



From infrastructure to capability

by Miska Merikukka, *VP of Sales & Business Development, Elomatic Marine*

The maritime industry has spent much of the past decade focused on a fundamental challenge: identifying fuels and technologies to achieve net-zero. However, as the energy transition moves from strategy to implementation, another challenge is becoming increasingly difficult to ignore. The sector may have identified much of the tech needed to reduce emissions, but does it have the industrial capability to build, retrofit, and maintain this new generation of vessels at the scale and speed required?

This question is becoming increasingly important beyond the energy transition itself. Across Europe and North America, governments are prioritising maritime sovereignty, supply-chain resilience, defence capacity, and the ability to maintain domestic shipbuilding capability, with significant public investment being directed towards rebuilding and expanding national maritime infrastructure.

Yet, physical investment alone will not make shipbuilding competitive. New docks and fabrication facilities may expand capacity – but they don't automatically deliver the engineering processes, production discipline, digital infrastructure, or organisational knowledge needed to use that capacity effectively.

The answer depends on a vital enabler: those who actually build vessels. Shipyard regeneration needs to be considered in terms of capability, not simply infrastructure. The proper measure is not how many vessels a yard could theoretically build, but how reliably it can turn investment and available capacity into ships delivered on time, to specification, and at a commercially viable cost.

Shipowners can commit to green methanol, ammonia, hydrogen, or multi-fuel propulsion systems, while bunker producers invest in new supply chains and regulators establish increasingly stringent emissions targets. However, between adopting a new technology and delivering the final vessel lies a complex industrial process involving intricate engineering, project management, procurement, fabrication, and integration. As vessels become more technologically advanced, a shipyard's ability to manage this process efficiently and consistently,

at the requisite volume, will directly affect how quickly the maritime sector can transition.

Managing integration complexity

The scale of this challenge is already visible in the newbuilding market. Over 500 alternative-fuelled vessels were ordered globally in 2024, a 38% increase on the previous year. Around 95% of orders went to Asian shipyards, underlining the extent to which the industrial capacity to deliver tonnage running on alternative fuels remains concentrated within the Far East markets.

For countries aiming to rebuild domestic shipbuilding capability, this presents a significant challenge. Having access to alternative-fuel technology is not the same as having the industrial capability to deploy it efficiently and at scale. Building a conventional vessel that incorporates a new fuel system introduces additional requirements related to propulsion architecture, fuel storage, safety systems, electrical integration, control systems, and regulatory compliance.

The engineering challenge therefore extends considerably beyond selecting a different engine or fuel tank. A proven hull carrying a relatively new fuel system is, in practical terms, a modified design, requiring a different approach to construction, project management, and change control. The ability of a yard to manage these interactions without letting complexity cause delays is the difference in maintaining commercial competitiveness.

The critical point

Despite its importance, shipyard optimisation remains underrepresented in the wider decarbonisation debate. Much of the focus has been on the challenge of

developing viable clean technologies – such as wind propulsion, carbon capture and electrification, as well as alternative fuels – and securing supply and building the infrastructure needed to support them. However, the shipyard sits at a critical point in integrating these technologies into vessel operations, and where integration complexity determines how quickly the industry scales.

As fuel technologies diversify and mature, shipyards will increasingly be required not only to build compliant vessels, but to integrate complex multi-fuel propulsion systems, manage retrofit programmes at scale, reduce build times for tonnage capable of zero/near-zero (ZNZ) emissions, and adopt more efficient, modular construction processes. Consequently, the energy transition's pace could become constrained by shipyard production capacity and capability as much as by fuel availability.

A shipyard that can deliver ZNZ vessels faster does more than improve productivity. It accelerates fleet renewal and enables fossil-fuelled vessels to be phased out sooner, creating an emissions impact that extends far beyond the efficiency gains achieved within the yard itself. This requires a shift from viewing optimisation as a collection of individual productivity improvements towards treating the shipyard as an integrated production ecosystem. Engineering, procurement, production, construction, and change management need to operate within a centralised project management environment, structured around repeatable processes that can accommodate new technologies without disrupting delivery.

This is where experienced engineering partners add critical value. New-tech navigators can transform first-of-a-kind projects

