



Use of Alkylate, Ethyl Tertiary Butyl Ether (ETBE), High Octane Denaturant Blend, Methyl Tertiary Butyl Ether (MTBE), Naphtha, Natural Gasoline, Raffinate, and Toluene as Denaturants

TTB authorizes alkylate, ethyl tertiary butyl ether (ETBE), high octane denaturant blend, methyl tertiary butyl ether (MTBE), naphtha, natural gasoline, raffinate, and toluene as substitute denaturants for making CDA 20 and as materials to render fuel alcohol unfit for beverage use in order to make fuel alcohol

TTB RUL. 2010-6

Introduction

The Alcohol and Tobacco Tax and Trade Bureau (TTB) has been asked whether a distilled spirits plant (DSP) proprietor may use alkylate, ethyl tertiary butyl ether (ETBE), high octane denaturant blend, methyl tertiary butyl ether (MTBE), naphtha, natural gasoline, raffinate, and toluene as substitute denaturants in completely denatured alcohol Formula 20 (CDA 20) (27 CFR 21.24).

TTB has also been asked whether an alcohol fuel plant (AFP) proprietor may use alkylate, ethyl tertiary butyl ether (ETBE), high octane denaturant blend, methyl tertiary butyl ether (MTBE), naphtha, natural gasoline, raffinate, and toluene as materials to render unfit for beverage use distilled spirits produced for fuel use (27 CFR 19.1005).

Background

The Internal Revenue Code of 1986 and the applicable TTB regulations provide two authorities for producing denatured alcohol for fuel use. Denatured alcohol for various industrial purposes, including fuel use, may be produced at DSPs. Distilled spirits rendered unfit for beverage use by the addition of substances that will not impair the quality of the spirits for fuel use may be made at AFPs, which are specially permitted DSPs.

With regard to denaturing spirits for industrial use, pursuant to 26 U.S.C. 5241 and 5242 and delegations of authority within the Department of the Treasury, TTB regulates materials that are suitable to denature such spirits. Materials authorized as denaturants by TTB shall be such that render distilled spirits unfit for beverage or internal human medicinal use (27 CFR 21.11). The regulations in 27 CFR part 21 identify specific formulas that must be used in denaturing spirits as well as the specifications for the denaturants. One formula contained in part 21 is CDA 20, which is restricted to fuel use (see 27 CFR 21.24). Pursuant to § 21.24, the

formula for making CDA 20 is: To every 100 gallons of ethyl alcohol of not less than 195 proof, add a total of 2.0 gallons of the denaturants listed, or any combination of the denaturants. The denaturants listed in § 21.24 for making CDA 20 are unleaded gasoline, rubber hydrocarbon solvent, kerosene, and deodorized kerosene. In addition, under 27 CFR 21.91, the appropriate TTB officer may authorize the use of substitute denaturants for CDA where the substitution will not jeopardize the revenue.

Pursuant to 26 U.S.C. 5181(e) and delegations of authority within the Department of the Treasury, TTB regulates materials that may be used to render distilled spirits unfit for beverage use before the spirits are withdrawn from an AFP. Spirits treated with materials or any combination of the materials listed in 27 CFR 19.1005(c) will be considered rendered unfit for beverage use and eligible for withdrawal as fuel alcohol. Substances that are currently approved are listed in the TTB regulations at 27 CFR 19.1005 and on the TTB website (www.ttb.gov). Under the authority of 27 CFR 19.1006, the appropriate TTB officer may authorize the use of additional materials for rendering spirits unfit for beverage use which will not impair the quality of the spirits for fuel use, that is, authorize the use of other materials which may be used at an AFP to make fuel alcohol from distilled spirits. The TTB officer approving a new material must also specify the quantity of new material that will be added to the distilled spirits in order to render them unfit for beverage use.

The regulatory standards that a material must meet to gain TTB approval as a denaturant under part 21 and to render spirits unfit for beverage use under part 19 are similar. To approve a material as a denaturant for CDA 20, TTB must determine:

1. That the proposed material makes the ethanol “unfit for beverage or internal human medicinal use” (27 CFR 21.11);
2. That the proposed material will be adequate to protect the Federal excise tax revenue (27 CFR 21.91); and
3. That the proposed material is “suitable to the use for which the denatured distilled spirits are intended to be withdrawn” (26 U.S.C. 5242).

To approve a material as suitable for producing fuel alcohol – that is, for rendering alcohol unfit for beverage use – TTB must determine:

1. That the proposed material will not impair the quality of the spirits for fuel use (27 CFR 19.1005),
2. That the proposed material makes the ethanol “unfit for beverage use,” and the quantity required for this purpose (27 CFR 19.1005), and
3. That the proposed material will be adequate to protect the Federal excise tax revenue (see 26 U.S.C. § 5181(e)(2)).

TTB makes these determinations for each proposed material on a case-by-case basis. In making these determinations, TTB considers a few factors. First, TTB considers circumstances which assure that the ethanol is not likely to be diverted for beverage purposes. One factor that TTB weighs when considering the possibility of diversion is the complexity and expense of equipment or processes that would be needed to obtain a significant quantity of potable alcohol from ethanol mixed with the proposed material. Other factors are whether the materials have boiling points similar to ethanol or whether they form azeotropic mixtures with ethanol, because these factors indicate that no more than a small amount of pure ethanol would be recoverable.

To determine whether a material renders ethanol unfit for beverage purposes, TTB considers the circumstances which assure that a reasonable person would not be inclined to drink it as an alcohol beverage, either because it would be disagreeable to the senses or harmful to one's health. In the latter case, TTB considers whether the mixture has a warning taste and odor.

