The practical dreamers meet again

Smart and green solutions towards net zero carbon shipping – when experts again gather at the »HIPER Conference«, technologies for future ships and future shipping will again be the overarching theme. *By Volker Bertram*

This year, it is the 16th edition of the well-known expert conference, which will take place in Drübeck/Germany, June 10–12. Advanced thinkers from research and industry will meet to discuss the future of shipping, presenting smart and green solutions for the decarbonization challenges.

First-class engineering, creative ingenuity, and entrepreneurship come together at HIPER – also this year, where again also ship operators join in force, not just in the audience, but also presenting strategies and sharing experience on implemented solutions.

This year, as in 2023, everything seems to tie again into decarbonization – the 2024 megatrend for the industry, as the first CII (Carbon Intensity Indicator) ratings are out, and the EU Emission Trading Scheme (ETS) is looming on the horizon with expected fuel cost increases of 50 % by 2026. While the CII is seen by some ship operators as a toothless tiger, the EU ETS will impact operators' fuel expenses already this year.

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In-transit cleaning is also shown at HIPER. »High-frequency hull grooming provides substantial benefits in terms of GHG emissions and offers substantial savings for the ship operator,« says Matan Nice (NakAI)

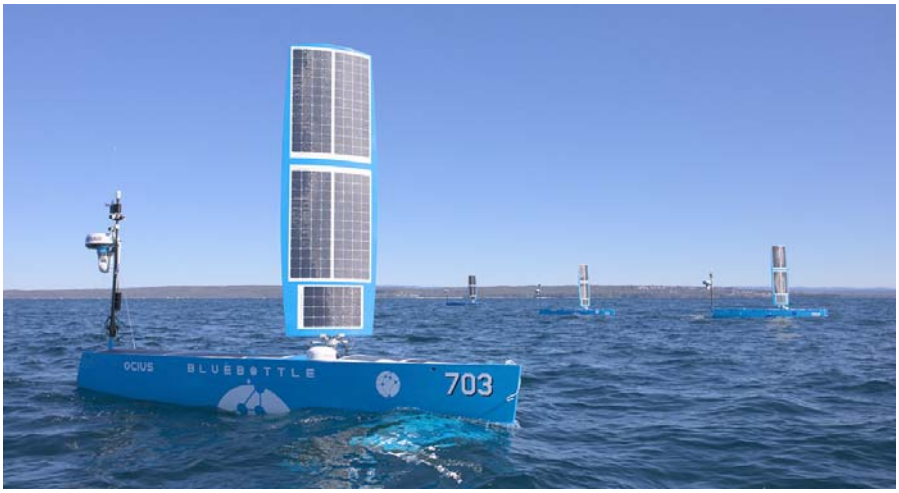
We need to move – and we do!

We need to move – and we do! The practical dreamers meet again, and there is a spirit that sees the challenges also as chances, focusing on solutions rather than lamenting. HIPER is not a forum for politicians and lobbyists, but engineers and managers who get things done with ingenuity and entrepreneurship.

Solutions presented cover various aspects of decarbonizing shipping:

- New fuels and e-technology, of course
- Wind assisted ship propulsion, of course
- Smart »optimized« solutions for hull, propulsion improving devices, air lubrication outlet, trim, routing, electric load, etc.

In the short-term to maybe 2030, IMO's decarbonization goals will be achieved through tried and proven measures, which will be implemented just more rigorously and wider than in the past. The industry stays within its comfort zone, and many of the measures to reduce CO_2 emissions pay for themselves through fuel savings. Employing these »conventional« measures, already significant progress in energy efficiency can be achieved, as exemplarily shown by Matija Vasilev (Ocean Pro), who evaluate energy efficiency in a combined fleet of bulk carriers and tankers. »The findings will be particularly relevant for fleet operators and industry stakeholders seeking to optimize energy efficiency in these vital segments of the maritime sector,« promises the author.



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Smart meets green: autonomous drones with solar-sails. Robert Dane, CEO of Ocius, takes the idea of sustainable propulsion one step further

Leaving the comfort zone

Beyond 2030, the industry will have to leave the comfort zone of the tried and proven, and explore largely yet unknown options including alternative fuels – but the process of exploration has already begun. Assorted R&D projects, on national and EU level, are preparing the ground and HIPER 2024 gives us some sneak previews into the post-2030 future.

New generations of ships will be much more energy efficient than those of the baseline average of 20 years ago. Better design procedures, innovative hull and propulsion designs, wind assistance, and even better coatings with lower roughness contribute to lowering the Energy Efficiency Design Index.

