



# Coatings Additives

*Solutions Through Chemistry*  
*Performance through relationships*

# PRODUCTS

**King Industries, Inc.** is a leader in additive development for the **paint and coatings industry** and a global supplier of specialty chemicals. King offers a broad range of high performance catalysts, corrosion inhibitors, rheology modifiers, resin modifiers and surface control additives used in a variety of applications including automotive, aerospace, flooring and general industrial. With over 80 years of experience, King has the technical service and knowledge to assist you in reaching specific requirements for your formulation.

## Solutions Through Chemistry

	Description	Chemistry	Applications
<b>NACURE® &amp; K-CURE®</b> Catalysts pages 3-5	Acid and blocked acid catalysts for amino thermoset coatings.	DNNSA, DNNDISA, DDBSA, p-TSA and proprietary acids.	<i>Amino crosslinked systems to reduce cure schedule and improve film properties.</i>
<b>K-KAT®</b> Tin-Free Catalysts pages 6-9	Non-tin catalysts for 2K PU, blocked isocyanate systems and silane functional polymers.	Metal compounds based on zinc, bismuth, zirconium and proprietary complexes.	<i>2K PU, blocked isocyanate and silane functional coatings to replace DBTDL.</i>
<b>K-PURE®</b> Catalysts for Epoxy Systems pages 10-11	Catalysts for epoxies and electronic applications.	Based on sulfonic, hexafluoroantimonate or triflic acid and other novel catalysts.	<i>Epoxy / hydroxyl and anhydride systems. Cycloaliphatic epoxies, glycidyl ester and ether resins.</i>
<b>K-FLEX® &amp; K-POL®</b> Specialty Resins & Modifiers pages 12-25	Resin modifiers for improved hardness and flexibility.	Polyester polyols, urethane diols and acetoacetate functional modifiers.	<i>Melamine / urea crosslinked, 2K urethane coatings and cast elastomers.</i>
<b>NACORR®</b> Corrosion Inhibitors pages 26-27	Liquid organic corrosion inhibitors for waterborne and solventborne systems.	Zinc, calcium, amine, barium, magnesium and sodium sulfonates.	<i>Alkyd polyester and urethane coatings for primary or synergistic corrosion protection.</i>
<b>K-STAY®</b> Rheology Modifiers pages 28-29	Pourable liquid thixotropes for pigmented systems. Imparts anti-sag and anti-settle.	Overbased calcium sulfonates.	<i>Polyester, acrylic and alkyd / melamine systems. 2K urethanes and epoxies.</i>
<b>K-SPERSE®</b> Dispersants page 30	High efficiency dispersants for solventborne systems.	Monomeric metal sulfonates and polymeric wetting and dispersing agents.	<i>Epoxies, polyesters, acrylics, alkyds and polyurethanes for highly effective dispersing.</i>
<b>DISPARLON®</b> Thixotropes & Surface Control pages 31-43	Highly effective additives for surface control and thixotropy.	Polyamides and oxidized olefins / polyurethane hybrids.	<i>Where superior shear thinning, anti-sag, stability and high gloss are needed.</i>

**NACURE** catalysts are best selected after the end use application and performance criteria have been determined. Clear definition of the end use will allow for easier crosslinker selection and proper catalyst selection, which will ultimately create specific performance results. *Table 1* below is a selection tool to help pair the correct catalyst to the crosslinker. In addition, King also offers catalysts for benzoguanamine and phenolic crosslinkers.

Table 1 - Catalyst Selection

**NACURE Selection**

Amino Crosslinker Type	Trademarks*	Applications**	Best NACURE	
<b>Fully Methylated High Solids (HS)</b>	Resimene 745	Coil Topcoat	<b>1051, 1323, XC-311</b>	<b>Strong Acid Catalysts</b>
	Resimene 747	Coil Primer	<b>1051, 1419, XC-300</b>	
	Cymel 301	Can Exterior	<b>155, 3525</b>	
	Cymel 303LF	Can Interior	<b>5925</b>	
	Luwipal 066	General Industrial	<b>155, 3525, 2500</b>	
	Melcross 03	Appliance	<b>3525, 1953</b>	
	CCP MR-603			
<b>Fully Alkylated Mixed Ether (HS)</b>	Resimene 751, 755	Coil Topcoat	<b>1051, 1323, XC-311</b>	<b>Strong Acid Catalysts</b>
	Cymel 1116, 1133	Coil Primer	<b>1051, 1419, XC-300</b>	
	Luwipal 052	Auto Topcoat	<b>5076, 5225, 2500</b>	
	Melcross 11	Auto Basecoat	<b>155, 3525, 2500, XC-320</b>	
	CCP MR-2133	Auto Primer	<b>155, 3525</b>	
<b>Highly Butylated Low-Med Solids</b>	Resimene 881, 891	Metal Decoration	<b>155, 3525</b>	<b>Weak Acid Catalysts</b>
	Cymel 1156	Auto Topcoat	<b>5076, 5225, 2500</b>	
	Luwipal 044	Wood	<b>155</b>	
	Melcross 22	Plastic	<b>155, X49-110</b>	
	Setamine 19			
<b>Highly Methylated High Imino</b>	Resimene 717	Auto Basecoat	<b>XC-235, 4575</b>	<b>Weak Acid Catalysts</b>
	Resimene 718	General Industrial	<b>4054, 4167</b>	
	Cymel 325	Wood	<b>XC-235, 4000</b>	
	Cymel 327	Plastic	<b>4000</b>	
	Luwipal 072	Paper	<b>4000</b>	
	Luwipal 073	Can Interior		
	Melcross 27			
CCP MR-625				
<b>Partially Methylated Polymeric</b>	Resimene 730	General Industrial	<b>4054, 4167</b>	<b>Weak Acid Catalysts</b>
	Resimene 741	Wood	<b>XC-235, 4000</b>	
	Cymel 370	Plastic	<b>4000</b>	
	Cymel 373	Paper	<b>4000</b>	
	Luwipal 069			

\*The registered trademarks above are listed on page 4.

\*\*The applications listed in the table above are those commonly associated with the crosslinker type in the previous column.

**Acid Strength** - Strong acid catalysts are generally used for fully methylated, fully alkylated and highly butylated amino crosslinkers. Weak acid catalysts can be used for highly methylated, partially methylated and phenolic crosslinkers.

**Hydrophilic Catalysts** - Benefits include faster and lower temperature curing in systems crosslinked with the more monomeric melamines like HMMM. They are typically water soluble and are well suited for waterborne applications.

**Hydrophobic Catalysts** - Benefits include good water and salt spray resistance properties. They are soluble in a wide range of solvents, including non-polar aromatic and aliphatic solvents.

NACURE Hydrophobicity by Acid Type*					
Hydrophilic	p-TSA	DDBSA	DNNSA	DNNSA	Hydrophobic
	2500	5225	155	1051	
	2547	5528	3525	1323	
		5076	X49-110	1419	

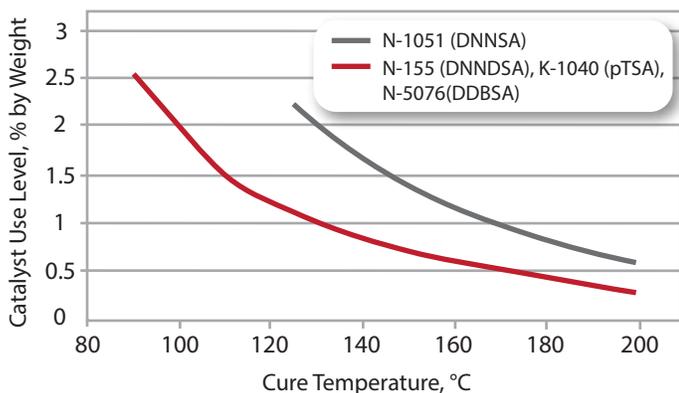
\*King also offers phosphates

NACURE				Auto	Can	Coil	Wood	Paper	Industrial
Product	% Active	Min. Cure	Attributes / Uses						
DNNSA	155	55%	RT	General purpose catalyst. Excellent adhesion. Excellent water, detergent and salt spray resistance.	W, P, R	E			P, TC
	3525	25%	120°C	Blocked. Excellent solubility, good salt spray resistance and adhesion properties.	W, P, BC	MC	P, MC		P, TC
	X49-110	25%	90°C	Blocked. Best overall properties of the DNNSA catalysts with excellent corrosion resistance and adhesion.	W, P, BC	MC			TC
p-TSA	2107	25%	90°C	Blocked. Ideal for textured coatings. Good metal mark resistance.			BC, MC		TC
	2500	25%	80°C	Blocked. Low temperature cure with excellent stability. Excellent color.	BC	E	BC, MC		TC
DNNSA	1051	50%	RT	Best water and corrosion resistance. Good overbake and telegraph resistance. For high temperature applications.			P, MC		P
	1323	21%	150°C	Blocked. For high temperature applications. Excellent solubility. Good package stability.			P, MC		
	1419	30%	150°C	Blocked. For high bake applications with good salt spray, detergent and boiling water resistance. Excellent adhesion.			P		
	1557	25%	150°C	Resolves solvent popping in thick films. Excellent humidity and detergent resistance.		E	P		P
DDBSA	5076	70%	RT	Complies with FDA 21 CFR Sec. 175.300 (b) (3) xii & xiii (a&b) and EC directive 10/2011. Fast cure		I, E			
	5225	25%	120°C	Blocked. Best solubility in high solids enamels with good performance in aliphatic solvents.	W, BC, CC, R		TC		
	5528	25%	120°C	Blocked. Broad solubility and excellent color stability.	W, BC, CC, R		TC		
	5925	25%	120°C	Blocked. Complies with FDA 21 CFR Sec. 175.300 (b) (3) xii & xiii (a&b)			I, E		

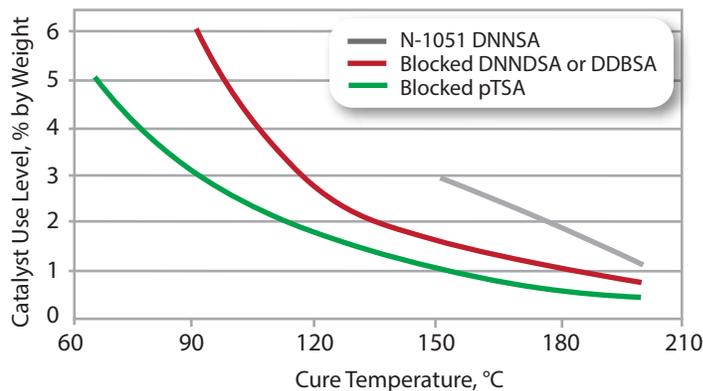
<b>NACURE</b>				Auto	Can	Coil	Wood	Paper	Industrial	
Product	% Active	Min. Cure	Attributes / Uses							
<b>PHOSPHATE</b>	<b>4000</b>	100%	80°C	A weak acid catalyst with broad solubility, good package stability and adhesion.			MC	MC		
	<b>4054</b>	50%	80°C	A weak acid catalyst with excellent solubility and water resistance compared to other phosphates.			MC	MC	P, TC	
	<b>4167</b>	25%	80°C	Blocked. Neutralized weak acid catalyst with good solubility, water resistance and excellent stability.	CC		MC	MC	P, TC	
	<b>4575</b>	25%	100°C	Blocked. Amine neutralized catalyst with high gloss and superb storage stability with polymeric amino resins.			MC	MC		
<b>NEW PRODUCTS</b>	<b>XC-296B</b>	28%	200°C	An acid catalyst designed for use in solventborne epoxy-free can coatings based on polyester/phenolic resin systems.			E, I	MC		
	<b>XC-300</b>	25%	150°C	Provides long storage stability for consistent cure response needed with basic pH anti-corrosive pigments.				P		P
	<b>XC-320</b>	50%	110°C	Formulated for water based systems to reduce cure temperature of amino crosslinked systems.			BC	P		

R = Repair    P = Primer    BC = Basecoat    CC = Clearcoat    I = Interior  
 W = Waterborne    MC = Monocoat    TC = Topcoat    E = Exterior

**Acid Catalysts - Typical Use Levels**



**Blocked Catalysts - Typical Use Levels**



**References (pages 2-4)**

1. Resimene	INEOS	4. Melcross	P&ID Co.
2. Cymel	ALLNEX	5. CCP MR	CCP
3. Luwipal	BASF	6. Setamine	Nuplex

**King Industries** has established itself as a leader in manufacturing more environmentally acceptable additives for coatings, while also providing unique performance advantages. The K-KAT range includes aluminum, bismuth, zinc and zirconium catalysts.

A summary of the main attributes and properties of the K-KAT product line can be seen in the table below. Additional benefits can be found within the performance examples in the following pages.

# Industry Leader in Tin Replacement Technology

### Tin Alternatives

	Typical Attributes / Properties
<p><b>Bismuth Carboxylates</b>  <i>Recommended for 2K SB and 1K SB blocked isocyanate polyurethane coatings and for silane functional systems</i></p>	<ul style="list-style-type: none"> <li>• Properties comparable to tin catalysts</li> <li>• Excellent exterior durability</li> <li>• Non-yellowing</li> <li>• Excellent gloss retention</li> <li>• Catalyzes secondary hydroxyl groups</li> </ul>
<p><b>Zirconium Chelates</b>  <i>Recommended for 2K SB, WB and high solids polyurethane coatings and elastomers</i></p>	<ul style="list-style-type: none"> <li>• Fast cure and selective catalysis (less gassing)</li> <li>• Effective in cold and humid conditions</li> <li>• Excellent exterior durability</li> <li>• Good pot life with 2,4-Pentanedione</li> </ul>
<p><b>Aluminum Chelate</b>  <i>Recommended for 2K SB polyurethane coatings</i></p>	<ul style="list-style-type: none"> <li>• Extends pot life better than tin with 2,4-Pentanedione</li> <li>• Synergistic effects with pot life extenders</li> <li>• Excellent exterior durability</li> </ul>
<p><b>Zinc Complex</b>  <i>Recommended for 2K WB and SB polyurethane coatings and 1K blocked isocyanate polyurethane coatings</i></p>	<ul style="list-style-type: none"> <li>• Excellent hydrolytic stability</li> <li>• Good selectivity</li> <li>• Good versatility</li> </ul>
<p><b>Zinc Carboxylate</b>  <i>Recommended for 2K polyurethane and 1K blocked isocyanate polyurethane coatings</i></p>	<ul style="list-style-type: none"> <li>• Hydrolytically stable</li> <li>• FDA 175.300 compliant</li> </ul>

## 2K PU Solventborne & Solventless

Auto OEM & Aerospace **XK-651 & XK-672**

Refinish **XK-635 & XK-651**

Maintenance **XK-651 & XK-672**

General Industrial **XK-651 & XK-672**

Clear Coatings **348 & XK-651**

Flooring **XK-635 & 6212**

Pot Life **5218 & 4205**

PU Resin Synthesis **348 & 6212**

## 2K PU Waterborne (All Applications)

Less Gassing vs. Tin **XK-661**

Less Gassing (Add to NCO) **6212**

## Silane Functional

For Moisture Cure **670**

## 1K PU Solventborne (All Applications)

Versatile Catalyst **XK-672**

Efficient Catalyst **XK-651**



<b>K-KAT</b>		Product	Use % (TRS)	Attributes	WB 2K PU	SB 2K PU	NV* 2K PU	Blocked NCO	Moisture Cure
<b>BISMUTH</b>	<b>XK-651</b>	0.1 - 2.5	Superior hydrolytic stability vs. other Bi carboxylate catalysts. Effective in some silane polymer systems.						<b>NEW EHA-Free</b>
	<b>348</b>	0.2 - 2.0	Similar cure profile and performance to DBTDL. Effective in urethane coatings and sealants.						
<b>ZINC</b>	<b>XK-661</b>	0.2 - 1.0	Effective in 2K WB and moisture cure urethane coatings. Similar performance to tin.						<b>NEW EHA-Free</b>
	<b>XK-635</b>	0.2 - 1.0	Very effective in solventborne and solventless 2K urethanes and 1K blocked isocyanate systems. Good with MEKO Blocked NCO.						
	<b>XK-672</b>	0.1 - 1.0	Excellent film properties. K-KAT XK-672 meets the requirements of FDA 21 CFR 175.300.						<b>NEW EHA-Free</b>
<b>ALUMINUM</b>	<b>5218</b>	0.5 - 2.0	Excellent 2K urethane pot life when used with 2,4-Pentanedione. Add pentanedione to polyol component before K-KAT 5218 addition.						
<b>ZIRCONIUM</b>	<b>4205</b>	1.0 - 2.0	Good pot life, 2K auto refinish coatings.						
	<b>6212</b>	0.3 - 2.0	Fast catalyst for WB coatings. Also effective in elastomers. For use in polyurethane synthesis.						

