

TECHNICAL BULLETIN

Dry Time Versus Cure Time Of Paint

When it comes to paint, one aspect that is commonly misunderstood is the difference between a coating's dry time and its cure time. Some may believe that these processes happen at the same time, yet the reality is that they occur at different stages. While it only takes hours for both latex and oil-based paints to dry, it can take days or weeks for a coating to completely cure. Knowing the difference can save time, trouble and money.

Dry Time

Drying takes place once the solvent has evaporated from a coating. This means that, as a paint dries, water and solvents disperse — allowing the pigment, resin and other components to bind and harden. Because latex coatings dry from the surface and then down toward the substrate, they have a faster dry time. Typically, they become dry-to-touch within one to two hours and can be recoated within two to four hours.

On the other hand, oil-based coatings often take longer to dry. While they can be dry-to-touch in four to eight hours, professional painters may wait 8 to 10 hours (or even overnight) before applying a second oil-based coating. This ensures that the paint dries completely, even in difficult conditions.

Cure Time

Curing is a chemical process that occurs well after a coating dries to touch. Latex coatings cure through a process called "coalescence." During solvent (and water) evaporation, particles of pigment and binder fuse together with great force, causing them to encase the pigment in a continuous dry film. This process can take anywhere from 14 days to 30 days. Some latex binder systems, including cross-linking binders, continue to cure as the process takes place. Cross-linking, by definition, is when polymers react, forming long chains in a "linked" network. This bond (commonly known as "curing/cross-linking") creates cross-linked polymer chains that help increase important film proper-

ties such as hardness, chemical resistance, etc. Depending on the type of cross-linking chemistry used, these reactions can occur over days or even weeks. On the other hand, oil-based coatings cure via a process called "oxidation," during which a paint first dries on the inside and then moves outward to the surface. After solvent evaporation leaves the pigment and binder on the surface, the binder dries or "oxidizes" as it reacts with the oxygen in the air, creating a hard film. While initial curing can occur in 7 to 10 days, oil-based coatings continue to harden over time.

Factors Affecting Dry Time and Cure Time

There are many dynamics that influence coating dry time and cure time. Depending on the coating, temperature variances either increase or decrease drying time. Lower ambient temperatures may cause coatings to thicken, which results in slower evaporation and longer drying times. Higher temperatures can cause a paint to dry on the surface first, leaving a soft interior matrix of the paint film. High humidity increases water vapor in the air and on surfaces. When humidity is high, coatings are exposed to greater amounts of water vapor, which affects drying. Therefore, when there is more moisture in the air, it takes longer for the water in latex coatings to evaporate. Color choice also determines dry and cure times. Typically, dark colors that contain a high loading of pigmentation take longer to dry and cure than light colors. On top of that, additives in colorants, such as surfactants and humectants, can further slow the curing of dark colors. The choice of gloss level also influences the time it takes for a coating to cure. In general, higher gloss coatings take longer to fully cure, as compared to lower sheen coatings. In addition, it's important to keep film thickness in mind, as it can affect dry time. Coatings with a higher film build may lengthen solvent evaporation, thus prolonging dry time. Last, ventilation should also be taken into account. For an interior project, a room with poor air circulation may prolong drying time. This is because, during evaporation, water from the film may increase the room's humidity, which negatively affects a paint's dry time. Increased ventilation encourages solvent evaporation, allowing the coating to cure properly.

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