

Draping Simulation Saves Yachtbuilders Time and Money

Patran Laminate Modeler Creates Flat Pattern Strips for Hull Materials



High-performance yachts are often made from expensive carbon-fibre reinforced pre-preg materials. These are typically supplied in rolls and are laid on male or female moulds to form the skins of the boat hull. Because hulls are typically of compound curvature, the strips will overlap when laid over the hull unless they are trimmed. This trimming is typically done using preliminary paper patterns which are themselves draped over the hull and cut to size. This process is difficult and expensive, and introduces errors.

A New Zealand company, Matrix Applied Computing, has successfully used MSC.Patran Laminate Modeler to generate these patterns quickly and effectively from a CAD model. In the words of Senior Consultant Don Campbell: "The client was dealing with very expensive stiff cloth. They could not afford to cut it to the incorrect shape, both from a materials perspective and also due to a shortage of time." The specifications called for accuracies on the order of +/-1mm. With advice from experts at MSC.Software, Matrix developed flat patterns for strips of material to be draped on a 16m hull section using MSC.Patran Laminate Modeler. This involved translating of the CAD geometry from the supplied hull surface to MSC.Patran, then using the draping simulation and flat pattern generation cap of MSC.Patran Laminate Modeler. The resulting IGES (Initial Graphics Exchange Specification) flat patterns were then transferred to an NC (numerical calculation) cutter at the material supplier's site, High Modulus Ltd.

Because this was a new process for the client, they wanted to confirm the accuracy of the patterns before using the expensive material. As a test, the initial patterns were cut out of relatively thick paper. Campbell says: "We went down to the boat yard where these strips of paper 16m long were then taped to the mould. It was amazing to see no visible gap between any of the strips and an almost exact match in the length direction."

"The use of MSC.Patran Laminate Modeler is now an integral part of our design offerings."

Customer:

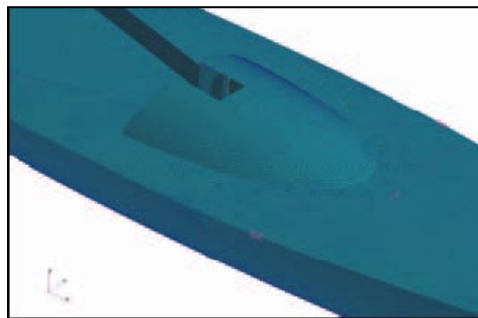
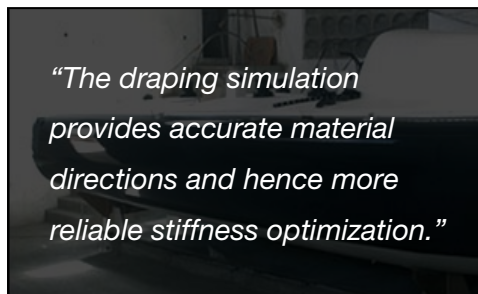
Matrix Applied Computing, New Zealand
www.matrix.co.nz

Software:

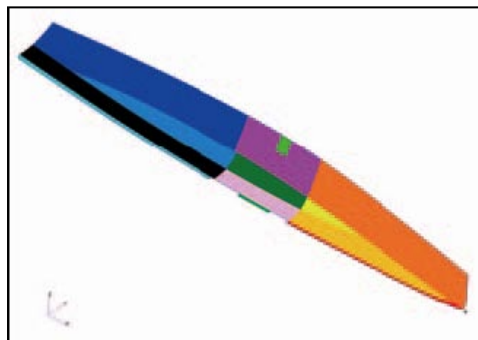
MSC.Patran™,
MSC.Patran Laminate Modeler

Summary:

The New Zealand company Matrix Applied Computing has successfully used MSC.Patran Laminate Modeler to generate flat patterns for strips of material quickly and effectively from a CAD model of a racing yacht. For racing yachts where stiffness and mass are of paramount importance, the draping simulation provides accurate material directions and hence more reliable stiffness optimisation. The use of MSC.Laminate Modeler is now an integral part of the company's design offerings.



“Based on that result, they then cut the true cloth and achieved a similar excellent result,” he continued. “We then proceeded to the next stage of offsetting the hull surface by the core thickness and cutting the cloth for the outer hull surface. It saved the boat builder hours and hours of work and avoided any embarrassment with the material. Not only was material cost an issue, but lead times for the material were on the order of six weeks, so a mistake would have really set back the production.”



As an added benefit, the fibre thicknesses and directions obtained from the draping simulation can be transferred directly to the FEA (Finite Element Analysis) model for subsequent structural analysis.

ID	Obj Name	Units of El	Mat	Prop Name	Angle	Output
101	hull_skin_001	hull_skin_001	hull_skin_001	0.0001	45	1
102	hull_skin_002	hull_skin_002	hull_skin_002	0.0002	-45	1
103	hull_skin_003	hull_skin_003	hull_skin_003	0.0003	90	1
104	hull_skin_004	hull_skin_004	hull_skin_004	0.0004	0	1
105	hull_skin_005	hull_skin_005	hull_skin_005	0.0005	45	1
106	hull_skin_006	hull_skin_006	hull_skin_006	0.0006	-45	1
107	hull_skin_007	hull_skin_007	hull_skin_007	0.0007	90	1
108	hull_skin_008	hull_skin_008	hull_skin_008	0.0008	0	1
109	hull_skin_009	hull_skin_009	hull_skin_009	0.0009	45	1
110	hull_skin_010	hull_skin_010	hull_skin_010	0.0010	-45	1
111	hull_skin_011	hull_skin_011	hull_skin_011	0.0011	90	1
112	hull_skin_012	hull_skin_012	hull_skin_012	0.0012	0	1
113	hull_skin_013	hull_skin_013	hull_skin_013	0.0013	45	1
114	hull_skin_014	hull_skin_014	hull_skin_014	0.0014	-45	1
115	hull_skin_015	hull_skin_015	hull_skin_015	0.0015	90	1
116	hull_skin_016	hull_skin_016	hull_skin_016	0.0016	0	1
117	hull_skin_017	hull_skin_017	hull_skin_017	0.0017	45	1
118	hull_skin_018	hull_skin_018	hull_skin_018	0.0018	-45	1
119	hull_skin_019	hull_skin_019	hull_skin_019	0.0019	90	1
120	hull_skin_020	hull_skin_020	hull_skin_020	0.0020	0	1

Matrix Applied Computing, working in conjunction with High Modulus Ltd. and their team of 20 composite design engineers, has built up an enviable reputation in this field with more than 20 large-scale marine FEA projects under its belt. Some high-profile projects include the successful 1995 and 2000 Team New Zealand America's Cup boats, The Mirabella, Galileo, and Volvo “around the world” yachts for Farr Design. To quote Don Campbell again, “The use of MSC.Patran Laminare Modeler is now an integral part of our design offerings. We could not imagine tackling a large marine project without the use of this software. For racing yachts where stiffness and mass are of paramount importance, the draping simulation provides accurate material directions and hence more reliable stiffness optimization.”

Corporate
MSC Software Corporation
2 MacArthur Place
Santa Ana, California 92707
Telephone 714 540 8900

www.mscsoftware.com

Europe, Middle East, Africa
MSC Software GmbH
Am Moosfeld 13
81829 Munich, Germany
Telephone 49 89 431 98 70

Asia-Pacific
MSC Software Japan LTD.
Shinjuku First West 8F
23-7 Nishi Shinjuku
1-Chome, Shinjuku-Ku
Tokyo, Japan 160-0023
Telephone 81 3 6911 1200