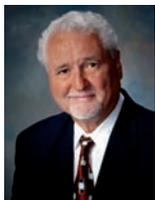


## New continuous-fibre thermoplastic technology for rail car application

Because we have more than 75 years of experience in the industry, some readers might think the authors of this article are like post-cure thermoset composites - rigid and set in their ways. They will be surprised to see the new panels we have developed for refrigerated rail cars made with continuous-fibre reinforced thermoplastics.



BY LOWELL MILES,  
CEO OF MILES FIBERGLASS &  
COMPOSITES,

AND  
ED PILPEL, PRESIDENT,  
POLYSTRAND, INC.

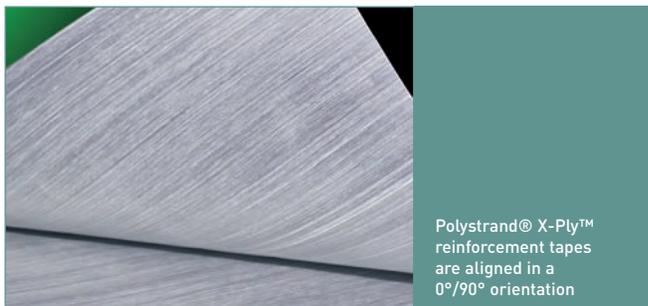


The benefits to end-users - rail car manufacturers and the transportation companies that buy them - are stronger and more scuff-resistant panels. The benefits to our companies - the materials consolidator and panel fabricator - include a consistent, sealed laminate surface and a cleaner, more environmentally-friendly process that employees like to work with.

### Manufacturing steps

The manufacturing process begins at Polystrand in Montrose, Colorado, USA, where continuous E-glass fibres are impregnated with polypropylene thermoplastic resin to make ThermoPro™ X-Ply™ reinforcement tapes. Polystrand ships the material in rolls which are 60% continuous fibres by weight, aligned in a 0°/90° orientation.

At Miles Fiberglass & Composites in Portland, Oregon, USA, two rolls of Polystrand® reinforcing material feed a laminating and forming process that heats, bonds and shapes the corrugated panels.



Polystrand® X-Ply™  
reinforcement tapes  
are aligned in a  
0°/90° orientation



At Miles Fiberglass & Composites, reinforcing material is heated, bonded and shaped into corrugated panels.

Miles ships the corrugated panels to a nearby Oregon facility where Gunderson Rail Services, a business of The Greenbrier Companies, Inc., installs the panels in railroad freight cars they outfit for transporting frozen and perishable products. The cars are being built under contract for Cryo-Trans, Inc., a company specializing in the leasing of refrigerated boxcars.

Once the panels are installed in the rail cars, urethane foam insulation is injected into the cavity between the panels and the exterior walls. A consistent, sealed surface is important at this stage because the absence of pinholes keeps the expanding foam insulation from coming out through the laminate. The corrugated shape adds strength and allows cold air to circulate within the car and around the cold cargo when the rail cars are in use.

Although the companies have both been in the composites business for many years, this application brought them together for the first time. They met after Dick Holland of Composites One, the US distributor serving both of them, recognized that one company's product could perhaps help improve the other company's product.

While Polystrand is only two years old, the company was formed after more than a dozen years of development work with advanced composite materials. The company was established after a proprietary process was developed to thoroughly impregnate continuous fibres with thermoplastic resin.

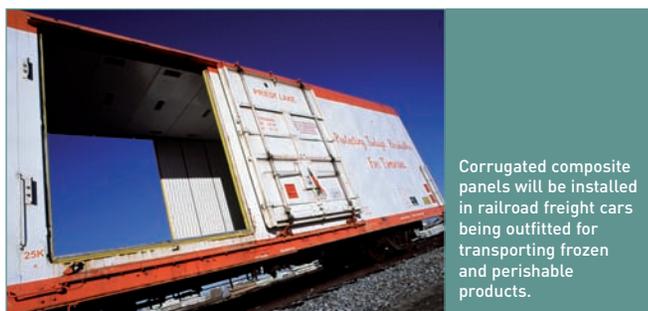
## Easy processing

Compared to traditional thermosetting composites, processing Polystrand material is easy, clean and simple. The material is dry and easily cut into a needed shape. No special storage is required and shelf life is virtually indefinite. There are no volatile organic compound (VOC) emissions or hazardous chemicals involved.

