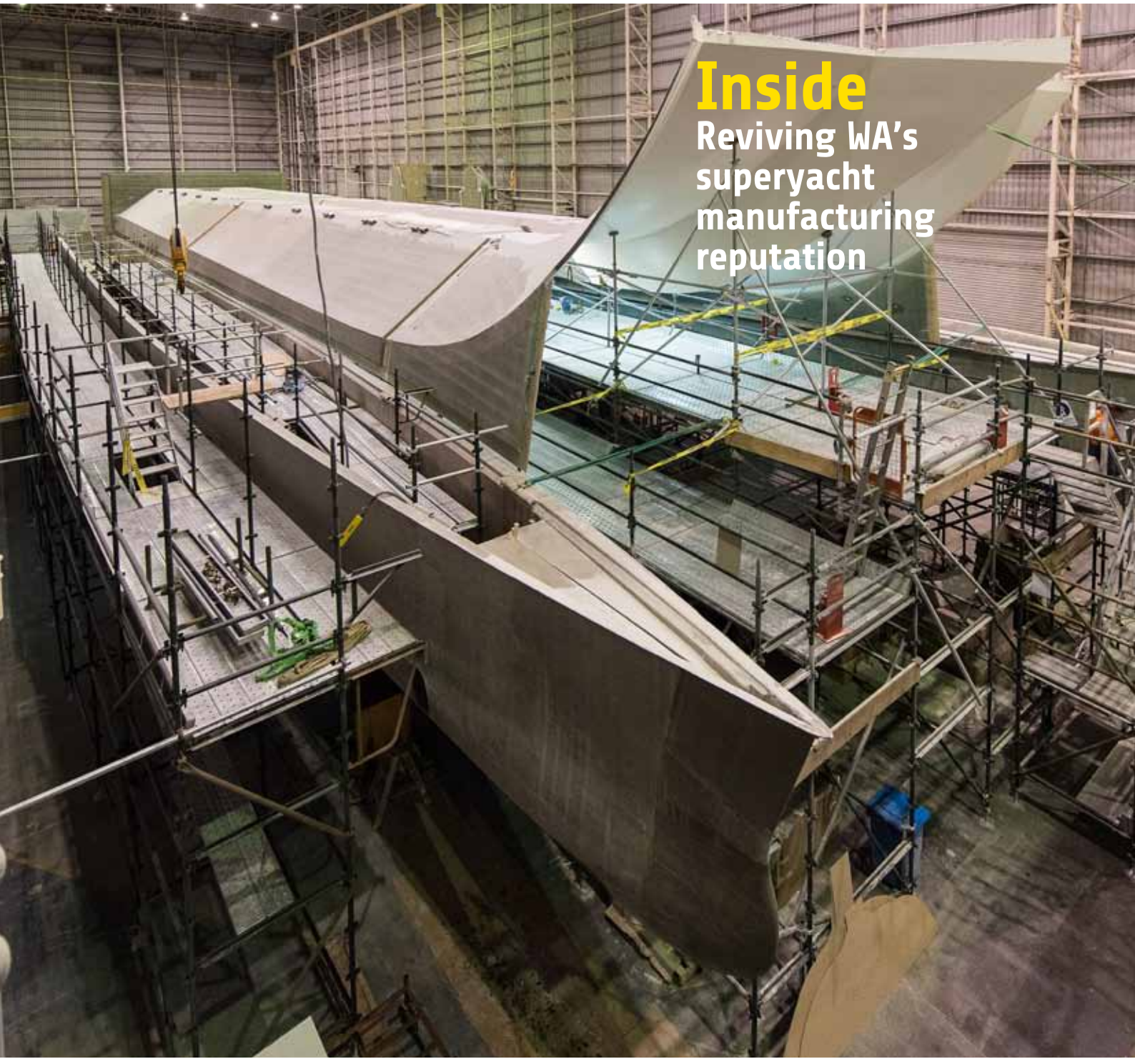
Connection

Issue 42 • June 2016

The official magazine of Composites Australia



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President's letter

In the shadow of this marathon federal election – eight weeks instead of the usual five or six – there are reports of accelerating activity levels across our sector with signs that composites manufacturing is broadening into new markets and applications such as infrastructure.

Examples in this issue of *Connection* include the growing support for composite pipe systems as the preferred material for Australia's major water and sewer infrastructure projects demonstrated by RPC Technologies (page 6) and the rehabilitation of the Cooktown Pier by Wagners CFT (page 8).

Omni Tankers expansion into European markets (page 5) with its innovative carbon fibre tank solution for safer and more cost-efficient transport of dangerous and corrosive goods, is another example. The story of Croker Oars (page 14) provides an interesting insight into the key factors behind the family company's success in growing domestic and international markets.

While the news of increases in orders and use of composites is heartening, it has triggered a skills and labour shortage, among other operating challenges. The test for both major parties in this federal election is to develop sound policies that enable small businesses to thrive, particularly manufacturers and their suppliers. I personally concur with the findings of the Ai Group's annual survey of federal budget priorities that revealed that Australia's high company tax rate is the key concern for businesses across the manufacturing, services and construction industries in 2016.

The Advanced Composites Innovation Conference, hosted by Composites Australia in Melbourne in April, inspired everyone attending. In her opening address, Victoria's Minister for Industry, Energy and Resources, Ms Lily D'Ambrosio outlined her government's Future Industries strategies. It was pleasing to hear the Minister acknowledge that composite materials underpin several of the strategies' priority sectors, including transport technologies, construction technologies and defence technologies.

Having travelled all the way from California, keynote speaker Dr Leslie Cohen, Senior Vice President, New Business Development and Strategic Technology with aerospace supplier HITCO Carbon Composites, set the tone for the conference with an upbeat look at what he described as the "inspirational" way the composites industry was rising to the occasion through innovation. He also provided insights into how the digital age can be leveraged to reduce the costs of manufacturing composite components. A fuller report on the conference can be found on page 10.

Composites Australia's focus for some time has been to give the sector a greater voice with those responsible for specifying and designing structures in order that more composite products are pulled into new markets. We are also working with agencies to change relevant specifications and guidelines to include composites. The Board continues to work on additional practical training and the promotion of composite materials at state and federal level.

Composites Australia continues to profile Australian-made composite products and processes through its annual schedule of trade nights and workshops. During March more than 50 composite professionals, some travelling from as far afield as Tasmania, attended the site tour of the Marky Industries plant in Creastmead, Queensland. Co-directors Martin Nicholas and his wife Krystyna generously shared their company's story and conducted small group-tours of the extensive plant. Their company has built a reputation for exceptional product quality, evidenced by the company's Q1 status with the Ford Motor Company and AS/NZS ISO 9001:2008 certification for products and services.

I urge you to check the Events Schedule on Page 19 of this magazine and also the website for upcoming events such as the Marky visit.

I hope you enjoy this 42nd edition of the *Connection* magazine. It brings you news on what is happening in our sector and showcases Australian innovation and capability. The growing library of case studies are also popular pages on our website.

