



Progress beyond

APE FREE SURFACTANTS

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APE FREE SOLUTIONS

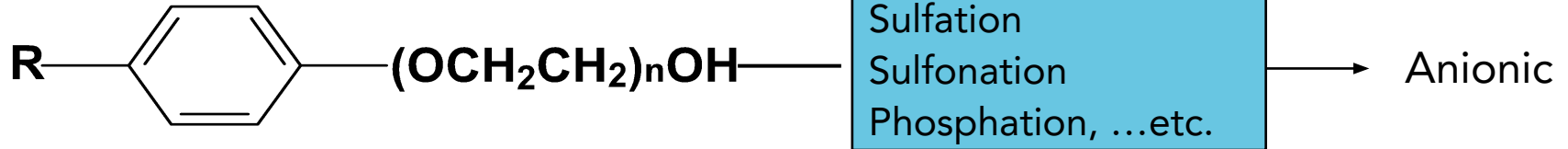
To change, we have to change twice. Not only do we have to change things, but we have to change the way we see things.

Luc de Brabandere



WHAT ARE APEs?

APEs - Alkylphenol ethoxylates



R - branched nonyl-, octyl- or dodecyl- chain

n - number of ethylene oxide (EO) repeating units

Surface active agents

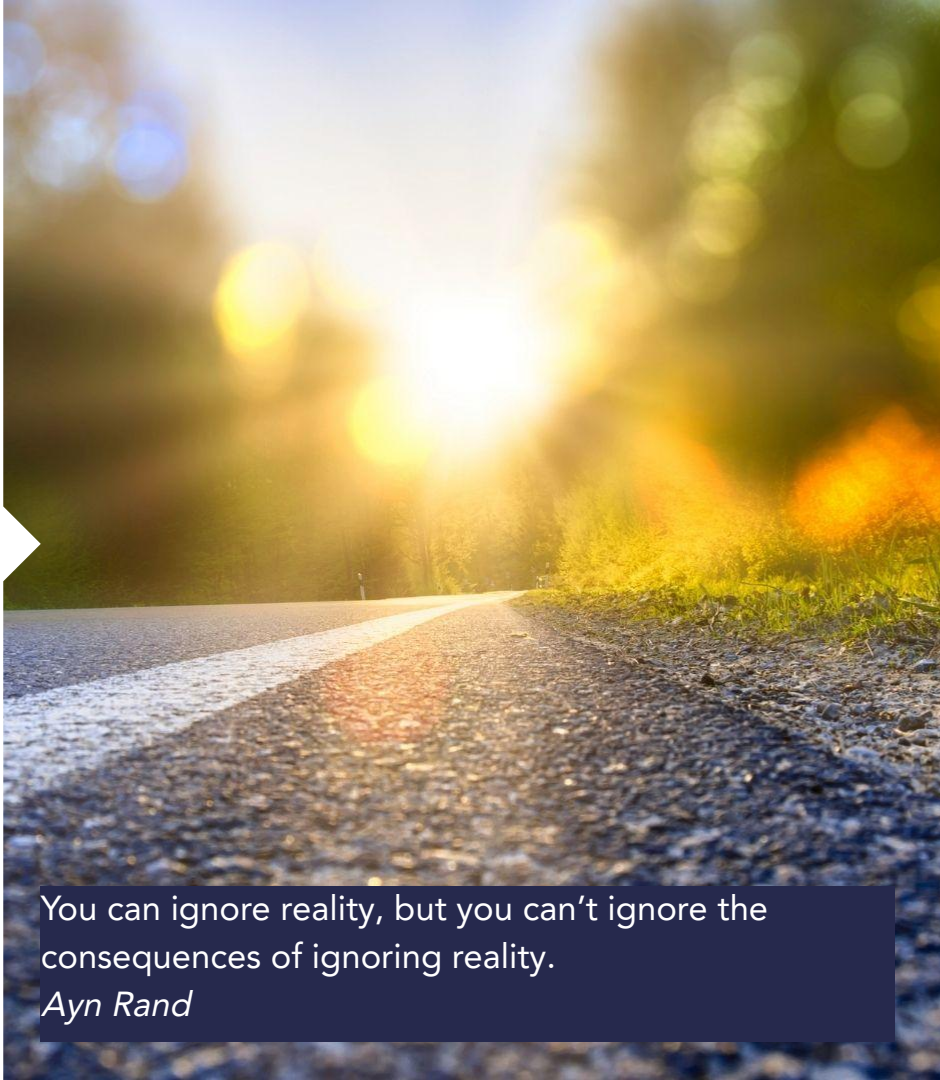
- Surface activity derived from alkylphenol hydrophobe and para-substituted long chain of repeating EO hydrophile

Why replace?

