

the official magazine of  **Composites**  
Australia

# Connection

## Magazine

Issue 62 • September 2023

### Inside

Composites technological  
innovation networks

**Carbon Revolution**

**Plastool**

**Link Composites**

**Cure Marine**

**ZONE RV**

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# Contents

Issue 62 • September 2023



## Feature Article

**Carbon Revolution:** In less than two decades, Australian regional manufacturer Carbon Revolution has climbed to the top of the global automotive supply chain pyramid, achieving the status of 'Tier 1 OEM supplier'.



## Front Cover

**This issue:** Carbon Revolution's aesthetic quality of carbon fibre weave on the visible surfaces of their high performance wheel face.

<b>President's letter</b>	4
<b>Wheel Evolution</b>	5
<b>Carbon Revolution</b> It takes a community to raise a global Tier 1 supplier	6-11
<b>Plastool</b> Swiss precision in Mordialloc (VIC)	12-13
<b>Link Composites</b> A structural alternative to legacy materials	14-15

<b>Cure Marine</b> Carbon fibre: Making the best adventure tools in the world	16-17
<b>Zone RV</b> In the ZONE	18-21
<b>The Evolution of Caravan Construction</b>	22-23

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# President's Letter

Genelle Coghlan **President**



**W**elcome to this 62nd edition of Connection magazine. Our focus of this edition is around two industrial clusters, the companies within which are growing by accelerating automation initiatives and capitalising on technological innovation networks. Despite the geographical distance separating them, Cooloom and Geelong share the virtue of interconnected businesses, suppliers and associated institutions that enable composites manufacturing.

Our article on Link Composites highlights the company's heady journey from a start-up a mere five years ago to recently increasing capacity through automation by a remarkable 500 per cent - most of which was designed and built in-house. Link has ridden the caravan boom detonated by COVID, and is gearing up for the next growth market in the application of load-bearing sandwich panels for construction.

Also located within the Cooloom industrial Estate is ZONE RV. Dave Biggar and his team have funneled their comprehensive experience in composite manufacturing across the marine, aeronautical and civil construction sectors to design and manufacture must-have adventure caravans. The SUMMIT, for instance, is an amalgamation of urban sophistication with the rugged spirit of a caravan – an embodiment of carbon fibre elegance.

Our article on another 'adventure tool', the Cure Marine Custom 70' - also being built shoulder to shoulder with Link Composites - is using 'Marine 4.0' technology. The catamaran's design philosophy encompasses a solid carbon fibre construction, balancing both weight and luxury, tipping the scales at an impressive 16 tonnes.

Then there's Carbon Revolution, a company challenging manufacturing conventions having transformed its foundational patented composite production technologies into an automated, digitalized mega production line, a vision realised with an on-shore industrial engineering network.

Featured on page 12, is long term Composites Australia member Plastool which has crafted the pivotal tools that now lie at the heart of some of Carbon Revolution's patented composite production technologies.

As usual, this issue provides insights across the breadth and depth of composites manufacturing. If you have any ideas for future articles, please drop us a line. We are always looking for interesting stories on our industry. I trust you will enjoy this edition of the Connections magazine.

Warm regards.  
Genelle Coghlan

# Wheel Evolution

a snippet

Written by Kerry Caulfield, Executive Director, Composites Australia Inc.



Light two-wheeled chariots sped Assyrian warriors to battle. Horses yoked like oxen to a central shaft provided power and speed.

**W**heel evolution spans over five to six millennia, with its humble inception in the 4th millennium BC. Sumerians in Lower Mesopotamia, present-day Iraq, initiated the journey by inserting rotating wooden axles into solid wooden discs. A significant transformation occurred around 2000 BC when these discs were hollowed to create lighter wheels, increasing their versatility. Spoked wheels have been found in graves that date back as late as 2100-1800 BC. Wire-spoked wheels didn't emerge until the 1870s.

Wheel technology took a giant leap in early 20th century with the patent of the first detachable metal wheel, albeit in the artillery style. The subsequent 120 years saw material transitions that shaped the wheel industry, including the first alloy wheels in 1924 and later, around the mid-to-late 1960s, aluminium-casting improvements resulted in safer, less brittle wheels.

In less than two decades, Carbon Revolution has climbed to the top of the global automotive supply chain pyramid, becoming a supplier of some of the most technically advanced wheels in the world. The compelling tale of this regional Australian company highlights the power of human ingenuity in leveraging material innovations to reshape industries.

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# Carbon Revolution

## It takes a community to raise a global Tier 1 supplier

Written by Kerryn Caulfield, Executive Director, Composites Australia Inc.

