



SEALING SOLUTIONS
FOR WIND POWER



FREUDENBERG INNOVATING TOGETHER

FREUDENBERG SEALING TECHNOLOGIES NO. 1 IN SEALING TECHNOLOGY

With its unique portfolio of products and services, Freudenberg Sealing Technologies is one of the world's leading specialist in sealing technologies. The company has developed its expertise over decades, and its material and technological competencies have defined it as a proven supplier and innovative development and service partner to the auto industry and many other sectors. Sealing solutions from Freudenberg are paving the way for electric mobility and many other promising applications – including the production of renewable energy, its transmission, and its distribution and storage.

Freudenberg Sealing Technologies is the largest business unit in the Freudenberg Group, with 15,000 employees and revenue of about 2.3 billion euros. In 2017, the entire global Freudenberg Group reported revenue of about 9.3 billion euros and employed more than 48,000 individuals in 60 countries in a range of business fields, including seals and vibration control technology, nonwovens and filtration, household products, specialties and other products.

More information can be found at: www.fst.com

HIGH-QUALITY AND DEPENDABLE SEALS FOR WIND ENERGY

Wind power is playing a pivotal role in the transition to clean, renewable energy sources. As power output of wind power stations rapidly rises, the demands on their components are growing. The rotors of today's multi-megawatt wind power facilities have a diameter of up to 180 m and generate enormous forces, which the main bearing and the driveshaft, in particular, must withstand. Other challenges, the impact of major temperature and other weather-related fluctuations, salt air, ozone, ultraviolet light and media effects, also impact wind turbine operations. These extreme stresses require the use of advanced technologies; For sealing technologies, the main requirements are low friction and the optimal wear behavior, that will maximize operating reliability and extend lifespans to 20 years or more.

For decades, Freudenberg Sealing Technologies has supplied the manufacturers of wind power facilities with made-to-order sealing solutions for shafts, bearings and gearboxes. Within the sector, products with names like Radiamatic®, Enviromatic® – more recently – Seventomatic® are associated with efficiency and reliability. The premium material, Ventoguard®, stands for especially resistant, friction-optimized sealing materials that Freudenberg has tailored specifically to the requirements of wind turbines.

READY FOR NEW DIMENSIONS IN THE WIND POWER INDUSTRY: THE SEVENTOMATIC® SEALING SOLUTION

RELIABLE PERFORMANCE FOR LARGE-SIZE, GREASE- LUBRICATED MAIN BEARINGS IN WIND TURBINES

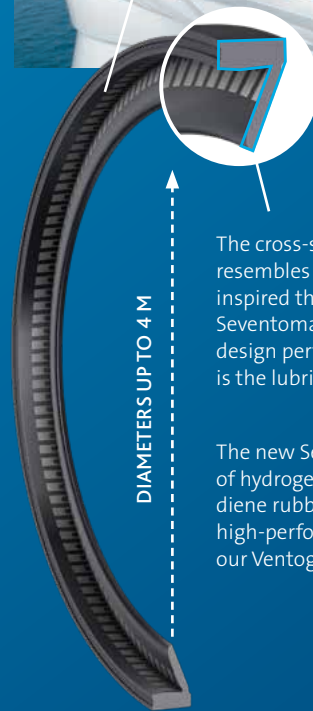
To make alternative energy technologies competitive with conventional types of electricity production, one of the main goals is to lower the cost of power generation. Increasing the size of wind turbines to make them more economical is one way to solve the issue. Wind turbine rotors with a diameter of 180 m today are no longer a rarity. But such large systems have to cope with enormous wind forces, which have a significant impact on main bearings and their shaft seals.

To continue to provide maximum reliability and planning security, our engineers have developed a new sealing solution for the main bearing in wind turbines: Seventomatic®.

Traditional shaft seals reach their functional limits with larger diameters. Their use of conventional coil springs unavoidably leads to increased leakage. The larger these seals become, the more they gradually lose their radial force on the sealing lip.

The special design of the newly developed seal type Seventomatic®, which features a meander spring, ensures a constant contact force from the sealing lip, completely independent from the diameter. The new seal offers a stable sealing function even in the case of large shaft offset.

Furthermore, various seal arrangements and sealing directions are provided, giving design engineers of wind turbines unprecedented flexibility.



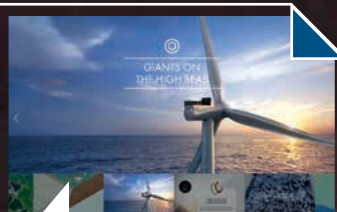
The cross-section of the seal resembles the number 7, which inspired the naming of the new Seventomatic®. Functionally, the design performs best if grease is the lubricant.

