

Welcome to the July edition of the FWPA R&D newsletter.

Our stories this month include research into obtaining electricity directly from plants; a study showing using on-board computers improves skidding operations during forest harvesting; the development of a flexible wood surfacing material named WoodSkin, which lends itself to all sorts of abstract architectural forms; and a FWPA sponsored report detailing economically viable opportunities for using wood residues left over after milling.

I hope you enjoy reading about these exciting research projects, and the others, presented in our newsletter.

Ric Sinclair
Managing Director, FWPA

MAIN NEWS

Opportunities for using sawmill residues in Australia

Getting the most value from each log is the aim of every good saw mill operator, and using the wood residues left over after milling is an important way to make the best use of precious forests and improve profitability.

A Forest and Wood Products Australia (FWPA) sponsored research project has considered the most economically viable opportunities for using residues, as either energy products such as heating and electricity, or non-energy products such as the basis for chemicals, food additives, engineered wood products and composts. The report, which predominately considers opportunities for small to medium scale timber processing sites, provides an extensive update to the first edition of the same name released in 2007 (FR08.2046).

As well as detailing the many options for using mill residues, the report also includes data sheets on the costs and benefits of producing wood briketts, wood pellets, and electricity generation via steam turbine, reciprocating steam engine or gasifier and internal combustion engine. As each saw mill operates with a unique set of benefits and constraints these data sheets are an easy reference tool for sawmill operators to quickly assess the suitability of each option for their particular circumstances, using the feedstock resources that their mill produces, and to decide on what works best for their business.

Project Reference: PRB280-1112

[Click here for report](#)

Assessing and managing social impacts resulting from forest policy changes

Workers and communities reliant on Australia's native forest timber industry experienced significant changes with the introduction of the Regional Forest Agreements (RFAs) signed between 1997 and 2001. These agreements initiated new strategies about how native forest timber is harvested and processed.

This FWPA sponsored PhD research, by Edwina Loxton (ANU), conducted a social impact assessment and evaluated mitigation strategies (e.g. the Forest Industry Structural Adjustment Package) included in the RFAs that helped forestry businesses, their employees and rural communities adjust to the changes. The research was focused on communities in northern NSW and south-west WA.

The findings showed social impacts occurred as a result of both the negotiation processes used to develop RFAs as well as the consequences of the actual changes introduced by the RFAs. In any future policy decisions it is important to acknowledge and manage the social impacts experienced during the anticipatory stage (i.e. the negotiation/policy design phase), to carefully design and implement mitigation strategies that minimise negative, and enhance positive, social impacts; and recognise that individuals' responses to the changes and impacts they predict or experience are critical to their overall experience of social impacts.



NEW PRODUCT INNOVATIONS

A battery made of wood?

A silver of wood coated with tin could make a tiny, long-lasting, efficient and environmentally friendly battery.

But don't try it at home yet – the components in the battery tested by scientists at the University of Maryland are a thousand times thinner than a piece of paper. Existing batteries are often created on stiff bases, which are too brittle to withstand the swelling and shrinking that happens as electrons are stored in and used up from the battery. Liangbing Hu, Teng Li and their team found that wood fibres are supple enough to let their sodium-ion battery last more than 400 charging cycles, which puts it among the longest lasting nanobatteries.

"Pushing sodium ions through tin anodes often weaken the tin's connection to its base material," said Li. "But the wood fibres are soft enough to serve as a mechanical buffer, and thus can accommodate tin's changes. This is the key to our long-lasting sodium-ion batteries."

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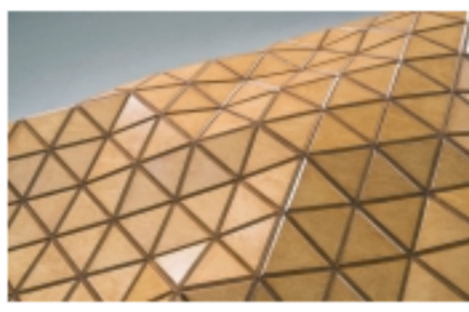
WoodSkin aims to bridge the gap between virtual design and real construction

These days it seems the term architecture has broadened to encompass fantastical projects and shapes in the virtual domain. Interdisciplinary design studio MammFotogramma hope to go some way towards bridging worlds real and virtual through the development of a flexible wood surfacing material named WoodSkin, which, being CNC-friendly, lends itself to all sorts of abstract forms.

