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2025: The year of the European Unions´s industrial maritime strategy

In 2024, SEA Europe achieved a significant milestone in its advocacy efforts with the European Union's recognition of the need for an industrial maritime strategy for European shipyards and maritime equipment manufacturers.

The journey towards this recognition was lengthy and challenging but gained significant momentum with the political support from the European Parliament, the European Commission's administration, the Competitiveness Council of Industry Ministers, the report on "The future of European competitiveness" by Mario Draghi, and the Mission Letter from European Commission President von der Leyen to Transport Commissioner Tzitzikostas.

The report by Mr. Draghi was powerful in its recognition of the importance of Europe's maritime industrial base and its naval dimension, its emphasis on the strong connections between commercial and naval shipbuilding and its plea for Europe to regain leadership in ferries, energy transport, and research vessels. Mr. Draghi also highlighted the importance for Europe to achieve global leadership in producing floating technologies and supply vessels for offshore wind installation and maintenance.

As we move into 2025, SEA Europe is ready to engage in the forthcoming but crucial political discussions with the European Commission and maritime stakeholders on elaborating the much-needed industrial maritime strategy.

This strategy will build on the recently published Clean Industrial Deal, which aims to combine the EU's climate agenda with a policy of reindustrialization. This policy of reindustrialization will also apply to shipbuilding, which is again considered strategic in a world of geopolitical tensions and less reliable partners, with shipyards and maritime equipment manufacturers considered as the key enablers to achieve the EU's climate goals for waterborne transport and a strong and efficient industry to build Europe's naval defence.

In the coming months, SEA Europe will actively contribute to the discussions on an industrial maritime strategy, with the concrete proposals presented in its manifesto of April 2024. These proposals cover the competitiveness of European shipyards and maritime equipment manufacturers, the demand for sustainable and digitalized vessels, the continuation of the co-Programmed Partnership on Zero-Emission Waterborne Transport and the setup of a similar partnership for the digitalization of waterborne transport, and better access to the EU's public money as well as to private financing for maritime investments.

In a world of increased trade protectionism and trade wars, the ability to rely on its own strategic industry for shipbuilding and maritime equipment manufacturing is crucial for Europe's naval capabilities, economic security, social impact on local communities and strategic autonomy. After two decades of limited political interest in shipbuilding and maritime equipment manufacturing, the time has come to take decisive and impactful actions that will allow Europe to consolidate its global leadership in complex shipbuilding (including cruise shipbuilding), take advantage of emerging markets in the Blue Economy and regain lost but strategic markets for Europe (e.g., shortsea shipping).

As President of SEA Europe, I am pleased to contribute with my shipbuilding experience to these political discussions. I also anticipate Aclunaga's full support in these discussions, as we all need to be positive contributors in shaping the future industrial horizon of Europe. We need to remain focused on a very simple and clear idea, only a more integrated, cohesive and cooperative Europe can guarantee a peaceful future for the next generations.

Alberto Maestrini
President of SEA Europe

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Retrofit to new fuels

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CT ENGINEERING DRIVEN PEOPLE

On July 25, 2023, the Council of the European Union approved the FuelIEU Maritime Regulation for the decarbonization of the maritime sector as part of the Fit for 55 climate package, which aims to reduce net greenhouse gas emissions by 55% by 2030 (compared to 1990) and achieve climate neutrality by 2050.

The objective of this regulation is to promote renewable and low-carbon fuels in the maritime sector, aiming to reduce greenhouse gases without compromising the competitiveness of the internal market of the European Economic Area.

This regulation proposes a gradual reduction of emissions from maritime fuels from 2% in 2025 to 80% in 2050, in addition to incentivizing non-biological renewable fuels due to their high decarbonization potential.

In addition to addressing fuel-related issues, it mandates that passenger ships and container ships with extended port stays maintain a shore power connection starting in 2030, aiming to reduce pollution in areas that are typically densely populated.

After Articles 8 and 9 of the regulation came into effect on August 31, 2024, this new legislation has been fully in force since January 1, 2025, along with one of the major mechanisms facing the sector: its inclusion in emissions trading with the aim of reducing GHG emissions by 43% in 2030 compared to 2025.

From January 1, 2024, maritime transport activities have been integrated into the European Union Emissions Trading System (EU ETS), thanks to the amendment of Directive 2003/87/EC, affecting all ships of over 5,000 tonnes operating in the areas defined by it regardless of the flag under which they sail.

From January 1, 2025, the threshold has been reduced to 400 tonnes under the MRV Regulation (Monitoring, Reporting and Verification).

Under this regulation, ships will have to declare and pay:

- 50% of the emissions from voyages between a port in the EU, Norway, or Iceland and a port outside the EU, Norway, or Iceland.
- 100% of the emissions from voyages between two ports in the EU, Norway, or Iceland.
- 100% of emissions from ships at berth in EU, Norwegian or Icelandic ports.

Additionally, the regulation initially covers carbon dioxide emissions, expanding in 2026 to include the phenomenon known as methane slip from incomplete combustion and nitrogen oxides, although these gases have already been included under the MRV Regulation since January 2024.

Starting in 2025, 40% of the emissions generated throughout 2024 will be paid, based on a gradual implementation of the mechanism that will be developed in 2026, with 70% of the emissions from 2025 being paid and 100% of the emissions generated in 2026 being paid.

Figure 1. On the left, the current routes; on the right, the routes with stops at North African ports to evade EU ETS control and avoid paying 50% of the emissions. Source: CENIT.

This new legislation has a direct impact on the positioning of the maritime sector in the coming years; first from the standpoint of commercial routes, and second from the perspective of modifications that will need to be made on board existing ships, known as retrofits.

Regarding route changes, the study conducted by the Transport Innovation Center (CENIT) in Barcelona on the main container routes between Spanish ports and eight routes between America and Europe, along with six routes between Asia and Europe, has revealed that the entry into force of this regulation may lead to the creation of CO2 tax havens in areas very close to each other in the Strait of Gibraltar and the Mediterranean, due to the proximity of the African and European coasts.

The study analyzes the impact of the reorganization of maritime routes in southern Europe, focusing on costs, time, emissions, and carbon leakage, with an emphasis on container traffic, which accounts for 90% of maritime goods. The results indicate that although the reconfiguration would reduce costs for shipping companies, it would increase emissions and lead to significant tax evasion on transatlantic and eastern routes.

On transatlantic routes, six out of eight would save costs, but emissions would increase between 0.5% and 24% in the long term. Eastern routes reflect an emissions increase of between 1% and 5%, with significant carbon leakage on all routes.

Regarding retrofits, several shipping companies have been implementing an emissions reduction strategy for years by installing carbon capture systems, gas scrubber towers, wind-assisted propulsion, or by modifying engines for the use of alternative fuels such as methanol, hydrogen, ammonia, and increasingly, vessels that operate on Liquefied Natural Gas (LNG).

If one compares the impact on emissions reduction between LNG and methanol, LNG would allow a reduction of sulfur oxides of up to 99%, nitrogen oxides by between 85-90%, and carbon dioxide by between 20-25%. In addition, it is highly competitive in terms of operating cost thanks to its higher energy density.

On the other hand, methanol eliminates sulfur oxides, reduces nitrogen oxides by 60%, and cuts carbon dioxide by 15%. It is easier to handle and store due to its liquid state at room temperature. However, its lower energy density results in higher costs per mile.

CMA CGM actively uses LNG in its fleet, with the vessel CMA CGM Jacques Saadé being the first large container ship entirely powered by LNG. With this change, a 99% reduction in sulfur oxide emissions, a 92% reduction in particulate matter, and up to a 20% reduction in carbon dioxide emissions have been achieved.

In fact, Norway's fishing industry has led various retrofit projects to adopt cleaner fuels, especially biogas and 100% electric systems, to comply with the stringent environmental regulations of the Nordic country, as evidenced by the Karoline, Libas, and Harvest vessels, among others.

In this regard, the Xunta de Galicia, through the Consellería del Mar's General Directorate of Fisheries, is working together with the Superior Technical School of Nautics and Machines of the University of A Coruña to anticipate both the technological needs that will have to be implemented on board fishing vessels as a result of fuel changes, and the training of the crew for their use and control.

Although LNG has a more established market compared to other low-carbon fuels due to the extensive experience gained in its handling, this does not mean it is the only option being implemented.

In April 2015, Stena Lines began operating the world's first ship with a dual engine powered by MGO and methanol, the Stena Germánica, achieving significant reductions in sulfur emissions, nitrogen oxides, and carbon emissions.

The choice of one fuel over another will depend on its availability along operating routes and market conditions, among other factors. Proof of this is MAN's successful conversion of the main engine on the Maersk Halifax—a 15,000 TEU vessel that entered service in 2017 and was originally powered by a MAN B&W 8G95ME-C9.5 engine. Its retrofit to an

Figure 2. Viking Energy. Photo by Peter Tubaas / Equinor.

8G95ME-LGIM Mk10.5 engine allows the Maersk Halifax to operate on green methanol, making it possible to reduce its carbon dioxide emissions by up to 90%.

Regarding the use of ammonia in the sector, although promising, it is currently being established based on prototypes.

