



NEWSletter 4



December 2024

Two years of synergies

SYNERGETICS – Synergies for Green Transformation of Inland and Coastal Shipping – the Innovation Action funded by the Horizon Europe programme of the EU has successfully completed 24 months of establishing synergies for the sector of inland and coastal shipping. Based on the sound understanding of the actual possibilities for greening through retrofit, the **SYNERGETICS** approach aspires to provide a proper meaning to the expression “low hanging fruits” when it comes to maturity of available solutions.

The year 2024 has proved to be an exciting period for **SYNERGETICS**, with notable advancements in the majority of the ongoing demonstrations. Deliverables have been submitted in a timely manner, and the first period reporting has been successfully completed. Furthermore, the **SYNERGETICS** consortium has demonstrated considerable proficiency in addressing the various challenges that arose, showcasing maturity and expertise.

The year commenced with the presentation of **SYNERGETICS** at the Transport Research Arena 2024, including the submission of a paper, titled "Exploration and Synchronisation of Greening of Shipping by Means of Retrofit: The **SYNERGETICS** Perspective", authored by Igor Bačkalov, Elimar Frank, Benjamin Friedhoff, Alex Grasman, Justin Jasa, Niels Kreukniet and Martin Quispel. A further scientific publication produced by the **SYNERGETICS** partners increased awareness among stakeholders and extended the outreach of the project. Entitled "Renewable Hydrogen Supply Scenarios for Inland Waterway Transport in Europe", this publication was authored by Elimar Frank and Luca Stauss.

The General Assembly, held in Gothenburg on the 13 and 14 June, constituted the highlight of the summer. It offered an ideal setting for the partners to present the achievements of the first 18 months of the project, as well as to discuss the challenges encountered and the strategies deployed to overcome them.



Merry Christmas and a **synergetics** New Year 2025

The mid-term conference in Brussels on 5 November represented the culmination of the year's activities. It provided an opportunity for project partners to engage with representatives of the inland shipping industry, European institutions, equipment manufacturers and a range of other stakeholders. The concluding event of the year, the Technology Transfer Workshop held in Antwerp in collaboration with the EU-financed project Platina4Action and the European Inland Waterway Platform, provided a further occasion to foster synergies.

We are grateful for your support in 2024. We promise you an amazing 2025 filled with exciting synergies.



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Activities – Mid-term Conference

The **SYNERGETICS** Mid-term Conference, titled *"Energy Transitions in Inland and Coastal Shipping"*, convened in Brussels on 5 November. The event featured three keynote speeches, a dynamic panel on lessons learned from implementing greening technologies, and eight expert presentations exploring technical, financial, regulatory, and policy dimensions of sustainability.

The programme included contributions from Muhammed Elemenler on policy frameworks, Benjamin Friedhoff presenting the **SYNERGETICS** vision, and Benjamin Boyer addressing regulatory developments. The synchronisation session comprised a panel discussion led by Niels Kreukniet, which included insights from industry leaders such as Joaquim Demeyer, Lukas Haag, Bo Salet and Matthias Schubert.



Synchronisation session - panel discussion (left); Matthias Schubert presenting Torqeedo's lessons learned (right)

Highlights included Marcello Leonardi's overview of EIB financial products, Matthieu Renault's insights into decarbonising rolling stock, and Martin Quispel's analysis of policies shaping retrofitting for greener shipping, emphasising **SYNERGETICS'** vital role in the transition to sustainability.

Work Package 2 – Lessons from past pilots

The drive to reduce the carbon footprint of coastal and inland vessels encounters considerable challenges, as evidenced by recent findings from Task 2.2, part of deliverable D2.2. The study, which comprises desk research, interviews and workshops on pilot projects, reveals a restricted range of practical decarbonisation solutions and identifies the principal obstacles impeding their widespread implementation.

Although technologies such as hydrogen, methanol and battery-stored electricity represent promising energy sources for vessels, their adoption remains slow. The high capital expenditure (CAPEX) required for retrofitting older vessels, worsened by price increases due to the

impact of the global pandemic and the ongoing war in Ukraine, represents a significant barrier to adoption. Furthermore, the lack of legal frameworks that incentivise the use of green vessels leaves the financial burden squarely on operators.

Operational expenditure (OPEX) also poses challenges. Although renewable fuels can sometimes reduce costs (e.g. electrical operations - important for battery electric and fuel cell propulsion - are said to reduce operational costs due to lower maintenance needs and higher efficiency), they still remain more expensive than fossil fuels, putting vessels using these alternatives at a competitive disadvantage. The





lack of long-term contracts with clients willing to pay a premium for decarbonised transport further complicates the situation. Many operators are awaiting governmental support to make renewable solutions more viable in the market.

