



Aggressive technology commitment by the NMA:

NORWEGIAN INNOVATION TO BECOME INTERNATIONAL STANDARD



The Norwegian Maritime Authority (NMA) is joining forces with the industry to equip Norway's maritime sector for the future. Facilitating safe operation with LNG, batteries, hydrogen and autonomous ships is an important priority.

*The preferred
maritime
administration*



Dear reader

The Norwegian Maritime Authority (NMA) has been through major changes over the past decade. It has developed into a modern and forward-looking regulator which gives great emphasis to innovation and to collaboration with the industry. That is reflected in our ambition to be "the preferred maritime administration" – a flag state among the best in the world where quality and safety are concerned.

The number of ships in our registers has grown substantially, with the overall tonnage up by nine per cent in 2016 alone as a result of several factors. One is that our clients now regard us as a regulator with a strong focus on solutions and service. Increased tonnage also means greater influence internationally, and gives us greater opportunities to make Norwegian innovation a global standard.

Norway's maritime sector is a world leader for intelligent solutions and new technology. Our job is to participate in such innovation by putting new regulations in place both at home and on the world stage. New energy bearers and autonomous vessels are among our most important commitments. We will maintain a high level of ship safety while giving the industry scope for development and new ideas.

We want to enhance the visibility of what we do and the way we market Norway as an attractive flag state. Our many committed and able employees are dedicated to reaching the goals we and the industry set. The supplement you are now reading provides an insight into some of the many exciting and important assignments we are working with today.

Enjoy!

DAG INGE AARHUS
Director, communication and public relations



TRADE AND INDUSTRY MINISTER Monica Mæland and NMA director general Olav Akselsen raise the flag on Nordmand Vision.

Monica Mæland, minister of trade and industry

Gaze turned to the sea

Despite a challenging market, 2016 was a good year for Norway as a flag state. The Norwegian Maritime Authority (NMA) bears part of the credit for this.

The NMA shows time and again that it emphasises good, digital and easily accessible services for the shipping sector. Its able staff help us to attain important maritime policy goals and parameters.

Sustainable

The government presented its ocean strategy in February. This aims to contribute to the highest possible sustainable value creation in the industries based on the sea.

Norway is well qualified to succeed. With proud traditions and world-leading

expertise, we will facilitate new, forward-looking technologies. It is crucial that regulation keeps pace with technological advances and takes care of health, safety and environmental consideration.

Autonomous

Digitalisation of the industry offers a good example. A number of shipping companies are looking today at opportunities for partly or wholly autonomous vessels.

But we need answers to a number of questions before such ships can set sail. How can we safeguard ourselves against sabotage and attacks on the technology, for example? Or be assured that these vessels are safe to use and do not harm the environment?

These and other issues are now being addressed by the Norwegian Forum for Autonomous Ships, and the NMA is contributing here.

Both it and Norwegian Coastal Administration are also collaborating with the industry and research organisation over the

world's first test area for autonomous ships in the Trondheim Fjord.

Environmental

Furthermore, the NMA is supporting the industry's environmental commitments. Norway's maritime sector is among the world leaders for using liquefied natural gas (LNG).

Hybrid systems and batteries are now making their entry, while hydrogen represents another exciting new technology. The NMA is facilitating this world-leading technological progress.

Opportunities

The government is working to ensure that Norway's maritime industry will be as well equipped as possible to tackle the challenges and to seize new opportunities.

That work calls for a joint commitment by the public sector and the industry. The NMA plays a crucial role, and I look forward to continuing this good collaboration.

“Its able staff help us to attain important maritime policy goals and parameters.”



Monica Mæland
Minister of trade and industry

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- Capacity: 2 000 passengers, about 500 cars



Color Line is committed to taking a lead role in introducing new and climate-friendly technology on board their ships and in the ports. Environment is an accelerator for Color Line, and the company has worked systematically over time to meet the climate requirements. This is the company's important contribution to the green shift.



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Safe shipping is the top priority

NMA DIRECTOR GENERAL OLAV AKSELSEN shares the maritime sector's big ambitions.

PHOTO: Steinar Haugberg, NMA

Making jobs at sea safer was the goal when Norway's Shipping Office came into being in 1903. And this remains the NMA's most important task, affirms director general Olav Akselsen.

The new section emerged in the then Ministry for Foreign Affairs, Trade, Shipping and Industry quite simply because one of the world's leading maritime nations at the time was falling behind.

Difficult financial conditions for shipowners, lack of regulation and an outdated fleet had contributed to astronomic figures for accidents and wrecks in the late 19th century.

"More than 2 000 Norwegian vessels sank and 3 000 of our seafarers died in the 1890s" says Akselsen.

"A direct line runs from there to our present job of making it safe to work at sea."

Taking charge of the NMA in 2008, after many years of service in the Storting (parliament) and government, brought him back to the west coast.

He talks today about changing challenges, and says that protecting the environment ranks high on the NMA's list of priorities.

"Twenty years ago, a large part of our job was to avoid oil tankers going aground. Environmental concerns have become much

wider, and now cover all activities pursued at sea.

"Regulations on emissions to the air and discharges to the sea are very stringent today, and the shipping industry's negative footprint is getting ever smaller."

Innovation

Akselsen believes innovation and new technology are the key to an even safer and greener maritime sector, and makes it clear that Norway can play a big role in this respect.

The goal is to turn Norwegian innovation and national regulations into a global standard by exerting active influence in such fora as the International Maritime Organisation (IMO).

He knows that success is possible, and cites the adoption of liquefied natural gas (LNG) for propulsion as an example of Norway's ability to innovate.

"We were the first in the field here, and are still the world's largest flag state with LNG-powered vessels," Akselsen points out.

"After a decade of negotiations, our proposal to the IMO that Norwegian regula-

tions on LNG ships should be adopted internationally was accepted last year.

"This means that shipyards worldwide can now apply a new and more environment-friendly technology with far few hindrances than we experienced."

Updated

As a consequence, the NMA gives great emphasis to keeping updated on technological advances. New power solutions such as batteries and hydrogen, innovative standards for shipping in Polar waters and trials with autonomous vessels are among the projects it is involved with.

"Battery power provides another example of the way Norway lies in the forefront internationally, with the world's first ferry driven in that way operating here," Akselsen says.

He is confident that Norwegian regulations will form the basis for a new global standard in this area, and believes developing maritime technology offers a golden

opportunity for domestic industry.

"As new technology moves into the wider world, Norwegian suppliers, yards and designers will possess unique and highly relevant expertise at the leading edge. That offers opportunities for global progress."

Safety first

Although the NMA's goal is to make provision for technological innovation, in the final analysis safety will always come first.

Akselsen and his colleagues are conscious of their responsibility here. Making maritime jobs secure remains the core of the NMA's activity, as it has been since 1903.

"We'll never compromise on safety – that's the very basis of our existence," Akselsen emphasises.

"At the same time, we can see that failure to adopt up-to-date technology was one of the reasons why safety was poor in Norwegian shipping 120 years ago. We won't be making that mistake again."

“Battery power provides another example of the way Norway lies in the forefront internationally.”



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THE INSPECTION TEAM takes fuel samples from a cargo ship to test for sulphur content.

PHOTO: Torbein K Gamst/NMA

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Stricter curbs on contaminants

Big cuts in the sulphur content of marine fuel oil recently adopted by the International Maritime Organisation (IMO) are set to have a significant impact on deaths from air pollution.

The revised requirements mean it will be forbidden from 2020 to use fuels containing more than 0.5 per cent of sulphur, compared with the present ceiling of 3.5 per cent.

"This is one of the largest curbs on polluting emissions in history," says Sigurd Enge, who heads shipping and Arctic work at Norway's Bellona environmental foundation. "It's really big."

International maritime transport is by far the biggest source of sulphur oxide (SO_x) emissions, with the sulphur content of heavy fuel oil (HFO) up to 3 500 times above European limits on diesel oil for cars.

These heavily polluting substances cause acid precipitation, but the biggest impact of the tighter rules will be felt in densely populated areas affected by heavy vessel traffic.

That includes such countries as Egypt, Japan, Singapore, the Philippines and China, where reducing the SO_x content in the air will literally extend the lives of many people.

Measures

"An unpublished study by the IMO indicates that the measures being adopted from

2020 will save as many as 200 000 people from an unnecessarily early grave," says Enge.

"That relates only to potential victims of lung cancer and heart disease from such pollution – and excludes loss of life because of asthma."

Sulphur in HFO is already strictly regulated in some sea areas – the Baltic, the North Sea south of the 62nd parallel and off the US west and east coasts.

The NMA is responsible for seeing to it that shipping complies with the 0.1 per cent limit set for these sulphur emission control areas (Secas).

Its inspectors have adopted new technology in the form of the Bruker S1 Titan and the Niton XL2 GOLDD™ portable measurement devices to catch environmental transgressors.

They use X-rays to determine the sulphur content in HFO in 30-60 seconds. Anyone caught out by the checks can expect juicy fines of NOK 100-200 000.

"In our experience, about five per cent of the ships inspected are breaching the rules," says principal engineer Svein Erik Enge in the NMA's section for inspection and emergency preparedness. "We have an ambitious

goal for increasing the number of checks."

Extended

"Our target for the Secas is to get them extended so that the Norwegian Sea above the 62nd parallel is also included," observes Sigurd Enge at Bellona.

He makes it clear that the NMA and the Norwegian government as a whole have made a strong contribution to the process leading up to the new IMO rules.

"This is a big victory for the regulation of international shipping, a sector which isn't that easy to bring under proper control."

"With the new regime, shipowners worldwide will have to convert to alternative fuels, such as liquefied natural gas and low-sulphur oil, at a cost of many billions of dollars."

"It's a great achievement that the negotiators have managed to break through such barriers and actually put the regulations in place."

The Bellona activist regards the NMA as a partner, and believes that Norway's maritime sector is among the best in the world.

