

### Binders, Repair, Tooling and Other Products

Because we, too, inhabit the shop floor, we know it's not enough to just supply the resins for infusion, layup and bonding. If our customers are to differentiate through efficient production, they need "end-to-end" solutions to facilitate all the steps in turbine and rotor blade manufacture and repair, from prototyping through molding—and the technical input to make it all work.

Binder system features:

- Fix fabrics in place for proper laminate positioning during lay-up
  - Actually crosslink into the cured laminate via epoxy functionality (PR685, PR687 and PR688)
  - Utilize a novel hotmelt spray-swirl application technique (05390)
- Repair system features:

- Cartridge delivery makes field repairs easy
  - Performs in many environmental conditions
  - Excellent bonding to various substrates, even metal
  - Easy 2:1 mixing ratio
- Tooling system features:

- Good chemical resistance
- Superior fiber wetting
- High Tg (>160°C)
- Low exotherm
- Low initial mix viscosity
- Long/extended pot life

### Wind Composites—BINDERS, REPAIR & TOOLING

Wind Composites—Bonding Paste								
Epoxy Resin System	Performance & Features							Remarks
	Mix Ratio (vol)	Pot Life Range (min <sup>1</sup> )	Gap Filling (mm)	Open Time	Crack Resistance	Fatigue Performance	Ease of Use	
<b>Hand Lay-up</b>								
EPIKOTE™ Resin MGS™ BPR 135 G3 Resin EPIKURE™ MGS™ BPH 134-137 GF Curing Agent	100:50	15-180	>10	●●○	●●●	●●○	●●○	<ul style="list-style-type: none"> <li>Today's industry benchmark</li> <li>Proven performance over 20 years in the field</li> <li>Wide range of curing agents available</li> <li>Low exothermicity</li> </ul>
EPIKOTE Resin MGS BPR 535/EPIKURE Curing Agent MGS BPH 538	100:43	260	>10	●●●	●●●	●●●	●●●	<ul style="list-style-type: none"> <li>Next generation</li> <li>High fracture toughness and strain</li> <li>Low density</li> <li>Best-in-class open time</li> </ul>
EPIKOTE Resin MGS BPR20/EPIKURE Curing Agent BPH20	100:50	15	<10	●●○	●●●	●●●	●●●	<ul style="list-style-type: none"> <li>Cartridge system for field and site repair</li> <li>Ambient cure</li> <li>Good adhesion on unprepared surfaces</li> <li>Composite-to-metal bonding</li> </ul>
GOOD ●●○	BETTER ●●○			BEST ●●●				
1) Pot life of 100g in a waterbath at 30°C								

## Epoxy Bonding Paste

If you're anxious about the longevity of your offshore turbine blade bond lines, our new lightweight, rapid cure bonding paste with excellent fatigue resistance can help. We offer:

- The strongest track record in the industry
- The most comprehensive knowledge of bonding technology
- Continuous innovation based on our research and collaborative technical efforts
- Research validated through top notch testing capabilities

### Wind Composites—Bonding Paste

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<b>Hand Lay-up</b>								
EPIKOTE™ Resin MGS™ BPR 135 G3 Resin EPIKURE™ MGS™ BPH 134-137 GF Curing Agent	100:50	15-180	>10	●●○	●●●	●●○	●●○	<ul style="list-style-type: none"> <li>Today's industry benchmark</li> <li>Proven performance over 20 years in the field</li> <li>Wide range of curing agents available</li> <li>Low exothermicity</li> </ul>
EPIKOTE Resin MGS BPR 535/EPIKURE Curing Agent MGS BPH 538	100:43	260	>10	●●●	●●●	●●●	●●●	<ul style="list-style-type: none"> <li>Next generation</li> <li>High fracture toughness and strain</li> <li>Low density</li> <li>Best-in-class open time</li> </ul>
EPIKOTE Resin MGS BPR20/EPIKURE Curing Agent BPH20	100:50	15	<10	●●○	●●●	●●●	●●●	<ul style="list-style-type: none"> <li>Cartridge system for field and site repair</li> <li>Ambient cure</li> <li>Good adhesion on unprepared surfaces</li> <li>Composite-to-metal bonding</li> </ul>
GOOD ●○○	BETTER ●●○			BEST ●●●				
1) Pot life of 100g in a waterbath at 30°C								

## Epoxy Hand Lay-up Systems for Wind Blades

Our hand-lamination systems have been used since the beginning of composite blade manufacture. We offer GL-approved systems with variable cure rates, higher service temperatures, optimized fiber wetting and a wide range of pot lives from a few minutes to several hours, all featuring the mixing ratio for ease of use. Benefits include:

- Proven for blade lamination, overlaminates and repairs
- Easy to process
- Hardeners can be blended to achieve desired pot life
- Same mixing ratio for all hardeners for ease of use
- Approval and use by OEMs worldwide make these systems the obvious choice for repair companies
- Our new 685 laminating system builds on the success of its proven predecessors, L135 and L235, combining best-in-class processing with user-friendly labeling. It represents a step-change from an environmental health and safety perspective.

