NOT MEASUREMENT SENSITIVE
A-A-59693A
JANUARY 15, 2004
SUPERSEDING
A-A-59693
September 7, 2001

# COMMERCIAL ITEM DESCRIPTION

# DIESEL FUEL, BIODIESEL BLEND (B20)

The General Services Administration has authorized the use of this commercial item description, for all federal agencies.

1. SCOPE. This commercial item description covers a biodiesel fuel blend containing 20 percent (%) biodiesel, with the remainder being low-sulfur diesel fuel oil. This fuel blend, hereafter referred to as B20, is intended for use in all non-tactical diesel fuel-consuming vehicles and equipment systems (see 6.5).

2. SALIENT CHARACTERISTICS.

2.1 Material. The B20 shall consist of biodiesel (see 6.3.1) conforming to the requirements of ASTM D 6751 and diesel fuel oil conforming to A-A-52557 or ASTM D 975. The amount of biodiesel shall be 20 ± 1% by volume. The remainder of the fuel blend shall be Grade Low Sulfur No. 1-D diesel fuel oil (see 6.3.2), Grade Low Sulfur No. 2-D diesel fuel oil (see 6.3.3), or a combination of Grade No. 1-D and Grade No. 2-D.

2.2 Chemical and physical requirements. The chemical and physical requirements of the finished fuel shall conform to those listed in table I.

Beneficial comments, recommendations, additions, deletions, clarifications, etc. and any data that may improve this document should be sent by letter to: U.S. Army Tank-automotive and Armaments Command, ATTN: AMSRD-TAR-E/ASI, 6501 E. 11 Mile Road, Warren, MI 48397-5000.

AMSC N/A FSC 9140

TABLE I. Requirements for B20 biodiesel blend.

| Property | Requirement | Test Method |
|---|---|---|
| Volume percent biodiesel in B20 | 20 ± 1 volume percent | Appendix A |
| Appearance | Clear, bright, and visually free from undissolved water, sediment, and suspended matter | ASTM D 4176 Procedure 1 |
| Kinematic Viscosity, $mm^2/s$, @ 40°C | 1.3 – 4.1 | ASTM D 445 |
| Flash Point, °C<br>April – September<br>October – March | <br>52°C min<br>38°C min | ASTM D 93 |
| Low Temperature Properties | 1/ | 1/ |
| Total Acid Number, mg KOH/g Sample | 0.2 max | ASTM D 664 |
| Water Content, volume % | 0.05 max | ASTM D 2709 |
| Sulfur Content, mass % | 0.05 max | ASTM D 5453, D 2622 |
| Cetane Number | 41 min | ASTM D 613 |
| Ash Content, mass % | 0.01 max | ASTM D 482 |
| Distillation, °C<br>T90 | <br>338 max | ASTM D 86 |
| Copper Strip Corrosion, 3 hours @ 50°C | 3 max | ASTM D 130 |
| Micro Carbon Residue, mass % | 0.05 max | ASTM D 4530 |

1/ The low temperature performance of the B20 shall be defined by one of the following two properties: cloud point or cold filter plugging point (CFPP). When specified (see 6.2), the maximum cloud point of the B20 shall be equal to or lower than the tenth percentile minimum ambient temperature in the geographical area and seasonal timeframe in which the B20 is to be used, when tested IAW ASTM D 2500. When specified (see 6.2), the maximum CFPP of the B20 shall be a minimum of 10°C below the tenth percentile minimum ambient temperature in the geographical area and seasonal timeframe in which the B20 is to be used, when tested IAW ASTM D 6371 (see 6.4). ASTM D 5773 can be used as an alternate cloud point test method to ASTM D 2500.

3. REGULATORY REQUIREMENTS. The offeror/contractor is encouraged to use recovered materials to the maximum extent practicable, IAW paragraph 23.403 of the Federal Acquisition Regulation (FAR).

3.1 Clean Air Act requirements. Under authority of the Clean Air Act, the U.S. Environmental Protection Agency (EPA) issues limits on the maximum sulfur level, the maximum aromatic content or minimum cetane index on diesel intended for on-road use. Details of the EPA regulations and test methods are given in Part 80 of Title 40 of the Code of Federal Regulations

(40 CFR 80). Specifics may be obtained by contacting the Air Quality Office of the state environmental office or headquarters.

3.2 Legal requirements. B20 furnished under this description shall meet all applicable legal requirements in accordance with (IAW) 40 CFR 80.

4. PRODUCT CONFORMANCE. The products provided shall meet the salient characteristics of this CID, conform to the producer's own drawings, specifications, standards, and quality assurance practices, and be the same product offered for sale in the commercial marketplace. The Government reserves the right to require proof of such conformance.

