Forest Products Laboratory

NewsLine

Volume 4, Issue 3 Summer 2005

In This Issue

Also Inside

Less is More

Reducing Brightness to Make a Better Paper

By George Couch, Public Affairs Specialist

Researchers at the USDA Forest Service Forest Products Laboratory (FPL) have joined with several other federal agencies and the pulp and paper industry in an effort to reduce economic and environmental costs of paper used by government agencies—while simultaneously improving the paper's quality.

The federal government annually buys some 500,000 tons of bleached kraft paper. That includes paper used in computer printers, copiers, and fax machines. It's the equivalent of using 11 million standard sheets of paper per hour, every hour of the year. (Even so, the federal government uses less than 2 percent of the bleached kraft paper produced in North America each year.)

In a "Green Engineering Partnership," the FPL researchers are working with the Office of the Federal Environmental Executive, the Government Printing Office, the Environmental Protection Agency's Office of Solid Waste, the Government Services Agency, and the Department of Defense Printing Service. The initial task facing the group will be to redefine paper "quality," that is, to determine what performance criteria for paper are most important to government printers and offices.

"One way to improve some paper performance characteristics while simultaneously reducing cost is to reduce the amount of bleaching," explains Dr. Carl Houtman, a chemical engineer in FPL's paper-research unit. "Eliminating a bleaching stage would conserve energy, wood pulp, water, and chemicals. The resulting paper will likely be stronger and more durable and possess other characteristics that better meet the government's needs."

Not surprisingly, however, eliminating a bleaching stage would also reduce

(continued on page 6)

Finding Sound Wood

Forest Products Laboratory (FPL) Project Leader Bob Ross demonstrates a piece of field equipment that uses several technologies to evaluate the quality of wood in standing trees. The equipment, which is marketed and sold by fibre-gen, a New Zealand-based company that is majority owned by Connecticut-based International Paper Corporation, employs lasers, ultrasound, vibration properties, and wireless technology. The equipment was developed jointly by FPL, the University of Minnesota–Duluth, and fibre-gen. The evaluation of standing trees permits more efficient timber harvests and better monitoring of forest health.

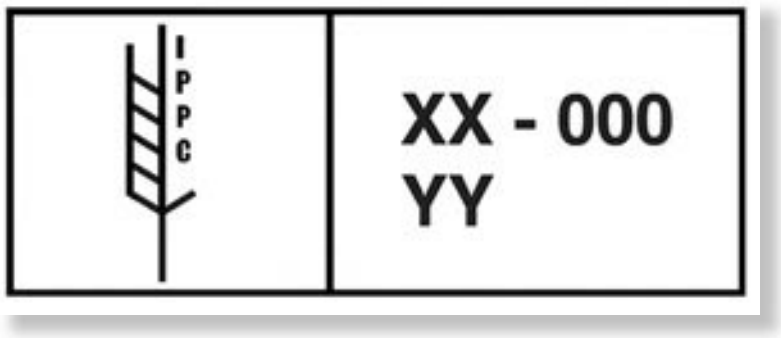
International Standard Slows the Spread of Invasive Species

By Rebecca Wallace, Public Affairs Specialist

With the prevalence of international trade today, insects and fungi can travel from continent to continent as easily as the products being shipped, and the results can be devastating. Invasive species can destroy entire forests, and remediation efforts can quickly become multi-billion-dollar endeavors.

The recent introduction of destructive pests, including the Asian Longhorn Beetle and the Emerald Ash Borer, to U.S. forests prompted the chief of the Forest Service to name invasive species as one of four major threats to our Nation's forest and grassland ecosystems.

Researchers at the Forest Products Laboratory (FPL) have been working to prevent the spread of invasive species by focusing on the wood packaging materials often used for international shipping.



ISPM 15 requires the use of a mark on wood packaging materials to certify that proper treatment has occurred.

"Approximately half of all world trade moves on wood packaging materials," says Dr. Barbara Illman, research plant pathologist at FPL. "These materials represent a major pathway for the introduction and spread of pests such as the Asian Longhorn Beetle."

Standards exist to minimize the risk of spreading invasive species through the trade of wood products such as logs and lumber. However, wood packaging

NewsLine Team: Gordie Blum, Judy Patenaude, George Couch, Rebecca Wallace, Sue Paulson, Jim Anderson, Steve Schmieding, and Bill Ireland

Published quarterly by USDA Forest Service Forest Products Laboratory, One Gifford Pinchot Drive, Madison, WI 53726–2398. Articles may be reprinted provided credit is given to the Forest Products Laboratory and **NewsLine.** To receive this newsletter electronically or to be removed from our mailing list, write Public Affairs Director Gordon Blum at the address above or at gblum@fs.fed.us or call Forest Products Laboratory at 608–231–9200.

