RÖCHLING

Plastics for efficient and low-maintenance wind turbines

Wind Energy

Content

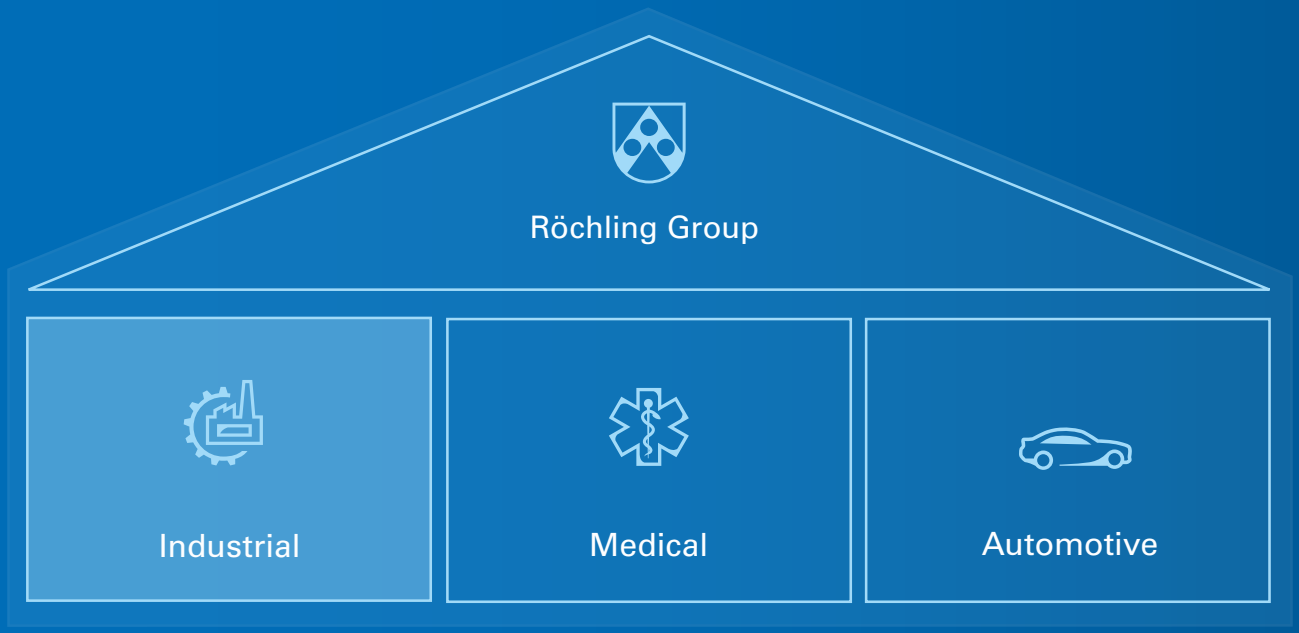
Competence in plastics

The Röchling Group, which is headquartered in Mannheim, includes a large number of locations in countries all over the world. With a workforce of several thousand employees, we manufacture our products in close proximity to our customers and markets. Our three company divisions, Industrial, Automotive and Medical, generate billions in sales every year on the European, American and Asian continents.

Röchling Industrial

The Industrial division supplies almost every sector of industry with optimal, application-oriented materials. To achieve this, Röchling has probably the world's biggest product portfolio of thermoplastics and composite materials. The company manufactures a range of semi-finished parts such as sheets, rods, tubes, flat bars, finished castings and profiles as well as machined and assembled precision components.

www.roechling.com



Röchling Group
Global presence: 89 locations in 25 countries

Competence in materials – An unparalleled range

Röchling offers you a unique range!

For over 100 years Röchling has specialised in the processing of plastics. Today, the product range is comprised of more than 140 different types of plastics – from standard plastics to high-performance plastics for withstanding high operating temperatures. The wide variety of modifications and special developments is also unparalleled worldwide.

You can benefit from this offer and the know-how of our excellently trained plastics experts, our technological leadership, own training centres and materials laboratories.

Our composites and thermoplastics at a glance

Your application needs materials with very specific requirements. With our comprehensive product range of composites and thermoplastics we will provide you the right material for your application. If not, we will find a new formulation!

