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IN THIS ISSUE

AOC®

World Leader in Resin Technology

Crosslink

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INSIDE

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Opening the Door

Opportunity is knocking for the composites industry, and AOC is committed to opening the door to help our customers flourish. Industry commitment has been a cornerstone of our business since its inception 50 years ago.

More and more, the world is thinking "green," and AOC is helping to put composites in that thought process with new EcoTek® Green Technologies. Products in this comprehensive line process and perform better than or as good as conventional materials.

Composites are very well-positioned to meet the demand for renewable energy resources, especially wind. To capitalize on this opportunity, AOC scientists are optimizing resin chemistries for the manufacture of wind energy system components.

There is more about these and other opportunities in this issue of Crosslink. Discover how AOC is leveraging its leadership strengths to help composites manufacturers turn potential into profits.

Frederick S. Norman
President
Chief Operating Officer

TECHNOLOGY for the ecology

AOC launches new EcoTek® Green Technologies to help composite and cast polymer customers respond to the growing call for a greener world. EcoTek materials help customers become better environmental stewards, follow regulatory standards, and meet the demand for goods that are friendly to the environment.

AOC chemists engineered EcoTek technologies for seamless conversion. Processing and end-use properties are better than or equivalent to conventional materials. EcoTek green is also backed by the industry's best technical support team and most knowledgeable sales force.

"AOC pioneered green resin technology in the 1980s when the company introduced unsaturated polyesters which chemically incorporate recycled polyethylene terephthalate, or PET," said Fletcher Lindberg, Business Manager, Open Mold - Reinforced. "Over the years, we expanded development of Earth-friendly materials that support customer preferences and requirements for greener practices."

How EcoTek® Is Green

EcoTek® product technologies follow three major paths toward greenness. Several products follow more than one path.

1. Renewable Content. Resin building blocks are derived from renewable resources such as corn and plant oils. Conventional resin building blocks are derived from crude oil and natural gas.

2. Recycled Content. EcoTek recycled content comes from reclaimed polyethylene terephthalate (PET) and/or from reclaimed glycols.

3. Styrene Free. Patented resin technology is entirely free of styrene. Alternative reactive diluent monomers reduce exposure in the workplace and lower emissions in the environment.

EcoTek®
GREEN TECHNOLOGIES

Engineered to Be Greener

www.green-resins.com

New EcoTek® Green Technologies have their own Internet home at www.green-resins.com. Site visitors learn that the product line covers the primary composite manufacturing processes and end-use market sectors. The initial product listings are:

1. Corrosion
2. Cured-In-Place-Pipe
3. Closed Mold
4. Open Mold Laminating
5. Styrene Free
6. Cast Polymer

EcoTek literature can be downloaded from www.green-resins.com or www.aoc-resins.com or can be requested from an AOC representative.

Award-Winning Technology

One of the first applications made with EcoTek material earned high industry honors for Alaglas Swimming Pools of St. Matthews, SC, USA. A pool made with EcoTek H460 polyester earned the 2010 Superior Quality in an Open Molded Part award from the American Composites Manufacturers Association (ACMA).

Alaglas started using EcoTek H460 polyester for the structural segment of its state-of-the-art composite pools. While most thermoset resins are produced solely from unsustainable petrochemical feedstocks, EcoTek H460 resin is 28 percent derived from biologically renewable resources and/or recycled materials.

With new EcoTek green resin, Alaglas is the first composite pool manufacturer to assure customers that their pool was made with more environment-friendly technology. Mechanical properties of EcoTek H460 are equal to or better than those of a conventional resin.

EcoTek®-content pools carry the same 50-year structural warranty as Alaglas pools made with traditional resin.

The Superior Quality award went to this pool for its exceptional fit, finish and quality.

"EcoTek resin makes us a better environmental steward and enhances the pool's appeal to customers looking to make greener lifestyle decisions," said Monty Felix, CEO of Alaglas. "The same manufacturing process techniques and equipment were used to seamlessly incorporate the new green resin into our material system," he continued. "We didn't have to change a thing. Resin conversion was a simple matter of moving our suction wand out of one drum and into another."

