

Additives for Architectural Coatings



Leading Global Supplier

Evonik Corporation is a leading global supplier of innovative specialty additives. This leadership position has been established with over 40 years of experience in advanced materials science and surface chemistry, as well as working closely with our customers to find the best solutions for their formulation and application needs. We have an ongoing commitment to develop environmentally compliant and high performance wetting agents, defoamers, and pigment dispersion additives. Our product lines offer a full range of specialty additives for architectural coatings. These additives improve existing coatings and optimize new formulations, while helping to meet the ever growing demand for environmental compliance and other market needs.

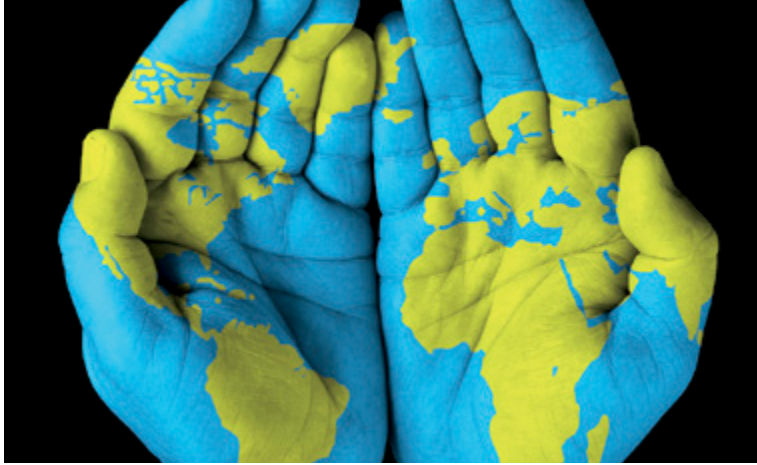
ARCHITECTURAL COATING FORMULATION CHALLENGES AND ADDITIVES

Formulation challenges

Evonik Corporation understands that there are many important properties to achieve in the development of an architectural paint. The formulating challenges to obtain the best balance of properties can be daunting when you consider this list of product requirements:

- Low/no volatile organic compounds (VOCs), hazardous air pollutants (HAPs), and alkylphenol ethoxylates (APEs)
- Colorant compatibility
- Substrate wetting; flow and leveling

- Ease and consistency of application (rheology control, sag and spatter resistance, etc.)
- Dry time, open time and block resistance
- Lack of foam and pinholes
- Film formation temperature
- Adhesion and recoatability
- Appearance (color, opacity, gloss, leveling, uniformity of finish)
- Stain resistance, stain removal, washability
- Scrub and burnish resistance



Specialty additives

With regulations aimed at decreasing VOCs and the development of new waterborne polymer systems and other technologies to meet these regulations, obtaining the combination of desired properties for specific applications and formulations becomes even more challenging and complex. Evonik Corporation's specialty additives can help obtain these properties.

- **Wetting agents** lower surface tension, which is critical for waterborne systems. Lowering surface tension allows the applied coating to properly wet the

substrate and promote flow and leveling to give optimal surface coverage and appearance. Selection of the optimal wetting agent for desired formulation and application properties is critical. Our product lines contain multifunctional wetting agents, superwetting surfactants, coalescing surfactants, and defoaming wetting agents.

- **Pigment dispersants** and other dispersion additives help wet, grind, disperse, and stabilize pigments which span a variety of chemistries. Our dispersants and dispersion additives reduce process time and energy, optimize color development

and colorant compatibility, and provide long term color and viscosity stability.

- **Defoamers and deaerators** prevent or eliminate foam which can form during paint production, preparation, and application. Evonik Corporation offers an extensive selection with a variety of chemistries that include siloxane, organic oil, and molecular defoamers. Our AIRASE® SSDL (Structured Siloxane Defoamer Line) defoamers exhibit predictable performance relative to each other, thus, providing formulators with a structured approach to optimal defoamer selection.

Multifunctional wetting agents



Waterborne systems, like those used in architectural coatings, have high surface tensions due to the high surface tension of water (72 mN/m). As a result, surfactants are required to lower surface tension in order to achieve pigment wetting for efficient grinds, as well as substrate wetting for improved appearance and performance of the applied coating. This becomes particularly challenging with lower VOC coatings (less than 50 g/L) that contain less solvent to help flow, leveling, and appearance of the coatings.

Many surfactants, especially those containing alkyl phenol ethoxylates (APEs) and those with high HLB values, can have the tendency to disrupt the efficiency of rheology modifiers and consequently cause a significant decrease in viscosity. Viscosity decrease can lead to shelf life problems such as pigment settling and application problems such as spatter and sag. In these cases, higher concentrations of rheology modifiers are required to attain the desired viscosity target, but this can also detract from other properties (e.g., water resistance) and add cost. Evonik Corporation's low foam dynamic wetting agents typically do not display this negative interaction with rheology modifiers and can decrease surface tension without altering the coating rheology profile, which is critical to application consistency and quality.

Superwetting surfactants

Our DYNOL™ surfactants are superwetting surfactants. These products provide exceptionally low contact angles and dynamic surface tension. In contrast to traditional surfactants, Evonik Corporation's superwetting surfactants have minimal foam stabilization. These high performance products are used to assist in wetting and flow when painting on low energy substrates such as plastics,

wood, glossy coatings and contaminated surfaces, where traditional surfactants may not provide enough surface tension reduction and will result in surface defects such as cratering and crawling. DYNOL™ 360 surfactant is our most popular superwetting surfactant for architectural coatings due to its ability to wet pigments, fillers and substrates, while also offering coalescing properties and minimal foam.



Vinyl acrylic interior commercial paint applied to a contaminated surface crawls and has major film defects. The same paint with 0.9% DYNOL™ 360 surfactant and DYNOL™ 800 surfactant wets the contaminated surface perfectly.

Did you know that some Evonik Corporation surfactants can be used to reduce VOCs and minimum film formation temperatures (MFFT's)?

