
DELTA SC®
Surface Control Additives
delta
little makes difference
MORDRY®
Driers
DELTA FC®
Foam Control Additives
DELTA DC®
Dispersion Control Additives
DELTA S®
MORDRY®
Specialty Additives

Surface Control Additives

The surface of coating (coating could mean paint, ink or composite) is exposed to "the outside world" and has to withstand some severe circumstances which may lead to a fast degradation of the system itself.

In most cases, superior surface properties cannot be achieved without the addition of surface control additives that alter the surface properties of the coating.

Depending on the kind of additive used, properties such as mar, slip and scratch resistance, abrasion resistance, anti-blocking ...etc can be altered.

Delta Specialties offer a variety of surface control additives suitable for water and solvent-based systems.

Surface Defects

Defects of wet and consequent dry coating films affecting coating appearance and sometimes performance are:

- Benard cells: Hexagonal cells with marked centers produced by circulation in the film caused by gradients of concentration, density and/or temperature.

- Floating: Benard cell circulation influences color shade and appearance; observed as mottled, blotchy, or streaked appearance of a paint film.

- Flooding: Surface color is uniform but different to the original one caused by uneven distribution of pigments in the film during drying.

- Craters: Small bowl-shaped depressions often having drops or bands of material at their centers and raised circular edges in a coating film. Caused by contaminants of lower surface tension.

- Orange peel: Surface bumpiness or waviness that looks like the skin of an orange. It is often caused by poor levelling and is a common defect in both spray and roll-applied coatings.

- Picture framing (edge crawling): De-wetting of the applied coating and the appearance of fat edges or picture framing around the edges of a panel or metal part. It is generally caused by increase of surface tension on the edge during drying. Low viscosity increases this phenomenon.

- Fish eyes: Crater-like holes whose centers consist of a uniform flat painted region, surrounded by a depression, followed by a ridge of paint. They are caused by un-dispersed fluid globules in the paint or by airborne droplets (silicones, water, dried soap, dust, wax, and oil) deposited on the painted surface. Large fish eyes can be found individually and small ones are often found in small densely packed clusters.

- Crawling: De-wetting of the applied film from the substrate due to surface tension differentials.

- Telegraphing: Flow of paint induced by temperature gradients or contaminant of the substrate surface.

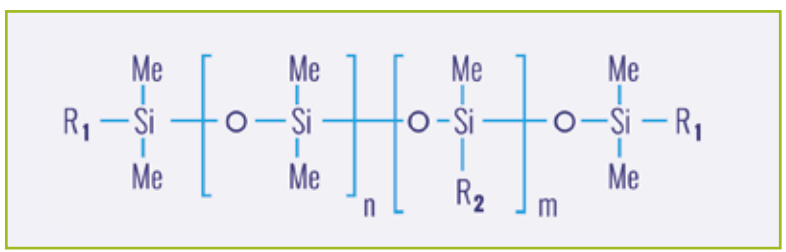
Choosing a Surface Control Additive

Surface control additives are silicones, polyacrylates or perfluoro surfactants.

Polysiloxanes (silicones) have a very high surface activity and therefore are often used as surface control additives. Commercial silicone-based surface control additives are modified by polyethers, polyesters or alkyl side groups to improve recoatability and inter-coat adhesion. Modification parameters are silicone content, molecular weight, and modification degree.

Dimethylpolysiloxanes (PDMS) are used for different purposes depending on their degree of polymerization. Low molecular weight products are used as levelling agents.

Increasing the molecular weight creates a higher degree of incompatibility with the coating medium and can generate a defoaming action.



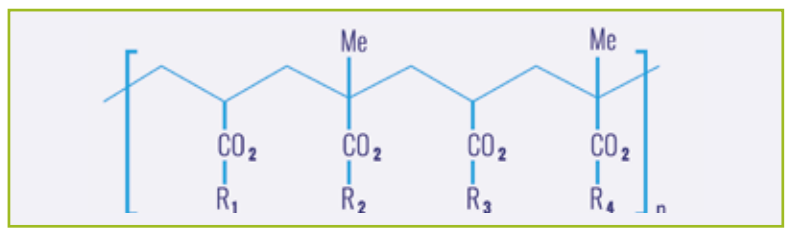
These products can be used to create a strong cratering tendency, a socalled hammer-tone effect. However, in most cases, recoatability is a problem with this product group and methylalkyl polysiloxanes are superior in this respect.