5. PACKAGING. Preservation, packing, and marking shall be as specified in the contract or order (see 6.2).

6. NOTES.

6.1 Source of documents.

6.1.1 Copies of 40 CFR 80 are available from the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402, or via the GPO website at http://www.access.gpo.gov/nara/cfr/index.html/ .

6.1.2 Copies of A-A-52557 "Fuel Oil, Diesel; for Posts, Camps and Stations" are available from the Document Automation and Production Service, Bldg. 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094 or via website http://assist2.daps.dla.mil/quicksearch/

6.1.3 Copies of the following ASTM documents can be obtained from ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, or via the ASTM website at http://www.astm.org/

| | | |
|---|---|---|
| D 86 | - | Standard Test Method for Distillation of Petroleum Products at Atmospheric Pressure (DoD Adopted) |
| D 93 | - | Standard Test Methods for Flash-Point by Pensky-Martens Closed Cup Tester (DoD Adopted) |
| D 130 | | Standard Test Method for Detection of Copper Corrosion from Petroleum Products by the Copper Strip Tarnish Test (DoD Adopted) |
| D 445 | - | Standard Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (the Calculation of Dynamic Viscosity) (DoD Adopted) |
| D 482 | - | Standard Test Method for Ash from Petroleum Products (DoD Adopted) |
| D 613 | - | Standard Test Method for Cetane Number of Diesel Fuel Oil (DoD Adopted) |
| D 664 | - | Standard Test Method for Acid Number of Petroleum Products by Potentiometric Titration (DoD Adopted) |
| D 975 | - | Standard Specification for Diesel Fuel Oils (DoD Adopted) |

| | | |
|---|---|---|
| D 2500 | - | Standard Test Method for Cloud Point of Petroleum Products (DoD Adopted) |
| D 2622 | - | Standard Test Method for Sulfur in Petroleum Products by Wavelength Dispersive X-ray Fluorescence Spectrometry (DoD Adopted) |
| D 2709 | - | Standard Test Method for Water and Sediment in Middle Distillate Fuels by Centrifuge (DoD Adopted) |
| D 4176 | - | Standard Test Method for Free Water and Particulate Contamination in Distillate Fuels (Visual Inspection Procedures) (DoD Adopted) |
| D 4530 | - | Standard Test Method for Determination of Carbon Residue (Micro Method) (DoD Adopted) |
| D 4865 | - | Standard Guide for Generation and Dissipation of Static Electricity in Petroleum Fuel Systems (DoD Adopted) |
| D 5453 | - | Standard Test Method for Determination of Total Sulfur in Light Hydrocarbons, Motor Fuels and Oils by Ultraviolet Fluorescence |
| D 5773 | - | Standard Test Method for Cloud Point of Petroleum Products (Constant Cooling Rate Method) |
| D 6371 | - | Standard Test Method for Cold Filter Plugging Point of Diesel and Heating Fuels (DoD Adopted) |
| D 6751 | - | Standard Specification for Biodiesel Fuel (B100) Blend Stock for Distillate Fuels |

6.1.4 Copies of SAE Paper No. 1999-01-3520 "Potential Analytical Methods for Stability Testing of Biodiesel and Biodiesel Blends" can be obtained from the Society of Automotive Engineers (SAE), 400 Commonwealth Drive, Warrendale, PA 15096-0001, or via the SAE website at http://www.sae.org/ .

6.2 Ordering data. The contract or order should specify the following:

a. CID document number and revision.
b. Product conformance provisions.
c. Cloud point or CFPP required.
d. Quantity in terms of gallons or barrels bulk or number and size of containers for packaged lots.
e. Selection of applicable packaging or delivery requirements.

6.3 Definitions.

6.3.1 Biodiesel. A fuel composed of mono-alkyl esters of long chain fatty acids derived from vegetable oils or animal fats, designated B100.

6.3.2 Grade Low Sulfur No. 1-D. A special-purpose, light distillate fuel used for automotive diesel and gas turbine engines requiring low sulfur fuel and requiring a higher volatility than that provided by Grade Low Sulfur No. 2-D.

6.3.3 Grade Low Sulfur No. 2-D. A general-purpose, middle distillate fuel used for automotive diesel and gas turbine engines requiring low sulfur fuel. It is also suitable for use in non-automotive application, especially in conditions of varying speed and load.

6.4 Minimum ambient temperatures. Tenth percentile minimum ambient temperatures for locations within the United States are provided in Appendix X4 of ASTM D 975 and may be used as a means of estimating expected regional temperatures.

