

**SPECIALITIES FOR
LUBRICANT APPLICATIONS**



RODALUBE®

Ester, Ether, Sugar Derivatives and other Specialities

By 1931, Deutsche Hydrierwerke (DHW) in Rodleben/Germany patented and initiated the world's first production of fatty alcohols based on evolving technology of catalytic, high pressure hydrogenation.

Today this important development in chemical processing still influences our lives. Industries such as food & nutrition, detergents and toiletries, cosmetics and pharmaceuticals as well as other industrial processes rely on these oleochemistry branch achievements.

The experiences of DHW in hydrogenation technology for manufacturing fatty and sugar alcohols were fundamentals for the ensuing "cascade" of chemical modifications leading to the development of esters, ethers, sugar derivatives and other chemical specialities. Applications of all products are as diverse as the products themselves being used as emulsifiers, surface active agents, chemical modifiers, consistency promoters, moisturizers, emollients, lubricants and chemical intermediates.

In 1991, DHW was incorporated into the worldwide network of research and production facilities of our oleochemical group. With the creation of Ecogreen Oleochemicals in 2001, DHW reinforced its position as a global producer and supplier of unsaturated fatty alcohols, primary fatty amines, sorbitols and other sugar alcohols as well as a new range of speciality fatty esters and ethers.

By 1999, a state-of-the-art technology was installed for the production of fatty esters and other chemical specialities derived from vegetable raw materials.

The longtime R&D experience combined with additional synergies from global oleochemistry allows DHW to present itself as a strong and reliable partner for industrial cooperation.

DHW Rodleben offers tailor-made oleochemical derivatives, which are used in the production of nutritional products, cosmetic and pharmaceutical goods as well as additives for industrial purposes.

Progress from Nature

Over years, worldwide awareness for environmental issues has grown, gentle processing technologies and the use of renewable resources have become increasingly important. Our technological expertise and the use of natural ingredients for the production of chemical substances qualifies DHW Rodleben to fulfill its obligations in meeting the requirements for a sustainable, ecologically-sound world. The concept of a chemical production site based on human needs and environmental awareness is already reality within our company today.

Based on natural, vegetable raw materials, Ecogreen Oleochemicals is producing and marketing a wide range of oleochemical products, which are used in many fields of applications.

The industry is using these products either directly or as raw material for other products.

