

Connection

Issue 43 • November 2016

The official magazine of  **Composites**
Australia

Inside

From Murray Bridge
to world stage: The story
of the Australian-made
composite cauldron



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President's letter

Final message

This is my last report to members as President of Composites Australia and I would like to take the opportunity to thank everyone in the Association for the opportunity to contribute to the industry.

I was first elected President in December 2009. Australia's GDP had plummeted the previous December and we were all anxious to know the depths and timeframe of the downturn that we now refer to as the Global Financial Crisis. Tony Abbott had just become Leader of the Opposition after defeating Malcolm Turnbull; and both Valspar and FGI were still in the market.

I am happy to report that while much has changed these past seven years, Composites Australia is still tracking well. The Association puts considerable work into promoting the uptake of composite solutions by Australian infrastructure authorities, consulting engineers, architects and other end-users. We keep members informed on new and emerging leading-edge technologies through our program of technology clinics. In this regard, I would like to put on record our appreciation of the time, expertise and contribution made by Dr Rik Heslehurst. This year's

tours of Prestige Fibreglass Products in Perth, Marky Industries in Brisbane and the West Gate Bridge in Melbourne were particular highlights.

I'd like to thank Kerryn Caulfield and her team for the excellent management they continue to deliver, and the members of the Board with whom I have had the privilege to work over these past seven years.

I am pleased to be handing over to the very capable Leona Reif, a Director of Fibreglass Design Panels. My parting message to you is to participate in your industry association, take advantage of all it offers you, your people and your business – collaborate where you don't compete, build networks, keep pace with the latest developments, invest in skills and knowledge for your people and yourself, and give back through your continued membership and participation.

Enjoy another excellent issue of *Connection*. I look forward to seeing you at the conference next March!

Genelle Cogan
Director, Colan Australia



Incoming President

As a Director and co-owner of Fibreglass Design Panels, a composites manufacturing business based in Queensland, I am very excited to be part of the Composites Australia team and to have an opportunity to contribute to the promotion of the Australian composites industry.

Our manufacturing business has been running since 1999, with a primary market in the bus and coach industry. I came into the family business in 2008, and work with my brother John in the day-to-day running of our two facilities, in Brisbane and on the Sunshine Coast.

Before my shift to manufacturing, I worked in the Queensland Government undertaking research and policy development in the youth and family services area. I have remained interested in the influence of research and knowledge, and how new technologies can influence our working environment. The importance of collaboration between businesses, government and universities in applying this knowledge is an area that I will be interested in developing in this role as President of Composites Australia.

I have been involved with Composites Australia for almost 10 years and have learnt a lot about the industry through its events and newsletters. The day-to-day running of a manufacturing facility 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, both manufacturing and research, and a great opportunity for learning and business development.

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 March 2017, which is our annual opportunity to learn, network, collaborate, promote and support our industry.

Leona Reif
President

First graduates of composites engineers apprenticeship



Seven Boeing Aerostructures Australia employees are the first in Australia to successfully complete the engineering - composites trade apprenticeship.

The certificate presentation ceremony at Boeing's Port Melbourne facility in August marked an important milestone for all in attendance. The nationally accredited apprenticeship training program was initiated by Composites Australia and realised through the support of Manufacturing Skills Australia.

Launched in 2013 in Victoria through Kangan TAFE, the apprenticeship was picked up by GoTAFE in October 2015 with well-known composites trade trainer Phil Bovis providing continuity for participants.

Brian Scholes, Learning and Development Trainer / Coordinator with Boeing Aerostructures Australia congratulated the graduates for withstanding the changes that prolonged the duration of their training, which began prior to the composites trade course becoming available.

GoTAFE's Commercial Manager for Automotive, Engineering, Marine Craft Construction & Composites, Brett Ambrosio also acknowledged the perseverance of the graduates and thanked Boeing for their support and the good partnership between the company's in-house training and GoTAFE.

Mr Mark Pontil-Scala, General Manager of Regina Glass Fibre Pty Ltd represented the Composites Australia Board at the certificate presentation ceremony. He joined senior managers from Boeing and representatives of GoTAFE and Manufacturing Skills Australia in

Celebrating the completion of their engineering composites apprenticeship with Boeing Aerostructures Australia trainer Brian Scholes (third from right).

congratulating the men on the successful completion of their apprenticeship.

"While your journey has been long and at times challenging, this qualification's beginnings were similarly challenging, but the rewards are in seeing growing numbers of skilled composite tradespeople in the Australian industry," said Mr Pontil-Scala.

"These composites tradespeople have reaped the benefit of that work and are to be congratulated for their commitment to complete the apprenticeship. They are, of course, really fortunate to have an employer like Boeing Australia, that is leading the way with innovative composite manufacturing solutions for the aerospace industry.

