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INVESTING IN THE FUTURE

AOC is proud to be leading our industry’s expansion as we drive the acceptance and utilization of composites across new markets. We are committed to the growth of tomorrow’s composite solutions, and will continue spearheading the development of new technologies that revolutionize the modern lives we know and enjoy.

AOC resins, gel coats and colorant products have transformed the industries they serve with exceptional quality, efficiency and value. This issue of CrossLink showcases how our technologies are meeting market needs for higher processing speed, lower-weight composite parts and more fuel-efficient vehicles.

We are dedicated to helping our customers find new ways to expand their business as we develop new technologies for the composites industry. To that end, AOC continues to invest in state-of-the-art manufacturing systems that produce the most consistent products in the composites industry. Please read more about our recent advancements to meet the growing demand for composites in this issue.

We will always invest in the people, technology and innovations that have propelled us to be a leading global supplier of resins, gel coats and colorant products — for both today and tomorrow.

Frederick S. Norman
President and Chief Executive Officer

Please send questions and comments to:
Leslie Beck, Editor
LBeck@aoc-resins.com   |   901.854.2318
Chroma-Tek, the color and specialty product line of AOC, has grown to offer more than 2,700 advanced pigment dispersions, colorants and additives. They can also create any color for custom solutions.

But one color holds special meaning for the division - silver - as Chroma-Tek celebrates 25 years of excellence in colorant chemistry, applications and formulations.

Chroma-Tek’s success is the result of business savvy combined with technical and R&D applications know-how. Early in its history, Chroma-Tek capitalized on its proximity to resin manufacturing, and research resources and began experimenting with different components used to make unsaturated polyester resins. The goal was to make a colorant with friendly handling characteristics and maximum compatibility. “We discovered through our work a combination that was compatible with the entire line of resins that we offered,” says Mark Harber, AOC Business Manager. “This particular resin, also known as a pigment and grinding vehicle, is still being produced today and is our initial choice for the pigmentation of casting and laminating applications.”
Backed by a team of material and process experts, the line has grown and introduced pioneering products for sheet molding compound (SMC), bulk molding compound (BMC), B-Sides, pultrusion, casting, panel, and engineered stone applications. They not only provide the color end of the equation, but also consider the entire polymer package. Moreover, they have the technical leadership and support that really benefits customers.

There are 12 research and development product specialists who can assist in successfully integrating the specialty chemicals and colorants into the best combined solution. Additionally, the technical service teams work closely with each customer to help them successfully implement their projects. We are continuing to look at the future. “Our main focus is obviously on unsaturated polyester-related markets, but we have also seen growth in several other thermoset-related segments, such as epoxy, vinyl ester, and urethane resins,” said Harber. “Some of our most innovative projects for Chroma-Tek’s specialty product line include a formulated vinyl ester coating made for corrosive environments; some very exciting technologies for the automotive industry; and a coatings product for the transportation and recreation vehicle industry that has improved surface appearance and durability.”

Chroma-Tek benefits are optimized when the colorant, additive or dispersion is synergized into a compatible system that includes an AOC produced resin. “If we know or can recommend which AOC resin is being used, we can then select from our specifically different pigment grinding vehicles – the carrier resins – which are designed to maximize the opacity, color development, and reduce typical problems, such as color separation,” said Harber. “A properly balanced system makes the most aesthetically pleasing composite part.”

As the Chroma-Tek team reflects on their first 25 years, the future looks bright as they are poised to continue to deliver the best hues, consistency and processability in the industry.
Low Density SMC: A Driving Force in Automotive Composites

AOC partnered with Continental Structural Plastics (CSP) to develop a revolutionary low-density sheet molding compound (SMC) for use in automotive and truck hoods, fenders, doors, roofs and deck lids. CSP is the leading U.S. supplier of SMC closure panels for automotive and truck manufacturers around the globe. The new system offers lower density and a Class A surface performance for high cosmetic appearance.

Since the 1970s SMC has provided a lightweight alternative to steel. Lighter weight vehicles require less fuel, thereby lowering CO2 emissions for a healthier environment. However, as CAFE standards continue to become more stringent, automakers are forced to either utilize lighter materials of construction or reduce the size of their vehicles. Many are considering the use of aluminum and carbon fiber composites which are both currently more expensive than SMC and require radical changes to their existing manufacturing processes.

The new system’s superior strength-to-weight ratio provides automakers the opportunity to reduce the weight of their vehicles with a material that fits their current manufacturing infrastructure.

