

# Esterification/Transesterification

## FEEDSTOCK CLASSIFICATION

Fats, grease and offals; plant-based oils

## FEEDSTOCK EXAMPLES

- [beef tallow](#)
- [edible offal](#)
- [inedible offal](#)
- [rapeseed](#)
- [scrap/spoilage \(meat packing\)](#)
- [soybeans](#)
- [waste cooking oil](#)

## FEEDSTOCK RESTRICTIONS

Feedstock must be oil-based.

## PROCESS DESCRIPTION

Esterification occurs when carboxylic (“fatty”) acids react with alcohol in the presence of catalytic amount of mineral acids, yielding compounds called esters. Transesterification is the process of exchanging the alkoxy group of an ester with another alcohol, often catalyzed by the addition of an acid or base. One outcome of these processes is that triglycerides can be converted into biodiesel.

## PRIMARY BIOBASED PRODUCTS

[Biodiesel](#), solvents, adhesive additives

## PROCESS BYPRODUCTS

[Glycerin](#), [crop fibers](#), [gluten](#), glycerol, alcohol, [full-fat flour](#), [meal](#) (if soybeans are used). The alcohol can be reused in esterification.

## MAJOR EQUIPMENT

Press/extrusion equipment; transesterification equipment.

## ENERGY REQUIRED

Medium, due to the electrical demand of the equipment.

## CAPITAL AND OPERATING COST

\$0.30-\$0.69/L, based on capacity, feedstock and process

## COMMERCIALIZATION STATUS

Commercially available

## COMMERCIAL SUPPLIERS

Crown Iron Works (<http://www.crowniron.com>) in Minneapolis, MN USA (651.639.8900)

Lurgi PSI (<http://www.lurgipsi.com>) in Memphis, TN USA (901.756.8250)  
Renewable Alternatives in Green Bay, WI USA  
Biosource Fuels, LLC in Kenosha, WI USA  
Triple "F" Feeds based in Des Moines, IA USA (515.254.1200)  
Topical Enhanced Solutions in Hollywood, FL USA  
OceanAir Environmental Fuel and Glycerin, LLC (<http://www.oceanaireenvironmental.com>) in  
Lakeland, FL USA  
Stratco, Inc. (<http://www.stratco.com>) in Leawood, KS USA  
Baroid Drilling Fluids ([http://www.baroid.com/z Baroid.htm](http://www.baroid.com/z_Baroid.htm)) in Houston, TX USA  
Cortec (<http://www.rawnamerica.com>) in St. Paul, MN USA  
Superior Process Technologies in St. Paul, MN  
Biodiesel Industries in Santa Barbara, CA  
Imperial Western Products, Inc. in Coachella, CA

## REFERENCES

- Carbohydrate Economy Clearinghouse. <http://www.carbohydrateeconomy.org/> (8 April 2004).
- Bender, M. 1999. Table 1. Projected expenditures (US\$/L) for biodiesel processing in 3 studies in "Economic feasibility review for community-scale farmer cooperatives for biodiesel. Bioresource Technology, 70: 81-87. <http://www.landinstitute.org/pages/MB-Biodiesel-tables.pdf>. (26 April 2004).
- Streitwieser, Andrew and Heathcock, Clayton H. Esterification. <http://wyk.edu.hk/~paulsiu/Chemistry/ester.htm> (26 April 2004).
- Tyson, K. Shaine. 2003. Biodiesel technology and feedstocks <http://www.sustainenergy.org/calendar/biodiesel/Tyson%20-%20Biodiesel%20Technology%20and%20Feedstocks.pdf>. (26 April 2004).
- Weber, J. Alan and Van Dyne, Donald L. 1998. Cost Implications of Feedstock Combinations for Community Sized Biodiesel Production. University of Missouri – Columbia, Columbia, MO.