Louisiana Forest Products Development Center

NEWSLETTER

Winter 2006 - 2007

Director's Message

Richard Vlosky
Director, Louisiana Forest Products Development Center, School of Renewable Natural Resources

The last time you heard from us at the Louisiana Forest Products Development Center, Louisiana and our neighboring states on the Gulf Coast were just beginning the slow recovery after hurricanes Katrina and Rita. The hurricanes hurt Louisiana's economy and turned our demographics upside down. Overnight, Baton Rouge doubled in size and today remains the largest city in Louisiana. All state budgets were cut, including higher education. But, recovery is progressing. Budgets have been stabilized and the state is actually projecting a sizable budget surplus this year. The funding we lost at the LFPDC, which precluded publication of our newsletter, was restored to pre-hurricane levels. The forest sector, particularly the 20,000 small nonindustrial timberland owners in south Louisiana were significantly affected by the hurricanes. Only an estimated 15 to 20 percent of the 3 billion board feet of downed timber has been salvaged. The LFPDC has been asked to take the lead in developing a hurricane disaster plan for the forest sector so that when, not if, the next catastrophic hurricane hits Louisiana, we will be better prepared.

Hui Pan, LFPDC Ph.D. candidate, pours liquefied wood into a beaker during her experimental work on using liquefied wood for bio-based composite panels.

Preliminary Investigation of Bio-composites Fabricated From Liquefied Wood/Phenol/Formaldehyde Co-condensation Resin

The objective of this preliminary study was to develop a wood liquefaction process as a precursor to produce liquefied products containing a large biomass content in an economically feasible manner. Compression molded composites were made from wood fiber and a liquefied wood/phenol/formaldehyde co-condensation resin. The two experimental variables selected were (1) phenol to wood ratio (P/W) in the liquefaction reaction and (2) phenol to formaldehyde molar ratio (P/F) in the co-condensation reaction. Panels were tested in static bending for modulus of rupture (MOR) and modulus of elasticity (MOE). Dimensional stability properties were also measured. It was found that P/W ratio had a significant effect on both strength and dimensional stability of the composites. P/F molar ratio and the interactions between P/W ratio and P/F molar ratio were not significant. The results of the tests suggested that (1) the optimum degree of wood liquefaction is obtained by leaving crystalline cellulose in the system to enhance the performance of molded products and (2) P/W ratio of 2/1 has potential for further development because of its favorable performance and cost factor.

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LSU AgCenter Research & Extension

Nanoassembly on Recycled Fibers to Improve Resource Utilization

Systematic modification of fiber external surfaces and their lumen was demonstrated by using layer-by-layer (LbL) nanoassemblies via alternate adsorption of positive and negative polyelectrolytes. Confocal laser scanning microscopy showed that the fiber surface and lumen are coated with polyelectrolyte films of 20 nm to 50 nm (4 mg/g to10 mg/g of dry fibers) depending on molecular composition of the LbL multilayer. In the best scenario of 1:1 mixture of positively and negatively charged LbL treated pulp, we doubled the paper tensile strength. This process was applied to simulated samples of recycled grade fibers (broken) and to real mill-broke and produced paper with increased strength properties. An LbL polyelectrolyte nanocoating of mill-broke provided strong positive surface charge to these short damaged fibers and, by this, converted them into glue-like material that enhanced integrity of handsheets. Nanocoated positive fiber segments became an integral part of the paper structure and provided a tighter paper. LbL nanocoated broken fibers were added to virgin fibers in an amount up to 40 percent to work as electrostatic binder and to improve paper integrity. Broken fibers were also coated with organized multilayers of SiO2 nanoparticles of 50 nm diameter and tubule halloysite nanoclay with controlled drug loading in the range of 0.5 wt percent - 3 wt percent and tested as pharmacological tablet filler.

LbL assembly allows controlled modification of an individual fiber's surface charge and surface roughness. The strong surface charges on short fibers and fines prevent their coagulation and subsequent bunching within stock slurries. Figure 1 shows how this might take place in a negative whole fiber and positive short fiber mix. The positive short fiber clings to the long whole fiber. Therefore, the short fibers are well distributed and because of their electrostatic bonding potentials will help bonding within the paper structure.

The last nanolayer on the short and damaged fibers (Figure 1) was positive PAH (polyallylamine, green fluorescence). Their contours show bright spots. They suggest increased amounts of polyelectrolyte deposition at those spots on cell wall surfaces. When mixing strong positive surface potential short fibers with negative whole fibers, an electrostatic fiber to fiber bonding increase paper integrity [1-2]. One can see in Figure 1 an attachment of positive (green) short fiber segment to negative (red) fibers.

Figure 1. Confocal image of positive small fibers and large negative whole fiber aggregate from pulp slurry.