\*NV = Non-Volatile / Solventless

**K-KAT XK-651** is a novel bismuth carboxylate designed for blocked isocyanate, 2K PU and silane terminated polymer coatings. K-KAT XK-651 exhibits improved hydrolytic stability compared to other bismuth carboxylate catalysts. The study below shows the excellent stability of K-KAT XK-651 when water is present in the formula.

### 2K PU Hydrolytic Stability Study

Conditions	Polyol spiked with 0.1% water
Metal Levels	Competitor Bismuth = 0.2% Bi on TRS <b>K-KAT XK-651</b> = 0.2% Bi on TRS

The pictures to the right demonstrate the outstanding hydrolytic stability of K-KAT XK-651 when compared to a competitor's bismuth carboxylate at 1 day and 30 days of ambient storage.



**K-KAT XK-651**  
Clear

Competitor Bismuth  
Hazy



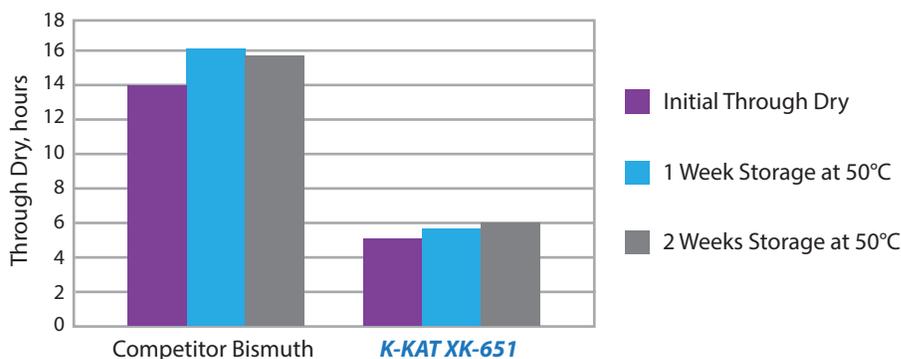
**K-KAT XK-651**  
Clear

Competitor Bismuth  
Settling

### Formulators Note

K-KAT XK-651 has superior hydrolytic stability and therefore is the preferred bismuth catalyst for use where moisture may be present.

### Through Dry - **K-KAT XK-651** vs. Comp. Bi



### Pot life and gloss vs. DBTDL - 2K WB

**K-KAT XK-661** is a novel non-tin catalyst recommended for 2K waterborne coatings. It has excellent hydrolytic stability, gloss retention and exterior durability. K-KAT XK-661 delivers superior pot life and gloss retention vs. tin, as seen in the study below where panels were coated with aged paint.

### 2K Waterbased Acrylic Isocyanate Clear Coat

Substrate	Bonderite 1000
Cure	30 minutes @ 80°C + 1 week ambient
Catalyst Levels	DBTDL = 0.04% on TRS <b>K-KAT XK-661</b> = 0.06% on TRS
Dry film thickness	0.7 mil

### Better Pot Life Stability = Better Gloss Retention

Gloss of panels coated with aged paint



2 hours with DBTDL  
**Loss of Gloss**  
Gloss 60° = 30.3



**3 hours with K-KAT XK-661**  
**Retains Gloss**  
Gloss 60° = 95.8

**K-KAT XK-672** is an effective catalyst for the reaction of isocyanates and polyols for the production of urethane coatings. It is a proprietary organometallic complex specifically designed to replace tin. It also meets FDA 21 CFR 175.300 requirements.

The following study is designed to demonstrate typical properties of tin-free catalysis in a 1K blocked isocyanate system. Improved pendulum hardness and MEK resistance can be seen in the results below.

K-KAT XK-672 is **FDA approvable** and compatible with FDA approvable resins and coatings systems.

**1K Blocked NCO System**

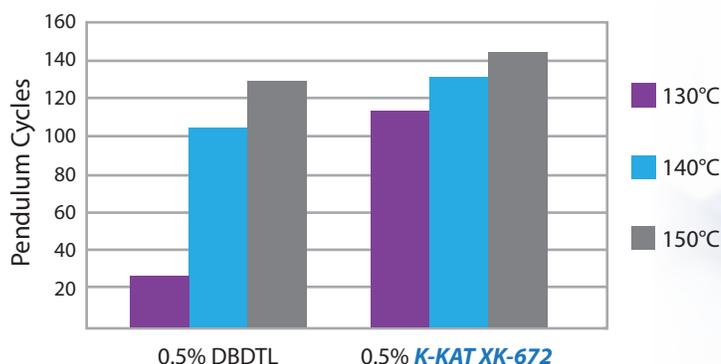
Materials	Description	Acrylic Control	Tin-FREE K-KAT
Joncryl <sup>1</sup> 500	Acrylic Polyol	45.74	45.74
<b>K-KAT XK-672</b>	<b>Tin-FREE Catalyst</b>	-	<b>0.32</b>
DBTDL	Tin Catalyst	0.32	-
PM Acetate <sup>2</sup>	Solvent	9.35	9.35
Aromatic 150	Solvent	3.88	3.88
Isopropanol	Solvent	2.89	2.89
DISPARLON® L-1984	Leveling Agent	0.29	0.29
Trixene <sup>3</sup> 7984	Blocked Isocyanate	37.54	37.54
Total		100	100

**Joncryl 500 / MEKO Blocked NCO**

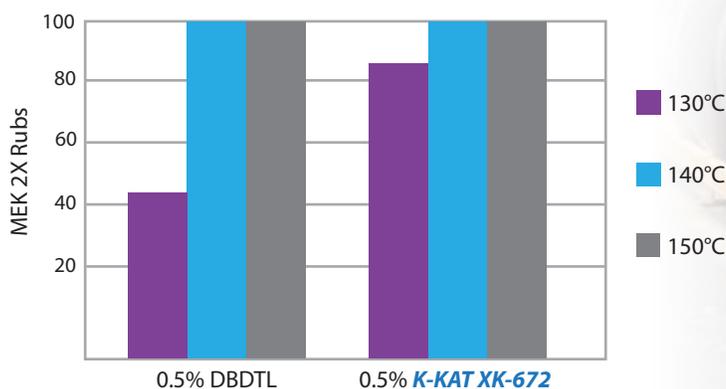
Substrate	Bonderite 1000
Cure	20 Min. Bake @ 130°C, 140°C, 150°C
Catalyst Levels	DBTDL = 0.5% on TRS <b>K-KAT XK-672</b> = 0.5% on TRS
Dry film thickness	1 mil

NCO:OH = 1:1

**Pendulum Hardness - K-KAT XK-672 vs. DBTDL**



**MEK Resistance - K-KAT XK-672 vs. DBTDL**



**References (pages 5-8)**

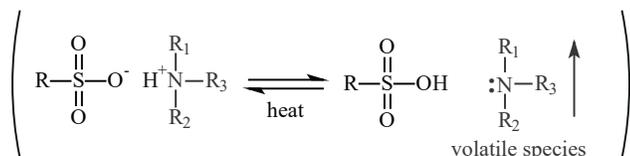
1. Joncryl	BASF
2. PM Acetate	Eastman
3. Trixene	Chemtura



**K-PURE TAG and CXC** blocked acids are particularly effective for accelerating and lowering the activation temperature of stable, one component systems based on; aminoplast, glycoluril, siloxane, silanol and phenoxy condensation reactions as well as epoxy homopolymerization and co-polymerization with polyols, vinyl ethers, oxetane and anhydride resins. Blocking techniques and features are described below.

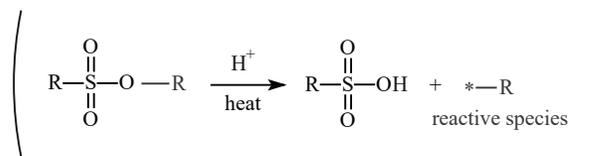
### Amine Blocked Acids

Solubility in water and polar solvents  
Broad activation temperature range  
Volatile by-product



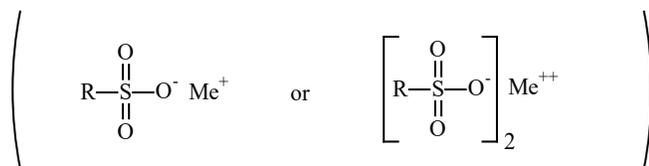
### Covalently Blocked Acids

No volatile by-products  
Narrower solubility range (hydrophobic)  
Solventbased



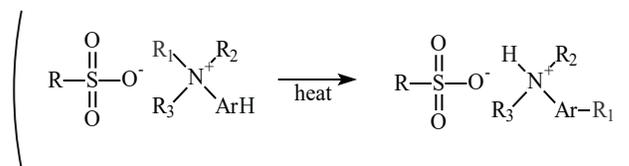
### Metal Blocked Acids

Mono and divalent metals  
Surface active compounds  
Hydrophobic and hydrophilic  
Corrosion inhibition with catalytic behavior



### Quaternary Blocked Acids

Broad control over activation range  
100% solids - white powders  
Narrower solubility range (hydrophobic)  
No volatile component



		Blocking Type	Min. Activation Range, °C *	Attributes
<b>SbF<sub>6</sub></b>	<b>CXC-1612</b>	Quaternary	80-110	Powder, most efficient product, lowest temperature
<b>TPFB</b>	<b>CXC-1821</b>	Quaternary	80-110	Powder, non antimony alternative to 1612
<b>TFSI</b>	<b>CXC-1802-60</b>	Quaternary	80-120	Liquid, 60% active in PGMEA
<b>OTf</b>	<b>CXC-1614</b>	Quaternary	100-150	Powder, mid-range activation temperature
	<b>CXC-2689</b>	Quaternary	130-170	Powder, mid-range activation temperature
	<b>CXC-2691</b>	Quaternary	170-190	Powder, high temperature TAG
<b>Other</b>	<b>CXC-1756</b>	Metal	110-130	Liquid, 2K epoxy systems
	<b>CXC-1765</b>	Metal	130-140	Liquid, 2K epoxy/acid anhydride reactions, low color

## K-PURE CDR - Resin Modifiers

**K-PURE resin modifiers** offer formulators three core chemistries that can be used to improve mechanical properties, crosslinking density and resistance properties.

**Core chemistries** include unique ester diols with low molecular weight and very narrow molecular weight distribution, urethane diols with an aliphatic urethane backbone and an acetoacetate functional reactive diluent.

K-PURE CDR Type	Amino	Isocyanate	Silanol	Solvent	Solventless	Water	Epoxy*	Epoxy**
Ester Diols	☑	☑	☑	☑	☑	☑	☑	☑
Urethane Diols	☑	☑	☑	☑	☑	☑	☑	☑
Acetoacetates	☑	☑	☑	☑	☑	☑	☑	☑

\*Anionic \*\*Cationic

### Ester Diols

Improve Flexibility  
Reduce Modulus

### Urethane Diols

Improve Chemical Resistance  
Improve Adhesion

### Acetoacetates (AA)

Improve Adhesion  
Improve Corrosion Resistance

		OH # / AN / EW	Viscosity Range, cPs	Tg	Adhesion	Toughness
Ester Diols	<b>CDR-3314</b>	225-245 (OH#)	10,000 - 12,000	High	Excellent	Best
	<b>CDR-3315</b>	132-145 (OH#)	4,000 - 5,000	Low	Good	Good
	<b>CDR-3316</b>	250-270 (OH#)	1,200 - 1,800	Med	Good	Best
	<b>CDR-3441</b>	135 (OH#) / 30 (AN)	40,000 - 60,000	Low	Best	Fair
Urethane	<b>CDR-3317</b>	340-360 (OH#)	150,000 - 300,000	High	Good	Good
AA	<b>CDR-3320</b>	190 (EW)	900 - 1,200	N/A	Best	Fair

## K-PURE CDI - Corrosion Inhibitors

**K-PURE** corrosion inhibitors represents a broad range of core chemistries for the protection of ferrous and non-ferrous metals. Most common applications and system dependency are found below.

### Sulfonic Acids

Potting Compounds  
Cleaners & Strippers

### Phosphate

Cleaners & Strippers  
Adhesives  
Potting Compounds

### Amino Acid Derivatives

Cleaners & Strippers  
CMP Slurries  
Adhesives  
Potting Compounds

K-PURE CDI Type	Oil	Solvent	Solventless	Water	Wax
Sulfonic Acid	☑	☑	☑	☑	☑
Phosphate	☑	☑	☑	☑	☑
Amino Acid	☑	☑	☑	☑	☑
Triazole	☑	☑	☑	☑	☑
Acetoacetate	☑	☑	☑	☑	☑

### Triazole Derivatives

Cleaners & Strippers  
CMP Slurries  
Wire  
Adhesives  
Potting

### Acetoacetate

Adhesives  
Potting Compounds

### Metal Type

Ferrous
Ferrous & Soft Metals
Soft Metals
Ferrous & Soft Metals
Aluminum

<b>K-PURE CDI Products</b>	<b>CDI-4301</b>	<b>CDI-4303</b> <b>CDI-4310</b>	<b>CDI-4308</b>	<b>CDR-3320</b>	<b>CDI-4311</b>
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**K-FLEX** 100% active polyester diols are used primarily as modifiers for acrylic, alkyd, epoxy and polyester formulations with isocyanate or melamine crosslinkers. The low molecular weight and narrow molecular distribution of these diols allows for the formulation of higher solids coatings and high compatibility with difficult resins and solvents. Primary hydroxyl groups provide high reactivity for lower temperature cure. Typical modification levels are 5% to 15% on total resin solids.



**Formulate lower VOC coatings**

**Lower cure temperature**

**Increase flexibility & maintain hardness**

**Maintain higher crosslink density**

**Improve adhesion**

**Excellent resistance properties**

**Excellent compatibility**

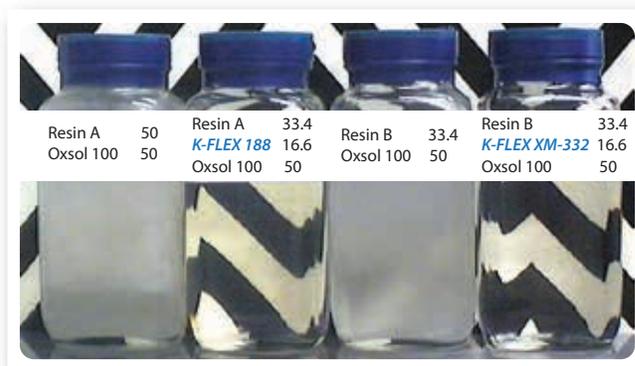
### Compatibilization & Solubility

Most polyester resins have poor solubility in exempt solvents. Solubility in Oxsol<sup>1</sup> 100 and t-butyl acetate are particularly difficult.

