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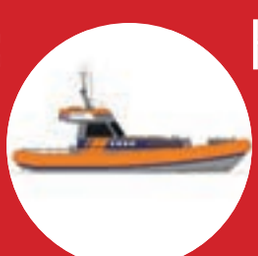
The latest in pipe-lay:
SEVEN VEGA

Focus on seafarers

Simulators, automation & Covid-19

HyMethShip cuts emissions

'Looking to implement the concept in a vessel'



KNRM vernieuwt

Van Wijk-klasse bijt het spits af

LAAGWATER EVENT 2021

11 maart 2021 online

Registreer nu

Laagwater: het nieuwe normaal?

Laagwater is van alle tijden, maar komt wel steeds vaker voor, waardoor het een bedreiging vormt voor de vervoerszekerheid van de binnenvaart.

- Hoe liggen de cruciale waterwegen er bij over 20 jaar?
- Wat zijn de gevolgen van een structureel lage waterstand?
- Hoe pakt u de kansen die laagwater biedt?

Op het Laagwater Event 2021 hoort u wat laagwater betekent voor uw supply chain en hoe u ermee om gaat.

events.schuttevaer.nl/laag-water

Feiten, aanpak en oplossingen

Alle spelers betrokken bij de binnenvaart komen aan het woord en geven inzicht in de huidige situatie, de toekomst en bespreken mogelijke oplossingen. Enkele sprekers zijn:

Lijdia Pater
Adjunct-directeur CBRB

Diederik Jan Antvelink
Directeur NedCargo International

Marleen Buitendijk
Beleidsadviseur Nautisch-Technisch Koninklijke BLN-Schuttevaer

Menno Menist
Directeur Panteia

Femke Brenninkmeijer
CEO NPRC

EEN EVENT VAN:

SCHUTTEVAER

Nieuwsblad Transport

PARTNERS:

Bargelink.com EASY BARGE LOGISTICS

DAMEN

EUROPORT 2021

SWZ|MARITIME

16 | Een leven lang (simu)leren

In de maritieme wereld volgen technische innovaties elkaar snel op. Binnen het onderwijs is de rol van simulatoren in de afgelopen 25 jaar enorm toegenomen en veranderen bestaande leermethoden door nieuwe onderwijskundige inzichten.

26 | Introduction to pipe-lay offshore

Pipe-laying offshore really kicked off from the 1950s and different pipe-lay methods emerged. Latest feat in the pipe-lay vessel segment was the delivery of the Seven Vega by Royal IHC to Subsea 7.

38 | KNRM steekt 83 miljoen in brede vlootvernieuwing

De KNRM steekt na overleg met alle 45 stations en 1400 'professionele vrijwilligers' acht miljoen euro extra in haar vlootvernieuwing tot 2035. Er is in totaal 83 miljoen uitgetrokken voor 75 nieuwe boten en ondersteunend materieel.

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Cover: The Seven Vega was designed and built by the Royal IHC shipyard in the Netherlands and represents the latest in pipe-lay technology with two reels, each with a horizontal shaft (photo Flying Focus).

Essential workers and special ships

The last couple of years before the Covid-19 pandemic, a lot has been written about automation of ships. Images of whole armadas of fully automated robot ships would soon take over the global fleets on the oceans. They could be just as easily run as the world's largest model railway Miniatur Wunderland in Hamburg. But Covid-19 has shown the world can't do without ships and the (wo)men who run them from shore and especially on board.

For a long time to come, most ships will just be operated by people on the bridge of these ships. Governments and politicians impose heavy requirements on those workers and good shipowners know what it takes to have highly educated and trained people on the helm of their sometimes hundreds of millions costing investments. Graduates of the Dutch maritime nautical training institutes can count on one of the highest starting salaries. But then why are they treated so poorly in a lot of ports all around the world? Human rights apparently count for politicians like Russian Navalny, but not for the workers that are essential to provide the goods for our wellbeing. So, plenty of reasons for SWZ|Maritime to pay extra attention in this February issue to the importance of the position, operations and education of the seafarer. Thanks to our colleague Annelinde Gerritsen for coordinating this special.

And SWZ|Maritime would not be what it is known for without special attention for ships built in the Netherlands, big or small. So, in this edition, a special report from our colleague Björn von Ubisch about what Dutch shipyard Royal IHC is known for: the construction of high-quality pipe-lay vessels. He wrote this article on the occasion of the sea trials and delivery of the Seven Vega, also shown on the cover. And not just the big ships are important: when in distress at sea off the Dutch coast or on the inland waterways, it is good to know that there is a whole fleet of exceptionally seaworthy Search and Rescue (SAR) vessels available. They are always up to date with the latest technology, designed in intensive collaboration with the crews that man the rescue boats. Read what our colleague Sander Klos wrote about the latest fleet renewal programme of the KNRM. SWZ|Maritime also has an open eye and ear for interesting developments abroad. So also read the article about the HyMethShip, a project from the university of Graz in Austria.

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ANTOON OOSTING

Jumbo develops flash rust remover

The belt sander works faster and has both environmental and health benefits.

Jumbo has developed a device that helps remove persistent flash rust caused by the removal of temporary welded securings on board its heavy-lift vessels. The method is said to be faster, cleaner for the environment and healthier for users, and improves the ship's appearance. The prototype was developed by Jumbo Chief Officer and part-time Master's student Bob Heikoop.
Flash rust is caused by the corrosion of steel particles dispersed during the removal of temporary welded securings, a process requiring the use of cutting, gouging and grinding tools. The steel and paint particles formed during the removal process can also be harmful to the environment and to human health. Furthermore, the removal of the temporary welded securing is a time-consuming and uncomfortable task for the ships' crews.
This situation did not go unnoticed to Heikoop. He had started a Master's degree in Marine Shipping Innovations at the Maritime Institute Willem Barentsz in the Netherlands in 2018, and was looking for a subject on which to focus his final thesis.
'I wanted to combine a practical problem that Jumbo was facing with a subject that was important to society in terms of sustainability,' says Heikoop. 'Solving the flash rust problem could achieve both of these. First: Reducing our environmental footprint by reducing the release of paint and steel particles. Second: Preventing, or at least reducing the rusty appearance.'
The solution was a Fein GIMS-75 belt sander, which he modified with the addition of a spark/molten steel particle catcher, an extraction system, and a collection container. The performance of the resultant prototype device was then verified within four separate parameters: Removal of paint layer, removal of top part of temporary welding, removal of bottom part of temporary welding and flattening of surrounding paint layer. The results were overwhelmingly positive.
Heikoop: 'The modifications made to the GIMS-75 mean that it catches and removes the steel and paint particles. In terms of sustainability, there are no particles entering the environment. But it is also much faster than the current way of working – on average, three times as fast – which makes it very interesting commercially.'
In addition, as the work can now be done standing up instead of on hands and knees and the device produces fewer vibrations, it also benefits the crew.

Damen ships soon to be equipped with collision avoidance functionality

Damen Shipyards and Sea Machines Robotics will partner to investigate including collision avoidance on board of Damen ships. The alliance aims at speeding up the adoption of several navigating technologies to increase autonomy levels on Damen-built vessels.
Damen will first adopt the Sea Machines SM300 autonomous-command and remote-helm control technology in its test environment. By doing so, a digital twin of the ship becomes reality and will display the benefits of autonomous technology even before it is installed on board.
'At Damen we don't so much see autonomous ships as unmanned "ghost" vessels, ploughing the oceans in silence,' says Toine Cleophas, Manager Programs at Damen. 'We foresee ships where a number of tasks are automated, allowing crew to have a more focused approached to those tasks that still require the human element.'
The collision avoidance system can support the crew in a variety of ways. The SM300 system puts the navigator in a supervisory role, allowing him to multitask while the ship sails its route and avoids collisions based on COLREGs. By using multiple sensors, such as radar and cameras and combining this with machine learning algorithms, the system uses artificial intelligence to recognise objects and manoeuvre the ship safely to its destination.

Hydrogen-powered barges to transport salt for Covestro

Inland shipping cooperative NPRC, together with German polymer producer Covestro, is going to convert part of its fleet on the Rhine to hydrogen-powered ships. The aim is to have the first two zero-emission ships sailing as early as 2024.
In terms of transport volume, salt is the most important raw material for the Covestro sites in North Rhine-Westphalia. The international project is part of the RH2INE initiative of the German Ministry of Economic Affairs of North Rhine-Westphalia and the Dutch Province of South Holland. The aim is a climate neutral transport route on the Rhine-Alpine corridor and thus to give substance to the EU Green Deal.
Initially, the technical and economic feasibility of the project will be examined. The technical design of the hull will also be optimised, so that the ships can be used even at low water levels. Also, the possibility of using green hydrogen from Covestro's own chlorine electrolysis to fuel the barges will be investigated.

Covestro and NPRC support the development of a hydrogen infrastructure for the salt transport fleet in ports and loading stations along the Rhine.

JRC offers Wave Analysis software that can help reduce rolling and pitching

Multiple ships have lost containers in heavy weather conditions over the last months. Heavy rolling and pitching of the ship are among the main causes stows collapse. JRC's Wave Analysis function now provides decision support to steer the ship on the best course and speed to reduce rolling and pitching.
Losing containers at sea has a major impact on the ocean environment and is a huge cost expense for shipping companies. The JRC Radar Wave Analysis function has been developed to measure wave height, direction and length. Even at rough sea, clear presented information about the wave provides navigational officers decision support to reduce rolling and pitching and as such, prevent containers from falling overboard.
The analysis technique is developed in the radar signal processor, TM Blizzard, that realises accurate wave measurement and ships detection simultaneously in optimising scan correlation and pulse length adjustment. The radar can analyse the wave in a zone of 4 square kilometres ahead in the range of 1.5-2 nautical miles, while the radar's ships detection is kept with 12 nautical miles, like two eyes. In combination with a JRC Dynamic Sensor JLR-21, which can measure the motion of the vessel around three axis, a clear Conning page can be created with all motion and wave information to support the crew to make course and speed decisions in difficult sailing circumstances. The wave analysis function is integrated in the JRC JMR-7200 and 9200 IMO radar as a software license function, no additional hardware is needed.

Thecla Bodewes new figurehead of Dutch Top Sector Water & Maritime

Thecla Bodewes is a well-known personality in the maritime world and in government circles.

Dutch State Secretary Mona Keijzer (Economic Affairs and Climate Policy), in coordination with Minister Cora van Nieuwenhuizen (Infrastructure and Water Management), has appointed Thecla Bodewes as figurehead of the Top Sector Water & Maritime. Her appointment takes effect from 1 April.
As CEO of Thecla Bodewes Shipyards, Bodewes is a well-known personality in the maritime world and in government circles. She has built up her network in The Hague in her role as chairman of the Dutch Trade and Investment Board and her membership of the State Export Committee. In her positions as "Business Woman of the Year 2011" and "Port Entrepreneur of the Year 2019 Port of Zwolle", she was an ambassador for entrepreneurship to governments and the general public.
Top Sector Water and Maritime is familiar territory for her. At the start of the Top Sector policy, she was responsible for the development of the Human Capital Agenda. With her network, influence and experience, she is the ideal person to connect the three subsectors in the Top Sector Water and Maritime to each other, to internationalise and to further connect the Top Sector with the other sectors in the mission-driven Top Sectors and Innovation Policy (MTIB). The board and management of Netherlands Maritime Technology (NMT) are delighted with Bodewes' appointment as figurehead of the Top Sector, a position which for the first time is being filled by a woman with a maritime heart.

Lifecycle analysis shows sustainability of EcoClipper

New research shows that the EcoClipper500, a prototype sailing cargo ship developed by Dutch start-up EcoClipper, has significantly less environmental and health impact than conventional ships. This research comes in the form of a Life Cycle Assessment (LCA) of the new ship yet to be built. The LCA was carried out by a team of specialists led by environmental researcher Andrew Simons (co-founder of 3SP and Sailink).
'By carrying out an LCA at such an early stage, EcoClipper not only shows that it takes the impact of human activity on the environment seriously, but also demonstrates its commitment to sustainability from the design phase onwards. At the same time, potential investors and ultimately customers can take this research into account in their considerations,' says Simons.
The LCA shows that the expected environmental impact of the EcoClipper500 during construction and later operation is significantly lower than existing transport and travel options. For example, the application of the concept results in emissions that are eighty per cent lower than those of a container ship (with a comparable load) during its service life. This is mainly due to the innovative use of wind energy for propulsion instead of heavy fuel oil engines.
'This study clearly demonstrates the sustainability relevance of the EcoClipper500 prototype. It is the next milestone on the road to a future logistics sector that,

The EcoClipper500 prototype.

through innovation and proper use of natural energy, becomes truly emission-free,' says Jorne Langelaan, founder and CEO of EcoClipper. Langelaan is currently in talks with several parties as a potential partner to bring the first ship into service.

THE RESEARCH IS THERE, BUT WHO WILL INVEST IN ZERO-EMISSION SHIPS?

The first ferries on batteries are sailing and there are some experiments with sailing on alternative fuels like ethanol, methanol, biofuels and ammonia or with wind-assisted propulsion. However, the big ships in the three main categories – tankers, bulkers and container carriers – that are ordered now will still use fossil fuels like HFO, MGO or LNG at best, like Hapag Lloyd's latest investments. Politicians and governments invent ever stricter measures to reduce the use of climate-threatening fossil fuels, but what lacks is clear market-based incentives for investing in zero-emission ships.

It is at least hopeful that research in cleaner shipping, especially in Scandinavia, the UK, Japan and also the Netherlands has been well on its way for some time. Recently, the Dutch Ocean Technology Centre (DOTC) and the *Platform voor Schone Scheepvaart* (Clean Shipping Platform) both held a webinar to give an update on their findings. The DOTC is a cooperation of TNO and the Delft University of Technology (TUD). The Platform is a cooperation of the Royal Association of Netherlands Shipowners (KVNR), the ports of Amsterdam and Rotterdam, again TNO, shipbuilding organisation Netherlands Maritime Technology, Dutch maritime research institute MARIN and Stichting De Noordzee, the environmentalist group for the protection of the North Sea.

One of the most obvious conclusions of these webinars is that the energy transition of shipping will probably lead to a huge diversification of propulsion systems and fuels. There's no simple unambiguous solution that fits all types of ships and sailing patterns like it used to be with HFO and MGO and the diesel combustion engine. And although the diesel combustion engine will still be in use for quite some decades to come, other types of engines and propulsion systems have to be developed to be able to seriously reduce the emission of greenhouse gases.

A major transition

According to TNO researcher and business developer maritime energy transition Jurrit Bergsma, we are on the eve of a major transition. 'This is a major challenge as ships last 25 years or more, the wide variety of ships and the large number of stakeholders.' To develop, design and validate more sustainable, preferably zero-emission ships represents a very clear technical challenge as it demands other energy carriers, other power systems, fuel cells, batteries, etc. And they have to be developed together now. Bergsma emphasizes that everyone has a role and responsibility: energy suppliers must ensure that there are enough energy carriers, ports have to enable bunkering facilities, but there are also roles for governments, financing institutes, suppliers and shipyards. Especially energy suppliers are very important as they have to guarantee that sufficient sustainable energy is available.
Bergsma stresses that all stakeholders in the industry need to participate in the process of designing concepts for new ships that will have to be built as early as 2025. That will be difficult enough, much more difficult than for example in the automotive industry, where one successful model can be produced in thousands. In shipbuilding, it leads to at most a few hundred ships. Therefore, Bergsma feels it is necessary to first develop a couple of experimental ships. Learning by doing has to ultimately lead to proven designs that can be used to renew the world fleet on a large scale with sustainable zero-emission ships. The designs for these kinds of ships also have to meet a business model that is able to attract the necessary investments.

No less than zero-emission

Sustainable ships in the vision of TNO/Bergsma have to be completely or nearly zero-emission. Only then will it be possible to reduce shipping's greenhouse gas emissions to a level that contributes to reducing global warming. This goes beyond the agreement the IMO reached in April 2018 to reduce GHGs from shipping by at least fifty per cent compared to 2008. This implies that ships should be at least seventy per cent cleaner. In 2008, shipping emitted around 1000 megatonnes of GHGs. Doing nothing, this would grow to 2500 megatonnes. According to the IMO scenario and the expected growth of shipping, total GHG emissions will remain at around these 1000 megatonnes. So, ships have to reduce their emissions by much more than those seventy per cent.

To reach this ambition, it is necessary to create market demand for clean shipping and zero-emission ships and clear regulatory requirements for these vessels. The problems that have to be solved are the uncertainty over the availability of sustainable zero-emission energy carriers, the availability of the sustainable technology to be able to build zero-emission ships and the lack of strategic clarity about the direction in which ships and shipping should be developed. With the now agreed R&D agenda, the DOTC cooperation aims to reduce some of these uncertainties. 'Wat is needed is synergy in the maritime sector between technology and business case,' Bergsma says.

Concrete possibilities

In the meantime, research is in full swing as we can learn from the overview MARIN's Christian Veldhuis gave in the DOTC webinar. In February 2019, a consortium of leading international maritime companies, supported by the Maritime Knowledge Centre, joined forces to investigate the feasibility of methanol as a sustainable marine fuel. As part of the project, the partners will look at concrete possibilities to adopt methanol as fuel on either newbuilds or conversions of the existing fleet. TNO, TUD, NLDA (Netherlands Defence Academy) and MARIN invest in this theme and provide knowledge-building and research capacity for the project by studying operational profiles, ship and engine configurations, performances, various emissions as well as many other relevant topics.

In October 2020, MARIN started its ZERO JIP (Joint Industry Project) in which some twenty Dutch and international maritime companies participate in an R&D project to build the "Engine room of the future". The objective of this JIP is to design, build and test a prototype engine room to ensure reliable future operations in realistic conditions while meeting functional and emission requirements. In doing so, answers must be formulated on questions like what will be the fuels of the next decade, how will energy have to be stored on board, distributed and managed, which power systems will impose itself and fulfil the ambitions, or which type of bunkering will be available in most ports. In the project, some eight types of ships will be looked at to see how they operate at this moment and how this will be with alternative fuels. This project runs until 2022.

NWO Proposal AmmoniaDrive

Just in December last year, TUD, the universities of Wageningen (WUR) and Groningen (RUG) and TNO launched a third project, the NWO Proposal AmmoniaDrive. The NWO is the Dutch organisation for scientific research that distributes subsidies. Ammonia (NH3) is one of the most promising hydrogen carriers and alternative fuels for long-distance vessels and other maritime applications. When produced from renewable power, ammonia would decarbonise shipping and help to achieve the goals of the Paris agreement. However, successful application of ammonia as a marine fuel is highly challenging due to its complex combustion properties, concerns about the effects on the marine environment and human safety and economic barriers. AmmoniaDrive addresses these issues by adopting ammonia in an innovative Solid Oxide Fuel Cell (SOFC) and internal combustion engine (ICE) combined power generation system on board of ships, or onshore for emergency power.

> There's no simple unambiguous solution that fits all types of ships and sailing patterns

The unique AmmoniaDrive power plant makes optimal use of the strengths of both energy converters (SOFC and ICE), utilises ammonia as both hydrogen and energy carrier and has a relatively small, and thus acceptable, impact on ship design. The result is a single-fuel, high-efficiency power plant that can be implemented on board with no pollutant emissions anywhere in the energy chain. The technical research in the proposal addresses key hurdles for successful application in order to prove and demonstrate technical feasibility. Ammonia is a little bit heavier that methanol, but with this a ship can possibly sail carbon-free. In two months, the initiators expect a go or no go from the NWO.

Shipowners want the right fuels

All this research ultimately has to result in reasonable business models for shipowners and investors. For several years already, they plea for market-based measures (MBMs) and a fund by which frontrunners can be rewarded when they invest in sustainable ships. The International Chamber of Shipping (ICS) proposed a USD 2 per tonne levy on marine fuel purchases last year to create a fund for the research and development of zero-carbon marine fuels. The fund would be supervised by the IMO and managed by a new International Maritime Research and Development Board (IMRB). ECSA, the organisation of the EU shipowners, is now calling upon the European Commission to address fuel suppliers by introducing sub-targets to make low- and zero-emission carbon fuels available for shipping. By imposing a levy on fossil fuels, the price gap with alternative zero-emission fuels could be bridged.

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NEW ORDERS

Wim Wolff

After a careful tendering process, NIOZ (Koninklijk Nederlands Instituut voor Onderzoek der Zee/Royal Netherlands Institute for Sea Research), Den Hoorn/Texel, has selected Thecla Bodewes Shipyards, Harlingen, to build the new Wadden Sea research vessel Wim Wolff (yard number 362). Led by the NIOZ Taskforce Fleet Replacement, the concept design was prepared in consultation with NWO. For the maritime engineering part, the taskforce worked in close cooperation with Conoship BV, Groningen. This new vessel is intended for shallow waters within the limits of the maximum dimensions and draught and will bring science to the Wadden Sea and Zeeland delta. The technical details are: 420 GT – Loa x B x D = 36.95 x 10.00 x 3.43 metres, design draught 1.00 metre, maximum 1.20 metres. Air draught is 8.90 metres above design draught. Two diesel generators, a sustainable diesel-electric power management system and a power pack that does not contain lithium allow the vessel's emissions to be minimal. In addition, the Wim Wolff can easily be modified to use new technologies and energy sources without the need for any large-scale refits. The work deck has a free area of approximately 125 m^2. The Wim Wolff is comparable to the current Navicula (1981 – 129 GT), but is equipped with larger laboratories and more accommodation for the researchers. The vessel is named after Wadden ecologist Wim Wolff (1940-2018). The new research vessel will be delivered in spring 2023 at the earliest.

The Wim Wolff is a new research vessel for NIOZ.

The EuroTractorTug 2410 Condor under construction at Neptune Marine.

Condor

Neptune Marine, Aalst, has received an order from Verbeke Shipping, Antwerp, for a new EuroTractorTug 2410, based on the proven EuroTug design (yard number 520). The multipurpose tugboat Condor (24 x 10 metres) will be equipped with two Caterpillar, type C32, main engines IMO Tier 3, total output of 2600 hp on two Voith propellers. Delivery is scheduled for mid 2021.

Three additional hybrid ferries for SKF

Schlepp- und Fährgesellschaft Kiel (SFK) has made use of a running option and signed a contract with Holland Shipyards Group to build three additional hybrid vessels. In December 2018, Holland Shipyards, Hardinxveld-Giessendam, was contracted by SFK for the design and delivery of a new hybrid ferry, the Gaarden (yard number HS2018-0138) and an option for three additional identical vessels. The dimensions of the Gaarden, which was delivered in July, are: Loa x B x D = 32.00 x 8.80 x 3.80 (2.40) metres. The ferry is provided with accommodation for 300 passengers. The energy to drive the electric motors on the two fixed propellers is supplied by two diesel generators or by means of a battery bank with a capacity of 340 kWh.

The hybrid ferry Gaarden was built by Holland Shipyards.

The hull of the fully electric ferry for Boreal.

