

“Ship design accounting for production and environmental factors”

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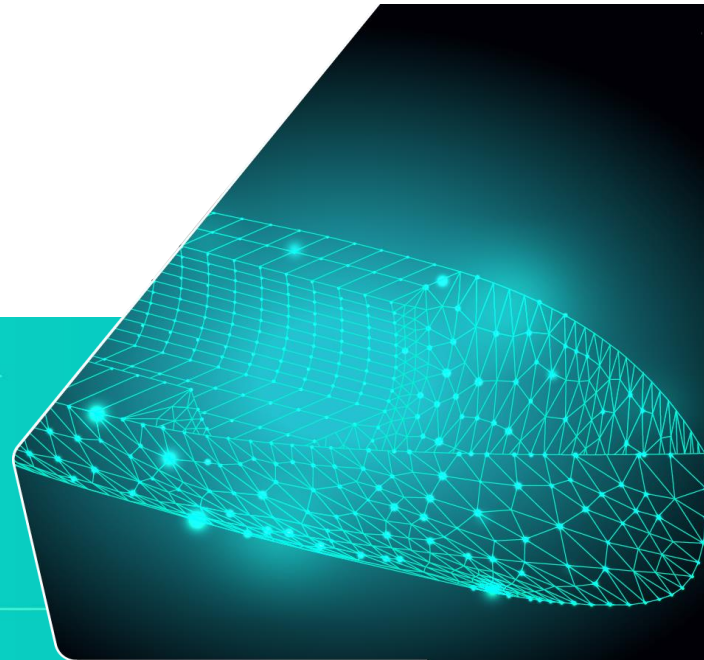
Final Dissemination Event

