

GREEN

FUELS

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LANXESS Deutschland GmbH
Chemiepark Leverkusen
51369 Leverkusen
Germany
www.lewatit.com
www.ionexchange.com

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LANXESS Sybron

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Energizing Chemistry



**LEWATIT® GREENFUELS:
WE TALK BIODIESEL**

LANXESS
Energizing Chemistry



LEWATIT® ION EXCHANGE RESINS



With a marketplace hungry for alternative fuels, biodiesel production is surging. Cutting-edge Lewatit® ion exchange technology from LANXESS - also known as GreenFuels (GF) technology - helps set the pace, delivering competitive advantages, economy and innovation.



At LANXESS, we talk biodiesel. A decade of diverse experience backs our business, so we speak industry lingo with ease. We hear your needs exactly and supply dependable, creative answers for even difficult purification issues. Let us open the conversation here and then trade ideas with you about Lewatit® GreenFuels. Between our products, our knowledge and our people, you will receive the innovative solutions you need to succeed in the biodiesel industry.



The LANXESS Group also offers products suitable for biodiesel. Baynox® and Baynox®Plus, antioxidants protecting biodiesel from oxidation. Please visit www.baynox.com. Preventol® a range of biocides keeping your process »clean«. Please visit: www.protectedbylanxess.com

THOROUGH...



Lewatit® GreenFuels technology is compatible with known feedstocks and provides solutions throughout the biodiesel production process.

Lewatit® GF 101 converts free fatty acids in low-grade feedstocks, upgrading these sources without corrosive sulfuric acid that requires special handling.

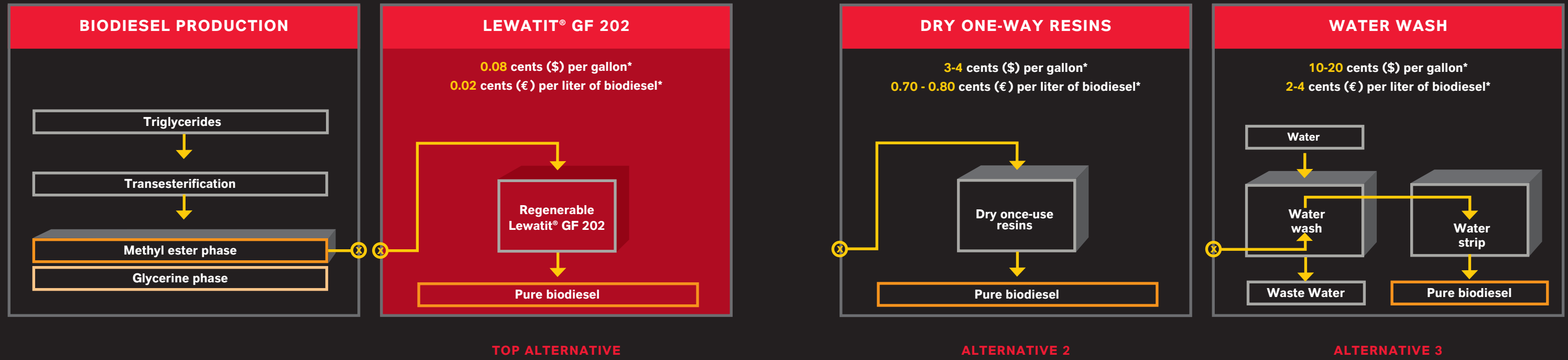
Lewatit® GF 201 and GF 202 remove glycerine, soaps, salts, water and methanol from biodiesel streams by adsorption.

Lewatit® GF 303, GF 404 and GF 505 efficiently remove salts and color bodies from crude glycerine.

The Lewatit® GreenFuels product line for Biodiesel/Glycerine

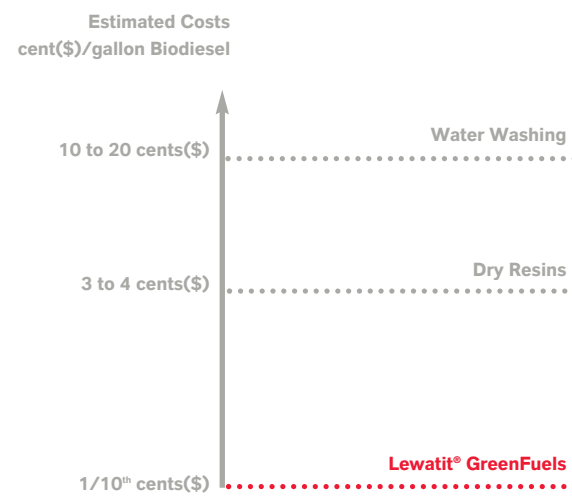
- | | |
|---------------|-------------------------------|
| GF 101 | Catalyst, Fatty Acids removal |
| GF 201 | Adsorber, glycerine |
| GF 202 | Adsorber, glycerine |
| GF 303 | Separation salts / glycerine |
| GF 404 | Polisher, cation removal |
| GF 505 | Polisher, anion removal |

LEWATIT® GF 202 VERSUS DRY RESINS AND WATER WASH



* model calculation

ECONOMICAL...



