

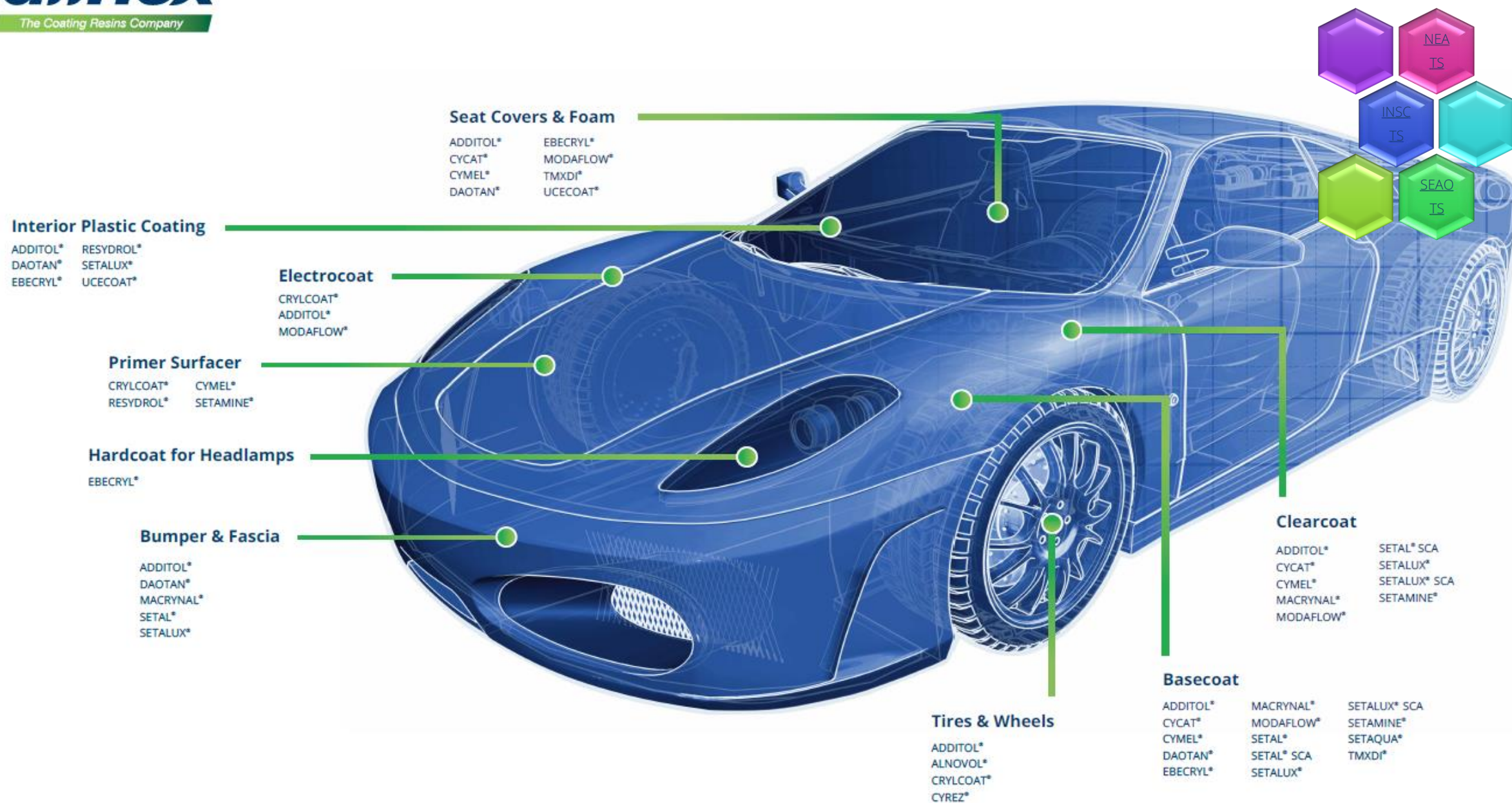
VEHICLE REFINISH

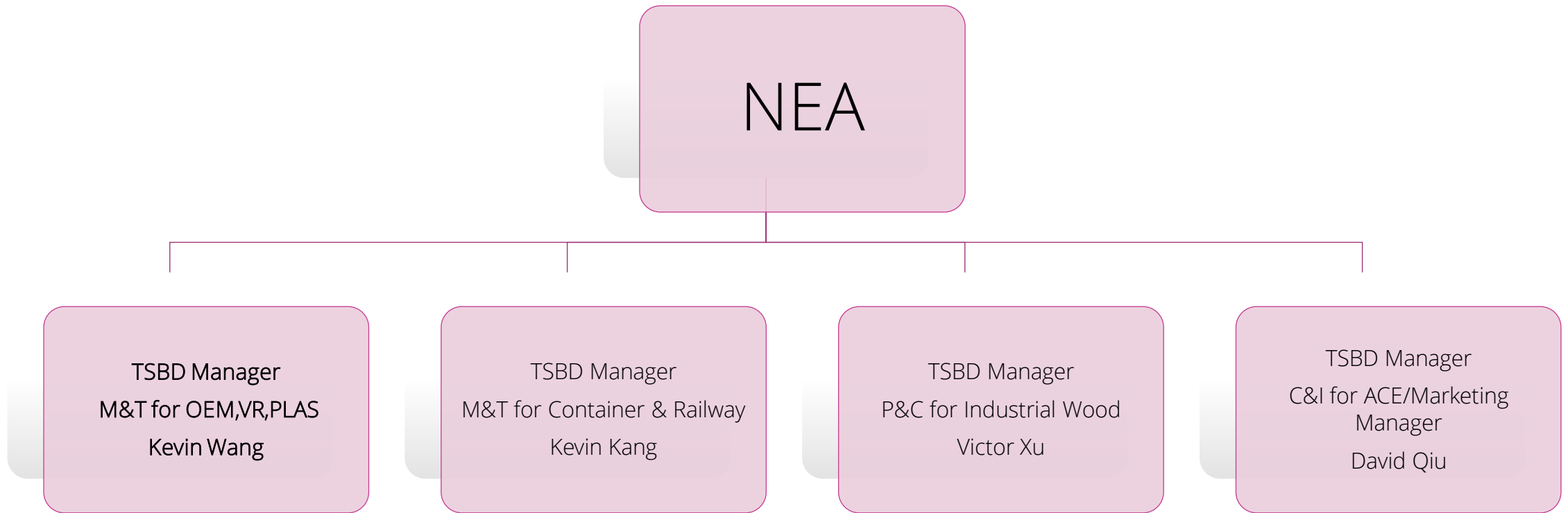
Products for Vehicle Refinishes Application



