In Pursuit of the New

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What Really Happens on Capitol Hill
Sometimes it’s hard to get the “real story” when it comes to politics. That’s why Composites Manufacturing asked Teri Schenk of Environmental Solutions and Cheryl Richards of PPG Inc. to keep a record of their Lobby Day experiences on Capitol Hill.

Going Green and Going Strong
As the recreational vehicle industry emerges from the economic downturn, it’s finding opportunity by going green. And composite materials are staking a larger claim in the sector because of it.
By A. Mike Shuler

In Pursuit of the New
University professors were asked to name some of the most influential composite products to come out of their labs in the last decade.
By A. Mike Shuler

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How Do You Define Your Company?

When my wife Juanita and I bought Alaglass Pools, 11 years ago, we thought we’d entered the swimming pool industry. We manufactured fiberglass swimming pools, so that’s how we defined our company.

We still make swimming pools, but after the Great Recession, Juanita and I looked for other ways to define our business and break into other markets. We didn’t want to be like the railroad companies...who thought they were in the railroad business, but should’ve realized they were in the transportation business. When they finally realized they were in the transportation business, their perception of market opportunities expanded. They began to sell their transportation services into new markets, leveraging their low cost service as a major differentiator. And they began to grow again.

We’ve come to see that we’re really not in the swimming pool manufacturing business; we’re a large-part composites manufacturer. This one little redefinition has given us a different perspective on who we really are and as a result we’ve expanded into two other large-part composites markets that will allow us to augment our seasonal pool business. Additionally, viewing our business from an expanded perspective has enabled us to not only look at other manufacturing processes that will help us meet quality, cost, and environmental requirements in these new markets, but also will help us in the swimming pool market.

How do you see and define your company? Are you a manufacturer who happens to make something out of composites? Or are you a composites manufacturer, able to enter new and different markets where your unique capabilities differentiate your products from your competition? You’d think that defining what your company is all about would be easy, but not necessarily. With increasing costs, environmental issues and competitive pressures, it makes sense to take time to figure out what business you’re in; and more importantly, how you want to profitably go forward with your business.

At ACMA, we just finished an in-depth strategic planning process, during which your Strategic Planning Committee and ACMA leadership grappled with the questions of who we are as an industry and association and where we need to be going. Three years ago, the Strategic Planning Committee did this same thing and developed a good road map to help us through the 2007-2010 timeframe (of course no one anticipated the tragic financial events of the past two years). We considered input from many different points-of-view and crafted a new three-year plan that we believe addresses our industry’s challenges and clarifies the association’s mission going forward.

We realized that one of ACMA’s top priorities is bringing members of the industry together. For Juanita and me, this is an important benefit of membership. As we redefine our business, we know the process will be much easier with the help of industry peers we’ve met through ACMA.

ACMA is also a place for companies that have already defined what they do. Immediately after the last strategic planning meeting, a group of composites manufacturers and suppliers came together to form a new committee. The new Utility Pole Committee is focused on expanding markets for composite poles, cross-arms and related products for power and communication structures applications. This is just one of many committees of the Composites Growth Initiative that brings like-minded companies together to work towards a common goal—and, in the process ACMA enrolled seven new members. For the folks on that committee, there is real value to membership because of increased business opportunities. If you have not joined a committee, I encourage you to do so now. For information on how you can get involved, email Adam Seery, ACMA’s director of membership, at aseery@acmanet.org.

I hope you have a great summer and that the remainder of this year is a prosperous one for your business.

Monty Felix
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The aerospace composite market will pocket $50 billion annually by 2018, up from $10 billion per year, according to a recent projection by InterFlight Global, an aerospace consulting firm based in Miami. Driving the upward trend are evolving products and innovative companies.

Dutch-based Fokker Aerostructures, TenCate Aerospace Composites and KVE Composites Group, and German-based Ticona are among those companies pushing the envelope. Gulfstream approached Fokker, with whom it had a long-term relationship, for ways to improve the structures on its newest aircraft, the Gulfstream G650. Fokker’s solution: a thermoplastic composite rudder and elevator. The new parts would meet Gulfstream’s desire for lighter weight and lower cost. According to Art Offringa, Fokker’s director of R&D, the company felt they could provide a product with the most improved cost-to-weight ratio by focusing on the tail.

As Fokker’s R&D evolved, it turned from a polyphenylene sulfide (PPS) composite bonded and riveted in place to an induction welding process. This process, used to create the elevator and rudder, requires PPS and carbon fabric. The film is heated and squeezed into the carbon fabric, after which the sheet is heated and stamped with match metal welding tools. Then the skin and ribs are assembled in place using precision tooling. The process results in no dimples and spot melting at the interface between layers.

This so-called blind process (contributed by KVE) cuts the manufacturing time in half and is now FAA certified. “This is a big step forward for thermoplastic composites,” says Mike Favoloro, technical marketing manager for Ticona. “The elevator and the rudder, also known as the tail portion of the plane used to control direction and stability, are critical parts on the exterior plane. It’s the first time those parts have manufactured from thermoplastic composites. Before this, the parts were made by thermosets because they’ve been proven on the military and commercial levels for the past 40 years, but thermoplastics are a newer technology. Until now it’s been limited to usage in minor parts such as the nose that you don’t want to lose, but aren’t critical to overall plane operation.”

Favoloro, Offringa and the rest of the team believe that thermoplastics are the next new thing in composites manufacturing. “Currently the percentage ratio of thermoplastics is very small, but the growth potential is very large,” says Offringa. Favoloro echoed his sentiments, stating, “Thermoplastics are just coming into play. The rudder and elevator are just baby steps to full implementation of an all-thermoplastic composite skin for aircraft applications.” Favoloro explains that companies like Gulfstream are making the switch to thermoplastics because it’s a cost savings in energy heat and product material. “Instead of heating the material for an hour at 350 F to 450 F, a thermoplastic part only requires a minute or two at around 580 F,” he says. Favoloro also notes that instead of paying $150 per pound for prepreg, a manufacturer can pay a fraction of the cost for a thermoplastic prepreg. “By squeezing out the thermoset technology, thermoplastics can take this maturing technology to the next step,” he states. “In weight alone, if we can eliminate a millimeter of thickness from an airline fuselage, it would equate to a 25 percent savings—and every pound saved shaves $1,000 in fuel per year.”

The team also believes that thermoplastics are alluring because of their green nature. “A thermoplastic is 100 percent recyclable. It can be pulverized and turned into pellets for further usage, whereas a thermoset cure emits VOCs and eventually ends up in an airplane graveyard,” says Favoloro. These characteristics impressed Gulfstream, which is now producing the parts and had its first flight in November 2009.
Like many states, North Carolina has witnessed its economy undergo great upheaval as its furniture, textile, automotive, marine and other manufacturing sectors have been shrinking. “It became apparent that North Carolina residents needed training for the jobs of the future,” says Ron Bolick, director of the Greensboro-based Advanced Composite Research and Training Center. “Several of us had been working in aerospace, transportation, aviation and composite research and manufacturing areas since the early 90s and saw these as the future path.”

Bolick and others encouraged companies in these sectors to locate in North Carolina, but the companies insisted on higher education curriculum and training centers focused on educating potential and current employees. A tobacco settlement corporation called Golden Leaf Inc. partnered with North Carolina A&T State University to propose the Advanced Composite Research and Training Center.

The center focuses on providing displaced workers the training they need for new jobs by instructors from the composites industry, NASA, military and academic centers. “So far, we’ve trained students, professors, researchers, Air Force personnel and manufacturing plant personnel from various companies and universities—even outside of North Carolina,” says Bolick. “Already, our students have found jobs at a variety of well-established companies.”

However, the increase in manufacturing still left a paucity of workers. In aerospace alone, Spirit, HondaJet, Timco and others chose to expand their businesses in North Carolina. “We did a survey across the state that showed...”

Alcan Composites Core Materials has added a line of fiber-reinforced urethane structural foam (formerly Penske Xtreme) to its family of core materials. These cost-effective products are now named AIREX® PX. The line is available in a range of densities in rigid panels as well as pre-cut kits. AIREX® PX is well suited to mass-transportation, marine, wind-energy and industrial applications and will complement our existing AIREX® foam and BALTEK® balsa core materials. For excellence in core solutions, contact us or visit us on the web at www.corematerials.alcancomposites.com

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there weren’t, and still aren’t, enough people to fill jobs coming in the near future,” says Bolick. “Airbus alone needs 1,500 people for its new facility, and there aren’t that many people in the area! So, we’re trying to get people to move back, offering incentives. But who will take their jobs? We need more than a temporary fix.”

The group turned to future generations. They spoke with college and high school students, asking them, “What do you want to do when you grow up?” and found (no surprise) that most had no idea. Of more concern, however, was the fact that students weren’t coming out of school with strong mathematics, engineering or technical knowledge. In an effort to rectify this problem, and raise the next crop of composite manufacturers and aerospace engineers, the group created the SOAR (Summer Orientation to Aerospace/Engineering/Sciences/Technology Retreat) program for the students.

Now, not only can students participate in the government-run community college online program or take classes in the summer, which allows them to graduate with a four-year college degree in two years, but they can participate in the SOAR program as well. This summer, beginning in June, will be the first time the center has catered specifically to the rising generation. “Through a study done by Golden Leaf and the universities, we found that upon entering college, students were not ready to progress to the next level of training due to deficiency in science, technology, engineering and math (STEM),” explains Bolick. “Through the camp we strive to pique students’ interest in various careers. We believe if they can gain some hands-on experience and speak with career professionals and have fun doing it, they will be more serious about STEM skills needed to get those jobs.”

