

discover  
your fibreglass world



# 3B, preferred partner for the automotive industry

Nowadays, most vehicles contain glass fibre developed and produced by 3B-the fibreglass company.

With more than 30 years of experience and expertise in the Automotive industry, 3B is a fibreglass industry leader developing functionalized fibreglass solutions for today and tomorrow's vehicles.

3B provides to the Automotive sector high performance glass fibres, chopped, continuous or mat forms specifically tailored to reinforce thermoplastic or thermoset resins for thermal and phonic insulation applications. 3B is totally committed to this Automotive market which represents the major part of its turnover.

As a leading supplier of fibreglass, 3B is already well recognized as a reliable partner within the Automotive market by Tier 2, Tier 1 & OEMs. To further support the Automotive industry throughout its entire value chain, 3B has put in place an internal dedicated Automotive organization encompassing all regions as well as a focused pool of functions from Sales & Marketing, Manufacturing and R&D. This dedicated structure enables customer intimacy needed to offer partners the optimized and tailored solutions they need within the shortest lead times.



To sustain its leadership position, 3B commits to further maintain its cutting edge level of expertise that allows **value creation** for all participants in the supply chain through:

- **Innovation:** 3B is not only partnering with its direct customers but also with key composite industry actors to innovate and create leading-edge solutions. In any event, 3B high performance products constitute enabling technologies that help the Automotive supply chain invent solutions for the future.
- **Quality, Proximity and Service:** 3B-the fibreglass company is recognized by its customers as the preferred supplier based on a combination of excellent service and best-in-class products. 3B is totally committed to supporting its customers both locally and internationally and to offer them a global reliable sourcing strategy with the same service level around the globe.

Thanks to this integrated approach of processes, technologies and teams, 3B is creating the fibreglass solutions for a durable mobility.

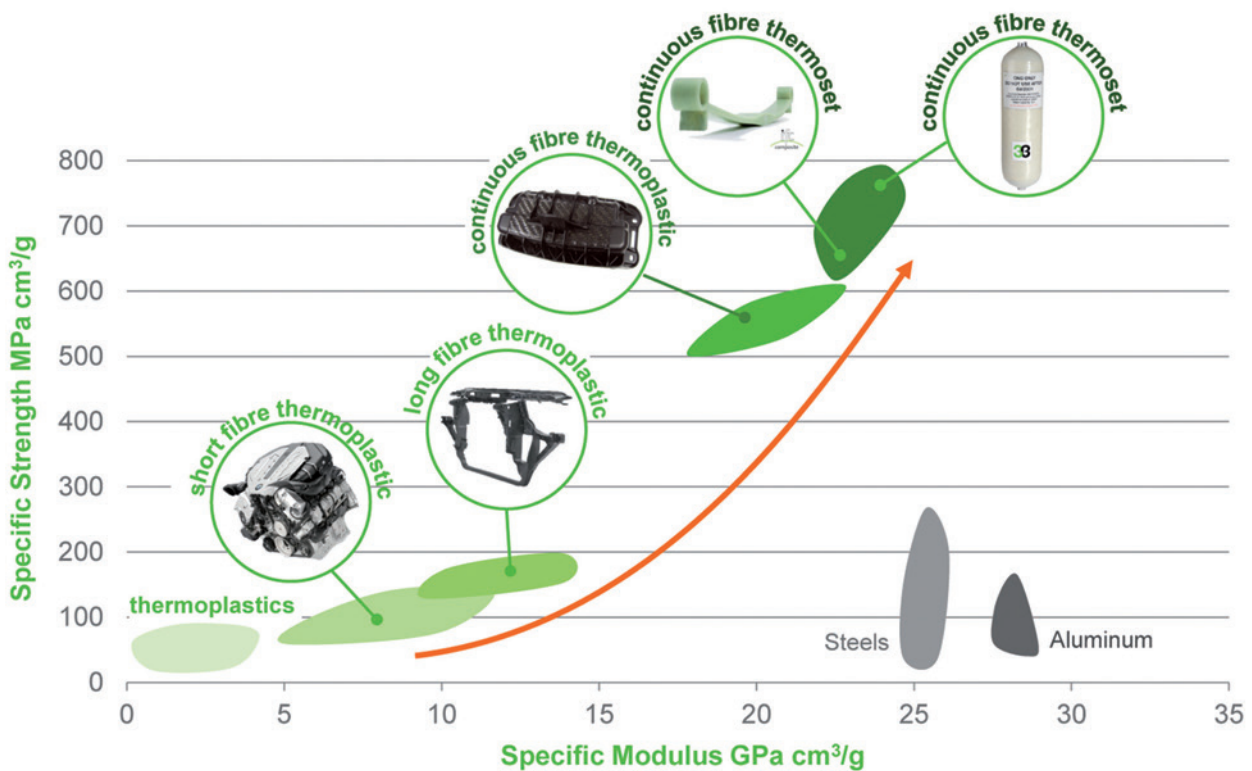
# Glass fibre for the XXI<sup>st</sup> century vehicles

