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The Benefit of Washington on Home Turf
Building relationships with legislators is an ongoing process. Once a year meetings aren’t enough to shape rules and regulations beneficial to the industry. See how some composite manufacturers are taking extra initiative to get their company and composite issues in front of legislators.

By Melinda Skea

Glimpse Inside Hybrid Composites
Today, several composite manufacturers and academics are combining fiber reinforced polymer (FRP) materials with other materials to create new systems with enhanced properties. These new processes are changing how people look and use composites.

COMPOSITES 2011 Show Guide
Only a few months away, the show guide gives you the tools you need to prepare and make the most of COMPOSITES 2011. Inside, you’ll find schedule at a glance, educational sessions, exhibitors listing and more. If you haven’t registered to attend, here’s a few more reasons you should act before it’s too late.

Online Exclusives
Composites are everywhere. So is Composites Manufacturing. Visit www.compositesmanufacturingblog.com for exclusive content, including Q&As with industry leaders, new product round-ups and up-to-date news.

Correction: The fall 2010 cover shot of Composites Manufacturing was generously provided by Zellcomp, Inc., Durham, N.C. The photo shows the company’s latest project, an FRP decking installation on the historic Broadway Bridge in Portland, Oregon. For more information, visit www.zellcomp.com.
Changing the Way I Do Business

Before my wife Juanita and I bought Alaglas Pools in 1999, we took a hard look at the financials and the market opportunities for swimming pools. They looked good, so I went about crafting a purchase agreement to close a deal in late April. That Fall, I attended my first industry show, then called the CFA Show and now called COMPOSITES, at the McCormick Center in Chicago.

I didn’t know anybody in the composites industry and very little about the industry itself, but I’d come from an industry where government regulation had an impact on my business. At the show, I looked for sessions that would educate me on the government’s involvement in the composites industry as well as sessions to help me better understand the nature and process of manufacturing using composite materials.

I attended a session on the soon-to-be EPA MACT standards, where I heard the word ‘styrene’ for the first time. I remember sitting in the last row of the session and turning to the guy next to me and asking if we had any of this styrene stuff in our products. He looked at me like I just landed from the moon.

As soon as the session ended, I introduced myself to one of the speakers and told him I had just purchased a small manufacturing company in South Carolina. It was the first time I met John Schweitzer, ACMA’s director of government affairs. He asked if I wanted to join the government affairs committee. I did and 12 years later, I’m still actively involved in the ACMA.

This short anecdote is meant to illustrate one big point: The COMPOSITES show changed the way Alaglas Pools does business. If I hadn’t met John and others at that and subsequent shows, I wouldn’t know who to call when I have questions or need help. Some folks like to use the term networking, but I like to think it’s about forming personal relationships with people in our industry (fellow manufacturers, suppliers, speakers, ACMA staff, etc.) that enable me to pick up the phone and call a friend. And it’s not just a one way street. It’s nice to know that I may be a resource to someone else as well.

Another important aspect about COMPOSITES is that the show affords me an opportunity to get a sense of where the industry is and what’s impacting or driving it today and into the future. I like to hear what other manufacturers are doing and how they are keeping up with the latest manufacturing technologies. We’re a small business in South Carolina, and like most small businesses, all of our time is focused on running the business. COMPOSITES is at least one opportunity every year for me to put my business in perspective and to see how it compares to the rest of the industry. If I feel good about it, then I’m comfortable that I am on the right track; if not, then I know who I can talk to for help in making some course corrections.

I haven’t missed a COMPOSITES show since getting into the industry, and I’m looking forward to Fort Lauderdale in February. I encourage everyone to come south to the sun and participate with all of us in a great show!

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Visit CCP at Booth 301 February 2-4 @ Composites 2011, the world’s largest composites industry event in North America!
Meet Puffin, a new stealthy, hover-capable concept vehicle from NASA. The Puffin is a vertical take-off and landing tail sitter aircraft concept made of carbon fiber that would be powered by a redundant set of electric motors.

The Puffin was developed with the help of the Massachusetts Institute of Technology, the Georgia Institute of Technology, the National Institute of Aerospace, and M-DOT Aerospace. According to Brainchild Mark Moore, an aerospace engineer at NASA’s Langley Research Center and internationally recognized expert in personal air vehicle technology, the Puffin is an unusual looking aircraft design: part plane, part helicopter that stands upright on the ground. It’s made almost entirely of composites. The material’s weight saving properties allows for more weight to be dedicated to a lithium phosphate battery.

“The scale model was made from carbon fiber to keep the weight low,” says Moore. “But going forward, we are looking at more exotic composites to incorporate into multi-functional structures, such as embedding carbon nanotube sheets that have the potential to help address problems like lightning strike due to its conductive properties.”

Moore proposed the Puffin project as part of the coursework for his PhD. The one-third scale design, headed by retired NASA/Army Engineer Todd Hodges, has been flying for months. “I’d been involved since the paper design study, and I wanted to build a radio-controlled model,” says Hodges. “We finished the model last December and, after a few problems, achieved hover capabilities over the summer and are now expanding the flight envelope.” Overall, he explains, composites allowed him to do complex prototyping rapidly. “At first I tried to go through the remote-controlled industry to match the parts to our paper study—I thought I’d have a lot more success than I did! While we did have to modify and redesign configurations, using both carbon fiber and graphite composite, we were able to hand lay-up the pieces we wanted.”

However, the Puffin is only intended to investigate the potential of electric power for certain aviation applications. “This is not intended as a near-term product. It is an advanced concept integration platform for exploring new technologies,” says Moore. “NASA’s focus is on providing new technologies for the U.S. industry, so that new solutions can be provided for our societal transportation needs. Hopefully in the future that technology can be used for things like harbor security patrol and border interdiction.”

Named after the small bird found along the north Pacific and Atlantic regions of the U.S., Moore considers the bird stealthy and green. “If you’ve ever seen a puffin on the ground, it looks very awkward, like its wings are too small to fly, which is exactly what our vehicle looks like,” Moore says. “But it’s also apparently the most environmentally friendly bird because it hides its poop and lives in solitude. Our Puffin is environmentally friendly because it essentially has no emissions and it’s a one-manned vehicle.”
In total, the Puffin would be about 12-feet long, 300 pounds (not including another approximately 300 pounds for battery, payload and pilot) and have a 14.5-foot wingspan. It could be flown by one person, or even operate as an unmanned aerial vehicle. “The flying machine was designed to achieve a ten-times lower noise level than current helicopters as well as provide close proximity vertical takeoff and landing operations,” says Moore. “And it would be powered by a total of 60 horsepower through electric motors with a cruising speed of 150 mph—but best at lower speeds.” The tail is designed to split into four legs that serve as landing gears and would lift off like a helicopter, hover and then lean forward to fly horizontally. “The pilot would lie down like in a hang-glider and, with the current battery technology, go about 50 miles,” he explains.

Engineers predict that electric propulsion aircraft will be relatively small, short-range vehicles that have less environmental impact with smaller noise, exhaust and emission signatures. They could offer new civilian and military mission capabilities. “Quiet, good neighbor operations will permit new types of close proximity operations for movement of people and goods, police and traffic monitoring, fast courier services and other services,” said Moore. “The challenge currently is achieving the level of noise reduction required. It calls for a great deal of higher-order analysis and testing, with a multi-disciplinary approach,” says Moore. “All the different disciplines—such as aerodynamics, propulsion, materials and structure—must work cooperatively in order to find constructive synergies.” Besides group cohesion, the biggest challenge for the team is energy storage technology, but investments in that technology are expected to triple battery capability in the next decade.”

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Developing a sustainable business plan can be a cause of consternation for growing businesses. That’s why, when Composite Moulding (CML), a British-based marine manufacturer, discovered a solution for its excess materials, it was heralded by the marine world. CML developed a plan to manufacture pram dinghies made entirely of surplus material from its manufacturing process.

The company builds 60-foot boat molds through vacuum bagging and wet lay up, which means they often over-order specified gel coats and resins. “After manufacturing a boat mold, we can end up with five to 10, sometimes 20 kilos of excess gel coat. If we’re using lay up inside the boat, we end up with huge pieces of extra cloth,” says Project Manager Tommi Buckley. “But since implementing lean manufacturing the year before, we wanted to find a good application for our off cuts and waste material.”

CML held a brainstorming meeting to see if there was anything they could do with the waste material. “We didn’t know exactly what to do with our scraps because we have to worry about batch control, each boat with its unique batch number, which meant we couldn’t use excess on other boats,” explains Buckley. “We also didn’t want to throw away valuable waste material, let alone spend money for someone to collect it and dispose of it properly—that’s just a double negative in my book.” Instead, after throwing out ideas like garden ponds and flower boxes, the company settled on something they felt was relevant to their existing market: pram dinghies.

