



Oregon Wood Innovation Center

Connecting people, ideas, resources

COMING OWIC EVENTS:

- [Wood-Based Composite Science Short Course Series](#), online
- March 7-8: [OWIC Innovation Days](#), Corvallis, OR

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WHAT’S NEW?:

Read the new [OWIC Executive Innovation Brief](#)

‘Urban Legends’ Related to Wood Growth Rate vs. Wood Strength

In the last edition of the newsletter, we introduced the concept of ‘urban legends’ related to wood. In that article we focused on casehardening. This edition, we focus on the relationship between growth rate and strength. In particular, many believe that wood from slow-grown trees is stronger than wood from fast-grown trees. Fact is, that is true much of the time. However, it is far from a universal truth.

Said another way, there is a common perception that lumber with wide growth rings (or few ‘rings per inch’) is weaker than lumber with narrow growth rings. Of course, any discussion of strength depends on what strength property we’re talking about – bending stiffness, compression perpendicular to grain, tension parallel to grain, hardness, etc?

But for sake of brevity here, we’ll just talk about ‘strength’ in generic terms.

The relationship between strength and density (or specific gravity – the ratio of the density of wood to the density of an equal volume of water) is greater than the relationship between strength and growth rate. In other words, the strength of a piece of wood is more dependent upon density than growth rate.

And this is one key point – growth rate alone does not tell the whole story but rather density. As most people know, you can count the rings of a tree to determine its age. The reason we can see the growth rings is because trees produce a low-density wood early in the growing season (called earlywood or springwood) and a higher-density wood later in the growing season (called

latewood or summerwood). If a piece of wood has wide growth rings that are predominantly earlywood, i.e., the wood contains relatively little latewood, the wood will likely be quite weak compared to wood that contains a higher percentage of latewood. So there is some connection here to growth rate, but it is not perfect. See the figure below of a glulam



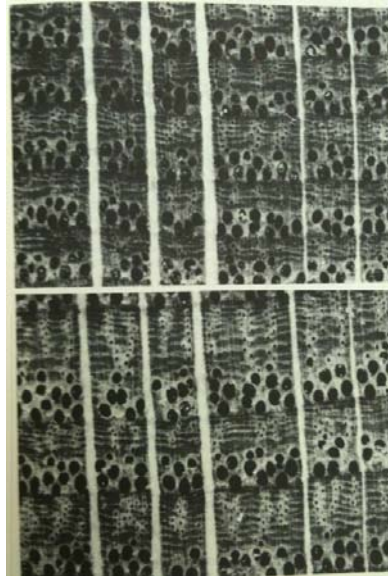
Source: Haygreen and Bowyer, 1989. Forest Products and Wood Science

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beam – all of the lamina are Douglas-fir. The labels are for specific gravity. As you can see, the lamina with the highest specific gravity also has the widest growth rings. Lumber grading standards acknowledge this point in the rules related to rate of growth. For example, for Douglas-fir and larch, Select Structural, No. 1 and No. 2 grades must have an average of 4 or more growth rings per inch. However, the grading rules also specify that less than 4 rings per inch is acceptable if the growth rings are 1/3 or more summerwood, the denser portion of the annual growth ring.

And it gets even more complex when it comes to comparing hardwoods and softwoods. For example, hardwoods like oak and ash produce a few rows of low-density wood early in the growing season and then produce

denser wood. If they are fast-grown, the wood is in fact denser and stronger than if they are slow-grown – see the figure below. Both images in the figure



Source: R. Bruce Hoadley, 2000. Understanding Wood

with the faster-grown and denser piece on the bottom.

Perhaps the easiest way to address this issue of growth rate vs. strength is simply to say as we so often do when it comes to wood – ‘it depends!’

Let us know if you have some urban legends related to wood and we’ll address them in the next edition of the newsletter.

are of the end grain of red oak –


OSU PROFESSIONAL AND NONCREDIT EDUCATION

Online Courses

Wood-Based Composite Science

Short Course Series

This online short course series provides mill operations, technical professionals and suppliers to the wood-based composites industry with a fundamental knowledge of wood as an engineering material.

Register at anytime, or choose to enroll in a cohort with other professionals. The next cohort begins in Jan. 15, 2013.

Register online at pne.oregonstate.edu/wood



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Wood-Based Composites Center



2012 Annual Report 'Preview'

The end of 2012 marked the completion of our seventh year of operations. We continue to emphasize connections to assist Oregon wood products firms solve challenges and pursue new opportunities. We work to connect industry personnel with our resources and technical information, help connect buyers and sellers of Oregon forest products, and enable industry professionals to network with one another.

Perhaps the biggest step we made last year was hiring Kent Davis, Undergraduate Student Research Project Coordinator. As we've gotten busier with testing projects for companies, we've relied more on involving our students in these 'experiential learning' opportunities. Kent is playing a critical role in mentoring students working on projects.

