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# The building material of the future

by CHIARA MACFARLANE

THE RAPID uptake in Australia of energy rating systems for new and existing buildings demonstrates a growing commitment to pursuing sustainable building practices and heralds a new era for engineered timber products. Consumers increasingly concerned about the environmental impacts of our built environment are spurring market demand for building materials that require less energy to produce and which have specific and enhanced performance attributes.

Dwindling resource levels has seen an increased desire to utilise available resources effectively, with innovative approaches to building design and the promotion of 'green' building materials. Advances in the design and manufacture of engineered wood products (EWP) has seen multiple high performance products replace many energy-intensive building materials. Industry standards and quality assurance measures have rebuilt consumer

confidence in EWPs, while the enhanced structural and physical properties has allowed greater design flexibility and facilitated energy efficient building design and construction.

Bruce Bell, director of Laminated Timber Supplies, believes engineered wood products are the building material of the future. "Timber is the only truly renewable building material," he says.

"Wood products harvested from forests store carbon for the life of the product. New forests replace those that have been harvested with the result that net atmospheric carbon accumulations fall."

Bell believes products from responsibly managed timber plantations play a significant role in mitigating effects of climate change and should be promoted as an eco-friendly alternative to traditional building materials.

He also believes that demand for engineered wood products will increase as environmental compliance issues force the building industry find substitutes for materials



■ Central Equity GL10 DuraBeam portals, Southbank.

with emissions intensive energy profiles.

"When harvested and

processed, timber uses little energy compared to steel which consumes up to 24 times more energy per tonne produced. Aluminium consumes a massive 126 times more energy per tonne."

The fact that EWP require more primary energy to manufacture than solid lumbar is allayed by their enhanced thermal qualities, fire resistance properties and longer life spans. The use of life-cycle assessments (LCA) that consider a product's overall energy profile is becoming popular as buildings aim for 5 Star Energy profiles through the NABERS and Green Star Energy Ratings. These systems consider production impacts from raw material manufacture, through to distribution, use, maintenance and disposal. LCA studies have shown that timber rates better than steel and concrete in terms of consumed energy, global warming potential, air emissions and solid waste production.

An effective alternative to non-renewable, or less-recyclable mineral or petrochemical based materials, engineered wood products are also much lighter than steel and concrete, and therefore require less consumed energy in transit. The ability to produce products with an A grade finished appearance means some EWP such as glued laminated timber (Glulam) are commonly used as the finished product, reducing overall product use. "All our Glulam beams have an A-grade appearance as our standard finish, which means the surface is near perfect for both exposed face appearance and

painting face finish," says Bell.

It's this ability to engineer specific and enhanced characteristics into timber products that has seen increased market demand for engineered timber products. Fabricated from various timber species, these products have defined and reliable structural properties and enhanced capabilities. Produced to precise design specifications and applications, products such as glued laminated timber, medium density fibre board, veneer and plywood products are replacing traditional wood products as consumers demand products that are aesthetically pleasing and have consistent structural and physical properties.

The production of innovative processing procedures has enabled wood modification to eliminate many of variable attributes inherent to untreated timber. Raw material can be made permeable through microwave processing, providing a uniform raw material for subsequent processing. On line pressure impregnation systems treat timber with preservative treatments and durable coatings to protect against decay, moisture and insects. Sound waves are used to determine the stiffness of the timber, allowing the arrangement of laminations in areas of greatest stress, ensuring a structurally superior product. Combining traditional timber work such as finger-joints with glued laminated technology creates large wood panels and extended curves; enhancing creative modern design.

Such treatment systems

improve durability, create specific engineering properties (density, hardness, stiffness, hardness and creep), provide dimensional stability and allow specific machining and surface finishing characteristics to be created.

## Making the most of what we've got

In addition to creating defined characteristics, EWPs make use of a diverse range of timber and natural bio-fibre based materials demonstrating an innovative approach towards a sustainable timber industry. Able to incorporate residues from sawn timber production, agricultural residues, defective wood and low value fibres, EWPs maximise available resources and stimulate demand for small diameter timber and fast plantation grown timber. The technology is adaptable to a changing resource base and shifting market needs, ensuring the sector remains competitive in a changing building culture.

Dr Con Adams, Senior Research Fellow at Monash University's Timber Engineering Department, believes Australian manufacturing standards and improved industry regulation has renewed interest in EWP. "Fifteen years ago there were some quality control issues which saw the initial enthusiasm for EWP wane," says Adams. "However, the industry has evolved, creating industry standards and quality control processes that have improved consumer confidence in the products."

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■ Camberwell Girls Grammar School ... two coats of Cutek on DuraBeam silvertop ash.

# Wood goes from strength to strength

THE ADVANTAGES and potential uses of laminated wood were highlighted at the International Symposium on Veneer Processing and Products in Finland in May.

Forestry Tasmania managing director Bob Gordon told the symposium that eucalypt veneer was recognised as one of the best timbers for container floors and that Forestry Tasmania's brand name had achieved a strong market position.

"Our wood accounts for 10% of the international container floor market and we have become the world's largest single supplier of hardwood veneer," he said.

Gordon and Forestry Tasmania overseas business manager Sandy Chen attended the conference which was seen as an opportunity to further plans to develop and market Tasmanian laminated veneer lumber (LVL) as a high value structural product.

"Hardwood LVL can replace steel and concrete

and will increase veneer value by at least 20%," Gordon said.

"Diversifying into this area will not only expand our product base and bring greater returns it will also mean more employment and help us to better withstand the global financial crisis."