"As a shipping nation, we benefit from strict environmental regulations quite simply because we have shipping companies and suppliers who position themselves in relation to these."

"This type of maritime activity is the business we're going to make our living from in the future, and the NMA plays a key role in that work."



INSPECTOR Odd Rune Isaksen analyses the samples on board.

PHOTO: Torbein K Gamst/NMA



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Pooling advanced technical competence

PHOTO: Steinar Haldberg / NMA

As the regulator of an industry making cutting-edge technological progress, the NMA has wanted to strengthen its expertise. The result is an expert group for innovation and new technology. “We saw a need to be involved in developments from our perspective and to serve as a discussion partner for the maritime sector,” says Lars Alvestad, head of the department for vessels and seafarers.

Comprising Kolbjørn Berge, Veronica Charlotte Haugan, Svein David Medhaug and Jarle Jacobsen, the new group adds up to a strong team. It will take the lead on the NMA’s commitment to new technology, paying particular attention to autonomous vessels and new energy bearers such as hydrogen and batteries. Although they have different backgrounds, the four team members share a genuine commitment to innovation in the shipping sector. The “green shift” calls for new solutions,

and the NMA has a clear strategy on possessing and maintaining leading-edge competence. That creates exciting jobs for these four maritime experts with an above-average interest in technology. **Broad** “In many ways, this is the dream job,” says fire engineer Haugan, who has a broad background which includes work with liquefied natural gas (LNG), passenger ships and the petroleum sector. She is currently pursuing an MSc in fire safety, a discipline of great significance for the development of hydrogen-driven vessels.

“This gas has many properties which make it important to pay special attention to fire and explosion hazards, in addition to safety culture in general. “Being in this group gives my colleagues and I the opportunity to keep up to date with the very latest developments in this area.” Working independently of other NMA discipline units, the team reflects the authority’s strong desire to be proactive towards the industry. Regulations and other parameters must keep pace with progress. The group’s job is to help ensure that the NMA has the expertise needed to get involved in development processes at an early

stage. That allows it to create parameters which the industry can relate to. **No brake** “Our job is to ensure that the NMA doesn’t put a brake on technological progress,” explains Jacobsen, who devotes most of his time to battery solutions. The former chief engineer worked on ships in foreign service before taking a job on land with Naturkraft AS at Kårstø north of Stavanger in 2010. He moved to the NMA in 2014. “Norway’s maritime cluster is strongly positioned in world terms,” he says. “A well-functioning regulator who can contribute tailored regulations and be a door-opener to international bodies such as the IMO is a key factor for this industry.” “At the same time, it’s important to emphasise that safety always comes first,” adds Medhaug, who specialises in autonomous vessels and navigation systems. With a background as a seafarer, he has

worked a good deal in recent years on digitalisation of navigation and automation. “In many ways, the technology needed for autonomous ships is already available – but the systems don’t communicate with each other,” he says, and believes the future will be different. “Greater efficiency and improved safety are the most important drivers in this development. Autonomous vessels will be cheaper to run and are likely to be safer, since human error is a key reason for safety breaches.” Berge has shipyard experience from building LNG vessels and service as a marine engineer in the offshore fleet. He emphasises that the team’s experience has so far been positive. “The industry is good at making use of us, and we’re closely involved in a number of big projects – both from the sidelines and as participants in project teams. “I think the energy mix will change in the future, and we’ll have to deal with more

energy bearers than today. This will be essential for reaching climate goals.” **Sharing** The four experts are concentrated in a single office with the aim of sharing information, exchanging experience and building a professional team which benefits both the NMA and the industry. Innovation in a number of areas is set to converge in the future – with autonomous hydrogen-driven vessels as a realistic scenario, for instance. Collaboration across disciplines and ship types creates the best conditions for the NMA when seeking to play an assertive role in this development. “We’ve wanted to put together the best possible professional team which can function as a resource pool for us and for our industry clients,” says Alvestad. “This is a strong and not least technically updated group, making constant progress.”



SVEIN DAVID MEDHAUG, senior engineer



VERONICA CHARLOTTE ANDERSEN HAUGAN, senior engineer



KOLBJØRN BERGE, senior engineer



JARLE JACOBSEN, senior engineer

“This is a strong and not least technically updated group, making constant progress.”

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Norway is a world leader in marine science, technology and business. We are a maritime nation and the government states in their new ocean strategy that they are certain that the ocean will be a key contributor to future prosperity and growth. An education in marine technology will give you a wide variety of career possibilities and you can participate in finding solutions in global challenges such as climate change, sustainable food production, energy efficient transport and the development of renewable energy extraction devices. The technology must be realized by today's youth. We can provide you the knowledge you need for taking part in creating a better world.

The Department of Marine Technology (IMT) is among the world leaders in marine technology education. The Marine Technology Centre (MTS) at NTNU in Trondheim is one of the largest research and educational centres of the marine industry in the western world. A master's degree in marine technology at NTNU is internationally recognized as a high-quality education. There is a strong international student community here, and you can cultivate a worldwide network during your studies. We need young people who think about the future in a global perspective.

Marine Technology is offered as a Master of Science programme where the first years consist of common technical subjects, which contribute to a general technical understanding. During the third year, students choose between eight different specializations. It is also possible to take Marine Technology as a two-year master's programme for students having a bachelor degree in naval architecture, ocean engineering or similar at admission. The two-year master's program is given in English, while the first three years of the five-year integrated master's program is given in Norwegian language.

Marine Technology students have their own campus at the Marine Technology Centre (MTS), which contributes to a great study environment across grade levels. The student association "Mannhullet" is one of the oldest and most active student associations in Trondheim. They arrange festivals, different courses, company visits, quiz nights and trips with their own sailing yacht and motorboat, which all students have the possibility of renting.

Research

The Marine Technology education programs are research-based, based on a world-leading research community at the Department of Marine Technology. The Department has active researchers in marine disciplines such as structural engineering, hydrodynamics, cybernetics, operation and maintenance, system design, aquaculture and machinery. The research is conducted in close cooperation with national and international industries.

The world-leading Centre for Autonomous Marine Operations and Systems (AMOS) is one of NTNU's Centres of Excellence. AMOS will contribute in the development of intelligent ships and ocean structures, autonomous unmanned vehicles (under water, on the surface and in air) and robots for high-precision and safety-critical operations in extreme environments. This is necessary in order to meet challenges related to environmental and climate, safe maritime transport, mapping and surveillance of large ocean and coastal regions, offshore renewable energy, fisheries and aquaculture as well as deep-sea and Arctic oil and gas exploration.

Graduates from this program have a unique possibility to become one of over 100 PhD students, which the Department have under education every year. Graduates from Marine Technology have a wide spectrum of job possibilities in an international and wide range of areas.

Ocean Space Centre

Ocean Space Centre is a knowledge centre for future ocean space technology. The new ocean strategy from the government supports the realization of the centre and will make Norway an international centre of gravity in ocean space technology, and is a response to growing internationalisation, advances in technology, the custodianship of the environment and the need for advanced technology in the future.



Students are searching for plane wrecks in the fjord with an underwater robot onboard NTNU's research vessel Gunnerus.



A master student carries out tests in one of NTNU's many laboratories.



The student association owns a sailboat and arranges weekly trips for the students.



A PhD fellow prepares an autonomous subsea vessel (AUV) for operation under ice.

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A picture of happiness

Captain Vidar Strønstad has become the first Norwegian in 16 years to win the Nordic photo contest for seafarers with a shot of a cormorant in flight he took in Rio de Janeiro.



Winner 2016

It was early in the morning and quite foggy, and I was out on my daily tour to inspect activity and progress with the work," says the gratified master, whose ship was docked at the time.

"My intention was to take photos to document what had been done, but capturing good subjects is always at the back of my mind when I've got the camera around my neck."

A seaman since leaving school at 14, he served for many years on fishing vessels in international waters before becoming master of the *Skandi Commander* offshore support vessel owned by DOF.

"The fog sweeping over Guanabara Bay and all the ships lying there created something of a special atmosphere that morning," Strønstad recalls.

"Sunbeams broke through now and again, and I caught glimpses of the ships lying a little way out in the bay. I liked what I saw and squatted down on the quay where we were berthed.

"While I was snapping away, my good 'friend' the cormorant appeared through the fog. He was swimming in my direction, but took flight as soon as he saw me."

Strønstad took a number of shots, and ended up with one which happily attracted praise from others as well as himself.

"Fog, morning sunbeams, a dead calm and a position just above the water combined to create this attractive image. The mooring rope above the bird also helped to produce a good composition."

His interest in photography was aroused by his father, who sold him his first single-lens reflex camera when he was 20. Taking pictures has been his hobby ever since.



WINNER OF THE NORDIC FINAL:
VIDAR STRØNSTAD



VIDAR STRØNSTAD'S SHOT OF MEN ON SCAFFOLDING RECEIVED AN HONOURABLE MENTION IN THE NORDIC FINAL

Cooperation

It also adds to the environment on *Skandi Commander*. His favourite activity is photographing people at work, and he is pleased when cooperation between photographer and crew yields good images.

"My colleagues are incredibly good at making themselves available when I'm taking photographs on board," Strønstad observes.

"Working at sea can appear dangerous, but you can often find good subjects which show a different reality – quiet moments when people are relaxed and taking a break."

A good example is provided by the shot of men working on scaffolding, he says. "The fellow on the left is sending a text to his wife, while the chap fourth from left only needs coffee and a cake for an optimum break."

Strønstad always shares his snaps with the crew, and the shipping company has also registered the master's interest in photography.

"DOF thinks it's great that one of its people takes prizes in photo competitions," he reports. "I got plaudits from the company when I won the Nordic contest."

He is glad of the opportunity to compete, and urges others to take part. "A hobby is good to have when you spend much of your time at sea. I've found the contest a big source of inspiration."

Appropriately enough, Strønstad has used the prize money to buy a camera for his son.

