

HiPer-tex™ fibre: the lightweight, low cost, high pressure cylinder solution



moving glass fibre into a higher gear



discover your fibreglass world



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HiPer-tex™ fibre: Moving glass fibre into a higher gear

HiPer-tex™ high performance fibre is the result of a groundbreaking manufacturing development. One that combines the technological advancements of a patented glass formulation and new melt fiberizing and sizing technologies. With a high-capacity production platform to deliver economies of scale.

HiPer-tex™ fibre delivers a host of benefits that include exceptional protection with light weight and affordable cost. In continuous filament form, it provides the ideal base material for filament winding processes, particularly to create composite pressure vessel structures.

The game-changing HiPer-tex™ glass fibre is an outstanding high pressure cylinder solution because it stands out in so many areas: high acid corrosion resistance, higher strength, higher modulus, and higher elongation at break.

Compared to traditional E-glass, HiPer-tex™ fibre delivers overall superior performance:

- up to 30% higher strength
- up to 17% higher stiffness
- 30% lower coefficient of linear thermal expansion
- 1 decade greater resistance to fatigue

Last but not least, the high corrosion resistance of HiPer-tex™ fibre has allowed it to pass the stringent acid corrosion test set by the United Nations ECE R110 regulation. Making it the ideal choice for motor vehicles using Compressed Natural Gas (CNG) cylinders.



driven to extremes

HiPer-tex™ fibre: Driven to extremes

The life of a high pressure cylinder can be extremely challenging. The demand for energy savings and CO₂ emissions reduction is increasing the need for low weight materials of high resilience. Calling for exceptional and extremely durable composite materials.

Composites based on HiPer-tex™ fibre can realize weight savings of up to 40% over steel and similar cost savings over carbon fibre. Optimal performance achieved without compromising practical constraints such as comfort, safety, product's availability and cost reductions. These properties, coupled with the temperature resistance and corrosion resistance properties of HiPer-tex™ fibre, make it the preferred solution for the growing high pressure cylinder market.

For automotive Compressed Natural Gas (CNG) cylinders, weight-optimised HiPer-tex™ fibre composite is the perfect solution. Indeed, its light weight, high modulus, high strength and high corrosion resistance bring significant benefits.

Filling the gap between steel cylinders and carbon cylinders. Some performance factors of ECE R110 certified CNG cylinders:

- Type 1 steel: 1 kg/L
- **Type 4 HiPer-tex™ fibre: 0.56 kg/L**
- Type 4 carbon: 0.35 kg/L

By combining HiPer-tex™ fibre with an appropriate resin matrix system – typically epoxy or vinylester – essential mechanical and physical properties can be engineered into the composites.



These are:

- Good visual aspect
- Moisture resistance
- Acid resistance
- Thermal stability over a wide temperature range
- Structural integrity
- UV resistance
- Impact resistance
- Fatigue resistance

Use of HiPer-tex™ fibre is highly recommended for high pressure applications in:

- CNG vehicles
- Accumulator shells
- Stockage and Transport of industrial & medical gas
- Self Contained Breathing apparatus
- Sport & Leisure cylinders

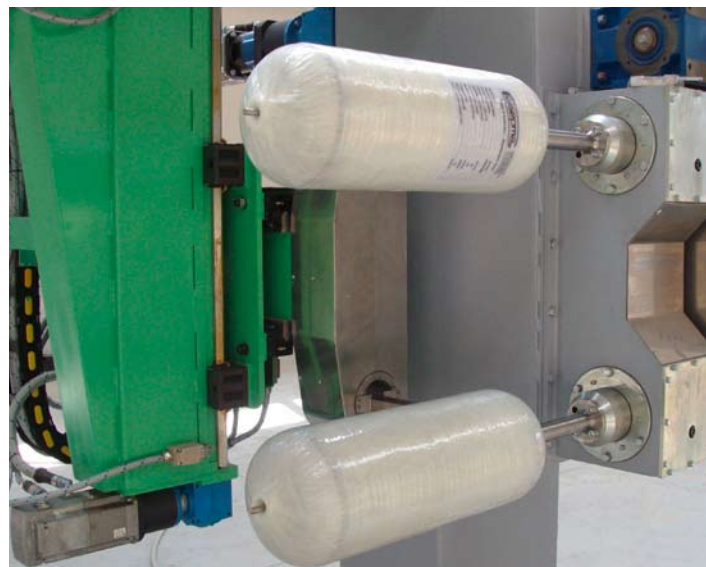
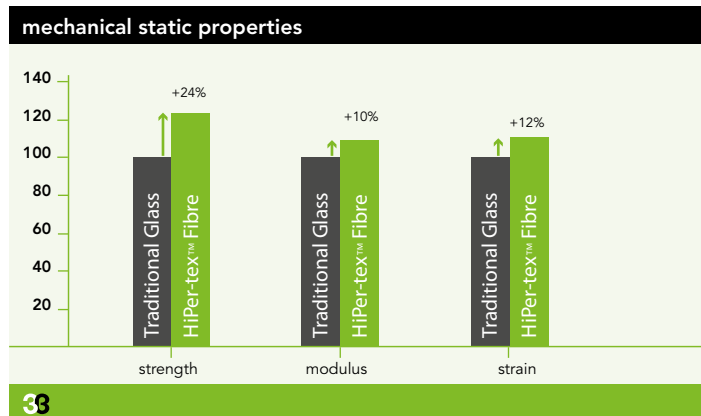


