

Hybrid Technologies for Durable Cool Roofs

Reflective Coatings and Cool Roofs – Milan 2025



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Agenda

- Value of a reflective & cool roof coatings
- Liquid applied waterproofing technology
- Hybrid Acrylic-PUD
- Proof the concept (Applications Data)
- Summary of Features & Benefits
- What's next?
- Appendix



Value of Reflective and Cool Roof Coatings



Mitigating Urban Heat Island

These coatings help lower urban temperatures by reducing heat absorption in dense city areas.



Energy Efficiency Benefits

Reflective roof coatings reduce cooling costs by reflecting solar heat and improving HVAC efficiency.



Sustainable and Cost-effective

Using reflective coatings supports sustainable building practices and lowers building ownership costs.

Value of Reflective and Cool Roof Coatings



Mitigating Urban Heat Island

These coatings help lower urban temperatures by reducing heat absorption in dense city areas.



Temperature Differences¹:

1. Urban areas can be up to **10°C warmer** than rural surroundings at night.
2. Cities like **London** and **Paris** regularly show **4°C higher nighttime temperatures**.



Health Impact & Mortality²:

- UHI contributes to **cardiovascular and respiratory risks**.
- Average **economic cost of €192 per adult per year**.

Value of Reflective and Cool Roof Coatings



Energy Efficiency Benefits

Reflective roof coatings reduce cooling costs by reflecting solar heat and improving HVAC efficiency.

Surface Temperature Reduction¹

- Reflective roofs can be **28–33°C cooler** than conventional dark roofs during peak summer conditions.
- Example: A black bitumen roof may reach **80°C**, while a reflective roof stays closer to **50°C**.
- In Cádiz, Spain, applying a reflective acrylic-epoxy coating reduced cooling needs by 30%.

Value of Reflective and Cool Roof Coatings



Sustainable and Cost-effective

Using reflective coatings supports sustainable building practices and lowers building ownership costs.

Indoor Comfort & HVAC Efficiency

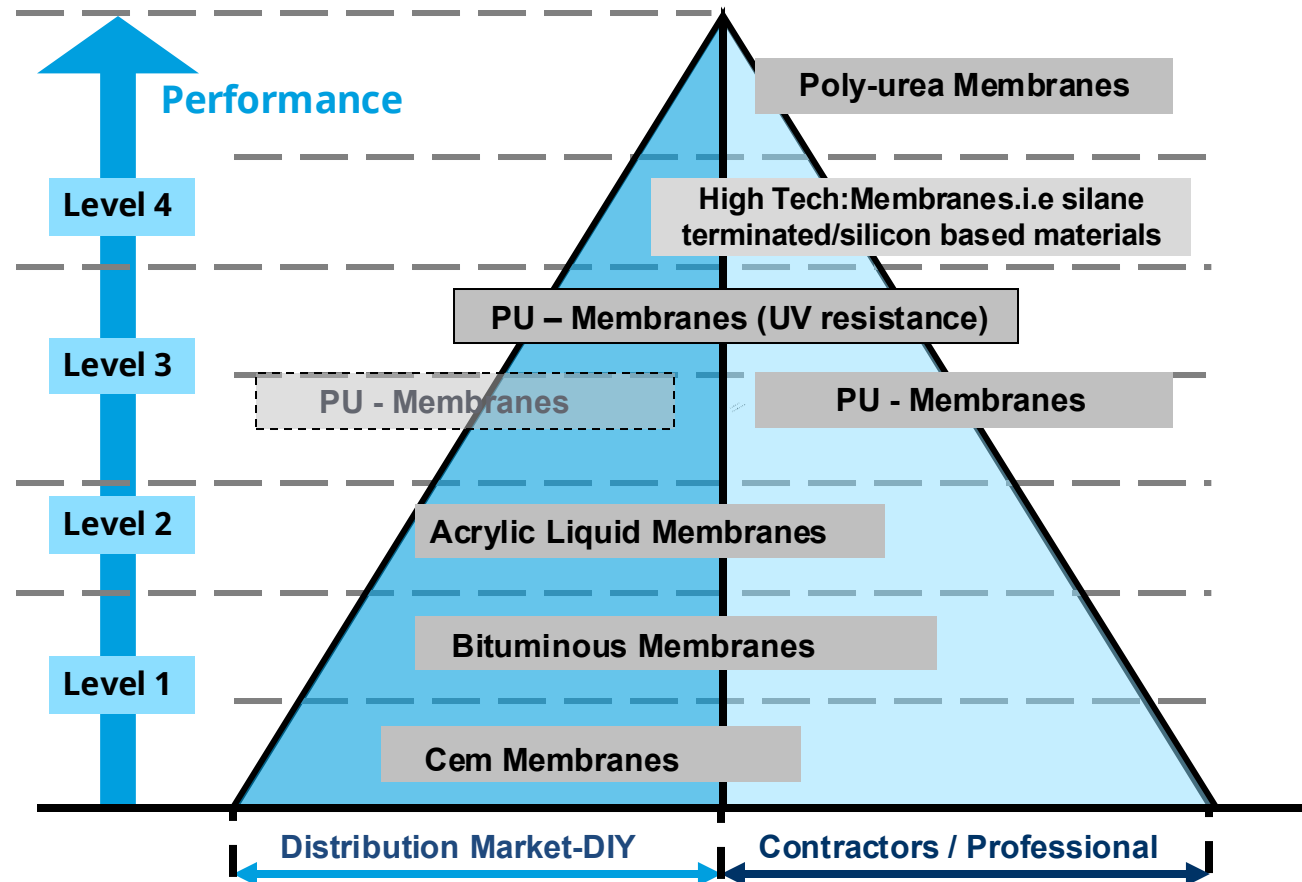
- In non-air-conditioned buildings, reflective coatings can reduce **maximum indoor temperatures by 1.2–3.3°C**.
- **Discomfort hours** can be reduced by **9–100%**, depending on building type and insulation.

