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Making a Case for Composite Recycling

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FRP is a tried-and-true material for corrosion-resistant pipes and tanks. But fabricators and their resin suppliers are expanding offerings in industrial environments by providing innovative solutions, including dual corrosion-resistant and heat-resistant products.
By Megan Headley

A Commitment to Quality .................................................. 17
Companies are proud to boast of ISO certification on their websites and on plaques at the office. But gaining certification requires a 24/7 commitment to quality. Three companies in the composites industry share their journey to ISO 9001 certification.
By Melissa O’Leary

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Once just a lofty goal, composites recycling has become a reality. However, although the technology exists to recycle carbon fiber and glass fiber, real growth in the market will only come when companies can make the business case for recycling.
By Mary Lou Jay

About the Cover: The Orange County Sanitation District’s wastewater treatment plant in Huntington Beach, Calif. Photo Courtesy of Ashland Inc. and Daniel Company
No Shortcuts in Quality Assurance

All industries depend on a reliable supply chain, and your company’s ability to produce a quality product is a fundamental link in this chain. Having your facilities registered or certified in a quality management system demonstrates that you have a solid foundation to support the needs of your customers.

Implementing a quality management system that will meet the rigorous standards required for certification forces you to take a hard look at all the facets of your business. It is important to remember that getting ISO-certified is a journey and not something that happens overnight. To be successful, the process needs the commitment and dedication of your entire management team.

In this edition of Composites Manufacturing, our lead feature story (page 17) provides guidance on how three companies in the composites industry have approached quality management certification and what it takes to build that foundation.

This issue also shines a light on corrosion-resistant technologies that ACMA members provide customers. Last year, our Corrosion Control Division (CCD) participated in the first-ever composites pavilion at NACE International’s annual CORROSION show. In April, CCD is heading back to the event to educate engineers about the value of composites in industrial applications where materials are often exposed to corrosive chemicals and other harsh environmental conditions. Check out our feature on corrosion-resistant technologies and applications on page 12.

Another area where ACMA members are leading the way is recycling. For the past few years, ACMA has established itself as a trailblazer in composites recycling through its IACMI-approved project to study a potentially game-changing pyrolysis technology. The association has also become a thought leader in recycling by providing opportunities for academia, industry and end users to share insights on where this effort is headed. To learn more about how to make the business case for composites recycling, check out our story on page 22 and make sure to sign up for ACMA’s Composites Recycling Conference – April 10-12 in Knoxville, Tenn.

Sincerely,

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In most modern FRP applications, composites are usually seen as a practical solution for industries looking to create structures that are strong, lightweight, durable and easy to build. Sometimes, though, composites can help designers achieve a deeper artistic goal. In an increasing number of buildings all over the world, architects are turning to FRP to accentuate what makes a certain place special. That was the case for Abin Chaudhuri, who led a two-year project to create and install FRP façades for an elementary school and its neighbouring secondary school in the Newtown area of Kolkata, the capital of India’s West Bengal state.

The Savitri Educational Foundation, which founded The Newtown School, reached out to Chaudhuri’s design firm, Abin Design Studio, while the school was already under construction. Chaudhuri described the framework for the buildings as “rather generic,” with six floors of classrooms, laboratories and other facilities surrounding the school’s central courtyards.

The project’s previous architect had struggled to come up with a façade that could simultaneously stay within the client’s design parameters while also being innovative. Abin Design Studio’s challenge was to work within these parameters to design façades that took air circulation, ventilation, classroom layout and environmental concerns into consideration.

“The first step was to create an identity for the school. Our approach was to create a screen that wraps around the buildings and unifies them visually,” says Chaudhuri. “The facade not only provides shade to the classrooms from

“Our approach was to create a screen that wraps around the buildings and unifies them visually.”

– Abin Chaudhuri, Abin Design Studio

When The Newtown School opened its doors in 2015, it became the first in Kolkata, India, to be registered with the Indian Green Building Council – a nonprofit working toward making the country a global leader in sustainable building by 2025.
Efficient processing of polyurethane, epoxy, polyester, and other adhesives

Highly accurate dispensing and spraying systems

Ergonomic design and user-friendly controls

Durable stainless steel structure

Streamlined maintenance saves time and money
the harsh sun, but also lends the school a distinct identity."

From a distance, each façade looks like a complex Rubik’s Cube® of letters and mathematic symbols. The letters and symbols were used to create a custom stencil for the façade. As Chaudhuri explains, the team wanted the structures to feature a graphic, yet relatable aesthetic for the young children.

“We intended for the central courtyards of the buildings to merge with the play area, creating a seamless connection between [the] junior and senior school,” says Chaudhuri. “Due to [an administrative] restriction, this ground level connection was not possible. However, the screen was created with a strong character so that its continuous application across the buildings by itself would prove to be a unifying element.”

Prior to fabrication and installation, the firm worked with Kolkata-based manufacturer Annex Design Pvt. Ltd. to create a small-scale model of the buildings to determine the best way to fabricate the panels for the façades. Due to the need for a wide range of complex shapes that were durable and lightweight, the team used GFRP to fabricate 488 3.2 x 3.2-meter panels consisting of 13 different combinations of symbols for each façade.

Chaudhuri says one of the team’s biggest struggles was finding the right combination of materials that would provide the best design flexibility, modularity and cost. After experimenting with several different composite and non-composite options, the team determined a glass fiber mat-reinforced polypropylene system would best meet its needs. Each panel weighs just 154 pounds.

The team created a grid-like framework made of steel to align with the FRP panels. Steel Z-profiles were embedded into the panels so they could be affixed to the building. Structural

Abin Design Studio used GFRP to fabricate nearly 500 panels made of 13 different combinations of symbols to make a unique façade for each of The Newtown School’s two 27,000-square-foot buildings.
concrete slabs protruded past the building surface to ensure an exact number of panels could fit on all surfaces of the façade. This made the panels easier to work with from behind and ensured better daylighting. The panels were installed in various orientations to give the façade a randomized effect. Once completed, the façade wrapped around each of the 27,000-square-foot buildings.

Visually, Chaudhuri says the grey epoxy background for the building’s walls and windows “brings out the white FRP screen in all its glory.” Between manufacturing, shipping, installation, painting and cleaning, the façade system took four months to complete onsite.

“The effect is exactly what we hoped for with its dramatic expression and unmistakable identity,” says Chaudhuri.

Evan Milberg is communications coordinator for ACMA. E-mail questions to emilberg@acmanet.org.

For more stories like this, visit CompositesManufacturingMagazine.com and check out the Architecture articles under the “Market Segments” tab.

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**ACMA Heads Back to AIA!**

From June 21-23, 2018, ACMA and its Architectural Division will head to New York City to represent the industry for a fifth consecutive year in the show’s annual Composites Pavilion. The pavilion provides an opportunity for thousands of architects and students to learn about the benefits of FRP in architectural applications, see the latest products and find out what ACMA is doing to grow the market. Like last year, the pavilion will feature presentations from ACMA members as well as the third annual student design competition.

