SVA POTSDAM MODEL BASIN items SVA POTSDAM MODEL BASIN tech

Schiffbau-Versuchsanstalt Potsdam GmbH No. 14 September 2014

Slow Steaming - a Challenge for Model Basins

Hamburg SMM 2014

Green shipping, ECO ships, slow steaming, EEDI are the actual keywords for the shipbuilding industry. The development and analysis of ship hull forms, propulsors and appendages for ships with a lower design speed than in the past is one of the main fields of operation of Potsdam Model Basin (SVA Potsdam). Ship-owners are searching for small percentages to increase the efficiency of propulsion systems and ship hulls. This is a wide market for the whole supply industry as well as for the yards. Not only new ships are under pressure of fulfilling the EEDI or EEOI requirements, also existing ships have to be redesigned to meet the environmental and economic objectives.

There are a lot of useful methods and devices to achieve these objectives. The redesign of ducts, bulbous bows, propellers, rudders and much more could help to reduce the fuel consumption significantly. SVA Potsdam sees as its obligation to make a positive contribution to the environment. To make sure that an investment gives a future profit, the percentage of efficiency must be detected to a very high degree of accuracy, because gains and losses are in a range of a few percent down to perhaps tenth of a percent for a single energy saving device (ESD). Experimental Fluid Dynamics (EFD) have to deal with these little changes of resistance and propulsion efficiency. Measurements and the accuracy of prediction must be much more precise than in the past to provide our customers with highly reliable data. Especially with fat hulls, full-ended ships and slow speeds, the measurement of force and momentum has to be sufficiently more accurate than before.

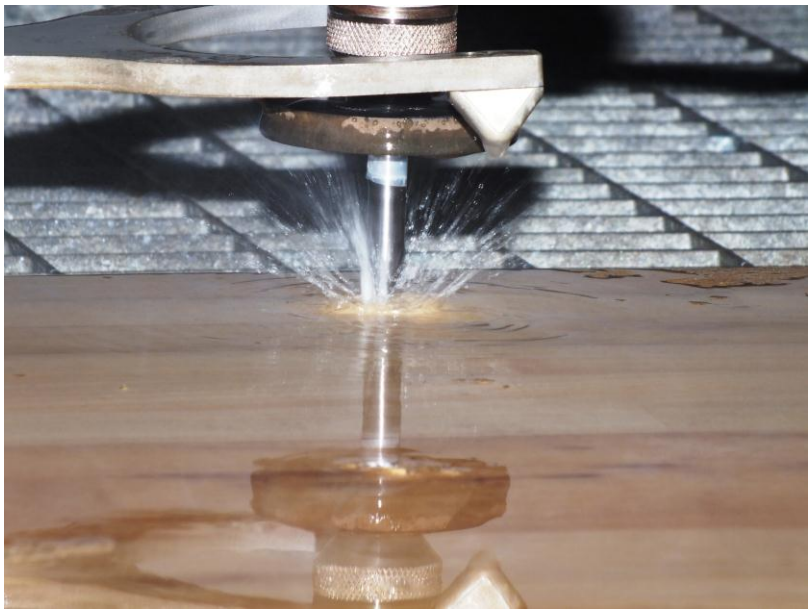
SVA Potsdam took this into account and invested a lot in test facilities to improve all our equipment. A wide variety of Z-drives, pods, rudder propellers on stock is available and with our design team, new samples can be manufactured within a short time.

Nevertheless, the power prediction by using EFD is not the only field of operation of SVA Potsdam. Several research projects are in progress, including acoustics and modern propellers like tip rake props and submerged water jets. But also simple changes in the operation of ships can save fuel, f. e. trim variation.

Slow steaming is the headline now, but SVA Potsdam is also a partner in the field of propeller design for submerged ships or high speed craft. Optimisation of hull lines using CFD could reduce EFD-costs and makes the ships even better.

With the invention of new production techniques, i.e. water cutting of timber to generate the hull form of our models as fast as possible, our new 5-axis-milling machine for wood and plastic, new machining centers for manufacturing some of the world's best model propellers and a highly skilled staff the SVA Potsdam is continuously moving forward. The SVA Potsdam assures best quality for all model tests – Always at your service.

