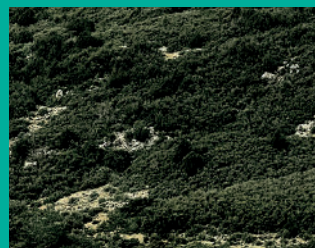




Wind energy solutions

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 **Crystic® 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

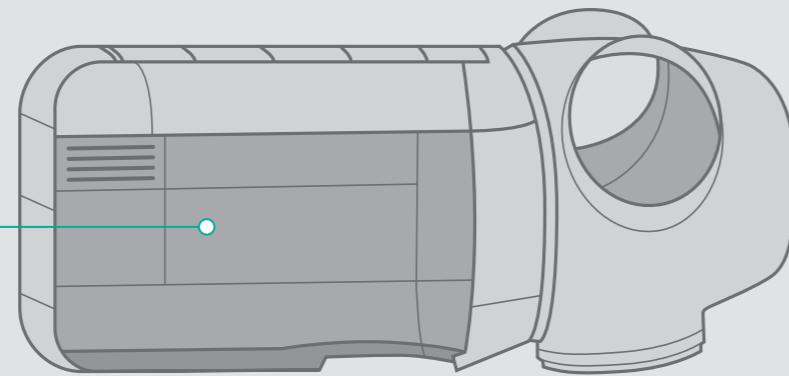
The construction of nacelle housing is increasing in complexity due to their expanding size and off-shore requirements. We recommend the following products for specific tasks:

- **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.

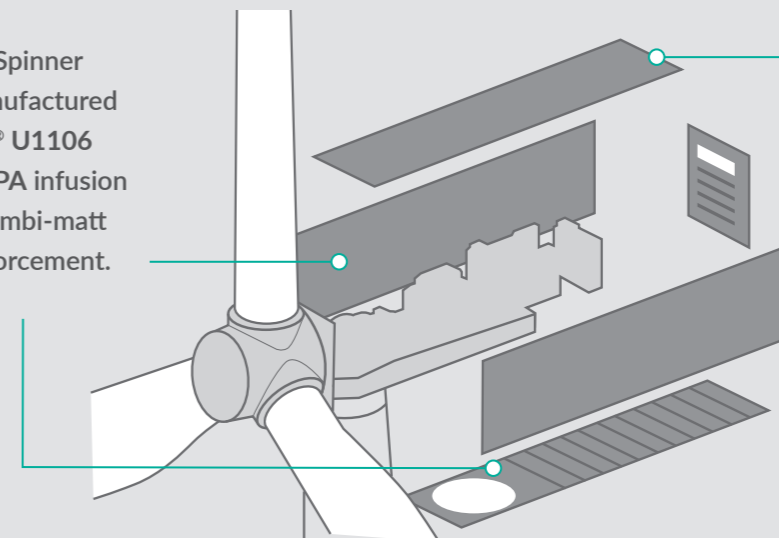
- **Bonding large composite panels**
Crestabond® M1-60HV and **Crestafix® 621 CC (hybrid)** are ideal. If using metal elements, or if a faster production time is desired, **Crestabond® M1-60HV** should be used.

- **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.

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

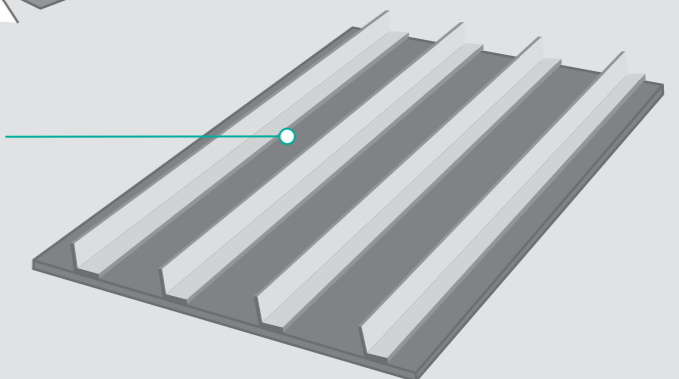


Nacelle and Spinner sections manufactured with Crystic® U1106 and 272-03 PA infusion resin with combi-matt E-glass reinforcement.