**Carbon Supercar Made by Hand Lay-Up**

Carbon fiber has long been regarded as an automotive application that many want, but few can afford. A majority of full-carbon cars will cost you upwards of $200,000, but one small manufacturer is trumping the trend with a model at half that cost.

Lucra’s LC470 is an automotive street racer comprised of 100 percent carbon fiber. The small company manufactures around 50 of these cars per year. The project, originally developed in 2006, began when Lucra saw a space in the market for a reasonably-priced supercar.

“When we first developed the car, fiberglass was the suggested material to use because there was this perception that due to cost, carbon fiber wasn’t an option,” says Project Manager Eric Shimp. Lucra felt that because tools like CNC machines have become more accessible to smaller companies, the barriers to entry weren’t too prohibitive. “It is a little more expensive, but as far as the perception to the buyer, full carbon really turns them on,” says Shimp.

**Hand Lay-up versus Prepreg**

The composite work itself is done through Carbon by Design. Though the company does a heavy amount of aerospace work these days, its roots are in automotive and John Schauer, who founded the company, says it’s become proficient at various composite manufacturing techniques.

Chief among these is simply being able to wet lay-up carbon fiber applications with no pressure intensifiers. “Most people that build carbon (especially out of Asia) use a polyester resin with no gel coat because they can’t get the air bubbles out. So they spray about six coats of automotive clear, sand it down and polish it to address that issue. But that doesn’t really do anything. It makes it look good when the customer gets it, but six months later, it’s faded and brittle,” says Schauer.

Carbon by Design sprays a marine-grade UV-protected gel coat in the mold. It then lays the fabric and the resin behind that, which the company says results in an air bubble-free surface—a technique Schauer calls a lost art. “We really feel the basis of all lamination starts by doing it with your hands. If you’re a good hand laminator, you’ll be good at infusion as soon as you learn it. If you’re good at that, you’ll be good at RTM, and then you’ll

**continued...**
Bringing strength on the road.
be good at prepreg. It’s just a learning curve from beginning to end. But mold making and hand layup is extremely important in order to create a bubble-free surface,” he says.

According to Schauer, hand lay-up has largely fallen out of fashion to make way for prepreg. “It’s certainly a quicker process; you just cut it and lay it down, and put a vacuum bag on it,” he says. Schauer also notes the degree of difficulty as a reason why prepreg is preferred for manufacturing. “You can train someone to use not only expensive to update, but can require an overhaul of the manufacturing process,” says Fore.

So what kind of overhaul might this be? “Over the years, people have developed resin-injection systems which inject resin directly into the process as opposed to liquid resin being sprayed. Fiberglass people have developed rolled fiberglass goods that take the place of strands and spraying gel-coat or resins. All of those processes are cleaner, not only physically in the plant but also air-quality wise,” says Fore.

Dicor Corporation has manufactured products for the RV industry for 26 years. With the formation of a new composites offshoot, it will focus not only on the materials, but environmental concerns as well.

The new firm, Vixen Composites, will specialize in composite structural and exterior panels for the recreational vehicle and commercial trailer industries, among others. Dicor will invest more than $6 million in machinery and equipment to lease 98,000 square feet of space.

Vixen President Gregg Fore says air quality concerns are a necessity because of Indiana’s own environment. “The Northwest section of Indiana is probably the worst air-polluter in the state, based on Indiana Department of Environmental Management (IDEM) measurements. As a result, the requirements have become more stringent,” he says.

Vixen is addressing the requirements by making sure that the product is cured when it comes off coated and finished during panel manufacturing. “We’re not atomizing any finish at all, which is important. The more you atomize, the more you spread pollution through the ambient air. I don’t know if it’s a serious health issue or not, but it’s at the very least an annoyance to employees,” says Fore. The company also cleans and filters the air so it has access to some of the air movement in the facility, especially in winter.

Fore believes composite manufacturers in particular are prone to air quality concerns. “Over the last 10 to 15 years, because of pressures from EPA and state quality boards, there has been a rapid change in technology that allows people to produce products in different methods,” he says. Newer firms have a slight advantage in this regard, being able to tailor their methods to standing regulations. Older businesses could be more likely to pollute. “I don’t think anyone wants to pollute, but those that might be doing it more are using technology that was available when they installed their production. It’s the The formation of Vixen Composites isn’t the only new automotive spinoff in the news. Here are other offshoots and partnerships making headlines:

- BMW and SGL Automotive have formed a group to build composites for BMW’s Megacity vehicle. The group recently announced the location of its new manufacturing facility: Moses Lake, Wash.
- Zoltek has formed a new subsidiary, Zoltek Automotive. The offshoot will speed the development of high-volume applications for lightweight carbon fibers within the industry.
- Daimler AG and Toray Industries Inc. will work together to develop components made from carbon-fiber reinforced plastics for vehicles such as the Mercedes-Benz.

For more information on these and other developments, visit CM’s blog at compositesmanufacturingblog.com, click on “Automotive.”
prepreg in a month, but it probably takes six months to train someone in hand lay-up,” he notes.

The process is so difficult because a worker is essentially doing it blind. “When you lay carbon on a clear gel coated mold, you can’t see the air bubbles because they’re under the carbon. So you have to go by feel, and it’s hard to feel every pinpoint air bubble in a part the size of a hood,” he says.

Market Forces at Work
One of the biggest reasons the LC470’s cost is much lower has to do with market forces. “For automakers such as Ferrari and Lamborghini, you’re paying for a name,” says Schauer. “I’m not knocking those cars, they’re great. But, they have a specific business model and it’s far different from this one. They set and create demand, and produce only as many vehicles as they see fit,” he adds.

Schauer thinks manufacturing with carbon fiber will get less expensive over time and that automotive will mirror developments in aerospace. “Right now, the aerospace industry is converting to composites to the point where everything could be made of composites in 20 to 30 years. The automotive industry will follow a similar path. Everyone wants to use carbon fiber, but they just don’t like the cost. When you have the R&D and money behind you, there will be ways to figure out how to do it,” he says.

According to Shimp, it’s the smaller companies that will help galvanize innovation and development. “Smaller companies are more versatile, and can take advantage of material changes and trends more quickly. Larger companies use tooling and assembly lines for longer periods of time, so you can’t change those as quickly,” he says. “Larger firms are also more sensitive to small changes in their bottom line in such areas as pricing. We just want to build the best product, so we’re not as sensitive to that.”
Nationwide housing starts rose for a third consecutive month in March to a seasonally adjusted annual rate of 626,000 units, according to a report from the National Association of Home Builders (NAHB) that relies on U.S. Commerce Department data. The report also indicates that the rate of permit issuance for new housing construction rose by 7.5 percent in the month, to a seasonally adjusted annual rate of 685,000 units. But how is this affecting the cast polymer market, which relies heavily on the housing industry for its business?

Composites Manufacturing talked to three manufacturers who have experienced modest growth in their business. Southern Cultured Marble, Custom Marble Products and Formatop have seen increases ranging from 10 to 25 percent over the past two months.

So what’s accounting for this growth? According to Mark Buehner, president of South Dakota-based Formatop, part of it may be psychology. “For too long, the news was too negative, and the way people feel has a strong influence on their purchasing habits,” he says. Buehner hopes the positive news galvanizes spending.

However, these companies still can’t fully shake the reality of their situation. “I tend to disregard percentages and focus on real numbers,” says Scott Bishop, vice president of South Carolina-based Southern Cultured Marble, Inc. “I think in this case, the percentage aspect is slightly misleading. It’s a percentage of a much smaller number, so the real growth isn’t as large as it would have been a few years ago.”

Todd Loebel, owner of Wisconsin-based Custom Marble Products, agrees, saying local homebuilders in the area who were once building 70 to 80 homes per year now struggle to build about 15. “I view percentages with a grain of salt. Ten percent growth sounds good, until you realize that because it comes from the lower number, you’re looking at essentially one extra home per year. That’s good, but not anywhere close to what the typical levels would be,” he says.

Even with the modest increase in new housing over the previous year, Bishop says the cost factor will continue to inhibit cultured marble. “The houses themselves are worth less, and feature less-expensive materials to match,” he says. “Unfortunately for us, the price of the raw materials hasn’t dropped. In fact, they’ve only increased, so we’re still at their mercy.”

Though the housing levels continue to be a fraction of what they were even a few years ago, these men say the industry will continue to focus on innovations and developments to make the recent growth even larger. “The industry has to look at the aesthetics of the product. For example, color trends change much faster than what they used to, so companies must always be thinking about what they can do to make things newer,” says Buehner.

InnoVida is donating 1,000 composite houses to the people of Haiti.

When Haiti’s recent earthquakes left residents without shelter and exposed the need for better infrastructure, one composites manufacturer found a way to do good...and good business.

InnoVida manufactures composite panels and assembles structures for housing applications in the residential and defense markets. The Miami-based company has pledged to donate 1,000 homes to Haitians. The implementation of such a large sample of composite homes is a charitable act, but it will also demonstrate the role composites can play in reha-
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bilitating housing infrastructure in areas ravaged by natural disasters and elsewhere.