"Composites is a career that is creative, giving a great deal of satisfaction and reward. It is also a career where learning never stops, where new technologies and processes are continually being developed and introduced," said Mr Pontil-Scala.


He congratulated Boeing Australia on providing employees with access to a trade qualification in the composites industry which is growing globally as sectors such as aerospace, automotive, transport, civil engineering, architecture and defence recognise the benefits offered by advanced composite technologies.

Troy Yates, Senior Manufacturing Leader at Boeing Australia inspired the group by emphasising that he and many of his fellow senior managers in manufacturing at Boeing Aerospace Australia began their careers as apprentices. "This is only the start for those who want to take their career further. Composites is where the future is with this company."

Mr Yates asked them to use the knowledge gained across multiple areas of the company's production line to identify opportunities for improvement.



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More than five steps is a waste

Veteran manufacturer Frank Cristiano firmly believes Australian manufacturers can successfully compete in today's global economy.

The general manager of Victorian-based composites manufacturer Tricomposite, Mr Cristiano says staying competitive is all about streamlining processes, introducing efficiencies that support ramping up production-rates and reducing costs while ensuring quality.

Since joining Tricomposite three years ago, he has increased monthly component output by 73 per cent to its current rate of 1700 parts per month for primary customer, RV manufacturer Jayco.

Mr Cristiano puts the efficiency gains, and quality improvements, down to a rigorous measurement regime, adoption of a Kaizen (continuous improvement) strategy supported by management and employee training in Lean Manufacturing. Also, joining the High Performance Consortium has personally given him access to senior managers and business owners from diverse industry sectors, all committed to sharing their expertise and knowledge to advance their businesses.

Above all the focus is on customer service, reinforced by exposure to the principles of design-led innovation. "It is looking at the business from the customer's perspective: how can we better meet their needs, help them with efficiencies in their processes," says Mr Cristiano.

"To do that, we had to be agile. We had to have procedures and processes to be able to identify issues early, resolve, assess the impact on our customer's production schedule and keep them informed. Then there is the analysis of the cause behind the issue and how it can be prevented."

Mr Cristiano joined Tricomposite as manager in 2013, taking on the general manager role a year later. Coming from a background in hydraulic



Robotic water-jet cutters contribute to quality consistency and efficiency.

Below right.

Tricomposite general manager Frank Cristiano believes Australian manufacturing can have a strong future.

Below.

Improvements in the LRTM and gelcoat areas have led to a 73 per cent increase in parts production / month compared with three years ago.

engineering and OEM manufacturing in Australia and Asia for the automotive sector, he brought to Tricomposite expertise in advanced manufacturing processes for mass production. The plant currently has one robotic cell with two water-jet cutters and he looks forward to production volumes increasing to a point that justifies further investment in technology.

"You also can't engulf people in high technology straight away. You have to learn to crawl, walk and then run. Introducing change is a progressive process. Today it's about asking, what can we do better.



"It has been the massive improvements in the gelcoat and LRTM areas that have brought us up to 1700 parts per month from 983 three years ago."

Joining the High Performance Consortium (HPC), Mr Cristiano introduced training in Lean Manufacturing principles for his 50 employees, setting out to eliminate waste across the production-line.

"If someone has to walk more than five steps to get the equipment or materials they need to do a job, it's a waste. So we have introduced trolleys to each work station with a person responsible for keeping them stocked. It's better managing the temperature of the vacuum moulds to reduce curing times.

Simple things can bring about rapid improvements in productivity," says Mr Cristiano.

"We weigh all materials and measure, measure, measure down to the electronic counter recording the number of strokes to apply the resin for each part. There is full traceability on every part that leaves the plant and if there's a fault identified we can find the cause, develop or revise the SOP and that leads to training.

"When we started with HPC the "action board" was full of areas the staff (and I) identified for improvement and now it's almost empty."

And if it is a change he can personally make, such

as the electric winches and block and tackle that now hold the weight of each spray gun unit, Mr Cristiano is quick to source and personally install.

"Our people are our best asset and you have got to look after them. These injection hoses are heavy. Imagine pulling them about all day. These (the electric pulleys) reduce fatigue and they can be more productive.

"HPC has been a good partnership for training the guys on all aspects of Lean. I needed the staff to come with me on this journey. Now we have a clean, efficient and safe workplace and a process for continuous improvement and we have more quality control and more ownership from the Team Leaders and team members.

Interestingly some of the rapid improvements have come from suggestions from fellow members of the Consortium – business owners and senior managers from unrelated business – who visited the Tricomposite plant to share ideas, knowledge and experiences.