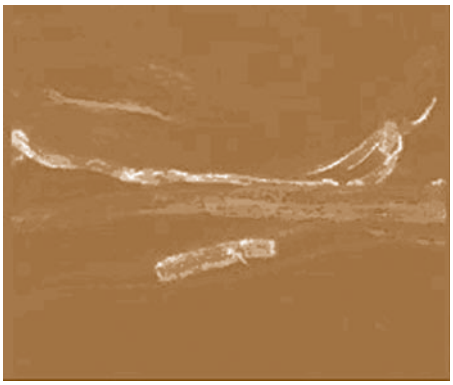

Figure 2a demonstrates an increase of paper handsheet tensile strength when we added nanocoated short fibers to virgin fibers. At 10 wt percent short fiber mix, the positive nanocoated short fibers increased tensile index from 35 N·m/g to 54 N·m/g. Further addition of positively charged short fiber in the pulp decreases paper strength. At a 20 percent nanocoated positive short fiber mix, the tensile index was 45 N·m/g. At the 30 percent and 40 percent of LbL-coated short fibers mixed with virgin fibers, the paper strength fell; however, it was higher compared to the paper made from 100 percent virgin fibers. In controlled experiments, we mixed virgin fibers with 10 percent, 20 percent and 30 percent of uncoated broken fibers, but no strength improvement was observed. Therefore, LbL nanocoated positive short fibers improve integrity of paper. This effect was even more profound when whole fibers also were coated with polyelectrolyte multilayer with anionic outermost, (PAH/PSS)2, enhancing their negative charge. Outermost layers of polycations on broke and polyanions on whole fibers provide stronger interaction giving almost 50 percent strength increase as compared with paper from virgin fibers only.

LbL modification of real mill broke fibers. In Figure 2b one can see results on tensile strength of paper sheet prepared from actual mill broke coated with (PAH/PSS)2PAH multilayers mixed with virgin whole fibers. There is a definite increase in the paper strength. The paper strength increased up to 30 percent use of LbL-treated damaged recycled fibers but dropped back when we further increase part of the recycled broke over 40 percent. Even with 40 percent of recycled broke paper, tensile strength is higher than the control. Therefore, positively charged mill-broke glues together negative virgin fibers making stronger paper.

References

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Lu, Z., Eadula, S., Zheng, Z., Xu, K., Grozdits, G., Lvov, Y. (2006): Layer-by-Layer Nanoparticle Coatings on Lignocellulose Wood Microfibers. Colloids and Surfaces A: Engineering, v.247, 834.

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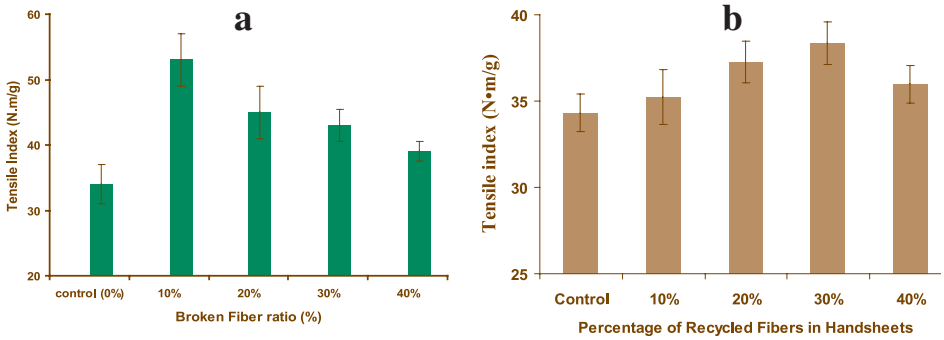
Figure 2a and 2b. Effect of LbL treatments on tensile indexes of handsheets made with 10 wt % to 40 wt % of LbL-coated short and virgin fibers (a). Effect of LbL treatments on tensile indexes of handsheets made with 10 wt % to 40 wt % of damaged fibers (actual mill-broke) LbL-coated with PAH/PSS/PAH (polyallylamine/polystyrenesulfonate) and virgin fibers (b). Control – 100 % virgin



Using GPS to Document Skidder Motions

Time-and-motion studies are a traditional method of measuring manufacturing activities. Repetitive activities are broken down into elements so that productivity can be predicted under differing circumstances. Each element, or task, is measured (usually in seconds or minutes) and recorded.

In logging, typical time elements for a skidder productivity study are travel empty, grappling, travel loaded, delimbing (gate) and ungrappling.

In addition, a dozen other activities are performed by a skidder that do not occur on each activity cycle, such as trail repair, hauling slash (tree limbs) to the woods and cleaning up around the log deck.

When these activities are measured, there is usually a side benefit – looking at the activities in detail often results in thinking about the activities and figuring out a way to improve efficiency.

