Issue 46 • December 2017

Connection

The official magazine of Composites Australia

Inside

Ocius Technology's Bluebottle marine drone:

Australian maritime technology innovation buoyed by Steber's composite know-how.

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President's letter

It is widely acknowledged that defence expenditure can present growth-promoting opportunities for Australian manufacturing including the multiplier effects of employment growth, technology development and investment. In this edition of *Connection* magazine, we feature two member companies that recently successfully entered the defence market.

Penguin Composites has been awarded a contract to supply composite components for the Hawkei protected mobility vehicle (Page 5). Steber International has begun manufacture of the first of five 38ft RAN support vessels as part of the SEA1778 Project (Page 8).

Steber's eyes are also firmly on the defence market with the development of the highly innovative *Bluebottle* unmanned surface vessel for Ocius Technology.

These two stories demonstrate the enabling qualities of composites including impact and corrosion resistance, embedded functionality and lightweighting. The defence contracts are also bringing meaningful employment to the regional towns of Penguin, on the north coast of Tasmania, and to Taree, on the mid-north coast of New South Wales, and a new breed of composite technicians in these areas.

The 2016 Defence White Paper outlined a commitment to AUD$195 billion investment in defence capability or equipment by 2020-21. Composites Australia continues to work with decision-makers to ensure that the benefits of composite materials and products are recognised and the capabilities of domestic companies are leveraged. One such example is our recent contribution to the Victorian government's vision for manufacturing in the future (See page 9). In our submission we advocated for government investment and support to unlock the opportunities for our sector in Victoria and this was acknowledged in a published commitment to "secure Victoria's global position as a leader in engineered materials such as fibre composites".

Our recent membership in the Advanced Manufacturing Growth Centre, the Federal Government-backed organisation formed to unlock new commercial opportunities and drive innovation in Australian manufacturing, will also assist Composites Australia to foster collaboration between our members and procurers.

The company case studies in each issue of this magazine, and my recent trip to Perth, where I stood under Spanda, the 29-metre composite sculpture inspired by rippling water and installed at Perth's Elizabeth Quay, continue to reinforce my belief in the future for the Australian composites industry.

The release of the third edition of the text book, *Composite Materials for Aircraft Structures* which was edited by Australians and first published over thirty years ago (Page 17) is a testament to the country's knowledge and expertise in composites technology as are the exciting developments for Australia's own carbon fibre manufacturing industry announced recently by Deakin University and CSIRO. (See Page 14)

Our 2018 annual conference will have a very different look with plans well underway for a program enriched by demonstrations and presentations to help us all keep pace with new materials, processes and technologies, offering opportunities to enter new markets and grow our businesses. I suggest you set aside the dates in your diary to be in Melbourne on Wednesday and Thursday 18 and 19 April, 2018 with a technology workshop on Tuesday 17th April. See page 15 for more details.

On behalf of the Board, I wish you all a safe and happy Christmas and New Year and a prosperous year ahead. I look forward to seeing you in 2018 at one or more of our events.

Leona Reif
President

Penguin Composites secures multi-million dollar defence contract

Tasmanian-based Penguin Composites signed a contract with Thales Australia in October 2017 to build bonnets and various associated parts for the new Hawkei protected Army vehicles.

The three-year contract, worth over $8 million, represents the company's first major defence-related contract.

Announcing the contract, the Minister for Defence Industry, the Hon Christopher Pyne MP, said it would provide a significant boost to Tasmania's share of the nation's defence investment.

"This contract will not only create new jobs in Tasmania, it will also involve the up-skilling of existing personnel to help deliver this work," Minister Pyne said.

"The manufacture of prototype parts is already underway with production parts scheduled to be available from late December."

"This is a textbook example of how Australian small-to-medium enterprises are building their capabilities and contributing to our sovereign defence industry capability."

In October 2015 Thales Australia signed a $1.3 billion contract with Defence to supply 1100 Hawkei vehicles and more than 1000 trailers, and is now ramping up for low-rate production.

Thales Australia CEO Chris Jenkins said Penguin Composites was one of around 40 Australian SMEs in the Hawkei supply chain. "This is a very exciting project and a critical capability for the Australian Army, so to be able to include outstanding Australian SMEs like Penguin in our supply chain at the very high standards required under the contract is tremendous for the project and for the broader economy."

Penguin's CEO John van der Woude said the contract had buoyed the spirits of all involved in the company and everyone was stepping up to the challenge. "The Thales contract requires stringent compliance to quality control systems now embedded in our ISO:9001 processes to deliver consistently high quality fully fitted components to the specifications," he said.

"It has also required us to fully utilise the capabilities of our ERP (Enterprise Resource Planning) system.

L to R. Penguin CEO John van der Woude, Engineer Piers Findlay and Manager David Mercer with a prototype of the bonnet, guard and sidesteps for the Hawkei protected Army vehicles for the Australian Defence Forces

Below Left. The moulds under production at Penguin Composites.

"We are upskilling the team across the company and have recruited 12 additional staff to date with total staff expected to increase by 30% to 50.

