SVA POTSDAM MODEL BASIN items SVA POTSDAM MODEL BASIN tech

Schiffbau-Versuchsanstalt Potsdam GmbH No. 13 September 2012

Green Shipping – a Challenge for the Presence and Future

Hamburg SMM 2012

Green shipping is a synonym for a ship concept under consideration of environment aspects and a great challenge for the presence and even more for the future.

Green shipping primarily comprises a reduction in emission. Concepts for the reduction of emissions can only be put into practice if there are new technological approaches and feasible solutions available. For the introduction of new technologies, the profitability plays an important role. But there is no panacea to reach this aim.

There are a set of trendsetting concepts. The long-term vision for the future can be the "Zero emission ship", a ship operation concept without detrimental emission in the environment.

How far are we from this vision? What can be realised?

Potentials for energy savings can be found in the design of ships and propulsion systems, in ship operation and in alternative fuel. The determining factor for the implementation is now and in the future the profitability, which is strongly related to the process efficiency. Energy saving measures can already amortise after a few years of operation and even more if a rise in fuel costs is taken into account.

Ship and propulsion system design in the SVA is carried out on basis of its excellent data base and the skill and know-how of our specialists. Results of several R&D-projects and industrial work conducted at the SVA have proven to help our clients to develop efficient and environmentally friendly ships with an optimal propulsion system. The design work includes CFD-calculations and model tests and the analysis of final designs and sea trials.

Potsdam Model Basin at SMM 2010

The Potsdam Model Basin would like to invite and discuss with you at the **SMM 2012 in exhibition hall B4, ground floor, place 302.**

Task for future generations

Shipping is classified in comparison with other traffic carriers as environmentally friendly. The energy requirement is considerable lower in comparison to other traffic carriers for the same transport capacity. This often leads to an underestimation of the share shipping has on the global emissions, but shipping is responsible for 8 % of SO_X- and 3 % of CO_2-emissions. This means, that also the shipping industry has to fulfil its contribution to meet the global climate target (temperature rise by maximal 2 degrees in this century).

With advancing globalisation the traffic takes a prominent position. Fuel consumption and emissions of the international shipping industry are expected to still rise, driven by the growing world trade. This means investments in efficient and environmentally friendly products are the best way to be prepared for the future. The journey towards lower emissions can be expected to be challenging but worthwhile taking. The SVA is prepared to offer its expertise and excellence to assist and serve you to meet and manage this future challenge. We offer hydrodynamic solutions for the maritime industry. C.H.

Green Shipping in Design and Operation

Heinke, C.; Heinke, H.-J.

Green shipping means preliminary a reduction in emission. The major issues are upon chemical pollutions and underwater noises. This has impact on ship and propeller designs, operational potentials, alternative propulsion systems and the choice of fuel. There are two ways of implementation: reduction of energy loss and recovery of energy losses.

Some saving potentials are realisable only at new ships, others can be retrofitted at existing ships or have impact on the ship operation.

The hydrodynamics is important for the fuel efficiency and a high environmental standard of ships.

The SVA Potsdam offers expertise in the **design stage** of new ships and propulsion systems.

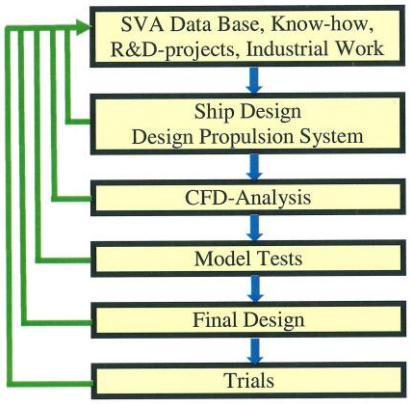
Design
Ship Concept
Optimum Dimension
Ship Design Resistance, Propulsion, Manoeuvring, Seakeeping
Propulsion System Propeller, Appendages, ESD

Hydrodynamic in the design stage

The main dimensions and the shape of the hull are important factors for high propulsion efficiencies of ships. The ship design must comprise an intelligent ship concept, optimum dimensions, a ship design under consideration of resistance, propulsion, manoeuvring and seakeeping behaviour and an effective propulsion system, with aligned appendages.

The SVA Potsdam offers to assist hull and propulsion system design in cooperation with ship yards, propeller manufactures and ship owners.

The SVA is using potential and viscous flow programs as well as model tests in the design and optimisation process and for the analysis of existing ships and propulsion systems.



