

Review

Solid Wood Packaging Materials for International Trade

Jongkoo Han

Virginia Tech

Abstract Hazards associated with use of wood packaging in international trade were addressed with regulations enforced. Measures to avoid spreading of pest in the trade were discussed in terms of current status and future availability.

Keywords Wood, Pest, Sanitation, Heat treatment, Methyl bromide

Introduction

Wood is one of the earliest package materials. Though it is substituted with more industrialized materials, such as corrugated fiberboard and plastics and used less frequently at present, it still plays an important role in industrial packaging for shipping large and heavy items that require rigidity and strength in its structure^{1,2)}. Most bulky or dense industrial products and many military items continue to be distributed in wooden containers. In the form of pallets, wood supports almost every kind of product throughout the supply chain. The different types of wood packaging made from lumber, veneer, or plywood include nailed wooden boxes and crates, wirebound boxes, barrels, baskets and hampers, pallets and skids, and other containerization units.

Wood is a structural material developed by nature and remarkably strong for its weight. Being a natural material, it is not quite uniform in its physical characteristics. With an excellent strength-to-weight ratio, wood is an economical structural material. It does not require very sophisticated equipment to assemble a box or crate, and for very rigid structures in small quantities, it is the material of choice.

However, wood is prone to attack by moisture and insects. Especially, when wood is used for export packages, a special treatment is required to destroy insects and other pests. Export shipments can expose a recipient country to pests that are not indigenous and pose special risk of spreading. An example is the *pinewood nematode*, a tiny worm that eats and causes disease in wood, which has been found in softwood pallets, boxes and crates exported from the U.S., Canada, Japan and China. There are fears that it, and other wood-borne pests, could spread around the world by means of international

shipments and devastate forests.

Regulation on wood packaging for export

Unmanufactured wood articles exported to other country pose a significant hazard of introducing plant pests, including pathogens, detrimental to agriculture and to natural, cultivated, and urban forest resources. The introduction of pests associated with *solid wood packaging material* (SWPM) is a worldwide problem. Because SWPM is very often reused, recycled or remanufactured, the true origin of any piece of SWPM is difficult to determine and thus its phytosanitary status cannot be ascertained. This often precludes national plant protection organizations from conducting useful specific risk analyses focused on the pests associated with SWPM of a particular type or place of origin, and imposing particular mitigation measures based on the results of such analysis.

For this reason, there is a need to develop globally accepted measures that may be applied to SWPM by all countries to practically eliminate the risk for most quarantine pests and significantly reduce the risk from other pests that may be associated with the SWPM^{3,4)}. In the case of phytosanitary standards, the international standard organization is the International Plant Protection Convention (IPPC). In March 2002, the Interim Commission on Phytosanitary Measures of the International Plant Protection Convention endorsed a standard prescribing uniform regulatory control of wood packaging materials moving in international commerce. This document titled: "*ISPM #15, Guidelines for Regulating Wood Packaging Material in International Trade*" recognizes the inherent pest risks associated with the international movement of untreated wood packaging materials⁵⁾. Although this standard does not obligate countries to establish regulatory controls, the guideline represents a mechanism by which any country may establish regulatory controls in a manner that is internationally harmonized.

†Corresponding Author : Jongkoo Han
Department of Wood Science and Forest Products Virginia Tech
1650 Ramble Road Blacksburg, VA24061
E-mail : <hanjongk@gmail.com>

Regulated wood packaging material

In the IPPC Guidelines the term *wood packaging material* (WPM) is defined as “Wood or wood products (excluding paper products) used in supporting, protecting or carrying a commodity (includes dunnage).” This definition is broader than the Animal and Plant Health Inspection Service (APHIS) term *solid wood packaging material*. WPM includes manufactured wood such as plywood, veneer, and fiberboard, as well as loose wood materials such as shavings and excelsior. The IPPC Guidelines then distinguish between types of WPM that should be regulated because they present a risk (e.g., raw wood pallets and dunnage), and types that should not be regulated because they present little risk (e.g., manufactured wood and shavings).

Since it would be better to use a different term that applied only to the types of wooden materials used in packaging that should be regulated, APHIS added a definition of regulated wood packaging material. The new definition of regulated WPM closely resembles current definition of SWPM: “Wood packaging materials other than manufactured wood materials, loose wood packaging materials, and wood pieces less than 6 mm (0.24 in) thick in any dimension, that are used or that are for use with cargo to prevent damage, including, but not limited to, dunnage, crating, pallets, packaging blocks, drums, cases, and skids.”

This definition of regulated WPM differs from the existing definition of SWPM in that it explicitly excludes manufactured wood materials, such as fiber board, plywood, whisky and wine barrels, and veneer. APHIS has never regulated such materials, but the definition of SWPM did not make that clear. The definition of regulated WPM also excludes pieces of wood that are less than 6 mm in any dimension. This exclusion will exempt from regulation many types of small boxes used to ship fruit or other articles.

