



DECK 2

# Maritime Greentech

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future

# Swedish Shipowners' Association – green technology at the forefront

The Swedish shipping industry is important in keeping Swedish industry competitive. The mission of the association is to increase knowledge of the shipping industry and promote issues vital for shipping nationally as well as internationally. The Swedish Shipowners' Association's members are at the very forefront of environmental and safety issues representing an attractive and innovative future field of business sector.

What the future will bring, no one yet knows. However, the Swedish Shipowners' Association works towards a zero vision approach concerning emissions. Our members work with a wide range of green

technologies to address the challenges for the future – from wind power to e-methanol, LNG, BNG, batteries and much more.

During 2019 the association published a new research and innovation strategy 2019-2023 which states five key areas for future research and development:

1. The ship and technology
2. Fuel and energy
3. Digitalization and automation
4. Behavior and logistics
5. Knowledge and competence

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The Swedish Shipowners' Association was founded in 1906 and is an industry association representing 55 Swedish shipping companies operating worldwide.

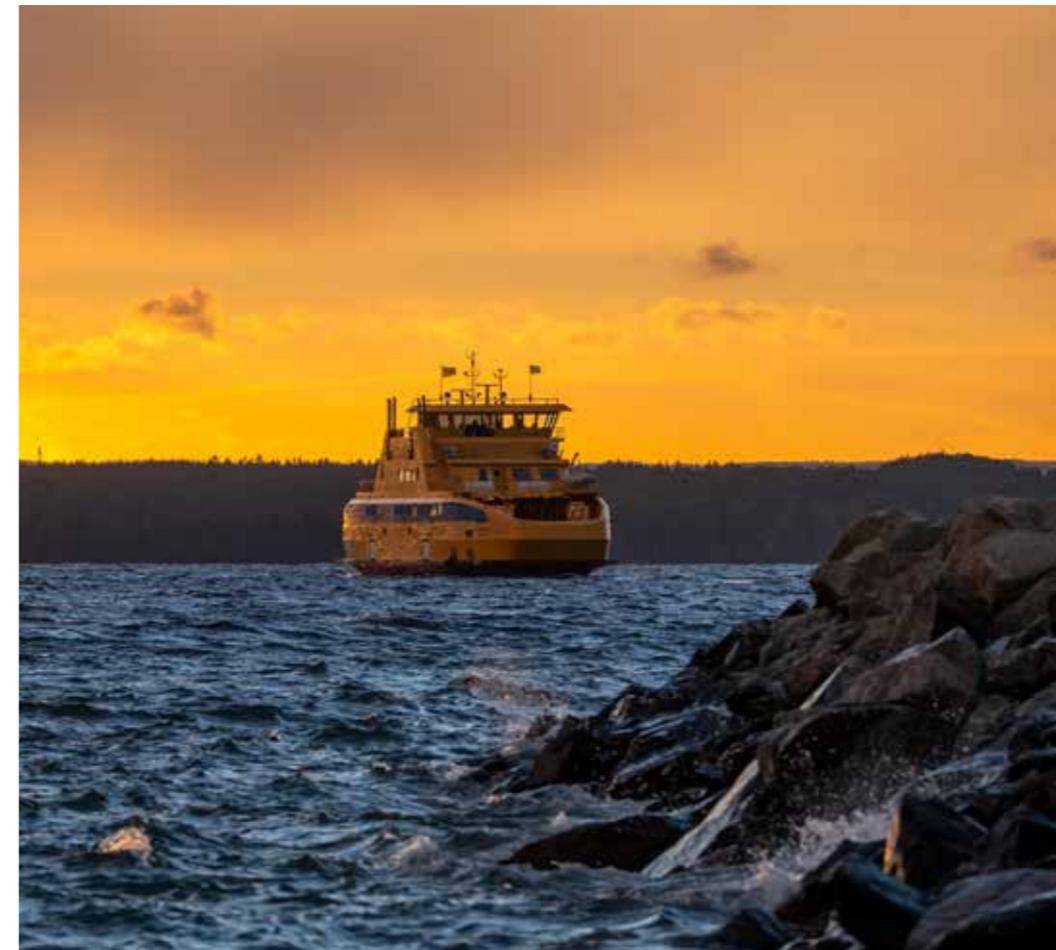


# Maritime Greentech

Welcome to a world of innovation, experience, experimentation and groundbreaking research – all done in the pursuit of achieving sustainable shipping in Finland, Sweden and the world.

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CHRISTOPHER KILLEBERG ROTHVALL

**SJÖFARTS  
TIDNINGEN**  
**Special edition**  
 produced by the editorial staff of the Swedish Shipping Gazette, Sweden's main maritime publication. Distributed at the maritime event Fairway Forward, a collaboration between the Finnish and Swedish maritime clusters.



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# “We are already global forerunners”

Collaboration is key – Finland and Sweden are leading the way towards green and sustainable maritime operations.

TEXT: TIINA TUURNALA & RIKARD ENGSTRÖM

**THE FINNISH AND SWEDISH** maritime clusters are significant by international standards. There is strong high-technology development, such as digitalization and environmental expertise in both countries which also represent two global megatrends. Automation and digitalization will lead to an unprecedented transformation in seafaring. Climate change is challenging the maritime cluster to identify solutions for low-emission maritime traffic.

**FINLAND AND SWEDEN** are likeminded neighbours and co-operate on numerous different issues. When it comes to creating new innovations in maritime, the situation is no different. Fairway Forward is a collaboration project between the Finnish and Swedish maritime clusters. Established in the beginning of 2019, the aim of the collaboration is to share best practices and collaborate to reach environmental and climate goals in the maritime sector.

**THE MARITIME SECTOR** has set ambitious targets for environmental sustainability and emission reductions. The IMO greenhouse gas strategy creates a global framework, that the whole industry must work hard to achieve. Furthermore, this year, we find ourselves in an extraordinary situation due the covid-19 pandemic. The global crisis has created significant effects all across the maritime industry.

However, when faced with challenges, we

must also look to see opportunity. In order to meet the emission reduction targets, as well as recover from the crisis created by the pandemic, the industry must be able to innovate and create new technology that can be put to use worldwide. The Nordic countries are already global forerunners when it comes to sustainability in the maritime sector and creating new technology. We have the high level of knowledge and skilled professionals, that is needed to develop greener and smarter solutions for shipping.

**TO FOSTER INNOVATION** and creativity, also collaboration is crucial. In addition to collaborating across countries, the Swedish and Finnish maritime clusters are good at collaborating in between the different sectors that are intrinsically linked - ports and port operators do well when shipowners and the marine industry are buoyant. In turn, these industries require good ports and fairways, functional logistics chains and good mutual collaboration.

**THIS MARITIME GREENTECH** special edition highlights some of the most interesting examples of sustainable innovations in the Finnish and Swedish maritime clusters. By working together, we can accomplish more and make a difference on a global scale. Some of the examples and best practice cases will also be highlighted during Fairway Forward’s webinar, which we hope will foster collaboration and give you inspiration. ■



▲ Tiina Tuurnala, CEO Finnish Shipowners' Association.



▲ Rikard Engström, CEO Swedish Shipowners' Association

**Participating organizations** in Fairway Forward are Swedish Shipowners' Association, Swedish Ports, Finnish Shipowners' Association, Finnish Ports' Association, and the Finnish Marine Industries, together with the Finnish Port Operators Association.

# "I prefer the carrot before the stick"

Minister of Infrastructure Tomas Eneroth wants to see a faster progress in meeting the climate challenge in shipping.

TEXT: PÅR-HENRIK SJÖSTRÖM

## How would you describe the role of shipping in the restart after the pandemic?

"The role of shipping is absolutely crucial. If we are to meet the climate goals, a strong Swedish shipping sector is essential. I have prioritized shipping for a long time because it is needed for us to meet the climate challenge, but also to ensure good opportunities for the export industry to ship their products to the world."

## Is a strong shipping sector important just for the industry itself, or for Sweden as a nation?

"Both. I have doubled the funding for research on shipping because I want to see a faster progress in meeting the climate challenge in shipping. I also know that the Swedish shipping industry wants faster progress and has made its own commitments in the transition towards cleaner transports. In the future transport buyers will choose the most climate-smart alternatives and that will benefit the shipping sector. Now, that the pandemic has hit many shipping companies hard, not least those operating passenger traffic, it has become even more important to ensure that shipping can emerge strong from the crisis. The shipping companies must have the resources to switch to new fuels or electrification, but also be able to gear up and recruit people."

**Buyers will choose the most climate-smart alternatives and that will benefit the shipping sector**

## Do you see a bright future also for inland shipping and coastal shipping?

"Yes, definitely, and it will be a result of initiatives that the government already has initiated. I appointed a national freight transport council and the government presented a national freight transport strategy for efficient, high-capacity and sustainable freight transport. The next step was to appoint Pia Berglund as a national coordinator for domestic shipping. She has developed an action plan with concrete efforts to strengthen shipping also when it comes to inland and coastal shipping. For the first time ever, I also invited all Swedish ports for talks about increasing their commitment to becoming nodes in the transport system. Together with shipping the ports will play an important role in the future renewal of the transport system. This is a development that already has started and that we are now promoting not least by doubling the research funding."

## Is it possible to change transport patterns by political measures?

"I believe that politics has an impact by targeting economic incentives and instruments, but also through climate legislation that makes transport buyers chose the most climate-smart alternatives. Then, of course, it also matters that we now, unlike before, talk more about the role of shipping in society. This is partially because we have an increased engagement among branch organizations and stakeholders within shipping, but also because the government has chosen to



KRISTIAN POHL/THE GOVERNMENT OFFICE

lift shipping as an important part in the sustainable transformation of the Swedish transport system. I hope that this will also make shipping an attractive labor market, not least to attract more female employees and achieve a better gender distribution among those who work in shipping. Today, unfortunately, only two per cent of those who work in shipping are women. Here we need an improvement."

## What opportunities does the government have to make a difference, carrot and stick?

"I always prefer the carrot before the stick, but I also strongly believe in collaboration. We have a good collaboration with Blå Tillväxt looking at initiatives for skills development and recruitment campaigns, but also financial instruments from the government. During the pandemic, we have made a number of efforts to support Swedish shipping, both in terms of granting exemptions for certificates and regulations, as well as expanding state aid for manning costs also to cover laid up vessels, or enabling shipping companies to apply for support from EKN, The Swedish Export Credit Agency."

## And what do you expect from the shipping companies in return?

"I expect a high level of ambition and I see that several shipping companies now take the climate issue seriously and are prepared to make major efforts in the future. I understand that the pandemic has been tough for many of them, but at the same time I know that competitiveness is about being first with a transition. Being early movers will benefit Swedish shipping companies. The transport buyers will prefer fossil-free and the political goal in both Sweden and Europe will be to reward transport routes that adapt early."

## How has shipping performed in the crisis?

"Regarding freight transport, I am pleased that we have been able to maintain a sufficient capacity during the pandemic. Not least Swedish shipping companies have made great efforts to maintain a functioning supply chain. It is now important to ensure that we have a strong shipping industry when we emerge from the crisis. It must be able to maintain the important freight transports but also to rebuild the passenger traffic when it will be possible to travel again." ■

▲ Tomas Eneroth, Swedish Minister for Infrastructure.

# “We need a maritime climate commission”

Are the climate targets realistic? We talked to Fredrik Larsson at Swedish Shipowners' Association. TEXT: PÅR-HENRIK SJÖSTRÖM



▲ Fredrik Larsson is responsible for climate and environmental issues at Swedish Shipowners' Association.

**IT ALL BEGINS** with the Paris Agreement. It sets out a global framework to avoid climate change by limiting global warming to well below 2°C and pursuing efforts to limit it to 1.5°C. The Paris Agreement was adopted at the Paris climate conference (COP21) in December 2015. EU and its member states are among the almost 190 parties to the agreement. EU formally ratified the agreement in October 2016.

“We all have to relate to the Paris Agreement. Simplified, you can say that we must cease emitting greenhouse gases by 2050 if we shall be able to reach the two-degree target. If we aim for 1.5 degree we have to reach net zero emissions between 2030 and 2035. The time is running out, especially if we aim for the 1.5 degree target”, says Fredrik Larsson, responsible for climate and environmental issues at Swedish Shipowners' Association.

The main actors setting the pace and rules are IMO, EU and the individual nations.

“IMO has stated that it will strive to fulfill the Paris Agreement and halve the emissions from shipping by 2050.”

**EU HAS SET** the bar higher when striving to get the European Climate Law in place, saying that EU should be climate neutral by 2050. A key target for 2030 is at least 40 per cent cuts in greenhouse gas emissions from 1990 levels. As part of the European Green Deal, the EU Commission proposed in September 2020 to raise the 2030 greenhouse gas emission reduction target, including emissions and removals, to at least 55 per cent compared to 1990.

In 2017, the Swedish Parliament decided by a large political majority to introduce a climate policy framework with a climate act for Sweden. This framework sets out implementation of the Paris Agreement in Sweden. By 2045, Sweden is to have zero net emissions of greenhouse gases. Domestic transport will reduce its emissions by 70 per cent in 2030 compared to what the emissions were in 2010.

**FINLAND HAS THE** ambition to become the world's first fossil-free welfare society. According to the government program in Finland will be carbon-neutral by 2035.

Fredrik Larsson states that the targets require that emissions must be reduced quickly.

“This raises the question of how to proceed. We have been talking about energy efficiency for quite some time. But at some point, we also have to start looking at how to become independent of fossil fuels. There are lots of exciting things going on, but the big question remains if this is enough for reaching net zero within the set time frame. At the same time, we see that there are various forms of support and subsidies from the government to promote a change. But at least in Sweden, perhaps not so much for shipping as for other sectors.”

He also points out that the environmental issues might be overlooked by the climate issue.

“Everything is about CO<sub>2</sub> and climate change. Here and now it is however toxic air pollution that kills people. When we talk about emissions in the air, everything depends on what type of fuel is used. As long as we use fossil fuels, we will see emissions of NO<sub>x</sub>, SO<sub>x</sub> and particles. But



CHRISTOPHER KULLENBERG ROTHVALL

LNG is one of the better alternatives available today, mainly because it eliminates emissions of NO<sub>x</sub>, SO<sub>x</sub> and particles.”

Fredrik Larsson believes that larger efforts are needed regarding research and innovation.

“To reach the targets we must become much more focused. We must move fast because we forget the time aspect. If we are to achieve the 1.5 degree-goal, we must have zero emissions by 2035. The question is if we are on track. I am thinking that we would need a maritime climate commission that evaluates where we stand and what has to be done.”

**FREDRIK LARSSON POINTS** out that the Swedish Shipowners' Association already in 2015 published a climate roadmap with many proposals for measures on how shipping can become fossil-free. Only a few of them have been addressed.

**As long as we use fossil fuels, we will see emissions of NO<sub>x</sub>, SO<sub>x</sub> and particles. But LNG is one of the better alternatives available today**

“There are a number of different obstacles and we published a long list of action proposals. We did not do so just because it looked nice. They are sharp and firm proposals how to succeed with a transition.”

