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Trust is earned

Know your **knots**

Hempel A/S, makes the case for frictionless sailing and outlines how quality hull coatings enable steam turbine gas carriers to swap power for speed.

For around one-third of the global LNG fleet, slow steaming as an option to reduce emissions does not apply.

The approximately 240 vessels that make up the steam turbine LNG carrier fleet are the oldest and least efficient of the gas carriers. Like all LNG vessels, they use boil-off gas (BOG) from their cargoes to propel them, but this older vessel type produces the most BOG per day compared to newer designs.

Simply put, if these vessels slow steam, their voyage time is increased and the cargo is on the vessel for a longer period of time, so the ship burns more gas to complete the journey. This results in increased emissions and contradicts the overall aims of the new IMO Carbon Intensity Indicator (CII) and Energy Efficiency Existing Ship Index (EEXI) rules.

Nevertheless, like all vessels, they still are obliged to bring their emissions in line with the rules and improve their performance.

But with slow steaming an unattractive option as it increases both operating costs and emissions for steam turbine LNG carriers, these vessels have to resort to other emissions reduction options, such as propeller shaft power limitation (ShaPOLi). According to 2021 Bureau Veritas data, in order to reach required EEXI emissions levels, ShaPOLi would have to be applied by 15 per cent to as much as 45 per cent. This equates to a potential speed loss of 2 – 2.5 knots.

Moreover, since the operational speed for these vessels will be very close to their maximum speed, owners need solutions to prevent or minimise the increase in power required due to hull and propeller deterioration.

These scenarios will erode steam turbines' commercial competitiveness and have charter party implications.

With this in mind, EEXI and CII are forcing some owners to rethink the future commercial viability of steam turbine-powered vessels. But before any big decisions are made, Hempel, a leading manufacturer of hull coatings, encourages owners to consider other options available to improve the speed/power ratio – including advanced silicone hull coating solutions.

A ship's hull represents around 70 per cent of its overall structure, and is thus a good place to start when considering a vessel emissions reduction programme.

One of the least intrusive and quickest ways to improve a vessel's operational performance is with a coatings upgrade. By reducing biofouling, and in turn reducing resistance as the hull cuts through the water, less energy is required by the propeller to power the vessel.

This leads to reduced fuel consumption and emissions and, ultimately, an improved Vref (speed reference as defined in model test) and CII rating compared to conventional antifouling solutions. Some coatings upgrades offer an immediate increase in Vref following application in dry dock, such as Hempel's Hempaguard MaX which offers a significant 2 – 3 per cent.

Calculating a coating

As a marine coatings provider, Hempel believes that its role in shipping's emissions reduction pathway is to act as a trusted industry advisor. Ship owners and operators often ask about the various emissions-reducing options available to help them with their CII rating and, in response, the company has created a platform that can generate a coatings impact report for any vessel in the world fleet.

These reports give ship-specific CII and EEXI analysis for any coating, and can compare and contrast between available products. It gives customers accurate data on the cost of ownership, return on investment (ROI) and CII/ EEXI impact of a coating prior to investment.

The CII & EEXI Impact Analysis Tool determines the performance of a hull coating by the 'out of dock speed/power gain' and the 'speed loss percentage'.

It can be visualised as follows: out of dock power gain + speed loss in power = total savings percentage.

After the coating has been applied in dry dock, the 'out of dock power gain' is realised within the first year and shows the decrease in power (and fuel consumption) at a specific speed. 'Speed loss percentage' is averaged over the ship's service period. Translating the speed loss percentage to power with a 3:1 speed-to-power relationship and adding it to the 'out of dock power gain' figure gives the 'total savings percentage' over the service period from a specific hull coating application.

We recommend that two or three paint systems are analysed including the existing system already applied to the vessel, so that accurate comparisons can be drawn. Further, we recommend that the following criteria be considered before committing to a new hull coating product or service:

Expected impact on CII for different coating systems, surface preparation scenarios and, if needed, the Vrefchange for the purpose of EEXI.

Total cost of ownership associated with the coatingchoice, including the cost of the coating itself, shipyard cost for surface preparation and paintapplication, cost of cleaning based on the expected performance of chosen coating, fuel cost over theship's service life, and return on investment in months.

Any economic benefits for the owner and operator, including fuel savings for the charter period andincrease in daily earnings (time charter equivalent).

With this data-driven approach, owners can fully appreciate the impact their investment will have on their vessel's efficiency and commercial prospects.

