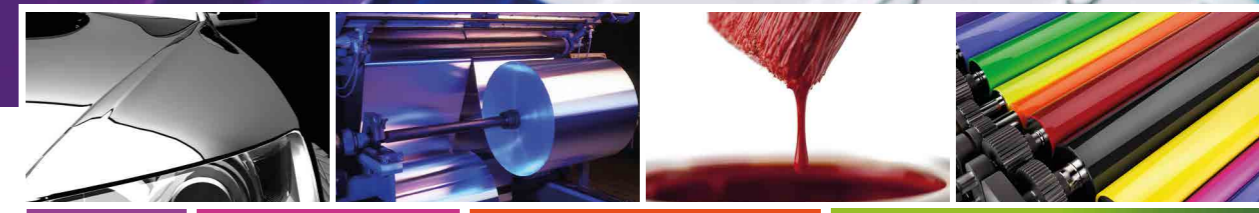


# COATING ADDITIVES

Product Guide - Worldwide



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## About allnex

allnex is a leading producer of industrial coating resins and additives for architectural, industrial, protective, automotive and special purpose coatings and inks. With manufacturing facilities and R&D centers located around the world, the allnex group offers access to a huge global network of innovation and provides

responsive, local support to our customers, helping them to quickly bring advanced coating solutions to market. Formed in 2016 by the merger of two leading resin companies, we have recently further strengthened (y)our business by becoming part of major international player PTT Global Chemical.

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## About Additives

The coating resins and additives portfolio is on the leading edge of performance. This broad package of products enables our customers to bring coatings faster to the market, solve problems and enhance properties.

We offer a broad range of additives for the formulation of coatings. Our portfolio includes low VOC, and hazardous air pollutant substance-free (HAPS free) technologies for solvent-borne, water-borne, high solids, powder coatings, and energy curable systems in both existing and emerging markets:

- Architectural-decorative Wall and Trim Coatings, Stains, Concrete
- Automotive and Transportation – OEM, Aerospace, Refinish, Parts and Accessories
- General Industry, Wood, Packaging, Coil, Metal Protection
- Marine and Protective

Additives enhance performance by modifying rheological properties, improving flow and leveling, reducing foam, improving pigment dispersability, accelerating cure and crosslinking, improving adhesion and reducing defects.

Our high performance dispersants and grinding resins are at the forefront of technology for the preparation of binder free pigment concentrates and pastes. The highest level of pigment, at the lowest VOC, without effects on corrosion resistance and other properties are achieved in systems using wetting and dispersing additives from allnex.

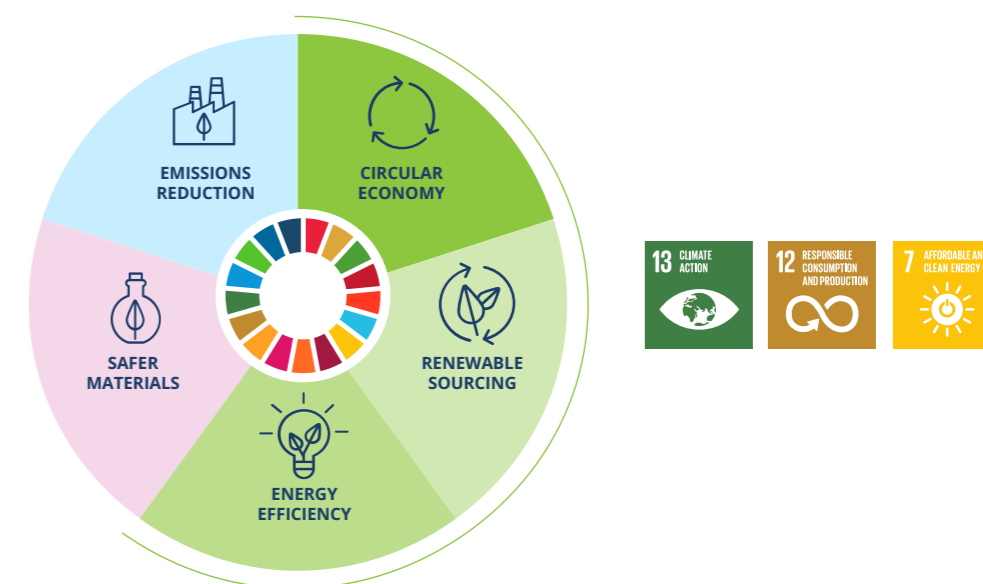
ADDITOL®, CF Series Driers, CYCAT®, MODAFLOW® additive families serve the following applications:






- Wetting and Dispersing Additives
- Flow and Leveling Additives
- Defoamer and Deaerater
- Rheology Modifier
- Catalysts and Drier

## Sustainability

### A fivefold focus for a new tomorrow – the pillars of our sustainability program.

These pillars form the basis of allnex's sustainability program, which covers all aspects from product development, raw material sourcing and manufacturing to supply chain management and customer service. The pillars stand for the circularity that is at the core of all our considerations, defining both how we plan and execute our activities.



- 
**Circular Economy**  
 We diligently explore options to limit the consumption of resources, keep them in use as long as possible, and eventually recover and recycle them at the end of service life.
- 
**Renewable Sourcing**  
 We aim at minimal use of finite resources and strive to reduce climate impacts by looking at renewable alternatives for raw materials and the energy we use.
- 
**Energy Efficiency**  
 We design our product and manufacturing process in a way that enables maximum efficiency in energy utilization across the product lifecycle.
- 
**Safer Materials**  
 We are committed to making the substitution of potentially harmful chemicals by safer options one of our guiding considerations.
- 
**Emissions Reduction**  
 We work to reduce the emissions of volatile organic solvents across the product lifecycle to protect people and the environment.

Being ECOWISE™ is the best way to be part of the solution – and that's exactly what our initiative and ECOWISE™ branded products help everyone to do. They spring from our deep commitment to a more sustainable future. They are also living proof that, with our broad range of technologies and sustainable focus, we are the ideal partner for smoothly and successfully making the transition to the solutions a more ECOWISE™ future needs.

## Wetting and Dispersing Additives

Additives for pigmented system – Pigments and extenders are dry solid particles, which have to be incorporated into the liquid phase, consisting of binders and solvents. Protective and decorative properties are influenced by this step in paint production. To reach a high level of performance it is important to disperse the solid components very well and to stabilize the distribution as homogeneously as possible.

Wetting agents are responsible for the first step in this process. They replace air from the surface of particles and support the liquid phase to cover pigments and extenders. Good wetting of pigments and fillers results in high gloss of coating systems. This kind of additive possesses surface activity character.

Dispersing agents are responsible for the stabilization of the homogeneous distribution of particles. These additives prevent re-agglomeration of pigments and fillers and the formation of flocculates. There are different kinds of stabilization, which have to be optimized in order to reach required properties of gloss, color strength, hiding power, corrosion protection and viscosity of the formulation.

Often combinations of different types of pigments are used to obtain the desired color and hiding properties. However, combinations of organic and inorganic pigments which have different polarity and surface tensions have a tendency to separate. This separation can be horizontal, forming cell like structures (Benard cells), or vertical, which results in a color change. These effects can be evaluated by the rub out test. Multifunctional wetting agents with higher surface activity are useful to reduce these defects. These additives work as anti-floating agents.

### Good to know ...

#### ... about usage of dispersants in epoxy systems

- Ionic dispersants are not used in Epoxy coatings because of activating oxirane ring. This results in either immediate reaction or slow destruction and loss of final paint performance.



Destruction of wb Epoxy formulation by ionic dispersants



Stable wb Epoxy formulation including ADDITOL® VXW 6208

- To ensure best Epoxy resin stability and performance use special developed ADDITOL® VXW 6208 or ADDITOL® VXW 6208/60.
- To achieve extreme high pigment loading in direct grinding processes or for pigment concentrates use ADDITOL® VXW 6394. Additionally this additive allows sufficient stabilization of inorganic fillers and pigments.
- ADDITOL® XL 6577 can load up to 50% more inorganic pigments & fillers compared to other dispersants in SB paints & pigment preparations. As a result it reduces viscosity of highly filled formulations and thus enable lower VOC levels.

### Trouble shooting guide



Strong pigment floating visible "rub out test"



Improved anti-floating effect

ADDITOL® XL 6514/80  
ADDITOL® XL 204  
ADDITOL® VXW 6208  
ADDITOL® VXL 6237N  
ADDITOL® XL 6577



Excellent pigment stabilization "rub out test"

## Wetting and Dispersing Additives

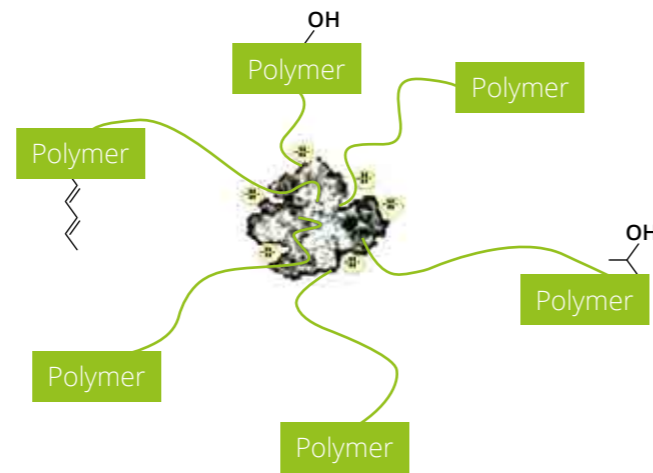
### Requirements for modern pigment pastes

The preparation of modern tinting systems has become very important since cycle times, high quality standards and cost efficient production each plays a large role in overall profitability.

Formulators have been able to use “pigment slurry” or “pigment paste” technology to generate high quality coating systems. But what if there is a new system which allows the combination of both of these high performance technologies. These new systems provide: very high loading, wide pigment compatibility, excellent stability and excellent color properties. In addition the new resin systems support effective film formation while meeting VOC targets. All of this can be accomplished while generally reducing the overall system cost.

### New technologies and trends for pigment pastes

To accomplish these objectives, we cannot use simply a grinding resin or a dispersing agent. Newly designed polymers are modified with strong anchoring groups. These “grinding media” combine the advantages of selective drying capacity, crosslinking into the film, anti-settling and anti-floating effect and compatibility to both solvent-borne and water-borne systems.



