PLATINUM PARTNERS
TABLE OF CONTENTS

1  DEME IN 2020 .................................................................................................................. 3
2  JAN DE NUL IN 2020 ....................................................................................................... 9
3  VAN OORD IN 2020 ....................................................................................................... 18
4  PORT OF ROTTERDAM IN 2020 .................................................................................... 25
5  TRELLEBORG IN 2020 .................................................................................................... 30
6  SHIBATAFENDERTEAM in 2020 ................................................................................... 38
7  BOSKALIS in 2020 ......................................................................................................... 44
8  PENTA-OCEAN CONSTRUCTION IN 2020 ................................................................. 50
9  BEKAERT IN 2020 ......................................................................................................... 55
1 DEME IN 2020

1.1 Fleet Investment Programme

In 2020, DEME’s multi-year fleet investment programme continued, with the arrival of two new trailing suction hopper dredgers, ‘Meuse River’ and ‘River Thames’. ‘Meuse River’, a sistership to the pioneering dual fuel hopper ‘Scheldt River’, immediately headed to a first project in the Arctic and was also deployed on the River Elbe deepening and widening project in Germany.

‘Spartacus’, the most powerful cutter suction dredger (CSD) in the world, is expected to arrive in the course of 2021. ‘Spartacus’ represents the next step in terms of production rates, pumping power, water depth and unmatched workability. It is also the first CSD that is capable of running on LNG.

CSBC-DEME Wind Engineering (CDWE) in Taiwan is investing in a dedicated DP3 heavy lift installation vessel ‘Green Jade’, which represents the largest single overseas investment for DEME. Being built in Taiwan, ‘Green Jade’ will feature an exceptional combination of high transport and load capacity, impressive lifting heights and green technology. The vessel is expected in the fourth quarter of 2022.

In May 2020, before DEME could take ownership of the new offshore installation vessel ‘Orion’, there was an accident involving the crane hook during overload tests. Due to the delay in the delivery of the vessel to DEME, third-party vessels had to be secured for the pending project pipeline.

To be able to offer the total package of services to the offshore wind industry, from installation to maintenance, DEME is building its first Service Operation Vessel for maintenance technicians. The vessel already has a long-term contract for the maintenance of the Rentel and Mermaid & Seastar (known as SeaMade) offshore wind farms in Belgium.
1.2 Dredging

By the end of the year, DEME has won the largest ever dredging and land reclamation contract in its history, in terms of dredging volume – the Abu Qir port project in Egypt. This is the first project where the game changing cutter suction dredger ‘Spartacus’ will be deployed.

DEME has successfully executed the first campaign of the ‘Sea Channel’ project in the Arctic. Eight large trailing suction hopper dredgers have been mobilised to dredge the access channel to Sabetta port, where a liquefied natural gas facility is being developed.

In Germany, the Elbe deepening and widening project continued, where DEME is responsible for the dredging, transportation and relocation of around 32 mio m³ of material. The dredging works for the modernisation project of the Świnoujście-Szczecin fairway in Poland started in 2020. Despite most of the mobilisation taking place at the height of the pandemic, the project is firmly on schedule.

In Southern Europe, DEME secured several contracts for port developments in Italy and Portugal. In Belgium, the long-term maintenance dredging contracts on major waterways and along the coast run until January 2022.

In a very remote project, taking place right in the midst of the pandemic, DEME successfully concluded a project to elevate wetlands between Bonny and Bodo in Nigeria, where a new road will be built. In Ghana a new contract has been awarded to develop Elmina port, enabling it to accommodate larger vessels.

At the end of 2020, all the marine works for the Tuas Terminal Phase 1 (TTP1) megaproject in Singapore were concluded, with only subsequent earthmoving works on the reclamation footprint remaining.

A major project in the Port of Rio Grande in Brazil was finished off in early 2020 and handed over to the client. DEME also wrapped up a maintenance campaign in the access channel of the Port of Buenaventura in Colombia at the end of the year.
1.3 Offshore

In a particularly impressive achievement, construction of Belgium’s largest offshore wind farm – SeaMade – was successfully completed within 16 months. Deploying ‘Apollo’, DEME installed 58 Siemens Gamesa 8.4 MW turbines. Ultimately, DEME installed the foundations, inter-array cables, two offshore substations, export cables and performed the rock placement works within just 16 months - a staggering performance given that most of the work took place in the middle of the pandemic.

A key milestone in the Saint-Nazaire offshore wind farm project was achieved when DEME successfully commissioned the tailormade XL subsea drill on schedule. Saint-Nazaire will be the first commercial offshore wind farm ever to be built in France. In 2021 DEME will deploy the drill for the installation of 73 foundations, which is a first in the offshore wind industry.

In Germany, DEME has been awarded the EPCI contract for the foundations for Parkwind’s Arcadis Ost 1 offshore wind farm and for the installation of collars at the Kaskasi wind farm. A new contract was also secured for the DolWin6 project, where DEME will transport and install the offshore section of the high-voltage direct-current cable, which runs from German offshore wind farms through the Wadden Sea.
In the Netherlands the installation of 94 foundations and turbines at the Borssele 1&2 wind farm has been completed.

In the UK DEME has been awarded a major EPCI contract for the inter-array cables at the Dogger Bank A and Dogger Bank B wind farms in the UK, the first two phases of the 3.6 GW Dogger Bank Wind Farm, which is the world’s largest offshore wind farm under development. This contract also makes history in the industry, being the largest inter-array project ever awarded.

DEME’s two-vessel turbine installation solution really proved successful at the East Anglia ONE offshore wind farm project, where 102 7 MW turbines seamlessly have been installed, even though DEME faced some heavy weather conditions and the challenges of the pandemic.

Offshore works for what will become the world’s largest offshore wind farm kicked off at the Hornsea Two offshore wind farm. In total, 165 monopiles and transition pieces will be installed in preparation for the site’s 8.4 MW turbines.

By the end of the year, 103 jackets have been installed at the Moray East offshore wind farm in Scotland. Offshore installation vessel ‘Orion’, which was earmarked for the project, was severely damaged before it was delivered to DEME, and just weeks before the Moray East project got underway. Despite the setback, DEME managed to swiftly charter a third-party vessel and production has continued apace ever since.

In the summer the latest rock placement campaign was completed for the North Sea Link project, an interconnector between Norway and the UK. A first rock placement project was completed in Taiwan for a gas pipeline. Several major projects around the Norwegian Continental Shelf on behalf of Equinor wrapped up in December.

A three-year contract has been awarded to perform various rock placement campaigns for the 1,400 MW high voltage direct current (DC) electricity link between the British and Danish transmission systems.