To determine whether a proposed material will not impair the quality of the spirits for fuel use, TTB considers the chemical properties of the proposed materials and the proposed use rates.

For completeness, this ruling includes materials already listed on the TTB website as authorized for rendering fuel alcohol unfit for beverage use, except straight run gasoline, which was approved as a substitute denaturant for CDA 20 and to render spirits unfit for beverage use in TTB Ruling 2008-2.

TTB Determination Regarding the Use of Alkylate, Ethyl Tertiary Butyl Ether (ETBE), High Octane Denaturant Blend, Methyl Tertiary Butyl Ether (MTBE), Naphtha, Natural Gasoline, and Raffinate as Denaturants for Making CDA 20 and as Materials for Making Fuel Alcohol

Held: Subject to the conditions described below, alkylate, ETBE, high octane denaturant blend, MTBE, naphtha, natural gasoline, and raffinate may be used by a distilled spirits plant (DSP) proprietor as a substitute denaturant in CDA 20.

Held Further: Subject to the conditions described below, alkylate, ETBE, high octane denaturant blend, MTBE, naphtha, natural gasoline, and raffinate may be used by an AFP proprietor to render spirits unfit for beverage use.

- Formula for making CDA 20: To every 100 gallons of ethyl alcohol of not less than 195 proof add a total of 2.0 gallons of these substitute denaturants alone or in combination with denaturants approved for use in making CDA 20.

- Formula for making Fuel Alcohol: To each 100 gallons of spirits add 2 gallons or more of alkylate, ETBE, high octane denaturant blend, MTBE, naphtha, natural gasoline, or raffinate, alone or in combination with each other or any of the materials listed in § 19.1005(c)(1)(i) through (vii).
- Specifications for Alkylate
 - API Gravity at 60°F: 70.4
 - Reid Vapor Pressure (PSI): 5.60 max.
 - Distillation (°F):
 - I.B.P.: 109.0
 - 10%: 186.6
 - 50%: 221.1
 - 90%: 271.8
 - End point distillation: 375.7
- Specifications for ETBE
 - Purity ≥ 95.0%
 - Color Colorless to light yellow
 - Odor Terpene-like
 - Specific gravity at 20 °C 0.70 to 0.80
 - Boiling point (°C) 73
- Specifications for High Octane Denaturant Blend
 - API Gravity at 60°F: 40 to 65
 - Reid Vapor Pressure (PSI): 6 to 15
 - Isopropanol: 24 to 40% vol.
 - Methanol: 1.6 to 9.6% vol.
 - Diisopropyl ether (DIPE): 4 to 12% vol.
 - Tert-butanol: 4 to 12% vol.
 - Iso-pentane: 4 to 9% vol.
 - Pentane: 4 to 9% vol.
 - Pentene: 0 to 2.4% vol.

- Hexane: 2 to 6% vol.
- Heptane: 1 to 3% vol.
- Sulfur (ppm): 0 to 120
- Benzene (% vol.): 0 to 1.1
- Distillation (°F):
 - 10%: 80 to 168
 - 50%: 250
 - End point distillation: 437

- Specifications for MTBE
 - Purity: $\geq 97.0\%$
 - Color: clear, colorless
 - Odor: turpentine-like
 - Specific Gravity at 20°C: 0.70 to 0.80
 - Boiling Point (°C): 55

- Specifications for Naphtha
 - API Gravity at 60°F: 30-85
 - Reid Vapor Pressure (PSI): 8 max.
 - Specific Gravity at 20°C: 0.70 – 0.80
 - Distillation (°F):
 - I.B.P.: 85 max.
 - 10%: 130 max.
 - 50%: 250 max.
 - 90%: 340 max.
 - End point distillation: 380 max.
 - Copper corrosion: 1
 - Sabolt color: 28 min.

- Specifications for Natural Gasoline
 - Natural gasoline is a mixture of various alkanes including butane, pentane, and hexane hydrocarbons extracted from natural gas. It has a distillation range wherein no more than 10% by volume of the sample may distill below 97°F; at least 50% by volume shall distill at or below 156°F; and at least 90% by volume shall distill at or below 209°F.

- Specifications for Raffinate
 - API Gravity at 60°F: 30 – 85
 - Reid Vapor Pressure (PSI) : 5 – 11
 - Octane (R+M/2): 66-70
 - Distillation (°F):
 - 10%: 120 - 150
 - 50%: 144 - 180
 - 90%: 168 - 200
 - End point distillation: 216 - 285

TTB Determination Regarding the Use of Toluene as a Denaturant for Making CDA 20 and as a Material for Making Fuel Alcohol

Held: Subject to the conditions described below, toluene may be used by a distilled spirits plant (DSP) proprietor as a substitute denaturant in CDA 20.

Held Further. Subject to the conditions described below, toluene may be used by an AFP proprietor to render spirits unfit for beverage use.

- Formula for making CDA 20: To every 100 gallons of ethyl alcohol of not less than 195 proof add a total of 5 gallons of Toluene.
- Formula for making Fuel Alcohol: To each 100 gallons of spirits add 5 gallons or more of Toluene.

- Specifications for Toluene
 - Specific Gravity at 15.56 °/15.56°C: 0.80 to 0.90
 - Boiling point (°C): 110.6
 - Distillation range (°C): Not more than 1% by volume should distill below 109, and not less than 99% by volume below 112

 - Odor: Characteristic odor

Date signed: October 26, 2010

Signed by John Manfreda

John J. Manfreda
Administrator
Alcohol and Tobacco Tax and Trade Bureau