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Committee D02 on PETROLEUM PRODUCTS AND LUBRICANTS

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The unapproved minutes of the May 13, 2009 Sequence VI Surveillance Panel conference call.

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The meeting was called to order at 10:00am by Chairman Charlie Leverett.

Agenda

The Agenda provided after the meeting is **Attachment 1**.

1.0 Roll Call

The attendance list is **Attachment 2**.

2.0 Approval of Minutes

2.1 Minutes from the 04.22.2009 meeting are posted.

2.2 Those minutes were approved unanimously.

3.0 Action Item Review

3.1 The SP is to determine requirements for the next batch of BL by the next Surveillance Panel meeting. TMC will be sending out the survey soon.

3.2 This was an earlier action item which was dropped and now back into place, Labs should start creating a list of acceptable engine reconditioning practices. The SP will review the list and make final recommendations on parts and actions required. (02/18/09) This will be dropped from the Action List as there has been no input on parts replacement.

3.3 SwRI had presented data on engine 11B after it was reassembled and installed into the stand. They have decided to abandon this engine and will tear it down and report any findings to the SP. This is still an open item.

4. Old Business

4.1 LTMS Review

4.1.1 Attachment 3 is the presentation on the response to PCEOCP questions.

An action item from the PCEOCP to the VI SP is:

The Sequence VI SP along with the Statistical Group will review the data once it becomes available to determine if the "Engine Hr. Correction Factor" needs to be adjusted.

4.1.2 Hours and tests have been added. Attachment 4 is the LTMS revision.

Attachment 5 shows the graph of the equation. Attachment 6 is the LTMS revision Rich Grundza sent out after the meeting.

4.1.3 There was discussion on reference oils and their assignment percentage.

Motion: For a new engine, all three oils [A, D, and X] will be assigned to be run in random order by TMC.

Gordon Farnsworth, and Guy Stubbs second. Passed unanimous.

Motion: The FEI adjusted engine hours correction will be added to the VID Procedure, but not included in the LTMS. Note: There was a later motion by Guy Stubbs to limit the correction to 3000 hours until more data was available, but this did not pass.

Charlie Leverett, and Dave Glaenzer second. Passed unanimous.

Action: The Data Dictionary will be modified slightly and add a note to Form 4 showing that the FEI results are adjusted for engine hours.

4.1.4 The question arose on how to chart reference data, whether to average the first 3 points for Z_i , or begin at Z_0 equal to zero. This would require an LTMS revision.

Motion: For the first reference on a new engine stand combination, the candidate period will be 4 tests or 700 hours. For the next reference, the period will be 6 tests or 1050 hours, and the third period will be 10 tests or 1750 hours.

Guy Stubbs, and George Szappanos second. Passed unanimous.

Motion: R_i is not calculated until there are two tests on an engine/stand combination. Z_0 is equal to the average of the first 3 valid tests, acceptable or not.

Phil Scinto, and George Szappanos second. Passed, with waives by OHT, SwRI, ExxonMobil, and ConocoPhillips.

4.2 Draft 6.0 Procedure Review

4.2.1 Review will be required to fill in anything missing – There will be a task force for this review and the final changes will be voted on by the membership. Volunteers: George, Dan, Rich, Mark & Jason.

4.2.2 There was discussion on engine stand hours and number of tests for a reference period.

5.0 New Business

5.1 Define the method for counting engine hrs so it is standardized within the VI Industry.

5.1.1 There was discussion on how to have a consistent engine hour count .

5.1.2 There was some interest in having an additional trigger of a minimum RPM, but no further action was taken on this point.

Motion: If engine ignition is turned on, the hours are counted.

Charlie Leverett, and Dave Glaenzer second. SwRI and Lubrizol voted negative, and OHT waived. The motion passed. Negatives on a passing motion would require a ballot.

5.1.2 All labs will need to install some form of engine hour meter triggered by ignition on.

Motion: The motion was to lock the engine hours correction at 3000 hours until the industry has more data on this parameter.

Guy Stubbs, and Robert Stockwell second. TMC and OHT waived. The motion did not carry.

5.2 Determine Data Dictionary changes needed for revisions to the report.

6. The next conference call will be per the Chairman.

7. The meeting adjourned at 11:50am.

Sequence VI Surveillance Panel Meeting
Conference Call
May 13, 2009

10:00 CT

Call-in #: 866-298-0814

Pass Code#: 2709134

Agenda

- 1.) Roll Call and comments on outcome from the PCEOCP meeting
- 2.) Approval of the minutes from the 04/22/09 meeting.
3. **Action Item Review**
 - 3.1) The SP is to determine requirements for the next batch of BL by the next Surveillance Panel meeting. **TMC will be sending out the survey soon.**
 - 3.2) This was an earlier action item which was dropped and now back into place, Labs should start creating a list of acceptable engine reconditioning practices. The SP will review the list and make final recommendations on parts and actions required. **(02/18/09) OPEN**
 - 3.3) SwRI had presented data on engine 11B after it was reassembled and installed into the stand. They have decided to abandon this engine and will tear it down and report any findings to the SP. **(04/02/09) OPEN**
- 4.) **Old Business**
 - 4.1 LTMS Review
 - 4.2 Draft 6.0 review will be required to fill in anything missing – I plan to form a task force for this review and the final changes will be voted on by the membership.
Volunteers: George, Dan, Rich, Mark & Jason

5.) New Business

5.1 Define the method for counting engine hrs so it is standardized within the VI Industry.

5.2 Determine Data Dictionary changes needed for revisions to the report.

5.3 An action item from the PCEOCP to the VI SP is:

The Sequence VI SP along with the Statistical Group will review the data once it becomes available to determine if the “Engine Hr. ~~Correction Factor~~ Adjustment” needs to be adjusted, we shall also consider the changes to the Standard Deviations.