"They see things we don't see," says Mr Cristiano.

"From my perspective, Australian manufacturing has a strong future. We can mass produce, high quality, cost efficient products and back our products with excellent customer service. We just need to step up and do what we do well, better."

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COLAN  **AUSTRALIA**

Hospital's spiraling sculpture to uplift and connect

A growing number of magnificent composite sculptures are transforming the Perth, Western Australia, landscape as artists discover the exciting potential offered by the material and new design technology.



The latest addition is an eight-metre high sculpture by artist Jon Tarry unveiled by St John of God Murdoch Hospital this month.

Entitled *Elevación*, the sculpture stands at the hospital entrance, part of a multi-million dollar redevelopment project.

Mr Tarry won the commission in a competitive process with his depiction in bronze of St John of God carrying a person watched over by an angel, the spiralling white abstract form created in FRP by Melbourne based Composites Constructions.

Mr Tarry blended these modern and traditional aesthetics and materials to create an artwork with an uplifting, nurturing theme to tie in with the hospital's vision of providing the community with holistic health care, said Chief Executive Officer John Fogarty.

"I wanted to create an artwork for everyone; one that could be open to interpretation so everyone would be able to form a connection with it," Mr Tarry said.

"I combined the two ways of working – traditional modelling in bronze of the two people and contemporary materials in abstract form for the angel, connecting the ground and sky to be aspirational. The two forms together are breathtaking."

Choosing composites for the abstract form, for their strength, light-weight and clean lines, Mr Tarry drew on the latest design and 3D modelling technology which translated directly into production at Stephen Campbell's Composites Constructions facility in Melbourne.

"I know and understand mould making and sculptural form so to be able to do that on a large scale and with organic forms is incredibly exciting. Composites have won me," says the Perth-based artist who has completed more than 42 public and numerous private art commissions in Australia, the USA, Middle East and Europe.

Artist John Tarry's sleek spiraling form aims to uplift the spirits of those entering and leaving the St John of God Murdoch Hospital, in Perth

Mr Campbell is equally as excited with the finished sculpture and being part of Mr Tarry's creative process. He kept Mr Tarry informed of progress with regular photos.

"Boat building involves large complex structures so this project was not a challenge for us but it did involve a lot of handwork, craftsmanship, at every stage," says Mr Campbell.

Using the artist's 3D CAD files and engineering drawings from Perth-based Capital House, moulds and the sandwich foam core were CNC machined, carbon fibre reinforcement added and then FRP hard-coated and finished with a highly durable marine-class paint.

"There were countless hours of hand lay-up and sanding to get the quality and finish we wanted. In all it was three months from getting the artist's drawings to putting the finished sculpture on the truck for the three and a half thousand kilometre trip to Perth. But seeing the result, it is just an amazing sculpture and we are proud to have been part of it."

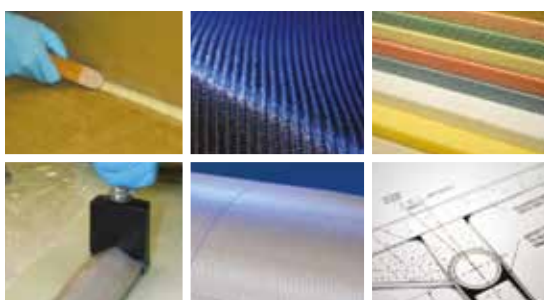


The Composites Constructions team behind the build: (l-r) Mark Copper, Joseph Wonneberger, Leigh Agius, Craig Ginnivan, Stephen Campbell.

Mr Tarry said: "When people arrive at the hospital, before their surgery or procedure, before visiting a loved one or before coming to work, I want them to see the beauty in Elevación and fill up with the spirit of life."

More information:
www.compositesconstructions.com.au
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Images courtesy of:
 Andrea Francolini, Tim Wright, Ragamuffin, Danish Yachts, Southerly Designs, Majesty Yachts.



Papers are invited for presentation at the 2017 Advanced Composites Innovation Conference and Exhibition to be held at the Intercontinental Sanctuary Cove Resort, Queensland on Wednesday and Thursday 29 and 30 March.

In its 14th year, this annual conference hosted by Composites Australia, with the support of SAMPE-Australia and the Engineers Australia technical society, Advanced Composites Structures Society (ACSS), will provide a valuable forum for the sharing of industry and scientific knowledge with domestic and international industry and academic leaders.

“The 2017 conference program will see a strong industry stream exploring market and product opportunities, new technologies and business and financial management,”

– Kerryn Caulfield, CEO of Composites Australia.



The conference exhibition is also an excellent opportunity for the industry to showcase their latest technologies, products and capabilities and network with current and prospective suppliers, customers and colleagues.

