The Hamburg Ship Model Basin HSVA

J. Friesch
Managing Director
“HSVA is a central point for applied research in all hydrodynamic areas related to transport systems and ship technologies in open water and ice. As an international, independent company HSVA offers advanced technologies and modern test facilities.”

**Main Advantages of HSVA**

*World leading position in highly science based customer service*

*Excellence in hydrodynamics since 1913.*

*Large scale facilities,*

*Large models up to 10m in length*

*High experienced and highly motivated staff.*

*Fully private company.*
HSVA Today

- Private Company
- Owned by shipyards, ship owners, supplying industry and a classification society, located in the wonderful city of Hamburg
- 20 Shareholders
- 93 Employees
- 11 – 13 million € turnover per year in the last years
- 80% Commercial orders (≈ 70% international from all over the world)
- 20% partially supported projects by Ministry of Research and EU
Industrial Services of HSVA cover the **whole** Design Cycle

- **Design**
- **Analysis**
- **Model Test**
- **Full Scale Investigation**
The Hamburg Ship Model Basin HSVA

Facilities
HSVA Facilities: Large Towing Tank

Description of carriage

- Tank length: 300.00 meters
- Tank breadth: 18.00 meters
- Tank depth: 6.00 meters
- Towing Carriage max. speed: > 10.00 m/s
HSVA Facilities: Large Towing Tank
HSVA Facilities: Large Towing Tank

Side Wave Generator

- Length: 40.0 meters
- Number of flaps: 80
- Max. wave height: 0.40 meters
- Wave heading: $20^\circ < \mu < 160^\circ$
HSVA Facilities: Large Towing Tank Development of Test equipment
HSVA Facilities: HYKAT (HydroAcoustic and Cavitation Tunnel)

Description of facility
Closed circulating cavitation tunnel with horizontal top, bottom branch submerged in a trench, numerous acoustic treatment features, variable speed, variable pressure, aeration/de-aeration system, planar motion mechanism, high speed video and PIV system.

- Dimension of test section: 2.80 x 1.60 x 11.00 meters
HSVA Facilities: Large Ice Tank

Description of facility

- Length: 78 m
- Width: 10 m
- Depth: 2.5 to 5 m

Arctic Environmental Test Basin

controlled laboratories for the determination of material properties
HSVA Facilities: Large Ice Tank
The Hamburg Ship Model Basin HSVA Services
HSVA Services: Computational Fluid Dynamics (CFD)

CFD calculations with in-house developments

- $\nu$-SHALLO calculations (potential flow code)
- FreSCo application (RANSE code)
HSVA Services: Computational Fluid Dynamics (CFD)

RANSE Computations

1. Numerical rudder calculations, profile optimisation
2. Numerical resistance prediction
3. Numerical cavitation prediction
4. Numerical self-propulsion test
HSVA Services: Propulsion and Seakeeping

- Seakeeping tests in head and stern seas
- Zero speed tests in beam seas
- Roll decay tests
HSVA Services:  Seakeeping and Manoeuvring

Side Wave Generator

- Models at zero and at forward speed in beam and oblique waves
- Tests in regular waves, long- or short-crested irregular seaways, wave packet, wind and swell seas, deterministic wave trains
- Tests for Ships, Offshore and Environment
HSVA Services: Propeller and Cavitation

- Propeller and Rudder Cavitation Tests
- Determination of Hydrodynamic Coeffs.
- Determination of Bearing Forces
- Determination of Surface Friction Forces
- Full Scale Cavitation Observations
- Full Scale Pressure Measurements
HSVA Services: Dept. Ice and Offshore (IO)

- Model tests in brash ice channel, in level ice and in broken ice
- Development of ice protection structures
- Investigation of rescue vessel for ships and offshore structures in ice covered environments
- Ice Trials
HSVA Services: Ice and Offshore

- Ice forces on offshore structures (model/full scale)
- Simulation of operational procedures in ice and in open waters
- Simulation of moves in ice covered environments
- Feasibility studies
1929 BREMEN wins the BLUE RIBBON with 27.73 kts average speed

1926-1929

Fast North-Atlantique Steamers
Ships and Structures

1926 - 1935

Resistance tests, Paint tests
Power predictions
Wake Measurements
Propeller design
Cavitation tests
Tests in waves
Full Scale Measurements

1933  Normandie wins the BLUE RIBBON with 30,08 kts average speed

Fast North-Atlantique Steamers

NORMANDIE
Zuhause auf allen Meeren,
egebaut in Korea
getestet in HAMBURG
Ships and Structures

02.11.2013

FRIESCH STG 100 Jahre HSVA
Ships and Structures
Part of HSVA’s company policy is the close cooperation with universities and the support of students by providing internships as well as Bachelor and Master Thesis.