**Achieving** the status of 'Tier 1 OEM supplier' at the performance and premium end of the market, Carbon Revolution has climbed to the top of the global automotive supply chain pyramid in less than two decades; a remarkable accomplishment for an Australian regional manufacturer. The feat becomes even more significant considering the cost-sensitive, conservative supply chain that is the automotive industry combined with a worldwide pandemic and its associated global supply chain challenges. In the same period, the company has not only succeeded in building relationships with high-performance, high profile brands – including Ferrari, GM, Ford and Jaguar Land Rover – to produce its technologically advanced, lightweight carbon fibre wheels but has also taken the critical steps of designing, engineering and commissioning an industrial mega-line for mass wheel production.

**H**istorically, Australian manufacturing leaned on imported European machinery for production lines, a strategy easily replicated worldwide, reducing competitive efficacy to mere labour

cost. However, Carbon Revolution breaks this norm with the installation of its 'Mega-line', a new-to-world industrialization program, much of it realised through a technological innovation network in Victoria.

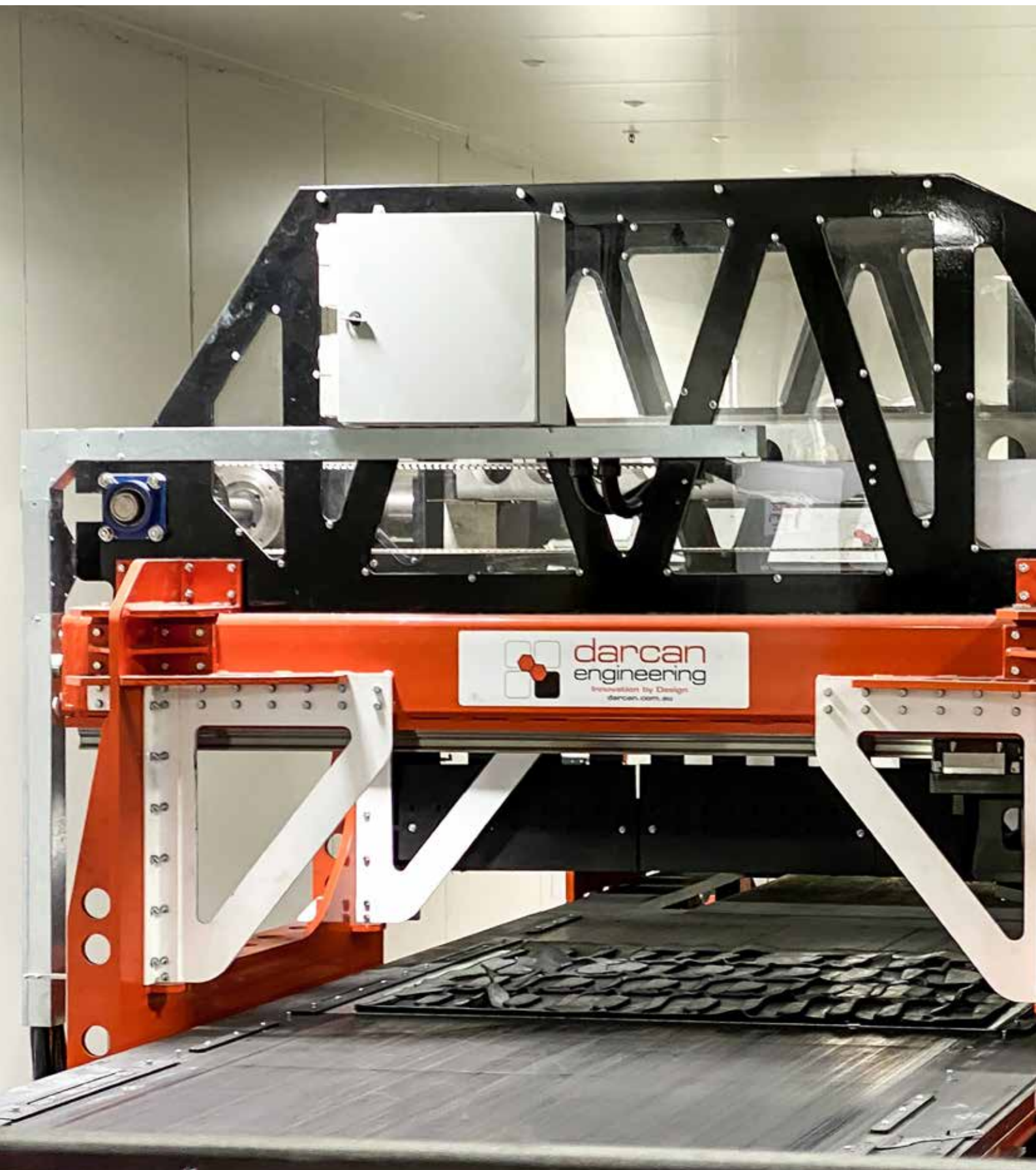
Carbon Revolution's 'Mega-line', a new-to-world industrialization program, much of it realised through a technological innovation network in Victoria.



Carbon Revolution's patented Diamond Weave Technology™ (patent pending), ensures the aesthetic quality of carbon fibre weave on visible surfaces of the wheel face.











The high-volume 'click press' engineered to penetrate multiple structural carbon fibre layers in one powerful, sequential action.

