
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

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Delta in Brief

About Us

Delta Specialties is a specialized multinational company serving the market with optimized solutions in multiple industries namely coatings, graphic arts and plastics industries. The core business arms are the driers and additives offered with consistent quality to more than 30 countries serving local, regional, and multinational base of clients around the GLOBE.

Having been in the market for over 15 years, Delta is currently operating with offices in Canada, India, Turkey and Egypt.

Our technical department holds the key for the continuous success of the company. The Research & Development labs together with the Technical Service & Application labs work very closely in testing existing products for new applications and developing new products according to the customers' demand.

Our business model is built around serving our customers in an industry that revolves around technology and innovation, but above all positive impact. From the huge change little additives can bring to your performance comes our belief that **little makes difference**.

Delta…Your Global Reliable Partner for Additive Solutions

Delta in Brief

Core Values

Honesty is our guiding principle; it reflects on our integrity with all stakeholders while bringing a high sense of trust to our markets and community at large.

Our deep belief in developing people and solutions reflects on our ability to successfully develop markets and business.

Our entrepreneurial acumen supports our forthcoming vision; adapting to market changes and responding with high flexibility.

We deal with business as humans; we understand their challenges and we cherish a partnership relation led by our devoted passionate team.

We are proactive and courageous; we take calculated risk trusting an empowered team enjoying self-realization and achieving outstanding performance.

Delta in Brief

Brand Promise

Optimized Solution-Based Portfolio
Understanding our customers' needs is key to adopt the most relevant solutions that fit their requirements and provide them with better product performance. We will be the ultimate choice contributing value for money partnership.

Reliable Partnership
Trust is a pillar formulating our relationship with our stakeholders. We will always deliver on promise to assure a partnership relation with all our stakeholders around the globe.

Human-to-Human Service
Empathy is in the heart of the way we deliver service; we will always deliver a close and personal relationship all backed up with responsive technical support and on- time & budget delivery.

Sustainable Impact
We work with impact, and we promise to embed sustainable development and support our customers aiming at more environmental friendly solutions.


delta

01

Foam Control Additives

Air can be incorporated into a coating by mixing during the polymer/pigment grinding and let-down steps, by pumping during package filling…etc.

Effective foam control additives are beneficial in preventing or reducing many common coating problems such as viscosity increase and loss of mechanical shearing power during milling, volume increase during the letdown and mixing steps…etc.

Delta Specialties offer a comprehensive range of foam control additives (silicone-free and silicone-based) to help you get rid of foam and achieve foam-free formulations in coatings, printing inks, adhesives and plastics (composite).

Composition of a Foam Control Additive

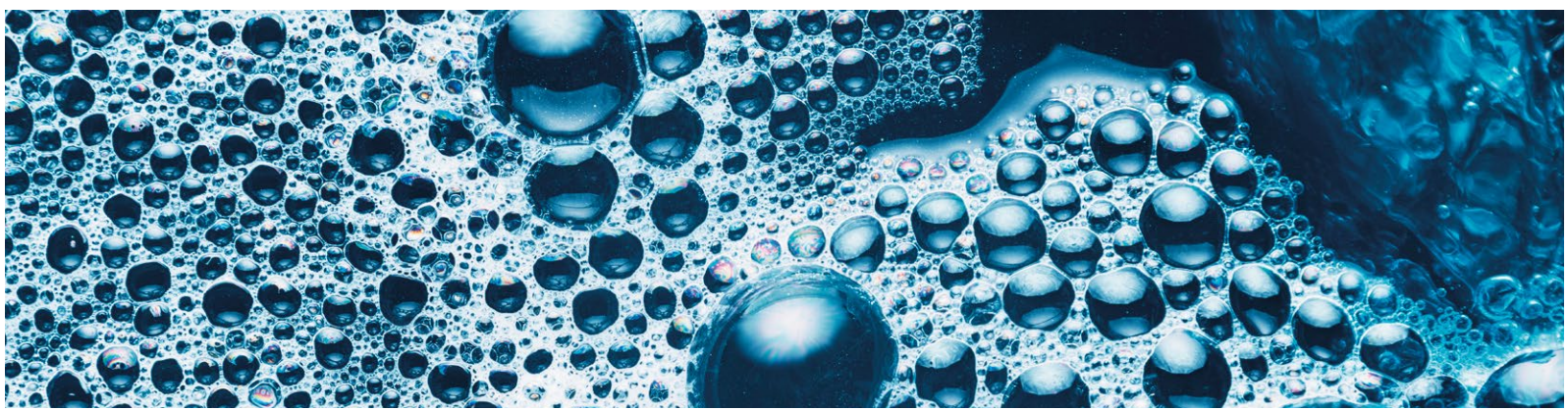
Typical foam control additives consist of the following components:

- Carrier fluids: They act to transfer the generally hydrophobic active substance uniformly into the hydrophilic medium. Typical carrier fluids include aliphatic and aromatic mineral oils, solvent blends, and water in the case of pre-emulsified defoamers.

- Surface active agents: They bring the active substance to the air interface and into contact with the stabilized foam structure. These substances work by having a general incompatibility with the formulation and disrupt the spreading mechanism for stabilizing foam.

- The most often used substances showing incompatible spreading include fatty acid esters and amides, glycols, silicones, and modified silicones.

- Active substances: They adsorb surfactant ingredients present in the formulation and destabilize foam. Hydrophobic particles such as metal soaps, waxes and hydrophobic fumed silica are adsorption compounds for foam destruction.



Choosing a Foam Control Additive

For solvent-based and solvent-free systems, polysiloxanes, polyacrylates and polyolefins are effective.

Pure polysiloxanes are also suitable but critical in terms of their compatibility, which can cause cratering. The best balance between compatibility and incompatibility is achieved through organically-modified polysiloxanes.

Modification of the polysiloxane backbone with fluorine results in the socalled fluoro-silicones known for their very low surface tension and strong defoaming properties.

For waterborne systems, a wider range of chemical structures can be used due to the generally higher surface tension of these systems.

Foam control additives for waterborne systems can generally be based upon:

- Mineral oil: As opposed to solvent-based systems, the spreading of mineral oils in water-based systems is sufficient to act as a foam control additive. In the presence of hydrophobic particles, the mineral oil acts in addition as carrier for these particles.

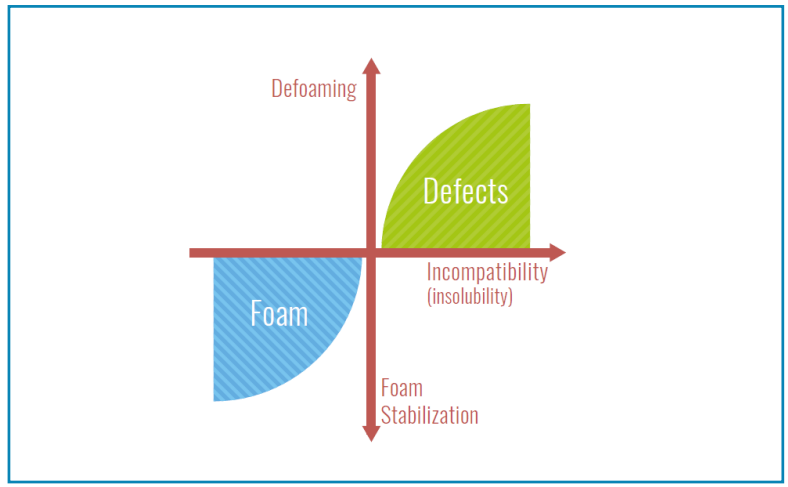
- Silicone: Both dimethylpolysiloxanes and modified polysiloxanes can be used as foam control agents in water-based systems.

An important point to consider is the incorporation of the foam control additive in the paint system. Since they are not soluble in the system, a good distribution of the active substance is necessary. This can be controlled by the mixing speed and time, otherwise craters can be formed or loss of defoaming efficiency is observed.

Since the performance of a foam control additive is difficult to predict due to the variety of raw materials used in a paint formulation and the application method, evaluation of your own system is indispensable.

The stirring or shaking tests are based on the incorporation of air in a system. After this air incorporation, the samples can be analysed on weight or volume. The foam reduction over time of these stirred or shaked samples can also be observed. These tests give the effectiveness of the foam control additive during the manufacturing process.

The roll test can be used to control the foam behaviour during the application of the paint. After application of the paint with a roller on a testpaper, the wet and dry film is analyzed on surface defects.



