industrial and Consumer Care
Home Care

Hostapur® SAS

Secondary Alkane Sulfonate

Clariant

Exactly your chemistry.

Clariant

Exactly your chemistry.

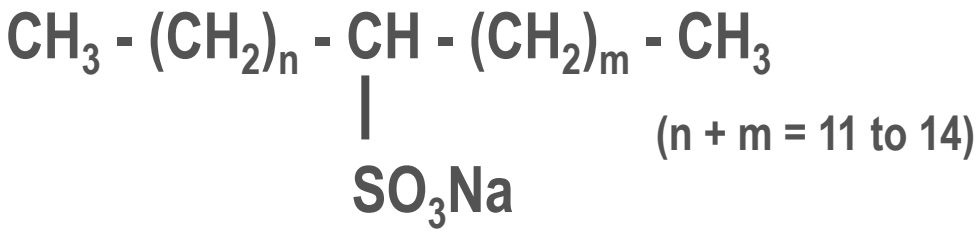
Structure and Production

Clariant

Exactly your chemistry.

Hostapur SAS

Secondary Alkane Sulfonate



Product Characteristics

- Excellent detergent/wetting agent
- Excellent solubility - electrolyte compatibility - hardness tolerance
- Enzyme and bleach compatible
- Mildness profile superior to LAS
- Foam profile similar to LAS
- Viscous liquid/paste with special handling/storage requirements

Product Status

- Commercially available
  - TSCA registered / DSL listed
- Readily biodegradable
- On-going production in Europe
- Applications - any liquid cleaning product application
- Many other potential application areas yet to be explored

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The Chemical Reaction SAS-Process (Photo-Sulphoxidation)

$$R\text{-}H + 2\,SO_2 + O_2 + H_2O \xrightarrow{light} R\text{-}SO_3H + H_2SO_4$$

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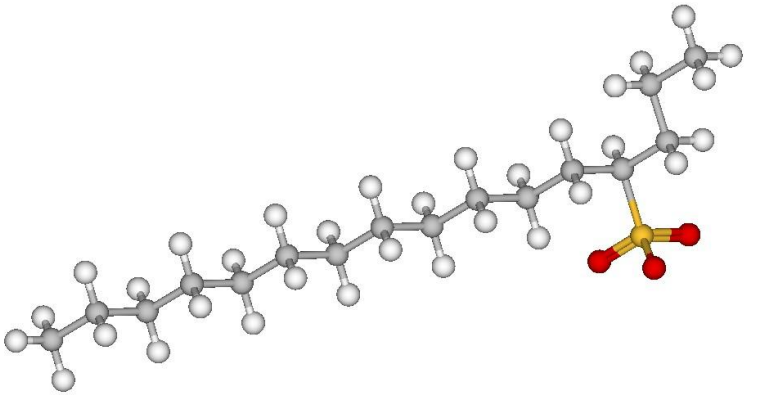
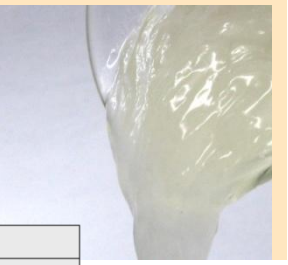
The Product
Hostapur SAS (Secondary Alkane Sulfonate)

C-chain Distribution	
< C_{13} n-Paraffin	max. 1%
C_{13} – C_{15} n-Paraffin	min. 59%
C_{16} – C_{17} n-Paraffin	max. 39%
> C_{17} n-Paraffin	max. 1%



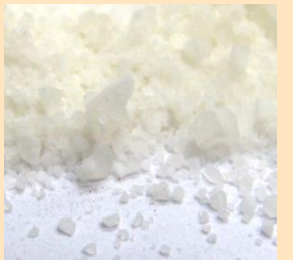
Hostapur SAS 30

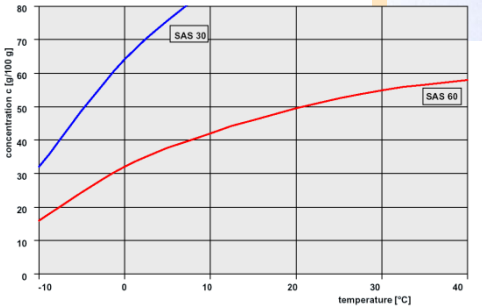
Hostapur SAS 60



Hostapur SAS 93

Hostapur SAS 93G





Solubility of the Hostapur SAS grades in distilled water

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Product Forms

Specifications

Specs	Hostapur SAS 30	Hostapur SAS 60	Hostapur SAS 93	Hostapur SAS 93G
Average Molecular Weight	328 g/mole C_{avg}= 15.5	328 g/mole C_{avg}= 15.5	328 g/mole C_{avg}= 15.5	328 g/mole C_{avg}= 15.5
% Active	30 ± 0.3%	60 ± 0.5%	93 ± 0.5%	92 ± 0.5%
Mono SO_3 Di SO_3	27 ± 0.3% 3± 0.3%	54 ± 0.5% 6 ± 0.5%	83.7 ± 0.5% 9.3 ± 0.5%	82.8 ± 0.5% 9.2 ± 0.5%
Sodium Sulfate	Max 2.0%	Max 4.0%	Max 6.5%	Max 6.5%
Paraffin	Max 0.3%	Max 0.5%	Max 0.7%	Max 0.7%
Appearance (25°C)	clear liquid 230 cps	soft paste 6,300 cps	prills	ground prills

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Hostapur SAS x LAS

Technical Differences

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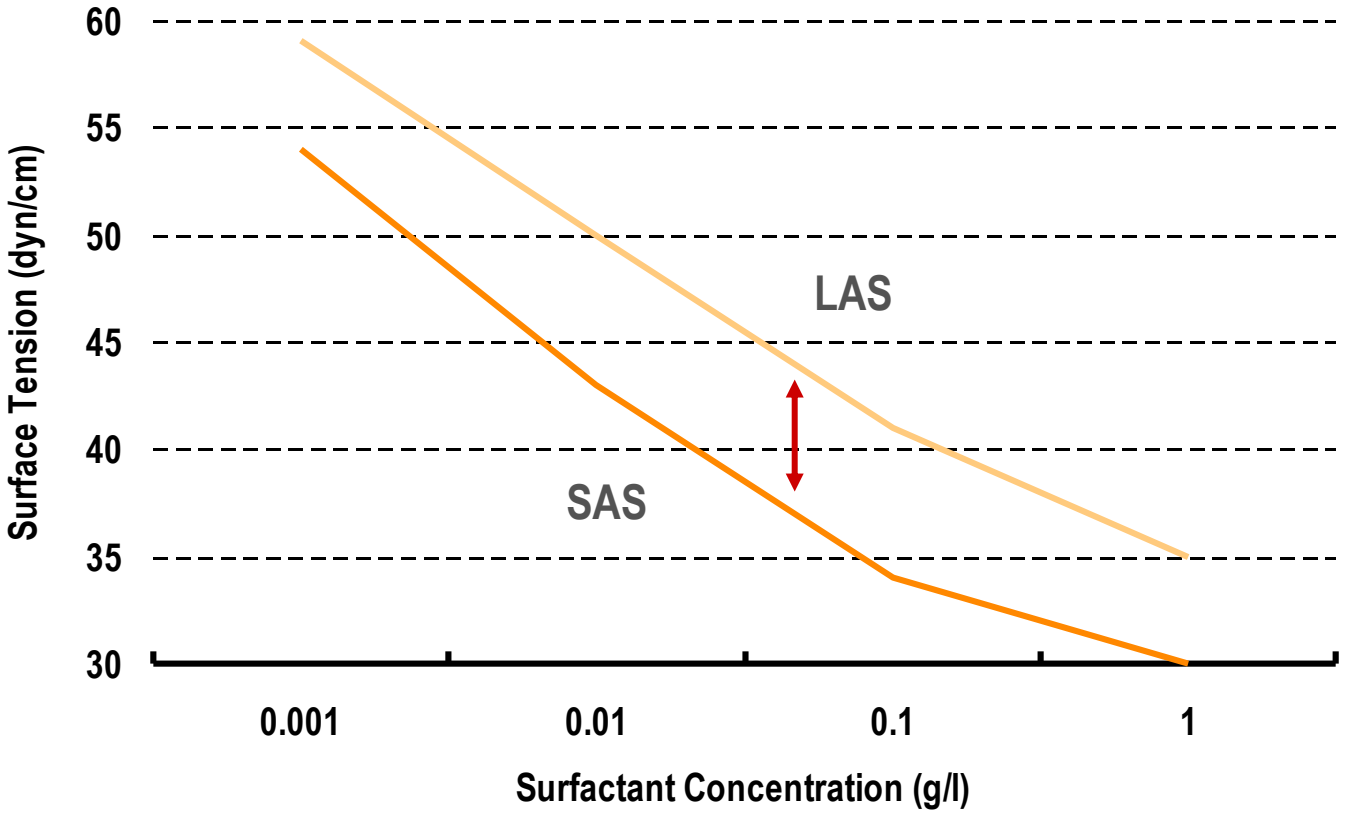
SAS x LAS – Technical Differences

