Composite Materials and Engineering Center

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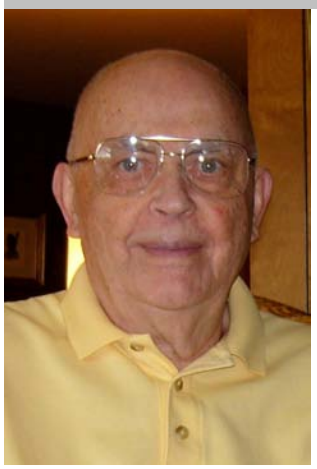
CMEC Alumni & Friends Newsletter

Tom Maloney, Editor
Suzanne Hamada, Associate Editor

Comments from the Editor



Tom Maloney

This Newsletter is being published a bit later than planned due to problems with the Editor. He is OK as problems have been resolved. In this issue we cover more accolades for **Mike Wolcott** (well deserved), a progress report on the NARA project, **Dan Dolan**'s earthquake information, an article on Alumnus **Brian Brashaw** (another of our very successful graduates of whom we are very proud of), a report on the 46th Wood Composites Symposium, a report on his on going research by PhD Candidate **William Lekobou** (included in this Newsletter showing readers one of the fundamental research efforts underway), and obituaries of two of our former colleagues **Art Noskowiak** and **Jack Rucker**. In the next Newsletter, we will feature the Extension work headed by **Vik Yadama** and **Karl Englund**.

And recently, the untimely passing of Dan Dolan's wife, **Desiree** has the whole Center in mourning. Her obituary is part of this newsletter. As noted, Dan and his family came to Pullman in 2002. So, all of the recent staff and alumni are well acquainted with her. For you old timers who did not know her, we lost an important and loving

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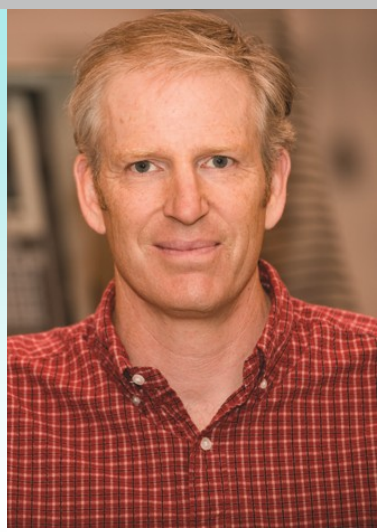
Wolcott Internationally Recognized

Michael Wolcott, *professor in the Washington State University Department of Civil and Environmental Engineering and director of WSU's Institute for Sustainable Design, has been named a fellow of the* ***International Academy of Wood Science.***



Michael Wolcott

The award recognizes Wolcott's outstanding contributions in wood research. He was recognized for his leadership in the field of natural fiber composites and biopolymers. He has led development of advanced materials to improve durability and reduce manufacturing costs and pollution.

He holds five patents for innovative materials and structures from wood and natural fibers. He has been actively engaged with industry to commercialize his research and has participated in projects for more than 50 companies.

Wolcott serves as co-project director for the Northwest Advanced Renewables Alliance (NARA) project, which aims to develop a supply chain for aviation biofuels. NARA re-

(Continued on page 2)

Comments from the Editor, continued

(Continued from page 1)

family member. When you see or talk to Dan, be sure and mention Desiree.

Recently **Bill Galligan** and wife **Pat** stopped by for a visit. In retirement they live in the Salem, Oregon area. It brought to mind the other people who have been on our staff over the years. Bill left us for a very successful career in industry and at the U.S. Forest Products Laboratory in Madison, Wisconsin. **Jim Logan** was with us in the initial days of our NDT work providing us with the electrical engineering expertise we needed. He went on to founding Metraguard with two partners and now is the owner and president of one of the very successful machinery firms in the wood products industry. **Ben Jayne** got us started on NDT back in the 1950's. Ben went on to several important jobs ending his career as Dean of the Forestry College at Duke University. **Murray Carroll** left us for the Canadian Forestry Laboratories (now Forintek) leading their composite work and other projects. **Duane Lyon** went on to earn his PhD at the University of California, Berkeley and then on to Mississippi State University as one of their outstanding scientists.

We try to provide all of our readers with news of our alumni and friends. Some of you have been very forthcoming in sending me such news. I know many of you are interested on how your classmates and friends are doing. So, I am asking you again to send me any news about yourself or any of your classmates or friends to me at tmaloney@pullman.com. ■

Wolcott , continued.

(Continued from page 1)

ceived a $40 million grant from the U.S. Department of Agriculture to develop alternatives to petroleum-based fuels and chemicals.

Wolcott has received numerous national awards for research excellence, including the prestigious Society of Wood Science and Technology's George Marra Award (in 1991 and 1995). He has been an invited keynote lecturer at renowned international conferences. He has previously managed nearly $20 million in funding and large research teams for numerous federal agencies, including the Office of Naval Research, the Department of Energy, the USDA, the U.S. Forest Service and the Federal Highway Administration.

Wolcott received a Ph.D. in materials engineering science from Virginia Polytechnic Institute and State University and his B.S./M.S. in forestry from the University of Maine.

Society of Wood Science and Technology (SWST)

Mike has been elected vice-president of SWST. This means he is on the pathway to being chosen as the President. He follows several of the Center's faculty who have held these offices in this prestigious international scientific society. **Ben Jayne** was a founding father of the

Wolcott , continued.

(Continued from page 2)

society back in the 1950's and one of the first presidents. He was followed later on by **Bob Hoyle**, the Editor, and **George Marra**. Unfortunately, George passed away shortly after being elected.

The society has prospered over the years and now holds international conferences in other countries. Recent ones have been held in Chile, Switzerland, and China. The society has had a presence in many other international scientific and engineering meetings as well as a presence in setting forest products governmental policies.

News Release **By Tina Hilding, College of Engineering and Architecture**

NARA: Entering a second year

NARA
Northwest Advanced Renewables Alliance

By Charles Burke, NARA Communications & Publicity Director.

NARA (Northwest Advanced Renewables Alliance) is an alliance of researchers from universities, businesses and governmental institutions dedicated to help create a woody residual biomass to biojet fuel and co-products industry in the Pacific Northwest. Created in fall 2011, the alliance is led by Washington State University and primarily funded by a $40 million Agriculture and Food Research Initiative Competitive Grant from the USDA National Institute of Food and Agriculture. (Continued on page 6)

NARA team members at the annual meeting in Missoula, MT

Dan Dolan's Research on Earthquakes, in case you missed it

Dan Dolan

J. Daniel Dolan is a professor in Civil and Environmental Engineering and serves as the Director of Codes and Standards at the Composite Materials and Engineering Center.

Come the big one, everyone becomes a Coug

by Eric Sorensen | © Washington State University

An earthquake is like a big finger in a spider web. Touch one spot and parts of the web far away will move.