Name	yard number	delivery
Friedrichsort	H2021-0588	Feb-2022
Wik	H2020-0696	May-2022
Schilksee	H2020-0006	Jan-2026

The hull (yard number HS2019-0678, imo 9913274) of one two fully electric ropax ferries Holland Shipyards is building for Boreal Norge AS, Flekkefjord, was loaded out of the newbuilding hall of Flushing Maritime & Offshore, Sloehaven-Vlissingen on 25 January. The details are: 393 GT, 49.80 x 14.70 metres, 35 cars and 149 passengers. The details of the other ferry (yard number HS2019-0677, imo 9913262) are: 200 GT, 29.80 x 10.20 metres, ten cars and 99 passengers. Both ferries are currently under construction and delivery is expected in October 2021.

Four Seagull USVs

Elbit Systems Ltd., Haifa, contracted De Haas Maassluis in January to supply four Seagull USVs to a navy of a country in the Asia-Pacific region. The multi-mission Unmanned Surface Vessel (USV) was designed by De Haas Maassluis BV and Ginton Naval Architects BV, Haarlem. The first two, the Seagull-301 and -302 (yard numbers 201 and 204), were

The multi-mission Seagull USV.

delivered in 2017. At the twelfth edition of the Maritime Awards Gala, the Seagull-301 was honoured with the title of Maritime Award KNVTS Ship of the Year 2017. Under the contract, Elbit Systems will provide Seagull USV systems that are specifically configured to perform mine counter measures (MCM) missions while facilitating the option to add technology modules needed for anti-submarine warfare. The Seagull USVs to be supplied will integrate side-scan and forward-looking sonars and remotely operated mine identification and destruction vehicles. The USVs will also be equipped with the company's autonomous suite, combat management system and satellite communication capability. The vessels will enable the customer's navy to execute end-to-end MCM operations, handling bottom, moored and drifting sea mines.
The Seagull USV offers endurance of four days seakeeping missions of up to sea state 5 and the flexibility to control several vessels from the same mission control system. The Seagull USV is a multifunctional vessel that can be widely operated for military and commercial purposes, manned, remotely controlled or fully autonomous.
The technical details of the Seagull USV are: dimensions: Loa x B (d) = 12.60 x 3.64 x 0.85 metres. Propulsion by two Cummins main engines, type QSB6.7M, total output 1084 hp or 810 kW, twin propeller for a service speed of 19 knots and a maximum speed of 30 knots.

Shoalbuster 2711

Ports of Jersey Ltd., St. Helier, has signed a contract with the Damen Shipyards Group for delivery of a Shoalbuster 2711 (yard number 571814, imo 9928944). The hull, built by Safe Co. Ltd. Sp.z.o.o., Gdansk, arrived in tow of the Danish mt Baltsund at Dordrecht on 5 February for completion at Hardinxveld. The Shoalbuster 2711 is an evolved version of the 2709. An extra two metres of beam provide more stability, work space, storage and space for a larger crane.
The details of the Shoalbuster 2711 are: 327 GT – Loa (pp) x B x D (d) = 27.02 (23.82) x 11.63 x 4.25 (3.00) metres. The propulsion installation consists of two Caterpillar main engines, type 3512C B, total output 3400 hp or 2500 kW at 1800 rpm via two WAF773 gearboxes (7.087 : 1) on two fixed Promarin propellers with a diameter of 2250 mm in Optima nozzles for a bollard pull of 45.2 tonnes and a speed of 12 knots. The hydraulic bow thruster is 200 hp. The bunker capacity is 125 m^3. The work deck measures 75 m^2 with space for two 20-ft containers. Accommodation is provided for seven people.

The Shoalbuster 2711 arrived at Hardinxveld for completion (photo K. Goudriaan).

LAUNCHINGS

Elisabeth K.

The Elisabeth K. (yard number 734, imo 9879052) was launched without ceremony on 22 January at Royal Bodewes, Hoogezand. The Elisabeth K. is the second of a series of three Eco Traders 5150 that the yard is building for K&T Holland CV (Alster Ship GmbH & Co. KG in Hamburg), Farmsum.

The Elisabeth K. is the second in a series of three Eco Traders 5150 (photo F.J. Olinga).

The main particulars of the Eco Trader 5150 are: 2999 GT, 1692 NT, 5150 DWT – Loa (pp) x B x D (d) = 86.93 (84.98) x 15.00 x 7.17 (6.35) metres. The MaK main engine, type 6M25C (255 x 400), has an output of 1850 kW or 2500 hp at 750 rpm on a controllable pitch propeller for a speed of 13 knots. The hold capacity is 6258 m^3 or 221,000 cft. Accommodation is provided for nine crew.
Delivery of the ship is planned for March. The identical Elke K. (yard number 733, imo 9879040) was commissioned on 2 October 2020. The third and last of the series, the Elisa K. (yard number 735, imo 9879064) will follow in May. Management of the Eco Traders was assigned to MF Shipping Group in Farmsum.

The FCS 7011 Aqua Helix is the largest vessel ever built in Antalya.

Vox Ariane

At the Keppel Singmarine shipyard in Singapore, the dredger Vox Ariane (yard number H 411, imo 9867085) was launched on 28 January by the Ambassador of the Netherlands to Singapore, Mrs Margriet Vonno. The Vox Ariane is the first 10,500-m^3 LNG powered trailing suction hopper dredger in a series of three, all currently under construction at Keppel Fels. They were ordered as part of a broader fleet renewal programme in May 2018. The Dutch-flagged ice class 1 A dredgers are each equipped with a suction pipe with submerged e-driven dredge pump, two shore discharge dredge pumps and five bottom doors. The first two vessels, Vox Ariane and Vox Apolonia (yard number H 412, imo 9867097), will be delivered in February and August 2021 with the third (to be named, yard number H 413, imo 9891763) scheduled for delivery in February 2022.
The technical details are: 10,234 GT, 16,930 DWT – Loa (pp) x B x D (d) = 137.60 (127.80) x 27.60 x 9.80 (5.80) metres. The energy will be provided by two MaK main engines, type 7M46DF (460 x 410) with a total output of 14,562 hp or 10,710 kW, twin propeller for a speed of 15 knots. Accommodation is provided for a crew of 22.

The 10,500-m^3 LNG powered trailing suction hopper dredger Vox Ariane.

Aqua Helix

At Damen Shipyards Antalya, the FCS 7011 Aqua Helix (yard number 547701, imo 9885245) was launched by means of two mobile cranes on 21 January. The vessel is the largest ever to have been launched in the Antalya Free Zone. Before launching, the Aqua Helix was transported on SPMTs (self propelled modular transporters, fifty axis lines) from the new-building hall to the quay as the current launching facility is under reconstruction. The keel for the FCS 7011 was laid on 24 June 2019. The FCS 7011 has an aluminium hull and superstructure.
The technical details are: 1276 GT, 105 DWT – Loa x B x D (d) = 73.60 x 11.20 x 5.50 (4.50) metres. Propulsion is provided by four MTU main engines, type 20V4000 M73L, with a total output of 14,400 kW via Reintjes VLJ 1930 on four Hamilton waterjets, type HT900, for a speed of 39 knots. The DP2 vessel is equipped with two retractable bow thrusters (2 x 426 kW) and one bow thruster in a tunnel (250 kW). The bunker capacity is 70 m^3 and the range at maximum speed is 650 nautical miles. For cargo, a surface of 35 m^2 is available on the fore deck with a permitted load of 2.5 tonnes/m^2. Accommodation is provided for eleven crew members and 120 technicians. After completion, the ship will sail to the Netherlands for installation of an Ampelmann motion compensated gangway. This electro hydaulically driven hexapod offers continuous access up to 18 metres above sea level. After this, the ship is ready for fully-integrated proof of concept trials in the North Sea.

DELIVERIES

Máxima

The Máxima (yard number 851, imo 9882061) was handed over in Delfzijl to EasyMax 2 BV (Wagenborg Shipping), Delfzijl, on 2 February. It is the second in a series of ice class 1A open-top multi-purpose vessels of the type EasyMax built for Wagenborg Shipping under Bureau Veritas' class. The ship had been launched at Royal Niestern Sander BV without ceremony on 28 October. On January 8, the Máxima was towed from the location behind the dikes of Niestern Sander via the Delfzijl sea lock to the outer dike location. Trial runs on the Ems were held from Delfzijl on 26 and 27 January. The EasyMax is the largest vessel built inside the dikes in the northern part of the Netherlands so far with the maximum possible dimensions within the capacities of Royal Niestern Sander Shipyard.
The technical details of the Máxima are: 8849 GT, 4475 NT, 14,330 DWT – Loa (pp) x B x D (d) = 149.95 (146.90) x 15.90 x 12.20 (8.60) metres. The propulsion installation consists of a MaK main engine, type 6M32C, set at 2999 kW or 4075 hp on one propeller in a nozzle for a service speed of 11.5 knots. The bunker capacity

The Máxima is the second EasyMax for Wagenborg Shipping (photo Flying Focus).

is 638.68 m³. The draught at open top is 7.20 metres at 11,000 DWT. The two large square holds (13.50 metres wide, 12.10 metres high and 47.36 and 64.38 metres long) with a total volume of 17,697 m³ are extremely suitable for transporting heavy and voluminous cargo, wood and paper products and open-top cargo. This makes the ship optimally deployable in the working area of Wagenborg: worldwide, including the East and North Seas, Mediterranean Sea and for passing the St. Lawrence Seaway, the Panama Canal and the Suez Canal. The EasyMax is a relatively large ship with an energy efficient propulsion installation. In addition, because the hull shape has been optimised for different draughts, an ultra low EEDI (Energy Efficiency Design Index) results in an extremely low fuel consumption. On 5 February, the Máxima left Delfzijl for Antwerp for its maiden voyage loading wood chips for the biomass CHP Plant Amagervaerket at Copenhagen.
The Máxima was to be christened during DelfSail 2021, which was planned for 10-13 June, but this event had to be postponed due to the corona measures. A new date is yet to be determined, but the timing of this event will be chosen in such a way that Wagenborg's domestic and foreign guests can fully witness the christening. As a royal company, Wagenborg is particularly honoured that Her Majesty has been pleased to associate her name with this sustainable new-build vessel.

Scot Ranger

The ice class 1A Trader 4800 Scot Ranger (yard number 750, imo 9851220) was delivered on 14 January in Eemshaven by Royal Bodewes to Scot Ranger Shipping Ltd./Scotline Ltd., Rochester. The Scot Ranger was launched on 6 November and on 4 January moved from the yard in Hoogezand to Delfzijl for the first trial, after which the second trial was executed from Eemshaven the following day.
The details of the Trader 4800 are: 3457 GT, 2201 NT, 5150 DWT – Loa (pp) x B x D (d) = 89.98 (84.87) x 15.20 x 6.60 (5.68) metres. The propulsion installation consists of a MaK main engine, type 6M25C, 1850 kW or 2515 hp via a Renk reduction box on a controllable pitch propeller in a nozzle for a speed of 12 knots. The hold has the dimensions L x B x H = 61.50 x 12.65 x 9.00 metres and a capacity of 235,000 cft or 6654 m³. The tank top has a maximum permissible load of 15 tonnes/m² and the tween deck 1.5 tonnes/m². The container capacity is 215 TEU of which 85 TEU on deck. The bow thruster has a capacity of 300 kW. Nine persons can be accommodated on board. The Scot Ranger was built under Lloyd's Register class and is the third of this type for Scotline. Earlier, the Scot Carrier (yard number 746, imo 9841782) and Scott Explorer (yard number 747, imo 9841794) with ice class 1B were already delivered to Scotline on 3 December 2018 and on 29 November 2019, but the Scot Ranger has been completed with ice class 1A. In the meantime, Scot Marine has ordered a fourth ice class 1A Trader 4800 from Royal Bodewes, which is to be delivered in the third quarter of 2021 as Scot Isles (yard number 751, imo 9728758). This ship will be equipped with a battery pack that can be charged with shore power, thus partially avoiding the use of generators. The Scot Ranger departed from Eemshaven to Varberg shortly after the handover to load forest products for Rochester.

The Scot Ranger is the third Trader 4800 completed by Royal Bodewes for Scotline.

Arklow Arrow

The Arklow Arrow (yard number 441, imo 9851971) was towed from Shipyard Ferus Smit, Westerbroek, to Delfzijl on 1 February for sea trials on the Ems river. The Arklow Arrow was taken over by Arklow Shipping ULC, Arklow, at Eemshaven on 6 February. The ship had been launched on 18 December 2020 as the fifth ice class 1A bulker of type FS 8500-1A in a series of six.
The details of the ship built under class of Bureau Veritas are: 5065 GT, 2704 NT, 8543 DWT – Loa (pp) x B x D (d) = 119.50 (116.89) x 14.99 x

The Arklow Arrow is the fifth in a series of six (photo F.J. Olinga).

The Willem van Rubroeck is the world's most powerful CSD (photo Flying Focus).

9.70 (7.19) metres. The MaK main engine, type 6M25C, has an output of 2660 kW via a Jake gearbox on a controllable pitch Berg propeller in a nozzle for a speed of 12 knots. The bunker capacity is 273.3 m^3. The A-series has two holds (4035 + 5867 m^3, total 9902 m^3 or 350,000 cft) with an adjustable tween deck. The maximum permissible load on the tank top is 20 tonnes/m^2, on the Coops Nieborg hatches 1.75 tonnes/m^2. On 6 February, the Arklow Arrow left Eemshaven for the maiden voyage to Vordingborg via the Kiel Canal.

Willem van Rubroeck

After final trials on the East Sea and commissioning on 15 December, the Willem van Rubroeck (yard number 500, imo 9738014) departed from Gdansk on 15 January and arrived at Zelzate five days later. The largest cutter suction dredger (CSD) in the Jan De Nul fleet with a total installed power of 40,975 kW already has a long history behind it. The self-propelled cutter suction dredger Willem van Rubroeck was ordered with the Croatian shipyard Uljanik Brodogradiliste in Pula by the Jan De Nul Group in March 2015. The CSD, designed by Jan De Nul, was scheduled for delivery in February 2017, but due to financial problems at the shipyard, the delays got ever worse. The Willem van Rubroeck was launched on 25 August 2017. After reorganisations at the yard, progress remained poor and Jan De Nul was forced to cancel the order in January 2019 followed by the bankruptcy of the Uljanik shipyard in May 2019. After months of negotiations, an agreement was reached that the CSD would be completed by another yard. In April 2020, on deck of the Chinese semi-submersible heavy cargo vessel Hua Yang Long, the semi-finished dredger was transported to Gdansk for final completion by Remontowa SA at last.

The technical details are: 15106 GT, 6900 DWT – Loa x B (d) = 151.30 x 36.00 (5.75) metres, The power is supplied by two MAN B&W main engines, type 14V48/60CR and two type 9L48/60CR. The Willem van Rubroeck has two retractable propellers (2 x 3000 kW) for a speed of 12 knots, three dredging pumps (3 x 8500 kW), of which two have been placed inboard and one in the cutter ladder. The CSD has a cutter power of 8500 kW and is suitable for dredging compact sand, clay and rocks up to a depth of 45 metres. The diameter of the suction pipe is 1100 mm, of the discharge pipe 1100 mm/1000 mm and of the barge loading system 1000 mm. Accommodation is provided for 67 persons. The dredger is flying the Luxembourg flag and the registered owner is Van Rubroeck SA, Capellen, a fully-owned subsidiary of Jan De Nul.

The ship is named after a Flemish missionary from Rubroek (Rubrouck) near Kassel in French Flanders who lived in the thirteenth century. Hardly any facts are known about the person; the year of his birth as well as his death are unknown. He travelled to the Mongolian empire from 1253 to 1255.

Galileo Galilei

Sofidra S.A. (Jan De Nul), Luxembourg, took delivery of the medium-sized 18,000-m^3 hopper dredger Galileo Galilei (yard number N-713, imo 9872365) on 20 January. The ship was built by Cosco (Dalian) Shipyard Co. Ltd. It was floated out on 20 December 2019 and departed from Dalian on 3 February 2021.

The Galileo Galilei has a diesel-electric propulsion existing of two MAN B&W main engines, type 12V32/44CR (320 x 440), with a total output of 17,136 kW or 23,298 hp, on two propellers in nozzles (2 x 7500 kW) for a speed of 15.5 knots. The pump power for trailing is 3400 kW and for discharging 14,000 kW. The bunker capacity is 2914.44 m^3. The maximum dredging depth is 86 metres. The diameter of the suction pipe is 1200 mm. The Galileo Galilei's two separated hoppers are a special feature of the ship and allow the dredged material to be spread evenly over both hoppers, thus optimally controlling the load and draught. Further details are: 28,539 GT, 8561 NT, 31,227 DWT – Loa (pp) x B x D (d) = 166.55 (144.00) x 36.00 x 13.60 (9.75) metres. Accommodation is

The medium-sized 18,000-m^3 hopper dredger Galileo Galilei.

The pushboat KP-1250 Maderas.

The P44 is the first of three StanPatrols 2507.

provided for 32 persons. The ship is classified by Bureau Veritas for unrestricted navigation, dredging within 15 miles from shore or within 20 miles from port, or dredging over 15 miles from shore with Hs (significant wave height) less than 3.00 metres or dredging over 8 miles from shore with Hs less than 2.00 metres.

BL-936072 Madeleine

Padmos Shipyard BV, Stellendam, delivered the BL-936072 Madeleine (yard number 220, imo 9905631) to Armement Boulonnais SAS (T. de Boer & Zonen, Urk), Boulogne-sur-Mer, on 22 January. It is the fourth twinrigger/flyshooter in a series, which Padmos built for Dutch principals. The hull, which was built by Casco- & Sectiebouw Rotterdam, arrived in tow at Stellendam on 4 July 2020 for completion. Trials were held from 20 to 26 January on the Haringvliet and on the North Sea.

The details of the Madeleine are: 233 GT – Loa (pp) x B x D (d) = 24.95 (23.40) x 8.50 x 4.00 (3.60) metres. The propulsion system consists of a Mitsubishi main engine, type S12R-MP-TAW, of 749 kW at 1500 rpm. The power plant consists of two Mitsubishi auxiliary engines: an S6A3-T2MPTAW of 450 kW at 1500 rpm for the hydro pump/generator and a 6D16T of 106 kW at 1500 rpm for the generator. It sailed from Stellendam to Boulogne on 4 February.

The twinrigger/flyshooter BL-936072 Madeleine (photo A. Neighbourfield).

Maderas

The Maderas (yard number 349) is the first pushboat type KP-1250 in a series of three to be built by Thecla Bodewes Shipyards (former Barkmeijer), Stroobos, for account of Chemgas Shipping BV, Rotterdam/Luxembourg. The vessel went on trials on the Van Starkeborgh Canal and IJsselmeer on 22 January.

The technical details of the KP-1250 are: 262 GT – Loa (pp) x B x D = 29.50 (28.20) x 11.40 x 2.76 metres. Propulsion is diesel-electric and provided by two Caterpillar main engines, type C32, with a total output of 1492 kW or 2028 hp at 1800 rpm on two propellers. The bunker capacity is 87.24 m^3. The air draught of the KP-1250 is 5.0 metres and the shallow draught is 1.50 metres. The KP1250 was designed by Ankerbeer Engineering in Kolham in close cooperation with TB Shipyards. The pushers are equipped with a special steering system: three main rudders and flanking rudders to starboard and port in order to be able to manoeuvre on winding rivers, which is impossible with a bow thruster. The second pushboat (yard number 350) was launched on 10 February, the third (yard number 351) is still under construction.

P44

Damen Shipyards, Gorinchem, delivered the seagoing StanPatrol 2506 P44 (yard number 549978) to the Dutch police on 27 December 2020. After delivery, the vessel was first tested for five weeks from Delfzijl and then commissioned.

The details of the StanPatrol 2506 are: 69 GT, 20 NT – Loa (pp) x B x D (d) = 25.12 (23.44) x 5.26 x 2.60 (0.99) metres. Propulsion is provided by two Volvo Penta main engines (131 x 158) with a total output of 1176 kW or 1598 hp at 2300 rpm, twin propeller for a speed of 24.8 knots. The bunker capacity is 1.86 m^3. The aluminium vessel is equipped with a Hull Vane, which reduces resistance through the water, increases speed and reduces the stern wave. The P44 has a slipway at the stern for launching the P144, a 5.5-metre long Ribcraft RHIB with a 115 hp Yamaha outboard engine. For the Dutch police, Damen is also building three StanPatrols 2005 (yard numbers 548924-548926) and a total of three StanPatrols 2506 (yard numbers 549978-548980).

Gerrit de Boer

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APM reduces emissions by 41.8%

Since 2015, AP Møller-Maersk (APM) has engaged more than fifty engineers each year in developing and deploying energy efficient solutions at a cost of USD 1 billion over the four years to 2019. Retrofitting activities included replacing bulbous bows, propellers optimised for the operational profiles and data driven decision-making tools to increase fleet performance. Between 2008-2019, these changes and sailing at lower average speed reduced emissions by 41.8 per cent while delivering the same transport volume. According to a recent publication from Clarksons, container ships now operate at an average speed of about 25 per cent below 2008. APM wants to get to sixty per cent reduction by 2030 and CO_2 neutral marine operations by 2050. Larger ships, enabling higher container loading per tonne of fuel, have also contributed to these results. *(Marine Professional and Clarksons)*

How to transport hydrogen?

A key challenge in developing the hydrogen economy comes from the high cost of transportation, which could be as much as three times the cost of production. This statement comes from a research report from the large international HSBC bank. Methods of storing hydrogen for transportation include conversion to methanol, in metal hydrides, and in pressurised or liquid form. According to the HSBC report, ammonia converted from hydrogen could be the most likely vehicle for hydrogen transportation because of its high storage density. Ammonia is easier to liquefy – it liquefies at -33°C against at about -250° for hydrogen – and contains seventeen times more hydrogen per m^3 than liquefied hydrogen. Ammonia can be used directly as a fuel for ships or in power plants or it can be reconverted into hydrogen. *(HellenicShippingNews)*

VLSFO can accelerate liner wear

Chevron Marine Lubricants has reported a pattern of unusual liner wear in some older engines that recently switched to very low sulphur fuel oil (VLSFO). At teardown, pistons showed signs of scuffing and strange red deposit, and liners showed heavy scoring marks with a deep red layer of deposit, along with iron burrs in the scavenge ports. The seventeen ships identified with these issues represented a cross-section of the fleet – bulkers, tankers and boxships of four to twenty years old. Since the vessels used a wide range of engine models and lubricating oils, Chevron rules out oil performance and engine design issues. The one unifying factor was the switch to VLSFO, and the engines that sustained damage were using fuels with high energy density meaning higher peak combustion pressure. This means more energy per tonne fuel and fuel cost savings, but it also results in more harsh operating conditions and more stress on the engine components. While newer ships do not have a problem using these fuels, engines already closer to an overhaul did struggle sometimes. *(Maritime Executive)*

Chinese all-electric river cruise vessel

Wuxu Saisiyi Electric Technology, a subsidiary of China Shipbuilding Corporation, will deliver one of the world's largest all-electric vessels at the end of this year. The Yangtze River Three Gorges 1 will be a battery-electric river cruise vessel with 7.5 megawatt-hours storage capacity. For safety, the 10,000 cells are divided into four separate compartments, with an additional backup battery for emergency use. The ship will be operated on the Yangtze for day cruises. *(Maritime Executive)*

Global upstream oil and gas: 2021

What are the trends to watch in the upstream oil and gas industry in 2021? The experts of Wood Mackenzie came up with the following predictions for the industry in 2021:

- Continued underinvestment will result in higher prices.
- The supply chain will bounce off rock bottom: more work again for equipment deliverers and exploration.
- Governments will start to make harvest versus growth decisions: making your fields empty before starting new fields.
- Momentum to reduce carbon emissions will continue to grow: long term less activity.
- Exploration will again be profitable.

