What’s New in Wind Turbines
Succession Planning
Composites Recycling
Vacuum Lines for Composite Bag Applications

Interior Supply and Return Ducts with Interior Lighting

Pressure Transducer Monitoring Lines and Data Acquisition Control System

Vacuum Piping System w/ Pressure Transducer & Thermocouple Jack Panel

Interior Thermocouple Jack Panel & Vacuum Stubs

Your Composite Curing Oven Specialists
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Companies in the renewable energy market are pushing the boundaries on wind blade production and installations. They are making blades that are nearly as long as a football field, experimenting with thermoplastics, installing large offshore wind farms and more.

By Mary Lou Jay

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Business succession planning is like drafting a will: You may not like it, but you’ve got to think about an exit strategy. Two composites fabricators who have successfully transitioned leadership teams pass on advice to peers.

By Megan Headley

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Plastic is simple to recycle. But add fibers to polymers and it gets tricky. Industry gurus are working hard to solve the composites recycling riddle from both a technical standpoint and as a value proposition.

By Evan Milberg

About the Cover: Block Island Wind Farm, which opened in December 2016, is America’s first commercial offshore wind farm. The wind farm has five turbines made with composites.

Photo Credit: Deepwater Wind
From the ACMA Chair

A Focus on Materials & Management

We are quickly approaching the halfway point of the year. Our markets got off to a relatively strong start and appear to have the momentum to stay strong for the balance of the year.

This issue of Composites Manufacturing has several great articles to help us maintain that momentum this year – and well into the future.

Composite materials offer many benefits over traditional materials, and our value propositions help position us well to sell against those materials. As we continue to make progress in key markets, one of the major challenges we face is how to efficiently recycle composites at end-of-life. The size, diversity and application of composite materials make developing a common recycling platform very challenging. However, recycling potential is a critical piece of our value proposition and one that requires a lot of focus and effort.

ACMA is leading the way, alongside other organizations, to develop processes to recycle products in a cost efficient way. This month’s article on composites recycling (page 21) details some of the progress made and provides updates on the latest technologies and efforts in composites recycling. ACMA also is holding a recycling symposium this fall, so stay tuned for more information on this event.

Another article focuses on a critical business management issue – succession planning. The most important asset in any business is its people. One key to long-term success is having a clear plan for succession. Changes happen in every business, and successful companies plan ahead to put themselves in the best possible position to manage through challenges and changes.

Ask yourself a few key questions:

- Do you have backups identified and ready for key positions in your organization?
- Have you identified the high-performing people in your organization who have the ability to grow into larger roles?
- Do you have a plan in place to develop those individuals so they are ready when needed in the organization?

Having a formalized program to identify and develop your future leaders will drive continuous performance for the future. The article on page 16 offers a glimpse into how two industry leaders smoothly transitioned to new ownership and includes tips from consultants on how you can do it, too.

As always, thank you for your support of ACMA. Your individual efforts, in conjunction with other members, is what makes us strong.

Jeff Craney
Crane Composites
ACMA Chairman of the Board
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Listing and Labeling for IBC Approval

By Bill Kreysler and Mike Stevens

Bill Kreysler, founder of Kreysler & Associates and chair of ACMA’s Architectural Division, has years of experience in the architecture market. As principal scientist at Ashland Company, Mike Stevens is an expert on fire-resistant resins. Together, they talk about FRP and the International Building Code, with Kreysler contributing the first part of this column and Stevens providing details on the steps involved in a listing and labeling program.

The International Building Code (IBC) serves as the rule book for construction in the U.S. While there are supplemental codes and some exceptions, the IBC is the base code standard. If your product or process isn’t recognized in the code, you’re out of luck. It’s like driving without a license: You can do it as long as you don’t get caught. But if you ignore the IBC, heaven help you if there’s a problem and your work or product is involved.

In 2007, ACMA’s Architectural Division decided to “get a license” by petitioning the code council to recognize FRP as a legitimate material for the first time. The result is section 2613 of the current IBC, which defines what FRP is, how it must be made to qualify as a building material and what tests it must pass for various applications. There are a handful of tests recognized by the IBC, but the two biggest are the ASTM E-84 and the NFPA 285, developed by the American Society for Testing and Materials International and the National Fire Protection Association respectively.

If a developer wants to cover more than 20 percent of the exterior of certain type buildings over 40 feet tall with FRP, the materials in the thickness specified for the project must be tested and achieve Class 1 ASTM E-84 for both flame and smoke. In addition, the wall assembly – including the exterior skin and whatever is behind it – must pass the NFPA 285 test. Passing the E-84 is easier and less costly than passing the 285. The E-84 is simply a materials test, while the 285 is an assembly test. Therefore, things like joints between panels and the space behind them are critical to passing the 285. (If you’re covering less than 20 percent of an exterior with FRP, there are less stringent tests. Other applications, such as interior walls and ceilings, also require other tests.)

When striving to pass building tests, it’s not enough to simply use a so-called “Class 1 fire-retardant resin.” There is no such thing in the IBC. To be code compliant, you must test the entire product – glass and resin – at the thickness you intend to use. In addition, these tests must be performed by the company making and providing the product, or be a “sub-listee” of the company that did the test.

Finally, the product delivered to the job site must be certified as having been made according to pre-approved quality standards by an IBC-approved independent testing lab and have a label on the product saying so. These labs offer what are called “listing and labeling programs” to fulfill these requirements and ensure that any product that ultimately reaches the end user is similar to the product that was approved during testing.

The process involved in participating in a listing and labeling program has many parts. The first step is to identify what applications you want the program to cover. Based on the application, you can then identify the required test methods set forth in the IBC code. If you aren’t sure, consult with a building code...
ACMA is excited to announce its new career center, COMPOSITES JOB SOURCE. The resource was created to give employers and job seekers a better way to connect and to find their perfect fit.

EMPLOYERS

Composites Job Source offers the targeted advertising you need to attract candidates with the right work experience and skills to match exactly what you are looking for.

- Quick and easy job postings
- Resume search included
- Online reports to provide job activity statistics
- 20% to 40% Discounts offered to members of ACMA

JOB SEEKERS

Composites Job Source is free for job seekers and provide you with access to the best employers and jobs the composites industry has to offer.

- Advanced job search options
- Free and confidential resume postings
- Optional email notifications when new jobs match your criteria
- The option to save up to 100 jobs for future reference

PROMOTION CODES:

“25LAUNCH” for 25% OFF a 30 or 60 day post • “LAUNCHFJ” for 1 featured job upgrade
official or code consultant.

The next step is to pick a listing agency for your product. There are several in North America, including Southwest Research Institute, Intertek and Quality Assurance International. Each of these agencies will work with you to set up the listing and labeling program. One of the tasks they will help with is development of a quality assurance (QA) manual, which inspectors will use when they audit your facility.

Another requirement of the listing program is to fabricate the requisite test panels under the eye of an inspector approved by the listing agency. The inspector will label the panels so they can be identified at the testing lab. Afterward, the panels are shipped to the testing lab to undergo the appropriate tests. Once completed, the test reports become part of the listing.

The QA manual also includes a description of how the products are made and typical applications for the product. The manual identifies any raw materials used in production of the part, including the resin’s product name. More than one resin can be listed as long as testing is done on each resin being used. Depending on the listing agency, the glass fiber brand and type may also have to be listed.

After the listing is complete – with all of the test results and the QA manual – the listing agency will create a time table for follow-up inspections of the shop. Inspections may occur annually or quarterly. The follow-up inspections verify that the fabricator is following the procedures outlined in the QA manual and none of the materials have been changed. In some cases, inspections may include random testing of parts to confirm that no changes have occurred since the initial testing.