Mobility & Transportation

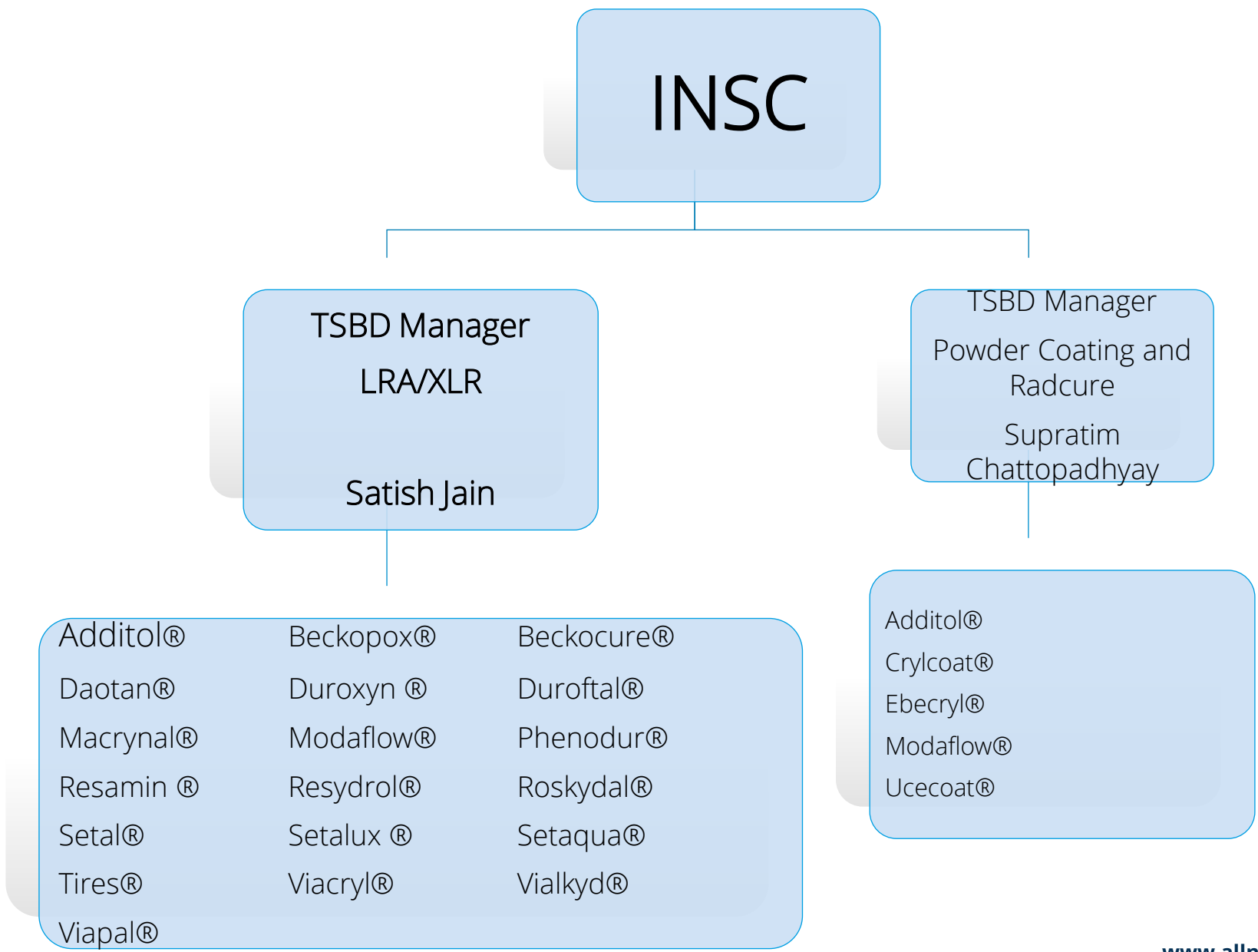


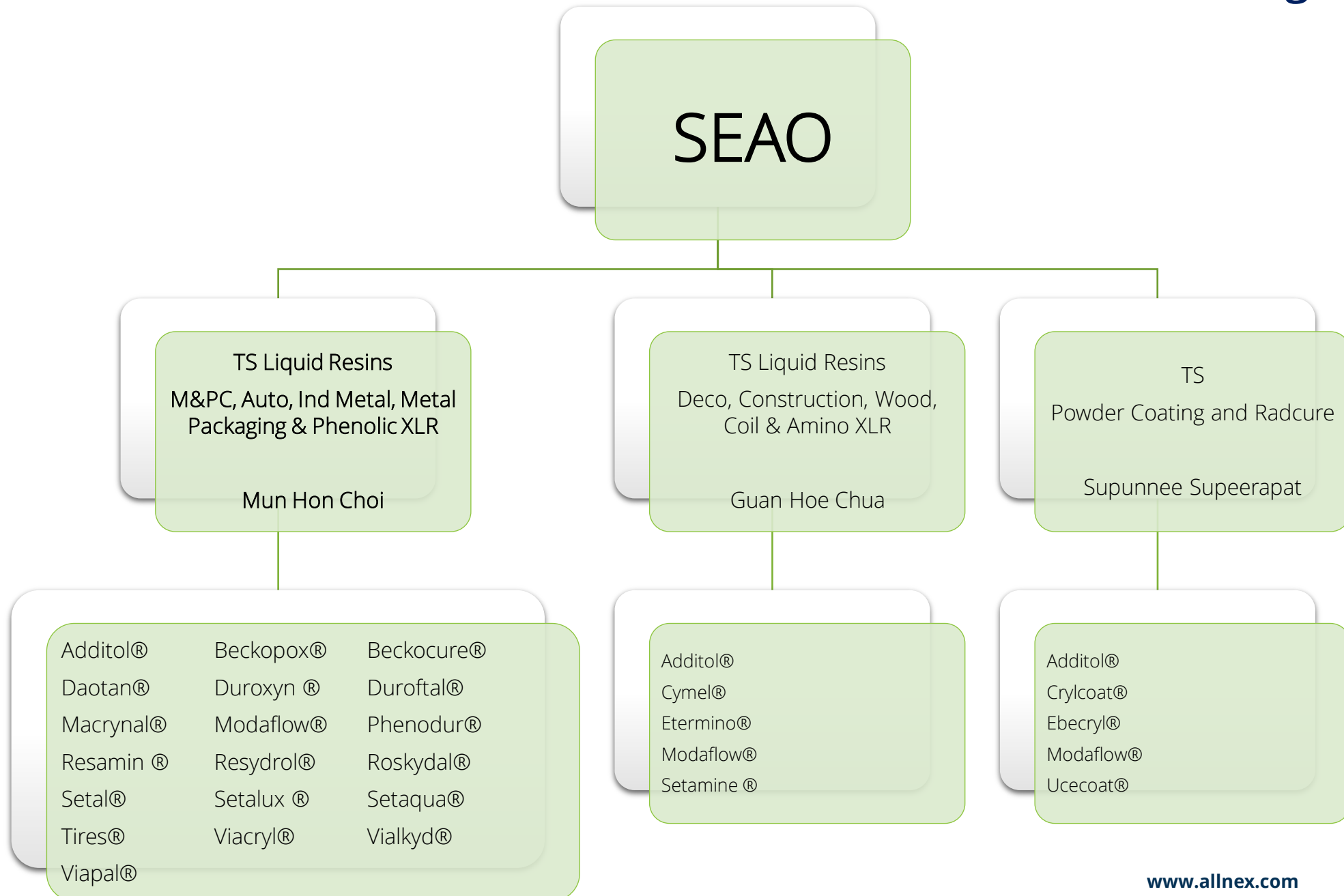




Note:

C&I = Construction & Infrastructure
MT = Mobility & transportation
P&C = Packaging & Consumer





Agenda resin for VR application

- Introduction to the VR market
- Technology
- Resins for each coating layer
- VR brochure



Vehicle Refinish vs Commercial Vehicles

Vehicle Refinish

Car Repair after incidence or accident

Pre-delivery remedial work to new cars / light vans

Painting is mostly done in body shops (about 80.000 in >130 countries*)

Commercial Vehicles

Coating of trailers

Livery painting and repair of commercial vehicles

Fleet renovating and repair

Manufacturing of Light CV (maximum 3.5 tons)

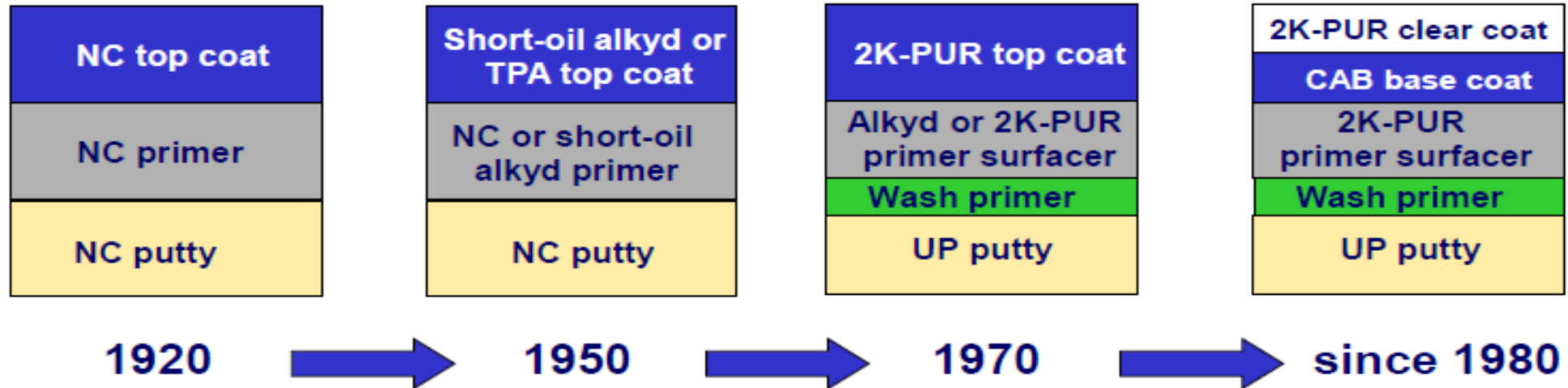
Manufacturing of Heavy CV (buses, coaches, trucks)

} mostly OEM type applications



*source Axalta

Vehicle Refinish Market



Drivers for technology changes:-

- Quality
- Efficiency
- Since ecological aspect- VOC legislation, green concept/water borne system

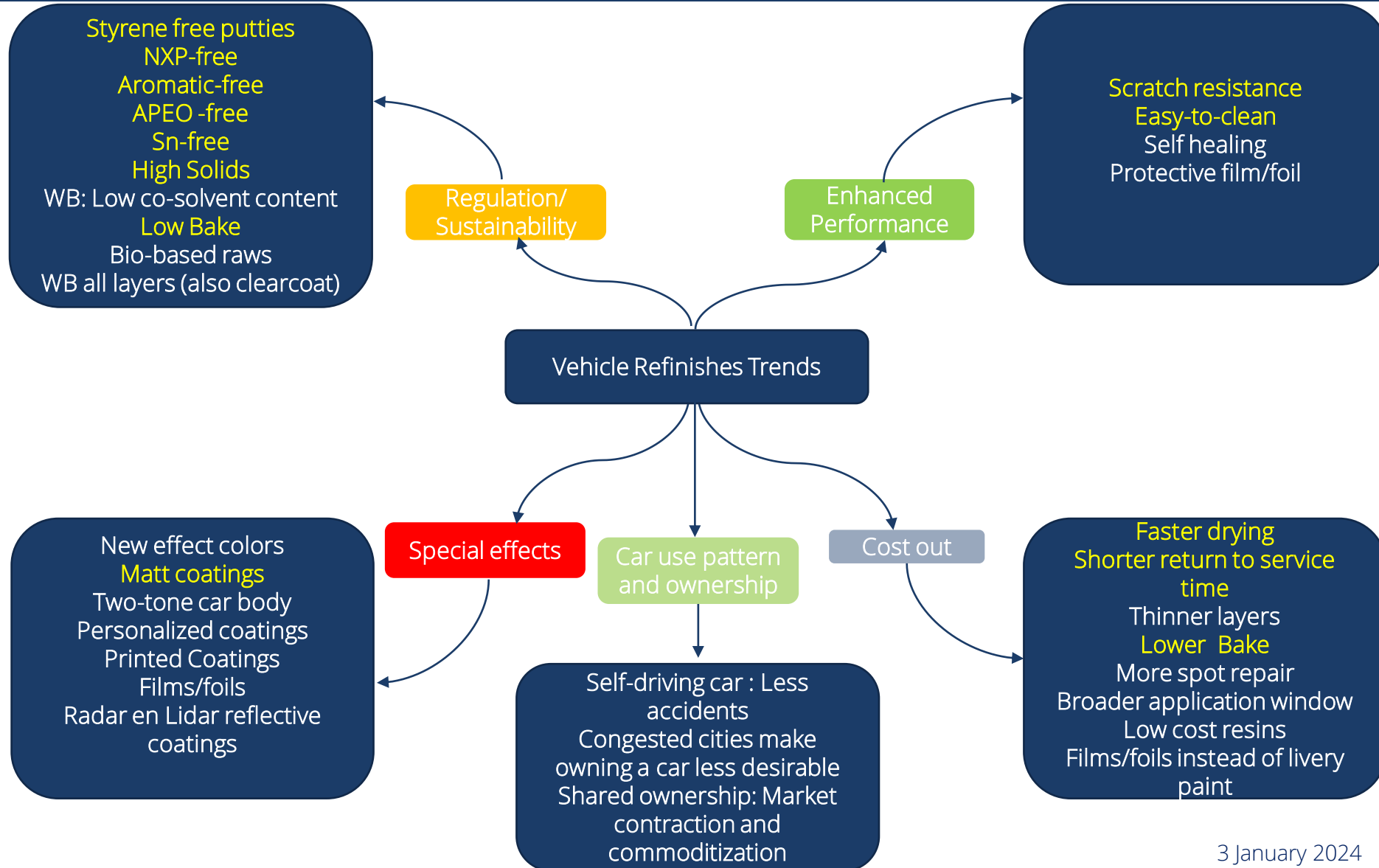
In ROA, still got market for NC putty, NC+ SOA, MOA, TPA & epoxy system – Cost orientated

Buying criteria

1st tier companies : resin quality, innovation

2nd tier companies : technical support

Vehicle Refinishes – Market Trends



Drying/curing: physical and/or oxidative and/or self-crosslinking

ALKYD

Short Oil Alkyds

Medium Oil Alkyds

Long Oil Alkyds



Several modifications to boost performance properties

ACRYLIC

Thermoplastic acrylics with high molecular weight and Tg

EPOXY:

Cationic epoxy amine adduct

Epoxy Esters

Copolymer: polybutadiene based

Technology – 2K UNSATURATED POLYESTER (body filler/putty)

Drying/curing: initiated polymerization reaction of resins with double bond functionality, usually in reactive solvent (styrene, vinyl toluene)

ACCELERATED: unsaturated polyester with amine (ROSKYDAL K types)

NON-ACCELERATED: unsaturated polyester (gloss polyester)

Important parameters:

Reactivity balanced with stability

Flexibility balanced with hardness

Hardener: peroxide based initiator

Technology – 2K EPOXY (primer surfacer)

Drying/curing: reaction of poly-amines with epoxy functional resins

EPOXY: Bisphenol A/F glycidyl ether based (flexibilized)

Liquid epoxy resins

Solid epoxy resins (mainly type 1)

AMINE: polyfunctional (primary) amines

Adduct

Mannich Base

Polyamidoamine

Important parameters:

Equivalent Weight, Reactivity, Flexibility

Technology – 2K POLYURETHANE

Drying/curing: reaction of isocyanates with hydroxyl functional resins

ACRYLIC POLYOL (APO): low, medium or high solids

POLYESTER POLYOL (PPO)

Important parameters:

Hydroxyl content (OH%)

Hydroxyl type (primary, secondary)

Hardener: poly-isocyanates (not *allnex*)

2K POLYURETHANE

Polyurethane (PU) is widely used as a binder in the worldwide paint and coating industry. Since solvent-borne 2K PU coatings were introduced around 1960, they have become the dominant coating technology wherever quality and efficiency are the main drivers.