(HellenicShippingNews)

Bulk carrier with wind propulsion

Oldendorff Carriers, one of the largest bulk carrier operators in the world, has signed a joint development project with the British company Anemoi Marine Technologies, Lloyd's Register and Shanghai Merchant Ship Design and Research Institute to develop a wind-assisted propulsion solution for dry bulk carriers. Scheduled for completion in 2022, the project consists of installing Anemoi's patented vertical rotors on the deck of a newcastlemax bulker allowing the system to be tested at long voyages. It is understood that the ship will be fitted with seven rotors. *(Splash247)*

Tiltable Rotor Sails on ro-ro vessel

Norsepower has installed two 35-metre tall tiltable Rotor Sails on a ro-ro, which it claims will reduce fuel consumption and emissions by up to 25 per cent. The tiltable system is suitable for ships that face height restrictions. The system is fully automated and detects whenever the wind is strong enough to deliver fuel savings, at which point the Rotor Sails start automatically. The chosen ship SC Connector operates between western Norway, Denmark, the Netherlands, Sweden and Poland and has to travel under multiple bridges and powerlines. *(Seatrade Maritime News)*

EEN LEVEN LANG (SIMU)LEREN

De Nederlandse Maritieme Strategie 2015-2025 noemt de hoge kwaliteit van het nautische onderwijs en het belang van een optimale afstemming van scholen op de behoeften van het maritieme cluster. Dat afstemmen gebeurt in een continu veranderend speelveld. In de maritieme wereld volgen technische innovaties elkaar snel op. Binnen het onderwijs is de rol van simulatoren in de afgelopen 25 jaar enorm toegenomen en veranderen bestaande leermethoden door nieuwe onderwijskundige inzichten.

Scholen willen inspelen op ontwikkelingen in de sector. Binnen die sterk innoverende sector blijven bijscholing en training noodzakelijk om professionals voor de sector te behouden. Met veranderende technologieën veranderen ook de benodigde vaardigheden.
Dit artikel heeft als doel een overzicht te geven van trends en ontwikkelingen die relevant zijn voor maritieme opleidingen en trainingen in de toekomst. Het zijn resultaten uit een onderzoek dat MARIN uitvoerde voor het ministerie van Infrastructuur en Waterstaat. In nauwe samenwerking met het Maritiem Simulatie en Training Centrum (MSTC) werkten we in twee parallelle opdrachten aan hetzelfde onderwerp: de inzet van simulatoren in maritiem onderwijs en de daaraan gekoppelde discussie rond de onderbouwing van de vaartijdreductie.

Vaartijdreductie

In de jaren negentig van de vorige eeuw was het MSTC op Terschelling het enige en gezamenlijke (civiele) simulatorcentrum voor alle nautische mbo- en hbo-opleidingen. In die tijd is onderzoek gedaan naar de effectiviteit van simulatortraining. Het leerrendement voor het ontwikkelen van de onderzochte vaardigheden blijkt in de simulator hoger dan aan boord. Dat gaf aanleiding tot het reduceren van het verplicht aantal vaardagen nodig voor het behalen van het vaarbewijs. De verplichte simulatortraining bij het MSTC geeft al 25 jaar een vaartijdreductie van zestig dagen.

Maritieme opleiding en training in Nederland

Een maritieme opleiding start in Nederland bij het middelbaar of hoger beroepsonderwijs. Dit onderwijs voldoet aan zowel educatieve standaarden als de (inter)nationale wetgeving voor zeevarenden en de STCW-standaard. Volgens internationale wetgeving is het opbouwen van een vaartijd van 360 dagen een verplicht onderdeel voor het behalen van het vaarbewijs. Naast theorie en praktijkvakken op school, zijn daarom twee stages van een half jaar aan boord een vast onderdeel van de opleiding. Alle zeevaartscholen hebben hun eigen simulator waarin zij theorie toepassen in een veilige omgeving. Bij de marineopleiding is simulatortraining een integraal onderdeel van het curriculum. Samen met het varen, dat een significant onderdeel van de opleiding is, vormt het de voorbereiding op een examen in de simulator. Middelbaar beroepsonderwijs voor de binnenvaart bevat een beroepsopleidende leerweg (BOL) met voltijds onderwijs waarbij stages en simulatoren praktijkervaring bie-

Foto: Het hoge leerrendement van simulatoren leidde tot een vaartijdreductie van zestig dagen.

den of een beroepsbegeleide leerweg (BBL) waarin werken en leren gecombineerd worden.
Het behalen van het vaarbewijs is het begin van een leven lang leren. Steeds meer bedrijven trainen in huis met eigen simulatoren specifieke vaardigheden zoals baggeren of ijsnavigatie. Dat zijn interne opleidingstrajecten waarbij de connectie tussen simulatie en praktijk sterk is. Bij het Nederlands Loodswezen is een simulatortraining een verplicht onderdeel voor een volgende carrièrestap. Carnival is dankzij een eigen trainingscentrum in staat een gelijke standaard te introduceren in de gehele vloot: eenzelfde cultuur met uniforme werkwijzen, veiligheidsstandaarden en een integraal promotie- en *assessment*-systeem voor de gehele organisatie.

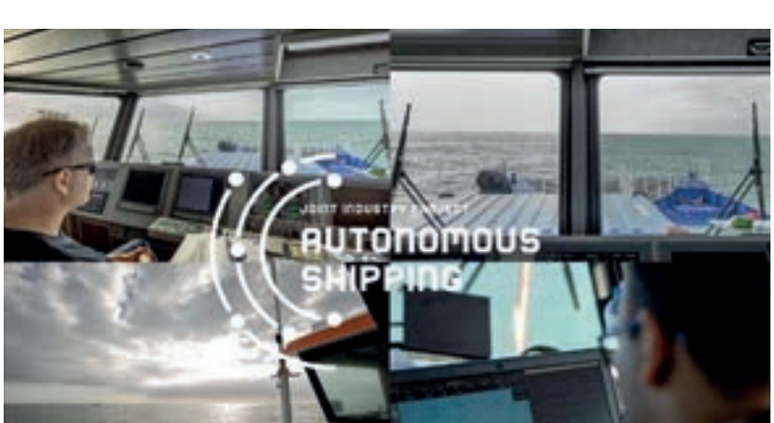
Het behalen van het vaarbewijs is het begin van een leven lang leren

Simulatoren bieden ook de mogelijkheid de uitvoer van nieuwe operaties voor te bereiden en te oefenen voordat het echte werk begint. MARIN vormt als kennisinstituut een belangrijke schakel tussen het ontwikkelen van kennis en het delen en toepassen van die kennis met de maritieme sector. Op maat gemaakte trainingen voor maritieme professionals, al dan niet voorafgegaan door een ontwerpworkshop waarin de beste operationele strategieën onderzocht worden, zijn daarvan een voorbeeld.

Trends

Tijdens het onderzoek naar de inzet van simulatoren voor maritieme opleiding en training hebben we een overzicht gemaakt van trends in de maritieme sector en het (maritieme) onderwijs.

1. **Maritieme ontwikkelingen:** schepen worden steeds schoner, slimmer en veiliger. Systemen aan boord zijn jarenlang geüpdatet en raken nu de grenzen van hun kunnen. Dat vraagt om vernieuwende concepten en een andere invulling van ontwerpen. Zoals schonere schepen die mede door wind voortgestuwd worden of zero-emissie-machinekamers hebben. Of slimme schepen met informatie- en communicatiesystemen aan boord en op de wal, als onderdeel van een logistieke keten, die autonoom informatie uitwisselen. Beslissings-ondersteunende systemen doen hun intrede om situationeel bewustzijn te vergroten. Technische en sociale innovaties veranderen de samenstelling van de bemanning aan boord. Bemanning aan boord reduceert, krijgt andere taken of verhuist naar de wal. Mogelijk is er straks minder mogelijkheid en begeleiding om aan boord te leren. Tegelijkertijd ontstaan nieuwe functies op de wal waarvoor nu nog geen leerplekken zijn.
   De mens blijft een belangrijke rol spelen in de operaties van de toekomst op de wal en aan boord. Je kunt niet alles aan boord leren, maar met simulatortraining wel lacunes vullen.
2. **Veiligheid:** veiligere schepen werken met een andere veiligheidscultuur waarbij actief risicomanagement en het leren van ongelukken meer centraal staan dan het vinden van de schuldige. Proactief risicomanagement zoals dat nu op de maritieme veiligheidsagenda staat, gaat nog een stap verder door vooraf risico's in te schatten en te beheersen. Veiligheid begint bij gedrag en bewustzijn van de impact van eigen gedrag op de veiligheid van je schip. Een sim leent zich goed om die veiligheidsprocedures te trainen. Wat kun je doen in extreme omstandigheden en hoe doe je dat veilig? Het bekende Hearts-and-Minds-programma van Shell is het eerste voorbeeld van de introductie van een bedrijfsbreed veiligheidsbewustzijnsprogramma. Later volgden ook andere bedrijven, zoals Carnival en Biglift, met eigen programma's.
3. **Simulatorontwikkeling:** tegenwoordig kunnen we complexe operaties realistisch simuleren. Het gedrag van de schepen, het buitenbeeld en de instrumenten in de simulatoren zijn sterk verbeterd waardoor de interactie tussen mens, techniek en omgeving beter tot zijn recht komt. Het is juist die interactie die de simulatorbeleving zo realistisch maakt. Gebruikten we simulatoren eerst vooral voor het ontwikkelen van individuele (technische) vaardigheden, tegenwoordig kunnen we ook teamprestaties en niet-technische vaardigheden trainen. Bijvoorbeeld wanneer we verschillende simulatoren (in internationaal verband) in een scenario koppelen. Dan kunnen we bijvoorbeeld ook aandacht besteden aan culturele verschillen gerelateerd aan assertiviteit en leiderschap.
   We zien simulatoren aan boord en zowel *augmented* als *virtual reality* doet zijn intrede. *E-learning* creëert tijdonafhankelijke leermogelijkheden. Met *serious gaming* is het mogelijk diverse perspectieven rondom een thema te verkennen of een team kennis te laten maken met nieuwe procedures. Tot slot zorgen de huidige Covid-19-beperkingen voor een boost in online leren.
4. **De menselijke factor:** sinds het toevoegen van niet-technische vaardigheden in de Manila-amendementen van STCW in 2010, krijgt de maritieme menselijke factor meer aandacht. Ook, of misschien wel juist, in autonoom varen en *shore-control*-centra. Vaardigheden die nodig zijn voor goed *bridge resource management* zoals leiderschap en management, samenwerken, situatio-



Een van de trends in het maritieme domein is autonoom varen.

Virtual reality in een bewegende simulator.

neel bewustzijn en beslissingen nemen, zijn onderdeel van de opleiding. De kunst is om die niet-technische vaardigheden te integreren in de technische taakuitvoering en het niet als twee losse ontwikkelgebieden te zien. De simulatoromgeving leent zich daar goed voor omdat je situaties kunt creëren die in de praktijk niet kunnen. Meten aan de mens gaat steeds beter. Het wordt inzichtelijker hoe iemand informatie verzamelt, verwerkt en hoe beslissingen worden genomen. Video-opnames in combinatie met gedragsindicatoren maken je bewust van (on)gewenst non-verbaal gedrag. Meer objectieve data over menselijk handelen maken assessment minder gevoelig voor subjectieve beoordelingen en het volgen van individuele leerlijnen makkelijker.

5. **Didactische inzichten:** vroeger gold "kennis is macht". Tegenwoordig is kennis voor iedereen toegankelijk. De huidige maatschappij vraagt meer om het selecteren van betrouwbare informatie en het combineren van kennis tot nieuwe toepassingen. De ontwikkeling van hogere cognitieve vaardigheden zoals begrijpen, oplossingsgericht handelen, analytisch denken, samenhang zien en reflecteren op het proces (21ste eeuwse vaardigheden) zijn nu relevanter. Aanpassingsvermogen, leiderschap en communicatie zijn niet-technische vaardigheden die het verschil gaan maken. Dat vraagt om nieuwe onderwijsmethoden die naast kennis ook vaardigheden en *attitude* ontwikkelen. De jongere generatie groeit er vanzelf mee op. Voor de oudere generatie is het mogelijk nieuw en een onderdeel om actief op te pakken tijdens het leven lang leren.
Competentiegericht onderwijs is daarop een passend antwoord. Niet alleen voor de jonge generatie. Ook voor volwassenenonderwijs is competentiegericht trainen de beste mogelijkheid om aan te sluiten op de al ontwikkelde kennis, kunde en kwaliteiten van de betreffende professional.
Nieuwe onderwijsconcepten zoals *High Impact Learning* doen hun intrede. Hierbij draait het om hybride onderwijs met een goede mix tussen on- en offline leren, tussen formeel en informeel leren. In de maritieme sector krijgt dat vorm in de combinatie van klassikale instructies, projecten, simulatortraining en

Meten aan de mens in een simulator.

stages. Onderwijs waarin niet het halen van toetsen en STCW-criteria een doel op zich zijn, maar waarin het gaat om het voorbereiden op het echte werk aan boord. Onderwijs waarbij de trainer/docent coacht op het leerproces in plaats van op de inhoud.

6. **Inspiratie uit andere sectoren:** daarnaast hebben we ook gekeken naar de inzet van simulatoren in andere disciplines. Binnen de luchtvaart is het bijvoorbeeld verplicht om (twee)jaarlijks een *proficiency-check* te doen. Na het afleggen van een examen in een simulator blijft het vliegbrevet geldig. De interactie tussen treinmachinisten en dienstleider en de introductie van nieuwe veiligheidssystemen zoals ERTMS, wordt met de inzet van simulatoren getraind. Veiligheidsregio's trainen de samenwerking tussen verschillende eenheden bij grootschalige incidenten met rollenspellen, *serious games* en simulaties. Op basis van de eerste rijlessen in een autosimulator is het mogelijk het rijgedrag van iemand te bepalen. Tijdens de corona-*lockdowns* bleken rijsimulatoren een onderbouwd alternatief voor rijlessen. Tot slot zijn simulatoren in de medische wereld een integraal onderdeel van de opleiding en vervangen ze het oefenen op echte patiënten.

Als je in de simulator het verschil tussen work as done en work as imagined ervaart, kun je gedrag veranderen

Simulatoren in een gebalanceerd trainingsprogramma

Simulatoren hebben mede dankzij het toegenomen realiteitsgehalte een prominente rol gekregen in onderwijs en professionele training. De simulator is en blijft een onderdeel van een leven lang leren dat op school begint met een gebalanceerd pakket van on- en offline leren inclusief stages. Toch is het vergroten van die realiteit niet het enige. De inzet van goede pedagogische tools wordt belangrijker bij competentiegericht leren en het verhogen van het rendement van simulatortraining.

Competenties zijn samengesteld uit kennis, kunde en gedrag. Je kunt de aan te leren competenties verdelen in drie categorieën:

- competenties die je alleen aan boord kunt leren,
- competenties die je zowel aan boord als in de simulator kunt leren en
- competenties die je alleen of beter in de simulator kunt leren.

Dan is het goed te realiseren dat zowel de simulator als de stageervaring aan boord hun sterke kanten hebben, afhankelijk van het leerdoel. In de simulator kun je fouten maken zonder ernstige gevolgen. Het is vooral een omgeving waarin je nieuw geleerde kennis kunt toepassen. Aan boord ervaar je heel andere kanten van het vak: lang van huis, wachtlopen, een multicultureel team en het samenvallen van alle elementen uit de opleiding in een operatie.

Voor het vergroten van de leeroverdracht is het van belang om gedurende de opleiding overeenkomsten en verschillen tussen de simulator en de praktijk te benoemen. Beperkingen in de simulator hoeven geen beperking aan boord te zijn, en andersom.

Wanneer professionals tijdens opfriscursussen weer teruggaan naar de basis (de theorie) en reflecteren op de bedrijfsspecifieke uitvoering in de praktijk vergroot dat het bewustzijn van de kloof tussen werk zoals het bedacht is en werk zoals het uitgevoerd wordt. Als je in de simulator het verschil tussen *work as done* en *work as imagined* ervaart, kun je gedrag veranderen. Enerzijds kan het je bewust maken dat *short cuts* nemen best link kan zijn. Anderzijds kan het je duidelijk maken dat de procedures van het bedrijf niet (meer) toepasbaar zijn in de echte wereld. Hoe mooi zou het zijn wanneer je dit zou kunnen doen met studenten en professionals in een simulator? Zou dat bijdragen aan een nog betere aansluiting tussen maritiem onderwijs en professionele ontwikkeling?

Vragen richting de toekomst

Met zoveel innovaties in de maritieme sector, de simulatortechnologie en in het onderwijs is het wellicht terecht de volgende vragen te stellen:

- Houdt de 25 jaar oude onderbouwing voor de vaartijdreductie nog wel stand? Maken nieuwe onderwijsvormen en de behoefte aan het ontwikkelen van andere competenties de effectiviteit van simulatoren nu nog groter?
- Hoe kun je in een simulator meer synergie bereiken tussen professionals die complexe vaardigheden en operaties trainen en maritieme studenten die vooral basisvaardigheden ontwikkelen?
- Welke innovaties dragen bij aan het ontwikkelen van een leven lang doorlopende leerlijn en het hoog houden van de kwaliteit van het maritieme onderwijs in Nederland?
- Kan de inzet van simulatoren in de maritieme sector profiteren van input vanuit andere sectoren zoals de luchtvaart?

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HOW THE PANDEMIC IMPACTS SEAFARERS

The Covid-19 pandemic has put seafarers around the world in precarious situations and they need help, support and solutions for the difficulties they run into. Several important maritime organisations have asked seafarers which problems they face and to give suggestions to improve the situation on board ships and on shore. Various actions have already been taken to support seafarers around the world.

The World Maritime University (WMU) conducted a worldwide survey in which 671 seafarers on board ships were questioned about their experiences during the Covid-19 pandemic [4]. Another 134 seafarers on board ships and on shore were questioned about their well-being during Covid-19 by Lloyd's Register (LR) in collaboration with the UK Chamber of Shipping, the Mission to Seafarers and Safety at Sea [1]. Both surveys were conducted to understand the impact of the pandemic on seafarers and the effect of the support measures that have been put in place.

Crew changes and ship-shore interactions

The results of the WMU survey show that especially crew changes and ship-shore interaction were affected by the pandemic [4]. About 400,000 seafarers were stranded on ships due to Covid-related travel restrictions. Some could not leave their ships, had to be quarantined on board for more than fourteen days without getting paid or were not even provided urgent medical assistance. Some have been on board vessels for seventeen months on end, far over the eleven-month contract limit set out in the Maritime Labour Convention. Others could not get to their ships and had to stay home, unable to provide for their families. In some cases, their contracts were terminated [5]. These problems had and still have a serious impact on seafarers and on the supply chain.

Key workers

Key findings of the Lloyd's Register survey are that many of the seafarers feel undervalued and unacknowledged for their essential role during the Covid-19 pandemic. One of the seafarers remarked: 'We work for each and every one of you to have food, water, fuel, cars, etc. We need support in these tough times, but we have been forgotten and abandoned by everybody' [1].
Seafarers need to be acknowledged as key workers by as many governments as possible to make crew changes possible. By mid 2020, seafarers were recognised as key workers by 42 countries. India, the Philippines, Dubai and Singapore reopened their ports to allow crew change and Australia even detained ships whose crews had worked longer than their contract required. But these examples

Photo: Due to the pandemic, some seafarers have been stuck on their ships much longer than contractually required (by Laurahayes7751, Wikimedia).

represent a minority and that is why some seafarers feel neglected by governments [3]. Complicated regional travel restrictions still make crew changes difficult and political and public pressure needs to be applied [2]. Current rules and policies are sometimes hard to comply with in these new situations and can even make crew changes impossible. [4]

Governments need to work together

There is a big role for governments in improving the situation of seafarers by providing a framework of protocols to ensure safe crew changes and travel during the coronavirus pandemic. Next to recognising seafarers as key workers, shore leave should be allowed and access to shore-based services provided. Compliance of vessels with international laws and regulations must be ensured. Solutions can only be found through a continuous cooperation between social partners and should include consultation with seafarers or their representatives to ensure all safe options are considered. [4]

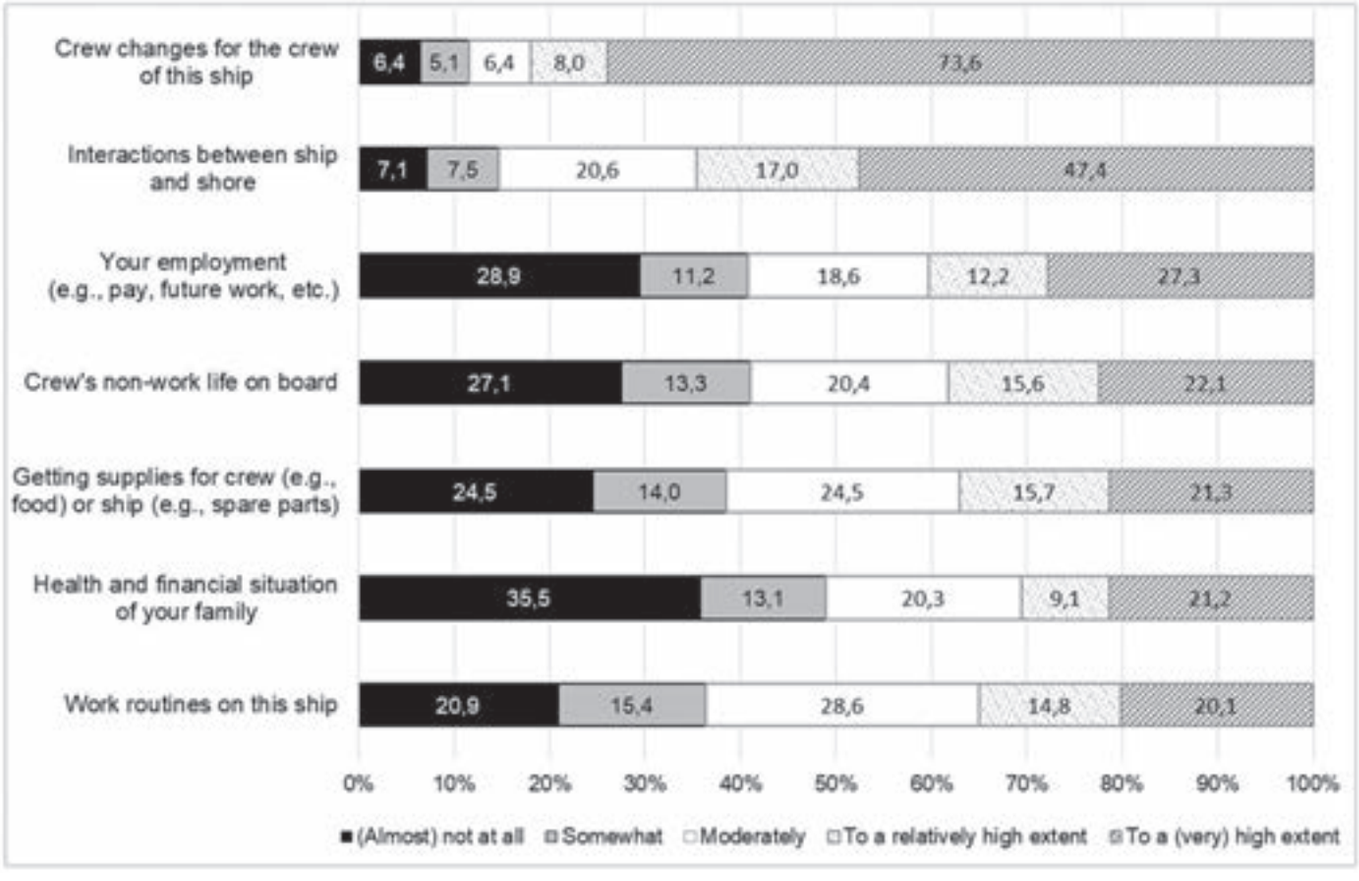
Protocols have been developed for safe transport of seafarers that are recognised by the International Maritime Organization (IMO). Unfortunately, these protocols have not been consistently implemented across all relevant jurisdictions or by all relevant stakeholders [7].