6.) Next Meeting

At the call of the Chairman

7.) Meeting Adjourned

ASTM SEQUENCE VI SURVEILLANCE PANEL

Name	Address	Phone/Fax/Email	Attendance
Bowden, Dwight Voting Member	OH Technologies, Inc. P.O. Box 5039 Mentor, OH 44061-5039	Phone: 440-354-7007 Fax: 440-354-7080 dhbowden@ohtech.com	Present
Jim Linden Voting Member	General Motors Research & Development 30500 Mound Rd./MC 480-106-160 Warren, MI 48090-9055	Phone: 586-986-1888 james.l.linden@gm.com	Present
Andy Ritchie Voting Member	Infineum 1900 East Linden Ave. Linden, NJ 07036-0735	Phone: 908-474- Fax: 908-474-3637	Gordon & Mike voting for Andy
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	
John Rosenbaum Voting member	Chevron Global Lubricants	Phone:	
Leverett, Charlie Voting Member	Intertek Automotive Research 5404 Bandera Road San Antonio, TX 78238	Phone: 210-647-9422 Fax: 210-523-4607 charlie.leverett@intertek.com	Present
Grundza, Rich Voting Member	ASTM TMC 6555 Penn Ave. Pittsburgh, PA 15206-4489	Phone: 412-365-1034 Fax: 412-365-1047 Dml@tmc.astm.cmri.cmu.edu	Present
Miranda, Timothy Voting Member	BP Castrol Lubricants USA 1500 Valley Road Wayne, NJ 07470	Phone: 973-305-3334 Timothy.Miranda@bp.com	
Mosher, Mark Voting Member	ExxonMobil 600 Billingsport Road Paulsboro, NJ 08066	Phone: 856-224-2132 Fax: 856-224-3628 mark_r_mosher@exxonmobil.com	Present
Caudill, Timothy Voting Member	Ashland, Inc. 21st and Front Streets Ashland, KY 41101	Phone: 606-329-5708 Fax: 606-329-3009 Tcaudill@ashland.com	Present
Stubbs, Guy Voting Member	Southwest Research Institute (SwRI) 6220 Culebra Road San Antonio, TX 78228	Phone: 522-5913 Fax: gstubbs@swri.edu	Present
Szappanos, George Voting Member	Lubrizol 29400 Lakeland Blvd. Wickliffe, OH 44092	Phone: 440-347- Fax: 440-347-4096 George.Szappanos@lubrizol.com	Present
Glaenzer, David Voting Member	Afton Research Center 500 Spring Street Richmond, VA 23218	Phone: 804-788-5214 Fax: 804-788-6358 Dave_Glaenzer@ethyl.com	Present
Tracey King Voting Member	Chrysler	Phone: Fax: tek1@chrysler.com	
Sutherland, Mark Voting Member	Chevron Oronite Company LLC 4502 Centerview Ste. 210 San Antonio, TX 78228	Phone: 731-5605 Fax: 731-5621 msut@chevrontexaco.com	Present
Robert Stockwell Voting Member	ConocoPhillips Lubricants R&D Passenger Car Engine Oil	office 580-767-6894 Robert.T.Stockwell@conocophillips.com	Present
Teri Kowalski Voting Member	Toyota	Phone: 734-995-4032 teri.kowalski@tema.toyota.com	

ASTM SEQUENCE VI SURVEILLANCE PANEL

Name	Address	Phone/Fax/Email	Attendance
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Guest Present at meeting

Adam & Jason Bowden
Doyle Boese
Bill Buscher
Dan Worchester
Gordon Farnsworth
Mike McMillan
Phil Scinto
Allison Rajakumar
Larry Hamilton
Jo Martinez
Jim Rutherford
Gene Hammerly

Response to PCEOCP Sequence VID Questions

Sequence VID Statistical Task Force

May 12, 2009

Summary of Responses to PCEOCP Questions

1. It has not been determined whether transformation of FEI continues to be unnecessary after correction for engine hours. The determination that no transformation was necessary was done with $\ln(\text{Engine Hours})$ in the model. NO transformation necessary.
2. In looking at FEI least square means by viscosity grade, the Statistical Group was asked to determine if the separation between viscosity grades changes after taking into account difference between GF-4 and GF-5 technologies. There does not appear to be an effect (insufficient statistical evidence) from the technologies that influences the separation of viscosity grades.
3. Impact of varying stage and FEI1/FEI2 weighting factors on discrimination and precision. Of the alternative FEI methods considered, Trapezoid, Average, FEI2B, there are possible improvements in test precision and discrimination. Note, however, that interpretation of the alternative methods in assessment of fuel economy in the field has not been established.

Summary of Responses to PCEOCP Questions

4. Determine if engine hour correction can be eliminated. Based on our analysis of the data, we recommend that we continue with the natural log of end of test hours correction factor for both reference and candidate oil data. We also recommend that the factor be reviewed at the semi-annual surveillance panel meetings.
5. Develop statistical methodology for identifying out-of-compliance engines. Utilize the proposed LTMS procedure to identify out-of-compliance engines.
6. Lubrizol believes FEI2B should be considered by PCEOCP as a way to more closely meet the goals of the GF-5 Needs Statement. Other methods such as the Trapezoid and Average FEI methods should also be considered. See response to Item 3.