Liquid Applied Waterproofing Membranes

Technologies



LAWM Technologies



(*) This is only a general representation of the liquid applied roof coating used technologies, and not all the available ones have been represented

Lubrizol Innovation Pillars



Performance

- **High-Durability:** Extend service life and reduce maintenance.
- **Multi-Functionality:** Do more than protect and beauty.
- **Energy-saving, Thermal-Management & Climate resilience.**



Sustainability

- Create safer environments: **WB and Low VOC**
- Resource conservation: **Bio-based & renewable coatings**
- Minimize health risk to workers and users: **Less hazardous substances**
- Decarbonization: **Improved CFP/LCA**



Productivity

- **Simplify paint process:** Eliminate the need for multilayers.
- **Efficiency:** Time and energy savings in both manufacture & application
- **Easy-to-Apply:** Minimal surface preparation
- **Primeless polymers (single coat)**
- **High Solids Resins**
- Self-crosslinking resins for fast-paced jobs

- Polyamide based PUD (Next level WB physical protection equal to SB)
- Self-healing technology
- **Hybrid technologies**
- Self-crosslinking AE and PUDs

- **Water Based product ranges (all platforms)**
- High renewable content PUDs
- High solids PUDs for better CFP
- **Low VOC formulation PUD and AE based**

Market need: Energy saving

Market Need: High-Durability, Thermal-Management & Climate Resilience

- Extended service life: **reduced maintenance**.
- Energy saving and thermal management: **Reflective solar heat systems**, surface insulation and energy generating coatings.
- Coatings that resist extreme temperatures, UV radiation, heavy rains, pollution resistance, etc. without degrading
- Efficiency: **Simplify paint process**, make it safer
- WB Coating systems with **reduced CFP** and no Hazardous substances

Lubrizol Solutions: Lubrizol Water-based Hybrid Technology

Polyurethane Dispersions

- Mechanical Properties
- Durability
- Hydrolytical stability

- Tensile strength
- Abrasion resistance
- Dirt Pick up resistance
- Enhance resistance to ageing

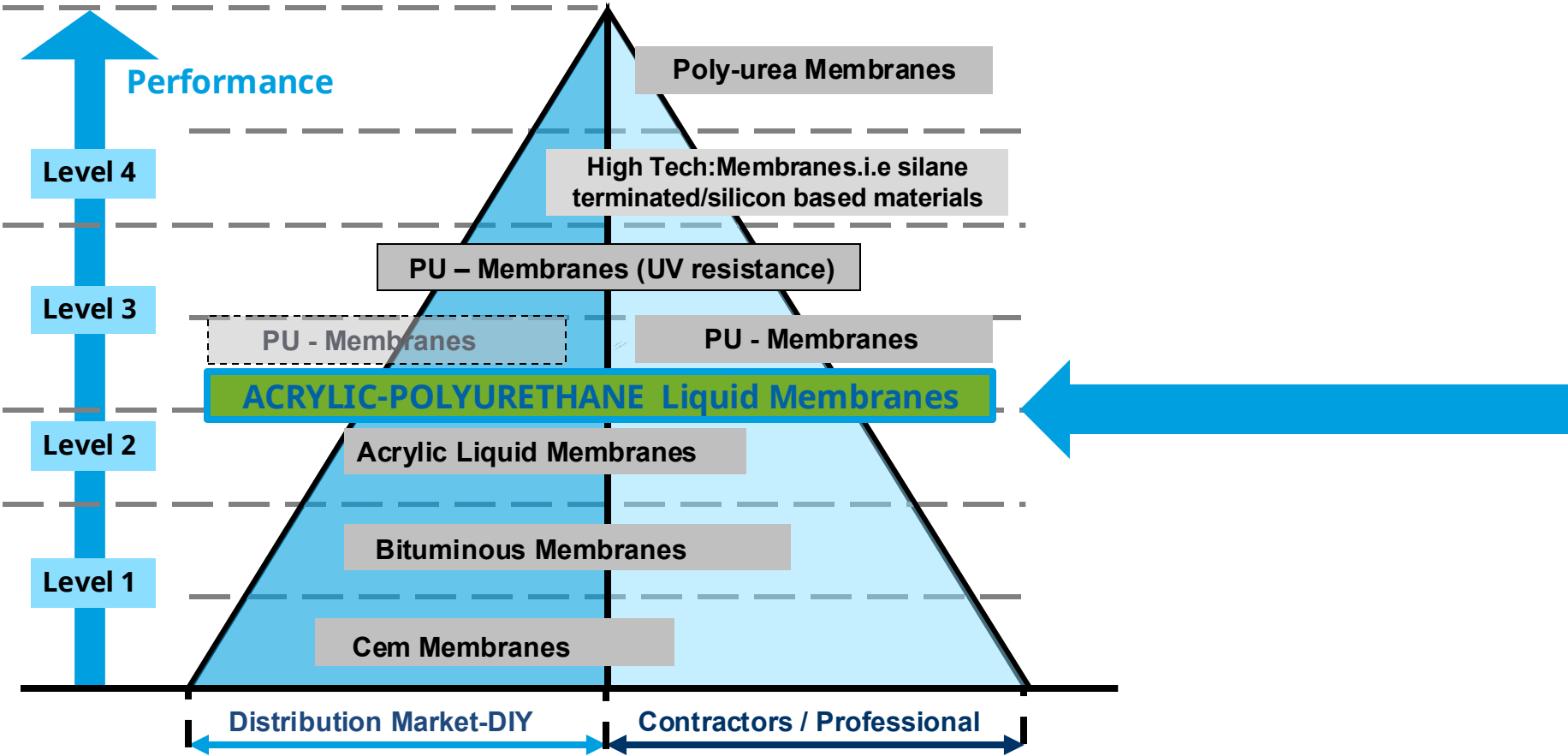
Acrylic Technology

- Alkaline Resistance
- UV Stability
- Pigment compatibility

- Resistance to high pH cementitious substrates
- Long term colour retention
- Formulation latitude
- Adhesion to multiple substrates



LAWM Lubrizol Technology



(*) This is only a general representation of the liquid applied roof coating used technologies, and not all the available ones have been represented

Hybrid Acrylic-PUD Description



Hybrid Acrylic-PUD Product Description

A Hybrid Acrylic-Polyurethane emulsion developed for the formulation of liquid applied waterproofing membranes, elastomeric and concrete protection coatings.



pH	8-9
Total Solids (%)	54-56
Viscosity Brookfield at 25°C (cps)	500-1500
MFFT (°C)	0
Tg (°C)	10(*)

(*) Calculated value

Applications & Properties



Applications and Properties

- ✓ Very **low water uptake** and capillary absorption
- ✓ Excellent **balance elasticity vs tensile strength**
- ✓ Good resistance to **UV and thermal ageing**
- ✓ **Adherence** to most commonly used **roof substrates** including wet concrete
- ✓ **No tack surface**; low dirt pick up & superior **bitumen bleed through resistance** as a Topcoat
- ✓ Efficient and **easy applications**