6.5 Limitations for B20 usage.

6.5.1 Vehicles and equipment. B20 has not been approved for use in Army combat and tactical vehicles and equipment at this time. The different types of engine systems and engine compartment configurations, modes of operation, environmental conditions, storage stability concerns (see 6.5.2), solvency effects (see 6.6), and fuel interchangeability issues associated with the single fuel forward policy will necessitate field testing to fully validate the use of B20 in combat and tactical vehicles and equipment.

6.5.2 Storage life. Available data indicates that the B20 in vehicles or storage tanks should be used within six months of manufacture. Fuels that have an acid number equal to or over 0.3 mg KOH/g are not recommended for use.

6.6 Solvency properties of biodiesel. Biodiesel (B100) is a good solvent. Use of B20 may clean the fueling system of existing deposits. Users should be prepared to change fuel filters more frequently upon initial use.

6.7 Viscosity and distillation properties of B20 blended with Grade No. 1-D diesel fuel oil. The user must be aware that B20 using Grade Low Sulfur No. 1-D diesel fuel oil as base fuel may exceed the maximum viscosity and the maximum 90% recovered temperature requirements for Grade Low Sulfur No. 1-D diesel fuel oil IAW A-A-52557 and ASTM D 975. The significance of this deviation has not been established.

6.8 Static electricity. The generation of static electricity can create problems in the handling of distillate fuel oils with which biodiesel may be blended. For more information on the subject, see ASTM D 4865.

6.9 Original Equipment Manufacturers (OEM) biodiesel allowances. The impact of biodiesel use on warranty coverage, which varies by vehicle/engine manufacturers, has been checked. Major engine manufacturers have all issued statements regarding the use of biodiesel as it pertains to their warranty coverage. Copies of any of these statements can be obtained from the National Biodiesel Board (NBB) by calling (800) 841-5849 or faxing (573) 635-7913, or via the NBB website at http://www.biodiesel.org/

6.10 Benefits of using biodiesel. The Energy Conservation Reauthorization Act (ECRA) of 1998, an amendment to the Energy Policy Act (EPACT) of 1992, permits Federal Agencies to use biodiesel to meet a portion of their alternative fueled vehicle (AFV) acquisition requirements. Section 312 (Biodiesel Fuel Use Credits) of ECRA permits Federal Agencies to meet up to 50% of their AFV acquisition requirements by using biodiesel fuel. Under the new provisions, each 450 gallons of pure biodiesel (B100) used in a vehicle weighing over 8500 pounds counts as one full AFV credit. Since biodiesel is typically used as B20, using 2250 gallons of B20 equates to one AFV credit under EPACT.

6.11 Key words.

Blend
Compression ignition engine
Diesel consuming equipment
Low sulfur

# APPENDIX A

## VOLUME PERCENT BIODIESEL DETERMINATION IN A BIODIESEL BLEND BY GAS CHROMATOGRAPHY

1. Scope

1.1 This method covers the determination of biodiesel volume percent (throughout the test method volume percent is represented as %) in a blend of diesel fuel and biodiesel. The test method is applicable to fuel blends having 0 to 30% biodiesel. This method is not dependant on the type of biodiesel feedstock or the grade of diesel fuel used in the biodiesel blends.

1.2 This test method does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this method to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

2. Summary of Test Method

2.1 A fuel sample is injected into a non-polar gas chromatographic column and run at specific conditions. The components of the biodiesel blend elute in boiling point order, with the biodiesel being the heaviest component. The initial column temperature is started high to elute the petroleum diesel quickly. Once the petroleum diesel has been eluted, the column temperature is raised to get good separation of the biodiesel components. A calibration curve is obtained under the same chromatographic conditions using known blends of biodiesel/petroleum diesel ranging from 0 to 30% biodiesel.

3. Significance and Use

3.1 This test method is useful in determining whether a fuel contains biodiesel and what volume percent of the blend is biodiesel. This method does not give any insight into the composition of the biodiesel feedstocks or of the grade of petroleum diesel used in the blend. This test method can be used for product specification testing of B20 fuel samples.

4. Apparatus

4.1 Gas Chromatograph. The gas chromatograph used must have the following performance characteristics:

4.1.1 Detector. A flame ionization detector (FID) capable of operating at 300°C and be capable of the connection of a megabore capillary column.

4.1.2 Column Temperature Programmer – The gas chromatograph must be capable of programmed temperature operation.

APPENDIX A

4.1.3 Sample Inlet System – The sample inlet must be capable of operating at 300°C and be capable of the connection of a megabore capillary column.

4.1.4 Flow Controllers – The gas chromatograph must be equipped with mass flow controllers capable of maintaining the carrier gas flow constant to ± 1% over the full operating temperature range of the column.