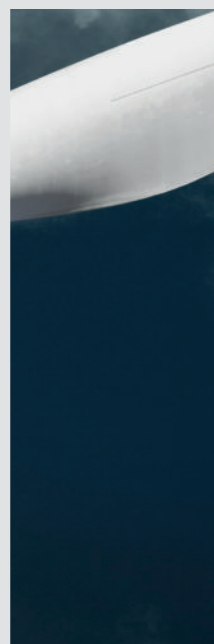
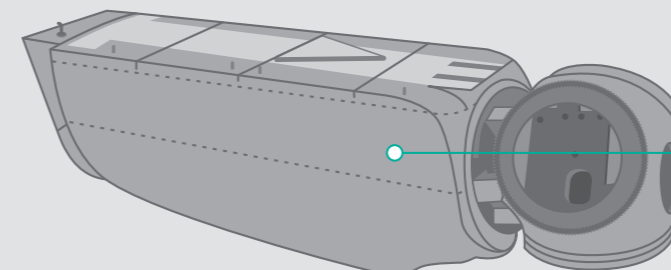


Pultruded profiles manufactured from Crestapol® 1255 used to locally stiffen panels – either incorporated in the laminate and over infused or separate profiles bonded post demould of the nacelle panels.

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).

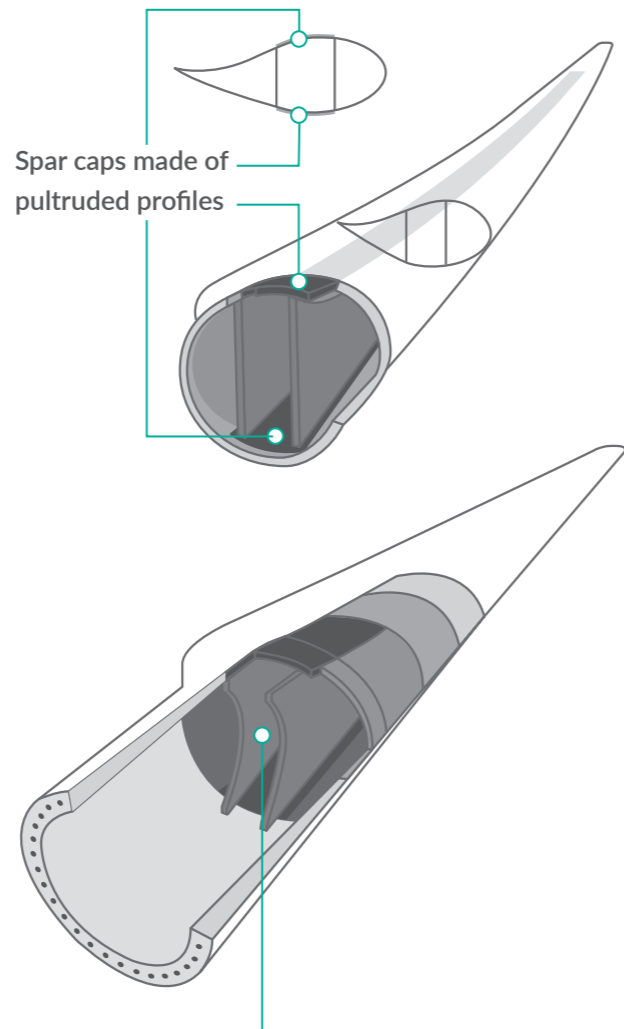
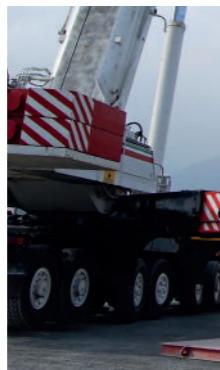
Scott Bader offers unique urethane acrylate and MMA technology to support OEMs and subcontract pultruders to reduce blade costs and finishing times. For in-field service teams our **Crystic**® resins, gelcoats and **Crestabond**® adhesives are a fast and effective way to repair blades and reduce turbine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