Roof Coating Applications



Proof the concept

Application Data



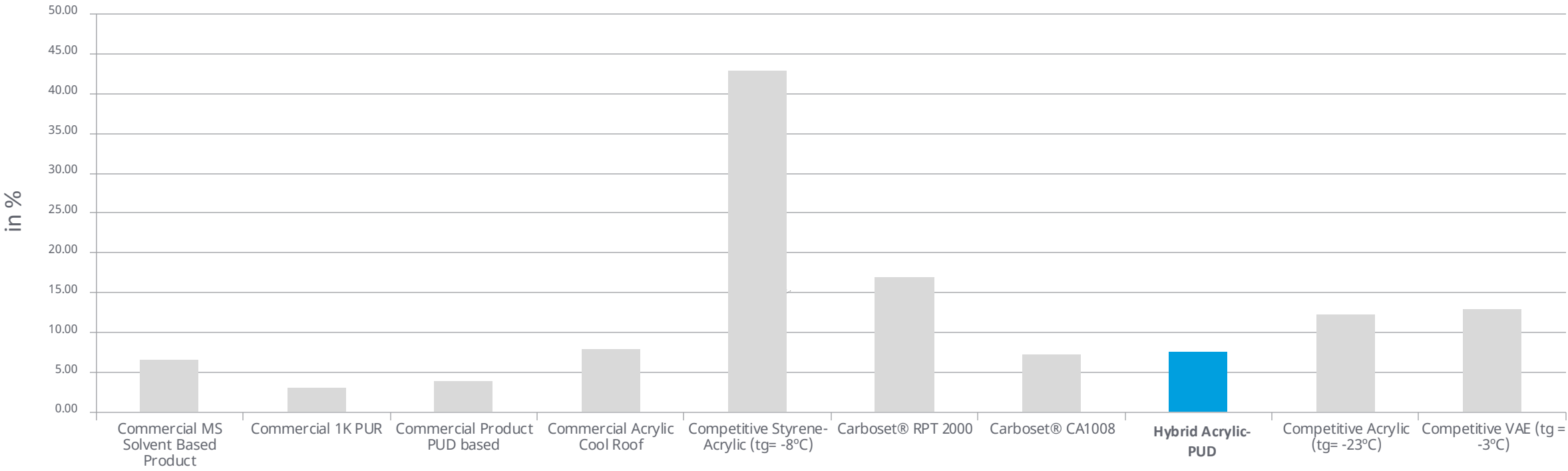
Testing Profile

- Water Uptake
- Adhesion to Different Substrates
- Mechanical Properties at different climate conditions
- **Solar Reflectance & Solar Emissivity**
- European Technical Approvals (ETAG)



Water Uptake

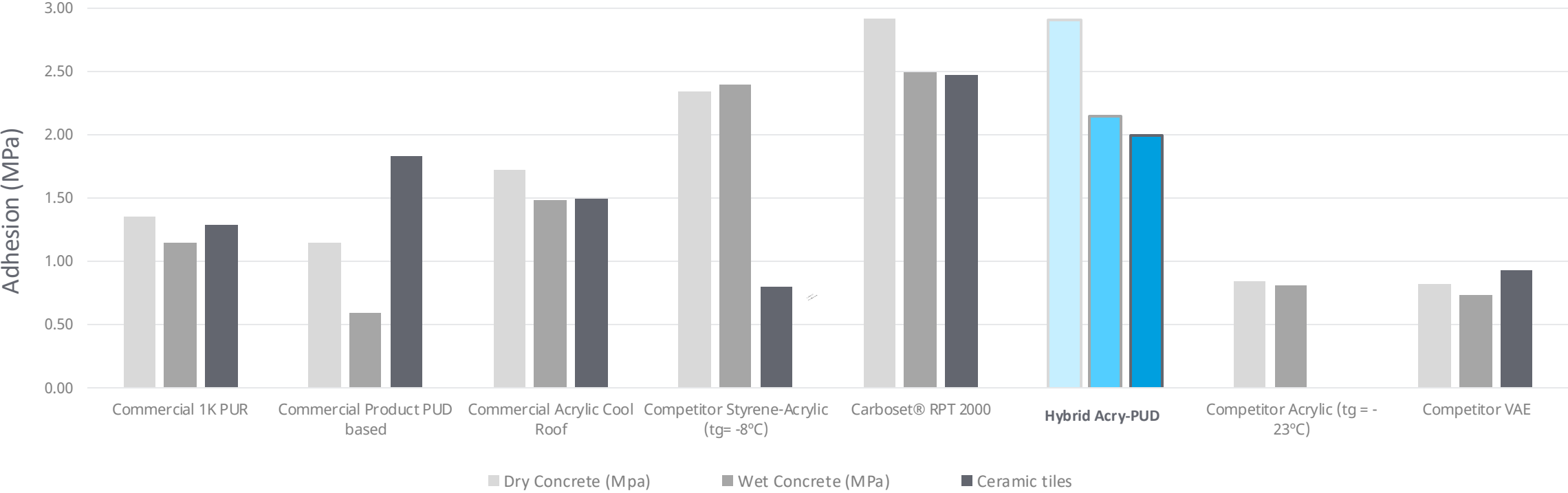
After 2 cycles of 28 days Immersion



Low water uptake means resistance to water.

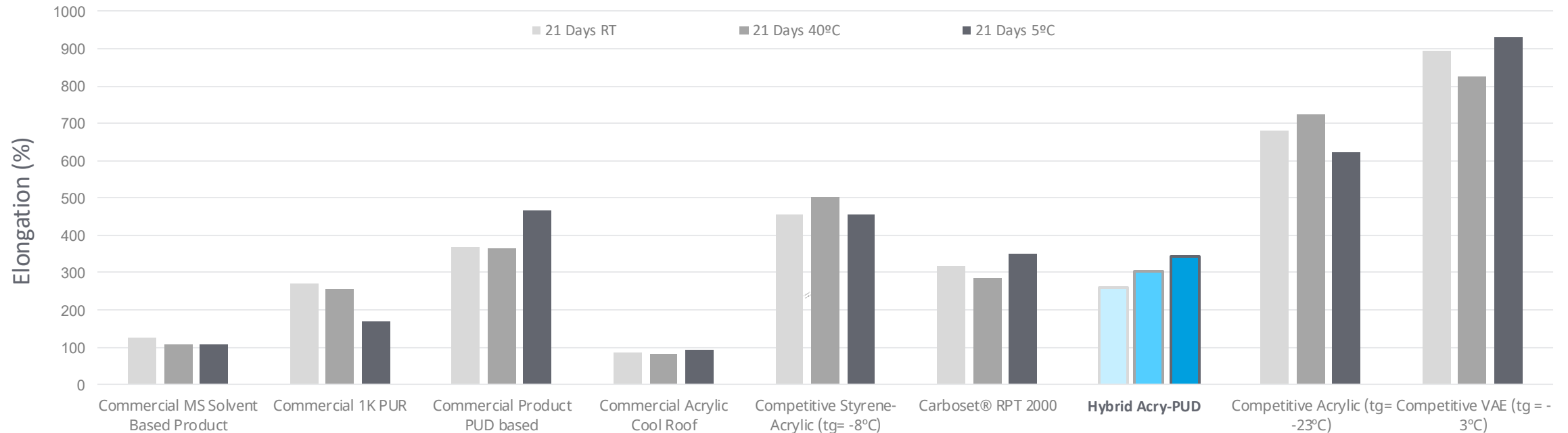
Benefits: Film resistance to cycles of swelling/de-swelling. Long lasting product.