4.1.5 Microsyringe – A microsyringe capable of 0.1microliter (μL) volumes is needed for sample introduction.

4.2 Column – 5 meters (m) × 0.53 millimeters (mm) × 2.65 micrometer (μm) HP-1, Agilent Technologies, Part# 19095S-100 has been used with success.

4.3 Data Acquisition System

4.3.1 Integrator – Means must be provided for determining the accumulated area under the chromatogram. This can be done by means of an electronic integrator or computer-based chromatography data system. The integrator/computer system must have chromatographic software for measuring the retention time and areas of eluting peaks.

5. Reagents and Materials

5.1 Carrier Gas – Helium of high purity. (Warning – Helium is a gas under high pressure.) Additional purification is recommended by the use of molecular sieves or other suitable agents to remove water, oxygen, and hydrocarbons. Available pressure must be sufficient to ensure a constant carrier gas flow rate.

5.2 Hydrogen – Hydrogen of high purity is used as fuel for the flame ionization detector (FID). (Warning – Hydrogen is an extremely flammable gas under high pressure.)

5.3 Air – High purity compressed air is used as the oxidant for the FID. (Warning – Compressed air is a gas under high pressure and supports combustion.)

5.4 Standards for Calibration and Identification – Standards of biodiesel and petroleum diesel are needed for establishing identification by retention time as well as calibration for quantitative measurements. These materials shall be free of the other components to be analyzed (i.e., the biodiesel shall be 100% biodiesel and the diesel fuel shall be 100% petroleum diesel fuel).

6. Sampling

6.1 Samples to be analyzed by this test method must be obtained using the procedures outlined in ASTM Practice D 4057.

6.2 The test specimen to be analyzed must be homogeneous and free of dust or undissolved material.

APPENDIX A

7 Preparation of Apparatus

7.1 Chromatograph – Place in service in accordance with the manufacturer's instructions. Typical operating conditions are shown in Table 1.

7.1.1 Regularly remove the deposits formed in the flame ionization detector from the combustion of the silicone liquid phase decomposition products. These deposits will change the response characteristics of the detector.

7.2 Capillary Column – Capillary columns with cross-linked and bonded stationary phases are available from many manufacturers and usually require conditioning. The column can be conditioned using the following procedure.

7.2.1 Properly install the capillary column into the gas chromatograph at the inlet only. Cap off the detector and set the column flow. Allow the column to purge at ambient temperature for 30 minutes.

7.2.2 At the end of the column purge time, uncap the detector and install the capillary column to the detector and set the detector flows.

7.2.3 Starting at ambient temperature, ramp the oven 10°C per minute to the final operating temperature of 240°C and hold for 30 minutes.

7.2.4 Run the temperature ramp program until a stable baseline is obtained.

TABLE 1. Typical operating conditions.

| | |
|---|---|
| Column Length | 5 m |
| Column inner diameter | 0.53 mm |
| Film thickness | 2.65 µm |
| Stationary phase | HP-1 |
| Carrier Gas | Helium |
| Carrier gas flow rate | 8.0 mL/min |
| Split Ratio | 5:1 |
| Initial Column temperature | 170°C, Hold 8 minutes |
| Final Column Temperature | 240°C, Hold 5 minutes |
| Programming rate | 10°C/min |

APPENDIX A

TABLE 1. Typical operating conditions - Continued.

| | |
|---|---|
| Detector | FID |
| FID Hydrogen Flow | 30 mL/min |
| FID Air Flow | 400 mL/min |
| FID Makeup Flow | 22 mL/min |
| Detector Temperature | 300°C |
| Injector Temperature | 300°C |
| Sample Size | 0.1 µL |
| Data Rate | 0.5 or 1 Hz |
| Total Analysis Time | 20 minutes |

A.8. Calibration and Standardization

A.8.1 Identification – 100% biodiesel (B100) contains three (3) major peaks. Determine the retention times and the percent concentration of each peak by injecting a 0.1µL sample. Figure 1 shows an overlay of 100% soy biodiesel fuel and 100% yellow grease biodiesel fuel samples. Notice that there is very little difference between the two B100 samples, so either fuel may be used for calibration.

A.8.2 Preparation of Calibration Blends.

A.8.2.1 Cal STD 1 – In a 100 mL volumetric flask, blend 30 mL of B100 (100% biodiesel) stock and dilute to the mark with biodiesel free petroleum diesel and label flask. This is the 30% biodiesel standard.