Dan Dolan has been pondering just how far away in the hopes that the web of our state's vast institutional infrastructure doesn't snap under the strain. Dolan, a professor of civil and environmental engineering, looked at how we might respond to and recover from damage to the state's building and housing stock as part of the Resilient Washington State Initiative, a multifaceted assessment of the ways an earthquake can hurt us and how hard it will be to recover.

The quick answer: Recovery could be very hard, and picking up the pieces will involve a lot more than lifting bricks. Dolan found that major damage could pull health and safety personnel from distant corners of the state, while condemned homes could turn residents into refugees, as happened after Hurricane Katrina damaged the Gulf Coast. Areas sapped of people would then have a hard time recovering economically.

"We figure New Orleans has probably extended their economic recovery by at least five years because people left the community, and also the economy takes longer to come back," says Dolan.

The state's seismic underpinnings have nearly two dozen ways to do damage. The Cascadia subduction zone megathrust could pack a magnitude 9 "Big One," while a catalog of earthquake scenarios compiled by the state Division of Emergency Management lists 19 other seismic faults and zones, most of which can produce a magnitude 7 or greater.

The last Cascadia event occurred in 1700, and the odds of another in the next 50 years are between 10 and 14 percent. A deep earthquake, like the magnitude 6.8 Nisqually quake of 2001, is a near certainty in the next half-century.

And the quake's magnitude is only one measure of its destructive power. Even moderate shaking can wear structures into submission if it lasts long enough.

"The Chilean earthquake [of 2008] was two minutes long and the damage is significant," says Dolan. "It doesn't have to be as strong an earthquake.

Dolan, continued.

When you have it that long, fatigue takes over after a while. The damage accumulation gets to be too much. And we currently don't design for earthquake duration. We only design for peak accelerations in our codes."

Earlier this year, the Resilient Washington State subcommittee summarized assessments compiled by teams in four areas: critical services, utilities, transportation, and Dolan's group, housing and economic development. The housing analysis showed some of the biggest shortcomings. To be resilient, single-family housing should be structurally sound, safe, and sanitary—fit for occupation—within a week of an earthquake. Housing group members were willing to let mid- and high-rise structures remain uninhabitable for a few weeks or months.

But the group found that houses built after 1950 might be uninhabitable up to a month and it could be three months to a year before older houses can be occupied. It could take up to three years before mid- and high-rise structures built before 1977 can be occupied.

One problem is many older apartment buildings have parking on the first floors with little support for the floors above. The 1994 Northridge earthquake near Los Angeles saw such buildings' parking levels collapse or "pancake."

"If you look around Aurora or drive up and down I-5, you'll see a lot of those buildings where a first floor is parking and then two to three floors of apartments above it," say Dolan. "And all are on steel columns, steel-piped columns or something like that. There's no lateral capacity on that first floor. And we perceive that as being a really large risk to having a resilient community because if those buildings come down, they're no longer habitable."

Similarly, if buildings were to fail at, say, the University of Washington, students might need to attend classes somewhere else. Which is where the spider-web analogy comes in: Damage on the west side of the state could force residents on the east side to make do with fewer doctors and less police protection, and WSU might have to temporarily teach UW students.

"We think that there will be significant damage," says Dolan, "at which point our schools will become crowded. If UW gets really hammered in some of their older buildings, well what are those students going to do? Are they going to just stop them, not let them continue? We're going to have to support them. That's part of being part of the state."

That will indeed be a topsy-turvy moment, when Huskies become Cougars. ■

NARA , continued

(Continued from page 3)

In mid September (13-15), NARA celebrated its first year anniversary. Over 100 NARA researchers from throughout the United States convened in Missoula Montana to review progress made and clarify future goals. Included at the annual meeting were various business, forestry, non-profit and government stakeholders from the four-state region who provided their valuable input and perspectives. Conducting the annual meeting in Missoula was no coincidence; the western Montana Corridor is one of the strategic communities in the four-state region that contribute significantly to the woody biomass to biojet fuel supply chain due to the high level of natural, social and industrial assets. You can view a news story about the annual meeting at http://goo.gl/u4NFM.

Individuals at the Composite Materials and Engineering Center at Washington State University contribute a significant role to NARA. Regents Professor **Michael Wolcott** is NARA co-project director. In this capacity, he oversees the sustainability measurement, education and outreach teams and serves on the NARA executive committee. A YouTube video (http://goo.gl/wWsZK) is available that features Mike providing a NARA overview to Montana stakeholders. **Vikram Yadama**, assistant professor and extension specialist, is NARA outreach team-leader and is responsible for connecting NARA research activities with communities in the Pacific Northwest. **Karl Englund**, assistant professor and extension specialist, provides inventory analysis on woody biomass collected at municipal solid waste sites and associated with construction and demolition. He also contributes to the NARA outreach team. **Jinwen Zhang**, associate professor, **Jinwu Wang**, assistant research professor, and Michael Wolcott identify novel ways to synthesize epoxies and polymers from lignin. Additional NARA contributors at CMEC are postdoctoral researchers **Jianglei Qin** and **Junna Xin** along with graduate student research assistants **Rui Zhu** and **Gerald Schneider**, and **Janet Duncan** on staff. ■

Alumni Spotlight: Brian Bradshaw

Editor's note: I asked Brian to prepare this article to show and inspire our students past and present the value of the Center's educational efforts

Great People, Challenging Courses, Exposure to Industry, and Research Project Diversity.

Those are the key things that I experienced during my graduate studies at Washington State University in 1989-1991. As one of the last graduate students to graduate with a M.S. degree in Material Science and Engineering, I was prepared to accept a position with the University of Minnesota Duluth's Natural Resources Research Institute (UMD NRRI), where I am the Program Director of the Wood Materials and Manufacturing Program. NRRI's mission is economic development. This means working on projects that are more applied in nature, with goals of job creation and retention, new product development, efficient

Alumni Spotlight: Brashaw, continued

resource utilization, and highly productive manufacturing operations.

All of the alumni of the WSU wood and composite materials program have a special place in their heart for Pullman, Washington. However, even with the knowledge that Pullman was in the heart of highly productive wheat farming, it was a startling drive down from Coeur D' Alene, Idaho for a forester who grew up in the heart of the Nicolet National Forest in Wisconsin. I was really amazed at the golden fields of wheat and the general lack of lakes and rivers as I arrived to Pullman in August of 1989. What a difference from the upper Midwest forests and the shores of Lake Michigan where I grew up.

My interest in forests and forest industry were formed when my dad accepted an accounting position in Laona, Wisconsin with Connor Forest Products. This company had a long history of hardwood and softwood logging and forest products manufacturing, celebrating the 100th Anniversary in 1976 when I was only in 4th grade. One of our family friends was a forester for the Forest Service, serving as the District Ranger for the Laona District of the Nicolet National Forest. As a family we spent time fishing on Silver Lake where my family built a modular home. In 1st grade I stayed home to watch our factory built Wausau Home be delivered and installed room by room over two days. The woods and waters were very special exploring areas for a kid, who from that point forward wanted to be a forester for the Forest Service.