Epoxy Resin System	Performance & Features						Remarks
	Mix Ratio (weight)	Pot Life Range (min <sup>1</sup> )	Crystallization Stability	Track Record	Process Robustness	Ambient Cure	
<b>Hand Lay-up</b>							
EPIKOTE™ Resin MGS™ LR 135 EPIKURE™ Curing Agents MGS LH 133 - 138	100:35	15-360	●●○	●●●	●●●	●●●	<ul style="list-style-type: none"> <li>Today's Industry benchmark</li> <li>Proven performance over 25 years in the field</li> </ul>
EPIKOTE Resin MGS LR 235 EPIKURE Curing Agents MGS LH 233 - 239	100:35	10-600	●●●	●●●	●●●	●●○	<ul style="list-style-type: none"> <li>Reduced bleed out</li> <li>Reduced exothermicity</li> <li>Improved laminate quality</li> <li>Bio-based components</li> </ul>
EPIKOTE Resin MGS LR 635 with LH 634-637	100:30	15-300	●●●	●○○	●●●	●●●	<ul style="list-style-type: none"> <li>New value-engineered hand lay-up system</li> <li>Improved cold cure</li> <li>Ideal for overlaminates and repairs</li> <li>Labelling ensures absence of GHS Class 06 and 08 labelling</li> </ul>
1) Pot life of 100g in a waterbath at 30°C ●○○ Good ●●○ Better ●●● Best							

# Epoxy Resin Infusion Systems for Wind Blades

We are committed to helping our customers compete in the energy marketplace through collaborative process design and value engineering. Whether it's resin flow and cure rates, temperature control, shifting of laid fiber, wrinkling, voids—we understand what's happening on your shop floor. Together, we can work out how to optimize production, lower cycle times and reduce the need for repairs. In resin infusion, we offer:

Hydrophobic systems to help eliminate void content, thereby reducing repair time substantially

Industry-best track record and market leadership in both materials and technical know-how

Value engineering

Innovation for cost out

Global grades which are manufactured regionally to high standards

With our GL-certified laboratory in Esslingen, Germany, customers can use our resources to qualify the infusion resin/fiber combination that makes the most sense for their shop floor. We have a large database of high quality test results to help us quickly respond to your qualification needs as well as benchmark different fiber combinations.

## Wind Composites—Infusion

Epoxy Resin System	Performance & Features								Remarks
	Mix Ratio (vol.)	Pot Life Range (min <sup>2</sup> )	Mixed Viscosity (at 25°C)	Infusion Performance	Exothermicity	Tg Development	Track Record/Laminate Database	Crystallization Stability	
<b>Resin Infusion</b>									
EPIKOTE™ Resin MGS™ RIMR 135 EPIKURE™ Curing Agents MGS RIMH 134 - 137	100:36	45-240	240-270	●●○	●●○	●●○	●●●	●●○	<ul style="list-style-type: none"> <li>• Today's Industry benchmark</li> <li>• Proven performance over 20 years in the field</li> <li>• Ideal infusion repair system with RIMH 134</li> </ul>
EPIKOTE Resin MGS RIMR 035c EPIKURE Curing Agents MGS RIMH 036 - 038	100:34	110-330	250-280	●●○	●●●	●●○	●●●	●●●	<ul style="list-style-type: none"> <li>• Today's most commonly used system</li> <li>• High degree of hydrophobicity</li> </ul>
EPIKOTE Resin MGS RIMR 036 EPIKURE Curing Agent MGS RIMH 039	100:41	300-380	240	●●●	●●●	●●○	●●○	●●●	<ul style="list-style-type: none"> <li>• Most robust infusion window</li> <li>• Low exotherm</li> </ul>
EPIKOTE Resin MGS RIMR 1036 EPIKURE Curing Agent MGS RIMH 1039	100:25	380	270	●●●	●●●	●●●	●○○	●○○	<ul style="list-style-type: none"> <li>• Long pot life</li> <li>• Fast cure</li> <li>• High integrated flow</li> </ul>
GOOD ●○○	BETTER ●●○					BEST ●●●			
1) With RIMH 038 2) Pot life of 100g in a waterbath at 30°C									