Harnessing automation for enhanced efficiency and precision and two years in the making, Carbon Revolution's Mega-line Industrialization Program, was designed to improve throughput and reduce production expenses. This line transforms the company's foundational patented composite production technologies into an automated, digitalized production setup, utilizing an overhead transport system to streamline material flow across various processes. To achieve this vision, Carbon Revolution formed industrial engineering partnerships with a number of local firms, including but not limited to Darcan Engineering, Plastool and Marand Precision Engineering to engineer a cutting-edge production line.



The Mega-line demoulding station: the mould tools, preserve precise part geometries upon demould.

The Carbon Revolution development team collaborated with the Victorian-regionally based firm, Darcan Engineering, to further automate the fabric cutting process which employs linear actuators that exert tonnes of sheer force. The process was developed and engineered to deliver high volumes of precisely cut structural fabric pieces. Precisely cut stacks of fabric shapes facilitate the subsequent automated pick and place production process.

Wheel rim preforms are fabricated from carbon fibre fabrics, carbon fibre tow and preforming aids that allow the precise construction demanded by the downstream RTM process. The fibrous materials are applied and wound at high speed by dedicated automated machinery - also developed in-house. An overhead transport system eliminates manual handling processes.

The Mega-line project encompasses multiple moulding stations coupled to High Pressure-RTM Injection moulding machines, achieving fast cycle time through decoupling production line constraints. Crafted by Plastool in Moorabbin, Victoria, the mould tools, maintain high levels of vacuum, hold back huge resin injection pressures and high moulding temperatures while delivering highly precise part geometries upon demould. The tools can weigh close to 500kg. The intricacies of the process are managed by specially designed robots, responsible for extracting the moulded wheel from its tool. Once the wheel is freed, these tools are automatically cleaned and returned to the initial layout area, ready for another production cycle.

Once moulded, the wheel embarks on a sequence of factory processes that encompass the unique Diamond Weave Technology™ (patents pending) application, followed by precision machining, CT scanning, and a finishing paint application.

Deflashing, though minimal, is now an automated process with robotic arms programmed to navigate and finesse complex curves.

The company's wheels feature its patented Diamond Weave Technology™ (patents pending), which ensures the aesthetic quality of carbon fibre weave on visible surfaces of the wheel face. Earlier methodologies placed the visible layer, a surface ply 2x2 Twill, at the outset in the face tool. The fascia's layer is now being integrated during a secondary moulding operation on the already structured wheel moulding. This methodology helps in many ways including sandwiching the surface ply fabric between two rigid tools ensuring its stability and perfectly detailed appearance.

Fellow Victorian company, Marand Precision Engineering, played a pivotal role in developing the mechanical framework of the Mega-line that seamlessly blends efficiency with precision. This collaboration highlights how expertise in mechanical engineering can transform the very essence of production, ensuring that each carbon fibre wheel is a testament to precision engineering and innovative design. This initial phase is expected to add 75,000 wheels per annum to its production capacity.

There is no doubt that the success of the Mega-line is a result of the extraordinary portfolio of R&D undertaken by Carbon Revolution, woven with contributions from an industrial community of experts – only some of which are mentioned above - each adding a unique thread to the masterpiece. The adage "It takes a village to raise a child" finds a fitting parallel in the world of manufacturing: it takes a community like Geelong, steeped in automotive manufacturing history to raise a new global Tier 1 supplier.

Carbon Revolution's IP portfolio, including more than 100 patents (granted and pending) and extensive wheel manufacturing know-how, enables the mass production of lightweight wheels and positions the



company as a market frontrunner in solving the global automotive industry's challenges in its shift to electrification. Four EV wheel programs are now underway with automotive OEMs and the company's light weight technology also has potential application in space, defence and other industrial markets.

Carbon Revolution's bold international expansion plans are apparent, aligning with a strategic intent to be nearer to its OEM customers and suppliers, particularly in North America. This proximity, combined with reduced labour and shipping costs, positions the Megaline as a model for offshore production, facilitating deeper market penetration. Concurrently, the company will maintain its Waurn Ponds, Geelong headquarters as an 'R&D Powerhouse' as well as continuing to expand its manufacturing site.

Pre-form CNC fibre cutting machine.



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# Plastool

## Swiss precision in Mordialloc (VIC)

Written by Kerryn Caulfield, Executive Director, Composites Australia Inc.

**Established** in 1956 by Herbert Down, Plastool stands as a pioneer in the plastics and mould making industry. The business remains a family operation, with founder Bert Down's sons, Gary and Andrew, holding positions as Chief Executive Officer and Manufacturing Director respectively.

**F**rom its 1,600sqm facility in Mordialloc, situated in Melbourne's south-eastern suburbs, Plastool specializes in producing high precision components, tooling, and 3D CNC machining solutions. These cater to Australian industrial manufacturers ranging from food packaging to aerospace and defence. The company also offers unique machining for materials such as carbon fibre, aluminium, stainless steel, and graphite.

