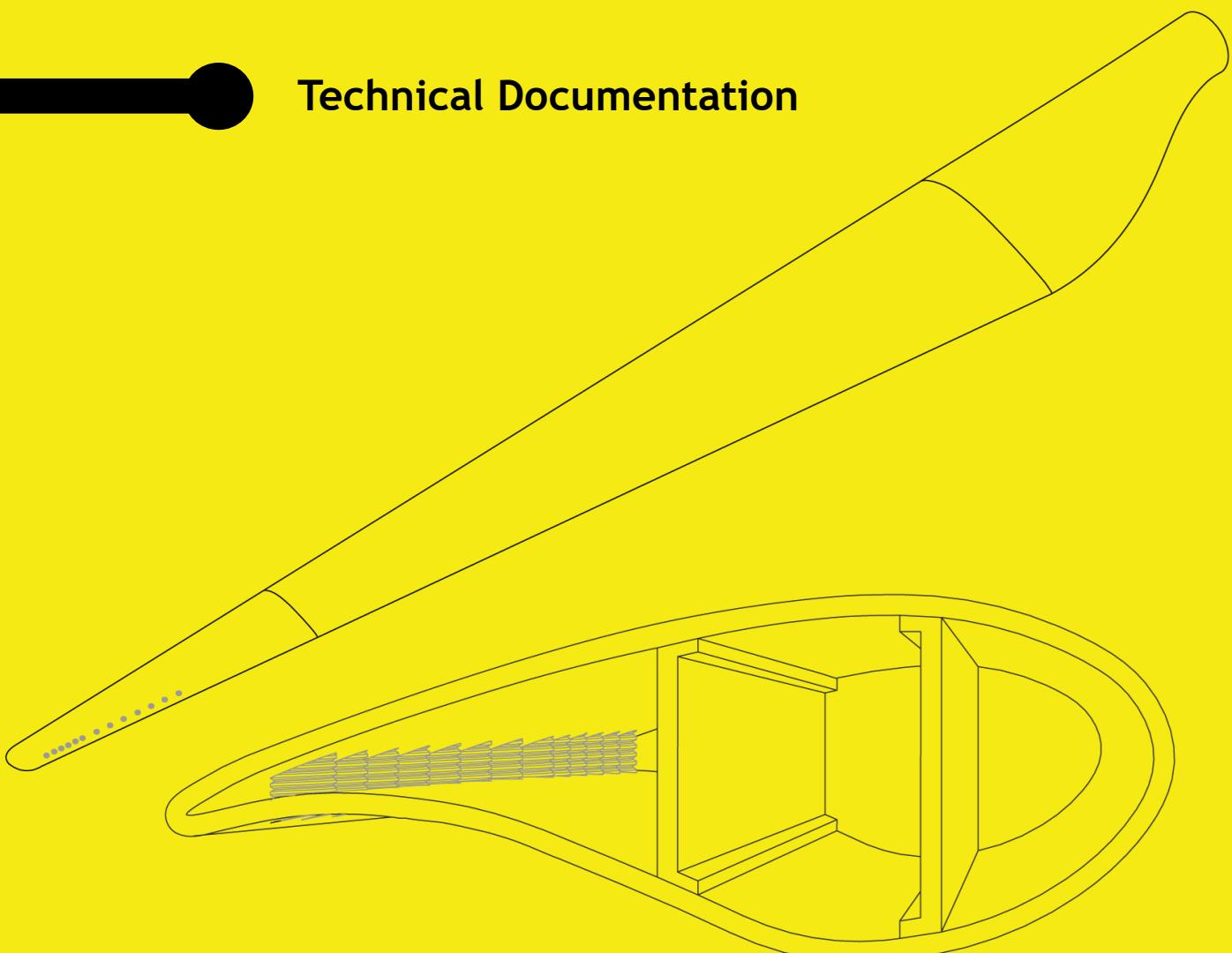


Bladena

BLADE ENABLER

D-Tip™

Technical Documentation

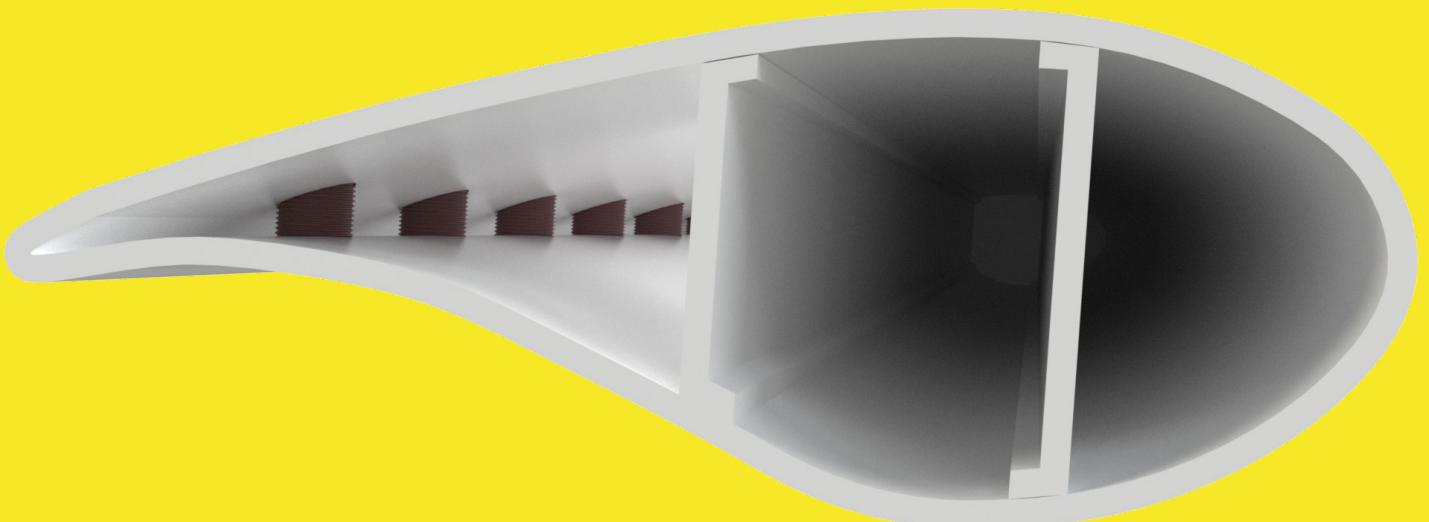


● D-Tip™

**Prevents the detachment of
the two shells in the tip area
