SVA items

SCHIFFBAU-VERSUCHSANSTALT POTSDAM GmbH No. 1, February 1996

The Potsdam Model Basin

The Potsdam Model Basin (SVA) at the outskirts of the town of Potsdam with its famous parks and castles was founded in 1952 and started testing in 1954 under the management of Dr.-Ing. e. h. Werner Henschke in a towing tank, 80 m. As early as 1958 experiments could be performed in a tank extended to 280 m length.

basin for various types of experiments.

In the course of more than forty years, about 1000 ship models have been manifactured and more than 2000 hull form variants of shape have been investigated. For propeller and propulsion investigations more than 200 propeller models and more

scientific institutes both in the country and in the Eastern countries.

In the course of the past 5 years, SVA succeeded in spite of difficult circumstances - including reducing staff by 45 percent - in adjustment to the new market conditions and in raising funds for research.

Palace Schloß Sanssouci

The towing carriage with a maximum towing speed of 8 m/s, a wave maker for regular waves and various measuring devices allow the extension of all routine tests, including manoeuvring experiments, in use internationally.

The facilities were complemented in 1971 by a cavitation tunnel, type K 15 A from Kempf & Remmers, a particularly cost efficient installation, and in 1988 by completion of an additional

than 100 propeller nozzles have been made and tested.

Allmost all ships were developed in the former GDR, at the Potsdam Model Basin tested and hydrodynamically optimized.

More than 50 per cent of the staff were engaged in research projects. R & D was very much tuned to the needs of the shipbuilding and shipping industries, the navy and the cooperation with

Now the staff consists of 25 hydrodynamicists, naval architects and professional engineers, 19 professionals and other skilled workers.

With our new model milling machine putting in operation since 1990 and their latest technologies for manufacturing of wooden and paraffin models, we are now in the position to promise for routine investigations quick turn round and internationally competitive quotations.

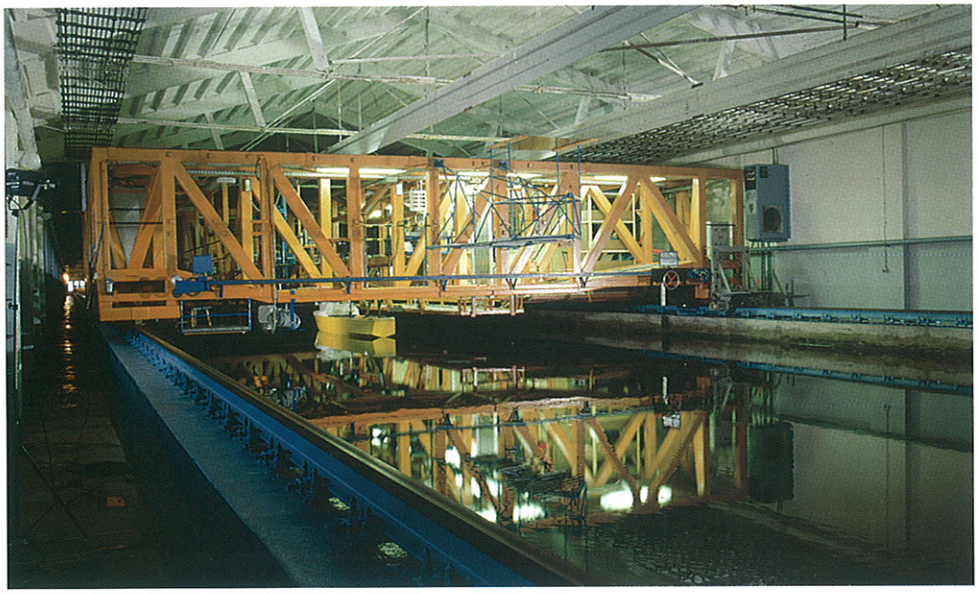
For the first issue

You may be wondering why once again you find in your mail another broshure. Why „SVA items" now? We thought it is time to let our clients, our friends and those interested know about recent developments of SVA. This development has reached in the last years such a technical and scientific level that all people at the Potsdam Model Basin are quite proud to belong to their organisation. We could achieve this only with the help of our clients and friends and by combining theory and practice.

In this first issue of „SVA items" we would like to introduce you to the Potsdam Model Basin, its facilities and areas of work. In the following issues short surveys will be given of current and earlier projects together with the main results and other activities.

If you are interested in receiving future issues of the „SVA items" or if you have any comments or proposals, so please let it know us.

Manfred Mehmel
Managing Direktor



Towing Carriage

Towing Tank

The dimensions of the SVA Towing Tank are follows:

Length	280.00 m
Breadth	9.00 m
Depth	4.50 m

The maximum speed of the towing carriage is 8 m/s. There is a wave maker for regular waves of 1.2 m to 12.0 m in length and between 4 cm to 35 cm in height.

