Wind energy solutions

High performance products for nacelles and wind blades
WELCOME TO WIND ENERGY EXCELLENCE

Established in 1921, Scott Bader is a global manufacturer of composite and adhesive materials for the wind energy market, supplying resins, gelcoats and adhesives to the world’s leading wind turbine manufacturers and independent blade builders.

Employing 700 people across six manufacturing sites and 15 offices worldwide, we manufacture and distribute the very best in wind energy solutions. Our comprehensive range of market leading products are used for:

- Nacelles and spinners
- Wind blade manufacture and repair
- Composite tooling

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**NACELLES AND SPINNERS**

In a drive to reduce the cost of energy, wind turbines and wind turbine nacelles are increasing in size, especially for offshore machines. Nacelle manufacturers are looking to reduce overall product costs and improve their performance and functionality.

Key technology development areas include:
- Automation of nacelle manufacture
- Optimising materials usage
- Fire protection of nacelles
- Sustainability and recycling of nacelles

Scott Bader offer a range of high-performance composite and adhesive products to help reduce costs and improve performance. We are partnering with leading wind turbine original equipment manufacturers (OEMs) and subcontractors to develop innovative products for the evolving requirements of nacelle and spinner manufacturers.

Both Cystic® VE676 and Crestapol® 1255 are recommended resins for pultruded reinforcements of nacelles and canopies as they offer outstanding economies of scale when used in large production quantities.

**Large scale applications**

The construction of nacelle housing is increasing in complexity due to their expanding size and off-shore requirements. We recommend the following products for specific tasks:

- Bonding multiple elements
  - Crestabond® MMA primerless structural adhesives and Crestafix® bonding pastes are the ideal adhesive solution for bonding multiple elements together within a desired timeframe. Both adhesives can be easily dispensed from bulk packages by a metering machine.

- Bonding large composite panels
  - Crestabond® M1-60HV and Crestafix® 621 CC (hybrid) are ideal. If using metal elements, or if a faster production time is desired, Crestabond® M1-60HV should be used.

- Bonding smaller elements
  - The Crestabond® M7 series is excellent for bonding smaller elements, such as brackets, even if they are made from galvanised metals or pultruded FRP profiles.

**Pultruded profiles manufactured from Crestapol® 1255 used to locally stiffen panels – either incorporated in the laminate and over infused or separate profiles bonded post demould of the nacelle panels.**

**Crystic® GC 76PA FR and Fireguard® GC 78PA applied to the inside of the nacelle housing for fire protection.**

**Metallic stiffeners, plates, brackets and inserts bonded using Crestabond® M7. Composite to composite bonded using Crestabond® M1-60HV and Crestafix® 621CC.**

**Crystic® GC 0209 KSD and GC 1208PA in-mould gelcoat used to protect the polyester GRP laminate from UV weathering and rain/moisture.**
WIND BLADE MANUFACTURE AND REPAIR

Wind turbines and blade sizes are increasing year-on-year, presenting new challenges to reduce weight and increase stiffness. At the same time there is an ageing fleet of wind turbines requiring maintenance and repair to deliver the best possible Annual Energy Production (AEP).

Scott Bader offers unique urethane acrylate and MMA technology to support OEMs and subcontract pultruders to reduce blade costs and finishing times. For in-field service teams our Crystic® resins, gelcoats and Crestabond® adhesives are a fast and effective way to repair blades and reduce turbine downtime.

Manufacture

For wind turbine blade spar cap pultruded profiles and blade root reinforcements, Scott Bader offers two different resin chemistries:

1. Crystic® VE676 is a high performance epoxy bisphenol A based vinyl ester resin for pultrusion applications with high mechanical strength, versatility and a robust curing mechanism.

2. Crestapol® 1255 is our most reactive resin with a unique urethane-acrylate chemistry, outstanding mechanical performance, wetting properties, surface quality and a superior line speed compared to traditional pultrusion resins, without the health and safety disadvantage of polyurethane and epoxy resins. It is a tough, low viscosity resin with a rapid cure, which can be highly filled.

Both Crystic® VE676 and Crestapol® 1255 can be over-infused with epoxy resins.