13 December 2023

Technocampus Océan, Nantes, France

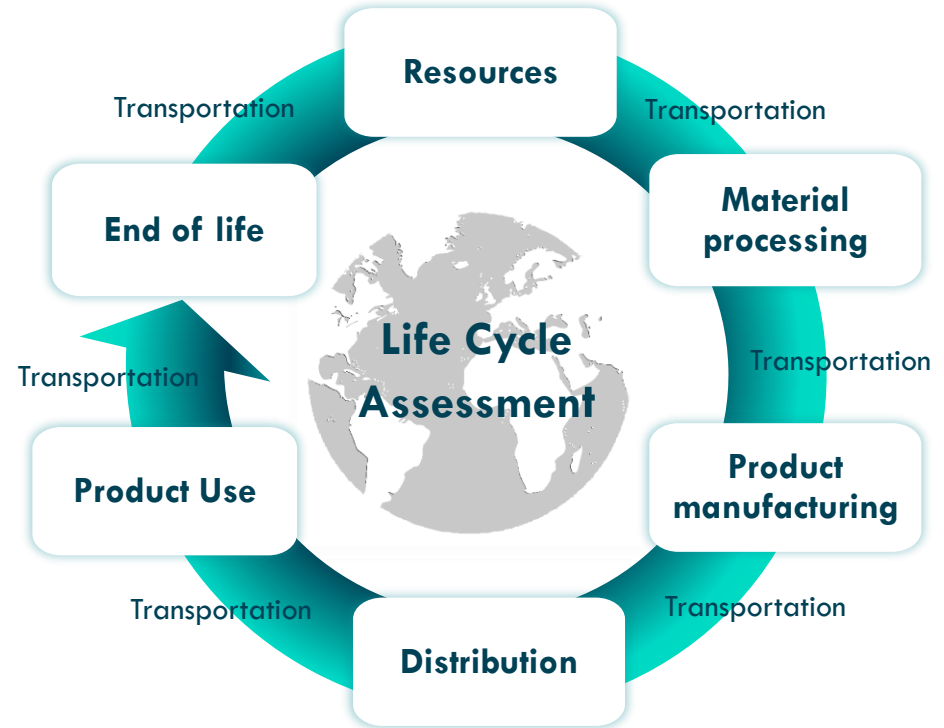


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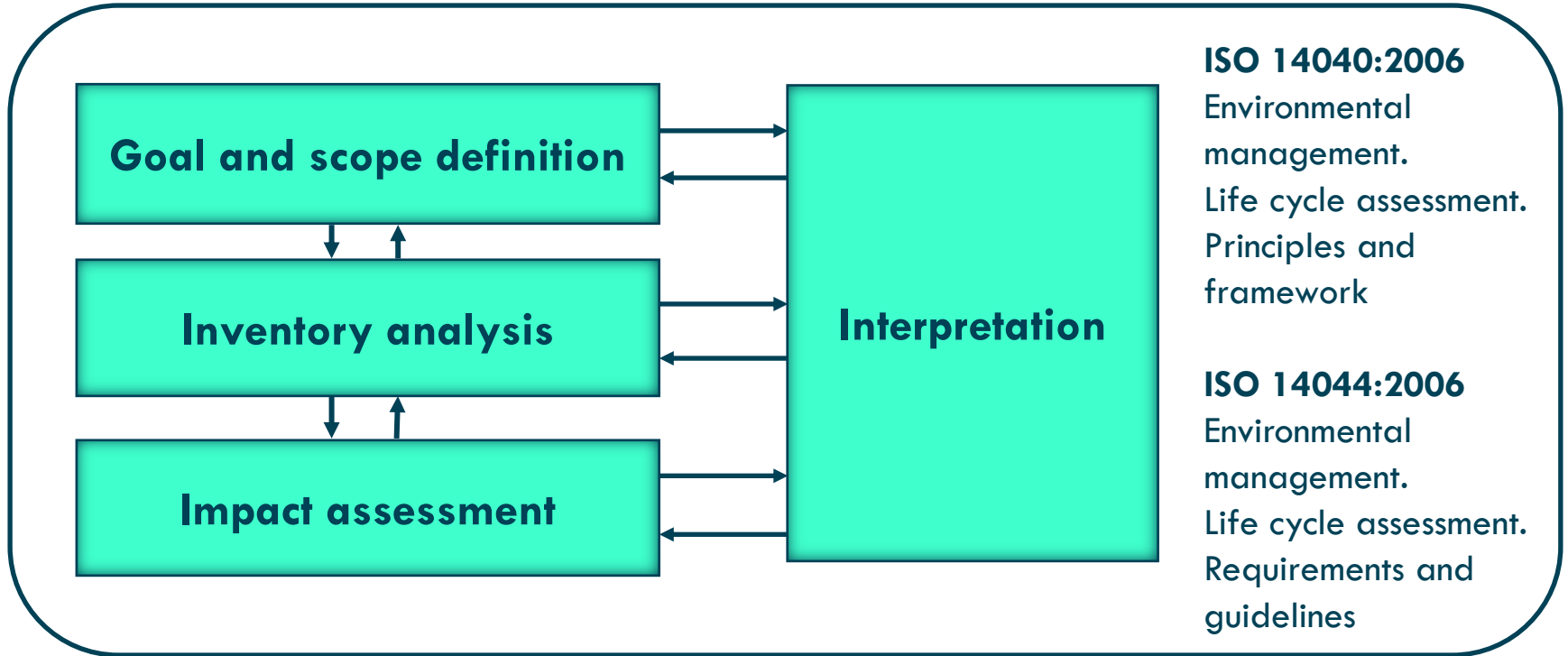