Composite materials (thermoset)

Reinforcement

- Glass or carbon fibres
- Roving, mat, fleece, woven or non-crimp fabric

Resin

- Unsaturated polyester (UP)
- Vinylester (VE)
- Epoxy (EP)
- Polyurethane (PUR)

Laminated densified wood

Laminated pressboard

Thermoplastics

Industrial plastics

- PE, PP, ABS, PVC, PMMA, PS

Engineering plastics

- PA, PK, PE-UHMW, POM, PET, PBT, PPE, PC

High-performance plastics

- PEEK, PVDF, E-CTFE, PPS, PEI, PPSU, PES, PSU

Glass fibre reinforced thermoplastics

- PEEK GF30, PA66 GF30

Typical applications of our composites and thermoplastics within wind turbines

Wind turbines only earn money in operation. Therefore, operators would like to improve the effectiveness of their wind turbines and reduce their downtimes. Every constructor therefore faces the challenge: How can a wind turbine be high-performance, reliable and operationally safe even at high stress? We support these targets with our composites and thermoplastics: Depending on material, they are very light-weight, while being highly resilient and with very good sliding properties. No matter if onshore or offshore: They help you to develop high-performance and low-maintenance wind turbines. Our plastics are used by many manufacturers around the world like Siemens, Gamesa or Enercon.

We offer you:

- Components for rotor blades (p. 6)
- Electrical insulation parts (p. 7)
- Parts for tower and nacelle (p. 8)

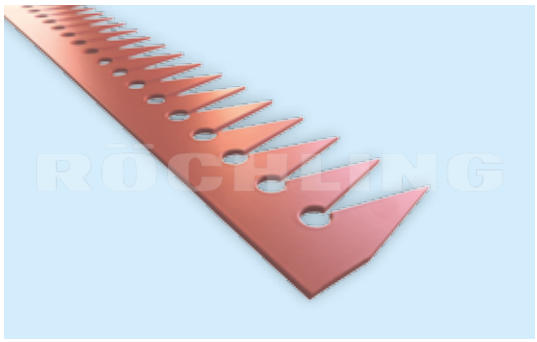
Components for rotor blades

Wind speeds up to 90 km/h, blade tip speeds up to 300 km/h, strong UV radiation and weather: Rotor blades are permanently exposed to high stress. In development, constructors must make many decisions, from the blade type to the structure and design. We support you in production with high-performing materials: We offer a great selection of composites and thermoplastics that are, e.g., mechanically highly resilient, UV-resistant or very form-stable. You can construct high-performance rotor blades with a long service life.

Advantages of our plastics for construction of rotor blades:

- Noise reduction
- High mechanical strength
- Long lifetime: UV and weather resistant
- Low maintenance

Product examples:



Serrations

Serrations machined from our glassfibre-reinforced material Durostone® offer high mechanical resilience, are UV-resistant and contribute to noise-optimised and efficient function of wind turbines.

Spar caps made of GFRP and CFRP

Spar cabs made of our carbonfibre-reinforced or glassfibre-reinforced Durostone® increase strength of rotor blades and thus contribute to longevity and reliability.

Gear wheels for rotor blade adjustment

Gear wheels machined of SUSTAMID 6 nature (PA 6) for rotor blade adjustment are wear-resistant, offer a high mechanical resilience and are resistant against lubricants. They permit simple reinforcement of the rotor blades for efficient conversion of wind power into energy.

Further products include: Wound cones and parts for reinforcement of the laminate in the rotor blade connection area, cover for lightning protection cables, spacer profiles for the rotor blade connection, GFRP-holders for lightning protection cables

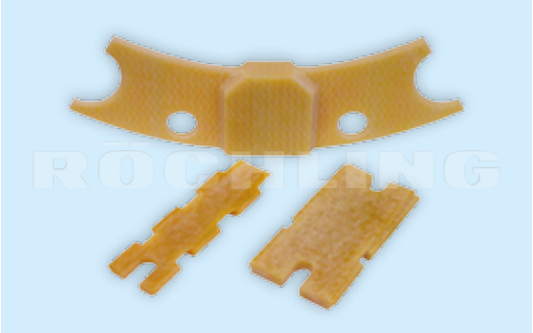
Electrical insulation parts

Once in operation, every wind turbine will need a high-performance and reliable electrical system. Generators, transformers and switchgear always must be coordinated with the planned output and build of the facility. We will help you in construction with our composites: They have been used in the electrical industry for more than 60 years. Electrically, mechanically and thermally highly resilient, they will enable you to develop reliable generators, transformers and switchgear with a high operating safety.