“The process does not go faster just because politicians revise their emission reduction targets. Shipping is whipped by goals and requirements but we can not run any faster. The load becomes too heavy. One reason for this is that we have a number of obstacles along the way and politics need to remove them. Then we can step up the pace.” ■

Financial measures to stimulate demand for sustainable solutions – that was the frequent reply when we asked six shipowners to share their wishes on political measures to achieve sustainable shipping. EDITOR: MAGNUS SANDELIN

Shipowner survey:

# What political measures

do you think  
are needed  
to make  
shipping  
more  
sustainable?

## Wallenius Marine: Per Tunell, COO

**"POLICY MUST ENSURE** a greater demand for environment and climate smart solutions. This can be done in several ways. One way is to simply ban the bad solutions through clear and powerful regulation. Another way is different types of financial incentives, such as fees or subsidies.

**CONCERNING THE USE** of fossil fuels - which affect both the environment and the climate - and the shift to better fuels, one should start already at the production level.

According to reports, the global annual subsidy of fossil fuels amounts to between EUR 300 and 600 billion. The Swedish annual subsidy amounts to about SEK 30 billion. Continuing these subsidies is becoming increasingly inde-

## Wallenius SOL: Ragnar Johansson, Managing Director

**"WE NEED ACCESS** to environment and climate friendly fuels. To achieve this, policy needs to contribute R&D support funds but also ensure the conditions for efficient production.

## Stena Line: Erik Lewenhaupt, Head of Sustainability

**"POLICY MEASURES IN** shipping should be coordinated with the rest of the transport system. Shipping is after all not isolated. And in the future, different types of energy, fuels and technologies will be developed, some of which are probably suitable for one segment and others

## A global total ban on burning fossil fuels should be introduced

fensible. A global change in this kind of subsidy should take place.

**IN THE LONG** run, a global total ban on burning fossil fuels should be introduced.

If we move on to the consumer side, we think that the "polluter pays" principle should apply. The one who pollutes should also be the one to pay. To avoid creating imbalance in competition, these measures have to be introduced globally.

On the national, regional or local level one should instead work with carrots to enable the transformation to sustainable solutions. This can be investment or development support, or even subsidies, to make it possible to operate competitively with sustainable solutions." ■

## Policy needs to contribute R&D support funds but also ensure efficient production

**IT IS LIKE** the case of electric cars - innovations need support to reach a critical mass before having enough momentum to continue on their own." ■

## Policy measures in shipping should be coordinated

**FOR ANOTHER. THAT** picture is however not clear at present. Support for research and commercialisation of technology and fuels vis-à-vis producers. Incentives in operations such as increased environmental differentiation of fairway fees and other financial incentives. Tax-free onshore power." ■



OSKAR ÖRNE



WALLENIUS SOL



STENA LINE



VIKING LINE

## Viking Line: Johanna Boijer-Svahnström, SVP, Corporate Communications

**“MOVING FORWARD THROUGH** global targets and regulations is the best way to take forward emission reductions. EU and IMO should co-work on these issues. It is also important to note that short sea shipping within EU is international traffic and should not be placed at a competitive disadvantage.

**THE EUROPEAN PARLIAMENT** has recently proposed that the reduction target for 2030 compared to 1990 will be increased from 40% to 60%. For shipping, this means that we should be given financial incentives and the authorities should stimulate technical solutions and innovations, so that we can speed up and achieve these goals. And not to forget, up here in the north

The Swedish government does not seem as interested in supporting shipping

we have winter conditions that are often forgotten and not taken into consideration.

**IF YOU LOOK** at the Government’s budget bill shipping is missing. They write that they have an ambition to shift transports from road to shipping, yet there are no investments that can realize the ambition. The Swedish Maritime Administration suffers from serious financial problems, which affects the shipping companies’ operations to a very great extent. Compared with Finland and Estonia, for example, the Swedish government does not seem as interested in supporting shipping. Neither fairway fees nor fee models promote sustainable investments for shipping companies. Unfortunately.” ■



ERIK THUN AB

## Erik Thun AB: Johan Källsson, Managing director & Johan Friberg, DPA/SCO

**“IT IS IMPORTANT** that politicians realise that what happens in one area affects the whole. If one for instance wants to shift cargo from road to sea, that development is affected by decisions made for road transport and ports as well as decisions made for shipping. It is important to understand the competition interfaces that exist between the modes of transport. Competitive neutrality between the modes of transport is essential.

**THE INFRASTRUCTURE IS** important when it comes to new fuels, such as bunkering possibilities and access to shore power, ensuring the

It must pay off to invest in the environment

possibility to create effective logistics chains.

It must pay off to invest in the environment. Fee systems and public support need to drive environmental investments. Early movers must be rewarded.

**THE BEST WAY** forward is for the customers (the cargo owners) to actively select sustainable transports. We need political decisions that promote shipping customers who choose shipping.

In the short term, fees and regulations affect the ability to increase sustainable shipping solutions.

To more than double the fees for shipping segments that most easily could relieve roads and railways, as has been done in Sweden, is NOT the right way towards sustainable shipping.” ■

## Terntank: Tryggve Möller, Senior Advisor

“The status of the Swedish Maritime Administration must be clarified. It is not reasonable that the shipping industry pays for the entire operation through fees.

**THE COMPETITIVENESS OF** shipping is constantly eroded. The state must step in and cover a larger part and make the existing discounts for modern green ships worth the name.

**INVESTMENTS IN SUSTAINABILITY** are expensive and the cost ought to be distributed between three parties: the shipping companies that already take the largest share, our customers who contribute, and the state, who we expect to take a reasonable share.

An updated tonnage tax scheme must be

It is not reasonable that the shipping industry pays for the entire operation through fees

introduced, making it possible for more ships to fly the Swedish flag. Include coastal traffic and ships in the service sector and introduce a green incentive, like some other countries in Europe have done.

**THE SWEDISH STAMP** duty (stämpelskatten) for shipping needs to be replaced by an administrative fee. The tax is an obstacle to transferring ships to the Swedish flag and it makes sustainable investments even more expensive as the tax is calculated on the entire value of the vessel.

Transport and tax legislation must be linked. The taxation of seafarers must be better managed to eliminate double taxation.” ■



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I am a great fan of sailing ships. Especially those large square riggers, the "windjammers", carrying grain from Australia to Europe as late as in the 1930s. The king of this grain trade was no doubt Gustaf Erikson, an Åland shipowner, who bought many of the last steel barks at a fair price when the era of sail in practice already had ended.

TEXT: PÄR-HENRIK SJÖSTRÖM, EDITOR-IN-CHIEF OF THE SWEDISH SHIPPING GAZETTE

# Some reflections on the power of sail

**IT IS JUST** 71 years since a zero emission cargo vessel for the last time shipped a cargo of 4,200 tons of South Australian grain to Europe. That voyage ended an era in the maritime history that had lasted for thousands of years - an era when the world trade had been carried by the wind.

The names of the very last windjammers, rounding Cape Horn in commercial traffic in 1949, were Pamir and Passat. In retrospect we know that the classic era of commercial sail may have ended with these voyages. But we also know that there very likely will be a comeback for wind powered ships.

It is perhaps not at all far-fetched that modern shipping once again begins to see the wind as an energy source, not least because it is an opportunity to achieve the climate goals to save the planet. Something that used to be irrelevant has today opened up new possibilities: The wind is clean and free. On the seas and oceans it is almost always present, except in the doldrums. With today's advanced systems for meteorological worldwide observations, it is also possible to predict the winds in a totally different way than during the era of sail.

**ACTUALLY, IT WOULD** be rather strange if shipping today, with all the technology and knowledge at its disposal, could not utilize the wind. Obviously, it is also possible. Otherwise, a large and serious company such as Wallenius Marine would hardly invest time and resources in developing Oceanbird - a ship concept that I strongly believe will be the first commercially successful wind-powered ocean-going cargo ship to be built in about 100 years.

The term sailing vessels would be misleading when talking about Oceanbird. It is a high-tech vessel utilizing the latest technology in many areas, not least in the rig. Oceanbird is in fact a whole concept, where many systems form a larger whole. Oceanbird will not rely solely on wind power. There will be support from other power sources, as Oceanbird also will be equipped with an engine providing additional power to keep its schedules. However, thorough studies of the weather conditions in the North

Atlantic have shown that it will be possible to rely on wind power during about 90 per cent of the crossing. Engine power will also be used for manoeuvring in ports and channels, as well as in other situations when sailing is not preferable.

Exactly what type of machinery is not yet determined, but the technology will be as green as possible. Thus, Wallenius Marine estimates that the emissions will be some 90 per cent lower than for a corresponding vessel with conventional propulsion.

**A COMPARISON BETWEEN** Oceanbird and, for example, the four-masted steel bark Pamir, confirms that they really have nothing in common but the wind as an energy source for propulsion. The Pamir was a typical representative of the last windjammers. She was nearly 100 meters long, about 14 meters wide and had a draft of just over 7 meters. The dead weight was about 4,500 tons. She was built in Hamburg in 1905.

Pamir had four masts, all of which except the farthest aft were square rigged. The height of the main mast (mast number two from the bow) was 52.5 meters above the waterline in full load. As a ship type the barque was considered ideal for large deep sea sailing vessels. Pamir could set 35 sails with a total area of about 3,800 square meters. The number of sails of course varied depending on the wind conditions.

All sails were handled with manpower on Gustaf Erikson's windjammers. It was a tough and dangerous job in the rig, often in darkness and bad weather, sometimes also in freezing conditions on, close to Antarctic waters.

**OCEANBIRD WILL BE** 200 meters long and 40 meters wide. The displacement is 32,000 tonnes. In stormy weather, the large sailing ships often heeled heavily and green seas washed over the entire deck. Oceanbird will, thanks to sophisticated systems, have a maximum heeling angle of five degrees, which will be compensated by anti-heeling systems.

The rig will be the total opposite to the classic setup on a square-rigger. Oceanbird has five huge wing sails that are up to 80 meters high.



The air draft will be 105 meters. The maximum sail area of the wing sails is 7,500 square meters.

When the wind force requires the sails to be powered down, the reduction of the sail area will automatically be decreased. The height of the wing sails is reduced telescopically and when they are fully recessed, the vessel's maximum height above the waterline is reduced to 45 meters. This also enables Oceanbird to pass under bridges.

**THE RIG OF** the Pamir included a lot of rope and wire, all of them needed to handle the complicated rig. On Oceanbird, the rig is robust, built in steel and composite material. The sails can be rotated 360 degrees to catch the wind in an optimal way, everything is done completely autonomously. In fact, the sails are more like aircraft wings than traditional sails. The hull form above waterline also works together with the rig to catch the wind in the most efficient way possible.

Even below the water line, Oceanbird's

hull has nothing in common with the hulls of the windjammers (which were much like the hulls of engine powered vessels). In the case of Oceanbird, much research has been devoted to the lines of the underwater hull. Changing tack with a four-masted bark was a time-consuming operation, requiring excellent seamanship and a skilful crew. On Oceanbird, a change of course becomes as undramatic as on an engine-powered vessel. Advanced control systems ensure that the wind is caught optimally and in a safe way.

The Oceanbird concept is applicable on virtually every type of ocean going vessel but this initial project is a car carrier for 7,000 cars. In terms of cargo handling, she will be a typical PCTC with a number of decks for lighter vehicles, but also some decks for project cargo and high and heavy. With an average speed of 10 knots, Oceanbird will cross the Atlantic in 12 days. Wallenius Marine expects this vessel to be operational in the North Atlantic by the end of 2024. ■

▲ Oceanbird with the telescopic wing sails in lowered position. Upper left: Sails fully erected, size comparison with the Pamir.

# Doubled R&D budget starts taking hold

Sweden is heading towards a stronger position in maritime research. Last year, the Swedish government doubled the state investment in maritime research – and now we are starting to see results.

TEXT: SUZANNE GREEN



▲ The author Suzanne Green is Research and Innovation manager at the Swedish Shipowners' Association

**THE DECISION FROM** the Swedish government in 2019 to double the budget for maritime research was long-awaited. For many years, Sweden has been investing less in maritime research than comparable countries. The lack of and hope for more collaboration state-industry was actually one of the main reasons for the Swedish Shipowners' Association to invest SEK 100 million in establishing the competence centre Lighthouse in 2005. This was a starting point for more thriving maritime research.

Even if shipping is generally considered to be an energy-efficient mode of transportation in comparison with the alternatives, there is a great need for improvement. Now we can see a lot of interesting projects, many of which with a basis in the industry's needs. This is going on in different areas, and there are most definitely projects in the area of green tech. One example of an area where Swedish research stands out is maritime environmental sciences.

**AT CHALMERS UNIVERSITY** of Technology, an interdisciplinary collaboration within areas such as future marine fuels, emissions (both to air and water) and energy efficiency was established a decade ago and it is a well-established field today with big possible societal impact. For example, during the last years, there has been a great discussion regarding the Swedish fairway dues and their environmental incentives. In an ongoing project where researchers from Chalmers and

This is one example of how the facts and knowledge can be used to promote 'the green blue'

IVL Swedish Environmental Research Institute are assessing various environmental impacts from shipping. This will be used in an analysis of how policy instruments can be designed to prioritize the most important impacts, as well as the effectiveness of policy instruments to reduce these pressures. The results will be used to develop the international Clean Shipping index, CSI, the index used to determine the vessel-based reduction of fairway dues, based on CSI score.

This is one example of how the facts and knowledge can be used to promote 'the green blue', more sustainable shipping. If you think about it, almost every innovation affects the environment in one way or another. For example, take a look at the research focusing on risk, fire and safety with the state-owned research institute RISE in the centre.

**THE RESEARCH ON** improving fire safety on roro ferries is not only a Swedish interest. RISE is the coordinating part in a big project called Lash Fire, where the EU is investing 12 million Euro. Project partners from 13 EU member states investigate cost-efficient measures to mitigate



CHRISTOPHER KULLENBERG ROTHVALL

the risk from ro-ro space fires. LASH FIRE covers the challenge of developing and demonstrating new procedures and technical innovations for maritime application.

**THE AMBITION OF** the project flows is in line with that of the IMO and other regulatory bodies to greatly enhance the safety of ro-ro ships. Besides, LASH FIRE gives European industry knowledge to address the technical challenges of these updated rules, enhancing shipyards, system suppliers and further industries to develop and build safer and more competitive ships for sustainable transport. Besides the research within LASH FIRE, there are several related projects. For example, a project funded by the Swedish Maritime Administration last winter published results on fire fighting methods in case of a fire involving alternative fuel vehicles in a ro-ro space results which can be applied

for safer and more efficient manual fire fighting operations.

The need for research on safety issues regarding alternative fuel vehicles highlights an aspect of green tech often overlooked - new greener technology in one area can impact other areas. Speaking of alternative fuels and propulsion a lot is going on in that area. One of the most prominent projects are the development of wind powered vessel, coordinated by Wallenius marine.

**TOGETHER WITH KTH** and SSPA, Wallenius marine is developing the groundbreaking concept for oceangoing PCTC (Pure Car and Truck

▲ Sirius Shipping's LNG bunker vessel Coralius.

The need for research on safety issues regarding alternative fuel vehicles highlights an aspect often overlooked



PAR-HENRIK SJOSTROM

▲ Viking Grace with its rotor sail from Norsepower.

Carrier). The Swedish Transport Administration has granted the project SEK 27 Million during the development phase. In September 2020 the concept was introduced under the name Oceanbird. The latest design shows a vessel 200 meters long and 40 meters wide, with standing sails and a capacity to carry 7,000 cars.