Cost Reduction with Lewatit® GreenFuels - Model Calculation

Lewatit® GF 201 and GF 202 can replace more expensive water wash. Biodiesel streams are dry - why add water? Lewatit® GF 201 and GF 202 help to keep dry streams dry, eliminating water-stripping expenditures. Comparing expenses per gallon treated from a process example tells the story with a few words: water washing easily costs 10 to 20 cents (\$), dry resins cost approximately 3 to 4 cents (\$) and Lewatit® resins cost less than one-tenth of a cent (\$). The high efficiency of Lewatit® GF 201 and GF 202 can minimize upfront capital costs and the technology's economics favor retrofitting of existing plants.

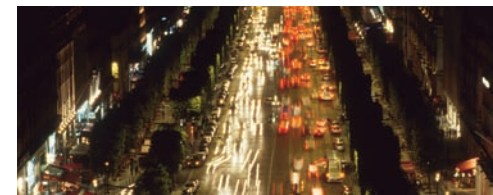
The typical biodiesel process can produce 10,000 metric tons of glycerine for every 100,000 metric tons of biodiesel. The glycerine yield from the Lewatit® GF 303, GF 404 and GF 505 process can easily be upgraded to technical or pharmaceutical grade. Traditional glycerine refining requires boiling the entire glycerine stream several times in multiple evaporators before removing water by evaporation at the end. This process is both capital and energy intensive. The Lewatit® GreenFuels technology for glycerine purification eliminates the glycerine evaporation steps resulting in reduced capital and operating costs.

RENEWABLE...



The Lewatit® GreenFuels GF 201 and GF 202 adsorbers for glycerine removal from biodiesel are regenerable, yielding long bed life. Other adsorbers operate on a »once-through« basis requiring frequent media replacement and disposal - short bed life and higher operating costs result. The same Lewatit® resins can provide several years of use with little decline in effectiveness. Regeneration virtually eliminates resin disposal costs as well as biodiesel and glycerine loss due to resin disposal. Regeneration is a simple procedure. The methanol process that regenerates Lewatit® resins is cost-neutral – after use, effluent cycles directly back to the transesterification tank.

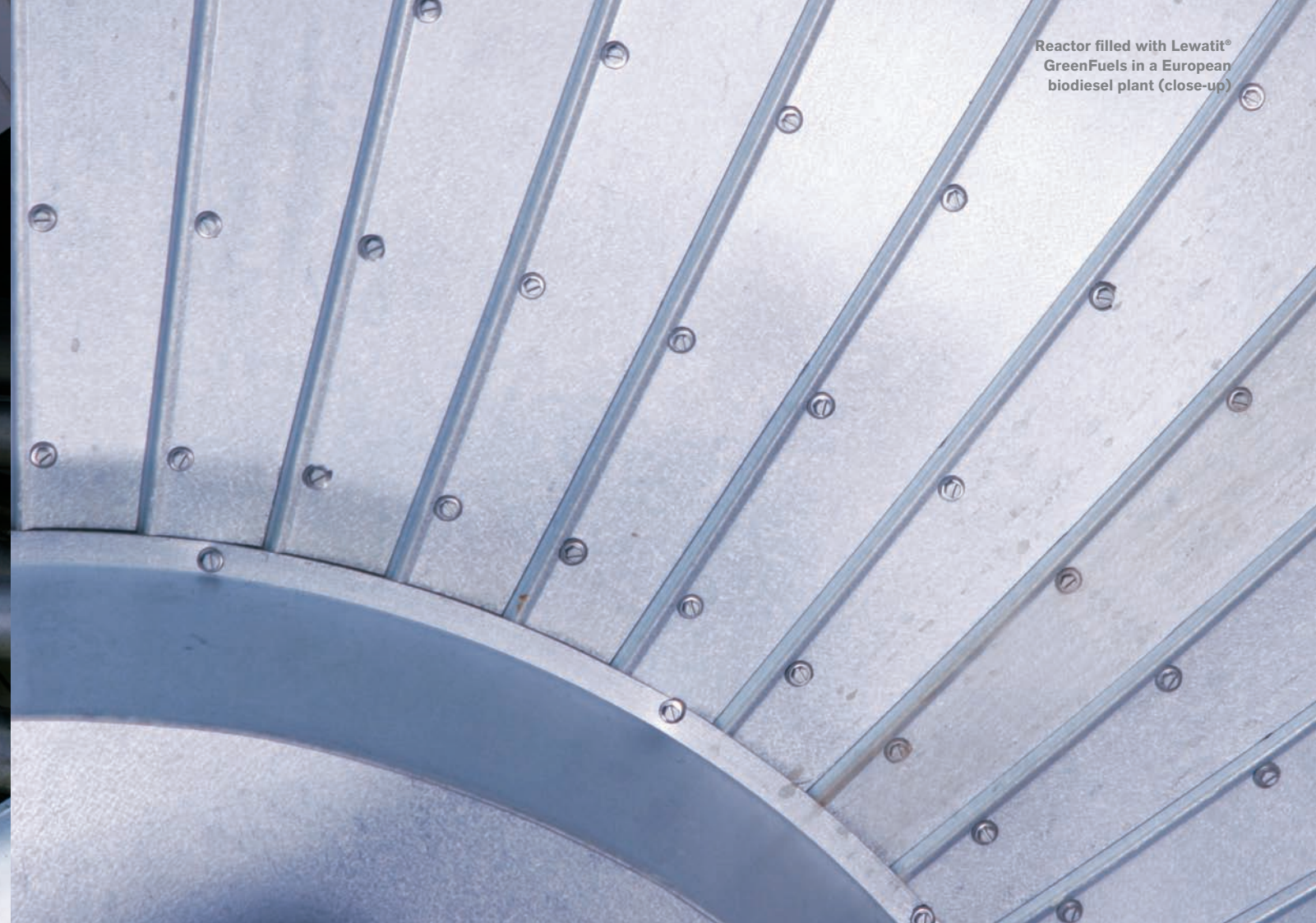
EFFICIENT...



