

REWOFORM[®]

Evonik Cleaning Solutions | EMEA



The Cleaning Industry has a large impact on the environment



Climate change



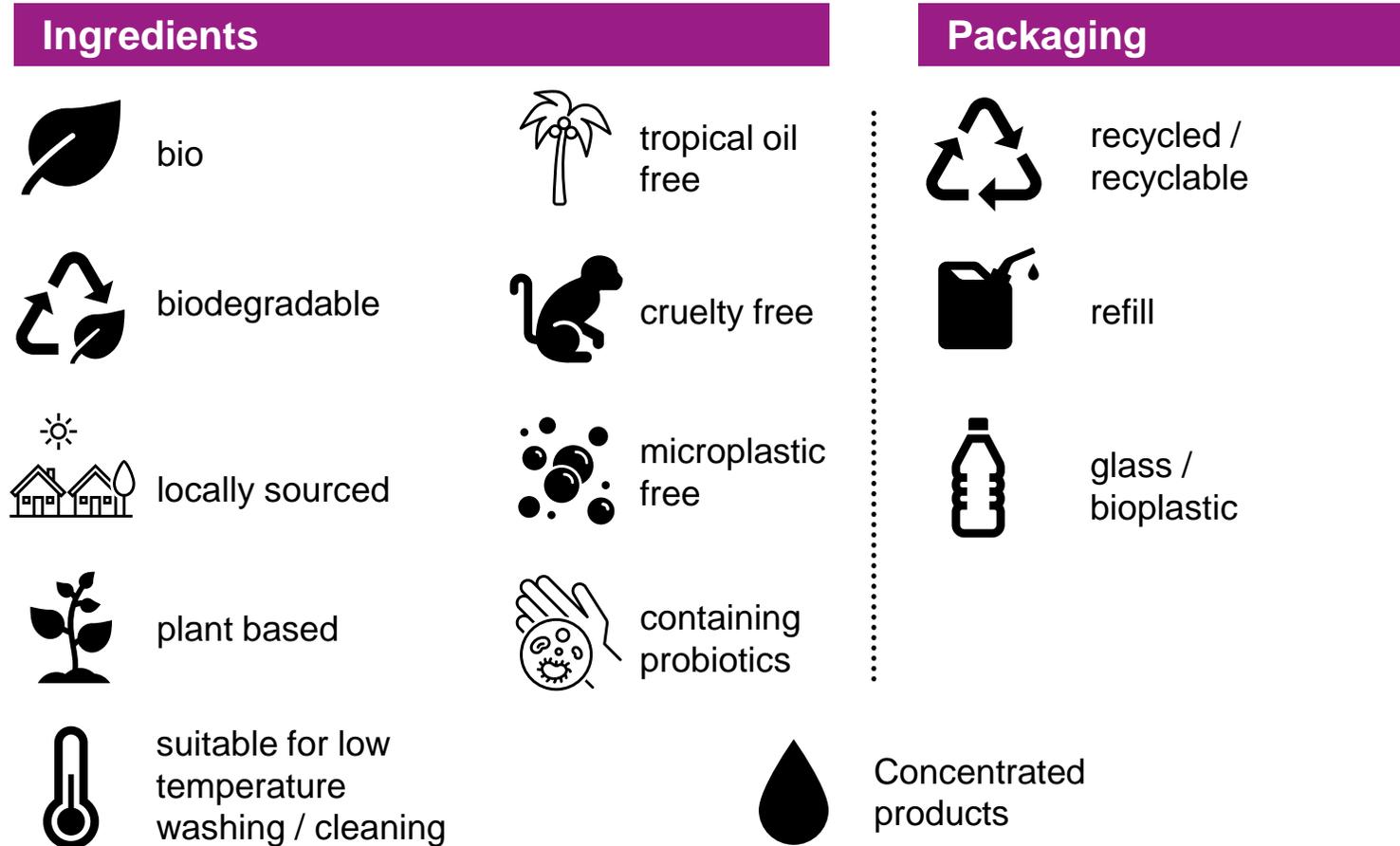
Deforestation



Toxic water

Time to act
now

... environmental concerns has driven innovators to develop sustainable solutions



