

## The Perils of the Home-Brew

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There's ample evidence that biodiesel made to the standards developed in Europe and the US poses no risk to diesel motors. It is a concern, however, that many people promoting the use of biodiesel are describing procedures which cannot produce biodiesel to these standards. Though users of this material report that it performs well in their vehicles, most appear to have traveled only a small fraction of the distance one expects, trouble-free, with a diesel.

There are three main contaminants that can easily be present in home-made biodiesel:

- unreacted and partly reacted starting material (triglycerides, diglycerides and monoglycerides).
- soaps.
- free fatty acids.

Gas chromatography appears to be the only way to accurately determine the level of unreacted glycerides. Properties such as viscosity or specific gravity can hardly be expected to change enough to confirm a level of the order of 1.5%. In any case these measurements will be corrupted if residual methanol is present, and it will be present in unwashed or partly washed product.

In performing the reaction, enough caustic must be used to neutralize all the free fatty acids present plus a small excess to act as a catalyst. This excess also reacts to form soap. While most of the soap goes out with the glycerine layer some remains in the ester layer. Some of this soap may settle out but some remains invisible in solution and can never settle. Without thorough washing, soap will inevitably be present. Soap is alkaline and attacks aluminum.

If attempts are made to clear the soap haze by adding acid, for example, vinegar, then part or all of the soap will be converted to free fatty acids. These are in solution and can never settle nor can they be washed out with water. Fatty acids attack steel.

It may be that the levels set out in the overseas standards will eventually prove to be excessively strict, but in the absence of scientific evidence to this effect it would appear prudent to take precautions. Production methods should be checked by gas chromatography to ensure the reaction has gone far enough and thorough washing should be used to remove soap. If the soap is removed there can be no case for the use of acid.

To help establish appropriate standards, does anyone have well documented evidence as to the levels of these three contaminants which can be tolerated?