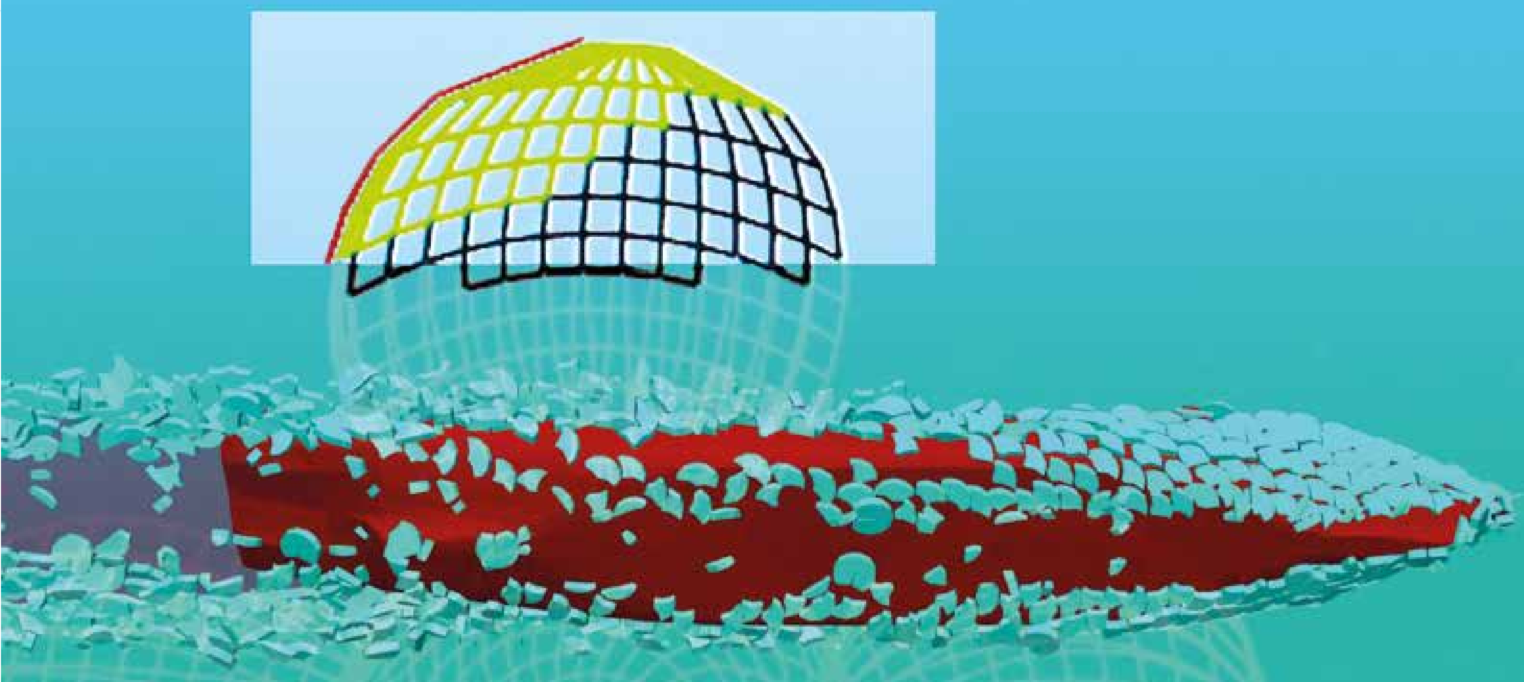
2-25

newswave

The Hamburg Ship Model Basin Newsletter

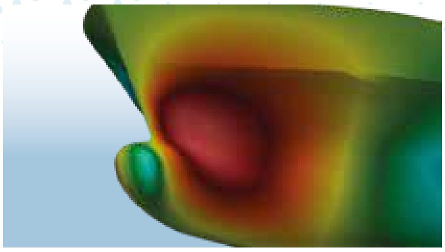


Assessing the Impact

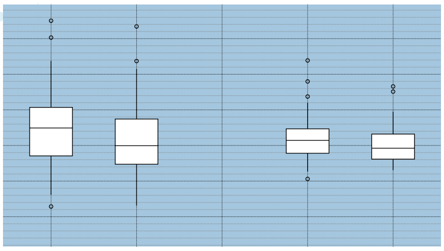
Thruster Ice Interaction in Model Testing

Voith Schneider Propellers
A Status Update

Ship Hull Design
Setting new Standards



Performance Prediction Correlation
Improving Accuracy



Dear reader,

I am delighted to be writing my first foreword for HSVA's NewsWave. My first contact with HSVA was during a tour in the introductory week of my studies of naval architecture in 2002. Ever since, I have been aware that HSVA is a very special company. This was confirmed to me as a customer of HSVA when I was still working at the shipyard.

Since April of this year, I am in the fortunate position of being able to dive into all areas of HSVA as deeply as I wish, taking into account the limited time available. The breadth of knowledge available, the motivation of the staff, the teamwork and the fantastic test facilities continue to impress me. Even though the world currently faces a lot of challenges and the international competition is hard, the more I learn about HSVA the more I reinforce my conviction that HSVA will continue to be successful on the global market as an independent and leading ship model basin and maritime consultant.

This issue of NewsWave shows you the wide range of topics that the HSVA staff deals with every day and that we are constantly developing all areas. Whether it is numerical tools for ship design, the correlation of test results, the design and construction of highly specialized test equipment, large-scale measurements or the design of new test facilities, HSVA is your partner for all areas of maritime hydro- and aerodynamics.

