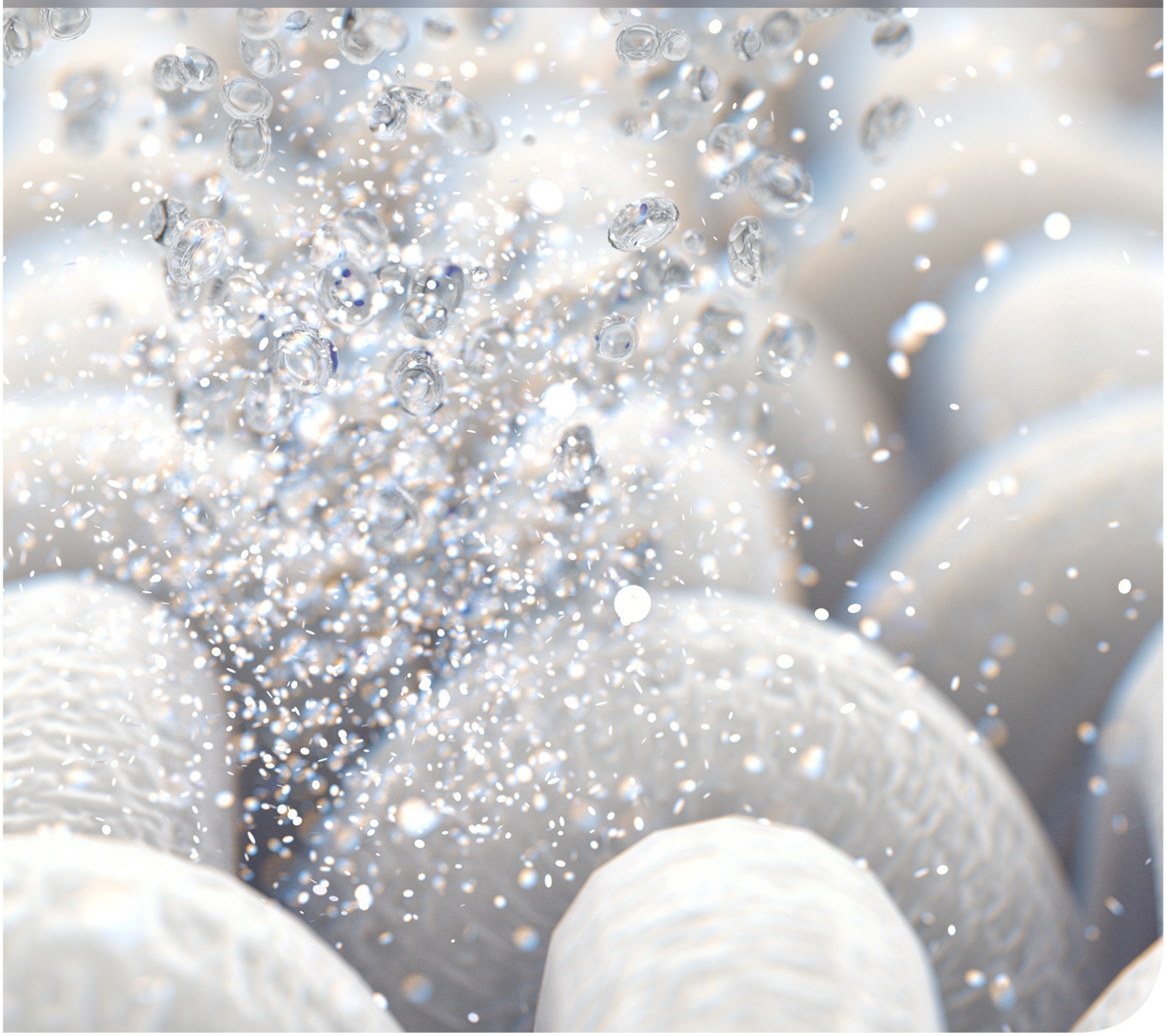
ROKAnol® **MT7** and **MT7E** versus ROKAnol® **L7**



PCC Exol

ROKAnol MT7 and MT7E versus ROKAnol L7

General characteristic

Basic information concerning the physical and chemical properties is summarised in a table below.

