

OXYGENATES

F A C T B O O K

A COMPILATION OF INFORMATION ON THE BENEFITS OF OXYGENATES IN GASOLINE



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INTRODUCTION

In January 1995, millions of Americans—about 33% of the population—were introduced to a new, cleaner-burning gasoline formula called Reformulated Gasoline, or RFG. This new gasoline blend has substantially cleaned our nation’s air—and has done so with little or no incremental cost to consumers, and without a need for expensive changes in vehicles or fuel infrastructure.

RFG reduces air pollution—in a variety of forms—by decreasing the propensity of gasoline to evaporate (volatility), reducing the use of toxic substances in gasoline, and reducing sulfur levels.

There is no question that the workhorse of the RFG program is **fuel oxygenates**. The addition of fuel oxygenates is the one gasoline change that has created the greatest opportunity to reduce the use of harmful gasoline components and provide for cleaner combustion.

As you’ll discover in the following pages, fuel oxygenates offer a number of benefits when added to gasoline, including:

- Reducing and displacing cancer-causing gasoline compounds such as benzene, toluene, xylene and ethyl benzene;
- Reducing the emission of carbon monoxide in winter months
- Reducing hydrocarbon emissions that (help?) produce summertime smog
- Reducing air toxic emissions year-round
- Reducing the emissions of small particulates and soot

In the U.S. Congress and elsewhere, there is a debate underway about the need to continue using fuel oxygenates in gasoline. Some argue that the use of oxygenates cuts into gasoline refining margins (and profits) too severely. Others argue that new technology vehicles run so cleanly that they do not need to use oxygenates to help clean the air. Still other public policy issues—agricultural development, protecting future air quality, water quality, energy and national security—continue to play a role in the discussion of fuel oxygenates.

What is clear to us—as evidenced in this Fact Book—is that the use of fuel oxygenates in gasoline provides substantial, tangible air quality benefits in a cost-effective and efficient manner. And the more we examine the use of fuel oxygenates in gasoline, the more benefits we discover.

We sincerely hope this Fact Book provides additional understanding of the benefits of oxygenates in gasoline—and helps continue our focus on our national goal to achieve clean air.



Douglas A. Durante, Executive Director
Clean Fuels Development Coalition

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THE HISTORICAL USE OF FUEL OXYGENATES

SIGNIFICANT POINTS

- **Ethanol has been used with success for nearly 100 years—starting with the Model T**
- **Oxygenated fuels have helped significantly reduce carbon monoxide (CO) levels and other pollutants—including carcinogens**
- **Oxygenate use expanded through Reformulated Gasoline (RFG) introduced by Congress in 1990 with documented success**
- **Oxygenates are used to some degree in 40-55% of all gasoline in the U.S.**

OXYGENATES HAVE A LONG HISTORY

The fuel oxygenate ethanol has been used both as a fuel and fuel additive for nearly 100 years—including its early use as the fuel for the original Ford Model-T motorcar. Other oxygenates, such as MTBE (methyl tertiary butyl ether), ETBE (ethyl tertiary butyl ether) and TAME (tertiary amyl methyl ether), have been used as effective octane enhancers in gasoline since the mid- to late- 1970s.

OXYGENATES HAVE LED TO LESS POLLUTION AND CLEANER AIR

Expanded use of oxygenates began in the late 1980s in states seeking to reduce harmful wintertime carbon monoxide (CO) emissions. Since their introduction, the use of these oxygenated gasolines has been tremendously effective—helping reduce wintertime carbon monoxide emissions so much that the majority of these states no longer have a problem with CO pollution.

Additional scientific and medical evidence shows that fuel oxygenates also help reduce other harmful pollutants. This evidence, coupled with the success of fuel oxygenates in reducing CO pollution, led Congress to expand the use of oxygenates in gasoline through Federal Reformulated Gasoline (RFG) introduced as part of the *Clean Air Act Amendments of 1990*.



In RFG, Congress saw oxygenates as a safe, efficient and cost-effective way to reduce the levels of harmful gasoline components and improve gasoline combustion. The factual data showed that oxygenates provided a number of important **environmental benefits**:

- increased the oxygen content in gasoline—allowing for more complete fuel combustion
- reduced carbon monoxide emissions during the winter months
- reduced smog-forming volatile organic compounds (VOCs) in the summertime
- reduced air toxic emissions year round

At the same time, Congress saw that oxygenates would maintain octane levels, extend the life of a barrel of oil, assist rural America, and lower tailpipe emission levels from gasoline powered vehicles.

OXYGENATES HELP REDUCE LEVELS OF CARCINOGENS IN GASOLINE

Since the late 1970s, as lead was removed from gasoline, use of aromatics such as benzene were increased to replace the lost octane. The scientific, medical and environmental communities had long advocated the removal or reduction of aromatics in gasoline. Oxygenates were seen by Congress as a way to effectively reduce aromatic content in gasoline, while maintaining octane levels.

OXYGENATES USED WITH SUCCESS ACROSS THE U.S.