DEME successfully completed the dredging and backfilling of a 130 km offshore pipeline in Nam Con Son, Vietnam.
1.4 Infra

In June, DEME has been awarded a major contract for the Oosterweel link, which will complete the Antwerp Ring Road. As a member of a consortium, DEME will construct the Scheldt tunnel (Scheldetunnel) for project developer Lantis.

The Femern Link Contractors joint venture, including DEME, now has the green light to proceed with the Fehmarnbelt Fixed Link project. Once completed, it will be the world’s longest immersed road and rail tunnel (18 km) and connect Denmark with Germany. This historic project, one of Europe’s largest infrastructure projects to date, will take nearly a decade to complete. For DEME’s Infra activity line, the project is another opportunity to deploy its expertise in immersed tunnels.

In the Netherlands, three mega-projects continued – the RijnlandRoute, New Lock Terneuzen and Blankenburgverbinding. Besides the infra marine works, a major dredging and ground works component is included in the projects. These huge infrastructure projects highlight how DEME’s core activity lines support, reinforce and generate works for each other. This combined strength ensures the success of these complex projects.

1.5 Environmental

In Belgium, large-scale remediation works continued at Blue Gate, Fort-Filips and BP Hoboken. In a joint venture, DEME has been awarded a contract to perform the environmental remediation of the former Renault site in Vilvoorde and the BASF site in Feluy.

DEME has been awarded a major contract to remediate the former ExxonMobil site in Bowling near Glasgow (Scotland), under an Early Contractor Involvement (ECI) agreement. This award followed very soon after the successful completion of a four-year refinery remediation project recently handed over to ExxonMobil in Tønsberg, Norway.

In an important contract awarded by Voies Navigables de France, work on the Condé-Pommeroeul Canal project continued throughout 2020. This multi-year project will ultimately lead to the reopening of a 6-km section of the canal between the Belgian border and the city of Condé in Northern France.

To tackle the increasing problem of river pollution, DEME launched an innovative project to deploy a marine litter hunter on the river Scheldt in Belgium. The project combines artificial intelligence, virtual reality and autonomous navigation to detect and collect marine litter. With DEME’s vast expertise in environmental remediation, it is a logical step for DEME to use this expertise to cooperate on solutions to tackle the plastic soup.
1.6 **GSR**

In 2020, GSR completed two key assessments of its seabed mineral collector technology. This paves the way for a new expedition to the CCZ in April 2021. GSR is close to completing a scoping report that will form the basis of a research programme to establish a baseline for biodiversity in the exploration area. These studies will assess the impact of nodule collection on the ecosystem’s function and services. They will also prepare the way for a full Environmental Impact Assessment, a crucial step in the process of applying to the International Seabed Authority (ISA) for a licence to commence commercial operations.

1.7 **Concessions**

As part of its investment regeneration policy, DEME sold its 12.5%-share in the 396 MW Merkur offshore wind farm. The transaction was signed in early December 2019, with financial close achieved in the second quarter of 2020.

DEME aims to be a front runner in the hydrogen market and has entered into several green hydrogen partnerships internationally to ensure the company is at the forefront of developments. The company entered into exclusive partnerships to develop industrial scale green hydrogen plants: one at Duqm (HYPORT® Duqm) and one in Belgium (HYPORT® Ostend).

Duqm offers the ideal location for solar energy and this can be optimally combined with a good resource of wind energy. Essentially, Duqm would be a hydrogen producer and exporter.

HYPORT® Ostend will be the first liquefied hydrogen plant in the EU producing hydrogen from renewable energy sources. The combination of renewable offshore wind energy with the production of green hydrogen is fully in line with DEME’s sustainability goals.

1.8 **COVID-19**

In an unprecedented year, many of DEME’s people had to stay on vessels and projects across the globe for much longer than anticipated because of the various lockdowns and travelling restrictions. Around 1,200 crew members had extended stays on board. DEME chartered more than 10 aircraft to bring people home. Several vessel deviations took place so crew changes could be carried out and so projects could continue. Additionally, special extraction teams and a crew change task force were organised to repatriate people. Throughout this challenging period, we remain focused on our number one priority of ensuring the health and safety of our staff and crew, while at the same time continuing to serve our clients.

In addition to dealing with the practical logistics matters, DEME recognised that the pandemic could potentially have a big impact on mental health. Several wellbeing training and development courses were set up, whereby the team could support people remotely wherever they were in the world. DEME also offered this support to family members as well.

[https://www.deme-group.com](https://www.deme-group.com)

https://www.linkedin.com/company/demegroup/

@DEMEgroup
**2 JAN DE NUL IN 2020**

**Shaping Water and Land**

Jan De Nul Group shapes both water and land. Worldwide. We enable the production of offshore energy and maintain the depth of waterways. We build new ports and create extra land. We realise complex infrastructure works and erect any type of building. We tackle pollution in whatever form. Thanks to the fruitful interaction within our company, we can offer overall solutions that combine one, several or even all these activities. Through a creative and innovative approach, we achieve sustainable and successful results. With us, the client can rest assured. Today, but also tomorrow. – [www.jandenul.com](http://www.jandenul.com)

**OUR 2020 IN REVIEW**

### 2.1 Responsible Entrepreneurship

#### 2.1.1 Jan De Nul Sets an Example as SDG Pioneer

Jan De Nul Group permanently works on the world of tomorrow, always striving for the best possible result for people, planet and society. For the third year in a row, Jan De Nul Group has been awarded the Voka Sustainable Business Charter in recognition of the implementation of its sustainability plan. The Flemish entrepreneurial network Voka supports organisations in their efforts to achieve their goals within the United Nations’ Sustainable Development Goals (SDGs) framework.

As a result of these 3 consecutive awards, Voka also recognised Jan De Nul NV as a figurehead of the United Nations’ SDGs, with the UNITAR ‘SDG Pioneer’ certificate.

This Voka Sustainable Business Charter is a driver to understand the SDGs and makes the SDGs more tangible for companies and employees. The Charter is entirely in line with Jan De Nul’s corporate strategy. Jan De Nul Group takes well-considered actions on all facets of the SDGs, with a clear focus on energy, emissions and climate.
2.1.2 Jan De Nul Teams Clean Beaches Worldwide

Our planet is under pressure and, as a maritime contractor, Jan De Nul feels closely involved. Plastic waste, for example, threatens the rich marine biodiversity in our oceans. Jan De Nul is committed to controlling and reducing waste streams: several project teams worldwide organised a local beach clean-up on or near site in 2020. Jan De Nul Group is aware of its impact on people and our planet. Through a well thought-out and sound CSR policy, based on the Sustainable Development Goals, Jan De Nul seeks to gradually increase its positive impact. Organizing a beach clean-up on a project contributes directly to SDG 14 Life below water and is a way to keep the oceans healthy.

