Comments to the Draft Suggested Biodiesel Policy

Michael F. Goldman
Engineering Supervisor
Engineering & Compliance Division Santa Barbara County Air Pollution Control District

Subject: FW: Comments on ARB Draft Suggested Biodiesel Policy
From: GoldmanM@sbcapcd.org
To: rokamoto@arb.ca.gov
CC: rhand@arb.ca.gov
Date: Mon, 05 Jun 2006 12:45:06 -0700

Robert,
Could you please clarify the bullet on page 6 of the ARB Suggested Biodiesel Policy presentation (http://www.arb.ca.gov/fuels/diesel/altdiesel/052406arb_prsntn.pdf) that states that B100 (or blends over 50%) are currently exempt from ARB's Diesel regulations:And compare that to the ARB's Stationary Diesel IC Engine ATCM FAQ #30 on page 8 (http://www.arb.ca.gov/diesel/documents/atcmfaq.pdf) where it says that that B100 cannot be used in new engines or existing engines that previously used diesel (as of 12/8/04). Thanks for helping clarify these two documents.

Michael F. Goldman
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Mark Saperstein
Senior Toxicologist
BP Amoco Chemical Company

Subject: Biodiesel Question
From: "Saperstein, Mark" <sapersm1@bp.com>
To: rokamoto@arb.ca.gov
Date: Mon, 05 Jun 2006 12:49:31 -0700

I had a question on the proposed CARB biodiesel policy. Will the policy address the isuue of whether Diesel Exhaust Particulate (DEP) emitted from a diesel engine fueld by biodiesel be evaluated under the existing OEHHA potency estimate for DEP? I have heard some CARB staff suggest that perhaps DEP

emissions from B100 blends should not be subject to risk assessments using that potency value. Thanks.

Matthew Cohen
General manager Marketing and Technical Services
Solpower Corporation

Subject: Biodiesel comments
From: MaLC385@aol.com
To: rokamoto@arb.ca.gov
Date: Mon, 05 Jun 2006 16:05:38 -0400 (EDT)

Robert Okamoto: RE: biodiesel draft policy summary Why would CARB consider allowing B-20 and not address the potential NOx increase, when effective additives have already been tested and shown to lower not only NOx, but HC, CO, and PM as well? The BAAQMD Biodiesel Feasibility study (attached contract report from Biodiesel Industries) featuring Soltron Enzyme Fuel Treatment lowered NOx 13% in virgin soy B-20 as well as in all other blends, in a UC Berkeley test. There is no justification for ignoring NOx, just to promote biodiesel. As it is, the fuel is troublesome enough, being sticky, hygroscopic, and good food for microbial growth. The users or refiners will either have to add pesticide, like they used to do in the marine industry, or they can add our nontoxic enzyme, as does just about the entire California recreational marine industry today. Soltron breaks up and disperses microbial growth in both diesel and biodiesel. Also proven at the City of Berkeley in their B-100, years ago. CARB can choose to have plain B-20, and have trucks spewing NOx and excessive particulate due to valve and ring sticking, and injector plugging from bacteria, or they can have B-20 that runs cleaner, according to UC Berkeley: -27% HC, -37% PM, and -9% Nox than straight CARB ULSD. Data is even better in reclaimed vegetable B-20. Its even better in plain CARB ULSD, for that matter. I have tried to get to Dean Simmeroth with this report. I don't know if he is aware of the test. I have not been able to reach him. I would greatly appreciate a response on the topic.

Respectfully,

Matthew Cohen
General manager
Marketing and Technical Services
Solpower Corporation

Attachments:

Biodiesel PDF 03-13-06FinalReport.pdf
RussCoverletter PDF203-28-06.pdf
Soltron Berkley Ltr.doc

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March 28, 2006

To whom it may concern:

The additive that was used for both (1) the testing performed by the Combustion Analysis Laboratory at UC Berkeley, and (2) the tail pipe emission study, for the Bay Area Air Quality Management District study was Soltron. We were very pleased with the results on all biodiesel types, independent of the feedstocks from which they were made. The effect was most pronounced on the biodiesel either at B100 or B20. There were also substantial emission reductions for CO, PM and HC using Soltron with straight CARB ULSD, and an observable, but slight, NOx reduction. There is further work which needs to be done to get the California Air Resources Board to recognize and accept these results, but we believe that it represents a substantial milestone in establishing the emission reduction benefits of Soltron in biodiesel blends, especially for NOx.

Russell Teall
President & Founder

BAY AREA AIR QUALITY MANAGEMENT DISTRICT
PROFESSIONAL SERVICES CONTRACT
CONTRACT NO. 2003-004

"Many people have falsely assumed that you have to choose between protecting the environment and protecting the economy. Nothing could be further from the truth."
Gov. Arnold Schwarzeneger

BIODIESEL FEASIBILITY STUDY FOR THE BAY AREA AND CONDUCT A BIODIESEL PILOT PROJECT
FINAL REPORT - SEPTEMBER 27, 2005

Principal Investigator
Russell Teall, President & Founder
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Introduction

The use of vegetable oils for use as a fuel in diesel engines is not new. In 1900 the inventor of the diesel engine, Dr. Rudolf Diesel, exhibited his new invention at the Paris World's Fair. His concept was that this revolutionary new source of power would be fueled by vegetable oils grown by Europe's farmers and that it would become the primary source of power in the new century. Unfortunately for us, only part of his vision became true. The diesel engine has become the power source of choice for commercial trucking, railroads and ships, but the fuel of choice is petroleum diesel not vegetable oil.

Our global economy now relies upon petroleum for fuel which pollutes the environment, diminishes human health, creates global conflicts and is being depleted at an alarming rate. Global demand for petroleum has exceeded the discovery of new reserves for the first time this year. Given the tragic nature of recent events we are now painfully aware that our petroleum supplies are subject to disruption by hurricanes and global conflicts.

Biodiesel has the potential to become the New Oil. It is nontoxic, biodegradable and made from renewable resources that reduce green house gases. The feedstocks that are used to make it can be grown and harvested in a socially responsible manner that respects the environment and supports economic development, even in some of the most impoverished parts of the world. Our challenge is to make this transition now before the growing global demand for energy has catastrophic political and environmental effects.

The contract for this study was awarded to Biodiesel Industries on April 10, 2003, with a final contract signed between the parties on July 2, 2003. The objectives for this study were:

1. Develop, implement and operate a biodiesel pilot project located in the DISTRICT that uses local feedstocks to produce Biodiesel.

2. Distribute the pilot project Biodiesel to local fleets.

3. Compare air emissions resulting from the use of the pilot project Biodiesel to air emissions from using petroleum diesel in local fleets.

4. Deliver report describing the three objectives above as well as obstacles to expanding biodiesel production in the District and actions required to remove the obstacles.

Executive Summary

Imagine if you can that Dr. Diesel's prediction that his new engine would be run on vegetable oil derived fuels became true and that all diesel engines have been running on biodiesel for the past one hundred years. The air is clean and there is an abundance of biodiesel made from resources grown by California farmers. Imagine also that petroleum was just recently discovered in the Middle East and that petroleum proponents are asking to have their new fuel approved for use in California. Their argument would be that even though using their product will result in severe environmental threats during the extraction, production and transport of their product, and that using their product as a fuel will produce toxic and carcinogenic emissions along with substantial increases in hydrocarbons, carbon monoxide and particulate matter, all with proven deleterious effects to human health, and that their product will come from politically unstable parts of the world administered by regimes that are hostile to us, but there is a bright side. Their product has been proven, by a series of studies with protocols under debate, to have a slight decrease in NOx emissions with an impact on ozone that is being questioned. Would petroleum diesel be permitted to be used as a fuel in California under such circumstances?

Unfortunately Dr. Diesel's prediction did not come true. Biodiesel is trying to become accepted in California with the primary concern expressed by regulators that there will be an increase in NOx. This study shows that biodiesel has substantial emission benefits under a range of testing protocols and there are NOx reduction strategies that work with biodiesel. Recently there has been an indication from CARB that biodiesel may have a role to play in California's fuel portfolio as a means to help meet recently adopted greenhouse gas reduction targets.

Another impediment to biodiesel implementation in California has historically been its high price in comparison to petroleum diesel. Recent price increases in petroleum coupled with biodiesel subsidies in the 2005 Energy Bill have made biodiesel competitively priced with petroleum diesel. It is now possible to make competitively priced biodiesel from a range of feedstocks available in the Bay Area and surrounding counties.

Scope of Work

The contract for this project specified a scope of work which was to be followed by the contractor. As this work was pursued there were several changes made in consultation with BAAQMD personnel. The scope of work was defined in the contract as follows:

> CONTRACTOR shall perform each of the tasks listed in Section B, pages 6 and 7 of the proposal, with additional specificity and detail provided below.
>
> 1. Construct or relocate a Biodiesel production facility in the DISTRICT and produce at least 5,000 gallons of 100% (B100) Biodiesel fuel from local feedstocks produced, recovered and recycled in the DISTRICT.
>
> 2. Analyze and evaluate no less than 20 local feedstocks and the Biodiesel produced from the local feedstocks. Selection of local feedstocks to be used in the pilot project shall be preapproved by the DISTRICT and shall include at a minimum, oils and fats from restaurants, rendering plants, dairies and agriculture.
>
> 3. Quantify and describe the fate of the feedtock prior to the implementation of the pilot project and volume of Biodiesel produced after implementation of the project, including any new waste streams and by-products created from the conversion process.
>
> 4. Describe the processing and conversion of the feedstock to Biodiesel and distribution into the fleet.
>
> 5. Identify the standards to which the biodiesel will be produced and describe any additives required to avoid problems with the use of Biodiesel.
>
> 6. Distribute a blend of 2% (B2), 5% (B5), 20% (B20), and 100% (B100) Biodiesel to petroleum diesel in no less than two heavy-duty fleet types. Possible fleet types include garbage trucks, school buses, transit buses, shuttles and agricultural equipment. At a minimum, CONTRACTOR, shall contact the fleet managers for the following entities to invite their participation in the pilot project: City of Palo Alto and Sonoma County solid waste hauling contractors, East Side Union High School District, Clos Du Bois and Benziger wineries, Clover Stornetts Farms, San Francisco MUNI and Petaluma Transit, Ecology Center, Albertson's, San Francisco International Airport Land Side Operation and Emery Go-Round Shuttle.
>
> 7. Provide appropriate guidance to fleet users for safe and efficient conversion from petroleum diesel to Biodiesel use.

8. Administer a DISTRICT-approved survey to the fleet operators that will provide a detailed description of the fleet of vehicles using the Biodiesel, average volume of diesel fuel use prior to the pilot project and after implementation of the pilot project, and their experience with the conversion of their fleet from petroleum diesel to a Biodiesel blend.

9. Test, analyze, evaluate and compare the air emissions resulting from the use of the four different pilot project blends with petroleum diesel. Proivde emission test data for NOx and PM for at least five representative vehicles from each of the two selected test fleets from item 6 above.

10. Analyze the cost of implementing the pilot project, including permitting and regulatory costs, developing infrastructure for the conversion of feedstocks to Biodiesel, disbursing the fuel, retrofit of vehicles, period of cost recovery and any other costs associated with developing the project.

11. Provide a quantitative comparison of the "cradle-to-grave" environmental impacts of the Biodiesel project with a no-project case.

12. Submit to DISTRICT a Report responding to the Scope of Work items 1 through 11 above.

Report of Results

The structure of reporting the results of this study will be to present each task as listed in the Scope of Work and then describe the work performed with the results.

Task 1 – Biodiesel Production Facility

1. Construct or relocate a biodiesel production facility in the DISTRICT and produce at least 5,000 gallons of 100% (B100) Biodiesel fuel from local feedstocks produced, recovered and recycled in the DISTRICT.

To complete this project CONTRACTOR used a Mini MPU (1/10 scale Modular Production Unit) that was fabricated in Bakersfield, California for the US Navy and was placed on loan for this project at the Ecology Center in Berkeley, California. The Mini MPU was designed to be deployable. All components fit onto a trailer towed by a ¾ ton pick up truck. The Mini MPU was connected by a single electrical cord which provided all power for electrical motors and process heat.

The Mini MPU was capable of processing 150 gallons of feedstock per batch from a wide variety of sources and was designed to duplicate all process phases used in full scale Modular Production Units (see Insert #2). The electrical system was explosion proof for use with alcohol vapors in the event of accidental spills and had a remotely mounted control panel with emergency stops both on the reactor and on the control panel. The reactor and other process components were mounted in a steel containment sump that wss designed to hold 250% of the largest vessel. All major reaction and filtering components were fabricated in stainless steel. A centrifuge was utilized to optimize separation of heavy phase liquids (such as glycerol and water) from light phase liquids (such as Biodiesel). All electrical components (including motors, pumps, heaters, control panels and wiring) as well as tanks, piping and valves were fabricated to UL standards. A special filtering and drying system was incorporated into the system to meet ASTM standards. Vents were adapted to a vacuum system and large activated charcoal canisters to control VOC emissions. Fire safety equipment, absorbent pads, and personal safety equipment (gloves, goggles, face masks, respirators and aprons) were provided for the operators. A field laboratory was set up for testing feedstocks as they came in as well as for monitoring the status of each step in the reaction process. Final products were tested at the Naval Tech Center at Naval Base Ventura County or at Biodiesel Industries laboratory in Denton, Texas. Processing was conducted at the Ecology Center in

Berkeley, California for several months, and after that at the Naval Tech Center when the Mini MPU was relocated there.

A specially fabricated truck was used to pick up used cooking oils from area restaurants (see Insert #1). The truck was an Izusu diesel (run on B100) that had a 600 gallon heated tank for holding the waste cooking oil.

Several public outreach events were conducted while the Mini MPU was located at the Ecology Center, including tours conducted for the East Bay Municipal Utility District, television stations, UC Berkeley's Combustion Analysis Laboratory, Bay Area Air Quality Management District and private venture capital firms.

Insert #1 – Grease Collection System Photos


RESERVED

Insert #2 – Mini Modular Biodiesel Production Unit Photos

Task 2 – Feedstock Evaluation

2. Analyze and evaluate no less than 20 local feedstocks and the Biodiesel produced from the local feedstocks. Selection of local feedstocks to be used in the pilot project shall be preapproved by the DISTRICT and shall include at a minimum, oils and fats from restaurants, rendering plants, dairies and agriculture.

Biodiesel can be produced commercially from a variety of oils and fats:

- Animal fats: all the other variations of tallow, lard, hog fat, poultry fat and fish oils
- Vegetable oils: soy, corn, canola, sunflower, rapeseed, cottonseed, mustard, palm, coconut, peanut, olive, sesame, and safflower
- Recycled greases: used cooking oils, restaurant frying oils, grease trap materials, waste water treatment plant scum
- In the future: oils produced from algae, fungi, bacteria, molds, and yeast.

Chelsea Teall titrating feedstock samples from waste water treatment plant

The feedstocks which were collected and used for biodiesel feedstocks include:

A. Restaurant yellow grease from:
Spengers Seafood Restaurant in Berkeley
Pyramid Brewery in Berkeley
CAL student housing cafeterias
Mel's Diner
Berkeley Marina hotels and restaurants (3)
Stanford student housing cafeterias
San Jose restaurants (4)
San Jose Waste Water Treatment Plant

B. Renedering Companies:
Baker Commodities
National By-Products

C. No suitable dairy by-products were found. All samples were high in water, protein, and other unsaponifiables, and low in reactable triglycerides. As pat of this investigation it was found that many of the coproducts of biodiesel oil seed

extraction and biodiesel production may be used to supplement cattle feed. Both the meal of many oil seeds and glycerin may be used in such a manner.

D. Agriculture Products:
   Almond
   Apricot
   Beef Tallow
   Canola
   Castor
   Chicken Fat
   Cotton
   Fish Oil
   Grape
   Hog Fat
   Jatropha
   Mustard (2)
   Neem
   Pongamia
   Soy – crude & refined

Jatropha nursery in India

The suitability of each oil and fat was determined by first removing any excess water or particulates, then measuring the free fatty acid level. An appropriate formulation for the transesterification reaction was developed and small samples were reacted then tested. All samples were found to be capable of being transformed into biodiesel. The principal difference between the feedstocks was cost. Lower free fatty acid feedstocks that are edible tend to be higher in price, while higher free fatty acid inedible feedstocks tend to be lower in price. Couple this with the varied subsidy support which different feedstocks attract, and it becomes a complex calculus for the biodiesel producer to determine which feedstock is best for use at any particular time. Virgin agricultural products generally receive twice the amount of subsidy support as compared to recycled agricultural products under both the USDA Bioenergy Program, and the IRS Blenders Tax Credit. Although this result may seem counter intuitive to recycling advocates, it is a testimony to the lobbying power of the American farmer.

The complexity of choosing the right feedstock is important to the profitability of a biodiesel production facility. As an example (and these are somewhat arbitrary figures to illustrate a point), if soybean oil costs $2.50 per gallon delivered, has a subsidy value of $1.75, a processing cost of $.50, and a processing time of 8 hours, then the net cost would be $1.25, excluding capitalization and overhead. With a sales price of $2.25 for finished biodiesel and an annual capacity of 3,000,000 gallons, the plant would generate $3,000,000 in gross profits.

Compare this to a “free feedstock” such as waste water treatment scum which has a cost of $.00 per gallon delivered, a subsidy value of $.87, a processing cost of $1, and a processing time of 24 hours. The net cost of production would be $.13 per gallon, so

with a sales price of $2.25 the gross profit per gallon would be $2.12. Consider though that the same production facility would only be able to produce 1,000,000 gallons per year, with a resulting gross profit of $2,120,00. The conclusion then is that the waste water treatment scum would not be the best feedstock to use for optimizing profits under this scenario even though it is free.

The cultivation and harvesting of biodiesel feedstocks can have unexpected beneficial effects. The canola which was used in these tests was grown on test plots in the Central Valley where it was being used as part of a bioremediation project to remove excessive levels of selenium in the soil. The harvesting of castor beans can also be used to control an otherwise noxious invasive exotic species. Jatropha curcas is also being considered as a potential feedstock because it can be grown on non-irrigated waste land.

Insert #3 – Harvesting Castor Beans

Insert #4 – Field Testing Lab at Ecology Center

Task 3 – Feedstock Utilization

3. Quantify and describe the fate of the feedtock prior to the implementation of the pilot project and volume of biodiesel produced after implementation of the project, including any new waste streams and by-products created from the conversion process.

Restaurant fryer oil is collected by several companies for a fee to the restaurants and the primary market for the collected oil is in the animal feed market. The fryer oil is also collected on an ad hoc basis by small underground biodiesel producers that are neither permitted to collect or properly zoned for production. As the price of diesel fuel continues to rise there will be a greater incentive for biodiesel home brewers to collect used fryer oil from area restaurants, which could impact the availability of that feedstock for commercial production. Several accidents as a result of home brewing biodiesel were reported during the course of the study, including explosions of methanol vapors and the destruction of a garage and home by fire.

A substantial opportunity exists for cultivating non-irrigated farmland which is not currently being used to grow commercial crops. Several species of oil bearing seeds can be grown in Bay Area and surrounding counties. Work was undertaken to grow mustard, canola and jatropha and the results are still being evaluated. It was found that canola and mustard could be grown successfully on non-irrigated acreage and that the resulting oil was suitable for making biodiesel. An extrusion/expeller style system was used and the resulting crude oils were converted to biodiesel. At present there are hundreds of thousands of acres in Northern California that could be placed into production, with the resulting oils being used to generated biodiesel.

There were also several tests run

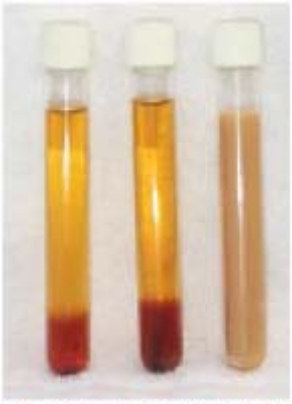
on extruding cottonseed, castor and "pumice" (grape skins and seeds left over from the wine crush). The problem with all of these materials is that there is little or no value to the meal. Traditional oil seeds such as soybeans or canola have a very high meal value, which coupled with the value of the oil, contributes to the "crush cost" and makes the entire enterprise economically viable. The Chicago Board of Trade maintains an "Agricultural Calculator" on its web site which is helpful in understanding the dynamic between meal and oil. Suffice it to say that extensive work still needs to be done to find uses for the meal portion of many biodiesel feedstocks which have been proposed.

Task 4 – Biodiesel Processing & Distribution

4. Describe the processing and conversion of the feedstock to Biodiesel and distribution into the fleet.

Compared to the chemistry of diesel fuel, which contains hundreds of compounds, the chemistry of different fats and oils typically used for biodiesel are very similar. Each fat or oil molecule is made up of a glycerin backbone of three carbons, and on each of these carbons is attached a long chain fatty acid. These long chain fatty acids are what react with methanol to make the methyl ester, or biodiesel. The glycerin backbone is turned into glycerin and sold as a byproduct of biodiesel manufacturing. The fats and oils listed above contain 10 common types of fatty acids which have between 12 and 22 carbons, with over 90% of them being between 16 and 18 carbons. Some of these fatty acid chains are saturated, while others are monounsaturated and others are polyunsaturated. Within the limits of the specifications, the differing levels of saturation can affect some of the biodiesel fuel properties.

Biodiesel was produced using a widely described and utilized formulation of using two base reactions of the feedstock with methanol and sodium hydroxide. The reactants are mixed, and the glycerol compounds are removed by decanting between reactions. The lighter portion of the separated liquid is then washed with water (to remove excess glycerin, methanol, soaps, and other water soluables), and a mild water acid solution to neutralize any excess sodium hydroxide. The liquid is then dried to remove excess water, filtered to remove particulates, and tested to assure conformance with ASTM 6751 (the recognized standard for biodiesel in the US).



Test Tube batches using waste fryer oil and various formulations, middle is "just right"

The chemical nature of biodiesel allows it to be blended with any kind of distillate, or diesel fuel. This includes light fuels such as jet fuel, kerosene, No.1 diesel, or military fuels (JP8, JP5), as well as normal diesel fuel like No. 2 diesel for diesel engines or gas turbines, and heating oil for boilers or home heating. Once biodiesel is blended thoroughly with diesel fuel, it stays together as one fuel and does not separate over time (assuming the fuel is maintained at temperatures above its cloud point). Once blended, B20 and lower blends should be treated exactly like conventional petrodiesel.

More recently, as demand increases, petroleum terminals and pipeline racks are installing biodiesel blending capability so that jobbers and distributors can receive a biodiesel blend directly at the rack and store and distribute only the blended biodiesel. This finished blend can then be sold to fleet or other applications that have some type of on-site storage. Even more recently, there are an increasing number of public pumps and key card pumps that are carrying biodiesel blends for individual users or fleets who do not have their own on-site storage capability (see Appendix D).

Insert 5 – Expeller/Extrusion Facility Photos

Red Rock Ranch 8/12/05
Testing the new oil seed
processing equipment

Task 5 – Biodiesel Standards & Additives

5. Identify the standards to which the biodiesel will be produced and describe any additives required to avoid problems with the use of Biodiesel.

ASTM International is a consensus based standards group comprised of engine and fuel injection equipment companies, fuel producers, and fuel users whose standards are recognized in the United States by most government entities, including states with the responsibility of insuring fuel quality. The specification for biodiesel (B100) is ASTM D6751. This specification is intended to insure the quality of biodiesel to be used as a blend stock at 20% and lower blend levels. Any biodiesel used in the United States for blending should meet ASTM D6751 standards.

Biodiesel is a legally registered fuel and fuel additive with the U.S. Environmental Protection Agency (EPA). The EPA registration includes all biodiesel meeting the ASTM International biodiesel specification, ASTM D 6751, and is not dependent upon the oil or fat used to produce the biodiesel or the specific process employed.

ASTM 6751 is the standard for Biodiesel in the US. The standard is as follows and compares to ASTM D975 for #2 petroleum diesel. Quality control is a major concern. BQ 9000 recognizes the "Big 5" as being the standard for commercial production. A field test kit has been developed by Randall Von Wedell of Cytoculture in Point Richmond, CA

As with other ASTM fuel standards, ASTM D6751 is based on the physical and chemical properties needed for safe and satisfactory diesel engine operation. It is not based on the specific raw materials or the manufacturing process used to produce the biodiesel. The finished blend stock must meet the properties specified in Insert #5 below as well as the following definition:

"Biodiesel, noun, a fuel comprised of mono-alkyl esters of long chain fatty acids derived from vegetable oils or animal fats, designated B100."

Insert #6 – ASTM Standard for Biodiesel

Requirements for Biodiesel (B100) Blend Stock as Listed in ASTM D6751-03

Property	ASTM	Limits	Units	Method
Flash Point	D93	130.0	min.	°C
Water and Sediment	D2709	0.050	max.	% vol.
Kinematic Viscosity, 40°C	D445	1.9 - 6.0		mm^2/s
Sulfated Ash	D874	0.020	max.	% mass
Sulfur *	D5453	0.0015	max. (S15)	% mass
		0.05	max. (S500)	
Copper Strip Corrosion	D130	No. 3	max.	
Cetane Number	D613	47	min.	
Cloud Point	D2500	Report to Customer		°C
Carbon Residue**	D4530	0.050	max.	% mass
Acid Number	D664	0.80	max.	mg KOH/g
Free Glycerin	D6584	0.020	max.	% mass
Total Glycerin	D6584	0.240	max.	% mass
Phosphorus Content	D4951	0.001	max.	% max.
Distillation Temperature, 90% Recovered (T90)***	D1160	360	max.	°C

* Sulfur content of on-road diesel fuel to be lowered to 15 ppm in 2006 ** Carbon residue shall be run on the 100% sample *** Atmospheric equivalent temperature

The definition of biodiesel contained in ASTM D 6751, along with the physical and chemical property limits, eliminates certain "biofuels" that have been incorrectly called biodiesel in the past. The raw vegetable oil or animal fat feedstock, partially reacted oils are not biodiesel and should not be confused as being biodiesel.

Raw or refined vegetable oil, or recycled greases that have not been processed into biodiesel, are not biodiesel and should be avoided. Research shows that vegetable oil or greases used in CI engines at levels as low as 10% to 20%, can cause long-term engine deposits, ring sticking, lube oil gelling, and other maintenance problems and can reduce engine life.

