BLACKBURN CHEMICALS LIMITED

Dispelair Foam Control Agents
Coatings Products
Technical Information

Foam Control in Paint

Paint in this context applies mainly to the decorative paint market – or emulsion paint. There are industrial water based products which require antifoams, but the large volume use is in the manufacture of decorative paints.

EMULSION PAINT MANUFACTURE

Modern paint plants can be highly automated. Most liquid raw materials are in $1m^3$ containers or 200 litre drums, which can be connected to the system via a manifold. If the raw material is in powder form, bulk silos can feed the dispersing machinery.

Pigments are normally carried from the silo to the disperser by a pneumatic transportation system. If the pigment is packed in bags, it is added to this disperser via a port. Additions can be computer controlled with the aid of load cells to measure weight, and sonic devices to determine the depth of the mixer blade in the liquid.

Manufacturing is a two-part process. When the dispersion is approved, it is added to a larger letdown tank which contains a liquid polymer. To reduce excessive aeration the mixture is stirred at low speeds. The addition of the foam control agent (FCA) is normally divided between the dispersion and the letdown stages.

Matt Emulsion Paint

This type of formulation has a higher pigment volume concentration (PVC) than silk or sheen paints. The polymer content is lower and often less FCA is required.

Silk or Sheen emulsion paint

These paints have lower PVC levels, higher polymer content, and usually require more FCA.

GENERATION OF FOAM

Foam in paint can be generated in 3 main areas:

- Manufacture
- Packaging and Transportation
- Application

Manufacture

During the mixing of the various components under high sheer in the disperser, air can be incorporated into the paint. Transferring the paint from one vessel to another can also cause aeration. Entrained air can significantly reduce the efficiency of the plant.

Packaging and Transportation

Once manufactured the paint has to be transferred into the relevant containers. To make sure that the smallest packaging is used, air must not be present in the paint as this effects the specific gravity and therefore the container size needed. During transportation vibration and agitation could also aerate the paint.

Application

During the application of a paint to a substrate, air can be introduced into the paint film. Unless this air is removed quickly the paint film will dry with the air still entrained. This will cause bubbles in the dried film, giving an unacceptable finish to the paint. It would also compromise any protective film properties the paint film is providing.

Besides the problem of large visible air bubbles, micro bubbles can also be formed. This is a particular problem in clear varnishes as micro-air causes the film to be opaque when it dries.

What Causes Foam?

Paint is composed of several different components. These can be split into pigments (e.g. TiO2), polymer / resin emulsions, solvents (usually water in emulsion paint systems), and additives.

Pigment

Before the polymer is added to the system the pigment is dispersed in water under high sheer. Wetting agents are added to reduce the viscosity of the pigment dispersion. The wetting agents are surface active and will therefore increase the chance of foam forming. FCAs can be added at this stage to prevent aeration and so improve the pigment dispersion process.

Polymer Emulsion

There are a large number of different polymer emulsions, each with their own characteristics. Some commercially important polymer emulsions are:

Acrylics
VA/VeOVA
Polyurethane
VA/Acrylics
Styrene/Acrylics

Each type of polymer adds different characteristics to the paint film. This could be flexibility, hardness, water resistance etc.

Many of the components of the polymers are surface active and have a potential to stabilise foam. There are almost infinite possibilities in mixing the various components of the polymer emulsion, and this makes it impossible to accurately predict which FCA will work with the particular polymer.

During the letdown stage in the paint process, where the pigment dispersion is added to the polymer emulsion there is a possibility of aeration. Also, transferring the polymer from one tank to another and agitating at high speed can cause processing problems due to air entrainment. FCAs can be added at this stage to control the aeration.

Additives

During the pigment dispersion and letdown stage certain other additives are incorporated into the paint system. These can be wetting agents, biocides, thickeners etc. Again all of these compounds are surface active and therefore have the potential to produce a stable foam.

TYPES OF FCA'S

The main types of FCAs are listed below:

- Oil based, containing
  -Hydrophobic Silica
  -Metal Soap
  -Hydrophobic Waxes
- Silicone based
- Modified silicone based
- Polyglycol based

The criteria for FCAs is as follows:

1. The FCA must deaerate / prevent aeration in the paint during manufacture.
2. The FCA must remain active for the shelf life of the paint. Consideration of the storage environment must be taken into account, e.g. extremes of temperature.
3. The FCA must cause the bubbles to burst on application of the paint.
4. The FCA must be compatible in the paint film and must not cause any detrimental affects, such as fisheyes.

FCAs are normally added to the paint system at about 0.1-0.4% w/w. However in certain systems higher levels can be used, providing the FCA remains compatible with the paint system.

LAB TESTING
Spin Test

The efficiency of the FCA can be measured using an air entrainment test. This gives an indication of the ability of the FCA to prevent aeration during the production process.

