

**Cummins Surveillance Panel Teleconference  
April 16, 2019 10:00 – 12:00 EDT**

**Attendance:**

Sean Moyer - TMC  
Nick Ariemma, Jim Matasic - LZ  
Christian Porter - Afton  
Jose Starling, Bob Warden - SwRI  
Jim Moritz, Andrew Smith, Josh Ward, Juan Vega – Intertek  
Marnix Torreman, Mark Cooper - Chevron Oronite  
Dan Lanctot – TEI  
Phil Shelton – Cummins  
Jim Gutzwiller, Elisa Santos, Bob Salgueiro – Infineum  
Prasad Tumati – Haltermann Solutions  
Jon VanScoyoc – CP Chem

**Agenda:**

- 1) **Alternate Fuel Supplier Request**
- 2) **ISB Cam situation and update – Start coordinated references to evaluate the batch change. Tappets too?**
- 3) **Approve the TGC Fuel Task Force Recommendation for Aromatics to use D5186 in mass% in place of D1319 in Volume% for fuel approval and in the fuel spec.**
- 4) **ISM alternate cleaning fluid proposal to allow heptane**
- 5) **ISM Injector Adjusting Screw Result Heads up.**
- 6) **Cummins Industry Statistician?**

**Meeting Minutes:**

- 1) **Alternate Fuel Supplier Request**

Prasad Tumati from Haltermann Solutions discussed Haltermann's interest in being an alternate fuel supplier for PC-9 and PC-10 fuels. Prasad and Haltermann are requesting the panel consider what steps Haltermann needs to take in order to be approved as an alternate supplier for these fuels. Prasad is asking the panel to consider this request and at the next meeting provide feedback to Haltermann.

- 2) **ISB Cam situation and update. Start coordinated references to evaluate the batch change. Tappets too?**

Phil Shelton from Cummins gave an update on the ISB camshaft batch. Initial TEI inspection of ISB camshafts did not give satisfactory results for cam lobe taper. Most of the camshafts

are not meeting the 0.01mm cam lobe taper spec. TEI shipped camshafts to Cummins for them to review. Cummins engineers are looking at the camshafts to determine if there is an issue with the supplier meeting Cummins spec. Cummins drawing says lobe must be convex across entire radius of the lobe. Cummins drawing shows no spec for a "taper" across the cam lobe. TEI says the current camshafts are not convex but that the lobe is tapered (sloped) from one side to the other. Jose, Andrew and Jim Moritz indicated that the previous batch of camshafts also exhibited this. There were questions as to where the lobe taper spec came from and it was hypothesized that the cam journal spec of 0.01 mm was transferred to the cam lobe at some point by the panel. There is also issues with porosity and pitting on some of the camshafts. Dan Lanctot indicated that about 50% of camshaft batch would be rejected due to the pitting/porosity issue and that we would then need to reject about 50% of those due to the taper spec. The taper spec would need to be increased to 0.02 mm to save 90% of the camshafts that are not rejected for casting issues. 0.015 would save about 75% of the camshafts. Panel agreed to open the spec to 0.015 and allow TEI rescreen the camshafts and release them to the labs for testing. ~100 camshafts would be available using that criteria.

**MOTION:**

***Jose Starling moved to temporarily make the camshaft lobe taper specification 0.015mm for this batch to allow coordinated references to be run. Andrew Smith seconded the motion. The motion passed unanimously.***

Discussion moved to what camshafts should be used for reference testing. Andrew volunteered to run a camshaft at the high end of the spec and the low end of the spec in each of the Intertek stands simultaneously in order to prove the higher spec camshafts have no impact. SwRI will run a test on a higher spec camshaft as well.

Jose asked about the tappets and the TEI indicated there are 300 kits worth of the current batch tappets so there is no need for coordinated references at this time.

**3) Approve the TGC Fuel Task Force Recommendation for Aromatics to use D5186 in mass% in place of D1319 in Volume% for fuel approval and in the fuel spec.**

Jon VanScoyoc presented information about the need to change aromatic measurement method from D1319 to D5186.

**MOTION:**

***Andrew motioned that the panel should accept the TGC fuel task force new fuel spec recommendation. Nick Ariemma seconded.***

It was pointed out that this would mean changing the method of aromatic measurement from D1319 to D5186 as well as removing the reporting requirement for olefins and

saturates for HD fuels as no method currently exists to measure them. Jon pointed out that CP Chem will likely develop that method going forward and that it should not be difficult but that it wasn't a necessity before and hence it does not exist.

The motion passed unanimously with no waives.