Lewatit® GreenFuels technology produces top-quality biodiesel rapidly and effectively. One liter of resins can purify 11 to 14 metric tons of biodiesel yearly. Further, the innovative design of Lewatit® GF 202 minimizes pressure-drop across the unit. Lewatit® resins typically utilize 90% of reactor volume because they do not swell with glycerine; competing products often utilize just 30% due to resin swelling.



Reactor filled with Lewatit® GreenFuels in a European biodiesel plant



Reactor filled with Lewatit® GreenFuels in a European biodiesel plant (close-up)

VERSATILE...

Lewatit® resins have been used in biodiesel plants of all sizes using a wide variety of reaction technology. Existing plants can be easily retrofitted. Biodiesel produced with Lewatit® resins fulfill international fuel industry specifications.

purification technology and our commitment continues. This commitment, emphasizing research and development, analytics and visionary innovation, is simply irreplaceable in a dynamic field like biodiesel production.

Our experience in the biodiesel industry helps us respond to your individual project needs. We collaborate with you throughout the entire project process, working with planners, engineers and process personnel to aid you in designing, installing and optimizing your system.

We have practiced our technology on an industrial scale and have thoroughly validated it in diverse process designs and plant sizes, so working with our products and us is straightforward. Lewatit® GreenFuels technology comes with LANXESS support from project conception through start up and into ongoing operation.

THE BOTTOM LINE? IT IS BETTER!

We believe Lewatit® resins are one of the most cost-effective, easy-to-use ion exchange resin-based biodiesel technologies on the market.

At LANXESS, we provide biodiesel purification solutions that can help to advance customers' businesses and position them to excel in this exciting marketplace. Tell us what you need and we will surpass your expectations. Once you talk biodiesel with us, you may find other technologies pale in comparison.

DO YOU LIKE WHAT YOU HEAR SO FAR?

There is more: At LANXESS, biodiesel purification products and knowledge are a core competency. We helped invent a superior biodiesel

REGIONAL BUSINESS CENTERS

EUROPE

LANXESS Deutschland GmbH
Langenfeld, Germany
Fax +49-2173-2033-311
lewatit.eu@lanxess.com

JAPAN & SOUTH KOREA

LANXESS K.K.
Minato-ku, Tokyo, Japan
Fax +81-3-3280-9869
lewatit.jp@lanxess.com

NAFTA

LANXESS Sybron Chemicals Inc.
Birmingham, NJ, USA
Fax +1-609-894-8641
ionexchange@sybronchemicals.com

SOUTH AMERICA

LANXESS Industria de Produtos Quimicos e Plasticos Ltda, Sao Paulo, Brazil
Fax +55-11-37412548
lewatit.br@lanxess.com

ASIA PACIFIC

LANXESS Pte Ltd
Singapore
Fax +65-6-2666959
lewatit.sg@lanxess.com

HEADQUARTERS

LANXESS Deutschland GmbH
Leverkusen, Germany
Fax +49-214-3050621
lewatit@lanxess.com