Multiple layers of Polystrand sheets or tapes can be stacked using the appropriate fibre, reinforcing content and orientation to meet the structural demands of a particular application. The stacked material is then heated until formable and consolidated, before being shaped and cooled to retain the configuration of the part. Production scrap can be 100% re used and the final part itself can also be 100% recycled in a sustainable, environmentally-responsible or "green" materials management programme.

The ability to produce stiffer, stronger and lighter parts has been especially attractive to aircraft, automotive and defence applications, and faster moulding and reduced waste have been attractive to everyone. Eliminating emissions, reducing mould time and eliminating waste are also benefits that impact the bottom line.

Polystrand reinforcement is available in X-Ply (0°/90°) laminates up to 1.27 m x 2.54 m. Tape rolls are available in 15.24 m widths and up to 547 m long, weighing 455 kg. A typical roll contains 547 m of reinforcing material and weighs about 455 kg.



Corrugated composite panels will be installed in railroad freight cars being outfitted for transporting frozen and perishable products.

At Miles, layers of Polystrand material can be combined and shaped with relatively low heat and pressure. The process combines the layers without adhesive, and the glass reinforcement and thermoplastic resin are already consolidated so employees can focus on forming the panels.

The clean process using thermoplastics also benefits Miles by allowing the company to add production capacity without impacting its federal air quality permit. Because no styrene or other volatile organic compounds are involved in the process, there are no emissions to report under the company's Title 5 permit.

## + More information ...

- Miles Fiberglass & Composites is a family-owned corporation founded in 1963. The company manufactures a variety of products using open moulding, vacuum bagging, press moulding and resin transfer moulding (RTM) processes. The company started by making products such as air conditioning unit covers and canoes, and has since expanded its capabilities to produce one-of-a-kind, custom-made items. [www.milesfiberglass.com](http://www.milesfiberglass.com), [webinfo@milesfiberglass.com](mailto:webinfo@milesfiberglass.com).

- Founded in 2004, Polystrand, Inc. is a privately-held company focused on developing the next generation of composites. The company makes reinforcement products with a variety of advanced fibres and thermoplastics for use in ballistic, commercial and industrial applications. [www.polystrand.com](http://www.polystrand.com), [todd@polystrand.com](mailto:todd@polystrand.com).

- Cryo-Trans is part of the MHW Group ([www.mhwgroup.com](http://www.mhwgroup.com)), an asset-based supply chain solutions company headquartered in Owings Mills, Md. MHW Group includes private and public refrigerated warehouses; Cryo-Trans Logistics, a full-service truck brokerage company; and Cryo-Trans, Inc. the largest privately-owned lessor of refrigerated railcars in the US.

In a two-month period, Miles will make nearly 30,000 corrugated panels that are 3.66 m long and either 0.762 or 0.914 m wide. The corrugated and other panels made by Miles will equip 429 rail cars. The entire contract will keep the company's employees busy for about a year.

The Polystrand reinforcement product is also being evaluated for internal bulkhead liners and threshold plates of truck trailers, which forklifts can damage during loading and unloading. The material shows great promise in this application as well.

While the truck application and others are being developed, Polystrand is expanding capacity to meet anticipated growing demand. The company now has two production lines with the ability to make 31.75-cm-wide tape. This summer, the company will add a third production line making 63.5-cm-wide tape.

Although we don't expect traditional thermoset composites to disappear, these old dogs expect to see a lot more use of continuous-fibre-reinforced thermoplastics in the years ahead. ■