# Challenges Facing the Biodiesel Industry: Focus on Biodiesel Testing Standards

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We can begin discussing the challenges of the Biodiesel Industry from the beginning, the Feedstock. Issues begin to arise even before Biodiesel becomes Biodiesel. The usability of vegetable oil feedstock is of utmost importance. Currently, the cost of a variety of feedstock used to make Biodiesel is very high. This is due to the availability of this feedstock in that they will always have other uses besides being an energy source. The major use is food for human nutritional needs. Only a fraction of vegetable oil production is available for non-food use. This dilemma is better known as "Food vs. Fuel". To simply grow and produce more vegetable oil and use it for fuel would simply not work. There is a finite amount of land and other natural limitations that make this notion unfeasible. We must develop "New Agriculture" such as Algae that does not compete with food crop for land use. A public policy initiative would act as a catalyst and push the thinking in this direction. This policy should be a performance based policy that pays according to performance not production. Ultimately, a system of Development and Sustainability must be in effect in order for the growth of Biodiesel to be successful.

Another Challenge facing the Biodiesel Industry is Quality Control. One major difference that separates Biodiesel from Petro-diesel is how Biodiesel behaves under extreme temperature conditions. Cold flow properties in the winter and oxidation stability in both the summer and winter are major issues in the Quality control of Biodiesel. These properties do differ slightly based on the feedstock in which the fuel is produced. For example, Biodiesel derived from palm oil, tallow, or used cooking oils generally have worse cold-flow properties than Biodiesel from soybean or canola oil. (Building Biodiesel, pg 7). The Oxidation Stability of Biodiesel greatly differs from that of Petro-Diesel. The rate at which this oxidation occurs increases with higher temperatures. Therefore, storage during the summer months will cause Biodiesel to deteriorate rapidly. The chemical composition of Biodiesel also contributes to its oxidation. Again, the composition depends on the feedstock in which the Biodiesel is produced. Biodiesel composed of unsaturated fatty acid alkyl ester-like linoleic and linolenic acid esters are more susceptible to oxidation than saturated fatty acid esters. (Biodiesel Magazine, Peng Ye).

The Diversity of the Biodiesel Testing Standards around the world is a major issue in the effort to make Biodiesel a mainstream energy source. As long as these major testing organizations have different views on the Quality parameters of Biodiesel, it will continue to be difficult to produce and distribute Biodiesel worldwide. There is however, an effort currently taking place to make Biofuel standards internationally compatible. Participants involved in this effort include the Government of Brazil, the European Commission (representing the European Union) and the Government of the United States of America. A Biofuels Standards Roadmap was developed in April 2007 that delineated the necessary steps that needed to be undertaken by the U.S., Brazil, and EU to achieve greater compatibility among existing biofuel standards. (ASTM, white paper, pg 5-6). Technical work began in July 2007 and classification of the various specifications was complete by the end of 2007. This classification was accompanied by comments on the extent and relative impact of the work that would be needed to bring closer alignment between the specifications, thus forming a preliminary basis for prioritization of next steps. (ASTM, white paper, pg 5-6). The various specifications were classified into three categories A, B, and C. Category A representing specifications that are already similar. Category B representing specifications with significant differences between parameters and methods, but which might be aligned by work on documentary standards and measurement standards. Category C representing specifications with fundamental differences, perhaps due to emissions or environmental regulations within one or more regions, which are not deemed bridgeable in the foreseeable future. This classification of the Various Biodiesel Specifications is given in *Table 1*.

| Category A *Similar* | Category B *Significant Differences* | Category C *Fundamental Differences* |
|---|---|---|
| Sulfated Ash | Total Glycerol Content | Sulfur Content |
| Alkali and Alkaline Earth Metal Content | Phosphorous Content | Cold Climate Operability |
| Free Glycerol Content | Carbon Residue | Cetane Number |
| Copper Strip Corrosion | Ester Content | Oxidation Stability |
| Methanol & Ethanol Content | Distillation Temperature | Mono-, Di-, Tri-acylglycerides |
| Acid Number | Flash Point | Density |
| | Total Contamination | Kinematic Viscosity |
| | Water Content & Sediment | Iodine Number |
| | | Linolenic Acid Content |
| | | Polyunsaturated Methyl Ester |

*Table 1: Classification of the Various Biodiesel Specifications (ASTM, white paper, pg8)*

The diversity among existing specifications is a result of a number of factors. The first factor being that some existing specifications have been formulated mainly around the locally available feedstock. This diversity of feedstock is then translated into significant divergences in specification properties of the derived fuels. Another factor contributing to the divergences in the specification properties is the fact that some specifications such as the U.S. and Brazil specifications are based on use as a blend stock or extender for fossil based diesel fuel, while others, such as the European specification is based on use as a 100% fuel for engines and as a blending component in hydrocarbon based fuel. (ASTM, white paper, pg 20). Furthermore, Biodiesel Standards in Brazil and the U.S. are applicable for both fatty acid methyl esters (FAME) and fatty acid ethyl esters (FAEE), whereas the current European Biodiesel Standard is only applicable for fatty acid methyl esters (FAME). Another source for the differences in the Biodiesel Specifications from region to region is the predominance of the types of diesel engines most common in that region. For example, the most prominent Diesel Engine in Europe is found in passenger cars. This diesel engine is fairly different than the heavy duty diesel engines found in the U.S. and Brazil. The different engines amount to differences in the Emissions regulations that govern these engines. These diverse Emissions regulations then contribute to differences in the Diesel Specifications amongst the...

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