The company’s fiber composite panel (FCP) system is a load-bearing insulating panel system with structural skins made of E-Glass fiber fabrics impregnated with a fire-resistant polymeric epoxy resin and a core made of a construction foam material. They use a combination of fiber composite panels laminated with a proprietary bonding material. This bonding agent is made from the same material used to fabricate the skin of the panels, and matches the chemical characteristics of the FCP when bonded. The result is a 100 percent composite monolithic building that can be constructed in one to three days from the prefabricated elements.

Mario Sanchez, vice president of construction, says that because the materials are centralized, the cost comes down. “If you add items like overhead costs, composites can be up to 25 percent less expensive compared to wood or concrete. Because we design everything ourselves, it leads to a cost savings because we cut out a lot of other things,” he says.

The use of composites in full-scale housing is in its infancy, but Sanchez thinks the material will prove itself during this tragedy. “Haiti’s an example of how change can be precipitated not due to economic forces, but rather natural forces,” says Sanchez. “We have people asking to remove concrete roofs and install our roofs because they’re afraid the concrete will kill them. It is becoming a social issue.”

Independent Testing Verifies Composite Deck Performance

Green Bay Decking didn’t start out as a deck manufacturer. The 10-year-old Wisconsin-based firm served a variety of markets by incorporating wastepaper sludge into composite products. But after several ownership changes, the company decided in 2006 to focus on decking because it was the best opportunity to market a product rather than a technology. “Many composite decks utilize sawdust and polyethylene, and we thought using reclaimed paper waste could boost performance in mechanical and strength resistance as well as moisture resistance,” says Shane O’Neill, director of research and development.

The company has a two-stage manufacturing process where they create a compound using a twin-screw extruder and profile-extrude geometries on two-stage single-screw extruders “Because we have all the compounding done on one piece of equipment, we have more control over the homogeneity of the final product. There’s no secondary mixing or dispersion, so the variability of the end product is much less,” says O’Neill.

Although the company conducted internal testing, they believed having others test the product would convince more people of the advantages of composites. “We know how the product does, and we wanted to put merit behind that and bring it out to the public,” says O’Neill.

The first of these tests, performed at the University of Maine, focused on water absorption. The test was based on the ASTM 1037 standard for wood-based materials. In it, the materials are weighed, submerged for 24 hours, and weighed again to see the weight differences in the two states. A modification looking at 30-day testing was also added, and O’Neill says the results were pleasing. “We were the lowest-absorbing product, and if it’s hard for water to get into product, it’s hard for moisture to get in there and decay the product,” he says.

At Intertek Plastic Laboratories, accelerated weathering was done based on the ASTM G155 standard. “Think of it like a tanning booth married to a car wash,” says O’Neill. Spray nozzles and UV tanning lamps were used to control the amount of UV energy and water sprayed to applied materials. In terms of a time scale, 2,000 hours of testing related to a year-and-a-half of exposure. Thus, it is intended to see what would happen to the material in the field, particularly if the color fades or changes.

O’Neill hopes the objective testing will help convince people to take the plunge into buying composites. “A lot of people sell things without really showing you what it does. By doing this testing, we’ve shown people how the product really behaves, which ultimately says a lot more.”
There and Back Again: 
A Yacht's Tale

After a bit of pomp and circumstance, the Tûranor Planet Solar (an Elvish name meaning “power of the sun” in the Lord of the Ring trilogy by J.R.R. Tolkien) was lifted out into the world on its first adventure. But what makes this boat so special? Sure, you may notice the usual carbon-sandwich design within the 30-meter long catamaran (the largest ever built), but for the truly unique you’ll need to look a bit higher. This high-performance catamaran’s deck is covered with photovoltaic panels, 825 in all, giving it nearly 94,000 kilowatts (KW) of power.

In 2006, Raphaël Domjan, the project leader and skipper, came up with the idea to circumnavigate the globe in a boat powered solely on solar energy. Domjan
recruited German-based Knierim Yachtbau to aid in his concept due to the company’s experience with individual high-tech yacht construction. “In the design, we started with a blank slate,” says Yachtbau’s CEO Steffan Muller. “We soon realized that in order to give the boat enough surface space to accommodate the solar panels, the catamaran most likely needed to be a multi-hull design. A multihull would provide a large surface area and create less drag through the water.” However, the team needed help determining if the best multihull would be a catamaran or a trimaran. After speaking with various designers, they chose Craig Loomes Design, based in Auckland, New Zealand, to design a wave-piercing catamaran.

From the beginning, Muller says it was clear that the boat needed to be as light as possible in order to use the energy generated from the panels effectively. “On the other hand, however, we knew it needed to be strong enough to survive any storm or large waves that occur in the ocean. The only solution was to implement composite technology using a carbon fiber sandwich,” he says. “We ran various computer simulations and predictive programming to identify how each section of the boat should be constructed.” Eventually the team created tank testing with a 1:20 scale model for safety requirements, which was monitored by Germanischer Lloyd (GL). Maneuvers in a catamaran of this kind had never been done, so the team needed to understand the behavior of the materials in different conditions to know how much power is needed to run at various speeds. This process took approximately nine months then moved on to another 16 months in manufacturing.

The hull itself is made from a light carbon-sandwich design and epoxy resin with structural foam of various densities to increase strength and stiffness of the structure at minimum weight. “Composites play an important role in this vessel. We believe this catamaran could not have been possible if it were to be built out of any other material, such as aluminum or steel,” says Muller. “These particular composite materials were chosen because we felt they provide the best relation between weight and durability and stiffness. But in some crucial areas like the beams connecting the demi hulls and the main hull, which provides the connection between the main hull and the swimmers, we decided to use plain carbon fiber layers—not sandwich—because the impact given by waves can be so strong.”

Despite their triumphant completion of a strong catamaran, Muller admits it could easily be dead in the water. “One fallback to a solar-powered catamaran is power source. The battery power is limited to three days or so. If the sun doesn’t shine for a long period of time, you’re out of luck. Therefore one of the biggest challenges will be to find a route with enough sunshine along with favorable winds and currents that will bring it back to its Mediterranean starting point,” he says.
Who are the Joneses and how do you keep up with them anyway? When it comes to wind energy, the answer is in the American Wind Energy Association’s (AWEA) Annual Market Report, which provides a benchmark for the growing industry.

Despite a constant boom-and-bust cycle, wind energy continues to flourish. For the past five years, wind power has been one of the largest new power sources, second only to natural gas. According to AWEA, in 2009 the U.S. had its best year to-date for wind turbine installations with 10,000 megawatts (MW) installed. That makes the overall capacity approximately 35,000 MW, which accounts for 39 percent of all new generating capacity in the U.S. and 1.8 percent of total U.S. power—a .5 percent increase from 2008. By comparison, Germany and China have installed approximately 25,000 MW.

“There were turbine installation drops in 2000, 2002 and 2004 due to the expiration of the Production Tax Credit, which is a federal incentive that encourages the development of wind projects,” explains Elizabeth Salerno, AWEA’s director of industry data and analysis. “The program was only ever extended a year at a time and then it was allowed to expire from anywhere between a few months to an entire year. It created a cliff of activity and every time the incentive expired, the amount of MWs installed dropped 70 to 90 percent. That wreaks havoc, especially on the manufacturing side of the sector, because if you don’t know what the industry looks like a few months from now, it’s difficult to establish a manufacturing sector.” However,

### Upgrading from a Light Breeze

The U.S. wind industry installed over 10,000 megawatts (MW) of new generating capacity in 2009.

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<tr>
<th>Most Capacity Additions</th>
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<th>Fastest Growing</th>
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<tr>
<td>Texas</td>
<td>2292 MW</td>
<td>Arizona</td>
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<td>Indiana</td>
<td>905 MW</td>
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<td>Iowa</td>
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<td>Illinois</td>
<td>632 MW</td>
<td>Rhode Island</td>
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- **Top wind power owner:** NextEra Energy Resources
- **Utility with most wind power on system:** Xcel Energy
- **Top U.S. wind turbine supplier:** GE Energy
- **Wind industry supported jobs:** 85,000
- **Number of online facilities:** >200

The U.S. wind industry installed over 10,000 megawatts (MW) of new generating capacity in 2009.
Renewable Energy

The Sunny Side of Panels

Compared to wind energy, solar energy sometimes resembles the forgotten star of yesteryear. Yet solar panels still have vast untapped potential within the composites industry.

One company taking advantage of that potential is California-based BioSolar.

BioSolar has developed a drop-in replacement for traditional petroleum-based photovoltaic backsheet (often criticized for disposability due to toxicity) with a bio-polymer composite backsheet, which gives it a boost in life-cycle analysis. The backsheet serves the dual purpose of an electric insulator and a protector for the cell itself from outside elements. “Whereas most are made from petroleum-based derivatives, we are taking a bio-polymer and adding different materials or combining it with wood fibers to create a product that improves properties and is recyclable,” says Stan Levy, BioSolar’s chief technology officer.

Current CEO David Lee started a company based on the name and what it implied; namely, renewable energy through solar power. “Lee is a smart guy, but he didn’t have extensive knowledge in photovoltaic materials, whereas I’ve been in industry for 25 years,” says Levy. “He soon found me and the rest is history.”

