

High-Performance Rotor Blades

for a New Generation of Wind Turbines



Member of SGL Group – The Carbon Company

SGL ROTEC
WIND ENERGY COMPONENTS

A Milestone in Wind Energy.

SGL Rotec GmbH & Co. KG, formerly known as Abeking & Rasmussen Rotec GmbH & Co. KG, is a joint venture between the Abeking & Rasmussen shipyard and SGL Group – The Carbon Company, a worldwide leading manufacturer of carbon products.

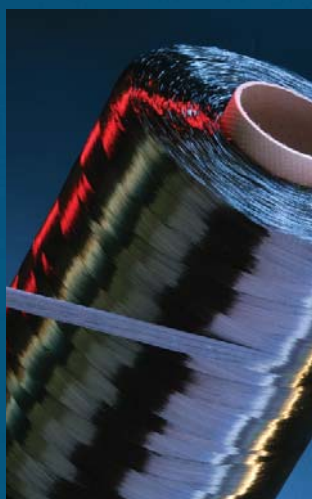
SGL Rotec is a leading manufacturer of rotor blades with “best in class” manufacturing know-how. The company uses highly automated production processes and will expand its global capacities.

As an independent supplier, SGL Rotec will manufacture rotor blades in close cooperation with its customers based exclusively on their “build-to-print” design requirements.

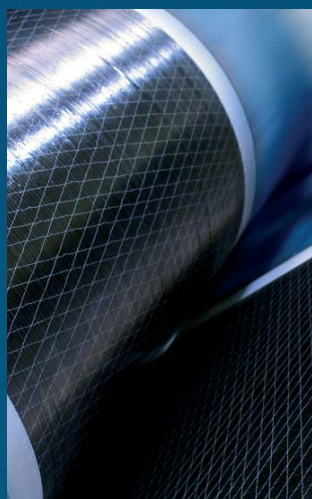
SGL Rotec is in a position to draw on the entire SGL Group value chain for the benefit of its customers:

The value chain ranges from the company’s own raw material and carbon fiber production to the subsequent processing phases (fabrics, preforms and prepregs) and the production of finished components, such as the rotor blades.

This approach allows us to serve our customers in the wind energy sector by ensuring sustainable supply security.



Carbon fibers



Prepregs



Multiaxial fabrics



Braidings and preforms

SGL ROTEC

We are a Leading Manufacturer of Rotor Blades for Wind Turbines.

SGL Rotec produces rotors with a nominal power output ranging from 1 MW to 6 MW. The main emphasis lies on the development, certification and construction of rotor blades for specific turbines. This is the only way to achieve ideal design characteristics in every respect.

The chosen construction methods are dictated by the demand for maximum safety combined with minimal noise emission and high cost-effectiveness. Our customers include the leading international manufacturers of wind turbines.

SGL Rotec – manufacturer of the world's largest rotor blades

We have been manufacturing rotor blades since the 1980s using fiber composites. In the early 1990s we constructed carbon-/glass fiber composite rotor blades – the largest in the world at the time – which measured 40 m (130 ft) in length, weighed 9 tons and were designed for the Aeolus II wind turbine, a 3 MW two-blade plant.



Rotor blade transport (Aeolus II, 40 m, 9 t, CFRP/GFRP/epoxy)



Loading of an E112 rotor blade at our ROTEC facility

Since 2000, we have been producing rotor blades using vacuum infusion. This method makes it possible to serially manufacture large-sized rotor blades with a consistently high laminate quality. In 2001, the company was commissioned by Enercon GmbH to build what at that time were to be the longest rotor blades in the world. Each blade weighed 20 tons and permitted the construction of rotors with a total diameter of 112 m (367 ft). The rotor blades were transported by ship and have been in successful service ever since.



REpower MN 82, GFRP/epoxy

SGL ROTEC

Our High Technology and Quality Requirements Enable us to Fulfill our Customers' Demands.

SGL Rotec is a leading supplier of both technology and quality in the production of rotor blades based on fiber-reinforced plastics and measuring between 6 and 65 meters (20 to 213 ft) in length. When manufacturing rotor blades by means of hand lamination, vacuum infusion or prepreg application, we utilize resins such as epoxy, vinyl ester and polyester reinforced with glass- and/or carbon fibers. SGL Rotec designs and constructs all of its models

and molds. High-quality products can only be manufactured economically using flawless molds. The molds are designed in their cold and heated state using FEM calculation. In order to ensure a high degree of contour precision, all models are stabilized using a substructure and the surface is milled and finished.

Our products made from high-tech composite materials require sophisticated and advanced methods in design, engineering, planning and production:

- ▶ Computer-aided design
- ▶ Structural analysis and improvement
- ▶ Materials research
- ▶ Numerically controlled mold construction
- ▶ Project, production and materials planning
- ▶ High quality, ISO certification, G.L. production license
- ▶ Static and dynamic component testing
- ▶ High employee motivation



Step-by-step introduction of automation in production processes largely dominated by manual labor. Together with the Bremen Institute for Construction Technology, we developed an automated preforming method (Preblade Project).



Production of GFRP/epoxy blade shells



Application of a water-based polyurethane coating



Finishing

SGL ROTEC

Lemwerder – the Ideal Location for the Production of our On- and Offshore Rotor Blades.

Our facility for manufacturing rotor blades spans more than 20,000 m² (215,000 ft²). The total production area is scheduled to be increased to 35,000 m² (380,000 ft²) by the year 2009. Our site in the North German town of Lemwerder near Bremen boasts an excellent infrastructure.

The facility is located on the banks of the River Weser with direct access to the port. This location on an international waterway permits direct shipment from the production plant, so that our company is ideally positioned to manufacture large rotor blades for offshore turbines. The site is also optimally connected to the national road network.



SGL Rotec, Lemwerder site



Overseas transport



SGL Rotec holds a stake in Powerblades GmbH, a joint venture with REpower Systems AG, for producing offshore rotor blades over 60 meters (200 ft) long.

SGL ROTEC

Composite Components – Individual or Small Production Series.

Depending on customer requests, SGL Rotec also develops and manufactures individual composite components or small production series. One example is a glass fiber-reinforced body made from an integrated and crash-absorbing sandwich structure for use in electric vehicles or aviation drones consisting of glass- and carbon fibers.



GFRP frames for solar cells
in photovoltaic modules



“SAX” electric vehicle, GFRP/epoxy
sandwich



KZO, Rheinmetall Defence
Electronics GmbH



Rotor blades,
GFRP/epoxy, 2.5 MW

Optimal Solutions for the Demands of the Wind Energy Sector. A Strong Partner is the Best Option.

SGL Group –
The Carbon Company

Abeking & Rasmussen
ROTEC

SGL ROTECH
WIND ENERGY COMPONENTS

We pool our competencies and create surplus value for our customers worldwide

- ▶ Many years of experience in the production of rotor blades
- ▶ Materials know-how ranging from individual fibers to the finished rotor blade
- ▶ Complete value chain for the wind energy industry
- ▶ Sustainable supply security
- ▶ Experience in the improvement and automation of production processes relating to composite components
- ▶ Plans to establish new production sites in potential wind energy markets
- ▶ Technology & Innovation Center: research and development to meet the demands placed on future-generation rotor blades
- ▶ Cost-effectiveness
- ▶ Global presence



Composite components

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This information is based on our present state of knowledge and is intended to provide general notes on our products and their uses. It should therefore not be construed as guaranteeing specific properties of the products described or their suitability for a particular application. Any existing industrial property rights must be observed. The quality of our products is guaranteed under our "General Conditions of Sale".

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