



New Defoaming Surfactants

“It can protect”

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Agenda



▶ **Surface Defects**

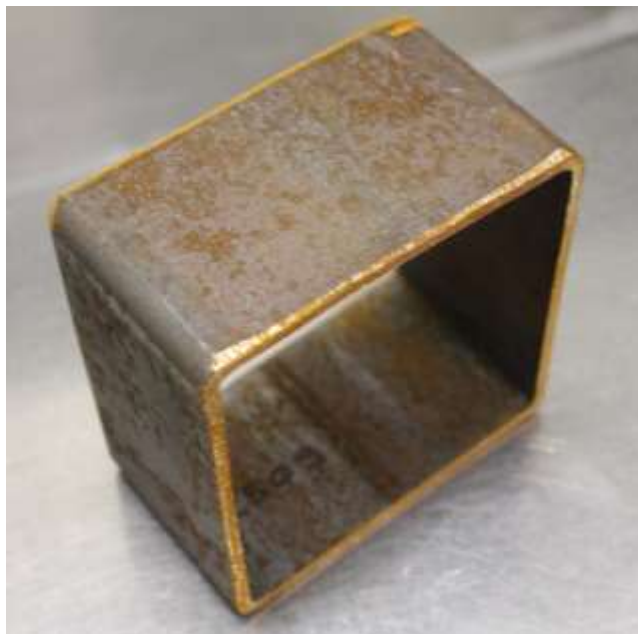
▶ **Chemistry of Surfactants**

▶ **Experimental Work**

▶ **Summary**

Why we need surfactant

Surface Defects



Poor metal substrates

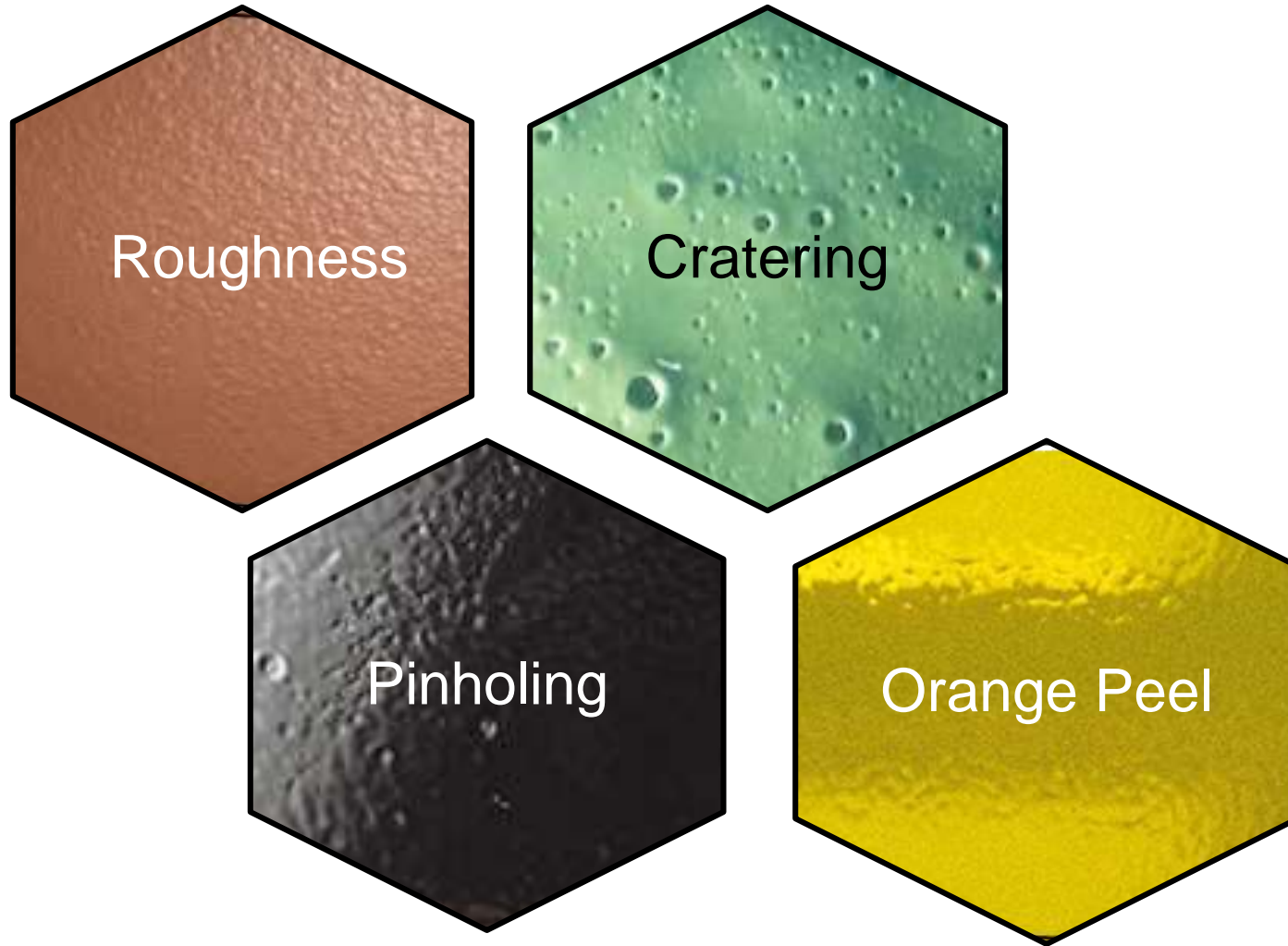


Non-polar plastic substrates/ parts



Evolving and challenging spray applications

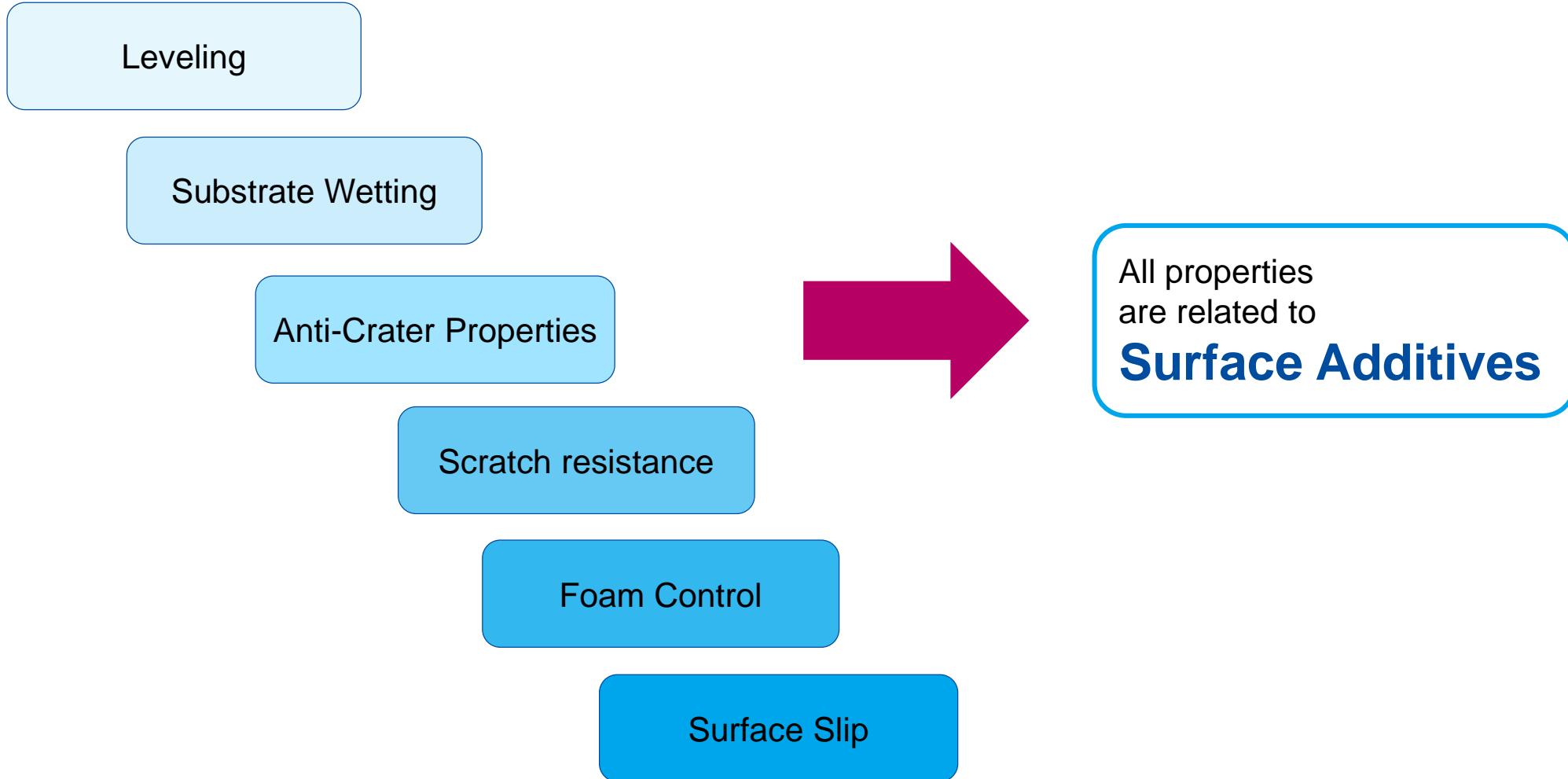
Surface Defects Appearance