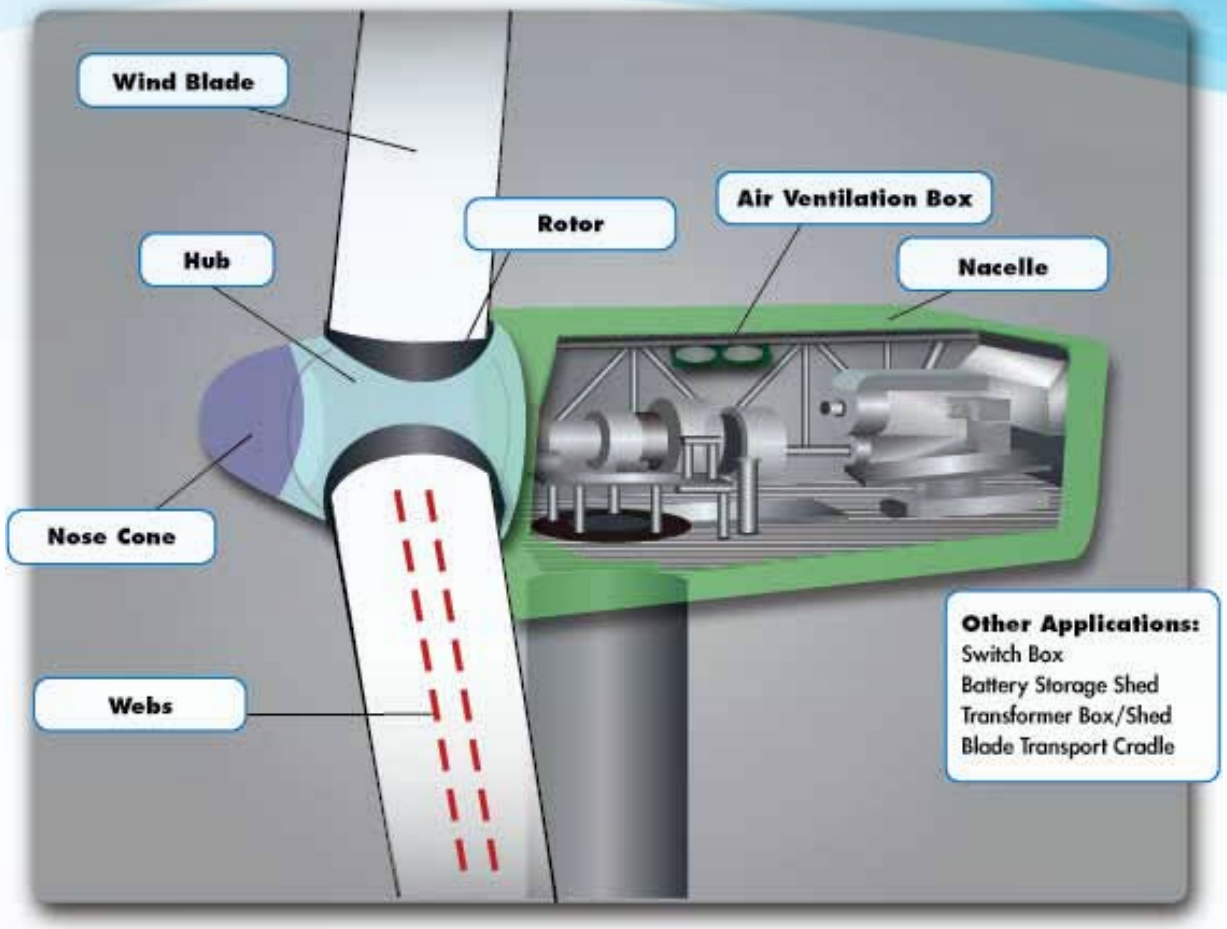
Hydropel®/EcoTek® System

Alaglas pool construction begins with a sprayed-on, moisture-resistant gel coat that is backed up with a layer of chopped glass fibers in a Hydropel® H010 vinyl ester. This elite marine grade resin from AOC forms a high performance barrier against moisture intrusion that can cause blisters on the gel coat surface.