PU can offer high quality finishes, also..

- High gloss

- Excellent outdoor durability

- Excellent chemical resistance

- Excellent mechanical properties- stone chip or impact resistance

- Good abrasion resistance

- Good water resistance

- Good adhesion on variety substrates like metal, plastic, wood and concrete

2K PU widely used in many coating market segment



Auto OEM & VR



MPC



ACE & Rails



Motorcycles & Plastics



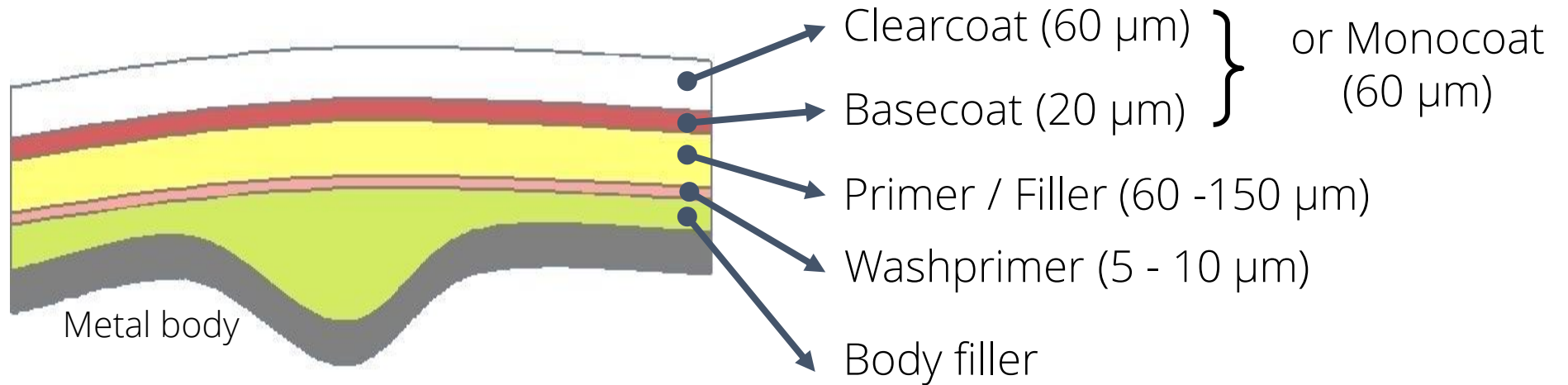
Ind wood



Deco & Floor



Vehicle Refinish layers



Vehicle Refinish Body Filler

Basic functions

Filling of holes and pores in the substrate

Further equalizing of unevenness

Adhesive layer for primer

Resin Requirements

Good thermo-stability

Good filling

Fast curing, even at low temperatures, for quick recoatability

Good dry sandability

Good adhesion



Body filler resins – Knife Putties

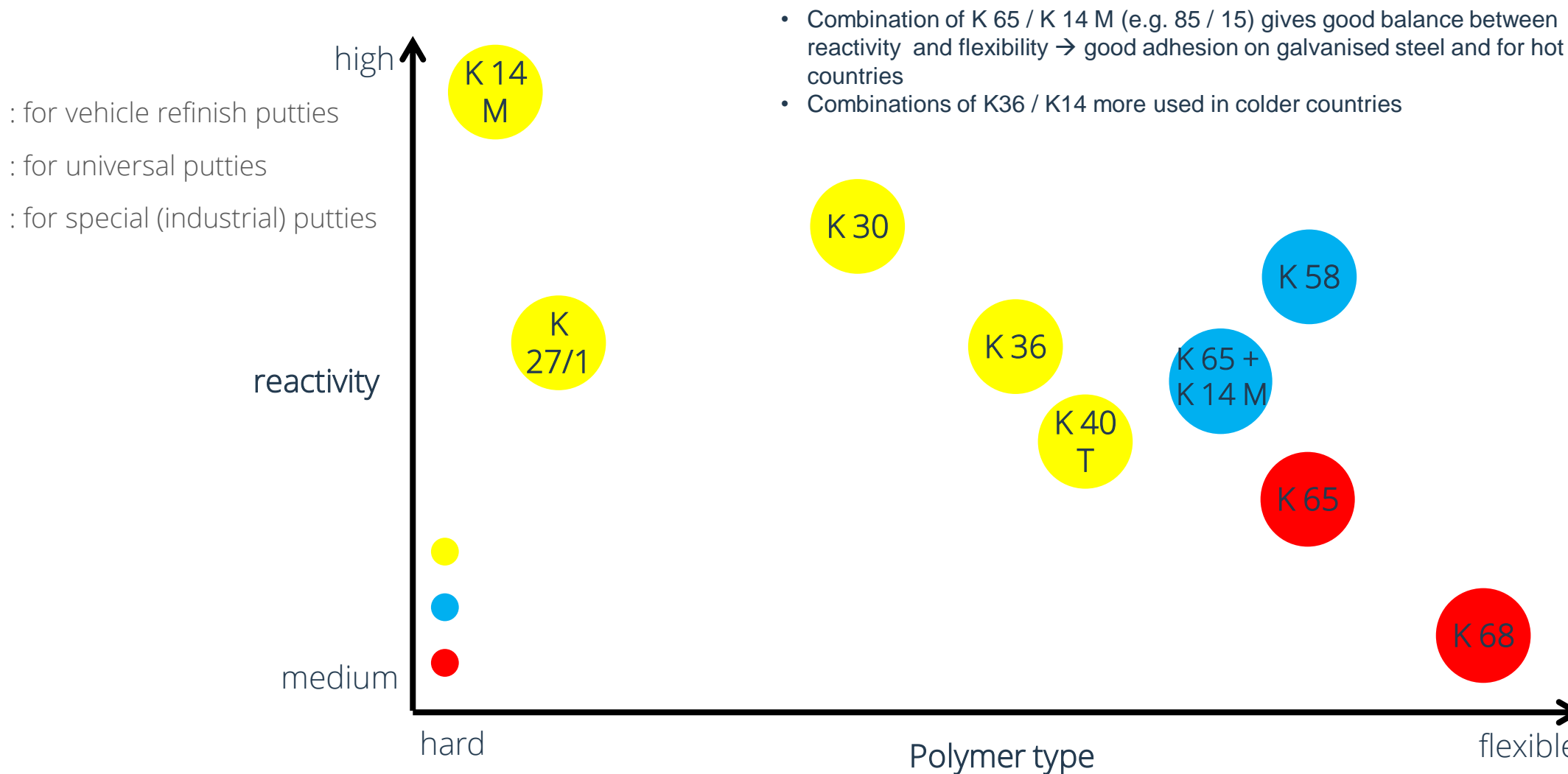
ROSKYDAL K-types - amine accelerated:

ROSKYDAL K 14 M	highest reactivity, yields hard polymers, combination resin
ROSKYDAL K 27/1	high reactivity, yields hard polymers
ROSKYDAL K 30	high reactivity, hard to medium flexible polymers
ROSKYDAL K 36	high reactivity, medium flexible polymers
ROSKYDAL K 40 T	thixotropic binder, high reactivity, medium flexible polymers
ROSKYDAL K 58	high reactivity, flexible polymers
ROSKYDAL K 65	medium reactivity, flexible polymers
ROSKYDAL K 68	medium reactivity, highly flexible polymers

All supplied in styrene

K 14M and K65 now also available in Vinyl Toluene

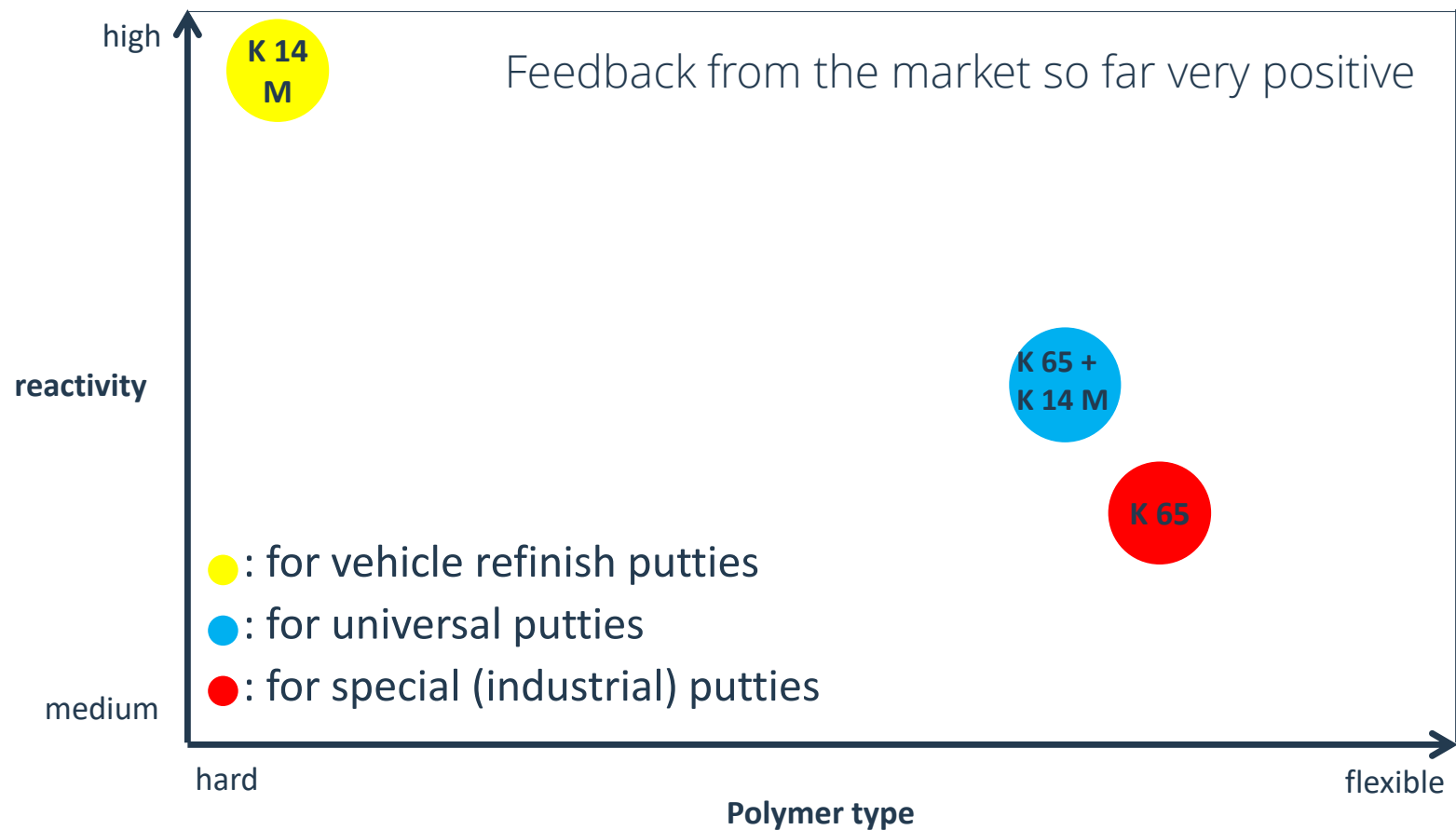
Body filler resins – Reactivity and Flexibility