Adhesion to Multiple Substrates



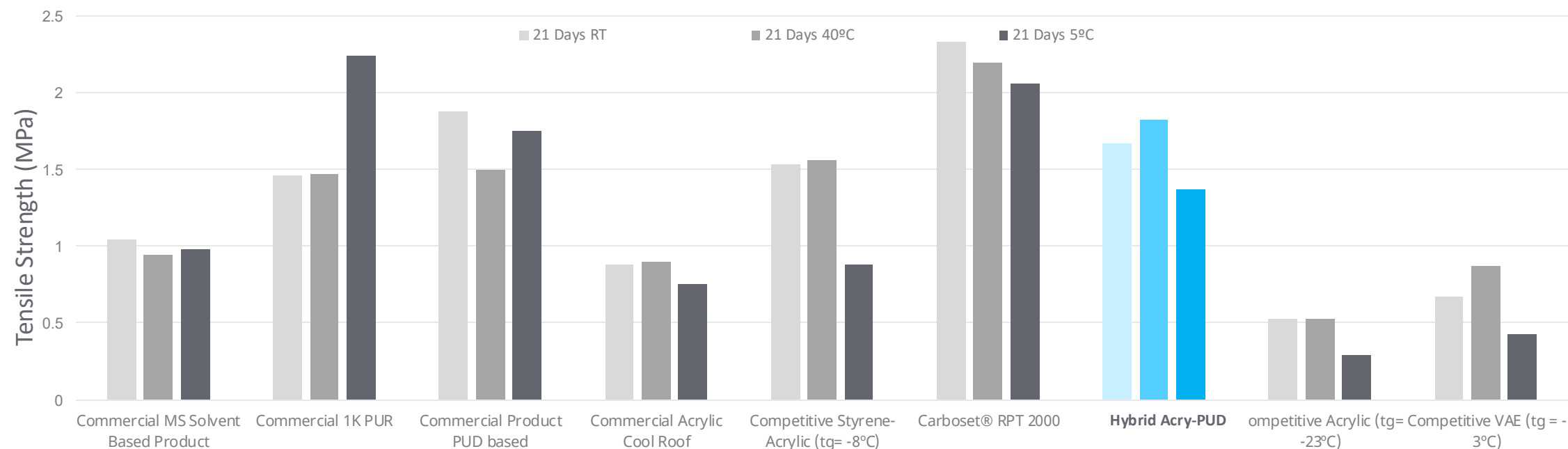
Adhesion to different substrates means product and application versatility.
Benefit: one product for multiple substrate conditions

Mechanical Properties at Different Climate Conditions



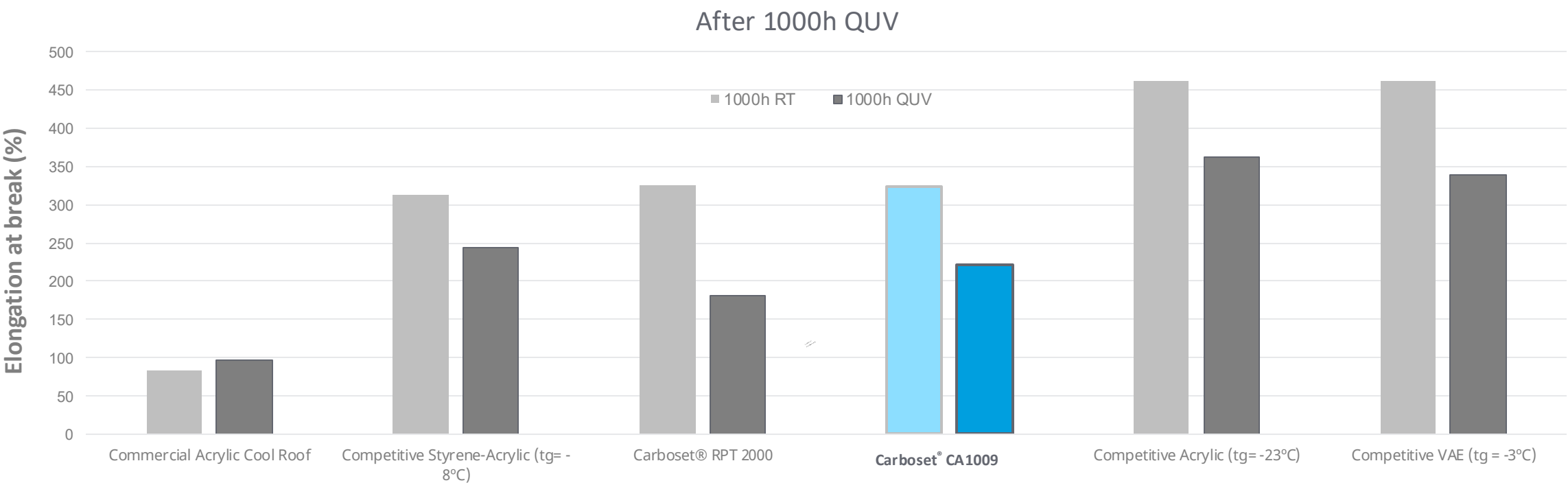
Similar elongation values at different climate conditions.
Benefit: product integrity even when subjected to climatic changes

Mechanical Properties at Different Climate Conditions



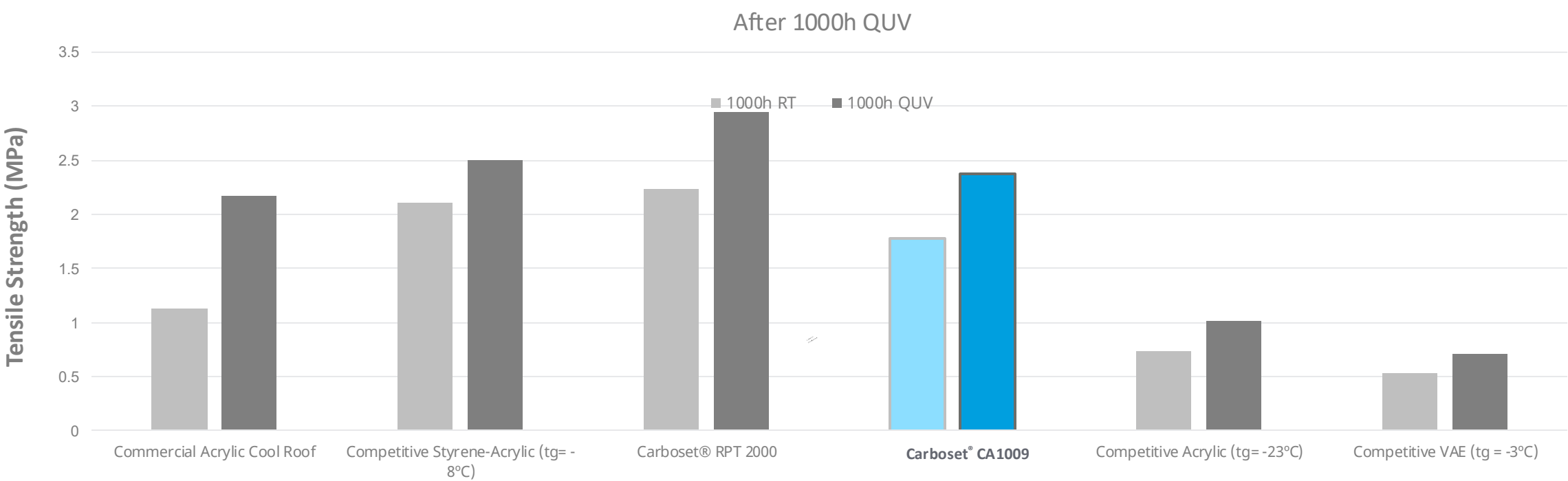
Benefit: tensile strength is related to final product walkability
and resistance to dirt pickup