Today, clean-burning fuel oxygenates make-up approximately five percent of the total volume of gasoline sold each year in the United States, and more than 10 volume percent of gasoline sold in RFG areas. In all, estimates show that some percentage of oxygenates are used in approximately 40 to 55 percent of all gasoline sold throughout the country.



OXYGENATES HELP ACHIEVE/SURPASS FEDERAL AIR QUALITY GOALS

SIGNIFICANT POINTS

- **Reformulated gasoline (RFG) has surpassed all mandated emission reduction requirements**
- **Oxygenates help reduce formation of harmful ground-level ozone**
- **Blending properties of oxygenates dilute harmful aromatics and improve the gasoline blend**
- **RFG provides the greatest reduction in emissions at the lowest cost**

RFG HAS ALWAYS BEEN AN OVERACHIEVER

The Federal Reformulated Gasoline (RFG) program contains two phases. During Phase I, which began January 1, 1995, RFG was required to reduce air toxic and volatile organic compounds (VOCs) emissions from motor fuels by at least 15 percent and result in no increase in nitrogen oxides (NOx) emissions from 1990 baseline fuels.

Phase II, which began on January 1, 2000, RFG was required to achieve at least a 25 percent reduction in VOCs, a 20 percent reduction in air toxic emissions and a 4 to 7 percent reduction in nitrogen oxides.

However, based on data collected by refiners, the U.S. Environmental Protection Agency, automakers and others clearly shows that RFG, primarily because of the use of oxygenates, has actually **surpassed all emission reduction requirements**. Use of RFG with oxygenates has actually resulted in emissions benefits of 13% above requirements for air toxics, 13% more than required for VOC's and an additional 8% in NOx reductions.

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More specifically, EPA emissions reduction data show that the use of oxygenates in gasoline directly provides a large percentage of RFG emission reductions, including:

- Up to 67% of total toxics reductions;
- Up to 23% of all VOCs reductions; and
- Up to 26% of total nitrogen oxide emission reductions.



BENEFICIAL BLENDING PROPERTIES OF OXYGENATES

Oxygenates offer beneficial gasoline blending properties such as high octane and low distillation temperatures, which would not normally occur without their use.

Because of their extremely low atmospheric reactivity, oxygenates reduce the long-term reactivity of CO in the atmosphere, which, in turn, reduces ozone formation.

(NOTE: Unlike the beneficial ozone layer that protects the earth, ground-level ozone such as that caused by exhaust emission is harmful to humans.)

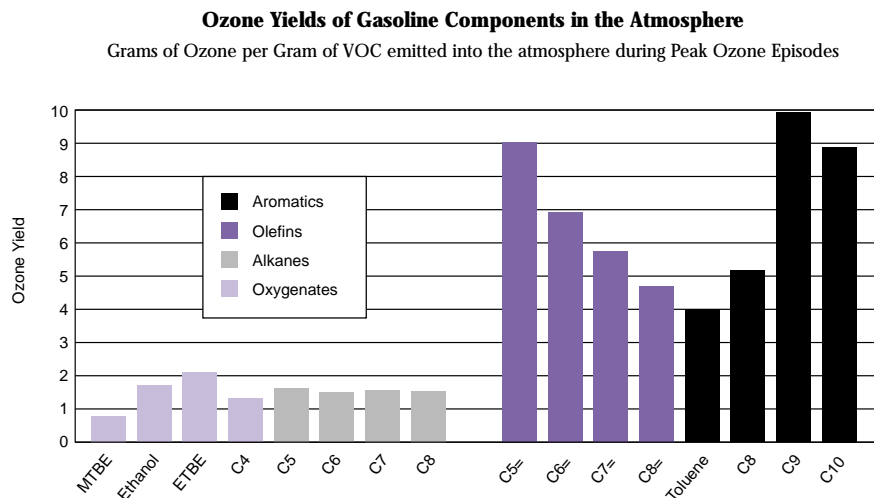
Available studies show that the use of oxygenates also substantially reduces primary particulate matter (PM) by as much as 25% to 30%.

These beneficial blending properties help dilute the presence of other, more harmful components (i.e. aromatics) and improve the over-all gasoline blend.

THE RISK OF CHANGING THE RFG FORMULA

Any attempts to change the RFG formula by potentially eliminating or limiting MTBE use must fully consider these substantial benefits. We must not allow refiners to significantly increase aromatic levels and distillation temperatures—doing so would directly result in increased risks to human health and the environment. The risk of reducing the air quality benefits enjoyed by 70 to 100 million Americans should not be taken lightly.

However, evidence shows that EPA continues to severely underrepresent the beneficial role oxygenates play in gasoline.



THE RFG FORMULA: A SUCCESSFUL SOLUTION

When comparing the various fuel formulations available today, it is apparent that Congress, with assistance from the U.S. Environmental Protection Agency and industry, created a fuel designed to achieve the greatest reductions in emissions at the lowest cost.

