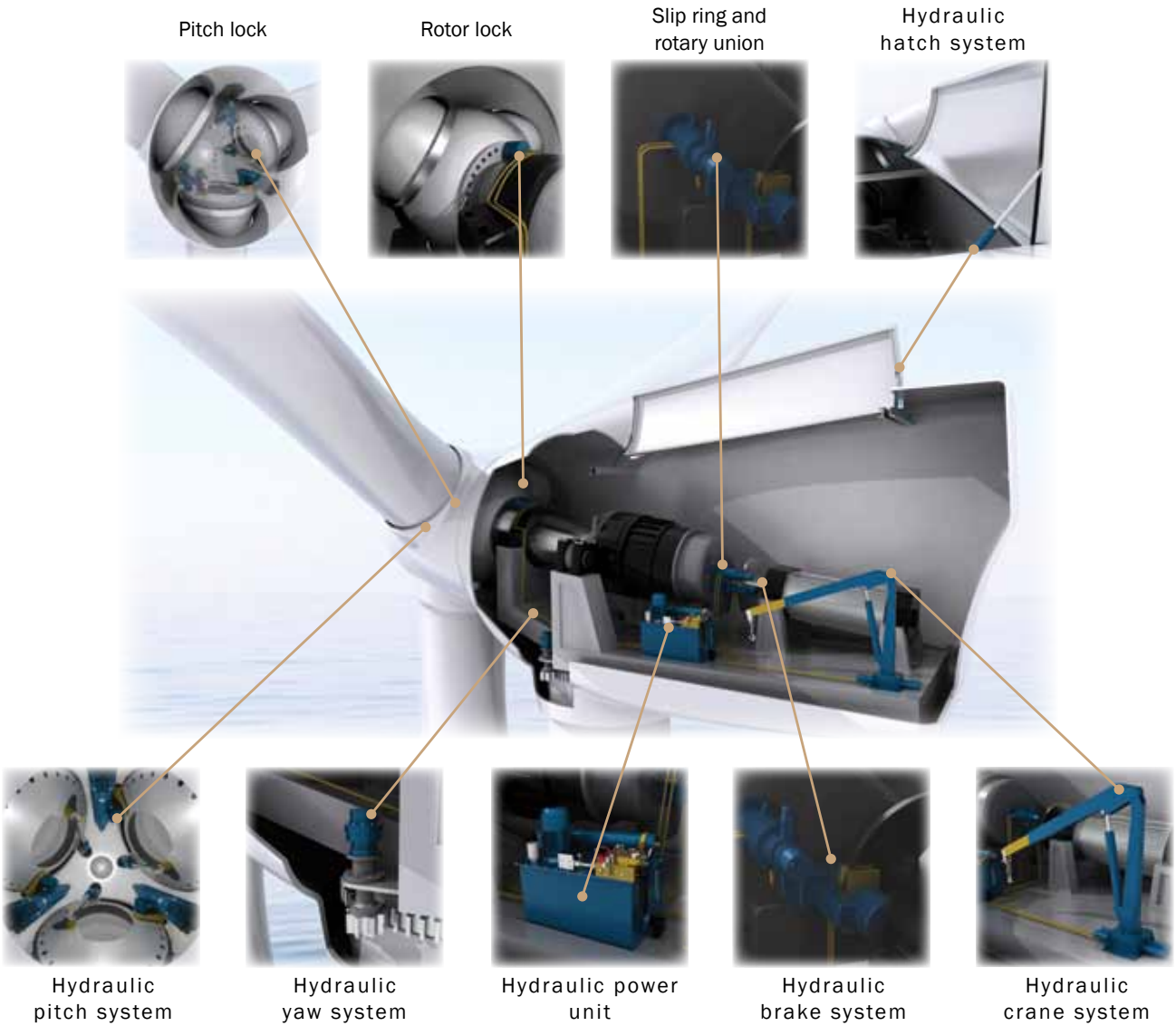
> Hydraulic systems solutions

FRITZ SCHUR ENERGY

Hydraulic system solutions

Modern wind turbine design often has a hydraulic power unit supplying the brake system, however the hydraulic power unit can supply numerous functions:



By including more functions through an expansion of the central power unit an optimal space/weight and power ratio is achieved in the most cost efficient way. One of the basic advantages of hydraulic drives compared to i.e. electric based drives is exactly the power/size ratio on the actuators. A hydraulic actuator in a certain size is able to provide much higher forces compared to an electric drive with same size. This not only saves space and weight, it also enables easy scaling to larger wind turbine designs.

