Fact Sheet

Clean Air Council

The Danger from Diesel

The Solution Lies With Cleaner Fuels

The Problem With Petroleum Diesel

In a vehicle engine, petroleum diesel is not completely combusted due to its complex chemical make-up. Consequently many substances are emitted in diesel exhaust. Diesel exhaust contains more than 40 toxic substances including cancer-causing agents such as arsenic, benzene, and nickel. Other toxics can cause long-term health problems such as lung, kidney, and nervous system damage, and short-term health effects such as skin irritation, and aggravated respiratory problems.

Diesel exhaust also poses a threat to the environment. The exhaust contains large quantites of Nirogen Oxide (NOx), which contributes to acid rain and ozone depletion. Also emitted is Sulfur Dioxide (SO_2), the primary component in acid rain, as well as Carbon Monoxide (CO), a harmful green-house gas.

The Future of Diesel

On December 20, 2000, the U.S. Environmental Protection Agency (EPA) adopted a national regulation for emission standards on heavy-duty diesel engines. In order to meet the new, stricter emission standards 'emission aftertreatment technologies' (exhaust filter devices) will be have to be installed on all new heavy-duty diesel vehicles. Unlike cars using catalytic converters, most heavy-duty vehicles do not currently use such devices. Exhaust aftertreatment devices however, are not tolerant to sulfur so the diesel rule establishes a new maximum sulfur level in highway 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 new emission standards apply to all new model year 2007 heavy-duty diesel vehicles. The introduction of ultra low sulfur fuel will be phased in between 2006-2010. Refiners will be required to start producing low sulfur diesel fuel, beginning June 1, 2006. At the terminal level, highway diesel fuel sold as low sulfur diesel fuel will be required to meet the low sulfur diesel standard as of July 15, 2006. For retail stations and fleets, highway diesel fuel sold as low sulfur diesel must reach the 15 ppm standard by September 1, 2006. Eighty percent of all highway fuel must meet the new 15 ppm standard by 2006, and it must be available nationwide by 2010.

The impacts of the emission control program and low sulfur diesel rule are expected to be great. The U.S. EPA estimates that each truck and bus operating on low sulfur diesel fuel and using the new emission control devices will be 90 percent cleaner! The nitrogen oxide emissions will be reduced by an estimated 115,000 tons per year, and particulate matter emissions by 109,000 tons per year.

The beneficial effects of the new regulation still seem to be many years away. However, there are a number of cleaner alternatives to diesel fuel commercially available today. The challenge lies with getting these fuels accepted among fleet operators and the general public. As with many other aspects of society, people are comfortable with what they understand and are often slower to accept new options.

Astronauts use hydrogen to fuel their shuttles, and then drink the only bi-product .... pure water!

The Soy-Bean Solution!

Perhaps the simplest and most convenient way for fleets to move away from the use of diesel is to switch to biodiesel.

Biodiesel commonly uses soybean or canola oil as its base, but animal fat or recycled cooking oil collected from restaurants can also be used. Biodeisel is made through a process called transesterification, which makes these resources into esterified oil. Esterified oil can then be used to fuel diesel vehicles, or mixed with regular diesel fuel to create a cleaner product. The fuel is made from agricultural resources and in its pure form, biodiesel is completely biodegradable and non-toxic to humans.

To speed the market introductionof biodiesel, and lessen its additional cost over petroleum diesel fuel, the most common commercial product is a blend of 20% biodiesel and 80% petroleum diesel fuel (B20). B20 requires absolutely no change in the storage or dispensing infrastructure that handles petroleum diesel fuel. Even pure biodiesel (or "B100") would only require minor changes such as the use of different materials for pump seals and hoses. Both B20 and B100 can be used in any standard unmodified diesel engine.