Through the Federal RFG, the use of oxygenates helped to maintain or improve the performance of gasoline while, at the same time, reducing the effect of harmful characteristics in ordinary gasoline. Other gasoline formulations do not have these combined positive effects:

Oxygenates (RFG)

Reduced aromatics and toxic emissions: A minimum 2.0 wt.% oxygen content is required in RFG. This requirement is commonly met through the addition of approximately 10 vol. % oxygenates. Oxygenates' high octane level also causes RFG producers to blend less aromatics and further reduces RFG's air toxic emissions.

More complete fuel combustion: Oxygenates provide for more complete combustion of gasoline, reducing exhaust emissions.

An effective petroleum replacer: Oxygenates also supply between 5 and 6 volume percent of the premium, non-petroleum energy in the nation's gasoline supplies. Removing oxygenates from the gasoline supply would have a severe impact on our nation's total gasoline supplies and drive up gasoline costs.

Benzene

Lower levels in RFG: Benzene levels are limited to no more than 1.0 vol.% in RFG. In conventional gasoline, benzene levels can be as high as 5.0 vol.%.

Effect on toxic emissions: Benzene reduction accounts for much of the air toxics emission reductions in RFG.



Aromatics

- **Lower levels in RFG:** In conventional gasoline, aromatic levels have reached as high as 50 vol.%. In RFG, typical aromatic levels will be limited to 27 vol.%.
- **Use increases as lead was phased out:** Due to their high octane content, the use of aromatics, including harmful air toxics such as benzene, toluene, and xylene, increased as lead was phased out of gasoline.

Reid Vapor Pressure (RVP)

- **Reduced during critical periods:** RVP is reduced in RFG during the summer months when ozone pollution is most severe.
- **Lower evaporation:** Reducing RVP lowers the volatility of RFG, thus reducing overall evaporative emissions.

OXYGENATES PROVIDE EXTRA AIR QUALITY BENEFITS

SIGNIFICANT POINTS

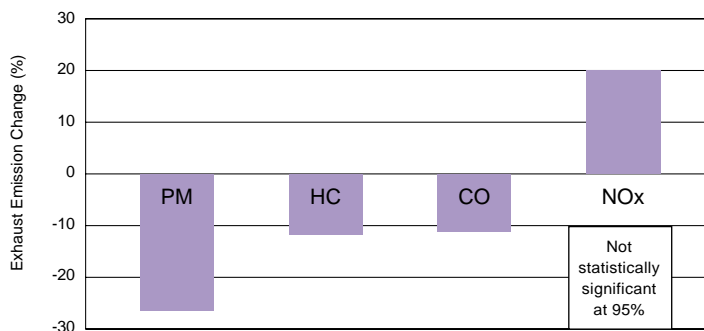
- **The oxygen content in RFG directly reduces particulate matter (PM), hydrocarbons (HC) and carbon monoxide (CO)**
- **Oxygenates have been useful in helping control greenhouse gas emissions**
- **Oxygenates are significantly reducing emissions from “off-road” engines and stationary sources as well**
- **Even with new engine technology, the benefits of oxygenated fuels will have a positive effect for decades**

DIRECT REDUCTION OF OTHER POLLUTANTS

In addition to the direct air quality benefits recognized by current EPA gasoline emission models, such as reductions in emissions of volatile organic compounds (VOCs) and air toxics, there are a number of additional pollution reduction benefits that the use of oxygenates in gasoline provide. In particular, the oxygen content in Reformulated Gasoline directly reduces particulate matter (PM), hydrocarbons (HC), and carbon monoxide (CO). These substantial reductions have helped communities throughout the nation achieve cleaner air.

Winter Time Emission Changes with 3.5% Oxygenated Fuel

1998 Colorado Study of 12 Tier 1 Vehicles (1995-97)



Source: "The Impact of a 10% Ethanol Blended Fuel on the Exhaust Emissions of Tier 0 and Tier 1 Light Duty Gasoline Vehicles at 35F Colorado Dept. of Health," May 26, 1999



SPECIFIC AIR QUALITY IMPROVEMENTS

Oxygenates provide benefits not readily captured by current gasoline emission reduction models. Following is a summary of these benefits:

Particulate Matter (PM):

The more the scientific and medical communities learn about emissions of particulate matter (soot) and their effects on human health, the more concerned they become about further reducing this pollutant. **Particulate matter has been found to penetrate deeply into human lungs.**

The Environmental Protection Agency is currently reviewing ways to achieve additional reductions in PM from stationary and point sources. While current PM regulations attempt to mitigate health risk by only controlling the total PM mass, it is only by controlling emissions of NO_x and sulfur oxides (SO_x) that we can adequately reduce emissions of fine particulate matter (PM 2.5). Carbon and other organic compounds make up nearly 50 percent of all PM 2.5 emissions in urban cities in the Northeast U.S., for example—**so reducing these compounds becomes vitally important.**

Use of oxygenates in gasoline immediately and effectively reduces the presence of carbon and other organics in gasoline and, therefore, cost-effectively helps to directly achieve reductions in the most harmful PM emissions. **In fact, the oxygen content in gasoline reduces PM emissions by more than 25 percent.**

