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MARITIME MAGAZINE

# HYBRID POWER

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*Shipbuilding industry in Europe faces new challenges and fights to survive*

# How to cope with the Chinese Dragon

POLAND@SEA talks with Christophe Tytgat, Secretary General of SEA EUROPE.


Photo: Piotr B. Stereńczak

**- The European Commission seems to be finally awaken and started to be aware of the threats for the shipbuilding industry in Europe, coming from China. But isn't it too late?**

- I hope not... It is late, but I hope it isn't too late yet. We are still doing a lot in Europe. We still have a strong position in the complex shipbuilding globally. We are still the leaders when it comes to the maritime equipment manufacturing. So, the key thing now is that we can maintain that in the european context. The best thing to do that is to make the European Commission as well as the EU member states and our national politicians aware of the need to support our industry, which they have unfortunatelly forgotten...

If we manage to convince them to work together, I think we have still good chances to keep the industry in Europe alive. If we are also able to be the front runners of the greening of shipping and digitalisation, we still have good chances to stay in business. If we don't do that, then I think it's too late, but I'm still hopeful...

**- Is there anything that the politicians have already done for this sake?**

- As I have earlier mentioned about China, in Europe we have now an awareness and also special legislation that has been in place. In April 2019, a special joint declaration was signed, where for the very first time such problems with China like the transfer of knowledge and expertise has been adressed. With South Korea for instance, there is a clear piece of legislation (the EU South Korean Free Trade Agreement), where we have told the European Commission, that the state policy South Korea has adopted to support their local shipping and shipbuilding community is not in conformity with the rules of the free trade agreement. So, there are instruments and the EC starts to act on them.

**- What do you think about some major shipyards from some member countries of SEA EUROPE going to China to transfer their, for example, cruiseship technology? Is it wise?**

- In normal conditions, any company should be able to do business with another country. Of course, China is a particular case, because you never know how far they will take you and push you over the line... Is it wise? Only time will tell. I know there are several schools of thought, several opinions about that. Some people think it's not wise, some others think that in a clever manner it can still work.

- For these companies it is a business opportunity that they want to take full advantage of. I think that if the European Commission is really implementing what they have now put in place or what they agreed with China, for instance the transfer of knowledge should no longer be done or should be acted upon more severely, then I think there is still a normal way of doing business in the future, but... again, only time will tell.

**- How do you find the position of Polish shipbuilding industry in the present situation of Europe? We all know that with a demise of the state-owned shipbuilding industry in 2009 and two big Polish shipyards closed, our position declined, but how do you perceive the actual contribution of the shipbuilding in Poland to the entire European industry?**

- I know that it hasn't been only the case in Poland. A lot of the countries which joined the EU, at the certain point of time suffered from, let's say, the new rules of the game. In addition there has been a crisis. That's of course something that has impacted everybody. But... If you look at Remontowa for instance, this is a very good example, that you can still stay alive, even without the state staying behind.

It's just the matter of being clever and innovative. There again Remontowa has been very illustrative with the British Columbia ferries, that they have converted into LNG vessels. I know that the number of some yards has declined but at the same time other yards are still there doing good business and being innovative. The key for the future is to be innovative in general and in the European context.

The Association od Polish Maritime Industries Forum Okretowe is active in this area, perhaps they could be even more active, but it is also a matter of having sufficient resources. The important think is that as long as there is somebody to convey the message, to convey the need of our industry in the Brussels' context through SEA EUROPE or directly, we do still have a good chance to be heard.

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## Adverts and promotion



Poland at SEA
is a special publication destined for maritime trade fairs in 2019.

POLAND @ SEA
MARITIME MAGAZINE

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*The most enviromnentally friendly ferries in London have begun their service on the Thames*


Photo: Remontowa Shipbuilding

# Hybrid power

***Ben Woollacott*** **built in Remontowa Shipbuilding on the way from Gdansk to London.**

**Remontowa Shipbuilding SA built for Transport for London (TfL) and delivered two hybrid battery ferries. The new Woolwich ferries are an excellent example of how a ferry service can respond quickly to alleviate congestion, delivering a product which is reliable, environmentally friendly and much more economic than a fixed link.**

London is divided into two parts by the River Thames. A ferry service has been in operation day-in day-out providing a tenuous link between the north and south circular roads. Known as the Woolwich Ferry, the existing trio of sixties-built ships have lasted well beyond their economic or technical lifetimes. TfL has replaced them with a pair of very modern double-enders designed by LMG Marin and built by the Remontowa Shipbuiding yard in Poland.

The new ferries were delivered in the last quarter of 2018, arriving in the Thames in November. They replaced their three predecessors *Ernest Bevin*, *John Burns* and *James Newman*, which had plied the route since 1963. In October the old ships were taken out of service and went to a recycling facility in Le Havre, northern France. At that time the ferry service had been shut down to prepare the berths for the new tonnage.

## Excitement in the air

There was much excitement in the air as operations restarted four months after the old ferries retired from their trips between North Woolwich and Woolwich. The new ferries arrived in London, after a long journey from Gdansk, via the Kiel Canal in northern Germany and the North Sea.

*"The tradition of naming ferries after local people have already helped the vessels, the Dame Vera Lynn and the Ben Woollacott, to earn a place in people's hearts"* - a journalist and historian Colin Grainger from the website royaldocks.london wrote in the article dedicated to the new boats.

*"The entertainer and 'Forces' Sweetheart' from East Ham is well known. But Ben Woollacott, the 19-year-old ferry deckhand who drowned in an accident in 2011, means more to locals. The young man came from a river-working family, the sixth generation of Thames watermen"* - he pointed out.

The steel cutting ceremony for the new ferries took place on April 20, 2017

at Remontowa Shipbuilding in Gdansk. The launching was executed on May 15, 2018. For the first time in the shipyard's history two ships were launched from a single floating dock at a time.

## 2,6 million passengers every year

The new ferries are operating the Thames crossing in the district of Woolwich, carrying over a million vehicles and 2,6 million passengers a year, which entails mooring around 25 000 times at each terminal.

They have been built according to LMG 60-DEH design, developed by LMG Marin and have complied with rules and regulations of Lloyd's Register and the Maritime & Coastguard Agency. The ferries are operated by Briggs Marine Contractors under a long term contract with TfL.

Each of the ferries, with a 210-metre ro-ro cargo lane can take 150 passengers and 45 passenger cars on board. Cyclists receive their separate area on the cargo deck, separated from the walking paths for pedestrians.

## Significant fuel savings

Each ferry is equipped with four azimuth thrusters powered by vertically mounted permanent magnet motors. The Lithium-Ion battery pack allows for significant fuel savings. Two diesel generating sets are installed and in normal operation only one runs at a near constant load with the battery installation providing the peak power demand for the crossings. When the propulsion power demand is low the excess generated power is used to recharge the batteries.

This novel hybrid system provides numerous advantages and in particular by reducing the number of engine running hours and also by ensuring that the diesel generator is constantly running at optimum load enabling emissions to be minimized. This solution is said to allow fuel savings of more than 15 per cent compared to a conventional modern propulsion solution, and to $CO_2$ and NOx emissions reduction.

Due to side tide flow of more than 4 knots, a strong focus has been given on the high manoeuvrability capabilities of the ferries as well as high redundancy of all machinery.

## MAIN PARTICULARS

| | |
|---|---|
| Ship names: | BEN WOOLLACOTT & DAME VERA LYNN (IMO 9822011 & 9822023) |
| Class: | Lloyd's Register |
| Length: | 62.6 m |
| Beam: | 18.8 m |
| Depth to vehicle deck: | 5.5 m |
| Draft: | 1.8 m |
| Dwt: | 607 t |
| GT: | 1,750 |
| Main engines: | 2 x Cummins QSK19-DM, MCR total 2 X 450kWe |
| Speed: | 8.5 knots |
| Passengers: | 150 |
| Cars: | 45 or 12 trucks / 210 lanemetres |

Woolwich is a district not far to the east from the city centre. Therefore, it was of utmost importance that the new ferries are environmentally friendly with harmful emissions reduced to an absolute minimum.


Photo: Marcin Koszałka

***Dame Vera Lynn* in Remontowa Shipbuilding shortly before her delivery to TfL.**

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## Low noise, high manoeuvrability

Reducing noise, especially during berthing operations, was also an important factor. Last but not least, there was a fairly long list of operational requirements with low fuel consumption, minimum manning, high manoeuvrability and high redundancy being probably the most important ones.

Batteries came into the picture as the natural and, at the same time, best solution for addressing the expectations in terms of green and efficient operation. A lot of time was spent on their sizing. While the aim was obviously to keep the capacity as low as possible, attention needed to be given to the fact that, although the crossing is a very short one.

The Thames is quite a crowded river and additional power is often required for manoeuvring. Therefore, it was vital to define the operational profile correctly in order to bring all the parameters to an optimum and, in turn, minimize both CAPEX and OPEX.

## Auto mooring system

The majority of challenges with regards to the auto mooring were related to the shore side part of the system. It is quite a special installation since it is located on pontoons fixed on pillars which allows the auto mooring pads to "follow the tide" and always attach to the vessel side exactly where they should.

Since the pads are of electromagnetic type, during design special attention was given to ensuring that the generated magnetic field will not influence the batteries in any way. It is worth mentioning that the auto mooring control system is part of an integrated solution which, after signalling that the ferry is in position, automatically attaches the pads, turns off the thrusters, lowers the linkspans and finally raises the car and passenger barriers.

Since in normal operation the vessels are running in the, so called, "peak shaving" mode with one generating set working at constant, optimum load and additional power being taken from the batteries, both generating sets (i.e. their Diesel engines) are equipped with both SCR (Selective Catalytic Reduction) and DPF (Diesel Particulate Filter) systems minimizing emissions and making the new Woolwich ferries the most environmentally friendly vessels on river Thames.

## 5 years of battery lifetime

In order to bring the initial expenditure even further down, it was proposed that instead of installing a bigger battery pack which would fulfill the 10-year lifetime requirement, so called, "battery re-coring", will be carried out after abt. 5 years of operation. This means that the cells in the battery modules will be replaced with new ones which will guarantee at least another 5 years of lifetime.

The battery modules, racks and the vessel itself have been designed in a way allowing for this operation to be carried out in a very easy and efficient manner. Same applies to replacing a generating set or a complete thruster unit (including the PM motor). Each of these operations can be performed in less than 8 hours allowing for an overnight intervention in case of problems. A spare generating set and a spare thruster unit have been delivered as part of the contract.