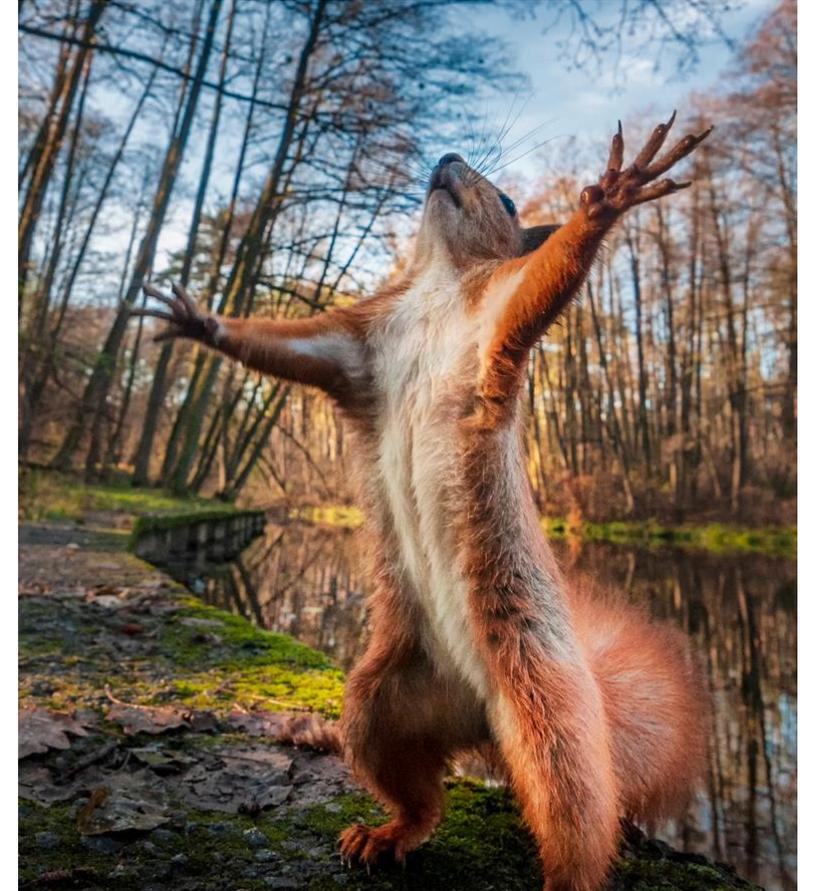
- Innovators work to improve emissions and produce products that contribute to a safer eco-system
- Two key levers to address these challenges
 - **Ingredients**
 - **Packaging**

REWOFERM® Biosurfactants

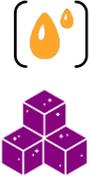
Evonik Answer is the REWOLUTION in the Surfactant Industry

Finally. The REWOLUTION

Evonik is the **first company to produce Biosurfactants on an industrial scale** that will benefit the personal, home care and industrial applications markets.



Surfactant evolution towards Biosurfactants

	Petrochemical	Partially bio-based	Fully bio-based	Biosurfactants
Technology				
Feedstock		 		 
Examples	<ul style="list-style-type: none"> ▪ Linear alkylbenzene sulfonate ▪ Synthetic alcohol ethoxylates 	<ul style="list-style-type: none"> ▪ Alkyl Ether Sulfates ▪ Cocamidopropyl Betaine 	<ul style="list-style-type: none"> ▪ Alkyl Polyglucoside (APG) ▪ Sodium cocoyl glycinate 	<ul style="list-style-type: none"> ▪ Rhamnolipids ▪ Sophorolipids
Lack of sustainability	<ul style="list-style-type: none"> ▪ Crude oil feedstock ▪ CO₂ footprint 	<ul style="list-style-type: none"> ▪ Mostly tropical oil based ▪ Often hazardous raw materials 	<ul style="list-style-type: none"> ▪ Mostly tropical oil based ▪ Often hazardous raw materials or processes ▪ Performance gaps 	<ul style="list-style-type: none"> ▪ Until recently, no feasible industrial production

What is a Biosurfactant?