It is possible to meet the above-mentioned challenges by using a specific silicone-based chemistry

Chemistry of Surfactant

Silicone, A Versatile Additive Chemistry



Silicone Surfactants

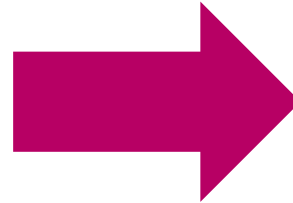
A Versatile Additive Chemistry for Water-borne Systems

Leveling

Substrate Wetting

Anti-Crater Properties

Foam Control



Silicone Surfactants

Provide

- leveling
- **substrate wetting**
- anti-crater properties
- may control foam

Do not have much impact on

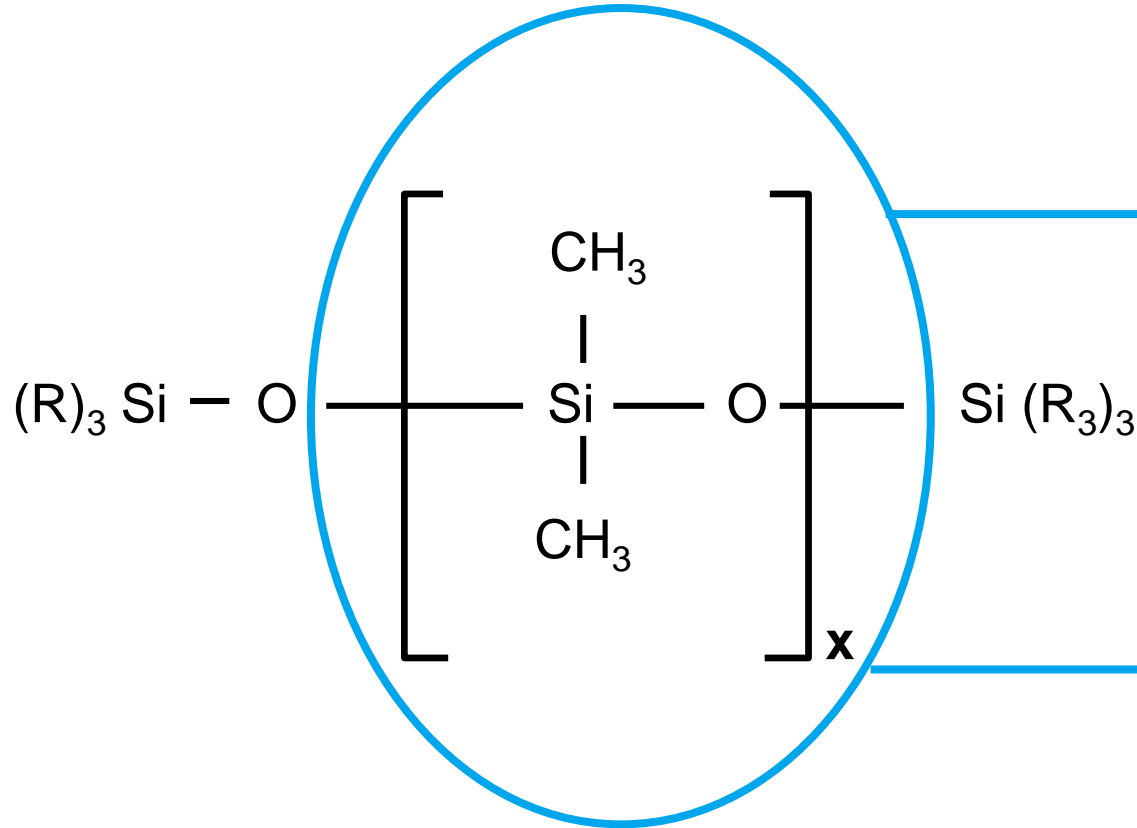
- anti-scratch properties
- reduction of COF

