



ASTM INTERNATIONAL
Helping our world work better

100 Barr Harbor Drive
PO Box C700
West Conshohocken, PA
19428-2959 USA

tel +1.610.832.9500
fax +1.610.832.9666
www.astm.org

COMMITTEE D02 on PETROLEUM PRODUCTS, LIQUID FUELS, AND LUBRICANTS

CHAIRMAN: Randy F Jennings, Tennessee Dept Of Agric, P O Box 40627, Nashville, TN 37204, United States (615) 837-5150, Fax: (615) 837-5327, e-mail: randy.jennings@tn.gov

FIRST VICE CHAIRMAN: James J Simnick, Bp America, 150 Warrenville Rd, Naperville, IL 60563, United States (630) 420-5936, Fax: (630) 420-4831, e-mail: simnicjj@bp.com

SECOND VICE CHAIRMAN: Michael A Collier, Petroleum Analyzer Co Lp, 21114 Hwy 113, Custer Park, IL 60481, United States (815) 458-0216, Fax: (815) 458-0217, e-mail: michael.collier@pacpl.com

SECOND SECRETARY: Hind M Abi-Akar, Caterpillar Inc, Building H2000, Old Galena Road, Mossville, IL 61552, United States (309) 578-9553, e-mail: abi-akar_hind@cat.com

SECRETARY: Scott Fenwick, National Biodiesel Board, PO Box 104848, Jefferson City, MO 65110-4898, United States (800) 841-5849, Fax: (537) 635-7913, e-mail: sfenwick@biodiesel.org

STAFF MANAGER: Alyson Fick, (610) 832-9710, e-mail: afick@astm.org

Unapproved Meeting Minutes of the Technical Guidance Committee Meeting

December 4, 2017

Marriott Marquis Houston, TX

Galveston A/B Meeting Room 4:00 PM to 5:30 PM CDT

Reply to: Patrick Lang

Southwest Research Institute, 6220 Culebra Road San Antonio, TX 78228

210-240-9461/patrick.lang@swri.org

Attendees introduced themselves at beginning of the meeting.

Agenda:

The meeting agenda can be found as attachment # 1

Pat Lang commented that the agenda order was chosen based on the hottest topics and that not all TGC topics are included.

Attendance List:

There were no changes requested for the membership list. The attendance list can be found as attachment # 2.

Review and Acceptance of Previous Meeting Minutes:

The June 28 meeting minutes were approved during the August 30, 2017 conference call. It was brought up again in this meeting for final review since there was minimal attendance on the conference call.

Chairman said that the minutes from the August 30, 2017 conference have not been released yet.

Action Item Review:

The first order of business was to review the action item list, along with their status. The Action Item List can be found as attachment # 3.

Comments related to open action items on the list.

Action Item #2:

The group agreed that the precision of a test result in any given test report needs to match the precision shown in ASTM D4485. If a discrepancy is identified it would have to be changed at the surveillance panel level (revise the test report forms) since it would be difficult to make a change to limit in D4485. The revised action here is to solicit examples from the group where discrepancies exist and then the respective surveillance panel would have to review and approve changing the test report to match the precision of D4485.

Action Item #4

Regarding the VH test procedure, the fuel supplier language was modified from what was in the VG by the VH Procedural Review Task Force. The wording focuses on some of what is required to prove out a batch of fuel. Although not completely defined, it serves as a good example of a prove-out requirement in the event that there is more than one supplier interested in providing the fuel. This type of approach is targeted to be applied to other GF-6 test procedures.

Action Item #5

Chairman is working to ensure critical parts are listed in GF-6 test procedures.

Action Item #7

Regarding the fuel data worksheet, a common field for where analysis is conducted will be added to the worksheet. This addition will be made along with Jim Matasic's current activities on communizing fuel specs in the various procedures.

Fuel Task Force Report:

Jim Matasic gave a report on the activities of the Fuels Task Force; his report can be found as attachment # 4.

Current task force activities:

- 1) Group is recommend that the PC-10 fuel specification that is being reviewed by the group will now reside on the TMC website instead of in the test procedure.
- 2) After Fuels TF review and recommendations are complete for the PC-10 fuel spec, the TGC chair will forward to all the SP chairs in diesel.

Rating Task Force Report:

The rating task force report was provided by Bob Campbell; his report can be found as attachment # 5. Goal is to have one to two calls before and after each rating workshop.

Current task force activities:

- 1) Recent rating workshop followed the new format with positive feedback. Some comments on the workshop are:
 - a. Too many parts were assigned to the experienced raters, not all got rated.
 - b. Since some parts didn't get rated, TMC need to determine how to handle precision calculation based on limited ratings.
 - c. The experienced raters become coaches for the second part of the week; they will wear a different shirt so they are distinguishable.
 - d. Re-rate allowances during workshop needed clarification; you can re-rate once, but not again after that.
- 2) CRC rating manuals 20/21 are not currently "owned" by anyone and need to be updated. The task force is suggesting that ASTM take over the manuals, work on getting them in the right format and style. They are currently sold by ASTM, but there is no way to update them, etc. The thought is that they need to be made into a standard. The Rating TF was nominated to upgrade these manuals, as the manuals currently have no technical owners. They would need to be upgraded and obtain surveillance panel approval. The rating manual could be a *standard guide* instead of a *test procedure* and as a result might not need to have an information letter system for updates. The goal is to have ASTM continue selling them. The manuals need to be printed in full, true, color. Dave Duncan stated that we should have a documented procedure to cover the rating process.