The new Seventomatic® is made of hydrogenated acrylonitrile-butadiene rubber (HNBR) – a proven high-performance material of our Ventoguard® group.

GIANTS ON THE HIGH SEAS

Find more information
on this topic here:

<https://essential-may-2018.fst.com/19/>



ENVIROMATIC V-RINGS

Enviromatic V-Rings protect sealing systems from environmental influences. They can also be used as the sole main bearing seal. The FEM-optimized sealing lip compensates for large shaft offset.



SIMMERRING® OIL SEALS

For decades, Simmerring® from Freudenberg have been the top choice for sealing rotating shafts. Thanks to materials and designs conceived for the most difficult operating conditions, they ensure the efficient operation of wind turbines.



DYNAMIC & STATIC PROFILES

Extruded profiles developed using FEM are impressive for their easy installation, excellent functionality and long lifespans – for either static or dynamic applications and whether made from the special material Ventoguard® or standard materials.



HYDRAULIC SEALS

The high quality and functionality of rod and piston seals, wipers and guides in a sealing system are crucial for lasting operational reliability and the efficiency of all hydraulic applications in wind power stations.



RADIAMATIC® SHAFT SEALS

Radiamatic® shaft seals, well proven in heavy industry, are the preferred main bearing seals for wind turbines with a seal diameter of up to 4 m. For the best possible service, all seals can be retrofitted on site.



SHAFT SLEEVES

Shaft sleeves offer an affordable alternative to replacing a shaft or its extensive reworking. From a technical and an economical standpoint, they are the best option for offsetting irregularities on the surface of the shaft.



GUIDE & BEARING BUSHINGS

Perfect-fit bearing and guide bushings handle diverse tasks: They absorb shearing forces, isolate vibrations and provide low-friction sealing at shafts and piston rods.



HYDRAULIC ACCUMULATORS

Diaphragm, piston and bladder accumulators, optimized for specific customers and applications, provide energy for hydraulic systems in wind power stations – for example, for rotor blade adjustments and braking.

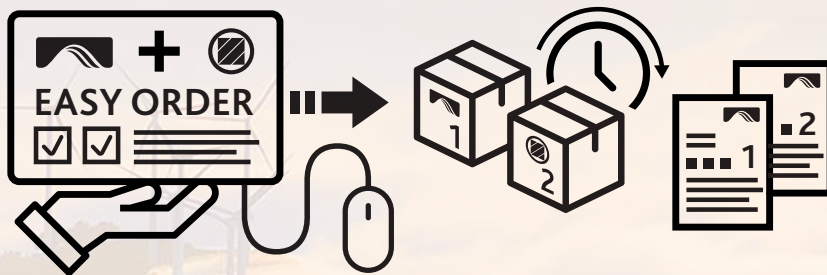


AN ARRAY OF SEALS FROM A SINGLE SOURCE

Freudenberg Sealing Technologies offers manufacturers and operators of wind power facilities a complete array of seals and services from a single source. They include high-tech FREUDENBERG premium products developed specifically for the customer, to meet extremely high requirements in applications critical to safety and functionality. In addition, customers can choose tried-and-tested DICHTOMATIK products – ranging from standard to individual formed parts – for areas of application where availability and cost-effectiveness are the main concern but industry-standard quality suffices. In short, the right product for every need.

WHETHER BASIC, PREMIUM OR FAST DELIVERY: THE RIGHT FIT FOR EVERY REQUIREMENT

High-value services are also available to customers. They include local logistical solutions for standard products or the assembly of customized parts kits. Freudenberg Xpress® is an important partner throughout the wind power sector: Its unique rapid manufacturing and delivery service is structured to quickly respond to urgently needed replacement parts, prototypes and short production runs. At Freudenberg Xpress® centers around the world, seals made of original materials are machined to meet customer specifications – at the quality level of the series-production part. When speed is of the essence, Freudenberg Xpress® components can be ordered, turned and delivered within 24 hours. After all, time is money.



THE SPECIAL RELATIONSHIP: LUBE & SEAL®

The interaction of seal and lubricant in a tribological system determines friction, wear and the service life of a seal. Lube & Seal® is the product of two Freudenberg companies that have a track record of “Innovating Together.” The sealing specialist Freudenberg Sealing Technologies and Klüber Lubrication, the lubrication expert within the Freudenberg Group, are combining their expertise and jointly developing the ideal sealing system for every application. In the process, they are perfecting the interplay of the sealing material and the lubricant, adapting both harmoniously with one another, to ensure functional reliability and to increase lifespans.

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