

FIBRE4YARDS

**Fibre Composite Manufacturing Technologies
for the Automation and Modular Construction
in Shipyards**

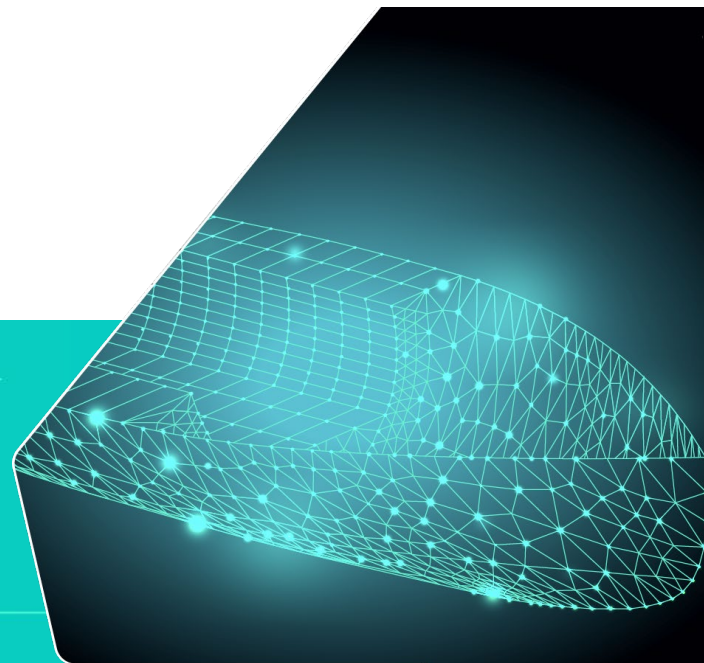
Xavier Martinez (CIMNE)

Daniel Sá (CompassIS)

All Project Consortium



This project has received funding from European Union's Horizon 2020
research and innovation programme under grant agreement n° 101006860



13 PARTNERS

7.6M€ BUDGET

6 COUNTRIES

5.9M€ EU CONTR.

36 MONTHS

995 PERS/MONTH

**TO DEVELOP FIBRE COMPOSITE MANUFACTURING TECHNOLOGIES FOR
THE AUTOMATION AND MODULAR CONSTRUCTION IN SHIPYARDS**

OBJECTIVES

The main objective of FIBRE4YARDS project is to maintain European global leadership in ship building and ship maintenance, through implementation of the Shipyard 4.0 concept in which advanced and innovative FRP manufacturing technologies are successfully introduced

OBJECTIVES

The focus of the FIBRE4YARDS project is the entire value chain (the shipyards and their ecosystem) cooperatively working on small and medium length fibre-based ships in a digital environment.

The main objective of the project will be achieved by:

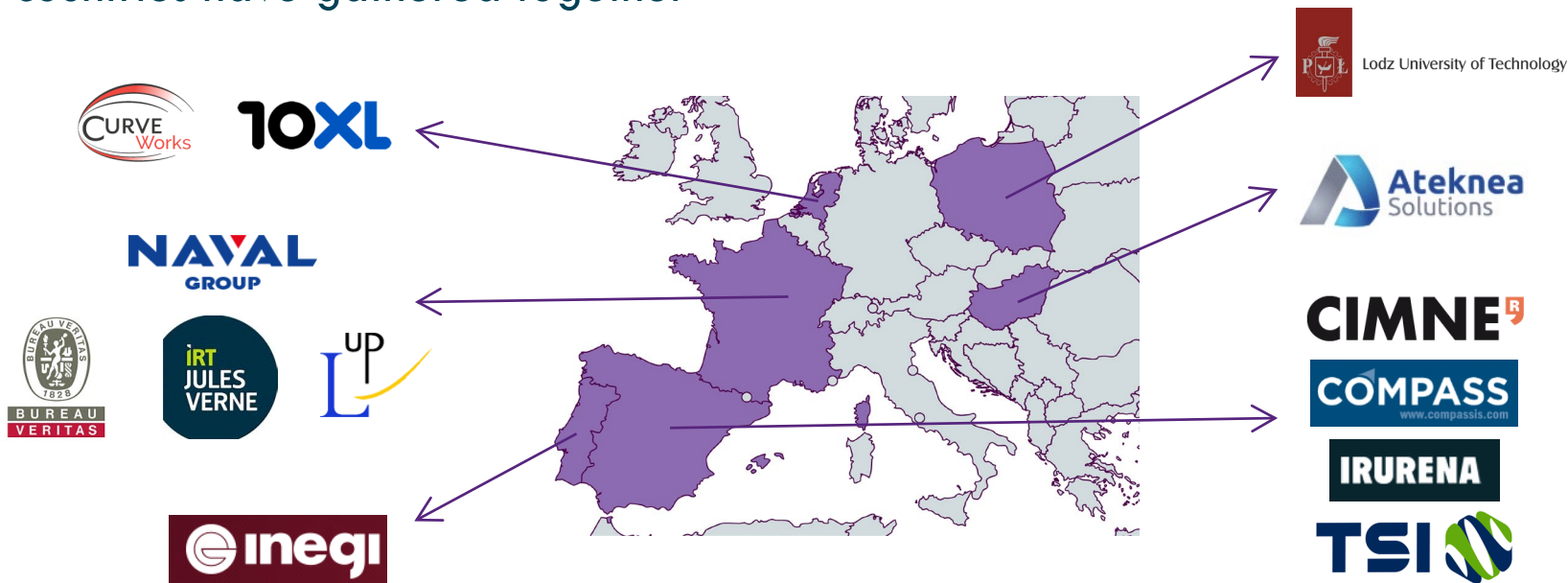
1. Introduction of smart and secure engineering, manufacturing and data sharing concepts in ship production.
2. Embedding advanced and highly automated FRP production technologies in the Shipyard 4.0. Application of these technologies in the ship production, maintenance and dismantling.

OBJECTIVES

3. Develop and validate new (digitalized) engineering and analysis simulation solutions to support modular ship design and construction in the Shipyard 4.0 concept.
4. Facilitate the industrial deployment of the FRP Shipyard 4.0 by providing guidelines for design, production, certification, and staff training.
5. Development of business plans and Intellectual Properties Rights (IPR) strategies for the shipyards.

CONSORTIUM

To achieve these objectives, a consortium of 13 institutions from 6 European countries have gathered together



CONSORTIUM

To achieve these objectives, a consortium of 13 institutions from 6 European countries have gathered together. Of those, there are:

