Connection

Issue 49 • December 2018

The official magazine of Composites Australia

Inside

allnex is the market leader in the manufacturing and distribution of composite materials in Australia, New Zealand and the Pacific Islands. We are the largest and only local producer of composite resins such as gelcoats, flowcoats, and unsaturated polyester and vinyl ester resins.

Our materials are used in a diverse range of composite applications and products such as boats, swimming pools, truck bodies, tanks, roof sheeting, pipelines and many more.

We pride ourselves on offering the region's most comprehensive product portfolio and end-to-end service ranging from research and product development to application advice and ongoing technical support.

Our local R&D operations are complimented by our global innovation network. By listening to our customers, identifying trends in the market place, and understanding the specifics of our customers' challenges, we make sure that we undertake development activities that deliver commercially viable solutions.

Globally, allnex is a leading producer of coating resins and additives for architectural, industrial, protective, automotive and special purpose coatings and inks with an annual revenue of €2.2 billion.

With 33 manufacturing facilities, 23 research and technology support centres and 6 joint ventures, the allnex group is present on four continents and serves customers in over 100 countries.

www.allnex.com

Australia: 1800 789 607
New Zealand: 0800 803 001

Contents

Issue 49 • December 2018

Front Cover
Wagners Pinkenba Wharf story.
Pages 5 and 6.
Image supplied by Russell Genrich.

Feature article

Marky Industries – 40 years in business: Read the heartening story of Krystyna and Martin Nikolas of Marky Industries, from a young married couple with $50 in start-up funds, to employing over 70 people in their purpose-built facility in Crestmead, Queensland.

9

Publisher:
Kerryn Caulfield
Chief Executive

Editorial inquiries:
magazine@compositesaustralia.com.au

Advertising inquiries:
Kerryn Caulfield

Design:
Stefan Morris
stefan.morris@smasheddesigns.com.au

Connection Magazine
is the official magazine of Composites Australia Inc.
ABN 28 611 244 813
Next issue: February 2019

Composites Australia

Composites Australia
17 Rooney Street, Richmond, Victoria 3121
Tel. +61 (0)3 9429 9884
Fax. +61 (0)3 9421 5516
www.compositesaustralia.com.au

President's letter

As we approach the end of another productive year, I take this opportunity to thank you for your support. The day-to-day running of any commercial operation tends to keep your head down and busy, so having an organisation like Composites Australia provides members with a vital link to others in the industry, be they suppliers, manufacturers, educators and researcher, and a great opportunity for learning and business development.

This year, our Executive Manager Kerryn Caulfield initiated an online strategy to chronicle of the Australian composites sector, its capabilities, expertise and breadth. Our linkedin following and feedback is exceeding expectations with Ministers now following our posts and the achievements of our members. As a result our business matching and endorsement program is stronger than ever.

To provide a voice for composites and a landscape for companies to tender supply for projects in the future, we ramped up our relationship with Standards Australia and the Industry Capability Network. The former for products such as pipes, access covers and rebar, as well as legacy committees such as pools and roofing. The ICN is just as keen as we are to see domestic supply for the large renewable energy projects.

The industry tours this year to Steber Craft (Taree), Tanks West (Perth) and Compass Pools (Newcastle) exceeded expectations. The families and staff that run these organisations showered delegates with generous hospitality and shared their stories, including challenges and step-changes.

These assemblies always initiate new programmes such as the formation of the Polymer Processing Industry Advisory Group in WA. A new composites training facility opened in Geelong during November with the Composites Technician apprenticeship on its scope. CA lobbied state and federal governments to develop the qualification (MEM31112) which provides a career pathway through the engineering stream. It was heartening to see the culmination of many years' work.

The annual Composites Australia conference will be held in Sydney from 2 to 4th April 2019. I urge you to join us for the event that will be filled with stimulating presentations from composites practitioners and thought-leaders. The program will feature more industry speakers than ever before, and maybe a DEMO or two – all in one of the world's most breathtaking locations on Sydney Harbour. With a focus on cracking composite applications, I have always benefitted from attending. Stay on and join us for the conference dinner at Luna Park in the shadow of the iconic Sydney Harbour Bridge.

As a member organisation, it is vital that Composites Australia represents the interests and concerns of that membership, so I look forward to meeting with and hearing from many of you over the coming year, particularly at the Composites Australia conference in April 2019, which is our annual opportunity to learn, network, collaborate, promote and support our industry.

Enjoy another excellent issue of Connection. I look forward to seeing you in Sydney.

Leona Reif
President

The Pinkenba Wharf – a step change in high technology building materials.