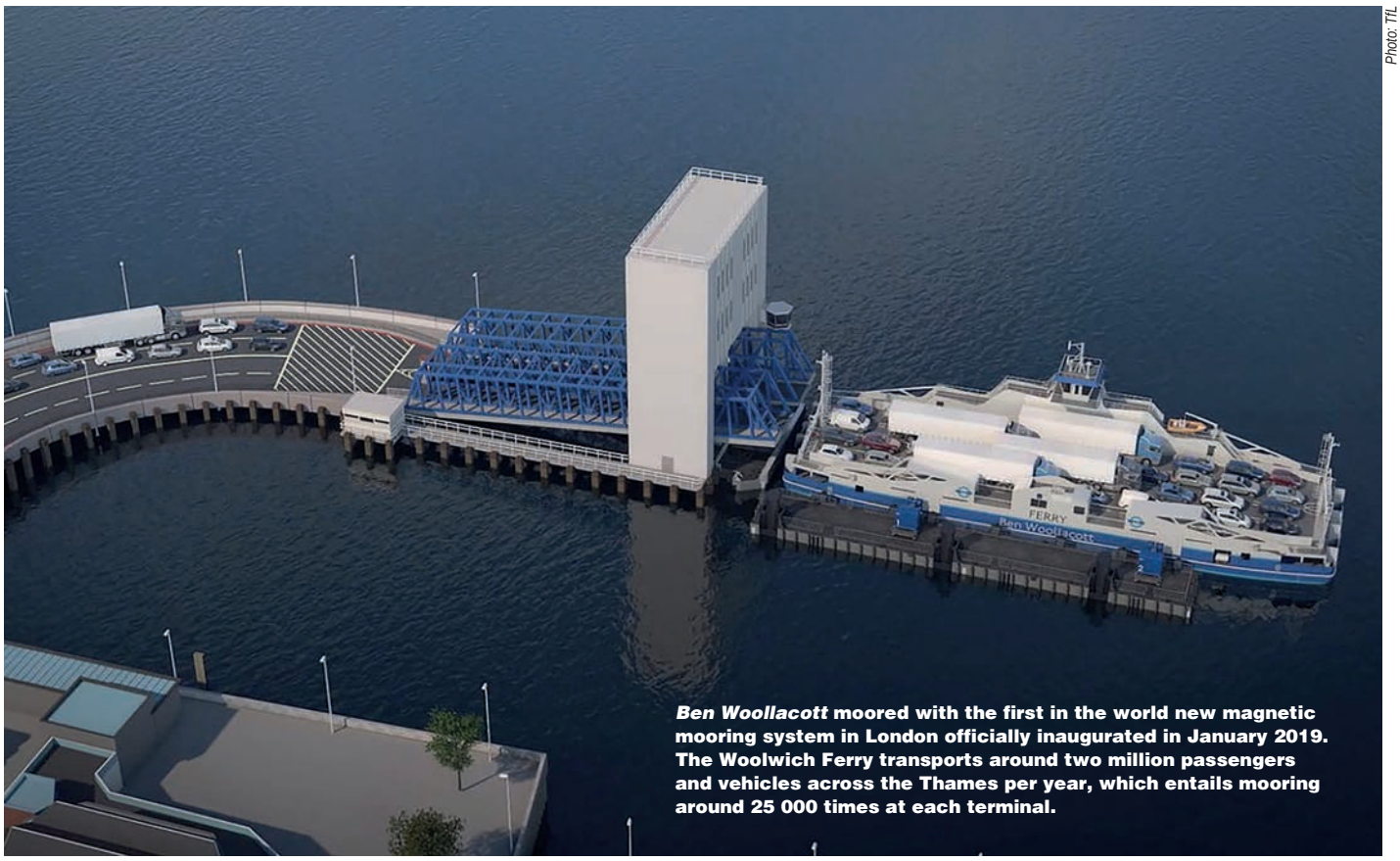



Photo: TfL

***Ben Woollacott*** **moored with the first in the world new magnetic mooring system in London officially inaugurated in January 2019. The Woolwich Ferry transports around two million passengers and vehicles across the Thames per year, which entails mooring around 25 000 times at each terminal.**

*All-electric car and passenger ferry for a special Icelandic route*

Photo: Piotr B. Stareńczak


# Herjólfur

***Herjólfur* departing from Crist shipyard in Gdynia for sea trials.**

The Icelandic Road and Coastal Administration, Vegagerđin, signed a contract with Polish yard Crist SA for the construction of a new ferry of Polarkonsult design PK-259.1. early 2017. In February 2019 the vessel was ready for delivery.

The ferry is intended to be operated between Landeyjahöfn and Vestmannaeyjar (eng. Westman Islands), a town and archipelago situated off the south coast of Iceland.

## Harsh weather conditions

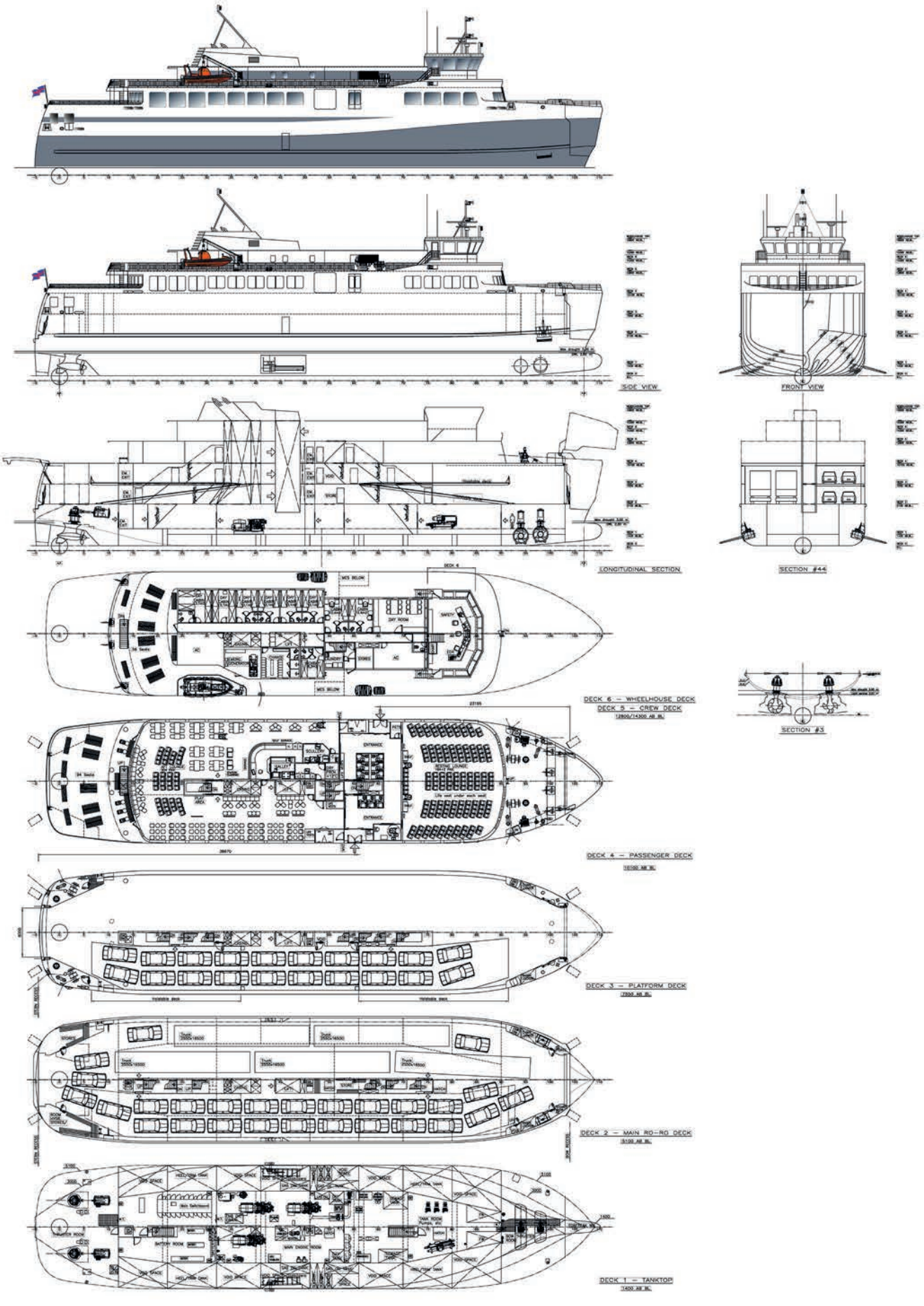
The weather conditions outside Landeyjahöfn are difficult with a mixture of long ocean waves and shorter coastal waves in combination with a strong transversal current at the entry of the harbour. The water depth is only 4,5 m and the ferry will be operating in up to 3,5 m waves. These conditions require excellent maneuvrability and shallow water seakeeping characteristics, to keep the ferry connection both safe and most possibly uninterruptible.

The ferry will be some 70 m in overall length and approx. 15 m wide, with a capacity of 540 passengers during summer or 390 passengers in winter with 10 crew members and 330 m ro-ro lane length capacity for personal cars.

From hybrid to all-electric propulsion

Conceptual design of the ferry has been prepared by renowned Norwegian company Polarkonsult AS. The class and detail design, along with production documentation of the vessel, have been provided by a Polish company StoGda Ship Design & Engineering Sp. z o.o., which has been cooperating with Crist for years. StoGda was also responsible

## General arrangement of the new ferry for Icelandic routes




Illust.: Polarkonsult AS

for extensive redesigning of the ship (modifications of the design), after the owner had decided to change the propulsion concept.

Initially (as originally ordered) the vessel was to be outfitted with hybrid electric propulsion, with significant part of propulsive energy coming from diesel generators. However, the price of batteries was showing a downward trend and the economies of the propulsion have changed, enabling the owner to opt for all-electric type of main propulsion, with much larger share of stored electrical energy (fed from shore connection) to be utilized, and thus - with larger set of batteries to be installed onboard.

## The propulsion...

... is provided by twin electrically driven azimuth pulling thrusters. The propulsion system was supplied by ABB, ensuring efficiency and sustainability for the ferry to be operated on a route known for its harsh weather conditions.

ABB supplied integrated power and electric storage solutions to the Icelandic Road and Coastal Administration's new ferry that will take 3600 annual trips, covering 13 km in about 45 minutes each time.