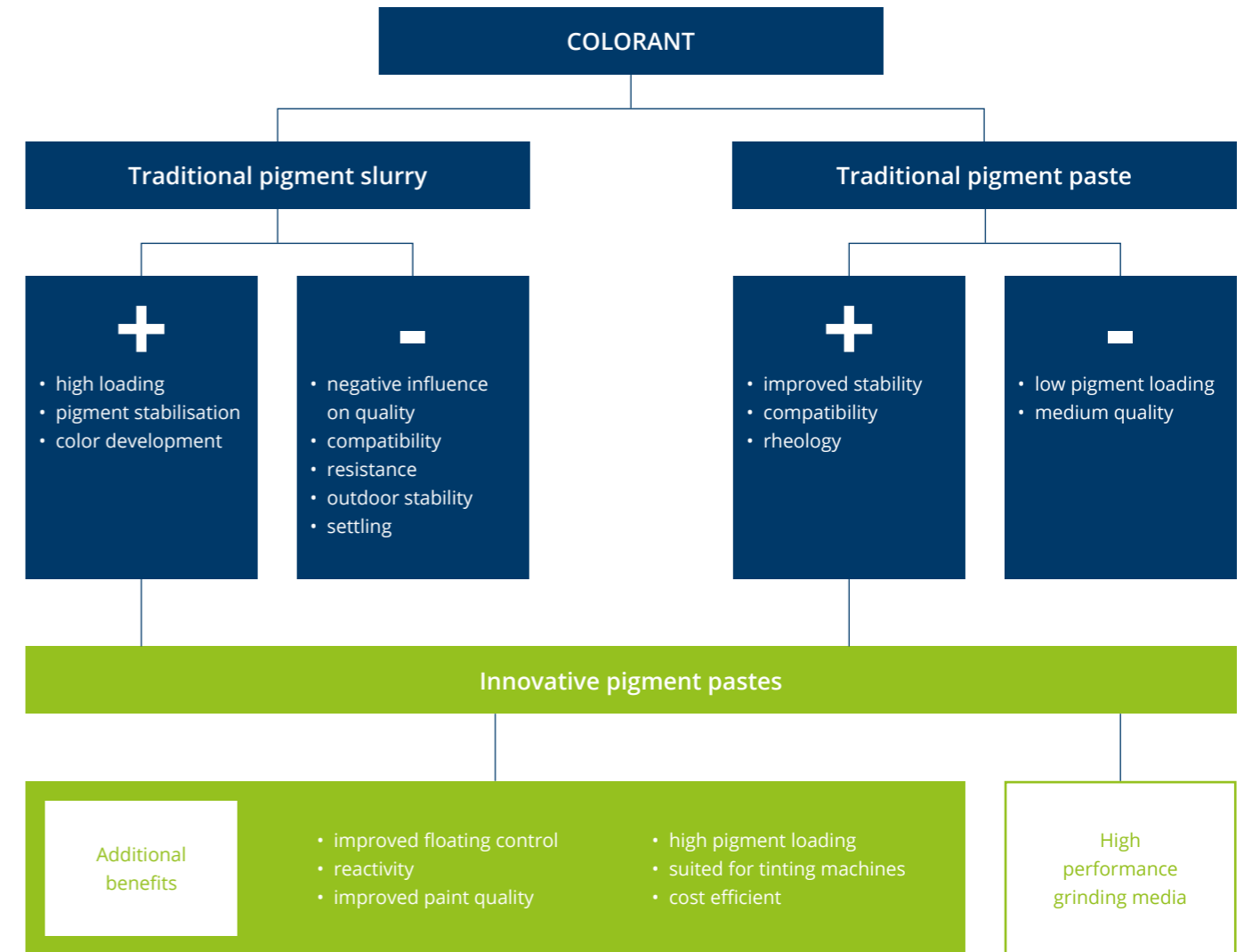
Such novel “grinding media” can be used to produce highest quality pigment pastes for Automotive OEM and Refinish paints, Industrial Coatings applications and Decorative paints.

In stoving and 2 pack systems they can improve chemical resistances and contribute to film hardness.

In anti-corrosive formulations the new grinding media maintain the high corrosion protection designed into the base coating.

In Decorative paints the pigment loading is significantly improved compared to conventional paste and slurry technologies. Furthermore a special modification provides compatibility in both solvent-borne and water-borne paints.

## About colorants



Product	Characteristics	General Industry	Automotive	Architecture
ADDITOL®* XL 6557	Cross-linkable in stoving / 2K PUR systems, supports air drying in alkyd paints. Improves chemical resistances and mechanical properties.	•		
ADDITOL® XW 6535	Air drying polymer, very high pigment loading. Improved floating control and exterior stability. Ultra low VOC.	•		•
ADDITOL® XW 6565	Universal high polymeric, auto-emulsifying with improved compatibility in non aqueous paints. Ultra low VOC.	•		•
ADDITOL® XW 6591	Cross-linkable in stoving / 2K PUR systems, improves corrosion protection and water resistance.	•	•	

\* ADDITOL® additives

## Wetting and Dispersing Additives

Additive name	Dosage	SB/WB	Automotive	Industrial	Architectural	Characteristics	Description	% Active matter
<b>Anti-floating</b>								
ADDITOL® XL 204	0,5 – 6,0 % pigment	S W	●	●	●	Silicone containing phosphoric acid ester; anionic	Anti-floating additive to improve significantly floating of inorganic and organic pigments and prevents the formation of Bénard cells. It has a strong pigment wetting character and helps to reduce dispersing time.	55 %
<b>Pigment wetting</b>								
ADDITOL® XL 250	0,5 – 5,0 % pigment / extender	S W	●	●	●	Phosphoric acid ester, neutralized by amine; anionic; low molecular	Pigment wetting additive with very strong pigment affinity especially to inorganic and metallic pigments. Besides reduced dispersing time it improves gloss and color strength as well as material flow.	55 %
ADDITOL® XL 255N	0,2 – 2,0 % inorg. 1,0 – 5,0 % org. pigment	S	●	●	●	Modified alkyd resin; neutralized	Pigment wetting additive to improve gloss and color strength; for all types of pigment recommended. It may be used for direct grinding or pigment paste process.	55 %
<b>Special Pigment wetting</b>								
ADDITOL® VXL 4992	0,5 – 2,0 % pigment / extender	S	●			Modified polyester	Multi purpose additive for UP - putties with strong wetting power for inorganic pigments and extenders. It reduces dispersing time and improves degassing and rheology.	50 %
<b>Dispersing Pigment slurries</b>								
ADDITOL® XL 6594	3,0 – 10 % inorg. 10 – 50 % org. pigment	S	●	●		Urethane modified acrylic copolymer; cationic; high molecular	High molecular weight dispersing additive for difficult wettable pigments. Recommended for direct grinding processes. Improved compatibility in acrylic systems.	30 %
ADDITOL® XL 6592	1,0 – 5% inorg. 5 – 30% org. pigment	S W	●	●	●	High molecular weight polymer; nonionic	High efficient, high molecular weight dispersing additive for all types of pigment. Recommended for direct grinding as well as for binder free pigment concentrates.	100 %
ADDITOL® XW 6588	3,0 – 10% inorg. 15 – 50% org. pigment	W	●	●	●	Nonionic, polymeric low ion migration (LIM) dispersant	High molecular weight dispersing additive for all types of pigment. Due to its non ionic polymer structure it is highly recommended in formulations containing sensitive resins. It is recommended for both, direct grinding and pigment concentrate processes.	48%
ADDITOL® XL 6593	5-20% inorg. 30 – 60% org. pigment	S	●	●	●	Wetting/dispersing agent; cationic; high molecular weight	High efficient, high molecular weight dispersing additive for all types of pigment. Recommended for direct grinding as well as for binder free pigment concentrates.	45%
ADDITOL® VXL 6237N	3,0 – 10 % inorg. 10 – 50 % org. pigment	S	●	●		Wetting/dispersing agent; cationic; high molecular	High efficient, high molecular weight dispersing additive for all types of pigment. Recommended for direct grinding as well as for binder free pigment concentrates.	30 %
ADDITOL® VXW 6200	0,5 – 4,0 % inorg. 4 – 15 % org. pigment	W			●	Acrylic copolymer-ammonia salt; anionic; medium molecular	Powerful dispersing additive especially for inorganic pigments. It reduces dispersing time and offers very good pigment stabilization. Especially recommended for glossy paints.	40 %
ADDITOL® VXW 6208	3,0 – 10 % inorg. 15 – 50 % org. pigment	W		●	●	Nonionically stabilized polymer; diluted in water	High molecular weight dispersing additive for all types of pigment. Due to its non ionic polymer structure it is highly recommended in formulations containing sensitive resins. It is recommended for both, direct grinding and pigment concentrate processes.	50 %
ADDITOL® VXW 6208/60	3,0 – 10 % inorg. 15 – 50 % org. pigment	S W		●	●	Nonionically stabilized polymer; diluted in methoxy propanol	High molecular weight dispersing additive for all types of pigment. Due to its non ionic polymer structure it is highly recommended in formulations containing sensitive resins. It is recommended for both, direct grinding and pigment concentrate processes. Highly recommended in 2K Epoxy formulations.	60 %
ADDITOL® XW 6581	3,0 – 10 % inorg. 15 – 40 % org. pigment	W		●	●	Wetting and dispersing agent; free of alkylphenol ethoxylates; no VOC	Wetting additive to improve gloss and color strength of difficult wettable pigments. It allows an improved material flow.	50 %
ADDITOL® VXW 6394	10 – 30 % inorg. 30 – 75 % org. pigment	W		●		High molecular weight polymer; nonionic	Very sufficient, high molecular weight dispersing additive for all types of pigment. Due to its non ionic polymer structure it is highly recommended in formulations containing sensitive resins. Further it can be used for the production of highly loaded, binder free pigment concentrates.	40 %
ADDITOL® XW 330	0,1 – 0,4 % pigment / extender	W			●	Polyacrylic acid-ammonia salt; anionic; low molecular	Low molecular weight wetting and dispersing additive especially for inorganic pigments and extenders. Strongly recommended for titanium dioxide white.	30 %