1. Transformation

- The determination that no transformation was necessary was done with $\text{Ln}(\text{Engine Hours})$ in the model.

2. Technology Interaction with Viscosity Grade

- Reduced Model
- H0: VID FEI effects due to CCS and HTHS are not dependent upon technology
- HA: VID FEI effects due to CCS and HTHS are different for technology 3
 - FEI = f (Lab, Technology, Base Oil Group, LN(Engine Hours), CCS30, HTHS150, CCS30byT3, HTHS150byT3)
 - FEI1: CCS30byT3 p-value = 0.29
 - FEI1: HTHS150byT3 p-value = 0.26
 - FEI2: CCS30byT3 p-value = 0.71
 - FEI2: HTHS150byT3 p-value = 0.60
- Fail to reject H0; assume that VID FEI effects due to CCS and HTHS are not dependent upon technology
 - See graphs for visual interpretation

Action Item 2: Technology Interaction with Viscosity Grade

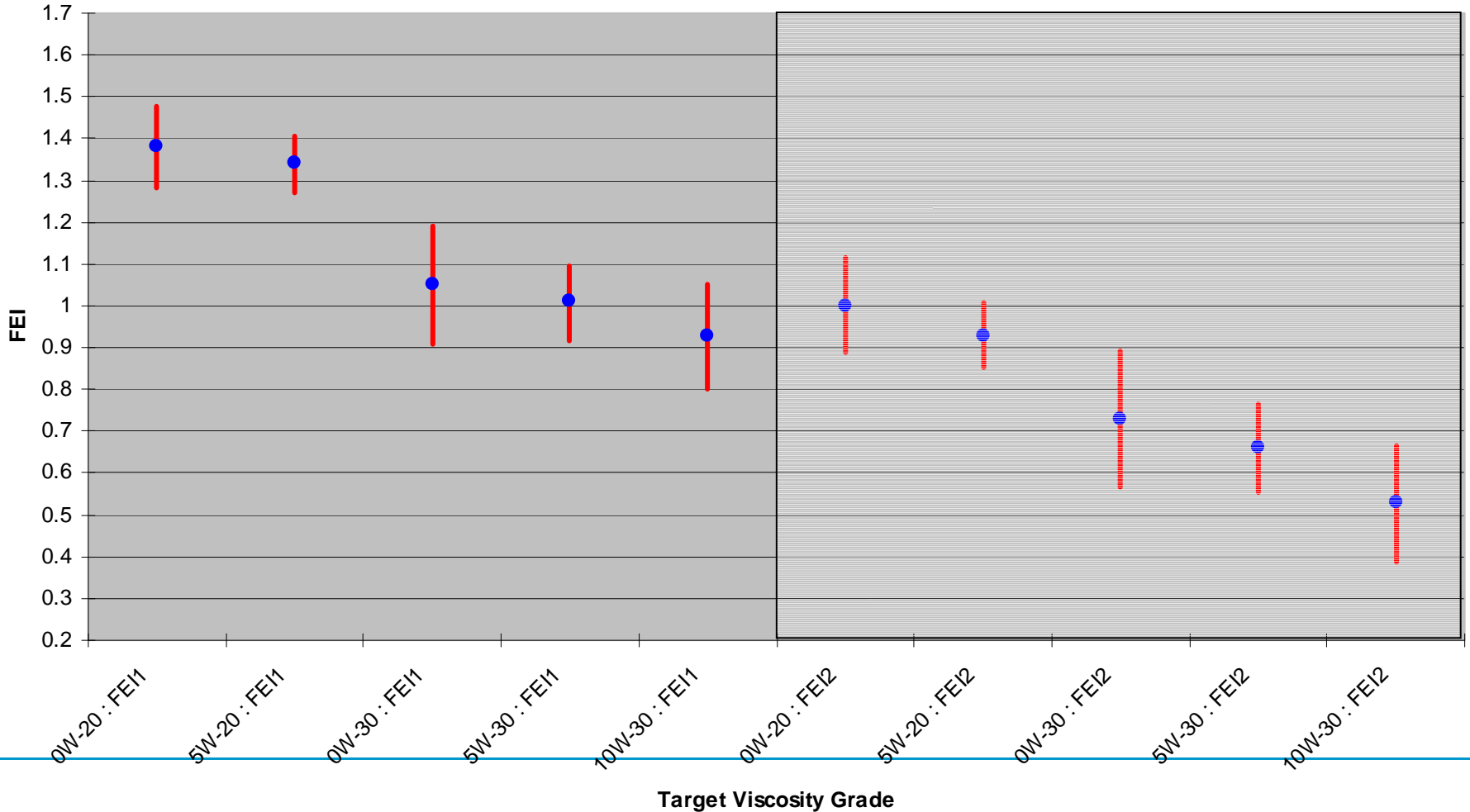
○ Building Viscosity Grades

- ❑ To compare viscosity grades in an unbiased fashion, they are calculated to target CCS and HTHS values
- ❑ Viscosity grades are calculated and compared both without and with the T3 interaction using reduced model 2

	Matrix Average		
Viscosity Grade	CCS Matrix Target	CCS at -30C	HTHS150
0W-20	5800 at -35C	3295	2.74
5W-20	6200 at -30C	6170	2.74
0W-30	5800 at -35C	3295	3.15
5W-30	6200 at -30C	6170	3.15
10W-30	6600 at -25C	11483	3.15