On the northern side of the Brisbane River, 10 kilometres from the Brisbane central business district and 10 minutes from the Brisbane airport, is a new wharf constructed from next generation composite building materials. Opened at the end of November 2018 by the Hon. Annastacia Palaszczuk MP, Queensland Premier and Minister for Trade, the Pinkenba Wharf is owned and operated by the Wagner Corporation. The wharf is a world first – using composite fibre technology and Wagners' proprietary Earth Friendly Concrete® (EFC) decking system for bridges, jetties and wharfs.

The new wharf is 252m long and 16m wide and constructed to facilitate seamless automated loading and offloading and direct berthing of cement clinker ships that carry up to 35,000 tonnes of cargo. While built primarily for efficiency and to enable easier access to offshore markets for the Wagner-owned cement plant, the wharf will also be used by third parties and has capacity to accommodate a handimax vessel up to 40,000 tonnes deadweight.

The company believes the Pinkenba Wharf to be the largest composites fibre infrastructure project completed to date anywhere in the world, with the highest capacity, and the largest use of structural fibreglass rebar in Australia in a single job. Executive General Manager for Wagners CFT Pty Ltd Michael Kemp said the company now has a mature and proven catalogue of composites work in civil infrastructure, and can confidently apply these skills and techniques to highly corrosive marine field conditions.

In a published paper titled "The use of Geopolymer Concrete and GFRP Materials for an innovative wharf structure", Thomas Glasby et al, EFC Manager, Wagners EFC Pty Ltd, describes the design and construction of the new wharf as follows:

The wharf's deck is comprised of 191 no. prefabricated panels that span between 8 and 12 metres over steel headstock beams. The panels are a unique hybrid structural system developed over many years by Wagners R&D division initially for use in pedestrian and road bridges. The system has been adapted and further developed for the challenging conditions of a marine wharf structure.

Each of the panels consists of:

- Pultruded composite fibre U-girders that provide the tensile beam spanning capacity,
- Geopolymer concrete engaged deck that acts as a compression flange while locking the U-girders together,
- Glass fibre reinforced polymer (GFRP) reinforcing bar in the concrete deck to form a completely non-metallic structure that is risk free for marine exposure,
- Vastly reduced embodied carbon emission compared to conventional steel and concrete materials.

Images of GFRP reinforcing bar layout

Above. Image of completed deck unit hauled by straddle carrier.

Above right. Aerial image of construction

The hybrid deck superstructure represents a new approach using high technology building materials to deliver efficient, low maintenance and low co2 emission engineering structures.

Wagners CFT used its pultrusion process to manufacture the proprietary GFRP sections using Electrical-Corrosion Resistant (ECR) type glass because it is high-grade and has excellent strength performance, workability and chemical resistance. The fibres are bound by a vinyl ester resin to provide the best structural solution at an economical cost.

In summary, a total of 517,637kgs of Fibre-Reinforced Plastic (FRP) were used constructing the wharf including: 573 Composite U Girders - 12m long lengths on the jetty and 8.2m long in the wharf, all manufactured in Toowoomba. Over 305 km (152 tonnes) of 16mm, 19mm and 22mm diameter GFRP rebar was used to reinforce the structure. Fourteen 11.7m long FRP light poles were also installed to illuminate the structure.

Compared with traditional materials, the use of FRP and EFC is known to reduce carbon emissions by 74%.

For some time, Composites Australia has been part of a committee working with Standards Australia to develop Australian Technical Specifications for FRP composite rebar. Given the absence of an Australian standard, the GFRP reinforced geopolymer concrete slabs for the Pinkenba Wharf deck units were designed in accordance with Canadian Standard CSA S806 (2012). As explained by Thomas Glasby, this standard outlines methods for manufacturing requirements, designing beams and slabs for ultimate and service loads, testing of reinforcing bars and testing the bar and slab interactions.

According to Michael Kemp: “GFRP has a very important role to play as reinforcement in concrete structures that will be exposed to harsh environmental conditions where traditional steel reinforcement could corrode, especially in marine and other salt laden environments.”

At the forthcoming Advancing Composites Innovation Conference, to be held in Sydney from 2 – 4th April 2019, Michael will present the on the design and manufacture of the Pinkenba Wharf prefabricated deck units and the testing and material properties validation that were undertaken on this structural system and its component materials.

L-R: Joe Wagner, John Wagner, Henry Wagner, the Hon. Annastacia Palaszczuk MP, QLD Premier and Minister for Trade, Neill Wagner and Denis Wagner. Simone D Photography.