Insert #7 – Biodiesel Compared to #2 Diesel

Selected Properties of Typical No. 2 Diesel and Biodiesel Fuels.

Fuel Property	Diesel Fuel Standard ASTM D975	Biodiesel ASTM D6751
Lower Heating Value, Btu/gal	~129,050	~118,170
Kinematic Viscosity, @ 40°C	1.3-4.1	4.0-6.0
Specific Gravity kg/l @ 60°F	0.85	0.88
Density, lb/gal @ 15°C	7.079	7.328
Water and Sediment, vol%	0.05 max	0.05 max
Carbon, wt %	87	77
Hydrogen, wt %	13	12
Oxygen, by dif. Wt % Sulfur, wt %*	0 0.05 max	11 0.0 to 0.0024
Boiling Point, °C	180 to 340	315 to 350
Flash Point, °C	60 to 80	100 to 170
Cloud Point, °C	-15 to 5	-3 to 12
Pour Point, °C	-35 to -15	-15 to 10
Cetane Number	40-55	48-65

Lubricity SLBOCLE, grams 2000-5000 >7,000
Lubricity HFRR, microns 300-600 <300
*Sulfur content for on-road fuel will be lowered to 15 ppm maximum in 2006

Currently there are ASTM specifications for B100 (D6751) and for petrodiesel (D975), but there is not a separate approved specification for biodiesel blends. Current practice to insure the quality of biodiesel blends is to use petrodiesel (No. 1 or No. 2) meeting D975 and biodiesel meeting D6751 prior to blending. Once blended, it is very difficult to determine the quality of the B100 used to make the blend. ASTM specifications for finished biodiesel blends up to B20 are under development, so please check with ASTM or the National Biodiesel Board (NBB) for updated information.

ADDITIVES - Additives are necessary for the control of stability, cold flow, microbial growth, water dispersion, and NOx reduction.

1. Stability - Few users have reported stability problems with B20 or B100 in the United States, but stability is a major issue for engine and fuel system manufacturers. Stability is a broad term, but really refers to two issues for fuels: long-term storage stability or aging and stability at elevated temperatures and/or pressures as the fuel is recirculated through an engine's fuel system. In the diesel fuel arena, long-term storage stability is commonly referred to as oxidative stability, and thermal stability is the common term for the stability of fuels at elevated fuel system temperatures. At this time there are no ASTM specifications for the stability of either diesel or biodiesel.

In biodiesel, fuel aging and oxidation can lead to high acid numbers, high viscosity, and the formation of gums and sediments that clog filters. If the acid number, viscosity, or sediment measurements exceed the limits in ASTM D6751, the B100 is degraded to the point where it is out of specification and should not be used. Biodiesel with high oxidation stability will take longer to reach an out of specification condition, while biodiesel with low oxidation stability will take less time in storage to reach an out of specification condition. Monitoring the acid number and viscosity of B100 over time can provide some idea about whether the fuel is oxidizing, with sampling at the receipt of the B100 and periodically during storage providing the most useful data.

There is not a lot of experience with B100 storage for periods greater than six months, so if the fuel is kept longer than six months, anti-oxidants should be used and/or periodic tests for acid number and sediments, and perhaps viscosity, should be performed to insure that the fuel remains within the boundaries of ASTM D6751.

As of this date there is a growing database available on B20 but more data is needed to accurately predict the impact of biodiesel on blend oxidative and thermal stability. Data includes results of the ASTM D4625 stability test for several B20 fuels. Compared to the B100 data on the same fuels, it appears that B20 may have a longer storage life than B100. Those data also show that some B20 can have good stability and others do not depending on the B100 used for blending. The D4625 data suggests that most B20 can be stored for 8 to 12 months. The National Biodiesel Board recommends that B20 be used within 6 months. This is comparable to the recommendations of petrodiesel suppliers, some of whom recommend petrodiesel be used within 3-4 months.

Adding antioxidants and/or stability additives is recommended for storage over longer periods.

Thermal stability is generally meant to be an indicator of fuel degradation when subjected to high temperatures for a short period of time, similar to what would be experienced in the fuel injector or fuel system of a modern diesel engine. If the fuel degrades here, the primary concern is the potential for injector coking. The data available regarding thermal stability generally show that B100 has good thermal stability. This makes some sense, as saturated vegetable oils and animal fats are used as frying oils and are subjected to extremely hot temperatures for relatively long periods of time. In addition, most reports from the field have indicated that biodiesel produces less injector coking that conventional diesel fuel, but much of this information is anecdotal.

In some cases, deposits from the cleaning effect or solvency of B100 have been confused with gums and sediments that could form over time in storage as the fuel ages. While sediment can clog a filter in either case, care should be taken to make sure the reason for the clogging is properly identified. For example, if the acid number of the fuel is within specification, then sediment formation is most likely due to the cleaning affect and not to fuel aging or oxidation.

2. Cold Flow - The cloud point of B100 starts at 30°F to 32°F for most of the vegetable oils that are made up primarily of mono- or poly-unsaturated fatty acid chains and can go as high as 80°F or higher for animal fats or frying oils that are highly saturated. Some examples of the cloud, pour, and cold filter plug point of B100 made from various sources can be found in Insert #8. It should be noted that the pour point of B100 is usually only a few degrees lower than the cloud point, so once biodiesel "begins to freeze," gelling can proceed rapidly if the temperature drops only a few degrees further.

Insert #8 - Cold Flow Data for Various B100 Fuels

Test Method	Cloud Point ASTM D2500		Pour Point ASTM D97		Cold Filter Plug Point ASTM D4539	
B100 Fuel	^{o}F	^{o}C	^{o}F	^{o}C	^{o}F	^{o}C
Soy Methyl Ester	36	2	30	-1	28	-2
Canola Methyl Ester	27	-3	25	-4	25	-4
Lard Methyl Ester	57	14	52	11	52	11
Edible Tallow Methyl Ester	68	20	55	13	57	14
Inedible Tallow Methyl Ester	73	23	46	8	50	10
Yellow Grease 1 Methyl Ester	108	42	54	12	52	11
Yellow Grease 2 Methyl Ester	46	8	46	8	34	1

3. MICROBIAL GROWTH - Biocides are recommended for conventional and biodiesel fuels wherever biological growth in the fuel has been a problem. If biological contamination is a problem, water contamination needs to be controlled with a water dipersant since the aerobic fungus, bacteria, and yeast hydrocarbon utilizing microorganisms (HUMBUGS) usually grow at the fuel-water interface. Anaerobic colonies, usually sulfur reducing, can be active in sediments on tank surfaces and cause corrosion. Since the biocides work where the HUMBUGS live (in the water), products that are used with diesel fuels will work equally well with biodiesel.

Task 6 – Distribute Biodiesel

6. *Distribute a blend of 2% (B2), 5% (B5), 20% (B20), and 100% (B100) Biodiesel to petroleum diesel in no less than two heavy-duty fleet types. Possible fleet types include garbage trucks, school buses, transit buses, shuttles and agricultural equipment. At a minimum, CONTRACTOR, shall contact the fleet managers for the following entities to invite their participation in the pilot project: City of Palo Alto and Sonoma County solid waste hauling contractors, East Side Union High School District, Clos Du Bois and Benziger wineries, Clover Stornetts Farms, San Francisco MUNI and Petaluma Transit, Ecology Center, Albertson's, San Francisco International Airport Land Side Operation and Emery Go-Round Shuttle.*

All listed fleets were contacted by Bob Brown at Western States Oil and the following fleets agreed to participate in the pilot project:

Benziger Winery, Glen Ellen, CA
Ecology Center, Berkeley, CA
Peninsula Sanitation Service, Palo Alto, CA
Rental Car Shuttle, Oakland, CA

Western States Oil blended the biodiesel provided by Biodiesel Industries with petroleum and an additive to make B20, which was then delivered to the fleet either by WSO or one of its sub distributors. In the case of Benziger the B20 was delivered by Royal Petroleum and in the case of the Rental Car Shuttle the B20 was delivered by Easy Fuel. Tailpipe emission testing was performed on a selection of vehicles in each fleet prior to the use of the B20. Testing was repeated once biodiesel use was initiated. Surveys were administered after biodiesel had been used by the fleets for some period of time. Because B20 is the most widely used blend of biodiesel and because of the need to test a larger number of vehicles than specified in order to get a more significant sampling, it was decided to limit the testing to B20 compared to petroleum diesel, but to do this in a larger number of vehicles than specified.

Biodiesel was also distributed by other sub-distributors of Western States Oil, but because of their wish to maintain the confidentiality of their client's identities,

these distributors declined to participate. From confidential interviews with these and other distributors, it is estimated that about 3,000,000 gallons of biodiesel was distributed in the Bay Area this past year.

There are now also several biodiesel retail stations in the Bay Area, including locations in Berkeley, San Jose and Vallejo (see Appendix D). Updated information of biodiesel retail stations can be obtained at www.biodiesel.org.

There are several small biodiesel coops that are producing small amounts of biodiesel. The bulk of the biodiesel consumed in the Bay Area is produced outside of the area. There was a biodiesel production facility in Vallejo, but it has now shut down. There is a new 2.5 million gallon per year facility that is rumored to be opening late this year in Richmond. Several other groups are also investigating potential biodiesel plant locations in the Bay Area.

Task 7 – Educate Fleet Managers

7. Provide appropriate guidance to fleet users for safe and efficient conversion from petroleum diesel to Biodiesel use.

Each fleet manager was instructed in the use and implementation of biodiesel as set forth in the U.S. Department of Energy, National Renewable Energy Laboratory's publication Biodiesel Handling and Use Guidelines, available at http://www.nrel.gov/vehiclesandfuels/npbf/pdfs/tp36182.pdf. The principal points that were emphasized were:

1. When the biodiesel is delivered retain a sample in a labeled container. This "retain" will provide a reference point if there are any problems later found with the fuel. This is common practice in the petroleum industry.
2. Examine the biodiesel for clarity. It should appear clear and bright. 10 point type should be readable through a pint jar at 70 degrees Fahrenheit. Cloudiness is an indication of pour fuel quality and/or moisture.
3. Obtain a Certificate of Analysis from the supplier indicating that the fuel meets ASTM 6751 standards.
4. Confirm with the supplier that proper additives for microbial growth, stability, water dispersion and cold flow have been added.
5. Have the storage tanks in which the Biodiesel is to be stored examined for water, particulate and microbial contamination prior to use. If there is a problem, it must be alleviated prior to storing biodiesel.
6. Keep an eye on vehicle fuel filters when first using Biodiesel. Filters may need changing after the first couple of tanks of biodiesel because the Biodiesel acts as a solvent to remove varnishes, gums and other contaminants that may be present in the vehicle fuel system.
7. Wipe any biodiesel spills on the vehicle off with soap and water. Biodiesel is a solvent and will discolor or even blister painted surfaces if allowed to sit for an extended period of time.

8. If the Biodiesel is to be stored for an extended period of time, have it tested every three months for its acid number. A rising acid number is an indication of deteriorating fuel quality.

9. Monitor rubber fuel lines and leaks. Some older materials may not be compatible with higher concentrations of Biodiesel. Fuel lines that become sticky and soft to the touch need to be replaced.

10. A test kit is now available for testing Biodiesel for commonly found problems in fuel which is off specification. The kit is not a substitute for full ASTM 6751 testing, but it is a good firewall for preventing problems with off spec biodiesel in the field.

Task 8 – Fleet Survey

8. Administer a DISTRICT-approved survey to the fleet operators that will provide a detailed description of the fleet of vehicles using the Biodiesel, average volume of diesel fuel use prior to the pilot project and after implementation of the pilot project, and their experience with the conversion of their fleet from petroleum diesel to a Biodiesel blend.

The survey results for the following fleets are contained in Appendix B and summarized below:

Benziger Family Winery

1883 London Ranch Road
Glen Ellen, CA 95442
Contact: Matt Atkinson 707-486-3906
Vehicle #1: 1987 Massey-Ferguson 375 4WD, Perkins LD 31140,
VIN: A40258
Vehicle #2: 1987 Massey-Ferguson 375 4WD, Perkins LD 31140,
VIN: D12103

Observations: Same or possible improvement in mileage. No change of power, noise, smoothness, engine starting, or performance. Appears to be less exhaust smoke. Service differences unknown at this time. Would be willing to use biodiesel if it was the same price as petroleum diesel. "As stated in our environmental policy we are committed to identifying and promoting the most environmentally safe and sustainable business and farming practices. We are very interested in the possibility of using components of our waste stream in the production of biodiesel."

Car Rental Shuttle

1029 Wright Street
Oakland, CA 94621
Contact: Abdul Khan, 510-382-2140
Vehicle # 8102: 1981 RTS/GMC, Detroit6V92,
VIN#1GOYT82JOBV811198, 99,131 miles
Vehicle # 8128: 1981 RTS/GMC, Detroit6V92,

VIN# 1GOYT82JXBV810754, 176,353 miles
Vehicle # 8142: 1981 RTS/GMC, Detroit6V92,
VIN# 1GOYT82JXBV810771, 622,349
Vehicle # 8145: 1981 RTS/GMC, Detroit6V92,
VIN# 1GOYP82J2BV810795, 241,649

Observations: No change in mileage, power, engine noise or maintenance. Checking on engine smoothness and starting. No Comments from drivers or fleet managers. They would use biodiesel if was the same price or $.10 a gallon more than petroleum diesel because it is the right thing to do and it is required by the Port of Oakland and the Rental Car Committee.

Ecology Center

1231 Second Street
Berkeley, CA 94710
Contact: Dave Williamson 510-406-9347, Daniel Maher 510-527-1585
Vehicle # 560: 1993 Lodal SA-3070, Cummins BT5.9, 150,000 miles

Observations: 17% reduction in mileage for B100 and no discernable decrease for B20. No change in power or noise. Exhaust was noticeably cleaner. 85% decrease in opacity readings with B100. Significantly smoother. Engine starting with B100 in cooler weather require a short warm up time in the morning. Other than that there are not problems. No service differences if tanks are cleaned at the beginning, otherwise fuel filter changes may be necessary. The change to biodiesel was completely transparent to the drivers. Fleet manager feels that the most important thing is to properly manage the logistics tails by having clean tanks, filling the vehicles every night to reduce potential water condensations, use a biocide to manage microbial growth, and possibly change fuel lines with B100. Would use biodiesel if it were the same price as petroleum diesel. Compared to other alternative fuels it is the least expensive. Most people compare the price to petroleum disel and if it were the same price they would use it. The fleet manager would be willing to pay $.50 to $1 more for biodiesel. It is especially cost effective, given its benefits, in low mileage urban setting when compared to CNG or exhaust treatment devices. Prolonged use of B100 can affect electronic control sensors. Retains of each load delivered should be kept for quality control purposes. Fleet manager would like to see 5% biodiesel in all ULSD in California, and incentives for using B100 in low mileage urban applications such a garbage trucks, street sweepers, school buses, transit buses and construction equipment.

Peninsula Sanitation Service

339 Bonair Siding
Stanford, CA 93405
Contact: Thomas Ott, 650-321-4236
Vehicle # 4: 1999 Volvo M11, Cummins engine 34912154 (4/98),
VIN# 4VMDCMPE7XN766178, 239,387 miles
Vehicle # 31: 2000 Volvo, Cummins ISM 34997181 (3/00),
VIN# 4V2DC2UE6YN258318, 93,936 miles
Vehicle # 32: 2001 Volvo, Cummins ISM engine 34998178 (3/00)

VIN# 4V2DC6UE11N258529, 101,629 miles

Observations: The fleet manager did not tell his drivers or mechanics when he first introduced biodiesel so there would be a blind test. There were not driver comments, however one of the mechanics commented that the fuel looked different. Other than that there were no comments about noise, power, visual exhaust, starting, service differences or mileage. They would use biodiesel if I was the same price as petroleum. All things being equal they feel that it is an environmental feather in their cap. They would prefer to use biodiesel instead of the existing exhaust treatment retrofits which are costing them $10,000-$12,000 per truck. Their recommendation is to use biodiesel and let the OEM's incorporate the exhaust treatment devices on the new trucks. They would not use biodiesel if it were more expensive than biodiesel or was an alternative to the exhaust treatment device retrofit program. The fleet manager did indicate that he personally would use biodiesel even if it was slightly more expensive.

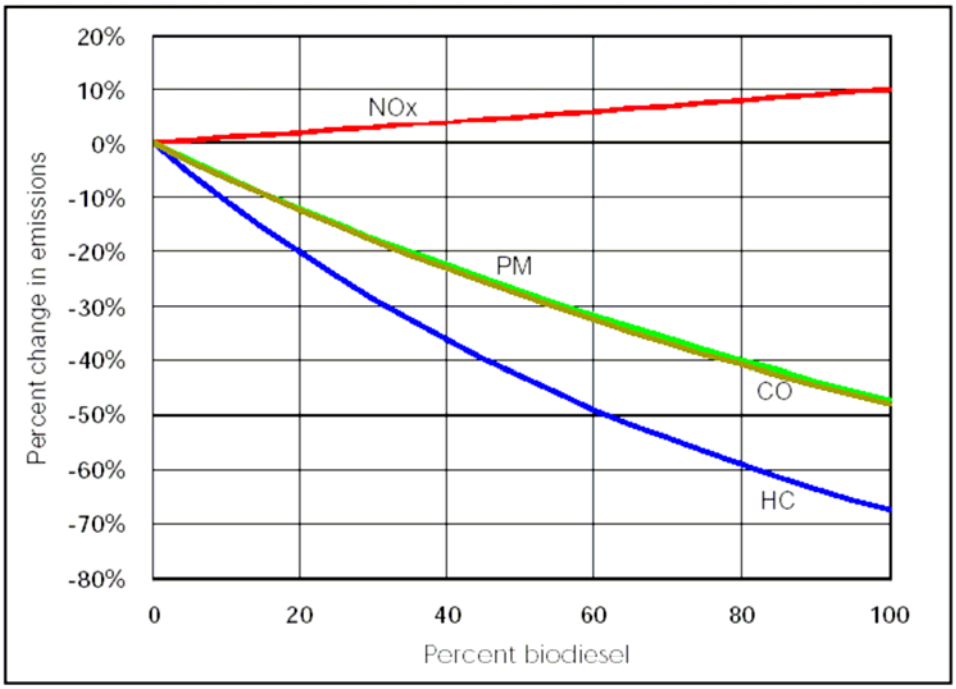
Task 9 – Emission Testing

9. Test, analyze, evaluate and compare the air emissions resulting from the use of the four different pilot project blends with petroleum diesel. Proivde emission test data for NOx and PM for at least five representative vehicles from each of the two selected test fleets from item 6 above.

Three series of emission test were conducted as part of this study. They were (1) Tailpipe Emissions in selected Bay Area fleets, (2) Engine dynamometer testing at the Combustion Analysis Laboratory at the University of California at Berkeley, and (3) engine dynamometer testing at Olson Ecologic Labs in Arcadia, California. Prior to reviewing the findings of these three tests it is important to understand the results of emission research that has already been conducted. The USEPA has compiled and summarized the most credible biodiesel emission research in a report available at www.biodieselindustries.com.

Biodiesel reduces tailpipe particulate matter (PM), hydrocarbon (HC), and carbon monoxide (CO) emissions from most modern four-stroke CI engines. These benefits occur because the fuel (B100) contains 11% oxygen by weight. The presence of fuel oxygen allows the fuel to burn more completely, so fewer unburned fuel emissions result. This same phenomenon reduces air toxics, because the air toxics are associated with the unburned or partially burned HC and PM emissions. Testing has shown that PM, HC, and CO reductions are somewhat independent of the feedstock used to make biodiesel. The EPA reviewed 80 biodiesel emission tests on CI engines and has concluded that the benefits are real and predictable over a wide range of biodiesel blends (Insert#8). For the full report see www.biodieselindustries.com.

Insert #9 – Biodiesel Emissions from USEPA



Biodiesel has also been shown to increase nitrogen oxide (NO_x) emissions in many engines. Biodiesel does not contain nitrogen so the increasing NO_x phenomenon is not related to fuel nitrogen content. NO_x is created in the engine as the nitrogen in the intake air reacts at the high in-cylinder combustion temperatures. As with petroleum based diesel fuel, the exact composition of the biodiesel can also influence NO_x emissions. Data shows NO_x variability between the various biodiesel meeting ASTM D6751 of around 15%, with soybean oil based biodiesel producing the highest NO_x increase. This is similar to the variability observed for conventional diesel fuels spanning the range of the ASTM diesel fuel specifications (ASTM D975).

Dr. Robert McCormick of the US Department of Energy's National Rebewable Energy Laboratory recently completed a study which brings into questions the commonly held belief that biodiesel blends inevitably cause an increase in NOx (http://www.nrel.gov/vehiclesandfuels/npbf/pdfs/38296.pdf). Dr. McCormick reported a 5% decrease in NOx on a series of transit buses tested on NREL's chassis dynamometer. He suspects that the results demonstrate some inherent differences between testing diesel engines on different sorts of dynamometers. A chassis dynamometer tests an entire vehicle with the engine and drive train in place, whereas an engine dynamometer just tests the engine. The USEPA requires that a chassis dynamometer be used to test gasoline vehicles, but allows an engine dynamometer to be used for diesels because of the large number of vehicle drive trains and bodies that the engines can be place in. Generally the chassis dynamometer is believed to give results that are more indicative the emission profile

a vehicle will experience in the real world. It is possible that biodiesel may not in fact cause an increase in NOx when measured on more accurate emission testing equipment. As Dr. McCormick indicates in the conclusion of his study, more study is needed.

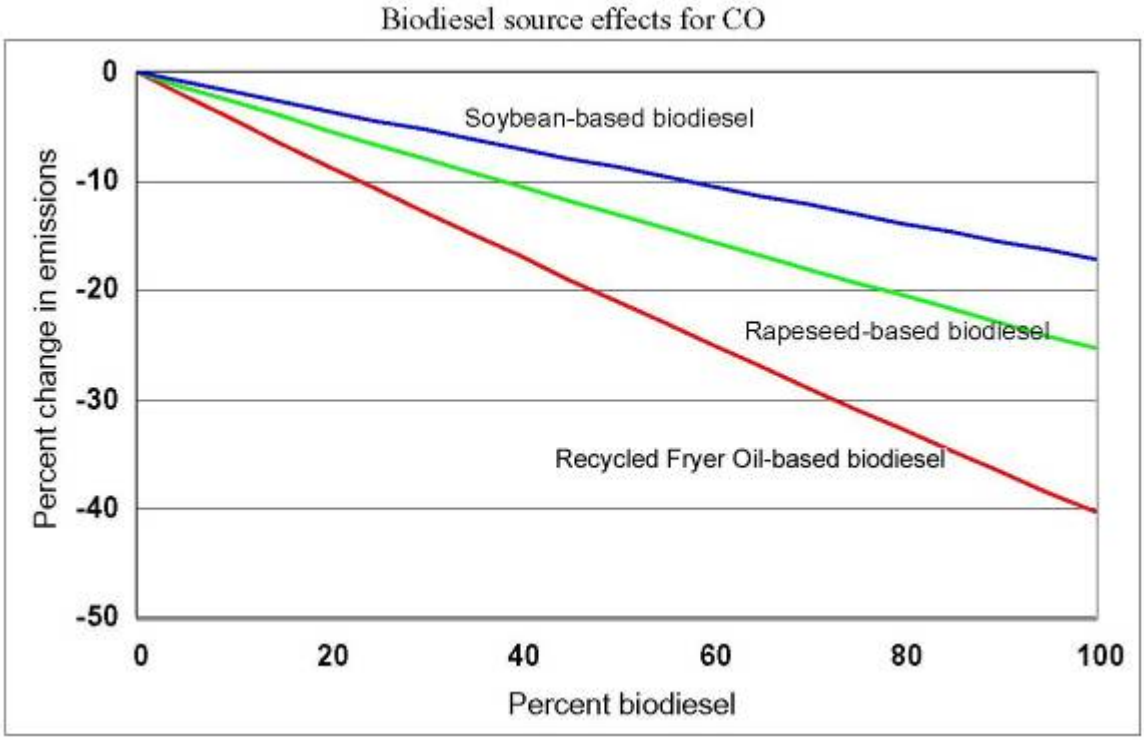
There are also significant questions raised about the emphasis placed upon controlling NOx as opposed to other criteria pollutants. It is generally accepted that NOx and hydrocarbons are the precursors to ozone and other photochemical smog. However recent studies have reported that on weekends in certain air basins when NOx emissions are lower, ozone levels increase, the so called "weekend effect." This unexpected result brings into question the conventional wisdom that NOx is the delimiting factor as an ozone precursor. In fact it may be the balance of ozone coupled with hydrocarbons that is the true culprit. This issue is hotly debated and the jury is still out as to the verdict.

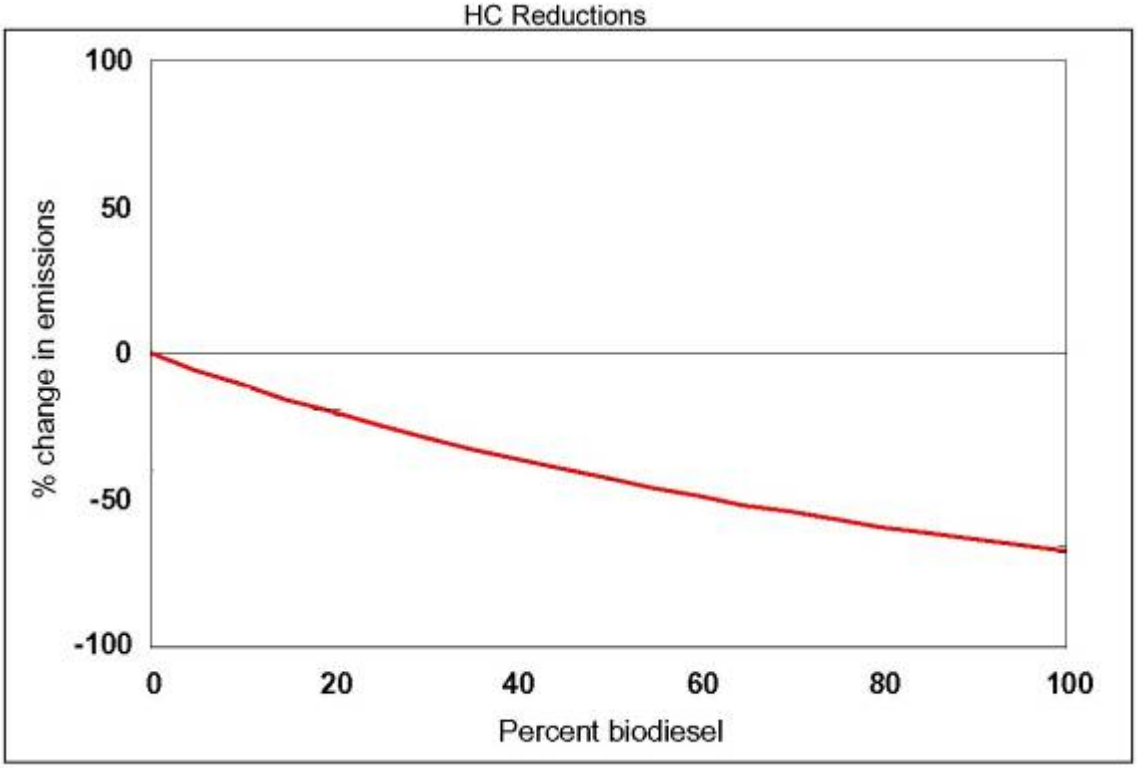
The conclusion then is that the assumption that biodiesel blends result in a NOx increase is in question, and that the benefits of reducing NOx may need to be balanced against the cumulative reductions of multiple criteria pollutants.