Plastool's competency as 'Swiss precision in Mordialloc', Carbon Revolution entrusted Plastool to aid in the development of its original low pressure tooling, and this partnership continued with the development of the RTM moulds for the recent Mega-line. These moulds facilitate a High Pressure-RTM Injection moulding process, allowing a moulding cycle time of 30 minutes each.

"The moulds consist of various tool steels; each engineered and designed for its particular function and to endure frequent use. A significant portion of the work takes place on our Makino V80S machines; these are a five-axis continuous processing platform tailored for large die/mould part machining, especially intricate, multifaceted, 3-D contours. This equipment helped create the 3D organic style flowing surface of the mould with accuracy within +/- 20 microns," says Kieron Donoghue, Operations Manager at Plastool.

Carbon Revolution manufactures wheels for the world's best OEM automotive brands such as Ferrari and the Ford, General Motors and Jaguar LandRover. Larger volume designs such as those for GM's Corvette, the Ford Mustang Shelby GT500 and the Range Rover Sport are produced on the highly automated Mega line. "Each brand has its own signature wheels crafted, engineered, and produced uniquely for them. It's not a uniform approach. Each requires a specific set of RTM tools, reflecting years of research and development that we have translated into tooling," states Kieron.

Plastool's recent proficiency and project management methods evolved from supplying thin wall injection moulding tools. This high-speed variation of traditional injection moulding focuses on lightweight plastic parts, streamlining material use and quickening cycle times. Predominantly seen in food and non-food sectors, thin-walled packaging includes containers and lids for a range of products from fresh food to cosmetics and pharmaceuticals. Industries today prioritize sustainability and reduced plastic consumption, driving the demand for lighter containers with thinner walls.



Plastool's climate controlled area featuring the Makino V80S milling machines.

"We've invested in state-of-the-art industrial capabilities optimised to serve the progressive automation of Australian manufacturers - we make things that make things. For composites, we design, engineer, hone, and service RTM, compression, and reaction injection moulds. We also produce blow and rubber moulds, thermoforming, and polyurethane tools and manufacture prototypes," says Gary Down.

Plastool partnered with Carbon Revolution early in its journey, developing pivotal tooling for patented composite production technologies in 2011. Ashley Denmead, CTO of Carbon Revolution, regards





Close-up of the 3D organic style flowing surface of the mould with accuracy within +/- 20 microns.



Laser welding at Plastool - high precision and close control of applied energy.

“

*It's not a uniform approach. Each requires a specific set of RTM tools, reflecting years of research and development that we have translated into tooling.*

**Kieron Donoghue**

”

Producing these thin walls demands exactness in tooling and dies. Wall thickness is determined by comparing the part's size to its wall thickness. As walls become slender, their injection moulding becomes intricate. Kieron states, “The more disposable the product, the superior the tool's quality needs to be. Achieving this part quality and rapid cycle times requires an efficient cooling system, consistent injection speeds and pressures, preserving the quality and integrity of the end product. We manufacture tooling to create products with a wall thickness under 0.5mm, this all helps to reduce plastic waste”



Laserwelding - a delicate technique is used for repairing tools, dies and bearing shafts. From left, Kieron Donoghue, Gary Down and Kerryn Caulfield.

## D-lamTool

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- ▲ It is not influenced by thickness changes in the structures.



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linkcomposites.com.au

# Link Composites

## A structural alternative to legacy materials

Written by Kerryn Caulfield, Executive Director, Composites Australia Inc.

**Founding** Link Composites a mere five years ago as a fledgling start-up, William Robinson, embarked on an intense and heady journey. Today, the company has evolved as an impressively automated composite sandwich panel manufacturer, boasting a remarkable 500 per cent increase in capacity in recent times. This rapid growth and development signifies a ride that was as challenging as it was rewarding.

**L**ink Composites' product portfolio includes lightweight sandwich panels, infused panels, fibreglass parts, extrusions and laminates. Its production methods include resin infusion, vacuum bagging, a hot melt continuous panel lamination line and CNC kitcutting technology that produces complex shapes and batch components with 100 per cent traceability.

The company's principal product, advanced composite sandwich panels, is used across the caravan and recreational vehicle industry, modular housing, marine craft, as well as trucking and mining industries. These panels consist of high-strength fibreglass reinforced with an XPS, PVC or PET core sourced from Europe. Its range of bespoke constructions of outer skins and cores delivers notable strength-to-weight ratios, thermal insulation, fire protection properties, shock resilience and resistance to moisture. Designed and manufactured to be a structural alternative to legacy materials, a complete panel set for, say, a caravan-including floor, walls and one-piece roof panels – can be cut in volumes to a preprogrammed shape ready for further assembly without the need for mechanical fasteners, significantly reducing their build times.



Will Robinson, Managing Director Link Composites with the company's automated composite sandwich panel hot melt adhesive line,



Link's line was built with a double sided adhesive spreader and calendar roller that optimises compaction pressure during the layup process.