Once they had the product picked, they did some good old-fashioned market research. “I went to shows and talked to people about what they wanted, how much things should cost and searched various online sources to see how we could make our product unique,” says Buckley. CML discovered that a finished 8-foot dinghy would cost approximately 700 pounds ($1,100 USD). However, if they manufactured and just sold a dinghy shell and allowed the buyer to finish it off themselves, they could sell it for just 100 pounds ($160 USD).

From the initial ah-ha moment to manufacturing was a quick process, approximately two months. The company was able to reclaim a mold they’d donated to a marine training center that wasn’t using it anymore. The 8-foot mold fit CML’s needs perfectly. Repairing the mold to good-standard and allocating space for it were the only challenges.

Once the mold was in-house, their
apprentices were given the freedom to man the project themselves. “Using open mold and a wet lay up process, we’d have the apprentices take the excess resin, generally a polyester or vinyl ester resin, and create the dinghies with a spare hour,” says Buckley.

“We’ve had a lot of success with the process. We get rid of our extra material, it covers the material and labor cost, keeps it out of the landfill, and even gives us a small profit,” he says. “I find that most people who own boats know how to repair and do simple things. So the option of finishing off a dinghy at a fraction of the price really appeals to them. We even have one customer that buys the dinghies to give as part of a package to their customers that buy an engine.”

In fact, the company has had so much success with the newly launched dinghy that it has a company that goes around the country and markets the dinghy for them. In regards to shelf life, Buckley is nothing but practical. “As a tender, its life will be a hard one. It will be launched in, hauled out and slammed around as a tender for a small- to medium-sized sailboat or used as a fishing boat. Its life will be harsh and short, and people expect that,” he says. “We’ve had people approach us about producing various parts for the dinghy, but we have to remember that the dinghy shell was a solution to our waste problem. We can’t spend too much time on it or else it will become a problem in itself. We’re here to make 60-foot vessels and it so happened we created a beneficial business solution to our lean manufacturing problem.”

CML developed a plan to manufacture pram dinghies made entirely of surplus material from its manufacturing process.

Wenonah Canoe is another success story from the 7 Rivers Alliance Region. The magic of the Mississippi and the beauty of the area attract and inspire, making the 7 Rivers Region an ideal location to sustain our network of composite manufacturers, higher education institutions, and organizations.

The 7 Rivers Alliance supports companies like Wenonah Canoe by uniting our members in the sharing of information, knowledge, technology and the people that make it work. We are inspired by our region’s natural beauty and relax in its recreational opportunities. Learn more about the 7 Rivers Alliance by visiting our website and watching an interview with Wenonah Canoe Founder, Mike Cichanowski.

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Ironically, LCOA Composites developed the DeadStop to keep police from coming to a dead stop. Targeted to help domestic police departments, SWAT teams and other government agencies, the DeadStop is a new lightweight police shield made from a composite hybrid material. The lightweight material gives the shield a multi-hit capability. For example, it can stop a .44 Magnum bullet at 15 feet, making it literally a life saver for the user.

In early 2010, the California-based company developed a hybrid composite flat panel for use in military vehicles and shelters. After partnering with Wintec Industries in Houston that summer, LCOA realized they could use this same panel to fill a gap in the ballistics mitigation shield market. “There are three types of shields,” explains Rob Wassem, vice president of Business Development. “First the riot shield, which mitigates sticks and stones but doesn’t have ballistic characteristics. Second, there’s the ballistic shield that does stop the equivalent of a .44 Magnum. Yet at two feet by four feet (a total of 8-feet of surface space), it weighs between 18 to 20 pounds and can be difficult to navigate, especially with a weapon in one hand. Thus, the demand for the third and lighter weight shield has grown and begins to expand.”

Composite shields have been on the ballistics mitigation market since the 1990s, but recent technology has allowed manufacturers to decrease weight and increase production. LCOA surveyed users and discovered that by using the newly developed hybrid composite flat panel, they could create a product that was five pounds lighter than the nearest competitor. “Most clients are familiar with ballistic standards, but I was surprised at the number of them who are unfamiliar with recent technology,” he says. “Most are familiar with ballistic ratings, but not the technology on how the shields are manufactured.”

Manufacturing the DeadStop

To manufacture the product, LCOA had to modify its manufacturing process from a post-forming standpoint. “Most products we manufacture are flat panel projects. This project required us to take the flat panel and use an autoclave system to create a curved shield,” says Wassem. “Our biggest concern with this process was maintaining the integrity and performance of the material as we shaped it into a shield. We use a hybrid composite made of a high-density, ultra lightweight fiber and resin. And while due to proprietary restrictions, I can’t tell you exactly what it is—it’s not an aramid or carbon fiber composite—it’s considered an UHMPE (ultra high molecular polyethylene) hybrid.”

Through four months of R&D, including two months of tweaking and trial and error, LCOA discovered the right amount of heat to apply during autoclave to cure the shield without creating a ripple effect on the surface.

Once the flat panel has been pressed and then curved in the autoclave, a bezel is inserted to hold the glass-view in place as well as a handle to create a final product. From there, the product is put through company testing as well as external testing. “Anyone in the marketplace has to have credibility,” says Wassem. “We did the V050 test, which is a standard test to see if a ballistics shield can withstand a shot from a .44 Magnum at 15 feet. Then, we sent it off to HP White and Chesapeake Labs, two very respectable labs, and gave them a 15x15-foot panel to see if the product can withstand five shots; one in each corner of the shield and one in the middle. One of the good things about using a hybrid composite is that the shield absorbs the bullet, creating a 1-inch deformation, instead of ricochet or splintering off.”

Overall, the composite shield is 30 percent lighter than similar products and will last between five and 10 years. However, LCOA suggests that if caught in the line of fire, trade the used one in for a new, shiny, lightweight, un-dented one.

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For every good turbine, there’s a good platform. At least that’s what Norwegian-based NLI Innovations is aiming for in its efforts to develop a new offshore floating platform. “There is still a lot of room for development within wind energy, especially turbines,” says Anders Tørud, business development manager at NLI. “That includes materials and how they are manufactured.”

The WindSea is a floating structure currently in the R&D process that can carry three standard horizontally axled wind turbines. “In our opinion, any of the commercially available offshore turbines on the market are compatible with the platform and can carry any of the 5 megawatts (MW) turbines available on the market,” says Tørud. “In fact, we believe the platform will be able to carry 6 to 10 MW turbines when they become commercially available.”

The turbine platform is based on the well-proven concept of semi-submersible platforms currently used extensively for offshore oil and gas installations. However, compared to other proposed design concepts that use a spar buoy design, the WindSea uses a semi-submersible platform. This allows it to operate in relatively shallow water, needing only approximately 147 feet to operate whereas others need between 300 and 400-foot depths. And currently Norwegian-based NLI Innovations is aiming to develop a new offshore floating platform, called the WindSea, by 2012.
there is no technical limit to water depth installation. To date, the WindSea has completed a proof of concept phase including tests in a wave tank and wind tunnel, and been verified by third parties. Now the company is working on financing a large 1:3 scale prototype project they hope to have operational by 2012. During this phase, the company hopes to narrow down its materials options, which include composites for both the primary structure as well as secondary structures like staircases and j-tubes. “Composites would allow a lighter structure and less corrosion,” says Tørud. “Deciding what and where products we’ll use will be a continuous process, even into the commercial phase as we determine what gives the overall system the best lifetime cost.”

One of the biggest options the company wants to offer with the WindSea is portability. From the beginning, NLI designed it so when the WindSea is not operational, for example, it only needs between 26 to 32 feet of water. Those specifications allow the platform to be completed at a yard—including the turbine installation—and transported from the shipyard, effectively eliminating the need for costly heavy-lifting vessels on site.

Faced with a potential problem, WindSea still feels its new product will bring a lot to the wind-market table. During development, NLI placed three turbines close together on a relatively small platform to test production rates. While one of the turbines will experience a shadow effect, where less wind is captured by a nearby turbine, the calculations and wind tunnel tests have both proven that over a one year production cycle, the shadow effect only amounts to a 7 percent production loss. Combine that, as they label it, nominal loss with the installation and upkeep reduction costs and NLI feels it has an attractive concept on the seaboard horizon.
What Breaks, Makes You Stronger

Failure analysts are like the Ghost Busters of the composites industry. When there’s something strange, you give them a call.

Joe Rakow, an expert in composite failure analysis, is asked to help companies figure out how and why product failures occur. Rakow investigates airplane accidents to broken pipelines and fire-damaged wind turbines. However, the industry where he sees the most problems may surprise many: The sports and recreation industry.

According to Rakow, composites are in the hands of a variety of users, which affects the likelihood of product failure. “I get the most calls for things like bikes, helmets and outdoor hunting equipment, like fishing poles, skis, snowboards and watercrafts,” he says. “In the sports and recreation industry, composites are used to increase performance and make high-performance products, which are then used by a wide range of skill users who don’t know how to use them or properly take care of them,” he says.