2.2 Ambitious CO₂ Reduction Targets

2.2.1 Dredging, Civil and Environmental Works All Achieve Prestigious CO₂ Ladder Level 5

Jan De Nul Group continuously strives to reduce its environmental footprint, through an intensive energy management system focussing on lowering energy consumption and lower emissions. Since 2013, the dredging activities of Jan De Nul Group in the Benelux have been certified according to the CO₂ performance ladder, an instrument for companies to demonstrate the awareness and reduction of CO₂.

Since 2020 the civil works in the Benelux, as well as all environmental works of Jan De Nul Group, have achieved the highest level 5.

Learn more on our CO₂ reduction ambitions:

2.2.2 Jan De Nul Vessel is the First in the World to Sail 2,000 Hours on 100 % Sustainable Marine Biofuel

Jan De Nul Group sets ambitious greenhouse gas reduction targets to reduce its climate footprint by choosing for its maritime fleet 100 % renewable fuel, a certified sustainable substitute for fossil fuel made from waste flows.

Early 2020, Trailing Suction Hopper Dredger Alexander von Humboldt completed 2,000 hours using 100 % renewable 2nd generation Biofuel Oil (BFO) resulting in a remarkable CO₂ reduction by 85 %. This major milestone represents the longest continuous use of 100 % sustainable marine biofuel in the maritime industry.

This achievement further reinforces the successful adoption of this fuel solution, showing to the maritime world that BFO is ready for use as a sustainable drop-in fuel to meet industry emissions reduction targets. Jan De Nul Group being the frontrunner in it.

2.2.3 Jan De Nul Further Invests in Minimal Climate and Air Impact with Its Ultra-Low Emission Vessels

In 2020, two sister Ultra-Low Emission vessels were delivered in Singapore. Trailing Suction Hopper Dredger Sanderus left the shipyard in January after successful offshore tests and immediately sailed to Belgium for her first mission. In the next two years she will maintain the navigation depth in the marine access channels to the Flemish ports under the authority of the Flemish Government.
The identical Trailing Suction Hopper Dredger Ortelius was delivered in December. Both vessels are diesel-electric driven and able to dredge to a maximum depth of 35 m. They feature a shallow draught, are highly manoeuvrable, and suitable for working in confined areas.

Learn more about the specifications of our Sanderus and Ortelius:

That same year, Jan De Nul also kicked off the construction of its next generation Offshore Installation Vessels Voltaire and Les Alizés, both ULEVs and the first seaworthy installation vessels in the world with extremely low emissions.

Additionally, Les Alizés will be fitted with an Energy Storage System (ESS), forming a hybrid setup together with the main diesel engines. This ESS will compensate power peaks on the main engines and recover energy from the heavy lift crane, resulting in optimised engine operation and less fuel consumption and emissions.

Les Alizés will also have a Cleanship NDO7 label and a Green Passport EU label. The Cleanship label confirms that the vessel checks and minimizes the waste water and all other residual waste. The second Green Passport label means that all materials and hazardous substances are mapped out during the construction phase, in order to facilitate the recycling of the vessel when decommissioned. Both certificates are issued by a specialised external agency.

Watch these short animations of our Offshore Jack-Up Installation Vessel Voltaire and Offshore Crane Vessel for floating installation Les Alizés:

2.2.4 Our Ultra-Low Emission Vessels, Frontrunners in the Shipping Industry

The latest generation of Jan De Nul vessels is a frontrunner in the shipping industry. They focus on post-treatment of combustion materials, which is the key to better air quality in the sector.

Internal combustion engines without post-treatment emit air pollution affecting both climate and air quality. Air pollution and particulate matter damage our health and also have a direct impact on our living environment.
Jan De Nul’s Ultra-Low Emission vessels don’t emit these harmful gases, because they are equipped with a catalyst that renders nitrogen oxides harmless and with a soot filter blocking the finest particles. Several of these pollutants also affect our climate so that the post-treatment also ensures a reduction of greenhouse gases.

Construction activities at sea are usually located close to coastlines, large and small ports, and densely populated areas. For that reason, Jan De Nul Group decided to invest in this highly advanced emission control technology. Jan De Nul is aware that, regardless of the choice of fuel or engine technology, the exhaust gases must always be filtered.

2.2.5 JDN Sites in the Port of Ghent are Foreseen with Own Wind Turbines for Own Electricity Generation

Jan De Nul Group is ambitious when it comes to lowering its emissions and its energy consumption. One of the initiatives is Jan De Nul’s own energy transition. Jan De Nul makes its premises available for producers of green energy. In 2020, two business sites in the port of Ghent were fitted with one or more turbines, producing enough green electricity for Jan De Nul’s own needs in the Benelux!

2.3 Driven by Innovation

2.3.1 In-House Designed Vacuum Cleaner Starts Port Clean-Up to Combat Historical Pollution

Port of Antwerp launched in 2019 its Galgeschoor Plastic Challenge to find an innovative, eco-friendly and economically viable solution to clean up millions of plastic particles left behind by the tides in the ‘Galgescoor’ nature reserve. Jan De Nul Group accepted the challenge, submitted its in-house designed Nul-O-Plastic and was chosen end 2019 as all-out winner out of 55 entries. On 19 September 2020, during World Clean-up Day, the Nul-O-Plastic started the port clean-up in the Galgeschoor.

Innovation drives Jan De Nul Group. It is one of the pillars of Jan De Nul's strategy to find circular solutions for a better planet. This strategy focuses on constantly reducing the ecological footprint. Not only on site and at the office, but also on project level. This innovative Nul-O-Plastic was able to remove all small plastic particles from this nature reserve, and can now be deployed in other port areas.

2.3.2 A Compact and All-Round Vacuum Cleaner

The Nul-O-Plastic is a flexible and compact vacuum cleaner on rubber caterpillar tracks to ensure minimal impact on the soil. Its long hose is easy to operate and hoovers up the plastic particles in its container. Once the container is full, it is emptied in a central depot. A major advantage of the Nul-O-Plastic is its mobility, thanks to its caterpillar tracks. Scan the QR for an animation of our Nul-O-Plastic.

2.3.3 Coastbusters Project Recognised for its Innovative Cooperation

In October, the Blue Innovation Awards of the Flemish Blue Cluster rewarded the Coastbusters project for the innovative cooperation between all partners Jan De Nul Group, ILVO, DEME, SIOEN Industries and VLIZ. These innovation awards recognise innovative initiatives to support the Flemish blue
The economy. The first phase of the Coastbusters project investigated the positive impact of biogenic reefs on coastal erosion off the Belgian coast.