Norwegian
finalists
2016



Vidar
Strønstad's
photo tips



1st PLACE IN THE NORWEGIAN FINAL: BJARNE HOVLAND



- 1 Use your eyes - good subjects can be found everywhere
- 2 When you've found a special subject, take many photos
- 3 Be creative/think along new lines, vary your camera settings, change position/angle where you're standing
- 4 Don't be afraid to use flash in daylight.

Get the
competitive urge

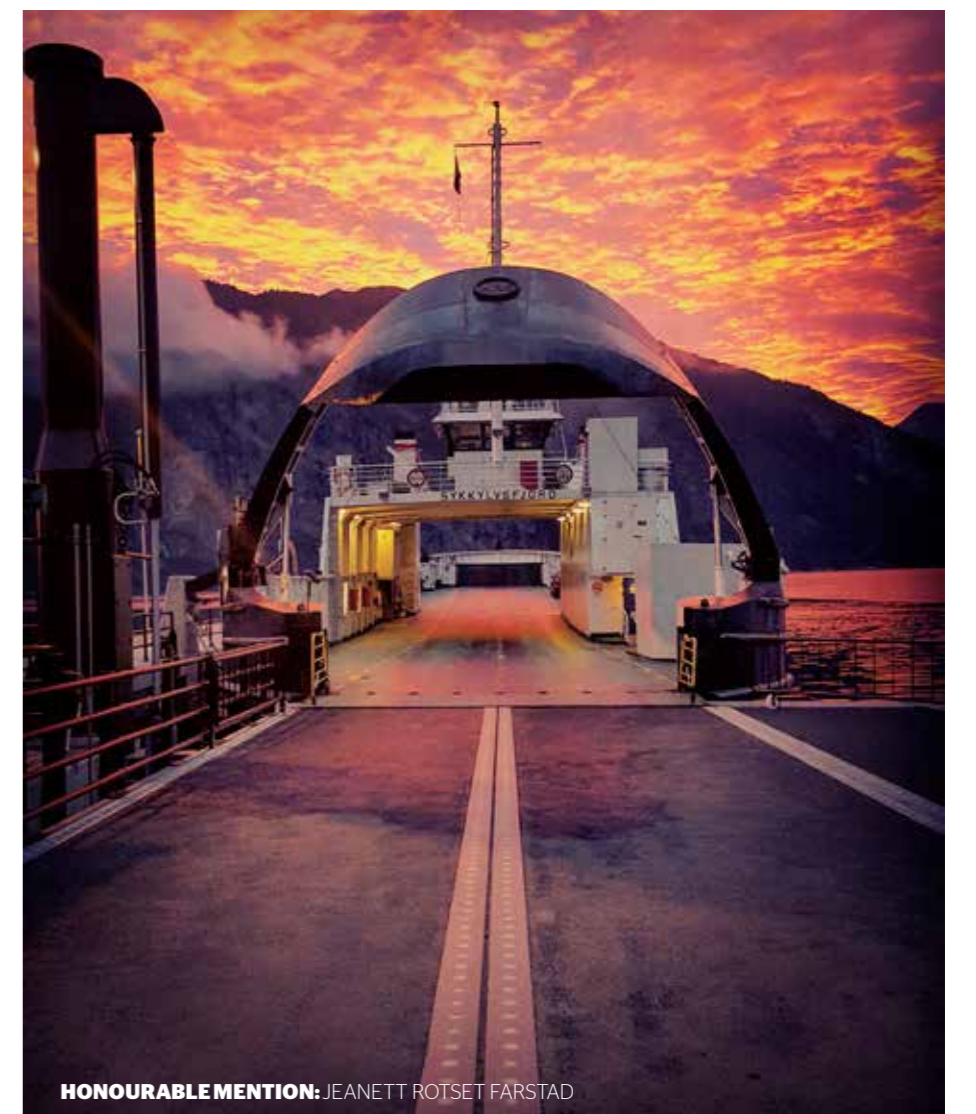
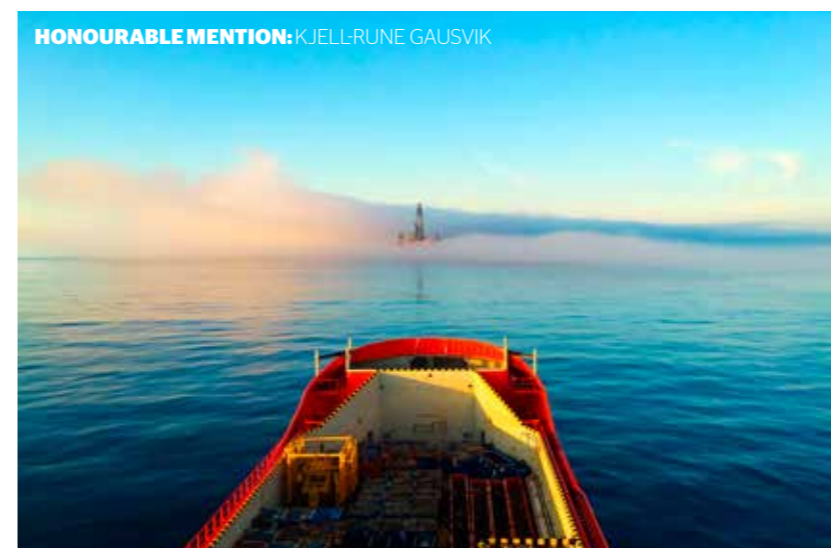
Photo contests for seafarers have been staged since 1949, and annually from 1988 with a Nordic final. Any crew member on Norwegian-registered/owned vessels can submit up to 10 digital photos to this competition.

Each image must be high-resolution (minimum one MB), preferably in JPEG/JPG format and sent as an e-mail attachment. The deadline is 31 December, with winners announced the following January.

The organisers hope seafarers will be inspired to compete, and accept images for the 2017 contest throughout the year. All types of motifs from life at sea are welcome.

These could include pictures of vessels, people, the sea, the coast, animals, life in port - send them in to velferden@sdir.no. The competition rules can be found at www.sjofartsdir.no.

2nd PLACE: HÅKON KJØLLMOEN



Broad-based expertise

The NMA's duties cover a wide range. That calls for a high level of expertise in many disciplines - from international regulations to supervision. Meet some of its able personnel.



TURID STEMRE

Turid Stemre, a senior adviser and naval architect, heads Norway's delegation to the International Maritime Organisation (IMO). She led the work on developing the IGF and Polar codes, which both entered into force on 1 January 2017. She can be contacted at tbs@sdir.no

"Norway was among the countries to initiate work on the Polar Code, which will enhance both safety and environmental protection in these waters."



ELISABETH FØRLAND

Senior surveyor Elisabeth Førland is responsible for fire safety in several projects involving battery-powered propulsion, and coordinated the NMA's work with *Ampere*, the world's first battery-powered electric ferry. She can be contacted at efo@sdir.no

"Fire safety is extremely important. Travelling by battery-driven vessels should be as safe as with conventionally powered ships."



ØRJAN TENDEN-VIE

As a port state control officer, senior surveyor Ørjan Tenden-Vie is responsible for inspections on all types of vessels. He has extensive experience as newbuild project manager for LNG vessels, with vessels to be operated in Polar areas and with tenders for hybrid vessels. He can be contacted at orte@sdir.no

"It's essential to remain competent on and up-to-date with new technology to ensure that Norwegian ships meet the highest safety level and environmental standard."



TONE OLSEN RISNES

Tone Olsen Risnes, senior adviser in the ship registration department, is the coordinator for general enquiries on changing flag to the Norwegian International Ship Register (NIS). She can be contacted at tor@sdir.no

"It's important for us to make the 'flagging in' process as straightforward and seamless as possible, and the shipowner is therefore assigned a single point of contact throughout."



LASSE KARLSEN

Technical director Lasse Karlsen is proud of the fact that the NMA has been a key partner in developing international rules on LNG-fuelled ships. Autonomous vessels are the next step. He can be contacted at lka@sdir.no

"Natural gas reserves are huge, and purified methane in the form of LNG is environment-friendly. It yields much lower emissions than diesel oil."



SVEIN ERIK ENGE

Senior engineer Svein Erik Enge is part of the team which answers questions about flag change. He is also the NMA's technical expert on regulations concerning sulphur emissions and its efforts to enforce the international rules. He can be contacted at see@sdir.no

"Intensifying control of the sulphur content in fuel is a priority. Those who assume responsibility for the environment shouldn't be at a disadvantage compared to those who shy away."



ALF TORE SØRHEIM

Alf Tore Sørheim is head of the section for inspection and emergency preparedness at the NMA. If a ship flying the Norwegian flag encounters difficulties anywhere in the world, his staff is ready to help. He can be contacted at ato@sdir.no

"We're available for Norwegian-flagged ships around the clock on our emergency phone line. Should unforeseen conditions arise, we'll be happy to assist day or night."



LARS CHRISTIAN ESPENES

Senior engineer Lars Christian Espenes heads the Norwegian delegation to the IMO. He can be contacted at lce@sdir.no

"We're fortunate to work closely with the maritime industry when discussing and developing international regulations, and we take advantage of the in-depth and diversified knowledge available in Norway's maritime cluster."



JULIE SYNNOVE BØE is committed to getting her BMI below 30.

PHOTO: Torbein K Garst, NMA

Weighty challenge for chief

Slimming down has become a key mission for mother-of-two and chief engineer Julie Synnøve Bøe (44) after an initial slimming drive to keep her medical certificate went into reverse.



It's time to get to grips with this, and I've given myself until the autumn to get my weight under control again" says Bøe, who faces another mandatory health check in October.

Before that happens, she wants to have her body mass index (BMI) below 30 – the limit for having to submit to a test of her physical capability.

"That's 30 kilograms in 30 weeks – an ambitious target, but I'll manage it," says Bøe. As a union official in ferry company Bastø Fosen and an alternate member of the Norwegian Union of Marine Engineers executive, she knows about action.

