

Hidden on the inside

Brakes in wind energy plants

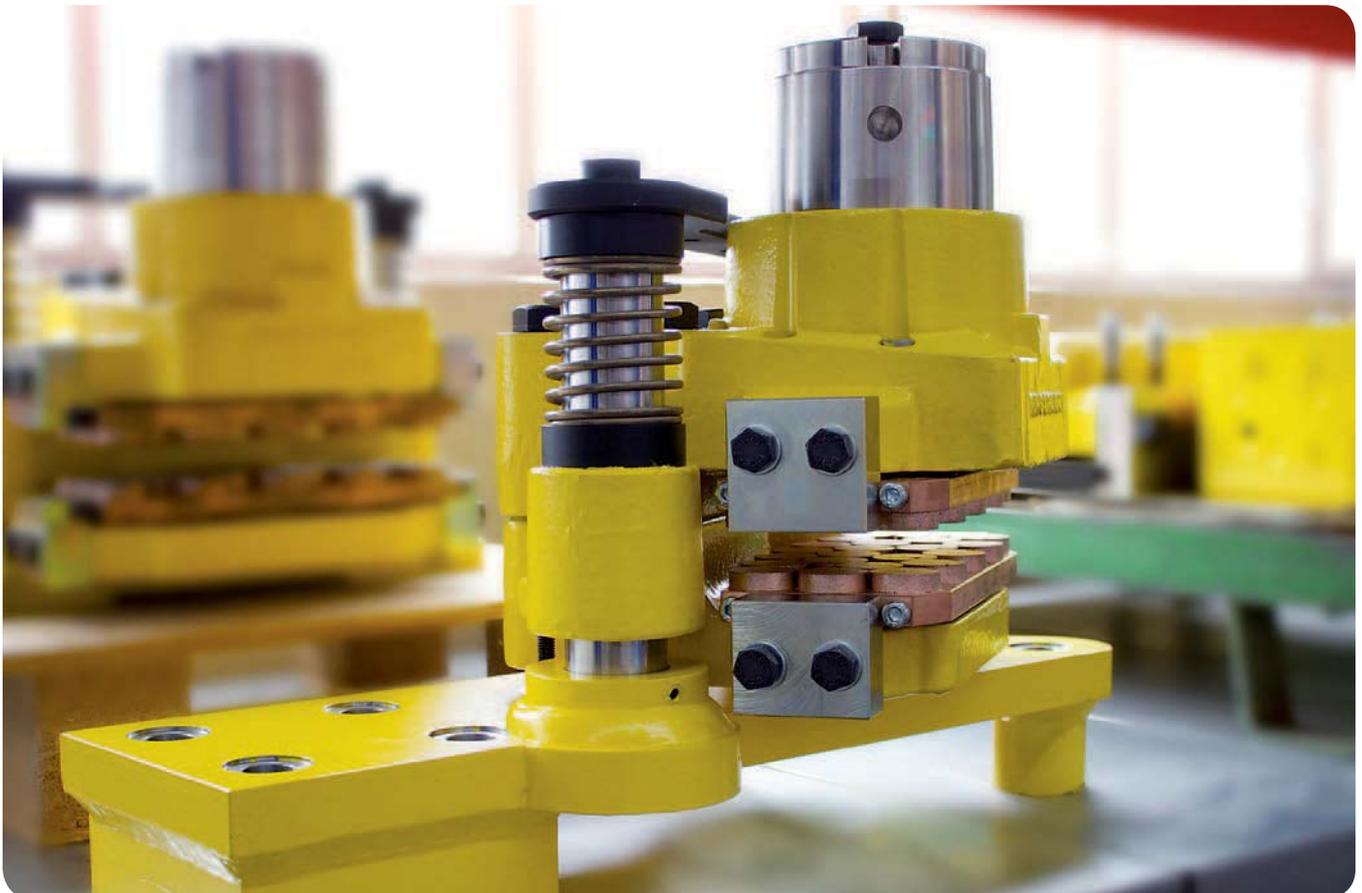
Apart from the main components that are important for energy generation such as the rotor and generator, modern wind energy plants consist of a large number of further components that are vital for operation. Some of these components are barely noticeable from the outside, like brakes. Solutions based on industrial disc brakes are often a good choice.

Brakes for example can be found at different places in a larger modern wind energy plant. These are used as rotor brakes or as azimuth brakes or brakes for pitch adjustment. Depending on the specific requirements for operation in each case, brakes of various designs are used. In the last few years, RINGSPANN GmbH has, in the area of brakes, consistently geared itself towards the requirements in wind energy plants. The brake caliper range has been expanded substantially among other things. Large hydraulic brake calipers such as the floating caliper HS 120 have been developed. Many of these newly developed brakes are optimised for use in wind energy plants. For azimuth applications in wind energy plants for example, a key focus is

on low noise levels at the friction lining. This is a great challenge due to the low sliding speeds and the danger of stick-slip effects. Since, on the other hand, the friction linings are in constant contact in this case of application, the piston retrieval that is necessary in other applications, such as rotor brakes, can be done without.