The vessel features a large battery pack of 3000 kWh and is designed to operate in a fully electric mode for most of time, with onshore charging in both harbours. During particularly challenging weather conditions, when the consumption of battery power may exceed the available energy, the ferry will utilize its diesel-electric generator set.

## High efficiency

ABB's power distribution system Onboard DC GridTM will ensure the high efficiency of the new ferry by allowing the batteries to connect directly to the DC link, which helps to avoid losses of power during charging and discharging. Additionally, the system allows the diesel engines to operate with variable speed, which results in reduced fuel consumption.

The scope of ABB supply also includes generators, transformers, switchboards, the Power and Energy Management System (PEMS) and the Energy Storage Control System (ESCS). The ferry will be connected to ABB Ability™ Collaborative Centers Infrastructure. This network uses remote equipment monitoring and data analytics to enable remote technical support, as well as predictive maintenance and planned interventions.

Crucial to the supporting infrastructure shoreside is the shore power connection delivered by ABB to recharge the battery with a power of 2500kW while the ferry is in the dock. On average, it will take about 30 minutes to recharge.

## Low environmental impact

The vessel construction and outfitting has been completed and the ferry was ready for delivery as we went to press, following the sea trials completed in February 2019. The new ferry is about to replace the current Herjólfur, which was built in 1992.

The change will be in line with Iceland's incentives to promote electric modes of transportation. With 80 percent of Iceland's energy coming from non-fossil resources, led by hydropower and geothermal energy, the newly built vessel will be well positioned to support Iceland's sustainability goals.

However, the new ferry will not only reduce the environmental impact, but also improve the regularity of the connection. Previously, during rough weather, the ferry operating the route would travel to an alternative harbor to dock safely, extending the sailing time from 45 minutes to close to 3 hours and causing motion sickness in passengers. The new ferry will be able to enter the destination harbor in challenging weather conditions most of the time, with the rare exception of particularly rough seas.

| *Herjolfur* - principal characteristics | |
|---|---|
| IMO No. | 9825099 |
| flag | Iceland |
| operator, owner | Vegagerdin, Iceland |
| technical manager | Samskip hf, Iceland |
| shipbuilder | Crist SA, Poland |
| newbuilding no. | 70 |
| float out | 12.2018 |
| keel laid | 19.07.2017 |
| first steel cut | 16.05.2017 |
| order | 02.2017 |
| length over all | 69.38 m |
| length between perpendiculars | 62.37 m (64,12 m according to other sources) |
| breadth extreme | 15.50 m |
| breadth moulded | 15.10 m |
| design draught | 2.80 m |
| depth | 5.10 m |
| deadweight at design draught | 315 t |
| net tonnage | 1500 |
| gross tonnage | 3000 |
| compensated gross tonnage (CGT) | 5886 |
| ro-ro lane length | 330 m |
| personal cars capacity | 75 |
| passengers (unberthed) | summer 540 /winter 390 |
| crew | 10 |
| main propulsion | 2 electric motors of 1700 kW each, driving two azimuth electric drive units |
| max. speed (trial speed) | 15.60 kts |
| service speed (cruising speed on route) | 13.00 kts |
| thrusters | 2 Tunnel thruster (forward), 600 kW (816 bhp) each |
| class | DNV-GL |

*First order for fully outfitted vessel from Alkor yard*


Photo: Marcin Koszałka

# A longliner for Iceland

**On December 12, 2017, Gdansk based shipyard Alkor Sp. z o.o. signed a contract with Icelandic ship owner for the construction of a longliner. The ship, which will be named *Páll Jónsson* and carry the GK 7 fishing number, was ordered by the owner Vísi hf. (Visir) from Grindavík.**

The new *Páll Jónsson* is not only the newbuilding no. 001 for the Polish yard, known so far from repairs, renovations and reconstructions, but also the largest vessel in the over 50 years long history of the Icelandic shipowner. The contractual value of the vessel is EUR 7.5 million.

The construction of the *Páll Jónsson* ship commenced in January 2018 and was expected to be completed by mid-2019, with some sources saying more recently the ship would be delivered in January 2020.

The Alkor shipyard built longliner is 45 m long and 10.5 m wide and features gross tonnage of 900. About 130 tonnes of fish will be stored in its holds. It translates into 420 tubs capacity. The ship is to be powered by a Caterpillar engine.

Of the three decks of the ship, one is dedicated for crew accommodation (including one-person cabins for 14 people).

The unit was designed in the main part by the design and consulting office Navis from Reykjavik, and also - in the electrical part - by Raftíðni, also from Reykjavik.

The vessel was launched in April 2019. The owners' representatives praised both the quality of construction and finishing works at Polish yard, as well as keeping the building process on schedule. According to Peter H. Pálsson, Vísir's managing director, the construction process has been successful so far. Likewise, the communication with Alkor shipyard, which had previously refurbished and modernized or reconstructed numerous ships, mainly fishing vessels (in some cases in far-reaching reconstructions), for Icelandic shipowners and Vísir itself.

After completion of outfitting works at Polish yard, the Mustad brand fish catching long line system, the first one in Iceland with an automatic rack system, will be installed in Norway.

Visir hr., which also processes catches at its own factory, is the largest longliner owner in Iceland, and owned five such units at the time of placing a newbuilding order in Poland. These were "old" *Pál Jónsson*, *Jóhanna Gísladóttir*, *Sighvatur*, *Kristín* and *Fjölnir*. The currently operated *Pál Jónsson*, to be replaced by a new ship from Alkor shipyard, is 50 years over old. *Fjölnir* has been largely rebuilt and modernized in Poland in 2016.

In turn, the *Arney* unit (formerly *Skarðsvík*), becoming the new *Sighvatur* GK 57 and replacing the "old" vessel under the same name in the Visir fleet was extensively rebuilt and modernized at Alkor. The vessel was lengthened by around 5 metres and only 2/3 of the steel structure remain from the "old" ship, while all the equipment was replaced with new units, with the redelivery of the vessel after completed reconstruction mid June 2018. Meanwhile, *Fjölnir* was recently demolished in Poland.

*Remontowa Shiprepair Yard has converted two large Canadian ferries to LNG*


Photo: Marcin Koszałka

# Eco twins

**The converted *Spirit of Vancouver* Island departing from Remontowa SA, heading Canada.**

*Spirit of Vancouver Island* owned by BC Ferries, has been converted at Remontowa Shiprepair Yard SA. On February 27, 2019 the ferry departed from the yard following the completion of a mid-life upgrade (MLU).

The *Spirit of Vancouver Island* entered Remontowa SA on October 15, 2018. The ferry underwent modernization, upgrade and machinery conversion completed in February 2019. Then the ship began her voyage across the Atlantic, the Panama Canal and a passage along the west coast of North America to Richmond in Canada.

On the Earth Day, April 22, 2019, the ferry returned to the Vancouver (Tsawwassen) – Victoria (Swartz Bay) run, the busiest route which she has been servicing since 1993. In the summer season the volume of passenger traffic is the highest.

The Earth Day is an annual event celebrated around the world to demonstrate support for environmental protection. First celebrated in 1970, it now includes events coordinated globally by the Earth Day Network in more than 193 countries.

*Spirit of Vancouver Island* is a sister ship to *Spirit of British Columbia* and the second of a "Spirit" class ferries which has her propulsion system converted at the Polish yard from traditional diesel based to environmentally friendly, powered by liquefied natural gas. Both conversions represent a significant investment in clean technology.

The shipyard equipped each of the "Spirit" class ferries with four new dual-fuel Wärtsilä 8L34DF main engines and a cryogenic tank. Currently, the ship's engine room is dual fuel, adapted to be fed both with low-sulfur diesel oil and natural gas (stored as LNG) as the main fuel.

After conversion, the "Spirit" class vessels reduce CO2 emissions by 12 500 tonnes per year, which corresponds to the removal of around 2500 vehicles per year.

According to Mark Collins, BC Ferries' President & CEO, both ferries have returned to service with clean technolo-

gy that reduces both their environmental footprint and cost of operations.

- The two "Spirit" class vessels consume approximately 16 per cent of our fuel annually. The conversion of our two largest ships in the fleet goes a long way to improving the sustainability of our operations and affordability for ferry users - Mark Collins emphasized.

- Operating these vessels on natural gas is both environmentally sound and good for affordable travel. We expect to reduce fuel costs by millions of dollars by running these vessels on LNG - he added.

Other upgrades include the renewal of navigation equipment, propulsion equipment components including gearboxes, rudders, steering system, bow thrusters, propeller blades, LED lighting, more efficient air conditioning equipment to reduce energy consumption and four marine evacuation systems.

The vessel's passenger areas have also been upgraded with new carpeting, furniture upholstery, new table tops, refurbishment of all public washrooms, as well as an additional washroom on Deck 5.

BC Ferries has congratulated Piotr Soyka, the co-owner and chairman of Remontowa Holding for an on-schedule delivery of the *Spirit of Vanocuver Island* in a special letter singed by Mark Collins, President and CEO and Mark Wilson, VP Strategy & Community Engagement at BC Ferries.

They have expressed their gratitude for *"the end result of this two-ship conversion project"* and for *"stepping up to the challenges and making the necessary adjustments to make the Spirit of British Columbia and Spirit of Vancouver Island a successful MLU program"*.

In the letter they emphasize, that the both ferries mid life upgrades *"were major undertakings on our two most important ships"*. They also appreciate, that *"a significant amount of*

**The ship's bridge with upgraded navigation equipment.**

*pre-fabrication work and procurement took place long before the vessel even arrived and a comprehensive project plan was executed with excellent project management (…). Finally the attention to detail and quality in the finishing of passenger areas met or exceed my expectations in all respects"* – Collins and Wilson pointed out.

They also expressed BC Ferries' interest *"in a long term relationship with Remontowa Holding"*.

Conversion of *Spirit of British Columbia* has also been recognized with a Shippax award. The Shippax Awards recognize and celebrate new concepts, creativity and innovation within the ferry, cruise, and shipping industry.

BC Ferries has won the Shippax Retrofit Award for completing the conversion of a large passenger ferry from diesel to liquefied natural gas (LNG). The award, received in March 2019 at the Shippax Ferry Conference, recognizes the innovative work performed at Remontowa SA on the *Spirit of British Columbia*, which is among the largest passenger ferries ever to be converted to natural gas propulsion. It is also the first passenger ferry in the world to refuel LNG via delivery on a fully-enclosed vehicle deck.

- BC Ferries is reducing our environmental footprint - Collins said. - We are safeguarding the environment, while finding new ways to improve the sustainability of our operations - he pointed out.