Because

- the orientation in paint systems is mainly towards the substrate /paint interface

Silicone Surfactants

Basic Molecule



Di-Methyl Group provides
“typical” silicone properties:

- A) Reduction of Surface Tension
- B) Increase of Surface Slip

The higher the amount of
di-methyl groups, the “stronger”
is a silicone.

Tri-Siloxanes
Wetting of low polar substrates

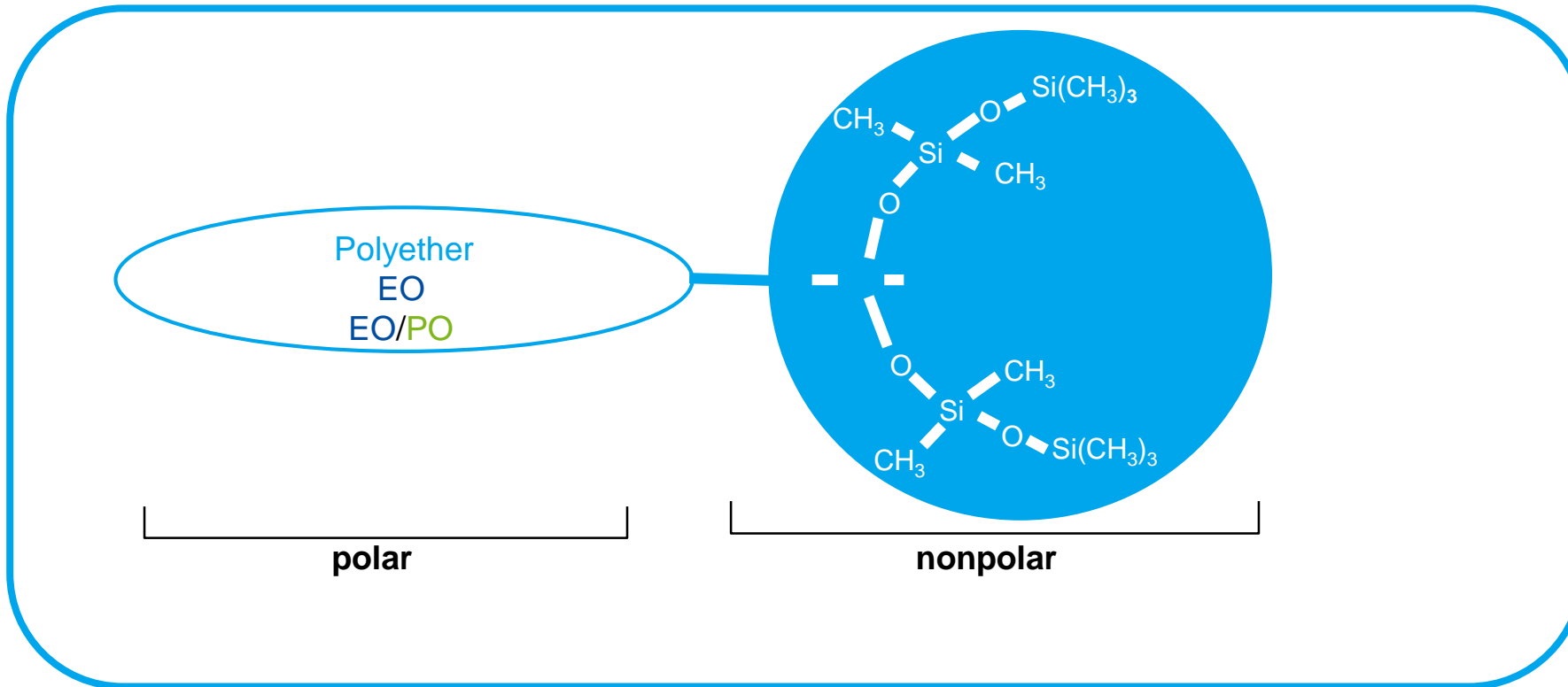
**Universal
Silicone Surfactants**

Silicone Surfactants
Improved leveling

**Defoaming
Silicone Surfactants**



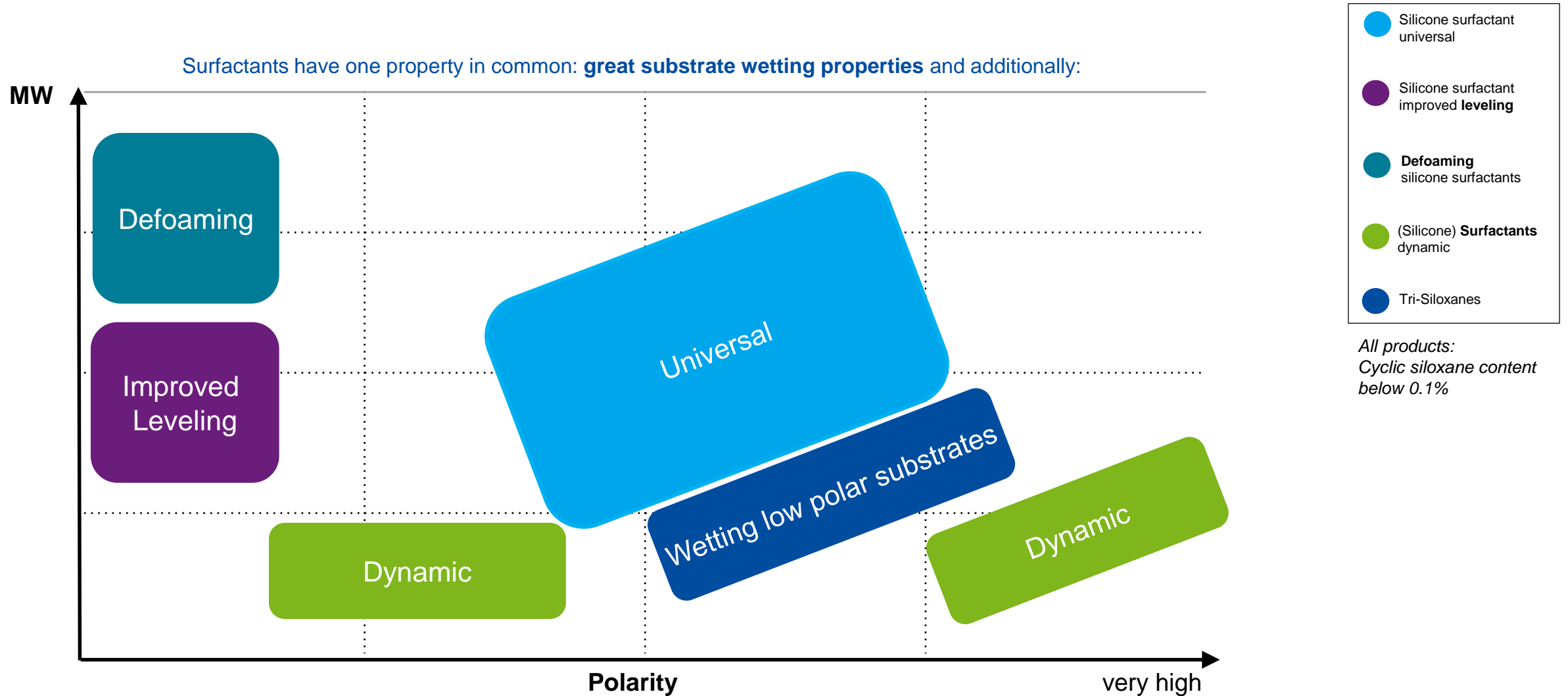
Silicone Surfactant in Water-borne Systems Structures



Basic structure of a silicone surfactant:
small Si-O backbone + large polyether structure result in a surfactant structure

Silicone Surfactant in Water-borne Systems

Overview of Surfactants



