

ENVIRONMENTAL PROTECTION AGENCY

[FRL-3856-9]

Regulation of Fuels and Fuel Additives; Definition of Substantially Similar

AGENCY: ENVIRONMENTAL PROTECTION AGENCY (EPA)

ACTION: Revised Interpretive Rule, Final Action

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SUMMARY: By letter dated March 9, 1990, the Oxygenated Fuels Association, Inc. (OFA) requested that the Environmental Protection Agency (EPA) revise an interpretive rule defining the term "substantially similar", as used in section 211(f) (1) of the Clean Air Act (Act), with respect to unleaded gasoline. After considering relevant evidence and written comments received from the public, EPA has decided to grant OFA's request and revise the interpretive rule. The allowable oxygen content for a "substantially similar" unleaded gasoline is increased from 2.0 percent by weight to 2.7 percent by weight, for blends of aliphatic alcohols and/or ethers, excluding methanol. In addition, the reference to American Society for Testing and Materials (ASTM) Standard D 439 (Standard Specifications for Automotive Gasoline) in the current interpretive rule is changed to ASTM Standard D 4814-88 (Standard Specification for Automotive Spark-Ignition Engine Fuel).

EFFECTIVE DATE: This revised interpretive rule is effective upon publication in the Federal Register.

ADDRESSES: Copies of information relevant to this rule are available for public inspection in Docket No. A-90-08 at EPA's Air Docket (LE-131), Room 1500M, 1st Floor Waterside Mall, 401 M Street, SW, Washington, D.C. (202) 382-7548. This docket is open for public inspection from 8:30 a.m. to 12:00 noon and from 1:30 p.m. to 3:30 p.m. As provided in 40 CFR Part 2, a reasonable fee may be charged for copying.

FOR FURTHER INFORMATION CONTACT: James W. Caldwell, Chief, Fuels Section, Field Operations and Support Division (EN-397F), U.S. Environmental Protection Agency, 401 M Street, SW, Washington, D.C. 20460, (202) 382-2635.

## SUPPLEMENTARY INFORMATION:

### I. BACKGROUND

Section 211(f) (1) (A) of the Act (42 U.S.C. 7545 (f) (1)) prohibits fuel or fuel additive manufacturers from first introducing into commerce, or increasing the concentration in use of, any fuel or fuel additive for general use in light-duty motor vehicles which is not substantially similar to that utilized in the certification of motor vehicles or engines under section 206 of the Act<sup>1</sup>.

For those fuels or fuel additives, which are not substantially similar, the manufacturer may apply for a waiver of this prohibition, as provided in section 211 (f)(4). The Act does not define the term "substantially similar."

To provide guidance to the industry, EPA has defined the term "substantially similar" as it applies to unleaded gasoline. This definition has been revised as needed, with the current version issued as an interpretive rule on July 28, 1981 (46 FR 38582). This interpretive rule restricts the oxygen content of unleaded gasoline to no more than 2.0 percent oxygen, by weight. Within this oxygen content limit, any combination of aliphatic ethers and/or aliphatic alcohols (excluding methanol) is allowable. Separate provisions establish limits for methanol content. In addition, unleaded gasoline is required to possess all the physical and chemical characteristics of at least one of the ASTM D 439 seasonal and geographical volatility classes.

On March 9, 1990, OFA petitioned EPA to revise this interpretive rule. OFA seeks expansion of the oxygen content limit from 2.0 percent by weight to 2.7 percent by weight, for

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<sup>1</sup> Section 214 of the Clean Air Act Amendments of 1990 (Pub. L. No. 101-549, November 15, 1990) redesignated section 211(f) (1) of the Act as section 211 (f) (1) (A) and added a new subparagraph (B) to section 211(f) (1). This action concerns the definition of "substantially similar" only as the term is used in section 211 (f) (1) (A).

combinations of aliphatic ethers and/or aliphatic alcohols (excluding methanol), as well as adoption of ASTM Standard D 4814 88, an updated version of D 439, in lieu of D 439. A Federal Register Notice announcing OFA's request and inviting comment was published on May 31, 1990 (55 FR 22065).