Polyether-modified siloxanes can be tailored to certain coating types and are superior to the dimethylpolysiloxanes. However, in certain applications, hydrolytic stability may be a problem. Self-condensation of hydroxyl functional polysiloxane can give rise to the formation of incompatible products with a strong tendency for cratering.

Polyester-modified siloxanes exhibit a higher stability against thermal degradation and improvements in compatibility. These products provide long-term slip and water repellency.

Homo and copolymers based on (meth)acrylic monomers are well known polyacrylate surface control additives. In some cases, they are incompatible in the paint system, which leads to the development of haze in clear-coats.This problem can be solved by choosing an acrylic leveling agent with lower molecular weight and improved compatibility. Gloss levels in solid colors are normally not affected by the incompatibility.

In addition to their positive impact on flow and leveling, acrylic homo- and co-polymers are effective as air-release agents. Since they are not reducing the surface tension of the coating to the extent of silicone-based products, the wetting of substrate surfaces is improved (substrate wetting).



Perfluoro-modified surface control additives are the most effective compounds to decrease surface tension, however, recoatability and foam stabilization and cratering may occur. These undesired side-effects depend very much on the system parameters that have to be optimized and adjusted to gain optimum results. Controlling the parameters of molecular weight, polarity, degree of fluorine modification, curing conditions, and additive concentration in the formulation must be evaluated carefully.

Surface Control Additives

● Highly Recommended
● Potentially Suitable

Product Name	Chemical Type	Active Ingredients %
DELTA SC® 2780	Polyacrylate-based	50
DELTA SC® 2777	Polyacrylate-based	70
DELTA SC® 2560	Silicone-based	>98
DELTA SC® 2284	Silicone-based	>98
DELTA SC® 2239	Silicone-based	>98
DELTA SC® 2231	Silicone-based	>98
DELTA SC® 2230	Silicone-based	>98
DELTA SC® 2212	Silicone-based	>98
DELTA SC® 2211	Silicone-based	>98
DELTA SC® 2035	Silicone-based	52.5
DELTA SC® 2034	Silicone-based	52.5
DELTA SC® 2033	Silicone-based	15
DELTA SC® 2031	Silicone-based	52.5
DELTA SC® 2030	Silicone-based	52
Solvent-based coatings		
Acid curable	●	●			●	●	●	●	●			●	●	●
Acrylic OH-functional	●	●		●		●	●	●	●	●	●	●	●	●
Acrylic self-crosslinking	●	●		●	●	●	●	●	●		●	●	●	●
Acrylic thermoplastic	●	●		●		●	●	●	●		●		●	●
Long-oil alkyd	●	●			●			●	●		●	●		
Medium-oil alkyd	●	●			●	●	●	●	●			●	●	●
Short-oil alkyd	●	●		●		●	●	●	●			●	●	●
Alkyd & PE OH-functional	●	●				●	●	●	●		●	●	●	●
Alkyd & PE OH-melamine	●	●		●	●	●	●	●	●		●	●	●	●
Chlorinated rubber						●	●	●	●		●	●	●	●
Solvent-based epoxy	●	●		●	●	●	●	●	●		●	●	●	●
Solvent-free epoxy	●	●		●	●		●	●	●	●	●	●		
Nitrocellulose				●	●	●	●	●	●		●	●	●	●
Unsaturated polyester	●	●		●	●			●	●	●	●			
Silicon resin	●	●					●	●	●		●			●
Vinyl copolymer								●	●		●			
Water-based coatings														
Acrylic emulsion			●						●					●
Acrylic water reducible			●						●					●
Alkyd emulsion			●						●					●
Alkyd melamine			●				●		●	●	●			●
Alkyd water reducible			●				●		●	●	●			●
Epoxy			●				●		●	●	●			●
Polyester melamine			●						●	●	●			●
Polyurethane emulsion			●						●	●	●			●
2K water-based polyurethane			●						●	●	●			●
Printing inks														
UV curable						●	●	●	●	●			●	
Packaging (gravure & flexo)	●	●				●	●	●	●			●	●	
Water-based			●				●	●	●		●			●
Composite														
Gelcoats					●							●		
Laminating					●									
Lay-up & spray-up					●									

Additives for Coatings, Printing Inks, Adhesives and Composites

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