Foam Control Additives

● Highly Recommended
● Potentially Suitable

Product Name	Chemical Type	Active Ingredients %	DELTA FC® 1730	DELTA FC® 1722	DELTA FC® 1720	DELTA FC® 1590	DELTA FC® 1531	DELTA FC® 1525	DELTA FC® 1522M	DELTA FC® 1520M	DELTA FC® 1504	DELTA FC® 1501	DELTA FC® 1041	DELTA FC® 1040	DELTA FC® 1030	DELTA FC® 1022	DELTA FC® 1020
			Silicone-based	Silicone-based	Silicone-free	Silicone-based	Mineral oil	Silicone-based	Mineral oil	Mineral oil	Mineral oil	Mineral oil	Silicone-based	Silicone-based	Silicone-based	Silicone-based	Silicone-free
			-	-	-	28	>98	23	>98	60	>98	>98	-	-	-	-	-
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 and Adhesives																	
Acrylic emulsion						●	●	●	●	●	●	●					
Acrylic water reducible						●	●	●	●	●	●	●					
Alkyd emulsion						●	●	●	●	●	●	●					
Alkyd melamine						●	●	●	●	●	●	●					
Alkyd water reducible						●	●	●	●	●	●	●					
Epoxy								●									
Polyester melamine								●									
Polyurethane emulsion								●									
Polyvinyl Acetate							●		●		●						
Printing inks																	
UV curable					●								●		●		
Packaging (gravure & flexo)					●								●	●	●	●	●
Water-based						●	●	●	●	●	●	●					
Composite																	
Gelcoats			●	●	●										●		●
Laminating			●	●	●										●		●
Lay-up & spray-up			●	●	●										●		●

02

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.

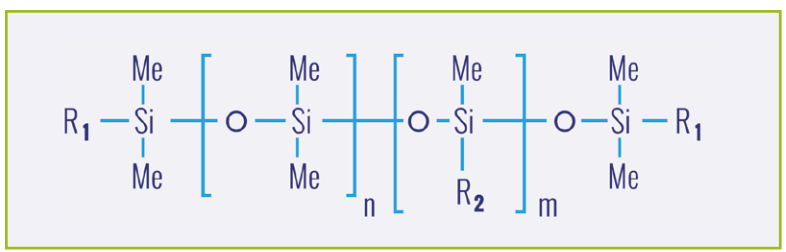
Choosing a Surface Control Additive

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.



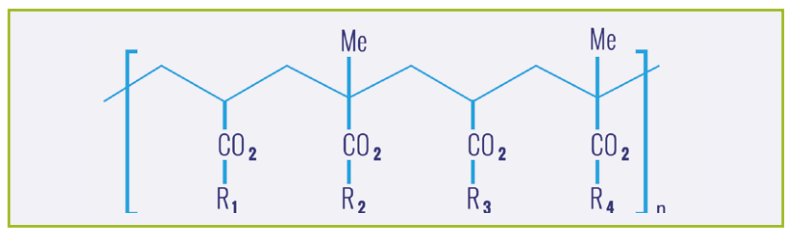
These products can be used to create a strong cratering tendency, a socalled hammer-tone effect. However, in most cases, recoatability is a problem with this product group and methylalkyl polysiloxanes are superior in this respect.

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					○									

03

Dispersion Control Additives

When dispersing pigments, one frequently encounters problems such as flocculation, insufficient color or transparency, poor rheological qualities or stability. With our dispersion control additives, you can ensure your pigment and filler particles will keep apart for quite long and thus avoid any (re)-flocculation or settling that may occur in your liquid formulations.

Delta Specialties offer a comprehensive range of dispersion control additives (low and high molecular weight) for solvent and water-based systems to help you optimize your dispersions in coatings, printing inks and plastics (composite).