To improve the situation now and in the future, regulations have to be designed with a long term perspective and progressive actions can be taken. Nationality-blind crew relief policies can help reduce nationality-based disembarkation discrimination. A global information-sharing portal on health guidelines can provide seafarers with continuous updates on relevant health and visitation information. In collaboration with national and international partners, an emergency fund could be developed to financially safeguard vulnerable seafarers [8].

> Many seafarers feel undervalued and unacknowledged for their essential role during the pandemic

Effects on mental and physical health

Following the survey, the WMU states that 'almost half of the respondents reported an increase in workload in comparison to their workload prior to the pandemic. On average, respondents felt less safe in port than at sea. Over forty per cent of the respondents indicated that they had experienced symptoms of depression several times, almost every day or every



Effects of Covid-19 according to seafarers [4].

day during the past seven days, whereas over half reported symptoms of anxiety. Moreover, on average, respondents had experienced symptoms of exhaustion between "once" and "several times" during the past seven days. Feeling exhausted, tired and having sleeping problems were most common, and were experienced by over half of the respondents "several times" or more frequently during the past seven days' [4].

Serious concerns have been raised over seafarer mental health, communications and disease management. Due to the pandemic, crew have not been receiving regular visits from shoreside personnel. They felt their health and safety was not being balanced appropriately with operational demands. A lot of seafarers felt they were not being helped actively to manage stress and fatigue during the pandemic.

However, there is some help available. In the Lloyd's Register survey, more ship than shore staff said they had access to a professional care worker through their job; someone who could provide personal advice and support. Still it was only a minority that used these professional services and actually sought help: only thirty per cent of ship staff and seventeen per cent of shore staff. Reasons ship staff gave for not seeking help was the stigma surrounding mental health and its potential impact on employment. Others said they felt there was no need to or that they did not think it would be effective [1].

A role for shipping companies

Some seafarers felt that there is a lack of support from the shipping company, such as lack of information, conflicting information, or high demands and pressure. The WMU survey also mentioned challenges related to expired or extended contracts or to financial problems and job insecurity. Sometimes companies even extended contracts instead of offering timely crew changes because of the crew changing problems.

Shipping companies can improve the situation by ensuring viable repatriation plans and making sure that seafarers have access to essential supplies and support. Examples are effective protective measurements, medical care, mental health support, essential goods, a good internet connection and possibilities for shore leave. Adjusting protocols and a fatigue risk management system can further support these measures [4].

Help from angels

A lot of actions have been taken to provide seafarers in problematic situations with suitable support. The IMO has established the Seafarer Crisis Action Team (SCAT) to help resolve individual cases. SCAT assists by contacting representatives from national governments, NGOs, trade unions or relevant associations to find solutions. In 2020, SCAT has dealt with cases involving thousands of individual seafarers. For example, they helped a fatigued seafarer on an offshore support vessel, who had been offshore for more than 100 days, to go home, they helped a British seafarer to go home to be able to assist her vulnerable relatives and they enabled an emergency evacuation of a seafarer who suffered from a stroke [5].

As a response to the Covid-19 situation, the Mission to Seafarers has recently launched the Flying Angel Campaign, to support with vital services. They provide technological solutions like digital chaplaincy, the Seafarers' Happiness Index App and MiFi Internet Units for onboard communications. They also provide support in ports such as by providing PPE globally, minibus adaptations, a Seafarer-safe Centres Fund and legal assistance to seafarers.

The pandemic has impacted all seafarers and other maritime personnel. Although this continues to be a fast-moving and evolving situation, support will continue to be needed for some time to come [6].

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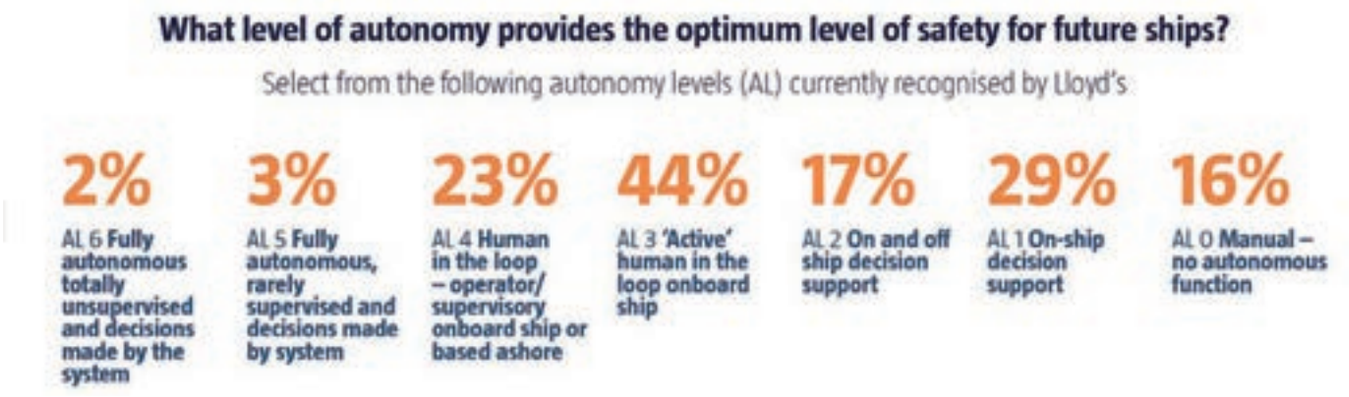
HUMANS AUTOMATE OR AUTOMATING HUMANS?

Autonomous ships and other machines have a great potential to innovate and optimise work processes. However, there is still a role for humans, as small as it may be. The question is how the tasks are divided between an operator and a machine, and how these agents work together. Several surveys and tests are being performed to get more knowledge on design requirements of automated work processes and how to make optimal use of automation in the maritime environment. In this article we give you an update on the views on this subject.



How respondents in the Nautilus survey responded to the different possible levels of autonomy.

Both machines and human beings have their strengths and weaknesses. Ed Verbeek, Master Mariner and editor of SWZ|Maritime, explains it this way:

'Automation has changed a lot over the years. It started with taking over the dull and uninteresting simple jobs. But as automation became more powerful, it has taken over more and more roles, and is now taking over even challenging tasks. I have the perception that there has been limited discussion about the philosophy behind automation. To me it appears to be that the norm was and is: whatever can be done, will be done. Does this take into account the relative strengths and weaknesses of machines and humans?

Let's look at one striking difference between human and machine: humans have a need for job satisfaction. Machines don't have that need at all. Humans need the feeling of being needed; they perform better when they have a challenging task, while machines couldn't care less. To me, it would make sense that the philosophy behind automation should take this difference into account and design the system in such a way that the humans involved have a challenging task. This has a number of positive effects. For instance, humans need practice to avoid skill loss. By giving the operators a challenging job to do, they get the practice they need to stay proficient. A couple of days per year on a simulator is no substitute for practising your skills daily. Automation doesn't suffer this kind of skill fade, and thus has no need to practise.

Imagine a vessel operating in autonomous mode on regular service in the Swedish Archipelago. For the first 852 trips, the vessel does everything it should do. On trip 853, it doesn't – maybe because of an imperfection or malfunction, or because a change in situation means that the automated action is no longer the right one. The navigator will have to look at least twice, and probably more than twice, to realise that the automation isn't doing what it should be doing. Then they have to assess the situation and the settings, take over and handle the vessel under high stress – something they might not have done for a long time. A better solution would be to let the navigator handle the ship. The automation could monitor whether the vessel stays within the planned window (position, speed, drift, RoT (rate of

When the DP operator is roaming the ship, he carries a tablet and a smart watch designed by TNO to warn him of changes.

turn, Ed.), etc.). If the vessel goes outside these parameters, it could give a prompt to either the co-navigator (for example on cruise vessels and most large passenger ro-ros) or to the single OOW (officer of the watch, Ed.). This could be a way to organise the system as a team, with human and machine working together, making use of the strengths of each team member and enabling the humans to maintain their skills and experience job satisfaction.' [1]

Autonomy can improve the quality of work at sea

The Nautilus Federation of maritime professionals presented a report in 2018 on a survey that represents the views of almost 900 maritime professionals from over twelve different countries on the issues surrounding autonomous technology and its potential effect on the maritime sector. 'The overwhelming majority of maritime professionals regard autonomous shipping as a threat to job security and two-thirds believe that unions should resist the process. However, the survey also shows that despite the generally negative attitude towards automation, 83 per cent of maritime professionals still believe that technology has the potential to improve the quality of work at sea.'

Just over eighty per cent of respondents in the survey said the best way of achieving such benefits would be through the careful introduction of "smart" systems alongside "manned" operations. The respondents were asked to set out their views on seven different levels of autonomy for unmanned, remotely operated, remotely monitored and unmanned systems – as defined by Lloyd's Register.

The result shows that seafarers are very open to a more hybrid approach, in which autonomous systems work in a supporting capacity alongside trained seafarers who remain in control. For an optimal level of safety, the creative thinking capacity of human beings is still needed.

> Work at sea can be improved by the careful introduction of smart systems alongside manned operations

The recommendations from this survey are that automation should be used to improve productivity, jobs and wages rather than reducing employment levels. It has the potential to reduce excessive workloads, cut fatigue and reduce paperwork. New ways in which new technology can be used have to be developed to enhance maritime skills and to create new roles in operational oversight and control, analysis, research and development. The professional experiences of seafarers are needed in this to make the introduction and integration of automation of maritime operations successful. Therefore, it is important to ensure that workers have a say in the introduction of technology at shipboard, company and regulatory levels. Appropriate training and qualification pro-

grammes have to support seafarers and shore personnel with the optimal use of automated systems [2].

Smart agent as a virtual team member

Highly automated systems and even autonomous systems are still man-machine interaction systems. Human interference is needed when complexity increases or automation fails. On the other hand, the high level of concentration that is needed to monitor these systems is hard to produce by humans. This problem of vigilance also results in complacency, which means that the operator is less and less interested in the status of the system. This can result in over-reliance on the automated system, even in potentially dangerous situations.

To gain more knowledge about the man-machine interactions needed to design better automated systems that take into account involvement and workload of the operator, TNO developed a supporting tool for a maritime use case of dynamic positioning (DP) systems. DP systems are complex systems that keep offshore vessels in place when they are performing dredging, cable-laying, diving and (oil) drilling operations. Failure of these systems can have huge consequences like diving accidents or pollution of the sea with dangerous substances. Time to react on a "drift off" or "drive off" is very short, so detection, identification, resolving and implementing the solution has to be done in a very small window of time. TNO designed an intelligent operator support system (IOSS) or "smart agent" as a "virtual teammate" that produces smart notifications to communicate with the human operator. The smart agent detects state changes that can possibly lead to a loss of position of the vessel. When the system is stable and shows no changes in state, the DP operator doesn't have to be alert, can perform secondary tasks or can even be "roaming" on another part of the ship. In the "roaming state", the operator carries a tablet and a smart watch. The tablet displays the most important data in graphics and the smart watch shows a "heartbeat" that is slow in a stable situation and is increased in frequency and gives a vibration when the operator needs to receive important information.

Human aware artificial intelligence

Several forms of intelligent automation are developed and integrated in the smart agent of TNO. With human aware artificial intelligence (AI) the roles are switched and the systems track the movements of the human operator, like his position on the ship and his actions. The system learns how the operator moves and can adjust the timing of messages at the right moment, together with the prediction of the time it takes for the operator to return to the bridge.

It is important to provide a suitable level of trust between system and operator

The next step in human aware AI for TNO is to involve eye-tracking of the operator to learn which information is interesting to the operator.

To help the operator with the interpretation of the information, the virtual teammate uses "explainable artificial intelligence" and helps, detects, warns, cooperates and explains with smart notifications in dialogue form like text messages on a mobile phone. From big data of the ship's systems, the smart agent can recognise patterns and learns to make connections. The amount of data that is involved in this is not processable for the human brain. With the right division of tasks between the smart agent and the operator, the workload of the operator can stay at a reasonable level and he doesn't get disturbed by trivialities.

Making the job of a seafarer more attractive

In the simulation centre of the STC Group, two DP scenarios were tested by experienced DP operators. They looked into the way the smart agent introduces itself to the operator, the messages of the smart agent, the usefulness of the supporting functions, and the reliability and overall impression of the system. The reactions of the operators were positive, the smart agent can make the job of a seafarer easier and more pleasant and time can be used a lot more efficiently.

However, the necessary conditions are that the system needs to be very reliable or even watertight and the cooperation between the system and the operator needs to be clear and smooth. It is important to provide a suitable level of trust between system and operator, so the smart agent becomes a familiar member of the crew on board.

To learn more about what the roaming concept means for the operator watch this video: tinyurl.com/54xgurw5.

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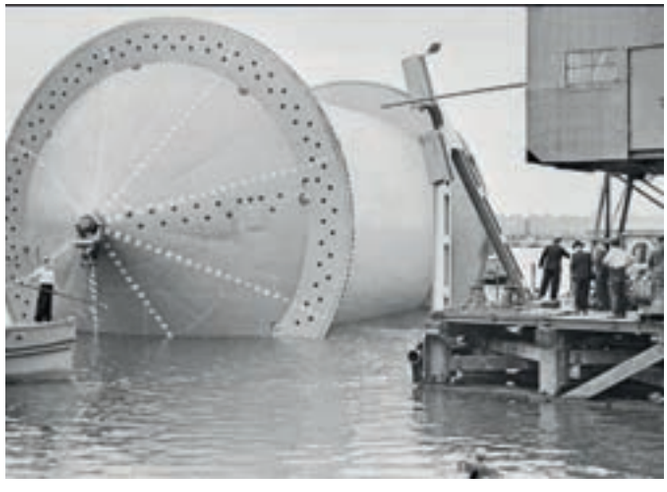
INTRODUCTION TO PIPE-LAY OFFSHORE

It is uncertain when the first crude oil pipeline was built. Yet, it soon became clear that pipelines are generally the most economical way to transport large quantities of oil, refined oil products or natural gas over land and subsea. Pipe-laying offshore really kicked off from the 1950s and different pipe-lay methods emerged. Latest feat in the pipe-lay vessel segment was the delivery of the Seven Vega by Royal IHC to Subsea 7.

Credit for the development of the first pipeline transport is disputed, with competing claims from Vladimir Shukhov and the Branobel company in the late nineteenth century, and the Oil Transport Association. The latter first constructed a 2-inch (51 mm) wrought iron pipeline over a 9.7-km track from an oil field in Pennsylvania to a railroad station in Oil Creek, in the 1860s. This was done to avoid the Teamsters (labour union who organised the people transporting the oil barrels), who normally transported the oil barrels with horse and wagon.

During World War II, pipelines were laid across the English Channel to support the allied troops after the invasion of Normandy. These were small diameter pipelines (75 mm). A number of these pipelines were braided hoses (from the cable industry) and a few were steel pipe.

The steel pipelines across the English channel in 1944 were laid from a reel pulled by three tugs (see picture on the right).



A Conundrum used during World War II (by permission of the Imperial War Museum).

Photo: Royal IHC delivered the pipe-layer Seven Vega to Subsea 7 in November 2020 (by Flying Focus).

Pipe-lay vessel Solitaire of Allseas, which was built on the same base as the Lorelay.

First large diameter pipeline

McDermott was one of the pioneering companies in the offshore pipe-laying business and McDermott organised its pipe-laying division in 1950. At that time, McDermott also installed the first Gulf of Mexico pipeline. In 1951, McDermott installed the first large diameter concrete coated pipeline in the Gulf of Mexico.

In 1986, Allseas' Lorelay was the world's first dynamically positioned pipe-lay vessel

In order to produce a pipeline offshore, the same techniques as on land were used. The pipes were shipped out on a flat top barge, welded or bolted together and pushed overboard via the stern ("stove piping"). The barge was moored with anchors and moved forward in increments according to the length of each pipe section that was pushed overboard. This worked well in shallow waters, but as the water depths increased, the problem with anchoring also increased. This method was slow and required a number of anchor handling vessels to shift anchors as the barge slowly moved forward. In deeper waters – more than 300 metres – the "conventionally" moored barge becomes difficult to handle. In 1986, the Allseas pipe-lay vessel Lorelay was introduced to the market as the world's first dynamically positioned pipe-lay vessel. The Allseas company was an offspring of the Heerema company and founded in 1985. What is now Heerema Marine Contractors originally started in 1948 in Venezuela with heavy lift operations as a speciality.

Different pipe-lay techniques

Pipes come in various types and shapes:

- Rigid pipe, welded on board to a continuous pipeline (arrives on board in lengths of around 12 metres up to 24 metres). This type of pipe can be up to 48" (1219 mm) in diameter and normally arrives on board with coating and only the welding joints are coated on board.

1 Thermoplastic inner tube

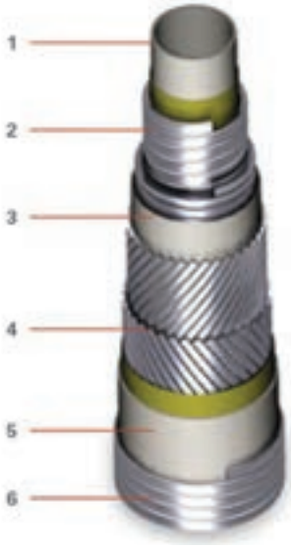
2 Zeta pressure carcass

3 Intermediate thermoplastic sheath

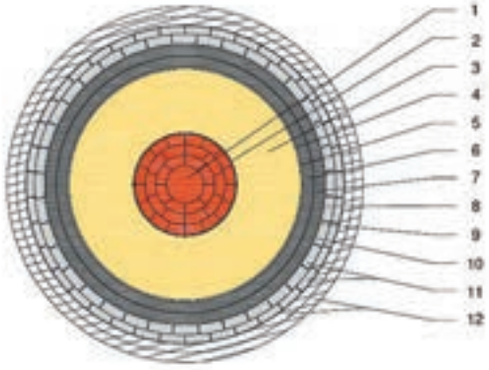
4 Crosswound tensile armour

5 Thermoplastic outer sheath

6 Stainless steel outer wrap



Coflexip or flexible pipe.



No.	Constituents	Nominal thickness (mm)	Nominal diameter (mm)
1	Conductor, copper		
2	Conductor screen		
3	Insulation		
4	Insulation screen		
5	Fabrick tape		
6	Lead sheath, F3		
7	Polyethylene sheath, MDPE		
8	Bedding tape		
9	Reinforcement		
10	Bedding tape		
11	Armour, galvanized steel wires, two layers		
12	Outer serving/PP yarn		107

Nominal Cable weight: 35.2 kg/m

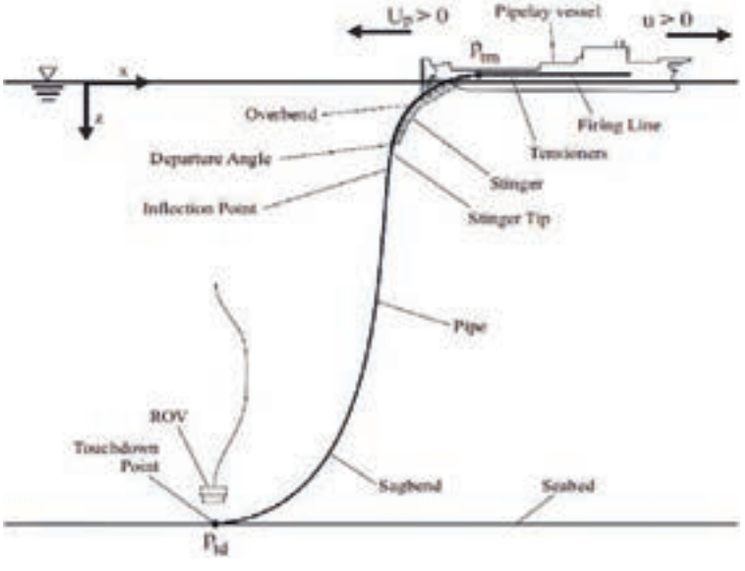
Submarine high voltage power transmission cable.

- Reel pipe, spooled onto a reel. This pipe is continuous without any joints on the reel or on the carousel. (This pipe can be many kilometres long.)
- Coflexip or flexible pipe. This pipe consists of a thermoplastic tube surrounded by several layers of armour.
- SURF (subsea umbilical, riser and flowlines). These pipes can consist of several conductors for liquids, gases plus power transmission cables as well as communication cables.
- Submarine high voltage power transmission cable. Often for direct current (DC), can also be for alternating current (AC). This cable is just as stiff as any flexible pipe.

Lay techniques

The Continental Shelf Authorities require the pipeline to be buried in certain areas. The US authorities require for example that in water depths of less than 60 metres, the pipeline is buried at least 1 metre below the seabed. This can be done by a plough that is towed by the lay vessel in front of the landing point of the pipeline. A special trencher or jetting machine can also be used during the lay process. This trencher is often self propelled.

Buoyancy affects the pipe-lay process, both in positive and negative ways. In water, the pipe weighs less if it is filled with air, which puts less stress on the pipe and the pipe-lay vessel. Once the pipe is on the seabed, it requires a downward force to remain in place. This can be provided by the weight of the oil passing through the pipeline, but gas gives very little additional weight. The pipeline will then start to drift across the seafloor. In shallow water, concrete is poured over the pipe to keep it in place, while in deep water situations, the amount of insulation and the thickness required to counteract the hydrostatic pressure is usually high enough to keep the pipeline in place. The most common pipeline installation methods are the S-lay, the J-lay and the reel-lay methods. In certain cases, like close to shore and through the surf, a certain length of pipeline is fabricated on land and then towed out underwater, suspended over the seafloor, and installed.



