

FUELS FOR COMMERCIAL VEHICLES

Compiled for Sierra Club website by Roanoke group volunteer Jason Ray Altice:

Some municipalities strongly discourage the use of hybrid or electric fleet vehicles.

- The average cost of a hybrid or electric bus is between \$450,000-500,000 (standard buses are between \$250,000-300,000)
- The technology is not reliable enough at this point.
- Some cities have been left with useless vehicles due to constant repair/ the companies that manufacture them have gone out of business/ etc.
- There are major infrastructure changes that have to be implemented (i.e. different maintenance facilities, different mechanics, different replacement parts inventory, expensive buses).

The most effective green fuel is compressed natural gas (CNG).

- CNG equipped buses are 25% more expensive than standard diesel buses.
- Fueling takes longer.
- This often leads to a decrease in available bus service.
- The decrease in public transit does little to stem emissions across the board.

Ultra low sulfur emitting diesel (ULSD) with particulate traps and oxidation catalyst is the most effective way to reduce emissions.

- Less costs than CNG or LPG (liquefied propane gas).
- Less infrastructure change (i.e. same mechanics, same fueling stations, same replacement parts inventory, same buses (with minor modifications)).

Ultra Low Sulfur Diesel (ULSD):

- By October 15, 2006, as mandated by the EPA, 80% of all diesel will be ULSD.

Percent reduction	Emission
95%	Sulfur
13%	Particulate Matter
13%	Hydrocarbon
6%	Carbon Monoxide
3%	NOx

- The drawbacks of USLD are:
 - Lubricity (The fuel doesn't lubricate as well as standard diesel decreasing engine life.)
 - Cold flow properties (We're talking below -20 degrees F)
 - Expense (add +5¢/gallon for extra refining costs)

Retrofitting ULSD Engines with Filters:

- “Diesel retrofits are one of the most cost effective strategies for pollutant reduction.”

Percent reduction (filtered)	Emission
95%	Sulfur
20-80%	Particulate Matter
90%	Hydrocarbon
90%	Carbon Monoxide
15-20%	NOx

- Filters can only be used on engines using ULSD.
- Two types of filters: 1.) Particulate Filters 2.) Oxidation Catalysts
- Filters take approximately 1-3 hours to install and can be installed by fleet mechanics.
- Note: according to the Washington D.C. Council of Government and Transportation Research Board:

Cost per ton of Nitrous Oxide Reduced

-retrofitting buses with filters	\$5,000/ton
-bike racks on buses	\$19,500/ton
-replacing with CNG	\$45,900/ton

- Retrofitting Fleets with filters is expensive:

Particulate Filters	NOx	PM	HC	CO	Price
Base Metal Oxidizing PM Filter	-	80%	50%	50%	\$6,500-10,000
Highly Oxidizing Precious Metal PM Filter	5%	90%	90%	90%	\$6,500-10,000

Oxidation Catalysts	NOx	PM	HC	CO	Price
Base Metal Oxidation Catalyst	-	10-30%	50%	50%	\$1,000-2,000
Precious Metal Oxidation Catalyst	-	20-40%	90%	90%	\$1,000-3,000

- The larger the engine the more expensive the filter.
- Higher sales volumes will lower the cost of filters.

BioDiesel:

- Biodiesel is refined from renewable oils such as animal, plant, or recycled cooking oils.
- B100 is 100% biodiesel, B20 is a blend of 20% biodiesel/ 80% petroleum diesel.
- Biodiesel can be blended to any ratio i.e. B1, B2, B50, etc.

B100

Percent Emission compared to petro-diesel	Emission
-67%	Hydrocarbon
-99%	Sulfur
-48%	Carbon Monoxide

-47%	Particulate Matter
+10%*	NOx

B20

Percent Emission compared to petro-diesel	Emission
-20%	Hydrocarbon
-99%	Sulfur
-12%	Carbon Monoxide
-12%	Particulate Matter
+2%*	NOx

*some companies use additives to reduce NOx emissions, and on retrofitted buses this percentage drops.

- B20 can be used with little to no modification of existing engine systems
- B20 can be stored in existing aluminum, steel, fluorinated polyethylene, polypropylene, or Teflon tanks with sediment monitoring.
- Little to no infrastructure change: same fleets, mechanics, spare parts, and fueling stations.
- “A U.S. Department of Energy and U.S. Department of Agriculture full lifecycle emissions study found that for every unit of fossil energy needed to make biodiesel 3.2 units of energy are gained. In contrast society uses 1.2 units of fossil resources to produce 1 unit of petroleum diesel. This means every gallon of biodiesel we use has the potential to displace 4 gallons of imported petroleum.”
- User feedback has said that maintenance requirements on engines using B20 is identical to those using standard diesel.
- A blend as diluted as B1 has been found to increase lubricity by as much as 65% having the potential to offset the corrosiveness of ULSD and dramatically increasing engine life.
- Biodiesel has actually been found to act as a cleaning agent for fuel systems.
- Drawbacks include:
 - 1) Some engine modification may be necessary (i.e. changing zinc components, rubber gaskets, etc.)
 - 2) Fuel economy is reduced 1-6% (plant based) and 2-15% (animal based)
 - 3) Engine components such as fuel filters should be monitored at first for sediment build up.
 - 4) Biodiesel attracts moisture that can lead to cold flow problems, water deposition in the fuel delivery system, fuel clouding, corrosion, and microbial growth.
 - 5) Count on biodiesel being 10-30% more expensive than conventional petroleum diesel.
 - 6) A boom in biodiesel could lead to deforestation and increased diversion from food grains. For example, 1000 miles of Indonesian rainforests is being cleared to grow biodiesel crops for the Chinese market.

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