Times change, though, and my family moved from Laona south to Two Rivers, Wisconsin on the shores or Lake Michigan. The love of forests and the outdoors did not go away though, and I followed through on my forestry interests by enrolling at the University of Wisconsin - Stevens Point, where they had the largest undergraduate forestry and natural resources program in the US. However, during my freshman year, I received a request from the College of Natural Resources Associate Dean, **Dr. Robert Engelhard** to visit with him about future plans. He proudly talked about a very special place, Pullman, Washington, and the success that a number of our foresters had in a forest products engineering program run by **Tom Maloney** and **Roy Pellerin**. Continued encouragement by **Dr. Engelhard** eventually resulted in an application and acceptance to WSU during my senior year, and an interesting conversation with a young lady I had just started dating. "Brian, it's too bad that you are moving to Washington State. I could get serious with you." Fortunately, though, **Susan Collar** decided that we were worth a 2-year long distance relationship. As I am writing this article, Susan and I are celebrating our 21st anniversary! We have been very blessed with two terrific kids, **Cole** 15 and **Hannah** 9.

I arrived in Pullman in 1989, and will never forget the world-class education I received. Some of it was actually in the classroom! The greatest experience though was the tremendous staff and friends I came to know at the Wood Materials and Engineering Laboratory. **Tom Maloney**, **Roy Pellerin**, **Tony Nilson**, **Marty Lentz**, **Glen**

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Alumni Spotlight: Bradshaw, continued

(Continued from page 7)

Cambrin, **Sam Leonhardy** and **Stephanie Hetrick**. While we were required to spend 20 hours a week at WMEL, I spent every minute that I wasn't in class at the lab working on projects. What a tremendous learning experience! Wood composites: particleboard, MDF, OSB and LVL with Marty and nondestructive and destructive testing with Tony. These men provided the hands-on experience in support of the education and guidance our students received from Tom and Roy. I would estimate that I worked on over 20 research projects during my 2+ years in Pullman. This experience was incredible, as we met and worked side by side with industry leaders in all of the major forest products sectors in North America. Add in the Particleboard and Composite Materials Symposium held at the CUB, and I was able to understand and link with European forest products leaders as well.

Pullman wasn't all academics and research for me. WSU had a strong football and basketball program during my time there. I'll never forget a starting frosh quarterback - **Drew Bledsoe** and a kicker who wanted to be a doctor**, Jason Hanson**. While Drew's career has ended, Jason Hanson keeps kicking - 21 years with the Lions. In some spare time, Tony and Marty got me connected with the Boy Scouts, with pack meetings in Palouse plus the Scout Camp in Idaho. Pullman was a very special place for me.

As I was nearing completion of my MS program in early 1991, several major issues resulted in a very difficult job market in the West. The spotted owl issue was in the forefront of forestry operations and the US was coming out of a short recession. Despite these impacts, I had several opportunities to join manufacturing and research organizations in the Midwest, back closer to home. The Particleboard Symposium in 1991 provided me with an opportunity to interview with **Roy Adams** (WSU PhD 1981) for a research position with the University of Minnesota Duluth Natural Resources Research Institute (UMD NRRI). This position really appealed to me since NRRI was very similar to WSU, in that it conducted industry research in support of wood composites, lumber, and secondary wood products companies. In accepting the position, Susan and I moved to Duluth in fall 1991 to begin a great professional and family adventure.

My responsibilities focused on wood composites research for the first several years, in support of the Minnesota OSB manufacturers. Our research teams provided support to Trus Joist MacMillan's first oriented strand lumber plant in Deerwood, and focused on NRRI's mission of economic development. One of our first highlights was the production of the first 4-by 8-ft strawboard panels in North America for IsoBoard.

After a number of years, I added nondestructive evaluation (NDE) projects to my responsibilities, conducting the first trials of using stress wave technology to grade green veneer, which became a commercial reality in the past 5 years. I developed a close relationship with **Bob Ross** of the USDA Forest Products Laboratory, who along with Roy Pellerin, were my mentors in NDE of wood products. I became involved in using stress wave technologies to grade trees and logs for structural properties, and hard-

Alumni Spotlight: Bradshaw, continued

wood lumber to locate quality defects. I began teaching an important section of a 2 day short course for ASCE, Structural Condition Assessment of Existing Structures, which has now been taught over 100 times for several thousand engineers, architects, facility managers and inspectors. We conducted a fair number of condition inspections of wood ships, historic buildings and timber bridges.

Perhaps a highlight was working with the City of New Orleans Chief Building Inspector to provide training on timber inspections after the massive flooding in 2005. I traveled to New Orleans several times as both a volunteer and a wood products professional. I marveled every time at the commitment they had to rebuild their city.

In support of other NDE professional activities, I am serving on the organizing committee of the International Nondestructive Testing and Evaluation of Wood Symposium Series. This series alternates around the world every two years. We hosted the Symposium in Duluth in 2007. The 2012 Symposium will be held in Madison, WI.

In addition to these areas, our research teams began to support the secondary wood products industry through product development and implementation of continuous improvement strategies. From 2003-2008, I had the privilege of serving as PI of a NSF Partnerships for Innovation program focused on introducing lean manufacturing into the wood products industry. This Partnership was formed to enhance the competitiveness of the wood products industry in the western Great Lakes region of Minnesota, Michigan, and Wisconsin. The Partnership linked private wood products manufacturers with UMD, Michigan Technological University, Northern Initiatives (a community development corporation), USDA Forest Products Laboratory, Minnesota, Michigan, and Wisconsin Departments of Natural Resources. This effort included development and delivery of training for over 400 companies and facilitation of company project teams aimed at lean manufacturing and product development for over 15 companies. While the U.S. has lost large numbers of manufacturing jobs to China and other countries, lean manufacturing offers companies the opportunity to compete, saving and growing U.S. jobs.

There are a lot of other project areas that we work in to include biomass energy, development of recycling and new products from landfill materials like mattresses, utilization of low-grade hardwood products, phytosanitary treatment, and new product development. We work closely with companies ranging from start-ups to large companies, working to develop, test or improve products and processes. For a kid who thought he was coming to Pullman to work in the composites industry, I find myself blessed to be working for all aspects of the forestry and forest products industry, and in support of broad-based manufacturing.

