

Spot the Difference: Better Wetting in Hard Surface Cleaning

Webinar, November 1st, 2018

Tony Simas, Ashish Taneja

Agenda

1. **BASF Introduction**
2. Streak Free Cleaning
3. BASF solutions
4. Case Study
5. Summary

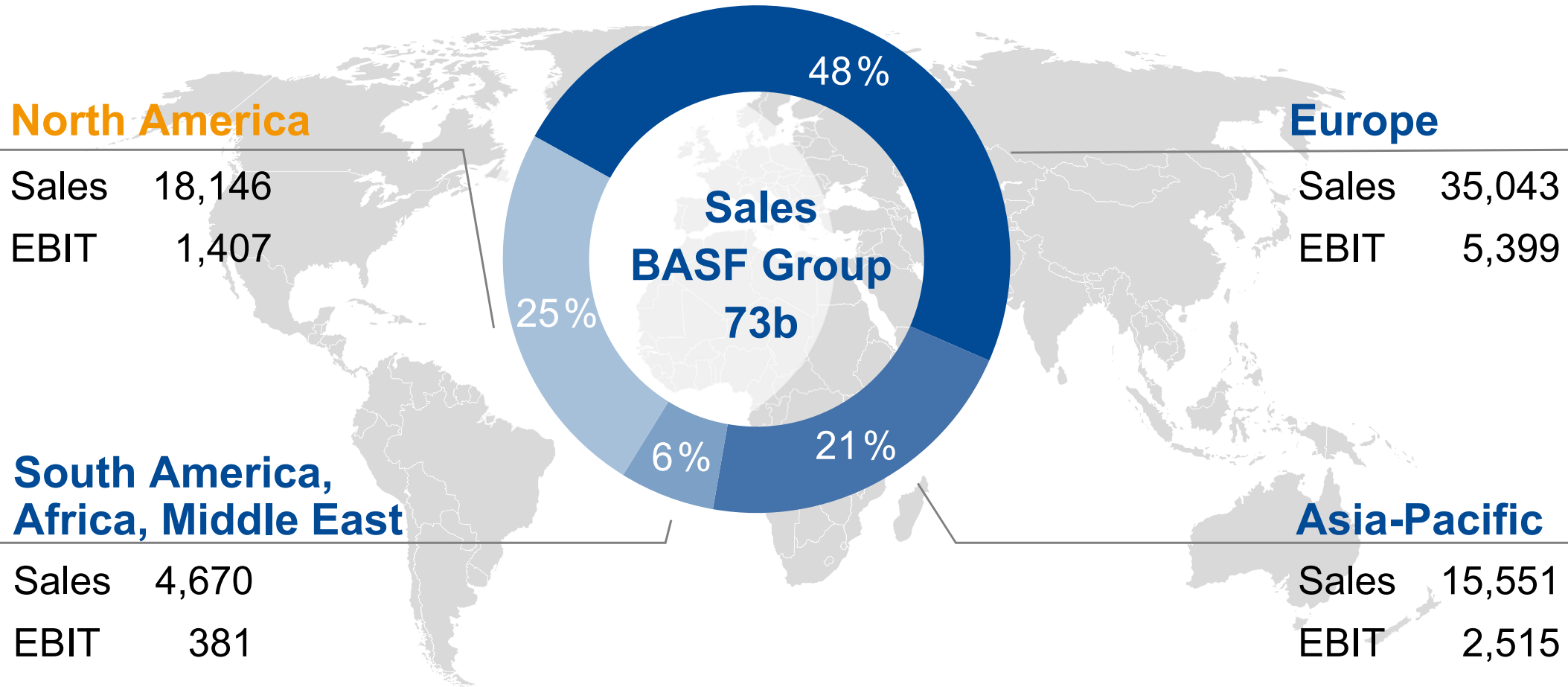
Slide 2

- AT1** **5 min.**
Ashish Taneja, 10/18/2018
- AT2** **2 min.**
Ashish Taneja, 10/18/2018
- AT3** **20**
Ashish Taneja, 10/18/2018
- AT4** **15**
Ashish Taneja, 10/18/2018
- AT5** **2**
Ashish Taneja, 10/18/2018

About BASF

North America accounts for 25 percent of global sales*

Figures in Million \$



BASF R&D Investment

Research for the future: With our innovative products and processes, we provide sustainable solutions for global needs.

- Expenditures for research and development \$2,136 billion
- Around 10,000 employees worldwide involved in research and development
- Around 3,000 research projects
- Around 800 new patents filed