Our test facilities are located in Barmbek-Nord in Hamburg, Germany, thus this is where our heart is. Being located close to the international airport of Hamburg, we are always happy to warmly welcome our valued customers from all over the world at our premises. Additionally our numerous business trips show that we also enjoy to visit our international customers to discuss your topics directly on site. This year, our teams travelled throughout Europe, as well as to China, India, Canada and the USA. HSVA thrives on its cosmopolitan attitude and no matter what type of ship or structure you want to investigate, we look forward to working with you!

I would like to thank the authors as well as the whole **#teamHSVA** for their excellent work and wish you, dear reader, much enjoyment and inspiration in reading this issue of HSVA's NewsWave!

All the best

Dr. Philip Augener
Managing Director

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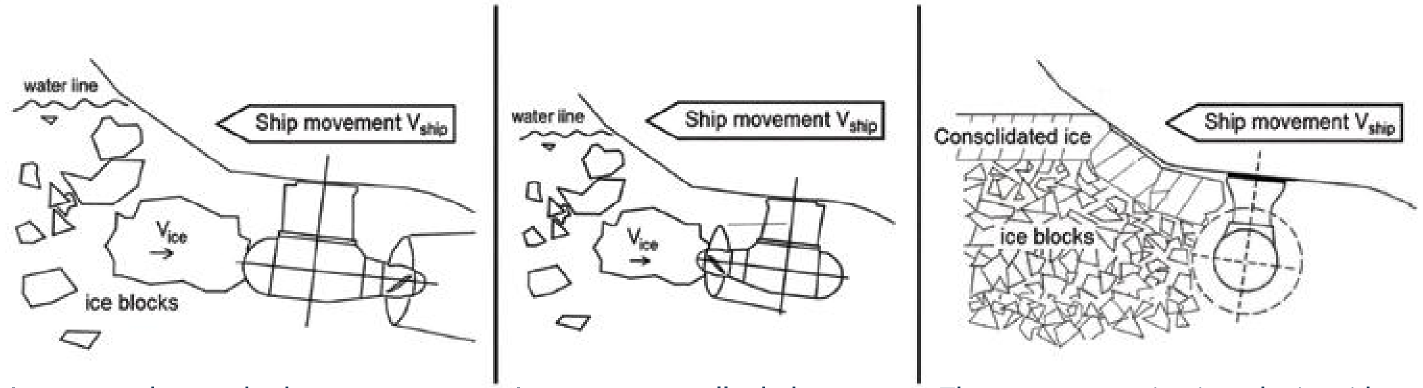
Thruster-Ice Interaction in Model Testing



Impact on thruster body — Impact on propeller hub — Thruster penetration into the ice ridge

Figure 1: Load cases for Azimuth / Pod thrusters in ice (TRAFI)

The type and extent of thruster-ice interaction is one of the key aspects in the evaluation of the performance of icebreakers and icebreaking cargo ships.

by Quentin Hisette and Nils Reimer

While icebreakers in most cases are designed for higher ice loads compared to icegoing cargo vessels their thrusters will also encounter heavier ice-interaction for longer periods during maneuvering, breaking of deformed ice and active use of thrusters for ice clearing. In addition to the importance for the structural design, the impact of different ice interaction types (Figure 1) on the operability of the propulsion system and ice performance (speed, maneuvering) needs to be analysed and minimised in the early design stage.

As available onboard measurements are leaving open questions in the relation between the ice conditions and the exact type and results of the interaction process with thrusters most available observations and data are obtained from ice model tests.

The governing phenomena of thruster-ice interaction can be well identified from model test observations:

- Ice impact and ice crushing at the thruster housings ▸ increase in ice resistance / reduction of system thrust
- Ice accumulation in the wake of the ship ▸ disturbed water inflow to the propeller ▸ reduced propulsion efficiency
- Ice impact to the propeller ▸ increase in ice resistance
- Ice impact on propeller blade ▸ reduction of propeller speed ▸ reduction of propulsion efficiency
- Ice milling ▸ increase of propeller torque ▸ reduction of propeller speed ▸ reduction of propulsion efficiency

In comparison to ice resistance of a ship hull, thruster-ice interaction is often related to different contact and failure mechanisms. Limitations are therefore given for the interpretation of thruster-ice interaction results obtained from common model ice types which were developed to reflect the bending failure between a ship hull and sea ice. The main factors for the limitations are deviations of crushing and compressive strength between model and sea ice, differences in the response of the propulsion system (propeller angular momentum during ice contact) and different ways of operating the thrusters in model tests and on the final vessel. ▶

Figure 2: Ice crushing at azimuth housing (left), indentation test to determine the model ice crushing strength (right)

An improvement of the prediction of thruster-ice interaction can be obtained by the measurement of additional ice properties and thruster data during standard ice model tests, usually ice compressive and crushing strength.