Life Cycle Assessment - LCA

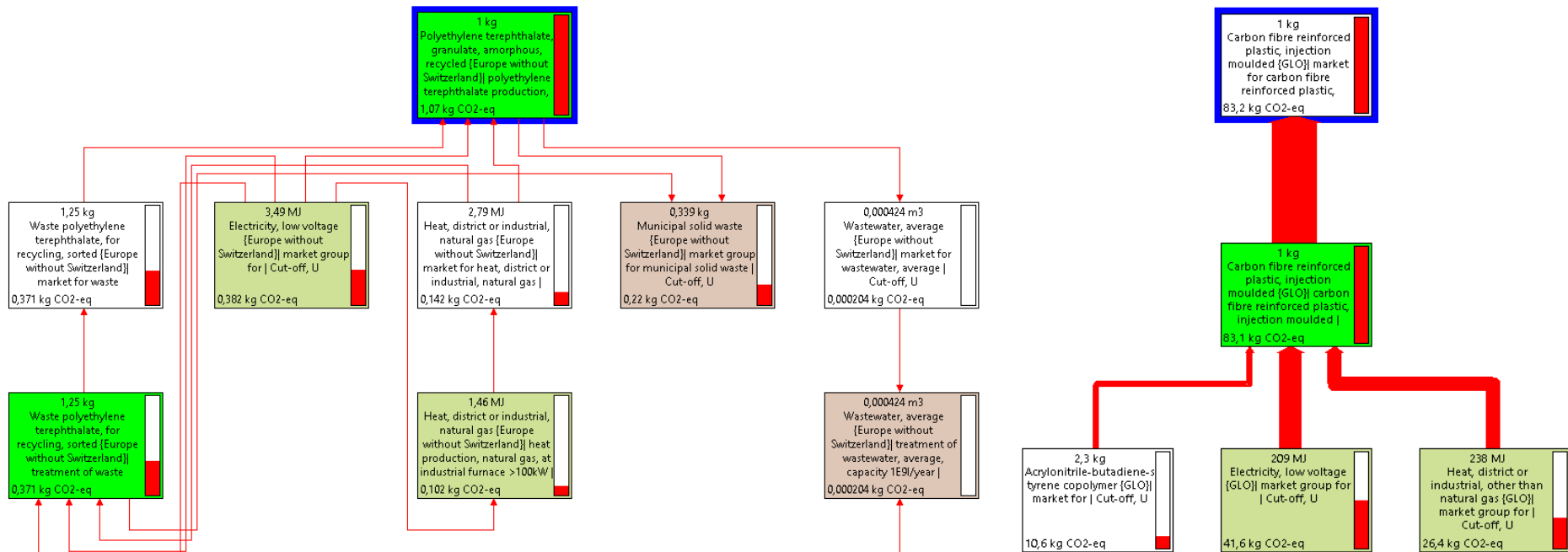
Life cycle assessment is an analysis technique to assess environmental impacts associated with all the stages of a product's life.



Life Cycle Assessment



Environmental Model: IPCC 2021 GWP 100a



Life Cycle Assessment in Fibre4Yards

Objectives

- ❑ To perform **LCA** analysis of advanced and innovative Fibre-Reinforced Polymers (FRP) manufacturing technologies developed in the project to assess the environmental impact over the entire life cycle of FRP ships.
- ❑ To provide recommendations for optimal solutions of the environmentally friendly FRP production technology for the shipbuilding industry.



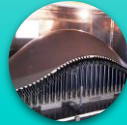
Out of die UV cured
pultrusion
IRURENA



Hot stamping
INEGI



ATP
3D printing
10XL



Adaptive moulds
CURVE WORKS



Vacuum infusion
Demosntrator
assembling

FRP manufacturing technologies

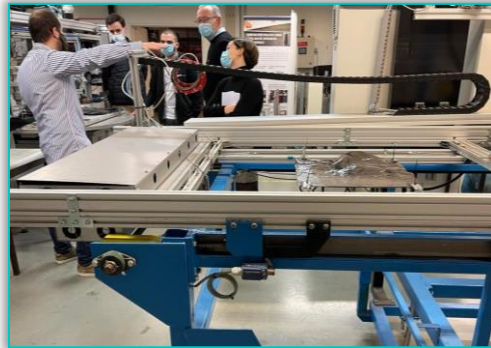
Technology Providers



IRURENAGROUP
ADVANCED TECH COATINGS



ineqi driving science & innovation



10XL



NAVAL
GROUP



Demonstrator - topside ©NAVAL GROUP



Demonstrator - deck ©NAVAL GROUP



Demonstrator - deck ©NAVAL GROUP



Superstructure Frigate La Fayette (1980 - 1990)

