Minutes of the Sequence VIF Task Force Teleconference Call

January 27, 2016 08:00 CST

The Sequence VIF Task Force was called to order by Chairman Dan Worcester at 08:00 CST. The meeting Agenda is included as Attachment 1. The meeting attendance roster is included as Attach. 2.

The minutes from the January 06, 2016 meeting were approved as written and are available on the ASTM-TMC web site. Motion for approval made by Dan Worcester, second by David Glaenzer.

ftp://ftp.astmtmc.cmu.edu/docs/gas/sequencevi/minutes/VIFTaskForceMinutes20160106.pdf

"Sense Check" testing continues at Southwest Research and Intertek Automotive Research. Three runs are complete (RO 543, RO 542-2 and a second RO 542-2) at SRI and the fourth (RO 543) is running with EOT projected for 02/04. IAR has completed three tests (RO 542-2, RO 543 and a second RO 543) and is running their fourth test (RO 542-2) with EOT projected for 01/28. Runs that have been reported to the ASTM-TMC are available at: ftp://ftp.astmtmc.cmu.edu/refdata/gas/vif/data/

Used oil samples are being delivered to IAR to complete additional analytical testing as noted in Agenda Item 5.1. Dan Worcester will distribute used oil analytical data to the group.

Following the initial four tests at the two labs, the Stats Group will be able to assess the data. Attachment 3, presentation (Proposal of Sequence VIF Test Development to PCEOCP and AOAP, Toyota Motor Corporation, September 9, 2015) contains on slides 7 through 9 the process that we accepted for evaluating "Sense Check" runs. Assuming that data is acceptable, testing will continue.

The next call will be held on Wednesday, February 03 at 08:00 CST.

Having no further business, the meeting was adjourned at 08:21 CST.

Respectfully submitted,

David L. Glaenzer, Afton Chemical Corporation

Attachment 1
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GF-6B Sequence VIF Task Force
01.27.2016

Toll-free dial-in number (U.S. and Canada):
(866) 588-1857
International dial-in number:
(678) 373-4882
Conference code:
1908975

Scope

The ASTM Sequence VI Surveillance Panel requested a Task Force be formed to determine if the Sequence VIE could be used for 0W 16 oils. The TF will look at development of the VIF test using 100 °C oil temperature and 94 °C coolant temperature for stages 1, 3, 4, and 6.

Objective

Review the Toyota proposal and work on selection of reference oils, stands to support testing, and running the Sense Check and test matrices.

The agenda for this meeting is shown below.

1.0 Chairman's Comments
2.0 Roll Call
3.0 The minutes for 01.06.2016 are posted. They are:
ftp://ftp.astmtmc.cmu.edu/docs/gas/sequencevi/minutes/VIFTaskForceMinutes20160106.pdf

4.0 All reference oils are ready at the two test labs.
5.0 The matrix for VIF testing has been chosen. SwRI has completed the first three tests, 543 and 542-2 twice. Their 4th test will start soon. IAR is running their 4th test on 542-2. The results are included with the VIE Precision Matrix Excel file.

Run	EOT Hour	SwRI#1	SwRI#2	IAR#1	IAR#2
1	350	543	1011	542-2	1011
2	550	542-2	542-2	543	543
3	750	542-2	1011	543	1011
4	950	543	543	542-2	542-2
5	1150	1011	543	1011	542-2
6	1350	543	1011	543	1011
7	1550	542-2	542-2	1011	543
8	1750	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 2 engines/2labs

TMC543 - Oil 400

Attachment 1
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5.1 Additional Chem for FEI 2 for the matrix

ICP	D-5185
TAN	D-664
TBN	D-4739
FTIR	IIIG METHOD E-168
VIS	D-445

5.2 All chemical analysis be done at IAR and be reviewed at the completion of Sense Check tests. An Excel file is included.