4 Research Institutes:



Lodz University of Technology

7 SMEs:



1 Industrial Company:

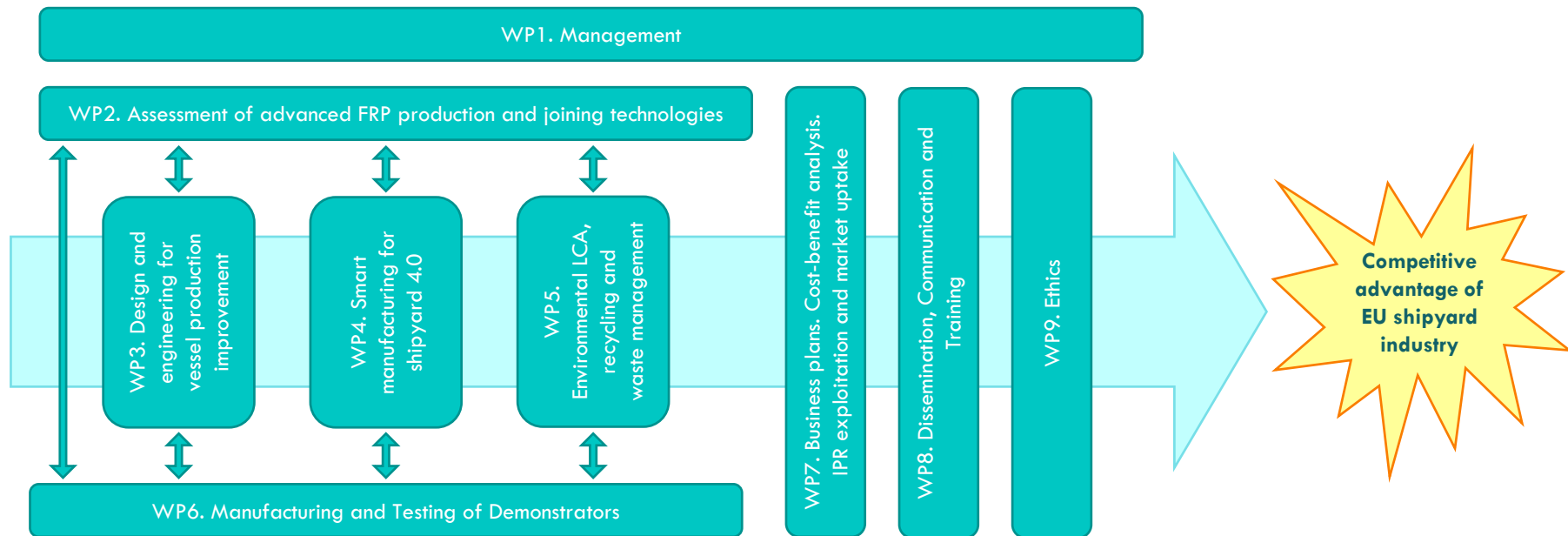


1 Classification Society:



WORKPLAN

The project objectives will be achieved through the following workpackages

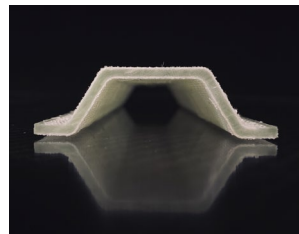
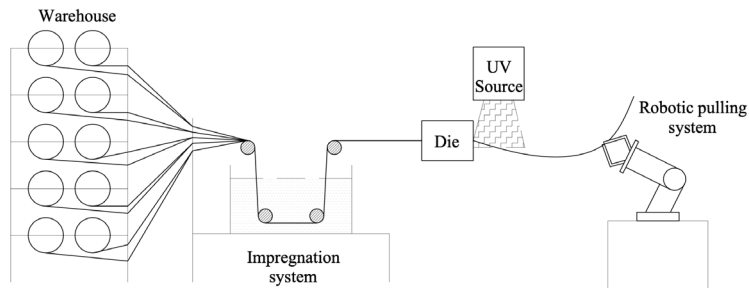


Advanced FRP production and joining technologies

FIBRE4YARDS will develop new FRP production technologies, and will also look into advanced production processes already used in other industries (aeronautics, wind, etc.) to adapt them to the marine sector.

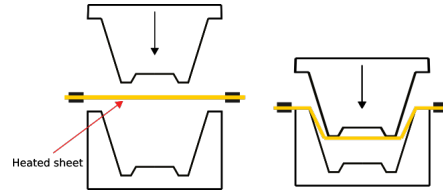
The technologies targeted are:

Out of die UV cured pultrusion for manufacturing curved profiles (IRURENA)



Advanced FRP production and joining technologies

Hot stamping of thermoplastic materials (INEGI)



Automatic Tape Placement (ATP)/Automatic Fibre Placement (AFP) (10XL)



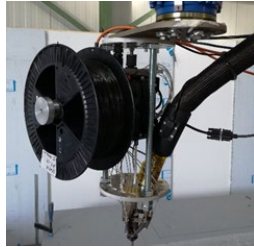
<https://www.tss.trelleborg.com/en/products-and-solutions/advanced-composites/automation-equipment/fiber-placement>