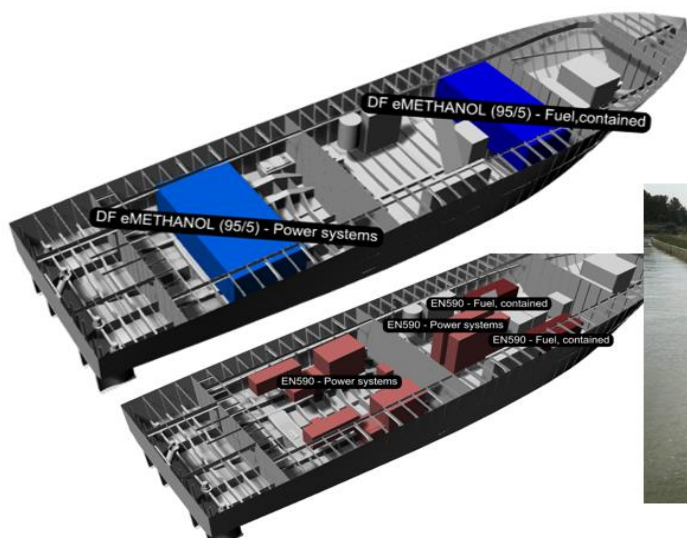
Infrastructural development for alternative energy sources along waterways and ports is another critical factor. Existing networks are not easily adaptable, and setting up new bunkering points or electric power supply is both costly and complex. This is compounded by a "chicken-and-egg" dilemma, where the lack of infrastructure deters operators, while the lack of operators hinders infrastructure development.

The report also highlights regulatory challenges, particularly with the Non-Road Mobile Machinery (NRMM) Directive, which restricts the use of hydrogen and methanol in new engines. Despite these barriers, one positive takeaway is the successful application of Hydrotreated Vegetable Oil (HVO) as a drop-in fuel for existing engines, offering a viable solution for greening efforts, though it falls outside the scope of this study.

While the research identifies some potential solutions, the slow progress reflects the broader need for regulatory, financial, and infrastructural support to drive the transition to greener vessels.

Work Package 3 – Technology selection for the Viadonau push vessel

MARIN commenced the analysis of the optimal design of the power and energy systems for the vessel by identifying the operational requirements. This included an operational analysis to determine key tasks the ship would perform with distinct power demands over time. Three Bunker Independent Operations (BIO), which describe the operations the ship will carry out between two consecutive bunkering events, were identified, and their power profiles helped determine the endurance and power needs for technology selection. The selection process considered various technologies based on their volume, weight, cost, and emissions, revealing that some options, like battery-electric and fuel cell solutions, were not suitable. Consequently, a methanol dual fuel engine was chosen, offering the possibility of running on bio or synthetic fuels in the event that methanol is not available.



Bad Deutsch-Altenburg power and fuel system: diesel vs. methanol

Viadonau introduced an additional BIO for waterway maintenance following high-water events, and a second technology selection was conducted, resulting in the necessity for an augmented bunker capacity. This validated the feasibility of the methanol dual fuel solution for the vessel's dimensions.

The forthcoming phase of the project will entail the refinement of the system through the evaluation of a number of different propulsion configurations, including methanol electric propulsion and direct propulsion. The objective is to determine the optimal configuration for the system. Once a decision has been made, the chosen configuration will be finalised and integrated into the vessel's 3D model, marking the commencement of the basic engineering for the power and energy systems.





Work Package 3 - Progress of the methanol and hydrogen demonstrations

Within the scope of WP3 of the **SYNERGETICS** project, **ScandiNAOS** is tasked with demonstrating the performance of marine methanol dual fuel (DF) and compression-ignited methanol (MD97) engines. The two engines are evaluated according to four criteria: engine power, engine efficiency, diesel replacement ratio and emission levels. The tests have been conducted in accordance with the ISO 8178 standard, and the results will be delivered by the end of this year.

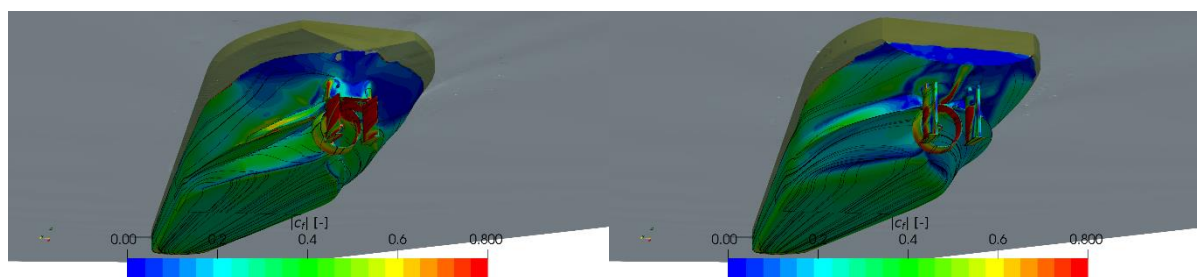
Significant progress has also been made with Demonstrator 1. **CMB Tech** has installed the hydrogen engine on the dyno. Subsequently, the calibration of the fuels, the emission certification and class approval will be conducted.



