WOOD ROTS & PAINT FAILS

You need to know how and why, to sell effective products to all your customers

Companies often have mission statements of how they serve their publics. You are our public and that's our mission statement, above. I'm Steve Smith and I believe in making people smarter and more able; I believe in making products that actually work. I make products that do things that other products just can't do.

Have you ever wondered why paint fails after a while? I found a solution thirty years ago, but I didn't know why it worked. I thought I knew, but that slowed the progress of understanding. Boat-owners told painters and contractors and architects, and they told others. Now, my company makes and sells the products that handle this. Understanding paint failure begins with the nature of wood: It is an energy storage device.

It all starts at dawn:

The ultimate source of life energy is sunlight. Plants capture it, store most of it in their chemical structure and use up the remainder. They are eaten (usually while alive) by animals, and sometimes by fungi. Some of those are eaten by other animals. Some of the plants and animals who were lucky to not be eaten entirely by others, eventually die. Various fungi and plants and animals feed on the corpses, and others feed on them.

There is a "food chain." Some life forms eat others. Seeking to survive, all life exchanges energy with other life.

In some cases the exchange may be rather one-sided, in that not everyone who comes to dinner goes home.

Each time one life form eats another, some of the stored energy is used in maintaining its own life, some stored as chemical energy within its own tissues, and the remainder excreted as waste (for them, but for another: fertilizer).

Fungi are one of the oldest and most primitive life forms on this planet. Fungi feed on just about anything, whether dead or alive. When a cell of fungus is in contact with something, the cell secretes digestive enzymes onto what it touches. The enzymes break down the surface and dissolve it, and the cell absorbs the digested material as food. The stomach of a fungal cell is its outside surface; if a human body worked that way, our stomach would be on the soles of our feet, and if we wore shoes all the time we'd either starve to death or learn to eat our shoes.

Fungi also create seeds, called spores. The spores are smaller than can be seen with the human eye, and they drift invisibly on the wind. When it rains, they are carried everywhere by rainwater.

Fungi need both water and air. On damp wood, the fungal spores hatch and eat and grow. When the surface dries and cannot support fungal life, the adult fungal cells make many spores and leave them scattered around. Eventually someone comes along and kicks that piece of rotten wood and zillions of fungal spores drift away on the wind. Wood is not safe from rot anywhere.

Before it rotted, wood consisted of bundles of large hollow tubes with doors across the tubes every so often. These tubes ("wood fibers") were the walls of living cells, long since dead with only the skeleton remaining. As the fungi eat away those cell walls, they make more space and the wood porosity is opened up more and more. More rainwater is more rapidly absorbed in the wood. More porous wood holds enough water to favor growth of not only fungi but bacteria, and between them they eat first the porous summer growth rings and then the harder winter growth rings, and finally there is nothing left.

And that is how wood rots. People try to stop this, and invented paint to protect wood.

Paint is supposed to protect wood, but it often fails on old wood, on older buildings, on weathered wood or the "weather-side" of a building. Even when the wood looks sound there are all-too-often mysterious failures. High-quality paint, professional surface preparation and painting, don't always give the best results. Paint stores and painting contractors both lose profits and have to deal with unhappy customers occasionally.

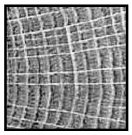
Why is this? If the paint was stuck well in the first place, why is the paint coming loose from the wood?

The wood is actually rotting away from under the paint. This is why paint comes loose from wood.

It was not always this way. Long ago, putty was made from lead carbonate (white lead) and linseed oil, and the paint itself contained lead carbonate pigment. Even though the fungal spores were everywhere, they could not grow in wood next to paints or fillers containing lead, a mild but effective fungicide. About fifty years ago, the use of lead in paint was discontinued. Now, there was nothing in any common paint, filler or sealant to stop fungal activity. I don't think anyone in the paint industry or the construction industry appreciated the preservative role of lead pigments in paint. At the time, a less expensive white pigment had become available:

Titanium Dioxide. For the paint manufacturers it was a simple economic decision: Replace white lead carbonate with white titanium dioxide.