Visit [http://discovercomposites.com](http://discovercomposites.com) to learn more.
Last December, the Materials and Manufacturing Directorate of the Air Force Research Laboratory (AFRL/RX) celebrated its 100th anniversary. Based at Wright-Patterson Air Force Base, Ohio near Dayton, AFRL/RX develops materials, processes and advanced manufacturing technologies for aircraft, spacecraft, missiles, rockets and ground-based systems.

Through the years, AFRL/RX has made significant contributions to the composites industry, beginning with ground-breaking research on carbon fiber in the 1960s. It has spent decades studying micromechanics to better understand the behavior of composites at the global and local level: How do composite materials behave, and how can engineers properly design structures from FRP?

In the 1990s, AFRL/RX began researching how to industrialize composites, moving from hand lay-up to autoclave manufacturing. Meanwhile, the Materials and Manufacturing Directorate recognized that the high cost of composites compared to metals was a barrier, so it launched the Composites Affordability Initiative in 1996 to make composites more affordable and more widely used. That led to advances in vacuum-assisted resin transfer molding (VARTM), adhesively-bonded structures, non-destructive inspection and other areas.

In recognition of the anniversary and achievements of AFRL/RX, Composites Manufacturing magazine talked to John D. Russell about the continuing role of composites in AFRL/RX’s mission. Russell is the technical director of the Manufacturing and Industrial Technologies Division of AFRL/RX.

**Q:** What major composites innovations has AFRL/RX been working on recently?

**A:** In the last few years, we’ve been dabbling with out-of-autoclave because the autoclave can be a factory choke point. We have conceived of some aircraft parts that may be bigger than the biggest autoclaves out there. And as autoclaves get larger, the cost goes up exponentially. So we’ve been looking into how to widen the footprint of our industrial base by going out of the autoclave.

**Q:** What challenges does the Air Force face in the future that will likely require a composite solution?

**A:** The Air Force has been very sensitive to the price of jet fuel since about the 2000s. It’s not like your car, where you pull up to the pump, see the price on the sign and pay that price. Our gas is delivered by a tanker, so the cost to deliver is that much more. Our transport fleet – our C-17s and C-5s – use a lot of gas. So as we look toward future airplanes, no matter what kind – from a fighter to a transport
– composites will play a big part because of the Air Force’s requirements for range, speed and payload capability. We need to have a lightweight structure, and that means composites are going to be a part of the answer.

Q: Clearly, composites fit in the overall strategic vision of the Air Force. Can you talk about any specific applications you are working on?
A: We’re looking at a new class of airplanes – something called Low Cost Attritable Aircraft Technology (LCAAT), which is an unmanned aircraft that is cheaper than traditional manned aircraft, but meets capability requirements. Leadership has given us the [cost] goal of $3 million a plane, not counting the payload. That’s a lot different than what you see today with our strategic assets like an F-35 fighter, B-2 bomber or Global Hawk unmanned aircraft system. These cost millions, if not billions of dollars.

If we need something really cheap, but still require long-range capabilities to get where we need to go, composites are going to be the solution. But it may not be the kind of composites we use today. It may be something adopted from outside the aerospace industry that helps us achieve high volumes affordably so we can make a lot of these things.

Q: So if LCAAT isn’t going to utilize traditional aerospace material, can you elaborate on what those materials might be?
A: We’re looking at what’s going on in the automotive and marine sectors, more in terms of the processes than the material. We still need the performance to go 3,000 nautical miles, and our aircraft are still going to be sitting out on a runway in the sun, so we will need higher temperature capabilities compared to what a car in your driveway would see. The aircraft will fly at around Mach .9, so again temperature and range will drive us to aerospace materials. But we may need to look at some alternative manufacturing processes that offer us higher volumes and higher speeds.

Q: What projects is AFRL currently working on to advance composites in aerospace applications?
A: Within basic research, we are starting to look at how to merge additive manufacturing with composites. We’re looking at thermoset resins rather than thermoplastics, which is what you currently see today. Can we incorporate carbon fibers in a continuous manner? For several years we’ve also been researching multifunctional structures – looking at adding antennas in composites or embedding some kind of health monitoring system in composites. We’re still a long way off, but the more you can integrate into the structure, the better aerodynamic lines for your airplane.

We’re also working with DARPA [the Defense Advanced Research Projects Agency]. Composites are really good right now for big parts, but for small parts we default to aluminum because it’s a lot cheaper. What if we can make composite part sizes of 20 pounds or less as cheap or cheaper than aluminum? There are lots of those parts on airplanes. That could save a ton of weight if we could get the cost right.

Q: What up-and-coming technologies show the most promise?
A: Most people have heard of the Industry 4.0 concept. How can we bring our traditional, hand lay-up, paper-driven aerospace industry into the 21st century with Internet of Things (IoT) and big data? How can we take advantage of robotics, which will be different for the military? Robotics are fine-tuned for the automotive market, where you’re building a production run of a couple hundred thousand cars. In aerospace – and especially military aerospace – it may be hundreds or less. How can we have robotics and automation that make sense for a capital investment, but for low volumes with maybe a high mix of activity? Maybe you have a robot building parts for something, then the same robot drills something else and paints another component. The big thing is we need to bring composites fully into the digital age.
Q: What are the primary roadblocks to further adoption of composite materials in the Air Force’s most advanced platforms?
A: The big roadblock is certification. The Federal Aviation Administration certifies commercial airplanes indicating they are safe to fly. The Air Force certifies our own airplanes. For structural integrity, the processes were put in place for metal airplanes back in the 1960s and they really haven’t changed that much. Metals fail in a much different manner than composites, but composites are still held to that metal standard. Because of that, composites have to be heavier in order to adhere to the existing standards. We are leaving performance on the table because of that.

Q: So what is the Air Force doing to revamp the certification process for composites?
A: AFRL has a big investment in next-gen certification. First, we’re looking at existing airplanes because we’re going to extend the life of all airplanes. We now have aircraft in inventory with a lot of composites, like the F-22 and the B-2.

We’re working with the Air Force Life Cycle Management Center to come up with new certification processes to help them understand what has happened to those composites over the current life of the airplane and how we can extend the life of these composite-laden airplanes another 10, 20, 30 years.

We are also looking at how to revamp the certification criteria for new airplanes to take advantage of what happens with composites. We need a deeper understanding of how composites fail so we don’t get caught with some kind of a surprise that leads to a catastrophic mid-flight failure. The Air Force plans to spend $50 million or $60 million over a 10-year period looking at this.

Q: What role can suppliers and manufacturers in the composites industry play in helping AFRL advance its research?
A: Ultimately, when we develop things here, they have to be in place in the industrial base because we don’t build our own airplanes. We rely on industry to do so. So we encourage companies to come and tell us what their issues are. Maybe we can work together to design an R&D program to help solve those. If companies have interesting solutions, come talk to us about how we can take advantage of them for next-gen airplanes.