There are no doubts that the ongoing change of paradigm from the XX<sup>th</sup> century Auto-Mobile to the XXI<sup>st</sup> century Eco-Auto-Mobility does call for eco-responsible, safer and more comfortable vehicles.

Optimized usage of resources, decrease in fuel consumption hence reduction of vehicles' emissions, development of alternative energies to replace fossil fuels do definitely trigger the need for durable, lighter and more performing materials.

**Innovative and cost effective glass fibre composites address efficiently these challenges:**

- The inherent mineral composition of glass fibre makes them extremely durable as well as resistant to high temperatures and to corrosion from most automotive fluids.
- Their specific mechanical performances and their versatility to be shaped in various forms open a large spectrum of tailored and optimized designed solutions that already over-perform traditional materials such as steel and aluminum as illustrated below.



Building on its leading edge expertise and convinced of the unlimited potential of glass reinforced composites, 3B is pushing the current composite boundaries to build the XXI<sup>st</sup> century vehicles.

# glass fibre for sound absorption of exhaust systems

The mineral composition of 3B glass fibres makes them extremely durable and resistant to high temperatures and exhaust fumes' chemicals.

The inherent properties of 3B glass fibres have triggered, some 25 years ago, the use of glass filled silencer systems that still equip today most vehicles globally.

The main advantage of 3B glass fibre is that it can easily be transformed into a well-texturized material that leads to an optimized acoustic absorption across the entire frequency spectrum. Also being able to withstand temperature peaks up to 800°C 3B glass fibres are the materials of choice in the most demanding sound absorption exhaust systems without showing any fibre deterioration across the vehicle's whole lifetime.



# glass fibres for light semi-structural parts

Over the last 30 years, glass fibre reinforced thermoplastic has increasingly replaced steel-made automotive components. Air intake manifolds, front-ends, back seat covers and engine cooling systems are typical reinforced thermoplastic applications.

The replacement of steel and aluminium by composite solutions is driven by the weight reduction and recyclability potentials of reinforced thermoplastic materials but also because parts

containing chopped discontinuous fibres - i.e. a semi-structural architecture - are extremely cost effective when molded for large automotive series.

As a pioneer and a leader in development of glass fibres compatible with thermoplastic resins, 3B continuously revamps its glass fibres' portfolio to address the increasingly demanding needs of this evolving market.

## Innovative glass fibre solutions for Short Fibre Thermoplastic (SFT) Technologies

SFT are the most widely used composite technologies within the automotive industry thanks to their low cycle time and competitive costs ideally suited for high production series.

Typically these technologies refer to injection or extrusion-compression molding of molten glass reinforced plastics within cavities that shape the final part.

Use of resilient, functionalized, well protected and extremely easy-flow glass fibres is crucial for an optimum balance between in molds molten compound's rheology and final part's performances.

3B's leadership position in thermoplastic represents a sign of quality and a guarantee of the company's know-how in the development of such fibres.