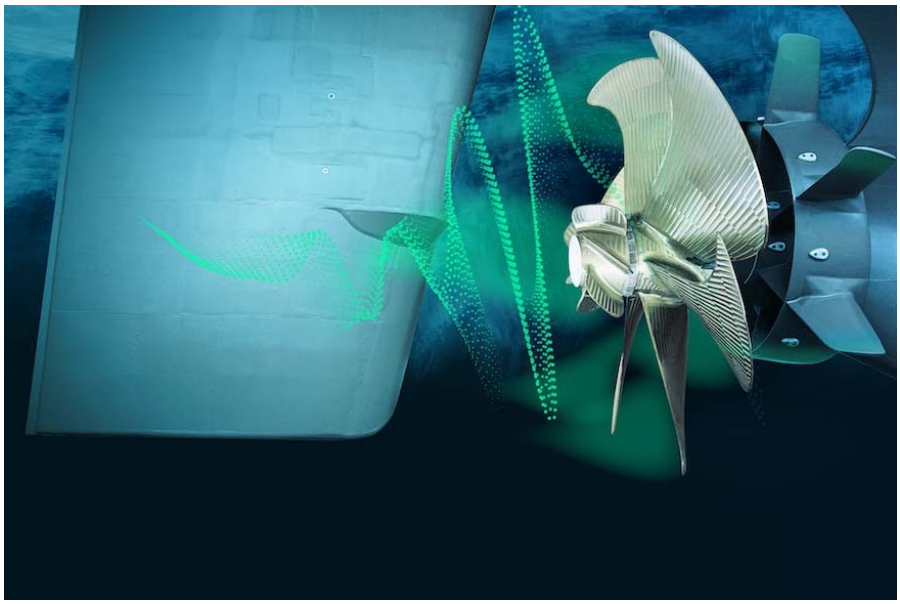
What is the first thing that comes to your mind when you hear »decarbonization«? For most of us, the answer is »alternative fuels«, such as biofuels, ammonia, methanol, or hydrogen. Not wrong, but alternative fuels are more a topic for the future for most ships.

However, the future state-of-the-art is the current state-of-research. The future of alternative fuels in shipping starts now, with exploring alternative fuels in on-board practice. The most likely candidates are in principle known, but much needs to be done on the ship side, such as best-practice regulations and guidelines for design and operation.

And open questions remain on worldwide availability and affordability of most alternative fuels. The Fuel EU Maritime (FEM) initiative will lower some of the price hurdles for alternative fuels, rewarding better well-to-wake performance e.g. for biofuels and green synthetic fuels. Matteo Barsotti (Oceanly) provides a notably overview of the Fuel EU Maritime (FEM) initiative and its role in promoting sustainable shipping, with focus on currently most relevant fuels like LNG and biofuels.

»The future state-of-the-art is the current state-of-research«

But why should one invest a lot of energy into producing synthetic fuels, when one could directly use electricity to drive a ship? The answer lies mostly in the weight and space requirements of batteries and still relatively small power of commercially available fuel cells. For short-sea shipping, e-propulsion is fine, for deep-sea shipping we may consider at best hybrid solutions. Friederike Engels (e-Cap Marine) present a sensible application of e-power for short sea shipping, with a 400 kW fuel cell retrofit based on green hydrogen power for an offshore supply vessel. In general, workboats and small craft offer high potential for short-term decarbonization, not least because they are often operated by governmental authorities which are under scrutiny and political pressure to lead in decarbonization efforts.



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Smart design tools support the quest for ultra-efficient cargo ships. Digital Twins support the naval architects in the challenges of designing the ships of the future

Prominent role for the wind

The cheapest fuel is the one you don't pay for. Which brings us to wind assisted ship propulsion (WASP), which again plays a prominent role at HIPER this year. The basic idea is appealing, and the images catch the eye, but take-up of WASPs so far has been lagging behind the hopes of many in the community. The reason is that the business case is often complicated. While costs are relatively easy to quantify for an interested ship owner, the savings are more difficult and vary much with chosen speed and operational area. Rotor sails are at present the preferred option for actual installations.

The Flettner rotor celebrates this year its 100th birthday, a timely occasion for Dirk Höflich (Norsepower) to look back at the historical development to today's high-tech solutions. These are described in more detail by his colleague Ville Paakkari (Norsepower), who points out that WASPs unfold their full decarbonizing potential best when they are matched with smart design and voyage planning tools: »The increasing share of sails [including rotor sails] in the »propulsion energy mix« mandates novel digital solutions«.