The big gauntlet I’ve been throwing down is that we would love to have a next-gen composite system. The Air Force typically designs its airplanes around open-hole compression. We would like to see a 25 percent improvement in open-hole compression, which would translate to a significant weight reduction in aircraft. That kind of improvement would be good for both the Air Force and the composites industry as a whole.

Susan Keen Flynn is managing editor of Composites Manufacturing magazine. Email comments to sflynn@keenconcepts.net.

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One of the most widely known benefits of composites is their corrosion resistance in industrial settings. However, some industry experts like Brad Doudican, Ph.D., P.E., president of Advantic LLC often wonder if perhaps the industry is beating a dead horse. He believes that after decades of proven performance, the benefits that FRP offers pipes and tanks should be clear by now. “We hammer corrosion so much,” Doudican says of the industry.

According to Doudican and other FRP fabricators who work in industrial markets, the obvious corrosion-resistant benefits that composite pipes and tanks provide to chemical processing, oil and gas, and other corrosive environments are what make FRP products the first choice. What’s less clear is how to build upon that strong...
corrosion resistance story to expand composites’ use beyond pipes and tanks and other standard applications to provide new solutions – including dual corrosion-resistant and heat-resistant products that better serve evolving industrial environments.

AOC LLC, a Collierville, Tenn.-based supplier of resin systems, is one of those companies working to develop the next generation of products that combine properties, such as heat and corrosion resistance. “Usually there’s a trade off,” explains Dr. John McAlvin, vice president of technology for AOC. “If you have a product that’s good in one area, it may not be good in another area. We’re trying to make resins that have multiple features and benefits that are good for environments that are very hot and very corrosive.” Product development is a lengthy process that includes measuring the retention of physical properties after long-term exposure tests to a variety of chemicals and high temperatures.

There’s growing interest in this combination of features, but FRP is not widely known among end users for its heat resistance. Fabricators and suppliers in the composites industry are trying to change that.

FRP Can Stand the Heat

Take the semiconductor industry, for example. “In the past approximately 15 years, with the advent of the semiconductor industry, there has been a need for high-temperature duct that would not smoke and burn so it could be used in clean room environments, such as semiconductor plants,” explains Daniel Naugle, president of North East, Md.-based FRP product fabricator Composites USA.

Composites USA began working to develop products that could meet the growing demand of these sensitive areas, which also soon included university and research cleanrooms. Ductwork in these areas must meet the UL 181 rating, which limits products to a flame-spread index of no less than 25 and a smoke-developed index of less than 50. But it also has to withstand potential corrosion from chemicals, such as the hydrofluoric acid that is one of the key chemicals needed to manufacture silicon components.

“FRP duct with antimony is going to have a flame-spread index of less than 25 but a smoke-developed index of more than 50 which will not pass UL 181,” Naugle says. “So we made a product with a fluoropolymer liner that uses a phenolic resin to achieve a flame-spread index of less than 5 and smoke-developed index of less than 10.” With an added Halar® liner, the DualGuard 2000™ ductwork also is resistant to corrosion from a variety of the chemicals – from hydrochloric acid to sulfuric acid – that are used in cleanrooms or chemical processing plants, with no sprinklers required.

With FRP products able to achieve a powerful combination of corrosion and heat resistance, new possibilities open up. For example, Naugle points out that wastewater treatment plants also often call for UL 181 ratings, as do some industrial paint booths. Composites USA has supplied its DualGuard 2000 product to Boeing for buried ductwork in paint booths at its plants. “There’s high heat and highly corrosive chemicals in their paint, and they use DualGuard 2000 to keep the ductwork from catching fire or corroding,” says Naugle. “And it doesn’t rust so you can put it underground.”

One of the biggest challenges, of course, is that new applications mean a fresh learning curve for end users who still believe that FRP products are more limited than steel in high heat environments. Geoff Clarkson, president and CEO of UTComp, an FRP engineering and testing firm with global operations based in Cambridge, Ontario, recalls a recent project for which the
Company designed and supported fabrication of a liner for a basin used in extraction of titanium dioxide at a mineral processing facility. The process involves applying hydrochloric acid during several high heat cycles to extract the desired concentration of titanium dioxide. “The liquid that gets dumped in could be as hot as 419 degrees Fahrenheit, and this liner had to be able to survive temperature changes from room temperature to that temperature in probably a minute or less,” Clarkson says.

Creating a liner that meets these demands is a balancing act at which UTCOMP has become adept. “The first thing you have to do is use the right resin material. There are some commercially available resins that can work to those temperatures without running into the structural problems that tend to develop,” Clarkson says. The structural failures of concern are related to glass transition of the resin. “Above a certain temperature, the resins used go through a change where they become like rubber and would deform under the stresses applied,” he says.

However, as anyone who has ever had a wooden deck warp knows, heat causes material to expand, including composites. In the case of this particular liner, Clarkson recalls, “The installers seemed to think that the liner had to be completely restrained—but we actually had to give it room to expand.”

The installers’ plan was to put the liner in place and then pour concrete around it, with the idea that the concrete would secure the liner in place. An onsite UTCOMP engineer explained that level of restraint would cause the liner to rapidly fail. “We had to show them how to build the concrete, which had to be done before they put this liner into place. It also meant they had to make a mold instead of using our product as a mold,” Clarkson says. With that onsite expertise, the team was able to install a liner that has thus far had five years of problem-free service, with a projected lifespan of 20 years more.

Finding the Right Balance

In his research at the new Ashland Corrosion Science Center, a part of the Dublin, Ohio-based resin supplier Ashland LLC, manager Kevin R. Lambrych has found in his work with unsaturated polyester and epoxy vinyl ester resins that some companies focus on the high heat distortion temperature (HDT) of the resin system but lose sight in the chase toward high-temperature performance that they need to maintain that performance over time. “The thermal and mechanical dynamic performance over time is just as critical as an initial mechanical property, like HDT,” Lambrych says.

A recent evaluation of Ashland’s Derakane™ epoxy vinyl ester resin against other similar products designed for high-temperature corrosion performance found that the initial HDT was less critical a consideration than expected. Instead, long-term success depended on taking a holistic view of how long the product can resist chemical failure while being exposed to high thermal conditions.

“As you have a resin exposed to high temperature over time, the covalent bonds will begin to break down,” Lambrych explains. “What we’ve discovered is it’s not just about things like initial temperature resistance or mechanical performance [attained]. It’s the ability for fabricated products to maintain those mechanical properties over time vs. temperature that is most critical to asset owners.”

As a result, Lambrych encourages design engineers and fabricators to ensure they’re meeting the true needs of the customer by balancing potential lifespan initial high heat performance and ultimate corrosion resistance.

“Just because you’ve produced a higher crosslink material that can deal with high temperature doesn’t mean it’s going to last at that high temperature for a long period of time,” Lambrych says.
It's critical for industry growth that fabricators get it right. As Lambrych points out, "Once you have an upset condition that destroys the FRP, the end user later will say 'I'm never going to use FRP again.'"