Vinyl toluene based resins

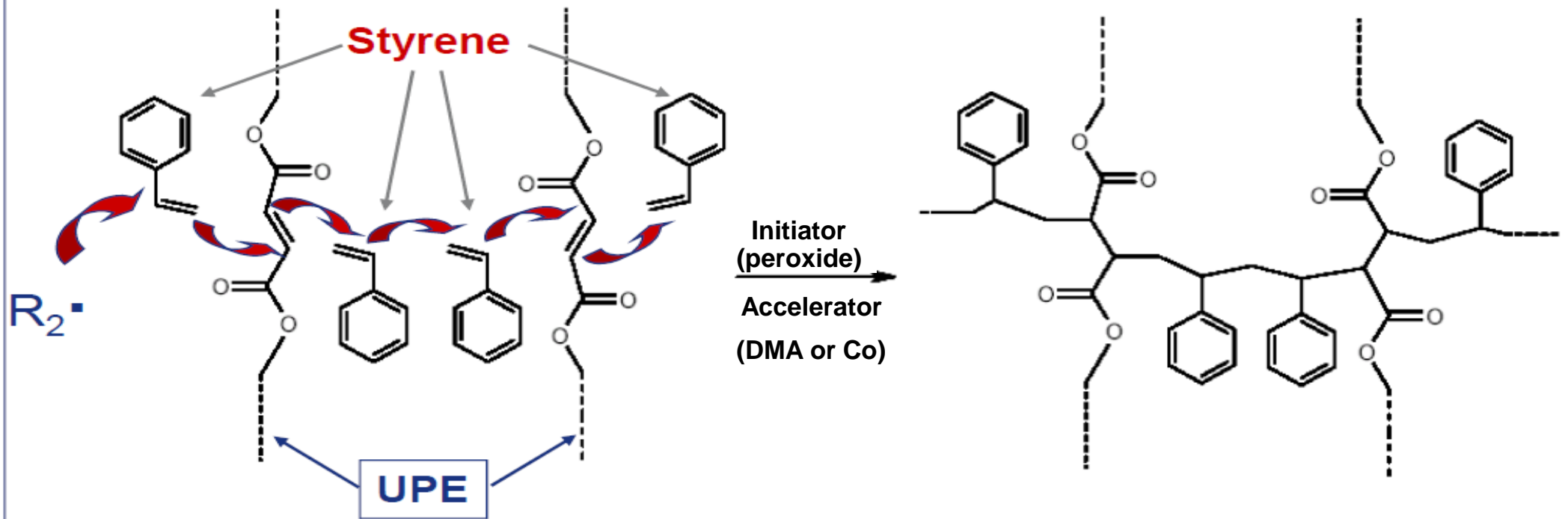
ROSKYDAL VT K65

ROSKYDAL VT K14 M



Curing mechanism of Unsaturated Polyester (UPE)

Radical Co-Polymerisation with Styrene:

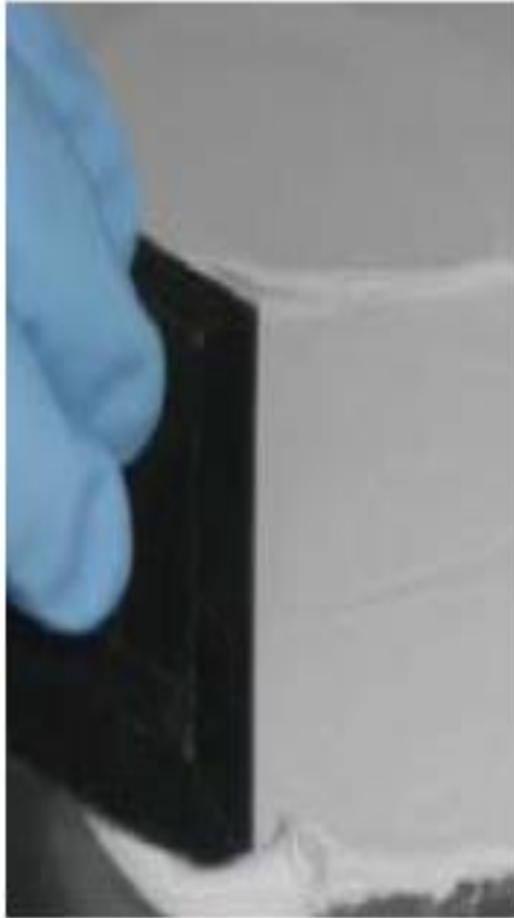


Typical Putty formulation (styrene content < 12.5 %)

Raw materials	% on weight	
ROSKYDAL K - type	27.0 - 35.0	
Thixotropic agent (for soft and creamy application)	0.5	e.g. Luvotix R-RF
Anti-settling agent (pseudo-plastic rheology additive)	0.5	e.g. Aerosil 200
Dispersant (wetting & stabilisation of pigments/extenders)	0.5	
Inorganic pigments (colour adjustment)	2.5	
Course & fine talc – combination (sandability/adhesion))	43.0	
Other extenders (dolomite, carbonate, baryte)	23.0 - 20.0	
styrene to adjust consistency	1.0 - 3.0	
Total	100.0	
Additional additives for special requests:		
• Hydrochinone (1% solution in ethyl acetate) to adjust potlife in hot climatic conditions (no effect on hardness) *	2-3 %	
• Cobalt octoate (6% cobalt content solution) to improve drying especially when fine extenders are used	0.30 %	

* Flexible UPE can also be added to prolong potlife, but will have effect on hardness

Required Properties For Body filler



Application consistency



Sanding



Adhesion



No resin separation



Summarized

Roskydal K Types	Roskydal Gloss Polyester
Amine pre-accelerated unsaturated polyester (UPE)	Unsaturated polyester (UPE)
Dissolved in styrene	Dissolved in styrene
Cured with peroxides - recommended benzoyl peroxide (BPO)	Cured with peroxides/Co-salts -recommended Cyclohexanone peroxide (CHPO)
Lower temperature curing	Reactivity of curing decreased when temperature < 15°C
Used in - Fillers, fine putties - Universal putties - Marble putties	Used in - Long pot-life putties - Spray putties

Body filler resins – Spray Putties & Long Potlife Fillers

“Gloss” polyesters: for spray and long potlife fillers.

Supplied in styrene

ROSKYDAL 500 A	medium hard polymers
ROSKYDAL 620	high reactivity, hard polymers
ROSKYDAL E 65	medium reactivity, flexible polymers
ROSKYDAL E 70	low reactivity, very flexible (soft) polymers

Supplied in butyl acetate

ROSKYDAL 502 BA	high reactivity, hard, for thin layers
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Often combination of hard polyester (ROSKYDAL 500 A, 620) with flexible polyester (ROSKYDAL E 65, E 70)

Typical Putty Formulation

- cured with CHPO hardener

Raw materials	% on weight
Roskydal-gloss polyester	28.0-32.0
Thixotropic agent (for soft and creamy application	0.5
Anti-settling agent (pseudoplastic rheology additive)	0.5
Dispersant (wetting & stabilisation of pigments/extenders)	0.5
Inorganic pigments (colour adjustment)	2.0-3.0
Coarse & fine talc –combination (sandability/adhesion)	35.0-40.0
Other extender (dolomite, calcite, barytes)	20.0-23.0
Cobalt octotate (6% Cobalt content solution)	4.0-8.0
Styrene (to adjust viscosity and consistency)	1.0-3.0
Total:	100.00
Additional additives for special requests:	
Hydroquinone (1% solution in ethyl acetate) to adjust pot-life in hot climate conditions	2-3%

Washprimer

Also often called Etch primer

For direct to metal, spot repair (not on TPA)

Often 2K, 1:1 mixing ratio with 'hardener' / activator (containing acid)

1K also available (also in spray can)

In general can be overcoated with 2K surfacers. Primers and in some cases topcoat, BUT not with Epoxy primer!

High VOC: ~720 g/l (max 780 g/l according EU VOC limits)

Low solids: ~14 vol%

Application: 18-20 sec DC 4 with HVLP 1.3-1.5 nozzle

Dry times: 10-15 minutes at RT

Low film build: 6-10 μm

Generic washprimer composition:

- Polyvinyl butyral resin (Mowital, Butvar, ...)
- Co-binders for improving adhesion, AC performance
 - Epoxy
 - Phenolic
- Additives (wetting/dispersing, rheology control)
- Anti corrosion pigments
- Colour pigments
- Extenders / silica
- Phosphoric acid for etching of the surface (separated or added inside)
- Solvents

Washprimer - Binders

BECKOPOX EM 460/60IBX

- modified epoxy resin, co-binder for in wash primers
- Good adhesion
- Possible for use under white topcoat (not yellowing)



REC18062 -
xx EM 460 - 1K Wa

PHENODUR PR 263/70B

- Curable phenolic resin
- Good corrosion protection



SB 1K Wash Primer based on PHENODUR PR 263_70B (2).pdf



SB 1K Wash Primer based on PHENODUR PR 263_70B results.pdf

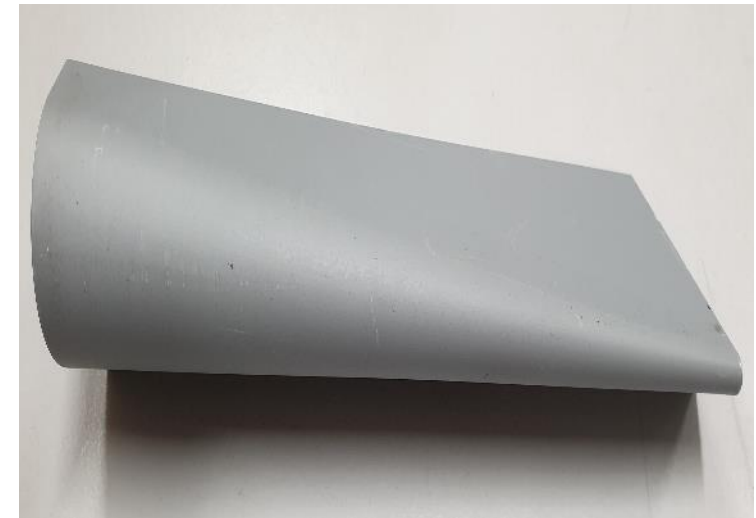
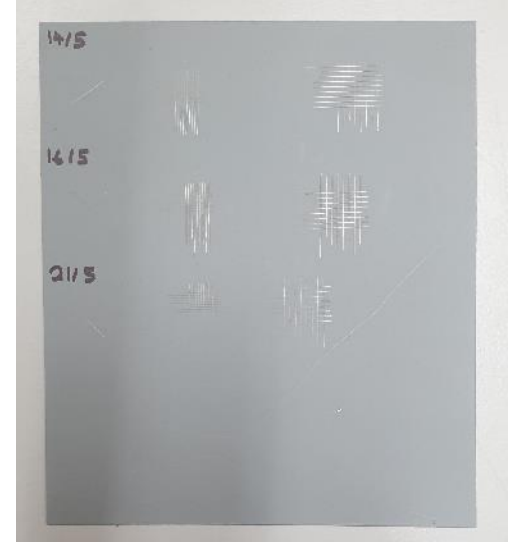
Vehicle Refinish Primer