## Wetting and Dispersing Additives

Additive name	Dosage	SB/WB	Automotive	Industrial	Architectural	Characteristics	Description	% Active matter
<b>Dispersing Pigment slurries</b>								
ADDITOL®* XL 6521	3,0 – 10 % inorg. 15 – 60 % org. pigment	S	●	●		Modified block copolymer; high molecular; cationic	Powerful, high molecular weight dispersing additives for very difficult wettable pigments. Especially recommended for all carbon black pigments in order to achieve perfect color properties and extreme high gloss.	60 %
ADDITOL® XW 6532	15 -50 % org. pig. 30-100 % carbon black	S W		●	●	Ionic polymeric dispersing additive	Highly efficient dispersant for organic pigments and carbon black. It can improve color acceptance of colorants in solventborne paints. It is recommended for the production of waterborne pigment slurries.	40 %
<b>Grinding media</b>								
ADDITOL® XL 6557	Grinding medium	S		●		Air drying alkyd polymer	Pigment grinding medium for solventborne (SB) industrial pigment pastes. High pigment concentration. Supports air-drying, physical drying and isocyanate and amino crosslinking systems. Compatible in broadest range of SB resins.	70 %
ADDITOL® XW 6535	Grinding medium	S W		●	●	High polymeric, auto emulsifying pigment grinding medium	Universal grinding medium for the production of pigment pastes used in all types of tinting machines. For improved color properties and better exterior performance. Recommended for all architectural, decorative and many industrial pigment pastes.	45 %
ADDITOL® XW 6565	Grinding medium	S W		●	●	High polymeric, auto-emulsifying pigment grinding medium; improved compatibility in non aqueous paints	Latest generation of high molecular, universal pigment grinding medium for Architectural colorant production. High pigment loading and low mill base viscosities. Designed for POS and in house tinting. Ultra low VOC and Eco labels 2009/543/EC and 2009/544/EC.	38 %
ADDITOL® XW 6591	Grinding medium	W	●	●		Polyester modified acrylic polymer; co-crosslinkable	Co - crosslinkable grinding medium with high pigment loading capacity. Due to its special composition and reactivity it can improve chemical resistance and corrosion protection. Broad compatibility. Improved life time stability.	35 %
<b>Special pigment wetting</b>								
ADDITOL® XL 6577	2,5% - 10% inorg. Pigment 15 - 60% matting agent	S		●		Copolymer with acidic groups	Excellent dispersant for SB and HS / UHS paints and inorganic pigment / filler preparations. Enables highest pigment loading with low viscosity. Supports low VOC formulations.	52 %
<b>Anti settling</b>								
ADDITOL® XL 6514/80	0,2 –1,0 % inorg. pigment 1,0 – 5,0 % org. pigment	S		●		Salt of a basic aminoamide with an acidic polyester	Wetting and anti-settling additive to improve gloss and pigment stabilisation and flow. Especially recommended in low VOC and high solid systems.	80 %

\* ADDITOL® additives

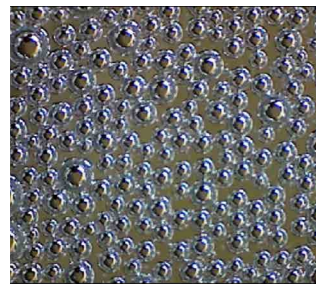
## Flow and Leveling Additives

Surface additives – Demands on optical performance are very high in most coating application areas. Defects in paint film are divergences from surface evenness and are proof of an imperfect coating process. Flow and Leveling agents are used to prevent or reduce surface defects like poor leveling, orange peel or cratering. These additives are surface active materials with a tendency to concentrate at the air coating interface. Poly (methyl) acrylates, modified silicones and surfactants based on fluorine-containing compounds are used for this application.

### Good to know ...

#### ... that some additives bring extra value

- High molecular weight flow promoters can bring added value in systems with entrapped micro foam. They allow for easy degassing even in high viscous formulations.



Micro foam bubbles in a solvent-borne clear coat

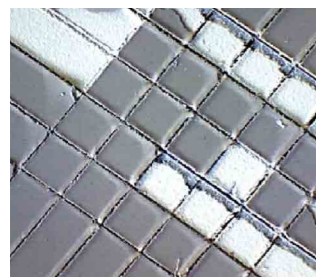


Micro foam disappears from liquid phase

- Use MODAFLOW® Resin or MODAFLOW® EPSILON

#### ... that standard silicones destroy adhesion

- Standard silicone additives are not heat stable and may create condensation products when heated over 150°C. The resultant silicone aggregates lead to crater formation or loss of intercoat adhesion.



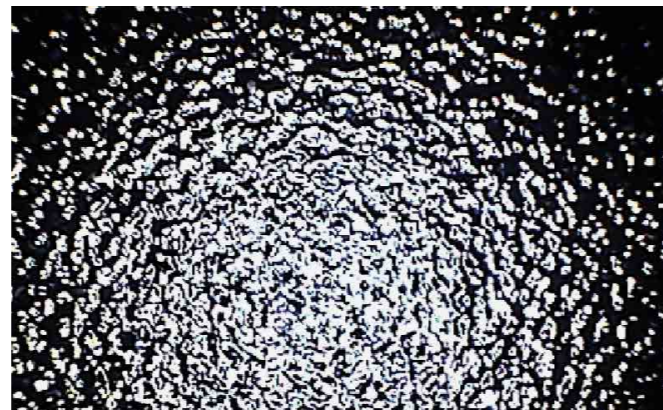
Loss of interlayer adhesion



Excellent adhesion on primer

- Use ADDITOL® XL 123N or MODAFLOW® Lambda

### Trouble shooting guide



Co-existence of short and long waves in black top coat

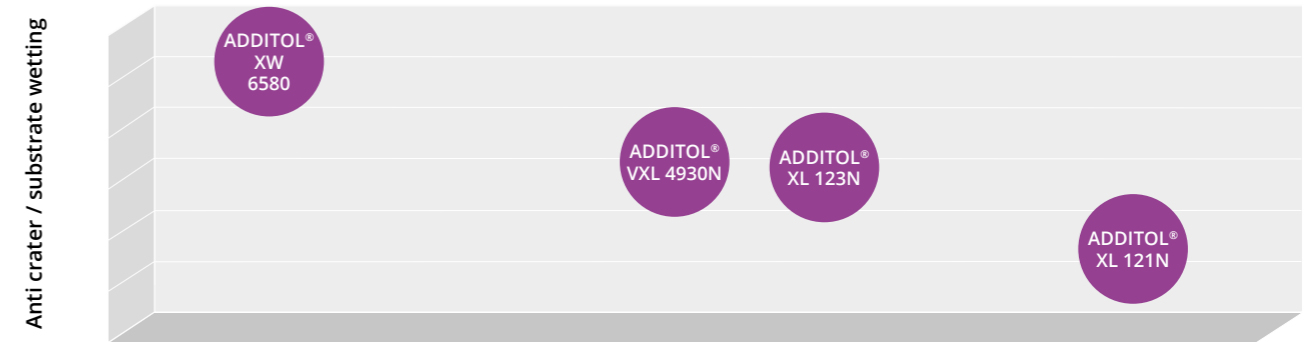
Elimination of short and long waves

ADDITOL® VXL 4930N  
ADDITOL® XW 6580  
ADDITOL® XW 395  
MODAFLOW® 9200  
MODAFLOW® AQ 3025  
MODAFLOW® EPSILON  
MODAFLOW® LAMBDA

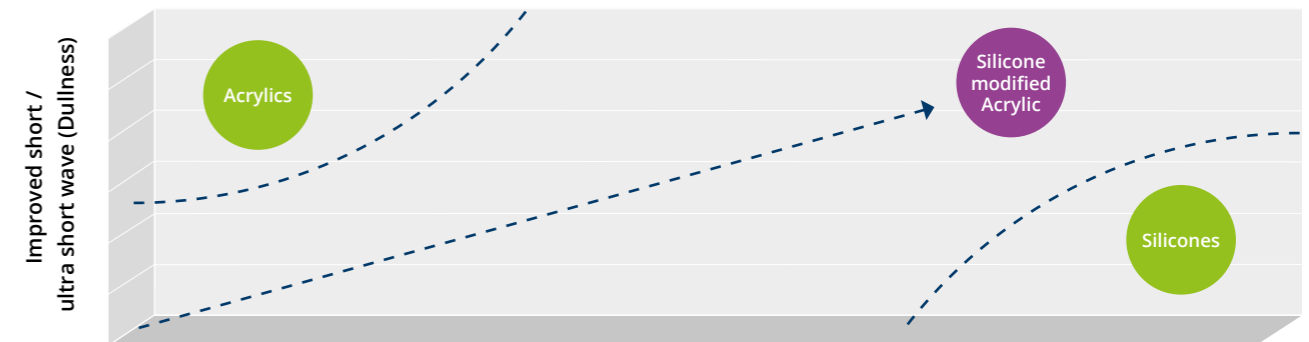


Strong improved sharpness by elimination of short and long waves

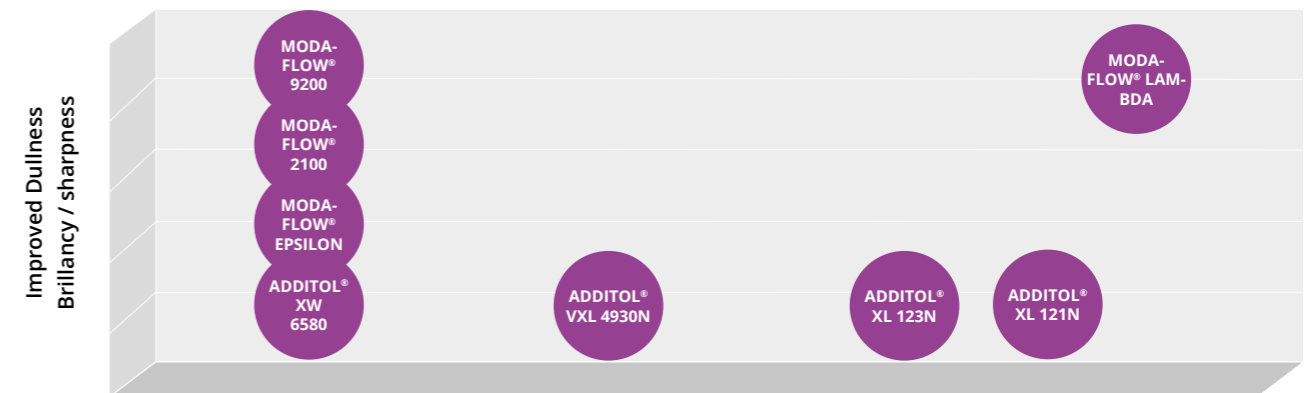
### How to select leveling additives



Slip / scratch



Improved long wave (orange peel)



Improved long wave (orange peel)



Long wave: (w d,e) 1,2-12mm



Short wave: (w b,c) 0,3-1,2m



Ultra short wave: (w a) 0,1-0,3m



Micro wave. micro structure <0,1mm

### Surface topography

- The surface topography of physically drying coatings is established during the solvent evaporation stage
- In the locations where the volatile components have evaporated, the surface tension increases, and the coatings flows towards these areas, **creating waves**

Typically the total wave amplitude is in the range of 1µm whereas the wave period varies from about 0,1mm up to 12mm. Wave lengths of less than 0,1mm create dullness or matte image.