Once the listing is completed and the inspection schedule is set up, a label can be placed on any parts that are made under this listing. The label for all products sold under this listing will be designed and agreed on by the listing agency and the fabricator. The label assures code officials and architects that these parts meet the code requirements. They can look up the listing on the testing agency’s website to find details about the product.

While it can be a laborious process, listing and labeling is beneficial to fabricators. Once listed, you don’t have to supply test reports on your product to code officials or architects. You can simply tell them where to look up the listing of the product, which includes all of the test reports. It should help facilitate sales in the construction market, and that’s something we all like to see!

Email comments to Bill Kreysler at bill@kreysler.com and Mike Stevens at mgstevens@ashland.com.

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Learn More About Composites
FRP Pipe Helps Make Power Plant Fish-Friendly

FiberSystems in Dayton, Ohio, made a splash for composites recently when its GFRP pipe was chosen over conventional materials for a fish-friendly project at National Grid’s Port Jefferson Power Station on Long Island. Located on the southwestern shore of Port Jefferson Harbor in the Long Island Sound, the facility has two active natural gas and oil-fired steam-electric units that generate more than 360 megawatts of electricity.

According to the environmental watchdog organization Grace Communications Foundation, the Port Jefferson Power Station takes in nearly 400 gallons of water each day – and simultaneously tens of thousands of fish each year. Port Jefferson Harbor is classified by the New York Department of Environmental Conservation as SA waters – the highest class of marine waters, indicating outstanding natural resources that should be preserved. As such, National Grid wanted to ensure that the varied species of marine fish, from bluefish to northern puffer and striped bass, could be safely returned to their natural habitat.

Last spring, National Grid installed special fish screens to “catch” the fish for return into the Port Jefferson Harbor. FiberSystems was selected to fabricate a relatively small, but important discharge pipe that would carry the fish and debris collected in the screen troughs back into the harbor. The specifications for this fish bypass tube called for a 69-inch long, 22-inch diameter corrosion-resistant pipe with ¼-inch thick walls. The tube needed to be water tight with a seamless interior, two ninety degree turns, a flange and a specially-beveled end.

To craft the pipe, FiberSystems made a foam mold using a CNC machine, then fabricated the pipe using hand lay-up in several stages. First, a 100-millimeter, four-ply corrosion liner was made with a layer of Owens Corning’s 1.5-ounce chopped strand mat, which was torn into shape by hand. The corrosion liner was then infused with CoREZYN® VEX229-041, a Bisphenol-A vinyl ester resin specifically formulated by Interplastic Corporation for this project and similar applications. Afterward, the liner was cured.

Next, eight structural plies were put down using two additional layers of 1.5-ounce chopped strand mat and a layer of Owens Corning’s 24-ounce woven roving fabric, which were infused with VEX 229-041 and left to gel before adding the remaining plies – another two layers of chopped strand mat, a single layer of woven roving and a final two layers of chopped strand mat. The laminate was then fully cured. The whole process took two days.

The pipe was laid up standing flange face down, which was difficult. “The biggest challenge that we found, because of the shape and the length, was to get this thing to stand up,” says Morton. “We had to build a jig or a framework to hold it up. So you had people working on the floor [and] you had people standing on a table to reach the top of it. It was definitely a group effort.”

After the pipe was extracted from the mold and deburred, the end was contoured, flange holes were drilled and the exterior was painted with SPECTATRON® 300, a polyurethane enamel from PPG. Three FRP lifting lugs were then affixed to the pipe to help workers place the pipe, which weighs approximately 375 pounds, into place.

Gaskin says the installed pipe “fit like a glove.” Morton believes it will have a lifespan of 30 years or more, adding that “fiberglass will outlast metal every time.”

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For more stories like this, visit CompositesManufacturing.com and check out the Infrastructure articles under the “Market Segments” tab.
For decades, the world has fantasized about the use of futuristic tubes as a form of ultra-high-speed transportation. However, while fun to watch in popular television shows like Star Trek and The Jetsons, to some the concept seemed more like a literal pipe dream than an actual possibility. That was, until 2012, when SpaceX CEO Elon Musk introduced the “Hyperloop” concept – a mode of passenger and freight transportation capable of propelling a pod-shaped vehicle through a vacuum-like tube. SpaceX describes the concept as the “fifth mode of transportation.”

The outline of the original Hyperloop concept was made public in August 2013 and included a suggested route from Los Angeles to the San Francisco Bay Area. The early analysis caught people’s attention, indicating that passengers could make the trip in 35 minutes, meaning that passengers would travel the 350-mile route at an average speed of around 600 mph, with a top speed of 760 mph. Magnets are used to allow the pod to hover above the track, which means that very little energy is lost during travel.

Since then, Hyperloop has been open-sourced by Musk and SpaceX, and the company has encouraged the world to build on the original idea and make it better. A number of startups, most notably Hyperloop One and Hyperloop Transportation Technologies, were formed to try to commercialize the technology, but perhaps some of the most innovative Hyperloop designs have come from students.

SpaceX held its inaugural Hyperloop Competition Weekend Jan. 27 – 29, 2017, in Hawthorne, Calif., where students from all over the world presented their innovative pod designs. Out of the 29 teams, the winning design from Delft University of Technology (TU Delft) in the Netherlands featured a pod shell designed using CFRP. The Delft Hyperloop Team’s half-scale pod is 4.5 meters long, 0.85 meters in diameter and only weighs 328 pounds. Early estimations during the design phase indicated weight savings of up to 20 percent compared to aluminum designs for the chassis of the pod.

While many other notable competitors used CFRP for the competition, TU Delft committed to composites during the initial design phase in 2015 before any other team did. Furthermore, most teams used composites for non-structural covers for their pod. The Delft Hyperloop Team was one of the few that used the material for structural purposes. However, regardless of who was first to the figurative carbon fiber finish line, TenCate Advanced Composites says it was encouraging to see so many designs that incorporated composites.

“In the final competition, we found that many more pod designs utilized advanced composite material solutions, further reinforcing it as a material that matches the demands of the Hyperloop concept,” says John Darlington, TenCate’s head of product management.

For the design phase, the TU Delft team approached TenCate, a multinational Netherlands-based company that has worked with the university for many
years across academia and student competitions alike. Marinus van der Meijs, structures & aerodynamics project manager at the Delft Hyperloop Team, says the team paired with TenCate for its "wide range of quality products and expert knowledge."

Composites were used in the chassis of the pod, the floor inside the pod (with honeycomb core also supplied by TenCate), the covers for the pod’s suspension and the “tail” of the vehicle. The Delft Hyperloop Team describes the tail as what protects all the electronics and batteries of the pod and provides the best possible aerodynamics.

TenCate’s recently-opened European Centre of Excellence for thermoset systems in Langley Mill, U.K., supplied the university’s team with epoxy-based carbon fiber materials for the manufacture of the pod’s monocoque. One primary material was TenCate 8020, a variable cure epoxy-based CFRP prepreg with woven and unidirectional fiber reinforcements.

“Prepregs deliver the optimum fiber-to-weight ratio resulting in the best performance from the fiber properties when compared to resin infusion and other composite fabrication techniques,” says Darlington. “Due to the specific nature of this unique pod, thermoset composites enabled the fabrication at room temperature with low-cost tooling.”

According to van der Meijs, composites helped the team create a pod with a flexible design shape, light weight, high strength and high stiffness compared to metals and plastics.

“The shape of the tail would have been very hard to produce using aluminum sheet metal,” says van der Meijs. “Sure, making a few parts from plastic and forming them would have been possible. However, strength and stiffness requirements would never have been met.”