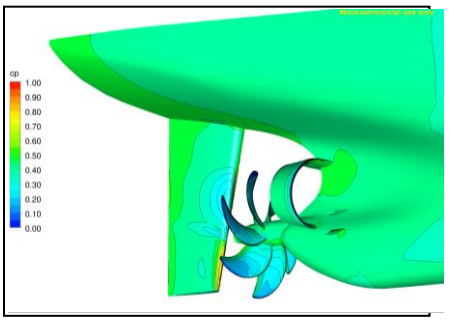
Design process

The continuous work in research and development projects is very important for the accumulation of knowledge and for validation of new methods and solution strategies in ship hydrodynamic.

For example the SVA Potsdam successfully finished the R&D-project “Investigation scale effects on wake influencing devices” [1]. Energy saving devices (ESD), like vortex generator fins (VGF) and wake equalising ducts (WED) are often applied for the improvement of the propeller inflow and for the reduction of losses.

Schneekluth nozzle in model test

Systematic model tests (propulsion and cavitation tests, velocity measurements by LDV or PIV) and CFD calculations (potential and viscous flow solver) were carried out for ships with VGF and WED.



CFD-calculation model with Schneekluth nozzle

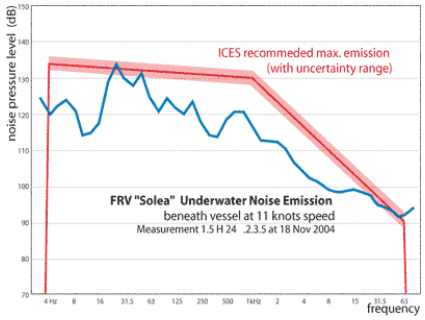
The investigations has shown that knowledge of the wake field in full-scale is necessary for the accurate design of the propeller and the prognosis of the cavitation behaviour and propeller induced pressure fluctuations. This is especially important for ships with WED or VGF. Thus CFD calculations should be used to predict the propeller inflow for ships with a wake equalizing duct or with vortex generator fins.

Additionally several others research and development projects, sponsored by German Federal Ministry of Economics and Technology under the project executing management of EuroNorm and PTJ, had been carried out for the improved design of propellers and energy saving devices (ESD) in the last years, broadening the data base of the SVA.

The industrial projects directly benefit from these R&D-projects. For example the propeller for the fishery research vessel (FRV) “SOLEA” from Fassmer Shipyard was designed for special requirements in quieting noise in the SVA Potsdam. The propeller was tested in model and full-scale successfully. Thereby it was demonstrated that the propeller fulfilled all requirements with respect to the power prognosis and noise radiation.

In the SVA potential flow calculations are in use for the design and optimisation of propellers. Viscous

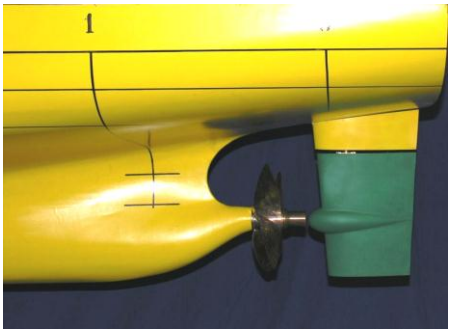
flow calculations are increasingly employed for the verification of the propeller design, the prediction of scale effects and for the design and optimisation of propulsion systems, like ducted propellers, thrusters, water jets.

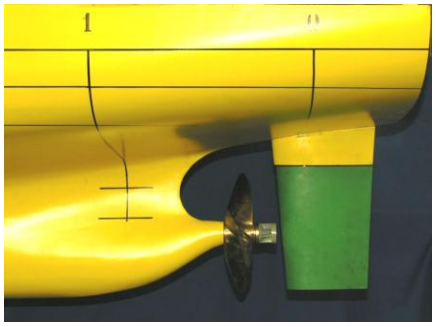


Noise demands for FRV SOLEA


Propeller for FRV SOLEA designed for low noises

The R&D-project BossCEff is dealing with the integrated design of propeller, boss cap and rudder. In cooperation with Technische Universität Hamburg-Harburg, Institut für Fluiddynamik & Schiffstheorie (FDS) and Mecklenburger Metallguss (MMG) investigations will be carried out with special designed boss caps and rudder bulbs, to minimise the hub vortex of the propeller and to recover energy losses.


