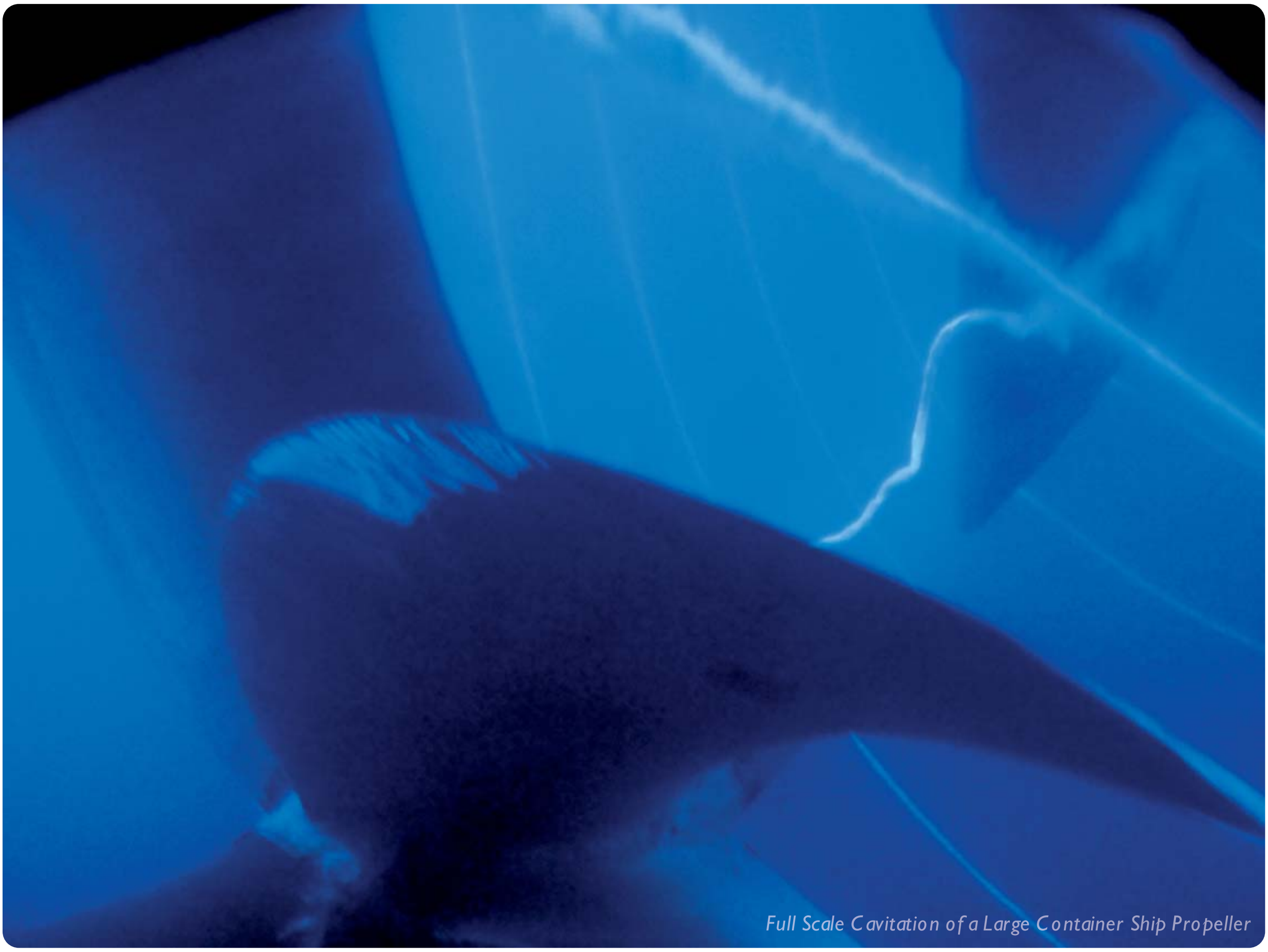
HSVA Newswave 2010/1

THE HAMBURG SHIP MODEL BASIN NEWSLETTER



Full Scale Cavitation of a Large Container Ship Propeller

IN THIS ISSUE:

Dear Reader,

2009 has certainly been one of the most challenging years for our industry. It also offered many new possibilities for us to show you how we can contribute to improving your designs. We would like to thank you for the confidence you have shown us when working together on some really interesting projects. We did our best to create real tailor-made solutions for your designs.

It is our strategy to meet your needs not only by continuously improving our tools – both, the experimental and the numerical ones – but also with the development of new equipment and facilities.

HSVA is ideally qualified to give you the competent consulting you expect. Innovative, dynamic and with a vision how the hydrodynamic part of the ship of the future has to look like, we never stop exploring new ways to get the most out of your ship and make your product a success. We at HSVA believe that now it is the ideal time to prepare not only your new but also your existing ships for the future. Our high quality consulting work, based on our excellent facilities, our new numerical tools and the experience of our staff, will make HSVA the ideal partner to answer all your questions related to your ship’s hydrodynamics, fuel efficiency and environmentally friendliness.

The future ahead of us is still somewhat dark, but we can work together to make it bright.

Juergen Friesch
Managing Director

A new and efficient Numerical Method for the Identification of Parametric Rolling

by Peter Soukup

The phenomenon of parametric rolling is actually well known. If the wave length is about equal to the ship length and if the wave encounter frequency in head waves is equal to twice, or in following waves equal to the natural rolling frequency of the ship, parametric rolling may occur. These resonant zones simply result from the Mathieu's differential equation, because the ship's righting levers periodically vary in waves. This theoretical approach is generally correct, but too inaccurate for a reliable prediction of parametric rolling.

The program ROLLSS is a very fast code for the simulation of parametric rolling. While the pitch, heave, sway and yaw motions are computed by a linear strip method, and the surge motion by a simple nonlinear approach, the roll motion is computed nonlinearly in time domain using the righting lever curves of static stability in waves. This approach is as simple as effective. The computation time for a full scale simulation in time domain is very short. Thus several hundred thousand simulations can be done within a few hours. This makes it possible to carry out several systematic studies efficiently varying significant parameters, like e.g. wave length, wave height, ship speed and encounter angle for various loading conditions. The result of each computation is the maximum roll angle.

Figure 1 displays a section of the results of such a computation series for one loading condition of a Panmax-Container ship in 10m high regular waves: The abscissa gives the wave length (expressed by the ratio to the ship length) and the ordinate the Froude number. Representing head wave conditions by negative Froude numbers and following wave conditions by positive Froude numbers and plotting them in one diagram gives a good overview over the parametric resonance zones. Each box represents one parameter setting and the colour shows the maximum roll angle.