A.8.2.2 Cal STD 2 – In a 100 mL volumetric flask, blend 25 mL of B100 stock and dilute to the mark with biodiesel free petroleum diesel and label flask. This is the 25% biodiesel standard.

A.8.2.3 Cal STD 3 – In a 100 mL volumetric flask, blend 20 mL of B100 stock and dilute to the mark with biodiesel free petroleum diesel and label flask. This is the 20% biodiesel standard.

A.8.2.4 Cal STD 4 – In a 100 mL volumetric flask, blend 15 mL of B100 stock and dilute to the mark with biodiesel free petroleum diesel and label flask. This is the 15% biodiesel standard.

A.8.2.5 Cal STD 5 – In a 100 mL volumetric flask, blend 10 mL of B100 stock and dilute to the mark with biodiesel free petroleum diesel and label flask. This is the 10% biodiesel standard.

A.8.2.6 Cal STD 6 – In a 100 mL volumetric flask, blend 5 mL of B100 stock and dilute to the mark with biodiesel free petroleum diesel and label flask. This is the 5% biodiesel standard.

APPENDIX A

A.8.2.7 Cal STD 7 – In a 100 mL volumetric flask, dilute to the mark with biodiesel-free petroleum diesel and label flask. This is the 0% biodiesel standard.

A.8.3 Standardization – Run the calibration standards and establish a calibration curve for each of the three biodiesel peaks. Using the concentrations of each peak obtained in section 8.1, calculate the value of each peak in each standard. Check that the correlation $r^2$ value for each calibration is at least 0.99 or better. Figure 2 shows an example of a Least-Squares Fit Calibration for biodiesel peak 2 as done by ChemStation software. To do a manual Least-Squares Fit Calibration see section 10, Calculations and Reporting.

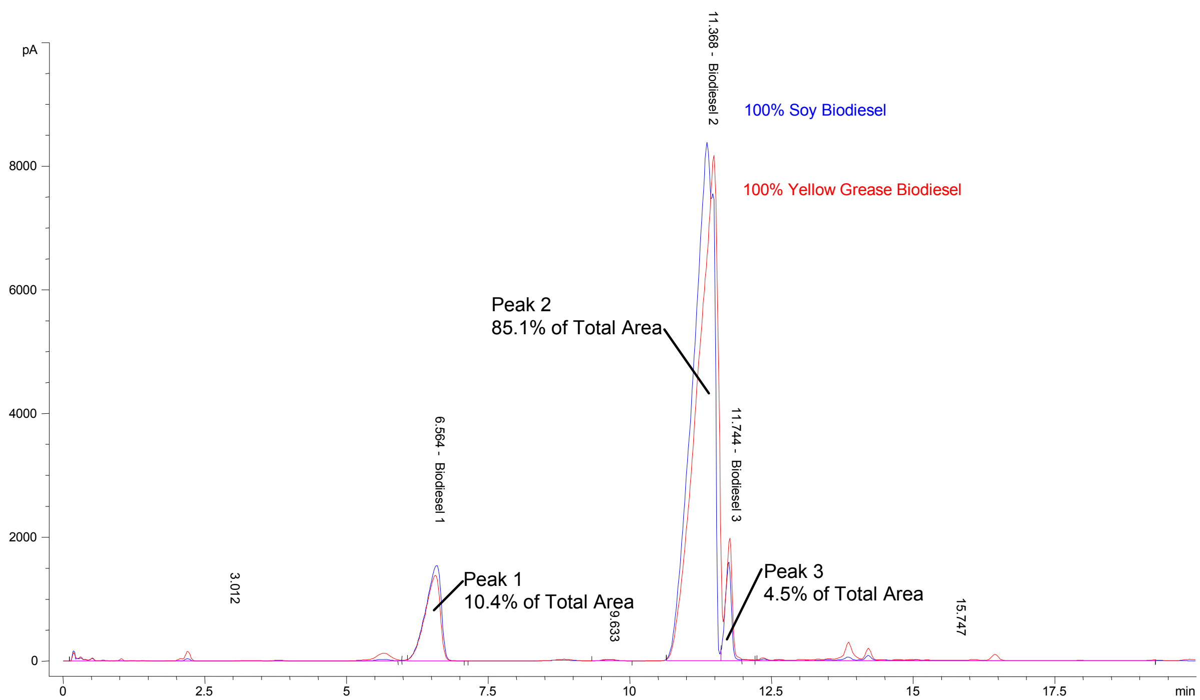


FIGURE 1. 100% soy biodiesel & 100% yellow grease biodiesel.

