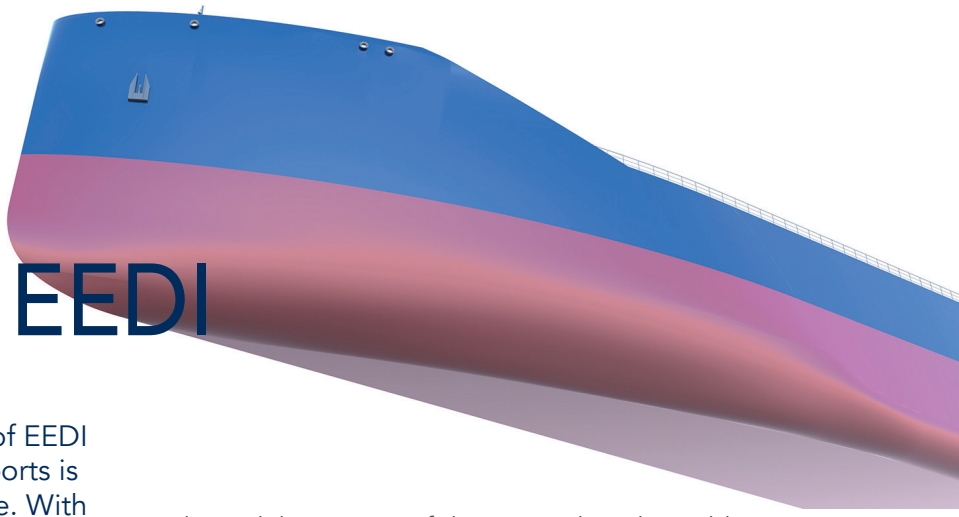
More ships comply with EEDI



A recent study shows that the number of EEDI vessels calling at Finnish and Swedish ports is still small but keeps growing all the time. With low power-to-deadweight ratios and upright bow forms, they are more likely to require icebreaker assistance in ice.

Development engineer Teemu Heinonen at Aker Arctic has continued to research how new vessels built according to the Energy Efficiency Design Index (EEDI), introduced by the International Maritime Organisation (IMO), can manage in ice conditions in the Baltic Sea. The results confirm the findings of his previous research project that he finished two years ago (see Arctic Passion News, issue 18).

This time, the research project was divided into two parts:

Part 1: Continue the previous research project regarding the need for icebreaker assistance, conducted for winters 2016 to 2018, to confirm the results over a longer period. The newly-investigated time comprised winters 2019 and 2020.

Part 2: Compare ship particulars between ice-classed EEDI vessels and older vessels built before EEDI regulations. The project would then investigate design trends in new vessels which could affect the need for icebreaker assistance.

30% needed assistance

All vessels were divided into four categories, as in the previous study: new ships designed and built to meet EEDI requirements applicable to them; older ships that predate EEDI but nonetheless meet the requirements; older ships that do not meet EEDI requirements for similar ships built today; and ships of any age not covered by EEDI.

In the winter of 2018-2019, 30% of built to comply EEDI vessels needed icebreaker assistance in Finnish and Swedish ports, whereas 20% of the older but EEDI compliant vessels needed assistance. Those vessels which were not EEDI compliant clearly needed less help.

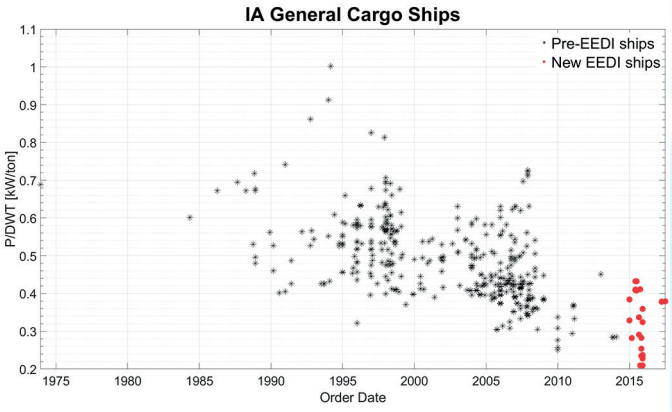
Similar trends were also visible for winter 2019-2020 as the non-EEDI compliant vessels needed less assistance than the EEDI compliant vessels. However, the winter 2019-2020 was one of the mildest ever recorded, which limited the amount of data, even though a mild winter can be navigationally challenging due to mobile ice forming ridges and brash ice barriers.

Ratio tells assistance need

In the second part of the study, ice-strengthened EEDI compliant ships were compared to other types of ice-strengthened ships which have visited Finnish and Swedish harbours in previous years.

Ships of a similar category were compared to each other, i.e. container ships to container ships and tankers to tankers. The results showed that the new EEDI ships clearly have a lower power-to-deadweight ratio than older ships.

"For example, ice class IA general cargo vessels are the most common cargo vessels in this environment," Heinonen says. "The new EEDI general cargo vessels have dropped their power-to-deadweight ratio by 30% compared to pre-EEDI vessels. This ratio is widely used as an indicator for icebreakers of how likely a vessel will need assistance. The assumption can therefore be made that the EEDI-compliant ice class IA general cargo vessels will very likely need assistance."