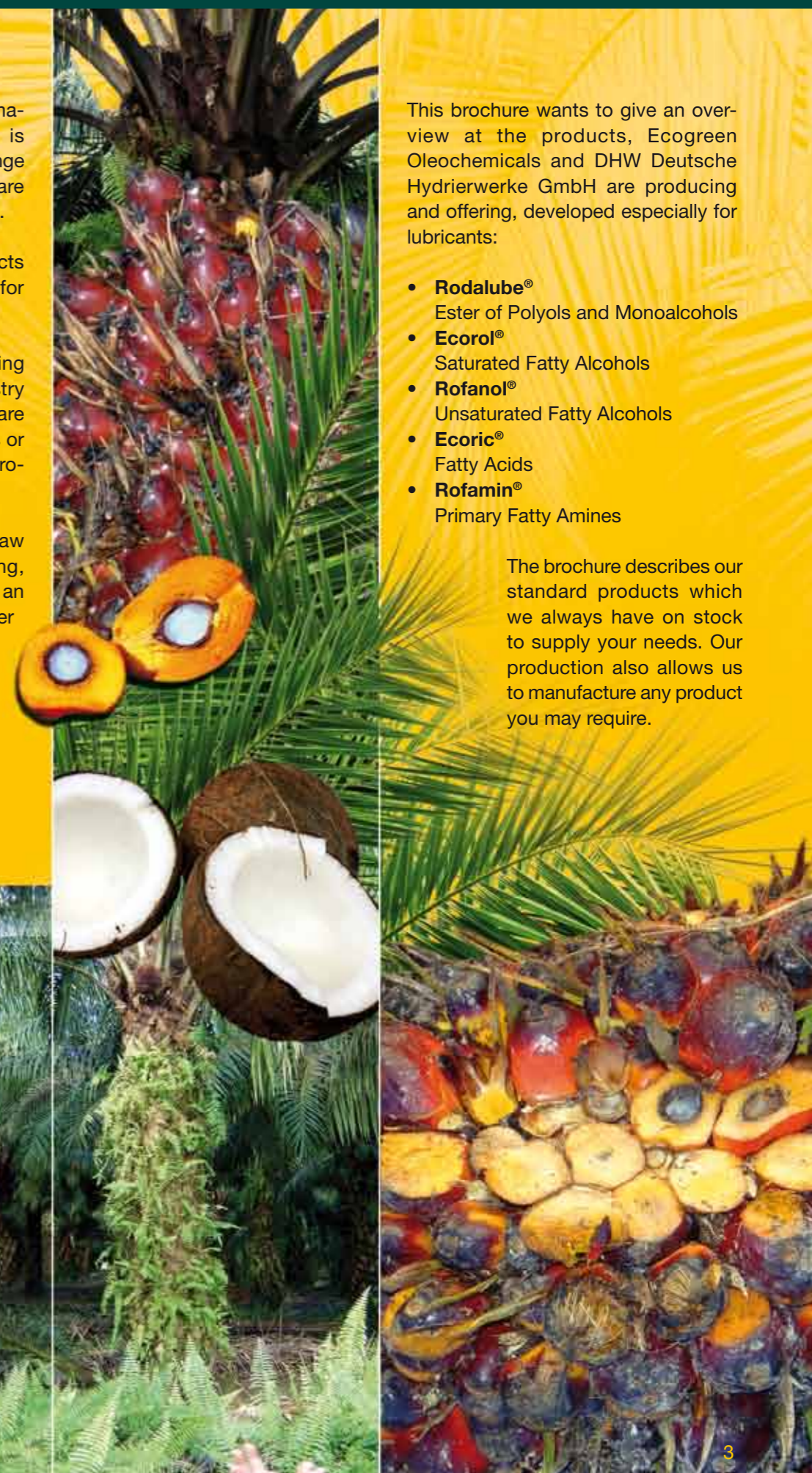
Ecogreen Oleochemicals is offering especially for the lubricant industry a wide range of products, which are used as raw material for lubricants or are processed as basis for further products made in our several plants.

With this philosophy of internal raw material sourcing and processing, Ecogreen Oleochemicals becomes an independent and sustainable partner of the lubricant industry and gives our clients the option to source several products, even based on each other.

This brochure wants to give an overview at the products, Ecogreen Oleochemicals and DHW Deutsche Hydrierwerke GmbH are producing and offering, developed especially for lubricants:

- **Rodalube®**
Ester of Polyols and Monoalcohols
- **Ecorol®**
Saturated Fatty Alcohols
- **Rofanol®**
Unsaturated Fatty Alcohols
- **Ecoric®**
Fatty Acids
- **Rofamin®**
Primary Fatty Amines

The brochure describes our standard products which we always have on stock to supply your needs. Our production also allows us to manufacture any product you may require.



The esterification of fatty acids with dedicated mono- and polyalcohols gives a wide range of ester oils, depending on the used raw materials, in different specific, physical and chemical properties.

With the right choice of raw material, **Rodalube®** fatty esters, can be produced with different specific properties, matching the requirements of the end applications. Cloud points, viscosity, lubricity and emulsifying properties, can be adjusted by the use of different fatty acids and alcohols and can vary for the different fields of applications and their specific demands.

Rodalube® polyol esters are used as base oils for the formulation of biodegradable hydraulic fluids and gear oils and as additives in mineral oil based formulations.

Rodalube® polyol esters are characterized by high viscosity indices, good lubricity, very good cold flow properties and excellent biodegradation. They are miscible with mineral oils.