Di-Design – Ensuring Diver Safety

For over 20 years, an average day at the office for DI-Design founder David Inggall was a remote subsea environment, constantly challenged by physical obstacles such as excessive water depth, extreme weather and wild currents. As a specialist in subsea remote intervention and robotic technology for the offshore oil and gas industries, David learnt his craft in places like the depths of the Black Sea and the brutal North Seas where 80 foot-tall freak waves have been recorded.

The need to improve these ruthless working conditions for divers and the maturity and accessibility of advanced materials has led to the worldwide adaptation of remote intervention or diverless (unmanned or remote) technology. Remotely Operated Vehicles (ROVs) now perform tasks previously carried out by divers. ROVs are used extensively in the construction of sub-sea developments and their subsequent repair and maintenance including pipeline surveys and inspection services, connecting pipelines, emergency repair and eventual decommissioning. By adding ancillary devices such as cameras, sonars, manipulators and custom tools, subsea ROVs are increasingly used to expand telecommunications, oceanographic, mining and defence sectors to areas that were once not thought possible or economically viable.

From its facility in Nunawading, Victoria, DI-Design specialises in the design and development of purpose-built subsea tooling including mini ROVs that provide solutions for challenging underwater problems in deep water frontiers off the West Coast of Africa, the North Sea and Australia at depths of over 2,000 metres. "Customarily, Work-Class vehicles ably perform a myriad of deep subsea tasks from Dynamic Positioned (DP) Class Support Vessels, but they are often over specified for shallow (1,000 metres or less) water operations. Our niche is providing more agile, cost effective solutions with a smaller team that can be mobilised quickly for shallow water operations often using smaller surface vessels", said David.

Closer to home in the shallower waters of Bass Strait, DI-Design was engaged to develop solutions for a pipeline decommissioning a subsea oil field. "Our job was to cut through a 10mm split pin, dissemble a calcified 45 tonne rated shackle by unscrewing a 98mm nut and detaching an 8 kg bolt, all in depths of 150 metres with no hands. Our solution was a mini ROV using breakthrough 3D printing technology with carbon fibre composite attachments specifically designed for the commission", said David.

Kerryn Caulfield with David Inggall of DI-Design discussing his "diverless connection running tool", destined for the ocean floor at 250 metres in Bass Strait. The device is used to remotely operate a subsea oil production tree.

David Inggall with a mini subsea ROV, onboard in Bass Strait.

According to David, accessibility of new technologies and materials is enabling increasingly swift response for near same day solutions. His Nunawading facility has been set-up to respond quickly to unexpected scenarios and includes five 3D printers of various capabilities, small scale filament winding machines and a network of local CNC machining capability. On hand is a suite of materials including buoyant plastics and high tensile steels that are chosen for their inherent non-ferrous properties to support pressures up to 700 Bar (10,150PSI) capacity. According to David, composites materials across all processes are an essential part of the suite of materials he uses for subsea remote intervention. In addition to his own equipment, he has built an extensive supply network on which he relies for bespoke components. The composites sleeve over the socket that unscrewed the 98mm nut in Bass Strait was filament wound by Penguin Composites in Tasmania.

For David, 3D printing technology in particular has been a game changer. “Working off-shore in deep water hubs requires ingenuity. We are often called upon to solve unexpected challenging problems in less than ideal conditions. 3D printing technology is now accessible, cost effective and portable. The old methods of tooling up over long periods on land are being challenged by 3D printing functional parts in materials such as carbon fibre, titanium and stainless-steel alloys. We can now solve underwater problems with task specific light weight 3D printing composite tools and perform tasks that were once the domain of divers and work class vehicles”.

Rapid response, efficient and effective interventions are the core concepts of the safety methodology developed by the offshore oil and gas industries to reduce vulnerability, protect personnel and facilities, and avert an environmental incident. “Keeping divers safe is a tenet of the sector, and as the offshore industry moves into deeper waters, the preference for diverless intervention only increases. Jobs such as connecting flow lines are now done by ROVs. It’s an exciting time for the sector and satisfying to be part of a revolution that keeps people safe while solving problems”, says David.

David Inggall will be presenting at the forthcoming Advancing Composites Innovation Conference from 2nd to 3rd April 2019.

Marky Industries – 40 years in business

This year marks 40 years in business for Marky Industries and the husband and wife duo behind the composites manufacturing firm, Krystyna and Martin Nikolas. While they are both clearly in awe of the milestone, they now proudly reflect on their journey from a young married couple with $50 in start-up funds, to employing over 70 people in their purpose-built facility in Crestmead, Queensland.

In 1978, Martin worked for an artist who also made car spoilers, Krystyna explained. "The company defaulted on Martin's wages of $1,400 – a lot of money for a young family – leaving him with only $50 as a consolation payment. That $50 got us started in business".