BASF Segments



Chemicals

Petrochemicals

Monomers

Intermediates



Performance Products

Dispersions & Pigments

Care
Chemicals

Nutrition & Health

Performance
Chemicals



Functional Materials & Solutions

Catalysts

Construction
Chemicals

Coatings

Performance
Materials



Agricultural Solutions

Crop
Protection



Oil & Gas*

Oil & Gas

BASF I&I at a Glance

Institutional

Industrial



Kitchen

**Institutional
Cleaning**

Vehicle Care

Laundry

**Food &
Beverage**

**Industrial
Cleaning**

Mega Trends

Population Growth



Emerging Middle Class

Strain on Resources

Urbanization

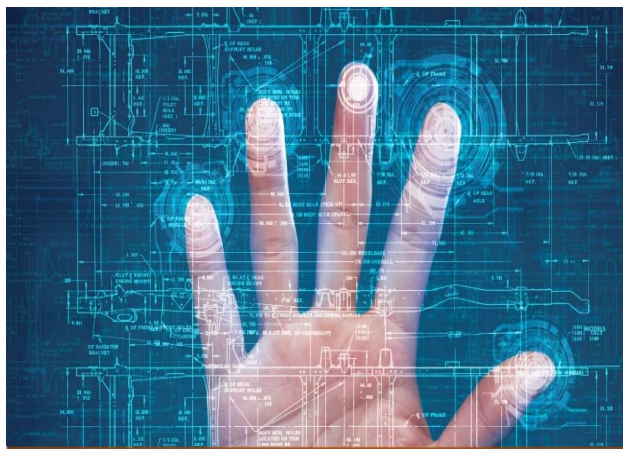


Smaller Spaces

Sharing Economy

Convenience

Digitalization



Big Data & E-Commerce

Internet of Things

Why We Believe in the Future of I&I

Mega Trends

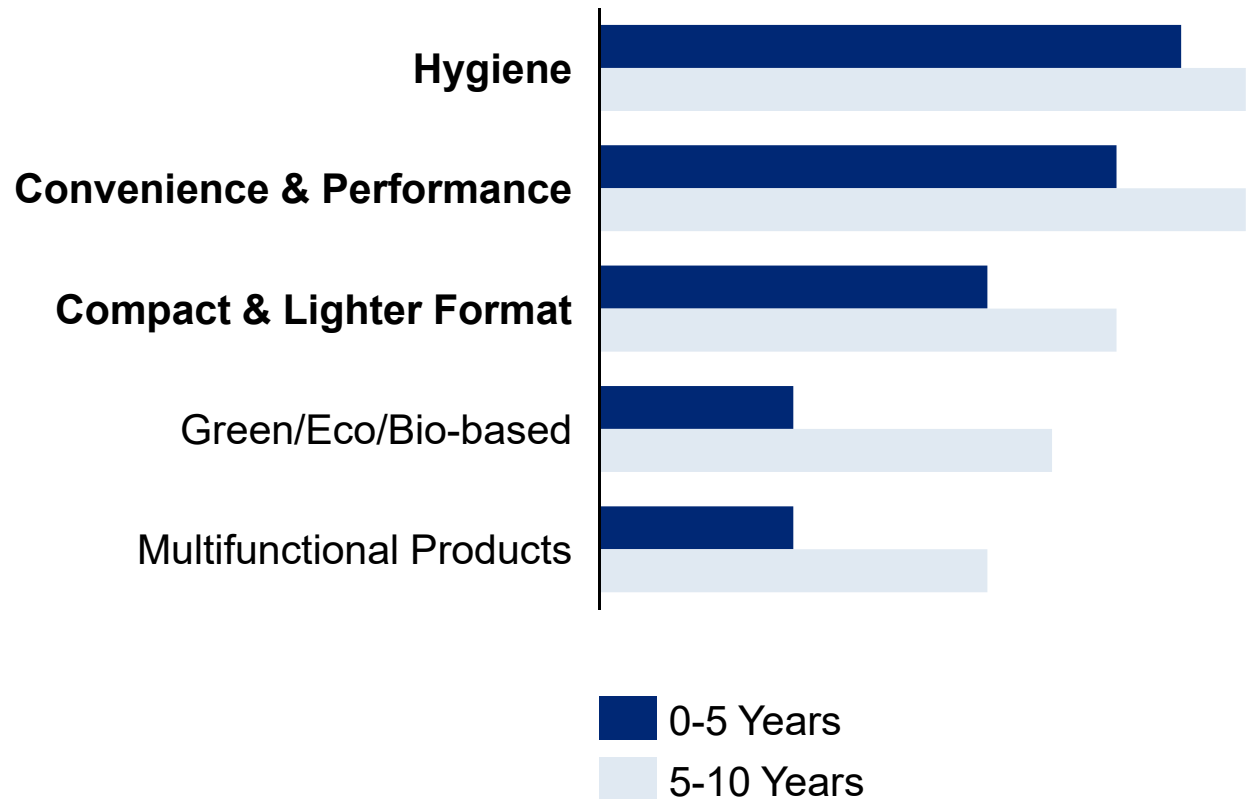
Population Growth



Urbanization



Trends Impact on I&I



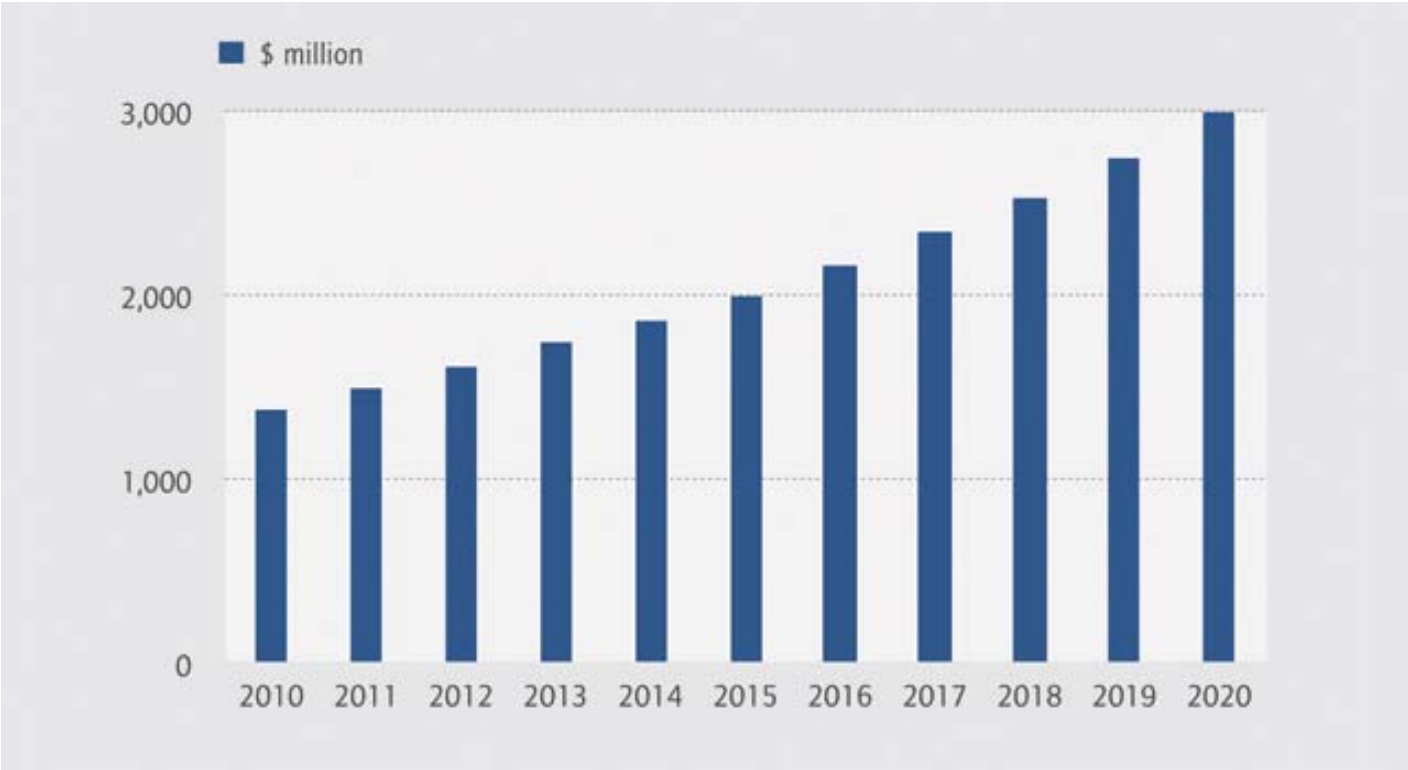
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Desire of Being Clean and Sanitized



The global cleaning & disinfecting wipes market will grow to \$3 billion by 2020

Ref: <http://www.smithersapex.com/news/2015/august/future-of-cleaning-and-disinfecting-wipes>

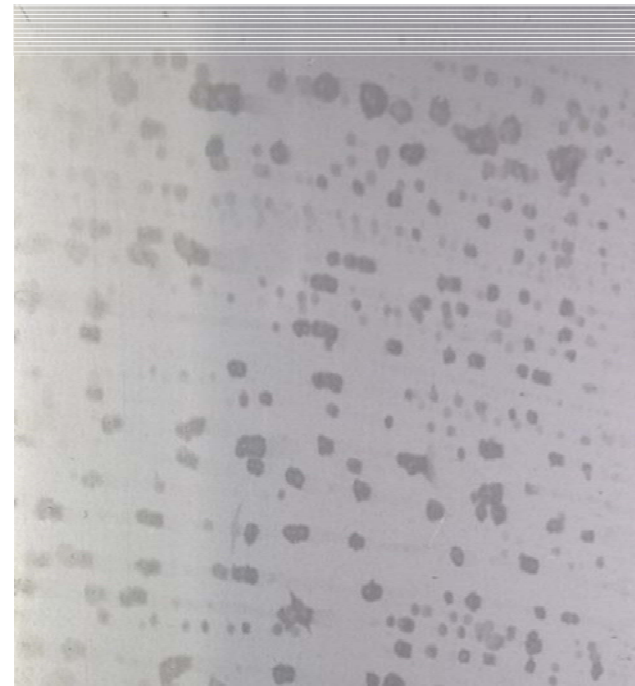
Cleaning vs. Streak free Cleaning

Applications & Benefits

Market Leader



Store Brand



They have same disinfection power ! Which one would you buy?

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Slide 12

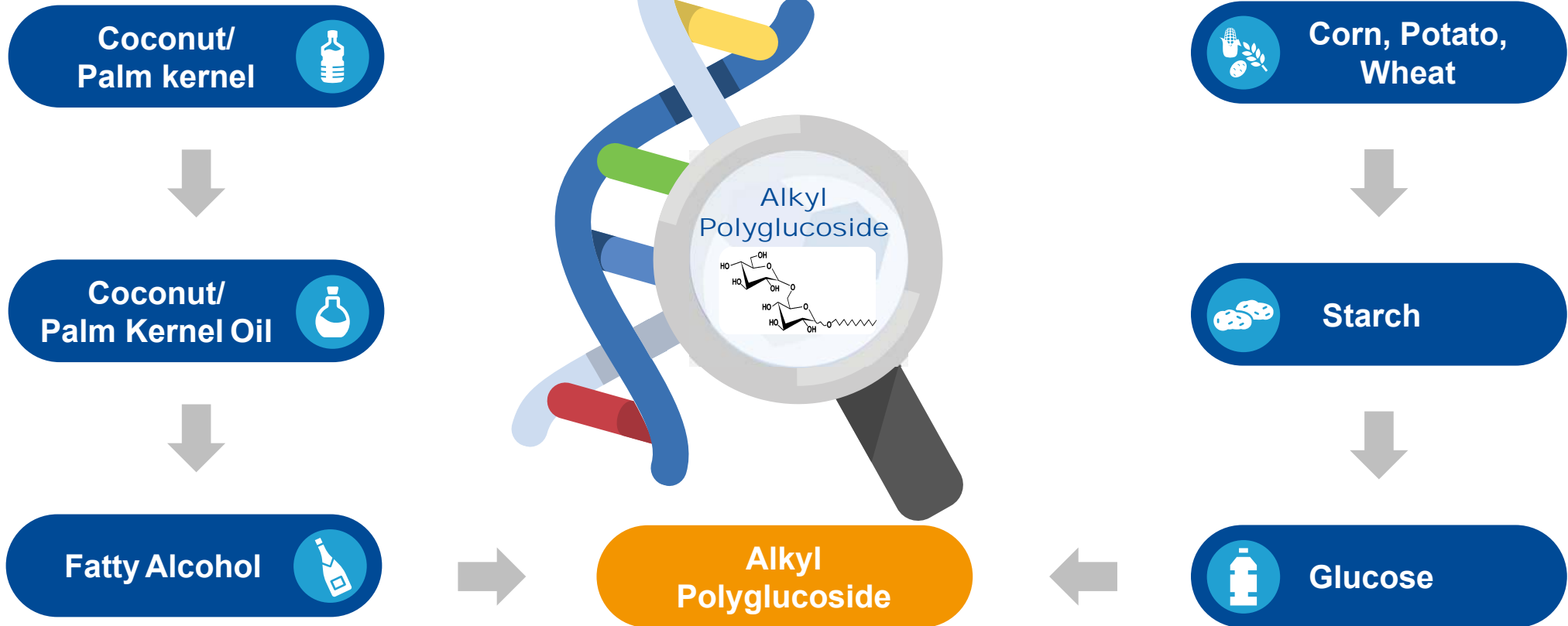
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Glucopon®

How it is Made!!

General Chemistry

What it looks like
(Chemical structure)



Glucopon®

Applications & Benefits

Glucopon® APG's are produced from natural renewable resources



Benefits

- Ethylene oxide and sulfate free – No CA Prop 65 ingredients
- Readily biodegradable under aerobic & anaerobic conditions
- Excellent foaming capacity and cleansing properties
- Not classified as “Dangerous for the Environment”
- Excellent eco-toxicological profile
- Not toxic or harmful in acute toxicity tests

Applications

- Cleaners & Detergents
- Food wash
- Cosmetics
- Pulp and Paper
- Foaming applications
- “Green” applications
- Agro

Alkyl Polyglucoside Offerings

Applications & Properties

| | APG® | Glucopon® Line | | | | |
|----------------------|---|-----------------------------------|--------------------------|---|--|---|
| Product Properties | 325 N | 215 UP | 225 DK | 425 N/420 UP | 600 UP/625 UP | 50 G |
| INCI | Decyl/Undecyl Glucoside | Caprylyl/Decyl Glucoside | Caprylyl/Decyl Glucoside | Caprylyl/Myristyl Glucoside | Lauryl/Myristyl Glucoside | Lauryl/Myristyl Glucoside (plus carrier) |
| C-Chains present | 9, 10, 11 | 8, 10 | 8, 10 | 8, 10, 12, 14, 16 | 12, 14, 16 | 12, 14, 16 |
| Appearance | Light yellow, clear liquid | Yellowish, hazy liquid | Brown liquid | Clear liquid | Light yellow, hazy paste | Beige granules |
| Active substance [%] | 48–52 | 62–65 | 68–72 | 48–52 | 48–52 | 45 – 55 |
| Water content [%] | 42–48 | 35–38 | 28–32 | 42–48 | 42–48 | Granular |
| pH value [10%] | 7.0–9.5 | 11.5–12.5 | 6.0–9.0 | 7.0–9.5/ 11.5-12.5 | 11.5–12.5 | |
| Main Application | Hard surface cleaners, manual dishwashing | Hard surface cleaners, rinse aids | I&I cleaners | Manual Dishwashing, hard surface cleaners, rinse aids | Laundry detergents, Manual dishwashing | Laundry detergents and cleaners (Powder or tablets) |

N = Neutral

DK = Dark

UP = Unpreserved

G = Granular

All except Glucopon® 50G are produced in US

Glucopon®

Applications

BASF Products

Range chart info
(Properties, Applications)