Check out our website at http://www.fpl.fs.fed.us

materials such as pallets, crates, boxes, and pieces of wood used to support cargo pose an equally dangerous threat, and the international movement of these wood products has not been regulated.

Illman and Dr. William Simpson, a research forest products technologist at FPL who has since retired, both led teams to develop treatment methods for wood packaging materials. These teams, consisting of FPL employees and partners from universities and other federal agencies, focused their work on developing heat treatment protocols to kill pests in packaging materials before they are shipped around the world. According to Illman, prevention is the key to slowing the spread of invasive species.

Taking many variables into consideration (including size, shape, density and moisture content), Simpson developed a mathematical model for estimating heating times required to eliminate the pests. The teams also developed heat sterilization schedules for many species of North American hardwoods and softwoods. These heat treatment protocols became the scientific basis to support new international quarantine measures for wood packaging materials.

As a member of the International Forestry Quarantine Research Group (IFQRG), Illman was able to implement the results of their research in a big way. IFQRG provides scientific advice to the International Plant Protection Convention of the Food and Agriculture Organization of the United Nations. Through this group, Illman provided advice for the development of International Standard for Phytosanitary Measures No. 15, or ISPM 15.

ISPM 15 requires that all wood packaging materials be heat treated to a minimum core temperature of 56ºC for at least 30 minutes or be treated with methyl bromide before shipping. These methods ensure that no pests remain in the materials. Treated packaging must then be marked with an official stamp that includes an IPPC symbol, a two-letter country code, an abbreviation of the type of treatment used, and a unique number assigned by the country's national plant protection organization. If wood packaging materials arrive in a member country without this stamp, officials at the port of arrival have the right to immediately re-export the shipment.

ISPM 15 has been, or is being, adopted by all IPPC member countries, including Australia in the fall of 2004, the European Union on March 1, 2005, and the United States, Canada, and Mexico by September 16, 2005.

Once fully implemented, ISPM 15 will help simplify and standardize international trade requirements for wood packaging materials. Adopting a uniform international standard for these materials will eliminate the need for countries to comply with separate standards for imports and exports.

As ISPM 15 is implemented, Illman continues to serve as a scientific advisor to national and international agencies, companies that import and export wood products, and forest health professionals. Her work in the development of heat treatments and as a member of IFQRG has had far reaching impacts, ranging from commerce to world trade to industrial procedures. But it all stems from recognizing the threat that invasive species pose to the environment.

"Our goal is to slow the global spread of invasive species, thereby protecting forests world wide," says Illman. "The implementation of ISPM 15 brings us much closer to reaching that goal."

What's New at the FPL Research Demonstration House?

1

2

3

4

1. Sign: This Juniper–plastic sign (technology from FPL) announces that the Research Demo House is now open for public tours Monday–Thursday at 2:00 p.m. To reserve your tour, call 608-231-9200.

2. BioMax 5: This small-scale biomass system, which produces 5 kW of electricity by gasifying wood chips, is now providing power for the basement lights at the Demo House.

3. Western larch flooring: Ken Verley of Tricon Lumber, St. Regis, Montana, sent us their latest new product, random-length tongue and groove flooring made from western larch that has been harvested as a part of forest restoration projects. This flooring will be installed in a bedroom in the house.

4. Rainwater harvesting: The next phase of the cold-climate rainwater harvesting system is being installed, in addition to the existing irrigation field and rain barrels. This unit will filter rainwater from the garage roof to supply the half-bath toilet and the washing machine.

VISIT another demonstration house, The Sustainable Resource House, at the Smithsonian FolkLife Festival.

☼☼☼ Turn to page 8 for more information. ☼☼☼

5

5. Accessibility ramp: Our new access ramp is also a durability project. We used nine different preservative-treated woods, four wood—plastic composite materials, and three naturally decay-resistant species: ipe, Douglas-fir, and black locust.

6. Moisture research: FPL research project leader Anton TenWolde is working with Syracuse University to measure air pressure, temperature, and relative humidity in the wall cavities. The cellulose insulation is being replaced with fiberglass to match the controlled conditions of the Syracuse lab. The FPL study includes state-of-the-art instrumentation engineered by FPL researchers Joe Murphy and John Hermanson to supply actual field measurements of moisture and airflow in the wall cavities.

6

Less is More *(continued from page 1)*

the paper's "brightness." Brightness is defined by the International Standards Organization (ISO) as the percentage of blue light at a particular wave length (457 nanometers) that is reflected by the paper's surface. Brightness is normally measured on an ISO scale, with standard office printing papers being in the range of 82 to 95 ISO. A brightness index of 90 ISO or above is commonly associated with "high quality" papers. Some manufacturers add fluorescent compounds to the paper's surface to increase brightness—enabling one major store chain to advertise paper with a brightness index of 113!