THE EFFECT OF FEEDSTOCK VARIATIONS ON EMISSIONS - As with petroleum-based fuels, the ASTM specifications for biodiesel allow for a variety of feedstocks and processes to be used to produce biodiesel. The specifications prescribe the amount of acceptable variability in the finished product. This variability is a compromise between maximizing the amount of fuel available for use and minimizing cost, while providing a minimum satisfactory level of engine performance.

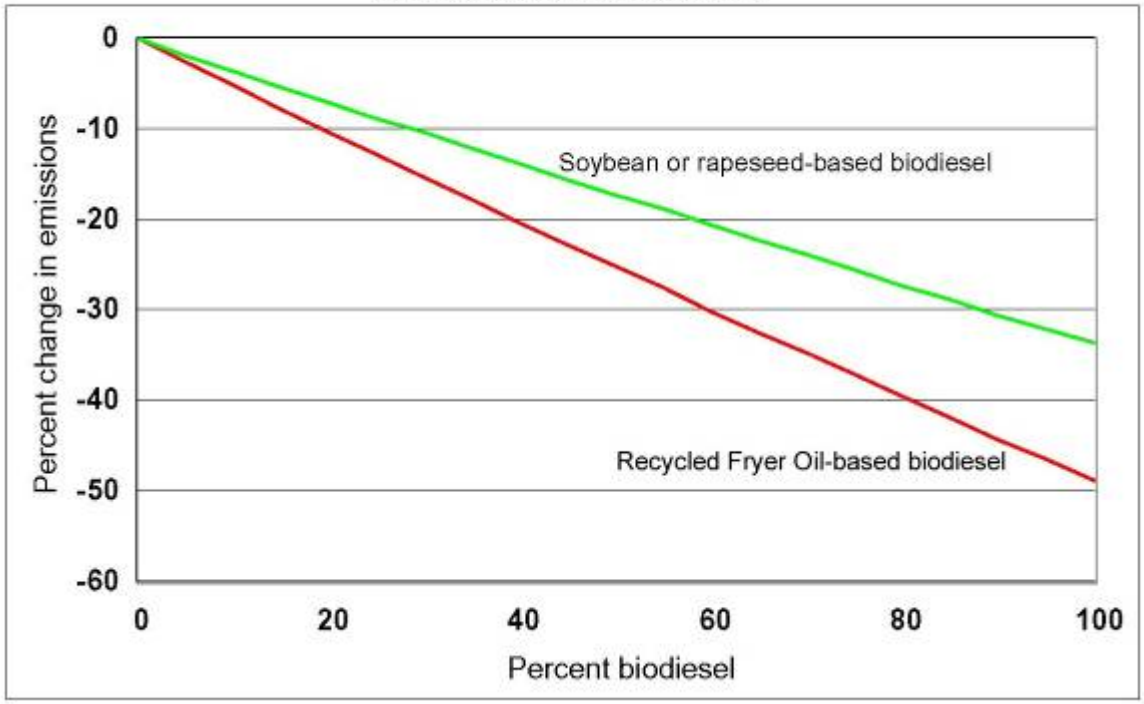
Since biodiesel is produced mainly as a whole cut fuel, where the goal is to take all of the vegetable oil or animal fat and turn it into biodiesel, some of the properties of finished biodiesel depend heavily on the feedstock. These properties can include cetane, cold flow, bulk modulus (compressibility and possibly the NOx effect), and stability. In addition, testing has shown that differing biodiesel properties can also lead to different levels of NOx emissions, although this does not appear to be the case with other regulated emissions (HC, CO, PM) or unregulated emissions (PAH, NPAH) or with open flame combustion in boilers or home heating applications. The following tables show the effects of feedstocks on emissions according to the USEPA (www.biodieselindustries.com):

Insert #10 – Biodiesel Emissions Based Upon Feedstock

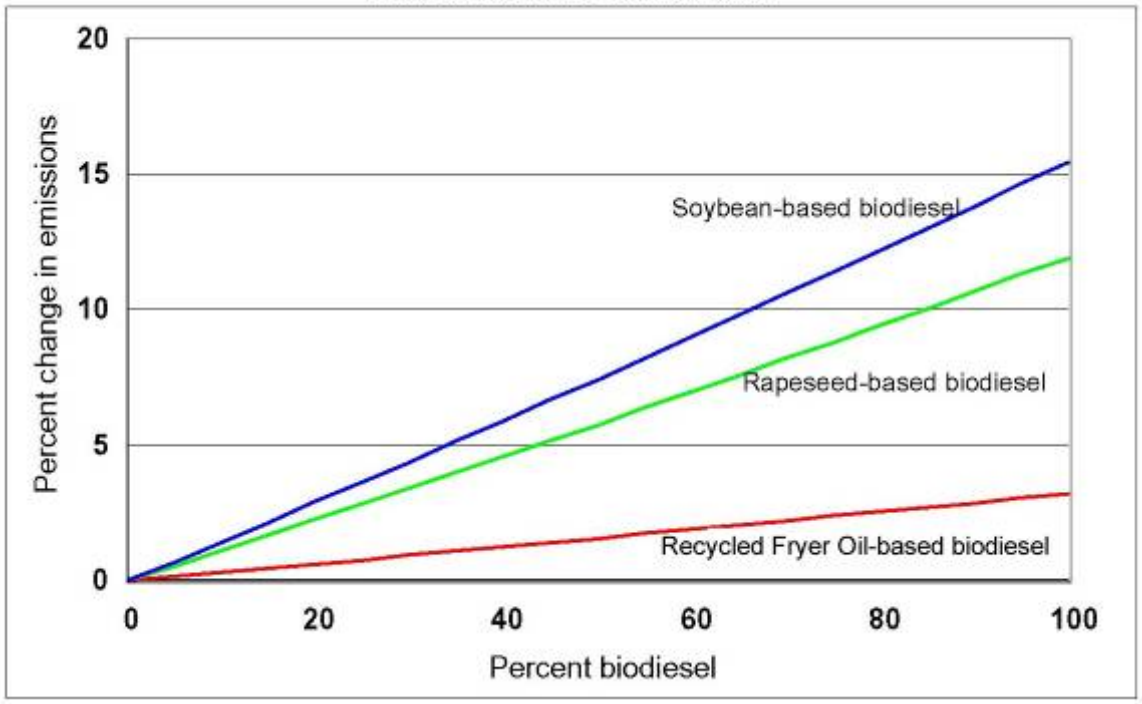




Biodiesel source effects for PM



Biodiesel source effects for NOx



It has been suggested in a study by Dr. McCormick that the difference in the emission characteristics is due to the saturation levels of the oils or fats that are used

to make biodiesel. The more saturated feedstocks, such as recycled fryer oil and animal fat, have a higher cetane level and better emission profiles.

The following tests were run on a variety of feedstocks to test the emissions of different biodiesel blends and NOx reduction strategies.

1. Tailpipe Emission Testing

Tailpipe emission testing is generally conceded to be one of the least accurate methods of testing emissions because of the high degree of variability caused by uncontrollable variables such as climatic conditions. By testing a larger number of vehicles, some of this variability can be averaged out. The test parameters in the contract called for five vehicles, but nine were selected to increase the reliability of the consolidated data.

The emission testing equipment was obtained from Clean Air Instruments, and was a CARB and USEPA approved device, a Testo 350 M/XL. The device was calibrated before the tests were begun and was purged between tests on each vehicle. Protocols established for the device were followed to allow for readings to stabilize before they were recorded.

The reference fuel used in each test varied, but in each case was the petroleum diesel being used by the fleet. This ranged from off road diesel in the case of Benziger Winery, to CARB low sulfur diesel for the Car Rental Shuttle and Ecology Center, to CARB ultra low sulfur diesel for Peninsula Sanitation. The candidate fuel was B20, a 20% blend of biodiesel made from recycled fryer oil, with 80% of the reference petroleum diesel, and a NOx reduction additive. The tests were performed over a two week period from September 2-14, 2005 at approximately the same time of day for the vehicle being tested. The following results were observed and recorded (Insert #11). The actual printed readings can be found in Appendix A.

Insert #11 – Tailpipe Emission Testing Results

Tailpipe Emission Testing:
CARB Diesel vs. 20% Blend of Biodiesel with Additive

	Vehice	Type/ID#	Model	Fuel	RPM	CO*	HC*	Nox*	Total %
Benziger Winery		Tractor	Perkins						
Glen Ellen, CA	1	#1		Diesel	Idle	410	1970	128	
					High	746	470	168	
				B20+**	Idle	291	270	112	
					High	465	230	111	
	2	#2		Diesel	Idle	214	770	300	
					High	357	330	270	
				B20+	Idle	189	220	267	
					High	287	140	245	
	Total Diesel					1727	3540	866	
	Total B20+					1232	860	735	
	Change					-495	-2680	-131	
								-	-
	Percentage Change					-28.7%	-75.7%	15.1%	119.5%

	Vehice	Type/#ID	Model	Fuel	RPM	CO*	HC*	Nox*	Total %
Car Rental Shuttle		Shuttle Bus							
Oakland, CA	1	#8102		Diesel	Idle	68	380	127	
					High	122	570	97	
				B20+	Idle	63	180	117	
					High	145	530	88	
	2	#8128		Diesel	Idle	98	240	168	
					High	90	300	139	
				B20+	Idle	76	200	165	
					High	116	410	112	
	3	#8142		Diesel	Idle	92	280	159	
					High	163	310	105	
				B20+	Idle	80	280	149	
					High	130	490	99	
	Total Diesel					633	2080	795	
	Total B20+					610	2090	730	
	Change					-23	10	-65	
	Percentage Change					-3.6%	0.5%	-8.2%	-11.3%

	Vehice	Type/#ID	Model	Fuel	RPM	CO*	HC*	Nox*	Total %
Ecology Center		Garbage Truck							
Berkeley, CA	1	#560		Diesel	Idle	192	2180	317	
					High	338	2050	206	
				B20+	Idle	157	130	300	
					High	326	230	197	
	Total Diesel					530	4230	523	
	Total B20+					483	360	497	
	Change					-47	-3870	-26	
	Percentage Change					-8.9%	-91.5%	-5.0%	-105.3%

	Vehice	Type/#ID	Model	Fuel	RPM	CO*	HC*	Nox*	Total %
Peninsula Sanaitation		Garbage Truck							
Palo Alto, CA	1	#4		Diesel	Idle	70	130	357	
					High	190	230	221	
				B20+	Idle	86	0	328	
					High	256	0	240	
	2	#31		Diesel	Idle	69	310	263	
					High	140	340	246	
				B20+	Idle	69	280	345	
					High	141	140	240	
	3	#32		Diesel	Idle	73	1200	294	
					High	159	1390	253	
				B20+	Idle	65	530	243	
					High	130	810	233	
	Total Diesel					701	3600	1634	
	Total B20+					747	1760	1629	
	Change					46	-1840	-5	
	Percentage Change					6.6%	-51.1%	-0.3%	-44.9%

TOTALS									
	Total Diesel					3591	13450	3818	
	Total B20+					3072	5070	3591	
	Change					-519	-8380	-227	
	Average Percentage Change					**-14.5%**	**-62.3%**	**-5.9%**	**-82.7%**

*Parts per million

**Blend of 20% biodiesel, 80% diesel fuel used by fleet, and additive

These results show that B20 with a NOx reduction additive can reduce cumulative emissions by almost 83%, and NOx emissions by almost 6%.

2. Combustion Analysis Laboratory Testing – Engine Dynamometer

As mentioned earlier, tailpipe emission testing has certain inherent limitations and it was decided in consultation with BAAQMD staff that engine dynamometer testing would also be undertaken. Arrangements were made to have testing done under the direction of Professor Robert Dibble at the Combustion Analysis Laboratory at the University of California at Berkeley. Professor Dibble, with the support of some of his graduate students, ran the testing protocols on a Cummins 5.9 liter diesel installed at the Combustion Analysis Laboratory during the summer of 2004.

The reference diesel fuel used for the tests was CARB ultra low sulfur diesel (ULSD) procured from the British Petroleum distributor in San Jose, Western States Oil. The biodiesel used was made using the Mini Modular Production Unit from feedstocks acquired in the Bay Area consisting of virgin refined soybean oil and used fryer oil. These two types of biodiesel were selected because research published by the USEPA suggests that NOx emissions would be highest with soy based biodiesel and lowest with used fryer oil based biodiesel. Various blends of biodiesel and ULSD were tested, including 100% ULSD, 20% biodiesel with 80% ULSD, and 100% biodiesel. Additional tests were run to test the effects of an additive and a fuel/lubricating oil filtration system. The results are tabulated in the following table (Insert #10):

Insert #10 – Combustion Analysis Laboratory Test Results

Run	Reference Fuels-Run in 5.9L, 6 Cylinder, Cummins	Blend	Fuel Filter	Additive	Additive Concentration	Speed (RPM)	Load (%)	HC (ppm)	HC (%)	CO (ppm)	CO (%)	PM (filters) (mg/m^3)	PM (%)	Nox (ppm)	Nox (%)	Total (%)
1	CARB ULS Diesel	N/A	No	No	N/A	1800	80	16.2	0.0%	42.8	0.0%	3.0	0.0%	636	0.0%	0.0%
2	Biodiesel Produced from Aggregate Used Vegetable Oil	B20	No	No	N/A	1800	80	12.8	-21.0%	39.2	-8.4%	2.7	-10.0%	646	1.6%	-37.8%
3	Biodiesel Produced from Virgin Soy Oil	B100	No	No	N/A	1800	80	10.0	-38.3%	36.3	-15.2%	2.3	-23.3%	720	13.2%	-63.6%
4	Biodiesel Produced from Virgin Soy Oil	B20	No	No	N/A	1800	80	10.8	-33.3%	37.9	-11.4%	1.9	-36.7%	645	1.4%	-80.0%
5	Biodiesel Produced from Aggregate Used Vegetable Oil	B100	No	No	N/A	1800	80	7.7	-52.5%	33.3	-22.2%	2.2	-26.7%	656	3.1%	-98.3%
6	Biodiesel Produced from Virgin Soy Oil	B20	No	Yes	1:2000	1800	80	11.8	-27.2%	41.9	-2.1%	1.9	-36.7%	576	-9.4%	-75.4%
7	Biodiesel Produced from Aggregate Used Vegetable Oil	B20	No	Yes	1:2000	1800	80	10.6	-34.6%	38.9	-9.1%	2.0	-33.3%	559	-12.1%	-89.1%
8	CARB ULS Diesel	N/A	No	Yes	1:2000	1800	80	7.4	-54.3%	37.0	-13.6%	1.9	-36.7%	632	-0.6%	-105.2%
9	CARB ULS Diesel	N/A	Yes	No	N/A	1800	80	12.2	-24.7%	39.2	-8.4%	2.5	-26.7%	510	-19.8%	-79.6%
10	Biodiesel Produced from Aggregate Used Vegetable Oil	B20	Yes	No	N/A	1800	80	11.1	-31.5%	35.1	-18.0%	1.6	-46.7%	530	-16.7%	-112.9%
11	Biodiesel Produced from Virgin Soy Oil	B20	Yes	No	N/A	1800	80	12.8	-21.0%	40.9	-4.4%	1.5	-50.0%	528	-17.0%	-92.4%
12	Biodiesel Produced from Virgin Soy Oil	B100	Yes	No	N/A	1800	80	8.4	-48.1%	34.5	-19.4%	1.7	-43.3%	591	-7.1%	-117.9%
13	Biodiesel Produced from Aggregate Used Vegetable Oil	B100	Yes	No	N/A	1800	80	6.8	-58.0%	31.7	-25.9%	2.1	-30.0%	601	-5.5%	-119.4%
14	Biodiesel Produced from Aggregate Used Vegetable Oil	B20	Yes	Yes	1:2000	1800	80	9.8	-39.5%	39.0	-8.9%	1.7	-43.3%	515	-19.0%	-110.7%
15	Biodiesel Produced from Virgin Soy Oil	B20	Yes	Yes	1:2000	1800	80	9.0	-44.4%	37.1	-13.3%	1.8	-40.0%	505	-20.6%	-118.3%
16	Biodiesel Produced from Aggregate Used Vegetable Oil	B100	No	Yes	1:2000	1800	80	7.7	-52.5%	27.7	-35.3%	1.9	-36.7%	560	-11.9%	-136.4%
17	Biodiesel Produced from Virgin Soy Oil	B100	No	Yes	1:2000	1800	80	7.9	-53.3%	32.5	-24.1%	1.8	-40.0%	563	-11.5%	-128.8%
18	Biodiesel Produced from Virgin Soy Oil	B100	No	Yes	1:1000	1800	80	6.6	-59.3%	31.7	-25.9%	2.2	-26.7%	610	-4.1%	-115.9%
19	Biodiesel Produced from Aggregate Used Vegetable Oil	B100	No	Yes	1:1000	1800	80	6.4	-60.5%	30.7	-28.3%	1.9	-36.7%	550	-13.5%	-139.0%
20	Biodiesel Produced from Aggregate Used Vegetable Oil	B100	No	Yes	1:4000	1800	80	5.3	-67.3%	32.4	-24.3%	2.0	-33.3%	554	-12.9%	-137.8%
21	Biodiesel Produced from Virgin Soy Oil	B100	No	Yes	1:4000	1800	80	5.2	-67.9%	32.1	-25.0%	1.8	-40.0%	559	-12.1%	-145.0%

There are several interesting results to note on this tabulation of results:

1. There were substantial cumulative emissions reduction benefits from all blends of biodiesel regardless of feedstock as high as 145%.

2. There were substantial NOx reductions using the additive with all biodiesel blends as high as 20.6%, and these same reductions were not observed when using the additive with CARB ULSD.

3. There were substantial emission reductions in all categories using the fuel/lube oil filter.

3. Olson-Ecologic Labs

This testing was performed by Olson-Ecologic Labs in Arcadia California in conformance with CARB and Texas Council of Environmental Quality Standards. The reference fuel was a low NOx, low aromatic TXLED diesel fuel (Texas Low Emission Diesel) that conformed to current low sulfur diesel standards. The candidate fuel was a 20% blend of biodiesel derived from crude cotton seed oil, 80% diesel fuel and an additive. The results showed almost a 3% reduction in NOx and led to Biodiesel Industries biodiesel blend being certified as the first and only low NOx certified biodiesel blend in Texas. Further testing is being conducted both privately and in conjunction with the National Biodiesel Board to have a low NOx biodiesel blend certified in California.

The final report from Olson-Ecologic Labs which documents the emission testing project conducted is attached as Appendix E. This project had the objective of showing emission equivalency between a B20 diesel candidate fuel treated with the proprietary polymer additive and the TXLED reference specification fuel when tested by the official EPA transient cycle emission test protocol. This project has been done in accordance with the detailed protocol and requirements specified by the Texas Commission for Environmental Quality in Austin, Texas.

Olson-Ecologic as an independent emission test laboratory is an ISO 2001:9000 registered facility. It is officially recognized and listed by EPA and CARB as a capable emission test facility for the protocols conducted in this project. All engine operation and transient cycle emission testing for this project was conducted on the Olson-EcoLogic 450 horsepower electric dynamometer.

The primary objective of this project was to demonstrate equivalency (or better) when comparing the B20 candidate fuel with additive treatment to the TXLED baseline reference fuel under identical test conditions, especially for NOx , PM and fuel consumption. Comparing the average of nine emission tests operating with the B20 candidate fuel with additive treatment to the average of six emission tests with the TXLED reference fuel resulted in the following comparisons and improvements for NOx, PM and Fuel Economy.

TxLed Reference fuel (six tests)

Grams per bhp-hr		lb per bhp-hr
NOx	PM	Fuel
5.040	0.213	0.3782

B20 Candidate Fuel with additive treatment (9 tests)

NOx	PM	Fuel
4.915	0.171	0.3634

Improvement with the B20 candidate fuel with additive treatment

NOx	PM	Fuel
2.5%	19.7%	3.9%

Discussion of Results:

The data in this report clearly indicate the statistical equivalency (or better) of the additive treated candidate fuel compared to the TXLED reference fuel. The statistical treatment of the average data (shown in the above summary) include the standard deviation and the +/- 95% confidence limits around the mean (or average) values for each set of data. The data variance from test to test was within the acceptable CFR standards for the test protocol and the regression coefficients for all tests were well within the CFR specified limits.

Insert #12 – TXLED Certification

Texas Low Emission Diesel Fuel (TxLED) Alternative Diesel Fuel Formulation Approval Notification

The alternative diesel fuel formulation listed herein has been demonstrated to the satisfaction of the executive director of the Texas Commission on Environmental Quality in accordance with the regulations specified under Title 30, Texas Administrative Code, Chapter 114, Subchapter H, Division 2, §114.315(c) to achieve comparable or better reductions in emissions of NOx, THC, NMHC, and PM to that of Texas Low Emission Diesel Fuel (TxLED). Therefore, the alternative diesel fuel formulation listed herein complies with the requirments specified under Title 30, Texas Administrative Code, Chapter 114, Subchapter H, Division 2, §114.312(f) and may be used to satisfy the requirements of §114.312(a) of this title.

Approval Date:	September 1, 2005
TCEQ Assigned Identification Number:	TXLED-A-00004
Approved alternative diesel fuel formulation:	Biodiesel Industries' B20 blend treated with [redacted] diesel fuel additive at a rate of 1 ounce to 20 gallons of B20 diesel fuel.
EPA Registration Number and Name:	"6228-123-11 Biodiesel B100 Methyl Esters"as registered by Biodiesel Industries, Inc. [redacted] - Not subject to EPA registration requirements.
Additive Identity:	Biodiesel Industries, Inc. B100 biodiesel. [redacted] This additive is a proprietary formulation [redacted]
Additive Minimum Concentration / Treatment Rate:	20% by volume Biodiesel Industries' B100 biodiesel per gallon of diesel fuel and 1 ounce of [redacted] additive per 20 gallons of blended B20 diesel fuel.
Base Diesel Fuel Specifications:	All base petroleum diesel fuels to be used for blending Biodiesel Industries' B20 diesel fuel must comply with the following specifications: • Any Grade No. 1-D or No. 2-D diesel fuel in compliance with ASTM D975-04c (Standard Specification for Diesel Fuel Oils) or current active version of ASTM D975, except for lubricity, may be used as the base fuel for blending this formulation.

4. NONREGULATED EMISSIONS

A. Greenhouse Gases (GHG) - Governor Scharzeneger recently signed Executive Order S-3-05 which establishes GHG reduction targets and charges the California Environmental Protection Agency Secretary, Alan Lloyd, with the coordination of the oversight of efforts to achieve them. The Secretary was directed to coordinate development and implementation of strategies to achieve the GHG reduction targets in conjunction with the secretary of Business, Transportation and Housing Agency, the secretary of the Department of Food and Agriculture, the secretary of the Resources Agency, the chairperson of the Air Resources Board, the chairperson of the Energy Commission and the president of the Public Utilities Commission.

According to the Governor, "California will continue to be a leader in the fight against global warming and protecting our environment. Today I am establishing clear and ambitious targets to reduce greenhouse gas emissions in our state to protect our many natural resources, public health, agriculture and diverse landscape. By working together we can meet the needs of both our economy and environment. Together we can continue California's environmental heritage and legacy of leadership in innovation in cutting-edge technology."

The targets the Governor announced call for a reduction of GHG emissions to 2000 levels by 2010; a reduction of GHG emissions to 1990 levels by 2020; and a reduction of GHG emissions to 80% below 1990 levels by 2050.

As acknowledged by Catherine Witherspoon at a recent California Air Resources Board meeting, biodiesel may play a significant role in achieving the Governor's GHG reduction targets. When biodiesel displaces petroleum, it reduces global warming gas emissions such as carbon dioxide (CO_2). When plants like soybeans grow they take CO_2 from the air to make the stems, roots, leaves, and seeds (soybeans). After the oil is extracted from the soybeans, it is converted into biodiesel and when burned produces CO_2 and other emissions, which return to the atmosphere. This cycle does not add to the net CO_2 concentration in the air because the next soybean crop will reuse the CO_2 in order to grow.

A complete lifecycle analysis performed by the National Renewable Energy laboratory reported that when fossil fuels are burned 100% of the CO_2 released adds to the CO_2 concentration levels in the air. Because fossil fuels are used to produce biodiesel, the recycling of CO_2 with biodiesel is not 100%, but substituting biodiesel for petroleum diesel reduces life-cycle CO_2 emissions by 78%. B20 reduces CO_2 by 15.66% (www.biodieselindustries.com).

B. Toxicity - Some PM and HC emissions from diesel fuel combustion are toxic or are suspected of causing cancer and other life threatening illnesses.

Using B100 can eliminate as much as 90% of these "air toxics." B20 reduces air toxics by 20% to 40%. The effects of biodiesel on air toxics are supported by numerous studies, starting with the former Bureau of Mines Center for Diesel Research at the University of Minnesota. The Department of Energy (DOE) conducted similar research through the University of Idaho, Southwest Research Institute, and the Montana Department of Environmental Quality. The National Biodiesel Board conducted Tier I and Tier II Health Effects Studies that also support these claims (www.biodieselindustries.com).

