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Six Criteria for Delivering Stellar Wind Turbine Blades

By Dr. Olivier Guillermin, VISTAGY

As the fervent embrace of wind energy expands across the globe, wind turbine blade manufacturers must meet the needs of an increasingly competitive marketplace. That essentially means one thing: lower the cost of delivered energy. To achieve this goal, engineering teams are given the daunting task of producing ever lighter, larger and safer blades to increase the output of a single wind turbine system while at the same time reducing labor and other manufacturing and lifecycle costs.

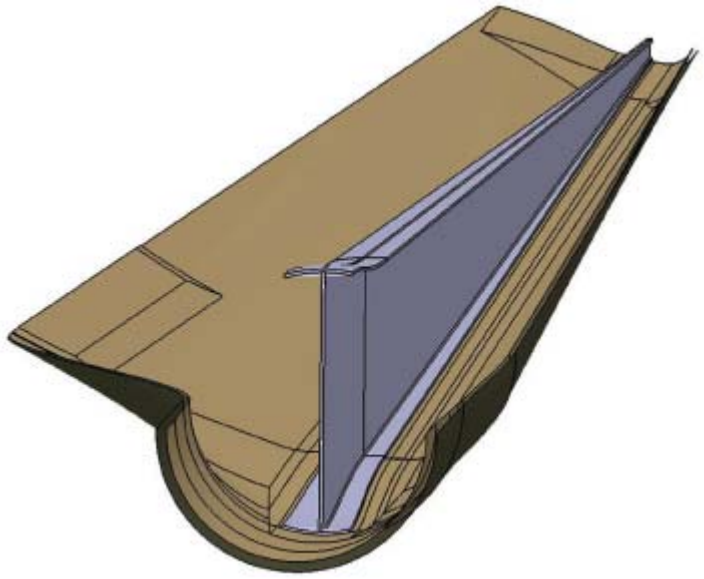
But this is a tall order because today's emerging composite manufacturing environment is disconnected from engineering and insufficiently equipped to manufacture sophisticated composite designs at high volume. As a result, wind turbine blade manufacturers are in search of a better composite blade development process and a partner who can help them make it happen.

VISTAGY's FiberSIM® composites engineering software enables the development of larger and lighter composite turbine blades, which are necessary to fuel the growth of the wind energy industry.

So where should you start when trying to decide on a solution to help you meet these challenges? There are six critical factors to consider when deciding upon a software application and prospective partner. The solution and partner should:

• Enable the transition from manual to automated manufacturing with the aim of reducing cost and cycle times, thus maximizing profits and market share. Encourage a design-for-manufacturing approach that can be used across the conceptual, preliminary and detailed design phases and supports multiple processes, including autoclave curing, resin injection and automated deposition.

• Provide improved blade quality to avoid premature failures and the resulting high litigation costs. This lowers lifecycle costs and makes it possible to command a premium price.



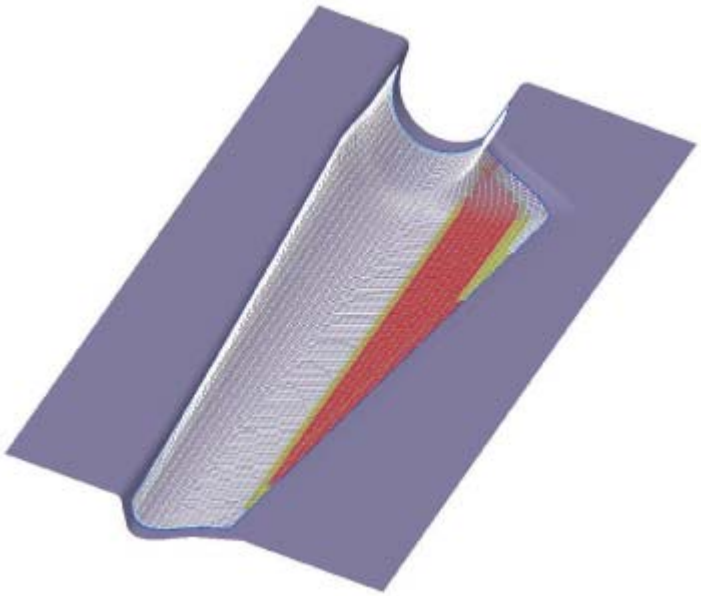
FiberSIM generates a solid model of a composite blade skin and spar directly from the ply and laminate definition (root area shown here). This can be used for mock-up and visualization, interference checking and the creation of tooling surfaces.

• Enhance blade performance by implementing a truly concurrent concept, design and analysis process that enables multiple design alternatives to be quickly evaluated. By doing this you can encourages the use of new materials and manufacturing processes to improve aerodynamics, reduce noise and vibrations, minimize weight and accelerate part optimization —all keys to increasing blade performance and lowering wind turbine lifecycle costs.

• Provide the ability to easily and rapidly customize designs so innovative solutions can be devised for different blade sizes, wind profiles and specific site and energy generation conditions.

• Offer flexible and open support for multiple and best-in-class CAD, CAE, CAM and data management systems without vendor constraints or third party gateways.

• Finally, the partner should be a recognized thought leader in composites engineering. They should have experience partnering with leading companies in a variety of industries so they are well equipped to develop the vision and processes necessary to meet your challenges specific to the wind industry.