"Under the contract we will supply Thales with a total of 1100 sets of bonnet, guards and side-steps fully finished with matching camouflage paint ready to complete the Hawkei build," says John. "After a successful prototype phase, production output will start at one set per day for a weekly shipment across Bass Strait to meet the production schedule.

"Matching the paint with the rest of the body is just one of the challenges being worked through for the prototype before production gets fully under way in December. We provided quite a bit of detailed engineering input into the designs of the components to resolve some identified problems."

The FRP components will be produced using a closed moulding process at the Penguin facility on Tasmania's north-west coast where they will be painted and fitted with headlights and other parts ready to be mounted on the blast and ballistic protected body on delivery.

"To be part of a project that is important to Australia and to our defence service men and women is really fulfilling and is inspiring all the team," says John.

Founded in 1976, the business became incorporated as Penguin Composites in 2003. The company provides a diverse range of products with the longest contracts supplying Elphinstone and Caterpillar's underground mining truck components.

Advancing manufacturing: The German ideal and Australian reality

By Kerryn Caulfield, Executive Officer, Composites Australia

In Stade, Kerryn Caulfield is dwarfed by the DLR German Aerospace Center's BALU, the world's largest R&D autoclave measuring 5.8 m diameter and 20 m long. Photo: Tom Cameron

There have been countless reports and opinions on a blueprint for a healthy and productive Australian advanced manufacturing sector. All acknowledge that Germany is one of the world leaders in science and technology and a force from which to draw inspiration. For that reason, I travelled to Germany in July to visit a number of leading organisations in composite technologies to assess their portfolios, industry strategies and funding models.

Germany's academic and research, development and innovation sectors work synergistically with industry and the government to drive manufacturing advancement. Germany's automotive companies employ more than 100,000 researchers (full time equivalent), which is more than one quarter of the total R&D workforce in Germany's private sector and the largest number of research personnel in its manufacturing sector, according to Germany Trade & Invest (GTAI). The spend for research and development for the aerospace sector is also very high at 12% of the sector's turnover. For both sectors, the government-driven motivation to reduce weight, material and energy consumption in production processes and the end products has led to unprecedented uptake in advanced composites for many years. In turn, many of the step-changes achieved in these markets have diffused across the world into a myriad of other markets, such as marine.

Prof Dr-Ing Richard Degenhardt of the Institute of Composite Structures and Adaptive Systems for DLR German Aerospace, based in the northern city of Braunschweig, kindly organised a comprehensive program of visits in Braunschweig, Stade and Bremen. The institute is a leading facility in the field of lightweight composite fibre design, research into more efficient manufacturing methods for CFRP structures and improved analysis and design methods. INVENT, an engineering firm that specialises in developing high-precision structural composites components which have been used in satellites and the equipment for the ExoMars 2016 and 2020 expeditions is close by. Its work in piezo actuators and sensors is particularly exciting.

Stade is the home of CFK Valley which was founded in 2004 to nurture the development of carbon fibre reinforced composites in the region through R&D partnerships, collaboration, value creation and training. Deriving its name from the successful cluster town of Silicon Valley, CFK Valley has a membership base

of more than 100 regional, national and international companies and institutes, including Airbus. Now an internationally recognised network, CFK Valley is following its members into surrounding countries and recently followed Airbus to form in China. CFK Valley is the blueprint for Carbon Nexus and the cluster of organisations at Deakin University in Waurn Ponds, near Geelong.

The highlights of my visit to the Valley include a tour of the DLR German Aerospace's Center for Lightweight-Production-Technology, home to BALU, the world's largest research autoclave, and a personalised tour of an Airbus manufacturing plant that specialises in the production and further development of CFRP technology. With a loading length of 20m, a loading diameter of 5.8m and maximum operating temperature of 420°C, the main objective of the DLR facility is the optimisation of the curing process for components made of carbon fibre.

With some 1,700 employees, the Airbus Stade plant produces vertical tailplanes for the entire Airbus fleet, from the A320 to the A380; and also the upper wing shells and the upper and lower fuselage shells for the A350XWB. Measuring 35m in length, these wing shells are the largest CFRP components built in Stade. Vertical tailplanes are manufactured on a state-of-the art 45m automated production line. Airbus Operations Stade also focuses on training for CFRP technology specialists.

In Stuttgart, I visited ARENA2036, a research factory dedicated to the future, particularly the year 2036, the 150 year anniversary of the car. Closely linked to the automotive industry in the region, lightweighting through design, engineering and the development of new materials and production technologies is its focus.

According to the Germany Trade & Invest (GTAI) the country's automotive industry is the largest in Europe with a recorded turnover in 2015 of Euro 404 billion (AUD$610 billion) which is around 20% of total German industry revenue. Its aerospace industry revenues were over EUR 37 billion in 2016. Both sectors drive technological innovation, bringing together electronics, robotics, measurement, control and materials technology to achieve accelerated outcomes.

Manufacturing is undergoing an historic transformation across the industrialised world. The needs of each economy and government policies will inform and steward the evolution of manufacturing in each country. While we can learn from Germany, the reality is that Australia's advanced composite manufacturing sector will adapt the best elements we have here and around the world to service our unique characteristics.

I thank Prof Murray Scott, Director of ACS, for his assistance and introductions, particularly to Richard Degenhardt.