**PER TUNELL, COO** Wallenius Marine said:

“We are proud to present our third iteration of our design, which we have worked with for several years. Shipping is a central function in

**We have started testing with seven metre models in open water recently and will continue this fall**

global trade and stands for around 90 per cent of all transported goods, but it also contributes to emissions. It is critical that shipping becomes sustainable. Our studies shows that wind is the most interesting energy source for ocean transports and with the 80 metre high wing sails on Oceanbird, we are developing the ocean-going freighters of the future.”

**RICHARD JEPSSON, VP** Commercial & Partnership, Oceanbird:

“The development project has come very far. We have started testing with seven metre models in open water recently and will continue this fall. The design will be ready for orders in 2021 and we are aiming for a possible launch in 2024.”

This innovative project, headed by Wallenius Marine, also pins down the ripple effect of big and bold projects. Not only can the results be applicable in other projects, but there are also already different smaller projects with relations to the Oceanbird project, for example studying how to optimize a propeller for a wind-assisted cargo ship. This is one of many projects within the Industry programme Sustainable Shipping.

**SUSTAINABLE SHIPPING IS** a programme, specifically procured by the Swedish Transport Administration and in 2019 the Swedish maritime competence centre Lighthouse was appointed to operate the programme. The program runs for 10 years and comprises SEK 115 million of state funds supplemented by part-financing from the industry. The programme is organized in the thematic areas Ship design, propulsion and operation, Maritime working life, Efficient transport systems, instruments and business models and Digitization and automation. Even if the Swedish Shipowners’ Association is the only industry partner in Lighthouse and the Sustainable Shipping programme, Suzanne feels that the needs of the industry are highly valued in the programme.

**IT CAN BE** very valuable to have such good relations with the academia. For example, when



WALLENIUS MARINE

a few Swedish shipowners asked for more knowledge about ammonia for shipping, a pre study was started shortly and it could demonstrate the potential of ammonia for shipping. This springed a bigger research project looking into both ammonia, hydrogen and battery operation and after that, maybe there will be a collaborative demonstration project? Good collaboration and routines for developing ideas promote projects that can have a real impact.

**WHEN IT COMES** to Swedish maritime research, there are several areas of strength. Lightweight and construction, maritime informatics, human factors, urban mobility, to mention a few. But there is still room for a lot of development.

When you look at the effects from the doubled research budget, it needs to be pointed out that the budget was doubled from a very

## Good collaboration and routines for developing ideas promote projects that can have a real impact

low baseline, less than all the other Nordic countries, regarding to a Lighthouse report from 2017.

Compared to other modes of transportation, maritime shipping has not enjoyed the same development when it comes to sustainable solutions, because neither the market nor laws and regulations have been a driving force. If the government really take their ambition to make Sweden the world’s first fossil-free welfare nation, more investments in research for green solutions are needed. ■

▲ Model tests of Wallenius Marine’s wind powered vessel concept at SSPA.

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DONSÖTANK

# Sweden ranks no. 2 in Innovation Index

The UN agency WIPO ranks Sweden second in the category of innovation capacity in the Global Innovation Index.

TEXT: SUZANNE GREEN

**Top 10 Global Innovation Index**

- 1 Switzerland
- 2 Sweden
- 3 USA
- 4 Great Britain
- 5 Netherlands
- 6 Denmark
- 7 Finland
- 8 Singapore
- 9 Germany
- 10 South Korea

**THE GLOBAL INNOVATION** index measures the ability of 131 countries to create a good climate for innovation. This is the second year in a row that Sweden ends up in the second-best place in the ranking. The Swedish economy is thus placed ahead of big economies such as the USA, Germany and Japan. The Global Innovation Index is compiled by the UN agency WIPO in collaboration with Cornell University and Insead.

“Sweden as a country consolidates second place in the annual survey of innovation globally, it is a good starting point to develop from. We continue to improve our overall ability to convert intangible assets into increased value, not least in the area of climate-smart environmental technology”, says Peter Strömbäck, Director General of PRV, the Swedish Patent and Registration Office, in a press release.

**THE INDEX RANKS** the world economies based on 80 different indicators. Sweden comes out at the top in most of the indicators, and three of the key success factors are infrastructure, strong institutions and developed entrepreneurship.

Data from this year’s report were collected in 2019 and thus do not show the impact of the corona pandemic. How the pandemic might have impacted different countries innovation capacity is too early to tell, but overall one can suppose that companies in countries with a higher degree of innovation capacity might have a better basis for coping with the big



disruptive changes caused by the pandemic.

The Global Innovation index also highlights that the global innovation landscape is slowly but steady shifting. China, Vietnam, India, and the Philippines are consistently on the rise and all four are now in the top 50. India represents the biggest jump by any major economy with 29 places move up since 2015.

**WHEN COMPARING THE** innovation capacities, Sweden has been in top repeatedly. Earlier this year the European Commission presented its EU Innovation Index, in which Sweden came out as number one, followed by Finland, Denmark and the Netherlands. The EU innovation index also show that EU’s innovation power has increased by 8.9 per cent since 2012. The report highlights what is often noted as a Swedish challenge: To strengthen the ability to launch new innovative products, investments in start-up companies and private investments in research and development. ■



▲ The author Suzanne Green is Research and Innovation manager at the Swedish Shipowners' Association



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**TERNTANK**

Shipping, Chartering & Ship Management 25

# Lighthouse: Laying the transition puzzle

Ammonia? It has potential. Speed controls? Hardly. Scrubbers? Doubtful. Neutral collaboration platform Lighthouse has identified and analyzed the puzzle piece candidates for sustainable shipping.

TEXT: LARS NICKLASON



▲ The author Lars Nicklason is Communications Manager at the Swedish Maritime Competence Center Lighthouse.

**WE HAVE TO** be on our toes. Research, innovation and development is often a slow process of several years, but the trends hyping potential green saviors often swing faster than it takes the earth to circle around the sun.

“Two years ago, ammonia was just a chemical in everyone’s eyes. Then it appeared as the marine fuel of the future and six months ago everyone was talking about it. Now it is instead hydrogen that gets most of the attention, Åsa Burman, Operations Manager at Lighthouse, says.

But that does not necessarily mean that ammonia is not a fuel of the future. It still has the same potential as stated in the pre-study that Lighthouse published within the framework of the Swedish Transport Administration’s industry program Sustainable Shipping this spring.

**“IT IS VERY** important not to bet everything on one horse. There is no silver bullet. Ammonia and hydrogen both have their advantages,

**We can’t get too obsessed with carbon dioxide and let other emissions increase**



above all they are carbon free. On the other hand, they are both produced today with fossil fuels and very large investments are required before they seriously can make shipping greener. We’re only at the beginning of the process but it can’t take 10-20 years as it did with the development of LNG. After the pre-study, a major project has been started where hydrogen, ammonia and also battery operation are included”, Åsa Burman says.

The transition period to a total fossil-free shipping industry is long and fossil fuels will still be with us for many years. During that time, we have to be careful to not create solutions that create new problems.

“We can’t get too obsessed with carbon dioxide and let other emissions increase. Scrubbers is a solution representing a typical example of this. That they are even allowed with an open loop is remarkable. Both an ICES viewpoint and a pre-study that we recently published clearly shows this.”

**MANDATORY SPEED CONTROLS**, proposed by various parties within the IMO last year, are another example of a dubious solution that was quickly analyzed in a Lighthouse pre-study.

“Within our network, we have been good at identifying issues that are on the current agenda or will soon be. The possible inclusion

of shipping in the EU emissions trading system is another example of one of those issues. A pre-study on the subject was completed this spring and it forms a good basis for all consultation bodies when such a system is to be designed. The Swedish Transport Administration has also invested SEK 4.3 million in taking the research further in a major project.”

**THE SECRET BEHIND** Lighthouse’s ability to take action is its network and members. Among those are the Swedish Maritime Administration, the Swedish Transport Administration, several shipping companies and of course those who carry out the research - the University of Gothenburg, Chalmers, Linnaeus University and research institutes such as IVL, SSPA and VTI.

If sustainable shipping is to be achieved, long-term triple helix cooperation between industry, academia and authorities is needed. And in the middle of this, Lighthouse is the hub and unifying force. When Lighthouse now, after 15 years, enters its third phase, it does so as a platform for knowledge exchange and collaboration on maritime research and innovation.

“We want to broaden our operations, both by bringing in more participants and by a broader commitment from all parts of the shipping sector. We think, for example, that ports have an important part to play in making shipping competitive and sustainable. In the industry program Sustainable Shipping, which we run for 10 years, we have started working with port issues. The Swedish Transport Administration’s long-term perspective is important because that means that different operators come together in smaller studies, which often leads to further collaborations.”

**LIGHTHOUSE HAS ALSO** taken the initiative to bring together the entire Swedish shipping sector in the work on a national agenda for maritime research and innovation - a work that will be completed in the autumn of 2020.

“The shipping industry is complex. The agenda describes it from a number of different



**It is very important not to bet everything on one horse. There is no silver bullet.**



▲ Åsa Burman, Operations Manager at Lighthouse.

aspects, identifies challenges and recommends how these should be addressed. The target group is mainly politicians and decision-makers, and the aim of the project is to provide them with the understanding and tools for creating conditions for the implementation of the agenda.”

**A BROADER OPERATION** also means a greater international involvement. Since last year, Lighthouse has been an active member of Waterborne, the EU’s official technology platform for shipping and marine technology.

“We also have high hopes that a partnership program, Zero emission waterborne transport, will be introduced within the framework of Horizon Europe. The idea is to provide and demonstrate zero-emission solutions for all main ship types and services before 2030, which will enable zero-emission waterborne transport before 2050. There are project proposals for both wind and ammonia, hydrogen and batteries. It is spot on”, Åsa Burman says. ■

# Ammonia: "More analysis is needed"

We asked Julia Hansson at research institute IVA about the findings so far on ammonia as a fuel.

TEXT: MARIANNE OVESEN

## Pre-study

Within the framework of the Swedish Transport Administration's industry program "Sustainable Shipping", Lighthouse has financed a preliminary study on the potential of ammonia as a fuel for shipping.



▲ Julia Hansson, researcher at IVL Swedish Environmental Research Institute, has led the pre-study project.

## What advantages does ammonia have?

"Ammonia is a carbon-free fuel of hydrogen and nitrogen and can be used in both combustion engines and fuel cells. It can be produced from hydrogen through electrolysis of water with renewable electricity and nitrogen from the air."

### But that is not how it is produced today?

"No, today ammonia is produced primarily from natural gas. It is cheaper but contributes to CO<sub>2</sub> emissions during production."

### Is there still an environmental potential?

"Yes, because really low CO<sub>2</sub> emissions can be achieved. In addition to that the supply of raw materials is unlimited, which is not the case with biofuels. But production will require a lot of electricity. However, there are several initiatives for renewable production. Therefore, ammonia is worth studying further."

### Are there remaining questions?

"The use of ammonia as marine fuel needs testing and examination of efficiency and emissions. It is also toxic and issues concerning environment and safety must be further investigated."

### How should it be done?

"A more thorough analysis is needed, where ammonia is compared with other possible marine fuels from a system point of view, including technology, economics and environmental aspects. But also a feasibility study with analysis of fuel systems, bunkering and safety issues. Chalmers, IVL and SSPA are launching a project for Lighthouse that, from a life cycle perspective, compares hydrogen, ammonia and battery operation."

## Will there be any full-scale tests too?

"Yes, it is under way. MAN Energy Solutions have built an LPG-powered dual-fuel engine, which they believe can be operated on liquid ammonia. MAN is also involved in a project with an ammonia-powered feeder vessel, equipped with an engine of that type."

### What about fuel cells?

"The European ShipFC project has received EUR 10 million to develop a battery with ammonia-powered fuel cells. By 2023, it will hopefully be installed on the supply vessel Viking Energy. However, more experiments are needed with ammonia and fuel cells."

### What's the catch with ammonia?

"The energy content is low and the fuel requires larger space on board than today's fuels. The ignition and combustion properties are neither very good. It is unclear how much pilot fuel is required for the ignition and how extensive the emissions are. In addition, the safety routines must be rigorous as an ammonia leak on board may be devastating for the crew."

### What do we know about the emissions?

"Provided that the production is fossil-free, ammonia does not generate CO<sub>2</sub> emissions. On the other hand, nitrogen emissions may occur as well as emissions of unburned ammonia, but it should be possible to handle these with cleaning technology."

### Is ammonia realistic as a ship fuel?

"I think that in the future shipping will use several different fuels. Ammonia may be one of them and used perhaps both in fuel cells and dual-fuel engines." ■



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# The challenge is to still **be competitive**



For decades, Stena Teknik has worked with energy efficiency and reducing emissions from the Stena Group's vessels. One important project is Stena Elektra, a battery-powered vessel that also may be equipped with fuel cells.

TEXT: CHRISTOPHER KULLENBERG ROTHVALL



STENA LINE

▲ The investment in batteries on Stena Jutlandica paved the way for the Elektra project.

**STENA TEKNIK IS** the hub of competence in the Stena Group when it comes to maritime technology, covering newbuilding projects as well as conversions of existing tonnage. There are 18 employees at the head office in Gothenburg and they have since the end of the 1990s worked mainly with one goal.

“In everything we do, our target is to increase energy efficiency and reduce emissions in various ways. But the challenge is that the vessels still have to be competitive”, says Harry Robertsson, technical director.

**IN VIEW OF** the transition that shipping is facing, the company has a key role in the Stena

Group when it comes to finding both economically and environmentally sustainable solutions. An ongoing project is Stena Elektra, an electric ship type intended for service on the route Gothenburg-Frederikshavn from 2030.

“We believe that we can operate vessels up to 50 nautical miles on battery-power only. The service speed must be slightly lower than today for eliminating the need of installing very large batteries. They will be simpler ships without so much equipment on board to keep the weight down”, says Harry Robertsson.

**THE IDEA WAS** born more or less by chance a couple of years ago.

“Our entire department was waiting for a bus outside the office when we saw one of our colleagues driving an electric bike. A discussion started about charging times, output and for how long time it is possible to run on battery. Eventu-

**In everything we do, our target is to increase energy efficiency and reduce emissions in various ways**

**But the challenge is that the vessels still have to be competitive.**

ally this resulted in a project to electrify two of the ferries on the service between Helsingborg and Helsingör, of which Stena owned 50 per cent at that time”, he says.

Since that time Stena Teknik has worked with electrification. One of the major projects leading to Elektra is the investment in batteries on Stena Jutlandica, where tests were initiated in 2018 to supply the ship with battery-power when maneuvering in port.

“It works perfectly and we have learned a lot from it. Step two in that project will be to go on battery-power to Vinga lighthouse. This has not been realized yet, mainly because the battery cost remains too high”, says Harry Robertsson.

**RIGHT NOW THE** Elektra project is mainly about commercializing the design and reducing the ship’s lightweight in order to reduce the power requirement as much as possible as well as designing the most efficient hull form.

“The hull form is developed in collaboration with SSPA. Discussions about the hull structure are held with SSAB and about the propulsion with ABB. But we have not finally chosen any suppliers yet and we can open up for further collaboration”, Harry Robertsson says and continues:

“To check that the project can be realized in terms of shipbuilding technology, we have collaborated with the Danish naval architects and marine engineers OSK Ship Tech. In addition to that, we run the development project Light electric vessels (Lätta elfartyg) together with institute, academia and industry within the framework of the collaboration platform Lighthouse.”