Now nestled within the Coolum Eco-Industrial Park, the company is co-located with a number of customers, namely ZoneRV and Cure Marine. Link Composites Managing Director Will Robinson said moving had both wrung logistic costs out of their supply chain and expedited plans to automate production. ‘We were running two shifts making panels on seven tables which limited our ability to scale up. So we decided to design and build the advanced hot melt adhesive line ourselves with the objective of producing longer panels at a rapid pace.’

The semi-automated line was built with a double sided adhesive spreader and calendar roller that optimises compaction pressure during the layup process. It uses hot melt moisture cure Polyurethane, commonly called ‘PUR hot melt’ that forms a strong initial bond and then continues to strengthen as the adhesive reacts with moisture. According to Will, the PUR has an open time of 90 seconds after which crosslinking occurs as it cools to form a strong, permanent bond. The line can now manufacture panels up to 15 metres in length at four metres per minute.

Will has now turned to turbo charging production flow with a fourth CNC machine that is once again being designed and built in-house. Features include auto dust control and tool changes and vacuum suction for holding fibreglass panel parts down.

The move and associated investment in new equipment was assisted by a Production Automation Grant through the Queensland Manufacturing Excellence Forum. Company relocation, expansion and automation were also supported through Council’s Sunshine Coast Economic Resurgence Plan which was established to provide support to local business and to assist with the region’s

CNC kitcutting technology that produces complex shapes and batch components with 100 per cent traceability.

economic recovery, post COVID. According to Will, the investment in automation has delivered greater reproducible quality and improved consistency across products resulting in the staggering 500 per cent increase in capacity. The company’s growth into robotics has also required upskilling staff and new recruits into specialist roles in engineering and mechatronics.

While Link Composites has ridden the caravan boom detonated by COVID, Will believes that Rapid Infrastructure Development (RID) presents the next opportunity for the application of sandwich panels in the industrial and commercial building, cold storage, residential construction, and modular housing sectors. This growth is largely due to the panels’ load-bearing structural properties, faster construction methods and the possibilities of significant reduction in the environmental impact of using recycled PET in residential construction.

‘As with our RV customers, we can design, manufacture, cut and supply complete panel sets that will significantly reduce their build times.’ Will believes that the future of the construction industry lies in the transition to a panel system and the re-education of tradespeople about the use of advanced materials. This involves a particular focus on chemical adhesion, heralding a new era of efficiency and sustainability in construction that offers a solution to the housing crisis.

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# Cure Marine

## Carbon fibre: Making the best adventure tools in the world

Written by Kerryn Caulfield, Executive Director, Composites Australia Inc.

**The term** 'Industry 4.0' represents the infusion of high technology and data exchange into traditional industrial practices, effectively automating manufacturing technologies and processes. Within the specific realm of Marine Craft Construction, 'Marine 4.0' signifies the harmonious union of time-honoured boat building techniques with cutting-edge engineering, robotics, construction methods, advanced materials and complex engineering software systems. It acknowledges the enduring necessity of skilled manual labour and problem solving skills required for marine construction.



Rendered image: The Cure Custom 70 optimizes performance while maximizing the space and comforts that catamarans traditionally offer.

**C**ure Marine, at the forefront of 'Marine 4.0' composites design and manufacturing, is utilising an impressive array of in-house, state-of-the-art automated machinery. This equipment includes robotics, CNC machines, laminate cutters, and one of the most significant 3D Printers found in the southern hemisphere. The company's application of advanced materials and intelligent manufacturing ensures precise high-quality output and operational efficiency inherent in automated processes.

Headquartered in an industrial estate on Queensland's Sunshine Coast, the seasoned team members at Cure Marine channelled their expertise of decades of experience in composite manufacturing into the flagship vessel - the 'Cure Marine Custom 70' - the largest thus far of its high performance cruising catamarans. This catamaran, a full carbon fibre epoxy resin-infused multi-hull, represents the epitome of efficient performance design for ocean sailing.

Given the unique global loads catamarans endure, such as pitch connecting moment, transverse bending movement and split force, the light weight of carbon fibre - at a mere 16 tonnes - proves advantageous. This reduced weight allows the boat to sit higher in the water,

facilitating easier wave navigation. Its stiffness attributed to the carbon fibre, enhances sailing smoothness, as the hull can slice through waves with less resistance. A higher waterline also opens opportunities for cruising boats to explore inland waterways and secure anchorages closer to shore, further enriching the adventure.

The catamaran's design prioritises 100 per cent carbon fibre construction, optimizing weight and performance while maximizing the space and cruising comforts typical of catamarans. This amalgamation of attributes yields a world-class, agile, yet spacious and comfortable catamaran, offering unparalleled sailing and cruising pleasure. The significant reduction in weight also enhances fuel efficiency by a remarkable 50 per cent, as the power necessary to propel the boat through water diminishes.