After barrier coat application, EcoTek H460-EKAG resin is used to wet out the reinforcing glass fibers in three manufacturing steps that create an engineered structural laminate: 1) spray up of chopped glass fibers and resin, 2) lay up of resin-impregnated stitched fabric that combines biaxial woven fiberglass cloth with multi-directional strand mat, and 3) another sprayed-up layer of chopped fibers and resin.

Felix stated: "A higher fiber content, the strength distribution of the fabric's fiber architecture, and EcoTek resin's low air entrapment synergize to deliver high structural integrity. Our pools are strong enough to meet some customers' preference for aboveground installation."

Opportunity BL



Composites technology is contributing to the highest growth in wind energy use since ancient mariners learned to sail. According to the World Wind Energy Association, wind power grew more than 30% globally in 2009.

To help composites grow in this sector, AOC identified major wind energy system opportunities and established a Wind Energy Laboratory to optimize formulations for producing the components. Work is focused on large parts that can benefit from the cost and performance advantages inherent in resin infusion and resin transfer molding.

Growth in wind energy around the world is encouraging companies such as Markos Co. Ltd., a Polish manufacturing company to advance large part production with infusion and open molding.

"Infusion technology has been successfully used in our factory for the last two years," said Piotr Targowski , Deputy Director, Proxy. "Markos considers infusion to be a strongly pro-ecological technology and a more efficient way of production." Targowski added that infusion has put more emphasis on resin quality because the process is more demanding than hand lay-up.

OWS Our Way

Markos workers finish the interior of a nacelle.

Some ventilation system housings are molded into the nacelle.

Hubs are ready to be installed.

For infused and open molded production, Markos relies on the technology, quality and service of global resin supplier AOC. "AOC became a Markos supplier mainly due to the infusion and vacuum qualities of Altek® R937 and H834 low-shrink resins. These resins are outstanding and perfectly meet production regimes."

For hand lay-up production, AOC supplies an Altek H834 series low profile laminating resin that meets Markos objectives for lower styrene emissions in the workplace. This resin is also engineered by AOC chemists to provide the proper viscosity for excellent fiber wetting. "We found AOC as a well-oriented partner who is flexible and trustworthy," said Bernard Marciniak, Shareholder.

Wind Energy Components

For wind energy, Marcos produces nacelles up to 29.5 feet (9 meters) long and 14.8 feet (4.5 meters) high and hubs (also called spinners) up to 13.1 feet (4 meters) high. Depending on the application, reinforcement materials include glass fiber chopped strand mat, woven roving, woven fabrics, and combination materials. Sandwich and core construction is used in locations that can benefit from added stiffness at a lower weight.

Some hand lay-up parts, such as housings for ventilation systems are integrally molded into the larger parts. Depending on the design specification, several composite wind energy components are manufactured to meet flame retardant requirements.

The job involved above- and below-ground pipe.

Vayyu crews field-laminated 858 joints.

Vipel® versatility in the desert

The world's largest high density polyethylene (HDPE) plant in Abu Dhabi uses fiber-reinforced polymer (FRP) composite pipe to cool manufacturing process water with seawater. The critical joint system for the extensive pipe system relied on the corrosion-resistant and process-friendly properties of Vipel® F013 bisphenol-A epoxy vinyl ester from AOC.

Called "Borouge 2," the plant is owned by Abu Dhabi Polymers Co. of Ruwais, Abu Dhabi. The pipe system conveys 97° to 115°F (36° to 46°C) temperature seawater to cool process water that is in the 104° to 122°F (40° to 50°C) temperature range. The pipe and joints were designed to withstand 160 psi (11.3 bar) of service pressure and were successfully hydro-tested at 215 psi (15 bar).

Butt and wrap field joints that connected pipe section to pipe section were accomplished by Vayyu Composites Technologies (Pvt.), Ltd., Chennai, India, a subsidiary of Vayyu LLC, Malvern, Pennsylvania, USA. Vayyu used 327 technicians — laminators, supervisors and engineers — to complete the job within 12 months.

