

# **A Novel Biofuel via Partial Transesterification of Vegetable Oil**

Dipl.-Ing. Andreas Stäbler, Dr. Michael Menner, Dr. Peter Eisner

Fraunhofer Institute for Process Engineering and Packaging (IVV), Freising, Germany

## Objective:

The importance of vegetable oil based biofuels, especially biodiesel, is increasing dramatically in recent years. From 2002 to 2008, the global production capacity increased from 2.2 Mio. t/a to 32.6 Mio. t/a [1]. Despite the rapid growth of the global biodiesel industry, there are significant disadvantages of this technology, mainly the fuel yield of only 90%, the extensive downstream processing and the missing market for the byproduct glycerol. Fraunhofer IVV has developed an enzymatic method to produce a fuel from vegetable oil with similar properties to biodiesel. During the reaction, no byproducts are formed. Therefore there is an almost 100% fuel yield and no need for an extensive downstream processing.

## Method:

The process is based on the use of carrier-bound lipases as catalysts. These enzymes only transesterify two of the three fatty acids of oil molecules. The product is a mixture of fatty acid ethyl esters and different bound glycerides.

## Results:

The product from the enzymatic partial transesterification process is a clear, single phase liquid with significantly reduced viscosity, a compared to vegetable oil. As the viscosity is higher than specified in the diesel or biodiesel standard, the fuels main application is utilization as fuel blend.

High ratios of the novel biofuel can be easily dissolved in diesel and biodiesel, forming stable solutions. Initial engine test runs, lasting 1.000 h using a 10% blend, showed a good and stable engine performance. After the engine tests, no deposits were found on the pistons, the fuel injector or in the particle filter. The exhaust gas composition measured was similar to the one obtained during the combustion of identical blends of diesel and standard biodiesel.

Currently, Fraunhofer IVV is working on a market implementation of the novel fuel in different regions. A pilot plant, as well as a production unit are already operational in Brazil.

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[1] „Biodiesel 2020: Global Market Survey, Feedstock Trends and Forecasts“, Multi-Client Study, 2nd Edition, 2008, Emerging Markets Online