May 2, 2006
Contact – Dr. Serpil Guran

Workgroup Recommendations and Other Potential Control Measures: Diesel Initiatives and Stationary Combustion Sources Workgroups

SCS002 – Biodiesel: An Alternative to be Considered

Policy Recommendation

Biodiesel is a promising alternative fuel for transportation, home heating and power generation. The Department should encourage, support and monitor production and voluntary usage of biodiesel in the state. The Department should also monitor the developments nationwide and worldwide regarding emissions, new regulations, and information on both life cycle analysis and manufacturers' warranties. In addition, there is growing interest in producing biodiesel from yellow and brown grease in New Jersey, which the Department should support and encourage as well.

Brief Rationale for Recommended Strategy

Biodiesel is a proven alternative fuel for home heating, power generation, and transportation that may help to reduce dependence on fossil fuels while also having significant environmental benefits. Biodiesel can be easily derived from food grade vegetable oils, nonfood grade vegetable oils, animal fats, and waste restaurant greases by transesterification, a chemical reaction where the triglyceride is reacted with alcohol in the presence of a catalyst. Biodiesel is an oxygenate and sulfur free, has a low toxicity level and is biodegradable, i.e., more than 90 % (regardless of amount spilled) of biodiesel will be biodegraded in four weeks in the case of accidental spill. If used restaurant vegetable oils and waste grease are processed, there is also a waste management benefit. Biodiesel was standardized by the ASTM in 1999 as a provisional fuel standard and became a full standard (ASTM D6751) in 2002. Biodiesel refers to the pure fuel before blending with diesel fuel. Blends are denoted as, "BXX" with "XX" representing the percentage of biodiesel contained in the blend (i.e., B20 is 20% biodiesel, 80% petroleum diesel). Biodiesel meets EPA fuel registration requirements (Clean Air Act, section: 211b).

Emissions from Biodiesel

Tests have shown that use of biodiesel reduces particulates (PM) by an average of 12% compared to conventional diesel fuel. However, the effects on NOx are inconclusive; recent tests have shown marginal reductions in NOx, but previous tests showed marginal increases. A sampling of test results follows.

Transportation:
US EPA Draft Report on Biodiesel (2002; EPA 20-P-02-001):

	B100 (Pure Biodiesel)	B20 (Petroleum diesel & 20 % Biodiesel)
THC	-67%	-20%
CO	-48%	-12%
PM	-47%	-12%
NOx	+10%	+ 2%

May 2, 2006
Contact – Dr. Serpil Guran

Workgroup Recommendations and Other Potential Control Measures: Diesel Initiatives and Stationary Combustion Sources Workgroups

SCS002 – Biodiesel: An Alternative to be Considered

Rowan University (2005): Some tests showed that ULSD (Ultra Low Sulfur Diesel) blends with 20% biodiesel would emit less NOx than pure ULSD and B20 (petroleum diesel with 20% biodiesel).

	CO (g/bhphr)	NOx (g/bhphr)	HC (g/bhphr)
B20	0.99	4.92	0.32
ULSD	0.44	5.48	0.32
ULSD/20%Biodiesel	0.40	4.57	0.22

NREL (National Renewable Energy Laboratory, 2005): Recent tests showed reductions with statistical confidence of >99%.

	PM	HC	CO	NOx
B20	-18%	-29%	-24%	-4%

(Petroleum diesel & 20 % Biodiesel)

New Jersey Medford Township School Buses biodiesel usage emission results (New Jersey Board of Public Utilities Biodiesel Rebate Program):

	PM(g/mile)	NOx(g/mile)	CO(g/mile)	HC(g/mile)
B20	1.035	4.517	3.422	0.149
Petroleum Diesel	1.703	6.885	5.315	1.441

Power Generation:
The State of Iowa performed tests on two stationary diesel engines with B10. PM emission reductions and NOx emissions increase were observed with 1972 model Cooper engine. New generation engines showed decrease of both PM and NOx emission reductions.

	NOx	**PM**
1999 Caterpillar engine	-12.9%	-60.5 %

Home Heating:
Brookhaven National Laboratory tested B20 (20 percent biodiesel blended with home heating oil) in home heaters and observed a 20% reduction of NOx emissions.

May 2, 2006
Contact – Dr. Serpil Guran

Workgroup Recommendations and Other Potential Control Measures: Diesel Initiatives and Stationary Combustion Sources Workgroups

SCS002 – Biodiesel: An Alternative to be Considered

States with Biodiesel Initiatives
Iowa, Minnesota, Washington, West Virginia, New York, Arkansas, Alabama, Colorado, Missouri, Hawaii, Illinois, Indiana, Pennsylvania. California Air Resources Board is proceeding to finalize testing methods for blends of biodiesel and petroleum diesel.

Trade Associations' Position
MECA (Manufacturers of Emission Controls Association) and EMA (Engine Manufacturers Association) agree that all biodiesel should meet the fuel specifications approved by ASTM. EMA also approved usage of B5.

The Division of Science, Research and Technology (DSRT)
DSRT intends to acquire information on key aspects of biodiesel production from various feedstocks including soybean oil, yellow grease, and brown grease. The study will examine specific energy inputs and the energy content of outputs, including byproducts such as animal feed. This information will be important in reducing uncertainty regarding the long-term viability, from an energy and carbon dioxide emissions standpoint, of the production and use of biodiesel. The study results will also help New Jersey in its future efforts to become more self-sufficient in energy and to minimize carbon dioxide and particulate emissions associated with fuel consumption.