The two started the company and agreed to develop a solar panel backsheet from sustainable materials. “While the requirements for photovoltaic materials are stringent, backsheets are what in the industry we’d call the lowest-hanging fruit, thus the easiest way to get into the business,” says Levy. “If we tried to break into the market with a product from the front side of a panel, we’d have to replace glass, requiring us to look for a green product that is totally transparent, which is very difficult. It would be the same with adhesives as well.”

Instead, the two men focused six months of R&D into finding the perfect biomaterial. “There is a lot of press on the PLA (poly-lactic acid) made from corn because it is widely adopted in inexpensive applications. However, the problem we found is that it’s biodegradable,” says Levy. “We created what we thought was a good backsheet from PLA with additives to improve the properties, but failed miserably in testing because it became a compost pile.” Next they began searching for renewable resources that weren’t biodegradable and settled on Nylon 11 made from castor beans. “Nylon 11 is a durable material; in fact it’s better than synthetic nylon and since we can compound and extrude in one step, we can cut the cost and manufacturing time by 25 percent. However, it still didn’t meet requirements, so we thought, ‘how can we make it better?’ The team used Nylon 11 as a matrix and filled it in with mineral powders and cellulosic fibers to create a new, sustainable backsheet,” states Levy.

The next 18 months were spent optimizing the product, which is now being tested by several companies for temperature, humidity and other necessary characteristics. “Right now our product can serve approximately 85 percent of the solar panel market,” says Levy. “The most common type of panel is crystal and silicon-based; however there is 10 to 15 percent of the market that requires a backsheet with zero water-vapor transmission.”

Overall, the team hopes to have the product officially commercialized by this summer while it continues to work on an aluminum-sandwich backsheet that would be impervious to water. Once those projects are complete, the duo plans on moving to the next-lowest solar panel hanging fruit: junction boxes.
Rodrigo Silveira has been designing custom jet skis for the past eight years. Now, he’s branching out and using composites to make his own line of personal watercraft.

Silveira’s company, Silveira Group, has developed the Samba XRS, a watercraft made largely from carbon fiber. Silveira notes the composite material is exactly what he needed to achieve his main goal: maneuverability. “Personal watercrafts are getting bigger, and are more about going from point A to B. If you want maneuverability, it’s tougher to achieve with big watercraft,” he says. “You see a lot of riders trying to do stunts or tricks, but because of their massive weight, the rider doesn’t have the control they need. Having a machine that is so small and so lightweight gives the rider more instinctive body control.”

Carbon fiber has helped achieve that control and as a result, the XRS comes in at about 34 pounds. “We wanted the rider to really have the most control of the machine, and we knew we had to make it as light as we could to do that. That’s why we turned to making it out of carbon fiber,” Silveira says.

This includes implementing the high-strength composite into unusual parts. The ride plate, which is the equivalent of an automotive chassis, is usually made from aluminum. Silveira cites the increased costs of mass production with carbon fiber have been the main reason for this, and he hopes this is one way to buck the trend.

The manufacturing process begins with creating a 3D model, then a wet lay-up for the mold. For the part itself, the company used prepreg and five layers of carbon fiber material, which Silveira says makes for a straightforward, easy lay-up. The mold is then heated in an autoclave for about an hour at 180 degrees and another hour at 250 degrees to cure it. “The first hour is used to soften the resin so it will flow into the right places in the material. The second hour is curing that resin,” Silveira says.

After the initial two hours has passed, the finished part can be pulled from the mold. The company uses two autoclaves for this process. A 10-ft. diameter model is used for the larger parts and a 5-ft. diameter model is used for smaller parts such as hood components and plates.

Silveira credits his background as a 3D designer for a smooth manufacturing process, which was accomplished by designing a model in 3D and extracting the patterns from that model in the CNC routing process. “Traditionally, you have people drawing out and manually cutting patterns for the lay-up. We streamlined this process which resulted in prototyping a new machine from start to finish in about two weeks,” he says.

Doing all the work in-house has also aided the streamlining process. “From the design to the routing to the fabric cutting to the mold-making in the actual part being made, doing everything in-house really does make the process quicker,” says Silveira. Though this current edition of the XRS is gas-powered, the company also hopes to make a splash with an electric-powered version this fall.
Composites Create Shipping Security

Less than five percent of shipping containers are scanned when they arrive at ports, making them susceptible to smuggling. In response to a Department of Homeland Security request, the University of Maine and Georgia Tech began working on solutions to monitor containers from the moment they’re sealed until they reach their final destinations. The University of Maine is attempting to create a composite container with embedded sensor technology. Meanwhile Georgia Tech worked on a monitoring system that could detect if a shipping container was opened en-route.

“Right now, there are no mechanisms to monitor cargo accurately. But with the technology we’re developing, if even a small hole is drilled, it will show us,” says Gisele Bennett, professor of electrical and computer engineering at Georgia Tech Research Institute. “The system is a series of sensors embedded into the walls, door and floor of the container that will monitor when a breach occurs. Then, GPS will tell us exactly where it occurred.”

However, the delicate nature of the electronic equipment posed a problem in shifting cargo. Bennett’s group needed a stable material in which to embed the security system. So last year the two schools teamed to create an alternative to metal shipping containers.

Composites + Steel Solution

“It’s hard to embed sensors into steel. It’s heavy, the contents shift around and the sensor system would break long before it had time to work in a shipping environment, says Habib Dagher, director of the AEWC (Advanced Structures & Composites Center) at the University of Maine. “Imagine a huge fork lift banging around these containers. They love to use the side of containers as a guide as they bring more containers in. Plus, a stack of containers can weigh 300 tons; imagine being the bottom container. We had to design a container that was strong enough to handle its load as well as that of others without generating false alarms within the sensor system.” Dagher also faced the problem that this type of work had never been done before. His team tried to find anyone else who had made a composite shipping container, and if so what did they do? What were the pitfalls and why didn’t they succeed? “We knew if we didn’t address these problems, we wouldn’t have a project,” says Dagher. “If we made it cost-effective but not durable enough, the container might not hold up to the rigors of the shipping environment. We had to find a way to reduce the cost of the composite container and not fall apart.”

Dagher discovered that combining steel and composites could result in a cost effective and durable container. “We didn’t use exotic fibers or resins. We developed a product that would meet the environment in which it would operate,” he says. “The main surface area, like an envelope, is composites. If someone looked at it from the outside, they would have to penetrate composites to get in.”

Georgia Tech began working on embedding sensors into the composite design, which required slight modifications to connect the grid, instead of the former wallpaper approach. One of the most important modifications was allowing the sensory system, made of a conductive mesh, to be able withstand high temperatures during the manufacturing of the composite panels.

The universities hope to have the container ISO certified by the end of 2010 and are optimistic about its future use in all types of shipping. Dagher explains that an initial cost increase could be a deterrent, but “Steel lasts only 10 to 15 years, whereas composites are lighter, more corrosion resistant and therefore can last longer,” he says. “Because of the reduction in weight, more material can be shipped in the composite containers and they can be used for a longer period of time. With revenue from increased shipment sizes and maintenance container shipment size, the container could potentially pay for itself in two to three years.”
According to the researchers, the material does not use chemical processes, making it quicker to recharge than conventional batteries and resulting in less degradation over time.

The group received funding from the British Ministry of Defense to explore the material. ICL wasn’t able to get this kind of funding when it began the project six months ago, but Emile Greenhalgh, ICL reader in composite materials and the project’s coordinator, says progress has advanced enough to where outside parties are now more interested. “We came up with a feasibility concept which resulted in the amount of energy to light an LED for 30 seconds. Right now, we’ve worked it up to where we can charge it for 10 seconds and it lights for 20 minutes.”

With the extra funding and partners on board, ICL hopes to scale the technology and put it into hybrid cars for a goal of 15 percent weight savings by replacing the metal structures with composites. “Platforms like that are power-hungry, so anything you can do to reduce the mass on those structures is a big deal,” says Greenhalgh.

Greenhalgh anticipates achieving that weight savings in automotive applications after a three-year span, but it will probably be another 10 years before the material is mature enough for wider use. In the meantime, the team will also explore other applications where weight or volume is important, such as tanks, boats and laptops.

Imperial College London’s composite material could power your car one day.

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What Really Happens on Capitol Hill
First-hand accounts from industry advocates

During ACMA’s recent Lobby Day and Composites Caucus events in Washington, D.C., industry members met with and educated Senators and Representatives on issues important to them. Composites Manufacturing asked Teri Schenk of Environmental Solutions and Cheryl Richards of PPG Inc. to record their experiences.

Teri Schenk is vice president for Environmental Solutions LLC, a consulting firm that provides health and safety services to corporations, organizations and local and state agencies.

Schenk joined other industry members asking Senators and Representatives to sign a letter sponsored by Rep. Rick Boucher and Rep. John Shadegg. The letter asks Health and Human Services Secretary Kathleen Sebelius to review the National Toxicology Program’s process listing styrene in the RoC (Report on Carcinogens).

Tuesday, April 13

What can one say about knowing they are going to be in Washington D.C. and working on Capitol Hill? No matter what your politics are or how much experience you have working with members of Congress, you can’t help but be excited each and every time. I worked hard to set up my appointments, and I want to make sure I have all the information correct. The things I remember from my days working at a state level are to tell the truth, keep it short, and make sure you have correct information. I plan on following the Time Bite method: address the problem (negative) talk about all our industry provides (positive) and give a possible solution. Keep it simple, stupid.