6.0 Next meeting will be Conference Call on 02.03.2016.

Attachment 2

Name	Affiliation		12/09/15		12/16/15		01/06/16		01/27/16	
Adrian Alfonso	Intertek		P		P		P		P	
Amol C Savant	Ashland	V					P		P	
Andrew Ritchie	Infineum	V							P	
Charlie Leverett	Intertek									
Chris Castanien	Nesteoil	V					P			
Cliff Salvensen	ExxonMobil		P				P			
Cole Hudson	SwRI	V								
Dan Worcester Jr.	Chairman, SwRI		P		P		P		P	
David Glaenzer	Secretary, Afton Chemical	V	P		P		P		P	
Denny Gaal	ExxonMobil									
Doyle Boese	Infineum		P		P				P	
Eric Liu	SwRI									
Gordon Farnsworth	Infineum		P		P		P		P	
Guy Stubs	SwRI		P		P					
Jason Bowden	OH Technologies	V			P		P			
Jim Linden	Toyota	V			P		P		P	
Jo Martinez	Chevron				P		P		P	
Kaustav Sinha	Chevron	V							P	
Kevin OMalley	Lubrizol	V			P		P		P	
Mark Adams	Tribology Testing				P				P	
Mark Mosher	ExxonMobil	V	P		P					
Martin Chadwick	Intertek									
Matthew Bowden	OH Technologies				P		P			
Michael Conrad	Lubrizol									
Mike McMillan	Infineum		P		P		P		P	
Nathaniel Moles	Lubrizol		P		P				P	
Patrick Lang	SwRI									
Ray Burn	ExxonMobil									
Rich Grundza	ASTM Test Monitoring	V	P		P		P		P	
Robert Stockwell	Oronite				P				P	
Ron Romano	Ford Motor Company	V								
Satoshi Hirano	Toyota				P		P		P	
Teri Kowalski	Toyota						P		P	
Timothy Cushing	General Motors	V					P			
Todd Dvorak	Afton Chemical		P		P				P	
Tracy King	Haltermann									
Valerie Lieu	Chevron				P					
William Buscher	Intertek	V			P		P		P	
Bob Campbell	Afton				P					
Mike Ragomo	ExxonMobil									
Travis Kotan	SwRI		P				P		P	
Thomas Hickl	GM Europe									
Jonas Leber	GM Europe									
Jerry Brys	Lubrizol						P			
Christine Eickscade	SwRI						P			

TOYOTA

Proposal of Sequence VIF Test Development to PCEOCP and AOAP

Prepared for
Sequence VIF Taskforce
September 9th, 2015
Toyota Motor Corporation

Current Status of Sequence VIE and VIF

TOYOTA

- Sequence VIE
  - Seq VI SP decided to proceed the VIE precision matrix without 0W-16 in it
    - The motion was in the e-ballot with closing on September 7th
  - Sequence VIE is dedicated for the ILSAC GF-6A
  - Tech 1 0W-16 (TMC1011) to be replaced by Tech 1 5W-30
    - ILSAC has agreed with this replacement
- Sequence VIF
  - Seq VI SP decided to pursue the modification of Sequence VIE to be better fit for xW-16 evaluation
  - This is the Sequence VIF and dedicated for the ILSAC GF-6B
  - Taskforce was formed with Dan Worcester (SwRI) as its chair

Decisions made for Sequence VIF at SP and TF

TOYOTA

- Sequence VIF Test Condition
  - Stage 1, 3, 4, and 6 have 100°C/94°C for engine oil/coolant instead of 115°C/109°C
  - All other test conditions and weighting factors stay the same
- Reference Oil Selection
  - 3 reference oils were decided
    - Tech 1 0W-16 (TMC1011)
    - TMC542-2 (0W-20)
    - Oil 400 (0W-16) from the Toyota VID Matrix
      - Latest Market General GF-5 from a major additive supplier
- Matrix Design
  - 30 test matrix with 8 test sense check run was decided
    - Involves 2 independent laboratories as test development
  - Dependent labs add REO data for the LTMS as next step

Sequence VIF Test Development

TOYOTA

- Test Conditions
  - Oil and Coolant Temperatures at Stage 1, 3, 4, and 6 are 15°C lower than those of Sequence VIE
  - No Change in Aging Conditions

Sequence VIF

Test Stage	1	2	3	4	5	6
Speed, RPM	2000	2000	1500	695	695	695
Torque , Nm	105	105	105	20	20	40
Oil Temp, °C	**100**	65	**100**	**100**	35	**100**
Coolant Temp, °C	**94**	65	**94**	**94**	35	**94**
Stage Weighting (%)	30	3.2	31	17.4	1.1	17.2