**K-FLEX** polyester diols are soluble at 10-50% by weight in Oxsol 100, acetone, propylene carbonate, dimethyl carbonate and t-butyl acetate.

**K-FLEX** polyester diols are very effective at compatibilizing other resins to achieve solubility in these exempt solvents. This is demonstrated in the adjacent image with two commercial resins (A&B) and Oxsol 100.

*The image below represents 33% replacements of polyester A&B to achieve solubility.*



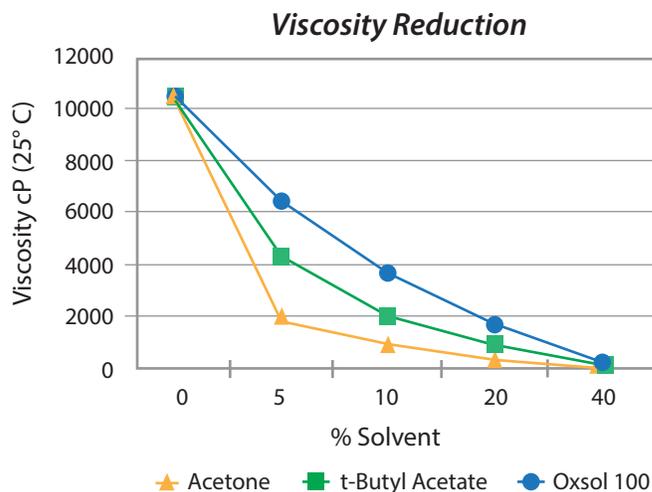
*K-FLEX compatibilization of other resins in Oxsol 100  
Identical results when used in t-butyl acetate*

### Viscosity Reduction - K-FLEX 188

**K-FLEX** diols provide efficient viscosity reduction with low levels of solvent due to their narrow molecular weight distribution.

Viscosity reduction of K-FLEX 188 with exempt solvents including Oxsol 100, t-butyl acetate and acetone are demonstrated in the graph to the right.

A spray viscosity is possible with K-FLEX 188 at about 90% solids in acetone or about 80% solids in t-butyl acetate. Ketones and esters are very efficient solvents for viscosity reduction of the K-FLEX polyester diols.



The formulation below demonstrates the performance of a high solids 2K acrylic polyurethane coating modified with **K-FLEX 188**, a light stable, high Tg (-32°C) polyester polyol. K-FLEX 188 modification is at 14% on TRS and VOC is reduced from 3.40 to 2.83 lbs./gal.

**King Formulation API-17**

Grind	Description	Weight %
Joncyl <sup>2</sup> 906	Acrylic Resin	15.6
Titanium Dioxide	Pigment	71.3
MP Acetate	Solvent	12.7
K-SPERSE <sup>®</sup> 152	Dispersant	0.4

Component 1	Description	Acrylic Control	K-FLEX Modification
Grind	See Grind	36.8	40.5
Joncyl 906	Acrylic Resin	36.6	28.0
<b>K-FLEX 188</b>	<b>Polyester Diol</b>	-	<b>6.2</b>
1M-2P Acetate	Solvent	14.8	10.2
BYK <sup>3</sup> 310	Wetting Agent	0.1	0.1
Tinuvin <sup>4</sup> 123	HALS	0.3	0.3
Tinuvin 1130	UV Absorber	1.0	1.0
Catalyst	Metal Catalyst	0.1	0.1

Component 2			
Desmodur <sup>5</sup> N-3300	Isocyanate resin	10.3	13.6

**Film Performance - Benefits**

-  Improved impact resistance
-  Improved water resistance
-  Major reduction in viscosity & VOC
-  Maintained hardness
-  Improved flexibility



 K-FLEX Modification: 14% based on TRS

**Cure & Application Conditions**

**Cure Schedule:** 30 minutes/80°C + 1 week ambient

**Dry Film Thickness:** 25µ (1.0-1.1 mils)

**Substrate:** Bonderite<sup>6</sup> 1000

FILM PROPERTIES	Control	K-FLEX 188
MEK Resistance (2X Rubs)	100+	100+
Pendulum hardness, cycles	119	115
Reverse impact (image below)	<5	160+

Both the control and the modified system exhibited 100% crosshatch adhesion



Control  
**FAIL: 160 in-lbs**

Control (Magnified)  
**FAIL: 160 in-lbs**

**K-FLEX 188**  
**PASS: 160 in-lbs**

**K-FLEX** diols have excellent solubility across a broad range of solvents including PC, DMC, TBA and PCBTF. Certain exempt solvents and resins were once incompatible with each other, resulting in poor appearance and poor performance. The addition of a K-FLEX polyester diol would compatibilize the resin and exempt solvent, resulting in improved film properties.

Formulation of API-17 on *Page 12* is based on conventional solvents. The VOC decreased from 3.40 to 2.83 lbs./gal with a 188 modification. The solvents in API-17 were replaced with exempt solvents to obtain a **zero VOC formulation** (API-18) described below. K-FLEX modification is at 14% on TRS.



### King Formulation API-18

Component 1	Description	Acrylic Control	XM-337	XM-332
Grind (see API-18)*	Resin, TiO <sub>2</sub> , Oxsol <sup>®</sup> 100	35.9	37.9	38.6
Joncryl 906-AC	Acrylic Resin	35.8	26.4	26.5
<b>K-FLEX</b>	<b>Polyester Diol</b>	-	<b>5.9</b>	<b>6.0</b>
Oxsol 100	Exempt Solvent	8.4	7.8	6.7
t-Butyl Acetate	Exempt Solvent	8.4	7.8	6.7
BYK 310	Wetting Agent	0.1	0.1	0.1
Tinuvin 123	HALS	0.4	0.4	0.4
Tinuvin 1130	UV Absorber	1.0	1.0	1.1
K-KAT <sup>®</sup> XK-635	Catalyst	0.1	0.1	0.1
<b>Component 2</b>				
Basonat <sup>7</sup> HI-100	Isocyanate Resin	9.9	12.5	13.7

\* API-18 is similar to API-17 (*Page 12*), replacing Joncryl 906 with Joncryl 906-AC and MP Acetate with Oxsol 100



### Cure & Application Conditions

- Cure Schedule:** 1 month ambient
- Dry Film Thickness:** 25μ
- Substrate:** Bonderite 1000

FILM PROPERTIES	Control	XM-337	XM-332
Pendulum hardness, cycles	125	136	109
Pencil hardness	H-2H	2H-3H	2H-3H
Reverse impact, in-lbs	30-40	160+	160+
Direct impact, in-lbs	110-120	160+	160+

100% crosshatch adhesion & 100 MEK 2X Rubs (all films in API-18 Formulation)

Modification of this filled 100% non-volatile 2K polyurethane floor coating formulation (PI-13) demonstrates higher hardness, tensile strength, elongation, elastic modulus, tear strength and improved gasoline and transmission fluid stain resistance. **K-FLEX** was added at 10% on TRS and it partially replaced the branched polyether-polyester triol and linear polyether diol, as can be seen in the images below.

**King Formulation PI-13**

Component 1	Description	Control	K-FLEX Modification
Sovermol <sup>®</sup> 750	Polyether/PE Triol	25.1	21.6
Sovermol 1052	Polyether Diol	10.7	7.4
<b>K-FLEX</b>	<b>Polyester Diol</b>	-	6.4
Efka <sup>®</sup> SI 2008	De-aerator	0.4	0.4
Barium Sulfate	Filler	35.8	35.4
Component 2			
Basonat HI-100	Isocyanate	27.9	28.7
K-KAT <sup>®</sup> 6212	Catalyst	0.1	0.1

**Cure & Application Conditions**

**Cure Schedule:** 2 weeks ambient  
**Dry Film Thickness:** 3 mm  
**Substrate:** 2K PU castings

FILM PROPERTIES	Control	XM-337	188
Shore D hardness	53	65	60
Tensile strength, psi	1,022	1,440	1,041
Elongation	40	63	50
Elastic modulus	5,951	10,067	5,013
Break/load - Die C, pli	43	86	76
Tear strength - Die C, psi	176	305	272
Taber abrasion, wear index	56	54	39
Crockmeter	6	1	3

Taber Abrasion and Crockmeter: Lower number = Better performance

**K-FLEX**

**Gasoline Soak, 30 Hours**



Control



K-FLEX XM-337

10% on TRS

**Transmission Fluid, 3 Day Spot Test**



1 2 3  
Exposure days

Control



1 2 3  
Exposure days

K-FLEX XM-337

In the King formulation below (HS-19), **K-FLEX 188** polyol is used as a modifier to provide improved flexibility, hardness and chemical resistance of a high solids polyester/melamine coating. Additionally, the K-FLEX modified systems resulted in better water resistance and a major viscosity reduction.

# K-FLEX

### King Formulation HS-19

Material	Description	Control	18% on TRS	23% on TRS	34% on TRS
Polymac <sup>10</sup> HS 57-5776	Polyester Resin	66.2	47.2	40.7	29.0
Cymel <sup>11</sup> 325	Melamine Crosslinker	23.4	26.8	28.8	32.1
<b>K-FLEX 188</b>	<b>Polyester Diol</b>	<b>0.0</b>	<b>13.4</b>	<b>17.3</b>	<b>24.7</b>
Methyl Ethyl Ketone	Solvent	5.2	6.3	6.6	7.1
2-Butoxy Ethanol	Solvent	5.2	6.3	6.6	7.1

### Application Conditions

**Coating Type:** Polyester/Melamine

**Cure Schedule:** 15 minutes/121°C

**Dry Film Thickness:** 20-25µ

**Substrate:** Bonderite 1000

**Catalyst:** NACURE® 3327  
0.75% on TRS

### Film Performance - Benefits

-  Significant improvement in impact resistance
-  Major reduction in viscosity
-  Maintained hardness
-  Improved MEK resistance
-  Better blushing resistance

CHARACTERISTICS	Control	K-FLEX 188 18% on TRS	K-FLEX 188 23% on TRS	K-FLEX 188 34% on TRS
HS 57-5776/K-188/Cymel 325	75/-/25	54/18/28	46/23/31	33/34/33
Total resin solids, weight %	75	<b>75</b>	<b>75</b>	<b>75</b>
Brookfield viscosity (cPs), 25°C	1000	<b>440</b>	<b>340</b>	<b>220</b>
FILM PROPERTIES				
Pencil hardness	H-2H	H-2H	H-2H	H-2H
MEK Resistance (2X Rubs)	90	<b>120</b>	<b>130</b>	<b>150</b>
Crosshatch adhesion	100	100	100	100
Direct impact (in-lbs)	50-60	<b>100-110</b>	<b>160+</b>	<b>160+</b>
Reverse impact (in-lbs)	5	<b>30-40</b>	<b>140-150</b>	<b>150-160</b>
Water soak, 360 hr @ 50°C	MD/9 Blushed	MD/9	MD/9	MD/9

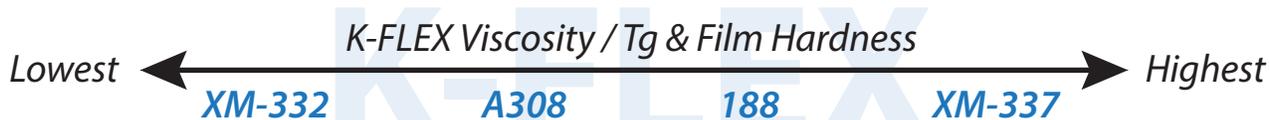


The **K-FLEX** polyester diols have been separated and presented in two different charts below. The top chart includes K-FLEX polyester diols with similar hydroxyl numbers in the 220 to 265 range. When comparing these similar hydroxyl number diols, we observe a positive correlation between Tg, viscosity, film hardness, moisture resistance and exterior durability. These values tend to increase with increasing Tg. This correlation can be seen in the top chart below.

The bottom chart includes K-FLEX polyester diols with lower hydroxyl numbers, ranging from 122 to 144. Due to the lower hydroxyl numbers, there is a lower crosslinker demand (isocyanate or melamine) compared to the resins in the above table. Both K-FLEX A307 and K-FLEX 171-90 typically provide good flexibility.

		System Type	Hydroxyl # as Supplied*	Viscosity 25°C (cP)	Tg	Attributes / Uses
	<b>XM-337</b>	SB, WB, 100% NV	220	55,000	-20	Provides increased toughness and chemical resistance for solvent based and high solids systems. Highest Tg and modulus.
	<b>188</b>	SB, WB, 100% NV	230	10,000	-32	Improves flexibility while maintaining hardness. Also improves salt spray, humidity resistance and exterior durability. Most versatile.
	<b>148</b>	SB 100% NV	235	3,750	-42	Improves flexibility and gloss. Increases solids at lower viscosity. Good flow and leveling. Recommended for primers.
	<b>A308</b>	SB, 100%NV	260	1,500	-59	Medium hardness with great flexibility. Best for mar and scratch resistance.
	<b>XM-332</b>	SB, 100% NV	265	400	-68	Lowest viscosity for lowest VOC. Softer films. Low temperature impact resistance.

\*All products supplied 100% active except 171-90



**Low Crosslinker Demand**

<b>A307</b>	SB	140	5,400	-50	Flexibility modifier with lower crosslinker demand.
<b>171-90**</b>	SB	122	3,700	-30	Offering longer pot life, improved adhesion and flexibility. Lower crosslinker demand.

\*\*Supplied 90% solids in xylene / n-butyl acetate

**References (pages 9-16)**

1. Oxsol	Makhteshim Agan
2. Joncryl	BASF
3. BYK	BYK
4. Tinuvin	BASF
5. Desmodur	Covestro

6. Bonderite	ACT
7. Basonat	BASF
8. Sovermol	BASF
9. Efka	BASF
10. Polymac	Polynt
11. Cymel	Allnex

The aliphatic urethane backbone of **K-FLEX Urethane Diols** provides excellent hydrolytic stability. It also allows the incorporation of aliphatic urethane functionality without the use of isocyanates. The urethane diols are used primarily as modifiers for melamine and isocyanate crosslinked coatings. They are compatible with polyester, acrylic and alkyd resins.

**Blocked Isocyanates**  
**2K Polyurethanes**

**Amino Crosslinked Systems**  
**Prepolymer Synthesis**

**K-FLEX** urethane diols are soluble in most polar organic solvents and in water. They are not soluble in more hydrophobic solvents like aliphatic or aromatic hydrocarbons. However, varying levels of hydrophobic solvents can be tolerated depending on the solubility parameters of the other solvents present.

### Advantages in Waterborne Coatings

**K-FLEX Urethane Diols** act as cosolvents by reducing the viscosity of the system. They can be used to replace volatile cosolvents in order to increase solids, increase crosslink density, improve flow and leveling and yield higher gloss.

Additionally, K-FLEX urethane diols enable the reduction or replacement of amine in the coating, resulting in lower VOC and faster cure of melamine baking systems.



✓ Higher hardness

✓ Excellent chemical resistance

✓ Improved wet adhesion

✓ Lower VOC (higher solids)

✓ Excellent hydrolytic stability

✓ Excellent gloss

<b>K-FLEX</b>				
Product	Composition	Hydroxyl # <i>On Solids</i>	Viscosity 25°C (cPs)	Attributes / Uses
<b>UD-350W</b>	88% active urethane diol in water for WB coatings	350	4,000	Higher solids, improved flow, gloss, hardness and resistance properties.
<b>UD-320</b>	82% active urethane diol for SB coatings	350	9,000	Increases application solids and hardness. Improves chemical resistance, exterior durability and hydrolytic stability.
<b>UD-320-100</b>	100% active urethane diol	350	7,000 at 50°C	Prepolymer synthesis. For water or solvent. Preparation of polyester urethanes.

