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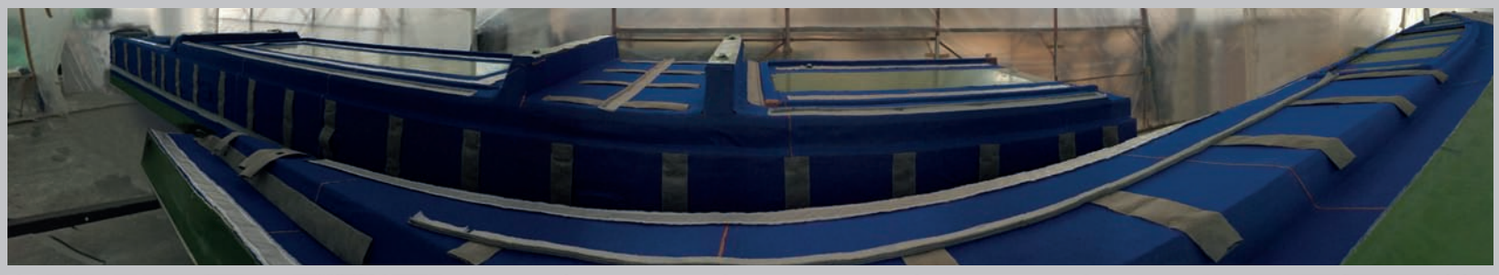
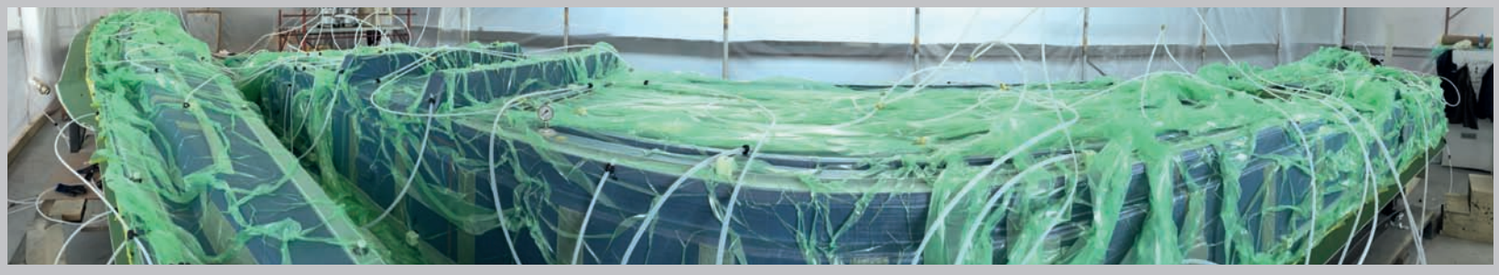
YACHT, SUPERYACHT, TECHNOLOGIES AND DESIGN





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Enzo Molinari

Banks Sails - Flying high

OFTEN THE KEY TO SOLVING FREQUENT PROBLEMS ON BOARD IS TO LOOK AT THEM FROM A NEW POINT OF VIEW. THIS IS THE PHILOSOPHY OF THE BANKS SAILS LOFT IN BARI, WHERE NEW IDEAS COME FROM A SOLID SCIENTIFIC BASE COUPLED WITH REAL-LIFE EXPERIENCE ON BOARD.

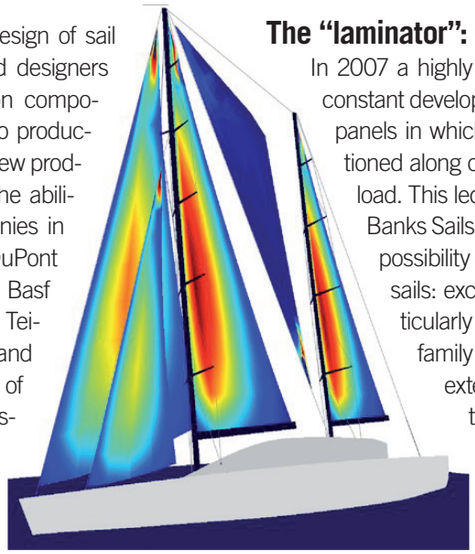
The Banks loft in Bari. The loft is large enough to produce and work on enormous megayacht sails.

A Membrane software image simulating the aeroelastic analysis of the sails of a cruising/racing yacht.

