



## Environmental Benefits

### **Emissions**

Biodiesel is the only alternative fuel to voluntarily perform EPA Tier I and Tier II testing to quantify emission characteristics and health effects. That study found that B20 (20% biodiesel blended with 80% conventional diesel fuel) reduced total hydrocarbons by up to 30%, Carbon Monoxide up to 20%, and total particulate matter up to 15%. Typically, emissions of nitrogen oxides are either slightly reduced or slightly increased depending on the duty cycle of the engine and testing methods used. Increases in NOx can be effectively eliminated with the use of normal mechanical remediation techniques (e.g. catalysts or timing changes). Research also documents the fact that the ozone forming potential of the hydrocarbon emissions of pure biodiesel is nearly 50% less than that of petroleum fuel. Pure biodiesel does not contain sulfur and therefore reduces sulfur dioxide exhaust from diesel engines to virtually zero.

Biodiesel can also help meet national goals for the net reduction of atmospheric carbon. As a renewable fuel derived from organic materials, biodiesel and blends of biodiesel reduce the net amount of carbon dioxide in the biosphere. A study by the US Department of Energy has found that biodiesel production and use, in comparison to petroleum diesel, produces 78.5% less CO<sub>2</sub> emissions. Carbon dioxide is "taken up" by the annual production of crops such as soybeans and then released when vegetable oil based biodiesel is combusted. This makes biodiesel the best technology currently available for heavy-duty diesel applications to reduce atmospheric carbon.

### **Health Effects**

Biodiesel is safer for people to breathe. Research conducted in the US shows biodiesel emissions have decreased levels of all target polycyclic aromatic hydrocarbons (PAH) and nitrated PAH compounds, as compared to petroleum diesel exhaust. PAH and nPAH compounds have been identified as potential cancer causing compounds. Targeted PAH compounds were reduced by 75 to 85 percent, with the exception of benzo(a)anthracene, which was reduced by roughly 50 percent. Target nPAH compounds were also reduced dramatically with biodiesel fuel, with 2-nitrofluorene and 1-nitropyrene reduced by 90 percent, and the rest of the nPAH compounds reduced to only trace levels. All of these reductions are due to the fact the biodiesel fuel contains no aromatic compounds.

### **Energy Balance**

Biodiesel helps preserve and protect natural resources. For every one unit of energy needed to produce biodiesel, 3.24 units of energy are gained. This is the highest energy balance of any fuel. Because of this high energy balance and since it is domestically produced, biodiesel use can greatly contribute to domestic energy security.

### **Biodegradability and Toxicity**



## Environmental Benefits

Biodiesel is nontoxic and biodegradable. Tests sponsored by the United States Department of Agriculture confirm that biodiesel is ten times less toxic than table salt and biodegrades as fast as dextrose (a test sugar).