Surfactant evolution

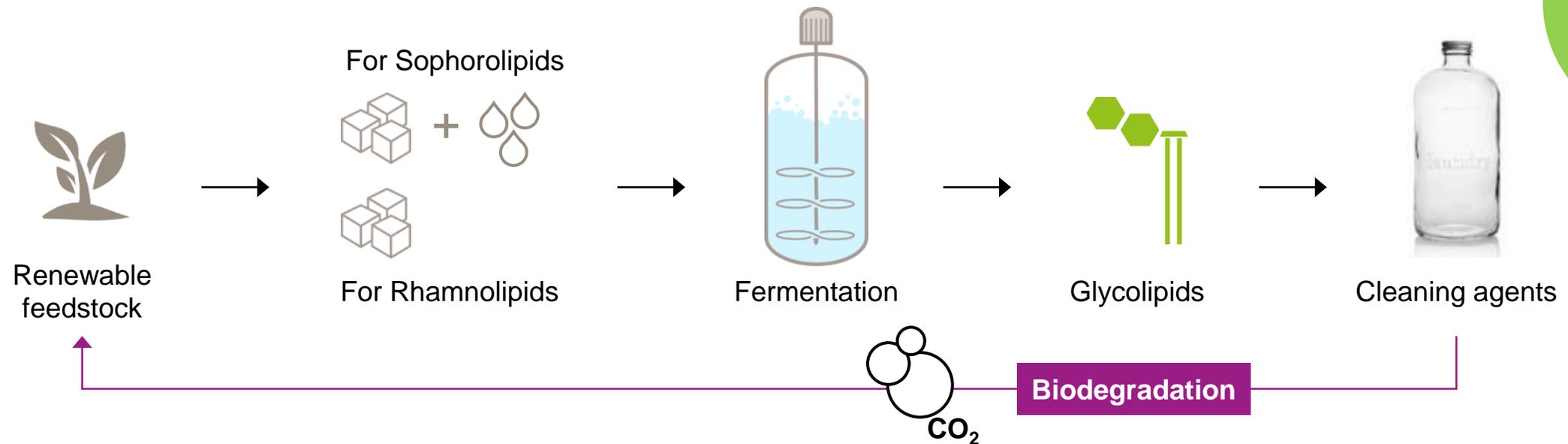
	Petrochemical	Partially bio-based	Fully bio-based	Biosurfactants
Technology				
Feedstock		 		 

Surface-active agent produced by the fermentation of natural feedstocks

REWOFORM® Biosurfactants

Production process

A unique process resulting in a unique product



Biosurfactants
enable circular
economy

Fulfilling today's and tomorrow's consumer needs



REWOFERM® Biosurfactants

Product Properties

REWOFORM® Biosurfactants

Product Properties

	REWOFORM® SL ONE Sophorolipid	REWOFORM® RL 100 Rhamnolipid
Surfactants	Secondary Surfactant	Primary and secondary surfactant
Aggregate state	Liquid, slightly yellow	Liquid, yellowish
Compatibility	Compatible with anionics, nonionics, amphoteric and cationics	Compatible with anionics, nonionics and amphoteric
Solubility	Soluble at pH > 4 and in surfactant systems	Water soluble at pH > 5.0
Dispersibility	Dispersable in water at pH < 4	–
Active content	45 %	~50 %
Stability	Stable at pH 5 – 8	Stable at pH 5.5 – 11
Processing	Cold processable, easy to handle	Cold processable, easy to handle
Surface tension, Surface tension pH dependent	<ul style="list-style-type: none"> ▪ 38 mN/m 	<ul style="list-style-type: none"> ▪ pH 5.5: 28 mN/m ▪ pH 9.0: 34 mN/m
CMC [g/L]	<ul style="list-style-type: none"> ▪ pH 5: 0.02 	<ul style="list-style-type: none"> ▪ pH 5.5: 0.02 ▪ pH 9.0: 0.04