The vessel Viking Energy, operated by Eidesvik Offshore in collaboration with Equinor within the framework of the European ShipFC project, is the world's first ammonia-powered vessel and features Wärtsilä as its engine supplier. This project, funded by the European Union, aims to consolidate the use of ammonia fuel cells to completely eliminate CO_2 emissions during its operations.

In this regard, the project by Mitsui O.S.K. Lines (MOL) and MAN Energy Solutions stands out for developing dual combustion engines capable of operating with both ammonia and the traditional fuels used in the industry. The project is focusing on container ships and bulk carriers, with the intention of conducting commercial trials during 2025.

From the hydrogen perspective, there are several small vessels where its viability is being tested. The catamaran Hydroville, launched in 2017, uses compressed hydrogen as fuel in an internal combustion engine, and the Topeka, a ro-ro vessel developed by Wilhelmsen in Norway, is designed for cargo transport using hydrogen fuel cells.

Currently, reducing the use of fossil fuels is essential to achieve the zero-emissions target set for 2050. However, the maritime sector will face a long adaptation process during 2025 to comply with the new regulations and consolidate the technological advances that are being achieved.

The main role of alternative fuels in the maritime industry will likely be as part of the synthetic fuels developed before 2050. In this context, natural gas, followed by methanol, will lead the transition towards an emissions-free future, while progress continues on solutions for ammonia and hydrogen.

No single solution exists for the complete decarbonization of the maritime sector. Although the market has adopted LNG as a transition fuel, fuel blends and synthetic fuels appear to be the most viable options to achieve the targets set for 2030, while at the same time minimizing the economic impact of including the maritime sector in the European emissions market.

All the revolution taking place in the maritime sector and globally will lead to the need for qualified professionals with extensive knowledge of new fuels and technologies.

In this regard, The CT Engineering Group is committed to training and raising awareness among all its personnel about environmental protection, and it is involved in projects such as the Erasmus+ **GREEN European Vet Network**. This project contributes to fostering environmental skills in future professionals through higher education and vocational training, thereby supporting the ecological transition in various economic sectors by integrating these skills into curricula, as well as in the training of teachers and trainers and professional development.

Our role in this project is clear: to identify, develop, test, and evaluate innovative approaches for a "greener" education that have the potential to be generalized across all systems, countries, and contexts, improve education and training systems, and contribute to enhancing policies and practices in the field of education and training within the most important industrial sectors, including the maritime sector. A role that aligns with the company's values of sustainability, profitability, and leadership.

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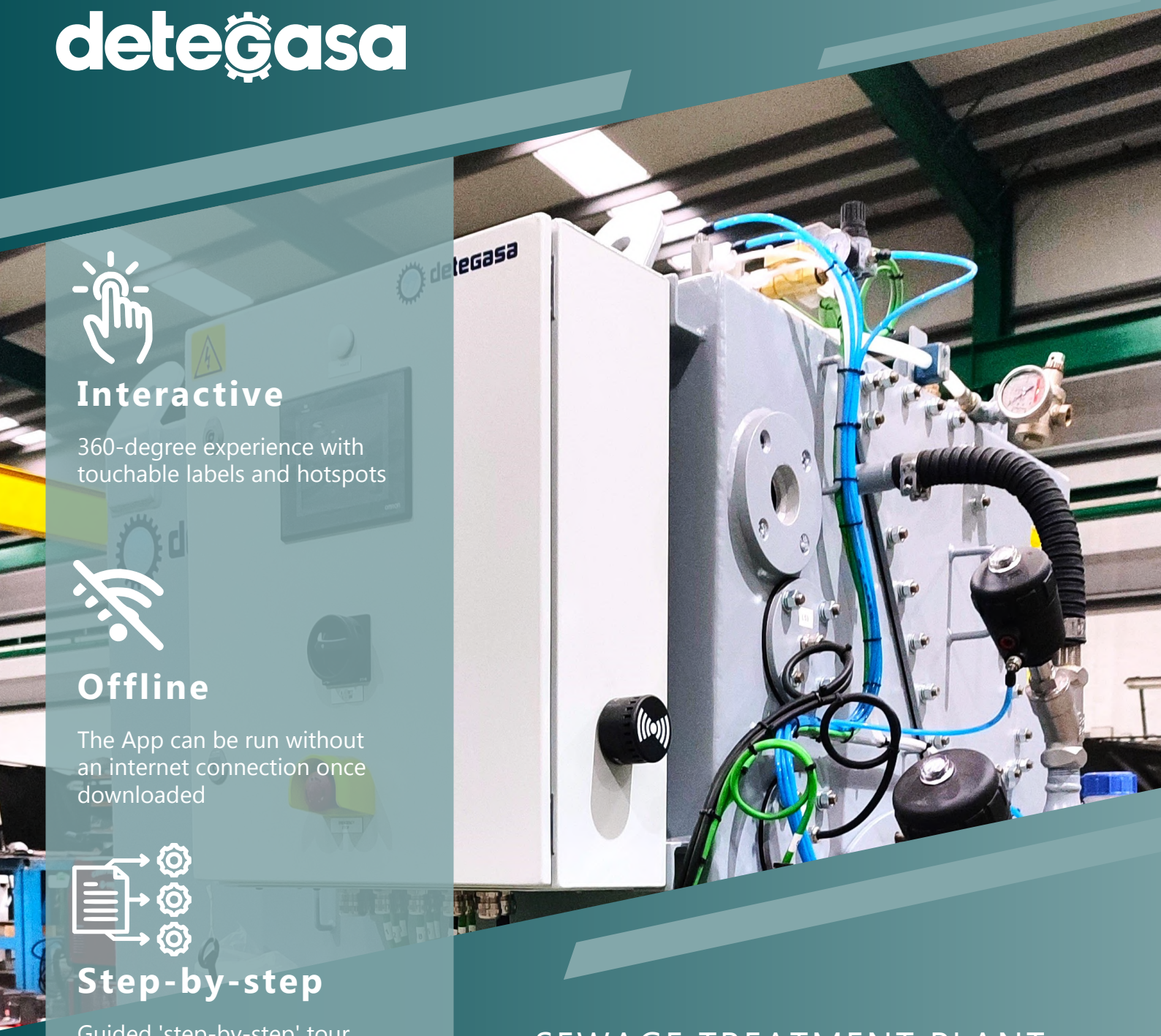

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Energy-saving devices: key technology for energy efficiency in maritime transport

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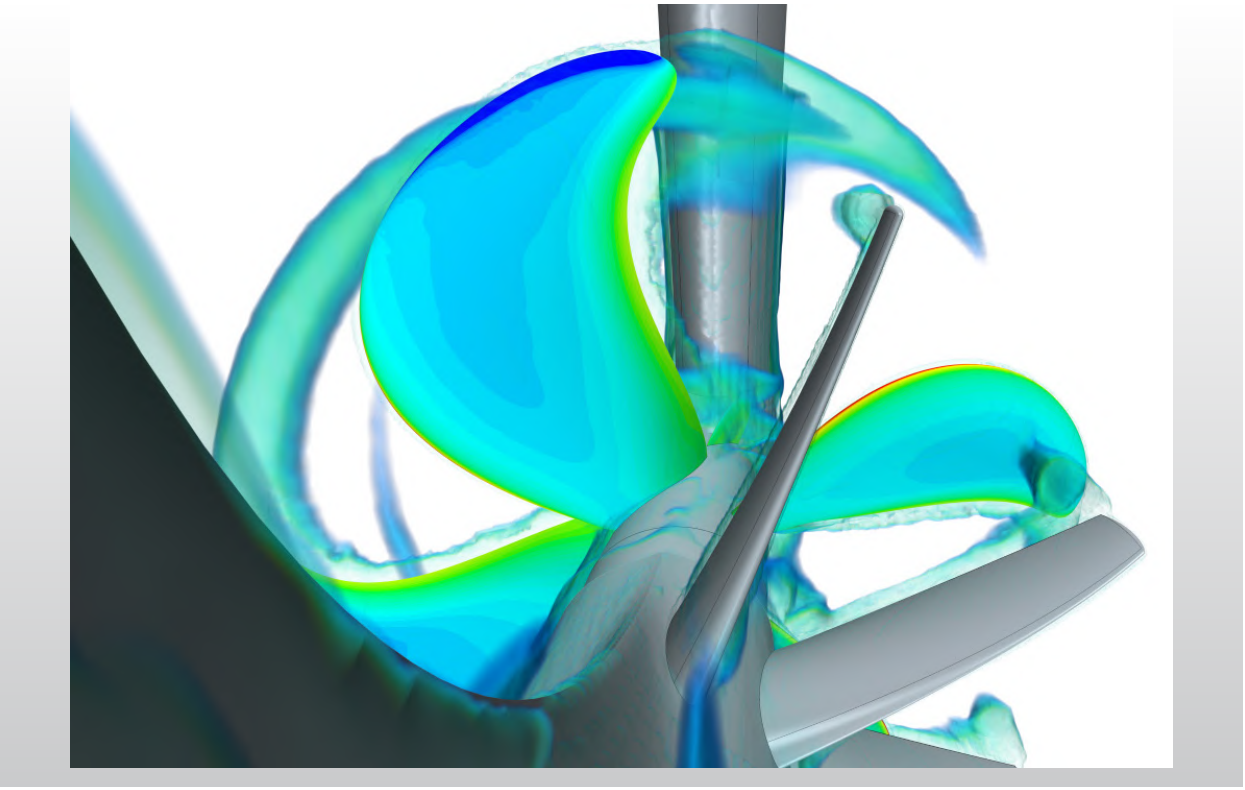


In a context of increasing regulatory pressure and the need to improve the sustainability of maritime transport, Energy Saving Devices (ESDs) have established themselves as effective and cost-efficient solutions for reducing fuel consumption and pollutant gas emissions. During a recent webinar organized by VICUSdt, a naval engineering company specialized in propulsive efficiency, the most relevant technologies, their advantages and challenges, as well as real case studies of application, were discussed in detail.