Action Item: The Rating Task Force to take the action of updating ASTM manual 20 and 21 to get it standardized and reflecting what is actually being done.

Alternate Supplier Protocol:

Chairman Lang reported that the latest draft of the alternative supplier wording was reviewed by all of the surveillance panels at PCMO meetings on November 13, 2017 in San Antonio (see attachment # 6). Pat Lang will pass this document on to the HD guys for their review. All surveillance panels will have to have a final vote and then the wording will be added to each test procedure.

Engineering Review of Test Procedure Deviations:

Jim Moritz went over the presentation on Procedural Review and Engineering Judgment (see attachment # 7). The concern here is how laboratories should be filling out the ACC conformance statement when there is a candidate test that has an anomaly. The conformance statement in question can be found on page two of Jim's presentation. Right now if a lab has a deviation on a required parameter for a test report, the box is checked with a "NO" and a comment is provided on the form defining the anomaly and the tests is considered valid. It has been questioned as to whether or not the test can truly be considered valid and ultimately who has the authority to deem it so. There are some that think that test validity should reside with the laboratory that conducts the test. With that comes concerns on whether there are any checks and balances for such decisions.

In order to address this some ideas have been kicked around. One suggestion that was entertained earlier but may need to be revisited is to have an additional section on the ACC conformance statement that identifies a special case. Another would be having a review of the anomaly by a third party like the TMC who currently does it for reference tests. Dave Duncan said that the anomalies happen more often than is liked, but they should be transparent. There needs to be review of tests, and it needs to be consistent between laboratories on how anomalies are handled and dismissed.

The group thought that finding a solution to this issue needs input from both the ACC and ASTM. As a result it was recommended that a Joint TF be formed. Dan Pridemore volunteered to bring back to ACC to see if they would want to support the joint task force. This is an important issue since, as an industry, we need to exercise sound engineering judgment so that good tests are not thrown away. Engine tests are very expensive to run so invalidating tests should be based on sound technical reasons.

At this point it was already 5:30 PM and the Executive Committee was scheduled to begin. The topic of a procurement process within ASTM was on the TGC agenda as well as the Executive Committee agenda so the discussion started on this topic before officially ending the TGC meeting and starting the Executive Committee meeting.

Review of ASTM TMC procurement process.

There needs to be some guidelines set up for the TMC to follow when exercising the procurement process. Frank Farber presented a first draft of a proposed flow chart for defining the procurement process (see attachment # 8). The proposal shows a different processes for materials that are only used by one surveillance panel and a process for materials that are used by more than one surveillance panel. TGC would validate technical terms; ASTM International would validate commercial terms. Labs would work directly with the suppliers as they do now. Frank went through the PC-10 fuel contract template that he put together (see attachment # 9), which has not been reviewed yet by ASTM International legal. With

this proposed process, that TMC could be responsible for approving the fuel before it is shipped to the laboratories.

There were several concerns voiced about the general process of handling contracts within ASTM. Prasad Tumati commented that individual companies would be more proficient at negotiating better contracts than ASTM. Ron Romano raised concerns over this negotiating creating delays in getting testing materials when needed for testing.

It was know that this would not be easy topic to handle but we had to start somewhere. Are there cleaner ways to do it other than a contract? The group is open to any ideas on how to do this better.

The meeting was ended due to time constraints; no other agenda items were discussed.

Attachment #1

Agenda

AGENDA

ASTM Technical Guidance Committee

Patrick Lang – Chairman

Monday, December 4, 2017 – 4:00 pm to 5:30 pm

Marriott Marquis, Houston, Texas

Room: Galveston A/B

1. Welcome, Introductions
2. Membership Review
3. Chairman's Comments
4. Review & Acceptance of Minutes
 - 4.1. June 28, 2017 minutes approved during 8-30-17 conference call
 - 4.2. 8-30-17 conference call minutes not released yet
5. Review Action Item List
6. Fuel Task Force Update (Jim Matasic)
 - 6.1. Fuel data report forms reviewed during the 8/3/17 conf. call
 - 6.2. PC-10 fuel spec recommended during of the 11/27/17 conf. call
7. Rating Task Force Update (Bob Campbell)
 - 7.1. Rating workshop summary
 - 7.2. Status of CEC Manuals 20/21
8. Old Business
 - 8.1. Alternate Supplier Protocol
 - 8.1.1. Recommended wording reviewed during PCMO in San Antonio the week of November 13th.
 - 8.2. Engineering review of test procedure deviations (Jim Moritz)