REWOFERM® Biosurfactants
Sustainability and Certifications

REWOFERM® Biosurfactants

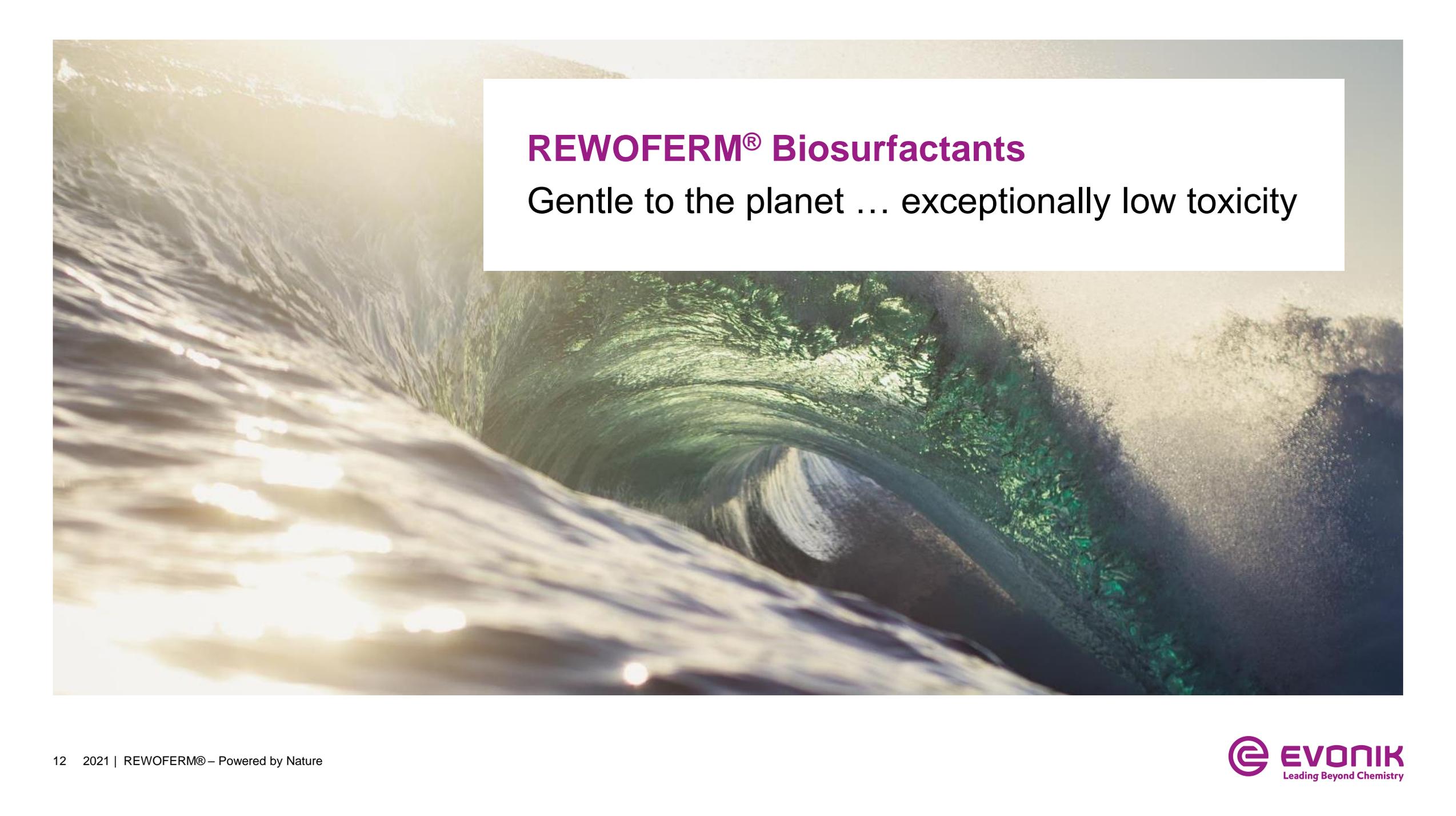
Sustainability and Certifications

	REWOFERM® SL ONE Sophorolipid	REWOFERM® RL 100 Rhamnolipid
ECOCERT Certified	✓	under evaluation
Suitable for EU Ecolabel formulations	✓	✓
100% Biodegradable (aerobic and anaerobic)	✓	✓
100% Natural*	✓	✓
100% Renewable**	✓	✓
Feedstock	rapeseed oil, sugar from EU	sugar from EU
Produced with renewable electricity	✓	✓
Exceptionally low aquatic toxicity	✓	✓
Very mild to skin	✓	✓
Certifications: Vegan, Halal	✓	✓