# APPENDIX A

TABLE 2. Concentrations of standards.

| Peak # | B100 | 30% Std | 25% Std | 20% Std | 15% Std | 10% Std | 5% Std | 0% Std |
|---|---|---|---|---|---|---|---|---|
| 1 | 10.4% | 3.120 | 2.600 | 2.080 | 1.560 | 1.040 | 0.520 | 0.000 |
| 2 | 85.1% | 25.530 | 21.275 | 17.020 | 12.765 | 8.510 | 4.255 | 0.000 |
| 3 | 4.5% | 1.350 | 1.125 | 0.900 | 0.675 | 0.450 | 0.225 | 0.000 |
| Total % | 100.0 | 30.0 | 25.0 | 20.0 | 15.0 | 10.0 | 5.0 | 0.0 |

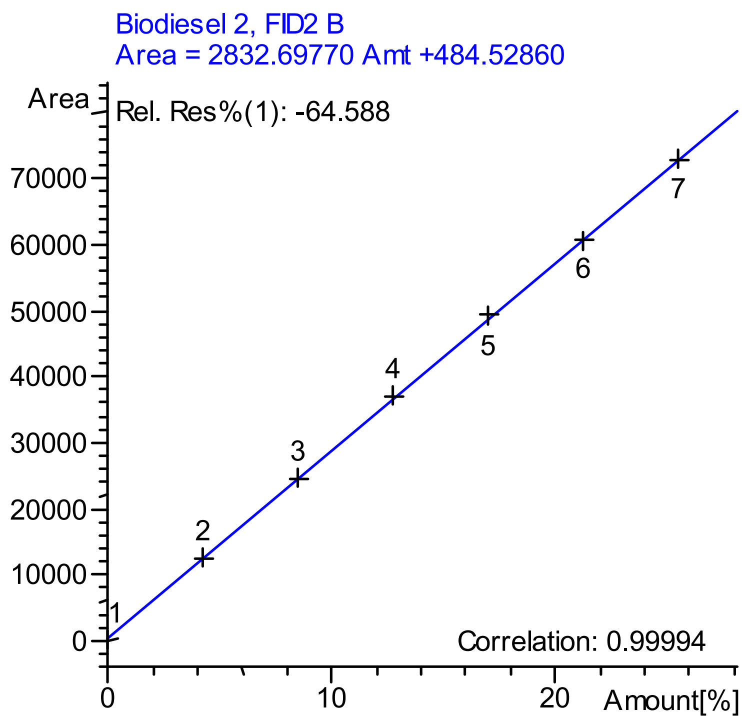


FIGURE 2. A least-squares fit calibration for biodiesel %.

APPENDIX A

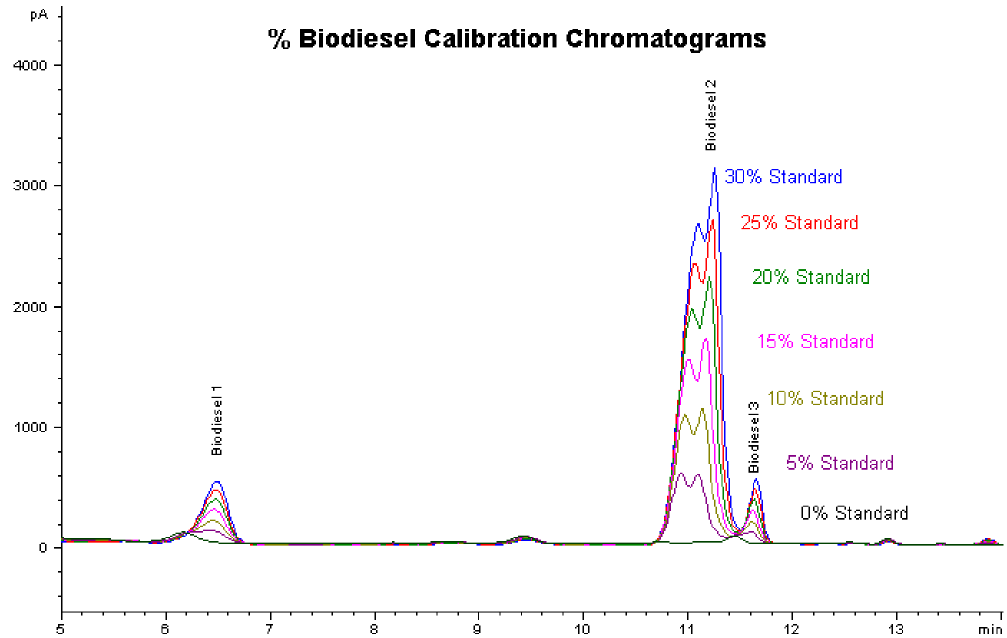


FIGURE 3. Overlay of calibration standards.