Weathering Resistance



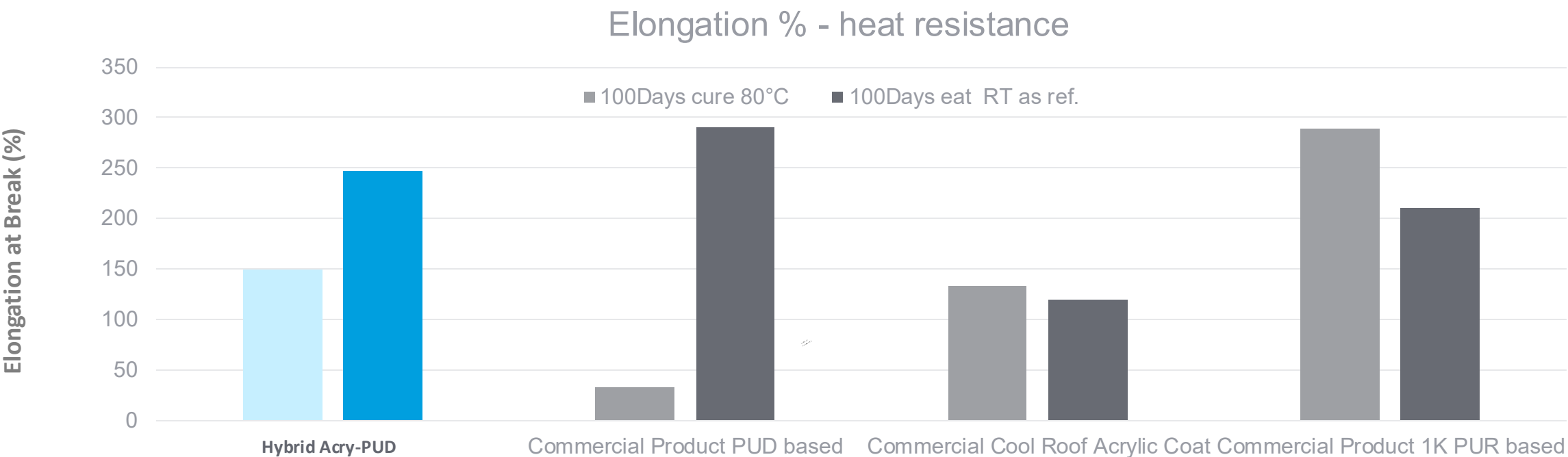
Benefit: product integrity even when subjected to UV ageing conditions. Increased working life

Weathering Resistance



Benefit: product integrity even when subjected to UV ageing conditions. Balance between elasticity and film toughness

Heat Resistance



Benefit: product integrity even when subjected to HEAT ageing conditions.

Cool Roof & Solar Reflectance

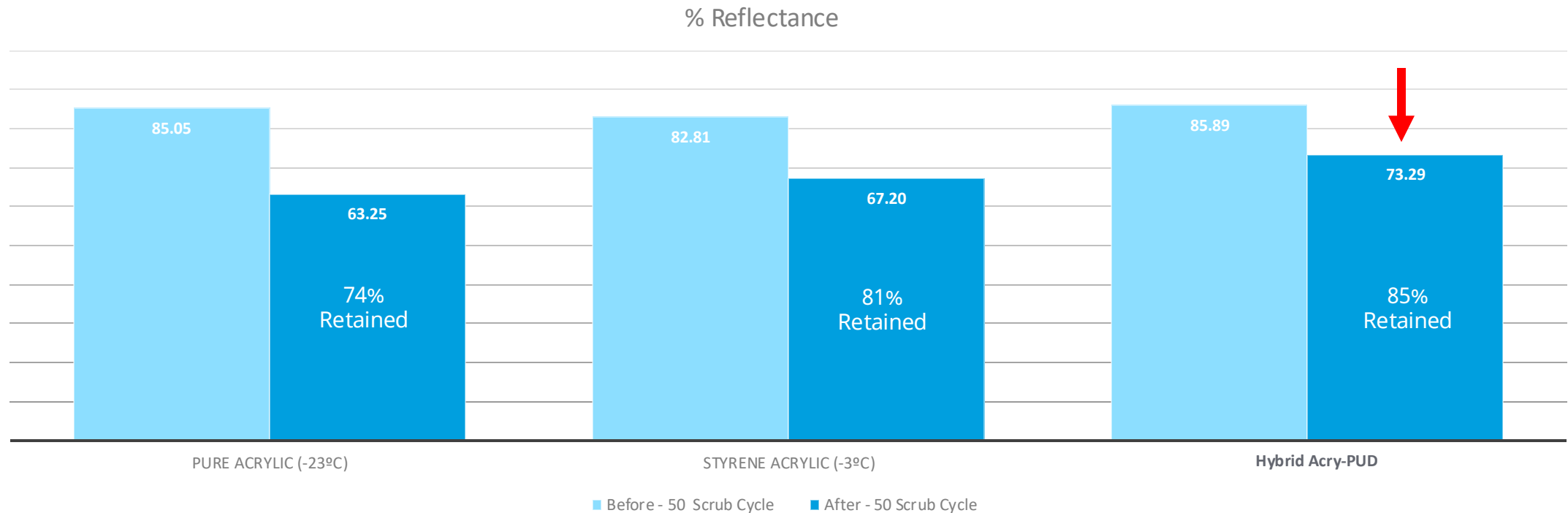
SOLAR REFLECTANCE

Solar Reflection (ASTM C1549-04) and Solar Emissivity (ASTM C1371-04a)			
Solar Reflectance >0.65 pass GS-11	0.859	0.862	0.866
Thermal Emissivity >75% pass GS-11	0.93	0.95	0.99
	Styrene-Acrylic	Pure Acrylic	HYBRID ACRY-PUD



Emissivity and reflectivity are largely influenced by the pigmentation system of the coating formulation, and less influenced by polymer choice.

Cool Roof & Solar Reflectance



Benefit: Hybrid Acry-PUD demonstrates good dirt pick-up resistance to maintain the energy efficiency over time.

Hybrid ACRY-PUD dirt pick up resistance helps keep the reflectance properties longer.