Susan, Cole, Hannah and I are starting our 21st year in

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The 2012 International Wood Composites Symposium

MANAGING THE WOODY BIOMASS SUPPLY CHAIN

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For its 46th Annual Symposium, Washington State University (WSU) integrated the topics of composite panel developments and advanced renewables technologies, assembling a variety of experts to give presentations in Seattle, Washington State, in April. **Geoff Rhodes** (consultant) summarises the presentations for **Wood Based Panels International.**

Close to 140 attendees from 14 countries greeted 39 speakers at the Red Lion Hotel in Seattle. (Editor's note: the sessions were first a Plenary Session followed by sessions on Future Demands for Woody Biomass; Biofuels and Bioenergy: New Products, Markets and Processes; Redefining Your Biomass Supply; Biofuels and Bioenergy: Pretreatment and Conversion Strategies; and Composites: Advances in Technology).

Introducing the Symposium, **Vikram Yadama** (WSU) proposed that the industry should regard the new demands for woody biomass and fuel not as competitive, but as an extension and integration of technologies. It was important that the forest products industry examines the whole supply chain, continues to add value (with examples such as chemical modification of wood), helps the industry diversify, offers sustainable supply and uses best forest practices which cater for a wide variety of needs.

He explained the new cooperation evolving with Northwest Advanced Renewables Alliance (NARA), which is bringing representative inputs from many different associations and interest groups.

Mike Jostrom, director of renewable resources, Plum Creek Timber Company, Seattle, keynoted the symposium.

He explained that forest landowners are encouraged by the

Vikram Yadama and Robert Tichy give the welcoming address at the 2012 IWCS

2012 IWCS, continued

prospects for new renewable energy markets for low quality wood fibre. Such markets will improve the utilisation of each tree harvested and will provide more economical thinning opportunities, he suggested. These opportunities promote forest productivity and health - especially important where existing pulpwood markets are in decline (150 paper plants closed in the US in the last 20 years).

Manufacturers of wood composite products are naturally concerned about new competition for wood fibre at a time when product markets have not yet recovered - especially when that competition is supported by the government. These perspectives represent what appear to be conflicting interests within the same value stream at a time when external pressures are creating large challenges for the industry.

Mr Jostrom's presentation discussed these competing interests, suggesting that other people are not as close to all this as we are, so we should all pick up the ball of the challenge the industry faces now to reconcile them as constructively as possible to support the healthy future of the industry.

Laurel Harmon, vice president of government relations at LanzaTech Inc, Roselle, Illinois, spoke about LanzaTech, a global company with bio refinery projects underway in the US, China, India and New Zealand. LanzaTech bio refineries hedge against changes in feedstock and end product markets through flexibility in both.

It recently initiated a project in Soperton, Georgia, that will utilise woody biomass feedstocks. Both international and regional policies are important to operations on a global scale. Governments worldwide have established diverse biofuel blending policies to support clean air and reduce carbon emissions and instituted mechanisms to promote bioenergy market development.

While forest products are gaining significant traction in the US as feedstock for the bio refinery industry, Europe remains a leader in woody biomass utilisation, although primarily for power. For a truly global biofuels industry to become a reality she suggested open international markets, harmonisation of domestic policies and effective sustainability criteria are essential.

Moreover, the inter-relationships of energy, agriculture and trade policies should not be ignored in effective biofuels policy. **Dwight Anderson**, bioconversion lead at Catchlight Energy LLC, Washington (a joint venture between Chevron and Weyerhaeuser) explained that cellulose feedstock can be used to produce liquid transportation fuels in a way that is sustainable and doesn't compete with the food supply. The very durability that makes cellulose desirable for construction, however, makes it challenging to convert into fuels.

The Energy Independence and Security Act of 2007 provided incentives that have catalysed the progress of many conversion technologies. Although commercialisation is occurring at a slower pace than envisioned in that legislation, commercial cellulose-based biofuel plants are likely to become a reality in the next few years. Mr Anderson described considerations around feedstock availability for biofuels and how the choice of a biofuel conversion technology may impact the use of woody biomass as a feedstock.

Jamie Barbour, programmes manager for Focused Science Delivery and Goods, Services and Values Programmes at the USDA Forest Service, Portland, Oregon, said the USDA Forest Service is interested in promoting the commercial use of traditionally non-merchantable wood and

Alumni Spotlight: Bradshaw, continued

(Continued from page 9)

Duluth. For a place where we thought we would be for 3 years, it is now home. We built a home in the woods, where we get a chance to live in our cabin year round. Our community is special, and important to us.

It has been a special ride, one that I have enjoyed at every moment. I have had the opportunity to work in all aspects of the wood products industry. I have been able to continue work with my WSU mentors, **Tom Maloney** and **Roy Pellerin**. I have been able to cooperate with I have been able to work with many University research programs through a leadership role with the Wood Utilization Research (WUR) Centers. I have worked with many talented researchers and colleagues. I have been able to travel the US and the World, making new friends and colleagues. And I am now working on a PhD, enrolled at Mississippi State University. All of this was due to the tremendous building blocks I received at WSU, where I got to work on great projects with great people! ■

2012 IWCS, continued

(Continued from page 11)

woody biomass (loosely defined as traditionally stems and logging slash) when its production helps to meet federal policy objectives.

The two most relevant policy initiatives are promoting jobs in rural economies and restoring healthy, sustainable, forest conditions. There are a variety of existing resources that evaluate forest conditions across the country which could help identify the places with the greatest opportunities for wood products. For instance, each state produced a forest assessment in response to the 2008 Farm Bill which outlines opportunities for forest restoration activities. The Forest Service Research Branch has also conducted several regional and national wood supply analyses.

Bruce Lippke, professor emeritus, University of Washington College of Environment, said the heightened interest in biofuels addresses both the national objective to reduce carbon emissions and to reduce dependence on foreign fossil fuels.

However, using wood that can displace fossil-intensive products is much more effective in reducing emissions than using biofuels to directly displace fossil fuels.

In contrast, displacing liquid fossil fuels by ethanol provides the opportunity to directly reduce energy dependence.

Using life cycle analysis to evaluate alternative uses of wood, including both products and fuels, reveals a hierarchy of carbon and energy impacts characterised by their efficiency in displacing carbon emissions and/or fossil energy imports.

Policies designed to increase biofuel use tend to divert feedstock from more effective uses, such as displacing fossil-intensive products. Policies must consider life cycle implications to avoid counter-productive outcomes, said Mr Lippke.

Christopher Wright, Idaho National Laboratory Biofuels & Renewable Energy Technologies, Idaho Falls, explained that woody feedstock supply systems encompass all operations necessary to move biomass from the land to the conversion facility. These operations, including harvest, pre-processing, handling, transport and storage, represent one of the largest challenges in terms of cost to the bioenergy industry.

The most significant of these challenges is economically managing the diversity and complexity of lignocellulosic feedstock and feedstock supply system configurations needed to achieve both near-term (produce six billion gallons of biofuels by 2017) and long-term (displace 30% of transportation fuels with renewable fuels by 2030) biofuel goals. These goals equate to moving approximately 70 million tons of lignocellulosic biomass annually in the next 10 years, and between 500 and 700 million tons annually in 20 years.