- Traditional surfactants only reduce surface tension

Try SURFYNOL® ADO1 and DYNOL™ 360 surfactants

- > They reduce surface tension
- > Aid in film coalescence
- > Enable the use of less coalescing solvent

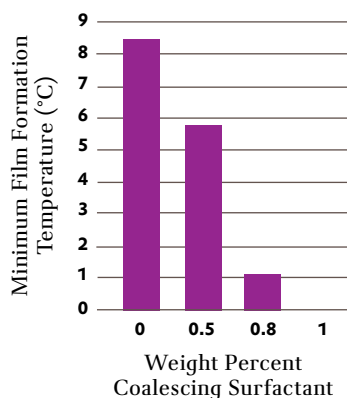
Coalescing surfactants

In addition to their ability to reduce surface tension, SURFYNOL® AD01 and DYNOL™ 360 surfactants also aid in latex particle coalescence and film formation. These surfactants can be used to reduce the minimum film formation temperature (MFFT) and/or reduce VOCs of your coating by lowering coalescing solvent demand in your formulation. They are compatible with a wide range of latex chemistries, including acrylic, vinyl acrylic, styrene acrylic, vinyl acetate, polyurethane dispersions and hybrids of these polymer chemistries. Using less than 1% SURFYNOL® AD01 or DYNOL™ 360 surfactants can reduce the MFFT by up to 10°C. As VOC regulations become more stringent, these surfactants can be used to reduce coalescing solvent levels to reach ultimate goals of 0 VOC.

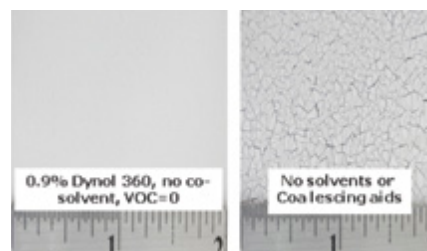
Low foam dynamic wetting agents

The SURFYNOL® 400 series of nonionic surfactants are based on Gemini acetylenic diol chemistry and they offer a unique combination of formulating benefits, including wetting and defoaming. The SURFYNOL® 400 series surfactants differ in their ethoxylation levels, which increases from SURFYNOL® 420 surfactant to SURFYNOL® 485 surfactant. Increasing ethoxylation consequently increases water solubility. One of the differentiating features of these products is that they provide low equilibrium and dynamic surface tension while also eliminating or minimizing foam. These products reduce surface tension, promote substrate wetting, while preventing foam and pinhole defects. SURFYNOL® 420 and 440 surfactants are often used in architectural coatings to provide the lowest equilibrium and dynamic surface tension without foam generation. SURFYNOL® 465 and 485 surfactants can be used when higher water solubility and increased formulation compatibility are desired.

DYNOL™ 360 surfactant can enable reduction in minimum film formation temperatures by promoting particle coalescence and film formation.



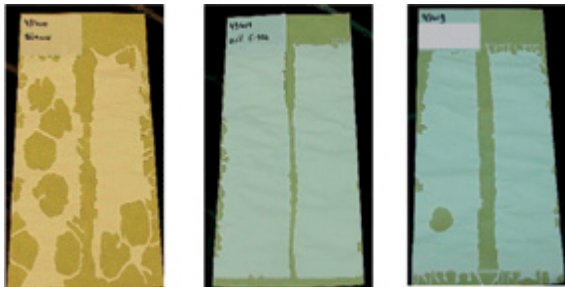
Coalescence and film formation of a polyurethane-acrylic latex topcoat: Adding 0.9% DYNOL™ 360 surfactant eliminates the need for a solvent based coalescing aid, providing the formulator proper coalescence and film formation for a wide variety of waterborne latex systems, while adding no VOCs



Traditional wetting agents

CARBOWET® 106 and 109 surfactants are solvent-free and non-APE additives that reduce surface tension and promote both pigment and substrate wetting. They are particularly suitable as replacements for 6 and 9 mole ethoxylated APEs and can usually be substituted without additional reformulating. CARBOWET® 106 and 109 surfactants have the added benefits of minimal effects on system rheology, and improved stability while being cost effective.

Flat interior wall paint applied to wall board. The blank coating (no wetting agent) and the coating with the competitive surfactant crawl on the substrate. The paint with CARBOWET® GA-100 surfactant completely wets the substrate.

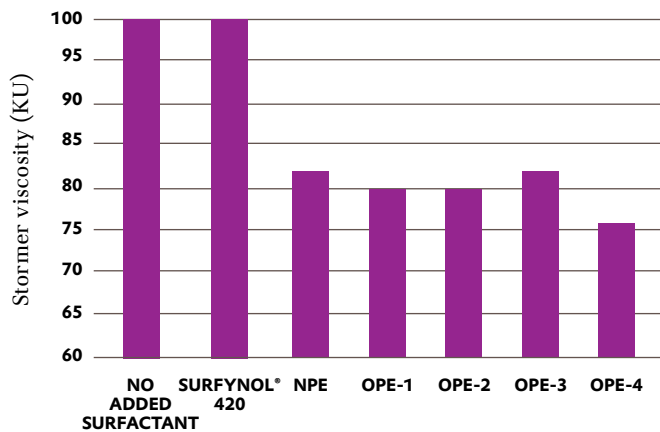


BLANK

CARBOWET® GA-100

COMPETITOR

Vinyl acrylic interior wall and trim paint, VOC = 35g/L. SURFYNOL® 420 surfactant does not affect paint viscosity while other surfactants such as nonyl phenol ethoxylates (NPE) and octyl phenol ethoxylates (OPE-1 through 4) dramatically reduce viscosity which can cause pigment settling and poor application performance such as sagging.



Did you know that Evonik Corporation's wetting agents can also be used to control foam?