2.3.4 ‘Plant a Million Seagrasses’ to Restore Coastal Ecosystems

Ghent University received a VLAIO Baekeland grant with support and cooperation from Jan De Nul Group, DEME Group, and the Portuguese marine institute CCMAR for its doctoral study ‘PLANT ME’. This research into the sustainable protection of vulnerable coastal areas aims at using seagrasses.

The presence of seagrass is decreasing worldwide due to poor water quality, plant diseases, climate change and coastal erosion. However, these seagrass beds are of great importance for shallow marine coastlines, because they provide a habitat for a high diversity of underwater fauna and flora and capture more CO\textsubscript{2} than rainforests. In addition, seagrass dampen waves to lose up to 75\% of their strength, thus significantly reducing erosion.

With the innovation project ‘PLANT ME’, the research team wants to enable the restoration of this ecosystem by developing a new planting technique for seagrass.

Read more about this innovative research:

2.3.5 Flat Oyster Aquaculture in Offshore Wind Farm Space

Offshore wind farms not only supply green electricity, they can also facilitate nature restoration and aquaculture. Project United is part of a large-scale European research programme aimed at using space at sea as sustainably as possible. A total of five pilot projects are being set up with the support of partners from eight countries. Jan De Nul Group participates in the research project in Belgium, which focuses on nature restoration and aquaculture, more specifically the restoration of the native flat oyster reefs. In this way, the group also contributes to a healthier ocean.

Despite some delays due to the COVID-19 crisis, the research partners made progress. During the summer months, the first flat oyster aquaculture structure and restoration tables have been set out in the Belgian part of the North Sea. All partners successfully accomplished the first four sea missions nearshore and were able to install longlines to collect wild oyster spat from the environment. The team also tested the potential for a restoration habitat to form natural flat oyster reefs at the nearshore site of Westdiep, 5 km off the coast of Nieuwpoort.

2.4 Investing To Be Future-Proof
Jan De Nul acquired in December 2020 the Offshore Construction and Cable-Lay Vessel Connector from Ocean Yield ASA. This marks a further investment in the offshore installation capacities of the Luxembourg based maritime contractor. The vessel will be officially transferred during the fourth quarter of 2020.

Thanks to these investments, Jan De Nul Group operates a very modern and balanced offshore fleet now comprising three offshore jack-up installation vessels, three floating crane installation vessels, three cable-lay vessels, five rock installation vessels and two multipurpose vessels.

The Connector makes a perfect combination with our Cable-Lay Vessel Isaac Newton. Both vessels are interchangeable with similar large carrying capacities thanks to similar dual turntable systems, while at the same time they each have their own specific characteristics that make them complementary. Our third Cable-Lay Vessel Willem de Vlamingh completes our trio with its unique all-round capabilities including operating in very shallow waters.

Read more about our strategy and the Connector’s specifications:

2.5 Some Further Jan De Nul Projects of 2020

2.5.1 Maputo Port Dredging Works Completed

Jan De Nul Group finished the maintenance dredging operations in the Port of Maputo, Mozambique, for the Maputo Port Development Company. This dredging campaign restored the depths created after Jan De Nul Group’s 2016 capital dredging campaign.

Trailing Suction Hopper Dredger Francesco di Giorgio and Water Injection Dredger Henri Pitot started the dredging works in October 2019. They removed 1.5 million cubic metres of accumulated silt, mud and sand in four months’ time, focusing on the Matola, Katembe, Polana, Xefina and Northern Channels. The drafts of the berths of the Maputo and Matola terminals were also secured.

2.5.2 Contract for Maintenance Dredging in Payra Port Signed

In December, Jan De Nul Group signed a contract with Payra Port Authorities in order to maintain the depths of the existing port access channel. Ultra-Low Emission vessel Diogo Cão and Water Injection Dredger Henry Darcy were mobilised to Bangladesh in order to start the works in January 2021.

2.5.3 Expansion of the Port of Fujairah in Dibba
A consortium of Jan De Nul Group and BESIX is assisting in the expansion plans of the Port of Fujairah in Dibba, the second largest city of the emirate of Fujairah in the U.A.E. The project was awarded by the Port of Fujairah (PoF), the world’s second largest bunkering hub, to expand and upgrade its bulk-handling capacity.

The design-and-build contract consists of dredging the navigation channel and port basin, reclamation and shore protection, as well as constructing breakwaters, a 765-m long quay wall, foundations for ship loader rails, port infrastructure and creating utilities and aids to navigation. The fishing harbour will be relocated in the process.

Read more on the scope of this project:

2.5.4 Deepening Dredging Works in the Access Channel to Guayaquil - Completed

After nine months of dredging, Jan De Nul Group reached a first important milestone by concluding the deepening of the 95-kilometre long access channel to the port in record time.

The operation and maintenance of the channel under the 25-year concession contract started immediately after. The total investment of the deepening and maintenance dredging works will be recuperated by collecting a transit fee.

2.5.5 Coastal Protection Works in Benin

In Benin, where Jan De Nul is installing two submerged dykes at about 150 metres off the coast. This project design was developed and tested in-house at Jan De Nul Group. Both dykes will have a wave damping effect, breaking the ocean waves before even reaching the coast. This wave-free climate between the submerged dyke and the coast will significantly reduce the impact on the beaches.

Early 2020, Jan De Nul successfully completed the second part of the underwater breakwater in Avleketé to reach a length of 4.15 km. In the meantime, 1.7 million m³ sand was replenished onto the eroded beaches for restoration and another volume of 850,000 m³ was reclaimed on land as stock for future civil works. By end 2020, the installation of the breakwater continued.

2.5.6 TPC Offshore Wind Farm in Taiwan

At the end of 2020, Jan De Nul Group and its consortium partner Hitachi proudly finalised the installation of the first two turbines on the TPC Offshore Wind Farm. The installation teams of Jan De Nul and Hitachi picked up the pace in the autumn in order to achieve this important milestone in a year that has been dictated unprecedentedly by the COVID-19.

Thanks to the measures implemented to reduce the COVID-19 impact, the consortium partners were able to fabricate, transport and install all onshore cables, all 21 wind turbine foundations, a large portion of the subsea cables and two complete wind turbines.
2.5.7 Dutch TenneT Cable Project Awarded

TenneT has awarded the consortium Jan De Nul Group and LS Cable & System the contracts for the supply and installation of high voltage cables for the grid connection of the Dutch offshore wind farms Hollandse Kust Noord and West Alpha. Jan De Nul Group will take care of the transportation, laying and protection of the cables that will be designed and manufactured by LS Cable & System. Offshore execution will take place in 2022-23.