The role of being an industry leader as it comes to the use of innovative technology that lowers emissions is a role BC Ferries takes seriously. *Spirit of British Columbia* was the first passenger vessel in the world to fuel LNG on a totally-enclosed deck.

What is more, the "Salish" class vessels, designed by Remontowa Marine Design, built and delivered by Remon-

Photo: Sławomir Lewandowski

towa Shipbuilding yard and introduced in 2017, were the first passenger vessels in the world to refuel LNG on an open vehicle deck using proprietary tanker truck technology.

BC Ferries now has five ships that operate on cleaner natural gas – two "Spirit" class and three "Salish" class ferries (*Salish Orca*, *Salish Eagle* and *Salish Raven*). All these ferries are converted (Remontowa Shiprepair Yard) or built (Remontowa Shipbuilding) by the companies of Polish Remontowa Holding group.

It's worth mentioning, that according to the "SHIPPAX MARKET 2018" review, among the 32 most significant ro-pax refits and conversion projects in the years 2017-2019, as many as eight vessels have undergone or have been ordered to undergo the above-mentioned modifications at Remontowa SA.


Photo: Slawomir Lewandowski

**The new cryogenic tank on-board the ferry.**

**Dining area.**

Photo: Slawomir Lewandowski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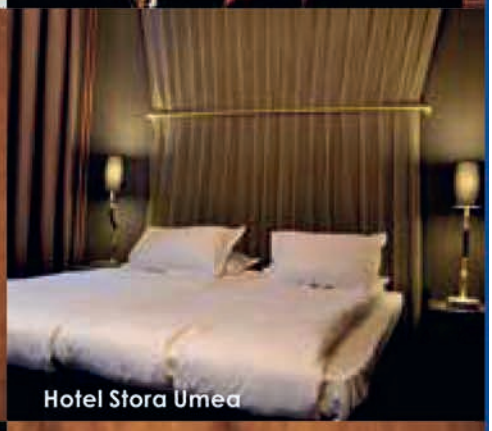
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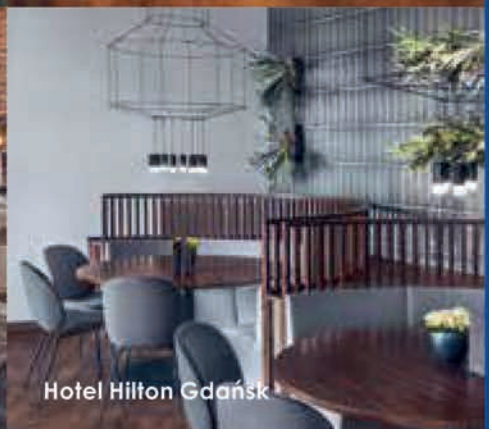
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*One of the most technically complex projects in this market segment in Europe*

Photo: Remontowa SA


# Hanne Knutsen FSO

**The FSO with tugs mooring to the quay of Remontowa SA in Gdansk.**

On May 14, 2018, the *Hanne Knutsen* tanker, converted at Remontowa Shiprepair Yard SA in Gdansk left the yard and sailed to the open sea, where the last trials were performed, before redelivery of the ship to the owner. On May 20, the vessel sailed to Haugesund in Norway for clarification and testing. In August she finally arrived at the Martin Linge field.

The Martin Linge project, i.e. the conversion of the shuttle tanker Hanne Knutsen to a FSO (Floating, Storage and Offloading) is one of the most technically complex projects in this market segment in Europe, which Remontowa SA carried out for Knutsen. It was also the second largest project, in terms of the scale and level of technical complexity, in the history of Remontowa SA (the largest project of this type so far has been the conversion of the FPF-1 production platform executed at the yard earlier).

## 400 km of cables

The conversion of *Hanne Knutsen* included, among others: division of cargo tanks, assembly of pipeline systems (over 30 km), installation of new electrical and electronic systems (including laying of over 400 km of cables), assembly of the stern offloading system, extension of the deck on the stern and extension of the superstructure. While executing this project, about 5000 tons of steel have been processed.

The helideck has been replaced with a new structure to allow new installations and the hull structure has been modified to fit a submerged turret loading buoy system. After rebuilding, the FSO weighs approximately 37 000 tons.

As we can learn from the KNUT'N company magazine, no. 2/2017: *"The scope of the rebuilding of Hanne Knutsen into a storage vessel became much more extensive than originally anticipated. Amongst others, the amount of cables and tubing increased substantially during the engineering phase. Moreover, the design was more complex than first assumed (...)".*

## New generation of FSO

The "new" *Hanne Knutsen* can be considered as a representative of the new generation of "an advanced FSO". She is intended for receiving the oil extracted from the production platform and

performing pre-treatment in the Martin Linge oil field before transferring oil to shuttle tankers. After conversion, the vessel also features a remote-controlled system allowing for the processing of oil and water to be controlled from the nearby production platform and onshore at Stavanger, as well.

The Martin Linge field, abundant in rich oil and gas resources, located in the Norwegian part of the North Sea, is operated by the consortium of Equinor Energy AS (70%) and Petoro AS (30%). Located 180 km off the coast of Norway near the border of the UK sector of the North Sea, it is estimated to contain recoverable resource of more than 300 million barrels oil equivalent (Mboe).

## Oil and gas

The Martin Linge field has a highly complex high-pressure and high-temperature reservoir containing both oil and gas. The infrastructure will include a standalone fully-integrated production platform with living quarters and a permanently anchored Martin Linge FSO vessel. The FSO is chartered for a period of eight years, extendable up to four optional years.

The cargo tanks of the vessel have been restructured at Remontowa SA to make room for the two parallel washing systems where oil will be separated from water. Each washing system comprises two 8500 sqm tanks.

The Martin Linge field mainly delivers gas, but also some oil which has high salinity and must be processed before it can be transported from the field. Consequently, the oil and water are to be separated from the gas on the platform and piped to the Martin Linge FSO unit located about 3.5 kilometres from the platform.

## New separation technology

The new separation technology has been installed on the FSO. When the oil and water arrive, it is routed into two parallel washing systems that are completely the same. Each system has two large tanks that the oil will pass through.

As Stig Helland, Senior Project Engineer for the FSO package on Martin Linge says, this technology is in place on the Norwegian shelf for the first time. The oil washing equipment will function well even in high waves in the North Sea.

The oil is separated from the saltwater in a process similar to a reverse sprinkler system. The oil and water are projected through a number of small holes in pipes near the bottom of the tank. This causes the oil to raise slowly towards the surface through a layer of water at the bottom of the tank. On its way up, the oil droplets coalesce, causing the oil to form a layer on top of the water. Simultaneously, the water droplets that accompany the oil will also coalesce and sink towards the bottom of the tank.

## No negative impact

Helland explains that when the oil is routed to the next tank, the process is repeated, but this time freshwater

Photo: Wojciech Podsiadło


***Hanne Knutsen*** **FSO was welcomed in the Martin Linge field by the** ***Seven Falcon*** **diving support vessel.**

is added and mixed with the oil. This freshwater dilutes the remaining saltwater and the water is again separated from the oil in the wash tank. Thus, the salt content is reduced, and the result is high-quality oil.

This novel Total patented technology allows for two advantages. Firstly, the weight and amount of equipment on the Martin Linge platform are reduced, as the oil is cleaned on the FSO, not on the platform itself. Secondly, it has no negative impact on the environment, since the processed water that is almost clean and remains after the oil has passed through the wash tanks, is returned to the reservoir near the oil recovery site.

Photo: Wojciech Podsiadło

***Hanne Knutsen* FSO approaches the Martin Linge field. A glance at the ship's deck. More than 30 km of tubing and over 400 km of cables were laid on the FSO at Remontowa SA.**

## On stream in 2020

Knutsen Group has revealed, that on Saturday 25th of August 2018, *Hanne Knutsen* finally arrived at the Martin Linge field ready for connection and further startup. After her arrival, the following weeks were dedicated to build-up the vessel to do her tasks as a Floating Storage and Offloading vessel. *Hanne Knutsen* is going to operate on Martin Linge field for a minimum of 8 years.

First oil from the field was previously scheduled for 2017, but due to delays on the construction of the Martin Linge platform, particularly related to the floor modules (topsides) being built at Samsung Heavy Industries in South Korea. According to Equinor Energy AS the field is now scheduled to come on stream in the first quarter of 2020.

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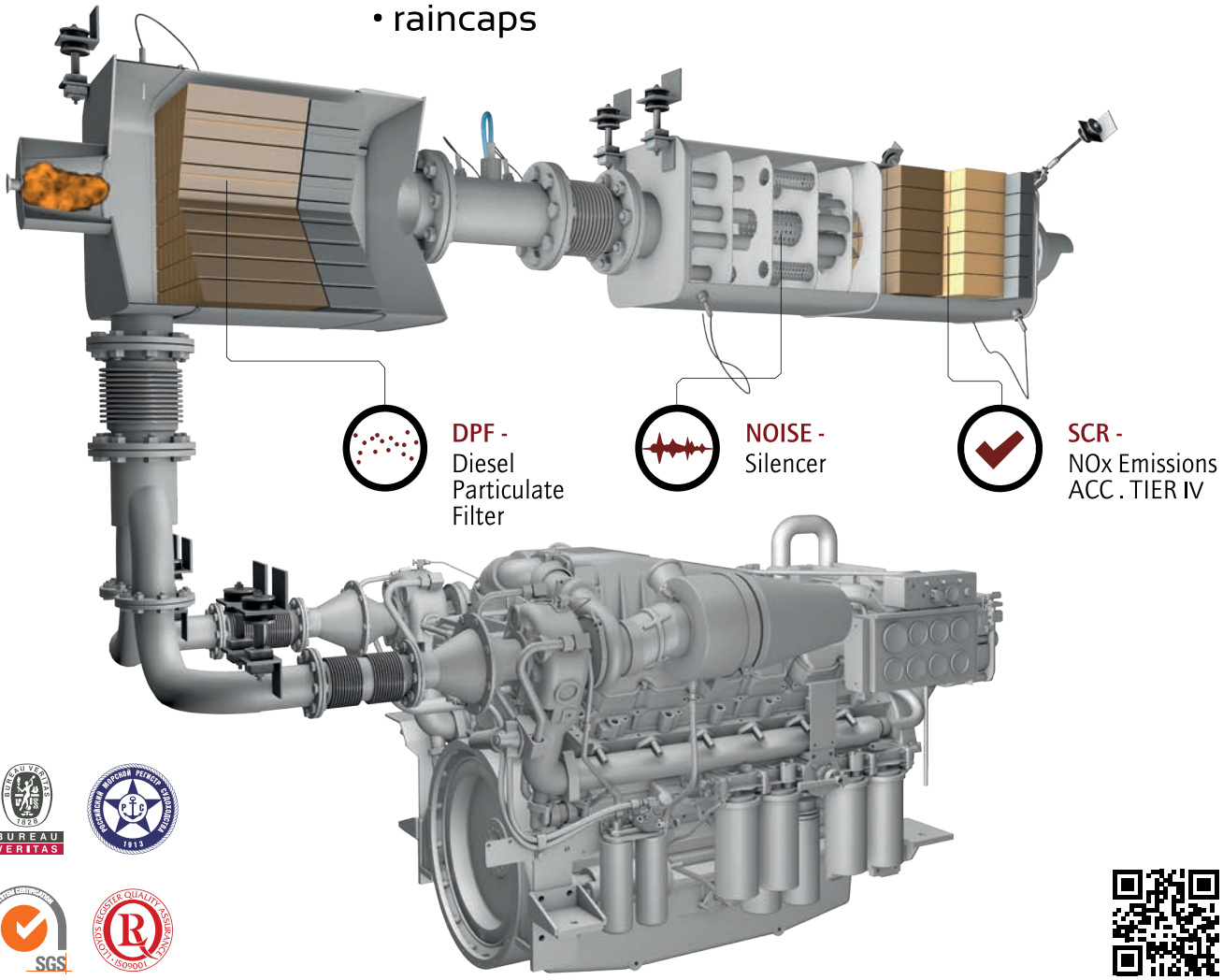