Basic functions

- protection of surface
- leveling, smoothing of rough surface
- adhesive layer for topcoat

Resin Requirements

- hardness / flexibility : stone chip resistance
- pigment wetting : leveling and appearance
- adhesion : corrosion resistance, no peeling-off of topcoats
- drying speed: earlier sanding
- low price : economics



Primer Resins – two component PU

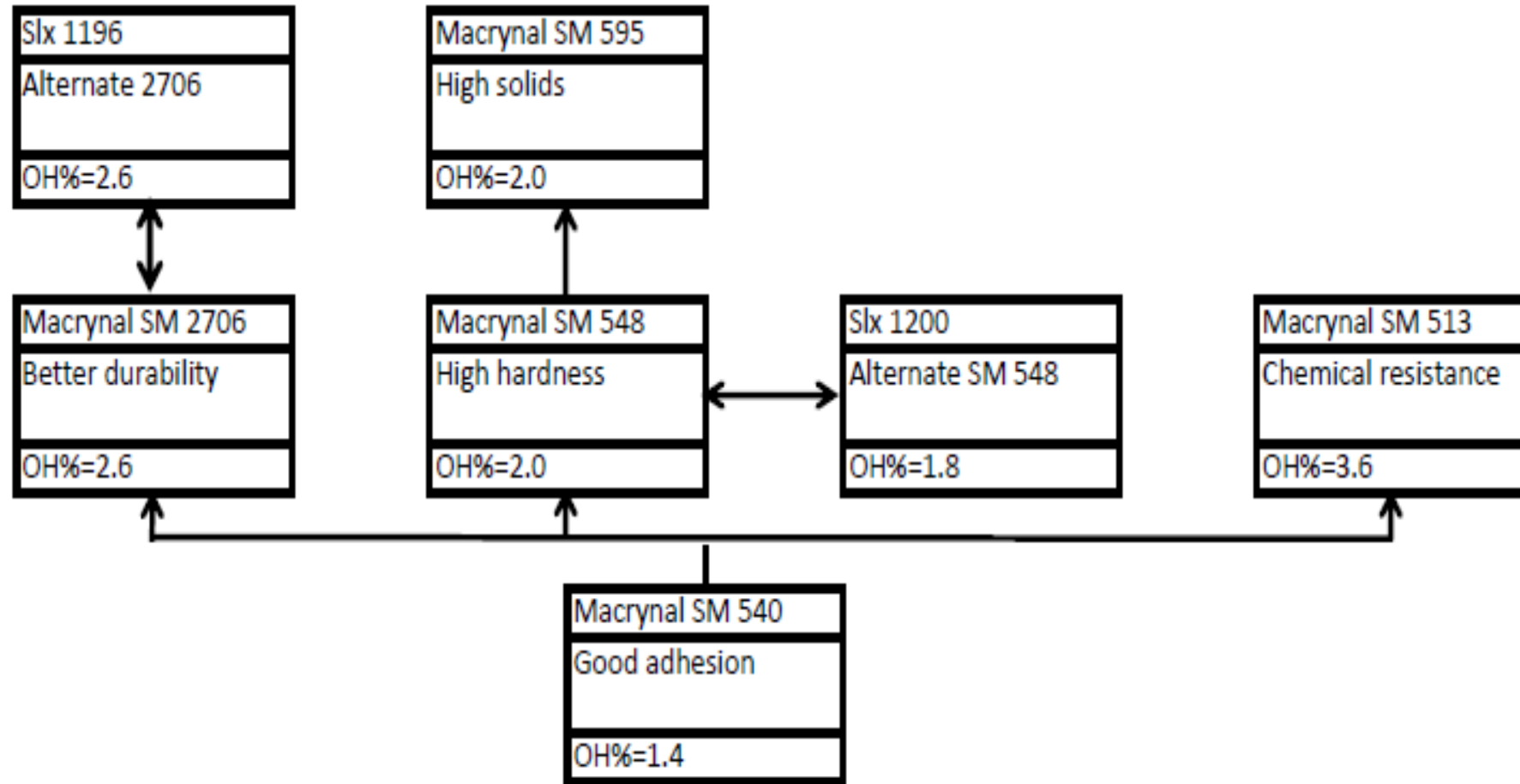
Solvent borne Resin

Formulation for a primer with PVC = 43% and 100% crosslinking

solid binder	100.0	acrylic polyol + isocyanate
Bentone 38	2.5	rheology control
Kronos 2190	40.0	hiding power
Micro Talc AT Extra	40.0	extender
China Clay	90.0	extender
Heucophos ZP10	30.0	anti-corrosion
Bayferrox 3910	6.0	hiding power
Dibutyl tin dilaurate (1% solution)	2.5	catalyst
BYK-141	1.0	defoamer
solvents	

APO product tree

VR 2K PU primer



Primer Resins – Solvent borne, single component

Resin - Various	Type	OH%	Feature / remark
Duroxyn EF 935/60X	Epoxy ester	n.a.	Good adhesion & corrosion resistance primer
VIACRYL SC 121/60X	TPA	n.a.	Broad adhesion
VIACRYL SC 200/40X	TPA	n.a.	Fast drying, high hardness, co-binder
SETAL 118 XX-60	SOA	n.a.	Pigment wetting, adhesion and impact resistance, as co-binder for NC primer system
SETAL 142 XX-60	SOA	2.4	Good elasticity, non-yellowing, adhesion on steel.

Primer Resins – Solvent borne (for Plastic)

Resin	Type	OH%	VOC ¹	Feature / remark
VIACRYL SC 121/60X	TPA	n.a.		Good flexibility, broad adhesion
VIACRYL SC 200/40X	TPA	n.a.		Fast drying, high hardness
SETALUX 2117 XS-30	TPA	0.6		Fast drying, broad adhesion
MACRYNAL SM 540/60X	APO	1.4		Broad adhesion
SETALUX 1182 SS-55	APO	1.8		Broad adhesion
SETALUX 1184 SS-51	APO	2.0		Fast, Broad adhesion
SETALUX 1187 XX-60	APO	3.8		Very flexible, blending partner
SETALUX XCS 1516 TS-45 (NEW)	CPO mod APO	0.8		Excellent adh to PP
SETALUX XCS 1518 BA-45 (NEW)	CPO mod APO	0.8		Excellent adh to PP, BTX free
Special “Additive” (!)	Type	OH%	VOC ¹	Feature / remark
ADDITOL VXL 4950	CPO	n.a.		Flash primer, direct-to-plastic

1) Suitable for VOC compliant coatings according Directive 2014/42/CE of EU

CPO Modified Acrylics for PP

Setalux XCS 1516 TS-45	Setalux XCS 1518 BA-45	Setalux 1529 TS-45
<p>NV: 44-46%</p> <p>Acid value (On solids): 5.0-11.0 mgKOH/g</p> <p>Viscosity: 3.0-6.0 Pa.s</p> <p>Key feature:</p> <p>Fast drying</p> <p>Excellent adhesion on PP</p> <p>Excellent storage stability</p> <p>Disadvantages:</p> <p>Limited adhesion on low cost PP</p> <p>Content aromatic solvent</p>	<p>NV: 44-46%</p> <p>Acid value (On solids): 6.0-12.0 mgKOH/g</p> <p>Viscosity: 3.0-10.0 Pa.s</p> <p>Key feature:</p> <p>Aromatic free</p> <p>Fast drying</p> <p>Excellent adhesion on PP</p> <p>Excellent storage stability</p>	<p>NV: 44-46%</p> <p>Acid value (On solids): 4.0-10.0 mgKOH/g</p> <p>Viscosity: 2.0-5.0 Pa.s</p> <p>Key feature:</p> <p>Improved adhesion on low cost & high filled PP</p> <p>Fast drying</p> <p>Excellent storage stability</p>

The Right Fit: Tailored solutions to problems whilst retaining core properties

Primer Resins - Waterborne

Resin	Type	OH%	VOC ¹	Feature / remark
SETAQUA 6768	SXL emulsion	n.a.	•	Very good adhesion, fast drying
SETAQUA 6795	Acr emulsion	1.5		Very fast dry, dual cure, good sandability
SETAQUA 6515	Acr dispersion	3.3	•	All-round, good adhesion, compatible with hydrophobic NCO
MACRYNAL SM 6826w/43WA	Acr dispersion	4.4	•	High BFFT (>150µm), very fast drying
BECKOCURE EH 2261w/41WA	Aliphatic amine adduct	450 AHEW	•	Hydrophobic, no volatile amines, excellent corrosion protection
BECKOPOX EP 2384w/57WA	Solid epox dispersion	450 EEW	•	Low VOC, fast high hardness, excellent corrosion protection
BECKOPOX EP 2387w/53WA	Solids epox dispersion, flexibilized	520 EEW	•	High flexibility, improve shear stability

1) Suitable for VOC compliant coatings according Directive 2014/42/CE of EU

Vehicle Refinish Basecoat

Basic function

- aesthetics

Resin Requirements

- pigment wetting / stability : colour matching and in-can stability
- adhesion : intercoat adhesion, no peeling-off between layers
- film inertness : prevent strike-in of solvents from clearcoat
- rheology control : metallic particle orientation, optimum flip-flop
- pseudoplastic : no setting of pigment with good spray properties
- in SB: compatibility with CAB: colour matching, transparency



