ip INNOVATIVE PROJECTS for the German wind market

The following pages are dedicated to companies whose new products, processes or methods ensure the continued development of the wind industry.

An excerpt of the BWE Industry Report **„Wind Industry in Germany 2021“**

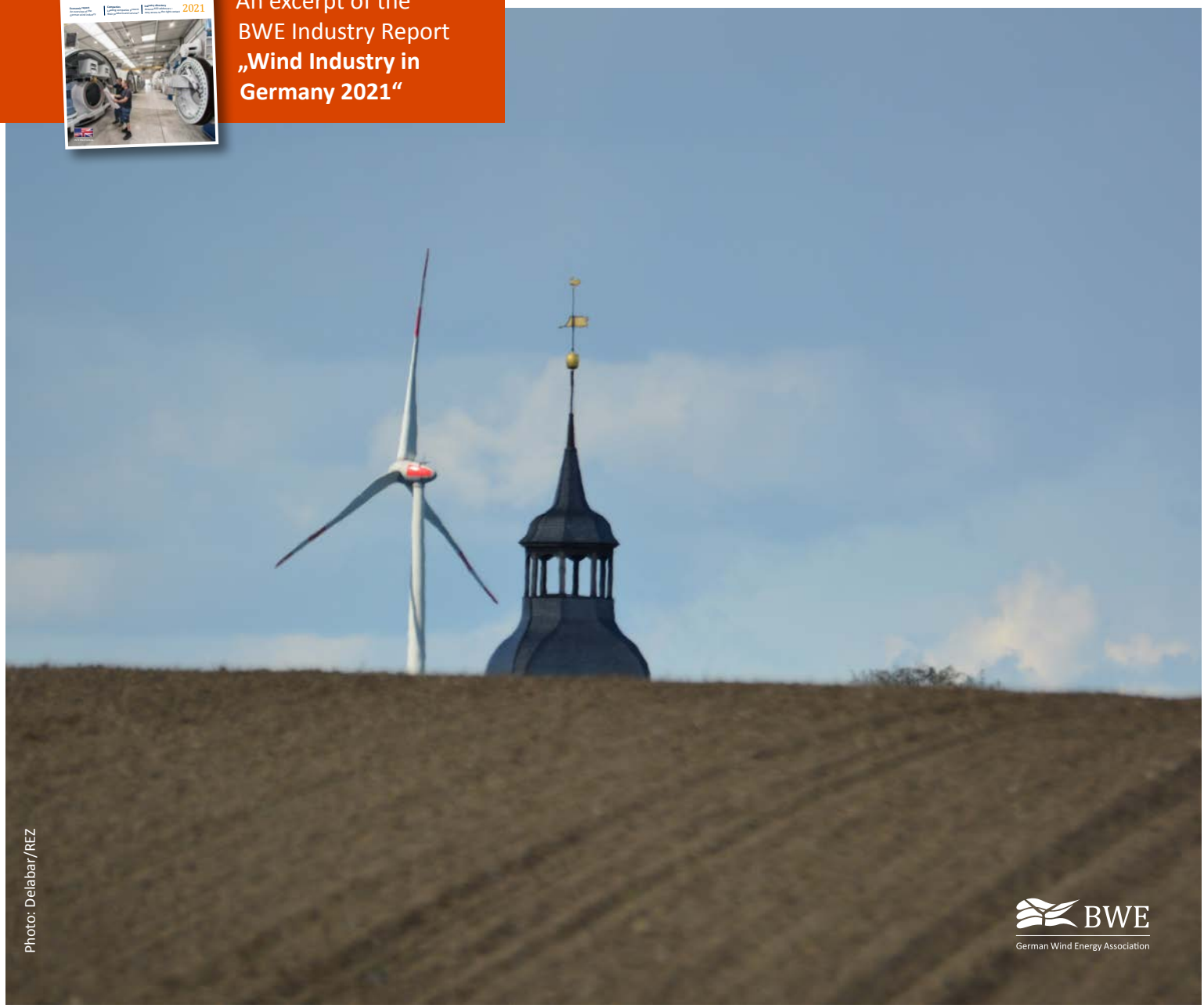


Photo: Delabar/REZ

FORERUNNER FOR YIELD- AND COST-OPTIMISED TURBINE GENERATIONS

ENERCON's new top model E-160 EP5 with permanent magnet generator technology marks the company's entry into the **large rotor class**. ENERCON is developing further turbine types based on it that take account of the increasing cost of energy demands.

ENERCON's new E-160 EP5 turbine type is an important cornerstone of our new product and marketing strategy with which the company intends to win an even greater share of the international market going forward. Many of the currently planned projects around the world are based on this new turbine, which is ENERCON's new top model with the largest rotor diameter in our entire product range – the low wind version of our EP5 platform, which also includes the E-147 EP5 for sites with medium wind speeds and the E-136 EP5 for sites with strong wind speeds. The prototype was installed at the Wieringermeer wind power test site in the Netherlands in July 2020.

Prototype of the E-160 EP5 in the Wieringermeer wind energy test field in the Netherlands
Photo: Klaas Eissens

The E-160 EP5 prototype, which has a rated power output of 4.6 MW was erected at the test site on a modular steel tower (MST tower) with a hub height of 120 meters. One of the special challenges involved in the installation of the first E-160 EP5 was transporting and handling the rotor blades, which at 78.3 metres, are currently the longest components in ENERCON's portfolio. A new logistics concept was therefore devised in collaboration with the transport service provider, which included trial loading and test drives with the planned transport equipment and a detailed route survey to prepare the direct run of the prototype components from the factory to the construction site in an optimum manner. The Blade Hoisting Device used for single-blade assembly, which is a special mounting device for the rotor blade to be assembled and is attached to the crane hook together with the clamped blade, was also new for ENERCON, as was the Hub Rotating Tool, an assembly tool adapted to the EP5 turbine type for rotating the rotor head during blade assembly.

Meanwhile, WRD, ENERCON's research and development company continues to work flat out on the EP5 programme. "The prototype", ENERCON CTO Jörg Scholle explains, "as constructed in Wieringermeer corresponds to the E1 version". For us, the E1 with its nominal power rating of 4.6 MW represents an initial foray into the large rotor class with permanent magnet generator technology. We're using this variant to validate the technological concept and to measure the turbine under practical conditions. At the same time, the E1 gives us the basis for the development of further variants with higher nominal and rated power outputs".