**K-FLEX UD-350W** is an aqueous solution of an aliphatic, low molecular weight urethane diol oligomer. It is recommended as a modifier for amino crosslinked water soluble and emulsified acrylic, alkyd, urethane and polyester resins. It is used to increase solids, increase crosslink density and to improve film/resistance properties and flow/leveling.

**King Formulation UDW-12**

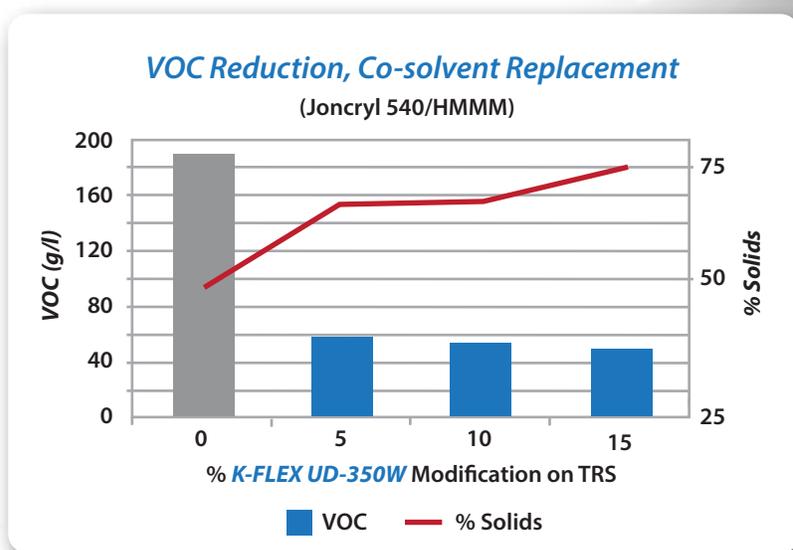
Grind	Description	Pounds
Joncryl <sup>1</sup> 540	Acrylic Emulsion	41.8
AMP <sup>2</sup> 95	Amine	1.0
Surfynol <sup>3</sup> 104 (Versum)	Wetting Agent	1.0
Ti-Pure <sup>4</sup> R-960	Rutile TiO <sub>2</sub>	48.6
Water	Diluent	48.6

**Acrylic Melamine Emulsion Performance**

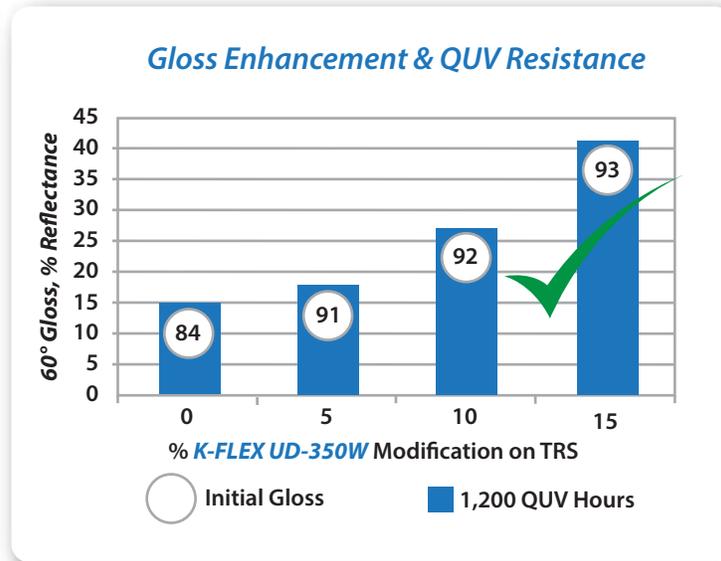
Urethane diol modification of a white acrylic/melamine emulsion (below) demonstrated several advantages, including improved flow/leveling, resulting in higher gloss, improved gloss retention, higher solids (lower VOC) and improved chemical resistance seen below.

Modification levels of 5, 10 and 15% were evaluated. Optimum levels of 5 and 10% are detailed below and on *Page 19*.

Letdown	Description	Acrylic Control	K-FLEX Modification	
			5%	10%
Acrylic/K-FLEX/HMMM	Composition %	70/0/30	65/5/30	57/10/33
Grind	See Grind	100	100	100
Joncryl 540	Acrylic Emulsion	58.3	50.9	39.1
HMMM	Crosslinker	19.9	19.9	29.1
2-Butoxyethanol	Solvent	11.4	-	-
<b>K-FLEX UD-350W</b>	<b>Urethane Polyol Modifier</b>	-	<b>3.6</b>	<b>7.2</b>
NACORR <sup>®</sup> 1552	Corrosion Inhibitor and Accelerator	1.3	1.3	1.3
Water	Diluent	43	23	25
Total		233.9	198.7	201.7



**K-FLEX UD-350W** urethane diol provides improved wetting over various substrates, as well as improved flow and leveling. The end result is higher gloss waterborne coatings.



### K-FLEX UD-350W - Waterborne Performance

The urethane backbone of the urethane diols provides excellent hydrolytic stability for long term storage in waterborne formulations. This excellent hydrolytic stability also provides improvements in the humidity, salt spray and boiling water resistance of fully crosslinked films. The results shown demonstrate these improvements in waterborne polyester/HMMM baking enamel.

#### King Formulation UDW 16

<b>HMMM Crosslinked Baking Enamel</b>		<b>Humidity Resistance (350 hrs) 60° Gloss % Reflectance</b>	<b>Salt Spray Resistance (350 hrs) Blisters*</b>	<b>Salt Spray Resistance (350 hrs) mm Creep</b>	<b>Boiled Water Resistance (1 hour) Blisters*</b>
Polymac <sup>5</sup> WR 72-7203	Control	5	4D	2	8D
Water Reducible Polyester (UDW-16)	<b>K-FLEX UD-350W % on TRS</b>	59	<b>4F</b>	<b>1</b>	<b>10 No Attack</b>

\*Blister Rank (ASTM D714): 10 = no blister, 1 = large blister  
D = Dense, M = Medium, F = Few

**K-FLEX UD-320** is a high solids, aliphatic, low molecular weight urethane diol. It is soluble in polar organic solvents and has broad compatibility with acrylic, polyester and alkyd resins. When used to modify a 2-component polyurethane, it will increase hardness and flexibility.

**K-FLEX UD-320** will increase the hardness and humidity resistance of a melamine crosslinked system. Typical applications include general industrial and automotive OEM coatings.

The formulation below illustrates the effect of K-FLEX UD-320 diol modification of a high solids automotive acrylic melamine coating. Benefits include higher solids, higher hardness and improved adhesion, chemical resistance, gloss and Florida exposure.

**King Formulation UD-3**

K-FLEX

Material	Description	Acrylic Control	K-FLEX UD-320 Modification		
			7%	13%	19%
Acrylic Resin	Acrylic Resin	64.2	57.2	50.2	43.5
<b>K-FLEX</b>	<b>Urethane Diol</b>	-	<b>5.2</b>	<b>10.3</b>	<b>15.3</b>
HMMM	Crosslinker	20.9	22.8	24.7	26.6
NACURE <sup>®</sup> 5528	Blocked Catalyst	1.3	1.3	1.4	1.4
DISPARLON <sup>®</sup> L-1985-50	Leveling Agent	0.2	0.2	0.2	0.2
Xylene	Solvent	10.7	10.6	10.6	10.4
Methanol	Solvent	2.7	2.7	2.6	2.6
Total		100	100	100	100
<b>Characteristics</b>					
Acrylic / K-FLEX / Mel		69/0/31	61/7/32	52/13/35	44/19/37
60 min., 110°C % Solids		61.6	62.4	63.5	63.5
Viscosity, 25°C (cPs)		156	158	156	157

### Cure & Application Conditions

**Cure Schedule:** 20 min / 120°C

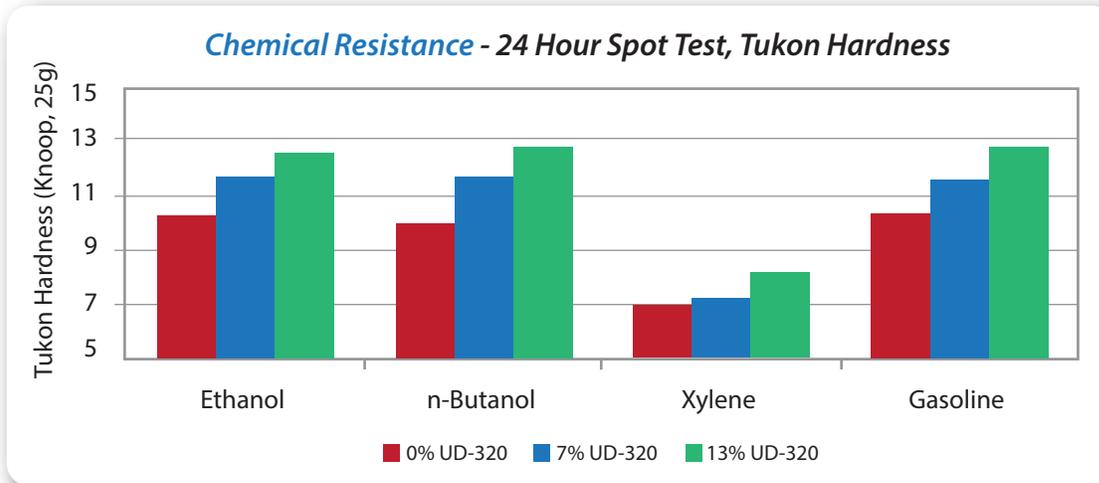
**Dry Film Thickness:** 37.5μ

**Substrate:** Iron Phosphated CRS

FILM PROPERTIES	Control	7%	13%	19%
Pencil Hardness	F-H	F-H	H-2H	H-2H
% Crosshatch Adhesion	0	20	90	100
Reverse impact, in-lbs	10-20	10-20	10-20	20-40
Direct impact, in-lbs	10-20	40-60	40-60	60-80

The control formulation was modified with 7% and 13% **K-FLEX UD-320** for testing chemical resistance. With each modification level, we increased the melamine content slightly, to accommodate the high hydroxyl number of the K-FLEX UD-320.

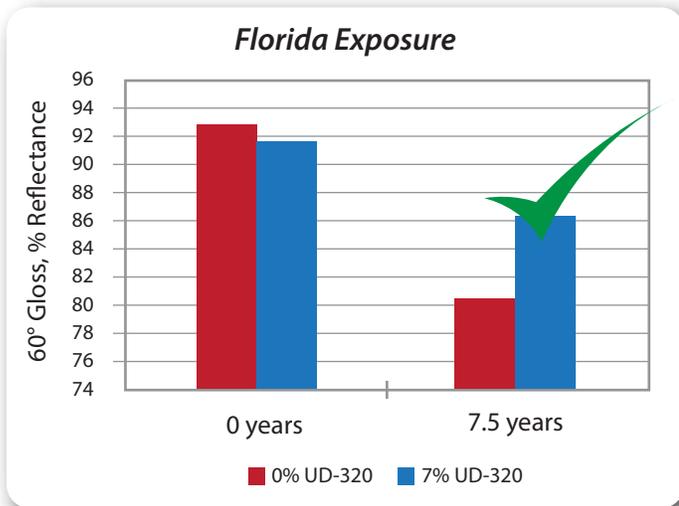
A 24 hour spot test was conducted to evaluate the chemical resistance to ethanol, n-butanol, xylene and gasoline. For each of these solvents tested, we see an improvement in the chemical resistance with a K-FLEX UD-320 modification. In addition, the chemical resistance increases with modification level.



### Florida Exposure Study - Gloss Retention & Crack Resistance

#### 60° Gloss Results - Florida Exposure (7.5 years)

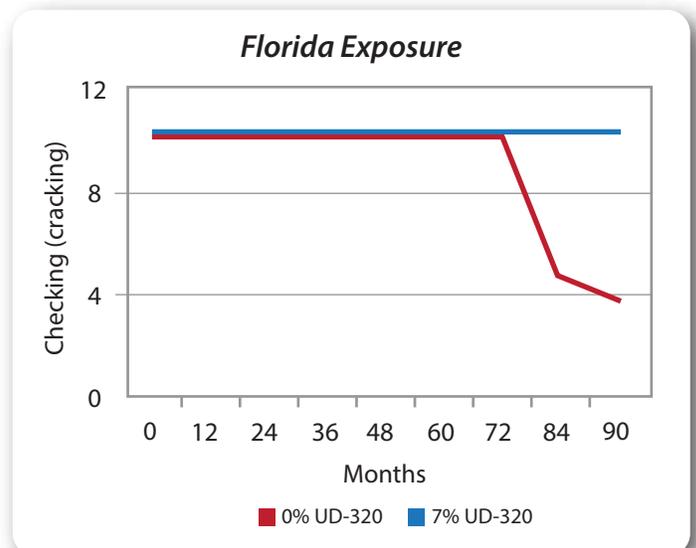
Modification with 7% **K-FLEX UD-320** drastically improved long term gloss stability in harsh environments as shown in the chart below.



#### Florida Exposure - Checking (crack) Resistance

The chart below demonstrates improved checking resistance with **K-FLEX UD-320** modification versus the acrylic control after 90 months (7.5 years) exposure in Florida at 5° South without UV stabilizers.

Modification at the 7% level provided the best overall cracking resistance.



#### References (pages 17-21)

1. Joncryl	BASF
2. AMP	Dow
3. Surfynol (Versum)	Air Products
4. Ti-Pure	Chemours

5. Polymac	Polynt
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**K-FLEX XM-B301** and **7301** are 100% active, low viscosity, acetoacetate functional resin modifiers with excellent compatibility in a wide range of resins. They can be used in solvent based and solventless systems and are primarily recommended for use in 2-component epoxy coatings and adhesives.

Modification of 2K epoxy systems with K-FLEX acetoacetate resin modifiers results in higher performance with reduced induction time, faster cure at low temperature (5°C), improved adhesion, salt spray and humidity resistance among other benefits.

-  **Reduced induction time**
-  **Eliminates amine blushing**
-  **Faster surface dry**

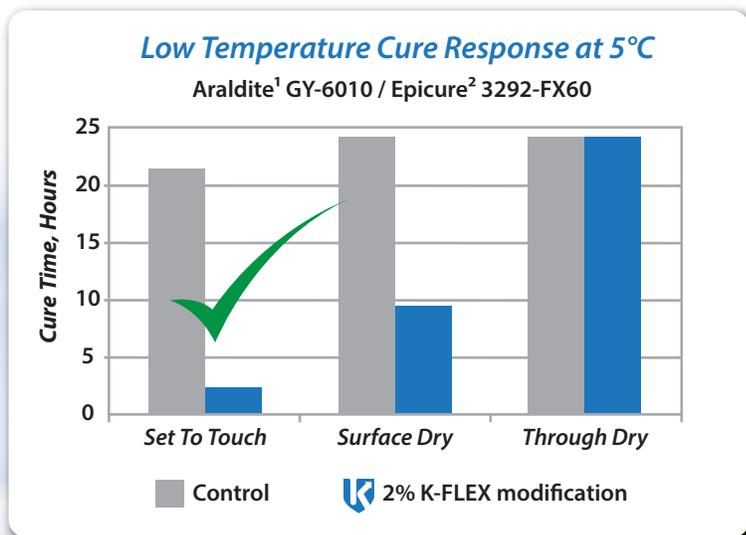
<b>K-FLEX</b>				
Product	% Active	Eq. Weight (g/eq. weight)	Visc. 25°C (Cp)	Attributes / Uses
<b>XM-B301</b>	100%	220	1,100	Excellent performance in epoxy-polyamide primers. Excellent resin compatibility.
<b>7301</b>	100%	125	150	For high solids and waterborne applications to improve adhesion and corrosion resistance.