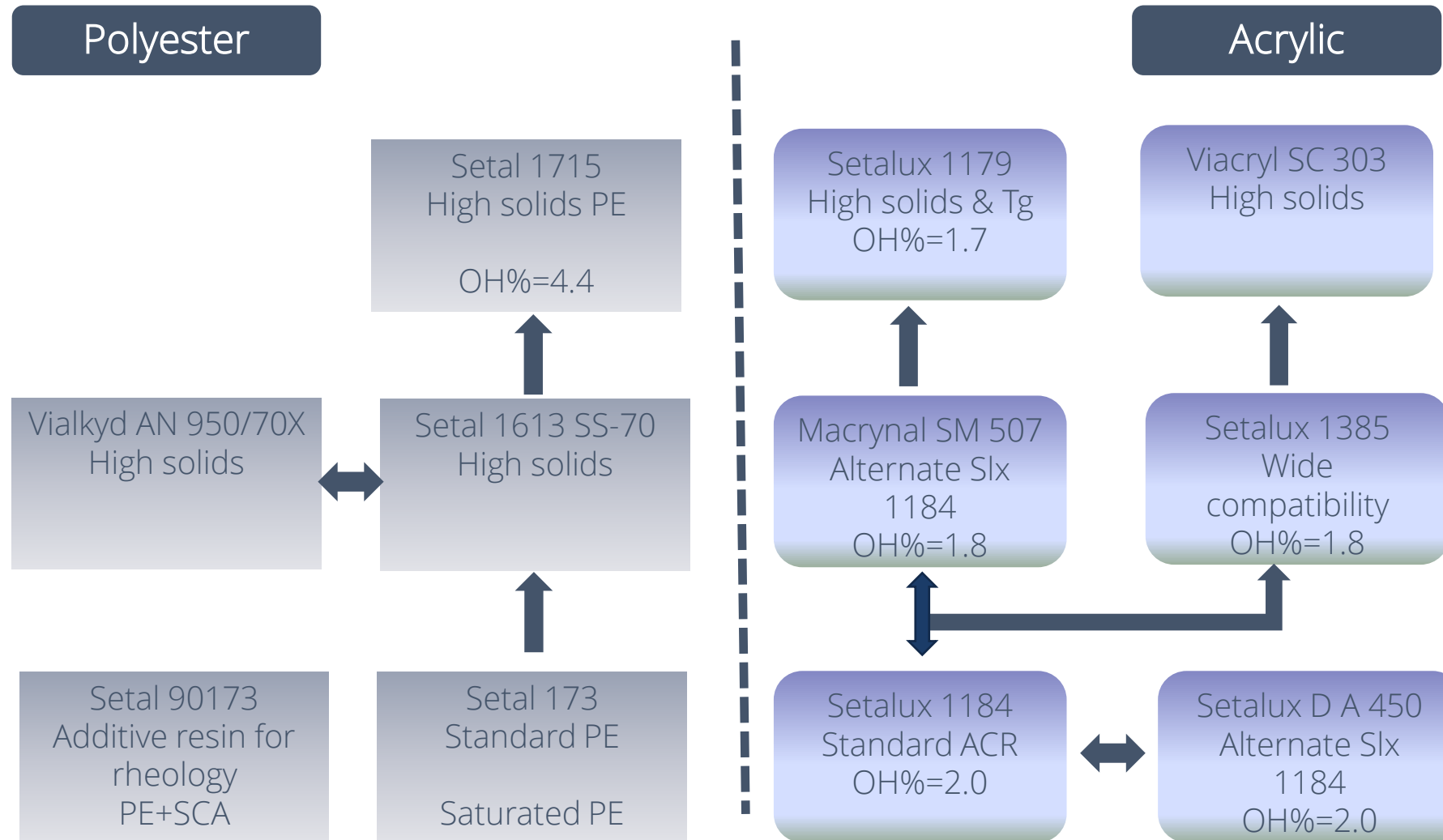
Typical basecoat formulation

Raw materials	% on weight
Cellulose acetate butyrate solution, CAB (physical drying)	40.0- 50.0
Pigments (colour adjustment)	4.0- 20.0
Resin (improve price, VOC and flexibility)	20.0- 25.0
Solvents (solubility & compatibility)	~ 10.0
Wax or Silica (for better metallic orientation & anti settling)	1.0 - 2.0
Additives (wetting and outdoor durability)	0.5 - 1.0
Total:	100.00
Additional information	
CAB normally prepared in 20-25% solution form with fast dry and strong solvency solvent like butyl acetate & xylene (low solids & fast solvent release)	
CAB grade normally using in VR is CAB 381-0.5, 531 & 551. CAB provide faster dry and initial hardness which help in wet on wet application and aluminium orientation.	

Metallic Orientation CAB Influence



Product Tree For VR basecoat



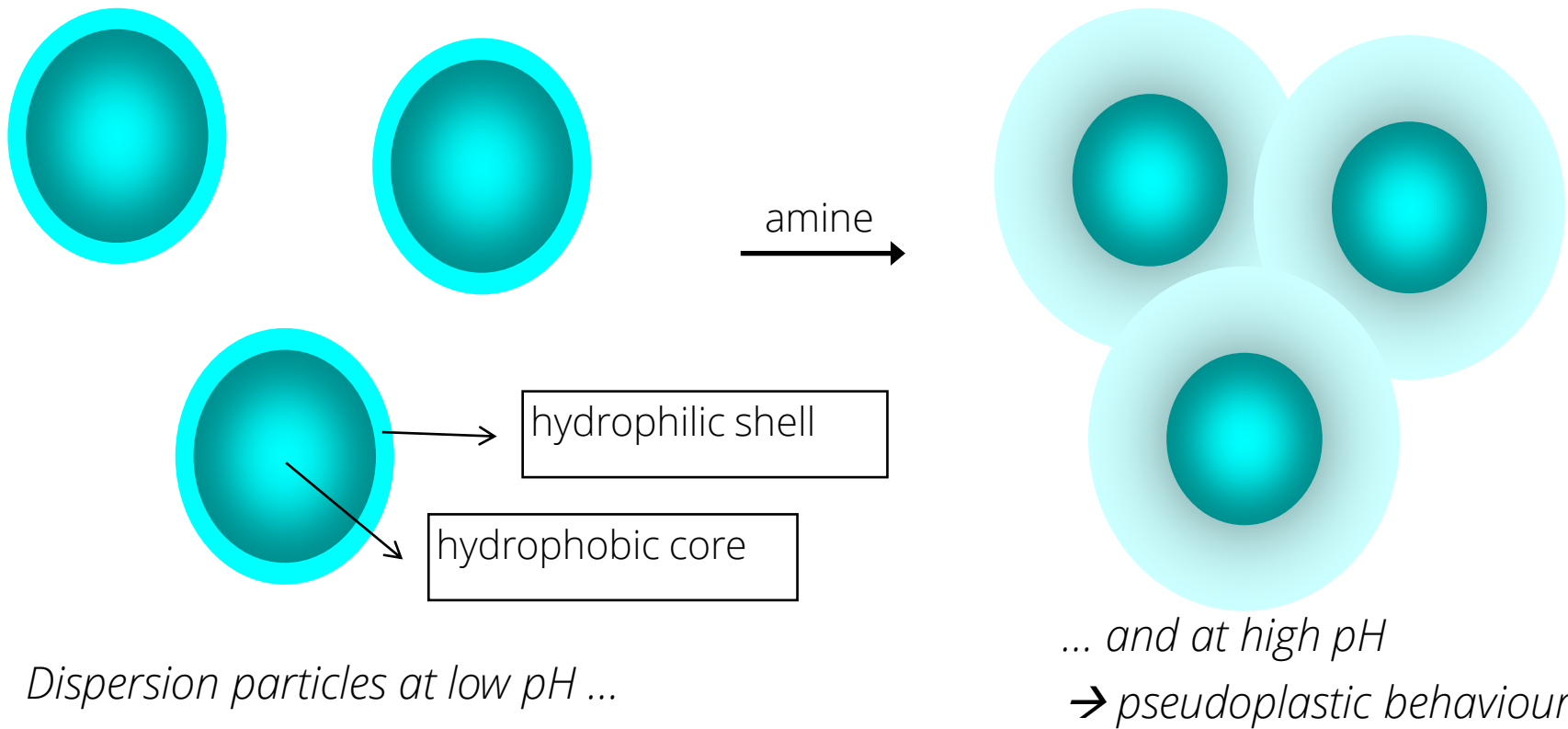
Solventborne Basecoat Resins

Resin	Type	OH%	VOC ¹	Feature / remark
SETALUX 1184 SS-51	Acrylic polyol	2.0		Fast drying, good CAB compatibility
SETALUX 1193 SS-51	Acrylic polyol	1.3		Fast drying, broad adhesion to plastic
SETALUX 1385 BX-51	Acrylic polyol	1.7		Very good CAB compatibility
VIACRYL SC 303/65XB	Acrylic polyol	2.4		Good outdoor stability and CAB compatibility
SETAL 173 VS-60	Saturated polyester	2.4		Good adhesion, good water and chemical resistance and good CAB compatibility
SETAL 1715 VX-74	Saturated polyester	4.4		High solids, broad compatibility
VIALKYD AN 950/70X	Saturated polyester	3.0		Good pigment wetting, high flexibility and excellent metal adhesion
SETAL 90173 SS-50	Saturated polyester, SCA modified	2.4		Rheology control, improves metallic orientation
SETAL 91715 SS-55	Saturated polyester, SCA modified	4.4		Rheology control, improves metallic orientation

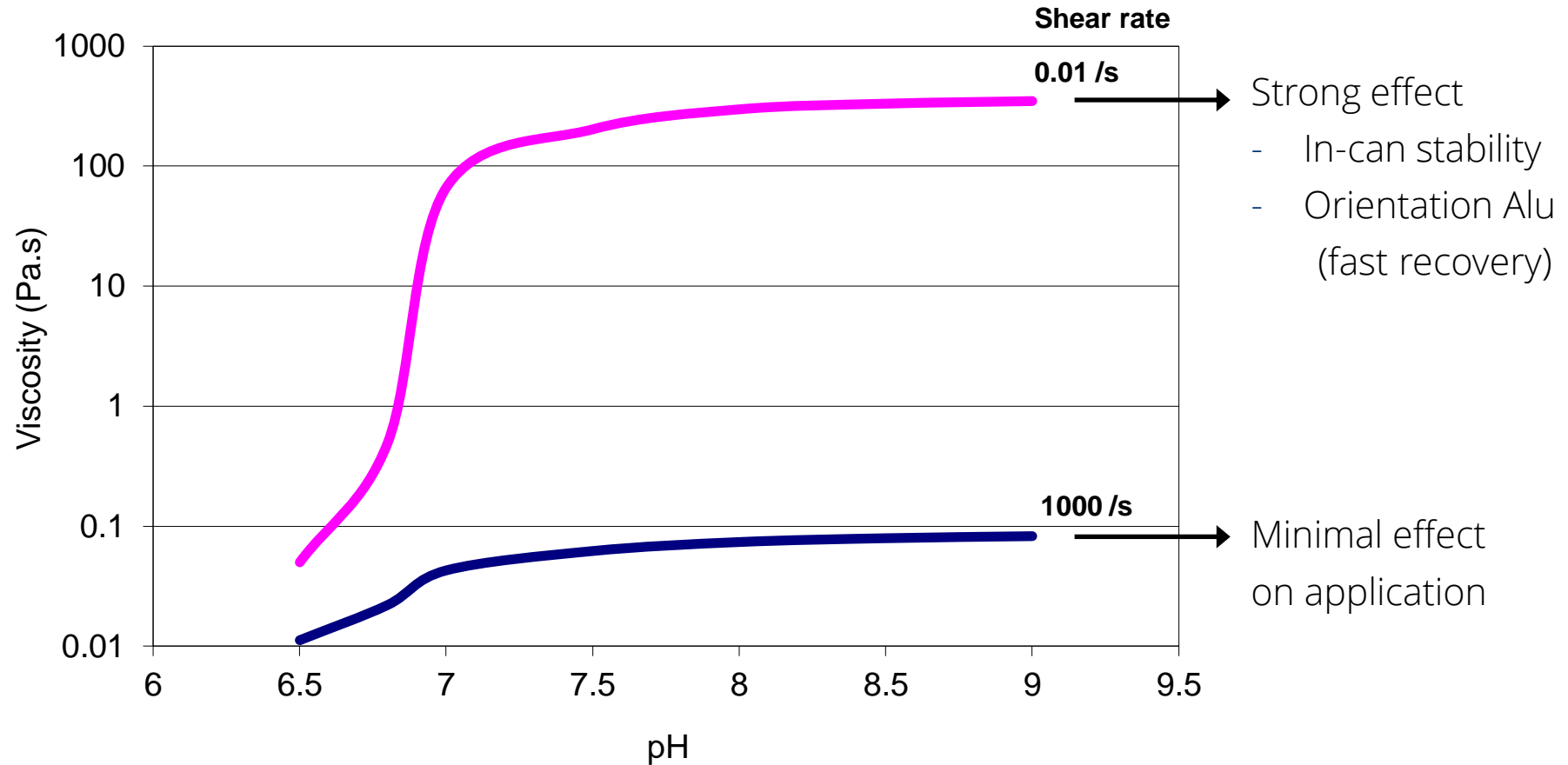
1) Suitable for VOC compliant coatings according Directive 2014/42/CE of EU