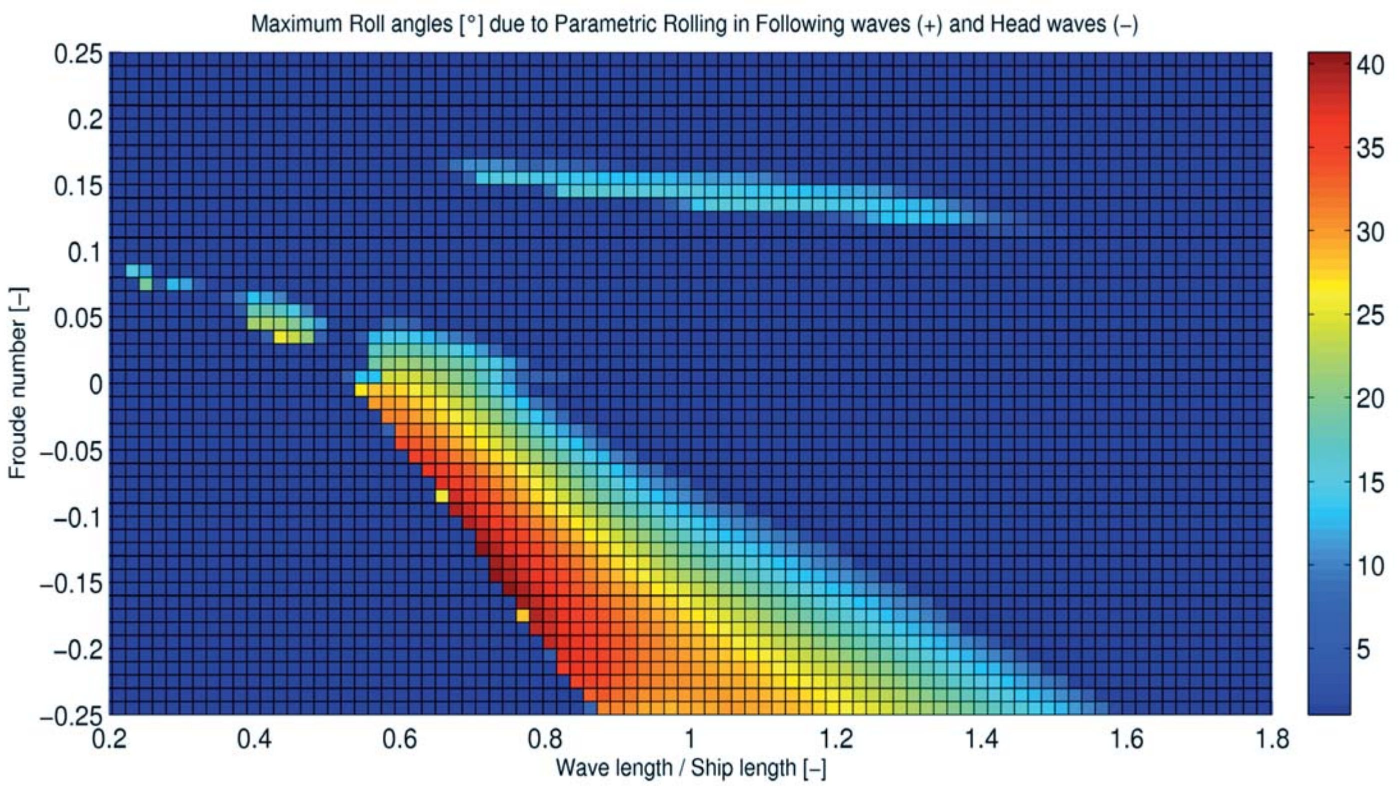


Fig. 1: Maximum roll angles in following waves (positive Froude numbers) and in head waves (negative Froude numbers) for 10 metres wave height.

As it can be seen there are two zones where parametric rolling occurs: one large zone in head waves, which covers the full ship velocity range in wave lengths between 0.6 and 1.6 ship lengths and roll angles up to 40 degrees. This can be recognised as a dangerous 1:2-resonance. The second zone, which is a 1:1-resonance, can be found in following waves in a small velocity range with the Froude number of Fn≈0.14 and wave lengths between 0.8 and 1.4 ship lengths.

In the next step we have a closer look at one Froude number and vary the wave height and length. Figure 2 shows the most interesting part in regular head waves at the very critical Froude number of Fn=0.12 with wave heights between 2 and 10 metres. It can bee seen that the onset of parametric rolling is at the wave height of 4 metres. The roll amplitude increases with increasing wave height and with decreasing wave length. The results for the less dangerous following wave condition at the critical Froude number of Fn=0.14 are shown in Figure 3. In this situation at least 8m wave height is necessary for parametric rolling.

Model tests were carried out to check the accuracy of the computed results. The agreement between the results computed with the program ROLLSS and the experiments concerning the onset of parametric rolling is very good. If the roll damping coefficients are well set, the computed roll amplitudes also fit well. Small motions tend to be underestimated, whereas large motions tend to be overestimated. Figure 4 shows a comparison of computed and measured time histories in regular head waves of 3.3m height.

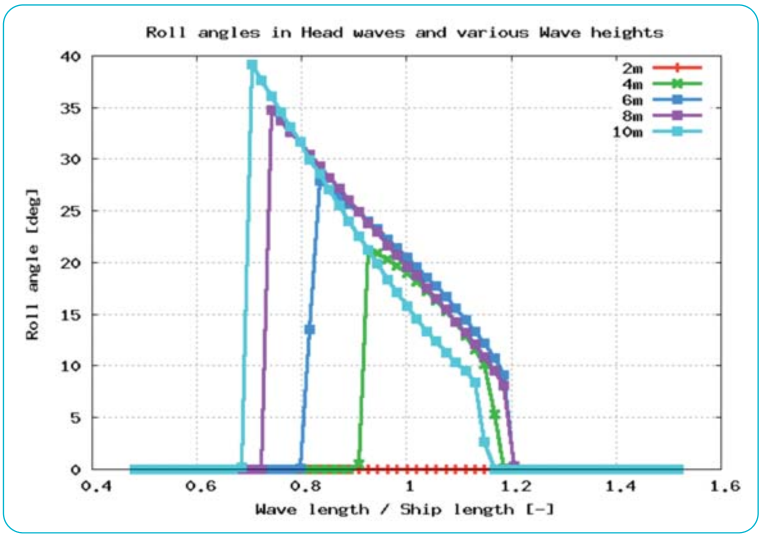


Fig. 2: Maximum roll angles in regular Head waves at a Froude number of Fn=0.12 and various wave heights up to 10 metres.

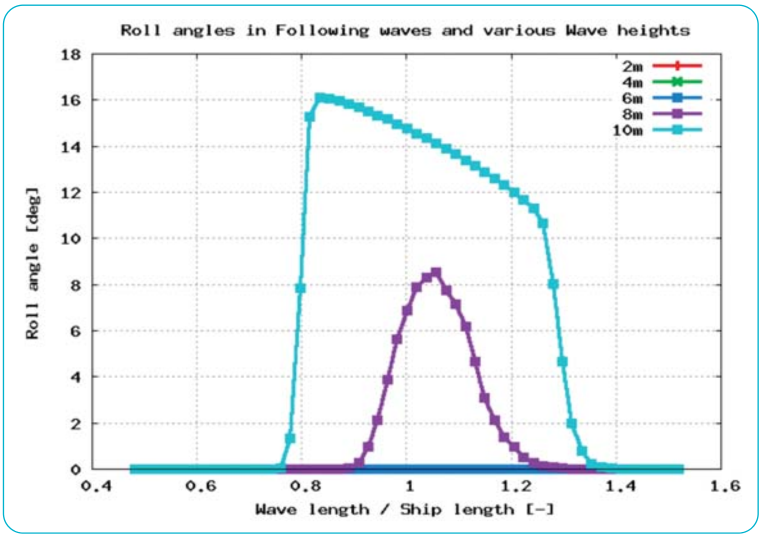


Fig. 3: Maximum roll angles in regular following waves at a Froude number of Fn=0.14 and various wave heights up to 10 metres

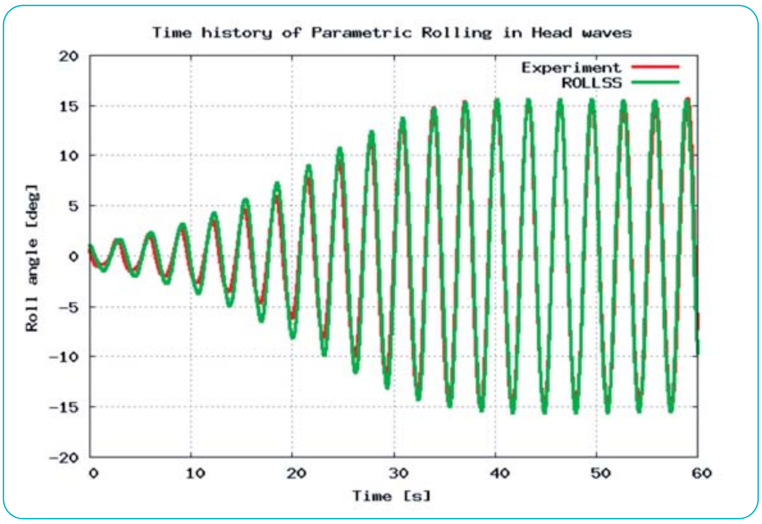


Fig. 3: Time history comparing the roll motion in regular Head waves (F_n=0.12, Wave height=3.3 m, WL/L_{pp}=1.04)

A new and efficient Numerical Method for the Identification of Parametric Rolling

These computations in regular waves give an overview of the worst situations. They can be assigned to irregular seaways with a peak period corresponding to the critical wave length. The significant wave height should be taken as half of the height of the regular waves, since the maximum wave height likely to be encountered in a storm event in an irregular sea state is expected to be approximately twice the significant wave height. Computations in such irregular long crested JONSWAP seaways have shown that the significant roll angles are usually much smaller, because the occurrence of a regular coherent wave packet with the critical period, which is long enough to excite roll motions of the ship to the maximum roll angle, is quite unlikely.

The main advantage of this method is that the behaviour of any individual ship and any loading condition can be efficiently investigated by a systematic variation of parameters. Thus dangerous situations due to parametric rolling can be detected and qualified reliably even in situations, where they are not expected. After these dangerous situations have been detected more detailed information for selected cases can be found by model tests and RANSE computations. Such computations are included in the present development work within the framework of the research project MODESH financed by the Federal Ministry of Economics and Technology (BMWi), as shown in Figure 5.

It is now possible to provide clear diagrams for ship owners showing the potentially dangerous conditions of the ship speed and wave length and height for each loading condition of the ship.