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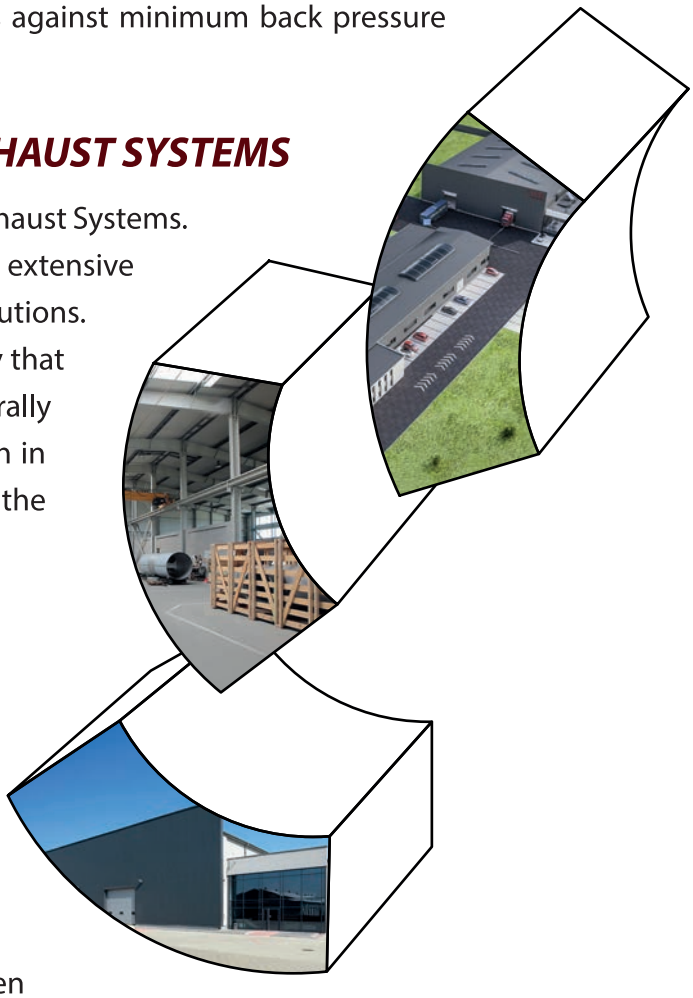

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*The largest Polish yard installs more and more eco-systems on ships*

# Green technologies

**Since August 2013 until February 2019 Remontowa Shiprepar Yard in Gdansk has retrofitted 40 vessels with 100 flue gas desulfurization systems. The shipyard has also installed a dozen or so ballast water systems on various ships. The amount of such green retrofits has been constantly increasing.**

Given the number of projects already completed and early market entry, with leading or even pioneering position, the installation of scrubber systems may be regarded as one of the specialties of the largest Polish repair yard and one of the largest in Europe.

## Demand for scrubbers

In general the ship owners operating in SECA go for scrubbers. This trend is confirmed especially by Baltic ro-ro and ferry operators, who have been installing scrubbers on their fleet, mainly DFDS, Finnlines, Scandlines, Transfennica. These owners and operators have been among the clients of Remontowa SA as well as the others - Spliethoff, Color Line, Brittany Ferries, Western Bridge, Stena Line, Solvang and Grimaldi Group.

Among 40 vessels equipped by Remontowa SA with more than 100 various types of scrubber systems (close loop, open loop and hybrid) in the last six years there have been: 12 ro-ro vessels, 17 ro-paxes, 9 general cargo ships, a bulk carrier and an LPG tanker.


Photo: Sławomir Lewandowski

The most recent ships retrofitted with scrubbers in Remontowa SA are: *Stena Scandinavica* (Stena Line), *Grande Lagos* and *Grande Dakar* (Grimaldi Group).

## From initial design to delivery

One of the largest car-passenger ferries in the fleet of Stena Line - *Stena Scandinavica* - entered the yard in January 2018. The most important point in the repair schedule was the installation of a scrubber system.

The implementation of this service was carried out from the initial design of the system, through the supply of the scrubber, assembly and collection, to handing over to the ship owner.

In addition to the installation of the flue gas desulphurization system, the scope of work on the ferry was very wide. 110 tons of steel were processed, 15 kilometres of cables and approx. 10 km of pipelines were laid. The exhaust system was also replaced on four main engines, and silicone coatings were placed on the hull.

***Grande Dakar* departing from Remontowa SA with scrubbers installed.**

**Engineers from Remontowa Marine Design carry out 3D Laser Scanning in BWT systems and scrubber retrofits.**

Stena Line has been undertaking environmentally-friendly activities on a large scale for several years now, systematically implementing more environmentally friendly technologies on its ships. These include scrubbers, ecological propulsion types, or the installation of more streamlined bulbous bows which reduce fuel consumption. A significant number of such projects have been commissioned by the Swedish operator to Remontowa SA.

## Grimaldi ships retrofitted

A few months later, two container/ro-ro carriers owned by Grimaldi Group were retrofitted with scrubbers.

Before *Grande Lagos* arrived in October 2018 at the quay of Remontowa SA, it stayed for nearly a week on the roadstead of the Gdansk port awaiting better weather conditions. Strong wind and high wave prevented the planned entry of this 236 metre unit to the shipyard.

In addition to the class survey, the main task was to modify the vessels's exhaust system and scrubber installation. For this purpose, most of the large-size elements needed to assemble the system, including scrubber, venturi, electrical switchboards, exhaust three-way valve, pipes and other elements, were transported using the quay cranes to the vessel while she was still at the quays.

Works related to the scrubber installation itself were already completed during the vessels's stay in the dock. The class survey included also painting the hull with silicone paint, a review of several dozens of electric motors and the aft ramp, as well as steel works on the hull plating in several ballast tanks. After four weeks, the carrier left Remontowa SA on 26 October 2018.

The second vessel of the Grimaldi Group which entered Remontowa SA for the scrubber installation in January 2019 was *Grande Dakar*. Just like *Grande Lagos*, the vessel was originally built so that in the future it would be possible to mount a scrubber, with free space left for such an option.

## Open loop system

Both above-mentioned ships have been equipped with Wartsila U-type scrubbers.

The system operates in an open loop utilising seawater to remove SOx from the exhaust. Exhaust gas enters the scrubber and is sprayed with seawater in three different stages. The sulphur oxide in the exhaust reacts with water and forms sulphuric acid. Chemicals are not required since the natural alkalinity of seawater neutralises the acid.

Wash water from the scrubber is treated and monitored at the inlet and outlet to ensure that it conforms with the MEPC 184(59) discharge criteria. It can then be discharged into the sea with no risk of harm to the environment.

The purity of exhaust gases leaving the scrubber is checked using a flue gas analyzer (CEMS) located on top of the scrubber. Thanks to the three-way

valve in the exhaust gas system, it is possible to return them to the scrubber, or directly to the atmosphere, when they meet the required emissions standards.

## Engineering works

The working documentation of the scrubber system and associated systems included in the scrubber installation was prepared by Remontowa Marine Design & Consulting (RMDC), the Remontowa Holding's in-house design office.

The RMDC's engineers supervised the work on the reconstructed unit, solving the problems resulting, among others, from the emerging differences between sister ships.

Like the first ship of the series, the *Grande Dakar* was also directed to the shipyard's largest dock, where it underwent next renovation stage.

*Grande Dakar* left the shipyard in February 2019. It was the fortieth of vessels on which Remontowa SA in Gdańsk installed so far a total of over 100 flue gas desulphurisation systems. Further vessels of this ship owner will have gone through the scrubber installation by the end of 2019.

But Remontowa SA has also been installing more and more ballast waters systems.

## Ballast water purification

It is estimated, that between 3 and 12 billion tonnes of ballast water is relocated, used to stabilize ships when they return without cargo. Marine traffic, crucial to carrying goods between countries and continents, brings with it ballast water from one port to the next. Ballast water contains micro organisms, animals and plants that may harm the environment and ecosystems where they are discharged.

The objective of the IMO's Ballast Water Management Convention is to prevent harmful marine organisms from spreading. New, stricter environmental regulations are forcing the shipping industry to take action.

However, as for ballast water management, the IMO is granting shipowners a transitional period before they must comply entirely. Meanwhile the industry is working full speed on implementing the BWM Convention which took effect in 2017. This necessitates investments in the order of billions.

As with scrubbers, understanding which types of ballast water treatment (BWT) systems are suitable for a specific ship type, and which of these systems meet both the IMO rules and the stricter requirements of the US Coast Guard is quite a challenging task, particularly for shipyards.

## First visit of Daiichi Tankers

One of the ships recently equipped in Remontowa SA with a BWT system is the *Sulphur Genesis*, a tanker intended for transporting liquid sulphur and owned by Daiichi Tankers. This was the first time this Japanese ship owner used the services of the largest Polish ship repair yard. The tanker entered the shipyard in April 2018. for a five year class survey extended with BWTS installation.