Aging condition: 2250 RPM, 110 Nm, 120 °C

Sequence VIF Test Development

TOYOTA

- REO Availability : will be ready well within 2 weeks
  - TMC1011 (Tech 1 0W-16)
    - Readily available
  - TMC542-2 (0W-20, current VID REO)
    - Approximately 600 gals available
    - More than enough to cover both VIE and VIF for their industry matrices and 1 reference period
  - Oil 400 (0W-16 from Toyota VID matrix)
    - The supplier has been working on gathering materials and blending the sample
    - We expect that 20 drums of the sample will be blended and shipped early in the next week (Sept 14th week) from the supplier

Sequence VIF Test Development

TOYOTA

- 30 Test Matrix Design (approved at Taskforce Sept 2nd)

Run	EOT Hour	Engine 11	Engine 21	Engine 12	Engine 22
1	350	Oil 400	TMC1011	TMC542-2	TMC1011
2	550	TMC542-2	TMC542-2	Oil 400	Oil 400
3	750	TMC542-2	TMC1011	Oil 400	TMC1011
4	950	Oil 400	Oil 400	TMC542-2	TMC542-2
5	1150	TMC1011	Oil 400	TMC1011	TMC542-2
6	1350	Oil 400	TMC1011	Oil 400	TMC1011
7	1550	TMC542-2	TMC542-2	TMC1011	Oil 400
8	1750	TMC1011		TMC542-2	

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

Stage 2 Sense Check Runs will be tested in other 2 engines/2 labs

Sequence VIF Test Development

TOYOTA

- REO Discrimination in Sense Check Runs
  - Comparison between TMC542-2 and Oil 400 will provide the best chance to discriminate 2 REOs.

- Oil Ranking :
  - Oil 400 > TMC54-2
- Precision :
  - VID Prove Out Estimate of s
  - FEI1 = 0.22
  - FEI2 = 0.26

	TMC542-2 (0W-20)	Oil 400 (0W-16)
VID FEI Sum	2.29 (1.49 + 0.80)	2.87
VID FEI2	0.8	1.51
Source	LTMS (Aug-2015)	Average of 4 Runs in Toyota VID Matrix Data

Matrices	VIF Sense Check Run	VIF Sense Check Run
No. of Stands	2	2
No. of Labs	2	2
No. of Ref Oils	2	2
Total No. of Tests	8	8
No. of Tests/Oil	4,4	4,4
Significance level (α)	0.1	0.2
Detectable Difference in s of variable and using t	2.17	1.75
Detectable Difference Assuming FEI2 s=0.26	0.56	0.45
Degrees of Freedom		
Oil	1	1
Lab	1	1
Engine Hour	1	1
Mean	1	1
Error	4	4
Total	8	8

