

The War on Mold



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New Treatments Aiding in Fight Against Ancient Fungus

In the past few years the issue of mold growth in the home has become a major topic of news stories in the print and broadcast media. Why now is there such ado about exposure to mold? After all, human beings and mold fungi have peacefully coexisted in close proximity for millions of years. In fact, some molds are even beneficial. Without mold we would have no stilton cheese, sauterne wine or penicillin-based antibiotics.

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Today however, due mainly to publicity from some high profile lawsuits, indoor mold growth is considered by many to be a major health hazard giving rise to allergic reactions, asthma attacks and even toxic syndromes. While there is no conclusive scientific evidence linking household molds to serious health risks, it is clear that many homeowners along

with plaintiffs’ attorneys, insurers, builders, and legislators are taking the issue of mold seriously.

From a regulatory standpoint, the U. S. Environmental Protection Agency and state regulators have begun to focus on indoor air quality (IAQ) as part of their mission for clean air. Initially, IAQ concerns revolved mainly around purported hazards from a variety of largely man-made substances, including asbestos, formaldehyde and second-hand tobacco smoke. However, over the past five years mold growth has reigned as the top IAQ issue. Primarily fueled by worries over indoor mold growth, 2003 will be remembered as one of the most active years for IAQ state legislative initiatives. In that year 27 state legislatures considered more than 60 pieces of IAQ-related legislation with 18 becoming law.

Mold-related claims are also the subject of many lawsuits. Although litigation over mold-related claims reached a high point in 2002, it is by no means fading away. According to the Insurance Information Institute, there are currently 10,000 mold-related lawsuits pending in the U. S., and several large, high profile awards have emboldened plaintiffs’ attorneys to pursue further litigation, looking at mold as the new asbestos.

Mold continues to create havoc in the insurance industry as well. Claims are piling up due to the mold-related lawsuits and a strong residential real estate market.

Premiums across the country have risen from six to fifteen percent per year. Moreover, many insurance companies have added mold exclusion endorsements to their policies, entirely eliminating coverage for loss that consists of or is directly caused by mold.

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What does all this mean to producers of building products such as framing lumber, OSB, plywood and other engineered wood products? It depends on whom you talk to. Some companies and individuals are taking a wait-and-see approach, believing that mold-based hysteria has peaked and will ultimately become a nuisance but not a major threat to the industry. Others see the threat as very real, with a potential to become a problem as big as asbestos if not immediately addressed. Still others are following the lead of some truss and framing manufacturers who are declaring that mold growth on wood and wood-based components is a naturally occurring process and disclaiming any obligation to protect against mold, or accept liability for the negative effects of mold on their products.

Recently, however, a growing number of progressive wood product manufacturers have begun looking at the mold issue as an opportunity rather than as a threat, and are warranting mold protected wood building products through the shipping, storage and construction process. They realize that the consuming public has already made up its mind that mold growth on building products is unacceptable. Large retailers, including the “big box” stores, have reacted to public apprehension over mold and have instituted what amounts to a zero tolerance policy for mold on the building products they carry. Home builders are another group which takes mold issues seriously. According to a recent study, over 60% of home builders have taken measures to prevent mold in the homes they

build. Many have been known to reject loads of building products which arrive on-site with obvious mold infestation.

To turn these potential negative situations into positive opportunities, several wood product manufacturers have introduced products with built-in mold protection. This not only responds to growing public concerns, but also creates new value-added products in a historically commodity-minded business. This article describes approaches being taken to develop mold-resistant products.

Mold Basics

Mold is a type of fungus, and at least 1000 varieties of it are common in the U. S. Mold spores can be found most anywhere and they can grow on virtually any substance provided moisture is present. These spores are attracted to the surfaces of wood and wood-based composites like OSB due to the sugars and starches readily available in these substrates. Four conditions are required for mold growth: oxygen, favorable temperature (usually 50-90° F), a source of food (the wood or wood fiber), and moisture. Mold needs a moisture content of at least 20 percent to survive on wood; above 30 percent it thrives. Needless to say, most efforts in controlling mold growth have focused on containing moisture levels.

Outdoors, the major challenge is to protect building materials from the elements during shipping, storage and the construction process. Plastic or paper wraps are sometimes utilized on bundles of lumber and panel products. They can be effective unless the wraps are torn and moisture gets inside. This can then create a greenhouse effect, accelerating mold growth. In any case, it is virtually impossible to totally protect building materials from rain, snow or humidity before a structure is framed-in.

Indoors, control of moisture is even more problematic. Faulty design, improper construction techniques and plumbing leaks can all result in intrusion of moisture within the building envelope, which can lead to mold

growth. Once inside the wall cavity, mold can be difficult if not impossible to totally eradicate. Remediation is expensive and not always effective. A better approach is to treat the wood or wood-based composite *before* it is exposed to mold.

While mold-resistant treatments are not intended to compensate for design flaws, construction mistakes or ingress of water from catastrophic events such as floods or major leaks, these treatments can go a long way toward protecting lumber and engineered wood products from mold growth during transportation, storage and construction, and in most cases, well after the construction process is complete.