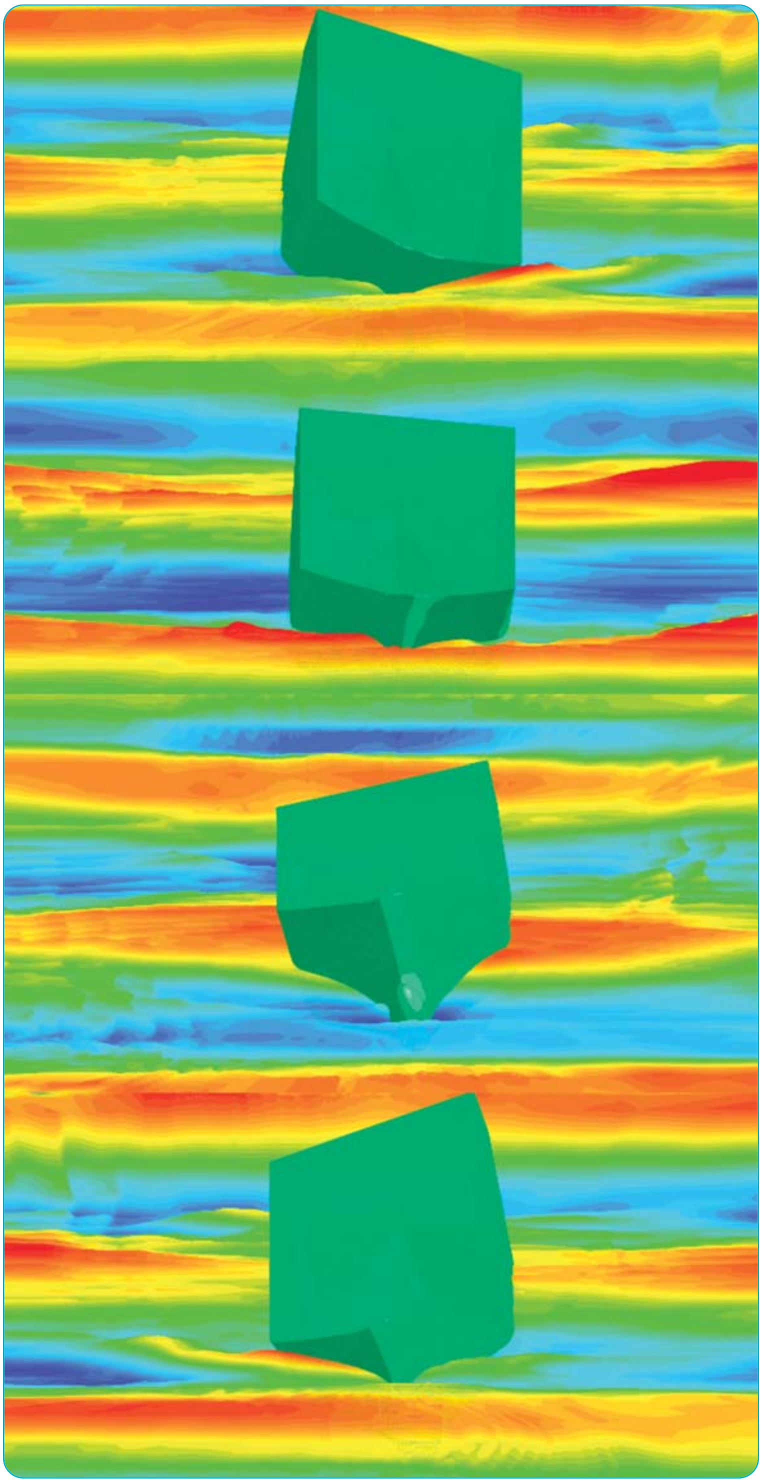


Fig. 5: RANSE computation of Parametric Rolling.

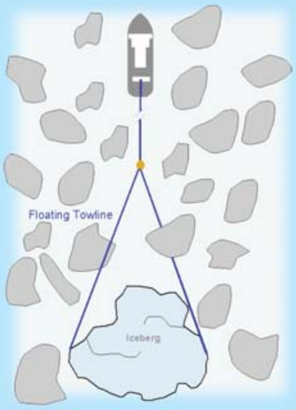
Iceberg towing – Ice tank tests

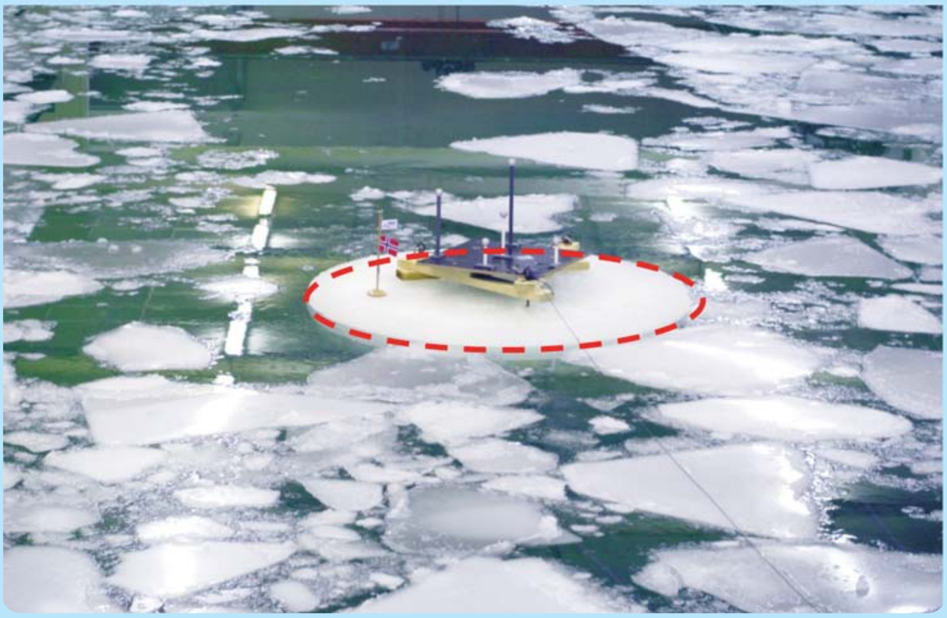
by Karl-Ulrich Evers

In polar regions drifting icebergs may pose a threat to offshore structures and vessels. If icebergs are detected and considered to be a threat, it has been documented that in open water they can be deflected into a safe direction in approximately 75% of the events. The preferred method for iceberg deflection is single vessel towing. While all successful iceberg towing operations so far have taken place in open water, future oil and gas developments are expected to take place in regions with occurrence of icebergs embedded in sea ice. The possibility to manage icebergs in such conditions will in future contribute to increased safety offshore operations in Arctic waters. The objective is to establish tools, which may be applied when planning real iceberg towing in order to estimate extreme loads, iceberg stability, probability of success etc.

Physical model tests in the Large Ice Tank at HSVA have been carried out recently by researchers from the Norwegian University of Science and Technology (NTNU), Technical University Hamburg-Harburg (TUHH) and University of Svalbard (UNIS) with cylindrical and rectangular shaped iceberg models at a scale of 1:40. The arrangements for iceberg towing and sampling data regarding towing power and behaviour of movement (pitch, roll, heave, surge, sway and yaw) for various ice floe concentrations were investigated. In the present study the length / diameter of the icebergs corresponds to 80 m in full scale and the ice floe thickness is 1.2 m (Figure 1). The tests are to be considered as a first step in order to provide data and information, which can be used as a basis for developing models regarding iceberg towing. From the tests the following preliminary results can be summarized:

- Towing of medium size icebergs in-between moderate thick ice floes is considered not to be feasible in ice floe coverage larger than 5/10th (=50%) due to high resistance caused by the ice floe impact on the iceberg.
- Iceberg tow loads are highly stochastic and log-normal distributions seem to represent the load distributions fairly well. The log-normal distribution parameters depend on the ice floe coverage.
- The general arrangements for single vessel iceberg towing in ice free waters seem applicable when towing in light ice coverage conditions. However, at higher ice floe concentration it is most likely that the towline will be lifted above the ice floe surface and may be damaged or even breaks.
- The influence of tow speed, acceleration and change of tow course is small compared to the impact of ice floe concentration.
- There are no significant differences regarding iceberg stability when towed in-between ice floes compared to ice free waters.
- Roll and pitch movement are small and surge and sway are significantly less in-between the ice floes than in ice free water due to the damping effect caused by surrounded ice floes.