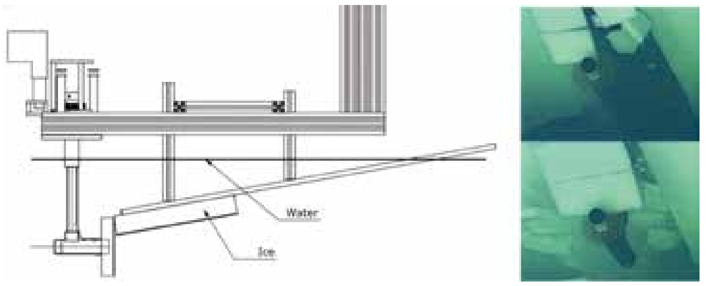


Figure 3: Thruster-ice interaction model tests

In addition, dedicated thruster-ice interaction tests (without the presence of a ship model) can provide more detailed results to quantify the effects on the ice performance. Regularly performed at HSVA are so-called free guidance thruster-ice interaction tests. A model thruster is installed on a 6-component load scale mounted behind an inclined ramp (Figure 3). The apparatus is driven at pre-defined speeds through ice pieces of known dimensions (pre-sawn ice), while forces and moments on the thruster are being recorded. Typical parameters being varied include the propeller RPM, the ice floe speed and size, the propeller cutting depth into the ice block, the thruster angle, as well as the ice thickness and strength. High measurement sampling rate and high speed cameras can be used to analyse each interaction in detail. This setup allows to investigate the influence of many parameters within a relatively short testing campaign: up to 2500 thruster-ice interaction events can be investigated in a single day.

The above-mentioned approach can be supported by numerical simulations at multiple levels (Figure 4). Simulations of the ship-ice breaking helps determining realistic estimates of the frequency, location and speed of the ice pieces hitting the thrusters. Other kinds of simulations can be used to characterise the location and pressure distribution of the contact area and between ice and thruster housing, while specific propeller-ice milling simulations can estimate the thrust losses and torque peaks which can be used to assess the performance of the propulsion system. Combined with an accurate prediction of the ice resistance, this allows to estimate the icebreaking capability of the vessel under ice milling conditions.

As an outlook HSVA plans to combine the results obtained from standard ice model tests (ship model thruster), thruster-ice interaction tests and numerical simulation to provide our clients with predictions of even higher confidence.

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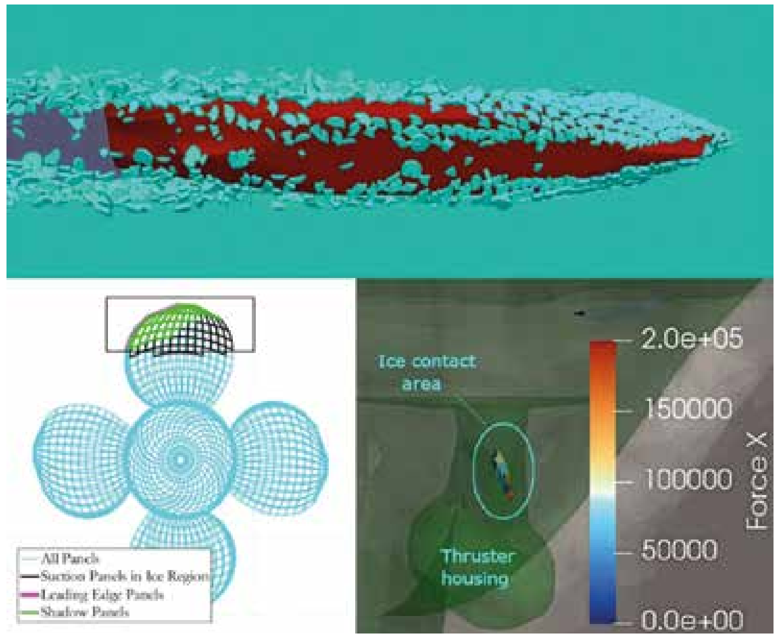

Figure 4: Simulation of ice breaking (top), propeller-ice milling (bottom left) and thruster-ice contact (bottom right)

Proprietary: HB Hunte Engineering GmbH

System Optimisation of Wind-assisted Propulsion

applied for a Tanker in FlettnerFLEET Project

Wind-assisted propulsion is emerging as a key pathway for the maritime industry to meet upcoming emission reduction targets—especially given the high costs of fully emission-free systems.

by Yan Xing-Kaeding, Henning Grashorn, Jörg Brunswig and Niklas Kühl

While many technologies promise major efficiency gains the holistic integration of wind propulsion into ship design remains limited. In the BMWK-funded project FletterFLEET, HSVA contributes aerodynamic and hydrodynamic analyses to advance optimized wind-assisted propulsion concepts. A fully automated numerical workflow—including parametric pre-, run-, and post-simulation stages—has been developed for integrated design solutions applicable to both newbuilds and retrofits. Using CFD combined with parametric geometry and topology modelling, HSVA optimized Flettner rotor arrangements across various ship types, ensuring coordination with key superstructure elements (already reported in NewsWave 1-25).

In the last period, performance predictions were conducted with HSVA's EcoLibrium tool, a modular and fast simulation environment for wind-assisted cargo ships. EcoLibrium accounts for six degrees of freedom and all relevant forces, determining equilibrium while minimizing power demand. Rotor lift and drag coefficients—capturing interactions with the superstructure—are derived from Eulerian CFD analyses, confirming that such interactions are significant.

While wind propulsion reduces conventional power demand, it also induces side forces that can cause drift, roll, or yaw if not balanced hydrodynamically. Maintaining yaw stability is therefore central to hydrodynamic optimisation. Under reduced propeller load—typical with strong wind assistance—rudder inflow decreases while yaw moments increase, potentially impairing course-keeping. Optimisation thus targets improved yaw stability through hull form optimisation or added appendages (e.g. fins) without raising resistance.

For this study, the initial hull form was provided by the project partner. Preliminary drift and EcoLibrium calculations revealed ▶

insufficient stabilising lateral forces in the aft-ship region. This results in very high rudder angles of approximately 16°, excessive rudder forces, and large drift angles. In response, the hull form was modified by increasing the lateral area at the stern while simultaneously reducing lateral-force-generating surfaces in the bow region, without altering the vessel's overall displacement.