Keynote speaker Dr John D. Russell is the Technical Director of the United States Air Force Research Laboratory’s Manufacturing and Industrial Technologies Division. He is also chairman of the Joint Defense Manufacturing Technology Panel which coordinates manufacturing technology requirements and strategies across the military services and agencies.

This year the conference theme is “Shaping the future with composites innovation”. Papers are invited for the Peer Reviewed and Industry streams on topics aligned, but not limited to the theme, through:

- New and emerging composite technologies
- New and emerging composite fibres, resins and systems
- Innovative solutions to design and engineering challenges
- Novel and new technical applications and processes
- Performance analysis and standards
- Support for industry.

The ACSS Best Paper Award of \$500 cash and a certificate will be awarded to the presenting author of the best peer reviewed paper as judged by the conference academic committee chaired by Dr Rik Heslehurst.

The conference exhibition is also an excellent opportunity for the industry to showcase their latest technologies, products and capabilities and network with current and prospective suppliers, customers and colleagues.

By popular demand, highly respected engineering consultant and educator, Dr Heslehurst, will again run a preconference technology workshop. This year the topic is *Detection and Repair of Composite Components and Structures*. The half-day workshop will be held from 12.30pm on Tuesday, 28 March 2017 at the conference venue.

For full details on how you can participate visit www.compositesconference.com

We are extremely fortunate to have the support of the following conference sponsors



IMCD

From adversity comes opportunity

After a major fire destroyed a production building at Perth-based Tanks West, the company decided to take the opportunity, and time, to modernise and extend the facility.



The modernised and extended production facility is delivering efficiencies and quality improvements with the latest air extraction and filtration systems and upgraded gelcoat systems.

Tanks West has been in operation since 1992, manufacturing large capacity FRP liquid storage and transportation tanks for Western Australia's rural and industrial sectors.

In early 2014, a major fire destroyed one of the production buildings on the Canning Vale site. It is believed a small leak from a catalyst supply line on a gelcoat machine, when combined with the extended period of weekend closure time and very high climatic temperatures, resulted in spontaneous combustion. While the fire brigade contained the fire within half an hour, the damage to the equipment and the building was extensive.

The business returned to full production in August this year. The building has been widened and the latest air extraction and filtration systems installed, together with a new compressed air system. These provide cleaner and dryer air, allowing the gelcoat and depositor system to function with less downtime, plus the variable drive compressor only works when in demand resulting in the whole facility being more energy efficient.



The fire caused extensive damage

The gelcoat systems have been upgraded to provided a more accurate catalyst-to-resin ratio and reduce waste when changing colours. An additional station has been added to the gelcoat circuit so that moulds pass under a hot air blower system to speed up and standardise cure before moulds move on to the main layup area. In the layup area the monitoring and recording of all materials including weight of glass deposited, resin ratio and catalyst levels is done and these figures are displayed on fluorescent screens so that operators are always measuring and monitoring their work.

Production Manager Alan Green says Tanks West has always sought to improve processes by keeping abreast of the most advanced resin systems and new advanced technology. "The new production facility is providing far better quality control and there are still opportunities to increase the levels of production so that the total man-hours per unit can be reduced as staff become more familiar with the new equipment. It's also making the working day more enjoyable."

According to Manager Stephen Thompson, the decision to modernise and extend the facility has paid off. "While the loss of the building limited our production for a period of time, out of adversity comes opportunity. Modernising the facility's systems has enabled the company to hold our position as the premier manufacturer and market leader in our field. The focus driving the company is product quality and customer satisfaction; the beneficiaries are our clients."

More information <http://www.tankswest.com.au/>

Composite Sandwich Structure Design Requirements



Composite Engineer's Viewpoint

By Rik Heslehurst PhD, MEng, BEng (Aero) FIEAust, FRAeS, CPEng

Part 8 – Panel Vibration Behaviour

The vibration of sandwich structures with metal skins is well established (see Allen¹). The difficulty with composite skins is that they have orthotropic properties and these complicate the analysis somewhat. For orthotropic skins the natural frequency of a simply supported sandwich panel can be expressed as:

$$\omega_{mn} = \left(\frac{\pi}{Rb} \right)^2 \sqrt{\frac{1}{\rho} \left(D_{11}m^4 + 2(D_{12} + 2D_{66})R^2m^2n^2 + D_{22}R^4n^4 \right)}$$

$$\frac{\omega_{mn}}{h_c} \left(\frac{b}{\pi} \right)^2 \sqrt{\frac{2\rho(1-\nu_{21}\nu_{12})}{E_2t_f}} = \sqrt{\frac{E_{11}}{E_2} \left(\frac{m}{R} \right)^4 + \frac{2\{ \nu_{21}E_1 + 2G_{12}(1-\nu_{21}\nu_{12}) \}}{E_2} \left(\frac{m}{R} \right)^2 + 1}$$