## Flow and Leveling Additives

Additive name	Dosage	SB/WB	Automotive	Industrial	Architectural	Characteristics	Description	% Active matter
<b>Acrylic flow promoters and leveling additives</b>								
ADDITOL®** VXW 4971	0,2 – 1,0 % binder	W	●	●	●	Acrylic copolymer; neutralized by amine	Crosslinkable leveling additive to improve flow and surface quality. It prevents surface defects.	50 %
ADDITOL® XL 480	0,1 – 0,5 % total	S	●	●		Modified acrylic copolymer; low molecular weight; FDA-approved	Low molecular weight leveling additive for improved surface and anti crater effect. Very good compatibility in all major solventborne systems. Especially recommended for car refinish and coil coating applications.	70 %
ADDITOL XL 482	0,1 - 2% solid binder	S	●	●		Modified acrylic copolymer	Medium molecular weight acrylic leveling additive to improve flow and surface quality. High TG.	100 %
ADDITOL® XL 490	0,1 – 2,0 % binder	S	●	●		Modified acrylic copolymer	Medium molecular weight acrylic leveling additive to improve flow and surface quality. Effective against film defects.	100 %
ADDITOL® XW 395	0,2 – 1,0 % binder	W	●	●		Acrylic copolymer; neutralized by amine; silicone-free; FDA-approved	Multi purpose leveling additive to improve surface conditions and prevent pin holes and crater formation. Also efficient against oil contaminations.	58 %
MODAFLOW®** 2100	0,1 – 1,0 % total	S	●	●		Acrylic copolymer; medium molecular weight; FDA-approved	Medium molecular weight, highly efficient flow modifier. Good compatibility and easy incorporation, fast mode of action. Recommended also in clear coat applications.	100 %
MODAFLOW® 9200	0,1 – 0,5 % total	S	●	●		Modified acrylic copolymer; low molecular weight; crosslinkable	Low molecular weight, high efficient and crosslinkable flow modifier. It reduces film defects and strongly increases gloss levels. Recommended for all solventborne high end applications.	100 %
MODAFLOW® AQ 3025	1,0 – 2,0 % total	W	●	●	●	Acrylic copolymer; neutralized by amine; silicone-free	Medium molecular weight flow and leveling additive. It supports pigment wetting and allows a fast degassing process.	25 %
MODAFLOW® EPSILON	0,1 – 2,0 % total	S	●	●		Acrylic polymer, high molecular weight	Highly efficient flow promoter with excellent degassing properties. Recommended for all solventborne systems, especially for pigmented top coats. Easy handling and incorporation.	80 %
MODAFLOW® RESIN	0,1 – 1,0 % total	S	●	●		Acrylic copolymer; high molecular weight; FDA-approved	Highly efficient flow promoter with excellent degassing properties. Recommended for all solventborne and high solid systems, especially for pigmented top coats.	100 %
MULTIFLOW®** RESIN	0,5 – 3,0 % binder	S	●	●		Acrylic copolymer diluted in xylene	Highly efficient flow promoter with excellent degassing properties. Recommended for all solventborne systems, especially for pigmented top coats.	50 %
<b>Substrate wetting additives (anti-crater effect)</b>								
ADDITOL® VXW 6503N	0,1 – 1,0 % total	S W		●	●	Silicone tenside	Special silicone tenside with very strong influence on surface tension and excellent substrate wetting performance. It is not foam stabilizing and does not show problems in recoatability.	50 %
ADDITOL® XW 6580	0,05 – 0,5% total	S W	●	●	●	Silicone tenside	Special silicone tenside with very strong influence on surface tension and excellent substrate wetting performance. It is not foam stabilizing and does not show problems in recoatability.	100 %

\* ADDITOL® additives

\* MODAFLOW® additives

## Flow and Leveling Additives

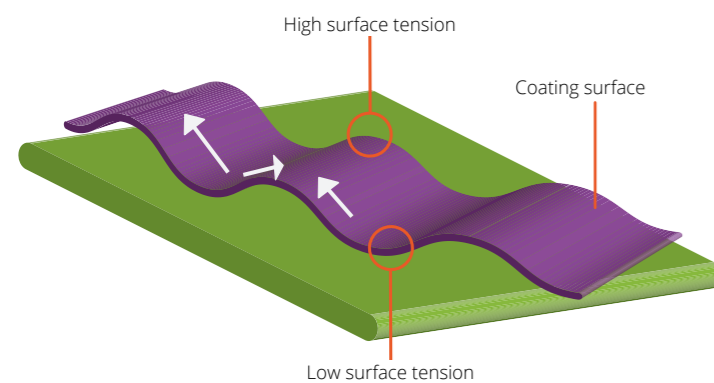
Additive name	Dosage	SB/WB	Automotive	Industrial	Architectural	Characteristics	Description	% Active matter
<b>Silicone leveling additives (slip and scratch) (anti orange peel) anti-crater effect)</b>								
ADDITOL®* VXL 4930N	0,05 – 0,3 % total	S W		●	●	Polyether-modified silicone	Universal, silicone leveling additive with very good compatibility. It is very well balanced in order to improve spray mist absorption, orange peel, cratering and leveling. Highly efficient and not foam stabilizing.	40 %
ADDITOL® XW 6586	0,05 % to 1 % total	S W	●	●	●	Organommodified polysiloxane type	Multipurpose silicone additive for improved surface quality, substrate wetting, slip and scratch resistance. FDA approved	100 %
ADDITOL® XL 121N	0,1 – 0,5 % total	S		●	●	Modified silicone	Silicone leveling additive that strongly increases slip and scratch resistance. Further it improves material flow.	14 %
ADDITOL® XL 122	0,05-0,3% total	S		●	●	Modified silicone	Silicone leveling additive to improve surface quality, slip and substrate wetting. Very good compatibility.	45 %
ADDITOL® XL 123N	0,05 – 0,5 % total	S W		●	●	Modified silicone	Silicone leveling additive to improve slip and scratch resistance. It has degassing properties and is thermostable up to 400°C.	50 %
ADDITOL® XW 329	0,1 – 0,3 % total	W		●		Modified silicone	Silicone additive to improve flow and scratch resistance.	50 %
<b>Hybrid polymer leveling</b>								
MODAFLOW®* LAMBDA	0,1- 0,5% total	S	●	●		Hydroxyl functional acrylic-silicone polymer	Highly efficient, cross linkable flow promoter for improved surface characteristics such as gloss, DOI, brilliancy, anti-orange peel effect.	100 %

\* ADDITOL® additives

\* MODAFLOW® additives

### Silicones

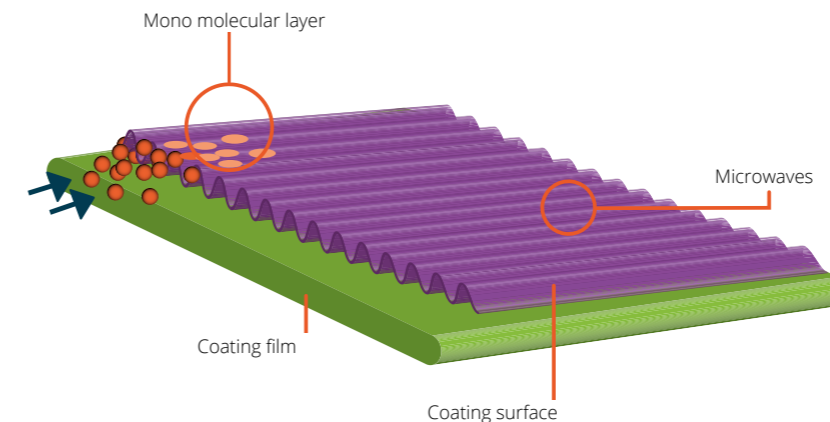
- + Reduce long wave (help to reduce orange peel)
- + Increase slip performance
- + Reduce surface tension (substrate wetting & film formation)
- Decrease interlayer adhesion



- Silicones reduce and equilibrate the surface tension of coatings during the solvent evaporation phase and directly control the formation of **long waves**.

### (Meth-)Acrylics

- + Reduce micro structure
- + No impact on surface tension
- + No impact on interlayer adhesion (can be used in multilayer systems)



- (Meth-)Acrylics copolymers have tendency to concentrate on the liquid/air interface during the drying period and form a mono molecular layer that efficiently reduces the formation of **short waves** caused by the shrinkage.

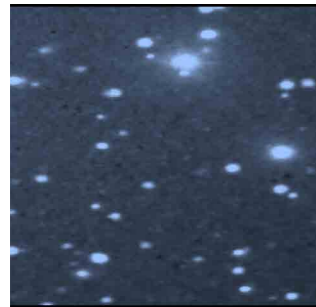
## Defoamer and Deaerater

Surface Additives – In many stages of production, handling and application, air is incorporated and finally dispersed into resins, lacquers and paints. During production and handling, the increase of volume by foam and the incorporated air will cause handling and filling problems. After application of coatings, air inside the system should leave the film while the viscosity is low enough to allow bubble marks to reflow. These larger bubbles are macro foam, which is eliminated by Defoamers. The dispersed air in the system which remains is called micro foam. Deaeraters or air release agents are used to carry these very small bubbles to the surface of the liquid phase. The technique of defoaming is based on controlled incompatibility in the system and it is important to calculate the right balance between activity and compatibility to avoid defects.

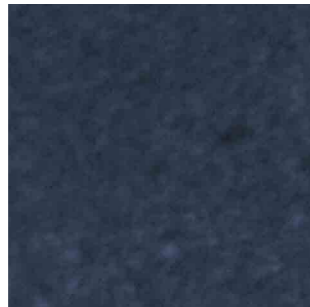
### Good to know ...

#### ... that some defoamers even enhance the system further

- Highly viscous and strong pseudo plastic paints applied with high wet film thicknesses e.g. by airless spray gun are very susceptible to entrapped foam. The foam within the coating may lead to pinhole formation and can weaken anti-corrosion performance of paints.



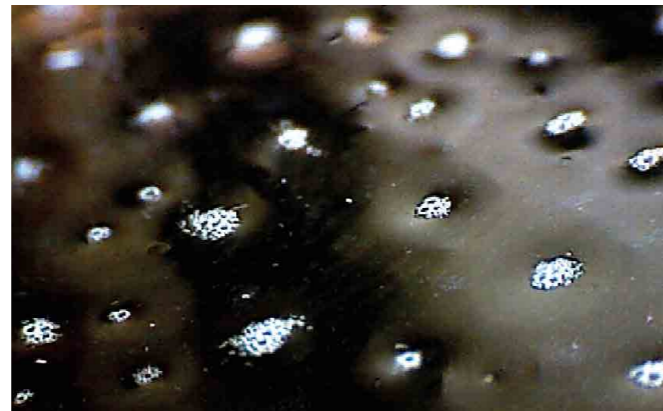
Pinholes in thick layer Epoxy primer



Closed surface obtained with ADDITOL® XW 6544

- Use ADDITOL® XW 6544 for:
  - All high viscous and high film thickness coatings
  - All airless / mix applied paints
  - All water-based pigment pastes
  - High molecular weight flow promoters can bring added value in systems with entrapped foam
- Use MODAFLOW® Resin or MODAFLOW® EPSILON.