Achieving the desired combination of properties is possible by researching the right resin and reinforcement combinations, but it's also about craftsmanship and working closely with the end user to understand engineering details.

Ultimately, Lambrych adds, "We're very focused on partnering with the end user to make sure that the empirical evaluation and ASTM C-581 corrosion testing has been done to show the product is going to work -- so that composites do not get a black eye."

UTComp is pushing industrial clients to consider non-invasive inspection technology that can reduce costs associated with both downtime and replacement. "We've just done some work with Swerea KIMAB (formerly the Swedish Corrosion Institute), which has said that what everyone thought was the way to deal with fitness for service of composites appears to be wrong," Clarkson says.

In a conventional inspection of composite structures in corrosion service, technicians go inside the tank that has contained noxious, toxic materials and look at the surface of the polymer to inspect for potential failure. The suggestion to replace corroded materials is generally based on soft skill training. "It's kind of like looking at the paint job on your car and saying, 'I don't like the paint job on my car; time to get a new car,'" Clarkson says. "That's pretty expensive."

Instead, Clarkson says, the Swedish institute is offering support for non-intrusive testing such as the UltraAnalytix™ system UTComp created. "We developed a technology where we can do an inspection of the same equipment from outside, usually while it's in operation, and tell customers the condition of the material and whether they need to do any repairs at all," he says.

UTComp uses ultrasonic testing, similar to that used for steel and other metal pipes and tanks but processes the resulting information differently to detect changes within the FRP and account for FRP's much wider variation in sonic velocity (the speed at which the ultrasonic sound travels) and other responses than steel. The analytics software can calculate the condition of in-use FRP products as a range with approximately 95 percent confidence. Clarkson points out that this technology provides a more objective, data-based approach to service life decisions, which ultimately can save industrial end users downtime and replacement costs.

Complementary Applications

As composites continue to prove suitable for new applications, a key challenge remains educating end users about possibilities beyond corrosion-resistant tanks and pipes. "There are other products we can make that are corrosion-resistant that are now being made from titanium or Hastelloy® [a high-performance alloy]," says Naugle.

One logical add-on solution may be support structures adjacent to pipes and tanks. Structures including catwalks and stair towers can also be exposed to corrosive elements in the manufacturing environment. This was the situation that led Advantic to discussions about building a support structure to help workers at a chemical processing company better use an existing FRP salt brining tank that creates salt byproducts, such as hydrochloric acid.

When the company began balancing the high cost of maintenance for the existing steel platform that sits over the open FRP tank with the need to replace that structure, decision-makers considered creating a platform with a stair tower made from a material that could better withstand the highly corrosive nature of the tank's aqueous salts. Advantic was brought on board to develop a 43-foot-high FRP stair tower adjacent to the tank.

"It's a pretty tall and substantial structure in an environment that is exposed to wind and seismic loads in addition to your dead and live load requirements," Doudican explains. From the concrete pad to the tank's top, Advantic is building a pultruded
FRP structure to include columns, beams, girders, grating, stringers and handrail. “We’re also going to place a long span structure across the top of the tank so they can get out and do sampling at the center of the open top tank,” Doudican adds.

Brian Stamper, vice president of business development with Advantic, points out that industrial facilities are beginning to recognize that corrosive environments extend beyond the tanks and pipes that touch chemicals directly, and FRP products can meet a much broader range of needs. “In a corrosive environment you don’t just need to use FRP grating and handrail,” Stamper says. “FRP structures are innovating the way towers and platforms are being constructed.”

There’s another piece to the story, though, and that comes with composites’ highly touted benefit – their light weight. “Given the weight savings, we’re going to be able to prefabricate that structure in a couple different pieces so the company’s [installation] downtime is significantly reduced,” Doudican says. For many industrial companies, that reduced downtime is a significant selling point.

As a result, Advantic is seeing growing demand in industrial markets for access structures, pipe racks, stair towers and related products. “Due to the light weight of composites, we’re able to compete head to head with structural steel,” Stamper says.

**The Next Opportunity**

Building these structural systems may serve as an effective gateway to what Alexander Thibodeau sees as another big opportunity for composites that provide corrosion resistance – the infrastructure market.

“That’s really the next major frontier for composites, both in materials in original construction and offering repair solutions for degradation and corrosion,” says Thibodeau, director of engineering and business development for Kenway Composites in Augusta, Maine. “A story about our crumbling infrastructure is on the 6 o’clock news at least once a week.” He says composites can be used to repair corroded structures and in that process can be rerated to accept a higher capacity load than the structure originally was designed for.

Kenway has been testing these waters by providing structural support systems for the U.S. Navy, including several sets of FRP deep draft camels for Navy submarines. “They’re essentially giant bumpers that the submarines rest against when they’re in port,” explains Thibodeau. “Historically, those were made of steel, so every five years they had to be hauled out of the water, sandblasted, repaired, repainted and put back in the water. These new ones are all composites, inside and out. The first time they get hauled is in 25 years.”

Experience developing these water bumpers has in turn led to opportunities replacing wood piers and piling with corrosion-resistant FRP. From here, Thibodeau has his eyes set on moving from water to land-based infrastructure and demonstrating the value of corrosion resistance in structural applications. Like many of his peers, Thibodeau is striving to move his company – and the corrosion-resistant niche within the composites industry – far beyond pipes and tanks.

Megan Headley is a freelance writer based in Fredericksburg, Va. Email comments to rmheadley3@gmail.com.
A Commitment to Quality

Three companies share their insights into the ISO 9001 certification process and its benefits.

By Melissa O’Leary

Composites One distributes thousands of products from its warehouses, including this one in Lenexa, Kan.
If you think that becoming ISO certified is about hanging a framed certificate on the wall and hauling in new customers by the dozens, think again. ISO certification is a much more complex process, and its benefits are far-reaching. It affects every aspect of business – from customer service and warehouse operations to engineering and upper management.

“It makes you a better organization,” says Michael Gassler, LEAN/ISO manager and management representative at Creative Pultrusions Inc. “It brings discipline, brings [a quality] culture, involves employees and improves morale. You get your hands around your processes, and you increase customer satisfaction as a result.”

In this article, Composites Manufacturing profiles three companies that have achieved ISO 9001 certification. Their candid stories reveal successes and challenges, as well as recommendations for engaging with the ISO 9001 standard.

**Company:** Composites One  
**Headquarters:** Arlington Heights, Ill.  
**Focus:** Distributes raw materials, processing supplies and equipment  
**Employees:** 500+ throughout North America

Composites One certified its 38,000-square-foot Monessen, Pa., distribution center to the AS9120A:2009 standard in 2011 after a customer said it was required to continue as a material supplier. The standard, published by the Society of Automotive Engineers for aviation, aerospace and defense distributors, includes ISO9001:2008. Seven years later, Vice President of Operations Don Hairhoger says that standardization, employee engagement, improved customer service and other internal benefits have led to plans to eventually certify all 39 of the company’s distribution centers.

The Monessen distribution center certification process took approximately 18 months. Hairhoger admits there was a steep learning curve and a tremendous amount of heavy lifting on the front end to get through the process.