Natural Gas Alternatives

Biodiesel may be the simplest and most convenient way to move towards a cleaner fuel, however, the fact remains that the use of B20 (the most commonly used commercial product) still involves the combustion of a substantial amount of petroleum-based diesel fuel. There are a number of other alternative fuels commercially available today:

Compressed Natural Gas: Natural gas comes from underground and is made up of around 95 percent methane. Methane is a hydrocarbon, meaning its molecules are made up of hydrogen and carbon atoms. Methane has a simple, one carbon, molecular structure (CH_4) which, allows for almost complete combustion. The remaining 5 percent of natural gas is made up of various gases such as butane, propane, ethane and small amounts of water vapor.

Cars, vans, buses and small trucks generally use natural gas that has been compressed (hence the name 'compressed' natural gas or CNG) and stored in high-pressure cylinders. The practically complete combustion ensures CNG is an extremely clean burning fuel.

Liquefied natural gas (LNG) is made by refrigerating natural gas to minus 260 degrees Fahrenheit (260 degrees below zero!) to condense it into a liquid. This process removes most of the water vapor, butane, propane, and other trace gases, that are usually included in ordinary natural gas. The resulting LNG is usually more than 98 percent pure methane.

The liquid form is much more dense than natural gas or CNG, hence, LNG has much more energy for the amount of space it takes up. Due to the density of LNG, much more energy can be stored in the same size fuel tank. Therefore, LNG is good option for large trucks that need to travel long distances before refueling.

Liquefied petroleum gas (LPG), as the name suggests, is partly a by-product of petroleum refining. However, nationwide the majority of LPG comes from natural gas processing. LPG consists of hydrocarbons, which are gases at room temperature, but turn to liquid when they are compressed. LPG is stored in special tanks that keep it under pressure, so it stays in its liquid form. The pressure of these tanks is usually about 200 pounds per square inch (psi). The main constituent of LPG is propane; the name by which it is often referred to.

Because LPG enters the engine as a vapor, it doesn't wash oil off cylinder walls or dilute the oil when the engine is cold, and it also doesn't put carbon particles and sulfuric acid into the oil. Thus an engine that runs on propane can expect a longer service life and reduced maintenance costs. LPG is also cheaper than gasoline in most places.

Zero-Emission Fuel of the Future

Hydrogen fuel cells combine oxygen from the air with hydrogen from the vehicle's fuel tank to produce electricity. When oxygen and hydrogen are combined all they produce is energy and water (H_2O). The electricity then powers an electric motor, just as in battery-powered vehicle. This process is completed without any burning (combustion).

Hydrogen fuel cell vehicles are considered by many to be the vehicles of the future in terms of their zero emissions. However, there is still much work to be done to ensure the vehicles can operate as efficiently, reliably, and safely as diesel vehicles

Hydrogen is stored on the vehicle in gaseous or liquid form. To carry gaseous hydrogen on a vehicle, it must be compressed. usually to a pressure of about 3000 pounds per square inch, so it must be stored in special high-pressure containers. Clearly, storing hyrogen (which has an extremely high explosive potential) at such high pressure causes concerns about safety. The other option is to store it in liquid form, which is chilled and to more than 423.2 degrees Fahrenheit below zero and compressed! Again, storage of pressurized fuel at such low temperatures is a major concern at the present time. In the long term however, the development of hydrogen fuel cells evokes a future where the only vehicle emisions are water!

What Can You Do?

Contact Us:

Clean Air Council
135 S. 19th St., Ste. 300
Philadelphia, PA 19103
PH: 215-567-4004

Harrisburg: 717 230 8806
Pittsburgh: 412 392 0550
Wilmington: 302 691 0112
www.cleanair.org

- For information on financial incentives for the purchase of alternative fuel vehicles and the conversion of existing vehicles to alternative fuels, contact the National Clean Cities hotline at 1-800-CCITIES, the **Greater Philadelphia Clean Cities Program** at 215-567-4004 x.273, or the **Pittsburgh Region Clean Cities Program** at 412-391-5590 x.310. .

- Contact your member of Congress and U.S. Senator encouraging them to support funding for clean fuels. To find your representatives go to www.congress.org/congressorg/dbq/officials or www.senate.gov.

Diesel Campaign