„The E2 is ENERCON's answer to our customers' the ever increasing 'Cost of Energy' requirements. Cost pressure is now a determining factor for wind turbine technology in all market regions around the world. Wherever we are, we must submit to the CoE Dictum"

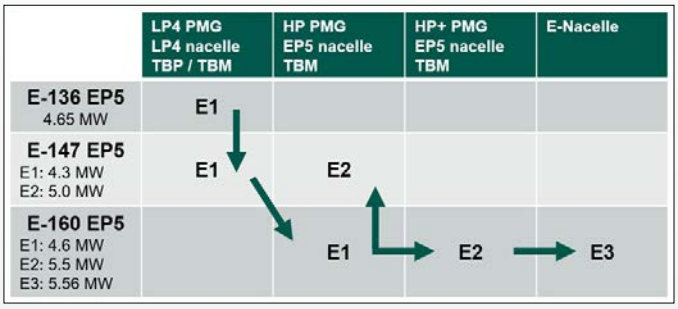
Jörg Scholle, CTO, ENERCON.

This product strategy, which takes ENERCON's striving for lower "cost of energy" values into account, will take concrete shape in the next step in the form of the previously announced E-160 EP5 E2. The E2 is the next evolutionary step of the E-160 EP5 and provides a significant increase in performance with a rated output of 5.5 MW. At locations with annual average wind speeds of 7.5 m/s at hub height, it will produce more than 21,534 megawatt hours (MWh) per annum. This is an increase of about 9 per cent compared with the E1, which produces about 19,615 MWh per year at the same location.

Cost-optimised rotor hub. Photo: Klaas Eissens

The developers also have ideas in hand for the post-E2 era. "In terms of research and development", says Jörg Scholle, "we're continuously striving to further optimise and simplify turbine design as well as production, transportation and assembly processes with a view to contributing to a further reduction in 'Cost of Energy' values. The same applies to the EP5, which is why we are already working on innovative solutions that go beyond the E2 development stage".

Rough modification history of the EP5 wind turbines:



New HP generator, new nacelle design (faster assembly; more common parts). Photo: Klaas Eissens

Project overview

Initiator	**Enercon GmbH**
Facts and figures	**E-160 EP5** **Nominal power: 4.6 MW** **Annual energy yield (average wind speed 7.5 m/s): 19,615 MWh** **Hub heights: 120 m, 166 m** **Rotor blade length: 78.3 meters** **Wind class: IEC IIIa** **Rotor diameter: 160 m** **Generator: Direct-drive permanent magnet generator (PMG)**
Project status	**Mechanical installation completed. Final commissioning at the Wieringer-meer site is imminent. R&D measure-ments to begin subsequently.**
Location	**Wieringermeer, Netherlands**

ENERCON
ENERGY FOR THE WORLD

Are you interested in the project and want to know how your community or your business can benefit from it? Contact us. Our contact can be found in the **company profile on page 93** ▶

REDUCED-RADIATION OBSTACLE LIGHTS

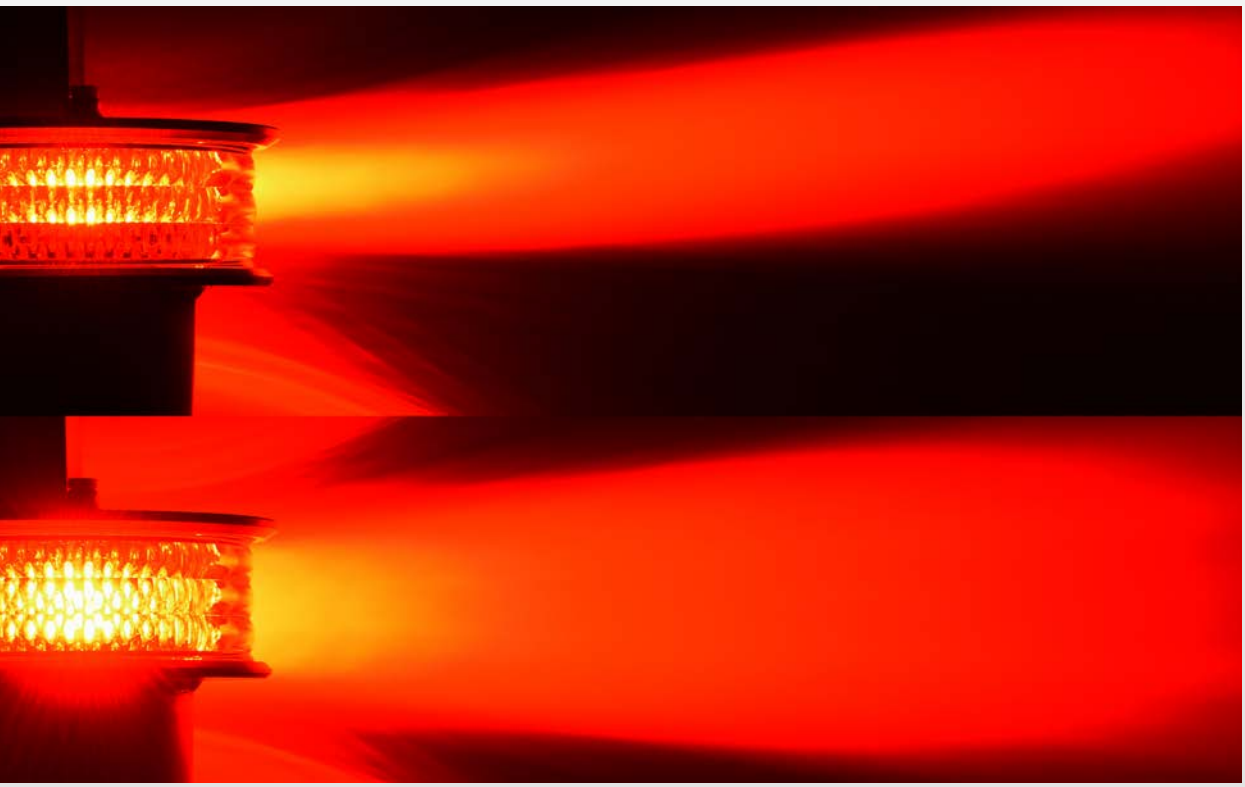
To a large extent, public acceptance of wind energy depends on the aviation hazard lighting used. Wind energy in Germany can only expand if this aspect is taken into account

