

# Ford 6.7L VWT Fuels Task Force

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# Goals and Outcomes

- Goal: Identify what requirements should apply to a fuel used for the Ford 6.7L Test and how to introduce it
- Outcomes
  - Fuel Spec or requirements
    - Where does this information live?
  - New Fuel Implementation process
    - Part of matrix
    - Post-matrix
  - Fuel Transition Process
  - Tracking Requirements

# Highlights

- Winter blends of fuel not permissible
  - No waiving of Flash Point/Viscosity requirements from No2 ULSD limits
  - No PPD/Cold Flow additives at the terminal/refinery
  - “Summer” fuel appears to be commonly available across the country
- 3 ASMT D975 Fuels Targeted for Matrix
  - TXLed – Lower Aromatics, Lower Density, Higher Cetane compared to PCI0
  - East Coast – Samples look close to PCI0
  - Other TBD
- Transitions must occur as part of a stand calibration process

# Winter Blend Notes

- Some parameters waived in the winter
- No I Diesel may be added to No2
- Pour point depressants and other cold flow additives may be added

concentration specifying equivalent to 0.15 of the solid dye standard solvent plus 25 per thousand barrels of diesel fuel or kerosine.

<sup>F</sup> When a cloud point less than  $-12\text{ }^{\circ}\text{C}$  is specified, as can occur during cold months, it is permitted and normal blending practice to combine Grades No. 1 and No. 2 to meet the low temperature requirements. In that case, the minimum flash point shall be  $38\text{ }^{\circ}\text{C}$ , the minimum viscosity at  $40\text{ }^{\circ}\text{C}$  shall be  $1.7\text{ mm}^2/\text{s}$ , and the minimum 90 % recovered temperature shall be waived.

<sup>G</sup> Other sulfur limits can apply in selected areas in the United States and in other countries.

<sup>H</sup> These test methods are specified in 40 CFR Part 80 for S500 grades.

<sup>I</sup> Where cetane number by Test Method **D613** is not available, Test Method **D4737** can be used as an approximation. Although biodiesel blends are excluded from the scope of Test Method **D4737**, the results of Test Method **D4737** for up to B5 blends can be used as an approximation.

<sup>J</sup> Low ambient temperatures as well as engine operation at high altitudes may require the use of fuels with higher cetane ratings.

<sup>K</sup> See 5.1.12.

<sup>L</sup> It is unrealistic to specify low temperature properties that will ensure satisfactory operation at all ambient conditions. In general, cloud point Low Temperature Flow Test, and Cold Filter Plugging Point Test may be used as an estimate of operating temperature limits for Grades No. 1–D S15; No. 2–D S15; No. 1–D S500; No. 2–D S500; and No. 1–D S5000 and No. 2–D S5000 diesel fuel. However, satisfactory operation below the cloud point may be achieved depending on equipment design, operating conditions, and the use of flow-improver additives as described in **X5.1.2**. Appropriate low temperature operability properties should be agreed upon between the fuel supplier and purchaser for the intended use and expected ambient temperatures. Test Methods **D4539** and **D6371** may be especially useful to estimate vehicle low temperature operability limits when flow improvers are used. Due to fuel delivery system, engine design, and test method differences, low temperature operability tests may not provide the same degree of protection in various vehicle operating classes. Tenth percentile minimum air temperatures for U.S. locations are provided in **Appendix X5** as a means of estimating expected regional temperatures. The tenth percentile minimum air temperatures can be used to estimate expected regional target temperatures for use with Test Methods **D2500**, **D4539**, and **D6371**. Refer to **X5.1.3** for further general guidance on test application.

**X1.2.2 Grade No. 1-D S15**—Grade No. 1-D S15 comprises the class of very low sulfur, volatile diesel fuels from kerosine to the intermediate middle distillates. Fuels within this grade are applicable for use in (1) high-speed diesel engines and diesel engine applications that require ultra-low sulfur fuels, (2) applications necessitating frequent and relatively wide variations in loads and speeds, and (3) applications where abnormally low operating temperatures are encountered.

**X1.2.5 Grade No. 2-D S15**—Grade No. 2-D S15 includes the class of very low sulfur, middle distillate gas oils of lower volatility than Grade No. 1-D S15. These fuels are applicable for use in (1) high speed diesel engines and diesel engine applications that require ultra-low sulfur fuels, (2) applications necessitating relatively high loads and uniform speeds, or (3) diesel engines not requiring fuels having higher volatility or other properties specified in Grade No. 1-D S15.

