

Putting the brakes on under pressure

Brakes are an integral component of a wind turbine, and among the most important are yaw brakes, active or passive, installed to align the nacelle into the wind. Now, Dellner Wind Solutions has revealed plans to introduce a new high-pressure braking system to reduce the number of yaw brakes required in a wind turbine.

Sliding bearings and special brakes control the same turbine motion, twisting or oscillating about the vertical axis. Dellner Group is a global, pioneering manufacturer of these systems, in addition to heavy duty rotor locks, rotor brakes and pitch brakes, used in various wind energy applications.

Rotor brakes, are typically caliper-style, while rotor lock pins, hydraulic or manual, are used for safety locking and maintenance. Dellner also makes high end coolers, hydraulic systems, cylinders, and accumulators.

In simple terms, an active yaw brake uses high hydraulic pressure to keep the wind turbine nacelle into the wind and low hydraulic pressure in case the nacelle needs to be moved around the vertical tower axis. In contrast, a passive yaw brake system is constantly applying the same force to keep the wind turbine rotor in the wind.

'An active yaw system has four main purposes,' says Michael Runde, Head of Engineering at Dellner Bubenzer Germany Wind GmbH. 'To align the nacelle to the prevailing wind direction; to avoid power losses during wind direction changes; to reduce loads resulting from yaw misalignment; and to allow easy cable unwinding.

'From an operational standpoint,' Runde adds, 'the nacelle is connected to the yaw bearing, and the yaw brake disc is constantly clamped between the upper and lower part of the hydraulically actuated caliper. In the case of yawing, the hydraulic pressure is reduced, and the yaw motors turn the nacelle. Only the torque is transferred through the calipers; all other loads are transferred via the yaw bearing into the tower.'

Typically, yaw brakes are designed for 180 BAR of pressure, but a new active system from Dellner can withstand up to 250 BAR, meaning higher braking capacity is available with the same size brake, and, importantly, fewer brakes are required.

Fabian Möllers, Head of Sales at Dellner Bubenzer Germany Wind GmbH, says, 'If a turbine manufacturer previously required eight 180 BAR yaw brakes, that can now be reduced to seven, for example. Wind energy is like any other sector where there is a constant demand to improve efficiency in terms of sustainability, operation, and costs.'

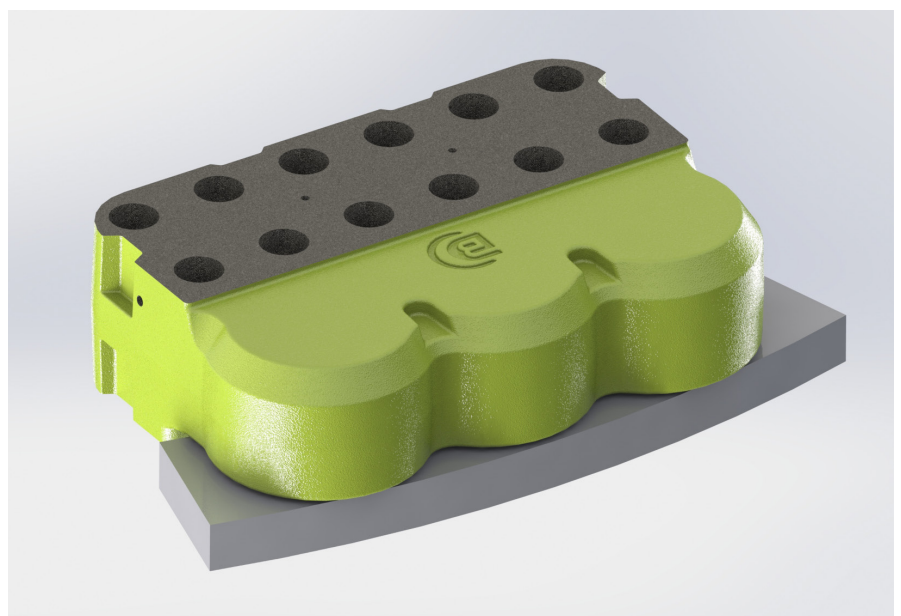
Build-to-spec yaw brake

Importantly, the new active yaw brake is a build-to-spec, not a build-to-print component, which means the parts are created by the manufacturer from scratch, based on clients' requirements. Build-to-print is the process of building products to a client's work instructions; nothing is left to interpretation and even the materials to be used are specified. The value of build-to-spec,