*Natural part np: [molecular weight of the part of final ingredient from natural origin] / [molecular weight of the final average chemical structure]

** C renewable: $C_{\text{renewable}} / C_{\text{local actives}}$

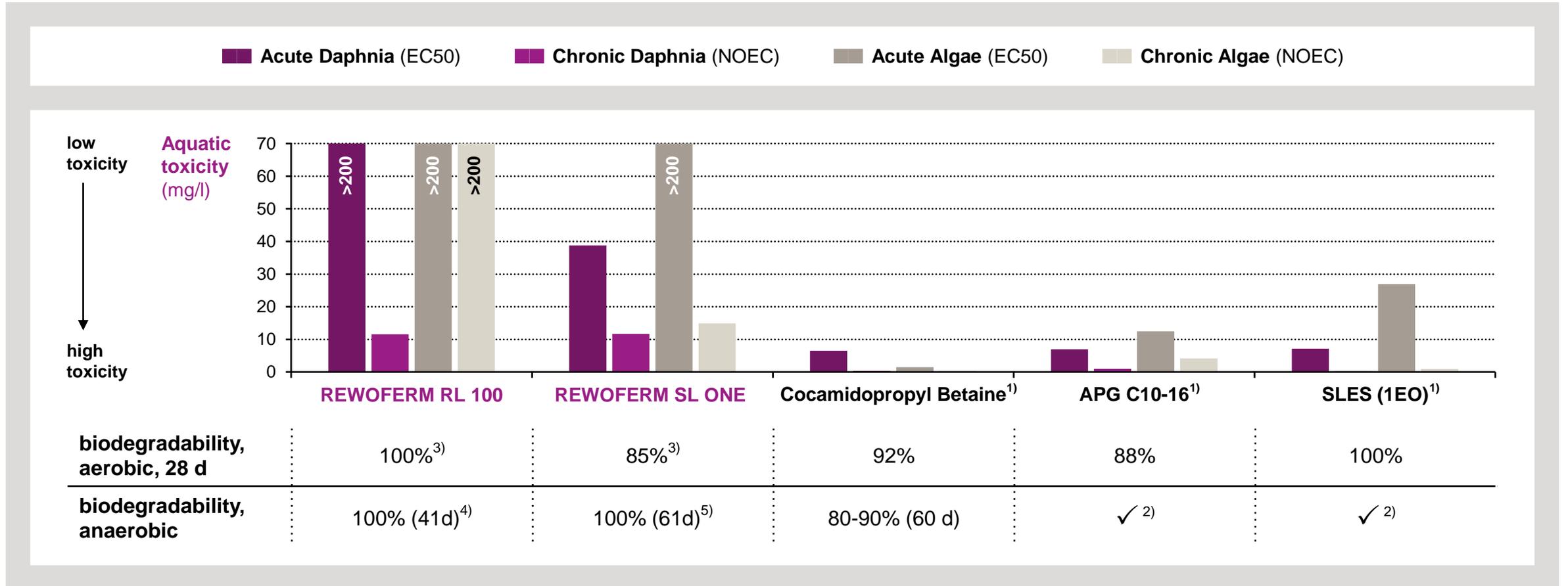


REWOFERM® Biosurfactants

Gentle to the planet ... exceptionally low toxicity

REWOFORM® Biosurfactants

Gentle to the planet...exceptionally low toxicity



¹⁾ Source: ECHA data

²⁾ anaerobic degradable acc. to DID list

³⁾ OECD301F

⁴⁾ OECD311

⁵⁾ ISO 11734

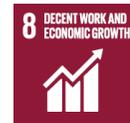
Supporting UN Sustainable Development Goals to transform our world

REWOFERM® Biosurfactants



Health & Comfort

- Skin-friendly
- Safe use



Society

- Flexible production options in developing regions
- Sugar from social projects possible



Efficiency

- High surface activity – lower usage concentration
- Concentrate – reduced number of batch releases, analytical cost etc.



