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Issued: January 12, 2016
Reply to: Dan Worcester
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These are the unapproved minutes of the 01.12.2016 Sequence VI Surveillance Panel call.

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The meeting was called to order at 8:00 AM Central Time by Jerry Brys.

Agenda

The Agenda is the included as **Attachment 1**.

1.0 Roll Call

The Attendance list is **Attachment 2**.

2.0 Approval of minutes

- 2.1 Approval of the minutes of the 01.05.2016 meeting.

<ftp://ftp.astmtmc.cmu.edu/docs/gas/sequencevi/minutes/VIMinutes20160105ConferenceCall.pdf>

MOTION: Approve the minutes from the 01.05.2016 conference call.

[Jason Bowden, Dan Worcester, second] Minutes were approved unanimous.

3.0 Action Item Review

- 3.1 OHT to provide update on current VIE inventory and service engine order. –OHT
There are 35 -001 engines and 144 -002 version. There are no more VID engines.
There will be a conference call to discuss handling the -002 distribution.
- 3.2 Labs reported VID engine inventory and expected depletion date of VID engines.
-Expected life of engines range from 2016 Q1 to 2018
Lab1: 2 engines
Lab2: 1 engines
Lab3: 3 engines
Lab4: 1 engines

4.0 Old Business

- 4.1 List of items to be reviewed after the Precision Matrix
Do we really need to run three RO tests to establish the new engine for LTMS?
Discussion of reducing the new reference requirement to two oils, then a third oil run after a defined number of candidates.
Discussion of using FEI 2 and FEI Sum for references to match candidate pass/fail criteria.
Discussion of evaluating 80/20 ratio of BL before to after for FEI 1 and 10/90 for FEI 2.
Should the acceptance bands value of 1.96 be rounded up? Due to the rounding on FEI 1 and 2 the actual pass limit is 1.91 and 1.92.
-SP chair and test sponsor to investigate what is needed to establish VID equivalent limits for VIE
-Discussion of changing BLB1 to BLB2 delta acceptable limits
-Consider evaluating FEI 1 vs. 100% BLB2 and FEI 2 vs. 100% BLA
This will be an on-going effort. The above line has been added for discussion.
- 4.2 Discussion on precision matrix. (Spreadsheet attached)–Rich Grundza/Labs.
25 tests are complete. [See Attachment 3.](#) Labs are running tests in the stands that will have extended runs. There was discussion on how to handle a matrix engine being removed then installed later to continue as a calibrated test engine. See Item 4.5. SwRI has generated a spreadsheet that can consider engine hour and stage weighting. This will be shared with the Statistics Group.

- 4.3 Update from task force, to investigate alternative test procedure Sequence “VIF” that would improve 0W-16. – Dan Worcester/Satoshi Hirano IAR continues to run their Sense Check tests. There will be a review of the 8 tests when they are complete on how to continue.
- 4.4 Update from task force to investigate option to prolong usable life of the available VIE engines. –Adrian Alfonso/Bill Buscher SwRI has received one short block, new heads and the parts to build a long block. SwRI and IAR will review these parts and the Task Force will make recommendations. SwRI will build the one engine and run a reference oil for comparison. There will continue to be discussion of what additional parts are needed like fuel injectors, rails, ignition coils and exhaust manifolds in addition to the new build parts.
- 4.5 Discussion of handling PM engine as calibrated test stands. –Dave Glaenzer This motion was made for handling the engines. See Attachment 4.

MOTION for Precision Matrix engines only:

[Dave Glaenzer, Gordon Farnsworth second]

Sequence VIE Precision Matrix engines that have been removed from their PM stand will undergo reconditioning following reinstallation on the stand.

The reconditioning schedule will be:

1. Prime oil pump and start engine with BL oil in crankcase.
2. Warm up to Stage Flush conditions for 60 minutes.
3. Transition to Stage 1 conditions, stabilize 90 minutes, gather BSFC data for 30 minutes.
4. Transition to Stage 2 conditions, stabilize 90 minutes, gather BSFC data for 30 minutes.
5. Transition to idle, cool down, stop.

YES 10 NO 0 WAIVE 2

The motion passed.

5.0 New Business

None

6.0 Next Meeting.

The next meeting will be 01.27.2016 conference call.

The meeting adjourned at 8:33 AM.