The Hollandse Kust Noord and Hollandse Kust West Alpha export cable systems will consist of two 220kV AC cable systems each. These four cable systems will cover a total length of 210 km, connecting the wind farms to the onshore Dutch power grid near Beverwijk, just north of the port of IJmuiden. When operational, these wind farms will generate up to 1,400 MW, enough green electricity to meet the annual needs of one million households.

2.5.8 Northwestern 2 Offshore Wind Farm Completed

Construction works for the seventh offshore wind farm off the Belgian coast started in 2019. The 219 MW project is located in the Belgian North Sea, approximately 50 km off the shore of Ostend, Belgium, and is the first project to use the world’s highest rated V164-9.5 MW MHI Vestas Offshore Wind turbines in commercial operation. The 23 turbines on monopile foundations link through an offshore high voltage station to Elia’s Offshore Switch Yard (OSY) to export its electricity. The Northwestern 2 wind farm powers approximately 220,000 households in Belgium.

Mid-April, Jan De Nul Group, MHI Vestas en owner Parkwind proudly announced the completion of the installation of all turbines at the Northwestern 2 offshore wind farm.

Watch our wrap-up video on Northwestern 2:
2.5.9 First Offshore Wind Farm Project in U.S. Waters Completed

End of June, Jan De Nul Group’s offshore installation vessels Vole au vent and Adhémar de Saint-Venant left the United States after having successfully completed the installation of the Coastal Virginia Offshore Wind pilot project.

Ørsted Wind Power North America LLC awarded the contract to Jan De Nul Group to install a 12MW demonstrator Offshore Wind Farm, 27 miles off the coast of Virginia. The scope for Jan De Nul Group included the transport and installation of both offshore foundations and WTGs, as well as the procurement and installation of the scour protection. Each foundation is composed of a monopile and transition piece.

Watch our wrap-up video on Coastal Virginia Offshore Wind Farm:

2.5.10 Interconnector Cable Project Crete-Peloponnese Kicked Off

Jan De Nul Group and Hellenic Cables started in 2020 the installation and protection of a submarine power cable between the island of Crete and the Peloponnese region of the Greek mainland, developed by ADMIE. Jan De Nul is responsible for the installation of the cable in water depths up to 980 meters using its Cable Laying Vessel Isaac Newton as well as the protection up to 100 metres water depth on both shore sides.

Learn more about this project:

https://www.jandenul.com

https://www.linkedin.com/company/jan-de-nul/

jandenulgroup
Van Oord

As a marine contractor Van Oord has a wide international presence in dredging, offshore, offshore wind and marine contracting. We enjoy a long and proud tradition of bringing our precision engineering expertise to construct offshore wind farms, preparing the world’s seabeds and ocean floors and to creating new land for a vast array of commercial and public sector projects.

Vision

Our vision is to create a better world for future generations by delivering Marine ingenuity.

Mission

As a global maritime contractor, we focus on dredging, oil & gas infrastructure and offshore wind. We work safe and closely with our clients and stakeholders to create innovative and sustainable solutions.

3.1 Dredging

More than half of the world’s population lives in cities. The world’s urban population currently stands at 3.7 billion people and is, with an expected to double by 2050. This has resulted in a growing worldwide demand to create more living space. Van Oord is adapting to these changing market conditions with our global marine engineering projects.

Dredging is our signature talent, one that we have perfected continuously since our business was founded. We maintain our position in traditional dredging markets and in our home markets thanks to the best dredging equipment and operational experience, supported by our local branches.
3.1.1 Taiwanese Dredging Project Awarded to Van Oord

Van Oord has been contracted to dredge the water intake basin of the Taiwanese Da Tan power plant. Cutter suction dredger HAM 218 and trailing suction hopper dredger HAM 318 will join forces on this project, which will kick off early 2021.

Driven by the growing demand for energy in Taiwan, the Da Tan power plant is currently being expanded by Hwa Chi Construction Co. Van Oord will deepen the existing water intake basin to increase its capacity to take in cooling water. Cutter suction dredger HAM 218 will be deployed for the dredging works.

3.1.2 Expansion of Aberdeen Harbour by Van Oord in Full Swing

Aberdeen Harbour Board has awarded two contracts for rock removal and revetment work for the Aberdeen South Harbour expansion project to Van Oord. Last week Van Oord’s backhoe Razende Bol joined backhoe Goliath at the project site in Scotland.

3.2 The Netherlands

Van Oord is entwined with landmark Dutch marine and civil engineering. The Netherlands is where our origins lie. A trusted partner to our local and global clients, we deliver complex projects helping them meet their environmental, social and emissions targets.

The impact of climate change means a growing number of people around the world now live in flood-risk areas. Serious water-related disasters occur more frequently making prevention vital. As a company with deep roots in the Netherlands, we are well aware of the threats. We know that they demand smart, innovative solutions to help us defend our coasts, reinforce our dikes and keep our waterways navigable and our ports accessible.
3.2.1 Rijkswaterstaat Has Awarded the Enlargement of the Twente Canals to a Consortium of Van Oord-Hakkers-Beens

Rijkswaterstaat, the executive agency of the Dutch Ministry of Infrastructure and Water Management, has awarded the final phase of the enlargement of the Twente canals to a consortium of Van Oord-Hakkers-Beens. The contract was signed this morning. The work will start in the spring of 2021 and will last until the end of December 2022.

By enlarging the waterway, the ports of Almelo, Hengelo and Enschede will be more easily accessible and larger vessels will be able to sail through more safely and smoothly. This will boost the regional economy and make water transport even more attractive.

3.2.2 Remediation of Averijhaven Awarded to Van Oord

Rijkswaterstaat, the executive agency of the Dutch Ministry of Infrastructure and Water Management, has awarded Van Oord the contract to design and carry out the removal of silt from the Averijhaven depot in IJmuiden. After the removal of the contaminated silt, the area will be developed into an energy port. The contract has a value of €18 million and preparations will start in the spring of 2021.

3.2.3 Hondsbossche and Pettemer Sea Defence

The Hondsbossche and Pettemer sea dyke in the Netherlands was reinforced in 2015, to strengthen the final 'weak link' along the North Sea coast. The innovative project design not only protects the coast but also created space for nature conservation and leisure activities. The resulting area has been renamed Hondsbossche Dunes. The project also presented a unique opportunity for studying the development of dunes and nature following large-scale sand replenishment using the Building with nature principles.