The composite sector needs a strong united voice in these challenging times. I therefore urge you to renew your Composites Australia membership for 2016-17 so the association can continue as the only industry body committed to advancing the sector. By bringing together the resources of composite practitioners, we can do what individual companies can't do for themselves.

Best wishes for everyone for the new financial year.

Genelle Coghlan
President

Members view the composite West Gate Bridge retrofit

by Kerryn Caulfield, Executive Manager, Composites Australia

On a windy autumnal day in April, members enjoyed the exciting privilege of looking over the underside and inside of Melbourne's West Gate Bridge, to inspect the carbon-fibre reinforced polymer (CFRP) retrofit.

With over 38,000km of carbon fibre laminates and 12,000m2 of carbon fibre fabric applied, the strengthening work commissioned by VicRoads continues to be the largest CFRP strengthened bridge anywhere in the world.

Opened in 1978 and originally built to take 40,000 vehicles a day, the increase to more than 160,000 freight and commuter vehicles a day and projections of 235,000 vehicles a day by 2031, required VicRoads to commission works to strengthen and upgrade the structure.

According to Dimi Polymenakos, VicRoads Manager West Gate Bridge, the objectives were to: fortify the bridge's long term structural integrity to ensure it continued to safely cater for current and future demands of commuter and freight traffic in compliance with current and future bridge design standards; improve public safety by installing barriers and upgrading traffic barriers; and reduce congestion by increasing the traffic capacity from four lanes to five in the peak direction and implementing a freeway management system.

Traditionally bridges are strengthened by adhering steel plates or jacketing sections with additional concrete that act in the same way as a splint or putting a cast on a broken limb. But over the past two decades engineers have been investigating alternative bracing materials such as carbon-fibre reinforced polymer (CFRP). CFRP is a strong, lightweight tape and/or fabric that can have up to 10 times the strength of steel, twice the stiffness, yet only one-seventh the weight.

With a significant proportion of today's civil infrastructure old and deteriorating, the ability of many structures to continue to sustain the increasing applied loads is becoming a challenge. The future bodes well for advanced fibre solutions.

Pictured 50 metres above the Yarra and under the West Gate Bridge are: (Back row) Simon Karpels, RPC Technologies; Piers Findlay, Penguin Composites and Rodney Thompson, ACS Australia. (Front row) Anna Civiti, Apical International; Peter Tzelepis, Geofabrics Australasia; Kerryn Caulfield, CA/TTNA; Xiao Ling Zhao, Monash University; Tim Head, CSIRO and Yew Chin Koay, VicRoads.

Nuplex and Allnex agree on acquisition

As Nuplex Industries Ltd shareholders prepare to vote on the acquisition offer received from Allnex Belgium SA/NV (Allnex) earlier this year, for Nuplex Composites ANZ it is "business as usual".

Prior to the meeting, scheduled for 7 July, Allnex needs regulatory approvals in a number of jurisdictions, including New Zealand, Australia and China.

The Independent Directors of Nuplex have unanimously recommended shareholders vote in favour of the offer. Nuplex chairman Peter Springford said: ''Nuplex and Allnex are complementary businesses and bringing them together would create a leading, global, independent coating resins producer."

In a statement Nuplex Composites, a division of Nuplex Industries, said: "It is business as usual. We are the leading manufacturer of unsaturated polyester resins, vinyl ester resins, gelcoats and flowcoats in Australia and New Zealand and remain committed to supporting the local composites industry as we have done for decades."

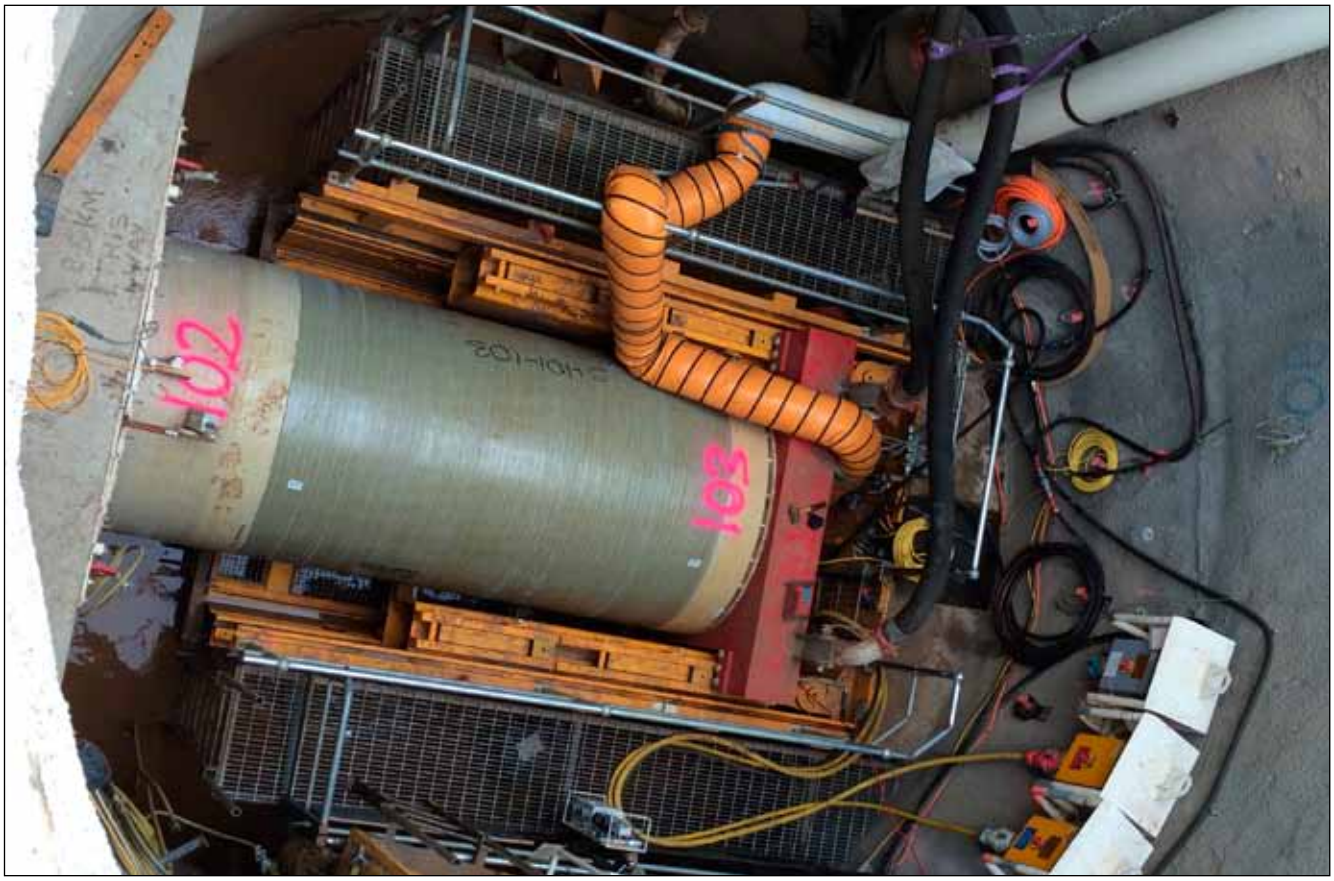
Nuplex started in Auckland in 1952 as a flooring distributor before branching out into resins and polymers during the next 20 years. Today the company's headquarters are in Sydney, and it has 16 production sites located across Asia, Europe, America, Australia and New Zealand, plus a global R&D network of local technical service support, regional R&D centres and a dedicated Innovation Centre in The Netherlands.