During performance evaluation, several aerodynamic and hydrodynamic optimisation loops were conducted to improve vessel performance. These included investigations into rotor configurations and yaw stability while ensuring no deterioration in ship resistance. To identify the most effective combination of rotor configuration and hull form, EcoLibrium simulations were carried out for selected rotor setups and hull variants under design conditions.

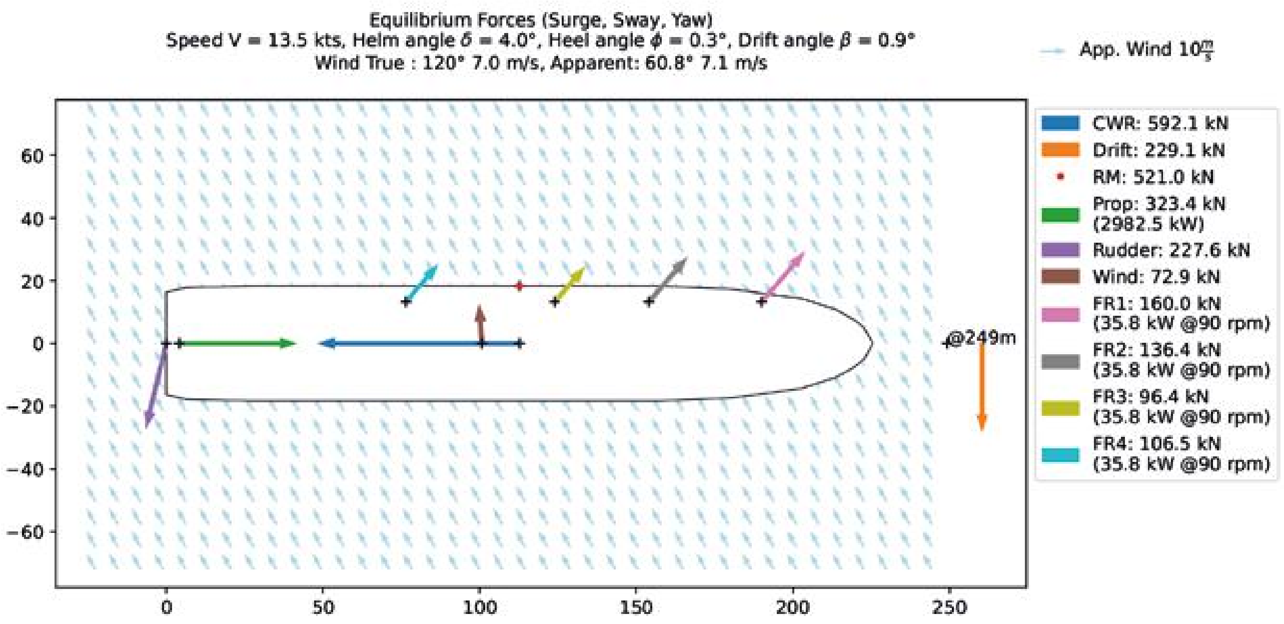

Figure 1: Example of an EcoLibrium output for four rotors at a true wind angle of 120°.

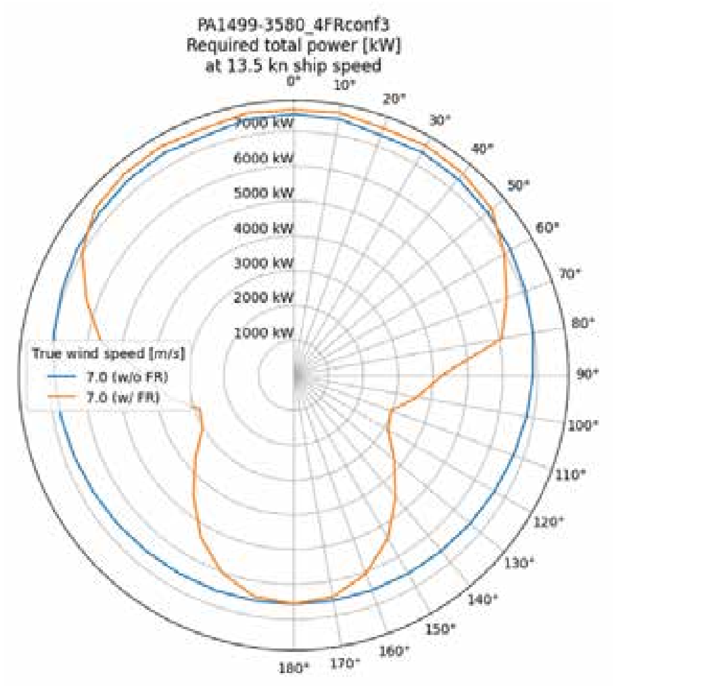

Figure 2: Polar diagram comparing the required propulsion power with and without Flettner rotors for the final hull form with four rotors.

Together with the project partners, the optimal configuration was identified as hull variant i3580 equipped with four rotors in configuration 3 (conf3). An example EcoLibrium output for conf3 at a true wind angle (TWA) of 120° is presented in Figure 1. The visualisation provides an intuitive representation of rotor positions and, most importantly, the resulting aerodynamic and hydrodynamic forces acting on the vessel. Figure 2 presents the polar diagram comparing required propulsion power with and without Flettner rotors for the optimized hull with four rotors in the final configuration. The polar representation of power savings provides a clear and direct means of comparing ship designs and evaluating alternative wind propulsion concepts.