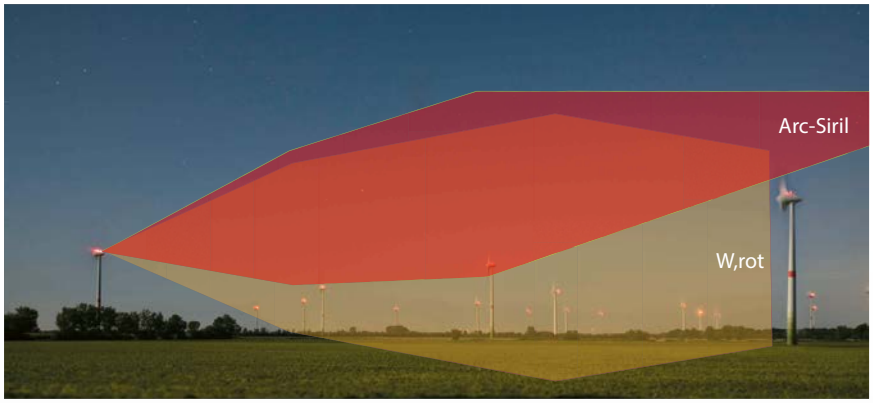
Acceptance by local residents has always been a central guiding principle for Lanthan in our developments and actions. Our successes include the introduction of visibility regulation and, earlier this year, the introduction of demand-controlled night-time marking using transponder technology (BNK). In areas where demand-controlled night-time marking cannot be used, reduced-radiation lighting represents a resident-friendly alternative.

Our "Aviation Regulation Conformal Surface Intensity Reduced Intelligent Lighting" (ARC-SIRIL) addresses our aforementioned guiding principle by means of a different operating principle.

The purpose of obstacle lights on wind turbines is to ensure aviation safety. The international requirements are defined by the ICAO and then specified in national guidelines by the respective states, in Germany, for example, in the Allgemeine Verwaltungsvorschrift zur Kennzeichnung von Luftfahrthindernissen (General Administrative Regulation on the Marking of Aviation Obstacles).

Usually, the night-time marking of wind turbines involves the use of two medium-power hazard lights and four additional obstruction lights at one or more tower levels. Fire W red is used as a specific solution in both Germany and in some neighbouring countries. Whilst this





is a much lower intensity lighting system, it has a much greater radiation below the horizon and towards the ground.

To develop our ARC-SIRIL radiation-reduced solution, we first analysed the space to be illuminated. We then determined the optimum light emission based on the interaction between the nacelle and tower lighting. This enabled us to develop the following innovations:

- The navigation obstacle lighting system illuminates the relevant airspace.
- The safety-relevant luminosity of the lighting system is only visible by the pilot.
- Residents living near wind farms are screened from unnecessary light emissions.

Due to the reduced light immissions on the earth's surface during the evening and at night, the wind turbines become almost invisible during this period. The graphic above illustrates the mode of operation.

It is very clear that not only is there less overall immission on the earth's surface, but also that the emission angle does not cover the airspace most relevant to residents, represented here by houses. To residents, the obstruction lights are therefore almost invisible, which makes the flashing of the lights that is criticised by residents irrelevant. However, pilots can still see the wind turbines with unimpaired brightness even from a slightly elevated position.

Conclusion

Reduced-radiation lighting systems are a cost-effective and resident-friendly supplement to demand-controlled night-time marking, which can also be adapted to comply with other national guidelines. The system is installed on a single turbine at Bremer Kreuz and is currently being installed in wind farms in the Paderborn area.

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LANTHAN

Are you interested in the project and want to know how your community or your business can benefit from it? Contact us. Our contact can be found in the **company profile on page 111** ▶

BATTERY-POWERED TORQUE WRENCH MAD-S: INDUSTRY 4.0 AND 1 % ACCURACY

M-PT Matjeschk-PowerTools has developed a sensor-controlled battery torque wrench. Integrated into the worker guidance systems **ProTight™** and **BoltPilot®** the tool guarantees maximum process security.

Being the newest development in bolting systems on the market, the battery-powered MAD-S delivers maximum ergonomics, occupational safety and accuracy on all bolted connections in the wind industry. The torque sensor on the MAD-S is located at the gearbox output. Thanks to this unique design the torque accuracy remains unaffected by progressive wear on the gearbox. This is different compared to conventional sensor-controlled bolting tools, where the torque sensor is placed between the motor and the gearbox input. These tools will become less accurate the more they are used: worn gear parts or motor failure have an adverse influence on the bolting accuracy of these tools.

The MAD-S has an accuracy of ±1,0 % in a torque range from 70–1.400Nm. More types of up to 7.000Nm are currently under development.

Certified Fastener Engineer (DSV)® Felix Hebestreit and hard-/software developer Peter Mirtschink at a bolt tightening analysis on field.

Sensor-controlled battery torque wrench series MAD-S.

The benefits of the MAD-S

- Sensor-controlled torque shut-off via strain gauges positioned on gearbox output
- Sensor-controlled angle tightening
- Suitable for bolting according to VDI/VDE 2862-2 category A
- Digital setup menu
- Brushless electric motor
- Adjustable automatic load release
- Including Documentation System and Bolt Check Function

With the help of the Torque Check program, made by M-PT, the MAD-S battery-powered torque wrench is able to check bolted connections without turning the bolt. This prevents overtightening of bolts.

Bolting in the worker guidance system ProTight™ with battery torque wrench MAD 20.

Bolting of vertical flange in the tower with sensor-controlled battery torque wrench MAD 7-S.

ProTight™ worker guidance system
The software on the MAD-S was programmed in cooperation with the development department of ProTight™, adhering to all criteria and requirements of this worker guidance system. ProTight™ software is mostly used by wind turbine manufacturers at their assembly workstations. Depending on the equipment, the bolting result will be visualized on signal lights as PASS or FAIL, or printed as a barcode and placed on the component. Furthermore, the bolting connections can be displayed on the monitor screen as a picture or a video. The ProTight™ software communicates with the bolting tool via Bluetooth and transmits all torque and angle values bolt by bolt.

BoltPilot® for use on site
For construction and maintenance of wind turbines, the sensor-controlled battery torque wrench MAD-S is also equipped with BoltPilot® software. All bolting processes will be documented and saved in the cloud with BoltPilot®. The assembly supervisor can check the recorded bolting values from any location. This facilitates the communication between the assembly supervisor and the technicians on site.

Conclusion

Thanks to the strain gauges being positioned on the gearbox output of the torque wrench an accuracy of ±1,0 % is ensured. Progressive gear wear has no influence on the accuracy of the tool, as opposed to competitors' tools. Bolted connections are fastened securely and reproducibly. Wind turbine manufacturers and wind turbine service companies can demonstrate the torque results to their clients and to quality assurance, and if specified, proof that all bolts were fastened within the specified torque range.

