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World Leader in Resin Technology

CaseHistory

Composites for Clean Coal Energy

In this aerial view of the project site, an arrow points out the composite liners ready to be installed in the new stack. *Photo: Kiewit Energy*

Resin:	Vipel® K022-AC fire retardant bisphenol-A, epoxy vinyl ester
Composite Application:	Stack liner for concrete chimney
Manufacturing Processes:	Filament winding
Individual Section Dimensions	13.5 feet (4.1 meters) tall 15 feet in diameter (4.6 meters)
Total liner height:	440 feet (134 meters)
Installed:	2008
Location:	Springfield, Illinois, USA

A new coal-fired power plant being built in Springfield, IL, USA, will help make the U.S. more energy independent while bringing more electric power to residents and businesses.

In the United States, coal resources are larger than remaining natural gas and oil resources, according to the Energy Information Administration of the U.S. Department of Energy. To bring energy self-sufficiency closer to home, plans call for the completed plant to annually burn up to 700,000 tons (63,500 metric tons) of coal mined from the State of Illinois.

The plant was designed and built by KBV Power Partners of Springfield, which is a joint venture of Black & Veatch and Kiewit Power Constructors. The plant is designed to be one of the most efficient and environmentally friendly coal power units in the U.S. At the end of the plant air quality control system, the plant has a 440-foot (134-meter) tall concrete chimney with a fiber-reinforced polymer (FRP) composite liner. Composite was specified for the liner because it is more cost-effective than metals for resisting the hot, corrosive environment of the exhaust process.

Composites for Clean Coal Energy, continued

Tri-Clor's state-of-the-art facility can manufacture a variety of corrosion-resistant composite applications.

Vipel® K022-AC vinyl ester provides a user-friendly processing window.

Tri-Clor, Inc., Hasting, MI, used state-of-the-art filament winding to manufacture the liner in 27 sections that were shipped to the construction site. Each section, referred to as a "can," was 13.5 feet tall by 15 feet in diameter (4.1 by 4.6 meters).

For joining in the field, the sections were aligned to within 0.25-inch (6.35-millimeter) tolerance. After surface preparation, the sections were then bonded together with interior and exterior laminates of 0.375-inch (9.53 millimeter) thick fiberglass/resin composite. A top coat was applied after cure.

The high performance resin for the liner was Vipel® K022-AC fire-retardant, bisphenol A epoxy vinyl ester from North American corrosion resin leader AOC. AOC also provided valuable technical support, said Seumas St. George, lead project site engineer for KBV.

"The stack liner was highly successful because of the way AOC and Tri-Clor worked together," said St. George. "Ben Bogner and other AOC technical experts are very knowledgeable and helped Tri-Clor optimize the manufacturing process for liner sections.

"The cooperation between fabricator and resin supplier and Tri-Clor's workmanship were important elements in keeping the chimney project precisely on schedule," added St. George. He said the quality of the liner cans was monitored by independent composite quality control consultant Juan L. Bustillos, P.E., President of Bustillos & Associates, LLC, Lake Jackson, TX.

Modern fabrication process

Tri-Clor manufactured the 27 cans in its modern, arch-shaped facility in Hastings, MI. Despite their impressive sizes, the building and equipment are designed to be portable for projects that would benefit from on-site composite cylinder fabrication.

Tri-Clor's cylinder-shaping mandrel is 14 feet (4.3 meters) in diameter, the standard dimension for many filament-wound composite applications such as tanks and scrubber shells. To achieve the 15-foot (4.6-meter) diameter requirement for the stack liner cans, Tri-Clor added a layer of urethane foam, which was then encapsulated between the initial 14-foot (4.3-meter) cylinder and an outer layer of additional filament wound composite.

During filament winding, non-woven fiber veils and glass fibers are impregnated with resin, then applied to the rotating mandrel. For the power plant stack liner, the resin was Vipel K022-AC, a vinyl ester engineered by AOC chemists to offer a combination of process and performance benefits.

"The production technicians really like the versatile workability of the resin," commented Tim Schoessel, Tri-Clor President. "The material has good wetting characteristics and works within a wide processing window that is very accommodating."

Composites for Clean Coal Energy

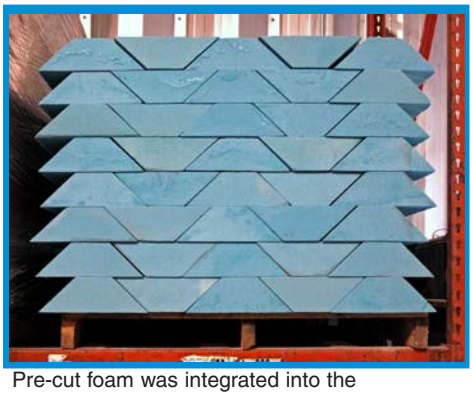
Vipel® can take the heat
Vipel K022-AC was also specified for its extraordinary performance properties. The resin resists the hot, moist exhaust smoke that will enter the stack with trace amounts of acidic gases. Such an environment would corrode the concrete chimney surface.

For strength, the resin's high mechanical properties combine with fiber reinforcing properties to withstand the static load of the 440-foot (134-meter) high, assembled structure. For fire retardance, the resin meets ASTM E84 Class I flame requirements without synergist.

The standard operating temperature within the chimney is expected to be in the 130° to 180°F (54° to 82°C) range. A published technical study by AOC Technical Corrosion Specialist Scott Lane demonstrated excellent resistance to temperature surges. Lane's analysis concluded that laminates made with brominated vinyl esters such as Vipel K022-AC can meet structural and corrosion-resistant specifications after short-term exposure to temperatures as high as 500°F (260°C). Lane's paper is available in the Technical Paper section under News & Information at www.aoc-resins.com.

About Tri-Clor
Tri-Clor Inc. is a premier FRP composite and dual laminate fabricator located in Hastings, MI. Tri-Clor provides in-house engineering, design, fabrication, and field services for corrosion and pollution control equipment needs. As evidenced by the service provided for the City Water, Light and Power new coal plant stack liner, Tri-Clor is committed to working within the customer's critical time constraints to minimize the financial effects of shutdowns and emergency repairs. For more information, contact Tim Schoessel by phoning (269) 948-9310, e-mailing tim@tri-clor.com, or going to www.tri-clor.com.

About AOC
Headquartered in Collierville, Tennessee, USA, AOC is a leading global supplier of resins, gel coats, colorants, additives and synergistic systems for composites and cast polymers. For more information on AOC technology, quality and service for the corrosion-resistant market sector, contact Ben Bogner, P.E., C. Eng., by e-mailing bbogner@aoc-resins.com or phoning (630) 665-2675. AOC also offers the world's most comprehensive and user-friendly website on corrosion-resistant composites at www.corrosionresins.com.



Pre-cut foam was integrated into the circumference of each section to help form exterior structural ribs that help support the liner.

The 13.5-foot tall by 15-foot diameter liner cans were shipped from Tri-Clor facility.

The composite cans were installed into the chimney to form a heat- and corrosion-resistant liner.

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CORROSION
RESISTANT RESIN