Manufacture

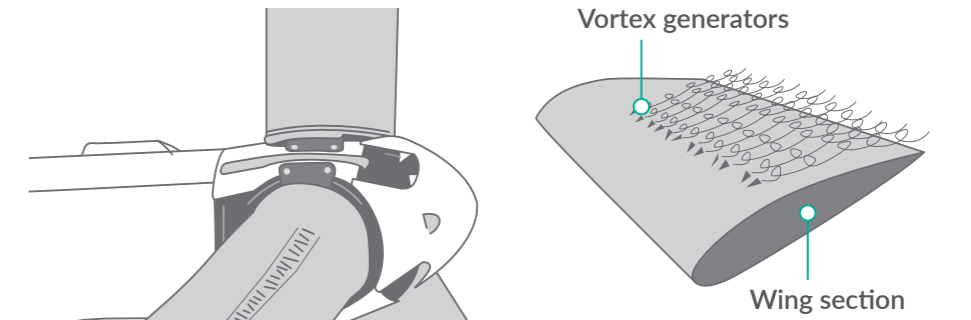
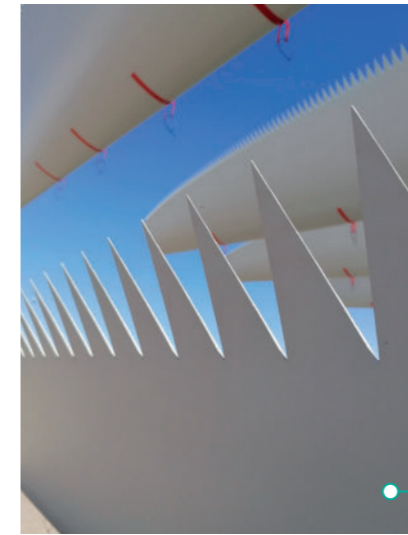
For wind turbine blade spar cap pultruded profiles and blade root reinforcements, Scott Bader offers two different resin chemistries:

- 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.



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.

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.

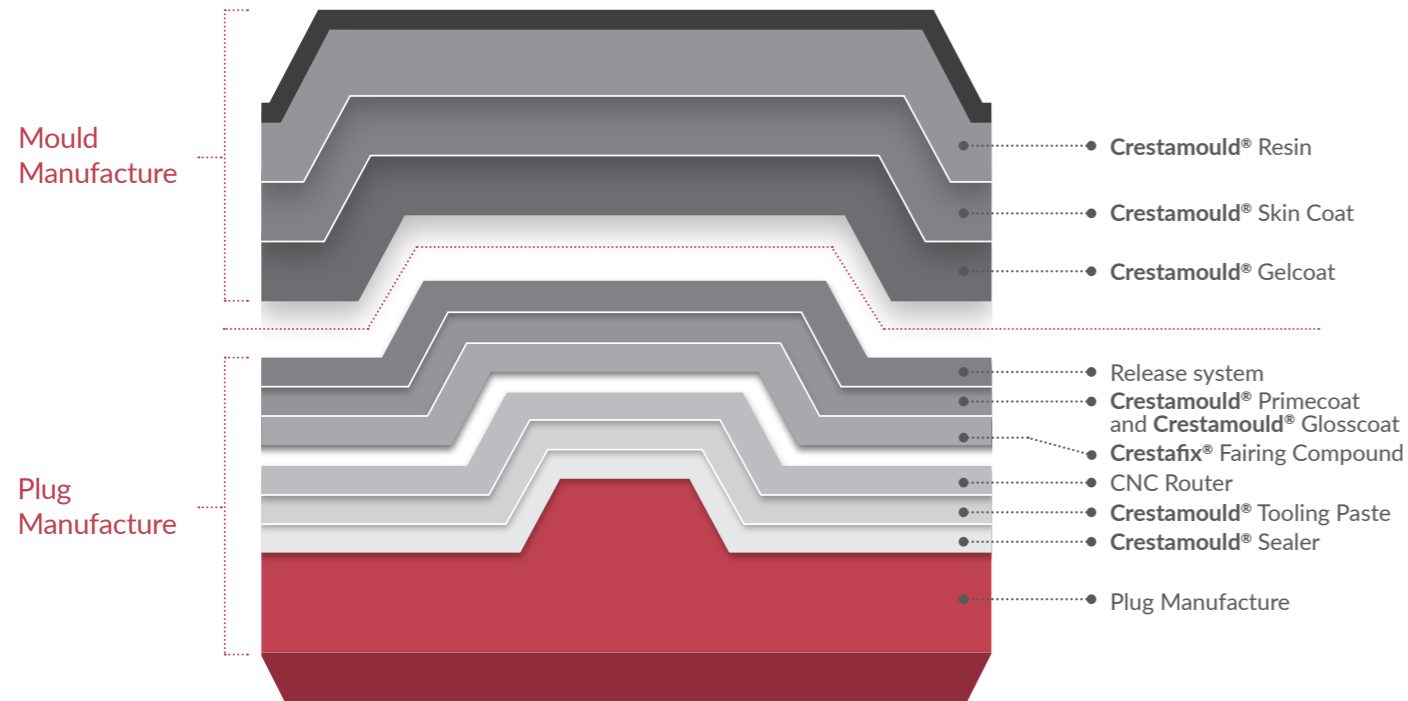
The faster curing **Crestabond**® **M1** products: **M1-04**, **M1-05** and **M1-20** are mainly used for secondary bonding applications on the blade. Spoilers and Vortex Generators are structurally bonded in production or in the field.