The two executives said the major premise of the conference was that to save the planet there is a need to grow more trees and to use more wood.

Buildings are responsible for 40% of the world's consumption of energy and materials and 34% of the world's carbon dioxide emissions.

"The potential benefits of using products like structural hardwood LVL were highlighted in a presentation on the environmental advantages of building with wood over using steel or concrete. For example, houses built from wood store an average of 29 tonnes of carbon, the equivalent to that emitted by a car over five years.

"In Europe it is quite

common to have six-storey buildings, including apartment blocks, made from wood - mostly LVL which is an environmentally friendly replacement steel.

"I was particularly impressed by the Sibelius Hall Congress and Concert Centre in Lahti in Finland which we visited after the conference," Gordon said.

"The six-storey high building which is covered in glass has a wooden structure and an exterior plywood wall with a translucent finish.

"The spacious entrance area has timber roof framing supported by nine large LVL columns. The open raised gallery is also supported by LVL beams.

The auditorium, which seats 1250, is made entirely from wood, including the seats and the balconies.

"The building is not only a wonderful architectural achievement but is also a great example of imaginative ways to use wood," Gordon said.

## The building material of future

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Australian manufacturers are also increasingly seeking environmental credentials such as the Forest Stewardship Certification as consumers demand product sourced from ethical and sustainable practices. Bell would like to see mandatory membership to industry regulatory bodies for Australian manufacturers of EWP, to promote quality assurance and consumer confidence in the products.

The creation of The Glue Lamination Timber Association Australia (GLTAA) has provided a vehicle for the promotion of glued timber laminates. Establishing a performance guide, a third party accreditation process and conducting ongoing quality audits, the GLTAA promotes industry regulation and compliance. The Monash Engineering Centre conducts third party quality audits on behalf of the GLTAA, ensuring manufacturers adhere to industry standards.

"In addition to spot quality checks we maintain a comprehensive data base of information which allows the industry to examine trends and pinpoint areas for improvement," said Dr Adams. At present, membership to GLTAA and the Engineered Wood Products Association Australasia (EWPA) Australasia

is voluntary, but all products must be made in accordance with stringent manufacturing standards.

Many industry experts believe increased marketing of EWPs is needed to ensure mass acceptance of the products within the residential and commercial building sectors. Although current demand is primarily for custom made projects, there is a chance to increase market demand if the building industry accepts EWP as a choice material for residential and commercial building. Bell says the challenge is changing perceptions within the building culture; where substitute products like steel have become the industry norm. Building foundations are still dominated by concrete slabs, despite innovations in the preservative treated wooden piles that provide foundations that are fast and simple to install, while being highly durable. Advances in pre-fabricating timber frames for on-site delivery allows faster installation and less on site waste - yet many builders still prefer to create frames on site using traditional timber processes.

This illustrates a need for raised awareness and increased dialogue between the timber industry and relevant building sectors. Bell believes in addition to ongoing scientific

research and industry accreditation processes, there must be a push for timber engineering in tertiary institutions. "There is still a lot of ignorance and misinformation," he says. Education will ensure the next generation of engineers, architects, builders and designers are savvy about potential of EWP to both meet user needs and promote effective resource management.

To remain competitive and viable, the timber industry needs to continue research and development of innovative products like engineered timber products. As a locally produced eco-friendly building material, EWPs are a tool that can increase public confidence in the timber industry's commitment to sustainable practices. The enhanced properties of EWP push the boundaries traditionally associated with timber products, allowing the design and creation of award winning buildings that are both aesthetically pleasing and meet modern energy targets.

## Eco-friendly way to simulate hardwood

THERE'S A strange connection between Norway, the tropics, rainforests and an all-new wood. Kebony, a sleek, dark wood, has all the characteristics of endangered mahogany from Peru's Amazon rainforest.

However, it is manufactured in Norway, in a five-day process that instills all the qualities of rare, tropical hardwood into sustainable softwood.

The company that makes it, Kebony, says it comes with none of the environmental cost.

"We have a green solution for the tropical wood market and we are there to take that market or at least be part of it," according to Kebony chief executive officer Christian Jebsen.

The global market for wood products from tropical forests is estimated to be worth some \$20 billion each year, according to the International Tropical Timber Organisation.

Kebony's move into the global wood market follows more than a decade of research started in the late 1990s by Canadian scientist Marc Schneider of the University of New Brunswick.

Rigorous testing took place before the first trial production in 2004. Strong demand for the product convinced the company to build a new plant with 10 times the production capacity. That plant opened in January.

"What we are doing with our technology is to permanently transform the wood so it doesn't

change. Our process is 100% environmentally friendly," Jebsen said.

The process involves injecting softwood with a patented formula that includes Furfuryl alcohol, a waste by-product of sugar cane production.

The wood is then subjected to pressure, heated and dried before being cured at high temperatures to create a product that the company says is stronger, more stable than untreated softwood and weather-proof.

Kebony's environmental credentials have been endorsed with the receipt of the Nordic region's eco-label, the Swan. It's also received Norway's national environmental prize, the "Glass Bear."

On a cost basis, the company says it can compete with the price of authentic teak on the European market.

Kebony is "slightly more expensive" when compared to pressure-treated wood, but it doesn't contain any of the potentially harmful metals or pesticides that are commonly used to improve the wood's durability.

Jebsen sees some of the company's best opportunities in the boat-building industry, where rare teak from Myanmar is being used at the luxury end of the market.

Now, the company is also planning a move into the US decking market where it is scouting for clients and recruiting distributors.

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