



Retrofitting of ships in Europe

EUROPE'S SHIP MAINTENANCE, REPAIR, RETROFIT AND CONVERSION SECTOR IS PIVOTAL FOR THE MARITIME ENERGY TRANSITION



1 Sector

All European coastal states have facilities to maintain seagoing vessels. The majority of countries have companies that offer facilities in the form of dry docks. These facilities are essential. Ports receive ships and these ships may need to visit a dry dock as they need to do (urgent) maintenance or repairs. During a voyage, damages can occur or accidents can happen, either at sea or in port and planned maintenance needs to take place. Having maintenance and repair facilities in the vicinity of a port is thereby essential and of strategic importance in order to guarantee a smooth operation of nearby ports.

The European dry docks, also referred to as the Ship Maintenance, Repair and Conversion (SMRC) shipyards are specialised in technical project management of high value assets and they understand the shipping market. Since decades they have a focus on 'retrofitting' of ships as well. Retrofitting is the term used when ships are upgraded with extra equipment. Retrofitting ships is a high impact activity for ships and requires the right skills and capacities, something that the European dry docks offer. Against the background of climate change and other environmental concerns, retrofitting has gained in economic and strategic importance, as it will be a key activity to transform dirty ships into climate and environmental friendly vessels and so ensure the success of ambitious political goals. The shipping industry faces an enormous challenge in lowering emissions and decarbonization. Strict policies on both international and European level force ship owners to reduce emissions drastically.

The SMRC industry employs around 125.000 people. This figure includes those working directly and indirectly at the around 60 SMRC yards in Europe. Furthermore, there are many smaller yards specialised in SMRC activities for other commercially operated vessels like fishery, inland shipping, etc. which are not included in this figure. The annual turnover of the sector is about 4 billion Euro.

The potential market for retrofits consists of 28.000 ships¹. These can be retrofits of any kind as described in this brochure as these will all contribute to lowering the emissions of greenhouse gases (GHG). The most impactful retrofit - both from a shipyard as well as GHG perspective - is the installation of a new ships engine including fuel system that operates on an alternative fuel like methanol, ammonia or hydrogen. *'A maximum addressable market of 9,000-12,900 large merchant vessels was identified up to 2030, after which it is anticipated that all vessels will be built with net-zero or near-zero carbon fuels capability. In all likelihood only a small number of these vessels will eventually be retrofitted as the business case for converting older vessels (beyond ten years) and smaller vessels will likely remain challenging. However, converting even a fraction of this potential market will require new capabilities and technologies from ship designers, shipyards and operators.'*²

1 Aggregated from S&P Global (2024), fleet <15 years of age and >100GT

2 <https://www.lr.org/en/knowledge/research-reports/applying-alternative-fuels-to-existing-ships/>

2 Retrofitting as a greening option

Retrofitting ships has gained significant attention and importance in recent years as the maritime industry and maritime transport strive to address environmental and climate challenges and must comply with international and/or regional regulations. In this regard, European SMRC shipyards have emerged as pivotal players in the retrofitting process, offering advanced technology, expertise, and sustainable solutions (including alternative fuels). This brochure examines the importance of these European shipyards for retrofitting ships, highlighting their contributions to environmental sustainability, regulatory compliance, and the economic growth of the maritime sector. It also explores the challenges faced by shipyards and discusses potential future developments in this field.

The global shipping industry is vital for international trade, but faces increasing political and societal pressure to reduce its environmental and climate impact and meet stringent legislative requirements and emissions standards. Retrofitting existing ships with advanced technologies and systems as well as alternative fuels has emerged as an effective strategy to enhance vessel efficiency, reduce emissions, and improve overall sustainability. European SMRC shipyards have become crucial hubs for retrofitting operations due to their expertise, advanced infrastructure, commitment to environmental stewardship and vicinity. Whilst European shipowners order newbuilt vessels massively in Asia, the vicinity of European SMRC shipyards is an essential feature for European shipowners to prefer European over foreign shipyards.

Environmental Sustainability

Retrofitting ships enables the implementation of eco-friendly technologies that significantly reduce emissions and mitigate environmental impacts. European SMRC shipyards have been at the forefront of developing and installing innovative solutions such as ballast water treatment systems and exhaust gas cleaning systems. These technologies have helped vessels meeting the International Maritime Organization's (IMO) regulations on ballast water management and air emissions, thereby contributing to cleaner oceans and improved air quality. They have also helped meeting regional legislative requirements, such as the reduction of SO_x and NO_x in European Emission Control Areas.

