

The Newsletter of the Tennessee Forest Products Center

The University of Tennessee, Knoxville

The Wood



Bin

<http://web.utk.edu/~tfpc>

Summer 1999

Welcome to the Tennessee Forest Products Center

by Dr. Paul M. Winistorfer, Professor and Director

We are the Tennessee Forest Products Center at the University of Tennessee in Knoxville. Welcome to the inaugural issue of the Wood Bin - our official newsletter of the Center. We will publish the Wood Bin twice each year, as one way to keep in touch with our primary and secondary wood products producers in Tennessee, with our research partners, and with other organizations and individuals interested in our growing research Center at the University. If you would like to be added to our mail list please contact us.

Our mission is to solve problems for Tennessee forest products producers and provide leadership in research and education to ensure future competitiveness and sustainability of the industry in Tennessee, the region, and beyond.

Our industry is \$18 billion dollar contributor to the Tennessee economy. We are committed to helping solve researchable problems for our producers and in helping to educate our producers in ways that will ultimately help them. We want to work cooperatively with you as research partners to solve important problems. In areas where we have the expertise, we want to help you lead - not follow the rest of the industry.

We currently have a staff of 8 professionals, with strong alliances to other valuable faculty and staff resources on the University campus. We are growing our graduate research program and expect to have five graduate research students on board by August. We are completing plans for a new 10,000 sq. ft. research and office complex on the Agricultural campus. Construction will start in October and be complete by late 2000. We recently received special funding in the amount of \$450,000 from the USDA for our research program. Our seven member Board of Advisors is helping us focus our efforts to become one of the best forest products research Centers in the country. We need your help and input.

Think what we could do for forestry and forest products in Tennessee if we achieve our vision!

News of some of our projects is presented below. Please contact me or any of our faculty in the Center if you have any questions about our work. If you are passing through Knoxville please stop in and visit us on the UT campus. I can be reached by phone at 423-974-8842 or by email at dstorfer@utk.edu.

October 1999 Conference

We are hosting an important conference in October 1999 that should be of interest to Tennessee producers.

The title of the conference is "Producing and Using Wood: How to increase Yield, Reduce Waste and Recover More for the Wood Resource". The two-day program

will be held in Knoxville on October 12 and 13, 1999 at the Convention Center, World's Fair Park. Day one of the program will focus on primary and secondary processing. Presentations will include topics such as:

- new trends in hardwood sawmills
- improvements in drying technologies
- optimization equipment
- lumber thickness variation research
- secondary machining research
- industrial intelligence for best rough mill operation
- automation in the secondary mill

Day two will focus on residue production and utilization, and will include topics such as:

- gasification with wood residues
- fingerjointing
- deconstruction of wood buildings
- biodegradation of wood
- recycling/reusing treated wood
- dealing with urban waste
- OSH at compost and mulch operations
- odor control at composting sites

A half-day field trip is scheduled for the afternoon of the 12th to a local composting site. Space for equipment vendors will be available. See our web page for conference details or contact the Center for more information and registration materials.

<http://web.utk.edu/~tfpc>
Experience the Tennessee Forest Products Center website

The Tennessee Hardwood Sawmill Project

The hardwood sawmill business has become a highly competitive industry, driven by demand. Especially apparent today is the continuing trend of rising stumpage prices contrasted by stagnant lumber prices. Declining profit margins are forcing some producers out of business and are forcing other producers to make investments in new technology to stay competitive.

The goal of the Tennessee Hardwood Sawmill Project is to provide Tennessee's hardwood lumber producers with an industry profile for assistance in decision-making for both short and long-term sustainability. A comprehensive assessment will profile the hardwood sawmill industry in Tennessee and will include evaluation of mill characteristics, profile equipment used and new equipment planned, examine external factors that influence mill productivity, profile foreign exports, look at concerns over environmental regulations, explore reoccurring production problems, and allow mills an opportunity to give insight into the future of their industry. The survey will be mailed to all Tennessee Primary producers the week of July 1st. We hope that all Tennessee sawmills will take this opportunity to express their opinion about the current and emerging needs of the industry. For more information about the Tennessee Hardwood Sawmill Project please contact researcher Leslie Ganus at 423-974-7994 or email lganus@utk.edu.

Sawmill "leftovers"—an underutilized wood resource in Tennessee

According to 1995 survey data jointly prepared by the Tennessee Department of Forestry and the USDA Forest Service, there were more than 400,000 green tons of unused wood residues generated by Tennessee sawmills. 10 counties account for nearly 65% of the total tonnage, with 8 counties located in middle-west Tennessee, accounting for 56% of the total. Leading counties were: Hardeman at nearly 85,000 unused tons, followed by McNairy (32,000 tons), Henry (28,000 tons) and Lawrence (20,000 tons). The 2 major counties in east Tennessee were Grundy (23,000 tons) and Monroe (10,000 tons).