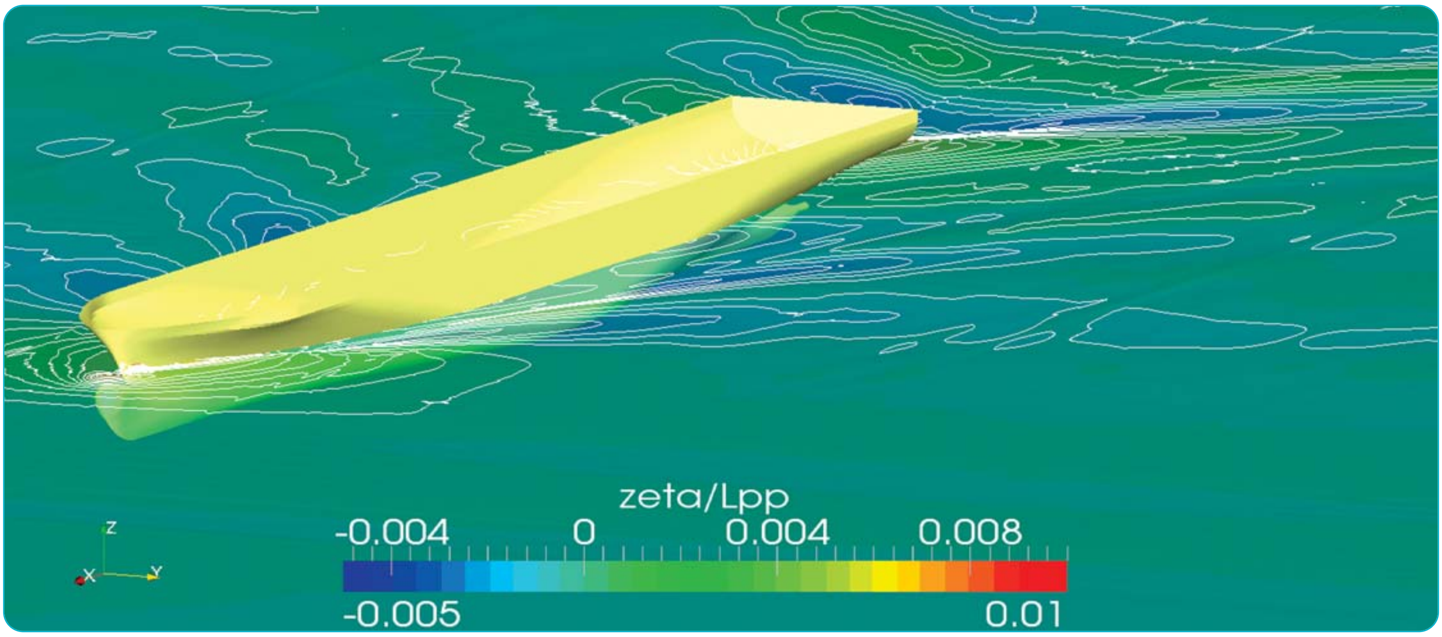




Iceberg tow operation in HSVA's Large Ice Model Basin and in full scale

For more information see Cold Regions Science & Technology 61 (2010) 13-28

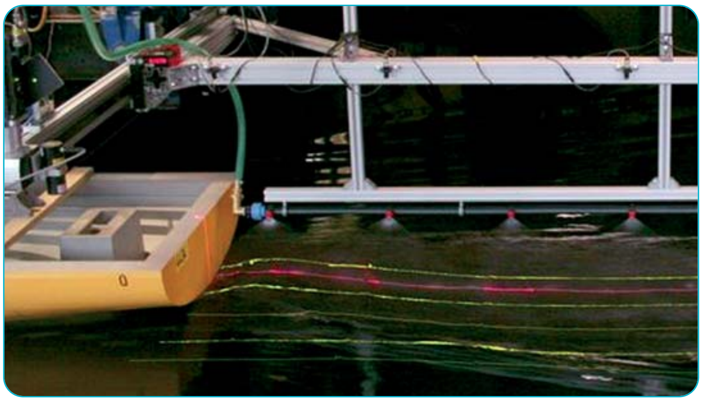
FreSCo+ expands the limits of free surface predictions

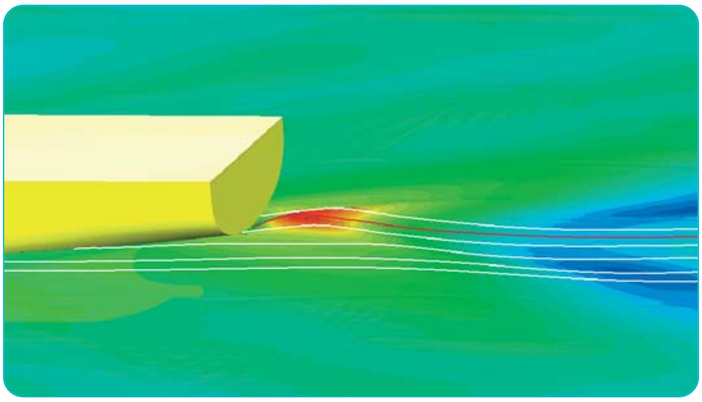


by Marco Schneider, Dieke Hafermann and Jochen Marzi

FreSCo, HSVA's new "Free Surface RANS code" – jointly developed with Technical University Hamburg-Harburg (TUHH) is living up to its name. Latest improvements increasing the code's versatility and speed now put it into reach for standard applications in routine projects involving free surface/wave resistance predictions.

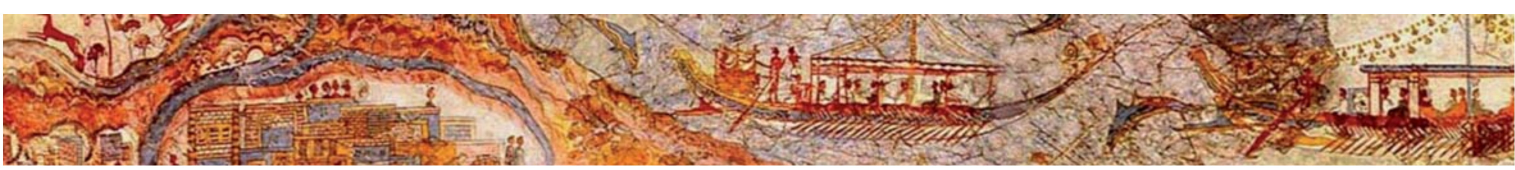
In a comprehensive computational exercise, FreSCo results have been validated against experimental data obtained from VIRTUE and the ABSS projects (see article in NewsWave 2007/1). Here detailed wave measurements beside the ship and behind the transom have been performed, the latter using a novel laser cut technology. One of the vessels investigated in this project has been the VIRTUE container ship, a contemporary design for a 3000 TEU vessel.

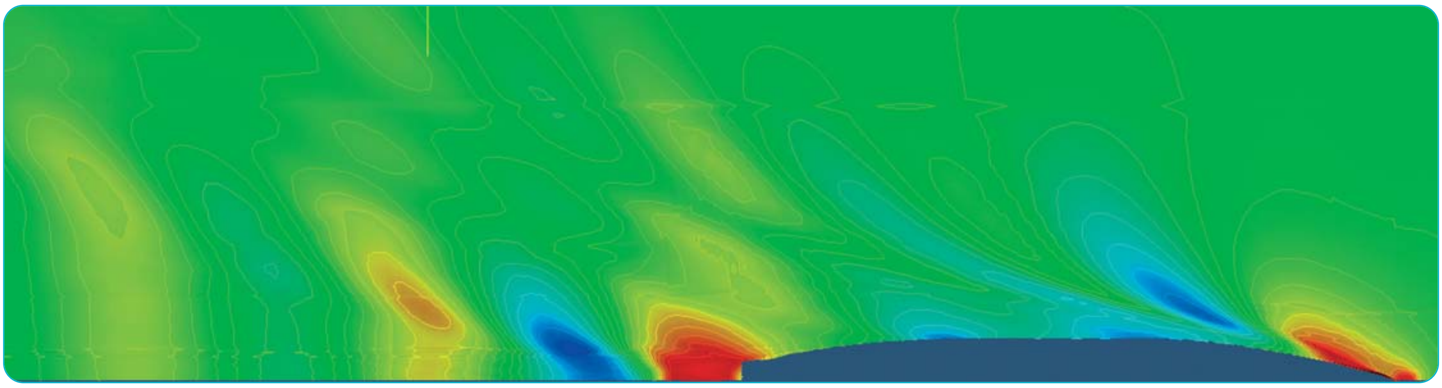


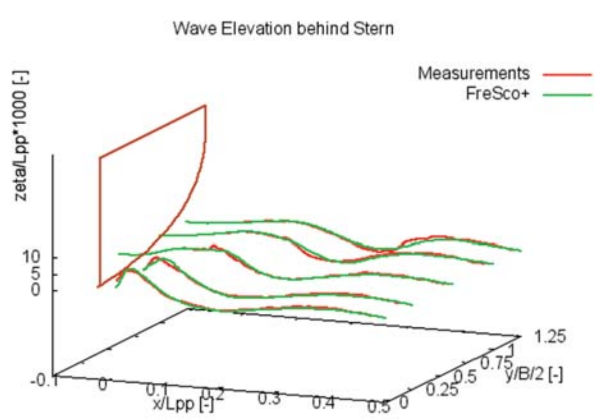


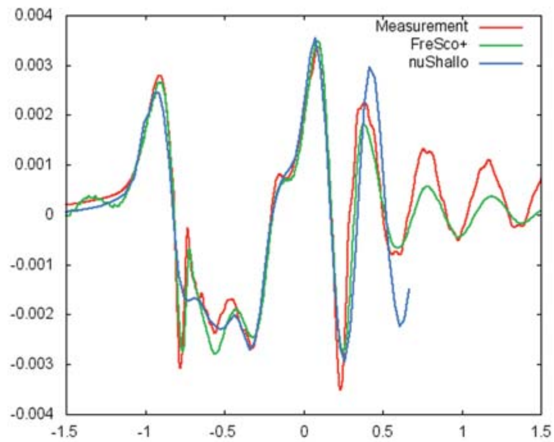
FreSCo has been used to compute the wave pattern around the ship, wave elevation on the hull and behind the transom stern as well as the total resistance force.