50 G

600 UP

625 UP

420 UP

425 N

APG 325 N

215 UP

225 DK

Dishwashing/
Laundry

Hard Surface
Cleaning

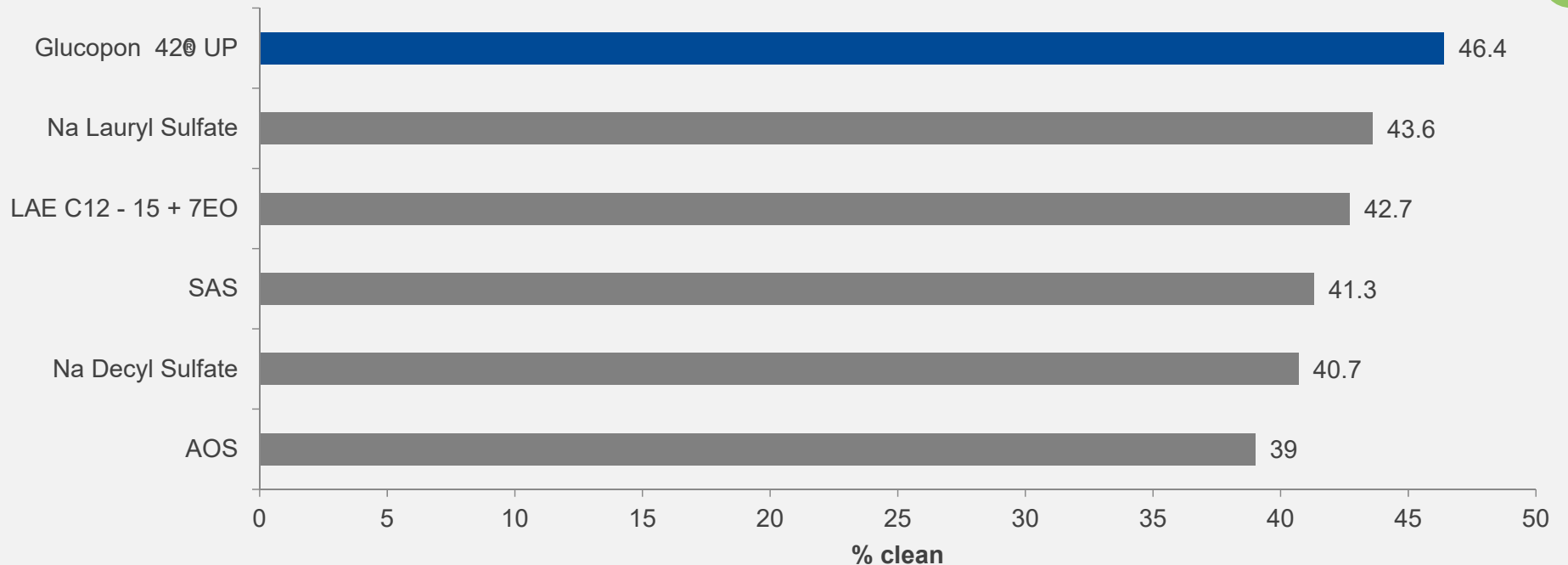
Hard Surface
Cleaning/
Highly Alkaline
Cleaning

 **BASF**
We create chemistry

Benefits and Performance

Applications - Hard Surface Cleaners

SOIL COMPOSITION: Mineral Oil, Motor Oil, Clay, Carbon Black



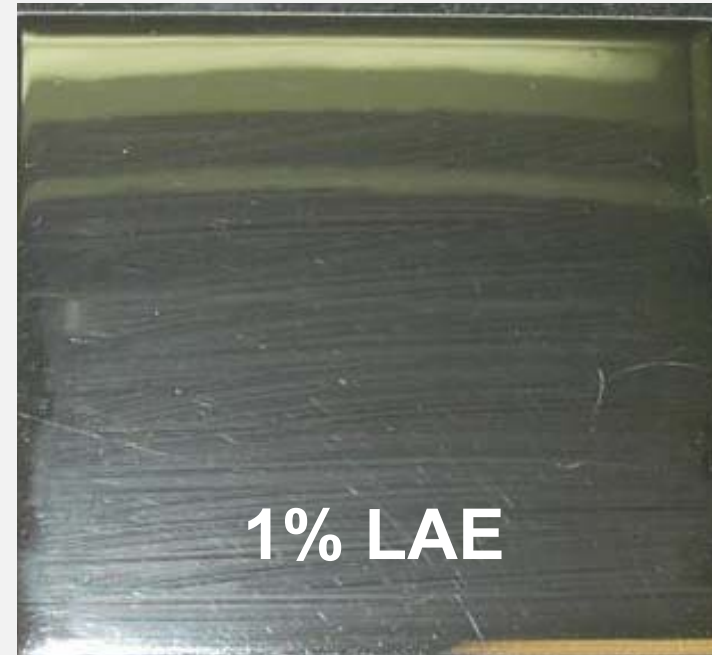
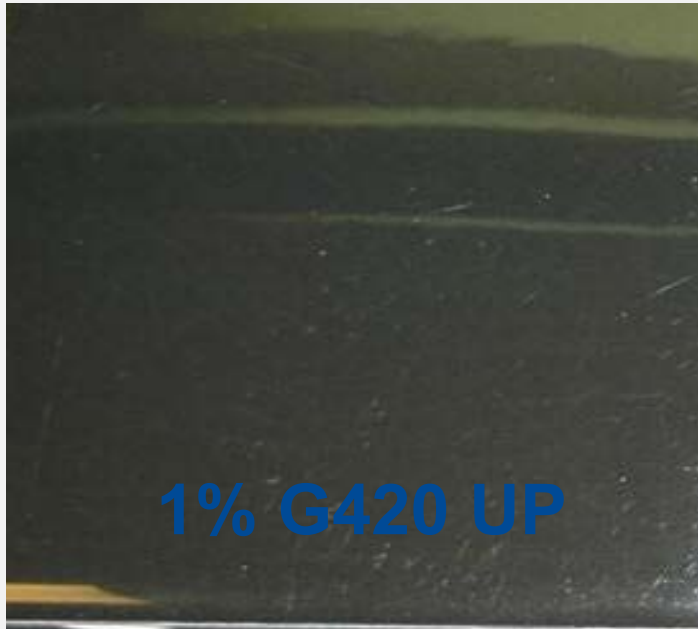
Evaluated According to ASTM D4488

1% Active Surfactant, pH 7-8, 25°C, Substrate: white solid vinyl tiles.

Superior cleaning performance as compared to traditional surfactants

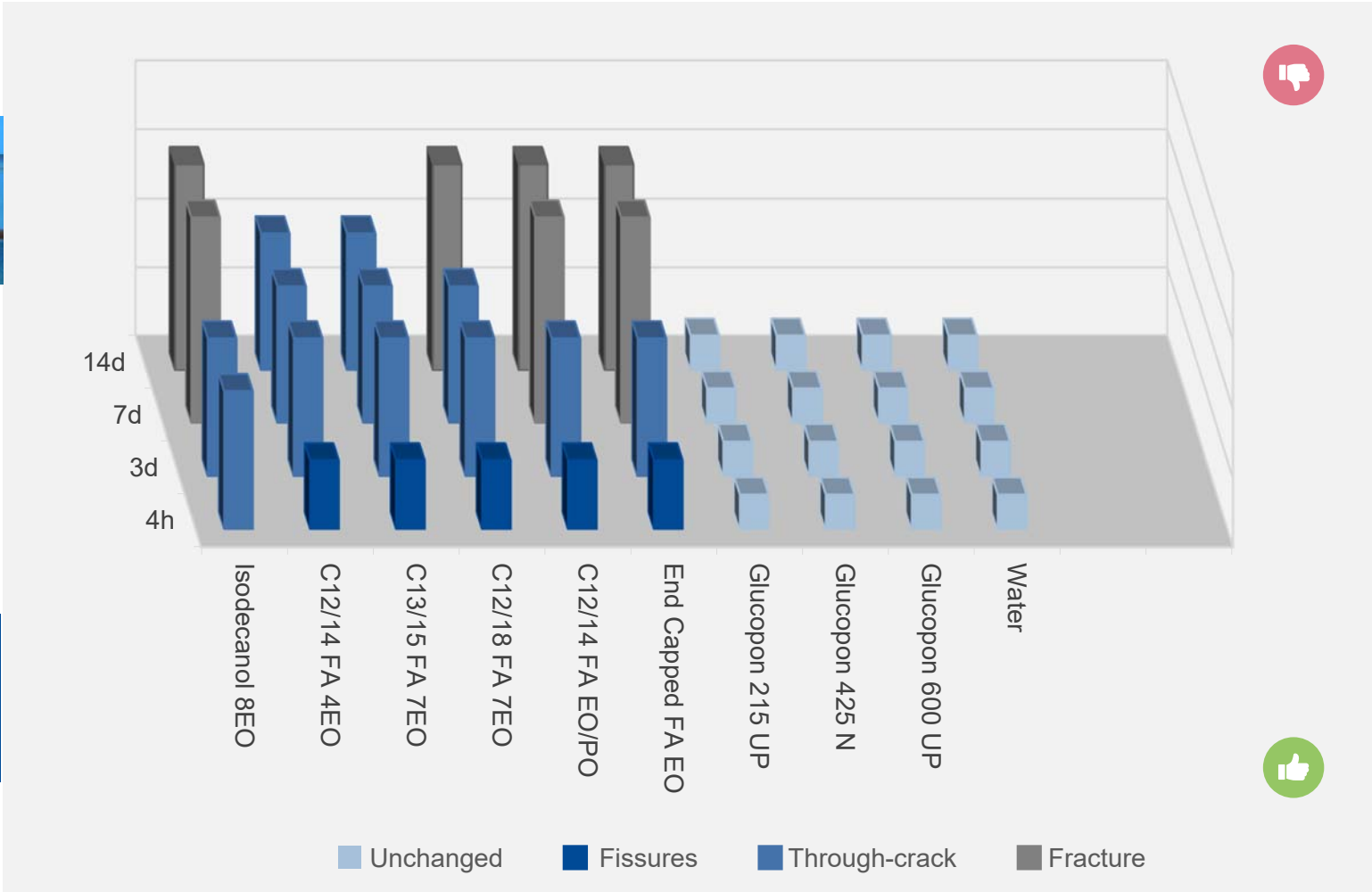
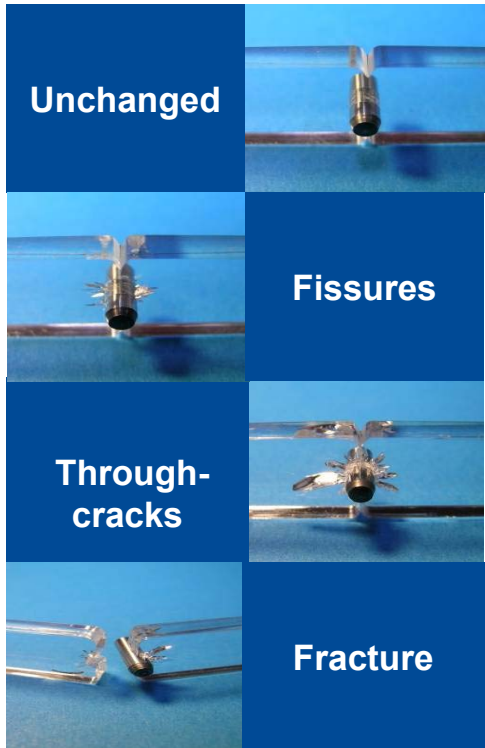
Benefits and Performance

Applications - Hard Surface Cleaners



Superior streak free performance as compared to LAE

Surface Compatibility – Polycarbonate (PC)



High plastic compatibility

Characteristics

Dehypound® Advanced in Brief



CHEMICAL DESCRIPTION

Nonionic Surfactant Blend

APPEARANCE

Light yellow clear liquid

ACTIVE MATTER

75 – 79%

PH – VALUE, CONC.