**A PROJECT DIRECTLY** connected to Elektra is the founding of Stena Recycling’s subsidiary Batteryloop. The project is partly financed by the EU and will investigate how used batteries from



CHRISTOPHER KULLBERG ROTHWALL

the transport sector can be utilized for storing energy on the quay.

“There are quite large amounts of energy that must be transferred to the ships in a short time and we may need energy storage ashore in the form of batteries”, he says.

**BUT BATTERIES WILL** not be the only solution adapted in Elektra. Stena Teknik is also looking at the possibility to use fuel cells.

“Until quite recently, Elektra has been completely powered by batteries, but large battery packs add a considerable cost. Halving the capacity must be compensated with something else and in that case fuel cells are an option.”

▲ Harry Robertsson, technical director at Stena Teknik.



STENA LINE

track of both research and the solutions of different technology companies. In recent years they have evaluated many solutions, including rotor sails.

“We put quite a lot of effort into it, but our assessment is that it is currently not cost-effective enough. The payback period would in several cases be too long.”

Earlier, Stena Teknik has also studied installation of kites, something that looked promising before the supplier raised the price and reduced the service life.

Stena Teknik has also been involved in the work of using artificial intelligence, AI, to reduce fuel consumption at Stena Scandinavica and in the project to operate Stena Germanica on methanol. It worked well and the plan was to use methanol on all Stena Line-ferries. What threw a spanner in the works was how the price of fuel developed.

“The demand increased in China, where they drive cars on methanol in different degrees of mixture. Methanol was cheaper than diesel when the project started, but suddenly became twice as expensive.”

**THE LATEST NEWBUILDING** project of Stena Teknik is an energy-efficient 50,000 DWT MR-tanker design for Stena Bulk, a concept called IMOIMeMAX. The vessel type was developed for the joint venture Proman Stena Bulk. The vessels will mainly carry methanol and they also use methanol as fuel. They are being built by Guangzhou Shipyard International in China for delivery in 2022.

Regarding the existing fleet of Stena Group, Harry Robertsson does not believe there will be conversions to alternative technologies. He thinks that we will see a development of new biofuels instead.

“In that case there is no need for conversions, emissions are momentarily reduced anyway. If the fuel price goes up with 10 per cent, the vessels must become 10 per cent more efficient to solve the equation. But I think that the production of biofuels must be streamlined, else it becomes too costly”, he says. ■

Harry Robertsson believes, however, that the Stena Elektra concept is already developed to an extent that a vessel could in principle be ordered today.

“Time is not the problem, the technology is generally that advanced, but it requires incentives and also large investments in the land based infrastructure. We are now working on optimization of the vessel to reduce the installed power. But our working hypothesis is that we will be able to order Elektra in five years’ time for delivery in 2030”, he says.

**IN ADDITION TO** new concepts, Stena Teknik is looking at alternative fuel solutions for the Group's existing vessels. They constantly keep

**Our working hypothesis is that we will be able to order Elektra in five years’ time for delivery in 2030**



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# The road towards zero emissions

The hybrid ferry Elektra has sailed almost 90,000 times between Pargas and Nagu in the archipelago south west of Turku.

TEXT: PÅR-HENRIK SJÖSTRÖM

**WHEN THE PROJECT** was initiated, the design goal was that 75 per cent of the total energy consumption would be taken from the batteries and 25 per cent generated with a diesel generator.

“Today we operate about 98 to 99 per cent of the time on power from batteries”, says Mats Rosin, CEO of Finferries.

**A CHALLENGE IN** the design phase was that momentary failures in power distribution in the archipelago may occur. As Finferries has an obligation to operate emergency traffic, the ferries must always be operational. Therefore, the battery-powered newbuilding would also be equipped with a diesel-powered backup.

The automatic charging takes place from a tower on the side of the ferry when it is docked. Elektra is charged directly from the network at both harbours.

The ferry runs on a 15-minute schedule. The crossing takes nine minutes and unloading and loading six minutes. When docking, one minute has been reserved for connection on arrival and one minute for disconnection on departure.

“We have four minutes of effective charging time. At most we take 1.8 MW. Since we have 1 MW battery pack on board, the C-value at that stage will be 1.8.”

Today we operate between 98 and 99 per cent of the time on power from the batteries

**MATS ROSIN THINKS** that it is important that the developers and suppliers of the systems also offer support throughout the life cycle.

“We are only users. On the shore side we have learned the importance of fast support 24/7 and also that you understand how the equipment works. We have our own automation engineers who have a deep understanding of how it works and have a close dialogue with those who in practice service the facility. If you have a supplier that is not close locally, it brings challenges.”

He explains that Finferries prefer a solution where the supplier makes an agreement with a local contractor who has the needed theoretical knowledge. In this case the equipment has been supplied by Italian Cavotec, which has employed service personnel on site in Finland.

**THE HYBRID SOLUTION** on board is supplied by Siemens, which also is the total system integrator, including the shore based charging system.

“We want to buy an all inclusive package from a competent and serious partner who takes responsibility for it. It is important if something goes wrong, which always happens when a new ferry is introduced. We provide a basic service for society and we are depending upon a whole chain of suppliers. They have to be involved and understand the importance of taking responsibility so that we are able to maintain our ferry services. We must provide a reliable service to those living in the archipelago. It is as simple as that.”



PÅR-HENRIK SJÖSTRÖM

**FINFERRIES HAS RECENTLY** ordered a ferry similar to Elektra.

“After procurement, it is the Polish shipyard Crist that will build the new ferry too. We have also chosen Siemens’ system. It was natural because we then operate two similar ferries on the same route”, Mats Rosin says.

However the new ferry will not be an identical sister to the Elektra. For example the underwater hull form is completely new to further improve energy efficiency.

“Technology has advanced significantly since the Elektra-project. Elektra was something of a prototype with an AC main grid system but the new ferry will have a more robust DC main grid system.”

Mats Rosin explains that the megatrend has moved towards DC, which entails certain advantages.

“It provides faster connection when you

We must provide a reliable service to those living in the archipelago. It is as simple as that.

▲ Elektra at the ferry harbour in Pargas. To the left is the charging tower.

come ashore, because we have a rectifier and the charging may commence immediately. With an AC grid system, you have to synchronize the frequency first.”

According to Mats Rosin also the battery technology has also developed.

“Above all, the life of the batteries is optimized by focusing on charging and their environment. On the new ferry Siemens Lithium-batteries will be installed.”

The new ferry will enter service in January 2023. For the route between Nagu and Korpo a slightly smaller hybrid ferry has been ordered. ■

# Not always easy to be in the forefront

Färjerederiet has made extensive investments in electrification of its fleet of road ferries and hopes to pave the way for other actors.

TEXT: CHRISTOPHER KULLENBERG ROTHVALL

## Färjerederiet

Publicly owned shipping company responsible for the Swedish network of road ferries.

In numbers:

- 40 ferry lines
- 70 ferries
- 1 million quay calls
- 13 million transports of vehicles
- 22 million passenger travels
- More than 800 employees
- Net turnover SEK 844,8 million

**IN 25 YEARS** Sweden shall be climate neutral, which presents a major challenge for the Swedish Transport Administration's ferry company Färjerederiet. But Färjerederiet has taken a leading position through extensive investment in electrification and hopes to pave the way for other actors. A first test is currently being done on the Ljusterö-route.

When deck officer Andreas Gerhardt docks the 86 meter long ferry Jupiter at Ljusterö north of Stockholm, things happen that do not happen in any other harbour of Färjerederiet. In just a few seconds, electric power from land has been connected to the ferry, completely without any action from the crew on board.

"We do not notice much more than the green container on the quay", says Andreas Gerhardt.

**BUT NO TRANSMISSION** of current takes place when Jupiter docks. In fact, there is not even electricity supplied to the facility. And Jupiter has no batteries, only diesel engines. It is all about a test that has been going on since February 2020. It will be completed during the autumn and then evaluated. But already now Färjerederiet has noted positive results.

"It worked well from day one. If you look at the statistics, it works between 98 and 99 per cent of the time and it is much better than we

thought", says Erik Froste, CEO of Färjerederiet.

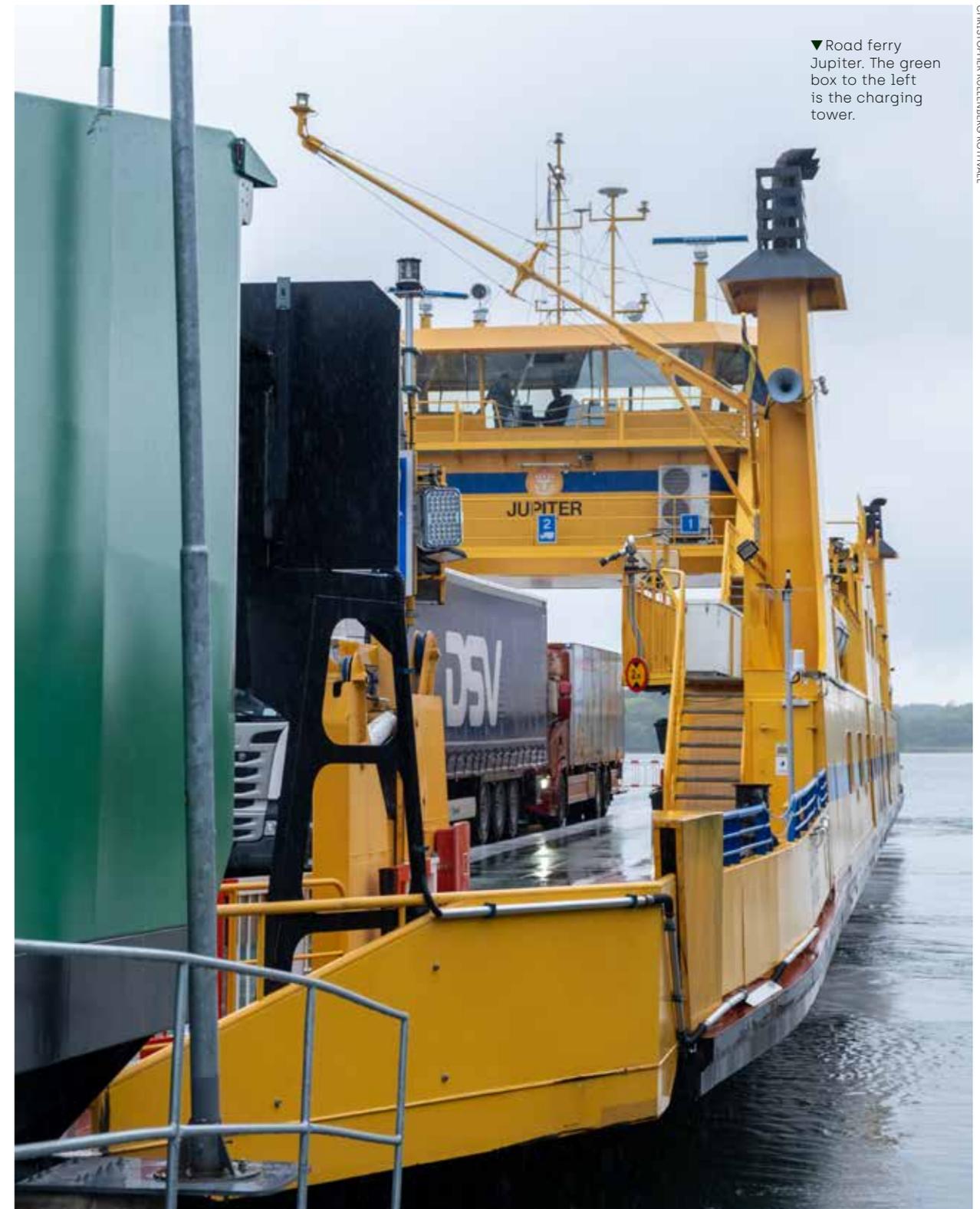
ABB has supplied the electronics and Mobimar in Turku has designed the container and the mechanics. The hope is that the technology works so well that it will become a permanent solution when Färjerederiet requests for tenders for four new electric ferries with a capacity for 60 cars. Two are to be operated at the Ljusterö route and two on the Vaxholm route. The ferries will be plug-in hybrids with two diesel engines for redundancy. From the beginning, the plan was to install electric propulsion only.

"In Norway, they started to operate all-electric boats, but are now returning to a solution with one or two diesel engines in the event of a power failure. That redundancy is needed", he says.

**THE AIM FOR** Sweden is to become climate neutral by 2045. For Färjerederiet, which has emitted some 38,000 tonnes CO<sub>2</sub> annually, this is a tough challenge. To succeed, they launched Vision 45 three years ago, with fossil-free operation as the ultimate goal. To succeed, Färjerederiet needs to order 25 new road ferries. Those of the ferries in the present fleet that will remain in service must be converted for use of different types of fossil-free fuels. An important subgoal is to become 70 per cent fossil-free by 2030.

"It's tough, really tough. Electrification is our main track, but we cannot rebuild more than two or three ferries a year because the others are needed in the operation. Then it is not so important for us if we reach 68 or 62

If you look at the statistics, it works between 98 and 99 per cent of the time and it is much better than we thought



▼ Road ferry Jupiter. The green box to the left is the charging tower.

CHRISTOPHER KULLENBERG ROTHVALL



CHRISTOPHER KULLENBERG NOTHALL

It is not so important for us if we reach 68 or 62 per cent by 2030. For us, the long-term plan to reach zero by 2045 is more important.

for Ljusterö has been a test for both Färjerederiet and the subcontractors.

“When we started talking about electric ferries three years ago, such automated technology did not even exist back then. When we signed the contract with ABB two years ago, there were indeed charging towers in both Finland and Norway.”

He says that these towers were standing on a pier or a large dolphin by the side of the ferry, but that many of Färjerederiet’s harbours lacked such constructions.

“We needed a system for charging over the bow and that did not exist”, he says.

**NOW THAT THE** problem seems to be solved, the next challenge is to get the network suppliers to deliver the needed current in the harbour. There are also ideas for installing battery packs ashore.

“When the ferry arrives, we can charge both from the batteries ashore and directly from the network. This means that we do not need such a strong electric current”, says Erik Froste.

An easier step is to electrify the cable ferries. Färjerederiet has already converted seven of its 21 cable ferries, where the Hamburgsund-route was first out already in 2012. There, the average consumption of diesel has decreased from 38,900 litres to about 2,000 litres annually, which means a reduction of fossil fuels by 90 per cent. The technology saves the environment to an extent that there are also plans to convert cable-free road ferries to cable ferries. This will be done on the Blidö route in Stockholm archipelago between the islands Yxlan and Blidö.

“Environmentally, it is an easy decision. In addition, it is more reliable, they have less technical problems”, says Erik Froste. ■

▲ Erik Froste, CEO of Färjerederiet.

per cent by 2030. For us, the long-term plan to reach zero by 2045 is more important”, says Erik Froste.

**SINCE THEN FÄRJEREDERIET** has already started the transition towards fossil-free operations.

“We share our experiences. Above all, we tell where we went wrong so that others do not make the same mistake. We must encourage others to take the first step. We must experiment and sometimes fail, test and spread our knowledge. We see this as an important part of Vision 45”, says Erik Froste.