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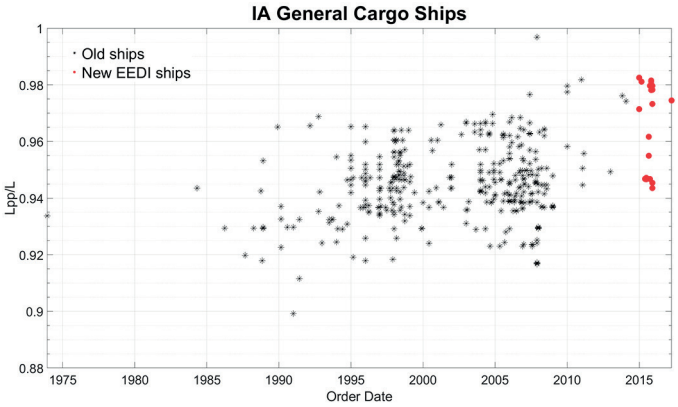
A straight bow form is weak in ice

Another interesting finding was that the length between perpendiculars (LPP) to overall length (LOA) ratio was closer to 1.0 for EEDI vessels, which indicates that many

EEDI vessels have a very straight bow with a practically vertical stem in order to maximize the waterline length and improve efficiency in open-water.

"This type of bow is not efficient in ice, especially if there is any unbroken level ice. The vessels' ability to operate independently in ice is weak and they will therefore need more assistance," Heinonen underlines.



The length between perpendiculars (LPP) to overall length (LOA) ratio was closer to 1.0 for EEDI vessels, which indicates that many EEDI vessels have a very straight bow with a practically vertical stem in order to maximize the waterline length and improve efficiency in open-water.

This is further intensified by the fact, that the large LPP/LOA-ratio (vertical bow) is often linked to a small power-to-deadweight ratio.

Tighter requirements for old vessels

Heinonen adds that EEDI regulates only new ships.

Currently, IMO is planning to adopt new energy efficiency regulations: the Energy Efficiency Existing Ship Index (EEXI). The regulations will apply to all existing ships, including EEDI ships, from 1 January 2023. It is anticipated that, in many cases, the EEXI regulations would limit the engine power of the older merchant ships with an overridable Engine Power Limitation (EPL) system.

"Basically, the EPL system could be overridden when operating in ice-infested waters, but how the system will actually be used in the future, the possible effects to the winter navigation system, and needs for icebreaker assistance are yet to be seen," he says.

Traficom aware of the situation

Maritime authorities from the Finnish Transport and Communications Agency, Traficom, have also noticed the downward trend of power-to-deadweight ratios and bowform optimisation for open-water operations. Special advisor Lauri Kuuliala from Traficom comments:

"There is a clear trend of decreasing the power-to-deadweight ratio in ice-classed ships, especially in the higher ice classes. It seems that this trend is not driven solely by environmental regulations such as EEDI but also by commercial concerns. Ice-classed vessels operate in a very competitive freight market and keeping costs to a minimum is essential for operators. Furthermore, a very significant portion of the ships calling at Finnish ports when assistance restrictions are in force only have a single visit per year to Finland. Therefore, it is understandable that those ships are optimised more towards open water operations, despite being ice-classed."

Safe and efficient winter navigation important

The decreasing power level of merchant vessels is a fact to which the winter navigation system has to adapt. However, ice operations must also be taken into account in ice-classed merchant vessel designs.

"While environmental and economic concerns are driving the power levels of new merchant vessels down, it is essential that care is taken to ensure that new ships can be assisted safely and efficiently by icebreakers. Sufficient ballast capacity to allow suitable draught and trim for ice navigation, as well as efficient towing arrangements, will become even more important for future ice-classed ships operating to northern Baltic ports," Kuuliala states.

Additionally, EEDI-regulated vessels need not have weak performance in ice. "It is possible to design a vessel which is competitive and efficient, both in open-water and in ice, with Aker Arctic's comprehensive design know-how," Heinonen adds. ■

EEXI – Energy Efficiency Existing Ship Index

IMO aims to reduce the carbon intensity of international shipping by 40% by 2030, compared to 2008. During the Marine Environment Protection Committee (MEPC) 75 session in November 2020, the IMO approved draft amendments to MARPOL Annex VI, introducing an Energy Efficiency Existing Ship Index (EEXI).

Ships are required to meet a specific EEXI, which is based on a reduction factor expressed as a percentage relative to the EEDI baseline. This will be applicable for specific ship types and sizes (same as for EEDI) regardless of contract date. The draft amendments are expected to be adopted at MEPC 76 in June 2021 with entry into force on 1 January 2023.

One possible method to reduce older ships' emissions is an overridable Engine Power Limitation (EPL) system. This is a verified and approved system for the limitation of the maximum engine power by technical means that can only be overridden by the ship's master for the purpose of securing the safety of a ship or saving life at sea.

www.imo.org, www.dnvgl.com, Traficom