Students from Delft University of Technology laminate their pod for SpaceX’s inaugural Hyperloop competition.

Darlington adds that the SpaceX Hyperloop program is a perfect example of student innovation and highlights composite development. “TenCate is very proud to have supported the Delft team with their development and believe that the winning pod will attract a lot of attention from competitive teams and composite designers alike,” he says.

Additionally, the Delft Hyperloop Team has created its own Hyperloop startup company known as HARDT. UNIIQ, a firm from South Holland dedicated to helping Dutch entrepreneurs, has invested €600,000 (approximately US$640,000) in HARDT and expects to finish building a fully operating test project in four years.

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For more stories like this, visit CompositesManufacturingMagazine.com and check out the Infrastructure articles under the “Market Segments” tab.
Wind is an increasingly important source of renewable energy. In 2015, wind power installations generated about 435 gigawatts (GWs) of power worldwide, approximately seven percent of all global power, according to the Global Wind Energy Council (GWEC). By 2030, GWEC projects that wind power could supply 2,110 GW, or about 20 percent of global electricity demand.

At least some of that growth will depend upon the advances made in the next decade in the composition, design and construction of composite turbine blades. Navigant Research, which specializes in analyzing clean energy markets, says that stakeholders involved in the wind turbine industry are devoting a greater amount of research and development investment to wind blades than to any other component in wind turbines. Blades are key to energy production; the longer the turbine’s blades, the longer the swept area and the more power they generate.
Long 73.5-meter blades are producing the power for Deepwater Wind’s new Block Island Wind Farm off the coast of Rhode Island. The five-turbine, 30-megawatt wind farm, the first offshore wind energy installation in the U.S., began feeding electricity into the New England power grid last December.

GE Renewable Energy supplied the turbines. LM Wind Power, subcontractor for the turbine blades, built them at its Denmark plant and then shipped them to Block Island for installation in June 2016.

The 73.5-meter blades were the longest in the world when LM Wind Power introduced them in 2012, according to Lene Mi Ran Kristiansen, senior manager, communications and sustainability, global communications. “With this blade, several innovative features were introduced to keep the weight down and ensure a smaller root diameter, but it was based on existing polyester technology.”

The company used different materials to create its record-breaking 88.4-meter blade last June. A new hybrid carbon fiber material combined properties from the less-expensive glass fiber with very light but expensive carbon fiber. “With all the blades, there's a balance to strike between weight and length, cost and performance,” says Kristiansen.

The challenges when building these giant blades are very much related to having adequate manufacturing facilities, equipment and logistics solutions to get them from the plant to their destination. That destination is offshore for these big blades, and tools that can cost effectively enable storage on land, transport by boat and crane handling offshore are key.

For manufacturing, several processes, such as laying up the raw materials in the mold, had to be adjusted and rethought. With the huge size of the mold, the operators are no longer able to reach out and manually put material in place in the way they can in smaller molds. In addition, as the vertical surfaces get bigger, the glass tends to slide down. These were just some of the production details that evolve into problems as the mold size increases.

It took lots of preparation and continuous dialogue to generate ideas and develop solutions that were the key to overcoming these challenges, says Kristiansen.

Reducing Variation

Molded Fiber Glass Companies (MFG) has been manufacturing blades, spinners, nose cones and nacelles for wind turbines for more than 25 years. “The units have to get cheaper to install, cheaper to operate and therefore provide more margin for the bottom line customers, the operators and finally the users of electricity,” says Carl LaFrance, senior vice president, quality. That means producing longer blades.

“When you double the length of a blade, you quadruple the amount of composites in it, unless you start narrowing down the design margin,” he says. A tighter design requires less variability in processes and materials. To gain more control over those factors, MFG is constantly looking for better materials, finishing technologies, and measurement and inspection methods.

“We are driving our vendors to change their processes to reduce variation. Variation is the enemy,” LaFrance says. MFG wants to know, for example, exactly how much glass is in a particular volume of laminate. “If you put in more glass than you need, you’re paying too much money. If you put in less than you need, you risk failure.”

It’s essential to ensure that the glass goes in at exactly the right orientation or combination of orientations. “Blades are primarily unidirectional, because you want to tailor the strengths and stiffness in a very specific direction from root to tip,” says LaFrance. “If you are off by a degree in how you lay that material down, it can affect performance.”

MFG has developed some proprietary processes to help improve accuracy and is beginning to use robots for the production of smaller turbine components. (Blades are too large.) “We’re also doing some work using pultruded components for wind turbine blades, but there are technical issues associated with it that have not been resolved,” says LaFrance.

“The challenges in technology are really in the blades because they have to get bigger – much faster than cells or spinners do – and they have to get lighter and less costly. We are providing aerospace quality for a commodity price,” he says.

MFG’s customers design most of their blades with E-glass fiberglass, but some request S-glass if they require more stiffness or strength. Although some turbine blade designers are now incorporating carbon fiber into their blades to improve stiffness, using the material causes additional challenges. “It has a much
narrower window for manufacture, and it doesn’t like bending at all,” LaFrance adds. Carbon fiber is also conductive, making it more susceptible to lightning strikes, which are the most common source of blade damage.

**Developing Design Tools**

GE’s Global Research Lab’s research with composite blades in the aviation industry has informed its work in wind turbines. “We have developed manufacturing processes – an understanding of materials and materials’ behavior and design tools,” says Shridhar Nath, technology leader, composites.

He notes that longer blades present logistical as well as materials challenges. As blade size increases, transportation costs become a larger factor. GE is investigating whether a two-piece blade would resolve some of those issues, but that would require blade manufacturers to find ways to join them in the field.

The manufacturing process for such blades would be slightly different. “For example, where do you break the blade up? It places more emphasis on the design aspect; we have to understand what are the loads, what is the wind regime, what are the mechanical issues or the structural issues that go into those?” says Nath. “Those are the challenges that we are addressing and that we are working toward resolving.”

GE is always looking at new glass fibers and resin systems that might reduce weight. “We have had a lot of experience with carbon with our aviation business, and carbon is one-third the density of glass, so certainly that becomes attractive. But it’s a lot more expensive,” he says. “So that’s the tradeoff. What is the investment, what is the value added, what are the tradeoffs between different material systems and design processes?”

Another important consideration is the availability of a material, which means checking the supply chain to ensure that potential materials will be available in the quantities that GE requires.

GE researchers have leveraged the tools they developed for aviation blades to improve the infusion process for wind turbine blades. “It sounds simplistic, but it’s quite complex because you are trying to model 40- or 50-meter long blades. You are looking at every material aspect, you are tracking the flow of resins, you are trying to optimize it so that you minimize any defects,” Nath adds.

While GE has experience in automated fiber placement and automated tape layup in the aircraft industry, Nath says it is not yet cost effective for wind because it won’t work in the volumes that the industry requires. But additive manufacturing offers possibilities, especially in tooling. The production of a blade tool can take 10 to 12 weeks, but with additive manufacturing that time could be reduced to a week.

Nath believes, however, that better design tools may play the biggest role in turbine blade improvements. “A wind blade is a combination of the aero structure, the actual structural analysis (the mechanical design) and the performance, because the customer at the end of the day is only interested in the annual energy production,” he says. “These are all conflicting. The aero guy develops a shape, but the manufacturing guys say that’s too expensive. So I think design tools that help us optimize all that are going to be another big innovation.”
WALiD partners developed highly durable thermoplastic foams and composites, a thermoplastic coating with high erosion and UV resistance and an automated fiber placement process for lay-up of hybrid fiber tapes. This resulted in a lighter blade with an improved design and an increase in service life, according to the WALiD website.