The regulatory challenge and energy efficiency

Compliance with current regulations such as the EEXI (Energy Efficiency Existing Ship Index), the CII (Carbon Intensity Indicator), and the EU Emissions Trading System (ETS) has created an urgent need for shipowners and operators to adapt their fleets. In this context, ESDs emerge as a viable strategy that enables compliance with the requirements without resorting to major structural modifications or disproportionate investments.

What are ESDs and why are they effective?

ESDs are devices installed in the propulsion area that modify the water flow reaching the propeller, optimizing its performance. This results in improved propulsive efficiency by enhancing the ship's various propulsion coefficients, such as the relative-rotative efficiency, thereby reducing the power required to generate the same thrust.

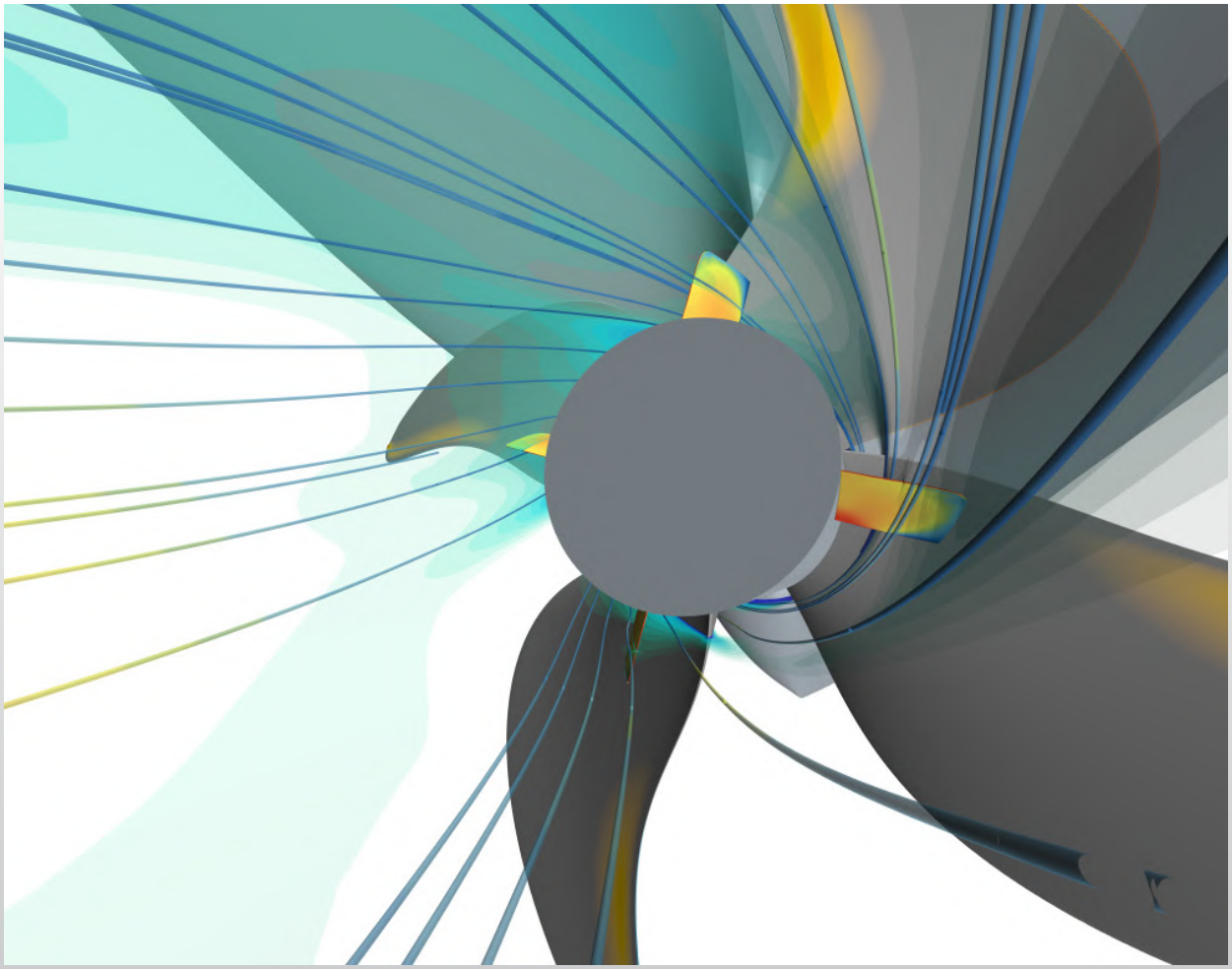
In addition, some ESDs help recover part of the energy that would normally be lost in the generation of hub vortices.

Through CFD (Computational Fluid Dynamics) simulations, it is possible to design customized solutions that ensure optimal interaction between the hull, the propeller, and these devices.

Types of ESDs and their characteristics

During the seminar, the main types of devices available on the market were analyzed:

- **Pre-Swirl Stator (PSS):** located upstream of the propeller, it acts on the flow rotation, improving relative efficiency. It is an affordable device, easy to install, and adaptable to different hull types. However, its ability to influence the flow is limited, and by modifying the wake, it can alter the operating point of the propeller. Its efficiency improvement ranges between 1% and 6%.
- **Pre-Duct:** an older yet still relevant technology. It improves the inflow to the propeller, especially in ships with high block coefficients. Its efficiency gains can range between 1% and 6%, although its



transport, alignment and installation require careful planning and additional costs.

- **PBCF (Propeller Boss Cap Fins):** fins mounted on the propeller cap that recover part of the vortex generated behind the hub. It is inexpensive and easy to install, even underwater, but its effectiveness is limited (0.5% to 1.5%).

- **Rudder bulb and fins:** devices mounted on the rudder, also focused on reducing the vortex generated at the hub. They generally offer better results than the PBCF (between 0.5% and 3%), although they cannot be installed underwater and require modifications to the cap in some cases.

- **Propeller redesign:** although not an ESD per se, redesigning the propeller to adapt to the new conditions created by the ESDs can significantly improve performance. The efficiency gains range from 1% to 5%, although the cost and complexity of the redesign must be taken into account.

Combination of devices

One common mistake is to assume that savings percentages can be directly added when combining ESDs. In practice, energy cannot be recovered twice. For example, if a pre-duct and a PBCF are installed, the latter may have marginal performance if the flow in the hub area has already been optimized, as the remaining vorticity in the hub will be lower and the ESD located downstream of the hub may even be counterproductive. Proper selection and return on investment (ROI) analysis are essential.

Importance of full-scale analysis

Model-scale tests (towing tank trials) can overestimate the benefits of certain ESDs due to scale effects, especially for devices in which the boundary layer plays a significant role. Therefore, it is essential to complement these trials with full-scale CFD studies and compare them with sea trial results. This methodology ensures more realistic predictions of the devices' performance in actual operation.

In the case of Pre-Duct nozzles, they often show overly optimistic values in towing tank tests due to the high thickness of the boundary layer at model scale, which underestimates the resistance generated by the nozzle itself. These improvements are significantly reduced when the analysis is performed at full scale, so it is important to evaluate the solution directly at ship scale.

Retrofitting and new designs

ESDs are especially useful in retrofitting projects, as they allow the energy efficiency of existing vessels to be improved without the need for major structural interventions. However, their integration into new designs from the conceptual engineering stage offers even greater benefits. Proper planning is essential to reduce installation costs and avoid delays during dry-docking.

An integral process:

from simulation to implementation

VICUSdt offers a comprehensive approach to the implementation of ESDs: technical and economic analysis, custom hydrodynamic design, manufacturing, and support during installation. This complete value chain ensures that each solution is optimized for the specific conditions of each vessel, backed by objective data rather than assumptions.

Real cases

During the webinar, several real cases were presented of vessels that have undergone a retrofit, where the results obtained in sea trials matched the previous CFD simulations. This reinforces the reliability of the methodology and demonstrates that, with a rigorous technical approach, it is possible to achieve realistic fuel savings—generally between 3% and 7%, depending on the vessel's configuration and the selected devices.

Conclusion

In a sector pressured by environmental regulations, fuel costs, and the need to remain competitive, ESDs represent an effective, adaptable solution with an attractive return on investment. However, their implementation requires a thorough technical evaluation, customized design, and a deep understanding of the interaction between hull, propeller, and water flow.

