ENERTRAG
One energy ahead

Operation

OperationsNews

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The next generation of rotor blade inspection and lightning protection measurement

Drone inspection in use throughout Germany from May 2022

With 16 years of experience in rotor blade inspection using rope access in total, ENERTRAG Operation entered new territory last year and developed a new type of inspection in which human and machine optimally complement each other and which meets all the requirements of a rotor blade inspection: Rotor blade inspection by drone – including lightning protection measurement.

At a glance: New process meets all important standards

Already in 2021 a feasibility study was carried out, which confirmed the quality of the new procedure. The next step followed at the end of January: TÜV Nord evaluated the innovative procedure for lightning protection measurement by drone and confirmed its quality, thus providing it a further seal of approval. With this recently received confirmation, the procedure now meets all relevant requirements for a rotor blade inspection including lightning protection measurement in Germany.

↘ ROTOR BLADE INSPECTION INCL. LIGHTNING PROTECTION MEASUREMENT COMPLETED:

- → Principles for the "Recurring Periodic Inspection of Wind Turbine Generator Systems" (BWE)
- → Guideline for Wind Turbines by Deutsches Institut für Bautechnik (DIBt)
- → Guideline for the certification of wind turbines (DNV)
- → Technical guideline for the inspection of lightning protection systems on wind turbines (BWE)

2022 – A mix of the new and the tried & true

Who's not familiar with it, the inner conflict in a new year between "turning everything upside down" and "never touch a running system". ENERTRAG Operation will continue to rely on a mix of both in 2022: Because established partnerships offer just as much added value as new innovations. In this issue, we have prepared examples of both topics for you. On top, there is an insight into the work with the Powersystem App developed by ENERTRAG, which accompanies our inspectors in their work.

Enjoy reading!

Michael Dahm
Managing Director

Level-Up in Rotor Blade Management: Digitization of Analysis Results Opens Up New Possibilities

In addition to the services of conventional inspection methods, which the new method fulfils, the drone-based method of rotor blade inspection and lightning protection measurement opens up a whole new level of rotor blade management.

Based on the digital measurement results of the lightning protection measurement, the **precise punctual identification of damaged spots** in lightning protection system is possible. The **complete photo documentation** of the rotor blades also makes it possible to view the results of the test for each cm^2 of the rotor blades. Additionally, the **high-resolution quality of the images** makes it possible to zoom in on damaged areas fluently – even the finest hairline cracks can be detected and analysed. Another advantage of the digital analysis is that any damage detected can be compared with older documentation of the same spot on the rotor blade, making **damage progress analysis** easier than ever before. With the help of the above-mentioned features and the ability to compare damage types and spots across turbine and blade types, nothing stands in the way of a **detailed fleet analysis**.

It is almost redundant to say: All content, analyses, protocols and reports can be accessed online and are therefore available anywhere at any time.

Photo example for the continuously zoomable documentation of the rotor blade inspection

Rotor blade inspection and lightning protection measurement by drone: how it works

SETUP AND CONTROL CONFIGURATION

Drone and mobile positioning station are brought into position, online connections are established and the wind turbine data gets imported

POSITIONING OF HIGH VOLTAGE GENERATOR AND CONNECTION OF LIGHTNING PROTEC-

The high-voltage generator is transported to the nacelle and connected to the lightning protection of the blades at the blade root

EXTERNAL INSPECTION OF THE ROTOR BLADES

Drone flight for damage documentation and lightning protection measurements

INTERNAL INSPECTION OF THE ROTOR BLADES

All rotor blades are walked on by a technician and manually checked for damage of the blade structure and the lightning protection system

MEASUREMENT OF THE CONDUCTION PATHS

Manual measurement of the conduction paths from the nacelle tower to the tower base

REPORTING

In the office the evaluations of damaged areas are carried out, visually processed and documented

About the drone inspection

Just before the drone flight: preparation of a drone for a rotor blade inspection and lightning protection measurement by the pilot

Close-up of a drone for rotor blade inspection and lightning protection measurement. In focus: the field strength meter for testing lightning protection

Safety first – Drone inspection for greater occupational safety

The drone takes away the most dangerous and time-intensive part of the technicians' job and provides the basis for a complete and systematic analysis of the rotor blade condition. The high-resolution camera on the drone captures the entire surface of the blade, ensuring that every spot can be inspected accurately. For latest generation blades with 70 to 80m length and 4-5m width in the blade root area, this is often a major challenge for rope climbers.

Perfect symbiosis of artificial intelligence and human experience

In order to relieve the inspector in data analysis, he is supported by a special software. Artificial intelligence (AI) helps to precisely identify damaged areas on the basis of image recognition algorithms and suggests them to the inspector as key points for analysis. The inspector first obtains an overall impression of the blade and then examines all potential damage points and assesses their severity, if any. In the whole process we put great emphasis on the expertise of our inspectors. All assessments are carried out by experienced rope climbers with at least 5 years of professional experience in rotor blade inspections and damage analysis.

The result of the rotor blade analysis is mapped in the usual rotor blade inspection protocols of ENERTRAG Operation.