- Many surfactants stabilize foam
- SURFYNOL® AD01, 420 and 440 surfactants do not stabilize foam. They provide dynamic surface tension reduction and act as defoaming wetting agents.
- If higher water solubility and greater system compatibility is desired, try SURFYNOL® 465, 485 and PSA-336 surfactants



Pigment dispersion additives

Evonik Corporation offers a wide range of surface active chemistries designed for superior performance in the aqueous dispersion of pigments. The dispersion of solid particles in liquid involves three processes: wetting of the dry particles, milling to the desired particle size, and stabilizing the dispersion. Various surface active chemistries can be employed to optimize both the dispersion processes and the end use application. Evonik Corporation has spent decades researching the technical requirements for these materials in aqueous dispersions and has developed products that optimize performance during each step.

Surface active additives for dispersion can be classified into two distinct groups: dispersants that provide the primary stabilization characteristics and secondary additives for dispersion, such as surfactants, grind aids, and co-dispersants that are designed to enhance the performance of a primary dispersant.

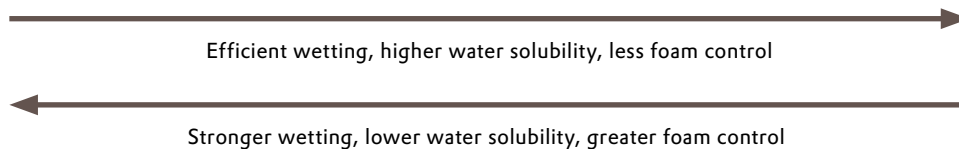
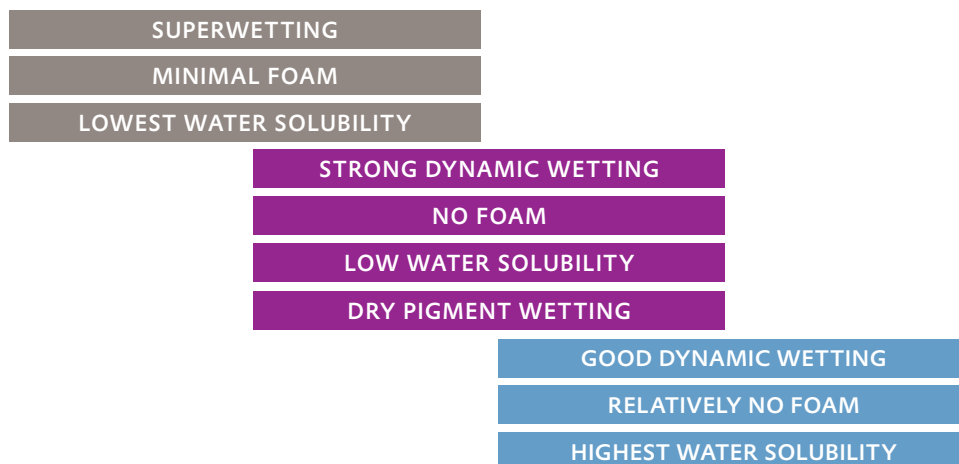
Figure 1 provides guidance for multifunctional wetting agent selection in architectural coatings based on surfactant characteristics and paint performance requirements.



FIGURE 1

Multifunctional Wetting Agent Selection Guidelines for Architectural Coatings

BEST CHOICES FOR



PRODUCT RECOMMENDATIONS		
DYNOL™ 360* DYNOL™ 800 DYNOL™ 980	SURFYNOL® 104 SURFYNOL® 420 SURFYNOL® 440 SURFYNOL® AD01*	CARBOWET® GA-210 SURFYNOL® PSA336 SURFYNOL® 465 SURFYNOL® 485

*Coalescing surfactants

CARBOWET® 106 and 109 surfactants are solvent free and non-APE-additives for surface tension reduction which promote both pigment and substrate wetting. They are well suited as replacements for 6 and 9 mole ethoxylate APEs and may be substituted without additional reformulating.

Evonik Corporation's pigment dispersion additives can be used in primary paint formulations as well as pigment tints and colorants.



Do you have problems with pigment dispersion viscosity or stability?

Try ZETASPERSE® 170, 179 or 182 dispersants to enhance your formulation

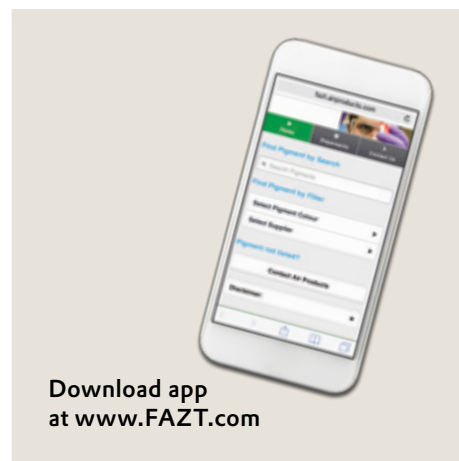
- At only 0.5-3.0 weight % these additives improve color acceptance and letdown compatibility

Did you know that ZETASPERSE® dispersants work well for colorant tinting systems?

- They can be used for in-plant or point-of-sale systems
- For general utility organic pigments, try ZETASPERSE® 2500 and 3600 dispersants
- For specialty organic pigments, try ZETASPERSE® 2500 and 3700 dispersants
- For inorganic and carbon black pigments, try ZETASPERSE® 3100 and 3600 dispersants

Dispersants

The ZETASPERSE® 1000, 2000, and 3000-series dispersants offer superior stabilization and performance characteristics for a wide range of pigment chemistries and formulations, especially resin-free aqueous dispersions for in-plant and point of sale tinting (colorant) systems. Based on a range of polymeric and oligomeric technologies, these products offer electrosteric stabilization and can serve as the primary dispersant in an aqueous pigment dispersion. Proper dispersant selection is dependent on the formulation parameters and the pigments to be dispersed. A selection guide for the ZETASPERSE® 1000, 2000, and 3000 dispersants is presented on page 22 of this brochure. More detailed information on our dispersants is provided in our “ZETASPERSE® dispersants and other additives for aqueous dispersion” brochure. In addition, pigment-specific additive product suggestions and starting point grind recommendations can be found in our user friendly online FAZT formulation tool, www.FAZT.com, for over 1500 specific commercial pigment products.