More specifically, 3B has been addressing in the last years the main challenges of automotive in terms of heat resistance, resistance to various automotive fluids, impact resistance and freedom of design. Those fibers are well-established benchmarks for reinforcing the most demanding cooling systems, air intake manifolds and oil pans while exhibiting at the same time outstanding mechanical properties thanks to a residual glass fibre length of 200 to 500  $\mu\text{m}$  within the final part.

### Innovative glass fibre for Long Fibre Thermoplastic (LFT) Technologies

Long Fibre Thermoplastic (LFT) parts are benefiting from residual glass fibre length in the range of the mils and become then the preferred option when better semi-structural properties than SFT-made parts are required.

With improved impact resistance, higher stiffness and enhanced long term resistance to solicitations, LFT-made components are pushing further the limits of reinforced thermoplastic materials in the race of metal substitution.

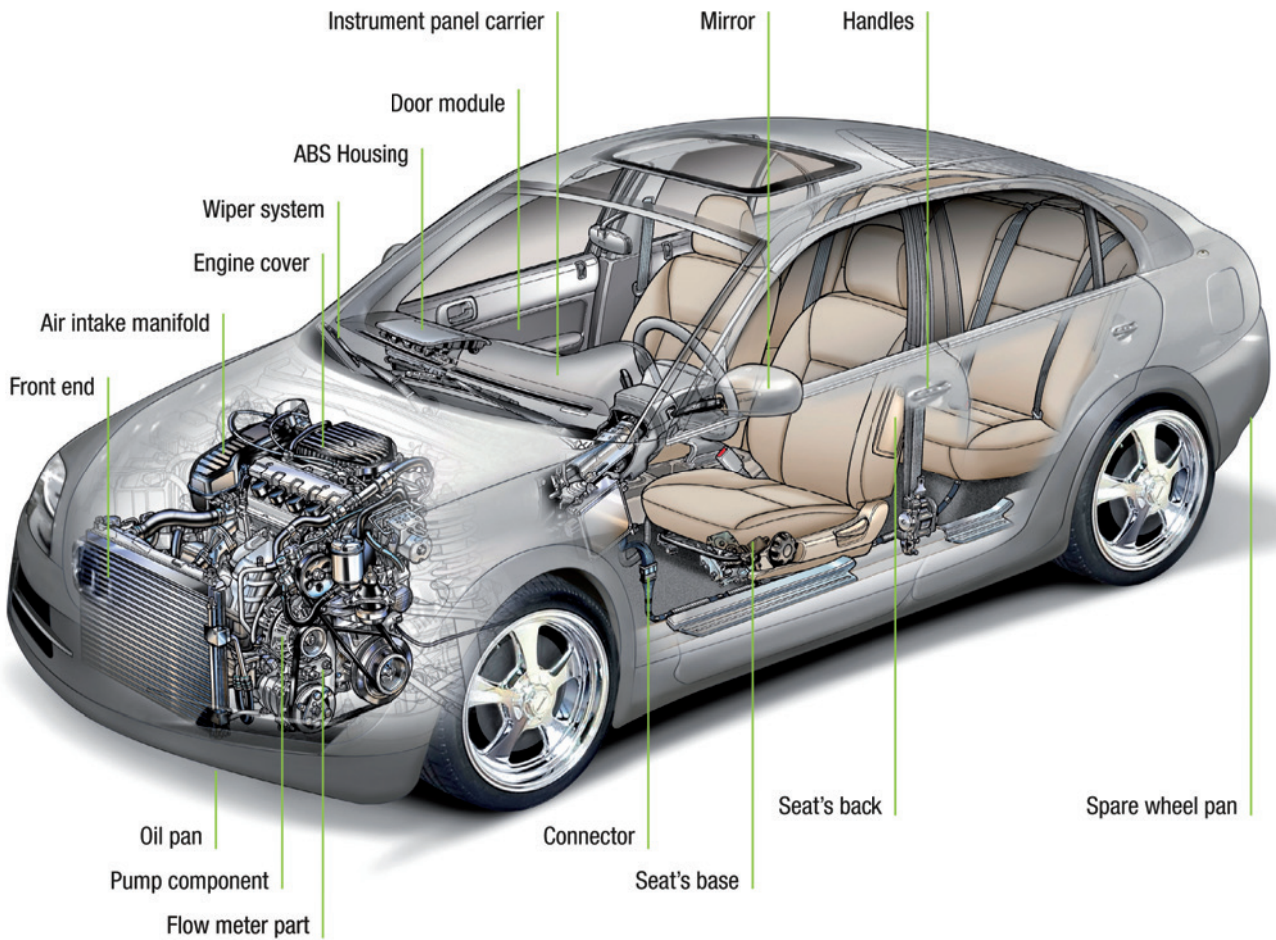
With glass input generally in the form of continuous fibres, LFT technologies (either through glass filled pellets or in-line direct compounding) call for fibres that show a high level of dispersion within the polymer to guarantee a nice visual aspect and optimum performances of the final parts.