Such a rapid expansion of the industry cannot be accomplished with many diverse, custom-designed feedstock supply system infrastructures and conversion facilities. Instead, these facilities must operate on a standardised supply system infrastructure similar to the grain ethanol facilities of today. As such, a significant element needed for rapid biorefinery facility replication is the development of a uniform feedstock supply system infrastructure.

Mike Wolcott speaking about the NARA project

Michael Wolcott, professor and director, Institute for Sustainable Design and Co-Principal Director, NARA, WSU, Pullman, suggested that scientists and engineers around the world are now focused on developing ways to turn one of the world's most plentiful commodities - cellulose - into biofuel and bio products. These developments have important implications for the sustainability of our global resource and energy supplies. Efforts are ongoing in the Pacific Northwest aimed at producing aviation biofuels and bio products from woody biomass.

These projects are taking a holistic approach to building a regional supply chain with the goal of increasing efficiency in everything from land management to forest operations to conversion processes, he said.

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2012 IWCS, continued

Examining a variety of feedstocks, including forest and mill residues, construction waste, as well as new energy crops, these efforts aim to create a sustainable industry that exists in coalition with other forest products uses. The underlying philosophical approach to this effort aims at improving sustainability through resource management, adaptive reuse of infrastructure and product selection.

As a part of the existing wood supply chain, wood composites facilities play an important and allied role in the emerging biofuels and bio products industry.

Focus on composites

In the afternoon, delegates heard from **Geoff Rhodes**, Chairman of the UK's Forest Products Research Institute (FPRI) advisory board at Edinburgh Napier University and owner of forest products consultancy Geoff Rhodes Associates in the UK.

He proposed that the forest products industry can learn much from the innovation, creativity and marketing prowess of the IT industry - and many other sectors - if it wants to maximise its earnings potential into the future. Differentiation and innovation in a fast-changing market is all about leading from the front and the forest products industry should give this serious consideration as it analyses its own opportunities and scope to grow revenues, he said.

Committing more funds to research and development and also pure research, linking with international universities to help develop and ultimately bring new products to market, are all themes that were presented by Mr Rhodes, as well as the real need to attract bright young people into our industry.

Allocating appropriate funds, increasing marketing spend, while understanding far better what the market and clients actually need, were now all key topics for reflection and review, he said.

William Mitchell, the Beck Group, Portland, Oregon spoke of the many lessons to be learnt from numerous benchmarking studies of composite industries. He proposed that: biggest is not necessarily best; there appears to be a large excess of OSB capacity relative to North American demand; top quality producers are often far more profitable than the volume operators; exchange rates can have a very significant impact; and that in particleboard, value-added is not necessarily profit-added, while in MDF one must take into consideration the huge energy requirements of a large facility.

John Bowser, president/ceo of NewWood Manufacturing, Elma, Washington, explained that diverting woody biomass from landfill and recycling it into a unique, value-added composite building material is the business of NewWood Manufacturing.

The NewWood composite panel combines recycled urban wood waste such as pallets and C&D debris, with post-consumer polyethylene. The current technology delivers 9 x 16ft panels, 7/16in thick from a multi-opening press using the patented PressAire manufacturing process. This presentation

2012 IWCS poster session

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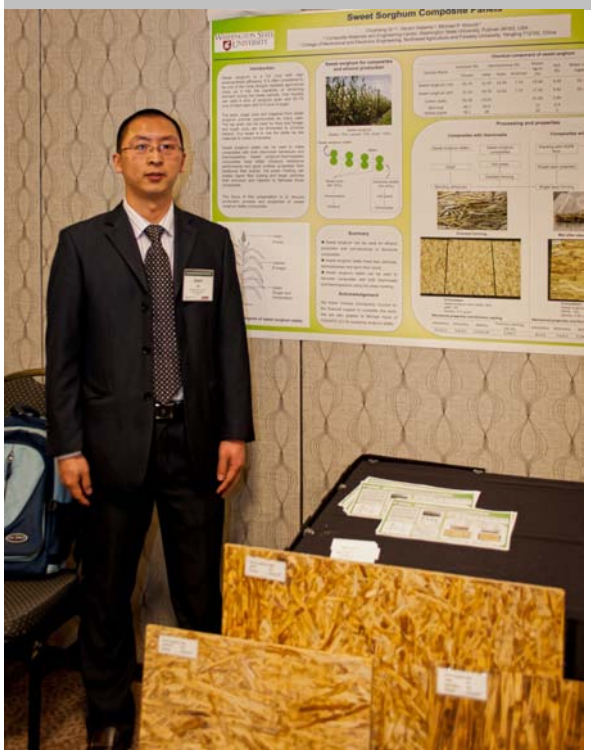
2012 IWCS, continued



Chusheng (Jason) Qi, Visiting Ph.D. Scholar from Northwest A&F University, China

Advisors: V. Yadama & M.P. Wolcott

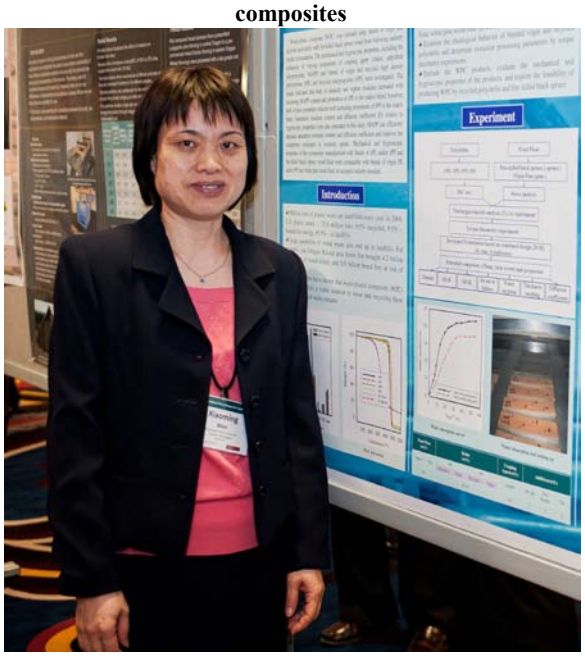
Thermal properties of natural fiber-thermoplastic composites

discussed the manufacturing process and product performance properties, as well as raw material procurement challenges. The quality and consistency of incoming raw materials from the recycling community was reviewed, along with quality control processes and procedures established with suppliers. The challenges of negotiating long term supply agreements and securing predictable and affordable supply costs were also discussed.

Pyrolytic Lignins as a thermoplastic resin for wood composites was presented by **Karl Englund**, associate research professor and extension specialist, Composite Materials and Engineering, WSU. The development of value-added products from lignin residues has historically been a focal point for the pulp and paper industry and more recently the bio-fuel industry. Fast pyrolysis converts woody biomass into a bio-oil which can be separated into a phenolic-rich fraction (PRF), low molecular weight compounds originating from lignin and tannins and a sugar-rich fraction derived from the cellulose and hemicelluloses component of the woody biomass. The unique rheological behaviour might provide opportunities for the wood composite industry as an adhesive or matrix material.

