



Vehicle Fuels and the 1990 Clean Air Act

Vehicle Fuels and Clean Air

Gasoline and diesel fuel are both produced from crude oil, that is, petroleum. Together, gasoline and diesel fuel power 99 percent of this country's motor vehicle fleet.

Past efforts to reduce vehicle emissions took petroleum fuels as a given and focused on the development of sophisticated engine and vehicle emission control systems involving catalytic converters, on-board computers, and other hardware. It is becoming apparent, however, that fuel composition and type are also critical factors in the clean vehicle equation.

The Clean Air Act of 1990 explicitly recognizes that changes in fuels as well as in vehicle technology must play a role in reducing air pollution from motor vehicles.

Why the Interest in New Fuels?

The recognition that fuels are significant opened up an interesting debate about the relative merits of petroleum and nonpetroleum fuels. Petroleum fuels have many advantages as vehicle fuels. Oil can still be discovered and pumped from the ground in many parts of the world for as little as ten or twenty cents per gallon. Gasoline and diesel fuel pack more energy per gallon than other fuels. Most important, our country's vast transportation infrastructure (refineries, pipelines, service stations, vehicle assembly plants, etc.) has been designed and optimized for petroleum fuels.

On the other hand, petroleum fuels have certain drawbacks. Emissions of reactive hydrocarbons, carbon monoxide, and oxides of nitrogen from gasoline and diesel vehicles contribute significantly to the air pollution that plagues most large American cities. Carbon dioxide emissions from petroleum fuel combustion add to the atmospheric buildup of greenhouse gases and the potential for global warming. The United States consumes far more oil than it can produce domestically, leading to concerns over our energy and national security.

There are several alternative (i.e., nonpetroleum) fuels, such as methanol, ethanol, natural gas, propane, electricity, and hydrogen, that could reduce vehicle emissions of conventional and greenhouse pollutants and could be produced from domestic feedstocks. Unfortunately, to varying degrees, a transition to one or more of these fuels could decrease vehicle range and increase the overall cost of the U.S. transportation system, particularly during the transition when infrastructure modifications would be necessary.

Clean Fuel Provisions of the Clean Air Act of 1990

The Clean Air Act stopped short of mandating the sale or use of alternative fuels. But the Act includes several programs that will require cleaner fuels and will open up the fuel market to nonpetroleum gasoline additives. These include provisions that force modifications in gasoline composition and that establish more stringent emission standards for vehicles in certain polluted areas. There are five major fuel-related provisions of the 1990 Clean Air Act:

- **Oxygenated Fuels**

The oxygenated fuels provision affects 31 metropolitan areas that have high levels of carbon monoxide pollution (see chart). Since November 1992, gasoline sold in the winter in these areas must contain a minimum of 2.7 percent oxygen. The oxygen helps vehicles burn fuel more completely. This program has reduced vehicle carbon monoxide emissions by 15 to 20 percent.

Fuel additives supply the extra oxygen for oxygenated gasolines. The most common additives are ethanol and methyl tertiary butyl ether (MTBE), a methanol derivative. These additives are being used in about a third of the nation's gasoline, displacing 100,000 to 200,000 barrels per day of oil. The oxygen additive added a few cents per gallon to the cost of gasoline.

- **Reformulated Gasoline**

The reformulated gasoline requirement applies to gasoline sold year-round in the nine metropolitan areas with the most severe ozone pollution (see chart). Beginning in 1995, reformulated gasoline specifications include a minimum oxygen content of 2 percent and a maximum 1 percent benzene content. Heavy metal additives are prohibited. Overall emission performance standards for reformulated gasoline call for at least 15 percent hydrocarbon and toxic emission reductions by 1995 and at least 20 to 25 percent reductions of hydrocarbons and toxic emissions beginning in the year 2000.

In addition to the use of oxygenates to boost fuel oxygen content, it is expected that refineries will have to restrict or delete certain high-volatility compounds, aromatics, olefins, and sulfur from gasoline.

The nine-city base requirement will reformulate 22 percent of the country's gasoline supply and displace between 100,000 and 350,000 barrels per day of oil. However, the Clean Air Act permits other polluted cities (up to 87 across the country) to voluntarily join the program, which could result in reformulating more than half of the nation's gasoline. Again, the price of gasoline is projected to rise by a few cents per gallon.

- **California Pilot Program**

This program sets lower hydrocarbon emission standards (relative to cars in the general U.S. market) for a set number of new passenger cars and light trucks sold in California beginning in

1996. The standards drop still lower beginning in 2001, when a new nitrogen oxide standard also takes effect. The sales requirement is 150,000 vehicles per year in 1996 through 1998 and 300,000 vehicles per year thereafter.

It appears that reformulated gasoline will likely be the fuel of choice to meet the California standards (possibly combined with some engine modifications and additional emission control hardware such as an electrically heated catalytic converter). Alcohol flexible fuel vehicles (which can operate on alcohol or gasoline or any blend of the two) are another possibility. California must mandate availability of any fuel necessary to operate clean-fueled vehicles. Other states may adopt California's vehicle standards.

- **Clean-Fuel Fleet Vehicle Program**

This provision applies to fleets in 23 metropolitan areas around the country that have high ozone and/or carbon monoxide pollution (see chart). Like the California Pilot Program, the fleet program requires vehicles that are cleaner than those for sale in the general U.S. market. A portion of new cars, light trucks, and medium-duty trucks purchased by fleets will need to meet the lower hydrocarbon and nitrogen oxide emission standards beginning in 1998. Individual states must ensure that appropriate fuels are available for clean-fueled fleet vehicles.

