

[AB]structures Relies on HyperWorks in Developing Three Record Breaking Round the World Racing Yachts

Overview

[AB]structures, an Italian structural design and engineering company, used the CAE suite HyperWorks first for the Volvo Ocean Race in 2006 to design the yacht for the ABN AMRO White team and has used it since then successfully for several other Volvo Ocean Race and America's Cup yachts.

This year [AB]structures used HyperWorks to structurally design and optimize three VO70 Round The World Racing Yachts for the 2011 – 2012 edition of the Volvo Ocean Race. This included the yacht Groupama 4, skippered by Franck Cammas, which claimed victory on July 9, 2012 in Galway, Ireland, after 9 months and more than 37,000 nautical miles sailed around the world under the harshest conditions.

With the naval architecture carried out by Juan Yacht Design, each of these teams required different solutions from [AB]structures, continuously pushing the design envelope. [AB] structures work with HyperWorks resulted this year in:

- Groupama winning the overall title, scoring the highest points of the offshore long distance legs and short course inshore racing series combined.
- The yacht of Puma Ocean Racing powered by Berg, finishing third overall and winning the overall inshore racing championships.
- Team Telefonica followed in fourth-place overall, after initially winning the first three legs of the race.

Business Profile

[AB]structures provides innovative design solutions for lightweight structures in both advanced composite materials and high-performance metal alloys. [AB]structures relies on more than a decade of experience in operating on the highest level in international yacht racing, from America's Cup to round-the-world yacht races, such as the Volvo Ocean Race. Additionally [AB]structures is providing its services to the aerospace industry and to the development teams of racing cars. From project brief to concept development and product delivery, [AB]structures follows the optimized lightweight approach all the way. [AB]structures is currently focused on structurally designing the Artemis Racing AC72 catamaran and wings for the 34th America's Cup 2013. For more information, please visit: www.abstructures.com.

Challenge

The [AB]structures engineers had to develop three structurally optimized but unique racing yachts in a preset time frame, considering the boundary conditions of the Volvo Ocean Race challenge such as the Volvo Open70 Box Rule, which defines for example parameters of the keel weight to be between 6.0-7.4 tons and the overall measured weight of the yacht to be no less than 14 tons.

"The Volvo Open 70 Rule is intended to produce fast, single mast monohull keelboats, suitable for long distance racing offshore at the highest level of the sport. The need for safety and self-sufficiency is paramount. The Rule is intended to foster gradual design development leading to easily driven, seaworthy yachts of high stability, requiring moderate crew numbers. Any development that is contrary to this may give rise to a rule change."

Taken from THEVOLVO OPEN 70 RULE, V3, May 25th, 2010, www.volvoceanrace.com.

[AB]structures

Advanced Structural Design



All three Volvo Ocean Race yachts, structurally developed by [AB]structures for the 2012 race.

Picture courtesy of [AB]structures

"We have been using HyperWorks for a long time, in many projects – with [AB]structures as well as within former work projects," says Andrea Avaldi, [AB] structures. "I like the software suite because the open architecture of HyperWorks has allowed us to integrate several design processes into one portal, which has partly automated our calculations and allowed us to have more time for the design aspect of structural engineering, which was very important with three boats in development simultaneously."

Solution

In order to meet the demands of three highly professional teams, the [AB]structures engineers employed several HyperWorks tools in the development of the successful yachts. Beyond the optimization aspect, HyperWorks includes the capability of simulating complex carbon-composites laminate sequences, which is helpful for this kind of projects, since the V070 yachts are designed and built completely from carbon composite. They used HyperMesh, the meshing tool of the suite, to create finite element models, OptiStruct for optimization, the RADIOSS solver for linear and non-linear analysis, and HyperView to postprocess the results. The engineers used the tools extensively to design and optimize the carbon structures of all three Volvo Open 70 yachts and to help again achieve fundamental structural improvements over the older-generation yachts that competed in the 2008 edition of the Volvo Ocean Race.



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Groupama 4, skippered by Franck Cammas, claimed victory on July 9, 2012 in Galway, Ireland.

Fabio Bressan, [AB]structures adds: “For companies like us this is very attractive, as it enables us to handle most of the development tasks in structural design not only within one user interface but also under the same license agreement. We continuously push the software boundaries, and throughout the entire process we are very well supported by Altair’s technical team.”

Results/Benefits

By applying HyperWorks to the design process of the structural parts of V070’s Groupama, Puma Ocean Racing and Telefonica yachts, [AB]structures could:

- Handle most of the development tasks in structural design within one software environment and under the same license agreement.
- With a minimum weight rule in place for overall yacht and keel, [AB]structures was able to reduce the yachts vertical centre of gravity, resulting in a higher righting moment, by using the HyperWorks optimization tool in the central part of the yacht’s design.
- Use on-site repair options by defining and optimizing the structure of a panel before it was build.

HyperWorks design model V070 Groupama courtesy of [AB]structures (www.abstructures.com). Original Photo Paul Todd/Volvo Ocean Race