Where: D_{ij} = Sandwich Panel Flexural Stiffness Constants

$$D_{ij} = \begin{bmatrix} \frac{E_{f1}t_f h_c^2}{2(1-\nu_{21}\nu_{12})} & \frac{\nu_{21}E_{f1}t_f h_c^2}{2(1-\nu_{21}\nu_{12})} & 0 \\ \frac{\nu_{21}E_{f1}t_f h_c^2}{2(1-\nu_{21}\nu_{12})} & \frac{E_{f2}t_f h_c^2}{2(1-\nu_{21}\nu_{12})} & 0 \\ 0 & 0 & \frac{G_{f12}t_f h_c^2}{2} \end{bmatrix}$$

Note for the first mode of vibration $m = n = 1$. The natural frequency can be converted to a frequency in cycles per second (Hz) using:

$$f_{mn} = \frac{\omega_{mn}}{2\pi}$$

There are several modes of vibration in a structure and the mode shape is defined by integer values in the longitudinal direction (m) and the transverse direction (n) in the plane of the plate. The natural frequency over a range of vibration modes for a specially orthotropic laminated sandwich plate (i.e. the laminate is symmetric and specially balanced such that $A_{16} = A_{26} = D_{16} = D_{26} = 0$) is given by (Whitney, 1987²):

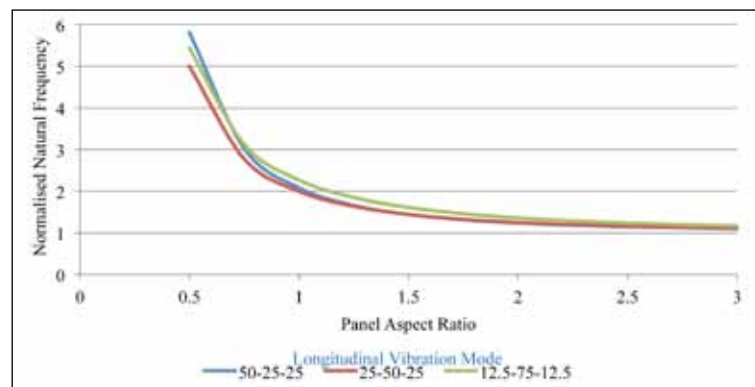
Hence, there are a lot of potential variables in the development of the plate natural frequency. The panel aspect ratio (R) has a major role to play in determining the natural frequency of the structure, as does the panel density (ρ) (controlled by fibre/resin type and the fibre volume ratio to some extent). Also, the factor in defining composite plate natural

frequency is the flexural rigidity of the panel (D_{ij}) and thus the through-the-thickness position of the contributing plies.

For $n = 1$ (first transverse frequency mode) and the sandwich panel expressions for D_{ij} substituted into the terms stiffness properties of the composite laminate into the natural frequency equation we have:

This expression can be plotted for a couple of composite skins with percentages of plies as follows:

- $[0/\pm 45/90] = [50\%/25\%/25\%]$,
- $[0/\pm 45/90] = [25\%/50\%/25\%]$,
- $[0/\pm 45/90] = [12.5\%/75\%/12.5\%]$,



Simply Supported Sandwich Panel with Orthotropic Facings with Natural Frequencies under Mode 1,1 conditions

From this plot the normalised natural frequency basically asymptotes at an aspect ratio above 2. We can also see that the facing have a limited effect on the normalised natural frequency. But the core thickness will play a key role to normalised natural frequency.

In the next article we will discuss structural detail in sandwich panels. Specifically, we will discuss facing and core depth holes, joining sandwich structures, the attachment of fittings and sandwich structure edge requirements.

References:

- Allen H.G., Analysis and Design of Structural Sandwich Panels, Pergamon Press, Sydney, 1969.
- Whitney J.M., Structural Analysis of Laminated Anisotropic Plates, Technomic Publishing Co., Lancaster PA, 1987.

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

Product snapshots shared on social media are paying off for Colan

Using social media, Sydney-based high performance industrial textile manufacturer Colan Australia is engaging with current and potential new customers across the globe at little cost in terms of time, money and effort, according to General Manager Damien Bensley.

The secret is to take your content to where the potential customers hang out, says Mr Bensley. Here he shares the story of the development of Colan's online marketing presence.

Colan Australia updated its website in 2013 adding an eCommerce platform providing a current listing of the company's products for customers to browse and even purchase online.