due to lightning strikes.**

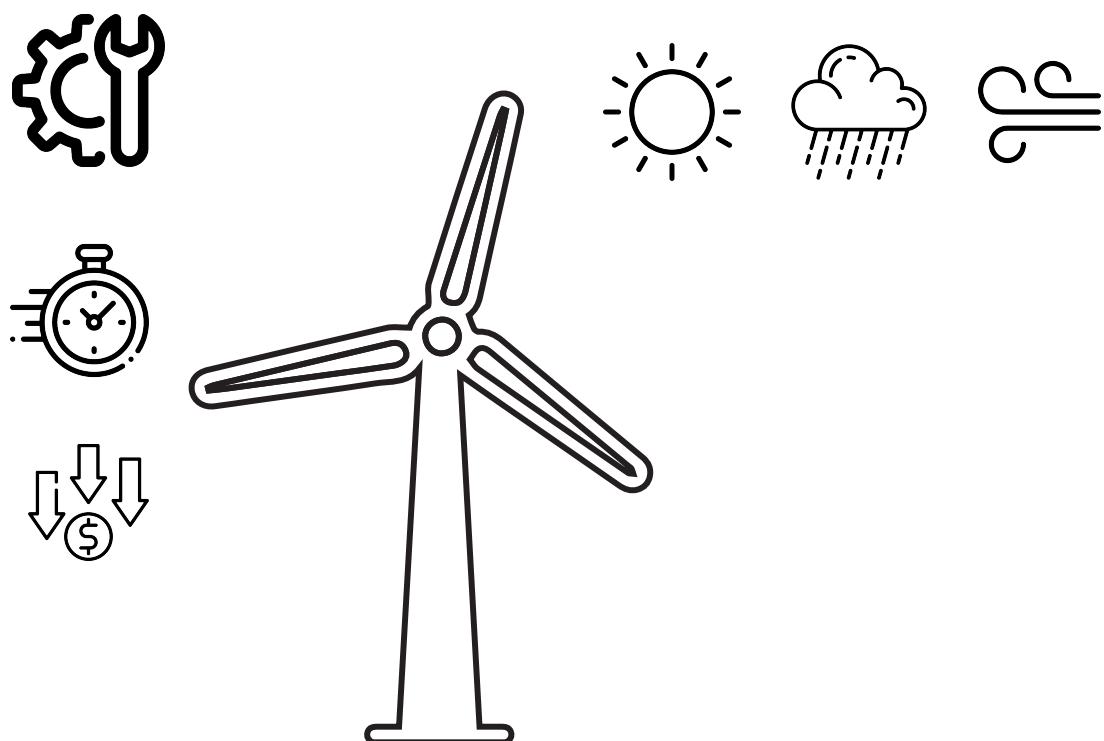
The D-Tip™ solution is a technology developed to address the tip opening issue of the wind turbine blade.