I should have remembered that the nuclear summit was going on. Traffic was horrific and it took over three hours to get to the hotel. I’m glad I flew in the day before the Congressional Reception.

Wednesday, April 14

The Congressional Reception provided several opportunities for networking. I was disappointed that none of the Indiana Representatives showed up. I was hoping for the opportunity to discuss my issues and let them know Indiana was here. I did make new friends and introduced myself to several ACMA members who were in attendance. What a joy it was to meet Jay Merrell. I later found out that he and I would be partners-in-crime as we lobbied to Indiana representatives. Jay seemed well informed! He is trying to recruit me for the Governmental Affairs Committee. MAYBE I will let him persuade me, LOL. Right now all I can think of is getting off my feet. I was so excited to get to the Capitol today that I walked over a mile-and-a-half in high heels because I didn’t want to wait for a cab. NOTE TO SELF: NOT A SMART IDEA...

Thursday, April 15

Here is the big day! Although this is my first Lobby Day with ACMA, it is
not my first time lobbying. Funny, the emotions are the same as they have been in the past. I can’t explain it, but there is something exciting about looking at the Capitol building. Today is beautiful outside. The flowers are in bloom and perfect in their own beauty, and there is no way to describe the beautiful architecture all around me. Most everyone is paired up. Jay and I are already calling ourselves the “A” team. I suppose this is fitting since our assignment papers show that we’re both team leaders. That made us both laugh...

We start our morning by walking to the Russell Building. We have a few moments so we sit on park benches to prepare. Okay, not going to lie: We’re both more than comfortable with the information to present, so we’re chatting about our kids. When it’s time for our first appointment, I tell Jay not to worry if I get held up in security. It happens to me all the time. I have to get my luggage checked, my purse checked and half the time I get patted down. He laughed and said that doesn’t happen to him. Imagine my hysteria when I pass through security the first time with no problems, and it takes Jay three times before he figured out his watch must be removed.

Our first meeting was with Julia Huber, Senator Evan Bayh’s aide. I had worked hard with Julia to find a time that would work. I hadn’t told her I was bringing others with me, so imagine her surprise when three of us come to the office. ACMA also had Zach Williams, a professional lobbyist, tag along. Julia was certain that Senator Bayh would be interested in doing something. Being in Senator Bayh’s waiting area brought back memories from when he was Indiana governor and how his office helped the composites industry during the Title V permit process and when some of the Presumptive NE-SHAP rules were being made.

We didn’t have much time before the next appointment with Senator Risch from Idaho. I was surprised at how well informed his aide was and impressed with the research he had done. It was great to chat with the Senator himself. He said that he would love to help us out and joked that hopefully this issue wouldn’t turn out to be like the health care issue. At the same time you could see he took seriously everything we told him.

Next, we went to the Hart building. The newer building beamed with all the marble, and it seemed that most senators in this building had given it that special home appearance and feel. We met with Alex, an aide to Senator Lugar. Jay had talked to Alex about ACMA issues just a few years prior, and Alex remembered him, so Jay took the lead at this meeting. Jay and I work so well as a team. We also have an advantage because both of us work
directly with the composites manufacturers. Jay owns his company, and I conduct environmental health and safety responsibilities for industry.

As we chatted with Alex, I became aware that I too was learning more and more about the composites industry. Although we didn’t have a lobbyist with us on this visit, I learned from some of his information too. The meeting seemed to go very well. Alex told us he was sure that Senator Lugar would want to do something. He just couldn’t say whether it would be making a call to HHS or signing a letter.

Next we met Zach in Senator Murray’s office. This meant walking back to the Russell building. Of all the meetings, this one appeared to be the most challenging. Senator Murray’s aide was nothing short of intense. Immediately, Zach stepped in. It was great to see how we all worked well together, each of us bringing information to the table.

Our schedule was far enough apart that we should have been able to eat lunch, but it didn’t happen. We left Senator Murray’s office and headed to the Rayburn building to meet Jay’s district representative, Congressman Burton. What a joyful surprise to walk into the office and find soda, water, pretzels, cookies and snacks sitting on a table. We met with Mary O’Keefe, and she invited us to share in these treats. Mary was very interested in what we had to say. She took a lot of notes. Once she listened to us talk about the issues, she decided to interrupt Representative Burton so we could meet him.

Although Burton wasn’t my Indiana representative, Mary stated on numerous issues that she was well informed of the impacts in Elkhart, and she was glad that I had come with Jay because the problems aren’t just in Burton’s district. It wasn’t long before Burton invited us to his office and listened to Jay and I answer his questions. At the end of the meeting he stated he would sign the Boucher-Shadegg letter and wanted to have his picture taken with each of us.

Finally, the one meeting we had all been waiting for, Representative Donnelly! Believe me I had worked hard to arrange this appointment, even threatening to meet him in the South Bend office if it wasn’t possible in D.C. When his scheduler met us, my first reaction was that she was going to tell us he couldn’t meet. To my surprise, she said he was voting, but would have someone take us to the Capitol so he could chat in between voting.

Nothing is more exciting than being invited to set foot in the Capitol. What an honor this was going to be. I could tell even Jay was excited by his unique reaction. Something like the first time you give candy to a baby. I asked him right away if he had called anyone to tell them about it, LOL. Jay had been participating in lobby day for five years. This was the first time he had been asked to go to the Capitol Floor for a representative visit.

Since Donnelly had been one of those representatives whose support we really needed, ACMA was sending Libby Greer, another paid lobbyist, with us. While we were trying to track her down, one of Donnelly’s assistants said, “I know you…We have letters from you.” He recognized my name from the business card. Perfect! Now I knew that this office was taking all my prior efforts seriously.

Libby showed up and the next thing I knew, we are walking outside the Capitol on the east bank lawn and down some stairs to Representative Donnelly. He told me to call him Joe. He took us into the Capitol through a back door entrance and into the Rayburn Room. He was smiling and excited to tell me that he was signing the letter, that he knew all about composites, and that he was there for his constituents. He gave us all business cards and told us if we needed anything to contact him.

I wanted to say, “Will the real Joe Donnelly please step down,” because clearly this wasn’t the man I had been talking to before. Here was proof positive that the letters he received worked. He needs to hear from his people. If he doesn’t, then he’ll think that they are matters of no concern. I suppose I was more impressed when I invited him to the Composites Caucus breakfast the next morning, and he was actually excited and stated he would attend.

Sometimes we don’t participate because we think we’re not knowledgeable enough or experienced enough, or we simply feel that one person isn’t going to matter. Your opinions matter on the Hill.

Every letter, every call and every visit is taken seriously.

— Teri Schenk, Health and Safety Consultant
Environmental Solutions, Elkhart, Indiana
My conclusion…It was a great day for me on the Hill.

At the dinner that night, it was so exciting to hear that ACMA members who had participated felt that this year’s lobbying efforts were the best ever. Several members said it was top on their positive experience list. Even Jay told me that this was one of the most memorable.

Although this is the end of Lobby Day 2010, the work is not over. It will require follow up. I know that the ACMA will send in the lobbyist next week. But I will be keeping an eye on the results from my office.

Friday, April 16
Dr. Robert Lindyberg from the University of Maine is a fabulous wealth of knowledge on the composites industry. I’m glad he was available to share his expertise with the members of the Congressional Composites Caucus at the staff briefing. Business aside, you can’t come to Washington and not see the sites. I found myself walking around the Capitol at around 12:30 p.m., ending up at the Smithsonian Museums and then finding myself at the Washington Monument. Once again I had become so enamored in the sites that I ended up walking more than three miles without even noticing. Once at the Monument, I had to continue on to the Lincoln Memorial.

If you have never had the opportunity to participate in a lobby day in D.C., it should be on your bucket list. Sometimes we don’t participate because we feel we can’t make a difference.

Sometimes we don’t participate because we think we’re not knowledgeable enough or experienced enough, or we simply feel that one person isn’t going to matter. Your opinions matter on the Hill. Every letter, every call and every visit is taken seriously.

Friday, April 23
A week later…….WOW how exciting is it for me to know that Representative Donnelly and his chief of staff contacted every person who wrote a letter to let them know he signed it. He even provided them with a copy of all the signatures! What a great end to Lobby Day!

(“What Really Happens on Capitol Hill” continues)
I flew into Washington D.C. from the JEC Composites show in Paris. The day before, there was volcanic activity in Iceland, which shut down airports in western Europe. We had no idea the magnitude of disruption the volcano would cause. By the time I arrived in D.C., I knew that I was fortunate to get out of Paris without any travel hassles and knew that the request to support ACMA with this caucus was the right thing to do.

I had never participated in a Composites Caucus before, but when being asked to support an event focused on wind energy, I couldn’t turn it down. I have been lobbying for wind energy policy for a few years now, whether internally to my colleagues or externally in D.C. and to our representatives.

Early on the day of the Caucus event, I walked to the Rayburn Building with Pete Emrich of MFG for breakfast. It was a beautiful day. I’ve been to D.C. before to lobby for wind energy policy, so I’m not a newcomer, but I’m not an expert on getting around. I do know that the Senate and House buildings are on either side of the Capitol. But which side? Pete and I eventually got it right.