The wood residues are classified in four categories: coarse, sawdust, bark and shavings. Of the total tonnage of unused residues, coarse material accounted for about 44%; sawdust, 36%; bark, 18%; and shavings, 2%.

A complete breakdown of sawmill residues on a county-by-county basis is available on The University of Tennessee Center for Industrial Services website at: www.cis.utk.edu. If you are a sawmill owner and want assistance in identifying end-uses for unused sawmill wood waste, contact Dr. Richard Buggeln, Manager, Tennessee Materials Exchange (423.974.3018).

Wood-Based Composites Research

The Center has a strong program in wood composites processing technology, which includes unique laboratory processing equipment for the manufacture of strandboard, fiberboard and particleboard products. The Center has wide support for this program, including funding from the USDA National Research Initiative Competitive Grants program, the Structural Board Association, the Composite Panel Association, and many private corporations. The Center has an international reputation for its work in wood-based composites research, recently winning awards at international meetings in Mexico and Wales. We are particularly known for our work in radiation densitometry as a tool to better understand how

composites are manufactured and perform. Much of our work in oriented strandboard research has been aimed at limiting thickness swell of this product. We recently initiated a project in conjunction with the Department of Civil and Environmental Engineering to look at engineering properties of oriented strandboard (modulus of rupture and modulus of elasticity) as related to the density profile of the board. The objective of the work is to be able to predict how changes in the density profile will affect the engineering properties of the OSB panel. This project is being directed by Dr. Richard Bennett, Professor, Department of Civil and Environmental Engineering, and Dr. Paul Winistorfer, Director of the Tennessee Forest Products Center. The graduate student working on this project, Carrie Whitley, was the top Bachelor of Science graduate in the College of Engineering in Fall 1998. We work closely with number of companies and manufacturing associations across North America. For details contact Dr. Siqun Wang at 423-974-7994 or swang@utk.edu.

In 1995, there were more than 400,000 green tons of unused wood residues generated by Tennessee sawmills. Coarse material and sawdust composed the majority (80%) of these underutilized "leftover" resources.



Industry Outreach

Wood Products Extension

The Tennessee Forest Products Center offers industry outreach programs through a partnership with the Agricultural Extension Service. Dr. Brian Bond plans and conducts educational programs for the primary and secondary industry as well for the consumers of wood products.

Mission

The mission of the wood products extension program is to provide continuing and informal educational opportunities to the forest products industry and the users of wood products in Tennessee and the region. The ultimate goal of the wood products extension program is to improve the efficiency in the industrial processing of forest products and to increase the utilization of our forest resources.

Dr. Bond's current focus is working to assure the future competitiveness and sustainability of the primary and secondary forest products manufacturers in the state of Tennessee through knowledge transfer, education, and training. Brian has identified several common educational needs in the primary and secondary industry and in response has developed several short courses, workshops, and literature.

Primary Industry Programming

Includes increasing the knowledge of practices that will improve production efficiency and increasing the utilization of the raw material at hardwood sawmills, the development of a hardwood sawmill improvement program and assisting in the development and implementation of the Tennessee Quality Lumber Initiative (TQLI). One example of programming for the primary industry is an edging and trimming short-course that is being offered September 2, 1999 in Knoxville, Tennessee. The short course is being offered in conjunction with Phil Araman, a Forest Products Technologist with the USDA Forest Service, Southern Research Station. The workshop will utilize software that allows operators to see how edging and trimming decisions can affect the grade and value of lumber.

Secondary Manufacturing Programming

Includes increasing the knowledge of how moisture effects the manufacture of wood products, implementing quality control procedures to reduce waste and rework, and increasing the knowledge of proper methods and practices used in the process of drying and storing hardwood lumber. A basic hardwood lumber drying short course is offered yearly to train new kiln employees and managers on the proper practices of hardwood lumber drying. An advanced course designed to meet special needs of current operators and managers is being offered

August 17-18, 1999 in Knoxville.

Short-courses and educational opportunities are offered throughout the state and can be conducted on-site for specific topics. To view a listing of these courses, complete with times and locations, logon our website at <http://web.utk.edu/~tfpc>.

For more information about the wood products extension program please contact Dr. Brian Bond at (423) 974-7991, Fax (423) 974-4714, email: bbond7@utk.edu.