Allnex, formerly Cytec Industries' Coating Resins business was acquired by Advent in 2013 for US$1.15 billion. Allnex is a leading global producer of coating resins and additives for architectural, industrial, protective, automotive and special purpose coatings and inks. The company has 17 manufacturing sites and 12 R&D support facilities.

More information:
www.nuplex.com/Corporate/investor-center/news

Composite pipes secure Australia's modern water and sewer infrastructure

Composite pipe systems are becoming the preferred material for Australia's major water and sewer infrastructure projects.



RPC's GRP jacking pipe is designed to seal as it is shunted into place along the pre-drilled tunnel to be part of Australia's longest GRP pipe jacking project – Yarra Valley Water's Amaroo Main Sewer.

In the latest of a growing number of projects, RPC Pipe Systems in Adelaide, a wholly owned subsidiary of RPC Technologies, is manufacturing and supplying continuous filament wound glass reinforced plastic pipe (GRP) to expand vital sewerage infrastructure in Melbourne's northern growth corridor.

Yarra Valley Water's contractor John Holland is progressing the Amaroo Main Sewer in leaps and bounds, tunnelling and pipe jacking the GRP pipe into place 14 to 20 metres below ground, with minimal disruption to the local community. The two to three metre long GRP pipes, with an internal diameter of up to 1.6 metres, are shunted between 161 and 785 metres along the pre-drilled tunnel, the pipe design ensuring each join is sealed.

On completion, the 8.5 km sewer will be the longest GRP pipe jacking in Australia and an important proving ground for Australian manufactured GRP jacking pipes.

RPC Pipe Systems Manager of Engineering, Mr Mark Robinson said substantive testing of the FLOWTITE® pipe system conclusively demonstrated the capability and advantages of GRP pipe in terms of weight, durability, corrosion resistance and environmental impact.

John Holland's Project Engineer Cameron Woodgate is confident in the pipe's strength and suitability for the project: "There were a number of strength tests carried out on the pipe before the project started and FLOWTITE® surpassed all requirements," said Mr Woodgate.

RPC Technologies' Corio plant, near Geelong, is supplying 23 GRP inspection manhole liners, channel liners and the vortex structures that manage the direction of the sewer flow and capture foreign objects flushed into the system.

The liners range from 3.2 to six metres in diameter and between 9.8m and 23m deep. They are easier to install than traditional construction methods, strong, corrosion resistant and light weight, says Mr Simon Karpeles, General Manager Engineering

Infrastructure for RPC Technologies. "Our solution, developed in collaboration with John Holland, can cut construction time from weeks to days, producing significant cost efficiencies. The vortex structures, drop pipes and internals are factory-fitted, saving months of on-site installation time and eliminating the need for crews to enter the excavated shafts, considerably minimising WH&S risk," he said.

"The totally sealed GRP system is rapidly gaining acceptance as the modern, cost effective way to replace aging brick and concrete sewers in cities around Australia and to deliver new water and sewer infrastructure to rural and growing urban areas."

RPC's Managing Director Tony Caristo said: "High performance composite solutions are the fabric of the future for infrastructure providers, industry and the communities they serve. We are absolutely thrilled that John Holland selected GRP and local engineering and manufacturing capability for this vital infrastructure project."

Pat McCafferty, Managing Director Yarra Valley Water said "The $130 million Amaroo Main Sewer is the first piece of a $400m investment by Yarra Valley Water over the next five years. It will provide a waste water infrastructure backbone for development of this growing northern part of Melbourne, supporting population growth in the north, enabling the formation of thriving communities, and job creation in the region."

Yarra Valley Water's Project Manager Robert Fittock said the 8.5 km of sewerage infrastructure will collect and transfer the vast majority of sewage in Melbourne's Northern Growth Corridor. "We are confident that we will have a fit for purpose asset that will last the 100-year design life and beyond."

The GRP channel liner is part of an innovative solution developed by RPC Technologies in collaboration with John Holland for Yarra Valley Water's Amaroo Main Sewer project.

More information: RPC Technologies www.rpctechnologies.com
Yarra Valley Water www.yvw.com.au

Composites give new life and safety to cyclone ravaged wharf

The redevelopment of the Cooktown waterfront in Far North Queensland highlights the benefits of composite materials for infrastructure in corrosive environments.

Queensland-based composite manufacturer Wagners Composite Fibre Technologies won the tender to replace the deteriorated wharf superstructure as part of a $4 million project to revitalise the town's foreshore and its esplanade.

Wagners General Manager Engineering, Michael Kemp said the company was able to draw on experience with composites in civil infrastructure gained over the last 15 years and the proven strength and quality of its pull-wound pultrusion assemblies.

Quality control is assured through rigorous batch analysis for shear strength and modulus testing, tensile strength and modulus testing, compression strength and modulus testing plus completeness of cure.

"Composites were the preferred solution because of their proven performance in marine and corrosive environments and the fast construction we can achieve because of their light weight and ease of handling," says Mr Kemp.

The wharf, used by large commercial fishing vessels and tour boats, required a superstructure capable of taking heavier loads including trucks and a crane, however the existing concrete piles were deemed sound.

"The design and the works also had to take into consideration standards for maritime structures, the close proximity to important natural habitats and the structure had to be cyclone rated," said Mr Kemp.

The superstructure installation was divided into stages (bays) so there was no requirement for a barge or water-based crane. The timber superstructure was cut, lifted and moved and replaced by the pre-drilled and labelled lightweight composite components that were assembled on site and lifted into place by the local council's forklift equipment. The new composite bay became the platform for the removal of the timber superstructure and installation of the next bay.

Composite handrails and light posts and fender piles completed the wharf.

Mr Kemp said working with local government required the building of long term relationships, a community focus, the ability to demonstrate value for money including the calculated whole of life costs (savings) and recognition of the distribution of risk and priority for resilient infrastructure.

Wagners drew on naval architect and structural engineers for design and engineering and on engineering consultants for structural certification.

Top: The new Cooktown commercial wharf – built with composites to last, minimise disturbance to natural habitats and withstand cyclones.
Above: Fast construction - a light crane lifts the wharf superstructure into place.
Right: Beneath the wharf prior to rehabilitation.

Australia to host international school on composites in infrastructure

The inaugural International Summer School on Composites in Infrastructure (ISSCI) will be held in Wollongong, Australia on 18-22 July 2016.

The ISSCI will be hosted by the University of Wollongong, supported by co-organisers: The Hong Kong Polytechnic University, Queen's University Belfast, Tsinghua University, the University of Queensland and Southern Cross University.

With the focus on the structural use of fibre-reinforced polymer (FRP) composites in infrastructure, the ISSCI, will be taught by a strong team of experts, including some of the world's leading scholars in the field.

