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COMMITTEE D02 ON PETROLEUM PRODUCTS, LIQUID FUELS, AND LUBRICANTS

Issued: Oct. 24, 2016

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

These are the unapproved minutes of the 10.19.2016 Sequence VI Conference Call.

The meeting was called to order at 9:05 AM Central Time by Greg Miranda.

Agenda

The Agenda is the included as Attachment 1.

1.0 Roll Call

The Attendance list is Attachment 2. That document now includes votes by members for each motion.

2. **Approval of Meeting minutes from Sept 14, 2016 Seq. VI SP meeting**
   2.1 Greg made the motion and Dan seconded.
   2.2 The vote was unanimous approval.

3. **Old Business and Update Item Review**
   3.1 VIE Procedure taskforce update
   The Task Force updates and current version of the Draft procedure are at the TMC web site.
   ftp://ftp.astmtmc.cmu.edu/docs/gas/sequencevi/procedure_and_ils/VIE/
   There were comments to review and update some of the Draft.
   3.2 VID Extension taskforce update
   The Task Force update is included as Attachment 3. There are 2 engines at IAR, 1 at SwRI and 1 at Lubrizol. Some of the mild engines were scrapped. There are 5 left. Vavoline has a calibrated engine with about 900 hours and Afton 2 with about 2000 hours. There may be redistribution of engines. Some other options would be to widen the bands for severity adjustment with no changes to the engines, try a re-ring or ultrasonic cleaning. Another option would be industry correction factors. Robert Stockwell is reviewing CLOG agreement to run some GF-5 oils to get a VID to VIE correlation.
   3.3 VIE hardware taskforce update
   All injectors are the same so a motion was made to include both part numbers.

Motion: The Sequence VIE/F Engine Rebuild Task force recommends to the Sequence VI Surveillance panel that:
The Sequence VIE procedure be modified to allow either GM Fuel Injector PN 92068193 or OHT Fuel Injectors PN OHT6D-042-1. See Attachment 4.
This motion will include modifications of the procedure for sections 6.14.2.2, 9.4, 12.1 and X7.1.
Adrian Alphonso, Dave Glaenzer second.
This passed 14 yes, no negatives, and 1 waive.

3.4 Lubrizol update on Seq. VIF supplemental PM work and projected timeline.
Lubrizol has completed 2 tests and the 3rd will start. All should complete by end of October. There will then be a Precision Matrix review by the Stats Group.

4.1 Finalization of VIE procedure
   4.1.1 Recent proposal: Recommend to SP to allow drive-by-wire engine control for break-in procedure only – **Dan Worcester**
   See Attachment 5. Charlie Leverett will review the traces from the Precision Matrix. TMC does receive and reviews break in traces. Jerry Brys recommended all labs follow the same procedure. This motion was tabled.

4.1.2 Procedural correction: From 20141020 minutes.
Recommend that Fuel to Flow Meter temperature be moved to “critical measurement and control parameter” in the VIE draft procedure with a hard specification of 26°C ± 2°C. Effective11/15/14.

There was discussion to change the wording on the VIE Draft to remove passenger car and light duty as the VIE is running other oils now. This will be discussed further.

4.1.3 Document acceptance by Sequence VI SP

Motion: The Sequence VI Surveillance panel recommends acceptance of the VIE Draft procedure with the pending changes from discussions during this meeting.

Greg Miranda, Dave Glaenzer second.
This passed 14 yes, no negatives, and 1 waive.

5.0 Next Meeting.

To be determined with completion of VIF matrix.

The meetings adjourned at 10:30 AM.

Sequence VI Surveillance Panel Conference Call Agenda
October 19, 2016 @ 10:00-11:30 EST

Audio Connection

Call-in Number: +1-415-655-0001
Conference Code: 190 755 458

Webex Meeting URL:
https://meetings.webex.com/collabs/#/meetings/detail?uuid=M4KEQWYZMYWJS6CQQ8L3JLJUVA-20XT&rnd=229371.20045

1. **Roll Call (start 10:05 EST)**

   1.1. SP Membership changes and additions

2. **Approval of Meeting minutes from Sept 14, 2016 Seq. VI SP meeting**

3. **Old Business and Update Item Review**

   3.1. VIE Procedure taskforce update

   3.2. VID Extension taskforce update

   3.3. VIE hardware taskforce update
      3.3.1. Motion:
      The Sequence VIE/F Engine Rebuild Task force recommends to the Sequence VI Surveillance panel that:
      The Sequence VIE procedure be modified to allow either GM Fuel Injector PN 92068193 or OHT Fuel Injectors PN OHT6D-042-1.