FIBER4YARDS Technologies

Stiffeners for
Superstructure panels
UV curved pultrusion process

IRURENAGROUP
ADVANCED TECH COATINGS

Pillars
3D printing, ATP/AFP

10XL

Superstructure Panels
Adaptive Mould Process

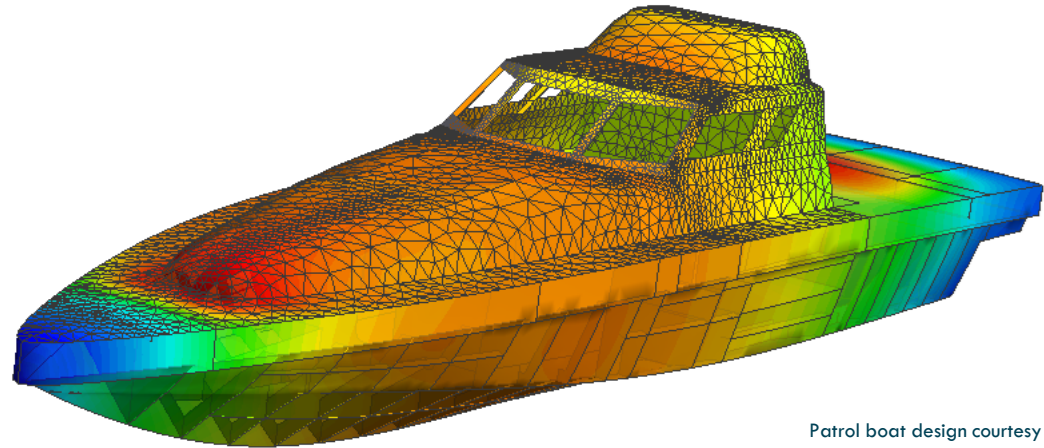


Brackets
Hot Stamping Technology

ineqi driving science
& innovation

Deck with stiffeners
Vacuum Infusion technology

NAVAL
GROUP



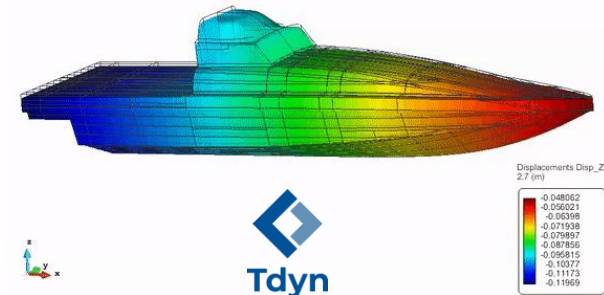
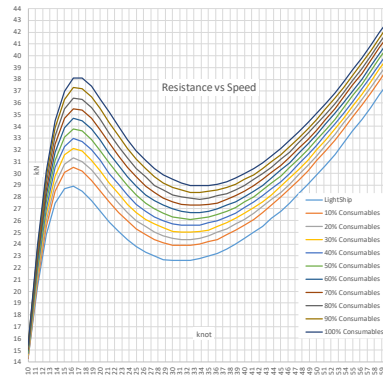
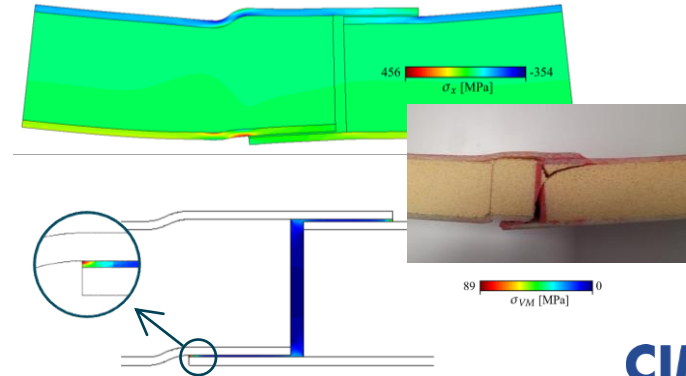
Patrol boat design courtesy of:

COMPASS
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FIBER4YARDS Technologies: Advanced Design and Engineering tools

Advanced manufacturing technologies require **Advanced Design & Engineering tools**:

- ✓ CAD/CAE/FEA/ML Tools which can be integrated in **IoT and Digital Twin platforms**.
- ✓ Adapted FEA codes which can properly account for the **specific properties and mechanic behaviour** of the materials involved.
- ✓ **FEA codes** capable of reproducing real life loads on the vessels' structure.
- ✓ **Machine Learning tools**, trained with FEM, which provide immediate response to the Naval Architect in order to take design decisions.