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.



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.



WIND ENERGY PRODUCT RANGE

PRODUCT	DESCRIPTION	APPLICATIONS
Nacelles/spinners		
Crystic® U1106LV50 and 80	Orthophthalic UP infusion resin	Manufacture of nacelle and spinner enclosure panels
Crystic® 272-03 PA	Isophthalic UP infusion resin	
Crystic® 704 PA	Orthophthalic UP infusion resin	
Crystic® Pigment Paste Ral 7035 Grey	Pigment paste for colouring UPR resin	Nacelle/spinner coating
Crystic® GC 0209 KSD and KH PA	Isophthalic and thixotropic polyester gelcoat specially designed for spray application	
Crystic® 1208 PA	High weathering performance pre accelerated isophthalic gelcoat for spray application	Nacelle assembly
Crestabond® M1	Two component 10:1 acrylic adhesive designed for bonding composites, thermoplastics and metals	
Crestabond® M7	Two component 1:1 acrylic adhesive designed for bonding composites, thermoplastics and metals	
Crestabond® M1-60HV and 90HV	Two component 10:1 acrylic adhesive designed for bonding composites, thermoplastics and metals	
Crestafix® 621CC	Urethane acrylate/isophthalic polyester high performance bonding paste	Fire retardant topcoat for interior of nacelles/spinners
Crystic® GC 76PA FR	Fire retardant topcoat designed to reduce smoke and the spread of flame	
Crystic® VE676	An epoxy bisphenol A based vinyl ester resin	Pultruded profiles for stiffening of nacelles
Crestapol® 1255	Non-thixotropic urethane acrylate hybrid resin with very high-speed cure and strength build characteristics	

WIND ENERGY PRODUCT RANGE



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	
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

PRODUCT	DESCRIPTION	APPLICATIONS
Tooling		
CATEGORY		Pattern/Direct Mould Build
Crestamould® B12	Polyester	Crestamould® B12 is a MEKP catalysed, brushable slightly thixotropic sealer designed to coat expanded and extruded polystyrene foams
Crestamould® T29	Polyester	Crestamould® T29 is a modified polyester compound, designed for milling of large plugs or direct limited production moulds with CNC multiple axis machines. T29 is available in sprayable or extrudable versions
Crestafix® F26	Polyester	Crestafix® F26 is a water resistant, low-density polyester-based fairing compound
Crystic® Primecoat	Polyester	Crystic® Primecoat is a high build, polyester coating material which allows the rapid surfacing of patterns constructed from wood, MDF, GRP
Crystic® Glosscoat	Polyester	Crystic® Glosscoat is a polyester coating designed to be applied over prepared Crystic® Primecoat to give a glossier and more durable surface
CATEGORY		GRP Mould Build
Crestamould® Gelcoat 15PA	Vinylester	Crestamould® Gelcoat 15PA is a pre-accelerated spray gelcoat specially formulated from a vinyl ester base resin and is available in a restricted range of colours
Crestamould® VE679PA	Vinylester	Crestamould® VE 679PA is a pre-accelerated, thixotropic, DCPD modified, vinyl ester resin
Crestamould® RTR 4010PA	Polyester	Crestamould® RTR 4010PA is a new, improved rapid tooling resin which incorporates better handling properties, lower viscosity, improved shrinkage control and is catalysed with standard MEKP catalyst. RTR 4010PA is a thixotropic, filled, low profile resin for hand-lay mould making applications. Best suited for smaller high volume moulds with room temperature processing
Crestamould® 474PA	Polyester	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

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