**4) ISM alternate cleaning fluid proposal to allow heptane**

Nick Ariemma brought forward a request to allow heptane as an alternate to pentane for cleaning in the ISM procedure. Bob Salgueiro asked the labs to consider why pentane was specified in the procedure knowing that heptane was readily available during test development as well. The panel decided to table this issue and if Lubrizol would like to provide more data for future discussions to bring it forward then.

**5) ISM Injector Adjusting Screw Result Heads up.**

There was a result outside of the target bands for a test result on the new IAS. References do not fail based on it but the panel needs to be aware and monitor future tests for severity shifts.

**6) Cummins Industry Statistician?**

With Kevin O'Malley's assignment change there is a need for a new statistician to support the Cummins panel. Elisa Santos indicated that she would be willing to help. Jim Moritz thanked her and cautioned that we don't want to burden the statisticians too much but this panel would call on her if needed.

Jim Moritz also informed the panel that Intertek would like to propose Andrew Smith to be made the Cummins SP chairman and asked that the panel consider that for future meetings.

Meeting adjourned at 11:24 EDT.



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## TGC Fuels Task Force Meeting

April 15, 2019

Webex: Southwest Research Institute, San Antonio, TX

Prepared by: Mike Lochte

### Aromatics in diesel fuel.

- The discussion began regarding the correlation equations for the D5186 that can be used to predict D1319 for the aromatics measurements, under ballot until May 8.
- After discussion about reproducibility, repeatability and limits of the two procedures, Jonathan VanScoyoc made a motion to keep the aromatics limits the same, but change the test method from D1319 to D5186. The units will be reported in mass% instead of volume percent. This is for PC-10 and PC-9HS. See attached recommendation.
  - LZ, Afton, Intertek and SwRI agreed. ExxonMobil was not on the call. Nobody objected.

- In order to formally approve the limits, they will still will have to be approved by the surveillance panels that use the fuel. Lochte will send a revised specification to the chairs.

#### Olefins and saturates in diesel fuel

- There are no test procedures for measuring olefins and saturates in diesel fuel. The chair asked for volunteers to develop an ASTM method. Since nobody volunteered, those two parameters will be stricken from PC-10 and PC-9HS.

#### Sequence VI and Sequence III fuel

After much discussion about Haltermann Solution's proposed aromatics change from 31.0 -35.0% with adoption of the D5769 test method, it was decided to table the issue for the next call. The goal is to give everyone a chance to study the situation and decide if those are the correct limits.

Discussion of the Haltermann Carless and Gage comments to the proposals for Sequence III and Sequence VI fuel proposed last year.

- Concerns were expressed regarding the breakdown of aromatics vs. total aromatics. Do we really need these breakdowns (manganese, phosphorus, etc.) since they weren't there before? Perhaps there should be a footnote "no intentional additions of these two elements are allowed."
- Haltermann to provide specific information (product name) for the deposit control additive and the red dye supplier's name.
- Lochte offered to work to meld Gage's and Haltermann Carless's comments with the draft specification, in an attempt to find a solution that meets most concerns. This would be distributed in advance of the next call.
- It was proposed to change the EEE fuel name, as there are other products also known as EEE. It was proposed to call it Sequence III, IX, and X fuel, and Sequence VI fuel. This would make it clear what the fuel was intended for and not include any trade names in the event an alternate supplier expressed interest in providing a fuel.
- Meeting adjourned 10:37 CST.

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TEST FUEL SPECIFICATIONS  
for TMC Monitored Tests

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*revision 4/16/19*

*M. Lichte*

ASTM Test Monitoring Center  
Fuels Task Force-Approved Fuel Specifications  
for Fuel Used in TMC Monitored Tests



A Program of ASTM International

Test Monitoring Center  
6555 Penn Avenue  
Pittsburgh, PA 15206-4489  
412-365-1000

Revised 4-13-2018

## **Introduction**

The fuel specifications shown on the following pages were developed and approved by the Technical Guidance Committee's Fuels Task Force. This task force includes representatives from industry fuel suppliers, testing laboratories, producers and additive suppliers, and the Test Monitoring Center. These specifications are intended for use by the suppliers of fuel used in the various ASTM tests monitored by the Test Monitoring Center.