Regulatory Compliance

Being global by nature, the shipping industry operates within a complex web of international regulations aimed at reducing greenhouse gas emissions, protecting marine ecosystems, and ensuring vessel safety. European SMRC shipyards have established themselves as reliable partners for shipowners and operators in navigating these regulations and achieving their targets. By offering retrofitting services that enable compliance with existing and forthcoming environmental standards, European SMRC shipyards have facilitated the industry's transition to a greener future and will continue to do so.

Economic Growth and Job Creation

The retrofitting of ships presents substantial economic opportunities for European SMRC shipyards. As shipowners and operators seek to upgrade their fleets, preferably in the vicinity of their vessel operations, European SMRC shipyards are experiencing an increased demand for retrofitting services. This surge in activity translates into job creation and economic growth in local maritime communities. Moreover, the expertise and knowledge developed by these shipyards, also in retrofitting operations, contribute to their competitiveness in the global shipbuilding and repair market.

Challenges and Future Developments

While European SMRC shipyards play a pivotal role in retrofitting ships and are facing promising business opportunities thanks to new international and/or regional legislation, they also face several challenges. These include the high costs associated with retrofitting projects, skilled labour shortage, the need to continually adapt to evolving regulations, (unfair) competition from (subsidies) shipyards in other regions and the ongoing expansion of urban areas that put a pressure on the physical location of the yards. To maintain their prominence, tap into the promising potential of business opportunities and maintain their critical know how, European SMRC shipyards invest in research and development, foster collaboration with technology providers, and must explore innovative financing mechanisms. Additionally, the digitalization of shipyards and the adoption of Industry 4.0 principles can enhance efficiency and productivity in retrofitting operations. These challenges can only be brought to a good end provided that adequate framework conditions are put in place which offer legal certainty, fair competition and financial incentives or support.

Conclusion

European SMRC shipyards are instrumental in the retrofitting of ships, contributing to fight climate change, environmental sustainability, regulatory compliance and economic growth. Through the implementation of advanced technologies, alternative fuels and adherence to international standards, European shipyards have established themselves as leaders in the maritime industry. However, continued investment in research and development, collaboration and adequate framework conditions are essential for these shipyards to remain at the forefront of ship retrofitting, to maintain a critical level of knowhow and industrial capacity, and to further drive the industry's transition toward a more sustainable and climate friendly future.

This brochure gives a glimpse of some of the many climate-related projects that have already been executed in the industry. One should note that the Industry is not only capable of handling complex projects on ships, it is also very well able to handle other big assets, such as offshore structures for fish farms, offshore wind and agriculture. With the growing importance of the blue economy and more and more offshore activities, the work of the SMRC industry diversifies.

3 Examples

Installation of rotor sails

The SMRC shipyard prefabricated and installed a steel foundation on two ferries. The ferries were retrofitted with one large-sized Norsepower Rotor Sail unit 30 meter in height and 5 meter in diameter, a modernised version of the Flettner rotor. The foundation work included the superstructure and decks. The shipyard reinforced the deck by installing additional pillars. Experience has now showed that both ferries have lowered their CO2 emissions by 4-5 percent thanks to this wind-assisted propulsion. Next to the rotor sail the company made many investments to reduce emissions.



Installation of upgraded propeller

Ships are not always fitted with the best propeller. Ships are designed and build for a so called 'design speed'. This is the speed for which the ship is optimized. Changing circumstances, e.g. slow(er) steaming in order to save fuel or a lower service speed of the ship, can change the average operational speed of the ship, making the ship sail at a non-optimized speed which makes the ship use more fuel and emit more GHG. With the new operational speed combined with other inputs including all latest innovations it is possible to design a new upgraded propeller. Fitting a new propeller is one of the many activities that is done at the SMRC shipyards. An upgraded propeller – in many cases combined with a new designed bulbous bow – will save several percent of fuel consumption.

Bulbous bow replacement

Due to changing operational conditions such as slow steaming in order to save fuel and lower GHG emissions the bulbous bow on a ship may not work or could even have a detrimental effect. Recalculating and redesigning a bulbous bow is essential when operational conditions change. European SMRC shipyards are very capable of doing this including the construction and installation of the new bulbous bow.



