Fuel Quality Plan

Biodiesel Blends 2018

Last Revised: 8/15/2018

ISSUED BY
COMPANY NAME

REPRESENTATIVE
NAME
EMAIL
PHONE
SITE NAME/LOCATION

PROVIDED BY
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Every effort has been made to ensure that this guidance document is accurate, complete, and comprehensive at the time of publication. It is intended to be used as a guide and resource document.
1.0 Introduction

With the increasing number of fuel offerings and renewable fuel blending options, maintaining fuel quality from a product liability and customer retention standpoint, has become increasingly important to today’s marketer.

1.1 Background

Renewable fuels include a number of financial incentives via the Internal Revenue Service (IRS) as well as the Environmental Protection Agency (EPA) and other state programs. In order for any credits or incentives to be viable, the fuel must meet certain ASTM fuel quality standards. If the fuel does not meet these standards and a credit is claimed, then the claimant is open to severe compliance penalties.

For example, an IRS Blender’s Tax Credit cannot be taken for B100 blending that does not meet ASTM D6751. Also, if the B100 does not meet the same ASTM standard, the renewable fuel identification numbers (RIN) cannot be attached. If it is attached to non-compliant fuel, then the RIN must be retired and made unavailable for sale.

Beyond compliance factors are product liability issues that can occur when offering off-spec fuel. These situations may irreparably harm your business should customers believe your fuel has damaged their vehicle.

1.2 Purpose

This document is a guide for those parties who blend, market and distribute biodiesel blends. While certain accreditations and quality assurance can be provided by biodiesel producers and ULSD suppliers, it is imperative that the blender/marketer remain vigilant regarding the quality of the finished product. To
do this, the marketer must consider each step in the blending process and how to mitigate any negative outcomes to their business, while at the same time taking advantage of the incentives blending fuel has to offer. This document is intended to provide further insight into each element of the blending process and delivery to customers, critical points for fuel quality management including sampling procedures, protocols and proposed schedules. This guide also includes cost-saving suggestions for analytical sampling which Alternative Fuel Council has negotiated on behalf of Alternative Fuel Council clients and NATSO members.

1.3 Renewable Diesel/Biodiesel

Biodiesel quality management is of primary concern but all blenders should, at a minimum, understand the differences between biodiesel and renewable diesel.

**Biodiesel** is manufactured from plant oils, recycled cooking greases or oils and many combinations of plant oils and/or greases. New feedstocks are always being developed, tested and vetted through the EPA. The biodiesel manufacturing process converts oil and fats into chemicals called long-chain mono alkyl esters, fatty acid methyl esters (FAME), or biodiesel. This process is also referred to as transesterification. The transesterification process typically includes reacting a short-chain alcohol like methanol with the feedstock along with a catalyst such as sodium hydroxide or potassium hydroxide. Glycerin is a co-product of the biodiesel manufacturing process. Prior to final use, biodiesel is typically blended with diesel or heating oil.

**Renewable Diesel** is a hydrocarbon diesel fuel produced from renewable feedstocks which include plant oils and recycled cooking greases. Renewable diesel is NOT made by transesterification, but rather by hydrotreating/hydroprocessing and isomerizing fats and oils. This process produces alkanes, which are chemically identical to some compounds found in conventional diesel. In order to truly identify whether renewable diesel is present, carbon dating testing (ASTM D6866) would need to be completed on a sample.
Renewable diesel is a drop in fuel that can be used without blending with diesel. Renewable diesel in the marketplace is yet another reason for blenders and marketers to stay vigilant regarding the product they are purchasing and selling to consumers. There are many unknowns regarding fuel quality of this product, but part of the best defense should include verifying ASTM specifications.

2.0 Purchasing

Many biodiesel producers today have been using different streams of feedstock rather than a single stream. Producers may also switch from a certain mix of feedstock to a different mix or a single stream during different seasons of the year. The differences in feedstock streams are also reflected in pricing. It is important to be aware of the feedstock stream(s) of the biodiesel for which a party has purchased in order to manage cold weather properties and quality of fuel.

2.1 BQ-9000

The BQ-9000 program is an accreditation by the National Biodiesel Accreditation Commission, which is an autonomous committee of the National Biodiesel Board. It is a voluntary and cooperative program for the certification of producers and marketers of biodiesel and biodiesel blends as well as analytical laboratories. The details and requirements of the program can be found at: http://bq-9000.org/

2.2 EPA Quality Assurance Program (QAP/Q-RIN)

The EPA Quality Assurance Program (QAP) under the Renewable Fuel Standard is also a voluntary program where independent third-parties may audit and verify that RINs have been properly generated and fuel meets ASTM standards. Fuel quality of the B100 is part of the program and samples are collected per ASTM
D6751 at least once per quarter and the fuel must meet specifications in order to generate RINs.