Banks Sails has been operating in the high-tech sails market since 1990, thanks to its founder Paolo Semeraro, a hydraulic engineer who has competed many times in the Olympics and the America's Cup. The headquarters of the company is in Bari and it is at the head of a network of Italian and European lofts. Sails produced by Banks have won many honours, with several victories in important offshore races such as the Maxi Rolex Cup, the ORC Worlds, the Giraglia and the Middle Sea Race. The know-how built up on racecourses has logically been transferred to high-performance cruising boats, thanks to a continuous exchange of experiences, ideas and technologies. Today Banks Sails is the only Italian sail brand with a worldwide presence.

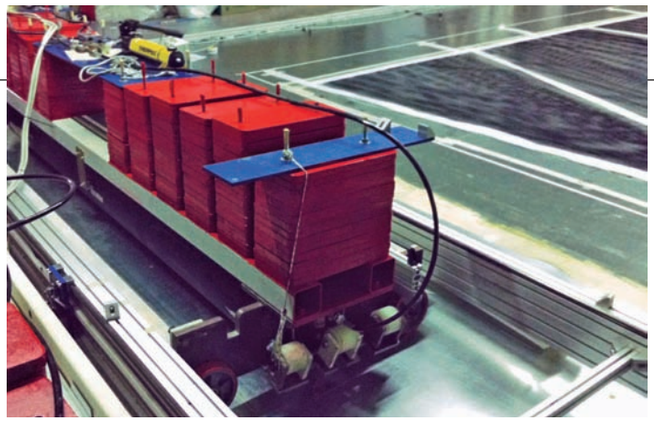
Technological research

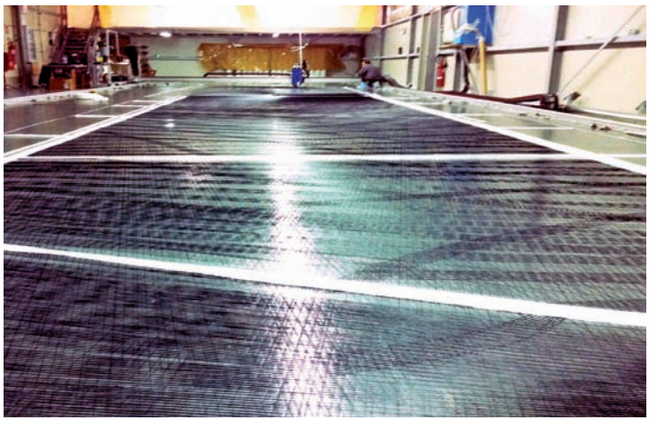
Among the company's activities are the design of sail and deck plans, consultancy to yards and designers and the construction of boats and carbon components. The process, from the conception to production in-house and testing on the water of a new product, is very short and this, together with the ability to create synergies with leading companies in complementary sectors (for example: DuPont and Mitsubishi for films; Dow Chemical, Basf and Sapici for adhesives, DSM, Aksa and Teijin for fibres) makes development very fast and effective. Thanks to this continual transfer of technology avant-garde production processes have been created, such as the treatment of individual fibres to precise indications to favour adhesion and glueing. Banks Sails can count on close collaboration with the departments of mechanics and Materials engineering of the Bari Polytechnic and is part of a Technological Cluster that recently won a European contract for the plasma treatment of fibres and films to promote adhesion. Materials initially designed for other applications, in electronics or footwear to name but some, have been analysed and modified to adapt them for sails, producing incredibly light and strong skins.



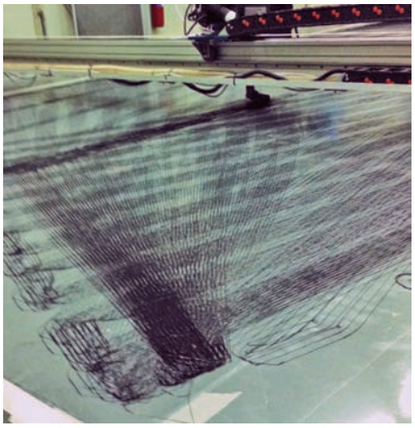
The "laminator": goodbye rolls of fabric

In 2007 a highly modern, proprietary technology plant under constant development was installed in Bari to make laminated panels in which the fibres (carbon, Dyneema etc) are positioned along curved lines with variable density according to load. This led to the innovative "MEMBRANE" brand sails. Banks Sails has some "technological secrets" such as the possibility of laminating fibres of all kinds in MEMBRANE sails: exclusive know-how of which Banks Sails is particularly proud. The latest product in the Membrane family is "Raw": an innovative, epoxy resin based external skin with remarkable strength, resistance to deformation, impermeability and light weight, which makes it particularly versatile





and suitable for both cruising and racing. The quality of the lamination and the ability to make these particular sales in Dyneema opened the way for the creation of specific products for mega yachts, called Membrane Megayacht.



