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Uncovering the vintage appeal of ships

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Lila Global

Older vessels are an integral part of maritime's journey towards holistic sustainability and decarbonisation, writes Laxman Kumar head of technical for GMS' shipowning arm Lila Global.

The CII and EEXI will come into force in January and are intended to accelerate greening of the world fleet. It is likely that many ships will not meet the IMO's EEXI and CII criteria for existing vessels and may well have to be phased out. In the past, shipowners have scrapped their existing vessels, and then gone to yard to commission a high-spec newbuild, to be fully compliant with the latest guidance.

Shipping is committed to improving its environmental footprint and meet the regulations and emissions targets laid out by the IMO, however, the green transformation of shipping's existing fleet must be looked at holistically. The new green vessel, or 'eco-ship,' may have a two- or four-stroke engine, mature technologies which – outside of the minutiae of valve timings and stroke length – have not changed much in decades. On the other hand, it might incorporate the latest emissions abatement technologies, which are developing at a transformative pace.

Two-stage turbocharging, carbon capture devices, can result in significant improvement in fuel, and CO2, efficiency.

One can also argue that newbuilding ships will be dual fuel and mostly use LNG, most of the emissions would be significantly reduced, but the use of LNG does not decrease the global warming potential by more than 8–20%. The reduction amount depends mainly on the magnitude of the methane slip from the gas engine. Also, a great deal of energy is consumed for gas liquefaction and transportation, resulting in significant emission quantities.

Computational fluid dynamics (CFD) has certainly tweaked existing hull designs by naval architects — but not very much. The new ship is likely to feature an optimised hull form with new design of bulbous bow to improve water flow through the propeller, reduced hull friction using bubble lubrication, or hybrid electrical propulsion or even sails.

However earnestly prepared a shipowner may be to invest in such green newbuilds to meet pressing environmental targets, the most important question is whether rushing to recycle vessels prematurely to rejuvenate fleets is truly the best approach.

Would an existing ship, even a 20-year-old one, not benefit from the aforementioned efficiency upgrades?

Further investment in ageing assets may not seem the obvious approach when seeking to reduce shipping's global emissions, but there are good reasons to believe it may, in fact, be the best course of action. Let us look at the alternative, building an entirely new ship.

Building new ships

The life cycle for the ships starts at steel manufacture and ends at scrapping. The ship structure, the machinery, piping, outfitting, and many miscellaneous articles in a ship are made of steel; the lightship weight is considered as the total weight of steel. Whenever a new ship is built, it requires a mountain of new steel, produced by one of the most carbon-intensive industrial sectors. While recycled ships are a vital source of steel scrap, recycled metal makes up less than 40% of steel production globally, a shortfall expected to widen, not narrow, in the

coming decades. The steel industry, while undergoing its own green transformation, often still utilise conventional blast furnaces, using virgin iron ore as a feedstock and coal as fuel.

Raw steel production from iron ore to steel using a basic oxygen furnace will require approximately 24.5 × 109 J energy per ton of steel produced.

Every ton of steel produced in 2018 emitted on average 1.85 tons of carbon dioxide, equating to about 8 percent of global carbon dioxide emissions. A newbuild bulk carrier, with a 150,000dwt capacity and a hull and machinery weight (lightweight, or LWT) of 20,000 tonnes, would require 15,400 tonnes of coal to be burned to generate enough steel for the vessel. This means that before any welding is done, the CO2 footprint of the vessel's construction is at least 37,000 tonnes.

Newbuilding also results in VOC emissions, and for a ship of 20,000 lightweight it is calculated at 173.51 tons, most of which is generated by painting activities.

Taking 'Well to Wake' emission calculation one will need to add energy spent on mining and transportation of the iron ore, and the coal, that manufacturers use to make the steel to build the ship. Just to deliver the raw material for production of steel generates an enormous additional carbon footprint.

Holistic view of energy and emissions

There is much more to building a ship than getting hold of steel, however. The energy required to create the essential material can be massive. Estimates reproduced in Lloyd's List recently said that in 2017, South Korea's shipyards generated 2.1m tonnes of CO2, of which 60% was driven through demand for electrical power.

In another estimate, the power consumption at a typical large Chinese shipyard is put at 20,000MWh – enough to keep the Three Gorges Dam running for several hours.

Unlike the cost of making steel, such tertiary emission sources – dubbed 'Scope 3', defined under the Greenhouse Gas Protocol Corporate

Standard as ‘indirect emissions that occur in the value chain’ of a company, both upstream and downstream’ — are more difficult to quantify. But it ought to encourage us to ask the question of whether laying down a new hull is the best approach in every case. What if instead, existing vessels could be refurbished, not rebuilt?

Older but not less safe

In many cases, there is a misconception that older vessels have seen significant wear and tear, which if combined with a lack of proper maintenance could make them unsafe. In such instances, pundits advocate replacing vintage tonnage with younger vessels on principle. However, older does not necessarily mean more accident prone, if maintenance and responsible operating procedures are adhered to.

Steel structures themselves can maintain integrity, and accidents relating to hull ruptures, breaches or breaks are not limited, as we might expect to old ships. In recent years, major incidents have involved vessels such as *Crimson Polaris*, 13 years old, M/V *Wakashio*, 13 years old, *MSC Napoli*, 15 years old and *MOL Comfort*, just five years old.

The need to change

Vessels will naturally be phased out of the fleet as part of a responsible ship recycling strategy, something that GMS supports. However, serious thought needs to be given as to the rate at which older vessels are phased out of the fleet and its true benefit to emission savings, to prevent EEXI and CII leading to net-negative outcomes. If shipping looks beyond its 2.4% contribution to global CO2 emissions and looks more widely at the carbon contributions of a vessel along its entire value chain, disposing of older vessels, no matter how well-intentioned, may not always be the best approach after all.