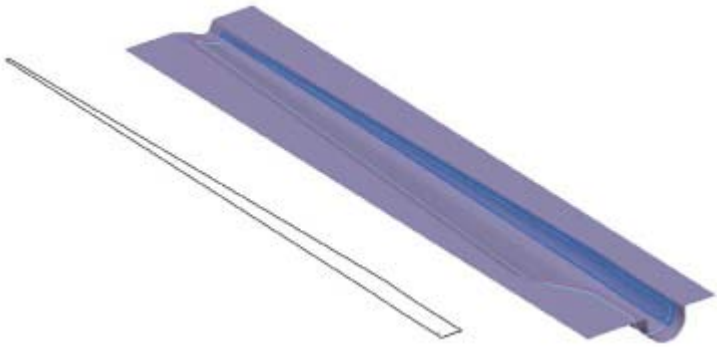


This FiberSIM simulation highlights fiber orientations that deviate from specification when draped over complex curvature. Excessive deviation is highlighted in red (yellow for moderate deviation), alerting engineers to potential performance problems. FiberSIM offers multiple process simulation options for both manual and automated ply deposition.

A long record of success

VISTAGY and its FiberSIM® composites engineering software meet all of these requirements. VISTAGY has strategic partnerships with the leading wind industry manufacturers and nearly 20 years experience in multiple industries developing software for creating highly complex composites products.

FiberSIM provides flexible and open technology that empowers users of commercial 3D CAD systems, including CATIA, NX and Pro/ENGINEER, to author and leverage wind-specific structured engineering data beyond basic geometry to create a truly complete product definition that fuels the entire development process.



Leading Edge Ext Ply Deformation Display with Flat Pattern FiberSIM creates flat patterns of plies directly from the 3D CAD model, improving the accuracy and speed of the ply development process for small to very large plies and gores.

It enables concurrent design and analysis, design for the manufacturing process, upfront design change validation, seamless transition to manufacturing, manufacturing automation and effective communication with the supply chain.

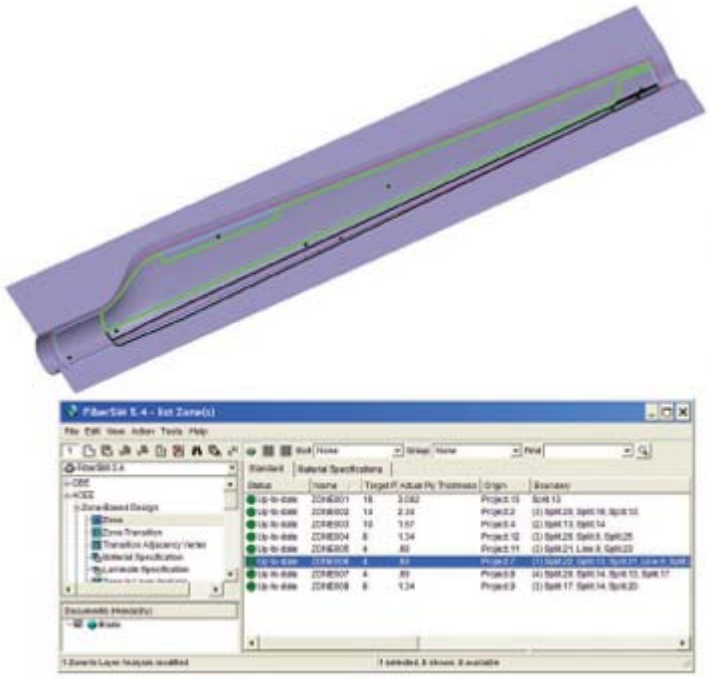
Additionally, FiberSIM can be used to optimize design practices, verify designs, create offset surface mockups, perform mating checks, test producibility, track materials and processes and develop splicing and darting strategies. Further, it can be used to communicate directly with

manufacturers to help users generate flat patterns; create manufacturing documentation, export laser positioning data and export nesting and cutting data.

Process Automation and Composites Experience the Key

Users can take advantage of FiberSIM to rapidly create and update design models. In the past, companies have been hampered by “traditional” design methods that rely on the use of only CAD geometry to model composite plies as well as manual interactions for adding laminate data and other ply characteristics.

FiberSIM enhances the composites design process by allowing users to take advantage of powerful grid-based and zone-based design tools and readily import analysis requirements. The zone-to-ply functionality automatically creates ply shapes from zone definitions and accounts for complex transitions and drop-offs. In addition, large numbers of laminates and plies can be easily created, modified and managed within FiberSIM.



FiberSIM supports structure- and zone-based design, which facilitates the integration of design and analysis early in the development process for better sizing and part optimization. This delivers higher performance wind turbine blades at reduced weight. Shown here is a zone list generated by FiberSIM.

Ultimately, by automating manual composite design and manufacturing processes and bringing many years of practical experience to bear, VISTAGY and FiberSIM provide wind turbine blade manufacturers with the perfect solutions for keeping up with the industry’s demand to develop cost-effective blades that are larger and lighter than ever before.

(Olivier Guillermin is a director of product and market strategy at VISTAGY, Inc., and leads the company’s efforts in the wind energy industry)