3) The laminator can produce pressure up to 10 times greater than that of a vacuum.

4) The laminator can produce panels of up to 26 x 6 m that are very light and extraordinarily strong.

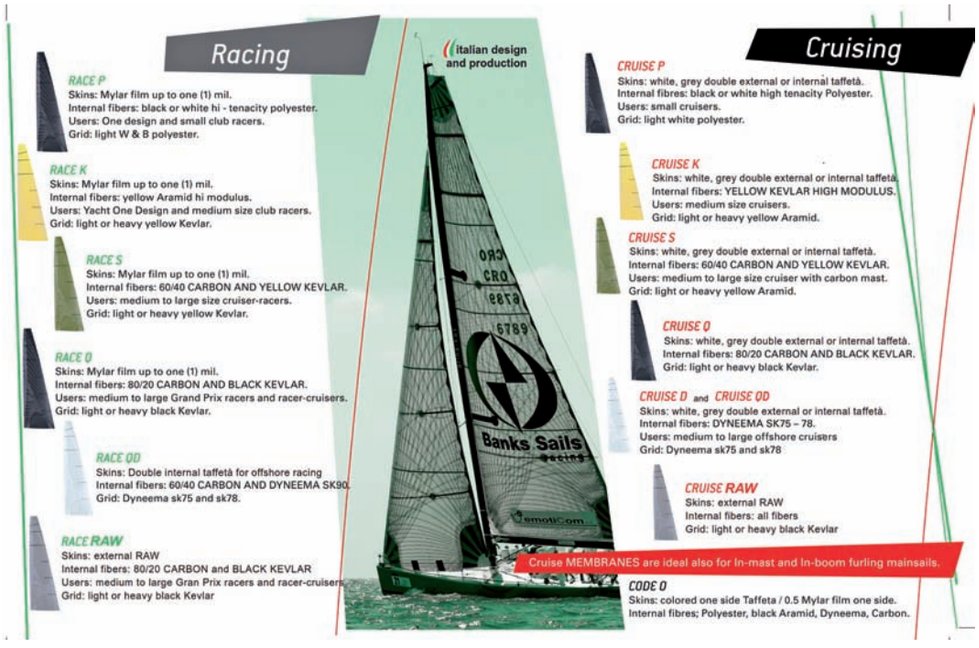
5) The carbon fibres can be positioned along curved lines and with variable density to take into account load changes.

Design

The design of a membrane is very complex and often undervalued. Accidental loads, caused by rough or mistaken use, are common on a big cruising boat and should be considered right from the design phase. Software is obviously very important, but not exhaustive, since the end result depends on the input at the beginning of the process as well as the boundary conditions imposed. In the production of a sail, as with most structures in other sectors, the project is simply the verification and later optimisation of an initial design "idea": if the idea is mediocre, its optimised version will also be mediocre. In 2005 Banks Sails commissioned from Smar Azure Ltd, a small Irish software house run by Italians, the Membrane software that over the years would become the most sophisticated integrated software for designing Membrane: today it is used, in its commercial version, in more than 50% of the world sail loft sector. The added value of this software consists not only in designing the three-dimensional shapes and geometries of sales but also in positioning the fibres in optimal quantities and positions, obtaining the deformation of the "real" sails and calculating the loads on the points of the sails and so on the rig. Recently the plug-in "Rig Edge" has been added. It is a module that calculates loads and deformation on every point of the mast, shrouds and chain plates. Rig Edge, which is unique of its kind, is used both by carbon mast producers and by important naval architecture studios in designing high performance boats.

The Membrane process

The Banks Sails laminator produces panels of up to 26 x 6 m that are very light and extraordinarily strong. Membrane is not just a material produced with new and exclusive technologies, but a different and evolved approach to the entire process of sailmaking, with no



The kinds of BANKS Membrane available and a comparison of cost, quality and lifespan according to specific usage.

