


1st ProEis Workshop

Free-of-charge workshop on ship efficiency depending on ship and propeller design of ice-going ships

Sep. 26th, 2017 Hamburg, Germany

SUMMARY OF PRESENTATIONS

ProEis - Overview and objectives of the German funded research project

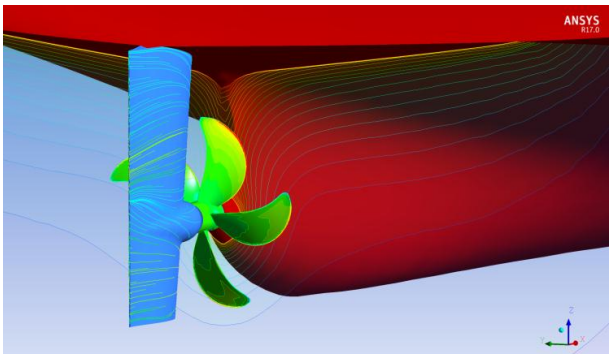
Daniela Myland, Hamburgische-Schiffbau Versuchsuchsanstalt, HSVA

A group of experts from HSVA, VOITH, MMG, DNV GL, TUHH, develogic and MV Werften Wismar aim on developing efficient software tools to analyze the interaction of ship hull, ship propulsion system and ice. Model tests and available data of sea trials serve as a basis for the developments and for validation. The tools will enable an analysis of the ice floe movement along the ship hull of different ship designs, the prediction of the influence on the propulsion efficiency and the calculation of ice impact on the propeller. By means of the software, design methods for propellers and ships can be improved. Furthermore, basic knowledge can be established for the development of guidelines for ice loaded propeller design.

Enhancement of efficiency of ice-class propellers

Lars Greitsch, Mecklenburger Metallguss GmbH, MMG

By investigation of unsteady CFD-based propulsion simulation and of parallel model tests the difference in propulsion efficiency affected by the requirement of ice-class rules has been identified. This investigation is the basis for a profitability analysis of the operation in Northern routes which would require a propeller with high ice-class. In a second step of the study the possibility of propeller efficiency enhancement by use of generic propeller optimisation targeting an increase in propeller efficiency by fulfilling the ice-class rules is investigated.



Depict: CFD-based re-calculation of propulsion performance

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Investigation of ice breaking performance

Daniela Myland, Hamburgische-Schiffbau Versuchsuchsanstalt, HSVA

Despite the importance of understanding the ice floe behavior along a ship hull, only little information is available on this issue. Thus, a method is developed to assess the floe size and distribution along a ship hull during model scale ice tests based on a detailed image analysis of underwater video recordings. As a result, the influence of ice and ship parameters on the ice floe size and distribution along the ship hull in level ice can be analyzed.

Depict: Identified ice floes

Development of a numerical ice-tank to improve the propulsion efficiency of ice-going ships

Christian Janßen, Technische Universität Hamburg-Harburg, TUHH

The talk focuses on the development of a numerical ice-tank, that can be used for an in-depth analysis of ice-going ships and a further optimization of the propulsion efficiency.
The essential ingredients of the ice tank are:
- Collision methods to mimic the ship-ice and ice-ice interactions
- Ice supply mechanisms to generate proper ice conditions in the numerical ice-tank, either from experimental data or other sources
- Propulsion models to assess the ice loads on the propeller blades as well as the influence on the propulsion efficiency

Depict: Ice-going ship in the numerical ice-tank

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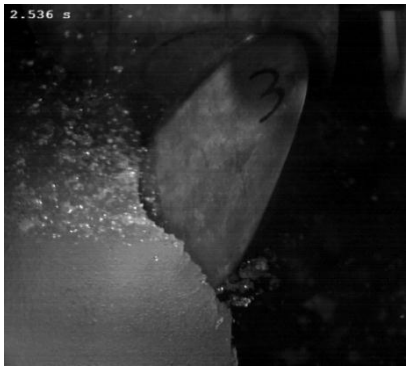
An experimental method for investigation of model propeller-ice interaction

Quentin Hisette, Hamburgische-Schiffbau Versuchsuchsanstalt, HSVA

The presentation focuses on the description of a device designed at HSVA in order to study propeller-ice interaction in model scale. The device is used to guide model ice floes into a rotating model propeller where they are milled under well-defined conditions. The resulting forces, moments and accelerations are measured, and a high speed video camera has been employed to observe the milling process in detail. Prior to experiments in submerged conditions, tests have also been performed in the absence of water, allowing to study the effects of propeller-ice interaction without related hydrodynamic effects.