A small group of large producers have a longer standing history of renewable fuel production and more financial backing than the smaller, newer producers. Their RINs are considered “qualified” to many within the industry, including the Obligated Parties. The smaller and newer producers, while providing a quality product, often seek additional assurance that their RINs and product is of high quality. The QAP program allows for these smaller producers to qualify and verify their RINs.

For questions concerning the quality and/or marketability of RIN credits, contact Alt Fuels Council staff.

### 2.3 Certificate of Analysis (CoA)

Suppliers of refined petrol and renewable fuel do not sample every load of product leaving their facility or terminal. Certificates of Analysis will be provided but it is important to note that the CoA may not directly represent the fuel that is being purchased.

### 3.0 Transporting

The chain of custody dictates who is responsible for fuel quality. Renewable fuel producers will assume responsibility up to the point of product leaving their facility. If the producer/supplier is also maintaining custody until the product has been delivered (FOB buyers city/state)(preferred), then this allows the buyer to test the fuel (post transport) prior to taking title to the product. It is inadvisable to assume title of renewable fuel downstream if you are unsure about the quality of the product. Most railcar deliveries allow up to 5 days of holding before unloading is required.
Transports and railcars should be compatible with B100 and certified cleaned (lining the car if materials are compatible with B100 may also be an option) before moving biodiesel. This will prevent picking up sediment and water which can quickly throw biodiesel out of spec.

Severe cold weather will require heated transports and railcars.

Prior to purchasing biodiesel, determine at what point title is transferred and include this language in your supply agreement. This will help in determining the length of time you have to sample the product prior to taking title. If samples are not meeting standards, it is suggested that supplier be notified immediately and the product returned to the supplier.

4.0 Storage

4.1 Storage and Fueling Equipment

B100 is a solvent and therefore may loosen or dissolve varnish and sediments in fuel tanks and systems which petroleum diesel has left over time. If diesel has been stored previously within a system, it is strongly recommended the entire system should be cleaned prior to storing biodiesel. Filters may become plugged frequently after the introduction of higher blends of biodiesel, with the frequency decreasing over time. Particulates, penetrating filters, can cause injector deposits and even fuel injector failure.

In addition, as with ULSD, biodiesel has a shelf life of approximately 6 months unless the appropriate additives are administered. Therefore, consider how long the fuel will be used and in storage may determine whether additives will be necessary due to potential cold flow challenges. The act of blending with ULSD will stabilize the B100 to a great degree.
Some housekeeping maintenance tips as provided within Minnesota's Department of Agriculture Biodiesel Blending Guide (see document for a complete list and other helpful tips specific to diagnosing filter plugging, link provided in Section 8):

- Fuel tanks should be kept as full as possible to reduce the amount of air and water entering the tank
- Check tanks and containment areas for water regularly and remove water when needed.
- In late fall, before winter season begins, and also in the spring, check tanks for water concentration and for microbial contamination.

4.2 Temperature Considerations

B100 gels at higher temperatures than most diesel due to its high cloud point. The feedstock of the biodiesel will create some variation at which the fuel will begin to gel. This variation can be from 32° to 60° F but will take-on coldflow properties of the ULSD if properly blended. Heated fuel lines and tanks (above ground) may be needed during the winter.

4.3 Equipment Incompatibility

B100 or "neat" biodiesel is not compatible with certain elastomers, metals, and plastics that are commonly used with petroleum diesel. Certain metals may affect the biodiesel by accelerating its oxidation process and creating fuel insolubles. Lead, tin, brass, bronze, and zinc significantly increase sediment formation in both B100 and B20. Galvanized Metal and terne-coated sheet metal are not compatible with biodiesel at any level. If in any doubt, contact the manufacturer for more information about the compatibility of specific materials with biodiesel.
4.4 Underground Storage Tank Federal Regulations

The EPA Office of Underground Storage Tanks recently updated the Federal UST regulation in 2015 with the addition of including biodiesel blends. It must be demonstrated that all components of the UST system must be compatible with the fuel stored. Please see the regulations which detail the requirements and contact your UST system service provider with any compatibility questions.