Engine replacement

Existing engines are in most cases not able of using alternative fuels. The use of these fuels is promoted and obliged by European legislation like FuelEU Maritime. Replacement of an engine for an engine that is capable of using alternative fuels is a serious option to consider for ship owners. The replacement of an engine is a complicated task that requires a lot of technical preparation and the execution requires a lot of high skilled labour as well as specialized facilities. The replacement not only comprises the removal and installation of a new engine but also the installation of a new fuel system including fuel tanks. Depending on the fuel type these systems and tanks can be very demanding and challenging to design and install. An engine replacement including all systems and tanks is something European SMRC shipyards are very well equipped for.

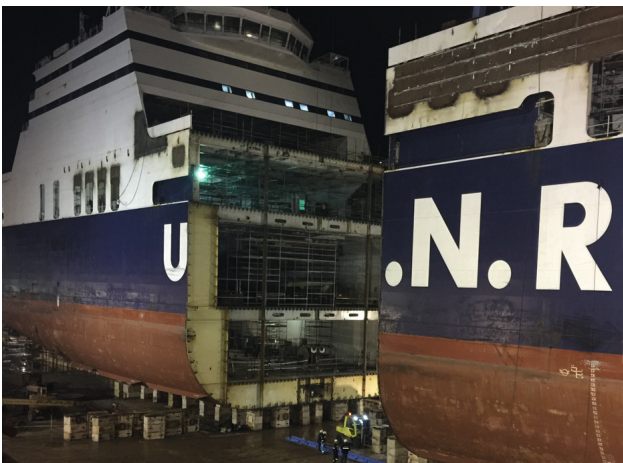
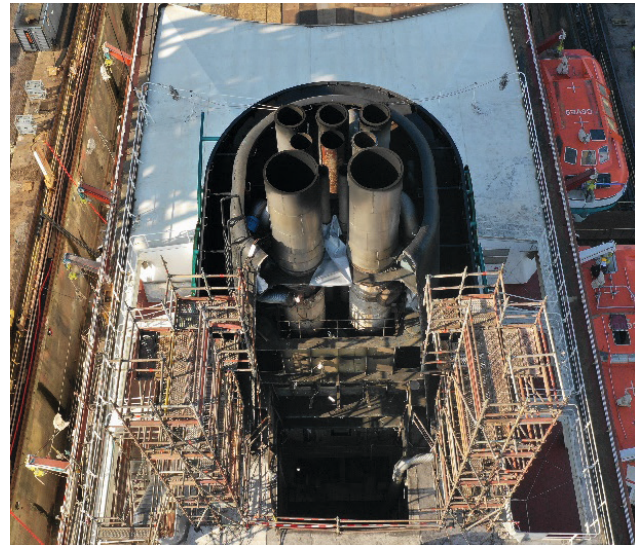
Retrofit of a battery system

A ship can be equipped with advanced battery hybrid power systems. In this case the existing engines have been supplemented with battery packs and auxiliary equipment. The 1.2 MW battery system stores additional energy to power both the thrusters and the ship's other systems when power demands increase without having to turn up the operation of diesel engines. As a result, the ship's fuel consumption and SOx, NOx and GHG emissions are reduced, improving efficiency and environmental credentials.



Exhaust gas treatment

Another interesting retrofit for existing ships is the installation of an onboard carbon capture (OCC) system. This unit is an add-on on the ships exhaust system. Exhaust gases are treated and thereby the CO₂ is captured from the exhaust gases. OCC systems need to be integrated with other systems onboard, and the CO₂ needs to be intermediately stored for later offloading to appropriate infrastructure. An OCC system retrofit therefor also comprises the installation of a CO₂ system including CO₂ storage tanks. The installation of the total system has a high impact on the ships technical system and design. European SMRC shipyards have already performed several installations.



Ship lengthening

For several reasons a ship can be lengthened. For example when a ship reduces its service speed it could be interesting from the perspective of engine power or sea behaviour to lengthen the ship. This is a complex operation as it comes not only to bringing together massive steel parts but it also requires all electrical cabling, piping etc. to be cut and reconnected. The economy of scale - also from a climate perspective - of a lengthened ship is better. European SMRC shipyards have the right facilities, skills and technical know-how to perform these complex projects.

SEA SMRC

The SEA Europe Ship Maintenance, Repair & Conversion (SEA SMRC) group is an autonomous working group of SEA Europe. SMRC represents the interests of the European SMRC industry under the umbrella of SEA Europe. The SMRC industry comprises yards dedicated to maintenance, repair, conversion and retrofitting of ships.

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