Torque wrenches with ProTight™ at a glance

- Battery torque wrench MAD (30–7.000 Nm)
- Sensor-controlled battery torque wrench MAD-S (70–1.400 Nm)
- Electric torque wrench MED (65–11.000 Nm)
- Sensor-controlled electric torque wrench MED-S (65–11.000 Nm)
- Electric torque wrench E-RAD BLU (135–16.500 Nm)
- Sensor-controlled electric torque wrench E-RAD BLU-S (135–16.500 Nm)

Project overview

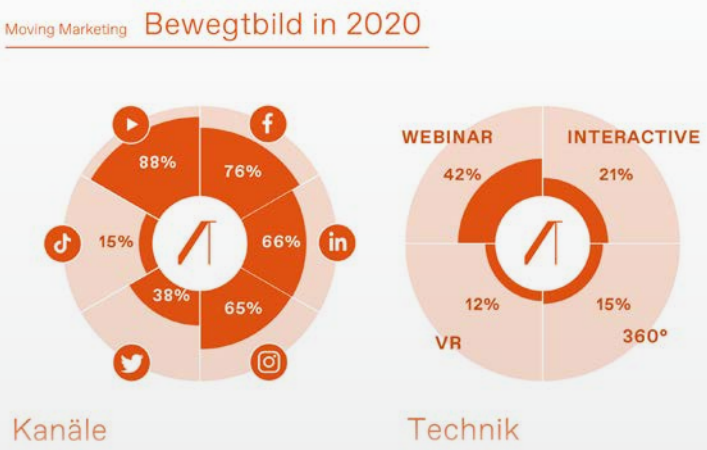
Initiator	**M-PT Matjeschk-PowerTools GmbH & Co. KG**
Implemented by	**M-PT Matjeschk-PowerTools GmbH & Co. KG, De Jaeger Automation BVBA and Texas Controls S.L.**
Facts and figures	**Development and sale as well as rental of torque wrenches (battery, electric, pneumatic) and hydraulic bolting systems (hydraulic torque wrenches, tensioners and pumps). Repair and calibration of all torqueing and clamping systems (also from other manufacturers).**
Project status	**On the market since April 2020.**

Matjeschk PowerTools

Are you interested in the project and want to know how your community or your business can benefit from it? Contact us. Our contact can be found **on page 250** ▶

MOVING MARKETING – SALES ON THE MOVE

Moving marketing stands for the interactive exchange of knowledge and for **an integrated concept of digital communications**, whereby the recipient interacts rather than simply accepts information.



Marketing and sales – a single unit
Moving marketing brings marketing and sales even closer together. “Touting for business”, the well-known way of acquiring new customers, is proving to be increasingly labour-intensive and, from a marketing perspective, is quite wasteful. Moving marketing fundamentally changes the acquisition of new customers because it is all about “being found”!

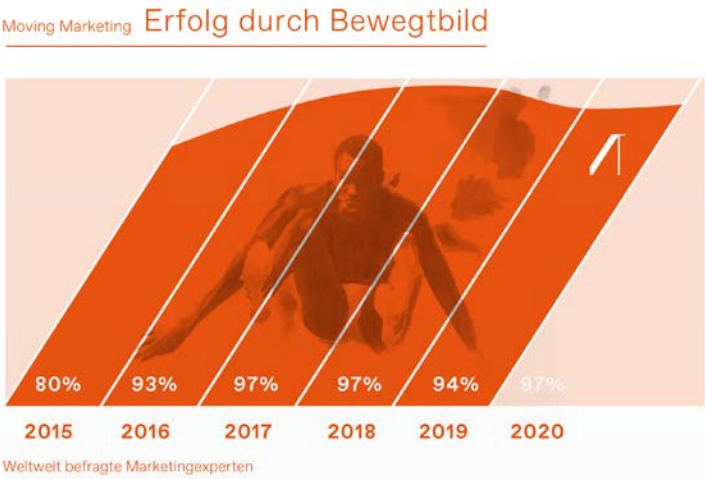
Demand-oriented communications
Digital communication channels make it possible to address several target groups at once based on their specific requirements. SEO, SEA, and social media platforms all create high visibility with manageable budgets. At the same time, precise target group marketing can be implemented, and campaign success can be tracked down to the smallest detail. Because of the diversity of the target groups, addressing them can be a major challenge, especially for companies in the renewable energy sector. Nölting GmbH was able to analyse and evaluate this during the past 10 years whilst providing consultancy services to various companies within the sector.

Moving marketing specifically promotes user interactions with the medium, message and content whilst also bundling the most diverse digital social and information media into an overall concept. Gone are the days of boring newsletters with their one-way communications!

The *Moving Letter* provides for interaction between the target group and experts. The Moving Magazine makes the message and knowledge digitally tangible. Interactive modules are incorporated into corporate websites. Closely connecting corporate communication media with YouTube, Facebook, Instagram, or LinkedIn is becoming a powerful standard. The relevance of this type of content delivery has been confirmed not least by a Forbes study, which showed that 90 percent of executives in US American companies watch product-related videos on YouTube.

„Move out of your comfort zone“

Vincent Nölting



Design Communications
Design plays a significant role in *Moving Marketing* campaigns. It is no longer sufficient to transfer images and colour schemes into a design. What is required is the conceptual and technical ability to set corporate communications in motion, in order to provide the user with an experience whilst conveying brand content (UX).

Implementation and advantages
Moving Marketing combines user experience, moving images and design elements with corresponding text. In addition to the technically relevant aspects, fun plays an increasingly important role.

Thus far, technical products and services have mostly been described in a static fact-based manner. Moving Marketing provides the means to make complex and subject-specific content accessible to purchasers and decision-makers who lack the necessary technical expertise. A complicated specialist article is transformed into tangible knowledge transfer.

Moving Marketing thus boosts sales through a holistic digital approach and supports long-term success.

Conclusion

***Moving Marketing* is the next generation in communications, enabling the varied renewable energy target group both to consume information and connect with it. It conveys emotions and values based on a uniform digital marketing concept.**

Project overview

Initiator	**Nölting GmbH, marketing communications specialists**
Implemented by	**Nölting GmbH & Nölting Network**

Want to include Moving Marketing into your sales and marketing communications? Get in touch. Our contact details are on page **178.** ▶

EFFICIENT ROTOR BLADE MONITORING

One challenge for wind turbine operators is having to continuously increase the efficiency of their wind turbines. The focus is on the rotor blades, which not only poses the greatest challenges but also offers opportunities.