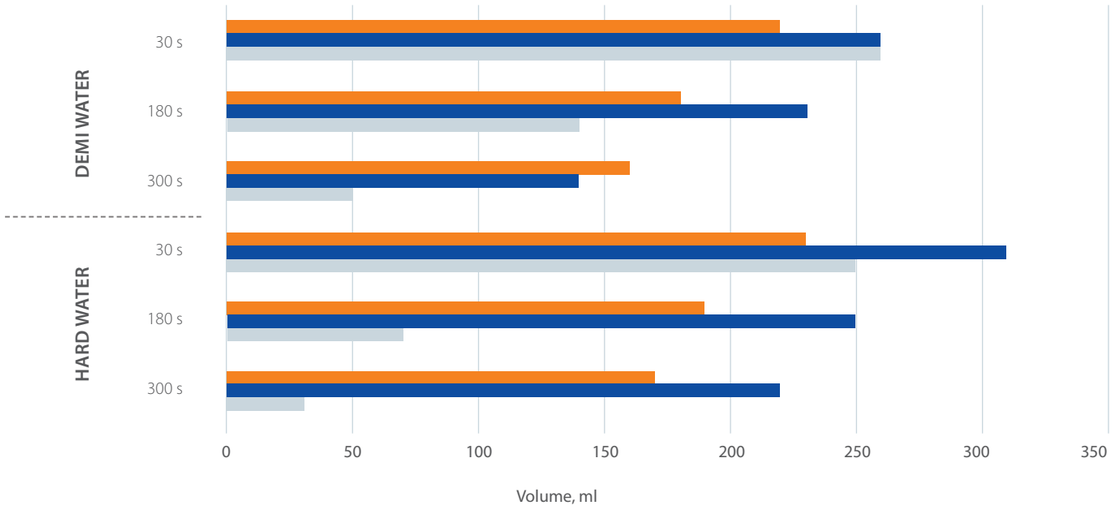
	ROKAnol L7	ROKAnol MT7	ROKAnol MT7E
Chemical Name	Alcohols, C12-14, ethoxylated	Alcohols, C8-18, ethoxylated	Alcohols, C8-18, ethoxylated
CAS Number	68439-50-9	157707-43-2	157707-43-2
Appearance at temperature (20÷25)°C	clear or slightly turbid liquid	liquid	clear or slightly turbid liquid
Colour (Hazen units) at 40°C	Max 70	Max 150	Max 150
pH of 5% solution	4.6-7.4	5-8	5-8
Cloud point (aqueous solution), °C, Method A 1)	30-40	56-62	56-62
Water, %(m/m)	Max 1.0	Max 0.5	Max 1.0

1) Cloud point according to PN-EN 1890:2006; Method A – aqueous solution

Foam capability

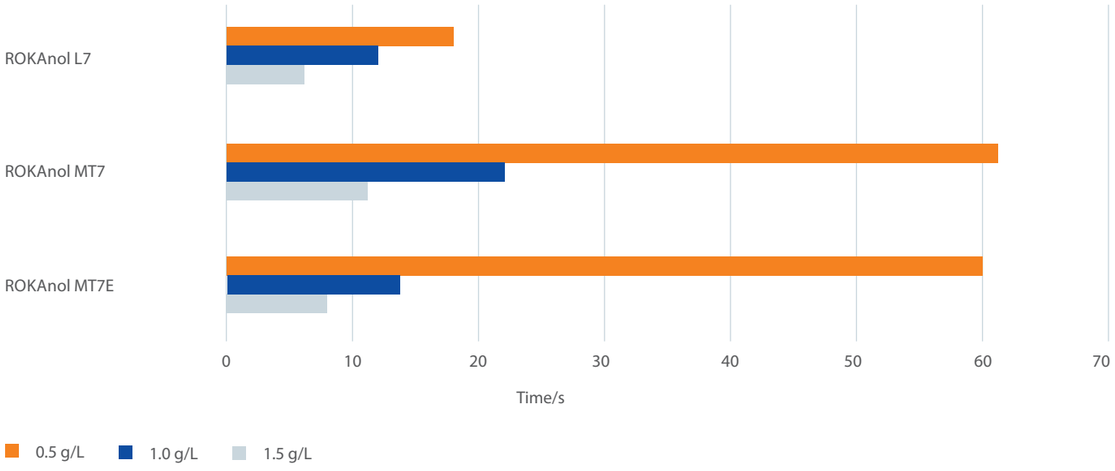
Foaming capability was measured according to modified Ross-Miles' method (PN-ISO 696:1994). The foam value was measured after 30, 180 and 300 seconds. The results were presented on graphs.