We had breakfast with John Busel and Bob Lindyberg, my co-presenters, in the Rayburn Building. What strikes me about this is the accessibility to our government. Although we walked through a metal detector, you realize that no one asks why you are there or tries to prevent you from entering. Our government is accessible, and if you want change, then you need to speak up. Doing this as a group is even more effective. And you may have to do this time after time, but isn’t that true for anything that you are trying to change?

We headed to the cafeteria for breakfast. I noted that the plates and cups are made from recycled materials. Although the country may sometimes be slow to adopt trends, our government does try to adopt important trends first, like recycling. This was clearly illustrated in the café. I was happy to see lots of healthy food options, a welcome site to a traveler.

After breakfast, we went the briefing room. I felt very comfortable in what I was about to do. When speaking to our congressional members and staffers, it’s important to make a clear case for what you want – or ask. You can’t leave behind too many messages. The clearer and simpler those messages are, the better. They are asked to support many things.

We started our preparations for this visit a few weeks earlier and made sure we knew what we were about to ask for. As for my expectations—they are high. I want to see energy policy. I want a National Renewable Electric Standard (RES). This is a key driver of wind energy growth in the U.S., and currently we have short-term policy in place. Other regions of the world have national policies and incentives, and the U.S.—one of the largest markets—does not. We’re also asking for policy to support R&D into wind energy. The U.S. initiated this important industry 20-plus years ago with the onset of the energy crisis. Our government was there with the proper vision, but we let it go, and the industry was nurtured and grew up in Europe. The world leaders in this market are headquartered there, with the exception a few. The revenues, jobs have been realized by those nations for some time. It’s time for the U.S. to get behind this too.

Our job was to show the Composites Caucus what a key role composites play in this industry. Without composites, we wouldn’t be able to capture wind in a cost-effective but lightweight and strong manner. Composites are used throughout the turbine as well. Pete highlighted the variety of composite processes from other industries that enable the critical parts of a turbine to be formed. Besides, he cites that

“Our government is accessible, and if you want change, then you need to speak up. You may have to do this time after time, but isn’t that true for anything that you are trying to change?”

— Cheryl Richards, Global market Development Manager, Wind Energy for PPG Industries
one of his facilities is a ¼ mile long. Imagine! And this one is not yet building the large off-shore turbines!

Our industry has the history and breadth necessary for innovation to solve the future problems and to provide jobs in years to come. My point is that the supply chain, large companies like mine and others also benefit. We have the jobs making the fiberglass and resin and core and parts—we are the manufacturing sector. Isn’t this where we want to lead? And we need stable policy to foster investment, to foster growth to continue to do so.

Bob talked about the high labor costs today and the further need for innovation. Composites can continue to provide novel solutions. Let’s industrialize the process for wind energy component manufacturing. Let’s make new combinations of materials to continue to solve the challenges for offshore, so we can put the U.S. back into a leadership position. Without a goal or vision, we can’t make this happen. We need the support of our government. And we have the tools, collaboration or a composite on a different level: industry+university+national labs. This is the right approach.

There were about 15 staffers in the room with a total of 34 people in attendance. I looked around to see who was listening and who had other things on their mind. At the end of the discussion we had a chance to speak to some of the staffers. I wish I had more time with them. One staffer wanted to know about supporting facilities in his community and the importance of innovation: Would it take too many jobs away? And what about the cost of setting up a new plant? Certainly investment is needed, but without policy, it’s hard for newcomers or smaller companies to commit the financial resources.

Another staffer had a bill he was proposing and asked for support and feedback. This bill was a give-and-take between gas and wind. I have to agree, better balance between all energy sources is needed. We have to find a way to share. I prefer energy coming from many places, so how can we better foster good for all industries?
As the recreational vehicle industry struggles with the economic downturn, it’s finding opportunity by going green. And composite materials are staking a larger claim in the sector because of it. “One of the biggest reasons [for going green] is that technology is advancing,” says Kevin Bloom, media relations director for the Recreational Vehicle Industry Association (RVIA). “Products like solar panels or wind turbines or water filtration are more accessible to people and the costs are starting to come down to the point where manufacturers can start incorporating those things into vehicles and trailers.”

Composites are included among these now more-accessible materials, comprising approximately 30 percent of the RV market, but the adoption of them on a larger scale is a relatively recent development. “Three years ago there were no composite RVs, so it’s certainly been growing in the past two-and-a-half years,” says Bloom.

Bloom says the lightweight nature of composites played well into industry development. “Another factor of course is that fuel prices went up considerably. As a reaction to that, RV manufacturers began looking for ways to increase fuel economy. On the trailer side, you’ll see smaller, lighter, more aerodynamic models, all of which combine to make towing a trailer more fuel efficient.” Bloom added that vehicles that use more composite materials are likely to be more fuel-efficient, citing a change in maximum efficiency from 15 mpg to 20 mpg.

From Wood to Composites
EverGreen RV, Middlebury, Ind., recently introduced the Everlite trailer, which exemplifies large-scale implementation of composites in RVs. The company claims the model is the first 100 percent composites trailer. EverGreen was formed by seasoned members of the RV industry, but this marks their first experience using composites in RV construction.

Kevin Slater, vice president of sales and one of the company’s founders, used wood in his previous manufacturing efforts. “We would have a full aluminum frame and then vacuum bond the walls and floors and the roof so they end up in one piece. Traditionally, up until now anyway, we would have a layer of luan or plywood behind the high-gloss exterior or exterior skin and also behind the vinyl interior wallpaper.”

Now EverGreen vacuum bonds the trailer with a material developed in-house that they call Compositek. The
company declined to elaborate on the specific makeup of the material (other than to assure that it was made from composites) but according to its website, the materials are not common in the RV industry, but are used in many other industries. Slater says their use of composites results in a vehicle that is approximately 1,200 pounds lighter than existing wood models of the same length.

Slater conceded that finding the materials was the company’s biggest challenge. “It took a lot of time to find what we needed. Then, when we found these materials, we began testing them and discovered that during vacuum-bonding, we had to use different adhesives than we did with wood. That changed the dynamics of the manufacturing process, and the whole thing just kept moving and moving.”

The drastic change in manufacturing was compelled largely by the strategy of going green, which Slater said became a noticeable development. “The driving force to go green was seen in the market a couple of years ago, and this was prior to the explosion of gas prices,” he said. “We knew as an industry that lighter vehicles were becoming more of an issue with customers. As we drove toward that lighter weight, we found that the only way we could get lighter than wood was by trying various types of composites that might be out there.

Slater has a material sample immersed in water on his desk (where it has remained for several months) and remarks how impressed he is that there’s been no deterioration in the materials. “In effect, we started saying it looks like we’ve got ourselves a construction method that’s waterproof,” he said.

Further tapping into customers’ green minds, the company emphasizes not only the recyclability of the Everlite, but of their business practices as well. “The other thing we realized was that these materials can be, at some point in their life span if a person so desires, chopped and recycled and used for other things like insulation,” said Slater. “To recycle, as a manufacturer, is not as easy as one might think. It’s sometimes hard to find people that will take certain things, and in some cases, you pay to get rid of them. But we’re willing to do that, because otherwise it ends up in a landfill. So there are some challenges inherent in the service but it’s important to us because it’s a more eco-friendly way.”

New Audiences
Another important consideration involves companies looking for both new ways to reach their audience and new audiences to reach. Michael Setzer, an independent manufacturer based in Camano Island, Washington, has developed an innovation with the latter idea in mind.

He is designing and developing the Scarab RV, a lightweight tent trailer. Though its eye-popping feature is a linear actuator-enhanced self-compressor, the composites body is of great importance. “I decided early on that the best way to use composites is to build it the same way that the new LiteSport aircraft is built, which utilizes a light steel frame and a light composite body that encloses it and gives it some good aerodynamic and aesthetic qualities.” The construction of the panels is pressure-molded fiberglass with a gel-coat finish.

Setzer had some experience working with composites in repairs and small boats, but tackling a project of this scale presented a new set of chal-
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ACMA
Challenges. “Initially, the whole body was carved out of foam,” he said. “That’s how the plug mold was made and I did that in a fairly conventional way that has been done over the years in building airplanes.” During the process, Setzer discovered a different way of manufacturing, which he will use in the final production. It involves CMC machining of the foam core treated with a core-tron material which becomes the plug mold.

What the product will do, Setzer said, is bring a new audience to the market. “The Scarab is going to be oriented more towards younger individuals who want to travel, who are cost conscious, energy conscious and adventurous, whether that’s a young single adventurer or a new family with young kids!”

Setzer said tent trailers made of traditional materials such as plywood and metal have a dry weight of, at a minimum, 1,000 pounds. While that isn’t much of a burden on pickup or SUV drivers, it represents an impasse for cyclists and smaller-vehicle drivers (Toyota, for example, specifically states drivers of their Prius hybrid cannot pull a tent trailer.) In contrast, the Scarab has a dry weight of 215 pounds. “That’s substantial numbers as far as I’m concerned,” said Setzer. “I know my Prius isn’t something I would want pulling a ton of weight behind me. But when you’re talking about something that weighs about what I, as a second passenger would weigh, isn’t very significant.”

Setzer thinks there is a large potential crossover in who the product will reach, including a greener audience. “I think ultimately the economically-conscious, green drivers are interested in having this kind of tent trailer they can take out, still get 45 miles to the gallon and have the convenience of not having to pull into a hotel every night if they’re out travelling.”