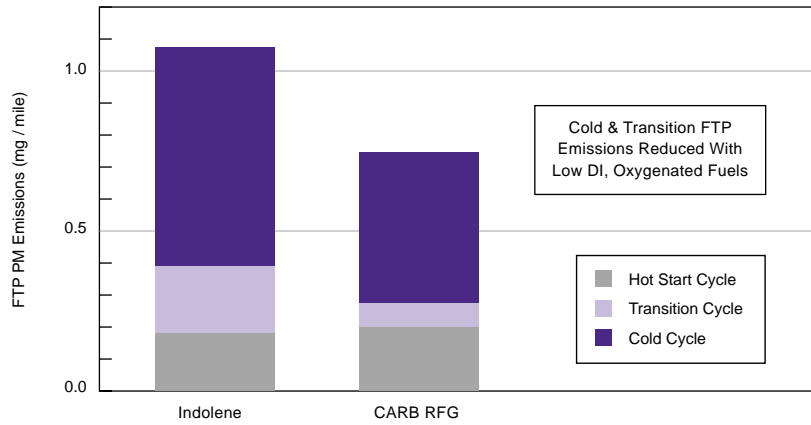
Furthermore, oxygenated gasolines help **reduce PM emissions from all vehicles**—even newer models with advanced emission reduction technology.

The benefits provided by oxygenates also extend to **off-road and small engines**—where PM reduction is most needed.

For all of these reasons, RFG with oxygenates has been found to be an effective way to control PM emissions.

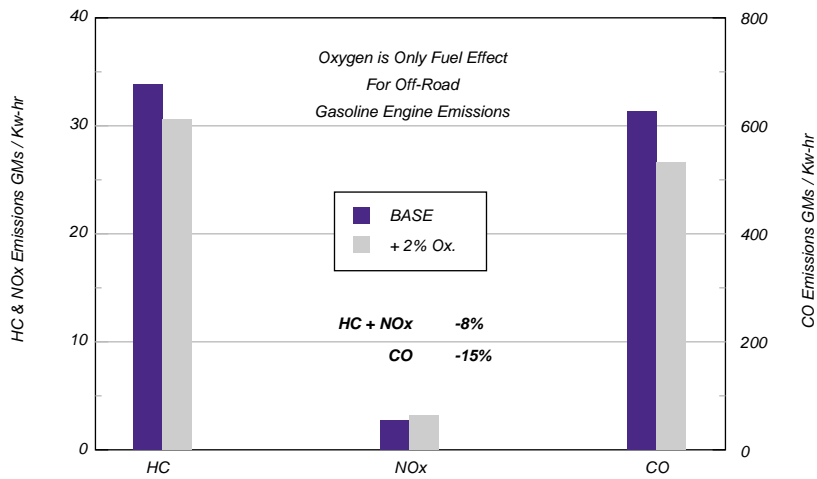


PM Emissions Reduced 31% Using RFG with 2% Oxygen
Ford Study Comparing 4 Lt. Duty Trucks



Source: *Env. Sci. & Tech.*, 1999, V33, 1618-26

2% Oxygen Reduces Ozone Precursors from Small Engines
13 Small 4-Cycle Engine Study By EPA in 1997



Source: EPA NR-003, Exhaust Emission Effects of Fuel Sulfur and Oxygen on Non-Road Engines



Capping Aromatics:

Aromatics are loosely defined as those gasoline components (e.g. benzene, toluene, xylene, ethyl benzene, and 1,3 butadiene) that are known, suspected, or can lead to formation of substances that cause cancer or other serious health effects in humans, such as birth defects or developmental effects.

Because aromatics from gasoline also generate the highest yield of ozone and PM into the atmosphere, the scientific community is looking increasingly for ways to effectively reduce aromatic content in gasoline as a way to cost-effectively improve our nation's air quality.

Every study shows that the use of **oxygenates in gasoline** helps to act as an “aromatics cap”—and **reduces the use of aromatics** through the increased use of clean-burning, octane-rich oxygenates. The contribution made by oxygenates in this instance goes beyond simply adding oxygenates to gasoline.

Oxygenates reduce the secondary aerosol emissions produced by aromatics **by more than 20 percent**.

Off-Road Engine Emissions:

An additional benefit provided by oxygenates in RFG that is also not recognized by any current EPA emission reduction model, is the direct reductions in VOC, CO, and PM emissions from off-road engines. Off-road engines constitute a significant (and increasing) source of these pollutants, and significant regulations of these off-road sources have yet to be put in effect.

As tighter gasoline emission reduction regulations continue to come into effect, the emissions from off-road engines will become increasingly burdensome. However, the good news is that oxygenated gasoline currently provides a tremendous benefit in off-road engines, significantly reducing the amount of emissions from these engines.