3.2.4 The Afsluitdijk – An Icon of Innovation

The Afsluitdijk has been an example of Dutch marine engineering for decades. The 32-kilometre long dam protect large parts of the Netherlands since 1932 against flooding from the Wadden Sea and the IJsselmeer. After more than 85 years, the dyke is in need of renewal. The dyke will combine various objectives and functions. Reinforced hydraulic structures and two new highwater protection locks will protect the hinterland from flooding. Location and circumstances will be exploited for innovative technology and sustainable energy. Following completion, the Netherlands will again have an iconic project as a symbol of the innovative character of Dutch marine engineering.

3.3 Offshore Wind
Climate change is the greatest threat facing humanity today. With an overwhelming need to reduce CO\textsubscript{2} emissions worldwide comes a rising demand for renewable energy sources. One key contributor to achieving climate change targets around the world is offshore wind.

With 20 years’ proven experience and an impressive track record in constructing offshore wind projects, Van Oord is leading the way in the transition towards renewable energy. In 2019, we completed offshore wind farm projects that deliver renewable energy to over 2.5 million households. With our safety standards, innovative solutions, our employees’ knowledge and expertise, and specialised offshore wind equipment, we are significantly contributing to making wind energy more competitive.

3.3.1 Van Oord Orders Green Cable-Laying Vessel

Van Oord has ordered a next-generation custom-built green cable-laying vessel. The vessel will be delivered from VARD in Norway and equipped with the latest sustainable technologies. The vessel will be fully operational in 2023.

This investment is part of Van Oord’s strategy to strengthen its leading position in the growing offshore wind market. Van Oord has a leading role in the laying and burying of offshore wind power cables. It highlights Van Oord’s drive to continuously reinforce its market position by investing in state-of-the-art sustainable technology. Van Oord has a dedicated cable unit to support all its cable projects.

3.3.2 RWE Chooses Van Oord for Foundations and Array Cables at Sofia Offshore Wind Farm

Van Oord has been selected by RWE as the preferred supplier for the engineering, procurement, construction and installation (EPCI) of the monopile foundations and array cables for Sofia Offshore Wind Farm, one of the world’s largest offshore wind projects.

The 1.4 GW Sofia is sited on Dogger Bank in the central North Sea 195 kilometres from the North East coast, where Van Oord, through its UK branch MPI Offshore, will create a logistics hub to deliver the comprehensive scope of work. Van Oord will deploy its offshore installation vessel Aeolus to install the 100 extended monopile foundations without transition pieces, while the 350 kilometres of array cables will be installed by cable-laying vessel Nexus. Van Oord will sub-contract the fabrication of the foundations and array cables.

3.3.3 Aeolus Completes Turbine Installation at Borssele III & IV Offshore Wind Farm

Rotterdam, the Netherlands, 27 November 2020 – Van Oord’s offshore installation vessel Aeolus has successfully completed the installation of all 77 MHI Vestas V164-9.5 MW turbines at the Borssele III & IV offshore wind farm.

As the Balance of Plant contractor for the Borssele III & IV offshore wind farm, Van Oord was responsible for the design, engineering, procurement, construction and installation of the foundations and inter array cables. In addition the Aeolus was deployed for the transport and installation of the wind turbines. In April, Van Oord installed the last of 77 monopiles. Cable installation vessel Nexus and trencher Dig-It completed the installation and burial of more than 170 kilometres of inter array cables.
3.3.4 Van Oord Shareholder in Saare Wind Energy

Following agreement between the parties, Van Oord is now a shareholder in Saare Wind Energy. Saare Wind Energy is developing the Saaremaa offshore wind farm in Estonia. The collaboration with Van Oord allows Saare Wind Energy to intensify the development process for this offshore wind farm, as financial support and knowledge are combined. Saare Wind Energy has extensive knowledge of local conditions and the environmental impact assessment. Van Oord, being an experienced offshore wind contractor, has been involved in several early developments of offshore wind farms.

3.3.5 Ecoscour Protection: Enhancing Nature Values in Offshore Wind Farms

Van Oord, as part of Two Towers, takes the next step in a research programme relating to the restoration of European flat oyster beds. To investigate methods for the development of oyster reefs at offshore locations, a total of eight reef structures with oysters will be installed underwater within the Borssele Wind Farm Site V in the North Sea.

3.3.6 Van Oord’s Deep Dig-It Trencher Buries Cables to 5.5 Metres Depth for Offshore Grid Connection

Van Oord’s Deep Dig-It trencher crossed the busy shipping route Rotterdam Maasmond successfully and is on its way to offshore Alpha jacket in the Hollandse Kust (zuid) wind farm area. TenneT is building the Hollandse Kust (zuid) offshore grid to connect new offshore wind farms. 4 cables will have to be buried into the North Sea seabed for this purpose. For the first 10 kilometres of the cable route, these cables will have to be buried more than 5 metres into the seabed in order to cross the busy shipping route Rotterdam Maasmond.

3.3.7 Van Oord Awarded Contract to Construct Hollandse Kust (Noord) Offshore Wind Farm

Following the announcement that CrossWind received the permit for the Hollandse Kust (noord) offshore wind farm, Van Oord is pleased to confirm that it has been contracted for the Balance of Plant scope. CrossWind is a joint venture between Shell and Eneco.

3.3.8 Ailes Marines Selects Van Oord for Saint-Brieuc Offshore Wind Farm

Ailes Marines, in charge of the development, construction, installation and operation of the offshore wind farm in the bay of Saint-Brieuc, has selected the Dutch marine contractor Van Oord to transport and install the 62 jacket foundations (steel lattice structure) and the foundation piles for the offshore substation.

3.3.9 Last Borssele III & IV Foundation in Place

Van Oord’s offshore installation vessel Aeolus has successfully completed the installation of 77 foundations for the Borssele III & IV wind farm.

3.4 Offshore Oil and Gas

The growth of the world economy and population is driving the global demand for energy. To meet this demand, Van Oord delivers ground-breaking projects in a challenging offshore market. Our offshore oil and gas activities provide integrated solutions with a focus on the installation, stabilisation, and protection of offshore oil and gas infrastructure. Van Oord has led the market in subsea rock installation for more than thirty years. We have managed to maintain that position by continuously challenging ourselves and improving our expertise.

Van Oord is a niche specialist in two services.
3.4.1 Subsea Rock Installation

We are market leader in the seabed intervention technique Subsea Rock Installation (SRI). Our fleet of flexible fallpipe vessels enables us to stabilise and protect pipelines, cables, and other installations.