   3.4. Lubrizol update on Seq. VIF supplemental PM work and projected timeline

4. **New Business**

   4.1. Finalization of VIE procedure
      4.1.1. Recent proposal: Recommend to SP to allow drive-by-wire engine control for break-in procedure only – ***Dan Worcester***

      4.1.2. Procedural correction: From 20141020 minutes.
         4.1.2.1. Motion: Recommend that Fuel to Flow Meter temperature be moved to "critical measurement and control parameter" in the VIE draft procedure with a hard specification of 26°C ± 2°C. Effective11/15/14.
         [Dave Glaenzer / Robert Stockwell / Passed (12 – 0 – 2)]

      4.1.3. Document acceptance by Sequence VI SP

4.2. Finalization of VIE TMC Report Forms

5. Next Meeting

5.1. First week of November 2016

6. Meeting Adjourned

ASTM SEQUENCE VI

Name	Email/Phone	Company	Attend
Adrian Alfonso **Voting Member**	Phone: (210) 838-0431 Adrian.Alfonso@intertek.com	Intertek	ATTEND
Jason Bowden **Voting Member**	Phone: (440) 354-7007 jhbowden@ohtech.com	OHT	ATTEND
Amol Savant **Voting Member**	ACSavant@ashland.com	Valvoline	ATTEND
Tim Cushing **Voting Member**	Phone: (248) 881-3518 Timothy.Cushing@gm.com	General Motors	ATTEND
David Glaenzer **Voting Member**	Phone: (804) 788-5214 Dave.Glaenzer@aftonchemical.com	Afton	ATTEND
Rich Grundza **Voting Member**	Phone: (412) 365-1034 reg@astmtmc.cmu.edu	TMC	ATTEND
Jeff Hsu **Voting Member**	Phone: (832) 419-3482 j.hsu@shell.com	Shell	ATTEND
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Dan Worcester **Voting Member**	Phone: (210) 522-2405 Dan.Worcester@swri.org	SwRI	ATTEND

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James Matasik	James.Matasic@lubrizol.com	Lubrizol	ATTEND

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Hap Thompson	Hapjthom@aol.com	Vix Facilitator	ATTEND
Chris Taylor	Chris.Taylor@vpracingfuels.com	VP Racing Fuels	

VOTE				

ASTM SEQUENCE VI

Name	Email/Phone	Company	Attend

VOTE	INJECTORS	BREAK IN	VIE DRAFT	
Adrian Alfonso **Voting Member**	YES	TABLE	YES	
Jason Bowden **Voting Member**	YES		YES	
Amol Savant **Voting Member**	YES		YES	
Tim Cushing **Voting Member**	YES		YES	
David Glaenzer **Voting Member**	YES		YES	
Rich Grundza **Voting Member**	YES		YES	
Jeff Hsu **Voting Member**	YES		YES	
Teri Kowalski **Voting Member**				
Dan Lanctot **Voting Member**	WAIVE		WAIVE	
Charlie Leverett **Voting Member**	YES		YES	
Brian Marks **Voting Member**				
Greg Miranda **Voting Member**	YES		YES	
Andy Ritchie **Voting Member**	YES		YES	
Ron Romano **Voting Member**	YES		YES	
Clifford Salvesen **Voting Member**	YES		YES	
Robert Stockwell **Voting Member**	YES		YES	
Haiying Tang **Voting Member**				
Dan Worcester **Voting Member**	YES		YES	

Sequence VID Extension

Current Status:

