CASE STUDY
BROCHURE

About **Bladestar** Renewables

Bladestar Renewables Ltd are a complex blade repair specialist based in the UK. We cover projects throughout the world on multiple blade manufacturers. Our technicians are certified and experienced in working on Siemens, LM, Vestas and Enercon blades.

With a pedigree in blade expertise, we provide our customers with solutions to all their blade defects and issues. Our bespoke repair plans are created in house with customers needs and budgets in mind.

Bladestar Renewables Ltd are accredited to ISO 9001, 14001, and 45001. Health & Safety, Environmental, and Quality are at the forefront of our success.

QMS ISO 9001 REGISTERED
QMS ISO 14001 REGISTERED
QMS ISO 45001 REGISTERED

TASK

- Bladestar Renewables Ltd were tasked with a Category 5 repair to a LM 45.0P blade which had sustained serious damage. Damage was located 5-7m from the root.

- The blade had suffered a 1.7metre crack at 90 degrees and 600mm at 0 degrees. Upon further investigation it was found that there were further stress fractures around the area deemed to be brought on by the spoiler removal.

- A previous internal factory repair which was located around 200mm below the spoiler had also played a part in the damage. Due to incorrect spoiler removal techniques, outer fiberglass layers had been cut resulting in weakness within the area.

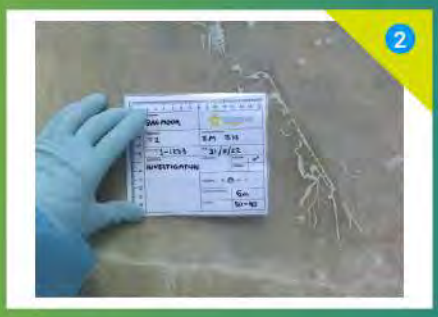
- This resulted in a substantial crack developing and propagating within the area. The crack had propagated through external fibreglass, core and internal fibreglass.
- Given the time of year and adverse weather becoming more frequent, it was decided that the majority of the works would be tackled internally.
- Bladestar Renewables Ltd created a bespoke repair plan in order to combat the environmental issues that were raised.
- This repair took 175.25 hours to complete start to finish. Repair was completed with the blade in situ thus mitigating the need for expensive crane hire and removal of the blade.

Please read on to see the full results of the repair strategy.

Investigation

The works were started with a thorough investigation of the external and internal crack. It was deemed that there was minimal SPAR damage during the investigation.

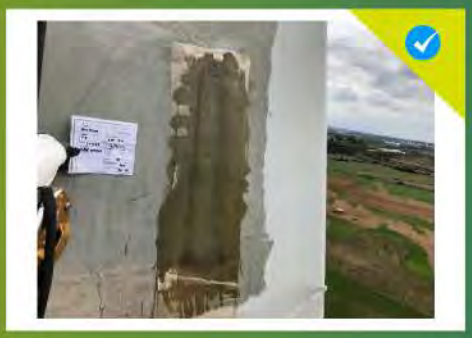
All layers of fiberglass and core were damaged resulting in a core replacement. This was chosen to be completed internally after the external fiberglass layers had been replaced making the damaged area water tight.



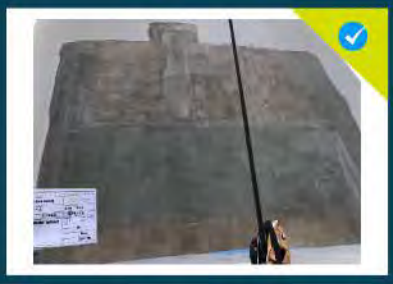
External Repair

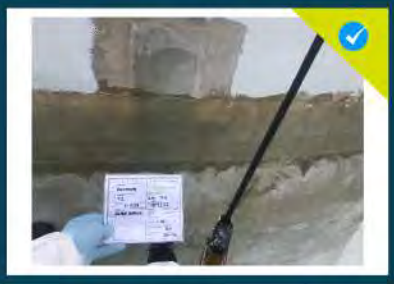
External fiberglass layers removed exposing crack in the core material. The fiberglass layers were chamfered and replaced in accordance with our work instruction for this repair.

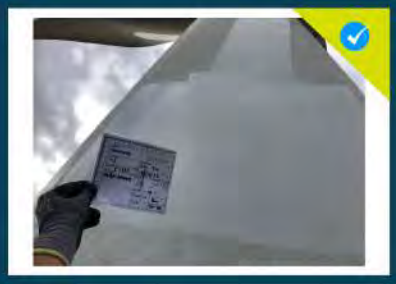
x4 separate structural laminations were applied to the affected area to rebuild the layers that had been removed. These extra structural laminations were necessary due to the incorrect removal of the spoiler. Cuts were found in the outer fiberglass layers which had been filled with paint. Due to the nature of these cuts being at varying angles causing structural stress' across the area these were removed.



Additional fiberglass was layered over the top of the structural laminations in order to spread the load across a greater surface area. This was completed in order to reinforce the original defect.





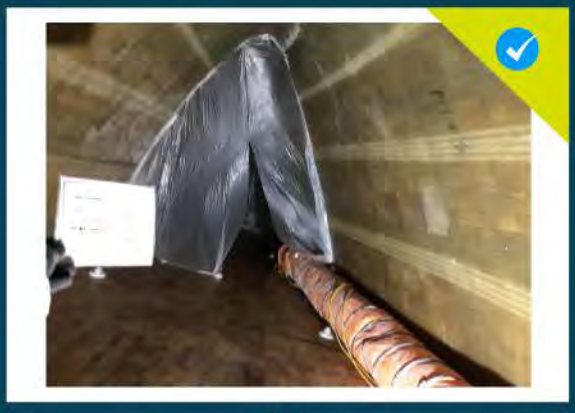


Upon completion of the laminate, the area was filled using sacrificial laminate and filler to restore blade profile. Filler then sanded and painted.

Internal Repair

Cracks were found to mirror the external defect. As a result of already identifying the core damage we were able to move straight into core replacement reducing the need for further investigation.

Minor cracks were identified across the web foot. As a result of this it was decided they would be removed and the cover laminate for the main defect would overlap from shell onto webfoot/web.



New core was bonded into place and vacuum consolidated to promote superior adhesion to the outer laminate.

Structural lamination was then completed and heat treated to improve strength.

Cover laminate applied in order to spread the load over a greater surface area and to encompass the webfoot and web reinforcements.

Testimonial

"Bladestar showed themselves with good communication before and during the project. The repair methodology was also transparently and openly communicated on a permanent basis, so that all steps could be understood from a technical point of view. This helped us a lot in ensuring quality and we look forward to working with Bladestar again on future projects."

- Customer - Deutsche Windtechnik.

Bladestar Renewables

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