The Potsdam Model Basin would like to invite and discuss with you at the **SMM 2014 in exhibition hall B4, ground floor, place 302.**



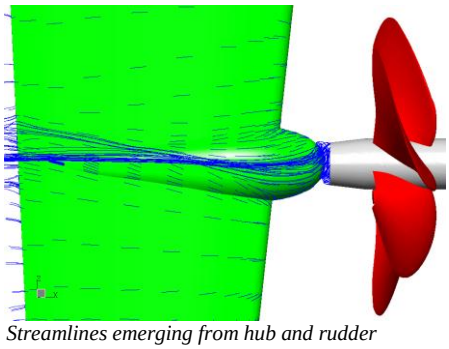
Improvement of the efficiency of shipping is an important challenge of SVA's work

Heinke, H.-J.; Steinwand, M.; Lübke. L.

The reduction of the power demand for the transportation of goods by ship and the minimising of maritime emissions is a preferential task for the design of ships and propulsion systems as well as for the ship operation. The optimisation of the ship hull, propeller and rudder and the use of energy saving devices is more than in the past a part of the development of new ships and the optimisation of existing ships (retrofitting). For this challenging task the ship model basin Potsdam (SVA) is an ideal partner, having a long and successful history in the field of maritime hydrodynamics and being able to offer first class engineering services to find the optimal solution for the benefit of our customers for a sustainable and profitable business.

In order to offer our customers this services, a key issue is to carry out intensive and continuous research and development work, which is a requirement for innovative solutions and vital for an effective cooperation within the shipbuilding and shipping industry. That's why the SVA Potsdam worked in the last years at different R&D-projects with the focus on ship – propeller – rudder interaction for improving the propulsion efficiency. The SVA is disposing over a variety of testing facilities and large computational resources and is looking forward to share this experience with our customers to find in a joint effort the optimal solutions for the requested tasks. In the following a brief overview is given.

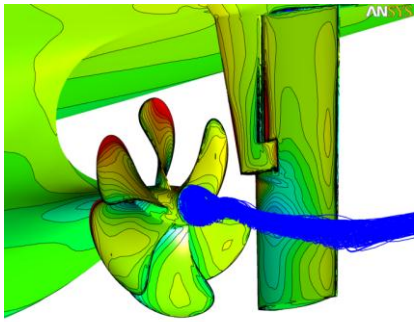
The design of rudder bulbs as a very effective way to increase the propulsion efficiency of the ship was investigated in the R&D project "Design of rudder bulbs using CFD". Different parameters of rudder bulbs were modified and its influence on propulsion were calculated and tested. Recommendations for numerical calculations of rudders in the propeller slip stream and for the design of rudder bulbs were given. The results of this R&D-project and systematic model tests are the basis for the design of propulsion bulbs in the SVA.



Streamlines emerging from hub and rudder

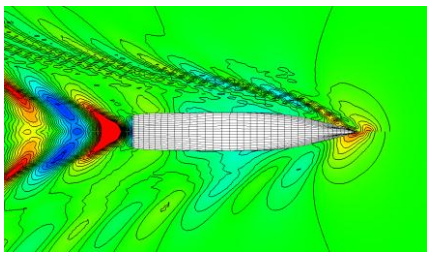
The design and application of semi-balanced rudders were investigated in the R&D-projects "High efficient semi-balanced rudder for container feeder ships" and "Numerical and experimental investigations of the effective rudder inflow at manoeuvring". The goal of these projects was the improvement of the rudder design with respect to the safety, efficiency and quality of the ship. Extensive measurements in model and also in full-scale measurements as well as computer simulations of the ship with propeller and rudder were carried out. On basis of these obtained results recommendations for the rudder design had been developed in cooperation with the German Lloyd (GL).