Time spent looking for logs unsuccessfully conducted on each half day (HD) of the study. This time element is often missed with the manual data collection method because one cannot see the skidder when this happens. In the future, GPS technology will be able to help the skidder operator know where log bundles are so that he does not waste time looking in the wrong place for logs.

Looking for Logs		Total Observations	Total Seconds	Average Seconds
HD1	Manual	0	0	0.0
	GPS	**0**	**0**	**0.0**
HD2	Manual	0	0	0.0
	GPS	**3**	**1418**	**473.0**
HD3	Manual	0	0	0.0
	GPS	**0**	**0**	**0.0**
HD4	Manual	0	0	0.0
	GPS	**1**	**110**	**110.0**
HD5	Manual	1	85	85.0
	GPS	**2**	**150**	**75.0**
HD6	Manual	2	92	46.0
	GPS	**2**	**124**	**62.0**

The traditional method of time-and-motion studies requires a stopwatch to measure the activities. In the case of logging studies, it requires two people who are in radio contact with each other to record the data. One is stationed near the log deck and the other is in the woods. The person in the woods must predict where the skidder will operate. When he is wrong, valuable data is missed. When he is right, he is in danger of being run over by the skidder or its drag of logs.

Global positioning systems (GPS) have created new and simple ways to track the movements of all types of vehicles. We performed a study using GPS to analyze the difference between the traditional method of collecting time data and using a GPS receiver.

The study was conducted on a second thinning of a loblolly pine (Pinus taeda) plantation that was being harvested by Slaughter Logging LLC (Dennis Aucoin, owner) of Clinton, Louisiana. The crew operates one skidder, one feller-buncher, and one Loader. This thinning crew produces between six and eight truckloads of chip-n-saw logs and pine pulpwood per day.

A Trimble GeoXT GPS receiver (WAAS enabled) was used with a magnetic-mount antenna, which is only a half inch tall. The small size of the antenna prevented it from being knocked off by branches or brush. GPS Pathfinder OfficeTM 3.0 was used to display the GPS data in a map view which could be manipulated. By scrolling through each point, the movements of the skidder were easily recognized and times were recorded in a spreadsheet.

Rubber-tired grapple skidder wit GPS antenna installed on roof (barely visible near front of roof).

After collecting the data on a GPS receiver and downloading it on a computer, the skidder's activities were surprisingly easy to follow on the computer screen. The GPS missed some data (for example, during idle times, the reason for sitting idle), but nearly every second is accounted for in some way. With the manual method, nearly every reason for an activity is known, but some activities are missed. Thus the two methods (unattended GPS vs. manual data collection) offset each other and are equally accurate.

The task 'looking for logs unsuccessfully' is more accurately collected with a GPS receiver. The reason for this is that when you are in the field you do not notice that the operator was looking for logs unsuccessfully unless you can see all the way down the skid trail to know for yourself that there are no bundles at the end of the trail. With GPS, you are able to scroll back and forth between the points to get a more precise measurement of the amount of time the skidder operator spent looking for logs unsuccessfully.

Trail repair work is difficult to record manually because most of the trail work is done out of sight of the researchers. Trail work can be easy to pinpoint with GPS if the operator spends time on the trail going back and forth. But, if the operator just slows down, drops slash on the trail, and then

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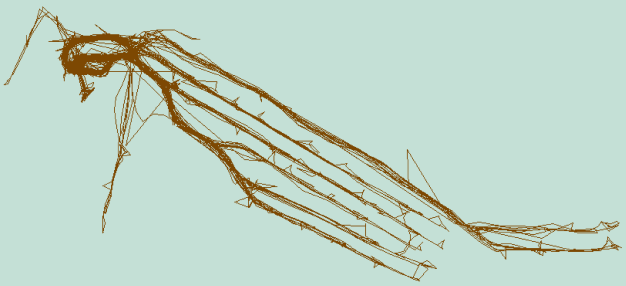

A line file that was collected by the GPS after four hours of skidder activities. The log deck (also called a set or landing) is located at upper left. The points where the skidder operator pulled off the trail to back up to the bundles are discernable from the triangle shaped lines protruding from the main trails.

Unprecedented Economic Development Opportunities

In the aftermath of Hurricane Katrina, Louisiana is poised for tremendous economic growth driven by aggressive state and federal government business incentives. The rebuilding efforts offer unprecedented investment opportunities for agribusiness and related enterprises. Two important federal programs are Gulf Opportunity Zone and Renewal Community.

