Complete Hydraulic Technology for Wind Turbine Generators
Environment-friendly power generation with hydraulic control technology from Rexroth

The future belongs to energy generation from “renewable sources”. A fine example of this is the generation of electricity from wind power. The more efficiently the technological groundwork is accomplished – from development and operation through to maintenance of the turbine – the faster sustainable energy generation methods will establish themselves in the marketplace.
As a component manufacturer and systems supplier for wind turbines, Rexroth uses its exceptional industry knowledge to target improved reliability, better performance and greater ease of maintenance. Our wind energy customers benefit from the innovation, stability and quality awareness of Bosch Rexroth.

The comprehensive drive & control expertise of Rexroth makes wind turbines more efficient – thanks in particular to the technological advantages of hydraulics in terms of high power density in limited space, low-maintenance and rugged design, and outstanding controllability.

**Boosting efficiency:**
- More precise actuator drives
- Shorter control cycles

**Low production costs:**
- Simulation techniques to speed up development
- Modular design through to the subsystem
- The entire technology from a single source
- Less assembly effort
- Simpler commissioning

**Low operating costs:**
- Longer maintenance intervals
- Reducing loads
- Preventing overload
- Low wear

Manufacturers receive all the technology from a single source – standardized from a broad range of proven components or modified to customer specifications. With its outstanding knowledge of the industry, Rexroth, in its capacity as a component manufacturer and system supplier, can make any required modifications directly.

As a result of its worldwide presence, Rexroth wind energy specialists are reliable partners, and always close by the customer’s side.
Ideally Positioned – thanks to Precision Pitch Control

As a component manufacturer and systems supplier for wind turbines, Rexroth uses its exceptional industry knowledge to target improved reliability, better performance and greater ease of maintenance. Our wind energy customers benefit from the innovation, stability and quality awareness of Bosch Rexroth. The 4WRPE 3x series proportional valve provides excellent pitch control combined with rugged reliability.

The availability of wind and grid capacity are the decisive factors for the wind turbine’s operational state – with proportional valves for flexible adaptation. In normal operation the positioning motions can be executed sensitively and slowly to minimize stressing of the materials, while in extreme conditions they are performed quickly to prevent damage to the turbine. The ideal rotor blade pitch is accurately set by hydraulic cylinders.

The 4WRPE proportional valve is a direct-operated control valve with position feedback and integrated electronics (OBE). The design of these specific proportional valves have taken into consideration the rigorous and demanding operating conditions of wind turbines, and have been improved for better performance and longer life expectancy. The integrated electronics (OBE) compares the specific command value to the actual spool position value to verify the valves’ functional control. Combining proportional control with mechanical default logic valves provides reliable turbine protection for all emergency shutdown situations. Available communication bus interfaces and on-board intelligence options can significantly reduce wiring and improve performance.

As the central drive element, the control block unites all the components in a single subassembly. As a result of its dual function as a component carrier and connecting element, the entire drive has been given an especially compact design. In addition to savings of space and materials, it also
provides protection from environmental aggression and physical damage.

The compact cartridge valves employed in the central block control secondary functions:
- Passive position holding
- Counterbalancing
- Emergency stopping

The interaction of electrically and hydraulically operated seat valves significantly reduces the number of control signals and system-related internal leakage.

Cylinder performance depends on the seal system. The standard seal system is pressure-loaded with pressure-dependent friction; the high-performance seal system operates pressure-unloaded with pressure-independent friction. Rexroth cylinders are available with either system, depending on the customer’s specific needs.

The cylinder is controlled by proportional valves in several variations.

**Valves with**
- External electronics
- Integrated electronics
- Integrated electronics and position controller

**Command value selection via**
- Current interface
- Voltage interface
- Field bus

**Valve characteristic curves**
- Linear
- Progressive
- Customized
Hydraulic Technology for Wind Turbines | Drive Train Brake

Strong, Yet Gentle – Drive Train and Yaw Drive Braking Systems

Modular design adapts to braking needs

Years of experience with industrial hydraulic applications has made Rexroth very familiar with specific design requirements needed for wind turbine braking systems. These requirements include:

- High reliability
- Minimum size
- Good corrosion resistance
- Long service life
- A wide ambient temperature range
- High vibration resistance

Rexroth has developed a modular braking system approach that meets all these specific requirements. All components for this extremely demanding application were specifically chosen to form a unique product portfolio. The modular design allows Rexroth to easily adapt to different combinations of rotor lock, drive train, and yaw drive braking needs. Rexroth is also able to manufacture custom components to customer specifications.

Features:

- Scaleable for all turbine sizes
- Functions configurable due to modular design
  - Yaw brake
  - Drive train brake
  - Rotor lock
- Customized requirements applicable (e.g. crane support)
Rexroth accumulator subassemblies

Hydraulic accumulators not only serve as an energy reserve in emergencies, but also cover peak demand. The advantage of this is that the installed power can be much lower, thus yielding savings in component sizes and energy consumption.

Wind turbines need special bladder-type accumulators that reduce the frictional wear occurring in rotary systems and withstand extremely low temperatures. Rexroth accumulators fill the bill perfectly.

