

# controlling mold on wood pallets

THE WOOD PALLET AND CONTAINER INDUSTRY CONSUMES 4.5 billion board feet (BBF) of hardwoods and 1.8 BBF of softwoods for the annual production of 400-500 million solid wood pallets. While alternative materials such as plastic, corrugated paperboard and metal have entered the market, solid wood remains the material of choice for a majority of pallets on the market (more than 95 percent). Advantages of using solid wood for pallets are numerous. Solid wood pallets are stronger and more durable than alternative materials. They have superior rigidity for long-term storage applications, low initial fabrication costs and subsequent repair costs, are readily available, safe, functional, clean and are available in custom sizes for specialty commodities. A major cause of user dissatisfaction, however, is vulnerability of wood pallets to mold.

*While alternative materials such as plastic, corrugated paperboard and metal have entered the market, solid wood remains the material of choice for a majority of pallets on the market. But a major cause of user dissatisfaction is vulnerability of wood pallets to mold.*

By Carol A. Clausen



# If valuable palletized product is being rejected for mold, then the manufacturer should carefully review their operation and take the time to implement changes.

While total wood pallet production has changed little since 2000, complaints about mold problems causing rejection of palletized product have increased steadily. The concern about mold growth on wood pallets may stem from several trends that have emerged within the industry in the past decade. Well-intentioned actions toward efficient logistics and cost-effective practices can have unexpected consequences (mold) that may deter pallet manufacturers from using wood.

Pallet management programs have been initiated in response to users that do not want to be responsible for disposal or recycling of used pallets. Such programs for recovery and reuse of pallets offer predictable pricing for the convenience, collection and repair of used pallets. However, switching the responsibility from users and small independent operations to larger network operations shifts the onus to maintain cleanliness of the pallet supply from the manufacturer to distributor.

Consequences of this trend are beyond the control of the manufacturer, but the industry needs to recognize and consider all factors that can negatively affect the perceived benefits of wood pallets in order to ensure continued success of using wood in this market.

Hardwoods account for around 70 percent of the raw materials used in pallet manufacturing. By necessity, hardwood pallets are fabricated from unseasoned wood when the material is most workable. The average moisture content of unseasoned heartwood for domestic

hardwoods exceeds 50 percent and the moisture content of unseasoned sapwood of softwoods is well beyond 100 percent. Mold spores are everywhere in the environment and can germinate in as little as 24-to-48 hours if exposed to proper moisture, temperature and a food source. Since wood is the food source and the suitable temperature range for mold growth is fairly broad, moisture is the controlling factor for preventing mold growth. And yet, as we have just pointed out, using unseasoned wood is also beyond the control of the pallet manufacturer.

Changing trends in logistics have possibly had the greatest effect on mold issues faced by pallet manufacturers. Round-the-clock plant operations and low (or no) inventory prevents rotation and time for air-drying pallets. Air-drying is a critical process for manufacturers while they still have control of their inventory. Without taking the time to air dry stock through a rotation program, pallets are distributed with relatively high moisture content. This can result in strike TWO against mold prevention!

With an estimated 64-71 million wooden pallets exported, the pallet industry provides a market for low-quality material that is unsuitable for other uses. To reduce the risk of pests, ISPM 15 has been implemented which states that both coniferous and non-coniferous pallets must be either fumigated or heat-treated until the largest piece of wood in the pallet reaches and retains a temperature of 56°C (133°F) for a minimum of 30 minutes. While the intent of the heat

treatment is noble, inexperienced kiln operation can result in inadvertent mold growth.

Mold spores germinate quickly on any wet surfaces under the proper temperature conditions. Heat treatment conditions of 133°F for 30 minutes are long enough to kill insect larvae, but also drive moisture from the center of a wood stack within a kiln to the surface of the stack. If the kiln was turned off after a run and the wood load was not promptly removed, mold spores that naturally occur in the environment can infest the surface of the load in as little as 24-to-48 hours. The worst case scenario is to turn the kiln off late Friday afternoon and accidentally leave the door of the kiln closed over a weekend. Large pallet operators often remove the load from the kiln and promptly use the material to manufacture pallets, which are stacked, possibly wrapped in polyethylene for shipment and/or placed immediately in aluminum semi-trailers for shipping. They may also end up in the hold of a ship for export. If the moisture that has been driven to the surface of the wood stack is trapped by plastic wrap followed by warmth from unconditioned storage in a truck trailer or ship hold, the manufacturer or distributor is essentially creating an incubator for mold to flourish.

Some instances of mold growth are beyond the control of the pallet manufacturer or end-user. For example, if a load of pallets or palletized product is dry when bound, but is placed in a leaking truck trailer, transported under wet

conditions or stored for any length of time in an unconditioned space, mold growth is likely to occur.

Alternative treatments exist for ridding wood of pests, including irradiation and microwave treatment, but neither method prevents re-infestation by insects. Dip treatments with chemical preservatives that have low mammalian toxicity, such as boron or copper-8-quinolinolate, have other concerns such as leaching and cost, and do not sufficiently control mold growth. Pressure treatments could provide lasting pest control, but would not be cost effective for the pallet industry. Treating requirements would also skew the pallet industry towards easily treatable softwood materials and away from hardwoods.

With the frantic pace of business, common sense solutions are often overlooked. It is believed that time cannot be taken to implement changes to remedy the moisture issue because "Time is money." If valuable palletized product is being rejected for mold, then the manufacturer should carefully review their operation and take the time to implement changes.

Since a majority of pallets are made from hardwoods, it is a given that you are

starting with wet material. Let us then work towards solutions that avoid adding more moisture to an operation. So, training kiln operators to remove the material from the kiln immediately following each treatment cycle is essential. Second, review your storage conditions. Storing pallets under open (roofed) sheds is the ideal condition for air drying to occur. An alternative to open-roofed storage is tarp caps for individual pallet stacks. If storage occurs in a closed shed, forced circulation of air that has not been heated above 120°F will dry dense hardwoods to a moisture content range of 20-to-25 percent and softwoods and low-density hardwoods to a moisture content range of 15-to-20 percent.

Air-drying requires sufficient time (weeks to months). If open yard storage is the only option, maintain good drainage in the storage yard and routinely remove vegetation that will come in contact with the base pallet in a stack. If possible, stick to tight stacks and train handlers to orient stacks such that air flow is maximized through the stacks to facilitate air drying. Develop a plan to rotate your stock instead of cross-docking. In the long run, rejected product

from mold issues will cost pallet manufacturers that cross-dock more than accepted product from a manufacturer with air-dried stock.

Train yard workers to follow the rotation plan and monitor yard operations. Wood may change in moisture content and dimension in transit and in storage; however, when dry softwood is shipped in tightly closed boxcars, shipping containers, trucks or in wrapped stacks, average moisture content changes will be 0.2 percent or less per month. In ship holds, dry wood absorbs about 1.5 percent moisture during normal shipping periods. But if green material is included in the cargo, moisture regain may double and if unprotected from the elements moisture regain can be as much as 7 percent. The benefits of reducing moisture content will be evident and measurable with implementation of simple, cost-effective measures while pallet stock is still under control of the manufacturer.

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