Gulf Opportunity Zone

On December 21, 2005, the U.S. Congress approved The Gulf Opportunity Zone ("GO Zone") Act, a package of business and individual tax incentives designed to help revitalize the southern parishes of Louisiana economy (see accompanying map). The key provisions of the GO Zone Act include:

Tax-exempt bond financing. The GO Zone Act established a new category of tax-exempt private activity bonds that allow private business owners and corporations to borrow capital at rates below conventional financing. The Act lays out four conditions for using the bonds:

- 95 percent or more of the net proceeds must be used for "qualified project costs" in the 37 affected parishes that comprise Louisiana's Gulf Opportunity Zone.
- The bonds must be designated by the State of Louisiana as qualified for the purposes state in the Act.
- The maximum amount of an issue cannot exceed $250 million.
- The bonds must be issued prior to January 1, 2011.

Table 1 provides an example of potential interest savings enjoyed by taking advantage of GO Zone Tax-Exempt Bond financing on an issue of $10 million for 20 years at current interest rates.

Qualified project costs include the costs of acquisition, construction, reconstruction and renovation of nonresidential real property (including buildings and their structural components and fixed improvements associated with such property). The cost of equipment that becomes an integrated, immovable component part of the facility is considered qualified.

Gulf Opportunity Zones and Renewal Communities

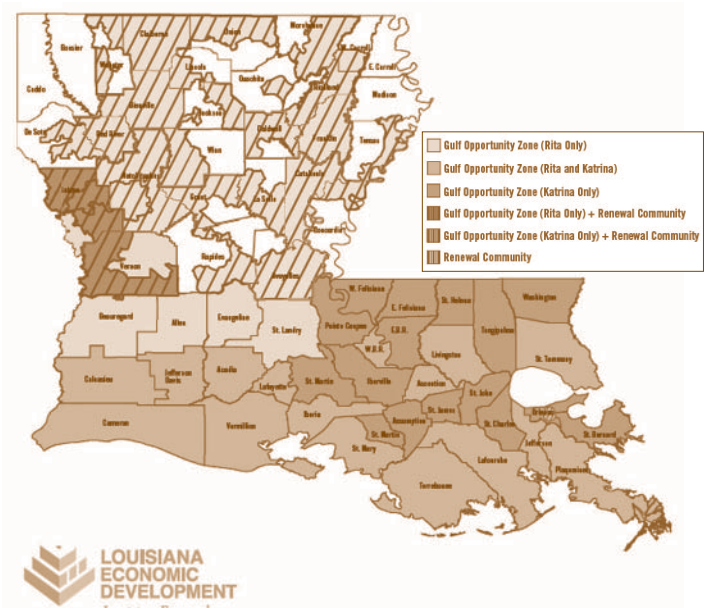

Table 1: GO Zone Tax-Exempt Bond Financing Benefits

	Option 1 No GO Zone	Option 2 GO Zone Benefits	Option 1 minus Option 2
Bond Issue	$10,000,000	$10,000,000	$0
Interest Rate	7.5%[a]	4.5%[b]	3.0%
Term (months)	240	240	0
Monthly Payment	$80,559	$63,265	$17,294
Total Repayment	$19,334,237	$15,183,586	$4,150,651
Total Interest Paid	$9,334,237	$5,183,585	$4,150,651
Interest as a % of Principal	93.3%	51.8%	41.5%

[a] Taxable bond issue risk rated for this type of industry
[b] Expected tax-exempt rate

Bonus depreciation. The GO Zone Act allows taxpayers to take an additional depreciation deduction equal to 50 percent of the depreciable basis of qualified property for the first year placed into service. The assets must be placed into service prior to December 31, 2008. Generally, a net operating loss can be carried back two years and carried forward 20 years. Under the GO Zone program, qualified losses can be carried back five years.

Renewal Community

The other major federal incentives program, Renewal Community (RC) targets parishes in northern Louisiana (see accompanying map). The RC program targets distressed areas in rural communities and is designed to spur business and job growth. The following key tax incentives are available from the RC program:

Wage credits. Renewal Community Employment Credit (RC Wage Credit). Credit against federal taxes of up to $1,500 during each year of RC designation for all existing employees and every new hire living in the RC.

Deductions. (1) Increased Section 179 deduction (up to $35,000) if qualified as a Renewal Community Business. Can be claimed on certain depreciable property such as equipment and machinery. (2) Commercial Revitalization Deduction (CRD) of either one-half of qualified revitalization expenditures (QREs) in the first year a building is placed in service or all QREs on a prorated basis over 10 years if QREs have been allocated to revitalization of a commercial building located in an RC.

Capital gains. Zero percent capital gains rate for RC asses. The holder, for a minimum of five years of an RC asset acquired between Jan 1, 2002, and Dec. 31, 2009, will not have to include in gross income any qualified capital gain from the sale or exchange of the asset.