8.2.1. Work towards defining a protocol to follow when performing engineering review of procedural deviations

8.3. Procurement process within ASTM

8.3.1. Provide guidelines for the TMC to follow

9. New Business

9.1. Request has been made to review the DACA II document

9.2. Protocol for scheduling industry conference calls when a vote is needed

10. Review of Scope and Objectives

11. Next Meeting

12. Adjournment

Attachment #2

Attendance List

Technical Guidance Committee Membership List

12/4/17

NAME	COMPANY AND ADDRESS	PHONE NUMBER E-MAIL ADDRESS FAX NUMBER
Hind Abi-Akar Test Developer	Caterpillar, Inc. Old Galeena Road Building H3000 Mossville, IL 61552-3000	Phone: (309) 578-9553 e-mail: abi-akar_hind@cat.com FAX: (309) 578-1485
Mesfin Belay Test Developer	Detroit Diesel Corporation 13400 West Outer Drive, K15 Detroit, MI 48239-4001	Phone: (313) 592-5970 e-mail: mesfin.belay@detroitdiesel.com FAX: (313) 592-5952
Don Bell OSCT	Afton Chemical Corporation 500 Spring Street PO Box 2158 Richmond, VA 23218-2158	Phone: (804) 788-6332 e-mail: don.bell@aftonchemical.com FAX: (804) 788-6243
Mike Birke HD and LD Elastomers	Southwest Research Institute 6620 Culebra Road San Antonio, TX 78228-0510	Phone: (210) 522-5310 e-mail: mike.birke@swri.org FAX: (210) 684-5907
Jason Bowden Central Parts Distributor	OH Technologies P.O. Box 5039 Mentor, OH 44061-5039	Phone: 440-354-7007 x101 e-mail: jbowden@oh-tech.com FAX: 440-354-7080
William Buscher, III Sequence IVA/IVB	Intertek Automotive Research 5404 Bandera Road San Antonio, TX 78238-1933	Phone: (210) e-mail: william.buscher@intertek.com FAX: (210)
G. E. Callis Two-Stoke Cycle	Spectrum Corporation 1523 SE Prestwick Lane Port St. Lucie, FL 34952-6038	Phone: (561) 337-5060 e-mail: ecallis@spectrumcorporation.com FAX: (561) 337-5061
Mark Cooper T-8/T-8E, T-11, T-12	Chevron Oronite Company, LLC 4502 Centerview Drive, Suite 210 San Antonio, TX 78228	Phone: (210) 731-5606 e-mail: mawc@chevrontexaco.com FAX: (210) 731-5699
Tim Cushing Test Developer Eric Johnson	GM Powertrain Engine Engineering Building 823 Joslyn Road, Mail Code 483-730-312 Pontiac, MI 48340-2920	Phone: e-mail: FAX:
Mike Faile TEOST SP Chair	Lubrizol 29400 Lakeland Blvd. Wickliffe, OH 44092-2298	Phone: e-mail: FAX:
Frank Farber TMC Administrator	ASTM Test Monitoring Center 6555 Penn Avenue Pittsburgh, PA 15206-4489	Phone: (412) 365-1005 e-mail: fmf@astmtmc.cmu.edu FAX: (412) 365-1047
Alan Flamberg ROBO SP	Evonik	Phone: e-mail: FAX:
Josh Frederick Volatility (D5800/D6417)SP	Valvoline	Phone: e-mail: FAX:
Frank Gotto HT Foam	The Lubrizol Corporation 29400 Lakeland Blvd. Wickliffe, OH 44092-2298	Phone: (440) 347-8087 e-mail: fig@lubrizol.com FAX: (440) 347-8101
Jim Gutzwiller C13	Infineum USA, L.P. 4241 Piedras Drive East, Suite111 San Antonio, TX 78228	Phone: (210) 732-8132 x13 e-mail: James.Gutzwiller@infineum.com FAX: (210) 732-8480
Brian Koehler HTCT	Southwest Research Institute 6220 Culebra Road San Antonio, TX 78228-0510	Phone: (210) 522-3588 e-mail: bkoehler@swri.edu FAX: (210) 680-1777