Comments were received from various fuel manufacturers, motor vehicle manufacturers, State governmental units, and other interested parties. A summary and response to the significant issues raised by the comments follows the explanation of the Agency's decision.

## II. AGENCY DECISION

Based on all the information before it, EPA is granting OFA's request and revising the definition of the term "substantially similar" for unleaded gasoline. Under the revised interpretation, a substantially similar unleaded gasoline may contain up to 2.7 percent oxygen by weight from any combination of aliphatic ethers and/or alcohols, excluding methanol. The present restrictions for methanol remain unchanged. EPA believes it is reasonable to permit this expansion of oxygen content because unleaded gasolines with such oxygen content are chemically and physically substantially similar to, and have been shown to have emissions properties substantially similar to, unleaded gasolines used in light-duty vehicle certification. In addition, the reference to ASTM Standard D 439 is changed to D 4814-88, and the reference to an applicable ASTM Emergency Standard is deleted. No other changes are made to the current definition of "substantially similar".

OFA submitted information on the physical and chemical properties of various aliphatic ethers and alcohols, and unleaded gasolines containing such ethers and/or alcohols. OFA also submitted information on the effects of these oxygenates on vehicle driveability, materials compatibility, and vehicle emissions. OFA's request also included the results from its test program on materials compatibility, as well as its analyses of the chemical and physical properties of various gasoline blends. The remaining information in OFA's request came primarily from published literature.

The information submitted by OFA on the chemical and physical properties of the aliphatic ethers and alcohols, and gasoline blends containing these oxygenates, supports the conclusion that unleaded gasolines containing aliphatic ethers and/or alcohols (excluding methanol), up to 2.7 percent oxygen by weight, are chemically and physically substantially

similar to unleaded gasoline used in vehicle emissions certification. OFA submitted information on the chemical and physical properties of various aliphatic alcohols and ethers, including methyl tertiary butyl ether (MTBE), tertiary amyl methyl ether (TAME), ethyl tertiary butyl ether (ETBE), tertiary amyl ethyl ether (TAEE), ethyl alcohol (ETOH), gasoline grade tertiary butyl alcohol (GTBA), and isopropyl alcohol (IPA). Information was also presented on the properties of gasolines containing certain of these oxygenates, singly and in combination. Although each of the various blends of unleaded gasoline containing aliphatic ethers or alcohols on which data were submitted exhibited differences from the other blends and from unleaded gasoline without oxygenates, these differences all appeared to be minor in nature.

OFA's information also supports the conclusion that unleaded gasolines containing up to 2.7 percent oxygen by weight, as requested, exhibit no major differences from vehicle certification fuel with respect to driveability or materials compatibility. Information submitted by commenters also reinforces this conclusion.

With respect to vehicle emissions, OFA's information indicates that the effect of blending the noted oxygenates into unleaded gasoline, at the levels requested by OFA, should result in emissions properties substantially similar to unleaded gasoline used in vehicle certification fuel. Clear differences in emissions appear only with respect to carbon monoxide (CO) emissions, but for CO the direction is towards decreased emissions, not increased. In general, hydrocarbon (HC) exhaust emissions are expected to be either unchanged or possibly decreased with the oxygenates. OFA also submitted information regarding oxides of nitrogen emissions (NO<sub>x</sub>). Results compiled from a variety of studies using unleaded gasolines containing varying amounts of methyl tertiary butyl ether (MTBE) support the conclusion that in general NO<sub>x</sub> emissions from vehicles using unleaded gasolines with up to 2.7 percent oxygen by weight are not significantly different from results obtained using certification gasolines. In general the data submitted by commenters also support these conclusions with respect to the impact on vehicle emissions of gasoline containing these oxygenates at the requested level.