5.0 Blending

The point of blending can be completed by an upstream supplier/distributor or could be completed downstream by a petroleum marketer/blender. It is important to note on purchase documents (BOLs, PTDs, Invoices, etc.) who the blender on record is. A note of importance is that the IRS and the EPA - RFS Program view a “blender” differently, and therefore this affects how a federal tax credit (Blenders Tax Credit, BTC) and how RINs are handled when blending. A party must be registered with both IRS (637M) and EPA - RFS Program in order to receive the credits and/or RINs. For more information on registering with IRS and EPA, contact your Alt Fuels Council staff.

<table>
<thead>
<tr>
<th>Authority with Jurisdiction</th>
<th>Blender on record</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal Revenue Service (IRS)</td>
<td>party who blends biodiesel with at least 0.01% diesel (B99/B99.9)</td>
</tr>
<tr>
<td>Environmental Protection Agency (EPA) - Renewable Fuel Standard (RFS)/Renewable Fuel Identification Number (RIN)</td>
<td>party who blends diesel with 1-80% biodiesel* for use into transportation, heating oil or jet fuel</td>
</tr>
</tbody>
</table>

* If B80-B100 can be used as is for use as transportation or heating oil, the RINs attached to the fuel may be separated. Documentation must be provided for evidence of this case.
There are two typical types of biodiesel blending processes; splash blending and in-line blending at a pipeline terminal. Biodiesel is slightly heavier than diesel and therefore, the more mixing, the better and more accurate the blend. Biodiesel may be blended at 10°F above the fuels cloud point, at a minimum. Cold weather blending in the Midwest and Upper Midwest typical blend when ULSD and B100 are between 50 and 65°F.

5.1 Splash Blending

B100 can be “splash blended” with diesel in a transport truck or within a storage tank. This is most often used when the biodiesel and diesel are loaded separately. Traveling within the transport truck and pumping into a tank may provide sufficient mixing of the fuels. If the mixing is not complete, the denser biodiesel will settle to the bottom. If the transport truck of splash blended fuel is being delivered to more than one tank, recirculation of the fuels may be required to provide sufficient mixing. More information on top-loading versus bottom-loading splash blending can be found in references listed in Section 8.0 of this Plan.

Consideration should also be given while offloading into an unheated tank when ambient temperatures are below the biodiesel cloud point, as the biodiesel may gel, potentially causing a poor mix of the fuels. Some recommendations for sufficient mixing using the splash blending method in cold winter months include adding half the ULSD warmed, then adding the biodiesel warmed to above 60°F or more at a high pressure and volume, then finally adding the rest of the diesel.

5.2 Terminal/Rack Blending

B100 is stored and blended at a terminal by a pipeline or terminal operator and offered as a finished fuel which most likely completed by in-line blending. In-line blending is completed when biodiesel is added via a smaller pipe or hose within a larger pipe of diesel flow, very similar to how additives are blended into fuel. This blending method is considered the most accurate and allows for the most optimal mixing as metering pumps and dual-fuel injection systems are utilized.

The quality of the diesel and biodiesel should be equally important to the blender to ensure the end blended product is of the highest standard.
5.3 On-site Blending Equipment

Fuel management systems which include fuel injectors and calculated metering devices are available to purchase for on-site blending at a truck stop or bulk facility. These systems, while providing more blending accuracy, can be costly. If you see extreme variations in fuel quality and blend levels, we suggest incorporating more advanced blending systems.

6.0 Dispenser Labeling

Diesel with a 5% or less biodiesel content does not require additional dispenser labels. Unless directed otherwise by terminal or supplier, it should be assumed that all ULSD contains up to 5% (B5). The following label should be affixed on the dispenser in clear sight when blending above B5:

A number of states have additional label requirements. Marketers should verify proper labeling with individual state agencies.
7.0 Sampling Protocols & Schedule Suggestions

Fuel quality sampling can protect your company against costly penalties and lost business. As part of this Fuel Quality Plan, Alternative Fuel Council has included some fuel sample collection suggestions as described in further detail below. Sample collection is not a required action by a blender/marketer; however, as the ultimate vendor of the final blend you are responsible for the quality of the fuel. Current regulations do not require sampling by the blender/marketer. Sampling, however, does create a useable defense against fuel quality complaints and compliance violations that can harm your business. Sampling protocols may also be a defense against Notices of Violation from state and federal agencies.

Alternative Fuel Council has provided suggested quality test checks along with timing of sample collection based upon fuel blends. While the full suite of ASTM fuel quality analysis panel can be applied to each sample, a partial panel of the ASTM standard specific to a particular blend may be adequate to indicate a fuel quality issue in a more cost effective manner.