The project focus was not on manufacturing a whole blade, but on material definition and process qualification. “We made a lot of characterization regarding mechanical performances on coupon and subcomponent levels,” says Rapp.

While there are no working models of WALiD’s rotor blades as of yet, Rapp says many manufacturers have expressed interest in their work. But manufacturing a complete thermoplastic blade will require a massive change in current production methods, which is especially hard to do when producing huge blades. Rapp believes that the technology WALiD developed might be used sooner for smaller blade production.

Meanwhile, researchers at the National Renewable Energy Laboratory (NREL), which leads the wind turbine technology area for IACMI-The Composites Institute, have manufactured an experimental thermoplastic blade just 9 meters long.

“We can’t go out and build a 70- or 80-meter blade every time we want to innovate with a new material or a new
Molded Fiber Glass Companies (MFG) now uses a Combi-Lift blade handling unit, which has reduced its blade handling time and cost by an average of 70 percent. The company uses the unit to transfer blades to trucks for transport to the field sites.
manufacturing process,” says Derek Berry, wind technology area director at IACMI. Although the laboratory began its research with coupon-level testing, the 9-meter blade is an ideal size to prove that you can scale up to thicker, bigger and more complex parts without going to the large megawatt-size blades, says Berry. “You can get 80 to 90 percent of the way there in understanding how a material will function in the manufacturing process, what type of properties you can get and things like that …. It gives you a huge amount of information on whether you should move forward with that material and that manufacturing process.”

The most aggressive innovation in the experimental blade was the use of a thermoplastic resin system. “Once you form [a thermoset blade] there is no way of going back; it is a chemical process that is irreversible. At the end of that blade life, 20 to 30 years down the road, the only thing you can do with it is put it in a landfill or maybe chop it up and use it for low-grade application,” he explains.

Thermoplastic resin blades, on the other hand, could be recycled. It might even be possible to pull out the fibers and the resin system and reuse them to make new blades or other composite structures.

The experimental 9-meter blade was made with Arkema’s Elium® resin system, which has an exotherm in the same range as thermosets. “It is a thermoplastic that works more like a thermoset when it comes to process,” says Berry. That’s significant because it would mean that blade manufacturers would not have to replace their tools and processing pumps.

While researchers started looking at thermoplastics because of their recyclability, it turns out they offer other benefits that may be even more important to the wind industry. For example, the use of thermoplastics would make it possible to thermo weld parts of the blade together. “Right now, we have two blade skins that we glue together with an adhesive,” says Berry. “Down the road, we could possibly get rid of that adhesive, just put the two skins together and then heat up the sections where they’re touching to bond them together. We could have better, more reliable and possibly less costly blades because of that thermal welding potential for thermoplastic resin systems.” Thermoplastic blades might also be easier to repair in the field.

Although IACMI and NREL researchers are still investigating whether thermoplastic blade production would be faster than thermoset, thermoplastic does have another advantage because it doesn’t require post-curing in an oven. That would save time, labor and processing time, in addition to capital costs related to oven purchases. Those savings could reduce blade costs as well.

Berry says the next step will be to make a full-size blade component—probably a large root section with over 100 mm thick walls—to test its exotherm.

“This blade has helped us to understand the challenges and learn more, but it’s just at the beginning,” says Berry. “We have several years’ worth of innovation between now and when thermoplastic resins may be used on megawatt-size wind turbine blades.” That work will include more coupon-level testing (for static, fatigue, lifetime, tensile strength, compression, shear and erosion) so that wind blade designers and manufacturers will have a complete database of the composite’s properties.

The goal is to take this promising manufacturing innovation and bridge the gap from research to commercialization, says Berry. “We’re here to work with our partners so that we can give them the base of what they need to make these decisions and to commercialize this technology to spread further into the market,” he says. Advances in blade manufacture could, in turn, improve the cost effectiveness of wind energy and drive a greater reliance on this renewable resource.

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Update on the CCT – Wind Blade Repair
ACMA just released the Wind Blade Repair Recertification and has updated its Wind Blade Repair Certification materials. For more information, visit www.compositescertification.org.
A survey on business owner succession planning conducted by the Financial Planning Association/CNBC in 2015 found that 78 percent of respondents planned to sell their businesses to fund their retirement. However, less than 30 percent of those respondents actually had a written succession plan. But succession planning – selecting an individual qualified to replace you in your business – is a complex undertaking that can take years of preparation.

“Creating a serious succession structure can take three to 10 years depending on the maturity of the leadership,” says Kevin Kennedy, CEO of Beacon Exit Planning, a specialist in helping business owners create succession and exit plans. And the first step of the process – exit planning, or the process of creating the financial plan that will allow for retirement or a business sale – should be done 10 to 15 years out, Kennedy adds.

“You have to plan for unforeseen circumstances,” urges Scott Balogh, president and CEO of Mar-Bal, an integrated compounder and molder of BMC thermoset composite products. Balogh refers to these unforeseen circumstances as the four Ds: death, disability, divorce and done.

Balogh understands firsthand the challenges of succession planning, particularly for a niche industry as technical as composites manufacturing. It took him nearly a decade of preparation to take the reins of the company his parents founded, and it has been an ongoing learning process.

A Family Affair

Since its early days, Mar-Bal has grown its focus on custom molding from the production of coil bobbins and composites for welding equipment to providing high-quality thermoset composite parts for well-known appliance brands.

“We’ve changed everything in one way or another,” Balogh says of the company’s evolution since he took over as president in 1998. “When we started out, we were a shoot-and-ship molder, and now I look at all the decorating that we do, all the assembly, all the value-add service and engineering. We’ve changed a lot.”

Mar-Bal was founded in 1970 by Balogh’s parents Jim and Carolyn in Chagrin Falls, Ohio, with one press and a focus on survival, Balogh says. “It was a family affair,” he adds. He and his brother Steven, who serves the company today as vice president, began by cleaning parts in the garage and spent summers as teenagers working at the family company. While there may have been an early expectation on both sides that the younger generation would join the family business, Balogh says, Jim and Carolyn urged their sons to “go out and do it on our own for a while. The last time I worked full time for the company I was 17, and I didn’t come back until I was 30.”

Ultimately, however, the brothers did return to the family business, where they worked in each department over time to better support the company as future leaders. “Our parents, in particular our father, were pretty adamant about making sure we worked in different areas of the business,” Balogh says. Coming from sales, he worked in sales and engineering at Mar-Bal for about six years, then took on responsibility in finance administration, ran a plant for a number of years and later supervised all the plant managers.

For Balogh, the product engineering unique to the composites industry proved to have the steepest learning curve in this educational process. “I had never studied engineering,
Balogh says that by the time the succession process began, everyone was ready to move on. “My dad started working on his own when he was 13 years old, so he was working for a long time,” he points out.

But what helped the company reach the next level was the objective perspective of an outside advisory board. “It helps you to take out some of the family dynamics that have existed since you wrecked your brother’s bike or you stayed out too late and didn’t get home for dinner – the family stuff that affects people,” he says.

John Lauseng, CPA, says, “An outside advisory board can provide perspective and expertise that may not exist within the management team because they bring a wide variety of experience.” Lauseng is audit partner for Aldrich Advisors, an accounting and consulting firm serving the manufacturing industry and others. “An effective advisory board will provide value through leveraging the multi-disciplinary capabilities of its members in an objective fashion,” he says. “They can provide specific guidance, helping to anticipate and identify opportunities and obstacles based on practical experience with other successions.”

