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Technical report of the mechanical behaviour of materials used for the manufacturing of the boat hull

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PP RESPONSABLES: UBS/Cambridge

Interreg France (Channel Manche) England

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Partners

KAIROS, UBS

Tasks done

➢ Objectives:

The objective of this report is to review the mechanical tests that have been carried out on composites made from the preforms developed by the partner TVDC. A wide range of experimental parameters were investigated as well as commercial materials from commercially available competing products.

➢ Materials:

The NCFs are provided by Teillage Vandecandelaère and will be compared with available commercial references provided by Safilin, Sicomin and Terre de Lin.

Samples	Producer	Fibres	Areal weight (g/m²)
BX TV 312	TV	Flax	312
BX TV 424	TV	Flax	424
BX SF 600	Safilin	Flax	600
BX TDL 250	Terre de Lin	Flax	250
BX GF 600	Sicomin	Glass	600

➢ Methods:

Various mechanical tests were carried out:

- Interfacial shear tests - ASTM D3518
- Tensile tests – IO 527
- Compression tests - ISO 14126

The shear tests were carried out on composites obtained from NCFs developed by TVDC and the tensile and compression tests on the unidirectional preforms used as a basis for the manufacture of NCFs.

➢ Results:

The shear tests are shown in Figure1.

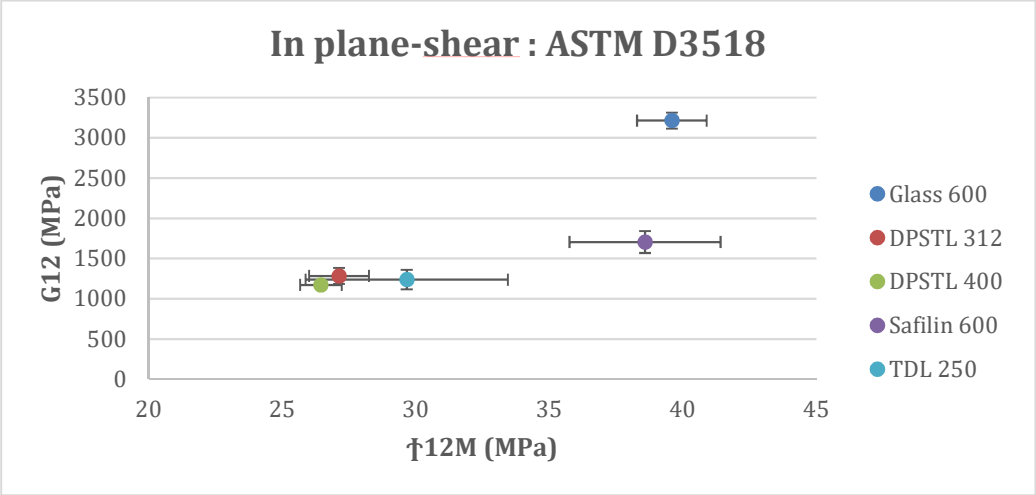

Figure 1 – Essais de cisaillement +/-45° sur les différents composites

The results show a relatively similar shear modulus to other available linen preforms, but the stress is lower, probably due to the individualisation of the fibres in the preform (see deliverable 3.4.1).

Next, a large number of composites were made on UD composites by varying the infusion process parameters and in particular void levels, resin type, flow rates, reinforcements and consumable type. An overview of the stiffness results obtained before optimisation is given in Figure 2.

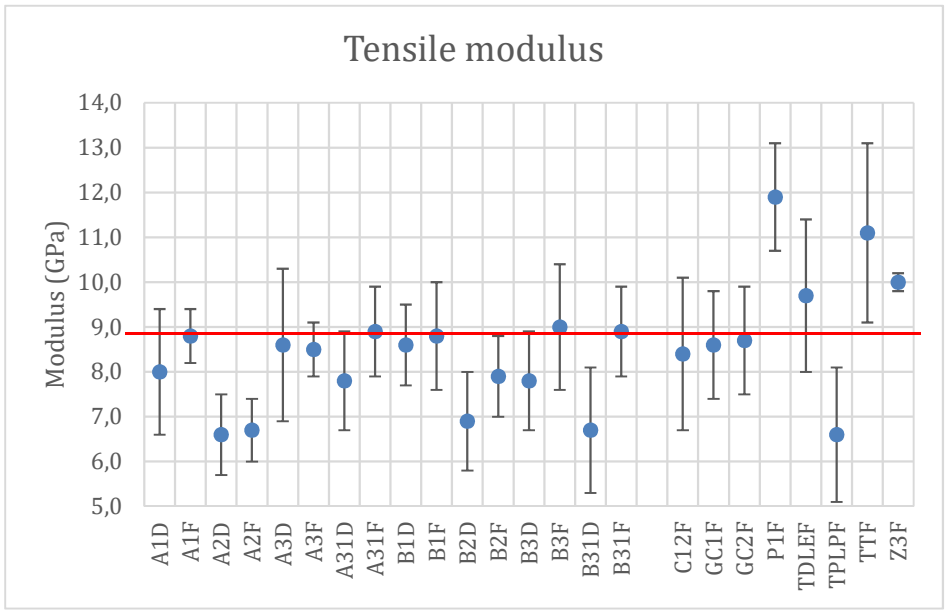

Figure 2 – Modules de traction obtenus sur composites en faisant varier les conditions d'infusion et les résines

The following tests focused on optimisation and, in particular, on the production of composites by varying the thickness of the plates in an attempt to resolve the homogeneity problems observed with plates that are too thin, given the specific architecture of the reinforcements.