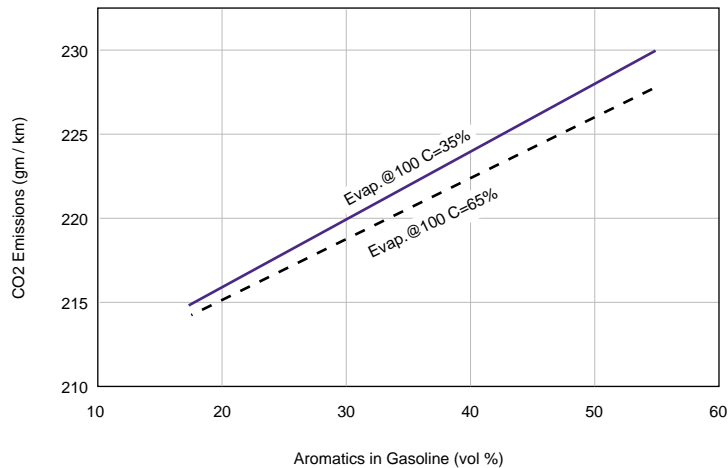
Should the federal oxygenate requirement be removed, then the substantial emissions benefits would be negated and air quality would suffer.

Carbon Dioxide Emission:

Despite the ongoing debate surrounding the U.S. ratification of the Kyoto Greenhouse Gas Reduction Protocol, there is little argument about the increasing need to develop ways to cost-effectively and efficiently reduce greenhouse gases from the atmosphere—in particular, emissions of carbon dioxide. In fact, effective ways to reduce carbon dioxide emissions from factories and other man-made structures have become part of the strategic business plan for virtually every industrialized corporation in the world.

Through the use of oxygenates in gasoline, aromatics are reduced, thus **directly reducing the emissions of carbon dioxide** (CO₂). As illustrated here, the use of oxygenated gasoline has already been a useful tool in the battle to control greenhouse gas emissions.

Aromatics In Gasoline Increase CO₂ Emissions



Source: SAE 961072, EPEFE



Stationary Sources of Pollution:

Pollution reduction from mobile sources is not the only air quality benefit realized through use of RFG with oxygenates. RFG refinery production is also an effective way to reduce many harmful stationary source emissions.

Because RFG contains oxygenates produced from cleaner-burning non-petroleum based sources such as natural gas and corn, less crude needs to be processed at the refinery. This adjustment to the refining process **decreases the impact of harmful emissions from refining operations.**

Reducing crude processing also decreases the production of residual fuels. Residual fuels, which are primarily used as a feedstock to power industrial plants, are a by-product of refined crude, and are high in pollutants such as carbon, sulfur, and heavy metals.

An alternative to use of residual fuels available to industry is use of non-petroleum based natural gas, which has a lower carbon and sulfur content, and burns more completely than residual fuels.

Estimates of Annual U.S. Releases	
	Thousands of Tons/Yr
Stationary Sources:	84
Mobile Sources:	
Gasoline	500
Diesel	100
Total Sources:	684

Source: Toxic Release Inventory, U.S. Environmental Protection Agency, 1993

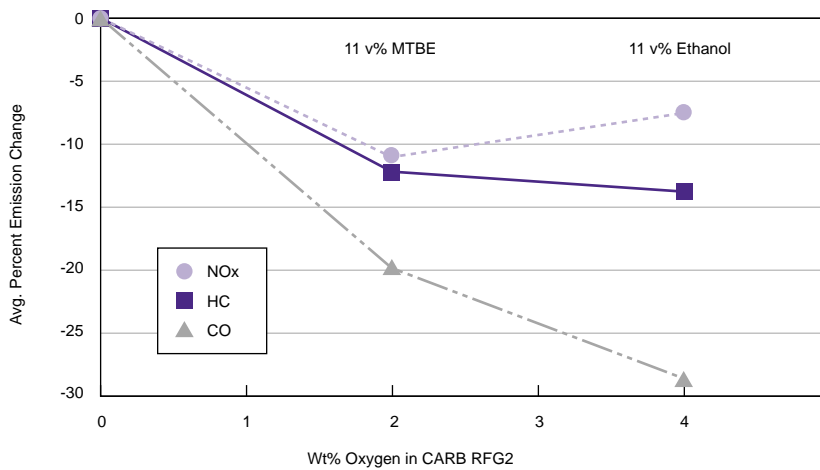
New Generation Vehicles:

Some have argued that the air quality benefits provided by oxygenates in gasoline will diminish as new technology cars enter the market. However, based on the latest information from the nation's automakers, however, this does not appear to be accurate. According to a recent presentation by the auto industry before the California Air Resources Board, RFG with **oxygenates provides significant emission reductions in new model vehicles.**

The preponderance of evidence shows that, the enormous air quality benefits of fuel oxygenates—reductions in carbon monoxide, particulate matter, air toxics, off-road emissions and stationary source emissions—will be effective and useful in automobile engines for years to come.

