Workshop on Updates to E85 Specifications

September 8, 2010

California Environmental Protection Agency

Air Resources Board

Overview

- Background
- Current E85 Specifications
- Options Under Consideration
  - Maximum Vapor Pressure/Volatility Class Designation
  - E85 Sulfur Content
  - Ethanol Content
  - Other Properties
  - Denatured Ethanol Sulfur Specification
  - Discussion of Other Issues
- Discussion
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Background

Background

- E85 is a blend of denatured ethanol and other hydrocarbons
- Nominally 85% ethanol and 15% gasoline
- E85 is used in flexible fueled vehicles (FFVs) which run on E85, gasoline, or a mix

E85 Regulatory Background

- E85 Specification
  - ARB specifications
  - ASTM International
- Related Requirements
  - Federal Renewable Fuels Program
  - ARB Low Carbon Fuel Standard

E85 Specifications

- ARB E85 specifications focus on air quality
  - Examples: properties such as maximum vapor pressure and sulfur content
- US EPA specifications focus on protecting public health and the environment from harmful gas and PM emissions from motor vehicles and engines
- ASTM specifications focus on fuel quality and safety

ARB E85 Specifications

- ARB E85 Specifications are in Title 13, CCR § 2292.4
- Part of ARB Alternative Fuel Regulations
  - Title 13, CCR § 2290 – 2293.5
  - Prohibits the sale or supply of fuels that do not meet specifications
- Current E85 specifications are out of date

US EPA / ASTM E85 Requirements

- No US EPA E85 specifications
- ASTM International
  - ASTM D5798-10 adopted

ASTM Specifications

- ASTM specifications focus on fuel quality, vehicle performance and safety
- Division of Measurement Standards (DMS) adopted ASTM D5798-10
  - ARB focus on specifications that impact air pollution emissions

Federal Renewable Fuels Standard

- Requires increasing amounts of renewable fuels to be used in transportation fuels eventually reaching 36 billion gallons by 2022
  - Most of the renewable fuels requirement is expected to be ethanol
  - Will be at E10 nationwide by 2012
  - E85 is expected to be used to meet increasing renewable fuels requirements after 2012

Low Carbon Fuel Standard

- Requires producers and importers of transportation fuels to reduce the carbon intensity of their fuel
- May contribute to the need for volumes of low carbon intensity E85

Current Picture

- About 40 E85 stations in California
- More than 300,000 FFVs in California
- The growing use of E85 has prompted a review of the specifications, which have not been updated since originally adopted.

Current E85 Specifications

Current ARB E85 Specifications

Ethanol	79 vol % (min.)	
Other alcohols	2 vol % (max.)	
Hydrocarbons + aliphatic ethers	15.21 vol %	
Vapor pressure, dry	6.5 to 8.7 psi 7.3 to 9.4 psi 8.7 to 10.2 psi	Volatility Class: A, A/B, B/A, B B/C, C/B, C, C/D, D/C D, D/E, E/D, E
Acidity as acetic acid	0.007 mass % (max.)	
Total chlorine as chloride	0.0004 mass % (max.)	

Current ARB E85 Specifications

Copper	0.07 mg/1 (max.)
Lead	2 mg/1 (max.)
Phosphorus	0.2 mg/1 (max.)
Sulfur	0.004 mass % (max.)
Gum, heptane washed	5 mg/100 ml (max.)
Total particulates	5 mg/1 (max.)
Water	1.25 mass % (max.)
Appearance	Free of turbidity, suspended matter and sediment

Options Under Consideration

Options Under Consideration

- E85
  - Maximum Vapor Pressure/Volatility Class Designation
  - Sulfur Content
  - Ethanol Content
  - Other Properties
- Denatured Ethanol
  - Sulfur Specification

Maximum Vapor Pressure / Volatility Class Designation

- Current ARB E85: 8.7 to 10.2 psi depending on area and time of year
- ARB staff considering: Maximum RVP of 7.2 psi in summer as defined in CaRFG3 CCR § 2262
- Volatility class the same as CaRFG3