**K-FLEX<sup>®</sup> XM-B301 - Performance in Epoxy Polyamide Coatings**

**XM-B301** is a low viscosity, acetoacetate functional reactive resin modifier offering excellent compatibility with a wide range of resins.

It is primarily recommended for use in 2K epoxy primers, but can also be used in systems with amino resins or polyisocyanates. Benefits include:

-  **Reduced induction time**
-  **Viscosity and VOC reduction**
-  **Excellent low temp. cure response**
-  **Excellent adhesion**
-  **Eliminates popping & pinholes**



**Adhesion - 500 Hour Salt Fog**



Control



**3.6% XM-B301 on epoxy solids**

**Cure & Application Conditions**

**Cure Schedule:** 3 weeks at 5°C

**Dry Film Thickness:** 3-5 mils

**Substrate:** Iron Phosphated Cold Rolled Steel

**References (page 22)**

1. Araldite	Huntsman Advanced Materials
2. Epicure	Hexion

**K-POL 8211** is a unique, 100% active, aliphatic and saturated diol recommended for 2-component polyurethane coatings, elastomers and coatings formulated with amino crosslinking resins. It provides hard films with good flexibility. K-POL 8211 will provide lower VOC systems with improved toughness, high modulus and good exterior durability, plus excellent performance in thin film coatings.

K-POL 8211 can be used in a variety of applications including industrial maintenance, automotive OEM/ refinish, general industrial, urethane elastomers, adhesives and sealants.

This section will focus on K-POL 8211 performance in polyurethane floor coatings.

## K-POL Performance - Polyurethane Floor Coating Study

Polyurethane floor coatings require good abrasion resistance, hardness, chemical resistance and stain resistance. They also require good mechanical properties like tensile strength, hardness, flexibility and tear resistance. A challenge for polyurethane coating formulators is to develop systems that meet these requirements with resin systems that have low viscosities without the use of volatile solvents.



Benefits of the addition of K-POL 8211 in a solventless 2K PU formulation include:

- ✔ Higher hardness
- ✔ Excellent flexibility
- ✔ Improved durability
- ✔ Higher modulus

## Solventless Aromatic Clearcoat Study

The K-POL 8211 modified casting had significantly higher tensile stress, elastic modulus and hardness compared to the control. The combination of higher elastic modulus (stiffness) and higher stress (toughness) with similar strain (elongation) indicate the modified casting is stronger and more robust than the control casting.

### Mechanical Properties

Properties	Control	8211
Stress at max, psi	474	762
Modulus, psi	637	1,266
Shore A	73	88
Shore D	25	42



Dog-bone sample used to test on Instron

**Die C Tear Resistance (Instron)**

K-POL® 8211 displayed tear strength that was double of the control system and about 5x the tear strength of the polycaprolactone diol PCL modified system.

Properties	Break Load, pli*
Control	222
<b>K-POL 8211, 10%</b>	<b>451</b>
PCL Diol	86

\*pli = pounds per linear inch

**Hot Tire Pickup**

3 mm castings over concrete were tested by placing heated tire sections onto the surface with an applied load and storing the sample at 60°C for one hour.

All of the films had good resistance to hot tire pick up. None of the coatings adhered to the tire section. However, black tire marking and coating compression was more evident on the control film.



FILM PROPERTIES	Control	10% PCL* diol	<b>K-POL 8211</b>
Black Tire Marking	3	1	<b>1</b>
Coating Compression	1	0	<b>0</b>
Coating Integrity/ Film Lifting	0	0	<b>0</b>

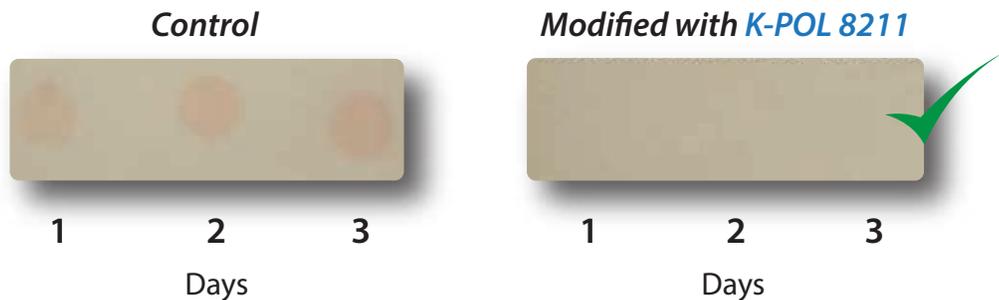
\*PCL= polycaprolactone

0 = no effect 5 = severe damage

**Solventless Aliphatic Filled Study**

The following automobile transmission fluid stain test was conducted over a 3 day period. The transmission fluid was applied onto the surface of the castings as 3 drops with a diameter of approximately 7 mm. The drop was wiped off after 1, 2 and 3 days of exposure. Castings formulated with 10% K-POL 8211 did not stain.

**Transmission Fluid, 3 Day Spot Test**



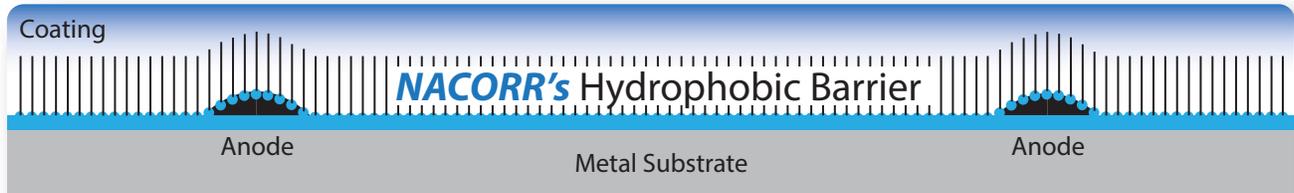
**Gasoline Soak, 30 Hours**

Disks cut from 3mm castings were immersed in gasoline for 30 hours. The gasoline caused severe damage to the control disk while the integrity of the K-POL modified disk was maintained.



NACORR consists of barium, calcium, zinc, magnesium and sodium sulfonates. NACORR molecules have a polar group and a long hydrophobic tail. NACORR prevents corrosion by two distinct mechanisms:

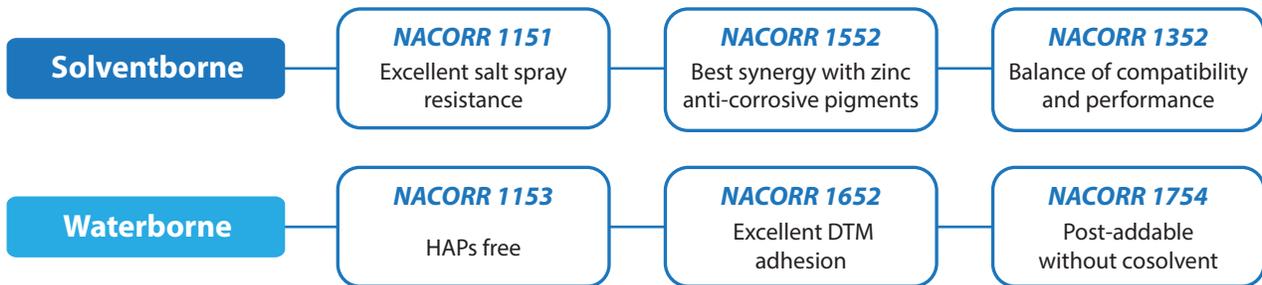
- 
**Polar sulfonate group** - The polar sulfonate groups have a strong attraction to the metal substrate. This passivates the metal surface and prevents the formation of potential anodic sites.
- 
**Hydrophobic tail** - The hydrophobic tail orients itself away from the metal substrate and prevents water from reaching it.



### NACORR - Synergy with Anti-Corrosive Pigments

NACORR liquid organic corrosion inhibitors allow the formulation of anti-corrosive primers and direct to metal topcoats. Although they perform well on their own, NACORR products are also known for their synergy with anti-corrosive pigments to boost the salt spray resistance of the coating.

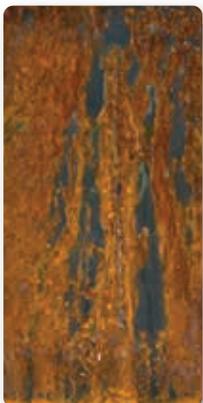
### NACORR Selection Chart



### NACORR Performance

*Salt Spray, 500 Hour Performance*  
Waterborne Acrylic Emulsion

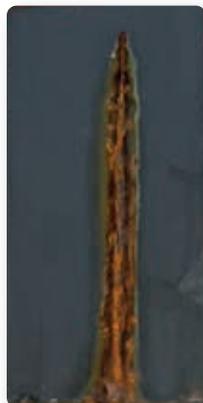
*Cleveland Humidity, 700 Hour Performance*  
Baked Water Reducible Alkyd



Control



5% Anti-Corrosive Pigment (ACP)



5% ACP +  
2% NACORR 1352



Control



ACP +  
NACORR 1151



Highly pigmented systems or pigments with high surface areas may require higher levels of NACORR.

Coating System	Best Practices: 2-4% on total weight
<b>Solventborne</b>	Post add with a mild mix or add to the mill base.
<b>Water Reducible</b> <i>With or without water in the mill base</i>	<p><b>With Water:</b> Post-add under high agitation, or if possible, remove water from base and add it to the letdown.</p> <p><b>Without Water:</b> Pre-mix NACORR, solvent and resin, and add 0.5 - 1.0% to the mill base. Add balance to letdown prior to any water addition.</p>
<b>Emulsions</b> <b>Colloids</b> <b>Dispersions</b> <i>With or without co-solvents or amines</i>	<p><b>No Co-solvent:</b> Post-add under high agitation during letdown prior to adding water.</p> <p><b>With Co-solvent:</b> Pre-mix NACORR with coalescing solvent prior to addition. A typical ratio of 1:1 is recommended. Next add mixture under high agitation prior to any water addition.</p> <p><b>With Co-solvent &amp; Amines:</b> Pre-mix NACORR with coalescent and amine. Add under high agitation prior to any water. A typical starting ratio for pre-mix: 50% NACORR, 45% coalescent and 5% amine by weight.</p>

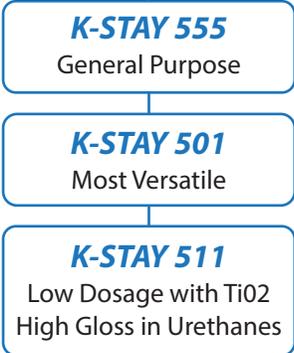
## NACORR

Product	Metal / Sulfonate	Solvent	% Active	Attributes / Uses
<b>1151</b>	Barium	Mineral Spirits	50	Excellent performance in waterborne and solventborne systems. Best for low pH applications.
<b>1352</b>	Calcium	2-Butoxyethanol	50	Excellent in waterborne applications.
<b>1389</b>	Calcium	2-Butoxyethanol	45	Effective in both solventborne and waterborne coatings. Can be used in air dry and thermoset systems.
<b>1389MS</b>	Calcium	Mineral Spirits	45	Developed for 2K solventborne urethane systems.
<b>1552</b>	Zinc	2-Butoxyethanol	50	Excellent adhesion with outstanding performance in primers. Catalytic in amino crosslinked coatings.
<b>1652</b>	Magnesium	2-Butoxyethanol	50	Excellent adhesion with outstanding performance in waterborne primers.
<b>1754</b>	Amine	2-Butoxyethanol n-Butyl Alcohol	35	Excellent compatibility in water based systems, emulsions and dispersion.
<b>4426</b>	Sodium	Complex Polymer / Water	50	For waterborne emulsions. Effective on steel, galvanized steel and aluminum.

**K-STAY 500 Series** are pourable, liquid rheology modifiers based on unique sulfonate technology for pigmented and filled systems that need thermal anti-sag. Benefits include:

- 🏷️ Excellent anti-settle & anti-sag performance
- 🏷️ High efficiency - low use levels
- 🏷️ High gloss and gloss retention
- 🏷️ Ease of use - pourable liquids

## Solvent Based Systems



Pourable liquid

## Applications

- 2K urethane
- Moisture cure
- Bake finishes
- Protective
- Monocoat
- General industrial



## K-STAY 500 SERIES

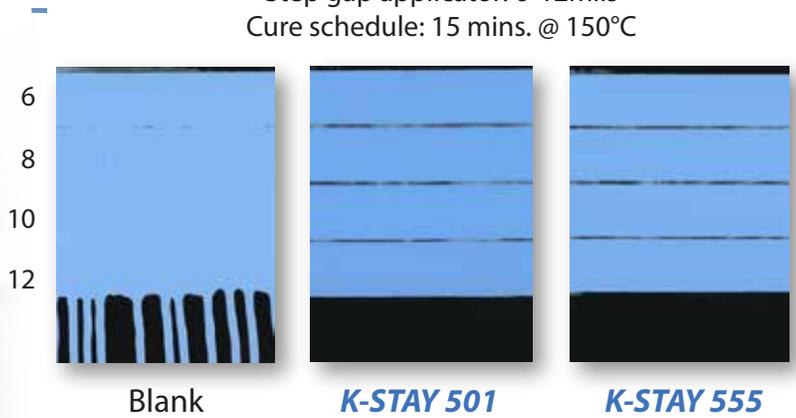
	Product	Composition	% Active	Treat Rate	Attributes / Uses
SOLVENTBORNE	<b>501</b>	Overbased Calcium Sulfonate Light Aromatic Naphtha	50	0.5-3.0%	For solventborne systems, including polyester/melamine, acrylic/melamine, alkyd/melamine, 2K urethanes and epoxies.
	<b>511</b>	Sulfonate Light Aromatic Naphtha	50	0.5-2.0%	Ultra high efficiency in TiO2 containing paints. Excellent gloss in urethane formulations.
	<b>555</b>	Overbased Calcium Sulfonate Light Aromatic Naphtha - MS	57	0.5-2.0%	General purpose anti-sag and anti-settling for solventborne systems. Economical, efficient and easy to use.

As shown in the photos to the right, K-STAY 501 and K-STAY 555 provide effective sag control at a 6-12mils film thickness of a polyester/melamine bake system.

### Thermal Sag Control

#### Polyester/Melamine Bake

Step gap applicator: 6-12mils  
Cure schedule: 15 mins. @ 150°C

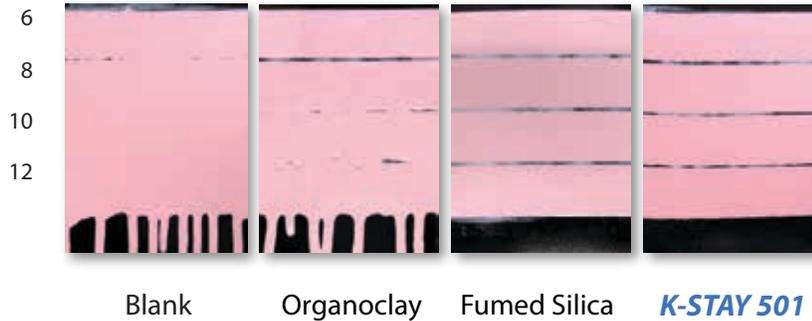


K-STAY 501 was evaluated against other conventional rheology modifiers in a 2K polyurethane formulation. K-STAY 501 had the best sag control and the best gloss performance as shown below.