the figures speak for themselves

HiPer-tex™ fibre: The figures speak for themselves

Static mechanical properties

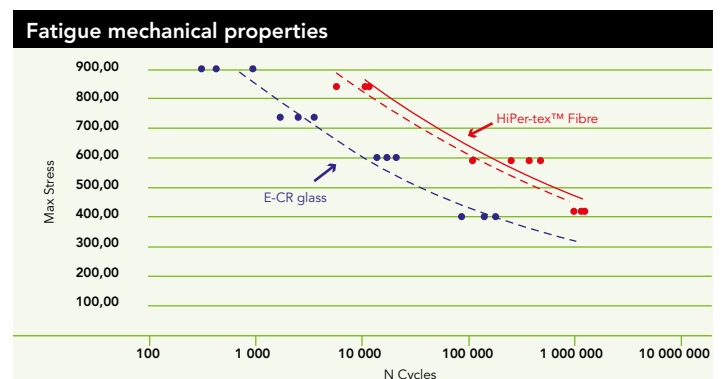
- Comparison of traditional E & E-CR reinforcement glass vs HiPer-tex™ fibre as per ASTM D2343-08 (epoxy impregnated strands)



• Courtesy of VEM Spa, www.vem.eu

Fatigue mechanical properties

- Comparison of traditional E & E-CR reinforcement glass vs HiPer-tex™ fibre
- Epoxy unidirectional laminates
- Tension/tension ratio: 0,1
- HiPer-tex™ fibre improves fatigue performance by one decade
- Courtesy of CRM Liège



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Acid corrosion resistance properties

- Corrosion resistance of E-Glass versus HiPer-tex™ fibre
- On real A14 test conditions – after exposure to acid – cylinder shall provide a residual burst pressure greater than 85%
- Mimicked A14 Acid Environment test of ECE R110 regulation for CNG cylinder approval
- Measurement of residual flexural properties of 100 hour immersed laminates in 30% H₂SO₄ solution @ RT. 35% strain level
- HiPer-tex™ fibre provides high residual mechanical static properties after mimicked A14 test:

Acid environment test

	Strength (MPa)	Residual Strength (MPa)	Residual Strength (%)	Modulus (GPa)	Residual Modulus (GPa)	Residual Modulus (%)
E-Glass 77,6% Wf	1497	0	0	50.6	0	0
HiPer-tex™ Fibre 79%Wf	1791	1659	92	56.5	56.4	99

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customer-led innovation

HiPer-tex™ fibre: Customer-led innovation

Groundbreaking, relevant, game-changing solutions. Like our breakthrough HiPer-tex™ Fibre for high pressure cylinders, which meet and exceed customers' need for high performance and cost effectiveness.

Young and dynamic, yet with a rich heritage in innovation, 3B glass fibre solutions are also proven out in the real world. Below, some examples taken from the Sport, Leisure and Medical, Aerospace and Automotive industries.

Further information on these solutions is available on request from:
3B.info@3b-fibreglass.com

Sport, Leisure & Medical Applications

HiPer-tex™ fibre Type 4 cylinder

- Light weight: 0.84 kg/l
- Service Pressure: 200 bar
- High impact resistance
- Nice white aspect



Aerospace Applications

HiPer-tex™ fibre Type 3 thin aluminum lined pressure vessels for enhanced mechanical properties

- Light weight: 0.36 kg/l
- Working pressure: 70 bar
- Courtesy of Sepma srl, www.vem.eu



Automotive Applications

HiPer-tex™ fibre Type 4 thermoplastic lined CNG cylinder

- Light weight: 0.56 kg/l
- Working pressure: 200 bars
- Approved to United Nation ECE R110 regulation
- Courtesy of Gastank Sweden



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formance. The user, by accepting the products described herein, agrees to be responsible for thoroughly testing any application to determine its suitability before committing to production. It is important for the user to determine the properties of its own commercial compounds when using this or any other reinforcement.

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