Since the issuance of its 1981 interpretation of "substantially similar", EPA has gained considerable experience with unleaded gasolines containing various oxygenates. This has included EPA's review of various applications for fuel waivers under section 211(f) (4) of the Act. For example, EPA has reviewed and granted the Synco 76 Fuel Corporation waiver (10

percent ethanol, with an additive )<sup>2</sup>, and the Sun Refining waiver (15 percent MTBE)<sup>3</sup>. Various-waivers have also been granted involving methanol - E. Z. Dupont (5 percent methanol, with cosolvent alcohols)<sup>4</sup>, ARCO (4.75 percent methanol, with GTBA)<sup>5</sup>, and Texas Methanol (5 percent methanol, with cosolvent alcohols)<sup>6</sup>.

The noted methanol waivers involve blending methanol plus various other aliphatic alcohols up to 3.7 percent (wt.) oxygen. Non-methanol alcohols should present fewer problems with materials compatibility and water separation than methanol because they have a lower polarity and, consequently, are more like gasoline than methanol. Likewise, ethers are even less polar than the non-methanol alcohols, and, generally speaking, present even fewer problems associated with materials compatibility and water tolerance. Additionally, because ether molecules are generally larger and less polar than alcohol molecules, additions of ethers results in blends which typically produce lower evaporative emissions than alcohol blends. Therefore, although methanol is not included in the group of aliphatic alcohols and ethers covered by today's revision, the evidence in these fuel waiver dockets involving methanol supports the conclusion that unleaded gasolines containing aliphatic ethers and/or alcohols (excluding methanol), at up to 2.7 percent oxygen by weight, are substantially similar to unleaded gasoline used in light-duty vehicle emissions certification.

In the 1981 definition of "substantially similar", EPA stated there were two primary purposes in selecting 2.0 weight percent as the maximum oxygen level: limiting the stoichiometric enleanment of fuel which could lead to NO<sub>x</sub> emission increases in some cars, and providing a means of limiting the concentration of alcohols of various oxygen contents. The latter was important because it limited those alcohols with a greater percentage of oxygen (hence a greater polarity and an increased likelihood of causing evaporative emissions or materials compatibility problems) to a lower level in the fuel.<sup>7</sup>

EPA concludes, based on the data discussed and its experiences since 1981 with section 211(f) (4) fuel waiver applications, that NO<sub>x</sub> emission increases from unleaded gasolines

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<sup>2</sup> 47 FR 22404 (May 24, 1982).

<sup>3</sup> 53 FR 33846 (September 1, 1988).

<sup>4</sup> 50 FR 2615 (January 17, 1985).

<sup>5</sup> 46 FR 56361 (November 16, 1981).

<sup>6</sup> 53 FR 3636 (February 8, 1988).

containing aliphatic ethers and/or alcohols (excluding methanol), at levels up to 2.7 percent oxygen by weight, are either nonexistent or at such low levels that such unleaded gasolines can reasonably be considered substantially similar to certification gasoline in this regard. With respect to evaporative emissions and materials compatibility, EPA also concludes that unleaded gasolines blended up to 2.7 percent oxygen by weight, as requested by OFA, will not typically exhibit evaporative emissions or materials compatibility problems.

Methanol with a cosolvent, for example, can be blended under a waiver up to 3.7 percent oxygen by weight, and non-methanol alcohols should present fewer problems of materials compatibility or water separation, based on the reduced polarity of higher alcohols. OFA has also presented empirical evidence showing that blends of ethers and alcohols did not produce such problems.

In effect, knowledge gained since 1981, and information submitted to this docket, have removed the uncertainties expressed by EPA in 1981 concerning emissions, materials compatibility, and driveability for unleaded gasolines containing the blends of oxygenates requested by OFA, at levels up to 2.7 percent oxygen by weight. The Agency does not determine today the exact emissions effects of each and every such blend of aliphatic ethers and/or alcohols. As with the 1981 definition, EPA's decision is based on information with respect to various specific fuels, public comments, and EPA's own experience and knowledge concerning oxygenates in unleaded gasoline. However, if at a later point EPA determines that any specific blend of aliphatic alcohols, ethers or combination thereof is considered appropriate for section 211(c) regulation, then today's determination will be no bar to such action. EPA may also revise its definition of "substantially similar" if it finds that any specific blend of gasoline containing aliphatic alcohols, ethers or combination thereof is not similar enough to certification fuel to warrant EPA's confidence regarding physical and chemical similarity, vehicle emissions, materials compatibility and driveability.

