Mildew and Mildew Control for Wood Surfaces

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WHAT IS MILDEW?

Definition

The term "mildew" is a common term in the paint and coatings industry and is used to describe an unsightly discoloration of a paint film. Mildew is a general term for growth produced by mold fungi. This growth can occur on a variety of surfaces both of organic and inorganic origins. Surfaces can be inanimate, such as wood, vinyl, and aluminum or living materials such as plants. Mildew can also grow on superficial surfaces such as dirt, grease, and other industrial pollutants, provided the appropriate nutrients are present to facilitate such growth. Mildew generally appears in two forms, a spore type, which resembles caviar in appearance, or a mycelium or filament type. Mildew generally appears as an unsightly discoloration on a finish, thereby making the appearance unacceptable. The performance of a finish may be compromised either by mildew growth on the coating surface, or by the application of a coating to a mildewed surface. The presence of mildew can have a detrimental effect on dirt pickup, cracking, flaking, and adhesion properties of the finish. When an appropriate finish is applied to a mildewed surface, the adhesion of that finish to the substrate will be reduced due to the physical interference of the mildew. When an infected finish is applied to a substrate, the above failures can occur even more rapidly.

Effect on Appearance and Performance

Mildew affects finishes in both appearance and performance. Mildew growth. Because of the infestation below the newly finished surface, mildew will certainly appear again on the new surface. In addition to the poor appearance of the mildew, a greater problem now exists with the adhesion of the new finish to the old finish, a property commonly referred to as intercoat adhesion. By not following good surface preparation procedures, the homeowner has allowed the mildew to exist between the old and new coats of finish. Intuitively and quantitatively, we know that this mildew interferes with the new finish’s ability to adhere to the old finish. Early failures such as cracking, flaking, and blistering can be expected. To insure the best intercoat adhesion, an appropriate method of surface preparation must be followed. This is described in the following.

Effect of Mildew on Wood: We have discussed some of the harmful effects that mildew can have on wood finishes. Mildew can also affect unfinished wood. In fact, it is often more of a problem with unfinished wood. The colored residue that mildew can deposit on a wood surface can cause severe discoloration; this discoloration can be a variety of colors but is most often gray or black. However, this mildew growth does not degrade the wood; mildew fungi are not capable of using lignin, cellulose, or hemicellulose for food. Therefore, mildew does not decrease the structural integrity of the wood. They can, however, use the nonpolymeric materials in wood, such as the extractives and natural oils for food. Wood species that are rich in natural extractives may be more prone to mildew growth than wood species with lower extractive content. Since mildew spores infect all surfaces, their growth can be limited only by controlling moisture, temperature, or using paint film mildewcides.

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If the surface is infected with mildew, it can be removed using a mildew cleaner, but it will return if the growth conditions remain the same. If wood is to be painted, it is beneficial to remove mildew before painting. This increases effectiveness of the paint film mildew-cide.

**Common Species**

There are a variety of common mold species known to affect coatings performance. A list of 19 of the most common species appears below:

- Alternaria sp.
- Aspergillus flavus
- Aspergillus niger
- Aureobasidium pullulans
- Botryodiplodia sp.
- Cephalosporium sp.
- Cladosporium sp.
- Fusarium sp.
- Helminthosporium sp.
- Monilia sp.
- Muscaphora sp.
- Pacacilomyces sp.
- Penicillium sp.
- Pestalotia sp.
- Phoma sp.
- Pleospora sp.
- Rhizopus sp.
- Stemphylium sp.
- Trichoderma sp.

Of these species, *Aureobasidium pullulans* and *Aspergillus niger* are the most common mold species encountered.