Treatments

Fungicides have been used to control decay fungi on wood since Biblical times. Many fungicides are also effective against mold. Most of these wood treatments do not act by directly killing the mold or mold spores on contact. Instead, they eliminate the wood starches and sugars as food sources by interfering with the mold's ability to digest them. The mold spore essentially "starves" because it no longer has a food source.

Of course, since wood treatments are based on chemicals, there is a possibility that some consumers might be hesitant to trade concerns about exposure to mold for concerns about exposure to chemicals inside their homes. Fortunately, many modern fungicides are based on materials which have excellent human health and safety profiles and are already found inside the home in a variety of products, including cosmetics, shampoos and detergents.

There are three basic ways that mold-resistant materials are applied to panel products such as OSB: *surface* barrier treatments, *integral* treatments and *penetrating* barrier treatments.

As the name implies, surface barrier treatments are applied to the product surfaces, usually as liquids which are sprayed on right after the production process. Since mold growth is primarily a

surface phenomenon, this method is a very efficient means of providing protection where it is needed. Both major faces of the panel must be treated in order to provide a complete envelope of protection. Surface treatments are often clear and essentially invisible once dry. Sometimes a dye is included to mark their presence. Surface treatments are effective as long as the envelope of protection is not breached. This can occur by puncture of the surface or severe abrasion to the panel surface causing removal of the protective treatment.

Integral treatments provide protection throughout the entire thickness of a product. Unlike surface treatments which are applied, for example, to finished OSB panels, integral treatments are introduced during the production process, before the panels are pressed. The active fungicides are combined with the wood furnish (strands or flakes) before forming and pressing. In order to be effective, these fungicides must be able to withstand the processing conditions, and they must not interfere with board strength properties. Integral treatments are generally more costly than surface treatments, but they provide protection throughout the thickness of the product. They can also contain additives to provide decay and insect resistance where these properties are desired.

Penetrating barrier treatments are a promising recent method of introducing wood preservatives and other additives to lumber and wood composites such as OSB. They are essentially a hybrid between surface treatments and integral treatments, offering the best properties of each method. In addition to organic fungicides, they also contain borates. Borates have the property of being able to diffuse throughout the thickness of panel products such as OSB when exposed to high humidity or moisture. They can also help carry other products in the wood.

These treatments are applied in the same manner as surface treatments, usually by in-line spray. Some of the organic components remain close to the surface to provide protection against mold, while the borates and some other ingredients, when exposed to

moisture, will penetrate through the entire thickness of the panel, providing interior protection against both mold and decay, and at higher loadings, termites too. Penetrating barrier treatments are intermediate in cost between surface and integral treatments. They are most useful when a full range of protection against mold, decay and/or insects is desired.

Test Methods

Reliable test methods are important as a means of measuring the performance of mold-resistant treatments. Since the growth of mold on wood and wood composites has only recently become an area of interest, mold testing protocols and methodologies are still largely in the development phase. The American Wood Preservers' Association (AWPA) is currently developing a laboratory test based on an ASTM standard for laboratory evaluation of mold growth on interior coatings.

In the AWPA test, samples of wood or wood composites are placed in a chamber where temperature and relative humidity are controlled to provide ideal growth conditions for the mold. The chamber and samples are inoculated with specified molds, and circulating air within the chamber subjects the samples to spores for the duration of the test. Samples are evaluated for surface mold growth every two weeks for a period of eight weeks. An acceptable treatment would be one which allows no more than 10% surface mold growth after eight weeks in the test chamber.

Field tests for evaluating resistance to mold growth are also currently in development. Most commonly used is the stack test, where treated and untreated materials such as OSB or lumber are stacked outdoors to simulate shipping, storage and construction conditions. In some cases plastic or paper wraps are used to cover the test pieces. For accelerated testing, extreme environments such as Florida are used to provide the best conditions for mold growth. Again, samples are evaluated visually for mold growth, with a score of 10%

surface growth or less being considered acceptable.

Other laboratory and field tests are also under development at academic, government and private laboratories.

Conclusions

In a period of just five years, mold growth in the home has evolved into a major health concern attracting the attention of legislators, litigators, insurance companies, builders, building product manufacturers, and homeowners. Progressive manufacturers of wood and engineered wood products are taking a proactive stance to this potential threat by offering products with built-in mold resistance.

To allay any concerns over exposure to chemicals, they are utilizing fungicides with excellent human health and safety profiles which are already found in many household products. The fungicides are incorporated either through in-line spray application, integral combination with the wood furnish before pressing, or a novel penetrating barrier technique. The penetrating barrier is a surface application which imparts protection throughout the thickness of the substrate when exposed to humidity or liquid moisture. Test methods are being developed by a number of institutions to help evaluate the overall effectiveness of these treatments.

These new treatments offer building materials manufacturers the opportunity to address a potentially major issue involving OSB and other wood-based substrates and to open new markets for value-added products.