Foam capability



Wetting capability

Wetting capability was measured at 20°C for three concentrations. The results were presented on graph.



Alkali and acid resistance

Alkali resistance

NaOH con., g/L Product name	30	40	50	60	70	80	90
ROKAnol L7	●	●	●	●	●	●	○
ROKAnol MT7	●	●	●	○	○	○	○
ROKAnol MT7E	●	●	●	○	○	○	○

Acid resistance

H_2SO_4 con., mL/L Product name	1	10	40	60	100	140	225
ROKAnol L7	●	●	●	●	●	●	○
ROKAnol MT7	●	●	●	○	○	○	○
ROKAnol MT7E	●	●	●	○	○	○	○

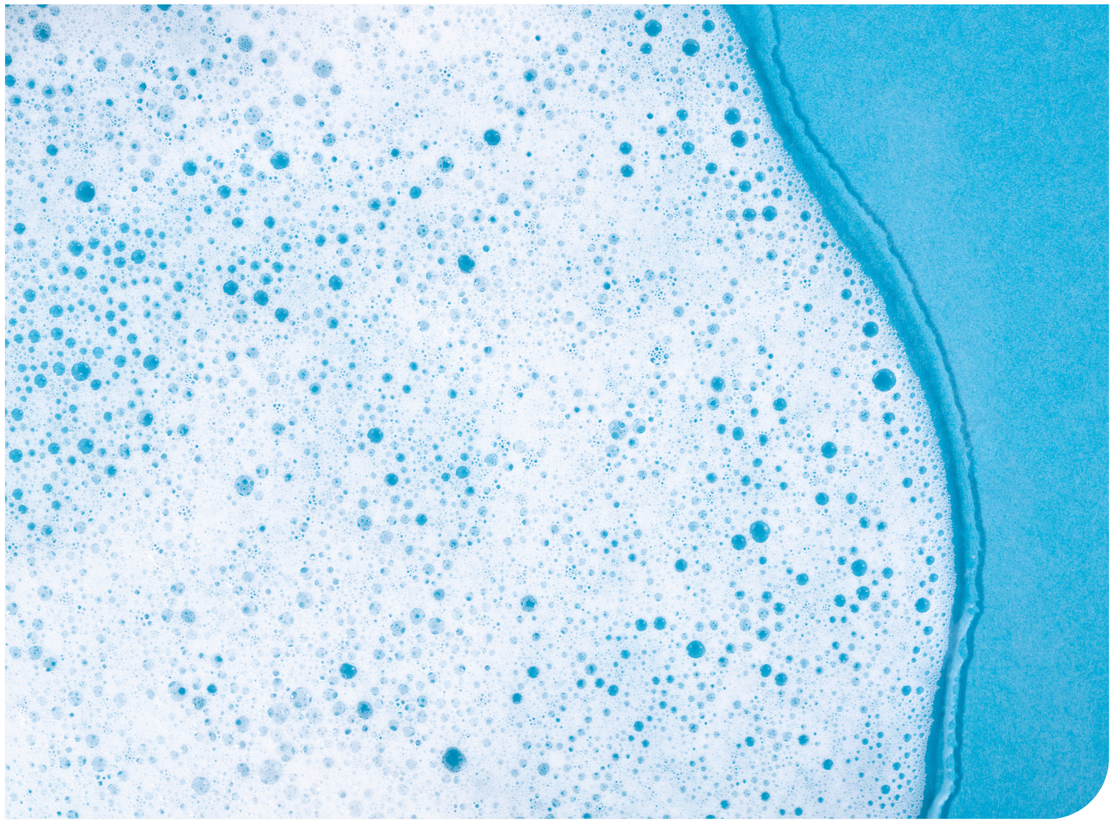
○ macroscopic phase separation
● homogeneous, cloudy solution
● clear, homogeneous solution
● homogeneous, opalescent solution

Solubility

Product name	Demineralized water	Methanol	Acetone	Ethyl ether
ROKAnol L7	●	●	●	●
ROKAnol MT7	●	●	●	●
ROKAnol MT7E	●	●	●	●

● soluble
● insoluble
● partially soluble

Both products showed similar solubility in the tested solvents.