EPA has also decided to change the definition's reference from ASTM D 439 to D 4814-88. In 1988, ASTM updated D 439 by including specific matters relating to oxygenates, and renumbered it as D 4814-88. Today's change does no more than recognize this updated ASTM Standard as the proper reference in the definition. EPA is not adopting D 4814-88 in its entirety, but is continuing unchanged the provision of the definition stating that the fuel must possess, at

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<sup>7</sup> 46 FR 38584 (July 28, 1981).

the time of manufacture, physical and chemical characteristics of the Standard for at least one of the seasonal and geographical volatility classes specified in the standard. In addition, such unleaded gasolines must also continue to meet any applicable federal or state fuel volatility limits.<sup>8</sup>

### III. SUMMARY OF COMMENTS RECEIVED AND AGENCY RESPONSE

The following is a summary and discussion of the significant issues raised in the comments to the May 31, 1990 Notice.

#### *Comment - Breadth of Requested Revision*

Several motor vehicle manufacturers objected to the breadth of OFA's request, expressing concern that allowing the use of a wide range of aliphatic alcohols or ethers up to 2.7 percent, some of which were "unknown" to the manufacturers, could result in adverse effects on the performance of emission control systems. General support was given for the use of oxygenates, but different manufacturers supported increases in the levels of different oxygenates. For example, one manufacturer stated it would not oppose an increase to 2.7 percent that was limited to MTBE, while another did not oppose an increase to 2.7 percent for MTBE, ethyl tertiary butyl ether (ETBE) and ethanol (ETON). One commenter (which was not a vehicle manufacturer) submitted a Research Publication from General Motors, published in 1990, that supported a general increase to 2.5 percent oxygen using ethers.

Several motor vehicle manufacturers also commented that a general increase in allowable oxygenate levels should not be allowed through revision of the definition of "substantially similar", but should be ruled upon via individual waivers under section 211(f)(4) of the Act. These manufacturers considered the waiver procedure to be the appropriate one to obtain assurances that the variety of fuels covered by the suggested revision would not cause emission failures.

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<sup>8</sup> EPA summertime fuel volatility regulations are published at 54 FR 11868 (March 22, 1989), and 55 FR 23658 (June 11, 1990). It should also be noted that the revised definition of substantially similar does not change the requirement of a minimum 9.0 percent (vol.) ethanol to obtain the additional 1.0 psi Reid vapor pressure allowed under these regulations for ethanol blends. 40 CFR Section 80.27(d) (2).

*Agency Response*

It is important to note that EPA is not changing in any way the type of alcohols and ethers allowable under its definition of "substantially similar". The same alcohols and ethers currently allowed in unleaded gasoline up to 2.0 percent oxygen by weight, will now be allowed up to 2.7 percent oxygen by weight. EPA is changing the allowable oxygen content, not the breadth of aliphatic ethers and alcohols allowed under its current definition of "substantially similar".

Clearly, vehicle manufacturers may be more concerned about this breadth of oxygenates at a higher oxygen level. However, EPA has concluded that unleaded gasolines containing this group of alcohols and ethers, even at this higher level, are physically and chemically substantially similar to certification gasoline and will possess substantially similar emissions properties.