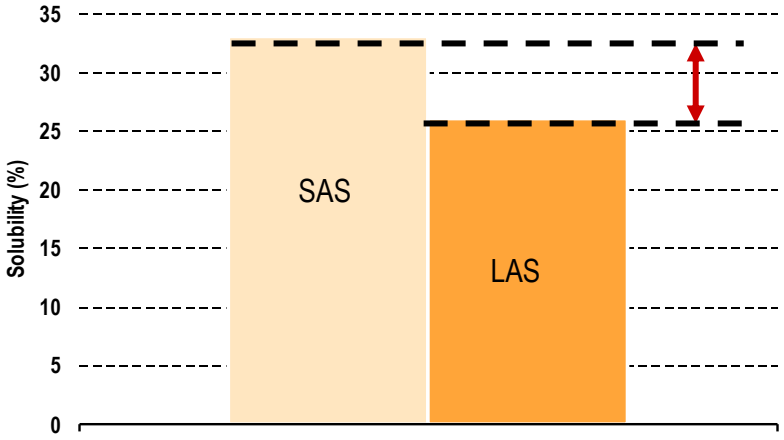
Surface Tension



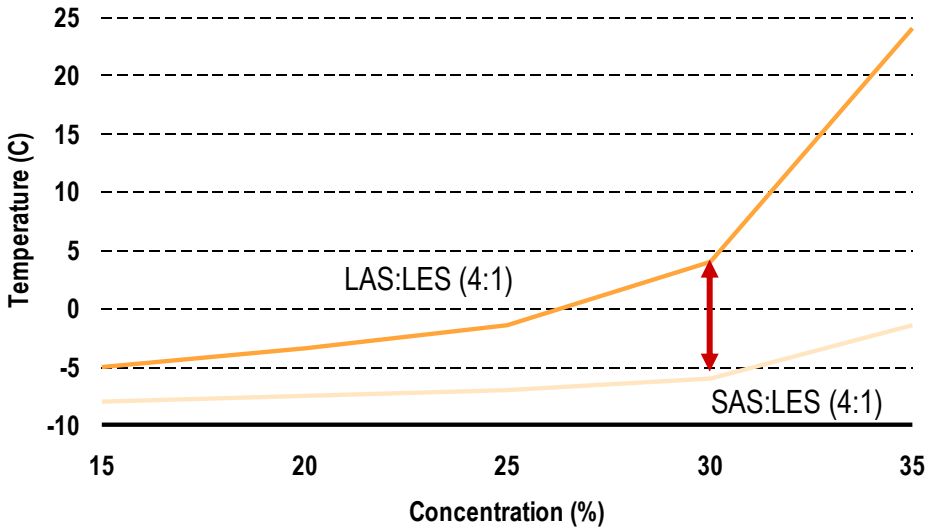
SAS presents lower surface tensions than LAS at different concentrations

SAS x LAS – Technical Differences

Solubility



The solubility of SAS is higher than the solubility of LAS



The solubility of SAS/LES mixture is higher than the solubility of LAS/LES

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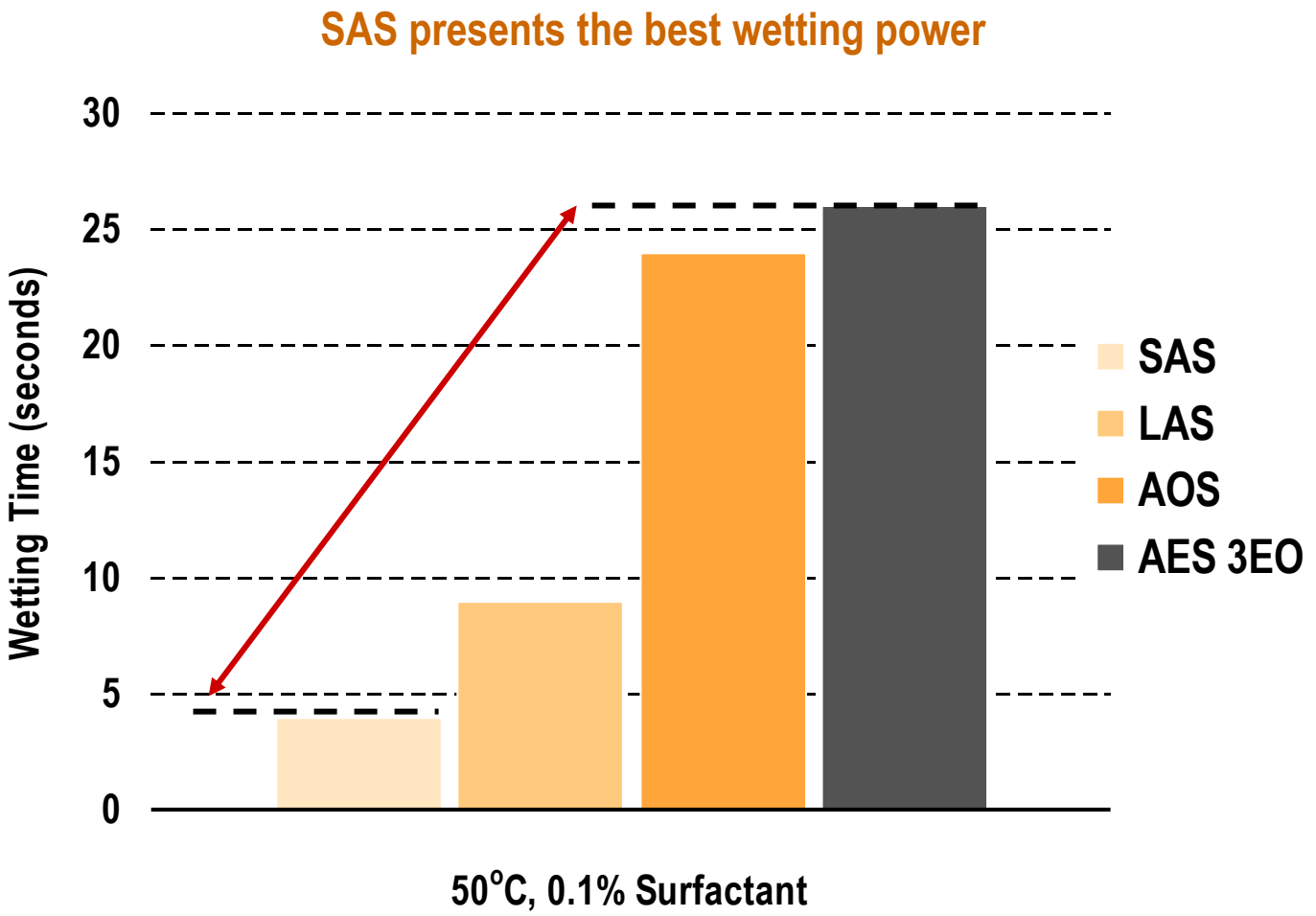
SAS x LAS – Technical Differences

Draves Wetting Test



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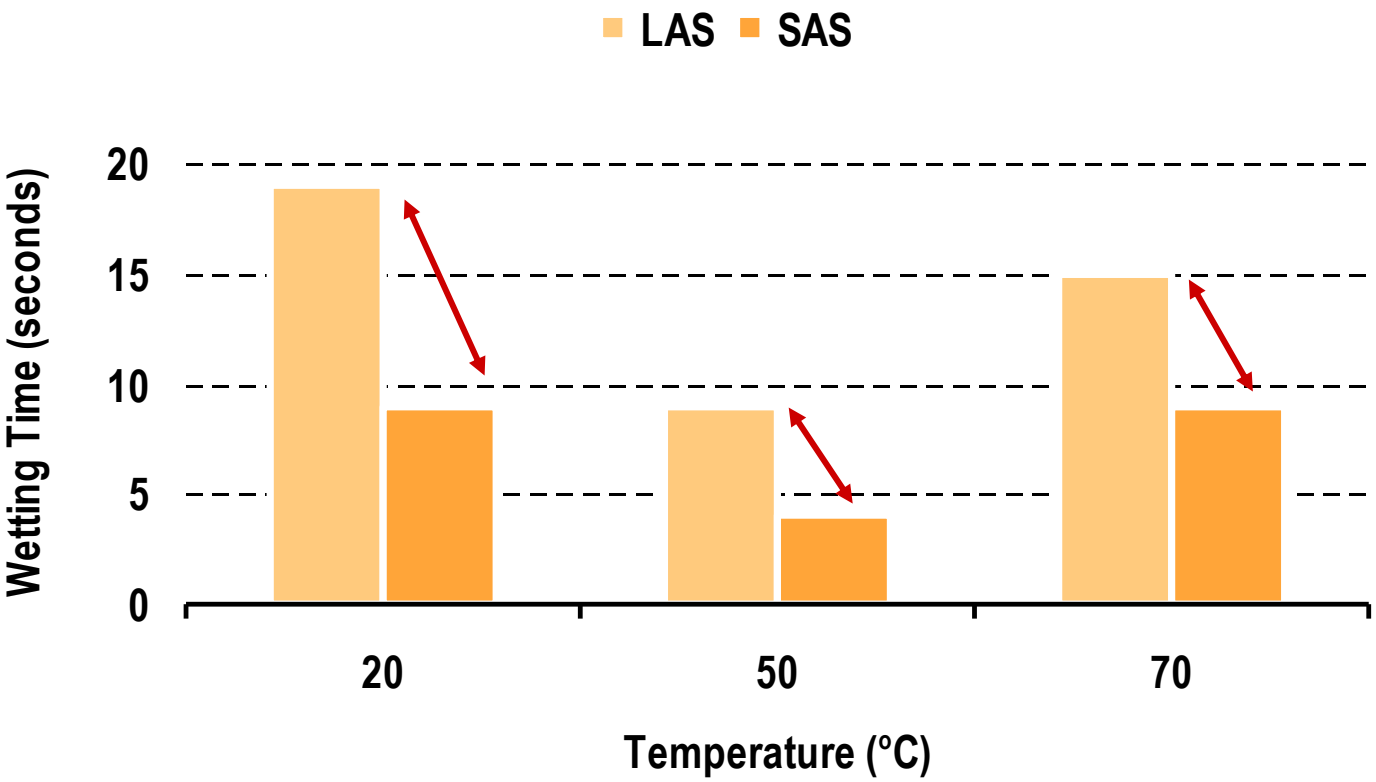
SAS x LAS – Technical Differences