3.4.2 Offshore Pipeline Installation

We provide integrated solutions for the installation of nearshore pipelines, cables, and offshore constructions. With over fifty years of experience in this niche market, Van Oord offers the best specialists on the job.

3.5 Other News

3.5.1 Van Oord Presents Climate Risk Overview

Van Oord has launched the Climate Risk Overview, a global online tool that combines multiple data layers and enables users to identify the world’s most-at-risk coastal areas. The tool is in the public domain and anyone can use it. Van Oord unveiled the new tool during the international Climate Adaptation Summit (CAS) 2021.

The Climate Risk Overview is the result of a collaboration between Van Oord and the Global Centre on Adaptation. The launch has therefore preceded the ‘official handover’ to co-chair Mr Ban Ki-moon, who will come to the Netherlands later this year. Van Oord is using the tool to drive discussion of knowledge-sharing, public-private partnerships and mobilisation of the necessary financing to deliver solutions to vulnerable areas. Go to the Climate Risk overview

3.5.2 New Member of the Supervisory Board

The Supervisory Board of Van Oord will be strengthened from 1 January 2021 with the arrival of Ms Charlotte Insinger. She is appointed for a period of four years with the possibility of reappointment.

Ms Insinger held management positions at Robeco Group and Royal Dutch Shell. She has also held several non-executive board memberships at large companies and public organisations, such as Ballast Nedam and Eneco. At this moment she is chair of the supervisory board of RET and member of the supervisory boards of Vastned Retail NV and Hogeschool Rotterdam.

3.5.3 First Podcast Launched in Latest Issue of Van Oord Magazine

Our story behind the latest headlines is disclosed in the brand-new edition of our online magazine. In this publication we introduce our very first podcast. Scroll through the 14th issue full of Marine ingenuity and find a nice mixture of projects and background stories.

3.5.4 First Green Loan for Van Oord

Van Oord has developed a Green loan framework as part of its financing strategy. The first Green Loans under the agreement were signed by Rabobank and BNP Paribas last week. The Green Loans are linked to Van Oord’s sustainability programme S.E.A. and are intended for the financing of the three new LNG trailing suction hopper dredgers currently being built by Keppel FELS Limited in Singapore.
3.5.5 **ReefGuard: Van Oord’s Coral Regeneration Initiative**

The aim of Van Oord’s Coral Regeneration Initiative is to provide solutions for coral rehabilitation and establishment. The ReefGuard was constructed as part of this initiative and is a state-of-the-art mobile aquaculture laboratory. The ReefGuard facility can be seen as the production facility which sources a final end product, Coral Engine, which incorporates these fresh ‘recruits’ together with large fragments. The Coral Engine then functions as a continuous source of genetically diverse coral, ready to be planted out in new areas or sites that are in need of rehabilitation.

3.5.6 **Partnership for the Goals in United Arab Emirates**

Van Oord is part of the newly formed Dutch Sustainability Group (DSG). The group signed a Memorandum of Understanding to jointly help the United Arab Emirates (UAE) achieve its Sustainable Development Goals (SDGs). The Memorandum was signed during the Abu Dhabi Sustainability Week (ADSW) in the presence of His Excellency Dr. Thani Ahmed Al Zeyoudi, Minister of Climate Change and Environment.

Van Oord - Home | Facebook

https://www.linkedin.com/company/van-oord/

@vanoord_official

https://vimeo.com/vanoord

https://www.youtube.com/c/VanOordDMC

magazine.vanoord.com
PORT OF ROTTERDAM IN 2020

The Port of Rotterdam is Europe’s largest seaport. The port stretches a distance of more than 40 kilometres, welcoming 30,000 seagoing vessels and 120,000 inland navigation vessels annually, and handling 470 million tonnes of goods a year. Earnings of EUR 45.6 billion – about 6.2% of Dutch GDP – are generated in the area. The port region owes its leading position to its excellent sea access, intermodal connections and the 385,000 people who work in and for the port and industrial area. The Port of Rotterdam is the place to achieve boundless ambitions! The core tasks of the Port of Rotterdam Authority are developing, managing and exploiting the port in a sustainable way and to deliver fast and safe services for shipping.

In 2020, we experienced some special moments together with our partners and developed the Port of Rotterdam into an even smarter, safer and more sustainable port. If you’d like to know about all that went on in our port this year, watch our annual year-in-review video. Or take a look at our brochure Facts & figures about the port. Click here.

Fig. 1: Thursday, 12 November, Total’s bunker vessel ‘Gas Agility’ started bunkering the container ship Jacques Saade with 18,000 m³ of LNG. More info

4.1 Smartest Port. Connecting the World.

The objective of the Port of Rotterdam Authority is to enhance the port’s competitive position as a logistics hub and world-class industrial complex – not only in terms of size, but also with regard to quality. The Port of Rotterdam Authority is therefore leading the transition to sustainable energy and is committed to digitalisation and innovation to make the port, and the supply chain, more efficient. Below, we will take a closer look at:

1. Digitalisation in the Port of Rotterdam
2. Sustainable Port Development and Sustainable Infrastructure
3. Innovation in the Port of Rotterdam
4.1.1 Digitalisation in the Port of Rotterdam

The Port of Rotterdam Authority is digitalising at a rapid pace. Click here to watch a video about digitalisation in the Port of Rotterdam. The Port Authority is doing this because it has the ambition to ‘run the most reliable, seamless and sustainable logistics chains through Rotterdam’. To achieve this, the Port of Rotterdam Authority is working on the realisation of a Digital Twin for the port: a digital representation of the port in which all asset information (static and dynamic) and environmental information come together.

This makes the assets smarter: using sensors, they measure for themselves how their degradation is progressing. This enables the Port of Rotterdam Authority to make decisions based on factual data. The expectation is that evidence-based decisions will lead to greater value for our customers.

In 2020, we took the next step. The Port of Rotterdam Authority is committed to digital port development for its Asset Life Cycle Building Information Management. Asset information will be included in a Building Information Model. BIM forms the foundation for the development of the Digital Twin and enables the Port of Rotterdam and the chain partners to exchange information in the same ‘language’.

This will lead to a reduction in failure costs in the chain, better decisions and better design and construction processes. For the implementation of BIM, the Port of Rotterdam is adopting standards that are available both nationally and internationally. In those areas in which standards have not yet been developed, the Port of Rotterdam Authority is initiating them. For example, the Port of Rotterdam Authority has developed an Object Type Library (OTL) for Maritime Infrastructure. This OTL is the basis for the Information Delivery Specification (IDS) that the Port of Rotterdam Authority has developed in collaboration with leading consultancy firms in the maritime infrastructure. The next step in the development of BIM is to contribute to the development of a BIM standard within the Maritime Navigation Commission of PIANC (MarCom).