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Roy O. Martin Lumber Company and Martco Limited Partnership Experience With FSC Certification

In April 2002, the Rainforest Alliance's SmartWood Program announced that the forest management operations of the Roy O. Martin Lumber Company (ROM) and its Martco Limited Partnership divisions were certified by SmartWood under the Forest Stewardship Council (FSC). This was a culmination of ROM's commitment to stewardship and responsible forest management that actually began with the company's founding in the 1920s. ROM received the first FSC Forest Management Certification in the State of Louisiana.

ROM is an Alexandria, La.-based company that owns and professionally manages almost 600,000 acres of timberland in 30 parishes. The company was founded in 1923 as a family-based business dedicated to the forest products industry. ROM has grown to become one of the largest independently owned wood products companies in the southern United States. Other major operations that are FSC-certified include a plywood plant in Chopin and a hardwood sawmill and an OSB (Oriented Strand Board) mill at LeMoyen. The Chopin plant is currently expanding. In addition, the company will begin operations at a new OSB mill in Oakdale. The following FSC-certified products are produced at the Martco plants:

OSB (Oriented Strand Board)
- The GRID Sheathing Panels
- Eclipse Radiant Barrier Sheathing
- The GRID Eclipse Radiant Barrier Sheathing
- Rated Sheathing for Roofs & Sidewalls

Plywood
- Sanded Plywood – AC, BC, AA, AB
- Eclipse Radiant Barrier Sheathing
- Rated Sheathing for Roofs, Sidewalls & Subfloors
- Sturd-I-Floor
- Beaded Panels or Wainscoting and Paneling
- Sanded Plywood – AC, BC, AA, AB
- Concrete Forming Panels
- Sheathing Panels

Lumber

Species
- Red Oak
- White Oak
- Pecan
- Ash
- Cypress
- Hackberry
- Sap Gum
- Southern Pine

Applications
- Flooring
- Cabinets
- Molding & Millwork
- Doors
- Windows
- Furniture
- Timbers
- Cypress Fencing
- Cypress Paneling

Landscape Materials
- Fence Posts & Corner Posts
- Landscape Timbers
- Peeler Cores
- Cypress Chips for Mulch

Why FSC?

The Forest Stewardship Council was formed in 1993 and is a worldwide organization. FSC standards for forest management have now been applied in more than 57 countries. As awareness grows to the values of FSC, having FSC certification becomes desirable. Ultimately, it is the end user that decides whether FSC products will be specified. At this time in the United States, those end users are primarily federally or municipally funded projects. Demand for FSC-certified products is growing in the residential housing and commercial construction sectors throughout the country. ROM is well-positioned to serve the needs with its diverse product line.

For a product to be FSC-certified it must have originated from FSC-certified timberland, processed in an FSC-certified mill and sold to an FSC-certified distributor before being sold to the end user. Each step transfers the "chain of custody" for that particular product. To maintain certification, the material must be stored, tracked and warehoused apart from other non-FSC material. Companies are audited to ensure adherence to these requirements.

Increasing Awareness and Demand

Since first receiving its certification in 2002, ROM has seen an increase in the number of inquiries for FSC-certified products. Awareness and demand started slowly with only five inquiries per month. By 2004, inquiries increased to five per week. Currently, inquiries are up to eight or more per day.

More and more architects and builders are specifying FSC-certified products. Demand is not limited to construction-grade building materials – interior doors, windows, floors and molding are included in the FSC specifications – and now there is demand for FSC furniture of all types.

Globally, the requirement for FSC-certified materials also has risen. Eleven countries in the European Union are in the process of writing standards that require all wood products used in government-funded projects to be FSC-certified. The 2012 Olympics in the United Kingdom is specifying the use of FSC-certified wood products in all venues.

For more information, contact:
John Sewell, Capital Projects Engineer, Martco Limited Partnership
Web site: martco.com

John Sewell at the International Woodworking Fair, Atlanta World Congress Center, 2006

Louisiana Forest Products Development Center Gets $790,000 Grant for Research on Plastic-Fiber Composites

An LSU AgCenter project to make natural fiber-reinforced plastic composites using recycled plastics and wood or other agricultural fibers recently received a $791,568 grant from the U.S. Department of Agriculture and the U.S. Department of Energy.

The grant is one of 17 given nationally for biomass research, development and demonstration projects, said Dr. Qinglin Wu, project leader in the School of Renewable Natural Resources.

The LSU AgCenter grant is for research designed to enhance creative approaches in developing next generation advanced technologies. The project aims to find technologically feasible and economically acceptable solutions for using wood and other natural fibers together with commingled waste plastics, Wu said.

"Because of a continuing proliferation of plastic resin types, the recycling industry cannot sort out all the contaminants – making more plastic waste," Wu said. "Combining waste plastics with natural fibers to produce high-quality industrial products provides a prospective solution for using biomass resources and leading to new economic development in an environmentally friendly manner."

The resulting fiber-reinforced plastic composites could be used to make weather-resistant products such as roofing shingles, patio furniture, decking and other structural materials. Other uses could be for bumpers, dashboards and similar components for automobiles and other power equipment.