Areas of focus for the Wood Products Extension program at the University of Tennessee:

Hardwood Lumber Manufacturing

- Hardwood Log Grading
- Efficiency and Improvement in Hardwood Sawmill Operation
- Increasing Hardwood Lumber Recovery and Value at the Edger and Trimmer

Furniture, Flooring, and Cabinet Manufacturing

- Effects of Moisture on the Manufacture of Furniture, Cabinets, and Millwork
- Identifying and Solving Problems in Furniture and Dimension Manufacturing

Lumber Drying

- Basic Hardwood Lumber Drying
- Advanced Techniques for Hardwood Lumber Drying

Wood Drying Research

The Center is actively involved in hardwood drying research. The Center is currently the university research partner, along with two industrial partners and several local industries, in a joint project with Oak Ridge National Laboratory investigating the effects of microwave pretreatment of hardwood lumber as a method to reduce drying time, reduce energy costs, and to prevent degrade of green lumber prior to drying. Microwave application facilities at ORNL and the research kilns and advanced materials testing equipment at the Center are being used to evaluate the effects of different types of microwave pretreatment on kiln drying rates and schedules, and on the material properties of wood dried this way.

The Center operates two research dry kilns, both as a part of the research program and as part of the extension wood products program. Information from past work on dry kiln corrosion control is available. For more information contact Bill Moschler at 423-974-0201 or bmoschle@utk.edu.

Timber Bridge Inspection Manual

Dr. Richard Bennett of the Department of Civil and Environmental Engineering and Paul Winistorfer, Director of the Tennessee Forest Products Center, are completing a field guide for timber bridge inspection. The USDA Forest Products Laboratory funded this project. The manual is designed for use in the field by the bridge inspector. The manual covers all parts of the inspection, and will have approximately seventy color photographs showing things to look for and various conditions of a timber bridge. The manual should be completed this year and will be distributed nationwide.

Web Page

<http://web.utk.edu/~tfpc>

The Center has a new web page that provides information on our faculty, staff, facilities, research and extension programs, and other information about wood. Our home page has a link to Tennessee forest products producers web pages. If you have a web page and want to be listed in our link to Tennessee producers, please contact Mr. J. David Cox at 423-974-7994 or email: jdcox@utk.edu.

Forest Products Industry Analysis

A 95-county, relational database was developed to provide Tennessee's forest products producers, state policy makers and others with information about the importance of the wood-producing industries in Tennessee. Recent information from the database shows the importance of the forest products industry to the Tennessee economy. The total contributions of the major forestry sectors (e.g., logging, solid wood products, wood furniture, and pulp and paper) in 1994 included \$15.4 billion in total product output, 159,000 jobs, and \$3.5 billion in wages. We have published a series of reports on the industry in Tennessee. Report titles are:

- **TFPC Report No. 1**--Database of the Tennessee Forestry and Forest Products Industry
 - **TFPC Report No. 2**--The Tennessee Forest Products Industry Relative to Other State Manufacturing Industries: 1984-1994
 - **TFPC Report No. 3**--Trends in the Tennessee Forest Products Industry, 1984-1994
 - **TFPC Report No. 4**--Value-Added Opportunities for the Tennessee Forest Products Industry
 - **TFPC Report No. 5**--Economic Impacts of Forestry and Forest Products Industries on the Tennessee Economy
- Information about the database and the on-going research work in this project can be directed to Dr. Joshua Idassi at 423-974-0754 or email: jidassi@utk.edu.

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Statistical Process Control

A Low Risk Method for Continuous Improvement

The Tennessee Forest Products Center has a new research program in the area of statistical process control (SPC). This new research program is under the guidance of Tim Young, an assistant professor in the Center. The overall goal of the SPC research program is to help the forest products industry to improve quality and productivity using low risk technology.

SPC is not new, and was first used in manufacturing in the 1930s at the now famous Western Electric Hawthorne Works. Many experts consider SPC to be the core principle of the third wave of the industrial revolution, also known as the Quality Revolution of the 1980s. However, the forest products industry lags far behind other industries in adoption of SPC.

The primary purpose of using SPC in manufacturing is to reduce process and product variation. Reductions in process and product variation lower manufacturing costs and improve product value. Shewhart control charts named after their inventor W.A. Shewhart (1931), were developed to prevent the manufacture of defective product by early detection of process problems.