We are working on our web-based annual report right now. However, a few highlights of our activities last year as well as work-in-progress includes:

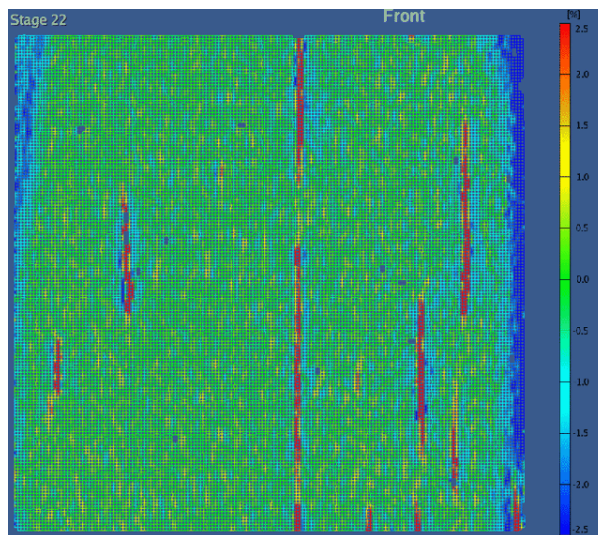
Courses/
Workshops - we offered several of our long-standing courses as well as few newer ones:

- Webinar series - The Lacey Act: A Brief History and New Requirements

- Quality Control in Wood Products Manufacturing
- Wood Composites Science Distance Education course - 5 modules are now available (Wood Structure, Wood & Water Relationships, Applied Statistics & Data Analysis, Wood Adhesion Science & Technology; and Strand-Based Composite Manufacturing)

Contract projects – we conducted numerous projects to help Oregon firms solve challenges and explore new products and new markets. The outcomes of some of these projects include:

- Product performance 1 – we conducted a large-scale study on the dimensional stability and moisture
- Product performance 2 - Mike Burnard completed his M.S. project studying checking in maple veneer – a persistent problem for Oregon



Stress development and checking in maple veneer

hardwood plywood manufacturers and their customers (i.e., furniture and cabinet makers). See <http://owic.oregonstate.edu/maple-veneer> for a summary of the project and the results

- New product development 1 - Bending strength and screw withdrawal were evaluated for a new fast-growing plantation species used as hardwood plywood core.
- New product development 2 - we evaluated a new anti-sapstain chemical to reduce rejected lumber at the retail level
- OWIC website - we made significant changes to our website this year, included a map of outdoor equilibrium moisture content (EMC) for wood in the US, a new smart phone app of our wood shrink/swell calculator
- Executive Innovation Briefs - Three publications were developed in this new series- Innovation on the Cheap, The User Innovator, and Regain Your Creative Confidence
- We assisted a firm in 2011-2012 by assessing wet strength of adhesives for laminated pine products and recommending the best adhesive for their product line. The company reported that, "we have been using the [new] adhesive since about May of last year. We have yet to see an issue with this adhesive and all of the testing we have done shows this product is far superior to the other adhesive we were using... We saved about 15-20% on adhesive costs last year."

Work In Progress –

- The Oregon Forest Industry Directory is being completely revamped this spring

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OWIC Innovations Days **March 7-8, 2013**

In previous OWIC newsletters you have learned about our change to offering a BS degree in Renewable Materials. We are excited that our undergraduate enrollment is now higher than any time in the last two decades. This means that we have a much higher need for internships for our students AND that there will be many more highly qualified people to fill your entry-level positions in the coming years.

Based on this positive development, we have organized the first annual OWIC Innovation Days. We have two primary goals for this event:

1. Create a closer link between our growing undergraduate student body and the industry
2. Provide insights for enhanced innovation in forest industry companies

Strong participation from industry will show our students that they have chosen to pursue a career in a dynamic and positive sector that is aggressively looking to add skilled employees. We hope to see you on campus in March! More details can be found below.

How You Will Benefit:

- Network with our students, your future employees
- Learn of cutting-edge technologies that might be implemented in your business
- Learn from companies successful in implementing product, process, and business systems innovations
- Learn about programs designed to enhance innovation in Oregon's forest sector

Agenda:

March 7 Networking dinner with Renewable Materials students including welcome from new College of Forestry Dean, Thomas Maness

March 8 All day – Rooms available for interviewing students for internships and permanent employment
 Conference 8:00-4:30

Session 1 – Innovation support programs

Session 2 – State-of-the-art in wood science research

Session 3 – Keynote speaker

Session 4 – Wood Science & Engineering Laboratory Tour

Session 5 – Innovation Case Examples

Registration Information: <http://oregonstate.edu/conferences/event/2013OWICInnovation/>



- and will include a mapping feature
- Problem-solving research - several projects are currently underway including:
 - Plywood discoloration - several students are working on a project to determine the cause of discoloration of hardwood plywood face veneer in-service
 - Evaluating the effectiveness of an anti-mold chemical on hardwood plywood
 - Resources for innovators - the first three editions in our new publication series Wood-based Entrepreneurs Toolkit are now available: Strategic Marketing, Communicating Effectively with Your Customers, and Public Relations; another publication on Strategic Planning is in-progress.



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Previous issues of the OWIC newsletter are available at: <http://owic.oregonstate.edu/newsletter/>