Both from migrant families escaping the depravations of post war Europe, the young couple's work ethic was defined early. "When we first started, there was no book that we could pick up to teach us how to run a composites manufacturing company. Our plan was simple - we just needed to survive. If you've nothing to fall back on, you have no choice but to keep working and to move forward", said Martin.

The company they formed, Marky Industries, was named by combining both Martin and Krystyna's names. That team approach has resulted in long term success for the composite specialists, manufacturing products for the mining, transport, construction, chemical, defence, recreational and building industries.

Employing a number of composite processes, Marky Industries manufactures a diverse range of components, many for the transport sector, including an award winning fully fitted sleeper cab for client truck production lines. The sleeper cabs are now state of the art, fitted with built-in seats, desk, fridge, TV, microwave and even coffee making machines.

The company's production output also includes over 4,000 components for trains in the Perth Urban Rail System including cosmetic internal panels, as well as train driver dashboards and whole cab fronts for Queensland Rail; all made of fire-retardant resins and specialised composite materials to ensure compliance with ballistic and high impact requirements.

"We're particularly proud of the longevity of our client relationships", says Martin. "We have supplied Mack trucks just-in-time daily deliveries for 35 years. Others such as Volvo, Iveco, Ford, Western Star and Navistar branded trucks have been loyal to us, as we have to them".

Their view is that composite companies can only compete in an environment where there is a reliable and efficient local supply network and a healthy composites manufacturing sector. For this reason, the couple have generously hosted a number of open days at their factory, allowing hundreds of people to tour and witness their production facilities. Martin has also contributed to the industry as a founding member of Plastic and Rubber Technical Education Centre, now known as PARTEC in Brisbane. He has been on the Board of Composites Australia Inc. for many years and is currently serving as Vice President.

Krystyna and Marin Nikolas in their purpose-built facility in Crestmead, Queensland.

A devoted customer base, loyal people and great production capability are key components in business and manufacturing success. However, Krystyna believes these factors are not enough to stay in business. She points out that: "Cash flow is the lifeblood of any small business. Managing cash flow effectively through the good times to weather the bad times, is absolutely essential. As with all SMEs around the world, the financial turmoil following the GFC of 2008-2009 caused an 80% drop in orders for Marky Industries. If we hadn't left profits in the business and had a handle on our cash flow, we wouldn't be here today".

The couple also attribute the company's success and longevity not only by the orders they accept, but by the ones they decline. Seared in their memory is a trip to Canada to sign a global contract with a major truck manufacturing company. "We wanted that contract so much, it clouded our thinking. Just before signing, we did a quick recalculation on the contract presented to us and said, hang on a minute, there is only 1% margin in this. We walked out and flew home". The need to test the economic viability of every deal has been the company's core business motto ever since.

Transport vehicles lined up in the Marky Industries purpose-built facility in Crestmead, Queensland.

Other company success factors include a dedication to continuous improvement and innovation in processes and inputs. A defining moment in the company's journey was achieving Ford Q1 Certification in 1994 that recognised excellence in four critical areas: capable systems, continuous improvement, ongoing performance and customer satisfaction. According to the couple, the indisputable value of Certifications, including the Quality Management System AS/NZS ISO 9001:2008 for products and services, comes from their power to open up international supply chain opportunities.

Martin maintains that he still gets a thrill with every new investment in technology and the resulting step changes in output and quality. "Working closely with our clients to provide unique solutions using specialised materials and manufacturing procedures and testing to achieve the weight, strength and safety performance is very satisfying", he says. The recent investment in closed moulding reusable vacuum membrane technology is already achieving huge production cost savings and efficiencies for the company. The Alan Harper silicone system is cleaner, reduces waste, has minimal exposure to VOCs, and can mould a part in six minutes.

With Krystyna as the Financial Controller and Martin as CEO, the Nikolas family has accomplished a lot together during their first 40 years. They still enjoy going to work every day and plan to continue for years to come. They are also generous in acknowledging the hard work of employees past and present. Martin says that "We could never have remained in business for so long or achieved the success we have without our customers and amazing staff that make up the extended Nikolas family".

Henkel – Developing high performance bonding technologies

Author: Konrad Brimo-Hayel– Henkel Germany
Co-Author: Brad Smith – Henkel Australia

As manufacturers worldwide look to reduce weight to overcome increasing fuel costs, reduce emissions and improve manufacturing processes, they find themselves challenged to set aside the mindset that has dictated traditional material and process choices and to look openly at new and emerging technologies. This includes adhesives and other joining options.

Today, each passenger vehicle contains on average 15 kg of adhesives. Components such as instrument panels, fenders, windshield wipers, gears and the cross members on frames are now secured by various types of adhesives.