Defence contracts boost for Steber International

NSW central coast commercial and recreation boat builder, Steber International is ramping up its presence in the defence market with development of the *Bluebottle* range of unmanned surface vessels.

General Manager Alan Steber with the innovative unmanned surveillance vessel, Bluebottle, at the recent Pacific 2017 International Maritime Exposition in Sydney.

A recent contract signed with Thales Australia for the supply of five 38ft navy support vessels as part of the SEA1778 Project, further cements the company's entrance into the defence market and will generate new job opportunities.

"Our current workforce sits at 22 but this is destined to increase with the recruitment of at least 10 specialised staff and apprentices, as we prepare to fulfill the naval support vessel contract," says General Manager Alan Steber.

The highly innovative Bluebottle unmanned surface vessel project is a collaboration between Ocius Technology and Steber with the drones featuring rigid FRP opening sails and hybrid marine power technology. Steber's advanced manufacturing facility combined with the ability to customise each Bluebottle has led to the success of the project, says Mr Streber.

The drones provide a low-cost, persistent, wide area ocean surveillance for defence, security, oceanographic, hydrographic and oil and gas applications.

By harvesting wind, wave and solar energy, the Bluebottle is self-propelled, self deployable and retrievable. They provide 20w average electrical power 24/7 for sensors and communications, with several kilowatts maximum power available for escort bursts.

Government grants are assisting in further development of the project, including extensive sea trials.

In another vote of confidence in the company's manufacturing reputation, Steber has recently won a contract with Thales Australia, to deliver 38ft vessels to the Australian Government as part of the SEA1778 Project.

While continuing the refinement of the Bluebottle, the team at Steber's 5000 sq m manufacturing facility in Taree is busy designing and producing more traditional composite products. "We are completing a 52ft versatile vessel for Fregate Island Resort on the Seychelles (our second for the resort); refitting small runabouts and even creating water slides," says Mr Steber.

Work has already started on the first of the Thales 38-footers with the five scheduled for delivery in 2018-19.

These Steber vessels will be turned into unmanned surface vessels (USV) and will deploy mine countermeasures systems used to protect Royal Australian Navy (RAN) assets. They will allow fleets to move along strategic routes and through choke points, says Thales Australia. This supports the RAN Mine Counter Measures (MCM) Initial Operations Capability (IOC).

Founded in 1946, Steber originally produced timber clinker hull boats, moving to fibreglass (FRP) construction in 1959.

"Since then, we have built a reputation for premium manufacture of commercial fibreglass vessels and composite components, with vessels ranging from six to 20 metres," says Mr Steber.

"Construction of commercial and recreation vessels, large and small refits and an active R & D program, all augers well for our continued growth in the years ahead."

Advanced materials key to manufacturing growth

The Victorian Government's Advanced Manufacturing Advisory Council invited Composites Australia to contribute to the review of the Victorian manufacturing sector.

At a meeting with Council Chair Ross Pilling, Composites Australia put forward our view in an "industry statement" that was submitted to the council.

The statement urges the Victorian government to:

- Assist investment in process machinery, including but not limited to robotics, resin infusion processes, compression/injection moulding and autoclaves.
- Invest in applied industry/research collaborations.
- Develop balanced industry policy that assists organisations that make things.
- Support the Victorian advanced composites sector as a whole, rather than a single fibre focus, to realise the growth potential across all materials.
- Consult with the Victorian advanced composites sector on major investment decisions.

In September, the Victorian Government announced its plan to grow the state's manufacturing industry and create skilled jobs. Entitled *Advancing Victoria's Manufacturing. A Blueprint for the Future*, the plan "has a more balanced approach than other recent publications on manufacturing," says Composites Australia Executive Manager Kerryn Caulfield.

"The plan recognises the competitive advantage offered by advanced materials in delivering better product performance in terms of durability, 'smart' features, or lighter weight, creating a sustainable advantage over low-cost alternatives."

The plan identifies "the utilisation of advanced materials is a major opportunity for Victoria's high-value manufacturing sector" and in the Government's future focus to capture high value manufacturing opportunities, commits to "secure Victoria's global position as a leader in engineered materials such as fibre composites."

Other welcome actions in the plan include supporting industry associations to enhance management and leadership capabilities and further strengthening of procurement processes to better support innovative design, engineering and manufacturing.

Members can access Composites Australia's industry statement and the Victorian government's plan on our website in the Member Centre under Reports to Members.

Events Roundup

The stories behind Perth's FRP sculptures

By Leona Reif, President, Composites Australia

Delegates and presenters gathered at the Royal Perth Golf Club for a recent Composites Australia networking event in Western Australia. The topic was the commissioning and installation of FRP architectural sculptures, with Perth City leading the way in Australia. Examples include Spanda, Ascalon, Elevacion and Convergence. All are creative, engineered structures that are aesthetically pleasing and enrich the surrounding urban landscape.

President Leona Reif is dwarfed by the 18m high FRP sculpture Ascalon in the forecourt of St George's Cathedral, Perth.