# Precision Matrix Update

- Not designed to test specific fuel parameters or approve a specific source, but determine if the test is as fuel insensitive as prove out runs indicate
- Determined through mean and standard deviation of “Fuel B” as a whole
- 10 tests PC-10, 10 tests ASTM D975 No2 SI5 ULSD
- Target: 3 “Fuel B” sources. One common between the labs.
- Looking for fuels regionally located near labs
- Stats group to review what fuels are run in what order as “Fuel B”
  - Considerations will be made for tank logistics and how many fuels can be at each lab
  - ~4,500 gallons per test, not quite a full tanker, muddles logistics

Stand A-1	Stand A-2	Stand G-1	Stand G-2
LWO, Fuel B	HWO, Fuel A	HWO, Fuel B	LWO, Fuel A
HWO, Fuel A	HWO, Fuel B	LWO, Fuel A	LWO, Fuel B
HWO, Fuel B	LWO, Fuel A	LWO, Fuel B	HWO, Fuel A
LWO, Fuel A	LWO, Fuel B	HWO, Fuel A	HWO, Fuel B
LWO, Fuel B	HWO, Fuel A	LWO, Fuel A	HWO, Fuel B

# Matrix Fuel Testing Requirements

- At the start and end of each test a sample should be taken at the test stand. Measure sulfur content and density (D4052 or equivalent).
- On the start of test sample measure net heating value (D240 or equivalent) and distillation (ASTM D86), cetane number (D613 or equivalent), KV40 (D445), and biodiesel content by an appropriate ASTM test method. This is both for PC-10 and Fuel B tests in the matrix.
- Add Ash testing to matrix fuels (ASTM D482)
- Report TGA Ash values from used oil samples as test progresses

# Draft Wording (To be located in test procedure)

## Ford 6.7L Fuel Requirements

A Ford 6.7L Valvetrain Wear Test may be conducted on a fuel that meets the criteria set out for a Grade No. 2-D S15 (ULSD) product in ASTM D975 with the following additional requirements;

- Must be a publically available fuel source
  - A company shall not blend or manufacture their own fuel on-site
- No winter performance additives are permissible
- No modifications or waiving of specification limits (flash point, viscosity, etc) for Winter months.
- Biodiesel content by D7371 (or equivalent) at <0.5%
- The test lab may not add any additives or other compounds to the fuel once on-site
  - Typical distribution additives at a pipeline terminal or refinery for a Summer fuel are permissible
  - The intent is for a lab to use a commercially available product that has not been specifically modified in any way for testing use
  - If a branded product is used, the same branded product should be used until a different fuel is brought into use through the methods noted below.

At the start and end of each test a sample should be taken at the test stand. Measure sulfur content and density (D4052 or equivalent).

On the start of test sample also measure net heating value (D240 or equivalent), distillation (ASTM D86), Cetane number (D613 or equivalent), KV40 (D445), and biodiesel content by an appropriate ASTM test method. For tests run using PC-10, the COA values may be used for reporting purposes.

# Draft Wording

## **Introduction of a New Fuel Source or Transition between Fuels (Assumes a Stand-based LTMS)**

A “New Fuel Source” shall be considered any change in the refinery or terminal the fuel is being sourced from. Changes in logistic details such as shipping method or Transport Company are not considered a New Fuel Source.

- Fuel Usage

- A candidate test on a calibrated stand must use fuel from the same source as the successful calibration test on that stand
  - A “source” is considered a refinery, terminal, storage facility, or other single point that bulk quantities of fuel are obtainable from.
- Each test stand may utilize a different fuel, provided each stand and fuel pair have meet the calibration criteria noted below



# Draft Wording

- New Fuel Introduction Process (Assumes a Stand-based LTMS)
  - All Stands in a Laboratory
    - A lab may introduce a fuel as part of a new stand introduction, or as a separate event.
      - Notify the TMC that a New Fuel will be utilized
      - If an existing stand, one (1) operationally valid calibration tests with no Level 2  $e_i$  alarms must be conducted on the New Fuel using TMC assigned reference oils
      - Otherwise a second test is required for calibration with neither test exceeding Level 3  $e_i$  alarms

# Draft Wording

- Transition Between Approved Fuels
  - If a laboratory desires to switch between two previously approved fuels, this must occur as part of the calibration process for a particular stand.
  - A fuel that has been approved for testing at one laboratory does not automatically gain acceptance at a second. Each laboratory must consider the fuel to be a New Fuel and follow the appropriate introduction process
  - The source tank must be addressed in one of two ways;
    - Fully drained and cleaned if the tank's previous contents were not an approved fuel for the test
    - At 5% or less of overall capacity of an approved fuel prior to refilling with the new fuel that is to be used for the calibration test
  - A previously approved and utilized fuel may be brought back into use for a stand with a single calibration test based on normal calibration criteria