An advisory board or consultant also can help companies weigh the importance of industry-specific skills versus leadership qualities. “Family-owned businesses often will look to the outside for the technical skill set needed if it is not currently found, or being developed, in the next generation,” says Brad Baumann, CPA, principal of CliftonLarsonAllen LLP, a wealth advisory and accounting firm. “An outside perspective can bring a lot of value to an organization, but that must be tempered with the culture of the businesses. It is also important to realize that there can be a significant difference between technical skills and leadership.”

Given the technical nature of the composites industry it may seem tempting to hire based on this skill set, but often these processes are so niche that it’s necessary to provide product-specific training to new hires. For this reason, Mar-Bal, as well as manufacturer Strongwell Corporation, passed to leaders who fit the company culture and could provide a broader perspective based on market need for growing these companies in the future.

A Competitor Comes In

While Strongwell traces its roots back through predecessor companies as far as 1924, it was in 1993 that John Tickle acquired the company from Shell Oil Co. He relaunched it as an independent, private company, then later renamed it Strongwell in 1997. Tickle had worked for the company since the early 1970s and created a strong vision for it, focused on pultrusion. But when it came time to develop a succession plan, Tickle looked to an outsider – from the aluminum industry.

“The Tickles and my family had been family friends for years, so I’ve known John since I was very young,” shares David Oakley, who took over as CEO of Strongwell in 2011. Oakley’s
Having gone through the succession process once, Scott Balogh, shown here, and his brother Steven have a plan in place for the next generation of Mar-Bal leaders. That plan will be reevaluated as the Baloghs’ children finish college and grow in their own careers.

Tickle and Strongwell COO Keith Liskey began building succession plans, they turned to Oakley. “We talked for three or four months, and the rest is history,” Oakley says.

Oakley’s perspective coming from a competitive industry has provided unique insight into his current position. “A lot of the markets and some of the customers are the same,” he says. “I was familiar with the material because I competed against it, so I knew the advantages of fiberglass.” Moreover, Oakley had worked on the Strongwell pultrusion floor in high school and did his college marketing internship with the company as well. “I was a little more familiar with the process than some might be,” he says.

Still, like Balogh, Oakley found his biggest challenge to be mastering the technical aspects of the composites company. Aside from the chemistry and the science behind composites and pultrusion in particular, there was a lot to learn in terms of the product base and the markets that we serve,” Oakley adds. “Most companies may have five, maybe 10 primary markets into which they sell. Strongwell, as we defined our markets in our last business plan, had upwards of 30 markets and many more product categories selling into those markets.”

To gain insight into these products and markets when Oakley first joined the company, he turned to the experts – a team of senior managers close to retirement age who had a wealth of information. “Not only was I able to rely on their knowledge, but Strongwell also has an excellent training program for new employees and I went through that like anyone else would,” says Oakley. He utilized online resources created for customers and new employees to learn the basics about resins and fiberglass.

A Unique Market Approach

The experienced experts who proved so invaluable as teachers to Oakley and others are nearly gone, with Tickle’s last direct report having set his retirement date. But all of these teaching experiences have influenced the direction of the company.
going forward. For example, Oakley knows firsthand that it’s important to hire for the right fit, as certain technical information can be taught.

“It was much easier in the steel and aluminum business to find someone to plug into a hole than it is to find in composites,” Oakley says. “Those [experts] are normally grown, not hired out of college, so particularly from a processing standpoint most of our engineers come to work for us early in their career and develop and learn as they go.”

As a result, Oakley encourages other composites managers looking to build leadership to do their due diligence. “Hire the right people if you’re hiring, and if you’re promoting from within, which is what we prefer to do, make sure that you’ve got the right people in the right positions… . Make sure that you’ve got the right person who is comfortable with the responsibilities and has a love for what they do.”

Building leadership is what succession planning is all about, Kennedy points out. “Exit planning is about replacing your income, and succession is about replacing yourself,” he says. “The disciplines in the succession part are more behavioral. In
Not “Just Business”

While it may seem easy to write the transition process off as “just business,” succession planning can be very personal. In fact, Balogh says he was surprised by how emotional succession planning was from the perspective of the incoming leader.

“It’s very emotional anytime you leave a particular role and move into doing something else,” he says. “You may still want to call that favorite customer or design something with your favorite engineer, but as you change in terms of your roles and responsibilities, you have to give up certain things. There are some things you may want to keep doing, but it doesn’t make sense after a certain period of time. You have to think ‘There is probably somebody who’s better at this than I am, so let’s get them involved.’”

Putting the company first may be a crucial quality, but no one says it’s easy. “Business is emotional,” Kennedy says. “You can’t spend 30 years building something with a whole team of people and just walk away. Business is not just what you do, it’s who you are.”

For business owners who truly believe their company is part of who they are, now is the time to create a plan that will build their business into a legacy.

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Five Tips to Start Building Your Succession Plan

1. **Begin planning today.** “Building a plan now provides you flexibility so you don’t have to be trapped in the corner when there is a health issue, loss of a significant customer, etc.,” says Brad Baumann, principal of CliftonLarsonAllen LLP, a wealth advisory and accounting firm. “The reality is what you decide now may not be the final outcome, but having that conversation now helps provide clarity.”

2. **Consider an outside perspective.** For composites company Mar-Bal, the transition process was smoothed by the assistance of an outside advisory board. “That was a game-changer for us,” says Scott Balogh, president and CEO of Mar-Bal. “That group helped us develop what I consider to be very good sales and operational planning tools.” The group helped to form, and now examines on a quarterly basis, key performance indicators and business metrics that keep the business constantly improving its quality processes.

3. **Ensure everyone is on the same page.** “One of the largest mistakes I see is around communication,” Baumann says. He cites an example from a family-owned business: A son is a key member of the management team in his parents’ business, and he would like to ultimately take over the company. However, the parents haven’t discussed succession planning. That’s discouraged the son, who is considering leaving the business – a move that would be “devastating to the business that he has helped grow,” says Baumann. “For a business owner looking to step away, the decision is very difficult and personal, and those are not conversations that family members always like to have – so they don’t.”

4. **Understand your blind spots.** Kevin Kennedy, CEO of succession planning specialist Beacon Exit Planning, says that self-awareness is a key ingredient for leaders. “The most important part of succession is having capable leaders. Leaders are the people everyone looks to to get through whatever problem they’re dealing with, and it’s earned, it’s not appointed. So you have to really work on having people recognize their blind spots and [build] self-awareness,” Kennedy says. Once acknowledged, these blind spots can often be filled through training.

5. **Never stop planning.** Kennedy encourages business leaders to review their succession plan on a regular basis. This means continually looking for individuals who can be groomed for future leadership. “To do that, you’re continuously training,” he says. “People who believe in succession always prepare for the unknown.”
In homes and offices throughout the world, recycling bins are ubiquitous. The concept of recycling has become so deeply engrained in society that no matter what you need to discard, chances are you can recycle it. That is, unless you’re looking to recycle glass or carbon fiber composites.

“Everybody knows you recycle aluminum cans, right? You don’t even think about it,” says Ed Pilpel, senior advisor at PolyOne Advanced Composites and chairman of ACMA’s Green Composites Council (GCC) Recycling Committee. “There’s a bin for it. There’s a bin for paper and [other] kinds of recycling. If we ever get to the point where there’s a recycling bin for composites, then we know we have achieved success.”

The industry isn’t quite there yet, but according to Pilpel and others, there has been significant progress over the past few years. Recycled CFRP has made major strides recently, and while GFRP recycling has some catching up to do, Pilpel is optimistic. That’s because in all corners of the world, businesses are developing and investing in novel recycling technology and establishing the business case for both carbon fiber and glass fiber composite recycling. All are working toward answering the million dollar question: How can we make recycling composites profitable?