"The ISSCI aims to prepare researchers and postgraduate students for high-quality research in the area, and to prepare engineers for practical applications," says co-chair of the organising committee, Dr Tao Yu, a Senior Lecturer in civil engineering and a Co-Director of the International Centre for Composites in Infrastructure at the University of Wollongong.

More information: Google search ISSCI or contact Dr Tao Yu, University of Wollongong T: 02 4221 3786 E:taoy@uow.edu.au

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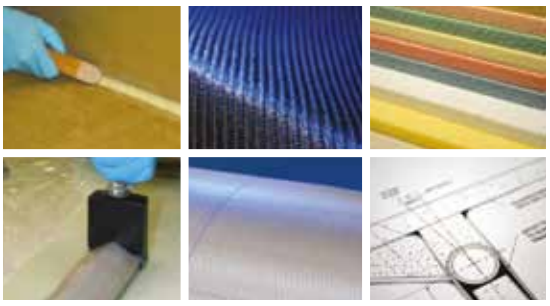

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Andrea Francolini, Tim Wright, Ragamuffin, Danish Yachts, Southerly Designs, Majesty Yachts.

ACI-16 confirms a strong future for composites

The 2016 Advanced Composites Innovation Conference was a great success judging by the very positive feedback from delegates and speakers.

The opening plenary session set the scene with the three keynote speakers challenging and inspiring optimism in the future for composites in the 100-plus audience.

In her opening address, Victoria's Minister for Industry, Energy and Resources, Ms Lily D'Ambrosio made the point that "the businesses that are thriving are nimble, focussed and outward looking".

The government's recently announced Future Industries strategies, supported by a $20 million Sector Growth Program, were designed to support such businesses, said Minister D'Ambrosio.

"Victoria is well placed to become a hub of advanced manufacturing excellence and composites are a critical part of this exciting future," she said.

"In particular, composite materials underpin several of the strategies' priority sectors, including transport technologies, construction technologies and defence technologies."

Picking up on the Minister's theme, Mr Andrew Stevens, chair of the recently established $14 million Advanced Manufacturing Growth Centre, said that Australia's manufacturing sector was going through a challenging transitional phase, "but with every threat there is an opportunity".

"We may not compete on production costs because our competitors have no shortage of labour, but we can out-perform in terms of differentiated products and their performance."

"All of us have a mission to develop competitiveness and economic lifters." He said Australia's advanced manufacturing sector needed to collaborate more and build on each other's strengths to develop game-changing products for global manufacturers. "The way to the future is to find ways into these value-chains," he said.

Keynote speaker Dr Leslie Cohen, Senior Vice President, New Business Development and Strategic Technology with aerospace supplier HITCO Carbon Composites, agreed: "It is not so much about labour as it is about being smart – having passion and the ability and leveraging the digital-age," said Dr. Cohen.

"As we automate we create the potential for higher profits and much lower sensitivity to the cost of touch labor. But, the profit is being eaten up by manual inspection, rework and repair. We must leverage sensor suites to capture the locations of defects and harmonise with automation to eliminate the creation of defects thereby leveraging the digital thread and creating profit."

Right: Keynote speaker Dr Leslie Cohen (HITCO Carbon Composites) gave a motivating presentation.
Below left: Prof. Murray Scott presents the Advanced Composites Structures Society Best Paper Award to Dr Adrian Orifici (RMIT University).
Below Right: Victorian Minister for Industry, Energy and resources, Ms Lily D'Ambrosio opens the conference.

"Without a high quality sensor suite we are stuck in the 20th century with no ability to leverage a 21st century digital technology that will reduce costs at high and low production rates. The biggest benefit is reducing rework and repair downtime, the single largest contribution to the lack of profitability in making AFP hardware."

He followed with advice on how to break into the global manufacturing supply chains by approaching them as a partner.

Left: Yew Chin Koay (VicRoads), Kelvin Chee (Pacific Resins), Gerard Laffan (GURIT).
Right: Stephen Brennan (BI Glassfibre), Mike Leggett (Oceania Composites Engineering), keynote speaker Paul Marks (Argosy International).

Above left: Sobhan Fakhrhoseini and Kathleen Beggs (Carbon Nexus, Deakin University).
Above centre: Andreas De Palmenaer (Institut für Textiltechnik at the RWTH Aachen University), Genelle Coghlan (Colan), Leona Reif (Fibreglass Design Panels).
Above right: John van der Woude (Penguin Composites), Floreana Coman (FCST), Jeff Lawrence (Sykes), Ashley Denmead (Carbon Revolution).
Left: Roger Cater (PARTEC Institute), John van der Woude, Brian Stick (NCS Composites), Martin Nikolas (MARKY Industries), Damien Bensley (Colan).

Left: Dr Leslie Cohen (HICTO Carbon Composites), Dr Rik Heslehurst (Heslehurst & Associates), Frank Masino (Maystorrr).
Right: Kerryn Caulfield (Composites Australia), Murray Scott (ACS Australia), Dan Naiker (Nuplex).

"The supplier is dead. Airbus, Boeing, the big automotive manufacturers want partners."

The pitch to a potential partner should include leveraging points that identify their challenge and show how you can help them succeed, he said.

The first day's industry stream, led by Dan Naiker, Nuplex Technical Services Manager; Michael Kemp, General Manager Engineering for Wagner CFT Manufacturing; and Darren Bishop, Senior Manager Operations – Victoria, for RPC Technologies, also generated a great deal of interest and discussion.

And, as a leading academic presenter on the second day commented, "This audience is really engaged."

"Delegates appeared and sounded energised by the topics and the speakers on both days with plenty of discussion both in the sessions and at the breaks," said conference organiser, Kerryn Caulfield, Executive Officer of Composites Australia.

"New connections were made, existing relationships renewed and strengthened and ideas for collaborations explored. It was clear the messages encouraging collaboration, not just between industry and R&D organisations but with each other, resonated."

A big thank you to SAMPE, the Australian Composites Structures Society (ACSS), and in particular Rik Heslehurst, for their invaluable support and input into the conference organisation and to our sponsors without whom the conference would not be possible.

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Composite Sandwich Structure Design Requirements

Composite Engineer's Viewpoint
By Rik Heslehurst PhD, MEng, BEng (Aero) FIEAust, FRAeS, CPEng

Panel Bending Behaviour

Sandwich panel bending behaviour is somewhat difficult based on the mathematical complexities of the analysis. Simplified solutions to the structural performance equations of motion have been derived by a number of authors and an application of that analysis is summarised here.