Growth in the use of adhesives can be attributed manufacturers turning to polymer-based composites to replace steel and aluminum, which in turn has created a growing need to find effective methods of bonding these types of mixed materials. In some applications, adhesives need to provide structure and rigidity, and in others they need to be flexible and pliable – all while providing a nearly unbreakable bond.

While initially it might seem counter-intuitive, testing has shown that adhesive bonds are more stable than welded joints. This makes them viable options in such demanding uses as in civil infrastructure, recreational vehicles, swimming pools, transport, piping, storage tanks and architecture. Traditional joining methods such as welding and riveting are costly and also compromise the strength of polymer-based composites. Adhesives can also help to seal scratches and joints, while also reducing noise.

In automotive, overcoming the different coefficients of thermal expansion (CTE) of hybrid multi-substrate systems in modern, lightweight bodies is a significant challenge facing designers. The market requires an adhesive that offers both high strength and high elasticity at the same time while ensuring the bond line will last for many years between very different materials.

Lightweight leaf springs made for the Volvo V90 estate, S90 and 60 series models.

Henkel developed the new adhesive Loctite UK 2015 to address the challenge. It is based on two-component polyurethane technology and is ideally suited for use on structural body parts, regardless of whether they are made of fiber-reinforced plastics, painted/e-coated steel or painted/e-coated aluminum.

Composite springs

An innovative example of where plastics composites are taking over from steel is one recently implemented by Volvo for use in its new top-line, crossover SUV model, the XC90, as well as in its premium V90 estate, S90 and 60 Series models. Henkel partnered with Austrian automotive composites specialist Benteler-SGL to redesign the vehicles' rear suspensions.

The aim was to replace the usual helical springs mounted on the rear axle. The team involved did this by using high-pressure resin transfer molding, or HP-RTM, to produce lightweight leaf springs made from an advanced, glass-fiber-reinforced polymer composite material.

The transverse leaf spring enables a more compact axle design than with the bulky helical steel springs it is replacing. The transverse leaf spring allows the elimination of the coil springs, which means the axle protrudes less into the trunk area, leaving more loading space. In addition, the new design provides a smoother ride and improved NVH (noise, vibration, harshness) behavior.

Even more important is that the composite leaf spring offers significant weight savings compared with their metallic counterparts. The new axle system weighs 4.5 kg less than the conventional helical spring construction.

Henkel's flagship product, the Loctite MAX 2 two-component polyurethane composite matrix resin system, is what enabled Benteler-SGL to develop these innovative leaf springs. Loctite MAX 2 has very low initial viscosity, which enables fast injection of the resin into the mold and excellent penetration between the tightly packed reinforcing glass fibers.

Once injected into the mold, the matrix resin cures very quickly, much faster than standard epoxy resins, for demold times as low as one minute per part. The production system installed at Benteler-SGL, which uses a multicavity tool, is designed for a production output of more than 400,000 pieces per year.

Henkel have also developed a new epoxy resin system, the Loctite Max 5 which is incorporating high fracture toughness with the benefits of improved curing processes.

Henkel is working with numerous companies in all industrial sectors with its high-performance composite matrix resins and adhesives. These include structural parts such as body components, exterior paintable parts, structural members and tube, piping applications.

Across numerous industries, the ability to leverage process know-how while also integrating and matching products within an overall package is essential for successfully applying this type of lightweight technology.

Increasing development activity

In 2016, Henkel opened the Composite Lab, a state-of-the-art test facility, in Heidelberg, Germany. A second Composite Lab has also opened in Japan in 2017 to help increasing customer requirements. Here manufactures can work with Henkel experts to develop and test composite parts and optimise series production process conditions. Companies can carry out trials with different test molds on Henkel's own HP-RTM equipment, which has resin injection units for polyurethanes and epoxies coupled to a 380-tonne press.

www.composite-lab.com

The Volvo V90 estate.

CST invests in Centreless Grinding Technology

Custom-made equipment and testing facilities and a highly qualified workforce of inquisitive minds with a love of precision manufacturing is what gives CST Composites in Sydney its competitive edge, according to its founder and Managing Director Clive Watts. CST's expertise in unique filament winding technology was developed through its experience of supplying carbon fibre spars and tubes to the marine sector, which it still services today. The company's client list has expanded exponentially over the past 20 years to include the industrial, aerospace and high-tech markets. A milestone in 2005 was supplying specialised engineered high modulus carbon filament wound tubes to the Hubble Telescope program at NASA's Goddard Space Flight Centre.