Draves Wetting Test – Various Temperatures



SAS presents better wetting power than LAS for all tested temperatures

SAS x LAS – Technical Differences

Skin Mildness - Zein Test Equivalent

Zein Test

There is a very good correlation between acute skin irritation and the solubilization capacity of surfactants. A common model substance for the solubilization of proteins is zein, the protein from corn grain. In the Zein Test some of the water insoluble zein is dissolved, to a greater or lesser extent, by aqueous surfactant solutions. After centrifugation the dissolved zein is decomposed with concentrated sulfuric acid and the nitrogen content of the solution coming out of the protein is determined. Surfactants with high zein values increase the roughness of the skin and are regarded as more skin irritant.

Mixture of 100 ml surfactant solution (1 % a.s.) with 6 g protein (zein)

↓

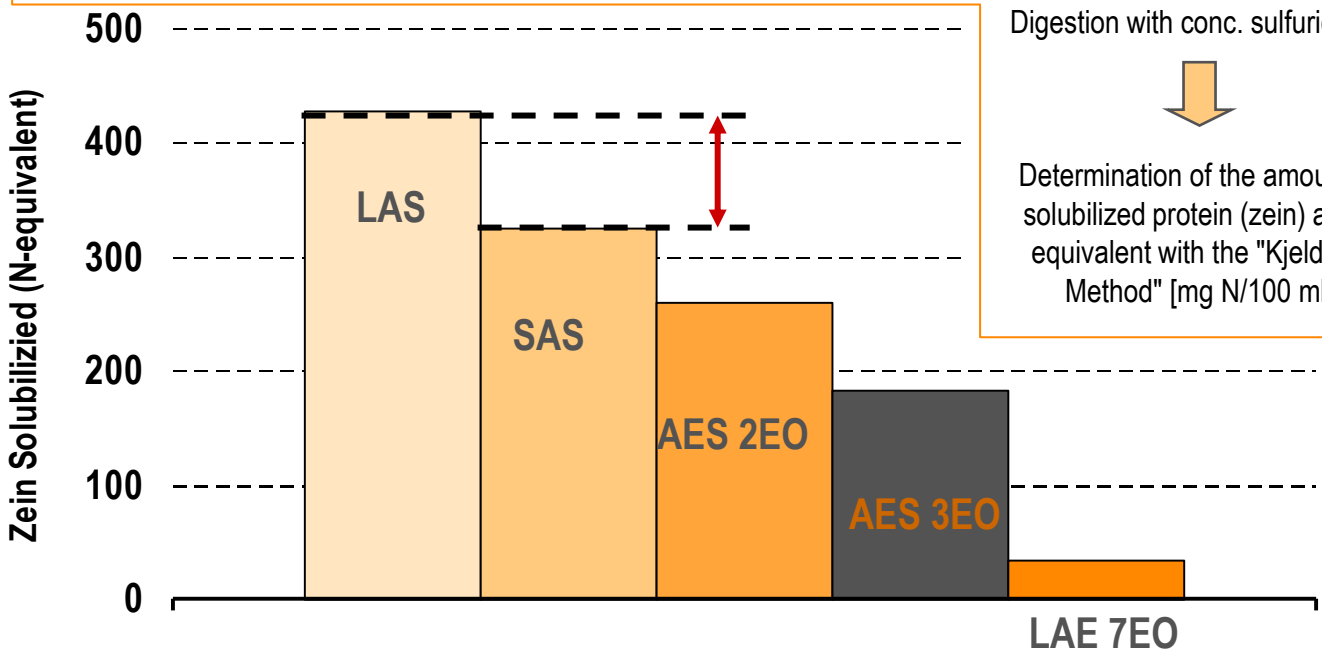
Stirring for 1 h
Centrifugation

↓

Digestion with conc. sulfuric acid

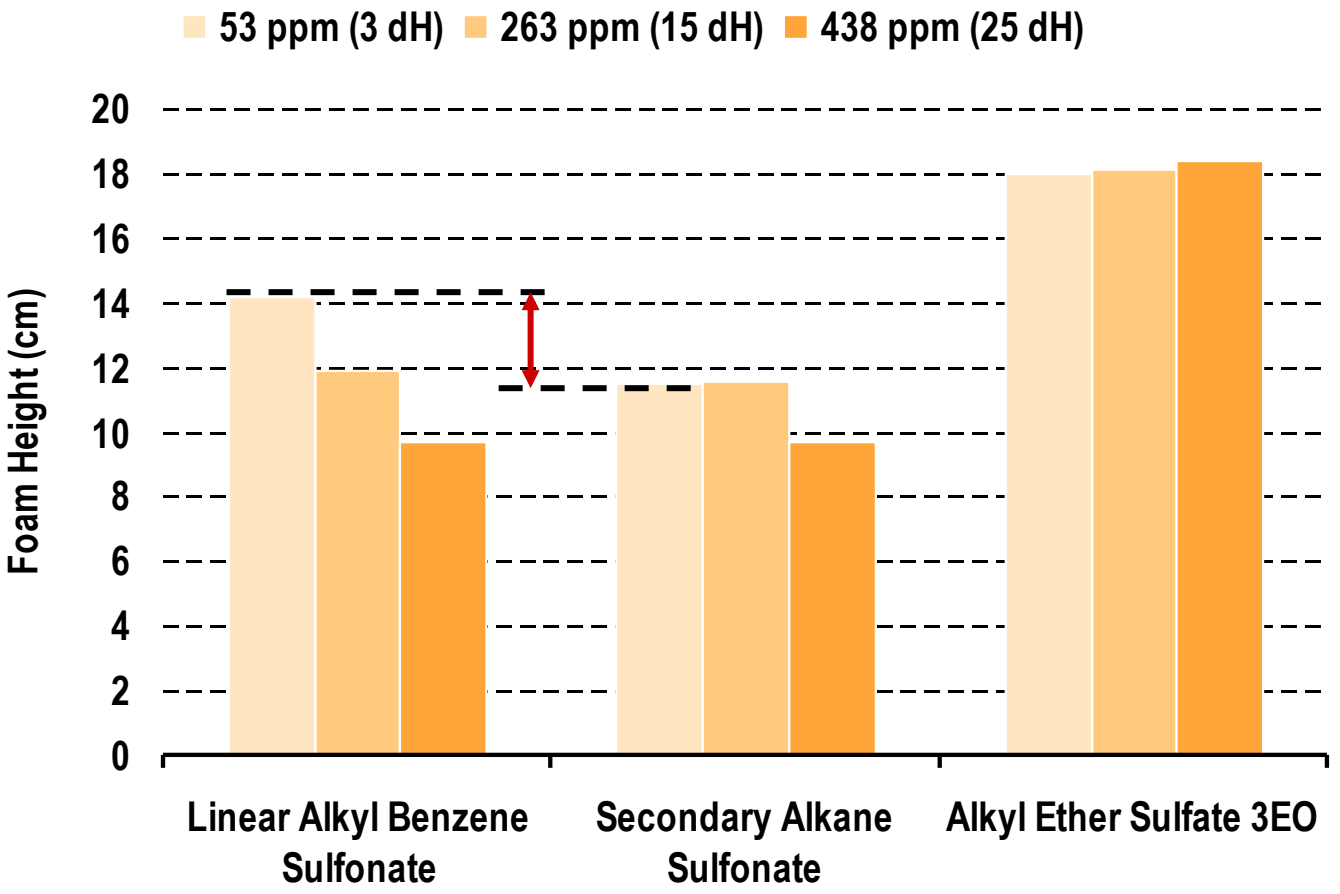
↓

Determination of the amount of solubilized protein (zein) as N-equivalent with the "Kjeldahl-Method" [mg N/100 ml]