Howard Lindsay, founder and CEO of Vyatek Sports in Scottsdale, Ariz., adds that the type and manner of failure depends on the product. “Failure is very product specific. Bikes fail differently than lacrosse sticks, which fail differently than baseball bats,” he says. “But in reality, I’d have to say failure occurs most often when a company is pushing the lightweight envelope. For example, bikes seem to have gotten to a point of diminishing returns. The carbon fiber road bikes have chased weight savings so much and are now so thin that they have high failure rates from simple use. These bike frames don’t fail when someone is riding them, but when they’re dropped against a hard object or during a crash. In perfect conditions, you can keep an egg shell fine, but when those conditions are less than perfect, not so much.”

Rakow and others like him try to flush out the flaws so companies can improve their products. “The first step to solving a failure problem is collecting the evidence, which includes obtaining the failed items, photographing them, looking over them and identifying common features,” he explains. As an analyst, Rakow also talks to the end user and the manufacturer to coordinate and piece together scenarios and chains of events. “That process may involve some sort of engineering analysis or simulation,” he says. “Once you can understand how the product was being used and in what environment it failed, it’s easier to pinpoint flaws. Common mistakes I see on the manufacturing end are voids, air bubbles, under-curving of materials or not using the appropriate materials. Most of the times, I find companies have processes and quality controls set up, but sometimes the quality control system wasn’t robust enough or there was an unknown product change.”

Investigating flaws or failures leads to new product development. Lindsay cites the recent ban of composite bats by the National Collegiate Athletic Association. “The NCAA took 20 to 25 composite bats from the 2009 College World Series and ran them through an ABI technique that forces deflection through the barrel. If the speed of the ball increases after the test (which it did) from delimitation of the bat, then the bat is illegal,” he says. Yet Lindsay says this problem isn’t new. “Manufacturers have struggled with this problem for a while and now that composite barrel bats are illegal, manufacturers look for other ways to develop their products,” he says. “Manufacturers are developing ways to differentiate their product by putting composites only in the taper and handle sections of the bat and leave the barrel as aluminum, which is completely legal. It also creates a unique feel, which ends up is a pretty important factor in the industry.”

Go to page 18 to read more about R&D and manufacturing processes of composite-hybrids.
Every composites manufacturer conducts product development if it wants to avoid stagnation, but the process differs depending on the size and type of company.

Mike Lopez, director of composite development & manufacturing for Serotta, a high-end bicycle-parts manufacturer, says his company’s process is evolving. The company recently introduced a new composite fork.

“It starts with defining the product. What’s it going to be? Is it going to be an aero fork? Is it going to be a cross fork,” says Lopez. “Then we do a little research and we talk to people. Then we define what I would call all the hard points—the axel has to go here and the brake has to go here etc.”

Alongside performance, the nature of the sporting goods industry demands particular attention to aesthetics. “It’s incredibly important. You have to marry the best of both worlds and that’s tough. You can spend a lot of time sitting around a table and say, so what do you think?” says Lopez. “You’re likely to get a lot of conflicting opinions. Somebody has to guide that effort and say, okay, I want it to look traditional, or I want it to look hi-tech. And we just went through that exercise.”

The outcome was a traditional-looking product that left some sales reps curious. “Ben [Serotta] and I, who are elder statesmen of our design effort, led our industrial designer down a certain path with the shape of...
some certain products trying to keep the same theme of some existing products,” says Lopez. “And the sales guys are 15 or 20 years’ younger, and maybe in their mind targeting different customers. They’re looking for something a little edgier, a little sharper.”

Feedback from the sales reps has made its way to the product development process. “I talked to Ben and said, ‘They’re the front line. They’re the troops so can they have a vote at the table?’” says Lopez. “Let them make some tweaks. Let them have some pride of authorship because they know who they’re trying to sell it to. That’s what it’s evolving into.”

When it comes to product development, there are some advantages that larger companies don’t enjoy: “We have a lot of freedom as a small company. We can do what we want when we want it,” says Lopez. “On the flip side, when people ask me why it takes so long during the product development cycle to do what I consider my due diligence on the mechanical testing on a fork…it can take me months to test all those samples. Why? The quantity of forks you have to test and the time it takes to do it when you have one machine versus 10 machines in the lab.”

One area that hasn’t made much impact lately on product development are materials innovations. The cycling industry isn’t quite large enough to drive innovation on the materials side. Instead, it benefits from innovations introduced to larger sporting goods markets, such as the golf industry.

There haven’t really been a lot of new materials that really do anything lately. It’s been variations on a theme,” says Lopez. “If anything has happened in materials that allow us to make bikes lighter, it’s lower aerial weight prepregs with high modulus, high-strength fibers, and a lot of that the primary reason those materials are available to us is because of the composites golf shaft industry. Because of their market being so big and them consuming so much material, they were able to make the prepregs develop new materials that really allowed bike guys to start making some lightweight, high-performance style bikes.”

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Building relationships with legislators is an ongoing process, a constant effort to be recognized and heard. Even if your company is known and appreciated by your representatives, all that can change in one election.

In efforts to stay in front of their representatives, several American Composites Manufacturers Association (ACMA) members participate in regular Lobby Day activities and fly-ins to Washington D.C. During their time on Capitol Hill, members educate their House representatives and Senators on the industry and its causes.

But once a year meetings aren’t enough to shape rules and regulations beneficial to the industry, so some composite manufacturers have taken extra initiative to get their company and composite issues in front of legislators. One simple means, according to a growing number of manufacturers, is a plant tour. But how do you get started? How do you prepare? What should you expect? Follow three manufacturers, Monroe Industries, Avon, N.Y.; IDI Composites, Noblesville, Ind.; and Aeroset Inc., Priest River, Idaho, to find out.

**Monroe Industries**
Avon, NY
Guide: Bonnie Webster
Representative: Chris Lee (R-NY)

**What to expect:** “Rep. Lee’s staff arrived first, then he showed up about 15 minutes later. In total, the tour took about 45 minutes. I showed him the process start to finish, beginning at the show room so he knew what a finished product looked like. I then shut down the equipment and started at the beginning.”

**Major talking points:** “I focused on our recycle-based materials and how the industry is making changes for the better. He’s a business man himself and wanted to know how many people we employ, how the economy affected us and what we did to deal with it.”

**Representative’s Reaction:** “He didn’t know much about our industry, let alone that there was one of us in his district. He was thrilled. He asked a lot of questions about the process and products and was interested in the green movement within the industry.”

**Your Reaction:** “Rep. Lee was nice, his staff was easy to work with and we got some good publicity from our local newspaper as well composite issues in front of congress. When I went to Lobby Day, I invited him to join the Composites Caucus and he came for a few minutes before he had to go vote on something.”

**Tips to Prepare:** “Our industry worries about styrene, so air out your plant and keep it clean. Show your representative that you have pride in what you do and that you manufacture good products. When you do a tour, you’re not just representing your company, you’re representing the industry, so take time to prepare.”

**Advice in 40 Words or Less:** “We’ve got to be proactive to show our representatives that we produce quality parts and make a positive contribution. But everyone has to do it; a few tours out of hundreds won’t be enough.”

**Quick Steps to Plan a Plant Tour**
The American Composites Manufacturers Association (ACMA) has developed a Plant Tour Guidebook that helps composite manufacturers organize and facilitate a successful meeting with their representatives. Here are a few tips from the guidebook:

- **Delegate employees.** Many hands make light work. Organize who will be in charge of certain aspects of the tour.
- **Do your homework.** Visit your representative’s website to see how to get in
IDI Composites
Noblesville, Ind.
Guide: Jay Merrell
Representative: Dan Burton (R-IN)

What to expect: “In September when I was in Washington D.C. for the Lobby Day, I went to Rep. Burton’s office and asked how I could arrange a plant tour. He gave me the number to his Indiana staff, and I had it arranged within a few days.”

Major talking points: “Rep. Burton was familiar with the industry and just had a few questions about styrene. I gave him as detailed a response as I could on the issue and the position of ACMA. He recognized the number of jobs our plant created, which is critical to the area.”

Representative’s Reaction: “He was very interested in our issues and how he could help, some of which he’s already done. He signed the congressional letter and is going to join the caucus and help where he can.”

Your Reaction: “I was impressed with the hour we spent together. Now I know it’s just a matter of continual follow-up because, let’s face it, there are a lot of constituents and all of whom have problems.”

Tips to Prepare: “Generate enough sample parts that will demonstrate the breadth of the composites industry. This will demonstrate that if we’re not able to do what we do, people won’t be able to buy a lot of U.S. made things. Also, remember to follow up. People who make contact several times a year are the ones they’ll remember and support.”

Advice in 40 Words or Less: “The most basic reason to do a plant tour is to put a face—100 faces—to the issues we tackle. You can go to their office, but when they see a building with people, it makes a difference.”

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Aeroset Inc.
Priest River, Idaho
Guide: Garry Hojan
Representative: Walt Minnick (D-ID)

What to expect: “We met Rep. Minnick, his staff and our mayor at the entrance for introductions and photos. After a safety briefing, we showed them our plant, focusing on production, machining, assembly and engineering. At each stage we had sample stations of completed work or components.”