CMB Tech Hydrogen engine on dyno

Work Package 3 – Hydrodynamic improvements of Ernst Kramer

The hydrodynamic improvement of Ernst Kramer reached the next milestone. After the baseline tests at **DST - Development Centre for Ship Technology and Transport Systems** had been completed in April, the multi-objective optimisation for representative combinations of load cases and water depths was performed. High-fidelity RANS CFD simulations were coupled with the parametric geometry in an automated optimisation environment. More or less identical displacement, same propeller diameter and similar minimum draught to ensure the resilience against low-water periods were used as design constraints. The design space exploration was followed by a response surface optimisation to determine the best combination of the selected design variables. Depending on the test conditions the best design showed power demands between 15% and 35% lower than the original ship.



Streaklines and flow separation zones on original (left) and optimised (right) aft-ships





The experimental verification of these results has just started, but the pictures below confirm the smooth ship wake for the new design on the right.



Experimental verification of the optimisation results in DST's large shallow water basin

Work Package 4 – Catalogue of Greening Technologies

One of the tools to be developed within the scope of **SYNERGETICS** is the Catalogue of Greening Technologies. By creating synergies between the knowledge from previous and ongoing research, the experiences from pilot projects, and the lessons learned from demonstrators, the Catalogue provides the most important information on the technical solutions with respect to the potential for greening, technology maturity, energy carrier availability, and retrofit feasibility, and provides the basis for a matching of the solutions with the fleet families. The catalogue is organised into items stored in a PostgreSQL database to ensure optimal utilisation within and beyond **SYNERGETICS**. This structure allows for reflection of dynamic technological developments, ensuring the content is always up-to-date.

The first version of the factsheets can be accessed via the project's website in the [Tools section](#). The readers of the Newsletter are invited to provide feedback to the Catalogue to the SYNERGETICS team.



Items in the current Catalogue of the Greening Retrofit Technologies



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Events

Danube Commission workshop

On 8 October, the **Danube Commission** and **EU Strategy for the Danube Region Priority Area 1a** hosted a workshop to discuss a roadmap for a zero-emission Danube fleet. Nearly 100 participants, including fleet operators and navigation authorities, attended.



Benjamin Friedhoff presented an overview of promising zero-emission solutions for European inland navigation, outlining their benefits, challenges, and future trends. With **SYNERGETICS Pilot Database** as a point of departure and considering the evolution of the greening pilots, an analysis of the observed trends has been conducted, outlining the projected evolution of greening technologies up to 2050. The presentation was met with considerable enthusiasm, stimulating both formal and informal discussions.

More of the event can be found [here](#).

2nd Technology transfer Workshop

In collaboration with the European Inland Waterway Platform and the PLATINA4Action project, **SYNERGETICS** organised the 2nd technology transfer workshop on the greening of the inland waterway fleet on 4 December in Antwerp. The event targeted Belgian and French ship owners and operators and showcased emission-reduction technologies through demonstrations and discussions.

Igor Bačkalov presented the **SYNERGETICS Catalogue**, providing a comprehensive overview of innovative greening technologies for inland navigation and coastal shipping, with a specific focus on the possibilities for reduction of power demand by hydrodynamic improvements. The workshop featured three greening case studies, whose success stories, lessons learned and the transfer of practical experiences feed into the Catalogue via the **SYNERGETICS** activity Exploration.

Danube Port Days 2024

The Danube Ports Days 2024, hosted by the **Danube Commission** and **Pro Danube** on 29 -30 October in Budapest, showcased pioneering strategies for sustainable multimodality in inland waterway transport (IWT). The event, supported by EU-funded initiatives such as MultiRELOAD, Green Inland Ports Study, and **SYNERGETICS**, convened policymakers, industry leaders, and stakeholders to explore solutions for climate-neutral European inland shipping.

Key themes included eco-friendly modal shifts, emission measurement, green energy initiatives, and digitalisation tools revolutionising port operations. Day two spotlighted the **SYNERGETICS** project, featuring a panel discussion on strategies to achieve emission targets, moderated by Manfred Seitz of the Danube Commission.

Speakers from the **SYNERGETICS** consortium shared expertise and achievements. Benjamin Friedhoff (**DST**) presented pilots and the *Catalogue of Greening Retrofit Solutions*, offering scalable emission reduction measures. Gianluca Giurco (**MARIN**) highlighted propulsion and energy innovations, while Esther Poortstra (**ZES**) showcased inland vessel electrification.



An informal **SYNERGETICS** workshop facilitated knowledge sharing on emission strategies and pilot projects. These discussions emphasised collaboration, practical tools, and cutting-edge technologies to drive greener, multimodal transport in the Danube region.

Presentations of the event can be found [here](#).





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DST – Entwicklungszentrum für Schiffstechnik und Transportsysteme e. V. (DE)

Partners:

SPB – Stichting Projecten Binnenvaart (NL)
 Scandinaos AB (SE)
 MARIN – Maritime Research Institute Netherlands (NL)
 viadonau – Österreichische Wasserstraßen-GmbH (AT)
 TTS – Transport Trade Services GmbH (AT)
 ZT Büro Anzböck Richard (AT)
 EUFRAK – Euroconsults Berlin GmbH (DE)
 CRS – Hrvatski Registar Brodova (HR)
 OST – Ostschweizer Fachhochschule (CH)

Argo-Anleg GmbH (DE)
 FPS – Future Proof Shipping (NL)
 Mercurius Shipbuilding BV (NL)
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