In addition to comparable weight reduction, low-density SMC offers many advantages over competing lightweight materials, including: more design freedom, parts consolidation, lower tooling cost, damage resistance, corrosion resistance and equal/better surface aesthetics. The raw materials are readily available and are totally compatible with existing manufacturing and assembly processes.

“AOC’s technical team continues to advance this versatile technology,” said Mike Dettre, AOC Business Manager. “Any automotive manufacturer seeking to substantially reduce the mass of their Class A body panels should definitely consider low density SMC. The automotive industry is facing huge challenges ahead and AOC is providing the technology to help them succeed.”

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<th>SMC Density</th>
<th>Specific Gravity</th>
<th>% Mass Reduction vs Standard SMC</th>
<th>% Mass Reduction vs Steel</th>
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AOC’s R058 Designed for Carbon Reinforced Composites

AOC has developed a line of resins to meet the increased demand for high-performance composites in aerospace, automotive, wind energy, military, marine and other markets. The R058 epoxy vinyl ester resin is specifically designed for use with carbon fiber reinforcements to create lightweight composite parts with exceptional strength-to-weight ratios.

The R058 packs a double punch, combining the performance of epoxy resins with the processing speed of unsaturated polyester resins. Designed for vacuum infusion and resin transfer molding, R058 has excellent mechanical properties and chemical resistance.

Other benefits of the epoxy vinyl ester resins include:

- Room temperature cure for laminates as thin as two millimeters.
- Low viscosity for shorter mold fill times and complete fiber wet-out.
- Low laminate exotherm for improved surface aesthetics.
- Superb strength, toughness and chemical resistance over a broad range of temperatures.

“R058 is an excellent choice for applications requiring lightweight and high-performance laminate,” says Mike Dettre, Business Manager. “They require no post-curing nor autoclaving, which makes them faster to process than most pure epoxy resins and that’s critical for high-volume applications.”
Building an Odor Control System That Lasts

Austin, Texas, one of the fastest growing cites in the United States, has gained one-million residents since 1990. However, while Austin’s population steadily climbed, its wastewater infrastructure had fallen behind. Imminent sanitary sewer overflow necessitated the construction of a new pipeline to intercept the existing sewer mains on the north and south shores of Lady Bird Lake. So the city of Austin constructed a new 3.9-mile wastewater relief tunnel, to alleviate the stress on aging water lines.

Wastewater treatment facilities are sites where corrosive and toxic chemicals are used at every part of the collection system, releasing objectionable odors at each stage in the treatment process. AOC and ECS Environmental Solutions collaborated to create the tunnel’s odor control system, an essential part of offsetting the effects of malodorous fumes and hazardous by-products.

ECS Environmental Solutions provided the odor control equipment and relied on AOC’s Vipel® resin for more than 1,000 feet of fiberglass ductwork – ranging in size from 12 inches to 72 inches in diameter – plus additional accessories. The fiber was impregnated with AOC’s Vipel® K022 corrosion-resistant vinyl ester resin, which is ideally suited for ECS’s computerized filament winding manufacturing. “The K022 resin was the best choice for this project,” says Jeff Jones, President of ECS. “Some of the gases in the air stream are corrosive – hydrogen sulfide and ammonia. There’s also sulfuric acid. Pipes built with this resin are very resistant to what goes in them: They will not easily corrode.”

“With the long runs and thick pipes, we went through material much faster than normal, and AOC was very good at meeting this fluctuation in demand.”
Jeff Jones, President of ECS
Saving 100,000 Gallons of Water a Day with CIPP-UV Cure

Up to 100,000 gallons per day of fresh rainwater were leaking into the clay sewage pipes serving Basye City’s remote vacation homes and ski resorts in southeast Virginia. The additional water burdened Stoney Creek Sanitary District’s water treatment plant. It decreased efficiency and expended resources to purify what was, essentially, clean water.

They knew that cured-in-place (CIPP) technology was the ideal solution. However, the leaks, caused by deteriorating rubber O-rings that connected the original clay pipes, were causing cool spots that could cause an incomplete cure with traditional CIPP cure methods. This condition could result in lower mechanical properties for the restored pipe.

Stoney Creek turned to Reline America for its Blue-Tek UV-curing technology, which cures resin with UV light instead of heat and therefore is not affected by cool spots. AOC’s Vipel® unsaturated polyester resin was selected because it’s formulated specifically for UV cure.