Major talking points: “He asked basic questions like how many people we employ, how many products we produce, the quantity of each product that is sold each year and what our legislative concerns are in regards to composites. More poignantly, we discussed the reclassification of styrene and the current disconnect between small businesses and Capitol Hill.”

Representative’s Reaction: “His overall reaction was one of appreciation for the type of work we do and quality of working being done. As an aerospace company in a rural community known for its timber operations, our company demonstrates that location is not a stumbling block to companies wanting to relocate.”

Your Reaction: “I always enjoy showing our products and processes, and we have a great group of skilled individuals. It was great being able to connect with our Congressman on a more personal level, it isn’t the same over the phone or via email as when you can talk face to face.”

Tips to Prepare: “Do your homework on your representative before they come. This will give you something to talk about and it shows that you have taken an interest in them as well. I’d also recommend calling the office before the tour to see if there are any special considerations that you should be aware of.”

Advice in 40 Words or Less: “Plant tours are an effective way of closing the gap between your representative and your company. You can also engage them by sending press releases or asking advice on issues.”

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For more information or to obtain a copy of ACMA’s guidebook, visit http://www.acmanet.org/ga/styrene.cfm.
Glimpse Inside Hybrid Composites
Hybrid composites combine best of many materials

By Richard Stewart

Composite applications that incorporate other materials into a system or mix various types of fibers and resins are often referred to as hybrid composites. Today, several composite manufacturers and academicians are combining fiber reinforced polymer (FRP) materials with other materials to create new systems with enhanced properties. Here are just a few examples:

Cement-Filled FRP Pipes
Pioneered by researchers at several U.S. universities, hybrid FRP/cement-bridge columns, pilings, and decks have been successfully incorporated into low-maintenance civil engineering projects. A pioneer in hybrid FRP/cement technology, Dr. Amir Mirmiran, professor and dean of the College of Engineering and Computing at Florida International University (FIU) in Miami, says, “We started about 15 years ago to demonstrate that we could introduce composites into civil engineering and construction projects. Because the name of the game was economy, we focused on hybrid construction with concrete because it combines the advantages of composites with the high compressive strength and low-cost of concrete,” he recounts.

Mirmiran has gone through two generations of these hybrid bridge columns, the first used a pipe filled with unreinforced concrete, for use in non-seismic areas. The second generation was reinforced with steel in the pipe for use in non-seismic areas. The second generation was reinforced with steel in the pipe for use in non-seismic areas. The second generation was reinforced with steel in the pipe for use in non-seismic areas. The second generation was reinforced with steel in the pipe for use in non-seismic areas. The second generation was reinforced with steel in the pipe for use in non-seismic areas. Researchers at FIU are now working on the third generation, which eliminates steel by using ultra-high-performance concrete (six times stronger than conventional concrete) in the lower 20 percent of the tube’s length, then filling the rest with conventional concrete. “Our tests show that Gen 3 should provide both the strength and ductility needed, even for seismic regions,” he says.

“Eliminating steel simplifies the construction tremendously because we don’t have to prepare the reinforcing cage first, embed it in the footing, then lower the tube onto the reinforcement before pouring the concrete. Now it’s a matter of placing the tube as designed then filling it with concrete for a much simpler, much cheaper construction, without worrying about corrosion.”

Another pioneer in this area is Prof. Amir Fam, Canada Research Chair in Innovative and Retrofitted Product Innovation.
Structures at Queens University in Ontario. He has worked with filament-wound composite tubes as “stay-in-place” closed forms for piles, columns and utility poles, as well as open forms for bridge decks for more than 15 years. “For closed forms, the advantage of using FRP pipes is that the properties can be engineered and controlled to achieve maximum flexural or axial strength for an application,” he explains.

Fam is the chair of the American Concrete Institute’s committee for Stay in Place Forms, which focuses on FRP reinforcement for concrete. The group is currently looking into developing a design guide. He is collaborating with others who have been involved in hybrid FRP systems, including a successful bridge project in Virginia that was built nearly a decade ago using hybrid FRP technology. He also works with Ontario, Canada’s Ministry of Transportation to promote these structural forms for bridge decks.

“Decision makers tend to be conservative, not risk-takers,” adds Fam. “There are those who are forward thinking, who are willing to try the technology, and those who prefer to stick with the conventional methods they have always used. Any new technology takes a long time to penetrate the market and get into wide use,” he says. “It’s our job to educate the civil engineering community about the benefits of these hybrid composites.”

At the University of South Carolina, Dr. Paul Ziehl oversees and maintains an active research program in the areas of nondestructive evaluation of composite and hybrid concrete structures. He agrees that more education is necessary for civil engineers. He was involved in the design of two bridges built in Texas as demonstration projects to show that the technology works well. The bridges used cement-filled U-beam FRP components, fabricated using glass-filled vinyl ester resin in a vacuum infusion process.

He feels that the reluctance on the part of state DOTs to utilize these hybrid concepts comes down to the higher first cost compared to conventional materials and non-familiarity with the design. “Engineers, generally, are not going to go with materials that they haven’t used before unless there is good guidance out there,” he says.

“People need to be educated in this type of material system, and it needs to be an industry-led push toward optimization and education to promote this technology. Ultimately, the people who are going to benefit from this are those who manufacture composites. So it needs to be led by them,” he comments. “It’s not realistic to think that it will be led by state DOTs.”

Hybrid FRP for Bridges
Hybrid composites technology has had great success in bridge applications, owing to its high fatigue resistance and non-corrosive nature. As a result, hybrids are making steady inroads into the civil infrastructure industry in new bridge construction. The Missouri DOT recently was

“Because the name of the game was economy, we focused on hybrid construction with concrete because it combines the advantages of composites with the high compressive strength and low-cost of concrete.”

— Amir Mirmiran, Dean of Engineering, Florida International University, Miami
awarded a Federal Highway Administration (FHWA) grant for projects using hybrid composite technology.

Concrete beams made with an FRP shell will be used to construct the bridges. The hybrid technology is expected to reduce construction time on the three-bridge project by 25 percent, according to the FHWA. The bridges can also be expected to last longer and require less maintenance than bridges made with steel-reinforced concrete components.

Lawrence Technological University (LTU) in Michigan has demonstrated innovative uses of carbon fiber composite hybrid applications in bridge structures. Led by Prof. Nabil Grace, dean over the College of Engineering and director of the Center for Innovative Materials Research (CIMR), the university developed a box-beam bridge design that incorporates carbon fiber reinforced composites as tendons to replace steel, which should double the life of a bridge, according to Grace.

He recently completed a study on
life-cycle cost assessment funded by the National Science Foundation. He found that by investing in innovative, non-corrosive materials for new bridge construction, significant savings can be realized over the life of the structure due to reduced maintenance and repairs. Over a 100-year lifespan, a bridge made with hybrid composites would cost one-third that of a conventional, steel-reinforced bridge, including the additional 15 percent initial cost for CFRP materials,” he says.

LTU has also developed a ductile hybrid fabric woven of two types of carbon fibers and a glass fiber. The patented fabric is designed to be wrapped around existing precast concrete beams to increase strength. One ply of the fabric is said to increase the moment-carrying capacity of a structure by 30 percent; two plies can increase the strength by 60 percent, says Grace. The fabric was tested under high heat and high pressure in the CIMR’s fire chamber, proving that it can also protect a concrete structure for up to three hours of fire exposure.

Fiber Metal Laminates
Researchers in the Structural Integrity Group at Delft University of Technology in the Netherlands focus on optimizing materials for aerospace-based applications. They developed the concept of fiber metal laminates (FML), fabricated by stacking thin layers of aluminum sheets together with FRP composites.

Called Glare technology, the resulting hybrid combines the advantages of metallic materials with fiber-reinforced matrix systems. The laminated material provides enhanced fatigue, impact and damage tolerance characteristics, as well as low density, according to Calvin Rans, professor at Delft’s Aerospace Engineering. Importantly, the hybrid can be tailored to optimize performance in particular locations on an aircraft structure.

“Fiber metal laminates take the best of both worlds and compensate for the worst of both worlds. Composites are fatigue insensitive, but they have a huge damage tolerance issue. Metals are the opposite. They are very forgiving; they plastically
Fiber metal laminate material is made up of stacked layers of thin aluminum sheets and FRP composites, providing the best of both materials.

deform and can react well to different types of accidents, but they suffer from fatigue,” he explains. “When you put them both together, they compensate for each other.”

The Airbus A380 was the first major application of FML materials. Standardized fiber metal laminates were used in order to aid certification, notes Rans. “We used very specific, defined layups because it helped to get it certified and get that technology going. Now we’re looking at tailoring FML for specific applications, looking at varying the types of alloys and using multiple composite types within a given laminate,” he says.