Sequence VIF Test Development

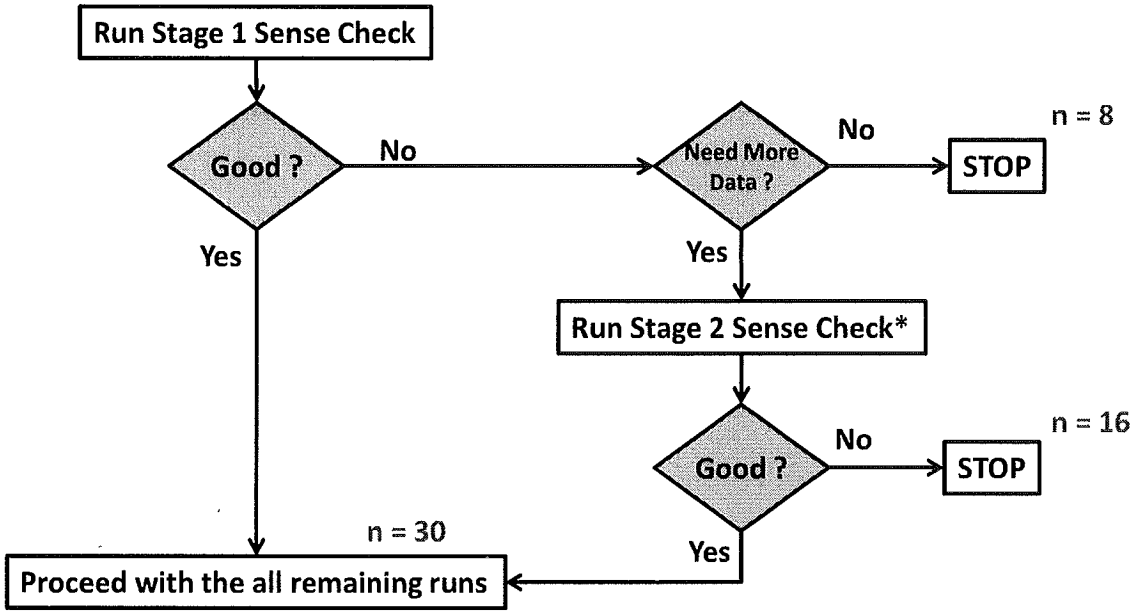
TOYOTA

- Test Plan
  - Stepwise Approach was decided
  - 30 Test Matrix
    - Involves 2 independent laboratories and 2 engines at each laboratory
    - To establish test procedure and REO discrimination
    - To establish engine hour correction equations
  - Additional REO Tests
    - Other dependent laboratory participate
    - To establish the LTMS target
    - The same approach as VID development

Sequence VIF Test Development

TOYOTA

- 30 Test Matrix Plan : Approved at the Taskforce Sept 2nd



* Stage 2 Sense Check can be re-designed based on the outcome of Stage 1 Sense Check

Sequence VIF Test Development

TOYOTA

- Sponsorship
  - 30 Test Matrix
    - Confirmed that 10 companies are OK to contribute each 3 VIF tests as test sponsors at the cost defined as Seq VIE in the MOA
    - 2 independent laboratories send the individual invoices to test sponsors
    - No MOA funding is used
  - Additional REO Runs
    - Dependent laboratories add REO tests to contribute to the database to establish the LTMS targets
    - Dependent laboratories need to sponsor themselves, unless additional sponsors are available

Sequence VIF Test Development Action Plan

TOYOTA

- **Best Case Scenario**

	Action Item	Action by	Target Timing
1	Finalize the SP/TF proposal of the test plan to the AOAP and the PCEOCP for approval	Seq VI SP Seq VIF TF	Before AOAP and PCEOCP on Sept 10th
2	Report the proposal and ask approval at the AOAP and PCEOCP meetings	Seq VI SP/VIF TF	September 10th
3	Blend and deliver REO samples to labs	Toyota / TF	Mid ~ Late Sept
4	Choose 3 sponsors for the sense check matrix (Toyota and other 2 companies)	Toyota / TF	Mid Sept
5	Allocate test engines/stands for the VIF	TF / Labs	Mid Sept
6	Process documentations to start testing (RFQ and Purchase Order)	Sponsors and Labs	Mid Sept
7	Execute the sense check tests	Labs / TF	Late Sept ~ Mid Oct
8	Analyze the Sense Check Matrix and Decide to proceed to the Step 2	TF and SP	Late Oct
9	Process documentations to prepare the Step 2	Sponsors and Labs	Late Sept ~ Late Oct
10	Execute the Step 2	Labs / TF	Nov ~ Dec
11	Analyze and Finalize the VIF Test Procedure	TF and SP	Jan 2016 ?
12	Execute Step 3	SP and Test Labs	Feb ~ Mar ? 2016
13	Analyze and Establish the initial LTMS target	SP	Apr 2016 ?

Open Items for Seq VI Surveillance Panel

TOYOTA

- Number of REO Runs to Calibrate New Engine
  - 3 REO Runs are required for current Sequence VID
  - Some SP members are interested in an investigation to see if 2 REO Runs are necessary enough to calibrate new test engine
- Requirement to Switch between VIE and VIF
  - VIE test engine and VIF test engine are physically separated
  - The same test stand can be used for both VIE and VIF
  - Need to establish new rules to switch VIE engine and VIF engine back and forth on the same test stand