Cool Roof & Solar Reflectance

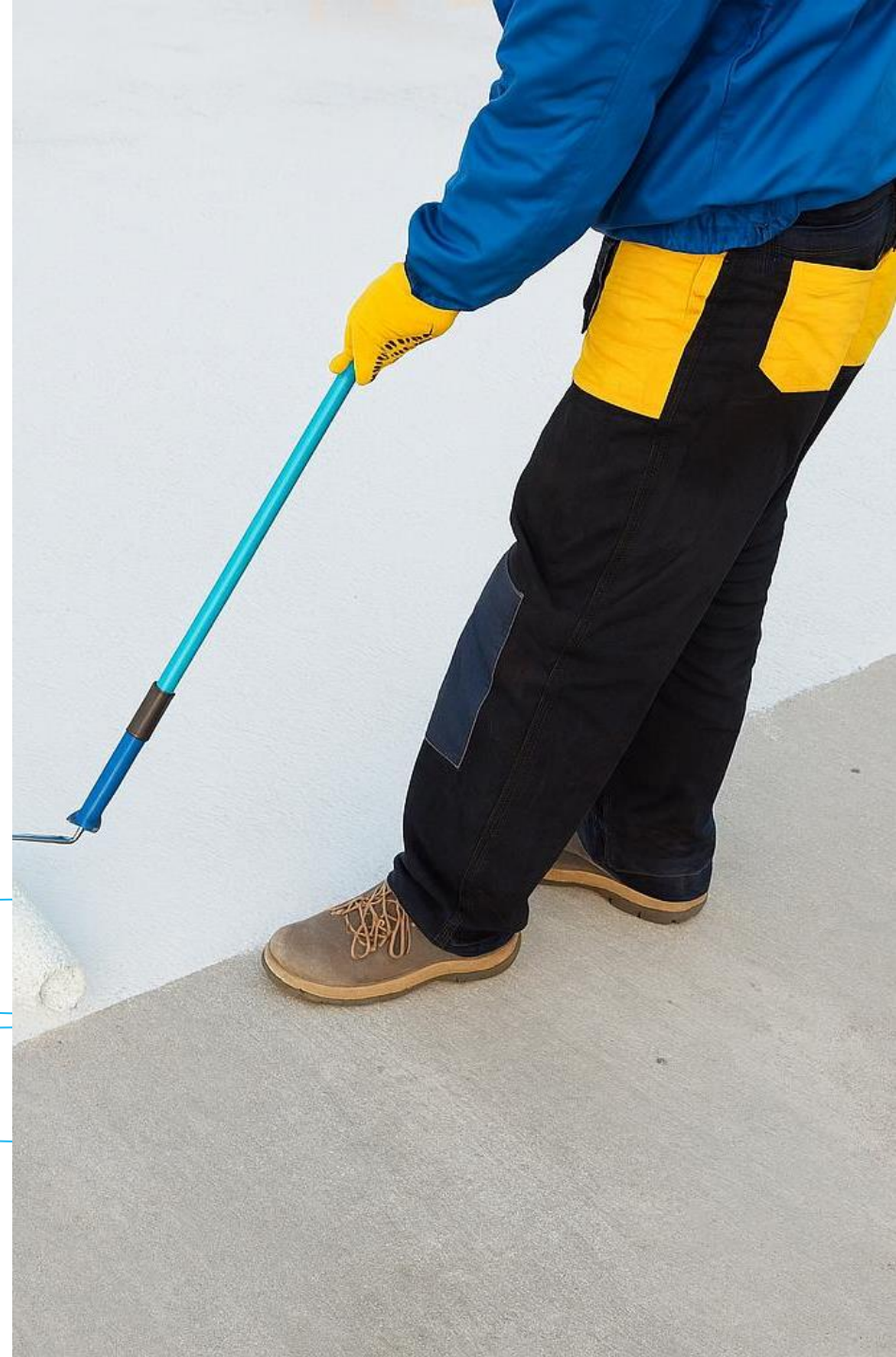
	Lubrizol Acrylic-Polurethane	Competitive Polymer 1	Competitive Polymer 2	Competitive Polymer 3	Competitive Polymer 4	Competitive Polymer 5
Primer Coating Non-Bleed Substrate						
Primer Coating Bitumen Felt Substrate	1.58	7.10	5.09	3.39	6.69	6.40
Primer Coating / Roof Tar Bitumen Felt Substrate	.97	12.11	9.64	6.64	11.32	8.75
Primer Coating / Roof Tar Bitumen Felt Substrate	1.28	6.50	2.84	2.15	5.51	3.06



Benefit: bitumen bleed-through resistance. Longer Reflectivity
Original and refurbished roofing installations. Primer or topcoat, asphaltic felts, BUR, modified bitumen, and single ply membranes

Features & Benefits Summary

Lubrizol



Summary Hybrid Acry-PUD

Features

- ✓ Hybrid technology
- ✓ Low water uptake
- ✓ Adhesion to a wide range of substrates
- ✓ Balance of mechanical properties at different temperatures
- ✓ No tack surface
- ✓ Dirt pick up resistance
- ✓ Bitumen bleed resistance

Benefits

- ✓ 100% Acrylic benefits enhanced with the PUD advantages
- ✓ Water resistance yields good film integrity even after cycles of swelling/de-swelling
- ✓ Product versatility: New and reparation jobs
- ✓ Able to stand the climatic changes
- ✓ Keeps solar reflectance for longer



What's next?

North America

- Flat roofs: Membranes
- New sustainable initiatives
- ASTM low temperatures

Europe

- Defined performance standards (ETAG)
- Sustainable solutions: Cool roofs, decarbonization, SVHC free, emissions...
- WB restricted to mild climates

LATAM

- Fibre cement, cementitious and asphalt in low slope
- Easy and efficient applications
- Cost / Performance
- Ponding water