It is expected that vehicles operating on reformulated gasoline will be able to meet the lower standards, though some fleets may consider fuels such as natural gas or propane which can offer cost savings. All in all, this program will affect approximately 35,000 fleets and should result in about one million clean-fueled vehicles by 2010.

- **Transit Bus Provisions**

The particulate matter emission standard for transit bus engines is progressively tightened in both 1993 and 1994. Although it is expected that redesigned diesel bus engines equipped with catalysts will be able to meet these standards, some transit operators are expected to consider alternative fuels such as methanol and natural gas.

Beginning in 1994, EPA must evaluate whether buses are continuing to emit low levels of particulate matter in actual service. If not, EPA must establish a low-polluting fuels requirement beginning in the late 1990s that would affect new transit buses in all cities with populations of 750,000 or more. This requirement could result in widespread substitution of alternative fuels for diesel in the nation's transit bus fleet.

For More Information:

The Office of Mobile Sources is the national center for research and policy on air pollution from highway and off-highway motor vehicles and equipment. You can write to us at the EPA National Vehicle and Fuel Emissions Laboratory, 2565 Plymouth Road, Ann Arbor, MI 48105. Our phone number is (313) 668-4333.

Cities Affected by Clean Fuels Provisions of the Clean Air Act

| METROPOLITAN AREA | POLLUTANT CATEGORY * | | CONTROL PROGRAM ** | | |
|---|----------------------|----------|-------------------------|------------------|-----------------|
| | Carbon Monoxide | Ozone | Reformulated Gasoline † | Oxygenated Fuels | Clean Fleets †† |
| Albuquerque, NM | Moderate | | | • | |
| Anchorage, AK | Moderate | | | | |
| Atlanta, GA | | Serious | | | • |
| Bakersfield, CA (San Joaquin Valley) | | Serious | | | • |
| Baltimore, MD | Moderate | Severe | • | • | • |
| Baton Rouge, LA | | Serious | | | • |
| Beaumont-Port Arthur, TX | | Serious | | | • |
| Boston-Lawrence-Worcester, MA-NH | Moderate | Serious | | | • |
| Chicago-Gary-Lake County, IL-IN-WI | | Severe | • | | • |
| Chico, CA | Moderate | | | • | |
| Cleveland-Akron-Lorain, OH | Moderate | Moderate | | | |
| Colorado Springs, CO | Moderate | | | • | |
| Denver-Boulder, CO | Moderate | | | • | • |
| Duluth, MN-WI | Moderate | | | | |
| El Paso, TX | Moderate | Serious | | • | • |
| Fairbanks, AK | Moderate | | | | |
| Fort Collins-Loveland, CO | Moderate | | | • | |
| Fresno, CA (San Joaquin Valley) | Moderate | Serious | | • | • |
| Greensboro-Winston Salem-High Point, NC | Moderate | Moderate | | • | |
| Hartford, CT (Greater Connecticut) | Moderate | Serious | • | | • |
| Houston-Galveston-Brazoria, TX | | Severe | • | | • |
| Josephine Co., OR (Grants Pass) | Moderate | | | • | |
| Klamath Co., OR (Klamath Falls) | Moderate | | | • | |
| Las Vegas, NV | Moderate | | | • | |
| Los Angeles South Coast Air Basin, CA | Serious | Extreme | • | • | • |
| Medford, OR | Moderate | | | • | |
| Memphis, TN-AR-MS | Moderate | Moderate | | | |
| Milwaukee, WI | | Severe | • | | • |
| Minneapolis-St. Paul, MN-WI | Moderate | | | • | |
| Missoula, MT | Moderate | | | • | |
| Modesto, CA | Moderate | Moderate | | • | |
| New York, Long Island, Northern NJ | Moderate | Severe | • | • | • |
| Philadelphia, PA | Moderate | Severe | • | • | • |
| Phoenix, AZ | Moderate | | | • | |
| Portland-Vancouver, OR-WA | Moderate | | | • | |
| Providence-Pawtucket-Fall River, RI-MA | | Serious | | | • |
| Provo-Orem, UT | Moderate | | | • | |
| Raleigh-Durham, NC | Moderate | Moderate | | • | |
| Reno, NV | Moderate | | | • | |
| Sacramento, CA | Moderate | Serious | | • | • |
| San Diego, CA | Moderate | Severe | • | • | • |
| San Francisco-Oakland-San Jose, CA | Moderate | Moderate | | • | |
| Seattle-Tacoma, WA | Moderate | | | • | |
| Southeast Desert, CA | | Severe | • | | • |
| Spokane, WA | Moderate | | | • | |
| Springfield, MA | | Serious | | | • |
| Stockton, CA | Moderate | Marginal | | • | |
| Syracuse, NY | Moderate | | | | |
| Ventura County, CA | | Severe | • | | • |
| Washington, DC-MD-VA | Moderate | Serious | | • | • |

* 1990 Clean Air Act classification. The metropolitan area generally includes suburbs and nearby towns.

** If a low-polluting transit bus fuels program is necessary, it would affect all cities with populations of 750,000 or more.

† Other ozone nonattainment areas are expected to opt in to this program.

†† States may opt out of the fleets program by substituting other programs that yield equivalent emission reductions.