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FIBRE4YARDS Technologies: Design and Engineering tools

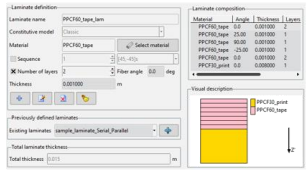
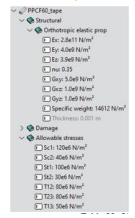
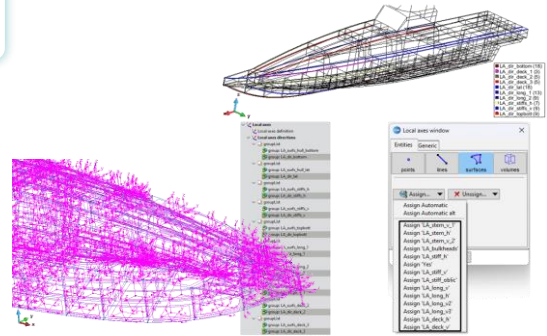
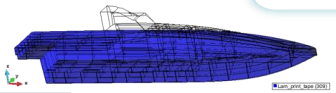
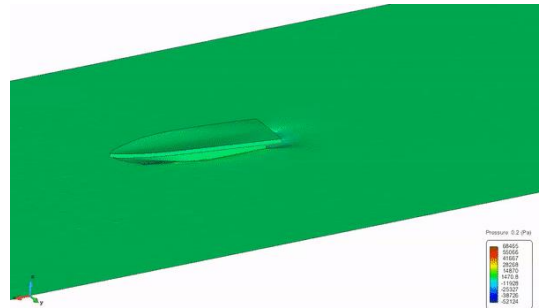
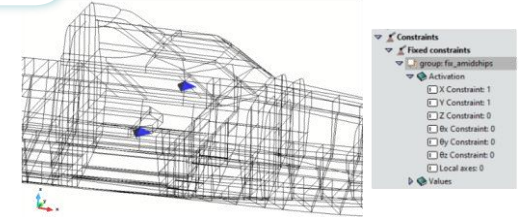
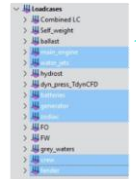
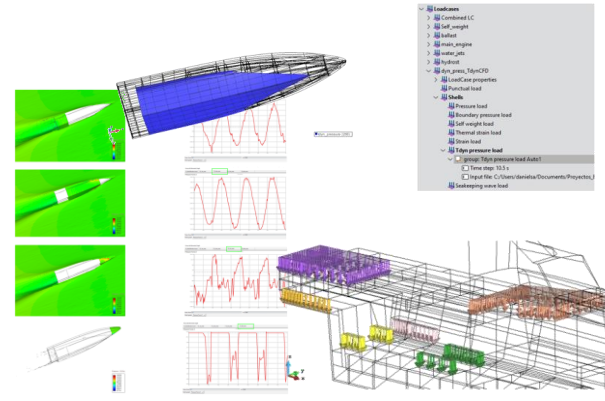
Real-life
LOADS

Real-life
CONSTRAINTS

ADVANCED
DESIGN

Tdyn

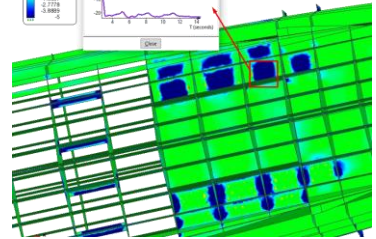
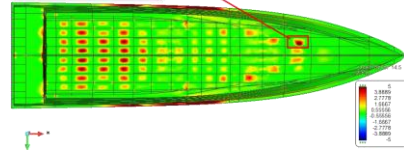
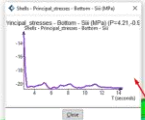
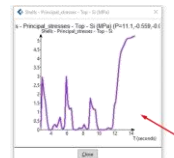
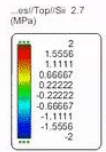
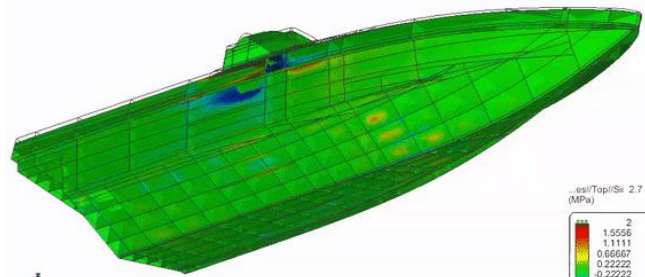
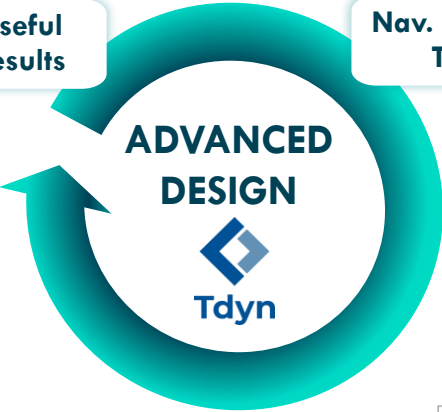
Advanced
MATERIALS