Patrick Govang, president and ceo, e2e Materials, Ithaca, New York, suggested that the American wood composites industry is being challenged on both short-term and long-term fronts. Formaldehyde legislation and increases in offshore furniture production capacity hinder the industry's near term viability, resulting in a number of plant closures and consolidations.

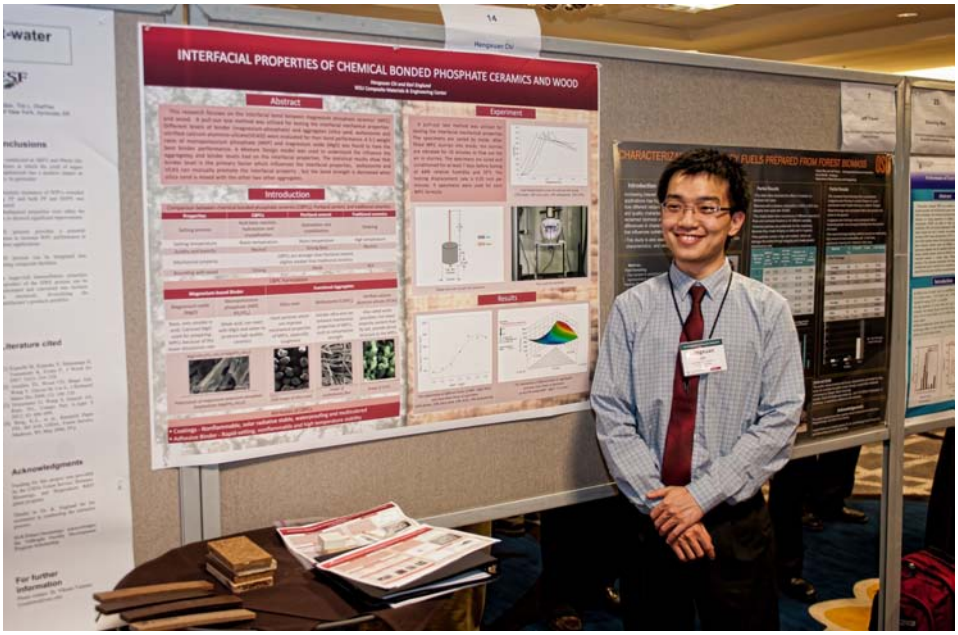
As the economies of India and China grow, long-term demand for the products



Xiaoming Wen, M.S. Civil Engineering student

Advisors: V. Yadama & K. Englund

Performance of extruded wood plastic composites from fire-killed black spruce & blends of polyolefin



Hengxuan Chi, Ph.D Civil Engineering student

Advisor: K. Englund

Interfacial properties of chemical bonded phosphate ceramics and wood

2012 IWCS, continued

produced from composite panels threatens to strip out supplies and forests. Incrementally improving our commodities to compete on price may well not meet these challenges. A different approach using Soya, fossil fuel-free and biodegradable, was presented that could meet some of the short- and long-term challenges facing this industry.

Mathias Fischer, sales director, GreCon, Alfeld, Germany presented a paper on Preventive fire and explosion protection with effective spark detection and extinguishing.

The end of the first day was followed by a wide ranging technical forum poster session whilst refreshments and 'hearty hors d'oeuvres' were served.

Day two of presentations

William Mitchell again presented, on Fibre supply assessments for bioenergy (co-gen).

The Beck Group has completed a number of fibre supply studies for clients considering co-generation, wood fuel pellets and other bioenergy projects. The presentation outlined the steps the firm typically follows in completing these studies, as well discussing key factors to consider such as: define the supply area; understand the language/terminology; different ways to estimate volume and value; verify assumptions with good interviews; account for other users; biomass is actually a low-value use; and location, location, location.

Bruce Summers, harvesting and product sales manager, GreenWood Resources Inc, Portland, Oregon, explained that GreenWood Resources is a specialised timber investment management organisation (TIMO) focused on the development and management of high-yield, short-rotation hybrid poplar plantations for multiple markets.

GreenWood maintains operations in North America, Asia, South America, and Europe. Approximately 35,000 acres are presently under management in the US.

Globally, GreenWood plantations are being managed to produce four types of product: Bio-energy feedstock as a dedicated biomass crop as well as an intercrop; debarked pulp chips for paper making operations; debarked and barky chips for composites and engineered wood products; and peeler and saw logs for quality veneer and lumber.

GreenWood is a unique TIMO to the extent that it provides for silvicultural management, harvesting and marketing operations, development of plant material and the capital management of its investment funds.

Terry Gillis, general manager, Recovery 1, Tacoma, Washington gave a presentation directed towards the wood composite manufacturing community. It helped those who desire to use wood of this type (the urban forest) to understand what it is reasonable to expect out of materials extracted from municipal solid waste by: Describing the municipal solid waste stream as it pertains to wood waste; detailing the differences between wood generated from construction projects and wood generated from demolition projects; and outlining the processes required to maintain a safe source of debris in-feed and therefore a usable/saleable flow of wood for manufacturing.

James H Dooley, chief technology officer at Forest Concepts LLC, Auburn, Washington explained that low-quality whole tree chips (also known as 'dirty chips'), shredded land-clearing and storm debris, and arborist/tree service chips are abundant and available at reasonably low cost. Today, more than 50 million tons of chipped and shredded biomass is produced, most of which is composted, dumped or goes to mulch users. A relatively small fraction is delivered to combustion biomass power plants as fuel.

Capture of clean wood fibre from dirty shredded and chipped woody biomass may reduce the competition and tension between new biofuels producers and existing composite wood products firms, as well as providing new sources of clean feedstocks for second generation liquid transportation fuel producers, suggested Mr Dooley.

Donald Bisson, vice president, government and industry affairs, Composite Panel Association (CPA) Leesburg, Virginia, provided a perspective from manufacturers of particleboard, MDF, hardboard and engineered wood siding and trim, on the market and governmental forces affecting wood fibre supply.

A review of the issues related to governmentally-defined woody biomass was provided, along with a review of the advocacy of CPA and its allies on behalf of composite wood products manufacturers and other affected industry sectors.

There then followed three presentations and a panel discussion on biomass logistics and utilisation: Woody biomass harvesting and transportation with **Bill Hermann**, ceo of Hermann Brothers Logging and Construction, Port Angeles, Washington; Han-Sup

2012 IWCS, continued

Han, professor, Humboldt State University, Arcata, California; and **Ed Tolan**, purchasing executive for Nippon Paper Industries, Seattle.