SAS x LAS – Technical Differences

Foam Height - Ross Miles



At low water hardness, SAS presents a lower foam profile compared to LAS

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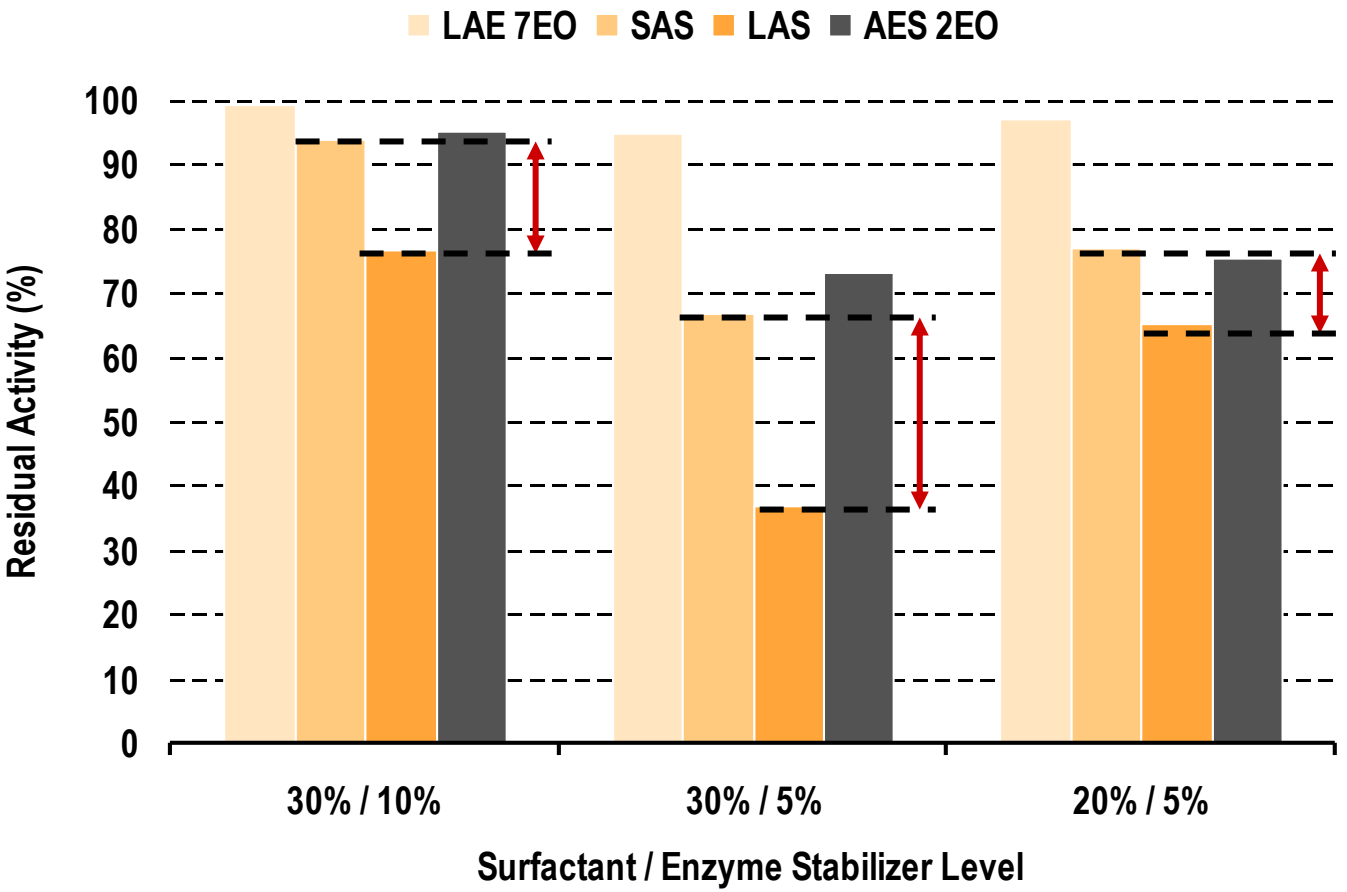
SAS x LAS – Technical Differences

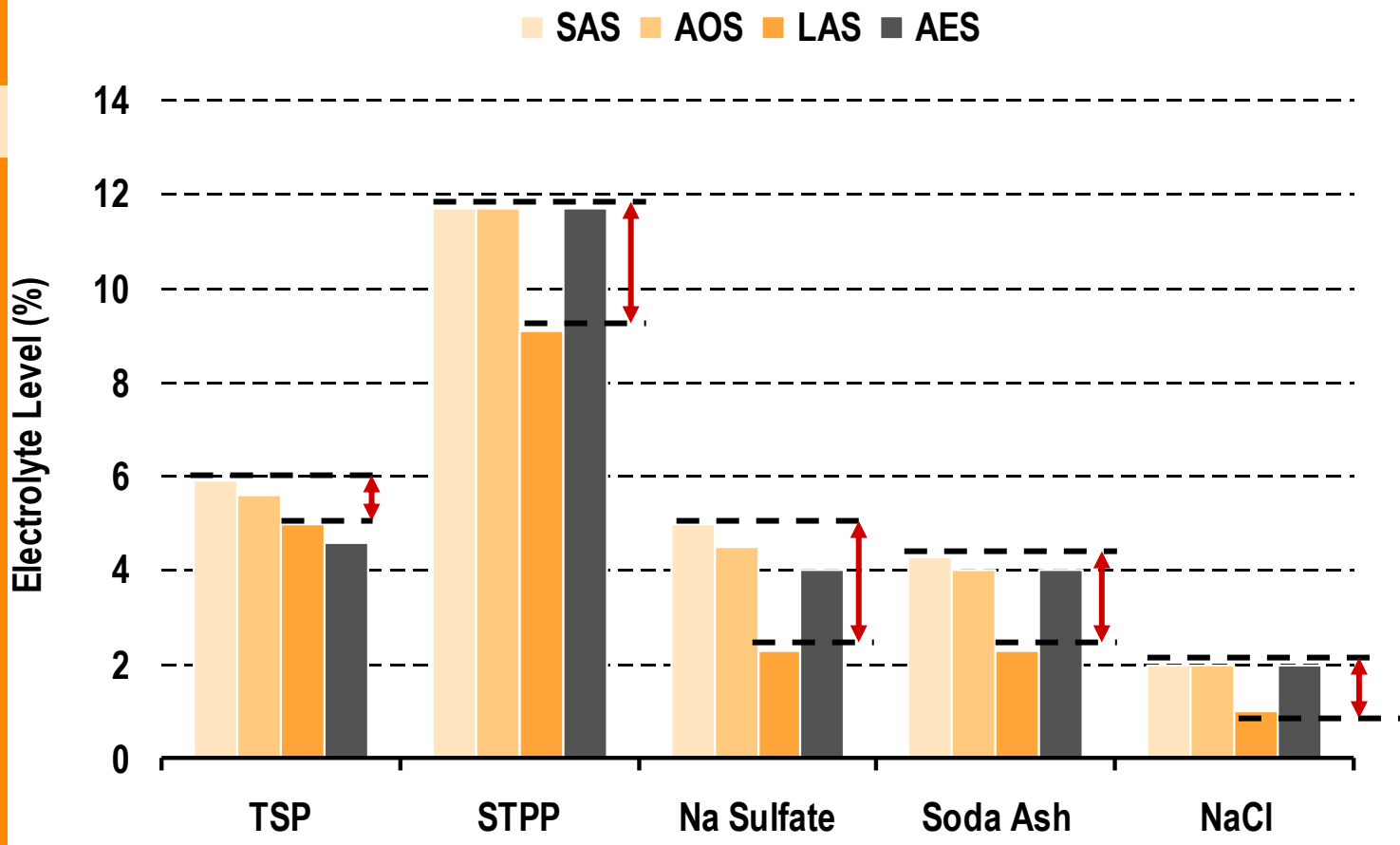
Protease Compatibility



The residual activity of enzymes in the presence of LAS is always lower than that with SAS

SAS x LAS – Technical Differences

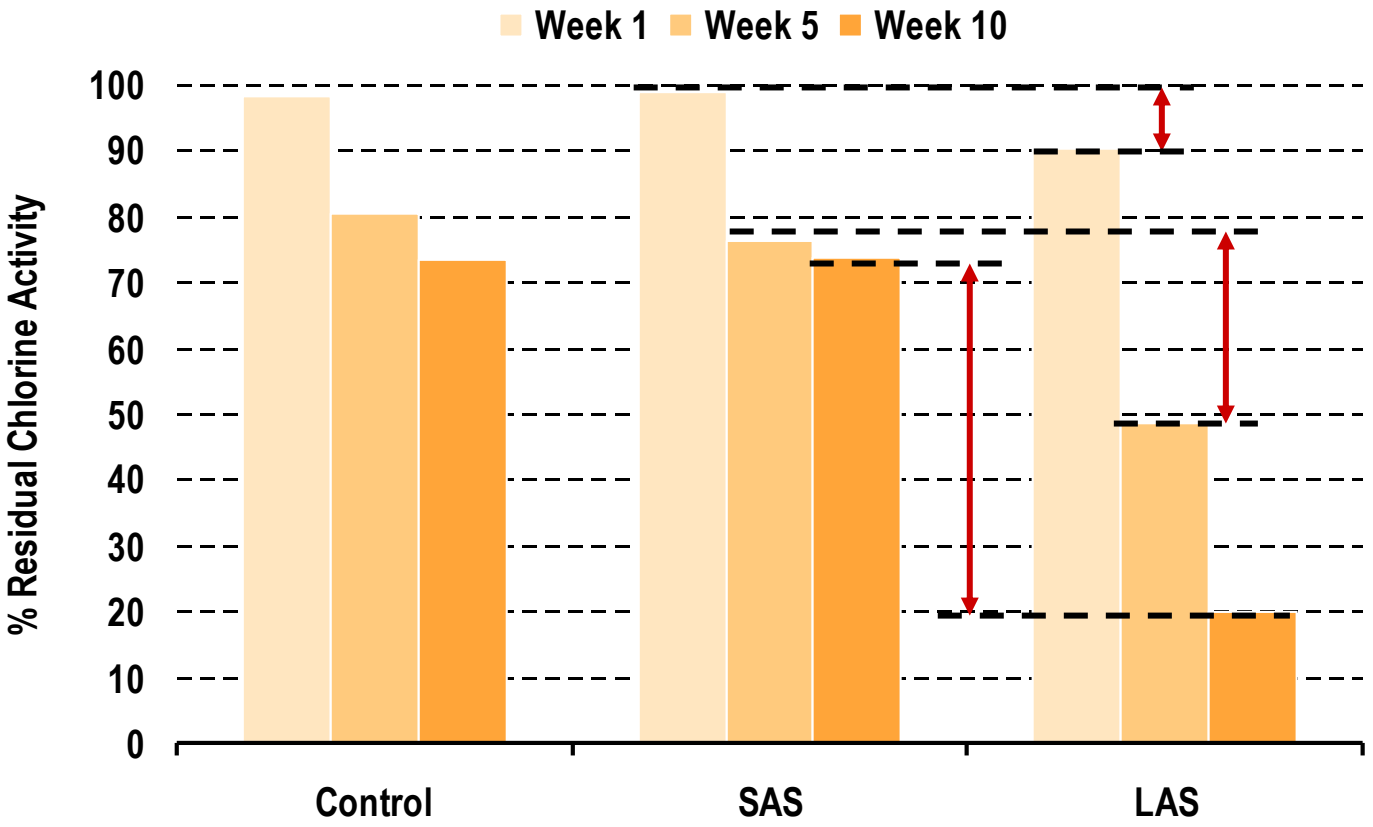
Electrolyte Compatibility - 10% Surfactant