Wu said the grant will allow the research to move to a larger scale by investing in machines that can make extruded or molded fiber-plastic materials in larger sizes and quantities.

"We want to create a process that can be commercialized," Wu said.

Wu cited Louisiana's large plastics manufacturing base along with the state's fiber production – both forest products and other agricultural by-products – as important to his research.

"This is a marriage of plastics and fiber," he said. "The ideal place for these industries to merge is in Louisiana."

Wu and his research team has been combining recycled plastics with such fibers as rice straw, wood and bagasse – the fibers remaining after the juice is squeezed out of sugarcane

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News From Louisiana Tech

Grozdits Receives Medal

On September 14, 2006, the Faculty of Wood Sciences at the University of West Hungary in Sopron, Hungary awarded Dr. George Grozdits a medal and certificate of merit (Pro Facultate Ligniensis) for his outstanding research activity in wood science, his long-time collaboration with the faculty of wood sciences, his participation in their research projects and conferences and for helping their students in their studies. He presented a paper, "Sonification and Nano-Coating of Straw Pulps for Paper," spoke to both undergraduate and graduate classes and talked with faculty scientists and others involved in various research projects while he was there.

Grozdits Promoted to Assistant Professor-Research

Dr. George Grozdits was promoted from research associate to assistant professor-research at Louisiana Tech University in September, 2006. The new title recognizes Dr. Grozdits' primary responsibility in wood products research and his successful collaboration with Louisiana Tech University's Institute for Micromanufacturing and the newly formed spin-off business, Nano Pulp and Paper LLC. He has been a major contributor to several current studies on nanocoating pulp fiber to modify paper properties.

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Dr. Richard Vlosky Helps Give Forest Products Marketing a Boost

Dr. Richard Vlosky, director and professor, Louisiana Forest Products Development Center, recently participated in and helped to coordinate two workshops on capacity-building in forest products marketing in southeastern Europe. The first workshop, held in the Czech Republic was attended by government officials and academic administrators from Armenia, Azerbaijan, Kyrgyzstan, Mongolia, Turkey and Uzbekistan.

In the second, Dr. Vlosky helped conduct a workshop for the Balkan countries in Serbia and Montenegro. The Former Yugoslav Republic of Macedonia, Albania, Bosnia and Herzegovina, Serbia and Montenegro, Croatia, Romania and the Czech Republic were represented at this workshop titled "Forest ProductsMarketing – From Principles to Practice." The LSU AgCenter co-sponsored this event.

Dr. Vlosky will be traveling to Dubrovnik, Croatia in early December to participate in the third workshop in this series. This workshop will concentrate on market development and procurement policies for Croatia and surrounding countries. Dr. Vlosky will present a series of case studies in forest products strategic planning and marketing from his experiences in the United States. A fourth workshop is being planned to be held in Moscow, Russia in spring of 2007.

Dr. Vlosky is chair of the United Nations Economic Commission for Europe/Food and Agriculture Organization of the United Nations (UNECE/FAO) Forest Products Marketing Specialists subgroup of the Timber Committee in Geneva, Switzerland.

Richard Vlosky (right) and Ed Pepke, UNECE/FAO Secretariat at a log concentration yard in the Czech Republic

LFPDC Student Wins Two Research Awards

Sangyeob Lee, graduate research assistant and doctoral candidate in the Louisiana Forest Products Development Center was recently informed by the Forest Products Society that he is the first place winner in the 2006 FPS Wood Award competition for his paper "Argon- and Oxygen-based Plasma Treatment Effects at the Thermomechanical Pulp Fiber and Isotactic Polypropylene Interface." The award consists of an engraved plaque and a cash honorarium of $1,000. The award is sponsored by Dynea, a major supplier of wood adhesives for the wood composite industry and was presented by Bruce Broline, R & D manager for Dynea in Springfield, Oregon at the International Convention of the Forest Products Society at Newport Beach, California June 25–28, 2006. The Forest Products Society's Wood Award recognizes and honors the most outstanding research in the field of wood and wood products conducted by graduate students.

In related news, Lee was also recently notified by the LSU School of Renewable Natural Resources that he is the 2006 recipient of the Ben and Pauline Stanley Graduate Student Excellence Award that recognizes doctoral and master's students who have made outstanding contributions to research, service or teaching in the School of Renewable Natural Resources. This award symbolizes the school's commitment to excellence in its graduate education and comes with a check for $500.

Dr. Todd Shupe, associate professor with the Louisiana Forest Products Development Center, is the faculty adviser for Lee. This is the second time that the LFPDC has had the first place winner for the Wood Award. Cheng Piao, Shupe's former doctoral student, also won the award in 2003. In that year, Ronnie Vun, doctoral student of Dr. Qinglin Wu, professor with the LFPDC, won second place.

