SVA POTSDAM MODEL BASIN items SVA POTSDAM MODEL BASIN tech

Schiffbau-Versuchsanstalt Potsdam GmbH No. 12 September 2010

# Shipping is green

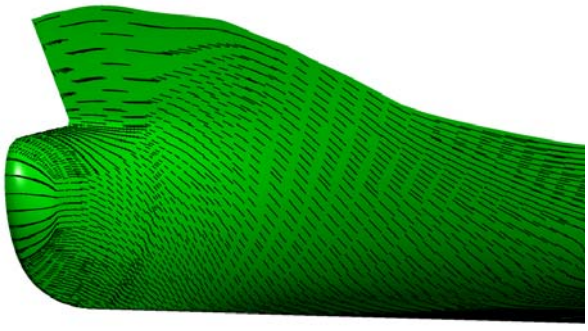
## Hamburg SMM 2010

No work without energy. Energy is impossible without any change of substance or any kind of cold or warm combustion. This is true for all kinds of engine driven transportation, which causes $CO_2$ emissions.

Shipping was and is the forerunner for an optimal use of energy, because the ship usually requires least energy per transported unit of cargo compared to other transport systems and is therefore all ready efficient. With the right expertise it could get even more efficient.

Ship form optimisation was and is the task for lower emission and model basins have contributed a lot to the progress the last 140 years. One of these old experiences is that the required power output scales with the speed cubed. This is valid for nearly all speeds for displacement ships. This means that slow steaming has big effects on the reduction of fuel consumption and therefore, costs and pollution. The savings are far higher for high speeds than for lower speeds. But slow steaming could have a more lasting effect, in case the hull form would be designed from the beginning for lower speeds, because then the savings in total power per unit transported are higher and the costs for machinery would be much lower. Bulker and tanker shipping could be seen here as a forerunner.

Besides other solutions for reducing the carbon footprint of a ship like guide fins or ducts, a free of charge solution is trim optimisation. The benefit of this approach lies in the range of 2 – 3 % in power reduction. A maximum up to 8 % have been reached! By model testing you will get the results fast and effectively for the full range of loading conditions and you have all the input data for your loading computer. Taking in account the actual fuel costs you will have a return of investment in 2 – 4 month. Try us!



The Potsdam Model Basin would like to invite and discus with you at the **SMM 2010 in exhibition hall 4, ground floor, place 530.**

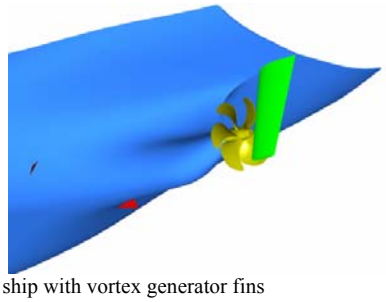
**Future needs the past**

The motto of the SMM 2010 “Go green” is the reaction with respect to the declining resources of carbon fuels, the rising demand caused by the growing population and the change in the climate, characterised by global warming. In the past the humans had only used green sources of energy, for heating wood as a renewable resource, sun power for warming, animals for land transportation, wind power for sea transportation and for the generation of mechanical energy water- and windmills. In the last three centuries, the era of carbon fuels, the humans found on the one hand new ways for the generation of energy and on the other hand the demand for energy had grown, because the fuel was cheap and the wish for comfort was high. By using oil and gas this development was catalysed. The first oil crisis in the seventies of the last century gave us an idea of what could happen, but the human tends to forget bad things fast. Now we have to face the dilemma described above and we must take counter-measures. In my opinion this means we have to return to our roots, with respect to the application of renewable energy resources in combination with a steady decline in energy consumption. Shipping industry is a forerunner because shipping is green. M.M.

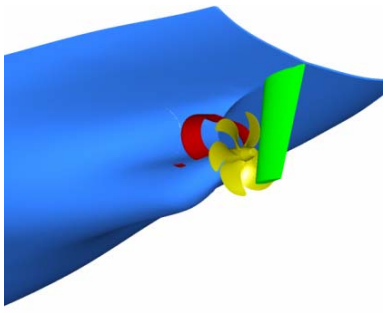
# R&D project “Improvement of the design and prognosis method for ships with wake influencing devices”[1]

Heinke, H.-J.