Dr. R.C. Alderliesten, also on the Aerospace Engineering faculty, notes that the researchers are stepping away from treating FML as a material and more as a structural concept that can be custom fit to the needs of the application. “I think there is going to be a huge potential for FML, especially within upcoming narrow-body aircraft design,” he observes. “Composites have made huge gains in wide-body aircraft because of their fatigue benefits, but both Airbus and Boeing are experiencing issues now with manufacturing quality control.”

Alderliesten notes that such large aircraft are not made at the same pace as the smaller, narrower planes, which are manufactured on the order of 45 or 50 aircraft a month, “So the type of manufacturing processes and the lead times needed for carbon fiber composite techniques are going to hamper that.”

“With hybrid materials, you can use composite manufacturing techniques, but you can also create flat sheets and assemble them like a metallic structure, using traditional fastening and riveting techniques and produce structures much more quickly,” he says.

Hybrid Bat a Homerun
VyaTek Sports Inc., Tempe, Ariz., created an innovative bat concept that strategically trims sections of aluminum from the tapered handle section and replaces the metal with stiff, lightweight carbon inserts. A pre-
formed carbon sleeve, called Exogrid, is bonded to the inside of the handle under high heat and temperature to create a carbon composite/aluminum hybrid in a process developed by VyaTek called Bi-Fusion technology.

“We have been working on a variety of metal and composite hybrid structures for nine years,” relates VyaTek founder and CEO Howard Lindsay, who has a strong background in both metals and composites. The Exogrid concept came about during the company’s development of a titanium bicycle as a way to reduce weight and increase torsional stiffness in the metal tubes. Next came a lacrosse stick that incorporated the hybrid composite technology with aluminum. Then the bat and a golf club shaft.

The latest generation of VyaTek’s Exogrid technology is incorporated in the company’s PhD (passive hybrid damping) line offered by sporting goods manufacturer Rawlings. The hybrid aluminum bat features an innovative visco-elastic layer that turns strain or movement energy into heat, explains Lindsay. “It’s a softer resin system that retains enough rigidity to be a structural component but enough elasticity to absorb energy.”

VyaTek technology has been used by Louisville Slugger in its Exogrid line of bats for players at the college, high school and Little League levels since 2005. Major League Baseball has outlawed them, however, because the velocity of a ball coming off an aluminum bat is substantially higher than a wood bat. “Aluminum or hybrid bats in the hands of major league hitters would radically change the character of baseball. Everybody would be hitting the ball out of the park,” observes Lindsay.

Richard Stewart is a freelance journalist who often writes about the composites industry.

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Despite an uncertain economy, the composites industry never stops moving forward. Its leading companies never cease to innovate, developing new technologies, products and processes.

There’s only one place where all this innovation comes together all at once, and that’s COMPOSITES 2011. The following pages outline the education opportunities and networking events in Fort Lauderdale, but here are some of the highlights:

Main Stage Education
Throughout the show, a site on the exhibit hall floor will be dedicated to education sessions and panel discussions. All attendees and exhibitors are welcome to hear presentations on a wide range of topics.

ACE/Pinnacle Awards
Products entered into the Award for Composites Excellence and Pinnacle Product competitions will be displayed in the exhibit hall at COMPOSITES 2011, including entrants in three new categories: Design, Manufacturing and Market Growth.

Keynote Speaker
Gen. Stanley McChrystal, retired Four-Star Army general and the former commander of U.S. and International Forces in Afghanistan, will provide the opening keynote address. He’ll discuss management strategy, with an emphasis on openness, teamwork, and forward-thinking. He will also discuss the use of composites in the military.

Inside Reporting
Before, during and after the Show, Composites Manufacturing editors and writers will post interviews with education presenters, exhibitors and attendees on www.compositesmanufacturing blog.com. Or follow us on Twitter @cmmagazine.
You’re invited to connect, learn and grow with the composites industry — Look inside to find out how.
COMPOSITES 2011 connects the entire composites industry to provide you the broadest range of networking, vendors and education — face-to-face and under one roof. Find everything from basic materials to cutting-edge, high-tech products and equipment to help you grow and remain competitive in traditional and emerging markets. Plus, learn with in-depth education and demonstrations focusing on real world applications of materials, processes and innovations.

Learn with Top-Notch Education

Expert speakers from inside and outside the industry and from around the globe are on-hand to provide education on topics for those just entering the industry, as well as advanced topics for seasoned professionals. You’ll find:

- General sessions open to all attendees
  - **Wednesday, February 2:** General Stanley McChrystal will share insights to help composite companies of all sizes understand the importance of openness, teamwork and forward-thinking.
  - **Thursday, February 3:** Future trends on societal changes, technology, globalization and what this means to the composites industry will be highlighted.

- Over 100 peer-reviewed technical papers and education breakout sessions — with some developed by SAMPE and SPE.

- Topics of interest to composite manufacturers, suppliers, distributors, end users, and specifiers.

- Sessions on green composites, materials, manufacturing, design and engineering, regulation and legislation, traditional and emerging composites markets, and business strategy and operations.

- A University Poster Session presenting new research.

Connect and Learn on the Show Floor

With the broadest range of composites industry companies together at once, the exhibit hall offers the best place in 2011 to see the newest innovations, products and services available. You’ll discover:

- An expected 200 exhibitors.

- Special pavilions for Adhesives and Sealants, International, University and First-Time exhibitors.

- Manufacturing demos directly on the Show Floor.

- An updated ACE and Pinnacle Competition Showcase with new categories showcasing the market potential, innovation and the creative possibilities of composites.

- Increased education on the “Main Stage” — hear from up-and-coming and women leaders in the industry, as well as technical paper award winners, ACE and Pinnacle Award submitters and exhibitors.

- Product/service announcements and launches from leading companies.

- A fabulous closing raffle prize for a cruise!

Connect with Colleagues

You’ll benefit from plenty of networking time to share successes, challenges, and to just connect — or re-connect — with others in the industry.

- Enjoy the Florida warmth outside in February at the not-be-missed Opening Welcome Reception.
Schedule-at-a-Glance

Wednesday, February 2, 2011
9:00 am – 12:00 pm
Education Sessions, Workshops and Technical Papers
12:00 pm – 1:00 pm
University Poster Display
1:30 pm – 2:45 pm
Keynote General Session with General Stanley McChrystal (open to all)
3:00 pm – 5:00 pm
Education Sessions, Workshops and Technical Papers
5:30 pm – 7:00 pm
Opening Welcome Reception

Thursday, February 3, 2011
8:30 am – 9:30 am
General Session: A Futurist Vision of the Industry
9:30 am – 5:30 pm
Exhibit Hall Open
12:00 pm – 1:30 pm
ACMA Awards Lunch
2:00 pm – 5:00 pm
Education Sessions and Technical Papers
5:30 pm – 6:30 pm
Specialized Industry Networking Receptions

Friday, February 4, 2011
8:30 am – 5:00 pm
Education Sessions and Technical Papers
9:00 am – 3:00 pm
Exhibit Hall Open Closing Raffle
5:00 pm – 9:00 pm
On Your Own Networking

GET CONNECTED!

Join COMPOSITES 2011 on Facebook, Twitter and LinkedIn to easily connect with other composites industry professionals.

Go to www.acmashow.org to sign up and receive special announcements and discounts!

Make Your Plans Now at www.acmashow.org:

- Register
- Make Housing Reservations
- View Exhibitors, Program and Speakers
- Set Appointments with Exhibitors
- Find Out Who’s Attending
- Create Your Personal Schedule of Events

FOR A CURRENT LIST OF EXHIBITORS, PROGRAM INFORMATION AND TO REGISTER, VISIT WWW.ACMASHOW.ORG
Visit with current suppliers, find the products you need and discover new vendors in the Exhibit Hall. Once registered, take advantage of the networking tools and set up appointments with exhibitors before you arrive.