Rodalube® monoalcohol esters are mainly used in neat oils or as a component to increase the lubricity of rolling oils.

The **Rodalube®** emulsifiers are used for the formulation of water miscible cooling fluids. Due to gained experience, collected in decades of producing and processing Sorbitol, Ecogreen Oleochemicals has an established knowledge about the functioning of emulsions, which are now used for our products of the lubricant industry.



Product Name	Chemical Name	Form	Kin. Viscosity at 40°C Typical Value, mm²/s	Acid Value mg KOH/g	Saponification Value mg KOH/g	Cloud Point °C	Colour	Flash Point °C
--------------	---------------	------	--	------------------------	----------------------------------	-------------------	--------	-------------------

Polyol Ester

Rodalube 380 ISO VG 15	NSF listed for HX 1 lubricants*	liquid	15	max. 0.1	325-355	max. -5	APHA max. 100	> 220
Rodalube 480	Propylene glycol dicaprylate/caprate	liquid	6	max. 0.2	315-340	max. -20	APHA max. 100	> 180
Rodalube 580	Pentaerythritol tetracaprylate/caprate	liquid	28	max. 0.3	323-338	**PP max. -3	APHA max. 250	> 270
Rodalube 680	Trimethylolpropane tricaprylate/caprate	liquid	19	max. 0.2	308-330	**PP max. -45	APHA max. 250	> 245
Rodalube 618	Trimethylolpropane trioleate	liquid	46	max. 1	178-187	** PP max. -40	Gardner max. 5	> 300

Monoalcohol Ester

Rodalube 112	2-Ethylhexyl laurate	liquid	5	max. 0.5	170-190	max. -15	APHA max. 100	> 150
Rodalube 181	2-Ethylhexyl stearate	liquid	9	max. 0.5	140-150	max. 10	APHA max. 100	> 210
Rodalube 118	2-Ethylhexyl oleate	liquid	8,5	max. 0.5	140-150	**PP max. -30	Gardner max. 4	> 170

Emulsifier

Rodalube 218	Sorbitan monooleate	liquid	400	max. 8	149-160	< -10	Gardner max. 5	> 150
Rodalube 219	Sorbitan trioleate	liquid	124	max. 15	170-190	< -15	Gardner max. 8	> 110

* NSF number 141596

**PP = Pour Point

The comprehensive natural fatty alcohol range of Ecogreen Oleochemicals includes saturated and unsaturated grades based on vegetable sustainable resources. These products and their derivatives are important constituents of metal working fluids and metal cleaning applications where they provide essential performance such as emulsification, lubricity, corrosion inhibition and foam control. Furthermore alcohol-based derivatives act as extreme pressure components and coupling agents.



Saturated Fatty Alcohols

Product Name	Chemical Name	Form	Kin. Viscosity at 40°C Typical Value, mm ² /s	Hydroxyl Value mg KOH/g	Iodine Value g I ₂ /100g	Solidification Range °C	Flash Point °C	C Chain Distribution					
								C10	C12	C14	C16	C18	C20
Ecorol 12/98	Lauryl alcohol	liquid	11	298-302	max. 0.1	22-24	130	< 2	min. 98	< 2	-	-	-
Ecorol 24	Lauryl/Myristyl alcohol	liquid	12	287-293	max. 0.1	18-23	130	< 1	70-76	23-30	< 1	-	-
Ecorol 26	Lauryl/Myristyl alcohol	liquid	13	283-289	max. 0.1	18-23	140	< 1	65-72	21-28	4-8	< 0.5	
Ecorol 28	Lauryl/Myristyl alcohol	liquid/solid	14	265-275	max. 0.1	max. 25	140	< 1	52-61	15-23	5-10	7-21	< 0.5
Ecorol 68/30	Cetyl/Stearyl alcohol	solid	-	210-219	max. 0.3	49-54	170	-	-	< 5	25-35	65-75	< 2