Figure 3 shows stress values obtained for materials of different thicknesses and reinforcements:

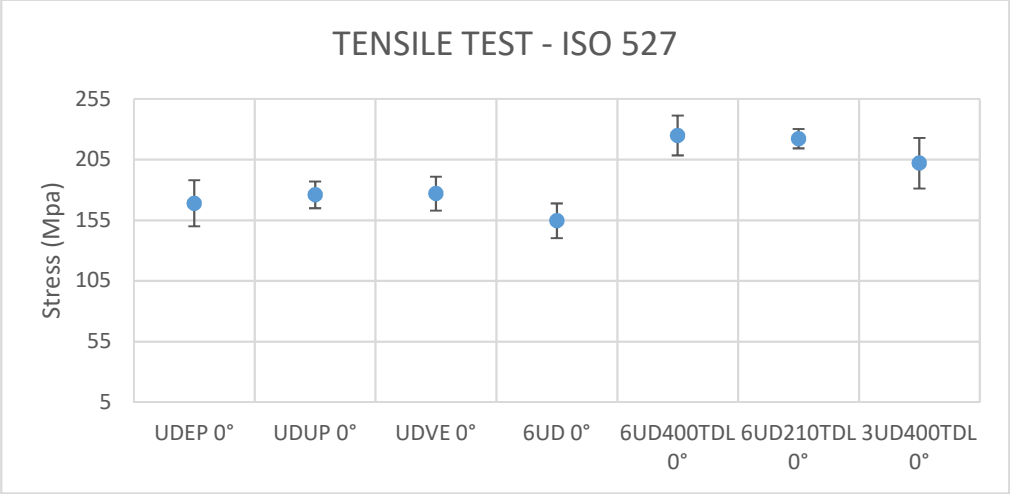

Figure 3 – Contraintes de traction mesurées sur des composites d'épaisseurs différentes

Finally, compression tests were carried out and significant differences were found, depending on the preforms used:

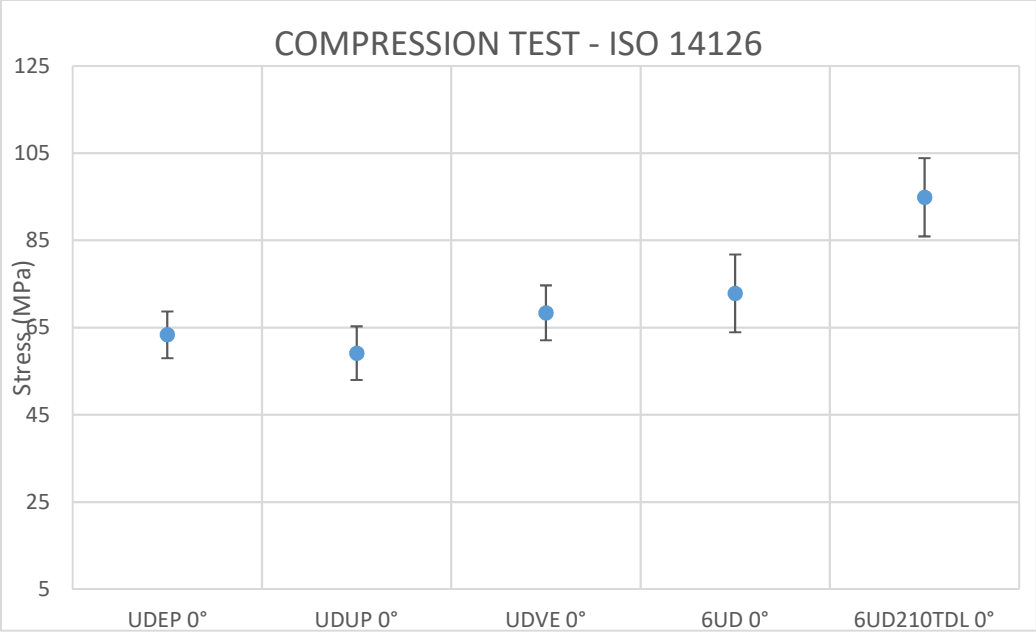

Figure 4 – Essais de compression sur composites UD

Conclusion

This range of trials was conducted under a variety of experimental conditions. The trials presented here constitute only a fraction of the work carried out.
They have enabled the products developed in the project to be compared with commercial references and to situate their performance. Their specific architecture limits their performance for the moment. Although the performances observed are sufficient to integrate them in the continuation of the work, developments are in progress with the company TVDC to obtain even better performing reinforcements.