- Independent Labs:
  - Intertek has 2 currently calibrated stand/engines, with end of life expected in November for both stand/engines.
  - SwRI has 1 currently calibrated stand/engine, with end of life expected in November or December for the stand/engine.
  - Intertek has 3 mild engines, each with multiple calibration attempts on multiple reference oils, all statistically unacceptable. Each engine has approximately 600 – 1,000 run hours.
  - Intertek has several retired engines in storage.
- Dependent Labs:
  - Lubrizol has 1 currently calibrated stand/engine, with end of life expected in November for the stand/engine.
  - Lubrizol has 1 or 2 retired engines in storage.
  - Afton has 1 mild engine, with multiple calibration attempts, all statistically unacceptable. This engine has approximately 600 – 1,000 run hours.
  - Afton has 2 engines, that were previously calibrated, but then removed from service. One engine has 1878 run hours, 800 ml oil consumption when removed, but was no longer producing acceptable response. The other has 2276 run hours, 1200 ml oil consumption when removed, but was no longer producing acceptable response.
  - Afton has 2 or 3 retired engines in storage.
  - Valvoline had 1 mild engine, with multiple calibration attempts, all statistically unacceptable. It has been redistributed to SwRI. This engine has approximately 600 – 1,000 run hours.
  - Valvoline has 1 engine, that was previously calibrated, but then removed from service, so their stand could be converted to Sequence VIE/F. This engine has 916 run hours.
- Independent labs have backlogs that exceed the estimated remaining number of available tests.
- Currently, the test is expected to become unavailable in late Q4 2016.
- General Motors would like to extend the test life to allow for new products to be licensed.
- Many test users prefer that lab resources, especially stand capacity, be utilized for the replacement tests.

Options:

1. Redistribute previously calibrated engines from dependent labs to one or both independent labs.
   - With approval from Valvoline and acceptance from one of the independent labs, redistribute Valvoline's previously calibrated engine to one of the independent labs to allow a stand/engine to be calibrated to keep the test available uninterrupted, and available to all test users.
   - With approval from Afton and acceptance from one of the independent labs, redistribute 1 or both of Afton's previously calibrated engines to one of the independent labs to allow a stand/engine to be calibrated to keep the test available uninterrupted, and available to all test users.

    - This option could extend the Sequence VID by 15 to 30 candidate tests and up to 40 weeks, if only one stand/engine remains in the industry.
2. Attempt to calibrate the mild engines at one or more labs. Redistribution of one or more mild engines might be necessary. Options to consider in attempting to calibrate these mild engines include:
    a. Attempt to calibrate the mild engines as is, with no changes to the engines or LTMS.
    b. Calibrate the mild engines as is, by widening or eliminating acceptance bands, and allowing large severity adjustments to correct for the mild performance.
    c. Disassemble and re-ring the mild engines with the OHT rings, in hope to shift their severity into the statistically acceptable range, and attempt to calibrate.
    d. Disassemble and perform other modifications, to be determined, in hope to shift their severity into the statistically acceptable range, and attempt to calibrate.
    e. Disassemble and ultra-sonic clean, in hope to shift their severity into the statistically acceptable range, and attempt to calibrate.
3. Disassemble, ultra-sonic clean, reassemble and attempt to re-calibrate previously retired engines.
4. TMC to extend calibration periods and reduce calibration test requirements for any scenario listed above and/or for the currently calibrated stand/engines.
    - Possibly reduce calibration test requirements for a new stand/engine from 3 to 1 or 2 tests.
5. Allow the test to become unavailable and shift efforts into Sequence VIE and eventually Sequence VIF equivalency to Sequence VID.

Concerns:

- Sequence VIE and VIF demand is limiting the labs' resources, especially stand capacity, to dedicate significant effort into extending the life of the Sequence VID.
- Would the current Sequence VID LTMS be capable of generating accurate severity adjustments to correct the mild engine's performance?
- Would correction factors be needed, in addition to severity adjustments?
- If so, how would we create correction factors? How many tests would be required, and from how many labs and stands? A large matrix would not be feasible or practical, due to the limited amount of mild engines available and time constraints.
- It is unknown if modified mild engines could be successfully calibrated. This creates a high level of risk to any lab that dedicates stand capacity and other resources to this effort. It is also at the sacrifice of dedicating this stand capacity and these resources to the Sequence VIE and VIF tests.
- How would we prove-out the modified mild engines? How many tests would be required, and from how many labs and stands? A large matrix would not be feasible or practical, due to the limited amount of mild engines available and time constraints.