Types of Dispersion Control Additives

Delta Specialties manufactures 2 types of dispersion control additives:

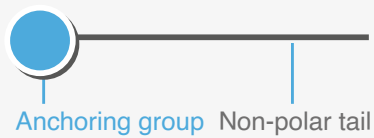
1 - Low molecular weight wetting and dispersing agents (**DELTA** DC® 4000 series)

Properties:

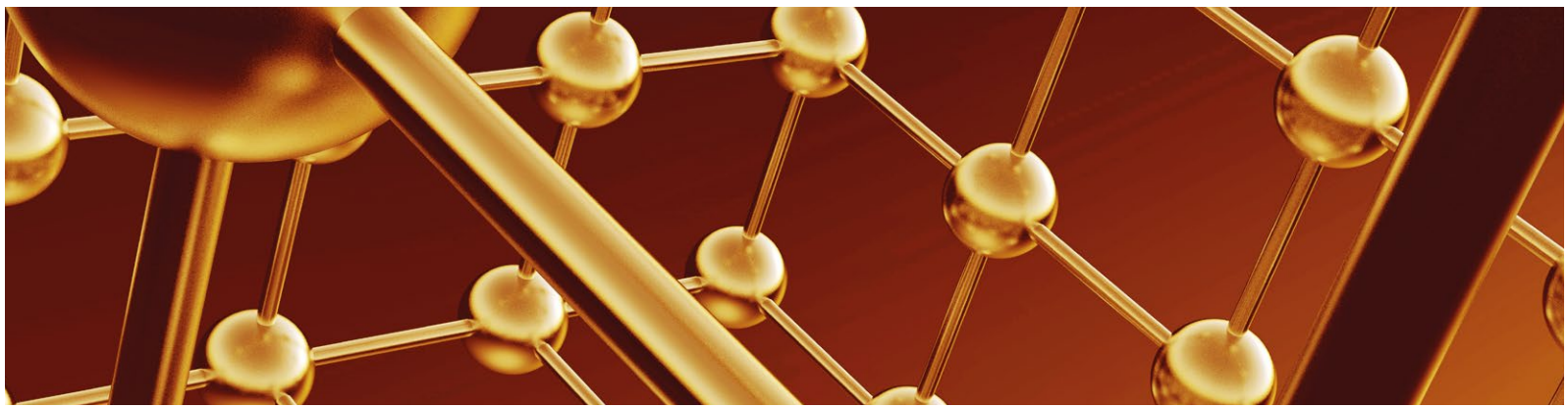
- 800 g/mol < Molecular weight < 2,000 g/mol.
- Categorized according to their chemical structure and the nature of their hydrophilic groups (amphoteric, cationic … etc).
- The interaction of their polar groups with the pigment surface and the behavior of the non-polar chains in the medium determine their effectiveness.
- Only used for stabilizing inorganic pigments and extenders.

Mode of Action:

- The polar heads will form hydrogen bonding interactions between different pigment units resulting in a network that enhances the separation of the particles (controlled flocculation).
- This interaction is of great importance in this class of dispersion control additives since the relatively low molecular weight will not give sufficient steric hindrance.
- Inorganic pigments are usually metal oxides, which contain positive metal ions and negative oxide ions. These ions are good anchoring points, where the anchoring groups that build-up the polar head of the dispersion control additive can attach to (polar interactions).
- Unfortunately this type of charge interaction is not possible with organic or black pigments.



DELTA DC® 4000 series



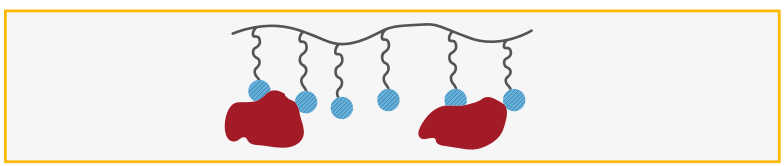
2 - High molecular weight wetting and dispersing agents (**DELTA** DC® 3000 series)

Properties:

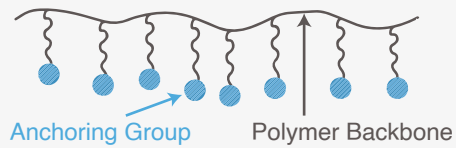
- 5,000 g/mol < Molecular weight < 30,000 g/mol.
- They are built of branched or long linear molecules, which in general have a polyurethane or polyacrylate structure.
- Designed to adsorb via special groups with high affinity towards specific sites on the pigment surface. These are called anchoring groups, and are built in at strategic points on the polymer backbone.
- Suited for inorganic and organic pigments, in addition to carbon black pigments.

Mode of Action:

- Anchoring groups enable strong interaction between the dispersion control additive and the pigment surface.
- This interaction is much stronger than in the case of the low molecular weight types as the dispersion control additive is bound to numerous sites on the surface via the anchoring groups, assuring an efficient steric hindrance between the solid particles by keeping them apart.



