

Towards a sustainable future

A pandemic and polar vortex combined to cause some issues for the composites industry, leading to temporary price rises and a lack of certain chemicals. However, this could also accelerate the general drive towards more sustainable solutions and shorter supply chains

WORDS: JAKE KAVANAGH



The march towards lightweight and renewable materials continues, but with no compromise on strength. Hexcel's HiMax multiaxial and DPA fabrics were used in the construction of Southern Wind's SW105 high-performance cruiser, now named *Wolfhound*

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THE COMPOSITES INDUSTRY – which covers everything from basic polyester resin to complex laminates of foam, epoxy and carbonfibre – has been steadily moving towards a greener future.

The pressures have come from several

directions. Major factors have been public concern about plastic pollution, and tightening legislation around volatile organic compounds and waste disposal. However, technological advances in transport are also seeking solutions from composites. Materials that can offer additional weight savings with no sacrifice in strength have proved very attractive to automotive, aerospace and marine applications, where electric power is becoming increasingly desirable.

Meanwhile, in the world of machinery, big advances have been made in 'additive' and 'subtractive' manufacture. 'Additive' is better known as 3D printing, where the raw material – either a thermo-plastic or metal alloy – is melted and then built up in

thin layers to create an object. 'Subtractive' manufacture uses routing and milling technology to create a highly accurate finished piece from a solid block. By more closely aligning the printing and the milling processes, even combining both into one cabinet, big savings can be made in time and raw materials.

We are rapidly getting to the stage where a company won't need to order parts from halfway round the world and wait for shipping. Instead, they download a licensed CAD file from the internet and make a pattern part on site instead. The US Navy is said to be particularly interested in this process, allowing warships to effectively make their own spare parts afloat. Many minds are now taking a closer look at bringing component production closer to home, encouraged by the logistical disasters brought about by Covid and the *Evergreen* Suez incident.

DEMAND AND SUPPLY

Before the pandemic skewed the data, it seems that marine composites were enjoying a surge in demand as lighter and greener vessels were being sought by discerning boaters. Composites lend themselves to high-load applications, particularly for foiling and performance sailing rigs, and can also produce incredibly strong structures for a fraction of the weight of conventional materials. The take-up of electric propulsion is also inspiring designers to develop hulls that can benefit from the more limited power available.

The use of flax and other natural materials for reinforcement and resin production is having a positive impact on the composite sector's carbon footprint. Nowadays, any product that carries key words such as 'renewable' 'green' 'low carbon' or 'sustainable' seems to have more appeal to the consumer.

The march to sustainable composites was partly interrupted in 2020 by a sequence of unforeseen global events, as summarised in the 2021 JEC Observer report. Compiled in collaboration with market analysts Estin & Co, the report aims to identify the trends in the composites sector between 2020 and 2025 to help OEMs plan for the future.

JEC Observer suggests that after consolidation, the 2020 figure for the global consumption of composite material is expected to be around 10 million metric tons to a value of US\$78bn, with Asia remaining the biggest market. The pandemic has put a dent in the previously healthy growth, which was around +4% from 2010 to 2019, but is expected to slump back to -14% once the 2020 figures are fully analysed. However, the authors predict that growth will pick up again post Covid at between +2% to +9% across various regions. This is due to an anticipated rebound in most sectors except aerospace, which should recover by 2022.

"The sanitary crisis has accelerated some deep underlying trends that were already present before the pandemic started" said Julien Deleuze, vice president at Estin & Co. "Asia has become – and will remain – a strong growth driver for the industry at global level. EMEA and Americas remain geographies where innovation for composites is at the fore-front. Composite materials still bring the critical positive features of mechanical strength, lightening, and insulation functions. Based on this, they pave the way for more resilient industrial applications in all types of transportation, construction, energy and electrical solutions."

GENERAL TRENDS

The three general trends in marine composites seem to be greater use of bio content, a move to further reduce weight, and more effort to minimise waste. Meanwhile, the problem of end-of-life boats remains. How to dispose of often complex laminates of resin, glass and foam?



Composite engineers Solico say that larger areas of yachts are now being given to lightweight hatches and other composite structures to make the deck more versatile. A swimming pool that converts into a helideck is a classic example. Right: Solico's maritime business unit manager Coen Meerbach



"Using renewables is a good way to lock carbon in," said technical sales director Tom Kugelstadt. "We are working with customers to improve the amount of bio-mass being used, but it comes with its own challenges. Natural fibres attract moisture, which can

give issues for resins and storage. However, we are experimenting by making standard components from existing moulds and comparing them alongside more traditional materials as we drive towards sustainable solutions."