C. Sulfur - By 2006, all U.S. highway diesel will contain less than 15 ppm sulfur—ultra low sulfur diesel fuel (ULSD). Currently highway diesel contains 500 ppm sulfur (or less). Biodiesel typically contains less than 15 parts per million (ppm) sulfur (sometimes as low as zero). Some biodiesel produced today may exceed 15 ppm sulfur, and those producers will be required to reduce those levels by 2006 if the biodiesel is sold into on-road markets.

In the on-road market, low-level blends of biodiesel such as 1% or 2% can improve lubricity of diesel fuels and this may be particularly important for ULSD as these fuels can have poor lubricating properties. Engine manufacturers depend on lubricity to keep moving parts, especially fuel pumps, from wearing prematurely. Even 2% biodiesel can restore adequate lubricity to dry fuels such as kerosene or Fischer-Tropsch diesel.

SUMMARY – All three emission tests documented significant cumulative and NOx specific emission reductions using various blends of biodiesel with a NOx reduction additive.

Task 10 – Cost Analysis

10. Analyze the cost of implementing the pilot project, including permitting and regulatory costs, developing infrastructure for the conversion of feedstocks to Biodiesel, disbursing the fuel, retrofit of vehicles, period of cost recovery and any other costs associated with developing the project.

The following scenarios illustrate some of the economics of biodisel production. The most significant factos include feedstock costs, labor, alcohol, and regulatory compliance. Finding a market for the glycerin produced and having an effective methanol recovery system can help mitigate costs.

SMALL PLANT ECONOMICS
WITH FULL REGULATORY COMPLIANCE

Capacity	100 gallons per shift in 8 hours 100,000 gallons per year in 8,000 hours
Production Equipment	$50,000
Vapor Recovery	$15,000
Truck & containers for oil collection	$50,000
Permitting	
EPA-NBB	$1,500
USDA – Bioenergy	$500
IRS Blender of Record	$1,600
CA Franchise Tax	$1,600
CA Department of Ag	$500
City	$1,500
Fire	$1,500
Air Management District	$1,500
Water discharge	$1,500
Electrical compliance	$3,000
Fire Safety	$1,000
OSHA Compliance	$3,000
HAZMAT containment	$1,600
CAPITAL COST	**$135,300**
Site Lease in proper zone	$12,000
Liability Insurance	$8,000
Vehicle maint, fuel, insurance	$12,000
General Administrative	$25,000
Utilities	$2,400
ANNUAL OPS COST	**$59,400**
Labor 8 hours @ $20 per hour	$160
Feedstock @ $.25 per gallon	$35

Methanol 25 gallons@ $2	$50
Sodium Hydroxide	$10
Additives	$3
Transportation @ $.10	$10
Testing $250 per 1,000 gal	$25
PRODUCTION COST p/gal	**$2.93**
ANNUAL OPS p/gal	**$.60**
CAP COST	**$.16**
TOTAL COST PER GALLON	**$3.69**
TOTAL ANNUAL COSTS	**$369,000**

REVENUE	
Biodiesel sales @ $2.70	$270,000
Glycerin sales @ $1	$11,000
CCC Bioenergy @ $.40	$40,000
Blender's Credit @ $.50 x 40%	$20,000
TOTAL REVENUE	**$347,000**
NET PROFIT	**-$22,000**

SMALL PLANT ECONOMICS
WITHOUT REGULATORY COMPLIANCE

It is very difficult to make a profit with a small Biodiesel production unit and still be in compliance with all regulatory, safety, environmental and quality control concerns. This explains why many small producers choose to ignore these issues, and perform all of the labor themselves for "free" so there is an apparent return at the end of the year.

Capacity	100 gallons per shift in 8 hours 25,000 gallons per year in 2,000 hours

Production Equipment	$5,000
Truck and containers	$10,000
CAPITAL COST	**$15,000**

Vehicle maint, fuel, insurance	$12,000
Utilities	$600
ANNUAL OPS COST	**$12,600**

Feedstock @ $.25 per gallon	$35
Methanol 25 gallons@ $2	$50
Sodium Hydroxide	$10
Transportation @ $.10	$10

PRODUCTION COST p/gal	**$1.05**
ANNUAL OPS p/gal	**$.13**
CAP COST	**$.02**
TOTAL COST PER GALLON	**$1.20**
TOTAL ANNUAL COSTS	**$30,000**

REVENUE	
Biodiesel sales @ $2.50	$62,500
Glycerin sales @ $1	$11,000
TOTAL REVENUE	**$73,500**

NET PROFIT **$43,000**

As with many activities, by ignoring regulatory, safety, environmental and quality requirements the underground Biodiesel producer can make a personal profit.

LARGE SCALE COMMERICAL PLANT ECONOMICS

Legitimate larger scale biodiesel production facilities can afford to maintain a quality control laboratory on site, and comply with all regulatory, safety and environmental standards. There are also economies of scale in terms of purchasing raw materials and the cost of labor per gallon.

Capacity	7,500 gallons per shift in 8 hours 6,000,000 gallons per year in 8,000 hours
Production Equipment	$6,000,000
Vapor Recovery	$150,000
Oil extraction system for virgin veg oil	$6,000,000
Trucks and containers for grease collection	$750,000
Permitting	
EPA-NBB	$7,500
USDA – Bioenergy	$1,500
IRS Blender of Record	$2,600
CA Franchise Tax	$2,600
CA Department of Ag	$1,500
City	$2,500
Fire	$2,500
Air Management District	$3,500
Water discharge	$3,500
Electrical compliance	$10,000
Fire Safety	$20,000
OSHA Compliance	$20,000
HAZMAT containment	$50,000
CAPITAL COST	**$13,027,700**

Site Lease in proper zone	$120,000
Liability Insurance	$80,000
General Administrative	$200,000
Advertising & marketing	$500,000
Customer support	$250,000
Utilities	$24,000
ANNUAL OPS COST	**$1,174,000**

For 7,500 gallons	per shift	per gallon
Labor 2 x 8 hours @ $25 per hour	$400	
Supervisory & lab time	$250	
TOTAL LABOR		$.09
Feedstock 20% @ $.25 p/gal		
80% @ $2.00 p/gal		
With 90% yield = $1.84	$13,750	$1.84
Methanol gallons@ $1.40	$1,575	$.21
Sodium Hydroxide	$750	$.10
Additives	$225	$.03
Transportation @ $.10	$750	$.10
	$17,700	$2.36

TOTAL COSTS	per year	per gallon
PRODUCTION COSTS	**$14,160,000**	**$2.36**
ANNUAAL OPS p/gal	**$1,174,000**	**$.20**
CAP COST	**$1,302,770**	**$.22**
TOTAL COSTS	**$16,636,770**	**$2.78**

TOTAL REVENUES	
Biodiesel sales @ $2.70	$16,200,000
Glycerin sales @ $.50	$330,000
CCC Bioenergy @ $.40	$2,400,000
Blender's Credit @ $.90 x 20%	$1,800,000
TOTAL REVENUE	**$20,010,000**

NET PROFIT	**$3,373 230**
Without government subsidies	**-$826,770**

From this analysis it can be seen that the single largest cost in making biodiesel is the cost of feedstocks. For Biodiesel to be competitive with petroleum diesel without government subsidies either the cost of petroleum diesel has to go up, or less expensive feedstock sources need to be found and developed.

Task 11 – Life Cycle Analysis of Biodiesel

11. Provide a quantitative comparison of the "cradle-to-grave" environmental impacts of the Biodiesel project with a no-project case.

A complete analysis was conducted as part of an Environmental Assessment under the National Environmental Policy Act for a biodiesel production facility located at Naval Base Ventura County. The result of the study was a "FONSI" or Finding of No Significant Impact. The no action alternative was weighted in light of the benefits of local biodiesel production. There is also an extensive biodiesel life cycle analysis conducted by the National Renewable Energy Laboratory. Both the Environmental Assessment and Life Cycle Analysis are available at http://biodieselindustries.com.

Task 12 – Write Final Report

12. Submit to DISTRICT a Report responding to the Scope of Work items 1 through 11 above.

This is the Final Report required under this task. Additional information may be obtained from the following sources:

Biodiesel Industries web site as an extensive amount of information and research reports at http://biodieselindustries.com.

The National Biodiesel Board has compiled an impressive library of online documents located at http://www.biodiesel.org/resources/reportsdatabase/.

The U.S. Department of Energy has some technical documents located at http://www.eere.energy.gov/biomass/document_database.html and with significant additional data at http://www.nrel.gov.

The EPA has reviewed many emission reports and has summarized them at http://www.epa.gov/OMS/models/biodsl.htm.

Iowa State University has an online tutorial on biodiesel at http://www.me.iastate.edu/biodiesel/Pages/biodiesel1.html.

Department of Defense A-A-59693A Biodiesel Commercial Item Description (CID) is located at http://assist.daps.dla.mil/docimages/0004/29/73/AA59693.PD0 in PDF format.

Conclusions

In conclusion, the prospect for implementing biodiesel production utilizing local resources is very good for the Bay Area. Objections based upon biodiesel NOx increases are being addressed with new NOx reduction strategies and new test protocols and results. The price of biodiesel is becoming more competitive with petroleum diesel as the result of increased petroleum prices and new federal subsidies for biodiesel.

Several small scale production facilities have already emerged in the Bay Area, and the distribution and use of biodiesel has accelerated widely over the past two years. Regulatory restrictions on the use of biodiesel have loosened somewhat because of the recognition of biodiesel's role in reducing greenhouse gases and as a renewable supplement to the fragile productive capacity of California's petroleum refineries.

Given these conditions, the production and use of biodiesel should increase in the Bay Area in the coming years.

APPENDIX A – Tailpipe Emission Results
1. Benziger Winery

Asset	#202740	#202740	#202740	#202740	#202740	#202740	#202740	#202740
Instrument	Testo t350 XL	Testo t350 XL	Testo t350 XL	Testo t350 XL	Testo t350 XL	Testo t350 XL	Testo t350 XL	Testo t350 XL
SN	00708752 /USA	00708752 /USA	00708752 /USA	00708752 /USA	00708752 /USA	00708752 /USA	00708752 /USA	00708752 /USA
NONAME	Benziger #1	Benziger #1	Benziger #2	Benziger #2	Benziger #1	Benziger #1	Benziger #2	Benziger #2
Date	09/01/05	09/12/05	09/01/05	09/12/05	09/01/05	09/12/05	09/01/05	09/12/05
Time	13:31:58	12:10:33	14:00:50	12:00:10	13:44:57	12:20:28	14:08:38	11:59:21
	IDLE – 700RPM	700RPM IDLE B20	RPM 700	RPM IDLE B20	RPM 1700	RPM 1700 B20	RPM 1700	B20 1700RPM
Fuel	Fueloil #2	Fueloil #2	Fueloil #2	Fueloil #2	Fueloil #2	Fueloil #2	Fueloil #2	Fueloil #2
% Oxygen	17.51	18.36	17.68	18.05	15.58	18.68	15.25	16.55
ppm CO	410	291	214	189	746	465	357	287
ppm CxHy	1970	270	770	220	470	230	330	140
ppm NO	80	74	241	210	142	86	243	178
ppm NO2	48.1	37.9	58.4	57.3	26.7	25.3	26.9	67.2
ppm NOx	128	112	300	267	168	111	270	245
ppm SO2	11	14	12	17	0	2	0	17
°F Ta	74.6	68.1	80.9	61.9	77.6	68.0	79.4	58.8
°F Tf	246.2	265.4	243.8	281.4	497.3	308.0	522.6	374.4
% CO2	2.57	1.93	2.44	2.17	4.02	1.70	4.27	3.29
V Batt.	8.9	9.3	9.1	9.2	8.9	9.3	9.0	9.2
l/m Pump	0.88	0.78	0.86	0.79	0.88	0.77	0.80	0.86
% Efficiency	75.9	66.5	75.9	66.7	65.7	56.0	65.8	68.1
% Excess air	444.2	607.9	472.1	587.5	258.8	693.6	239.8	333.3

APPENDIX A – Tailpipe Emission Results
2. Car Rental Shuttle

APPENDIX A – Tailpipe Emission Results
3. Ecology Center

APPENDIX A – Tailpipe Emission Results
4. Peninsula Sanitation Service

APPENDIX B – Fleet Surveys
1. Benziger Winery (a)

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BIODIESEL INDUSTRIES INC.
PRODUCTION • TECHNOLOGY • DEVELOPMENT

Thank you for participating in this demonstration and evaluation program of biodiesel being conducted by Biodiesel Industries and Western States Oil in conjunction with the Bay Area Air Quality Management District. For each participating vehicle please complete the following information. If you have any questions you may contact:

Joe Steinberger, Bay Area Air Quality Management District, 415-749-5018,
Russell Teall, Biodiesel Industries, 805-683-8103, or,
Bob Brown, Western States Oil, 408-351-2328

Fleet Owner Name: Benziger Family Winery
Address: 1883 London Ranch Rd
Glen Ellen, CA. 95442
Fleet Manager Name: Matt Atkinson Phone Number (707) 486-3906
Vehicle Make: Massey-Ferguson Model: 375 4WD VIN: D12103
Engine Make: Perkins Model: 4D 31140 Age: 1987
U6753O6A
Beginning Test Date: _____ Odometer Mileage: NA
Ending Test Date: _____ Odometer Mileage: NA
Please provide any emission test data gathered on a separate sheet: Yes _____ No _____
Indicate any change in mileage: Same or possible improvement
Indicate any change in power: None noticed
Indicate any change in noise: None
Indicate any change in visual exhaust: Appears to be less exhaust smoke
Indicate any change in engine smoothness: None noticed
Indicate any change in engine starting: None
Indicate any service differences: unknown at this time

APPENDIX B – Fleet Surveys
1. Benziger Winery (b)

BIODIESEL INDUSTRIES INC.
PRODUCTION • TECHNOLOGY • DEVELOPMENT

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Address: 1883 London Ranch Rd
Glen Ellen, CA. 95442
Fleet Manager Name: Matt Atkinson Phone Number: (707) 486-3906
Vehicle Make: Massey-Ferguson Model: 375 4WD VIN: A40258
Engine Make: Perkins Model: LD31140 Age: 1987
U533565W
Beginning Test Date: _____ Odometer Mileage: NA
Ending Test Date: _____ Odometer Mileage: NA
Please provide any emission test data gathered on a separate sheet: Yes_____ No_____
Indicate any change in mileage: _____
Indicate any change in power: _____
Indicate any change in noise: _____
Indicate any change in visual exhaust: _____
Indicate any change in engine smoothness: _____
Indicate any change in engine starting: _____
Indicate any service differences: _____

APPENDIX B – Fleet Surveys
1. Benziger Winery (c)

09/18/2005 22:48 7079354049 BENZIGER WINERY PAGE 03

Indicate any driver comments: No difference in performance overall has been observed at this time. Fuel has only been in use for one week.

Indicate any fleet manager comments: : Too early in test to determine any changes

Would you be willing to use Biodiesel if it were the same price as petroleum diesel? Yes

Why/why not? : As stated in our environmental policy we are committed to identifying and promoting the most environmentally safe and sustainable business and farming practices.

Would you be willing to use Biodiesel if it were $.10 per gallon more expensive than petroleum diesel? Yes

Why/why not? : for the same reason as above

Any other comments about biodiesel fuel? : We are very interested in the possibility of using components of our waste stream in the production of biodiesel.

When completed please fax to:
Russell Teall 805-[redacted]
456-2192

APPENDIX B – Fleet Surveys
2. Car Rental Shuttle (a)

BIODIESEL INDUSTRIES INC.
PRODUCTION • TECHNOLOGY • DEVELOPMENT

Thank you for participating in this demonstration and evaluation program of biodiesel being conducted by Biodiesel Industries and Western States Oil in conjunction with the Bay Area Air Quality Management District. For each participating vehicle please complete the following information. If you have any questions you may contact:

Joe Steinberger, Bay Area Air Quality Management District, 415-749-5018,
Russell Teall, Biodiesel Industries, 805-683-8103, or,
Bob Brown, Western States Oil, 408-351-2328

Fleet Owner Name: Car Rental Center

Address: 1029 Wright Street
Oakland, CA 94621

Fleet Manager Name: Abdul Khan Phone Number: 510-382-2140

Vehicle Make: GMC Model: RTS VIN: NOTED for all 4

Engine Make: Detroit Model: 6V92 Age: 1981

Beginning Test Date: 9/12 Odometer Mileage: 600-700K

Ending Test Date: 9/13 Odometer Mileage:

Please provide any emission test data gathered on a separate sheet: Yes_____ No_____

Indicate any change in mileage: Nothing yet

Indicate any change in power: NO

Indicate any change in noise: NO

Indicate any change in visual exhaust: Yes

Indicate any change in engine smoothness: ?

Indicate any change in engine starting: ?

Indicate any service differences: Same

APPENDIX B – Fleet Surveys
2. Car Rental Shuttle (b)

Indicate any driver comments: NO

Indicate any fleet manager comments: : NO

Would you be willing to use Biodiesel if it were the same price as petroleum diesel? YES

Why/why not? : RIGHT Thing to do

Would you be willing to use Biodiesel if it were $.10 per gallon more expensive than petroleum diesel? YES

Why/why not? : Port of Oakland requires it
Rental Car Committee

Any other comments about biodiesel fuel? : NO

When completed please fax to:
Russell Teall 805-~~456-9808~~
456-2182

APPENDIX B – Fleet Surveys
3. Ecology Center (a)

BIODIESEL INDUSTRIES INC.
PRODUCTION • TECHNOLOGY • DEVELOPMENT

Thank you for participating in this demonstration and evaluation program of biodiesel being conducted by Biodiesel Industries and Western States Oil in conjunction with the Bay Area Air Quality Management District. For each participating vehicle please complete the following information. If you have any questions you may contact:

Joe Steinberger, Bay Area Air Quality Management District, 415-749-5018,
Russell Teall, Biodiesel Industries, 805-683-8103, or,
Bob Brown, Western States Oil, 408-351-2328

Fleet Owner Name: Ecology Center

Address: 1231 2nd Street

Berkeley, CA 94710 Sarah 527-5555

Fleet Manager Name: Dave Williamson / Daniel Maher 510-527-1585 Phone Number:

Vehicle Make: Lodal Model: SA-3070 VIN:

Engine Make: Cummins Model: B5.9 Age: 1993

Beginning Test Date: Odometer Mileage: 150,000

Ending Test Date: Odometer Mileage:

Please provide any emission test data gathered on a separate sheet: Yes ✓ No

Indicate any change in mileage: yes, 17% decrease w/ B100, B20 No discernable decrease

Indicate any change in power: none

Indicate any change in noise: none

Indicate any change in visual exhaust: Biodiesel is substantially clean than DINO. DIESEL, 85% decrease in opacity w/ B100

Indicate any change in engine smoothness: significantly smoother

Indicate any change in engine starting: in cooler temps B100 engines start warmer than other than that none

Indicate any service differences: none, if individual fuels tank clean, otherwise change of fuel filter needed

APPENDIX B – Fleet Surveys
3. Ecology Center (b)

Indicate any driver comments: Completely transparent to drivers

Indicate any fleet manager comments: : most important thing is to manage logistics well - clean tanks, fill every night, change fuel lines, use biocide,

Would you be willing to use Biodiesel if it were the same price as petroleum diesel? Yes

Why/why not? : Compared to other alt fuels it is the least expensive, most people compare it to petro & if it were the same price most people would use it

Would you be willing to use Biodiesel if it were $.10 per gallon more expensive than petroleum diesel? yes

Why/why not? : would pay $.50 /gal max, Biodiesel is cost effective, especially low mileage given benefits in urban areas, less expensive than CNG or Exhaust treated

Any other comments about biodiesel fuel? : prolonged use of B100 can effect electronic control sensors. Retains of each load needed & inspection of fuel would like to see a requirement that all ULSD have 5% Biodiesel in CA. Encourage more B100 in low milage high populated areas, garbage, street sweepers, school buses, transit buses & construction equipment

When completed please fax to:
Russell Teall 805-~~456-8008~~ 456-2182

APPENDIX B – Fleet Surveys
4. Peninsula Sanitation Service (a)

BIODIESEL INDUSTRIES INC.
PRODUCTION • TECHNOLOGY • DEVELOPMENT

Thank you for participating in this demonstration and evaluation program of biodiesel being conducted by Biodiesel Industries and Western States Oil in conjunction with the Bay Area Air Quality Management District. For each participating vehicle please complete the following information. If you have any questions you may contact:

Joe Steinberger, Bay Area Air Quality Management District, 415-749-5018,
Russell Teall, Biodiesel Industries, 805-683-8103, or,
Bob Brown, Western States Oil, 408-351-2328

Fleet Owner Name: Peninsula Sanitation Service

Address: 339 Bonair Siding
Stanford, CA 93405

Fleet Manager Name: Tom Ott Phone Number: 650-321-4236

Vehicle Make: #1, 31+32 Model: See report VIN:

Engine Make: Model: Age:

Beginning Test Date: Odometer Mileage:

Ending Test Date: Odometer Mileage:

Please provide any emission test data gathered on a separate sheet: Yes_____ No_____

Indicate any change in mileage: not yet

Indicate any change in power: NO, only mechanic noticed, blind #31

Indicate any change in noise: NO

Indicate any change in visual exhaust: NO

Indicate any change in engine smoothness: NO

Indicate any change in engine starting: NO

Indicate any service differences: NO

APPENDIX B – Fleet Surveys
4. Peninsula Sanitation Service (b)

Indicate any driver comments: NO

Indicate any fleet manager comments: : NO,

Would you be willing to use Biodiesel if it were the same price as petroleum diesel? ~~YES~~

Why/why not? : all things being equal, environmental feather in our cap, bio fuel instead of retrofits, Let OEM's do changes $10-12K per truck

Would you be willing to use Biodiesel if it were $.10 per gallon more expensive than petroleum diesel? NO

Why/why not? : would personally, but company would not unless the exhaust treatment device no blames

Any other comments about biodiesel fuel? : worthwhile, retro fits to trucks are expensive + impacts on bottom line

TOM O @ PSSI. STANFORD. EDU

When completed please fax to:
Russell Teall 805-~~466-8008~~ 456-2182

APPENDIX C – CA GHG Reduction Targets

OFFICE OF THE GOVERNOR

Governor Schwarzenegger Establishes Green House Gas Emission Reduction Targets

Governor Arnold Schwarzenegger today announced greenhouse gas (GHG) emission reduction targets for California at the United Nations World Environment Day in San Francisco. The Governor signed Executive Order S-3-05 which establishes these GHG targets and charges the California Environmental Protection Agency secretary with the coordination of the oversight of efforts to achieve them.

"California will continue to be a leader in the fight against global warming and protecting our environment. Today I am establishing clear and ambitious targets to reduce greenhouse gas emissions in our state to protect our many natural resources, public health, agriculture and diverse landscape," said Governor Schwarzenegger. "By working together we can meet the needs of both our economy and environment. Together we can continue California's environmental heritage and legacy of leadership in innovation in cutting-edge technology."

The targets the Governor announced today call for a reduction of GHG emissions to 2000 levels by 2010; a reduction of GHG emissions to 1990 levels by 2020; and a reduction of GHG emissions to 80% below 1990 levels by 2050.

California's scientists lead the world in developing the basis for evaluating the impacts of GHG emissions. Many California companies have taken significant steps to reduce GHG emissions from their operations and to develop products that will reduce GHG emissions.

California is vulnerable to the impacts of climate change through the reduction in the quality and supply of water to the state from the Sierra snow pack; the exacerbation of California's air quality problems; the adverse impact on human health by increasing heat stress and related deaths, incidence of infectious disease, and risk of asthma, respiratory and other health problems; the rise in sea level along the 1,100 miles of coastline; and detrimental impacts to agriculture due to increased temperatures, diminished water supply and changes in the abundance and distribution of pests.

"Technologies that reduce GHG emissions are increasingly in demand in the worldwide marketplace," said California Environmental Protection Agency Secretary Alan Lloyd. "California companies investing in these technologies are well placed to benefit from this demand. This will boost California's economy and protect public health and the environment."

The California Environmental Protection Agency secretary will coordinate development and implementation of strategies to achieve the GHG reduction targets in conjunction with the secretary of Business, Transportation and Housing Agency, the secretary of the Department of Food and Agriculture, the secretary of the Resources Agency, the chairperson of the Air Resources Board, the chairperson of the Energy Commission and the president of the Public Utilities Commission. The work of the agencies will build on the efforts underway at the Air Resources Board, the Energy Commission and the Public Utilities Commission. The secretary will report to the Governor and the Legislature on progress made, mitigation and adaptation proposals and options for a GHG emission cap and trade systems to reduce GHG emissions in the most cost effective manner possible. Executive Order S-3-05 requires the secretary to make the first report on progress to the Governor and the Legislature by January 2006.