The results obtained from these predictions demonstrate that the new code allows to accurately predict the wave pattern around a ship hull, capturing more detail e.g. in the region of the forward shoulder and especially behind the transom stern.









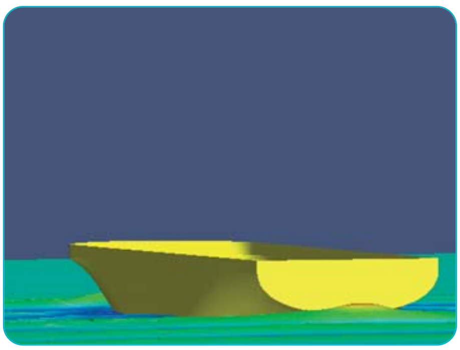
Figures above show the comparison of wave cuts along the ship and behind the transom at different transverse sections. The comparison of FreSCo results and earlier potential flow data indicates an excellent agreement of the RANS results with experimental data.

FreSCo lends itself also to the treatment of more complex cases such as blunt ships which will often show breaking bow waves and fully wetted transoms, conditions which cannot be treated with a potential flow method.

Improved accuracy in wave pattern prediction in turn yields an improved accuracy of the force prediction. Resistance forces from the new FreSCo predictions are typically within 3% of the benchmark data obtained form model tests.

In a second line of development, FreSCo has been linked to HSVA's standard panel code ν-Shallo for improved efficiency. Computing the steady state flow around a ship hull beneath a pre-specified free surface resulting from the panel code prediction allows to rapidly perform a complete numerical resistance test over a typical range of speeds and floating conditions.

Free surface predictions, combined with the equally new developed numerical propulsion test, make FreSCo the tool of choice for ambitious ship applications. HSVA now includes a full range of FreSCo based services in routine projects for the benefit of our customers.



☝ *Picture source: Wikipedia*

Optimisation of a Harbour Ferry

✎ by Hilmar Klug and Hans-Uwe Schnoor

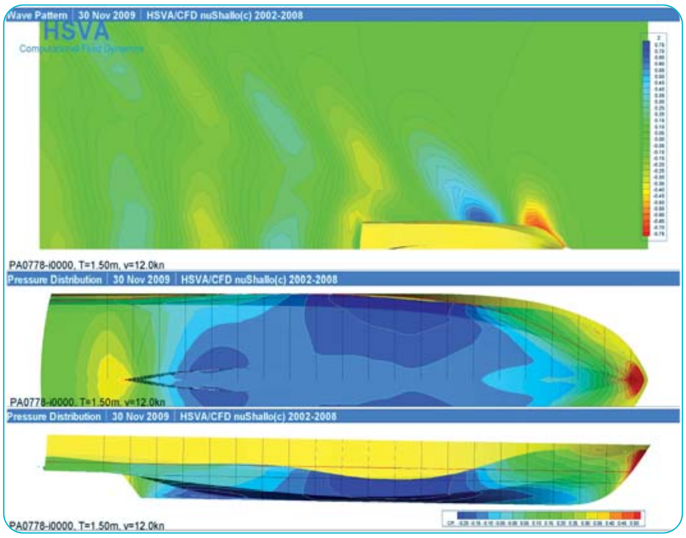
In February 2009 the European Commission in Brussels gave the title European Green Capital 2011 to the North German city Hamburg, home of the Hamburg Ship Model Basin (HSVA). The title honours the past and future achievements and efforts made by the city with respect to an environmental friendly economy and living. A significant contribution is given by the public transport system formed by busses (conventional diesel engine driven and modern ones, fuelled by natural gas and hydrogen), subway trains and harbour and lake/river ferry boats (including a solar boat and a hydrogen fuelled boat).

In Hamburg's world famous harbour a fleet of harbour ferries is operated by the HADAG Seetouristik und Fährdienst AG. Aiming at the improvement of the fuel efficiency and reduction of corresponding exhaust and greenhouse gases HADAG asked HSVA for support and expertise. It was decided to investigate the hull lines of the existing 30 m long ferries in combination with an additional bulbous bow suitable for an easy retrofit.

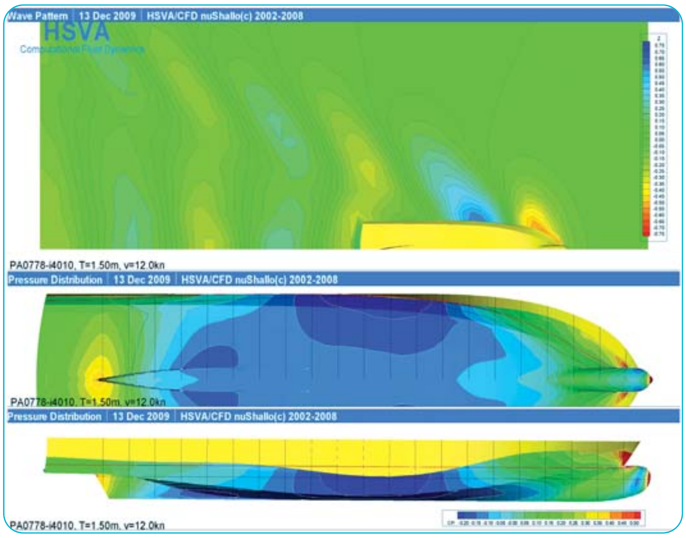
At first various bulbous bow shapes were investigated by potential flow computations with HSVA's ν-Shallo code. Since the results were promising the finally selected bulb was manufactured in model scale and fitted to the ship model.

In HSVA's large towing tank comparative resistance tests were performed for the ferries as in service, i.e. without bulbous bow, and with the bulbous bow fitted. At the 12 knots service speed the reduction in total resistance was found to be 9% and confirmed the results of the CFD computations.

Full scale ferry without bulbous bow



CFD computation for the ferries as in service



CFD computation with additive bulbous bow

Model ferry fitted with bulbous bow in HSVA's large towing tank

Operating CP Propellers in "Off-Design" Conditions

by Uwe Hollenbach
and Hans-Uwe Schnoor

Small and medium sized merchant ships such as container ships, multi-purpose vessels, tankers, RoRo and RoPax ships and passenger ferries operating in coastal areas are often equipped with controllable pitch propeller plants. The cp propeller plant offers a flexible operation of the ship, excellent stopping abilities without the need of reversing the main engine and, in combination with a shaft generator, to generate the electricity for the sea load by the main engine. To supply electric power the cp propeller plant is operated in the constant rpm mode. As an alternative, a thyristor-controlled generator could be used, but this is quite an expensive solution. For the design condition of a ship, the efficiency of the cp propeller is almost the same as with a fixed pitch propeller. However, this may change when it comes to "off-design" conditions.

For an existing ship in service, HSVA has been contracted by a ship owner to investigate the behaviour of the cp propeller plant especially in "off-design" conditions. Precondition for such an investigation is the availability of model test results for the draught and speed range of interest, and the availability of open water curves of the cp propeller for a set of pitch settings from the "zero-thrust" condition up to the maximum pitch. Most reliable information on the propeller performance can be gathered from propeller open water tests performed for different pitch settings. Alternatively, as has been done in this case, the propeller manufacturer can supply the propeller open water curves.

As a reference, for each draught condition the performance of the cp propeller for the "fixed pitch mode" has been calculated. Further the performance of the cp propeller in the "constant rpm mode" has been calculated, and finally the performance in the "combinator mode". In the figure 1 the power requirement in the different modes is shown for one draught condition.