The Forest Products Society is an international not-for-profit technical association founded in 1947 to provide an information network for all segments of the forest products industry — from standing tree to finished product.

First place winner Sangyeob Lee (left) with Dr. Todd Shupe.

New Graduate Students, Post-Docs, Visiting Scientists and Research Associates

Anil Raj Kizhakkepurakkal is a M.S. student working with **Dr. Niels de Hoop**. He hails from Manjeri-3, state of Kerala, India, which is near the southern tip of his country. He received a B.S. in Forestry from Kerala Agriculture University, Thrissur, in 2004. In India, he worked for the Centre for Environment and Development, the Kerala Forest Department and the Kerala Forest Research Institute. Anil came to LSU in January and will be researching logging productivity and efficiency.

Several visiting scientists have spent time recently working with **Dr. Todd Shupe** at the LFPDC or cooperating with him at the USDA Forest Service lab in Pineville, La. All cooperators have worked on various aspects of the closed-loop recycling program for treated wood that Dr. Shupe is developing with **Dr. Chung Hse** with the USDA Forest Service. The recent visitors include **Liu Jun**, assistant professor, Heilongjiang University, Harbin, China; **Langling Lin**, assistant professor, Chinese Academy of Forestry; **Animin Huang**, assistant professor, Chinese Academy of Forestry; **Wenjing Guo**, assistant professor, Chinese Academy of Forestry. Current visitors include **Zengchu Qiu**, associate professor, College of Mechanical & Electronic Engineering, Northwest Agriculture & Forestry University Yangling, Shaanxi, China; **Jianbo Wang**, associate professor, Chinese Academy of Forestry; and **Jun Liu**, associate professor, Chinese Academy of Forestry.

Odoom Domson is a new M.S. student from Ghana working with **Dr. Richard Vlosky**. Odoom received a B.S. in Natural Resource Management from Kwame Nkrumah University of Science and Technology in Ghana. He also worked with Ipalco Wood Treatment Specialists as the quality control manager, and Pridam Investment Ghana Limited as production manager. His research area is in strategic positioning for the Ghana Wood Products Exporting Sector.

Rangika Perera is a new M.S. student from Sri Lanka working in Forest Sector Planning under **Dr. Vlosky**. Rangika has a B.S. in forestry from the Department of Forestry and Environmental Science at the University of Sri Jayewardenepura in Sri Lanka.

Mark Gibson & George Grozdits Louisiana Tech

Publications

Zheng, Z., J. McDonald, R. Khillan, L. Su, T. Shutava, G. Grozdits, and Y. M. Lvov. 2006. Layer-by-layer nanocoating of lignocellulosic fibers for enhanced paper properties. Journal of Nanoscience and Nanotechnology, 6(3): 624-632.

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Niels de Hoop LSU AgCenter

Publications

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Qinglin Wu LSU AgCenter

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A project led by Dr. Qinglin Wu at the Louisiana Forest Products Development Center, LSU Ag Center received a $791,568 funding from the DOE/USDA biomass research program. The university will provide additional $206,676 in cash match and salary support.

Dr. Qinglin Wu and Dr. Kun Lian were awarded a contract of $110,000 by LEQSF-ITRS for a proposal entitled "Nano Copper Carbon Core-Shell (NCCCS) Compound for Next Generation Wood-Based Treatments: Industrial Application Development". The industry matches $40,000 in cash and in-kind support for the project. The fund is being used to develop new treatment technology for wood and wood composites using nano particles.

Todd Shupe LSU AgCenter

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Shupe, T.F. Elder Wood Preserving. $3,000.

Shupe, T.F. Osmose. $2,500.

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Shupe, T.F. Special Boron, LLC. $8,000.

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Shupe, T.F. Southern Forest Products Association. $1,000.

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Richard Vlosky
LSU AgCenter

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Vlosky, R.P. and T.F. Shupe. Spatial Mapping and Analysis of Louisiana Secondary Forest Products Manufacturers; Louisiana Department of Economic Development; $6,000.

Vlosky, R.P. and T.F. Shupe. Spatial Mapping and Analysis of Louisiana Primary Forest Products Manufacturers; Louisiana Department of Agriculture and Forestry; $12,000.

Vlosky, R.P., Ramesh Kolluru, Mark Smith Enhancing Louisiana Forest Products Industry Development and Competitiveness; Louisiana Board of Regents-Enhancement Program; $83,700.

Glenn Hughes (lead), R.P. Vlosky, Michael Dunn. Certified Forests: Preparing Private Landowners for the Future; SARE: Sustainable Agriculture Research & Education; $113,398.

Vlosky, R.P., James M. Fannin, Todd F. Shupe. A Strategic Analysis of the U.S. Treated Wood Industry; Southern Forest Products Association; $23,287.