Vipel® F013 bisphenol-A epoxy vinyl ester resin was specified for its high resistance to corrosive attack from the hot, saline seawater. The laminating crew also appreciated the resin's excellent wetting, handling and curing characteristics in the hostile desert environment.

"In spite of extreme temperature ranges of 50°F (10°C) during winter nights and 115°F (46°C) during summer days, the resin performed consistently," said G.S. Viswanath, Senior Partner & Chief Technical Officer. "The gel time was extremely predictable. We were also pleasantly surprised by the shelf life of the resin in the intense summer heat."

Turning Waste Into Energy

The composite liners were installed in a combined steel housing that was shipped to the plant site.

More than 40 years of experience and expertise helped Tunetanken A/S, Vejen, Denmark, obtain the contract for high-performance, fiber-reinforced polymer (FRP) composite chimney liners for a modern waste-to-energy incineration plant. To get the best technology, quality and service for the liner resins, Tunetanken specified Vipel® epoxy novolac vinyl esters from AOC.

The incineration plant in Bergen, Norway, is operated by BiR Avfallsenergi, which converts waste that otherwise would have to be landfilled into useful energy. Incineration exhaust is sent through two stacks in a combined housing made of steel.

The liners were installed in the housing by Tunetanken customer, chimney manufacturer Steelcon A/S, Esbjerg N, Denmark. One liner is 226 feet (69 meters) tall, while the other is 236 feet (72 meters) tall. Both liners are 55 inches (1400 millimeters) in diameter.

Incineration exhaust is so hot that one liner must withstand an operating temperature of 302°F (150°C) and exposure to 356°F (180°C) for up to one hour. To meet these requirements, the liner was made with Vipel F086 epoxy novolac vinyl ester. The design temperature for the other liner is 266°F (130°C), and the maximum one-hour exposure temperature is 320°F (160°C). These requirements are met with Vipel F085 epoxy novolac vinyl ester.

"The Vipel epoxy novolac vinyl esters are easy to process for both our winding and hand lay-up operations," said Tunetanken Administrative Director Henrik Kjærholm. "AOC also has a very fast and helpful team when we need resin chemical resistance data and performance specifications."

The liners are made from filament wound sections.

The tanks were assembled at the riverside site before being loaded on a barge for river transport to the Gulf of Mexico.

At a Gulf port, the tanks were transferred to an ocean-going vessel headed for Saudi Arabia.

FROM THE MIDWEST *to the Middle East*

Precision engineering and manufacturing were key to the way RL Industries overcame logistical obstacles to successfully fabricate composite storage tanks for a chemical plant in Saudi Arabia. To resist the highly acidic nature of the storage media, the resin used for the tanks was Vipel® F010 bisphenol A, epoxy vinyl ester.

The job required three 20-foot (6.1-meter) diameter composite tanks to store a 32% solution of hydrogen chloride or a 20% solution of sodium hydroxide. Based on previous experience, the U.S.-based engineer commissioned to design the tanks recommended RL Industries to give the customer the highest level of quality and structural integrity. The company's manufacturing is certified to demanding American Society of Mechanical Engineers standards for corrosion-resistant structures.

Vipel® technology & AOC service

RL Industries Engineering Manager Brian Linnemann explained why Vipel resin technology was specified for all the work. "We turned to AOC because of our favorable history with them on other projects," he said. "They provide a very good corrosion resin recommendation with excellent documentation of process constituents and chemical service details. A Vipel resin is proven technology that is optimized for the application."

After the tank sections were manufactured, they were assembled at a site 20 miles (32 kilometers) away. Special permits were obtained to ship the tank sections over the road to the assembly site.

At the assembly site, the cylindrical sections were sequentially assembled using laminating techniques that are similar to the way chimney liner "can" sections are joined.

The contract also called for two smaller tanks for holding non-potable water for emergency safety showers. After all tanks successfully passed hydro-testing protocols, they were loaded on a barge for transport down the Ohio and Mississippi Rivers to a Gulf of Mexico port. The equipment was then transferred to an ocean-going vessel for shipment to Saudi Arabia.