Approved measures associated with wood packaging material

Any treatment, process, or a combination of these that is significantly effective against most pests should be considered effective in mitigating pest risks associated with wood packaging material used in distribution. The choice of a measure for wood packaging material is based on consideration of:

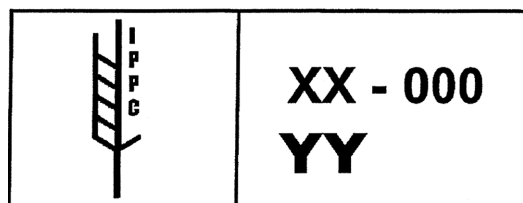


Fig. 1. Marking for treatment.

- the range of pests that may be affected
- the efficacy of the measure
- the technical and/or commercial feasibility.

At present two measures were approved: heat treatment and methyl bromide fumigation. Wood packaging material subjected to these approved measures should display a specified mark shown in Figure 1.

Heat Treatment (HT)

Wood packaging material should be heated in accordance with a specific time-temperature schedule that achieves a minimum wood core temperature of 56°C for a minimum of 30 minutes. Kiln-drying (KD), chemical pressure impregnation (CPI), or other treatments may be considered HT treatments to the extent that these meet the HT specifications. For example, CPI may meet the HT specification through the use of steam, hot water, or dry heat. Heat treatment is indicated by the mark HT. (replacing YY in Figure 1)

Methyl Bromide (MB) fumigation

The wood packaging material should be fumigated with methyl bromide. The treatment is indicated by the mark MB. (replacing YY in Figure 1) The minimum standard for methyl bromide fumigation treatment for wood packaging material is given in Table 1.

List of most significant pests targeted by HT and MB

Pest members associated with wood packaging material (Table 2) are practically eliminated by HT and MB treatment in accordance with the specifications listed above.

Table 1. Standard for methyl bromide fumigation treatment for wood packaging material

Temperature, °C/°F	Initial dose, g/m ³ & lbs/1,000ft ³	Minimum required concentration after: (g/m ³ & lbs/1,000 ft ³)			
		0.5 hrs	2 hrs.	4 hrs.	16 hrs.
21/70 or above	48/3.0	36/2.25	24/1.50	17/1.06	14/0.875
16/61 or above	56/3.5	42/2.63	28/1.75	20/1.25	17/1.060
11/52 or above	64/4.0	48/3.00	32/2.0	22/1.38	19/1.190

The minimum temperature should not be less than 10°C and the minimum exposure time should be 16 hours.

Table 2. Pest groups eliminated by heat treatment and methyl bromide fumigation

Pest group	Insects	Anobiidae Bostrichidae Buprestidae Cerambycidae Curculionidae Isoptera Lyctidae (with some exceptions for HT) Oedemeridae Scolytidae Siricidae
	Nematodes	<i>Bursaphelenchus xylophilus</i>

Environmentally preferable alternative

The environmentally preferable alternative would be to prohibit importation of wood packaging material, which would virtually eliminate all associated pest risks, as well as the need for quarantine treatments. However, at the current time it would be technically and economically infeasible for many exporters, especially in developing countries.

The environment can be harmed by using methyl bromide, in which case recovery of the ozone layer may be delayed, or by not using methyl bromide, in which case agriculture and forested ecosystems, among other aspects of environmental quality, could be devastated unless other equally or more effective alternatives were strictly enforced (i.e., heat treatment or use of substitute packaging materials). A considerable amount of research and development on methyl bromide alternatives has been conducted within the USDA and continues today. Although fumigation with methyl bromide has been accepted, it is expected to be abandoned in favor of alternative treatment in all cases in the future. Other treatments are being considered, including chemical pressure impregnation and irradiation.

Measures being considered for approval

Treatments being considered and which may be approved

Table 3. Treatments being considered for wood treatment

Fumigation	Phosphine Sulfuryl fluoride Carbonyl sulphide
Chemical pressure impregnation	High-pressure/vacuum process Double vacuum process Hot and cold open tank process Sap displacement method
Irradiation	Gamma radiation X-rays Microwaves Infra red Electron beam treatment
Controlled atmosphere	

when appropriate data becomes available are listed in Table 3.

The exporter must understand the country of destination's import packaging regulation on wood packaging material. Up-to-date information for American shippers can be found at <http://www.aphis.usda.gov/ppq/wpm/>. Inspectors look for the accredited mark, and shipments found not to comply can be delayed, refused entry, destroyed or treated there.

References

- Hanlon, J.F., Kelsey, R.J. and Forcinia, H.R. 1998. Handbook of Packaging Engineering-Third Edition, Technomic Publishing, Basel, Switzerland, pp. 485-512.
- Twede, D. and Selke, S. 2005. Cartons, Crates and Corrugated Board: Handbook of Paper and Wood Packaging Technology. DEStech Publications. Lancaster, Pennsylvania, USA, pp. 99-171.
- Office of the Federal Register. 2004. Importation of Wood Packaging Material. Federal Register, Vol. 69, No. 179, USA, pp. 55719-55733,
- Canadian Food Inspection Agency. 2005. D-98-08, Entry Requirements for Wood Packaging Materials Produced in All Areas Other Than the Continental United States. Ottawa, Canada.
- FAO. 2002. ISPM No. 15, Guidelines for Regulating Wood Packaging Material in International Trade. Secretariat of the International Plant Protection Convention, Rome.