Additives for dispersion

ZETASPERSE® 100-series dispersants, SURFYNOL® and DYNOL™ surfactants, and CARBOWET® GA grind aid surfactants can be used to enhance the performance characteristics of a dispersion, both in optimization of the milling process as well as the end use application. These additives are designed to improve the surface activity characteristics of a dispersion to enhance performance.

The ZETASPERSE® 170, 179 and 182 dispersants are based on nonionic polymers that provide steric stabilization characteristics. They are specifically designed for optimizing dispersions that contain anionic polymeric dispersants or stabilizing resins, where, in conjunction with the dispersant, they provide a dual stabilizing mechanism. This often provides performance synergies such as lower dispersion viscosity, improved dispersion stability, and greater resistance to letdown shock and other incompatibilities. These co-dispersants are typically added at use levels of 0.5 to 3.0 wt. % on total formulation prior to milling, although post addition to the mill base or paint is suitable for enhancement of color acceptance and letdown compatibility benefits.

SURFYNOL® and DYNOL™ surfactants can be used for optimal wetting performance in a dispersion, providing excellent pigment wetting, deaeration, and milling efficiencies. Polymeric dispersants are typically weak and slow in surface tension reduction, and additional surface active additives are often used in conjunction with these dispersants to enhance performance. This is particularly true when using commodity dispersants, grind resins, and some high

performance dispersants, where stabilization may be adequate but other attributes are not optimal. The addition of dynamic wetting agents also can improve dry powder cut-in time and significantly reduce air entrainment. These dynamic wetting agents include DYNOL™ 360 and SURFYNOL® AD01 surfactants as well as SURFYNOL® 420 and 104 surfactants. These products are typically used at a 0.5-1.5 wt% use level on total formulation.

CARBON BLACK DISPERSION

Optimum dispersant provides maximum color development and viscosity stability



**BENCHMARK
A**

Viscosity: 30cps

**BENCHMARK
B**

Viscosity: gel

**BENCHMARK
C**

Viscosity: 9350cps

**ZETASPERSE®
3100
DISPERSANT**

Viscosity: 26cps

Did you know that Evonik Corporation offers a full spectrum of surfactants, including specialty multifunctional products and traditional alcohol ethoxylates?

Try CARBOWET® 106 and 109

- > Effective in both the grind and letdown
- > Drop-in replacements for APEs
- > Can provide improved color and viscosity stability



Is your pigment dispersion process efficient?

Try our Grind Aids – CARBOWET® GA-100, 200, 210, 211 and 221 surfactants

- > Improve milling time
- > Increase hiding power
- > Better color development
- > Reduce letdown shock

The CARBOWET® GA surfactant series are grind aids designed to enhance dispersion milling efficiencies for improved gloss, hiding, color, as well as to offer benefits in color acceptance, letdown compatibility and wetting. These products function through a combination of dynamic wetting and steric stabilization that helps overcome deficiencies of the polymeric dispersant. Our grind aids include CARBOWET® GA-100, GA-200, GA-210, GA-211, and GA-221 surfactants. They are typically effective at concentrations of 0.1 to 3.0 wt. %, with higher solid surface area pigments requiring higher additive levels.

CARBOWET® 106 and 109 surfactants are non-APE alternatives for common alkylphenol ethoxylate surfactants. Based on alcohol ethoxylate technology, these products offer drop-in performance for cost effective wetting and milling benefits in mill bases. CARBOWET® 106 and 109 surfactants, were designed specifically to replace nonylphenol 6 mole and 9 mole APE containing surfactants, respectively; however they are suitable in a wide range of applications.

Figure 2 provides guidelines for selecting dispersion additives based on formulation parameters and performance requirements.

Grind aid surfactant such as CARBOWET® GA-210 surfactant (0.3%) can reduce pigment particle size, shorten milling time, and promote better color development.

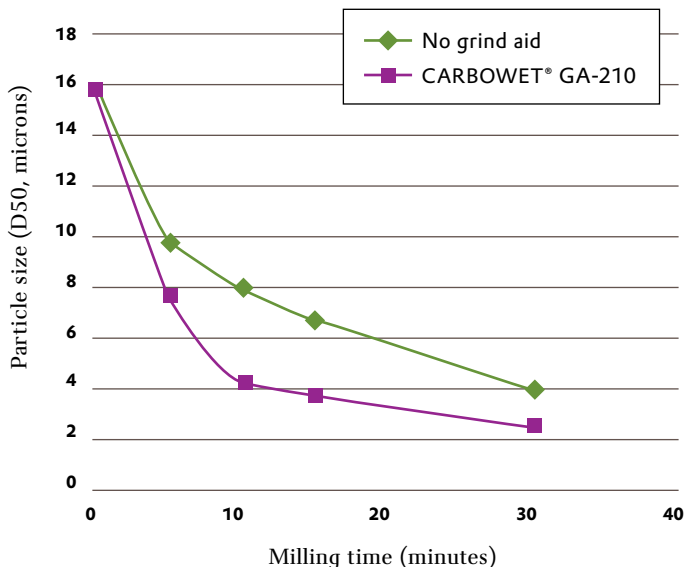
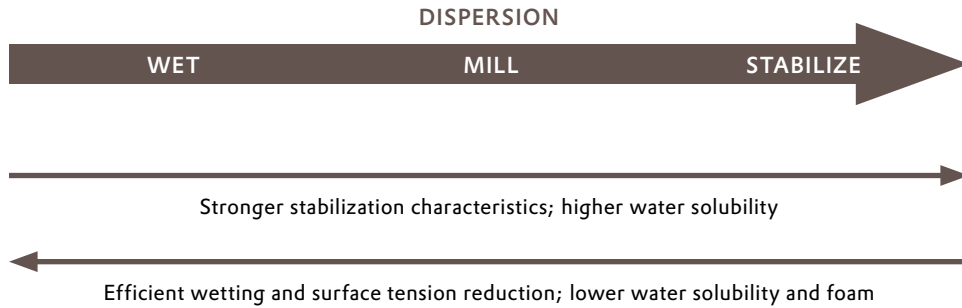
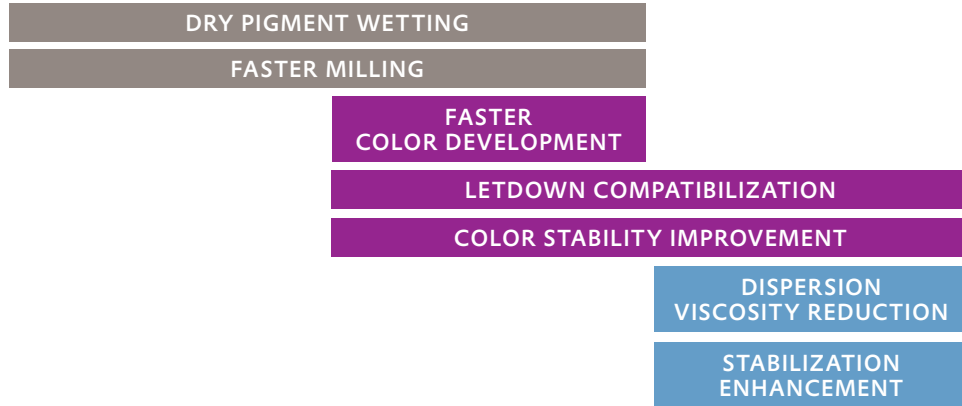