Ian McMahon, co-founder of Cure Marine, is a seasoned mariner, with an impressive portfolio of 28 boats constructed under his supervision. Cure Marine heavily relies on Ian's extensive experience in all facets of marine manufacturing, particularly to uphold the high-quality standard mandated for all builds. Cure cats were conceived to be able to cross oceans with speed and comfort whilst still being easily single or short-handed.

"The Cure Custom 70, the first all-carbon custom catamaran of its size constructed in Australia in recent times, stands as an exceptional testament to Cure Marine's capabilities," McMahon remarks. "Launching a production brand always presents challenges, yet the technological and production foundation present at Cure Marine undoubtedly eases the process. All fit-outs have undergone CNC testing in situ. We construct using our methods, our technology, and our take on clean aesthetics and style. Creating and working on a dream build such as this is exciting."

Carl Bird, CEO of Cure Marine: "Employment of virtual product development technologies, like digital



Carl Bird, CEO of Cure Marine with Kerry Caulfield, Composites Australia on the foredeck of the Cure Custom 70 under construction.

twinning, allows for a precise depiction of functionality, enabling us to identify and review potential challenges before they materialise. These insights can greatly influence product design, the manufacturing process, and the operation of the product throughout its lifecycle, subsequently enhancing performance.”

The Cure Marine Custom 70 embodies a synthesis of advanced technology, design sophistication, and the finest craftsmanship. A performance cruising catamaran, it showcases the remarkable potential of all-carbon fibre construction, which amongst its attributes is a reduction in weight that remarkably improves fuel efficiency by 50 per cent.

The Cure Custom 70 optimizes performance while maximizing the space and comforts that catamarans traditionally offer. It combines agility and speed with spaciousness and comfort, yielding a vessel that heightens sailing pleasure. The use of carbon fibre and other advanced materials significantly enhanced the build and performance.

Its layout features a luxurious owner’s cabin to starboard, boasting a large ensuite. To port, there is an expansive aft guest cabin and a forward cabin with versatile configurations for additional berths, office space, or workshop and storage space. The separate toilet and shower compartments add a touch of convenience, completing the package of an exceptional cruising catamaran.

Attaining CE Yacht Compliance Certification, while costly, certifies that the construction meets a recognised standard, transcending mere assembly. Boat builders need to perform stringent tests and thorough documentation to demonstrate compliance with relevant European Union directives and requirements. These measures scrutinise the structural strength and integrity of vital hull components, in addition to evaluating the reliability and functionality of propulsion, steering systems, power

generation and all other onboard features fundamental to the yacht’s primary services. This certification also necessitates comprehensive records of all material inputs, including resin batches. As Carl notes, ‘this practice acts as a benchmark, substantiating both the boat’s intrinsic value and its potential for resale’.

Cure Marine’s model is a union of time-honoured boat building techniques with cutting-edge engineering, robotics, construction methods, advanced materials and complex engineering software systems.



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# Zone RV In the ZONE

Written by Kerryyn Caulfield, Executive Director, Composites Australia Inc.

**For Australians**, caravanning isn't merely a mode of travel; it's a cherished tradition and alternative lifestyle, and a testament to our deep-seated love for adventure and the great outdoors.

**A**ccording to Dave Biggar, Co-Founder and Managing Director of Sunshine RV manufacturing company Zone RV, caravans are the best adventure tools in the world. To optimise the experience for caravanning enthusiasts, Dave and his team leveraged their comprehensive experience in composite manufacturing across the marine, aeronautical and civil construction sectors to design and manufacture the world's best adventure caravans.

From a start-up in 2015 to employing more than 230 staff at its purpose-built facility, Zone RV now offers the ultimate luxury in off-road caravans, striking a balance between strength and lightness. All models across the three classes – Sojourn, Peregrine & Expedition - prioritize safety and weight, and are engineered and equipped to navigate challenging terrains.

"We understood from the beginning that a top-tier product could only materialize from cutting-edge



equipment, capable of maximizing the attributes of advanced materials and intricate engineering software systems. We have employed advanced composites, bonding and adhesive technologies across all elements of the build, assisting our vans in maintaining the Gross Combined Mass (GCM) within the capability of a typical tow vehicle,” stated Dave.

Adhesives play a pivotal role in reducing weight, maintaining structural integrity, and enhancing production economics. Particularly, they prove crucial in the task of fusing dissimilar materials, with the resulting structures demonstrating consistent performance under a wide range of conditions.

Zone is using Korapop 225/2k, a 2-part part hybrid moisture curing construction sealant and adhesive by H.B. Fuller. Upon curing – in a little less than three hours - it forms a seal that is durable, flexible and weather-resistant. As a mid-high modulus product, it possesses vibration dampening capabilities and resistance to shock and impact, effectively dealing with vehicle bounce and road corrugation. Importantly, the range is devoid of isocyanates and solvents. Zone also uses Korapop 240A which is manufactured locally in Melbourne offering a longer shelf life compared to imported counterparts.