Banks Sails		Cruise				
		Yacht	Performance	Durability	Weight	Cost
MEMBRANE	"D"	No Limit O.S.	★★★★★	★★★★★★	●	€€€€€€
MEMBRANE	"Q"	No Limit	★★★★★★	★★★	●●	€€€€€
MEMBRANE	"S"	No Limit	★★★★★	★★★★	●●	€€€€€
MEMBRANE	"K"	Up to 60'	★★★★	★★★★	●●●	€€€€
MEMBRANE	"P"	Up to 40'	★★★	★★★★	●●●●	€€€
Dys		No Limit O.S.	★★★	★★★★★	●●●●●	€€€€€
Hydranet		No Limit O.S.	★★	★★★★★★	●●●●●●	€€€€
M. D. Laminate		Up to 55'	★★	★★★	●●●●●	€€
Dacron		No Limit	★	★★★★	●●●●●●	€

The company

Banks Sails, based in Bari, has its origins in the reorganisation of the English group Bruce Banks Sails. Technical head of the group is Paolo Semeraro (seen working on board a megayacht in the photograph), an engineer and yachtsman who has competed in two Olympics, one America's Cup and dozens of national and international competitions. Banks Sails has a large number of lofts and service points in Italy and Europe and the growing number of cruising yachts using Membrane sails is the sign of a company looking to the future with innovation and creativity.

size limits. In particular the process has:

- a lamination surface in glass;
- two component adhesives with irreversible reticulation;;
- multiple layer lamination up to fibre thicknesses of 20 mm;
- internal, porous skins that favour fibre adhesion;
- external skins treated with epoxy resin to make them completely impermeable;
- vacuum lamination with extra pressure up to 10 times that of the vacuum;
- curing and pressing of the material along its full length at the same time;
- vacuum post curing with controlled humidity and temperature up to 7 days;
- the possibility of laminating Dyneema and waterproof and self lubricating fibres.

1 - Laying the first skin and fibre

After the first external layer has been laid out on the glass laminating surface, a plotter deposits the fibres, wetted with the binder, in bundles of 10.

Banks Sails has some "technological secrets" such as the possibility of laminating fibres of all kinds in MEMBRANE sails: exclusive know-how of which Banks Sails is particularly proud

2 - Application of the two component binder

The effectiveness of two component binders makes it possible to achieve high performance with minimal quantities. For each fibre are the most suitable binder is chosen, with a different catalyst for every season. The weight of the sail is reduced and the process, which is no longer affected by temperature, is irreversible. This does not happen in many products on the market that use thermoplastic adhesives that can be reactivated numberless times by heating and so are quick to degrade.

3 - Laying the second skin and the vacuum

The fibres are covered with the second external skin and everything is placed in a vacuum bag: it's a process quite similar to that used to make boats in composites. Powerful pumps suck out the air between the two sealed skins. The vacuum is carefully controlled by an ultrasound device.

4 – Heating

The infrared lamps cover the entire laminating surface so as to heat the multistrate uniformly and not produce dilation and contraction in neighbouring areas of material. The speed of the lamps and their distance from the surface determine the lamination temperature, which differs from fibre to fibre. Fibres react differently to temperature: Dyneema, for example, changes its properties at 90° and so cannot be used in processes that involve heat setting adhesives that require high temperatures for activation.

5 – Calendering

Weighted rubber coated rollers follow the lamps over the entire width of the panel, eliminating air residues, and create pressure up to 10 times that of the vacuum. The compacting of the layers permits considerable accumulation of fibre in the areas subject to greater stress. Thicknesses of up to 18 mm of fibre have been produced around the clews of megayacht sails. This additional pressure is an essential factor for the lamination of Dyneema.

6 - Flat vacuum cooling

To obtain perfect reticulation of the composite cooling must be carried out under vacuum with a well-defined temperature curve. In the case of fibres such as Dyneema this post-cure phase, under vacuum and in temperature and humidity controlled environments, can last even as long as 10 days for a single panel.

7 – Tracing curves once the material is stabilised

The curves, which are fundamental for the shape of the sail, traced once the material is stabilised and cooled, giving perfect control and repeatability of the shapes.

8 – Assembly and finishing

Only a few weeks later does the sail past to the sail makers who finish it in every smallest detail, often by hand. Further surface treatments on the finished sail help to protect it from dirt and mould.