APE Surfactants are harmful to the health and environment. It is not an easily biodegradable product. They are bioaccumulative, harming the food chain of fish and birds. They can cause serious diseases to humans.

Even without a regulation, many producers outside of Europe are changing the formulation to APE Free.

The APE Free products can give better supply chain security than the conventional APEs.



You can ignore reality, but you can't ignore the consequences of ignoring reality.

Ayn Rand

APE-Free, a Global Trend



- Based on GS-11 (Green Seal Environmental Standard for Paints and Coatings), a commonly used reference for US paint/coating industry, alkylphenol ethoxylates should not be present in the product.
- Based on Ecolabel (Environmental Standard for Indoor Paints), a commonly used reference for European paint/coating industry, it requires that ingredients shall not contain certain chemicals including alkylphenol ethoxylates.
- Korea: Ban the use of APE by 2010.
- Japan: Elimination of APE surfactants from major household and institutional applications
- Australia / New Zealand: Trend of moving to APE-free
- Singapore: Ban the use of APE surfactants for major household application
- China: replacement of currently used APE product and development of new formulation with APE-free product is imperative
- LATAM: replacement replacement of APEO is not mandatory, however all the global players are working or had done the replacement, for local players also is a trend, more gradual though.

Nonionics – Nonylphenol Ethoxylates



# EO	APE Product	HLB	Cloud Point (C)	APE-free Product	HLB	Cloud Point (C)
1.5	Igepal CO-210	4.3	<20	Rhodasurf L-1	3.6	<20
3	Igepal CO-430	8.8	< 20	Rhodasurf L-3 Rhodasurf BC-420	8.0 8.0	< 20 < 20
5	Igepal CO-520	10.8	< 20	Rhodasurf L-4 STD Rhodasurf DA-530	9.5 10.5	< 20 < 20
6	Igepal CO-530	10.8	< 20	Rhodasurf L-4 STD Rhodasurf BC-610	9.5 11.4	< 20 < 20
9	Igepal CO-630	13.0	52 - 56	Rhodasurf L-7/90 Rhodasurf BC-729	12.1 13.8	53 – 63 58 - 62
12	Igepal CO-710	14.6	70 - 74	Rhodasurf LA-9/85	14.5	74 - 78
15	Igepal CO-730	15	95 - 100	Rhodasurf ON-877 Rhodasurf BC-840	15.4 15.4	> 100 > 100
30	Igepal CO-887	17.2	> 100	Rhodasurf 6530 Rhodasurf TLA-3040	17	> 100
40	Igepal CO-897	17.8	> 100	Rhodasurf TLA-4050	18	> 100
50	Igepal CO-977	18.2	> 100	Rhodasurf TLA-4050	18	> 100
70	Igepal CO-987	18.6	> 100	Rhodasurf TB-970	19	> 100
100	Igepal CO-997	19	> 100	Rhodasurf TB-970	19	> 100

Nonionics – Octylphenol Ethoxylates



# EO	APE Product	HLB	Cloud Point (C)	APE-free Product	HLB	Cloud Point (C)
1.5	Igepal CA-210	5.3	< 20	Rhodasurf L-1	3.6	<20
3	Igepal CA-420	8.0	< 20	Rhodasurf L-3 Rhodasurf BC-420	8.0 8.0	< 20 < 20
6	Igepal CA-520	10	< 20	Rhodasurf L-4 STD Rhodasurf BC-610	9.5 11.4	< 20 < 20
9	Igepal CA-630	12.5	63 – 67	Rhodasurf L-7/90 Rhodasurf BC-729	12.1 13.8	53 – 63 58 - 62
12	Igepal CA-720	14.2	86 – 90	Rhodasurf LA-9/85	14.5	74 - 78
20	Igepal CA-877	16.6	> 100	Rhodasurf ON-877 Abex 2515	15.4	> 100
30	Igepal CA-887	16.6	> 100 > 100	Rhodasurf 6530 Rhodasurf TLA-3040	17	> 100
40	Igepal CA-897 Igepal CA-407	18.0	> 100	Rhodasurf TLA-4050	18	> 100