### Trouble shooting guide



Presence of macro foam in wet clear coat



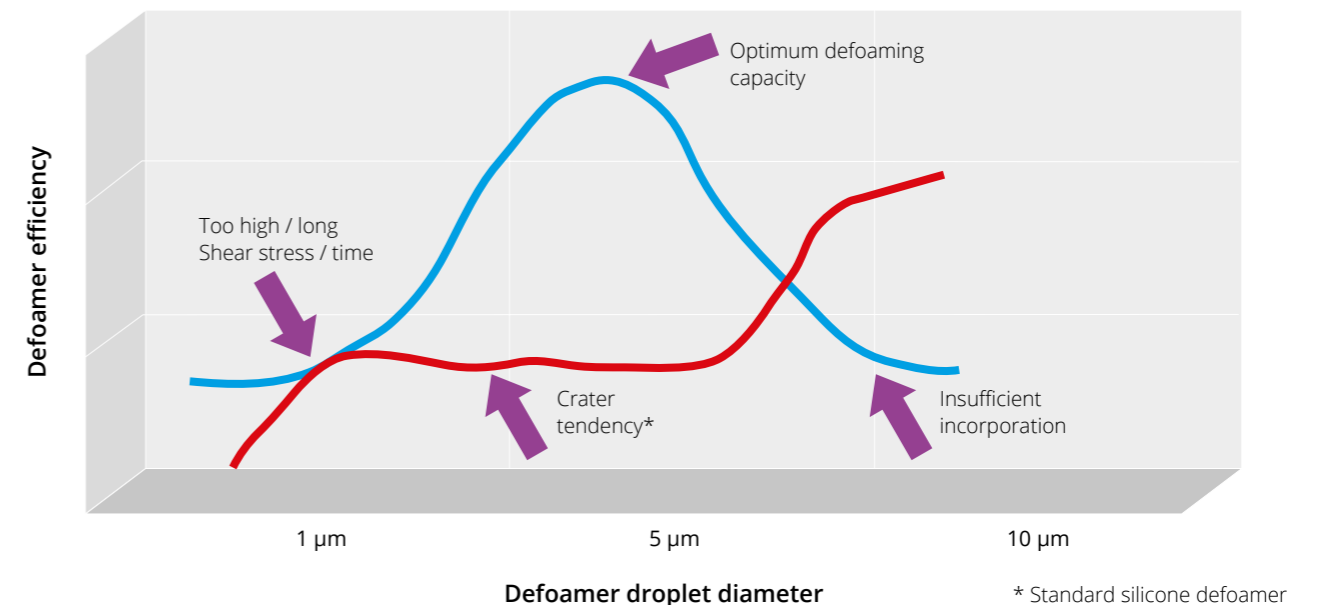
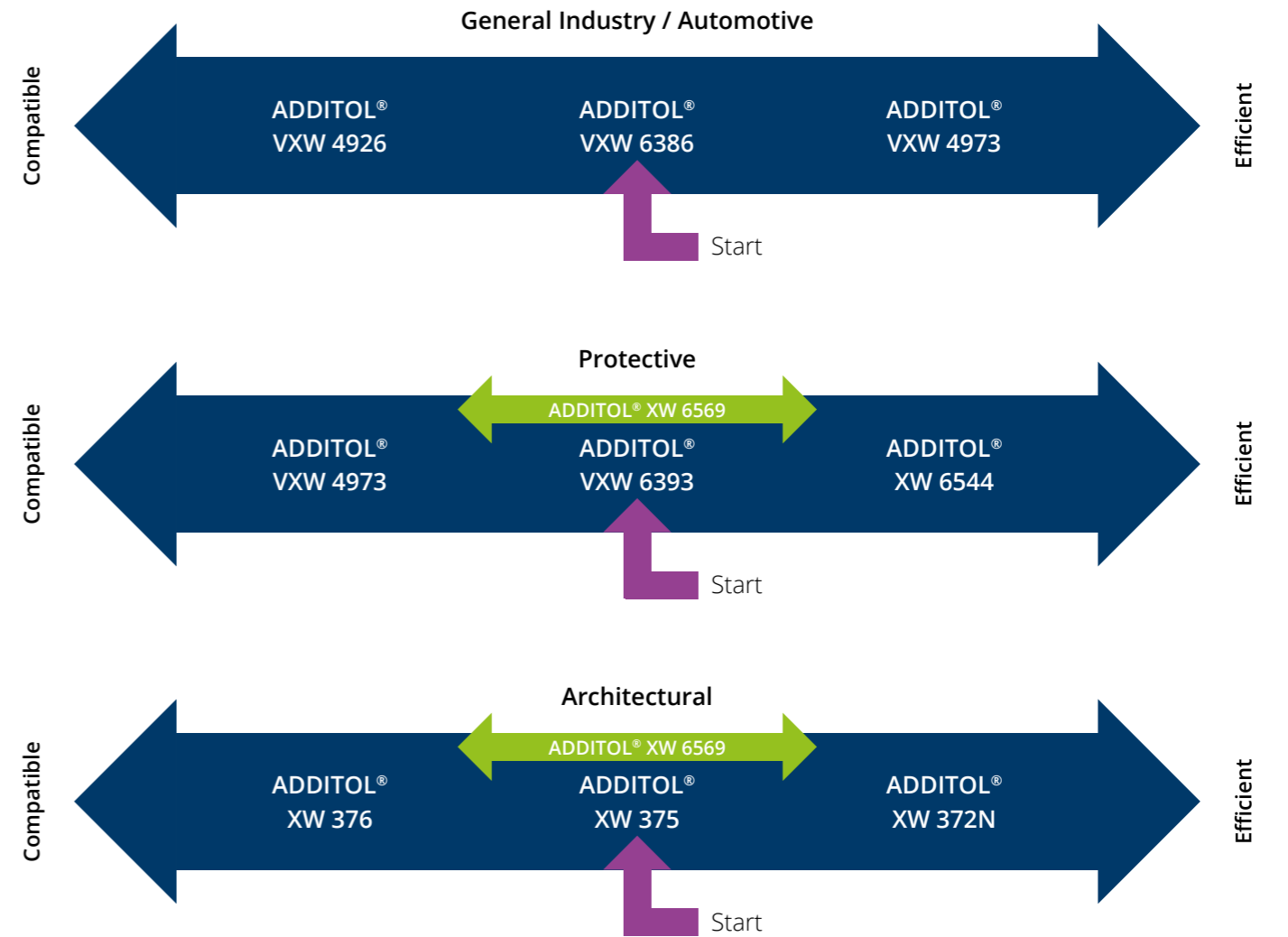
Reduction of macro and micro foam

ADDITOL® XL 6507  
 ADDITOL® VXW 4926  
 ADDITOL® VXW 4973  
 ADDITOL® VXW 6386  
 ADDITOL® VXW 6393  
 ADDITOL® XW 6544  
 ADDITOL® XW 6569



Efficient destruction of macro foam

### How to select leveling additives



## Defoamer and Deaerater

Additive name	Dosage	SB/WB	Automotive	Industrial	Architectural	Characteristics	Description	% Active matter
<b>Defoamers (silicone free)</b>								
ADDITOL®* VXW 4973	0,1 – 0,6 % total	W	●	●	●	Mineral oil, waxes	Highly efficient defoamer with good compatibility and easy incorporation. Broad field of application.	100 %
ADDITOL® VXW 6211	0,05 – 0,5 % total	W		●	●	Hydrocarbons; hydrophobic solid particles	Very strong defoamer for highly pigmented paints or pigment pastes.	100 %
ADDITOL® VXW 6235	0,2 – 1,0 % powder	W		●		Defoaming compounds applied on silica; dry powder	Powder defoamer for flooring systems or epoxy cement applications.	60 %
ADDITOL® VXW 6386	0,5 – 1,5 % total	W	●	●		Hydrocarbons, waxes	Defoamer for high quality lacquers with good compatibility. Homogenize prior use!	100 %
ADDITOL® VXW 6393	0,1 – 0,5 % total	W		●	●	Special mineral oil, waxes; low odor	Highly efficient defoamer for architectural and decorative coatings. Low odor, especially for interior applications.	100 %
ADDITOL® XW 375	0,1 – 0,6 % total	W		●	●	Mineral oil, waxes	High efficient defoamer for architectural and decorative paint mainly.	100 %
ADDITOL® XW 376	0,05 – 0,5 % paint	W		●	●	Mineral oil / wax emulsion	High efficient, easy to incorporate defoamer emulsion for architectural and decorative paints mainly.	50 %
ADDITOL® XW 6544	0,05 – 0,5 % total	W	●	●	●	Polymer defoamer, VOC free	Very efficient defoamer and deaerator for high viscous systems with strong gas incorporations. Excellent re-flow effect improves surface quality.	100 %
ADDITOL® XW 6567	0,05 – 0,5%	W		●		Modified hydrocarbon, waxes	Food contact compliant defoamer for B&B, DWI, general line containers, caps, closures and aerosol industry.	100 %
<b>Defoamers (silicone)</b>								
ADDITOL® VXW 6210N	0,05 – 0,5 % total	W	●	●	●	Modified silicone; blend of hydrocarbons	Heavy duty defoamer recommended for preparation of pigment concentrates and strong foaming systems.	100 %
ADDITOL® XW 372N	0,1 – 0,5 % total	W		●		Mineral oil, waxes; silicone containing	Defoamer with excellent long term stability, enhances flow and leveling.	100 %
ADDITOL® XW 6569	0,05 – 0,5%	W		●	●	Emulsifier free silicone emulsion, hydrophobic solid particles	Balanced efficient defoamer for transparent and high gloss systems. No impact on rheology modifiers or recoatability.	20 %
ADDITOL® XW 6584	0,05 – 0,5%	W		●	●	Emulsifier free silicone emulsion, hydrophobic solid particles	Highly efficient defoamer for transparent and high gloss pigmented topcoats. Defoamer for low shear incorporation (let down phase).	20 %
ADDITOL® XW 6585	0,2 – 1%	W		●	●	Emulsifier free silicone emulsion, hydrophobic solid particles	Highly efficient defoamer for transparent and high gloss systems. Suitable for high and low PVC formulations. thickeners - no impact on rheology profile.	25 %
<b>Air release agents (silicone free)</b>								
ADDITOL®* XW 393	0,5 – 3,0 % binder	W		●		Foam reducing compounds	Defoamer to prevent pin hole formation and improves flow.	35 %
ADDITOL® VXW 4926	2,0 – 15,0 % binder	W	●	●		Special fatty acid ester	Defoamer and deaerator with rheology improvement in order to allow better film build-up. Very fast mode of action, crosslinkable.	100 %
ADDITOL® VXW 5907	2,0 – 3,0 % binder	W	●	●		Degassing / defoaming polymer; surface active	Defoamer and deaerator to reduce flash-off time. Recommended for spray applications.	100 %
ADDITOL® XL 6507	0,1 – 1,5 % total	S		●		Degassing / defoaming polymers; silicone-free	Defoamer and deaerator for all industrial paints and lacquers, high efficient.	10 %
ADDITOL® XL 6531	0,1 - 0,5 % total	S		●		Polymer defoamer	Special polymer defoamer/deaerator, recommended for pigmented systems.	40 %

\* ADDITOL® additives

## Rheology Modifier

The rheological properties of coating systems primarily are designed to improve paint handling, application and leveling properties. Rheology modifiers are compounds which interact with formulation components, building up a three dimensional network or modifying the fluid phase only. These additives optimize the viscosity profile of coating systems.

