Technical Guidance Committee Report

Prepared by: Patrick Lang

December 9, 2019

New Orleans

Summary of Activity this Period

- Rating Task Force continued to be very active during this reporting period.
  - LED lights have been approved for use.
  - Updated Manual 20 expected to be printed early 2020.
  - Some changes proposed for the workshop structure to ensure heavier focus on lab raters.
- Fuels Task Force continues with their review of the various fuel specifications.
  - Now reviewing the KA24E “green” fuel spec.

Activity this Period (cont'd)

- The Sequence VI Surveillance Panel approved the Alternate Fuel Supplier Task Force's recommendation for the amount of engine testing required by a potential alternate supplier.
  - Eight tests
  - Two engines
  - One reference oil
- The Sequence IIIH Alternate Fuel Supplier Task force has been meeting. A final recommendation has not been made yet but getting close. Looks like group is honing in on a nine test matrix.

Rater Task Force Update to TGC

12/9/2019

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TF Communications and Next Workshops

- **Pre-HD workshop call (9/19/2019)**
- **HD workshop held (week of 9/30/19)**
- **Post-HD workshop calls (10/30 & 11/13)**

- **Next LD Workshop (week of 5/4/20)**
- **Next HD Workshop (week of 9/28/20)**

Manual 20 Update

- **Group agreed to eliminate term “glossy” from page 16 of the paint specification and prohibit its use**
- **Surveillance panels have agreed that data generated at Spring workshop supported inclusion of LED lighting into Manual 20.**
- **Updated Manual at ASTM for reprint—expected early 2020!**

HD Workshop update

- **Attendance was “normal” (nice surprise)**
  - 13 raters in Session A, 20 raters in Session B
- **Sessions ran very smoothly**
- **Data output very quickly (thanks to TMC)**

- **But……Several gaps identified**
  - Need better system to identify differences
    - and provide time to rectify these differences when observed
  - No sludge color coding currently

Improvement Discussions

- **Small F2F meeting between TMC, TGC and Rating TF Chair (Farber, Clark, Lang, Campbell) 11/21/19**

- **Slight modifications to format and requirements being discussed but not finalized yet……..**
  - Seq V panel just approved reduction in piston requirement (24 to 16) and added color coding requirement for sludge (12/3/19)
  - Session A only for lab raters
  - Extend Session A by ½ day, decrease Session B by same
  - Require real-time data entry
    - Will allow more “real time” data monitoring to identify problems quicker
  - Add intermediate (2^{nd}) data review to Session A
  - Employ more visual techniques (JMP or equivalent) during review
  - Reduction in hardware, more focus on difference resolution

Spring Workshop Expectations

- **Employ newer format, addressing observations from Fall**
  - Identify and resolve differences earlier
  - Heavier focus on lab raters (Session A)
    - However Trainers still available for Session B, which will be open to all
  - Provide more time to achieve better interaction

- **Better Product!**

TGC Fuels Task force Update

Michael Lochte, Chairman

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SCOPE

- The scope of this task force is to create a document including best practices for HD and PC test fuel monitoring, handling, storage, and supply. The task force also needs to establish mechanisms for single and multiple source supply.

OBJECTIVES

- Maintain a data depository for all test fuel data, located in the TMC website. This should include test fuel formulation details (similar to reference oils) and create a procedure to indicate when significant changes occur in a test fuel formulation.

- Develop test fuel monitoring plans, include what to analyze (what are key parameters) and how to determine what properties of the test fuel affect the parameters the lubricant test is evaluating. Define what a "batch" is.

- Establish best practices for test fuel transporting, handling, and storage at the suppliers and laboratories.

- Develop robust back up plans to account for lack of supply, natural disasters, raw material shortages, etc. From original supplier or alternative suppliers.

- Include test fuel as critical parameter and test fuel suppliers as partners at the start of test development. Start out with multiple supply scenarios in new procedures.

OBJECTIVES, cont'd

- Look to reduce the amount of industry test fuels and reduce storage complexity for labs.

- Develop alternative supplier standards for test fuel across lubricant testing procedures. (being handled by surveillance panels, recommend we remove this from the objectives)

Activity since last ASTM TGC meeting….

- The TGC Fuels Task force met by Telecon on July 9, October 2, and November 25, 2019.
- The proposed Sequence III and Sequence VI fuel specifications were accepted by the task force and forwarded to the Sequence III, VI, IX, and X surveillance panel chairs.
- Currently the task force is working on the KA24E fuel specification, which is utilized for the IVA, IVB, and VIII tests.