NAME	COMPANY AND ADDRESS	PHONE NUMBER E-MAIL ADDRESS FAX NUMBER
Cory Koglin L-42	Afton Chemical Corporation 500 Spring Street P.O. Box 2158 Richmond, VA 23218-2158	Phone: (804) 788-5305 e-mail: cory.koglin@aftonchemical.com FAX: (804) 788-6358
Patrick Lang Sequence VIII	Southwest Research Institute 6220 Culebra Road San Antonio, TX 78228-0510	Phone: (210) 522-2820 e-mail: plang@swri.org FAX: (210) 684-7523
Mike Lopez	Intertek Automotive Research 5404 Bandera Road San Antonio, TX 78238-1933	Phone: e-mail: FAX:
Jim Matasic ✓	The Lubrizol Corporation 29400 Lakeland Boulevard Wickliffe, OH 44092-2298	Phone: (440) e-mail: FAX: (440)
Jim McCord 1K, 1N, 1P, 1R, 1M-PC	Southwest Research Institute 6220 Culebra Road San Antonio, TX 78228-0510	Phone: (210) 522-3439 e-mail: jmccord@swri.edu FAX: (210) 523-6919
Yon-Li McFarland EOFT/EOWTT SP	Southwest Research Institute 6220 Culebra Road San Antonio, TX 78228-0510	Phone: (210) 522-2715 e-mail: yonli.mcfarland@swri.org FAX:
Greg Miranda Sequence VID/VIE/VIF	The Lubrizol Corporation 29400 Lakeland Boulevard Wickliffe, OH 44092-2298	Phone: (440) 347-8516 e-mail: Greg.miranda@lubrizol.com FAX:
Jim Moritz M11, M11EGR, ISB, ISM	Intertek Automotive Research 5404 Bandera Road San Antonio, TX 78238-1933	Phone: (210) 523-4601 e-mail: jim.moritz@intertek.com FAX: (210) 523-4607
Jessica Villareal BRT	Intertek Automotive Research 5404 Bandera Road San Antonio, TX 78238-1933	Phone: e-mail: jessica.villareal@intertek.com FAX:
Gil Reinhard CBT, HTCBT	Intertek Automotive Research 5404 Bandera Road San Antonio, TX 78238-1933	Phone: (210) 523-4674 e-mail: gil.reinhard@intertek.com FAX: (210) 681-8300
Andy Ritchie Sequence VG SP Chair	Infineum 1900 East Linden Ave. Linden, NJ 07036-0735	Phone: 908-474-2097 andrew.ritchie@infineum.com Fax: 908-474-3637
Ron Romano Test Developer	FCSD, Service Product Dev, SEO Diagnostic Service Center II Room 410 1800 Fairlane Drive Allen Park, MI 48101	Phone: (313) 845-4068 e-mail: rromano@ford.com FAX:
Chris Schenkenberger L-60-1	The Lubrizol Corporation 29400 Lakeland Blvd. Wickliffe, OH 44092-2298	Phone: (440) 347-2927 e-mail: csc@lubrizol.com FAX: (440) 347-2878
Matt Schlaff Gelation Index SP HT Foam SP D874 (SASH) SP	Intertek Automotive Research 5404 Bandera Road San Antonio, TX 78238-1933	Phone: e-mail: FAX:
Greg Shank Test Developer	Volvo Powertrain 13302 Pennsylvania Avenue Hagerstown, MD 21742	Phone: (301) 790-5817 e-mail: greg.shank@volvo.com FAX: (301) 790-5815
Dale Smith L-33-1	PARC Technical Service, Inc. 100 William Pitt Way Pittsburgh, PA 15238	Phone: (412) 826-5051 e-mail: dbs@usaor.net FAX: (412) 826-5443
Robert Stockwell RFWT/Sequence IIIF/G/H Chairman	Chevron Oronite Company, LLC 4502 Centerview Drive, Suite 210 San Antonio, TX 78228	Phone: (210) 232-3188 e-mail: robert.stockwell@chevron.com FAX:

NOT COPY

NAME	COMPANY AND ADDRESS	PHONE NUMBER E-MAIL ADDRESS FAX NUMBER
Haiying Tang Test Developer/OEM	Chrysler FCA	Phone: e-mail: FAX:
Shawn Whitacre	Chevron Lubricants	Phone: e-mail: FAX:
Dave Duncan	Lubrizol	Phone: 440 347 2018 e-mail: David.Duncan@Lubrizol.com FAX:
Alfuss Lopez	Intertek	Phone: e-mail: al.lopez@intertek.com FAX:
Joe Franklin	Intertek	Phone: 210-523-4671 e-mail: Joe.Franklin@intertek.com FAX:
Pat Holmes	Volvo/Mack	717 658 8007 patrick.holmes@volvo.com
Bob Campbell	Afton	
Dan Redmore	Afton	dan.redmore@ aftonchemical.com
Greg Shank	Volvo/Mack	301 573 6690 greg.shank@volvo.com
Mark Corp	Chevron Oronite	210-867-8606 mawc@chevron.com
PRASAD TUMATI	HALTERMANN	(313) 300-8300 PTUMATI@JHALTERMANN.COM
Matthew Bowen	OH. TECHNOLOGIES	MJBOWEN@OHTECH.COM
Joffran Pastor	INFINEUM.	JOFFRAN.PASTOR@INFINEUM. COM
Steve Marty	SWRI	(210) 522-5929 smarty@swri.org
AUTUMNLINN GLASS	CUMMINS, INC	autumnlynn.glass@cummins.com
Ryan Denton	Cummins Inc.	ryan.denton@cummins.com

Attachment #3

Action Items List and Status as of 12/4/17

Technical Guidance Committee (TGC)

Action Items List and Status as of 12-4-17:

1. Action Item – The TGC chair to recommend to the HDEO Surveillance Panel chairs that they consider adoption of the rater calibration protocols that the PCMO test types follow.
 - *Currently being discussed in the Rating Taskforce.*
2. Action Item – The TGC chair to recommend to the HDEO Surveillance Panel chairs that the HDEO merit system be evaluated for whether or not the final result value should be reported to the same precision as the pass/fail limit.
 - *Per discussion at the June 28, 2017 TGC Meeting the recommendation was made to come up with some specific examples where D4485 precision conflicts with test report (data dictionary) precision and review within the TGC.*
3. Action Item – The TGC to develop standardized wording for the process for substituting materials, which can be applied to all test types.
 - *Suggested wording presented to PCMO Surveillance Panels during the November 2017 meeting in San Antonio. The chairman requested that any additional changes be forwarded to him for review. Next step it to present wording to the HD panels.*
4. Action Item – The Sequence VH ASTM test procedure will include a fuel approval procedure. This fuel approval procedure can be considered for adaption into other test type test procedures.
 - *Done, Excerpt from VH procedural review group is as follows:*