The test paint is weighed into a tall form beaker. The FCA is accurately weighed onto the surface of the paint. A wire whisk stirrer is used to mix the paint at a fixed speed between 1000 – 2000rpm for a defined period between 5 – 15 minutes. The speed and time of agitation is determined by the foaming properties of the test paint. A rapid specific gravity (S.G.) measurement is made using a weight per gallon cup. By comparing the S.G. of the paint before and after the spin test, a determination of the efficiency of the FCAs can be made. Several FCAs can be directly compared by using this method.

Application Test

The test paint without FCA is applied to a suitable substrate using a roller. The roller aerates the paint on application, and once dried the paint film is inspected for the amount of macro and micro bubbles on the surface. The test is then repeated with a FCAs incorporated into the paint and a comparison can then be made.

Compatibility Testing

The main compatibility issues are as follows:

1. **Fisheyes.** This effect is caused by localised dewetting of the paint film due to hydrophobic particles being present.
2. **Orange Peel Effect.** This is caused by surface tension gradient in the paint film and can produce a surface similar to an orange peel.
3. **Floating of the FCA on the surface of the paint.** This can happen if the FCA does not disperse well within the paint. If the FCA has a lower S.G. than the paint then it will tend to float to the surface.
4. **Clouding.** This is a problem particularly with clear varnishes. If an FCA is used that contains silica it can sometimes cause the film to become opaque.
5. **Gloss.** It is important when using an FCA in a gloss paint formulation that there is no reduction of gloss in the final film. This can be measured using a gloss meter.

Compatibility is usually determined by drawing a thin film of the test paint down a glass plate with a wire wound bar. This is done on a blank paint sample and then with the FCA incorporated to give a comparison. Once dried the film can be checked for imperfections.

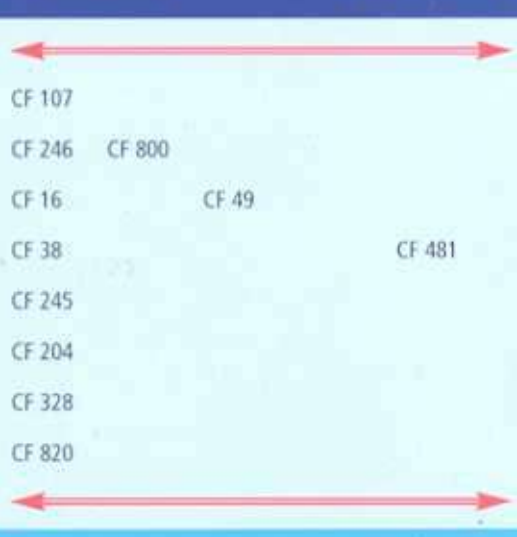
COMPOSITION

Dispelair Product Code	Type of Chemistry
CF 107, CF 246, CF 800, CF 481, CF 49	Mineral hydrocarbons, silica and surfactants
CF 38, CF 245	Mineral hydrocarbons, metal soaps, surfactants and a low level of silicone
CF 16	Mineral hydrocarbons, metal soaps and surfactants
CF 204	Emulsion of modified silicones and surface active agents
CF 328	Emulsion of modified silicones
CF 820	Emulsion of mineral hydrocarbons, silica and surfactants and a low level of silicone

PHYSICAL SPECIFICATION & APPLICATION AREAS

Product Code	Appearance	Matt Paint	Silk Paint	Gloss Paint	Varnishes	Polymer Latex	Adhesives
CF 107	Opaque amber liquid	✓	✓	✓			✓
CF 246	Opaque amber liquid	✓	✓	✓			✓
CF 38	Opaque amber liquid	✓	✓				✓
CF 245	Opaque amber liquid	✓	✓				
CF 49	Opaque amber liquid	✓	✓			✓	
CF 820	Off white emulsion	✓	✓			✓	✓
CF 16	Opaque amber liquid	✓	✓				
CF 481	Opaque amber liquid	✓	✓			✓	
CF 800	Opaque amber liquid	✓	✓				
CF 328	White emulsion	✓	✓	✓	✓	✓	
CF 204	White emulsion	✓	✓				

DISPERSIBILITY



PROPERTIES

Dispelair CF 107/ CF 246/ CF 16	Broad ranging foam control agents. Can be used in low to high PVC systems
Dispelair CF 800/ CF 49	Broad ranging foam control agents. Suitable for systems with a low surfactant content
Dispelair CF 481	Highly emulsified foam control agent. Suitable for polymer latexes or low viscosity coatings
Dispelair CF 38/ CF 245	Effective foam control agents for use in systems with a medium to high PVC
Dispelair CF 820	Water based foam control agent suitable for medium to high PVC
Dispelair CF 204	Suitable for exterior/ elastomeric coatings
Dispelair CF 328	Effective foam control agent for use in wood coating systems & elastometric paints

The above products are a selection of our range. If none of the above meet your requirements we are happy to recommend and/or develop a more suitable produ

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