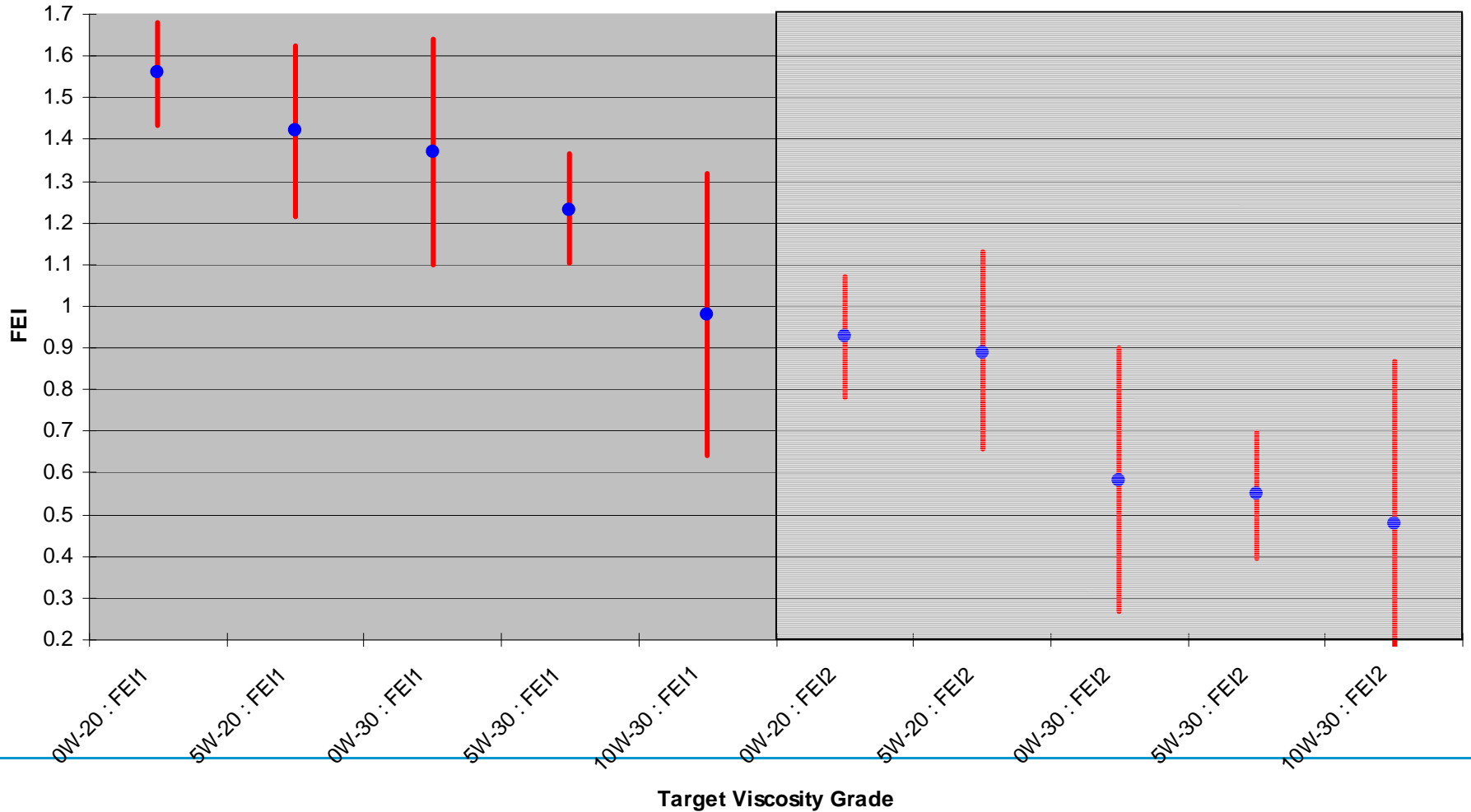
Action Item 2: Technology Interaction with Viscosity Grade

VID 95% Tukey Simultaneous Confidence Intervals by Grade
Confidence Intervals May be Compared for Significance
No Technology by CCS/HTHS Interaction Fit for Model



Action Item 2: Technology Interaction with Viscosity Grade

VID 95% Tukey Simultaneous Confidence Intervals by Grade for GF-5 Technology 3
Confidence Intervals May be Compared for Significance
GF-5 Technology by CCS/HTHS Interaction Fit for Model



Action Item 2 Summary

- Separation of viscosity grades is similar for all technologies
 - There is not enough statistical evidence to prove that separation of viscosity grades is different between GF-4 and GF-5 technologies
- There is statistical evidence to conclude that HTHS150 has an effect on FEI1 and FEI2 (direction appears correct)
- There is some statistical evidence to conclude that CCS30 has an effect on FEI1 and FEI2 (direction appears correct)
- There is statistical evidence of discrimination between summer grades
- There is not enough statistical evidence of discrimination between winter grades

3. Impact of various FEI methods

○ For this item, the following FEI methods were considered.

- FEI1 and FEI2 – Utilizing FTP related stage weights as agreed to in 8/08 Consortium meeting
- Trapezoid – Area under FEI versus Test Duration curve
- Average – Average of FEI1 and FEI2
- FEI2B – FEI2 weighting only Boundary Stages 4 and 6 (previous Stages 7 and 9) as 0.55 and 0.45, respectively.