But being in the forefront, pushing the envelope, is not easy. Just developing the technology



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# Pleased after two years of service

ESL Shipping, a major operator of ice strengthened bulk tonnage in the Baltic Sea area, has the ambition to be a leader in environmentally smart solutions. TEXT: PÄR-HENRIK SJÖSTRÖM

**MATTI-MIKAEL KOSKINEN, MANAGING** director of ESL Shipping, points out that in general shipping is by far the most environmental friendly transportation mode.

“But indeed there is still potential for improvement. In the Bothnia Bulk-project we reached the target and reduced CO<sub>2</sub> emissions by 50 per cent in the transport chain. This has also been verified. In cooperation with the industry we can reach really good results”, he says, and adds:

“We are pleased with our choice. After two years of service with the LNG-powered bulk carriers Viikki and Haaga we are in a good situation, but indeed minor adjustments are made all the time.”

**ESL SHIPPING IS** also a pioneer in the use of liquefied biogas (LBG) in Finland. The 25,600 DWT bulk carrier Viikki bunkered 100 per cent LBG before shipping a cargo of iron ore for the Swedish steel company SSAB.

“This marks the first time when 100 per cent renewable LBG is used in maritime transport in Finland. LBG reduces greenhouse gas emissions by up to 85 per cent compared to fossil fuels”, Matti-Mikael Koskinen informs.

The biogas was supplied by Gasum.

“The results are encouraging. Originally we

chose LNG as a fuel for our newest vessels Haaga and Viikki because it is a real challenge to find an alternative fuel with an industry grade supply chain. There is much talk and hype about for example hydrogen and ammonia as a marine fuel, but there are no engines on the market that work with these fuels or these fuels are lacking a functioning supply chain.”

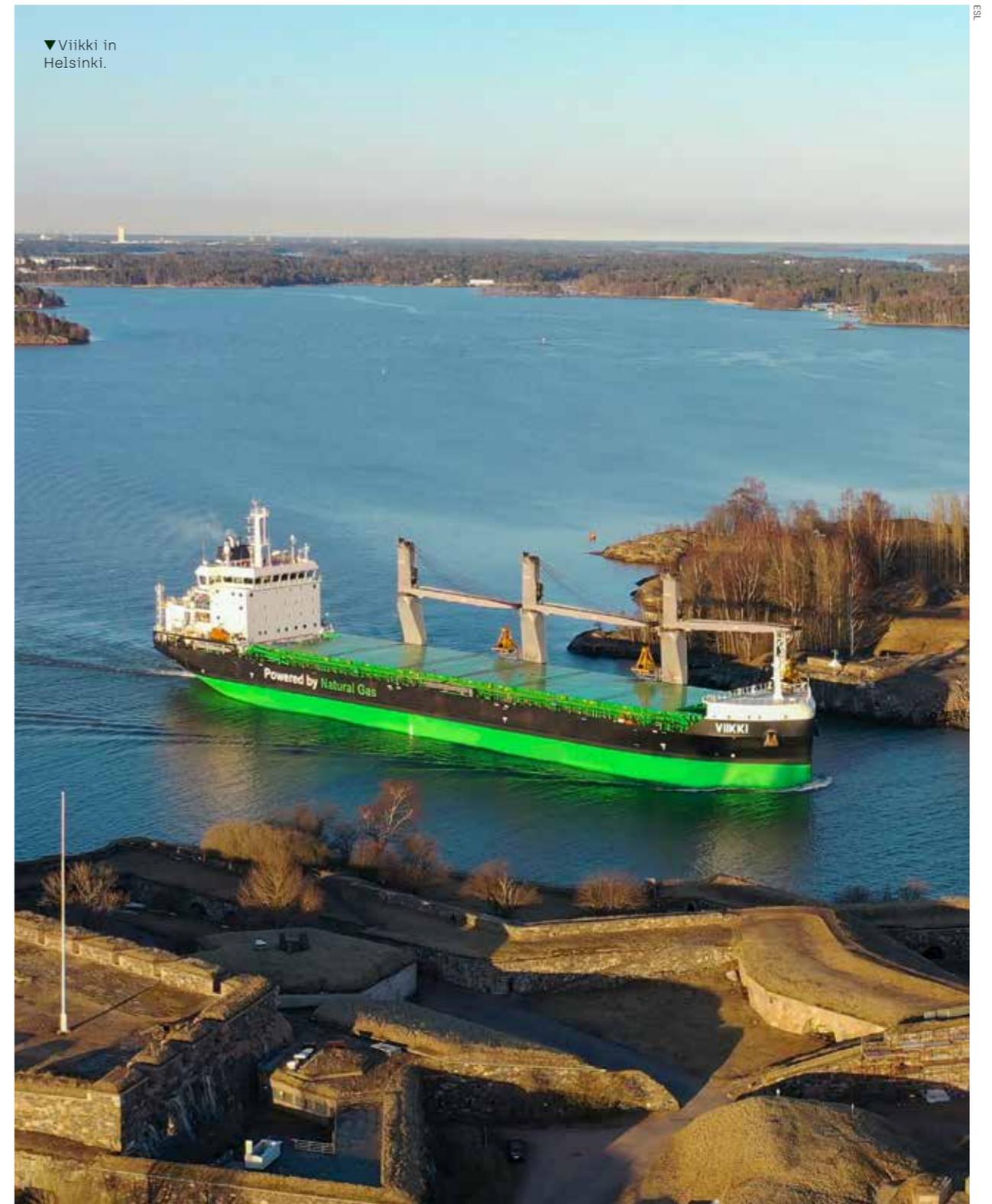
**ACCORDING TO MATTI-MIKAEL** Koskinen there may be a certain inconsistency when for example authorities compare the costs of fossil and fossil-free fuels.

“They forget that it is really hard to establish a supply chain covering a large enough area for some of the fuels. Many of the new alternatives does not even work today. Therefore, when an industrial supply chain for LNG at last has been established, we hope that it will not be punished for the methane slip, at least not with applying a direct coefficient. Also an LNG-powered vessel may be operated with really small emissions.”

This has been verified by real-time measurements by Aeromon of the dual fueled main engine of the bulk carrier Haaga in autumn 2019. Measurement equipment was installed in the main engine exhaust pipe measuring carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), carbon monoxide (CO), nitric oxide (NO) and nitrogen dioxide (NO<sub>2</sub>) emissions.

“Their measurements show that there are hardly any methane emissions from the two-stroke main engine. It is not entirely negligible but we are happy to report much lower,

**We reached the target and reduced CO<sub>2</sub> emissions by 50 per cent in the transport chain**





▲ Matti-Mikael Koskinen and master Kari Levander at the delivery of Viikki.

sustainable levels, than has been argued in some environmental reports”, Matti-Mikael Koskinen underlines.

**MATTI-MIKAEL KOSKINEN THINKS** that a problem with gas, in opposite to other fuels, is that it is analyzed according to the well to wake-principle.

“There is an obvious risk that raising too much noise about the methane slip will result in throwing the baby out with the bathwater. I think LNG is facing trouble it should not face, because it is the only industrial scale marine fuel that could lead us to the use of bio gas or synthetic gas. What we really seek for in the end is a way to get access to a true recyclable fuel.”

Another problem that he draws attention to is that there must be more producers of bio gas to cover the future demand within shipping. Our supplier has promised that we can get as much LBG as we need, but when the number of users increase the raw material base for the production has to increase too. The long term perspective most certainly include production of synthetic methane with the power to gas principle, where CO<sub>2</sub> emissions may be utilized to produce different hydrocarbons using hydrogen.”

The need for ice classed vessels also puts certain demands upon the ship design. In the winter many ports, especially in the Northern Gulf of Bothnia, have traffic restrictions with

## Raising too much noise about the methane slip will result in throwing the baby out with the bathwater

certain demands for ice class for obtaining icebreaker assistance.

“The regulations for the highest Finnish/Swedish ice classes require roughly twice as much engine power as what the actual vessel needs in open water. It is a big challenge regarding EEDI-classification and environment technology. In open water for example, Viikki and Haaga use only about 50 to 55 per cent of their main engine’s output to reach their service speed of 12 knots, but EEDI is calculated on 75 per cent. Except for navigating in ice they never operate with that engine load. From a political point of view Finland and Sweden should guard their interests in EU when talking about emission trade so that the special needs of ice going vessels is compensated. Such vessels are more expensive to build and operate and always consume more fuel than vessels lacking ice class”, Matti-Mikael Koskinen explains.

**ESL SHIPPING IS** also operating a fleet of mini bulkers in the range 3,000 to 5,000 dwt in its Swedish subsidiary AtoB@C Shipping.

“Our target is to have the best vessels with leading environmental technology also in the smaller segment. If it is not possible to acquire suitable second hand vessels we will over time order newbuildings”, Matti-Mikael Koskinen informs.

He adds that many alternatives are being studied.

“Peak shaving and batteries is a technology that I think that almost all vessels will have in the future. We also see that LNG and LBG is a good choice for smaller vessels. Many smaller vessels could be powered by bio diesel, but the lack of supply means that this is not an option for the time being. I also think that some vessels will use wind propulsion in one way or another.” ■

# Giants who make a difference



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**WALLENIOUS SOL**



# Saving energy with Blueflow – “It's crazy”

In February 2019, the Norwegian ferry operator Fjord Line invested in the energy management system Blueflow on its vessel Bergensfjord.

SOURCE: DEIF

**A SIMILAR INSTALLATION** was commissioned in September 2019 on the sister ship Stavangerfjord.

“In the past, we have used an enormous amount of time on tapping in data in Excel sheets, making graphs and we have already made the obvious energy-saving improvements,

but we still had a feeling that we missed an untapped potential”, Fjord Line’s tech superintendent Kristoffer Morgenstern explains.

However, Fjord Line did not have a tool that could show them the effect of the initiatives and that is why they decided to implement Blueflow. Now the system helps them to iden-

tify potential savings, and they can immediately see results.

“Blueflow is of course not free of charge, but as if by magic, we can now compare real-time data, and we save a lot of time, and we can make decisions based on facts”, Kristoffer Morgenstern says.

**IN MAY 2019** Bergensfjord’s fuel consumption reached the lowest level so far. It was a windless month, but so was May 2018. Still fuel consumption was 6.67 per cent lower in May 2019 than in May 2018.

“We have aimed at reducing the fuel consumption, but it is the first time ever we have reached this level. It’s crazy, and even though the weather has a large impact, the drop in fuel consumption is not solely a result of good weather but also due to the implementation of Blueflow”, Kristoffer Morgenstern says.

Fjord Line uses Blueflow on the bridge, in the engine room and at the head office but in different ways. Nevertheless, the three works closely together and shares the gained insights.

**ON THE BRIDGE** of Bergensfjord senior captain Jan Richter is a pioneer in eco-friendly driving, and he works determinedly with Blueflow to optimise manoeuvring and thereby bring down fuel consumption. In his opinion, Blueflow is a real game changer.

“We have used a lot of time to locate potential savings which we have succeeded with to a large extent. However, I am convinced that we would have reached the same results way faster if we had Blueflow from the beginning.”

“Blueflow has changed my way of manoeuvring, the way I accelerate and the number of engines I use. The system gives me immediate feedback and shows me where I hit the nail on the head.”

**CHIEF OFFICER JONAS** Munk-Madsen also works with Blueflow: “Blueflow has eliminated a lot of doubt as we now can base decisions on facts instead of gut feelings.”

In the engine room, chief engineer Kim



The system gives me immediate feedback and shows me where I hit the nail on the head



▲ Jan Richter, senior captain, Bergensfjord.

Storgaard also has access to Blueflow.

“Initially, we used another system that solely focused on the main engines. Blueflow receives input from all energy consumers, providing us with a much more varied picture of the fuel consumption”, he explains.

Besides lowering the overall fuel consumption, the ambition is to reduce the running hours on the diesel gensets, and that way reduce cost for maintenance.

**NOT ONLY DOES** Blueflow identify potential energy-saving initiatives, but it can also be used for diagnosing problems and maintenance. The tech superintendent and his team identified a pitch problem on both Bergensfjord and the sister vessel Stavangerfjord. Data showed that something happened when the ships are sailing with one engine connected.

“It is the propeller and the main engine that cause the problem. We have a pitch trend program, but with Blueflow, we can see both the pitch drive and prove the effect on the economy”, he explains. ■

# Shipowner and bio fuel producer

The challenges with biofuel are the availability of raw materials and above all the network for cost-efficient collection of them.

TEXT: PÅR-HENRIK SJÖSTRÖM

**IN ADDITION TO** providing shipping services with own and chartered tonnage, the Meriaura Group produces biofuel and bio gas within the company VG EcoFuel Oy.

“The fuel that we now produce is not bio diesel, because biofuel is not esterified. Compared to fossil fuels, our biofuel corresponds mainly to heavy fuel oil, HFO”, says ship owner Jussi Mälkiä, founder of Meriaura Group.

**TODAY ALMOST ALL** biofuel from Meriaura’s own production plant is delivered to the two EcoCoaster-vessels in the Meriaura-fleet. The theoretical annual production capacity of the plant is 10,000 tons.

“With the current supply of raw material, we are able to produce just over 1,500 tons of biofuel per year”, says Jussi Mälkiä, and adds that it corresponds to more than 50 per cent of the fuel consumption on the mini bulkers Mirva VG and Eeva VG.

“Their ABC-main engines were originally developed for use in Africa. They do not have too much hi-tech and automation and work well with fuels of lower quality.”

Also the open deck carrier Meri has been designed for use of biofuel, although now is operated on MDO.

“It requires certain technical modifications in the fuel supply to the three main engines, says Ville Koskinen, CEO of VG Shipping, the company within the group that takes care of technical management and manning of the vessels.

**THE RAW MATERIALS** for both biofuel and bio gas origins from several sources. Thousands of tons of used cooking oil is for example collected annually from hamburger bars and restaurants.

“Although the supply has a certain potential to increase, it is limited in terms of food and kitchen waste. In the future, we need to expand our sources of raw materials. If you are able to handle the costs for the raw material, your competitive starting point is very good. Biofuel does not become much more expensive than fossil fuel and the larger the volumes, the more competitive the product becomes”, Jussi Mälkiä explains.

**ALL OF THE** production from the bio gas plant is sold to the local energy company for district heating. Jussi Mälkiä informs that the group has no plans to start producing bio gas for shipping.

“When it comes to marine fuels, our focus is on biofuel, which is marketed under the VG Marine EcoFuel brand.”

Jussi Mälkiä describes the production process of biofuel as “quite simple”.

“It is a process that does not require a large



MERIAURA

## Meriaura EcoVoy Contract

Meriaura has introduced nearly carbon neutral transport contracts, based upon the biofuel-powered EcoCoaster vessels. With VG Marine EcoFuel, transports' lifecycle emissions are 92–96 per cent lower than with fossil fuels.

Among many different marine fuels, bio fuel oil can play a significant role in five to ten years

refinery. It is not a chemical process either, it is mainly about filtering, separating and cleaning the raw material. The operation on board is more demanding, as the ships must have suitable technical arrangements for biofuel. In addition, building a large scale network for cost-efficient collection of raw material is quite a challenge.”

**JUSSI MÄLKIÄ ADMITS** that it might not be completely problem-free to switch to biofuel in any ship. According to him, there are still many vessels that can be converted without any larger problems.