Silicone Surfactant in Water-borne Systems

Overview of Surfactants*

Reduction of dynamic surface tension

- Small and “fast” surfactants
- **Strong impact on reduction of dynamic surface tension**

Tri-Siloxanes

Wetting of low polar substrates

- Fast
- **Excellent spreading on low polar substrates**

Universal Silicone Surfactants

- Ideal for all kind of substrates
- **Very wide resin compatibility**

Silicone Surfactants

Improved leveling

- Wide resin compatibility
- Ideal for water-borne UV systems
- Good performance with porous substrates
- **Very good leveling**

Defoaming Silicone Surfactants

- Especially (but not only) suitable for spray applied systems
- Good leveling properties
- **Defoaming**

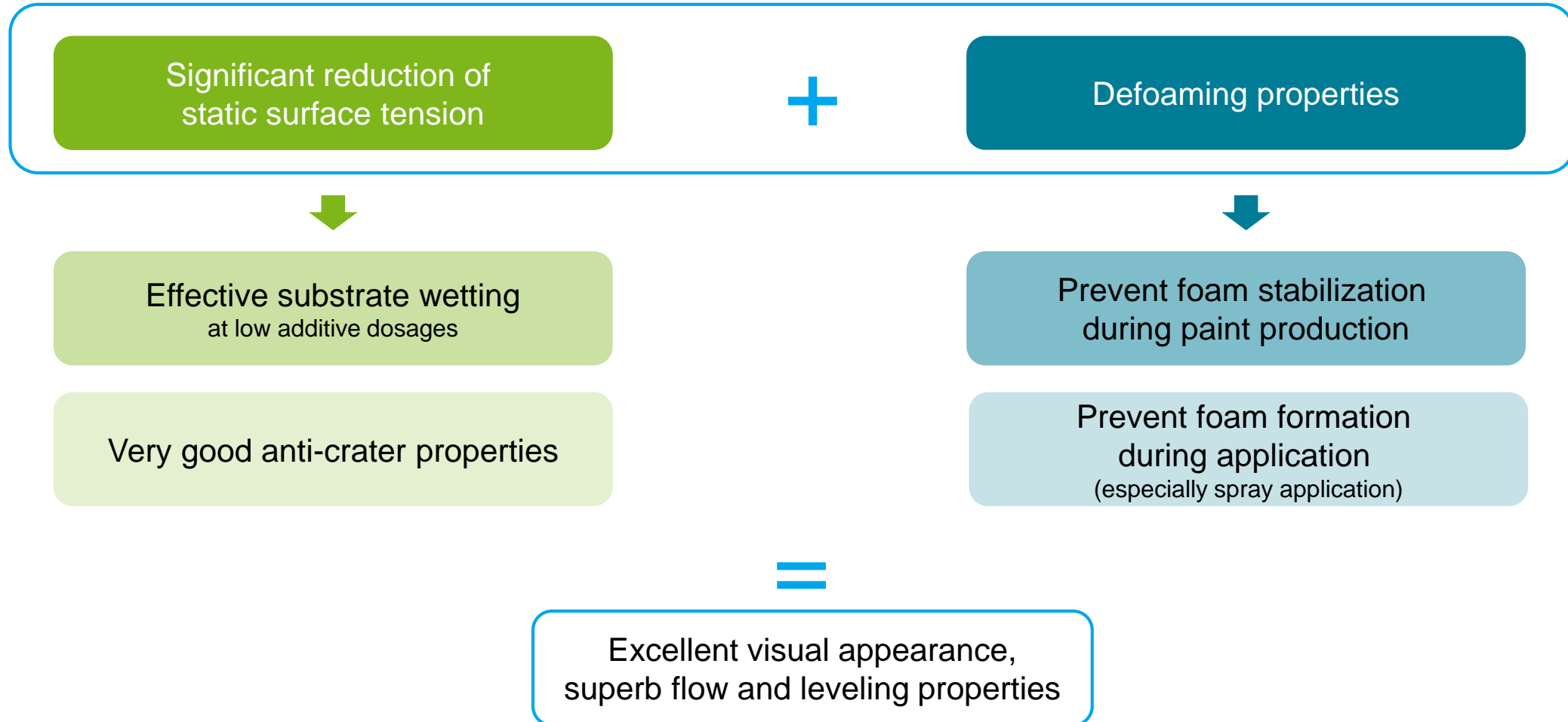
Surfactants have one property in common: **great substrate wetting properties**