S-lay pipe-laying method.

S-lay

The traditional way of laying pipe offshore is the S-lay method. With this method, the pipe is deployed as an "S". This is done via a stinger, see the sketch below and the drawing of the pipe-lay vessel Solitaire of Allseas). On the right hand side of the drawing, the stinger can be seen. The stinger can be lowered to form a suitable angle depending on water depth and form a continuation of the catenary.

The S-lay system is suitable for welded pipe joints with concrete coating in shallow and intermediate water depths. S-lay also has a very high production rate.

The pipe is welded on deck in a "firing line" to one continuous pipe. At the end of the firing line, there is an X-ray station or a test station, a repair station and a coating station. After that, the pipe goes overboard via the stinger.

J-lay

With the J-lay method, the pipe is deployed in a "J". The J-lay method is very suitable for deep waters. The advantage with this method is that the pipe is bent only once, at the seabed. This improves the fatigue life.

The amount of pipe that can be stored in a carousel can be up to 6000 tonnes

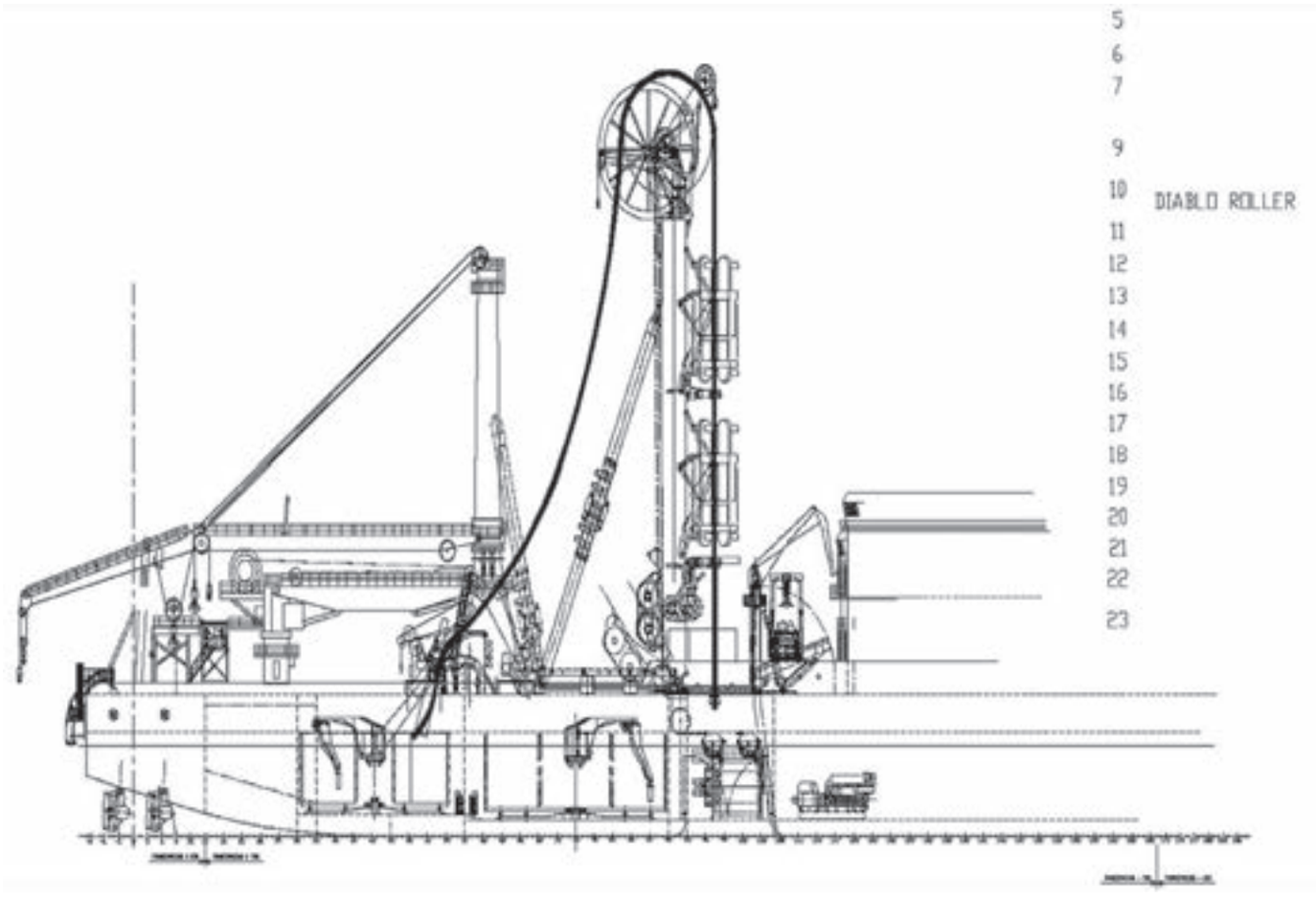
The pipe is deployed over a ramp or a tower. With rigid pipe, the pipe lengths are welded in the tower (or ramp) that contains several work stations. At the bottom of the tower, there is an X-ray station, a repair station and a coating station and below that a hang-off clamp to prevent the pipe from slipping overboard.

The J-lay method is suitable for rigid pipe or reeled pipe. The J-lay method for rigid pipe is rather slow due to the relative short "firing line" in the tower due to a limited amount of workstations. In some cases, the pipe is welded from short pipe lengths on board and then spooled onto a reel and from the reel deployed overboard for seabed installation.

The tower inclination is chosen in such a way that it is in line with the pipe catenary to the seabed.

Reel-lay

The rigid pipe can be spooled onto a reel in one continuous length. The pipe is then welded, tested and coated onshore and this saves quite some time offshore. The reel can have a horizontal shaft or a vertical shaft. Pipe diameters can vary from 100 mm up to 630 mm. Reel-lay vessels spend most of their time loading pipe or in transit. Therefore, modern reel-lay vessels can have a service speed of 15 knots and above. Spooling of the pipe (loading) takes more than fifty



System for flex lay.

per cent of the vessel's total time for an installation job. Installation of the pipe on site is only about seven per cent of the total vessel time.

The pipe is produced at a shore base and spooled onto the reel or carousel when the vessel is docked at the shore base. The disadvantage with this system is that the shore base should be close to the deployment area.

The pipe is taken off the reel, led over the top of the lay tower, straightened and via tensioners is delivered overboard to the seabed. The tower is inclined depending on water depth. Reeled pipe is always deployed via a tower. This has to do with the fatigue and bending of the pipe.

Flexible pipe-lay

A flexible pipe-lay system consists mainly of a vertical ramp or a tower with one or more tensioners and a chute or a wheel on top of the tower. The flexible pipe-lay can also be horizontal over the stern, but as soon as the tensions start to approach 150 tonnes, a vertical deployment system is required. Flexible pipe-lay is with a vertical tower. The tower can be inclined, but that has to do with air-draught (bridge in Rio de Janeiro) and the fact that there is a patent about joining the flex pipes in a vertical position. In order to avoid the patent, the tower is then inclined. The flexible pipe is spooled from a reel (vertical or horizontal shaft) or from a carousel with vertical shaft.

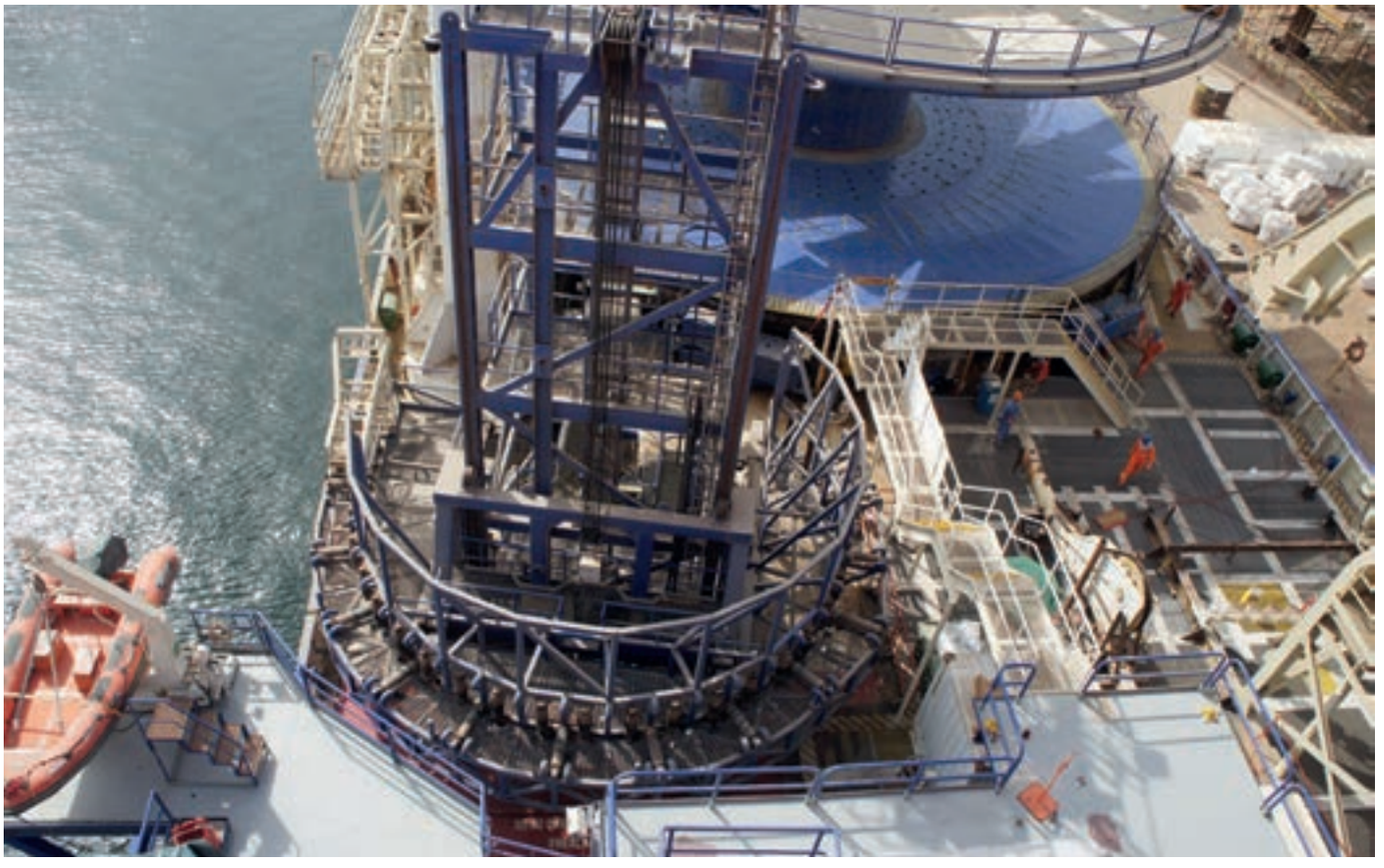
Joining the flexible pipe is rather simple as the end has a flange.

The advantage of flex lay is that it is a simple installation, less sensitive to fatigue and the abandonment and recovery procedure for the pipe is simpler than for rigid pipe. A flex lay installation is not suitable for the installation of rigid pipe and is therefore often combined with other pipe-lay methods as well as high voltage power transmission cable lay.

The system depicted above is for flexible pipe, which can be stored in two carousels below deck. The pipe is pulled out through a hatch above the carousel. Loading the carousels is over the stern via a separate loading hatch, which is about twice the size of the offloading hatch. The loading hatch size is determined from the PLETS (pipe end termination system).

Carousels and reels

Carousels are usually either a basket type (with perimeter wall) or reel type (without a wall), though in some cases a combination unit can be provided, which can be used in either mode depending upon product requirements. Carousels are used for storing flexible pipe, umbilical flowlines, high voltage power transmission cable, etc. The carousel can be located on the weather deck or below deck. Many

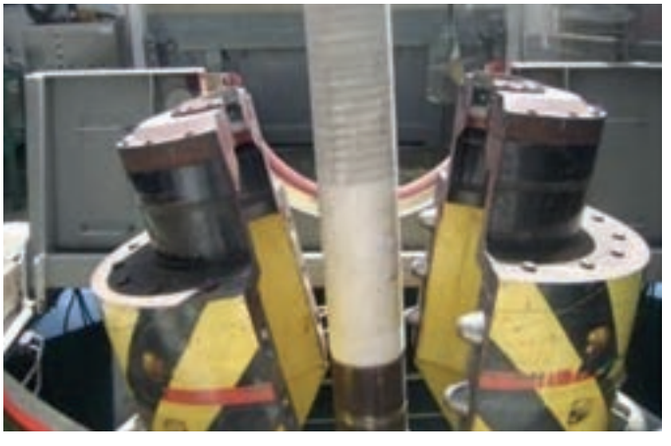


Spooling device with the reel and a vertical shaft in the background.

pipe-lay vessels have carousels above and below deck. In this way, pipe can be deployed in a "piggy-back" configuration (one pipe on top of the other) or different types of pipe can be carried.
Carousels and reels are electrically driven by a number of electrical motors driven via gearbox and a rack and pinion drive or a sprocket wheel engaged to a chain attached to the bottom perimeter of the reel or the carousel. A loading arm or a spooling arm is used for loading the carousel. A reel requires a spooling device.

In the past, three to four persons equipped with "paddles" walked the pipe inside the carousel to ensure that the pipe was properly stored and that there were minimum gaps between the coils. The deployment or off-loading of the pipe is via tensioners of suitable size, depending on pipe weight and water depth, and an overboard chute.
The amount of pipe that can be stored in a carousel can be up to 6000 tonnes. The "crushing" force on the bottom layer limits the ca-

Tensioners are normally hydraulically driven and have two or four caterpillar tracks squeezing the pipe in order to gain friction and have control over the pipe tension.



The hang-off clamp is used in J-Lay configuration when the pipe is not suspended by other means like tensioners or cranes.

A traction winch and storage winch (top right).

pacity of the reel or the carousel. The carousel and the reel with a vertical shaft are supported by a number of roller assemblies welded to the deck or to the tank top of the vessel. The rollers can be arranged in several concentric circles depending on the weight of the fully loaded carousel or reel. These rollers distribute the weight of the carousel or reel into the ship's structure.
Reels will require a spooling device that ensures that the pipe is spooled up properly on the reel without gaps between the coils.

Pipe tensioners

Pipe tensioners are there for keeping tension in the pipeline during deployment of the pipe. Without the proper tension, the pipe will buckle. Tensioners are the central element in all pipe-lay operations. They are normally hydraulically driven and have two or four caterpillar tracks squeezing the pipe in order to gain friction and have control over the pipe tension. The squeeze pressure is accomplished by hydraulic cylinders.
Pipe tension in a large rigid pipe-lay system for reeled pipe can be up to 650 tonnes. Tensioners for steel pipe have steel pads and the friction coefficient used is very high. When laying flexible pipe, the tensioners will leave imprints in the surface of the pipe. These types of pipes are regarded as slippery and the friction coefficient is below 0.1. Often the tensioner can be opened in order to let larger objects pass through. The speed of the tensioner can be synchronised with the ship's speed for example via a dynamic positioning system. The tensioner's speed is also synchronised with the load out speed of the carousel or reel.

Hang-off clamp

The hang-off clamp is used in J-Lay configuration when the pipe is not suspended by other means like tensioners or cranes. The hang-off clamp works with friction or it uses the flange to get a firm grip on the pipe.

Pipe straightener

If a flexible or rigid subsea pipeline is installed using reel-lay, the pipe requires straightening after it is spooled off from the reel. The pipe is also bent over an aligner prior to deployment overboard. The design of the straightener depends on the diameter of pipe, wall thickness, yield strength and the type of coating on the pipe. Generally, the straightener consists of two curve tracks that use the aligner as third bending point for straightening.

Line-up systems

The already deployed pipe in the hang-off clamp will require line-up with the new section of pipe to be added to the pipeline already partly deployed. The line-up system normally consists of two friction clamps mounted on a frame that can be positioned using spindles. When a new pipe is presented to the tool, the friction clamps close and squeeze the pipe so that the load can be taken by the tool. The load is measured to ensure that the hand-over is complete. As soon as the pipes are aligned, the new pipe can be landed on the seagoing pipe using hydraulic cylinders in series with the vertical spin-

Pipeline end termination equipment (PLET).

dles. When the line-up is complete, the pipes are welded together and the tool can be disengaged.

Winches and abandonment and recovery systems

At certain times, the end of the pipe will have to be laid down on the seabed and later be recovered. This can be because of the weather or because the pipe installation is terminated. For this purpose, an abandonment and recovery (A&R) winch is used. With increasing water depth, the weight of the pipe also increases. A&R winches with up to 650 tonnes of line pull and for 3500 metres of water have been delivered. For this type of winch, traction winches are used. A traction winch consists of two capstans and a storage winch for the steel wire. Traction winches also have the advantage that the fleet angle is constant and not varying as with "normal" winches. In certain cases, the A&R winch is located below deck, because of the size of the drums.

Maximum practical size of an A&R winch is around 450 tonnes with a cable of Ø 136 mm and a safety factor of around 2.5. A winch of 600 tonnes will have a cable Ø 156 mm with a safety factor of 3. Often one large (450 tonnes) and a smaller A&R winch (150-250 tonnes) are fitted. The smaller winch has a cheaper cable and is easier to handle. For the very heave pipe-lay operations, the large winch is used (maybe thirty per cent of the time). Two A&R winches can be used together, but there is great risk of the wires getting entangled and both wires will then be lost.

Pipeline end termination equipment (PLET)

This is an example of pipeline end termination piece of equipment (PLET), which is welded (rigid pipe) or bolted (flexible pipe) to the end of the pipeline. The PLET ensures that the end of the pipeline is securely fastened to the base frame or a template or a module, which the pipeline is to serve.

Reel-lay vessel Seven Vega

UK-based company Subsea 7 ordered the Seven Vega from the Dutch Shipyard Royal IHC in September 2017. The reel-lay vessel was built at the shipyard in Krimpen aan den IJssel, where its keel was laid in July 2018. The launch followed in May 2019 with sea trials in September 2020 (one week). The ship was delivered in November 2020.

The "Special Purpose Ship" notation implies that the Seven Vega has the same safety standards as a passenger vessel. It is a diesel electric ship with three separate engine rooms, three thrusters aft and four thrusters forward. It has a double hull with engine rooms and accommodation forward. The aft deck and below contains the pipe-lay storage and deployment equipment. Aft is a lay tower with tensioners and such. The tower can be tilted depending on pipe tension, water depth, and so on. The design and fabrication of the pipe-lay equipment is by the Royal IHC company in the UK. Royal IHC and Huisman Equipment have supplied all the electrical equipment for the cranes and the pipe-lay installation.
Bakker Sliedrecht is the electrical system integrator and delivered the complete automation and alarm system including the dynamic positioning (DP) system.
The medium tension electrical installation including drives and motors, 6.6 kVolt installation, including generators, thruster drives and motors have been supplied by Bakker Sliedrecht and the low voltage installation by Croonwolter & Dros.
Huisman Equipment has delivered the main 250-tonne heave compensated electrical crane. Thrusters are from Wärtsilä and the diesel generators, medium speed, from Hyundai HiMSEN.

General layout

The Seven Vega was designed and built by the Royal IHC shipyard in the Netherlands and represents the latest in pipe-lay technology with two reels, each with a horizontal shaft. The ship has the accommodation and power plant located forward with all the pipe-lay equipment aft of the superstructure. A helicopter deck is located on

The tower can be tilted depending on pipe tension, water depth, and so on (photo Flying Focus).

top of the forecastle deck in front of and above the deckhouse.
The hull has double skin throughout and is ice strengthened. The ice class 1D does not give the ship any ice going capacity, it just strengthens the hull forward. The Seven Vega has the notation "Winterisation H(-30) D(-30)" which means that the materials for hull, superstructure and equipment can withstand outside temperatures down to -30°C. The ship can work in a cold environment like in the winter in the North Sea and the North Atlantic, but is not suitable for ice conditions.
Forward there are four thrusters, two tunnels surrounded by two

MAIN PARTICULARS SEVEN VEGA

Classification:	Lloyd's Register of Shipping - 100A1, WDL (10 t/m² aft of frame 69), Ice class 1D, helideck (Super Puma, Sikorsky 61N) ECO (BMT, NOx-3) - LMC, UMS, CAC3, ICC, NAV-1, DP(AAA), IBS *IWS, winterisation H(-30) D(-30)
IMO:	SPS (Special Purpose Ship)
Flag:	Isle of Man

Dimensions

Length over all:	149.2 metres
Breadth:	33 metres
Depth:	13 metres
Draught design:	8.3 metres
Deadweight:	10,800 tonnes
Gross tonnage:	21,334 RT
Net tonnage:	6400 RT
Main deck area:	800 m²

Tank capacities

Marine gas oil:	2900 m³
Potable water:	725 m³
Ballast water:	3900 m³
Technical freshwater:	1680 m³ (in ballast water tanks)
Heeling tanks:	1200 m³

Accommodation

Total complement:	120 persons
Suites:	4
Single cabins:	42
Double cabins:	37

Machinery

Main diesel generators:	3 x 3500 kW (3360 ekW) 3 x 4000 kW (3840 ekW)
Total:	22,500 kW

Propulsion

Azimuthing thrusters aft:	3 x 3200 kW
Azimuthing thrusters forward:	2 x 2400 kW (retractable)
Tunnel thrusters forward:	2 x 2200 kW
Speed:	13.8 knots
Bollard pull:	100 tonnes (in DP3 failure mode, 2/3 power)
DP system:	Kongsberg, 3 x DGPS, 2 x HiPAP, radius spot track

Cranes

Main crane, AHC:	250 tonnes/14 metres, water depth 3000 metres
Auxiliary crane 1, AHC:	50 tonnes/24 metres, water depth 3000 metres
Auxiliary crane 2:	20 tonnes
Ramp top crane:	20 tonnes
ROV:	Integrated side launch system, 2 x Work Class Perry XLV-EVO, 3000 metres

Pipe-lay equipment

Main reel capacity:	5600 tonnes
Secondary reel capacity:	1600 tonnes
Pipe diameter:	4" to 20"
Dynamic top tension:	600 tonnes
Upper tensioner:	162 tonnes
Lower tensioner:	318 tonnes
Back tension:	120 tonnes
PLET, maximum:	5 x 5 x 10 metres
A&R winches:	2 x 325 tonnes, maximum 600 tonnes
Ramp angle:	45 to 95°
Piggyback DEH and rigid flexible pipe – top tension:	120 tonnes
Aligner diameter:	21 metres
Spooling on tensioner:	75 tonnes

Twin level work station and travelling platform
Straightener for 14" x 18" pipe in pipe
Max. operating water depth: 3000 metres

retractable azimuthing thrusters. The two tunnels are located in one watertight compartment and each of the azimuthing thrusters in separate compartments. Aft of the thruster rooms is the main diesel generator room with two diesel generators. On top of the diesel generator room are the three switchboard rooms. The main reel is recessed into the hull and extends all the way down to the double bottom. The other two diesel generator rooms are located athwartships of the recess for the main reel. The two A&R winches (abandonment and recovery) are also located below the main deck aft. All the way aft, there are three separate thruster rooms.