Sequence VI Surveillance Panel Conference Call Agenda January 12 @ 9:00-10:00AM EST

Call-in information is included below:

Call-in Number: 866-528-2256
Conference Code: 3744024

1.0) Roll Call

Do we have any membership changes or additions?

2.0) Approval of minutes

2.1 Approve the minutes from the January 5, 2015 Sequence VI Surveillance Panel.

<ftp://ftp.astmtmc.cmu.edu/docs/gas/sequencevi/minutes/VIMinutes20160105ConferenceCall.pdf>

3.0) Action Item Review

3.1 OHT to provide update on current VIE inventory and service engine order. –OHT

3.2 Update of VID engine inventory and expected depletion date of VID engines.

-Expected life of engines range from 2016 Q1

Lab1: 1 engines

Lab2: 1 engines

Lab3: 3 engines

Lab4: 1 engines

4.) Old Business

4.1 List of items to be reviewed after the Precision Matrix

-Do we really need to run three RO tests to establish the new engine for LTMS?

-Discussion of reducing the new reference requirement to two oils, then a third oil run after a defined number of candidates.

- Discussion of using FEI 2 and FEI Sum for references to match candidate pass/fail criteria.
- Discussion of evaluating 80/20 ratio of BL before to after for FEI 1 and 10/90 for FEI 2.
- Should the acceptance bands value of 1.96 be rounded up? Due to the rounding on FEI 1 and 2 the actual pass limit is 1.91 and 1.92.
- SP chair and test sponsor to investigate what is needed to establish VID equivalent limits for VIE
- Discussion of changing BLB1 to BLB2 delta acceptable limits

4.2 Discussion on precision matrix. (Spreadsheet attached)–Rich Grundza/Labs

4.3 Update from task force, to investigate alternative test procedure Sequence “VIF” that would improve OW-16. – Dan Worcester/Satoshi Hirano

4.4 Update from task force to investigate option to use short blocks to supplement engine inventory. –Adrian Alfonso/Bill Buscher

4.6 Discussion of handling PM engine as calibrated test stands. –Dave Glaenzer (Spreadsheet attached)

5.) New Business

6.) Next Meeting

Next Tuesday (reoccurring weekly meeting)

7.) Meeting Adjourned

ASTM SEQUENCE VI

| Name | Address | Phone/Fax/Email | Attendance |
|---|------------------------------|---|---------------|
| Adrian Alfonso Voting Member | Intertek Automotive Research | Phone: (210) 838-0431 adrian.alfonso@intertek.com | ATTEND |
| Jason Bowden Voting Member | OH Technologies | Phone: (440) 354-7007 jhbowden@ohtech.com | ATTEND |
| Timothy Caudill Voting Member | Ashland | Phone: (606) 329-5708 Tlcaudill@ashland.com | |
| Tim Cushing Voting Member | General Motors | Phone: (248) 881-3518 timothy.cushing@gm.com | ATTEND |
| David Glaenzer Voting Member | Afton | Phone: (804) 788-5214 Dave.Glaenzer@aftonchemical.com | ATTEND |
| Rich Grundza Voting Member | ASTM TMC | Phone: (412) 365-1034 reg@astmtmc.cmu.edu | ATTEND |
| Jeff Hsu Voting Member | Shell | Phone: (832) 419-3482 j.hsu@shell.com | |
| Tracey King Voting Member | Haltermann | Phone: (947) 517-4107 tking@jhaltermann.com | ATTEND |
| Teri Kowalski Voting Member | Toyota | Phone: (734) 995-4032 teri.kowalski@tema.toyota.com | |
| Dan Lanctot Voting Member | TEI | Phone: (210) 690-1958 dlanctot@tei-net.com | |
| Brian Marks Voting Member | BP Castrol | Phone: (973) 686-3325 Brian.Marks@bp.com | |
| Nathaniel Moles Voting Member | Lubrizol | Phone: (440) 347-4472 Nathaniel.Moles@Lubrizol.com | |
| Andy Ritchie Voting Member | Infineum | Phone: (908) 474-2097 Andrew.Ritchie@infineum.com | |
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| Clifford Salvesen Voting Member | ExxonMobil | Phone: clifford.r.salvesen@exxonmobil.com | |
| Kaustav Sinha Voting Member | Chevron Oronite | Phone: (713) 432-6642 LFNQ@chevron.com | |
| Haiying Tang Voting Member | Chrysler | Phone: (248) 512-0593 HT146@Chrysler.com | |
| Dan Worcester Voting Member | Southwest Research Institute | Phone: (210) 522-2405 dan.worcester@swri.org | ATTEND |