Strategic and operational cooperation – the collaboration between GP JOULE SERVICE and ENERTRAG

Helge Feddersen
Managing Director of GP JOULE Service GmbH & Co. KG

Since April 2019, ENERTRAG SE and GP JOULE Service GmbH & Co. KG have been joining forces and pulling together in operational management. What are the goals of the cooperation and what are the results after almost three years? A guest commentary by Helge Feddersen, who together with Michael Dahm, is responsible for the management of GP JOULE Service GmbH & Co. KG.

Within the GP JOULE Group, GP JOULE SERVICE is responsible for the technical and commercial management of wind energy and solar plants in the MW class and has been a subsidiary of GP JOULE Utility and ENERTRAG SE in equal parts since April 2019. We have around 50 employees who provide the best possible technical and commercial support for around 1,200 megawatts of total contractual output.

We are pleased to have found a partner in ENERTRAG with whom we complement each other perfectly, especially in the field of technical wind management, and who at the same time shares with us a very similar approach to the daily challenges. We are united by regional ties, the goal of broad citizen participation in energy turnaround projects and consensus with regard to a stable and sustainable growth strategy.

Our goal was and is to bundle our competences at a reliably high-quality standard and to fully exploit the synergy effects for the benefit of our customers. In the past two years, GP JOULE SERVICE has successfully taken over the technical management of a large wind portfolio as the local on-site partner of ENERTRAG Operation at the "Wind Site North". At the same time, our wind customers benefit from the 24/7 control centre of ENERTRAG Operation. The synergies achieved allowed us to successfully acquire the technical management of two larger community wind farms in the region as part of a tender in December 2021. We are able to offer professional service to our customers in Germany and selected European countries by combining our competences in a meaningful way.

In addition to sharing resources, we will also keep moving closer together when it comes to sharing knowledge and experience in the wind sector. We want to intensify our cooperation in the future in the area of turbine inspection, especially drone-based rotor blade inspection in particular.

We are looking forward to continuing to fill our partnership with life in the coming years in the spirit of all the positive experiences to date – in the interest of all our customers. We are also grateful for the trusting cooperation that exists between us.

Helge Feddersen, Managing Director of GP JOULE Service GmbH & Co. KG and **Michael Dahm**, Managing Director of ENERTRAG Operation and Managing Director of GP JOULE Service GmbH & Co. KG

At the wind park: Inspections with smartphone and app

ENERTRAG Operation carries out 3,250 inspections on wind turbines per year. Christian Rabe and Robert Gall, who have both been working in the inspection department for four years, on a smart companion, loads of paper that have disappeared, and why the 2-in-1 rule will soon apply to recurring periodic inspections and lightning protection measurements.

The smartphone is our everyday companion. We carry countless videos, photos and apps around with us. This morning, however, Robert Gall and Christian Rabe are not calling up news or weather forecasts. They are standing in the Schönfeld wind field in the Uckermark region opening the Powersystem Inspection app. After all, why shouldn't they be able to perform a recurring periodic inspection on a Südwind S77 supported by an application? Every recurring periodic inspection has the same goal: to document all deviations and defects that endanger the functionality and stability of a turbine and provide protocols with all relevant information for operators and insurers.

From wind field plan to digital navigator

Whereas our colleagues had to print out wind field maps before each inspection day to plan the route to the turbines in the past, the app's navigation function conveniently guides them to their destination today. That saves time and decreases the number of unnecessary paper printouts.

Turbines of different manufacturers? Preconfigured log templates

Another feature that brings enormous time-saving potential are the preconfigured log templates. As each type of turbine has specific needs there are a lot of individual aspects to take into consideration during an inspection. "The app streamlines the preparation effort in advance because we can select the appropriate protocol template for the respective turbine," explains Rabe. "We download it in the app before driving up for the turbine to be inspected, and during the inspection, only the relevant information for that specific turbine is shown." for an ENERCON turbine, there are no points in the app for the "transmission" section, since these types of turbines are based on a gearless design. The app "knows" that.

Step by step

The app guides the inspectors through the individual protocol points step by step – clearly arranged and well structured. In the event of a discrepancy, they can instantly add photos and notes to the report. There's no doubt: Working with the Powersystem Inspection app is much more efficient than in the past, when the information had to be typed into the computer in the office, the photos had to be transferred from the camera and everything had to be brought together from different sources correctly.