WoodSkin is a sandwich of plywood triangular tiles with a textile mesh in between. The production process takes a composite nylon and polymer mesh and encases it between sheets of Finnish plywood, all of which are glued together using a custom mixed adhesive. A three-part compression process then strengthens the material to support its movements. The sandwiched materials are cut into small modules by a CNC mill that creates the 3D pattern and breaks up the rigid surface.

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Image credit: Gizmag



Researchers explore harvesting electricity directly from plants

The sun provides the most abundant source of energy on the planet. However, only a tiny fraction of the solar radiation on Earth is converted into useful energy. To help solve this problem, researchers at the University of Georgia looked to nature for inspiration, and they are now developing a new technology that makes it possible to use plants to generate electricity.

"Clean energy is the need of the century," said Ramaraja Ramasamy, assistant professor in the UGA College of Engineering and the corresponding author of a paper describing the process in the Journal of Energy and Environmental Science. "This approach may one day transform our ability to generate cleaner power from sunlight using plant-based systems".

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Image credit: UGA Today



New fluid-repellent paper could lead to inexpensive diagnostic devices

Scientists at the Georgia Institute of Technology have produced a new kind of paper that repels a range of liquids, including water and oil. The new paper shows significant promise as an affordable and recyclable packaging material, but it's the paper's potential as an inexpensive biomedical diagnostic tool that has really got the researchers excited.

By applying a chemical coating and creating new surface patterns at the nanometer and micron-scale, the researchers are able to reproduce the same repellent effect in the paper that is observed in the leaves of the lotus plant. This changes the paper from an absorbent material to one which repels all fluids.

So far, the new paper has only been produced in samples of roughly 10 cm on a side, but the researchers are confident that the process can be scaled-up.

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Image credit: Gizmag



TIMBER CONSTRUCTION AND DESIGN

Prefab houses that are glued, not nailed, together

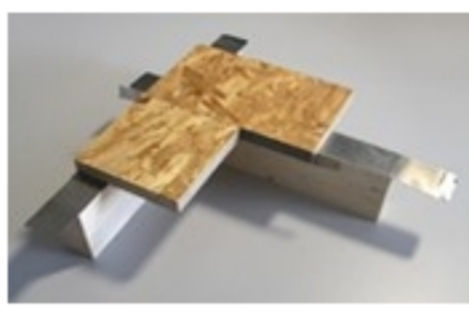
With prefabricated houses, the dream of having one's own home can quickly become a reality. Until now, nails have been used to hold the individual components together. Now an adhesive tape has been developed to perform this task.

A research group, lead by the Fraunhofer Institute for Wood Research, have come up with a new approach to joining boards and other timber parts together for construction. "We've developed an adhesive tape that sets in under a minute to reliably and durably bond together the individual components," says Dr. Andreas Zillesen. The adhesive sets at the push of a button, so to speak. This means that when we apply the adhesive tape when assembling components, we can wait as long as we like without the adhesive drying out, as other kinds of adhesive would."

The secret is inside the material itself: unlike ordinary adhesive tape, it does not consist merely of a backing material and adhesive – it also has its own "heating system".

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Image credit: Fraunhofer WKI



42 storey timber tower report

A new report has been released outlining the design of a 42 storey timber tower, using a system described as the "Concrete Jointed Timber Frame".

Prepared by Skidmore Owings and Merrill LLP (SOM) and funded by America's Softwood Lumber Board, the goal of the "Timber Tower Research Project" was to develop a structural system for tall buildings that uses mass timber as the main structural material and minimises the embodied carbon footprint of the building. The structural system research was applied to a prototypical building based on an existing concrete benchmark for comparison.

This system plays to the strengths of both timber and concrete and allows the engineer to apply sound tall building engineering fundamentals. The result is believed to be an efficient structure that could compete with reinforced concrete and steel while reducing the carbon footprint by 60 to 75%.