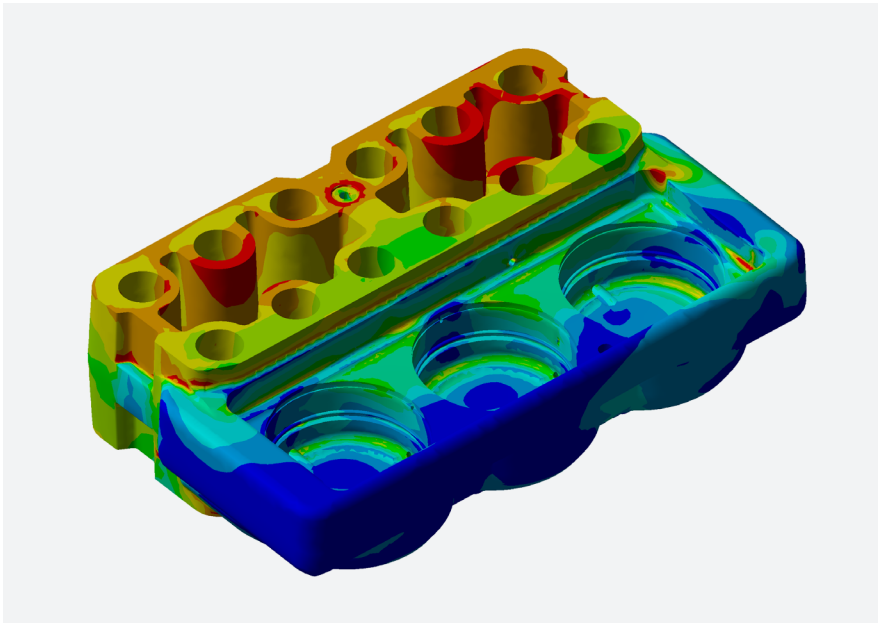
even in an industry that has lurched somewhat towards build-to-print in recent years, is that engineering expertise in heavy duty rotor, yaw, and pitch brakes is given due opportunity to drive continued improvement of industry best practices.

Runde points to the topology optimisation of the new brake, as an example, where a finite element method (FEM) was employed to evaluate the design performance. Over a period, involving extensive pressure tests, Dellner engineers were able to improve the property strength of the brake housing to the point where serial manufacturing of a 250 BAR yaw brake is possible.

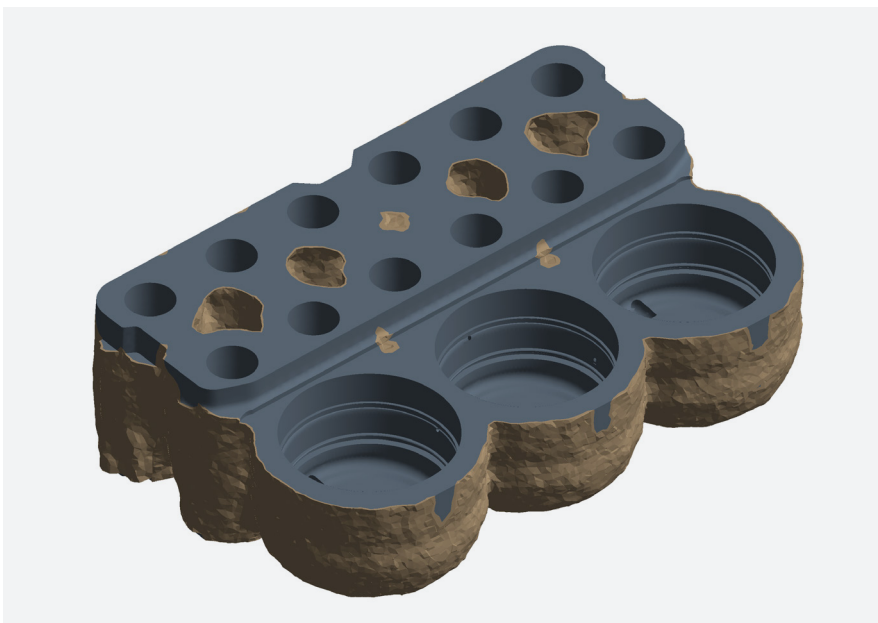
During structural optimization using FEM, the geometry of the brake caliper is optimised in such a way that the mechanical stresses are