In 2022, Zone RV significantly enhanced its production capability and capacity with the acquisition

## CHECK OUT YOUR OWN BACKYARD

The caravan and camping industry remains the backbone of the domestic tourism industry and major contributor to the country's economy... Looking forward, it will continue to build on the \$27 billion worth of annual economic value to the Australian economy. Fast fact: Australians have 30.3 caravans/campervans per 1000 people – The Caravan Industry Association of Australia (CIAA.)

of a large volume 3D printing system. This is a VSF Composite printer from Australian manufacturer CNC Design, and is said to be the largest in the southern hemisphere. The massive system, now installed at Zone RV's manufacturing facility, serves in trimming and polishing moulds and printing blanks for mould production. The large area gantry system manages to integrate five-axis milling and three-axis printing in one machine. The VSF system is a single-bridge gantry spanning 22m x 5m x 1.6m, equipped with Siemens SINUMERIK ONE - one of the most advanced CNC systems currently available. The machine undertakes high speed five-axis milling using a 10kW, 20,000 rpm milling spindle from HSD Mechatronics, complemented by swarf extraction. Three-axis 3D printing occurs through a CNC Design Model 30 print head, featuring a vacuum pellet drying and conveying system, allowing printing rates of up



Dave Biggar and his team have funneled their comprehensive experience in composite manufacturing across the marine, aeronautical and civil construction sectors to design and manufacture must-have adventure caravans.



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## STANDING ON THE TOP

With a look more akin to an inner-city apartment with carbon fibre aesthetics, clean modern lines, recessed LED strip lighting, the SUMMIT's modern interior styling feels more like an apartment than a caravan - just perfect after a tough day on corrugated outback tracks.

### Zone RV Peregrine Summit

Travel length:	8200 mm
External body length:	5800 mm
External body width:	2500 mm
Travel height:	3100 mm
Tare:	2818 kg
ATM:	4000 kg
Ball weight:	220 kg
Body:	Carbon fibre/fibreglass sandwich wall, end and roof panels with PET core insulation
Chassis:	Hot dipped galvanised steel with tough coat rubberised coating
Suspension:	Independent Cruisemaster ATX airbag, height adjustable
Brakes:	Cruisemaster disc brakes
Wheels:	17 Alloy Wheels with 26570r17 (5 stud or 6 stud)
Price:	From \$197,800
Supplied by:	Zone RV, Coolum Beach, Queensland

### Zone RV Sojourn Summit

Travel length:	8800 mm
External body length:	6400 mm
External body width:	2500 mm
Travel height:	3100 mm
Tare:	2915 kg
ATM:	4000 kg
Ball weight:	225 kg
Body:	Carbon fibre/fibreglass sandwich wall, end and roof panels with PET core insulation
Chassis:	Hot dipped galvanised steel with tough coat rubberised coating
Suspension:	Independent Cruisemaster ATX airbag, height adjustable
Brakes:	Cruisemaster disc brakes
Wheels:	17 Alloy Wheels with 26570r17 (5 stud or 6 stud)
Price:	From \$197,800
Supplied by:	Zone RV, Coolum Beach, Queensland

to 30 kilograms per hour. The system also provides five-axis orbital sanding; incorporating a built-in tool rack, part probing and print head calibration unit.


One of the significant benefits of 3D printing technology, according to Dave, is Rapid Prototyping. "We have the capability to design, manufacture, test and subsequently modify a custom part within a brief timeframe, without compromising the pace of the production line. This gives us liberty to innovate without lengthy lead times or the requirement for warehouses brimming with costly machinery. We are now 3D printing many of our smaller production parts and components."

The SUMMIT series, sitting at the top tier of the product range, claims to be the first carbon-fibre timber-free fully bonded caravan. It features a frameless carbon fibre monocoque design and external skins crafted from carbon fibre sandwich panels with an enhanced PET core which is many more times thermally efficient than 'traditional' construction materials. Designed and manufactured to be a structural alternative to legacy materials, a complete panel set includes floor, walls and one-piece roof panels all of which are fabricated without mechanical fasteners significantly reducing build times. According to Dave, substituting the fibreglass external skin of the sandwich panelling with carbon fibre has also helped reduce overall.

Recognising that advanced equipment operates at its best in skilled hands, Dave prioritised investment in an apprenticeship training program that blends traditional institutional training, with on-site tutorials and assessment. Currently, the company boasts four apprentices under the tutelage of the Brisbane based PARTEC Composites Training Centre. Dieter Heydenrych, a Composites Technician with PARTEC, visits regularly and often spends a day working hand-in-hand with his apprentices. The apprentices carry out their practical assignments on the floor, utilizing Zone's specialized equipment and materials. Dave muses, "Who wouldn't want to work on cool sophisticated equipment on the Sunshine Coast while gaining a composites technician trade qualification?"