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This project is partly funded by the Federal Ministry of Education and Research.

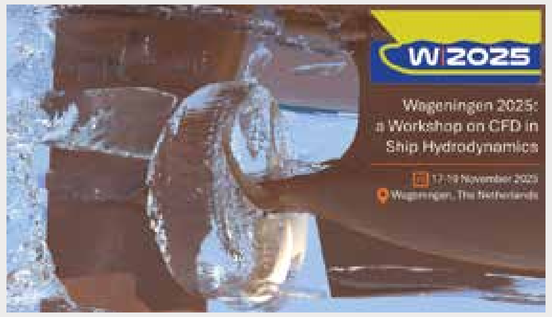
Federal Ministry of Education and Research

Nils Reimer appointed as Director of HSVA

Nils Reimer was appointed as director of HSVA in August this year. Already in his role as Division Manager Arctic Technology Nils has been involved in many projects of HSVA with high legal and administrative requirements. In recent years he has worked in the legal team of HSVA to conclude agreements with clients for many different types of projects and supervised the progress of contract preparations. In addition he presented HSVA at several exhibitions, conferences and project meetings in many different countries. Nils is looking forward to even more support all relevant steps for the realisation of new projects and customer relations in his additional role.

HSVA at "Wageningen 2025"

Workshop on CFD in Ship Hydrodynamics



HSVA will participate in the upcoming international CFD workshop "Wageningen 2025" (W2025). This event continues a long tradition of CFD benchmark meetings in ship hydrodynamics, which began in the 1980s with the well-known Gothenburg and Tokyo workshops.

by Niklas Kühl and Peter Horn

The objective of W2025 is to assess the current state of the art in CFD for ship hydrodynamics. Such benchmark events are important as they bring together research institutes, universities, and industry partners to compare methods, share results, and set standards for future developments.

A broad international participation is expected. HSVA will contribute with its own CFD studies and looks forward to exchanging ideas and results with experts from around the world. Compared to previous workshops, W2025 introduces several new and exciting elements:

- Full-scale CFD predictions will be compared directly with sea trial results.
- Cavitation simulations will be included among the benchmark cases.

For HSVA, this workshop offers an excellent opportunity to demonstrate its expertise and to strengthen the dialogue with other CFD developers and users. We are convinced that such collaborative events play a key role in ensuring that CFD methods are reliable, robust, and ready for practical ship design applications. Meeting in person in Wageningen in 2025 will be a great opportunity to discuss results and future developments.

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Full-scale Measurements

Being a ship model basin does not limit HSVA's services to the world of model testing, numerical predictions and hull line / propeller design and optimisation. Another major field of expertise and activity comprises the conduct of full-scale trials, with focus on:

- Speed / power trials
- Manoeuvring trials
- Cavitation observations
- Pressure pulse measurements
- Ice trials

Besides full service of trial planning, measurements and analysis, HSVA's portfolio also offers single service packages, such as witnessing and consultancy on board or the evaluation of provided data (including on-board performance monitoring data).

To ascertain precise and independent measurements, the following equipment is available for trial campaigns accompanied by HSVA:

- Onboard data recording systems
- DGPS compass for precise position and speed
- Shaft torque and speed telemetry system
- Ultrasonic anemometer for accurate wind measurement
- Wave buoy for monitoring sea state conditions
- Hydrometer for measuring water density and temperature
- Accelerometers for motion and vibration analysis
- Hull opening adapter with pressure transducer or borescope
- Observation windows for direct visual monitoring of propeller cavitation
- Video and photo cameras, including aerial and underwater drone footage
- Full ice test instrumentation

The information from the devices (or even directly from the board system) are recorded, calibrated and validated. After appropriate data reduction, the information is further processed and visualised according to the requirements of the tasks involved and finally condensed into reports, manoeuvring booklets, wheelhouse posters, etc.

For the data collection and processing, sophisticated in-house software developments are used in conjunction with a third-party front-end for live view of the trial data and dedicated storage solutions, all of which can be flexibly extended to non-standard tasks, where necessary.

Recent examples of extensions from the standard are fuel consumption estimations based on additional fuel oil consumption and fuel density recordings during a speed trial or the evaluation of non-standard manoeuvres.

HSVA

Driving Excellence for the Maritime Future

VSP Model Testing @ HSVA

Two and a half years have passed since the introduction of the first thrust scale prototype for Voith Schneider Propellers (VSPs) at HSVA (see NewsWave 01–2023). The topic has seen substantial progress in the meantime. A status update.

Figure 1: Typical Twin-VSP thrust scale installation

by Oliver Reinholz

The new measurement system was developed in order to provide a valuable contribution to VSP model testing – the thrust measurement and the related insights into the interaction between propulsor and hull. Starting with just one prototype scale in 2023, the system was rigorously tested and refined in numerous towing tank test campaigns. With the valuable feedback coming from the labs, an improved re-design was successfully launched and manufactured as a pair of force scales in mid–2024. This major step now allowed thrust measurement on both ship sides. Additionally, the conventional measurement chain, which required the detailed knowledge of the mechanical losses inside the VSP model gears and units, was completely bypassed from this point on.

Despite the achievements made so far, HSVA pushed on. We did not focus on cavitation and propulsion tests only. Our own plug and play open water rack was designed, manufactured and introduced into daily testing as a first prototype in 2024, enabling us to obtain the lift and drag coefficients for VSPs under uniform open water conditions as well.

