BINDER: The 'GLUE' That Holds Paint Together

This second in a series of articles on paint ingredients describes how the binder holds pigment particles together while providing film adhesion and integrity.

As a painting contractor, it's important that you know how the ingredients of a paint affect its performance. It's important because it will help you select the right paint for your customer's job, and because it will aid you in explaining the paint's benefits to your customer.

In the previous issue of *Professional Painter,* we took a look at pigments, the finely ground particles that provide paint with its color and hiding. Now, we'll look at another ingredient, the binder or "glue" that holds paint together.

The binder is a resinous material that surrounds the pigment particles, binds them together, and gives the paint film its integrity. When paint is applied and dries, it is also the binder that provides adhesion to the surface.

The binder is a key ingredient that affects almost all paint properties. Not only does it impact adhesion and related properties such as resistance to blistering, cracking and peeling, it also affects other resistance properties such as resistance to scrubbing, chalking and fading, and application properties such as flow, leveling, and gloss development.

LATEX-BASED BINDERS

The binder in a latex paint is a solid, plastic-like synthetic material that is dispersed as microscopic particles in water. This dispersion is a milky-white liquid called "latex" because it is reminiscent of natural latex from the rubber tree. This latex is then mixed with pigments and other ingredients to produce "latex paint."

Several polymer types are used as binders in latex paint. The two types used most commonly in North America are 100% acrylic and vinyl-acrylic (also called PVA for polyvinyl acetate).

100% acrylic binders formulated for exterior use provide excellent performance benefits related to adhesion, water resistance and resistance to alkalinity. They are generally used in higher quality exterior latex paints where top quality performance is required.

100% acrylic binders used in premium interior latex paints provide benefits in terms of adhesion under wet conditions, and resistance to waterborne stains, blocking, and alkaline cleaners, but the differences are not as pronounced as with exterior applications.

Properly formulated, vinyl acrylic latex binders perform adequately in interior wall paints, drywall primers, and satin/semigloss paints. Vinyl acrylics are also used in some exterior paints for reasons of economy. However, if using these, avoid application on bare masonry, to surfaces such as high gloss alkyd paint where blistering is most likely to occur, and in situations where resistance to mildew and dirt are important.

OIL-BASED BINDERS

Binders in oil-based paints are either natural or synthetic. The natural binder in an oil-based paint is made from a vegetable oil that "dries" when it is exposed to the air. Drying oils traditionally used in paints include linseed oil, tung oil and soya oil.

Today, few paints are made with oil alone. Rather, they are based on modified oils called alkyds. Made from vegetable oils and synthetic resins, alkyds are chemical compounds that dry harder and faster than oils. Nearly all "oil-based" paints now have alkyds as binders. Exterior oil-based wood primers often are made with a combination of oil and alkyds.

FILM FORMATION: OIL-BASED PAINTS

How a paint dries, forms a protective film and develops its properties differs between oil-based and latex paints. This is primarily due to the differences in their binders. The difference in binders also helps explain why oil-based and latex paints differ in long-term performance.

Film formation of oil- and alkyd-based paints is a two-step process. When an oil-based paint is applied to a surface, the liquid evaporates and leaves the binder and pigment on the surface. The oil or alkyd binder then dries, or oxidizes, as it reacts chemically with oxygen in the air.

It is this oxidation that develops the hard, tough properties of an oil or alkyd paint. Unfortunately, this reaction continues indefinitely, and over time can produce some unwanted results. For example, oxidation can cause yellowing that typically is bleached out by sunshine, but may be quite noticeable in areas not exposed to sunlight.

Other problems can occur later. The continuing oxidation process in oil-based and alkyd paints can ultimately render the film not only hard, but also brittle. Then, when an exterior substrate expands and contracts, the paint film may crack and flake because it remains rigid. In interior situations, the paint may chip if struck by items such as furniture.

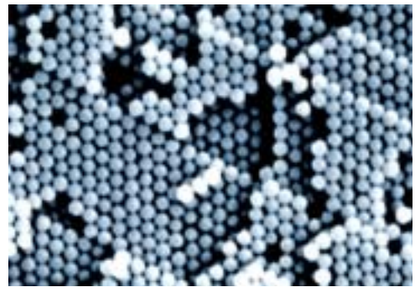
FILM FORMATION: LATEX PAINTS

Film formation of latex paints occurs in a much different manner. As the liquid in the paint evaporates, the microscopic particles of latex binder and pigment that remain on the painted surface come closer together.

As the last vestiges of liquid evaporate, capillary action draws the binder particles together, causing them to fuse and bind the pigment into a continuous, flexible film that will be water resistant when dry. This process is called coalescence. Since no oxidation takes place — either initially or over time — the film tends to maintain its flexibility over the life of the paint job.

The film formation process also allows latex paint to retain microscopic openings that allow it to "breathe," that is, allow moisture vapor to pass through. Latex paint is thus more tolerant of moisture coming from inside the building than are oil or alkyd paints.

Oil or alkyd paints form a tighter film, and are prone to blister or lift if moisture is behind the paint.



Latex binder particles are extremely small and, in some cases, highly uniform. The particles in this magnified view are only .000008 inches in diameter.

By providing this brief description of the role the binder plays, we hope you now understand why it is such a key ingredient in a can of quality paint. In the next article in this series, we'll look at the remaining ingredients in paint: the liquid that acts as the carrier for getting the binder and pigments from the can onto the surface, and the additives that provide or enhance certain paint properties. ■

The latex film formation process has some limitations that contractors should be aware of, especially on exterior applications. See the related article on the following page that describes how application weather conditions affect latex paint performance.