In recent years, the rotor blade has clearly become the centre of attention in terms of the development of monitoring solutions for wind turbines. On the one hand, operators need to know about events that may damage the rotor blades. On the other, the measured data is increasingly being used for system control purposes. Ideally, therefore, a solution will be used in wind turbines that monitors different areas of the rotor blade and can be expanded in future.

Phoenix Contact Deutschland GmbH's Blade Intelligence system combines lightning measurement, ice detection and load monitoring processes, whereby the system is designed in such a way that operators can select only those functions that they actually need. If they wish to expand the system at a later date, they can do so easily.

> **“The ice sensors are attached to the rotor blade using adhesive film. They are equipped with a solar cell and memory, which means that they can work self-sufficiently for up to 1000 hours even in regions with less direct sunlight”.**
>
> *Oliver Pukall,*
> *Renewable Energies Industry Manager*

Several configuration stages are available for the ice detection function: depending on the requirements and the regional situation, the operator can choose between a simple ice detection system which will stop the turbine when there is ice on the rotor blades or a restart procedure, which will automatically restart the wind turbine when the blades are ice free. The basic system can be upgraded to the restart solution at any time.

The LM-S lightning measurement system has already been installed in many wind turbines and enables the measurement of lightning strikes into rotor blade arresters. Valuable service information can be gained from the collected data and decisions made on the basis of it such as, for example, whether and when a blade needs a closer examination. So, blade maintenance can be better planned, and the service technicians know what to expect on the wind turbine before they start work. The efficiency of the LM-S can be increased by combining it with other blade monitoring systems, such as load monitoring data, for example, which can identify changes related to the time of the lightning strike. Options such as these significantly improve the analytical possibilities in terms of remote monitoring.

Cost efficient strain gauges have been used to measure loads in wind turbine rotor blades for several years now, which is why Phoenix Contact has integrated them into a housing in such a way that they are robust enough for use in rotor blades even if they are not directly laminated during production. The advantage of this is that defective sensors can easily be replaced. The complete blade intelligence system can also be retrofitted as required.

As with the ice detection system, various upgrades are also available for the load measurement system. An additional inertia metering unit (IMU) in the blade or hub records further data concerning, for example, acceleration, rotation rate or temperature, all of which can be used to monitor the wind turbine.

Conclusion

Our Blade Intelligence System provides operators with greater transparency about rotor blade events such as lightning strikes, ice build-up or conspicuous loads, so they are always informed about the current status. This solution is not only suitable for new plants but can also be retrofitted in older wind turbines. By retrofitting the respective sensors, existing systems can be upgraded to the current state of the art to optimise their performance.

Project overview

Initiator	**Phoenix Contact**
Implemented by	**Phoenix Contact Deutschland GmbH**
Facts and figures	**Blade Intelligence rotor blade monitoring system comprising lightning current measurement, ice detection and load monitoring**
Project status	**Development completed, commercially available**
Location	The project is not site-specific. The system can be used throughout Germany.

Are you interested in the project and want to know how your community or your business can benefit from it? Contact us. Our contact can be found in the **company profile on page 118** ▶

REPAIR AND PROTECTION WITH REWITEC

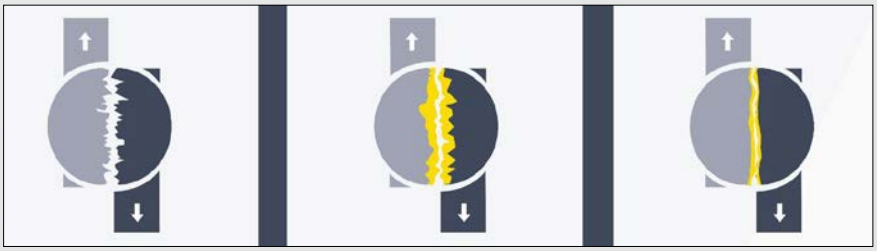
Increasing the service life and efficiency of wind turbine bearings and gears through innovative layer silicate-based additives for oils and greases

REWITEC technology-based product range.

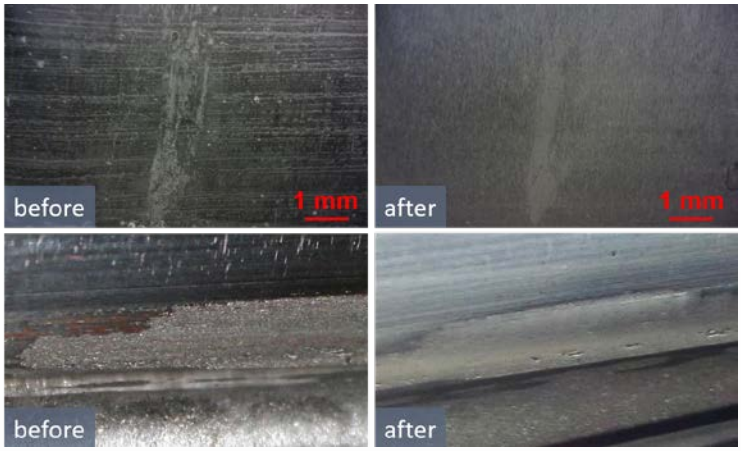
The number of wind turbines worldwide has been increasing continuously for many years as has their rated output and complexity. Whilst the rated output of turbines constructed just a few years ago was only 1 to 2 MW or was even still in the kW range, the current trend is towards much more powerful and larger turbines with rated outputs of 8 MW and more. According to wind turbine manufacturers, this trend is expected to continue in the coming years, which means that the relevant technology will have to do more and more.

The load on mechanical components such as bearings and gears, increases in line with increasing size and performance, which leads to multiple mechanical damages after just a few years of operation, which in turn often require premature and costly part replacements. However, this situation is not expected to improve, because mechanical components are kept as small as possible for economic reasons, resulting in enormous stress on contact surfaces, which quickly leads to material fatigue and other kinds of damage. This damage can cause a total system failure after a given period, which in turn leads to expensive repairs and undesirable downtime.

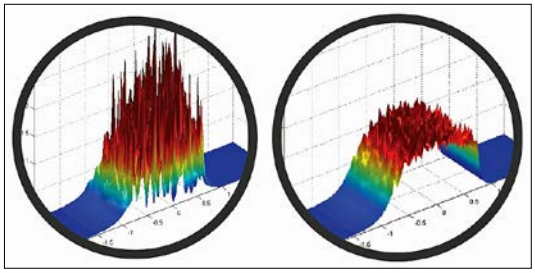
REWITEC GmbH, a medium-sized company from Lahnau, and a subsidiary of the English chemical group Croda, provides an efficient solution to this problem, which consists of innovative oil and grease additives with protective and repair properties. In addition to surface protection, the technology in question also reduces friction and therefore temperature in gearboxes and bearings, which significantly increases the efficiency and service life of these components.