Appendix D – List of Retail Biodiesel Locations in California

California

Business Name / Location (Sort by City, Sort by Blend)		Contact	Phone	Blend	Restrictions
Bay Area Diablo Petroleum 3575 Pacheco Blvd Martinez, CA 94553	Google Maps	Jack Bene	925-372-5406	B100	Any Blend Available. Open 7-4 M-F. Credit Cards accepted.
BioFuel Oasis 2465 - 4th St. Berkeley, CA 94710	Google Maps	Gretchen Zimmerman	510-665-6609	B99	Sun, Tue, Thur. 4-8pm, Fri & Sat 10-5pm, Cash or Check
Eel River Fuels, Inc 3371 North State Street Ukiah, CA 95482	Google Maps	Ken H. Foster / Al Banta	707-462-5554	B99	24/7, All Major Credir Cards
ITL, Inc. 8330 Atlantic Avenue Cudahy, CA 90201	Google Maps	Mike Rohrer	323-562-3230	B20	Premium B20 at the pump - credit card or cash accepted
McCormix Corporation 22 N. Calle Cesar Chavez Santa Barbara, CA 93117	Google Maps	Ken Olsen	805-963-9366	B20, B100	6am - 5pm
McCormix Corporation 55 Depot Rd. Goleta, CA 92117	Google Maps	Ken Olsen	805-963-9366	B20	24 hours a day
Pacific Biofuel 1601 Jarvis Rd Santa Cruz, CA 95065	Google Maps	Ray Newkirk	831-459-6774	B100	Retail purchasers must call ahead
Renner Petroleum / World Energy 76 Bear Canyon Rd. Garberville, CA 95542	Google Maps		707-443-1645	B20	public/no restrictions
RTC Fuels, LLC 4067 El Cajon Blvd. San Diego, CA 92105	Google Maps	Mike McCallen	619-521-2469	B20	
San Francisco Petroleum 4290 Santa Rosa Avenue Santa Rosa, CA 95407	Google Maps	Rod Martin	707-586-2765	B100	
Solar Living Institute 13771 South Highway 101 Hopland, CA 95449	Google Maps		707-744-2017	B100	M-F 8:30 - 5:30 / Sat/Sun 10-5
Solar Living Institute 13771 S. Highway 101 Hopland, CA 95449	Google Maps		707-744-2017	B100	M-F 9-6
T.W. Brown Oil 1457 Fleet Ave. Ventura, CA 93003	Google Maps	Ted Brown, Sr.	805-339-2355	B20, B99	
The Biofuel Station 44440 Highway 101 Laytonville, CA 95454	Google Maps	Kimber or Eric	707-984-6818	B100	M-F 9-5
Toro Petroleum Corp 2109 Fremont St Monterey, CA 93940	Google Maps	James Hill	831-424-1691	B20	
Ventura Harbor Marine Fuel, Inc. 1449 Spinnaker Dr. Ventura, CA 93001	Google Maps		805-644-4046	B100	public
Western States Oil 1790 S. 10th San Jose, CA 95112	Google Maps				open 9-5 M-F; cash or credit card
Yokayo Biofuels 150 Perry Street Ukiah, CA 95482	Google Maps	Kumar Plocher	877-806-0900	B100	M-F 9-5; Cash, Check, MC/Visa

ENVIRONMENTAL FUEL SPECIALIST

PO Box 161
Templeton, CA 93465
(805) 237-2207
Fax: (805) 239-8621

March 10, 2003

Mr. Matthew A. Cohen
Sales Manager
Solpower Corporation
307 E. 22d St.
San Pedro, CA 90731

Dear Matt,

I thought you would be interested in a recent application of your Soltron fuel additive.

One of our clients, the City of Berkeley, maintains a 20,000 gallon tank of B-100 for their municipal fleet. One load of fuel had sat unused an excessively long time and through a rainy month. The combined delay in use and high humidity in the tank's airspace resulted in a severe microbial contamination. The fuel became unusable.

Mr. Von Wadel, the fleet manager called EFS to provide our fuel filtration process and clean up the batch on site. When our service team arrived, they found the contamination had created a severe phase separation in the entire body of the fuel, and it was so viscous and loaded with particulate, they couldn't get it to go through the pre-screen filters. It appeared that the fuel had to be dumped.

As a last resort, I suggested they add a double dose of Soltron to the tank, mix it with the air hose for a few minutes and let it sit overnight. They did just that. The following morning, to their amazement, the body of fuel was clear, and the solids were loose, and settled on the bottom. They hooked up the EFS Filtration unit, ran for 6 hours, and had the tank immaculate and the fuel crystal clear. The fleet manager was amazed, and to say the least, very impressed. So were we.

We now routinely use Soltron whenever we service a customer's fuel tank, and are quite impressed with its ability to clean and recover contaminated fuel.

Respectfully,

Ron F. Sickels
V.P. of Engineering
EFS

Mike Millikin
Editor Green Car Congress
Energy, Technologies, Issues and Policies for Sustainable Mobility

Subject: Question on new biodiesel policy
From: Michael Millikin <mmillikin@bioagemedia.com>
To: rokamoto@arb.ca.gov
Date: Mon, 05 Jun 2006 18:53:36 -0700

Hello Mr. Okamoto,
Would changing the designation of biodiesel blends of B20 and lower to California diesel have any implication or create any confusion about the applicability of state or federal incentives for the use of biodiesel?What are the key benefits in making such a change?
Thanks very much,
Regards,

Mike Millikin

Editor
Green Car Congress
Energy, Technologies, Issues and Policies for Sustainable Mobility
http://www.greencarcongress.com

Hashim Navrozali
Principal Environmental Specialist - Air
San Diego Gas & Electric Company

Subject: Status of B100 fuel
Date: Wed, 07 Jun 2006 07:52:36 -0700
From: "Navrozali, Hashim" <HNavrozali@semprautilities.com>
To: rokamoto@arb.ca.gov

Mr. Akamoto,

Based on ARB's suggested biodiesel policy (5/26) it appears that biodiesel blends B50 and higher would be exempt from ARB's diesel regulations. I would be interested to know how these blends would then be treated. For example, if my company decides to pursue plans to build a B100 fired stationary turbine power plant, would the B100 fuel be considered approvable? What is ARB's stance on this issue.

Would appreciates some feedback.

Hashim Navrozali
Principal Environmental Specialist - Air

San Diego Gas & Electric Company
Office: 858-650-4087
Cell: 619-980-7154
Fax: 858-637-3700
hnavrozali@SempraUtilities.com

Meagan Moore
Graduate Student
Department of Chemistry and Biochemistry
University of California San Diego
La Jolla CA 92093

Subject: Suggested Biodiesel Policy
Date: Thu, 08 Jun 2006 16:43:32 -0700
From: Meagan Moore <moore@chem.ucsd.edu>
To: rokamoto@arb.ca.gov

To Robert Okamoto,

My name is Meagan Moore and I am a graduate student in the department of chemistry studying atmospheric chemistry at the University of California San Diego. Here I am also a member of a student run group called the Biofuels Awareness and Action Network (BAAN). We are currently trying to implement a pilot project of running one of the UCSD shuttles on 100% biodiesel. Once this project progresses there are plans to do a multidisciplinary research project with life-cycle analysis, emissions and health effects within many departments here at UCSD. The results of such a project may be very relevant for future alternative fuel policies at CARB.

As a member of BAAN and a student in atmospheric chemistry I am very pleased that CARB is raising the percentage of biodiesel recognized. I would also encourage higher blends become implemented as "recognized" more quickly then according to the current "Suggested Biodiesel Policy".

The main drawback of biodiesel is the increase in NOx emissions compared to petroleum diesel as the percentage of biodiesel in the blend increases. However, many other emissions such as CO, CO2, PM and unburned hydrocarbons decrease significantly. It would be a mistake to put off "recognition" of higher blends of biodiesel so far in the future as 2020, as there are available (or very soon available) technologies such as clean diesel technology (CDT) and other possible emission reduction technologies (Selective Catalytic Reduction -SCR, Exhaust Gas Recirculation-EGR) that would address the NOx emission increase issue, making biodiesel a more than viable alternative fuel for use in the close future.

I thank you for your time and hope that my comments are found helpful. Also I hope that CARB can recognize that UCSD can and hopefully will be acting as a leader for implementing biodiesel in the close future and the results of which could be very relevant for future alternative fuel policies. Thank-you.

Sincerely,

Meagan Moore
Meagan Moore
Graduate Student
Department of Chemistry and Biochemistry
University of California San Diego
La Jolla CA 92093

Dick Tighe
Assistant Superintendent Business Services
Lemon Grove School District

Subject: California Air Rersources Board
Date: Thu, 08 Jun 2006 16:46:59 -0700
From: Dick Tighe <dtighe@lgsd.k12.ca.us>
To: rokamoto@arb.ca.gov
CC: Kenneth Fine kfine@lgsd.k12.ca.us

As the Assistant Superintendent Business Services for the Lemon Grove School District which has 2 CNG busses and one CNG truck and had two of the Ford electric cars I am urging you to adopt a reasonable bio-diesel fuel policy for the state of California. Our District also has 3 school sites producing 95% of their electrical needs from solar panels. We are very energy conscious and stress the importance of becoming less dependent on foreign fossil fuels and more dependent on bio-diesel which could be used in existing vehicles while at the same time supporting local farmers who could produce the raw products like corn.

Your support and that of the total California Air Resources Board would be greatly appreciated for bio-diesel in California.

Stuart Rodman
Authorized "Bio Willie" Representative

Subject: Suggested Biodiesel Policy (Public Comment)
Date: Thu, 08 Jun 2006 16:55:51 -0700
From: Mark Snyder Electric <marksnyderelectric@sbcglobal.net>
To: rokamoto@arb.ca.gov

Mr. Okamoto, We are the authorized representatives in California for Willie Nelson's biodiesel companies and provider of "Bio Willie" diesel fuel. With the

help of Plavan Petroleum and the Pearson Ford Fuel Depot in San Diego, we are responsible for the opening of Mr. Nelson's first California B20 pump (www.cleanairuse.org/news.html). We strongly urge CARB to verify B20 (biodiesel) and lower blends as diesel fuel. This should be done at the earliest possible time. It has been our experience with our sales and marketing efforts for biodiesel that such actions will lead to wider public acceptance of biodiesel and lead to a balance of economic and environmental benefits across the state. It is our hope and expectation that enactment of this change will be part of a broader initiative at the State level that will allow biodiesel to become more readily available to diesel operators at price points that will make biodiesel their fuel of choice. The commercial truck drivers, school bus operators, and all the rest of us that know that the use of biodeisel will reduce emission associated with cancer, smog formation, acid rain, and global warming will thank you for your leadership, wisdom and your efforts to protect the health of our children and other loved ones who depend on you now to enact these reforms.
Sincerely,

Stuart Rodman
Authorized "Bio Willie" Representative
858 231-3397

Chris Burmester

Subject: Biodiesel Comment
Date: Mon, 12 Jun 2006 12:37:17 -0700
From: Chris Burmester <christopher@formulate.com>
To: rokamoto@arb.ca.gov
CC: christopher@formulate.com

As an end consumer, I am very interested in being able to legally run a personal automobile using B100 blends of biodiesel in the state of California. I hope that you will consider this in your rulings and deliberations.

I'm also interested in being able to obtain higher MPG diesel automobiles from other states and other countries (like Europe), and I hope that you will factor this also into any deliberations and rulings. Other countries have economy diesel passenger cars that exceed 50 and 60 mpg. This is much better than any hybrid or other car technology available in the US today.

The combination of using B100 diesel and a high fuel efficiency car means that I have the choice, as a consumer, of selecting a non-fossil fuel option with very high fuel efficiency TODAY. I don't have to wait who knows how many years for some other alternative - say hydrogen - that would be very expensive and who's fuel would likely still come from foreign fossil oil sources.

I urge you to empower me as a California consumer to make the personal choice in my life for a personal transportation alternative that doesn't depend on imported fossil fuels (and the foreign policy implications) and is greenhouse gas neutral. I see B100 biodiesel as the only practical alternative available to me today. I'd like to see a legal alternative in California as soon as possible.

My sincere regards,

Chris Burmester

Kermit Johansson

Subject: California Biodiesel Proposed Policy
Date: Thu, 15 Jun 2006 23:27:58 -0700 (PDT)
From: Kermit Johansson <terra_tree@yahoo.com>
To: rokamoto@arb.ca.gov

Appreciate your sharing of information of the past event, history, information and the proposed new regulations. I support the proposed policy of the ARB staff with the following suggestions for changes.1. The Govenors EO S-06-06 biofields production targets are too conservative - biofuels should progress faster to achieve 100% by 2025.2. No mention of supporting or allowing sales of diesel vehicles immediately into California. If diesel is so great, where are the vehicles that are to burn them and why aren' t we promoting them as much as diesel fuel. I have 2 diesel vehicles (a 2005 Jeep Liberty and 2006 VW Beetle) which I have had to purchase outside the state. These are new fuel efficient, emission gentle engines that are better for the environment than similar vehicles than gasoline, but they cannot be purchased in CA. Therefore part of your recommendation should be to allow diesel engines to be sold in CA. Please make this part of your recommendation. Thank you for the opportunity to comment,

Kermit Johansson
545 E. Sonora St.
San Bernardino, CA. 92404.
805-794-8869.

A. S. (Ed) Cheng, Ph.D.
Assistant Professor, Mechanical Engineering
San Francisco State University

Subject: Fuels Workshop and Biodiesel
Date: Fri, 16 Jun 2006 12:13:30 -0700
From: Ed Cheng <ascheng@sfsu.edu>
To: gyee@arb.ca.gov, Bob Okamoto <rokamoto@arb.ca.gov

Hi, Gary and Bob --

I participated in this morning's Fuels Workshop via webcast (through all of the diesel topics). I have a few informal comments regarding the Draft Biodiesel Policy and biodiesel in general to pass along.

I will reference my comments about the Draft Biodiesel Policy according to the page numbers in today's ARB Staff Presentation (http://www.arb.ca.gov/fuels/gasoline/meeting/2006/061606arbpstn.pdf).

Pg 11

- I believe considering only B20 and below to be appropriate at this time; higher blend levels may produce technical issues in distribution/storage/engine operation that the market may not be currently ready to handle.

- Re: "Not address potential NOx increase" -- This aspect of the policy is tricky, but as levels up to B20 should not produce more than a ~2% increase in NOx on average, I don't have a major objection to it (perhaps the approximate magnitude of the NOx increase should be explicitly identified in the policy). With aftertreatment systems, the ~2% NOx increase engine-out would be even less significant at the tailpipe. Also, very minor adjustments to the engine management strategy (e.g., EGR, injection timing) can be utilized to offset the NOx increase, while still significantly reducing PM relative to conventional diesel. Such engine management modifications may be simpler than pursuing a fuel additive strategy (depending on the vehicle/engine).

Pg 12

- Re: today's discussion about a biodiesel definition, I suggest going with that stated in ASTM 6751: "mono-alkyl esters of long-chain fatty acids derived from vegetable oils or animal fats." I believe it would be inappropriate to extend the policy to other renewable fuels as they may behave in a manner significantly different from biodiesel.

General Comments

- Re: discussions about different biodiesel feedstocks and their impact on emissions -- at the <20% blend level, I don't believe feedstock differences will be significant and probably do not need to be explicitly addressed.

- You may want to consider acknowledging the lubricity benefits of blending biodiesel with convention diesel fuel, especially in light of the lubricity concerns with <15 ppm sulfur fuels.

- The development of a biodiesel certification or test fuel is something I've really felt would be useful -- I was interested to hear about EMA's development of a test fuel spec, but have yet to review their document as I could not find it on their website. I'd urge ARB to participate in and support any efforts to develop a biodiesel test fuel specification.

Regards,
Ed

A. S. (Ed) Cheng, Ph.D.
Assistant Professor, Mechanical Engineering
School of Engineering
San Francisco State University
1600 Holloway Avenue, SCI 112A
San Francisco, CA 94132

Tel: 415-405-3486 / Fax: 415-338-0525
E-mail: ascheng@sfsu.edu

David Craft
Air Quality Engineer
MBUAPCD

Subject: Biodiesel Policies
Date: Fri, 16 Jun 2006 07:38:23 -0700
From: DAVID CRAFT <dcraft@mbuapcd.org>
To: rokamoto@arb.ca.gov

Bob - It is important that ARB allow B99 as a compliance strategy for all Diesel ATCMs provided NOx non-attainment districts use a biodiesel that does not increase NOx. This appears to be technically feasible by removing the nitrogen in the fuel, or by adding additives such as VISCOM. This is especially important for the construction industry as a compliance option when the cancer risk is included in the CEQA evaluation. B99 is the least cost option for reducing the cancer risk beyond 85%, since B99 is being sold (at least here) at the same price as conventional diesel.

David Craft
Air Quality Engineer
MBUAPCD

(831) 647-9418 x 218
Fax (831) 647-8501

Robert L. McCormick, PhD
Principal Engineer
National Renewable Energy Laboratory

Subject: ARB proposed biodiesel policy
Date: Fri, 16 Jun 2006 15:53 -0600
From: "McComick, Robert" Robert_McCormick@nrel.gov
To: rokamoto@arb.ca.gov

Hi Bob,

I just wanted to say that I strongly support the proposed biodiesel policy that ARB has articulated here:

http://www.arb.ca.gov/fuels/diesel/altdiesel/052406arb_prsntn.pdf
This seems very balanced and sensible.

Bob

Robert L. McCormick, PhD
Principal Engineer
National Renewable Energy Laboratory
1617 Cole Blvd, MS 1633
Golden, CO 80401
303-275-4432
303-275-4415 f

Joe Kubsh
Executive Director
Manufacturers of Emission Controls Assoc. (MECA)

Subject: suggested ARB biodiesel policy
Date: Mon, 19 Jun 2006 08:58:33 -0400
From: Joe Kubsh <jkubsh@meca.org>
To: rokamoto@arb.ca.gov
CC: ahebert@arb.ca.gov, Antonio Santos <asantos@meca.org>

Bob –
Before MECA provides ARB with our comments on ARB's suggested biodiesel policy, I would like some additional clarification on this policy as it impacts the use of verified retrofit technologies. The slides on this proposed biodiesel policy state that the users should determine if the use of a given biodiesel blend will

affect the emission control or engine warranty. This seems to imply that manufacturers of verified retrofit equipment can choose not to provide a warranty for biodiesel blends that are not compatible with their retrofit equipment. Is this decision about warranty coverage completely up to the retrofit manufacturer? Can a manufacturer choose not to provide a warranty for a B20 blend even if it complies with the available ASTM spec.? What is the implication of this proposed policy on ARB's verified retrofit technology in-use testing requirements? If this policy is approved, does that mean that verified retrofit manufacturers will no longer have to be verified for compatibility with B20? Would manufacturers need to inform ARB about whether they intend to provide a warranty on B20 operation? MECA needs clarifications on these items before we can offer comments on the proposed policy. You can either respond by e-mail or call me on my cell phone today: cell phone no. 703-403-8790. Thanks for your inputs to these questions.

Joe Kubsh
Executive Director
Manufacturers of Emission Controls Assoc. (MECA)
phone: 202-296-4797 ext 114
e-mail: jkubsh@meca.org

Phillip Roberts
Extengine Transport Systems

Subject: CARB Biodiesel B20 Policy
Date: Mon, 19 Jun 2006 17:48:54 -0700
From: Phillip Roberts <PRoberts@extengine.com>
To: rokamoto@arb.ca.gov
CC: Richard Carlson <rcarlson@extengine.com>,
Don Anair <danair@ucsusa.org>, dbailey@nrdc.org

Dear Bob,

This letter is in response to the proposed CARB B20 Biodiesel Policy. As you are aware, Extengine Transport Systems, a California based company, is in the process of verifying TruBlue™ Biodiesel, a low NOx B5 and B20 biodiesel blend as a California Alternative Diesel Fuel for the California and national market. Extengine is an ardent proponent of biodiesel for use in all California diesel fuels at B2 – B5 levels. We feel as a stakeholder being effected by this new proposed CARB biodiesel policy that there are currently better policy approaches which would not increase NOx emissions, particularly in non-attainment counties, that should be considered before recommending a new biodiesel policy that may ultimately have negative repercussions for the public.

Our current experience is that most California diesel fleet operators that have looked into biodiesel as a cleaner fuel choice are somewhat reluctant to use

biodiesel because of what many environmental groups have stated, that with the widespread use of conventional B20 biodiesel in the State of California they will be contributing to a substantial rise in overall NOx emissions state wide. It is widely accepted that a B20 biodiesel blend will raise NOx emissions from 3-4% and that the PM reductions of 10-12% does not justify the trade off, we believe that there is adequate data to support such concerns. In particular, the net PM emissions benefit using a B20 with passive conventional CARB level 3 PM filters (capable reducing PM over 85-95%) is virtually non-existent. More importantly, with the widespread use of PM filters there will be a significant NO2 increase which would only be exacerbated with an additional overall net NOx increase with the use of a B20 conventional biodiesel fuel.

We suggest that the CARB B20 recommendation take into account that while many in-use diesel engines are older and may no longer be in warranty, many of the diesel engine manufacturers today will not warranty more than a B5 biodiesel fuel blend and that recommending a B20 may create unnecessary concerns from a fleet operators position as to whether the use of a B20 will void the vehicle or equipment manufacturers warranty. Catalyst suppliers should be required to verify, just as the supplier of an alternative diesel fuel, that the combination of whatever fuel and after-treatment add-on device does not raise any pollutant, especially NOx.

The message the proposed CARB B20 Policy recommendation will be giving is that it is OK to use a B20 regardless of the NOx impacts. Many fleet operators who are purchasing a B20 as a means of conforming to their fleet alternative fuel purchase requirements will no longer be looking to utilize a lower NOx biodiesel, if available, if your recommendation is adopted. Our TruBlue B20 biodiesel fuel, we believe that once CARB verified, will qualify as an emission control strategy lowering PM over 25% while simultaneously lowering NOx 10-15%, without the use of any add-on retrofit device. Even if the B20 TruBlue Biodiesel fuel does not qualify for the 25% PM reduction threshold on a fuel by itself, Extengine will have a B5 and B20 and flow-through filter integrated system that should be qualified/verified as a CARB level 2 system with overall lower NOx. Our company has spent significant time and resources to go through a defined CARB alternative diesel fuels verification process to verify our biodiesel blends and integrated systems. By recommending this new B20 policy CARB may be assisting some verified diesel filter/catalyst suppliers who are attempting to market their filters to parties interested in biodiesel, but may also be inadvertently creating a NOx rise in non-attainment areas making it more difficult for the state's counties to meet their respective SIPs. I suggest you take into consideration all of the factors mentioned above and recommend the CARB biodiesel policy to be based on a B5- not a B20.

Sincerely,

Phillip Roberts

Extengine Transport Systems

Chuck White
Government Affairs
Waste Management/West

Subject: RE: diesel-retrofit Suggested Biodiesel Policy
Date: Mon, 19 Jun 2006 20:50:48 -0500
From: "White, Chuck" <cwhite1@wm.com>
To: rokamoto@arb.ca.gov
CC: "Tufte, Marty" <MTufte@wm.com>, "Hamstra, Don" <dhamstra@wm.com>,
"Hardebeck, Jerry" <jhardebeck@wm.com>,
"Stoddard, Kent" <kstoddar@wm.com>, "Pope, Ron" <RPope@wm.com>,
"Mazanec, Frank" FMazanec@wm.com

Robert --

Thank you for the opportunity to comment on your proposed biodiesel policy. As you may be aware, Waste Management (WM) has one of the largest diesel fleets in California that we use with our solid waste and recyclable collection and transport services. WM is actively evaluating the potential for increased biodiesel use in our fleet. With respect to your proposed policy, we have no specific comment -- with the understanding that any use of biodiesel fuel is strictly voluntary and there is no requirement to do so -- or any penalty for not using biodiesel blends.

Currently, we do not believe that many of our diesel engine suppliers will warranty an engine for our use with more than 2% biodiesel content in its fuel -- although one manufacturer is considering providing a warranty for up to 5% biodiesel usage. Until engine manufacturers will warranty higher percentage content, WM currently has no plans to use more than the 2% (possibly 5%) range allowed under the engine manufacturers' warranties.

Please do not hesitate to contact me if you have any questions or require further information.

Sincerely,
Chuck White
Government Affairs
Waste Management/West
915 L Street, Suite 1430
Sacramento, CA 95814
Phone: 916-552-5859
Fax: 916-448-2470
Mobile: 916-761-7882
Email: cwhite1@wm.com

Bryan Shull

Date: Mon, 19 Jun 2006 20:00:20 -0700 (PDT)
From: Bryan Shull <bryanshull@sbcglobal.net>
To: rokamoto@arb.ca.gov

Specific comments:
1. page 3 of the 7 page "suggested ARB biodiesel policy" states ASTMrequirements. what about "homebrew"?
2. "resulting mix contains no more than 20% bio by volume". What does that mean? It seems to imply B20 is ok but higher mixtures are questionable. The previous page says larger mixtures will not be addressed at this time3. Why are blends between 20 and 50% not recommended at this time yet b100 is exempt.
Could you address these questions for me?
Thank you
Bryan Shull

Richard Moskowitz
Assistant General Counsel & Regulatory Affairs Counsel
American Trucking Associations

June 22, 2006

Robert Okamoto
Industrial Section
Air Resources Board
P.O. Box 2815
Sacramento, California 95814

Via e-mail: bokamoto@arb.ca.gov

Re: Comments on the California ARB Draft Suggested Biodiesel Policy

To Whom It May Concern:

The American Trucking Associations, Inc.[1] ("ATA") submits these comments in response to the California Air Resources Board ("ARB") suggested biodiesel policy (hereinafter the "draft biodiesel policy").[2] As the national representative of the trucking industry, ATA is vitally interested in matters affecting truck fleets, including the supply, price and specifications of diesel fuel. ATA's membership is directly affected by the diesel fuel specifications enacted by various states and has a substantial interest in the ARB biodiesel policy

Diesel fuel is the lifeblood of the trucking industry. Our industry consumes more than 36 billion gallons of diesel fuel annually and is on pace to spend almost $100 billion on diesel fuel this year. For most motor carriers, the cost of fuel is their second highest operating expense – after labor expenses – and for many long-haul carriers fuel equals as much as 25 per cent of total operating costs.

In addition to the cost of diesel fuel, diesel's performance characteristics directly affect the trucking industry's ability to deliver more than 70% of the freight transported in the United States. Diesel specifications directly affect truck productivity, emissions, and the ability to store and distribute fuel. For these reasons, ATA appreciates the opportunity to help inform ARB on the impacts of biodiesel upon the trucking industry.

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[1] ATA is a united federation of motor carriers, state trucking associations, and national trucking conferences created to promote and protect the interests of the trucking industry. Directly and through its affiliated organizations, ATA encompasses over 37,000 companies and every type and class of motor carrier operation.

[2] The comments set forth herein are based upon a 7-slide presentation posted on the CARB website. *See* http://www.arb.ca.gov/fuels/diesel/altdiesel/052406arb_prsntn.pdf

The high cost of petroleum-based diesel fuel, coupled with the desire to eliminate the United States' dependence upon foreign sources of oil has resulted in renewed interest in the production and use of biodiesel. Based upon these interests, ATA's environmental policy and technical and engineering committees conducted a thorough review on the impact of biodiesel upon the trucking industry. As a result of this review, ATA's Board of Directors recently revised ATA's biodiesel policy as follows: ATA supports the *voluntary* use of biodiesel in blends of up to five percent (B5) as a reasonable means to extend the supply of diesel fuel. ATA remains opposed to state biodiesel *mandates* and is concerned that any biodiesel blended into on-road diesel complies with certain quality standards.