8.2.4 Fuel Batch Approval Process—Obtain fuel from the a fuel supplier listed in. Current approved supplier and batch listed in X2.1.5. Each new batch of fuel is approved by the following process:

8.2.4.1 Before initial blending, typical samples of the fuel blend components are analyzed, and the data are compared with predetermined physical specifications. A small amount of fuel mixture is then blended,

analyzed, and compared to predetermined specifications. The ASTM Sequence V Surveillance Panel (SP) confirms the acceptability of the fuel mixture analytical data and authorizes blending of the entire batch for engine testing. After the entire batch is blended, the SP confirms the acceptability of the analytical data of the entire fuel batch, and authorizes the engine test fuel approval program.

- 8.2.4.2 A sample of the fuel is shipped to the designated laboratories. A statistically designed test program involving more than one calibration test is completed using reference oils selected by the SP. (The Sequence V Surveillance Panel designs the test program.) The SP reviews the test results and if acceptable, authorizes the fuel supplier to notify potential purchasers of the approval status of the fuel batch. **The TMC then publishes an information letter showing the batch number/identification of the approved fuel batch and the supplier, with contact information.**

5. Action Item – The TGC to review the parts lists in each test procedure, starting with the PCMO test types, to determine if they list all necessary parts and if they properly identify the critical test parts.

- *In process, chair currently working with GF-6 procedure task forces to incorporate/refine these lists.*

6. Action Item – TGC to review the current document for “out of control” tests.

- *No action at this point*

7. Action Item – TMC to add a field to the fuel data input form to identify the lab where the analysis was conducted. This is intended to identify if the data is sourced from the suppliers in-house lab or at a test lab

- *Pending*

8. Action Item – Frank Farber to add a link to the ASTM TMC website that will link you to a current list of surveillance panel chairmen.

- *Done*

9. Action Item – Add ACEA contacts to the distribution list that was created to advise industry stakeholders when the availability of a test changes.

- *Done*

10.Action Item – Work towards creating equivalency testing guidelines for commissioning alternate supplier components/materials.

- *Some discussions but still open*

11.Action Item – Establish guidelines for the TMC when exercising the procurement process for testing materials.

- *Open*

Attachment #4

**TCG Fuels Task Force Update
12/4/2017**



TGC Fuels Task Force

Update to TGC 12/4/2017



8/3/ Meeting

- ▶ Reviewed fuel data report forms
- ▶ TMC reviewed TMC website data upload portal
- ▶ Start date TBD based on finalization of fuel specs



11/27/17 Meeting

- ▶ PC10 ULSD Fuels Spec Review
 - ▶ Spec to be kept on TMC website and test procedures to refer to spec and location
 - ▶ Eliminates potential variation and need to update multiple procedures when spec is updated
 - ▶ Discussion around using D6079 as replacement for D6078 for lubricity method and spec
 - ▶ ISB, T12, DD13, C13, and COAT to approve change
 - ▶ Task Force working to add spec on Bio-Diesel content
 - ▶ Task Force working to update Sulfur content method
- ▶ CPChem to provide data analysis of all batches of PC10 and PC9 fuel for data analysis and refinement of specs
- ▶ PC9 Fuel Spec Review
 - ▶ Review started by Task force and needs completed
 - ▶ More complicated due to varying differences in test procedures

Recommended PC10 Fuel Spec

Measurement	Units	Method	Spec
<i>Additives</i>		Lubricity Additive Only	
<i>Distillation</i>			
<i>90% Volume</i>			292-332
<i>API Gravity</i>	^o API	D4052	34-37
<i>Cetane Index</i>	unitless	ASTM D976	report
<i>Cetane Number</i>	unitless	ASTM D613	43-47
<i>Specific Gravity</i>		D4052	0.840-0.855
<i>Ramsbottom Carbon Residue on 10% Distillation</i>	%	ASTM D524	max 0.35
<i>Net Heating Value</i>	MJ/kg	ASTM D3338	report
<i>Composition, aromatics</i>	volume %	ASTM D5186	26-31.5
<i>Composition, olefins</i>	volume %	ASTM D1319	report
<i>Composition, saturates</i>	volume %	ASTM D1319	report
<i>Ash</i>	mass %	ASTM D482	max 0.005
<i>Flash Point</i>	^o C	ASTM D93	min 54
<i>Pour Point</i>	^o C	ASTM D97	max -18
<i>Cloud Point</i>	^o C	ASTM D2500	report
<i>Strong Acid Number</i>	mg KOH/g	ASTM D664	max 0.00
<i>Total Acid Number</i>	mg KOH/g	ASTM D664	max 0.05
<i>Accelerated Stability</i>	mg/100 mL	ASTM D2274	max 1.5
<i>Copper Corrosion</i>	classification	ASTM D130	max 1
<i>Kinematic Viscosity</i>	cSt	ASTM D445	2.0-2.6
<i>Water and Sediment</i>	volume %	ASTM D2709	max 0.05
<i>Total Sulfur</i>	mg/kg	ASTM D5453	7-15
Lubricity (HFRR)	μm	A4-4 D6079	max 460
Bio-Diesel	XXX	XXX	XXX