7.0 – 9.0

DENSITY (20°C)

1.065–1.080 g/cm³

VOCS

2.38%

APPROVED DFE ON

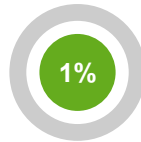
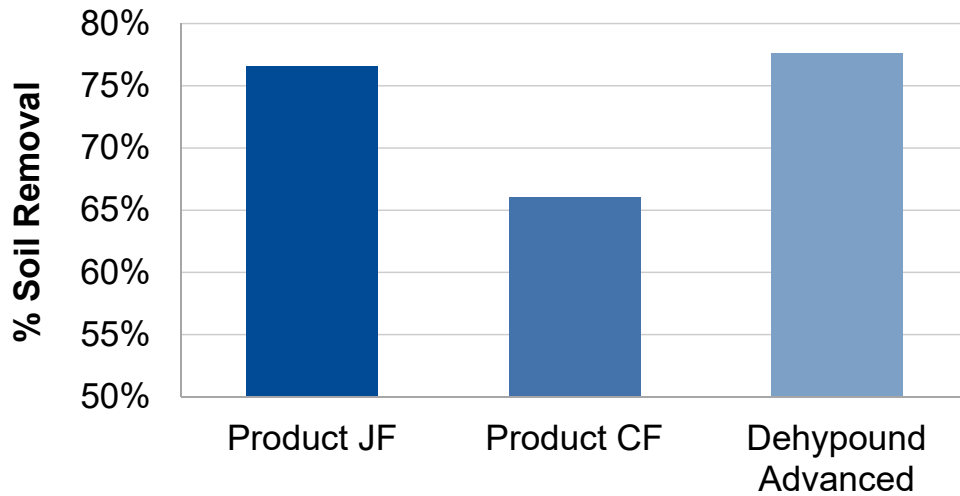


All Purpose Cleaner Benchmarking

Soil Removal-Dehypound® Advanced vs. Market Products

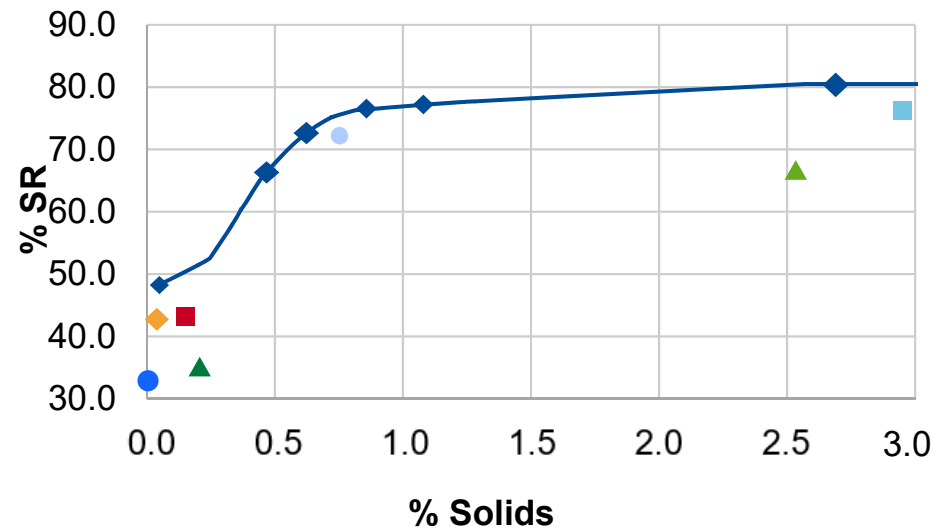


% Soil Removal, ASTM D4488, A6 soil



Active

Recommended Use Level 0.5 – 2% active



- ◆ ADVANCED
- Product SE
- ▲ Product MC
- ◆ Product JD
- Product SG
- Product JF
- ▲ Product CF
- Water

NO SOLVENT NEEDED

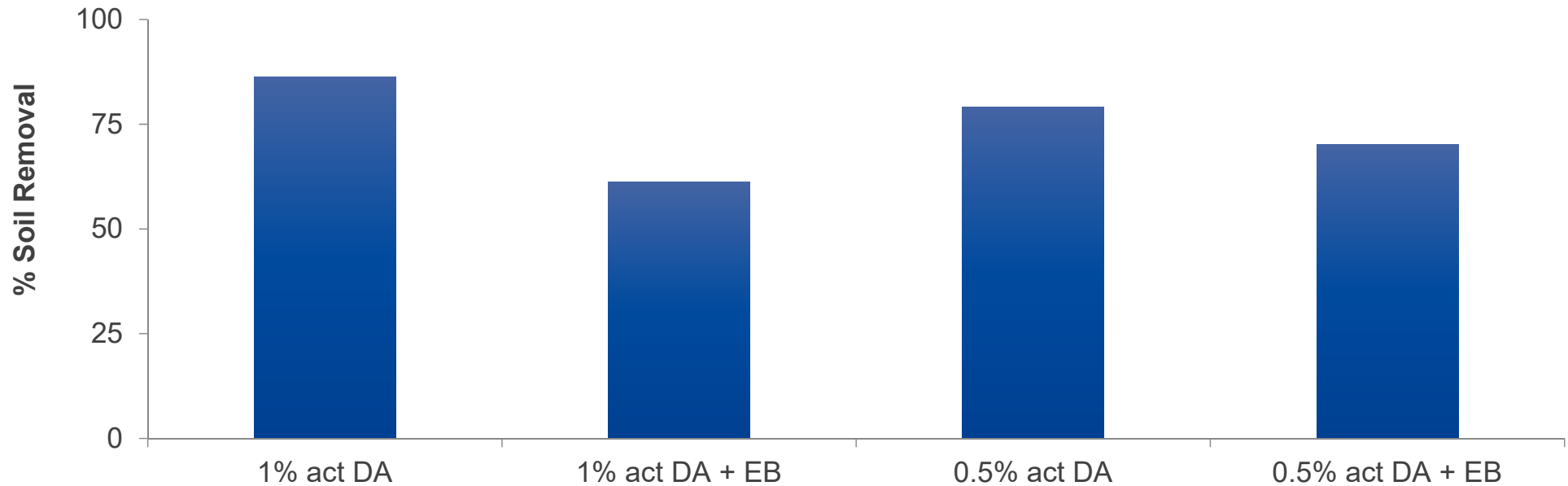
NO BUILDER NEEDED

Performance

Dehypound® Advanced + Glycol Ether Solvent (3.9%)



Primary Cleaning,
ASTM D4488, A6 Soil

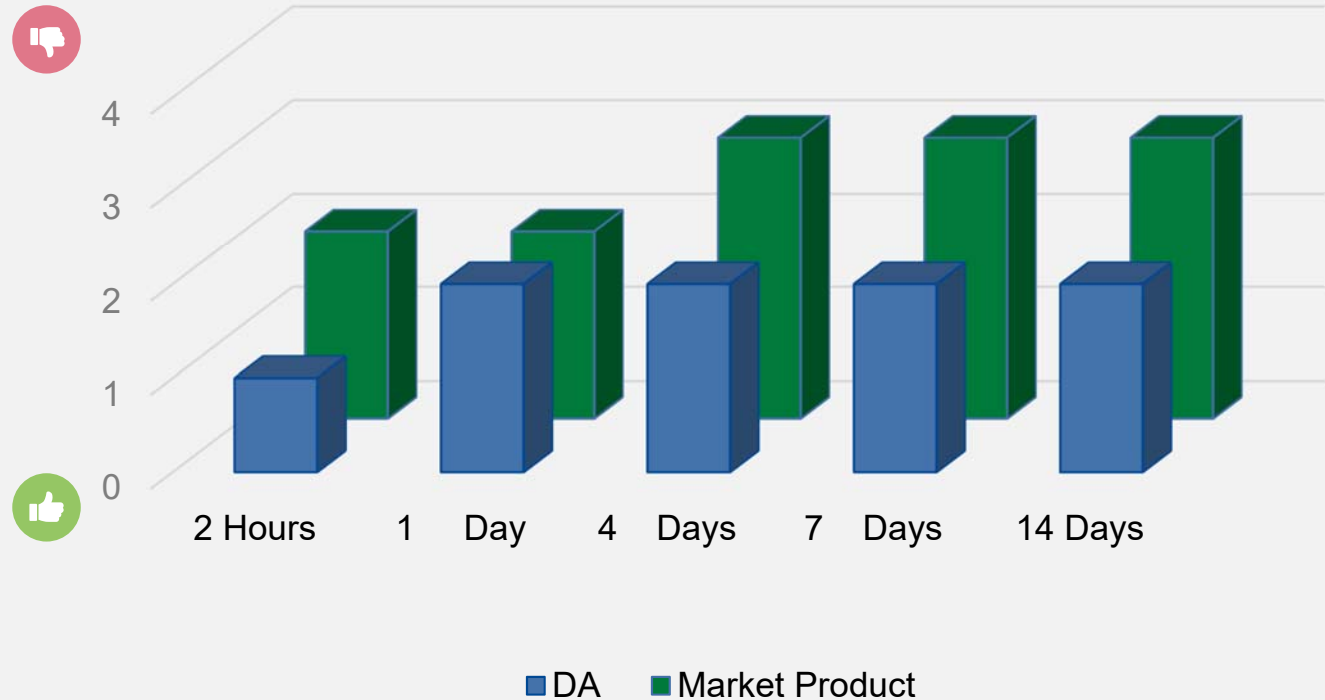
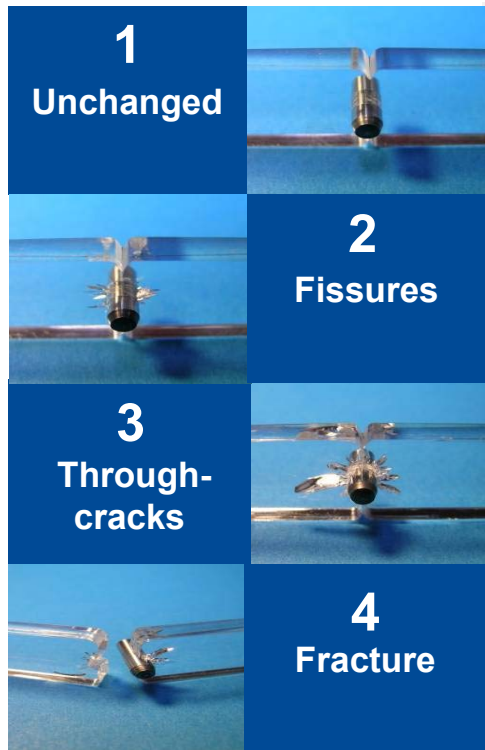


Recommendation

- NO glycol ether solvents to be used (Due to Dehypound® Advanced finely balanced surfactant system and HLB)

Surface Compatibility – Polyacrylate

Dehypound vs. Market Product



High plastic compatibility

Lutensol® Nonionic Surfactants

Alcohol Alkoxylate

Alcohol

EO



Functional Properties

- Wetting
- Emulsification
- Low foam/Defoaming
- Detergency



Products

- Branched Alcohols
 - Lutensol XP and XL
 - Lutensol TO
 - Lutensol TDA
- Linear Alcohols
 - Lutensol AN
 - Lutensol AO







Application

- **Laundry**
- Auto Dish
- **Hard surface cleaning**
- Industrial cleaning
- Hand Dish

