



CASE STUDY

SMALL SOLUTION, HUGE COST IMPACT

**JÄGER GROUP DEVELOPS
DECISIVE ASSEMBLY PROTECTION
FOR ROTOR BLADE BOLTS**

CHALLENGE

Precisely fitting assembly of rotor blades with more than 50 bolts

Cost-effective protection for rotor blade bolts against impacts and scratches

Facilitation of the **blade alignment** during assembly



SOLUTION

PP half-shells as assembly protection for rotor blade bolts

Stable and cost-effective material

Simple assembly principle via click lock



RESULT

Secure protection of the rotor blade bolts against damage

Expensive **replacement** procedures on running systems are **no longer necessary**

Faster initial assembly of the rotor blades



CHALLENGE



FAULT-FREE INSTALLATION AT A LOFTY HEIGHT

The assembly of rotor blades is a highly complex process. Depending on the system type, at least 54 bolts must be aligned to the alignment of the corresponding rotor blade hub opening. A process with large weights on the crane, swinging at lofty heights. This does not always succeed without problems and can lead to damages on the rotor blade bolts. And damaged bolts can corrode with time and lose stability. In this case, high costs would be the consequence.

A manufacturer of wind turbines reports to Jäger Gummi und Kunststoff GmbH with this issue. They already know each other: Jäger has already developed highly efficient and cost-optimized processes and products for previous challenges this customer faced.

How then will Jäger now construct a protection for the extension shaft of the bolt with a diameter of 36 millimeters which simultaneously facilitates blade alignment, avoids servicing costs, and ideally reduces assembly costs?

CHALLENGE

HIGH COSTS DUE TO ASSEMBLY DAMAGES

The cost calculation presses on the system manufacturer from two fronts. Not only the replacement of the rotor blade bolt strains the costing, but the actual exchange of the damaged rotor blade bolt, which must be conducted during standstill. Thus the wind turbine cannot produce any electricity during the replacement, which leads to a loss of proceeds.

This potential weakness in the bolt was not considered in the initial calculation. Therefore, the development of the desired product for the bolt is now added to the servicing items. The pressure to find a solution is correspondingly high, which is following a simple and resilient path both in production and assembly.

CHALLENGE

PROTECTIVE COATING FOR EXTENSION SHAFT NOT SUITABLE

The weak point on the extension shaft of the bolt, which is supposed to take up or balance dynamic forces by tapering its diameter, can be traced back to a change in corrosion protection. The so-called zinc flake coating has replaced hot-dip galvanization: The bolts receive a high quality paint coat, but even the tiniest scratches already offer points of attack for corrosion. Alternative approaches to face this weak point were already proven unsuitable.

Attaching an elastic protective hose is also ruled out as the thread of a rotor bolt is larger than the shaft itself. Due to this circumstance, attaching a protective hose is more difficult and costly than, for example, with double ends which have continuously uniform diameters. Also the required quantity gives the engineers food for thought.

SOLUTION



ONE-KLICK SOLUTION: HALF SHELLS

The JÄGER experts propose an alternative: two half shells lockable with each other, manufactured with injection molding.

After the first exchange of ideas between the engineers at Jäger and the developers of the bolt manufacturer as well as the system manufacturer, the Jäger engineers manufacture the first mutual proto-types with a 3D print procedure. The prototypes made from drawings run through several steps which form the coordination process with all those involved.

The basic idea seems so simple and convincing: Two half-shells hug the area of the extension shaft and are

connected via a click lock. The half-shells are made of PP (polypropylene) and offer the right average between stability and dimensional tolerance of the extension shaft.

In order that the bolts are centered to the hub inside the throughway opening during the assembly process of the rotor blade the half-shell receives a slim, circumferential bulge at one place. This does not only protect the scratch-sensitive surface from material damage. The rotor blade bolt is fixed on the hub using a nut, keeping the protection of the extension shaft in the system.

RESULT

ASSEMBLY SUCCEEDS FASTER

The precise development process and the sample production are bulky for this task. But the stamina of the Jäger engineers pays off for the customer: As a result, the company is now provided with a cost-effective and reliable solution.

The Jäger solution facilitates assembly and saves from future costly servicing works on the already in-stalled wind turbine each valued at several thousand Euro.



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