TGC Fuels Task Force Recommendations to TGC

- ▶ PC10 Fuel Spec to be agreed upon by each test method using PC10 fuel
 - ▶ All effected surveillance panels to vote and approve

- ▶ Fuel Specs to be kept on TMC website and referred to within procedures
 - ▶ All HD surveillance panels to modify procedures by removing current spec and adding comment on test fuel and location of spec for that fuel
 - ▶ PC9, PC10, and SDTF

Attachment #5

Rater Task Force Update to TGC

12/4/2017



Rater Task Force Update to TGC

12/4/2017

Passion for Solutions®

What we've been doing.....

 Conference call 7/11

 HD Workshop week of 10/2

 Post-Mortem Conference call 10/26

 Call to be scheduled Jan, 2018

Workshop update

- ▲ **New format for last two workshops – seems to work well**
- ▲ **Parts quantity at workshop may need adjustment**
- ▲ **Requirement for “experienced rater” will be further defined by TMC**
- ▲ **Some parts weren’t fully rated, so discussion on how to determine precision if this occurs again – TMC to propose**
- ▲ **Improve interactions between raters and coaches**
 - ▲ TMC to provide shirts to make coaches more recognizable
- ▲ **Rerate requirements/allowances during workshop need clarification**

CEC Manuals 20/21

- ▶ **Currently nobody owns them, so they are very outdated**
- ▶ **Suggest ASTM take the manual's over, get them updated, and manage like our test methods**
 - ▶ Who should own it?

Ongoing Actions

-  **Group has an open action item to upgrade the rating booth light requirement (currently outdated T12 fluorescents required)**
-  **Continue to review parts availability and workshop protocols to ensure the industry are properly served**
-  **Ensure more interaction between rating community and surveillance panels**
-  **Potentially Manual upgrade and ownership**

Attachment #6

**Draft of the wording for Alternate Supplier
generated during TGC meeting on
6/28/17**

Draft of the wording that was generated during the June 28, 2017 Technical Guidance Committee Meeting:

ASTM International policy is to encourage the development of test methods based on generic equipment. It is recognized that there are occasions where critical/sole-source equipment is required and has been approved by the technical subcommittee. The technical committee that oversees the test method is encouraged to clearly identify if the part is considered critical in the parent test method. If a part is deemed to be critical, ASTM encourages alternate suppliers to be given the opportunity for consideration of supplying the part/component providing they meet the approval process set forth by the technical committee.

An alternate supplier can start the process by initiating contact with the surveillance panel chairman (current surveillance panel chairs shown on ASTM TMC website). The supplier should advise on the details of the part that is intended to be supplied. The surveillance panel chairman will review the request with the panel. The panel will review the request and determine feasibility. In the event that a replacement critical part has been identified and proven equivalent the sole-source supplier footnote shall be removed from the test method.

Attachment #7
Intertek Presentation on
Procedural Requirements and Engineering
Review Provision
12/4/17

PROCEDURAL REQUIREMENTS AND ENGINEERING REVIEW PROVISION

How to maintain test integrity with a review

Jim Moritz – Intertek Automotive
December 4, 2017



TEST VALIDITY AND CONFORMANCE STATEMENT



V/I/N	V = Valid
	I = Invalid
	N = Results cannot be interpreted as representative of oil performance (Non-reference oil) and shall not be used for multiple test acceptance

In my opinion this test Has/Has Not been conducted in a valid manner in accordance with the Test Method, D XXXX, and appropriate amendments. The remarks included in the report describe the anomalies associated with this test.

The laboratory ran this test for the full duration following all procedural requirements; and all operational validity requirements of the latest version of the applicable test procedure (ASTM or other), including all updates issued by the organization responsible for the test, were met. Yes _____ No _____*

BACKGROUND FROM ASTM FORM AND STYLE FOR ASTM STANDARDS (BLUE BOOK)



From the Definitions section (page iv)

- **test method**, *n*— a definitive procedure that produces a test result.
 - *DISCUSSION*—Examples of test methods include, but are not limited to: identification, measurement, and evaluation of one or more qualities, characteristics, or properties. A precision and bias statement shall be reported at the end of a test method. (Refer to Section A21 on Precision and Bias.)

From the Subject Headings of Text section (page A-2)

- It may be necessary to include other headings for specialized subjects. The headings identified as “mandatory” are required. Other headings shall be included when the subject matter is pertinent to the document under development, in which case, all instructions and guidance for that particular section shall be followed.

From the Significance and Use (Mandatory) section (page A-6)

- A9.2 Include any discretion needed in the interpretation of the results of the test.