A keen observer of current trends is the Dutch composite engineering company Solico, which has just expanded its team to cope with an increased workload. The company operates across a broad range of composite design and engineering projects on superyachts, RIBs, powerboats and sailing yachts.

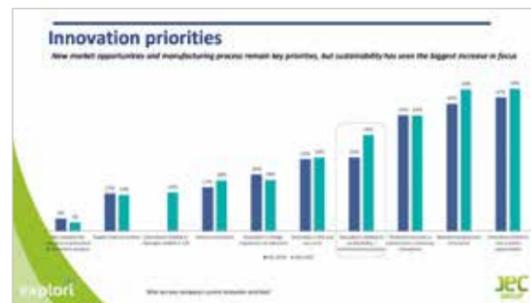
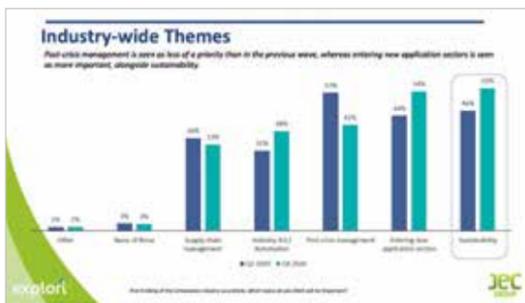
"Probably the biggest trend we see in the leisure marine and superyacht sector is for vessels to pack in more features," said maritime unit business manager Coen Meerbach. "Typically, these would include larger tenders and more motorized toys. We have worked on several exciting projects recently where highly engineered lightweight composite structures have allowed designers to hide large tender and toy garages. This maintains a smooth deck profile and gives the ability to open large hatches in the yacht's topsides. Guests can enjoy more seating options for stunning views from the yacht's interior spaces."

With no JEC Composites expo to report from this March, *IBI* has looked instead for any technological developments. ➔

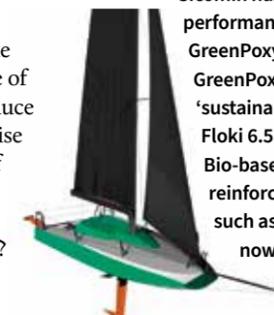


Sicomin has developed a range of high-performance bio-based resins under the GreenPoxy brand. (Left) InfuGreen 810 and GreenPoxy 33 are both being used on the 'sustainable' new Mini Class yacht, the Floki 6.5 from Atelier Interface. (Above) Bio-based epoxies also work well with reinforcements from renewable sources, such as the flax layup seen here with the now proven Flax 27 from Greenboats

Thailand-based Cobra, which describes itself as a one-stop shop for serial composite production, says it has seen a lot of growth in the use of foils. The company has recently partnered with Keeta Foiling Craft to bring new models of foiling dinghies and surf boards to a new global market



These graphs from the JEC Observer report show that sustainability is a key target across the entire composites industry, not just marine. Greener solutions are also a growing priority in innovation



The resupply challenge - Scott Bader's strategy

"CELEBRATING ITS CENTENARY this year is the global chemicals company Scott Bader. Now employing 700 people and with six manufacturing sites, it supplies most of the major international boatbuilders, so took the full brunt of the raw material shortage. It quickly brought in strategies to cope with the supply situation.

"It's been a hectic few months," said CEO Kevin Matthews. "Boatbuilders who used to be selective are now keen to buy anything available and this could be used by suppliers to make extra profit but we are taking the opposite approach - we are prioritising supply over profit as we want to retain our customers when this crisis is over. It has been a scramble at times, but we have two big advantages - we are vertically integrated, so we make the base resins from which all our other compounds are produced, and we also have a global network of multiple production sites. It is unusual for all the sites to be impacted at the same time, so we had the chance to pool resources around the group to fill any shortfalls. This has buffered us from the worst of the supply issues. We have also been asking customers to be prudent with their orders so that we can supply as many of them as possible."