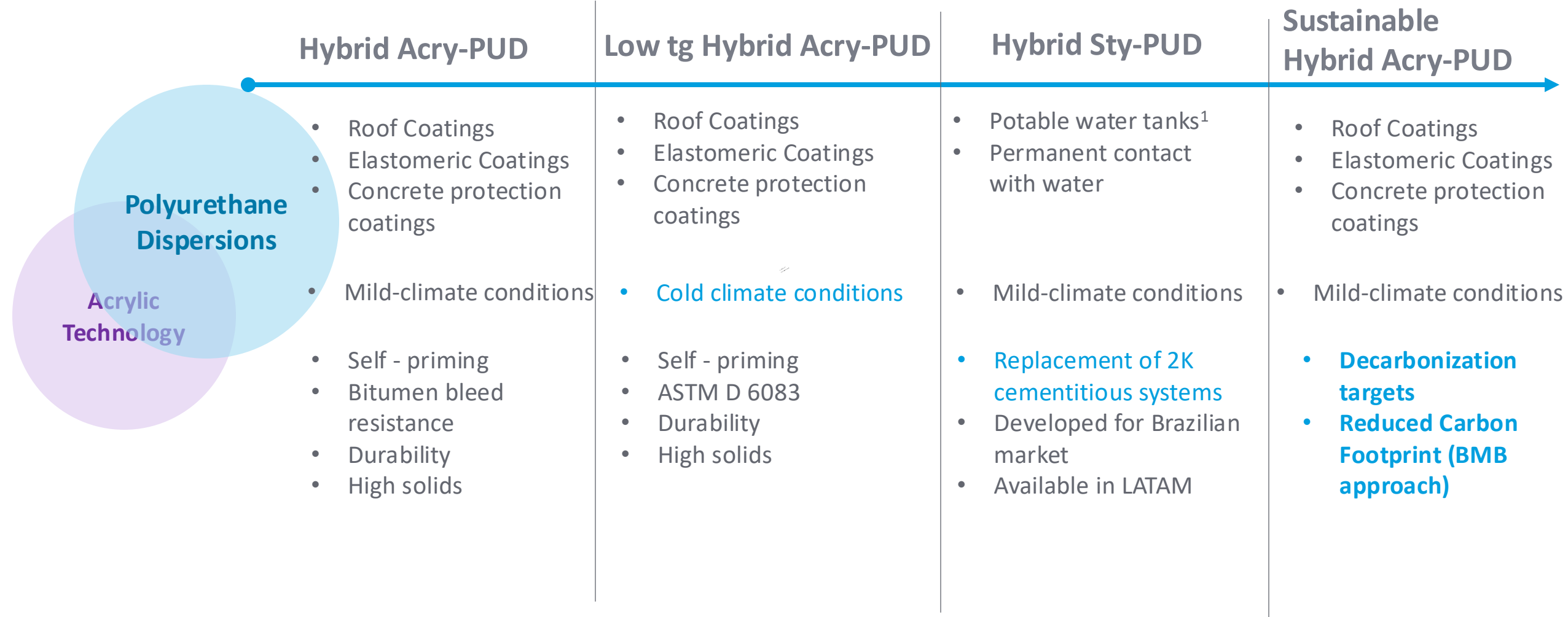
South Africa

- Cementitious and Metal substrates
- Bright colours
- Easy applications

India / SEA

- Cementitious and Metal substrates
- Easy applications
- Cool roofs demand

Water-based Acrylic Polyurethane Emulsion Technology



¹ = Potable water compliant Brazilian regulation

Thank you

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Appendix / Formulations

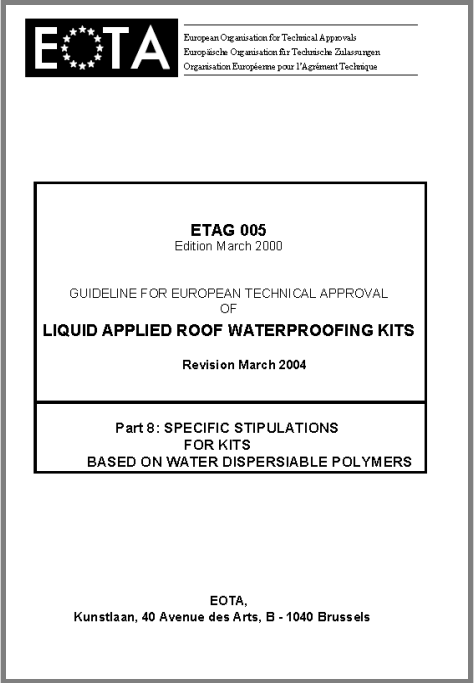
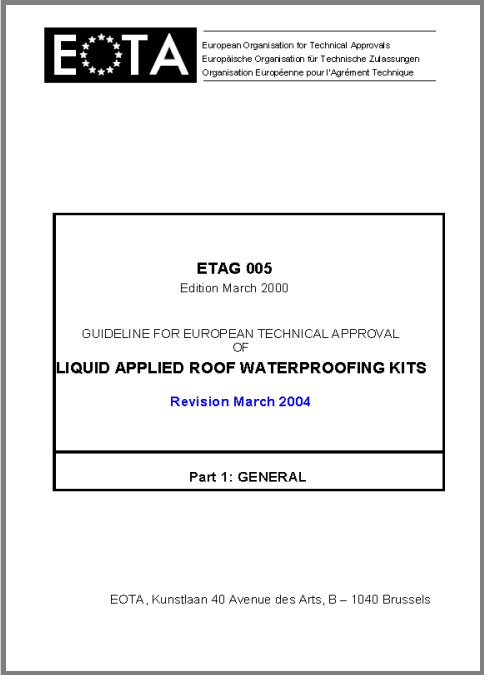


Formulation Guidelines

Material	Pounds	Gallons	% by Weight	Use
Add the following to clean let down tank with agitation.				
Carboset® CA 1009	547.00	62.08	50.00	Acrylic Dispersion
Water	79.12	9.50	7.23	
Tego® Airex 902W	2.20	0.26	0.20	Defoamer
In separate clean tank, add the following ingredients separately with continuous agitation. Mix 10 minutes.				
Water	80.98	9.71	7.40	-
Natrosol™ 250 HBR	1.10	0.10	0.10	Rheology modifier
Add the following with continuous agitation. Disperse on high speed for 20 minutes.				
Solsperse™ 41090	15.50	1.61	1.42	Dispersant
Tego® Foamex 810	2.20	0.25	0.20	Defoamer
Ti-Pure® R-706	65.59	1.97	6.00	Pigment
Omyacarb® 2SV	284.39	12.60	26.00	Filler pigment
Add the following in order listed. Mix 15 minutes.				
Texanol™	9.85	1.25	0.90	Co-solvent
Acticide® MBS	1.65	0.18	0.15	Biocide
Rheovis® PU 1214	4.35	0.49	0.40	Rheology Modifier
TOTAL	1093.93	100.00	100.00	

Physical Properties:	
Density, pounds per gallon	10.94
Specific gravity, (g/ml)	1.34
Weight solids, %	61.40
Volume solids, %	53.88
PVC, %	32.65
VOC – g/l (USA)	25.65
VOC – g/l (Europe) Method 2 ISO11890-1	1.40

ETAG 005-Part 8 – In house testing



Product Categorisation	
Working life	W2 (Ten Years)
Climatic Zone	S (Severe)
User Loads	P2 (Moderate)
Roof Slope	S1 < 5%
Minimum Surface Temperature	TL2 (-10°C)
Maximum Surface Temperature	TH3 (80°C)