Unsaturated Fatty Alcohols

Product Name	Chemical Name	Form	Kin. Viscosity at 40°C mm ² /s	Hydroxyl Value mg KOH/g	Iodine Value g I ₂ /100g	Solidification Range °C	Flash Point °C	C Chain Distribution				
								C12	C14	C16	C18	C20
Rofanol 50/55V	Oleyl/Cetyl alcohol	solid	19	210-220	50-55	29-37	170	0-2	1-7	25-35	55-75	0-2
Rofanol 60/65V	Oleyl/Cetyl alcohol	solid/liquid	19	208-218	60-65	25-30	170	0-2	1-6	20-30	55-75	0-2
Rofanol 70/75V	Oleyl/Cetyl alcohol	liquid	18	208-218	70-75	19-26	180	0-2	0-6	10-25	70-90	0-2
Rofanol 80/85V	Oleyl alcohol	liquid	18	205-215	85-90	6-16	180	0-2	0-6	4-14	80-98	0-3
Rofanol 90/95V	Oleyl alcohol	liquid	18	205-215	90-98	2-12	180	-	0-2	2-10	90-98	0-3

Under the trade name **Ecoric®**, Eco-green Oleochemicals is producing and offering a wide range of fatty acids, which are used in many lubricants, such as greases, metal working fluids and demoulding fluids, as thickeners or base fluid.

Ecoric® fatty acids correspond with the requirements of the lubricant industry and are characterized by high purities and good colours.



Product Name	Chemical Name	Form	Acid Value mg KOH/g	Iodine Value g I ₂ /100 g	Colour Ly/Lr 5 1/4"	C-Chain Distribution							
						C6	C8	C10	C12	C14	C16	C18	C18'

Fatty acids															
Ecoric 6/99	Caproic acid	liquid	min. 476	max. 0.5	max. 1.3/0.2	min. 99	max. 0.5	max. 0.5							
Ecoric 8/99	Caprylic acid	liquid	386-391	max. 0.3	max. 5.0/0.5	max. 0.5	min. 99	max. 0.5							
Ecoric 10/99	Capric acid	solid	323-328	max. 0.5	max. 3.0/0.5		max. 1	min. 99	max. 1						
Ecoric 810	Caprylic/Capric acid	liquid	354-367	max. 1	max. 10 (10 R+G)	max. 1	54-65	32-45	max. 2	> C12	max. 0.5				
Ecoric 80	Caprylic/Capric acid	liquid	352-365	max. 1	max. 10/1	max. 4	48-60	40-50	max. 2	max. 1	max. 1	max. 1			
Ecoric 18 W/75	Oleic acid	liquid	195-207	min. 75	max. 15/1.5						max. 7	max. 2.5	min. 75	max. 12	
Ecoric 18 W/80	Oleic acid	liquid	198-205	min. 80	max. 5/0.5						max. 5	max. 2.5	min. 80	max. 12	
Ecoric 68 TA	Fatty acid C16-C18 and C18 unsaturated	solid	202-208	50-65	max. 20/2			max. 5			21-37	10-30	33-47	3-10	

The production of primary fatty amines from natural raw materials are one of our experiences in the field of hydrogenation. DHW fatty amines are made and distributed under their trade names **Rofamin®**. Through extensive research and development, continuous quality assurance and customer information, the **Rofamin®** range has expanded to include products of a large variety of applications in industrial and chemical processing.

The affinity of primary fatty amines for metal surfaces combined with their hydrophobic character makes them attractive for corrosion inhibitors and intermediates for corrosion inhibitors. Furthermore **Rofamin®**'s and their derivatives are suitable for the use as lube additives and are used in the manufacture of greases. Urea greases use organic thickeners derived from the reaction of fatty amine with an isocyanate. The resulting thickener mixed with base-oil affords a grease that particularly has a good thermal stability making it suitable for applications, for example such as the lubrication of high-speed bearings.