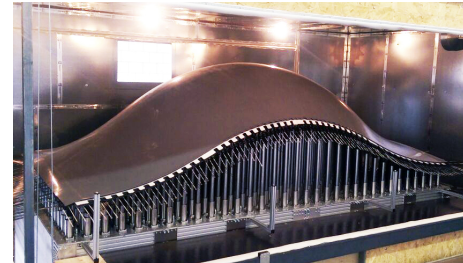
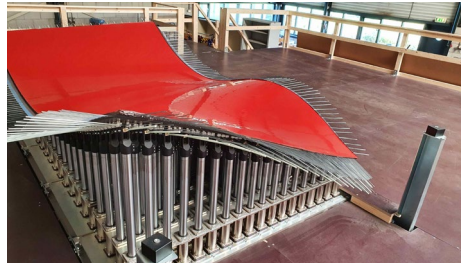
<https://www.compositesworld.com/articles/automating-wind-blade-manufacture>

Advanced FRP production and joining technologies

Additive manufacturing: 3D printing (10XL)

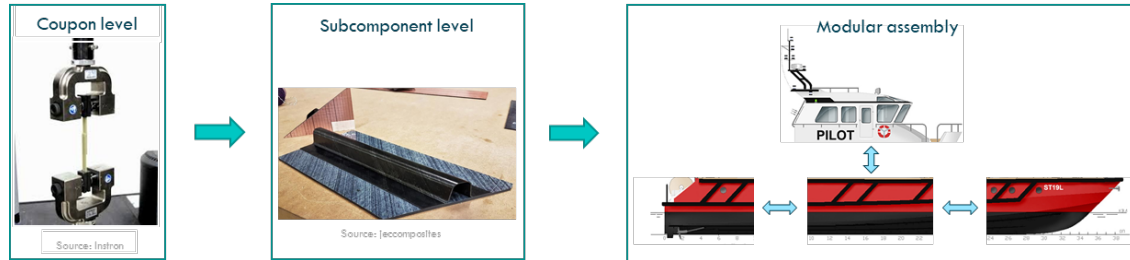


Adaptive moulds for composite panel assemblies (CURVE WORKS)

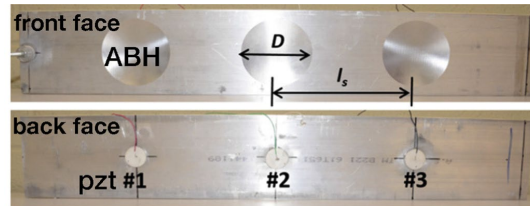


Advanced FRP production and joining technologies

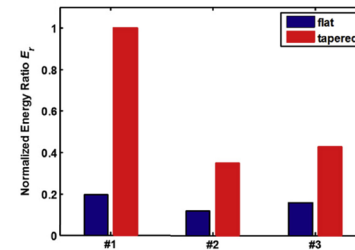
Connection Techniques (INEGI)



Acoustic damping by using “acoustic black holes” (IRT JULES VERNE)



<https://doi.org/10.1016/j.jsv.2020.115316>



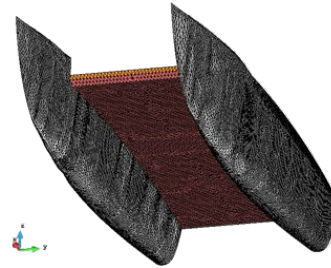
Advanced FRP production and joining technologies

For all these technologies, the project will look at the best way in which they can be applied to shipbuilding by:

- ❑ Looking at the optimal procedure to use the technology in the shipyard
- ❑ Studying the ship parts and components that can benefit the most of the technology

Design and engineering for vessel production improvement

FIBRE4YARDS will design two ships, optimized by means of the production methods developed, and enabled to be produced in a Shipyard 4.0 environment.



The numerical software will contain the formulations developed to predict the performance of composite structures manufactured with the advanced technologies developed within the project.