LAS formulations become clouded with lower electrolyte concentrations than SAS formulations

SAS x LAS – Technical Differences

Chlorine Stability - 40°C, 4.5% NaOCl, 0.3% NaOH, 1% active surfactant, aqueous



The residual activity of Chlorine in the presence of LAS is always lower than that with SAS

Comparison of Anionic Surfactants

	SAS	AES	LAS	Important for… Formulations
Surface tension (CMC)	++	+	+	HDL, LDL, APC
Interfacial tension	++	0	+	APC, LDL
Wetting power	++	+	++	LDL, APC
Foam behavior (hard water)	0	++	0	HDL, LDL
Solubility in water	++	++	+	HDL, LDL (conc.)
Water hardness stability	-	++	-	APC, (LDL)
Calcium soap dispersing	-	++	-	APC, LDL, (HDL)
Cold stability (cloud point)	++	+	0	LDL, (HDL)
Solubility IPM	+	-	++	ADL, APC
Detergency	+	0	+	HDL
Acid/Alkaline stability	++	-	++	APC, I&I-cleaner
Electrolyte stability	++	+	+	APC, (LDL)
Chlorine stability	++	-	0	APC, Disinfectant
Enzyme stability	++	++	0	HDL
Biodegradability (readily)	++	++	+	LDL, HDL, APC

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Hostapur SAS x LAS

Environmental Profile

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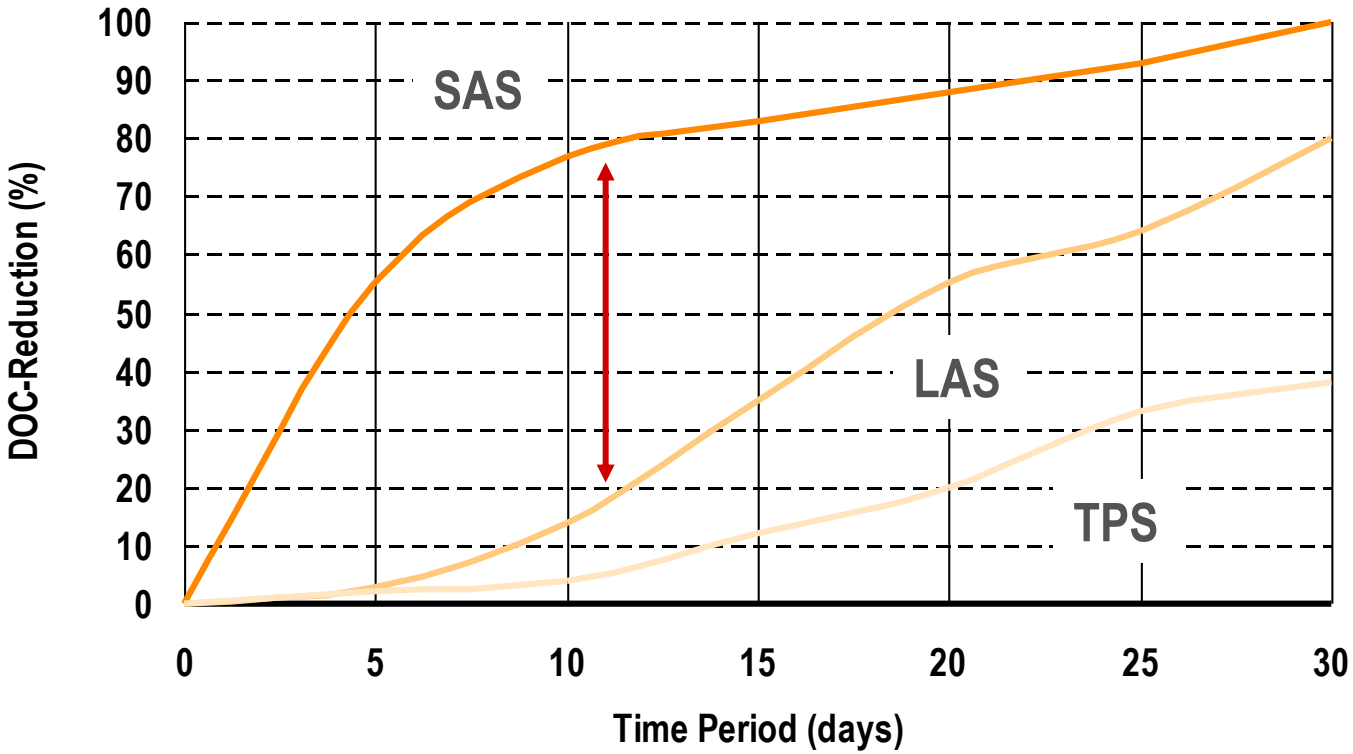
SAS x LAS – Environmental Profile

Biodegradation according to modified OECD Screening Test 301 E



TPS: Tetrapropylene Sulfonate

SAS x LAS – Environmental Profile

Method	SAS	LAS
OECD 301 B - CO_2 evolution test: Degradation is followed over 28 days by determining the carbon dioxide produced.	78%	61%
OECD 301 D - Closed bottle test: Degradation is followed by analysis of dissolved oxygen over a 28 days period.	-	80%
OECD 301 E Modified OECD screening test: Degradation is followed by DOC (Dissolved Organic Carbon) analysis at frequent intervals over a 28 days period.	89%	-
OECD 302 B Zahn-Wellens / EMPA(1) Test: The biodegradation process is monitored by determination of DOC in filtered samples taken at daily or other time intervals for 28 days.	>90%	-

SAS x LAS – Inherent Advantages

Summary

Hostapur SAS compared to LAS

Technical Profile

- Reduced surface tension
- Comparable foam profile
- Superior mildness
- Superior chlorine bleach compatibility
- Superior grease removal performance
- Superior enzymes compatibility
- Superior electrolyte compatibility
- Reduced hydrotrope/solvent requirements
- Reduced viscosity
- Faster wetting speeds