Robert Dane, CEO of Ocius, takes the idea of sustainable propulsion one step further: why not combine solar and wind power. Originally conceived in 1996, the idea took off with various SolarSailor boats equipped with rigid sails covered by thin solar panels. The evolution of the technology has continued and is used now on surface drones that are autonomous both in terms of energy supply and intelligent team mission executions.

The first phase of decarbonization has its focus on energy efficiency, and this is likely to continue as we move to costly alternative fuels and electrically powered ships, where making the most of each kWh is key.

Optimzation or Improvement?

Which leads us to optimization. Besides »Artificial Intelligence«, »optimiza-tion« is probably the most often used term in HIPER this year. »The term ›optimization‹ is widely used, but often the term ›improvement‹ would be more appropriate« sets Karsten Hochkirch (DNV) the record straight in his overview on optimization for ship design, retrofit and operation.

Whether optimized or improved, in the end the industry is interested in how much fuel was saved. As often, the biggest life-cycle savings are to be

made in design. Formal hull optimization saves typically 4–6 % on yearly fuel consumption on propulsion (i.e. excluding hotel load). But also in retrofits of bulbous bows, significant changes are reported with payback times under 6 months. The business for »nose jobs« has been booming last year and is likely to continue to do so for the foreseeable future.

The trend is towards more complex machinery and propulsion systems, combining e.g. wind assistant propulsion with diesel-electric propulsion, fuel cells with dual-fuel diesel engines, etc.

As the designs get more complex, so does the design process. Digital Twins support the naval architects in the challenges of designing the ships of the future. Moving from CAD to CAD, we »witness the power of simulation within integrated digital frameworks, emphasizing key aspects such as the design of optimal marine propulsion systems […], virtual wave tank testing for performance verification, structural integrity assessment, and […] evaluation of occupant safety«, Rodrigo Perez Fernandez (Siemens).

Teemu Kuusisto (Wärtsilä) explores possibilities for hybrid cruise vessel performance optimization through data-driven battery usage. Based on the insight from the Digital Twin, he concludes »that with the expectations of increasing fuel prices and decreasing battery CAPEX, the financially unjustifiable investment in hybrid vessel can in the coming years become feasible.«

Hull optimization is well established, but the technology is now also increasingly applied to appendages and recesses, such as rudders, propulsion improving devices, Kiron Ramesh (IIT Kharagpur), and air lubrication release units, Hannes Renzsch et al. (Friendship Systems).

A view on Ardmore's fleet

»What is right for one, is cheap for another« is a popular saying, which comes to mind for optimization. The one in this case is the design, the other is ship operation. Oliwia Galecka (Ardmore Shipping) describes the effects of using robust voyage optimization on a tanker's CII performance. At the heart of weather routing lies a ship performance model. Better performance monitoring allows better voyage optimization, and ultimately better performance. Ardmore Shipping's fleet has a stellar performance with almost all ships having A and B CII ratings, and it is plausible that the developed ship performance model and voyage optimization procedures have contributed to this. But how much is actually saved through voyage optimization? That may be anybody's guess, as discussed in the paper »Savings from Route Optimization: Myth or Reality«.

The second largest lever after speed management is hull management, and the industry gets smart on it. This year sees the first autonomous in-transit cleaning robot installed on a ship by Israeli startup NakAI.

New options on the table

Frequent proactive cleaning or grooming is in theory an effective way to keep the CII down, but only feasible by using robots. NakAI's robot is largely autonomous and cleans the hull except the ship ends in-transit, thus avoiding common restrictions for in-port cleaning. »High-frequency hull grooming provides substantial benefits in terms of GHG emissions and offers substantial savings for the ship operator,« summarizes developer Matan Nice (NakAI).

Jan Kelling (Hasytec) presents results of the EU-funded CHEK project for an ultrasonic antifouling hull solution. The technology is well established by now for the protection of niche areas against fouling. The CHEK project has brought us one step closer to full hull protection of large cargo ships. »After successful factory acceptance tests, results will be examined in real life test during a 7-month demo voyage period.«

It seems as if in times of need the industry can rise to the challenges. We can witness at HIPER a community moving forward and shaping the future. Not every idea presented will eventually meet success, but new options are on the table and being adopted. ■

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Again part of HIPER: The HANSA Maritime Innovator Awards. Last year, Florian Gerland and Helle V. Ertsas were honoured (right picture). In the centre: HIPER organiser Volker Bertram