Resources

- Traceably and responsibly sourced
- Various carbon sources possible, including 2nd generation biomass



Emissions

- High active matter – less transportation
- Fully covered by life-cycle analysis (LCA)



Water

- Exceptionally low aquatic toxicity
- 100% biodegradability (aerobic & anaerobic)

Source: <http://www.un.org/sustainabledevelopment/sustainable-development-goals>



REWOFERM® Biosurfactants
Cleaning Benefits

REWOFORM® Biosurfactants

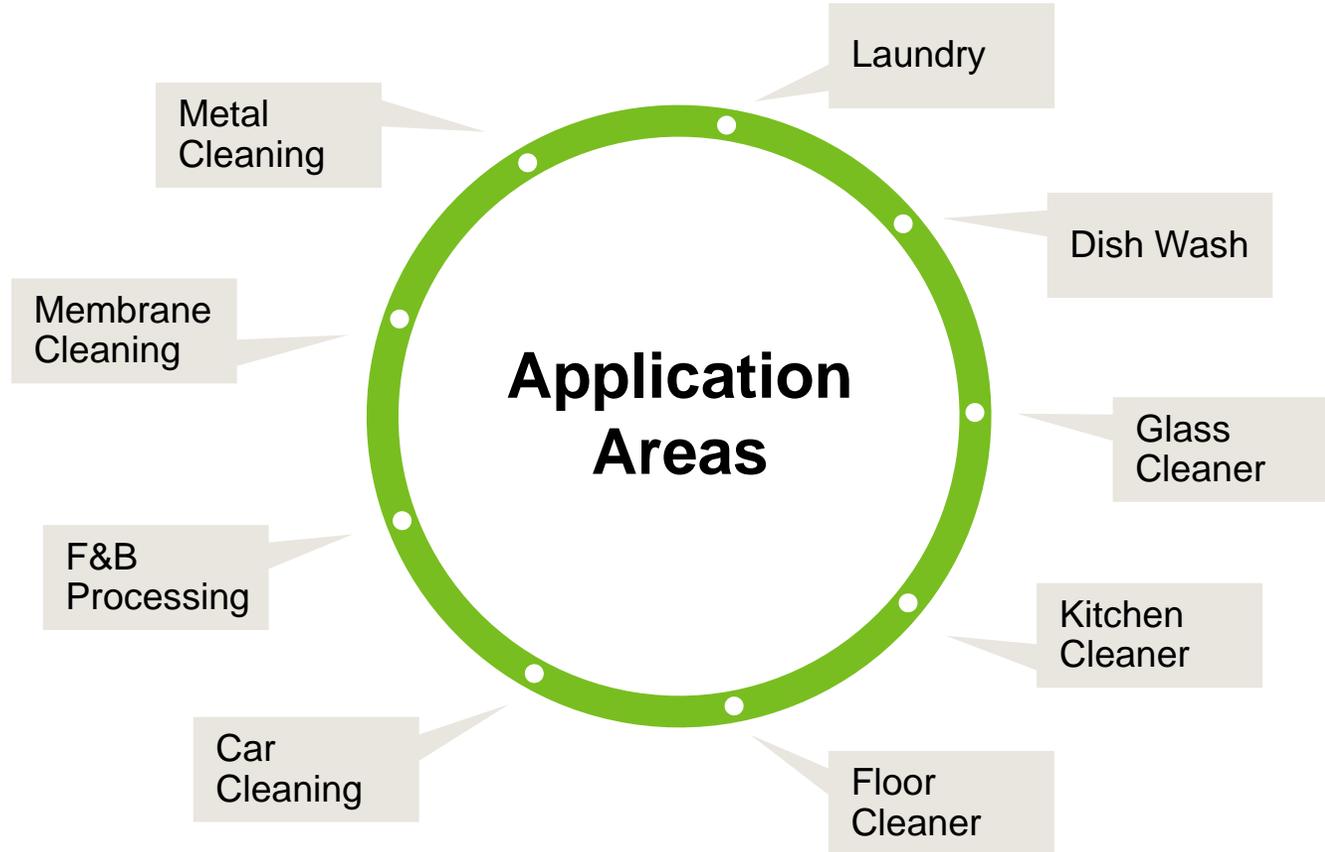
Cleaning Benefits

		REWOFORM® SL ONE	REWOFORM® RL 100
		Sophorolipid	Rhamnolipid
Performance	Excellent cleaning performance	–	●
	Good grease removal	●	–
	Primary surfactant	–	●
	Secondary surfactant	●	●
	Excellent foaming power	–	●
	Low foaming but foam stabilizing properties	●	–
	Cleaning booster	●	●
	Good enzyme stability	●	●
	Solubilizing properties	●	●
	No cloud point	●	●
	Performance not affected by water hardness	●	●
Formula property	Easy to formulate	●	●
	Reduces formulation complexity	–	●
	Mild formulation possible	●	●



