

“The Green Deal and the coatings industry”

Latest developments in biobased resins for paints and coatings.

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octima

organizzazione per la chimica e per la tecnologia innovativa dei materiali avanzati
organization for chemistry and innovation technology of advanced materials



Table of contents

- Alberdingk Boleys history in biobased products
- Future strategy
- Wishful thinking vs reality
- Decorative paints
- Metal coatings
- Wood Coatings





Green for 250 years

It's in our DNA: oils, oleo chemicals and waterborne dispersions

- Products based on vegetable oils are part of our legacy
- Alberdingk Boley has never been involved in solventborne products!





Green for 250 years

- **Since 1970:**
Waterborne products
- **Since 1994:**
Waterborne PU dispersions based on
castor oil
- **Since 2005:**
Waterborne Polyurethane dispersions
based on linseed oil
ALBODUR[®] polyols based on castor oil





Future strategy

- Continue development of PUDs based on castor or linseed oil and other renewable resource materials
- Development of acrylics based on renewable resource materials
- Certification for Biomass-Balance production





Wishful thinking vs reality



- Customers would like to be able to purchase „true“ biobased products
 - With >50% renewable content
 - For not more than 20% higher cost
- Large chemical companies show little interest in segregated processes
- Biobased acrylate monomers only made in batch processes
- Availability of biobased raw materials is limited
- War in Ukraine will increase the ethical discussion about biobased chemistry
- New structures will most likely not be compliant with e.g. food contact regulations

Biobased Polymers

Products for decorative coatings





ALBERDINGK® CUR 751 VP



Flexible, amine free, castor oil modified polyurethane dispersion

Technical data:

- Solids content: 34 -36%
- Viscosity: 100 - 2000 mPas (product is shear thinning)
- pH-value: 7.0 – 8.5
- MFFT: 0°C
- **renewable resource content: approx. 51% (on solids)**



ALBERDINGK[®] CUR 751 VP



Flexible, amine free, castor oil modified polyurethane dispersion

Features:

- Silicate compatible
- Excellent wet scrub resistance
- Extremely low odour
- Excellent pigment & extender compatibility & tolerant to high pH-values

What is the suggested field of application?

- For highly pigmented and filled coatings based on renewable resource polymer.