A. Ensuring Biodiesel Quality is Critical.

The ARB draft biodiesel policy attempts to address the biodiesel quality issue by referencing a requirement that any biodiesel used for blending meet the ASTM 6751 specification. This is critically important to ensuring that end users will be able to operate their vehicles on biodiesel. In addition to ensuring that the neat biodiesel complies with the ASTM specifications, ARB also should consider requiring the finished blend to comply with the ASTM 975 standard for diesel fuel. The failure to use fuel that complies with the ASTM 975 specification could harm the engine and invalidate any warranty claims. The ARB policy seems to require the neat biodiesel and base fuel to meet certain specifications, but does not appear to require the actual blended product to meet an accepted quality specification.

The recent experience in Minnesota (the only state with a fully-implemented biodiesel mandate) highlights the importance of ensuring biodiesel quality. Earlier this year, shortcuts taken by certain biodiesel producers resulted in a biodiesel blend that did not meet the ASTM specifications. This poor quality fuel found its way into the on-road diesel supply and caused numerous trucks to malfunction and become stranded. To prevent this situation from being repeated, government must require <u>all biodiesel</u> used in on-road engines to be <u>tested and certified</u> to be in compliance with the ASTM 6751 standard and also ensure that the finished blend meets the appropriate specifications.

B. Biodiesel Emissions

In addition to the perception of energy security, biodiesel advocates have long touted the environmental benefits of biodiesel. Indeed, biodiesel use reduces particulate and hydrocarbon emissions; however, biodiesel use also results in a measurable increase in nitrogen oxide emissions. The ARB draft biodiesel policy seems to ignore the potential increase in nitrogen oxide emissions that would result from widespread biodiesel use. Considering the fact that California has one of the most significant ozone attainment problems in the country, it is difficult to explain why the

ARB draft biodiesel policy does not address the issue of increased nitrogen oxide emissions.

The trucking industry has been very vocal in its opposition to California's CARB-diesel fuel mandate. This boutique fuel has resulted in the highest diesel fuel prices in the nation and has been harmful to the trucking industry. The trucking industry has repeatedly been told that CARB-diesel is necessary to reduce nitrogen oxide emissions, so we are confused as to why ARB would turn a blind eye to the potential nitrogen oxide emissions caused by biodiesel use.

The issue of increased nitrogen oxide emissions is not well settled; however, there is enough evidence on both sides of the issue to warrant additional testing on various biodiesel blends. This testing should occur prior to enacting a policy that embraces biodiesel use. In addition, the recently enacted Energy Policy Act of 2005 requires, among other things, a detailed assessment of the environmental impacts of biodiesel.[3] ARB should review this study and conduct its own tests concerning the blending of biodiesel with California's unique diesel fuel, prior to finalizing any policy on the use of biodiesel.

C. Biodiesel Blend Limits

The ARB draft biodiesel policy would consider blends of up to twenty percent biodiesel as California fuel. The ARB presentation also references the Governor's executive order, calling for escalating biofuels production targets over time.[4] At this time, ARB should not authorize the use of biodiesel in on-road diesel engines in blends that exceed five percent (B5). Low percentage blends of biodiesel that meet the ASTM specifications should perform comparably to today's petroleum-based diesel fuel; however, blends exceeding five percent present operational challenges for the trucking industry. We discuss these operational challenges below:

1. Fuel Economy and Cost Differentials

High percentage blends of biodiesel cost more than petroleum-based diesel fuel and have a lower energy value, requiring more fuel to be purchased to perform an equivalent amount of work.

The existence of generous federal and state tax incentives should make the price of biodiesel roughly equivalent to the price of petroleum-based diesel. Notwithstanding these subsidies, a review of the March 2006 Clean Cities Alternative Fuel Price Report revealed the following price differentials between a twenty percent biodiesel

[3] *See* Energy Policy Act of 2005, Public Law 109-58, § 1823(b) (enacted August 8, 2005).

[4] The Governors Executive Order S-06-06 sets California biofuels production targets. These production targets escalate over time and approach 75% in 2050.

blend (B20) and petroleum diesel. The prices set forth in the chart below are retail prices that include federal, state and local taxes:

Location	**Diesel Fuel**	**Biodiesel (B20)**	**Price Differential**[5]
New England	$2.64	$2.80	16 cents
Lower Atlantic	$2.46	$2.50	4 cents
Midwest	$2.42	$2.51	9 cents
Gulf Coast	$2.46	$2.44	2 cents
Rocky Mountains	$2.46	$2.65	19 cents
West Coast	$2.60	$2.82	22 cents
National Average	**$2.47**	**$2.64**	**17 cents**

Another economic factor that must be considered is that, neat biodiesel (B100) has a lower energy content than No. 2 diesel. No. 2 diesel fuel typically contains about 140,000 BTUs per gallon, while biodiesel made from vegetable oil typically contains about 130,000 BTUs per gallon, which results in an energy reduction of approximately seven percent (7%). There is insufficient data on the impact that low percentage blends of biodiesel have upon fuel economy.

2. Cold Weather Performance

High percentage blends of biodiesel gel at a higher temperature than petroleum-based diesel and may cause trucks to become stranded in cold weather. Petroleum diesel fuels have both pour points and cloud points (the temperature at which a cloud or haze of wax crystals first appears and separates from the fuel) well within the range of cold temperatures at which they might be used. Biodiesel has the same issues, but at even higher temperatures. The cloud point for biodiesel will vary based on the type of feedstock used. Whereas No. 2 diesel typically gels at 16°F, soy-based biodiesel gels at 32°F, and biodiesel derived from animal fat gels at 68°F. Users of a 20 percent biodiesel blend (B20) will experience an increase of the cold flow problems (cold filter plugging point, cloud point, pour point) of approximately 5°F. Anti-gelling products, heating systems for fuel tanks and blending with No. 1 diesel fuel have been used to prevent gelling, but each of these options adds to operating costs.

[5] *See* U.S. Department of Energy, Energy Information Administration, Office of Energy Efficiency and Renewable Energy, *Clean Cities Alternative Fuel Price Report* (February 2006).

3. Engine Performance and Manufacturer Warranties

High percentage blends of biodiesel could create difficulties with manufacturer warranty claims – most heavy-duty truck engine manufacturers do not recommend biodiesel in blends exceeding B5.

High percentage biodiesel blends can cause a variety of engine performance problems, including filter plugging, injector coking, piston ring sticking and breaking, elastomer seal swelling and hardening/cracking, and severe engine lubricant degradation. Additional testing is needed to determine whether these operational issues are present at low percentage blends used over an extended period of time. According to the Engine Manufacturers Association ("EMA"), biodiesel blends up to a maximum of B5 should not cause engine or fuel system problems, provided the biodiesel used in the blend meets the requirements of ASTM 6751. EMA recommends that the conditions of seals, hoses, gaskets, and wire coatings should be monitored regularly when biodiesel fuels are used. Older trucks (pre-1994) may require upgraded components to ensure trouble-free operation.

Individual engine manufacturers determine what implications, if any, the use of biodiesel fuel has on the manufacturers' commercial warranties. Engine manufacturers warrant their engines for "materials and workmanship." An engine company will cover a fault with an engine part or with engine operation within the prescribed warranty period, if the fault is due to an error in manufacturing or assembly. Typically, an engine company will define what fuel the engine was designed for and will recommend the use of that fuel to their customers in their owners' manuals. While truck and engine manufacturers do not warrant the fuel, most indicate that biodiesel blends of up to B5 (providing the quality specifications are met) should not create operational issues for their products. If higher percentage blends of biodiesel are used and engine malfunctions can be traced back to the use of biodiesel, then the manufacturers will deny warranty claims. This results in a transfer of risk to the end-user, who may have refueled at various locations and not know where the off-spec or poor quality fuel was purchased. If ARB enacts the proposed biodiesel policy authorizing blends of biodiesel that exceed five percent by volume, then the end-user will bear the financial risk of any malfunctions caused by the biodiesel, even though most end-users would be unable to control the amount of biodiesel they use.

The manufacturers' warranty issue, in conjunction with some of the operational challenges of using high percentage blends, highlights the need for ARB's policy to address the pump labeling issue. In light of the potential financial impact on warranty claims and other operational challenges (discussed above), ARB's biodiesel policy should require fuel dispensers to be labeled with the quantity of biodiesel being dispensed.

4. Solvent Issues

Another operational challenge presented by biodiesel is that biodiesel blends that exceed five percent tend to act like a solvent and may dislodge sediment that naturally accumulates in truck fuel systems, requiring an unanticipated fuel filter change in advance of regularly scheduled maintenance. This could be a significant issue for over-the-road trucks, which are often located far from their base of operations. Although this issue is not related to air emissions, ARB should consider operational impacts that flow from its policy decisions.

5. Distinguishing On-Road and Off-Road Vehicles

It is important to distinguish between off-road diesel fuel, which is used in vehicles that do not travel far from their base of operations, and on-road diesel fuel, which is used by the commercial trucking industry in vehicles that travel hundreds of miles away from their base of operations. Cold weather performance and unscheduled fuel filter changes are manageable issues for most off-road engine applications; while over-the-road trucks using on-road diesel fuel may have difficulty overcoming the operational challenges presented by biodiesel blends that exceed B5. For these reasons, we request that ARB draw a distinction between on-road and off-road diesel fuel and impose a five percent cap on biodiesel used in on-road vehicles.

The five percent biodiesel cap for on-road diesel fuel may be waived for state and municipally owned vehicles. Much like off-road engines, these vehicles seldom travel far from their base of operations and are much better equipped to confront the operational challenges posed by biodiesel blends that exceed five percent. Moreover, these vehicles do not have to operate in a competitive environment similar to over-the-road trucking, where increases in the price of diesel fuel could drive companies out of business.

6. Practical Limitations on Biodiesel Production

Last year the trucking industry consumed more than 36 *billion* gallons of diesel fuel. Other modes and off road engines also consumed billions of gallons of diesel fuel. In 2005, the biodiesel industry produced only 75 *million* gallons (0.2% of the total on-road diesel fuel used by the trucking industry). Most of this production occurred outside of California. This year the biodiesel industry is expected to produce 150 million gallons (0.4% of the on-road diesel fuel used by the trucking industry). With the continuation of financial incentives, the biodiesel industry may reach a billion gallons by 2015, but even at a billion gallons biodiesel would account for only a few percentage points of the diesel fuel consumed by the trucking industry alone. As such, there is no reason to allow on-road blends of biodiesel that exceed B5.[6] A five percent cap on on-road biodiesel blends will protect the trucking industry from

[6] Higher percentage blends of biodiesel may be permitted for off-road vehicles and state and municipally-owned vehicles, which seldom travel far from their base of operation.

operational problems and will ensure that the biodiesel industry can continue to grow for many years to come.

CONCLUSION

ARB's adoption of a biodiesel policy is an opportunity to expand the use of biodiesel within California, while ensuring that the trucking industry does not suffer the harmful effects that often accompany fuel changes. To accomplish this, ARB's biodiesel policy must include the following provisions:

- Ensure that all biodiesel distributed in the state is tested and certified to meet the ASTM 6751 standard;
- Ensure that the finished blends of on-road diesel fuel are tested and certified to meet the ASTM 975 standard;
- Ensure that the use of biodiesel will not increase nitrogen oxide emissions in ozone non-attainment areas;
- Ensure that all pumps dispensing biodiesel for on-road use are properly labeled to indicate the amount of biodiesel in the blend; and
- Ensure that on-road biodiesel blends are limited to **five percent** biodiesel.

If you have any questions concerning these comments, please contact the undersigned at 703-838-1910.

Respectfully submitted,

Richard Moskowitz
Assistant General Counsel
American Trucking Associations

Eric M. Bowen
Acting Chairman
California Biodiesel Alliance
SF Biodiesel, LLC

June 23, 2006

VIA EMAIL

Robert Okamoto
Industrial Section
California Air Resources Board
Sacramento, CA
RE: Biodiesel Policy

Dear Mr. Okamoto,

The California Biodiesel Alliance (CBA) strongly supports the inclusion of biodiesel into the California transportation fuels portfolio. We applaud the Air Resources Board's (ARB) draft biodiesel policy. The policy will begin the process of breaking down the regulatory logjam biodiesel has faced in California.

The California Biodiesel Alliance (CBA) is a diverse association of biodiesel feedstock suppliers, producers, fuel marketers and distributors, technology providers, fuel retailers, consumers and advocates. The CBA is affiliated with the National Biodiesel Board (NBB) as the California State Chapter with support from and direct access to the NBB and its resources. Our mission is to promote increased use of high quality renewable biodiesel in California.

We would like to draw your attention to our strong support of the following specific items in the draft policy:

First, we strongly supports ARB's proposal to "consider B20 and below as California diesel fuel."

Second, we strongly support ARB's proposal to "allow use with verified technologies."

Third, we strongly support ARB's proposal to "initiate biodiesel research and study the impact of biodiesel use in California." We encourage ARB to publish the specifics on what tests will be done, who will be expected to pay for them (state vs. industry) and a timeline for such testing. Providing a road map for this

process will be a great assistance to the biodiesel industry and other stakeholders.

We would also like to draw your attention to a few specific items in the draft policy where we have concerns.

First, we are concerned about the uncertainty that biodiesel blends between B21 and B50 face. The ARB needs to establish a procedure to remove this uncertainty as soon as practicable. Blends between B21 and B50 are important and need your support. Such blends are currently being used by Marin County and both Santa Monica and San Francisco have plans to begin using such blends in the near future. These blend levels are frequently sought by biodiesel users who are motivated to use higher blends as a means of further reducing emissions and increasing the renewability of their diesel fuel. B21-B50 are common blend levels that fleets use when implementing staged biodiesel programs where they start with lower blends like B20 and slowly increase the percentage of biodiesel in the blend until they reach blends up to B100 (which as you know is really B99.9 for excise tax reasons).

Second, the draft policy states that "NOx emissions may increase." We greatly appreciate ARB's recognition of recent testing data that shows NOx emissions increase, decrease, or remain the same depending on the biodiesel feedstock, engine type and engine duty. We encourage ARB to revise the statement "NOx emissions may increase" and replace it with something more nuanced along the following alliance: "recent data indicates that NOx emissions may increase or decrease depending on a number of factors including, but not limited to, biodiesel feedstock, engine type, engine duty and testing protocols."

Third, we would appreciate some clarity and around the statement "widespread use of biodiesel may require ARB to set specifications to ensure CARB diesel emissions benefits." As you know, regulatory uncertainty is harmful to the growth of the emerging biodiesel industry. Accordingly, anything you can do to reduce uncertainty would be greatly appreciated.

We would like to take this opportunity to remind you of some of the key benefits of biodiesel.

Including biodiesel in the California transportation fuel portfolio will:

- Take the lead to meet Governor Arnold Schwarzenegger's GHG reduction and biofuel production goals;
- Lower costs to clean the air, ground and waterways of diesel pollutants and improperly disposed waste; and

- Add to the state's job and tax base by supporting Californian and American farmers;
- Decrease fleet maintenance costs while increasing employment and innovation within the renewable energy sector;
- Assist in the transition toward a diverse transportation fuel portfolio necessary for the growth of our economy.
- Reduce health care costs to state residents caused by diesel pollutants;

Biodiesel is the fastest growing alternative fuel in the US market. It:

- Is a clean burning renewable fuel,
- Can be produced in California using crops grown in California that will benefit California farmers (canola, mustard, cotton seed, walnuts, flax, etc.);
- Contains no petroleum, but it can be blended at any level with petroleum diesel to create a biodiesel blend;
- Adds lubricity to Ultra Low Sulfur Diesel without the risks associated with un-tested additives
- Mitigates or reduces many of the problems of diesel including emissions and bio-contamination from spill, and
- Is simple to use, biodegradable, nontoxic, and essentially free of sulfur and aromatics.

In 1998, the National Renewable Energy Lab (NREL) showed the ratio of energy in biodiesel to fossil energy used to produce it was 1:3.2. A recent study of energy balance by the University of Idaho demonstrates a slightly higher energy balance of 1:3.8. These energy balance numbers are based on soy crops. Many alternative feedstocks can be used for biodiesel production such as animal fats, inedible kitchen greases and experimental algae that dramatically increase the energy balance and carbon sequestration ratios.

Biodiesel diversifies our energy supply and stabilizes our fuel prices. While biodiesel has historically cost slightly more than petroleum diesel, biodiesel has more recently maintained price or gone down in price as compared with petroleum diesel, which saw an increase of 40% last year alone. Biodiesel's role in providing enhanced lubricity, decreased exposure to toxics and support of American farmers makes any price difference negligible at best. By diversifying our energy supplies with a clean renewable fuel that is 100% compatible with petroleum diesel, CARB will help provide California residents some relief to our current diesel only economy. As volatile petroleum prices jump even higher, biodiesel can provide energy stability and dramatic economic savings.

Biodiesel is also a direct benefit to American farmers. With continued California innovation, biodiesel can be grown (at least in part) by our strong California

agricultural community. Direct economic benefits to farmers, production and transportation jobs and state taxes created by biodiesel production could add millions to the California economy.

At a variety of blend levels, the performance, economic, environmental and social advantages of using biodiesel in our on-road and off-road diesel engines is the most cost-effective alternative to diesel fuel available today.

We urge you to adopt the draft biodiesel policy. We also encourage you to continue biodiesel testing through ARB's existing programs and to establish a policy for the use of biodiesel blends between B21-B50.

Please let us know if the California Biodiesel Alliance or any of its members can provide assistance to you in these important matters.

Sincerely,

/s/ Eric M. Bowen

Eric M. Bowen
Acting Chairman
California Biodiesel Alliance

Curtis Wright, P.E.
Divsion Manager
Imperial Western Products

Robert Okamoto
Industrial Section
California Air Resources Board
Sacramento, CA

RE: Biodiesel Policy

Dear Mr. Okamoto,

Imperial Western Products, Inc. (IWP) strongly supports the Air Resources Board's (ARB) draft biodiesel policy.

IWP is the largest biodiesel producer in California, with annual production of over 7 million gallons. We have been producing biodiesel in Coachella since 2001, and our primary feedstock are oils that are produced in California, such as used

cooking oils, poultry fat, and vegetable oils. IWP is a member of the National Biodiesel Board (NBB) and is a BQ9000 Accredited Producer.

IWP strongly supports ARB's proposal to "initiate biodiesel research and study the impact of biodiesel use in California." We encourage ARB to take advantage of the wealth of data that has already been collected by EPA, the National Renewable Energy Lab (NREL), the Engine Manufacturers Association (EMA), the Oak Ridge National Laboratory, and other states.

One concern IWP has is that the draft policy states that "NOx emissions may increase." Recent testing data by NREL shows NOx emissions increase, decrease, or remain the same depending on the biodiesel feedstock, engine type and engine duty. We encourage ARB to consider this data and revise the statement "NOx emissions may increase" to a statement such as "recent data indicates that NOx emissions are not affected by biodiesel blends up to B20."

Please let me know if IWP can be of any assistance to you regarding this important matter.

Sincerely,

Curtis Wright
Division Manager
Imperial Western Products, Inc.
PO Box 1110
Coachella, CA 92236
760-398-0815

Roger Gault
Technical Director
Engine Manufacturers Association

June 26, 2006

Robert Okamoto
Industrial Section
Air Resources Board
P.O. Box 2815
Sacramento, CA 95814
Via email – bokamoto@arb.ca.gov

Dear Robert:

The Engine Manufacturers Association ("EMA") is an international membership association representing the world's leading manufacturers of internal combustion engines. Included among the broad array of engine products manufactured by EMA's members are diesel-fueled/combustion-ignition engines for on-highway, non-road, marine, locomotive, and stationary applications.

The Air Resources Board ("ARB") has asked for comments on its "Suggested ARB Biodiesel Policy" presented at the May 24, 2006 Fuels Workshop (the "Suggested Policy"). Inasmuch as the Suggested Policy is not a draft policy statement, but rather a Power Point presentation of concepts being considered by ARB, the following comments are only preliminary.

In March 2003, EMA issued a "Technical Statement on the Use of Biodiesel Fuel in Compression Ignition Engines" ("Technical Statement"), which is still in effect today. In the Technical Statement, EMA members stated that, based on their current understanding of biodiesel fuels and blending with petroleum-based diesel fuel, fuel blends having up to a maximum of five percent (5%) biodiesel content should not cause engine or fuel system problems, provided the 100% biodiesel ("neat biodiesel") used in the blend meets the requirements of ASTM D6751, DIN 51606, or EN 14214. In addition, EMA and its members have recommended that both the petroleum-based diesel fuel with which the neat biodiesel is blended and the final blended fuel meet the requirements of ASTM D975. If fuel blends exceeding five percent biodiesel are desired, vehicle owners and operators should consult their engine manufacturer regarding the implications of using such fuel.

On June 16, 2006, EMA released "Test Specifications for Biodiesel Fuel" to facilitate the testing and evaluation of biodiesel fuel blends in today's clean-

burning diesel engines ("Test Specifications"). The Test Specifications define a biodiesel blend fuel, having up to a maximum of twenty percent (20%) biodiesel content, along with other properties and characteristics that engine manufacturers believe are needed to ensure good performance in today's engines. Engine manufacturers consider the specifications a critical and necessary first step in further testing and evaluating fuel blends with biodiesel content greater than 5%.

The Test Specifications do not imply or constitute an endorsement for the use of 20% biodiesel fuel blends by EMA or any of its member companies. Instead, they are intended to provide a means by which engine manufacturers can gain assurance that biodiesel blends are an acceptable fuel, and that their use in state-of-the-art engines does not have a negative impact on performance, durability, or the ability to meet the near-zero emissions limit set by the California Air Resource Board. Considering the tremendous investment that engine manufacturers and the nation have made to develop today's low-emitting and energy efficient diesel technology, it is imperative that any proposed biodiesel blend fuel be shown to meet all engine requirements and that its use result in equivalent performance and emissions. Without substantiation, ARB should not just assume that biodiesel is better.

EMA and its members recommend that ARB develop a draft policy consistent with the principles that we have identified above. We further recommend that ARB publish a fully developed proposed policy for review and comment by interested stakeholders. However ARB proceeds, it is critical that it recognize that, as demonstrated in other jurisdictions, biodiesel blends, even at very low blend concentrations, can cause significant problems if the biodiesel quality is not maintained. Given the potential adverse consequences, the quality of the biodiesel fuel must be monitored to assure compliance with ASTM standards. Thus, ARB and/or other appropriate agencies should adopt an inspection program as part of the implementation of any final policy statement on biodiesel.

Finally, it is critical that ARB continue to mandate a single, defined, fuel specification for certification and compliance testing of all compression ignition engines. This fuel specification currently defines a petroleum-only fuel and should not be amended to allow a biodiesel component.

EMA looks forward to working with the ARB Staff as they develop the Board's biodiesel policy.

Very truly yours,

Roger T. Gault
Technical Director

Terry Wigglesworth
The Wigglesworth Company

Sent Electronically to:

Robert Okamoto
bokamoto@arb.ca.gov
Industrial Section
California Air Resources Board
Sacramento, CA

RE: Suggested ARB Biodiesel Policy

Dear Mr. Okamoto:

Baker Commodities, Inc. (Baker) appreciates the opportunity to comment on the Suggested Biodiesel Policy by the California Air Resources Board, as presented in the ARB Fuels Workshop May 24, 2006.

1. Baker strongly supports ARB's proposal to "consider B20 and below as California diesel fuel." This will enable the use of B20 and below as California diesel fuel in on-road and off-road engines utilizing CARB verified retrofit devices, as well as new engines utilizing EPA-approved technology.

    - Biodiesel can be a significant contributor to the Governor's Biofuels Production Targets as defined in executive order S-06-06. In order for California to produce a minimum of 20 percent of its biofuels within the state by 2010, 40 percent by 2020 and 75 percent by 2050, all sources of "acceptable biofuels" will be needed. Acceptable biofuels are biofuels, with fuel parameters that can be measured to be in compliance with an agreed upon standard, such as an ASTM standard. B20 is an acceptable biofuel.

    - Biodiesel can be manufactured to meet the 15 ppm sulfur requirement for Ultra-Low Sulfur Diesel (ULSD). Biodiesel can be used to extend California's supply of ULSD and can provide California refiners with additional lower cost options for complying with the ULSD standard.

    - Biodiesel can contribute to California's energy conservation and waste reduction efforts by utilizing a former waste product –

recycled restaurant grease, also known as recycled cooking oil, as a feedstock.

- Biodiesel can contribute to a cleaner environment by reducing greenhouse gases by a minimum of 78 percent as compared with petroleum diesel. (Comparison is for B100 based on CO2 reductions.) B20 reduces greenhouse gases by 16 percent. Greenhouse gas reductions quoted here are from the National Renewable Energy Laboratory (NREL).

- The production of biodiesel will "grow" the state's economy as California companies such as Baker Commodities, Inc. enter the biodiesel market and provide jobs to Californians.

- New opportunities will be created for California farmers as they provide feedstocks for biodiesel.

2. Baker agrees with the suggested policy that California should not address a potential increase of nitrogen oxides (NOx) for B20 and that biodiesel has been shown to reduce emissions of particulate matter and organic compounds.

    - Recent studies by the NREL, North Carolina State University and the US Navy have shown in chassis tests with newer engines that B20 has, on average, no significant effect on diesel engine NOx emissions. Data from these and other tests is currently being evaluated by U.S. EPA.

    - The attached June 5, 2006 letter to US EPA states: "The National Renewable Energy Laboratory is conducting heavy-duty vehicle chassis dynamometer emission studies and anticipates producing a report by" the end of September 2006 (updated report date)..."Preliminary results of these studies indicate that the PM, CO, and hydrocarbon emission reductions commonly attributed to biodiesel are robust and relatively independent of technology or test cycle. Nitrogen oxide emissions, on the other hand, tend to vary significantly with driving cycle. A presentation of these results is attached. NREL is attempting to understand quantitatively how driving cycle impacts NO_x. The difficulty of this is compounded by the fact that the NO_x emission changes observed for B20 are typically +/-2% or less. The most straightforward interpretation of the preliminary results is that on average biodiesel has no significant impact on NO_x emissions."