The logical consequence of the established new hardware was the development of our own tailor-made full scale correction method for cycloidal propellers, see NewsWave 01–2024 and on the following page. Using the results obtained from model tests with the new measurement hardware, flanked by CFD calculations and correlated against sea trial data, we are currently in the phase of the new method´s validation. See page 11 in this NewsWave issue for a detailed update on the status.

Thank you to everyone involved in the project at HSVA and to our valued customers who gave and give us the possibility to install, test and improve the thrust scale system using their models. Work continues and we are happy to get ever closer to a full rollout of the combined measurement and scale correction system across our VSP operations at HSVA.

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Development of a new Scale Correction Method for Cycloidal Propellers

Following up on our article in the NewsWave 1-2024, where we announced the development of our new scale correction method tailored for cycloidal propellers, we would like to present the status of our method. This process goes hand in hand with the development of the force balance described on page 10 in this issue.

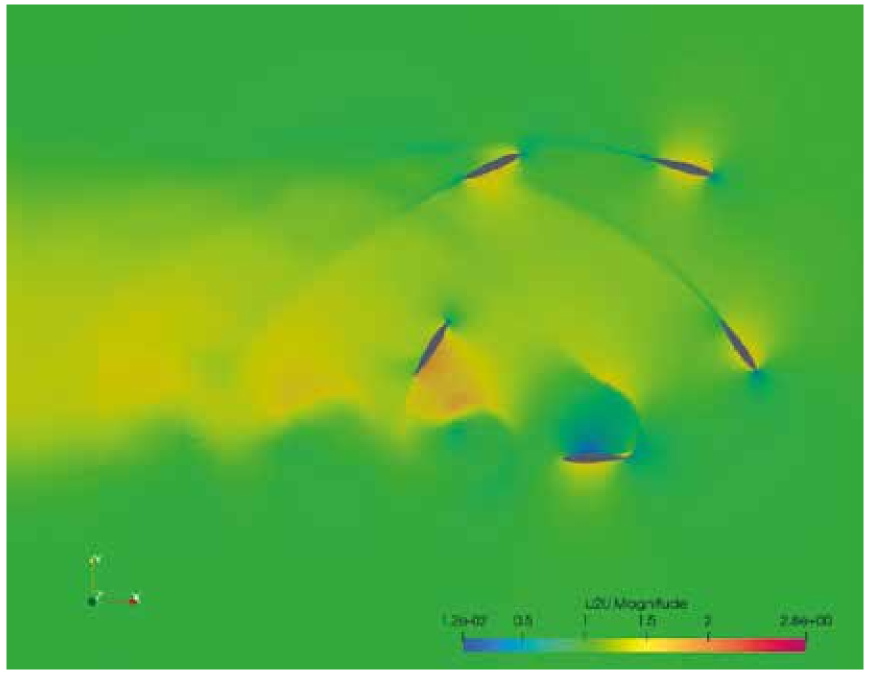

Figure 1 : Axial component of the predicted normalised flow field (u/U0) in full scale around the blades at about 50% span

by Tom Lücke

Our developed procedure consists of a surface strip method especially tailored for the scale correction of cycloidal propeller test results by means of surface stripes and drag- as well as lift- coefficients (cd, cl). As the kinematics of vertical- or cycloidal propellers are all but stationary not only due to the propeller rotation but especially due to the periodic blade pitching motion, described by the blade steering curve, the prediction method addresses these transient effects.

At typical propulsion test conditions the chord based mean Reynolds-Number ranges from $5x10^4$ to 10^5. Due to the upwind- and downwind- motion of the blades the relative speeds of the blades vary significantly affecting the local Reynolds-Number. This leads to a possible spread of scale effects already within one revolution and to a challenge describing them.

Thanks to VSP blade steering curves provided by VOITH the real blade pitch kinematics could be used within our correction method as well as for the CFD analysis by means of the HSVA in-house viscous flow solver ***FreSCo+***. The latter has been employed for determining open water characteristics in full scale for additional correlation reasons and especially to depict details of the time dependent force distribution within one propeller revolution. This is one example where model tests and Computational Fluid Dynamics (CFD) complement each other within the portfolio of a ship model basin.

Figure 1 shows the axial component of the predicted normalised flow field (u/U0) in full scale around the blades at about 50% span. The scaling method can either be applied to open water test results or directly to the propulsion test results, in cases where no open water test results are available.

This development is part of our applied research at HSVA towards integration of measuring and scaling methods into our standard process.

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Next Level Decision Support in Hull Form Design

With an adjoint CFD solver, HSVA sets new standards in ship hull optimisation

The optimisation of ship hulls has always been a synergy of experience, model testing, and continuously evolving simulation methods. Today, Computational Fluid Dynamics (CFD) is an indispensable tool that supports the decision-making process in hull form design.

by Niklas Kühl, Peter Horn and Jörg Brunswig

With its adjoint module HSVA's CFD solver ***FreSCo+*** now takes this to the next level: mathematically rigorous objective and parameter-free decision support that reaches beyond conventional optimisation approaches.

Continuous Validation – Trust Through Reality

The reliability of HSVA's CFD is grounded in continuous validation by model tests and full-scale measurements. This ongoing comparison ensures that numerical results are not only convincing in theory but also compelling in practice.

Parameter-Free – Freedom for Innovation

While traditional optimisation approaches often rely on predefined CAD parameters, the adjoint solver works entirely parameter-free. In just one additional computation per operating point, the complete gradient of hull resistance or propeller thrust with respect to the entire wetted surface is obtained. Instead of a limited number of parameter variations, designers gain a full sensitivity map that highlights precisely which regions of the hull should be altered to achieve meaningful performance improvements. This opens up the entire design space, uncovers hidden optimisation potential, and transforms optimisation from a trial-and-error exercise into a systematic and efficient process.