A.9. Procedure

A.9.1 Sample Preparation – If using an automatic sampler then transfer an aliquot of the sample into a glass gas chromatographic (GC) vial. Seal the GC vial with a Teflon-lined septum cap.

A.9.2 Chromatographic Analysis – Introduce a representative aliquot of the sample into the gas chromatograph using the same technique and sample size used for the calibration analysis. An injection volume of 0.1µL with a 5:1 split ratio has been used successfully. Start the recording and integrating devices in synchronization with the sample introduction. Obtain a chromatogram and an integrated peak report which displays the retention times and integrated area of each biodiesel peak. (See Figure 4)

A.9.3 Integration – Table 3 shows an example of integration events. The peak area before the three biodiesel peaks are summed, this is the petroleum diesel fuel. Each of the three biodiesel peaks are integrated individually and the three are summed to obtain the total % of biodiesel present in the sample.

APPENDIX A

Table 3. Example of integration events.

| Time | Integration Events | Value |
|---|---|---|
| Initial | Slope Sensitivity | 25 |
| Initial | Peak Width | 0.4 |
| Initial | Area Reject | 1000 |
| Initial | Height Reject | 25 |
| Initial | Shoulders | OFF |
| | | |
| 0.100 | Area Sum | ON |
| 5.900 | Area Sum | OFF |
| 12.200 | Integration | OFF |

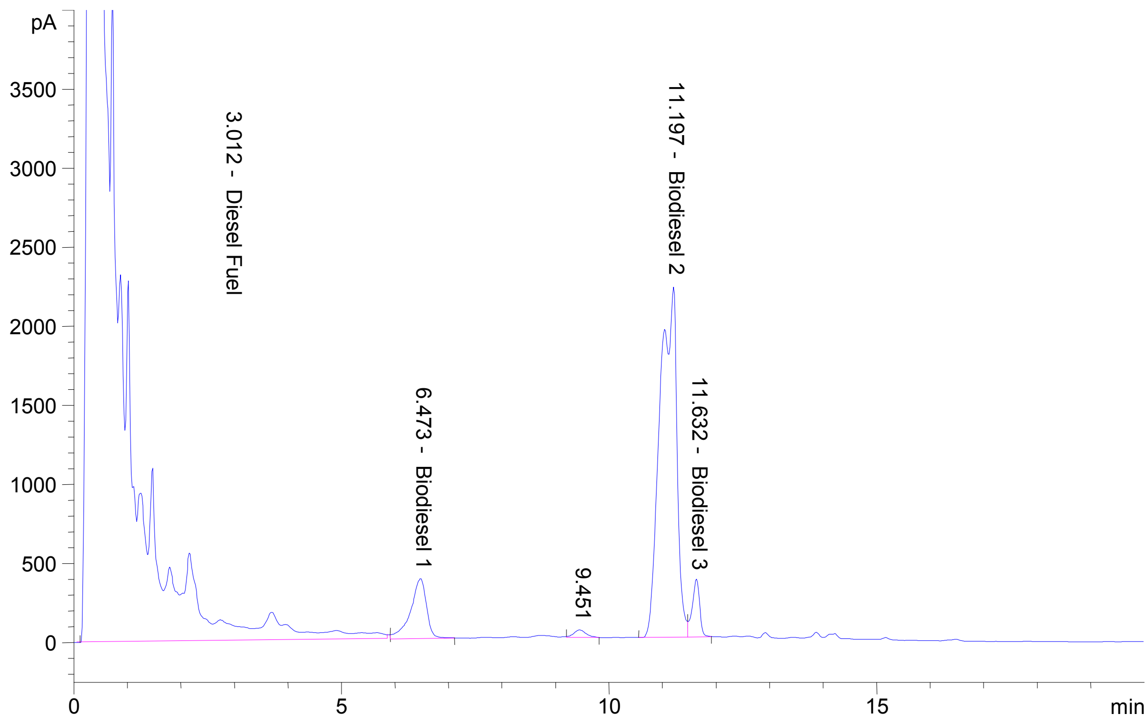


FIGURE 4. Typical % biodiesel chromatogram.