Today the company runs a series of filament winding and pultrusion machines as well as a wide range of specialist machines and tools used for the fabrication of composite sections. According to Clive, CST is now the largest user of carbon fibre tow in Australia and New Zealand. "We've grown threefold in recent years because of our brand of precision engineering and manufacturing".

The company is now operating from two factories in south-west Sydney, both of which are swelling with new high-tech equipment to ensure quality and consistency of it's output. CST's recent investment in precision "centreless grinding technology" allows the outside of its carbon fibre composite tubing to be finished within OD tolerances of +/- 50 microns. Laser sensors are also used to measure the tight tolerances. "We have been able to do some jobs to +/- 5 microns. This kind of extreme accuracy, both inside and outside of our tubing is what is required to supply into high tech markets including supercars, electrical goods and aerospace, but it's also what we enjoy doing," says Clive.

Exports have now grown to 93% of the company's output of filament-wound and pultruded product. As testament to the company's innovation strategy, earlier this year, CST Composites received the Global Supply Chain Integration Award at the Endeavour Awards held by Manufacturers' Monthly. The prestigious award was in recognition of its international achievements in supplying Australian manufactured advanced carbon fibre components into global supply chains.

CST continues to invest to strengthen its supply chains by investing in automated machines for making tubes, tool making, raw material production, in-house metrology, data tracking software and marketing. Clive commented "Some people call it 'industry 4.0 and big data' - whatever it is we've been doing it for 23½ years."

Top. Clive Watts, founder of CST with in-house metrology equipment.

Bottom.Clive Watts with Kerryn Caulfield in the CST Ingleburn facility inspecting specialised engineered high modulus filament wound tubes.

Set aside the dates for the Composites Australia Conference. 2 – 4 April 2019

Australia's leading Advancing Composites Innovation Conference will be held in one of the world's most breathtaking locations on Wednesday 3rd and Thursday 4th April 2019.

Now in its 16th year, this flagship event for composite professionals features an outstanding speaker lineup against the backdrop of the world's most stunning harbour. Join us in celebrating manufacturing technology overlooking breath-taking Lavender Bay and in the shadow of the iconic Sydney Harbour Bridge.

As always, the annual Advancing Composites Innovation conference is an opportunity to advance your knowledge, networks and your business, by joining the conversation with industry leaders and researchers at the forefront of new and emerging trends, science and materials. Presentations also feature solutions to the practical challenges encountered in business and manufacturing.

The conference includes two days of presentations, a welcome reception and conference dinner. It is also preceded by a technology workshop.

Conference:

Wednesday 3rd, Thursday 4th April 2019
The Kirribilli Club, 11 Harbourview Crescent, Lavender Bay, NSW 2060

Technology Workshop (half day)

Tuesday 2nd April 2019
The Kirribilli Club, 11 Harbourview Crescent, Lavender Bay, NSW 2060

Conference Dinner

Wednesday 3rd April 2019
Luna Park, Milsons Point, NSW 2060

Details are on the conference website: www.compositesconference.com.au

Composite Sandwich Structures

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

Part 13– Testing for Performance of Sandwich Structures

Destructive testing of sandwich structures is necessary to identify the structural performance, physical and mechanical properties of the sandwich structure as a whole product, or the facings, or the core and/or the facing-to-core adhesion. The most used set of approved sandwich structure testing standards are provided by the American Society for Testing and Methods (ASTM).

The testing methods associated with composite faced sandwich panels are considered based on testing of the composite facing properties (typically attached to the sandwich panel core), the core mechanical, environmental and performance properties, and the overall sandwich panel properties.

Following is a list of the important testing methods for composite faced sandwich structures. The table below lists ASTM test methods that I consider the primary tests that provide evidence of sandwich structure quality under the three categories listed:

1) **Test methods relating to facings (composites):** All composite faced sandwich structures operate in environmental conditions that expose them to moisture, temperature and other environmental fluids and effects. There are seven specifically related ASTM testing standards relating to the composite facing materials of the sandwich panel.
2) **Test methods relating to cores:** The testing of core materials and the weakness between the core and the facing adhesion is critical to identifying the common weak-link in sandwich structures. More often than not sandwich panel failure initiates in the core materials.
3) **Test methods relating to sandwich panels:** Overall sandwich panel performance is determined by the following ASTM test methods. Some of the following list have been repeated but can be used to isolate different performance outcomes.

