FR Strategist

The hottest news on fire resistant composites

Winter 2010

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HETRON®

MODAR®

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FRP delivers fuel savings, aesthetic appearance and public safety without compromise in coach interiors.

Passenger rail growing globally

All the studies point to the same conclusion – passenger rail ridership is up ***tremendously.*** In the U.S., the American Public Transportation Association (APTA) reports the highest ridership numbers in more than 50 years. With the continuing high cost of fuel and congestion of roadways globally, it is easy to see why the masses continue to turn to rail as the single best solution to today's transportation needs.

The latest UNIFE report confirms this observation. The Association of the European Rail Industry reports that rolling stock has now reached some 50 million units across 50 countries with an annual growth rate of 2.0% – 2.5% annually. Total market volume is currently projected at 37 billion euros. Europe remains the dominant market for rail coach procurement with NAFTA coming in second; but the Asia – Pacific region is soon expected to overtake North America as the second largest consumer of coaches.

During the Bush administration, rail projects were not high on the U.S. agenda and federal financing was hard to come by. Under the Obama administration, however, interest in passenger rail investment has increased dramatically. In fact, IIR (Industrial Information Research) is currently tracking 90 rail projects with a value exceeding $17 billion. Another $100 billion in new projects are currently in various planning stages.

Going forward it is anticipated that the "green" movement will accelerate the use of public transportation. In the US, greenhouse gases from transportation currently represent a third of all emissions. Public transportation, however, saves 37 million MT of CO_2 annually. That's about the same as the emissions generated by the electricity consumed in 5 million homes. Public transportation offers an immediate alternative for individuals looking to reduce energy consumption, commuting expenses and their carbon footprint.

The high cost of fuel makes weight a paramount concern in rolling stock. Costs of fuel for public transportation systems have nearly doubled since 2004. In the US fuel has risen from 6% of operating budgets to 11% today. Using composites to reduce weight and improve aerodynamics has long been

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Passenger rail growing globally

demonstrated to significantly reduce fuel consumption. For example, Alstom reports a 15% reduction in fuel consumption and some 70 MT weight reduction on its AGV train using composites.

Composites (FRP) are most commonly found in interior passenger coach components. FRP enables the coach designer to mold in multiple features, hence reducing part assembly requirements, labor and maintenance. Designers can also mold in surface textures that deter graffiti. Composites are used heavily in ceiling and floor panels, front ends, sidewalls, window masks, luggage stows, lavatories, kitchen and driver compartment modules and seating units.

Fire safety in rail applications is a critical concern. One of the best means to satisfy this need is mandated Fire Resistance (FR) norms and performance standards. Ashland Performance Materials has developed a full line of fire resistant composite resins for use in fabricating FR compliant components for the rail market. These products are most commonly sold under the Hetron and Modar brand names. As an international player, Ashland has developed commercial products that meet regulatory demands in nearly every corner of the world. Ashland Hetron and Modar resins find use in a wide variety of fabrication processes – from hand lay up and pultrusion to sheet molding compounds to infusion.

The passenger rail industry is growing like never before. And whether you live in New York, London, Shanghai or Mumbai, the demands are much the same for fire protection in passenger rail rolling stock. Comprehensive FR technology from Ashland Performance Materials as found in its Hetron and Modar resins enables composites to deliver fuel savings, aesthetic appearance and public safety without compromise in passenger rail applications.

FRP provides high durability and minimal assembly requirements in engineer consoles.

Alstom and Petrobras use FRP for Trains and Offshore Platforms in Brazil

Provided by **Ara Ashland** – Modar® 814A resin has two main Fire Resistant (FR) applications in Brazil: passenger train coaches and pultruded profiles for offshore oil platforms.

In the first case, the manufacturer **Fênix** used Modar resin to produce 800 train frames (end caps) that the Brazilian subsidiary of **Alstom** provided to the New York subway. Features such as low toxicity and optical density of smoke, as well as flame retardancy, were crucial to the choice of Modar® 814, reminds Paulo Gonzales, Fênix's CEO. "The frames are set in stainless steel parts located in the front and rear of the trains", he explains.

With respect to the application of FRP on offshore platforms, **Stratus** and **Enmac** – two of the main pultruders in Brazil – used Ara Ashland's Modar resin to fabricate railings, cable tray and cable bed systems for numerous **Petrobras** facilities. "Petrobras standards do not determine which resin should be adopted, but the requirements that must be followed by the pultruded profile. And in these cases, Modar® 814A has fully complied with the requirements", said Sérgio Barbosa, Stratus CEO.

Looking forward to 2010, Barbosa and Rodrigo Vale, Enmac's industrial manager, are optimistic about opportunities for consumption of pultruded profiles fabricated with Modar® 814A. The reason: the construction of the **Petrochemical Complex of Rio de Janeiro (Comperj)**. "The volume tends to be quite significant, after all, Comperj will be one of the largest developments in the history of Petrobras", Vale points out.