3 REWITEC surface modification steps.



Microscopic (above) and photographic (below) images of a gear tooth flank before and after REWITEC application.



Load distribution on the rough surface before REWITEC application and on the smooth, modified surface after the application.

3 surface repair steps in a main bearing outer ring (before as well as 5 and 12 months after application).

The technology is based on phyllosilicates in the form of micro- and nanoparticles in addition to several other additives that optimise the effect whereby active particles use the lubricant as a carrier medium to reach the surfaces and cover them by means of adsorption. Where necessary, the particles remaining in the lubricant repair the built-up layer, which ensures a lasting and reliable effect. The new, modified surface has a significantly lower degree of roughness, which leads to a more even load distribution within the system thereby significantly reducing local loads. This innovative technology has been tested in numerous experiments carried out in collaboration with several universities and colleges and is protected by the relevant patents. The product is currently being used successfully around the world, especially in the wind energy sector and this trend is increasing.

Conclusion

The layered silicate based REWITEC additives can optimise surface conditions from a tribological perspective, both in new and older systems to minimise friction, wear, surface roughness and temperature. Modifying the surfaces repairs and protects the components, which leads to a significant increase in the service life, reliability, and efficiency of the equipment.

Project overview

Initiator	**REWITEC GmbH**
Implemented by	**pilot projects with representative turbine types, first main bearing applications with first result analyses**
Facts and figures	**over 3000 gearbox and bearing applications in wind turbines**
Project status	**Ongoing**
Location	**Worldwide**

REWITEC
Part of Croda International Plc

Are you interested in the project and want to know how your community or your business can benefit from it? Contact us. Our contact can be found in the **company profile on page 120** ▶

SUSTAINABLE PARTICIPATION

Participation opportunities for the neighbours of wind farms must be fair and social. The REZ has developed new concepts in collaboration with wind farms owned by the MLK Group.

In the hood
Wind farms often suffer from the fact that their operators are not based locally and not accessible to local residents. Even community participation projects cannot gloss over this fact. However, provided they are specific and structurally simple, such projects can encourage local residents to come to terms with wind energy and benefit from it. The direct economic benefits regions derive from operating wind farms are often barely tangible.
If renewable energies want to be accepted by their neighbours, they need to offer more than trade income taxes and free beer at the local festival.

Wind farm participation concepts are designed to enable local residents to participate in the economic success of a project. In the early years, this objective was achieved through citizen-owned wind farms, a concept which is now moribund in terms of tax income and partly also from an economic perspective. Yet, citizen-owned wind farms are currently returning in a different guise in the form of cooperative and crowd funding models, although the entrepreneurial risk associated with investing in a wind farm is underestimated by most investors.

Socially responsible, specific and low risk
This is why REZ and MLK radically expanded their participation concept. Rather than mere economic participation, a broader spectrum of participation instruments was used. These also take account of social aspects, thus targeting demographic groups with no disposable income or who cannot risk their invested capital.

The MLK participation projects are also designed to be as specific and tangible as possible. Shareholdings in various projects or monies paid to the municipalities, as is the case in Mecklenburg-Western Pomerania and Brandenburg, are not visible to broad sections of the population.

Concrete offers
The projects implemented to date have included reduced tariffs for local power supply, various citizen savings projects with attractive interest rates and direct wind farm participation opportunities.
A partnership agreement was also concluded with a day-care centre, which not only included agreements on joint projects, but under which equipment was provided and the daily supply of milk to the day-care centre was ensured.
A central aspect of this approach is to provide personal support and to be in regular contact. Although this requires extraordinary efforts on the part of planners, operators, and managers, it is worth it, for both partners.

A subsidised neighbourhood electricity tariff was launched at two locations in collaboration with green electricity suppliers. The participating wind farms pay the electricity supplier an annual subsidy of between 156 and 180 euro per annum for each contract. One of the projects also receives a social subsidy of another 60 euro per year. As things currently stand, the local resident tariff is tax-neutral for beneficiaries and does not entail any reduction in unemployment benefits. MLK has also made its funding combinable with the funding of the neighbouring planner ENERTRAG at sites near Prenzlau, resulting in incredibly low-cost offers, despite offering green electricity.

Two citizen savings projects implemented with the DKB (Deutsche Kreditbank AG) in 2017 and 2020, provided a total of 200,000 and 300,000 euro respectively with an annual guaranteed interest rate of 3 percent. The investors were allowed to invest up to 10,000 euro per capita, and the programme was without any discernible risk for the investors because the deposited sums were secured by the bank security fund. The term in each case was three years.

„Our objective is to provide effective and fair participation instruments for all residents without risking money."

Heinrich Lohmann,
founder and managing director of the MLK Group

MLK is currently implementing another crowd-funding project with an interest rate of over 4 percent to enable groups with just a small amount of their own capital to participate in wind farm successes. To minimise the risk for the investors, a wind turbine is used which has already been in operation for about 10 years and whose feed-in is sufficiently secure. Conservative revenue estimates were also used. Again, this project is being supported by the DKB. The digitally designed crowd funding project will also be supplemented by local advertising measures to attract local investors. If necessary, digital laypersons can receive assistance in setting up their financial investment. The invested amounts can be anything from 250 to 25,000 euro, but an asset report must be provided by the investors for investments of 1,000 euro and above.

Conclusion

Local participation concepts must take account of local conditions and also include demographic groups with no disposable resources of their own as well as groups with little funding. They should also be used to assume on-site responsibility either through electricity for residents, citizen savings schemes, participation through crowdfunding or collaboration agreements with kindergartens or other social institutions.

Project overview

Initiator	**MLK Windparks in Brandenburg**
Implemented by	**Regenerative Energien Zernsee GmbH & Co KG**
Facts and figures	• **Neighbour electricity status: approx. 100 local electricity customers** • **Effort: between 156 resp. 180 Euros funding/customer** • **Social tariff (near FFO): an additional 60 Euros** • **Eligibility group: Neighboring locations add. conceptual and communication effort** • **Status: ongoing, campaigns approx. every 2 years**
Project status	**ongoing, campaigns approx. every 2 years**

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Are you interested in the project and want to know how your community or your business can benefit from it? Contact us. Our contact can be found in the **company profiles on page 174 and 185.** ▶

ROBOTIC DATA INTELLIGENCE

Robotic Data Intelligence is the newest innovation in **OneView® SCADA Software**. The feature is designed to automate the cleaning, organizing and reporting stages of data collection.