Intertek Automotive Research

Sequence VI Fuel Injectors

Adrian Alfonso

9/13/2016

Seq. VI Engine Fuel Injectors PN Issue

- **Current draft of VIE Procedure require the use of fuel injectors OHT6D-042-1 (See Below).**

  6.14.2.2 Fuel Injectors, Purchase from the CPD, OHT6D-042-1.

  Also listed in:

  9.4.12.1 Fuel Injectors—Use fuel injectors, OHT6D-042-1. Refer to Annex A12 for injector flow specifications. Verification of each injector is required prior to use.

  TABLE A7.1 Other Specified Engine Parts

  TABLE A7.2 Sequence VID/VIE Parts List

- **Some labs have been using injectors that came with the new engines, not the OHT6D-042-1.**

Intertek Automotive

- **VID and VIE Injector's flow data**

Lab	VID Injector Flow mL	VIE Injector Flow mL	Comments
1	206	203 – 208	Injectors that came with engine
2	216 - 220	219-222	Injectors that came with engine
3	218 -222	217 – 220	Injectors that came with engine
4	218 – 222	224-226	Injectors OHT6D-042-1
5	230-234	230 – 236	Injectors OHT6D-042-1

Seq. VI Engine Fuel Injectors PN Issue

- **Some labs completed VIE PM with injectors that came with new engines.**
- **Injector's check by procedure specifies:**

  A12.2.6 The set of injectors for an engine shall have a flow rate within of each other of 5 mL. Discard any injector that does not flow within this range.
- **OHT6D-042-1 Injectors and Injectors that came with the engine have part numbers 92068193 (GM PN) molded on one side and 0280156300 (manufacturer PN) on the other side.**
- **Motion:**
  - **The Sequence VIE/F Engine Rebuild Task force recommends to the Sequence VI Surveillance panel that:**

    The Sequence VIE procedure be modified to allow either GM Fuel Injector PN 92068193 or OHT Fuel Injectors PN OHT6D-042-1.

Sequence VI Break In Motion

SOUTHWEST RESEARCH INSTITUTE®

October 2016

Break In Procedure

11.5.3 *Break-in Operating Conditions*—Follow the break-in schedule for new engines as shown in Table 2. It is suggested that the cycling be a step function, rather than a ramp function. If a ramp function is used, take care to ensure that the ramp is not too mild, since too mild a ramp may not work the engine hard enough to successfully accomplish break-in.

Table 2

TABLE 2 Sequence VIE New Engine Cyclic Break-in [A]

	Cycle	
	A	B
Time at Each Step, min	4	1
Time to Decel. to Step A, s		15 max
Time to Accel. to Step B, s	15 max	
Speed, r/min	1500 ± 50	3500 ± 50
Power, kW	6.0	16.5
Torque, N·m	38.00 ± 5	45.00 ± 5
Oil Gallery, °C	80 ± 2	80 ± 2
Coolant In, °C	80 ± 2	80 ± 5
Coolant Flow, L/min	80 ± 5	80 ± 5
Intake Air Temperature and Humidity	Control Not Required	
Exh. Back Press., kPa	105	Not Specified
AFR	Record	Not Specified
Fuel Pressure to Fuel Rail, kPa	405 ± 10	405 ± 10
Fuel Temperature to Fuel Rail, °C	22 ± 2	22 ± 2
Fuel Flow, kg/h	Not Specified	Not Specified
BSFC, kg/kWh	Not Specified	Not Specified

[A] The time at each cycle and their acceleration and deceleration times shall be adhered to; target all parameters as close as possible.

VIE MOTION

- Recommend to the Surveillance Panel:

  Section 6.13.9

  Modified Throttle Body Assembly—Purchase from the CPD, OHT6D-050-1.

  Add " GM drive by wire throttle body

  [**OHT6D-041-1**] may be used for break in."