Nonionics – Octylphenol Ethoxylates



# EO	APE Product	HLB	Cloud Point (C)	APE-free Product	HLB	Cloud Point (C)
1.5	Igepal CA-210	5.3	< 20	Rhodasurf L-1	3.6	<20
3	Igepal CA-420	8.0	< 20	Rhodasurf L-3 Rhodasurf BC-420	8.0 8.0	< 20 < 20
6	Igepal CA-520	10	< 20	Rhodasurf L-4 STD Rhodasurf BC-610	9.5 11.4	< 20 < 20
9	Igepal CA-630	12.5	63 – 67	Rhodasurf L-7/90 Rhodasurf BC-729	12.1 13.8	53 – 63 58 - 62
12	Igepal CA-720	14.2	86 – 90	Rhodasurf LA-9/85	14.5	74 - 78
20	Igepal CA-877	16.6	> 100	Rhodasurf ON-877 Abex 2515	15.4	> 100
30	Igepal CA-887	16.6	> 100 > 100	Rhodasurf 6530 Rhodasurf TLA-3040	17	> 100
40	Igepal CA-897 Igepal CA-407	18.0	> 100	Rhodasurf TLA-4050 Abex 2535	18	> 100

Nonionics – Other Alkyl PhenolEthoxylates



# EO	APE Product	HLB	Cloud Point (C)	APE-free Product	HLB	Cloud Point (C)
7	Igepal DM-430	9.5	< 20	Rhodasurf L-4 STD	9.5	< 20
9	Igepal DM-530	10.6	< 20	Rhodasurf DA-530	10.5	< 20
15	Igepal DM-710	13	48 – 52	Rhodasurf 91-6 Rhodasurf TDA 8.5	12.4 12.5	48 – 54 52 - 56
24	Igepal DM-730	15	> 100	Rhodasurf LA-12/80 Rhodasurf ON-877	15.0 15.4	90 – 100 > 100
49	Igepal DM-880	17.2	> 100	Rhodasurf 6530 Rhodasurf TLA-3040	17	> 100
5.5	Igepal RC-520	9.6	< 20	Rhodasurf L-4 STD	9.5	< 20
9.5	Igepal RC-620	12.3	38 – 42	Rhodasurf 91-6 Rhodasurf TDA 8.5	12.4 12.5	48 – 54 52 - 56
11	Igepal RC-630	13	62 - 66	Rhodasurf L-7/90 Rhodasurf BC-729	12.1 13.8	53 – 63 58 - 62

Anionic – Ether Sulfates



APE Product	Salt	APE-free Product	Salt
Abex EP-100 Rhodapex CO-436	NH ₄ NH ₄	Rhodapex EAC-70 Rhodapex ESC-3 Rhodapex EST-30 SBL Rhodapex BSA 40 Rhodapex BSA	NH ₄ Na Na
Abex EP-110 Rhodapex 439	NH ₄ NH ₄	Abex 23S Rhodapex AB-20U Rhodapex BSA	Na NH ₄
Abex EP-120K Rhodapex OPS-253 Rhodapex EP-120S	NH ₄ Na NA	Abex 2115A Rhodapex LA-300 Rhodapex BSA 300 Abex 18S	NH ₄ Na Na
Abex 26S	Na	Abex 18S	Na
Abex 48S Abex VA-50	Na Na	Abex 2020	Na
Abex 33S	Na	Abex 8018	Na

Anionic – Phosphate Esters



APE Product	Acid or Salt	% Active	APE-free Product	Acid or Salt	% Active
Rhodafac RE-410	Acid	100	Rhodafac RS-410	Acid	100
Rhodafac PE-510	Acid	100	Rhodafac RS-610	Acid	100
Rhodafac LO-529	Salt	90	Rhodafac RS-610 A25 Rhodoline 4188	Salt Salt	25 88
Rhodafac RE-610	Acid	100	Rhodafac RS-710	Acid	100
Rhodafac RE-610 D	Acid	90	Rhodafac RS-710D	Acid	30
Rhodafac BX-645	Acid	45	Rhodafac BS-715	Acid	45
Rhodafac RE-960	Acid	90	Rhodafac RS-960	Acid	90

Nonionic Wetting Agent Selection

Low HLB: 4-8	→ low foam/low solubility (Rhodasurf® BC-420)
Mid HLB: 9-14	→ workhorse for paints: pigment wetting, stability, color (Rhodasurf® BC-729)
High HLB: 15-18	→ stability improvement (Rhodoline® WA-200)



Thank you



Progress beyond

&

Leandro Lemos Alves

Novecare - Coatings

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