

On Tour...

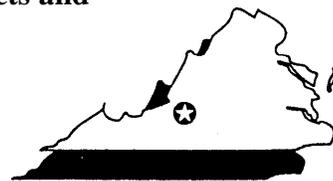
Primary Hardwood Processing, Products and Recycling Unit

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Housed within the Department of Wood Science and Forest Products at Virginia Polytechnic Institute is a three-person USDA Forest Service research work unit (with one vacancy) devoted to hardwood processing and recycling research. **Phil Araman** is the project leader of this truly unique and productive unit, titled "Primary Hardwood Processing, Products and Recycling."

The work unit has a research mission to increase U.S. competitiveness and share of domestic and foreign markets by developing automated primary hardwood processing technologies and new or improved products made from lower grade hardwood sawtimber and nonselect species. The unit is also conducting repair and recycling research for hardwood pallets.

Unique Arrangement Allows For Intensive Cooperation

Its collocation within the Department of Wood Science and Forest Products allows Araman's Primary Hardwood Processing Unit to join its resources with the expertise of the faculty, staff and graduate students of Virginia Tech, thereby increasing the productivity of the unit to a level that belies its three-man size. The relationship is symbiotic: Virginia Tech provides office and research facilities, and the Forest Service provides \$500,000 in research funding and an outlet for publishing and disseminating research results. At last count, there were 23 active or recently finished studies supported by the unit.

Focus is on Extending the Resource

Underlying all of the technological wizardry created by Araman's unit and their Virginia Tech cooperators is the desire to extend the hardwood resource. All of the

ongoing research programs will, in one way or another, increase the utilization of underutilized materials, reduce the waste in processing hardwood lumber, and/or extend the useful life of hardwood products.

Process Automation Research

The most visible and technically intriguing research of the unit is in automated processing technology. Araman and co-researcher **Dan Schmoldt**, together with Virginia Tech cooperators **Richard Conners**, **D. Earl Kline**, and several graduate students, have developed a prototype multiple-sensor, machine vision system for automating lumber processing.

Automated Defect Detection at Industrial Speeds

Unlike lumber scanning systems being developed commercially, the Forest Service/Virginia Tech system simultaneously uses color camera, laser and X-ray imaging at industrial speeds for automatic defect detection. The high-resolution color camera inspects the boards' external appearance and grain characteristics. Lasers measure the surface contours of the boards and determine their exact dimensions. Finally, an X-ray scanning system scans the boards for hard to see knots and interior defects.

Unit scientists are working with **Richard Conners**, head of Virginia Tech's Spatial Data Analysis Laboratory, to develop software that can analyze the digitized data as rapidly as it is produced by the scanning and digitizing hardware.

Systems Will Find Multitude of Uses in Hardwood Processing

The machine vision system being developed by the Primary Hardwood Processing Unit has the potential to revolutionize the

hardwood industry. Current research and development efforts are using the system to develop new technologies including (1) automatic hardwood lumber manufacturing systems, (2) automatic hardwood lumber grading systems, (3) automatic furniture parts manufacturing systems, and (4) automatic color and grain pattern sorting systems.

CT Log Scanning

Unit scientists are also working with Virginia Tech and University of Missouri faculty and students to analyze and use CT data from log scans. CT (computed tomography) scans produce a 3-dimensional X-ray-type image of a log. Work is being completed on a system to automatically find and label internal defects in whole logs. The information will be used in log processing optimization simulations.

Scientists have already developed a veneer simulation program that uses the log CT data. Veneer slicers can look at the effects of their flitching decisions and see the resulting veneer characteristics on the monitor, including grain patterns and potential defects. The program simulates six different veneer slicing techniques. The simulator should be available within six months.

Computerized Training Tools

Two additional computerized training tools are under development with university cooperators: a Hardwood Edging and Trimming Trainer (available soon), and a 3-D training program for sawyers.

Production Layout and Equipment Evaluation

The unit has completed a joint effort with the Robert C. Byrd Hardwood Technology Center and the USDA Forest Service's

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On Tour... Blacksburg

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Hardwood Utilization Unit, in Princeton, WV, to develop a computerized production layout and equipment evaluator. This powerful tool will allow companies to learn if proposed manufacturing changes or new production lines will satisfy their production goals before purchasing the equipment or making expensive modifications.

Pallet Reuse and Recycling

The other major area of research for this USDA Forest Service research work unit is in the repair and recycling of hardwood pallets. Five hundred million new wooden pallets are produced each year in the United States. Currently, the pallet industry is the largest single user of U.S. hardwood and discarded pallets could become an environmental problem.

Efforts by this unit, in conjunction with the William H. Sardo Jr. Pallet and Container Laboratory and the Center for Forest Products Marketing (also housed within Virginia Tech), are seeking to increase the use of repaired pallets and reduce virgin material needs. Research has determined the amounts of pallets being repaired and has examined user perceptions of repaired pallets. They are also conducting a study to determine the amounts of pallets discarded at landfills.

Finding a Second Life for Pallets

Scientists are looking for new, less expensive and more durable means for repairing broken pallets. The landfill survey should help to show that, with increased tipping fees, it is often more costly to throw away pallets than to repair and reuse them.

For pallets that are beyond repair, researchers want to develop new products and new markets for recycled pallet fiber. Both of these efforts-extending the serviceable life of wooden pallets and creating a 'second life' for pallet fibers-will extend the hardwood resource.

A special thanks to Phil Araman and his graduate students. Watch future "On Tour..." segments for more on the Sardo Pallet Laboratory, the Brooks Forest Products Center, and the Virginia Tech Department of Wood Science and Forest Products.

