WEST COAST COLLABORATIVE
Public-private partnership to reduce diesel emissions

Diesel Emissions Mitigation Opportunities

Our goal is to leverage significant federal funds to reduce emissions from the most polluting diesel sources in the most affected communities and significantly improve air quality and public health. By targeting the higher polluting engines with the most cost effective strategies, the benefits from the Collaborative are estimated to significantly outweigh the costs.

What diesel emissions mitigation options exist?[i]

There are three primary approaches to diesel emissions mitigation:

- **Retrofit**: Diesel engines retrofitted with after-treatment air pollution control devices can achieve considerable emissions reductions. Many of these devices significantly reduce emissions on stationary and mobile diesel engines.

- **Cleaner Fuels**: Heavy duty vehicles pollute the air we breathe because their fuel is, typically, inherently dirty. A "cleaner fuel" is a cleaner-burning replacement for regular diesel fuel, whether it is a modified form of the same fuel or an outright alternative to diesel. Unlike retrofit devices, the use of cleaner fuels reduces harmful air pollutants before they are combusted in the engine.

- **Idle Reduction**: Heavy duty vehicle/vessel idling provides heat or air conditioning inside the vehicle/vessel for driver/occupant(s') comfort, keeps the engine and fuel warm during cool weather, and provides electrical power for onboard applications. While there are certainly relevant technologies to reduce idling-related air pollution, this can often best be accomplished simply through behavioral changes by the drivers.

What are the major retrofit technologies?

In most systems, a **Diesel Oxidation Catalyst (DOC)** consists of a stainless steel canister that contains a honeycomb structure called a substrate or catalyst support. It contains no moving parts, only an interior surface coated with catalytic metals such as platinum or palladium. The catalyst oxidizes the soluble organic fraction (SOF) of particulate matter, specifically, carbon monoxide, gaseous hydrocarbons and liquid hydrocarbons absorbed on carbon particles. The soluble organic fraction is converted into carbon dioxide and water. Oxidation catalysts can reduce the SOF of the particulate by 90 percent under certain operating conditions and can reduce total particulate emissions by 40 to 50 percent.

Diesel particulate matter filters are ceramic devices that collect particulate matter in the exhaust stream. The high temperature of the exhaust heats the ceramic structure and allows the particles inside to break down (oxidize) into less harmful components. They can be installed on new and used buses, but they must be used in conjunction with ultra-low sulfur diesel (ULSD) - fuel with a sulfur content of less than 15 parts per million (ppm). The combination of particulate

matter filters and ULSD can reduce emissions of particulate matter (PM), hydrocarbons (HC) and carbon monoxide (CO) by 60 to 90 percent.

Selective Catalytic Reduction (SCR) is used to control NOx emissions from stationary sources and can be applied to mobile sources including trucks, marine vessels, and locomotives. Similar to an oxidation catalyst, SCR uses a catalyst to cause chemical reactions. However, SCR requires a reductant in the exhaust stream to convert NOx to nitrogen and oxygen in an oxidizing environment. The reductant is usually ammonia or urea. This device reduces 75 to 90 percent of NOx emissions, 50 to 90 percent of hydrocarbon emissions, and 30 to 50 percent of particulate matter emissions.

What are considered "Cleaner Fuels"?

Ultra low sulfur diesel (ULSD) fuel is a specially refined petroleum diesel fuel that has dramatically lower sulfur content than standard on-highway diesel. The sulfur content in ULSD is 15 ppm or less. Standard highway diesel typically has a sulfur content of 500 ppm. Anything less than 500 ppm is considered "low sulfur" diesel. Under federal law, all on-road diesel fuel will be limited to a sulfur content of no more than 15 ppm by Fall 2006.

Biodiesel is liquid fuel that can be used as a petrodiesel substitute or additive. Pure biodiesel is different from standard diesel in that it is not made with a petroleum product. Biodiesel is typically made from soybeans, rapeseed or sunflower. Biodiesel is made by chemically reacting alcohol with vegetable oils, fats or greases. Biodiesel is often blended with standard diesel to create a biodiesel blend. Biodiesel can be used in any diesel engine with little or no modification to the engine or fuel system. Biodiesel in its pure form is called "neat biodiesel". Neat biodiesel is a 100% biofuel. Most biodiesel used today is a blend of biodiesel with petrodiesel. The most common is B20, which is 20 percent biodiesel and 80 percent petrodiesel.

Natural gas is an odorless, colorless, tasteless gaseous fuel derived primarily from methane. Natural gas generally comes from gas wells but also can be captured from gases emitted by landfills. Vehicles can use the fuel in two forms: either as compressed natural gas (CNG) or as liquefied natural gas (LNG). Unlike biodiesel, natural gas can only be used in vehicles that have been specifically designed to use it.

Like natural gas, **propane** is a natural colorless, nontoxic gas that can be used as a fuel. Also like natural gas, vehicles must be specifically designed to run on propane. It is a byproduct of natural gas processing and petroleum refining. For fueling and storage purposes, propane is generally liquefied (called LPG, or liquefied petroleum gas).

What are the idle reduction techniques and technologies?

Mobile technologies

Direct-Fired Heaters are stand-alone units capable of providing heat to vehicles in cold weather. They cost about $1,000 to $2,000. Unfortunately, they do not provide for other driver needs, like air conditioning. **Automatic Engine Idle devices** actually shut off engines when not being used, while still providing needed air conditioning or heating. These also cost about $1,000 to $2,000. Lastly, **Auxiliary Power Units (APUs)** are small electric generators. They are more expensive, costing anywhere from $5,000 to $7,000, and limit the carrying load of the vehicle because of their weight.

Stationary Technologies

Truck Stop Electrification (TSE) refers to truck stops that are able to provide power to trucks so that drivers can meet all their needs without having to run their engines. Shore Power TSE requires trucks to be specifically modified in order to accept electricity transmitted at the truck stop. The cost is about $2,500 per truck parking space to provide the electricity and another $2,500 to modify the truck so that it can receive the electricity. Advanced, or Rental, TSE can provide electricity to practically any truck with little modification required. The cost of installing this type of system is about $10,000 per parking space. For both types of TSEs there is also an operating fee while using the electricity of about $1.00 to $1.50 an hour.

Cold ironing is the process whereby ships turn off their engines and use shore-based power for their electrical needs. It is especially cost-effective for ships making frequent port calls or those with high power demands during hotelling, or docking.

Automatic startup/shutdown controls—a technology utilized in locomotive engines—are computerized controls that sense when a train is idling and switch an engine on and off accordingly. As with other idling technologies, these controls conserve fuel and reduce diesel emissions.

Other

While, some idling needs have to do with driver comfort (i.e., keeping a truck cab or a bus warm during the winter and cool during the summer), some idling is strictly a matter of habit. The driver just does not feel like turning off the engine since he or she will soon have to start it up again. In cases such as these, idle reduction policies, supported by driver education, can be very effective.

How can I find out more about the Collaborative?

For more information about the West Coast Collaborative, please contact Peter Murchie (murchie.peter@epa.gov) or Michelle Roos (roos.michelle@epa.gov), or visit our website at www.westcoastcollaborative.org.

[i] This information sourced from “Philadelphia Diesel Difference” June 2005 http://www.cleanair.org/dieseldifference/resources/index.html