The revised rule will allow combinations of oxygenates in unleaded gasoline, at up to 2.7 percent (wt.), for which data have not been submitted by OFA, as it already does for 2.0 percent (wt.). However, based on their chemical and physical similarities to the aliphatic ethers and alcohols for which OFA did submit data, and all the information discussed earlier, the Agency believes unleaded gasoline containing combinations of such oxygenates at levels up to 2.7 percent (wt.) oxygen, is substantially similar to vehicle certification fuel. No data or other evidence was presented by vehicle manufacturers or others to persuade the Agency otherwise.<sup>9</sup>

Today's determination by EPA to revise its definition of "substantially similar", and allow the lawful introduction into commerce of fuels and fuel additives containing a specified level of oxygen without individual waivers under section 211(f) (4) of the Act, is consistent with the Agency's 1981 precedent. The same practice is already followed under the present definition of "substantially similar". Today's revision only increases the level of certain oxygenates permitted without a waiver from 2.0 to 2.7 percent (wt.).

However, a section 211(f)(4) waiver will be necessary before gasoline containing such generic combinations of aliphatic ethers and/or alcohols (excluding methanol), with an oxygen content above 2.7 percent by weight, can be lawfully introduced into commerce. Moreover, if

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<sup>9</sup> One vehicle manufacturer suggested inclusion of a labeling requirement on the refueling pump to identify the oxygenate in the fuel. However, for the reasons just stated (i.e., substantially similar emissions, chemical and physical characteristics), the Agency sees no basis for distinguishing among fuels that satisfy EPA's revised definition of substantially similar.



evidence is brought to EPA's attention at a later point which shows that adverse emission or other effects can be expected from specific aliphatic ethers or alcohols, or their combinations, at levels below 2.7 percent oxygen by weight, then EPA will consider revising the 2.7 percent limit for such oxygenates in the definition of "substantially similar". Furthermore, the Agency clearly has authority to impose appropriate controls or prohibitions under section 211(c) of the Act.

*Comment - ASTM D-4814*

In its 1981 interpretive rule defining "substantially similar", the Agency required unleaded gasolines to meet the specifications of ASTM D 439, a Standard containing specifications for automotive gasoline. One specification in this Standard referred to volatility, with guidelines for volatility set depending on seasonal and geographical classes. EPA's 1981 definition adopted D 439 (or applicable Emergency Standard, if instituted) with the provision that an unleaded gasoline must meet the physical and chemical characteristics of the Standard for at least one of the seasonal and geographical classes specified in the Standard. In 1988, ASTM approved Standard D 4814-88 as a replacement for D 439. D 4814-88, "Standard Specification for Automotive Spark-Ignition Fuel", is designed to cover gasoline, including gasoline containing oxygenates such as alcohols and ethers. OFA's March 9, 1990 request to revise the definition of substantially similar appeared to include a request that D 4814-88 be adopted, in its entirety.

In general, fuel manufacturers supported the change to D 4814-88. Several commenters recommended that EPA change no more than the reference to the Standard, but not change the current definition's flexibility with respect to compliance with seasonal and geographical volatility classes. One commenter suggested adoption of D 4814-88 in whole to protect against water separation in the blended fuel. No commenter suggested retention of D 439 in the definition of "substantially similar".

*Agency Response*

In an August 10, 1990 letter to EPA, OFA clarified its original petition, requesting that the current reference in the definition to D 439 be replaced by reference to D 4814-88, but that the Agency continue with the flexibility in the current definition regarding compliance with at least one seasonal and geographical volatility class. Given OFA's August 10, 1990 submission, the comments received on this issue, the lack of evidence supporting adoption of D 4814-88 in its entirety, and the fact that adoption of D 4814-88 in its entirety would represent a significant

tightening of the "substantially similar" definition with respect to volatility controls, the Agency does not consider it appropriate to make such a change. Therefore, reference in the definition to D 439 will be replaced by reference to D 4814-88, but the current provisions regarding compliance with the volatility classes will be continued. The reference in the definition to an Emergency Standard has also been removed as unnecessary.

#### IV. STATUTORY AUTHORITY

Authority for the actions proposed in this notice is granted to EPA by sections 211 and 301(a) of the Clean Air Act as amended (42 U.S.C. 7545 and 7601(a)).