This proved quite successful and is regularly used as a tool for showing potential and existing customers our vast range of products. At the same time we created a Facebook page, YouTube channel and LinkedIn profile to strengthen the company's online presence.

These helped us to reach potential clients and maintain another level of contact with our existing customer base. However after some time, I found that the key element that was missing from our current online presence was a quick visual aid for showing our range of Surf Craft industry materials.

For many composite surf manufacturers, the textile industry-based descriptions we normally use are not enough. The aesthetic nature of many of these products meant I was constantly emailing or texting photos of our custom materials to customers.

I also had to constantly remind customers that the products we supply are actually produced here in Australia and that there are many elements that are completely customisable.

Noting the surfing community, including manufacturers, had a strong presence on the photo-sharing app Instagram, I decided to create Colan's own

Instagram profile to share photos of past and present products the company has designed and produced specifically for the surf industry.

So far this has proven our most successful online campaign yet and has seen our network of contacts

grow dramatically. Since early July this year, we have already captured the attention of many surf brands and received enquiries for our unique products from all over the globe.



A snapshot of the Colan Instagram gallery

I found that the key element that was missing from our current online presence was a quick visual aid for showing our range of Surf Craft industry materials.

- Damien Bensley,
General Manager, Colan

We have also used Instagram as a way to support our own network of customers and help promote the Australian Composite industry to the rest of the world.

By early October, three months post launch onto Instagram, Colan had gained more than 300 followers, most of whom are surfcraft manufacturers and we hope to continue expanding this into the future.

You can see the results at <https://www.instagram.com/colanaustralia/>

The wonder of Australian composites manufacturing takes centre-stage at Rio Olympics

Few people realise the gleaming cauldron that was centre stage at the opening and closing ceremonies of the 2016 Rio Summer Olympics and Paralympics was made in Murray Bridge, South Australia, not from steel, but from FRP (Fibre Reinforced Polymer).



Above. The cauldron sits upside-down on a stand ready for painting

Left. The FRP cauldron gleams in the sun on its transport frame outside Newell Composites before setting off for Rio de Janeiro via FCT Flames in Adelaide where it was fitted out and tested.

Pages 14 and 15 images supplied by Newell Composites. Cover image: AP Photo / Photographer: Matt Dunham

Such is the secrecy around International Olympic Committee projects that it was only when their TV honed in on the cauldron as it was lit by Brazilian marathon runner Vanderlei de Lima, that Robert August, his son Tyson and their team at Newell Composites, realised they had made the cauldron that was being watched by more than 340 million people around the world.

“I had done some research and gained an idea of what we were actually manufacturing, but we were all extremely surprised and excited to see our work was the actual cauldron and being viewed by millions of people worldwide,” says Robert August, Managing Director of Newell Composites.

Adelaide-based FCT Flames has been the leading supplier of cauldrons and flames features to the elite sporting events of the world since the Sydney Olympics in 2000. The company uses Adelaide and regional South Australian suppliers where possible to assist in the manufacture of their unique flame features.

FCT Flames first contacted Newell Composites in early December 2015 with the request to quote on a “carrot shaped” object that was to look like stainless steel with internal steel work and an attachment for a gas burner. In early February 2016, FCT Flames went back to Newell Composites to discuss a spherical shape between 710mm and 1500mm diameter. “At this point, I advised FCT Flames we could do the sphere from a fire retardant resin with excellent properties to allow for any heat effect,” says Robert.

The company’s main stream products are industrial chemical storage tanks, pressure vessels and custom built projects such the fire retardant 12,800lt water cartage tanks made for a South Australian department for firefighting. The cauldron was the first of its type for the team and presented a series of hurdles to be overcome within a tight and firm schedule.

“The main hurdle was the heat generated from the gas burner and the 1200mm diameter sphere was required to support its own weight and the weight of the burners while fixed on top of a six metre long

150mm diameter steel support post," says Robert.

"We used a fire retardant resin from Nuplex Composites. The two halves of the sphere were hand laminated using CSM and Woven Rovings with high glass content. All laminates were fully post cured at elevated temperatures for a minimum of six hours to ensure a full cure was achieved," says Robert. "All chemical storage, aquaculture, rainwater tanks and pressure vessels are cured in the same manner."

Another hurdle was the requirement to look like stainless steel. After trialling and investigating a series of options, Robert and local Murray Bridge painter Brenton Burgess (Burgess Paint N Panel) decided on a chrome paint system that had a high heat resistance and an effect very close to stainless steel.

"Dimensional accuracy was critical to allow the assembly of mechanical equipment inside the sphere and the neat fit of a decorative external stainless steel rim, one of the client's artistic requirements," says David Retallack, CEO of FCT Flames.