Some analysis of ULSD and B100 is completed during the course of production and distribution by producers and suppliers. Suppliers of the “neat” blendstocks will offer CofAs for B100 (ASTM D6751) and ULSD (ASTM D975) but the blender must be aware that both of these products chemical characteristics may vary. In rare instances, the blending of on-spec ULSD and B100 may still produce undesirable results depending on feedstocks used and pipeline additives.
In the table below are the ASTM fuel specification standards for verifying B100, ULSD, and final blended product (B6-B20) as the blender and/or marketer:

<table>
<thead>
<tr>
<th>Fuel Blend</th>
<th>Alt Fuel Partial ASTM Standard Panel Quality Check (See Appendix 2 for more detail)</th>
<th>Suggested Routine Fuel Quality Sample Timing** (see Appendix A-7 for an example sampling schedule)</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1-B5 and ULSD*</td>
<td>ASTM D975</td>
<td>Semi-annual - Based Upon Seasonal Changes</td>
</tr>
<tr>
<td>B6-B20</td>
<td>ASTM D7467</td>
<td>At least monthly, but up to 4 times per month in Jan/Dec</td>
</tr>
<tr>
<td>B100</td>
<td>ASTM D6751</td>
<td>Monthly during Q1, Q4, as well as April and September. Sampling additionally suggested prior to off-loading from rail, prior to off-loading from bulk storage</td>
</tr>
</tbody>
</table>

*It has been determined that B1-B5 is substantially similar to straight ULSD and therefore covered under test methods found in ASTM D975 for ULSD.

**Seasonal factors may affect the quality of your fuel. It is highly encouraged that blenders be more vigilant during seasonal transitions.


Alternative Fuel Council has included several tables within Appendix A (A-1) which detail the full panel of fuel specifications as determined by ASTM. Partial Panel Quality Check ASTM fuel specifications (See Appendix A-2 for more detail) have been developed and suggested by Alternative Fuel Council and the Iowa Central Fuel Testing Laboratory (ICTFL), a nationally recognized BQ-9000 lab. These partial panels are suggested and included within this document to provide a cost-effective, representative quality sample which will provide adequate justification to pursue further testing if needed. Should your Alternative Fuel Council Partial Panel Quality Check samples indicate unacceptable results, please contact Iowa Central Fuel Testing Lab for further, full ASTM, test suggestions and
pricing. Examples of test results (Appendix A-3) and Iowa Central Fuel Testing Laboratory’s credentials (Appendix A-4) can be found within the Appendices.

7.2 Sampling Protocols

When manually collecting samples from dispensers, storage tanks, rail cars or rack/pipeline, OSHA regulations and guidelines should be followed for health and safety precautionary measures. Proper personal protective equipment (PPE) and safe handling practices should be paramount to collecting a sample. A separate Sampling and Analysis Plan is also available upon request.

A link to The National Institute of Standards and Technology (NIST) Field Sampling Procedures for Fuel and Motor Oil Quality Testing Handbook 158, 2016 Edition, has been included in Section 8. The following are simplified steps for sample collection at your facility:

1. Go to the ICFTL webpage to login (or register if first time) to order the Alternative Fuel Council Partial Panel Quality Check package of choice (D7467, D975, D6751). ICFL will send the appropriate sample container(s) and shipping container to your facility.
2. Gather clean sample containers required (as provided by the preferred lab) for the analysis desired of the sample collection
3. Determine where your sample will be collected and label as such on your sample container(s). Provide location, type of sample collection, date, time, initials of sampler on the label provided. It may also be helpful to complete the Chain of Custody (COC) at this time as well. This document is provided by the preferred lab (ICFTL) in Appendix A-5 which can be copied and shipped with samples to lab.
4. Ensure proper PPE is applied and health and safety guidelines are reviewed and followed while collecting the fuel sample.
5. Depending upon the sample location, gather any sample collection equipment needed.
a. Tank Sample: This is a limited sampling plan. Should dispenser samples indicate poor fuel quality, contact Alternative Fuel Council for further sampling procedures.

b. Nozzle/Outlet Sample: It is recommended that a minimum amount (up to 0.5 gallons) of fuel be flushed from the dispenser prior to sample collection. This will provide greater assurance that the hose is filled with the product desired for greater sample accuracy.

6. Once the sample is collected, the COC along with the samples will be placed in a shipping container provided by the preferred lab, along with instructions for complying with Department of Transportation shipping requirements. Be sure the lid on sample container is tightly closed.