3B's large solution portfolio is continuously expanding and leads the way to new fibreglass uses in Automotive.

### Innovative glass Continuous Fibre Mat for thermoset technologies

Continuous Fibre Mat is an example of innovative and unique form of glass fibre produced by 3B that shows a high performance to weight ratio for medium to large automotive parts while combining easy manufacturing of medium size series.

Ideally suited for technologies such as polyurethane S-RIM (Structural-Reactive Injection Molding) 3B's Continuous Fibre Mat acquired his letters of nobility in the manufacturing of, for instance, light weight composite back-seats of premium vehicles.



# glass fibres for stronger & lighter structural parts

Structural applications are and will increasingly be benefiting from the use of continuous fibre composites whose high specific performances enable advantageous replacement of traditional materials. 3B has indeed been the pioneer in developing and supplying glass fibres for the first in-line pultrusion process that has supplied several millions of well recognized glass fibre composites leafsprings which display an 80% reduced weight compared to the one made of steel.

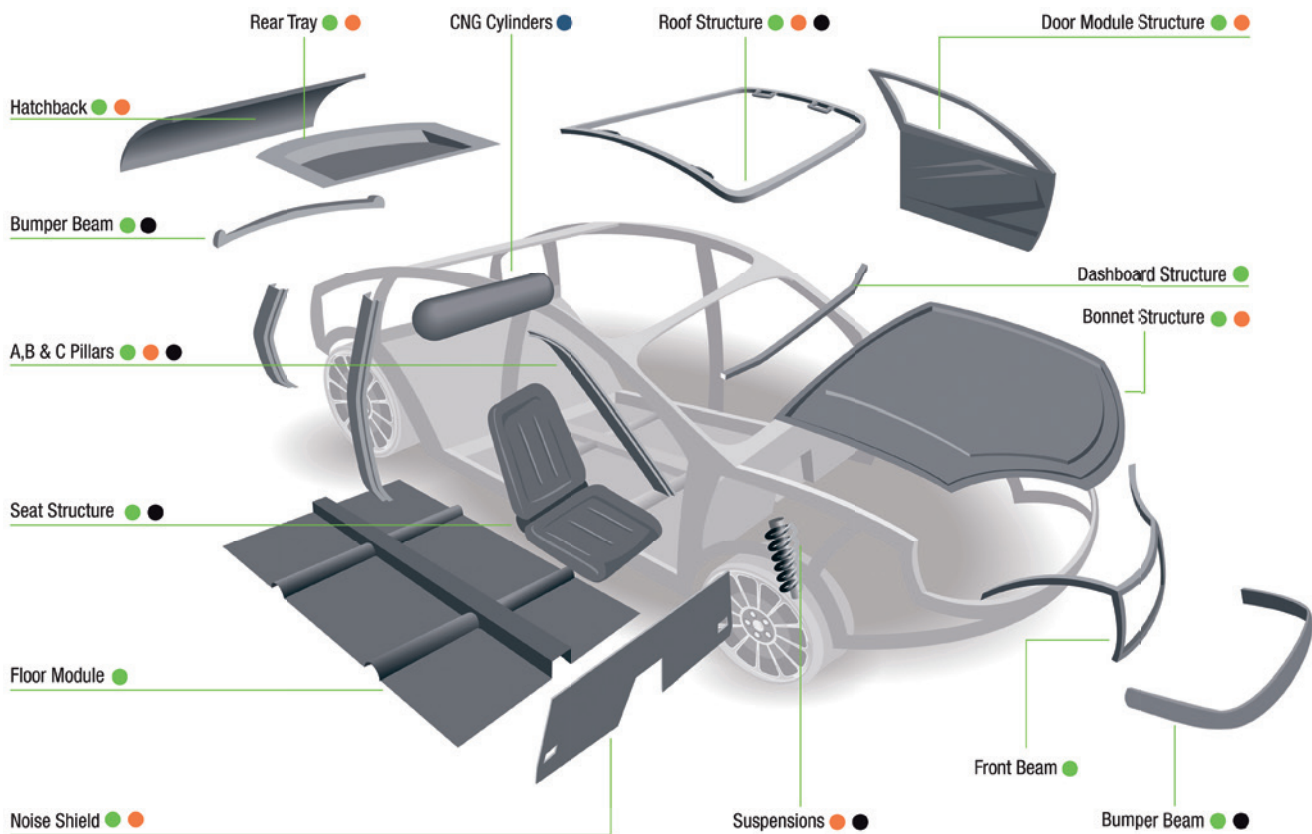
Production of medium and large automotive series require competitive costs and shorter cycle times. As a consequence, with its clear strategy of creating value for all participants in Automotive value chain, 3B has decided to focus its glass fibre development expertise on some of the technologies that are in the near future foreseen to be suitable to address this challenge of low costs productions of medium and large series for light structural parts.

## Innovative glass fibre solutions for RTM technologies

As the favorite technology to produce medium sized and complex geometry components, RTM (Resin Transfer Molding) calls for a decrease in cycle time that is mainly influenced by the part's consolidation phase while being molded.