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Image credit: SOM



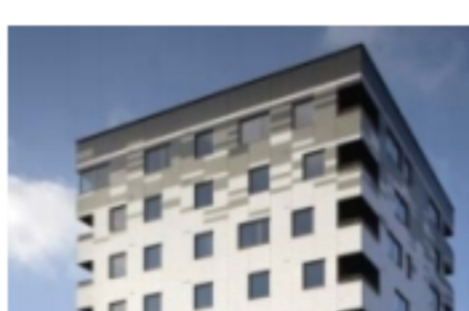
Green star buildings slash emissions by two-thirds

A new study has revealed that buildings which possess Green Star certification emit only around a third the greenhouse gas emissions of their conventional peers within Australia.

The report, entitled "The Value of Green Star: A decade of environmental benefits", was released by the Green Building Council of Australia (GBCA) and provides an analysis of 428 Green-Star-certified buildings and fitouts. The report compares the performance of these Green Star-certified buildings with average Australian buildings and minimum practice benchmarks.

According to GBCA chief executive Romilly Madew, the study is groundbreaking in terms of its range and scope. "This is the first time we've quantified green star's overall impact on Australia's built environment," she said.

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WOOD HARVESTING, TRANSPORT AND LOGISTICS

On-board computers to increase skidding productivity

The usefulness of on-board computers to improve skidding operations was determined through research on South African operations.

The study examined three extraction operations on three sites in South African pine sawtimber operations. Multi-lit on-board computers developed by FPMotions were fitted to cable and grapple skidders. While the computers were collecting data, parallel manual time studies took place. This was used to evaluate the accuracy of the data from the on-board computers.

The results show that the use of the vibration sensor of the on-board computer, together with operator input, could be used to adequately determine the machine utilisation rate. The GPS track-log of the on-board computer could also be used to determine machine utilisation, but it was found that a considerable amount of post-operation processing was necessary to correctly interpret the data. GPS data could also be used to perform work studies for productivity determination, but it was also found to require much post-operation data manipulation.

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Fighter aircraft technology in forest machines

Will fighter aircraft technology make its way into the forest to enable more efficient operation of forestry machines? The Swedish-Norwegian company Optea is ready to present its pioneering 'The Forest Falcon' to the world's gaze. A head-up display (HUD) for the operator, featuring all the necessary information projected directly into the air, could take the operation of forest machines to new heights.

"Our images appear as if you have a transparent screen hanging on a fishing rod five metres in front of you, exactly where you look when you're working in the forest," explains Esteban Arboix, CEO of Optea AB. "Because you get the information right there and right away, you can also work faster and more efficiently."

So far the company's HUD has only been tested on a small scale. Later this year a larger one-year study will begin of the technology and its usability in the forest.

[Click here for source](#)

Image credit: ElmiaWood



OTHER INFORMATION

Pulp and paper industry switching to closed-loop water systems

The pulp and paper industry's focus on water recycling, biogas generation and sludge management is sustaining strong investments in the water and wastewater treatment market.

According to an analysis from consultancy firm Frost & Sullivan, the pulp and paper industry is seeking advanced water and wastewater treatment technologies which will see the industry expand by more than 50% by 2020.

Frost & Sullivan energy and environmental research analyst Paulina Szyplinska said: "Pulp and paper manufacturers are looking for advanced water and wastewater treatment technologies with an efficient energy rating and easy operation and maintenance."

The report highlights that pulp and paper manufacturers are switching from conventional treatment systems to more sophisticated solutions such as membranes to increase treatment levels and reduce the loss of raw materials. Szyplinska added: "Continuous technological advancements and infrastructure improvements are vital to boost recycling rates."

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Image credit: edieWater



Is wood-based biofuel more harmful for the environment?

Wood-based biofuel could be more harmful for the environment than previously thought because intensive forest management practices may lead to the release of underground carbon.

A US study, which involved assessing several recent research papers about lower soil carbon levels, found that carbon emissions analyses often do not account for carbon stored in deep soils. Intensive forest management practices can release this carbon into the atmosphere.

Co-author and Dartmouth College Professor Andrew Friedland said the study suggests "boosting our reliance on wood could increase the release of carbon stored in mineral soil. Researchers urged policymakers to reconsider encouraging the use of trees in biofuel. The study, "Mineral soil carbon fluxes in forests and implications for carbon balance assessments" can be found in the journal of "Global Change Biology-Bioenergy".

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