Criteria

All seafarers must undergo a mandatory medical examination every other year, and weight is one of the criteria assessed under the heading of physical capability.

Sight and hearing are also tested, and the medical certificate forms part of general safety work. Many shipboard jobs can be physically demanding, and excess weight is one factor which can prevent work being done in an acceptable manner.

Bøe certainly handles big forces. On the Bastø III ferry, she rules over two Wärtsilä engines with an output of 3 300 horsepower each.

"As chief, I'm responsible for all technical equipment on board, and it's important to be able to move about easily and get through narrow openings, for example, or work in confined spaces," she admits.

"The health requirements are also necessary to ensure that everyone is capable of performing their safety functions."

CrossFit and Instagram

The CrossFit fitness regime is giving Bøe

a good start to her hefty challenge, along with paying attention to her diet. She also maintains a generally high level of physical activity.

"It's not hard to put on weight when you're working at sea – lots of sitting around and easy access to food which isn't exactly the healthiest can soon tip the scales the wrong way."

She has refused to eat a single waffle since starting her diet, and urges shipping companies to make provision for physical activity and a healthy diet on board. "Gyms and conscious cooks can make a big difference."

Bøe has opted to be open about her weight reduction programme on the web, and her Instagram account is full of candid posts about how things are going.

"Sharing on Instagram is motivational, both for myself and hopefully for others struggling with their weight," she says, and adds that the occupational health service also gives good support.

"I'd recommend everyone who wants to start a serious weight loss programme to seek help and backing. That makes the job much simpler. Ultimately, however, it's up to me."



Eidesvik with hybrid offshore vessel

Eidesvik is the first Norwegian offshore shipping company to replace generators with batteries. The aim is both to reduce emissions and to get an even better vessel.



Environment-friendly shipping is a priority area for the government and for us," says Jan Lodden, COO of Eidesvik. The company was an early adopter of hybrid operation, and installed batteries to relieve diesel generators in 2016. It is now continuing its commitment with supply ship *Viking Princess*, where a complete LNG generator set will be replaced by batteries.

"Good experience means we're continuing with this exciting project," says Lodden. "We believe it will help to increase our competitiveness in the market as well as being a good environmental measures."

Good combination

The combination of batteries and LNG generators offers a 20 per cent fuel saving on average, and up to 30 per cent when dynamic positioning is used for loading and discharging alongside oil platforms. That means big savings. "We estimate these to be NOK 6-10 000 per day," says Lodden. But fuel consumption is not the only area to benefit from the hybrid solution. "The batteries have much smaller energy loss and warm up much faster than conventional engines, which mean the ship reacts more quickly in the water."

The market trend is clear, and more and more ports demand zero-emission technology on vessels operating in or near them. Batteries on board make it possible to switch to them where required, even if they do not supply enough energy for long-distance propulsion.

Environmental focus

"Innovation for us is largely about the environment," explains Lodden. "Our choice of LNG to fuel supply ships underlines that. In 2013, we celebrated the 10th anniversary of *Viking Energy*, our first LNG supply ship, and we've brought a further four such vessels into operation since then. That makes us by far the world's largest operator of this ship type. We're now phasing in batteries as well as becoming involved in a



Jan Lodden

number of other innovation projects aimed at enhancing fuel efficiency and thereby reducing emissions. We think environment every hour of every day. A clean environment motivates us."





SENIOR ENGINEER Camille Røhme leads the pilot project in the Norwegian Public Roads Administration.

PHOTO: Kristin Svorte.

Fuel for the future

Cutting emissions from Norway's many ferries would eliminate large quantities of greenhouse gases (GHG). And its first such vessel to be powered by hydrogen-electric technology is now in the offing.

Plans call for the first Norwegian ferry to be running on this form of energy by 2021," reports Camilla Røhme, senior engineer and project manager at the Norwegian Public Roads Administration.

With 130 crossings, 200 vessels and an annual turnover of NOK 6 billion, Norway ranks as a big ferry operator and is already a leader for environment-friendly operation in this sector.

The country's first ferry fuelled by liquefied natural gas (LNG) began work in 2000, while the battery-powered *Ampere* began sailing between Lavik and Oppedal in western Norway during 2015.

Guidelines for developing such low-emission vessels have been laid down by the Storting (parliament) to help reduce an annual GHG output calculated to equal that from 200 000 passenger cars.

Instrument

"Government procurement of ferry services represents an important environment poli-

cy instrument, and could contribute to substantial cuts in GHGs," says Røhme.

"The goal is therefore that all such transport links will have requirements for zero- and low-emission technology by 2030, and the hydrogen project is an important element in these efforts."

While battery power is very suitable for many services, it would be inadequate for large and heavy ferries on long crossings. Hydrogen fuel cells aim to overcome such restrictions.

"Our project is very ambitious," affirms Røhme. "The goal is a solution for zero-emission operation where pure battery power would not be sufficient, and that's asking a lot."

Challenges

Much needs to be put in place, including systems for storing and refuelling with hydrogen and for optimising power distribution between fuel cells and batteries.

Energy density in the storage units is another of the technical challenges to be overcome – and a regulatory framework must

also be put in place.

At the moment, no prescriptive regulations exist for using hydrogen as a maritime fuel. As Kolbjørn Berge at the NMA observes, this means a risk-based approval process is required.

He is monitoring the development process closely, and has presented regulations to be utilised in the approval process for hydrogen-electric operation.

Unveiled at a dialogue conference this April in Stavanger, these proposals are intended to ensure that a predictable framework for the process has already been established.

"The international IGF code for ships using gases and other low flashpoint fuels will incorporate both fuel cells and hydrogen in the longer term," Berge points out.

"Until then, however, risk-based approval will be required in line with the guidelines provided by the International Maritime Organisation's maritime safety committee in MSC.1/Circ 1455."

He adds that the NMA wants to ensure that the project does not run into unforeseen problems in the approval process, and has therefore become involved at an early stage.

"Our job is to identify what we call 'show-stoppers', and see to it that the project takes account of everything required to achieve approval.

"The most important consideration is to put in place a process where all relevant risk

assessments are made. Hydrogen is highly combustible, and many avenues must be explored."

Detailed

The project Røhme heads certainly involves a very detailed process. Procurement will be conducted in accordance with the competitive dialogue procedure.

Providing the roads authority secures framework permission from the Ministry of Transport and Communications, plans call for the competition basis to be published in June.

Qualification of bidders will take place in August, followed by a dialogue with those who qualify before they are invited to submit final tenders in May 2018.

The above-mentioned dialogue conference was attended by possible bidders and sub-contractors as well as relevant government agencies.

Construction of a first hydrogen-electric ferry is expected to start in December 2018, and Røhme admits this represents an ambitious timetable.

"But we're confident that efficient cooperation and detailed dialogue will make it feasible," she emphasises.

Røhme sees big development opportunities with the project, and points out that Norway is already a leader for zero- and low-emission operation in the shipping sector.

"This project will give us even more of a lead in terms of expertise," she believes.



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Green shipping – gold for Norway

Extensive work is currently under way in Norway's maritime sector to develop tomorrow's emission-free shipping industry. The Maritime Battery Forum and the Green Coastal Shipping Programme are two of the players working energetically to promote the green shift.

We have an ambitious vision," says Sondre Henningsgård, managing director of the Maritime Battery Forum. The goal is to make the Norwegian maritime sector a world leader for battery-powered value creation.

Leader for batteries

"Norway already occupies a leading position internationally, with about half the world's 100 electrically powered vessels in operation," reports Henningsgård.

"Moreover, we have a complete cluster of players, from battery manufacturers to shipping companies and government agencies committed to batteries. The ferry segment in particular has come a long way, but a lot is also happening in the offshore, fishing and maritime freight sectors.

"All parts of this industry come together in the Maritime Battery Forum to discuss opportunities and challenges at our member meetings and conferences, as well as in specific projects. And they come from all parts of the world."

Many advantages

Batteries have many advantages, Henningsgård observes. They can utilise renewable energy for charging and release no emissions during operation. Moreover, their efficiency is unbeatable and they are silent. Less has been heard about their low response time, which is enough to justify battery use on its own.

"While mechanical systems take time to warm up, batteries and electric motors reach maximum output the moment they are turned on," says Henningsgård.

"That means your system responds faster, which increases safety."

In many cases, more engines than necessary are used for safety's sake in handling load changes. Batteries can respond to such changes more quickly, making it possible to run fewer motors closer to the optimum.

The drawback with batteries is their relatively low energy density, Henningsgård accepts. "Pure battery operation works fine over short distances – ferries provide a good example. Tomorrow's large-scale systems will probably be hybrid solutions with batteries as the key component.

"Ships operating on low load can run on batteries close to port and during such operations as manoeuvring in port and crane operation. Batteries can be used for far more than straightforward propulsion."

Huge opportunities

Prime movers in the green shift include DNV GL, a key player in founding the Maritime Battery Forum. Narve Mjøs, director for maritime battery systems at the classification society, is also programme head for the Green Coastal Shipping Programme. This public-private partnership has been founded with government involvement to establish Norway as the world's most efficient and environment-friendly coastal shipping nation.

Mjøs envisages huge opportunities for green shipping technology, both as a climate measure and as an export product for Norway's maritime industry.

"Shipping is already one of the country's biggest industries, with 110 000 employees, and the clear leader among our export sectors apart from the petroleum sector," he says. "And Norway is also a

leader for green technologies, with LNG and battery operation in place and now also several ambitious projects utilising hydrogen fuel cells.

"The Norwegian maritime community is unique in the sense that a number of ambitious joint projects have been established, where many players are driving innovation together. This is efficient, because innovative solutions often arise at the interface between industries and technologies. We're getting payback here from the Norwegian spirit of cooperative action."

