



ANSYS® + First Water

“ANSYS SpaceClaim, Workbench and Mechanical solutions provide us with a seamless system for the 3D design, engineering and manufacturing of kayaks and canoes. We rely on ANSYS to simulate large numbers of material changes and boat designs without the considerable expenses incurred when relying solely on physical prototyping and testing. Simulation gives us the confidence that our customers will be getting into a safe, reliable and high-performing boat at an affordable price.”

Paul Gentile, PE, Ph.D.
Owner/Mechanical Engineer
First Water PLLC
Belgrade, Montana

First Water Develops Innovative Kayaks, Canoes and Catamarans with ANSYS Simulation Solutions

Kayakers and canoeists demand adventure-capable watercraft with a hull that is durable, responsive, affordable and lightweight. The hull must also balance stability with speed. With an infinite number of possible composite layups and hull geometries, simulation is necessary to optimize each boat model design within an acceptable timeframe and budget. Engineering simulation is also paramount to ensure that the boats meet key safety parameters and regulations.

Challenges

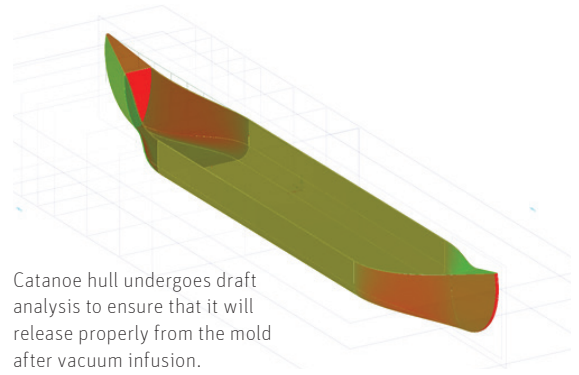
Simulation software was required to reduce the need for expensive and time-consuming lofting, manufacturing and testing of boat prototypes. The software needed to be capable of quickly creating and modifying complex 3D parts and assemblies, with a seamless transition between design, engineering and manufacturing. The simulation solution needed to be capable of finite element analysis (FEA) of composite layups.

Technology Used

- ANSYS® SpaceClaim®
- ANSYS® Mechanical®
- ANSYS® CFD-Post™

Engineering Solution

- Rapid 3D modeling increased the number of product designs per man-hour.
- Assembly and version tracking ensured compatibility prior to production.
- Geometric dimensioned and toleranced 2D/3D drawings decreased production times.
- Boat hull draft angles ensured proper mold release.
- Curvature mapping ensured fair hulls.
- Inertia properties ensured boats were stable.
- Mass properties were used to assign weight limit ratings, estimate depth of water that can be traversed and ensure adequate flotation.



Catanoe hull undergoes draft analysis to ensure that it will release properly from the mold after vacuum infusion.

- Wet area was minimized to increase efficiency.
- Structural analysis ensured decking strength was sufficient.
- Composite FEA software reduced the costs of hull materials without sacrificing durability and performance.

Benefits

- SpaceClaim's rapid modeling tools allowed the design and analysis of 16 different hull designs and three complete assemblies in just hundreds of engineering hours. Typically over 100 hours of physical labor plus around \$10,000 in material prototyping costs are required to build just one canoe or kayak infusion molded hull for destructive field testing.
- ANSYS composite simulation reduced the likelihood of delamination via analysis of multiple unbalanced and balanced composite layups.
- Analysis quantitatively compared weight and cost savings with strength changes when considering core material, reinforcements (e.g., aramid, e-glass and carbon fiber) and fiber orientation.
- Watertight compartments and flotation chamber volumes were designed according to code in an iterative process.

Company Description

Established in 2016 by Professional Engineer Dr. Paul Gentile, First Water is developing an innovative line of kayaks and canoes that convert to catamarans. In 2017 the Katayak and Catanoe were designed, engineered and prototyped. In 2018 First Water will be building and moving into a 8000 sq. ft. state-of-the-art manufacturing facility to bring their products to market.

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