While Hairhoger and others at Composites One began the certification process internally – at times using “gut instinct” to work through issues – that wasn’t enough. The company hired a consultant, who performed a gap analysis for Composites One to compare existing practices with the standard and identify areas that required attention.

The first area was metrics. ISO requires that companies establish quality assurance objectives. While Composites One previously measured dozens of things, the certification process prompted the company to narrow down to four key quality metrics to keep the ISO process simple. “What gets measured, gets done,” Hairhoger explains, adding that the metrics the company chose to measure are ones that are most important to customers. While he declined to share all four metrics, Hairhoger cited one – fill rates, which track order speed and accuracy.

Once metrics were streamlined, the company began putting processes and procedures in place to meet goals related to those four areas. Staff training was key. Executive management in the company’s Arlington Heights, Ill., corporate office and every employee in Monessen from sales staff and customer service to truck drivers and warehouse workers received training. “I think
that is really key,” says Hairhoger. “Get your key stakeholders around a table and give them a general overview, then go department by department or person by person and explain their role to them – because everybody plays a role.”

Composites One also instituted “opportunities for improvement” (OFIs), which encourage employees to ask, “What are we doing today that can be more effective in taking care of our customers?” One identified OFI was damaged stock drums. The company conducted a root cause analysis to determine why an unacceptably high number of drums were being dented or otherwise damaged. The analysis revealed that most damage occurred because transportation carriers were moving drums with forklifts rather than drum handlers. To fix this, the company’s sales and logistics teams arranged for stock drums to be transported on pallets, which has reduced damage. This is what ISO 9001 certification is all about, emphasizes Hairhoger – continual improvement to better serve customers.

“Improvements don’t have to be big leaps and gains,” he says. “I think a lot of companies that go into ISO think that right off the bat they are going to find a million dollars of business or savings somewhere out there that they didn’t know about. There are small, incremental gains, but each one of those are building blocks toward driving your company ahead and continuing to improve.”

Composites One also formalized incidence reporting. Previously, if someone in the warehouse made a shipping error, the distribution center manager might ask what happened and tell the employee not to do it again. “There was no follow-up, no root cause investigation, no how did it happen,” says Hairhoger. “There are 20 different reasons that could have caused it, so we were just putting a Band-Aid® on things.”

When errors occur today, the manager and employees conduct a root cause investigation, establish a corrective action plan and review it in 60 to 90 days. Hairhoger notes that the incident reporting system has engaged both management and employees, while enabling the sales team to provide better answers to customers when things go awry.

The benefits of certifying the Monessen facility have carried over to the entire company. “We have applied a lot of the things that we learned during the certification process to how we do business everywhere,” says Director of Marketing Communications Marcy Offner.

For example, the receiving process utilized in Monessen, which includes a three-way match of purchase orders, packing slips and product labels to prevent errors, is now used in all distribution centers. Composites One also uses the work management and automation platform first implemented at Monessen at 14 other large distribution centers and the corporate office. Hairhoger says the database allows the company to monitor trends, then use them to eliminate waste and serve customers more efficiently.

Composites One plans to certify four other distribution centers in July and will migrate two facilities to the new ISO 9001:2015 standard, along with AS9120B:2016 – the Monessen facility and BMB Solutions Composites in Montreal.

Ironically, the customer that first led the company to ISO certification is no longer in business. “How about that?” Hairhoger laughs. “But that’s OK, because it put us on a path to where we are today and where we want to be in the future.”

**Company:** Composite Resources Inc.  
**Headquarters:** Rock Hill, S.C.  
**Focus:** Supplies components and tooling, primarily for aerospace and defense  
**Employees:** 35

As a manufacturer for the aerospace and defense industries, Composite Resources was already a process-oriented company with high levels of documentation before it sought ISO 9001 certification in 2010. Having well-established quality systems, a quality inspector and advanced inspection equipment, including a FARO® 3D measurement arm and a coordinate measuring machine, meant that most practices were already aligned with the standard.
“I think for some organizations, it’s really a big leap to go from what they're doing to becoming ISO certified,” says Morgan Brady, COO of Composite Resources. “However, in our case, it wasn’t a big step because we were already doing 90 percent of the required processes and documentation.”

Quality systems evolved organically at Composite Resources as the company grew, but the push for certification stemmed from a common industry refrain – a customer request. Brady recalls an aerospace customer saying, “Your product is fantastic and your quality records are off the charts, but for us to do business and certify this product, it needs to come with an ISO certification.”

The certification process for its 55,000-square-foot facility took six months, with preparations focused on formalizing existing practices or adapting them slightly to conform to ISO standards. Composite Resources’ software systems were key to standardization. MQ1 quality management software allows the company to manage documents, including tooling and job notations, standard operating procedures and safety data sheets for materials. The company’s JobBOSS shop management software helps simplify the compliance process by managing purchase orders, sales orders, internal part numbers and descriptions. It also has a labor/data collection feature that allows the company to track the time for each step of a process and measure efficiency.

To help prepare for certification, Composite Resources employed an outside consultant who walked the company through the certification process, trained internal auditors and conducted a gap analysis to identify areas that weren’t up to the standard. Relying on an outside consultant is key, says Amy Autovino, quality technician at Composite Resources. “You’ve got someone who comes in, knows the standard and can explain to you the things that you don’t understand,” she says.

Composite Resources is currently preparing to certify to the newer ISO 9001:2015 standard. To get started, Autovino and the quality manager completed a week-long audit class covering the updated standard at South Carolina Manufacturing Extension Partnership (SCMEP), a non-profit group that offers a range of resources to companies in South Carolina. Then they began revamping processes to adhere to the updated standard.

One of the changes in the ISO 9001:2015 standard is an emphasis on risk-based thinking, which requires companies to consider the consequences – especially negative ones – of any proposed action. While previous standards required “preventative actions,” the 2015 standard calls for a systematic assessment of risks at every step of the quality management process, from planning and operations to analysis and evaluation.

“It's a mindset that helped everyone think about risks associated with projects and shop floor activities,” explains Autovino. For example, new product/part launch meetings held by engineering staff now include a discussion of the pros and cons of the intended project; potential delays related to materials, machining or lay-up; and worst-case scenarios.

The new standard also places more emphasis on how the input and output of various business processes interact with each other. For instance, how does the output of the sales team (orders) become input for the engineering department (products to be designed)? Composite Resources created diagrams to analyze and document the input and output of each of their processes.

After a few weeks of internal preparation, a consultant from SCMEP conducted an audit and provided a gap analysis. Autovino says the company was confident in its processes, but was unsure how to implement a few into their ISO quality manual. “We used the gap analysis to make sure we did not miss any important information,” she explains. Next, the company will conduct an internal audit to prepare for July certification.

“I think that if you are serious about growing your business, ISO is a really good way to start,” says Autovino. Brady agrees, but advises letting the market dictate when the time is right. “I wouldn't expect that just because you become ISO-certified, it will all of a sudden create a huge demand [for your products],” he cautions. “If you are going to do it, make sure that it is truly part of a strategic plan that's going to allow you to enter a certain market.”

