ESAComp meets challenging marine applications

About Olivari Composites

Olivari Composites specializes in the engineering of composite structures for motorboats and sailboats, with many years of experience in the design of a vast number of racing and cruising yachts. Their knowledge and expertise is also applied to many other sectors: from aeronautics to transportation to renewable energy and natural fibers.

Dr. Luca Olivari is a naval architect and a major European expert in the engineering of composite materials;

"To give you an example, over the years, I've been involved in the design and analysis of over 60 composite rudders of all sizes up to 350kg", explains Dr. Olivari. "I was also involved with Fincantieri Military Dept. in the project of a stealth composite upper structure for a 90m ship. Since 1987, I have done all the structural projects for Del Pardo and, from 2004, all the structural projects for the Azimut-Benetti Group".

Fig. 1 – Dr. Luca Olivari, Olivari Composites Engineering

Over 15 years ago, Olivari Composites were the first Italian ESAComp user - the software solution provided by Componeering Inc. (Finland), which remains as the first choice for the design of many composite structures.

"My practical experience, gained from building and sailing a lot of the boats, allowed me to optimize the theoretic aspect of the calculation and construction technique with composite materials".

"I mainly use ESAComp for my marine projects, both sail and powerboat composite structures", explains Dr. Olivari.

RIB "Rigid-hulled Inflatable Boat": the latest project challenge for Olivari Composites

Let's talk about the design of the carbon Rigid-hulled Inflatable Boat

"The design-development of the rigid-hulled inflatable boat (RIB) was really challenging, it is a high-performance boat, 16.5m in length with carbon fiber primary structures (keel and hull). This boat has a very powerful engine with surface propellers and an advanced transmission system, reaching a maximum speed of

Fig. 2 – Olivari Composites Engineering technical team

about 60 knots. The choice of material depends on the requirement of the main design related to the stiffness/mass ratio. The design of the hull was heavily influenced by constraints such as interior spaces, low profile and external boat profile".

What are the design drivers for this kind of boat?

"First of all the boat is classified by length and performance requirements. The reinforced panels of the hull have been verified according to several industry Standard Rules. The ABS Rules (American Bureau of Shipping) can be considered a good reference, but in this case the Italian RINA and Norwegian DNV Rules were also taken into account. Once the shape and size of the boat were fixed, the structural grid and the inner constraints were also defined. The entire structure is then simplified in several elementary subsystems, which are then verified through ESAComp. According to these Standards, the pressure distribution on the panels is applied one by one".

What is the added value provided by ESAComp?

A suitable definition of the material properties are mandatory to build a robust and reliable numerical model. "The ESAComp Data Bank is an excellent reference source that is continuously updated. I usually couple this data with my personal material library - built from the years of working with the main Italian shipyards".

In addition, ESAComp provides several analysis features, used to verify the mechanical static and dynamic response of the composite reinforced panels, under the operative conditions - as suggested by the Standards.

Do you interface ESAComp to external FE software?

"Sometimes I use this capability, the material properties of the plies and laminate lay-ups are directly exported, so the FE model set-up is really straightforward and quick".

"In this case, however, only the analysis tools provided by ESAComp was able to evaluate the mechanical performances of each panel; guaranteeing a suitable margin of safety".

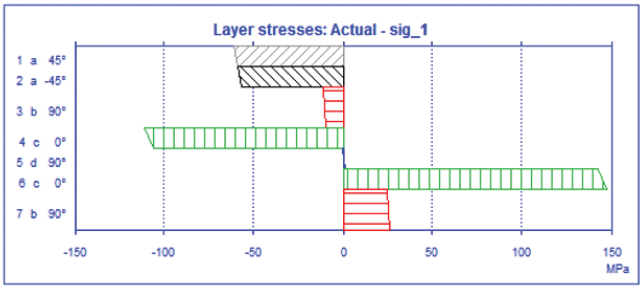

Fig. 4 – ESAComp "through-the-thickness" stress analysis

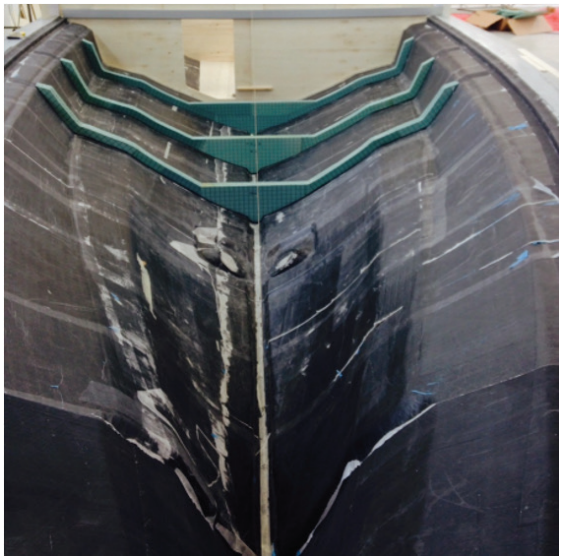

Fig. 5 – ESAComp "through-the-thickness" stress analysis

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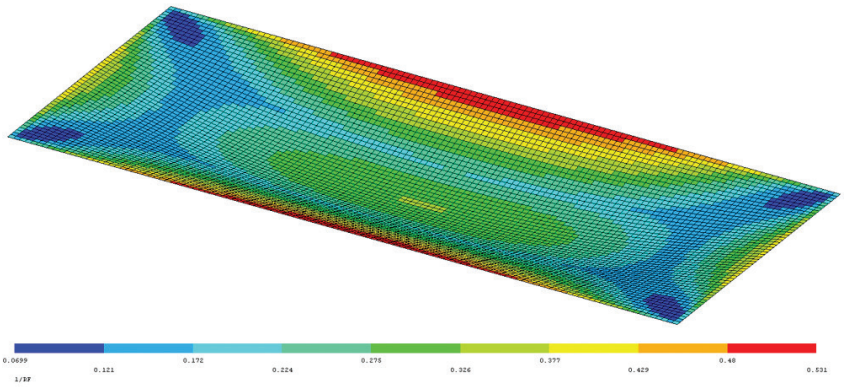

Fig. 3 – ESAComp panel analysis, section 10