CUR 751 VP – preservative free paint FP 751-01



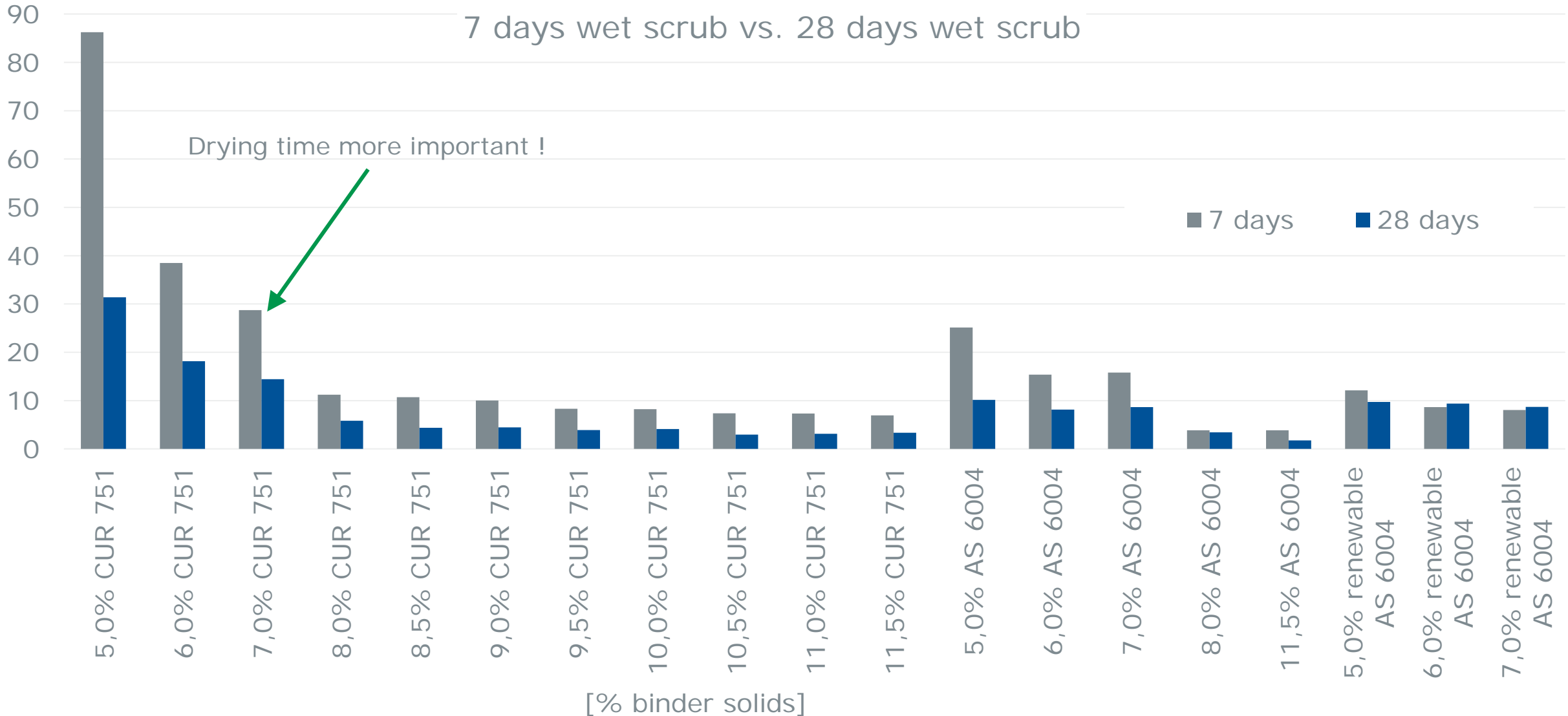
Pos.	Raw Material	Amount	Product	Supplier
1	Water (deion.)	16.90		
2	Bermocoll EHM 300	0.20	rheology control-additive	Nouryon
3	Dispersogen SP Plus	0.40	dispersant	Clariant
4	BYK-014	0.30	defoamer	BYK Chemie
5	Kronos 2190	11.30	pigment	Kronos
6	Omyacarb 10G	10.00	extender	OMYA
7	Dorkafill H	10.00	extender	Dorfner
8	Dorkafill Pro Void	8.00	extender	Dorfner
9	Alberdingk [®] CUR 751 VP	32.90*	castor-oil based PU-dispersion	Alberdingk Boley
10	Betolin K 28	10.00	K-silicate binder	Woellner
	Total	100.00		

*Optimised binder content for class 2 paint:

11.6% resin solids



CUR 751 VP – wet scrub resistance in FP 751-01





CUR 751 VP – CO₂ reduced paint FP 751-02



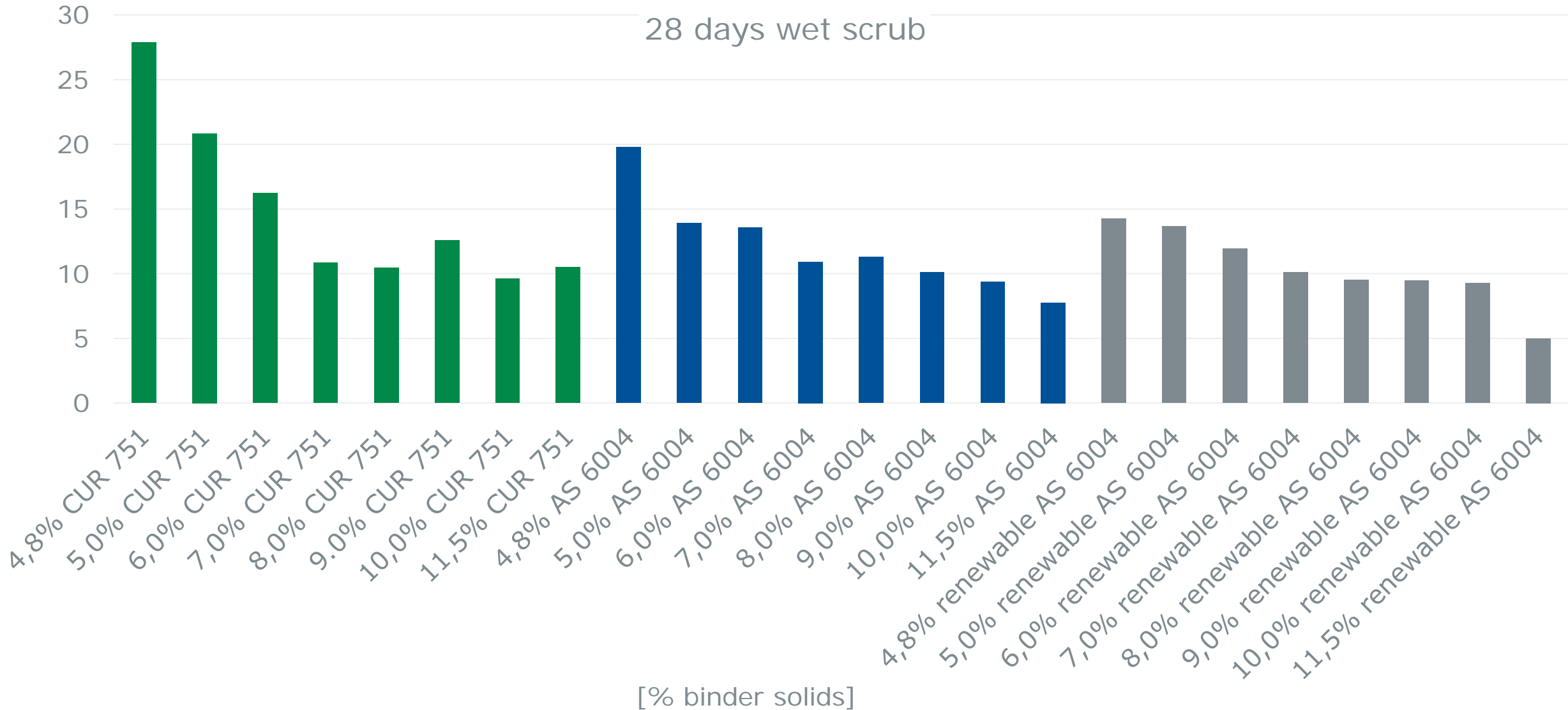
Pos.	Raw Material	Amount	Product	Supplier
1	Water (deion.)	20.20		
2	Bermocoll EHM 300	0.20	rheology control-additive	Nouryon
3	Dispersogen SP Plus	0.40	dispersant	Clariant
4	BYK-014	0.30	defoamer	BYK Chemie
5	Kronos 2190	8.00	pigment	Kronos
6	Omyacarb 5 GU	29.00	extender	OMYA
7	AlphaTalc CT 30P	8.00	extender	Alpha Calcit
8	Alberdingk [®] CUR 751 VP	20.00*	castor-oil based PU-dispersion	Alberdingk Boley
9	Betolin K 28	14.00	K-silicate binder	Woellner
Total		100.00		

*Optimised binder content for class 2 paint:

7% resin solids



CUR 751 VP – wet scrub resistance in FP 751-02





Commercial biobased paint comparison



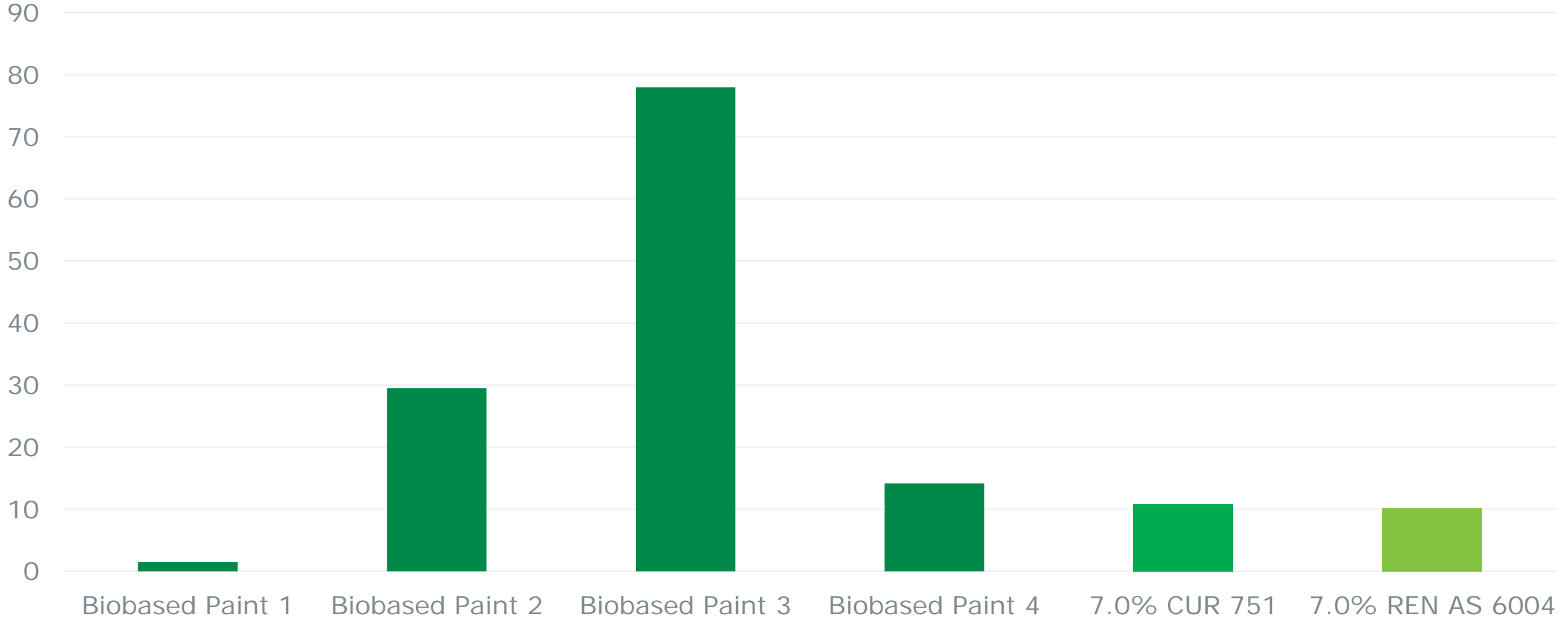
Name	Biobased Paint 1	Biobased Paint 2	Biobased Paint 3	Biobased Paint 4	AB-SPF CUR 751	AB-SPF REN AS 6004
resin type	alkyd	potato starch/styrene acrylic/silicate	acrylic	acrylic	PUD	styrene acrylic
biobased C ₁₄ (ASTM D6866) (%)	ca. 95	ca. 16	ca. 49	ca. 53	ca. 50	ca. 40
solids (%)	ca. 66,2	ca. 47,5	ca. 62,5	ca. 56,6	ca. 56,3	ca. 56,3
TiO ₂ content (%)	ca. 20,8	ca. 9,5	ca. 25,7	ca. 16,8	ca. 10	ca. 10
organic content (%)	ca. 18,0	ca. 6,1	ca. 15,3	ca. 13,4	ca. 7	ca. 7