Find Exhibitors representing these categories:

**MATERIALS**
- Adhesives & Sealants
- Additives/Fire Retardants/Fillers
- Armor/Ballistic Materials
- Carbon Fibers
- Cast Polymer
- Ceramic Materials/Composites
- Coatings
- Composites Structural Elements
- Compounds/Putties
- Core Materials
- Glass Fibers
- High Performance Materials
- Electrical/Electric
- Fabrics
- Foams
- Matrix Materials
- Thermoplastics
- Reinforcements
- Resin & Gel Coat
- Solid Surface
- Preforms
- Prepregs

**EQUIPMENT AND SUPPLIES**
- Assembly/Bonding Equipment
- Automation Equipment
- Blenders/Mixers
- Auxiliary Processing
- Braiding, Knitting/Stitching
- Autoclave
- Cleaning Products
- CNC Machining Equipment
- Cure Initiators/Catalysts
- Tools & Tooling Equipment
- Vacuum Systems
- Ventilating Equipment/Dust/Odor Control
- Pultrusion Equipment
- Ovens/Dryers/Furnaces
- Fabricating Supplies
- Fasteners
- Filament Winding Equipment
- Mold Release Systems
- Presses, Compression
- Infusion Technology Equipment
- Laser Projection Equipment
- Sporting Equipment
- Testing Equipment
- Resin Transfer Molding Equipment
- Safety Equipment and Supplies
- Repair

**BUSINESS**
- Computer Hardware/Software
- Consulting Services

**OTHER**
- Association, Trade or Civic
- Design/Product Development Services
- Education/Training
- Publications, Trade

**EXHIBIT HALL HOURS**
- Thursday, February 3
  - 9:30 am – 5:30 pm
- Friday, February 4
  - 9:00 am – 3:00 pm
EXHIBITOR LISTING

A.B. Carter Inc.
A.P.C.M. Manufacturing LLC
ACMA Central
ACS International
Adhesive Systems Inc.
Adhesive Technologies Inc.
Ahlstrom Glass Nonwovens LLC
Airetech International
Akzo Nobel Polymer Chemicals
Allied Custom Gypsum
American Colors Inc.
Amorim Cork Composites
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North America’s largest polyester resin manufacturer has a wide range of open and closed mold resins, gel coats, colorants and additives. The industry’s best technical service team provides further support. Our proprietary process control software guarantees batch-to-batch consistency from six North American plants, three European and three Asian facilities.
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Ashland Inc.
Ashland provides specialty chemical solutions to the world’s most essential industries. Ashland is committed to the composites industry and has sponsored a new initiative to grow the composites industry in 2011. Visit us at booth S25 at Composites 2011 to learn more about GreenBuild and the CompositeBuild.com showcases.
ATC Formulated Polymers Inc.
Axel
Baltek Inc. — a division of 3A Composites Core Materials
Bayer Material Science
Bedford Reinforced Plastics
Best Bath Systems
Binks DeVilbiss — ITW Industrial finishing
Brenntag Specialties Inc.
Broadview Technologies Inc.
BYK USA Inc.
Center for Integration of Composites into Infrastructure
Chemique Adhesives Inc.
Chem-Trend LP
China National Building Materials Corporation
CHOMARAT North America
CISC-CPP
tCMS North America
Colbond Inc.

Composite Panel Solutions
Composite Polymer Design
Composite Technical Services
Composites Europe
Composites Manufacturing Magazine
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When you work with Composites One, you are guaranteed a complete product line, technical and regulatory knowledge, and online business solutions. We offer a variety of raw materials including resins, gel coats, fiberglass and even MRO supplies. Experience the Power of One. Composites One.
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Dyplast Products LLC
E.T. Horn Company
Eastman Machine Company
EcoPoxy Systems
Elliot Company of Indianapolis Inc.
Engineered Fillers International
Engineered Syntactic Systems
Envirosystems LLC
Eurovac Inc.
Fiber Glass Industries
Fiberglass Coatings Inc.
Fiber-Line Inc.
Franklyn Industries
Frees Inc.
Freudenberg Nonwovens
FRP Equipment.com Inc.
General Plastics MgF Co.
Gibco Flex-nold Inc.
Gibson Fiberglass
Graco Inc.
Gruber Systems, Inc.
Gunnar USA Inc.
Hawkeye Industries Inc.
Henkel Corporation
Hennecke
HK Research Corporation
Hodogaya Chemical (USA) Inc.
Huber Engineered Materials
IKONICS Advanced Material Solutions
Imperium Inc.
Interplastic Corporation/NAC
Intertek
IPS Structural Adhesives
ITW Insulation Systems
ITW Plexus
ITW WindGroup
JRL Ventures
Kenrich Petrochemicals Inc.
Kenway Corporation
KNF FLEXPAK Corporation
Knowlton Technologies
LCOA Composites
Lectra
Lindau Chemicals Inc.
LITEK Composites Corporation
LITEK Composites Corp is the US division of Interland Company Ltd. whom have been supplied the best quality of the standard FRP Pipes and Fittings products to FRP industry Worldwide since 1984. LITEK Composites Corp is the new distribution center located in Southern California with stocks of different standard sizes of Coupling, Elbow, Flanges, Manways, U-vents and tools are ready for immediate delivery. Please visit our websites at www.frpsupply.com to view our product lines and check out our great prices!
Lucintel
Luna Technologies
MacMillan & Donnelly Inc.
Magna Exteriors and Interiors
Magnum Venus Plastech
Mahogany Composites Kit Manufacturing
McClellan Anderson
McCabe Division/McGee Industries Inc.
Mektech Composites Inc.
METYX Composites
Momentive Performance Materials Inc.
MultiCam Inc.
Nida-Core Corporation
Northern Fiber Glass Sales
Norton Abrasives
NuWhirl Systems Corporation
Olympus
Owens Corning
Parabeam BV
Park Electrochemical Corporation
Performance Minerals Corporation
Phoenix Resins Inc/ MAS Products
Plascore Inc.
Plasticolors Inc.
PPG Industries
Precision Fabrics Group
Precision Quincy Corporation
Pro-Set Inc.
Reichhold
Rexco Mold Care Products
SAERTEX USA, LLC
SAMPE
Scott Bader Inc.
Sika Corporation
S-L Laser
Smart Tooling
Smooth-On Inc.
Southwestern Ontario Marketing Alliance
Specialty Products Co.
Structural Composites Inc.
Superior Fiberglass & Resins
SWORL (div. of Prairie Technology Group Inc.)
Sygma Performance Initiators Inc.
Tacionic
TCR Composites Inc.
Technical Fibre Products
Teijin Aramid USA Inc.
The ChemQuest Group Inc.
The R.J. Marshall Company
The Warm Company
Thermal Wave Imaging
Thermwood Corporation
Techo Tenax America Inc.
TR Industries
TriClad Honeycomb Corporation
Unicomposite Technology Co. Ltd.
United Soybean Board
University of Alabama at Birmingham (UAB)
University of Calgary
University of Mississippi
Valspar
Vectorply Corporation
Ventilation Solutions
Wabash National (DuraPlate Products Group)
Wattines & Associates Inc.
WebCore Technologies
Wisconsin Oven Corporation
Wm. T. Burnett & Co.
Xamax Industries Inc.
XG Sciences
Zeon Chemicals and Telene

Below is a listing of educational and technical paper topics, subject to change, as of November 12, 2011. For a complete schedule including dates, times, and up-to-date speaker information, see the Conference Program online at www.acmashow.org.

**EDUCATION SESSION TOPICS**

**Design and Engineering**
- Toward Designing Pultruded Structures with an ASCE Standard
- Methods for Construction of Self-Heated Molds for Curing of Composite Laminates
- Review and Comparison of ASTM Tensile Test Methods for Composite Materials

**Business Strategy and Operations**
- Composites Statistics and Global Industry Trends
- Exporting Issues
- Understanding Investments, Joint Ventures, Mergers and Acquisitions
- Women in Composites
- Future Leaders in the Industry
- Nailing Innovation
- How to Take Advantage of Government Initiatives to Finance Innovation in the Composites Industry
- Advanced Lawsuit Protection, Tax Reduction, and Estate Planning Strategies
- University-Industry Partnerships — From Research to Practice

**Traditional and Emerging Markets**
- A State-of-the-Art Overview: Composite Utility & Telecommunication Structures
- Advances in Light Weight Boat Fabrication
- DOE and WindPower
- A Global View of Composites in Aerospace
- Lightweighting

**Manufacturing**
- Robotic Trimming Helps Composites Manufacturers Improve Quality and Safety While Saving Time and Money
- Gel Coat Repair
- Advancements in Processing Additives for Compression Molding
- How to Select the Right Mold Release
- How to Set Up Spray Equipment for Maximum Performance/ State of the Art in Open Mold Production
- Advantages of Lean & LRTM Manufacturing in Composites
- Benefits of the LRTM Process and Troubleshooting Tips

**Materials**
- Room Curable Polyurethane Adhesive for “Primerless” Composite Bonding
- Fiberglass Sizing 201: How Formulation Translates to Function
- Taking Composites to a Higher Level (Developed by SAMPE)

**Green Composites**
- Lowering the Operations Environmental Footprint
- Creating Competitive Advantage Through Sustainability
- Green Design for Better Manufacturing and Profit
- Natural Fiber for Composites 101: When, Why and How to Replace Fiberglass with Kenaf/Juet/Flax
- USDA Bio-Preferred Program
- CompositeBuild.com — Reach our End Users
- The Value of Third Party Certifications
- LCI-Pultrusion Model
- Green Energy: Growth Potential Beyond Wind
- Life Cycle Assessments (LCA) and Life Cycle Inventory (LCI)