*The effect of surfactants is system dependent

New Defoaming Surfactants

Main Benefits

Highly active silicone surfactants with 100% active substance (no solvent evaporation)



New Defoaming Surfactants

Product Properties

100% active substance

For water-borne systems
(organic co-solvent content of >3%)

For critical substrates like plastics
or poorly treated, dirty metal surfaces

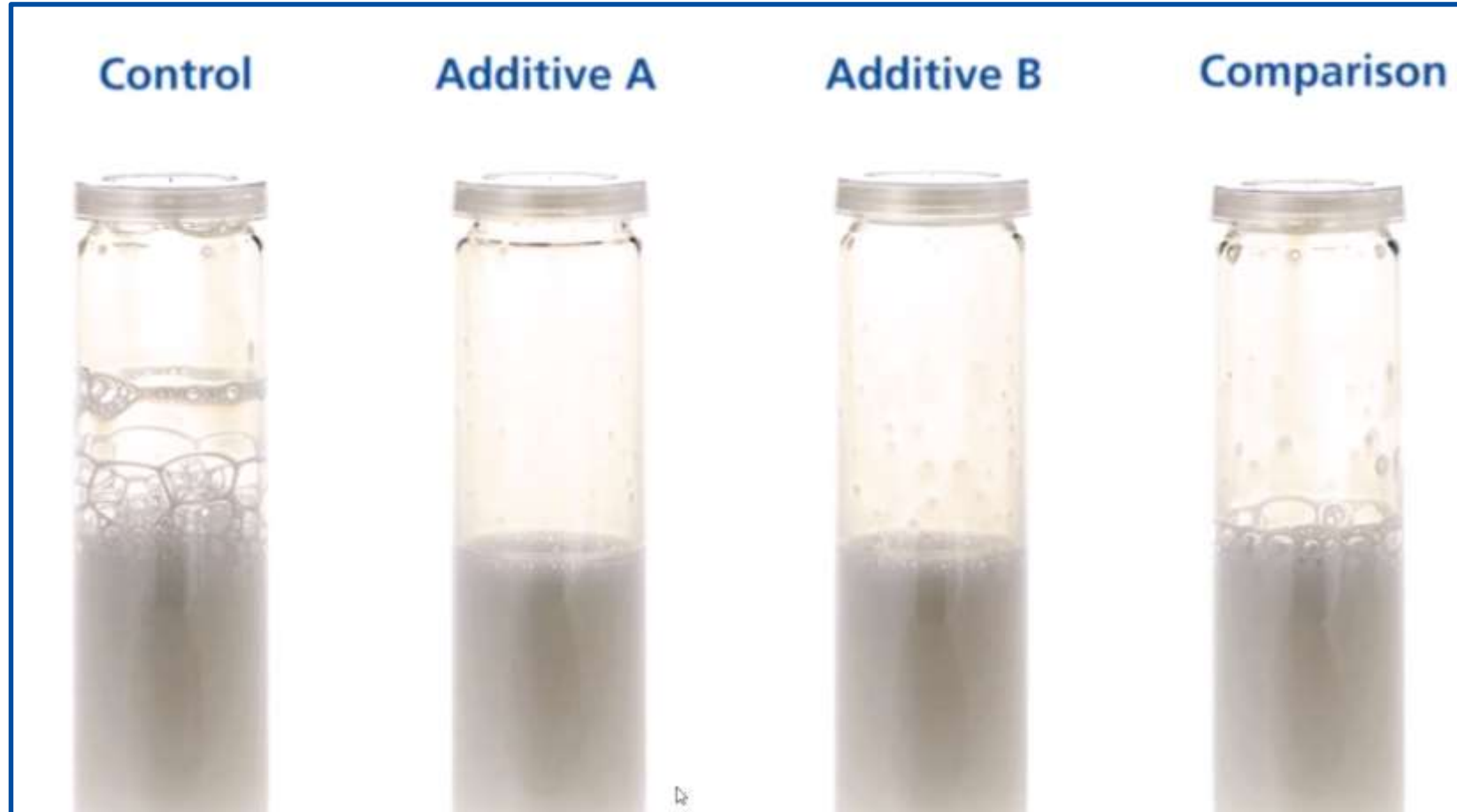
Can be post-added as troubleshooting
additive