Repair

Scott Bader’s Crestabond® MMA primerless structural adhesives can be used for the repair of cracks formed during production or operation of a wind turbine.

The Crestabond® M1 series will bond epoxy or polyester resins without surface preparation and they can be injected into the crack by the drill and fill method. During field repairs, the downtime is largely reduced due to the room temperature curing mechanism and the fast-curing times. Larger gaps can be filled with Crestabond® M1-30 and M1-60HV. These adhesives have a high toughness and excellent fatigue properties.

The faster curing Crestabond® M1 products: M1-04, M1-05 and M1-20 are mainly used for secondary bonding applications on the blade. Spoilers and Vortex Generators are structurally bonded in production or in the field.

The Crestabond® M7 series are used as a general-purpose adhesive at many blade manufacturers. The working times of Crestabond® M7-05 and the M7-15 will fit many applications and almost all substrates can be easily bonded without primers.

Crestabond® M1-60HV is used to fill any voids between the shear web, which normally has a return flange and encapsulated spar caps. Repairs are made from outside the blade by drilling through the shell and injecting the adhesive into the cavity/defect.

Crestabond® M1 is used for bonding vortex generators to increase lift and reduce drag. Spoilers can be bonded on the trailing edge to reduce noise.

Spar caps made of pultruded profiles
**CRESTAMOULD®**

**COMPOSITE TOOLING**

Our Crestamould® matched tooling systems offer a fast and effective way to produce moulds for the manufacture of blade, nacelle and spinner components. Our low-profile laminating and infusion resins minimise shrinkage to improve the dimensional accuracy of moulds combined with gelcoat and skincoat products to deliver a high quality and robust mould surface.

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**PRODUCT RANGE**

**WIND ENERGY PRODUCT RANGE**

<table>
<thead>
<tr>
<th>PRODUCT</th>
<th>DESCRIPTION</th>
<th>APPLICATIONS</th>
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</thead>
<tbody>
<tr>
<td>Crystic® U1106LV50 and 80</td>
<td>Orthophthalic UP infusion resin</td>
<td>Manufacture of nacelle and spinner enclosure panels</td>
</tr>
<tr>
<td>Crystic® 272-03 PA</td>
<td>Isophthalic UP infusion resin</td>
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<tr>
<td>Crystic® 704 PA</td>
<td>Ortho UP laminating resin</td>
<td></td>
</tr>
<tr>
<td>Crystic® GC 0209 KSD and KH PA</td>
<td>Isophthalic and thixotropic polyester gelcoat specially designed for spray application</td>
<td>Nacelle/spinner coating</td>
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<tr>
<td>Crystic® 1208 PA</td>
<td>High weathering performance pre accelerated isophthalic gelcoat for spray application</td>
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<tr>
<td>Crystic Ecogel® S3 PA</td>
<td>A high performance low VOC isophthalic neopentyl glycol gelcoat</td>
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<tr>
<td>Crestabond® M1</td>
<td>Two component 10:1 acrylic adhesive designed for bonding composites, thermoplastics and metals</td>
<td>Nacelle assembly</td>
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<tr>
<td>Crestabond® M7</td>
<td>Two component 1:1 acrylic adhesive designed for bonding composites, thermoplastics and metals</td>
<td></td>
</tr>
<tr>
<td>Crestabond® M1-60HV and 90HV</td>
<td>Two component 10:1 acrylic adhesive designed for bonding composites, thermoplastics and metals</td>
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<tr>
<td>Crestafix® 621CC</td>
<td>Urethane acrylate/isophthalic polyester high performance bonding paste</td>
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<tr>
<td>Crystic® GC 76PA FR</td>
<td>Fire retardant topcoat designed to reduce smoke and the spread of flame</td>
<td>Fire retardant topcoat for interior of nacelles/spinners</td>
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<tr>
<td>Fireguard® GC 78PA</td>
<td>Pre-accelerated fire retardant gelcoat designed for applications requiring the highest levels of fire and smoke performance</td>
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<tr>
<td>Crystic® VE676</td>
<td>An epoxy bisphenol A based vinyl ester resin</td>
<td>Pultruded profiles for stiffening of nacelles</td>
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<tr>
<td>Crestapol® 1255</td>
<td>Non-thixotropic urethane acrylate hybrid resin with very high-speed cure and strength build characteristics</td>
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</table>
### WIND ENERGY SOLUTIONS