Product Name	Chemical Name	Form	Primary Amine %	Secondary Amine %	Amine Value mg KOH/g	Iodine value g I ₂ /100 g	Colour
--------------	---------------	------	-----------------	-------------------	----------------------	--------------------------------------	--------

Primary Fatty Amines - Saturated

Rofamin K	Cocos amine, technical grade	liquid	min. 94	max. 4	min. 270	max. 12	Gardner max. 6
Rofamin KD	Cocos amine, distilled	liquid	min. 98	max. 1	min. 280	max. 12	APHA max. 50
Rofamin T*	Tallow amine, hydrogenated, technical grade	solid	min. 95	max. 3	min. 207	max. 5	Gardner max. 5
Rofamin TD*	Tallow amine, hydrogenated, distilled	solid	min. 98	max. 1	min. 210	max. 5	APHA max. 50
Rofamin ST*	Stearyl amine, technical grade	solid	min. 95	max. 4	min. 202	max. 5	Gardner max. 5
Rofamin STD*	Stearyl amine, distilled	solid	min. 98	max. 2	min. 204	max. 3	APHA max. 100

Primary Fatty Amines - Unsaturated

Rofamin T 40	Tallow amine, technical grade	solid	min. 95	max. 3	min. 207	min. 40	Gardner max. 5
Rofamin TD 40	Tallow amine, distilled	solid	min. 98	max. 1	min. 210	min. 40	APHA max. 100
Rofamin O 80	Oleyl amine, technical grade	liquid/paste	min. 95	max. 4	min. 200	min. 80	Gardner max. 8
Rofamin OD 80	Oleyl amine, distilled	liquid/paste	min. 98	max. 1	min. 207	min. 80	APHA max. 100
Rofamin O 85	Oleyl amine, technical grade	liquid/paste	min. 95	max. 4	min. 200	min. 85	Gardner max. 8
Rofamin OD 85	Oleyl amine, distilled	liquid/paste	min. 98	max. 1	min. 207	min. 85	APHA max. 100
Rofamin O 90	Oleyl amine, technical grade	liquid	min. 95	max. 5	199-213	min. 90	Gardner max. 5
Rofamin OD 90	Oleyl amine, distilled	liquid	min. 98	max. 2	min. 202	min. 90	APHA max. 100

* Flakes available

A Strong Global Partner in Oleochemicals

Our strength is experience in the manufacturing of products based on renewable raw materials combined with our direct access to natural resources. Our core business is based on the production of saturated and unsaturated natural fatty alcohols from palm kernel or coconut oil.

Polyols, fatty amines and speciality chemicals expand our current product portfolio and day by day we add new products to our range. Throughout the world we develop products, technological solutions, performance optimizations and new application formulas. With our initiatives, we want you to benefit from the global strength of our dynamic group.

State-of-the-Art Service

Your requirements define our guidelines for customer service

- Innovative product modification
- Technical support for specific customer application segments
- Flexible and efficient logistics

We look forward to work with you!

Europe:

DHW Deutsche Hydrierwerke GmbH Rodleben
Ecogreen Oleochemicals GmbH

Brambacher Weg 1
06861 Dessau-Rosslau
Germany

Telephone: (49)34901 5484-60

Facsimile: (49)34901 5484-70

E-Mail: info@ecogreenoleo.de

USA:

Ecogreen Oleochemicals Inc.

2825 Wilcrest Drive
Suite # 418
Houston, TX 77042, USA

Telephone : (1) 713 787 5449

Facsimile: (1) 713 787 0633

E-Mail: info@ecogreenoleo.net

Asia Pacific:

Ecogreen Oleochemicals (S) Pte.Ltd

99 Bukit Timah Road
#03-01/02 Alfa Centre
Singapore 229835

Telephone: (65) 6337 7726

Facsimile: (65) 6337 2110

E-Mail: info@ecogreenoleo.com



www.ecogreenoleo.com