FIBER4YARDS Technologies: Design and Engineering tools

Purposeful
FEA results

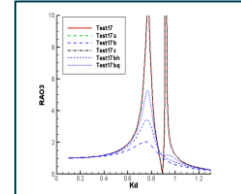
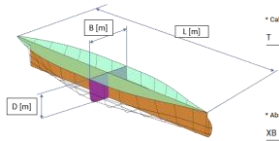
Nav. Arch. ML
Tools



CÓMPASS

Datos de entrada

* Estora L	* Coef. Bloque CB
* Manga B	* Coef. Maestra CM
* Calado T	* Coef. Orzúa CC
	* Coef. Fijación CF
* Abscisa centro carena XB	* Ordenada centro carena ZB
* Radio metacéntrico long GML	* Radio metacéntrico trans. GMT

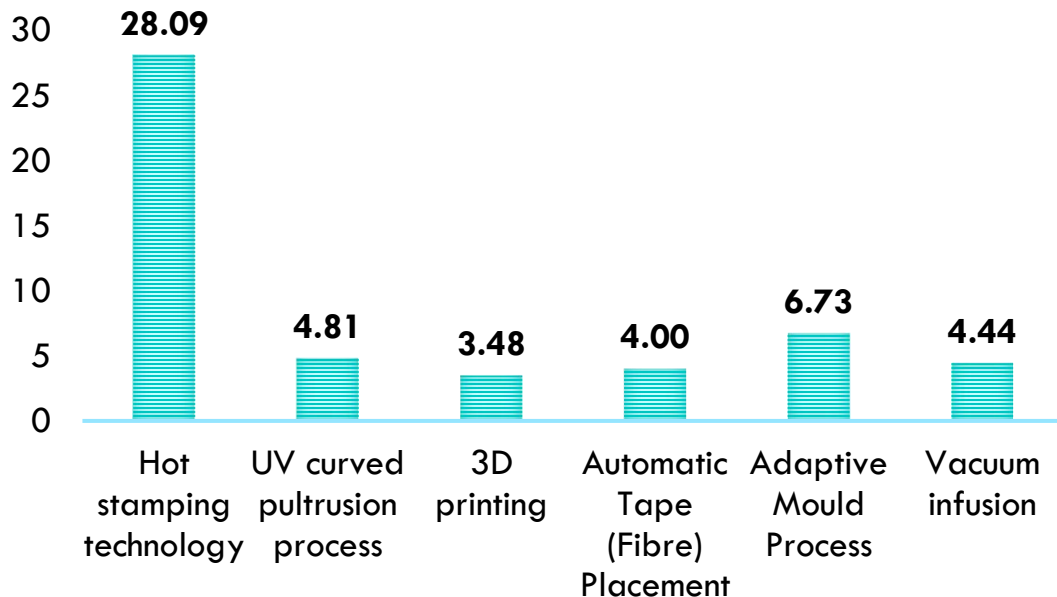


Fibre4Yards Project
WP3 Design Optimization
 Development for web-based ML/AI Naval Architecture Tools

Final results

Comparison of environmental loads produced by each FIBRE4YARDS technology in kg CO₂ eq.

GWP, KG CO₂ EQ.



Technology	GWP, kg CO ₂ eq
Hot stamping technology	28,09
UV curved pultrusion process	4,81
3D printing	3,48
Automatic Tape Placement	4,00
Adaptive Mould Process	6,73
Vacuum infusion	4,44

Thank you !

 <https://www.fibre4yards.eu/>

 <https://www.linkedin.com/company/fibre4yards/>

If not acknowledged, images courtesy of the consortium partners.

This presentation reflects only the consortium's view. The European Commission and the European Climate, Infrastructure and Environment Executive Agency (CINEA) are not responsible for any use that may be made of the information it contains.

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