Oxygenates Provide Exhaust Emission Reductions Even With New Model Vehicles

CARB RFG2 in Ten Vehicles (8 LEVs and 2 ULEVs)



Source: Automakers' Presentation; Calif. ARB Workshop; July 12, 2001

GASOLINE ALTERNATIVES TO OXYGENATES FAIL TO PROVIDE EQUIVALENT AIR QUALITY BENEFITS

SIGNIFICANT POINTS

- **RFG with oxygenates offer better engine performance than low RVP fuels**
- **Cities adopting low RVP instead of RFG have not seen as great a reduction in emissions**
- **Low RVP fuels primarily address evaporative VOCs, while RFG also addresses exhaust VOCs which are three times more reactive in ozone production**
- **The relatively limited benefits of low RVP fuels are applicable only during summer months**
- **The benefits of RFG with oxygenates are available all year long**

RFG VS. LOW RVP FUELS

There are those who propose fuels with low Reid Vapor Pressure (RVP) as an alternative to Federal Reformulated Gasoline (RFG) with oxygenates. By removing the lightest components of conventional gasoline, refiners can produce low RVP fuel—helping control evaporation into the atmosphere. Historically, the use of such low RVP fuels has been an effective method to reduce VOC emissions, particularly evaporative emissions.

In low RVP fuels, most of the VOC reductions are achieved by reducing or removing the butane and pentane components in the gasoline. Simply removing these lighter components from gasoline tends to result in increased concentrations of other, heavier fuel components (i.e. aromatics, olefins) which serve to decrease vehicle performance.

Unlike low RVP fuels, RFG improves all the key performance parameters in gasoline.

THE POINT OF THE BOILING POINT

Both oxygenates and aromatics (benzene, xylene, toluene) are high octane gasoline components, but the difference in their boiling properties has a direct effect on driveability performance.

Aromatics are high-boilers. Oxygenates are low-boilers.

High-boilers have a negative impact on the ability to start when cold (i.e. “cold starts”) because they do not vaporize as easily as low boilers. By removing butanes (low-boilers), low RVP fuels tend to increase the concentration of aromatics (high-boilers)—making driveability and performance worse in cold weather.

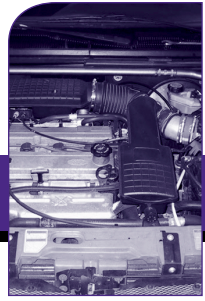
For this reason, automakers have expressed concern about the use of low RVP fuels—without use of oxygenates or considerations for vehicle driveability. They have historically argued that **low RVP fuels result in deterioration of vehicle driveability**.

CONCERN ABOUT COLD STARTS WITH LOW RVP

In low RVP fuels, many high-octane fuel components such as aromatics, often do not vaporize quickly—especially in cold engines—hindering vehicle driveability and startability. Oxygenates, on the other hand, tend to vaporize more readily than aromatics, especially in cold engines. **The nation’s automakers** have expressed concern about cold-start problems and **expressed a preference for the use of oxygenates in RFG** over use of aromatics in low RVP fuels.

RFG PROVIDES TWO TYPES OF VOC REDUCTIONS

Areas of the country that have adopted low RVP gasolines instead of RFG with oxygenates have failed to achieve equivalent emission reduction benefits. While low RVP fuels primarily reduce only the evaporative VOC emissions, RFG with oxygenates reduces both evaporative VOCs and “exhaust” VOCs. This is beneficial because exhaust VOCs are about three times more reactive at producing ozone.



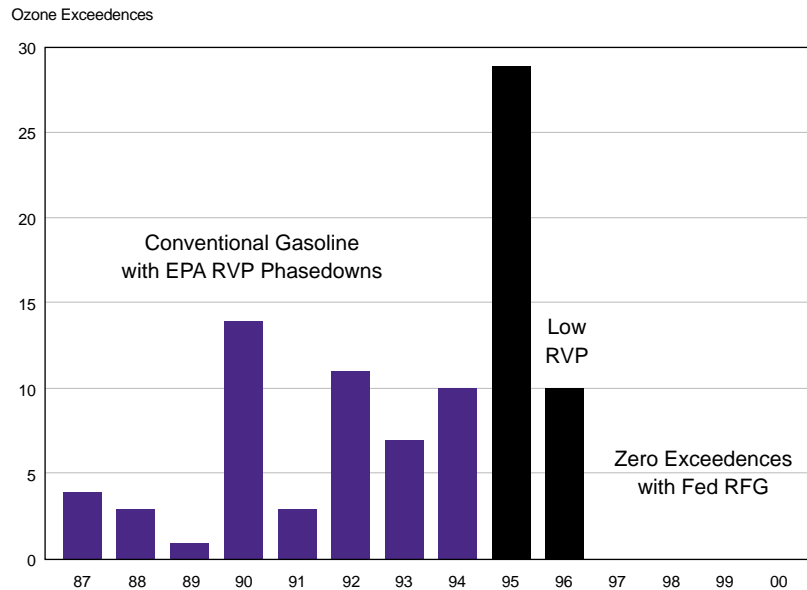
LOW RVP BENEFITS LIMITED TO SUMMER MONTHS

The benefits associated with low RVP fuels are limited to the five-month summertime season, whereas RFG's benefits are realized year-round. Furthermore, low RVP fuels offer no protection during the "shoulder season" between winter and summer. Warm periods outside of the traditional summer control periods are not unusual and without proper control measures ozone exceedences can occur during these seasons. Low RVP fuels can not reduce ozone pollution during the shoulder season while RFG effectively controls ozone formation throughout the year.

RFG IS PROVEN TO REDUCE AIR POLLUTION

It has become patently clear in the past five years that RFG with oxygenates substantially reduce air pollution.