Time will tell if the RV industry’s green push will be a passing fad or lead to permanent changes. But with green-related issues such as fuel economy becoming a higher priority in all automotive sectors, vehicles such as Everlite and Scarab are showcasing how composite materials can be used smartly to meet these changes.

For more RV and automotive stories, turn to page 6.

A. Mike Shuler is the assistant editor at ACMA. Email comments to mshuler@acmanet.org.
Progress comes about incrementally and collaboratively. It builds on the foundation of what came before it. It takes time to realize breakthroughs. That’s one reason why the research and development that takes place in higher learning institutions is so important. Researchers and their students don’t face the same pressures as industry to commercialize ideas, so they have the wherewithal to pursue hypotheses before there’s a business case for it.

Of course, academic researchers work closely with industry and their work sometimes results in viable products. In the past decade, the composites industry has benefitted greatly from the emerging technologies borne out of university research centers.

Composites Manufacturing rounded up some notable achievements for this article, but it’s hardly a comprehensive list. If you see something missing, email Managing Editor Melinda Skea at mskea@acmanet.org or comment on www.compositesmanufacturingblog.com.

BYU professor David Jensen had a vision: Take advantage of carbon fiber to produce better structures. He used previous work on grid structures to form the foundation of IsoTruss, a technology for bike manufacturing. “This technology differs because the structure itself is three-dimensional, so you won’t use a tubular mandrill like you would in a typical tubular frame,” Jensen says. This makes the tooling more complex. Specifically, the straightness of the member is key. “It should be under tension during cure, straight and properly consolidated. We wanted the intersections of the members interlocked so there’s some structural integrity in those joints,” says Jensen. “Because this is a fibrous material, we can weave those joints.”

Interweaving separates the fibers like a log cabin. The members are separated by notching the logs and chinking in between the logs. Jensen says this approach would use excess resin and add needless weight: “Our goal was to pull those fibers together, and the intersection is trying to pull them apart. There’s a natural problem that has to be overcome with some kind of tooling. Our automated process uses a braided sleeve to accomplish that function of pulling the members together. The match mode uses the tooling to push the members together.”

**BIKE FIBERS RIDE TOGETHER**

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**PROJECT:** IsoTruss  
**SCHOOL:** Brigham Young University  
**LOCATION:** Provo, Utah  
**DIRECTOR:** David Jensen

The IsoTruss technology pulls carbon fiber members together to toughen the structure.
FRP PROTECTION HEATS UP

Mark Green, professor at Ontario-based Queen’s University, saw the need to increase fire resistance in infrastructure applications by using fiber-reinforced polymers (FRP). To find a solution, the university teamed with Isis Canada, a research network, and collaborated with the National Research Council’s (NRC) fire research program.

The consortium has focused mainly on FRPs in the areas of concrete repair and external insulation. “If a column is wrapped with FRP, the FRP provides an external insulation to the system,” says Green. This is important for two reasons: The insulation prevents the FRP itself from burning early in a fire and it gives the structure much higher strength in a fire than there would be without the material.

The group conducted testing with both columns and beams. “We took regular reinforced concrete columns and beams and sprayed the FRP insulation on the structure to strengthen them. We then put the columns and beams into a special chamber at NRC. The conditions in that chamber are designed to simulate exactly what you’d expect to happen to those structures when they’re exposed to fire,” says Green.

Green feels the process has yet to reach its full potential: “It could open up opportunities where there’s little infrastructure to start with so you have to rely on FRP as a strengthening situation as well. In situations such as fires, we need a better idea of exactly what its strength is under those conditions. If you’re looking at FRP for internal reinforcement, although the behavior is a bit different in terms of the products, they meet under different conditions.”

FROM PETROLEUM TO BIO-BASED RESINS

The United Soybean Board asked Richard Wool, professor at the University of Delaware, to develop green resins from surplus soybean oil. Wool assembled a team of chemists, pharmaceutical professionals and food science experts to come up with a solution. This collaborative effort resulted in patents that became the basis for new bio-resins. The group also discovered how to toughen resins with lignum, a wood tissue.

The green composite resins are suited to liquid molding operations such as RTM and high-performance applications, bulk molding and sheet molding compounds. “The transition from petroleum-based resins involved extensive research into the properties of oils. The objective was to appropriate the right oils for the right purpose and learn how to design molecular architectures that would translate into good properties,” Wool explains.

The resins are commercially available in such applications as a John Deere tractor. “In an application like a bulk molding compound, they will be developed by a compounding specifically for different applications in automotive or appliances. We can currently tailor the monomers for each of these,” says Wool.

When asked if green technology was here to stay, Wool expressed emphatically that he hoped so. “There’s obviously a huge advertising cachet about green materials. Companies are starting to position themselves to sell the government as being a bio-preferred program. The government is the largest purchaser, and they’re giving preference to green suppliers,” he says.
The defense industry has been one of the biggest investors in composites over the past few years. While much of the material is used in vehicles and infrastructure to protect lives, an equally-important consideration is the apparel soldiers wear.

University of Alabama Professor Uday Vaidya has worked with the Army Research Lab on several projects and developed a lightweight liner made of long fiber thermoplastics (LFT) that adds stiffness without adding weight. LFTs are more commonly associated with the automotive industry, but Vaidya wanted to show how they can be used effectively in unconventional applications.

Vaidya did base science work before producing the product, including pre-testing on the coupons to understand fiber orientations, impact testing, and flow conditions. “One of the obstacles in using these fibers was flow during the molding process,” he says. “Because we were using long fibers, they tend to cool quickly. We had to make the mold quicker to accommodate the fibers.”

The result is a LFT rim-stiffened helmet liner that reduces the crush deflection by 66 percent with an added weight penalty of only 19 percent to the outer shell of a helmet. However, Vaidya wants to make the weight even lower. He’s currently in discussions with helmet manufacturers to integrate the concept into their designs. He says this innovative way of demonstrating this approach could fit well with similar needs in personal protection and systems. In other words, there are a lot of avenues in the defense market to pursue, he says.

When University of Miami Professor Tony Nanni came up with the idea to groove concrete and drop bars into the grooves for reinforcement, he thought he was the first, but it turns out it had already been discovered in another time and place: post-WWII Sweden.

However, the Swedes used steel bars whereas Nanni saw potential in applying composites, coining the technology as near-surface mounted reinforcements (NSM). The focus with the technology is construction repair and rehabilitation. One of the main ben-
efits of the technology is continuity through joints, which allow penetration to provide continual reinforcement. Additionally, in floor slats, you have the ability to lightly groove the top side of the floor and drop these bars for very quick repair/rehab.

However, there is trickery associated with the surface configuration of the bars. “There has to be a good bond between the bar and the material; typically epoxy resin is used as a binder in the groove. So the surface configuration and quality is not that of a typical pultruded product. The differentiation between companies is related to the surface treatment,” says Nanni.

Nanni states there is a lack of industry regulation of codes and standards that prescribe minimal require-

ments. “If the technology is not standardized, there’s no way to make it part of a contractual agreement. If those documents were general knowledge, they could be incorporated without the engineers reinventing the wheel every time.”

On the up side, he feels the technology has matured and developed for flexural strengthening and that future opportunities exist in shear strengthening and combinations with other strengthening technologies.
When you consider the notion of using fiber-reinforced polymers (FRP) for strengthening and repair of structures, those structures are usually concrete. But North Carolina State University (NCSU) Professor Sami Rizkalla wanted to look beyond that, and apply the technology to steel structures. “The majority of civil infrastructure involves steel, so it makes sense to try and use FRP to strengthen those structures,” he says.

Rizkalla first worked with a company to produce high-modulus carbon, which adds stiffness due to being twice the elastic modulus of steel. Next, studies were done to select appropriate adhesives for repair, and testing was done using a model bridge made of steel beams and composite action with concrete.

Testing ultimately led the team to design a guideline on how to strengthen steel structures with FRP. “This guideline was sent to the International Institute for FRP in Construction’s (IIFC) technical committee on FRP-strengthened metallic structures. They reviewed and edited it and now we are close to a final guideline,” says Rizkalla.

The school’s results have been recognized by technical journals and were awarded as one of the best published papers at a Structural Faults and Repair conference in Scotland. However, the guidelines aren’t being accepted easily because there are no codes. Rizkalla has found that reluctance to take a chance on using FRP for steel repair. He feels acceptance will come with time, and believes a lot has already been accomplished.
Q&A: Fiberglass Pultruder Succeeds by Treating Window Manufacturing as a Science
Bob Rambo, president of ComfortLine Inc., began as a vinyl extruder and manufacturer of windows and doors. The company first saw the benefits of fiberglass in the early 1990s and has since adopted the pultrusion process and become a manufacturer exclusively of fiberglass windows and doors.

Q&A: Wind Energy Exec Says Composite Blades Need to Be Lighter
Christian Kjaer began his career in wind energy in 1998 as an economist with the Danish Wind Energy Association. With a masters in international finance and economics, Kjaer quickly moved up the ranks. Now he is the policy director over lobbying for the European Wind Energy Association (EWEA).

Q&A: Why Can’t Composites Get Traction in Automotive?
Hamid Kia is the author of more than 40 published papers and has more than 25 patents to his name. He is a participant at the United States Council for Automotive Research LLC (USCAR), a joint venture company formed by Chrysler Group LLC, Ford Motor Company and General Motors Company (GM) to support and facilitate collaborative research.

