

NEW TECHNOLOGIES FOR DESIGN

In an earlier article (nautech number 02 of 2015) we saw how captivating and complex design has made it necessary to use new technologies and instruments (e.G. Fem calculation) for the design of large products in composite's and how the use of composite's with an epoxy matrix and reinforcement in carbon has made it possible to build structures with great rigidity and low weight, a result it would have been hard to achieve even a few years ago.

The real obstacle was the difficulty of using epoxy systems in carbon fibre, and the equipment for processing them properly; the cost of production as a result was not comparable with an identical product in glass fibre with a different matrix.

The technology

Today, thanks to the widespread use of CFRP + EP in all manufacturing sectors, from automotive to sporting goods, from wind energy to transportation, solid know-how has been developed

in knowledge of the subject and there is in-depth technical literature available; in addition, access to the materials is considerably simplified compared with the past: the challenge for the future will be to develop technologies and methodologies for production that is efficient, economic all and optimised to exploit to the full the advantages of composite materials.

Composites, which originally meant only "fibreglass", from being an economic material that was not high quality have now become a prized material with a high technological content and infinite potential and applications.

As is known, unlike other sectors that have large production volumes and big investments (automotive and aerospace), where the

important thing is production time and process automation, the yachting sector is governed by a different logic, dictated by small/medium production volumes and the use of large quantities of material. The proposal from SIKa, in collaboration with MDS, is to seek to develop a "tailor-made" technology/operating methodology for each customer so as to meet his requirements precisely and so reduce to a minimum the impact of the use of advanced composites on infrastructures, production cycles and so on process costs.

The Sika solution

As concerns materials, Sika has developed high-performance epoxy systems suitable for the construction of large products, in infusion and wet lay-up, with post-cure temperatures of less than 60°C. The Sika Biresin CR range. As far as technologies are concerned, Sika proposes itself as a partner for the development of made-to-measure solutions: from the study and design of heated moulds or components in composite, to the customisation of cure and post-cure cycles and products. These solutions are designed to optimise the construction process of the particular application on the basis of customer needs, guaranteeing optimal conditions for work on the product and maximising the result.

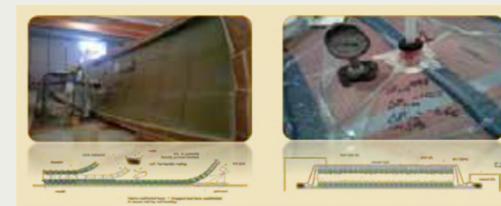
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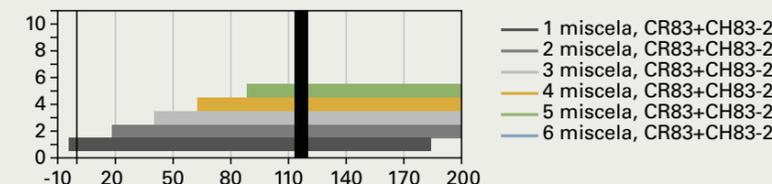
Construction technology:

- Manual work
- Manual work with pre-impregnating machine and compacting under vacuum
- Infusion



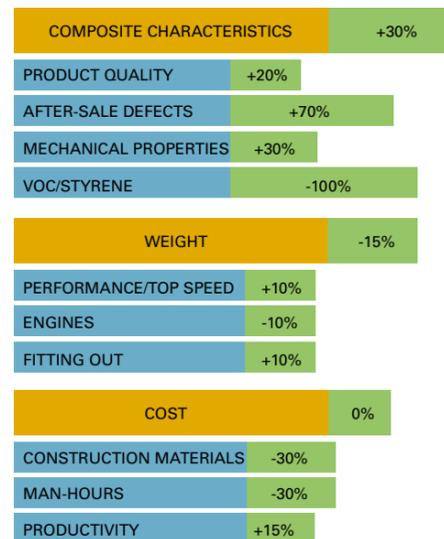
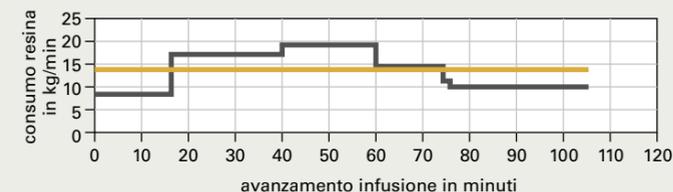
Choice of materials:

- Reinforcing fibre, material and layout
- Epoxy system: resin + hardener
- Structural foam: sheets, grooved...



Process simulation:

- Work environment
- Organising work phases



THE COMPANY

The first factor for successful research and development in Sika is a strategy oriented towards training in specific competences. Specifically: sealing, glueing, reinforcement, insulation and protection structures in the building and industrial sectors.

SEALING

Sealing reduces the flow of gas and liquids between cavities and interstices, and avoids the dispersion of heat and cold. Huge flat roofs, the construction of complicated tunnels, water basins that can be easily damaged, sophisticated facades, resist wind and rain, temperature, ageing and vibrations. So the functionality and comfort of the spaces inside are improved.

GLUEING

Elastic glueing of joints, in all kinds of materials, permanently and safely. Vehicles, windows and even structural elements of bridges and viaducts in concrete are glued using new systems. Sika glueing technologies increase the final safety of the product and permit great design freedom. These applications also optimise the time needed for the production process.

INSULATION AND SOUNDPROOFING

The insulation of fixed and movable objects reduces vibrations of any wavelength, thus reducing reverberation and noise in structural elements and closed environments. The noise of vehicles, for example in buses and cruise ships, is reduced, considerably improving comfort.