“It depends on the type of engine and its speed range. It is much easier with engines designed for the use of HFO. In the operation, there are certain details that must be taken into account too. The fuel must be stored at a suitable temperature and it should be remembered that it

They do not have too much hi-tech and work well with lower quality fuels

is organic. It is more sensitive in terms of storage and freezes more easily.”

Jussi Mälkiä says that the supply on the market is still relatively small, but that interest is increasing. In a slightly longer term, he plans to sell VG Marine EcoFuel to other shipping companies as well.

“Biofuel can become a major ship fuel, but it requires a more efficient approach on the raw material side. I see a great opportunity because it is fossil-free. There will no longer be just one driving factor. Among many different marine fuels, biofuel can play a significant role in five to ten years.” ■

▲ Jussi Mälkiä at the bunkering station on the 4,850 DWAT EcoCoaster Mirva VG, built in 2016.

# An AI platform for better decisions

Smart Port as a Service is a web application that allows users to interact and collaborate with other actors in real-time.

TEXT: PÄR-HENRIK SJÖSTRÖM

**THE FINNISH STARTUP** Awake.AI was established 2018 to create a software platform for port digitalization and autonomous shipping. Last spring Awake.AI announced the launch of Smart Port as a Service, a web application that allows users to interact and collaborate with other actors in real-time. According to Awake.AI it will enable improved efficiency, sustainability, competitiveness, and lower costs for all port actors, including for example port authorities, terminal operators and cargo owners.

**THE AWAKE PLATFORM** brings all maritime logistics actors together to plan operations and achieve sustainability goals by reducing emissions and enabling optimization of different processes within the maritime sector. The platform is an open and collaborative platform, a single place for information trusted by all maritime logistic actors.

“Port digitalization and development requires close collaboration with stakeholders not only within the maritime sector, but all parties in the extensive logistic chain. Our central role as orchestrator of this ecosystem means that we make sure the ecosystem is built around trust between all its partners”, says Karno Tenovuo, CEO an co-founder of Awake.AI.

**AWAKE.AI IS APPLYING** artificial intelligence (AI) and especially machine learning (ML) methods as an integral part of the Awake Platform. A variety of ML models are used in software development for example data cleaning, filtering, structuring, preprocessing and automated data labeling.

The platform can for example provide accurate ETA for ships, take weather forecasts into account and link the situational information from port side to determine the best possible JIT-arrival. Up-to-date RTA (Recommended Time of Arrival) and ETD information is provided to optimize the fleet utilization and reduce emissions.

**THE COMPUTER VISION-BASED** solution for smart ports is designed to analyze and monitor cargo and vehicles in the port in real time. The solution automates challenging manual resource monitoring, tracking, and analysis, speeds up cargo logistics planning, and improves the detection of potential exceptional situations.

“With the solution we developed, the port actors gain situational awareness of their port area utilisation, which allows them to identify manufacturers using the port area as a short-term warehouse and to better predict potential capacity problems”, Jussi Poikonen from Awake.AI says.

**THE AWAKE PLATFORM** is embedded with Smart Messaging capability, allowing compre-

**Awake.AI**

The founding team has a background in the marine industry, including the world's first situational awareness solution for vessels, the world's first remotely controlled commercial vessel (tug) and the world's first autonomous commercial vessel (ferry).

Port digitalization and development requires close collaboration with stakeholders



AWAKE.AI

hensive context aware information sharing between port call actors. Automated bots generate messages like port call state changes and deviations.

The Awake Platform includes charts with dynamic content. Map layers include AIS, navigation charts and 2D land maps. Weather data can be displayed to support decisions about certain operations such as loading and unloading. The Awake Platform also includes cloud security, access management, security auditing and operational capability.

**THE PLATFORM AIMS** to reduce shipping emissions significantly, taking help from its ecosystem partner network over 100 partners. VP of Sales and Marketing Sami Kaksonen says that they are looking for new pilot ports and operators.

“It is possible to take the digital leap in a week. Awake.AI progresses the sustainability

We are looking for pilot ports and operators. It is possible to take the digital leap in a week

and the efficiency within maritime logistics. Even though the vessels would be fully automated, there has to be a legal and technological infrastructure in place shoreside in order to make commercialization viable. Awake.AI is focusing on enabling and accelerating the adoption of the ‘digital handshakes’ and communications between different maritime logistics actors, and not just ships”, he explains. ■



AWAKE.AI

▲ With its novel AI models, the Awake Platform provides port status and service predictions with unprecedented accuracy and reliability.



MAGNUS SANDELIN

# Reducing a mountain of plastic bottles

In an old manor house in Kålleröd outside Gothenburg, work is currently underway to deal with the enormous consumption of plastic bottles at sea.

TEXT: MAGNUS SANDELIN

**THE COMPANY JOWA**, focusing on products for purification and distribution of water at sea, is in the final phase of the development work with a filter, Jowa Safe Water, which will hopefully make seafarers choose the vessels' own drinking water over bottled water.

Greg Shannon, technical sales manager at Jowa, has worked at the company since 2004 and it is, among other things, the environmental focus that makes him feel so good at work, he says.

"To be able to work to protect the marine

On each ship 10,000 plastic bottles of drinking water are consumed every year. That makes 600,000,000 plastic bottles every year.

environment and at the same time have contact with people all over the world is fantastic, he says."

He himself comes from Sydney, and the working days usually start with him talking to Jowa's agents in Australia. A world map behind the desk shows where the company is represented.

"At lunch there will be contact with India, the Middle East and Europe, and after afternoon coffee they have woken up in the US and South America."

**THE NEW FILTER** was, like so much else, delayed due to the corona epidemic, when it has not been possible to get all parts delivered from abroad.

According to Greg Shannon, drinking water on board cargo ships is usually not a high priority.

"We saw that the ordinary water on board was not always so good, so the crew chooses bottled water instead. There are 60,000 freighters in the world, and on each ship 10,000 plastic bottles of drinking water are consumed every year. That makes 600,000,000 plastic bottles every year. We saw the need to be able to deliver clean water and thus also reduce all plastic that is thrown into the oceans."

**SIMPLY EXPLAINED, THE** drinking water filter consists of a biological barrier through which viruses, bacteria and discolorations cannot pass.

"It should be beneficial for both the crew and the environment, but also financially profitable to invest in for the shipowner", says Greg Shannon.

Today Jowa operates in a global market with



MAGNUS SANDELIN

customers in Japan, the USA, Singapore and China, among others.

"For us, it is important to be able to provide our customers with service regardless of where in the world the ships are located."

**HE SHOWS US** around the old building that is the company's head office and the workplace for 29 people. In the basement, the company's products are tested. There are hydrophores, bilge water separators and reverse osmosis filters.

"The production of large tanks takes place in our factory in China, while assembly and fine-tuning are done here in Sweden. We also have some in-house manufacturing, programming and more", says Greg Shannon. ■

▲ Greg Shannon, Technical Sales Manager at Jowa.

# Propeller dimensions – a size that matters

Shipowners are increasingly competent and demanding clients when placing a shipbuilding order. That is where Berg Propulsion wants to play a role. TEXT: CHRISTOPHER KULLENBERG ROTHVALL

**THE MOST ENVIRONMENTALLY** efficient propulsion systems with low fuel consumption are developed as a result of a dialogue between shipowners, propeller manufacturers and ship designers. That is the opinion of Stefan Sedersten, CEO of Berg Propulsion AB, a Swedish propeller manufacturer that made comeback last summer.

**IN A DEAL** at the beginning of the summer Caterpillar Propulsion AB again became Swedish-owned and got back the former name Berg Propulsion AB. Caterpillar Propulsion AB was bought from Caterpillar Luxembourg Sarl by the former chief operating officer and minority owner Stefan Sedersten through his holding company Gula Skrinet AB. He saw an opportunity in a situation where the global market for propeller technology began to decline, not least because of the pandemic but also due to a more and more complex market.

**“WE ESTIMATE THAT** these products need to be sold in direct dialogue with the customer and end user. They are tailor made for the ship’s design, but also for the way they are to be operated, and therefore the dialogue is very important, says Stefan Sedersten.

Previously, the production was located in both Öckerö and Singapore. The production in Singapore is now being phased out and instead the company is initiating new investments in Öckerö, including recruitments as well as the construction of a new facility for, among other

**We can support the shipowner in designing energy and environmentally efficient systems**

things, assembling and testing of thruster products.

“There are two sides of the coin, we are closing in one place and investing here. When we acquired the company it had close to 300 employees, now we will land at just over 200”, he says.

**BOTH THE MOVE** and the acquisition are reflecting a recent change in the way newbuildings are ordered. Previously, a shipowner set up the outline specification and then shipyards and suppliers met it. Now it is much more about tailor-made orders where the shipowners want a ship for a certain type of traffic profile. Stefan Sedersten believes that Berg Propulsion has a role to play here.

“We can support the shipowner in designing energy- and environmentally efficient systems. Shipowners have become much more competent nowadays. There are legal requirements to fulfill, for example from IMO, which have forced them to take action. This has turned them into more competent clients”, he says.

Jonas Nyberg, Managing Director West, thinks that only in recent years there has been a change

## Berg Propulsion

The main focus at Berg Propulsion is controllable pitch propellers, targeted for owners in everything from fishing boats to tankers, roro-vessels and offshore supply ships.



▼ Stefan Sedersten, CEO of Berg Propulsion AB.



BERG PROPULSION AB

▲ Archive image from the Berg Propulsion production site.

among both shipowners and ship designers on the view upon the propeller's importance for reduced fuel consumption and reduced environmental impact. This happens by reducing the power requirement by using larger propellers.

“It has happened very quickly. Instead of asking which propeller is suitable for a particular engine, the shipowners now ask how large a propeller can be fitted and how it affects the needed output of the main engine. In just five years, the propeller diameter has increased between 10 and 20 per cent in the same size of tonnage”, he says.

**BERG PROPULSION HAS** experience of many projects where the dialogue between end users and subsuppliers has been in focus, for example in the tugboat segment. In cooperation with the customers the company has been able to deliver an adaptable system design depending on how the vessel will be operated.

“They are advanced hybrid tugs where a

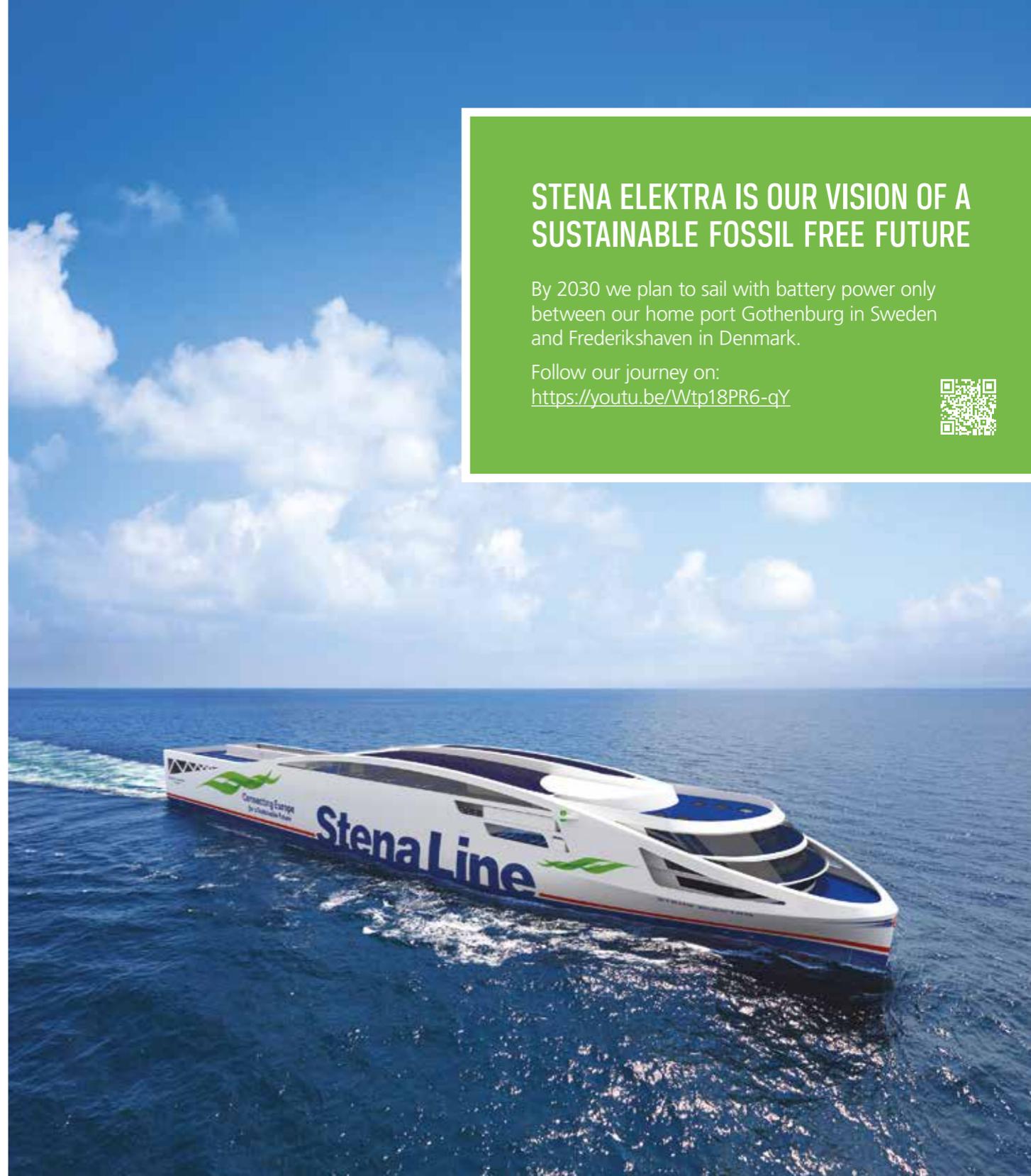
combination with generators and main engines enables operation in eco mode, standard mode or turbo mode. It is eco when you drive to the operation area, standard when there is bad weather and turbo when you are working”, says Stefan Sedersten.

The operation is controlled by an integrated system that continuously optimizes the tug for the ongoing operation.

“The overall result is that you can avoid using the main engine en route to the operation area, which saves both operating costs and maintenance hours”, says Stefan Sedersten.

**BY INVESTING IN** centralized operations on Öckerö, Berg Propulsion aims at getting closer to their customers.

“We are launching a new product support in Scandinavia to reach those customers who already have our equipment. It is a very important customer contact for us”, says Stefan Sedersten. ■



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# Saving fuel with optimal rpm

With the variable gearbox OptixDrive from OptixMarine it is possible to lower fuel consumption up to 25 per cent for ships with shaft generator.

TEXT: PÅR-HENRIK SJÖSTRÖM



OPTIXMARINE

The first commercial installation was made on Rederi AB Donsötank's product tankers Solando and Solero in the end of 2019 and beginning of 2020.

"Since then Solando has logged just over 2,500 hours of operation, producing 500,000 kWh. So far the saving is over 500,000 SEK in maintenance and fuel. Until then our Achilles heel had been the lack of reference plants on vessels, as only a few owners are willing to take the first step with new technology. But there has been a tremendous interest among shipowners."

**TORBJÖRN LUNDH EXPLAINS** that the common solution today is that the complete driveline is optimized to the shaft generator.