Technical service manager Tom Kugelstadt has been helping OEMs with some alternative thinking. "A big advantage is that we have a very close



Whether the OEM is large or small Scott Bader says it has 'jumped through hoops' to keep them supplied

working relationship with boatbuilders," he said. "We know their operations well and can advise on how to circumvent specific shortages. For example, several different products can often do much the same job, particularly with adhesives. If the OEM usually uses product A, but can't get it for several weeks, then product B or C could work just as well. This allows boatbuilders to avoid bottlenecks in their production cycle.

"We have also been able to advise on 'upstream and downstream' products, such as foam cores and catalysts. We keep a catalogue of different materials outside of our range and how they will react with our resins. Even if a boatbuilder is using a third-party core or reinforcement that we don't have any data on, we will do some quick lab tests at no expense to ensure it will be suitable."

Matthews is upbeat about the logistical situation easing. "The good news is that the situation is now stable, and even starting to improve," he said.

"We will still see disruption over the next 6-8 weeks, but by Q3 we should be getting back to more normal supply territories. We were forced to put up our prices as a direct result of the cost of the raw materials, which went from a 10-year low to a 10-year high in about three months, but we expect prices will return to normal levels before too long.

CHOMARAT'S NEW G-FLOW

The major French composite manufacturer Chomarat is working towards low environmental impact by increasing the mechanical strength of its reinforcements whilst simultaneously reducing the actual amounts required. The end result should be a lighter but stronger moulding. One of their solutions is G-FLOW, described as 'A patented woven glass fabric that combines mechanical strength and good resin flow properties. It's innovative textile structure, with a non-compressive pattern construction, allows the resin to flow easily

Chomarat's new G-FLOW 500L material has a non-compressive pattern structure to save up to 50% in infusion consumables



without the need to add either an external or internal flow media.'

For the boat builder, this gives three major advantages. The first is reduced consumables and waste. "The flow properties are more effective than other solutions currently available on the market," said the head of Chomarat's glass business division, Vincent Cholvy. "This allows a significant reduction in the number of resin feed lines for infusion. For example, one of our customers has reported using 50% less consumables for the resin supply networks compared to their previous solutions."

The second major advantage is reduced resin consumption - especially welcome with current prices - and that includes in the resins lines and the flow medium. Finally, the boatbuilder has 100% fibreglass fabric that can 'integrate structural functions.'

"G-FLOW can replace a fabric layer (NCF) with the same mechanical



The domestic market in China has seen a surge in demand

Main factors for the shortages

1 Strong demand in China. US sanctions and a burgeoning regional market has reduced the availability of raw materials from Asia. The material is being used for internal markets instead.

2 Shortage of containers. A huge demand for consumer items, especially in the US, has led to a 'log jam' of ships outside key ports. There is also a shortage of vaccinated staff to unload them. This means that the containers are held up at these ports, delaying their return to exporters.

3 Fewer ships. Many of the world's cargo ships have been put out of action as they are refitted to meet the new emissions regulations.

4 Rising prices: Inevitably, with such pressure on the container market, prices have rocketed. A typical 40-foot container shipped from China to the US has seen a rise from the usual US\$2,000-3,000 to more than US\$10,000.

5 Oil price recovers. Consumption of oil fell in 2020 as whole nations locked down. Production was cut back, but since December 2020 demand is forcing up prices. Many of the key chemicals needed for composite production are sourced from oil.

6 Record bad weather: The 'Polar Vortex' snow storms in Texas and other US states has led to the damage and closure of key refineries and chemical plants, leading to 100% loss of availability of some key products.

7 Temporary blocking of the Suez Canal: The week-long blockage of the Suez Canal led to a major backlog in orders of raw materials destined for the composites industry.



Modern control rooms are helping to get containers to where they are needed

properties,” Cholvy explained. “This basically gives you two products in one. This new reinforcement makes infusion an attractive proposition compared with hand lay-up and gives both ecological and economic benefits.”

www.chomarat.com

REMOVING SPRAY GLUE FOR LESS VOCS

A major aim of both the composites and coatings industries is to reduce (or eliminate completely) the use of Volatile Organic Compounds (VOCs.) These are typically found in spray glues used to tack-position laminates into a mould prior to lay-up. To this end, Chomarat has been developing its FX adhesive solutions, where a non-VOC adhesive is already added to the cloth to allow it to be tacked into position. The process is said to be particularly useful when hanging fabric vertically in a mould as the amount of adhesive used is consistent. There is no risk of overspray which could affect the final layup. This adhesive coating is available as an option on a wide range of Chomarat’s most popular fabrics, such as G-WEAVE and ROVIMAT, and can be supplemented with Easytape glass tapes. These have the option of single or double-sided adhesive surfaces. www.chomarat.com

‘CIRCULAR’ MANUFACTURING USING DANU

Based in Scotland, the Ultimate Boat Company (UBC) has recently announced a series of new projects using the new material DANU. Interestingly, little is known about this composite, except that it is made with a large percentage of recyclables.