A typical container ship without and with wake equalizing duct of Schneekluth design (WED) and with vortex generator fins (VG) were investigated. The special interest of the R&D project was the knowledge of the Reynolds number effects on the flow around the appendages and on the inflow to the propeller.



ship with vortex generator fins



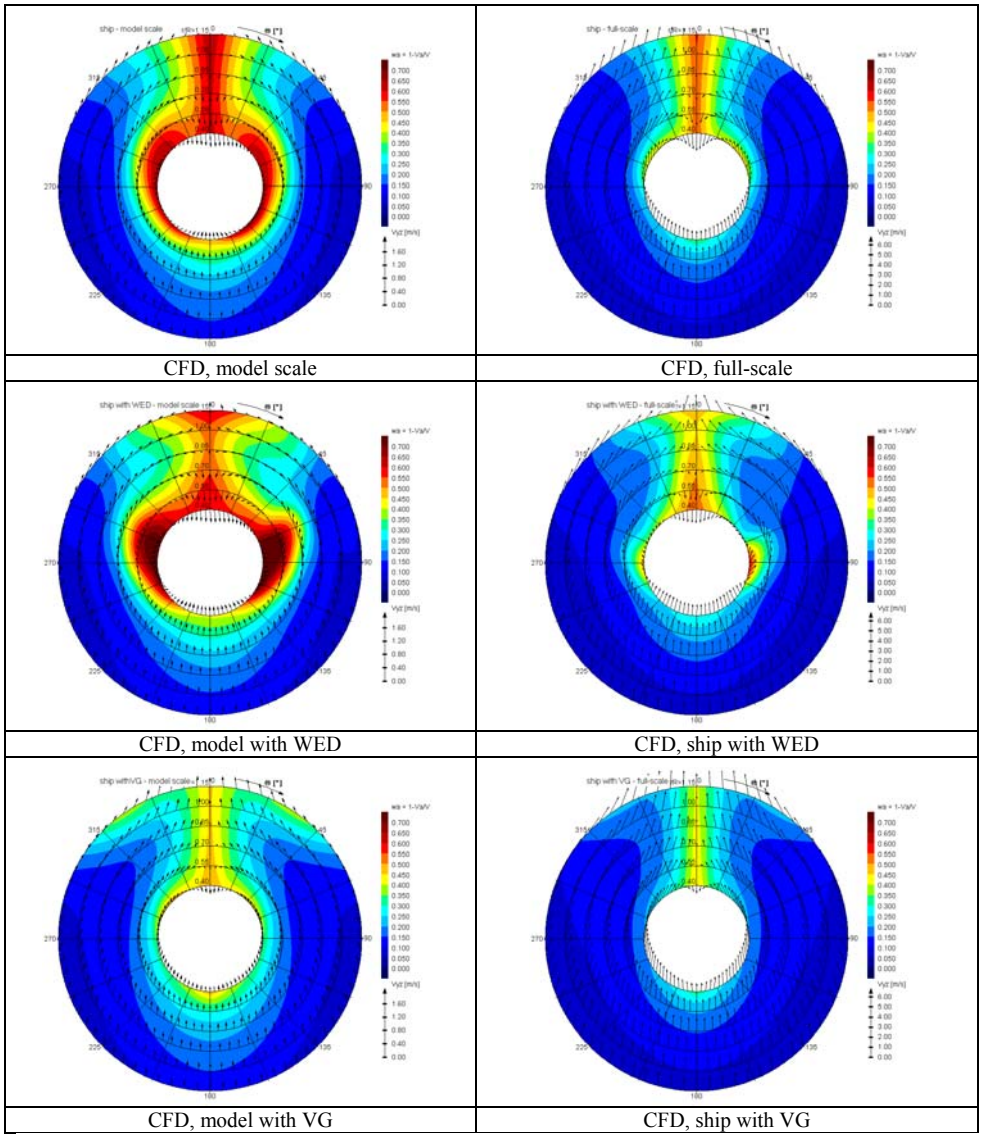
ship with wake equalizing duct

Figure 1: Aft ship with VG and with WED

The Figure 2 shows results of viscous flow calculations for a container ship without and with WED or VG for the model and the full-scale Reynolds number.