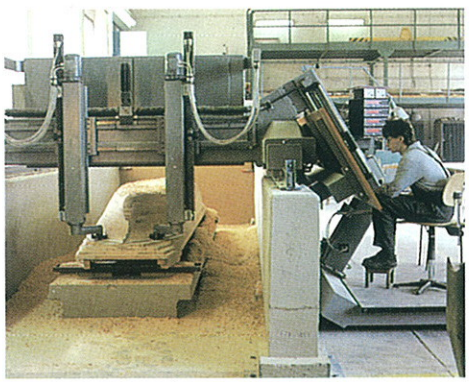
Experiments in the Towing Tank

- resistance and propulsion tests in still water and in regular waves
- measurement of wake fields and hull boundary layers
- open water tests of propellers and of ducted propellers
- flow visualization on hulls and appendages
- manoeuvring tests (zig-zag tests, turn to tests, system identification tests, stopping tests)
- measurement of forces and moments on rudders, nozzles, submerged and partially submerged bodies

Seakeeping Tests with S-175 Model

- measurement of forces and moments on single propeller blades
- oblique towing tests
- measurement of ship motions (roll, heave, pitch) in waves
- investigation of hull slamming in waves
- measurement of propeller induced pressure pulses

Besides routine tests the SVA carries out a lot of additional investigations, such as optimization of hull forms, determination of manoeuvring and seakeeping characteristics in-



Milling Machine

cluding slamming loads, and studies of energy saving devices, tunnels and nozzles. Towing tests with fishing gear, life-saving equipment, leasure craft are also offered by SVA. High measuring accuracy and repeatality of the measured data as well as many years of experience in hydrodynamic testing are the basis of high standards as regards correlation of model results and full scale measurements.

About 1000 ship models with several form variations have been tested over the last 40 years. The ship models are normally made in wood or parafin-wax and are built and equipped in house. They have excellent durability and can be used again at any time if required.

In recent years the model production in parafin was rationalized and the quality improved. The production of a normal parafin model takes between 8 and 10 days. Because of using our own parafin mixture and new technology the parafin models can be stored as long as wooden models in normal climatic conditions.

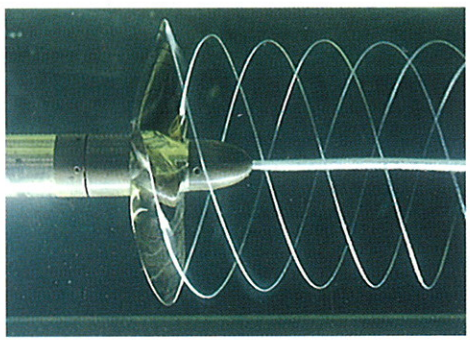
Cavitation Tunnel

The staff of the Cavitation Tunnel experienced in model testing, design, measuring techniques, data processing and calculation.

Test facilities

The medium sized Kempf & Remmers cavitation tunnel (type K15A) is used for model tests with various propulsion systems. The experiments can be carried out in the 600 x 600 mm test section at water speed of up to 12 m/s or in the 850 x 850 mm test section at water speeds up to 6 m/s.

The facility is equipped with two propeller dynamometers of different sizes and with modern measuring systems, such as a laser doppler anemometer.



Cavitating Propeller

Experiments in the Cavitation Tunnel

- open water and cavitation inception tests
- measurement of wake distributions behind grids or dummy models
- cavitation tests as well as noise and pressure fluctuation measurements
- cavitation erosion tests
- thrust, torque and cavitation measurements with propellers, ducted propellers, Z-drive units, contra-rotating propellers, linear jets, vertical axis propellers
- measurements of propeller blade bending moments and of thrust and torque fluctuations
- measurements of forces on rudders, Z-drives, nozzles, foils, bodies
- measurements of velocities around rudders, Z-drives, nozzles, foils, bodies with laser doppler anemometer

Ship form design

In addition to ship form optimization, the SVA also offers hull form design. Based on many years of research and development in ship design, SVA uses its own data base. This allows the selection of optimal values for form parameters and the creation of suitable lines in the first design stage.

Recent projects here concerned with containerships, dry-cargo vessels, tankers, passenger ships and tugboats. SVA has extensive know-how for fishing vessels of all sizes.

To minimize wave resistance, SVA offers bow bulb designs and optimization. For this purpose the SVA computer package WELLWI has been developed which is usually employed at the early design stage. This is one reason for the low resistance characteristics of SVA hull designs.

