

How Fiberglass Sandwich Panels Deliver Value Added in the Transportation Industry

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Due to the rapid technical development in the past years, various advantageous applications for fiberglass fabrics have been made possible. The widely observable implementation of glass fabrics can give many players in the transportation industry a leg-up, as the composite not only serves to replace expensive materials, but delivers advantages such as corrosion resistance and fire retardancy.

However only in the form of sandwich structures, fiberglass exploits its full potential and adds extra features to products. For this reason, especially the transportation industry has applied fiberglass sandwich panels.

Typically these structures consist of three main parts: two thin, stiff and strong facing layers separated by a light and weaker inner core. In the transportation industry, the faces, also referred to as skin layers, are usually made up of glass or carbon fiber-reinforced thermoset polymers. These are adhesively attached to the fiberglass core, i.e. multi-axial high-strength (honeycomb) structures in special antiskid tread pattern. More specifically, 2 Z -directionally w

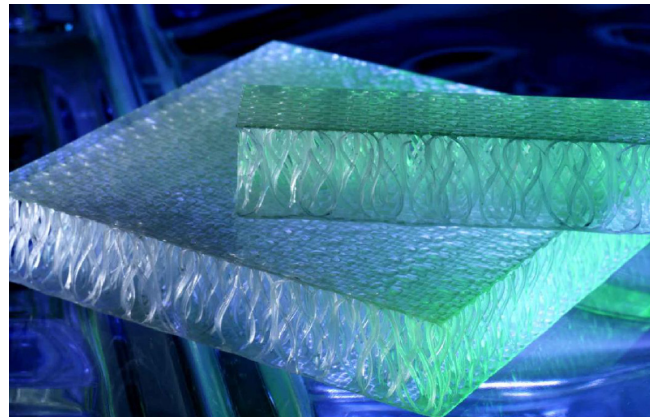


Image 1, www.parabeam.com

oven bundles of fiberglass with diameters as small as 4 micros create deck layers, which are connected by vertical yarns (see image 1). This way, the core itself obtains a load transfer between the components. Due to this smart structure, fiberglass fabrics are suitable as reinforcement layers to replace any other conventional material and at the same time deliver value added for the transportation industry.

Energy efficiency

Several studies have shown that fiberglass sandwich constructions lead to drastic weight savings. Instead of using stiff and relatively thick metal or polymer panels, producers in the aeroplane, automobile and railway sector for this reason prefer sandwich structures. Especially non-structural applications, such as interior panels in the automobile industry, can lead to weight savings of up to 5%. In the railway segment, savings of up to 3% in weight have been achieved. Continuous R&D however promises even higher numbers in the near future.

Even though these numbers might appear a bit low at first glance, the savings make a big difference in the long run, and an even bigger one for transportation fleets. Eventually these savings in weight increase the energy efficiency of transportation, as a lighter car (or coach, train, plane) means less mass to move. This translates to an increase of approximately 3% in energy efficiency for single cars, 1-2% for coaches, and up to 1% for planes and trains.

High Strength & Loadability Increase Impact Resistance

Fiberglass sandwich structures can easily match up to the strength and load capacity of often used metal, molded plastic, or wood panels. It is therefore not surprising that for example some car manufacturers apply sandwich constructions instead of impact-absorbing foam blocks between the door panels and the interior trim. Other applications as energy absorbing material (for buffers, fenders and driver protection) is also often found in interior carriage panels or the separating floor of coaches.

With one skin in compression, the other one is in tension. As previously mentioned, the skin layers this way allow for a load transfer between the different components. The property of each separate component is utilized to the structural advantage of the whole assembly leading to a very high stiffness-to-weight and high bending strength-to-weight ratio. As a consequence fiberglass sandwich components achieve an even better structural performance as conventional materials with less weight. In particular the average crushing load and crush force efficiency has been evaluated in several studies, with the designed sandwich structures exhibiting higher energy absorption capabilities and crush force efficiencies (for detailed information read *Advanced composite sandwich structure design for energy absorption applications: Blast protection and crashworthiness* by Tarlochan, Ramesh, and Harpreet).

Cost Savings

A few years ago, fiberglass sandwich panels were still too expensive for most transportation mean manufacturers, especially in the railway sector. However nowadays these structures provide an adequate solution to competitive prices. Considering further aspects where fiberglass leads to cost reduction, it becomes clear that it's application provides an decisive edge over competitors that stick to old solutions.

This financial advantage derives from three main factors:

- **Energy efficiency:** It is self-explaining that an increase in energy efficiency reduces the amount of “wasted” energy and thus money, especially in the long run.
- **Easy processing:** Cutting fiberglass sandwich panels requires few effort compared to other relevant composites. Furthermore in some cases, adhesive bonding can replace the more sophisticated process of welding and assembling.
- **Cheap delivery:** The transportation cost for the delivery of one cubic meter of a fiberglass sandwich panel is 50 times cheaper than for example the delivery of metal sheet.

Conclusion

However the best way to determine whether fiberglass sandwich panels are really suited for your needs is to obtain more informations about feasibility and whether they provide value added. For more in-depth information and application engineering expertise, you can contact our fiberglass experts directly.



For more information, please contact sales@parabeam.com.