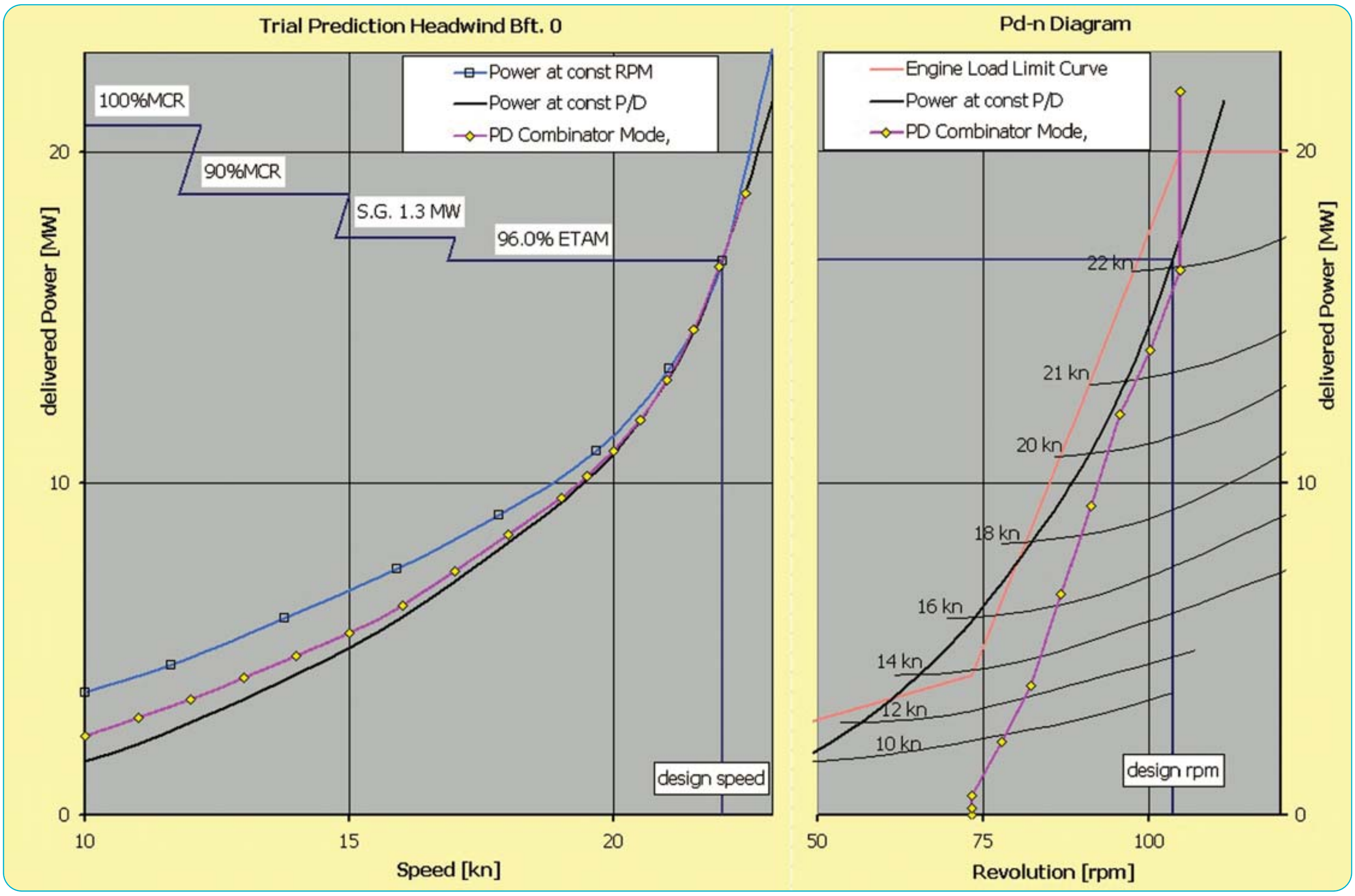


Fig. 1: Speed-power and rpm-power prediction for a cp propeller

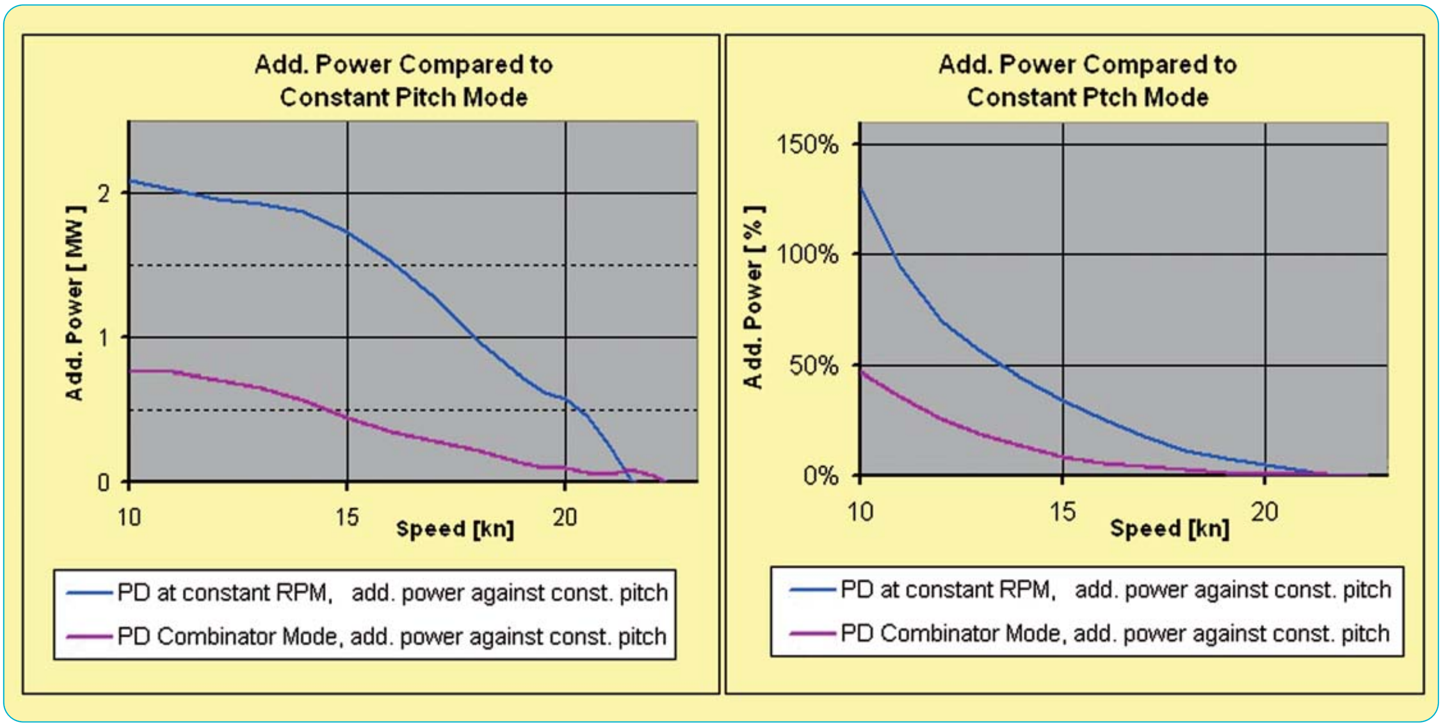


Fig. 2: Additional power demand of a cp propeller in different modes

It is noted that with reduced speed the power demand in the "constant rpm mode" is significantly higher as in the reference condition "fixed pitch mode". In the "combinator mode" the power demand is almost as low as in the reference condition. In this example presented in figure 2 the required power at the 70% speed in the "constant rpm mode" is about 35% higher compared to the "fixed pitch mode".

Such investigations of the performance of a cp propeller plant can be performed for a range of draughts and ship speeds, and for various wind and sea conditions. All information in hand allows the ship owner and operator to decide upon the optimal operating mode of his cp propeller plant within the allowed envelope of the engine load diagram. He then can decide, whether it is more efficient to operate the cp propeller in "constant rpm mode" in combination with the shaft generator, or to switch to the "combinator-mode" and generate the needed electric power by an additional auxiliary engine. In this particular case the engine load limit curve allows combinator settings, which are rather close to the fixed pitch situation. In cases where the engine has a very narrow load limit curve the resulting combinator setting can be more close to the constant rpm situation. Also the more expensive option with a thyristor-controlled generator may pay off, when comparing with the additional fuel oil costs due to cp propeller operation in the "constant rpm mode".

Investigations for different type of propellers conclude that highly loaded cp propellers typically have a much higher power demand than low-loaded cp propellers in "off-design" conditions. Even trickier to judge is the operation of cp propeller plants of twin-screw vessels (e.g. single shaft operation) or propulsion plants, where two main engines are operating on a single propeller.

Extreme propeller pitch reduction to achieve low ship speed often results in severe face cavitation, causing strong vibration excitations. For more information on this refer to HSVA NewsWave 2005/2. Further, HSVA has launched the research project "OFF-Design" in August 2008 to increase the ship-, propeller- and rudder design in its cavitation and efficiency characteristics especially for "off-design" conditions.

Pragmatic Approach for Investigation into Whale Protection

Computations on low frequency noise spectrum in the far field

by Heinrich Streckwall and Herbert Bretschneider

A boundary element method tailored to predict the excitation of the hull due to the working and cavitating propeller was successfully applied to access the far field behaviour of propeller generated noise. The method simulates the cavitating propeller in the presence of the hull as shown in Fig. 1. The extended functionality of the method was first set into use for a study on the underwater noise emission for LNG carriers commissioned by Shell International Trading and Shipping Company Limited (Shell), London.