The event was a unique opportunity to hear the full story of the creation of the 18m high sculptural installation, Ascalon at St George's Cathedral in Perth. Artist Marcus Canning provided a client perspective that was very relevant and valuable for all who attended, particularly as the concept for Ascalon was "conceived as a flight of fancy" that then required the attributes of FRP to achieve the desired outcome. Marcus and collaborating artist Christian de Vietri, have continued to utilise the wonders of composites in their artistic endeavours.

Brian Nelson, CEO, Capital House Australasia, expanded on the technical solutions. Over the past decade, Brian's work has largely focused on the implementation of both synthetic and natural fibre reinforced composite materials in art, architecture and infrastructure. He discussed how composites are often the only solution that will meet both the performance specification, as well as the creative brief, for a broad range of structures. Brian's insights into scaling up production for an international market were very informative.

The fabricator behind Ascalon, Glenn Swarbrick, CEO of Swarbrick Technologies, talked us through the manufacture and installation of the finished product. Glenn provided an entertaining presentation that captured the adventure that goes with refocussing a manufacturing business to meet the changing economic environment. Swarbrick Technologies has been involved in a number of architectural and artistic projects.

In the final presentation, David Thompson, Composites Engineer with ShapeShift Design Technologies, outlined the journey from project inception through to erection of Spanda, a spectacular installation comprising a series of thin composite tubular spans, with the largest standing 30m high. Designed by Christian de Vietri, it is a major landmark in the revitalised dockland area of Perth. David's presentation focussed on the engineering challenges that had to be overcome in the design of such a tall sculpture, and how the intrinsic properties of composite materials made this possible.

The networking opportunity that these events provide was appreciated by all who attended, and are a great opportunity for members to get together and be inspired by the growing range activities being undertaken in the Australian composites industry.

Riviera opens its doors to industry colleagues

It is often said that generosity can make your career, for leaders and managers who are generous engender trust, respect and goodwill from their colleagues and employees. Wes Moxey (right), CEO of Riviera Australia Pty Ltd, displayed all these characteristics in July when he opened the company's state-of-the-art luxury motor yacht building and showroom facilities on the banks of the Coomera River to 70 Composites Australia members and guests.

Wes was compellingly honest about his management belief system and this was appreciated by the audience, judging by the nodding heads. He recounted the company's 37-year journey through boom times and recessions to its current growth in the global luxury yacht market. Remarkably, Wes maintained his greatest achievement remained having 180 apprentices and establishing their training facility on site in the early 2000's. While the apprenticeship pool is less these days, his commitment to making a great company

Members and guests enjoyed a fascinating guided tour of Riviera's production lines.

through employing and training great people to make great boats is evident. He still vets every employment application that the company receives. "I need to know what will make this young person get out of bed everyday – I was once that young person."

Wes joined Riviera in 1982 as a shipwright, just two years after the company was founded in 1980. His ascent into management took seven years and a further 11 to reach the role of Managing Director. Wes attributed Riviera's success to the combination of four factors: the product remains niche and relies on American sizing, European styling and Australian practicality.

While model after model embodies innovation and the highest quality finish, he admitted that the company has a long way to go before it is "great in the area of fibre glassing". Wes closed with a challenge that there are opportunities for experts to help Riviera in the fibre glassing journey to excellence.

Lowering the cost of automating composite production

For large scale production of composite components, precision automation and robotics will no doubt reduce the cost of production and reduce waste while enhancing the repeatability of the component. However the high investment cost required is a barrier to adoption.

The Institute for Aircraft Design at the University of Stuttgart has initiated a project to develop low cost, flexible, integrated composite processing, called the "LOWFLIP Programme". Financially supported by the European Commission's research and innovation program and industry partners, LOWFLIP is an innovative approach to the automation of composite manufacture.

Professor Peter Middendorf, Director of the Institute, recently visited Australia to present the project, its challenges and outcomes at Swinburne University of Technology in Melbourne. It was argued that to manufacture Carbon Fibre Reinforced Polymer (CFRP) components using traditional closed moulding processes, 50% of the cost is in materials and 50% in processing, including machines, tools, labour and energy. A project focus for the Institute is on reducing the processing costs by developing energy efficient tools for fast curing and heating. They are experimenting with different solutions for the truck, automotive and aerospace sectors. In partnership with global carbon fibre manufacturer SGL, the LOWFLIP team is developing a new snap-cure prepreg that can cure in 15 minutes at 120 degrees Celsius or 3 minutes at 150 degrees Celsius. To replace the traditional hand lay-up system, the LOWFLIP team is also developing a robotic automated ply process system that works synergistically with a rotatable tool.

Prof Peter Middendorf shares developments in reducing processing costs for CFRP components at Swinburne University, Melbourne

Composites Australia Board member, Mark Pontil Scala attended the event with several other industry representatives. "Any innovation or step change that lowers the high capital investment required and reduces costs to manufacturing composite components for all transport modes is a worthy investment of time and funds," said Mark.

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

Part 11 A–The Operational Environment
Temperature and corrosion

In this article we continue the focus on operational environmental effects on sandwich structures, focusing on temperature and corrosion. The article in the June issue discussed moisture ingress.