However viscosity control is also very important to shelf storage stability, to reduce the tendency of pigment and extender sedimentation in the container. During storage, pigments and extenders may show a tendency to settle into a soft or hard layer in the container. This is caused by the higher density of these components in relation to the liquid phase. Sedimentation can be overcome by using additives which form three dimensional networks. Anti-settling agents modify the viscosity at extremely low shear rates which governs sedimentation.

### Good to know ...

#### ... that there is a way to increase wet film thickness without sagging

- In case of high wet film thicknesses applied e.g. by airless spray gun or in case of overlap areas, PUR thickeners have their limits. The paint will start sagging on vertical substrates.



Strong sagging of paint



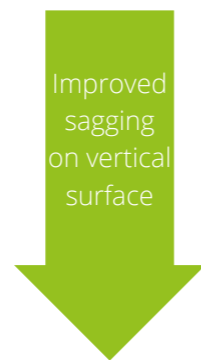
Improved sagging control

- Use ADDITOL® XW 6536 to achieve extreme high film thickness without sagging.

### Trouble shooting guide



Sagging of paint on vertical substrate



Improved sagging on vertical surface

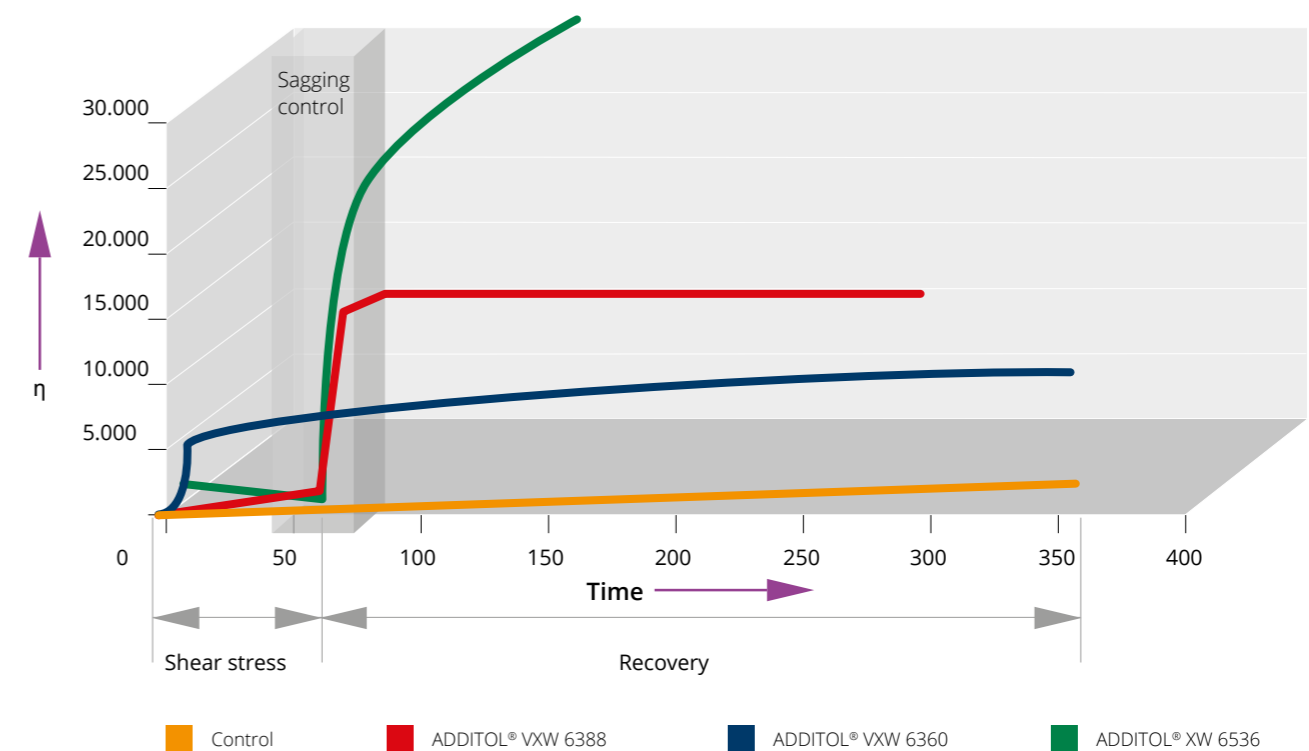
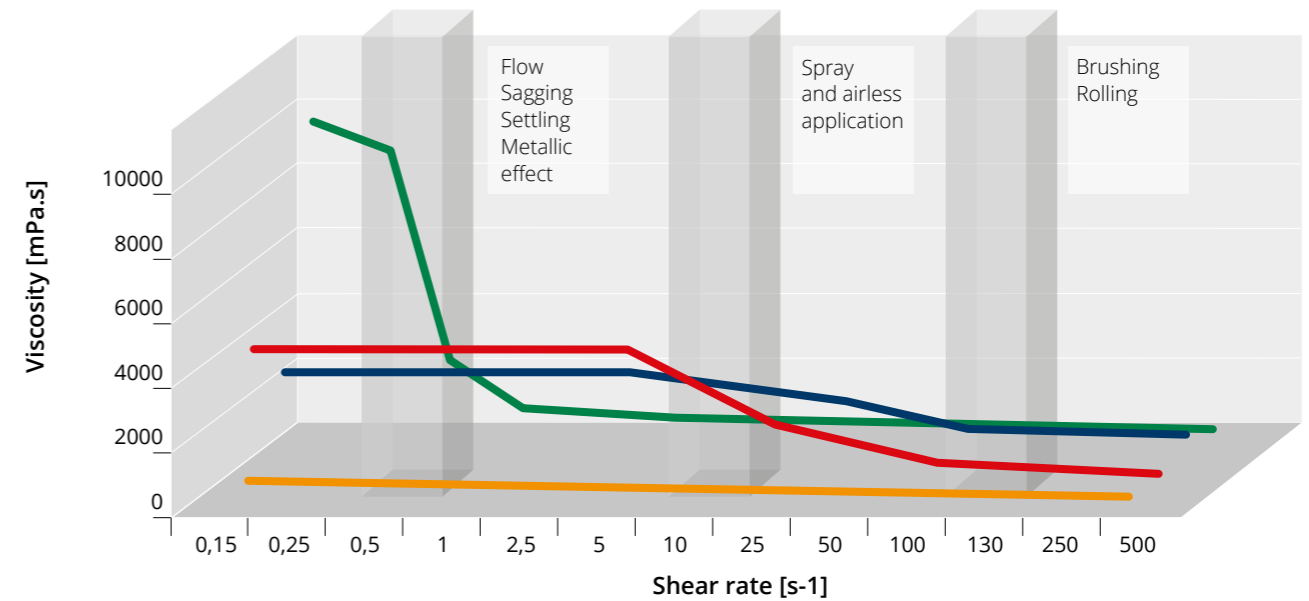
ADDITOL® VXW 6360  
ADDITOL® VXW 6387  
ADDITOL® VXW 6388  
ADDITOL® XW 6536



Paint stays on vertical substrate without sagging

### How to select rheology modifiers

#### Rheology profile of a water-based acrylic clear coat



## Rheology Modifier

Additive name	Dosage	SB/WB	Automotive	Industrial	Architectural	Characteristics	Description	% Active matter
<b>Rheology modifiers</b>								
ADDITOL®* VXW 4934	1,0 – 10,0 % binder	W	●	●	●	Modified wax emulsion	Reduces settling and sagging, enhances edge covering.	35 %
ADDITOL® VXW 6360	0,1 – 3,0 % total	w	●	●	●	Polyurethane thickener	Associative thickener to control rheology and flow. It improves applicability by roller or brush. Easy to incorporate.	30 %
ADDITOL® VXW 6387	0,1 – 5,0 % pigment	S W	●	●	●	Special fatty acids; amine neutralized; silicone-free	Rheology modifier to prevent pigment sedimentation, sagging and storage stability.	60 %
ADDITOL® VXW 6388	0,1 – 3,0 % total	W	●	●	●	Polyurethane thickener	Associative thickener to control rheology at low shear stress. Recommended for spray application. Excellent against sedimentation and sagging.	35 %
ADDITOL® XL 270	0,1 – 2,0 % pigment	S W	●	●	●	Special fatty acid modified silicone; amine neutralized	Multi purpose additive to improve rheology and prevent from settling and floating. Also recommended in high gloss systems.	55 %
ADDITOL® XL 280	5,0 – 10,0 % pigment	S	●	●	●	Special modified montmorillonite clay	Rheology modifier to prevent powerful settling of pigments and extenders, reduces sagging.	36 %
ADDITOL® XW 6536	0,2 -0,8 % total	W	●	●	●	Special organic activated clay	Special rheology modifier with extremely fast viscosity recovery. Recommended for all high wet film thicknesses e.g. in case of airless application. Prevents sagging and settling at zero and low shear stress sufficiently.	37 %

\* ADDITOL® additives

## Driers & Catalysts

Driers and Catalyst selection are very important elements to ensure the desired performance in reactive and crosslinked coatings.

The cross linking reaction of air drying alkyd systems is based on a radical mechanism, starting with the incorporation of oxygen from air. The absorption step is accelerated by Driers, which are carboxylic salts of metals. Cobalt, manganese and iron are the most important active drying metals whereas barium, zirconium or calcium belong to the group of secondary drying metals. Pre-emulsified combination driers allow efficient set and through drying with easy incorporation in water-borne paint formulations.

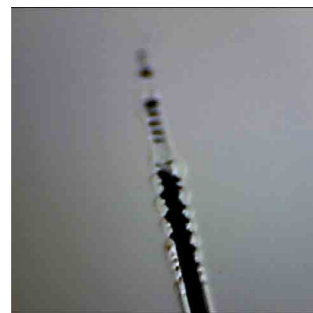
### Good to know ...

#### ... that we have fast reactivity Cobalt-free driers

- Next generation Cobalt-free driers are as efficient as Cobalt metal driers and fully in line with latest legislations. ADDITOL® dry CF series are universal driers for SB/HS/UHS and WB Architectural & Industrial formulations. Very fast set, through drying and hardness development. Supports anti corrosive performance and long lasting effect during paint storage.



Air drying paint without drier on drying recorder



Rapidly drying paint on drying recorder

- Some driers have compatibility problems when incorporated in water-based paints. In these cases pre-mixing amine with the drier immediately prior to incorporation may solve the problem.