BACKGROUND FROM ASTM FORM AND STYLE FOR ASTM STANDARDS (BLUE BOOK) CONTINUED



From the Procedure (Mandatory) section (page A-10)

- A18.1 Include in proper sequence detailed directions for performing the test. Describe the procedure in the imperative mood, present tense; for example: “Heat the test specimen ...” rather than “The test specimen shall be heated ...” State the number of samples to be taken, and also state the number of specimens to be tested from each sample. Describe in detail the successive steps of the procedure, grouping related operations into logical divisions. Subheadings may be used if they will help the organization of the material. Make the text of the procedure concise, to the point, and easily understandable. When alternative procedures are given, state their relative status; that is, which is the preferred or referee procedure.



TWO SCENARIOS TO CONSIDER

1 – Steps or procedural requirements added or performed that are not listed in a test method.

- Could a lab install a glass tube oil level sight glass across the oil pan to monitor oil level if a procedure doesn't mention it at all?

2 – Steps or procedural requirements missed, omitted, or otherwise not met that are listed in a method.

- Missed Sequence III blowby, missed C13 4 hour oil sample, one cylinder surface finish out of specification by the smallest significant digit...

POSSIBLE NEW PROCEDURE WORDING (STARTING POINT FOR DISCUSSION)



1 - All hardware specified in this method, both engine and stand, shall be used without modification. The only permitted modifications, substitutions, or adjustments are explicitly stated in this method. Any test conducted using modified, substituted, or adjusted method specified hardware is considered invalid.

2 - All portions of this method that do not include an explicit statement concerning test validity are subject to engineering review for the purpose of determining test validity. If after engineering review a test with deviations from the method is considered valid, an explanation shall be included in the comments section of the test report.

or

2 - Conduct an engineering review whenever any requirement listed in this test method is not met. For any test method requirement not met with an expressly stated need for determination of validity or needed to calculate a performance measure, declare the test invalid. For any other test method requirement not met, an explanation shall be included in the comment section of the test report.

Jim Moritz

 210-523-4601

 Jim.moritz@intertek.com

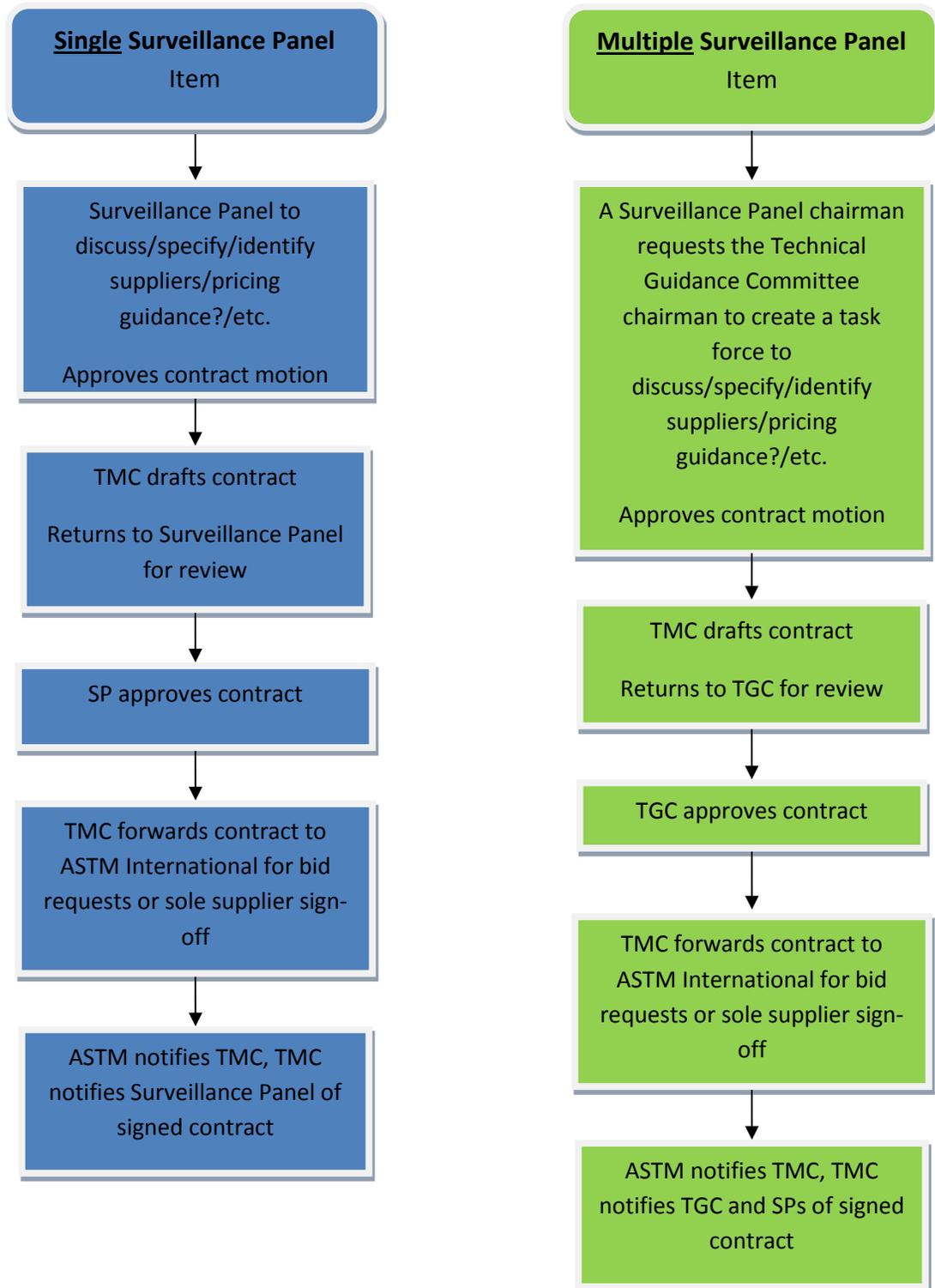
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Attachment #8
Supplier Contract Flow Chart Draft