"Cast in two halves, the finishing of the sphere to ensure joint lines weren't visible was an important quality measure," Mr Retallack said. "The finishing and painting of the sphere was completed to a very high standard that exceeded FCT's and the client's expectations. This was all achieved under a very tight timeframe, on time and on budget ensuring



Shining brighter than stainless steel, as the brief required, after multiple coats of the specialist paint.

the cauldron was delivered in time for the opening ceremony on 5 August 2016."

The excitement of the opening ceremony culminated in Mr de Lima climbing the stairs to the waiting cauldron. With the flame burning brilliantly, the cauldron was raised high into the Rio sky to reflect against a huge kinetic sculpture by the artist Anthony Howe, the combination symbolising the power of the sun. It burned throughout the 17 days of the Rio Summer Olympics and 12 days of the Paralympics.

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WA boat builders' Seabin innovation to clean marinas and oceans

Two Western Australian boat builders and keen surfers have turned their composites skills and passion for the sea into an innovative solution to clean-up litter in the world's marinas.



Tooling the V5 hybrid moulds: Seabin Project co-founders Andrew Turton (left) and Pete Ceglinski are developing prototypes of their innovative ocean-cleaning device using their composites boat building skills.

With the help of WA seed investors Shark Mitigation Systems and a highly successful crowd funding campaign that raised \$300,000 in two months over the 2015/2016 Christmas New Year period, Andrew Turton and Pete Ceglinski have quit their jobs to get their Seabin Project off the ground.

They headed to the Spanish island of Mallorca, its coast populated by 26 marinas, the ideal location to develop and take their technology to market.

"Andrew and I were both boat builders for high performance yacht racing teams including The Americas Cup, The Volvo Ocean Race and TP52 Super Series. Through our work and connections we ended up here in Mallorca and BMComposites are the Gurit dealer here. They offered their services to us," says Seabin Project

co-founder and managing director Pete Ceglinski, an industrial designer.

The Seabin is attached to marina infrastructure moving up and down with the tide. Water and rubbish are sucked in from the surface, a re-usable, fine weave jute hessian bag captures rubbish and particles down to 2mm; the clean water continuously pumped back into the sea.

After refurbishing a disused factory in the island's capital, Palma, the pair has been focussing their energies on the build, test and refinement of prototypes in fibreglass.

The process started with a sketch, 3D modelling in CAD to a 3D printed scale model, CNC cutting the moulds for the 1:1 prototype using a simple double bias e glad with Gurit epoxy resin. The weave is +/- 45° and we have engineered the wall thickness to replicate 4 mm wall PE plastic, says Pete.

"We are using fibreglass because it has similar properties to PE plastic which will be the final material."

Seabin V5 was still under development, solving challenges such as protecting marine life, as Connection went to press, with testing of the prototype underway at a yacht club marina in Palma.

"We are using this version for trials and inhouse modifications of the prototype before sending final 3D files for serial production to our industrial partner Porala Marine that has manufacturing plants



in France and Western Australia (through EWS (Engineered Water Systems in Henderson, south of Perth," says Pete.

"For the production we will be using rotational moulding and PE plastic, with an aim for 100% recycled PE and injection moulding to utilise the mixed plastics collected by the Seabins." The team are investigating natural fibres for the strengthening matrix required for mixed plastics.

Co-founder and director Andrew Turton came up with the Seabin idea seven years ago. "If we can have a rubbish bin on land then why not have one in the water," says Andrew. He mocked up the first Seabin using plastic rubbish bins, glue and duck tape and took them around the world to yachting events.

In 2013 he teamed up with fellow WA boat builder, surfer and product designer Pete Ceglinski and launched Seabin Pty Ltd in 2015. They will be showcasing the prototype at the Marine Equipment Trade Show (METS Trade 2016) in Amsterdam in mid-November. Their crowdfunding video has already attracted keen interest from marinas around the world including Europe, US, Japan, Korea, Maldives and Bora Bora.



Above. Choosing sustainable materials: Co-founder and Managing Director Pete Ceglinski cuts the hessian fibre material for the filter bags for the prototypes.

Left. The team put their expertise in working with composites into perfecting the Seabin V5 prototype.

The team's aim is contrary to most entrepreneurs: "A future where there is no need for Seabins. Now that would be something," says Andrew.

It is a vision the company hopes to achieve through their global community awareness/ education activities that are already underway: "It is a global situation we feel can only be really solved through education, working with industry and changing our consumer culture... for cleaner oceans."

More information
www.seabinproject.com



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RESEARCH ROUND-UP

Deakin researcher develops advanced polymers for high performance precursors and carbon fibres



A Deakin University researcher has improved the methods for the design and synthesis of high performance carbon fibre precursor polymers.

