

Bonn, 05. December 2016

## Intelligently responding to wind loads

Flexible rotor blades make wind turbines more efficient

Wind turbines are getting increasingly bigger, which increases the loads acting on the rotor blades. Existing designs are, however, reaching their limits. So-called smart blades on the other hand respond passively or with active components to changing wind conditions. The new BINE Projektinfo brochure entitled "The smarter blade gives in" (16/2016) presents three different technologies.

Passive smart blades can not only bend but also twist axially when the wind is strong. This changes the flow angle, which in turn automatically counteracts the load change. The investigations by the scientists have shown that flexible, 80-metre-long sickle-shaped blades are particularly ideal for this purpose. A special arrangement of the fibres in the rotor blade interior supplements this approach. Here the fibre layers are laid not only in the longitudinal direction but also diagonally from the leading to the trailing edge of the blade.

Active smart blades achieve the same effect with the help of flexible parts or adjustable flaps. Project manager Dr Jan Teßmer from the German Aerospace Centre (DLR) explains: "Active elements generally have to be maintained more intensively, so the mechanisms for smart blades have to be robust and economical." An example of this is provided by rear edge flaps. The moving parts are controllable and regulate the loads on each blade individually and locally. Integrated leading edge slats respond quickly to aerodynamic forces during turbulent inflows. The scientists tested these among others in wind tunnel experiments.

In a next step, the researchers will test the various concepts in field experiments. The research project was led by the German Aerospace Centre.

The BINE Projektinfo brochure, which can be obtained free of charge from the BINE Information Service at FIZ Karlsruhe, is available online at [www.bine.info](http://www.bine.info) or by calling +49 (0)228 92379-0. The brochure cover and an additional image can also be downloaded from the press section in this web portal.

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