Pre-Swirl Stator and Propeller Design for Varying Operating Conditions - DTU Orbit
(09/08/2019)

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Over the last two decades, an increasing number of studies have been conducted to develop and improve energy saving devices (ESDs) in order to increase the propulsive efficiency. One well-known example is the pre-swirl stator (PSS), which consists of an often asymmetric arrangement of fixed stator blades ahead of the propeller. This paper describes the hydrodynamic design of a pre-swirl stator with radially variable pitch, paired with a conventional propeller. The aim is to achieve the highest possible efficiency in various operating conditions, and to avoid efficiency penalties in off-design operation. To investigate the propeller and stator designs and configurations in different operating conditions, the computationally inexpensive vortex-lattice method is used as a first step to optimize the geometry in an initial parameter study. Then the flow over hull, stator and propeller is simulated in a CFD-based approach to confirm the results obtained in the first stage.

General information
Publication status: Published
Organisations: Department of Mechanical Engineering, Fluid Mechanics, Coastal and Maritime Engineering
Contributors: Saettone, S., Regener, P. B., Andersen, P.
Number of pages: 8
Publication date: 2016

Host publication information
Title of host publication: Proceedings of the 13th International Symposium on PRActical Design of Ships and Other Floating Structures (PRADS' 2016)
Publisher: Technical University of Denmark (DTU)
Editors: Dam Nielsen, U., Juncher Jensen, J.
Keywords: Energy Saving Device, Pre-Swirl Stator, Vortex-Lattice Method, RANS-BEM Coupling
Electronic versions:
Saettone_Paper_PRADS2016.pdf
Source: PublicationPreSubmission
Source-ID: 125785060
Research output: Chapter in Book/Report/Conference proceeding › Article in proceedings – Annual report year: 2016 › Research › peer-review