

# HERTIS

## Hybrid Exhaust Gas Cleaning Retrofit Technology for International Shipping

### ACCELERATOR FOR GREENER SHIPPING

The first ever use of accelerator technology on a sea-going ship

Horizon 2020 Mobility for Growth, Innovation Action project proposal within the topic LC-MG-1-8-2019

- We are offering solution to tackle one of the shipping industry's most pressing problems – its large-scale maritime emissions
- It is singular and cost effective technology dealing simultaneously with SO<sub>x</sub>, NO<sub>x</sub>, particulate matter and volatile organic compounds in the ship exhaust gases
- Its feasibility has been recently confirmed within the ARIES Proof of the Concept project
- It will help EU maritime and accelerator industries to regain their competitive edge and to improve our maritime trade footprint at the global scale

**HERTIS** links established scientific labs of **West Europe** with dynamic maritime industry of **South Europe** and vibrant research institutes of **North-East Europe**. It is unprecedented and truly Europe **trans-national** and **multi-disciplinary** undertaking, **linking together maritime and particle accelerator communities** under umbrella of the scientific research:

- » Joint endeavour of 12 partners from 8 European countries
- » World's leading research organisations – CERN and Fraunhofer FEP in the strong pan-European partnership with INCT, Riga Technical University and University of Tartu
- » Major shipping industry players – Grimaldi Group, American Bureau of Shipping, Remontowa holding, and Ecospray
- » Economical feasibility and business case will be impartially evaluated by leading business expert KPMG supported by Biopolinex
- » Environmental impact assessment expertise and objectiveness is ensured by Western Norway Research Institute
- » Supported by crucial stakeholders: TIARA and ARIES communities, EC, IT CG, and scrubber manufacturers



Fraunhofer



UNIVERSITY  
OF TARTU



WESTERN NORWAY RESEARCH INSTITUTE  
VESTLANDSFORSKING

#### Project info:

Total budget for 4 years: 6 131 418 EUR

Requested EU contribution: 5 027 620 EUR

Matching funds by industry: 486 275 EUR

Co-financed by Fraunhofer FEP and INCT: 633 865 EUR

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## Hybrid Exhaust Gas Cleaning Retrofit Technology for International Shipping



We are developing a compact, safe and highly portable hybrid exhaust gas-cleaning retrofit unit that combines an electron beam accelerator with improved wet-scrubbing technology

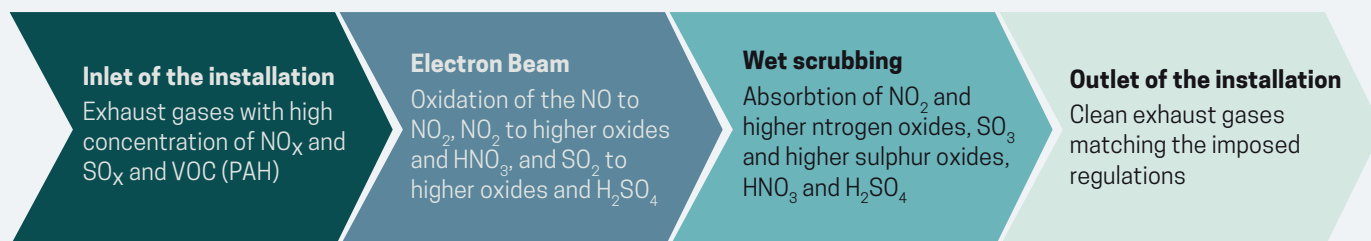


We will install the hybrid system on a ship and will test it both during sea voyage and while manoeuvring in ports – demonstration of technology in the relevant environment (TRL6)



This will achieve reduction of  $\text{SO}_x \leq 6 \text{ g/kWh}$  as  $\text{SO}_2$ , and  $\text{NO}_x \leq 1.96 \text{ g/kWh}$  as  $\text{NO}_2$  – thus exceeding the most stringent current legislative requirements. The PM emission should not exceed  $0.20 \text{ g/kWh}$

Principle of the hybrid EB-wet scrubber exhaust gas cleaning technology



**HERTIS goal** is to develop, demonstrate and validate a **novel hybrid exhaust gas cleaning retrofit technology**, providing the European maritime and accelerator community with a much-needed innovative, cost-effective retrofit solution that would substantially improve environmental performance of existing fleets by significantly reducing ship emissions of  $\text{NO}_x$ ,  $\text{SO}_x$ , PM and VOC (including PAHs).

- **Design, model, manufacture and demonstrate** on-board a unique hybrid ship exhaust gas cleaning retrofit system, comprised of EB accelerator and improved wet scrubber
- Develop a **novel toroidal type of EB accelerator** for the on-board exhaust gas cleaning retrofit system
- **Perform economic and financial analysis**, including assessment of life-cycle cost-effectiveness of the exhaust gas cleaning retrofit system and creating the business case roadmap
- **Perform environmental impact analysis and life-cycle assessment** of the hybrid exhaust gas cleaning retrofit system
- **Define** operational, test and demonstration (in the maritime environment – statutory and class) **requirements** of the novel hybrid exhaust gas-cleaning retrofit system
- **Engage stakeholders** and link the **particle accelerator community with the maritime community**
- **Disseminate progress and outcomes** and facilitate maritime and accelerator communities **uptake**