

# Inside rotor blades: rotor blades in practice and reporting software

Hans-Peter Zimmer, CEO, blade care GmbH and trainer at the blade care Academy, had so much to share last issue that PES felt a follow up interview was necessary. We wanted to find out in more detail about clients' motivation and some of the specific know-how the Academy offers. Research is also an integral part of improving the services and training offered.

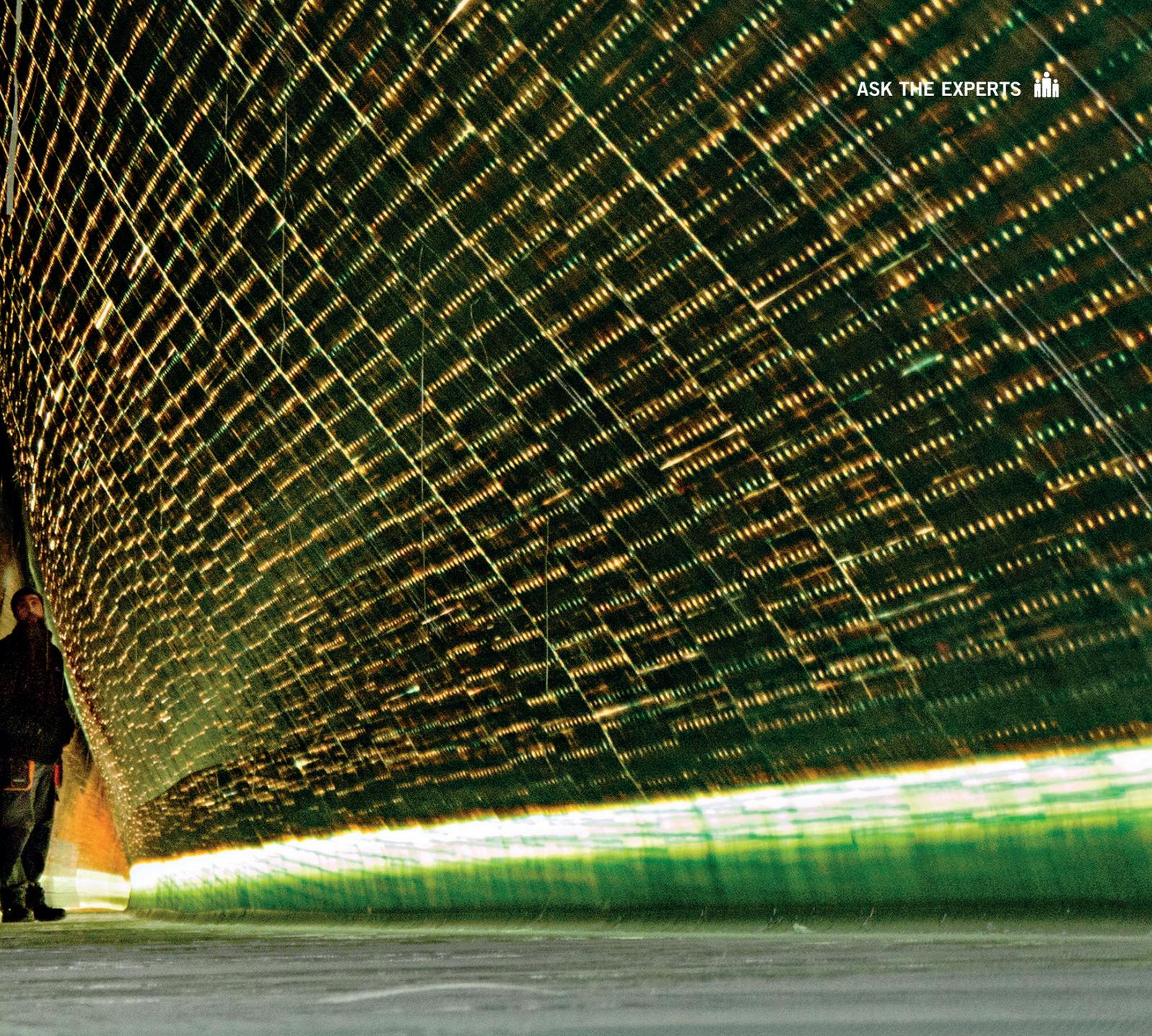
**PES:** Thanks for coming to talk with us again. In our last interview we learned a lot about blade care's service on rotor blades and the Academy training programmes. We thought it would be interesting to have more details about what types of training the Academy offers and to have more information on your new reporting and management software. To begin with would you like to tell us which the most popular topics in the seminars for administrators?

**Hans-Peter Zimmer:** Clients feel much more confident once they know about the blade structure. The administrators and decision makers need to know the importance of visible and invisible damage.

An example is the need to understand the effect of lightning strikes. Some clients are not aware of the fact that plasma arcs can be generated inside the blades. Internal plasma arcs can cause severe damage on the inside, but show only small traces on the blade surface. By understanding the structure of a blade, the severity of the

damage and urgency of repair can be assessed. The extent of the damage depends on the specific blade design and its location on the blade.

Another important programme is the access method for repairs. A common practice is rope access – especially offshore but also onshore. Here we note that some clients still have an unclear picture of what can be repaired on a blade and when a blade should be taken to ground.