- The remaining parts of the dispersion control additive act as a steric barrier to the surroundings by stretching into the liquid phase preventing flocculation.
- These parts have a good affinity with the solvent and the resin system, so the compatibility with the liquid phase is increased and the viscosity of the paint system is reduced as a desired side effect.
- Organic pigments molecules consist mainly of the elements C, H, O and N. These atoms are not charged and are connected to each other through covalent bonds. Despite the fact that the main interaction between the anchoring groups and pigment surface is hydrogen bonding, this mechanism applies for both organic and inorganic pigments.
- Inorganic pigments are usually treated with different types of polar organic compounds which enable this interaction to take place as it does by the organic pigments.



DELTA DC® 3000 series

The compatibility of the dispersion control additive chain in various vehicles is determined by its chemical nature. Therefore different chemistries were developed by Delta Specialties, which are divided according to their chemical composition into two groups:

- **Polyurethane-based:** They have a branched backbone, with a 3 dimensional network structure. On various places of this network structure, different anchoring groups are introduced. They are compatible with systems from medium to high polarity. They reduce the viscosity of the mill-base greatly and therefore promote the use of higher pigment loading during grinding (pigment concentrate applications). However, since viscosity and tendency for settling may increase in the case of high density pigments (inorganic pigments), it is essential to use a rheological modifier or an anti-settling agent next to the polyurethane-based dispersion control additives.
- **Polyacrylate-based:** They have linear structures with a carbon-carbon backbone, which bears various functional side groups and short chains. They bear groups, which participate in the anchoring of the pigment. Others play a role in the solvation of the acrylate in the liquid medium, or induce a sterical hindrance, that thwarts the re-agglomeration, after the adsorption of the polymer onto the pigment surface. They are compatible with systems from non-polar to very high polar systems and do not reduce the viscosity as much as in the first class. This allows the polyacrylate-based dispersion control additives to promote anti-settling behaviour as well.

Choosing a Dispersion Control Additive

To achieve the best de-flocculation/stability effect of pigment dispersions, one must consider three main points:
- Compatibility of the dispersion control additive with the vehicle
- Quantity of the dispersion control additive in relation to pigment
- Proper application procedure

A quick preliminary test can be carried out to ensure that no major errors are made in the initial choice of the dispersion control additive. The test is done by mixing the dispersant with the main letdown vehicle in the ratio 90:10. The mixture should be clear. It might be necessary in some cases to shake the mixture with glass beads (1:1 by weight) using a shaker like Skandex® for 1 hour. The mixture must then be clear. The extra mixing is needed to find out whether the dispersant is difficult to incorporate or is completely incompatible.

This test, however, is not indicative of the effectiveness of the dispersing agent. It can only predict possible deficiencies in de-flocculation performances (loss of gloss) and, in the case of mixed pigments, the risk for floatation.

Addition levels used in the case of low molecular weight dispersion control additives are generally low and thus can easily be determined. In the case of high molecular weight dispersion control additives, it is of prime importance to use the right addition level in order to achieve an optimum pigment dispersion.

From past experience, a handy calculation method has been developed that will minimize initial testing trials.

For inorganic pigments, the percentage of high molecular weight dispersant (as active material) used on pigment is usually 10% of the oil absorption value*.

For carbon black pigments, the minimum percentage (as active material) used on pigment is 20% of the DBP-value**.

(*)Oil Absorption (OA) value of a pigment is defined as the number of grams of linseed oil absorbed by 100g of the pigment.

(**)DBP (Dibutylphtalate) -value is defined as being the volume of Dibutylphtalate absorbed by 100g of carbon black pigment.

The required percentage for organic pigments is more difficult to determine. The BET-value*** is a good starting point. For yellow, orange and red pigments, the percentage (as active material) used on pigment is 50% of the BET-value. For phthalo-cyanine blue, phthalo-cyanine green, maroon and violet pigments, with BET-values lower than 50 m^2/g, the percentages(as active material) used on pigment are 50% of the BET-value.

The general guideline for calculating the amount of high molecular weight dispersion control additive required to stabilize a certain type and quantity of pigment will be correct in most cases. However, organic pigments might require amounts of dispersants beyond or below the calculated ones.