REINFORCEMENT

Increasing in a targeted way the load bearing capacity of static and dynamic structures subjected to high loads, such as lightweight window frames, shock resistant elements in the automotive sector and large concrete bridges. Sika has solutions for reinforcement that optimise new and existing structures.

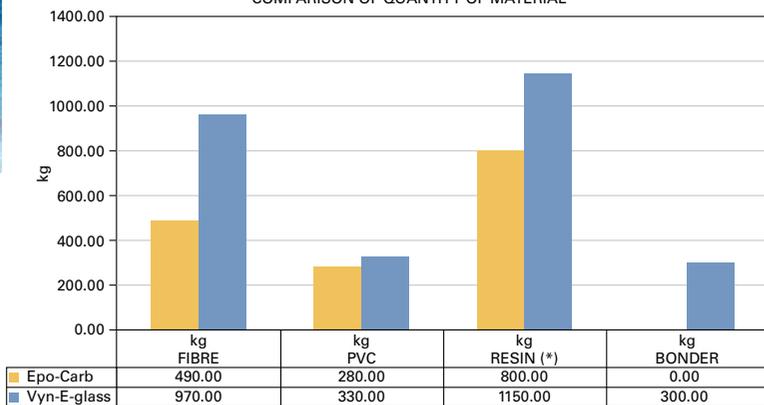
PROTECTION

Protection increases the life of structures and conserves the quality of new and renovated objects. Sika solutions guarantee effective protection against climate aggression, chemical agents in the environment and fire for structures in concrete and steel. La protezione aumenta la durabilità delle strutture e preserva la qualità di oggetti nuovi e rinnovati. Le soluzioni Sika garantiscono una protezione efficace nei confronti delle aggressioni climatiche, degli agenti chimici ambientali e del fuoco per strutture in calcestruzzo e acciaio.

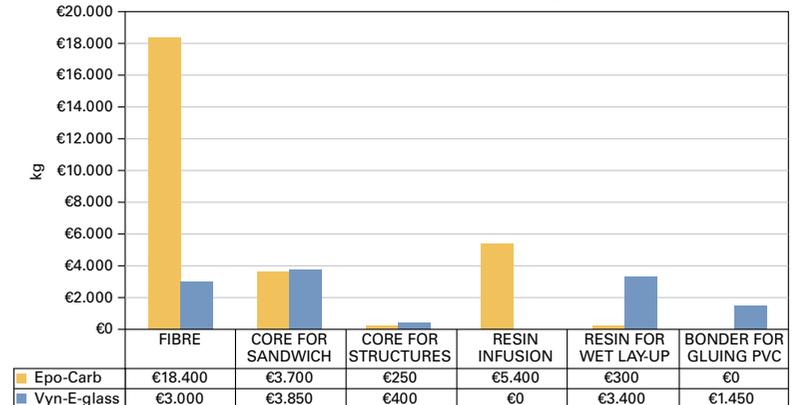
Starting from an optimised project, making small investments in production sites and equipment, it is possible to manufacture high quality and high performance products, quality controlled and repeatable, at a cost comparable to that of "traditional fibreglass".



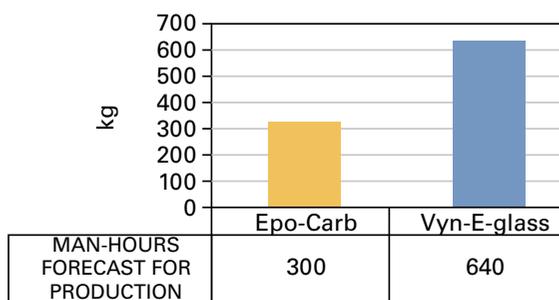
COMPARISON OF QUANTITY OF MATERIAL



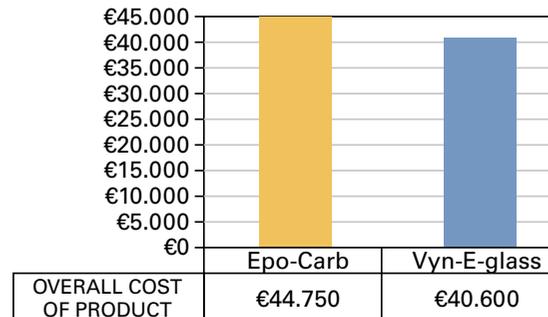
COMPARISON OF COST OF MATERIALS



MAN-HOURS FORECAST FOR PRODUCTION



OVERALL COST OF PRODUCT



repeatable, at a cost comparable to that of "traditional fibreglass". Analysing the economic impact of the manufacture of a large open (about 100 feet/150-180 m²), excluding windows and starting from current material and manpower costs, gives us the following parameters. The weight of the product is reduced by about 45%, from about 2700 kg to about 1500 kg, which translates into a need to purchase less material and use less manpower to work on it. The extra production cost of the process is less than 10%, a negligible value for construction of this importance. The quality of the product is clearly superior to what can be obtained with classic methods.

The cost of management in terms of service and guarantees, which are usual for a construction of this size (problems of bodywork, surface finish and stability under temperature changes), is reduced to

zero. Considering the preceding parameters and the difficulty of managing atmospheric emissions of VOC, which with the use of epoxy resins are no longer a problem, it seems clear that the change can be implemented at exactly the same cost. We must also consider, though this is almost taken for granted, an increase in the overall performance of vessels in stability and performance.

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