The accommodation is distributed over five decks with a lift in between.

The electrical power plant is split in three parts with three separate diesel generator rooms and three separate switchboard rooms. The operational mode for DP equipment class 2 operations is with closed circuit breakers and for DP Equipment Class 3 is with open circuit breakers. Each azimuthing thruster aft is fed from a separate switchboard. The two tunnel thrusters forward are fed from the central switchboard and the two retractable thrusters forward are each fed from the SB and the PS switchboard respectively.

Björn von Ubisch MSc
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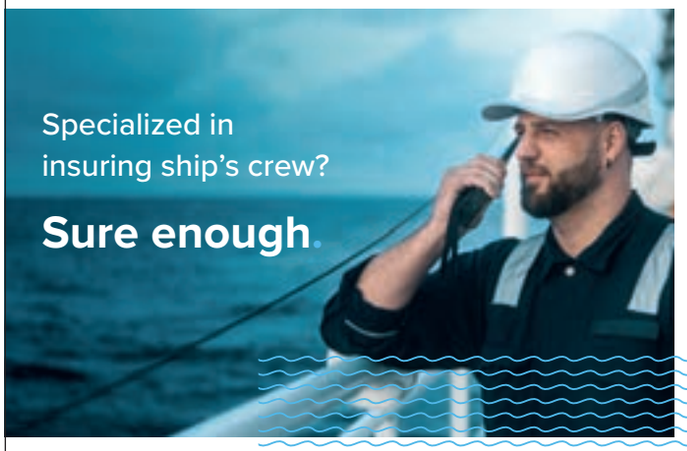

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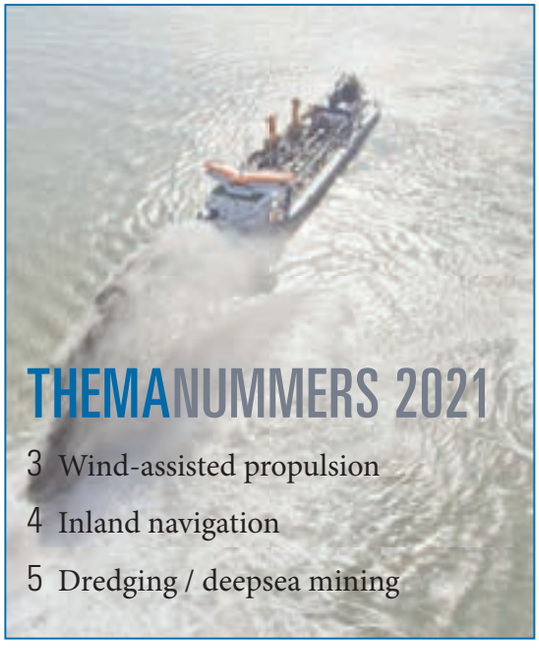

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3 Wind-assisted propulsion
4 Inland navigation
5 Dredging / deepsea mining

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2021

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HYMETHSHIP TO REDUCE CO_2 BY MORE THAN 95 PER CENT

Filling and emptying a combined tank for methanol and CO_2 is more complex

The HyMethShip technology demonstrator at the LEC. On the left hand side, the internal combustion engine in the test cell environment. On the right hand side (the smaller room), is the membrane reformer system, including heat recovery units. On the wall between the rooms are the interfaces between the two systems, the exhaust gas heat exchangers and the hydrogen fuel line going to the engine.

The HyMethShip project started in 2018 and ends in June 2021. The total budget was 9.2 million euros of which the EU Horizon 2020 programme funded 8.4 million. Project coordinator is the LEC in Austria and Nicole Wermuth explains more about it: 'We are still looking for opportunities to implement the HyMethShip concept in a vessel.'

The main goal of the HyMethShip concept is a drastic reduction in emissions. The concept can reduce CO_2 emissions by more than 95 per cent, while virtually eliminating sulphur oxide and particulate matter emissions and reducing NO_X-emissions below Tier III-levels, applicable to emission control areas (ECA).

The key to achieving the targeted CO_2 emission reduction is a closed CO_2 cycle. The concept uses methanol bunkering, onboard methanol reforming, pre-combustion carbon capture and hydrogen combustion in an internal combustion engine. Ideally, the captured CO_2 is used onshore for the production of green methanol – thus closing the CO_2 cycle. Advantages of this concept are the use of estab-

lished reciprocating engine technology, the bunkering of a liquid fuel that does not require high pressure or cryogenic storage and the usage of engine waste heat for the pre-combustion carbon capture process.

Sub-systems do the work

The onboard set-up consists of two interconnected sub-systems: the fuel production and carbon capture subsystem and the fuel consuming subsystem providing the propulsion power. The carbon capture sub-system consumes methanol and water and produces hydrogen via methanol-steam-reformation in the catalyst portion of the membrane reactor.

After the separation of hydrogen and CO_2 in the membrane section of the membrane reformer, the CO_2 is liquefied and transferred to the tank system. The two subsystems exchange the hydrogen fuel and the engine exhaust gas enthalpy. The engine exhaust heat is a crucial part in the fuel production, that is, the methanol reforming (which is an endothermic process, thus requiring heat to be sustained) and CO_2 liquefaction. The cooling power for the CO_2 condensation is produced with an ammonia absorption chiller that uses heat as the main energy input and requires little electric power.

> The engine exhaust heat is a crucial part in the fuel production

Normal propulsion

The propulsion engine can be derived from a diesel or a gas engine (so the engine can be designed either for spark ignition or for diesel pilot ignition) and is upgraded to operate with hydrogen fuel. Hydrogen combustion will be the standard operating mode, so that the engine produces mainly water and nitrogen and oxygen emissions. Hydrogen combustion will take place with an air excess in the combustion chamber ensuring that the NO_x emissions are kept below the Tier III-limit.

All dual-fuel

For maritime applications, the redundancy requirements and, therefore, the fuel back-up operation needs to be considered as well. That's why the combustion systems that are investigated in this project are all dual-fuel combustion systems that will be able to operate with a liquid fuel as well.

One option is the well-established dual-fuel configuration with diesel pilot ignition during the gas operation and diesel operation for the back-up. This requires a flexible diesel injection system that can reliably deliver fuel quantities from one to 100 per cent of the full load mass.

ROLE OF COLIBRI

Colibri is a Dutch company specialised in ammonia absorption refrigeration technology. Within the HyMethShip project, Colibri is responsible for designing the absorption refrigeration system. This system is to provide the cooling for the liquefaction of the arising carbon dioxide from the reformer and is mainly operated by the waste heat of the propulsion engine and the reformer process instead of being operated with electricity. Colibri is to carry out the design works of an appropriate absorption system with regard to an optimal fitting to the results of other work-packages of this project. Depending on these results, arising from calculations and/or technical experience of the test rig, Colibri's work is to define the proper process design for maximum efficiency, the piping and instrumentation diagram (P&I-D) of the refrigeration system, the component design, layout-support for integration into a vessel and the control narratives of this system.

Methanol on board and storing CO_2

In the HyMethShip concept, methanol will also be bunkered on the vessel. Therefore, it might be desirable to use methanol as a back-up fuel. That solution has the advantage that no diesel fuel tank would be required and there is an additional emission reduction potential in back-up operation as well. This concept will use spark ignition for hydrogen as well as for methanol combustion. Particulate matter emissions might be produced if the engine is running on a liquid fuel, for example in case of system warm-up.

Depending on the vessel layout, available cargo space, et cetera, there are two options for the CO_2 storage. Either a combined tank system for methanol and CO_2 is used where the tanks first carry methanol and once the tanks are emptied of methanol, they are filled with liquid CO_2, or a tank system with separate tanks for methanol and CO_2.

The combined tank solution might save some storage space, but has the disadvantage of higher complexity for the filling and emptying of the tanks. The separate tank solution has lower complexity and

Nicole Wermuth: 'We are still looking for a vessel'

in some cases, the methanol tank could even be integrated in the vessel structure, thus reducing the space needed and possible loss of cargo capacity.

Work streams

The project has three main work streams: technology development and technology demonstration (onshore), case study vessel design and life cycle and cost assessment.

Wermuth: 'The technology demonstration will take place at the LEC in Graz. We are currently building the system and expect to perform the technology demonstration in the middle of 2021.'

'The design of a case study ship provides a practical example of the integration of the complete system into the vessel. This case study ship will be used for the risk assessment according to shipping guidelines as well.'

'The life cycle and cost assessment includes the vessel and vessel operation as well as the onshore methanol production. The goal of this assessment is to evaluate for which vessel types and routes this concept will be most beneficial and economically feasible.'

'The final assessment will be performed once the technology demonstration is complete. A preliminary assessment was published earlier this year (Malmgren et.al. TRA2020.pdf (tugraz.at)). This assessment compared different propulsion concepts and in particular different fuels. Two fuels chosen for comparison were E-diesel and e-methanol. Both of them showed higher annual cost than the HyMethShip concept. The main reason for this advantage is the closed CO_2 cycle. While for the HyMethShip concept the CO_2 is already available because it is returned from the ship, the other two options need to rely on other methods for CO_2. In the study published, the CO_2 was generated with Direct Air Capture technology.'

The HyMethShip concept's closed CO_2 cycle results in lower annual cost

METHANOL AS ARCTIC FUEL

The Methanol Institute (MI) is urging the maritime community to mitigate pollution and emissions risk in polar regions by adopting methanol as marine fuel, applying safe bunkering guidelines developed by the European Committee for Standardisation (CEN). The MI is the global trade association for the methanol industry.

Facilitated by the Safe Maritime Operations under Extreme Conditions: the Arctic Case (SEDNA), which advocates an integrated risk-based approach to safe arctic navigation, ship design and operation, the project secured a CEN Workshop Agreement on a process to address safety during bunkering of methanol as a marine fuel.

IMO member states agreed amendments to MARPOL regulations to restrict the use of heavy fuel oil in arctic waters, changes that have come in for criticism from environmental groups thanks to exemptions and waivers that may not see a comprehensive ban on HFO (heavy fuel oil) come into effect until mid-2029. Some NGOs are also concerned that very low sulphur fuel oil used in place of HFO contains high levels of black carbon, a particularly dangerous pollutant to the arctic environment where it can settle on and increase the melt rate of sea ice.

The SEDNA project put forward technical provisions and assessment of relative safety risks along with safety zone guidance for the bunkering concepts truck-to-ship, shore-to-ship and ship-to-ship. It included a safety assessment of the implications for the environment, for vessels and their crews of projected accidents where the vessels involved were using low flash point and conventional fossil fuels. Consideration was given for ships intended to be exposed to the Arctic's specific environmental conditions, by providing comprehensively comparative safety assessments of the use of low flash point fuels in arctic shipping operations in place of conventional fossil fuels. The CEN Workshop Agreement on methanol bunkering processes set out requirements for bunkering methanol to marine vessels and included guidelines for usage of hardware and transfer system, operational procedures, requirement for the methanol provider to provide a bunker delivery note and training and qualification of personnel involved. *(www.methanol.org/contact-us/)*

PROJECT PARTNERS

Partners in the the HyMethShip project are:

- INNIO Jenbacher (Austria)
- Fraunhofer Institute for Ceramic Technologies and Systems IKTS (Germany)
- Förderung der angewandten Forschung (Germany)
- Chalmers Tekniska Hoegskola (Sweden)
- SSPA Sweden (Sweden)
- Lloyd's Register EMEA (UK)
- Colibri (Netherlands)
- EXMAR Marine (Belgium)
- MUW Screentec (Germany)
- Meyer Werft Papenburg (Germany)
- Hoerbiger Wien (Austria)
- SE.S (Austria)
- Technical University Graz (Austria)

Project website: www.hymethship.com.

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KNRM STEEKT 83 MILJOEN IN BREDE VLOOTVERNIEUWING

Van Wijk-klasse bijt het spits af met acht nieuwelingen

De KNRM steekt na overleg met alle 45 stations en 1400 'professionele vrijwilligers' nog eens acht miljoen euro extra in haar vlootvernieuwing tot 2035. Er is 83 miljoen uitgetrokken voor de operatie, goed voor 75 nieuwe boten en ondersteunend materieel. Daarvan is dertig miljoen al beschikbaar via schenkingen en nalatenschappen. De nieuwe boten variëren in prijs van 50.000 tot 2,5 miljoen euro. Bij het plan draait alles om de kernbegrippen gereddencapaciteit en aanvaartijden.

Hoofd Operaties John Geel en hoofd Technische Dienst Gert-Jan Wijker zijn blij met de ronde langs de stations, want her en der waren plaatselijke omstandigheden aanleiding plannen aan te passen. Zo krijgen kuststations als Zandvoort en Wijk aan Zee geen kleinere RIB (*rigid inflatable boat*) van circa negen meter, maar een nieuwe Van Wijk-klasse, omdat de boot ook kitesurfers moet bijstaan. Want voor die watersporters begint het leven pas bij windkracht zes.

Schaven aan plan

Op de Waddeneilanden was het plan de Atlantic 75 (7,38 meter) te vervangen door een Float 500 (vijf meter) op strandtrailer. 'Maar die kleinere boot heeft in vergelijking met een Atlantic operationele beperkingen en voor de bemanning maakt het verschil of je op een *buddyseat* of op een matrasje zit,' schetst Geel. De aanvaartijd blijkt, ook als de Atlantic vanaf het Wad moet omvaren, nog acceptabel. Omdat de gereddencapaciteit in het gebied tussen Neeltje Jans en Scheveningen te groot was, ging het vlootplan uit van een kleinere boot voor Stellendam. Geel: 'We hielden ook rekening met verondieping van het Slijkgat, maar toen bleek de overheid – met het oog op de zeevisserij – verplicht die geul op diepte te houden. Dat, gecombineerd met de gevaarzetting van dat gebied, leidde tot handhaving van een *all weather*-boot.' Hier voorziet het plan nu in stationering van een verbeterde versie van de Nh1816 rond 2034. Het vlootplan wordt voortaan elke vijf jaar tegen het licht gehouden en zo nodig aangepast.

John Geel: 'buddyseat of matrasje maakt verschil'.

ALLEEN BEWEZEN GROEN

De KNRM heeft het nodige onderzoek besteed aan 'groen varen'. Geel: 'Maar op boten van deze maat en gezien de noodzaak van gewichtsbesparing is zelfs een roetfilter niet haalbaar, ook vanwege de hoogoplopende temperaturen.' Wijker: 'Wij kunnen alleen werken met techniek die zich heeft bewezen. Dus elektrische aandrijving of iets als waterstof zijn nog niet haalbaar. Bij waterstof heb je ook nog eens te maken met een gemeen goedje en afwegingen rond opslag en ventilatie. Bij HVO 30 moet je trouwens al goed letten op de betrouwbaarheid van de levering.'
Geel vult aan: 'Onze Zweedse collega's experimenteren met elektrische aandrijving, maar komen daar al een beetje op terug. Aan de andere kant doen onze Britse collega's alles conventioneel. Het is altijd afwegen tussen gewicht en snelheid. Het aantal pk's per kilo is altijd een vraagstuk.'

Gert-Jan Wijker: 'verwachtingen rond Nh1816/2 luisteren nauw.'

Proeven aan Atlantic 85

Rond het vlootplan lopen tal van onderzoeken. Wijker: 'We moeten voor stations als Petten en Ouddorp nog keuzes maken voor een lanceerbare RIB van circa negen meter en een tweede RIB van circa 7,5 meter. Die laatste wordt vooral ingezet op de ruime binnenwateren. We doen nu marktonderzoek en mogen van de collega's van de Britse RNLI (Royal National Lifeboat Institution, red.) een Atlantic 85 (8,44 meter, 86 kW) lenen.'

Acht Van Wijks

Eén besluit is al gevallen en dat is na jaren onderzoek en overleg de bouw van de eerste acht boten van de trailerbare Van Wijk-klasse (twaalf meter). Deze doorontwikkeling van de Valentijn 2000-klasse (elf meter) wordt beurtelings gebouwd bij Dok- en Scheepsbouw Woudsend en Habbeké Shipyard in Hoorn. Woudsend bouwt de aluminium casco's van Jachtbouw Folmer in Rijsaf, Habbeké bouwt de casco's zelf. Deze eerste order heeft een waarde van 9,5 miljoen euro. Voor het ontwerp tekende De Vries Lentsch. De boot krijgt naar voorbeeld van de Nh1816 een drenkelingenklep achterop, waarmee mensen horizontaal worden gered. De aandrijflijn bestaat uit een Volvo Penta D6-440 WJ Solas van 324 kW/440 pk en Hamilton HTX30-waterjets. 'Deze motor voldoet aan Tier 2 en kan op HVO 30 (*hydrotreated vegetable oil*) varen.' Volgens bunkeraars verbruikt deze brandstof minder AdBlue, is emissiearm en winterbestendig en reduceert CO_2-uitstoot tot dertig procent. Geel noemt de aandrijflijn 'effectiever en met meer *torque*. Dat geeft je meer acceleratievermogen in de branding.' Voor deze motoren werkt de KNRM samen met Betsema Scheepsmotoren op Texel (zie kader).

> We willen voordat we doorgaan alle kinderziektes eruit hebben

Volgens Wijker streeft de KNRM bij deze seriebouw naar 'volledig identieke boten', wat moet leiden tot kostenvoordelen in onderhoud en voorraadbeheer.

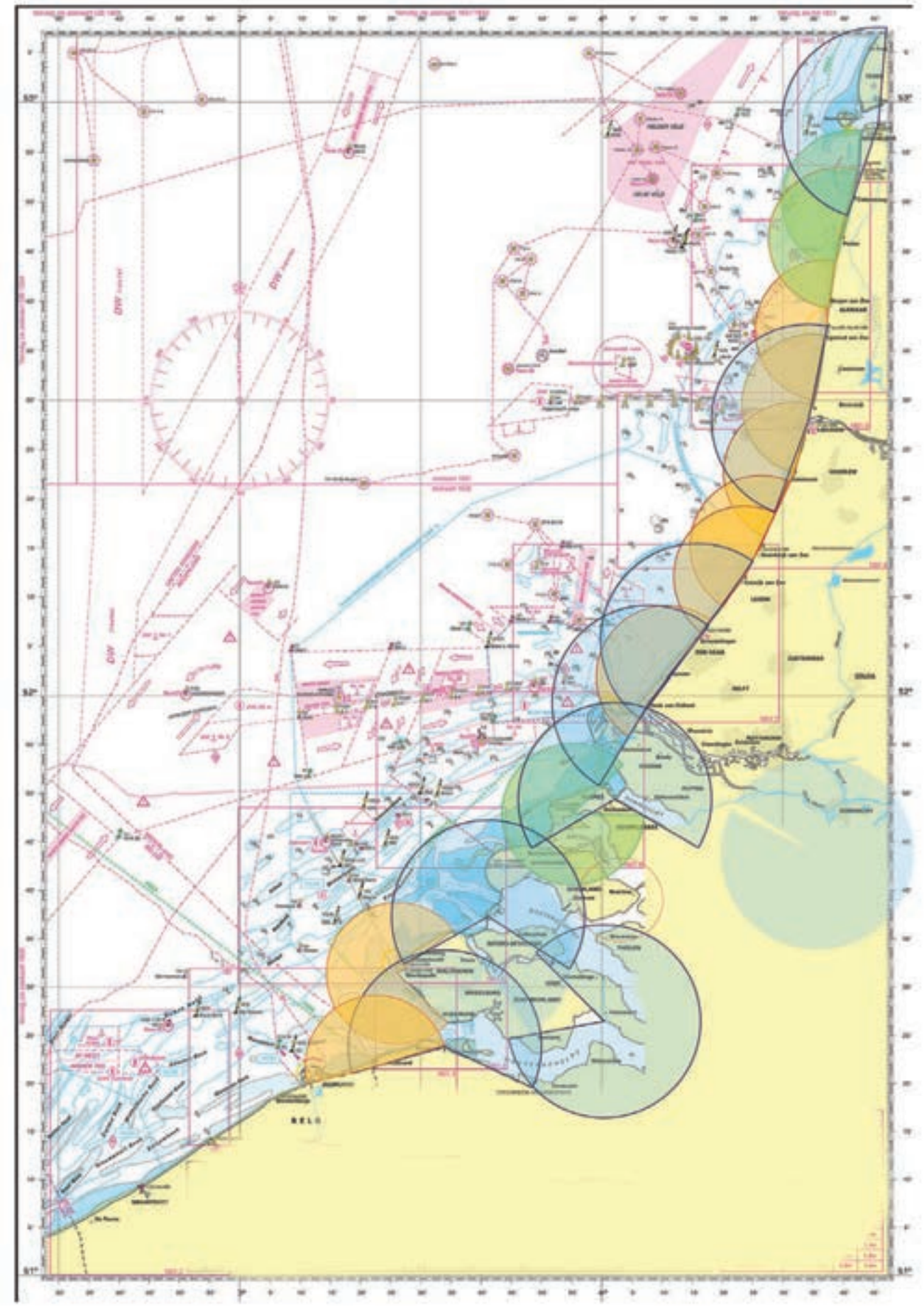
'G-KRACHTEN SLOOPTEN IN BEGINTIJD MOTOREN'

Betsema Scheepsmotoren op Texel kwam 25 jaar geleden via de eerste Valentijn-klasse in contact met de KNRM. Peter Betsema: 'In die tijd van de eerste snelle reddingboten waren er nogal wat problemen met de aandrijving onder die extreme belastingen. We hadden bijvoorbeeld last van de grote G-krachten in zwaar weer. Motorsteunen en diverse andere onderdelen braken gewoon af en werden in samenwerking met Volvo Penta en de KNRM aangepast. De combinatie met waterjets was vervolgens weer onalledaags. Dit totaal andere vermogensgebied eiste dat de motoren koppel hadden. Dit werd in die tijd opgelost met andere turbo's op de motoren.'

Weer lichter

Maar de tijd staat niet stil. 'Bij de ontwikkeling van de nieuwe Van Wijk-klasse is gekozen voor de Volvo Penta D6-440 van 440 pk bij 3700 tpm, die via een Twin Disc MG 5061SC 1.77-1 is gekoppeld aan een Hamilton HTX30-waterjet. Dit is een doorontwikkeling van de huidige aandrijflijn. Deze twee D6-motoren zijn samen 800 kilo lichter en leveren toch veel vermogen, wat de bootprestaties ten goede komt. In reddingboot De Redder bleek deze combinatie qua prestaties en kwaliteit zeer betrouwbaar. De Van Wijk-klasse krijgt deze lijn met enkele aanpassingen. De lijn voldoet aan de SOLAS-eisen, noodzakelijk voor de bedrijfszekerheid in de extreme situaties waarin ze varen. We bouwen de motoren op met keerkoppeling, voorverwarming en extra pompen. Samen met de ontwerpers en bouwers kijken we nog naar vermindering van geluid en trillingen.'
Broer Martin is reserveschipper op de Beursplein 5 en zijn zoon, die ook in het bedrijf werkt, is machinist. Zelf moest Peter na twintig jaar als machinist te hebben gevaren, na een ongeluk opgeven.