The solution connects the pressure side and suction side to prevent the detachment of the two shells of the tip, caused by the internal thermal expansion of the moist air inside the tip when a lightning strike hit the tip.



Main Benefits

1. **The D-Tip™ solution makes it possible to keep a blade with lightning damages in operation.**
2. **The D-Tip™ significantly reduces the repair time in compared to classic repair procedures.**
3. **The D-Tip™ repair costs are low, as the repair is simple and easy to do up-tower regardless of the weather conditions.**
4. **The installation of D-Tip™ does not affect the weight and aerodynamic integrity of your blade.**



D-Tip™ Technical Description

The D-Tip™ is a designed solution aiming the root cause of tip openings. It comes as a retrofit kit, installed by Bladena certified technicians.

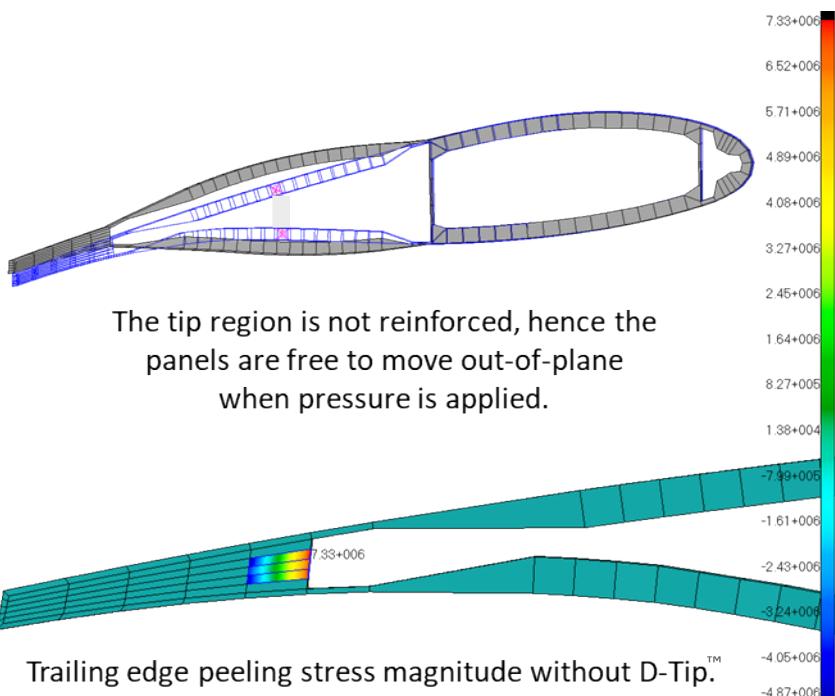
The D-Tip™ is designed as a strong yet light weight product, which makes it easy to install up-tower. The D-Tip™ is used for interim or preventative repair of tip damages caused by lightning.



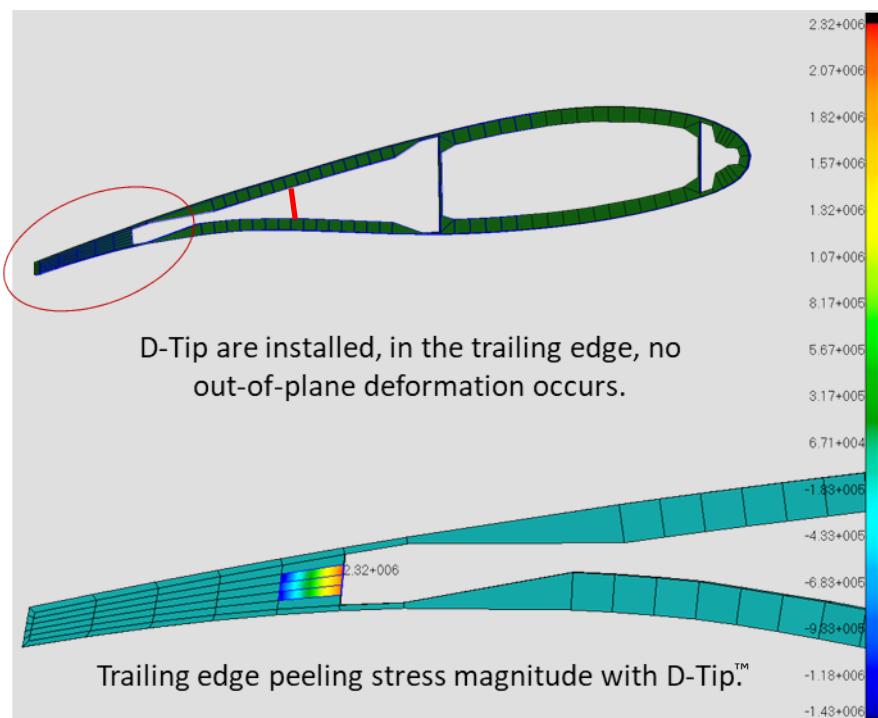
The D-Tip™ installation: Verified by a Numerical FEM Simulation