The experience accumulated by VICUSdt shows that there are no universal solutions, but there are effective methodologies to maximize propulsive performance in each case. Energy efficiency is not an option—it is a necessity. And ESDs are one of the key tools to achieve it.

AI will reshape the traditional shipbuilding industry

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Not a day goes by without hearing about artificial intelligence (AI). In some industries and sectors – particularly in industrial and manufacturing settings – it is already transformative, helping to automate more mundane, repetitive tasks or close the gap in worker shortages. Still, many people are sitting in meeting and conference rooms asking, "What are we going to do about AI?"

The U.S. National Artificial Intelligence Act of 2020 defined the term 'artificial intelligence' as "machine-based system that can, for a given set of human-defined objectives, make predictions, recommendations or decisions influencing real or virtual environments." We can think of AI today as a co-pilot, helping human workers gain a broader 360-degree virtual view of their environments, complete mundane tasks, and make more informed decisions, faster.

It may be surprising to learn that AI is already very much a part of the marine industry today and is poised to transform it even more in the future. For example, naval organizations around the world have been at the forefront of using AI for applications like autonomous navigation, predictive maintenance, and intelligent decision support systems. They have invested heavily in developing AI-powered systems to enhance the development and operational capabilities of their fleets. In contrast, the commercial industry – while making inroads in digitalization for vessel design, engineering and manufacturing – is somewhat slower to adopt AI as they examine its benefits and build a business case.

In this article we'll take a look at trends and challenges in the marine industry – both naval and commercial – and how they can be addressed with AI within a digital transformation framework.

Challenges in shipbuilding and maritime industry today

Although the maritime industry has evolved for centuries, today we are facing new challenges in a technology-rich world, both in the shipyard and at sea. With fewer shipyards operating around the world, there's more competition for cost-effective vessels, delivered faster. Commercial and naval shipyards alike are reporting a struggle to hire and maintain a workforce of skilled tradesman as older and more skilled workers retire and take their knowledge with them. Poor shipyard infrastructures, internal team silos and supply chain issues are all contributing to longer vessel engineering and construction times. Also, ship owners and operators face a high cost of maintenance, repair and overhaul (MRO) in their existing fleets, as well as pressure to conform to regulations driving decarbonization.

Smooth sailing requires digital transformation maturity

Digital transformation is a critical solution for solving many of the challenges above. It's not merely about delivering data or digitalizing processes; it's about fundamentally transforming how a company

Navantia and its Shipyard 5.0 highlight how digitalization can transform the design and construction of new vessels. (image: Navantia)

operates and delivers value. Siemens has developed a five-step framework to guide shipbuilders on this journey, helping them assess their progress and take the next steps on their digital transformation journey.

The first step in this framework is **configure**, which involves transitioning from document-based workflows to model-based systems. This means managing product data in a way that ensures all relevant information is centrally stored and easily accessible throughout the product lifecycle. By moving to a model-based approach, companies can begin to streamline their operations and improve the accuracy and reusability of their data.

Next is the connect phase, where companies bridge their data across multiple domains, creating a single source of truth for the entire product lifecycle. This includes connecting data across teams, ensuring that all stakeholders are working with the most accurate and up-to-date information. Many companies currently find themselves at this stage, where digital tools are in place but not yet fully optimized. To unlock the full benefits of digital transformation, companies must continue progressing through the next stages.

Automate is the third phase and lies at the core of digital transformation and AI. Automation frees engineers and workers from tedious, repetitive tasks, allowing them to focus on more valuable and creative aspects of their roles. There are two parts to automation: automating the mundane tasks that humans don't want to do and automating complex tasks that we thought only humans could do.

This starts by automating mundane tasks involved with configuration and connection and then automating aspects such as report and requirement development. Once a company has automated the mundane, they are on their way to creating a better

work environment that more engineers will want to be a part of. More than just increasing efficiency, this attracts new talent and reduces attrition.

In the **generate** phase, companies can leverage advanced technologies like generative design to explore multiple design alternatives based on predefined parameters. This approach is not limited to product design but extends to the development of manufacturing processes as well. Engineers and planners can now quickly evaluate various yard layouts, equipment configurations and material flows to optimize ship construction alongside design and engineering. By generating multiple options, teams can accelerate decision-making in production planning, shipyard layouts and execution.

Finally, the **optimize** phase involves utilizing the comprehensive digital twin and other advanced tools to refine and perfect designs. This phase closes the loop on digital transformation by evaluating multiple alternatives against KPIs and using simulations to predict how a product will perform before it is physically built. This not only reduces production costs but also shortens time to market and minimizes the risk of costly errors.

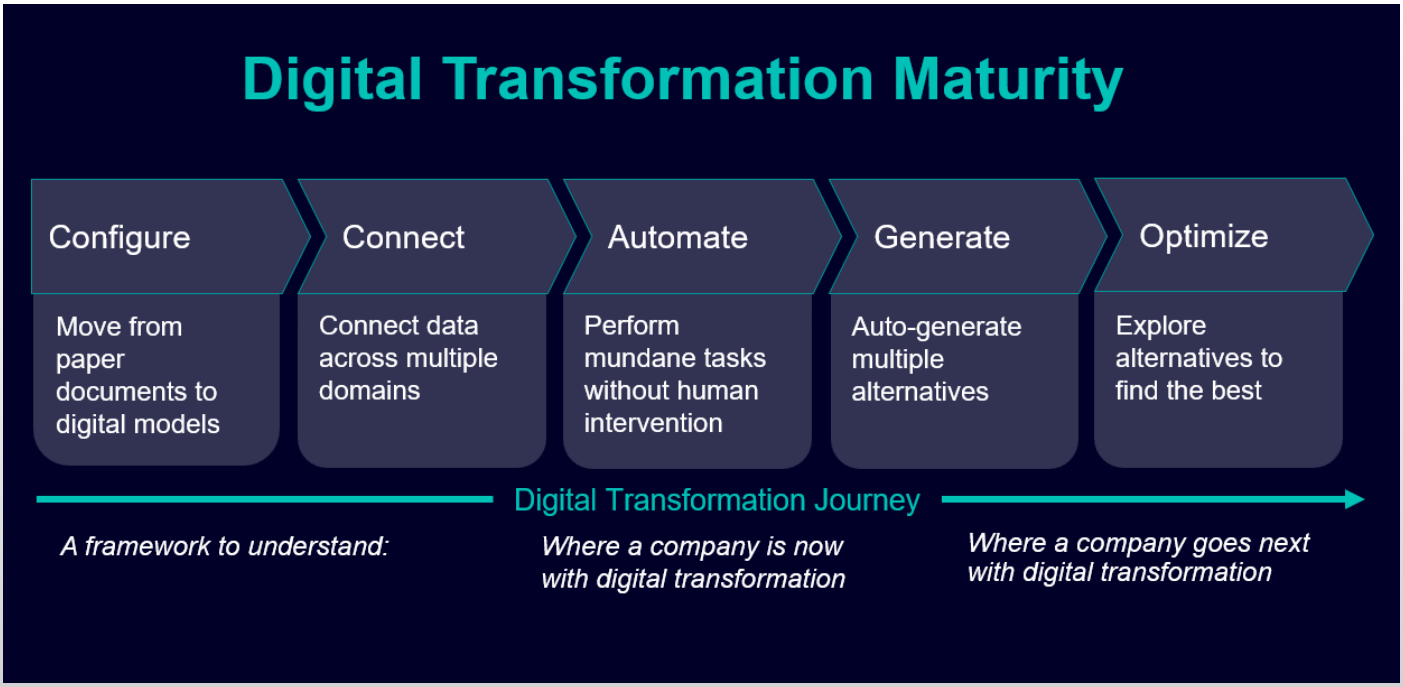
Some of the world's largest shipyards have completed the first two steps to configure data and connect teams along a common digital backbone, but let's take a deeper look at the third step, automate – where AI is an essential element.