De Edith Grondel, de laatste nieuwe Valentijn, kreeg twee Volvo Penta D6-435-motoren (foto met dank aan Betsema).



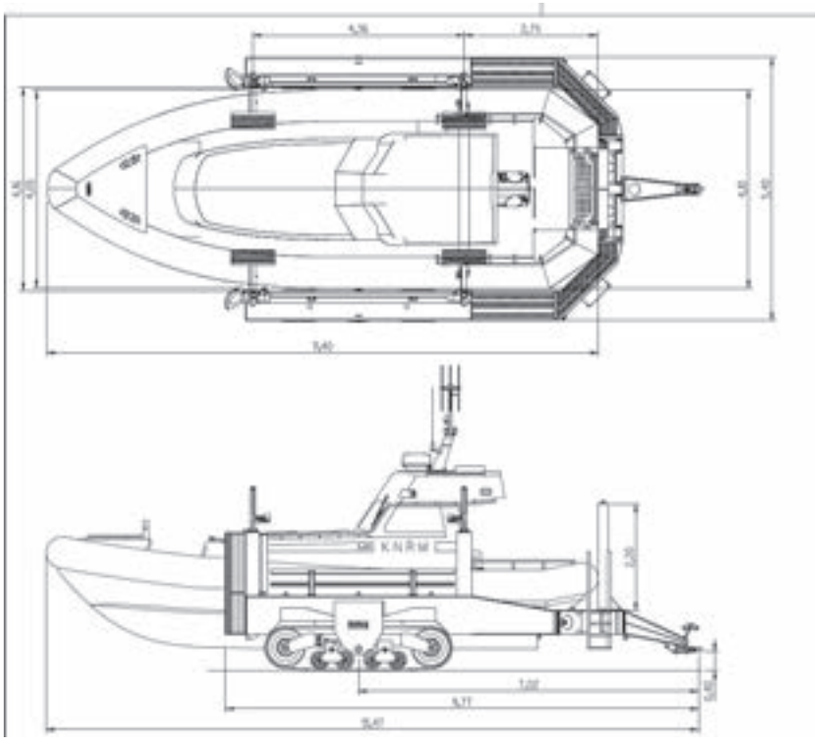
Deze kaart geeft aan welke actieradius de KNRM voor de Hollandse en Zeeuwse kust heeft tot dertig minuten na alarmering.

Voorproeven

Net als eerder bij de Nh1816, krijgen opvarenden de kans via een proefstuurhut (*mock-up*) hun mening te geven over zaken als ergonomie en beste plaatsing van apparatuur. Dat geldt zowel voor de bemanning als de technische dienst, die alles moet onderhouden. Wijker: 'Bij die bezichtiging willen we ook meten of bemanningen iets voelen voor een verplaatsbaar stuurwiel. Volgens een filosofie uit de wereld van de snelle boten is het beter als het stuurwiel iets uit het midden staat, zodat je lichaam centraal staat en beide armen gelijkmatig worden belast. Door middel van een adaptorplaat kan de bemanning kiezen voor in het midden of uit het midden sturen.'
De eerste Van Wijk geldt als 'reserveboot' en ondergaat in Woudsend de normale val- en kantelproeven en valt onder klasse van Lloyd's volgens de *grey boat code*. Daarna gaan boot en trailer 'op stage op zoet, zout, haven en strand' bij diverse stations. 'We willen voordat we doorgaan alle kinderziektes eruit hebben. Zoals de vraag of de bergingspomp op plek A nou wel zo handig is. We nodigen dan ook mensen van andere stations uit,' stelt Wijker. 'Na laatste aanpassingen aan het ontwerp willen we begin 2022 de nummers 2, 3 en 4 in opdracht geven. Pas bij stationering krijgen de boten hun naam.'

Vooral volger

In de toekomst wil de KNRM met partners 'technologische ontwikkelingen' volgen. Geel is direct duidelijk: 'We gaan die ontwikkelingen volgen, maar zelf niet innoveren. Hoogstens de rol van *early adopter* spelen. Onze Nh1816 was één groot innovatieplatform, zeker op het gebied van IT, maar in de Van Wijk doen we een stap terug.'
'We kijken wel naar de resultaten van NederDrone, want drones (zie kader) kunnen ons bij zoekwerk – de S van SAR – helpen. Voor andere technische en innovatieve ambities, zoals een energieneutraal botenhuis of twee stations met nul op de elektriciteitsmeter, zoeken we tijd. Ook kijken we naar voor- en nadelen van elektrische in plaats van dieselaandrijving op onze bootwagens.'
Met een partner als Simrad keek de KNRM voor de Van Wijk naar standaardisatie van dashboards, innovaties en betere afleesbaarheid. Wijker: 'Over vijf jaar moeten klokken moeiteloos uitwisselbaar zijn.'



Van deze Van Wijk-klasse op trailer worden er de komende tijd acht gebouwd.

Nh1816

De eerste versie van de Nh1816 werkt vanuit IJmuiden, maar het plan is om alle twaalf in aanmerking komende stations opnieuw te bevragen over hun wensen. De eerste Nh1816/2 moet in 2024 vanuit Breskens aan het werk.
Geel schetst de doorontwikkeling als 'in het beginstadium'. 'We gaan terug naar de tekentafel en kijken in overleg met de toekomstige stations wat de boot moet kunnen. De eerste doet vanuit IJmuiden keurig haar werk, maar heeft haar beperkingen. De rompvorm en "bijlboeg' zorgen zoals bedoeld voor minder verticale versnellingen en minder uitbreken bij voor de zee weglopen, maar in combinatie met de lengte zijn de zijdelingse bewegingen wel sterker. In ons werk assisteren we kleinere vaartuigen ook vaak via de "schouder" op het voorschip, maar de hoge steven en *tube* van de Nh1816 bemoeilijken dat. Maar in IJmuiden pakt de nieuwe schipper een klein bootje via de achterkant.'
Wijker onderschrijft de noodzaak van aanpassingen ('er is al een lijst'), maar benadrukt het belang van 'verwachtingsmanagement' in de gesprekken met de bemanningen. Hij en Geel beseffen dat de Nh1816 een min of meer valste start maakte. Geel: 'Ze werd nog voordat ze echt in actie was geweest gekozen tot KNVTS-Schip van het jaar. In samenspraak met alle betrokken partijen is ervoor gekozen geen vervolgorders van deze uitvoering van de Nh1816 te plaat-

GEREDDENCAPACITEIT

Zie je de boten van de KNRM rondvaren en je vraagt je af, hoeveel capaciteit die hebben om mensen te redden – de gereddencapaciteit – dan hoor je dat de Arie Visser-klasse 120 personen tegelijk 'buiten verdrinkingsgevaar' kan brengen. Het zal duidelijk zijn, dat dat het manoeuvreergedrag verandert.
John Geel legt het uit: 'We verplichten ons op de Noordzee om in een range van tien mijl uit de kust na een uur 300 personen buiten verdrinkingsgevaar te kunnen brengen. Voor de range van dertig mijl geldt 600 personen in twee uur. Die prestatie is in 95 procent van de gevallen haalbaar. Uiteraard is het de bedoeling om de geredden zo snel mogelijk naar een veilige plek of op een groter hulpvaartuig over te brengen. Maar het is altijd improviseren met tenders. Soms kun je bij passagiersschepen ook helikopters inzetten.'

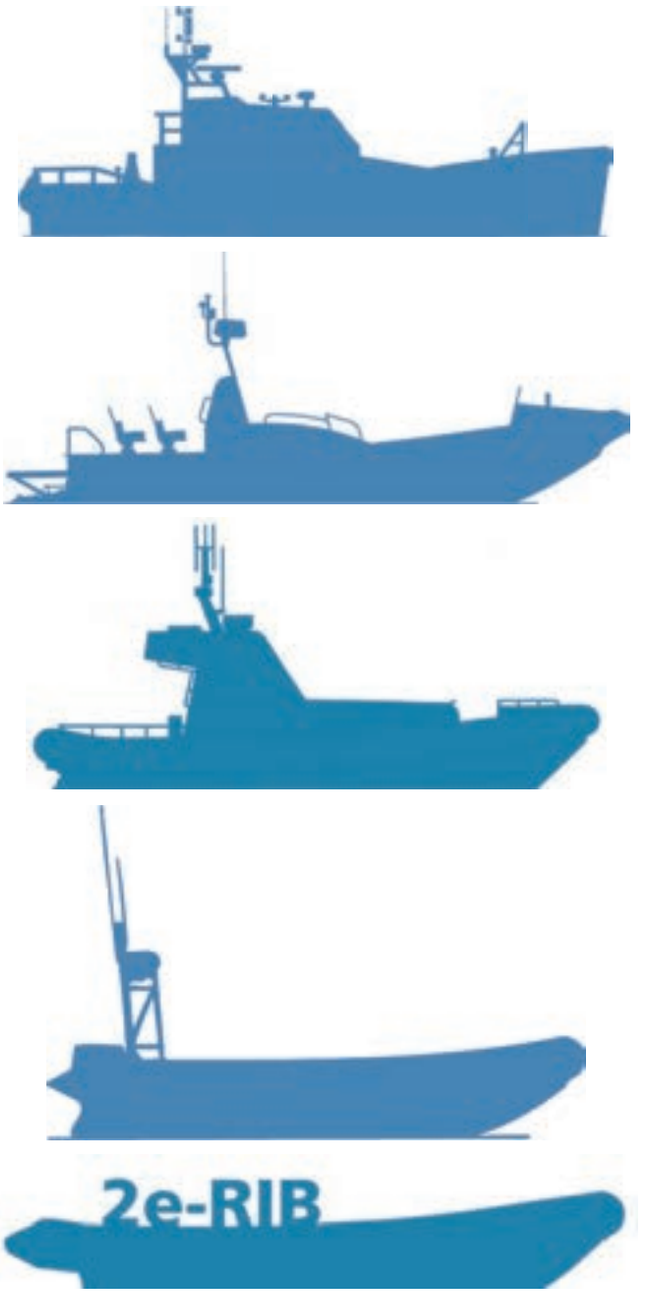
sen. Met de input van de reddingstations gaan we zorgen dat de beste eigenschappen van de Nh1816 en die van de Arie Visser-klasse terugkomen in de volgende Nh1816.'
De IJmuider boot gaat binnenkort bij De Haas de kant op voor enkele aanpassingen. Wijker: 'In samenwerking en met advies van Fender Innovations in Wieringerwerf kijken we naar een zachter materiaal, dat klappen beter opvangt wanneer de Nh1816 langszij ligt. Ook is het ontwerp van de fender doorontwikkeld zodat dat het beter mogelijk maakt boten op de schouder te nemen.'

DRONES TE WATER

Onderzoekers van het Micro Air Vehicle Laboratory (MAVLab) van de TU Delft lieten recent een drone vliegen vanaf een varend kustwachtschip. De drone werd tijdens de vlucht opgeladen door middel van waterstof, wat de vliegtijd verlengt.
Vaak moet een drone verticaal opstijgen of landen, ook bij verkenningsvluchten vanaf een schip. Verticaal opstijgen door middel van een multirotor kost veel energie. *Fixed-wing* drones zijn op de lange afstand in het voordeel, maar hebben extra voorzieningen nodig, zoals een start- en landingsbaan of een vangnet.
Een hybride drone stijgt op als een multirotor en vliegt daarna urenlang verder als een fixed-wing. Onderzoekers van het MAVLab ontwikkelden een hybride drone – de NederDrone – die dankzij waterstof extra lang kan vliegen. De drone weegt inclusief brandstofcel en accu's dertien kilo en heeft een spanwijdte van drie meter. Hij vliegt met twaalf motoren en kan zelfs bij uitval van enkele motoren nog veilig landen.
De drone is uitgerust met een 300 bar, 6,8 liter carboncomposiet waterstofcilinder. Die levert de waterstof op lage druk aan de 800-watt-brandstofcel, die de waterstof omzet in elektriciteit. Daarbij komen alleen zuurstof en waterdamp vrij. Een set batterijen levert samen met de brandstofcel extra energie aan de motoren tijdens het verticaal opstijgen en landen.

Maritiem gebruik

Drones komen op zee extra uitdagingen tegen zoals wind, zout water en een bewegend schip met beperkte stijg- en landingsmogelijkheden. Daarom is de Delftse waterstofdrone ook vanaf marine- en kustwachtschepen getest.
De drone kon dankzij de combinatie van de vleugels en een waterstofcilinder en accu tijdens de eerste testvluchten al ruim 3,5 uur in de lucht blijven en een stabiele vlucht maken. Met die eigenschappen kan de drone ondersteunen bij verkennings- en inspectietaken.
In binnen- en buitenland doen tal van partijen onderzoek naar het vliegen op waterstof als stap richting emissievrije luchtvaart. Zo experimenteert het NLR met de door waterstof aangedreven drone HYDRA. En het Spaanse Quaternium vestigde een record door een waterstofaangedreven multirotordrone ruim acht uur onafgebroken te laten vliegen.



De standaardboten in de toekomst, met van boven naar beneden: de Nh1816/2 – negentien meter, zes bemanningsleden, twee motoren; de Nikolaas-klasse – negen meter, vier bemanningsleden, een of twee motoren; de Van Wijk-klasse – elf meter, vier bemanningsleden, twee motoren en de Float-klasse – vijf meter, drie bemanningsleden, één motor. Nog te ontwerpen en bouwen zijn een lanceerbare RIB van circa negen meter en een tweede RIB van circa 7,5 meter.

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FAST AND SACRED SHIPS

The fast and sacred triremes that are the subject of this article are the fifth and fourth century ships of Athens that served in diplomatic missions. These fast government ships served in sacred embassies – conveying the Athenian deputies to the Festival of Delos – and took part in the boat races during festivals. As state vessels, they also served as scout and messenger ships, delivering official state messages. When present in the line of battle, they carried the admiral of the fleet.

The missions of the sacred triremes were not directed against enemies, however – for that there were troops and the fleets – but firstly against offenders among the Athenian citizens; consider generals abroad who were slack in paying what the Athenian government was due. In such cases, three principal instruments of punishment were considered: a special decree, impeachment, or the Paralos.

An embassy for the sacred triremes of Athens usually involved the transport of money and persons. Their reputation was that they served urgent needs only, conform to what Plutarch tells us that Critolaus believes: 'ought to employ himself in the chiefest and greatest affairs, like the King of the universe, who, as Euripides says, "Reserves great things for his own government, but small things leaves to Fortune's management".'

The historic sacred ship Paralos was not under command of the usual triarch [*triērarchos*], but of a high-level magistrate called the tamias. The tamias of the Paralos was an official elected treasurer, who added to the Paralos' reputation of "the people's cudgel" [*rhopalon*].

To illustrate how the sacred triremes were put to use is the story of how the Salamina sailed to Sicily with orders to transport general Alkibiades and certain others back to Athens, to answer the charges which the state had brought against them.

In 415 BCE, Athens prepared an expedition to support the Sicilian city of Segesta in the war against Selinus and Syracuse. This expedition was under command of General [*Stratēgós*] Alkibiades, the beautiful and brilliant member of the *jeunesse dorée* of Athens; pampered rich sons who, under the influence of the sophists' movement, with all sorts of wanton behaviour indicated their displeasure with the value system of Athens.

The night before the fleet was to leave, a large number of Athenian *hermai* were mutilated. Alkibiades and his friends, a group called the *hetaireiai*, were accused of this vandalism, but not charged. The Athenian fleet under command of Alkibiades set sail as planned and proceeded to Sicily. There, however, they found the state vessel Salaminia, coming from Athens with orders for Alkibiades to sail home and to answer the charges which the state had brought against him and certain other soldiers.

Alkibiades agreed to follow the Salamina with his own ship, but at Thurii [*Thourioi*] in southern Italy, he changed his mind and his course, escaped and sought refuge in Sparta. There he promised to help the Spartans according to the familiar saying, 'the more harm I did you as an enemy, the more good can I do you as a friend. For I know the secrets of the Athenians, while I could only guess at yours.'

Side view of the forebody of an Athenian trireme, 5th century BCE (model on display at the Nautical Museum of Chania, Crete).

This is the twelfth in a series of historic articles and an abbreviated version. Read the full article as well as the previous ones online by entering Rien de Meij into the search box on our website, www.swzmaritime.nl.

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GERRIT J. DE BOER

Scheepshistorie 28

Bij Uitgeverij Lanasta verscheen de 28ste editie in de serie Scheepshistorie met weer een grote verscheidenheid aan maritiem historische onderwerpen en zoals gebruikelijk prachtig geïllustreerd.

In deze editie onder andere een gedetailleerde beschrijving van de Hollandse galei rond 1600, een artikel over de Nederlandse houtvaart in de zeventiende eeuw, Piet Heyn en de Zilvervloot 1628, scheepsarcheologie: de vondst van een zeventiende eeuws fluitschip in de Oostzee, een beschrijving van oude maritieme woordenboeken, zeereizen van de Prins der Nederlanden in de negentiende eeuw, proviandering van de schepen van de Koninklijke Marine in het heden en verleden, navigatie en een artikel over Jan Jacob Slauerhoff (1898-1936), geschreven en geïllustreerd door Arne Zuidhoek.

Scheepshistorie 28, formaat 22 x 27 cm, 128 pagina's, afbeeldingen, ISBN 978908613359, prijs € 24,95

PCE 1604 series frigate Panter

In de Engelstalige serie Warship is nummer 11 verschenen. Uitgever Jantinus Mulder en oud-marine-officier Henk Visser beschrijven de zes kleine fregatten van het type PCE (Patrol Craft Escort).

De vaartuigen zijn in 1954 gebouwd bij General Shipbuilding & Engineering Works, Boston, en Avondale Marine Ways, New Orleans. In het kader van de Mutual Defense Assistance Act stelde de Amerikaanse overheid ze beschikbaar aan de marine. Op 12 juli 1954 kwam de eerste, de F 817 Wolf, in Den Helder aan. Onder Nederlandse vlag zijn de vaartuigen aangeduid als de Roofdier-klasse. De volgende schepen waren de F 818 Fret, F 819 Hermelijn, F 820 Vos, F 821 Panter en F 822 Jaguar. Zij escorteerden langzame kustkonvooien in Het Kanaal en op de Noordzee en werden als een apart eskader ingezet. In vredestijd waren ze beschikbaar voor andere taken, zoals de bescherming van de visserij op de Noordzee. Drie fregatten waren in actieve dienst en drie werden in Den Helder als reserve opgelegd. In 1984 is de klasse uit dienst gesteld en in 1986 en 1987 voor de sloop verkocht. In voorbereiding is nummer 12, het geleide-wapenfregat Tromp 1976.

PCE 1604 series frigate Panter, formaat 22 x 27,5 cm, 56 pagina's, afbeeldingen, ISBN 9789086164011, prijs € 14,95

Nederlandse marineschepen 1939-1945, Deel 1 – Kruisers, torpedobootjagers, kanonneerboten, escorteschepen en onderzeeboten

Er zijn al eerder boeken uitgegeven met als onderwerp de Koninklijke Marine tijdens de Tweede Wereldoorlog, maar dit is het eerste waarin zowel alle schepen worden vermeld als technisch beschreven. Verder zijn de levenslopen en hun prestaties in de oorlogsperiode uitvoerig toegelicht.

Bovendien is bij alle schepen, voor zover bekend, de bouw beschreven en komen de belangrijkste politieke beslissingen, waarbij defensiebezuinigingen schering en inslag waren in de jaren twintig en dertig, aan de orde. Vlak voor de Tweede Wereldoorlog werd nog een aantal schepen besteld om de te kleine oorlogsvloot uit te breiden. Er waren zelfs plannen voor drie slagkruisers, maar dat was voor een van de grootste koloniale mogendheden ter wereld allemaal te weinig en te laat. Toen Duitsland op 10 mei 1940 Nederland binnenviel, moest de marine het stellen met een verouderde kruiser, zes onderzeeboten, negen torpedoboten, een torpedobootjager, veertien kanonneerboten, zeven mijnenleggers, acht mijnenvegers, een antiek pantserschip als drijvende batterij en een tachtigtal vliegtuigen waarvan er misschien tien oorlogswaarde hadden. In de Koloniën was het niet veel beter. De marine in Oost-Indië moest het doen met drie lichte kruisers, een verouderd pantserschip, zeven torpedobootjagers, vijftien onderzeeboten en 34 vliegboten, aangevuld met wat vaartuigen van de Gouvernements Marine. De Nederlandse zeemacht bestond in West-Indië uit een artillerie-instructieschip en twee onderzeeboten. Volstrekt ontoereikend en dat werd tijdens WO II pijnlijk duidelijk. De marine werd op alle fronten verpletterend verslagen. Door de veerkracht en moed van de marinemannen en met hulp van bondgenoten, kon de Nederlandse zeemacht de strijd tegen de Asmogendheden toch voortzetten.

In dit boek geeft Peter Kimenai een gedetailleerd overzicht van alle Nederlandse oorlogsschepen tijdens de Tweede Wereldoorlog. Ook de schepen die tijdens de oorlog aan de vloot toegevoegd werden door nieuwbouw, aankoop of op leenbasis. In deel 1 worden de kruisers, torpedobootjagers, kanonneerboten, escortevaartuigen en de onderzeeboten beschreven. In deel 2 komen de torpedoboten, pantserschepen, bewakings- en patrouillevaartuigen aan bod en in de volgende delen de mijnenvegers, gemilitariseerde schepen van de Gouvernements Marine, kleinere schepen en hulpschepen.

Nederlandse marineschepen 1939-1945, Deel 1, formaat 22 x 28 cm, 240 pagina's, afbeeldingen, ISBN 9789086162314, prijs € 32,95

IJzeren schroefstoomschip 4e klasse Zr.Ms. Bonaire – Monument van de moderne scheepsbouw in Nederland

In de negentiende eeuw beschikte Nederland over uitgestrekte gekoloniseerde gebieden in Azië en in het Caribisch gebied. De marine was van cruciale betekenis om de verbindingen met deze gebieden te onderhouden en het gezag aldaar te handhaven. Voor deze taken zijn in de tweede helft van de negentiende eeuw tientallen schepen gebouwd met gecombineerd zeil- en stoomvermogen.