In the second 'Composites' section, **Tomas Joscak**, ceo of Dascanova GmbH Vienna, Austria, spoke about Three-dimensional rearrangement of wood based panel density in a one-press process. The Dascanova Technology (international patent applications pending) is based on 3-D denser structure inside the fibreboard or particleboard.

David Harmon, laboratory & North America wood fibre technical manager at Momentive Specialty Chemicals Inc, Springfield, Oregon discussed Low formaldehyde emission challenges in composite wood products.

Formaldehyde emissions from composite wood products are globally converging to near natural wood background levels.

Advances in resin and board manufacturing technologies have kept pace with the demand for high-performing, lowemitting, composite wood products, primarily through new-generation families of amino formaldehyde binders, which are becoming known as Ultra-Low-Emitting Formaldehyde (ULEF) resins. While other technologies may also provide equivalent overall performance, there remain challenges to implementation of these alternatives on the global scale, said the speaker. In turn, the methods used for validation/compliance demonstration must be highly accurate at the very low levels required to meet applicable requirements.

Then **Tony Ferrante**, sales and service manager, Columbia Forest Products, Greensboro, North Carolina, presented on Commercialisation of a new protein based adhesive. Columbia Forest Products is currently utilising a soy-based adhesive system in all its hardwood plywood. The conversion from a UF based system to the current soy-based one was a task that was neither easy nor accomplished overnight, said Mr. Ferrante, adding that it took several years of research and diligence to achieve the goals of offering a product with no added formaldehyde.

In this presentation, Columbia Innovations discussed the commercialisation of this protein based technology and what it takes to bring a new adhesive to market.

Michael Rushton, ceo, Lignol Innovations Inc, Burnaby, Canada, spoke of the use of HP-L™ Lignin as an ingredient in wood composite adhesives.

Incorporation of lignin into wood composite adhesives has been under development for some years, with mixed results. Mr. Rushton said that Lignol has now developed a hybrid resin material, containing a large proportion of its proprietary HP-L Lignin product, which has performed well in test production of a range of wood composite products.

Core blending efficiency improvements achieved in continuous pressing of particleboard was the topic for **Raymond J Roberts**, consulting physicist, RJ Roberts Consulting Pty Ltd, Victoria, Australia.

In papers presented in 2011 at this conference the author had demonstrated the inefficiency of high speed blenders caused by surface energy considerations and by destruction of flake geometry and how this might be improved. This paper presented the results of three full-scale plant trials using Rezex A with modifications to high speed core blenders from PAL srl of Italy. The results from full-scale plant trials verify the predictions made in the previous papers, said Mr. Roberts.

Finally, to close day two, **Ning Yan**, assistant professor, University of Toronto, Canada, described Bark biorefinery: Conversion of bark residue to bark-based PF adhesives and PU foams.

Bark, available in large quantities as residue from forest mill operations, is highly promising as suitable feedstock for producing value added chemicals and bio-based products due to its unique compositional advantages, said the speaker.

The renewable bark-biomass-derived chemicals and materials can be used as environmentally-friendly substitutes for petroleum-based industrial products, thus contributing to global sustainability, he added.

At the University of Toronto, they have assembled a large multidisciplinary public and private research team focused on conversion of bark to these environmentally friendly chemicals and products, using solvent liquefaction and extraction methods, concluded Dr. Yan. ■

Doctoral Research: William Lekobou

Atmospheric pressure plasma processing of cellulosic fillers: a green alternative to manufacturing composites

By William Lekobou, PhD Candidate

William Lekobou

William Lekobou is advised by Dr. Karl Englund (Dr. Marie Pierre Laborie got this project started before leaving us to go to the University of Freiburg in Germany)

Since its discovery in the late 19th century, plasma, as so named by Irving Langmuir has been studied by a very large community of scientists who are still attempting to explain itsi mysteries. In the meantime plasma have made its way into our living rooms as a display for TV, and paved the highway that led to most of the advanced technology we depend on today, from communication devices to entertainment, transportation, health care, defense… The impact of plasma has become so considerable that almost every automated system nowadays contains microchips that were fabricated using a sort of plasma. They are smartphones, computers and all sort of electronic devices and parts. Without this technology, most of our tools wouldn't look the same. And just like humans long mastered the art and use of fire before explaining the concept of combustion, it is very likely we will use plasmas in basic applications long before the mysteries of its science are unveiled.

Plasma is a collection of electrons, ions, neutrals and molecules coexisting in a defined environment. All particles in plasma are in motion and electrons possess a much higher kinetic energy than other charged particles. This energy is sufficient to ionize atoms and molecules or break chemical bonds through collision impacts. Ions and/or neutrals resulting from these plasma enhanced reactions can then be collected on a substrate to achieve desired modifications. At this point in time most applications using plasma have been developed at low vacuum. Operating at low vacuum requires additional and expensive logistics as well as it limit processing to a batch-type. Consequently plasma is usually considered only when other methods cannot achieve comparable results. This inconvenience considerably limits applications of plasma especially for advanced composites or health industry where the ability of plasma to modify surface properties of a material without affecting its bulk properties is highly valued. For these types of applications scientist and engineers have been investigating on processing with plasma at atmospheric pressure.

(Continued on page 20)

Remembrances

Desiree Dolan: Beloved wife and mother

Clotide Desiree Dolan, known as Desiree, passed away at home October 31 after a long illness.

Born in Suva, Fiji, in 1950, Desiree immigrated to Vancouver, British Columbia, Canada when she was 13.

Upon finishing high school she began to work as a secretary at the University of British Columbia until 1989, when she married **Dan Dolan** and moved to Blacksburg, VA. In Blacksburg, she worked for Virginia Tech as a secretary, administrative assistant and finally as a coordinator for conference planning.

In 2002, she moved with her family to Pullman, WA. While in Pullman, she participated in activities to support the Gladish Community and Cultural Center, Trinity Lutheran Church and other civic organizations. Her passion was to expand people's understanding of international cultures and the benefits the wide diversity of cultures bring to life.

Desiree is survived by her husband and children, **Dan**, **Stefan**, and **Katrina Dolan**; her brother Gary Cheung, and two sisters Gloria Lowe and Evelyn Fong. ■

Arthur F. Noskowiak

We lost one of our long-time colleagues and good friend, **Art Noskowiak**, earlier this year. Art joined our group in the late 1950's to head up our part of a large study on strength properties of Douglas-fir. Later on I have included a shortened abstract of this huge project so that all of our newer alumni, students, and friends are aware of this important project.

We had people sampling material throughout the western U.S. east of the Cascade Mountains–from Canada to Mexico. We used every testing machine we could get our hands on throughout the Division of Industrial Research. At the same time we were conducting one of our first large NDT studies evaluating lumber of different sizes from many different sources. Fortunately the testing mostly took place in the summer so the testing machines were available as well as many students that we hired. There was a staff of over 40 running the tests 24 hours a day.