7. Suppliers of B100 and ULSD will/must supply a Certificate of Analysis (CofA) at the time of title transfer. The CofA, however, may not represent the actual gallons being purchased. Some Blenders sample all B100 prior to accepting title. We believe that each Blender must determine the level at which he/she entrusts their suppliers’ CofA and sample accordingly. If you wish to sample your B100 prior to taking ownership, your supplier should be made aware prior to contracting supply. It is advisable to collect a B100 sample (clear quart jar) prior to depositing into your transport for possible future analysis. Label correctly and hold the sample until respective fuel/blend has been consumed by end-users.

7.3 Analytical Results and Next Steps
Biodiesel blending and quality have seen impressive improvements over the past 15 years. The analytical results, however, may indicate values outside of the acceptable parameters from time-to-time. The analytical limits and definitions of the test methods are listed in Appendix A-2 for reference. The analytical report will most likely include a brief narrative indicating the results of the tests. Sample results are strictly confidential. Alternative Fuel Council and the Iowa Central Fuel Testing Lab have designed a system that will monitor your fuel quality over periods of time so you can determine periods of fluctuating fuel quality (example provided in Appendix A-6). Please indicate to ICFTL if you should want to include this data tracking report. Should you have questions regarding analytical results or general
fuel quality, Alternative Fuel Council suggests first contacting Dr. Don Heck at 800-362-2793 ext 1243/ Heck@iowacentral.edu or Jeff Hove at 515-250-2966/jhove@natso.com or your fuel quality specialist and additive provider.

8.0 References


A Biodiesel Blend Handling Guide, A Publication of the Minnesota Biodiesel Technical Cold Weather Issues Team Handling Subcommittee, Minnesota Department of Agriculture
# A-1 Full Analysis Tables

## Table 1

**ASTM D6751 / BQ-9000 FULL SPEC TEST PACKAGE for B100**

<table>
<thead>
<tr>
<th>Test</th>
<th>Code</th>
<th>Test</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium &amp; Magnesium</td>
<td>EN 14538</td>
<td>Carbon Residue</td>
<td>D 4530</td>
</tr>
<tr>
<td>Flash Point (Proc. C)</td>
<td>D 93</td>
<td>Total Acid Number</td>
<td>D 664</td>
</tr>
<tr>
<td>Water &amp; Sediment</td>
<td>D 2709</td>
<td>Cold Soak Filterability</td>
<td>D 7501</td>
</tr>
<tr>
<td>Kinematic Viscosity</td>
<td>D 445</td>
<td>Free &amp; Total Glycerin</td>
<td>D 6584</td>
</tr>
<tr>
<td>Sulfated Ash</td>
<td>D 874</td>
<td>Phosphorus</td>
<td>D 4951</td>
</tr>
<tr>
<td>Sulfur</td>
<td>D 5453</td>
<td>Distillation @ 90% rec.</td>
<td>D 1160</td>
</tr>
<tr>
<td>Copper Corrosion</td>
<td>D 130</td>
<td>Sodium &amp; Potassium</td>
<td>EN 14538</td>
</tr>
<tr>
<td>Cloud Point</td>
<td>D 2500</td>
<td>Oxidation Stability</td>
<td>EN 15751</td>
</tr>
<tr>
<td>Cetane Number</td>
<td>D 613</td>
<td>Visual Inspection</td>
<td>D 4176</td>
</tr>
</tbody>
</table>

## Table 2

**ASTM D7467 TEST PACKAGE for B6-B20 (S15)**

<table>
<thead>
<tr>
<th>Test</th>
<th>Code</th>
<th>Test</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Acid Number</td>
<td>D 664</td>
<td>Cetane Number</td>
<td>D 613</td>
</tr>
<tr>
<td>Kinematic Viscosity</td>
<td>D 445</td>
<td>Cetane Index</td>
<td>D 976</td>
</tr>
<tr>
<td>Flash Point (Proc. A)</td>
<td>D 93</td>
<td>Ash</td>
<td>D 482</td>
</tr>
<tr>
<td>Cloud Point</td>
<td>D 2500</td>
<td>Water &amp; Sediment</td>
<td>D 2709</td>
</tr>
<tr>
<td>Sulfur</td>
<td>D 5453</td>
<td>Copper Corrosion</td>
<td>D 130</td>
</tr>
<tr>
<td>Distillation at 90% rec.</td>
<td>D 86</td>
<td>Biodiesel Content</td>
<td>D 7371</td>
</tr>
<tr>
<td>Ramsbottom Carbon Residue</td>
<td>D 524</td>
<td>Oxidation Stability</td>
<td>EN 15751</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lubricity</td>
<td>D 6079</td>
</tr>
</tbody>
</table>