Advantages of our plastics for design of electrical insulating components:

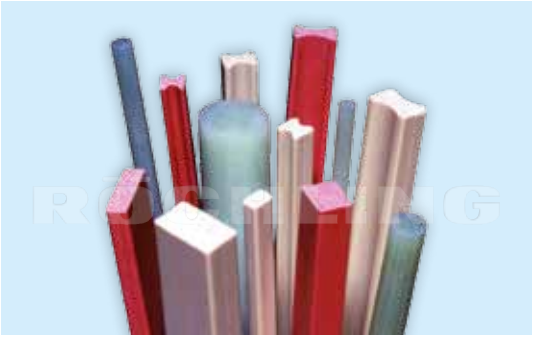
- Flame retardant
- High electrical resistance
- High mechanical strength
- High thermal capacity
- Long lifetime

Product examples:



Parts for generators

Depending on the output and the design, wind turbines use synchronous or asynchronous generators. With Durostone® (GFRP) we offer a material with outstanding electrical and mechanical properties to increase reliability and operational safety of your generators. Typical parts include slot wedges, slot inserts and winding head support rings.



Parts for transformers

Transformers must be operationally safe and reliable even at high usage temperatures and high electrical stress. We offer Durostone®, Lignostone® Transformerwood® and Trafoboard® – materials specifically developed for these requirements. They meet the highest dielectrical and thermal requirements. Some of these materials have been used in transformers for more than 60 years. They will help you in construction of high-performance and operationally safe transformers.

Parts for switchgear

With Durostone® (GFRP), we offer a material with outstanding mechanical and electrical resilience that is used around the world in the construction of high-performance low- and medium-voltage switchgear for wind turbines.

Further products include: Bearing insulations for ball bearings, GFRP-sockets for cable penetrations

Parts for tower and nacelle

As the machine centre, the nacelle is often considered the technical heart of a wind turbine. Carried by the tower, it contains many components from generator to gear that an operator must be able to rely on. Constructors therefore need reliable parts and materials for construction. We support you in this with our plastics. They convince, among others, with low weight at high strength, high corrosion resilience or good sliding properties. Thus, they offer benefits as compared to traditional materials, and help you construct reliable towers and nacelles.

Advantages of our plastics for the design of components for tower and nacelle:

- High efficiency
- High reliability
- Low maintenance
- Avoid a slip-stick effect

Product examples:

Sliding sheets in the Azimuth system

In the Azimuth system, sliding sheets made of SUSTAPET® WP (PET), SUSTAMID 6 GOL or SUSTARIN® C GLD 350 (POM) permit quick and precise alignment of the nacelle in the wind direction. Thanks to the self-lubricating properties, the nacelle moves quickly, evenly and with little energy expenditure. The slip-stick effect, a jerking and sliding, which may cause enormous noise development is prevented.

Durostone® fasteners

With their high corrosion resistance and electrical properties, our Durostone® fasteners offer a long service life, while their low density (between 1.9 and 2 g/cm³) makes it possible to save weight when building your nacelles.

Labyrinth seals

Labyrinth seals of SUSTAMID 6G (PA 6G) for the rotor bearing are resilient against lubricants, provide high dimensions stability and thus permit reliable minimisation of the lubrication loss in the long term.

Further products include: Sandwich boards and bottom profiles, railings for platforms

Technical advice

Schedule technical advice

The performance capacity and service life of materials for wind turbines is determined by different influences. These must be considered for proper selection. For example:

- Mechanical load
- Electrical load
- Thermal stress
- Contact with lubricants and corrosive salt water
- Outer influences such as UV radiation and weather
- Constructional requirements
- Dimensions and tolerances

We will gladly advise you in selecting the right materials for your application.

Competence in machining and finishing

Machined components and semi-finished products

In the development and design of your product according to your individual specifications, our experienced engineers will be happy to advise you so as to achieve an optimum functional result for your application. We offer you semi-finished products and machined components to customers drawings. With our broad range of production possibilty we are able to deliver you the product that best meets the requirements of your application.

Everywhere close to you

With our world-wide subsidiaries in Europa, America and Asia as well as sales and distribution offices we have a leading position internationally in producing and machining semi-finished products and machined parts made of composites and thermoplastics. We liaise closely with our customers, discussing requirements and problems on site. Development and Quality Management staff ensures sound professional advice.