Art was also an expert on spiral grain and how it affected properties of lumber. He, as was the case in those days, taught wood technology courses in the Department of Forestry as they did not have any qualified faculty. After many years, Forestry was using up most of Art's time while we paid the bill. At that time, I made a deal with Forestry to take Art on full time. But he continued to help us out on many projects that required his skills and knowledge.

Art was an avid skier and outdoors person. He skied at many places over the world. He was a gentle, good-natured person with the highest level of integrity. All of his old friends, I know, will miss him. ■ Find on page 21 an abstract of Art's research

Remembrances

Jack Rucker

Jack Rucker passed away a few months ago after fighting cancer for several years. He was a forestry graduate from Washington State and was part of our staff in the late 1950's and early 1960's. He left us to pursue an advanced degree at the University of Washington. Then he became the Technical Director of the U.S. Plywood Co. plywood plant in Seattle. This plant produced a premium plywood and also manufactured different overlayed panels and decorative plywood panels. About 20 years ago the company, during one of the economic downturns, decided to close all of their west coast plants. They offered Jack the chance to transfer to one of their other plants but since he was well-settled in Seattle, he declined the job and signed on to a hardware store where he worked up until a few weeks of his death.

Jack was an army veteran, a close friend of mine, and a valuable staff member in the Wood Technology Section as it was known at that time. Over the years he kept his hand in the forest products industry by volunteering at the University of Washington developing and keeping their international collection of wood species. This one of his many interesting "hobbies." His knowledge of species from around the world was valuable for many companies. We employed his services in a project we had in The Philippines. There were 50 unidentified species we were to research for possible use in a particleboard plant. He was able identify the different species as to members of a family. We used this knowledge along with specific gravity and chemical measurements to successfully advise the company on problem species and which ones not to even try to use at that time in history.

Jack was my roommate when working in the laboratory and later married my **Donna**'s roommate–so we have a long history together. His wife, **Evelyn** survives him as well as a daughter, **Andrea** (a WSU BA and MA graduate) working in the financial field and a son **Paul**, a University of Washington graduate. Paul is now the Alumni Association Director for the UW—a prestigious position. ■

Lekobou, continued.

(Continued from page 17)

In the composite industry there is a high demand in advanced composites reinforced with nanoparticles with the intent of benefiting from their high mechanical properties. The most common techniques used to overcome the incompatibility between nanoparticles and plastics are based on wet chemistry. While they yield good surface compatibilization, they also generate byproducts and involve the use of some chemicals that are rather toxic or need to be disposed appropriately. The objective of the research we conduct at the CMEC is to modify the surface of micro- and nanoparticles used as fillers in composites with plastics. We investigate on the performances of atmospheric pressure plasma as a method to coat the surface of particles with a plasma polymerized layer that is compatible with plastics. The so plasma polymerized layer is expected to establish a strong bond with the surface of individual particles on one end and on the other end present to the matrix a surface that possesses similar properties. It is well known in composite industry that the main reasons for lower mechanical properties of composites are related to incompatibility between surface properties of both fillers and matrix. With our approach the plasma polymerized interfacial layer will prevent particles from aggregating into cluster when they are mixed with plastics (this is the main source of mechanical defects). It would also serve as a bridge to transfer the mechanical properties of fibers to the matrix and result in improved properties for composites. The surface properties of plasma polymerized layer can also be finely tuned to match the properties of the desired matrix simply with the appropriate choice of precursor and plasma processing parameters.

These attributes allow optimistic expectation that plasma processing can be applied to composites manufacturing simply by inserting an inline plasma reactor to achieve the desired pre-treatment/treatment or by building a separate unit to treat fillers before mixing. The benefit of this research would also be useful to improve adhesive bonding as well as paints and coatings adhesion. ■

Effect of Locality of Growth on Certain Strength Properties of Douglas-fir

1961

Arthur F. Noskowiak and James D. Snodgrass

Abstract

The western forest products industry through the Western Pine Association sponsored a massive research project on certain strength properties of Douglas-fir. By the late 1950's, the industry was well into cutting the second growth forest and there was some question as to whether the strength properties found originally in the lumber from the virgin forest logs was the same or greater than in the lumber from second growth logs. Douglas-fir was categorized for strength at the time as coast, intermediate and Rocky Mountain types. The coast fir had the highest strength values and the Rocky Mountain type the lowest values.

The research was conducted jointly by the Wood Technology Section at Washington State University and the Forest Research Laboratory at Oregon State University. This research had to determine the strength properties of the "new" Douglas-fir lumber being produced from about 1600 sawmills.

Major strength properties and specific gravity were determined and compared for clear, unseasoned wood of Douglas-fir grown in the Coast and Inland regions. Together, these regions comprise the commercial range of this species in 10 far-western states of the United States, excluding Alaska. The range includes trees of the typical variety of Douglas-fir, Pseudotsuga menziesii var. menziesii and the Rocky Mountain variety, P. menziesii var. glauca (Beissn.) Franco.

Specimens for testing were obtained from sawmills by using techniques of probability sampling. This was a departure from the usual standard procedure of gathering bolts from trees in the forest for determining average strength of a species of timber.

Methods for picking specimens at each sawmill resulted in random selection of one piece from a log, and probably only one from a tree. Efficiency and precision were achieved by stratifying the commercial range of Douglas-fir into 19 more or less homogeneous areas for sampling. The Coast region included 10 such areas and the Inland region had nine. Number of samples (sawmills) allocated to each area in a region was proportionate to estimated volume of Douglas-fir lumber produced in the area, relative to estimated total production in the region. Allocation within areas was proportionate to lumber production by mills in six classes delineated according to mill production capacity. A total of 405 sawmills were sampled in this study. These were selected according to a predetermined plan from the 1600 mills known to be cutting this species, such that a random assignment occurred in each area-mill-size stratum.

Standard testing procedures were followed insofar as possible. Estimates of means and measures of dispersion were obtained for specific gravity, moduli of elasticity and rupture in static bending, and crushing and shearing strengths, parallel-to-grain. Estimated mean values of specific gravity and major strength properties were greater for Coastal Douglas-fir than for Inland fir, except shearing strength. Differences between means for the two regions were statistically significant for all properties, as determined by appropriate analysis.

The critical question of whether observed differences were sufficiently large to be of practical importance relative to specification and use of Douglas-fir wood must be decided by agencies concerned with such matters.

Because of the political nature behind this study, the official publication covering this study was not issued until May, 1968. The title of the publication was "Strength and Related Properties of Douglas Fir from mill Samples", Forest Research Laboratory, Bulletin No. 10, Oregon State University, Corvallis, Oregon. Authors were James D. Snodgrass and Arthur F. Noskowiak. A copy of this publication is with the Wood Materials & Engineering Laboratory Report No. 43 and is numbered WMEL 43-A.

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