Lutensol XP and XL® Types

Description & Application

|  |  |  |  |
|---|---|--|---|
| Product line | Chemistry | Properties | Applications |
| Lutensol® XP | <i>Alcohol Ethoxylates C₁₀ (2PH) Guerbet alcohol (3 – 9 moles EO)</i> | <ul style="list-style-type: none"> ■ Excellent wetting ■ Dynamic ■ Fast soil removal ■ High cmc | <ul style="list-style-type: none"> ■ Hard Surface Cleaning ■ Hand Dish ■ Laundry ■ I&I cleaners ■ Dairy applications |
| Lutensol® XL | <i>Alcohol Alkoxylates C₁₀ (2PH) Guerbet alcohol (7 – 10 moles EO)</i> | <ul style="list-style-type: none"> ■ Excellent wetting ■ Dynamic ■ Fast soil removal ■ Solubilizer ■ Low odor | <ul style="list-style-type: none"> ■ Hard Surface Cleaning ■ Hand Dish ■ Laundry ■ I&I cleaners ■ Dairy applications |

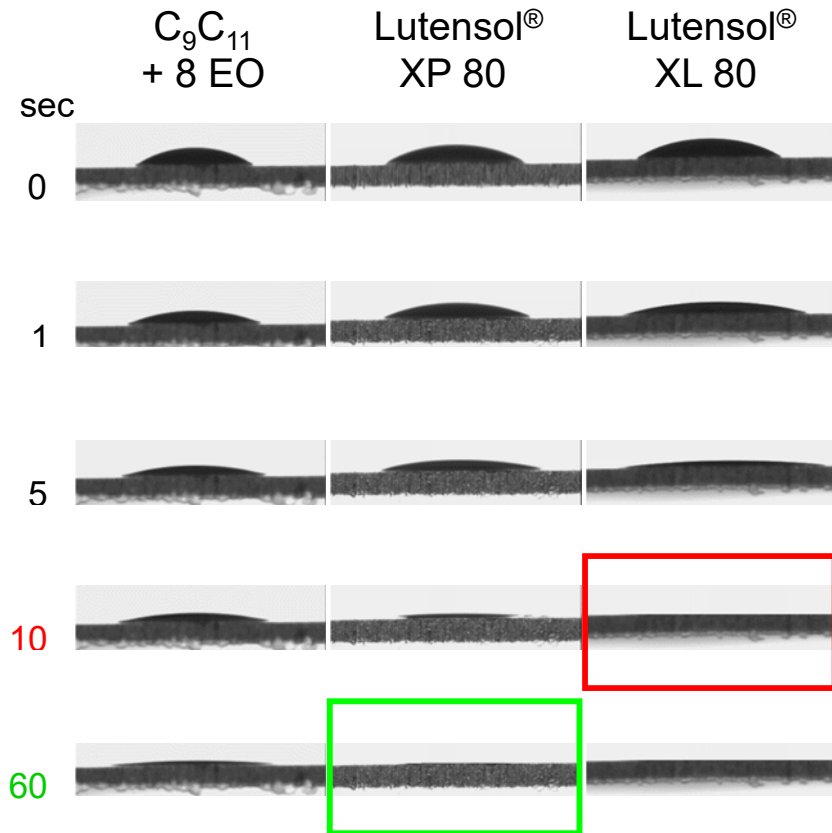


Lutensol® XP/XL

- XL and XP Surfactants are not aquatoxic
- No labelling requirements for EU
- Biodegradable: Meets OECD301 regulation in Europe
- DFE listed

Lutensol XP and XL® Types

Fast wetting for Hard Surface Cleaning



Contact angle on glass (23°C; 0.5g/l)

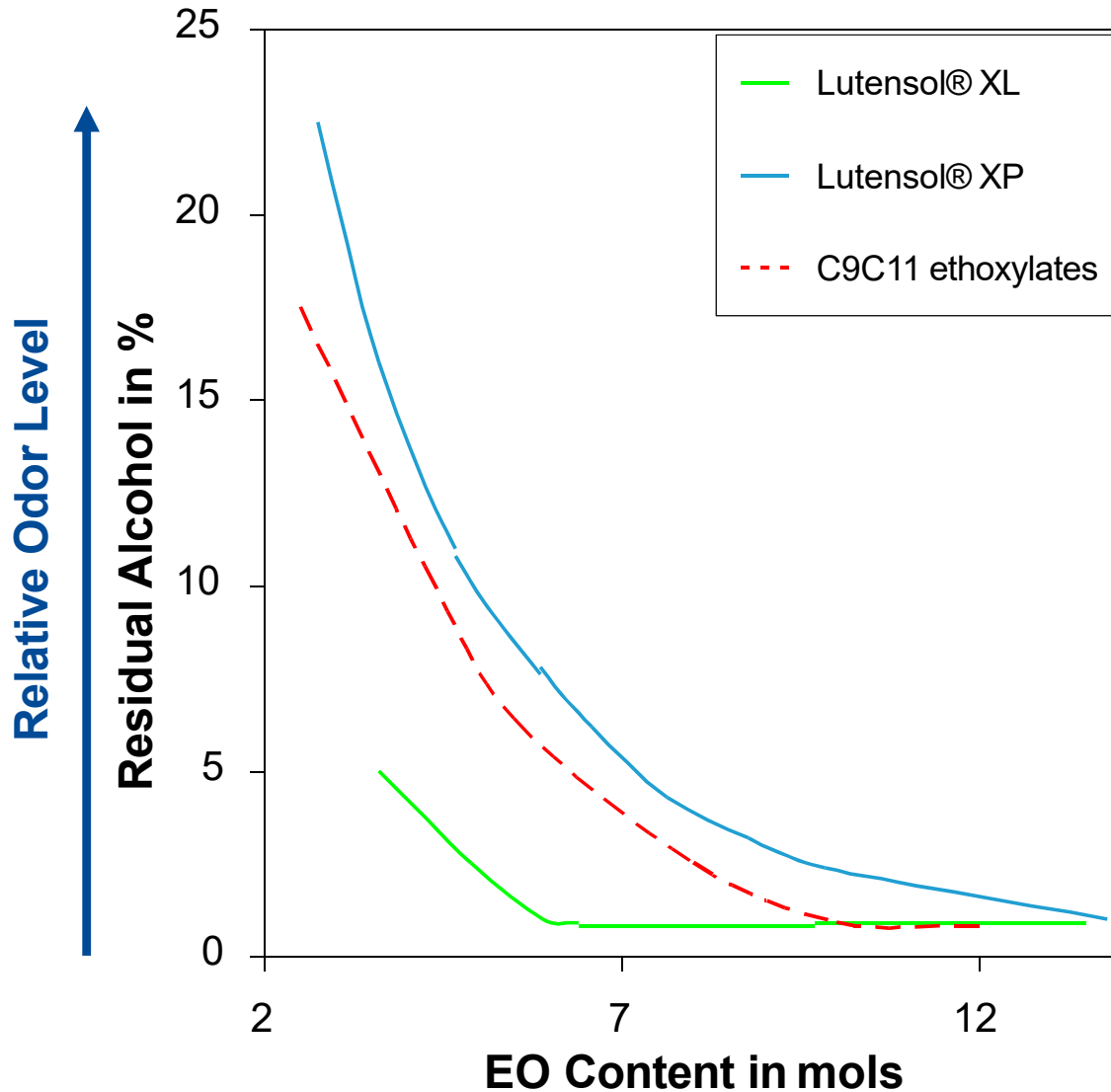
Benefits VS. Linear Nonionics Ethoxylates

- Faster Wetting
- Better Emulsification & Detergency
- Less odor
- Less gelling
- Lower foam
- Lower aqua toxicity



Lutensol® XP and XL Types

Residual Alcohol content/Odor

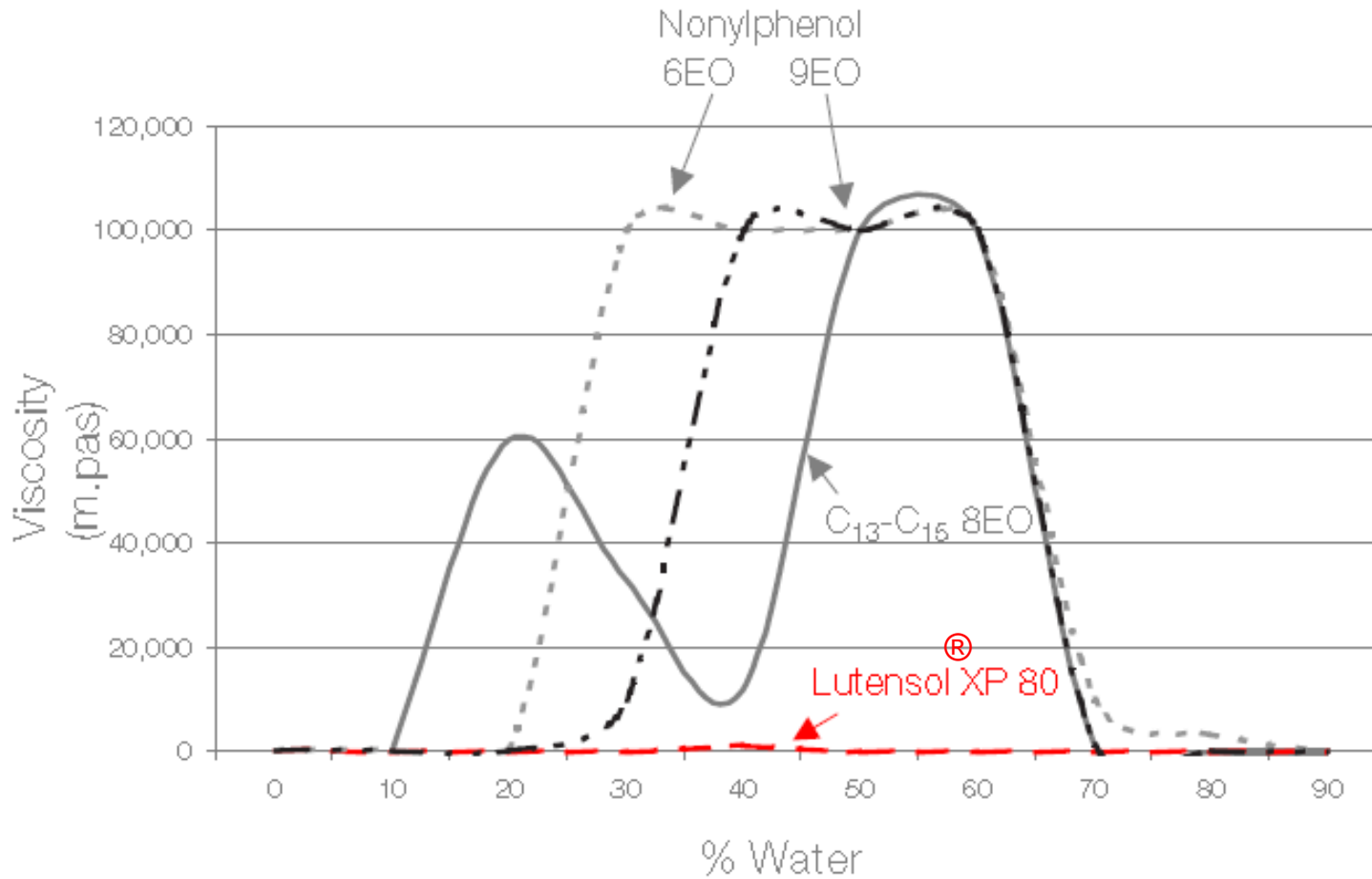


Lutensol® XL products have further reduced odor than C9C11 ethoxylate from lower residual alcohol content