The D-Tip™ is installed in the tip region and a comparison of the blade with and without D-Tip™ with the same pressure applied is made.

Without D-Tip™ installed



With D-Tip™ installed



Conclusion

Based on the simulation, installing the D-Tip™ in the tip region, trailing edge, will decrease the peeling stress level by approx. 70% when pressure from a lightning strike will deform the panels out-of-plane. The pressure applied in this scenario does not reflect the real-life situation. The comparison is only for the purpose to verify the D-Tip™ .

D-Tip™ field case validation

Blade

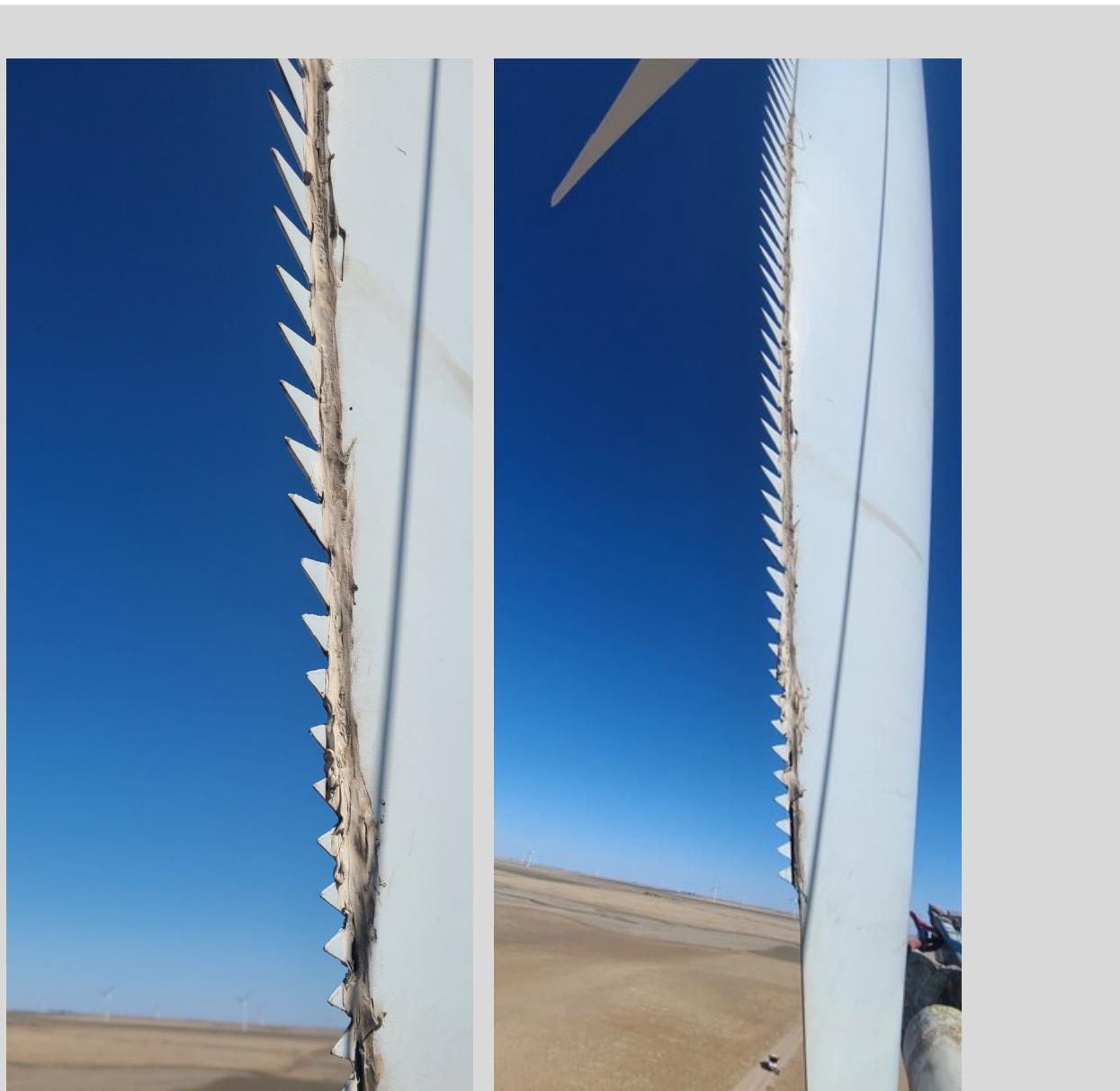
Length: 50.2m

Problem

The blade had approximately 0.5m of the pressure side shell at the tip torn away and liberated from a lightning strike.

Customer's requirement

Temporary repair to keep the blade operating until a full repair can be performed.



D-Tip™ field case - solution



Solution

D-Tip™

150mm below the start of the Split TE. Each marking is 200mm apart, towards the root, and 200mm away from the TE.

