



FF4EuroHPC Success Story

HPC-based Design of Wind Assisted Propulsion Technology

Organizations

AYRO is a French SME that designs, manufactures and delivers the wind propulsion system Oceanwings®.

ToolsPole is an Estonian SME that develops the software BREVA for the automation of design workflows.

Universita'della Svizzera Italiana is a public university in Switzerland and **Politecnico di Milano** is the largest scientific-technological university in Italy.

CINECA is the largest Italian supercomputing centre.



End User



Domain Experts



ToolsPole
LIGHTEN YOUR FLOW



Universita'
della
Svizzera
Italiana



POLITECNICO
MILANO 1863

HPC Provider

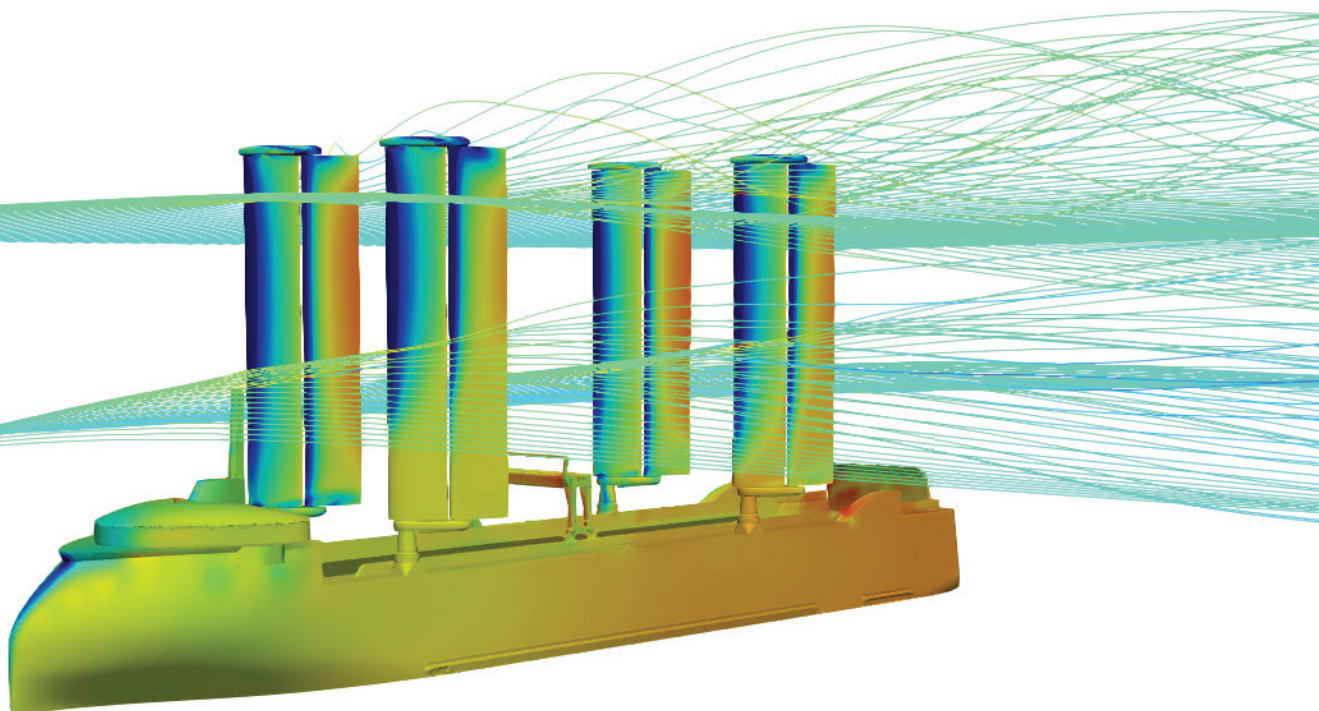
CINECA

CINECA is part of the Italian NCC.



The Challenge

AYRO has created Oceanwings®, a rigid wing technology, consisting of a two-element articulated wingsail generating forward thrust through aerodynamic lift. It is controlled by automated AI software optimizing the wing's angle of attack and camber in real time to maximize thrust and save up to 45% of a ship's fuel consumption. AYRO aims to further optimize the design of the sail, adapt it to different ships and to improve the control software.





Industry Sector
Maritime

Technology used:
**CFD Simulation,
HPC**

The Solution

PoliMi, AYRO and CINECA developed a robust and easy-to-use tool to automatically launch OpenFOAM CFD simulations on HPC systems.

Simulation results are included in ToolsPole's BREVA software environment, which, based on a Bayesian optimizer developed by USI, finds the best trim of the wings with respect to optimal thrust, thereby providing information about optimal design of the wings and – at the same time - generating large databases to feed the AI-based control software.

The Impact

The experiment set up an HPC-based automated tool chain and workflow for extensive high-fidelity simulations and optimizations at an affordable cost with competitive time-to-solution, producing excellent results which benefit AYRO as follows:

- Improved performance of the AI on-board wing sail control software leading to higher fuel savings and thereby to follow-up business with existing customers willing to pay for algorithm upgrades.
- Improved design and thereby aerodynamic performance make Oceanwings® more competitive in terms of price/performance. A 10% increase in performance is possible with these new products with margins yet to explore for improvements.
- Easier generation of adaptive configurations allows AYRO to now make competitive offers for a variety of ships.
- Automation of the design workflow and use of opensource code speeds up the development process by a factor of 3 by allowing simultaneous computations without incurring prohibitive license costs.
- With improved designs and control software CO2 emissions can be further reduced.

Benefits

- AYRO expects an additional annual turnover of €300,000 due to the improved control software.
- Wing sails-related turnover is projected to increase by 300% by 2030.
- ToolsPole will increase its sales by up to €40,000 annually due to improved technology toolchains.
- CINECA could gain additional business as an HPC supplier approx. €20,000 per year.