Environmental profile

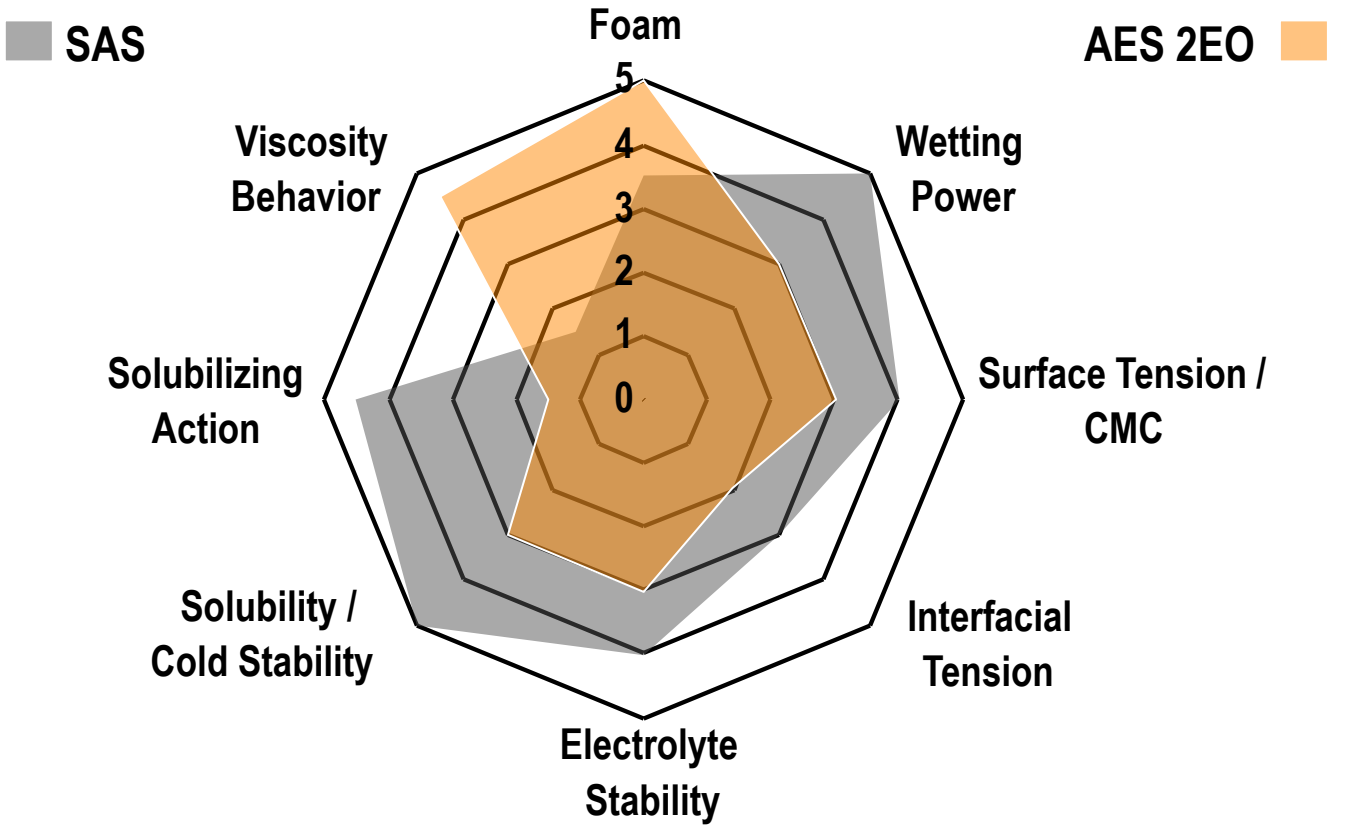
- Independency from the benzene ring
- Comparable toxicity profile
- Superior biodegradation profile
- “Greener Chemistry”

Hostapur SAS:AES

Synergy

Comparison SAS x AES

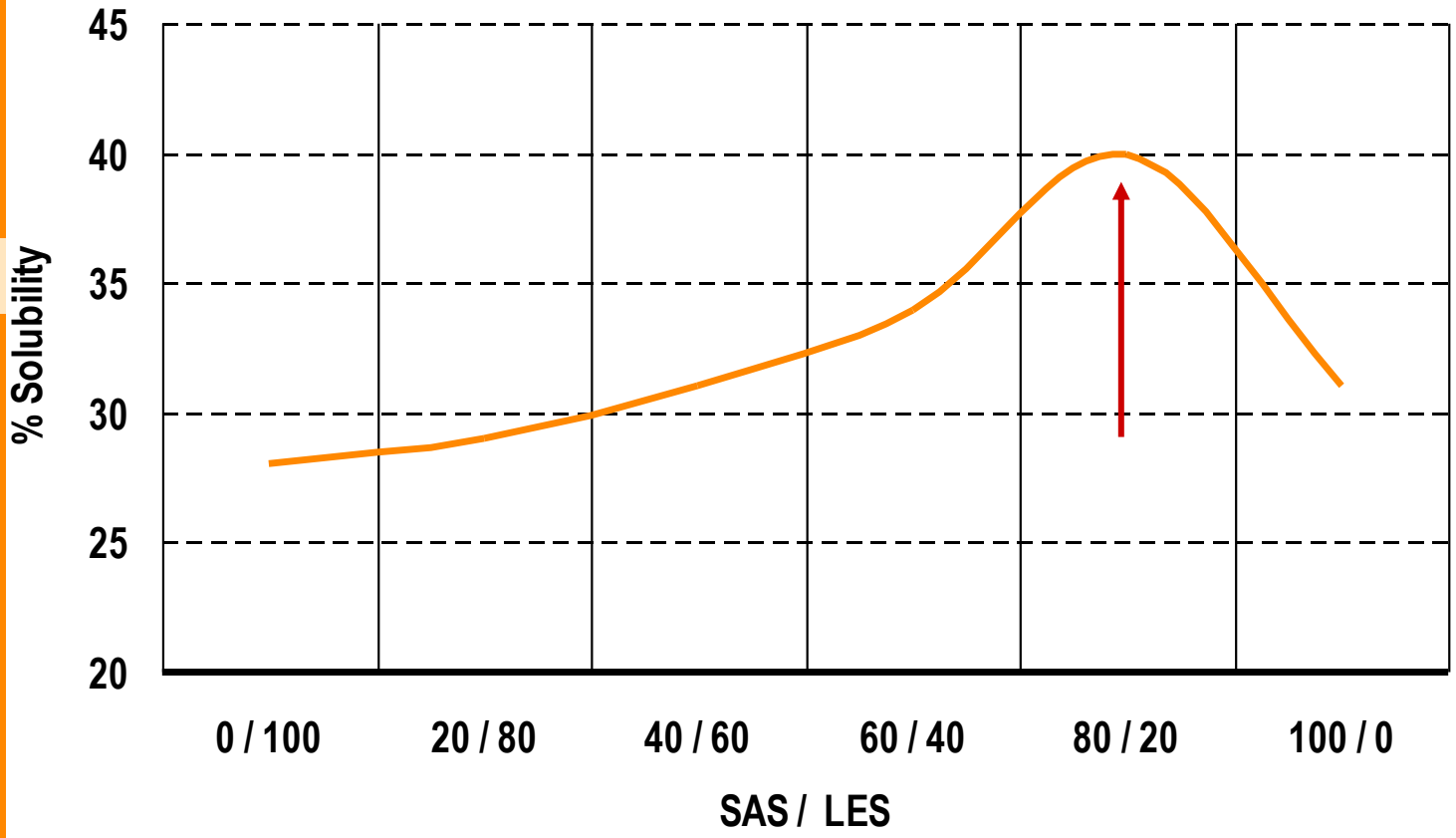
Hard surface cleaners and hand dishwashing liquids



The combination of SAS / AES 4:1 shows optimal performance benefits as a basic surfactant system for LDL formulations

Solubility of SAS:LES

Mixtures at 20°C



A 4:1 mixture of SAS to LES allows for the production of water soluble highly concentrated products

Hostapur SAS x LAS
Hand Dishwashing

Hand Dishwashing Liquids

Formulations

Sulphonate : Sulphate = 2:1, 35% a.m.

ID#	1	2	3	4	5	6	7	8	9	10
Component	a.s. [%]	a.s. [%]	a.s. [%]	a.s. [%]	a.s. [%]	a.s. [%]	a.s. [%]	a.s. [%]	a.s. [%]	a.s. [%]
SAS	**23.3**	-	**20**	-	**23.4**	-	**20**	-	**18**	-
LAS	-	**23.3**	-	**20**	-	**23.4**	-	**20**	-	**18**
LES	11.7	11.7	10	10	5.8	5.8	5	5	8	8
AS	-	-	-	-	5.8	5.8	5	5	-	-
Betaine	-	-	5	5	-	-	5	5	5	5
HEQ	-	-	-	-	-	-	-	-	2	2
Ethanol	2.5	7.5	3.5	5	2.5	6.5	4	5.5	3	-
Water	ad 100	ad 100	ad 100	ad 100	ad 100	ad 100	ad 100	ad 100	ad 100	ad 100
Notes	-	-	-	-	-	-	-	-		turbid

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Hand Dishwashing Liquids

Viscosity

Sulphonate : Sulphate = 2:1, 35% a.m.