"The main engine is run at fixed speed to obtain the right frequency for the generator. The shaft generator consumes some ten per cent of the engine's output and the rest is consumed by the propeller. We allow the customer to optimize their driveline to the propeller instead, which counts for 90 per cent. The saving is therefore not related only to that part of the output needed for the shaft generator, it is related to the total driveline output."

In practice this means that the output of the main engine can be radically reduced by lowering the rpm and increasing the pitch of the propeller.

"Then the engine is operated on the curve of momentum instead, so that the load is about 80 to 85 per cent. With fixed rpm the load is

Solando has logged just over 2,500 hours of operation. So far the saving is over 500,000 SEK in maintenance and fuel.

normally between 30 to 40 per cent and the efficiency of the engine becomes quite poor."

**THE OPTIXDRIVE IS** installed between the Power Take Out (PTO) and the shaft generator. It uses hydraulic power to compensate for reduced primary speed and adjusts the secondary speed to the generator's preferred rpm. The shaft generator can be connected from idling up to maximum rpm. The overall efficiency of the OptixDrive during normal operation is 95 to 98 per cent.

The rpm compensation is working even below idling rpm and provides time for the



JOACHIM SJÖSTRÖM

auxiliary generators to start and take over electrical power production instead of causing a black-out.

"Statistics show that this function removes more than 95 per cent of the risk of black-out on board", Torbjörn Lundh says. ■

▲ Donsötank's Solando had the OptixDrive installed in the end of 2019.

▲ Installed unit of the variable gearbox Optix-Drive.

**ACCORDING TO TORBJÖRN** Lundh, managing director of OptixMarine, the main engine can be operated in an optimal way by enabling it to run on variable rpm instead of fixed rpm it. This saves fuel and reduces emissions.

The prototype has been tested since 2018 on the product carrier Astoria, owned by Rederi AB Veritas Tankers.

"The main engine on Astoria had already before been operating on variable rpm but still the fuel consumption was reduced by 16 per cent. When compared to operation with fixed rpm the saving is about 25 per cent."



OPTIXMARINE

The fuel consumption was reduced by 16 per cent. Compared with fixed rpm the saving is about 25 per cent.

**Meriaura EcoVoy Contract – nearly carbon neutral sea transport**

**Transport with climate friendly, waste based biofuel and 92 - 96% lower emissions**






# Ships loaded with green solutions

Donsötank's newbuildings are characterised by a mix of different technologies to reduce emissions and maximise energy-efficiency.

TEXT: PÅR-HENRIK SJÖSTRÖM

**REDERI AB DONSÖTANK** has two 22,000 DWT products and chemical tankers under construction at Wuhu Shipyard Co. Ltd in China. The delivery of the newbuildings is planned to summer 2021.

The new tankers are designed by FKAB, based on a low-resistance hull design. They will have a Wärtsilä 10V31 dual fuel main engine powered by LNG.

The auxiliary engines are from Wärtsilä too and equipped with a Catamizer from Gesab. The Catamizer is a combined unit for waste heat recovery and NOx reduction of exhaust gases by Selective Catalyst Reduction (SCR) to comply with the Tier III requirements.

“Our technical team has done a great job with this project. They had a key role in designing the vessels and they have looked at all available green technology on the market,” Ingvar Lorensen, Managing Director of Donsötank, says.

**THE VESSELS WILL** also have shore to ship connection for supply of electrical power from the port.

“The intention is not only to use the shore based power grid when we are loading. We will also do so when discharging and we are working

This tanker generation is designed with focus on the energy efficiency from the beginning

together with several ports to enable this”, Ingvar Lorensen, explains.

**TO FURTHER IMPROVE** the energy-efficiency of the vessels, waste heat is recovered with exhaust gas boilers and fed to the thermal oil system. Jacket cooling water heat is also recovered for several heating purposes.

During detailed engineering, it appeared that there was more waste heat than heat consumers. Therefore, it was decided to convert the surplus into electricity by means of an ORC (Organic Rankine Cycle). The system was ordered from Orcan Energy through their Swedish representative Sveadiesel AB.

**ORCAN ENERGY'S EFFICIENCY** Pack uses waste heat from the thermal oil and HT water system to produce electricity, thereby recovering waste heat from both the main engine and the auxiliary engines. In order to do that a heat exchanger transfers waste heat from the thermal oil circuit to the ORC.

The HT water is being routed through the efficiency PACKs directly. Here, the refrigerant is evaporated - a non-toxic, non-flammable hydrocarbon - and routed to the expansion machine as superheated vapour. The highly pressurised refrigerant is expanded, thereby driving the expansion machine. The rotational energy is used to drive a generator that produces electricity.

**THERE IS ENOUGH** waste heat to operate the efficiency PACK throughout the year with differ-



DONSÖTANK

ent operating conditions and varying seasonal influences. Especially during the energy-intensive discharge operations a lot of waste heat can be recovered.

The efficiency PACK will provide well over 80 kW of additional electrical net power to the ship's grid while discharging. But also at sea, when less heat is available the waste heat recovery system contributes significantly to the on-board electricity demand by feeding back more than 70 kW into the grid. One of the main advantages of the expansion machine inside the system is that it's very well suited for fluctuating amounts of waste heat, meaning that it retains its efficiency.

The results of applying waste heat recovery: A CO<sub>2</sub> reduction of 295 tonnes, fuel savings of around 100 tonnes. In other words: for both tankers combined the efficiency PACK will save the equivalent of approximately 5,000 gas tanks for cars every year.

**INGVAR LORENSSON EXPLAINS** the choice for this technology: “This tanker generation is designed with focus on the energy efficiency from the beginning. To recover the waste heat and convert it to electricity is one step to



DONSÖTANK

minimize the emissions. We came in contact with Orcan Energy and Sveadiesel in an early stage and their solution fits perfectly into our vessels.”

The installation of the efficiency PACKs was supported by the Swedish Environmental Protection Agency. Their Klimatkivet (Climate Leap) initiative aims to reduce emissions that affect the climate by making local investments for the greatest possible climate gain. ■

▲ Ingvar Lorensen, Managing Director of Donsötank.

# World's largest 1A super roro-vessels

Wallenius SOL's new, ice-strengthened, LNG-powered roro-vessels will connect the Gulf of Bothnia with the North Sea area.

TEXT: PÄR-HENRIK SJÖSTRÖM

**THE RORO-VESSELS ARE** under construction at the CIMC Raffles shipyard in China, where the project is led by Wallenius Marine. These 242 meters long giants will have a cargo capacity of 5,800 lane meters and will introduce a new era in industrial shipments to and from the ports by the Gulf of Bothnia. Therefore they will be ice strengthened to Finnish/Swedish ice class 1A Super.

**IVL WAS COMMISSIONED** to calculate how the new type of vessel compares with those currently trading between northern Baltic to ports on the Continent. A comparison was made with the relatively new roro-vessel Thuleland, which has been in operation since 2006 and is the best-in-class in the company's fleet in terms of low environmental impact.

According to the calculations, the new class of vessel will be significantly more energy efficient. The new ships will reduce emissions of greenhouse gases by 63 per cent, NOx 96 per cent, SOx 99 per cent and particles 99 per cent.

The improved energy efficiency is partially a result of upscaling. According to Wallenius SOL these larger vessels have greater cargo capacity and are therefore more efficient. However, the

improved efficiency is also a result of a number of features in the design - partly through the hydrodynamic characteristics of the hull and partly due to the ability of the designers to keep the weight down.

"We put a great deal of effort into the design. We conducted two parallel processes when developing the hull, and you could say that Knud E Hansen and SSPA were urged to 'compete' with each their own design. This resulted in a very good hull that works better than we expected", says Martin Carlweitz, who works with operations in Liner Service at Wallenius SOL.

**THERE IS A** certain imbalance in the cargo flow on the route. The ships will be heavily laden on the outbound voyages, but on the return legs they will carry lighter cargo.

"In our case, there will be a 2.5 metre difference in draught between the outbound and return trips. It would be easy to think that we only need optimize for the deepest draught, but we wanted to do so for the actual operating profile we anticipated. Among other things, this resulted in a tear-drop bulbous bow rather than a more conventional, rounded shape. We have also put great effort into the stern, which will be shaped like a W", says Martin Carlweitz.

**THE VESSELS ALSO** have to perform optimally in as well open water and ice.

"The slimmer a hull is, the less fuel it uses.



WALLENIUS SOL

But at the same time, a ship must have a high cargo capacity. I think that we've achieved a good balance between an ample and slim hull, which in turn provides a good trade-off between cargo capacity and fuel consumption. We've slimmed down the hull as far as possible without compromising on capacity, e.g. by carefully thinking through the location of machinery spaces and loading ramps", says Martin Carlweitz.

**THE SHIP'S WEIGHT** also affects fuel consumption.

"It's inevitable that a ship with four cargo decks will have a high centre of gravity. But we managed to lower the ship's centre of gravity more than we initially anticipated, which means we'll need less ballast", says Martin Carlweitz.

Powering ships with LNG almost eliminates

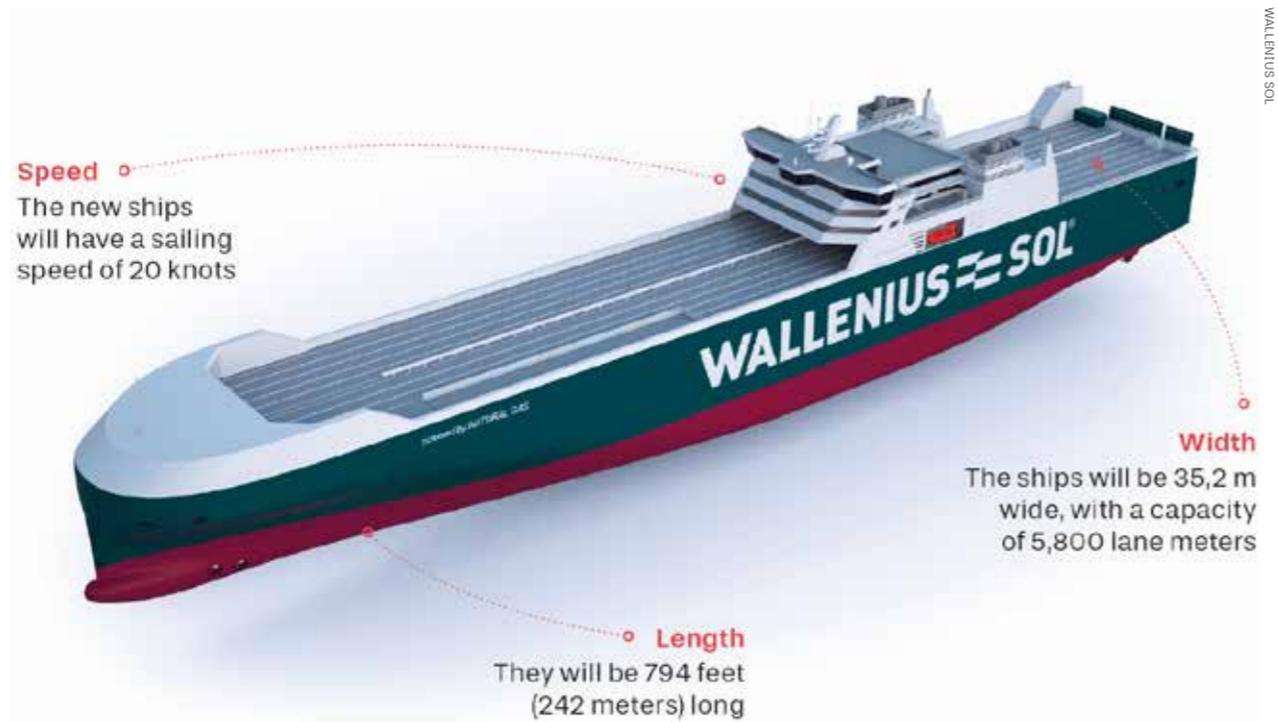
SOx and particulates, while NOx emissions are reduced. However, LNG is a fossil fuel with everything this means in terms of greenhouse gas emissions. But thanks to the improved energy efficiency, greenhouse gas emissions are still significantly reduced.

**"WE SEE LNG** as the best realistic fuel option right now. LNG will have to be a step on the road toward the biofuels for which our ships are ready, but the production of such alternatives is currently too low at present. The ships are also prepared for what is known as peak shaving, where surplus power from the engines is used to charge a battery. We've prepared space, wiring and ventilation, and the only thing missing is the battery itself. The idea here is to use power from the battery, e.g. for manoeuvring the ship in port", says Martin Carlweitz.

Two vessels of this type are under construc-

▲ Wallenius SOL's LNG-powered roro-vessels will be 242 meters long with a cargo capacity of 5,800 lane meters on four cargo decks.

There will be a 2.5 metre difference in draught between the outbound and return trips



tion and delivery is planned to autumn 2021. The newbuildings are designed by Wallenius Marine in collaboration with Knud E. Hansen.

**IVL HAS ALSO** calculated the socio-economic benefits arising from the lower environmental impact, using the Impact Pathway Approach, a method used for many years in e.g. infrastructure projects to determine the external costs resulting from a given activity.

According to the calculations the greatest impact will be on public health, but lower CO<sub>2</sub> emissions and less crop damage will also mean lower costs to society.

“In the case of health, we’re talking about a reduction in diseases, which in turn will lead to lower rates of sick leave and fewer premature deaths”, says Erik Fridell, who works with



WALLENIUS SOL

Because particulates, NOx and SOx are harmful in the here and now, it feels great to know that our new ships emit virtually none of these

maritime issues at IVL, and continues:

“CO<sub>2</sub> emissions also have a price tag. In the case of crops, the savings from reduced NOx emissions are in fact greater than shown in our report, as we have not taken the costs of eutrophication and algal blooming into account.”

**RAGNAR JOHANSSON, MANAGING** director of Wallenius SOL, emphasizes that the benefit to society is something Wallenius SOL is very conscious of and proud of.

“Shipping not only impacts the environment, but also the climate, and I would like to emphasize that both issues are important. Sometimes it feels like climate overshadows the environment. Our industry must of course reduce its greenhouse gas emissions to help achieve a sustainable climate, but we must not forget the environment. Because particulates, NOx and SOx are harmful in the here and now, it feels great to know that our new ships emit virtually none of these. It shows we’re willing and able to shoulder our responsibility.” ■



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# The Fure Vinga class – a complete success

The Fure Vinga class is a joint shipbuilding project including three Swedish ship owners within the Gothia Tanker Alliance.

TEXT: PÅR-HENRIK SJÖSTRÖM

**A TOTAL OF** eight vessels in three batches were ordered, of which two remain to be delivered. After just one year in service the owner Furetank got an offer to sell the lead vessel Fure Vinga to Canada. After that the last batch of two vessels, were contracted, of which the first one will be the “new” Fure Vinga.

The other two shipping companies involved in this project are Älvtank and Thun Tankers. All seven vessels of this type, owned by these shipping companies, are included in the Gothia Tanker Alliance.

The 17,999 DWT design has been developed by Furetank in close collaboration with FKAB. Conceptually the newbuildings are a further development of the series that Furetank and Älvtank built in China in 2004-2006.

**COMPARED WITH THE** previous generation’s vessels, the hull lines have been completely modified in the bow and stern. The new vessels load 1,500 cubic meters more but have slightly less draft than the older vessels.