The higher Reynolds number at the ship affects a relative smaller boundary layer than at the model. The wake peak at the ship is distinctly narrower and the wake gradient is higher. The calculated maximum wake fractions at the ship are smaller in comparison to model scale.

The measurement or calculation of the nominal wake field of a ship with a wake equalizing duct isn’t standard. The main reason for this deficit is that the wake equalizing duct and the spoilers are treaten as part of the propulsion system.



CFD, model scale | CFD, full-scale

CFD, model with WED | CFD, ship with WED

CFD, model with VG | CFD, ship with VG

Figure 2: Influence of the Reynolds number on the propeller inflow of a container ship

The calculations show that the wake equalizing duct accelerates the water in the wake peak (the maximum wake fractions are lower). The effect of the WED is more pronounced in full-scale.

The vortex generator fins distinctly reduce the wake peak. In the model scale the vortices of the vortex generator fins touch the propeller disc. In full-scale the vortices lie above the propeller disc.

The measured thrust deduction and wake fraction coefficients of the ship with and without the appendages WED or VG have been used for the propulsion prognosis with the ITTC 1978 method. In addition the propulsion coefficients of these ships have been calculated for the propulsion point in model and full-scale with ANSYS CFX. The agreement between the predicted scale effects

[1] Sponsored by German Federal Ministry of Economics and Technology

on basis of the ITTC 1978 method and the CFD calculations is good. The scale effects on the effective wake fraction of a ship with WED or VG can be approximated with the ITTC 1978 method.

The calculated wake fields of the container ship without and with WED or VG have been used together with the propulsion prognosis for cavitation and pressure fluctuation calculations with a lifting surface programme.

The calculations show the reduction of the propeller induced pressure fluctuations due to the use of a wake equalizing duct or vortex generator fins. In addition the calculations also show the reduction of the pressure fluctuation amplitudes in full-scale.

The knowledge of the wake field in full-scale is necessary for the design of the propeller and the prognosis of the cavitation behaviour and propeller induced pressure fluctuations.

This is also important for ships with WED or VG. That's why the wake field of these ships should be measured in model scale and extrapolated to full-scale. CFD calculations should also be applied in the design process of the wake equalizing duct and the vortex generator fins.

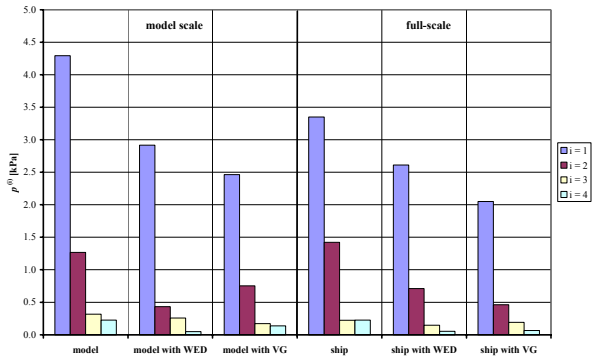



Figure 3: Pressure fluctuation amplitudes, propeller in the calculated model and full-scale wake fields

## Manoeuvring tests for fast ships

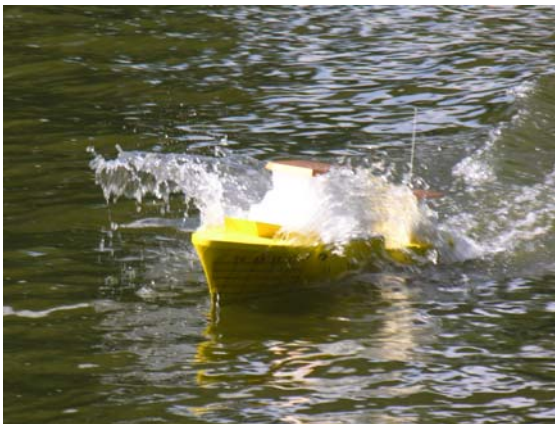
Steinwand, M.

The SVA Potsdam is improving its measurement technique permanently and consequently. One result of this development is the new possibility to investigate the manoeuvring behaviour of fast ships.