This is the first known use of DANU, which UBC describes as “A super-strong composite material that’s less brittle than carbon fibre and twice as strong as fibreglass. Using DANU, our powerboats are built to last a lifetime.”



UBC will be using the new DANU material, made with a high recycle content, for its new range of workboats. Leisure versions are expected soon

Each hull has been designed for a specific application, such as commercial offshore, tactical, rescue or ‘seafari’ and fluid dynamics used to maximise performance.

UBC have the intellectual property rights to the formula, which for the moment remains a closely-guarded secret. However, by specifying DANU for the build material, UBC has also set out to tackle the end-of-life issues that beset traditional GRP vessels.

“Each boat is created with the circular economy in mind,” said UBC’s Colin McAndrew. “It can be completely recycled, upcycled, or re-manufactured. Currently, UBC is the only boatbuilder to offer the sustainability and unparalleled performance of DANU.”

You can see the full range of designs, all from the pen of veteran naval architect John Moxham, at www.ultimate-boats.com

HEXCEL’S NEW HEXPLY M79 AND M9 PREPREGS

The use of ‘pre-impregnated’ (pre-preg) reinforcements, where exact amounts of resin have already been introduced into the weave by the manufacturer, result in very light and strong mouldings with a fast cure time and very little waste. One of the leaders in this field is US-based Hexcel, which has just launched two new DNV-approved products and a new surfacing pre-preg technology.

The first of these new products is HexPly M79, which is said to be particularly well suited to marine composite applications. This is due to the lower curing temperatures, namely 70°C for eight hours or 80°C for four hours, which reduces tooling costs and cycle times.

Another new product is the HexPly M9 range of pre-pregs which enable short cure times at 100°C and above to ‘provide an excellent balance between ease of processing and mechanical performance.’ When partnered with the fibres in HexTow IMC2 and HexTow HM54/HM63, this can

Hexcel’s new HexPly M9 has just been certified for DNV approval. This is in response to an increased demand for type-approved pre-preg materials for large structures, such as this commercial sail for the Silencesseas cruise ship concept



Reducing weight - TruDesign’s new 75mm seacocks



AS AN EXAMPLE of how modern composites can replace traditional metal fittings, New Zealand based manufacturer TruDesign has recently launched a new 3in (75mm) ball valve range of seacocks. By using a glass-reinforced nylon material the 3in ball assembly (pictured above) weighs in at just 1.5kg, compared with 8kg for a typical metal alternative. With several ball valves per boat, this adds up to a significant weight saving. Whilst the outer sleeve and handles are made from glass-filled nylon, the ball itself and the seals are made from a PTFE (Teflon) polymer, which reduces friction and wear and prevents the growth of marine fouling. The whole assembly is said to be immune to corrosion and electrolysis (so no need for electrical bonding) and can operate in the range of -40°C to +110°C. With a fire-rating of HB (self-extinguishing), it is suitable for use in engine rooms. TruDesign says ‘Glass filled nylon has many advantageous properties. It is typically used in applications that need lighter material weight, toughness, and good resistance to impact and thermal variations.’

result in structures that can withstand repeated high loading. Designers can use this combination to engineer masts, wingsails and foils with ‘increased glass transition temperatures (Tg) and improved long-term fatigue performance.’

Completing the product roll-out is the new HexPly XF technology, described as a ‘Surfacing pre-preg that gives a superior surface finish, with no pin holes or visible overlaps.’ This higher out-of-mould quality saves labour time and cost as the amount of sanding and finishing required is reduced. The XF technology also has the potential to remove the need for a cosmetic barrier coat. As this usually consists of non-structural layers of chopped-strand mat (CSM) to avoid print-through in production hulls, weight can be saved, too. ➔

“Hexcel is seeing a continued trend towards lighter and more efficient marine composite structures in the leisure marine craft segment,” said product manager Andreas Sageder. “Builders are continuing to develop production processes such as vacuum infusion using HiMax stitched multiaxial fabrics or prepreg constructions with HexPly prepreps. This increases the quality and consistency of laminates as well as improving working conditions on the shop floor.”