Design of propeller and propulsion systems

SVA's design activities are concentrated on conventional propellers, unconventional propellers (Tip Fins, CLT, CRP), propellers with guide vanes and propellers with boss cap fins. Together with propeller manufacturers and other companies SVA is also engaged in the fields of ducted propellers, thrusters, Z-drive-units, jets and vertical axis propellers.

Lifting surface methods are used for calculation of open water characteristics, cavitation and propeller induced vibration. Stress distributions can be determined by FEM-calculations.

Circulation Distribution at a Propeller Blade

SVA is developing computational fluid dynamics methods (CFD) and inverse methods based on lifting surface programs for the optimization of propulsion systems. The customer can provided a cost-effective designs of propulsion systems within a short period of time. This can be achieved by a combination of computer analysis, very short times for model manufacture and efficient model testing.

Numerical Simulation

Computational fluid dynamics (CFD)has become an important tool in all areas of engineering practice dealing with fluid flow and related phenomena. The success of introducing CFD methods in ship design does not only depend on the quality of the predicted flow quantities but also on economic aspects, such as cost and turnround time.

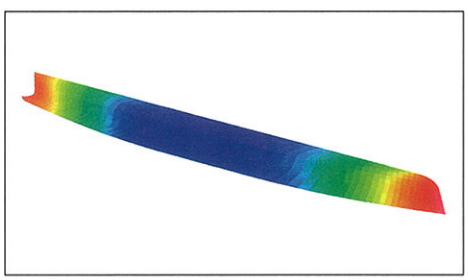
SVA has for some years considerable experience with the application of CFD methods to improve hull forms. Besides SVA own programs, commercial software is used, such as Phoenics, Shipflow, TASCflow and Hydrotech. As in towing tank tests the following can be computed:

- wave resistance
- viscous resistance
- induced resistance
- wake
- propeller flow
- stream lines
- velocity vectors
- pressures
- sinkage and trim

The most recent research and commercial projects are dealing with:

- forebody optimization.
- improving of propeller inflow
- sinkage and trim in shallow water
- local flow direction in stern region

Moreover, SVA offers numerical simulation for a wide range of engineering applications, such as environmental matters and water resources. Modern concepts of water balance models are applied which allow specific factors of influence at any location within a particular catchment area to be taken into account.



Pressure Distribution on a Ship Hull, Ship in Channel

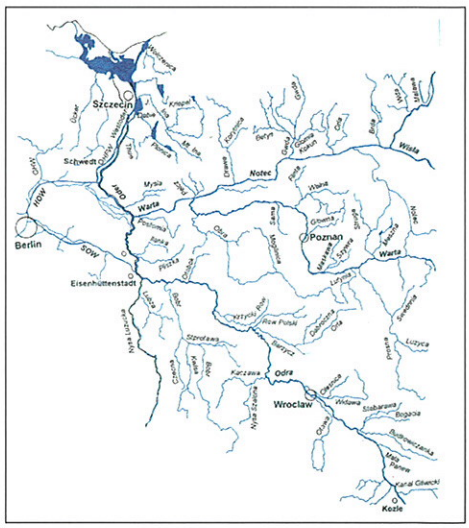
A recent project was dealing with threedimensional numerical simulation of rapidly varying open channel flows. To validate the numerical calculations, laboratory experiments may be carried out as an example for the investigation of dammbreaking flows and flooding waves.

Transport Engineering Problems

The subject of transport engineering offers concepts for regional and international investigations into traffic infrastructures, especially in shipping and waterways, and inland water navigation:

- analysis of infrastructure, such as the network of waterways
- narrow pass analysis
- evaluation into dimensions of adaptation of waterways and ports
- investigations of transport economics
- problem analysis of environmental conservation

Investigations of inland waterway navigation problems are inevitable related to the



Waterways in the Oder Region

development in inland waterway as such, the development of waterways, of ports, in transshipping, in fleet configurations and in the quantity of goods to be shipped.

Recommendations being prepared for legislation in problems of inland waterway navigation in different regions.

These are based on extensive data banks of shipyards, shipping companies and waterway authorities, in and outside Germany, including Eastern Europe. Our experience and contacts in this area have proved to be particularly useful.

Members of the staff

Hans-Jürgen Heinke

Hans-Jürgen Heinke studied Naval Architecture at the University of Rostock where he graduated in 1982. In the same year he was employed at SVA in Potsdam. He worked in the Resistance & Propulsion and in the Cavitation Department. Since 1988 Hans-Jürgen Heinke is the Head of the Cavitation Tunnel Department.