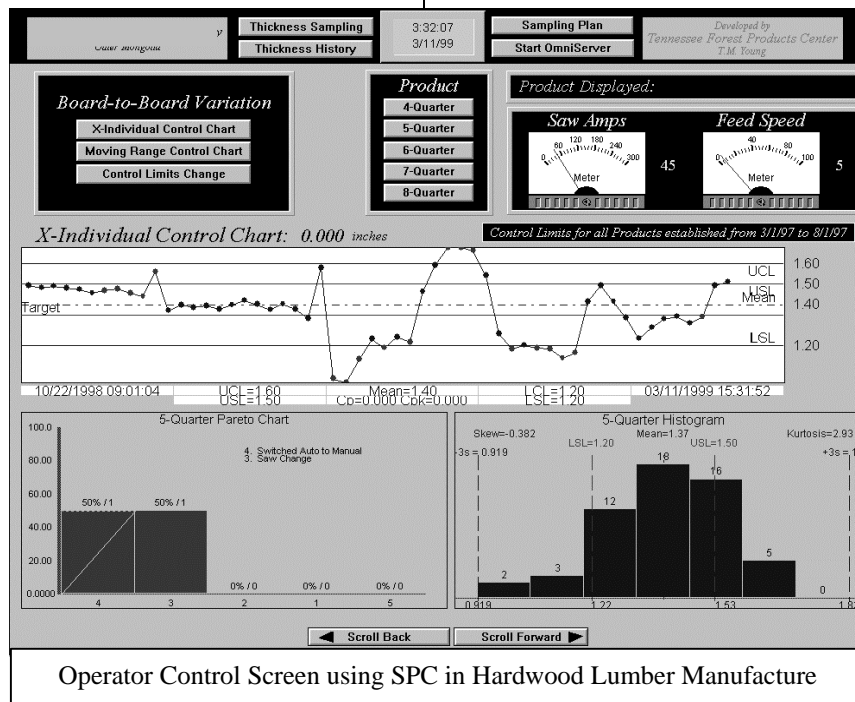
SPC is dynamic, focusing on long-term innovation and continuous improvement of the system where everyone in the company is involved in the decision-making process. Traditional management systems, by themselves, which are based on accounting and finance principles do not have the same goals as systems based on SPC and continuous improvement. The goal of continuous improvement is to reduce variation at all stages of the manufacturing process which will in turn

reduce costs and improve quality. Reduced variation can also have additional benefits such as lower lumber drying costs and reduced wood waste.

The control chart is a statistically sound, graphical detection method for

process "adjustment" and "improvement" which separates variation as "special cause" or "common cause."

Tim Young has several SPC research contracts with hardwood lumber producers and engineered-wood manufacturers. If you would like more information about the SPC research program contact Tim Young at 423.974.3656 (e-mail: tmyoung1@utk.edu) or visit the TFPC website at <http://web.utk.edu/~tfpc/>.



Tennessee Quality Lumber Initiative[©]

A Statewide Continuous Improvement Program

by Tim Young, Assistant Professor Tennessee Forest Products Center

The Tennessee Forest Products Center has developed a research partnership with Tennessee hardwood lumber producers which focuses on improving lumber quality and productivity at hardwood sawmills. The Tennessee Quality Lumber Initiative (TQLI) is a multi-phase research program. Phase I of the TQLI focuses on reducing lumber thickness variation. The primary methodology that is used for reducing lumber thickness variation is statistical process control (SPC) and human machine interface technology (HMI).

Thickness measurements are taken with wireless micrometers at key locations in the sawmilling process and operators, supervisors and other management personnel are presented with "real-time" thickness data via Wonderware[®]'s human machine interface system. The human machine interface platform allows for operator and management interaction where reasons for "out-of-control" points can be entered in a "real-time" setting. Corrective action procedures can be also entered in the software. All thickness data, "special-cause" reasons and corrective action statements are stored in a database and historical data can be easily accessed.

Phase II of the Tennessee Quality Lumber Initiative focuses on using advanced laser scanning technology to measure lumber thickness in a "real-time" setting. The laser systems will be interfaced with programmable logic controllers and Wonderware[®]'s human machine interface system to provide "real-time" thickness data to operators, supervisors and other management personnel. The TQLI is

a study in using SPC and HMI technology to help Tennessee hardwood lumber producers improve lumber quality, productivity and ultimately competitive position. The TQLI is not solely a study in thickness measurement technology.

A possible benefit of the SPC system will be that it will give the "Head-Rig" Operator, "Re-saw" Operator, Lumber Grader and Supervisors a "real-time" view of lumber thickness that may currently not be available. This may allow the operators to saw closer to target as thickness is plotted on the control charts in a "real-time" setting. The SPC system will also

objectively define for the operators the natural variation of lumber thickness by species and product. "Real-time" thickness data in a SPC format can be used as powerful continuous improvement tool.

The potential economic benefits of the TQLI will be improved lumber yield and

reduced thickness variation of final product. Improved lumber yield will also lower manufacturing costs. Reduced lumber thickness variation will benefit the customer by improved product value.

For additional information about the TQLI, contact Tim Young at 423.974.3656 or e-mail tmyoung1@utk.edu. More detailed information about the TQLI is also available at the Tennessee Forest Products Center website <http://web.utk.edu/~tfpc/>.

The Tennessee Quality Lumber Initiative (TQLI) provides the potential to improve lumber yield, reduce lumber thickness variation, and lower manufacturing costs.