The ABCs of ISO 9001

ISO 9001 is the international standard for quality management systems set by the Geneva-based international nonprofit organization, Organization for Standardization (ISO). ISO has 162 national standards organizations as members, including the American National Standards Institute (ANSI).

Certification to the ISO: 9001 standard is an outward assurance to customers that a company has good systems for monitoring quality, safety and efficiency and provides consistent, quality products and services to its customers. The standard provides a process-oriented approach to documenting and reviewing the structure, responsibilities and procedures necessary to achieve effective quality management within a company.

Creative Pultrusions Inc. (CPI) began aligning its processes and procedures with ISO 9001 standards in the late 1990s. While it didn't complete the process then due to resource constraints, CPI did develop the nucleus of its quality systems, which continued to evolve until the company certified to the 2008 standard in 2015.

LEAN/ISO Manager and Management Representative Michael Gassler, who has been through five certification processes throughout his career, says the company was ready to position itself as the industry leader in its chosen markets and to demonstrate its level of commitment. “Once we made the decision to go to ISO certification, the process was much easier than the others that I’ve done because the management team is so focused and there were so many good systems already in place that just had to be tied together,” he says.

CPI worked with Core Business Solutions (CBS) intensively for several months during its year-long certification process. CBS conducted a gap analysis and provided online training for the senior management team.

One area that was in great shape was CPI’s engineering system. The company already had a specification file for each of its 1,000-plus products that includes part construction, inspection documents, quality documentation and tooling, and part, heater and guiding system drawings. Other systems needed more work to bring them up to the 2008 standard. For example, CPI has 400 controlled documents, including its quality manual, quality procedures and work instructions. These documents were scattered throughout the company’s internal network, there were multiple versions of similar documents, and employees were saving documents to their computers. “There was no central control,” says Gassler.

To correct this, the company confiscated and evaluated every electronic document. Unneeded documents were cast aside, while others were revised. All remaining documents were uploaded into the CORE ISO Compliance Platform® (CORE) cloud-based document management software. Gassler then used the CORE platform to assign each document an owner, unique control numbers, revision levels and reviewers.

Today, reviewers must give electronic approval in the CORE platform before a document is released for employee use. Once approved, documents are converted into pdf files so that they can’t be changed. All documents are reviewed on an annual cycle, with 20 to 70 becoming due each month. Consequently, Gassler says, “Any employee can walk up to a computer and open any of the work instructions, and I am sure that everything they will see is current.”

CPI also revamped its training documents for certification in 2015, as well as the process for ascertaining which employees have been trained on new procedures. New training documents are identified at level 0. When the company makes process changes, the documents are relabeled to level 1, level 2 and so on to indicate a revision was made. However, that labeling system didn’t signify employee training.

“If we had a work instruction or a procedure that was revised, there was nothing systematically that told us to go out, get employees and make them aware of the changes,” says Gassler. Therefore, employees may still have been operating under previous guidelines.

To create a more robust system, Kevin Grace, safety manager, developed a database that ties each of the company’s 400 process documents and their revision level to each of its 150 employees. Now when a revised document is released, Grace can immediately identify employees who need to be retrained or updated based on changes.

“That’s the beauty of the ISO program,” says Gassler. “Once you get your certification, it’s a process of continuous improvement. It constantly forces an organization to be on guard for, identify and eliminate system weaknesses.”

ISO also has improved employee engagement. For example, CPI’s engineering and quality staff met with one customer to conduct a four-day, deep-dive analysis on how to improve products. Afterward, CPI certified a select group of employees as the only ones who can work on this product line.

“To see the engagement and the ownership that employees are taking in this process is tremendous,” says Gassler. “We now have employees coming up with suggestions on how to improve things on a regular basis.”

Last year, CPI migrated to the 2015 standard, which requires senior management take direct responsibility for one or more quality systems as a “process owner.” The director of sales at CPI now “owns” customer satisfaction and customer service quality efforts, while the director of finance and materials “owns” purchasing.

This focus on ownership is a big change in the quality management world, according to Gassler. “Before, it used to be about hiring a guy like me and putting me in charge of quality,” says Gassler. “Then I owned ISO – I owned all the problems and everything else that goes with it.” Now, the CEO and all the directors are responsible for effective management of the quality management system.

Gassler recommends that every company consider engaging with ISO standards, whether their customers demand it or not. “Don’t go after certification simply to put a plaque on the wall,” he urges. “Embrace everything the standard asks you to do, and embrace it as a continuous improvement process.”

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Last year, ACMA held a webinar covering applications of Lean Six Sigma principles for composites manufacturing to help its members improve their manufacturing quality. The webinar covered how composites manufacturing applications differ in critical ways from the manufacturing of traditional materials and how to tailor process improvement programs. To download the webinar, visit http://bit.ly/CCTSixSigma.
Making the Case for Composites Recycling

Technology improvements and new markets for recycled fibers could spur its growth.

By Mary Lou Jay
Just two years ago, the recycling of composite materials was an aspirational goal but not a commercial reality, according to Dan Coughlin, ACMA's vice president of composites market development. But thanks to the concerted efforts of ACMA members and partners from around the world, the situation is much different today. The recycling of carbon fiber composites has become a reality, and the industry is actively pursuing new glass fiber recycling technologies.

For ACMA members, there are several incentives to jumpstarting the composites recycling industry in the United States. The country's composites industry is taking the lead to develop and commercialize recycling technology. This industry-led model stands in contrast to regulations and mandates in other regions of the world, such as Europe. The composites industry also is responding to the needs of its customers, such as aircraft manufacturers and automotive OEMs, who need cost-effective and sustainable methods for handling their scrap materials and end-of-life composite parts.

Establishing a Recycling Infrastructure

Building a viable composites recycling system from scratch is a complex process, because many different things have to occur within the same general time frame. First, companies have to solve the technical challenges of extracting the different types of fibers during the recycling process. To date, they've made more progress with carbon fibers than with glass fibers due to the relatively high value of recovered carbon fibers.

Then, to reach the operational scale required for commercially viable operations, companies will have to identify a consistent source of composite scrap material. They may have to adapt the recycling technology according to the type of material they're recycling – carbon fiber or glass fiber, prepreg scrap, trim waste from a cured composite or cured composite.

“Polymer types are different surrounding glass fiber versus carbon fiber, so the reclaiming process conditions may vary,” observes Soydan Ozcan, senior R&D scientist at Oak Ridge National Laboratories (ORNL) and IACMI composite recycling lead. The industry will have to determine, among other things, if a single process can reclaim both types of fiber effectively and if different resins and fibers will react differently to the recycling process.

Companies that provide composites scrap for recycling feedstock will have to be prepared to provide a thorough breakdown of their content. That will require the creation of specifications for such materials, says David Wagger, chief scientist/director of environmental management at the Institute of Scrap Recycling Industries. The organization has been helping ACMA and its partners assess what's needed for successful composites recycling.