EOTAG 005-Part 8 – In house testing

REF.ETAG 005-8	PROPERTY	TEST/SUBSTRATE	METHOD	RESULTS HYBRID
---	Water Vapour Permeability	Free films 2000μ	ISO 7783	Sd = 3,6m V=5,57 g/m2/d
4.2.3	Adhesion (KPa)	Ceramic	TR-004	2.000
	Min 50 KPa	Concrete		2.910
4.2.5	Static Indentation(23°C)	Steel	TR-007	L2(*)
4.2.8	Resistance to High Temperatures	Static indentation (80°C)	TR-007	L1(*)
4.2.9	Heat Resistance 80°C-100days TR-011 ISO-527-3	Tensile (MPa)	RT	0,70
			Aged	0,78
		Elongation (%)	RT	247
			Aged	149
4.2.10	UV Resistance TR-010 (UV-A) 1000 hours ("S" Severe conditions: 60°C, 5 h UV, 1h spray)	Tensile (MPa)	RT	1,78
			Aged	2,37
		Elongation (%)	RT	324
			Aged	222
4.2.11	Hot Water Resistance 30d at 60°C TR-012	Adhesion to concrete	TR-004	Not tested
		Static Indentation TR-007	60°C	L2(*)
			90°C	L2(*)

EOTAG 005-Part 8 – In house testing

REF.ETAG 005-8	PROPERTY	TEST/SUBSTRATE	METHOD	RESULTS HYBRID
4.4.1	Effect of Climate Conditions	Tensile (MPa) 21days 23°C	ISO 527-3	1,67
		Elongation(%) 21days 23°C		261
		Tensile (MPa) 21days 5°C		1,37
		Elongation(%) 21days 5°C		344
		Tensile (MPa) 21days 40°C		1,82
		Elongation(%) 21days 40°C		303
N/A	Water Uptake (%)	Free films 2000µ	2 cycles 28 days	7,57
N/A	Compatibility to Wet Concrete	Wet concrete Substrate Preparation: Concrete immersed in water for 1 week prior application.	Dry concrete	2.910
	DIN EN 13578 Adhesion (KPa)	Test conditions: After coating test pieces stored for 56 days in water bath for capillary water absorption	Wet concrete	2.150

Application Tips

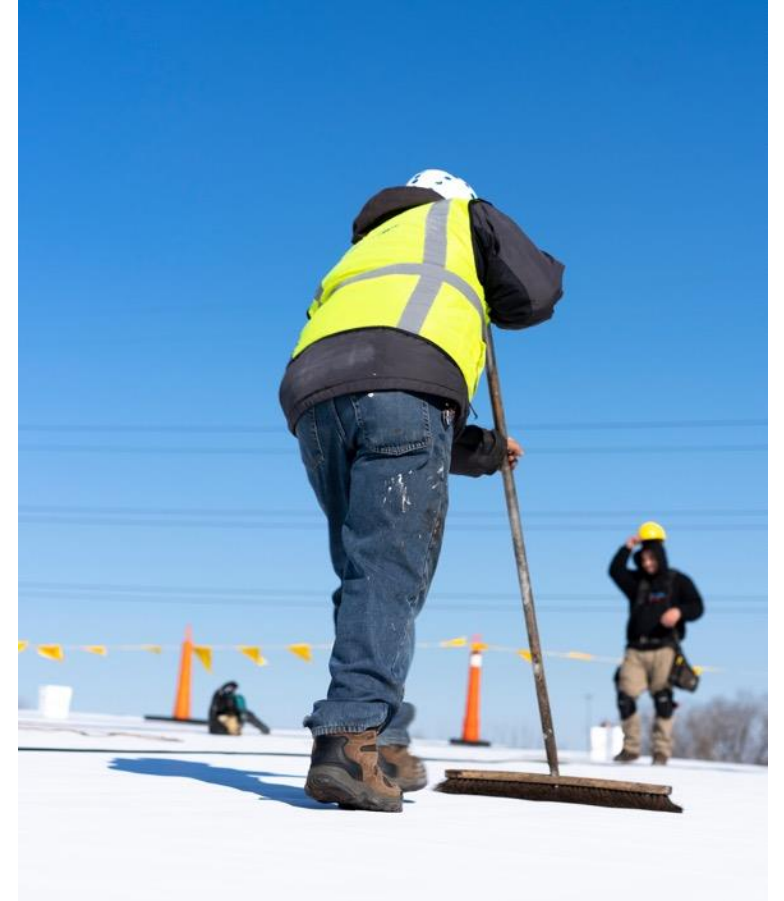


Surface Preparation

Roof Coating and Façade Coating:

- Loose particles and dust or chalk should be removed
- If sealers or release compounds were used commercial detergents may be required
- If cracks are present, repair with appropriate crack filler or reinforcement might be necessary
- Contaminants such as efflorescence should be cleaned with a slightly acidic cleaner, then thoroughly rinsing and allowing to dry
- Stains from water, smoke, or other household items that may bleed should be spot sealed with a stain blocking primer
- Loose and peeling paint should be removed with a scraper and sand paper. Mildew should be cleaned off with a dilute bleach solution
- Glossy surfaces should be sanded

** Guidelines also serve as Maintenance recommendations for repainting*



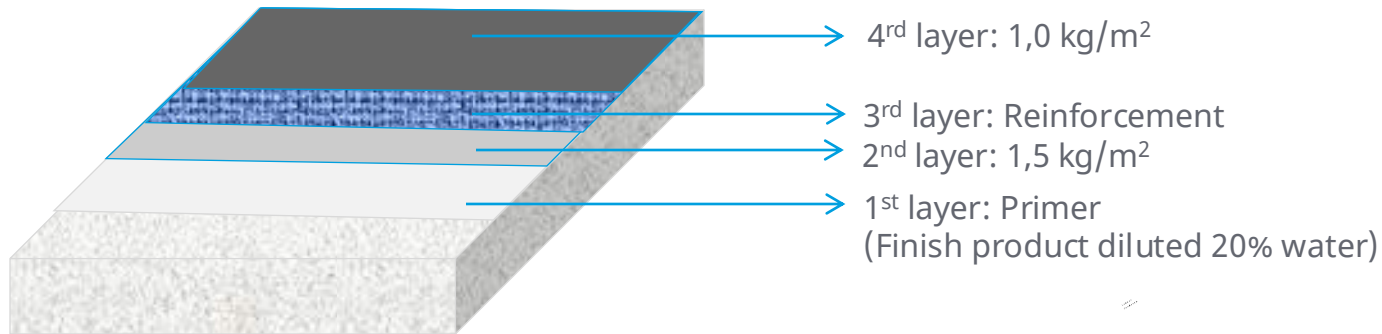
Roof Coating System Application | New Masonry Substrate

Vertical Application: Façade Coating

- Two separate coats recommended to minimize film imperfections
 - Small defects can have dramatic effect on water & efflorescence resistance.
 - Spreading rate of approx. 250 gr/m² for each layer or coat depending on substrate porosity. The use of a primer might be necessary depending on this. Carboset®CA1009 based product could be diluted and could be used as a primer.
- Allow 24 hours between applications for complete coalescence.

Roof Coating System Application | New Masonry Substrate

Horizontal Application: Roof Coating (*)



- Depending on the working life-durability, application system might change being reduced or increased in number of layers.
- Allow 24 hours between applications for coalescence.