ASTM SEQUENCE VI

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| Mike Warholic | Michael.warholic@Infineum.com Phone: 908.474.2065 | Infineum | |
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SEQUENCE VIE RESULTS WITH NO HOUR ADJUSTMENT

| SW 1 (Lab A) | | | | SW2 (Lab A) | | | | IAR 1 (Lab G) | | | | IAR 2 (Lab G) | | | | LZ (Lab B) | | | | Afton (Lab D) | | | | Ashland (Lab C) | | | | XOM (Lab F) | | | |
|--------------|-------|-------|--------|-------------|-------|-------|--------|---------------|----------|-------|--------|---------------|-------|-------|--------|------------|-------|-------|--------|---------------|-------|-------|--------|-----------------|-------|-------|--------|-------------|-------|-------|--------|
| | FEI 1 | FEI 2 | EOT hr | | FEI 1 | FEI 2 | EOT hr | | FEI 1 | FEI 2 | EOT hr | | FEI 1 | FEI 2 | EOT hr | | FEI 1 | FEI 2 | EOT hr | | FEI 1 | FEI 2 | EOT hr | | FEI 1 | FEI 2 | EOT hr | | FEI 1 | FEI 2 | EOT hr |
| 544 | | | | 1010-1 | 1.60 | 1.74 | 374 | 542-2 | 2.34 | 1.70 | 390 | 544 | 1.36 | 1.83 | 363 | 542-2 | 3.00 | 1.86 | 399 | 542-2 | 2.77 | 1.70 | 370 | 544 | 2.14 | 2.08 | 368 | 1010-1 | 2.12 | 2.14 | 364 |
| 544 | | | | 1010-1 | 1.84 | 1.59 | 574 | 1010-1 | 1.67 | 1.51 | 602 | 542-2 | 2.93 | 2.16 | 561 | 544 | 1.48 | 1.64 | 597 | 542-2 | 2.53 | 1.74 | 571 | 1010-1 | 2.18 | 1.82 | 575 | 544 | 0.84 | 1.51 | 569 |
| 542-2 | | | | 542-2 | 2.46 | 1.48 | 776 | 1010-1 | 1.59 | 1.49 | 803 | 1010-1 | 1.95 | 2.12 | 758 | 1010-1 | 1.77 | 1.99 | 794 | 544 | 1.48 | 1.24 | 772 | 542-2 | | | | 544 | 1.04 | 1.64 | 768 |
| 1010-1 | | | | 544 | 1.24 | 1.11 | 978 | 544 | est.1.06 | | | 1010-1 | 1.71 | 2.00 | 956 | 544 | 1.04 | 1.38 | 992 | 1010-1 | 1.83 | 1.68 | 928 | 542-2 | | | | 542-2 | 2.86 | 2.13 | 968 |
| | | | | 544 | | | | | | | | 542-2 | | | | 544 | | | | | | | | | | | | | | | |
| | | | | 1010-1 | | | | | | | | 542-2 | | | | 542-2 | | | | | | | | | | | | | | | |
| | | | | 544 | | | | | | | | 544 | | | | 542-2 | | | | | | | | | | | | | | | |
| | | | | 542-2 | | | | | | | | 544 | | | | 1010-1 | | | | | | | | | | | | | | | |
| | | | | 542-2 | | | | | | | | 1010-1 | | | | 1010-1 | | | | | | | | | | | | | | | |
| | | | | 1010-1 | | | | | | | | 544 | | | | 542-2 | | | | | | | | | | | | | | | |
| | | | | 1010-1 | | | | | | | | 542-2 | | | | | | | | | | | | | | | | | | | |

| | | FEI 1 | FEI 2 |
|-----------|----------|-------|-------|
| RO 542-2 | 0W-20 | 1.49 | 0.80 |
| RO 1010-1 | 5W-20 | 1.34 | 1.10 |
| RO 544 | 5W-30 T1 | N/A | N/A |