ASTM	Standard Test Method	1	2	3
C 271 – 16	Density of Sandwich Core Materials		✓	
C 272 – 16	Water Absorption of Core Materials for Sandwich Constructions		✓	
C 273 – 16	Shear Properties of Sandwich Core Materials		✓	
C 297 – 16	Flatwise Tensile Strength of Sandwich Constructions		✓	✓
C 363 – 16	Node Tensile Strength of Honeycomb Core Materials		✓	
C 364 – 16	Edgewise Compressive Strength of Sandwich Constructions	✓		✓
C 365 – 16	Flatwise Compressive Properties of Sandwich Cores		✓	✓
C 366 – 16	Measurement of Thickness of Sandwich Cores		✓	
C 393 – 16	Core Shear Properties of Sandwich Constructions by Beam Flexure		✓	✓
C 394 – 16	Shear Fatigue of Sandwich Core Materials		✓	
C 480	Flexure Creep of Sandwich Constructions			✓
C 481 – 99 (16)	Laboratory Aging of Sandwich Constructions		✓	✓
D 1781	Climbing Drum Peel for Adhesives			✓
D 3039 – 17	Tensile Properties of Polymer Matrix Composite Materials	✓		
D 3518 – 18	In-Plane Shear Response of Polymer Matrix Composite Materials by Tensile Test of a ±45 Laminate	✓		
D 6416	Two-Dimensional Flexural Properties of Simply Supported Sandwich Composite Plates Subjected to a Distributed Load		✓	
D 6641 – 16e1	Compressive Properties of Polymer Matrix Composite Materials Using a Combined Loading Compression (CLC) Test Fixture	✓		
D 7078 – 12	Shear Properties of Composite Materials by V-Notched Rail Shear Method	✓		
D 7249 – 18	Facesheet Properties of Sandwich Constructions by Long Beam Flexure	✓		✓
D 7250 – 16	Standard Practice for Determining Sandwich Beam Flexural and Shear Stiffness	✓	✓	✓
D 7336 – 16	Static Energy Absorption Properties of Honeycomb Sandwich Core Materials		✓	
D 7766	Standard Practice for Damage Resistance Testing of Sandwich Constructions			✓
E 2004	Face sheet Cleavage of Sandwich Panels			✓
F 1645 – 16	Water Migration in Honeycomb Core 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.
The next article will cover Non-Destructive Inspection (NDI) of Sandwich Structures.

N.J. Robinson launches new multi-chip filled gelcoater

N.J. Robinson Limited, the company behind the first Australian-made chopper gun, recently launched a new multi-coloured gelcoater. The multi pump 'Robinson Chip Filled Gelcoater' can spray chips and flakes up to 3,000 microns in diameter in a concentration of up to 40% of filler giving a unique finish. The device is designed with a low pressure internal mix spray unit with a non-mechanical catalyst flowmeter and optional positive displacement catalyst slave pump. The unique straight-through system enables chip, flake or ceramic filled materials to be minutely sprayed as a one-coat or multiple coat application.

The 54 year old company's strategy has always been to grow with their customers. While continuing to offer a comprehensive and evolving range of off-the-shelf spray machinery, N.J. Robinson has grown through its custom-designed and custom-made equipment tailored to the requirements of government, defence and university research centres. One example is the deployment for the University of Queensland of a dispensing unit for one of only two research reactive extrusion lines in Australia.

The business strategy has also opened up export markets in South East Asia, the South Pacific, Europe and the United States. Exports designed and manufactured in the company's West End (QLD) premises now amount to over 60% of their business.

Developing machinery tailored to an array of customers continually challenges the skills and expertise of the N.J. Robinson team, but according to Bruce Garbutt, the skills provided by the traditional "Fitter and Turner" qualification are still relevant today. For this reason, the company remains committed to training and currently has two employees undertaking apprenticeships at the Eagle Farm TAFE Campus (QLD).

According to Bruce materials have improved and standards of precision and accuracy of manufacture have steadily increased through the use of sophisticated machinery for high speed cutting and machining. Increased mechanical strength, heat sensitivity and lightweight alloys have enabled greater design possibilities of specialised equipment for epoxies, polyurethane, glass reinforced concrete, chip gelcoat spray and other materials pumping dispenser units used in most parts of the manufacturing industry. Hardy lightweight components have enabled a reduction of at least 2 kilos in the new chopper gun model.

Audaciously rethinking functional uses for carbon fibre

Sydney-based industrial design firm Talon Technology has two recent additions to its considerable portfolio of multi-award winning products - a carbon fibre tap and eyewear frames. Talon's Managing Director Geoff Germon described the company's new developments as "an audacious rethink" of the traditional uses for carbon fibre composites. The use of new materials and processes in the manufacture of traditional products will open up opportunities for aesthetically elegant, innovative products with greater functionality.

Carbon fibre frames featuring the unique Carbon/Kevlar® hinge system.