Louisiana Forest Products Development Center Gets $790,000 Grant for Research on Plastic-Fiber Composites

(Continued from page 6)

– for several years.

"We have already created in the laboratory products with potential applications," Wu said.

The researchers have created co-polymers reinforced with natural fibers to reduce brittleness and increase strength. A new twin-screw extrusion machine in the Forest Products Development Center combines fibers and plastics under heat and pushes the product out like toothpaste from a tube.

Using a combination of 50 percent plastics and 50 percent fibers, Wu and his team can produce materials with similar handling properties as wood – meaning they can be sawed or drilled.

For homes, they can be used for decking or interior moldings in various colors. They can replace treated wood that could eventually split and decay. And they're termite resistant.

These materials also can be used to make automobile components, such as bumpers and dashboards, Wu said. And, unlike fiberglass, these natural fiber-plastic compounds can be recycled.

Because molded materials have to flow, Wu said, these materials have to have a higher ratio of plastic to wood.

"For example, a product could be made of 70 percent recycled plastic and 30 percent rice straw, 30 percent rice husk or 30 percent pine wood," Wu said.

Because of the way they're formed, extruded materials can contain longer fibers and larger proportions of fiber, making them stiffer than plastics but less brittle than wood. They're not as strong as wood, however, Wu said, because the fibers are shorter. The researchers also are looking at nano particles – such as nanoclays – to improve the bonds between the plastics and the natural fibers. Nanoclays are extremely small, microscopic bits of clay that can separate during composite mixing to form a layered structure at a nano – or microscopic – scale.

"The polymer molecules can then penetrate into the layered clays to form stronger bonds, leading to enhanced composite properties," Wu said.

"The bond between wood and plastic is not a true chemical bond but a physical bond," Wu said. "We're looking at nano technology using nanoclays with a new generation of coupling agents to create chemical bridges or bonds between them. The agents attach with chemical bonds to both the plastics and the wood fibers. Then their chemical properties create a stronger composite material."

The next step is to acquire an industrial-sized, twin-screw extrusion machine to evaluate different formulations and create testing samples.

"The current wood composites laboratory has state-of-the art equipment essential to polymer-based composite research," Wu said. "It's considered to be one of the best composite labs in the South."

Wu credits Louisiana Board of Regents' grants from the Louisiana Education Quality Support Fund, as well as other grants from the National Science Foundation, USDA, the Governor's Biotechnology Initiative Program and private funds, for helping to equip the current laboratory. That was instrumental in being able to compete successfully for the latest grant, he said.

Wu's long-term goal is to form a Louisiana Bio-fiber Polymer Composite Consortium under the LSU AgCenter umbrella.

"We're ready to commercialize composite technology which will contribute to economic development and industry growth in Louisiana," Wu said.

Wu is the Roy O. Martin Sr. Professor in Composites and Engineered Wood Products in the LSU AgCenter's School of Renewable Natural Resources. Other members of the research team are Dr. Craig M. Clemons at the USDA Forest Products Laboratory in Madison, Wis., Dr. Kun Lian at the LSU Center for Advanced Microstructures and Devices and Dr. Yong Lei of the AgCenter's Louisiana Forest Products Development Center.

Using GPS to Document Skidder Motions

(Continued from page 3)

continues, it can be more difficult to collect using GPS. The more time that is spent on trail work, the easier it is to collect with GPS.

Overall, we concluded that a GPS receiver is a good tool to use for collecting time data on rubber-tired grapple skidders operating in second thin loblolly pine plantations. In fact a GPS unit could be used for a completely unattended time study of grapple skidders because the mistakes associated with the manual time data collection method and GPS method offset each other.

Ideally a combination of one researcher plus a GPS unit could collect very accurate time data. GPS has shown to be a very useful tool in collecting time data on trail work, travel empty, grapple time, searching for logs unsuccessfully, idle time and deck time. A researcher would be needed to make notes on haul slash, travel loaded, un-grapple time and deck work, as well as make notes on why the skidder is idling in

For more information, contact:
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Upcoming Events, Workshops, Conferences

52nd Annual Hardwood Log, Lumber and Tree Grading Workshop. School of Forestry, Louisiana Tech University, Ruston, La., March 27-30, 2007. For additional information contact Mark D. Gibson, Workshop Coordinator (mgibson@latech.edu), phone (318) 257-3392, fax (318) 257-5061.

2007 Southeastern Utility Pole Conference and Trade Show, February 11-13, 2007

Position Vacancy Announcement

Value-Added Wood Products Extension Associate (100% Extension)
LSU AgCenter, Louisiana Forest Products Development Center

Application Deadline: February 1, 2007 or until suitable candidate is selected.

For information about this position contact:

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