Must see the whole picture

All the studies conducted by the Green Coastal Shipping Programme show that new types of fuel are needed to reach the climate goals Norway is committed to under its agreement with the EU and the Paris accord. Shipping emits substantial volumes of greenhouse gases and additional harmful substances and, despite other measures to protect the environment, a transition to low-emission technology is needed with the ultimate aim of zero emissions by 2050. That will call for a big effort.

"Everyone must pull together here, and it must happen now," says Mjøs. "Infrastructure, expertise, regulations and technology must be established in parallel, and that's a challenge. But it's crucial that we exploit this window of opportunity."

Big international interest

The Green Coastal Shipping Programme, which won the *Lloyd's List* global environmental prize in 2015, is now in phase two. After conducting extensive analyses and barrier studies, and launching five

pilot projects in the first phase, five more pilots are underway in the latest stage. These cover a plug-in hybrid biofuel ferry (Torghatten), autonomous emission-free freight transport (Kongsberg Gruppen), fish transport from road to sea (Kystrederiet), hydrogen-driven high-speed vessels (Flora local authority) and tomorrow's fishing vessel (Fiskebåt). The common denominator for this commitment is advanced environmental technology – and the experience and results obtained will benefit the whole industry.

"These technologies are attracting great interest from abroad," report Mjøs. "We're in a unique win-win position here. We can contribute to meeting national goals and commitments for greenhouse gas emissions while also developing an export industry of significance for the global environment, with thousands of jobs in Norway. The Maritime Battery Forum is already working internationally.

"Our success depends on a close and open collaboration between industry players and government. A lot depends on the political will to implement this."



Narve Mjøs

"Tomorrow's large-scale systems will probably be hybrid solutions with batteries as the key component."

Sondre Henningsgård



THE NEW KRISTIAN WITH – a hybrid LNG and battery vessel – is one of the pilot projects in phase 2 of the Green Coastal Shipping Programme. This project is owned by Kystrederiene.


Grønt Kystfartsprogram


Maritime Battery Forum

More about the Maritime Battery Forum: maritimebatteryforum.com
More about the Green Coastal Shipping Programme: www.dnvgl.no/maritime/gront-kystfartsprogram

“Lighthouse has now seven ships engaged in international bulk traffic. All are NIS-registered.”



LIGHTHOUSE SHIPHOLDING opted for the NIS. It is not alone in making this choice.

PHOTO: Lighthouse Shipholding

Registering progress

Changes to the regulations are not the only reason for the current expansion in the Norwegian International Ship Register (NIS), says Anita Irene Malmedal, head of the ship registers at the NMA.

The NIS was opened on 1 January 2016 for cargo ships operating between ports along the Norwegian coast. Malmedal describes the consequent sharp increase in new registrations as gratifying.

“Restricting the service area of NIS vessels meant that much of the traffic along our coast went to foreign-registered tonnage,” she points out. “We’re pleased that many owners are now choosing to register these ships in the NIS.”

The goal when creating this register in 1987 was precisely to ensure that vessels associated with Norway, via ownership or technical/financial operation, could fly the national flag.

But excluding vessels plying along the Norwegian coast had exactly the opposite effect, and removing this ban means these

ships can once again secure registration in Norway.

“The regulatory changes also opens the door for construction support ships – in the offshore industry, for example,” explains Malmedal. “That’s another important Norwegian shipping segment.”

Increase

But she would not attribute last year’s NIS tonnage increase of no less than 8.5 per cent solely to the entry of fairly small vessels engaged in coastal traffic.

Both tankers and bulkers are represented in this growth, and Malmedal believes that the NMA’s reputation and commitment to customer service and new technology are also strong attractions.

“We see that shipping companies use us differently than before. I think having a stable and well-run flag state behind you is seen as a big advantage in today’s demanding maritime sector.”

She adds that the NMA has made a big commitment to being a good partner for the companies, not least with regard to new technology.

Fuel technologies and autonomous ships are examples of such advances, and the NMA is an active contributor to getting these innovations incorporated in international regulations.

Fruit

“The efforts we’ve made in recent years are starting to bear fruit,” Malmedal emphasises. “More and more players with new technology are choosing to register in the NIS.”

She reports that the NMA and the NIS are prime movers in the processes which open the way internationally for technological innovation.

One example cited by Malmedal is the Polar Code, a new international standard for ships sailing in north or south polar waters.

“The melting of the ice caps will increase

maritime traffic in these areas, and Norway has been very concerned to help ensure that such activities take place in a safe and sustainable manner.

“This has produced an international code covering all aspects relevant for vessels in polar waters, from design and construction, through requirements for equipment, training and search and rescue, to environmental protection.”

Potential

Malmedal wants an even bigger and more robust NIS in coming years, and sees a big growth potential. The Norwegian-controlled fleet in foreign service is still large, and many of the vessels are registered abroad. She is keen for their owners to choose the NIS.

“This register backs up the shipping companies with a serious and heavyweight player, and not least one with an international presence.

“Norway has a broad-based foreign service, for example, which can support companies in the event of such incidents as pirate attacks or accidents.

“Nothing suggests that choosing Norway as your flag state involves any additional financial burden, and we look forward to receiving new registrations.”



ANITA MALMEDAL
Director, Norwegian Ship Registers



Reasons for choosing the Norwegian flag

The grant scheme for seafarers is, in addition to the excellent service offered by the NMA, one of the most important reasons why ship-owners choose the Norwegian flag. The grant scheme also contributes to an increased number of Norwegian seafarers and thus enhanced maritime competence. Other advantages of flying the Norwegian flag:

- The NMA has an officer on call 24 hours a day for urgent matters and inquiries
- Our skilled workforce demonstrates a high level of expertise and customer focus
- Norway is leading the way in green shipping and fuel development
- The NMA is constantly developing new digital solutions for their customers
- Norway offers a safe framework, longevity and stability
- Norway’s comprehensive code of maritime law assures owners, managers and creditors that the NIS represents a safe and professional alternative
- Norway is in the top 10 on the Paris MoU whitelist
- Registration of vessels, their ownership and encumbrances is possible from 7 a.m. until midnight every day except Sundays and international public holidays
- Ships registered in the NIS fly the Norwegian flag and are subject to Norwegian jurisdiction
- Norway has consulates in 164 countries



FRODE BJØRKLUND, CEO

Opted for the NIS

Lighthouse Shipholding has chosen the Norwegian International Ship Register for its seven dry bulk carriers. “Several factors influenced that decision,” says CEO Frode Bjørklund.

The company became operational in 2015 with two Ultramax dry bulkers, and expanded its fleet by three new vessels of the same type the following year.

It now has seven ships engaged in international bulk traffic. All are NIS-registered, and Bjørklund highlights three principal reasons for flying the Norwegian flag.

“The NIS is extremely helpful and available during the registration process, and all transactions related to new entrants – such as encumbrances – progress easily and smoothly.

“Lawyers and other people involved are naturally very familiar with these procedures, but it’s very reassuring for me as CEO to meet such helpfulness and good service.”

He adds that NIS registration ranks as a

stamp of quality, with a high reputation in the international shipping community.

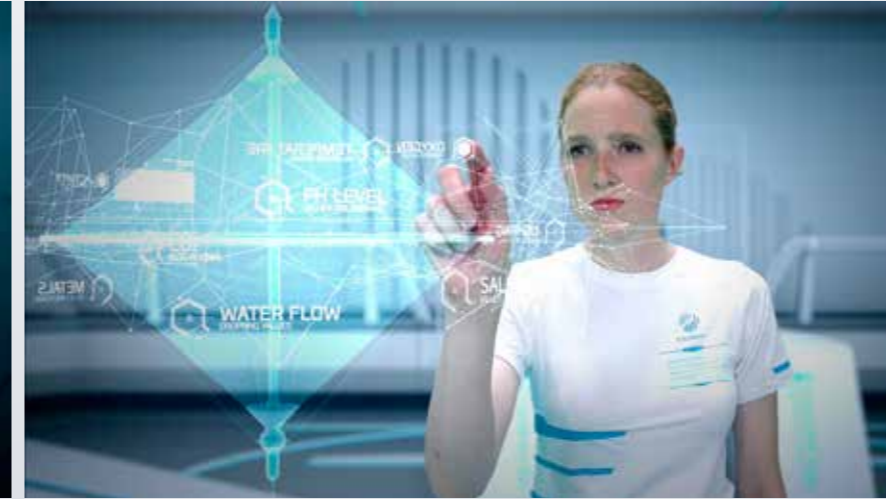
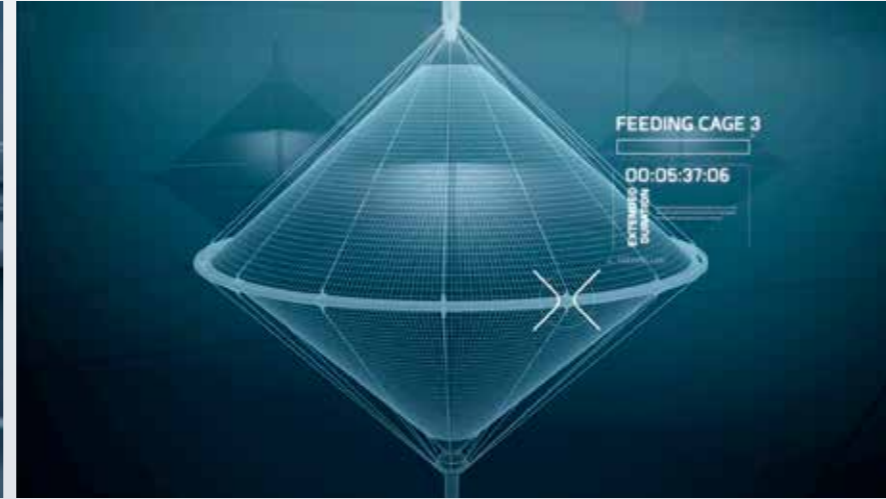
“This sends an important signal to customers, creditors, insurers and port authorities worldwide. The NIS is recognised as being a quality flag.