Figure 1: Result of a single adjoint computation at the KCS container ship showing the sensitivity map in y-direction indicating where to modify the hull form to get better hull form resistance.

From Experience to Objective Decision Making

CFD has long been a valuable complement to classical model-based optimisation, providing additional objectivity to design choices. With the adjoint method, this process now enters a new dimension: built on the calculus of variations, the solver delivers precise sensitivity information that shows where modifications to the hull form will have the most significant impact. Importantly, even already optimized hulls can be routinely checked to ensure that no hidden potential has been overlooked – much like obtaining a trusted second opinion from a medical specialist. Human expertise is not replaced, but rather strengthened, by transparent, data-driven insights that guide design choices more effectively than ever before.

The HSVA Edge

HSVA thus offers not only proven CFD analysis, but also an enhanced methodology that combines scientific depth, industrial applicability, and decades of hydrodynamic experience. The adjoint solver is not a replacement for established approaches – it is their next level of advancement.

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Performance Prediction Correlation

by Jonas Wagner and Jan Richter

What exactly is the correlation allowance?

Predictions based on model tests are an established means for determining the performance of a vessel at an early stage. Typically, Froude's law of similitude is followed, meaning that the ratio of flow inertia and gravity forces are scaled correctly. The viscous part, however, follows Reynold's law of similitude and cannot be applied at the same time. The friction components behave differently in model and in full-scale and are treated theoretically. The increased boundary layer in model scale and the different Reynolds-numbers lead to different values of the friction coefficient C_F. The average hull roughness of the full-scale ship make part of the ITTC roughness allowance ΔC_F. Experience showed that these are not the only effects that appear in model testing and scaling. Other factors, such as the dimensions of the model basin or facility-specific effects (tank circulations, height of the model, etc.) lead to an additional offset, not covered by ΔC_F. In order to account for these effects, an additional correlation allowance C_A has been introduced in the scaling process by ITTC. The factor is model test facility dependent and determined from comparing model predictions and full-scale trial results.

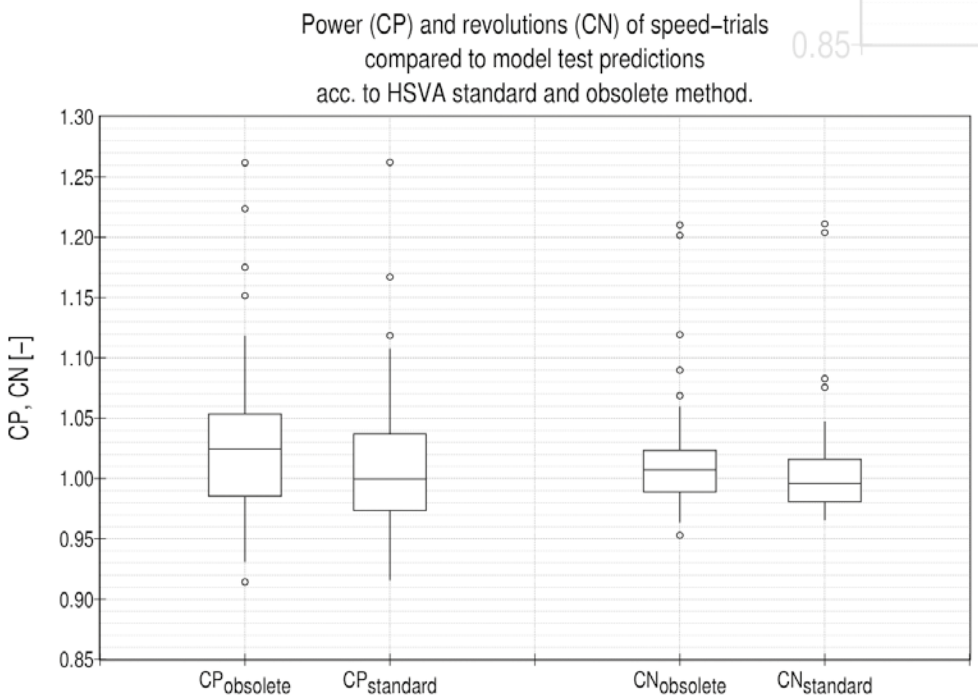

Figure 1: Comparison of the power (CP) and revolution (CN) differences of sea trial to model test prediction for the obsolete evaluation method and the current HSVA standard, introduced in 2014.

Updated correlation in 2014 – a re-cap

HSVA last updated its correlation allowance C_A in 2014, based on speed trial recordings, in order to further improve the performance prediction's accuracy, especially on loaded conditions. The correlation function maintained its original shape but the underlying coefficients have been adjusted to better match the results of trials both on ballast and on deeper draughts. After more than 10 years of active use and constant review, it seems about time to summarise the performance of the correlation allowance since its introduction as a basis for taking further steps into the future. The benefits of the updated correlation can be seen when analysing a random collection of about 90 vessels from HSVA's speed trial database: Their sea trials and underlying model test predictions are re-evaluated following the obsolete method as well as the current standard. The resulting differences in power demand (CP) and propeller revolutions (CN) are summarised by Figure 1.