WB Basecoat Resins - Core-Shell morphology in waterborne system

Upon neutralization with amine the shell swells and the particles are able to physically interact. The dispersion becomes pseudo-plastic with high viscosity at low shear and low viscosity at high shear

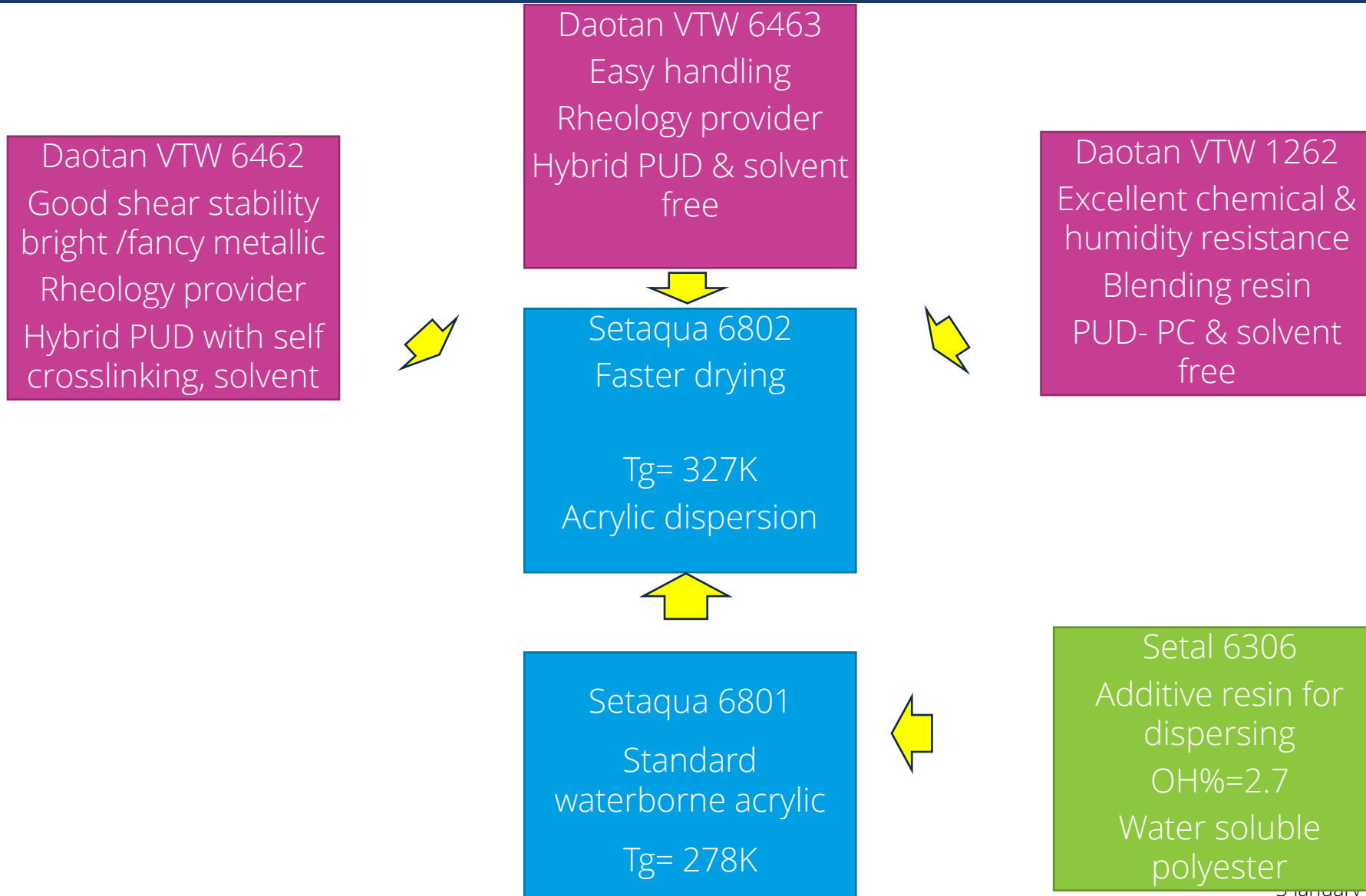


WB Basecoat Resins - Influence of pH on rheology in Setaqua 6801 clearbase



low shear viscosity can increase with a factor of 10,000
while high shear viscosity increases with a factor of 10

Product Tree For WB VR basecoat



Waterborne Basecoat Resins

Resin	Type	OH%	VOC ¹	Feature / remark
DAOTAN VTW 1262/35WA	Polyurethane dispersion	n.a.	•	Excellent adhesion and stone chip properties, very good humidity resistance
DAOTAN VTW 6462/36WA	Urethane acrylic hybrid	n.a.	•	Fast drying, self-crosslinking, provides excellent and very bright metallic effects
DAOTAN VTW 6463/36WA	Urethane acrylic hybrid	n.a.	•	Like Daotan VTW 6462 but without self-crosslinking moieties
DAOTAN TW 6464/36WA	Urethane acrylic hybrid	n.a.	•	Like Daotan VTW 6462 but with improved shear resistance and color stability
DAOTAN TW 6466/36WA	Urethane acrylic hybrid	n.a.	•	Like Daotan VTW 6462 but improved flexibility, wet adhesion, lower tendency for pinhole formation and excellent flop
SETAL 6306 SS-60	Saturated polyester	2.7	•	Water soluble after neutralisation, good pigment wetting, good stabilisation of aluminium pigments, improves film forming and flow. (HEW=1050 as supplied)
SETAQUA 6801	Pseudoplastic Acrylic Dispersion	n.a.	•	Rheology control, very good metallic orientation, low co-solvent demand
SETAQUA 6802	Pseudoplastic Acrylic Dispersion	n.a.	•	Rheology control, very good metallic orientation, higher hardness
VIACRYL VSC 6254w/40WA	Thermoplastic Acrylic Dispersion	1.8	•	Improves physical drying properties (co-binder)

1) Suitable for VOC compliant coatings according Directive 2014/42/CE of EU

Vehicle Refinish Clearcoat

Basic function

Protection of basecoat layer against environment

Aesthetics

Resin Requirements

Good gloss, levelling, clarity : overall appearance

Chemical resistance : no acid attack

Weathering resistance : outdoor durability

Fast drying / hardness development : earlier handling / polish-ability

Low colour : no problems in colour matching

Good adhesion : intercoat adhesion

Optional: scratch resistance - minimized car wash defects



Vehicle Refinish Clearcoat Resins

Allnex has a broad range of resins for use in refinish CC (see brochure)

These can be divided in the following categories*:

Solventborne

- Low Solid Acrylic Polyol
- Medium Solid Acrylic Polyol
- High Solid Acrylic Polyol
- High / Ultra High Solid Polyester Polyol
- SCA modified Acrylic and/or Polyester Polyol