Phoenix Experienced No Exceedences with Fed RFG



Any possible consideration regarding reducing the use of fuel oxygenates must fully realize that the alternatives will not achieve equivalent air quality protection.

RFG WITH OXYGENATES PROVIDES SUBSTANTIAL AIR QUALITY ADVANTAGES FOR STATES

SIGNIFICANT POINTS

- **Every state using RFG has seen improvement in air quality—while those that do not use RFG have not seen equivalent air quality improvement**
- **State air pollution reduction plans are heavily dependent on the current RFG program to achieve air quality goals**
- **Removal of RFG would result in more restrictive policies and greater costs to states and consumers**

RFG IS A SIGNIFICANT CONTRIBUTOR TO IMPROVED AIR QUALITY

Seventeen states and the District of Columbia have used Reformulated Gasoline with oxygenates since 1995. Each of these states has seen their individual air quality steadily improve during this time. Conversely, areas of the country that have chosen to use alternative gasoline formulations have not experienced equivalent air quality improvement.

In addition, each of the states that have adopted RFG as an air quality control measure have submitted, in conformance with federal requirements, state air pollution reduction plans that prescribe how the states will achieve significant emission reduction targets. States that have included RFG as part of their individual state plans are heavily dependent on the current RFG program to help them achieve their air pollution reduction goals.

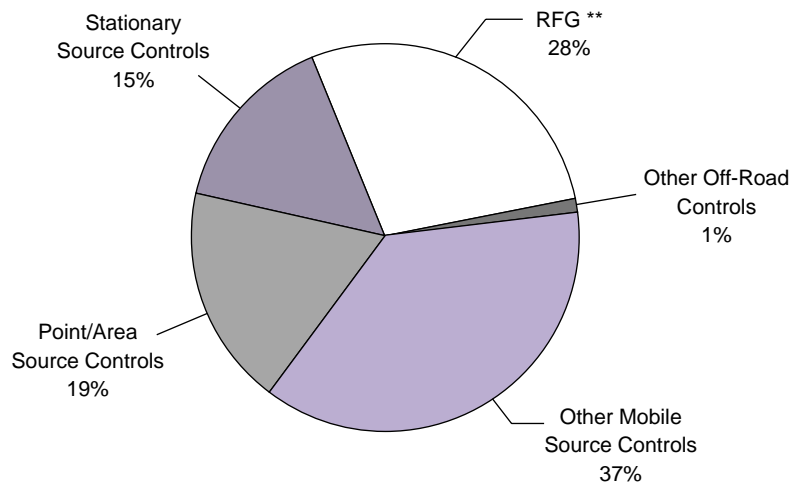


RFG IS AN IMPORTANT AIR QUALITY STRATEGY FOR THE NATION

As the following chart shows, RFG represents a significant percentage of the combined emission reduction requirements for Delaware, Pennsylvania, New Jersey, New York and Rhode Island.

Emission Reduction Control Strategies For Selected Mid-Atlantic & Northeast States

15% Target VOC Reductions = 600.318 Tons Per Day



RFG represents 28% of all VOC Control Strategies, & 73% of all mobile source emission reduction strategies for these states.

Notes: States included are DE, PA, NJ, NY, RI. ** Includes emission reductions from non-road sources that use RFG. Sources: 64 Fed. Reg. 9952 (3/1/99); 64 Fed. Reg. 59706 (11/3/99); 62 Fed. Reg. 11131 (3/11/97); Rhode Island Revised Rate of Progress Analysis and Post 1996 Rate of Progress Plan, Sept. 1998; Summary of Delaware Rate of Progress Plan for Kent and New Castle counties, Feb. 2000. Reductions for DE are projected for 2002 and beyond. Point and stationary source controls include a ban on open burning, controls on the food manufacturing, paper manufacturing, construction, dry cleaning and residential fuel consumption, among others.

Without RFG and oxygenates, these states would see tightening gasoline supplies and increased fuel costs

- RFG represents 59% of the gasoline sold in these states.
- Oxygenates represent approximately 6.5% of the total gasoline sold in these states.

Without the ability to use RFG with oxygenates, these states would require more restrictive and more costly pollution reduction alternatives, such as:

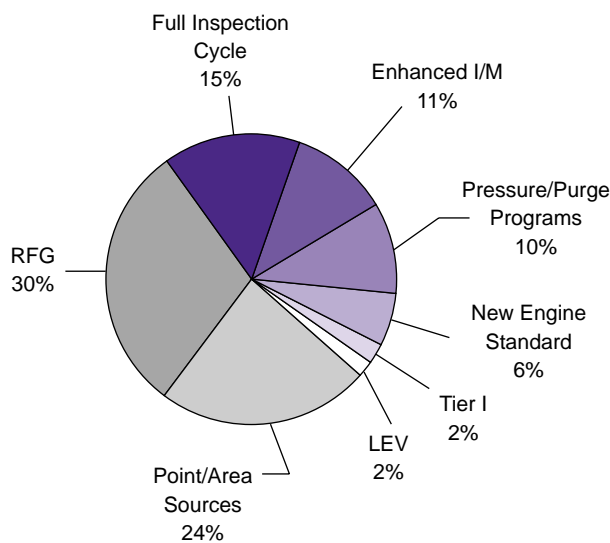
- More stringent, consumer unfriendly and costly vehicle inspection and maintenance programs;
- Mandatory car pooling for businesses and personal use;
- Restricting hours of operation for paint and body shops, bakeries and dry cleaners;
- More restrictions on stationary source emitters (power plants, factories);
- Limitations on new industrial and commercial growth;
- Imposition of even/odd driving days.