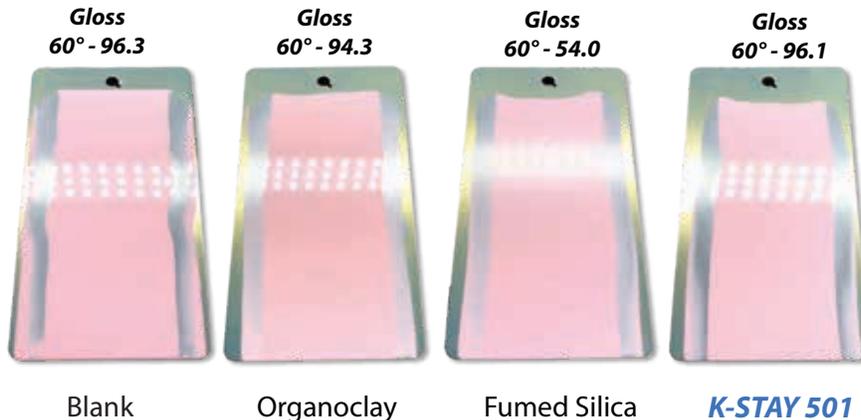
### Sag Control

#### 2K Polyurethane

Step gap applicator: 6-12mils  
Cure schedule: Force cure 30mins @ 80°C, 1 week ambient



### Gloss Performance



Monomeric K-SPERSE dispersants are designed for use in non-aqueous systems. These easy to use liquid products are effective at 50% to 75% lower loading than other dispersants. They are particularly efficient at dispersing TiO<sub>2</sub> and iron oxides.

-  Low dosage
-  Cost effective
-  High efficiency

## K-SPERSE

Product	Composition	% Active	Attributes / Uses
131	Calcium Sulfonate Mineral Spirits	50	Use in formulas containing driers/accelerators including alkyds, urethanes and epoxies.
152	Zinc Sulfonate 2-Butoxyethanol	50	General purpose. Can be used at 1/3 to 1/2 the level of typical commercial dispersants. Synergist for competitive polymeric dispersants.

### K-SPERSE 152 - Black Tint of a White Base

Black dispersions were prepared using K-SPERSE 152, a polymeric dispersant and an amphoteric dispersant to tint a white base to determine the color strength developed by each after milling in a steel ball mill.



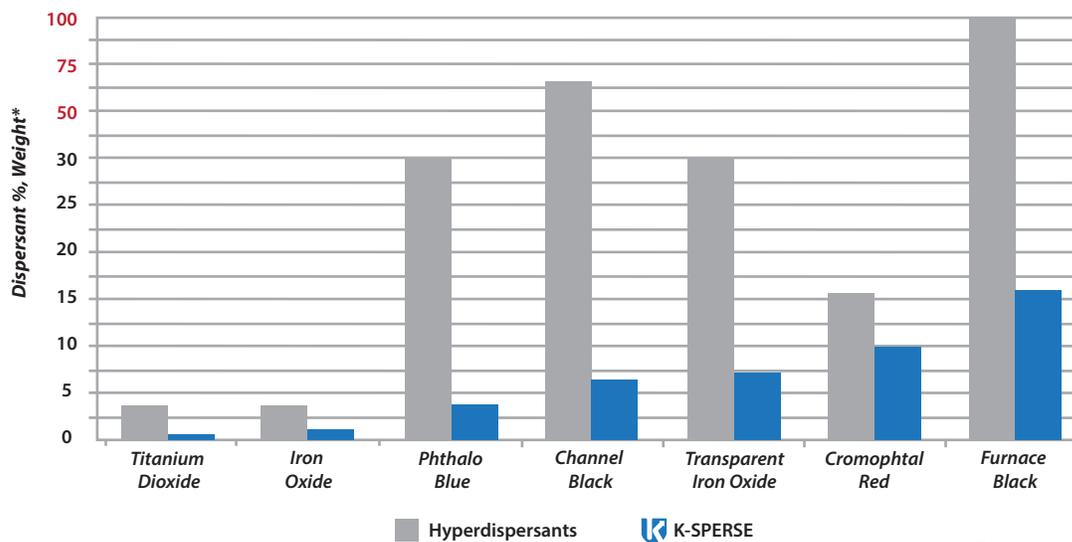
Amphoteric  
Dispersant A

Polymeric  
Dispersant B



### Superior Color Development at Lower Dosages

Comparison: Dispersant Weight % on Pigment

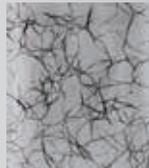


\*Y-axis scale changes

The **DISPARLON®** trade name is applied to a series of functional additives used in paint, ink, adhesive and sealant markets worldwide. Major product lines include thixotropes, dispersants and surface control agents. Proven over years of service, the DISPARLON line continues to expand and revolutionize the market.

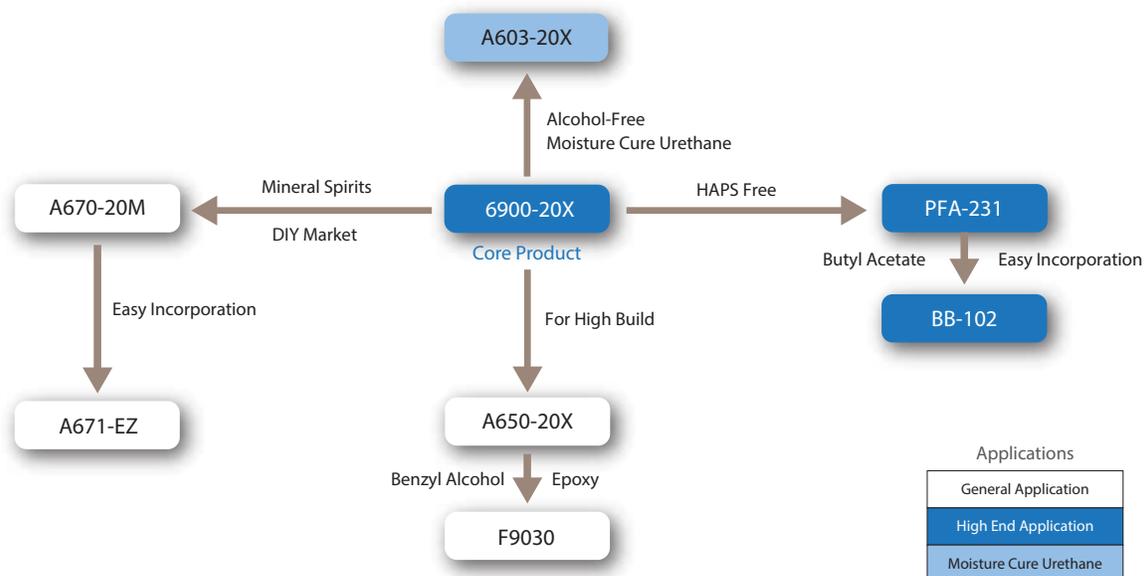


## DISPARLON Selection

Additive Type	Typical Attributes / Properties
<p><b>Thixotropes</b> <b>Anti-Sagging</b> <b>Anti-Settling</b></p>	<p>DISPARLON thixotropes offer formulators a wide choice of unique products with performance benefits including: superior shear thinning, non-seeding, maximum anti-sag/anti-settling, excellent stability on aging and superior performance in high gloss systems.</p>
	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>Pre-activated type 6900-20X</p> </div> <div style="text-align: center;">  <p>Polyolefin type 4200-10</p> </div> <div style="text-align: center;">  <p>Hybrid type NS-5500</p> </div> </div>
<p><b>Leveling</b> <b>Anti-Cratering</b> <b>Wetting</b></p>	<p>Surface control agents are based on a specially prepared acrylic, silicone and acrylic silicone copolymers. These additives are ideal for industrial coatings and offer excellent recoatability.</p>
<p><b>Defoaming</b> <b>Anti-Popping</b></p>	<p>Additives designed to eliminate entrapped air and improve gloss and clarity, while preventing pinholes and craters. Available for air dry and baked systems.</p>
<p><b>Dispersants</b></p>	<p>A series of additives designed to improve color strength and gloss, prevent flocculation, reduce grinding time and reduce or eliminate flood and float problems.</p>

# DISPARLON® Pre Activated Thixotropes

For Solventborne & Solventless Systems



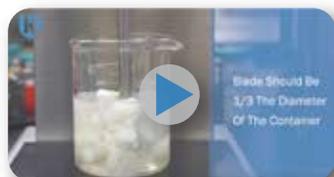
Product	Volatile	Active	Additive Level (Total Formula Weight)	Application
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## Pre-activated Polyamide

<b>6900-20X</b>	Xylene, alcohol	20% Paste	0.5-5.0%	General purpose. Best gloss in thin films & clears or with metallic and pearlescent pigments.
<b>A603-20X</b>	Xylene	20% Paste	0.5-5.0%	Moisture cure urethane systems.
<b>A650-20X</b>	Xylene, alcohol	20% Paste	0.5-5.0%	Primers and industrial maintenance coatings. Best efficiency in thick films.
<b>A670-20M</b>	Mineral spirits, alcohol	20% Paste	0.5-5.0%	DIY and industrial stains for good anti-settling of pigments. DIY varnishes for suspension/spacing of flattening silica.
<b>A671-EZ</b>	Mineral spirits, alcohol	10% Soft Paste	0.5-5.0%	Easier to use version of A670-20M.
<b>BB-102</b>	Butyl acetate, alcohol	10% Soft Paste	1.0-6.0%	Pourable paste. Post addable. HAPS free. For best overall appearance and easiest incorporation.
<b>F-9030</b>	Benzyl alcohol	30% Paste	0.4-4.0%	100% solids epoxy systems and epoxy floor paints.
<b>PFA-231</b>	Hydrocarbon, alcohol	20% Paste	0.5-5.0%	HAPS-free version of 6900-20X.

For help with incorporation, visit [www.kingindustries.com](http://www.kingindustries.com) for videos

DISPARLON® 6900-20X  
Paste incorporation



DISPARLON 6900-20X  
Incorporation into filled or pigmented systems

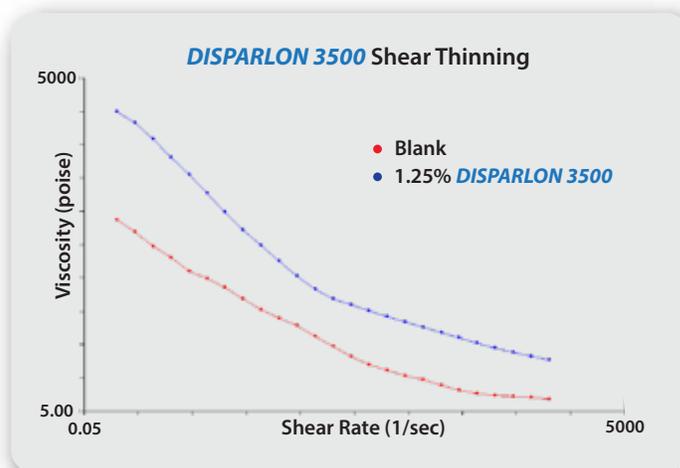
Product	Composition	Volatile	Active	Additive Level (Total Formula Weight)	Application
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**Pigment Dependent**

<b>3500</b>	Polyether phosphate	-	100% Liquid	0.5-2.0%	Zero VOC liquid thixotrope. 2K PU. Highly filled systems. <b>NEW Pourable</b>
<b>4200-10</b>	Oxidized polyolefin	Xylene	10% Flowable Paste	1.0-5.0%	Metallic orientations and anti-settling for industrial systems.
<b>4200-20</b>	Oxidized polyolefin	Xylene	20% Paste	0.3-1.0%	Anti-settling for all non-aqueous pigmented systems.
<b>NS-30</b>	Hybrid oxidized polyolefin with polyamide	Xylene	15% Paste	1.0-5.0%	For polyamide side of 2K epoxy maintenance coatings. Anti-sag/anti-settle.
<b>NS-5500</b>	Hybrid oxidized polyolefin with polyamide	Solvent naphtha, Alcohol	7% Flowable Paste	3.0-8.0%	Post addable. Improved flip/flop with metallics and orientation and anti-settling of flattening silica and inorganic pigments. <b>NEW Pourable</b>
<b>F-9050</b>	Hybrid oxidized polyolefin with polyamide	Low volatility Diluent	20% Paste	1.0-5.0%	Solvent-free anti-sag and anti-settling agent for 100% solids systems

**New Thixotropes**

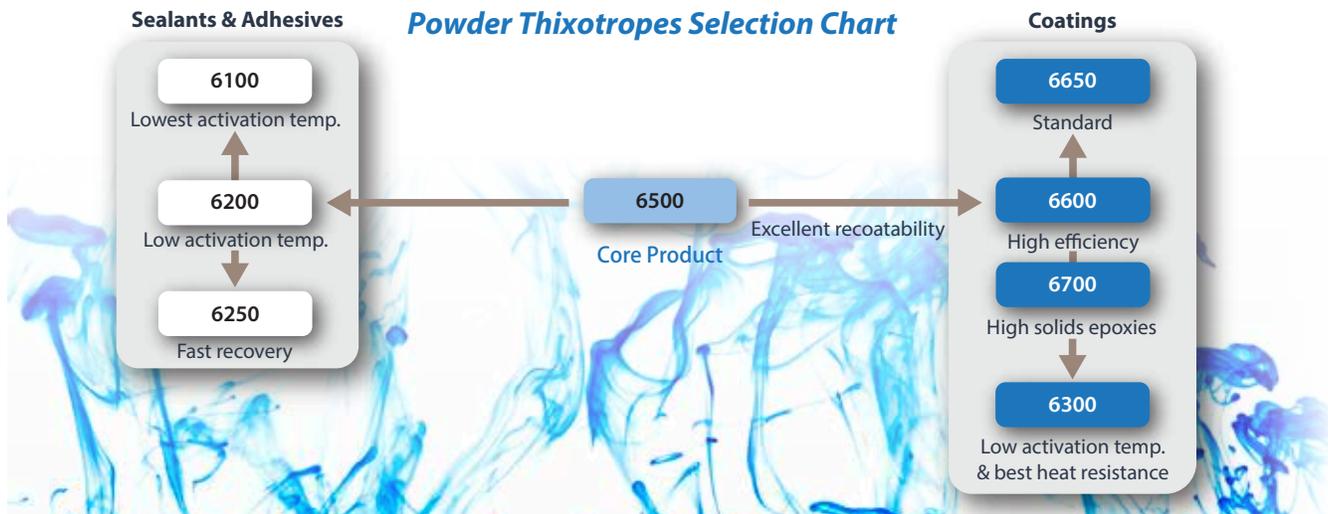
**DISPARLON® 3500** is a zero VOC liquid thixotrope for pigmented systems. It associates with the pigment and fillers contained in a formulation at dosage levels in the range of 0.5 to 2.0% to improve sag control and rheological properties. DISPARLON 3500's key benefits include ease of use, excellent sag resistance, strong KU response in highly filled formulations, excellent shear thinning and high gloss.



**DISPARLON NS-5500** is a hybrid thixotropic agent based on a combination of unique technologies and is supplied as a free flowing paste. Since it is pre-activated, this product can be easily post-added for immediate effects without having to make a master-batch. DISPARLON NS-5500 enables uniform pigment orientation with good gloss, particularly on vertical surfaces because of the uniform extension of its thixotropic structure throughout the coating film. This product is especially effective for anti-settling and orientation of aluminum and mica pigments.