542-2

| Lab | Stand | Stand Run | FEI 1 | FEI 2 | FEI Sum | EOT Hours | BLB1/BLB2 Shift | BLB2/BLA Shift | Oil Consumption |
|-----------|-------|-----------|-------|-------|---------|-----------|-----------------|----------------|-----------------|
| IAR (G) | 1 | 1 | 2.34 | 1.70 | 4.04 | 390 | 0.23 | 0.60 | 700 |
| LZ (B) | 1 | 1 | 3.00 | 1.86 | 4.86 | 399 | 0.36 | 0.76 | 600 |
| Afton (D) | 1 | 1 | 2.77 | 1.70 | 4.47 | 370 | 0.17 | 1.03 | 400 |
| IAR (G) | 2 | 2 | 2.93 | 2.16 | 5.09 | 561 | 0.08 | -0.30 | 800 |
| Afton (D) | 1 | 2 | 2.53 | 1.74 | 4.27 | 571 | 0.18 | 0.08 | 400 |
| SRI (A) | 1 | 3 | | | | | | | |
| SRI (A) | 2 | 3 | 2.46 | 1.48 | 3.94 | 776 | 0.20 | -0.85 | 600 |
| APAL (C) | 1 | 3 | | | | | | | |
| APAL (C) | 1 | 4 | | | | | | | |
| XOM (F) | 1 | 4 | 2.86 | 2.13 | 4.99 | 965 | 0.23 | -0.19 | 700 |
| IAR (G) | 2 | 5 | | | | | | | |
| IAR (G) | 2 | 6 | | | | | | | |
| LZ (B) | 1 | 6 | | | | | | | |
| LZ (B) | 1 | 7 | | | | | | | |
| SRI (A) | 2 | 8 | | | | | | | |
| SRI (A) | 2 | 9 | | | | | | | |
| LZ (B) | 1 | 10 | | | | | | | |
| IAR (G) | 2 | 11 | | | | | | | |

544

| Lab | Stand | Stand Run | FEI 1 | FEI 2 | FEI Sum | EOT Hours | BLB1/BLB2 Shift | BLB2/BLA Shift | Oil Consumption |
|-----------|-------|-----------|-----------|-------|---------|-----------|-----------------|----------------|-----------------|
| SRI (A) | 1 | 1 | | | | | | | |
| IAR (G) | 2 | 1 | 1.36 | 1.83 | 3.19 | 363 | 0.23 | 0.72 | 600 |
| APAL (C) | 1 | 1 | 2.14 | 2.08 | 4.22 | 368 | 0.16 | 1.52 | 700 |
| SRI (A) | 1 | 2 | | | | | | | |
| LZ (B) | 1 | 2 | 1.48 | 1.64 | 3.12 | 597 | 0.24 | 0.46 | 1000 |
| XOM (F) | 1 | 2 | 0.84 | 1.51 | 2.35 | 569 | 0.22 | -0.50 | 650 |
| Afton (D) | 1 | 3 | 1.48 | 1.24 | 2.72 | 772 | 0.30 | 0.12 | 800 |
| XOM (F) | 1 | 3 | 1.04 | 1.64 | 2.68 | 768 | 0.09 | -0.37 | 700 |
| SRI (A) | 2 | 4 | 1.24 | 1.11 | 2.35 | 978 | 0.22 | -1.53 | 700 |
| IAR (G) | 1 | 4 | est. 1.06 | | | | | | |
| LZ (B) | 1 | 4 | 1.04 | 1.38 | 2.42 | 992 | 0.36 | -0.60 | 800 |
| SRI (A) | 2 | 5 | | | | | | | |
| LZ (B) | 1 | 5 | | | | | | | |
| SRI (A) | 2 | 7 | | | | | | | |
| IAR (G) | 2 | 7 | | | | | | | |
| IAR (G) | 2 | 8 | | | | | | | |
| IAR (G) | 2 | 10 | | | | | | | |