Appalachian Plastics, Inc., manufactures water filters up to 96 inches (243.8 centimeters) in diameter.

Water Resort Filters Rely on Vipel®

Once considered only a major oil producer, Dubai, one of seven United Arab Emirates, has diversified its economy and emerged as a major 21st Century tourist destination. One of the most spectacular visitor attractions in Dubai is Atlantis The Palm, one of the largest and most exciting water-themed resorts in the world.

Keeping the water clean at Atlantis The Palm, Dubai, is a daunting task that is facilitated by 167 special mega-filters. The filters were supplied by Neptune-Benson™ whose expertise in filter design and marketing blends perfectly with the filter manufacturing expertise of Appalachian Plastics, Inc. (API).

To achieve high strength and outstanding chemical resistance, API turned to resin technology from AOC. The large fiber-reinforced polymer (FRP) composite housings for the filter systems are produced with Vipel® F010 bisphenol A epoxy-based vinyl ester. The resin is certified for API use in filters by NFS International, an independent, not-for-profit standards organization.

Making filters that last

API General Manager Allen DeBusk, said the Vipel F010 resin processes well for both winding and hand lay-up operations and is backed by very good technical support. He added how the toughness and durability of Vipel F010 vinyl ester helps resist cracking and crazing.

"To meet requirements for corrosion resistance, the filters could be made with an isophthalic polyester resin," DeBusk said. "But isopolyesters are brittle and develop surface cracks under the cyclic action of the filtering process. This does not affect structural performance but encourages unwanted algae to grow."

The horizontal composite filters for Dubai are 5 feet in diameter by 12 feet long (1.5 by 3.7 meters). Each filter has an internal manifold made of polyvinyl chloride. Water is pumped into the filters and conveyed under pressure through a bed of sand filtering media which trap dirt and particles. The filters are designed to withstand pressures up to 100 psi (6.9 bar).

Composite Shelters Keep Transit Users Cooler

Designing a bus shelter for a desert climate is serious business that strives to protect waiting passengers from the danger of excessive heat. An Arizona State University study concluded that the heat inside a traditional metal bus shelter can rise above 140°F (60°C).

A shelter solution created by architect Jeff Jarvis of TranSystems Corporation integrates a fiber-reinforced polymer (FRP) composite grid structure into a unique microclimate system. Composite grating panels are used for vertical walls and the roof to take advantage of the grating's inherent grid pattern and because composite does not conduct heat the way metals do.

The performance of the composite-based bus stations for the City of Mesa, Arizona, USA, has been so positive that the Valley Metro Regional Public Transit Authority has expanded its use to the next series of stations built in Chandler, Mesa and Gilbert.

Color is critical

"The color is critical to the application," Jarvis states. "Green makes a statement. It is psychologically cooler and blends with the native trees." To achieve the precise color that works best, grid supplier Fibergrate Composite Structures Inc., Dallas, Texas, turned to AOC for a Chroma-Tek® pigment dispersion.

"We have a long history with AOC's colorants unit," said Darryl Moczygemba, Director of Corporate Quality and Supplier Relations for Fibergrate. "Working with our AOC sales representative Eric Stuck and AOC color expert Mark Harber, we were able to provide the architect samples within the very short time frame we had available."

Harber, Business Manager - Open Mold Non-Reinforced, said, "We ensure that the carrier resin and pigment dispersion mixture is homogenous and that carrier resin reactivity is totally compatible with Fibergrate's processing resin and UV stabilization system."

John Sauer, Territory Manager for Arizona and Southern California added: "We wouldn't be able to do this if it weren't for AOC's technical support. And the pigment dispersion that went into production is exactly the same as the dispersion for the approved sample. I wouldn't say Chroma-Tek consistency is good. I'd say it is excellent."

Chroma-Tek® pigment dispersion consistently ensures the precise green shade for composite bus shelter grids.