We first recognized, that the scope of the existing method complies with the intentions of the above mentioned study, namely to protect the biological environment and to study basic aspects of propeller noise emission against this background. We identified the low frequency part of the propeller noise spectrum (8-100 Hz) as the most important contribution and could benefit from the fact that the sources for hull excitation and propeller emitted low frequency noise are the same. We changed the software, so that we were able to use arbitrary 'numerical' pressure sensors anywhere in the flow field instead of being confined to the natural pressure sensors given by the hull panel system. Then the link to the standard acoustic interpretation of noise was readily established, namely to plot a logarithmic measure of the pressure at the sensors known as the **Sound Pressure Level *L***. In particular we used…

$$L = 20 \log (\Delta p_k / p_{ref}) \ [\mathrm{dB}]$$

…where $p_{ref} = 10^{-6}$ **Pa = 1µPa = reference sound pressure in water** and

Δp_k **= pressure amplitude of k-th Blade Frequency (BF)**

In the above mentioned study for Shell the far field acoustics (starting at ½ ship length from the propeller, reaching up to several kilometres distance) were of special concern. Such large distances could not be covered by the acoustic measurements performed in the HYKAT as part of the study and appear also unreasonable for complete RANSE simulations. It was recognized, that a combination of both, of HYKAT tests giving the near field sound pressure or the hull pressure fluctuations and of boundary element calculations giving the far field sound pressure represents the most reliable procedure.

The calculation method neglects the finite speed of sound and accordingly interference and multipath spreading. With this we lose some structure of the true noise field but we can still supply the most significant information, namely the upper limit for local noise levels. In particular, assuming unlimited water depth we investigated:

- The influence of cavitation on the far field low frequency propeller noise
- The effect of a rigid cover substituting the free water surface (aiming at a simulation of a nearby ice cover)
- The directional characteristic of the emitted noise going into lateral, downstream and vertical direction

Further we looked for a correlation between hull surface pressure level and far field low frequency noise.

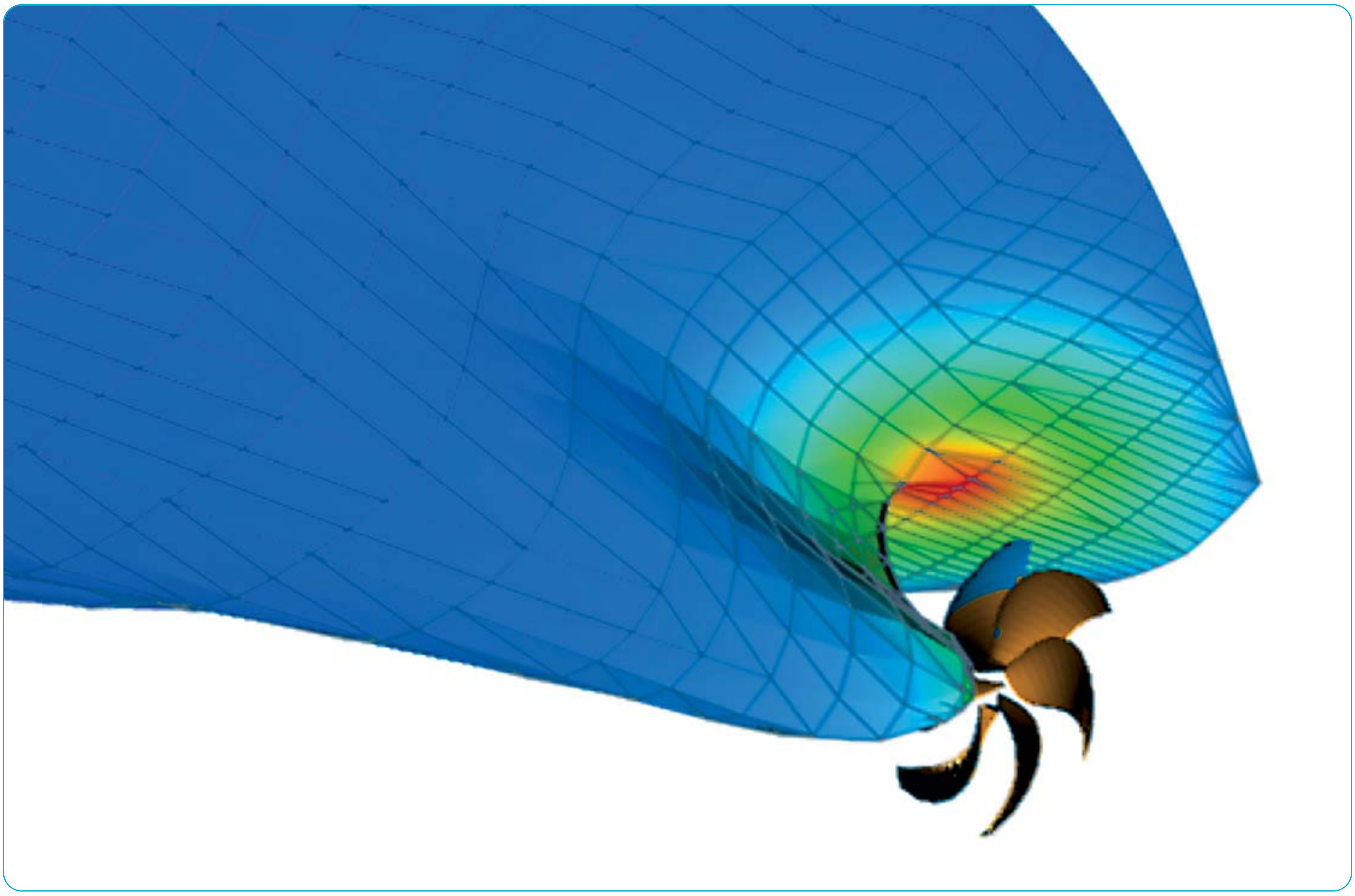


Fig. 1: Original scope of the method: instantaneous interaction of the propeller pressure field with the hull. The figure also indicates that the propeller cavitation is contributing.

Pragmatic Approach for Investigation into Whale Protection

Computations on low frequency noise spectrum in the far field

To capture the behaviour of the propeller noise in all directions, we arranged the numerical pressure sensors on spheres as shown in Fig. 2. The boundary element method referenced above gave us very informative basic results. Comparing a cavitating and a non-cavitating propeller for example we found that

- developed cavitation increases the far field propeller noise by typically 10 dB

Comparing the free surface and the rigid cover (a crude substitute of a nearby ice cover) one can register, that (fortunately) a lot of energy from the propeller pressure field is converted into distortions of the free surface while the opposite (reflection of energy) is the case for the rigid cover. This is reproduced in Fig. 2 (1st blade frequency sound pressure levels for cavitating propeller, hull and free water surface) and Fig. 3 (1st blade frequency for cavitating propeller, hull and rigid cover). The nearby pressure levels on the hull reach similar values while the far field levels show a progressive offset in vertical direction (in this particular case the offset reads 20 dB at 70 m depth). We can state that

- under a free surface the far field sound levels are much lower than under a rigid cover
- under a free surface there is a strong directional dependency for the decay of the pressure levels (progressing stronger in the horizontal directions)
- a nearly isotropic decay holds for the rigid cover

From variations of the propeller tip clearance, which changed the amplitudes at the hull significantly but hardly influenced the far field characteristic it could be concluded that

- hull pressure amplitudes can not be used to judge the far field propeller noise

The above conclusions may not be new or unexpected. However we could set up a procedure which helps to quantify the low frequency part of the propeller radiated noise, an information that can be provided together with the hull pressure amplitudes. It is now planned to further extend the scope of the method, in particular to predict the far field noise up to several ship lengths distance and to introduce a numerical model for the sea bottom.

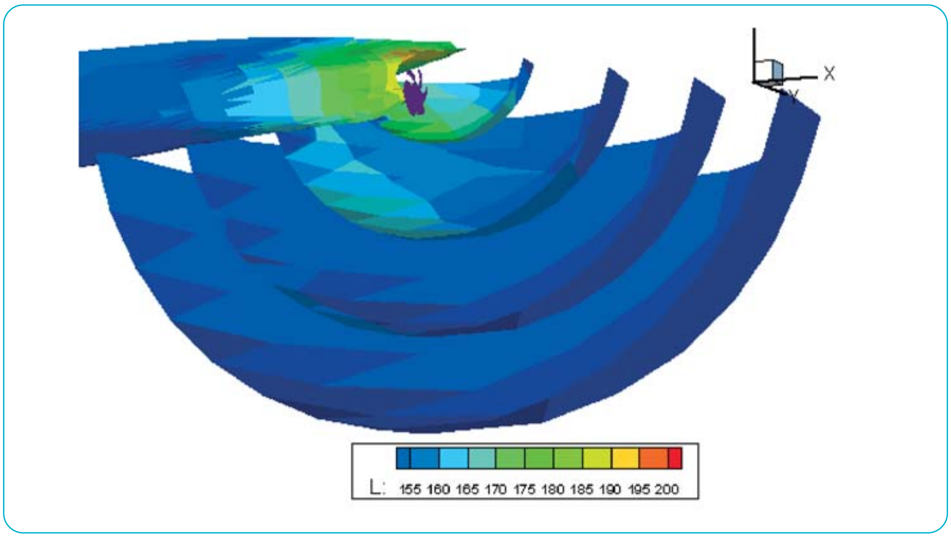


Fig. 2: Calculated sound pressure levels L for 1st blade frequency assuming cavitating propeller, hull considered under a free water surface.