Suitable for all kind of application areas,
recommended for spray application

Prevent Foam Stabilization In a Water-borne 2-pack PUR System

System: Formulation 2:
2-pack PUR based

Additive dosage: 0.2%
active substance on
component A



Reduction of Static Surface Tension In a 2-pack PUR System

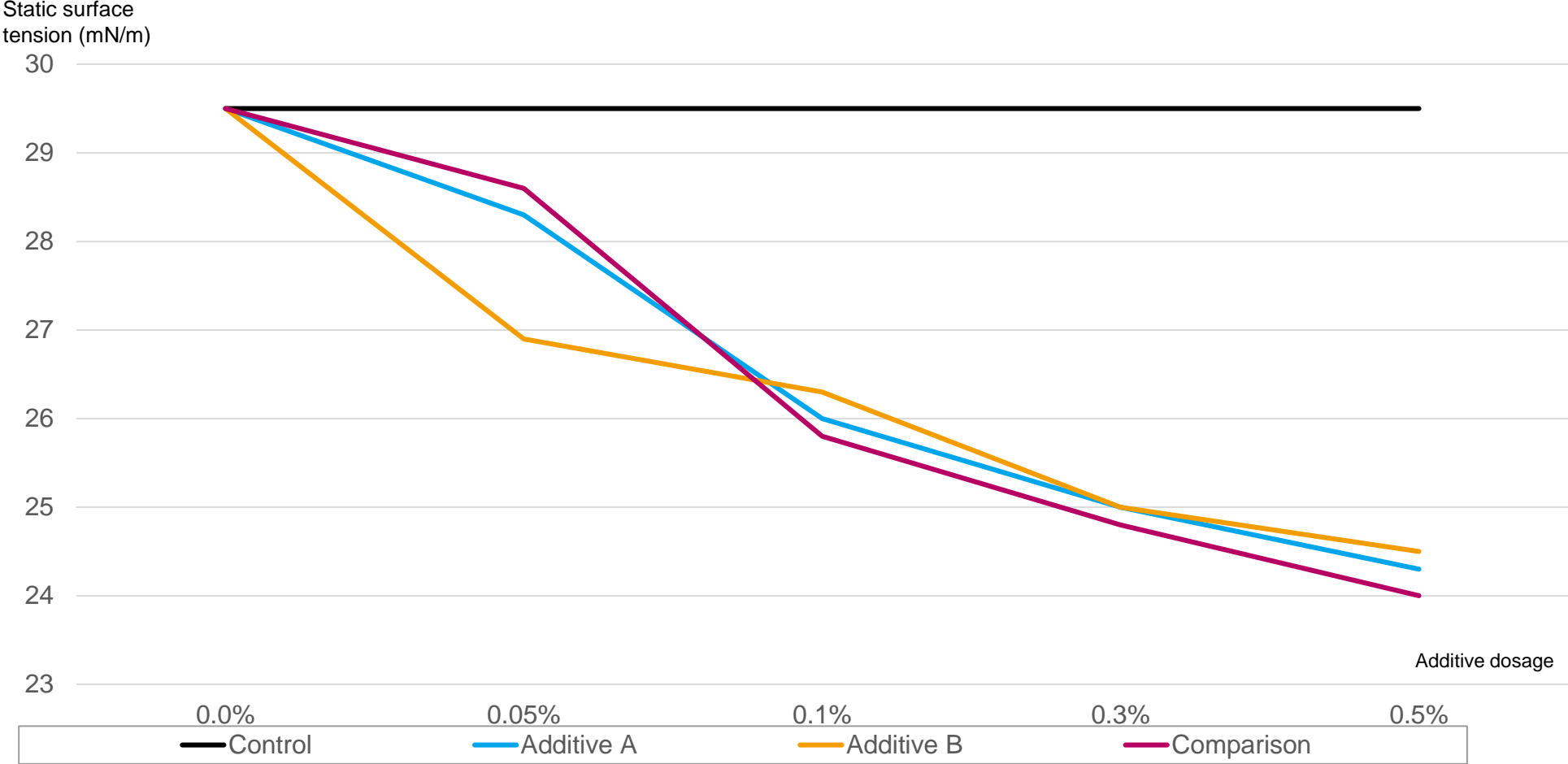
System: Formulation 2:
**Clearcoat 2-pack
acrylate emulsion**