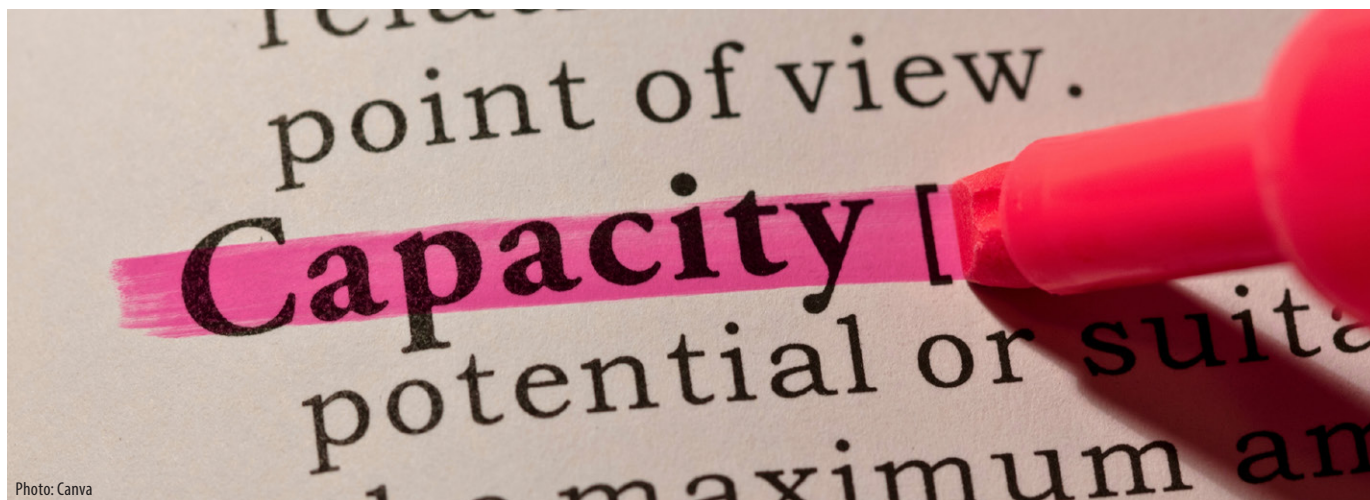


Photo: Canva

from high-risk exercises into structured, repeatable processes, allowing shipyards to build confidence, improve efficiency, and ultimately scale the energy transition.

Once a vessel reaches the yard

While newbuild ZNZ vessels dominate the current discussion, retrofitting the existing fleet will be equally critical to decarbonising maritime transport. As regulations evolve and carbon pricing increases, a growing number of ships will need to be adapted for alternative fuels, hybrid systems, or greater energy efficiency.

However, retrofitting presents a fundamentally different set of challenges from newbuild construction. Existing vessels bring accumulated modifications, historic documentation, and often incomplete information regarding their current condition, further complicating change management processes. An unexpected finding in dry-dock can trigger engineering changes, procurement delays, and installation issues, creating knock-on effects across the wider project schedule.

As modernisation of the existing global fleet remains a fundamental lever of industry decarbonisation, the sector cannot rely on reactive problem-solving once a vessel reaches the yard. Accurate and accessible vessel data, together with integrated planning, can shift uncertainty into the preparation phase, allowing potential issues to be identified and addressed before they become costly delays.

Turning data into production capability

While digital transformation is often framed around automation, improved operational efficiency, and reduced administrative workloads, its greater value may lie in connecting information that

has traditionally been fragmented across functions and systems. When engineering data, maintenance records, documentation, and production knowledge sit in separate environments, it becomes difficult to build a reliable, shared view of the vessel or project.

A more connected data environment can bridge these gaps, giving engineering teams greater visibility of the whole project while allowing maintenance and asset information to feed directly into retrofit planning and execution. Over time, this also enables recurring issues to be tackled, with successful approaches being identified and incorporated into more standardised processes.

The result is not simply a more sophisticated shipyard environment but a more predictable one. With structured, up-to-date vessel data integrated into a unified planning ecosystem, dry-dock and retrofit activity can shift from reactive execution towards predictive planning, reducing costs and improving turnaround times to make large-scale retrofit programmes more manageable. Tools such as **Elomatic's Aura APM** put this approach into practice by consolidating maintenance history, documentation, and permit management into a single planning layer, helping turn unexpected issues into more predictable, manageable costs.

Similarly, the EU-funded SEUS project, with Cadmatic as technical coordinator, aims to deliver a 30% reduction in engineering time and a 20% reduction in

assembly time. Results are expected in late 2026 and could provide valuable yard-scale evidence of how digitalisation can translate into measurable production efficiencies.

The one that can connect

Maritime decarbonisation's next phase demands broader industry understanding of the energy transition challenge. Developing clean tech, integrating sophisticated digital systems, improving vessel efficiency, and establishing harmonised regulatory frameworks will remain essential, but these efforts ultimately depend on an industrial system capable of delivering the vessels and modifications required at scale.

Shipyard optimisation must therefore move beyond the traditional conversation around productivity. The competitive shipyard of the future will not necessarily be the one with the most sophisticated individual technology, but the one that can connect engineering, procurement, production, asset information, and people into a system capable of absorbing greater complexity, whilst maintaining project timelines and cost.

For nations looking to accelerate the development of their maritime capabilities, the shipyard of the future must be considered not simply as a strategic asset that supports industrial policy but as a critical enabler of the maritime energy transition itself. Net-zero progress depends on fuels and clean technologies, yet its pace ultimately hinges on the industry's ability to turn that innovation into repeatable industrial production at scale. □



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