A.10. Calculations and Reporting

A.10.1 Calculate the Least-Squares Fit calibration for each of the three biodiesel peaks using the following formulas:

APPENDIX A

$$\text{Correlation} = (\Sigma\, xy)^2 / (\Sigma\, x^2)(\Sigma\, y^2) \quad (1)$$
$$\text{Slope} = \Sigma\, xy \,/\, \Sigma\, x^2 \quad (2)$$
$$\text{Y-Intercept} = \bar{y} - (\text{Slope} \times \bar{x}) \quad (3)$$

Where:

$x_i$ = % Concentration of Standard
$y_i$ = Peak Area
$\bar{x}$ = the Sum of $x_i$ divided by the number of Standards
$\bar{y}$ = the Sum of $y_i$ divided by the number of Standards
$x = x_i - \bar{x}$
$y = y_i - \bar{y}$
$xy = x \times y$
$x^2 = x \times x$
$y^2 = y \times y$

A.10.1.1 Table 4 gives an example of the calculations for biodiesel peak #2. Using Equations (1), (2), and (3), the correlation $r^2$, slope, and y-intercept are calculated as follows:

$r^2$ = 2062123967630.830 / (506.941 × 4068495595.089) = 0.9998
Slope = 1436009.738 / 506.941 = 2832.6977
y-intercept = 36643.914 – (2832.6977 × 12.765) = 484.5286

A.10.1.2 The calculations can be checked by calculating the areas of the standards as unknowns using Equation (4) and the peak areas from Table 4. The calculated % Concentration will closely match the actual concentration as seen in the following example:

% Concentration = ((0.00000 - 484.5286) / 2832.6977) × 0.9998 = -0.171
% Concentration = ((12763.0 - 484.5286) / 2832.6977) × 0.9998 = 4.334
% Concentration = ((24663.2 - 484.5286) / 2832.6977) × 0.9998 = 8.534
% Concentration = ((37027.6 - 484.5286) / 2832.6977) × 0.9998 = 12.898
% Concentration = ((49040.7 - 484.5286) / 2832.6977) × 0.9998 = 17.138
% Concentration = ((60402.6 - 484.5286) / 2832.6977) × 0.9998 = 21.149
% Concentration = ((72610.3 - 484.5286) / 2832.6977) × 0.9998 = 25.457

A.10.2 Each of the three biodiesel peaks for the unknown sample are calculated using the corresponding Least-Squares calibration using the following formula:

$$\text{\% Concentration} = ((\text{Peak Area} - \text{Y-Intercept}) / \text{Slope}) \times \text{Correlation} \quad (4)$$

A.10.3 Add the % concentrations of each of the three biodiesel peaks for total biodiesel in the sample. Report the total volume percent to the nearest 0.01 volume percent.

APPENDIX A

Table 4. Example calculation of correlation coefficient.

| Biodiesel Peak 2 | | | | | | |
|---|---|---|---|---|---|---|
| $X_i$ | $Y_i$ | x | y | xy | $x^2$ | $y^2$ |
| (% Conc.) | (Peak Area) | | | | | |
| 0.000 | 0.000 | -12.765 | -36643.914 | 467759.566 | 162.945 | 1342776454.179 |
| 4.255 | 12763.000 | -8.510 | -23880.914 | 203226.581 | 72.420 | 570298067.122 |
| 8.510 | 24663.200 | -4.255 | -11980.714 | 50977.939 | 18.105 | 143537514.796 |
| 12.765 | 37027.600 | 0.000 | 383.686 | 0.000 | 0.000 | 147214.727 |
| 17.020 | 49040.700 | 4.255 | 12396.786 | 52748.323 | 18.105 | 153680296.046 |
| 21.275 | 60402.600 | 8.510 | 23758.686 | 202186.415 | 72.420 | 564475146.870 |
| 25.530 | 72610.300 | 12.765 | 35966.386 | 459110.914 | 162.945 | 1293580901.349 |
| | | | | | | |
| $\bar{x}$ | $\bar{y}$ | | | | | |
| 12.765 | 36643.914 | | | 1436009.738 | 506.941 | 4068495595.089 |
| | | | | | | |
| $\Sigma xy = 1436009.738$ | | | | | | |
| $(\Sigma xy)^2 = 2062123967630.830$ | | | | | | |
| $\Sigma x^2 = 506.941$ | | | | | | |
| $\Sigma y^2 = 4068495595.089$ | | | | | | |

A.11. Precision and Bias

A.11.1 Precision – The precision of this test method has not been determined by a statistical examination by interlaboratory test results.

A.11.2 Repeatability – The difference between successive results obtained by the same operator with the same apparatus under constant operating conditions on identical test materials have not been determined.

MILITARY INTERESTS:

Custodians:
Army - AT
Navy - SH
Air Force - 68

Review Activities:
Army - AR, MI
Navy - EC, MC, SA
Air Force - 03
DLA - PS

CIVIL AGENCY COORDINATION ACTIVITIES:
GSA/FSS - 6FEE
HHS - FEC, NIH
DOT - NHT

Preparing Activity:
Army - AT

(Project 9140-1148)