Thermal Effects

Composite Skins. The effect of temperature on composite skins is more dominant on matrix properties. As long as the temperatures are kept below Tg during normal operations, and since most structural composites are fibre dominated, then temperature does not have a significant effect on composite mechanical properties. If, however, excessive local heating is applied, then matrix degradation will occur. In thermoset resins this will cause cracking with a reduction in local stiffness, but a lesser reduction in strength.

Adhesives. The effects of temperature on the adhesive joint between the skin and core can be discussed in terms of the three major components of the joint:

a. Skins are generally of no major concern, particularly metal adherends, whilst composite adherends have been discussed earlier.

b. Interface effects are generally unknown, but based on the atomic bonding theory, the lower temperature range of bonding is the secondary bond (electrostatic or van der Waals forces) as opposed to covalent and ionic bonding.

c. Adhesive properties are generally the more concern, particularly around the glass transition temperature. The effects on the adhesive properties generally follow the same concerns of the matrix in a composite skin.

The temperature performance of sandwich structure is dependent on the glass transition temperature 'Tg' of the various polymer materials being used in the skin, adhesive and core. Below the glass transition temperature polymers are hard and rigid (glassy), and above the glass transition temperature polymers turn to a soft, flexible rubbery substance. There are very marked changes in the mechanical properties of a polymer through the glass transition temperature, Table 1. Therefore, it is strongly recommended that operating temperatures are well below the glass transition temperature of the critical sandwich panel component.

Core. The core material thermal issues are mostly focused on the non-metallic foams and honeycomb cores. Keeping the temperature below the glass transition temperatures of the polymer based cores is of primary importance. Honeycomb core material temperature effects are shown in Figure 3.

Adhesive Group	Temperature (°C)
Acrylates/Cyanoacrylates	80
Epoxies - Polyamides	65
- Aliphatic Amides	100
- Aromatic Amines	150
- Acid Anhydrides	175
Silicones	200
Polyimides	260

Table 1: Temperature Limits of Structural Adhesives

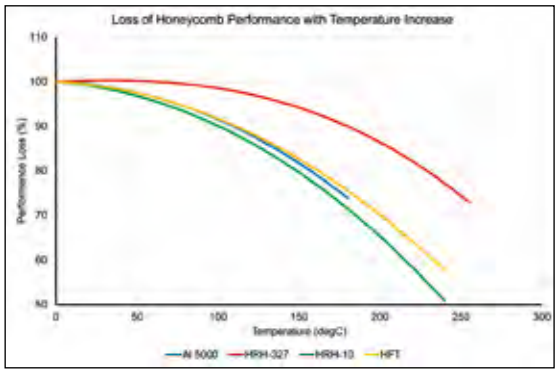

Figure 3: Strength Loss of Honeycomb Core with Temperature

Core Description	CTE (mm/mm/degC)
5000 series Aluminium Honeycomb	7.33×10^{-6}
Fibreglass Honeycomb	4.56×10^{-6}
Nomex Honeycomb	10.8×10^{-6}
Kevlar Honeycomb	1.50×10^{-6}
Graphite Honeycomb	1.11×10^{-6}
FR-3318 Polyurethane Foam	9.4×10^{-6}
Balsa-Longitudinal	11.1×10^{-6}
Balsa-Radial	25.6×10^{-6}
Balsa-Tangential	37.8×10^{-6}
Divinycell HT	12.3×10^{-6}
Divinycell F	11.1×10^{-6}

Table 2: Core Material Coefficient of Thermal Expansion

Foam core follows similar trends as shown in material brochures. The expansion of core materials with temperature is shown in Table 2.

Corrosion

The corrosion effect on sandwich structures is limited to ensuring that no contacting metallic surface suffers from galvanic corrosion. Table 4 shows the galvanic corrosion potential of several common metals and graphite composite materials (sandwich structure skin). Metal core materials are of particular concern for corrosive action and the focus must be on a good seal of the core by edge close-out. Long term maintenance surveillance of the metal core is needed to ensure corrosion is not occurring during the life of the component.
In the next article we will continue the discussion on operational issues with an examination of damage and damage tolerance of sandwich structures.

Magnesium	12
Zinc	11
Aluminium	9
Cadmium	8
Carbon Steel	6
Brass	2
Nickel	1
CRES	0
Titanium	0
Monel Steel	0

(On a scale of 1 - 12, where 12 is the maximum corrosion potential)

Table 4: Corrosion Potential of Metals and Graphite

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

Thickness testing guage

A new high powered ultrasonic thickness gauge takes the guesswork out of determining the consistency of gel coated fibreglass and other composites such as carbon fibre. NDT Equipment Sales has introduced to the Australian market an easy to read handheld gauge and probe kit. "We have tested fibreglass samples from 3mm to 20mm and are delighted with the results," says NDT's manager, Rod Martin.

Birth of Australian-made carbon fibre industry

The vision for Geelong, Victoria, to be a carbon fibre manufacturing hub producing low-cost high performance material for the Australian and global markets is fast becoming a reality with three recent developments.

Carbon Nexus PhD student Maxime Maghe (centre) with Greg LeMond (left) and Deakin University Vice Chancellor Prof Jan Ven Hollander, AO, (right) with members of the Carbon Nexus team at the announcement of the $44m licensing agreement for the production of low-cost carbon fibre.