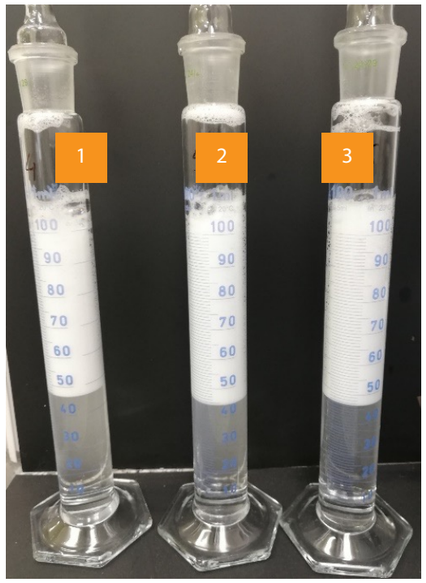


Formulations- performance tests

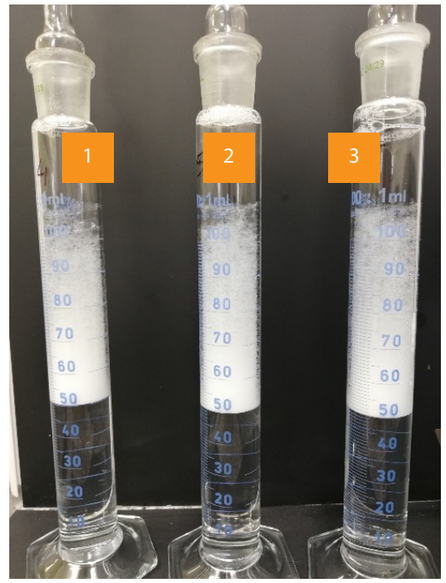
1. The basic formulations for three tested surfactants are shown in a table below.

Brand name	ROKAnol L7	ROKAnol MT7	ROKAnol MT7E
	Concentration [%]		
Aqua	81.5		
SULFOROKAnol L270/1	8.0		
ROKAmina K30	5.0		
ROKAmid KAD	1.0		
ROKAnol L7	2.0	-	-
ROKAnol MT7	-	2.0	-
ROKAnol MT7E	-	-	2.0
Sodium Chloride	2.5		
	Physical and chemical properties		
Appearance	clear, transparent homogenous liquid		
Viscosity [cP]	1000-1500	200-400	20-100
pH	6-7	6-7	6-7

The foaming properties were measured for samples: ROKAnol L7 (1), ROKAnol MT7 (2), ROKAnol MT7E (3). The results are presented on the photos.



After 30 seconds



After 5 seconds

2. In the next step new formulations with higher organic matter were prepared. The formulations are shown in a table below.

Brand name	ROKAnol L7	ROKAnol MT7	ROKAnol MT7E
	Concentration [%]		
Aqua	78.9		
SULFOROKAnol L270/1	10.0		
ROKAmina K30	7.0		
ROKAmid KAD	0.7		
ROKAnol L7	1.4	-	-
ROKAnol MT7	-	1.4	-
ROKAnol MT7E	-	-	1.4
Sodium Chloride	2.6		
Physical and chemical properties			
Appearance	clear, transparent homogeneous liquid		
Viscosity [cP]	4000-5500	1500-3000	1500-2500
pH	6-7	6-7	6-7