Proposed Sequence III fuel spec

Seq III, IX, and X Lube Cert Gasoline

17-Jul-19

TEST	METHOD	UNITS	Seq. III Specs MIN	TARGET	MAX
Distillation - IBP	ASTM D86	°C	23.9		35.0
5%		°C			
10%		°C	48.9		57.2
20%		°C			
30%		°C			
40%		°C			
50%		°C	93.3		110.0
60%		°C			
70%		°C			
80%		°C			
90%		°C	151.7		162.8
95%		°C			
Distillation - EP		°C			212.8
Recovery		vol %		Report	
Residue		vol %		Report	
Loss		vol %		Report	
Gravity @ 60°F/60°F	ASTM D4052	°API	58.7		61.2
Density @ 15° C	ASTM D4052	kg/l	0.734		0.744
Dry Vapor Pressure Equivalent	ASTM D5191	kPa	60.1		63.4
Carbon	ASTM D3343	wt %		Report	
Carbon	ASTM D5291	mass %		Report	
Hydrogen	ASTM D5291	mass %		Report	
Hydrogen/Carbon ratio	ASTM D5291	mole/mole		Report	
Oxygen[1]	ASTM D4815	wt %			0.2
Oxygenates Ethanol	ASTM D4815	%		Report	
MTBE		%		Report	
ETBE		%		Report	
Methanol		%		Report	
Sulfur	ASTM D5453	mg/kg	3		15
Composition, aromatics	**ASTM D5769[3]**	**vol %**	31.0		34.0
C6 aromatics (benzene)	**ASTM D5769**	**vol %**			1.0
C7 aromatics (toluene)	**ASTM D5769**	**vol %**		Report	
C8 aromatics	**ASTM D5769**	**vol %**		Report	
C9 aromatics	**ASTM D5769**	**vol %**		Report	
C10+ aromatics	**ASTM D5769**	**vol %**		Report	
Composition, olefins	**ASTM D6550[3]**	**wt%**			2.0
Lead[1]	ASTM D3237	mg/l			2.6
Manganese[1]	ASTM D3831	g/gal			0.01
Phosphorus[1]	ASTM D3231	mg/l			1.3
Silicon[1]	ICP method	mg/kg			4
Particulate matter	ASTM D5452	mg/l			1
Oxidation Stability	ASTM D525	minutes	1000		
Copper Corrosion	ASTM D130				1
Gum content, washed	ASTM D381	mg/100mls			5.0
Gum content, unwashed	ASTM D381	mg/100mls			10.0
Research Octane Number	ASTM D2699		96.0		
Motor Octane Number	ASTM D2700			Report	
R+M/2	D2699/2700			Report	
Sensitivity			7.5		
Net Heating Value, btu/lb	ASTM D3338	btu/lb		Report	
Gross Heating Value, btu/lb	ASTM D240	btu/lb		Report	
Net Heating Value, btu/lb	ASTM D240	btu/lb		Report	
Water and Sediment	ASTM D2709	vol%			0.01
Color[2]	VISUAL	1.75 ptb		Red	

[1]no intentional addition of these elements permitted.
[2]Innospec Oil Red B4 Liquid Dye
[3]or use D6839 for everything measured by D5769 and D6550

Proposed Sequence VI fuel spec

Seq. VI Lube Certification Fuel

2-Oct-19

TEST	METHOD	UNITS	Seq. VI Specs MIN	TARGET	MAX
Distillation - IBP	ASTM D86	°C	23.9		35.0
5%		°C			
10%		°C	48.9		57.2
20%		°C			
30%		°C			
40%		°C			
50%		°C	93.3		110.0
60%		°C			
70%		°C			
80%		°C			
90%		°C	151.7		162.8
95%		°C			
Distillation - EP		°C			212.8
Recovery		vol %		Report	
Residue		vol %		Report	
Loss		vol %		Report	
Gravity @ 60°F/60°F	ASTM D4052	°API	58.7		**61.2**
Density @ 15° C	ASTM D4052	kg/l	0.734		0.744
Dry Vapor Pressure Equivalent	ASTM D5191	kPa	60.1		63.4
Carbon	ASTM D3343	wt %		Report	
Carbon	ASTM D5291	mass %		Report	
Hydrogen	ASTM D5291	mass %		Report	
Hydrogen/Carbon ratio	ASTM D5291	mole/mole		Report	
Oxygen[1]	ASTM D4815	wt %			0.2
Oxygenates Ethanol	ASTM D4815	%		Report	
MTBE		%		Report	
ETBE		%		Report	
Methanol		%		Report	
Sulfur	ASTM D5453	mg/kg	3		15
Composition, aromatics	**ASTM D5769[4]**	**vol %**	**31.0**		**34.0**
C6 aromatics (benzene)	**ASTM D5769**	**vol %**			**1.00**
C7 aromatics (toluene)	**ASTM D5769**	**vol %**		**Report**	
C8 aromatics	**ASTM D5769**	**vol %**		**Report**	
C9 aromatics	**ASTM D5769**	**vol %**		**Report**	
C10+ aromatics	**ASTM D5769**	**vol %**		**Report**	
Composition, olefins	**ASTM D6550[4]**	**wt%**			**2.0**
Lead[1]	ASTM D3237	mg/l			2.6
Manganese[1]	ASTM D3831	g/gal			0.01
Phosphorus[1]	ASTM D3231	mg/l			1.3
Silicon[1]	ICP method	mg/kg			4
Particulate matter	ASTM D5452	mg/l			1
Oxidation Stability	ASTM D525	minutes	1000		
Copper Corrosion	ASTM D130				1
Gum content, washed	ASTM D381	mg/100mls			5.0
Gum content, unwashed	ASTM D381	mg/100mls	7.0		20.0
Research Octane Number	ASTM D2699		96.0		
Motor Octane Number	ASTM D2700			Report	
R+M/2	D2699/2700			Report	
Sensitivity			7.5		
Net Heating Value, btu/lb	ASTM D3338	btu/lb		Report	
Gross Heating Value, btu/lb	ASTM D240	btu/lb		Report	
Net Heating Value, btu/lb	ASTM D240	btu/lb		Report	
Water and Sediment	ASTM D2709	vol%			0.01
Color[2]	VISUAL	1.75 ptb		Red	
Top Tier Additive[3]	ppm m/m	267		Report	