It is a common staple that, in data science, 80 % of time is spent cleaning and organizing data, with only 20 % spent on analysis. With Robotic Data Intelligence, SCADA International gives you the opportunity to reverse those numbers, and reduce time spent on collecting and cleaning data. The goal of Robotic Data Intelligence is to give access to better data and improve the efficiency of Wind turbines, by automating the cleaning, when collecting data.

Robotic Data Intelligence takes data from multiple sources, cleans it by removing incorrect or duplicated data and fuses into concise and easy to access data, while also formatting it to ease the use of it.

The program is built to accompany features already found in OneView® SCADA. Robotic Data Intelligence works essentially in three stages:

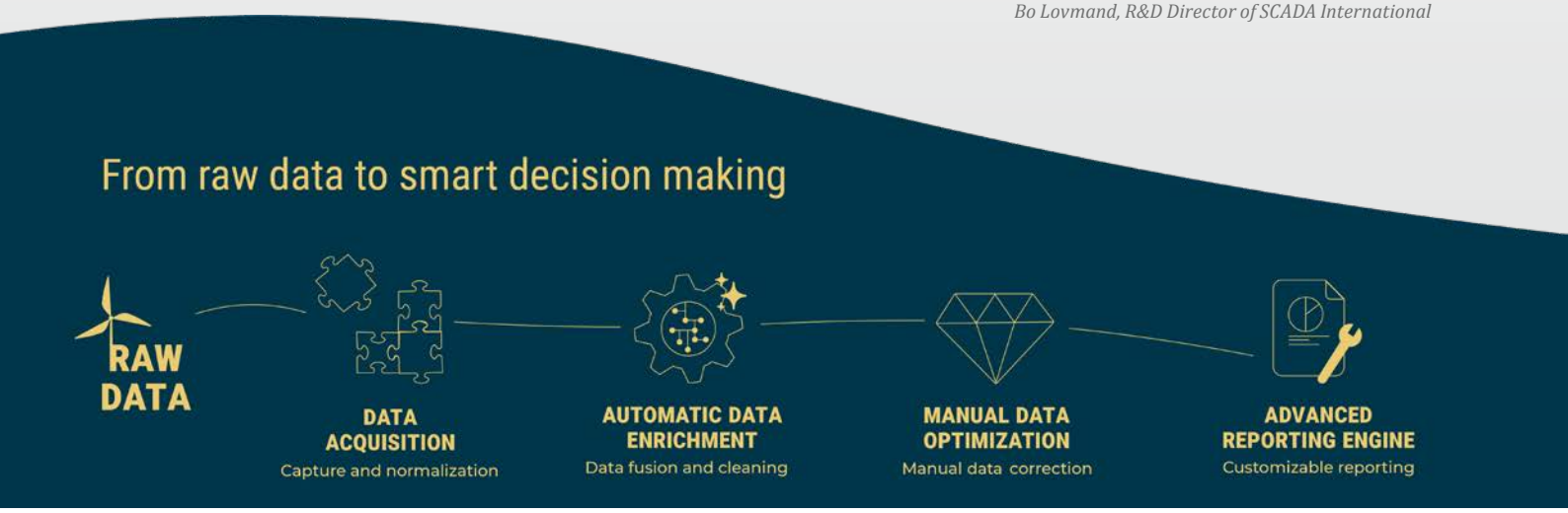
- Automatic Data Enrichment
- Manual Data Optimization
- Advanced Reporting Engine

Automatic Data Enrichment is a patented solution for fusing multiple data sources into coherent and cleaned data. Missing critical events in data from turbines and OEM SCADA systems often cause problems. Therefore, the system is designed to automatically detect missing critical events from time counters in the turbine.

OneView® uses other data sources to "intelligently" cleanup event data. This is especially important when event data is used for generating lost production periods and thus availability.

"Errors in event data are not uncommon, and unfortunately their impact on the data quality can be drastic. Ideally, every single set of an event is followed by a matching reset of the same event. But sometime the reset of an event is missing and the consequence can range anything from a few minutes of data is wrongly calculated to several months of data wrongly calculated."

Bo Lovmand, R&D Director of SCADA International



Robotic Data Intelligence

Complete operational overview
Improved data completeness
Automatic downtime allocation

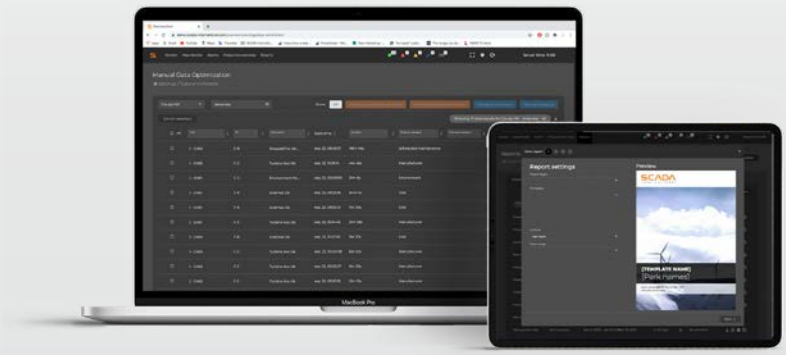
The solution has been developed with expert knowledge of different types of wind turbines, to give the best view of the turbine's operational situation, regardless of the model type.

The next step is the Manual Data Optimization. A system where it is possible for experts to manually allocate lost time events, before building reports. The final step is the Advanced Reporting Engine. A customizable system, which creates specialized reports on performance regarding production, budget and availability across your fleet of turbines. These reports can be made in different formats, including site and portfolio reports. One of the primary goals of the reporting engine is to improve the transparency of the availability calculations. The engine must be capable of handling most availability formulas and show how the figures on the report is calculated, and the Advanced Reporting Engine can handle both operational and contractual availability.

It becomes possible to develop optimization strategies, that better utilize the equipment you have at hand, with more time spent on the solution, rather than finding the problems. By optimizing the data received from wind turbines, you can reduce downtime and thereby increase availability.

Collecting and cleaning data is one of the hardest and most time-consuming parts of running a fleet of wind turbines. But it is still vitally important, in order to complete reports and optimize in the future.

Robotic Data Intelligence is a feature, that improves your system's efficiency, by automating a process that would otherwise take many staff hours to complete.