3. The formulations for baby laundry detergent and stain remover are presented below.

BABY LAUNDRY DETERGENT

Brand name	ROKAnol L7	ROKAnol MT7	ROKAnol MT7E
	Concentration [%]		
Aqua	43.0		
SULFOROKAnol L227/1	35.0		
EXOsoft MG	5.0		
EXOsoft PO30	5.0		
ROKAnol L7	3.0	-	-
ROKAnol MT7	-	3.0	-
ROKAnol MT7E	-	-	3.0
GLDA	2.5		
Euperlan HCA	0.5		
Glycerin	6.0		
Physical and chemical properties			
Appearance	clear, transparent homogeneous liquid		
Viscosity [cP]	700-900	100-200	<100
pH	7-9	7-9	7-9

STAIN REMOVER

Brand name	ROKAnol L7	ROKAnol MT7	ROKAnol MT7E
	Concentration [%]		
Aqua	51.3		
ABSNa 50%	7.7		
ROKAnol L7	11.0	-	-
ROKAnol MT7	-	11.0	-
ROKAnol MT7E	-	-	11.0
Perhydrol, 35%	-	30	-
Citric Acid			
Physical and chemical properties			
Appearance	clear, transparent homogeneous liquid		
Viscosity [cP]	<200 cP	<200 cP	<200 cP
pH	4-6	4-6	4-6

4. The detergency test for final product.

Detergency - the ability of the detergent to remove soils from the fabric surface during the laundering process. Detergency tests were performed using to own method, with a different solids:

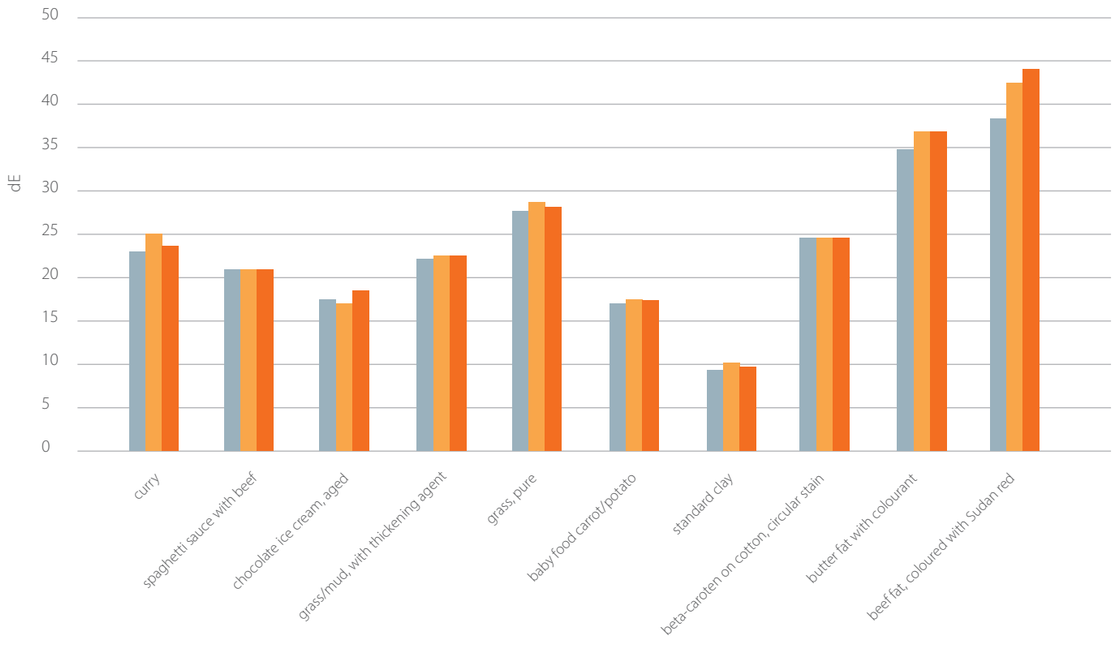
1. Fluid make-up, 2. Curry, 3. Blood, aged, 4. Wine, aged, 5. Spaghetti sauce with beef, 6. Chocolate ice cream, aged, 7. Grass/mud, with thickening agent, 8. Highly discriminative tea, 9. Grass, pure, 10. Baby food carrot/potato, 11. Standard clay, 12. Beta-carotene on cotton, circular stain, 13. Dirty Motor Oil (DMO), 14. Butterfat with colourant, 15. Beef fat, coloured with Sudan red

Test conditions for baby laundry detergents:

- automatic washmachine
- 40°C (with one of the formulations)
- cotton program
- load - calculated for 2 kg of dry, white towels
- fabric soiled with standard dirt

After the washing process was performed, the standardly disturbed fabrics were dried and ironed, and then the degree of washing was assessed by measuring parameter dE from the CIE LAB scale, as the difference between the initially disturbed stain and the degree of its washing. The greater dE value, the better the washing outcome.

