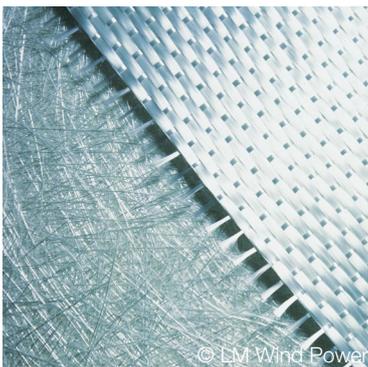


Optimizing multiscale materials in wind turbine blades

LM Wind Power puts a lot of R&D efforts in the investigation of the materials they use in their wind power blades. The strength of a blade is determined by the fiber reinforcement, the elasticity of the resin, pre-bending of the blade and weight of the material and how all these work together.

A collaboration with the Imaging Industry Portal at DTU allowed LM Wind Power to get a deeper understanding of how the different materials interact and how design and production methods can be optimized to construct even more efficient and reliable blades.



LM WIND POWER

LM Wind Power is the world's leading supplier of components and services to the wind turbine industry. LM Wind Power Group has produced more than 175,000 blades since 1978, corresponding to approximately 70 GW installed wind power capacity.

www.lmwindpower.com/

Challenge

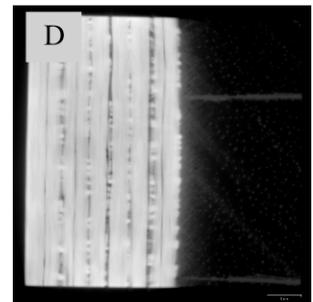
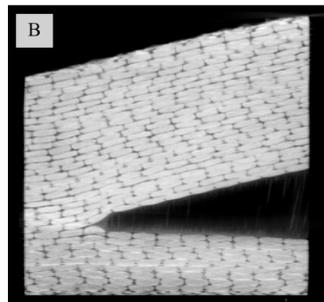
A wind turbine blade consists of a strong load-carrying laminate and lighter sandwich panels made of glass fiber composites and balsa wood. The multiscale nature of the sandwich panel is difficult to investigate with classical microscopy methods, since it requires dynamic measurements, which would show how glass fiber composites, balsa wood and resin interact and evolve in time.

Collaboration

LM Wind Power entered a collaboration with the Imaging Industry Portal in order to explore the possibilities X-ray could offer compared to other imaging techniques. The company sent cm-scale samples of blades, which were scanned on a μ -CT scanner in Lyngby.

Results

The 3D images delivered to LM Wind Power had an unexpected high level of detail and gave the company's engineers a unique insight in the pore microstructure of balsa wood, which is a key issue to understand the role of this material in the blade's robustness.

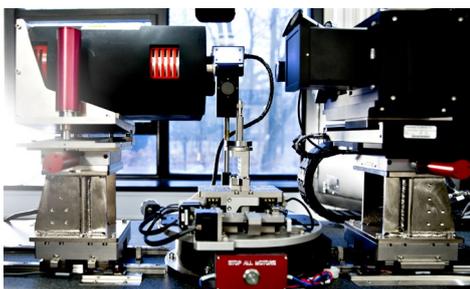


μ -X-ray scans revealing the brick structure of laminate (light) and the pore microstructure of the wedge-shaped piece of balsa (dark with light spots).

Perspectives

"We can now gain a much better understanding of how our materials work together and how damages might occur. This will definitely help us design and construct even more efficient and reliable blades."

Michael Wenani Nielsen, Senior Engineer & PhD, LM Wind Power



About the Imaging Industry Portal at DTU

The Imaging Industry Portal assists companies in using and implementing 3D Imaging in research, development and production.

The portal offers research-based 3D Imaging service and provides companies with the latest equipment and the most advanced knowledge within 3D Imaging and data analysis.

The Imaging Industry Portal works as a gateway to ESS and MAX IV as well as other large scale facilities.

www.imaging.dtu.dk/english/Industry-Portal