“In addition, it’s known for close and good follow-up of ships in the register. The Norwegian flag signals good management, and actually simplifies operation of the vessels.”

The Egersund-based company runs its ships from Hong Kong, but Bjørklund openly admits that some sentiment also lies behind the NIS registration.

“This choice reflects a little touch of patriotism. It feels right to fly the national flag. We’re also Egersund enthusiasts, and all our ships have it as their home port. NIS registration makes that possible.”





Steinsvik – high-tech for practical use

Robust high-tech solutions for demanding conditions have been Steinsvik's business concept since it started in 2004, but its roots go back to 1966. Headquartered in Tysvær outside Haugesund, the company is now a global group delivering high-tech solutions to the aquaculture, petroleum and maritime industries. It has big ambitions.



We're working actively to develop tomorrow's solutions in our business areas," says CEO Bjørnar Apeland at Steinsvik AS. He believes artificial intelligence, automation and autonomics have a huge potential across the company's whole range of activities, and takes fish farming as an example.

"Since we accomplish this in the sea, where everything is in continuous motion, it can obviously be transferred to alternative areas such as other types of underwater operation and monitoring on autonomous ships. We have a clear ambition of expanding our presence in the maritime segment, for example."

Optimised production

"We're delivering a number of computer systems to the aquaculture sector today which handle production follow-up for salmon from egg to slaughter," Apeland relates. Advanced computing technology combined with high-tech hardware gives the fish farmer a completely different basis for efficient and profitable operation.

Products include the NOVA feeding raft, which can carry up to 850 tonnes of salmon feed and is crammed with advanced computer systems. The raft is rigged for the future, and imagination is virtually the only limit to what can be done with it in purely technological terms. Advanced camera systems not only provide visual monitoring of underwater conditions, but also register vital data such as temperature, salinity, currents, overall biomass and even salmon lice – in other words, a camera from Steinsvik is not just a camera, but a multisensor.

Many areas of application

"This system is capable of counting pellets as well as measuring the size of a salmon and its condition in the sea," says Apeland, who sees many applications for the technology.

International technology group

Branches in Scotland, Chile, Vietnam, Canada, Oceania and Estonia, as well as number of offices along Norway's coast, bear witness to a broad international presence for the Norwegian group. It develops its own designs and technology, and has a unit for software development in Vietnam where 50 bright brains work to create tomorrow's high-tech solutions. Apeland envisages rapid progress, with the various operations related to aquaculture, for example, being integrated in intelligent automated logistical solutions.

"Digitalisation and artificial intelligence have the potential to revolutionise operations and create the basis for completely new logistical solutions and optimised measures," says Apeland enthusiastically. "The person feeding the fish can sit shoulder to shoulder with the operator of autonomous ships to freight salmon taken from the cages on the basis of real-time data about available biomass in the sea. Transport times can be cut and products tailored for the market to an even greater extent than today. The result could be an even more profitable industry and, not least, even better products on dinner tables worldwide."



STEINSVIK



ENTHUSIASTIC SEASCOUTS in full activity.



PHOTO: Søgne Sea Scout Troop/Steinar Monsen

Helping to make life at sea safer

The enthusiasm displayed by Steinar Monsen, leader of the 1st Søgne Sea Scouts in southern Norway, for maritime life and safety gets good backing from the NMA's support scheme for safe boating. Aged from seven to 20, the 90 members of his troop pursue extensive activities on the water, with sailing and life-saving as key elements.

"We'll be sailing non-stop to the Trøndelag coast on the way up, so it'll be a demanding run," says Monsen enthusiastically. "Some scouts will be taking their engineer badge, while others will qualify as cooks and stewards."

"Everyone will be bunking on board, and they'll be learning to navigate in darkness and the Midnight Sun with the aid of brand-new paper charts."

"This will be a big experience for all participants," affirms the north Norwegian, who has personally taken the lengthy voyage along the Norwegian coast several times.

"Many of them have never been further north than Bergen. Once we pass that point, they're really going to learn what high and low water means. A two-metre range makes very different demands on mooring."

Supported

The NMA has supported the voyage and the training in Bodø with a grant of NOK 65 000 under the safe boating scheme established in 2014. This aims to prevent accidents and boost environmental awareness and enjoyment among pleasure-boat users.

An annual sum of NOK 1 million is shared out on application between voluntary organisations organising safe boating activities for children and young people.

Additional support for the scouts from the Gjensidige Foundation and local sponsors means that the cost per youngster will be low. Giving everyone a chance to take part is important in the scouting movement.

"We believe this support scheme for voluntary associations will initiate a number of good safe boating activities directed at children and young people," says NMA director general Olav Akselsen.

"Expanding the geographical range of such activities will ensure that many members of this target group learn safe boating. Combined with annual campaigns directed at risk areas in pleasure boating, this will focus attention on changing attitudes among pleasure-boat users."

Want to apply for support?

Are you planning activities to promote safe boating among children and young people? Find more information about the NMA's support scheme (in Norwegian only) at www.sdir.no/tilskuddsordningen/. The application form for 2018 will be available from 1 October, with the deadline for applications set for 1 November 2017.

This is in line with the general orientation of the sea scouts, who are basically to be found in parts of Norway where the watery element occupies a central place for many people.

That makes active training in safe boating all the more important, and Monsen highlights two projects which have both received financial support from the NMA.

Lifejackets

"We staged a test of inflatable lifejackets in connection with our Whitsun camp in 2016," he reports. "We sent the youngsters out in a boat and capsized it."

The aim was to identify how good the jackets actually were, and the results were an eye-opener – every sixth jacket failed to function, regardless of whether they were new or old.

"This equipment is hardly appropriate

for children, and even adults should check such jackets carefully," says Monsen, who has been a sea scout leader for five years.

"I grew up at Saltdalen in northern Nordland county, so boating is innate. This is a great way of pursuing outdoor activities."

Armada

The next big project is planned for this summer, when an armada of eight fishing smacks and two other boats leaves Sandnes near Stavanger on 16 June and sets a course north to Bodø.

A total of 130 crew will be taking part in this long voyage and, on arrival, more than 2 000 regular scouts attending the 2017 national jamboree will be getting lessons on safe boating.

After a change of crew in Bodø, the excursion will continue around the Lofoten islands further north before 130 new sea scouts sail south to reach home on 1 August.

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HOW YARA AND KONGSBERG GRUPPEN envisage their new commitment.

ARTIST'S IMPRESSION: Yara

Innovative concept gets real

Plans to build the world's first autonomous and emission-free container carrier have been unveiled jointly by Norwegian chemical group Yara and technology specialist Kongsberg Gruppen.

This is exciting news, and shows that Norway's maritime sector is becoming one of the drivers for such technological development in green shipping," says NMA director-general Olav Akselsen.

Due to be named *Yara Birkeland*, the planned vessel will be the world's first fully electric autonomous container carrier with zero emissions.

It is scheduled to come into service in the last half of 2018 to ship products from Yara's factory in Porsgrunn south of Oslo to the ports of Breivik and Larvik further down the coast.

"We're proud to work with Kongsberg to realise the world's first autonomous, all-electric vessel to enter commercial operation," says Svein Tore Holsether, president and CEO of Yara.

Kongsberg Gruppen is responsible for developing and delivering the technology in the project, including the sensors and integration needed for remote and autonomous operation.

The company's delivery will also embrace the electric drive, battery and propulsion control systems, it reports in a joint press release with Yara.

"By moving container transport from land to sea, Yara Birkeland is the start of a major contribution to fulfilling national and international environmental impact goals," says Geir Håøy, president and CEO of Kongsberg.

"The new concept is also a giant step for-

ward towards increased seaborne transport in general."

Since this innovative project will also challenge the maritime regulatory regime, the NMA is playing an important part in its development.

"It's important and positive that those who are now developing new solutions involve the NMA and other relevant agencies at an early stage," says Akselsen.

"That gives us an opportunity to work with the industry to find solutions for the challenges which might arise in relation to regulations and safety, for example."

Much is now happening with new technology involving fuel, autonomous operation and so forth. The NMA has therefore allocated dedicated personnel able to acquire expertise in these areas.

"It's both important and exciting for those of us who need to learn about technological advances to be involved with these projects," says Svein David Medhaug.

He is responsible at the NMA for his team of experts working on issues related to automation.

"A lot of innovation is happening in Norway's maritime sector. In line with our strategic plan, we'll also help to establish these Norwegian advances as international standards."



OLAV AKSELSEN, NMA director general.

“It's important and positive that those who are now developing new solutions involve the NMA and other relevant agencies at an early stage.

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NEW MARKETING MANAGER Caroline Stensland and communication director Dag Inge Aarhus are looking forward to a good collaboration.

PHOTO: Steinar Haugberg/NMA

Managing a stronger image

The NMA wants to become more visible, and recently appointed a marketing manager. "This is an important step in our external profiling," says communication director Dag Inge Aarhus.

He is pleased to be able to present Caroline Stensland in this new role. British-born and with an economics degree, she has lived in Norway since 1994 and is very interested in the maritime sector.

Combined with a broad background in public sector work, her market communication and political lobbying experience made her a clear first choice among more than 50 applicants for the post.

"It's not that usual for Norwegian government agencies to have marketing managers, but we're keen to strengthen our external

image – particularly in connection with the NIS," says Aarhus.

"Stensland's job will primarily be active promotion of Norway as a flag state. She'll play an important role in efforts to bring more ships under our flag, and we have great expectations."

Top of the list are Norwegian shipping companies with vessels registered in foreign flag states. "We see big opportunities in this segment," Aarhus emphasises.

Motivated

Stensland herself is extremely pleased, describes herself as very motivated, and clearly

"I've always been very interested in the maritime sector, and have even led an advertising agency directed at the industry."

sees this post as a dream job.