Baby laundry detergents - typical stain for children

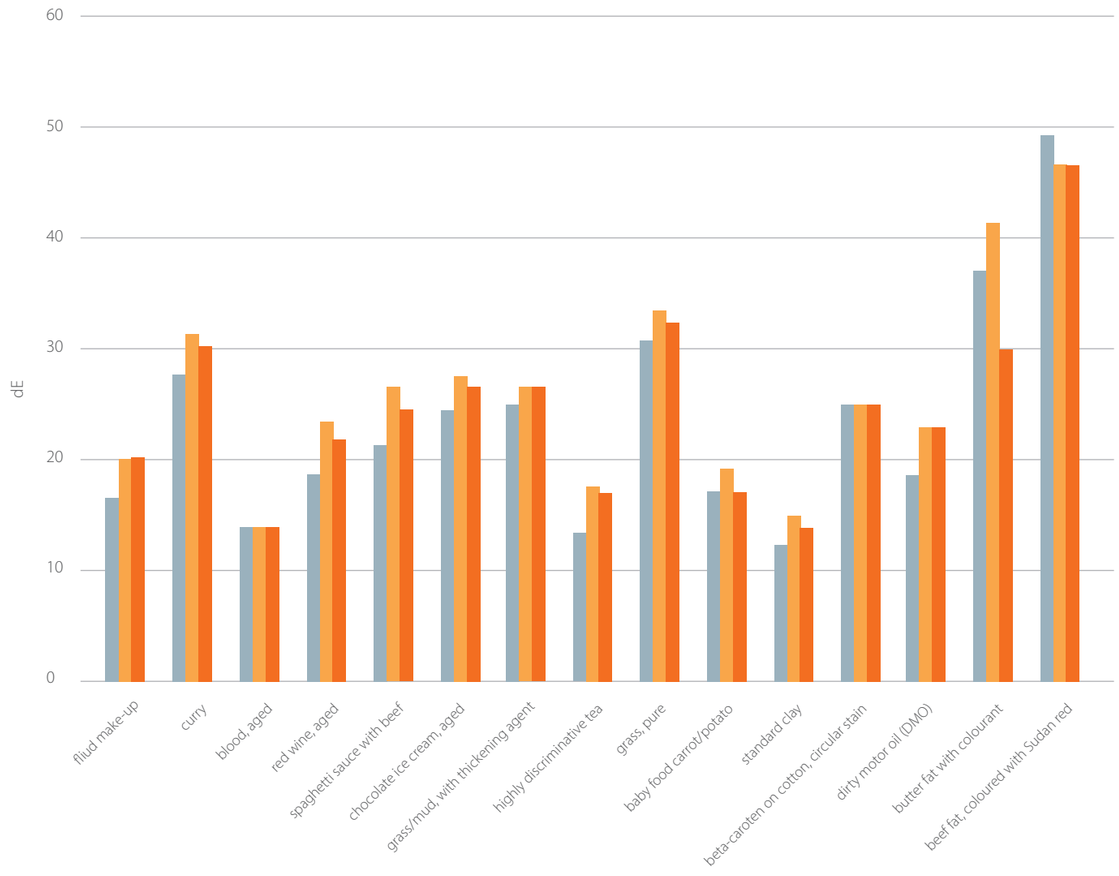


Test conditions for stain remover:

- automatic washmachine
- 40°C (with one of the formulations)
- cotton program
- load - calculated for 2.5 kg of dry, white towels
- the dosing of the stain remove: 100 ml with market capsule
- fabric soiled with standard dirt

After the washing process was performed, the standardly disturbed fabrics were dried and ironed, and then the degree of washing was assessed by measuring parameter dE from the CIE LAB scale, as the difference between the initially disturbed stain and the degree of its washing. The greater dE value, the better the washing outcome.