FIGURE 2

Pigment Dispersion Additive Selection Guidelines for Architectural Coatings

BEST CHOICES FOR



PRODUCT RECOMMENDATIONS

Dynamic Wetting Agents	Grind Aids	Co-dispersants
DYNOL™ 360 SURFYNOL® AD01 SURFYNOL® 420	CARBOWET® GA-100 CARBOWET® GA-200 CARBOWET® GA-210 CARBOWET® GA-211	ZETASPERSE® 170 ZETASPERSE® 179 ZETASPERSE® 182

CARBOWET® 106 and 109 surfactants are solvent free and non-APE-additives for surface tension reduction which promote both pigment and substrate wetting. They are well suited as replacements for 6 and 9 mole ethoxylate APEs and may be substituted without additional reformulating.

Defoamers and deaerators

Foam can be generated in paints and coatings during manufacturing, preparation and application. Fortunately, foam problems can be avoided or overcome by selection of an optimal defoamer or deaerator. Defoamer performance is greatly affected by a large number of complicated formulation and application parameters which makes selection of the optimal defoamer difficult and time consuming. Selecting the wrong defoamer will lead to even greater defects, problems, and potentially to coating failure.

Evonik Corporation offers a complete portfolio of defoamers and deaerators, from organic oil-based to siloxane to our unique molecular defoamers. With such a complete palette to work from, as well as guidance from our product descriptions and selector guides, formulators can quickly determine the best defoamer for a specific application and formulation.



Conventional defoamers

Conventional defoamers such as siloxanes, mineral and other organic oil-based defoamers are insoluble, low surface tension materials that work through an incompatibility mechanism. Generally stronger defoamers are more incompatible, while weaker ones are more compatible. Stronger defoamers are required for higher viscosity, higher PVC, lower gloss, and thicker coatings where the foam is more tenacious, but these coatings also resist flow so they are less prone to craters and can accept stronger, more incompatible defoamers. Lower viscosity, thinner films, low PVC, higher gloss, and clearcoats are easier to defoam but are more prone to cratering; therefore, weaker defoamers with more compatibility are warranted.

Molecular defoamers

Molecular defoamers, which are uniquely provided by Evonik Corporation, are non-silicone, non-oil, surfactant based defoamers and deaerators that are highly effective against macro- and microfoam. They provide good foam inhibition and knockdown. As they also are surfactants, they usually provide good compatibility, thus offering the formulator a balance between good defoaming and good compatibility. They are suitable for low viscosity, mid-high gloss, low pigment volume concentration (PVC) formulations and clearcoats that may be highly sensitive to craters and pinholes. Molecular defoamers also are very effective at breaking microfoam (small bubbles <100 nm trapped within the liquid) where other defoamers are less successful. Because of their unique Gemini (twin) surfactant structures, they also can provide additional dynamic wetting properties to the formulation. Molecular defoamers can be used in combination with other defoamers to improve foam control.

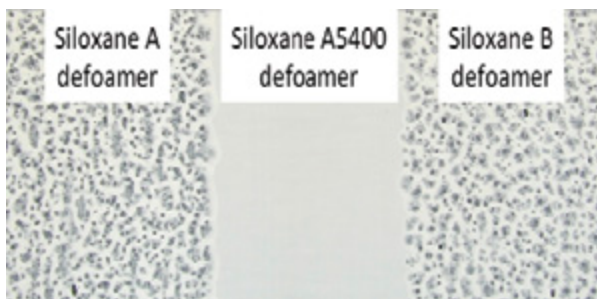
Need a simple way to select the optimal defoamer?

Try Evonik Corporation's AIRASE® SSDL 5000 series defoamers

- > These defoamers span the range of strong to weak defoamers
- > Simply match your formulation compatibility needs to our product selection scale
- > Quickly narrow your product selection choice for the optimal defoamer



Improved coating with proper defoamer selection – AIRASE® 5400 defoamer in exterior acrylic topcoat

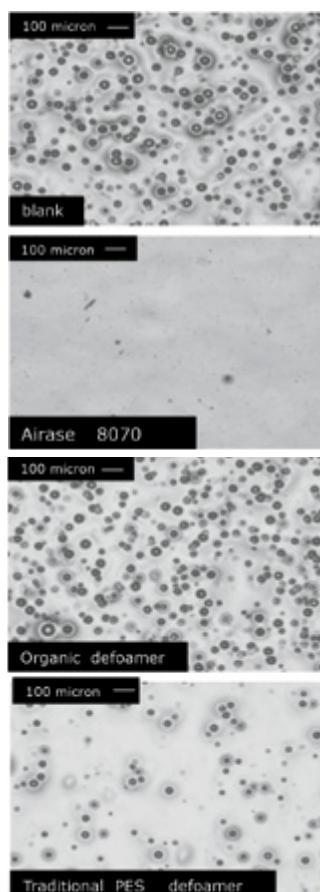


Did you know that some defoamers also aid substrate wetting?

