Fact Sheet

Clean Air Council

The Danger from Diesel

The Problem With Petroleum-based Fuels

What Is Diesel?

Petroleum originates from decomposed vegetation that has been stored and altered in the upper strata of the earth for thousands of years. Two primary products of petroleum are diesel and gasoline; both are used to fuel vehicles. The fuels are made by separating and chemically changing petroleum compounds, a process referred to as refining.

What Is The Difference Between Diesel And Gasoline?

Diesel and gasoline are both made up of many different hydrocarbons, which are compounds consisting of hydrogen and carbon elements. However, diesel carbon atoms are in longer chains than gasoline. Diesel chains have 14 carbon atoms whereas gasoline chains have 9. The chemical abreviations are: $C_{14}H_{30}$ and C_9H_{20} respectively. Diesel fuel is consequently heavier and oilier and requires less refining than gasoline.

Diesel exhaust contains thousands of chemicals, over 40 have been identified by the U.S. EPA as toxic, and many labeled as "likely human carcinogens."

The main differences between diesel and gasoline engines are as follows:

a) A diesel engine takes air into the cylinder and compresses it. Fuel is then injected directly into the cylinder. The heat of the compression lights the fuel spontaneously. A gasoline engine takes in a mixture of gas and air. The fuel and air are mixed outside of the cylinder, once they are both injected they require a spark to ignite.

b) A diesel engine uses a much higher compression ratio than a gasoline engine. The heat created in a diesel engine by this higher compression is therefore, much greater than the heat created in a gasoline engine.

Why Do People Choose Diesel?

There are a number of reasons why people choose diesel over gasoline. Diesel fuel is cheaper than gasoline simply because it takes less refining to produce. Diesel also has a higher energy density than gasoline. On average a gallon of diesel fuel contains 147,000 BTUs, while a gallon of gasoline contains 125,000 BTUs. The higher the compression ratio in the engine, the better the efficiency. The higher energy density of the fuel combined with the greater engine efficiency means diesel engines get better mileage than gasoline engines.

Cause For Concern?

For over ten years the U.S. Environmental Protection Agency (EPA) has worked to reduce the amount of emissions that diesel trucks and buses are allowed to release, due to the threat posed to human health and the environment. Much less has been done to clean up diesel fuel and diesel engines than gasoline alternatives. Diesel fuel not only contains a higher portion of dangerous substancescompared to gasoline (as a result of less refining), but also the high-heat combustion in diesel engines allows a larger portion of these substances to form and be released. The high heat in diesel engines creates NOx. NOx reacts with sunlight and Volatile Organic Compounds (VOCs) to form smog, which triggers asthma. The Clean Air Network estimated that in 1997, smog triggered 370,000 asthma attacks, and 9,600 emergency room visits in Pennsylvania. Fourteen Americans die every day from asthma. SO_2 contributes to particulate matter (soot) and when inhaled, particles of soot get lodged deep in the lungs causing infection, and potentially cancer and premature death. CO deprives the heart, brain, lungs, and other tissues of oxygen.

Diesel exhaust contains more than 40 toxic substances, many more than are found in gasoline. The U.S. EPA stated that diesel exhaust is a 'likely human carcinogen', or cancer-causing agent. Studies in California suggest that over 70% of all cancers attributed to air pollution are caused by diesel exhaust. Carcinogens in diesel exhaust include arsenic and benzene. Other toxics include formaldehyde, cyanide, dioxin, ammonia, and 1-3 butadiene which, can cause long-term health problems such as lung, kidney, and nervous system damage, and short-term effects such as skin and eye irritation, and aggravated respiratory problems.

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How Bad Is The Problem?

People are exposed to the dangers of inhaling diesel emissions every day. The threat is especially serious for people with respiratory and cardiovascular problems. Asthma sufferers are particularly affected by diesel particulates as the tiny particles disrupt their already disabled breathing. The elderly are also highly affected as their immune systems are compromised or weaker. High diesel exposure areas include, walking on the sidewalk along diesel bus routes, cycling near polluting diesel buses and trucks, being in a car behind a diesel bus or truck, and alarmingly, being a passenger in a diesel bus or truck.

The most recent discovery, and perhaps the most alarming, was the January, 2001 announcement by the California Air Resources Board, that a child riding inside a diesel school bus may be exposed to four times more toxic diesel exhaust than someone standing or riding beside it. Under federal law these exposures are 23 to 46 times higher than the exposure rate considered to be a 'significant cancer risk'. The danger to children is that exposures are not only higher inside diesel school buses, but children's respiratory systems work at four times the rate of an adult, which makes them especially susceptible to the effects of diesel exhaust.

How Can Diesel Emissions Be Reduced?

In December 2000, a new EPA regulation for emissions standards on heavy-duty diesel engines and low sulfur fuel was announced. To meet the new standards emission after-treatment technologies will have to be installed. Unlike cars which have catalytic converters, most heavy duty vehicles do not have such devices. The devices are not tolerant to sulfur, so the diesel rule establishes a new maximum sulfur level in fuel. Currently the maximum sulfur level is 500 parts per million/ppm (by weight). The new regulation sets a cap on sulfur at 15 ppm. The rule applies to all new model year 2007 heavy-duty diesel vehicles. The introduction of ultra low sulfur fuel will be phased in, and by 2006, eighty percent of all highway fuel must meet the new standard. It must be available nationwide by 2010. This development will play a large part in reducing diesel pollution. Unfortunately, oil refiners say the technology necessary to produce the low-sulfur fuel is cost prohibitive. As of August 2001 the U.S. EPA convened a panel to review the rule.

However, there are other non-petroleum based fuels available on the market today that represent a more permanent solution. Several fleets across the U.S. have already commited to using vehicles fueled by alternatives to diesel and gasoline. Pennsylvania has it's own success stories. Lower Merion School District in Ardmore began its move to CNG buses in 1995, when the local community raised concerns about noise and pollution from the district's diesel school buses. The school district now has 63 CNG buses—more than half its fleet—and plans to become the first Pennsylvania school district whose fleet runs entirely on alternative fuels. Lower Merion displaces over 800 gallons of diesel fuel every day by using CNG.

Seven PA transit agencies currently operate 95 CNG buses in twelve counties across the state; Erie, McKean, Cameron, Clearfield, Jefferson, Allegheny, Indiana, Centre, York, and Berks counties. Central Area Transit Authority has the largest CNG transit fleet in the state operating 44 CNG buses. In total, the 95 buses reduce emissions of NOx, CO, and VOCs by 151.82 tons each year, which is equivalent to taking 1600 cars off the road.

What Can You Do?

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- Report buses emitting visible black smoke to your local transit authority immediately. Report trucks emitting black smoke to their fleet operators immediately.

- Contact your member of Congress encouraging them to support the implementation of clean transit fleets, other public fleets (trash trucks, airport vehicles etc.), and school bus fleets. To find your representatives contact information go to www.congress.org/congressorg/dbq/officials.

- Contact your state Senator to encourage them to support the implementation of and funding for clean fueled fleets. To find your representative go to www.senate.gov.

- Advise fleet managers to contact the **Greater Philadelphia Clean Cities Coalition** (215-567-4004 x273) & the **Pittsburg Region Clean Cities Coalition** (412-391-5590 x310) to find out about funding opportunities for alternative fuel vehicle purchases and conversions.

- Write a letter to the editor of your newspaper, in favor of alternative fuels and a clean fueled fleets program.

- Enlist other concerned parents, your PTA, and members of the school board to advocate for, and pass a resolution calling for clean school buses

- visit: www.cleanair.org/diesel

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