Depict: High speed video showing propeller-ice interaction

Numerical investigation of propeller-ice interaction effects

Quentin Hisette, Hamburgische-Schiffbau Versuchsuchsanstalt, HSVA

A numerical simulation tool based on the panel method has been enriched by an ice contact module, aiming at assessing the effects of propeller-ice interaction on the propeller efficiency as well as estimating the maximal ice load on the blades. Several reference tests, involving different ice contact areas, impact speeds and/or ice bending strength values, are considered. Results are briefly analyzed and compared with experimental model scale results.

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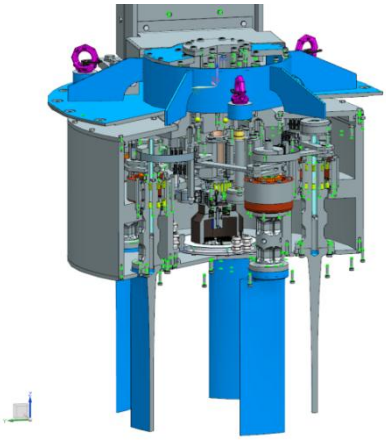
Measurement of ice interaction loads at the model of a Voith Schneider Propeller

Philipp Hauer, Voith Turbo Schneider Propulsion

There is some experience with Voith Schneider Propellers in light and medium ice conditions, but concerning the ice interaction loads there is a lack of knowledge. It is acknowledged that the construction principle is suitable for different types of non-hydrodynamic loads like ice, timber and grounding, but it is difficult to quantify the ice loads which is a requirement to gain class certificates, e.g. according to the Baltic ice classes. Therefore, in the context of the research project ProEis, a new model propeller was developed which is equipped with sensors to measure ice interaction loads. Measurements are to be conducted in the 3rd quarter 2017 in the ice model basin of HSVA Hamburg.

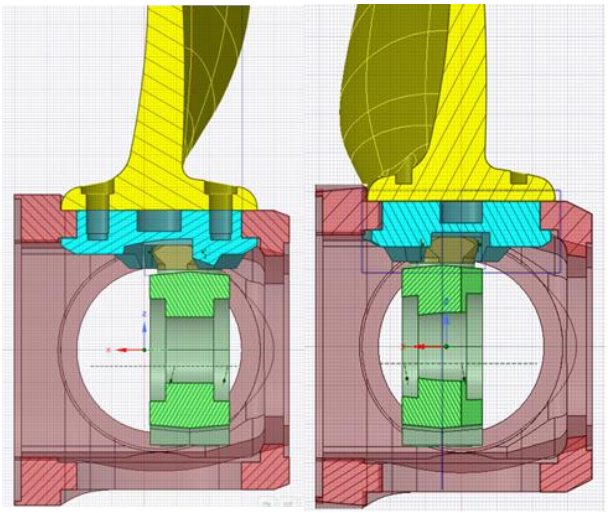


Depict: Section through VSP model propeller equipped to measure loads on blades and blade actuating gear

Strength analysis of propeller pitch mechanism under ice loads

Holger Mumm, DNV GL SE

The pitch mechanisms of CP propellers operating in ice are exposed to increased blade spindle torques to be considered in the design. Traditional, prescriptive design methods are straightforward to use but unavoidably imply safety margins to account for generalizations. Therefore, DNV GL investigated in which way direct calculation methods could be effectively used to verify the structural longevity of the components of the pitch mechanisms under ice loads. The study was performed at the example of a typical modern CP propeller series as used for vessels operating in open water as well as in light and heavy ice conditions.



Depict: Propeller pitch mechanism geometry at forward and backward ship speed

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