



Advanced Composites for High Speed Rail Applications

MTM[®]82S-C Phenolics for Interiors

Advanced Composites Group's (ACG's) MTM[®]82S-C pre-impregnated (prepreg) composite material technology allows the manufacture of thin, lightweight sections that provide significant weight savings for railway interior applications.

MTM82S-C Features

- Suitable for low cost vacuum bag processing, and press and autoclave moulding
- Ease of use, offering a broad processing window
- Ideal for monolithic and sandwich structures
- Provides a good surface finish
- Provides outstanding mechanical performance
- Can be supplied on a range of fabrics and fibres

Fire Requirements

MTM82S-C complies with the most stringent fire requirements:

- BS 476 Part 6
- BS 476 Part 7
- BS 6853 Cat 1a
- NF P 92-501 Rating M1
- NF F 16-101 Rating F1
- DIN5510 Rating S4, SR2, ST2

Advantages of Composite Materials in High Speed Rail Interiors

Weight Reduction

The weight of a typical MTM82S-C glass/phenolic composite is 50% less than aluminium and 80% less than steel, allowing significantly lighter components to be manufactured for railway interiors.

Cost Reduction

Reduced train weight lowers initial inertia and allows higher speeds to be attained quickly and efficiently. In turn, lighter trains reduce track load, decrease track wear and, consequently, lower trackside maintenance.

Applications

- Wall Panels and Partitions
- Window Frames
- Connecting Archways
- Floors, Ceilings and Decking
- Bulkheads and Stand Backs
- Luggage Racks and Compartments
- Seating and Furnishings
- Hatches and Doors
- Driver's Cab Instrument Panels

Components manufactured using MTM82S-C composite materials provide outstanding mechanical performance and meet the most stringent fire requirements.



Materials for Exterior Structures

ACG manufactures preregs using a combination of resin systems and carbon, glass or Kevlar reinforcement. These preregs have been developed specifically for applications in the rail industry, and are particularly suited to lightweight, high speed rail applications. Resin systems include standard and toughened epoxies, including flame retarded variants.

ZPREG® the Composite Technology for Large Structures

ACG's ZPREG® material technology uses selective, striped impregnation of the fibre reinforcements (or multiple layers thereof), which retains the fabric's excellent inherent drape characteristics whilst introducing air transport paths.

Advantages

- When compared to traditional, fully impregnated products, this material format speeds up the lay-up process and removes lengthy debulking cycles.
- ZPREG material facilitates the production of high performance, high quality finish and low void content components, avoiding the compromises required with other multi-layer systems and standard preregs.

- ZPREG materials can be formatted to meet any number of specific processing and performance profiles for tooling and components.
- The resin technologies used in ACG's ZPREG gives a broad processing window from 65 to 150°C and permits low temperature initial curing of very large structures on relatively simple mould tools.
- The step ahead glass transition temperature (T_g) allows for free-standing post-cure if required, or very fast turn around of smaller components at higher temperatures from the same resin system.
- When compared to traditional fibre reinforced systems cured in conventional ovens, ZPREG materials offer a reduction of up to 60% in manufacturing time.

DForm® Deformable Composite System

ACG's DForm® Deformable Composite System (DCS) is a labour saving, rapid processing prepreg technology that combines the conformability of a short fibre moulding compound with the directional characteristics of a high performance, long fibre composite.

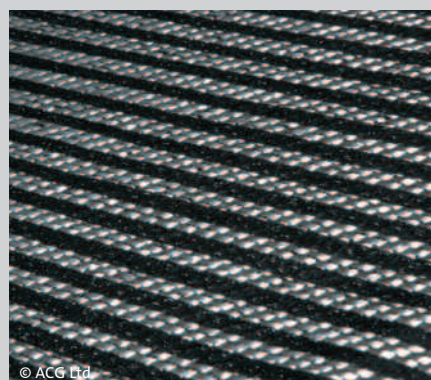
This unique combination of characteristics is achieved through selective fibre slitting of a unidirectional prepreg precursor.

Advantage

DForm does not require detailed laminating or extensive vacuum debulking. On the contrary, it flows readily under pressure to replicate the precise details of a complex mould tool or component.

Applications

- Front End Fairings
- Energy Absorbers
- Doors and Inspection Covers
- Bogie Debris Inspection Plates
- Stone Guards
- Tunnel Reinforcement Props and Panels
- Fishplates
- Bogie Leaf Springs



Case Study

ACG's Materials Offer Improved Quality and Reduced Operating Costs

After receiving a substantial order from Bombardier Transportation UK for 960 cosmetic panels for its Class 379 Electrostar EMU Passenger Trains, Ipeco Composites (based in Bristol, UK) approached ACG for advice on how they might achieve the following key objectives:

- Improved dimensional tolerances
- Reduced onsite labour costs
- Improved quality
- Quicker delivery
- Compliant with BS6853 Cat.1a, - standard governing the fire performance of rail rolling stock.

Ipeco Composites has a history of manufacturing phenolic prepreg structures for the aircraft industry, and it was a natural progression for the company to extend its expertise to the railway industry.

Previous cosmetic panels were manufactured using wet layup processing, but Ipeco considered that this technique was unsuitable for an order of this magnitude. They were particularly keen to reduce the manufacturing costs by:

- Improving surface finish
- Improving dimensional tolerances
- Reducing overall weight

ACG considered the issues and potential benefits for Ipeco and its



client, and offered its autoclave curable MTM®82S-C phenolic prepreg.

ACG's medium temperature moulding MTM82S-C is one of a range of controlled flow phenolic resin matrices exhibiting excellent fire, smoke and toxicity performance, and good mechanical properties.

With expert technical assistance and materials from ACG, all standbacks manufactured by Ipeco passed effortlessly through Bombardier Transportation's rigorous quality approval process thanks to the superior dimensional tolerances offered by prepreg moulding in comparison to wet layup processes.

The autoclaved MTM82S-C standbacks were installed by Bombardier without rework, thus reducing onsite labour costs and so contributing to the quality and timely delivery of this fleet of trains.

National Express, Bombardier Transportation's client, will benefit from reduced in-service operation and maintenance costs thanks to a significant weight saving and the robust nature of prepreg composite parts. Indeed, at only 6.4kg per unit, the standbacks provide a 40% reduction over a typical 10.5kg wet layup structure.

Unrivalled Service

Catering for all Industries

ACG offers a complete package of materials, including carbon fibre and glass fibre reinforcements, which are pre-impregnated with specially formulated epoxy, cyanate ester or bismaleimide resin matrixes.

Available in woven and stitched fabrics or as unidirectional tape formats, they are used across a diverse range of industries.

ACG also supplies elastomers, reusable vacuum bags plus a range of associated supplementary products, providing a complete suite of matched materials formulated to provide an effective composites processing package.

In addition to materials, ACG offers:

- Full technical support and assistance in the use of materials
- Training packages
- Technology transfer
- Tooling design and prototype service

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