Customized to your needs

A hydraulic solution from Fritz Schur Energy can be customized and potentially includes hydraulic pressure supply for the following functions:

- ✓ Pitch control
- ✓ Slip ring and rotary union
- ✓ Rotor lock
- ✓ Hatch system
- ✓ Brakes
- ✓ Pitch lock
- ✓ Crane
- ✓ Yaw system

Furthermore one or more of the below listed functions can be included according to the customer's requirements:

- ✓ Offline oil filtration
- ✓ Particle counting
- ✓ Oil cooling

Hydraulic pitch system

The functionality of our pitch system is based on cylinders pitching the blades. Through this solution installation of electric motors/transmissions and mechanical drives are not needed, and as such you will minimize wear and need for maintenance. Over the years cylinders with increasing lifetime, with a minimum of maintenance (replacement of wear parts such as sealings and o-rings) have been developed. This contributes to making hydraulic pitch solutions the most reliable and cost efficient solution over the entire lifetime of the turbine, for the benefit of the owner.

Advantages of hydraulic pitch:

- ✓ Proven, reliable and mature technology refined and improved over years through real life operation experience
- ✓ Optimized power production through dynamic pitching
- ✓ Especially applicable for all torque demanding functions
- ✓ Fast response time
- ✓ Fail safe – able to perform emergency stop of turbine without electric power
- ✓ Fast start up after emergency stop (1 to 2 minutes)
- ✓ Ability to perform under all climate conditions down to - 30 °C and up to +55 °C
- ✓ Easily scalable to larger turbine sizes
- ✓ Able to provide higher torques with less space and weight consumption compared to other pitch technologies
- ✓ Damping effect to dynamic forces applied to the drive train by the wind
- ✓ No backlash or pitting problem in mechanical drive
- ✓ No lubrication required
- ✓ Much lower power consumption in hub
- ✓ Less sensitive to strike of lightning and grid failures compared to electric pitch systems

High reliability with hydraulic pitch systems:

- ✓ To achieve the optimum performance of the hydraulic systems some precautions must be taken into account already in the design phase. For instance, Fritz Schur Energy only uses components from leading high quality hydraulic component suppliers

Main data hydraulic systems

- ✓ Customized design
- ✓ Ambient temperature range from -30 ° C to + 55 ° C
- ✓ Emergency stop time: According to agreement with customer
- ✓ Restart time: 1-2 minutes after stop
- ✓ Up to 8.500 operation hours per year
- ✓ Normal working pressure 180-250 bar
- ✓ Fail safe emergency stop function through use of piston accumulators
- ✓ Environmental friendly oil types can be used in our hydraulic systems
- ✓ General data is adjustable according to each customer's requirements and conditions

Proven reliable technology

Fritz Schur Energy has supplied hydraulic solutions for land based turbines for 25 years and for offshore turbines for 19 years. The technology has been innovated over the years and consequently fulfilling the highest standards for reliability with a minimum requirement for maintenance.

Invest in your customer

Investment in quality products and training of staff is an investment in lower warranty costs, lower maintenance costs, lower down time of the turbine, higher production and consequently higher profit for the wind turbine owner. Investing in prevention of problems is cost efficient and improves the overall Total Cost of Ownership (TCO) for the investors thereby providing complementary advantages in customer satisfaction.

Avoid hydraulic leakages

Fritz Schur Energy only uses hoses, pipes and fittings of the highest and newest standards, which are designed to withstand the conditions that wind turbines are exposed to. Furthermore process control and management in production as well as thorough training of staff involved in handling the hydraulic system is evident. As such, Fritz Schur Energy offers training of our customer's fitters, service engineers and service technicians to achieve high workmanship standards. Through proper maintenance a clean and well functioning system is secured.

Solutions for extreme conditions

Fritz Schur Energy also produces systems for extreme conditions, including offshore and warm or arctic climate. For example more than 450 of the systems that we have delivered over time have been for offshore installations.

Easy after sales support

Hydraulic solutions from Fritz Schur Energy mainly consist of components from leading global and regional hydraulic component suppliers with a widespread distribution network. This enables easy access to spare parts and support. Accessibility of the few customized components is secured for our customers through individual agreements based on our customer's requirements and needs.

Proven track record

Over time Fritz Schur Energy has designed prototypes and serial produced hydraulic solutions for various customers including Siemens Wind Power and Nordex. Today more than 8.000 wind turbines are up and running with hydraulic solutions from Fritz Schur Energy.

Your future partner?

Fritz Schur Energy develops prototypes together with you and according to your specifications and puts them into serial production. Presently we are expanding heavily on various markets such as the USA and China, and we will also be able to offer a solution just right for your requirements.

Fritz Schur Energy A/S
Fabriksparken 7-9, DK - 2600 Glostrup
Finlandsvej 1, DK - 8660 Skanderborg
Telephone +45 7020 1616
Fax: +45 7020 1615
www.fsenergy.dk

ANNO 1946
FRITZ SCHUR ENERGY