Action Item 3: Impact of various FEI methods

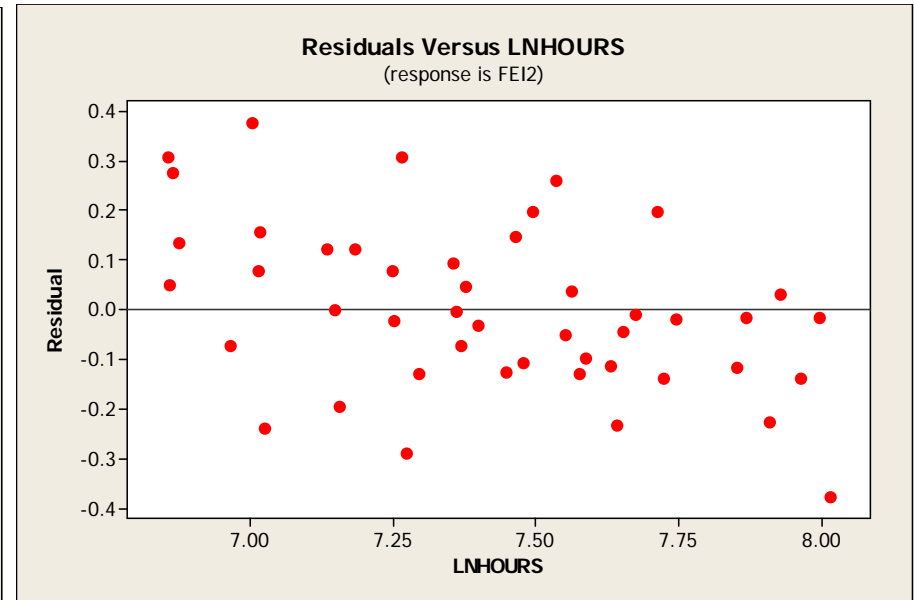
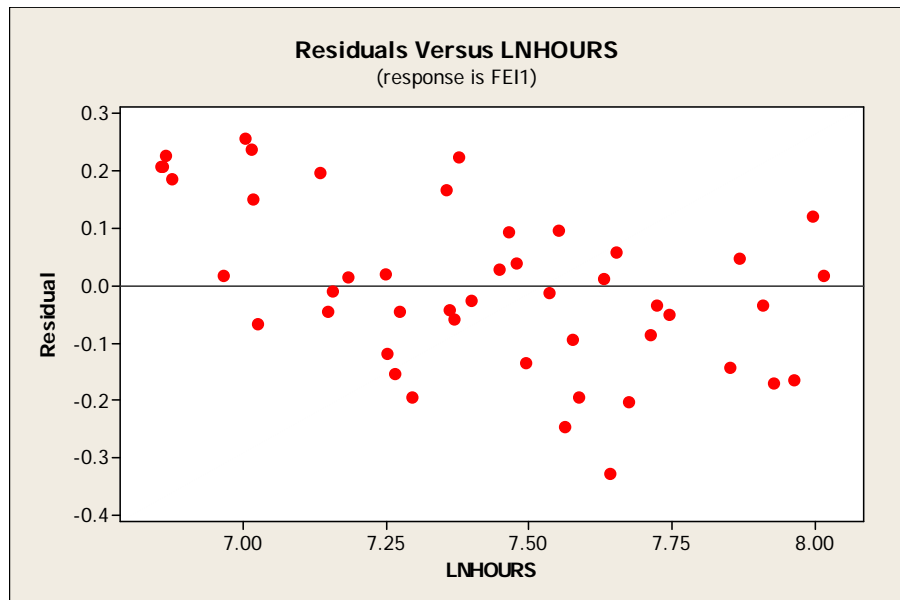
	FEI1	FEI2	Trapezoid	Average	FEI2B
Viscometric Discrimination	YES	YES	YES	YES	NO
FM Discrimination	YES	NO	YES	YES	YES
Standard Deviation	0.14	0.16	0.10	0.10	0.38
Correlation to FTP Cycle	YES	YES	YES	YES	NO
Extrapolation	NO	NO	YES	YES*	NO

4. Elimination of Engine Hours Correction

- Based on our revisited analysis of the data, we recommend that we continue with the natural log of end of test hours correction factor for both reference and candidate oil data. We also recommend that the factor be reviewed at the semi-annual surveillance panel meetings.
- Why?
 - ❑ Best overall variability
 - ❑ Consistency in seeing effect from Matrix II, V, and Precision Matrix.
 - ❑ Data analyzed in engine hour subsets reveals negative coefficient in all subsets.
 - ❑ Residual plots show effect even when eliminating test results with less than 850 hours
 - ❑ LTMS is expected to identify engines that deviate from the hours correction model.