In the past manoeuvring tests in the SVA Potsdam were only possible in the towing tank with the length of 280 m and the breadth of 9 m. The towing tank size is suitable for displacement ships with moderate ship speeds. With so called "source tests" a mathematical model for the manoeuvring behaviour will be developed. On this basis the desired manoeuvres will be simulated. Various validation tests show an excellent correlation between simulation and tested manoeuvres.

Now the SVA Potsdam is able to carry out "free water" tests, offering the possibilities for manoeuvring tests.

Not only fast ships like semi-planning hulls or planning hulls,



but also displacement ships up to a length of 7 m, can be investigated on free water. This gives the possibility to use the same model for all inquired tests in a model basin. The model will be fitted out with a gyroscope, a GPS-system, WLAN communication and up to 10 kW of motor power to provide the necessary power. If desired the forces and moments on the propulsion system can be also measured.

Every kind of manoeuvre can be tested, like turning circles, zig-zag tests, stop manoeuvres, pull-out tests etc. All necessary data for the wheelhouse poster and manoeuvring booklet according to IMO can be collected. Differences in manoeuvring behaviour in planning condition and displacement condition can be investigated. Also a manual, radio controlled steering of the model is possible for the client to "feel" the behaviour of the ship.

Altogether a reliable manoeuvring test system is ready for application for our clients.

## New office building for the SVA Potsdam

The Potsdam Model Basin SVA is currently carrying out the biggest investment in the companies history since the reestablishment as a GmbH in 1990. On the occasion of the 20th anniversary at the end of May, the foundation stone for a new office building was laid.

The new building offers on 3 floors an excellent working environment for the scientific staff, project engineers and the management. In total 32 modern office workplaces will be available. Additionally two meeting rooms and a large conference room will be provided. The migration to the new building, planned for the end of the year, will clearly improve the working conditions for the staff in total.

If the construction works are carried out in time, the SVA Potsdam will be able to welcome the guests of the 4th Research Forum in the new conference room.

**Contact:** rieck@sva-potsdam.de

### Announcement

### 4th SVA- R&D Forum

27th January 2011
(Schiffbau-Versuchsanstalt Potsdam GmbH)

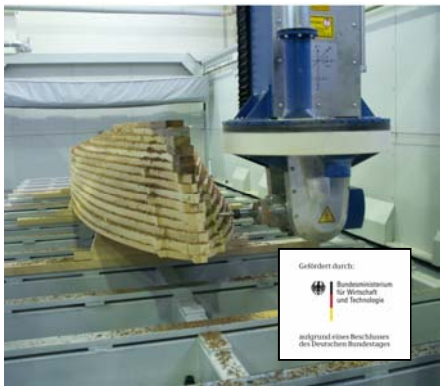
„Theoria cum praxi“

## New milling system

Since November 2009 a new large 5-axis-CNC-milling-system is installed in the SVA Potsdam. This milling-system, founded by the German Federal Ministry of Economics and Technology and manufactured by Huber & Grimme, is replacing the old 3-axis milling machine.

The advantages for the client are a faster model manufacturing and a higher accuracy.

This milling system can be used for model and prototyping for any object up to a length of 7.7 metres, beam of 2.5 metres and height of 1.2 metres.



After half a year of operation the milling-system has fulfilled the expectations.

Together with the metal milling machine VMC100 the SVA Potsdam is competent to offer all necessary milling works in house, for model manufacturing and preparation, with up to date milling-systems.

**Contact:** welzer@sva-potsdam.de, graichen@sva-potsdam.de

## Member of the Staff

### Cornelia Heinke

Cornelia Heinke is project manager in the Towing Tank Department as well as responsible for the marketing activities in the SVA Potsdam.She studied naval architecture at the University of Rostock. In 1983 she graduated and joined the SVA.

Since this time she has worked in the field of traffic systems, roll damping tanks as well as investigation of special innovative propulsion systems, like surface piercing propellers, podded drives, thrusters and paddle wheels. Cornelia is involved in several research and customer projects.

She is married and has got two children. Her hobbies are literature and needle work.


**Impressum**
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