**Regulatory and Legislative**
- Combustible Dust
- Styrene Industry Worker Exposure Limit
- Current Compliance Topics for Composites Manufacturers
- Proactive Strategies for Surviving an EPA Compliance Audit
- Expansion of UEF to Include Emissions from Closed Molding and SMC Machines
- Communicating Sensitive Information to Employees and Communities
- Protecting Employees with Respiratory Equipment and Ventilation Systems
- Styrene Health Effects
- Liability and Insurance Issues
POLYCON — Cast Polymer
- Lean Manufacturing in 2011
- Landing LEEDS Projects
- Developing a Sales System
- Understanding Your Market
- Profitable Showers
- Differentiating Your Product Offering Through Kitchen and Bath Industry Partners
- 45 Tips in 45 Minutes
- Using MasterCast™ to Market Your Product
- ICPA General Session

TECHNICAL PAPER TOPICS

Design & Engineering
- 20 Years of FRP Applications in Italy for Restoration, Strengthening and Seismic Upgrade of Historical Structures: Materials and Case Studies
- Reactive Renewable Oil Oligomer as a Green Additive to Enhance DCPD Resins
- Evaluation of Different Approaches for Property Estimation for Pyrolysis Modeling Applied to FRP Composites
- Real-Time Collaborative Engineering for Composites
- Challenges of Vacuum Infusion with Large Complex Shapes
- Making Advanced Composites with Multi-Functional Monitoring Capabilities
- Experimental and Numerical Studies on the Effects of Geometry and Stacking Sequence of Composite Plate Under the Influence of High-Velocity Impact
- An Investigation of Pin Bearing Strength on Composite Materials

Green Composites
- Innovation Approach in Reducing Flammability of Cellulosic Fibers for Polymer Composite Production
- Green Composites Through the Use of Styrene-Free Resins and Unsaturated Polyesters Derived From Renewable and Recycled Raw Materials
- The Effects of Chemical Modification Techniques on the Mechanical Properties and Moisture Absorption of PHB/Oak Wood Flour Engineered Biobased Composites
- The Future of One-Hundred Percent Bio-Based Composite Resins

Manufacturing
- The Effect of Bonding Fixture Heat Source on Bond-Line Read-Through Severity
- Precision Waterjet Cutting in the Composites Industry Utilizing Robots for High Quality Accurate Machining
- Enhancing Flow of CNT-Doped Resins in the Manufacture of Multi-Scale Composites Using the RIDFT Process
- 6 Sigma & Designed Experiments — Understand Your Materials and Processes while Minimizing Unnecessary Testing

Traditional and Emerging Markets
- Developing a Composite Repair System for High Temperature Pipe Repairs
- Flexure and Shear Performance of PHB/Hemp Engineered Biobased Composite Sandwich Panels

Materials
- The Effect of Initiator Type and Amount on the Linear Shrinkage and Cure of Unsaturated Polyester Resins
- Innovative Use of Ultrasound in the Manufacturing of Paints and Coatings
- Novel Ultraviolet Light Absorber for the Photo Protection of Carbon Fiber Reinforced Polymers
- Optimization of Silicon-Interface Deposition Time for the Growth of Carbon Nanotubes on Carbon Fiber
- Development of the High Performance GFRP Included Multi-Walled Carbon Nanotubes
- Development of Innovative Epoxy Prepregs Using Bio-Based Curing Agents
- Mechanism of E-glass Corrosion Using SEM/EDX

Pultrusion
- Thermoplastic Pultrusion Process using TWINTEX(r), GLASS POLYPRO Roving
- Effect of Injection Chamber Length and Resin Viscosity in the Resin Injection Pultrusion Process
- Examination of Test Conditions for the Freeze/Thaw Testing of Pultruded Composites
- Evaluation of Elevated Temperature Factors for Pultruded Composites
- Improvements in Pultrusion Processing and Mechanical Properties of Pultruded Epoxy Carbon Fiber Composites using 3M Matrix Resin S831

FOR A CURRENT LIST OF EXHIBITORS, PROGRAM INFORMATION AND TO REGISTER, VISIT WWW.ACMASHOW.ORG
Registration and Housing

To register and to make your hotel reservations, visit www.acmashow.org

**Full Conference** — Includes access to all activities and tickets to all events

*Early Bird*
- Member: $539 | Non-Member: $699

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- Member: $659 | Non-Member: $859

**Exhibit Hall Only** — Includes access to the Exhibit Hall. Tickets to receptions and Awards Luncheon must be purchased separately. Education session tickets can be purchased onsite.

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*Regular*
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**Show Sampler** — Includes access to 3 educational or technical paper sessions and the Exhibit Hall. Tickets to Receptions and Awards Luncheon must be purchased separately.

*Early Bird*
- Member: $299 | Non-member: $399

*Regular*
- Member: $359 | Non-member: $479

For ticket prices, onsite rates, and student, spouse/guest and press registration information, see the Registration section at www.acmashow.org.

**Housing Information**

Make your reservations by January 7, 2011, for the best rates and availability. All hotels have complimentary shuttle bus transportation to and from the Ft. Lauderdale Convention Center. Rates listed below are for COMPOSITES attendees and do not include taxes and fees. Reservations MUST be made through the COMPOSITES Housing Bureau at www.acmashow.org (under Housing Information) to receive these rates.

- **Hilton Marina**
  - COMPOSITES 2011 Headquarters Hotel
  - Room Rate of $229/night
  - Walk to COMPOSITES 2011 (.3 miles, 10 min.)

- **Bahia Mar Resort & Yacht Club**
  - Room rate of $159/night or $189/night
  - 2 Miles to COMPOSITES 2011

- **Embassy Suites Ft. Lauderdale**
  - Room rate of $189/night
  - Walk to COMPOSITES 2011 (.7 miles, 15 min.)

- **Hyatt Regency Pier Sixty-Six Resort & Spa**
  - Room rate of $219/night
  - 1 Mile to COMPOSITES 2011

- **Renaissance Ft. Lauderdale**
  - Room rate of $180/night
  - Walk to COMPOSITES 2011 (.3 miles, 10 min.)

- **Sheraton Ft. Lauderdale Beach Hotel**
  - Room rate of $169/night
  - 1.6 Miles to COMPOSITES 2011

For ticket prices, onsite rates, and student, spouse/guest and press registration information, see the Registration section at www.acmashow.org.
Composites and the Humpty Dumpty Effect
Howard Lindsay spent more than 10 years creating effective aerospace and military composite-based products and technologies. He then founded ViaTech, where he applied that knowledge to consumer products. He is now head of Vyatek Sports, a composites technology and R&D company.

Why Engineers Won’t Specify Composites
In his role at the American Composites Manufacturers Association, John Busel interfaces with government, academia, and industry to promote composites and lead industry programs in market expansion and development of new market opportunities.

Aerospace Composites: Invention or Perfection
Theo Dingemans began working on high performance polymers as a graduate student at UNC-Chapel Hill. After, he worked at the advanced materials and processing branch at NASA-Langley. In 2003, he returned to his native Netherlands, where he teaches at TU Delft as a professor of Aerospace and Engineering.

Failure Analyst Points to Flaws in Manufacturing Composites
As a PhD student at the University of Michigan, Joseph Rakow’s research carried him from advanced composites laboratories into failure analysis. Rakow has expertise in structural and mechanical engineering with an emphasis on composites. As a failure analysis associate, companies call on him to find the how and why of a composite failure in their product.

AWEA CEO Says it’s Time for the U.S. to Step-Up Production
Denise Bode is CEO of the American Wind Energy Association (AWEA). She is a nationally recognized energy policy expert and has more than 30 years experience in the energy field. Here, Bode shares her opinions on the growing wind energy market and the role composites can play.

To read the interviews with these and other leading members of the composites industry, visit www.compositesmanufacturingblog.com and click on “Q&A Interviews.”
Not long ago, the Utility and Communications Structures Working Group (UCS-WG), comprised of manufacturers, distributors and suppliers, met at ACMA Headquarters to talk strategy. The UCS-WG is one of many committees of like-minded members who collaborate to promote composites in particular market sectors. Working together, groups like the UCS-WG have made an impact on codes and standards, and changed specifiers’ perceptions of composite materials. No individual company could accomplish the same on their own.

ACMA supports and fosters these committees as part of its Composites Growth Initiative. All it takes to form a committee are members willing to share resources and ideas to make composites the material of choice in any given market. If you’d like to join an existing committee or start a new one, please call our membership department at 703-525-0511 and let us know.

Tom Dobbins, CAE
Composites Caucus Co-Chair Loses Seat
Rep. Rick Boucher (D), co-chair of the House Composites Caucus, lost his race for re-election in Virginia’s 9th District to Republican Morgan Griffith. Boucher held the seat for 28 years and has been instrumental in helping ACMA pursue a reasonable assessment of styrene by the NTP. Recently, he co-sponsored a letter to Department of Health and Human Services Secretary Kathleen Sebelius to address several concerns with the National Toxicology Program’s proposal to list styrene as a “reasonably anticipated” carcinogen in the NTP Reports on Carcinogens.