SPHERETEX’S SPHERE.CORE PSI FOR HIGH VACUUM INFUSION

German-based Spheretex has responded to requests from boat builders for a core material that can withstand very high vacuum pressures. This allows for tight curves within a closed mould, whilst also producing lightweight but stiff sandwich laminates. The solution is Sphere.core PSI, which is available in thicknesses from 2mm to 10mm.

“This core has been specially designed for high-pressure infusion or injection moulding,” said Spheretex’s CEO Holga Zorn. “By using this core, there is no need for layers of peel ply and breather material, the so called ‘external infusion.’ Sphere.core can be shaped around corners, and the final laminate is tough enough to accept metal screws.”

Spheretex is also developing an RTM/infusion mat that fulfils the requirements of fire resistance. “Our Flowmat FR will be made of glass only,” Zorn said. “Two layers of chopped strand mat are combined with a centre layer of glass-based flow medium.”

Zorn says the overriding purpose of Spheretex’s core materials is to save weight, with no compromise to strength or other mechanical qualities. The company can also offer ‘turnkey’ reinforcements to save build time, with several layers merged into one product. ➔



Spheretex’s Sphere Easy IP is described as an all-in-one solution and consists of four layers with the objective of reducing lamination weight and cost

Tough new polycarbonate to protect solar panels

WITH SINGLE CRYSTAL silicon panels now widely used in boats and increasingly on the ‘sunshine roofs’ of electric vehicles, a new polycarbonate has been developed to protect them.

Japan-based chemicals company Teijin Ltd is promoting a new resin polycarbonate called Panlite, which is described as having ‘very high impact strength, no electrical conductivity, excellent thermal and dimensional stability and outstanding transparency.’ The material can also be extruded and both injection and blown moulded. Recognising Panlite’s protective properties for a photo-voltaic array (PVA), Teijin has partnered with electric vehicle builders Applied EV to create a load-bearing structure to support a roof of solar cells. The curved nature of the roof design is achieved using Panlite for the surface of an internally moulded composite shell. The company says this process would be extremely difficult and costly using conventional glass. Every boatowner knows that exposed plastics can deteriorate with age, but Panlite is said to be longer lived, especially when treated with a protective glaze. This offers a 10-year warranty against UV degradation. The long-lived transparency is important for the solar panels to remain effective. The vehicle in the image apparently returns 330w from its roof in ideal



Panlite is a tough new transparent resin polycarbonate being used to protect the solar cells on the roofs of electric vehicles. The ability to curve this material, and its resistance to impact and UV fading (with a special coating) could make it ideal for future marine solar applications, such as on this Sunreef Eco 50

conditions, significantly lowering the charging time for the batteries. In addition, the Panlite structure is very light, reducing the overall weight of the vehicle and so making it more energy efficient. When the car is parked outside, the new Panlite roof is claimed to extend its range by up to 50 miles. With other companies such as Hyundai developing their own versions of the curved solar roof, this technology lends itself to the aerofoil shapes used in performance boats, as well as the curved sides of the hull or transom.

More information from www.teijin.com. For a full (paid for) report from a specialist consultancy visit www.IDTechEx.com.

Further reading

JORGE NASSEH, ONE of IBI’s hosts for the Rio International Boat Show, has published a new guide. Nasseh is the founder and CEO of Brazil-based Barracuda Composites and also an award-winning scientific researcher. He has drawn on his extensive technical background to produce the first edition of his *Processo de Infusão a Vácuo em Composites* (Resin Infusion Processing in Composites). The 400-page volume covers everything from the selection of the raw materials right through to computer simulations and is prefaced by two leading authorities on the subject. The first preface is written by Dr. Scott Beckwith (SAMPE Global Technical Director) and describes the volume as a “very useful theoretical, yet extremely practical book with respect to resin infusion technology.” The second by Marcio Sandri (Owens Corning Global Composite president) says this fifth book by Nasseh is “A pièce de résistance and depth.”



Advanced composites is an incredibly complex subject and in a constant state of flux, but there are several guides to help you

The book is currently only available in Brazilian Portuguese, but we can no doubt look forward to some translations soon.