"I've always had a keen interest in the maritime sector, and have even led an advertising agency directed at the industry. This is an incredibly interesting job, where I'll be able to put my skills and experience into practice."

She was interviewed on her first day at the office, and had already been in meetings with members of parliament (the

Storting) for the Labour Party and on digitalisation of the industry.

The next step is to become familiar with the NMA. "There's a lot to get to grips with, but it's something I'm really looking forward to," she says.

"And I'm looking forward to collaborating with a full-blooded marketer," adds Aarhus with a satisfied nod.



Brødrene Dahl – excellence in valves and pipes

Brødrene Dahl has for more than 40 years supplied valves, pipes and actuators to over 500 vessels. There is a ship sailing every ocean with Brødrene Dahl equipment on board. The company is expanding, both in Norway and internationally, and has operations in Romania and Vietnam.

Three factors in particular are mentioned by Brødrene Dahl's customers to describe their deliveries. – We have unique logistics securing quick deliveries and reducing customers' stock cost.

We are advisors throughout the design process, and so ensures the best solutions. And not least, we continuously work to supply the best products. These three factors are the most important ones when our customers describe us, says Mr Roar Hagen, Marketing Manager Industry in Brødrene Dahl.

Logistics are important

Customers need delivery just in time. Brødrene Dahl has a unique logistics and a warehouse system ensuring quick delivery, both for building and maintenance.

– Our warehouses reduce the customers'

costs because they do not need large stocks of spare parts. They can trust us, Mr Hagen confirms.

Brødrene Dahl is Norway's largest specialised company for pipes and fittings. – We have experts who can give advice on design and maintenance. Doing so will often result in better and more reasonable solutions. It is all about knowledge, also in our business, Mr Hagen says.

Cooperating with the best

Brødrene Dahl cooperates with leading producers of pipes, valves and actuators all over the world. – We work with suppliers to develop the best solutions. The latest is Dikkan, a new main supplier of marine valves. Many customers will see improvements compared with competing products, ends Mr Roar Hagen of Brødrene Dahl.



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Höegh LNG – a global natural gas player

Favourable LNG prices due to growth in production capacity, fluctuations in national energy production and focus on energy security are among the reasons why the global LNG market is growing.

“More and more new LNG importers want safe and stable natural gas deliveries, and we see a great potential for growth in the coming decades,” says CEO Sveinung Støhle in Höegh LNG, a world-leading supplier of floating LNG import terminals.



Independence, Lithuania



PGN FSRU Lampung, Indonesia



Neptune, Turkey

FSRU - Floating Storage Re-gasification Unit - is in principle a terminal that converts liquefied natural gas (LNG) to gas and sends it into the on-shore gas grid, or directly to a power plant. The specialised units thus function as import terminals for natural gas, a necessity for anyone who uses gas for energy production. With more than 40 years of experience from the LNG market, Höegh LNG was among the first to develop the FSRU market ten years ago. Today, six of 24 FSRUs in operation globally are owned and operated by Höegh LNG. The company has four additional units under construction at Korean shipyards, and has options for additional six.

International market

The use of floating LNG import terminals has major advantages over the construction of land-based import terminals. Delivery times and costs are significantly lower - about 50%. Additionally, the floating units do not occupy valuable land, and offer great flexibility since they can be relocated and trade as LNG carriers. More and more markets see the benefits of FSRUs, says Støhle.

“We currently have units operating in Indonesia, Lithuania, Colombia, Egypt and Turkey, and have contracted entities in Ghana, Chile and Pakistan that are still under construction,” says Støhle. “We see great opportunities and increasing demand for this technology and have positioned ourselves with one available

FSRU under construction at any time. “That positions us for projects with short lead times and gives us flexibility in the market,” he continues.

Strategic drivers

Natural gas has become an affordable source of energy, and there can be significant savings compared to alternatives like oil products and coal. The strategic rationale for importing LNG and utilising an FSRU as import technology varies from country to country and region to region. Some countries are experiencing seasonal variations in national energy production, while others suffer from declining national production of natural gas. At the same time, energy demand increases with increasing living

standards, and for some countries there may also be geopolitical assessments underlying.

“Höegh LNG is only involved on the infrastructure side and takes no position in the commodity. At the same time, we see ourselves as a global driver for the development of industry,” says Støhle.

Capital-intensive industry

Energy supply is a critical part of a country's critical infrastructure. In addition, the industry is capital intensive, and deliveries are technically advanced. As a consequence, customers have high expectations and requirements to a supplier of FSRUs. With long experience, a solid organisation and in-house departments for technical development,

project execution, finance and fleet management, Höegh LNG is well equipped for the task.

In 2016, the company's FSRUs had a technical availability rate of 99.9% and a

lost time injury rate of zero. It is important to highlight the around 500 maritime personnel on-board that make up a very important part of our team, Støhle emphasises.



Höegh Grace, Colombia

Solid company

Total contractual revenue of around USD 6.2 billion, or close to 50 billion NOK over the next 20 years gives Höegh LNG a solid capital base for further expansion. The company has been listed on Oslo stock exchange since 2011 and has a subsidiary listed on the New York Stock Exchange since 2014. In addition, Höegh LNG is active in the bond market and thus has diversified access to capital to secure further growth.

“Höegh LNG is a market leader in a growing FSRU industry and is well positioned to further develop its leading role in the coming years,” Støhle concludes.



SVEINUNGSTØHLE, CEO



HÖEGH LNG



PHOTO: Helga Maria S. Sundin/NMA
STEINAR HAUGBERG AND TORBEIN K GAMST are leading work to create the My page service for seafarers.



Portal promises better backup

A new web-based service is set to make it easier for Norwegian seafarers to check the information held by the NMA on their certificates and qualifications.

This "My page" facility will be launched at the end of 2017 to supplement the electronic application form for certificates already provided by the authority for a number of years.

Some 11-18 000 requests for certifications from seafarers are dealt with every year, says project manager Steinar Haugberg at the NMA.

Portal

"The new service will be a digital portal similar to others provided by government bodies, such as the Norwegian State Educational Loan Fund," he explains.

"Users will be able to log in around the clock and get an overview of the data we hold on them. That includes existing certificates and their expiry date.

"The status of any applications in the approval process will also be shown. And sea-

farers will be notified in good time before renewal deadlines."

In addition, the portal will present the status of the user's medical certificate and provide an overview of their qualifications in the form of education and courses.

The goal is to improve the support available to the 35-40 000 seafarers who hold certificates issued by the NMA, Haugberg reports.

Important

"Keeping certificates and qualifications updated is very important for seafarers," he says. "We hope to make the job easier and significantly increase accessibility and the level of service."

He guarantees that the information will be secure. "Data protection is an important aspect of the project, which we're treating very seriously. And making the site as easy as possible to use is another key target."



Green commitment in Førde

Multi Maritime has designed more than 120 tailor-made vessels since its creation in 1983, ranging from icebreakers, tankers and MPSVs to ferries. In recent years, the company has been an important player in developing the use of alternative fuels - including a number of gas- and battery-powered ferries conceived on the drawing board at the Førde-based company.

We've developed very broad expertise, and work actively to optimise each vessel and exploit the whole potential offered by new technology," says CEO Gjermund Johannessen at Multi Maritime. He leads a company with 35 specialists who serve customers worldwide. The main field is ship design and engineering, but consultancy and specified technology package solutions are also offered. "We're entirely independent and concentrate on the client's needs without any form of constraint, and can thereby sew together the best overall solution regardless of who delivers the equipment."

Systematic work concentrated on en-

ergy efficiency and implementing forward-looking solutions has made Multi Maritime today's leader in developing and using environmental technology on ships. It has developed and delivered design and engineering to all the Norwegian battery-powered ferries currently under construction by a number of yards at home and abroad. In addition, a number of newbuilt or converted ships with battery solutions combined with LNG or (bio)diesel are on its reference list. Multi Maritime also has a large number of LNG-fuelled vessels among its references, including car ferries, passenger ships, cargo carriers and LNG bunkering vessels.

Johannessen points to energy utiliza-

tion as one of the biggest advantages with batteries.

"Battery-driven vessels typically have 85 per cent energy efficiency from land-generated electricity to the propeller. The corresponding figure for conventional vessels is typically 35 per cent. This is a good argument in itself for electric propulsion." Development manager Arvid Holsen adds: "And that's before you take emissions into account. It's nevertheless very important that both main and auxiliary systems are arranged to utilise energy-optimised battery and hybrid solutions, and thereby exploit the potential to the full."

Long experience with batteries and gas means Multi Maritime is well placed to tackle the next generation of technological innovation - maritime use of hydrogen cells in combination with batteries. "We're involved in a pilot project," says Johannessen, who can also report new and exciting projects centred on hybrid technology. MM 80 CC LNG Hybrid is the designation for a brand-new coastal freighter concept which exploits the benefits of batteries in combination with LNG.

"This vessel is designed for transport along the Norwegian coast, where batteries alone can't deliver sufficient range," Holsen explains. "Instead, we

can use batteries to optimise fuel consumption and to provide port navigation and operation free of noise and emissions. Furthermore, the ship is equipped with a number of exciting technologies. We're exploiting the kinetic energy in the cranes to charge batteries, for example." Derived from the Green Coastal Shipping Programme, this vessel will soon be under construction.

"Battery operation in ferries has given us broad experience, which we'll also be applying to other types of vessels," says Johannessen. "This is an important step and the future for Norway's shipping industry."

"Battery operation in ferries has given us broad experience, which we'll also be applying to other types of vessels."

Home from home proves big draw

A new international welfare centre for seafarers opened in Bergen on 24 May last year has proved highly popular, with 2 500 visitors during its first 60 days alone.

Crew can get internet access here, have a cup of coffee, learn about Bergen, store their luggage or just take a break from life on board," explains Per Erik Nielsen at the NMA.

He has been involved in building up the facility, and can report that its users are primarily personnel from cruise ships visiting western Norway's leading city.