“There also needs to be a market for the recycled material to go to,” Wagger adds. “You can do all the collection, sorting and processing, but if it doesn’t make it to someone who is actually transforming it into a new material, then recycling doesn’t happen.”

Manufacturers of composites and composite parts have to start thinking about recycling from day one. How can dispensable parts and production scrap be harvested, separated out and converted to a product that can be reprocessed into new material?

Outlook Promising for Carbon Fiber

The composites industry will be more likely to embrace recycling if there’s a good business case for its adoption. “We have a good story to tell on the carbon fiber side,” says Coughlin. “People are recovering carbon fiber; they are selling it, and it is getting used to the point where there is market pull from major OEMs who see recycled carbon fiber as an attractive resource.” Turning composites scrap from a waste material into a valued resource is a significant milestone in the progress that the industry has made just in the last few years.

ELG Carbon Fibre has spent seven years working on a pyrolysis (high-temperature decomposition) process to recover the carbon fiber from composites, and it’s ready to operate on an industrial scale, according to Alasdair Gledhill, ELG’s commercial director. “Now the challenge is to commercialize recycled carbon fiber products,” he says. “We are at a point where ELG is in a position to put together a tailor-engineered, specification-grade raw material for use in many different markets.”

ELG’s primary target is the automotive industry, but there are many different applications and markets in which recycled carbon fibers could be used, including other parts of the transportation industry. “Perhaps we will see recycled carbon fiber making some inroads into the aerospace market for non-mission-critical, non-structural components that require light weighting and high strength,” Gledhill adds.

ELG uses industrial scrap, cured and uncured prepregs and laminates for its feedstock, most coming from aerospace industrial scrap. “As the business matures, maybe 15 to 20 years from now, we will start seeing more end-of-life scrap come back to us,” Gledhill says. For example, when an automobile is shredded at the end of its lifespan, companies like ELG can capture its carbon fiber components and recycle them. Wind turbine blades could be another source of carbon fiber, even though they contain more glass fiber than carbon.

Gledhill says ELG has the capability of scaling production to meet demand, and the company has set a goal of tripling its capacity in carbon fiber recycling within three years. “Our goal is to make recycled fiber an integral part of the supply chain,” says Gledhill. “We see recycled carbon fiber as being complementary to the growth of primary carbon fibers. In many ways, recycled carbon fiber helps to fill in the supply deficit, which is already forecast for primary carbon fiber.”

V-Carbon, co-founded by Ron Allred and Damian Cessario, is another company hoping to supply that need. It uses a low-pressure, moderate temperature chemolysis (decomposition using chemical agents) for reclaiming the carbon fiber from composites. It is establishing advanced manufacturing operations in Europe and has a prototype facility in the U.S. that produces about 30 pounds of reclaimed carbon fiber every three days. It will soon open a new plant in Wichita, Kan., that will be able to scale up to meet customers’ needs.

Allred, who serves as head of research and development at V-Carbon, says there is definitely a market for the product. “We have done extensive sampling and prototyping in Europe for the automotive industry and the marine industry for luxury yachts and sporting goods. In Europe, at least, they are very aware that it is coming,” he says. He’s confident that V-Carbon will also get a positive response from customers in the U.S. once the fiber is available in commercial quantities.

V-Carbon plans to vertically integrate its carbon recycling process. “We will generate the recycled fibers, we will process
them into non-woven fabrics – both random and aligned – and sometimes make spun yards from them, and then we will have the manufacturing capabilities to produce parts and supply them to the marketplace,” says Allred. “We also have a family of sizings that allows for good translation of properties using the reclaimed fibers. That creates value in every step, and that will make the business profitable.”

The Business Case

Reducing costs is key to the growth of carbon fiber recycling. “Recycled carbon fiber offers a great value for some applications, striking the balance between performance and cost, which is all-important,” says Gledhill.

Recycling has other economic benefits as well. “IACMI estimates that it takes 15 percent of the energy to get the recycled fibers as it does to make the original fiber; that translates into a cost benefit,” says Allred.

“By recycling carbon fiber waste, you are preserving that entrained energy that is already invested in the primary fiber. That makes economic sense,” says Gledhill. When carbon fiber composite waste goes into a landfill, you lose that entrained energy and have downstream environmental costs.

Reclaimed carbon fibers retain most of their mechanical properties. After pyrolysis, carbon fibers show only a four percent reduction in tensile strength and a two percent reduction in tensile modulus, according to Gledhill.

But recycled carbon fibers differ in one significant way from virgin carbon fibers; the reclaimed fibers are short and discontinuous, rather than continuous. That limits their use in some applications.

“But it also opens up a whole new world of different products that can use short fiber,” says Gledhill. “For example, ELG takes our short fiber and runs it through a carding line [which aligns the fibers] to make a non-woven mat. That is a completely new product that is being brought to market, and that non-woven mat can be substituted in some cases for primary prepreg material or sheet molding compound, which are made from primary fiber.”

Allred says one way to improve the usefulness of reclaimed carbon fiber would be finding a way to align the short carbon fibers. “That would produce a volume fraction up around 50 percent, essentially doubling your mechanical properties,” he adds.

Developing new manufacturing methods could lead to the creation of new, high-value-added products that incorporate these reclaimed fibers, says Ozcan. One IACMI project team is currently working to develop a process and the necessary equipment to align these recycled short carbon fibers. For another project, IACMI is working with BASF, ORNL and the University of Tennessee, Knoxville, to develop high-volume, high-speed processing and material technologies that use short carbon fibers to produce automotive body panels with a Class A surface appearance and the necessary mechanical properties.

Glass Fiber Challenges

Carbon fiber recycling is paving the way to explore fiber recovery technologies that may benefit glass fibers in the future. There have been several attempts made at glass fiber recycling, but it’s met with less success than carbon fiber recycling because of the business model needed to support a fiber recovery program. There is a much greater need, however, as more than 90 percent of the world’s composites are made with glass fibers.

The cement kiln process is one technology currently used for glass fiber recycling. That captures some of the material’s entrained energy, and the reclaimed glass fiber is used primarily for low-value cement filler. That’s better than sending the
composite to a landfill but doesn’t provide the best economic incentives for recycling. Pyrolysis is another technology option, but previous attempts have not provided the right combination of recovered fiber strength and value.

Looking for a better solution, ACMA and Owens Corning, under the auspices of IACMI, are leading a collaboration of 12 industry and research partners in the development of a thermal composite recycling technology known as the Thermolyzer."It is a controlled pyrolysis unit that uses the energy inherent in the composites to fuel the recycling process while preserving the structural value of both glass fiber and carbon fiber. Excess energy generated by the process might even help run other equipment in a factory or laboratory where the Thermolyzer is located.

The ACMA-led team will be using a Thermolyzer test unit located in Germany during a trial in March. It plans to recycle a variety of shredded composite materials – wind turbines, industrial scrap and automotive SMC – that contain both carbon and glass fibers.