AOC designs and produces the resin to exacting specifications to cure at specific wave lengths of light. The resin creates an extremely efficient and thorough cure and, ultimately, a high-performance composite.

Stoney Creek will significantly reduce its system’s base flow as well as save money with unnecessary treatment costs.

“This technology has come of age,” said Rodney W. McClain, Director of Public Utilities at the Stoney Creek Sanitary District. “Stoney Creek Sanitary District is proof that even a relatively small utility can utilize new technologies in-house with significant cost savings over traditional methods of pipe replacement.”
Crafting a Super-Sized Spa

Large-scale, technically precise applications call for AOC ingenuity. So when Hawkeye Manufacturing began producing a 2,000-gallon combination swim spa and hot tub, the company turned to AOC for technology and support to ensure quality and durability.

The Bossetti tub – named after the Argentine waterfall – features 37 stainless steel spa jets, six adjustable-flow swim jets, flow fountains and, of course, a waterfall. Hawkeye Manufacturing began production with an acrylic sheet that is heated and vacuum-formed into the shape of the spa’s smooth, seamless uni-liner. Next, came the real challenge: developing a protocol for the fiber-reinforced polymer (FRP) structural composite backup.

The first step for the backup composite is applying a skin coat consisting of chopped glass fibers and high-performance Altek® H100 vinyl ester. This technique prevents moisture from reaching and affecting the integrity of the thicker composite structure. The vinyl ester also provides excellent adhesion between the composite and acrylic. To finish the backup laminate, Hawkeye technicians apply chopped fiber in Altek C949 polyester.

“This spa is larger than anything we have ever produced before,” says Casey Murray, vice president for Hawkeye Manufacturing. “The consistency of AOC resins and outstanding technical support were essential to helping us reach this milestone.”
Hanging Gardens *Inspire Awe*

Even before visitors to the Pérez Art Museum Miami (PAMM) enter its gallery to admire more than 1,800 pieces of modern and contemporary art, they are treated to an artistic masterpiece in the form of the elaborate hanging gardens descending from the museum’s trellised roof. Consisting of dozens of mammoth vertical columns housing vibrantly flowering plants, the hanging gardens are able to withstand the strong winds, salt spray and potential hurricanes typical of Miami’s climate.

JTI, an industrial supplier of fiberglass pipe, designed and fabricated a complete structural support system for all seven chambers of the vertical gardens. Each chamber features eight to 11 custom fiberglass tubes that range in length from 28 to 51 feet. JTI devised a laminate structure that would bend, but not break, under hurricane strength winds and endure the water and salt exposure of a coastal environment. The tubes are constructed of mat woven roving and C-veil fiberglass, Hardwire® high-strength twisted steel wires and AOC’s K022-AA epoxy vinyl ester resin.

The team at JTI fabricated the tubes using hand lay-up, alternating layers of fiberglass and Hardwire in a sandwich construction to create the 3/8-inch thick tubes. JTI built custom 40-foot-long mandrels to accommodate the project.

The fiberglass tubes were then wrapped in felt, which was perforated with small pockets to hold the plants. Water is delivered into the felt through nozzles at the top of the tubes. The water works its way down the tubes, sustaining the plant roots in a soil-less system.

“This was a one-of-a-kind project that had to go off without a hitch for the general public,” says Jason Brough, President of JTI. “There was no second chance. And there was no benchmark.” JTI, in partnership with AOC, ensured it was a success.
AOC Unveils New Vinyl Ester Reactor in Lakeland Florida Facility

AOC recently installed a new high-performance reactor, which is producing vinyl ester resins at its manufacturing plant in Lakeland, Florida. This investment underscores AOC’s commitment to the growing corrosion-resistant composites market which relies on the unique properties of vinyl ester resins.

Driven by unparalleled customer support, technical expertise and product quality, AOC’s comprehensive line of vinyl ester resins has become the preferred choice for corrosion-resistant markets. AOC’s vinyl ester resins meet customer specifications for a range of applications, including water and wastewater treatment, marine, industrial tanks and pipes, and chemical processing.

“This reactor is a major investment and exemplifies our continued focus on technology and growth” said Fletcher Lindberg, AOC’s Vice President of Marketing. “The new reactor greatly expands our capacity, which allows us to serve more customers and meet their needs.”