His research interests are the development of propulsion systems and improvement of the test facilities and techniques. The last years he was project leader for different research and development projects and worked in the fields of propeller theories, propeller induced pressure pulses and on acceptable noise levels, ducted propellers, vertical axis propellers and unconventional propulsion systems.

He is maried and has got 2 children. His hobbies are chess and football.

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4th SVA-Forum

„Development of Propulsion and Manoeuvring Systems"

In 1995 the SVA organised three SVA-Forums about **Computational Fluid Dynamic Methods, Use of new Methods for the Optimization of Ships and Manoeuvring with Models and Full Scale Ships.**

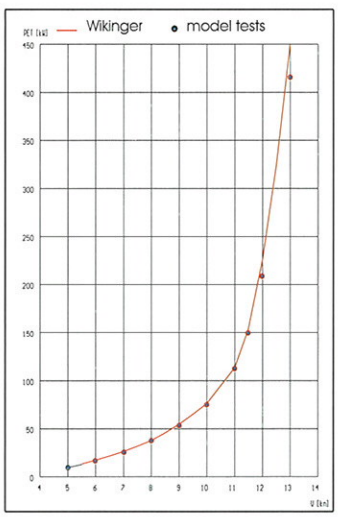
The 4th SVA-Forum will be held on Wendsday 27th March 1996 at the Potsdam Model Basin (SVA). The purpose of the SVA-Forum is to present and discuss new developments, methods and techniques. The topics of the 4th SVA-Forum concentrate on the development of propulsion and manoeuvring systems.

Programme

09.00 - 10.00 -	Registration
10.00 - 10.05 -	Opening
10.05 - 10.30 -	Dr. D. Jürgens, JAFO Technologie Cycloidal Rudder - a new Manoeuvring and Propulsion System
10.30 - 10.55 -	Prof. P. Andersen, Dept. of Ocean Engineering, DTU Unconventional High Efficiency Propellers
10.55 - 11.20 -	Dr.-habil. R. Schulze, SVA Propeller with Endplates
11.20 - 11.45 -	Dr. M. Abdel-Maksoud, SVA Calculation of the Viscose Flow Around a Rotating Propeller
11.45 - 12.30 -	Diskussion
12.30 - 13.15 -	Coffee
13.15 - 14.45 -	Demonstrations (for example a cavitation test with an unconventional propeller model and a demonstration of the manoeuvrability of a model with cycloidal rudders) and special discussions

WIKINGER

Resistance and Propulsion Software for Small Displacement Ships



Comparison of Prediction and Model Tests

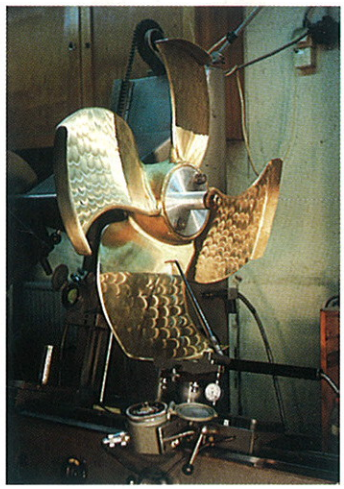
The SVA completed the development and validation of the program WIKINGER. This program is suited for the prediction of resistance and shaft power for displacement vessels up to a length of L_{pp} = 35 m. The selection of optimum propeller parameters and the determination of the influence of different hull parameters on the resistance of a vessel is possible.

WIKINGER includes the experience of SVA in the field of the prediction of resistance and propulsion. The agreement between results of the predictions and model tests is particularly good because WIKINGER mainly deals only with hulls of displacement type vessels.

TVV Propeller

In cooperation with SCHOTTEL a TVV Propeller (Tip-Vortex-Vane Propeller) has been developed and tested in the cavitation tunnel and on a test pontoon.

It is the objective of every propeller design to achieve a high efficiency as possible and to have little or no cavitation. Peripherical vortices are formed at the tips of the propeller blades due to of the pressure difference between the two sides of the propeller. They are caused by water flowing from the pressure to the suction side and reduction of the pressure difference between the blade sides which can be utilised for producing thrust.



Propeller with Endplates

A substantial decrease of tip vortex strength can be achieved by using socalled Tip-Fin Propellers. The TVV Propeller is a special propeller with end plates at the blade tips. The TVV Propeller offers the following advantages over conventional propellers:

- The TVV Propeller allows a higher propeller load and therefore enables more power to be transmitted than conventional propellers of the same diameter.
- Test results have shown that with the TVV Propeller, efficiencies can be achieved that at high thrust loading coefficients are up to 10% higher than those of conventional propellers.
- At speeds at which nozzles can no longer be used effectively because of their high inherent resistance, the TVV Propeller is in special applications capable of compensating for the disadvantages of the nozzle.