Additive dosage:
active substance on total
formulation



Static Surface Tension

Du Noüy ring method:
Determination of the
surface tension of a liquid



Excellent Leveling

In a Spray-applied Clear-Coat based on a 2-pack PUR System

System: Formulation 2:
2-pack PUR based on

Additive dosage: 0.1%
active substance on total
formulation

Co-Solvent Content:
3.4% in Component
A 12.1% in total
formulation

Application method:
Spray application on
PMMA substrate



Excellent Leveling

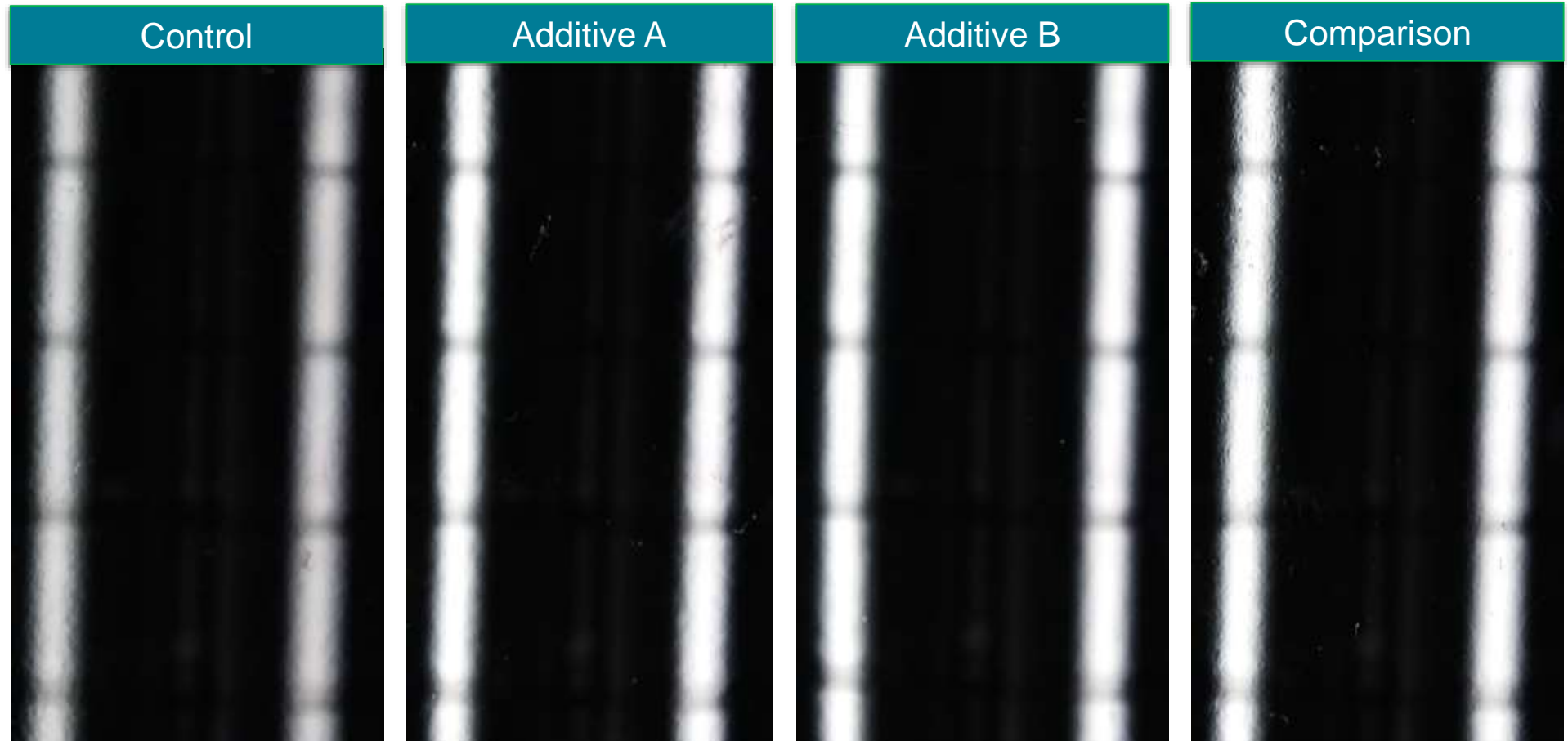
In a Spray-applied Clear-Coat based on a 1-pack PUR System