The developments will hopefully give the Australian composites industry a distinct market advantage and open the opportunity globally for the benefits of carbon fibre to be introduced to applications where the cost has previously been uneconomic.

In August, US-based LeMond Composites and Deakin University announced a A$44 million, exclusive 20-year global licensing agreement to commercialise Deakin's patent pending manufacturing process to produce high volumes of high performance, low-cost carbon fibre. The technology was developed by Carbon Nexus PhD student Maxime Maghe and then Carbon Nexus General Manager Steve Atkiss.

"This could make Geelong the new composite valley," said Greg LeMond, three-time Tour de France champion and CEO/Founder of LeMond Composites.

"Deakin University's manufacturing process will make it possible to localise manufacturing and make carbon fibre technology more accessible to a wider range of industries like transportation, renewable energy and infrastructure or any industry that benefits from using lighter, stronger, safer materials."

Nicolas Wegener, COO of LeMond Composites negotiated the deal. He said Deakin's process oxidises carbon fibre faster, with lower capital and energy costs and greater output of carbon fibre over a shorter period.

"The process requires 75% less energy and also reduces the amount of process equipment by 75 percent. These factors make the production of low-cost carbon fiber scalable at a velocity that can keep up with the market demand."

Two months after the license agreement was signed, the Federal Government announced a $2.5 million grant to LeMond Composites "for the design and build of Australia's first industrial carbon fibre line", in the Geelong carbon fibre hub based around Deakin's Waurn Ponds, Geelong campus.

The manufacturing plant is expected to cost in the order of $30 million and generate much-needed skilled jobs to the region that has seen the recent closure of its biggest employer, the Ford manufacturing plant. In the meantime, it is understood Mr LeMond is considering commercial production using the university's carbon fibre line. He is also undertaking a major expansion of his manufacturing headquarters in Oak Ridge, Tennessee to accommodate a carbon fibre line.

The third development came on 8 November in an address by CSIRO's Chief Executive Dr Larry Marshall to the National Press Club in which he announced a major CSIRO breakthrough.

Australia has joined the elite club of carbon fibre manufacturers using CSIRO patented technology. This is the first step in creating a generation of carbon fibre that is stronger and of a higher quality, Dr Marshall said.

"Together with Deakin University, we've created the seed to grow our manufacturing industry in Australia – generating jobs of the future built on home-grown innovation."

CSIRO Research Director Dr John Tsanaktsidis said: "On our first attempt we created car-quality carbon fibre – we now expect to improve on that result and produce aerospace standard carbon fibre."

Come and enjoy the 2018 experiential Advancing Composites Innovation Conference

Set aside the dates in your diary. The 2018 Advancing Composites Innovation Conference (ACI-18), Australia's biggest networking and knowledge sharing event for the Australasian composites industry, will be held on Wednesday and Thursday 18 and 19 April, 2018 at the Australian Synchrotron, in Clayton, Victoria.

In its 15th year, this flagship event for composite professionals is a different format to previous conferences.

"The program is designed to bridge the gap between theory and practical application," says Kerryn Caulfield, Executive Manager of Composites Australia.

"Much of what we've learnt from composite materials and technologies is by watching and studying their performance and behaviours.

"Hence, ACI-18 will feature presentations and demonstrations, across the two days, showcasing the latest developments in composite materials, processes and applications across the full advanced composites and fibreglass value chains. Demonstrations will cover the capabilities of new composite materials technology, inputs and processes including, but not limited to, real time closed moulding demonstration using a number of resin systems; adhesive and bonding systems, mould release agents and technologies; and more.

"Come and be apprenticed, if only for two days, to masters with a wealth of experience in their trades, products and processes."

The conference is fortunate to have the continued support of SAMPE and the Advanced Composites Structures Society (ACSS), an Engineers Australia technical group that is again providing the $500 Best Paper Prize for the presenting author of the outstanding Peer Reviewed paper.

The welcome reception and conference dinner are opportunities to network, advance your career or business and identify opportunities for collaboration in the relaxed and friendly environment.

This year the dinner will be held at the Clayton Lawn Bowls Club where guests will enjoy a great meal, a round of bowls and beer on tap.

Details for the conference and accommodation options are all on the conference website: www.compositesconference.com.au

The venue for ACI-18: the Australian Synchrotron, Clayton, Victoria.

ACI 18

ADVANCING COMPOSITES INNOVATION CONFERENCE

17-19 April 2018, Australian Synchrotron
Melbourne, Australia

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Maximising the benefits of closed mould systems

By Adrienne Steier-Clark, Marketing Manager ANZ, allnex Composites

Composite solutions are applied to thousands of end-use applications everywhere – from the depths of our oceans to beyond the clouds. To meet these diverse demands, there are many different processes available to manufacture composite products. While traditional, open mould applications are the common practice for many composite products, closed mould applications are becoming increasingly more important to achieve more technically advanced and precise manufactured parts.

Above. Full deck and structure infusion at Hart Marine – a first in Australia for pilot vessels.
Above right. Through improvements in the LRTM process and the gelcoat and resin used Tricomposite has significantly increased productivity and reduced wastage.