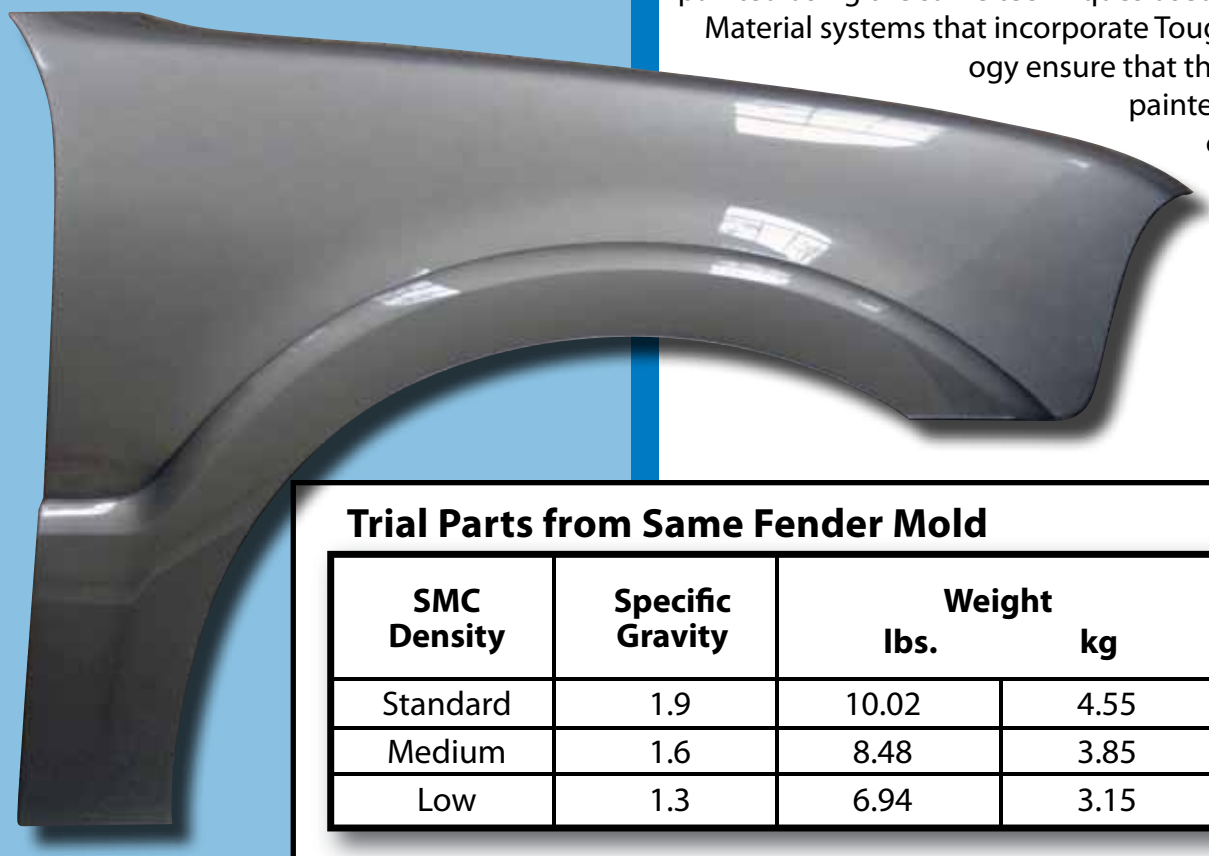
Lightweight SMC Gets Even Lighter

To help automotive engineers design more fuel efficient vehicles, new material technologies are making sheet molding composite (SMC) lighter than ever.

With new medium- and low-density SMC formulations, engineers get the same advantages they always enjoyed with SMC. However, with densities up to 30% lower than standard SMC, newer technologies put SMC's lightweight advantage on a par with such nonferrous metals as aluminum and magnesium.

Dan Houston, Technical Specialist, Ford Motor Company, said, "Body panels with low-density SMC inner panels and medium-density SMC outer panels are under development and may be on vehicles in two years. Evaluations are underway to ensure that the coefficients of thermal expansion for the inner and outer material systems are compatible. We also want to make sure there is no bond-line read-through on the outer panel surface."