Such unexpected required amounts are dependant on the way the pigment is pre-treated. Many pigments are pre-treated nowadays, in such a way that they can be dispersed easier than the untreated ones.

Please take a look at our website www.delta-specialties.com (select 'Technical Information' and then 'Pigment list') where you can have access to a list (sorted by pigment color) containing a large number of commercially known pigments with their respective technical information (color index, supplier name, BET-value...etc).
In case a pigment is not listed in, please contact your pigment supplier to get the required value (OA, BET or DBP) for your calculation of dispersant dosage.

We will be delighted to establish a tailored formulation for you should you find difficulties collecting the technical information from your supplier. All you have to do is to send our Technical Service team a small sample of your pigment.

(***) BET-value is defined as being the surface area of a pigment per its weight; and is determined by N_2 adsorption method according to Brunauer, Emmet and Teller.

High-Molecular Weight Wetting & Dispersing Agents

Dispersion Control Additives

● Highly Recommended
● Potentially Suitable

Product Name	Chemical Type	Active Ingredients %
DELTA DC® 3080	Polyester Polymer	52
DELTA DC® 3750	Sodium Polyacrylate	43
DELTA DC® 3740	Ammonium Polyacrylate	43
DELTA DC® 3591	Polyester-based	40
DELTA DC® 3047	Polyurethane-based	35
DELTA DC® 3046	Polyurethane-based	40
DELTA DC® 3013	Anionic Polyester-based	>98
DELTA DC® 3011	Polyurethane-based	60
DELTA DC® 3009	Polyurethane-based	60
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		

Dispersion Control Additives

● Highly Recommended
● Potentially Suitable

Product Name	DELTA DC® 4296	DELTA DC® 4244	DELTA DC® 4274	DELTA DC® 4242	DELTA DC® 4211	DELTA DC® 4208	DELTA DC® 4207	DELTA DC® 4075	DELTA DC® 4073	DELTA DC® 4071	DELTA DC® 4066	DELTA DC® 4065	DELTA DC® 4054	DELTA DC® 4044	DELTA DC® 4010M	DELTA DC® 4007	DELTA DC® 4001
Active Ingredients %	>98	>98	>98	>98	>98	>98	>98	90	50	52	52	52	52	52	50	70	30
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		●	●		●									●	●		

04

Specialty Additives

This range represents specialty additives with unique chemistries and exceptional technical features.

Multi-Purpose Additives
DELTA S® 5220 & DELTA S® 5225

DELTA S® 5220 and DELTA S® 5225 are multi-functional additives, both can be used as:

- Color acceptance improver
- Dispersant of choice for transparent iron oxides

DELTA S® 5225 can be used as sole dispersion control additive for the manufacturing of universal colorants.

DELTA S® 5220 is excellent dispersion control additive for inorganic pigments and extenders in water and solvent-based systems, also for preparation of slurries and matting agent dispersions.

Both **DELTA** S® 5225 and **DELTA** S® 5220 are 100% active, APE-free dispersion control additives. They are based on unsaturated fatty acids having polar tertiary amines heads.

The hydrophobic chains have unsaturated character which allows the additive to be liquid at room temperature (easy handling).

In addition, the 'unsaturation' provides drying properties by cross-linking in the presence of oxygen.
The anchoring groups used in **DELTA** S® 5225 are similar to those of our high molecular weight dispersion control additives (**DELTA** DC® 3000 series) and hence have strong affinity towards pigment surfaces (inorganic, organic and carbon black pigments).

DELTA S® 5220 has special anchoring groups allowing the additive to drastically reduce the viscosity of inorganic pigments and extenders.
Slurries and highly pigmented iron oxide or titanium dioxide pastes can be prepared by using one single dispersion control additive.

Colour Acceptance Improvement

It is possible to improve colour acceptance of base paints (solvent and water-based paints) when using both **DELTA** S® 5225 or **DELTA** S® 5220 as post-additives by preventing the 'de-wetting' of surfactants (surfactant stripping) used for the formulation of universal colorants.

0.5-1.5 parts by weight of either **DELTA** S® 5225 or **DELTA** S® 5220 into the white base paint (alkyd or emulsion base) can make a world of difference.

Universal Colorants for Architectural Paints

Production of colorants is essential for tinting of the architectural paints. Ideally these universal tinting pastes should be compatible with water-based as well as solvent-based paints.

