

EXCLUSIVE SPECIAL REPORT FROM Wärtsilä Marine Power

Making the right decarbonisation choices to futureproof cruise and ferry assets

Taking a lifetime, modular approach to decarbonisation provides maximum flexibility while protecting assets for cruise and ferry owners says Maikel Arts, General Manager Market Innovation at Wärtsilä Marine Power.

The climate crisis poses an existential challenge for the shipping industry and wider society. However, we must also be honest about the fact that the marine market needs to follow the most financially viable route to net zero.

The tension between commerciality and sustainability is going to define the industry's debate and discussion in the coming decades. The cruise and ferry segments arguably must navigate an even more particular set of challenges and circumstances, thanks to the nature of how it operates, how vessels are bought, traded and sold, and the lifespan of assets.

Some principles will hold true regardless of the direction of the industry's discourse. Most importantly, to protect assets, owners need to consider the entire lifetime of the vessel from the beginning, particularly when we consider regional regulations that differ across Europe and Asia.

A vessel can operate in one region but may be relocated once sold: a common chapter in the life of a passenger ship. This is an important consideration in determining a successful decarbonisation strategy that protects the asset value while keeping the vessel attractive to second and third owners.

RoPax lifecycle

Several RoPax vessels are built in Japan, which means that South European owners are often buying second-hand vessels around 10-15 years old from Japan or South Korea. Analysing the next 10 years of the asset's lifespan and where it will be operating in Europe will help to determine the best decarbonisation solutions. However, the vessel may well then be sold on to operators in locations, such as Africa or the Philippines, where the infrastructure and fuel usage scenario will be different once again.

Choosing alternative fuels will therefore require holistic consideration of the global infrastructure. Central Europe has the infrastructure and access to methanol and ammonia, whereas the Mediterranean is currently focused on biofuels.

Cruise options

On the other hand, small cruise vessels will tend to prioritise options, such as biofuels or synthetic fuels, due to the limited space onboard and the lower energy density of new fuels. An added advantage is that the vessels do not need significant upgrades to handle these new fuels.

For larger vessels, greater emissions reductions can be achieved with the use of energy saving devices, such as air lubrication due to their hydrodynamic properties and operating

patterns, although alternative fuels are still an option. Additionally, hybrid systems are becoming far more common and shore connection will aid the move towards the electrification of the cruise and ferry sectors by enabling zero-emission operation while in port.

Ferry diversity

Few maritime sectors are as diverse or challenging as the ferry market. From small commuter ferries making tens of trips per day to the biggest RoPax ferries sailing overnight, each segment faces individual challenges based on regulations, business case and operating profile.

The relatively small size of many ferries and their fixed, short routes mean that many efficiency technologies and power sources are more viable than for bigger vessels covering greater distance. Ferries connecting routes often benefit from electric and hybrid battery solutions due to the short routes and lack of long-term power demand. Working on short, fixed routes also allows ferries to benefit from port power systems where battery recharging is a possibility.

Energy storage solutions

Using energy storage allows for lower installed engine power, resulting in lower fuel use, reduced emissions and better ratings in the International Maritime Organization's (IMO) Energy Efficiency Existing ship Index (EEXI) and Carbon Intensity Indicator (CII) schemes. The availability of multiple power sources also offers operational flexibility, including running fully electric for extended periods depending on battery capacity.

Typical functions for hybrid vessels include spinning reserve to provide emergency power in case of blackout; peak shaving to keep engines running at optimal load; full electric manoeuvring to comply with port emission regulations; and dynamic load taking to reduce the time it takes for vessels to start up and reach a required speed.

Hybrid vessels hold the ability to accommodate multiple power sources – including wind, solar and onshore charging - and their ability to reduce fuel consumption dramatically improves the business case for using clean fuels, which are expected to be more expensive than current fuels.

Choosing fuels

Switching to LNG enables cruise and ferry owners to make immediate reductions in CO₂, SO_x and NO_x emissions, and it supports compliance with regulations, such as EEXI and CII. However, for LNG or any other new fuel, owners need to consider fuel availability, operational and financial impacts and technical feasibility.

Flexible, multi-fuel engine technology eliminates the need for operators to make a long-term commitment to one fuel by allowing the use of multiple fuels. It provides the adaptability to take the first steps towards decarbonisation with a transition fuel, such as LNG and progress through drop-in and fuel blend strategies towards the renewable zero-carbon fuels of the future.

In 2022, we launched two multi-fuel engines - the Wärtsilä 46TS-DF and the Wärtsilä 25 (W25) – both centred on taking fuel efficiency to a new level to offer a futureproofed solution for ship owners to reach decarbonisation targets.

Both engines are capable of operating on diesel, LNG, or either gas or liquid carbon-neutral biofuels. The value add of running on LNG is that it reduces CO₂, NO_x and SO_x emissions,

and paves the way for the adoption of bio-LNG and synthetic methane in the future. When operating with natural gas, the engines are IMO Tier III compliant. Compliance is also possible with diesel when integrated with a Wärtsilä NO_x Reducer (NOR) emissions abatement system. Furthermore, the engines enable compliance with the IMO's CII and EEXI protocols that enter into force from January 1, 2023.

Wärtsilä 46TS-DF is available in 6 to 16-cylinder configurations, corresponding to a power output range of 7.8 to 20.8 MW at 600 rpm. In gas fuel mode, the engine has the highest efficiency thus far achieved in the medium-speed engine market. The first order for this engine type was placed by Chantiers de l'Atlantique, where the engines will be installed on Royal Caribbean Cruises' latest Oasis class ship *Utopia of the Seas*.

W25 is a multi-fuel medium-speed four-stroke marine engine, available in 6 to 9-cylinder configurations with a power output ranging from 1.9–3.4 MW. Its modular design allows for simple and seamless conversions to low or zero-carbon fuels in future, and is intended to be the first engine to run on ammonia as a fuel. These characteristics make this engine the ideal choice for futureproofing small cruise vessels.

The overriding basis for these new engines is to offer a new level of flexibility and efficiency that will make it easy to retrofit the engines for carbon-neutral and carbon-free fuels in future, while also reducing fuel consumption, lowering emissions and keeping cost-effective maintenance.

Billion-dollar undertaking

The annual 2021 State of the Cruise Industry Outlook produced by the Cruise Lines International Association (CLIA) highlighted that the industry has already invested \$23.5 billion in new technologies and cleaner fuels to reduce CO₂ emissions. This is just the start of the investment that will be needed in the lead-up to 2050 and, despite the pressures to act immediately, shipowners need to be sure that they are taking a full lifecycle approach to their investments.

Wärtsilä recognises there is no single solution to decarbonisation. There is a range of effective technology that can be deployed today depending on the vessel profile and lifecycle. It is important to determine how technology can be best integrated for greatest effect - to achieve the best return on investment and to maintain operational flexibility now, and for future owners.

By working with each customer to identify a decarbonisation pathway that is financially viable, we are creating added value as we tackle the energy transition ahead while continually maintaining the highest safety standards.