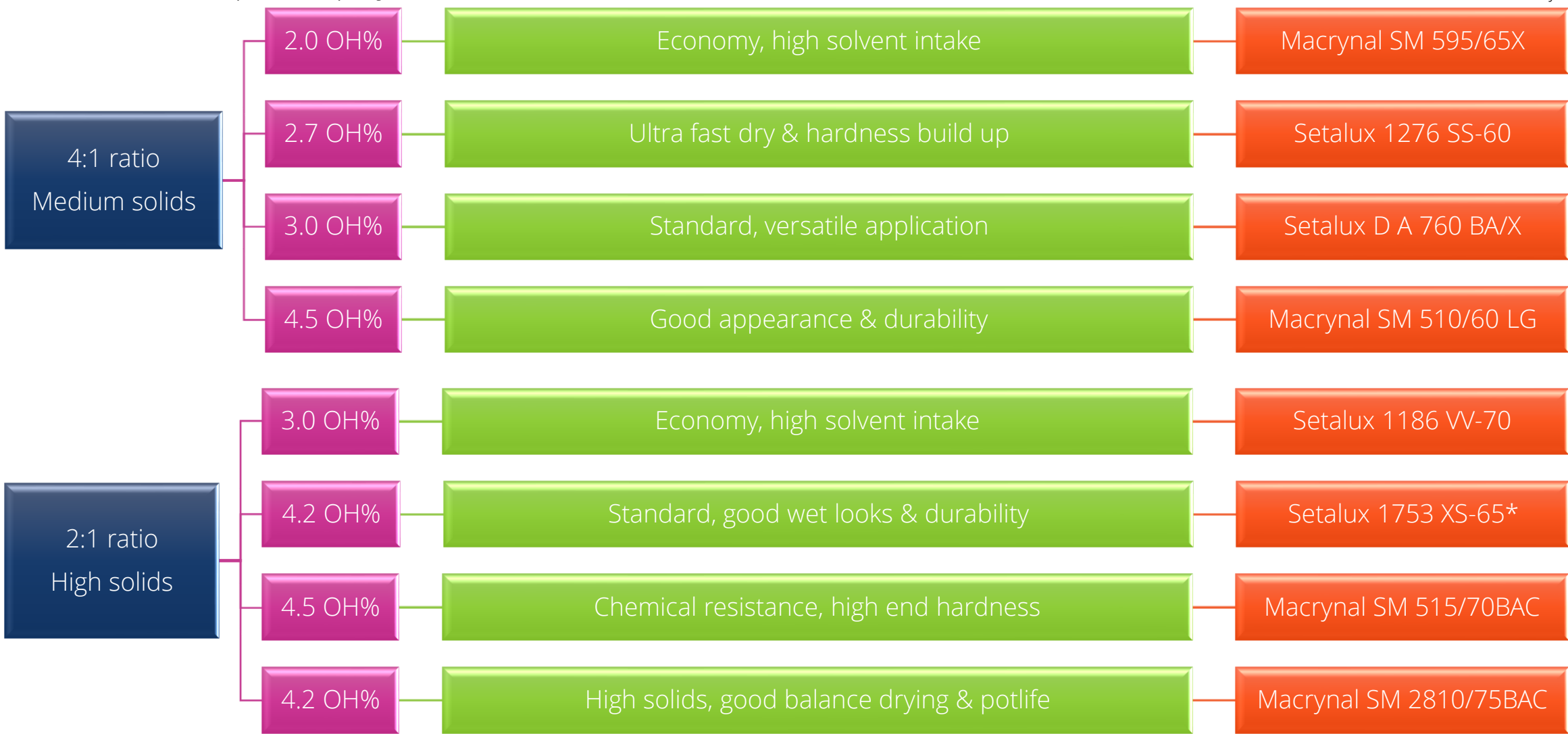
Waterborne

- Acrylic Polyol Emulsion

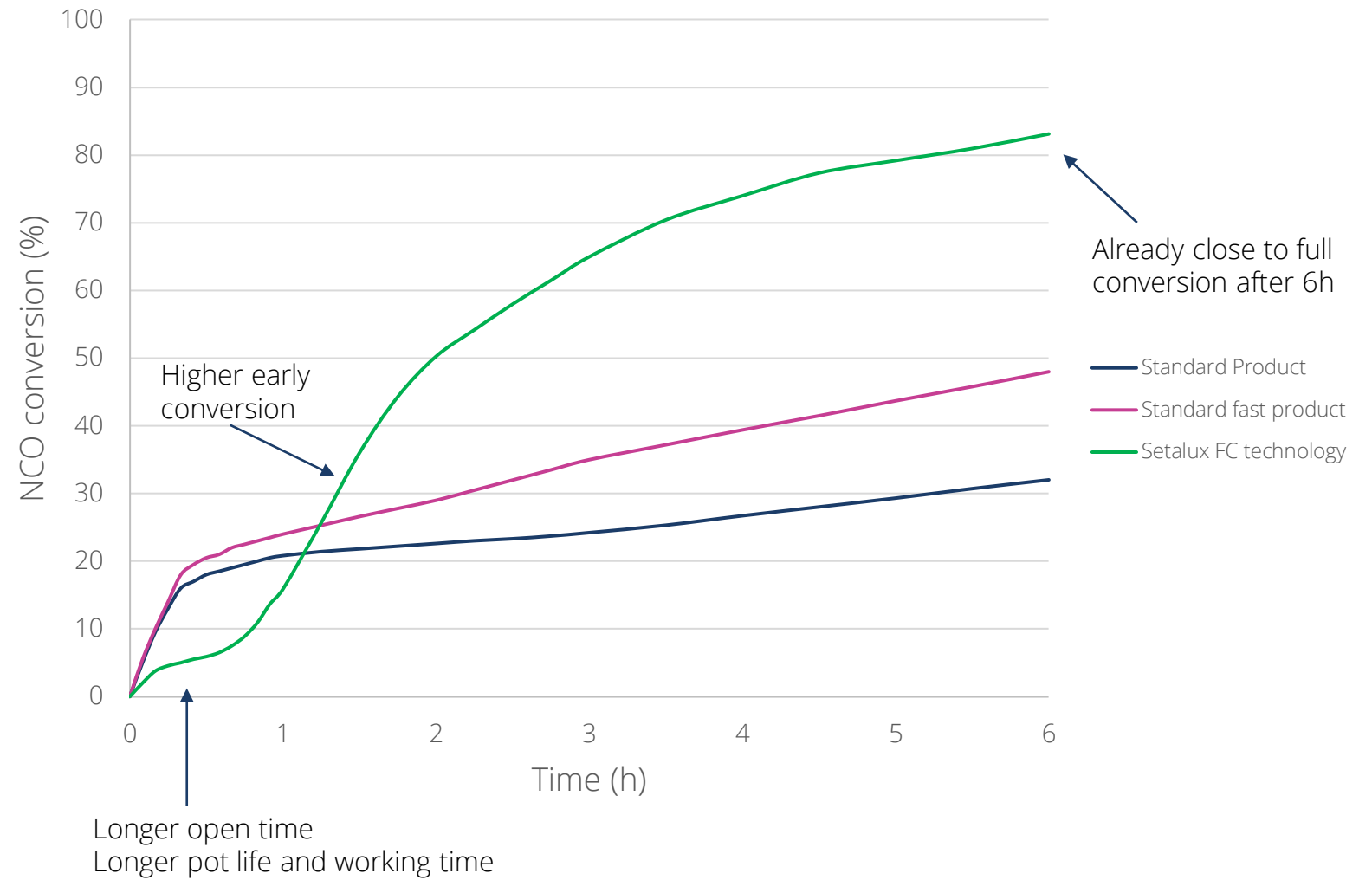
Solvent borne solutions for Vehicle Refinish Clearcoat

Clearcoat: Two component polyurethane with base: hardener ratio

Note: OH% based on solids
* = other delivery form available



SETALUX® FC POLYOLS SHOW RAPID NCO CONVERSION



Fast Cure 2K PU system



VALUE PROPOSITION OF SETALUX® FC POLYOLS



Features

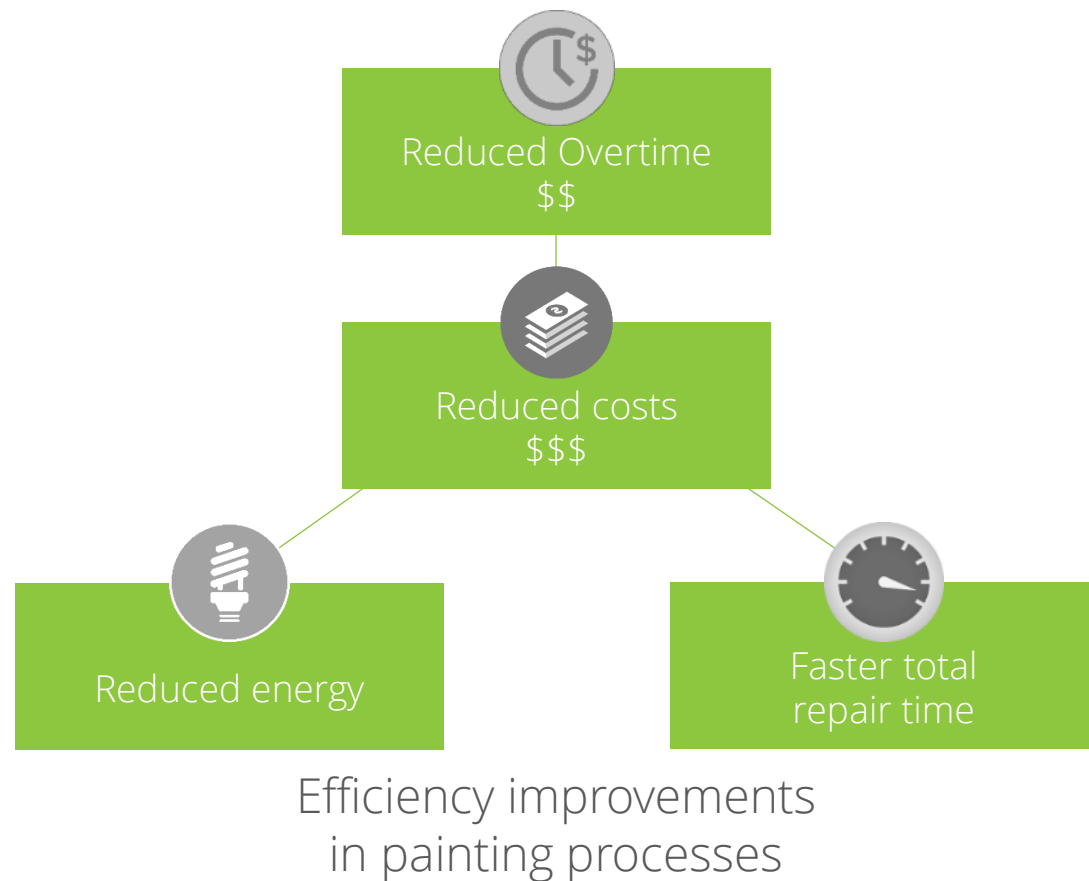
Fast to ultra fast dry

Curing at lower temperatures

Improved early hardness development

Excellent pot life and working time

Customer Benefits



Vehicle Refinish Topcoat

Basic function

Protection against environment

Aesthetics

Resin Requirements

Good gloss, levelling, clarity : overall appearance

Chemical resistance : no acid attack

Pigment wetting : no problems in colour matching

Scratch resistance : minimized car wash defects

Weathering resistance : outdoor durability

Fast drying / hardness development : earlier handling / polish-ability



VR 1K Topcoat– Solvent borne

Resin - Various	Type	OH%	Feature / remark
SETYRENE 74 XX-60	Acrylic modified alkyd	n.a.	Fast drying, low initial yellowing
SETALUX 1261 VX-51	TPA	n.a.	Fast drying, good outdoor
SETAL 142 XX-60	SOA	2.4	Good elasticity, non-yellowing, adhesion on steel.
SETAL 84 XX-70	SOA	n.a	Good compatibility, can 1K VR/OEM topcoat
SETAL 191 WX-55	MOA	n.a	Good compatibility, can 1K VR topcoat

Vehicle Refinish 2K Topcoat Resins

SB MS Acrylic Polyol	Type	OH% ↓	VOC ⁽¹⁾	Feature / remark
SETALUX 1218 VX-70	Acrylic polyol	2.8		Economy grade, good adhesion
SETALUX 1186 SS-60	Acrylic polyol	3.0		Economy grade, excellent hardness
SETALUX 1279 BA-70	Acrylic polyol	3.0		Fast drying, good hardness and appearance
SETALUX 1753 SS-70	Acrylic polyol	4.2		High build and gloss
MACRYNAL SM 510n/60LG *	Acrylic polyol	4.5		Quick hardness development
MACRYNAL SM 515/70BuAc	Acrylic polyol	4.5		Excellent gloss, high hardness, chemical resistance

1) Suitable for VOC compliant coatings according Directive 2014/42/CE of EU

Vehicle Refinish 2K Topcoat Resins

SB HS Acrylic polyol	Type	OH% ↓	VOC ⁽¹⁾	Feature / remark
SETALUX D A 760 BA/X	Acrylic polyol	3.0	•	Economy grade, good durability
SETALUX 1915 BA-75	Acrylic polyol	4.1	•	Fast drying, high hardness
SETALUX 1907 BA-75	Acrylic polyol	4.5	•	High solids universal
SETALUX 1916 BA-75	Acrylic polyol	4.5	•	High solids, outstanding appearance, flow and levelling
SETALUX 1909 BA-75	Acrylic polyol	5.0	•	High solids, scratch resistance

SB HS/UHS Polyester Polyol	Type	OH% ↓	VOC ⁽¹⁾	Feature / remark
SETAL 1606 BA-80	Polyester	5.2	•	Flexible, reduce VOC
DUROFTAL VPI 2803/78BuAc	Polyester	6.0	•	Excellent outdoor durability
DUROFTAL PI 2801/78BuAc	Polyester	7.0	•	High hardness

1) Suitable for VOC compliant coatings according Directive 2014/42/CE of EU

Vehicle Refinish - WB 2K Topcoat Resins

WB Acrylic polyol	Type	OH% ↓	VOC ⁽¹⁾	Feature / remark
MACRYNAL SM 6817w/44WA	Acrylic polyol	3.0	•	Fast drying, economy grade
SETAQUA 6515	Acrylic polyol	3.3	•	All-round resin, very good compatibility with hydrophobic NCO
MACRYNAL VSM 6299w/42WA	Acrylic polyol	4.1	•	Excellent appearance, well balanced performance profile
MACRYNAL SM 6810w/42WA	Acrylic polyol	4.1	•	Excellent applicability and appearance
SETAQUA 6513	Acrylic polyol	4.2	•	Excellent appearance, butyl glycol free
MACRYNAL VSM 2521w/42WAB	Acrylic polyol	4.2	•	Rapid hardness development and high chemical resistance
MACRYNAL SM 6826w/43WA	Acrylic polyol	4.4	•	High dry film thickness (>150µm) without defects, very fast drying, for intrinsic matt coatings

1) Suitable for VOC compliant coatings according Directive 2014/42/CE of EU

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