With **DELTA** S® 5225, you can from now onward formulate your 16 colorants without any resin and with only one dispersion control additive. Making universal colorants has never been so easy!

Given its unique chemistry and the absence of any carrier, **DELTA** S® 5225 will enable customers to:
• Meet the stringent VOC restrictions in place today.
• Comply with the current and anticipated requirements in terms of APEs (Aryl phenylethoxylates) and environmental aspects.

In view of the future environmental legislation and increased health and safety awareness, more and more paint manufacturers in the Middle East market will opt for APE-free products.

Due to many construction projects in the pipeline and the unusual and fast growth in the DIY (Do-It- Yourself) concept, demand for both interior and exterior paints from end-consumers in the Middle East will witness a steady increase in the coming years.

DELTA S® 5225 will enable paint manufacturers to formulate environmentally friendly colorants, with no APE raw materials and lowered or no VOC content.

The following formulations, developed for in-plant tinting have been tested in our technical service laboratory in various white base paints (water and solvent-based) from different manufacturers in the Middle East. Their compatibility and stability over time are just stunning.

PC 23 Violet	PG 36 Low Green	PBK 7/PY 42 /PR 101 Amber	PY 83 Orange Yellow	PY 42 Yellow Oxide	PR 112 Red	PR 168 Orange Red	PB 15:4 Low Blue
PY 74 Yellow High	PG 7 High Green	PR 122 Magenta	PB 15:3 High Blue	PY 138 Yellow Low	PW 6 White	PBK 7 Black	PR 101 Red Oxide

	PY 74	PB 15:3	PR 112	PG 7	PR 101	PY 42	PW 6	PBK 7
Monoethyleneglycol	18.0	16.0	11.0	16.0	15.3	18.0	15.5	18.0
DELTA S® 5225	6.5	10.0	17.0	10.0	66	7.7	7.3	4.5
Demi-Water	33.8	32.8	38.7	32.8	12.0	17.2	14.1	57.7
NaOH (25% in water)	1.0	1.5	2.6	1.5	1.0	1.1	1.1	1.1
DELTA FC® 1525	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Anti-settling	--	--	--	--	0.3	0.3	0.3	--
Preservative	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Pigment	40.0	39.0	30.0	39.0	64.0	55.0	61.0	18.0
Total weight	100.0	100.0	100.0	100.0	99.9	100.0	100.0	100.0
Pigment characteristics	BET=17	BET=57	BET=30	BET=44	OA=26	OA=34	OA=16	DBP=93

Please note that the above formulations were established using specific pigments with determined OA-, BET– and DBP- value (Please refer to Choosing a Dispersion Control Additive).

In case you use pigments with different properties, it is obvious that your formulations would need some adjustments.

Should you require tailored colorant formulations for your own system (s), our Technical Service technicians would be more than pleased to assist.

We can indeed provide you with all the support you need to develop your own tinting system.

Multi-Functional Additives

DELTA S® 5700 is an anti- gel agent and viscosity stabilizer for air-drying and stoving coating systems. It delays/prevents thickening, which can occur as a result of oxidation or condensation of the binder.

- It also reduces the reaction of the pigments with the vehicle.
- It is usually added prior to grinding, but already gelled materials can be restored to processing viscosity by the addition of **DELTA** S® 5700.

DELTA S® 97 provides pH control and stability. It can substitute ammonia and thus reduces odor during production and in the final paint.

- It also reduces the dose of dispersant, wetting agent, anti-foam and coalescent agent and provides excellent wetting properties.

DELTA S® 5750 is a diol ester compound that function as a coalescing agent for different types of latexes in water-based paints. **DELTA** S® 5750 is characterized by its low water solubility and good hydrolytic stability over wide pH range which enhances its coalescing effect. Further additional benefits are enhancing the scrub resistance, reducing the MFFT, improving color development and has a good hydrolytic stability over wide pH range.

DELTA S® 5715 is a multifunctional additive for printing inks. It acts as an adhesion promoter and substrate wetting additive for laminating inks. Further, **DELTA** S® 5715 improves color strength and stability.

- It can be effectively used with different types of laminating liquid inks improving adhesion on different substrates.