Lutensol® XP and XL Types

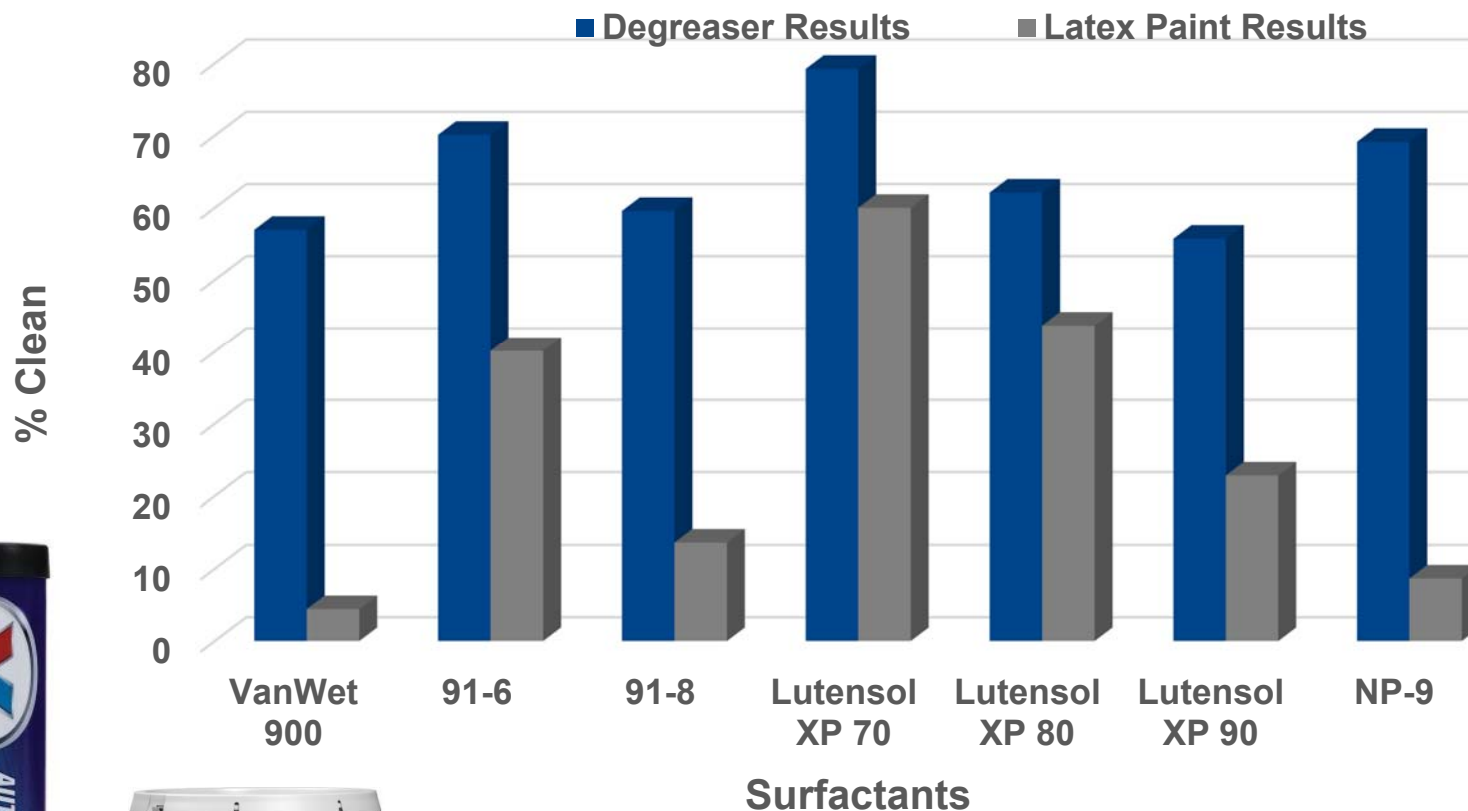
Lower Gelling

Viscosity vs. water concentration



Lutensol® XP and XL Types

Degreasing Performance



Formulations tested at 1:32 Dilution.

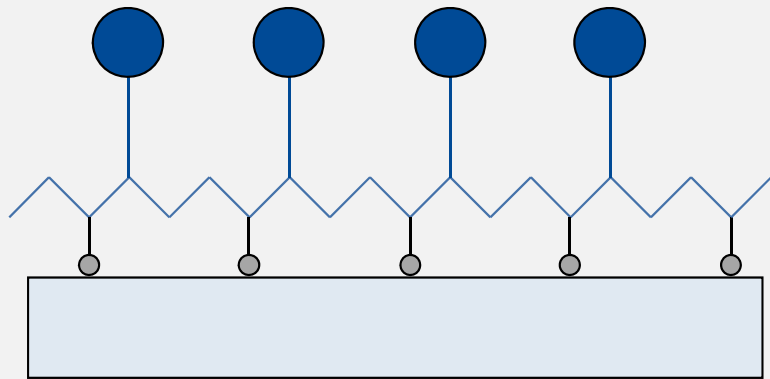
Degreaser Formulation

| Ingredient | % |
|------------------------|-------------|
| Surfactant (as-is) | 8 |
| Trilon® M Liq. T (40%) | 1.0 |
| Sodium Silicate (44%) | 3.0 |
| SXS (40%) | 7.0 |
| DPnP | 1.5 |
| DPnB | 3.5 |
| D.I. Water | q.s. to 100 |



Polyquart®

Surface Modification



Surface Modification

- Improved rinsing
- Less glass corrosion
- Improved drying
- Easy next time Cleaning

What is a surface modification polymer?

- Bi-functional polymer to temporarily change surface properties

A good surface modification polymer?

- Two-sided polymer with molecular attraction to the desired surface

Who cares about surface modification?

- Anyone that wants to change surface properties! Laundry, Auto Dish Wash, hard surface, I&I, etc...

Polyquart® Products: Benefits

Polyquart® Ecoclean

- Perfect wetting
- Anti-Rain, no water drops on the surface, esp. on windows
- Easy to clean again; less re-soiling
- Especially good for horizontal surfaces
- Aerobically and anaerobically readily biodegradable



Polyquart® 149/ Pro A

- Perfect draining (not for horizontal surfaces as a hydrophobizer)
- Excellent water repellency on ceramic and glass
- Easy to clean again – effect
- Less re-soiling
- Especially good for vertical surfaces




Polyquart® Pro A: Spotless Drying



Ceramic Tile
untreated

Untreated



Ceramic Tile
treated with
Polyquart PRO

Treated with Polyquart® Pro A

Polyquart® 149 or PRO A

Easy to Clean AGAIN: Acidic Cleaner Example

Bathroom Cleaner

Easy Cleaning

Over time, Cleaning gets easier

Soiled with Bathroom Soil soap scum soil (CBR II)

0.1% AM Polyquart®



Without
Polyquart®

With
Polyquart®



Polyquart® 149 and PRO A

Product Benefits

- **Perfect draining** (Not for horizontal surfaces as a hydrophobizer)
- Excellent **water repellency** on ceramic and glass
- **Easy to clean** again – Effect
- **Less resoiling**
- Especially good for **vertical surfaces**



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Slide 35

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Case Study:

Warewashing



- ✓ It is difficult to clean plastic ware
The dishes show lot of spots and look dirty even if there is no soil on them.
- ✓ They don't come out dry.
Requires wiping with cloth or drying with an external blower.

Washing & Drying Plastics is a big challenge

Case Study:

Warewashing

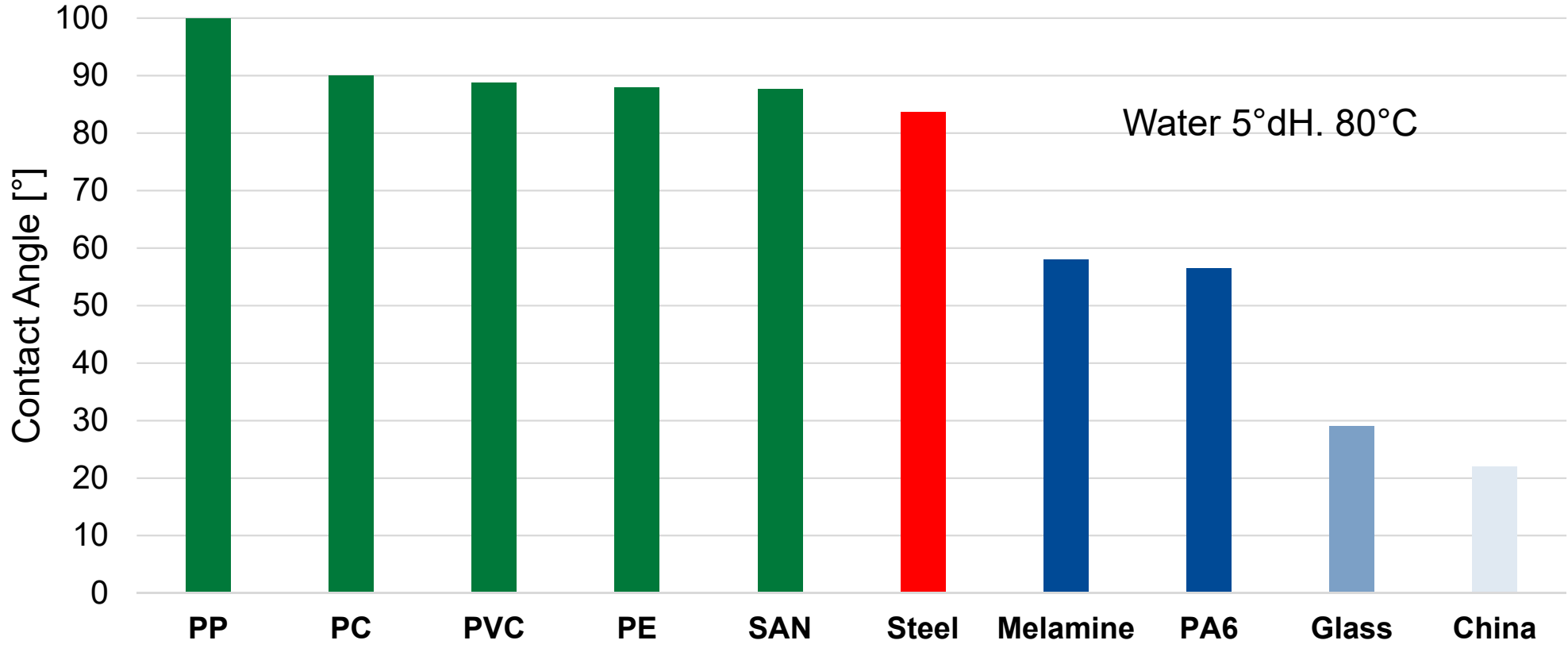
What makes plastics the most challenging materials for drying?



