

3M™ Matrix Resins



The
game
has changed.

Stronger, lighter, tougher composites

3M

3M™ Matrix Resins

Re-writing the rules for pressure vessel performance.



Reinforcing filament wound composite pressure vessels had always been a balancing act between weight and performance. You either had to maximize performance by adding more material, or minimize weight by using just enough material to satisfy minimum performance requirements.

3M now makes it easier to strike a perfect balance: a new generation of high-tech, nano-silica resins that allow you to create lighter, stronger, tougher composites—with the same processes you're already using today.

Design lighter, stronger, tougher composites

Highly uniform dispersions of silica nanoparticles are the key to the exceptional performance of 3M™ Matrix Resins. Embedded in an epoxy resin with 3M's advanced particle and dispersion processing technology, 3M matrix resins can help you:

- Design lighter vessels by significantly improving burst pressure, after-impact burst pressure and fatigue life
- Increase both fracture resistance and shear modulus of your matrix resin
- Use less resin and fiber in your designs
- Strengthen fatigue resistance
- Preserve cure properties
- Outperform current warranty test standard limits



A recent study found that vessels wound with 3M™ Matrix Resin 4831 withstood a 6% increase in burst pressure vs. traditional Bis-A epoxy vessels. What's more, after-impact burst pressure increased an amazing 30%.

Type III pressure vessel burst test

Control Vessel



Average Burst Pressure 6373 psi

Bis-A Epoxy

Lindride 36Y Curative
Toray T700 Carbon Fiber

2

3M Vessel



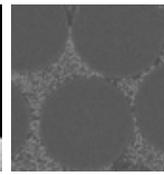
Average Burst Pressure 6779 psi

3M™ Matrix Resin 4831

Lindride 36Y Curative
Toray T700 Carbon Fiber

3

- 6% increase in burst pressure
- 55% average increase in fatigue life
- 30% increase in after-impact burst pressure



5

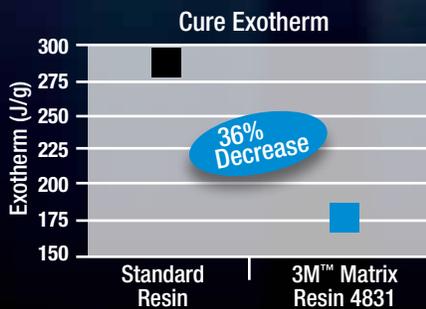


Improve processing, cycle time, product quality and yield

Manufacturing efficiency is always a factor when considering a new process or product for your production lines. 3M matrix resins can help you improve your manufacturing productivity, as well:

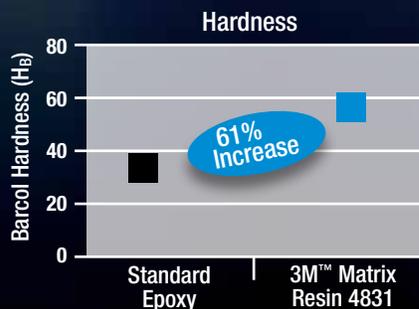
- Take advantage of lower exotherm properties to make thicker parts with increased efficiency in your cure cycles
- Create harder, more durable composites, with fewer scratches and scuffs
- Reduce shrinkage and warping in your products

Lower exotherms



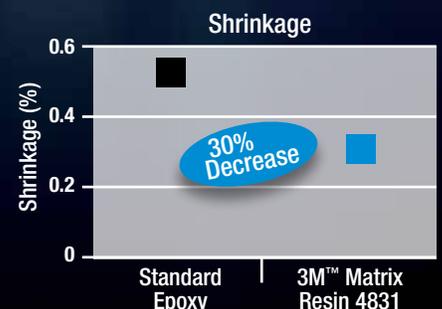
3M™ Matrix Resins exotherm significantly less than standard resins during curing, allowing you to make thicker parts.

Increase hardness



3M™ Matrix Resins are 61% harder than standard epoxy resins. So there are fewer problems with scuffing and scratching, and better aesthetics in your finished parts.

Reduce shrinkage



3M™ Matrix Resins shrink less than standard epoxy resins during cure, reducing residual stress, distortion and warpage in your finished pieces.

Note: The technical information and data should be considered representative only and should not be used for specification purposes.

Another ingenious solution from a world leader in nanotechnologies and specialty materials.

With 45 technology platforms and a culture of continuous innovation, 3M is known around the world for delivering practical and ingenious solutions to problems in every sphere of life. To develop our thermosetting resin systems for fiber composites, 3M scientists leveraged our expertise in three core technologies: specialty materials, nanotechnology, and particle and dispersion processing. The result: Easy to use composite materials that are lighter, stronger and more durable than anything else on the market today.

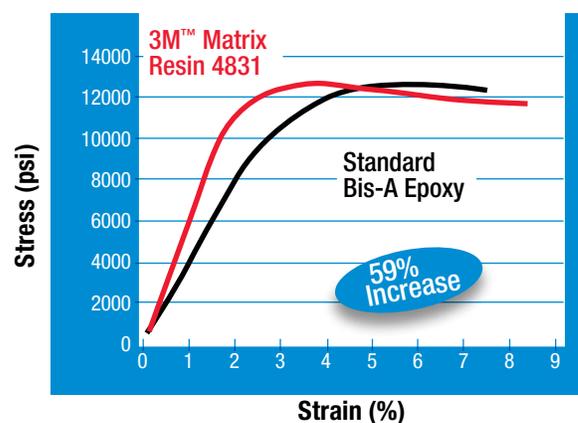
Resin Properties

Property	Unit	Method	Standard Bis-A Epoxy	3M™ Matrix Resin 4831
K_{Ic}	MPa√m	ASTM D5045 (Compact Tension Geometry)	0.5	1.3
T_g	°C	DMA (peak of tan Δ)	132	122
Shear Modulus, G	ksi	ASTM D638 (via Poisson's Ratio)	167	268
Tensile Modulus, E	ksi	ASTM D638	455	722
Peak Tensile Strength	ksi	ASTM D638	12.1	12.8
Elongation at Yield	%	ASTM D638	5.3	3.4
Barcol Hardness	H _B	ASTM D2583	36	58
Complex Viscosity η_1^* at 30°C	Pa-s	Parallel Plate, dynamic mode	0.63	1.40
at 40°C	0.29		0.65	
at 50°C	0.14		0.34	

Note: All samples cured with Lindau Chemicals' Lindride 6K at 0.95 equiv epoxy.

3M™ Matrix Resins perform significantly better than standard epoxies on a variety of important measures.

Tensile Stress



Learn more about making your composites lighter, stronger and tougher at 3M.com/matrixresin or 1-800-362-3550.

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Note: Neat resins cured with Lindride 6K anhydride. The technical information and data should be considered representative only and should not be used for specification purposes.



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