Try our unique molecular defoamer, SURFYNOL® MD20 defoamer

- > Reduces or eliminates microfoam for medium-high gloss, low PVC, low viscosity coatings
- > Also acts as a wetting agent

AIRASE® 8070 deaerator provides great deaeration of an air assisted spray applied coating.



Deaerators

Deaerators are specifically designed to work on bubbles in the bulk of the liquid. They act below the liquid surface by allowing bubbles to coalesce and rise to the surface quicker. Deaeration is more problematic with smaller bubbles, such as microfoam, where the small bubbles do not rise to the surface quickly enough and get trapped in the bulk of the coating as it dries. Deaerators are effective in systems and applications that are prone to large amounts of air entrapment or microfoam, such as when using airless spray and high volume, low pressure (HVLP) applications, high viscosity systems, or fast dry times. Molecular defoamers, such as SURFYNOL® MD20 molecular defoamer, work well in defoaming as well as deaeration. Also, AIRASE® 8070 deaerator is a modified siloxane deaerator designed to eliminate foam, pinholing and popping problems in water-based coatings applied by airless, air assisted or HVLP spray technologies without generating surface defects. AIRASE® 8070 deaerator is especially effective against microfoam, leaving a defect-free surface, even when thick layers are applied or when highly viscous coatings are sprayed.

Defoamer summary

What does this mean for architectural coatings? Evonik Corporation's broad palette of defoamers allows much easier and more confident selection of an optimal defoamer for the variety of architectural coating formulations and applications. For example, one can follow these guidelines for defoamer selection. If pigment grinds are high in viscosity and pigment content and are subjected to high shear, these conditions indicate the need for a strong defoamer such as AIRASE® 5100 or 5200 defoamers. For letdown and application foam, AIRASE® 5400 defoamer (siloxane), and AIRASE® 4500 defoamer (organic oil) are suitable. For low viscosity, lower PVC and thinner coatings, such as wood stains, a more compatible defoamer such as AIRASE® 5700 defoamer or a molecular defoamer such as SURFYNOL® MD-20 molecular defoamer are optimal. For elimination of microfoam as experienced with airless spray application of viscous coatings, try deaeration with SURFYNOL® MD-20 molecular defoamer or AIRASE® 8070 deaerator. Some formulations require two different defoamers, one strong defoamer such as AIRASE® 5100 defoamer in the grind and one weaker defoamer such as SURFYNOL® MD20 molecular defoamer in the letdown to address application foam.

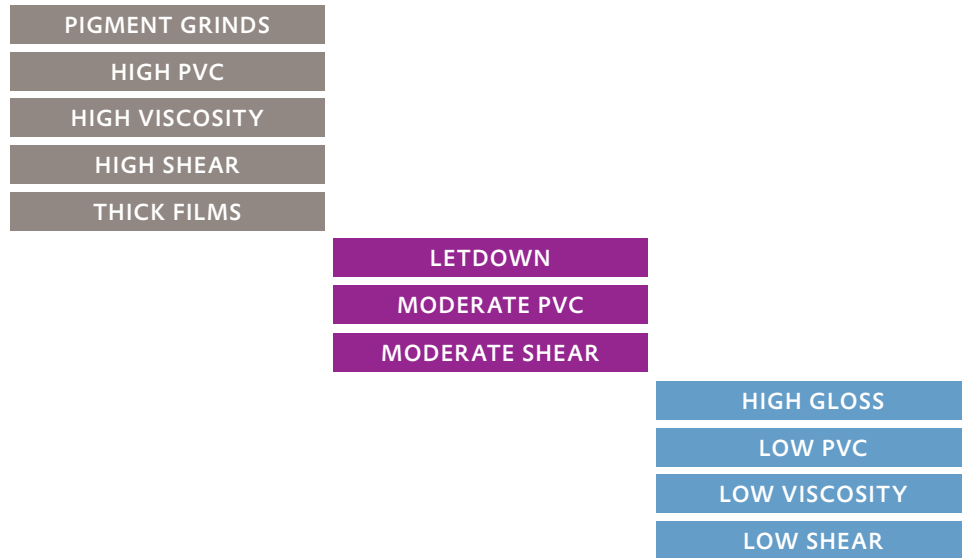
Along with these descriptions and guidelines, **Figure 3** provides additional guidance on effects of formulation and application parameters on defoamer selection for architectural coatings and paints.



FIGURE 3

Defoamer and deaerator selection guidelines for architectural coatings

BEST CHOICES FOR



PRODUCT RECOMMENDATIONS

AIRASE® 4500
AIRASE® 5100
AIRASE® 5200
SURFYNOL® AD01

AIRASE® 5400
AIRASE® 5500
AIRASE® 8070

SURFYNOL® MD-20
AIRASE® 5600
AIRASE® 5700

AIRASE® 8070 deaerator for microfoam control, including severe microfoam from airless, air assisted, and HVLP spray application.

Product descriptions

Multifunctional wetting agents

SUPERWETTERS

DYNOL™ 360 surfactant

A proprietary superwetter, DYNOL™ 360 surfactant is designed to provide the outstanding surface tension reduction and low contact angles necessary to wet pigments, fillers and the most difficult surfaces. DYNOL™ 360 surfactant stands out against siloxane and fluorosurfactants because it does not stabilize foam and acts as a coalescing surfactant. DYNOL™ 360 surfactant is a 100% active liquid.

DYNOL™ 800 surfactant

A high-performance, nonionic superwetter (100% active liquid). DYNOL™ 800 surfactant provides a superior balance of properties compared to traditional fluorosurfactants and silicone surfactants. Based on Gemini technology, DYNOL™ 800 surfactant is easy to formulate and has the ability to reduce dynamic surface tension to levels not achieved with other surfactants. This excellent balance of properties makes DYNOL™ 800 surfactant an excellent alternative for difficult-to-wet substrates requiring good flow and leveling under diverse application conditions.

