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NOISE REDUCTION METHODS FOR MERCHANT SHIPPING WITH CONCENTRATION ON PROPELLER DESIGN

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Introduction

In recent years noise produced on board of ships and underwater is considered from two different point of view, Marine environment and safety (fatigue on crew).
Impact of underwater noise on marine life has been widely investigated and reports presented at MEPC meetings [1]. There are a number of different source of underwater noise from shipping. These can be subdivided into those caused by the propeller, machinery, and those caused by the movement of the hull through the water.
Most important causes of noise on board of ship are machinery (main engine, auxiliary engines, winches, AC, …) and propeller [2]. MSC committee at its next meeting will consider turning the previous guideline of sound level on board ship to a mandatory document.
It is clear that propeller cavitation has an important contribution to noise both under water and on board of ships. So in this paper methods to reduce this phenomenon will be investigated. Different available technologies will be considered.

Cavitation noise

it is almost certain that cavitation noise dominates the underwater noise signature of large commercial vessels [3]. For this reason on this paper we focus on ways to reduce cavitation. Figure 1 illustrates the difference between noise generated by a non- cavitating propeller and a cavitating one.

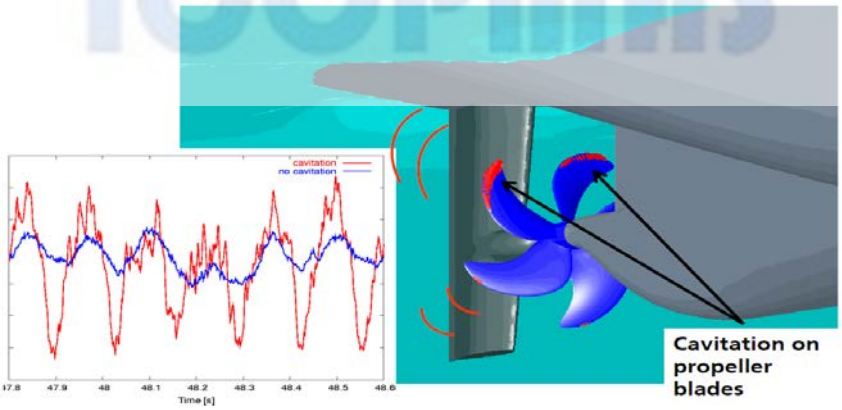

Figure 1. Difference between noise generated in case of cavitaion and without cavitation

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Another important cause of cavitaion is wake flow to the propeller. Propeller operates in a non-uniform flow behind the ship. Although in general designers attempt to provide good flow to the propeller, this is clearly limited by the desire to have as full a hull form as possible, to increase the capacity of the vessel.

Noise reduction methods by employing technologies available

There are some basic principles that can be applied to reduce the propeller noise without decreasing efficiency[4]. In this paper some design concepts such as High skew propellers [5], Kappel propellers, Concentrated and loaded tip propellers, New blade section propellers are discussed. Modifications for reducing hub cap vortex and uniform wake flow into the propeller are also investigated.

conclusion

It is not known how these concepts will influence hydro-acoustic noise, however available data suggests that it is very likely that one or other of these concepts would also have required effect of reducing noise.

Also there is the potential to improve the wake flow into the propeller for existing ships by fitting appropriately designed appendages such as wake equalising ducts, vortex generators or spoilers.

However there is little knowledge about how they will reduce the hydro-acoustic noise.

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