System: Formation 1:
1-pack PUR

Additive dosage:
0.1% active substance
on total formulation

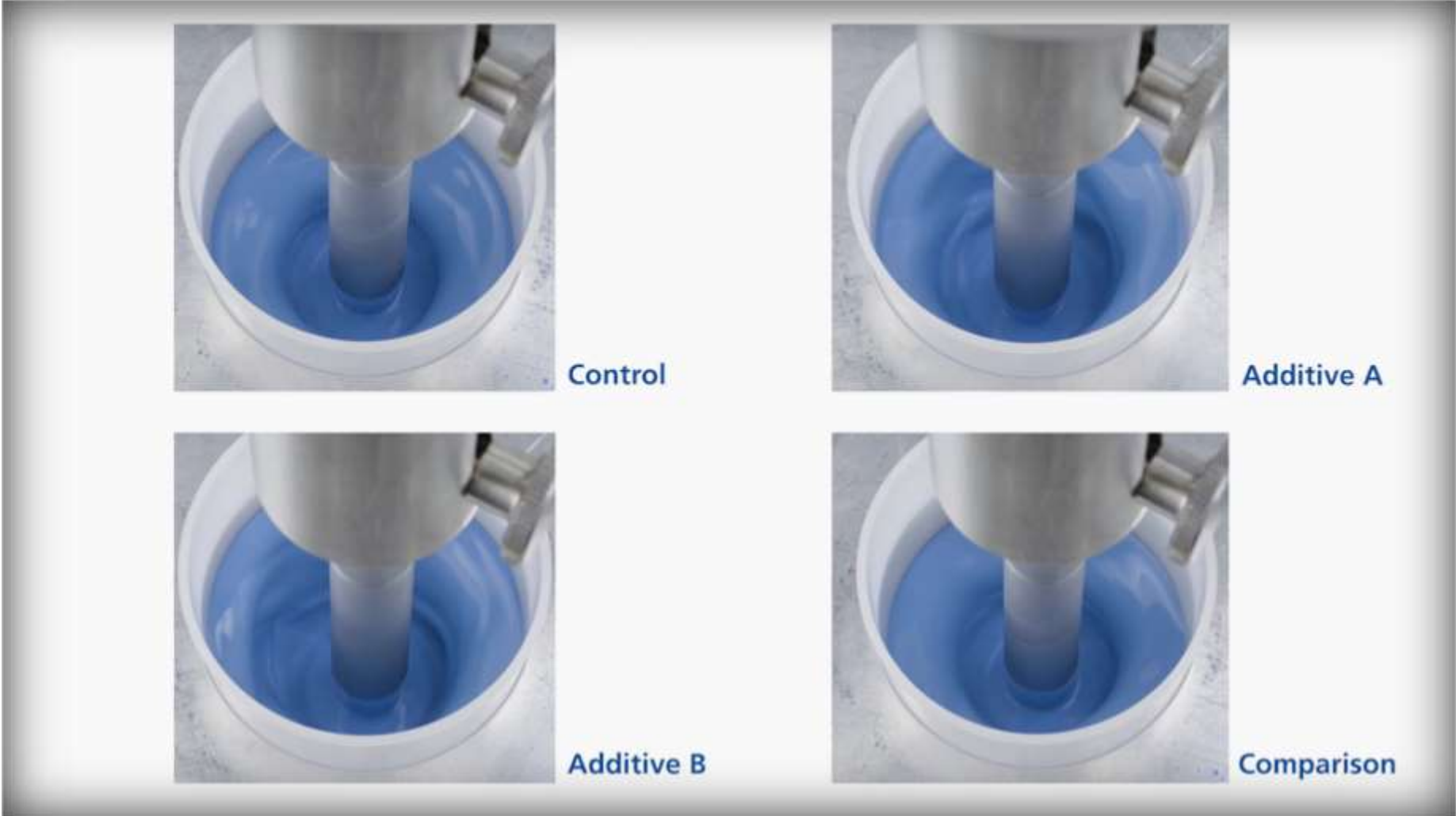
Co-Solvent Content:
8% Co-solvent

Application method:
Spray application on
PMMA substrate



Prevent Foam Stabilization

During Paint Production



Brilliant Visual Appearance

After Spray Application in a 2-pack PUR System

System: Formulation 3:
2-pack PUR based
Additive dosage: 0.2%
active substance on total
formulation

Co-solvent content:
4.1% in Component
A 6.6% in total
formulation
HVLP-Spray application
on PMMA-Substrate



Excellent Performance

As a Trouble Shooting Additive

Problem:

Unknown contamination caused cratering after spray application

System:

Water-borne acrylic melamine
baking system
15% organic co-solvent content
(Dowanol PM : ethanol = 1:1)

Application:

Spray application

Additive dosage:

Active substance on total formulation



Customer paint
without Additive A



Customer paint
with post-addition of 0.5% Additive A

Excellent Performance

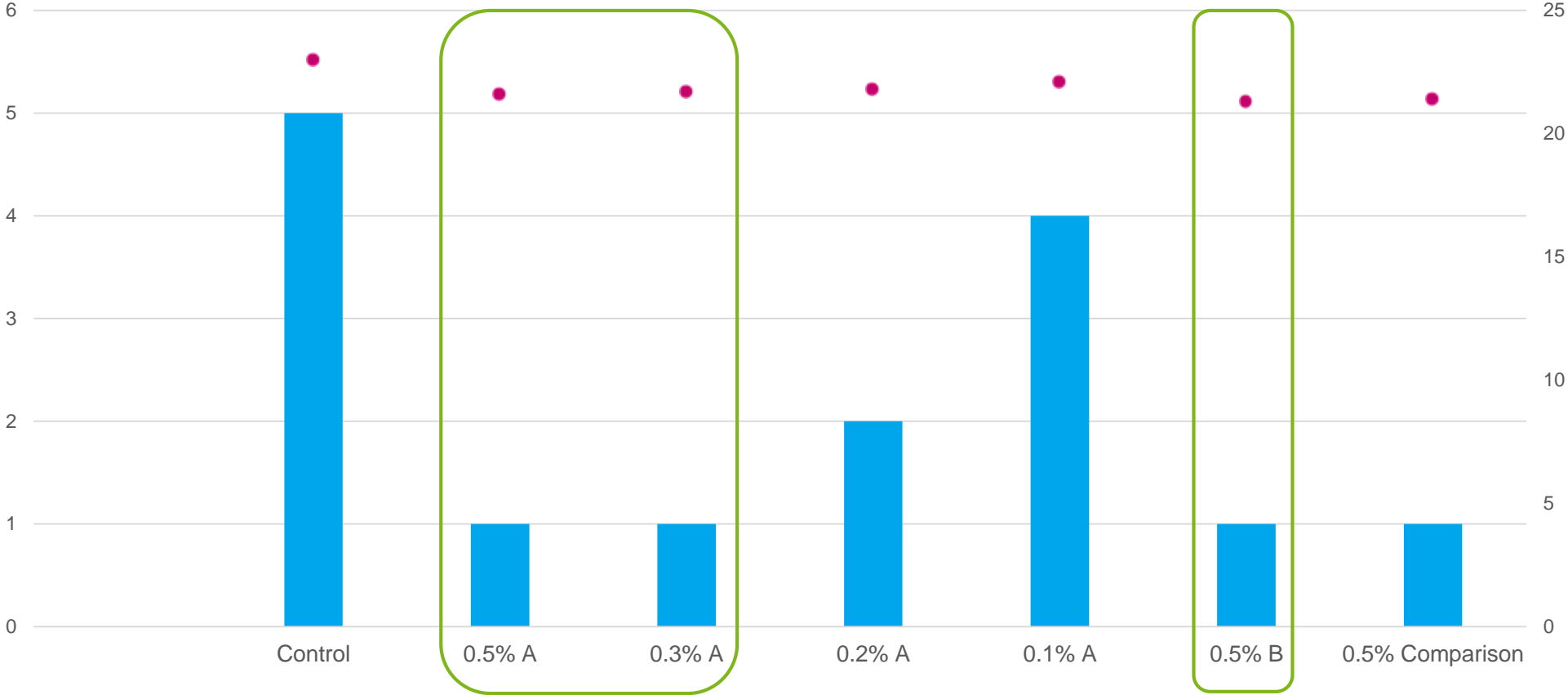
As a Trouble Shooting Additive

Problem:
Unknown contamination caused cratering after spray application

System:
Water-borne acrylic melamine baking system
15% organic co-solvent (Dowanol PM : ethanol = 1:1)

Application:
Spray application

Additive dosage:
active substance on total formulation



Key visual judgement of crater tendency:
1: no cratering
5: severe cratering

● Series 1
Static surface tension (mN/m)

■ Series 2 - Visual judgement of crater tendency after spray application

Summary

- Many surface defects in coatings are related to a stabilized foam or a poor flow behavior
- Low polar, silicone base chemistry helps drops surface tension to improve flow and does not stabilize foam
- New defoaming surfactant chemistry focuses on excellent substrate wetting and good levelling with a strong defoaming effect
- Silicone-based products, therefore do evaluation of inter-coat adhesion and re-coatability in a ladder study is highly recommended

Thank you for
your attention.