Q&A: Car Salesman Tactics Could Benefit Composites
Jason Carrington, president of Carrington Yachts Limited, is sought after to create new sleeker, lighter yachts. In his experience as a project manager and an avid racer (he has competed in the Volvo Ocean Race four times), he helps designers and manufacturers find the right balance between speed and sleek sturdiness.

Q&A: Georgia Tech Aerospace Professor Warns Against Composites Presumptions
Robert Michelson is a principal research engineer at the Georgia Tech Research Institute, a retired adjunct associate professor at the School of Aerospace Engineering at Georgia Institute of Technology and has worked with various academia and institutions on aerospace projects.

To read the interviews with these and other leading members of the composites industry, visit www.composites manufacturingblog.com and click on “Q&A Interviews”.

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A Two-Pronged Approach to Government Affairs

A CMA has always had a strong government affairs program, aimed at defending the composites industry against unreasonable and infeasible regulations. While we continue this tradition, we’ve also added a new mission—to proactively affect legislation by educating lawmakers about the benefits of composites. At the foundation of this program are a number of important programs: the Composites Caucus, the Composites Advocacy Program and our Composites Growth Initiative. A number of stories in this issue illustrate the work these programs have been doing, including our recent Lobby Day Fly-In to meet with lawmakers, our Capitol Hill briefing on wind energy and the creation of a new Utility Pole Committee that has already met with Department of Energy staff and representatives.

One of the benefits of ACMA membership is sharing in our presence on Capitol Hill and having an opportunity to weigh in on policy issues that matter to your industry and market. Join us today and make your voice heard.

Tom Dobbins, Chief Staff Executive

DOE Meets with Composites Utility Pole Committee

A new Composites Growth Initiative (CGI) group is focused on expanding markets for composite poles, cross-arms and related products for power and communication structures applications. Eleven ACMA members voted to launch this new committee and undertake a number of marketing and legislative initiatives to help grow this segment. The group elected Brian Lacoursiere, RS Technologies, as committee chairman.

Representatives of this new Composite Utility Structures Working Group and ACMA staff recently met with William Bryan, Deputy Assistant Secretary, Infrastructure Security & Energy Restoration and key staff at the Department of Energy. As a result, DOE invited the industry to provide case studies and analyses of cost and environmental performance, to allow them to inform utilities and Congress of the availability and benefits of composite products. For more information, email John Busel at jbusel@acmanet.org.

ACMA Announces COMPOSITES 2011 Call for Presentations

ACMA announced a June 11 deadline for submitting technical paper abstracts and a September 1 deadline for submitting education presentations for COMPOSITES 2011 to be held February 2-4 in Ft. Lauderdale, Fla. All submissions must be made online on the COMPOSITES website at www.acmashow.org.

Lobby Day Builds Congressional Support for Composites

During ACMA’s April 15 Washington D.C. Fly-In, member companies participated in 58 meetings with Congressional offices. Prior to the Fly-In, 21 House members had agreed to sign a bipartisan Congressional letter to Dept. of Health and Human Services Secretary Kathleen Sebelius, calling on her to reform the process used by the National Toxicology Program to characterize the carcinogenic potential of styrene and then to reevaluate the styrene data. An additional 11 Representatives agreed to sign as a result of the April 15 meetings. The Fly-In concluded with a briefing to the Composites Caucus on Wind Energy. To read more about Lobby Day and the Briefing, turn to page 20.
Exhibit Sales Now Open for COMPOSITES 2011

The COMPOSITES 2011 exhibit hall is filling up quickly. Space selection is now open and available to all companies. Companies that have not yet reserved their exhibit space should sign up on COMPOSITES website or contact Ryan Brown at rbrown@acmanet.org.

ACMA Welcomes Three New Board Directors

Three new directors will be joining ACMA’s Board of Directors on July 1. Gary Anderson, president of Aquatic (formerly Lasco) and Dana Paulson, EHS Manager of LM Glasfiber, are each joining for a three-year term; Randy Weghorst, president and CEO of AOC, will join for a two-year term, filling out the term of John Gaither, CEO of Reichhold, who will serve as Supplier-at-Large.

Composites Can Boost Fuel Economy

The U.S. Department of Transportation (DOT) and the U.S. Environmental Protection Agency (EPA) jointly established new federal rules that will significantly increase the fuel economy of the vehicles starting with the 2012 model year, according to a DOT press release. An ACMA event planned for Sept. 22-24, 2010, will focus on the use of composites in improving vehicle fuel economy. For more information, email John Schweitzer at jschweitzer@acmanet.org.

Building a Housing Proposal

The Composites Growth Initiative (CGI) is spearheading an effort to get composites companies involved in an academic-based Engineering Research Center (ERC) proposal to develop a project focused on hurricane-resistant housing. The ERC, which would go through the University of Miami, will focus on the role of composites in sustainable housing along coastal areas most affected by

Inside ICPA

New Focus at Multi-Regional Meeting

A multi-regional meeting will take place at Ashland Performance Materials, Columbus, Ohio, June 24-25. This event stresses practical demonstrations and presentations for both cast polymer management and production personnel. The program will include a CCT training session to educate production workers, as well as presentations on best business practices. For more information, visit the ICPA website at www.icpa-hq.org.

Board Ballots in the Mail

Ballots for electing board members will be sent during the week of May 10. Please check your mail and fax forms to ACMA at 703-525-0735 by June 15. The ICPA Board has announced the following members for positions on the ICPA Board of Advisors: Secretary: Jack Simmons, ACS International; Supplier at Large: Anne Morris, Composites One; Directors: Craig Abner, Advances Plastics Inc. and Daryl Francis, Interplastic Corporation.
these storms. Companies from composites, insurance, code standards and housing standards would work in tandem on the project. Charlie McClaskey, consultant for Syrgis Performance Initiators and chair of the CGI’s outreach committee encourages everyone to participate because, “The people making the decisions are sitting at the table with you, so this is a remarkable—and rare—opportunity for individual companies to get access to people of this type,” he says. For more information, email John Busel at jbusel@acmanet.org.

**Volunteers Needed for Composites Merit Badge Booth**

ACMA needs industry professionals to volunteer at the Composites Merit Badge Booth at the Boy Scouts National Jamboree, July 26 – August 4, 2010, in Fredericksburg, Va. Volunteers will work with youth to build composite skate boards and other hands-on projects to meet composite merit badge requirements. For more information and to sign up, email Jim Scholler at jscholler@trek7.com.
Mark Your Calendar Now for ACMA’s Upcoming Education Programs

**2010**

June 24-25  ICPA Multi-Regional Meeting
(Dublin, OH)

July 15  ACMA Regulatory Update (Webinar)
Free to ACMA Members

October  Green Composites Symposium
(Location TBD) — New!

November 9-10  CCT Instructors Course
(ACMA Headquarters, Arlington, VA)

**2011**

February 2-4  COMPOSITES: THE Convention and Exhibition (Ft. Lauderdale, Fla.)

May 10-12  Construction, Corrosion and Infrastructure Conference & Exhibits
(Cesars, Las Vegas)

May 17-18  CCT Instructors Course
(ACMA Headquarters, Arlington, Va.)

For more information, visit
www.acmanet.org/meetings
Here at Composites Manufacturing, we report on how composites are used in applications that affect you most, such as automotive, infrastructure and wind energy. But composites are also used in some very odd and unusual applications. Here’s a snapshot at the lighter side of our industry.

**Pocket Shark:**
It’s a writing utensil that doubles as a defense weapon; at least that’s how Cold Steel markets its glass reinforced plastic composite Pocket Shark pen. The company says this product is four times thicker than an average pen, which helps in providing a blunt hit to an attacker.

**Chopsticks:**
Feel a bit nostalgic for the original Karate Kid? The least of us could probably catch a fly like Mr. Miyagi with these tough utensils. These new chopsticks by Carbon Fiber Gear are made from a solid block of aerospace carbon fiber and come with a matching rest. The product can be heated to over 400 degrees, making it non-toxic and dishwasher safe.

**Toilet Seat:**
If you’re a real composites king or queen, you may want an appropriate throne to fit your lifestyle. Dynamic Composites branched from its bicycle and racing component ways to manufacture a toilet seat from hand layered carbon composites around a pre-molded foam core. The company expresses “best flushes” to those who purchase this product.

**Bend Bench:**
Do you think more people would have heard Forrest Gump’s fantastic tales if he was sitting on a more exciting bench? VelopA used a combination of steel and composite bulk molding compound (BMC) to create a unique-looking street bench.

**Hog Haulin’ Trailer:**
Have a love for farm life, or just dying to turn heads when you’re on the road? AFS Limited has just the travel device for you: a motorcycle trailer shaped like a pig. Using a fiberglass foam sculpture coated with polyester resin, this trailer will make you top hog on the road. Not so keen on bacon? You can customize Georgia-style with a bulldog.

**Bullet Ring:**
One composite ring to rule them all…or at the very least be a snazzy accessory. Since the start-up company began in 2004, Ultra Carbon Fiber has created six unique rings out of uni-directional carbon fiber as the perfect accompaniment of an “I Do” or some understated bling.
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The Earth is getting a lot more attention these days, and composite and cast polymer manufacturers are taking notice by turning to “greener” solutions. To help manufacturers become better environmental stewards and market to the growing green marketplace, AOC introduces revolutionary, new EcoTek™ Green Technologies.

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