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www.zhenit.eu

Zero waste Heat vessel towards relevant  
Energy savings also thanks to IT technologies

# ZHENIT



## PROJECT CONSORTIUM

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ZHENIT Project

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 THERMAL ENERGY STORAGE (TES) FOR OPTIMAL WHR	 ON-BOARD ADVANCED MONITORING	 HYBRID PROPULSION (WINGSAIL)
 INTEGRATED CONTROL FOR WHR MAXIMISATION	 Isobaric Expansion (IE) Engine WH-to-mechanical work	 Adsorption System WH-to-cooling and Desalination
 Innovative ORC integrated with HP with ejector WH-to-Trigeneration	 70°C > 100°C	 > 100°C

## FUNDAMENTALS

# THE PROJECT

In 2018 the International Maritime Organisation – IMO – released a directive to target the 50% reduction of greenhouse gas - GHG - emissions due to international maritime transport by the 2050, by boosting the maritime logistic sector to be more sustainable.

The ZHENIT project develops a strategy to that contributes to decarbonise the maritime transport by using innovative waste heat recovery – WHR - solutions, already available for terrestrial and maritime applications, to be exploited more extensively onboard to reduce pollutants also in hoteling/harbour conditions.

Furthermore, ZHENIT combines the zero waste heat solutions with ICT monitoring and energy management solutions, thermal energy storage and a hybrid propulsion system aiming to reduce ship emissions both in harbour area and open sea. ZHENIT will prove the capabilities of different WH-to-X solutions and their key role for shipping sector by validating on board of a pilot cargo vessel and in laboratory conditions.

 <p><b>11 PARTNERS</b></p>	 <p><b>42 months</b></p>	 <p><b>7 Countries</b></p>	 <p><b>4.4M Funding</b></p>
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# AMBITION

ZHENIT aims to promote WHR as key and “ready-to-scale up” solutions to reach the decarbonization targets by validating different systems at various temperature levels, for different end-product (cooling, power, desalination) and optimizing integration/performance thanks to Thermal Energy Storage (TES). ZHENIT valorizes WH via different WH-to-X solutions:

- WH-to-Trigeneration via innovative recuperated ORC integrated with a HP with ejector ( $T > 100^{\circ}\text{C}$ )
- WH-to-Cooling and Desalination via an adsorption system ( $70 < T < 100^{\circ}\text{C}$ )
- WH-to-Mechanical Work (e.g. for fuel compression) via an isobaric expansion (IE) engine ( $T < 100^{\circ}\text{C}$ )

These solutions straight forward to making the shipping sector more sustainable, accessible and clean.

 <p><b>DIGITAL</b></p>	 <p><b>SUSTAINABLE</b></p>	 <p><b>PROPULSION</b></p>
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# THE APPROACH

Thanks to its validation campaign on-board of a cargo vessel and in laboratory conditions ZHENIT will showcase how WH-to-X, if properly integrated with Digital Solutions (energy monitoring and optimized management) and hybrid propulsion (wingsail), can bring up to a 25% reduction of vessel energy consumption. Validation results will drive a replication roadmap (at regulatory and economic level) towards 2027-2030 marketability of ZHENIT solutions.

	during zhenit		beyond zhenit	
	2022	2024	2026	2028
<b>RESULTS</b>	<ul style="list-style-type: none"> <li>- Design and realization of WH-to-X technologies</li> <li>- WH and Energy audit Tools</li> </ul>	<ul style="list-style-type: none"> <li>- Validation Campaign</li> <li>- Business Model, Environomics Analysis</li> </ul>	<ul style="list-style-type: none"> <li>- Further Replicability Studies</li> <li>- WH-to-X technologies at TRL9 and further integrability with on-board systems</li> <li>- Higher Scale Demonstration on board</li> </ul>	<ul style="list-style-type: none"> <li>- Targeting «Zero WH vessel» ready to sail integrating digital solutions too</li> </ul>
<b>BUSINESS</b>	<ul style="list-style-type: none"> <li>- Cost analysis for preliminary market value setup</li> <li>- Stakeholders Workshops</li> <li>- Analisis of the EU Standards</li> </ul>	<ul style="list-style-type: none"> <li>- Business Model Agreement (Partners as Licentiary Provider)</li> <li>- Extra EU replicability Analysis</li> </ul>	<ul style="list-style-type: none"> <li>- Identification of first vessel for refitting and agreement with licentiary, consulting engineering services for feasibility studies and scale up (Royalties Agreed)</li> </ul>	<ul style="list-style-type: none"> <li>- Promotion of ZHENIT Vessels among shipping Stakeholders and in the identified EU markets</li> </ul>
	<b>Industrial Manufacturer laboratory tests (TRL4)</b>	<b>laboratory and la Naumon vessel campaign (TRL5-6)</b>	<b>Further Demonstration and Normative Analysis (TRL7-8)</b>	<b>JOINT VENTURE READY (TRL9)</b>

zhenit on the market