The deformation of a rectangular sandwich panel, Figure 1, where the core is at least four times the skin thickness, is based on specially orthotropic composite facings with the panel simply supported on all four edges under a uniformly distributed pressure load (p_o). A specially orthotropic laminate possesses mid-plane through-the-thickness symmetry has zero, or near-zero, values for the twist-coupling flexural stiffness coefficients (D_{16}, D_{61}, D_{26}, D_{62}). The deformation, based on the double Fourier sinewave series, at any point in the panel, is given by:

$$w(x,y)=\sum_{m=1}^{\infty}\sum_{n=1}^{\infty}A_{mn}\sin\left(\frac{m\pi x}{a}\right)\sin\left(\frac{n\pi x}{b}\right)$$

$$A_{mn}=B_{mn}\left[D_{11}\left(\frac{m\pi}{a}\right)^4+2(D_{12}+2D_{66})\left(\frac{m\pi}{a}\right)^2\left(\frac{n\pi}{b}\right)^2+D_{22}\left(\frac{n\pi}{b}\right)^4\right]^{-1}$$

$$B_{mn}=\frac{4p_o}{\pi^2 mn}\left[1-(-1)^m\right]\left[1-(-1)^n\right]$$

Where:
m and n are series integer values 1, 2, 3, 4 ....
a and b are the panel length and width dimensions, respectively
D_{ij} are the 9 components of the bending stiffness matrix (i and j = 1, 2, 6)

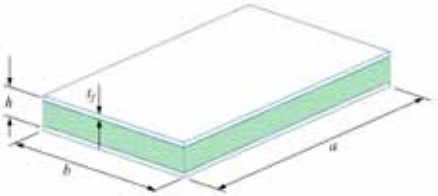


Figure 1: Sandwich Panel Geometry

The maximum deformation of the panel is at the panel mid-point, $x = a/2$ and $y = b/2$. From the double Fourier series expression of the deformation expression $w(x, y)$, even number values of m and n are zero. Typically the first four series values represent no less than 95% of the maximum deformation and for this discussion this will be considered as the limits of the summation. Thus the deformation parameters B_{mn} are:

$$B_{11}=\frac{16p_o}{\pi^2}\qquad B_{31}=B_{13}=\frac{16p_o}{3\pi^2}\qquad B_{33}=\frac{16p_o}{9\pi^2}$$

The maximum deformation at the panel centre is thus:

$$w\left(a/2,b/2\right)=A_{11}+A_{31}+A_{13}+A_{33}$$

Where:

$$A_{11}=\frac{16a^4p_o}{\pi^6}\left[D_{11}+2(D_{12}+2D_{66})R^2+D_{22}R^4\right]^{-1}$$

$$A_{31}=\frac{16a^4p_o}{3\pi^6}\left[81D_{11}+18(D_{12}+2D_{66})R^2+D_{22}R^4\right]^{-1}$$

$$A_{13}=\frac{16a^4p_o}{3\pi^6}\left[D_{11}+18(D_{12}+2D_{66})R^2+81D_{22}R^4\right]^{-1}$$

$$A_{33}=\frac{16a^4p_o}{9\pi^6}\left[81D_{11}+162(D_{12}+2D_{66})R^2+81D_{22}R^4\right]^{-1}$$

$R=a/b$ or the panel aspect ratio.

In a previous article we saw that the relationship between the bending stiffness of sandwich panels and the axial stiffness was related by $h^2/4$. With a simple parameterisation of the deflection expression we can observe the central deformation in normalised form and in terms of the skin engineering stiffness properties and panel geometry. This is expressed as:

$$w_{max}\left[\frac{9\pi^6h^2t_fE_{f_2}}{32a^4(1-\nu_{21}\nu_{12})p_o}\right]=\begin{bmatrix}9\left[\left(E_{f_1}/E_{f_2}\right)+2\left(\nu_{21}\left(E_{f_1}/E_{f_2}\right)+\left(G_{f_{12}}/E_{f_2}\right)\right)R^2+R^4\right]^{-1}\\ -3\left[81\left(E_{f_1}/E_{f_2}\right)+18\left(\nu_{21}\left(E_{f_1}/E_{f_2}\right)+\left(G_{f_{12}}/E_{f_2}\right)\right)R^2+E_{f_2}R^4\right]^{-1}\\ -3\left[\left(E_{f_1}/E_{f_2}\right)+18\left(\nu_{21}\left(E_{f_1}/E_{f_2}\right)+\left(G_{f_{12}}/E_{f_2}\right)\right)R^2+81E_{f_2}R^4\right]^{-1}\\ +\left[81\left(E_{f_1}/E_{f_2}\right)+162\left(\nu_{21}\left(E_{f_1}/E_{f_2}\right)+\left(G_{f_{12}}/E_{f_2}\right)\right)R^2+81E_{f_2}R^4\right]^{-1}\end{bmatrix}$$

Whilst geometry (aspect ratio), boundary conditions and surface load all play an important role in determining the panel bending performance, the composite skinned sandwich structure flexural stiffness [Dij] has a role to play in structural performance, as seen in Figure 2.

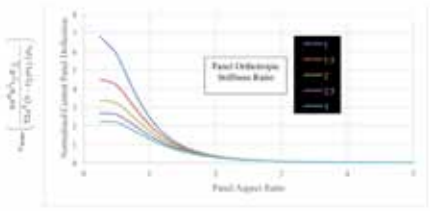


Figure 2: Central Bending Deformation of a Composite Skinned Sandwich Panel

This normalised plot (Figure 2) clearly shows that as the aspect ratio of the sandwich panel increases the influence of the composite skin laminate configuration becomes insignificant and, at aspect ratios of two and greater the panel will perform like a sandwich structure with isotropic skins. Also note that core shear deformation is neglected if the panel planar dimensions are greater that 50 times the core thickness. Other boundary conditions (fixed or clamped) will decrease the panel bending deformation performance.

In the next article we will discuss sandwich panel vibration behaviour with a focus on natural frequency determination and the effects of damping afforded by composite materials.

All articles published in Engineer's Viewpoint are available on the Composites Australia website (www.compositesaustralia.com.au/industry). Rik welcomes questions, comments and your point of view by email to rikheslehurst@gmail.com

CST Composites supports sailors going for gold

CST Composites is looking forward to the 2016 Rio Olympics with a keen eye on the sailing events.

Australia's Olympic Gold medallists Nathan Outteridge & Iain Jensen racing in the lead-up to the Rio Olympics. Image: Australian Sailing Team/Beau Outteridge

Numerous sailors from different countries, across a number of different classes, are hoping to win gold in Rio, using CST Composite's latest tiller extension products. The tiller extensions are critical in steering the yachts through the course.

They are the result of years of development by the Sydney-based carbon fibre and composite tubing, profiles and components manufacturer that had its beginnings in high performance sailing masts.

Founder and CEO Clive Watts, a keen sailor working for Hawker de Havilland on advanced aerospace composite components for Boeing in 1995, identified an opportunity in the high performance sailing market for filament wound masts. He set to work and built his own filament winding machine and software from first principles.

After winning several world titles, CST Composites' filament wound sailing masts quickly became popular and remain the most technologically advanced sailing filament wound masts on the market. Continued development of filament winding technology has enabled CST Composites to diversify into new niche markets and continue to develop its sailing products.

"We are very passionate about what we do and about providing the best products for our customers that help them to win races. We have a never-ending quest to go faster!" says Mr Watts.

"In order to do this we have aligned ourselves with some of the best sailors on the planet and fortunately for us, they have been based in Australia which has helped with development of our products."

In the 2012 London Olympics, the CST Tiller Extension products were used successfully by many sailors and helped win gold in the Laser and 49er classes.