### Trouble shooting guide



Weak corrosion protection in 2 layer system



Improved corrosion protection

CYCAT® 4040  
CYCAT® VXK 6395

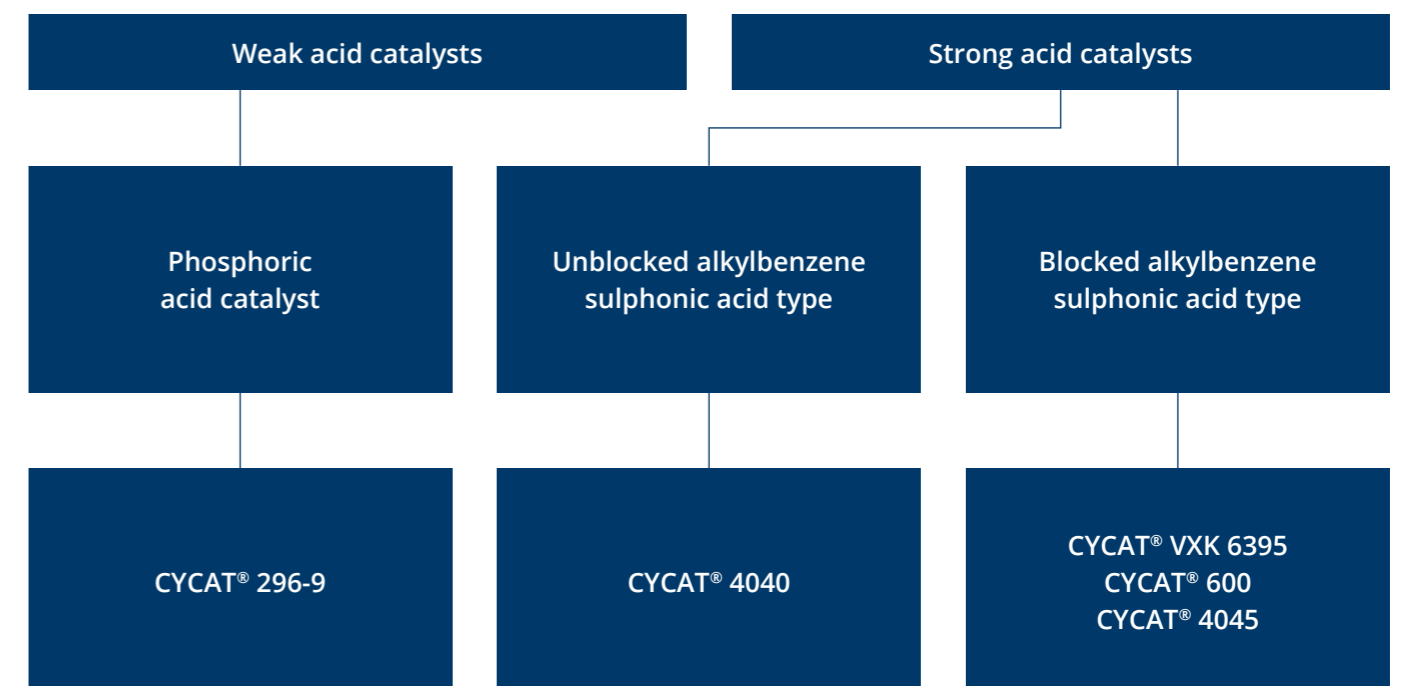
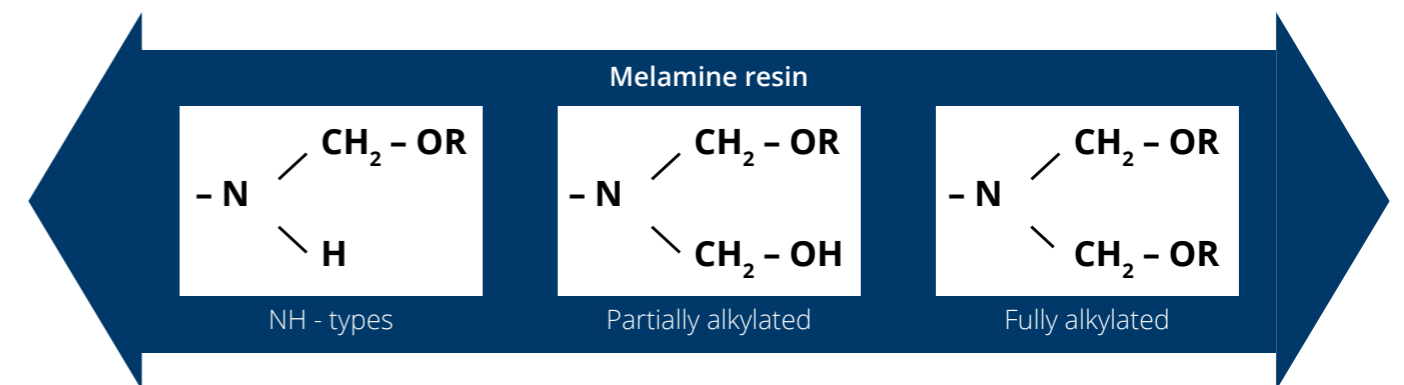


Improved corrosion protection by choosing the right catalyst

Catalysts are used to speed up cross linking reactions of two-component polyurethane systems or improve curing conditions in stoving enamels. The reaction of melamine resins and polyols is complex and require acidic catalysts. The relative efficiency of catalysts correlates to the acidity and the overall reaction rate is direct proportional to the concentration of the catalyst. Frequently used catalysts are p-toluene sulfonic acid (PTSA), dodecyl benzene sulfonic acid (DDBSA), dinonyl naphthalene di sulfonic acid (DNNDSA), phosphoric acid derivatives or organic acids.

Ionic or covalently blocked sulfonic acid catalysts are used in amino resin based stoving systems. The heat sensitive deactivation of the sulfonic acid is a very important tool to achieve the desired balance of storage stability of a catalyzed system and then rapid cure when the coating reaches the desired cure temperature.

### How to select catalysts



## Catalysts

Additive name	Dosage	SB/WB	Automotive	Industrial	Architectural	Characteristics	Description	% Active matter
<b>Catalysts</b>								
CYCAT® 296-9	0,5 – 5,0 % solid binder	S W		●		Weak phosphoric acid catalyst	To accelerate the cure reactions of high imino and partially alkylated resins	50 %
CYCAT® 4040	0,5 – 4,0 % solid binder	S W	●	●		Strong alkyl benzene sulfonic acid	Strong acid catalyst for highly alkylated melamine, benzoguanamine, glycoluril and urea resins	40 %
CYCAT® 4045	1,0 – 5,0 % solid binder	S W	●	●		Amine blocked alkyl benzene sulfonic acid catalyst	For highly alkylated melamine, benzoguanamine, glycoluril and urea resins. Provides excellent stability in wb and high solid systems	35 %
CYCAT® 600	0,5 – 4,0 % solid binder	S W		●		Strong dodecyl benzene sulfonic acid catalyst	Especially recommended for high solids formulations with hydrocarbon solubility	70 %
CYCAT® VXX 6364	0,5-4,0% solid binder	S W		●		pTSA neutralized by amine	Reduces stoving temperature/time	50 %
ADDITOL® VXX 6365	5,0 – 15 % binder	W		●		Resinous, tin containing catalyst	Catalyst for waterborne PU-systems	1 %
CYCAT® VXX 6395	1,0 – 5,0 % solid binder	S W	●	●		Amine blocked sulfonic acid	Especially for low temperature stoving applications in general industry and OEM	25 %
CYCAT® XK 406N	2,0 – 5,0 % solid binder	S		●		Phosphoric acid based catalyst	Accelerates curing of phenolic and phenolic / epoxy systems	9 %
CYCAT® 6925	0,5 – 5,0 % solid binder	S W		●		Amine blocked dodecyl benzene sulfonic acid	Recommended for packaging coating with direct food contact. Complies with FDA 21 CFR, Sec. 175.300 (b) xiii (a&b)	25%
CYCAT® 6325	0,5 – 5,0 % solid binder	S W	●	●		Amine blocked dodecyl benzene sulfonic acid	Accelerates the cure of amino crosslinking agents and provide improved formulated package stability	25%
CYCAT® 6020	0,5 – 4,0 % solid binder	S W	●	●		Amine blocked dodecyl benzene sulfonic acid	Best appearance, excellent color in automotive clear coat	40%