- Currently US EPA is considering recommendations from NREL and others that biodiesel emission factors should be based on chassis versus engine tests and on tests with newer engines. The attached June 5, 2006 letter to US EPA states: "In EPA's Draft Technical Report, A Comprehensive Analysis of Biodiesel Impacts on Exhaust Emissions, October 2002 (EPA420-P-02-001), more than three-fourths of the engines included were built before 1994. Additionally, guidance on the impact of biodiesel on emission factors is based on heavy-duty FTP (or similar) test cycle data. While the heavy-duty FTP remains an adequate test for certification of engines to meet emission standards, it is not an adequate basis for development of heavy-duty emission factors for inventory purposes. In our opinion, vehicle testing data appear to provide a more realistic basis for this purpose."

3. Baker supports the initiation of biodiesel research to study the impacts of biodiesel use in California. We are confident that such research will demonstrate the positive impact that biodiesel can have on the environment and the state's economy.

4. Baker endorses the comments of the California Biodiesel Alliance.

Baker Commodities, Inc.

Since 1937, Baker has been engaged in one of the oldest recycling businesses, rendering. We are a privately owned company that provides quality products and services worldwide. We have 600 employees located in Arizona, California, Connecticut, Hawaii, Maine, Massachusetts, Montana, Nevada, New York, Oregon, Rhode Island, Vermont, and Washington.

Baker is actively involved in the National Biodiesel Board (serving as Vice-Chairman and on the Governing Board), the National Renderers Association, the Fats and Proteins Research Foundation, and the Animal Protein Producers Industry.

Baker strongly supports the use of recycled and rendered products to produce renewable energy, such as biodiesel. Baker applauds the ARB for strong support of the environment, recycling and incentives for renewable energy.

Please direct any questions regarding these comments to me or Baker's Washington DC representative, Ms. Terry Wigglesworth at 703 319-7827 or twiggs2@attglobal.net.

Sincerely,

Fred Wellons

Fred Wellons
Director of Research and Commercial Development

Attachment

June 5, 2006

Mr. Chet France
Director, Assessment and Standards Division
US EPA Mail Code: ASB
2000 Traverwood Dr.
Ann Arbor, MI 48105

Dear Mr. France:

We appreciate the work EPA is doing to finish the RFS proposed regulations by early September. We are very aware of the enormity of this undertaking and, thus, commend EPA on your willingness to meet with affected parties to learn their concerns in spite of your tight deadline.

We have been contacting parties that have conducted emission testing with biodiesel blends and encouraging them to send their data to EPA. In addition, the National Renewable Energy Laboratory is conducting heavy-duty vehicle chassis dynamometer emission studies and anticipates producing a report by the end of fiscal 2006. Preliminary results of these studies indicate that the PM, CO, and hydrocarbon emission reductions commonly attributed to biodiesel are robust and relatively independent of technology or test cycle. Nitrogen oxide emissions, on the other hand, tend to vary significantly with driving cycle. A presentation of these results is attached. NREL is attempting to understand quantitatively how driving cycle impacts NO_x. The difficulty of this is compounded by the fact that the NO_x emission changes observed for B20 are typically +/-2% or less. The most straightforward interpretation of the preliminary results is that on average biodiesel has no significant impact on NO_x emissions.

This information is being presented to EPA to suggest that the RFS Preamble present current, more relevant data on the NO_x emission impact of B20 and lower blends. States that we routinely work with are continuing to use old data from EPA's Draft Technical Report, A Comprehensive Analysis of Biodiesel Impacts on Exhaust Emissions, October 2002 (EPA420-P-02-001), and they are expressing to us their desire for more recent data for use in air quality planning. More than three-fourths of the engines included in the 2002 study were built before 1994. Additionally, guidance on the impact of biodiesel on emission factors is based on heavy-duty FTP (or similar) test cycle data. While the heavy-duty FTP remains an adequate test for certification of engines to meet emission standards, it is not an adequate basis for development of heavy-duty emission factors for inventory purposes. In our opinion, vehicle testing data appear to provide a more realistic basis for this purpose. Vehicle test data using onboard emission measurement systems will be even more realistic, and are the basis for

modal emission factors in EPA's MOVES model. An onboard emissions study recently conducted in North Carolina on vehicles using B20 is also attached.

Since EPA may not receive new NO_x data in time to include it in the proposed RFS rule, we suggest that EPA include the following language in the preamble, to encourage states to assist EPA in the process of collecting and evaluating biodiesel emissions data:

In today's proposal EPA is requesting data on mobile source emissions from renewable fuels, particularly with respect to biodiesel NO_x emissions. In October 2002, EPA released a Draft Technical Report (EPA420-P-02-001), which was a compilation of biodiesel emission data from the early 1980s to 1999. This data demonstrated significant emission reductions for biodiesel over petroleum diesel for all criteria pollutants except NO_x.

Since the EPA Draft Technical Report was released, EPA is aware that additional biodiesel emission tests for NO_x have demonstrated no net NO_x increase and in some cases a NO_x decrease. EPA has not had adequate time to evaluate new biodiesel NO_x data, therefore no conclusion can be reached at this time. However, EPA recommends that states considering the use of biodiesel in emission reduction plans not base control choices solely on the 2002 Draft Technical Report. States should consider recent biodiesel emission data from NREL and other credible sources. EPA also requests that states submit applicable data, if they are aware of any or have developed data from their own testing program, to EPA so that EPA will have all available data to review.

Issues that states should consider in evaluating new NO_x data are:

- Quality of the test methodology and data, including intake air humidity control and proper calibration of all instrumentation
- A preference for vehicle test data over engine test data as being more representative of actual emission factors, and
- Acquiring test data on a representative sample of vehicles, rejecting data on vehicles that are so old they are no longer a part of, or will soon be leaving the in-use fleet.

Sincerely,

Terry Wigglesworth
The Wigglesworth Company

Robert L. McCormick
Principal Engineer, National Renewable Energy Laboratory

Scott Hughes
National Biodiesel Board

Joe Kubsh
Executive Director
MECA

Subject: RE: suggested ARB biodiesel policy
Date: Mon, 26 Jun 2006 16:56:20 -0400
From: Joe Kubsh <jkubsh@meca.org>
To: rokamoto@arb.ca.gov
CC: ahebert@arb.ca.gov, Antonio Santos <asantos@meca.org>

Bob – since you did not reply to my e-mail below or to the call that MECA made to you last week. It is difficult for MECA to provide ARB with complete comments at this time on the proposed ARB biodiesel policy as it pertains to verified retrofit technology. MECA, in general, is supportive of designating B20 on an equivalent basis to ARB's diesel fuel provided that the biodiesel component of B20 meets a recognized specification that all stakeholders have agreed to and that the B20 formulation meets all of the required fuel sulfur specifications. Under this proposal, retrofit manufacturers would only need to verify using ARB diesel fuel. There would appear to be no additional requirements for showing compatibility between an "approved" B20 blend and a verified retrofit technology. This type of "automatic" compatibility appears to be acceptable for many of the retrofit technologies that have already been verified by ARB including DOCs, flow-thru-filters, and passively regenerated DPFs. One verified retrofit manufacturer has already received a B20 compatibility verification based on the B20 definitions associated with the current biodiesel policy proposal. This approach may not be acceptable for any retrofit technology that employs the injection of diesel fuel upstream of a retrofit device such as a lean NOx catalyst or DPF (e.g., an actively regenerated system that makes use of diesel fuel injection upstream of a catalytic device). The properties of the B20 in this case need to be compatible with a fuel injector much the same way as the injectors used in a diesel engine. MECA feels that engine manufacturers and fuel injector manufacturers are in the best position to determine an acceptable B20 specification that is compatible with fuel injection hardware. In some cases this also might mean additional compatibility testing by the verified retrofit technology manufacturer. In this regard, it seems important to let the manufacturer of the verified retrofit technology to decide if it wants to offer a warranty for use of this technology with an "approved" B20 blend. The proposed ARB biodiesel policy suggests that the current B100 ASTM specification should be used for the biodiesel blending component of B20. More recently the Engine Manufacturers Association (EMA) has proposed a B20 test specification that goes beyond the current ASTM

specification. MECA finds the EMA biodiesel test specification proposal to have merits especially with respect to the use of B20 with verified retrofit technologies since the EMA test specification has a very low limit on phosphorus content and non-detectable limits of alkali and alkaline earth materials – materials that can all be potential poisons to catalyst-based emission control equipment. MECA still needs clarification to the questions I raised in my e-mail of June 19 that follows this e-mail to more fully comment on the ARB proposed biodiesel policy with respect to verified retrofit equipment. These June 19 questions deal with retrofit warranty coverage and in-use testing under ARB's current verified technology protocol. MECA will continue to follow the discussion on developing a biodiesel policy within ARB and supply additional comments as this policy is clarified and evolved through discussions with all affected stakeholders. I look forward to your feedback on my comments and questions.

Joe Kubsh
Executive Director
Manufacturers of Emission Controls Assoc. (MECA)
phone: 202-296-4797 ext 114
e-mail: jkubsh@meca.org

From: Joe Kubsh
Date: Mon 6/19/2006 8:58 AM
To: bokamoto@arb.ca.gov

Bob – before MECA provides ARB with our comments on ARB's suggested biodiesel policy, I would like some additional clarification on this policy as it impacts the use of verified retrofit technologies. The slides on this proposed biodiesel policy state that the users should determine if the use of a given biodiesel blend will affect the emission control or engine warranty. This seems to imply that manufacturers of verified retrofit equipment can choose not to provide a warranty for biodiesel blends that are not compatible with their retrofit equipment. Is this decision about warranty coverage completely up to the retrofit manufacturer? Can a manufacturer choose not to provide a warranty for a B20 blend even if it complies with the available ASTM spec.? What is the implication of this proposed policy on ARB's verified retrofit technology in-use testing requirements? If this policy is approved, does that mean that verified retrofit manufacturers will no longer have to be verified for compatibility with B20? Would manufacturers need to inform ARB about whether they intend to provide a warranty on B20 operation? MECA needs clarifications on these items before we can offer comments on the proposed policy. You can either respond by e-mail or call me on my cell phone today: cell phone no. 703-403-8790. Thanks for your inputs to these questions.

Joe Kubsh

Executive Director
Manufacturers of Emission Controls Assoc. (MECA)

Frederick Tornatore
TSS Consultants

Randall von Wedel
CytoCulture International

CytoCulture International Inc.
249 Tewksbury Ave., Pt. Richmond, CA 94801
(510) 233-0102
RvW@cytoculture.com

To: Robert Okamoto
Industrial Section
California Air Resources Board

From: Advisors to the National Biodiesel Board

Randall von Wedel, Ph.D. – Principal Biochemist, CytoCulture
Frederick Tornatore, R.E.A. – Air Quality Specialist, TSS Consultants

Subject: Comments Regarding California Air Resources Board Biodiesel Policy as presented at the May 24, 2006 Workshop

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We would like to thank the California Air Resources Board (CARB) for the opportunity to respond to their proposed Biodiesel Policy presented at the May 24 Workshop. Whereas we encourage CARB to proceed with their proposed strategies as an excellent initial step in accepting biodiesel as a viable alternative fuel in California, we would also like CARB to consider a few specific comments pertaining to broader acceptance of biodiesel blends:

1. The potential increase in NOx emissions by biodiesel blends should no longer be a concern to CARB

CARB policy on NOx emissions from engines powered by biodiesel and blends of biodiesel have always relied on older data generated before 2001 using 1991 and earlier engines. The early NOx emission studies were averaged and compiled by the U.S. Environmental Protection Agency (EPA) for their "Draft Report of 2002" which to this day remains posted on the EPA website. These data summarize results from 14 studies, many of them performed on engine dynamometers under conditions that are optimal for the engine performance (higher rpm) but more likely to result in higher NOx emissions as well. Even those early studies demonstrated that some engines and under different test conditions, NOx emissions were sometimes reduced for the B20 blend relative to emissions from the same engines operated on EPA diesel fuel. Nonetheless, the data from the various studies were averaged and published on the EPA website in 2002 indicating that on the average, NOx emissions increase for B20 about 1-2%. This single averaged data statistic has been relied on by CARB as the basis for objecting to widespread B20 use in California on account of the slight increase in NOx, despite all the proven and clear evidence for B20 emission reductions in CO, HC, particulates and air toxics.

Recent research conducted at the National Renewable Energy Laboratory (NREL) by Dr. Robert McCormick's group has confirmed there is a net reduction in NOx emissions for modern transit buses. Chassis dynamometer data for Denver Rapid Transit District buses (ISM 2000 diesel engines) operating on a B20 blend (20% soybean oil biodiesel with reference ULSD) resulted in a net 4% reduction in nitrogen oxides relative to the straight ULSD fuel. A graphic representation of this data is attached in Appendix A.

According to Dr. Robert McCormick, the reasons for the NOx reduction observed in the more recent studies conducted at NREL include:

- Chassis dynamometer gives a more realistic simulation of an urban or suburban heavy duty cycle for engine operation; the data is collected in the range of the power curve that most approximates real world operation, not in the range of the power curve that is optimized for the engine (higher rpm) and where NOx levels tend to be higher
- Modern engines are more efficient, clean burning than the 1991 and earlier engines commonly used in emissions testing. Even so, under the chassis dynamometer conditions of the heavy duty cycle, NOx emissions for the B20 were reduced in some of these older engines
- Older test data results indicating 1-2% NOx increases with B20 were published in the DRAFT report of the EPA (2002) on their web site. These results were based on averages of chassis and engine dynamometer data (including studies done at NREL) and cover a wide range of engines. It is important to note that some of the engines and test conditions showed a net NOx reduction for B20 powered engines, although the average emissions among different engines indicated a slight 1-2%

increase in NOx levels. These studies were conducted over many years on a variety of older engines (1991 and earlier).

- NOx emissions will vary with engine type, duty cycle, and other operating conditions as well as the method used to collect the data. Data generated more recently is suggesting that modern engines in heavy vehicles operating under realistic duty cycles will tend to reduce, not increase, NOx emissions. It would be unreasonable to discourage the use of biodiesel blends in heavy duty vehicles based solely on averages of earlier studies when in fact some of those studies indicated NOx emissions were actually reduced.

2. Biodiesel blends could serve as an Emission Control Strategy for Older Heavy Duty Diesel Engines

B20 and higher intermediate blends of biodiesel up to B50 could reduce the PM emissions of diesel engines by 18% (for B20) and at least 25% (for B30-B50) comparable to the Level 1 25% reduction in PM requested by CARB in older diesel engines that are NOT good candidates for after-treatments.

Besides achieving substantial reductions in PM, the use of B20 and higher blends of biodiesel would further reduce levels of carbon monoxide, unburned hydrocarbons, polyaromatic hydrocarbons and nitrated-PAHs, and air toxics.

Even with the widespread adaptation of particle traps, oxidation catalysts, and other after-treatment technologies in California, there will still be a large number of older vehicles or out of state vehicles that will not be retrofitted with these devices to reduce PM.

Using biodiesel as a "Fuel Retrofit" in blends of B20 (or higher) would provide a cost-effective, practical and flexible means of reducing PM while also reducing CO, HC and air toxics in the following types of engines:

- **130** SF Muni pre-1991 (two stroke diesel engines) that would not be replaced until new diesel-electric hybrids come later next year
- Old school buses in rural and urban areas throughout the state
- Agricultural pumps and farming equipment in the Central Valley
- Operator-owned independent tractor trailer rigs at busy ports of Oakland (5,000 trucks a day) and Long Beach (35,000 per day)
- Heavy equipment and construction trucks, bulldozers, loaders
- Older municipal public works vehicles such as street sweepers, recycling trucks, garbage trucks, solid refuse transfer trucks, etc.

- Rural community public works trucks and snowplows
- Refrigerated trailers parked at supermarkets
- Ferries and work vessels operating on the SF Bay

By encouraging and providing tax exemption or other financial incentives for these vehicles and vessels to operate on a **B20 biodiesel blend** (without engine modifications), the levels of PM emissions could be reduced by 18% or higher, along with substantial reductions in CO, HC, and air toxics.

Hence, using biodiesel blends as a Fuel Retrofit could be a "stand alone" strategy that does not necessarily have to include retrofitting with traps.

At **higher blends (e.g., B50)** targeted for vehicles operating in congested cities and in non-attainment areas, the levels of PM could be reduced by over **25%** without the use of particle traps or oxidative catalysts.

In **non-attainment zones for PM** such as the Central Valley, a **B50** blend could serve as an Emission Control Strategy by reducing the PM by over 25% without any significant engine modifications or using particle traps.

By selecting **more hydrogenated feedstock** (higher H to C ratios that also result in higher cetane numbers), the NOx emissions of biodiesel blends could be curtailed to within the same emission range as ULSD.

Most of the anticipated **in-state feedstock** for making biodiesel in California will be locally available tallow and fats, recycled cooking oils, and trap grease that have been shown to result in significantly lower NOx emissions than soybean oil based biodiesel currently being imported from the Midwestern states of our country.

Achieving **NOx neutrality** is an important milestone for biodiesel blends, especially in California and it is one that should be achievable very soon.

School buses that cannot be retrofitted with particle traps to reduce PM can use the B20 or higher biodiesel blends to lower PM, CO and HC emissions. Recent studies showed that PM levels inside the school bus caused higher exposure for students riding in the bus than for students outside the bus, including research sponsored by CARB in the past several years.

B20 blend reduces air toxics (carcinogens, mutagens, toxic substances) by reducing the emissions of poly aromatic hydrocarbons (PAHs) and nitrated PAHs. See the appendices for a summary of specific emissions reduced by using B100 and the B20 biodiesel blend

relative to EPA diesel No. 2. See comment No. 4 below for more information on reducing air toxics with biodiesel.

3. Biodiesel blends are compatible with after-treatment technologies

Particle traps and oxidative catalysts are compatible with the biodiesel B20 blend; CARB issued a statement last year indicating that B20 could be used in combination with certain CARB-certified after treatment devices. More devices await testing and approvals, but the indications obtained from the manufacturers so far are that B20 blends should all be compatible with current models of particle traps (as they are using in Europe, for example) and oxidation catalysts.

Using B20 biodiesel blend with the CARB approved devices could actually improve their performance and longevity, as well as reduce their maintenance costs by extending the intervals between mandatory services.

NREL presented research data in November 2005 (NREL conference) demonstrating that the **B20 blend improved the performance** (and extended longevity) of **oxidative catalysts**, with a net 62% improvement in PM reduction compared to operating the device on ULSD alone.

4. Biodiesel provides an immediate answer to Environmental Justice

Distressed neighborhoods such as West Oakland and the Hunter's Point / Bayview districts of San Francisco could benefit immediately from the use of B20 and higher blends to reduce PM and air toxics. **Biodiesel exhaust is qualitatively different** from the exhaust of diesel fuel; chemically different, lower toxicity, lower PAHs, lower mutagenicity, as established in 1998 by the EPA Tier 1 (mutagenicity) testing at UC Davis (see data graphic in Appendix A).

Biodiesel exhaust proved to be far less harmful than suspected. Biodiesel is the only fuel to have gone through the **EPA Tier II Health Effects Study**. Inhalation study on white rats showed that even at higher concentrations of biodiesel exhaust, the rats did not die after long term exposure. Subsequent investigation showed minimal pathology in the lungs and organs of the sacrificed animals that had been breathing biodiesel exhaust for weeks.
CARB has indicated in the past they were unwilling to review the Tier II Health Effects Study since it did not also test diesel fuel for comparison (a diesel fuel control was not included in the EPA protocol).

According to the National Renewable Energy Laboratory's 2004 "Guidelines for Handling and Using Biodiesel", using B100 in special applications (like urban school buses, street sweepers, garbage trucks that operate in neighborhoods) can eliminate as

much as 90% of the air toxics suspected of causing cancer and other life threatening illnesses.

Using **B20** should reduce toxic emissions by 20 to 40%, including nitrated polyaromatic hydrocarbons. The effects of biodiesel on air toxic, the report goes on to state, are supported by numerous studies, starting with the former Bureau of Mines Center for Diesel Research at the University of Minnesota. The Department of Energy (DOE) conducted similar research through the University of Idaho, Southwest Research Institute, and the Montana Department of Environmental Quality.

Recently, the Department of Labor's Mining Safety Health Administration (MSHA) tested and approved the use of biodiesel in **underground mining** equipment where workers are exposed to high levels of diesel exhaust. Switching to biodiesel blends is believed to reduce the risk of illness and life-threatening diseases to miners. Obviously it would be prudent to recommend the use of biodiesel blends in congested urban areas of California where children and elderly citizens are most vulnerable to the diesel exhaust emissions of older vehicles (most of which are unlikely candidates for particle traps and oxidative catalysts).

5. Biodiesel offers a cost-effective solution to improve Air Quality

Thanks to rising petroleum prices and recent federal subsidies to support biodiesel programs nationwide, the use of biodiesel blends has become very cost effective relative to other emission control strategies.

B20 blends of biodiesel have been selling in recent months for the same price as regular diesel, and in some cases, LESS than the price of regular diesel. Blends of B20 made with ULSD are expected to be price neutral by the end of this year.

In some states, the biodiesel B100 is actually cheaper than the price of diesel fuel on account of state tax incentives. In the aftermath of Hurricane Katrina, biodiesel B100 and blends of biodiesel were all cheaper than regular diesel in Texas and Colorado. Unlike petroleum fuels, the price of biodiesel has remained relatively stable in the past year since the Federal government allowed blenders of biodiesel a credit of $1.00 for every gallon of biodiesel blended into diesel fuel (assuming first use feedstock from crop oil and animal fats) or 50 cents per gallon for biodiesel made from recycled feedstock oil and grease. These tax incentives have boosted the sales of biodiesel and allowed the scale of production to increase leading to lower production costs for biodiesel in the near future.

By creating incentives for diesel fleets and operators of diesel engines incentives to use a cost-effective, cleaner burning domestic fuel made in our state, California should be in a position to rapidly reduce the impact of diesel engine emissions in the most critical PM non-attainment areas of our state.

Biodiesel will continue to enjoy the tax incentives and state incentives (including mandates for using biodiesel in states like Washington and Minnesota) for years to come and, therefore, remain cost competitive with ULSD in many areas of the country.

California remains one of the few states where biodiesel has yet to make real progress as an alternative fuel, in part because it has yet to be accepted by CAR.

We urge CARB to continue an open dialog with the National Biodiesel Board and NREL so that the latest emission and performance research information can be made available for review. Testing protocols for B20 need to be finalized before the Southwest Research Institute can proceed with Verification Testing of B20 as an Alternative Fuel.

We would like to offer our assistance in communicating information to CARB as well as clarifying concerns and testing requirements back to the National Biodiesel Board so that these important testing protocols can be completed.

Thank you for your continued efforts to establish new policies that open more opportunities to introduce biodiesel blends into our communities.

Respectfully yours,

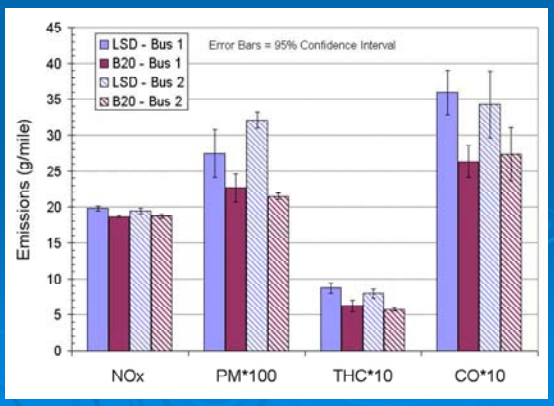
Randall von Wedel, Ph.D.

Frederick A. Tornatore, R.E.A.

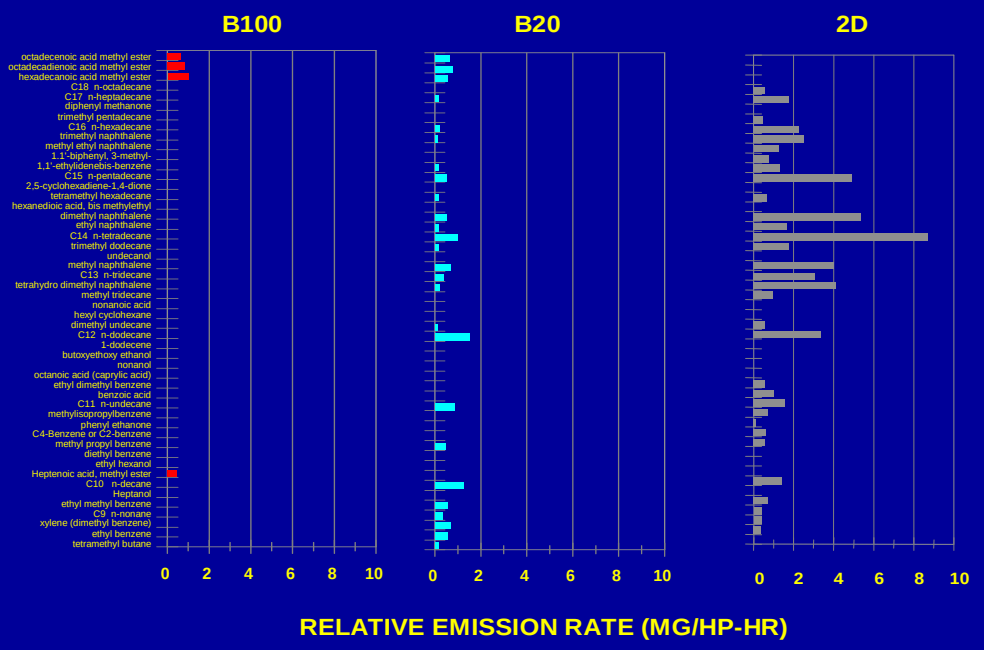
APPENDIX A

Biodiesel Bus Chassis Dynamometer Testing

- B20 vs. conventional diesel fuel
- 2 in-use buses tested (40,000 lb GVWR)
- City Suburban Heavy Vehicle Cycle (CSHVC) at 35,000 lb inertia
- Cummins ISM 2000 Engine – No EGR
- Fuel economy reduction ≈ 3%
- Emission reductions (g/mile basis)
  - **PM ≈ 18%**
  - **HC ≈ 29%**
  - **CO ≈ 24%**
  - **NO_x ≈ 4%**
  - **statistical confidence > 99%**



HEAVY HC SPECIATION – EPA BASE N14 ENGINE



Beatriz Duque
Legislative Analyst and Grassroots Coordinator
California Trucking Association

June 26, 2006

Robert Okamoto
Industrial Section
Air Resources Board
P.O. Box 2815
Sacramento, California 95814

CALIFORNIA TRUCKING ASSOCIATION

Dear Mr. Okamoto:

The California Trucking Association (CTA) presents these comments in conjunction with the comments that were submitted by the American Trucking Associations (ATA) on June 22, 2006, in response to the California Air Resources Board (ARB) suggested biodiesel policy. As the California representative of the national trucking industry, CTA is vitally interested in matters affecting truck fleets, including the supply, price and specifications of diesel fuel. CTA's membership is directly affected by the diesel fuel specifications enacted by various states and has a substantial interest in the ARB biodiesel policy.