Ship-driven data

Given how environmental regulations coming down the line are likely to impact various vessel segments and classes differently, vessel performance monitoring is more important than ever before and Hempel is focused on finding ways for customers to gain as much insight from their vessels' data as possible.

Whilst official sea trials are required in order to obtain an updated Vref for EEXI, we encourage our clients to carry out in-service monitoring so that the true impact of the new coating can be evaluated.

Measuring 'out of dock' power gain

The company recommends three different ways to measure a coating's effectiveness.

The first compares vessel performance data obtained following two consecutive dry docks when paint has been applied. The first set of data will be obtained from the noon reports logged by the master following the application of a conventional anti-fouling coating during the last dry dock.

The second set of data would be obtained after the next dry dock when a high-performance silicon anti-fouling system is applied. In-service measurements are then taken using a torquemeter installed onboard.
The performance comparison between the two time periods after dry dock will derive the speed/power gain (Figure 1).

Another option for owners wishing to understand the effectiveness of a high-performance silicon anti-fouling system on their vessels is to apply a numerical prediction method, based on experimental data measuring frictional resistance coefficients at a model scale.

Meanwhile, a third option for consideration is to measure over a period of time the long-term effect of added power obtained through application of high-quality coating. Many shipowners and operators are using in-service data collected from their ships and analysing it using Hempel's specialised performance monitoring software based on ISO 19030 (which outlines the principals that should be used to measure changes in hull and propeller performance).

This data is crucial for informed decision making and as a new coating on a vessel is a significant commitment, it makes sense to monitor how well it performs at sea.

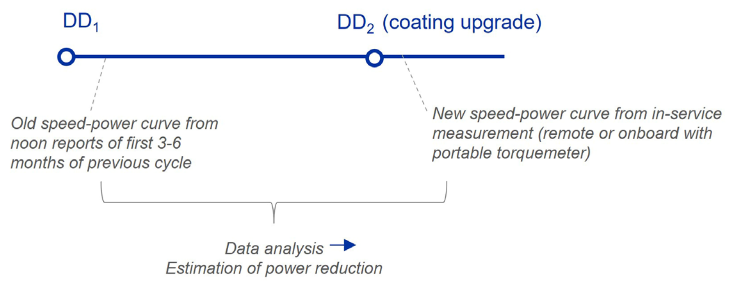

Figure 1. In service measurements timeline.

The coatings effect

Armed with this data intelligence, Hempel is ready to support owners and operators of all vessel types so that they can make informed decisions and adopt emissions reduction pathways that will help keep their vessels in service. The company's flagship coating ranges include Hempaguard X7, which delivers 6 per cent fuel savings as the out of dock power gain, due to the silicone smoothness effect and a maximum speed loss of 1.4 per cent across a five-year docking interval. Meanwhile, Hempaguard MaX offers 8 per cent fuel savings as an out of dock power gain.

Both Hempaguard X7 and Hempaguard MaX are formulated with an activated silicone hydrogel which exhibits non-stick properties that repel organisms and effectively maintains a lower frictional resistance to aid the movement of the ship's hull through the water. A biocide-activated hydrogel is formed on the surface of the silicone coating and as the biocide diffuses out of the film, it is trapped in the hydrogel layer.

This increases its surface concentration and prolongs the time the biocide is retained at the surface of the coating – where it is most effective. This means that considerably less biocide is needed compared with standard hull coatings, yet it is much more effective at preventing the settlement of biofouling organisms.

For steam turbine vessels, the value of Hempaguard lies in the Vref increase after a ShaPOLi has been installed. Even a small change in speed of 0.3 – 0.5 knots can be critical for customers' shaft measurements.

It enables these vessels to offset at least in part, speed lost through ShaPOLi, whilst avoiding slow steaming. This in turn increases their commercial attractiveness and can help them meet agreed charterparty speed requirements.

Return on investment

With only a small percentage of exceptions, ship owners and operators will need to adopt energy saving measures to bring their vessels in line with both existing and upcoming regulations.

Hempel is constantly reviewing its own commitments to the environment and have introduced a set of targets to reduce its footprint. The company will be carbon neutral in its own operations by 2025, and has committed to set science-based targets in its value chain in accordance with the 1.5˚C pathway.

Hempel has also set the challenge to reduce customer carbon dioxide emissions by at least 30 million tonnes by 2025. This will be achieved through a renewed focus on sustainability in technology research programmes and the innovation incubator, GrowHub, will be central to future product offerings.

With these goals, the industry will be futureproofed and customers will be supported in their ambitions to operate vessels in a low-to-no-carbon shipping environment.

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