Underwater radiated noise measurements

Prediction of underwater radiated noise due to propeller cavitation

Assessing underwater radiated noise during the design phase has long been important for certain ships types such as naval, fishery research and seismic survey vessels. With increasing attention on the impact of shipping on the environment, noise is now also seen as a relevant issue for a wider range of vessel types. This has led to the recent introduction of several new noise standards and classification notations. In most cases, the dominant noise source is cavitation. MARIN's unique facility – the Depressurised Wave Basin - allows model-scale testing of cavitating propellers behind a ship model, resulting in realistic full-scale noise predictions.

Services for:

- Clients who wish to check if a vessel complies with relevant class notations or noise standards
- Clients wishing to estimate underwater radiated noise of a design for which environmental impact is an important aspect

Ship model in the Depressurised Wave Basin

Environmental impact of shipping noise

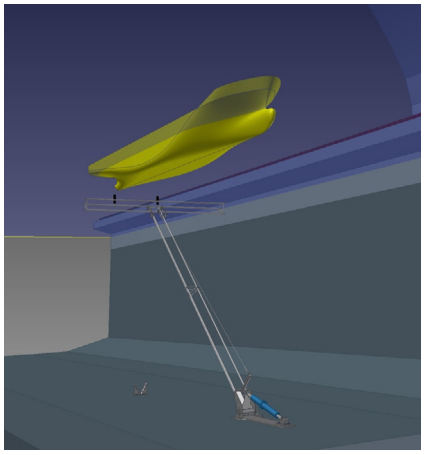
Traditionally, underwater radiated noise was mainly relevant for naval and fishery research vessels. Nowadays however, there is growing concern that marine life is affected by the rise in background noise levels in the oceans, to which shipping is a major contributor. Marine mammals and fish use sound to communicate and to sense their environment, requiring low background noise levels to do so.

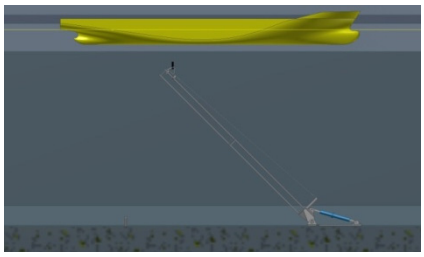
Noise regulation and classification

The aforementioned concern regarding the impact of shipping noise on marine animals has resulted in an increased body of regulatory material. This includes notations from several classification societies, IMO guidelines and the ICES 209 norm. New standards are often intended for pleasure and cruise vessels operating in environmentally-sensitive areas, although it is expected that this will apply to many more vessels in the future.

Model-scale noise measurements

In order to substantiate that a ship design can be expected to comply with relevant noise regulations, it is possible to use model-scale tests. This allows for cost-effective design assessment prior to the ship begin built and full-scale measurements being carried out.





Hydrophone mast for noise measurements

Related products:

- Cavitation observations
- Cavitation inception tests
- Propeller-induced hull pressure fluctuation measurements
- Propeller design support & evaluation

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State of the art facility

Depressurised Wave Basin

The Depressurised Wave Basin (DWB) is a unique research facility for performing propeller cavitation and noise tests in realistic operational conditions. The air pressure in the basin can be decreased to as low as 2.5% of atmospheric pressure, meaning cavitation, and associated noise and vibrations, can be studied using a scaled condition for both water and air. Using Froude scaling, the propeller(s) operate at the correctly-scaled cavitation number everywhere in the flow.

Silent towing carriage

The DWB is fitted with a silent towing carriage for noise measurements. The low background noise of the silent towing carriage allows radiated noise measurements of ship propellers which need to comply with noise standards such as classification society notations. Cavitation noise is measured by means of a hydrophone affixed to a bottom-mounted mast. Research has shown that the noise levels for a representative cavitating propeller lie sufficiently above the background noise levels across a wide range of frequencies.

Expertise and experience

MARIN has decades of experience in performing tests in the DWB for a wide range of ship types. This includes knowledge relevant for model preparation, choice of appropriate model-scale test conditions, and data scaling. This results in accurate predictions of full-scale noise levels, as illustrated in the figure below.
In addition, MARIN's design experts can assist the client in improving the hull, appendage and/or propeller design should this be deemed necessary based on the results of the noise measurements.