### The Business Proposal

According to Pilpel, the business case for recycling composites has been a project many years in the making. When the GCC Recycling Committee was formed in 2011, the industry’s rate of recycling was approximately 1 to 2 percent. Pilpel was making presentations around the country about what he calls the “recycling puzzle” and the need to solve it, but the resources to do so weren’t readily available. That was, until a newly-minted composites institute with the resources to tackle the puzzle came into the picture. In June 2015, the U.S. Department of Energy (DOE) launched IACMI-The Composites Institute – a $259 million program for manufacturing innovation. A few months later, ACMA and IACMI agreed to collaborate on a wide range of topics, including recycling.

“One of the big things we didn’t expect was IACMI to show up and the DOE to get involved this way, because one of our concerns was how is government going to deal with composites recycling?” recalls Pilpel.

IACMI is currently reviewing ACMA’s proposal to study and test CHZ Technologies’ Thermolyzer™ technology, which recycles all liquids, tars and oils from composite materials and...
converts them into clean synthetic gases. By working with the Institute of Scrap Recycling Industries (ISRI), Pilpel and the Recycling Committee learned that industries like rubber find profit through recycling by separating their various elements. Pilpel says the composites industry can draw inspiration from rubber companies who separate the two main components of tires: the nylon core and steel cords. In FRP, the two main components you can separate are the fiber and the polymer matrix.

However, according to Pilpel, by approaching recycling that way, the committee was left with a tough question: How can you make the materials attractive to an end user? The answer, according to ISRI, was to look at energy conversion as the baseline technology of recycling. That means if the supply chain can’t find value in the glass fiber itself, perhaps businesses can sell the fuel byproduct that comes from it instead. “We believe we can gain more energy out of that process than competitive technologies and competitive materials,” says Pilpel. “There’s a place where we can gain some dollars in terms of selling [the byproduct] as a fuel.”

Since beginning the project, Pilpel says that the process has made significant progress. “The technology looks very promising,” says Pilpel. “The second phase would be to … do some validation of the process at a real pilot plant which is available today. This will help substantiate the business case. The third phase is to bring the technology to make this an enterprise level – commercialize this.”

CFRP Recycling

Currently, the most common form of composite recycling is pyrolysis, during which the polymer matrix of the scrap CFRP decomposes under air exclusion and typically at a temperature of 500 to 600 C. The alternative that other researchers prefer is solvolysis, which reclaims fibers by splitting a solvent at a much lower temperature. While proponents of solvolysis claim pyrolysis compromises the overall quality of the end product, according to the Fraunhofer Institute for Chemical Technology (ICT), pyrolysis
is currently considered to be the only process for recycling CFRP that is available on an industrial scale.

One notable example of the industry’s investment in pyrolysis is Toray Industries, which last year signed a deal with Toyota Tsusho Corporation to build a pilot plant that uses gases from the pyrolysis process as an energy source for the recycling of carbon fiber. Toyota believes this could lead to a big reduction in the overall energy consumption of the process.

Another company whose advancements in pyrolysis have caught the industry’s attention is Coseley, U.K.-based ELG Carbon Fibre. As ELG’s Managing Director Frazer Barnes explains, 35 percent of the materials ELG recycles come from dry waste forms, another 35 percent is laminate material and 30 percent is uncured prepreg. The process, Barnes adds, can be used to make non-woven mats, milled fibers, carbon fiber reinforced thermoplastic (CFRT) pellets for injection molding or chopped fibers.

ELG’s furnace has a low oxygen content, so as Barnes describes, the company pyrolizes the non-carbon fiber materials and turns them into gas. Those gases get burnt off in an exhaust treatment system. Later, a carbon char forms on the carbon fiber and ELG introduces air into the process that oxidizes the char into CO2. “And we end up at the end of this process with a clean carbon fiber that shows a slight reduction in tensile strength compared to virgin fiber and virtually the same tensile modulus as virgin fiber,” Barnes says. He adds ELG can produce around 1,500 tons of fiber output through that process.

Automotive Potential

One of the biggest potential markets for recycled carbon fiber is automotive. According to Recycling International magazine, about 10 percent of the CFRP used in BMW i series vehicles is recycled material. Toyota Europe adds that by European Union law, all new vehicles in Europe have to be 85 percent reusable or recyclable (by mass) and 95 percent recoverable. In Germany, landfilling is already prohibited, adding to industry’s urgency to reclaim as much carbon fiber as possible. Barnes says that recycling gives the automotive industry a stable supply chain, low cost carbon fiber (less than $5-7 per pound) as well as 90 percent less global warming impact than virgin carbon fiber.

Recycling carbon fiber could also revolutionize the way cars are made. Last year, ELG collaborated with Gordon Murray Design in the development of iStream® – the world’s first affordable high-volume carbon fiber chassis. The iStream has a hybrid structural composite chassis comprising 14 composite structural panels made from Carbiso™ M, ELG’s signature line of carbon fiber nonwoven mats. Barnes says a project of that magnitude would not have been possible without close collaboration.

“I think [you need] that close collaboration throughout the supply chain, from the vehicle designer to the component manufacturer to the materials supplier … regardless of what type of composite material you’re using to make projects of this size doable,” Barnes says. ELG worked closely with the OEM to optimize its materials, and the OEM worked with ELG to ensure it had the right design data to design its parts.

ELG’s next step is to set up its first composites recycling center in the United States within the next few years. To facilitate that goal, ELG became a member of IACMI and signed a memorandum of understanding with the institute’s west coast strategic partner – Port Angeles, Wash.-based Composites Recycling Technology Center (CRTC).

West Coast Innovation

Opened in 2015, the CRTC is the world’s first facility for product development from recycled carbon fiber prepreg. It has drawn attention throughout the past year for making recycled carbon fiber paddles for a rapidly-growing sport called pickleball. The sport, invented in 1965, combines elements of badminton, tennis and table tennis. In December 2016, CRTC signed an exclusive distribution agreement with Pickleball Central to distribute the very first pickleball paddle made with recycled carbon fiber.
An Alternate Approach

Connora Technologies, a relatively new company in Hayward, Calif., has developed an entirely different recycling process that does not involve grinding, burning or using solvolysis on uncured resin. As Connora CEO Rey Banatao explains, the company’s Recyclamine process does what no other known process can do: recycle a cured epoxy thermoset into a thermoplastic.

“If you want to make something recyclable, especially a material that wasn’t recyclable before, you need to redesign it at the chemistry level,” Banatao says. During the process, Connora engineers a curing agent to have a cleavable bond, so when it reacts with the epoxy, it forms a thermoset with all the inherent properties and high-performance characteristics that one would want in a traditional epoxy thermoset.

“When you cleave that bond, it comes back as a thermoplastic,” Banatao explains. “You can pull out all the other components of your composites – carbon fiber, fiberglass, whatever. You would then later reclaim the plastic out of that recycling solution.”

According to Banatao, this is the first example of recycled thermosets being reclaimed as reusable materials, where thermosets are normally disposed. Banatao says Connora’s process can actually get back whole woven fibers so the fibers are totally free of the polymer matrix. However, as Banatao says, with many new technologies, it will take time for it to be fully embraced by the composites industry and end user. Still, Banatao remains optimistic.

“People are very slow to change, so that’s our battle today in terms of adoption as a solution,” Banatao says. He hopes that as early adopters demonstrate the Recyclamine process as a viable alternative to traditional recycling methods, the industry will change its mindset.

Banatao says, however, that although it’s not on the cusp of widespread commercialization, the company has been drawing interested customers from the sporting goods market—which he sees as the “low hanging fruit” of the nascent recycled carbon fiber industry.

aerospace-grade carbon fiber.