# Sequence V Fuel Specification

| Measurement           | Units         | ASTM Test Method | Spec            | Quarterly Measurements |
|-----------------------|---------------|------------------|-----------------|------------------------|
| Distillation          |               | D86              |                 |                        |
| Initial Boiling Point |               |                  | 22.2 - 35.0     | ✓                      |
| 5 % Volume            |               |                  | Report          |                        |
| 10 % Volume           |               |                  | 48.9 - 57.2     | ✓                      |
| 20 % Volume           |               |                  |                 |                        |
| 30 % Volume           |               |                  |                 |                        |
| 40 % Volume           |               |                  |                 |                        |
| 50 % Volume           |               |                  | 98.9 – 115.2    | ✓                      |
| 60 % Volume           |               |                  |                 |                        |
| 70 % Volume           |               |                  |                 |                        |
| 80 % Volume           |               |                  |                 |                        |
| 90 % Volume           |               |                  | 162.8 – 176.7   | ✓                      |
| 95 % Volume           |               |                  | 196.1 – 212.8   | ✓                      |
| End Point             |               |                  |                 |                        |
| Recovery              | volume %      |                  | Report          |                        |
| Residue               | volume %      |                  | 2.0 Max         |                        |
| Loss                  | volume %      |                  | Report          |                        |
| API Gravity           | °API          | D4052            | 56.5 – 61.2     | ✓                      |
| Specific Gravity      | unitless      | D4052            | Report          |                        |
| Reid Vapor Pressure   | kPa           | D5191            | 60.7 – 63.4     | ✓                      |
| Carbon                | mass fraction | D5291            | 0.8580 – 0.8690 |                        |
| Hydrogen              | mass fraction | D5291            | Report          |                        |
| Carbon                | mass fraction | D3343            | Report          |                        |
| Oxygen                | mass %        | D4815            | 0.05 maximum    |                        |

| Measurement                 | Units     | ASTM Test Method | Spec             | Quarterly Measurements |
|-----------------------------|-----------|------------------|------------------|------------------------|
| Sulfur                      | mg/kg     | D5453            | 100 maximum      |                        |
| Lead                        | mg/L      | D3237            | 2.6 maximum      | ✓                      |
| Phosphorous                 | mg/L      | D3231            | 1.3 maximum      |                        |
| Composition, aromatics      | volume %  | D1319            | 35.0 maximum     |                        |
| Composition, aromatics      | volume %  | D5769            | report           |                        |
| Composition, olefins        | volume %  | D1319            | 10 maximum       |                        |
| Composition, olefins        | volume %  | D6550            | report           |                        |
| Composition, saturates      | volume %  | D1319            | Report           |                        |
| Oxidation Stability         | minutes   | D525             | 1440 minimum     | ✓                      |
| Copper Corrosion            | unitless  | D130             | 1 maximum        |                        |
| Solvent Washed Gum Content  | mg/100 mL | D381             | 3 maximum        | ✓                      |
| Research Octane Number      | unitless  | D2699            | 96.0 – 98.0      |                        |
| Motor Octane Number         | unitless  | 2700             | Report           |                        |
| Anti-Knock Index (R+M)/2    | unitless  | 2700             | Report           |                        |
| Sensitivity                 | unitless  | D2700            | 7.5 minimum      |                        |
| Appearance                  | unitless  | N/A              | clear and bright | ✓                      |
| Net Heat of Combustion      | Btu/lb    | D240             | Report           |                        |
| Additive, Ethyl antioxidant | ptb       | calculated       | Report           |                        |



# PC-9HS Fuel Specification

| Measurement                                   | Units    | ASTM Test Method | Spec          |
|---|----------|------------------|---------------|
| Distillation                                  | °C       | D86              | report        |
| Initial Boiling Point                         | °C       |                  | report        |
| 5% volume                                     | °C       |                  | report        |
| 10% Volume                                    | °C       |                  | report        |
| 20% volume                                    | °C       |                  | report        |
| 30% volume                                    | °C       |                  | report        |
| 40% volume                                    | °C       |                  | report        |
| 50% Volume                                    | °C       |                  | report        |
| 60% volume                                    | °C       |                  | report        |
| 70% volume                                    | °C       |                  | report        |
| 80% volume                                    | °C       |                  | report        |
| 90% Volume                                    | °C       |                  | report        |
| 95% volume                                    | °C       |                  | 282-338       |
| End Point loss                                | ml       |                  | report        |
| residue                                       | ml       |                  | report        |
| API Gravity                                   | °API     | D4052            | 34.5-36.5     |
| Specific Gravity                              |          | D4052            | 0.8423-0.8520 |
| Cetane Index                                  | unitless | D4737 or D976    | report        |
| Cetane Number                                 | unitless | D613             | 42-48         |
| Ramsbottom Carbon Residue on 10% Distillation | %        | D524             | max 0.35      |
| Composition, aromatics                        | volume % | D1319            | 28.9-33.0     |
| Composition, aromatics                        | mass %   | D5186            | 28.0-33.0     |
| Composition, olefins                          | volume % | D1319            | report        |
| Composition, saturates                        | volume % | D1319            | report        |