How AI solutions can enhance ship design and engineering

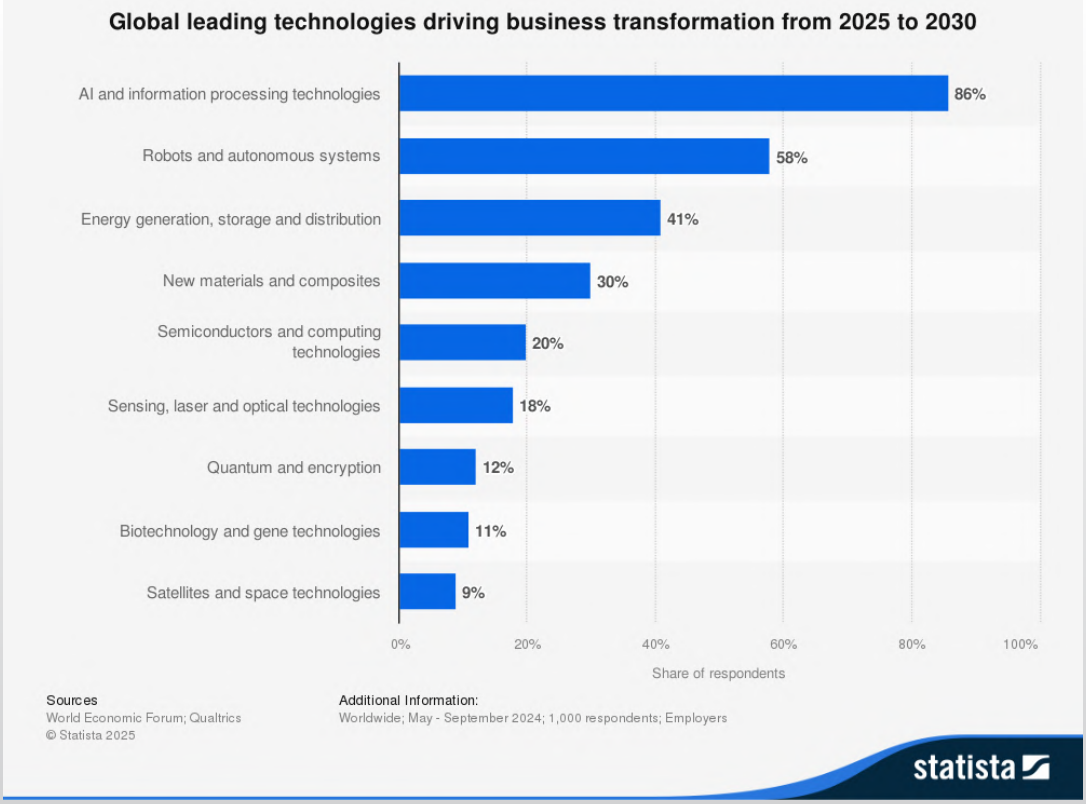
As a 'lower volume' industry, shipbuilding is wildly different from automotive or aerospace, so AI technology is being adopted more slowly and used differently. It's no surprise that with technology that is so transformative, many marine organizations are taking a "wait and see" approach.

However, we can't wait too long. Implementing AI technologies can significantly enhance the overall efficiency of shipbuilding processes.

According to the World Economic Forum, a 2025 survey showed that 86% of businesses worldwide are prioritizing AI and information processing technologies, making it the most widely adopted innovation.



The digital transformation maturity framework helps companies understand where they are with digital transformation and where they need to go next. (Graphic credit: Siemens)



Businesses leaders worldwide consider AI to be the most transformative technology over the next five years (sources: World Economic Forum, Qualtrics; image credit: Statista).

Artificial intelligence is a strategic priority across the Siemens Xcelerator portfolio of software, services and applications for all industries. AI solutions are primarily focused on generating content, UX and user productivity, automations, optimization, and search. Utilizing strong partnerships with OpenAI, Microsoft and Amazon AWS, our tech stack is modern and continuously evolving. With the power of AI, organizations can realize these benefits:

- **Improved user interaction:** AI has the potential to make software applications more intuitive, personalized, and responsive to customer needs. It can ensure that relevant content is easily available for users and automate repetitive and time-consuming tasks, shielding the users from a lot of the traditional manual work.

For example, in a large organization it can be challenging to find historical data or design and simulation models unless you have the exact search criteria. Otherwise, relevant information can be overlooked. But AI can provide support by automatically interpreting the request – no matter how vague and/or imperfect – and deliver results, even if the user isn't exactly sure how to define the search criteria. Over time, the AI will gain more context from each new request to build a knowledge library of relevant data and models, thus enhancing overall product quality.

In the future, large language models (LLMs) will improve productivity even further. These models are trained on massive datasets to understand and generate human-like text. LLMs are comprised of chatbots to find relevant answers faster; copilots that interact with chatbots to uncover deeper insights and automate common tasks to enhance productivity; and autonomous agents, which can plan and iterate to complete

high-level complex tasks, either in collaboration with the human user or other agents.

Some organizations may not trust AI with their data, while others may not trust AI with the results. For those with concerns about connected workflows and data security, advanced AI models like retrieval-augmented generation (RAG) offer a solution. This model allows companies to leverage public AI capabilities while protecting their proprietary internal data, ensuring that sensitive information is not shared or misused.

- **Innovative design support:** To reach a certain design objective, the number of design alternatives is virtually unlimited. By harnessing the power of AI, designers and engineers can uncover groundbreaking design concepts, accelerating innovation.

Software with generative AI significantly enhances the design process with analyze (show me how to), generate (create a model of) and optimize (which option solves) capabilities. Users work with the model on step-by-step directions, navigating data, creating accurate design and engineering content, and handling multi-domain tasks seamlessly. The intelligent agent can evaluate various design choices and balances trade-offs to offer the best solutions, improving product efficiency and effectiveness. By integrating these advanced AI functionalities, users are empowered to work smarter, achieving better results faster and making the design process more efficient.

- **Faster decision making:** A combination of physics solvers and AI-based inference can speed up the total simulation time. AI can analyze vast amounts of data and identify patterns, trends and correlations.

Simulation-based digital twin models have revolutionized the way shipbuilders have designed products as well as processes. But now they can go even further. A reduced order model (ROM) simplifies a complex digital twin model, maintaining essential behavior but reducing overall complexity to help run simulations even faster.

AI is one of the methods to generate ROMs by leveraging large datasets to capture patters and essential dynamics of complex systems, which helps to approximate the behavior of models. Machine learning techniques can also be used to identify and learn key patterns to accurately predict system behavior. Then, AI will continue to learn and adapt ROMs in real time as new data becomes available, ensuring the model stays accurate.

These faster simulation models reduce time to market, reduce the complexity of product simulation, ensure digital thread continuity, and help create smarter, more technologically advanced vessels. They also help bring together multi-domain teams, where simulation is needed for several disciplines. By consolidating simulations and results for each sub-domain, the overall accuracy of the model is improved.

Earlier this year, Siemens strengthened our commitment to building the most comprehensive digital twin with the acquisition of Altair Engineering, Inc. – a leader in mechanical simulation, high-performance computing, data science and AI. Adding these innovations to the Siemens Xcelerator platform will create the world's most complete AI-powered design, engineering and simulation portfolio. Altair's data science and AI-powered simulation capabilities have the potential to help shipbuilders accelerate digital transformation, decrease time to market and accelerate design iterations.

The future isn´t just digital - it´s virtual

The industrial metaverse (IMv) is the next stage in the evolution of digital transformation, combining the comprehensive digital twin, AI, and software-defined automation to bring the real and digital worlds even closer together. With next-generation software, shipbuilders will be able to create an intuitive and collaborative virtual environment built on precise real-world data. The IMv will also act as a single-pane-of-glass behind which all lifecycle data is collected, orchestrated, and displayed for review or manipulation.

As part of Siemens' collaboration with NVIDIA, new software will provide engineering teams with the ability to create ultra-intuitive, photorealistic, real-time and physics-based digital twins. These digital twins will combine the precision of industry software with the power of generative AI and real-time physically-based rendering delivered on NVIDIA Omniverse Cloud. Engineering data can thus be visualized as it would appear in the real world. And tasks that used

to take days can be completed in just a few hours.

For a demonstration, look to HD Hyundai, the world's largest shipbuilder. The company has been developing ammonia and hydrogen-based ships, requiring oversight of vessels that contain over seven million discrete parts. Using the new, AI-powered photorealistic digital twins, HD Hyundai is able to unify and visualize the massive engineering datasets interactively.

As a result, new, sustainable ships can be brought to the market faster and at lower costs. And even more, this solution accelerates the transformation of maritime shipping and the decarbonization of global trade in general. This shows how embracing AI and taking the next steps into digital transformation and the industrial metaverse helps companies speed up change and progress.

Prepare for the AI transformation

AI's influence is growing all around us – from simple Internet queries to autonomous cars – we're experiencing it every day and its ultimate potential is still unknown. What is known is that its ability to train itself on vast quantities of data in record time and work alongside skilled humans in ship design, engineering, manufacturing and operations will ultimately bring smarter, more sustainable vessels to the seas faster and more affordably.

In the industrial metaverse, engineers can enter the virtual world of their product and interact with it in real-time. (Photo credit: Sean Anthony Eddy, Getty Images)

Siemens Digital Industries Software helps organizations of all sizes digitally transform using software, hardware and services from the Siemens Xcelerator business platform. Siemens' software and the comprehensive digital twin enable companies to optimize their design, engineering and manufacturing processes to turn today's ideas into the sustainable products of the future. From chips to entire systems, from product to process, across all industries. Siemens Digital Industries Software – Accelerating transformation.

The Moules Frites, a new-generation mussel boat by AISTER for the Belgian sea

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Moules-frites—literally mussels with French fries—are one of the most typical dishes of Belgian cuisine. And that's the name given to AISTER's latest delivery. The new vessel from the shipyard in Moaña, on the northern shore of the Vigo estuary, is a commission from Colruyt, Belgium's leading food company, operating under brands such as Colruyt Meilleurs Prix, Okay, Comarché, or Spar. The vessel will operate through the shipping company Fleetco NV in offshore mussel farming and harvesting operations from its home port in Nieuwpoort.