## Table 3

**ASTM D975 TEST PACKAGE for Diesel up to B5**

<table>
<thead>
<tr>
<th>Test</th>
<th>Code</th>
<th>Test</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flash Point (Proc. A)</td>
<td>D 93</td>
<td>Copper Corrosion</td>
<td>D 130</td>
</tr>
<tr>
<td>Water &amp; Sediment</td>
<td>D 2709</td>
<td>Cetane Number</td>
<td>D 613</td>
</tr>
<tr>
<td>Distillation at 90% rec.</td>
<td>D 86</td>
<td>Cetane Index</td>
<td>D 976</td>
</tr>
<tr>
<td>Kinematic Viscosity</td>
<td>D 445</td>
<td>Cloud Point</td>
<td>D 2500</td>
</tr>
<tr>
<td>Ash</td>
<td>D 482</td>
<td>Ramsbottom Carbon Residue</td>
<td>D 524</td>
</tr>
<tr>
<td>Sulfur</td>
<td>D 5453</td>
<td>Lubricity</td>
<td>D 6079</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Conductivity</td>
<td>D 2624</td>
</tr>
</tbody>
</table>
A-2 Table 2-1: B100 Quality Check Test Description

Currently four classes of B100 exist today. Review the table below and discuss quality grade expectations with your supplier.

There may be multiple ASTM methods for analyzing certain properties. Listed below are single test methods. For more information on test methods, visit www.astm.org.

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method</th>
<th>Grade No. 1-B</th>
<th>Grade No. 1-B</th>
<th>Grade No. 2-B</th>
<th>Grade No. 2-B</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulfur, % mass (ppm), max</td>
<td>D6463</td>
<td>0.0015 (15)</td>
<td>0.05 (500)</td>
<td>0.0015 (15)</td>
<td>0.05 (500)</td>
<td>Feedstocks can contain sulfur-bearing materials. This method is used to determine sulfur in process feeds or sulfur in the finished product.</td>
</tr>
<tr>
<td>Cold soak filterability, s, max</td>
<td>D7501</td>
<td>200</td>
<td>200</td>
<td>360</td>
<td>360</td>
<td>Some substances may be soluble in Biodiesel at room temperature, but upon cooling to temperatures above the cloud point (or even being at room temperature for longer periods of time), these substances may “come out” of the solution and further cause filter plugging. This method tests for a cloud point below 20°C (changes depending on method) to ensure low temperature operability.</td>
</tr>
<tr>
<td>Acid number, mg KOH/g, max</td>
<td>D664</td>
<td>0.50</td>
<td>0.50</td>
<td>0.50</td>
<td>0.50</td>
<td>Biodiesel may contain degradation (oxidation) products that are made up of acidic constituents. This method results in a “acid number” which is a measurement of the acidic substances in the biodiesel.</td>
</tr>
<tr>
<td>Free glycerin, % mass, max</td>
<td>D6684</td>
<td>0.02</td>
<td>0.240</td>
<td>0.240</td>
<td>0.240</td>
<td>The production of biodiesel through transesterification produces glycerin, an unwanted byproduct that must be removed. This method measures the amount of unreacted % partially reacted feedstocks left in the biodiesel.</td>
</tr>
<tr>
<td>Total glycerin, % mass, max</td>
<td>D6684</td>
<td>0.02</td>
<td>0.240</td>
<td>0.240</td>
<td>0.240</td>
<td></td>
</tr>
<tr>
<td>Oxidation Stability, hours, min</td>
<td>EN ISO 15751</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>Oxidation stability is a key parameter of biodiesel quality. As such, EN ISO 15751 was developed to determine the oxidation stability of biodiesel blends.</td>
</tr>
<tr>
<td>KF Moisture, ppm, max [EN]</td>
<td>D6304</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>Knowing the water content of fuel additives and similar products is important to help predict a fuel’s quality/ performance. Moisture may lead to premature corrosion which can increase the debris. This can cause filter plugging and reduce the effect of additives as well as increase bacterial growth. This method determines the proportion of water in a product.</td>
</tr>
<tr>
<td>Property</td>
<td>Test Method</td>
<td>Requirement</td>
<td>Description</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>-------------</td>
<td>-------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>KF Moisture, ppm, max (EN)</td>
<td>D5304</td>
<td>(No U.S. specification - Below 200 is expected)</td>
<td>Knowing the water content of fuel additives and similar products is important to help predict a fuel's quality/performance. Moisture may lead to premature corrosion which can increase the debris. This can cause filter plugging and reduce the effect of additives as well as increase bacterial growth. This method determines the proportion of water in a product.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Microbial Count</td>
<td>D5974</td>
<td>Determines amount and enumeration</td>
<td>Microbes may infect fuel systems through slime accumulations on system surfaces (or at the fuel-water interface). Fuel-phase organisms are often the most readily available indicators of fuel contamination. This method both detects and determines the enumeration of HPC (Heterotrophic bacteria) and fungi in the fuel.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cloud point, °C, max or CFPP, °C, max</td>
<td>D2500, D5371</td>
<td>See Below¹</td>
<td>The cloud point for a petroleum product is an index of the lowest temperature of their utility (for certain applications). The D2500 test method determines the cloud point for fuels.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flash, °C, min</td>
<td>D93</td>
<td>52</td>
<td>The flash point temperature is the measure of a fuel's ignitability. The flash point test method is used in shipping and safety regulations.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sulfur, ppm, max</td>
<td>D5453</td>
<td>15</td>
<td>Feedstocks can contain sulfur-bearing materials. This method is used to determine sulfur in process feeds or sulfur in the finished product.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biodiesel Content, % (V/V), range</td>
<td>D7371</td>
<td>6-20</td>
<td>Biodiesel is a blendstock commodity primarily used as a “value-added blending component” with diesel fuel. This method is used for quality control in the production and distribution of diesel fuel &amp; biodiesel blends containing FAME (Fatty Acid Methyl Esters).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oxidation Stability, hours, min</td>
<td>EN15751</td>
<td>6</td>
<td>Oxidation stability is a key parameter of biodiesel quality. As such, EN 15751 was developed to determine the oxidation stability of biodiesel blends.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