1010-1

| Lab | Stand | Stand Run | FEI 1 | FEI 2 | FEI Sum | EOT Hours | BLB1/BLB2 Shift | BLB2/BLA Shift | Oil Consumption |
|-----------|-------|-----------|-------|-------|---------|-----------|-----------------|----------------|-----------------|
| SRI (A) | 2 | 1 | 1.60 | 1.74 | 3.34 | 374 | 0.34 | 0.51 | 600 |
| XOM (F) | 1 | 1 | 2.12 | 2.14 | 4.26 | 364 | 0.28 | 0.84 | 500 |
| SRI (A) | 2 | 2 | 1.84 | 1.59 | 3.43 | 574 | 0.22 | -0.05 | 700 |
| IAR (G) | 1 | 2 | 1.67 | 1.51 | 3.18 | 602 | -0.01 | -0.02 | 1100 |
| APAL (C) | 1 | 2 | 2.18 | 1.82 | 4.00 | 575 | 0.21 | 0.68 | 800 |
| IAR (G) | 1 | 3 | 1.59 | 1.49 | 3.08 | 803 | -0.08 | -0.22 | 1700 |
| IAR (G) | 2 | 3 | 1.95 | 2.12 | 4.07 | 758 | 0.39 | -0.09 | 1000 |
| LZ (B) | 1 | 3 | 1.77 | 1.99 | 3.76 | 794 | 0.28 | -0.46 | 1000 |
| SRI (A) | 1 | 4 | | | | | | | |
| IAR (G) | 2 | 4 | 1.71 | 2.00 | 3.71 | 956 | 0.29 | -0.51 | 1100 |
| Afton (D) | 1 | 4 | 1.83 | 1.68 | 3.51 | 928 | 0.12 | -0.20 | 900 |
| SRI (A) | 2 | 6 | | | | | | | |
| LZ (B) | 1 | 8 | | | | | | | |
| IAR (G) | 2 | 9 | | | | | | | |
| LZ (B) | 1 | 9 | | | | | | | |
| SRI (A) | 2 | 10 | | | | | | | |
| SRI (A) | 2 | 11 | | | | | | | |

SEQUENCE VIF RESULTS WITH NO HOUR ADJUSTMENT

| SW 1 (Lab A) | | | | SW2 (Lab A) | | | | IAR 1 (Lab G) | | | | IAR 2 (Lab G) | | | |
|--------------|-------|-------|--------|-------------|-------|-------|--------|---------------|-------|-------|--------|---------------|-------|-------|--------|
| | FEI 1 | FEI 2 | EOT hr | | FEI 1 | FEI 2 | EOT hr | | FEI 1 | FEI 2 | EOT hr | | FEI 1 | FEI 2 | EOT hr |
| 543 | 1.75 | 2.33 | 369 | 1011 | | | | 542-2 | 2.10 | 1.44 | 371 | 1011 | | | |
| | | | | | | | | | | | | | | | |
| 542-2 | 2.42 | 1.59 | 572 | 542-2 | | | | 543 | | | | 543 | | | |
| | | | | | | | | | | | | | | | |
| 542-2 | 2.28 | 1.46 | 777 | 1011 | | | | 543 | | | | 1011 | | | |
| | | | | | | | | | | | | | | | |
| 543 | | | | 543 | | | | 542-2 | | | | 542-2 | | | |
| | | | | | | | | | | | | | | | |
| 1011 | | | | 543 | | | | 1011 | | | | 542-2 | | | |
| | | | | | | | | | | | | | | | |
| 543 | | | | 1011 | | | | 543 | | | | 1011 | | | |
| | | | | | | | | | | | | | | | |
| 542-2 | | | | 542-2 | | | | 1011 | | | | 543 | | | |
| | | | | | | | | | | | | | | | |
| 1011 | | | | | | | | 542-2 | | | | | | | |
| | | | | | | | | | | | | | | | |

Stage 1 Sense Check runs will be tested in 2 engines/2 labs

Stage 2 Sense Check runs will be tested in the other two engines/2labs

| | Do you Re-Condition Engines That Have Been Removed and Re-Installed? | If So, Describe Your Practice. | Do you Re-Condition Engines That Have Extended Downtime? | What Constitutes Extended Downtime? | Describe Your Practice For Extended Downtime |
|--------------|--|---|--|-------------------------------------|--|
| Lab Response | Have never re-installed | N/A | Yes | 1 Week | Run Aging for 5-8 hours |
| Lab Response | Yes | Run Stage 2 Stab. + BSFC & Run Stage 3 Stab. + BSFC | Yes | 24 hours | Run Stage 2 Stab. + BSFC & Run Stage 3 Stab. + BSFC |
| Lab Response | Have never re-installed | N/A | Yes | 24-48 hours | Run Aging for about 8 hours |
| Lab Response | Have never re-installed | N/A | Yes | 1 Week | Run flush conditions for 6 hours |
| Lab Response | Have never re-installed | N/A | Yes | 3 months | Run 2 hour warm-up, flush to BL, run at least Stages 1-3 |
| Lab Response | | | | | |