“We started with very modest capabilities, which is why making something very simple like a pickleball paddle is a great way for us to start production, to get our feet wet, so to speak,” says CRTC CEO Bob Larsen. “It’s conventional wisdom that the biggest impediment to the growth of the recycled composites industry is lack of demand. CRTC intends to show the demand is there. We plan to introduce three more products before the end of the year and multiple products in different segments in 2018.”

The CRTC’s goal is to recycle 1 million pounds of carbon fiber per year by 2022. Larsen is confident the CRTC will reach that goal thanks to its supply agreement with Toray, its role in IACMI and exposure to more partners in the industry (like ELG) through ACMA. “Our relationship with ELG has opened up several important high-volume markets that we intend to develop cost-competitive products for in the near future,” he says.

The center has also maintained relationships with Washington state officials such as Sen. Maria Cantwell (D) and Gov. Jay Inslee (D), who have recognized that with Boeing as a major contributor to the state’s economy, there needs to be legislation in place that invests resources into carbon fiber recycling. Larsen notes that the state’s clean energy fund allowed CRTC to obtain $7 million in grant money to buy new production equipment. In Congress, Cantwell has plans to reintroduce the Carbon Fiber Recycling Act to support the state’s need to recycle CFRP.

According to a study by honor society Phi Kappa Phi, Boeing and Airbus each generate as much as a 1 million pounds of cured and uncured carbon fiber prepreg waste each year from Boeing 787 and Airbus A350 XWB production. In Washington state alone, 96 composite companies produce 2 million pounds of production waste carbon fiber each year that is sent to a landfill. According to the DOE, carbon fiber has a potential market value of $50 million if it can be reused and recycled.

Another west coast state whose economy is impacted by carbon fiber and its potential for recycling is Colorado, where carbon fiber recycling company Vartega is helping lead the charge. The company’s motto is to “reduce the world’s carbon footprint by increasing its carbon fiber footprint.” Vartega focuses on recycling uncured and expired material. Vartega president Andrew Maxey says the company uses a chemistry-based process to separate out the uncured resin system from the carbon fiber reinforcement.

“This process can work on other fiber reinforcements as well, but the economics for carbon fiber make the most sense right now,” Maxey says. “It’s a low-energy, low-heat process, and it results in a recycled carbon fiber with very good mechanical properties. In fact, our mechanical properties are essentially [the] same as virgin carbon fiber.”

Maxey says the composites industry can reduce landfill burdens with recycled carbon fiber to displace energy intensive production of virgin material. Ultimately, it saves everyone in the supply chain money. “At the end of the day, we save waste generator money because they’re paying less to recycle than they are to landfill their scrap material,” Maxey says. “Then on the flip side, recycled materials are lower cost than virgin carbon fiber, so we provide an economic incentive for our customers there as well to use recycled materials rather than virgin materials.”

GFRP Recycling

Currently, there are several factors that make the goal of creating a business out of recycling GFRP more ambitious than attainable. The biggest overarching issue is Economics 101 – supply and demand. CFRP recycling is easier to justify because the material has high market value and is produced in relatively low volumes. GFRP is the opposite.
“Who in their right mind wants to use a recycled material when they can use a virgin material cheaper?” says Bill Magill, director of reinforcements for Superior Oil Co. Inc. He adds that since there’s such a wide variety of ways you can combine materials to make GFRP, it’s difficult to find a uniform feedstock for recycling. A-glass, E-glass, S-glass and C-glass composites have different structures and cores. “It’s a process engineering nightmare,” Magill says.

Magill notes, though, that GFRP is a lot easier and cheaper to recycle if the resin is a thermoplastic, such as polyamide, polyester or polypropylene. He says thermoplastic GFRP accounts for more pounds of recycled composite materials than all other forms of composites combined in terms of overall magnitude.

According to Dr. Soydan Ozcan, senior scientist of Oak Ridge National Laboratory (ORNL) and composite recycling thrust lead for IACMI, ISRI gave ACMA good advice about trying to sell the fuel that comes from GFRP. However, it opens the door to many questions that don’t have a clear answer yet.

“Can we actually generate electricity out of that so it can actually run your factory?” Ozcan says. “And thinking a little further, can we really sell the electricity back to the grid? Is it possible or not?”

The Big Picture
One of the most significant hurdles Pilpel and others in the industry have already overcome is convincing manufacturers of the urgent need to recycle. Now that most manufacturers are on board, the industry has set some lofty goals. IACMI’s technical
goals for 2020 are to reduce the cost of CFRP by 25 percent, reduce CFRP embodied energy by 50 percent and increase CFRP recyclability by 80 percent.

While Pilpel believes having quantitative goals is helpful, there is still some uncertainty as to how to define success in composites recycling. “What does 80 percent mean?” he asks. “Is the criteria that the waste stream come from manufacturing?” Ultimately, Pilpel believes the onus is on the composites industry to continue developing recycling technology. The industry should define its own parameters of success in terms of what it is capable of doing on an industrial scale in addition to the ones handed down from the government.

The long-term goal, Maxey says, is to no longer have anymore CFRP waste, but rather to have scrap go directly into the supply chain. He also hopes the industry can make the economics work for fiberglass recycling. But it’s not enough to simply develop the technology, he adds. The industry needs to continue raising the bar for market penetration.

“A realistic short-term goal is to get recycled carbon fiber into a handful of high-value automotive programs and demonstrate that the supply chain can scale and that the economics work out on both sides,” says Maxey.

The biggest goal of all, Pilpel says, is for the industry to have as robust a recycling system as competing materials. With the right combination of continued federal funding, research, development and marketing, it’s possible.

Evan Milberg is communications coordinator for ACMA. Email comments to emilberg@acmanet.org.
This year, more than 6,500 corrosion professionals from more than 70 countries came together in New Orleans for CORROSION 2017 Conference and Expo, NACE International’s 72nd annual conference. The conference had its highest number of first-time attendees, representing 35 percent of the total attendance.

From March 26-30, the Ernest N. Morial Convention Center was home to the largest meeting of corrosion professionals, vendors, and educators, all of whom focus on preventing and mitigating worldwide corrosion.

The technical strides made by corrosion professionals were readily apparent during hundreds of events, including technical symposia, committee meetings, seminars and lectures, training opportunities and social gatherings. CORROSION 2017’s keynote speaker, security consultant Frank Abagnale, discussed the importance of continuously improving security and ethical standards in the corrosion industry, which relies heavily on accurate reporting, planning and budgeting to maintain billions of dollars of assets.

The conference’s technical program featured 488 technical symposia – the largest offering of symposia since 2000. Hundreds of symposia, technical meetings, forums and poster sessions covered all areas of corrosion control and mitigation, including oil and gas corrosion inhibitors, coatings, practical field application of cathodic protection, pipeline integrity, materials, testing and instrumentation, marine corrosion and corrosion in nuclear systems.

Nine forums this year highlighted a wide array of issues in water/wastewater, maritime, the Middle East and regulatory impacts. CORROSION 2017 also included more than 160 poster presentations, the highest number in the conference’s history.

Attendees also had the opportunity to visit the largest corrosion exhibition in the world, including this year’s inaugural Composites Pavilion, which included more than 35 exhibiting companies highlighting the use of composites in corrosion-resistant equipment.

“NACE International is proud to highlight an ally in the fight against corrosion,” says Bob Chalker, CEO of NACE International. “Composites are a vital corrosion solution, and growth and innovation made it clear it was time to host our first Composites Pavilion at the NACE International annual conference. With ACMA’s support we assembled a pavilion that provided convenient access to composites expertise, experience and knowledge.”