"The biggest attraction is internet access," Nielsen notes. This reflects the fact that life at sea can still be tough for people spending up to nine months away from their families.

Internet connections on ships are often unstable and very expensive. So an opportunity to maintain contact with loved ones at home is among the centre's most important attractions.

All the signs are that the NMA has hit

the bull's eye along with its partners, the Port of Bergen and the European Cruise Service. The latter has donated furniture and fittings.

"We attracted some 3 700 seafarers last year from the opening until the season ended," reports Nielsen. "At peak, we've had 100 visitors at one time."

This year's goal is 7 000, he says. "We're shut from November to February, but cruise ships are increasingly arriving in these months for the Northern Lights. So plans call for year-round operation from 2018."

This type of facility is meant to rest on voluntary efforts, and the willingness of retired masters and others to participate in a

watch system will be crucial for the future.

"The centre is intended to be a welcoming place for seafarers who're far from home," says Nielsen. "We seem to have succeeded well with that."

"This is a good example of how we can discharge our duties to crew," says Lars Alvestad, head of the NMA's department for vessels and seafarers.

He hopes to see more such facilities along the Norwegian coast: "We want this to be the start of a service available in a number of strategic ports."

"Here, we depend entirely on port authorities and local councils accepting their responsibilities as part of the coast state's role in such work."

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Prime minister Erna Solberg met 22 wartime sailors on 27 October 2016 at the initiative of Hans Herman Horn. (Photo: Torgeir Haugaard, Armed Forces Media Centre)

Supporter Hans Herman Horn (left) with Audun Myhre, director of the Archive Foundation.

Honouring Norwegian seafarers

More than 40 000 Norwegian and foreign seafarers on Norwegian ships made a heroic commitment during the Second World War. They were responsible for Norway's biggest and most important contribution to the Allied victory. The Wartime Sailors Register (Krigsseilerregisteret) has now begun the work of honouring these seafarers and sharing their stories.

The Norwegian Centre for Wartime Sailor History at the Archive Foundation (Stiftelsen Arkivet) researches, communicates and documents the history of these seafarers. It communicates through www.krigsseilerregisteret.no, which has so far documented and honoured almost 21 000 wartime seafarers and their histories.

"Their significance was great, but so were their losses," says Bjørn Tore Rosendahl at the centre, who notes that it is doing an important job. "The register provides a digital monument which honours both those who died and those who survived. In this way, the history of the seafarers will also be documented and related in a new way. We must learn from history and establish interpretative frameworks, understanding and involvement in order to create greater space for human dignity today.

"Through the register, very many descendants of these seafarers can learn for the first time more about what their father, grandfather, uncle or aunt experienced during the war. This history was often repressed, with little said about it afterwards. In addition, the wartime seafarers are receiving recognition for the job they did."

He adds that much of this information has hitherto been unavailable to ordinary people. Materials in Norway's National Archive form the main basis for the register, with volunteers from the Oslo Seafarers' Association contributing to the digitalisation of one million documents. These sources provide information on who the wartime seafarers

were, and when and on which ships they sailed.

"Everyone gets their own home page on our website," explains Rosendahl. "You can also find other documents of possible interest, such as letters and photographs. It's important to collect and preserve this documentation for posterity before it gets lost."

The Kristiansand-based centre has therefore established a private archive scheme to accept such documentation about the seafarers. Seafarers' associations are also contributing by collecting materials for the centre.

Voluntary work

"The register is the visible and massive bit we work on, and we collaborate over this job with about 60 volunteers from seafarers' associations and others throughout Norway who've been trained in registering wartime sailors," explains Rosendahl. "We have a particularly good and close collaboration with the Lille-sand Seafarers Association, and run the register in partnership with it. We also employ historians to ensure that the work is done properly and that what we communicate is credible and trustworthy." A historian himself, he is currently completing a PhD on the history of the wartime sailors.

Deserve hero status

Hans Herman Horn has made a significant contribution to the register by taking the initiative to speed up the project. That has been made possible through a wide-ranging collection effort

at his own expense.

"This is important for several reasons," he says. "The wartime sailors never received the recognition they deserved for their significant contribution during the conflict in their own lifetimes, and I want to help ensure they get it now. And Norwegian society must never forget.

"Norway's merchant fleet contributed to the Allied victory by shipping oil and other necessities which kept the wheels turning. We owe these people a debt of gratitude, and they must not be forgotten. A register of those who survived and those who died is therefore incredibly important. I don't want my children and

Further financing is required to continue developing the register, reports Rosendahl. "Horn has so far been a committed and crucial supporter in securing the funds for faster completion of this work. On 26 April, we could celebrate that the collection target of NOK 3 million had been reached. The Storting (parliament) provides an annual grant. But we still need more partners and further backing for the register, the documentation work and our research. So we want to establish contacts with others who'll support us and collaborate on keeping the history of the wartime sailors alive in coming years."



Staff and volunteers at the Norwegian Centre for Wartime Sailor History.

grandchildren to come and ask 10 years from now: 'the wartime sailors - who are they?'"

An equally important goal for Horn is to honour those who are still alive. "We must complete this register while some of the wartime seafarers are still with us. Many of them have been treated very badly by the government, and got little help after all they went through. No good support structure was in place for them after the war, and a number of them struggled with anxiety, alcoholism and mental problems. I expect society not to forget these heroes, and to give them the place they deserve in history."



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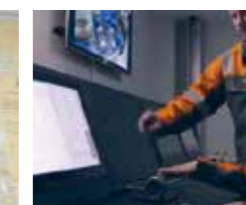
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www.gann.no/skole

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New system for lower fuel consumption

"Our tests show that the amount of fuel consumed can be reduced by an average of 10 per cent," says CEO Robert Dreyer Utheim at Heinzmann Automation.

FuelMACS utilises information available in most modern vessels. Integration and processing of meteorological data, such as current and wind conditions, in combination with continuous measurement of fuel flow, trim and pitch provides the operator with information on such aspects as optimum use of engine combinations and speed as well as the best choice of sailing route.

"Very minor adjustments can have big effects," says Utheim. When FuelMACS is in use, its interactive learning system will register data and decisions taken by the operator on board. "The unique aspect of FuelMACS is that we combine information on route, meteorology and ship and run it through self-learning algorithms which calculate the optimum value for the vessel," he explains. The module for sailing route choice allows the system to identify the best course for the vessel by drawing on the latest available weather data, including satellite images of relevant routes. "That can yield big savings, and is real green shipping," says Utheim.

The system has been developed in cooperation with Dr Ing Per Arne Sundsbø at the Narvik campus of the University of Tromsø and Finnish company Testlab Finland Ltd.



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Artist's rendering of how the world's first hydrogen powered high-speed craft might look if HRF members Brødrene Aa, Florø Skyssebåt and MANCRAFT succeed. Note the hydrogen tanks and associated equipment placed on the upper deck.

Most forms of transportation require large scale infrastructure development like road and railway construction, bridges, tunnels and their associated and costly maintenance. In comparison, the maritime infrastructure required to operate a high-speed craft service is relatively simple and cheap to build and maintain.

Hurtigbåtforbundet, HRF, is an umbrella organization for the ship-owners, yards, subcontractors and consultants in a maritime cluster which covers most of the high-speed craft industry. HRF is also an employer organization for the maritime sector, and an interest group for the entire industry.

HRF's annual High-Speed Craft Conference covers a large range of subjects of interest. The High-Speed Craft Conference 2017 focused on the environment, and the participants showed a great willingness to turn the high-speed craft into the world's most environmentally friendly form of transportation.

Since its introduction in the 1960's, the high-speed craft has been a very important factor for the settlements along the coast. When the Westamran was introduced in 1971, it represented a revolution in mass transportation. Within a few years, there were high speed services up and down most of the Norwegian coast. The high-speed craft became the standard solution for local routes, ambulance- and medical transport, tourist routes and larger regional routes.

Up until a few years ago, nobody questioned the choice of the high-speed craft for these services. But with the rising focus on air pollution, we have been forced to take

a closer look at the environmental cost of the high-speed craft. Moving fast through water costs a lot of energy. The high-speed crafts have large diesel engines, and consequently large exhaust gas emissions.

However, much has already been done to reduce the environmental footprint of the high-speed craft. When new built vessels replace old ones, the exhaust gas emissions have been cut by as much as 30 to 50%. This has been achieved through better hull design, lighter materials, new and modern diesel engines, and more efficient propulsion systems.

Lectures held at the last High-Speed Craft Conference showed that there is even more to gain by reducing the time spent maneuvering at slow speed to and from terminals, even better hull designs, new and more efficient exhaust gas cleaning and altered sailing patterns. However, the real breakthrough will come when hydrogen becomes readily available for commercial use.

There is a lot of research and development taking place in this field today. HRF has no doubt that this will yield significant results within the next few years, but there is uncertainty regarding the future cost of these solutions. An interesting side to this is whether the employers, largely public authorities, will demand the use of new and clean technology even though the initial operating costs are higher than with traditional solutions.

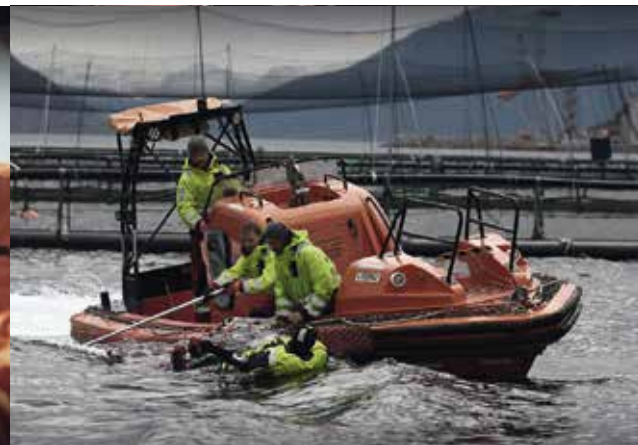




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