**Necessary Contributing Factors**

**Substrate and Environment:** Regardless of specific species, all mildew require oxygen, water, a food source, and a narrow temperature range to metabolize and reproduce. Typically, mildew causes problems with the finish after it has been applied and dried, and does not affect the product in the can as there is usually insufficient oxygen present for metabolism. Mildew needs water to grow. Consequently, as the humidity of the environment continues to rise, the mildew flourishes. For food, mildew generally metabolize organic food sources like starches, sugars, proteins, and some oils found in paint systems. Specifically, mildew can also feed on pollens, bacteria, or many other organic contaminants on the finished surface. Temperatures from -70°F to 90°F (-20°C to 30°C) are ideal for mildew growth. Below freezing, mildew fungi become dormant, however, they do not die.

**Paint Film:** Other factors that can also contribute to mildew growth include the type of finish and its surface characteristics. Generally, top quality paints offer the best protection from mildew. As the quality of the paint decreases, the chance for mildew growth typically increases (a further discussion will follow under Mildew Control). Generally, latex finishes are more mildew resistant than alkyd paints.

**Geographically Prone Areas**

Mildew growth can occur anywhere in the world. Climates that supply more of the contributing factors previously discussed will promote greater mildew growth. For example, hot, tropical regions often have the greatest mildew growth. Coastal regions generally grow more mildew than dry inland areas. However, inland areas near lakes, rivers, or heavy vegetation can experience heavy mildew growth.

**Mildew Control**

**Surface Preparation**

If mildew is already present on a substrate, the mildew must be killed and removed before the substrate is repainted, or else the mildew will grow through the new finish, as previously discussed. To kill mildew and remove mildew from a surface, follow the steps outlined in the following:

1. Do not mix bleach and ammonia. This mixture can result in hazardous, toxic vapors.
2. Precautions should be taken to protect shrubs and other areas that may be adversely affected by bleach.
3. Protect eyes and skin from contact with bleach solution.

The bleach is the key component that actually kills the mildew. Allowing this solution to set for 10-15 min gives the bleach time to settle into any crevices and hard to reach places to kill all of the mildew present. Skipping this 10-15 min set time may result in an inadequate job. The detergent is added in a small amount to help emulsify any mildew or dirt to aid in its removal. Liquid dishwasher detergent is the best choice because it will not foam like dry dish or laundry detergent. Most dry detergents are not easily washed off with cold water. Use of trisodium phosphate (TSP) detergents is cautioned since the phosphate may actually serve as a food source for mildew and may actually promote future mildew growth.

2. Wash the substrate clean using a power washer. A second choice, if a power washer is unavailable, is to scrub the surface. For masonry substrates use a wire brush. For wood, use a softer bristle brush. For substrates sensitive to abrasive damage like aluminum and vinyl siding, use a sponge.

3. Use a garden hose to wash off any excess dirt, mildew, and loose substrate residue from the surface. Residue left behind can cause adhesion failures of the finish.

If mildew was present on the original substrate or previous coats, and a new finish coat is already applied, the mildew will grow through the new finish. It is usually impossible to stop mildew growth at this point. All the finishes must be stripped down to the original substrate and then cleaned as previously described before applying a new finish coat.

**Mildewcides**

Mildewcides are chemicals added to paints and other finishes to help stop mildew growth on the finish. There are a wide variety of mildewicides used in the paint and coatings industry. Identifications of these chemicals are usually listed on the container label, although exact amounts are not usually revealed. For the consumer, attempting to study can label analysis to determine the best mildew resistance of a finish would be tedious and nonproductive. A majority of the mildewcide names are extremely long, complex, and meaningless to the consumer. The best way for the consumer to gauge mildew performance is by the overall quality of the finish. Top quality finishes will offer the best mildew protection in nearly all cases.

Certain pigments offer mildewstatic protection and, when used in combination with certain mildewcides, offer superior mildew protection. One commonly used mildewstatic pigment is zinc oxide.

**Pretreatments and Preservatives**

We previously discussed surface preparation before recoating a substrate. After proper surface preparation has been done, one may choose to apply a special coating before applying the finish coats. Types of special coatings in