Derived CAD model



Stress distribution of original caliper



FEM optimised yaw brake caliper

as low as possible despite the maximum load. At the same time, the amount of material used and therefore the weight of the brake caliper is minimised, ensuring a cost effective yet reliable solution.

This led Dellner to a final design based not only on material strength and avoidance of cracking the brake housing but also the best shape of the yaw brake. Instead of a single brake pad, there are now three distinct, circular areas that share the forces to add greater braking efficiency.

As the wind energy sector reconsiders the inherent value of build-to-spec, its OEMs must also settle on a strategy for megawatt (MW) turbine capacities, following a period where they were constantly striving for more and bigger. Readers will remember Mingyang Smart Energy announcing the MySE 22 MW at the China Wind Power 2023 exhibition in Beijing.

Joel Cox, Global Sales Director at Dellner Wind Solutions, commented in an earlier edition of PES Wind that, one moment we were talking about five and six megawatt turbines; then 15, 16, 18, and upwards were on the table. 'Then we were hearing about 30 MW test machines and plans to build a 35 MW model,' he said. 'This trend has abated, and the focus is, thankfully, now more on making the existing products profitable versus upscaling them.'

That adjustment in mentality aligns with the launch of Dellner's new high pressure active yaw braking system, which also adds further sustainability to component manufacturing.

Möllers says, 'The product will reduce costs for all wind turbine types that have a yaw system. The benefits cover both trending directions of travel because it dovetails with cost efficiency, but greater MW power generates higher forces that need to be absorbed by the entire wind turbine structure and its components.'

Dellner Wind Solutions will confirm widespread availability of the new high pressure braking system in due course.

www.DellnerWind.com

Dellner Wind Solutions at WindEnergy Hamburg

Dellner Wind Solutions will exhibit at WindEnergy Hamburg, which takes place from 24th to 27th September. The show attracts major players in the wind industry, including planners, manufacturers, financial backers, suppliers, energy and service providers, onshore and offshore.

It will be the first staging of the event since Dellner Group brought its wind technologies together as Dellner Wind Solutions, one of six new business units, each dedicated to a vertical marketplace.

The Dellner brand has been synonymous with industrial braking since Dellner Brakes was founded in 1941, but it has been a story of perpetual motion, right up to and beyond the 2021 acquisition of Dellner Hydratech, the Danish supplier of high-end hydraulic systems, cylinders, and accumulators for wind, offshore, and marine applications.

Other landmarks include the acquisition of Pintsch Bubenzer in 2018, leading to the formation of the Dellner Bubenzer Group.

That's without referencing Gummi USA, a brake and clutch company, bought in 2017; and JHS Jungblut, a pioneer of noise-free, lightweight brakes, and yaw sliding bearings

for wind turbines, which was added to the portfolio a year later. Other brands have featured along the journey too, all serving as signposts towards today's Dellner Wind Solutions.

Fabian Möllers, Head of Sales at Dellner Bubenzer Germany Wind GmbH, says, 'The show will represent an opportunity to see many of our OEM [original equipment manufacturers] customers. Of course, we will talk about our new high-pressure brake system, while showcasing existing brakes, couplings, hydraulics, and offline filtration systems.'

See Dellner at WindEnergy Hamburg, Hall B5, Stand 411.