It is worth recalling, that the shipyard installed a BWT system for the first time in 2007. The *SR American Progress* tanker was equipped with a Balpure (Severn Trend/ De Nora) system at that time. In 2011, at Remontowa SA a Norwegian tanker *Gijon Knutsen* got a KBAL system designed and patented

***Ark Futura* departing from Remontowa SA with an Alfa Laval BWT system installed.**


Photo: Sławomir Lewandowski


Photo: Jerzy Uklejewski

***Stena Scandinavica*** **leaving Remontowa SA with the exhaust system replaced on four main engines.**

by Knutsen OAS Shipping. The KBAL system neither uses any kind of chemicals nor any filters.

## Many systems from various suppliers

In 2012, the shipyard installed a prototype Cathelco system on the *Eddystone* vessel. In subsequent years, Remontowa SA equipped more ships with systems from many other producers, including Balpure, Optimarin, Techcross and Alfa Laval, the last three of which are listed as suppliers of systems certified by the US Coast Guard Marine Safety Center.

In the case of *Sulphur Genesis*, the owner decided to install a system produced by a Japanese company, Miura. In this solution microorganisms and living organisms transferred in ballast waters are neutralized by UV. Next, dead organisms are retained in a filter station thanks to which ballast waters are purified.

The installation of the system on *Sulphur Genesis* required introducing many alterations and modifications to the previous configuration of the tanker space in order to adjust it to the installation of new devices, which were also connected

**Complete 3D data as-built ship for retrofit design projects translates into better design and enables to avoid any collision of new systems with the existing ones.**

to the power grid already existing on the ship. This required proper planning of works and logistic preparations, as well as prior prefabrication of elements.

Apart from new ship owners commissioning installation of BWT systems, Remontowa Shiprepair Yard provides services of this type to regular clients. *Ark Futura* is one of the many ferries owned by Danish company DFDS repaired in the shipyard, the previous visit of which took place in 2016.

## DFDS continues cooperation

This time, the ferry came to the shipyard to install a BWT system produced by Alfa Laval. The company prepared detailed documentation of the installed system and blueprints of the rooms developed on the basis of 3D scans were especially helpful, thanks to which it was easier to plan a collision free course of pipelines.

In the first stage, the shipyard had to make place for the "heart" of the entire system (the so-called 'unit'). This required adjusting part of the engine room, including cutting out elements of the already existing constructions. BWT system on *Ark Futura* also includes two new feed pumps and a system of pipelines with over 30 valves.

Remontowa Shiprepair Yard SA has vast experience in both repair and conversion projects as well as special services such as Ballast Water Treatment and scrubber systems installation on-board ro-pax'es, ro-ro ships and passenger ferries. This Polish yard has also made many such vessels more energy efficient and safe for the environment modernizing hull shapes, exchanging boulbous bows or converting propulsion systems to green fuels.

## Vast experience

Thanks to cooperation with other companies operating in the Remontowa Holding group, the shipyard can assist owners in the most demanding projects. Remontowa LNG Systems as a producer and supplier of complete LNG power systems can support the yard in the implementation such systems on-board ships. Remontowa Marine Design & Consulting has designed many advanced LNG driven vessels most of which have been ferries. The majority have been built at Remontowa Shipbuilding, one of the biggest manufacturer of LNG powered vessels worldwide. Of 37 car passenger ferries built in the Remontowa Holding group so far, as many as 15 have been LNG fuelled.

Remontowa Marine Design & Consulting has recently announced signing a frame agreement on BWT systems engineering services for existing fleet of DFDS. The agreement covers more than 40 ferries to be retrofitted in the period from 2020 to 2024. Engineering works include full scope of BWTS retrofit, from vessels scanning, throughout feasibility study, class design up to fabrication and as built documentation. Design will be carried out in close cooperation with DFDS and chosen system supplier DESMI Ocean Guard A/S with their CompactClean Ballast Water Management System.


Photo: Sławomir Lewandowski

**The Japaneese sulphur tanker at the shipyard's quay after completion of works.**

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To determine how important maritime safety is, I will describe the aspects of pilot boarding a ship.

Pilot's transition from a pilot boat to a pilot ladder hanging on the ship's side in conditions of a rough sea is the most difficult and the most dangerous moment in the pilot's work.

Maximum comfort and safety should be provided to the incoming pilot by means of backup from an assistant and equipment that will not fail in the worst conditions.

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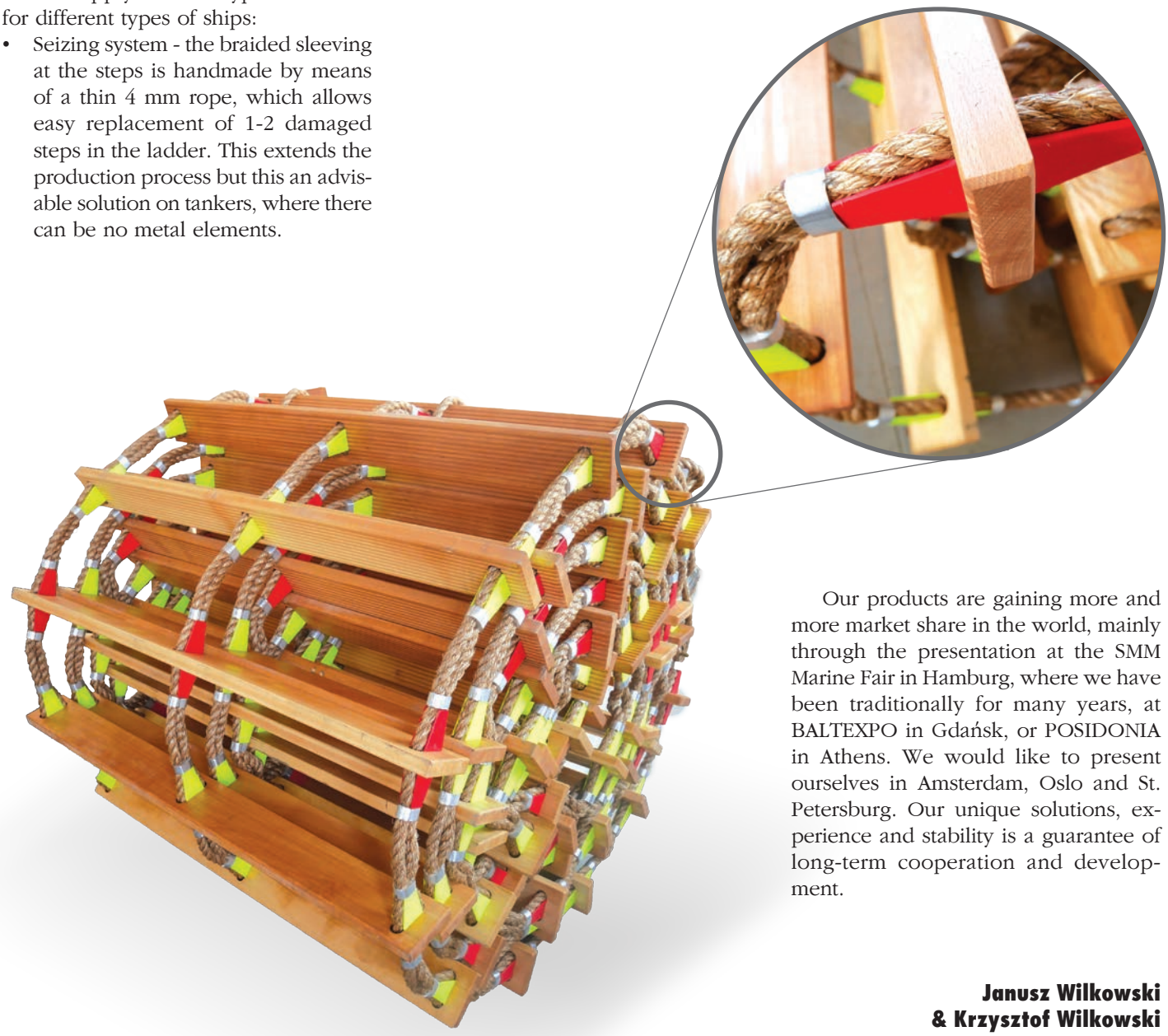

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**Janusz Wilkowski**
**& Krzysztof Wilkowski**


Photo: Courtesy of Remontowa SA

***Coral Methane* departing from Gdansk based Remontowa Shipbuilding SA in 2009.**

*Triple gas carrier converted into LNG bunker vessel*

# *Coral Methane* acquired a unique function

As a result of modernization carried out at Remontowa Shiprepair Yard SA in Poland, the gas carrier *Coral Methane* has become one of the few LNG bunker tankers in the world.

In 2017, Shell and a renowned Dutch gas shipowner, Anthony Veder, signed an agreement under which *Coral Methane* was supposed to undergo reconstruction to perform a new function consisting in delivering LNG fuel to other vessels. For that purpose, it was necessary to fit it with an installation and integration of specialized devices.

## First stage

This unique project was implemented following two separate contracts. After the winning of the tender contest by Remontowa SA, the vessel entered the shipyard in April 2018 to complete the first stage of works.

The repair was extensive, the main part being the installation of an additional gas cooler which required preparing a special space. A 20 ton separate

compartment was prefabricated prior to the ship's arrival at Remontowa SA, also Void room no 1 was adapted on the vessel, in which electrical equipment was installed to control new devices.

A new pump and plate cooler were installed in the PSA room and new communication routes were also fitted. The vessel docked twice during that time and underwent many surveys, repairs, maintenance, and painting works.

During that time, hull maintenance was carried out, box coolers and propellers, including an azimuth thrusters, were dismantled. A radar system for measuring gas volume in the cargo tanks provided by Kongsberg was also installed in the shipyard.

## Second stage

After completing the first stage of works, *Coral Methane* left Gdańsk and... came back in November 2018 as, once again, the offer of Remontowa Shiprepair Yard SA for carrying out the second stage of modernization proved to be the best one. This time the task consisted of preparing a transportation route and installing a subcooler in an external casing that had been built during the previous visit.

After completing the modernization, the gas carrier became one of the few LNG bunker tankers in the world. She is expected to supply LNG fuel mainly in the southern part of the North Sea and on the Mediterranean Sea. Before modernization in Remontowa SA, the ship, with a load capacity of 7500 cubic metres, 117.8 m long and 18.6 m wide, was used by the charterer - Shell - as a multipurpose gas carrier. However, she was mainly employed on the so-called small scale LNG market as a feeder and for regional LNG distribution in Northern Europe.