Subway car end caps fabricated by Fênix for NY Subway

Pultruded gratings, railings and structural members for Petrobras platform

Ashland partners with CMGD

Located about 50 miles (80 km) from Ashland's Sauveterre facility in the South of France, the materials research centre "Centre de Recherche Matériaux de Grande Diffusion" (CMGD) of the Ecole des Mines d'Alès specializes in materials, mechanics and civil engineering for a wide variety of applications.

CMGD employs about 60 degreed professionals, mainly senior staff scientists, and has a contractual turnover around $1 million per year. CMGD has established numerous academic and industrial partnerships around the world.

Professor José-Marie Lopez-Cuesta leads various studies on the fire resistance of polymers and nanocomposites. New formulations are developed and optimized which generate synergies between FR additives thanks to interfacial modifications of additives and polymers.

Toxicological aspects of components during combustion are also taken into account with a special focus on nanocomposites. CMGD has capabilities for material processing, mechanical and microstructural characterization, as well as fire testing (Cone calorimeter, Epiradiateur, Limit Oxygen Index and X-ray diffraction equipped with a programmable furnace). They also organize seminars and training on the scope of fire behavior of materials.

The collaboration of Ashland with CMGD provides a great opportunity to investigate new routes for the improvement of FR properties in thermoset resins and development of innovative new environmentally friendly FR technologies.

Cone calorimeter

X-rays diffraction with programmed furnace

Composites beat out metals for lighter, stiffer, high-performance radar telescope reflector dishes.

Composite dish enables next generation radio telescopes

The Composites Applications to Radio Telescopes (CART) Team at the Herzberg Institute for Astrophysics (HIA) was recently recognized with the Canadian National Research Council's Outstanding Achievement Award for their breakthrough development of the Mk II composite reflector radio telescope. The CART Mk II telescope was also the Innovation Award winner in the Aerospace category at the JEC Asia Conference held in Singapore in October of this year. The team chose Hetron 922 Epoxy Vinyl Ester resin to fabricate the dish via an infusion process.

As Gordon Lacy – Project Engineer for the CART Team describes, "Composites allow us to mold a near perfect dish surface. What this means is that the dish comes off the mold finished; no further adjustment is required. All metal dishes (except some small ones), require post-assembly adjustments. Metal dishes must also be fabricated from many small components, while the Mk II composite dish consists of just 10 large pieces. The dish itself is a single 33 foot diameter piece."

Composites offer a range of benefits over traditional metal structures in the construction of large (> 10 meter diameter) radio telescope reflectors, allowing lighter, stiffer structures that are thermally stable and yielding high performance over wide operating temperature ranges. Should the Mk II dish be selected as the preferred design for the Square Kilometer Array project in 2012, it will mean the construction of some 3000 of these composite reflectors for the very large array installation currently planned for either South Africa or Australia.

We want to hear from you!

Do you have a technical question about using an Ashland FR resin? Want to know what resin to use for a particular FR specification? Send your inquiries to **FR@ashland.com**. We're also looking for interesting new stories and welcome your ideas. Simply send in your question or idea — we'll be in touch soon!

Ares I rocket launch on Launch Pad 39B with Lightning Protection System

FRP protects NASA space craft from lightning strikes

Ershigs has provided NASA with three FRP masts for use in their Launch Pad 39B Lightning Protection System at the Kennedy Space Center in central Florida. Each 7 foot diameter, 100 foot tall mast was filament wound with Hetron FR 992SB epoxy vinyl ester resin. The lightning masts will be used in the next generation Constellation Program which replaces the soon-to-retire Space Shuttle.

The system consists of three free-standing steel towers, each topped with a fiberglass mast, for a total height of nearly 600 feet. The towers are interconnected with a catenary cable array including down conductor cables designed to divert lightning away from the rocket and service structure and into the ground. The three masts were fabricated at the Ershigs' Bellingham, WA facility with final assembly at Ershigs' Grand Bay manufacturing plant in Alabama. Ivy's Construction Inc erected the masts on site at the Kennedy Space Center Complex.

Florida is one of the most active regions within the US for lightning strikes. According to Steve Hettick – VP of Manufacturing for Ershigs, "FRP was the obvious choice for this application given the simultaneous need for low electrical conductivity and high axial strength required for the operating and upset (wind) conditions. In fact, NASA has consistently utilized FRP as the preferred material of construction for their lightning protection systems." The installed masts on Pad 39B are now the tallest structures at the Kennedy Space Center Complex. This new system provides better protection from lightning strikes and helps avoid costly delays to the launch schedule.

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FR Strategist is published by Ashland Inc. and reports the many ways professional fabricators tell us they are using Hetron FR resins to manufacture fire-resistant reinforced plastic (fiberglass) equipment. For additional technical product information on Hetron FR resins, visit www.hetron.com or send an email to FR@Ashland.com. You can also contact your Ashland representative at Ashland Composite Polymers, P.O. Box 2219, Columbus, OH 43216, 614.790.4059. Address all news items to: FR Strategist Editor, Ashland Communications, P.O. Box 2219, Columbus, OH 43216.