Rexroth filter-cooler modules

Clean and cool oil is essential if the hydraulics system is to enjoy a long service life. For use in wind turbines, Rexroth supplies modules in different power categories, in standardized motor-pump-filter series.

The subassembly can be integrated with ease into existing systems. Custom options include system-dependent and country-specific application sizing per turbine size, optimization of cooling capacity to application conditions, and comprehensive kitting including fluid conveyance hoses per turbine gear box size and requirements, all to reduce assembly and logistic costs.

Filter elements are available in different sizes and different fineness of filtration, for initial equipment as well as for spare part usage.
A hydraulic power unit as it should be: intelligent, customized, cost-optimized

Hydraulic power units for mechanical engineering are being subjected to higher requirements than ever before: they should be powerful, energy-efficient, and quickly available, yet also intelligent, flexible, and of course, cost-effective at the same time. With the new ABPAC series standard power units, Bosch Rexroth has come up with a convincing answer.

The power unit for power generation
To move and control the components of a wind turbine, a standard power unit from Rexroth, consisting of standard-sized subassemblies, is almost always sufficient.

Rexroth motor-pump subassemblies
If manufacturers of wind turbines want a decentralized design, they can choose from a broad spectrum of electric motors and hydraulic pumps, all of which can be freely combined. Rexroth supplies gear, vane and piston pumps with fixed or variable displacement and with mechanical or electrical pump controllers.

Control pumps from Rexroth are renowned for their high, energy-conserving adaptability, material saving, longer service life and longer maintenance intervals.

In wind turbines, Rexroth axial piston pumps efficiently regulate pressure and flow. Via the mechanical pressure controller, the system pressure is permanently set at the pump – the pump only displaces as much oil as required. On the load-sensing solution, system pressure is additionally adapted to load pressure.

For electrical control, the system control refers to current operating conditions in calculating command values and adapts pump pressure and flow to the situation.
Save energy: with variable-speed Sytronix drives
You can save a lot of energy and money when you optionally use drives from the Sytronix modular system. The variable-speed drives are not only particularly powerful and quiet, more importantly, they save up to 80% energy! The drives can be custom chosen for your application.

Multifunctional block: with all basic functions and variable interfaces
The extremely compact multifunctional block contains all the standard basic functions you need – from pressure filtration through to the bypass for custom applications. It is the central interface to advanced hydraulic control systems. This saves space, reduces the piping work and gives you the option to integrate the hydraulic control either in the ABPAC or in the machine. There are four designs in two sizes available (with/without pressure filtration as well as with/without mounting option for the standard hydraulic control IH20).

Your advantages at a glance
- Intelligent condition monitoring via standardized bus interfaces and extended sensor technology
- Sytronix drives for increased energy efficiency and reduced noise emission
- Basic functions integrated in the multifunctional block
- Interface to additional hydraulic control concepts
- Products from the GoTo program for optimized delivery times
Rexroth Service – the Original!

Quality service and repair solutions for wind technology

As the global market leader in hydraulics, Rexroth offers hydraulic solutions for wind turbine applications: hydraulic pitch controls, drive train brakes, and rotor locks. Rexroth provides services that include technical support with factory trained and qualified personnel, strategically located stock of commonly needed spares, and condition monitoring systems to quickly and cost-effectively support the field population.

In addition, we also provide factory repair and field service capabilities using Rexroth trained technical experts with years of field experience in customer service/support.

Our four hydraulics repair Centers of Technology and Competence in the U.S.A. are located in Bethlehem, PA, Columbus, OH, Houston, TX, and Dallas, TX. They provide a wide variety of services to help you keep your wind farm at the top of its game.

Help Desk / Technical Support
Our Helpdesk service experts will be your skilled contact partner when you need fast technical assistance solving a problem on the telephone, or when you need to procure spare parts. They will arrange the fastest possible field service calls and help you in processing the repair. The Helpdesk can be reached 24/7 at 1-800-REXROTH.

Field Service
With our skilled team of experienced field service engineers, we offer you on-site support in planning, installation, start-up, application assistance, troubleshooting and fault elimination, and maintenance. Preventive maintenance of the hydraulics and lubrication systems improves the endurance of your wind turbine installation and its operational efficiency. Our qualified service engineers have comprehensive experience regarding the early detection of faults. They use proven inspection software and perform measurements and tests with the help of modern equipment and systems.
Spare Parts
Rexroth Service is characterized by speed, competence, efficiency and world-wide logistics. We will furnish genuine spares of OEM quality, spares kits and upgrade sets for existing equipment, even when the equipment is no longer in series production. Our goal is to provide replacement parts with high availability and speed.

Repairs
Our comprehensive hydraulics design knowledge guarantees that expert repairs are carried out on a cost-effective basis. We check and repair exclusively with original spare components according to manufacturer specifications. Prior to delivery, every repaired unit is tested up to full loads according to the most stringent quality criteria with relevant reports being provided. We also offer consistent quality standards for emergency and express repairs as well as warranties on repaired products.
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