Various Application Areas to Improve
the Environmental Footprint

Various Application Areas to Improve the Environmental Footprint



REWOFERM®

.....
Biosurfactants with unique power and almost limitless end applications

Unilever has successfully launched the first household cleaning product in the world containing Evonik Rhamnolipid



Evonik and Unilever have partnered to commercialize a new hand dishwashing liquid based on Evonik’s Rhamnolipid technology.

Unilever has successfully launched the product under its “Quix” brand. – The first time rhamnolipid has been used in a household cleaning product anywhere in the world.

Finally. The REWOLution!

Entering a new era with sustainable and all-natural ingredients



Biotechnological process



Traceable and responsible sourcing



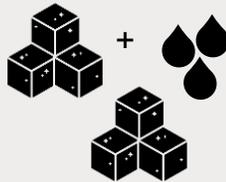
Low aquatox



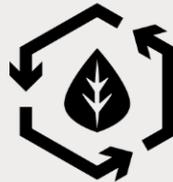
Powerful performance



Nature-identical structure



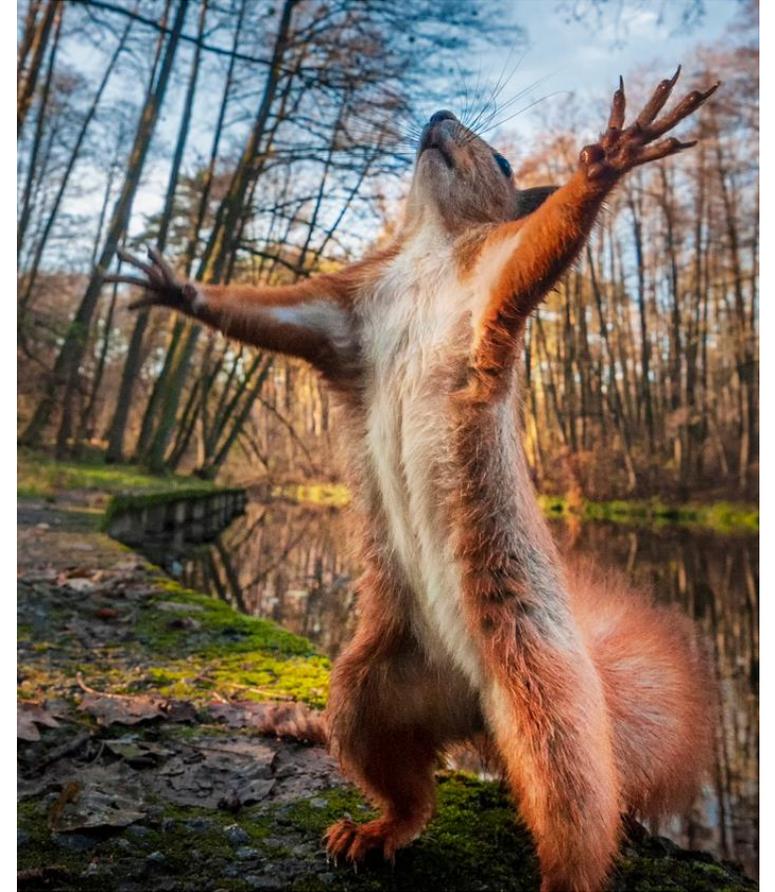
Sugar and/or rapeseed oil based ingredient



100% Biodegradability



Pleasant and mild



CLEANING BEGINS WITH KNOWLEDGE

.....
intoCleaning.evonik.com

PRODUCT
INFORMATION

VIDEOS

PRODUCT
SELECTION TOOL

CONCEPTS

CERTIFICATES AND
FACT SHEETS

... AND MANY MORE





EVONIK

Leading Beyond Chemistry