Full-scale measurements, ship with semi-balanced rudder



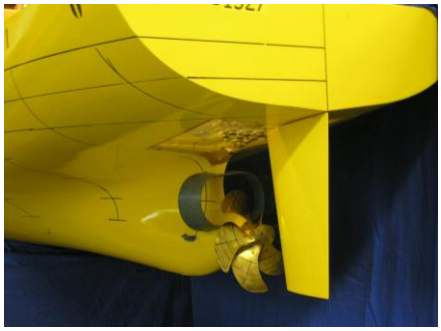
Simulation of the ship with propeller and rudder

A procedure for the optimisation of ship hulls, with respect to the reduction of the propeller induced pressure pulses and the required power, was developed and tested in the R&D-project "Form optimisation under consideration of the wake field characteristic". The project was executed in cooperation with Aker Yards Germany (now NORDIC Yards) and FRIENDSHIP-Systems. The ship hull was described by means of a parametric model within the FRIENDSHIP-Framework, allowing the generation of a variety of different hull forms in a short amount of time automatically. On basis of the parametric geometry the numerical meshes were generated, employing structured and unstructured mesh topologies. The numerical calculations were carried out with the program ANSYS CFX. As objective function during a multi-objective optimisation the required power and the homogeneity of the wake field were optimized. In course of the project the knowledge and procedures to conduct all sorts of optimizations were successfully established and verified in a variety of projects ever since.



Ship form optimisation, showing the wave pattern for the initial design at the top and the optimised design at the bottom

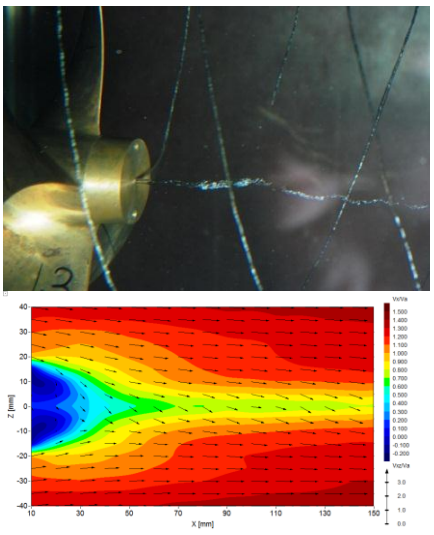
The improvement of the propeller inflow using a wake equalising duct (WED) or Vortex Generator Fins (VG) was the key aspect of the R&D-project "Increasing of the design and prognosis reliability for ships with wake field influencing devices".



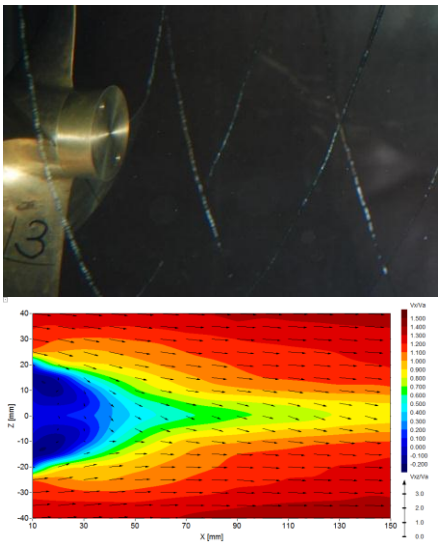
Ship model with Schneekluth nozzle

Questions regarding Reynolds number effects on the inflow to the propeller, the correlation of the model tests with the trials and the design of the propeller in interaction with wake field influencing devices were investigated in this project. Model tests in the towing tank, cavitation tunnel and the large circulating and cavitation tunnel of the Technical University of Berlin were carried out to validate and to assess the accuracy of the calculations.

The joint research project BossCEff - "Increase of the propulsion efficiency and reduction of the hub vortex cavitation by an improved consideration of the interaction between propeller jet and boss cap" was finished in 2013. The main focus of the project BossCEff was the increase of the propulsion efficiency and the reduction of the hub vortex cavitation by an improved adaptation between propeller geometry, boss cap and rudder. Extensive model tests were carried out and analysed for the development and enlargement of the numerical methods and their validation. The model tests included propulsion tests with measurement of the forces and moments at the propeller, boss cap and rudder separate, velocity measurements behind the boss caps and in front of the rudder as well as hull vortex cavitation inception tests.