Mike Dettre, Business Manager - Closed Mold, AOC, added: "Tests show that low- and medium-density SMC can be painted using the same techniques used for standard SMC. Material systems that incorporate Tough Class A technology ensure that the smooth surface of painted parts will not be compromised by paint-curing temperatures."



Trial Parts from Same Fender Mold

SMC Density	Specific Gravity	Weight lbs.	Weight kg	Percent Weight Savings
Standard	1.9	10.02	4.55	
Medium	1.6	8.48	3.85	15
Low	1.3	6.94	3.15	30

AOC NEWS

Executive Promotions

To better serve the composite and cast polymer industries, AOC announced promotions and created new management team positions.

Fred Norman was appointed to the newly created position of President and Chief Operating Officer of AOC. Norman reports to Randy Weghorst, who continues in his role as Chairman and Chief Executive Officer. Norman was previously Executive Vice President and Chief Financial Officer of AOC and was instrumental in the formation of AOC, formerly the joint venture between The Alpha Corporation and Owens Corning.

John Griggs, Vice President - International Development, was appointed to the position of Vice President - Finance and Chief Financial Officer, reporting to Norman. Griggs joined The Alpha Corporation in 1983 and became Vice President and Treasurer of AOC in 1997.

Brian Parker was named to the new position of Global Managing Director and is responsible for all International Operations. Parker continues responsibilities as Managing Director of Latin America.

Emilio Oramas was appointed to the new position of Director of Sales: US and Canada. Oramas has responsibility for all sales in the United States and Canada. Reporting to Oramas are the Regional Sales Managers. He is also responsible for AOC's Distribution segment.

Fletcher Lindberg was promoted to Business Manager - Open Mold Reinforced applications for AOC. Lindberg most recently served as Business Manager for AOC's Non-Reinforced and Distribution segments.

Mark Harber was named Business Manager – Open Mold Non-Reinforced products, a position that manages AOC's gel coat, pigment dispersion, and specialty product lines. Harber was most recently Research & Development Manager for colorants.

Parker, Oramas, Lindberg and Harber report to Jack Roesle, Sr. Vice President Global Sales and Marketing.

AROUND THE WORLD

AOC World Headquarters

Teams Consolidated

AOC improved its efficiency and responsiveness by consolidating corporate management and the corporate technical team into dedicated facilities. Management functions are now based in the new AOC World Headquarters, which achieved Leadership in Environmental and Energy Design (LEED) certification from the U.S. Green Building Council.

AOC research and development and technical support leadership moved into the former World Headquarters building. Previously, various functions of the AOC technical organization were housed in different buildings throughout the corporate campus.

AOC (UK) Ltd.

AOC (UK) Ltd, is the new name of the wholly-owned AOC company that was known as CMS, a total service distributor to the UK composites industry.

Doctor Hoeglund with DSC

University of Memphis Donation

Loyalty to the alma mater that helped shape a career led to the gift of a differential scanning calorimeter (DSC) from AOC to the Chemistry Department of the University of Memphis. The equipment is valued at US$44,000.

The catalyst, so to speak, behind the donation was Dr. Adrienne Hoeglund, a Senior Analytical Scientist for AOC. Consolidation of research and development to improve efficiencies left AOC with a redundant DSC. Hoeglund saw a need for the equipment at the University of Memphis where she earned Master's and Doctorate degrees in Chemistry. She set a plan in motion to have the system donated to the university.

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The World of AOC

AOC is a leading global supplier of resins, gel coats, colorants, additives and synergistic systems for composites and cast polymers. AOC products are manufactured in facilities strategically located in North America, Europe and Asia. AOC-owned manufacturing plants are ISO 9001:2008-certified, use proprietary technology to ensure resin batch-to-batch consistency, and follow Six Sigma-Lean principles for improved efficiency and quality. Whatever you are making or the manufacturing processes you use, discover AOC's innovative technology, process expertise and commitment to service by going to **www.aoc-resins.com** on the Internet.

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