The RBC-D is a yoke for every situation

As turbine platforms grow larger and more powerful, installation demands continue to rise. Longer blades, higher hub heights and tighter construction windows, combined with increasingly complex terrain, are placing new technical and logistical pressures on installation teams. Lifting technology has therefore become a decisive factor in safety, efficiency and overall project economics. Julian Eberhard, CTO of ematec AG, discusses with PES Wind how the RBC-D yoke is designed to meet these evolving challenges.

PES: Julian, welcome to PES Wind. ematec's RBC-D yokes are widely regarded as the benchmark for safe and efficient rotor blade installation. Why is that?

Julian Eberhard: Our technology combines several advantages that are unique in their overall package. The RBC-D is still the only rotor blade yoke on the market with adaptive blade gripping for all rotor blades, regardless of blade length and weight, and regardless of the manufacturer.

This means that they are not only ideal for installing new turbines, but also for servicing and dismantling older turbines. The RBC-D is a yoke for every situation. Companies seriously considering repowering projects, a huge market worldwide, would find this technology a cost-effective and transformative solution.

PES: That's a strong statement. What makes it the most cost-effective solution in your view?

JE: It's no secret that our yokes are positioned in the premium price segment. However, any investment decision should always consider lifecycle costs, which is where our yokes represent genuine value, because they are designed for a service life of 20 years or even beyond.

Other yokes are often limited to specific blades and must either be laboriously retrofitted or completely replaced when new blade generations come along. This additional effort and cost are eliminated with our system. We offer our customers a high level of investment security.

PES: How does the technology work in practice and what advantages does it offer?

JE: For safe rotor blade handling, the RBC-D always determines the exact centre of gravity individually. Two counterweights on the two yoke arms automatically adjust to the centre of gravity, with and without the rotor blade. This prevents uncontrolled movements even when the blade is released from the hub, which could damage the blade or derail the handling process.

Thanks to the arc shape on the yoke, it always remains perfectly balanced when tilting up to ±30 degrees. The same applies when pitching the arm up to a maximum of ±8 degrees, which rules out any uncontrolled movement of the unit during tilting or pitching.

For the operator, this offers the major advantage that the rotor blades are always held securely, even if they are not rigged exactly at 100% of the centre of gravity. With

The first blades of the new E-175 turbines are already installed

other yokes, such a situation could lead to uncontrolled movements. Due to the double variant of the RBC-D being equipped with telescopic grippers, not only at the bottom but also at the top, the rotor blades are held firmly in a clamp grip even at tilts of up to ±30 degrees so they cannot slip.

PES: In practice, you often see the RBC-D in combination with bolted-on propellers. What advantage does that bring?

JE: That's right: our customer Enercon generally uses the combination of RBC-D and the autonomous positioning system (APS) from Seasight Solutions when installing rotor blades on its current wind turbines. This brings clear advantages for onsite process flow and provides a significant time benefit.

The key advantage is that guide ropes can be omitted when installing the rotor blades. There is no need for winches on the ground either, which reduces the space required on the construction site. Especially at high altitude sites with forests and steep topography, this is a tremendous advantage and can be decisive for whether projects can be realized at all.

For example, during an installation in the Black Forest, when building the turbines at Taubenkopf near Freiburg, installation with RBC-D and APS was the only viable option due to the terrain's topography. There was no other installation method available to the team onsite.

PES: What other advantages are there?

JE: In addition, rotor blades can be installed with the RBC-D-APS system at wind speeds of up to 10 m/s. With conventional methods, work usually has to stop once wind speeds reach 8 m/s. Depending on local conditions, it is possible to install up to three rotor blades per day. Our customers and their installation service providers value the reliability of this process very highly.

As a rule, things never run perfectly smoothly on site and unfortunately, there are always

Julian Eberhard

unforeseen delays. That's why it's great when the installation team knows it can finalise a site in a single day, if necessary, especially when a spell of bad weather or days with high winds are forecast. This option is available with our RBC technology in combination with the APS from Seasight Solutions.