Contract Flow Chart Draft



Attachment #9
Industry Contract PC10 ULSD Fuel Draft

Industry Contract PC10 ULSD Fuel

Draft

This contract is effective *Month Day, Year* and terminates *Month Day, Year + 4*.

Between:

Table 1
Purchaser/Supplier Designation

Purchaser	Supplier
ASTM International	Fuel Supplier A
100 Barr Harbor Dr, Conshohocken, PA 19428	99999 Gasoline Alley Anytown, XX XXXXX

ASTM International only represents the contract signing entity. Requests for shipments and payment will be made by companies designated as part of the ASTM Test Monitoring System listed below:

Table 2
Receiving Companies

Company Name	Address
Afton Chemical Corporation	500 Spring Street, Richmond, VA 23219
ExxonMobil Research & Engineering	600 Billingsport Road, Paulsboro, NJ 08066
Intertek Automotive Research	5404 Bandera Rd, San Antonio, TX 78238
The Lubrizol Corporation	29400 Lakeland Blvd, Wickliffe, OH 44092
Southwest Research Institute	6220 Culebra Rd, San Antonio, TX 78238
<i>May be amended by the ASTM Technical Guidance Committee</i>	

The fuel to be supplied is described in attachment A. Before delivery each fuel batch is to be analyzed by the supplier for the measurements specified in attachment A and uploaded to the ASTM Test Monitoring Center (TMC) for approval. According to the ASTM Electronic Test Report Transmission Model (ETRTM). Any measurement not performed directly by the supplier is to be indicated as an outsourced measurement when reporting the results to the TMC. No fuel is to be delivered before obtaining approval from the TMC. Delivery dates, terms and conditions along with payment are to be handled on an individual company basis. The supplier ordering procedure is specified in Table 3:

Table 3
Supplier Ordering Procedure

Once a fuel batch is approved by the TMC, supplier storage is to maintain the fuel within the approved limits. A delivery Certificate of Analysis indicating the fuel was approved by the TMC and is being delivered within the specification shown in Attachment A is to be given to the company receiving the fuel.

The supplier will produce batches in volumes that exceed XXX gallons and designate each batch with a unique batch code. Transportation costs from our plant are shown in Table 4. FET and Destination Taxes are applicable for on and off-road in the absence of appropriate tax exemptions.

Table 4
Transportation Cost

During the term of this contract the Supplier agrees to sell the fuel to the companies shown in Table 1 at the following price.

The price for each batch will be based on the monthly average of the high and low daily Platts LS No. 2 US Gulf Pipe index in effect at the time of production. This price will remain in effect until the batch is depleted. The Index Reference Symbol is XXXXXX (use to be POAER00). The total price charged is equal to:

Monthly Platts Daily High/Low Average + Supplier Charge + Delivery Cost.

Attachment A

Fuel Specification

Measurement	Units	Method	Limits
Distillation 90% Volume			292-332
API Gravity	°API	D4052	34-37
Cetane Index	unitless	ASTM D976	report
Cetane Number	unitless	ASTM D613	43-47
Specific Gravity		D4052	0.840-0.855
Ramsbottom Carbon Residue on 10% Distillation	%	ASTM D524	max 0.35
Net Heating Value	MJ/kg	ASTM D3338	report
Composition, aromatics	volume %	ASTM D5186	26-31.5
Composition, olefins	volume %	ASTM D1319	report
Composition, saturates	volume %	ASTM D1319	report
Ash	mass %	ASTM D482	max 0.005
Flash Point	°C	ASTM D93	min 54
Pour Point	°C	ASTM D97	max -18
Cloud Point	°C	ASTM D2500	report
Strong Acid Number	mg KOH/g	ASTM D664	max 0.00
Total Acid Number	mg KOH/g	ASTM D664	max 0.05
Accelerated Stability	mg/100 mL	ASTM D2274	max 1.5
Copper Corrosion	classification	ASTM D130	max 1
Kinematic Viscosity	cSt	ASTM D445	2.0-2.6
Water and Sediment	volume %	ASTM D2709	max 0.05
Total Sulfur	mg/kg	ASTM D5453	7-15
Lubricity (SLBOCLE)	g	D6078	min 3100
Lubricity (HFRR)	µm	D6079	max 460