According to the shipowner - Anthony Veder Rederijzaken BV, which owns a fleet of over 20 gas tankers - adapting *Coral Methane* to an LNG bunker tank meets the growing demand for LNG fuel on the shipping market.

## Polish-built ship

It is worth adding that *Coral Methane* had been ordered by Anthony Veder in Remontowa Shiprepair Yard, which then subcontracted the ship's construction to Remontowa Shipbuilding SA, a newbuilding arm of the present Remontowa Holding group.

The building yard delivered the ship in 2009. At that time, she was one of the first vessels in the world built for transport of three types of cargo: LNG, LPG and ethylene, and the first such vessel constructed in a European shipyard. Thanks to its diesel and electric drive and partial use of LNG as fuel, it was also one of the most modern and most ecological ships sailing the European waterways.

## Clean energy for remote areas

The development of this unique triple gas carrier started in 2006 as an innovative study by Anthony Veder for Norwegian client Gasnor, which produces and distributes natural gas as a clean energy source to various places in Norway.

In 2006 Gasnor's extensive Norwegian pipe and truck distribution network was to be further expanded by small scale LNG shipping. As such they were


Photo: Sławomir Lewandowski

**Newly painted *Coral Methane* docked at Remontowa SA in 2018.**

able to reach more clients, who used LNG as fuel for propulsion of: supply vessels, car ferries, cars and buses, in remote areas along the long coast of Norway (25 000 km).

A challenging logistical solution for Gasnor was found in the Anthony Veder's optimal size and flexibility in the conceived vessel.

## *Coral Methane* features and cargo systems

The ship has an overall length of 117.8 m, a molded breadth of 18.6 m and a draught of 6.8 m. The deadweight of the ship is 6,150 t. She is equipped with two electrical generating systems, which run on LNG cargo boil-off gas (BOG) and heavy fuel oil. It is built according to high standards and received the 'Cleanship Super' notation from the Bureau Veritas classification society. *Coral Methane* can sail at a maximum speed of 15.5 kt.

The cargo-handling plant includes IMO Type C insulated, pressure vessel cargo tanks designed by TGE Marine Engineering. The tanks can store LPG, ethylene and LNG, can avoid partial filling restrictions and has a secondary barrier containment system. The ethylene system design is modified to allow the carriage of LNG at -163 °C. The vessel can also carry ethylene at -104 °C.

The triple gas carrier is designed as a two grade cargo vessel for the simultaneous transportation of two cargoes (one cooled, one uncooled), intended for the transport of liquefied gases with a maximum cargo density of 0,65 t/m3 in two independent cylindrical type C tanks located in separate compartments. The vessel is suitable to carry LNG, methane, ethylene, ethane, propylene, propane, butylene, and butane.

The deepwell cargo pumps developed by Hamworthy Svanehoj are also modified to adapt the lower service temperature of LNG. The cargo pumps are fitted with conventional explosion-proof motors powered by frequency converters. The motors develop 210 mlc in LNG service and 120 mlc while handling LEG or LPG at a flow rate of 450m³/hour for both transfers. The ship is also equipped with a booster pump.

Photo: Sławomir Lewandowski

***Coral Methane*** **was docked twice undergoing many reviews surveys, repairs, maintenance and painting works.**

The cargo heating/vaporising equipment includes an indirect ethylene vaporiser, a direct sea water heated LPG heater or vaporiser and an indirect LNG vaporiser. The ship is equipped with a Cascade/direct cycle reliquefaction system. The system consists of two refrigerant compressors, two cargo compressors and a suction gas heater for fuel gas. There is also a pressure swing adsorption nitrogen generation plant.

## Propulsion

*Coral Methane*'s complete gas/diesel-electric propulsion system is designed and delivered by Rolls-Royce. The system includes two Bergen gas gensets and two Bergen diesel gensets, electric system, two Azipull 120 thrusters with pulling propellers and a bow tunnel thruster.

*Coral Methane* is the first gas carrier to be equipped with Azipull thrusters. These units provide high manoeuvrability and fuel efficiency to the vessel. The electric drive system incorporates a low voltage water-cooled frequency converters. The two 2,500kW drives were integrated into a Rolls-Royce drive train configuration. The Bergen gas engine-powered gensets are run on Boil-Off Gas (BOG) when the ship is loaded with LNG and diesel gensets are operated while the ship is in ballast or carrying gas cargoes other than LNG.

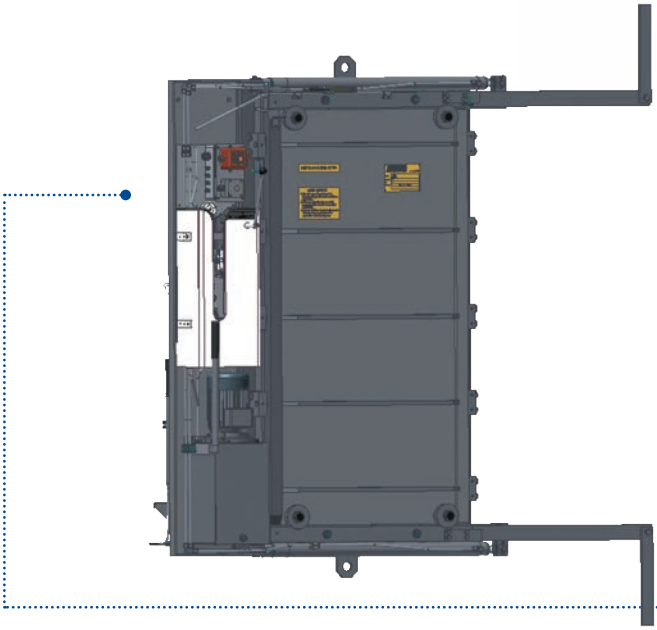
The propulsion system comprises a diesel plant and a gas plant. Gas engines achieve a 100 per cent reduction in sulphur oxide (SOx) and particulate emissions and around 92 per cent reduction in nitrogen oxide (NOx) emissions in comparison with the engines burning heavy fuel oil (HFO). Gas engines also cut down carbon dioxide (CO2) emissions by up to 25 per cent.

In 2008 *Coral Methane* won the Innovation Award of the Royal Association of Dutch Shipowners (KVNR). The vessel was also included in the Significant Ships of the Year 2009 published by the Royal Institution of Naval Architects (RINA).


Photo: Sławomir Lewandowski

# REMONTOWA HYDROSTER SYSTEMS
## – quality & customized solutions

## Bulkhead Watertight Sliding Doors for Ro-Ro and passengers vessels



Watertight sliding doors from REMONTOWA HYDROSTER SYSTEMS, known well before as HYDROSTER brand, have a long tradition. The first bulkhead watertight sliding door was designed and manufactured in 1964. Production for offshore industry started in 2004 (AHTS and PSV vessels).

RHS manufactures doors for cargo, passenger and ro-ro vessels. Depending on customer requirements, we provide door with electrohydraulic or electric drive. The modular equipment panel on the door enables to easy and simple install them on the ship. Along with the door, a mimic panel for use on the bridge is supplied, which indicates the actual status (position) of both the door and its drive.

The systems are supplied with a set of data outputs to the external monitoring system (VDR/IAS) or with outputs in communication protocol (NMEA 0183/MODBU RTU) as a standard. And last but not least is compliance with SOLAS, NORSOK and with all major class rules.

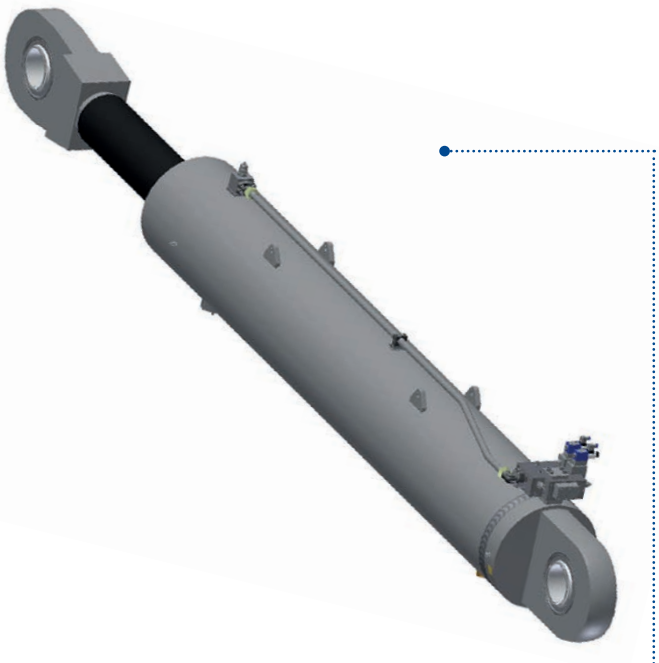
**Bulkhead watertight sliding door with electro-hydraulic drive**

## Hydraulic Cylinders

Hydraulic Cylinders have a long tradition in REMONTOWA HYDROSTER SYSTEMS, which was well known before as HYDROSTER brand. Many years of experience in design and production are the key to a reliable and solid product. They are used in systems installed on shore, offshore and board of the vessel.

Our strength is confirmed by the fact that most of our products are constructions dedicated to the client's needs. The piston rods of our production can be covered with double chrome or composite coatings to obtain high corrosion resistance and resistance to difficult working conditions.

Examples of use our cylinders: hydrotechnics (weir dams, lock gates), hydraulic presses, coke ovens, lifts, cranes, unloading and charging devices for coal and other loose materials. We make cylinders with diameters up to 500 mm and stroke of up to 11 meters.



**Hydraulic cylinders piston type, double-actiong, self-aligning, mounting with one side piston rod cylinder**

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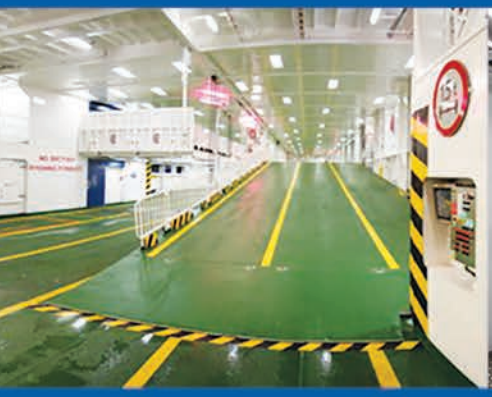
# OFFSHORE & MARINE



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*World's first LNG cruise ship bunkered at sea*

# Polish clues...

**On 16 January 2019, *Coral Methane* successfully carried out her first liquefied natural gas (LNG) bunkering operation on the world's first LNG-powered cruise ship at Santa Cruz de Tenerife in the Canary Islands.**

The bunker vessel fuelled *AIDAnova*, the newest ship from AIDA Cruises (Carnival Corporation) which made history as the cruise industry's first ship to be powered at sea and in port by the world's cleanest burning fossil fuel.