But the brake caliper itself is not the only thing to be geared to the respective application. In the case of rotor brakes in particular, the installation conditions are often very confined. In addition, connecting dimensions are stipulated by the gearbox or the generator. Thanks to the plant-specific adjustment of the installation plate for example, it is possible to make the brake's installation very simple and ultimately minimise the costs in the drive train.

RINGSPANN has geared its components in the brake area to the requirements in wind energy plants. The specialist has considerably extended its brake caliper range among other things: Here is the brake caliper HW 075 FHM.

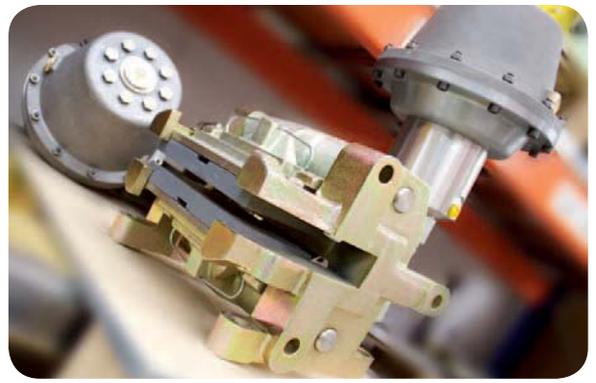


Pictures: RINGSPANN

Brake calipers

Thanks to the wide range of different brake designs, good solutions can also be found for some wind energy plants through the use of one of the tried-and-tested RINGSPANN brake calipers. This applies in particular for plants of a medium size. A DU 060 for example is successfully used in different designs. The universal attachment frame offers various possibilities for installing the brake into the overall construction. All RINGSPANN brakes can ultimately be used in wind energy plants. Even the small brakes such as that of type DH 010 can be found in constructions for smaller outputs. The option of using an actuation cable with hand lever or foot pedal, which is possible in the case of brake calipers, is also used in order to securely immobilise the rotor from an easily accessible area in the case of maintenance.

With the recently fully re-engineered automatic wear adjustment in the spring-activated pneumatic cylinders of the brakes, RINGSPANN offers another very interesting option. When using an automatic wear adjustment, the user can skip manual checks that may be necessary and some of the adjustment work. The structure for the wear adjustment has been considerably simplified in the new development. A result of this is higher braking torques compared to the previous design. In addition, high amounts of wear at the friction lining can be compensated without any problems.



For wind energy plants of a medium size, there are brake calipers such as DU 060 FHM. The universal attachment frame offers flexibility in installation.

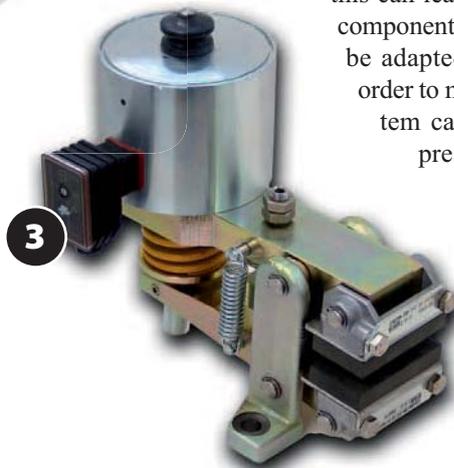
Electrical brakes

In larger wind energy plants, the brakes used are predominantly hydraulic brakes. There are usually hydraulics in these plants already for various functions. This is different in the case of small wind energy plants. Relatively compact and simple drive train concepts leave little room for additional hydraulic functionality. Using electrical brakes that are easy to control is recommended for such plants. Since energy is to be generated by the plant, the energy dissipation of the brake is a crucial criterion for selection. A possible option is using a DV 020 FEM for example. This brake stands out for its very low power consumption in open position of only 12 W. This is one of the best values for electrical brakes of this magnitude available on the market. Further developments of electrically released or electrically applied brakes are already being worked on. The new developments will offer much higher clamping forces compared to the brakes shown in the catalogue until now.

Controlled braking

Special challenges arise in wind energy plants due to the fact that the load to be braked varies depending on the operating mode of the plant. If the braking system is designed for the maximum required brake torque and braked with this torque in an unfavourable scenario, this can lead to drive train overloading and thus to component damage. Ideally, the brake torque should be adapted to the respective operating mode. In order to make this possible, a controlled brake system can be used. This controls the hydraulic pressure at the brake. Such a system is also beneficial if, for example, a change of the friction coefficient cannot be prevented due to environmental influences.

The control adapts the braking procedure to the current conditions. In some cases, a plant will also react sensitively to intermittent overloads during braking procedures. These load peaks can also be reliably prevented through a controlled braking procedure. Since coordinating the individual components with one another is essential for the operation in such a system, a controlled brake system should be designed in close coordination with the brake manufacturer or procured over the latter.



1 Even small brakes such as that of type DH 010 are used in wind energy plants for smaller outputs.

2 The control system BCS 600 for controlled braking.

3 Energy dissipation is a crucial criterion for electrical brakes. This is also the case for the DV 020 FEM with a continuous output of just twelve watts.

Author

Dipl.-Ing. Franz Eisele, RINGSPANN GmbH