There's more: wood isn't what it used to be. Lumber companies have developed faster growing trees, since 1950 or so. Old-growth high-quality wood has its growth rings less than a sixteenth of an inch apart. Faster-grown wood has growth rings spaced an eighth to a quarter-inch apart, has more porosity, less resistance to water absorption into the wood, and rot spreads more rapidly through the wood.



OLD GROWTH WOOD

NEW GROWTH WOOD

These factors, contributing to wood rotting sooner, might not have been so bad. But then something else happened, and first I need to explain about how oil-base enamel paints are made.

The paint resins were linseed oil from the flax plant, boiled to partly cure the oil. The cured paint film was very flexible. As the wood naturally moved, that film could stretch a bit and resist cracking and tearing, and kept rainwater away from the wood. These very viscous (thick) resins required a lot of solvent to thin them down to brushable consistency. This was not really an issue until some State Governments felt it necessary to regulate [meaning force a reduction of] the solvent content of paints. This is called the Volatile Organic Content (V. O. C.). Paint manufacturers in the late Twentieth Century were forced to produce paint formulas with more uncured oils, which gave stiffer films. On fast-grown wood these cracked sooner. With no lead in the paint, the wood was completely unprotected.

Meanwhile, Mother Nature is still busy, helping water to get under a painted surface and start the rot process. Consider the morning dew. Do you know why it is there?

Everything radiates heat. You have likely felt radiated heat from a campfire or a hot stove. The clouds above act as a heat mirror, keeping the planet surface from getting really cold at night. When there are no clouds overhead, the earth radiates its heat away to the night sky, which is about 450 degrees below zero. When it gets cold enough at night, moisture in the air condenses. That is dew. The surface temperature at which dew forms on that surface is called the Dew Point.

Wood contains over a thousand times as much moisture as air. When the dew forms on the outside surface, water vapor similarly condenses on the backside of the paint film, and the wood becomes completely waterlogged just below the painted surface.

When the sun comes up in the morning, there now exists warm, damp wood below the paint film. Fungal spores hatch, grow, eat the wood, multiply rapidly and teach their young for a few hours a day. The wood under the paint rots little by little. Finally the paint cracks and peels.

About thirty years ago I found a solution for rot just starting up in wood. It turned out that paint stuck better when this was used first. It took me a long time, however, to discover ***why*** it worked. There are, I found, three important functions that must be performed by a wood primer: ***to glue down the topcoat, to discourage rot at the wood surface beneath, and to glue itself to the wood.***

One of the Smith & Co. products is MultiWoodPrime™, also marketed for wood restoration applications under the name Clear Penetrating Epoxy Sealer™ (CPES™). MultiWoodPrime bonds paint to older, weathered wood (as well as new wood) even better than the older oil-based primers did on old-growth, high-quality wood. Here's how it works:

MultiWoodPrime is a solvent-borne product that ***impregnates the wood with flexible epoxy glue***. This resin is hydrophobic, allowing water vapor to pass but discouraging the condensation of liquid water. The result is wood fibers bonded together and coated with a water-repellent resin not easily digestible by fungi. This naturally discourages fungal activity. It develops an excellent adhesive bond to the resins and fibers of wood.

Unlike latex paint, ***MultiWoodPrime is made largely from the natural resins of wood***, so it can bond to the existing wood. Fungi are deprived of an air space under the paint film, the wood moisture content under the paint film tends to be lower, and the available food supply is made less attractive. By removing these key elements necessary for fungal growth, and by actually gluing the paint to the wood, MultiWoodPrime reduces early failure of painted wood and many more years of paint life are commonly seen. Any latex or oil-base paint sticks better and lasts longer when the wood is treated with MultiWoodPrime first.

Steve Smith is the chemist at Smith & Co., since 1972 a manufacturer and distributor of wood restoration products, primers and coatings.

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