Smart manufacturing for shipyard 4.0

In order to define a new generation of 4.0 shipyards, FIBRE4YARDS will:

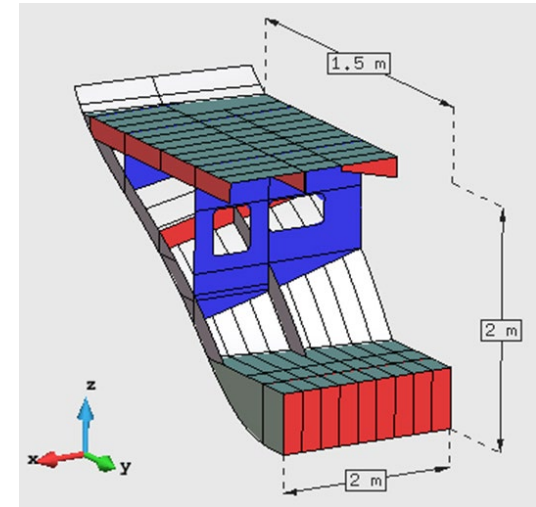
- ❑ Develop monitoring strategies to obtain required data for continuous quality control and factory maintenance.
- ❑ Develop a DIGITAL TWIN MODEL of the shipyard, which based on the continuous monitoring and the internet of things (IoT) will control the different production processes that take place.
This will allow assessing the best maintenance plan or to adapt the shipyard production based on a real time measured performance.
- ❑ Define applications of smart technology based on IoT to shipbuilding to develop the shipyard 4.0 concept and improve production and maintenance processes
- ❑ Cyber-security measures will be developed to be included in the shipyard 4.0

Manufacturing and Testing of Demonstrators

All developments made in FIBRE4YARDS will be evaluated with the construction of two demonstrators.

- ❑ The first one will contain elements produced with each one of the production technologies developed, and it will be designed with the numerical tools also developed.

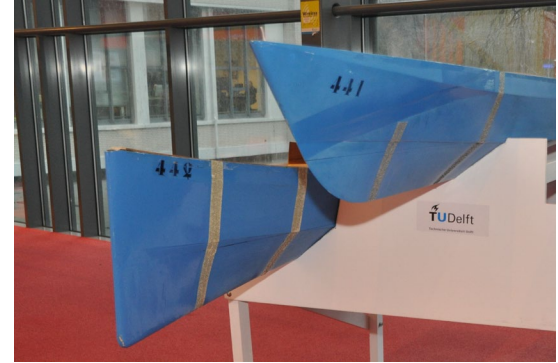
The construction of the demonstrator will also help to evaluate the performance of the Shipyard 4.0 elements developed in the framework of the project.



Manufacturing and Testing of Demonstrators

- ❑ The second demonstration will be a 3D printed axe-bow.

This demonstrator will be also used to evaluate the performance of the IoT and the shipyard 4.0 elements that have been implemented during the project.



PROJECT IMPACTS

The success of FIBRE4YARDS project is expected to have a positive impact in the following axis:

1. Competitiveness and Growth for Small and Medium shipyards

The new production processes developed, together with the implementation of a shipyard 4.0, will improve the production and increase the competitiveness of European shipyards.

2. Employment and Skills of European Workforce

Advanced manufacturing procedures such the ones proposed by FIBRE4YARDS will required workers with improved skills, and will keep and even increase European workforce as shipyards will be more competitive.

PROJECT IMPACTS

3. Improved Environmental Performance

FRP ships manufactured with advanced production procedures will use less material more efficiently, reducing significantly the ship weight and improving its environmental performance. A LCA will be conducted to ensure this outcome.

4. Multiplication Effect within Europe

Developments made towards a 4.0 shipyard and the use of advanced manufacturing procedures will be easily adapted to other shipyards besides the ones directly involved in the project, spreading the project results easily.