Styrene Affects Mice Differently
A recent SIRC study with genetically modified mice supports the hypothesis that mouse lung tumors following inhalation exposure to styrene are not relevant to human risk assessment. The study undercuts the basis of NTP’s proposed listing of styrene as a “reasonably anticipated” carcinogen. Contact John Schweitzer at jschweitzer@acmanet.org for more information.

Government Proposes Truck Fuel Efficiency Standards
According to a DOE release, on Oct. 25 the EPA and DOT announced the first U.S. standards to reduce CO2 emissions and improve fuel efficiency of heavy-duty trucks and buses, beginning with the model year 2014. The agencies
propose new standards for three categories of heavy trucks: combination tractors, heavy-duty pickups and vans, and vocational vehicles. There will be a 60-day comment period beginning when the proposal is published in the Federal Register. For more information visit the NHTSA website at www.nhtsa.gov/fuel-economy.

ACI 440 Balloting New Standards
The American Concrete Institute Committee 440 (FRP Composites) will ballot several important documents related to FRP and concrete over the coming months. The documents include updates to the 440.1R-06 on FRP rebars in concrete information on deflection and serviceability issues, 440.1R-08 on a new chapter for FRP strengthening materials used in seismic strengthening applications, and a first ever report on FRP durability in concrete applications that offer accelerated conditioning protocols for FRP products. For more information, email John Busel at jbusel@acmanet.org.

FRP and Concrete: Mark Your Calendars
The 10th Fiber Reinforced Polymer for Reinforced Concrete Structures Conference, in conjunction with the Spring American Concrete Institute convention, will focus on the state of FRP composites in civil infrastructure. Topics will include strengthening, internal reinforcement, masonry, fatigue, extreme events, durability, bond, emerging technologies and applications, and material characterization of FRP. For program information email John Busel at jbusel@acmanet.org.

Volunteers Needed for New Marketing Committee
ACMA seeks volunteers to join the new Marketing and Public Relations Committee. The committee will identify appropriate content and vehicles for promoting composites, branding ACMA, and prioritizing outreach strategies. Individuals who hold a marketing and/or public relations position within their company are encouraged to apply. For more information, please email Marcy Dickson at mdickson@acmanet.org or call 703-682-1671.
Inside ICPA

Nominate Manufacturer and Supplier of the Year
The best of the best will be honored by ICPA during COMPOSITES 2011, Feb. 2-4 in Ft. Lauderdale, Fla., when Manufacturer and Supplier of the Year awards are given during the ICPA General Business Session. Submit your nomination online at www.icpa-hq.org/ by December 15, 2010.

ICPA Multi-Regional Workshop a Success
More than 60 attendees took part in the Fall 2010 ICPA Multi-Regional Meeting held near Dallas at the end of October. The education sessions focused on understanding how outside forces – from architects and construction - play a role in your company’s success. Hands-on demonstrations were held at Gruber Systems’ facilities, and attendees networked at the Dallas Cowboy’s stadium. A special thanks to Gruber Systems for hosting the meeting, and Huber Engineered Materials and R.J. Marshall for sponsoring this event.

Call for Photos
Composites Manufacturing is requesting photos of your plant, products, and people for use in PostCure Chatter, the magazine’s back-page department. Email Melinda Skea at mskea@acmanet.org for details.

Composites Manufacturing

Conference & Trade Show 2011
17-18 March
Hyatt Regency Sanctuary Cove, Gold Coast, Queensland, Australia

Invitation to Participate
Speakers Exhibitors Sponsors Delegates
The Conference will feature two days of presentations, a trade show and live practical demonstrations.
The Conference Dinner is a must!
Give a Presentation, workshop or tutorial
Exhibit your products & services at the trade show
Stage a practical demonstration
Attend the conference & trade show
Sponsorship options also available
Register online
www.compositesconference.com

NIDACORE (Australia)
Zero Shrink Nord™ Tooling Resin
Glen Nørsett of Marine Concepts: “We have run the Nord resins for over 2 years with excellent results. Recently we built 4 molds for an aerospace project using the Nord RM 3000 vinyl ester resin. The specification on the molds required post curing (parts) at 250 deg while maintaining tight tolerances (almost zero shrink). The tools performed as designed and the customer was very happy. I would recommend both resins to anyone who wants to build a stable quality mold.”

Come see us at COMPOSITES 2011, Booth #718
### New Members
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  - Houston
- Better Composites LLC
  - Gig Harbor, Wash.
- C.R. Onsrud Inc.
  - Troutman, N.C.
- Companion Systems
  - North Salt Lake, Utah
- Harbor Technologies LLC
  - Brunswick, Maine
- Illstreet Composites
  - Charleston, S.C.
- NEW TEC Inc.
  - Aberdeen, S.D.
- Southwestern Ontario
  - Marketing Alliance
  - St. Thomas, Ontario, Canada
- Vero Verde LLC
  - Baltimore

### New CCTs
- Javier Aguirre, CCT
  - Independence, Kan.
- Karla Appelblom, CCT
  - Drummondville, Quebec, Canada
- Nick Case, CCT-VIP
  - Spearfish, S.D.
- Chad Green, CCT-VIP
  - Spearfish, S.D.
- Lloyd Harlan, CCT
  - Miami, Okla.
- Travis Hins, CCT
  - Miami, Okla.
- Jerry Hocutt, CCT
  - Chickasha, Okla.
- Cory Hoffman, CCT-VIP
  - Spearfish, S.D.
- Jeffrey Huff, CCT
  - Miami, Okla.
- Chris Malo, CCT-VIP
  - Spearfish, S.D.
- Alan McCoy, CCT-VIP
  - Spearfish, S.D.
- Eric Mizen, CCT
  - Joplin, Mo.
- Robert Murray, CCT
  - Kingsbury, Texas
- Stewart Olsen, CCT
  - Houston
- Chris Owens, CCT
  - Kingsbury, Texas
- Don Partridge, CCT-VIP
  - Tulsa, Okla.
- Jean-Guy Picard, CCT
  - Drummondville, Quebec, Canada
- Kurt Snell, CCT
  - Tulsa, Okla.
- Chris Snell, CCT
  - Tulsa, Okla.
- Konan Swimmer, CCT
  - Tulsa, Okla.

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**META AND PARA ARAMID PAPER**

LongPont Co., Ltd manufactures meta and para aramid paper at its three production lines in China, producing 600 tons per year, for use in aviation, marine, and electrical housing applications and more.

For more information, visit

www.longpont.cn or email davidlianjun@163.com
Come to Composites 2011 and see the structure from CompositeBuild.com sponsored by Ashland.

Presented LIVE by Composites One with the Closed Mold Alliance and over 15 top suppliers at Composites 2011, Booth # 917, February 3-4.

LEAN MEAN CLOSED MOLD MACHINE DEMO FEBRUARY 3-4 SAVE THE DATE
Confounded Composites!

Take a second look and see if you can find the differences in these two pictures.

Meet Puffin, a new stealthy, hover-capable concept vehicle from NASA.
The Puffin is a vertical take-off and landing tail sitter aircraft concept made of carbon fiber that would be powered by a redundant set of electric motors. To read more about it, turn to page 4.

1. Color of Nike swoop on shoe;
2. Extra house in background;
3. Blue stripe now red;
4. Added graphic on back pocket of jeans;
5. Smaller left propeller;
6. Missing wrist watch;
7. Puffin missing back leg;
8. Third hole on middle, left of Puffin;
9. Added wind turbine in background;
10. Missing orange fence (right)
You don’t have to sacrifice performance to go “green”

Ashland Distribution makes it easy for you!

Get the products, processes and technology you need to improve productivity, meet emissions standards and reduce waste with cost-competitive “green” solutions:

- Sprayomer® elastomers featuring reusable, net shape, spray-on infusion bag technology to enhance your closed molding operation
- ACRASTRIP® composite resin remover, the only DfE Division of U.S. EPA-endorsed cleaning solvent for thermoset resin systems that is non-flammable and HAP-free and a 100% replacement for acetone.
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Call Ashland Distribution today at 1.800.531.7106 or e-mail us at greenconnection@ashland.com

Ashland Distribution has been providing access to the composites industry’s leading suppliers for more than 20 years, assisting with resin, gelcoat, reinforcement, catalyst, core, adhesive and other product and business support needs. We are committed to long-term partnerships, offering a highly experienced support team, advanced inventory management systems, ISO certification and the most comprehensive North American distribution service network in the industry.

Come see us at COMPOSITES 2011, Booth #525
EcoTek® is for the only planet we have.

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, AOC introduces revolutionary, new EcoTek® Green Technologies.

Processing characteristics and mechanical properties of EcoTek unsaturated polyesters and vinyl esters are similar to or better than those of traditional materials. The difference is in the EcoTek advantage of renewable content, recycled content and/or styrene-free technologies.

EcoTek puts more green into what you make. To get started, e-mail Fletcher Lindberg at flindberg@aoc-resins.com, phone him at 901-854-2800 or go to www.green-resins.com

Come see us at COMPOSITES 2011, Booth #504