Influence of a conical boss cap on hub vortex cavitation and the velocity field



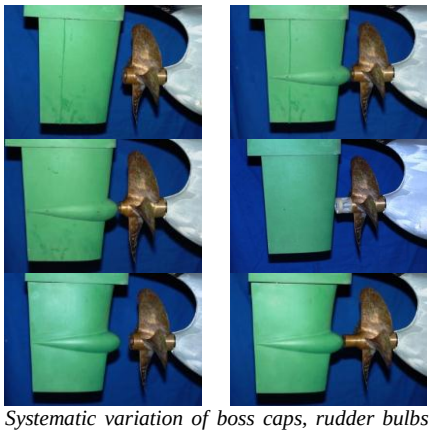
Influence of a divergent boss cap on hub vortex cavitation and the velocity field

Special propeller boss caps for the use of rudders with propulsion bulbs and boss caps with fins were developed in cooperation with the project partners Technische Universität Hamburg-Harburg, Institut für Fluiddynamik & Schiffstheorie (FDS) and Mecklenburger Metallguss (MMG). The improvement of the propulsion efficiency due to the integrated design of the propeller, boss cap and rudder were verified in model tests and in the full-scale measurements for different ships.

The following maximum propulsion improvements could be verified in the R&D-project:

- Twisted rudder up to 1.4%
- Costa propulsion bulb at twisted rudder up to 3.7%
- Costa propulsion bulb at conventional rudder up to 2.5%
- Boss cap fin up to 3.2%
- Propeller redesign up to 10%

On the basis of the mentioned R&D project over 50 optimisations of the efficiency for customers could performed in the last 2 years.



Systematic variation of boss caps, rudder bulbs and rudder-propeller distances

Mecklenburger Metallguss developed in the joint research project BossCEff a new energy saving cap – MMG ESCAP®. This boss cap fin focuses on the improvement of the propeller performance in case of a propeller retrofit or for existing propellers. But also for new designed propellers the ESCAP® can be applied.

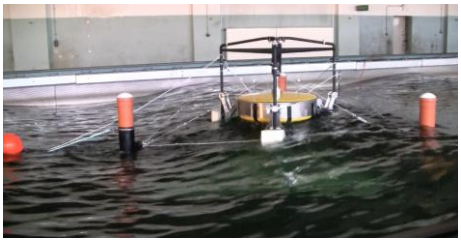
Propeller with ESCAP®, designed and manufactured by MMG

The research and development projects are sponsored by German Federal Ministry of Economics and Technology under the project executing management of EuroNorm and PTJ. The SVA would like to express its gratitude to the Ministry and the project management for the support of the research projects.

Investing in the Future – Water as an Energy Source

The Potsdam Model Basin is also involved in different research projects regarding innovative energy sources.

The aim of the joint R&D project "Experimental and theoretical investigations for hydrodynamic design of a wave energy converter" is the development, optimisation and testing of a wave converter in closed cooperation with the University Rostock and the firm ENERLYT.



Laboratory model in sea way

In the scope of the R&D-project "Mathematical and experimental modelling of turbine rotors" the focus lies in the further development and validation of design and optimisation tools of turbine rotors as well as in the formulation of basics for procedure and analysis of experimental investigations. These rotors in different versions can be used for central power generation.

Test set-up for turbine rotors

Announcement

Reception - 10 years SVAtech GmbH
"Services for the shipbuilding and supplying industry"

7th SVA - R&D Forum
„Theoria cum praxi"

29th January 2015

SVAtech GmbH
Schiffbau-Versuchsanstalt Potsdam GmbH

10 years SVAtech GmbH

The SVAtech GmbH, a subsidiary company of SVA, was established at the end of 2004.

The aim of this foundation was to meet the growing demands of the industry regarding complex engineering tasks.

All facilities and members of staff of the Potsdam Model Basin are available to the SVAtech GmbH.

Contact: heinkec@sva-potsdam.de

New Managing Director

Dr. Christian Masilge

studied naval architecture at the Technical University in Berlin. After his diploma about cavitation erosion of oscillating foil sections he continued to write his doctor thesis on the subject of waterjet design. He started his business career as chief designer and yard manager in a former GDR-shipyard in Berlin. After some years in the industry he opened his own design office and designed around 60 ships, mostly small craft and passenger vessels for coastal and inshore service. Since 2003 he has a lectureship at the Technical University of Berlin for Yacht Design and since 2011 additionally for Inshore Ship Design. Since March 2014 he joined the team of SVA Potsdam as Managing Director.
He is married and father of two children. As an experienced sailor he took part in ocean races in the past. Nowadays he preferred to sail his wooden one-ton yacht on the lakes of Berlin.

Impressum
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