New York Example:

More specifically, under these plans, the state of New York, especially the entire NYC Metropolitan area, is heavily dependent on the current RFG Program to achieve its air pollution reduction requirements.

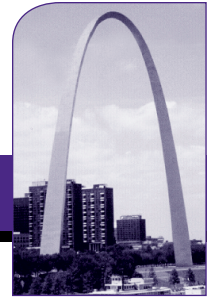
New York Air Quality Control Strategies

15% Target VOC Reductions = 197.2 Tons per Day



Source: Approval and Promulgation of Implementation Plans: State of New York, 64 Fed. Reg. 59706 (November 3, 1999).

*Point/Area Sources Include autobody refinishing, bakeries, consumer products, graphic art facilities, and VOC RACT (reasonably available control technology for industrial clean-up solvents used in ink manufacturing, plastic parts and coatings).



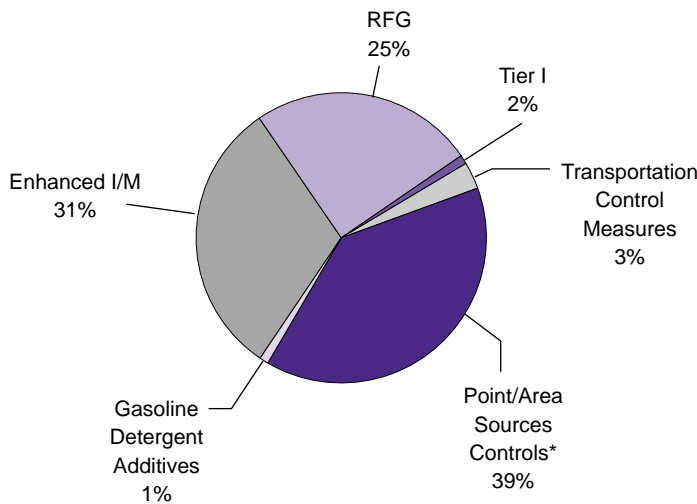
RFG represents 30.28% of all VOC control strategies (and 65.5% of mobile source reductions) New York needs to achieve federal requirements.

Without RFG with oxygenates gasoline supplies would tighten and costs would increase:

- RFG represents **55%** of all gasoline sold in New York (**100%** of the NYC metro area)
- Oxygenates represent **6%** of the total gasoline volume sold in New York and 10% in the NYC Metro area.

Missouri Example:

More specifically, under these plans, the state of Missouri, especially the entire St. Louis Metropolitan area, is heavily dependent on the current Federal Reformulated Gasoline (RFG) Program to achieve its air pollution reduction requirements.



Source: 65 FR 8083; 2/17/00. RFG control strategy includes reductions from RFG Phase 1 and 2, as well as non-road benefits.

**Point/area source controls include a ban on open burning, automobile refinishing, "voluntary" stationary source emission reductions, and credits for permanent plant closings.*

Without RFG with oxygenates, gasoline supplies would tighten and fuel costs would increase:

- RFG represents **40%** of the gasoline sold in Missouri (**100%** of the gas sold in the St. Louis metro area).
- Oxygenates represent **4%** of the total gasoline sold in Missouri and **10%** in the St. Louis Metro area.

ABOUT CFDC

The Clean Fuels Development Coalition (CFDC) is a non-profit organization comprised of oxygenated fuel producers, additive manufacturers, U.S. automakers, agricultural interests, state government agencies and engineering and new technology companies. CFDC has almost 15 years of experience dealing directly with issues surrounding cleaner burning gasoline and gasoline additives, air quality, *Clean Air Act and Energy Policy Act* requirements, and alternative and renewable fuels. Since its inception, CFDC has become a respected source of information for state, local and federal policymakers as well as private industry on a wide-range of transportation, energy and environmental issues.

Through our active involvement and close association with federal and state air and fuel quality officials and fuels and automotive industry experts throughout the country, we are uniquely aware of the complex issues surrounding the debate about the future use of oxygenates in gasoline.

Our understanding of cleaner burning fuels, our involvement in the development of the federal Reformulated Gasoline provisions, and our active participation in the debate surrounding the use of clean burning oxygenates, make CFDC uniquely qualified to present the facts about oxygenates and their contributions to clean air. We have prepared this Fact Book to help better identify and more fully explain the many air and fuel quality benefits provided through the use of oxygenates in gasoline.

On behalf of its membership, CFDC looks forward to continuing its ongoing efforts in support of fuel oxygenates and cleaner burning fuels.