DYNOL™ 980

DYNOL™ 980 superwetting surfactant is an optimized siloxane-based surfactant providing excellent equilibrium and dynamic surface tension reduction in a wide variety of aqueous formulations. Designed to provide superwetting on difficult-to-wet substrates, it offers superior substrate wetting, flow and leveling. The characteristics of DYNOL™ 980 surfactant enable exceptional performance in waterborne coatings where it can provide excellent flow and leveling under diverse application conditions.

DYNAMIC WETTING AGENTS

SURFYNOL® AD01 surfactant

A 100% active liquid wetting agent and molecular defoamer, SURFYNOL® AD01 surfactant is used to wet and deaerate dry powders and provide foam control throughout the dispersion process. Molecular defoamers can be used as the sole defoamer in a formulation or can work synergistically with traditional defoamers for improved control. SURFYNOL® AD01 is also a coalescing surfactant.

SURFYNOL® 104 surfactant

Renowned for its benefits in aqueous systems, SURFYNOL® 104 surfactant offers unique attributes in dispersions. Highly effective at wetting dry powders and substrates, SURFYNOL® 104 surfactant can also provide strong molecular defoaming to maximize deaeration and inhibit foam stabilization.

SURFYNOL® 420 surfactant

A minimally ethoxylated acetylenic diol, SURFYNOL® 420 surfactant is designed to provide excellent wetting and molecular defoaming. SURFYNOL® 420 surfactant is a 100% active liquid that contains no added solvents or APEs.

SURFYNOL® 440, 465 and 485 surfactants

Ethoxylated low-foam wetting agents (100% active liquid), SURFYNOL® 440, 465, 485 surfactants provide low foam dynamic and equilibrium surface tension reduction with improved dispersibility and ease of incorporation in waterborne architectural coatings. They contain no added solvents or APEs.

SURFYNOL® PSA-336 surfactant

A formulated wetting agent, SURFYNOL® PSA-336 surfactant is based on a proprietary combination of surface active chemistries. It provides very low dynamic surface tension and substrate wetting while improving flow and leveling in water-based architectural coatings applications.

TRADITIONAL WETTING AGENTS

CARBOWET® 106 surfactant

An ethoxylated nonionic surfactant, CARBOWET® 106 surfactant is a proprietary composition designed to provide performance comparable to 6 mole alkylphenoethoxylate surfactants in waterborne and similar alkyl phenol-based surfactants in waterborne architectural coatings. CARBOWET® 106 surfactant enables the surface tension reduction necessary to wet both pigment and substrate, and it can improve color acceptance. It contains no added solvents or APEs.

CARBOWET® 109 surfactant

An ethoxylated nonionic surfactant, CARBOWET® 109 surfactant is a proprietary composition designed to provide performance comparable to 9 mole alkylphenoethoxylate surfactants in waterborne NP-9 type and similar alkyl phenol-based surfactants in waterborne architectural coatings. CARBOWET® 109 surfactant enables the surface tension reduction necessary to wet both pigment and substrate, and it can improve color acceptance. It contains no added solvents or APEs.

Pigment dispersion additives

DISPERSANTS

ZETASPERSE® 1200 dispersant

A high-performance dispersant designed for the dispersion of inorganic chemistries, ZETASPERSE® 1200 dispersant has been shown to be highly effective with titanium dioxides, iron oxides, other inorganic pigments and particle chemistries. Based on a combination of lower molecular weight dynamic wetting and stabilizing chemistries with an anionic dispersant polymer, ZETASPERSE® 1200 dispersant can provide excellent performance attributes in application and throughout the dispersion process and is a 45% active solution in water.

ZETASPERSE® 2300 dispersant

A very cost effective, low molecular weight electrosteric dispersant, this product provides robust stabilization for a wide range of particle chemistries. ZETASPERSE® 2300 is a first choice for cost sensitive applications, low solid dispersions, and large particle size materials.

ZETASPERSE® 2500 dispersant

A low molecular weight electrosteric dispersant, this product was specifically designed to provide strong steric stabilization characteristics to inhibit viscosity build in organic pigments. ZETASPERSE® 2500 is a first choice with organic pigments.

ZETASPERSE® 3100 dispersant

A moderate molecular weight electrosteric dispersant, ZETASPERSE® 3100 was designed to provide consistent performance across carbon black pigments, particularly mass tone grades. ZETASPERSE® 3100 is also excellent with many inorganic pigments and particles and works best when combined with a CARBOWET® grind aid for optimal wetting and milling efficiency.

ZETASPERSE® 3400 dispersant

A moderate molecular weight electrosteric dispersant, this product was designed to inhibit the viscosity build common with some organic pigment types. ZETASPERSE® 3400 is a first choice for quinacridone, perylene, and other organic pigments, and has also shown excellent benefits with inorganic particles in industrial specialty applications.

ZETASPERSE® 3600 dispersant

A moderate molecular weight electrosteric dispersant formulated with lower molecular grind aids, this product was designed to provide optimal milling characteristics for organic pigments. ZETASPERSE® 3600 is a first choice for pigments and particles that are difficult to mill and has shown excellent performance with mid-grade organic pigments, less refined grades, as well as transparent inorganic pigments.

ZETASPERSE® 3700 dispersant

A moderate molecular weight electrosteric dispersant, this product was designed for optimal color stability with some organic pigment types. ZETASPERSE® 3700 is a first choice for phthalocyanine, DPP, azo, and other organic pigments.

ZETASPERSE® 3800 dispersant

A moderate molecular weight steric dispersant, this product was designed to offer robust stabilization across all particle chemistries. ZETASPERSE® 3800 is a first choice where one dispersant is desired for many systems and an easy to use option for new formulation development.

CO-DISPERSANTS

ZETASPERSE® 170 dispersant

Lower in molecular weight, ZETASPERSE® 170 dispersant is designed for optimal performance with acidic surface groups such as carbon black. A tertiary amine provides strong affinity for acidic substrates, and its nonionic character adds strong steric stabilization. ZETASPERSE® 170 dispersant is most effective when used as a secondary dispersant with anionic polymeric dispersants for organic and inorganic pigments. It can provide a boost in stabilization and typically lowers dispersion viscosities, allowing for higher solids loadings and improved overall dispersion stability.