Our competence in machining comprises:

Composites

Compression molding

- SMC, prepreg, wet molding

Pultrusion

- Glass or carbonfibre reinforced profiles

Press forming

- SMC, BMC

Filament winding

- Large rings up to Ø 3,5 m

Machining

- Water jet cutting, milling, drilling, cutting
- Modern 3D gauge inspection

Assembling

- Gluing (Certificate for bonding in accordance with DIN 6701), screwing, attaching inserts, insert molding

Painting

- Protective or decorative coating

Thermoplastics

Extrusion

- Profiles, rods and sheets

Compression molding

Polymerization

(vertical casting, shaped part molding, spin casting)

- Selective laser sintering
- Injection molding up to 32 KN

Machining

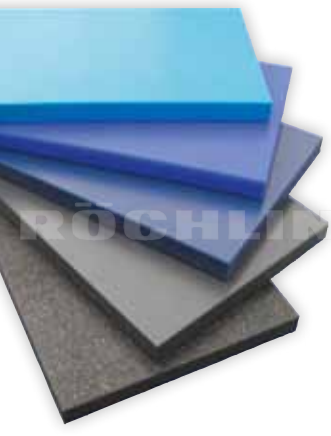
- Water jet cutting, milling, drilling, cutting, punching, lathing

Assembling

- Welding, gluing, screwing, attaching inserts, insert molding

Finishing

- Film cladding, in-mold decoration, in-mold graining, printing, coating



More value for our customers

- Product and materials development
- Modification of existing compositions
- Practical testing facilities
- Cooperation with scientists
- State-of-the-art materials laboratory

Research and development

Competitive advantages through innovation

At Röchling, our top priority is innovation. This allows us to present the market with product developments that provide our customers with competitive advantages.

We develop new products and manufacturing processes to fit the specific problem definitions of our customers in our excellently outfitted materials laboratory, and in close cooperation with suppliers, scientists and institutes.

Our laboratories have access to more than 700 standards. Additionally, over 350 material tests are conducted. Our quality management system is regularly inspected in audits in accordance with DIN EN ISO 9001:2015 ff. and its compliance ensured. Moreover, our products undergo ongoing controls in all phases of the production process.

We actively engage in serving the industries through our collaboration with numerous advisory boards and committees, and thus, help define the quality standards of the future.

RÖCHLING

EUROPE

Germany
Röchling Sustaplast SE & Co. KG
Lahnstr. 22 | 56412 Nentershausen
Tel. +49 6485 889-0
formtechnik@sustaplast.de
www.roechling.com

Röchling Engineering Plastics SE & Co. KG
Röchlingstr. 1 | 49733 Haren
Tel. +49 5934 701-0
info@roechling-plastics.com
www.roechling.com

Denmark
Röchling Meta-Plast A/S
Tøjstrupvej 31 | 8961 Allingåbro
Tel. +45 8648 1711
sales@meta-plast.dk
www.meta-plast.dk

France
Röchling Permali Composites S.A.S.
8, rue André Fruchard
B.P.12, Maxéville
54527 LAXOU Cedex | France
Tel. +33 383 34 24 24
info@roechling-permali.fr
www.permali.com

Spain
Röchling Plásticos Técnicos S.A.U.
Ctra. Villena, s/n. - Apartado 34
46880 Bocairent
Tel. +34 962 350165
comercial@roechling-plastics.es
www.roechling-plastics.es

AMERICA

USA
Röchling Machined Plastics
161 Westec Drive
15666 Mount Pleasant | USA
Tel. +1 724 696-5200
rmp@roechling.biz
www.roechling-plastics.us

Röchling Glastic Composites
4321 Glenridge Road
44121 Cleveland | USA
Tel. +1 216 486-0100
info@glastic.com
www.roechling-glastic.com

Brasil
Rochling Plásticos de Engenharia do Brasil Ltda
Avenida Emílio Chechinatto, 4.195 A
Bairro São Roque da Chave
Itupeva - São Paulo 13295-000 | Brasil
Tel. +55 11 4496 8420
brasil@roechling-plastics.com
www.roechling.com

ASIA

India
Röchling Engineering Plastics (India) Pvt. Ltd.
Vadodara Plant
Plot No. 8A, Savli GIDC | Alindra
391775 Vadodara | India
Tel. +91 2667 267-867
vadodara@roechling-india.com
www.roechling-india.com

Roechling Engineering Plastics (India) Pvt. Ltd.
Gala 1-5, 7, 8, Colaco Industrial Estate, Sativali
Vasai East – 401 208, Maharashtra | India
info@roechling-india.com
www.roechling-india.com

China
Roechling International (Shanghai) Co., Ltd.
No. 448 Chang Yang Street
Suzhou Industrial Park
215024 Suzhou | P.R. China
Tel. +86 512 6265 2899
Fax +86 512 6265 2699
ris@roechling-plastics.com.cn
www.roechling-plastics.cn

INTEGRATED MANAGEMENT SYSTEM
RÖCHLING
Quality wins

Röchling Industrial. Empowering Industry.

www.roechling.com

08/2018 | 10439-09679
iStock.com