DELTA S® 5800 is a specially formulated humectant that can replace traditional glycols to help in formulating a low VOC water-based colorants and pigment pastes. It prevents the drying out of water-based pigment pastes, prevents pigment caking and maintains the pigment pastes quality upon storage.

DELTA S® 5845 is a high molecular polymeric wetting and dispersing agent particularly developed for dispersing organic and carbon black pigments in plasticizers and polyols. It offers an excellent viscosity reduction and color strength. **DELTA** S® 5845 is supplied as %50 active in phthalate-free plasticizer.

Replacements for Cobalt Drier Mordry 410/420

MORDRY 410 and MORDRY 420 are highly efficient replacements for cobalt drier in urethane-modified alkyds and alkyds.
They can be efficiently applied in clear and brightly pigmented urethane-modified alkyds and in conventional alkyds, which tend to discolor.

As compared to cobalt octoate, these cobalt replacements can offer superior properties such as:

- The minimization of discoloration of clear urethane-modified alkyds in can.
- The improvement of alkali resistance.
- The increase in yellowing resistance of air-drying alkyd finishes especially those subjected to prolonged heat or alkaline fumes.
- The prevention of 'loss of dry' on aging.
- The relative lower level of toxicity compared to cobalt.

To highlight the performance of one of these special driers, **MORDRY**®410 was tested in 2 different urethane-modified alkyds (see table below) in comparison to cobalt octoate, considered to be the benchmark.

Internal reference: Formulation 6/ 2009	Formulation 1	Formulation 2	Formulation 3	Formulation 4
Uralac AR 202 W50 (DSM)	80.00 pbw	80.00 pbw	--	--
U-alkyd 20621 (60%) (Local)	--	--	80.00 pbw	80.00 pbw
White Spirit	18.96 pbw	18.96 pbw	18.46 pbw	18.46 pbw
MORDRY® 410	0.24 pbw	--	0.30 pbw	--
MORDRY® Cobalt 10%	--	0.24 pbw	--	0.30 pbw
MORDRY® Calcium 10%	0.48 pbw	0.48 pbw	0.48 pbw	0.48 pbw
MORDRY® Zirconium 18%	0.80 pbw	0.80 pbw	0.80 pbw	0.80 pbw
Color/Gardner	4 - 5	13 - 14	4 - 5	14
Drying time @25 C (min)	140 min	130 min	150 min	145 min

05

Driers & Catalysts

The chemical hardening of unsaturated liquid binders by means of the reaction with atmospheric oxygen is described as “drying”.

Metal-organic compounds (metal soaps or complex) are used in relatively small concentrations to control drying processes. Such additives are described as driers .

From the chemical standpoint, driers are molecular (homophase) catalysts for free radical oxidative polymerisation, which is a chain process developing in the presence of the atmosphere oxygen.

Product List

Delta Specialties can offer a broad range of driers to help you control the drying time of your coating films.

For solvent-based systems,
Single Metal Driers

MORDRY® Barium 12.5
MORDRY® Calcium 4
MORDRY® Calcium 5
MORDRY® Calcium 10
MORDRY® Cerium 10
MORDRY® Cobalt 6
MORDRY® Cobalt 10
MORDRY® Cobalt 12
MORDRY® Copper 8
MORDRY® Lead 24
MORDRY® Lead 32
MORDRY® Lead 36
MORDRY® Lithium 2
MORDRY® Manganese 10
MORDRY® Potassium 10
MORDRY® Strontium 10
MORDRY® Zinc 12
MORDRY® Zinc 18
MORDRY® Zirconium 12
MORDRY® Zirconium 18
MORDRY® Zirconium 24

Mixed Driers

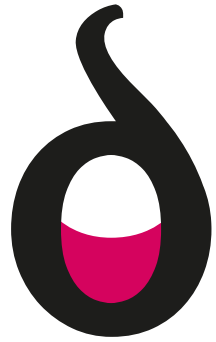
MORDRY® 210
MORDRY® 320
MORDRY® 390

For water-reducible systems,

MORDRY® Barium 10 WD
MORDRY® Calcium 4 WD
MORDRY® Cobalt 6 WD
MORDRY® Manganese 6 WD
MORDRY® Zirconium 12 WD

Catalysts

MORCURE® 6P
MORCURE® 8P
MORCURE® 6P HV
MORCURE 730
MORCURE 140
MORCURE 145



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