Some clients are concerned about the quality of repairs performed by rope access technicians. They are often very surprised when we demonstrate the performance of skilled rope technicians. An array of repairs can be carried out by rope technicians insuring high quality—onshore and offshore. Only for very severe structural damage do the blades need to be taken to the ground.

**PES:** Is it possible to highlight some of the damage that can compromise the turbine performance and safety, which should be repaired immediately? And what is normal wear and tear?

**HZ:** Because of the different design criteria, I can make only general statements here. For example, damage exposing the laminate on blades, with wooden core material, should be repaired as soon as possible, even when it is only small. The impact is often underestimated. It also depends on where it's located, the laminate

layer is just 2-4mm thick. When the core material is exposed, especially if it's balsa wood, which is the case for a wide range of older and new blades, the wood absorbs the water like a sponge and is softened over a large area.

The core material provides strength and stiffens the blade. Once this function is no longer there, the blade loses part of its structural integrity. The magnitude of such damage is not visible on the outside. For example, damage to the laminate, only 10mm in diameter, can become a repair area of 1m<sup>2</sup>.

The most significant wear on blades, which has a direct effect on the performance and generated income, is the erosion of the leading-edge. It is difficult to put an exact figure on the power loss. The extent of the affected leading edge section and the degree of erosion, determines the loss of efficiency. For this reason, various sources

indicate a production loss of 1% to 10%. Since the lift force generates most of the income and the lift force is predominantly generated at the last 30% to 50% of the blade length so it is easy to understand that compromised aerodynamics due to damaged leading edge will have a large impact on the performance.

**PES:** We would like to know more about your research activities on repair methods and materials. Has this not already been sufficiently researched for rotor blades?

**HZ:** Surprising enough for the specific field of rotor blades almost all research has been undertaken for new blade designs, but not for damage and repair methods. Much research has been done on fibre composites in combination with aluminium. Only some isolated studies are available that are related to blade repairs.



We are looking for more specific practice related information for rotor blades. In recent years, various experts have recommended different lamination methods and chamfering ratios. But we could find nothing scientifically founded to prove which method is the best.

We also want to find out about the difference in repair quality performed under different climatic conditions, other than those stated on the materials data sheet. We are working on these studies with the German Federal Institute of Material Research and Testing - BAM in Berlin.

Another project involves testing various new leading-edge protection coating systems. At the Fraunhofer Institute in Bremerhaven we are a member of a working group of turbine and blade manufacturers and other blade service companies, for testing various new protection coating products.

**PES:** You also mentioned your consulting service. Who are your clients and what service is most requested?

**HZ:** There are different groups of clients. We advise operators who have turbines from various manufacturers. Operators mostly have either service contracts with the manufacturers or, work with independent service providers. Our opinion is sought to evaluate their performance, and in some cases, we receive an order to inspect the blades to determine their condition.

Some clients ask for assistance in determining the root cause of explicit damage or are challenged to find a suitable repair method.

We also work for international consulting companies who ask for expertise on blades. Some customers like to know which requirements and agreements must be observed in rotor blade order and service contracts.

We also offer consulting and assistance to some of our Academy clients. Specifically, the ones who are new in the field of blade service. In this case we provide all

assistance that is required for servicing, managing and reporting.

**PES:** We know that one of your most favourite projects is your turbine reporting and management software. What is so special about it? What is different compared to other reporting software?

**HZ:** The reporting software is optimised for editing the common inspection and repair reports on blades and other turbine components. The software enables the complete report workflow, data acquisition, teamwork, data evaluation, and detailed searches.

We have researched the market and have talked to many blade and turbine service providers and manufacturers so that we could integrate their requirements in our first version of the application.

Currently some of the companies are working with self-made report templates others work with software that has been adopted from other trades. But none of the



software is efficient and none can easily be adopted for new features or company specific requirements. When we talk about our software, in fact we are talking about software that was created by a professional software developing company.

The layout was developed by blade care over many years. The software developer has now taken this to another level – a web-based application. This makes it versatile for individual users as well as for large companies, with many users and working groups. This is also very interesting for turbine and blade manufacturers. The software is platform independent and can be used on Mac, PC and tablets.

Through prepared templates technicians can generate reports on site – even when there is no access to the internet. All reports can be printed in various layouts.

Because the software is data base driven all entries can be used for evaluation. Data of single turbines, entire wind farms and complete fleets of turbines can be evaluated and displayed in charts. Wind farms and fleets can be managed by one single programme.

We want to continue exploiting the potential of the software in the near future. For example, a translation module is in progress. A report edited in any language can be changed to another language with one click.

**PES:** Have you anything else in the pipeline?

**HZ:** In mid-October we will start a new repair course which will run for four weeks. Then in November and December, there will be special seminars for rotor blade inspectors and administrators.

Before the end of this year we will train an additional coach for the Academy. He is a very experienced blade technician, with experience onshore and offshore, but most important is his attitude and devotion to transmit his know-how.

In 2019 we will have special events for celebrating the Academy's 10<sup>th</sup> anniversary. There will be special discounts and we will invite all our students for a free 3-day upgrade course. Looking back to the start of the Academy we see there is new, important information which should be passed on to former students.

Lastly In 2019, we expect to have new results and findings from our scientific work which will be helpful for all turbine manufacturers and owners alike.

[www.bladecare-academy.com](http://www.bladecare-academy.com)

[www.bladecare-windpower.com](http://www.bladecare-windpower.com)