De Nederlandse marine hield tot aan het einde van de negentiende eeuw vast aan het beproefde concept van schroefstoomschepen met stoom- en zeilvermogen die in uiteenlopende tonnages en afmetingen van hout, composiet, ijzer en ten slotte staal werden gebouwd. Ze werden naar gelang de machinevermogens in vier klassen onderverdeeld. De grote schroefstoomschepen eerste klasse onderhielden de verbindingen tussen Nederland, Nederlands Oost-Indië en West-Indië. Het meest talrijk waren de in de vierde klasse ingedeelde kleinste eenheden die de geringste machinevermogens hadden. Deze kleine schroefschepen, zoals de Bonaire, Suriname en Makassar, volstonden voor de uitvoering van uiteenlopende taken in deze verre streken. Zij werden meestal ingezet als stationsschip in de Oost of de West.
De scheepsbouw veranderde in de loop van de negentiende eeuw volledig door de opkomst van de stoomvaart en de toepassing van ijzer als bouwmateriaal. Theoretische grondslagen en rekenmodellen voor efficiëntere stoomwerktuigen en schepen met betere vaareigenschappen versnelden de modernisering. De Nederlandse scheepsbouwers werden door de marine min of meer uitgedaagd te vernieuwen en kwalitatief hoogwaardige schepen te bouwen. Het eisenpakket dat de marine in 1876 samenstelde voor de bouw van de schoenergetuigde schroefstoomschepen vierde klasse Zr. Ms. Bonaire, Suriname en Makassar voorzag in een romp van puddelijzer en de inbouw van een krachtige stoommachine met oppervlaktecondensatie voor schroefvoortstuwing. De ook verlangde houten scheepshuid en driemast zeiltuigage waren welbewust een tussenfase van de houten zeil- naar de ijzeren stoomschepen. Aanvankelijk waren compromissen uit de gecombineerde toepassing van nieuwe techniek en klassieke verworvenheden zelfs noodzakelijk omdat de stoomvaart nog in ontwikkeling was. Schepen moesten immers langdurig op zee kunnen blijven en grote afstanden afleggen.
Jan Klootwijk en Dick Vries hebben niet alleen de geschiedenis van de Bonaire, maar ook van de negentiende eeuwse scheepsbouw in Nederland beschreven. In het boek komen andere schepen van de Koninklijke Marine uit dezelfde periode aan de orde. De Koninklijke Marine bestelde in 1876 drie vrijwel identieke schroefstoomschepen: de Bonaire bij de Nederlandsche Stoomboot Maatschappij, etablissement Fijenoord in Rotterdam, de Makassar en de Suriname bij de Koninklijke Fabriek van Stoom- en andere Werktuigen in Amsterdam. De Bonaire is op 12 mei 1877 te water gelaten en op 1 mei 1880 in dienst gesteld. De Makassar is op 16 juli 1877 als eerste in dienst gesteld en de Suriname als laatste op 1 februari 1881.
De Bonaire is in 1902 op de Rijkswerf ingericht als logementschip voor aspirant-machinisten in Hellevoetsluis. In 1915 is de opleiding met de Bonaire naar Dordrecht verhuisd. Toen de school in augustus 1923 werd opgeheven, is de Bonaire teruggesleept naar Hellevoetsluis om te worden afgevoerd. Een jaar later is het schip verkocht aan de gemeente Delfzijl die het kon gebruiken als internaatschip Abel Tasman voor de zeevaartschool. Nadat het internaat werd opgeheven werden in 1986 plannen ontwikkeld het oude schip te restaureren, maar de gemeente kon dat niet realiseren. Met veel moeite kon de Bonaire voor de sloop worden behoed en op 10 oktober 1995 is de Bonaire door de mslb Regge van Delfzijl naar Den Helder gesleept. Op 20 maart 1997 werd de Bonaire in het gegraven dok uit 1822 van Willemsoord opgenomen en kon de omvangrijke restauratie beginnen. Dankzij aanzienlijke subsidies van de gemeente Den Helder, provincie Noord-Holland en particuliere fondsen werd het schip in originele staat teruggebracht, waarbij de traditionele technieken werden toegepast. De restauratie, die in 2005 begon, is in het laatste hoofdstuk uitvoerig beschreven.
De Bonaire is het laatste nog bestaande ijzeren stoomzeilschip van de marine. De Suriname werd in 1903 uit dienst gesteld en fungeerde nog enkele jaren als opleidingsschip in Hellevoetsluis totdat het in 1911 werd gesloopt. De Makassar werd in hetzelfde jaar uit dienst gesteld en deed nog tot 1919 dienst als munitieschip. Het boek is geïllustreerd met authentieke foto's, tekeningen, algemene plannen en schema's. Ook de bewapening is uitvoerig gedocumenteerd.
IJzeren schroefstoomschip 4e klasse Zr.Ms. Bonaire, formaat 22 x 28 cm, 160 pagina's, afbeeldingen, ISBN 9789086161522, prijs € 34,95

In detail Bonaire schroefstoomschip 4e klasse

Van de notities en tekeningen van Foeke Roukema hebben de auteurs een onbewerkte selectie gemaakt voor een afzonderlijke publicatie. Deze postuum op naam van J.F. Roukema verschenen publicatie is met name van belang voor modelbouwers.

De in 2017 overleden Groningse ontwerper van pleziervaartuigen Foeke Roukema verdiepte zich tot in detail in dit schip. Dit boek bevat zijn beschrijvingen en tekeningen van de Bonaire en van het model dat hij van het schip vervaardigde.

In detail Bonaire schroefstoomschip 4e klasse, formaat 22 x 27,5 cm, 128 pagina's, afbeeldingen, ISBN 9789086163519, prijs € 25,96, info: www.lanasta.eu

VOICE CONCERNS AND STAND YOUR GROUND

Mariners' Alerting and Reporting Scheme

Misapplication of force leads to facial injury: Mars 202102

A berthed tanker was discharging cargo and a deck crew member was assigned valve operation duties at the manifold. While applying force using an "f-spanner" on one of the valves he slipped. His face hit the valve spindle with some considerable force causing an injury to his upper lip.

Investigation findings

The company investigation found that, among other things, he had not assumed the proper position for the task. This was linked to his lack of experience and inadequate training for this particular job.

Lessons learned

- When investigating for cause, always go deeper than the unsafe act. In this case, the unsafe act of not being properly positioned was linked to the unsafe condition of inadequate training.
- All hazards related to a particular task should be explained to new crew. Proper training would include the execution of the task while under supervision.

Poor risk analysis for stuck anchor results in fatality: Mars 202104

As edited from TSIB (Singapore) report MIB/MAI/CAS.013

A bulk carrier in ballast weighed the port anchor and departed the anchorage for a sea passage. As the anchor came into view, it was discovered that the flukes were not positioned properly. Heaving was stopped, but not before one of the flukes entered the hawsepipe and became stuck. The anchor was secured in that position and the vessel left the anchorage for the sea passage.

The next day, work started on trying to free and reposition the anchor. Several attempts were made to free it by lowering and heaving the anchor, but without success. Next, under the master's instructions and over the objections of the chief mate, a crew member was tasked to go over the side on a rope ladder while the vessel continued to make way. He was instructed to pass a mooring rope over the crown of the anchor, with a view to using the winches to pull the anchor free. This method also proved unsuccessful.

The next day, a support was welded inside the hawsepipe so that a hydraulic jack could be used to move the chain in the hope of dislodging the anchor fluke. A crew member entered the hawsepipe to position the hydraulic jack against the anchor chain and started operating the jack to move the anchor chain.

Suddenly, the anchor chain moved with a jerk and pinned the man against the wall of the hawsepipe. The victim was retrieved from the hawsepipe and found motionless. First aid was administered, but the victim could not be revived. The vessel deviated from its passage in order to disembark the victim's body.

Top: Stuck fluke. Bottom: Crew member pinned in hawse pipe.

Lessons learned

- The early plan of sending a crew member over the side at the bow while underway was a clear signal that improvisational and unsafe practices were being employed.
- Stand your ground. In this case, the chief mate was not in agreement with the practices used and refused to participate. The master, uninhibited by the chief mate's warnings, continued the various attempts that eventually cost the life of a crew member.
- When a new challenge arises, it is best to use cool heads to analyse all risks and benefits. In this instance, it would have been evident that sending a man over the side at the bow while underway or having someone enter the hawsepipe were dangerous acts that could not be justified.

Deadly fall into unprotected hold: Mars 202106

As edited from TSIB (Singapore) report MIB/MAI/CAS.028

A container vessel was in the process of loading. At one point, a crew member was seen walking on the raised catwalk adjacent to number 4 cargo hold, which was open and empty. It was early morning and a fine dew had wetted most of the steel surfaces of the vessel. Suddenly, the crew member was seen to trip backward and fall into the empty hold number 4, a distance of about 14 metres.

He remained motionless at the bottom of the hold and an evacuation procedure was initiated. Later that day, he was pronounced dead at the shore hospital.

Investigation findings

The ensuing investigation was unable to establish why the crew member was walking on the raised catwalk near the open hold. However, it was found that there were no barriers to prevent falling and that the narrow (70 cm) catwalk was littered

Location where the crew member fell into the hold.

with loose securing gear that made walking on that surface hazardous.

Lessons learned

- A combination of wet and cluttered surfaces and a lack of fall barriers resulted in a very hazardous work area. Then, the crew member made his fatal decision to enter that area without fall-arrest equipment.
- We do not always make the best and safest "on-the-spot" decisions. This is why strong procedural integrity and a robust safety culture are important safeguards against negative outcomes.

Fatigue and weak bridge practices contribute to expensive accident: Mars 202107

As edited from NTSB (USA) report MAB 1908

A partially loaded bulk carrier was inbound in a port channel under pilotage. A rudder angle indicator was lit and, because the bridge had been darkened for night vision, it could easily be seen by the bridge team. The pilot conned the vessel from the centreline windows, the helmsman was directly behind him and the officer of the watch (OOW) was near the engine order telegraph just to the helmsman's left.

Upon reaching a planned course alteration point, the pilot gave a port 20-degree command to start the turn. The helmsman answered, 'port 20', but instead put the helm 20 degrees to starboard. About eleven seconds later, the pilot saw that the wrong helm direction had been applied so he ordered 'midships' then repeated the port 20 order. Combined with a full-ahead burst of speed, the vessel's swing to starboard was arrested about 38 seconds after the original command to port had been given and the vessel regained the required heading.

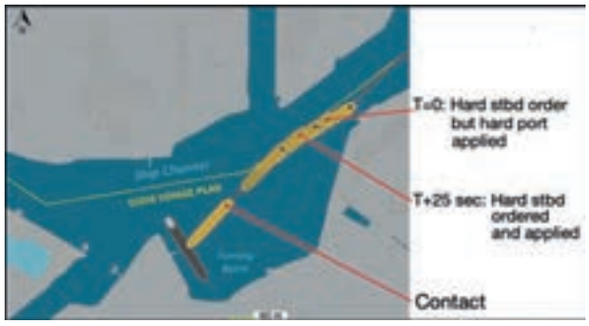
Following the helmsman's error and recovery, the pilot and OOW had a brief conversation about the mate's duty to watch the helmsman. The second mate agreed to double-check the helmsman with each command. The master was not on the bridge at the time. The OOW offered to call him, but the pilot declined. Although the OOW did not understand conversational English, he told investigators he understood the pilot's orders.

Some ninety minutes later, the vessel approached a major turn to starboard. By now the master was on the bridge. The pilot planned to turn wide, intending to stay to the south side of the channel to pass a working dredger. The pilot gave a port 20-degree command to bring the ship slightly left, ahead of the turn to starboard, and the helmsman answered accordingly. The pilot's next order to make the turn to the right, 24 seconds later, was 'hard starboard'. The helmsman repeated his order, but instead put the rudder hard to port.

Ten seconds later, the pilot recognised the error and ordered midships while tapping with his fingers on the rudder angle indicator above his head to get the helmsman's attention. It took the steering gear fifteen seconds to shift from hard port to midships, and then the pilot repeated his original hard-starboard order. The rudder reached hard starboard twelve seconds later, although the ship's heading was still falling to port at about 12 degrees per minute. The pilot now realised an emergency manoeuvre was needed.

The pilot ordered 'stop engines; let go anchor' and seven seconds later, 'full astern'. The vessel's whistle was sounded. At this point, the vessel was making about 6 knots and its heading was still falling to port.

The pilot estimated that increasing the engine speed to power through the turn, as he had done earlier, would not work so he chose instead to attempt to stop the vessel. With the port anchor and two shots of chain deployed, the vessel nonetheless collided with the port side of a berthed tank barge while making almost 4 knots.



The helmsman put the rudder hard to port instead of to starboard resulting in a collision.

Although there were no fatalities or injuries as a result of this accident, the two vessels and the shore facility suffered damage that amounted to more than USD 21 million in total.

Investigation findings

The investigation found, among other things, that the helmsman had probably been fatigued by carrying out extra duties the day before and that this contributed to the accident.

Lessons learned

- When in restricted waterways, the helmsman's actions should always be verified by same-time sighting of the rudder angle indicator. A wrong rudder application may be irrecoverable if left for even ten seconds.
- The OOW was apparently not sighting the indicator at all and, if he was, he did not indicate the wrong rudder application to the pilot. The pilot was sighting the rudder indicator, but only after a ten- or eleven-second delay. In the first instance, they were able to recover, but not in the second.
- The work-rest log did not indicate the helmsman's extra duties the day before. When collecting data for fatigue, investigators should not restrict themselves to looking at the work-rest logbooks, but should also question each person in detail about their previous 72-hour, or preferably 96-hour, work-rest routine.

All Mars Reports are also published online, www.swzmaritime.nl.

UITBREIDING BESTUUR KNVTS AFDELING ROTTERDAM

De afdeling Rotterdam heeft het genoegen haar bestuur met drie nieuwe leden uit te breiden. Deze nieuwe bestuursleden zijn: Taco Terpstra, Erik Klok en Roel van Eijle.

Tijdens de coronacrisis is het niet gemakkelijk een algemene afdelingsledenvergadering te houden. Daarom is ervoor gekozen de leden van de afdeling Rotterdam te raadplegen. Als zij bezwaar hebben tegen de benoeming van de voorgestelde bestuursleden, dienen zij dit binnen twee weken na het verschijnen van SWZ|Maritime bij het bestuur kenbaar te maken. Afhankelijk van de situatie na afloop van deze twee weken, zal het bestuur een besluit nemen ten aanzien van de benoeming van de drie nieuwe bestuursleden. Aan het voorgaande moet nog worden toegevoegd dat Taco Terpstra tevens bereid is Wim Veldhuyzen als vertegenwoordiger van de afdeling in het hoofdbestuur van de KNVTS op te volgen.

De drie nieuwe bestuursleden zijn:

- T. Terpstra, roepnaam Taco, 50 jaar. Afgestudeerd aan de HTS Haarlem, Scheepsbouwkunde. Daarna mastertitel behaald aan de University of Newcastle upon Tyne, UK, specialisatie subsea engineering. Momenteel werkzaam als senior projectmanager binnen de divisie Dredging & Infra van Boskalis.

- J.H. Klok, roepnaam Erik, 47 jaar. Afgestudeerd als Maroff in Vlissingen. Daaropvolgend de opleiding Master Maintenance and Safety Management gevolgd, wat de uiteindelijke reden is geweest dat het varen achterwege is gebleven. Altijd actief gebleven in de maritieme sector, maar veel meer op het vlak van risicomanagement, procesoptimalisatie en asset performance management.

- R.J. van Eijle, roepnaam Roel, 66 jaar. Afgestudeerd aan de HTS Dordrecht, Scheepsbouwkunde met een aanvullend jaar Economische bedrijfstechniek. Heeft bijna 38 jaar bij Scheepswerf Damen in Gorinchem gewerkt.

Voor een uitgebreide omschrijving van de profielen zie de website www.knvts.nl.

WEBINARS AFDELING AMSTERDAM

Door Covid-19 heeft de afdeling Amsterdam helaas geen mogelijkheid om de succesvolle bijeenkomsten aan boord van de Pollux te houden. Als vervanging hebben we de webinars. Een aantal daarvan heeft inmiddels plaatsgevonden, maar er staat ook nog een flink aantal op de planning.

De KNVTS afdeling Amsterdam is bezig met een verdere ontwikkeling van haar organisatie waarin diverse bestuursleden hun taken hebben. Omdat we ook jonge zeevarenden in het bestuur hebben, zorgen we voor de juiste back-up als mensen op zee zijn. Daarnaast mogen we ons verheugen in het toetreden van jonge scheepsbouwkundigen en mensen met ervaring. Zo hebben we nu binnen alle leeftijdsgroepen vertegenwoordigers en zorgen we voor een goede balans.

Om in contact te blijven met onze leden, organiseren we webinars. Hoewel deze natuurlijk niet de contacten opleveren als aan boord van een schip, mogen we ons verheugen in internationale belangstelling. Ook internationale sprekers komen makkelijker aan bod. We hebben inmiddels vier webinars georganiseerd en dat waren:

- Redeployment of Aoka Mizu (Bluewater Energy Services); deze webinar werd georganiseerd in samenwerking met met YoungShip Rotterdam, aantal aanmeldingen: 88 personen.
- FAUSST (Hyconnect), aantal aanmeldingen: 52 personen.
- EcoClipper, aantal aanmeldingen: 172 personen.
- Unmanned Service Vehicles, aantal aanmeldingen: 95 personen.
- Offshore Wind Turbine (Canada), vond plaats op 17 februari, het totaal aantal aanmeldingen was bij het drukken van dit blad nog niet bekend.

De webinars kunnen nog worden bekeken door middel van videoregistratie die beschikbaar zijn en komen op Youtube.

Op het programma staan nog:

- 17 March (webinar): 4Fold Containers
- 21st April (webinar): SurfWEC
- May: HVAC energy saving for mega yachts
- June: Ice Whale – Polar winter expeditions
- July: Hull design for mega yachts
- August: Fuel consumption and trim efficient

Zodra er een mogelijkheid is voor de normale fysieke bijeenkomsten zullen we dat snel organiseren zodat we elkaar weer onder genot van een diner en een borrel kunnen ontmoeten.

Ton Bos, bestuurslid afdeling Amsterdam

SWZ|Maritime is onder meer het periodiek van de Koninklijke Nederlandse Vereniging van Technici op Scheepvaartgebied, opgericht in 1898. SWZ|Maritime verschijnt elfmaal per jaar. Het lidmaatschap van de KNVTS bedraagt € 88,00 per jaar, voor juniorleden € 39,00 per jaar, beide inclusief dit periodiek. Een digitaal lidmaatschap (alleen voor studenten) kost € 15,00 per jaar. Het geeft u de vooraankondigingen van de maandelijkse lezingen, te houden op vier verschillende plaatsen in Nederland en korting op verschillende activiteiten. U kunt zich opgeven als lid bij de algemeen secretaris van de KNVTS, Zeemansstraat 13, 3016 CN Rotterdam, e-mail: secretariaat@knvts.nl of via het aanmeldingsformulier op de website: www.knvts.nl.

LEZINGENPROGRAMMA MAART

KNVTS afdeling Amsterdam
Wednesday 17 March, 19:30 to 20:30hs
Webinar: Foldable container – Solution to global imbalance in shipping
Speaker: Hans Broekhuis, CEO 4Fold Containers
World trade has a significant imbalance in the volume of containers shipped from especially East-Asia to the rest of the world and vice versa. As a result, global empty container transport at sea amounts to twenty per cent. On land, this is even forty per cent. So we're shipping a lot of air around the world. To tackle this inefficiency, Dutch start-up 4Fold Containers has developed the first fully ISO certified foldable container, reducing the space of an empty container to a quarter of its size, resulting in up to 37 per cent reduction in CO_2 emissions and more cost efficient transport all over the world. In this webinar, CEO Hans Broekhuis will zoom in on the solution 4Fold Containers offers and the current challenges they face to conquer the world.
The webinar will be recorded. After the presentation, there will be thirty minutes for Q&A. This lecture will be given in English. To register for the lecture, please click the link on the website www.knvts.nl.

Foldable containers reduce the space needed to transport an empty container to a quarter of its original size.

KNVTS afdelingen Noord, Rotterdam en Zeeland
Door de huidige omstandigheden zullen er tot nader order geen fysieke bijeenkomsten worden georganiseerd. Wij verzoeken u de website en LinkedIn van de KNVTS te blijven volgen omtrent meldingen over webinars.

NIEUWE LEDEN

- Franke, C. (René), Rijkswaterstaat, Middelburg, Adviseur WTB&Staal, afdeling Zeeland
- Jansen, J.J. (Julius), Stolt Tankers, Rotterdam, Project analyst, afdeling Rotterdam
- Langelaan, J. (Jorne), EcoClipper, Alkmaar, CEO, afdeling Amsterdam

IN MEMORIAM: IR. DRS. JAN JAAP VAN RIJN

Op 18 januari is Jan Jaap van Rijn overleden, een markant scheepsbouwkundig ingenieur. En een veelzijdig mens: balletdanser, fanatiek badmintonspeler en scheidsrechter, afgestudeerd in theaterwetenschappen en hij maakte zeiltochten naar Amerika.
Werkend voor de Koninklijke Marine vanaf 1963, heeft hij zijn hele loopbaan gewijd aan het ontwerp en de bouw van onderzeeboten. Eerst onder leiding van ir. S.J.A. Heemstra, werkte hij aan de Zwaardvis en Tijgerhaai. Deze boten waren deels afgeleid van de Amerikaanse Barbel-klasse en de Nederlandse driecilinder onderzeeboot van ir. Gunnink. Toch werd het een eigen uniek ontwerp van een geavanceerde diesel-elektrische onderzeeboot. Het contract werd getekend in 1965. De Zwaardvis werd enigszins vertraagd in dienst gesteld in 1972.
Op basis van de Zwaardvis werd daarna begonnen met het ontwerp van de Walrus. Aan deze boot zijn hogere eisen gesteld. Zo werd onder meer de duikdiepte verdubbeld, maar ook andere eisen werden verzwaard. En digitalisering deed haar intrede; de boot werd voor het eerst bediend en bewaakt met toetsenborden en beeldschermen. Het project werd een van de meest complexe ooit in de geschiedenis van de Koninklijke Marine. Van Rijn werd belast met de belangrijke coördinatie van alle scheepsbouwkundige onderdelen en aspecten en was tevens het gezicht van de afdeling naar buiten. Complexe, meer wetenschappelijke vraagstukken liet hij over aan deskundigen, maar hij bleef het wel volgen. Het was een gedreven man met veel zorg voor de kwaliteit van de boot en de veiligheid van de bemanning straks. Daarbij oogstte hij lof van de onderzeedienst en de bemanningen waarmee hij later de proeftochten uitvoerde. En hij was aan boord bij de eerste diepduik. Maar voor de mensen in zijn team was hij niet gemakkelijk. Zijn kritiek kon hard en soms bitter zijn, ook voor de vele mensen in werkgroepen en tekenkamers, die in dit uitermate complexe project met grote inzet bezig waren. Er zijn mensen die daaronder geleden hebben. Niets was eenvoudig in dit project en Van Rijn was in zekere mate bevreesd dat er fouten werden gemaakt die wellicht niet meer te herstellen waren.
Ondanks alle spanningen vond hij kennelijk altijd weer ontspanning in zijn activiteiten buiten werktijd. Daar kon hij genieten van theater, sport en film. Het was een markant mens.
Bij de indienststelling van de Zr. Ms. Bruinvis op 5 juli 1994 werd hij onderscheiden als Officier in de orde van Oranje Nassau.
Ir. Jaap Huisman

Hydraulic engineering (dredging/offshore/wind energy)

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