“The new vessels have a relatively high block coefficient. At the same time, fuel consumption at 12 knots has decreased from about 17 tonnes of diesel to 9.5 tonnes of LNG per day”, says Lars Höglund, CEO of Furetank.



ADAM BERGMAN

**Fuel consumption at 12 knots has decreased from about 17 tonnes of diesel to 9.5 tonnes of LNG per day**

He explains that the shipping company already from the beginning of the project took a holistic approach to energy efficiency. The energy consumption of existing vessels was thoroughly analyzed during one year of operation.

“We came to the conclusion that 95 per cent of the energy produced on board during a year is consumed during the sea legs and when discharging in ports. By using LNG also when we discharge, we can generate 95 per cent of our energy needs with a more environmentally friendly fuel.”

**THE NEWBUILDINGS CAN** also use liquid biogas (LBG) as fuel. In addition to all the environmental benefits that LNG provides compared to conventional bunker oils, LBG is also renewable.

Fure Vinga was in fact the first vessel in Sweden to bunker LBG.

The Fure Vinga-class meet IMO’s strictest emission classification Tier III. For the main engine, the requirements are met by using LNG or LBG as fuel and for the auxiliary engines by SCR.

The main engine is a medium-speed Wärtsilä 9L34DF multi-fuel engine that develops a maximum of 4,500 kW. However, the speed can be varied between 625 and 750 rpm.

**THE POSSIBILITY OF** using the main engine for generating electrical power during unload-



GOThIA TANKER ALLIANCE

ing requires certain special solutions. In normal mode, the main engine’s maximum speed is 750 per minute, and it develops 4,500 kW. The power is then sufficient to meet the rules for ice class 1A thanks to the propeller being in the nozzle, which increases the traction of the propeller by about 25 per cent at low speed. Furthermore, the nozzle is said to reduce the underwater noise normally caused by the propeller.

**HOWEVER, THE NORMAL** power of the main engine would be too great to power a generator in port. The main engine therefore has a second mode, “Harbor Mode”, where the speed is reduced from 750 to 625 and the maximum power is then 2,600 kW.

“At this lower power we can use the main engine for generating electrical power in port and then we get a 30 to 40 per cent load when we are discharging. We were probably the first in the world with this solution”, says Lars Höglund.

**THE INERT GAS** generator also uses LNG as fuel but can also be operated on gas oil. Thanks to

**At this lower power we can use the main engine for generating electrical power in port**

this “dual fuel” IG generator, the ship can always have control over the pressure in its LNG bunker tanks.

The two vessels of the third batch are built with possibility for connection to the shore based electrical grid, providing all the power required for discharging without using the vessels’ auxiliary engines.

**COMPARED TO A** vessel of corresponding type and size built in 2006, the Fure Vinga-class has 40 per cent lower fuel consumption.

The emissions contain 55 per cent less CO<sub>2</sub>, 86 per cent less NO<sub>x</sub>, 99 per cent less SO<sub>x</sub> and 99 per cent less particles. The noise level is reduced by 50 per cent.

The vessels are built to Finnish/Swedish ice class 1A. ■

▲ A total of eight vessels of the Fure Vinga class are in service or under construction.



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# NEOT takes hybrid tankers on TC

Co-operation between Terntank and NEOT will be taken to the next level with a new generation of LNG/LBG hybrid product carriers.

TEXT: PÅR-HENRIK SJÖSTRÖM

## Terntank Hybrid Solution

Product and chemical tankers built by China Merchants Jinling Shipyard for delivery 2021 and 2022. Yard No AD0077 & AD0078.

- 15,000 dwt
- 147x8,7 m
- Class: Bureau Veritas
- Owner: Terntank

**THE NEW VESSEL** class is derived from the product carriers of Ternsund-type. As the project designation "Terntank Hybrid Solution" suggests, the new vessels will take a step further, combining LNG/LBG-powered engines with a DC Link Battery Storage System. Both vessels will be taken on TC by NEOT, a Finnish oil products supply company operating in the Baltic Sea region. After that all five vessels in the NEOT-fleet are owned by Terntank, of which four will be LNG-powered.

According to Tryggve Möller, Senior Advisor at Tertank, the shipyard has managed to maintain almost full activity during the Covid-19 pandemic despite additional challenges such as heavy rain and local flooding in and around the Yangtze River. Travel restrictions have of course impacted on the possibility to visit the shipyard during construction of the two vessels.



TERNTANK

**"DURING THE PRESENT** challenging times we are thankful to have established a very close cooperation with both the shipyard and our local site team. This enables us to build the vessels and keep quality and time schedules at a distance through contact via Microsoft Teams and e-mail. Through close cooperation and

We are grateful that we can continue our investments in environmentally friendly vessels

communication our goal is however to have the vessels constructed at distance at least until a few months prior to delivery in November 2021 and February 2022 respectively", he explains.

**THE HYBRID SOLUTION** is a further development of the four Ternsund-class vessels from China Merchants Jinling Shipyard, formerly known as Avic Dingheng.

"Our aim is to make the vessels even more environmentally sustainable through fuel reduction by way of battery package to reduce auxiliary engine running hours. The battery package will replace auxiliary engine usage when navigating to and from ports. Further we are planning to have shore power connection to minimize auxiliary engine usage", Tryggve Möller clarifies.

**TOGETHER WITH THE** vessel designer and propeller manufacturer Kongsberg Terntank has also optimized the propeller and rudder to reduce fuel consumption. The hull form is similar to that on the four earlier Terntank-vessels from the shipyard. The energy efficient design has had a dramatical impact on reducing the fuel consumption. The 15,000 DWT vessel has a fuel consumption which was typical for a 5,000 to 6,000 DWT product carrier some 15 years ago - despite the fact that the newbuildings will be carrying three times more cargo at a higher speed.

"Our modern vessels today use LNG as fuel



TERNTANK

and we have even contributed in the building up of the logistics for LNG fuel supply in our trading area. Since the main engine and the boiler runs on LNG it is also ready for LBG."

The auxiliary engines are equipped with SCR (Catamizers) and the emission levels are below TIER III. They are prepared for operation on HVO (bio-diesel).

**THE MOST INTERESTING** novelty on board is probably the planned installation of a DC Link Battery Storage System and the preparation for shore power connection to reduce auxiliary engine usage and thereby reduce emissions.

"Our investment in battery package and shore power connection is directly linked to the Port of Gothenburg having shore power connection ashore ready by end 2021 when the first one of our two new vessels will be delivered", says Tryggve Möller.

The VFD keeps the voltage and frequency from the shaft generator stable, as it supplies the main switchboard. The main engine control system together with the VFD enables the main engine to run in combinator mode with variable speed, to the next destination accordingly and arrive Just-In-Time. Result is lesser fuel consumption and lesser emission to the environment.

**"WE ARE GRATEFUL** that we can continue our investments in environmentally friendly vessels and that our customers have the same goal to optimize and improve transportation at sea. We, from the owners' side - Tryggve, Rigmor, Annika and John - kindly thank our customer NEOT and our colleagues on board and at the offices who all contribute to make these investments and building possible", Tryggve Möller concludes. ■

▲ The Terntank Hybrid Solution project introduces several new features.

# Energy efficiency without compromise

Northern Offshore Services' new hybrid technology E-class is under construction.

TEXT: PÅR-HENRIK SJÖSTRÖM



NORTHERN OFFSHORE SERVICES

Services, is one of the highest on the market today.

**NORTHERN OFFSHORE SERVICES** has developed a green power concept, called “Hybrid Technology”. The newbuilding has batteries installed that can be recharged from shore. The vessel is also prepared for charging the batteries from a wind farm, thus utilizing clean renewable energy directly from production to consumer.

Operations can be optimized to lower the fuel consumption and reduce noise thanks to a variety of engine and power combinations. The propulsion system has four modes and in eco-mode the vessel is operated on the gen-set at low speed with support from the batteries. This mode of operation will result in large fuel savings and reduction in emissions when the CTV is in standby between docking operations. The vessel is also able to operate only in battery mode, without any CO2-emissions.

“**NORTHERN OFFSHORE SERVICES** believes in constant innovation and improvements and we are happy to present the new E-class to our customers and the industry. The future is green and the E-class is our first step towards a fully electrified CTV fleet. We believe that electrification is a central part of the future of safe and environmentally friendly CTV: s and we will continue to improve and develop our services. We are confident that the E-class will be a great contribution to our fleet today and further strengthen our position in the CTV market”, said David Kristensson, CEO, Northern Offshore Services. ■

**THE FIRST E-CLASS** crew transfer vessels (CTV) will be named Energizer. Delivery from the Norwegian shipyard Grovfjord Mek. Verksted is planned to 2021.

A combination of high energy efficiency and fuel saving without compromising on outstanding performance and power will be characteristic for the E-class. New developments in the propulsion plant, for example lower propeller speed and larger diameter of the propeller, provides the E-class with high efficiency propulsion.

**THIS RESULTS IN** lower fuel consumption during transit and higher bollard push during docking. The bollard push is up to 30 tons, which, according to Northern Offshore



NORTHERN OFFSHORE SERVICES

The future is green and the E-class is our first step towards a fully electrified CTV fleet

# This is where you read about Swedish shipping.



# Hybrid ro-ro-vessels built for low emission

The construction of Finnlines' new series of ro-ro-vessels has begun in China.

TEXT: PÄR-HENRIK SJÖSTRÖM,



FINNLINES

The new vessels will modernize our fleet further and offer us the lowest possible fuel consumption and emissions

further and offer us the lowest possible fuel consumption and emissions. These will be the most innovative and efficient ro-ro-vessels in the world. We continue our successful track record in investing sustainable operation of our fleet”, says Emanuele Grimaldi, CEO of Finnlines.



GRIMALDI

**FINNLINES' ONGOING EUR 500 million** newbuilding programme also includes two eco-friendly Superstar ropax-vessels. The ro-ro vessels are expected to be delivered during 2021-2022 and the Superstar ro-pax vessels are set to start in traffic in 2023.

“We continue to implement our strategy with resolve and consistency. At Finnlines, we continuously develop our way of working. Over the past ten years, we have steered investments to energy efficiency and green technologies and our newbuilding programme focuses on further energy-saving features. These new ultra-green vessels will offer our customers very sustainable liner services in the future”, says Emanuele Grimaldi. ■

**Finneco**

Roro-vessels with battery banks for zero emission in port.

- 238 x 34 m
- 60,370 GT
- 5,800 lane meters
- Speed 20.7 knots
- 12 drivers
- Hydrodynamic hull shape and integrated propeller/rudder system

**THE CONSTRUCTION OF** the first of three ro-ro-vessels for Finnlines started on 8 June 2020 at the Chinese Nanjing Jinling shipyard. The steel cutting ceremony for the second vessel was held on 16 September 2020.

The hybrid ro-ro-vessels will be built with the latest technology available to ensure the lowest CO<sub>2</sub> emissions. In addition to lithium-ion battery systems that enables zero-emission operations in port, they will be equipped with efficient engines, emission abatement systems and an innovative air lubrication system to reduce hull resistance. The vessels will have the highest Finnish/Swedish ice class.

**THE NEW HYBRID** ro-ro-vessels will be named Finneco I, Finneco II and Finneco III in honour of green innovations.

“The new vessels will modernize our fleet

# The new Kvarken “bridge” is green

The newbuilding project started from a list of environmental goals rather than a draft for an outline specification.

TEXT: PÄR-HENRIK SJÖSTRÖM

**THE ROPAX-FERRY AURORA** Botnia is the first ever purpose-built newbuilding for the route Vasa-Umeå, operated by Wasaline.

“The whole ferry design was based upon minimizing the environmental footprint. We had a long list of things to be done to make it as energy efficient and environmentally friendly as possible”, says Peter Ståhlberg, Managing Director of Wasaline

**THE IMPORTANCE OF** this ferry link across the narrowest part of the Gulf of Bothnia, the Kvarken Strait, is proved by the fact that the cities of Umeå and Vasa jointly stands behind the company Kvarken Link Ab, owner of Wasaline. They also serve as guarantors of the financing.

“The first unanimous decision ever taken in Vasa city council was to guarantee half of the EUR 70 million loan from the European Investment Bank plus financing of the newbuilding with EUR 25 million, says Peter Ståhlberg.

The newbuilding contract is worth approximately EUR 120 million.

Kvarken Link organized a naming contest in which almost 2,500 names were submitted. The winning name was Aurora Botnia.

“Northern Lights or Polar Lights in Latin are called Aurora borealis and this is a phenom-

enon we can admire on our latitudes. Hence the name Aurora. Botnia, tells us where we are”, says Bertil Hammarstedt, CEO of Kvarken Link.

**AURORA BOTNIA WAS** recently floated out at Rauma Marine Constructions Oy (RMC) in Rauma, Finland. The ship has two cargo decks with a total capacity of 1,500 lane meters and a free height of 4.9 meters providing excellent possibilities for shipments of high and heavy project cargo. Aft on the upper car deck is an open IMO deck. Passenger capacity is 800.

The ship’s hybrid propulsion includes four Wärtsilä 31DF dual-fuel engines capable of operating on liquefied natural gas (LNG) and/or liquefied biogas (LBG). Wärtsilä will also supply the LNG storage, supply and control systems, as well as the thrusters, catalysators, controls, and the integrated electrical and automation systems. The latter will incorporate an energy and power management system to optimise the use and operation of the hybrid power solution.

**WÄRTSILÄ’S EQUIPMENT SUPPLY** is augmented by a 10-year service agreement, as well as an agreement that allows Wärtsilä to utilise the vessel as an R&D test platform and technology demonstrator.

“We have managed to attract makers to invest resources in us. For example one of the four main engines is owned by Wärtsilä. The ship is more than just a ferry, it is also a

**Aurora Botnia**  
Car & passenger ferry built by Rauma Marine Constructions. Delivery 2021.  
• 150 x 26 m  
• 24,300 GT  
• Speed 20 knots  
• Dual fuel engines LNG/LBG as primary fuel  
• SOLAS 2020 and “Stockholm agreement” stability rules

The ship is more than just a ferry, it is also a research platform for green technology

## INNOVATIONS IN FERRY TECHNOLOGY

First LNG/LBG battery ship in the world with pods under the vehicle deck

- 2 x tunnel thrusters with controls
- Integrated automation system
- Energy and power management
- NOR catalysators



We had a long list of things to be done to make it as energy efficient as possible

research platform for green technology”, Peter Ståhlberg says.

When arriving at port a high capacity shore connection is automatically plugged in, automatically charging the 2.3 MW batteries. The battery power is provided for propulsion when entering and departing port.

**WE TECH SOLUTIONS** Oy (WE Tech) has supplied the hybrid electric propulsion solution, including propulsion drives, main generators, energy storage system (battery banks and DCDC converters), main propulsion switchboards, shore connection switchgears, energy management system and the propulsion control system.

Propulsion is provided by two 5.8 MW Azipod-units from ABB with permanent magnet motor technology. They are designed to meet Polar Code 6 criteria.

Aurora Botnia is also the first separator free



RoPax-ferry in the world. By replacing traditional lubrication oil and fuel oil separators with a filter solution from GreenOil Standard ApS the energy consumption will significantly be reduced.

“I am grateful that suppliers have been willing to participate in this project. This will be a unique showcase for the industry too. We will have an observation room in the engine room, to where suppliers or we are able to invite guests”, Peter Ståhlberg says. ■



▲ Peter Ståhlberg, Wasaline