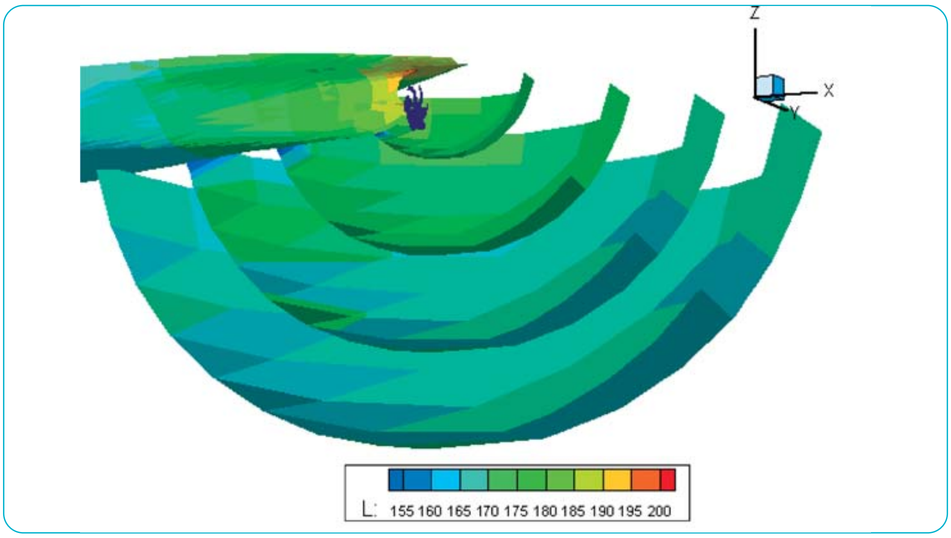


Fig. 3: Calculated sound pressure levels L for 1st blade frequency assuming cavitating propeller, hull considered under a rigid surface that substitutes the water surface (plate).

Coping with "Bad Memories" — the New Project KONKAV I

Research on Correlation of Cavitation Effects and Water Quality

by Johannes Schöön

The pseudo-scientist Jacques Benveniste and his homeopathy colleagues shot to fame in the late 1980ies after they had published "evidence" that water can remember dissolved medical substances, long after they have been diluted out of the solution. Although (most) cavitation experts do not believe in the wonderful claims of homeopathy, when they conduct experiments in their cavitation tunnel, they do have to cope with the memory effects of their tunnel water.

When subjected to sufficiently low pressures — statically or dynamically — water will rupture, that is, cavitate. Analogous to many construction materials, water tends to "break" at internal points of imperfection. The counterparts of crystal boundaries, impurities and pre-existing fissures in metals, are the so called cavitation nuclei in water. Most of them are microscopic bubbles, but specks of dust also qualify, as they can have minute crevices in their surface. In these crevices, pockets of gas can hide, ready to expand if pressure drops low enough for water to evaporate across their free surfaces.

The cavitation that will be observed during an experiment does not depend exclusively on tunnel pressure, water velocity, and pressure, but is also influenced by the amount of dissolved gasses, dust content, and size-distribution of micro-bubbles in the water. In the parlance of the cavitation experts, the headaches caused by these additional factors are often called water quality effects. Their potential impact on experimental results was beautifully illustrated by the comparative cavitation inception tests organised by the ITTC in the mid sixties (Fig. 1), where simple head forms were tested in different cavitation facilities around the world.

They say that the devil is in the details, and this certainly seems to be the case for water quality. Not only does each cavitation facility seem to have its own water quality, it also varies with time and is influenced by the experiments carried out. The size of each micro-bubble depends on the surrounding pressure, the amount of gases and vapour it contains, and the surface tension of its boundary. Since gas and vapour are free to diffuse and evaporate or condense across the boundary, the size of each micro-bubble will evolve constantly under the influence of the local conditions. These mass transport phenomena are quick enough to react upon the changing conditions during a working day on the one hand, but on the other hand sluggish enough to endow the tunnel water with a short time "memory".

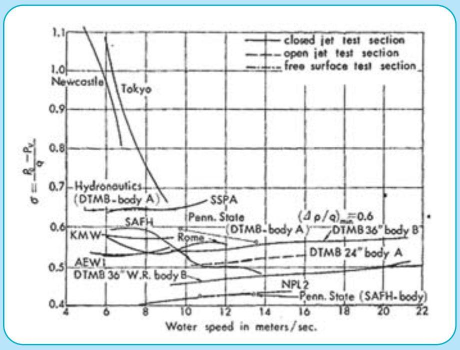


Fig. 1: Cavitation Inception in different facilities

Although a lot of progress has been made on this subject since the ITTC head form experiments in the 60ies, and our understanding of water quality has deepened, there is still a lot to learn. Reliable cavitation test results are nowadays rather achieved through long-term experience with the model basins respective tunnel water, than by real understanding of the physical mechanisms.

The latest effort of HSVA on this scientific frontier is our participation in and coordination of the cooperative research project KONKAV I, Korrelation von Kavitationseffekten unter Berücksichtigung der Wassereigenschaften. The other participants are the Hamburg University of Technology, the University of Rostock, and the Potsdam Model Basin (SVA). Together, we plan to develop and improve

- optical methods for in situ assessment of nuclei distributions
- numerical methods for the simulation of cavitating flows
- scaling laws that compensate for water quality effects

KONKAV I will run for three years and is sponsored by the German Federal Ministry of Economics and Technology (BMWi). If all goes well, it will soon be accompanied by KONKAV II, aiming at including wake effects in the propeller cavitation scaling, and KONKAV III, focussing on how to predict full scale cavitation erosion.

Even if we fail to achieve all our objectives, we are confident that the KONKAV I project will not make us qualify for the questionable honour of receiving the satirical Ig Nobel prize, as was the case for Jacques Benveniste in 1991 (http://improbable.com/ig/winners).

Conceptual Design Study for "POLARSTERN 2"

"POLARSTERN" (Photo: Gauthier Chapelle, source: Alfred Wegener Institut)

The Alfred Wegener Institute for Polar and Marine Research (AWI) carries out research in the Arctic and Antarctic regions and co-ordinates the German polar research activities. Since 1981 the AWI has been operating the icebreaking research vessel POLARSTERN. This sophisticated and reliable research icebreaker sails about 320 days every year in the service of science. Over the years POLARSTERN has earned an outstanding reputation within the international community of maritime scientists.

Although POLARSTERN was regularly maintained and up-dated with the latest scientific equipment, she will reach the end of her planned service life in the middle of this decade. Having this in mind the AWI has started the planning for a replacement vessel which is to be commissioned in 2016.

As a first step towards the development of the new vessel the AWI has approached several international ship design companies with competence in ice-going research vessels for the purpose of conducting a conceptual design study. Out of this group of companies the AWI has selected SDC Ship Design & Consult GmbH and three other companies to prepare and submit alternative conceptual designs for the POLARSTERN replacement vessel. For the hull form design work SDC will subcontract HSVA and thus will make use of HSVA's competence in the design of hull forms and propulsion concepts for vessels operating in open water and in ice. HSVA's know how in icebreaker design dates back to 1943 and is reflected in nearly 30 years of successful and reliable operation of the present POLARSTERN in both polar regions.

SMM 2010
Congress Center Hamburg

From September 7th-10th the Shipbuilding, Machinery & Marine technology international trade fair (SMM), the most important maritime exhibition in Europe, takes place at the Hamburg Congress Centre.

HSVA is looking forward to seeing you at our booth No. 260 in hall B4, to present our actual research projects as well as recent developments.

Member of staff

Peter Jochmann has been appointed head of Ice & Offshore department in April 2009. He joined HSVA first in 1978 as research engineer and project manager with emphasis to instrumentation, data acquisition and evaluation in the Ice & Offshore department. He became supervisor for instrumentation and data processing in 1985. In this position he was responsible for many developments and improvements with respect to model test techniques and determining mechanical ice properties.

Even though he was involved in and supervised countless model test projects, his great passion was the field work. Several field projects and expeditions took him to arctic and subarctic regions on 3 continents. The biggest challenge was supervising the task for determining ice forces acting on the lighthouse Norstrømsgrund in the Gulf of Bothnia within the EU-funded research projects LOLEIF and STRICE.

Peter Jochmann received his engineering diploma in applied physics from the University of Applied Science Wedel.

In his spare time he enjoys his family, cycling and trying to improve his golf handicap.

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