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Are you interested in the project and want to know how your community or your business can benefit from it? Contact us. Our contact can be found in the **company profile on page 190** ▶

PRECISE DETECTION OF LIGHTNING PROTECTION DAMAGE BY DRONE

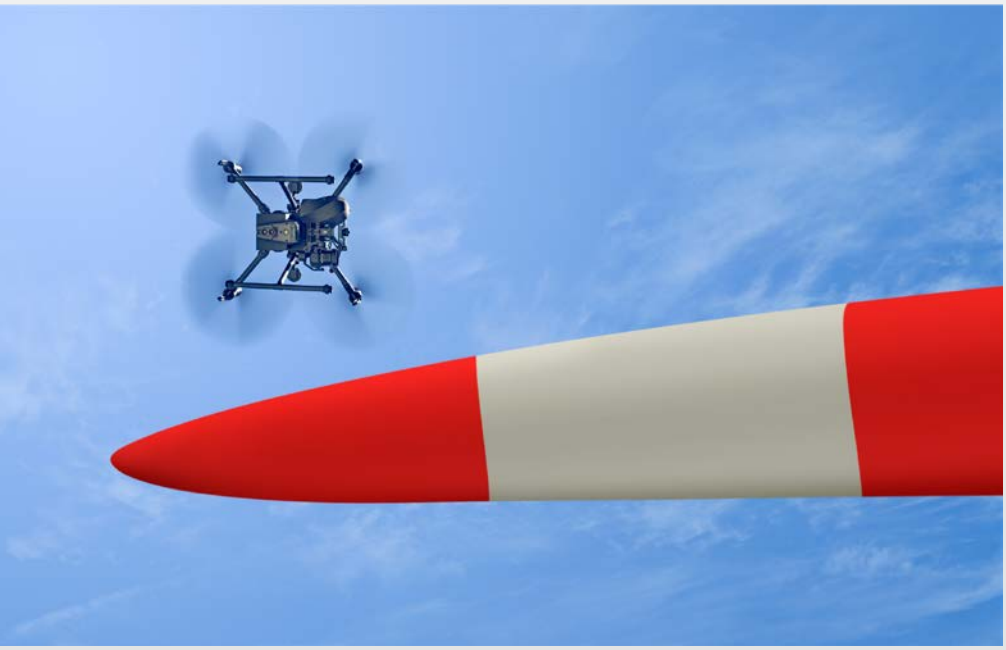
Until now, lightning protection damage has been difficult to detect and conventional methods are overtaxed. TOPseven solves this problem: autonomously flying drones use special sensors to **locate the defect rapidly, without contact and with pinpoint accuracy.**

Wind turbines are a frequent target for lightning due to their height: every turbine is struck once a year according to experts. There is a risk of massive damage if the lightning protection is defective: the electrical control systems can be damaged by overloading, and, in the worst-case scenario, the turbine could catch fire. Therefore, insurers in particular are demanding regular lightning protection tests.

Previously complex troubleshooting: inside the rotor blade with the endoscopy camera

Professional rope access technicians currently test the lightning protection by measuring the low-impedance current resistance between the interception devices in the rotor blades and the ground connection lug at the base of the tower.

Apart from their limited availability, the most serious challenges are the height of contemporary on- and offshore wind turbines and the length of the rotor blades: the cables required for the tests often have to be up to 100 meters long.



However, the time-consuming process of identifying damage is by no means sufficient: the break in the conductor also has to be localised within the rotor blade. To locate the break between the tip and the root of the blade along its entire length, the experts have to drill holes in the structure and examine the lightning conductor using an endoscopic camera.

A globally unique TOPseven patent solves this problem with the contactless and autonomous drone-supported lightning protection test

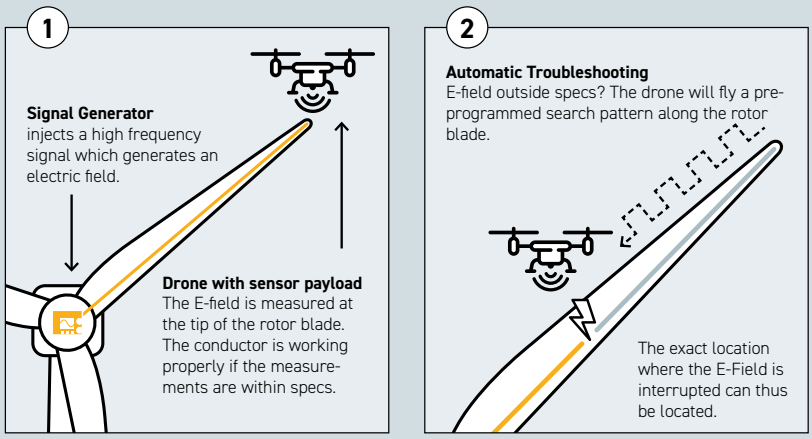
Over many years, the Starnberg-based company TOPseven has developed a totally contactless lightning protection test procedure with the aid of an autonomously flying drone.

Various high-frequency signals are fed into the lightning conductor at the root of the rotor blade by a specially developed signal generator. The patented process generates an electric field with different frequencies and matching impedance values. The frequencies used have been approved by the German Federal Network Agency (BNetzA).

„The Starnberg-based company TOPseven gave us a demonstration of an impressive innovative solution for the drone-based inspection of a wind turbine today, which also allows for contactless lightning protection testing for the first time. We have been following this development for a long time and are pleased that today's test gives rise to the expectation that this patented technology will eliminate inspection bottlenecks in the future and will make them even safer".

Peter H. Meier
Head of Wind Service Center
TÜV SÜD Industrie Service GmbH

TOPseven – Drone Assisted Contactless Lightning Protection Measurement



The counterpart, which is integrated into the autonomously flying Top7 drone, is a highly sensitive electrical 3D field sensor with an extremely low bandwidth and high sampling rate. If the sensor receives no signal at the tip of the rotor blade or if the signal strength is insufficient, it means that the lightning conductor along the rotor blade is damaged or broken.

The drone then autonomously flies along the rotor blade within just a few minutes and measures the intensity of the electric field, which enables it to identify the point at which the electrical field breaks down in a fully automated manner, thus pinpointing the damage precisely.

Conclusion

Conventional lightning protection inspection methods are overtaxed. The worldwide patented TOPseven process solves the problem: TOPseven's contactless and autonomous drone-based lightning protection test system is scalable, saves a considerable amount of time and provides precise results in terms of functionality and, in case of breakages, their precise locations.
This makes TOPseven the only supplier to combine a completely autonomous optical on- and offshore wind turbine rotor blade and tower inspection with an advanced contactless lightning protection test system – rapid, precise, and efficient.

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TOP7
MAKING DRONES SMARTER.

Are you interested in the project and want to know how your community or your business can benefit from it? Contact us. Our contact can be found in the **company profile on page 195** ▶