Significant improvements in acoustic stealth performance are possible in service conditions - courtesy CAVDKM.

Modern navies all agree on one thing: they need propeller designs which delay cavitation inception to keep their ships as quiet as possible. Bert Koops and Tom van Terwisga report on the research effort underway to meet these often complex requirements during daily operations.

Naval stealth skills advanced by MARIN research

Silent Running

In present day practice, propeller design is carried out to meet specific requirements under ideal operating conditions with a ship moving at constant forward speed on a straight course in calm seas. These conditions can be simulated easily in model test facilities, such as cavitation tunnels and towing tanks, where design results can be tested and evaluated.

Assess effects on cavitation performance

The real world, however, is somewhat different. In practice a naval ship will hardly ever sail in calm water on a perfectly straight course due to the presence of waves and currents. It will manoeuvre at certain times to sail a specific course or fulfil specific tasks, and will have periods of acceleration and deceleration. The ship will experience changes in resistance due to wind and waves that change the loading condition of the propellers.

To assess these effects on the cavitation performance of naval ships, the Canadian, Netherlands and Australian Navies have jointly participated with MARIN in a Co-operative Research Navies (CRN) Project on In-Service Propeller Performance that has the following objectives:

- to determine the most important factors contributing to the degradation in the propeller cavitation performance during typical manoeuvres and operations in a seaway and the level of this degradation;
- to evaluate available methods for predicting the most important effects and assemble an analysis package that can be used to predict cavitation performance under these conditions;
- to use these tools to formulate strategies for operational guidance on existing ships and suggest improvements for the design of new propellers and ship control systems in order to control and maximise the operational window for cavitation-free operation.

Methods for calculation

Previous work has explored some of the most important factors related to inception speed degradation. In conjunction with this exploratory work, methods for the calculation of performance degradation have been developed. A new phase of the project was started last July and is scheduled to run for two years. This phase is aimed at validation and consequent improvements of the methods reviewed here. Further work is expected to concentrate on operator guidance.

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