Clynton Wade-Lehmann, CST's Marine Sales Manager and a former Olympic sailor says: "Our tiller extension is 22mm in diameter and is untapered so it's easier to grip. Also the fibres aren't unidirectional. By orienting fibres off axis we've engineered some flex into the product, while improving durability. The final layer is an open-weave, spiral helix in aramid (Kevlar) fibre which further improves damage tolerance and grip. It also aids to keep the extension in one piece even if the carbon fibres are broken."

Carbon fibre innovation takes a family business to international success

Croker Oars, a family business based on the mid-NSW coast, has made its presence felt at every Olympic Games since 1964, just two years after the company started.

Today the distinctive pink-sleeved carbon fibre oars are the preferred equipment for not only the Australian Olympic and Paralympic teams but also for rowers competing for New Zealand, the USA, China, Hong Kong, Singapore, Thailand, Germany, Lithuania, Italy and Ireland.

CEO Darren Croker puts the company's success down to the ergonomic design and quality of their oars and the company's presence at every major rowing regatta in Australia, Europe, the USA and Asia.

"We cannot compete on price but no-one else can match us for the durability and quality of our gear and the comfort they give the rowers," says Mr Croker, son of the company's founder Howard Croker.

"We give the rower maximum comfort and feel at the three points where they are in contact with the boat – the oars, the seat and with our foot stretchers. The more comfortable they are and the better their feel of the boat moving through the water, the harder and longer they can train, the faster and stronger they become."

Today Croker Oars make over 10,000 oars a year with a workforce of 17. It's a far cry from the early 1980s when the company's two oarmakers each took one day to craft a perfectly weighted wooden oar.

Carbon fibre was the game-changer. Investing long hours in research and development into materials, tools, design and technology, the company transitioned into carbon fibre, launching their first carbon fibre oar in September 1990.

The same exacting standards of the craftsman approach to the precision and quality of every oar produced continues to prevail. "We spend a lot of time on R&D, testing materials and processes, problem solving to get the best result for the rowers, breaking new ground," says Mr Croker.

"The weight in the hand and the deflection of every oar that leaves us is the same; there is not more than one gram difference," says Mr Croker.

Each pair of high modulus carbon fibre oars is produced to the requirements of the individual rowers with options provided for different sleeves, handle and grip sizes and styles to maximise comfort and performance.

"When the US women's eights order a new set, their set of oars is exactly what they wanted."

Mr Croker builds a close relationship with the athletes by personally attending a busy schedule of major regattas, getting the athletes to test and provide feedback on the latest refinements to the Croker gear. While the Olympics are prestigious, it's a small rowing regatta when compared with the thousands that will be competing in other events in his diary for the second half of 2016 - Dad Vail Regatta, the largest inter-college rowing event in the USA; Stotesbury Cup in Philadelphia, the world's largest schools regatta; and the Royal Henley Regatta in London.

"I'll spend about three months in Europe and two to three in the US, as well as the major regattas in Australia. It's every weekend, a way of life," says Mr Croker.

It's a passion for the sport that runs through every member of the family from founder Howard Croker, who continues to maintain an active involvement in the company, through to his three sons, Darren, Craig and Troy, who is production manager, and daughter Joanne.

All are familiar faces at rowing and surf lifesaving events across Australia where they connect with their customers on their shared mission to remain the best in the market.

With the aid of Australia's Croker Arrow carbon fibre oars, Australia's men's quadruple rowing team power through the water at the recent 2016 World Rowing Cup in Varese Italy. Image reproduced with permission from Rowing Australia. Copyright Rowing Australia/ Delly Carr.

Sweet sounds of carbon fibre acoustic guitar

Using aerospace-grade carbon fibre material used in helicopters, engineering students at The University of Queensland (UQ) have manufactured an acoustic guitar.

The project team: Students (from left) Vivian Wheatley, Benjamin Blevin, Liam Berneville-Claye and Benjamin Whittam (right) with A/Prof. Martin Veidt and Dr Luigi Vandi.

The team of four undergraduate mechanical engineering students designed and developed the unique guitar as part of their 4th Year Major Design Engineering Course.

Mechanical engineering student Liam Berneville-Clay says the team developed the guitar from scratch using 12 layers of carbon fibre material donated by Airbus Helicopters, Composites, Eagle Farm, which also provided access to one of the company's autoclaves. The guitar's complex geometry presented challenges for the team but the result was worth the 180 hours put into manufacturing.

"It was incredibly challenging, we spent a week straight with very little sleep in the UQ composites lab going through everything and getting this perfect," says Mr Berneville-Clay.

"Everyone who has played it who knows guitars has said that it sounds amazing."

The team's supervisors Dr Luigi Vandi and Associate Professor Martin Veidt said they were intrigued by the team's proposed approach for conducting the project and interested to see how it would develop.

"Compared to any other wooden acoustic guitar, this guitar has the advantage of having the body and the neck made from a single component, which means the entire structure is significantly stiffer, whilst the hollow neck amplifies the acoustic response," says Dr Vandi.

"Composite materials are also very stable against humidity and temperature changes, which means that the guitar will not get out of tune and can be played in the snow or very close to a campfire!"

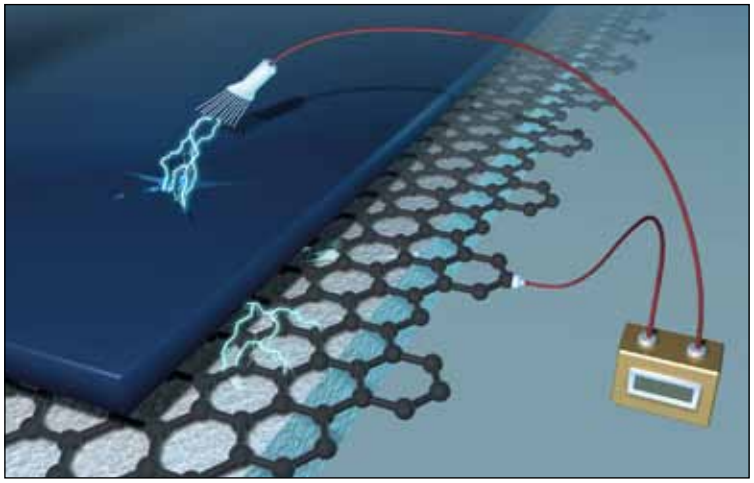
"This carbon fibre guitar is unique in the sense that it is the only guitar known to date that is made using aerospace material and a high-technology autoclave curing process from the aerospace industry."

The instrument will be used to demonstrate the exciting projects UQ students can undertake in their final year major design course and to demonstrate the diversity of products that can be produced from composite materials.

Musician Mark Lowndes enjoys playing the guitar.

Australia takes the lead in race to commercialise graphene for super intelligent materials

An Australian manufacturer is set to become the first company in the world to use the new super material, graphene, in large scale production.