Stain remover



PCC EXOL SA
Sustainable technologies for new generations

PCC EXOL SA combines innovative technologies with experience in designing, producing and selling surfactants and chemical formulations

PCC EXOL SA is a company that combines cutting-edge technologies with rich experience in production of surfactants (surface active agents). The company is located in Brzeg Dolny (Poland), where anionic, nonionic and amphoteric surfactant production plants have been launched. Due to the flexible production processes, the company offers a wide spectrum of surfactants and industrial formulations, which are often suited for the individual customers operating in plenty of various industry sectors. As one of the leading surfactant manufacturers, PCC EXOL SA carries out new investment projects and implements innovative technologies based on the global sustainability trends.

PCC EXOL SA portfolio includes surfactants with a broad range of applications. Besides of the mass production for personal care and detregents industry, the substances produced by PCC EXOL SA also include specialized products used in various branches, such as textile, agrochemical, metal cleaning, oil drilling, building & construction, paints & coatings, paper industry, extraction & drilling, and many others.

The company comprehensive portfolio is continuously enriched with new innovative products, which meet even the strictest market requirements and adapt to the individual needs of customers. This is possible due to the dynamic development of the research facilities, flexible production, knowledge as well as experienced personnel.

PCC EXOL SA has the key competence necessary for a worldwide production of surfactants. The ongoing projects will soon bring the new opportunities for the company's further development and expansion into new markets. The company offers not only a wide portfolio and professional servicing but most of all flexible production and comprehensive system solutions that meet individual customer demands. The strategic PCC EXOL SA investor is PCC SE, operating on international markets of the chemical raw materials, transport, energy, coal, coke, petrol, plastics and metallurgy. PCC SE includes 80 companies operating in 39 different locations in 17 countries.

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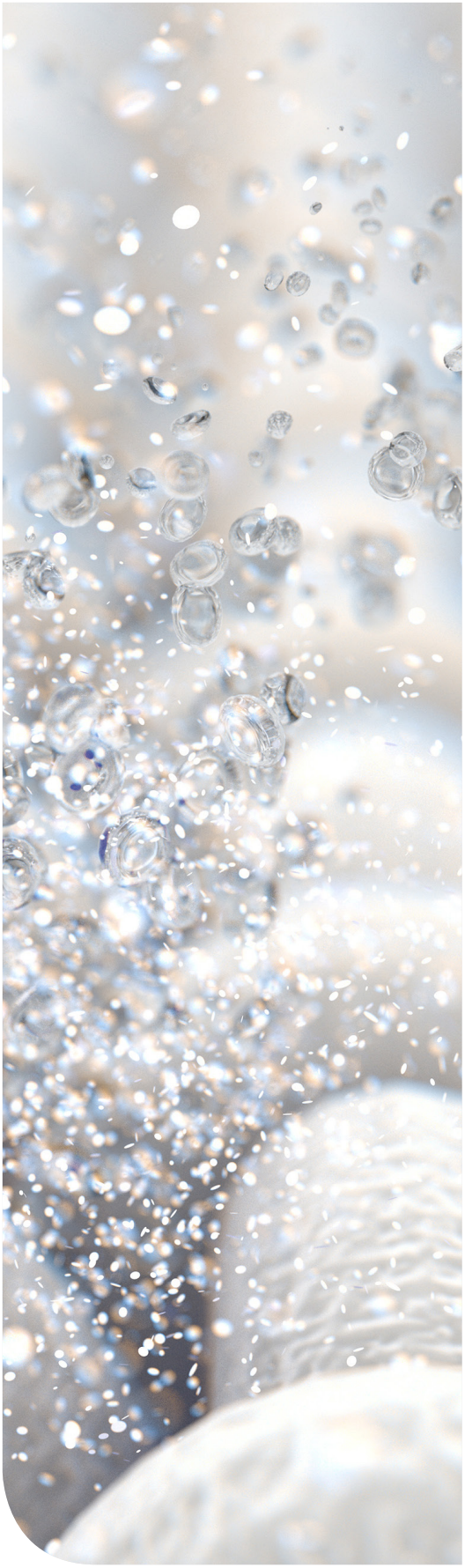

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