Is it the Hydrophobicity of the Plastic ?

Case Study:

Water contact angles at 80°C



Plastics are more hydrophobic than Glass or China

Case Study:

Requirements for Rinse Aids

Rinse Performance

- All items must show no/low spotting and filming

Excellent Drying of all Materials

- All items including plastic need to be dry

No Foam Formation

- No/low foam should be formed at temperatures of 25 – 90°C and pressures of 0.5 – 1.2 bar with pump capacities of 175 – 2,000 l/min.

Defoaming Action

- Foam formation caused by soil components must be suppressed.

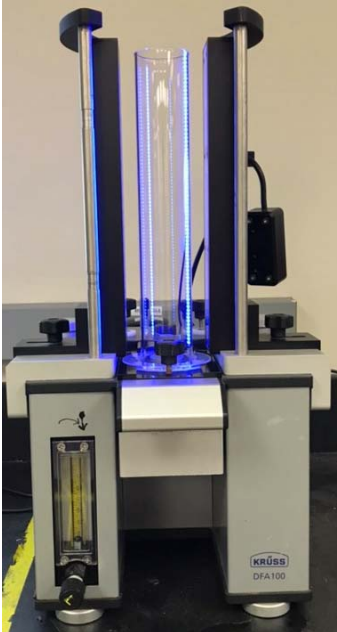
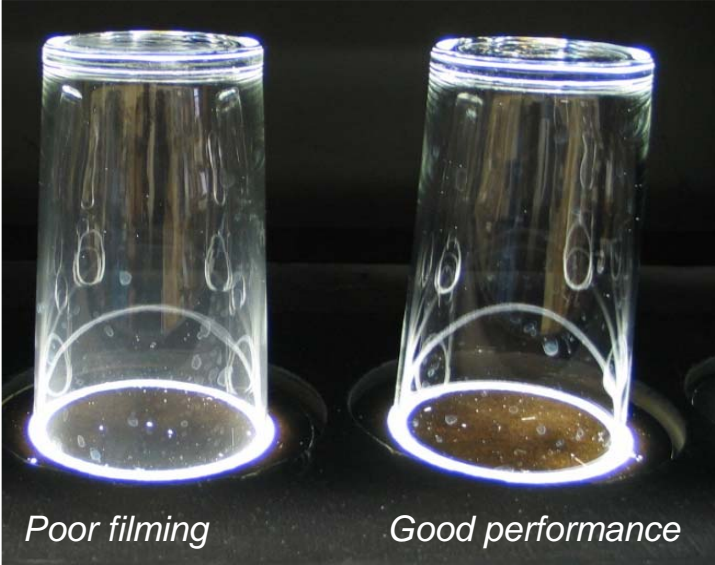
Universal

- Should be able to work with both high and low temperature machines



Case Study:

Lab Capabilities



Case Study:

Performance Evaluation

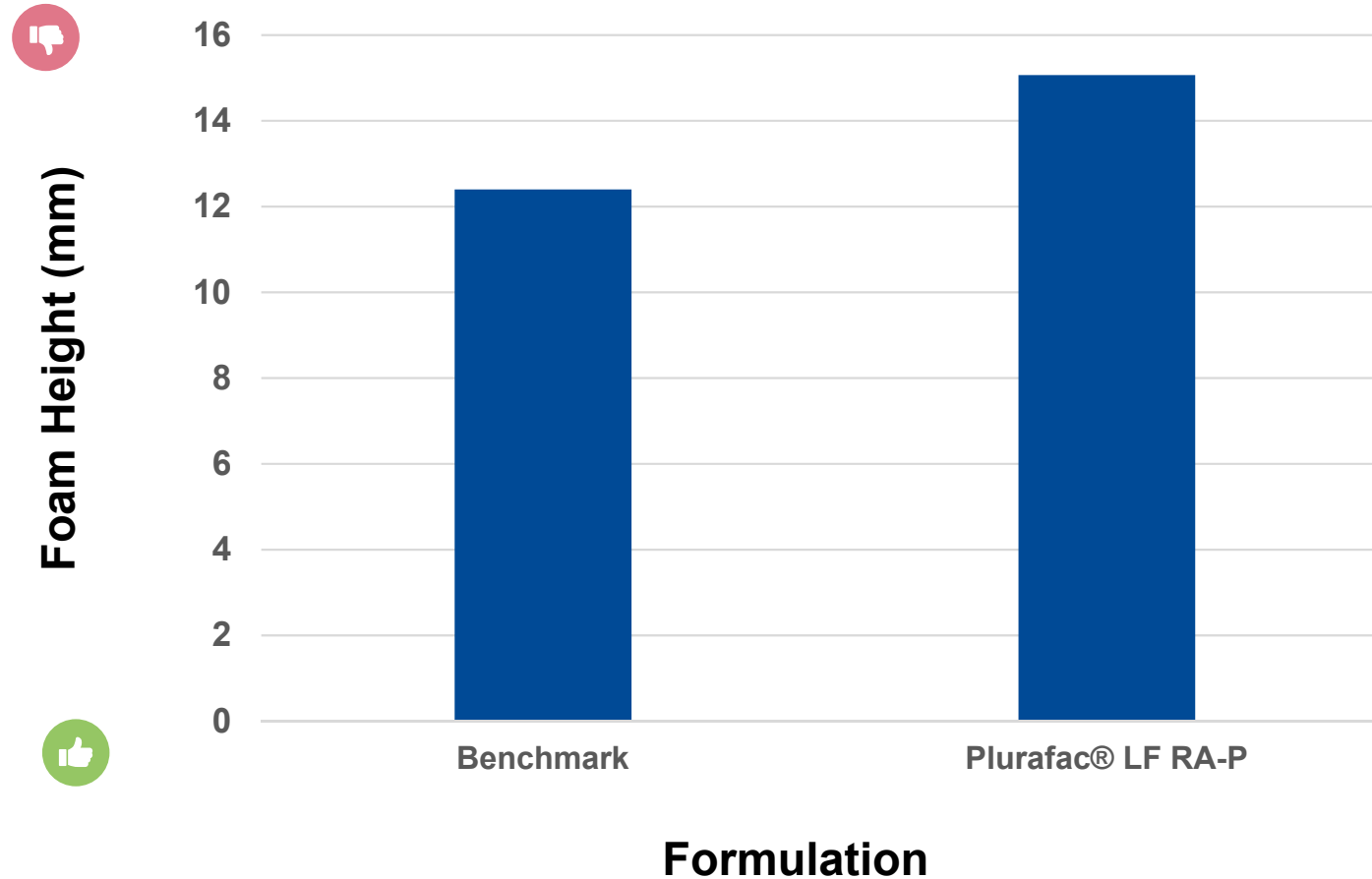
- ✓ Self Foaming Behavior
- ✓ Defoaming characteristics
- ✓ Spotting and Filming performance at high and low temperature machines.

Frame Formulation

| Ingredient | % |
|--------------------------|--------------|
| Plurafac® LF RA-P | 30 |
| SXS (40%) | 20 |
| Water | q.s. To 100 |
| Citric acid | q.s. To pH 7 |

Case Study:

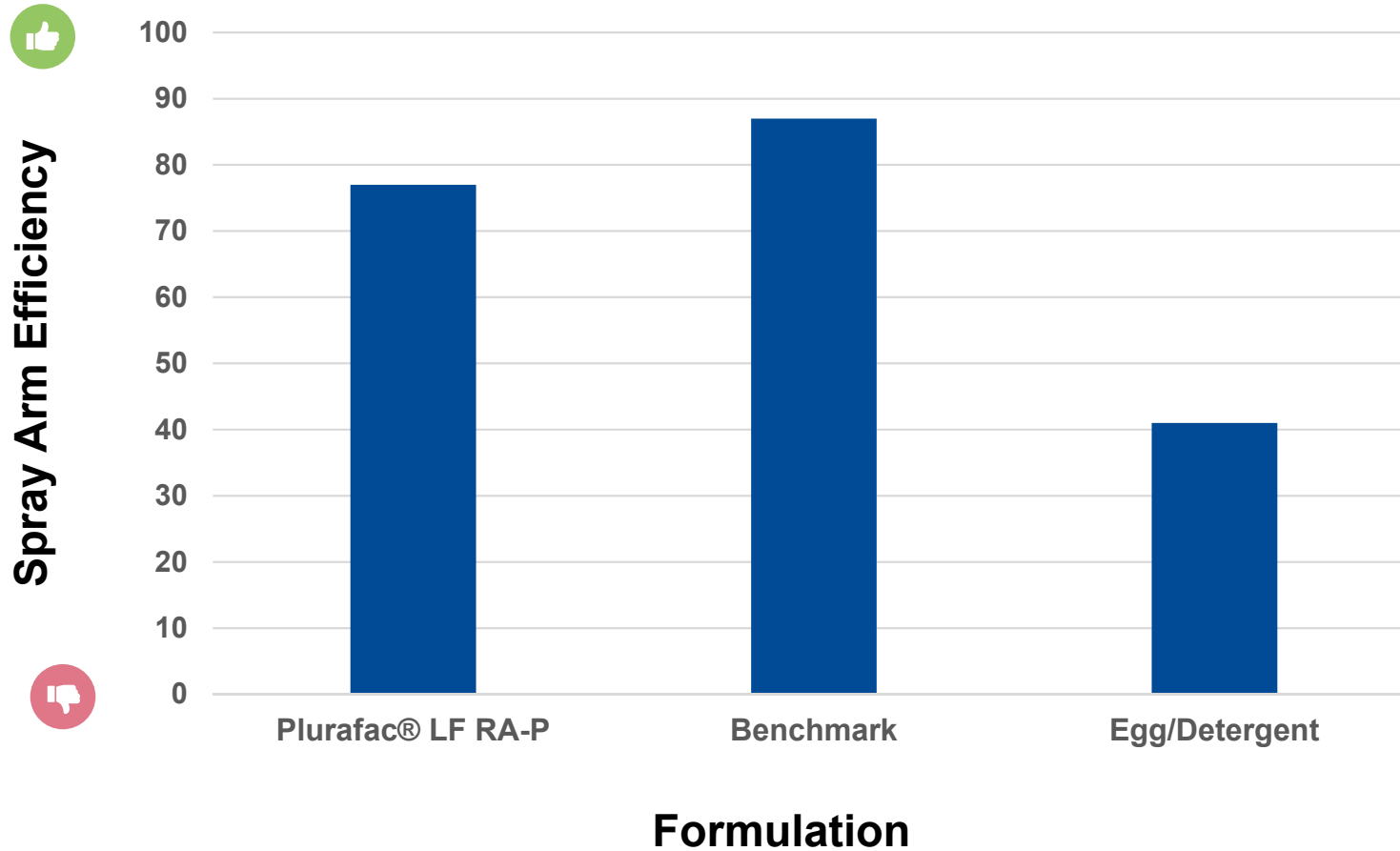
Self foaming Characteristics at 50°C



Plurafac® LF RA-P based formulation has comparable performance

Case Study:

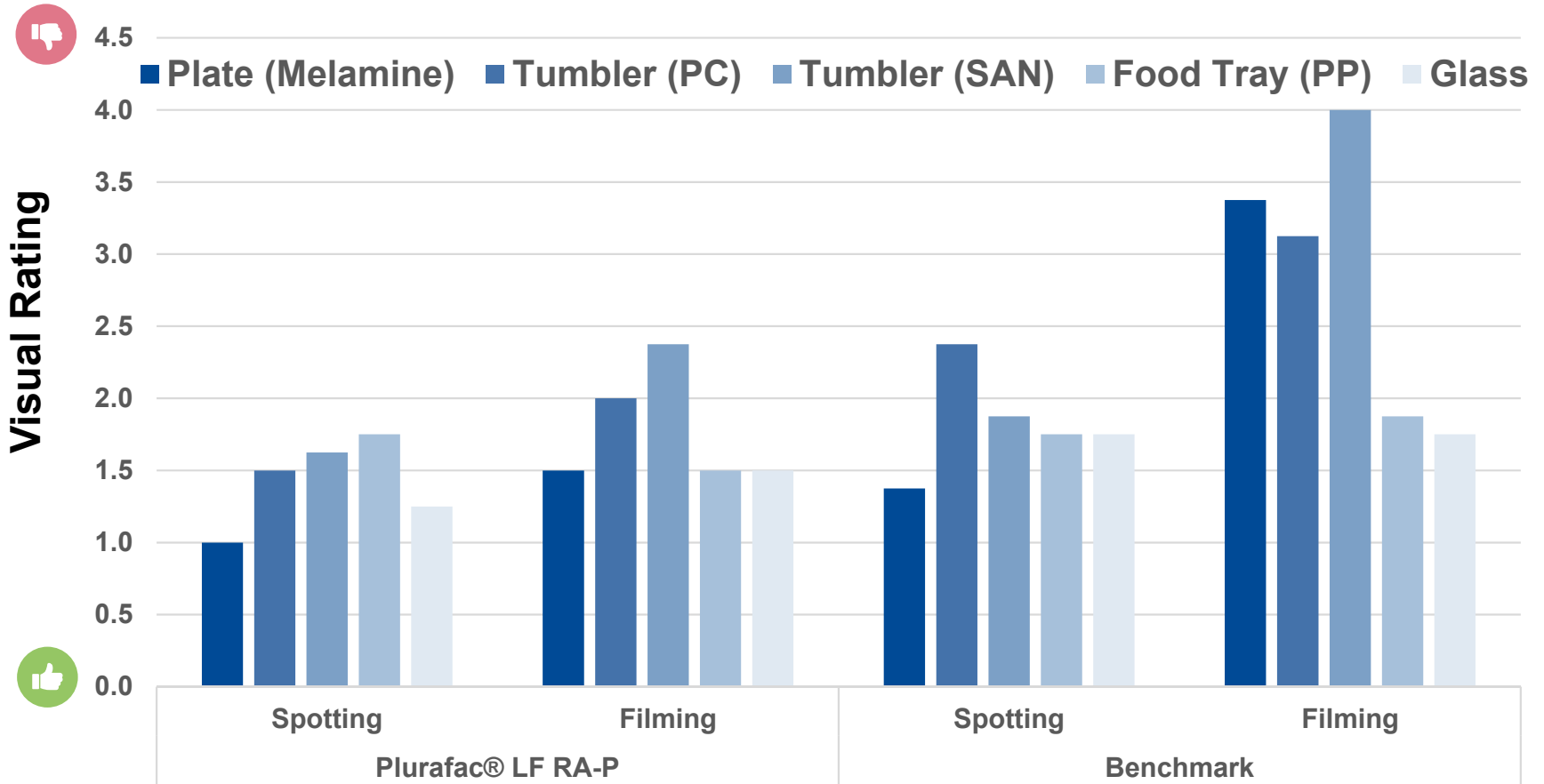
Defoaming Characteristics: Egg at 50°C



Plurafac® LF RA-P based formulation has comparable performance

Case Study:

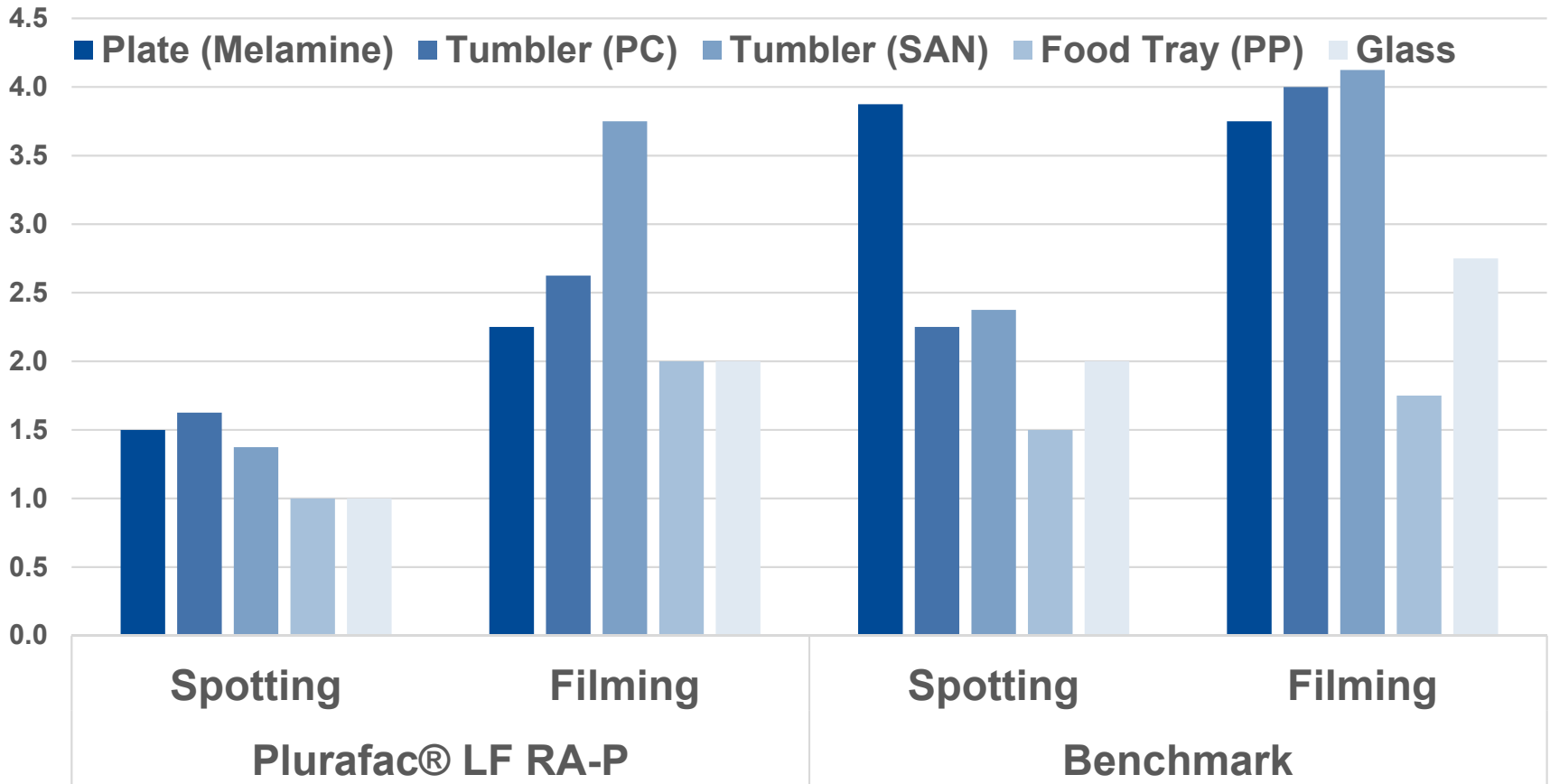
Spotting and Filming Performance: Low Temperature Machine



Plurafac® LF RA-P based formulation has better performance

Case Study:

Spotting and Filming Performance: High Temperature Machine

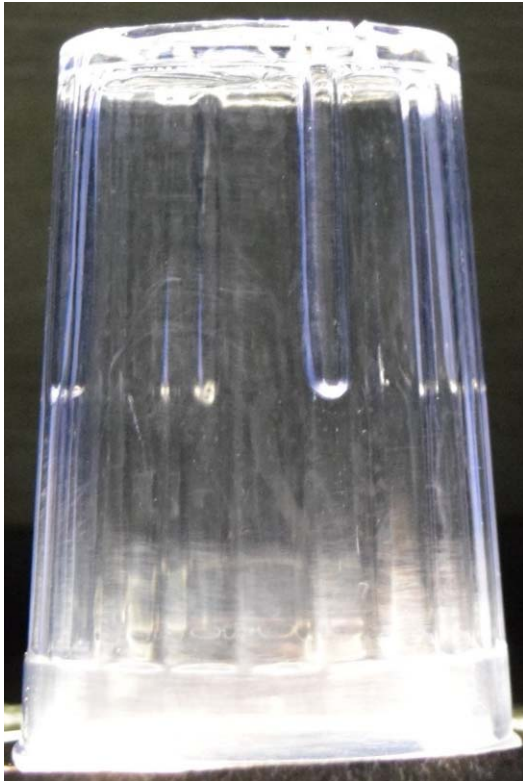


Plurafac® LF RA-P based formulation has better performance

Case Study:

Rinse: Visual Performance in Low Temperature machine

Formulation with LF RA-P



Commercial Benchmark



Plurafac® LF RA-P based formulation has better performance

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Summary

- **BASF has several high performing solutions to boost the cleaning performance in a hard surface cleaner.**

- **Many different solutions via surfactant chemistry were discussed**
 - ✓ **Plurafac® LF RA-P**
 - **A new rinse aid surfactant to improve spotting/filming behavior and faster drying, especially for plastic dishes.**

 - ✓ **Glucopon® Surfactants**
 - **100% natural with high cleaning and no streak performance.**

 - ✓ **Polyquart® PRO A**
 - **Surface modification polymer for reducing the spotting/filming behavior and easy next time cleaning**

 - ✓ **Lutensol® XL/XP**
 - **High dynamic wetting and cleaning performance**

 - ✓ **Dehypound® Advanced**
 - **Solvent free and Simple cleaning**

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