[1] no intentional addition of these elements

[2] Innospec Oil Red B4 Liquid Dye

[3] Lubrizol UltraZol 8219. Can be obtained from Lubriol Sales.

[4] or use D6839 for everything measured by D5769 and D6550

On the to-do list for TGC fuels task force….

- Will need to address the KA24E (IVA, IVB, and VIII) and STDF (diesel 1MPC and 1K) fuel specifications because of the D1319 issue, and conflicts between COA and the various test procedures.

Seq. VI Alt. Fuel Supplier Protocol

Approval Requirements for Alternate Fuel Supplier, Sequence VI

For an alternate supplier to obtain approval for Sequence VI tests, the supplier must demonstrate, through chemical analysis of the fuel candidate and engine testing, that the potential fuel will provide acceptable results when used for Sequence VI registered testing. The supplier will provide a C of A documenting that the fuel meets the current Sequence VI fuel specification, as well as conducting a prove-out program.

The prove-out program will be completed using the Sequence VIE test, and is to be performed in one test stand, using a minimum of two engines and a single reference oil, 1010-1 (or subsequent approved reblends). Testing will utilize the first four runs of the engines' life and will be alternated between the current fuel and the alternate fuel candidate, as shown in Table 1 (below).

Engine	Break-in Fuel	Run #1	Run #2	Run #3	Run #4
Engines 1, 3,…	Current Fuel	Current Fuel	Alternate Fuel	Current Fuel	Alternate Fuel
Engines 2, 4,…	Alternate Fuel	Alternate Fuel	Current Fuel	Alternate	Current Fuel

Table 1: Engine Tests Run Order

At the completion of each engine after Engine #2, two ANOVA models will be constructed using the engine hour corrected results. The response variables will be FEI1 Yi and FEI2 Yi, which are the standardized results, and factors to include are "Engine", with levels Engine1, Engine2, …, EngineN, and "Fuel", with two levels. For the alternate fuel to be qualified, the following must be true of the ANOVA model results for both the FEI1 Yi model and the FEI2 Yi model:

1. The absolute difference in the least squares mean for Fuel A and the least squares mean for Fuel B is less than one.
2. When forming a 95% confidence interval on the least squares mean difference between fuels, the upper and lower limits are both less than 2.5 in absolute value.

If the above two criteria are not satisfied for both FEI1 and FEI2, then an additional four tests must be conducted on another engine, followed by another ANOVA model. This process will continue until both criteria have been satisfied for both parameters.

If approved, the alternate fuel may be used for registered testing in both the Sequence VIE and the Sequence VIF, provided acceptable reference testing has been completed on the stand/engine combination. All test run for registration purposes must be run on the same fuel (current or alternate) that the stand engine was calibrated on. When changing fuels, add fuel from a new batch to a laboratory's fuel tank when the current fuel level is below 10 % of the final fuel (new and previous) mixture's total volume.

The following motion was made during the 10/25/19 Sequence VI Surveillance Panel Conference Call:

Motion: Recommend to the Surveillance Panel the alternate supplier method be added to a procedure annex by information letter.

Adrian Alfonso, Ben second. 7 yes, 5 waive, 3 no. The motion passed.

TGC Scope and Objectives

The Technical Guidance Committee is a standing committee under the ASTM Test Monitoring System Executive Committee. The TGC shall consist of the chairmen of the surveillance panels of monitored tests, a representative of each of the test developers/sponsor who are responsible for the test procedures and the Director. The Technical Guidance Committee will advise the Director in technical matters concerning test procedures.

This will involve working with the surveillance panels, test developers, critical parts suppliers, fuel suppliers and testing laboratories across all testing types to improve the repeatability and reproducibility of the test procedures. The TGC will provide guidance for future test developments. Additionally, the TGC chairman will liaise with the ACC PAPTG Chair.

Objectives:

1) Develop guidelines for issues that are potentially common to all HD/PC engine, gear and bench testing.
2) Work with the Rating Committee to provide guidance for issues related to visual deposit ratings.
3) Provide guidance on best practices for critical component identification within test procedures.
4) Continue to refine the “Guide for Test Development” document as new categories are developed.