On average, the model test predictions have improved both in the power demand and in the propeller revolutions, most notably for the less numerous speed trials on loaded draughts. The scatter was not affected significantly by the updated correlation allowance, with an interquartile range of 6.8% and 6.3% for the power demand and 3.4% and 3.5% for the propeller revolutions in the obsolete and in the standard method, respectively. This spread and particularly the outliers observed cannot be explained by the correlation method, which is expected to result in a normally distributed scatter around the mean value.

Instead, they are likely due to other effects, such as large draught deviations, unsuitable trial conditions or modifications in hull form or propeller design between prediction and trial. A more restrictive selection of trials (e.g. only in fair weather conditions or based on the most reliable trial log sheets) would decrease the range and might, to a certain extent, also affect the observations made on the scatter and the median.

From the quick view into HSVA's database it is concluded that the current correlation allowance fulfils its purpose: the predictions match the full-scale recordings well and have especially improved on the deeper draughts, where the updated prediction results in more conservative estimates. As the scatter, or interquartile range, of the comparison did not improve in the same way as the median prediction accuracy, it would be desirable to take further measures to address this topic.

What the future holds for us

The world is far from static. Improvements in manufacturing quality and new inventions constantly change the actual performance of newbuilt vessels. Beyond that, new or optimised model test and scaling procedures lead to more accurate predictions. Even though it copes well on average, it is expected that the correlation needs to be adjusted in future, in order to account for these factors.

The previously mentioned scatter in the performance prediction's accuracy cannot be reduced by simply adjusting the correlation allowance and should therefore be tackled by improvements and extensions of the scaling process itself. But, as this will naturally affect the final performance, it is expected that the C_A needs to be tweaked for each change in the complex scaling process as well. Besides actual changes in the scaling procedure, increasing the refresh-cycle of the correlation allowance based on the latest speed trial recordings results in up-to-date predictions that account for the latest developments in ship design and construction.

This vision of a dynamic C_A allows to more easily account for latest insights in the scaling procedure and feedback from full-scale trials. Naturally, a certain scatter as well as outliers cannot be fully prevented by this approach either, because these do not solely result from the correlation process. Still it is expected that a dynamic C_A can further improve the average prediction accuracy and reduce the spread around the mean between model test prediction and full-scale trial.

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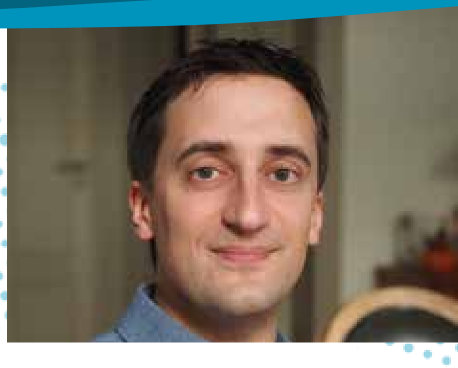

Johannes Stobel has been part of HSVA for over a decade now, bringing experience and passion to every project he undertakes. Over the years, he has worked with all of HSVA's test facilities, explored a wide range of vessel types, and carried out numerous exciting projects with clients from all over the world. His strong relationships, especially with our valued partners in the Asian market, are built on trust, expertise, and a deep understanding of their needs.

Born in Berlin and educated at Hamburg University of Technology as a Naval Architect, Johannes joined HSVA shortly after completing his studies. Today, he and his family are firmly rooted in the beautiful eastern part of Hamburg. From there, it's just a short journey to the Baltic Sea for a sailing trip—or to the field hockey pitch, when he's looking for a little more action with his team mates.

#teamHSVA

Dr. Yan Xing-Kaeding is a senior researcher and project manager at HSVA in the field of CFD, design and optimisation. She joined HSVA more than a decade ago and since then engaged in a variety of different tasks, especially in a number of national and international research projects. She has worked in EU-founded projects GRIP, eSHARK, TrAM, GATERS etc. and very recently the German national founded project FlettnerFLEET focusing on Wind-Assisted Ship Propulsion.

Before joining HSVA, she has worked in the aerospace sector for several years after receiving her doctoral degree with distinction at the FDS/TUHH in the year 2006. Her PhD Thesis, awarded by the Georg-Weinblum-Award in the same year, deals with flow-induced 6-DOF (Degree of Freedom) floating-body motions in seakeeping and maneuvering operations. Yan Xing-Kaeding studied in the Dalian University of Technology in China and made her master thesis in cooperation with the Hiroshima University after receiving a scholarship from the "Japan International Education Association". In her spare time she enjoys reading, swimming and cycling. She also likes traveling and exploring the landscape/culture of the world.

Since he saw a picture of HSVA's ice tank over 12 years ago, **Quentin Hisette** knew it was the place where he wanted to work. Shortly after, he joined HSVA and started to work as project manager for ice-related topics. Over the years, Quentin has gathered valuable experience about polar vessels. In his senior role, he provides assistance to our customers in their most complex projects and teaches younger colleagues how to conduct ice model tests.

Besides his daily work in the office and the ice tank, Quentin is also responsible for full scale ice trials, travelling to the Arctic and Antarctic waters to verify the performance of cargo and polar research vessels. He is also an active member of the ITTC ice committee, developing better procedures and guidelines with experts from other institutes.

Originally from Belgium, Quentin now calls Hamburg his home. In his free time, he enjoys gardening and travelling the world with his wife.

marintec China

The **MARINTEC CHINA 2025** will take place from 2 to 5 December 2025 at Shanghai New International Expo Centre (SNIEC), China.

HSVA will have its own stand N2B6A-06 in the German Pavilion. Our subsidiary SDC Ship Design & Consult GmbH will also be on board. We are looking forward to seeing you soon.

www.marintec.german-pavilion.com