¹It is unrealistic to specify low-temperature properties that will ensure satisfactory operation at all ambient conditions. However, satisfactory operation below the cloud point (or wax appearance point) may be achieved depending on equipment design, operating conditions, and the use of flow-improvement additives. Appropriate low-temperature operability properties should be agreed upon between the fuel supplier and purchaser for the intended use and expected ambient temperatures.
# Detailed Requirements for ULSD

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method</th>
<th>Requirement</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RF Moisture, ppm, max (EN)</td>
<td>D6804</td>
<td>(No U.S. specification - Below 100 is expected)</td>
<td>Knowing the water content of fuel additives and similar products is important to help predict a fuel's quality/performance. Moisture may lead to premature corrosion which can increase the debris. This can cause filter plugging and reduce the effect of additives as well as increase bacterial growth. This method determines the proportion of water in a product.</td>
</tr>
<tr>
<td>Microbial Count</td>
<td>D6974</td>
<td>Determines amount and enumeration</td>
<td>Microbes may infect fuel systems through slime accumulations on system surfaces (or at the fuel-water interface). Fuel-phase microorganisms are often the most readily available indicators of fuel contamination. This method both detects and determines the enumeration of HPC (Heterotrophic bacteria) and fungi in the fuel.</td>
</tr>
<tr>
<td>Cloud point, °C, max</td>
<td>D2500</td>
<td>See Below*</td>
<td>The cloud point for a petroleum product is an index of the lowest temperature of their utility (for certain applications). The D2500 test method determines the cloud point for fuels.</td>
</tr>
<tr>
<td>Flash, °C, min</td>
<td>D93</td>
<td>52</td>
<td>The flash point temperature is the measure of a fuel's ignitability. The flash point test method is used in shipping and safety regulations in the range from 40°C to 970°C.</td>
</tr>
<tr>
<td>Sulfur, ppm, max</td>
<td>D5453</td>
<td>15</td>
<td>Feedstocks can contain sulfur-bearing materials. This method is used to determine sulfur in process feeds or sulfur in the finished product.</td>
</tr>
</tbody>
</table>

*It is unrealistic to specify low-temperature properties that will ensure satisfactory operation at all ambient conditions. However, satisfactory operation below the cloud point (or wax appearance point) may be achieved depending on equipment design, operating conditions, and the use of low-temperature additives. Appropriate low-temperature operability properties should be agreed upon between the fuel supplier and purchaser for the intended use and expected ambient temperatures.*
A-3 Laboratory Credentials