The RBC-D yoke from ematec at the wind farm Röschenwald

The RBC-D from ematec enables rotor blade installation at a wide range of angles within ±30 degrees

PES: Where does the time advantage of this combination come from?

JE: The rotor blades can be installed with the RBC-D at any angle up to ±30 degrees, so the rotor hub no longer has to be rotated after installing a blade. During installation, teams no longer need to fit a ballast arm as a buffer, automatically saving at least two crane lifts per turbine.

Enercon and its project partners have benefited from this advantage on a whole series of turbine installations in Germany. Of course, we are very pleased that our innovative technologies are helping to make the energy transition in Germany a success.

PES: Which projects best demonstrate the capabilities of the RBC-D?

JE: Just a few weeks ago, the rotor blades were installed at the Röschenwald wind farm in Baden-Württemberg. Four next generation Enercon E-160 EP5 E3 wind turbines are being erected there. Each turbine delivers 5.56 MW, so with a total capacity of more than 22 MW, the annual electricity demand of more than 10,000 four person households can be covered with regionally produced green power.

Röschenwald wind farm is a joint project of Alterric and Windkraft Bodensee-Oberschwaben GmbH & Co. KG (WKBO), which also offers citizen participation in the form of subordinated loans.

We were also involved in another great project in Ettenheim in the Black Forest with the RBC-D. In that repowering project, a total of six old turbines are being replaced by three new turbines. The project partners have halved the number of turbines while quadrupling the output. The distance of the turbines to the local population has also doubled. That's a win-win project for everyone involved.

In addition, local citizens see it that way too. To invest in a wind turbine, the Ettenheim Bürgerenergie eG allocated a total of EUR 800,000 via crowdfunding subordinated loans. These shares were gone within 36 minutes.

PES: Are there any interesting projects coming up?

JE: Yes, definitely. Ökostromgruppe Freiburg, one of the drivers of the energy transition in the Black Forest, has a whole range of interesting projects in the pipeline. And of course, the more powerful and larger the wind turbines become, the greater the need for our RBC technology.

Enercon also consistently relies on our high end yokes. We are looking forward to a whole series of projects with the new E-175 EP5 platform, which will be implemented as early as 2026. The first installations, such as the construction of an E-175 turbine in Meschede in the Sauerland region, have already taken place.

Let's go up

Inside ematec's RBC-D rotor blade yokes

The RBC generation rotor blade yokes are the world's first and only single blade yokes that can automatically and individually adapt to the respective rotor blade while continuously balancing themselves. They can accommodate blades between 45 and 110 metres long and stabilize them up to a tilt angle of ±30 degrees, preventing uncontrolled movements of the units.

For safe rotor blade handling, the RBC determines the blade's exact centre of gravity for each operation. Two counterweights on the yoke arms then automatically balance the system, whether the blade is attached or not.

The 'D' in RBC-D stands for 'double' and means that in addition to the lower telescopic gripper, the upper telescopic gripper is also equipped with fourteen hydraulically actuated and cardanically suspended grip pads.

Additional highlights

- Hydraulic cylinders with integrated safety valves prevent blade slippage, even in the event of operator error.
- With an overall height of approximately 3.5 metres, the RBC series simplifies crane management, particularly with increasing hub heights.

Ready for use in record time

Onsite, RBC yokes are ready for operation faster than comparable systems. They automatically move into operating position and rigging to the rotor blade is completed in under 30 minutes.

The Green Line variants are battery-powered and designed to install three rotor blades at temperatures as low as –20°C. Battery operation features double redundancy.

Thanks to Green Line technology, wind turbine manufacturers avoid tightened exhaust regulations under Euro 5 and US EPA Tier 4 Final standards. The electric motor is deliberately kept below 48 volts, ensuring smooth use in the USA and compliance with UL requirements.

With transport dimensions of approximately 14 m × 3 m × 2.95 m (L × W × H) and an unladen weight of around 27 tonnes (RBC-D 50), the yokes can be transported in Germany under a permanent permit pursuant to Section 70 of the German Road Traffic Licensing Regulations (StVZO).

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