





Wind energy in the Black Forest: ensuring process reliability

Words: Ingo Jensen

The Black Forest, with its diverse landscapes, countless hiking trails, picturesque towns and rich cultural traditions, is one of Germany's most popular vacation destinations. Beyond tourism, the region also plays a crucial role in the country's energy transition. For more than 20 years, numerous wind turbines have stood across the area, and they are now receiving performance upgrades through repowering projects. In addition, several new projects are planned for the coming years.

One of the key drivers of the energy transition in southwestern Baden-Württemberg is Ökostromgruppe Freiburg. Together with its partners, the company completed three wind power projects in 2024, producing a combined 37.5 million kWh annually. Currently, four additional wind farms with a total capacity of 46.4 million kWh per year are under construction.

By 2027, Ökostromgruppe Freiburg plans to implement 15 more projects, with 20 wind turbines across the districts of Breisgau-Hochschwarzwald, Emmendingen, Ortenau, and the city of Freiburg. With an expected annual output of 240 million kWh, these projects could supply around 80,000 households with green electricity.

New ENERCON turbines

There is substantial work for ENERCON, Germany's largest wind turbine manufacturer, headquartered in Aurich, East Frisia. The company supplies E-138-EP3

turbines for replacing older units in repowering projects, as well as E-160 EP5 E3 and E-175 EP5 E3 models for both repowering and new installations.

Installation teams do not have to worry about lifting equipment for rotor blade assembly, as they can rely on the RBC-D 50 high-end yoke from the Allgäu-based specialist ematec AG. Its adaptive blade mount handles all types of rotor blades, regardless of size or weight, making it a versatile solution across projects.

Combination of RBC-D and APS

Maximum process reliability is achieved by using the RBC-D in combination with the Autonomous Positioning System (APS) from Seasight Solutions. Two propellers are mounted to the yoke, enabling rotor blade installation without guide ropes or winches.

That's a huge advantage, especially in forested or steep terrain, and often the deciding factor in whether a project can be realised at all.



The RBC-D from ematec requires minimal space on the construction site

During the recent installation at Taubenkopf near Freiburg, using the RBC-D and APS was the only feasible solution due to the topography. Any other assembly method would have been impossible.

Installation at ± 30 degrees

ENERCON and its installation partners also benefit from significant time savings onsite. With the RBC-D, rotor blades can be installed at any angle within ± 30 degrees, eliminating the need for additional tools to rotate the hub after each blade is mounted. The installation teams no longer need to install a ballast arm as a buffer during installation, saving at least two crane lifts per turbine.

Less downtime on construction sites

Another practical advantage of the RBC-D and APS combination is that rotor blades can be installed in wind speeds of up to 10 m/s. 'This allows much greater flexibility in the installation process and significantly reduces weather-related delays,' says Norman Huske, who trains ENERCON installation teams worldwide on using the RBC-D and APS.

Using the new technology, all three blades of a turbine can be installed within a single day if needed. 'The limiting factor here is usually the crane operator's shift schedule, not the equipment,' Huske adds.

Smooth installation in Ettenheim

At the latest wind farm project in the Black Forest, the RBC-D and APS again ensured safe and efficient blade installation. At the Schnürbuck wind farm near Ettenheim, the rotor blades of ENERCON E-160 EP5 E3 turbines were installed in just 1.5 days each. 'We lifted the first two blades on the first day and the third the next morning. Even in rain and fog, everything went smoothly,' Huske reports.

The Schnürbuck project is a joint venture between Ökostromgruppe Freiburg, Ettenheimer Bürgerenergie, and Alterric. In total, six old turbines are being replaced by three new ENERCON units in this major repowering project. 'We're cutting the number of turbines in half while quadrupling the output and doubling the distance from residential areas. It's a win-win for everyone involved,' says Jörg Bold, Chairman of Ettenheimer Bürgerenergie eG.

The citizens share that enthusiasm: through crowdfunding, the cooperative raised 800,000 Euros in just 36 minutes by securing loans. 'That level of engagement is fantastic,' Bold adds.

Strong public support

Public backing for renewable energy projects extends beyond Ettenheim. 'Support across the entire region is enormous,' says Thomas Schuwald, Managing Partner at Ökostromgruppe Freiburg.

'More than 25,000 citizens are actively participating in current and planned energy projects, as cooperative members or direct lenders. For our community projects alone, we've earmarked around 70 million Euros in citizen capital, roughly 20% of the total 350 million Euros investment volume.'

Safe and efficient installation as top priority

This commitment also impresses Julian Eberhard, CTO of ematec AG: 'For us, it's an honour to contribute to Germany's energy transition with our yokes. Our priority is ensuring that ENERCON and its partners can execute every project as safely and efficiently as possible.'

According to Schuwald, the decision of Ökostromgruppe Freiburg and its partners to rely on ENERCON's expertise is clear: 'Projects in the Black Forest are always challenging. Together, we consistently find pragmatic and creative solutions. Over the decades, our collaboration has evolved into a strong partnership, and it certainly helps that ENERCON operates its own service base in Waldkirch.'

About RBC-D generation yokes

The RBC generation rotor blade yokes from ematec are the world's first and only single-blade yokes that automatically and individually adapt to each rotor blade, consistently balancing them. They can handle

Using the new technology, all three blades of a turbine can be installed within a single day if needed.

blades ranging from 45 to 110 meters in length and stabilise them at inclination angles of up to ± 30 degrees, ensuring uncontrolled movements are entirely avoided.

The system always identifies the precise centre of gravity for safe blade handling. Two counterweights at each wing of the yoke automatically adjust to the centre of gravity, with or without the blade.

The 'D' in RBC-D stands for 'Double,' indicating that, in addition to the lower gripper, the upper telescopic gripper is also equipped with fourteen hydraulically actuated and gimbal-mounted grip pads.

The gripper hydraulic cylinders feature integrated safety valves that prevent blades from slipping out, even if improperly handled. With a hang height of only approximately 3.5 meters, the RBC series greatly simplifies

crane management, particularly given the increasing hub heights of wind turbines.

Ready for action in record time

On construction sites, RBC yokes become operational faster than any other yokes, automatically moving into their working positions and attaching to the rotor blade at record speed. The RBC yokes require less than 30 minutes to complete these two steps.

The Green-Line variants of the RBC yokes are powered by high-performance batteries, suitable for mounting three rotor blades at temperatures as low as -20 degrees Celsius. Battery operation is double-redundant. Thanks to the Green-Line technology, wind turbine manufacturers can bypass stringent emissions standards, such as Euro-5 and USA EPA Tier 4 final regulations, effective since January 1, 2019.

Additionally, ematec maintains the electric motor below 48 volts, making it fully compliant and easily deployable in the USA according to UL (Underwriters Laboratories) requirements.

With innovative equipment like the RBC-D and APS, ematec and its partners are helping make wind energy projects in complex terrains safer, faster, and more reliable. Their work in the Black Forest illustrates how advanced technology and community engagement can drive Germany's clean energy future.

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Onsite, the RBC-D and APS easily float toward the rotor blade