Because pulp must be bleached at least 5 points higher than the final paper brightness to compensate for a phenomenon called brightness reversion, paper with an 84 ISO brightness—like much of that used in government agencies—requires actual bleaching to 89 ISO.

The Green Engineering Partnership is challenging the assumption that high brightness is important for most applications.

"Depending on how the paper is being used, high brightness might not be desirable," Houtman says. "For example, it might create glare that could interfere with readability. And the amount of bleaching needed to achieve a high brightness will have a negative impact on qualities such as durability or printability."

And, of course, achieving high brightness ratings requires more energy, more chemicals, and more wood pulp. A shorter process could reduce energy consumption by a third and similarly reduce handling and consumption of potentially hazardous chemicals such as hydrogen peroxide, chlorine dioxide, and alkali. Pulp yield could be increased by as much as 1 percent, significantly reducing wood consumption.

Eliminating a bleaching step could reduce the cost of paper by $34 per ton, saving the federal government $17 million a year. A typical pulp plant processing 1,000 tons per day would save more than $11 million per year, and some 70 such plants operate in the United States.

Eventually, the big savings—economically and environmentally—will come when less-bright paper becomes more widely accepted. In North America, some 40 million tons of bleached kraft paper are produced each year, and 98 percent of this paper is used by businesses, state and local governments, and consumers.

Honor Day

May 3, 2005 was declared Honor Day throughout the Forest Service in observance of the 100 year centennial. The day honored all employees and their contributions as well as Forest Service employees who died in the line of duty. Director Chris Risbrudt took this opportunity to plant a Sagamore Hill (home of Theodore Roosevelt) red oak and flowering lilac on the lawn of FPL's Research Demonstration House.

Ask FPL

We get thousands of questions each year about wood and paper products. In each issue of NewsLine we print what we feel are some of the best. Here is one we recently received.

Can you accurately tell the age of a tree by counting its rings? Is there anything else that can be learned from tree rings?

The ages of trees in temperate climates can be fairly accurately determined by counting rings, as long as the rings are counted near the base of the tree. Rings are formed by changes in growth early and late in the annual growing season, so trees in tropical climates—where growth occurs year round—may not have clear rings.

A tree's rate of growth can be seen in the width of the rings—wider rings are formed during times of more rapid growth, narrower rings during times of slower growth. A sudden change in ring width can indicate some sort of disturbance. For example, rings that become suddenly wider may indicate that a canopy tree fell, allowing more sunlight to reach the under story trees and causing a growth spurt. Rings that narrow abruptly could indicate environmental stresses, such as fire, insect infestation, drought, or chronic acid rain.

Studying tree rings can provide valuable clues to the past. Tree rings can imply past climate conditions, ring chronologies have been used to determine the legitimacy of Stradivarius violins, and the C14 radiocarbon dating method was calibrated using tree rings dating back more than 4,900 years.

To the trained eye, the life history of a tree—and the history of the world around it—can be guessed just by looking at its rings.

Questions?

Contact us at
Forest Products Laboratory,
One Gifford Pinchot Drive,
Madison, WI 53726-2398

http://www.fpl.fs.fed.us

or write
mailroom_forest_products_laboratory@fs.fed.us

We can also be reached by telephone at
608-231-9200

TDD
608-231-9544

FAX
608-231-9592

NewsLine

Published Quarterly by

USDA Forest Service
Forest Products Laboratory
One Gifford Pinchot Drive
Madison, WI 53726-2398

Chris Risbrudt
Director

FOR THE 100TH ANNIVERSARY of the Forest Service, we will be participating in the Smithsonian Folklife Festival on the Mall in Washington, DC, June 23–27 and June 30–July 4. The Sustainable Resource House is being built for the Folklife Festival and will demonstrate the link between sustainable forestry, modern efficient wood products, and green building. The house will be given to a Habitat for Humanity family from North Carolina following the Festival. The sponsoring organizations of the house are APA—The Engineered Wood Association; Forest Products Laboratory; Structural Insulated Panel Association; Southern Pine Council; and Builder Al Cobb of PanelWright LLC. If you're in the DC area during this time, please put the Smithsonian Folklife Festival on your calendar.

39th Annual Smithsonian Folklife Festival on the National Mall Washington, D.C.

☼☼☼

June 23-27 and June 30-July 4, 2005

☼☼☼

– Open daily 11 a.m. - 5:30 p.m. –
– Evening events 5:30 - 9 p.m. –