ZETASPERSE® 179 and 182 dispersants

These dispersants are most effective when used as a secondary dispersant in conjunction with anionic polymeric dispersants and grind resins. Both dispersants can provide significant wetting, milling, and steric stabilization benefits, often improving milling efficiency, color development and dispersion stability, enabling formulators to achieve higher performance. ZETASPERSE® 179 and 182 dispersants can provide a significant boost to dispersion stability by enhancing steric stabilization mechanisms and are typically used to control dispersion viscosity, improve resistance to flocculation in letdown, and provide general stability benefits. These highly alkoxyated surfactants differ from one another in the nature of the hydrophobic group.

Multifunctional wetting agents

GRIND AIDS

CARBOWET® GA-100 surfactant	A grind aid specifically designed for optimal performance in architectural paint grinds, CARBOWET® GA-100 surfactant helps to optimize milling efficiency and offers a favorable alternative to modified APE-based aids. When used in the pigment grind, CARBOWET® GA-100 surfactant can improve the pigment paste acceptance and may eliminate the need for special pigment paste acceptance additives used in the letdown stage of white base paint manufacturing.
CARBOWET® GA-200 surfactant	A grind aid designed to provide the superior low-foam surfactancy needed in pigmented systems, which includes dynamic wetting, milling, and compatibilization benefits without the adverse impacts on water sensitivity, foam, or rheology typically found with other surfactants. Additionally, CARBOWET® GA-200 surfactant is suitable for low- or zero-VOC, low emission and EcoLabel compliant formulations.
CARBOWET® GA-210 surfactant	A broad utility surfactant, CARBOWET® GA-210 surfactant can deliver excellent grind aid benefits in aqueous dispersions with strong wetting and milling efficiency benefits. It has proven performance as a grind surfactant in coating dispersions and excellent attributes in many other dispersion formulations.
CARBOWET® GA-211 surfactant	A combination of surface active agents, CARBOWET® GA-211 surfactant can provide excellent dry solid wetting with dynamic stabilization to improve the efficiency of the milling process. Compared to the other grind aid products, CARBOWET® GA-211 surfactant offers strong stabilization benefits with somewhat lesser wetting performance. When used in a dispersion, CARBOWET® GA-211 surfactant and the other grind aids may provide enough wetting to eliminate the need for additional wetting agents.
CARBOWET® GA-221 surfactant	A combination of surface active agents, CARBOWET® GA-221 surfactant offers excellent dry solid wetting with dynamic stabilizing that can improve the efficiency of the milling process. Compared to the other grind aid products, CARBOWET® GA-221 surfactant offers the strongest stabilization benefits with somewhat lesser wetting performance. When used in a dispersion, CARBOWET® GA-221 surfactant and the other grind aids provide enough wetting that additional wetting agents are not typically needed.

DEFOAMERS AND DEAERATORS

AIRASE® SSDL 5000 series defoamers	The AIRASE® 5000 series defoamers are a structured siloxane defoamer line (SSDL) providing a predictable range of products that vary in system compatibility and defoaming strength. This allows a formulator to quickly identify the best balance of defoamer properties with minimal experimentation.
AIRASE® 4500 defoamer	An organic defoamer for pigment milling and letdown operations, AIRASE® 4500 defoamer can be used in any dispersion. It contains no added VOCs, mineral oils, hazardous air pollutants or APEs.
AIRASE® 4750V defoamer	A proprietary vegetable oil based defoamer designed to control foam, bubbles, and entrapped air without generating surface defects. It does not contain added mineral oils, hazardous air pollutants (HAPs), or alkyl phenol ethoxylates (APEs). This defoamer combines good efficiency with excellent film compatibility and sustained defoaming performance, suitable for a wide range of waterborne applications.
AIRASE® 4800 defoamer	100% active, mineral oil based defoamer for a variety of water-based formulations. It does not contain added hazardous air pollutants (HAPs), or alkyl phenol ethoxylates (APEs). This defoamer combines good film compatibility with sustained, long term defoaming performance.
SURFYNOL® MD-20 defoamer	SURFYNOL® MD-20 molecular defoamer has been found to be particularly effective in sensitive systems for strong yet defect-free foam control including deaeration. A 100% active liquid, SURFYNOL® MD-20 defoamer is easy to handle and incorporate. It also provides substrate wetting benefits.
AIRASE® 8070 deaerator	A formulated deaerator, AIRASE® 8070 deaerator can provide excellent foam control during milling. It is effective in many dispersions, particularly highly filled systems and coatings prone to microfoam from airless, air-assisted and HVLP application.

Dispersant Selection Guide (Resin Free Systems)

ZETASPERSE®	Z1200	Z2300	Z2500	Z3100	Z3400	Z3600	Z3700
ORGANIC PIGMENTS							
General utility across most types			+++			+++	+
Quinacridone & perylene pigments			+++		+++	+	
Dioxazine and DPP pigments			+++		+	+	+++
Phthalocyanine pigments			+++		+	+	+++
General azo pigments		+	+++		+	+	+++
Mono azo pigments		+++	+		+	+	+++
Metal salt red/lake pigments			+++			+	
CARBON BLACK PIGMENTS							
General utility across most types				+++		+++	
Mass tone		+	+	+++		+	
Tints		+++	+	+		+	
Commodity grades		+++	+	+++		+	
INORGANIC PIGMENTS							
General utility across most types				+++		+++	
Opaque iron oxide pigments	+++			+		+	
Transparent iron oxide pigments	+			+++	+	+++	
TiO2 pigments	+++			+		+++	
Bismuth vanadate	+	+		+	+++	+	
Other inorganic pigments	+++	+		+++		+	
INORGANIC FILLERS	+	+++		+++		+++	
ORGANIC PARTICLES		+++	+++	+	+	+++	
INORGANIC PARTICLES		+++		+++	+	+++	





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