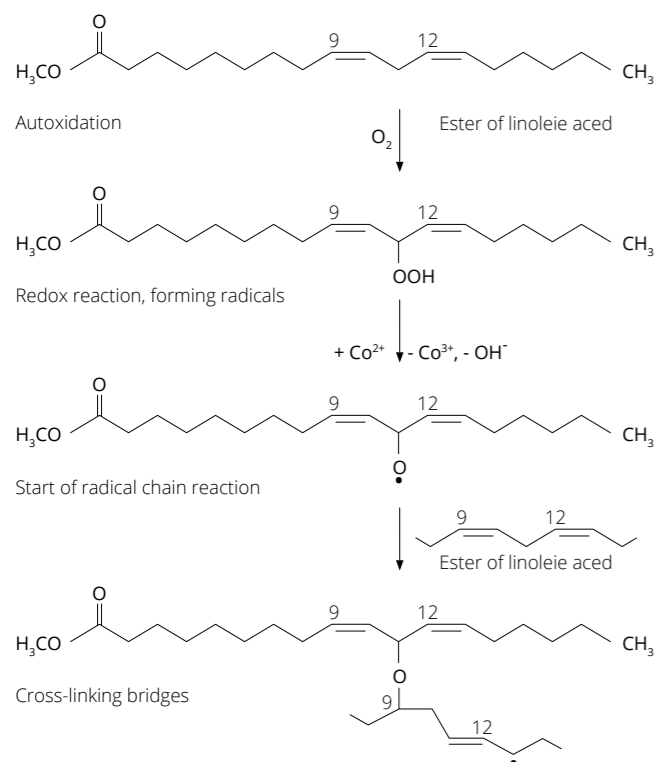


## Driers

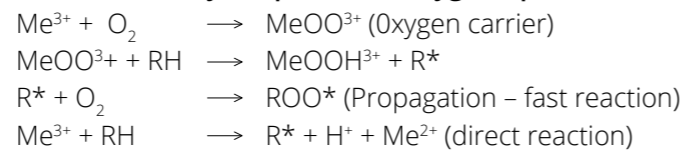
Additive name	Dosage	SB/WB	Automotive	Industrial	Architectural	Characteristics	Description	% Active matter
<b>Driers</b>								
ADDITOL®* VXW 4940N	2,0 – 3,0 % binder	W		●	●	Combination drier; 3 % Co / 3 %Ba / 5 %Zr in form of emulsion; NPE-free	Easy to incorporate; enhances surface and through drying	
ADDITOL® VXW 6206	1,0 – 3,0 % solid binder	S W		●	●	Combination drier; 5 % Co / 0,22 %Li / 7,5 %Zr; NPE-free	Enhances surface and through drying	
ADDITOL® XW 6533	4,0 – 6,0 % binder	S W		●	●	Special accelerated cobalt free combination drier; contains Mn and Zr	Allows fast set and through drying and excellent hardness development. Recommended for primers and top coats.	
ADDITOL® XW 6555	3,0 – 6,0% solid binder	S W		●	●	Nontoxic polymeric cobalt containing combination drier; 1,5% Co-polymer / 2,5% Zr / 1,3% Ba / VOC <25g/l	Easy incorporation in WB & SB alkyd paints. Very good through drying. This drier requires app 48 hours activation time after completing the formulation.	
ADDITOL® XW 6566	2,5 – 7,5% solid binder	S W		●	●	Nontoxic polymeric cobalt containing combination drier; 2% Co-polymer / 3% Zr / 0,1% Li / VOC < 25g/l	Easy incorporation in WB & SB alkyd paints. Very fast set drying. This drier requires app 48 hours activation time after completing the formulation.	
ADDITOL® dry CF100	0,3 – 1,3% solid binder	S W		●	●	Cobalt free drier; twin accelerated Manganese; ligand protection	Universal high performance drier for SB and WB alkyd paints. Designed for Architectural and Industrial formulations. Fast set & through drying with excellent hardness development. Can replace all Cobalt containing driers (!) Synergy drier recommendation SB: Ca / Zr or Li / Zr. Auxiliary drier for WB systems - ADDITOL® dry CF200.	
ADDITOL® DRY CF103	0,3 – 1,3% solid binder	S W		●	●	Cobalt free drier; mono accelerated Manganese; ligand protection	Universal high performance drier for SB and WB alkyd paints. Designed for Inks and Architectural formulations. Fast set & through drying with excellent hardness development. Can replace all Cobalt containing driers (!) Synergy drier recommendation SB: Ca / Zr or Li / Zr. Auxiliary drier for WB systems - ADDITOL dry CF200 or CF 300. Ultra low VOC.	
ADDITOL® dry CF200	0,75 - 1,35% solid binder	S W		●	●	Auxiliary drier combination for ADDITOL dry CF series 10% Zr 0,3% Li	Balanced auxiliary drier metal combination to be used together with ADDITOL dry CF series in WB alkyd paint formulations. Ready to use, easy incorporation in all WB alkyd formulations. Improves set drying.	
ADDITOL® dry CF300	0,75 - 1,35% solid binder	S W		●	●	Auxiliary drier combination for ADDITOL dry CF series 8,1% Zr 4,6% Ba	Balanced auxiliary drier metal combination to be used together with ADDITOL dry CF series in WB alkyd paint formulations. Ready to use, easy incorporation in all WB alkyd formulations. Improves through drying.	
BESCHLEUNIGER Co 1		S		●		Dissolved Cobalt octoate (contains xylene)	Cobalt accelerator for radical polymerisation of unsaturated polyester products.	

\* ADDITOL® additives

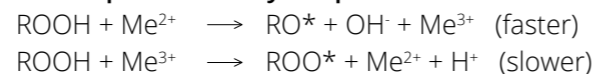
### Possible drying reactions



### Formation of hydro-peroxide (oxygen uptake)



### Decomposition of hydro-peroxide



### Combination with another unsaturated side chain (start of auto polymerization)

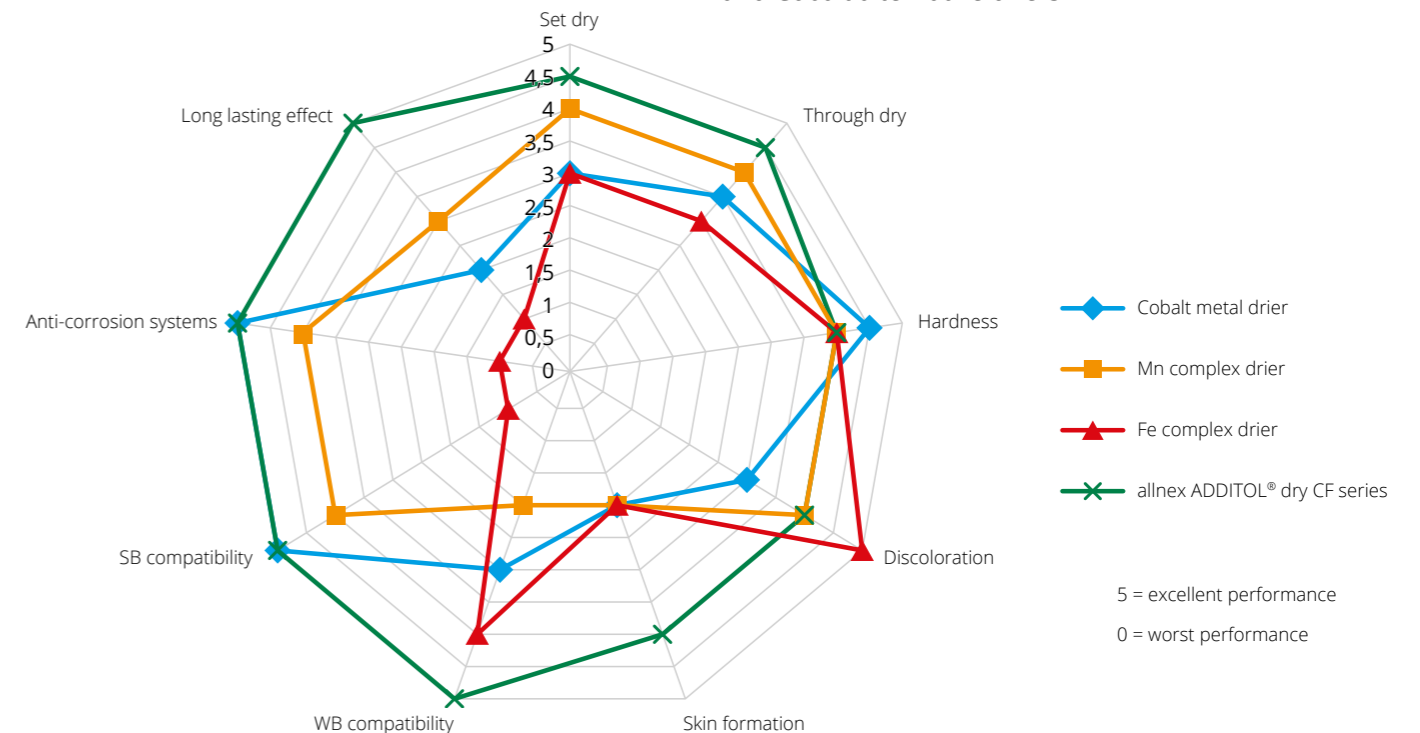
### Generation of a carbon-based radical

> Further polymerization

### ADDITOL® dry CF Series cobalt-free driers

### Overall performance diagram

allnex's next generation drier vs competitive Cobalt and Cobalt alternative driers

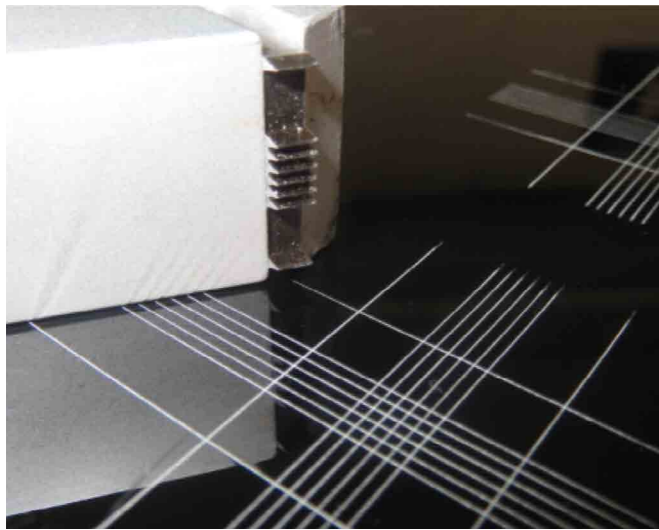


## Specialty Additives

allnex offers a selection of specialty additives which can be used for special effects in paint and coating applications as well as for other non related businesses.



- Highly efficient ANTI-ADHESION promoter technology enables most of WB & SB paints to be removed from nearly any substrate after drying/ curing. Formulations available for temporary protection coating systems. Be creative for new innovative peelable coating systems and order a sample of ADDITOL® XL 6568.



- Adhesion is often a challenge as soon as required on critical substrates such as plastics, special metals and alloys, porous substrates or wood. Also interlayer adhesion in multilayer systems requires special attention and sometimes the addition of certain additives. ADDITOL® XL 180 and ADDITOL® XL 186 are designed to deal with a variety of adhesion problems.



### Good to know ...

#### ... that we have the most effective surface energy control additives available

- Improving adhesion of WB and SB paints on porous substrates such as concrete or wood, keep dynamic surface tension low as long as drying/curing effectively takes place. ADDITOL® XW 6580 is a zero VOC surface energy control additive that helps you with substrate wetting and adhesion.



## Specialty Additives

Additive name	Dosage	SB/WB	Automotive	Industrial	Architectural	Characteristics	Description	% Active matter
<b>Adhesion promotors</b>								
ADDITOL®* VXL 4950	Flash primer	S	●	●		Halogenated polyolefin	Flash primer for plastic substrates; recommended dilution 1:8 in aromatic solvents	43 %
ADDITOL® XL 180	0,1 - 1,0 % total	S W	●	●	●	Phosphoric acid compound	Adhesion promoter for ferrous & non ferrous metals. Interlayer adhesion improvement in multilayer systems	98 %
ADDITOL® XL 186	0,3- 1,0 % total	S W	●	●	●	Phosphoric acid compound	Adhesion promoter for ferrous & non ferrous metals. Very good interlayer adhesion improvement in multilayer systems.	90 %
<b>Anti - adhesion promotor</b>								
ADDITOL® XL 6568	2 - 5% total	S W	●	●	●	Amino modified fatty acid polymer	Special anti adhesion additive for the production of peelable coatings (temporary protection and moulding). Recommended for various substrates	96 %
<b>Anti -skinning additives</b>								
ADDITOL® XL 109/50LG	2 - 5% total	S W		●	●	Phenol resin type	Anti skinning additive that prevent in can skin formation and control through drying by scavanging oxygen radicals	50 %
ADDITOL® XL 297	2 - 5% total	S W		●	●	Oxime type	Anti skinning additive that prevent in can skin formation. No impact on set drying in applied film.	100 %
<b>Flexibility / durability improver</b>								
RESAMIN® HF 480	0,5 - 5% total	S	●	●	●	Carbamic resin type compound	Special plasticizing and compatibilizing additive for physical, forced drying, 2K and stoving paints. Heat and hydrolisis stable polymer that improves flexibility, adhesion, gloss and outdoor durability. Also recommended for metallic effect paints to improve flip/flop effect.	100%
<b>Special alkyd additive</b>								
TUNGOPHEN® B NV	1 - 3% solid binder	S W		●	●	Modified phenol/formaldehyde polymer	Special (oxidative) drying control additive to accelerate through drying, improve gloss and flow of SB alkyd systems. Especially recommended for pigmented (non white) mono/topcoats based on medium oil alkyd resins.	

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## Notes

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