

Continuous Fiber Reinforcement in Wind Turbine Rotor Blades

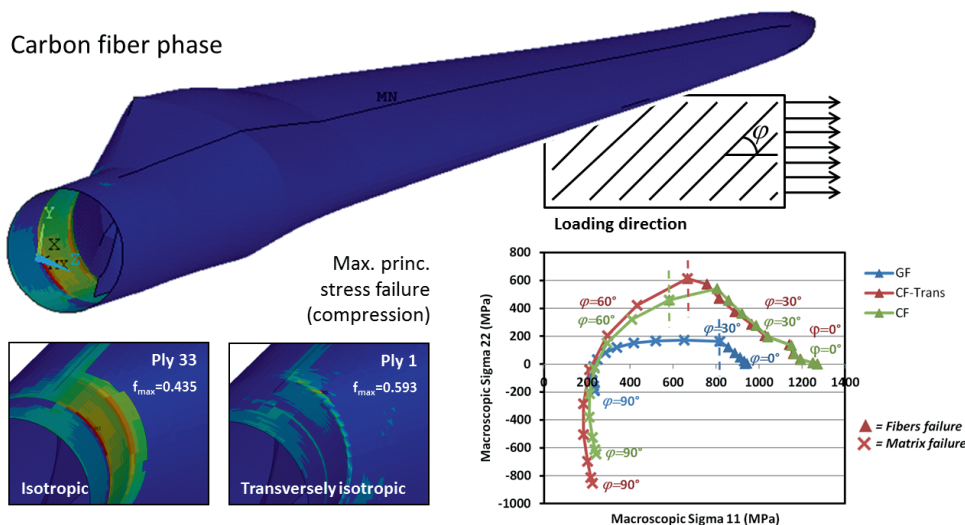
PARTNER: CADFEM GmbH

- ANSYS Competence Center FEM in Germany - Reseller of leading software solutions (ANSYS®, DIGIMAT) and provider of engineering services
- More than 25 years of FEA experience
- Know-how of more than 100 experts in FEM, consulting and support

CHALLENGE

- Design of bigger turbine blades with low weight & high rotational inertia
- Optimal use of expensive high-end composite materials
- Flexible & realistic simulation approach to investigate design concepts

HOW TO BRIDGE THE GAP BETWEEN MICRO AND MACRO SCALE?



DIGIMAT SOLUTION

- Multi-scale analysis based on ANSYS Composite PrepPost™ model
- Describe GFRP and CFRP composites via a unique material modeling approach using the mean field homogenization on the microscopic scale in DIGIMAT
- Fiber description taking into account isotropic or transversely isotropic properties
- Systematic analysis of failure directly in the Epoxy and the fiber phases

RESULTS

- Failure indicators are in general much lower for carbon fiber than for glass fiber reinforcement
- Carbon fiber reinforced blade fails on different ply level compared to the glass fiber design
- The usage of a transversely isotropic description for the carbon fibers is critically important for a realistic simulation approach

MATERIALS

Reinforced plastics

PERFORMANCES

Stiffness

DIGIMAT

Digmat-MF, Digimat-CAE

CAE TECHNOLOGY

ANSYS

INDUSTRY

Renewable energy

APPLICATION

Wind turbine blade



"DIGIMAT enhances our product portfolio and closes the gap towards advanced modeling of heterogeneous anisotropic and nonlinear materials. We see a large potential for taking into account the micromechanical properties of fiber reinforced plastics."

Martin Kracht, Product Manager DIGIMAT at CADFEM GmbH - ANSYS Competence Center FEM in Germany

The nonlinear multi-scale material & structure modeling platform

Digimat material modeling platform means developing innovative, optimized and cost-effective products. As a unique nonlinear multi-scale material and structure modeling platform, Digimat offers:

Digimat MF: Mean-Field homogenization software used to predict the nonlinear behavior of multi-phase materials.

Digimat FE: Finite Element based homogenization software used to model the nonlinear behavior of Representative Volume Elements (RVE) of material microstructures.

Digimat MX: Material eXchange platform used to prepare, store, retrieve and securely exchange Digimat material models between material suppliers and end-users.

Digimat CAE: Digimat linear and nonlinear interfaces to major processing and structural FEA software to enable multi-scale analyses of composite structures.

Digimat MAP: Shell & 3D mapping software used to transfer fiber orientation, residual stresses and temperatures between dissimilar processing and structural meshes.

Digimat RP: Easy and efficient solution for the design of fiber reinforced plastic parts.

Digimat HC: Easy and efficient solution for the design of honeycomb sandwich panels.



The material modeling company

MSC Software Company

e-Xstream engineering is a provider of simulation software & engineering services, 100% focused on advanced material modeling. e-Xstream was founded in 2003 in Belgium and Luxembourg. e-Xstream is an MSC Software company since September 2012 with more than 1100 associates working from over 20 offices around the world.

e-Xstream engineering develops and commercializes Digimat – the nonlinear multi-scale material and structure modeling platform that fastens the development of optimal composite materials and parts.

Digimat customers are material experts and structural engineers who accurately predict the behavior of multi-phase composite materials and structures. Digimat is used by all major material suppliers and users across all industries (Automotive, Aerospace, Electric & Electronics, Leisure, Defense ...).

With this important customer base worldwide, e-Xstream combines deep expertise in material modeling and numerical simulations with the business understanding of the large variety of materials used across all industries.

www.e-Xstream.com