Dr Nisa Salim, a researcher within Deakin's carbon fibre research facility, Carbon Nexus, has developed advanced polyacrylonitrile polymers capable of producing fibres with enhanced structure and properties.

Through a Victoria Fellowship, Dr Salim's visited several overseas carbon

fibre composite research facilities in the United States including two months at the Polymer School at the University of Southern Mississippi, working with Professor Jeff Wiggins, whose research group has recently developed advanced protocols and customised laboratory facilities to design and synthesise the next generation of carbon fibre precursors using a variety of technologies including semi-batch RAFT polymerisation.

The collaborative research between the Polymer School and Deakin University has led to the synthesis of nearly ten precursor polymers with high molecular weight and uniform order and distribution of co-monomers.

"A critical challenge of wet spun fibres is the presence of voids developed during the coagulation process. Previously, there were no reliable procedures to quantitatively measure the size and volume of pores in the fibres. The research program helped us to combine the right skills and shared knowledge to develop a method to quantify the porosity of these fibres," says Dr Salim.

Also, as part of the Fellowship-funded study tour, Dr Salim experienced hands-on training on the world-class

customised wet spinning line at the Centre for Applied Energy Research at the University of Kentucky, where she worked in partnership with the carbon materials group led by Dr Mathew Weisenberger.

"Dr Salim did an amazing job developing the analysis to evaluate the porosity distribution in her precursor PAN-based fibres. I'm sure this work will be very valuable moving forward," Dr Weisenberger said.

The Deakin-CSIRO partnership based at the university's Waurin Ponds campus near Geelong, is now commissioning a world-class pilot-scale wet spinning facility that will complete the carbon fibre value chain from molecular level synthesis of precursors through to fabrication of composite laminates using high quality carbon fibres manufactured on-site by Carbon Nexus.

Dr Salim is an Alfred Deakin Post-Doctoral Research Fellow now working with the university's Institute for Frontier Materials Australian Research Council Future Fellow Associate Professor Joselito Razal to develop new polymer formulations followed by wet spinning for making high performance precursors and carbon fibres.

Russell Varley joins Deakin's Carbon Nexus

After 26 years working on composite materials within CSIRO Manufacturing, Russell Varley has joined Deakin University's Institute for Frontier Materials.

In the role of Professor of Composite Materials, Russell brings his extensive knowledge of resin technology and polymer science to the university's carbon fibre manufacturing research facility Carbon Nexus.

Since obtaining his PhD in Materials Engineering from Melbourne's

Monash University in 1998, Russell has worked continuously on network and engineering polymers publishing over 70 peer-reviewed papers while working with various multi-national companies and Australian SMEs to create solutions for wide-ranging materials-based problems.

He says his goal at Deakin will be to grow the carbon fibre and composite manufacturing research through impact science and is looking forward to working closely with the Australian composite community.



Events Schedule 2016 – 2017

November

Wednesday 23
Perth, WA

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.

Wednesday 29 & Thursday 30
Sanctuary Cove, QLD

2017 Advanced Composites Innovation Conference and Exhibition
Hosted by Composites Australia with the support of SAMPE and ACCS this conference is the premier event for the Australasian composites industry, engineers, designers and researchers. The two-day program is packed with industry presentations and academic papers on new and emerging technologies and applications while offering exclusive networking and business development opportunities.

December

Thursday 8
Queensland, QLD

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.

May

Thursday 4
VIC

Technology workshop: Sandwich structure design and fabrication – the good, the bad and the ugly
This full-day course will be delivered by composites engineering consultant Dr Rik Heslehurst

July

Thursday 20
Coomera, QLD

Riviera Luxury Motor Yachts site visit and networking
Australia's most awarded luxury motor-yacht builder, Riviera, will open its doors to Composites Australia members for this site visit and networking event.

August

Tuesday 29
Perth, WA

Industry briefing and networking event
Details to be advised

October

Thursday 12
Sydney, NSW

Technology workshop: Adhesive bonding
This full-day course will be delivered by international composites engineering consultant Dr Rik Heslehurst.

November

Tuesday 28
NSW

End of year industry site visit and networking event
Details to be advised

2017 February

Friday 24
Penguin, TAS

Penguin Composites site visit and networking
Site visit to Penguin Composites manufacturer of an extensive range of composite products and custom-made solutions for domestic and global customers.

March

Tuesday 28
Sanctuary Cove, QLD

Pre-conference technology seminar: Finding and repairing damage and defects in composite components and structures
This afternoon technology seminar will be delivered by well-known international composites engineering consultant and trainer, Rik Heslehurst.

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.



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