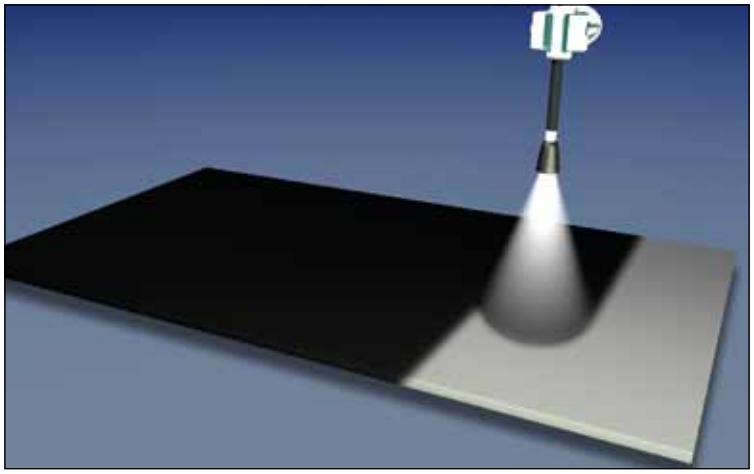


Graphic representation of the graphene sensor layer. Source: ImagineIM

Australia's largest geotextiles manufacturer, Geofabrics, will use graphene coating technology developed by Sydney-based Imagine Intelligent Materials (Imagine IM) to produce leak-detecting textiles for applications in landfill, mining and construction. Production is expected to start later this year.

Graphene, discovered in 2004, is a one atom thick layer of carbon extracted from graphite. It is 100 times stronger than steel, is impervious to water and gases, can stretch like rubber and has extremely high electrical and thermal conductivity. Graphene's discoverers were awarded the Nobel Prize in 2010.

The Geofabrics licensing agreement was one of a series of Imagine IM announcements in recent months, as the company moves to commercialise its IP in graphene coatings for leak detection, sensing systems and water wicking and wetting.



Applying the graphene layer. Source: ImagineIM

In a move pivotal to achieving that goal, the company is establishing Australia's first commercial graphene manufacturing plant in Geelong, Victoria, the home of several innovative carbon fibre start-ups and Deakin University's Carbon Nexus.

Phil Aitchison, COO and head of R&D at Imagine IM, said the pilot plant to be built by Geelong-based engineering company Austeng, would be used to bed-down proprietary production processes and to supply Imagine IM's domestic customers in 2016 and 2017. "It will lay the foundation for our expansion, both domestically and internationally, where we anticipate a need for well over 100 tonnes of graphene per year within the next four years," he said.

"The scientific and engineering team at Imagine IM is proud that we have taken graphene out of the research laboratory and transformed its potential into a genuine commercial application and in so doing boosted Australia's 'clever country' credentials," says Imagine IM CEO Chris Gilbey.

Geofabrics is scheduled to provide the marketplace with the first of its graphene coated geotextile products in August this year. The products will be manufactured at Geofabrics' facility in Albury, NSW.

General Manager, Brendan Swifte said his company was confident in Imagine IM's ability to quality assure the product and the supply chain. "We believe that our bidim® geotextile with graphene coating is a 'game changer' for the geotextile industry. It will be a high tech solution at an extremely competitive price."

Mr Gilbey says Imagine IM is currently discussing international licensing agreements for its graphene technologies in the United States.

"The race to commercialise graphene has seen the launch of numerous companies in the USA, Europe and Asia, however, up till now, no company has been able to develop a product that delivers at industrial scale the potential that has been indicated in research labs."

Graphene Technology Seminar: Imagine IM Chief Operating Officer Phil Aitchison will outline the opportunities for graphene on Wednesday 26 October 2016. See the Composites Australia website for details.

Echo Yachts sets out to revive WA's superyacht manufacturing reputation

In an immense shed at Henderson, south of Perth, a team of veteran ship builders and a Singaporean client are setting out to reinvigorate the state's superyacht industry.

Their showcase is impressive: two record-breaking superyachts. The 84-metre luxury aluminium *White Rabbit Golf*, is the largest trimaran superyacht in the world and the largest and first diesel electric superyacht to be built in Australia. Its shadow vessel, a 46-metre composite catamaran, is the largest vacuum infused vessel built in Australia and one of the largest GRP vessels to be built here.

Claiming the new benchmarks is Echo Yachts, a privately owned venture led by experienced superyacht and fast craft specialists with a background in the manufacture and repair of vessels to serve Australia's off-shore oil and gas projects. The company's portfolio also includes wave piercing ferries, crew transfer vessels and offshore windfarm support vessels.

The Echo Yachts team and their client see the latest project as proof of Australia's capability to compete in the world's glamorous superyacht manufacturing industry.

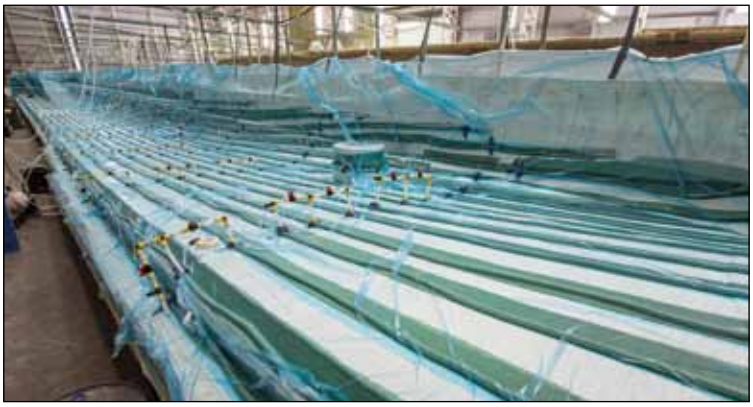
The client approached veteran shipbuilders Mark Stothard, Jurien Van Rongen and Nick Gardiner from Evolution Commercial to take on the project and the company Echo Yachts was born. The number of workers at Echo has since jumped from 50 to 300 engineers, designers and craftsmen skilled in building and fitting out steel, aluminium, composite and combination marine vessels.

"There was a bit of philanthropy in our client supporting us and the build. He wanted to support a skilled industry here in Australia that he was passionate about," says co-director Mark Stothard.

"Australia can excel at the construction of one-off unique vessels that would intimidate the big rival shipyards of Asia and Europe that prefer the predictability and repeatability of building the same or similar designs again and again.

"We in WA, as a shipbuilding state, have proven we're very good at doing one-off custom projects and it is this, coupled with our experience and flexibility, that we bring to the table."

The luxury trimaran, styled externally and internally by Fremantle's Sam Sorgiovanni with the naval architecture by Sydney's One 2 Three Naval Architects, will accommodate 22 guests and 30 crew. The shadow vessel, designed by LOMOcean in New Zealand, is being built with a full GURIT materials package supplied by distributor Summit Composites



The 46m shadow superyacht is the largest vacuum infused vessel to be built in Australia.

and mechanical testing by GURIT. It will cater for 11 guests and 11 crew, and all the luxury 'toys' and exploration equipment the superyacht lifestyle desires, including helicopter, hovercraft, catamaran and jet skis. Its impressive strength to weight ratio will see the shadow vessel efficiently and comfortably cruise in a wide range of environments.

"Just as *White Rabbit Golf* demonstrates all that can be achieved in quality and performance with aluminium, the shadow vessel is a showcase of the best that can be achieved with composites," says co-director Jurien van Rongen.

