



Information for Boaters: **Biodiesel for Marine Engines**

What is Biodiesel? Biodiesel is an alternative fuel for diesel engines processed from soybean oil and other vegetable oils or recycled cooking oil. Biodiesel is sold in California as a diesel fuel additive for recreational boats. There are currently three Biodiesel producers marketing in California: NOPEC Corp. (Florida) selling "BioBooster" in 5-gallon containers at 12 stores and docks, AG Environmental Products (Iowa) selling "SoyGold" fuel docks in Southern California and PMC/ Griffin Industries who are offering pre-mixed blends of biodiesel for marine and transportation applications.

How do I use Biodiesel? Biodiesel is sold in 5-gallon containers at stores and fuel docks so it can be poured directly into to your fuel tank (it mixes readily with regular petroleum diesel # 2) to create blends of up to 20%. Add 5 gallons of Biodiesel for every 20 gallons of regular diesel fuel. Tanks should be kept full, particularly in winter, to reduce moisture condensation. Biocides are recommended to inhibit the growth of bacteria. Commercial biocides are available at local marine supply stores. Follow directions for their use carefully.

What can I expect from using Biodiesel or its blends? At a 5% blend, Biodiesel can restore the lubricity properties of diesel fuel sold in California before late 1993 when California Air Resources Board (CARB) mandated fuel changes. At 20%, there will be a noticeable reduction in smoke, soot and burned diesel odor from the engine's exhaust.

What were the CARB fuel changes? In 1993, the US EPA and the California Air Resources Board (CARB) mandated formulation changes for petroleum diesel fuel to achieve reduced emissions of sulfur oxides, carbon monoxide and unburned particulate material (soot). These changes have led to allegations, due to the reduced lubricity of the fuels, of injector pump failure and fuel leakage from failing O-ring and injector pump seals. Blends of Biodiesel with reformulated petroleum diesel have been shown to improve the efficiency of combustion of the petroleum (in addition to diluting the noxious compounds) and thereby reduce emissions of sulfur oxides, carbon monoxide and particulates. There are important mechanical advantages as well since the biodiesel provides high lubricity to protect against wear in the fuel and injector pumps. Elastomeric properties of the original (pre-1993) diesel are restored by the solvent action of the oxygenated fuel allowing the engine seals, pump O-rings and gaskets to swell for tighter fits designed for use with the original formulation.

Can I use more than a 20% blend? In Europe and on the east coast, Biodiesel is marketed as an alternative fuel to replace petroleum diesel in marine engines. There are considerable environmental and aesthetic benefits to using the biodiesel in higher concentrations or as a "neat" (100%) biofuel. However, by state law in California, and warranties provided by the suppliers, biodiesel is marketed and sold as an additive for marine diesel engines to be used in blends up to 20% (5 gallons to every 20 gallons of regular petroleum diesel # 2).

What other changes can I expect from the use of Biodiesel? Besides the reduction of exhaust odor, higher concentrations of Biodiesel should also reduce the amount of soot being deposited on the boats hull. Your diesel engine should run smoother, particularly at low rpms, and it may start easier. Being an oxygenated fuel with no crude oil contaminants, the Biodiesel itself burns cleanly and it further improves the combustion of the petroleum fuel.

Do I have to modify my engine to use Biodiesel in my boat? No, Biodiesel mixes with your regular diesel fuel as a blend and should require no changes to your engine in blends up to 20%. Biodiesel (in high concentrations)



can affect old rubber fuel lines and also clean the inside of old fuel tanks, causing the released sediment to clog fuel filters. Of 100 boaters surveyed this year, only 6% reported any problems at all (mostly due to old fuel lines and dirty tanks affected by high concentrations of Biodiesel). 87% of the boaters had no problems at all using Biodiesel, even at high concentrations (50% of the boaters surveyed used Biodiesel from 50% to 100%). The following precautions are recommended for boats with older tanks and engines:

1. Start off with clean fuel tanks and clean fuel before adding biodiesel. Old fuel tanks that have not been kept "topped off" through the winter or have much turnover of fuel (standing long periods of time) are highly susceptible to growth of diesel-degrading microorganisms. Sediments and slime from the deteriorated fuel may be released from the tank by Biodiesel.
2. If you are not sure, inspect your fuel filters regularly for signs of sediment accumulation. Moisture condensation in diesel tanks will promote the growth of bacteria and mold (not "algae") that will eventually foul fuel filters. In extreme cases, your engine might stop, so be very careful to monitor the filters and change them on a regular basis to be safe.
3. Monitor rubber fuel hoses, filter gaskets and seals, and replace them as needed. The solvent action of the oxygenated Biodiesel can slowly deteriorate old rubber hoses, gaskets and seals. Again, these effects appear to be limited to higher concentrations of Biodiesel (e.g., 50-100%) and are rare among older boat engines operating on 20% or less Biodiesel. If a fuel line gets soft, replace it with USCG-approved grade A-1 fuel hose sold in stores.

Recommendations for Handling and Using Biodiesel

Avoid spilling Biodiesel into bilges, onto engine or on painted surfaces; clean spills up immediately with absorbent pads. Rinse surfaces with mild detergent and water.

Biodiesel has been shown to degrade polysulphide rubber compounds used on decks. To date, we have had input from users that spilling Biodiesel on teak decks utilizing polysulphide caulking has resulted in the deterioration of deck seams. Spills which are immediately cleaned up with soapy water have not had the same impact on deck caulking compounds.

We have not seen or heard of any problems from boaters with their soft rubber engine mounts. It can be extrapolated from other rubber compound incompatibilities, that exposure to rubber engine mounts could lead to degradation of the rubber compound and failure of the engine mount. As in other instances, cleaning of rubber mounts and painted surfaces exposed to Biodiesel is easily accomplished with warm soapy water. Treat the Biodiesel as fuel, wipe up spills, wash off exposed surfaces and prevent any discharges of the product to the Bay.

How do I get more information? Contact the marine sales department of the Biodiesel supplier by calling the toll free number on the product label. For NOPEC BioBooster, call 888-BY-NOPEC (296-6732). For AEP SoyGold, call 888-4 SOYGOLD (476-9465). You may contact the National Biodiesel Board at 800-841-5849 (web site at www.biodiesel.org).

CytoCulture in Point Richmond, CA has recently published a "Technical Handbook on Marine Biodiesel" and "Survey of 100 Recreational Boaters using Biodiesel on San Francisco Bay". These two reports, along with other technical documents pertaining to Biodiesel test specifications and current Federal/State laws may be reviewed on the CytoCulture web site at www.cytoculture.com/biodiesel. For further information, contact CytoCulture at 510-233-6660.