HSVA continuously offers opportunities for students for state of the art research projects and internships to gain work experience during cooperation with our experienced and worldwide acknowledged experts. We are prepared to be your partner for your sophisticated

MASTER and / or BACHELOR THESIS.
HSVA offers interested students collaboration in the fields of

All work related to **model testing**

* Development of test equipment / procedures
* Instrumentation and calibration of test setups
* Perform tests (model and Full scale)
* Data evaluation and analysis including reporting

**Theoretical numerical work**

* Use our tools
* Develop tools
* Perform calculation → prognosis
* Correlation with experimental results
The Arctic Technology Department can offer themes for Bachelor and Master Thesis’ within research projects dealing with the following issues

A
Develop a method for the prediction of Sea Ice thickness based on meteorological data

B
Picture analysis of managed Ice Conditions in arctic waters

The Propeller and Cavitation Department can offer themes for Bachelor and Master Thesis’ within research projects dealing with the following issues

C
Integrated Tool for Propeller Modification and Performance Calculation
Method for Prediction of Sea Ice Thickness Based on Meteorological Data

The objective of this student project is to develop a method to estimate sea ice thickness that results from heat transfer processes based on meteorological data.

Software tools are needed that allow easily to predict sea ice thickness. Existing algorithms should be reviewed, possibly improved and checked regarding their user-friendliness and applicability.

As outcome is expected a Matlab or C++ code, a summary report describing the theoretical findings, a working software solution and a short user manual that enables any other student or engineer working at HSVA to use the software tool.

The student will get assistance as needed to conduct this study.
Task of a student project is to optimize the analysis of the pictures taken from a managed ice field both in terms of quality and in terms of applicability.

Software tools are needed that allow to stitch, cut and analyze the picture taken and further analyze the numbers that have been derived from the picture analysis. For each of the steps software is available—partially in Matlab. The existing codes need to be reviewed, possibly improved and checked for their user-friendliness.

Expected outcome: a summary report describing the theoretical findings, a working software solution and short user manual that enables any other student or engineer working at HSVA to use the software tool. The results are to be presented in a format that they are ready to be used in a report as for example the floe size distributions shown in the figure.

The student gets assistance as needed.
HSVA and UNIVERSITIES (5)

Picture Analysis of Managed Ice Conditions in Arctic Waters
HSVA and UNIVERSITIES (5)

Integrated Tool for Propeller Modification and Performance Calculation

Background
HSVA operates a highly sophisticated numerical tool for ship propeller performance calculation. This tool calculates propeller open water characteristics, cavitation extent and propeller induced hull pressure pulses with a vortex lattice approach. This in-house developed tool is frequently used for propeller design and optimization. For this purpose a large number of QCM calculations is necessary, where for example the propeller inflow (wake filed), the propeller tip clearance or the propeller geometry itself is varied.
Integrated Tool for Propeller Modification and Performance Calculation

The Task
This student project is addressed to scientists or to naval architects with strong computer affinity. The challenge is to marry the large HSVA data base of propeller geometries and wake fields with the QCM code, so that different combinations can be assessed easily. The emphasis lies on an easy-to-handle user interface as well as an appealing presentation of the results. With respect to propeller geometry modifications an easy-to-use geometry editor shall be implemented, that allows quick modification of propeller main parameters, such as radial distribution of chord length, camber or thickness.

The student will get advice and assistance by the developer of code as well as by our data base specialist.
The Hamburg Ship Model Basin HSVA

Hamburgische Schiffbau-Versuchsanstalt GmbH
Bramfelder Str. 164
22305 Hamburg, Germany
Tel. +49 40 69203-0
Fax +49 40 69203-345
www.hsva.de
info@hsva.de