"We invested a large amount of R&D design and engineering work in the project prior to the start of the build to ensure a construction process that is extremely efficient without any compromise on quality.

"We are using cutting edge laminates and building processes that have proven to produce high quality CNC cut moulds at a fraction of the man-hours traditional mould making methods take.

An artist's impression of the finished superyacht due for launch in August 2017.

"Our focus on R&D, harnessing innovation and transferring skills and knowledge to the younger members of our team are core to achieving our goals – a sustainable superyacht industry producing the highest quality builds that meet our client's requirements, while achieving cost efficiencies that keep us competitive with the best in the world."

More information:
www.echoyachts.com.au
www.gurit.com
www.summitcomposites.com.au

NEWS

Omni Tanker exports to Germany, wins JEC Innovation Award

May marked a big month on the global stage for Sydney-based Omni Tanker Holdings. The company launched its first exports to Germany for the transport of dangerous goods in the European market, plus its carbon fibre composite A & AB transport tankers won a JEC Americas 2016 Innovation Award.

Omni Tanker CEO Daniel Rodgers and CTO Luke Djukic receive their innovation award at the 2016 JEC Americas Conference.

The patented manufacturing technology was developed by the company through extensive research and development to meet the needs of the chemical transport market. The Omni Tanker A and AB Tanks are manufactured using carbon fibre composite materials with a seamless interior of polyethylene thermoplastic.

"These composite tanks are particularly light and strong, with a mass of approximately half that of a steel tank with equivalent volume," says CEO Daniel Rodgers.

"The benefits of a lightweight tank are numerous: fuel savings and reduced emissions associated with transport, and more importantly, an increased payload can be shipped in a single transport run. At the same time, the high chemical resistance of the lining and excellent washout properties supports a wide range of liquid cargoes and back loads.

"With strong performance from the tankers in the Australian market and IP protection through granted international patents, we are expanding into international markets with these first exports to Germany," Says Mr Rogers.

The Omni Tanker, award winning Australian composite innovation for the chemical transport sector.

Manufacturing excellence award for carbon fibre wheel innovator

Dr Ashley Denmead, Engineering and Design Director with Geelong-based Carbon Revolution, has been named the 2016 Victorian Young Manufacturer of the Year.

The annual award, presented by the Victorian government at a gala dinner on 9 June, recognises the contribution of young outstanding individuals in the Victorian manufacturing sector.

The award citation recognises Dr Denmead as one of the original inventors of the technology that led to the world's first commercialised carbon fibre wheel.

"During the final years of study in his mechanical engineering degree at Deakin University, Ashley was team leader and then chief engineer of the university's Formula SAE-A program. This experience shaped his future – the competition, the people involved and the challenge it represented was the seed for his career direction," says the citation.

The 2016 Victorian Young Manufacturer of the Year, Dr Ashley Denmead of Carbon Revolution.

"The drive to produce the highest performing F-SAE race car was the reason one piece carbon fibre wheels were conceived, evolved and manufactured within the team and its supporters."

"Dr Denmead progressed his studies in the form of a PhD based around composite materials at the Centre for Materials and Fibre Innovation at Deakin University. In conjunction with these studies the development of carbon fibre wheels was progressed and Carbon Revolution was founded as a company in 2007.

"Now the Engineering and Design Director for Carbon Revolution, he has contributed to all aspects of the design of the product and process through the last eight years and has inventor status on all patents in the Carbon Revolution IP portfolio."

Events Schedule 2016

August

Wednesday 10
Victoria

Technology webinar: Redefining what is possible in the world of composite engineering for architects and designers
Leading Australian architects, engineers and composite manufacturers will share their learnings from major projects, explore the opportunities and the challenges to realizing the potential of composites in design and architecture and how we can work together to achieve amazing buildings and structures.

Wednesday 5
NSW

Technology Seminar: Composites for Infrastructure
Details to be advised.

Composites Australia

Sponsorship Opportunities

Composites Australia is seeking sponsorship support to ensure the association is successful in meeting its objectives. Sponsorship opportunities are in two categories:

Association Sponsor and Annual Conference Sponsor.
Sponsors demonstrate a strong commitment to the Australian composites industry as well as being seen to working together with Composites Australia to increase awareness of the capabilities of the Australian composites industry and the adoption of composites technologies by Australian manufacturers, engineers, architects and designers.

Tailored sponsorship packages include brand exposure in *Connection* magazine, web, print and electronic communications and conference business development opportunities.

For more information contact Anna Civiti, at Composites Australia
T: 03 9429 9884 Email: admin@compositesaustralia.com.au

October

Wednesday 26
Victoria

Graphene – the future for high performance materials
This half day technology seminar will outline the value proposition for graphene and its potential for new, high performance polymers and composite materials.

Victoria

Annual General Meeting
The AGM will follow this technology seminar at 3pm.

November

Wednesday 23
Perth

Technology Seminar: A road map to lower cost of carbon fibre
Next – Generation Composite Materials
Derek Buckmaster, Director of Carbon Nexus at Deakin University, will provide an overview of the global market for carbon fibre and the journey towards mainstream applications.

December

Thursday 8
Queensland

Technology clinic: Introductory Design of Concrete Structures Internally Reinforced with FRP Bars
A full-day technology workshop with Prof. Brahim Benmokrane, an internationally renowned leader on the innovative use of fibre-reinforced polymer composite materials in construction, and Dr Allan Manalo, senior lecturer at the School of Civil Engineering and Surveying at the University of Southern Queensland.

Composites Australia end of year function
The technology clinic will be followed by the Composites Australia end of year function – a networking event with refreshments for attendees and members.

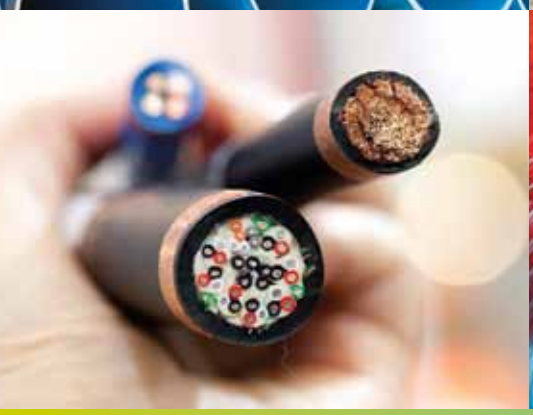
For full details and to register go to
www.compositesaustralia.com.au/events

Disclaimer: This schedule was current at time of going to print but is subject to change. Composites Australia is not liable for any loss or expenses incurred due to changes in the program.









AN EXPANSIVE RANGE OF PRODUCTS TO SUIT YOUR REQUIREMENTS

IMCD Business Group Plastics

Through our expanding partnerships with suppliers, we can offer an extremely comprehensive speciality plastics product portfolio. In-depth knowledge of the plastics production chain, innovative solutions at every stage of the process, technical expertise, market knowledge, and by building solid partnerships with you, we can ensure mutual growth. Contact us to find out how we can develop the perfect solution for you.

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IMCD

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