Options

E85 Sulfur

- Current ARB E85: 40 ppm
- ARB staff considering Maximum Sulfur Content: 20 ppm

Options

Ethanol Content

- Current ARB: 79% (min)
- Current ASTM
  - 68-83% (Class 1, 2 and 3)
- ARB staff considering ASTM proposal
- Less ethanol/more gasoline makes it easier to meet minimum vapor pressure

Options

Other Properties

- Aromatics, benzene, olefins, lead, phosphorus, and manganese
  - Currently evaluating current E85 requirements and CaRFG3
  - Goal: at least as protective as CaRFG3

Options

Other Specifications

Property	CaRFG3	E85 Current	E85 Proposed
Benzene Content	1.10 vol %	-	0.30 vol %
Aromatics Content	35.0 vol %	-	10.0 vol %
Olefins Content	10.0 vol %	-	3.0 vol %
Phosphorus	0.005 g/gal (1.3 mg/l)	0.2 mg/l No added	0.2 mg/l No added
Lead	0.050 g/gal (13 mg/l) No added	2 mg/l No added	2 mg/l No added
Manganese	No added	-	No added

Options

Denatured Ethanol Sulfur Specification

- Proposed Specification: 10 ppm
  - Consistent with denatured ethanol for CaRFG3
  - Evaluating feasibility of having one denatured ethanol specification

Discussion of Other E85 Issues

- Minimum Vapor Pressure
  - E85 is currently being sold under test program exemptions
    - Test program exemptions a temporary fix
  - Evaluate use of Federal gasoline as a blendstock
    - Cost-effective way to meet minimum vapor pressure
  - Current ARB E85: 5.5, 7.0, and 9.5 psi depending on area and time of year
- Test Program Exemptions

Discussion

Discussion

ARB Seeking Information

- Costs, availabilities, and vapor pressure of alternative blendstocks
  - Examples: Pentanes, Federal RBOB (California, Washington)

Discussion

Vapor Pressure Test Method

- Current E85 specification test methods in 13 CCR 2262, and ASTM D 4953-90 as an alternative
- Propose to update reference to 13 CCR 2297, and active standard ASTM D 4953-06 as an alternative

Discussion

E85 Test Methods

Specification	Test Method
Ethanol	ASTM D 3545-90 (the denaturant must meet the ASTM D 4806-88 specification for denatured fuel ethanol, except the denaturant cannot be rubber hydrocarbon solvent. The final blend specifications for E85 take precedence over the ASTM D 4806-88 specifications.)
Other alcohols	ASTM D 4815-89
Hydrocarbons + aliphatic ethers	ASTM D 4815-89, and then subtract concentration of alcohols, ethers and water from 100 to obtain percent hydrocarbons. The denaturant is included in this percentage.

Discussion

E85 Test Methods

Specification	Test Method
Vapor Pressure, dry	Methods contained in Title 13, Section 2262 must be used. ASTM D 4953-90 is an alternative method. However, in case of dispute about the vapor pressure, the value determined by the methods contained in 13 CCR 2262 shall prevail over the value calculated by ASTM D4953-90, including its precision statement.
Acidity as acetic acid	ASTM D 1613-85
Total chlorine as chloride	ASTM D 3120-87 modified for the det. of organic chlorides, and ASTM D 2988-86.
Copper	ASTM D 1688-90 as modified in ASTM D 4806-88

Discussion

E85 Test Methods

Specification	Test Method
Lead	ASTM D 3229-88
Phosphorus	ASTM D 3231-89
Sulfur	ASTM D 2622-87
Gum, heptane washed	ASTM D 381-86
Total particulates	ASTM D 2276-89, modified to replace cellulose acetate filter with a 0.8 micron pore size membrane filter
Water	ASTM E 203-75
Appearance	Visually determined at 25°C by Proc. A of ASTM D 4176-86

Schedule

Schedule

■ 1st Public Workshop	April 15, 2010
■ 2nd Public Workshop	Sept. 8, 2010
■ Submit Workshop Comments	Sept. 23, 2010
■ Board Hearing	March 2011

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http://www.arb.ca.gov/fuels/altfuels/e85/e85.htm