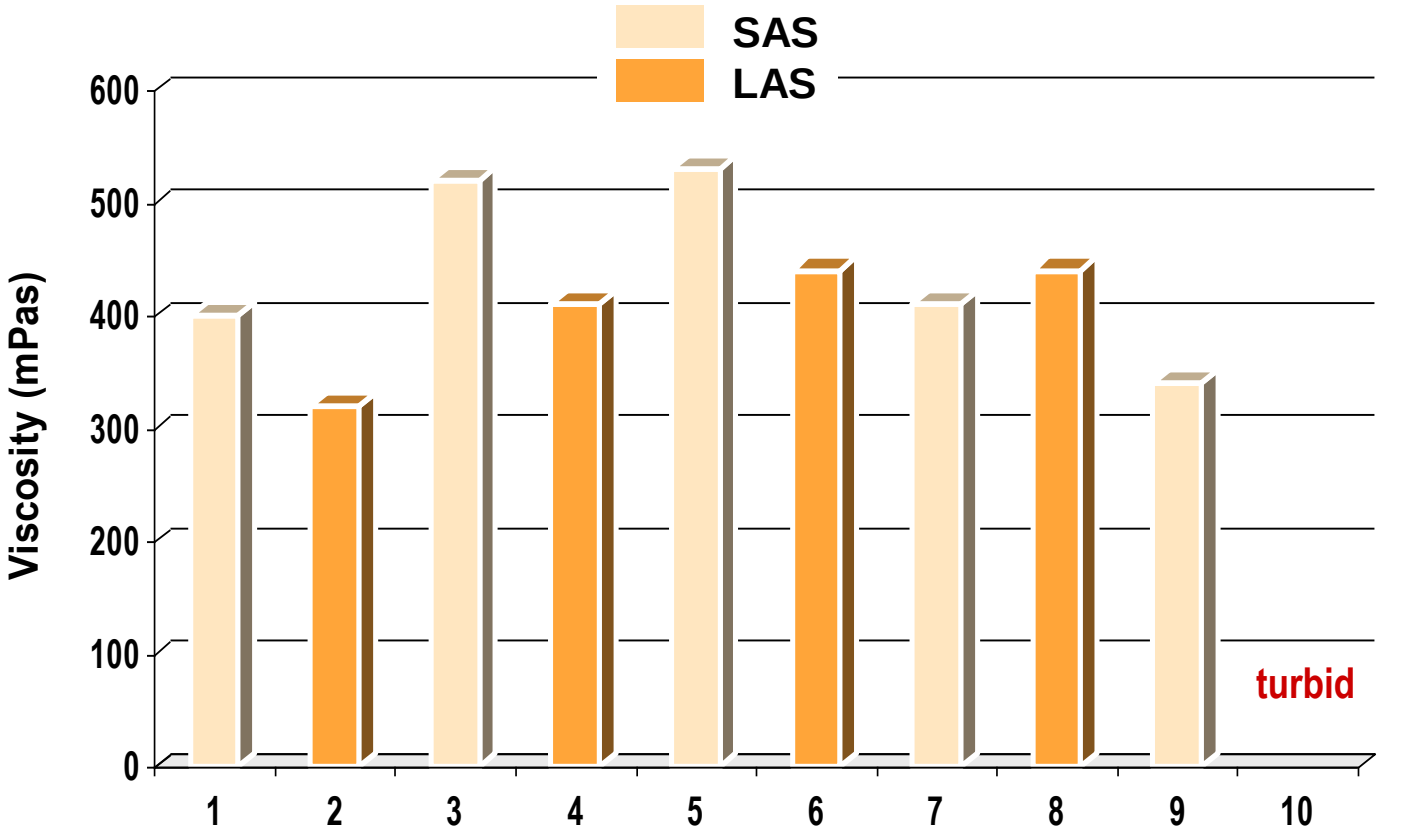
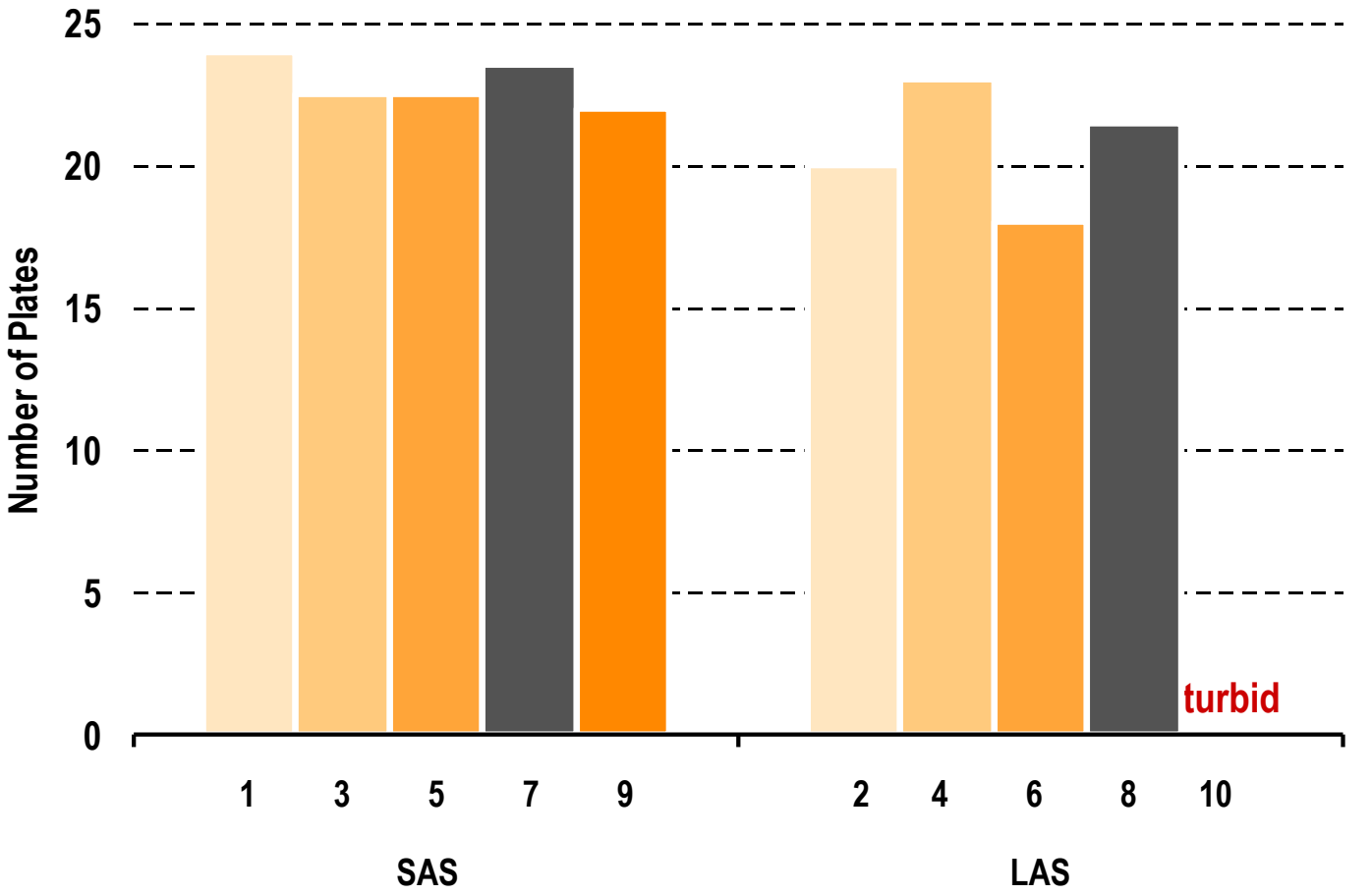


Plate Test (fat)

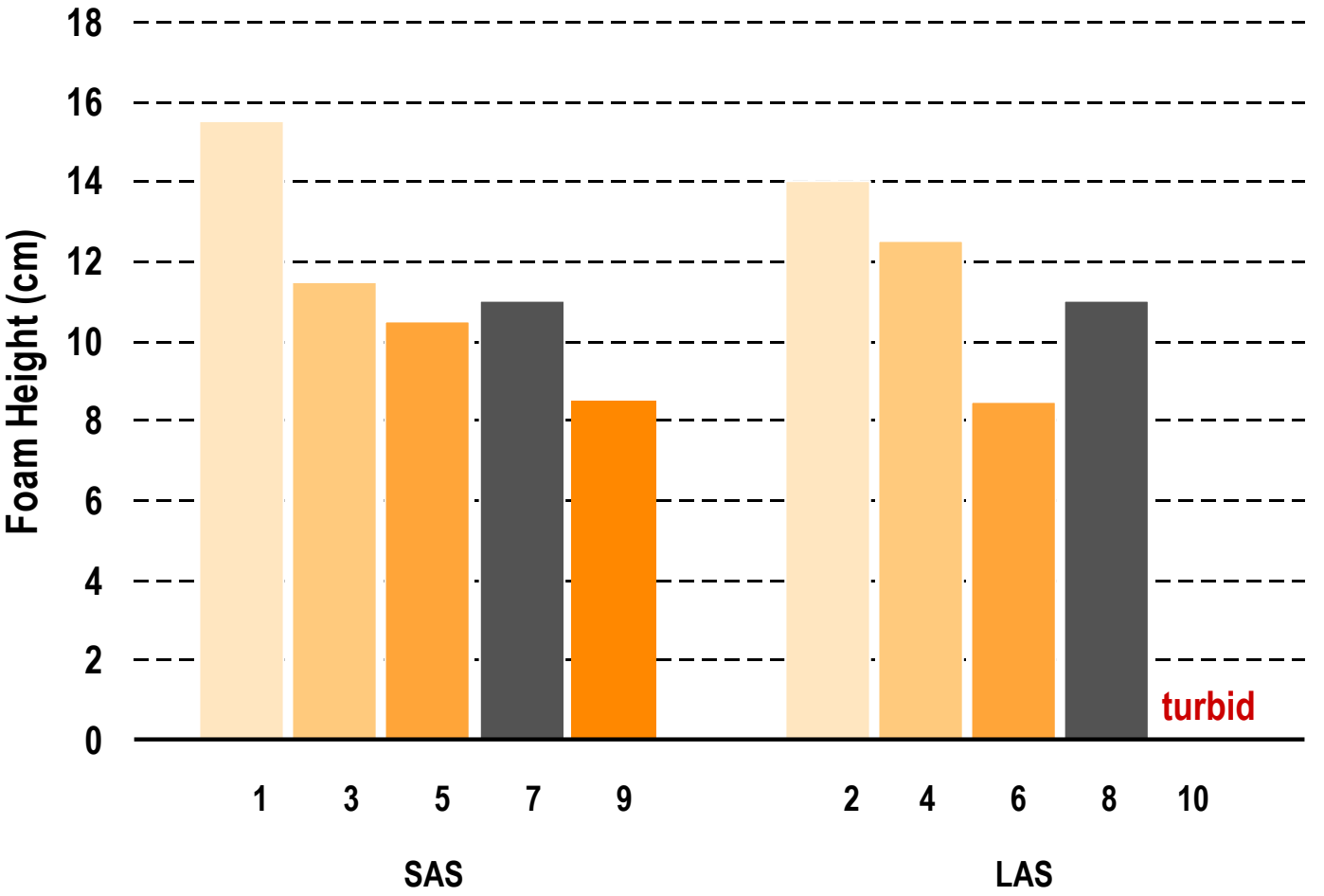
Sulphonate : Sulphate = 2:1, 35% a.m.
c = 0.4 g/l, Water hardness: 267ppm,
Start temperature: 47°C, Soil III: 5.0g Soil/Plate