Zone RV Peregrine  
Summit Caravan





Large format 3D printing requires thermoplastic materials that maintain their shape as parts cool. Traditional plastics have high shrinkage rates that make printing difficult, causing parts to warp. The addition of fibres helps to control the warping, while adding additional strength and stiffness. Glass or carbon fibres can get chemically treated to promote adhesion with the plastic matrix. This creates material with dimensional stability required to print, while further improving the strength of the printed parts.

**Vahid Montazeri, Director. INNOMERIX Pty Ltd**

“

*We have the capability to design, manufacture, test and subsequently modify a custom part within a brief timeframe, without compromising the pace of the production line. This gives us liberty to innovate without lengthy lead times or the requirement for warehouses brimming with costly machinery. We are now 3D printing many of our smaller production parts and components.*

**Dave Biggar**

●



Kerryn Caulfield with Dave Biggar, Co-Founder and Managing Director of Sunshine Coast RV manufacturing company Zone RV, with one of the SUMMIT series that sits at the top tier of the Zone product range.

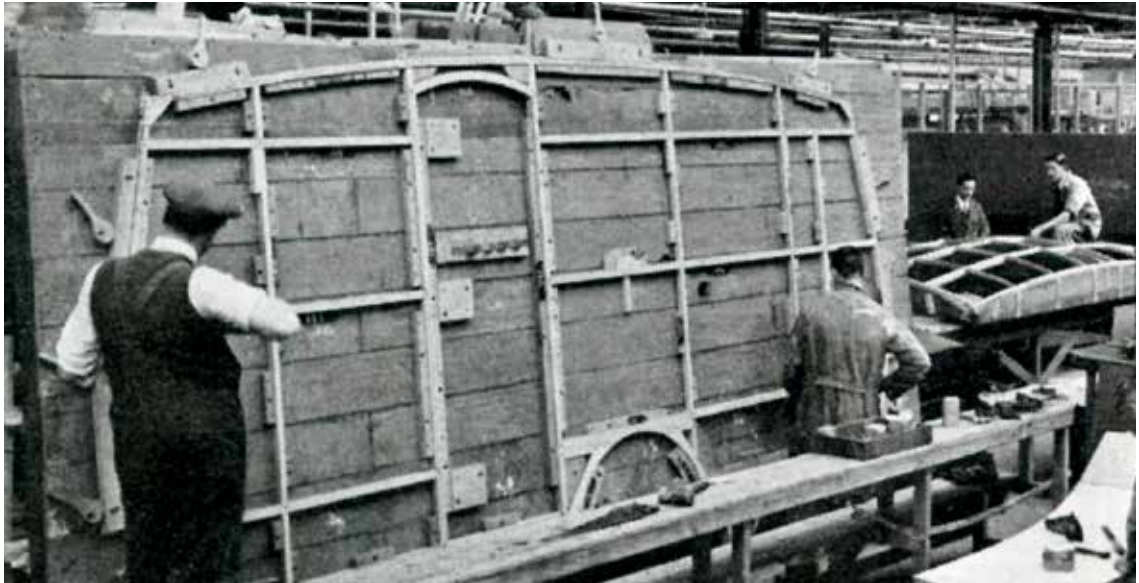


a snippet

# The Evolution of Caravan Construction

Written by Kerryn Caulfield, Executive Director, Composites Australia Inc.

Heritage caravan.  
In the 1940s Eccles  
built panel parts,  
assembling them in  
a line.



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**S**ince the creation of the touring caravan, construction has undergone significant developments over time. In the early days, caravans were constructed with a mix of wood panelled sides and treated canvas made by Australian mills. Soft to firm hardwood remained one of the primary materials used in framing while canvas was replaced with plywood, often marine ply. Despite its versatility, wood has limited insulation properties and is susceptible to rot when exposed at length to damp conditions.

In the late 1970s, a shift was seen with the introduction of aluminium frames and ribbed aluminium cladding. Notable advantages were increased strength and durability. Nevertheless, aluminium frames were not without their issues. Problems arising from metal fatigue, especially in offroad vans subjected to years of travel on rough roads, resulted in cracks forming around rivet points and welds. While generally capable of serving its purpose, aluminium cladding can also dent with relatively little force and is particularly susceptible to damage from

hail. Additionally, its insulating properties are minimal, leading to caravans being prone to extreme variations in heat and cold.

Composite materials, particularly sandwich panels are the next generation of materials for the construction of caravans. Their lightweight and functional properties lowers environmental impact by reduce towing costs through improved fuel efficiency. A lighter caravan allows for increased payload capacity, accommodating more amenities for comfort. Furthermore, easier manoeuvrability enhances overall handling and safety during travel and reduced wear on tyres and brakes prolongs their lifespan.

Lastly, lightweight caravans are more accessible to a wider range of vehicles, enabling owners to enjoy caravan adventures with smaller, more economical tow vehicles. In summary, lightweighting promotes cost-effectiveness, manoeuvrability, increased amenities, improved vehicle longevity and broader accessibility for a more enjoyable and sustainable caravanning experience.

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