# DISPARLON® Powder Thixotropes

For Solventborne & Solventless Systems



Product	Activation Temp.	Active	Additive Level (Total Formula Weight)	Application
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## Powder Polyamide

6100	30°C-60°C	100% Powder	0.5-3.0%	Sag/slump control. Lowest activation temperature. Designed specifically for MMA, adhesives and sealants.
6200	40°C-80°C	100% Powder	0.5-3.0%	Sag/slump control. Low activation temperature. Designed specifically for adhesives and sealants.
6250	60°C-80°C	100% Powder	0.5-3.0%	Low activation temperature for silicone, urethane and MS sealants. <b>NEW</b>
6300	50°C-80°C	100% Powder	0.5-2.0%	Low activation temperature. Best sag control when applied to hot surfaces. 100% solids epoxy coatings and adhesives. <b>NEW</b>
6500	60°C-90°C	100% Powder	0.5-2.0%	Sag control. Most versatile. General purpose coatings and sealants.
6600	60°C-70°C	100% Powder	0.5-2.0%	Sag control with improved recoatability for coatings, such as epoxy primers.
6650	60°C-70°C	100% Powder	0.5-2.0%	Cost effective sag control with improved recoatability for coatings, such as epoxy primers.
6700	60°C-70°C	100% Powder	0.5-2.0%	Sag control in heavy-duty paints. Particularly effective in 100% solids epoxies and epoxies containing polar solvents.

## New Thixotropes

**DISPARLON® 6300** is a powdered thixotropic agent based on amide wax for heavy duty paints. Being 100% active, this product is favorable not only in cost/performance, but because it offers excellent recoatability. This product activates so easily that it finds applications in a wide variety of formulations. DISPARLON 6300 typically activates at 10°C less than conventional polyamide thixotropes.

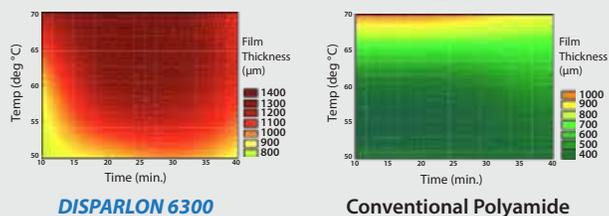
### High Solids Epoxy Primer - High Temperature Substrate

Paint Temp: 32°C/Substrate: 50°C



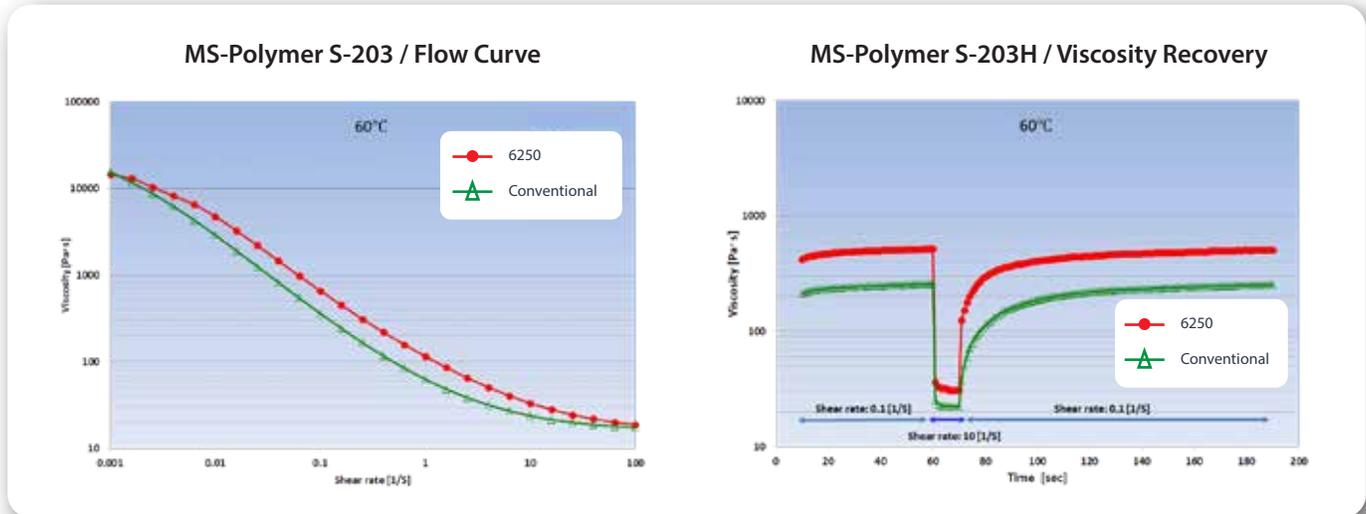
### Time vs. Temperature vs. Sagging

(Thicker Films Equate to Better Anti-sagging)



### New Thixotropes

**DISPARLON® 6250** is a powdered thixotrope based on amide wax for silicone, urethane and polysulfide MS sealants. This product is 100% active and activates at low temperatures of 60°C-80°C for excellent slump resistance, shear thinning and strong structure recovery.

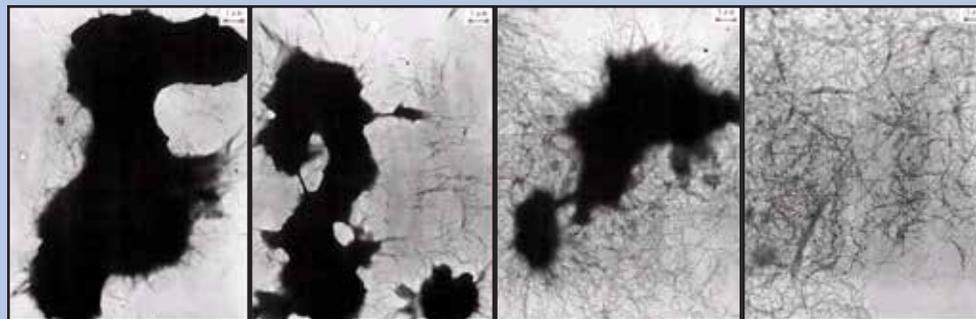


### Activation of Powder Thixotropes

The polyamide powder thixotropes need to be activated (swelled and dispersed) in the system. Add the powder to the pigment grind portion of the formulation. While grinding the pigments, allow the temperature of the grind to rise to the temperatures shown in the selection chart below. Once at the “activation temperature” continue to grind for 15 minutes to get full activation of the polyamide. After activating the polyamide, it is generally best to mix slowly during the first 20°C of cool down. The slow mixing during cool down will give the system the most uniform and reproducible rheology.

Please note, these materials will activate at lower temperatures than shown in the chart when in the presence of alcohols or amines, due to increased hydrogen bonding.

### Thixotrope Structure vs Dispersing Temperature



Not Activated

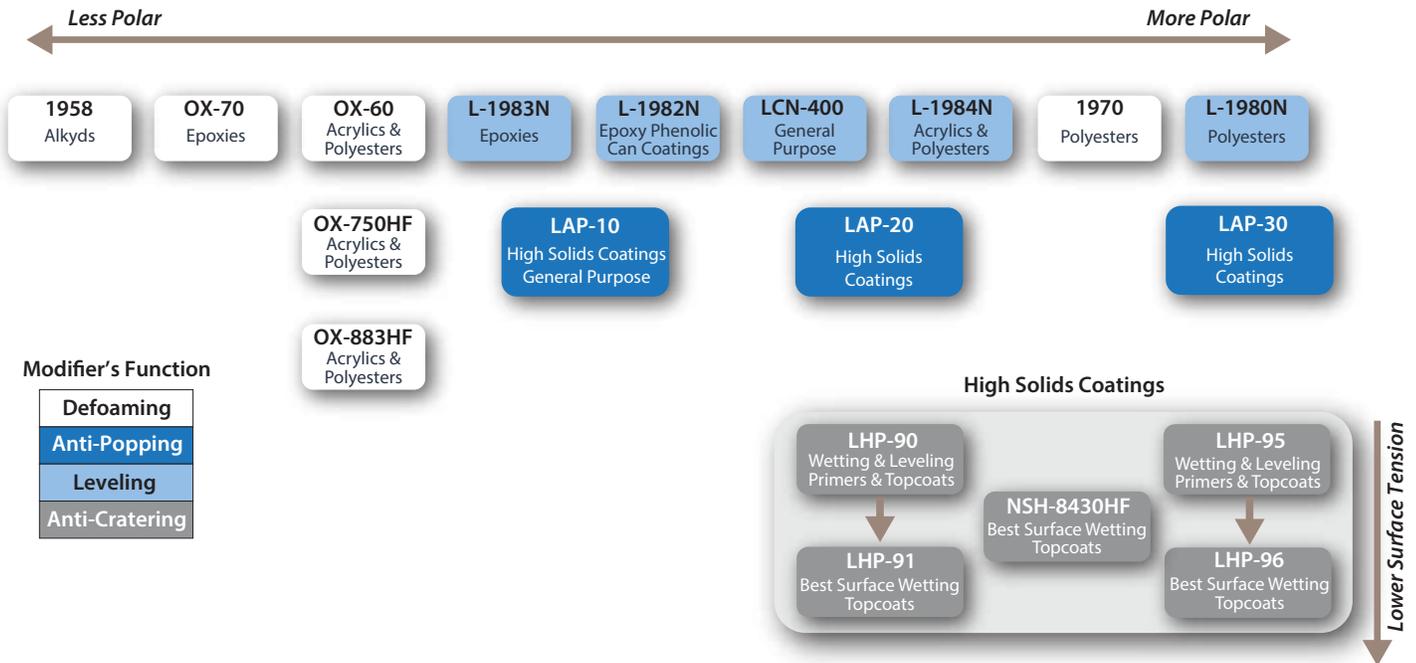
Begin Activation

Activation

Fully Activated

<b>Solvent Epoxy</b>	20-35°C	35-50°C	50-60°C	60-80°C
<b>Solvent-Free Epoxy</b>	20-40°C	40-60°C	60-70°C	70-90°C
<b>Curing Agent</b>	<20°C	20-30°C	30-40°C	40-60°C

## Surface Tension Modifiers Selection Chart



Product	Volatile	Active	Additive Level (Total Formula Weight)	Application
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### Leveling

<b>1958</b>	Mineral spirits	20% Liquid	0.2-1.0%	For use with long oil alkyds.
<b>1970</b>	Xylene, mineral spirits	40% Liquid	0.2-1.0%	Baking systems, automotive, coil.
<b>L-1980N</b>	-	100% Liquid	0.2-1.0%	Polyesters, can, coil. Complies with FDA 21 CFR*.
<b>L-1982N</b>	-	100% Liquid	0.2-1.0%	Epoxy phenolic can coatings.
<b>L-1983N</b>	-	100% Liquid	0.2-1.0%	Epoxy coatings. Complies FDA 21 CFR*
<b>L-1984N</b>	-	100% Liquid	0.2-1.0%	Most versatile. Acrylic & polyester based coatings. Automotive coatings. Complies FDA 21 CFR*
<b>LCN-400</b>	Butyl acetate	50% Liquid	0.2-1.5%	General purpose, cost effective, easy to use.

\* FDA 21 CFR Section 175.300 (b) (3) xii & xiii (a&b)

Product	Volatile	Active	Additive Level (Total Formula Weight)	Application
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### Anti-Cratering and Leveling

<b>LHP-90</b>	Solvent naphtha, Ethyl acetate	50% Liquid	1.0-2.0%	Excellent substrate wetting and leveling. Eliminates surface defects. Silicone free. Auto refinish and industrial coatings.
<b>LHP-91</b>	Solvent naphtha, Ethyl acetate	50% Liquid	1.0-2.0%	Silicone modified version of DISPARLON® LHP-90.
<b>LHP-95</b>	Solvent naphtha	50% Liquid	1.0-2.0%	Excellent substrate wetting and leveling. Eliminates surface defects. Silicone free. Auto refinish and industrial coatings.
<b>LHP-96</b>	Solvent naphtha	50% Liquid	1.0-2.0%	Silicone modified version of DISPARLON LHP-95.
<b>NSH-8430HF</b>	Solvent naphtha, Butyl acetate	10% Liquid	0.5-2.0%	Silicone acrylic copolymer. Excellent wetting and leveling with good recoatability. Primers and top coats. Bake systems.

### Defoaming and Anti-Popping

<b>LAP-10</b>	Solvent naphtha, Butyl acetate	20% Liquid	0.5-2.0%	All high solids systems. Select based on coating polarity. Coil coatings.
<b>LAP-20</b>	Butyl acetate	20% Liquid	0.5-2.0%	All high solids systems. Select based on coating polarity. Intermediate polarity coatings.
<b>LAP-30</b>	Butyl acetate	20% Liquid	0.5-2.0%	All high solids systems. Select based on coating polarity. Intermediate polarity coatings.
<b>OX-60</b>	Xylene	50% Liquid	0.2-1.0%	Ambient cure and bake finishes. Acrylic and polyester coatings. Excellent in urethane coatings.
<b>OX-70</b>	Toluene, mineral spirits	30% Liquid	0.2-1.0%	Epoxy coatings. Ambient cure.
<b>OX-750HF</b>	Solvent naphtha	10% Liquid	0.5-1.5%	Acrylic and polyester coatings. Bake coatings. Automotive. HAPS free.
<b>OX-883HF</b>	Solvent naphtha	30% Liquid	0.2-1.5%	Acrylic and polyester coatings. Bake coatings. Automotive. HAPS free.

### UV Additives

<b>UVX-188</b>	-	100% Liquid	0.1-2.0%	For use in cationic epoxy based UV systems.
<b>UVX-189</b>	-	100% Liquid	0.1-2.0%	General purpose. For use in cationic epoxy and acrylic based UV systems.
<b>UVX-190</b>	-	100% Liquid	0.1-2.0%	For use in acrylic based UV systems.
<b>UVX-35</b>	-	100% Liquid	0.1-2.0%	For use in highly polar UV systems.
<b>UVX-36</b>	-	100% Liquid	0.1-2.0%	For use in acrylic UV systems.

# DISPARLON®

Dispersants & Flood/Float Additives  
For Solventborne & Solventless Systems

Product	Volatile	Active	Additive Level (Total Formula Weight)	Application
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## Dispersants

DA-325	-	100% Liquid	1.0-20% (In-organic pig)	Solvent-free. Dispersing of organic pigments.
DA-375	-	100% Liquid	30-100% (Organic pig)	Solvent-free. Dispersing of organic pigments.

NEW

## Anti-Flood / Anti-Float

KS-273N	Xylene	45% Liquid	0.4-1.2%	Mixed organic and inorganic pigments. Prevents flocculation and flood/float.
KS-873N	Xylene	47% Liquid	0.2-1.0%	Mixed organic and inorganic pigments. Prevents flocculation and flood/float.

## New Dispersants & Flood/Float Additives

**DISPARLON® DA-325** is a solvent free wetting and dispersing agent based on an amine salt of polyether phosphate, designed for dispersing pigments in solvent free coating systems. It is particularly effective when used with filler and inorganic pigments.

**DISPARLON DA-375** is a solvent free wetting and dispersing agent, based on polyether phosphate ester. DISPARLON DA-375 is effective in decreasing viscosity in coating systems that are highly filled with pigments or fillers.

**Pearl Pigment Wetting**

IRIODIN 121 [MERCK]	10.0	
Xylene	11.5	Dissolver: 1,000rpm-5min.
DA-325/DA-375		



BLANK      DA-325      DA-375

The **DISPARLON®** trade name is applied to a series of functional additives used in paint, ink, adhesive and sealant markets worldwide. Major product lines include rheology modifiers, dispersants and surface control agents.