The LNG bunkering operation was carried out by the 7,500 cbm vessel originally built in 2009 for Anthony Veder shipping group, modified from an ethylene/LNG carrier to an LNG bunker vessel in 2018 and chartered by Shell subsidiary Gasnor, the LNG supplier. The ship had been originally both built and after a few years adapted to the new function in Poland.

As the pure bunker vessel she operates across Europe, primarily in the southern part of the North Sea and Mediterranean. According to Anthony Veder, the size of *Coral Methane* as well as its other bunker and feeder vessels is ideal for economic loading at large-scale terminals while still being easily manoeuvrable for ship-to-ship bunker operations.

- We believe LNG is today's most sustainable marine fuel. The delivery of *Coral Methane* as an LNG bunker vessel in partnership with Shell, underlines our dedication to LNG and marks the next step in our contribution to a sustainable supply chain - said Klaas Kerssemakers, Chief Operating Officer of Anthony Veder.

- The success of this project is due to an excellent cooperation with all parties involved, from the engineering phase up to and includinag our first LNG bunkering operation - he added.

The LNG bunker vessel's modification project, managed by Anthony Veder, took twelve months. It required engineering and modification works, as well as obtaining bunkering licenses for the various ports. To guarantee safe bunkering operations, the crew was familiarized with all the necessary equipment and procedures together with employees of Shell and AIDA Cruises, along with Carnival Corporation.

The operation was the first ship-to-ship bunkering conducted in Spanish territorial waters in the context of the ten-year worldwide LNG supply contract with Carnival Group's ships (made by eight different companies including Costa Crociere). Shell's terminal in Gibraltar, run by Gasnor, consists of five LNG tanks of which each one has the capacity of 1000 cbm.

*Coral Methane* is equipped with Azipull thrusters that give the vessel high maneuvrability and fuel efficiency. Its proven flexibility provides the necessary conditions to operate as an LNG bunker vessel. Modifications such as the installed hose transfer system enable the


Photo: Anthony Veder

**It was the first ship-to-ship bunkering conducted in Spanish territorial waters.**

ship to perform safe bunkering operations while the boil-off gas management system provides a sustainable solution for efficient use of natural gas and carbon emission reductions. The project also involved a review of all necessary operational procedures to ensure compliance with the SGMF (Society for Gas as Marine Fuel) recommendations and guidelines.

*AIDAnova*, that was put into service in December 2018 and currently navigates under the Italian flag, is the first ship of the new Helios Class based on a "Green Cruising Concept" that can be entirely powered by environmentally friendly liquefied natural gas.

She has been built by the Meyer Werft shipyard in Papenburg, Germany. Several subcontractors from Poland have also contributed to the ship's construction. For instance two bow sections for the *AIDAnova* cruise ship were built and supplied by Gdansk based Marine Projects. Many Polish companies, i.a. Stocznia Wisła, Crist and others have been cooperating for years with Meyer Vertf in manufacturing various steel constructions for cruise liners built by the German shipyard.


Photo: Anthony Veder

**LNG bunkering of *AIDAnova*, the world's first LNG cruise ship, in the Canary Islands.**

The ship, 337 metres long, exceeds 183 000 gross tons and has 20 desks, 2626 staterooms and can accommodate 5200 passengers and a crew of about 1500 people.

In the recent winter season *AIDAnova* was embarking on seven-day cruises around the Canary Islands. The program included the volcanic scenaries of Gran Canaria, Tenerife, Lanzarote and Fuerteventura, along with the Portuguese archipelago of Madeira.

Since the mid-April 2019, *AIDAnova* has set sail for another favorite travel spot – the Mediterranean. The summer season features Mediterranean destinations such as Majorca, Barcelona, Rome, Florence and Marseille.

*Polish companies are developing the LNG supply market in the Baltic Sea*


Photo: Port of Gdansk

**On 13 March 2019, 54 tonnes of LNG were pumped into the tanks of *Fure Valo*, a vessel owned by a Swedish shipping company in the Port of Gdansk.**

# First LNG bunkering operations at seaports

**Lotos Asfalt and PGNiG Obrót Detaliczny - the companies from the Lotos and PGNiG capital groups - jointly offers a bunkering service with LNG coming from a gas terminal in Świnoujście.**

The cooperation agreement was signed on April 19 in 2018 during a conference devoted to the future of LNG as marine fuel in the Baltic. This was the culmination of more than one year of cooperation, under which over 30 bunkering operations with LNG fuel were executed in the Remontowa Shipbuilding and Remontowa Shiprepair yards in Gdansk.

Owing to the agreement that enables the use of PGNiG's LNG and Lotos knowledge of the marine fuel market, both companies can provide a fully professional bunkering service for LNG fuelled ships.

## LNG bunkering points by 2025

The development of bunkering infrastructure is a key element of the further increase in the popularity of LNG. According to the Directive for alternative fuels - by 2025 at the latest, a base network of LNG bunkering points should be established in seaports. In the case of Poland, these are to be: Gdansk, Gdynia, Szczecin and Świnoujście.

The need to ensure the availability of bunkering services in these locations is included in the "National framework

for the development of alternative fuels infrastructure" developed by the Ministry of Energy in Poland.

In January 2018 Grupa Lotos and Remontowa LNG Systems have signed a letter of intent regarding the construction of a pilot LNG distribution system. The contract concerns the design, construction and testing of a pilot docking station. Its main task will be maintaining, in the long-term, safe technical parameters of intermodal, cryogenic LNG tanks.

Remontowa LNG Systems have developed a concept of using LNG containers for bunkering ships through a set of valves and pumps built into a 40-foot container frame.

## Two seagoing ships already bunkered

Between March 13th and March 18th 2019, Grupa LOTOS and PGNiG completed two LNG commercial bunkering operations for seagoing ships. These were the first such operations carried out at the sea ports of Gdansk and Gdynia. Both companies are set to continue cooperation in LNG bunkering as this will enhance the competitiveness of Polish ports and promote the use of LNG, as an environmentally friendly fuel in the Baltic Sea.

– LNG bunkering of ships is yet another of the many possible applications of gas imported by PGNiG to Poland from Qatar, Norway and the United States via the Lech Kaczyński LNG Terminal in Świnoujście. We are convinced that LNG, due to its environmentally friendly qualities, will be the future of maritime transport in the Baltic – said Maciej Woźniak, Vice President of the PGNIG Management Board for Trade.

## Succesful cooperation in LNG promotion

– Grupa LOTOS readily engages in projects involving alternative fuels, which is consistent with our Group's growth strategy for 2017–2022. LOTOS's ambition is to win leadership in promoting new generation alternative fuels, such as LNG. It is a clean and safe fuel. The key to further enhancing its popularity is development of LNG logistics and bunkering infrastructure. To this end, Grupa LOTOS have become involved in conducting a feasibility study for the construction of a small-scale LNG handling terminal in Gdansk, which is partly financed by the European Union (CEF) – said Patryk Demski, Vice President of the Management Board of Grupa LOTOS S.A., Chief Investment and Innovation Officer.

– Grupa LOTOS and PGNiG have worked together for many years. PGNiG supplies natural gas to Grupa LOTOS, and Grupa LOTOS uses this fuel in oil refining. The collaboration has been very successful. Each company can draw on the experience of the other: LOTOS's knowledge of the marine fuel market and PGNiG's expertise in LNG – added Cezary Godziuk, President of the Management Board of LOTOS Asfalt.

On March 13th 2019, 54 tonnes (32,000 Nm3) of LNG were pumped into the tanks of *Fure Valo*, a vessel owned

Photo: Ireneusz Gradkowski


**LNG bunkering operation at Remontowa Shiprepair Yard in Gdansk, carried out on 27 March 2018. The *Spirit of British Columbia* ferry converted in this shipyard to be powered by LNG was fed by this clean fuel using truck-to-ship method.**

by a Swedish shipping company which plans to increase its LNG-powered fleet to six such vessels by the end of the year. The second bunkering operation was performed on March 18th, when 18 tonnes (10,800 Nm3) of LNG were loaded into the tanks of the *Ireland* vessel, from a single container.

– I am glad that, in line with our last year's declarations, we completed the first fully commercial LNG bunkering of ships in Poland. It is a milestone in the development of LNG bunkering at Polish sea ports, which will greatly enhance their competitiveness. I would like to emphasise in particular the excellent cooperation in ship bunkering both with the Port of Gdansk and the Port of Gdynia – said Henryk Mucha, President of the Management Board of PGNiG Obrót Detaliczny Sp. z o.o.

## Growing awarness

– Shipowners are very much interested in the bunkering service at Polish ports. The reason behind this is the growing awareness that LNG, as an alternative marine fuel, is the only mature solution that can meet both existing and future emission standards and be economically viable at the same time – said Marcin Szczudło, Vice President of the PGNiG Obrót Detaliczny Management Board, responsible for CNG/LNG activities.

LNG will become increasingly popular also due to the implementation of the Sulphur Directive. The European Commission plans to completely eliminate emissions from maritime transport by 2050. This means that Central and Eastern European countries will have to meet more stringent standards than those binding in other parts of the world. The Sulphur Directive requires shipping companies whose vessels sail in Sulphur Emission Control Areas (SECAs), e.g. the Baltic Sea and the North Sea, to use fuels with sulphur content not exceeding 0.1 per cent.

- Our experts participated in a several dozen meetings, workshops and conferences, where they shared knowledge on LNG. Their professionalism, involvement and know-how contributed to the development of regulations and procedures that may be used today by others - comments Adam Meller, President of the Port of Gdynia Authority.

- Polish ports are having their moment. We are running large investment schemes and winning new contracts, with the aim to respond to current market needs and secondly, to prepare to what the future has for us. One of the elements for the future are vessels fuelled with liquid natural gas - explains Łukasz Greinke, President of the Port of Gdansk Authority.

Both ports had been preparing to bunkering vessels with LNG for a long time. They performed rescue and fire-fighting drills, worked on procedures and regulations thanks to which bunkering operations could be successfully performed.


Photo: Port of Gdynia

**On 18 March 2019, 18 tonnes of LNG were loaded into the tanks of the *Ireland* vessel, from a single container.**

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