COMPONENTS AND TECHNICIANS: BIG PARTS TO PLAY

When it comes to wind-turbine braking systems, brake manufacturers need to stay at the cutting edge of their own technological field, while leading the way in height safety best practice. (Courtesy: Shutterstock)

High in the air, often miles offshore, component experts need a complex raft of skills to serve the wind-energy market.

By JOEL COX

Dwarfed by a fleet of sky-scraping wind turbines, one might not realize there are up to 20 brakes installed in each one. They are typically rotor brakes and yaw brakes, while, on the electric pitch systems, there are pitch brakes on each drive motor.

In the fast-paced, wind-power world, when up-tower, it is important to minimize downtime and take up exactly what is needed — first time. For example, when working around nuclear installations, it's necessary to have detailed tool lists and extensive pre-planning meetings to avoid delays and reduce radiation exposure. In wind, the stakes are just as high.

ROTOR, YAW, AND PITCH BRAKES

Rotor brakes are likely caliper-style (active or passive), while rotor lock style pins (hydraulic or manual) are used for safety locking and maintenance purposes. Yaw brakes (active or passive) and sliding bearings, along with special brakes, are installed for pitch movement on the blades. Then there are high-end coolers, hydraulic systems, cylinders, and accumulators.

Throw into the equation that modern-day turbines can reach to more than 850 feet and can be as many as 50 nautical miles offshore, and the scale of the task to keep thousands of braking systems operational, even on a single wind farm, starts to present itself. It means that brake manufacturers need to stay at the cutting edge of their own technological field, while leading the way in height safety best practice.

When high-end powertrain and braking components are involved, unscheduled maintenance is seldom required. This also means work can be planned and emergencies prevented. While manual checks on brake pad thickness and wear-and-tear are necessary, modern brakes have wear indicators that can alert maintenance teams of any issues ahead of time.

UNSUNG HEROES

Each brake is a feat of engineering in its own right, and being able to examine one on a workbench takes years of training and practice. The fact that none of the tasks alluded to earlier ever takes place in the comfort of a workshop means plans must be made accordingly from the point of design all the way through manufacturing and application. Where ropes and hoisting equipment enable safe access to nacelles, tools are designed with lanyards to prevent dropped objects. If one is using a wrench or torque wrench to calibrate, think about

A line-up of barrel pistons and pucks being produced for yaw passive braking system. (Courtesy: Dellner Bubenzer Group)

what can happen if a worker suddenly slips. Damage to equipment, property, and personnel is the first thought at all times.

A wind-turbine nacelle is not always a comfortable environment to perform such labor. Certain places, such as the hub or lower yawing area, present particular challenges. Where, in the industrial sector, detailed work plans, including specific access and egress protocols, would be in place anytime a worker had to complete a job in a confined space, in wind energy, this environment is the norm. Much respect goes to tower technicians who stand, crouch, crawl, and climb to get jobs done. Some scoff, but they are totally deserving of the higher pay scales that the industry affords them.

PRESSURE ON COMPONENT SUPPLIERS

For a long time, the brake and component industry has tried to impart its knowledge onto wind-energy engineers, but the required expertise largely remains within the product sector itself. While the installed base of wind farms in the U.S. tends to be onshore, more offshore farms are starting to be approved and built. This only adds to the pressure on component suppliers.

As suggested, once competent on brakes, a technician must also be a pioneer in height safety. Safe work at height and climbing to get there involves extensive training and a thorough understanding of the requirements for ascent, descent, and everything in between. It's not an environment where one can only think about themselves, either; support, rescue, and emergency plans must also be rehearsed and constantly retrained.

I have been throwing on harnesses all my career to work on electric overhead traveling (EOT) cranes, but until going to a wind power-related training class some years ago, I had no real understanding of the evolution that has taken place in climbing, rigging, and height safety. It was eye-opening and concerning in equal measure.

Next time you're in the field, looking up at a wind turbine and take a moment to think about the abundance of heavy-duty rotor, yaw, and pitch brakes in operation, and the expertise required to access them and keep everything working safely and efficiently. A truly worldwide operation, Dellner adopts a "think globally, act locally" mentality, which enables the company to operate almost seamlessly at wind

A factory worker completes manufacturing of rotor lock pins for OEM wind turbines. (Courtesy: Dellner Bubenzer Group)

A line-up of some aftermarket specialty upgrade kits for offshore turbines. (Courtesy: Dellner Bubenzer Group)

turbines turn across the world. Technical teams from China, India, Denmark, Germany, Spain, and the U.S. make sure that, if required, Dellner can be on site at a moment's notice.

ABOUT THE AUTHOR

Joel Cox is global sales director — wind, at Dellner Bubenzer Group (formerly managing director of sales for Dellner Bubenzer USA and global sales director for the Americas). He has spent nearly 30 years in the electric overhead traveling (EOT) crane business and has been extensively involved in OSHA inspections in addition to the design, build, fabrication, installation, modification, and load testing of lifting equipment. He dedicated a decade of his career to the high-level modernization of some of the largest, heaviest duty cranes in North America. He has been around Dellner Bubenzer products for 20 years but has worked for the manufacturer since 2012. Cox was educated at East Gaston (two years ICT, Industrial Co-operative); Central Piedmont Community College (Associate of Applied Science in Electrical Engineering); Clemson University (Occupational Safety & Health Administration); Marshall School of Business (Strategic Marketing); and University of Miami (International Communications, D.C.I.E).

REDISCOVERING BUILD-TO-SPEC, DOWNSIZING

Two trends can be expected to last the duration of 2025 — and beyond.

One is the transition to build-to-print from build-to-spec; and the other is the slowing race to higher megawatt MW turbine capacities. Both demonstrate the industry's tendency to change direction.

Being a manufacturer of components for wind turbines puts one in a perfect position to check the pulse — and temperature — of the industry. And, from this vantage point, it's evident that these two patterns will continue shaping the way products and services are delivered.

The first trend is more alarming: The transition to build-to-print from build-to-spec. Remember, wind energy was once a build-to-spec-only sector; today, the direction of travel is very much to build-to-print, and it will have long-term implications in that the industry is cultivating a supplier base that can only produce at low cost.

Another trend is that the race to higher capacities is slowing to the point where the industry has realized the wider benefits of consolidating rather than constantly upsizing. It was a trend that started onshore and then went offshore. Most understood the theory, but the industry didn't scale it correctly. It was also true that there were geographical nuances in play in that Europe generally has less space for multiple turbines, whereas in the U.S., in places like Ohio, there is a much greater landmass where multiple turbine farms can be built with little impact on public life or other infrastructure.

Having put the brakes on the theory that bigger is always better, we can re-examine the benefits of build-to-spec and return to a model where our engineering expertise in heavy-duty rotor, yaw, and pitch brakes is given due opportunity to drive continued improvement of industry best practices.

—Joel Cox