4. Elimination of Engine Hours Correction

- Residuals from tests with <850 hours eliminated



5. Statistical Methodology for Identifying Out-of-Compliance Engines

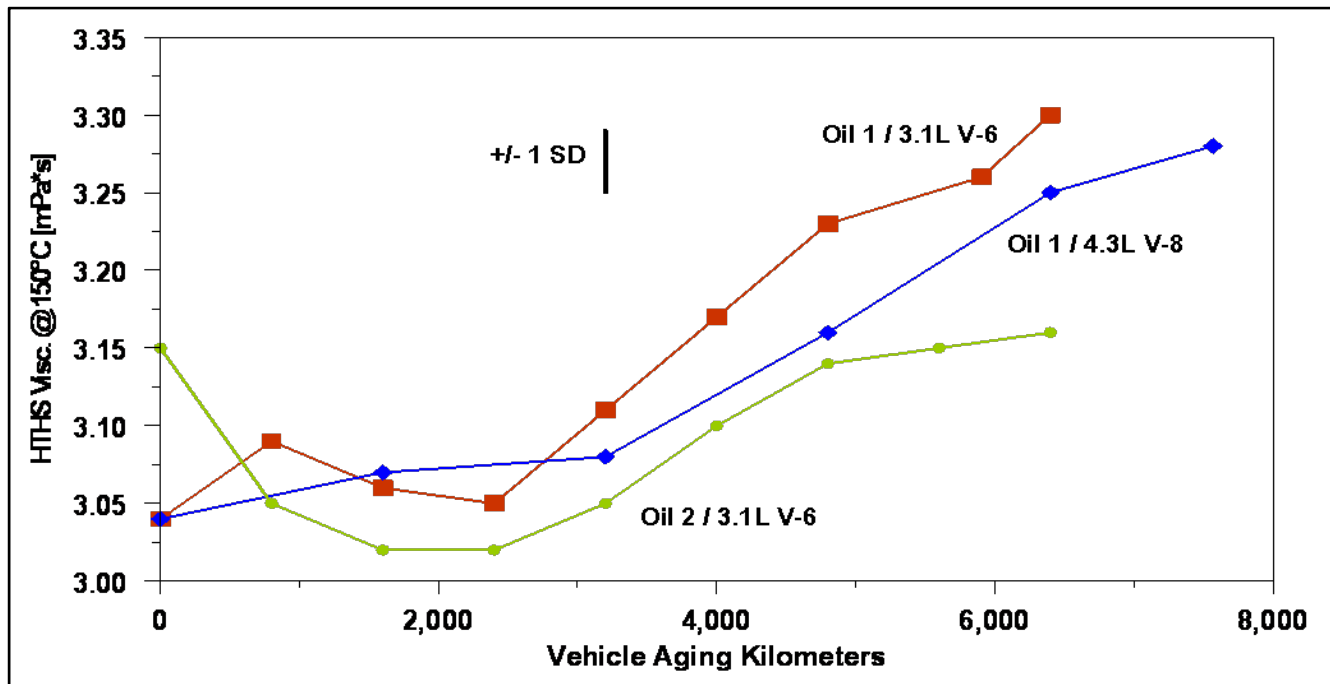
- Utilize the proposed LTMS procedure to identify out-of-compliance engines.

Appendix. FM and Viscometric Aging Effects

Evaluation of FEI2 Stage Weight Proposal

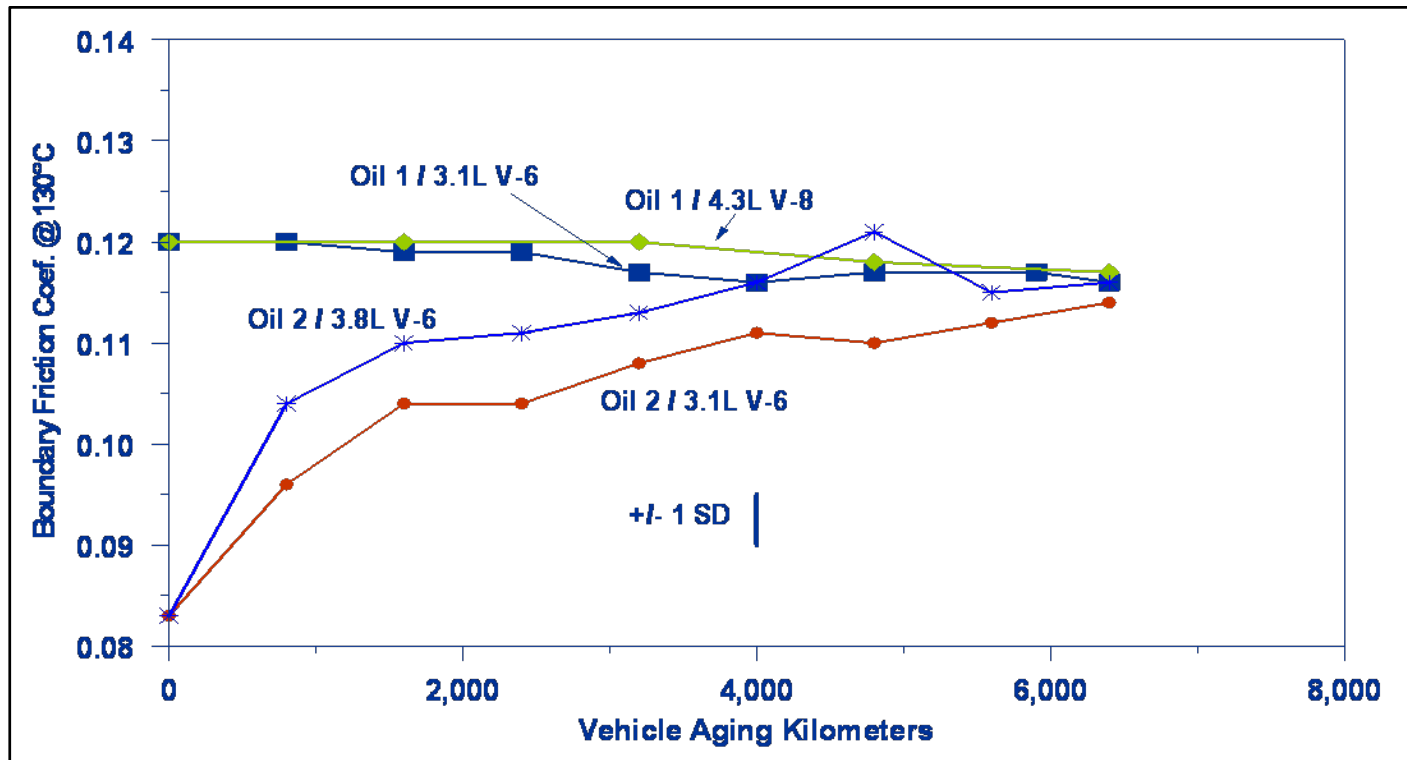
Other data sources relating to the aging effect on the physical properties of the oil:
In vehicles HTHS Viscosity @150C can continue to increase without “leveling off”
(SAE982504⁵).