Comparison of commercial paints vs. AB formulations



Wet scrub resistance after 28 days





Conclusion decorative coatings



- New biobased, castor oil PUD offers superior wet scrub resistance
- Odour of paints based on castor oil is lower than in other biobased paints
- Castor oil based PUD is suitable for standard paint formulations as well as preservative free paints with high pH
- Properties of CO-PUD and biobased styrene acrylics are comparable
- Castor oil has a positive ethical aspect as it's not in competition with food crops

Biobased Polymers

Products for metal coatings





ALBERDINGK[®] REN AC 8403 VP



Biobased, self-crosslinking, multiphase acrylic dispersion

Technical data:

- Solids content: 46 - 48%
- Viscosity: 200 – 2.000 mPas
- pH-value: 8.0 – 9.0
- MFFT: ca. 20°C
- **renewable resource content: approx. 30% (on solids)**



ALBERDINGK[®] REN AC 8403 VP



Biobased, self-crosslinking, multiphase acrylic dispersion

Features:

- Super hydrophobic polymer film
- Multi substrate adhesion
- Efflorescence resistance

What is the suggested field of application?

- For biobased metal coatings (C5 very high) , stick to anything paints, primer and concrete coatings



Comparison of AC 2403 vs. REN AC 8403 VP after 168 h NSST

ALBERDINGK® AC 2403



ALBERDINGK® REN AC 8403 VP





Comparison of AC 2403 vs. REN AC 8403 VP after 1340 h NSST

ALBERDINGK® AC 2403



ALBERDINGK® REN AC 8403 VP





Comparison of AC 2403 vs. REN AC 8403 VP after 1340 h NSST

ALBERDINGK® AC 2403



ALBERDINGK® REN AC 8403 VP

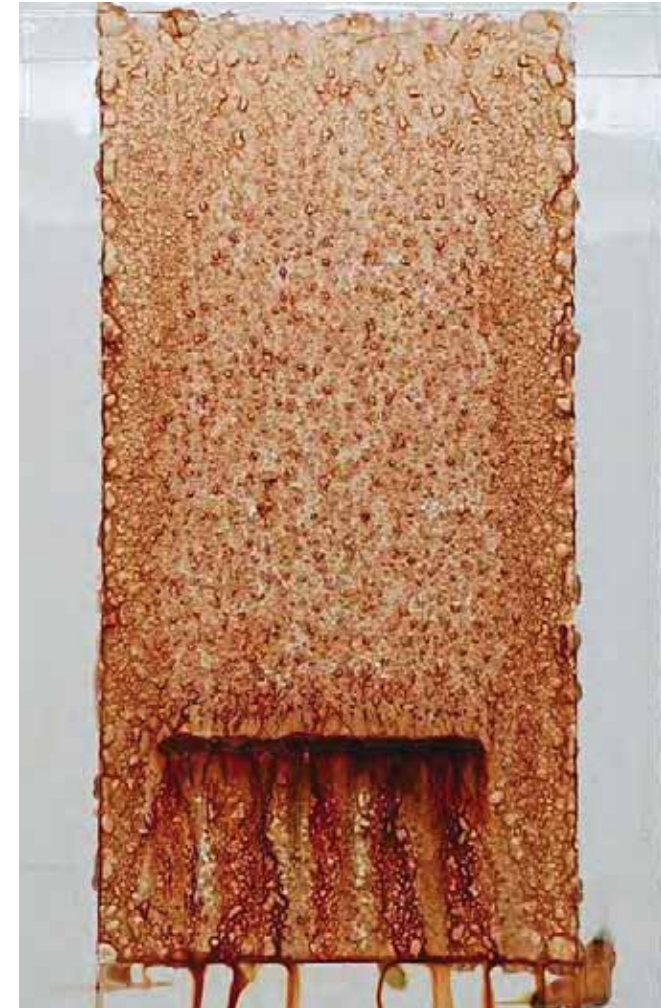




REN AC 8403 VP comparison to commercial primer after 168 h NSST

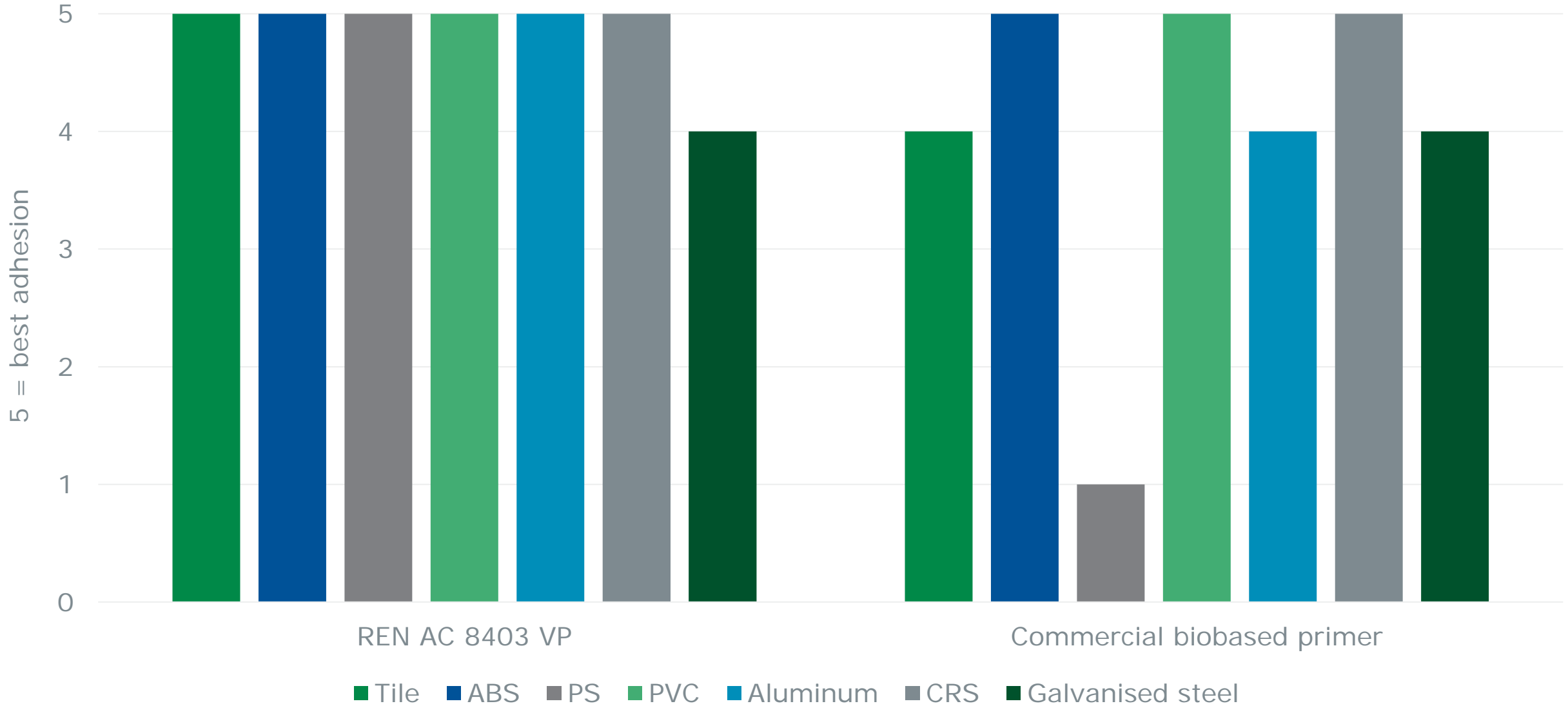
ALBERDINGK® REN AC 8403 VP

Commercial biobased primer





Comparative adhesion testing on various substrates





Conclusion metal coatings



ALBERDINGK[®] REN AC 8403 VP offers same corrosion performance than current standard product (ALBERDINGK[®] AC 2403)