#### PRODUCT DESCRIPTION APPLICATIONS

**Blade**
- **Crestapol® 1255**
  - Non-thixotropic urethane acrylate hybrid resin with very high-speed cure and strength build characteristics
  - Spar cap pultruded profiles to stiffen blades and root sections

- **Crystic® VE676**
  - An epoxy bisphenol A based vinyl ester resin

- **Crestabond® M1 series**
  - Two component 10:1 acrylic adhesive designed for bonding composites, thermoplastics and metals
  - Bonding of vortex generators and trailing edge profiles/spoilers. Blade bondline repair ('Drill & Fill' applications)

- **Crestabond® M7 series**
  - Two component 1:1 acrylic adhesive designed for bonding composites, thermoplastics and metals
  - General purpose adhesive for sub-assemblies

**Repair**
- **Crystic® 2.446PA**
  - A pre-accelerated, thixotropic, spray viscosity orthophthalic polyester resin with low styrene emission
  - Used for structural repair of polyester GRP blades when combined with glass fabrics

- **Crystic® 489**
  - A pre-accelerated, thixotropic isophthalic polyester resin with outstanding durability and superior blister resistance

- **GelTint**
  - GelTint offers a fast and precise service that delivers high quality colour matched gelcoats (available in a wide range of colours including R7035, R9018 & R9016). Only available from selected Scott Bader distributors in Europe
  - Colour matched gelcoats for the manufacture of replacement GRP blade sections or as a topcoat for in-field blade repairs

- **Crystic® Gelcoat 0209**
  - A pre-accelerated isophthalic and thixotropic polyester gelcoat specially designed for brush application
  - Fast curing topcoat that can be applied over polyester GRP laminates, filler and existing gelcoat to provide blade weathering protection (UV, moisture & particle/rain erosion). X209 variant is designed for use at ambient temperatures of less than 10°C

- **X401 Filler**
  - A filler with no sagging on vertical walls, rapid curing and easy sanding
  - Used to ‘fill & fair’ the surface of the repair area prior to application of the topcoat

- **Crestabond® M1**
  - Two component 10:1 acrylic adhesives designed for bonding composites, thermoplastics and metals
  - Structural adhesives for in-field repair of split blade trailing edges, bonding of lightning receptors and vortex generators/trailing edge profiles damaged during blade transport or in service. Can be used for ‘Drill & Fill’ applications where voids or disbonds are detected between the shear web and the encapsulated spar cap

**Tooling**

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>Pattern/Direct Mould Build</th>
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<tbody>
<tr>
<td><strong>Crestamould® B12</strong></td>
<td>Polyester</td>
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<tr>
<td>Crestamould® VE679PA</td>
<td>Polyester</td>
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<tr>
<td>Crestamould® M79</td>
<td>Polyester</td>
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<tr>
<td>Crestafix® F26</td>
<td>Polyester</td>
</tr>
<tr>
<td>Crestico® Primecoat</td>
<td>Polyester</td>
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<tr>
<td>Crestico® Glosscoat</td>
<td>Polyester</td>
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</tbody>
</table>

**GRP Mould Build**

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<tr>
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<tbody>
<tr>
<td><strong>Crestamould® Gelcoat 15PA</strong></td>
<td>Vinylester</td>
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<tr>
<td><strong>Crestamould® VE679PA</strong></td>
<td>Vinylester</td>
</tr>
<tr>
<td><strong>Crestamould® RTR 4010PA</strong></td>
<td>Vinylester</td>
</tr>
<tr>
<td><strong>Crestamould® RTR 4010PA</strong></td>
<td>Vinylester</td>
</tr>
<tr>
<td><strong>Crestamould® 474PA</strong></td>
<td>Polyester</td>
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</tbody>
</table>

**Crestamould® 474PA** is a thixotropic, pre-accelerated orthophthalic polyester resin with good heat and chemical resistant properties. Best suited for larger moulds that will undergo elevated temperature processing cycles.