The app's biggest advantage: saving time at the end

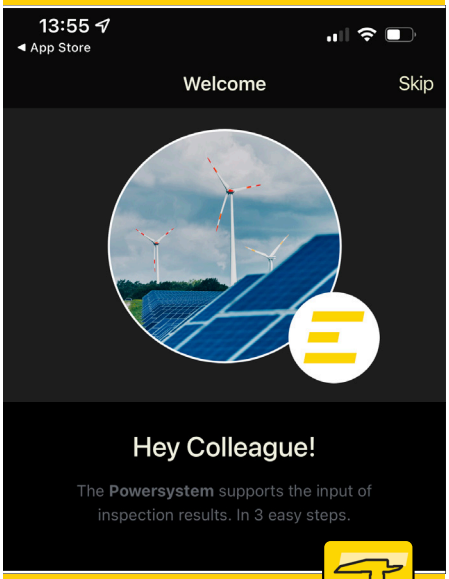
"It's in the follow-up phase that the Powersystem Inspection app shows its greatest advantage. This is when we really save time," explains Robert Gall. "The information collected during the inspection is already digitally documented in the app. This means that we only have to re-check the information once we are in the office and supplement it with recommendations for action." To put it in numbers: the time saved by using the Powersystem Inspection app can be up to 80 percent for a recurring periodic inspection. In addition to that, using the Powersystem Inspection app also helps saving other resources: To print the 13 to 14-page Excel document is, other than in the past, no longer needed. With the app, the final protocol can be generated with only one click and sent to the customer. "The customer receives all relevant information clearly, promptly and cost-effectively", Gall resumes.

Inspector **Robert Gall** at work, using the Powersystem App

WHAT'S BETTER THAN HAVING TIME? HAVING EVEN MORE TIME.

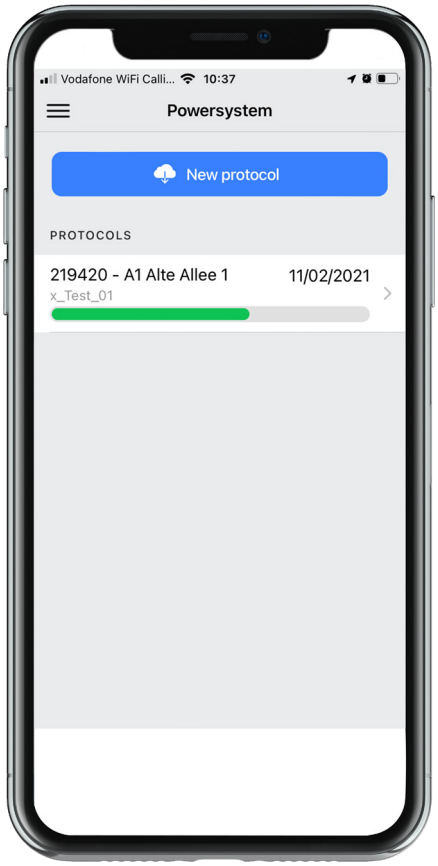
It's not just the app that streamlines inspection processes. ENERTRAG Operation has developed an innovative and realistic method for lightning protection measurements using drone technology that will be used universally from May 2022 on. Read more about that on page 1 – 3 of this newsletter.

THE POWERSYSTEM INSPECTION APP HAS IT ALL



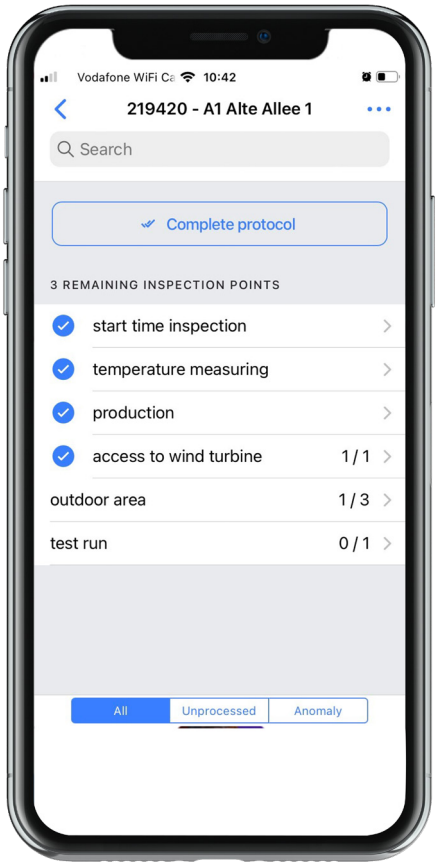
- → Multilingual
- → Offline-capable
- → Optimized for smartphones with iOS or Android
- → Flexible navigation
- → Parallel editing by several employees possible
- → Flexible merging of content
- → Integrated processes, such as master data, location & contacts, special characteristics & risks, online registration

POWERSYSTEM
Lass Daten sprechen



MAIN VIEW OF THE INSPECTION APP

All logs currently saved on the device are listed here. For each log, you can see some information and a progress bar that shows how many inspection points have already been processed. With one click, protocols can be distributed to several devices. This can be done on site, without being connected to the internet.



MAIN VIEW FOR A SPECIFIC PROTOCOL IN EDITING MODE

The inspection scope can be composed hierarchically of inspection groups and points. For example, the inspection date, the meter reading or a deviation can be included as a single point. At the bottom you can see the filter options: For example, one can display only those points where a deviation was detected or select inspection points by free text search. With only one click, all inspection points that have not been processed in any other way can be marked as "OK" at a time.

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Accredited quality: ENERTRAG Betrieb is your excellent partner. ENERTRAG WindStrom GmbH is a type C inspection agency accredited by the German Accreditation Body (DAkkS) according to DIN EN ISO/IEC 17020 for the scope defined in the document annex D-IS-18273-01-00.

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