For example, Geoff reasons that water taps, now made with ceramic disk valves with rubber seats, no longer need to be made of metal. In terms of fabrication, the Talon carbon fibre tap is a transformational hybrid of a 3D-printed water channel, a syntactic core and a RTM (resin transfer moulding) process. The design of the tap is deliberately organic and mollusc-like, with edges and curved surfaces to make it easy to use with wet hands.

Carbon fibre tap by Talon Technology designed deliberately organic and mollusc like.

The second new product is a moulded eyewear frame that is manufactured in one piece. The front, arms and hinges are made in a single press operation, with only minor detailing and almost no post-finishing. The frame features Talon's unique Carbon/Kevlar® hinge system which is extremely strong and can sustain over 1 million cycles, and is fully integrated into the carbon fibre frame.

The Carbon-Kevlar Hinge is made from co-moulded carbon fibre prepreg wings with a gap between that forms the flex unit. The wings are either a woven carbon fibre/epoxy laminate or a hybrid glass and carbon fibre/epoxy laminate, while the flex unit is woven Kevlar impregnated with a flexible urethane. Geoff explained "Our idea was to develop a composite hinge without any metal that would be super lightweight and also a solution for industries that can't use metal. It took us two years to optimize the performance of this hinge and develop it to be a manufacturable product." Other materials, such as aluminium, can be used on the frames to allow for adjustment.

For Geoff, carbon fibre is not just a pretty finish but crucial to both the form and function of the product. "I am keen for carbon fibre to stay true to its DNA which is to be useful, and not be used simply as a trim piece glued to a metal body," said Geoff.

To add to his portfolio of activities, Geoff is also an Adjunct Professor in Design at the University of Canberra where he teaches a three-day course on composites for industrial design students. Geoff believes that educating a generation of industrial designers and engineers about composites is the catalyst for creating a future where more consumer products will made from composites.

Awesome tour of Compass Pools – Tomago NSW

Delegates and hosts touring the Compass Pools state-of-the-art manufacturing facility in Tomago, NSW.

It was a pleasure to tour Compass Pools (CPA) 21,500m² manufacturing site in the regional town of Tomago NSW in August. Since 1980, over 40,000 CPA swimming pools have been installed across Australia and NZ. The company's R&D and patent strategies continue to serve it well, particularly its development of ceramic core and Bi-luminite™ pool shell technology that uses a dual-layer approach to create a 3D effect when a pool is filled with water.

CEO, Anthony Cross provided delegates with an insight into how CPA and its team are responding to a market searching for unique, personalise swimming pool experiences likely to require bespoke add-on components and interconnectivity. The options for colour and add-ons is ever expanding.

Delivery solutions across our vast country are also being initiated by the company every day. "Freighting a pool that can be over 12 metres long by road takes logistical practice, and a discipline that we take seriously," advised Anthony.

The Compass Pools team showered delegates with hospitality and were generous with their knowledge for which we are grateful.

There are over 800,000 swimming pools in Australia, half of which are likely to be made from fibreglass.

Events Schedule 2019

February

Wednesday 20
Geelong, VIC

Carbon Fibre Workshop

Thursday 21–Friday 22
Geelong, VIC

Carbon Fibre – Future Directions Conference
Advanced materials for advanced manufacturing

April

Tuesday 2–Thursday 4
Sydney, NSW

Composites Australia annual conference – Advancing Composites Innovation
Featuring composites practitioners presenting on the latest developments in composite material technologies, processes and systems. More details at www.compositesconference.com.au

May

Wednesday 1
Perth WA

Technology Clinic covering the use of materials in corrosive environments, particularly the mining, minerals processing, chemical, oil & gas industries as well as the water, waste and desalination industries. More details at www.compositesconference.com.au

July

Thursday 18
Melbourne, VIC

Technology workshop on cost-efficient fibre and textile solutions for lightweight composite components.

August

Sunday 11–Friday 16
Melbourne, VIC

22nd International Conference on Composite Materials 2019
The International Conference on Composite Materials (ICCM) is an international scientific conference devoted to all aspects of composite materials.

December

Wednesday 4
Perth WA

Fibre-reinforced polymer (FRP) bars technology clinic and end of year networking function. Technology workshop on latest developments in FRP reinforced concrete structures followed by end of year networking function.

For full details and to register go to www.compositesaustralia.com.au/events. Further events will be listed on the Composites Australia website as they are confirmed in the New Year.

EXPERIENCE THE DIFFERENCE WITH OUR RESINS AND ADDITIVES

IMCD, accelerators of development

Let's build the world of tomorrow together!

IMCD Australia
Telephone: 1300 130 295
E-mail: cs@imcd.com.au
www.imcdgroup.com

AkzoNobel

aliancys QUALITY RESINS

BYK

IMCD

Value through expertise