NACE International’s CORROSION 2018 Conference and Expo will take place in Phoenix next April. To learn more about how you can attend or exhibit, visit www.nacecorrosion.org.
ACMA Testifies on the Hill

On March 15, Shane Weyant, President and CEO of Creative Pultrusions; and Dr. Hota GangaRao, PhD., Director, Constructed Facilities Center, West Virginia University, testified before the U.S. House of Representatives Energy and Commerce Subcommittee on Digital Commerce and Consumer Protection to outline the benefits of FRP in infrastructure applications.

The hearing was part of the subcommittee’s “Disrupter Series” that presents opportunities for members of the House to learn about emerging technologies and their applications in the marketplace. ACMA’s participation in the hearing contributed to our efforts to advocate for infrastructure funding, which include references to composites materials and our ongoing grassroots efforts to provide a platform for ACMA members to have their voices heard by Washington policymakers and leaders. The full hearing is available online at http://bit.ly/ACMAYouTube.

ACMA Membership Awards

ACMA is accepting nominations for its 2017 Membership Awards! Each year, ACMA is proud to provide a platform for its outstanding members to be honored for their work to develop and grow critical markets, advocate for composites and help make others in the industry successful. Please consider nominating someone who you believe sets a standard of excellence for our Outstanding Volunteer Award, Lifetime Achievement Award or ACMA Hall of Fame Award. The deadline for nominations is May 19. More information is available online at http://www.acmanet.org/our-association/award-programs.
Do You Use Styrene?

Any company that uses styrene needs to be aware of a new regulation that took effect April 22. The Prop 65 regulation affects products that travel through California and has labeling implications. While not all companies will be affected, ACMA encourages all companies to review the regulation so they can make an appropriate determination for their products and operations. To help ACMA members understand and comply with California’s Prop 65 regulation, ACMA has published “Understanding Prop 65: For Composites Manufacturers.” To supplement the 10-page document, ACMA held a webinar outlining the basics of Prop 65 and offers a technical paper that discusses offgasing of styrene, which companies may be able to use to estimate styrene exposures associated with use of products. All documents and webinars are now available to ACMA members on the ACMA Education Hub at www.acmaeducationhub.com.

New Areas at CAMX 2017

This year, the CAMX Exhibit Hall will feature four new areas for attendees that will help to spark ideas, discussions and connections. In “Innovation Park” attendees will have the opportunity for discussions on key industry topics with each other throughout CAMX, and with thought-leaders at designated times. A “Theater” will allow for exhibitor sales presentations, Award Presentations, Poster Session presentations and much more! The “Connection Zone” is a place to network with each other, have some fun and take a break. Finally, the “New Exhibitor Station” is for new exhibitors at CAMX with new products or services to offer. Stay tuned for more information on how all these areas will help make your CAMX experience one you won’t want to miss! For more information, visit thecamx.org.

New Members

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Auburn, Ala.

City of Rochester
Rochester, N.H.

Composite Resources
Rock Hill, S.C.

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Kansas City, Mo.

Infiana USA, Inc.
Malvern, Pa.

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For more information on becoming a member of ACMA, email membership@acmanet.org or call 703-525-0511.

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Pultrusion Conference Recap

More than 160 composite manufacturing industry professionals registered for ACMA’s first ever North American Pultrusion Conference in Atlanta, co-produced with the European Pultrusion Technology Association (EPTA). The April conference provided the latest knowledge, education and technical resources to pultruders as well as OEMs that wanted to learn more about pultruded products.

The conference was keynoted by Jeff Martin, who has been a leader in pultrusion for 50 years. Martin shared his view of the industry and its future, as well as his experiences overcoming challenges at his company.

Other presenters highlighted the wide range of end-use applications where pultrusion has made an impact, such as the world’s first composite lighthouse and an award-winning communication tower for the Air Force.

ACMA will contribute to EPTA’s World Pultrusion Conference next year in Austria.

New Free Webinar and Guidance Document

Does Your Business Manufacture Products Sold or Used in California?

“Introduction to Prop 65 for Composites Manufacturers” is a full-hour webinar, available on demand in the ACMA Education Hub.

- Learn about enforcement actions related to Prop 65 that could impact your business.
- Understand compliance guidelines – whether your company is located in California or not.
- Gain an understanding and knowledge about Prop 65.

The resource is free for ACMA members. Non-members can access the webinar for a fee.

Extra Resource for ACMA Members!

ACMA Members have access to the accompanying Guidance Document – Understanding Prop 65: For Composites Manufacturers.

Learn more and access the webinar anytime at www.acmaeducationhub.org!
ACMA Makes Regulatory Recommendations

In response to a request for information by the U.S. Department of Commerce, ACMA’s Regulatory Steering Committee developed a list of standards and laws that inhibit the viability and growth of composites manufacturing. The department intends to use this feedback to develop a targeted list of regulations for revision, replacement or repeal.

Responses to the request will help execute President Trump’s memorandum to streamline the construction permitting process and reduce the regulatory burdens for domestic manufacturing. The department requested information regarding a number of issues, including how regulations impact the operations of small manufacturers.

Based on responses to an ACMA member survey, the association offered several recommendations to the department, most notably:

1. Eliminate redundant and conflicting federal risk assessment programs.
2. Ease the burden of proof requirements for OSHA’s hierarchy of control policy.
3. Work with Congress to amend the Clean Air Act to remove EPA’s risk and technology reviews program.

For the full scope of ACMA’s recommendations, visit http://bit.ly/ACMACommerce.

Upcoming Events

- **May 2-4, 2017**
  - CCT-Instructor Course
  - Polynt Composites Application Center
  - North Kansas City, Mo.

- **June 5-8, 2017**
  - ACMA Presents at the International Bridge Conference
  - National Harbor, Md.

- **Sept. 11-14, 2017**
  - CAMX 2017
  - Orlando, Fla.

- **Jan. 31-Feb. 1, 2018**
  - Global Composites Conference
  - Las Vegas, Nev.

First NACE Composites Pavilion

In late March, ACMA took part in the first ever composites pavilion at NACE International’s CORROSION show in New Orleans. The show attracted more than 6,500 corrosion professionals from more than 70 countries. ACMA members are already signing up to participate in the pavilion next year at CORROSION 2018 in Phoenix. For more information, contact Sarah Boyer at sboyer@acmanet.org.

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Piaggio Fast Forward (PFF), a pioneer in the lightweight transportation sector, launched its first product in February: Gita is a 22-pound, semi-autonomous, battery-powered, two-wheeled robot that can carry up to 40 pounds of cargo, indoors or outdoors.

According to architect Greg Lynn, PFF’s chief creative officer, Gita can match the movement of its owner and has a zero turn radius, which means it can turn in the space it occupies. Lynn says Gita can reach speeds up to 22 mph, but it can also accelerate or decelerate to match the speed of the person it’s following.

“It’s all about accentuating human mobility,” says Lynn. “[We had] this idea of it following a person pretty seamlessly so that people can have their hands free from needing to pull things or push things, and also that you can [use this robot to] make decisions to … walk five blocks to pick up a case of wine or a gallon of milk, rather than getting in a car.”

Lynn says that Gita had to be made with composite materials in order to complete the project quickly and for the robot to achieve high performance. “The speed with which we could build working parts … as well as the need for stiffness and light weight is what really drove us toward [composites],” says Lynn.

One day, Lynn believes, a Gita robot could deliver everything from packages to groceries or even cooked food. However, while many worry about the prospect of autonomous technology supplanting humans, Lynn says that is not PFF’s goal.

“We aren’t putting that delivery person out of a job,” Lynn says. “We’re just making [the process] more efficient.”
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