In close cooperation with its resin producer partners, 3B offers and is developing continuous fibres suitable for the new and next generation of so-called snap-cure resin systems - curing time within the minute range - that enable an extremely fast curing of the parts while achieving the highest quality resin-glass interphase thanks to in-house 3B glass sizing technologies.

Being an expert in thermoplastics sizing technologies, 3B also supports development of high performing glass fibre tailored to T-RTM (Thermoplastic- RTM). One of the latest public examples is the launch in 2013 of the first continuous high performance glass fibre suitable for acrylic resins T-RTM.



- Hybridization
- Filament Winding
- RTM
- Pultrusion

## Innovative glass fibre solutions for Hybridization technologies

3B does not underestimate the trends of parts' hybridization which current thermoplastic injection or compression molding technologies will benefit in the long run to produce optimized automobile medium sized and medium geometric complexity components. Concept of hybridization - composite of a composite – translates into manufacturing of parts where some low stressed areas can be fitted solely with short or long fibre reinforced polymers whereas heavy stressed areas are reinforced by continuous fibre materials along the load paths. In this very promising context, 3B has already designed a full range of thermoplastics compatible continuous fibres that cope with the very specific needs of Tapes and organosheet technologies.

## Innovative glass fibre solution for Filament Winding and Pultrusion technologies

Fibre winding and Pultrusion are suitable also for large symmetric parts such as tanks and beams that are widely used in the transportation industry. These already heavily automated technologies require easy processable and high mechanical performance fibres when designers of the final components wish to exhibit the highest possible mechanical performances a glass composite can display. This has guided the recent developments of glass fibres that allowed 3B to take the lead in the leafsprings and high pressure tanks markets, achieving higher performances than steel and aluminum solutions.