Higher viscosity increase with mile aging is likely to decrease FEI



Evaluation of FEI2 (FM Effect) Stage Weight Proposal

Other data sources relating to the aging effect on the physical properties of the oil:
In vehicles, friction increases to level equivalent to oil without Friction Modifier
(SAE982504)



The following are the specific Sequence VID calibration test requirements.

A. Reference Oils and Critical Parameters

The parameters are FEI1 and FEI2. The reference oils required for test stand and test laboratory calibration are reference oils accepted by the ASTM VID Surveillance Panel. The means and standard deviations for the current reference oils for each parameter are presented below.

FEI1
Unit of Measure: Percent
Critical Parameter

Reference Oil	Mean	Standard Deviation
GF5A	1.32	0.14
GF5D	0.87	0.14
GF5X	1.49	0.14

FEI2
Unit of Measure: Percent
Critical Parameter

Reference Oil	Mean	Standard Deviation
GF5A	1.04	0.16
GF5D	0.71	0.16
GF5X	0.80	0.16

B. Acceptance Criteria

1. New Test Engine(s)

- a. A minimum of **three (3)** operationally valid calibration tests, with no Shewhart severity alarms (all parameters), are required to calibrate each test engine **and should not be interrupted by non-calibration tests.** Precision requirements and severity adjustments are only to be evaluated after the third operationally valid test that has successfully met the Shewhart severity requirement. Note that Special K limits may not be used for Shewhart severity control charts in the calibration of a new test engine. Special K limits may only be used for existing test engines.
- b. For every two (2) operationally invalid tests during the attempt to calibrate a new engine **after the first operationally valid test (the count does not start until after the first valid test),** an additional operationally valid calibration test will be added to the stand/engine calibration requirement.

2. Existing Test Engine(s)

a. A test engine shall begin a reference oil test no later than 100 or 110 days following the completion of the engine's previous reference oil test or:

2nd calibration: after no more than 4 test starts in the engine or XXX hrs

3rd calibration: after no more than 6 test starts in the engine XXX hrs

Subsequent calibration: after no more than 10 test starts in the engine XXX hrs

whichever comes first (these intervals may be reduced depending on the status of the engine control charts).

b. If there are two (2) or more operationally invalid tests during the attempt to calibrate an existing engine, then two (2) operationally valid calibration tests, with no Shewhart severity alarms (all parameters), are required to calibrate the engine.

3. Reference Oil Assignment:

New Engines: GF5A, GF5D, GF5X

Existing Engines:

GF5A: 40%

GF5D: 20%

GF5X: 40%

4. Control Charts

In Section 1, the construction of the control charts that contribute to the Lubricant Test Monitoring System is outlined. The constants used for the construction of the control charts for the VID, and the response necessary in the case of control chart limit alarms, are depicted below. *Note that laboratory control charts are only updated following an acceptable stand calibration test.*

		EWMA				Shewhart Chart	
		LAMBDA		K		K	
Chart Level	Limit Type	Precision	Severity	Precision	Severity	Precision	Severity
Engine	Reduced K	--	--	--	--	--	--
	Special K	--	--	--	--	--	Stand K + 1
	Warning	--	--	--	--	1.645	--
	Action	0.1	0.3	1.645	0.00	2.325	1.96
Lab	Warning	--	--	--	--	1.645	--
	Action	0.1	0.2	1.645	1.96	2.325	--
Industry	Warning	0.1	0.2	1.645	1.96	--	--
	Action	0.1	0.2	2.33	2.575	--	--

The following are the steps that must be taken in the case of exceeding control chart limits. The steps are listed in order of priority, although charts should be studied simultaneously to determine the cause(s) of a problem. In the case of multiple alarms, contact the TMC for guidance, but note that except for severity adjustments (enacting a severity adjustment may occur at the same time as an action for a different alarm), the actions for alarms are not cumulative (in other words, only the most severe action is required in the case of multiple alarms in addition to a possible severity adjustment). The laboratory always has the option of removing any stand and/or engine from the system.

o Exceed EWMA Precision Engine Action Alarm

- Special K no longer applies for the parameter.
- Immediately conduct one additional calibration test in the offending engine with no Shewhart severity alarms (all parameters). Precision requirements are waived until the next reference test.
- Reduce the reference interval for the next scheduled reference test in the engine by fifty percent (50%).

o Exceed Shewhart Precision Engine Action Alarm

- Special K no longer applies for the parameter.
- Reduce the reference interval for the next scheduled reference test in the stand by fifty percent (50%).
-

o Exceed Shewhart Precision Engine Warning Alarm

- Special K no longer applies for the parameter.
- Reduce the reference interval for the next scheduled reference test in the stand by twenty-five percent (25%). (round down)

o Exceed Shewhart Severity Engine Action Alarm

- First check the status of the Precision alarms. Under certain circumstances Special K, and/or Severity Adjustments MAY NOT be utilized.
- Immediately conduct an additional calibration test in the offending engine. However, if a severity adjustment existed in the engine prior to the reference test, and the alarm is in the direction of the severity adjustment, then an additional calibration test need not be run as long as the test result is within the Special K control chart limit.
- If there are two (2) or more operationally invalid tests during the attempt to calibrate an existing engine, then two (2) operationally valid calibration tests, with no Shewhart severity alarms (all parameters), are required to calibrate the engine.