Products manufactured through various closed mould applications are generally expected to be more consistent in thickness and composition, and to have higher mechanical strength properties than those achieved through traditional hand lay-up or spray lay-up processes. While closed mould applications can require higher capital investment in tooling and infrastructure, this is often offset by the ability to produce in greater volumes, achieve faster cycle times, automate processes, lower product usage and improve workshop conditions due to the reduction of styrene and other volatile emissions.

In addition, technological advances in resin systems suitable for closed mould applications also allow for further improvements in finished product quality and manufacturing efficiencies.

Importance of the resin system

When constructing a closed mould system, the selection of the right resin system is just as important as the design of the mould. The most critical properties to look for are low viscosity, low shrinkage and low exotherm.

A good resin system will allow the proper and fast wet-out of the reinforcement and show minimal shrinkage during manufacture to avoid distortion or warpage-related issues in the final part. It will also ensure a consistent and quality finished part by reducing any potential issues relating to hot spots that can lead to shrinkage issues and damage the mould, reducing its lifespan.

Infusion resins developed by allnex, have been specifically designed to meet the critical requirements of closed mould processes and have helped manufacturers to further improve their productivity. Customers report that when using our resin system in combination with other high quality materials and mould release agents it has enabled them to:

- maximise the number of cycles before mould release needs to be reapplied resulting in more parts manufactured per day from a single mould.
- minimise wastage and downtime.
- produce consistent parts with good mechanical properties.

The new allnex infusion resin systems have been successfully trialed with marine, transportation and tank manufacturing customers. We work with each customer on a one-on-one basis to tailor the system to suit their specific application needs.

One customer to successfully use this resin system is Hart Marine who manufacture high performance and internationally sought after ORC pilot, patrol and SAR vessels in their Mornington facility.

"Producing a one piece structure is a major success for us. We are extremely proud and excited about this achievement. Thanks to our valued partners Diab and allnex," says Mal Hart, Managing Director at Hart Marine.

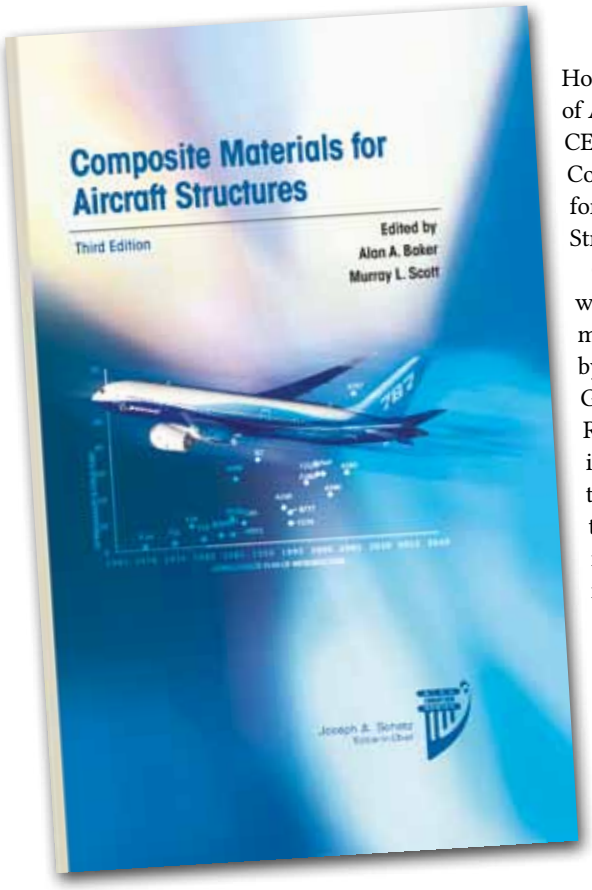
We have also worked closely with Tricomposite in North Laverton, Victoria, a premium fibreglass manufacturer specialising in high volume open and closed mould composites, to help further improve manufacturing efficiencies.

"Improvements in our LRTM process, and the gelcoat and resin we use have led to a 73% increase in parts production per month compared to three years ago. We have also managed to achieve a reduction in wastage." says Frank Cristiano, General Manager at Tricomposite.

More information: T.1800 789 607 www.allnex.com

Book signifies Australia's knowledge in composite materials for aircraft

Thirty years after initial publication, Composite Materials for Aircraft Structures, continues to provide both university students and practising aerospace engineers with an authoritative reference book on almost every technical aspect of composite aircraft structures.



The book is an Australian initiative and testament to the country's knowledge and expertise in the field that continues today.

The American Institute of Aeronautics and Astronautics has recently published the third edition of this popular text, edited by well-known Australian researchers in aerospace composite structures, Dr Alan Baker and Prof Murray Scott, both of Advanced Composite Structures Australia (ACS Australia).

Dr Baker is also Honorary Research Fellow, Aerospace Composite Structures, in the Aerospace Division of the Australian Defence Science and Technology Group (DST) and co-editor of the original edition in 1986 with Brian Hoskin. Prof Scott is Chairman of ACS Australia and was CEO of the world-renowned Cooperative Research Centre for Advanced Composite Structures (CRC-ACS).

Originating in extensive work undertaken on polymer matrix composite materials by a team at the Australian Government Aeronautical Research Laboratories (ARL) in Melbourne, now DST, the Third Edition covers topics ranging from raw materials, design, analysis, manufacture and assembly to maintenance.