Propeller with a long boss cap and with Costa bulb

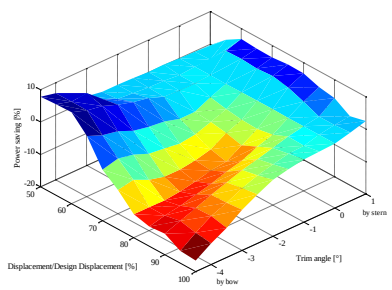

Propeller with HVV

In **ship operation** fuel consumption can be reduced by decreasing the speed (slow steaming) and/or optimisation of the trim conditions and routes as well as by optimising the interaction between engine and propeller.

Operation
Interaction Engine – Propeller
Trim Optimisation
Route Optimisation
Slow Steaming

Hydrodynamic in ship operation

Trim optimisation means the systematic investigation of trim and required power for specific operational states. Model tests are still the most effective, fastest and most exact way to determine the potential of power savings for ships. These investigations comprise the specific analysis of a matrix on defined trim and loading conditions. As a result, the ship owner receives information how the ship can be operated with respect to an optimal trim in order to reduce the fuel consumption. Supported services like CFD calculations, optimisation of the propulsion system and slow steaming check are also offered.



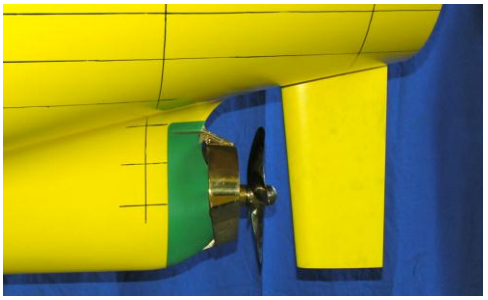
Power saving by trim optimisation

The benefit of the trim optimisation lies in the range of 2 – 3% in power reduction. A maximum up to 8% have been reached! So the costs for the investigations can be amortized under consideration of the current fuel costs after 2 to 4 months of operation.

A further possibility for energy saving offers the so called "slow steaming", i.e. simply cutting back on speed. The reduction of speed of a ship is the simplest and most efficient way for saving energy from the viewpoint of hydrodynamics. Ten percent reduction in speed gives thirty percent reduction in power. It is valid for fast as well as slow vessels.

Additional there are also saving potential in operation of ships regarding routes (like "weather routing") and logistic processes as well as by new regenerative energy devices or the use of high-energy fuel.

The Mewis Duct® is recommended as efficient energy saving device. The possible power reduction by the Mewis Duct® was demonstrates in several projects. The energy savings lies on average at 6.3 % [2].


Model with Mewis Duct®, tested in the SVA

References

[1] Heinke, H.-J.; Hellwig-Rieck, K.
Investigation of Scale Effects on Ships with a Wake Equalizing Duct or with Vortex Generator Fins
Second International Symposium on Marine Propulsors, smp'11, Hamburg, Germany, June 2011

[2] Mewis, F.
Propulsionsversuche mit und ohne Mewis Duct®
Schiff & Hafen, Mai 2012, Nr. 5

Investigations in manpower

In the last years the staff of the SVA was reinforced with young and also experienced people (engineers and skilled workers).

New staff members are Arne Singer in the towing tank and Erik Schomburg in the numerical simulation department. In the administration our team is completed by Kathrin Babbé. Wolfgang Wocher and Michael Fräßdorf replace staff members in our mechanical workshop as well as Mario Klebow in the wooden workshop.

Steve Michaelis completes our team in the laboratories.

New staff members

Announcement

6th SVA - R&D Forum

31th January 2013
(Schiffbau-Versuchsanstalt Potsdam GmbH)

„Theoria cum praxi“

Dr. habil Reinhard Schulze – 65 years

Dr. Reinhard Schulze has been employed as senior research scientist at the Potsdam Model Basin since 1993.

His engagement covered mainly in the application of mathematical optimisation methods for the propeller design and development of software components. He was project leader for numerous R&D-projects in the field of propeller design and development of innovative propulsion systems.

Additionally the hydrodynamic and acoustic characteristic of superhydrophob coating at ships was his special working field in the last years.

Contact: heinkec@sva-potsdam.de

Announcement

16th SVA - Forum
“Design of propulsion systems
– one focus of the Potsdam Model Basin since 20 years”

27th September 2012
Schiffbau-Versuchsanstalt Potsdam GmbH

Member of the Staff

Thomas Nietzschmann

Thomas Nietzschmann is project engineer in the Towing Tank Department. He studied mechanical engineering and naval architecture at the University of Rostock. In 2003 he graduated and joined the SVA.

Since this time he is employed in the towing tank department working on basic design and hull form optimisation using empirical and numerical methods as well as model testing. Thomas is project leader of different research and development projects.

He is father of two children. His hobbies are volleyball, outdoor activities and sailing.

Impressum
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