Stellite 21 AM powder is a matrix alloy of cobalt, molybdenum and chrome



A part made from Stellite in a laser powder bed additive manufacturing machine

PART 2 Machines

Much of the machinery used in marine cutting and routing was reassigned to produce equipment to tackle the pandemic, but despite furloughed staff and a lot of working from home there have still been some developments. Most of these have taken place in 3D printing, a technology that could soon revolutionise manufacturing by eliminating many of the supply chains that were so badly affected last year.

Here are a few innovations that caught our attention, but no doubt the virtual composites show in June will reveal a lot more.

KENNAMETAL'S STELLITE FOR LASER POWDER-BEDS

With 3D printing gaining some traction in mainstream manufacture, many OEMs are developing new materials to assist the process. One of these is Stellite 21 AM from Pittsburgh-based Kennametal. Stellite is claimed to be the first metal powder

qualified for use in laser powder bed additive manufacturing, where the metal is sintered by the heat source and built up into layers. Stellite has been designed for this type of printing, with unique corrosion and wear resistance properties. Although destined for high performance components in the oil, gas and power generation industries, the powder clearly has a role in marine applications. The alloy is a matrix of cobalt chrome molybdenum containing dispersed hard carbides to increase the strength of the final component. Stellite 21 AM is available directly to clients for use in their own laser 3D printers, or in combination with Kennametal's end-to-end production capabilities. www.kennametal.com

EASTMAN CUTTING ADVICE FOR PRE-PREGS

US-based Eastman has been consolidating over the pandemic period with new buildings and recruiting more staff. ➔

Trends expected for manufacturing 2021 – the DMS view

US-BASED DIVERSIFIED Machine Systems (DMS) says it has thrived during 2020, mainly by 'adapting rather than just reacting'. The type of CNC cutters, routers and 5-axis milling machines the company produces were exceptionally busy during the early stages of the pandemic as the world rushed to produce protective equipment. In their blog, the DMS team has made some predictions about manufacturing in 2021 that reflect what IBI is hearing elsewhere.

LESS GLOBAL - MORE LOCAL

DMS saw Covid reduce US manufacturing output by 16.5% during 2020 as international supply chains either slowed or broke down completely. The company has realised that many US-based OEMs are now pivoting away from extended supply lines to focus more on domestic producers.

"In 2021, we expect to see more companies prioritise American manufacturing, from start to finish," the blog says. "By diversifying and cutting out the weak links in our supply chains, manufacturing will be better prepared for the bumps in the road."



Metal additive manufacture, as seen in this DMS machine, is set to have an increasing role in the marine industry by shortening supply chains and minimising waste

MORE B2C AS HOME PROJECTS THRIVE

DMS predicts that manufacturing output will involve less business-to-business (B2B) and more business-to-customer (B2C) in the years ahead. This is because home projects thrived during lockdown as people - including boat owners - had more time on their hands. Many continue to work from home and the hours saved in commuting funneled into constructive hobbies. By selling directly to these individuals, the B2C model has the potential for increased profits, better

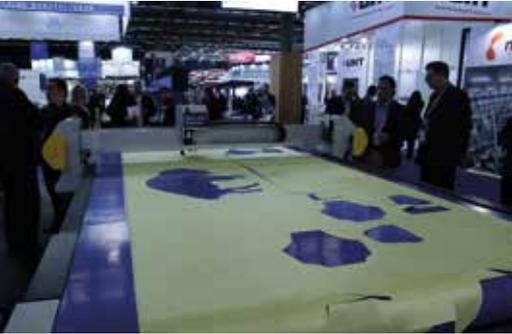
brand control and faster turnaround. DMS says it is seeing more demand for the materials and machines needed for small projects and boat restorations, citing the DMS 'Freedom Machine' router as a typical purchase. "Manufacturers will continue to interact more directly with their clients, building strong networks of trust between businesses and customers."

PRIORITISING DIGITAL

The final prediction also harnesses the new trend of more people working from home. As such, many businesses have recognised the value of 'going digital'.

"Manufacturing has traditionally prioritised an in-person work model," the blog says. "But companies that incorporate more digital platforms will find themselves better prepared for the future. We expect to see more manufacturers developing their own e-commerce channels, cutting out the middle-man through direct sales. Digital marketing and customer service will also ensure that manufacturers are not hampered when the workforce must stay at home."