o Exceed EWMA Severity Engine Action Alarm

- First check the status of the Precision alarms. Under certain circumstances, Special K, and/or Severity Adjustments MAY NOT be utilized.
- Calculate test engine Severity Adjustment (SA) for each parameter that exceeds the action limit. Use the current laboratory EWMA (Zi) as follows:

FEI1: $SA = -Z_i * (\text{industry approved pooled standard deviation for the test parameter})$

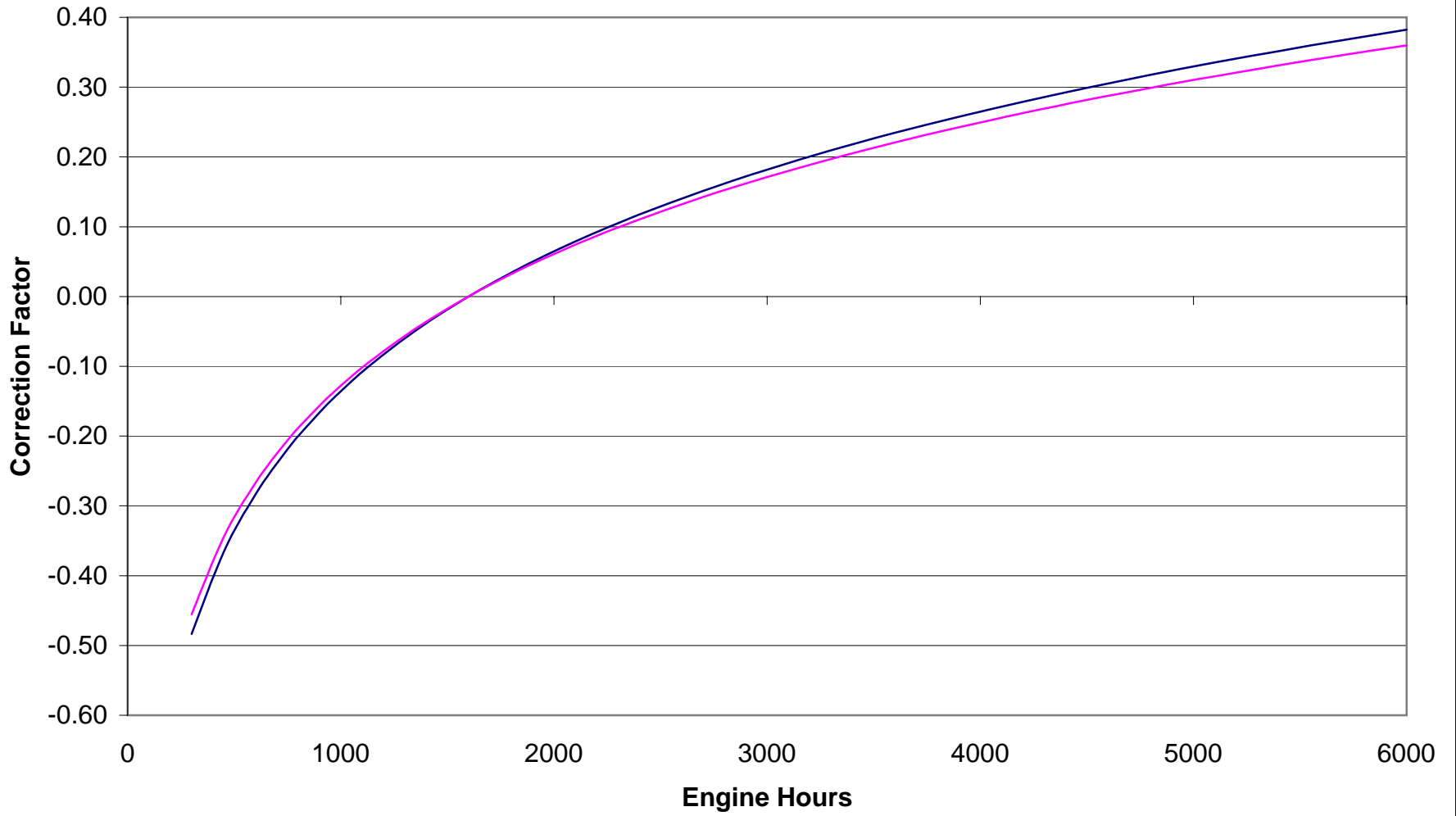
FEI2: $SA = -Z_i * (\text{industry approved pooled standard deviation for the test parameter})$

- Confirm calculation with the TMC.

5. Removal of Test Stands from the System

The laboratory must notify the TMC and the ACC Monitoring Agency when removing a stand/engine from the system. No reference oil data shall be removed from the control charts from test stand/engine(s) that have been used for registered candidate oil testing. Reintroduction of a stand/engine into the system requires completion of new stand/engine acceptance requirements. In all instances of stand/engine removal, stand/engine renumbering can occur only if the stand/engine undergoes a significant rebuild, as agreed upon by the laboratory and the TMC.

VID Engine Hours Correction



— FEI1 En Hrs Corr — FEI2 En Hrs Corr