supplementary control. Maintain air in the enclosure within the operating temperature range specified by the load cell manufacturer within a variability of no more than  $\pm 6$  °C. Control temperature by a means that does not cause uneven temperatures on the body of the load cell. **Plumbing the engine intake air supply to the enclosure has been found to be a suitable method for temperature control.***

*10.1.1.2 The first three calibration periods on a given stand/engine combination are ten full-length non-reference oil tests or **2200** engine hours or **125** days, whichever occurs first.*

*10.1.1.3 Subsequent calibration periods on a given stand/engine combination are seven full-length non-reference oil tests or **1550** engine hours or **125** days, whichever occurs first.*

*10.1.1.4 If the elapsed time between Sequence VIE tests on a stand/engine combination is more than **125** days EOT (end-of-test) to SOT (start-of-test), a minimum of one operationally valid, statistically acceptable reference oil test is required.*

11.6.1.1 *Unscheduled Shutdown and Restart*—There are no scheduled shutdown periods in the test. Continuous operation is expected from initial warm-up prior to flushing in the BL oil before test oil through the final testing of the BL oil segment after the test oil. If an unexpected shutdown does occur, the maximum allowable downtime per test is 24 h. Only five unscheduled shutdowns per test are allowed. Report all shutdowns and the amount of time per shut down in the downtime occurrence section of the final report. Report all other deviations in test time from the appropriate table in the comment section of the final report. Include details in these comments as to why the deviation occurred and the total time of the occurrence. If unexpected shutdowns occur, the following guidelines apply

**Motion** – Accept the motion of the VIE Task Force.

Dave Glaenzer, Dan Worcester, second. Unanimous.

- 4.2 Further changes for the VIE procedure will need to wait for further industry testing and data analysis. This will include BLB Delta, stage weighting, and aging.
- 4.3 The oil pan levels will need to be reviewed.  
These issues will be added as Action Items.

**5.0 New Business**

5.1 GM presented a Memo on the VIE test

See Attachment 3. The focus was on correcting burned valves. Labs are not able to run 6400 RPM without significant procedure changes. Additized fuel resolves the concern, but the additive supplied to labs for initial testing is no longer available. GM wants a Top Tier additive. They also support continued testing on the 2012 VIE engine.

5.2 There was discussion and data on additized fuel as a solution for burned valves:

Lubrizol @ 744 hrs						
Cylinder #	1	2	3	4	5	6
Compression PSI	159	149	145	152	154	152
Lubrizol @ 744 hrs						
Compression PSI	152	159	145	159	159	159
SwRI Eng. #76 @ 770 hrs						
Cylinder #	1	2	3	4	5	6
Compression PSI	190	190	190	195	190	190
Leak Down%	8	6	6	6	6	6

IAR Engine 22A							
Engine Hours	Cylinder Number						Average
	Cyl. 1	Cyl. 3	Cyl. 5	Cyl. 2	Cyl. 4	Cyl. 6	
(360 Hrs)	185	190	180	185	180	180	183
(579 Hrs)	200	195	195	190	195	195	195
(782 Hrs)	No Data						
(998 Hrs)	No Data						
(1197 Hrs)	210	210	210	205	210	205	208
(1397 Hrs)	205	200	205	185	200	185	197

5.3 There was discussion on how to procure additive for the fuel.

5.4 Engine Refresh Task Force [Christian Porter]

5.4.1 Lubrizol and IAR had burned valves

5.4.2 Afton had timing chain problems, and concerns with lifters and wear in the cam to head journal area. The chains were measured and in specification and not hitting the timing cover. Some issues may be related to 0W-16 oils

**ACTION:** Find a 0W-16 reference oil.

5.4.3 GM does not want to rebuild heads so the Refresh Task Force disbanded.

## 6.0 Next Meeting or Conference Call

At the call of the Chairman

## 6.0 Meeting Adjourned

The meeting adjourned at 1:35 PM.

**ASTM SEQUENCE VI**

Name	Address	Phone/Fax/Email	Attendance
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August 5, 2013

To: Sequence VI Surveillance Panel  
Subject: Sequence VIE Engine  
From: Bruce Matthews, GM Powertrain

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During initial testing of the 2012 LY7 engine, some problems have surfaced at a few testing labs. General Motors has been diligently investigating these problems and evaluating the root causes. At this time these problems are isolated and therefore GM supports the use of the 2012 LY7 engines purchased by OHT for Sequence VIE testing. Use of this engine without any refresh or reconditioning work is strongly preferred as there is no justification for this work at this time. In addition the use of rebuilt Sequence VID engines for the VIE testing is not acceptable to GM.

Reconditioning the VID engines (2009 LY7) will likely introduce unnecessary variability in test result data. Engines which are built on the factory production line have the most consistent build quality and therefore are best suited for this fuel economy test.

During initial testing of the 2012 LY7 engine two problems have surfaced at a few testing labs. These problems have been thoroughly investigated and the causes understood.

1. Deposit build-up causing exhaust valves to leak.

This has occurred with three VIE engines which were all connected to the same company. Two engines were located at the company's facility while the third engine was located at an independent lab but bought, installed, and operated under the direction of the same company.

At this time, exhaust valve leakage is not an industry wide problem but should it become one then here are GM's suggested solutions;

- A) Commercial Top Tier additive in Sequence VIE fuel. We are testing to determine if chemically cleaning the valves is a viable option to increase engine life. While it has been shown by various sources that 1/4 to 1/3 of fuel additives end up in the oil, reduced VIE engine life is also a concern. Fuel additives are in all legal commercial on-road gasoline sold in the USA. Therefore any oil additive that may react with a fuel additive should be avoided. Current testing shows this additive is keeping the valves clean without significantly affecting the test results.
- B) Running the engine to 6400 rpm for 10 minutes before every test will mechanically clean the valve seat area due to valve rotation. Mechanically induced valve rotation is the method used in production engines and preferred by GM.

2. Cylinder head hydraulic valve adjuster noise

The two engines at one lab had this noise after the use of 0W-16 oils. Use of this oil viscosity may cause insufficient oil pressure and flow to the top of the engine causing scuffed rear camshaft bearing journals, increased timing chain wear, and noisy valve adjusters. Timing chains from these engines were measured by the chain manufacturer and the wear was found to be within the specified tolerance. While it is possible this engine is not suitable for use with 0W-16 oils, under the current test conditions, this investigation is ongoing.

Investigations into both these problems are ongoing.

GM supports the continuation of Sequence VIE test development with the 2012 LY7 engines purchased by OHT.