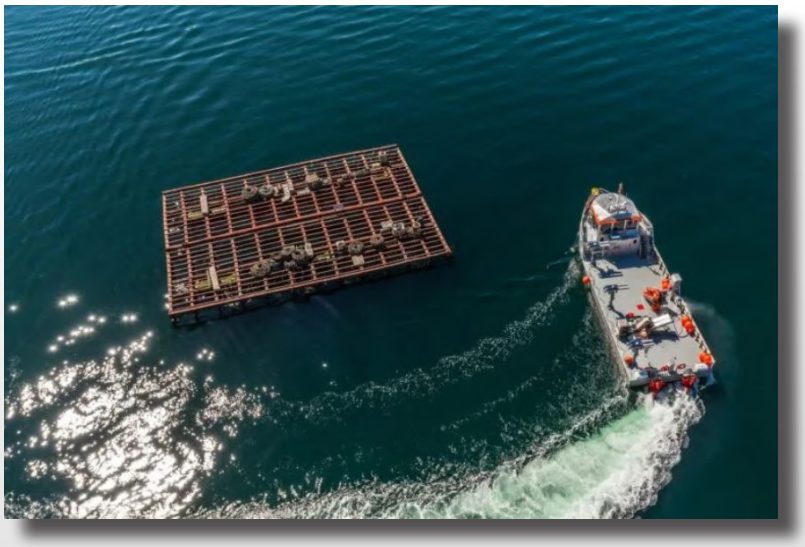
The Moules Frites is built in aluminum, the specialty of the Pontevedra-based shipyard. With dimensions of 24.3 meters in length, 6.95 meters in beam, and a depth of 1.8 meters, it can accommodate up to 8 crew members, who have on board a kitchen, a dining room for 6 people, a changing room with bathroom, and a mechanical workshop.

The wheelhouse, which offers a 360º view, features an advanced automation system that allows all of the vessel's systems and machinery to be contro-

lled and monitored from a single station, simplifying operations and enhancing safety. The wide working deck allows for flexible configuration of processing machinery and is equipped with a crane with a 1-ton lifting capacity at 10 meters, along with a 15-ton deck load capacity.

Two Volvo D8MH engines of 310 kW each enable the Moules Frites to reach a maximum speed of 14 knots. Inside the hull, space has been reserved for the future installation of a lithium-ion battery bank, which will allow for full electric propulsion in the future, aligning with the International Maritime Organization's zero-emissions goals. A bow thruster and the vessel's shallow draft provide great maneuverability, even in shallow waters.

The Moules Frites will operate offshore in areas dedicated to mussel farming, performing harvesting tasks using the long-line system. This method involves the installation of a main line several kilometers long, suspended by flotation systems such as buoys, arranged according to the productive load. The line is secured with various anchoring systems depending on the site's oceanographic and environmental conditions, in order to prevent it from being dragged by currents. Productive units to be farmed are then suspended from the line.



Robotic and Augmented Reality User Centric Applications for Assembly and Welding Tasks in Naval Components

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Introduction

The manufacturing method for naval components is based on the sub-assembly of partial elements, which implies working with different geometries, resulting in changing environments with variable components. The main drawback of the shipbuilding industry is the high emission of greenhouse gases, so opting for a connected industry can improve the efficiency and sustainability of production processes.

Moreover, the shipbuilding sector faces a lack of welding experts, leading to the promotion of related training invocational programs to meet these needs [1][2].

AIMEN is a private, non-profit research association created to increase technological competence in the manufacturing industry through R&D&I projects, industrial services and technology transfer. Recently, research activity has focused on digital technologies with the aim of generating a flexible, sustainable, reconfigurable, circular and high-quality manufacturing methodology.

These aspects have been addressed through national and European projects, all aimed at supporting the operator in manufacturing processes and focusing on a connected industry where product life cycle information is acquired, covering design, planning, and manufacturing stages. Among the latest projects at AIMEN focused on the naval sector we find Mari4_YARD and CASANDRA.

Mari4_YARD

It is a European project carried out between 2020 and 2024, led by AIMEN and funded by the H2020 programme, GA 101006798.

In Mari4_YARD [3][12], specific user centric tools have been developed to support the execution of production processes in the shipbuilding industry. This technological portfolio comprises 12 solutions mainly focused on applications intended for small and medium-sized shipyards. These developments—including portable collaborative robotics, high-payload robots, exoskeletons, mobile manipulators, projection systems, augmented reality, and drones—have been implemented and validated in real environments, namely shipyards. All these user centric technologies focus on improving ergono-

mics, sustainability, and the quality of manufacturing processes.

The results of Mari4_YARD have been internationally recognized, receiving two awards, including the WATERBORNE Award [4] in the Economic Feasibility category [4] during the WATERBORNE Days [6] (Brussels, February 2025). The recognition highlights that Mari4_YARD leveraged the potential of the Internet of Things (IoT), mobile and ubiquitous ICT tools, and robotics to implement a new connected shipyard, offering the European shipbuilding industry the opportunity to remain at the forefront. Specifically, the project launched a portfolio of worker-centered solutions supported by innovative collaborative robotics and ubiquitous portable solutions.

Recently, in another international event in Vigo (June 2025), AIMEN was awarded in the Collaboration category [7], recognizing its work in collaborative projects and highlighting Mari4_YARD—an initiative that promotes the modernization of small and medium-sized shipyards with user centric technological solutions, enhancing safety and ergonomics, as well as improving the competitiveness of these shipyards in the sector.

Figure 1. Awards

CASANDRA

It is a national project (2025–2028) [10, 11] formed by two consortia: CDTI (composed of companies) and AEI (technology centres and universities, led by AIMEN). It is funded under agreements EXP-00169779 / MIG-20242031.

The objective of CASANDRA is the implementation of a digital thread for the traceability of all production processes involved in the manufacturing of large component parts, with one of the use cases in the shipbuilding industry. It will be supported by the development of robotic technologies, exoskeletons, augmented reality, and artificial intelligence to improve the ergonomics, productivity and sustainability of these processes.

User centric Solutions

AIMEN has focused its recent projects on the development of user centric solutions for the execution of various tasks involved in naval manufacturing processes.

Augmented Reality

Augmented reality solutions have been implemented through projection systems and virtual reality systems. The main advantage of these technologies is that they remove the need to consult drawings during different manufacturing and assembly processes, as well as the subsequent marking on the scene. They also enable the remote supervision and monitoring of these processes thanks to their connectivity, cameras and voice system.

AIMEN has worked on the development of a portable 3D projection system with a good cost-efficiency ratio (Figure 2) [8]. This solution makes use of 3D perception systems, CAD files, and a pan-tilt unit to localize the system and project the elements of interest onto the target area.

This solution has been validated at the facilities of Brodosplit shipyard (Split, Croatia), demonstrating good accuracy in the projection of elements.

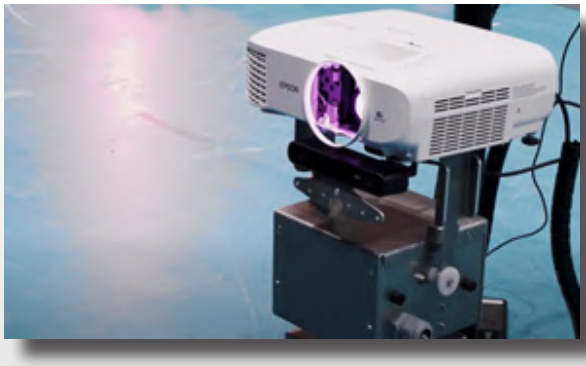

Figure 2. Projection system. © AIMEN

ting in time reduction for cutting, fewer operations, and high precision in both localization and cutting processes.

Figure 3. Plasma cutting robot. © AIMEN

Portable and Collaborative Robotics for Plasma Cutting or Welding

Collaborative robotics currently offers a lightweight and portable solution. This provides high value help to the operator for reconfiguring solutions and carrying out manufacturing tasks at different points within the shipyard.

AIMEN has developed a portable and collaborative robotic solution thanks to its mounting on a magnetized base for plasma cutting activities (Figure 3) [8]. As with the projection system, this solution makes use of computer vision and CAD file to locate the robot within the structure. With this information, the robot can automatically move to the cutting plane to detect it and obtain the target trajectory. By using the same localization procedure, and modifying the robot tools or vision algorithms, other tasks such as joint welding can be addressed.

This solution has been validated at the facilities of NODOSA (Marín, Pontevedra), where the robotic process was compared with the manual one, resul-

Hand Guiding System

The hand guiding system developed by AIMEN, currently available for ABB, KUKA, and COMAU, enables intuitive robot movement by applying force to the robot's wrist (Figure 4). This system incorporates all the necessary safety features to ensure an interaction without risk for the operator.

This technology can be used for transporting heavy loads, depending on the robot's payload, as well as for easy point programming. This allows trajectory reconfigurability and brings robotics closer to operators who may not be familiar with robotic systems, thanks to its ease of use. The hand guiding system will be highly useful for positioning elements prior to welding or other required processes.

Mobile Robotics and Mobile Manipulators

Mobile robotics and mobile manipulators can be used in shipbuilding from the intralogistics phase—transporting naval components during early stages—to the Pick & Place of components in later sta-

Figure 4. Manual guidance system. © AIMEN.

ges, as well as for interaction with the environment, such as performing welds, cuts or other activities. For intralogistics tasks, robots capable of withstanding heavy loads are employed due to the high weight of naval components.