5. Maximise EU added value by minimizing technology leakage

FIBRE4YARDS has a specific task to protect the IP generated in the project

SUMMARY

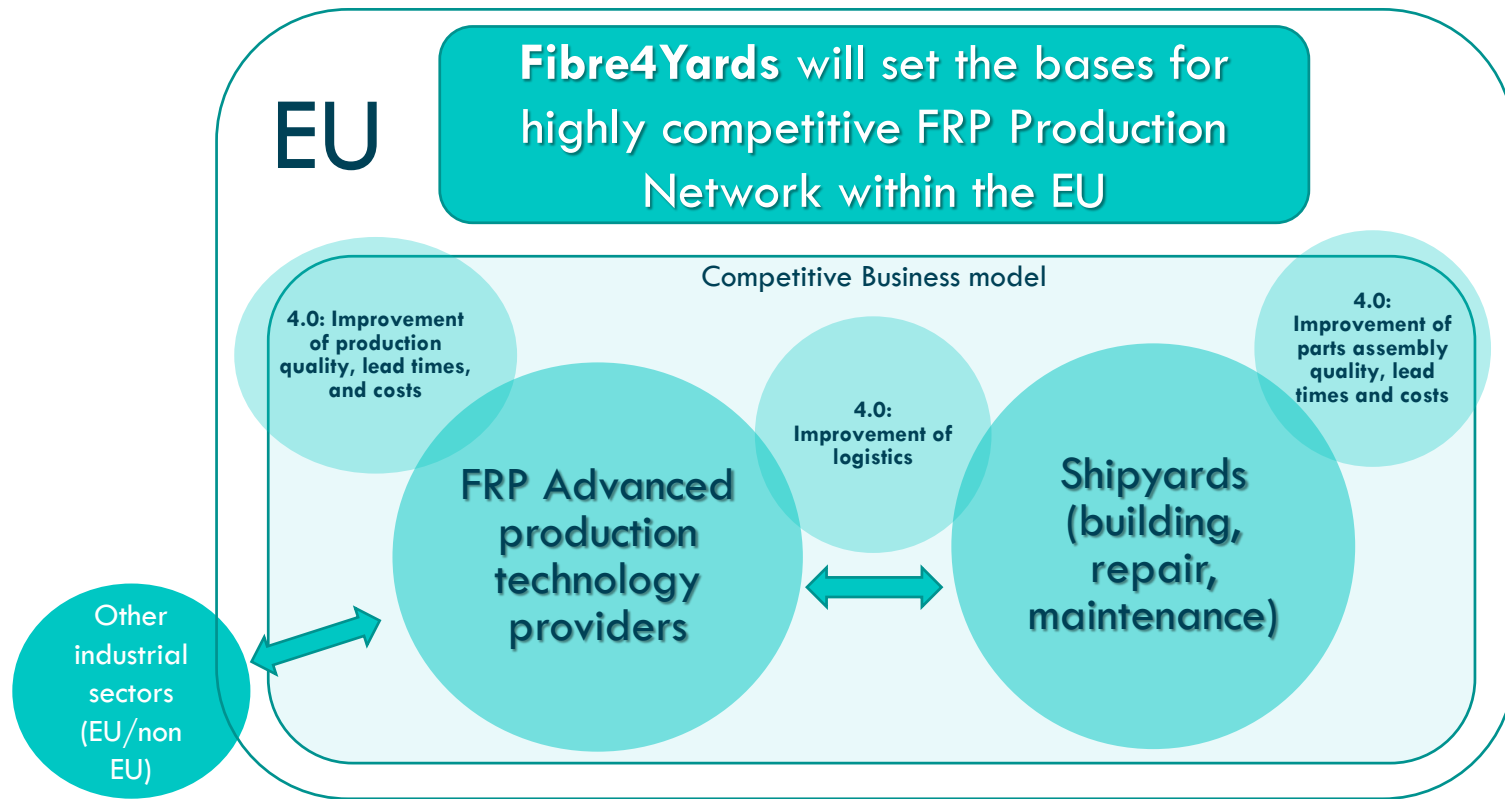
FIBRE4YARDS has the resources, and has brought together a consortium with the expertise and the willing to improve productivity of European shipyards.

This will be achieved by implementing automatized production methods that will allow a modular construction of the ship, which will be constructed in a new shipyard redefined in a 4.0 environment.

New developments will take into account the ship LCA, and the new ships will be redesigned to adapt them to the new production technologies.

Finally, FIBRE4YARDS will develop a business plan in order to maximize the impacts of the project.

SUMMARY (conceptual)



Thank you !

fibre4yards@cimne.upc.edu

xmartinez@cimne.upc.edu

danielsa@compassis.com