The Florida manufacturing plant was the chosen location to maximize AOC’s global logistics network. The reactor utilizes AOC’s proprietary manufacturing and control systems that set the world standard for producing resins of exacting consistency.
AOC Adds New Grinder to Guelph, Ontario Facility

AOC’s manufacturing facility in Guelph, Ontario recently installed a new mechanical grinder, which is used to create binder materials for chopped strand mat (CSM) and continuous fiber mat (CFM) applications. The new machine feeds solid resin into the grinding chamber, which is then crushed into a fine powder to meet customer’s specific requirements. The customers, typically fiberglass manufacturers, apply the powder onto glass mats to bind the glass fibers together.

“Everybody at Guelph is happy to see the new grinder in operation”, said Fletcher Lindberg, AOC’s Vice President of Marketing. “Not only does the new grinder better serve existing customers by reducing cycle time and increasing product consistency, but it also for the first time expands AOC’s ability to serve certain powder markets, something AOC couldn’t do before the new grinder’s installation," Lindberg added. In addition to the benefits for customers, the new grinder generates very little dust during operation, something every manufacturing employee at Guelph appreciates.

Benefits include:
- A nearly dust-free environment
- Batch time reduction
- More batch consistency
- Product line expansion
New Leadership Positions AOC for Continued Growth

AOC recently announced promotions to its leadership team that will strengthen the company’s presence as a leader in the global composites industry.

Matt Watkins was promoted to Executive Vice President. Watkins is responsible for overseeing all manufacturing, engineering, purchasing, safety and regulatory processes, information technology, finance, accounting and human resources. During his 24 years of service to AOC, Watkins has held several leadership positions, each focusing on continuously improving product quality and service. Watkins has a Bachelor of Science in Mechanical Engineering from Auburn University.

Allen Brown was promoted to Vice President, Information Technology. Brown is responsible for the direction and management of all global IT infrastructure, software development and Oracle business processes. Brown has held several IT positions since joining AOC in 1996 and leads a team of IT professionals focused on technology and business strategy alignment. Brown has a Bachelor of Business Administration in Management Information Systems and a Master of Science in Business Administration from the University of Memphis.

Dan Cox was promoted to Vice President, Operations. Cox is responsible for the management of all manufacturing, engineering, safety and regulatory processes. Since joining AOC as a project engineer in 2003, he was promoted to Director of Engineering in 2008 and Director of Operations in 2012. During his time at AOC, Cox has led the development of technologies and procedures that improve product quality, increase manufacturing productivity and enhance sustainable operations. He has a Bachelor of Science in Mechanical Engineering from the University of Memphis.
Mark Harber, currently AOC’s Business Manager for Non-Reinforced Resins, Gel Coats and Colorants, will add Closed Mold to his list of responsibilities. Harber has held a number of other positions in AOC’s gel coat, pigment dispersion and specialty product lines since he joined the company in 1982, including Technical Service Manager and Research and Development Manager. He has a Bachelor of Science in Mechanical Engineering from the University of Memphis.

Mike Diehl was promoted to Open Mold Business Manager. Diehl is responsible for managing AOC’s open mold business, which includes both reinforced and non-reinforced applications. Since joining AOC as a Formulation Process Engineer, Diehl has held several other positions at the company including Reactor Process Engineer and Technical Leader. He most recently worked as AOC’s Plant Manager in Kathleen, Fla. Before that, Diehl held the same position at AOC’s Colorant plant in Collierville, Tenn. He has a Bachelor of Science in Chemical Engineering and a Bachelor of Science in Chemistry, both from The University of Florida.

Paul Hutson was promoted to Plant Manager of AOC’s manufacturing plant in Kathleen, Fla. Since joining AOC as a Research & Development Synthesis Technician in 2000, Hutson has held several positions at AOC including Logistics Coordinator (Tennessee Plant) and Reactor Process Engineer (Florida Plant). Most recently he served as Technical Leader at AOC’s Florida Plant. Hutson has a Bachelor of Science in Chemistry from Shorter College.

“Our dedicated people strengthen our commitment to delivering unparalleled customer support, technical leadership and product quality. This team will ensure our continued growth by bringing the benefits of AOC’s innovation and service to more customers around the world.”

Fred Norman, AOC President and Chief Executive Officer
AOC is a leading global supplier of resins, gel coats, colorants, additive and synergistic material systems for composites and cast polymers. AOC develops technology, lives quality, and delivers service better than any other resin supplier.

For more information, go to AOC-RESINS.com.