Diesel fuel is the lifeblood of the trucking industry. Our industry consumes more than 36 billion gallons of diesel fuel annually and is on pace to spend almost $100 billion on diesel fuel this year. For most motor carriers, the cost of fuel is their second highest operating expense, after labor expenses, and for many long-haul carriers fuel equals as much as 25 percent of total operating costs. In addition to the cost of diesel fuel, diesel's performance characteristics directly affect the trucking industry's ability to deliver more than 98% of the agricultural goods and almost 100% of retail goods transported in California. Diesel specifications directly affect truck productivity, emissions, and the ability to store and distribute fuel. For these reasons, CTA encourages the ARB to seriously consider the ATA's suggestions for biodiesel policy in California as follows:

- Ensure that all biodiesel distributed in the state is tested and certified to meet the ASTM 6751 standard;
- Ensure that the finished blends of on-road diesel fuel are tested and certified to meet the ASTM 975 standard;
- Ensure that the use of biodiesel will not increase nitrogen oxide emissions in ozone non-attainment areas;
- Ensure that all pumps dispensing biodiesel for on-road use are properly labeled to indicate the amount of biodiesel in the blend; and
- Ensure that on-road biodiesel blends are limited to **five percent** biodiesel.

Should you have any questions in regard to the position of the CTA please feel free to contact the CTA at 916-373-3516. Thank you in advance for your consideration.

Sincerely,

BEATRIZ DUQUE

Beatriz Duque
Legislative Analyst
California Trucking Association

Brooke Coleman
Director, Renewable Energy Action Project

REAP Comments on the Proposed ARB Biodiesel Policy

The Renewable Energy Action Project (REAP) is a national coalition that supports the increased use of renewable fuels as a strategy to reduce petroleum dependence and climate change emissions. REAP has reviewed the Air Resources Board's proposed biodiesel policy, and offers the following comments.

- We commend the ARB for taking a proactive approach to biodiesel use in the State of California. Governor Schwarzenegger has made clear, with the issuance of Executive Order S-06-06, that the State should increase its production and use of biofuels, including ethanol and biodiesel.

- We recommend that the ARB consider adopting the policy as an "interim" policy. Adoption of an interim biodiesel policy has several benefits: (1) it recognizes the need to conduct further analysis into the impacts of biodiesel use prior to final policymaking; (2) it puts to rest the contention that the ARB is not concerned about possible NOx emissions increases associated (correctly or incorrectly) with biodiesel use; (3) it offers proper context for the proposed policy, as a first step toward a comprehensive biodiesel blending program; (4) it reaffirms the State's commitment to increased biodiesel use in the near term, which is critical for reducing California's carbon output and petroleum dependence, and providing regulatory certainty to the private sector.

- We disagree with comments expressed by select stakeholders at the May 2006 fuels meeting that the proposed biodiesel policy represents a major step with regard to fuels policy, especially the contention that the policy is "precedent setting." The proposed policy merely reestablishes the ARB's existing policy, which allows biodiesel blending at levels up to 50 percent by volume, while reaffirming the need to conduct further analysis. It was clear at the fuels meeting that the ARB plans to confirm the emissions impacts of biodiesel, including NOx, in the event that "specifications" are needed to ensure CARB diesel emissions benefits. This is a reasonable approach.

- REAP supports the ARB's commitment to further examine the air quality implications of widespread biodiesel use, *as long as the ARB encourages biodiesel use in the interim period*. This is a critical time for biofuels and fuel diversification efforts. Regulatory uncertainty can undercut new energy markets. We encourage the ARB to adopt a preliminary policy that promotes sector growth while it conducts further analysis of the environmental impacts of B20 and other blends. California cannot afford to delay biofuels market growth.

- We encourage the ARB to make a stronger "interim" endorsement of B2-B5 blends, which most experts believe reduce emissions of unhealthy pollutants like particulate (PM) without the alleged, but unconfirmed NOx implications of higher blends. In addition, most vehicles carry warranties for B5. An endorsement of B2-B5 will send a clear signal to the petroleum industry to utilize biodiesel to meet fuel lubricity requirements in the context of the new low sulfur diesel fuel requirements. It will also send a clear signal to the private sector that California is committed to promoting the fuel in the immediate term.

- REAP has investigated the issues reported in Minnesota with regard to 2 percent biodiesel use. Several stakeholders have cited the "Minnesota experience" as supportive of a cautious approach to biodiesel blending. The fact is: (1) most Minnesota fleets and terminals did not have problems after the B2 requirement went into effect; (2) it remains unclear whether the problems reported were related to biodiesel (glycerin), or problems with petro-diesel base fuel; (3) filter clogging episodes were widespread in 2005 in states without biodiesel in the fuel. More specifically, there were reported shortages of "wintertime diesel" as a result of Katrina-related supply issues, which led to the use of summertime diesel in cold weather. In addition, there was no glycerin present in a large percentage of the clogged filters tested by the State. REAP believes that while some of the issues may have been related to isolated biodiesel manufacturing problems, a larger portion of the problem was related to: (a) normal cold operation problems, (b) use of summertime diesel in cold weather due to Katrina-related supply shortages, and (c) low quality diesel fuel. The Minnesota biodiesel blending requirement was reinstated in February 2006.

We appreciate the opportunity to comment on the proposed biodiesel policy, and look forward to working together on this important issue.

Sincerely,

R. Brooke Coleman
Director
Renewable Energy Action Project (REAP)

Peg Gutmann
Manager, Vehicle Energy Planning and Compliance
Vehicle Environmental Engineering

Robert D. Brown
Director, Vehicle Environmental Engineering
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One American Road
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Robert Okamoto
Industrial Section
Air Resources Board
P.O Box 2815
Sacramento, California 95814
Email: bokamoto@arb.ca.gov

June 29, 2006

Subject: Comments on the Suggested Biodiesel Policy as presented by ARB Staff in the Fuels Workshop in Sacramento on May 24, 2006

Ford appreciates the opportunity to submit comments on the ARB Suggested Biodiesel Policy as presented in draft form at the May 24, 2006 Fuels Workshop. Since the ARB draft policy is only an outline rather than a full policy statement, Ford's comments in this document reflect the concepts presented at the workshop and may change upon final release of the actual final policy language.

In reviewing the ARB presentation, Ford highlights three main areas of concern: biodiesel and diesel fuel definitions and specifications; biodiesel availability practices and use; and engine, fuel and emission system impacts. Our recommendations are as follows:

- ARB should investigate and adopt protective B100 and B20 specifications and a quality control process for biodiesel production and handling.
- B20 should not be made available to public retail stations at this time. Its availability should be limited to fleet and private operators.
- ARB should participate in continued biofuels research to further understand their impacts.

We will be pleased to discuss this information with you or members of your staff. Should you wish to do so, please contact me at 313-322-0033 or Peg Gutmann at 313-594-0400.

Sincerely,

Robert D. Brown

Enclosures

FORD MOTOR COMPANY COMMENTS

ON THE STATE OF CALIFORNIA AIR RESOURCES BOARD

Suggested Biodiesel Policy as presented in draft form at the May 24, 2006 Workshop

Ford appreciates the opportunity to submit comments on the ARB Suggested Biodiesel Policy as presented in draft form at the May 24, 2006 Fuels Workshop. Since the ARB draft policy is only an outline rather than a full policy statement, Ford's comments in this document reflect the concepts presented at the workshop and may change upon final release of the actual final policy language.

Ford understands that the purpose of this policy is to consolidate and harmonize existing regulations and policies regarding the use of biodiesel in California. However, we are concerned that this new policy may give our customers the impression that B20 is approved for use in their diesel vehicles. These vehicles have not been designed for operation with biodiesel blends over five percent. Currently, Ford approves of diesel fuels containing no more than 5% biodiesel to be used in current Ford diesel powered vehicles available to the public.

The World-Wide Fuel Charter, a compilation of fuel quality requirements endorsed by the major automobile and engine manufacturer associations, does not recommend any biodiesel for vehicles required to meet the most stringent emission standards, such as those found in California. Furthermore, the document does not endorse fuels which contain more than 5% biodiesel for the other areas adopting emission standards less stringent than LEV II.

The following comments address our three main areas of concerns with the ARB Suggested Biodiesel Policy:

I. Biodiesel and Diesel Fuel Definitions and Specifications;
II. Biodiesel Availability, Practices and Use; and
III. Engine, Fuel and Emission System Impacts.

I. Biodiesel and Diesel Fuel Definitions and Specifications

ARB should provide individual definitions for biodiesel blends of over 5% to 20% by volume biodiesel and avoid classification as California diesel fuel, since some of the important individual fuel parameters can be altered by the presence of biodiesel at these levels. For example, a blend of 20% biodiesel is not expected to have the same characteristics as the CARB diesel fuel as defined in California Code of Regulations, Title 13, Division 3, Chapter 5, Article 2 (Standards for Diesel Fuel). Only biodiesel blends at five percent or less have been found to have similar characteristics as conventional diesel fuel. Both biodiesel and diesel fuel have clear definitions and it is critical to maintain those definitions and not jeopardize the expected performance of diesel fuel in the field. According to Title 13, CCR, Section 2701, B20 should be classified as an "Alternative Diesel Fuel" because it is not expected to comply with the specifications in ASTM D975. Thus, in the adoption of the final policy, ARB should consider B20 as an alternative fuel and acknowledge that B20 may not be compatible with all diesel engines and vehicles on the road today or into the future.

In order to meet customer performance needs and assure that today's very low emission standards are met, all biodiesel fuels used in today's high performance diesel engines must consistently meet high quality standards and specifications. Ford supports ARB's policy of requiring the diesel portion of the mixture to meet CARB diesel fuel regulations. ARB should add to their policy that the B5 final blend also be required to comply with the CARB diesel fuel standard. The 5% biodiesel should not dramatically vary individual fuel parameters such that it places the final blend out of CARB diesel fuel specifications. This B5 practice is similar in nature to manufacturer recommendations for Federal B5.

Requiring the biodiesel portion of the mixture to meet ASTM D6751 is directionally correct; however, the current ASTM D6751 B100 specification is deficient from a fuel thermal and oxidation stability standpoint. Therefore the resultant B20 blend may be deficient as well. The World-Wide Fuel Charter recommends that the B100 used in commercial fuel meet both the ASTM D 6751 and EN 14214 specifications. Reference to European fuel specifications is in recognition that ASTM lacks parameters to sufficiently reduce fuel degradation risks or to ensure fuel compatibility. ASTM is in process of balloting changes to D6751 to incorporate specifications to address some of these deficiencies and is working on developing a specification for B20.

Ford recommends that California adopt its own B100 and B20 specifications that address these deficiencies and adopt the future ASTM specifications when they become available. One set of specifications that CARB can use as a guide is the B20 Test Specifications for Biodiesel Fuel that EMA recently adopted and released publicly on June 16, 2006. To ensure fuel quality and good vehicle performance, the final B20 blends should be required to meet a minimum CARB B20 fuel specification until such time that the ASTM process produces a suitable blending specification consistent with manufacturer recommendations. This practice was previously employed during the implementation of the diesel fuel lubricity standards and was successful.

Ford agrees, subject to the recommendations found in this document, with the approach of ARB of limiting the concentration of biodiesel to a maximum of 20% biodiesel by volume. Using increased concentrations of biodiesel result in several additional concerns including NOx emissions increase, material compatibility and others listed in Section III of this paper. There has been some concern that the use of extensively hydro-treated diesel to produce Ultra-Low Sulfur Diesel fuel in combination with biodiesel may result in a final blend with different properties than the current Low Sulfur Diesel fuel blended with biodiesel. ARB is urged to validate the stability of different biodiesel blends to ensure that customers are afforded a certain amount of protection.

Additionally, the use of uniform quality standards such as those provided in BQ9000 program, administered by the National Biodiesel Board, are needed to promote improved biodiesel quality control and assurances. California should encourage the participation of biodiesel providers in quality programs and encourage further development of standards as more knowledge, experience and information become available.

ARB should make it clear that its Biodiesel Policy should not be construed to imply that B20 is compatible with vehicles on the road today or introduced in the future. ARB should continue to recommend to customers that individual manufacturers and owner guides be consulted to confirm the use of biodiesel or any other fuel, additive, or alternative fuel for use in vehicles and engines to verify warranty applicability.

II. Biodiesel Availability, Practices and Use

Ford as well as other manufacturers permits the use of up to five percent biodiesel blends in the current diesel vehicle population. Since vehicles are designed to handle fuel compliant with ASTM D975, biodiesel blends up to B5 which are also compliant with ASTM D975 can be allowed to enter retail fuel markets at this time.

However, since the same statement cannot be made regarding blends up to B20, it is recommended that B20 should be restricted to captive fleets or private operators who are better equipped to understand vehicle compatibility concerns and the fuel storage and handling precautions. The general public should not be given the opportunity to refuel on B20 since there are not specific B20 compatible vehicles being produced or offered for sale to the general public at this time.

On slide 3 of the Staff presentation, ARB suggests that "Biodiesel blends can be used in on- and off-road diesel vehicles..." Although we agree that this statement is true for biodiesel blends up to 5%, ARB should clarify its statements to avoid public confusion and potential subsequent vehicle issues.

As this program goes forward, California should ensure that the fuel pump labeling requirements in the Division of Measurement Standards regulations are followed. California should also continue to recommend to consumers that individual manufacturers and owner guides be consulted to confirm the use of biodiesel or any other fuel, additive, or alternative fuel for use in vehicles and engines to verify warranty applicability.

III. Engine, Fuel and Emission System Impacts

Although most engine manufacturers have indicated that a 5% biodiesel blend can be used in today's engines, engine manufactures have limited data regarding the use of higher blends and most do not approve biodiesel blends higher than 5% without additional testing and evaluation. This is critically true for the new diesel engine and aftertreatment systems needed to meet ARB's and EPA's near zero emissions standards. There have been several published studies on the use of B20 on older controlled fleets which cite some issue with fuel quality or vehicle compatibility with B20. For example, the J30 SAE Subcommittee R13 initially analyzed hoses that failed in the field, prompting further investigation on biodiesel and hose compatibility. ARB should make a formal request to the subcommittee for a full report to understand the potential impacts of biodiesel on hose materials in the presence of elevated temperatures. Furthermore, gathering current state of knowledge and expertise from fuel system suppliers regarding biodiesel use may prove beneficial.

It has been demonstrated in certain captive fleets that under certain vehicle design and ambient environmental conditions, biodiesel blends that meet applicable standards of fuel quality and stability can be used successfully in diesel powered vehicles. However, concerns include fuel degradation, instability, incompatible materials, and when biodiesel is introduced into a vehicle which historically operated on conventional diesel fuel. Areas needing investigation include fuel-water separator units, fuel filters, low pressure fuel systems, fuel system coatings, seals, elastomers and hoses. ARB should recognize that issues can also manifest themselves into much larger concerns which may not be intuitively traceable to the point of origination – the fuel. Increasing the percent volume concentration of biodiesel can contribute to increased risk of jeopardizing the components' designed durability and functionality.

There are benefits of adding limited concentrations of biodiesel in diesel fuel. For example, 2% biodiesel can improve the diesel fuel lubricity, as long as the fuel maintains stability (biodiesel exhibits decreased overall stability compared to conventional diesel fuel free from biodiesel). There is no evidence that adding more biodiesel, above B2, will result in significant additional diesel fuel lubricity benefit.

In older engines, some emissions benefit has been demonstrated, but research is continuing for both older and more advanced diesel engine and emission aftertreatment technologies. Appreciable tailpipe emission differences by using biodiesel in advanced technologies have not been demonstrated.

Considering the above comments, Ford encourages California to conduct or participate in continued biodiesel research to understand the emissions and lifecycle impacts before allowing the general public to use B20. These issues need to be fully investigated prior to a blanket release of a new fuel product into the mainstream retail venue.

Summary

Ford Motor Company recognizes the importance of implementing a timely biofuels policy. However, we believe it is also important for ARB to fully consider the proposed policy's implications, including issues

associated with the availability of an inadequately defined and specified fuel, the guidance this policy may send to other regions and the ongoing research regarding vehicle impacts. ARB is encouraged to acknowledge any concerns and other potential analytical shortcomings at this stage of the development process. A poor public experience with biodiesel now could taint public perception and impede a successful biodiesel expansion for years to come. Thus, we urge ARB to reconsider and modify its proposal in light of the considerations outlined in this document.

Ford further recommends that:

- ARB should investigate and adopt protective B100 and B20 specifications and a quality control process for biodiesel production and handling.
- B20 should not be made available to public retail stations at this time. Its availability should be limited to fleet and private operators.
- ARB should participate in continued biofuels research to further understand their impacts.

We thank the State of California and the California Air Resources Board for giving us this opportunity to send our comments regarding this important topic and look forward to working with you and other stakeholders to achieve our common goals.

Cal Hodge
President
A 2nd Opinion Inc.

Subject: Comments On Biodiesel Policy
Date: Thu, 29 Jun 2006 20:42:35 -0400 (EDT)
From: A2ndOpinionInc@aol.com
To: rokamoto@arb.ca.gov
CC: henrik.erametsa@nesteoil.com, sbrisby@arb.ca.gov)

Dear Mr. Okamoto:

I am filing these comments on the proposed biodiesel policy on behalf of NESTE Oil. NESTE is interested in this issue because it has developed a process to make a renewable synthetic hydrocarbon diesel fuel and is interested in building a facility in California. Outside of the United States this product is considered to be biodiesel. Inside the United States a National Biodiesel Board member has asked me to not refer to the NESTE product as biodiesel because it is a hydrocarbon rather than an ester. To prevent confusion in my comments, I will refer to the NESTE product and other similar products as renewable hydrocarbon diesel and use the term ester diesel for the other renewable diesel product. My comments are as follows:

Based upon a careful reading of the proposed policy slides and comments made by ARB staff at the Fuels Workshops, NESTE understands that the proposed policy is not intended to in any way limit the use of renewable hydrocarbon diesel. NESTE would appreciate a statement in the policy paper saying that the policy is not intended to limit advances in technology or the use of renewable hydrocarbon diesel.

In the proposed policy you require the "diesel fuel" portion of the blend to comply with CARB diesel fuel regulations. Neste recommends ARB replace "diesel fuel" with the word "hydrocarbon" in this one sentence. Grammatically this eliminates a redundancy. The diesel fuel portion is made up of hydrocarbons. It could prevent someone from inadvertently adding more ester diesel to a "diesel fuel" that already contains the maximum allowable concentration of ester diesel because your proposed policy also :would: Consider B20 and below as California diesel fuel.
On behalf of NESTE Oil by A 2nd Opinion, Inc.

Cal Hodge

Cal Hodge, President
19 Serenade Pines Place
The Woodlands, TX 77382-2005
Phone: 281 844 4162

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Gina D. Grey
Policy & Fuels Director, Southwest Manager
Western States Petroleum Association

Western States Petroleum Association
Credible Solutions • Responsive Service • Since 1907

Gina Grey, Director of Policy & Fuels, Southwest Manager

June 30, 2006

Mr. Robert Okamoto
Industrial Section
Air Resources Board
P.O. Box 2815
Sacramento, CA 95814

Via e-mail to bokamoto@arb.ca..gov

Re. CARB's Proposed Bio-diesel Policy

Dear Mr. Okamoto:

The Western States Petroleum Association (WSPA) is pleased to take this opportunity to provide comments on CARB's proposed bio-diesel policy that has been discussed at recent ARB fuels workshops. As you may be aware, WSPA is comprised of 26 member companies that are involved in all aspects of petroleum and petroleum products exploration, production, refining and distribution. Several of our members have announced they are currently undertaking bio-diesel efforts, so they have a direct interest in the proposed policy.

Our **first** comment addresses a basic issue. Apart from the ARB Powerpoint presentation given at the fuels workshop, and then distributed via "listserve", there does not appear to be a complete written proposed bio-diesel policy for us to review. It is very unusual for ARB to announce a new policy, but not have draft language for all interested parties to review and comment on. As a result, WSPA is requesting that staff prepare a more formal written document that contains, in clear language, what the objective of the policy is, what the policy consists of, and how it translates into practical application. Without this critical information, we find it very difficult to comment in an informed and useful fashion.

Our **second** comment relates to the legal significance of this policy, which appears to be either a proposed regulation, which does not conform to the required

regulatory process, or a policy statement – without apparent legal stature. We are unaware of historical instances where ARB has published, via a Powerpoint presentation, a regulatory policy, especially in the area of fuels, without taking it to the Board for appropriate review and adoption. As stated in the above paragraph, we recommend instead of an unclear and unwritten policy announcement, staff should develop the regulation using the normal regulatory process, as it relates to bio-diesel verification and associated topics.

Our **third** comment is WSPA questions CARB's approach on the proposed policy where the agency suspects bio-diesel may have a detrimental air quality impact from an increase in NOx emissions. The issue is CARB's statement on page 1 of the presentation, which indicates the suggested policy "would not address [the] potential NOx increase". CARB has been aware for quite some time that bio-diesel and blends may increase NOx emissions during use in vehicles and other equipment. Although ARB claims the research study that is about to be initiated will help to define whether/how much of a NOx increase there may be as a result of using bio-diesel, this research will not be completed for quite some time- at a minimum a year from now and possibly two to three years. In the meantime, the agency is clearly stating it has taken a policy of delaying the opportunity to address the potential negative air quality impact.

WSPA has concern with this policy approach. We recommend this policy be taken before the CARB Board for consideration immediately, and no further action be taken to formalize the policy until this is done. The ARB should not promulgate any policy or regulation without a complete understanding of the air quality and other environmental, as well as consumer impacts. We understand ARB believes the potential NOx increase is similar to the ethanol permeation issue in terms of the lag between recognition of a potential problem and addressing the problem. Our main concern is the ethanol permeation issue was formally brought before the Board and staff was directed how to pursue it. The bio-diesel NOx issue should, likewise, be given equal treatment by the agency.

As a follow-on to the above comment, WSPA believes this ARB policy proposal opens up a number of other significant questions relative to bio-diesel. It appears NOx isn't the only issue relative to bio-diesel that has received inadequate review by the agency in recent years. We believe bio-diesel should be treated like any other fuel in the state, and should be put through a multimedia evaluation

where any potential increase in criteria or toxic pollutants is addressed before it is allowed into the transportation fuel pool. This will become even more critical as efforts to increase renewable fuels, including bio-diesel, get ramped up by the Governor, the legislature, the ARB and other state agencies.

ARB's Powerpoint presentation indicates that "widespread use of bio-diesel may require ARB to set specifications to ensure CARB diesel emissions benefits". We would like ARB to define "widespread". It seems illogical that ARB has a separate regulation governing fuel such as LPG, for example, which most would consider a minor volume fuel in the marketplace, but will wait until bio-diesel is in widespread use before it develops specifications to protect air quality. WSPA recommends ARB separate out bio-diesel from the general diesel regulations, so it is clearly identified and treated as a stand-alone fuel, or at least that ARB treats bio-diesel in a much more comprehensive fashion where the fuel specification issues, the retrofit verification issues, and the multiple retrofit rules are integrated properly.

Similarly, WSPA is troubled by mention in the policy that B100 or blends above or equal to 50 percent are exempt from ARB diesel regulations. Again, we do not agree with this selective treatment of motor fuels, particularly since the prior page of the policy presentation indicates that air quality effects increase as the percent of bio-diesel in the fuel increases. If ARB has any suspicion that blends above B20 are a risk to air quality, then it should move to regulate the fuel's specifications and apply any restrictions it deems appropriate in order to protect the air and the consumer, as it has with other alternative fuels.

In terms of the latter category – the consumer - it is inappropriate for ARB to leave the consumer in a very difficult position by stating, "bio-diesel blends above 20% and less than 50% bio-diesel are not prohibited by ARB regulations; but are not recommended at this time." More specifics should be provided to explain to the consumer what is meant by this part of the policy. In addition, the policy does not state whether ARB recommends the use of B50 to B100 – just that these are exempt from current ARB regulations.

Furthermore, there seems to be lack of coordination and coverage of issues between CARB and DMS with respect to bio-diesel. While not directly an ARB

issue, it is of concern that DMS's regulations, in particular their specifications, only apply to bio-diesel sold at retail and do not apply to wholesale bio-diesel quality. Again, WSPA believes ARB should develop bio-diesel specification requirements to ensure performance and quality in the state are consistent and adequate.

Relative to this last point, we notice on the second page of the ARB Powerpoint policy presentation that bio-diesel blends must meet certain conditions. There is

an inconsistency between what ARB considers appropriate and what DMS considers appropriate. The DMS regulations require a final biodiesel blend to meet D975. In addition, separate biodiesel and diesel components must meet certain ASTM requirements. We suggest ARB include this final blend D975 requirement as well.

We understand it is ARB's intent to apply this policy to vehicles that have been retrofitted with various verified retrofit devices. It is unclear what the policy is if a non-verified trap is used.

Our final comment concerns the broad applicability of this policy, which goes beyond the originally enacted relevant enabling legislation. The legislation only applies to specific fleet vehicles through January 1, 2008 (e.g. solid waste collection; federal, state and local government). However, the ARB policy is for any retrofit vehicle with a verified device in perpetuity. We recommend ARB discuss somewhere in the policy this expanded range of coverage, and its authority for doing so.

Overall, WSPA is concerned with the informal, unclear, policy approach taken by ARB on this issue, and we recommend the agency return to a normal regulatory approach, which may include the setting of specifications separate from the conventional diesel regulations, but definitely includes formal consideration by the CARB Board. Part of the Board's consideration should concern itself with staff's explanation as to why they are recommending an extension of the applicability of the policy beyond the explicitly-stated applicable fleets in the enabling legislation.

If you have any questions relative to our comments, I'd be happy to discuss them with you.

Sincerely,

Gina Grey