# DISPARLON

## DISPARLON Selection

Additive Type	Typical Attributes / Properties
<p><b>Rheology Modifiers</b> <b>Anti-Sagging</b> <b>Anti-Settling</b></p>	<p>A range of anti-settling, anti-sagging and pigment orientation agents which are recommended for use in coatings, inks, varnishes and stains. They are extremely shear thinning, which allows for easy application by spray, dip, brush or roller, while maintaining excellent anti-settling in the container.</p>
<p><b>Dispersants</b></p>	<p>The AQ series of dispersants are designed for a variety of hard to disperse pigments. DISPARLON AQ-320 and AQ-330 are especially recommended for pearlescent and metallic pigments, while DISPARLON AQ-380 was designed for dispersing carbon black and other organic pigments.</p>
<p><b>Defoaming</b> <b>Anti-Popping</b></p>	<p>A variety of additives designed to eliminate entrapped air and improve gloss and clarity, while preventing pinholes. Available for air dry and baked systems.</p>
<p><b>Leveling</b> <b>Anti-Cratering</b> <b>Wetting</b></p>	<p>A group of surface control agents based on a specially prepared acrylic, silicone and acrylic silicone copolymers. These products have the unique ability to eliminate cratering caused by various kinds of surface contaminants and spray mists.</p>

The **DISPARLON® AQ Series** of polyamide associative rheology modifiers is designed to suspend dense materials such as metallic, pearlescent and iron oxide pigments, while maintaining low “in can” viscosity and good sag resistance. New products have been developed to improve ease of incorporation and performance properties.

Product	Volatile	Active	Additive Level (Total Formula Weight)	Application
<b>Acrylic Rheology Modifier</b>				
<b>AQ-001</b>	Water, Dimethylethanolamine	15% Liquid	0.5-5.0%	Post addable, highly thixotropic <b>NEW</b>

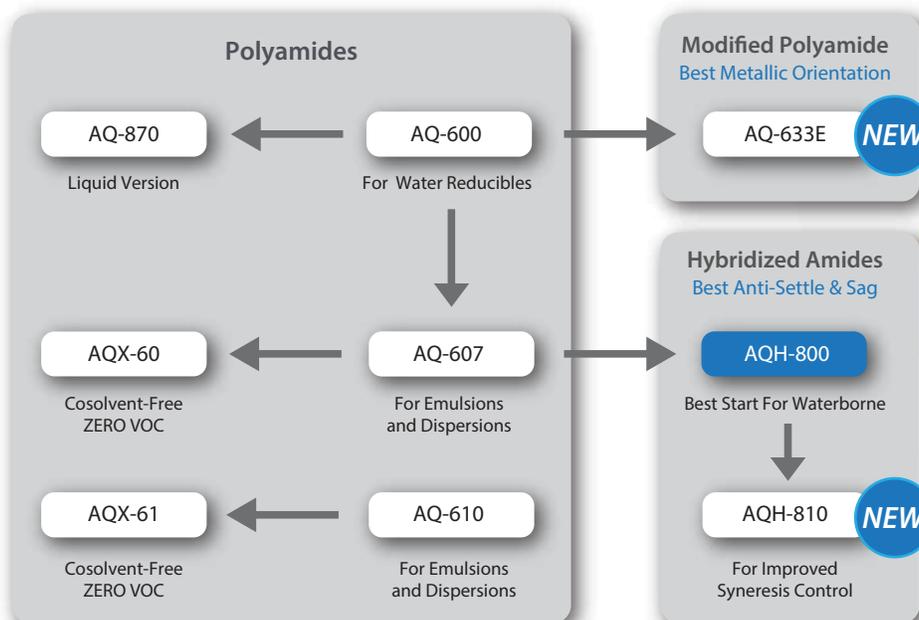
### Polyamide Rheology Modifiers

<b>AQ-600</b>	Water, Propylene glycol monomethylether	20% Gel	1.0-5.0%	Water reducible systems <b>Also available as a liquid - AQ-870</b>
<b>AQ-607</b>	Water, Propylene glycol monobutylether	15% Gel	1.0-5.0%	Emulsions and dispersions, best compatibility, excellent efficiency <b>Also available as ZERO VOC - AQX-60</b>
<b>AQ-610</b>	Water, Propylene glycol monomethylether	15% Gel	1.0-5.0%	Emulsions and dispersions <b>Also available as ZERO VOC - AQX-61</b>
<b>AQ-633E</b>	Water, Propylene glycol monomethylether	22.5% Soft Gel	1.0-5.0%	Best metallic and pearlescent pigment orientation, post addable <b>NEW</b>

### Hybrid Rheology Modifiers

<b>AQH-800</b>	Water, Propylene glycol monomethylether	10% Soft Gel	1.0-5.0%	First recommendation for all waterborne, anti-settle/anti-sag, post addable, easiest to use
<b>AQH-810</b>	Water, Propylene glycol monomethylether	15% Soft Gel	1.0-5.0%	AQH-800 with enhanced syneresis control, post addable <b>NEW</b>

## Amide Selection Tool



**DISPARLON AQH-800** is an easy to use rheology control additive based on hybridized amide technology developed for waterborne systems. It forms unique needle-like structures within the formulation, which provides excellent sag control and prevents pigment settling and hard cake development.

**DISPARLON AQH-800** is ideal for coatings requiring good pigment suspension, while maintaining a low "in-can" viscosity.

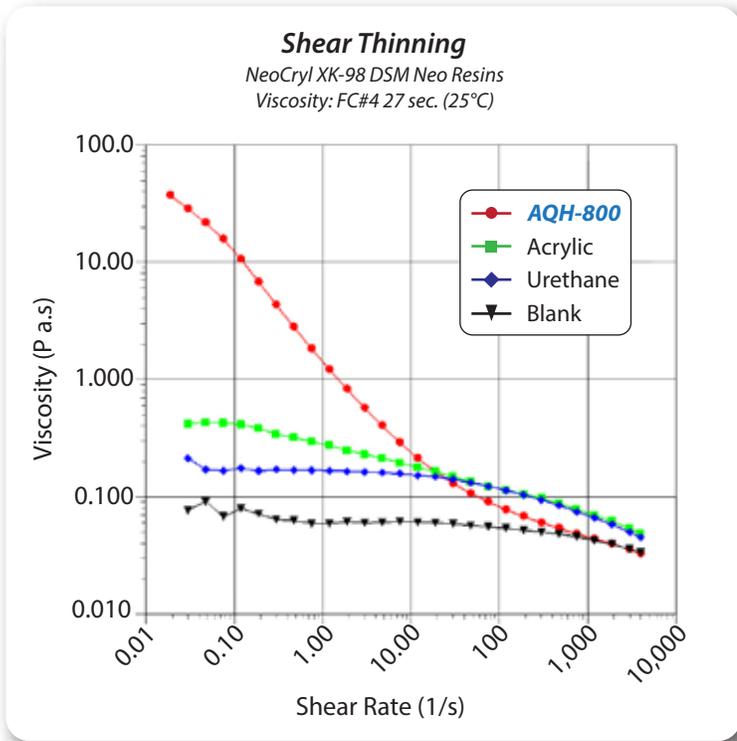
**AQH-800 Performance: Shear Thinning, Salt Spray, Anti-Sag, Anti-Settle**

**Shear Thinning**

DISPARLON AQH-800 imparts an excellent thixotropic effect without a large increase in viscosity, making it unique when compared to other rheology control agents. AQH-800 is also extremely high shear thinning which allows for easy application by spray, dip, brush or roller, while maintaining excellent pigment suspension within a container.

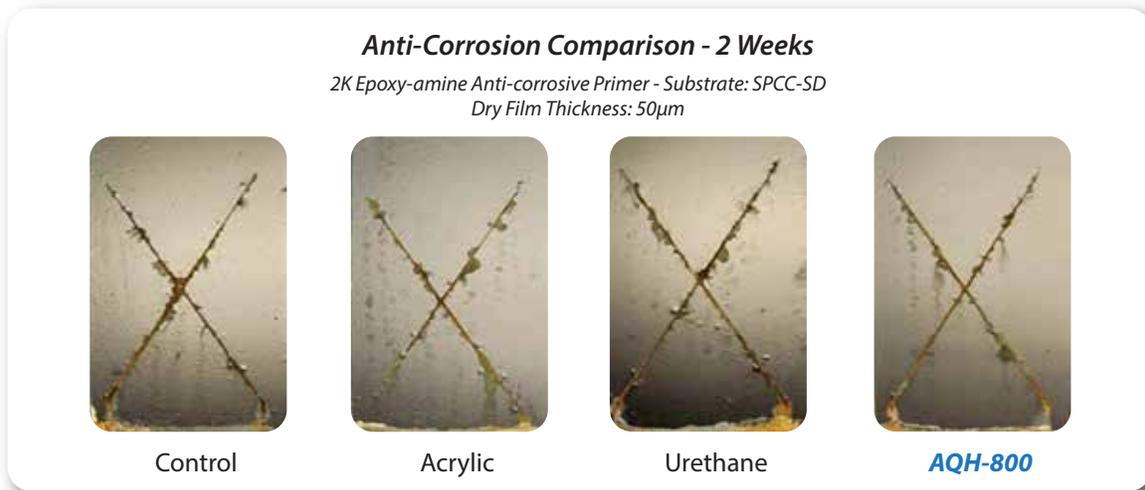
**Anti-Sag & Anti-Settle**

The photos below demonstrate the excellent anti-sagging and long-term anti-settle performance of DISPARLON AQH-800 compared to other modifier types. Typical dosage is 2-3% on total formula weight.



**Salt Spray**

The photos below demonstrate salt spray performance and hydrophobic nature of DISPARLON AQH-800 compared to other rheology modifiers.



DISPARLON® AQ-300 series of dispersants are specifically designed to aid in the dispersion of metallic and pearlescent and carbon black and other organic pigment types.

SELECTION GUIDE (DISPERSANTS for Waterborne Systems)															
PIGMENTS	Aluminum	Pearl	Carbon Black	Quinacridone Magenta	Phthalocyanine Blue	Phthalocyanine Green	Isoindolinone Yellow	Red Iron Oxide	Titanium Oxide (TiO <sub>2</sub> )	Zinc Oxide (ZnO)	Talc	Barium Sulfate (BaSO <sub>4</sub> )	Calcium Carbonate (CaCO <sub>3</sub> )	Barium Titanate (BaO <sub>3</sub> Ti)	Alumina (Al <sub>2</sub> O <sub>3</sub> )
	PRODUCTS														
AQ-320	Strongly Recommend	Recommend	Strongly Recommend	Recommend	Strongly Recommend	Recommend	Recommend	Strongly Recommend	Recommend	Recommend	Recommend	Strongly Recommend	Recommend	Strongly Recommend	Recommend
AQ-330	Strongly Recommend	Recommend	Strongly Recommend	Recommend	Strongly Recommend	Recommend	Recommend	Strongly Recommend	Recommend	Recommend	Recommend	Strongly Recommend	Recommend	Strongly Recommend	Recommend
AQ-380	Recommend	Recommend	Strongly Recommend	Recommend	Strongly Recommend	Recommend	Recommend	Strongly Recommend	Recommend	Recommend	Recommend	Strongly Recommend	Recommend	Strongly Recommend	Recommend

Strongly Recommend Recommend

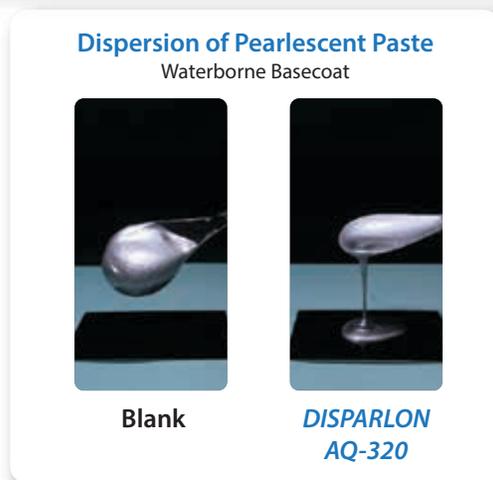
Product	Volatile	Active	Additive Level (Total Formula Weight)	Application
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### Polyester Phosphate

AQ-320	-	100%	1.0-2.0% (In-organic pigment), 30-100% (Organic pigment)	Pearlescent & metallic pigment dispersions made with cosolvent such as butyl glycol
AQ-330	-	100%		Pearlescent & metallic pigment dispersions made without cosolvent

### Acrylic Polymer

AQ-380	Propylene glycol monomethylether	30%	3.0-30% (In-organic pigment), 40-130% (Carbon black / Organic pigment)	Specifically designed to disperse carbon black and organic pigments in waterborne formulations
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DISPARLON AQ-300 series dispersants work synergistically with AQH Rheology Modifiers to improve separation and pigment dispersion in various formulations.

Product	Volatile	Active	Additive Level (Total Formula Weight)	Application
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**Vinyl Polymer**

<b>AQ-501</b>	2-ethylhexyl alcohol, Mineral Oil	85%	0.3-1.0%	Anti-popping agent for waterborne bake systems
<b>AQ-7533</b>	Hydrocarbon, 2-ethylhexyl alcohol	30%	1.0-3.0%	Universal defoamer and anti-popping agent for all types of waterborne coatings

**Defoaming Performance**



Blank



With **DISPARLON**



**Leveling / Anti-Cratering / Wetting**

Product	Volatile	Active	Additive Level (Total Formula Weight)	Application
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**Polyether Modified Silicone**

<b>LS-430</b>	Propylene glycol monomethylether acetate	50%	0.03-1.0%	Wetting and leveling, wood, plastic, general industrial
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**Acrylic**

<b>AQ-200</b>	Butyl cellosolve	20%	0.3-1.0%	Leveling with good recoatability, bake and air dry coatings
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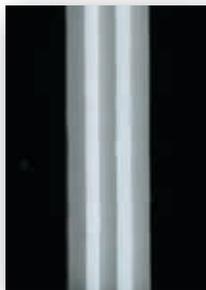
**Silicone Acrylic Copolymer**

<b>AQ-7120</b>	2-Ethylhexyl alcohol	30%	0.5-1.5%	Excellent wetting, leveling with excellent recoatability
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**Leveling Performance**



Blank



With **DISPARLON**



Blank



With **DISPARLON**

## Manufacturing



Since 1932, King Industries has been developing and manufacturing specialty additives to improve the performance properties of lubricants, coatings, adhesives, sealants, elastomers, rubber and more recently, electronics.

## Technical Service

With decades of experience and state-of-the-art testing equipment, our team of technical sales and service members are ready to assist you in reaching specific requirements for your formulations. From answering a quick question to collaborative development projects, we view technical support of our products as the foundation of our business.



## Customized Products



We have the flexibility to customize existing products and the facilities to rapidly develop new products. Our customers work closely with sales, technical service and R&D, who in turn create and test new products in their applications. Once a product is selected, our production department can generally be manufacturing the new product in a matter of weeks.

## Regulatory

Regulation within our industry plays an important role in sustainability and protection to both individuals and the environment. King embraces regulation and builds on it to offer products that are globally registered, giving customers the security of knowing that our products are properly manufactured, documented and registered around the world.



## Compliance



King recognizes that the benefit of conforming to the International Organization for Standards not only ensures efficient business operations, but more importantly, it reassures customers that our products are safe, efficient and environmentally friendly. King currently holds three certificates; ISO 9001 for Quality, ISO 14001 for Environmental and OHSAS 18001 for Health and Safety. All ISO systems at King are supported by an active internal auditing program.

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