THIS CERTIFIES

IOWA CENTRAL FUEL TESTING LABORATORY

AS A BQ-9000 LABORATORY

COMMENCING ON THIS 8TH DAY OF JUNE, 2010

RECERTIFIED 2013, 2016, AND EXPIRING THE 8TH DAY OF JUNE, 2019

NBAC

www.BQ-9000.org

AUTHORIZED BY

ROGER VAULT, NATIONAL BIODIESEL
ACCREDITATION COMMISSION
CHAIRMAN

DATE: 6/16/16

ENDORSED BY THE NATIONAL BIODIESEL ACCREDITATION COMMISSION AND THE NATIONAL BIODIESEL BOARD

Certificate of Registration

This certificate has been awarded to

IOWA CENTRAL FUEL TESTING LABORATORY

Four Triton Circle, Fort Dodge, IA, 50501, USA

in recognition of the organization’s Quality Management System which complies with

ISO 9001:2015

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# A-4 Standard Chain of Custody and Shipping

## Chain of Custody Form

### Step 1: Complete Form

### Step 2: Ship Samples & Original Form To

Iowa Central Fuel Testing Laboratory  
Four Triton Circle  
Fort Dodge, Iowa 50501  
[www.iowafuellab.com](http://www.iowafuellab.com)  
Phone: 877-797-4059 / 515-574-1259

## Customer Information

<table>
<thead>
<tr>
<th>Company</th>
<th>POP</th>
<th>Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Address</td>
<td>Contact Person</td>
<td>Billing Address:</td>
</tr>
<tr>
<td>City, State, Zip</td>
<td>Email for Results</td>
<td></td>
</tr>
<tr>
<td>Phone</td>
<td>Comments</td>
<td></td>
</tr>
</tbody>
</table>

## Sample Information

<table>
<thead>
<tr>
<th></th>
<th>Sample 1</th>
<th>Sample 2</th>
<th>Sample 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer Sample ID</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Date Sampled</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Containers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuel Type (e.g. B100, B5, Ethanol)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Tests to be Performed

(check those requested by sample)

- B100 ASTM D6751 Quality Check Test Package
- B6-B20 ASTM D 7467 Quality Check Test Package*
- Diesel ASTM D 975 Quality Check Test Package*
  *Choice of Cloud Point or Cold Filter Plug Point (please circle one)*  
  Cloud Point  
  Cold Filter Plug Point  
  Cloud Point  
  Cold Filter Plug Point  
  Cloud Point  
  Cold Filter Plug Point

Individual tests and packages available; prices online at [www.iowafuellab.com](http://www.iowafuellab.com).

## Custody Transfer Record

<table>
<thead>
<tr>
<th>Print Name / Signature</th>
<th>Date / Time</th>
<th>Released/Received</th>
<th>Comments</th>
</tr>
</thead>
</table>

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A-5 Example Fuel Quality Monitoring Results

B6-B20 Karl Fischer Moisture

B6-B20 Flash Point

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Note: Prior to introducing biodiesel into your fueling system, tanks should be cleaned. If tanks are not cleaned, we suggest a stepped approach to introducing biodiesel blends. Begin with lower blends up to B10 and gradually work higher if so desired. Close attention should be paid to fueling system filters as the higher level of biodiesel will free tank deposits which can plug these filters. Sampling intensity should reflect seasonal changes that will impact fuel quality and engine operability.

### Alternative Fuels Council Suggested Fuel Screening Schedule

<table>
<thead>
<tr>
<th></th>
<th>Partial D7467 (B6-B20)</th>
<th>Partial D975 (ULSD)</th>
<th>Partial D6751 (B100)</th>
<th>FULL TESTING Dependent Upon Partial Testing Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>2-4 times</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>February</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>March</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>April</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>May</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>June</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>July</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>August</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>September</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>October</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>November</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>December</td>
<td>2-4</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

The above is only a suggested practice. Each facility should consider fuel throughput, seasonal variations, and source of biodiesel and ULSD supply. Should blending techniques change or vary, increased sampling should be completed to verify accuracy of blend percent as well as fuel quality.

The Alternative Fuels Council suggested limited sampling (partial ASTM analysis) is a fuel quality screening approach intended to reduce overall costs for your company. We encourage you to contact Alternative Fuel Council staff to discuss additional needs or fuel quality management issues, in general, at any time.
A-7 Contacts

Fuel Quality Plan Contact Information:

**Alternative Fuels Council/NATSO**

Jeff Hove, Fuels Specialist

[jhove@natsoaltfuels.com](mailto:jhove@natsoaltfuels.com)

O-703-739-7560

C-515-250-2966

**Iowa Central Fuel Testing Laboratory**

Dr. Don Heck, Lab Director

Rhonda Jones, Lab Manager

[Fuels@iowafuellab.com](mailto:Fuels@iowafuellab.com)

800-362-2793 ext 1243