Result

- Reduced repair time. The D-Tip™ only took 1/3rd time of the classical repair procedure.
- Utilized as a mechanical fix.
- Continuous operation in the period when a classical repair was not possible due to weather conditions.

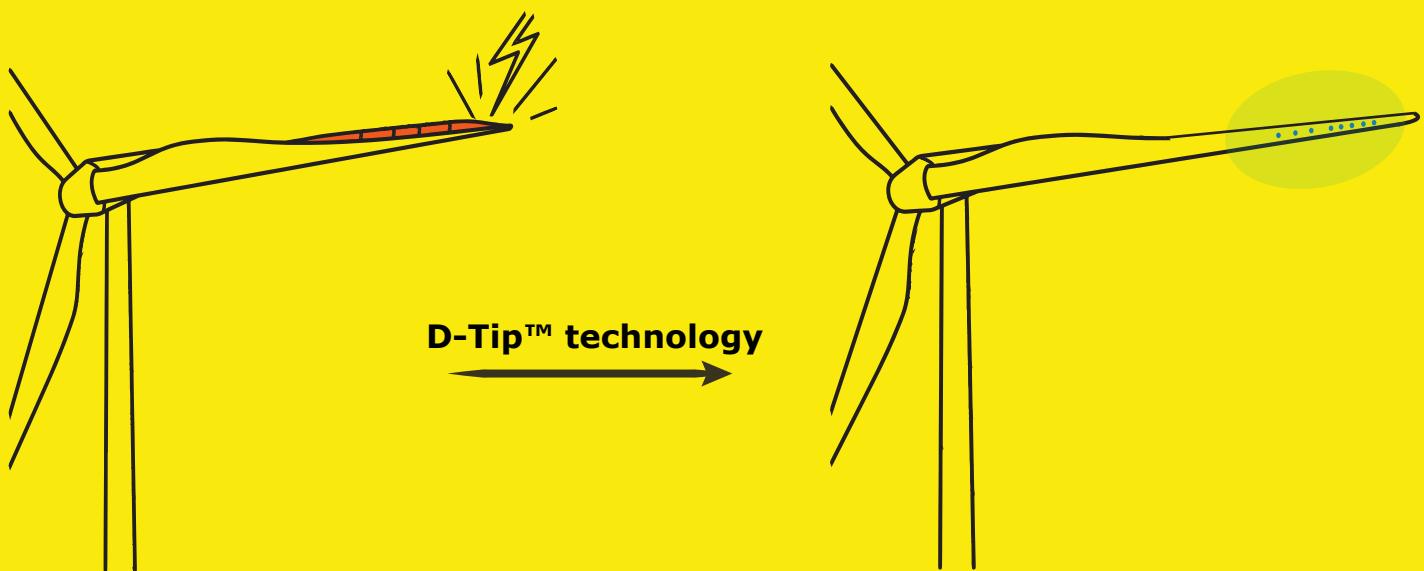
The D-Tip™ reinforces the tip of your blade without adding weight to the blade.

Easy and cost effective installation.

The D-Tip™ helps to avoid extensive downtime.

The D-Tip™ decrease the LCoE thus increasing the profit margin.

The D-Tip™ does not affect the weight and aerodynamic profile of your blade.



If you need more help with the D-Tip™, please contact one of our Certified Installation companies who you will find at our webpage, <https://www.bladena.com/about-us.html> or contact Bladena.

**Want to talk more about your blades or become a certified technician?
Simply contact Bladena**



D-Tip™
By Bladena

Contact Bladena
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bladena.com