| Measurement                 | Units              | ASTM Test Method | Spec      |
|-----------------------------|--------------------|------------------|-----------|
| Net Heating Value           | MJ/kg              | D4809            | report    |
| Ash                         | mass %             | D482             | max 0.005 |
| Flash Point                 | °C                 | D93              | min 54    |
| Pour Point                  | °C                 | D97              | max -18   |
| Cloud Point                 | °C                 | D2500            | report    |
| Strong Acid Number          | mg KOH/g           | D664             | max 0.00  |
| Total Acid Number           | mg KOH/g           | D664             | max 0.050 |
| Accelerated Stability       | mg/100 mL          | D2274            | report    |
| Copper Corrosion            | classification     | D130             | max 1     |
| Kinematic Viscosity         | mm <sup>2</sup> /s | D445             | 2.4-3.0   |
| Water and Sediment          | volume %           | D2709            | max 0.050 |
| Total Sulfur                | ppm                | D7039            | 400 - 500 |
| Lubricity (HFRR)            | µm                 | D6079            | report    |
| Bio fuel content            | %                  | D7371            | max 0.5%  |
| Particulate matter hydrogen | mg/L               | D6217            | report    |
| carbon                      | wt %               | D3343            | report    |
|                             | wt %               | D3343            | report    |

# PC-10 Fuel Specification

| Measurement                                   | Units    | ASTM Test Method | Spec                   |
|---|----------|------------------|------------------------|
| Distillation                                  |          | D86              |                        |
| Initial Boiling Point                         | °C       |                  | report                 |
| 5% volume                                     | °C       |                  | report                 |
| 10% Volume                                    | °C       |                  | report                 |
| 20% volume                                    | °C       |                  | report                 |
| 30% volume                                    | °C       |                  | report                 |
| 40% volume                                    | °C       |                  | report                 |
| 50% Volume                                    | °C       |                  | report                 |
| 60% volume                                    | °C       |                  | report                 |
| 70% volume                                    | °C       |                  | report                 |
| 80% volume                                    | °C       |                  | report                 |
| 90% volume                                    | °C       |                  | report                 |
| 95% volume                                    | °C       |                  | 293-332                |
| end boiling point                             | °C       |                  | report                 |
| loss  | ml       |                  | report                 |
| residue                                       | ml       |                  | report                 |
| API Gravity                                   | °API     | D4052            | 34.0-37.0              |
| Cetane Index                                  | unitless | D4737            | report                 |
| Cetane Number                                 | unitless | D613             | 43-47                  |
| Specific Gravity                              |          | D4052            | 0.8400-0.8550          |
| Ramsbottom Carbon Residue on 10% Distillation | %        | D524             | max 0.350              |
| Net Heating Value                             | MJ/kg    | D4809            | report                 |
| Composition, aromatics                        | volume % | <del>D1319</del> | <del>28.0 - 33.5</del> |
| Composition, aromatics                        | mass %   | D5186            | report                 |
| Composition, olefins                          | volume % | <del>D1319</del> | report                 |
| Composition, saturates                        | volume % | <del>D1319</del> | report                 |
| Ash   | mass %   | D482             | max 0.005              |
| Flash Point                                   | °C       | D93              | min 54                 |
| Pour Point                                    | °C       | D97              | max -18                |
| Cloud Point                                   | °C       | D2500            | report                 |

28.0-33.5

| Measurement           | Units          | ASTM Test Method | Spec     |
|-----------------------|----------------|------------------|----------|
| Strong Acid Number    | mg KOH/g       | D974             | max 0.00 |
| Total Acid Number     | mg KOH/g       | D974             | max 0.05 |
| Accelerated Stability | mg/100 mL      | D2274            | max 1.5  |
| Copper Corrosion      | classification | D130             | max 1    |
| Kinematic Viscosity   | cSt            | D445             | 2.0-2.6  |
| Water and Sediment    | volume %       | D2709            | max 0.05 |
| Total Sulfur          | mg/kg          | D7039            | 7-15     |
| Particulate matter    | mg/L           | D6217            | report   |
| hydrogen              | wt %           | D3343            | report   |
| carbon                | wt %           | D3343            | report   |
| Lubricity (HFRR)      | µm             | D6079            | max 460  |
| Bio fuel content      | %              | D7371            | max 0.5% |