Ross-Miles Foam

Sulphonate : Sulphate = 2:1 (35% a.m.)

c = 0.3 %, water hardness: 267ppm, Temp. 37°C



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Hostapur SAS x LAS

Liquid Laundry Detergent

Regular HDL

Feasible Formulation Based on SAS

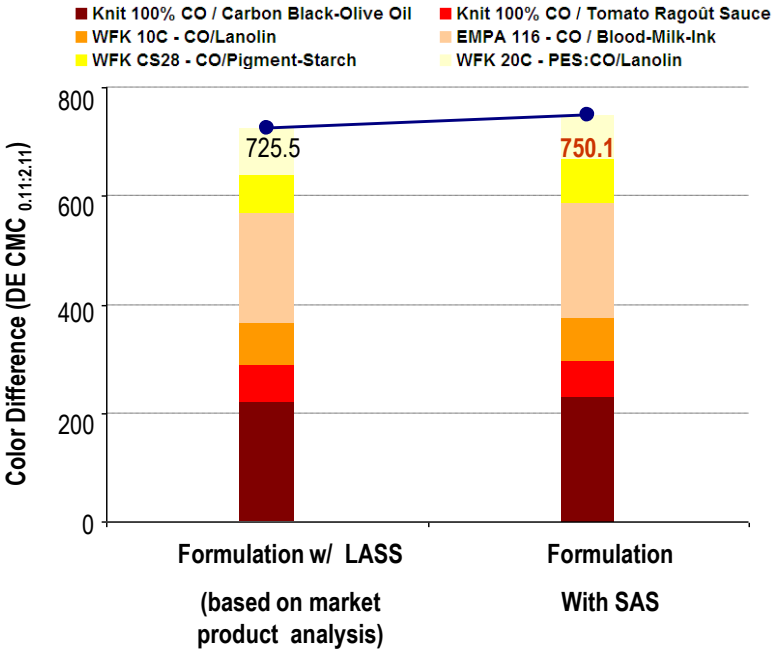
Regular HDL	% am
SAS	*5.0*
C_{12-14} SLES-2EO	*8.0*
C_{12-14} FAE-7EO	*5.0*
C_{12-14} FAE-3EO	*2.5*
Boric Acid	*2.5*
Sodium Citrate	*3.0*
$MgCl_2.6H_2O$	*5.0*
Optical Brightener	*0.1*
Protease	*0.5*
Amylase	*0.3*
Water	*qsp 100*

pH 8.0

Viscosity 145 mPas.s

(25ºC, Brokfield RVT, 20 rpm, 60 s, spindle 3)

Colorimetric Evaluation



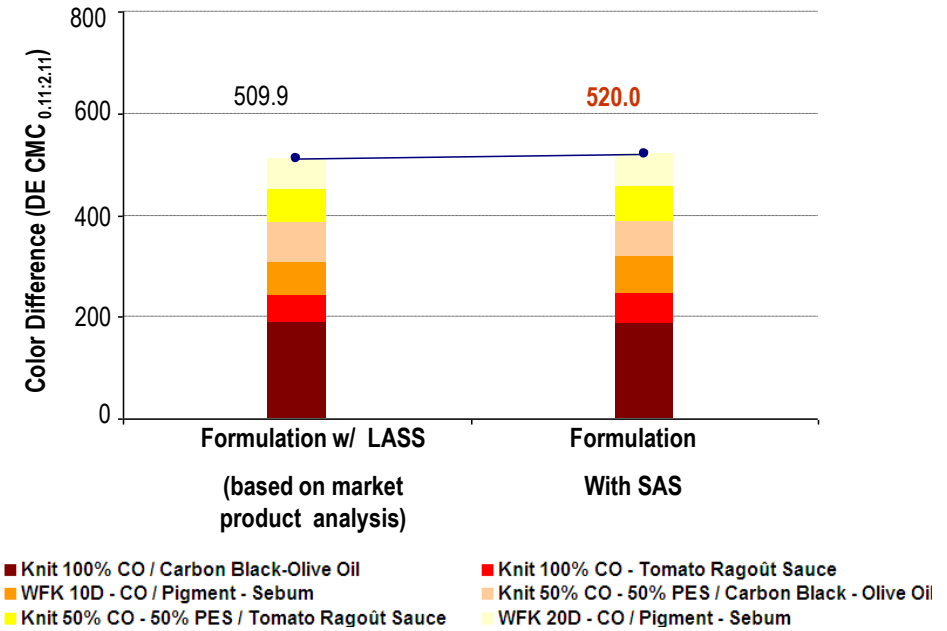
EMPA 116 – CO soiled with Blood / Milk / Ink

Colorimetric Evaluation

HE HDL

Feasible Formulation Based on SAS

Colorimetric Evaluation



Knit 100% CO / Tomato Ragoût Sauce

Formulation With LASS | Formulation With SAS

Visual Evaluation

pH	8.0
Viscosity	75 mPas.s

(25°C, Brokfield RVT, 20 rpm, 60 s, spindle 3)

HE HDL	% am
SAS	***5.0***
C_{12-14} SLES-2EO	*10.0*
C_{12-15} Oxoalcohol 7EO	*4.0*
C_{12-14} FAE-3EO	*2.0*
C_{10-12} Alkyl Alkoxylate 4EO-4PO	*3.0*
Ethanol	*1.0*
Propyleneglycol	*0.5*
Boric Acid	*2.5*
Sodium Citrate	*3.0*
$MgCl_2.6H_2O$	*5.0*
Optical Brightener	*0.1*
Protease	*0.5*
Amylase	*0.3*
Water	*qsp 100*

HE HDL

Feasible Formulation Based on SAS

Sudsing Profile

Initial
(right after water filling)

60 minutes

90 minutes (end)

HE HDL	% am
SAS	*5.0*
C_{12-14} SLES-2EO	*10.0*
C_{12-15} Oxoalcohol 7EO	*4.0*
C_{12-14} FAE-3EO	*2.0*
C_{10-12} Alkyl Alkoxylate 4EO-4PO	*3.0*
Ethanol	*1.0*
Propyleneglycol	*0.5*
Boric Acid	*2.5*
Sodium Citrate	*3.0*
$MgCl_2.6H_2O$	*5.0*
Optical Brightener	*0.1*
Protease	*0.5*
Amylase	*0.3*
Water	*qsp 100*

3X HDL

Feasible Formulation Based on SAS

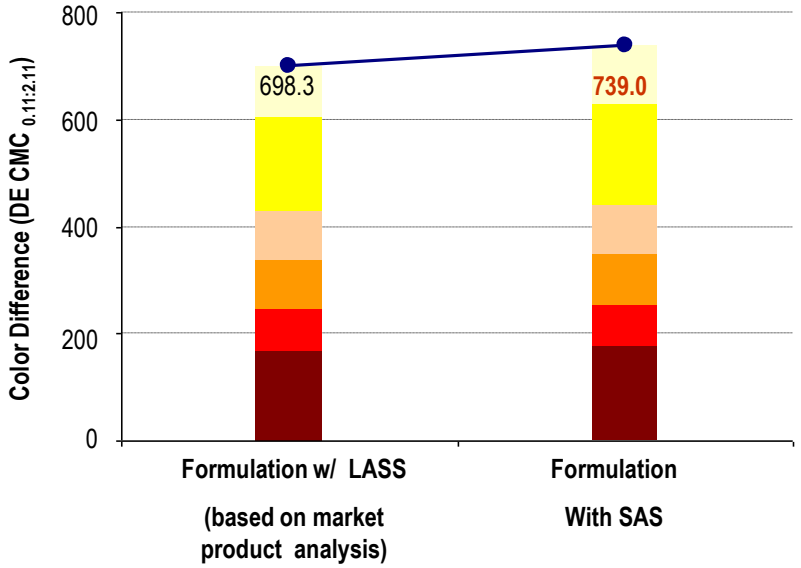
Conc. HDL	% am
SAS	*16.0*
C_{12-14} SLES-2EO	*10.0*
C_{12-14} FAE-7EO	*14.0*
Cocamidopropyl Betaine	*0.5*
Boric Acid	*3.5*
Sodium Citrate	*3.5*
$MgCl_2.6H_2O$	*10.0*
Optical Brightener	*0.2*
Protease	*0.5*
Amylase	*0.3*
Water	*qsp 100*

pH 8.0

Viscosity 540 mPas.s

(25ºC, Brokfield RVT, 20 rpm, 60 s, spindle 3)

Colorimetric Evaluation



WFK 20D – PES:CO / Pigment - Sebum

Formulation With LASS | Formulation With SAS

Visual Evaluation