These robots will be able to determine their position within the facility using a map of the plant and move to different locations with precise positioning, which may be achieved using markers. The navigation algorithms are designed to adapt to potential obstacles in the environment, recalculating the trajectory or stopping to ensure safety.

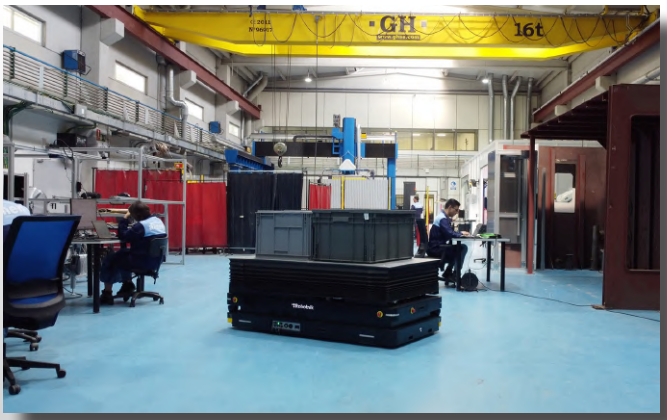

Figure 5. Mobile robotics solutions. © AIMEN

Exoskeletons

Exoskeletons have a wide range of applications, from the medical field for rehabilitation to improving ergonomics in the naval, aerospace, and other industrial sectors [9]. Specifically, in the projects discussed in this article, lumbar support and upper-limb exoskeletons have been used to reduce strain on the operator's joints, as such strain can be prolonged throughout the workday, affecting not only the operator's health but also the quality of their work.

By using exoskeletons, when the operator adopts an uncomfortable posture (Figure 6), assistance is provided so that the exoskeleton assumes the joint strain, thereby reducing fatigue during welding tasks.

Figure 6. Exoskeletons. Source: [3]. © MARI4_YARD

Digitalisation and Connectivity

At AIMEN we are working on the process digitalization, with the focus on the traceability of the product life cycle from the design stages to the final manufacturing stages. During this period, process information such as plans, configuration files, or parameterization will be collected. Process information from the equipment used, such as robot positions, images or welding equipment variables, will be stored. All this information will be gathered through digital twins to interact with higher layers. Additionally, there will be a digital thread to collect all data in

a single access point, where the operator could add and consult data intuitively.

XXL Pilot Factory

The XXL Pilot Factory consists of an environment located within AIMEN's facilities and equipped with vision systems, robotics and control, as well as real naval or boilerwork components. The purpose of these facilities is the validation of technologies developed by AIMEN or by project partners before being validated at the end users' facilities. Additionally, the XXL Pilot Factory can be offered as a service to third parties to test their technologies in realistic environments to perform tests on development or integration, due to the difficulty of access to the real scenario because of the production times.

At AIMEN, the XXL Pilot Factory is also being used to carry out open trainings and workshops (Figure 8)

Figure 7. XXL Pilot Factory of AIMEN. © AIMEN

for workers in the sector to showcase the results and technologies developed of the projects.

Specifically, among the equipment and facilities that make up the XXL Pilot Factory are:

Figure 8. Training on XXL Pilot Factory. © AIMEN

- **Mobile platforms**, including a robot with a lifting system (Figure 5) capable of supporting up to 1000 kg and measuring 1717x850 mm, allowing handling and transport of heavy and large loads, and complying with safety-related standards and regulations.
- **Mobile manipulators** for intralogistics tasks and interaction with the environment such as welding or positioning of elements.
- **Industrial and collaborative robots** with different load capacities and reach. Here we find ABB, KUKA, UR in different mounting configurations.
- **Open shared-space cell** (Figure 7) with machine vision systems for operator monitoring and industrial safety systems.
- **Large-scale naval components** such as a bulkhead or double bottom, as well as a shell plate from the boilerwork sector.

Future Shipbuilding 5.0

The future of the naval industry is envisaged as a connected industry where product, process, and resource information are collected, connected from global management or control layers with physical systems, and enhancing the operator's capabilities, whether through artificial intelligence systems, augmented reality, robotics or exoskeletons.

Digitization and the application of emerging technologies will result in the optimization of different resources through system learning and the dynamic adjustment of welding parameters or other proces-

ses, as well as the planning and definition of production sequences.

The evolution towards Shipbuilding 5.0 will achieve increased production efficiency, reduction of rework and costs, directly related to sustainability and better adaptation to changes in production needs.

Conclusions

At AIMEN, research and development of technological solutions are underway to improve ergonomics and the quality of production processes. Based on developments in previous projects in naval sector, good acceptance has been observed among end users, since risks to the operator are minimized due to reduced exposure to hazards thanks to robotics, as well as the prevention of possible musculoskeletal disorders caused by adopting uncomfortable postures, which leads to the prevention of errors caused by fatigue through exoskeletons. The incorporation of AR/VR systems prevents the operator from having to consult a plan and take measurements, which contributes to improving process efficiency.

AIMEN's objective for future projects will be the implementation and integration of all these technologies and their initial validation at the XXL Pilot Factory, to later test them in real naval sector environments at the facilities of the end users of the various projects.

Referencias

[1] El sector naval, en busca de trabajadores cualificados en San Fernando: una "oportunidad histórica" para "un empleo garantizado"

[2] El repunte de la construcción naval encalla en la falta de mano de obra

[3] Mari4_YARD Project: https://www.mari4yard.eu

[4] https://cinea.ec.europa.eu/news-events/news/waterborne-days-2025-scaling-sustainable-and-competitive-solutions-waterborne-transport-2025-02-06_en

[5] 250211_Press_Release_Waterborne_Days.pdf

[6] MAGAZINE_FINAAL_interactief_LR.pdf

[7] https://mindtechvigo.com/se-anuncian-los-ganadores-de-los-mindtech-awards/

[8] Masood, J., Vidal, F., Castro, D., Pertusa, A. M. y Feijóo, A. "Robotized technologies for enhanced shipyard operations: challenges and solutions" (2024, volume 2, article 6). *Green Manufacturing Open.* DOI: 10.20517/gmo.2023.102601

[9] Masood, J. y Vidal, F. "Didactic Factories for Emerging Technologies: Occupational Exoskeleton". (October 2023, Volume 1, Tema 1) *Advances in Robotic Technology.* Medwin Publishers. DOI: 10.23880/art-16000103

[10] Impulsando la adopción de flujos de datos en la cadena de suministro en AIMEN Centro Tecnológico

[11] https://proyectocasandra.net

[12] Grazi, L., Feijoo A., Gasoirek, A., Pertusa A., Grajeda, A., Kanakis, A., Rodríguez, A., Parri, A., Vidal, F., Ergas, I., Zeljkovic, I., Parmies, J., Perez, J., Katsampiris, K., Rocha, L., Núñez, L, Petry, M., Neufeld, M., Dimitropoulos, N. Köster, N., Mimma, R., Varao, S.; Crea, S. Makris, S., Giartzas, S., Settler, V., Masood, J. "Methodology and Challenges of Implementing Advanced Technological Solutions in Small and Medium Shipyards". *Electronics* **2025,** 14(8), 1597; https://doi.org/10.3390/electronics14081597

Today we interview:

Andrés Moya

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DETEGASA is a world-leading company in the engineering and manufacturing of waste, water, and fuel treatment equipment.

Four decades of excellence in innovation and design have made DETEGASA a national and international benchmark for navies, shipowners, and operators around the world. They supply and support the life cycle of equipment and systems, helping to reduce emissions with a strong focus on environmental sustainability and marine life protection through the design of their products.

Their products include: wastewater treatment plants, incinerators, cooling modules, food waste treatment systems, fire-fighting stations, helicopter refueling systems, oil-water separators, and more. DETEGASA has been a pioneer in digitalization and technological development, creating digital twins for their products, as well as using augmented reality and virtual reality for crew training, among other innovations.

• What types of vessels, based on your experience, are currently in demand and are expected to be in greater demand in the coming years? Where should efforts be focused?

In Europe, shipbuilding is primarily focused on military vessels, cruise ships, special-purpose ships, fishing vessels, and megayachts. I believe the outlook is generally reasonably good for all of them, and especially favorable for military vessels. Transport ships are built in Asia, and that market could experience a slowdown from now on, unless the new trade barriers are reversed.

I believe that one of the keys to competing and surviving in the long term is achieving competitive advantages through specialization and the incorporation of technology. Each company should follow its own strategy, enhancing its individual capabilities and its position in the market.

• What strengths do you see in our sector, given the types of companies that make it up?

Most of the few civilian shipyards still operating in Spain —particularly in Galicia— have a long-standing history, have weathered various crises, and generally hold strong positions within their market niches. This shows that they are well-managed companies. I believe their main strengths lie in good

management, a high level of specialization, and a solid reputation in the market.

As for weaknesses, I would highlight the small size of the shipbuilding hub in both Galicia and Spain, the lack of skilled workers, and the potential for labor conflict, which could resurface in the future.