To keep pace with the continued development in composite materials and technologies for aerospace structures, Dr Baker and co-editor Prof Scott embarked on this latest edition resulting in a total revision of content by a large team of contributors coordinated under a CRC-ACS education project led by Dr Martin Jones.

"The many chapter authors are experts in their fields, and collectively they represent enormous expertise based on extensive practical experience and theoretical knowledge of composites relevant to aircraft structures," said Prof Scott.

"Some have now worked together continuously on CRC-ACS projects for almost a quarter of a century.

"It is the areas of design, manufacture, application to primary structure and through-life support that have advanced significantly over the past decade, with the largest and most notable examples of significant civil aircraft usage of advanced composites now in service being the Airbus A350 and the Boeing 787, with several others soon to join them."

More information: The book can be purchased direct from https://arc.aiaa.org

Composites solve construction dilemma

USQ graduates (from left) Nick Leggat, Kurt Lembo and Matthew Robertson at the assembly of FRP reinforcement to the concrete foundation for the new annex of the Toowoomba City Hall. They are joined by current USQ students Mojdeh Khotbehsara, Ali Mohammed, Angel Baker and academic Dr Ginghis Maranan.

When it became apparent that the footings for the annex extension of the Toowoomba City Hall would encroach on an Ergon Energy substation easement there were two options: redesign or find a non-conductive solution for the footings.

"Luckily our structural engineers for the job, Matt Robertson and Natalie Ambroso, were familiar with the concept of FRP reinforcement bars and were able to provide contacts and guidance on the installation of the material," says Nick Leggat, Contract Administrator, for Northbuild Construction Pty Ltd.

Mr Robertson, a structural engineer with GHD Australia, conducted his final year thesis on the use of FRP in concrete elements while completing his studies at the University of Southern Queensland (USQ). He approached Dr Allan Manalo for guidance on the reinforcement design and layout.

"The research Dr Manalo has been conducting at USQ has directly aided in the use of the FRP on site," Mr Leggat said.

Dr Allan Manalo, who heads USQ's research into FRP bars as internal reinforcement to concrete structures through its Centre for Future Materials (CFM), said the application of FRP bars for the project was a major milestone in the university's research into civil composite materials.

"It proves that the research we are conducting here at USQ and the research training we are providing students are translating to actual applications and impacting the community," Dr Manalo said.

FRP has excellent properties, such as corrosion resistance, lightweight and high-strength, which has helped it gain worldwide interest and a growing acceptance in the construction industry.

Over the past five years, Dr Manalo and his research team have been studying the combined use of concrete and FRP bars in building a high-strength, sustainable and maintenance-free infrastructure.

"In Australia, the environments are severe to use steel as reinforcement to concrete structures from the viewpoint of corrosion damage," Dr Manalo said.

"Corrosion damage costs Australia more than $13 billion per year. Thus, FRP reinforced concrete structures for use in infrastructure applications are an emerging technology that can play a significant role in the Australian construction and civil infrastructure."

CFM Director Professor Peter Schubel said the success of the research would boost the Centre's efforts to expedite the uptake of FRP bars as reinforcement to concrete structures with existing industries, such as marine, building and construction.

"USQ is one of the nominated organisations to lead the development of Standards for this alternative reinforcing material, which is strong, economical, safe and durable," Professor Schubel said.

"The work we have undertaken provides an excellent framework for reference in the development of design criteria and specifications for FRP bars so that the construction industry can benefit more widely from this technology."

Events Schedule 2017–2018

December

December 15 to April 15
National Gallery of Victoria, Melbourne

The Triennial Exhibition
Premiers sculptor Ron Mueck's largest work to date, Mass 2017, created using resin, fibreglass, silicone among other materials. Supported by King's Fibreglass and commissioned by the NGV with funding from the Fenton Bequest.
Free entry

February

Friday 16
Taree, NSW

Steber International site visit
The Steber family have been manufacturing commercial and recreation boats since 1947 and continue to evolve the business and enter new markets. At this networking event, guests will hear the fascinating Steber story and tour the facility

April

Tuesday 17
Clayton, Melbourne, VIC

Pre-conference Workshop
With international trainer and composites engineer Dr Rik Heslehurst

Wednesday 18 & Thursday 19
Clayton, Melbourne, VIC

2018 Advanced Composites Innovation Conference
An experiential program combining knowledge sharing on the latest developments in materials and processes with live demonstrations of the latest developments in material technologies, processes and systems.

May

Thursday 24
Sydney, NSW

Full-day workshop on methylacrylates

July

Thursday 26
Victoria

Site visit and networking

July 29 to August 1
Cairns, QLD

11th Asian-Australasian Conference on Composite Materials
A three-day program with a divergent range of composite research themes, including additive manufacturing and cement-based composites.

August

Tuesday 14
WA

Site visit and networking

Thursday 30
Tomago, NSW

Compass Pools site visit and tour
At this morning networking event, members have the opportunity to hear the story behind one of the most innovative and successful pool manufacturers in Australia and enjoy a guided tour of the manufacturing facility.

December

Wednesday 5
QLD

Workshop 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

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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