The authors conclude: "By being aware of the trends, we can prepare for what happens next."



Eastman demonstrates one of its precision cutting machines at JEC 19

It recently published some useful advice about its polyurethane cutting belts and ultrasonic heads when dealing with pre-pregs. Because the material has been pre-impregnated with heat-sensitive resin, there are production challenges.

“The manufacturing process and end product dictate how a business approaches cutting a prepreg and its accompanying peel ply,” Eastman advises. “A prepreg cutting machine must be able to adapt to the many ways manufacturers cut these layers. This may include removing either the top or bottom peel ply layer (or both the top and bottom layers) prior to the material entering the cutter. Or, prepreg processing may require that only the peel ply layer is scored using a ‘kiss cut’ method that leaves the composite itself unscathed.

“A smooth, easy-to-clean cutting surface is essential, especially in manufacturing processes where the peel ply is removed

prior to cutting. Eastman Machine recommends its polyurethane cutting belts because the material is easy to clean, ensuring the prepreg is not contaminated during cutting. Felt cutting belts can “shed” fiber particles and degrade the quality of the raw material.

An ultrasonic tool head cutting at 20,000 oscillations per second, also helps address the challenges of prepreg processing. This type of tool spindle offers accuracy, speed, and repeated quality by reducing blade gumming and friction, even when cutting tacky materials.

Reducing friction also minimizes the prepreg’s exposure to heat, which can cause the resin in the material to begin curing prematurely.”

JEC CONNECT - A VIRTUAL COMPOSITES EXHIBITION

The June 1-2 JEC Connect will work as an on-line trade show, with digital stands for companies to showcase their products. There will also be various networking rooms, a meeting request platform and a conference area to access live streaming content.

The awards for innovation ceremony will be held on Wednesday 2 June with a keynote speech by French inventor Franky Zapata, the pioneer of the Flyboard Air. After famously crossing the English Channel on his Flyboard in 2019, he will be unveiling a new flying machine this year. A full programme will available soon at www.jeccomposites.com



There is no substitute to being able to get ‘hands-on’ with materials and machines, but the JEC Group is doing the next best thing. On June 1st-2nd, the organisation will be hosting a virtual ‘meeting place for all things composite.’ Described as the first ‘round the clock for the industry’s most significant event’ JEC Connect will be highlighting innovation through live-streamed competitions, keynote speeches and awards ceremonies

Our thanks to:

BARRACUDA ADVANCED COMPOSITES

Based in Rio de Janeiro, Barracuda Advanced Composites has been a principle supplier of composite materials and structural engineering services to South America for over 30 years www.barracudacomposites.com.br

CHOMARAT

Based in France and founded in 1898, Chomarar is an independent industrial group manufacturing coatings, films, textiles and composite reinforcements. www.chomarar.com

DMS

Headquartered in Colorado, Diversified Machine Systems manufactures a range of custom CNC routers and machining solutions for OEMs, including 3D additive printers. www.dmscncrouters.com

EASTMAN

Established more than 130 years ago in Buffalo, USA, Eastman Machine Company manufactures a wide range of cutting machines suitable for marine reinforcements. www.eastmancuts.com

HEXCEL

Founded in 1948 and based in the US, Hexcel is a major producer of carbon fibre reinforcements and resin systems for the aerospace, industrial and marine sectors. www.hexcel.com

JEC GROUP

Formed in 1963, the JEC Group is a French-based non-profit association dedicated to the promotion of composite materials and the development of their market. www.jeccomposites.com

KENNAMETAL

A major American supplier of tooling and industrial materials founded in 1938. The company also specialises in metal powders used in the 3D printing process. www.kennametal.com

SCOTT BADER

Established in the UK in 1921, so celebrating its centenary this year, Scott Bader produces resins and compounds for composites in 6 major production facilities. www.scottbader.com

SICOMIN

Based in Southern France, Sicomin formulates and manufactures a range of advanced epoxy systems, including bio resins, as well as high performance core materials and fabrics. www.sicomin.com

SPHERETEX

Headquartered in Germany, Spheretex has been developing and producing materials for lamination for the past 25 years, with the focus on ease of use. www.spheretex.com

TRUDESIGN

Based in New Zealand, TruDesign specialises in the design, manufacture and marketing of composite marine valves, skin fitting hose nozzles and associated products. www.trudesign.nz