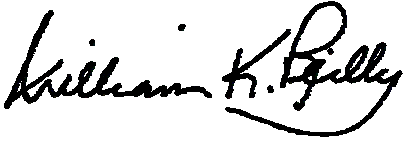
#### V. ADMINISTRATIVE DESIGNATION AND REGULATORY ANALYSIS

Under Executive Order 12291, EPA must judge whether an action is "major" and therefore subject to the requirement of a Regulatory Impact Analysis. This proposed action is not major because it is not likely to result in:

- (1) An annual effect on the economy of \$100 million or more;
- (2) A major increase in costs or prices for consumers, individual industries, Federal, State or local government agencies, or geographic regions; or
- (3) Significant adverse effect on competition, employment, investment, productivity, innovation or on the ability of United States - based enterprises to compete with foreign-based enterprises in domestic or export markets.

The effects of this action are to increase the allowable oxygen content of unleaded gasolines which use blends of aliphatic ethers and/or aliphatic alcohols (excluding methanol). Comments from the oil industry and governmental agencies uniformly supported the increase on the grounds it would promote flexibility in meeting governmental regulations on required levels of oxygen content in gasoline. Today's revisions to the definition of "substantially similar" impose no requirements on industry to use any specific oxygenate or combination of oxygenates, at any level. Today's revisions only provide additional flexibility to fuel manufacturers who decide, for whatever reason, to blend oxygenates into unleaded gasoline. As such, this interpretive rule does not qualify as a major rule and is therefore not subject to the requirement of a Regulatory Impact Analysis.

DATE: JAN 24 1991

A handwritten signature in black ink that reads "William K. Reilly". The signature is written in a cursive style with a large, looping "R" at the end.

William K. Reilly,  
Administrator

CERTIFIED TRUE COPY  
Vickie Reed

For the reasons set out in the preamble, the definition of "substantially similar" is amended as set forth below.

Definition - Substantially Similar.

EPA will treat a fuel or fuel additive for general use in light-duty vehicles manufactured after model year 1974 as substantially similar to any fuel or fuel additive utilized in the certification of any model year 1975, or subsequent model year vehicle or engine, under section 206 of the Act, i.e., "substantially similar", if the following criteria are met.

(1) The fuel must contain carbon, hydrogen, and oxygen, nitrogen, and/or sulfur, exclusively,<sup>1</sup> in the form of some combination of the following:

(a) hydrocarbons;

(b) aliphatic ethers;

(c) aliphatic alcohols other than methanol;

(d) (i) up to 0.3 percent methanol by volume;

(ii) up to 2.75 percent methanol by volume with an equal volume of butanol, or higher molecular weight alcohol;

(e) a fuel additive<sup>2</sup> at a concentration of no more than 0.25 percent by weight which contributes no more than 15 ppm sulfur by weight to the fuel.

(2) The fuel must contain no more than 2.0 percent oxygen by weight, except fuels containing aliphatic ethers and/or alcohols (excluding methanol) must contain no more than 2.7 percent oxygen by weight.

(3) The fuel must possess, at the time of manufacture, all of the physical and chemical characteristics of an unleaded gasoline as specified in ASTM Standard D 4814-88 for at least one of the Seasonal and Geographical Volatility Classes specified in the standard.

(4) The fuel additive must contain only carbon, hydrogen, and any one or all of the following elements: oxygen, nitrogen, and/or sulfur.<sup>3</sup>

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<sup>1</sup> Impurities which produce gaseous combustion products (i.e., products which exist as a gas at Standard Temperature and Pressure) may be present in the fuel at trace levels. An impurity is that substance which is present through contamination, or remains naturally, after processing of the fuel is completed.

<sup>2</sup> For the purposes of this interpretive rule, the term "fuel additive" refers only to that part of the additive package which is not hydrocarbon.

<sup>3</sup> Impurities which produce gaseous combustion products may be present in the fuel additive at trace levels.