### SUMMARY OF MECHANICAL PROPERTIES PER MATERIAL

						Synthesis
Specific Stiffness	% in weight of material		Properties	E (MPa)	$\rho$ (kg/m <sup>3</sup> )	E specific (x 10 <sup>6</sup> m)
Short Fibre Thermoplastic	20%	Standard glass	Isotropic	4.800	1.040	<b>0,47</b>
	30%	Standard glass	Isotropic	6.700	1.270	<b>0,54</b>
	35%	Standard glass	Isotropic	8.200	1.350	<b>0,62</b>
	50%	Standard glass	Isotropic	11.500	1.580	<b>0,74</b>
	60%	Standard glass	Isotropic	13.500	1.690	<b>0,81</b>
Long Fibre Thermoplastic	20%	Standard glass	Isotropic	5.300	1.040	<b>0,52</b>
	30%	Standard glass	Isotropic	7.400	1.235	<b>0,61</b>
	40%	Standard glass	Isotropic	9.700	1.400	<b>0,71</b>
	50%	Standard glass	Isotropic	13.250	1.565	<b>0,86</b>
	60%	Standard glass	Isotropic	17.750	1.700	<b>1,06</b>
Continous Fibre Thermoplastic*	65%	Standard glass	Unidirectional	2.000	1.600	<b>1,78</b>
	70%	Standard glass	Unidirectional	33.000	1.600	<b>2,10</b>
Continuous Fibre Thermoset	80%	Standard glass	Unidirectional	46.000	1.900	<b>2,47</b>
Aluminum	100%	Aluminum	Isotropic	72.000	2.700	<b>2,72</b>
Ultra High Strength Steel	100%	Steel	Isotropic	210.000	7.800	<b>2,74</b>
Standard High Strength Steel	100%	Steel	Isotropic	210.000	7.800	<b>2,74</b>
Continuous Fibre Thermoset	80%	3B's High Performance glass	Unidirectional	53.000	1.900	<b>2,84</b>

						Synthesis
Specific Strength	% in weight of material		Properties	$\sigma$ (MPa)	$\rho$ (kg/m <sup>3</sup> )	$\sigma$ specific (x 10 <sup>3</sup> m)
Short Fibre Thermoplastic	20%	Standard glass	Isotropic	75	1.040	<b>7,4</b>
Standard High Strength Steel	100%	SHS Steel	Isotropic	600	7.800	<b>7,8</b>
Short Fibre Thermoplastic	30%	Standard glass	Isotropic	110	1.270	<b>8,8</b>
	35%	Standard glass	Isotropic	120	1.350	<b>9,1</b>
	50%	Standard glass	Isotropic	160	1.580	<b>10,3</b>
	60%	Standard glass	Isotropic	175	1.690	<b>10,6</b>
Long Fibre Thermoplastic	20%	Standard glass	Isotropic	105	1.040	<b>10,3</b>
	30%	Standard glass	Isotropic	130	1.235	<b>10,7</b>
	40%	Standard glass	Isotropic	165	1.400	<b>12,0</b>
	50%	Standard glass	Isotropic	195	1.565	<b>12,7</b>
	60%	Standard glass	Isotropic	215	1.700	<b>12,9</b>
Ultra High Strength Steel	100%	UHS Steel	Isotropic	1.400	7.800	<b>18,3</b>
Aluminum	100%	Aluminum	Isotropic	600	2.700	<b>22,7</b>
Continous Fibre Thermoplastic*	65%	Standard glass	Unidirectional	800	1.600	<b>51,0</b>
	80%	Standard glass	Unidirectional	1.120	1.900	<b>60,1</b>
	70%	Standard glass	Unidirectional	990	1.600	<b>63,1</b>
Continuous Fibre Thermoset	80%	3B's High Performance glass	Unidirectional	1.420	1.900	<b>76,2</b>

\*data from FRT Tapes ; [www.frttapes.com](http://www.frttapes.com)



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