“[For glass composite recycling] we have to look at pulling out fiber that has a length of greater than ½-inch so that it retains its strength and is not embrittled – it’s usable,” says Dave Hartman, scientific advisor, composites at Owens Corning.

“Once we have figured out how to get the fibers out economically, we are still going to need to develop applications using the recovered glass fiber,” Coughlin adds. The goal is to reach a commercially acceptable level of fiber strength suitable for reinforcement.

Since a continuous process runs most efficiently when it is operating 24/7, the composites industry could work with other industries, such as carpeting and electronics, which also have waste streams that need recycling. This would supply the equipment with the steady fuel stock it requires.

The project team will complete the work by December. While recycling GFRP won’t be easy, Coughlin believes the composites industry will find an answer. He cites the example of paper companies, which had to find ways to make the recycling of low-cost cellulose fiber work. The key was creating a market pull for the recycled products. The federal government helped when it specified the purchase of recycled paper. Commercial companies soon followed, creating demand for fiber recovery. The composites industry and their customers could create that same kind of market pull if they can develop the right applications for recycled glass and carbon fibers.

As the technologies improve and new markets open for both recycled glass and recycled carbon fibers, the supply of both will increase to meet the demand. There is a lot of opportunity for growth of recovered fibers: Among the approximately 100,000 tons of primary carbon fiber produced each year, about 30,000 tons become scrap in the production process and only about 10 percent of that is currently recycled.

“There’s still a long way to go to make sure that the 30,000 tons of carbon fiber scrap is handled responsibly and sustainably and recycled,” Gledhill says. “I think it will become self-evident that when you have a waste stream that has inherent value, there are economic incentives to keep it out of a hole in the ground.” In Europe, at least, there are also regulations to prevent landfilling.

“Those two things will come together and drive the development of more recycling capacity,” Gledhill says.

A Global Concern
The worldwide composites industry needs to develop better, cost-effective technologies for recycling composite materials. European composites and parts manufacturers in particular are facing stringent regulatory mandates because of the lack of landfill space. They must recycle virtually all their waste and/or their composite products at end of life.

To spur international cooperation, ACMA has taken a leadership role in establishing the Global Composites Recycling Coalition. It includes six trade associations, five labs/universities and 25 companies with representation from Europe, Asia, North America, Africa and Australia. “We have been promoting the idea of cooperating and disseminating technology,” says Dan Coughlin, ACMA’s vice president of composites market development.

The group met in 2016 and 2017 and plans another meeting this year. Participants have discussed topics such as recycling technologies and strategies, standards developments for recycled fibers and parts, promoting market pull for recycled composite products and overcoming barriers to composites recycling.

ACMA will also bring together experts from around the world for its first-ever Composites Recycling Conference, scheduled for April 10-12 in Knoxville, Tenn. For more information, visit www.acmanet.org/recycling.
A New Approach to Industry Statistics

One of the ways the composites industry stays abreast of where it’s headed is through *Composites Manufacturing*’s annual State of the Industry report. While the report helps provide a macro view, the industry also needs accessible and specific data about composite usage. At the beginning of 2018, ACMA formally launched its statistics program to help address this void. Andy Beer, vice president of composites for North America at Ashland and vice chairman of the ACMA Board of Directors, is leading the project. We sat down with Beer to learn more about the program and its expected impact on the industry.

**CM:** How did ACMA determine the need for a self-sustaining statistics program?

**Beer:** One of the key elements of ACMA’s strategic plan is to assist and drive market growth. To really see if the association’s efforts in driving market growth are successful, we need to have a way to measure that success. The best way to measure that is through a robust statistics program. Our program is being designed to measure this industry’s penetration and success in creating opportunities for our members and the entire industry to grow. This program is the benchmark that will actually show us how we’re doing relative to the markets that we’re trying to serve.

**CM:** How will the data be used and interpreted?

**Beer:** On a quarter-over-quarter basis, we’ll be able to see the evolution of composites usage into those market segments and then compare that to other data for those market segments. For example, in transportation, which includes automotive and heavy truck, we can compare how the total composites usage compares to widely available data that shows how many cars and trucks are manufactured. We can then compare our industry’s growth rate to the growth rate in those exact segments, which will give us an idea if we are growing faster, at the same rate or slower. This will help ACMA and its members gauge the success of our initiatives to drive market growth, including our Composites Growth Initiatives.

**CM:** Who specifically will have access to this data, and how will it differ from the extensive industry data that already exist?

**Beer:** The data will be driven by ACMA members, therefore, we believe it will have more relevance and accuracy than typical consultant data that is available today. Consultants do a really nice job, and we aren’t trying to take over their space, but we’re trying to create value for our members. In terms of who the data is available to, that part of the program is still evolving. The specific data, such as total pounds and volume, will be available to the contributing members. More broad data, such as growth percentages and our annual report, will be distributed more broadly. Our goal is to get to the point where this program is seen as a critical membership benefit that the association can use to generate revenue.

**CM:** What’s the next step for the program, and what are you anticipating in terms of a project timeline?

**Beer:** We just launched it in January, so we are still populating the data. The next 12-month goal will be working through any issues with the program process and workings. We also want to develop the specific platforms we intend to use to distribute the data. The third step in the vision of the of the statistics program is to increase the program’s reach and robustness, including adding more input from more contributing members to get a broader and deeper view of the overall composites market.

of composites that are being used in specific markets. Those markets are marine, transportation, building construction, infrastructure and “other.” The data will be a combination of the key components, including reinforcement, resin and other raw materials, that will be reported out as a total composites volume for those five market segments.
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In late January, the National Institute of Standards and Technology (NIST) published a Roadmapping Workshop Report that suggests ways to facilitate wider adoption of composites in a variety of infrastructure applications, including dams, bridges, highways, railroads, harbors and waterfront structures, utility poles and buildings.

The NIST report summarizes ideas gleaned from a February 2017 workshop facilitated by ACMA. One of the ways ACMA advocates for the interests of the composites community is by working with policymakers, regulators and federal agencies to foster policies and standards that grow the industry.

“As a leader in composites industry advocacy and standards development, ACMA was proud to support the development of this important project,” says Tom Dobbins, ACMA president. “Last year’s workshop helped us better understand the needs of infrastructure stakeholders, and the roadmap was developed with their feedback in mind.”

During the workshop, designers, engineers, ACMA member manufacturers, researchers, owners and end users identified barriers that must be overcome to enable the adoption of composite technology. The attendees developed a preliminary roadmap with three proposed solutions to those barriers. If carried out, they could lead to the increased adoption of FRP in infrastructure applications. “We look forward to working with the composites industry, other government agencies and university partners to address the needs identified by the workshop participants,” states Jeffrey Gilman, leader of the composites project at NIST.

The Roadmapping Workshop Report is available free of charge at https://doi.org/10.6028/NIST.SP.1218.
The American Composites Manufacturers Association is the world’s largest composites industry trade group. We are manufacturers, material and equipment suppliers, distributors, academia, and end users.

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