Regarding the auxiliary industry, achieving stability requires diversification and internationalization whenever possible—though that depends on each specific case. In every business, we must work to generate competitive advantages that enable us to achieve adequate profitability and a strong market position, which will allow us to endure difficult times.

As for the military industry, Navantia and the defense sector in general have excellent prospects. The main risk I see in the medium to long term would be a potential loss of sovereignty among European countries in deciding what ships to build and where to build them.

• From your point of view, what advice or warning would you give to companies in the Galician naval sector?

I believe companies must work continuously to improve both their business and production processes. This involves constant innovation, incorporating available technology in manufacturing machinery as well as in digital tools. It is essential to manage risks effectively. The main reason why some shipyards have disappeared in recent decades has been due to inaccurate cost estimation and poor contract negotiation.

As for the auxiliary industry, companies often go bankrupt because they have too much business concentrated in a single client who runs into trouble, stops paying, or loses business.

• What is DETEGASA's flagship category? What are the particularities of this type of construction?

Our main business area has always been Defense. For decades, we have been a strategic subcontractor for the Navy, and we maintain a team of technicians permanently available at each of the naval bases. In addition, we are a trusted supplier for clients such as Navantia and BAE Systems, among others. These three major clients receive our highest level of attention and priority.

• What is the origin of DETEGASA? Since its founding, have you continued with the same original lines of activity, or have you diversified? What sets you apart from your competitors?

This year, DETEGASA celebrates 40 years since its establishment. Over the past decade, we have accelerated the process of internationalization, market diversification, and the expansion of our portfolio of equipment and systems. We have also carried out a reengineering of our designs and production processes. Currently, we are immersed in a digitalization process that covers both our services and internal operations.

What sets us apart in the Defense sector is that we have the capabilities and experience to offer comprehensive, tailor-made solutions for onboard waste, water, and fuel management, among other areas. In the commercial shipping sector, we offer half a dozen highly optimized designs, which allow us to compete globally.

• Would you say that the way companies compete has changed nowadays? In what way? In both the domestic and international markets, do you believe there has been any significant change in the way business is done or contracts are secured?

I don't believe there have been any major changes in our sector over the past decade. I would highlight that specialization is now more important than ever. Europe has established itself in the niche market of special-purpose vessels, and I believe that trend will continue in the medium term. The naval sector is quite traditional: there is limited adoption of technology, and production processes evolve slowly due to the lack of economies of scale.

• Do you encounter any difficulties in carrying out your activity—such as infrastructure, transport, logistics, environmental regulations? Could you point out the advantages and disadvantages, strengths and weaknesses of the region?

The logistics costs associated with being based in Galicia are clearly higher than those faced by other regions in Europe. In our case, this represents a competitive disadvantage because it makes our product more expensive, in some cases significantly so. In the specific case of Ferrol, we are connected by an expensive motorway, there is no train service, flights to Madrid are costly, and there are virtually no international flights. This hinders the movement of people and goods, the internationalization of companies, and overall competitiveness, especially when compared to better-connected areas of Europe. Having three airports is not an advantage.

• In your opinion, what are the weak points of shipbuilding in Galicia?

With regard to the commercial ship sector, I believe the small size of the industry is the most notable issue. In addition, the size of the shipyards is limited by the available facilities. The auxiliary industry has a low level of internationa-

lization due to the type of companies we have. The lack of qualified labor has also been a limiting factor for several years now.

• What sets DETEGASA apart from its competitors in terms of specific products and services?

In terms of product, we have a strong ability to adapt to the needs and specifications of each project. We can work with the most complex requirements and regulations, and we are able to offer our clients a complete solution for waste management, water treatment, and helicopter refueling.

In addition, we aim to keep pace with digital transformation. Five years ago, we developed our first digital twin. Since then, we have digitized several services, such as commissioning and training. We are now implementing a local AI system, among other things. We chose to keep it local due to the sensitivity of our own information and that of our clients, which is protected by confidentiality agreements. Internally, we have banned the use of generic AI applications, as we cannot allow this information to leave our direct control.

We also plan to use it for translations, text enhancement, and so on. It's a tool that will boost our productivity — for instance, by helping us process extensive technical documentation through summaries and by highlighting relevant content for our operations.

Furthermore, it will be very useful in tasks requiring precision, such as legal language. The idea is for the AI to process complex texts, compare them with our inputs, and point out differences from standard conditions, among other things.

• How do you plan to continue developing and expanding the business? What are your short- and medium-term goals?

We plan to continue improving the performance, quality, and also the scope of our product portfolio. We will remain focused on diversifying, mainly toward large and strategic clients interested in establishing long-term relationships. Our business volume is expected to keep growing over the next five years.

• Another challenge we are facing is the renewal of our workforce. Why do younger people not feel attracted to the sector? How can companies appeal to young talent? Do you face this issue at DETEGASA? Why do you think that is?

In general, trades have lost their appeal among young people, and this is not a problem exclusive to our sector. I believe Vocational Training should continue to be promoted as a way to mitigate this issue as much as possible.

In addition, workers today are generally less committed than they were ten or twenty years ago. It's

something we need to acknowledge and manage as effectively as possible. We also have to take into account the evolution of labor laws and the legal uncertainty surrounding them, which is currently at historic highs.

As for talent, it is usually large companies that attract it first — especially tech companies, as they tend to be more appealing to younger generations.

In the naval sector, the product itself and the level of internationalization are attractive for young professionals. On the downside, the sector is mostly made up of medium and small-sized companies, is not highly technological, and suffers from a somewhat negative reputation due to its vulnerability to economic cycles.

At DETEGASA, we are no exception, and we are currently also facing significant difficulties in hiring qualified professionals. Two years ago, we experienced a notable wave of departures — mostly engineers — who chose to join Navantia. However, we managed to recover fairly quickly.

• Innovation is often described as one of the key pillars for the development of modern businesses. To what extent has R&D+i been important in DETEGASA's trajectory? How far has it taken you? Is a company like DETEGASA prepared to embrace digital transformation?

DETEGASA is a product-focused company, and much of our value and our ability to generate business lies in our designs. Devoting sufficient attention and resources to product development and innovation is essential. Without it, we could not ensure our long-term survival. At DETEGASA, we are constantly developing new products and improving existing ones. We design and build prototypes, industrialize them, certify them, and bring them to market. Our ability to generate business, our reputation, and our market position—both short- and long-term—depend largely on the quality of our designs.

As for digitalization, we are implementing it both at the product level and to improve our internal business processes. For now, it is not easy to visualize the economic return that product digitalization may bring us. Even so, we will continue to develop it. We are also allocating significant resources to the digitalization of internal processes. I believe that companies that neglect digitalization will find themselves at a disadvantage sooner or later.

• Productivity levels in Spain remain relatively low compared to the European average. How is this issue related to the training of professionals?

There are many factors that affect productivity, and training is one of them. In Spain, training has always been quite disconnected from the real needs of companies. And I believe it will continue to be, because most public organizations and individuals involved in training have very little incentive to coordinate with private industry, which is the one that actually knows what it needs. As a result, companies are forced to provide training themselves.

On the other hand, there are many people who want to work but lack the necessary qualifications. And companies cannot pay the same salary to a qualified worker as to an unqualified one. This is the dilemma—one for which no truly effective solution has yet been found in practice.

• In the current context, what measures do you consider urgent or necessary to strengthen and protect the sector?

With regard to the auxiliary industry, of which we are a part, I believe it is important that the efforts being made by the Galician regional government in support of internationalization, innovation, and investment continue—and are even intensified. These support measures should be flexible enough in terms of timelines and project content to give companies sufficient room to develop their projects according to their specific needs.

In addition, I believe that the administration, Aclunaga, and other associations should continue to promote the internationalization of companies as a driver of business growth and a means of strengthening our Galicia brand.

• The presence of women in the naval sector is limited. Is there any effort being made to encourage greater female participation in the industry?

I believe efforts should be made to encourage both women and men to take an interest in the naval sector, not only for operational roles but also for workshop trades. With the exception of Navantia, no company in our sector has the capacity on its own to promote employment in the naval industry, so this type of sector-wide initiative could be coordinated by the government and the Cluster.

• Does the naval sector work in a coordinated way? How is it perceived from the point of view of an auxiliary company?

I believe there is excessive fragmentation in terms of the organizations that represent us. For example, in Spain there are more than half a dozen naval industry clusters across different regions, not to mention other associations or entities that also represent the sector, either fully or partially. In the defense sector, there is also a high number of associations and clusters. This fragmentation reduces effectiveness and weakens the influence we can exert. Since we are already in a situation with many such bodies, the best course of action would be to work toward the greatest possible coordination and mutual understanding among them all.

• Given the challenges and uncertainties ahead, are you optimistic about the future?

Things have gone well in recent years, and 2024 has been a record year for many in our sector. However, I believe we may be on the verge of an economic cycle shift—particularly one that could negatively impact European industry and accelerate its decline. You only have to look at what's happening in the automotive sector.

That said, there are industrial niches with promising outlooks, such as the defense industry and those related to new energy sources. As for the shipbuilding sector, and given the type of vessels we build in Europe, I believe the outlook is reasonably good, despite the current uncertainty.

Acknowledgements:

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