- Complies with DIN EN ISO 12944-6:2018 category „C5 very high“

Biobased Polymers

Products for wood coatings





ALBERDINGK[®] REN AC 8742 VP



Biobased, self-crosslinking, multiphase acrylic dispersion

Technical data:

- Solids content: 46 - 48%
- Viscosity: 2000 – 4.000 mPas
- pH-value: 7.5 – 8.5
- MFFT: ca. 45°C
- **renewable resource content: approx. 20% (on solids)**



ALBERDINGK[®] REN AC 8742 VP



Biobased, self-crosslinking, multiphase acrylic dispersion

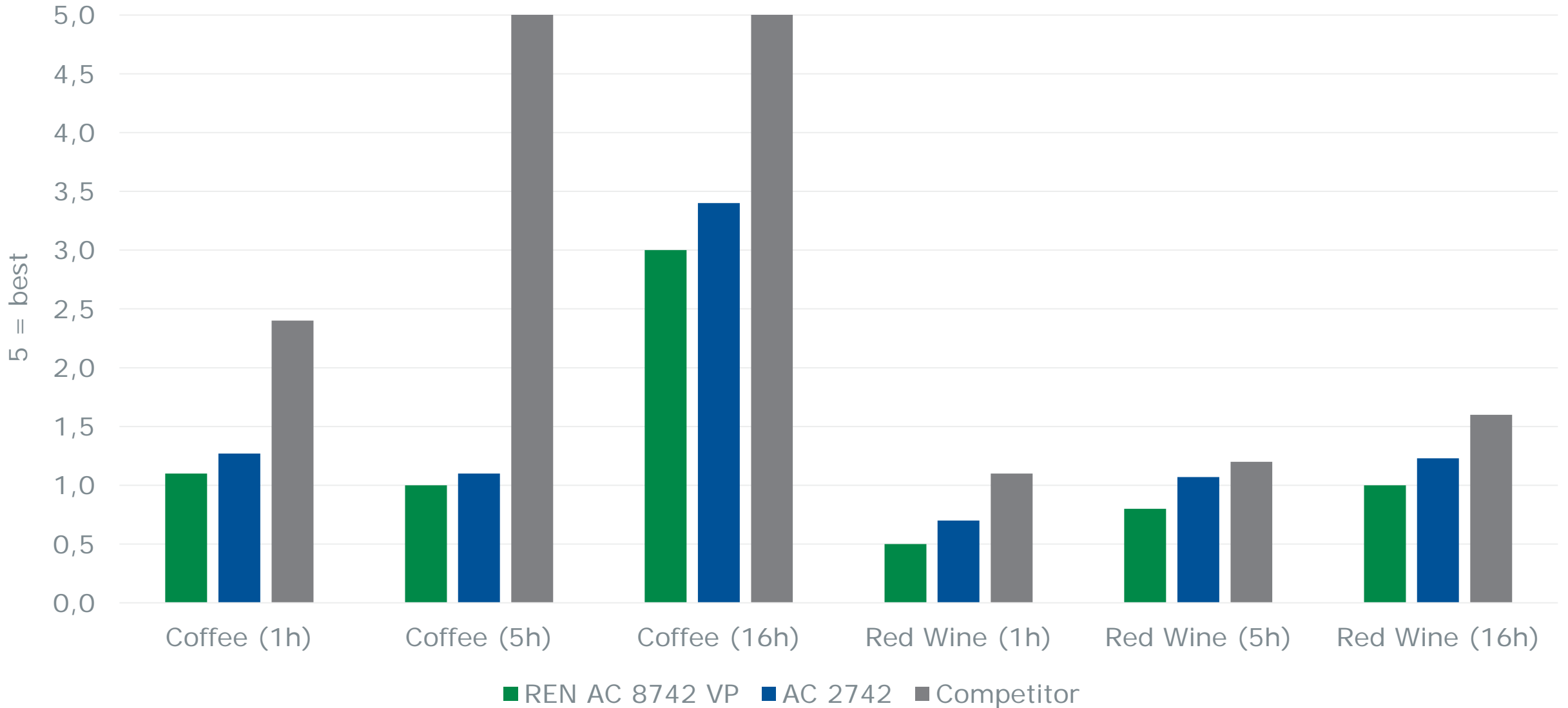
Features:

- very hydrophobic polymer film
- excellent stain resistance
- very good pigment wetting

What is the suggested field of application?

- For biobased wood and plastic coatings with excellent stain resistance

Stain resistance – ΔE , white pigmented



ALBERDINGK® LUR 3



Solvent-free, aliphatic polyurethane dispersion based on linseed oil

Technical data:

- Solids content: 34 - 36%
- Viscosity: 20 – 400 mPas
- pH-value: 7.5 – 8.5
- MFFT: ca. 0°C
- **renewable resource content: approx. 50% (on solids)**



ALBERDINGK[®] LUR 3



Solvent-free, aliphatic polyurethane dispersion based on linseed oil

Features:

- very hydrophobic polymer film
- no need for siccatives, due to high molecular weight
- superior weathering resistance

What is the suggested field of application?

- For biobased wood and concrete coatings

LUR 3 weathering resistance



Formulation Proposal FP 3600-12

Decking stain, based on Alberdingk[®] AC 3600

& **Alberdingk[®] LUR 3**

After 3 years outdoor weathering





Weathering resistance of clear varnish LUR 3



After 2 years outdoor weathering

Left to right:

- LUR 3
- LUR 3 + 10% Lignocure 2010
- LUR 3 + 20% Lignocure 2010
- LUR 3 + 30% Lignocure 2010





Conclusion



- Biobased polymers (acrylic, styrene acrylic, polyurethane, etc) are offering same or sometimes even better performances
- Availability and prices of raw materials remain the key issue for commercial success
 - Acrylic monomers rely on biobased alcohols -> long chain = high biobased content
 - Limitations in processing
 - High Tg products are currently offering lower biobased content
- Paint manufacturers are facing more difficulties to “market” biobased in e.g. DIY stores
- Large brand owners with sustainability targets are “pulling” to get more sustainable solutions

Conclusion



- Industry needs to invest in people for the regulatory part
 - LCA generation, data collection = higher cost (similar to REACH implementation)
 - LCA data for raw materials needs to be improved
- Investment in data collection for energy consumption
- Focus only on biobased content is senseless as e.g. TiO₂ content is a major contributor to CO₂ emissions
- New labels, which should be easy to understand should be used for a harmonised approach in biobased coatings “Green Angel” or “Grüner Engel”





Conclusion



- Coatings with certain compliance (FDA, Swiss O., etc) will need “old” structures but biobased content
 - e.g. Bio-Butyl and Biobutylmethacrylate for food contact coatings
- Mass balance approach will need a breakthrough as chemical industry otherwise won't be able to meet their climate goals

Thank you very much for your attention!



Disclaimer:

The aforesaid information is based on our present state of knowledge and shall inform about our products and their application possibilities. It is not intended to assure certain characteristics of the products and their suitability for precise application fields. Products including "VP" in their label are trial products during test stage. For these products Alberdingk Boley is only able to provide preliminary characteristics without obligation. Please consider possible industrial property rights. Subject to change without prior notice. ALBERDINGK® and ALBODUR® are registered trademarks of ALBERDINGK BOLEY GmbH or an affiliate thereof in one or more, but not all, countries. Possible trademark rights of third-party products mentioned have to be observed.

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