![Fig. 2: Information management, risk-based and data-driven decisions using real-time quay wall data](image)

4.1.2 Sustainable Port Development and Sustainable Infrastructure

The Port of Rotterdam Authority is committed to combatting climate change and wants to play a leading role in the global energy transition. The reduction of CO₂ emissions and efficient use of raw and residual materials are important tasks for the Port of Rotterdam Authority. We have committed ourselves to
reducing the port’s CO₂ emissions by 49% in 2030 as compared to 1990 and to the ultimate target of achieving zero carbon footprint by 2050.

We are working towards achieving a carbon-neutral and circular port area in three steps. Steps one to three are: efficiency & infrastructure, transitioning to a new energy system and transitioning to a new raw materials and fuel system. An example of the sustainable port development is the realisation of shore power.

In addition to the sustainable spatial planning of the port, a new port infrastructure is being designed, constructed, and maintained with a focus on sustainable methods. The current focus is on achieving carbon neutrality for the construction of assets such as quay walls, roads, and maintenance dredging activities. In an early stage of development, carbon footprint reduction opportunities are being identified and included in the process.

Fig. 3: Carbon footprint of a quay wall

The main contributions are: the use of renewable fuels in maintenance dredging contracts and long-term maintenance contracts for roads, the use of sustainable criteria in the tendering process for large quay walls and the implementation of sustainable requirements in construction contracts. The software tool Dubocalc is also being used to quantify and monitor the CO₂ and to make an Environmental Cost Indicator footprint (known in Dutch as a ‘Milieukostenindicator’ or MKI).

The active search for design optimisations, challenging standards and guidelines and search for and research into new products will lead to the reduction of the CO₂ footprint for the assets quay walls and roads. In the years ahead, the Port of Rotterdam Authority will also assess other assets (such as jetties and slopes) to determine how they can be designed and constructed more sustainably.

4.1.3 Innovation in the Port of Rotterdam

The Rotterdam port district can facilitate the largest vessels in the world. Some of the berths, however, were constructed during the final decades of the previous century. The Port of Rotterdam intends to deepen these berths to ensure the nautical accessibility of the next generation of ships at existing terminals. To do this, the Port of Rotterdam Authority initiated an innovation programme entitled ‘Infra Innovation’ to improve the performance and durability of the port infrastructure.
In this innovation programme, the Port of Rotterdam divisions Harbour Master, Asset Management and Port Development are working jointly on scientific and practical research projects with the goal of achieving lower costs over the lifetime of the port assets, more cargo per berth and lower emissions. The projects are diverse: ranging from scientific to practical research, but always with a strong civil-engineering character.

Data-driven research is of the utmost importance to support maintenance of design guidelines and to validate new methods. Together with the industry, the Port of Rotterdam Authority is contributing to the new Eurocode and is pleased that specific reliability classes have been implemented in the latest version of this code.

Below, we highlight some other recent projects that are contributing to achieving this ambition:

**Project 1 – Preventing Corrosion Using ‘Impressed Current’ (Overall Engineering)**

Without cathodic protection, a submerged steel soil-retaining wall will gradually show some corrosion. For this reason, the new steel quay walls will generally be subject to an impressed current to prevent degradation of the steel retaining wall itself. At the HES Hartel Tank Terminal in the Port of Rotterdam, over 2 km of steel quay wall are currently being protected using this method, which is more sustainable and ‘smarter’ than conventional anodes. Click here to watch a video about corrosion prevention in quay walls.

**Project 2 – Full-Scale Field Test Foundation Piles (Soil Structure)**

In 2017, the pile base factors ($\alpha_p$) of foundation piles were reduced by 30%. This led to an increase in construction costs and has had a negative influence on the carbon footprint of marine structures, while no damage was recorded in practise. In 2020, the Port of Rotterdam Authority tested 11 new foundation piles until failure. The results of this static load testing programme have provided us with new insights into the actual bearing capacity of these foundation piles. The precast concrete piles and vibro piles seem to have a much higher capacity compared to the existing design code. In this research, a new method was developed to design new foundation piles and to assess existing foundation piles, which was used to optimise the design of future quay wall projects. Using the results, it seems possible to achieve a higher reliability level with less materials. In total, approximately 3.3 kt CO$_2$ can be saved per kilometre of quay wall. The results will be published and presented at a future PIANC conference.

**Project 3 – Field Test Water Injection Dredging (Ship Bottom)**

The Port of Rotterdam Authority is examining whether it would be realistic to expand its new maintenance dredging programme in Rotterdam with Water Injection Dredging. This study fits within the Port Authority’s PRISMA research programme, which is looking into new dredging methods and at how sediment reacts to these techniques. The purpose of PRISMA is to improve the efficiency of dredging.
in the port area and to reduce the associated carbon emissions. Click here to watch a video about a WID trial conducted in the Port of Rotterdam.

**Project 4 Smart Bollard (Ship Shore)**

The Rotterdam Smart Bollard (RSB300) is a smart bollard which has been developed in a partnership between Straatman B.V. and Port of Rotterdam as part of the I2 innovation programme. The Smart Bollard is a new type of bollard which has the same functions as the existing standard bollard, AND can also measure the forces of moored ships on the bollards.

The Smart Bolder is an essential step in the realisation of a Digital Twin of the port and an important link in communication with a moored (autonomous) ship. The Smart Bollard can measure forces on a bollard, which are then communicated to the Port of Rotterdam, providing real-time insight into the degree of safety of moored ships. In addition, the Smart Bolder is used for research. Long-term measurements are expected to show that forces predicted in computer simulations are too conservative, and therefore (at certain locations) admission of larger ships is expected to be possible.

![Smart Bollard on location at ECT Europahaven](image)

A slightly scaled Smart Bollard (the RSB120) has been subject to a tensile test and has been installed on location at ECT Europahaven. The test results have demonstrated the durability and operation of the Smart Bollard, thus making the Smart Bolder suitable for wider use.

**4.2 Upgrade Your Knowledge**

Would you like to be informed about the developments in the port? Check out our online magazine Rotterdam Port Magazine. Subscribe to our newsletter here or get inspired by our white papers, podcasts, reports and expert videos or follow our social media posts.


[https://www.linkedin.com/company/port-of-rotterdam/](https://www.linkedin.com/company/port-of-rotterdam/)

[@PortOfRotterdam](https://twitter.com/PortOfRotterdam)
Trelleborg, a world leader in the design and manufacture of high-performance end-to-end marine, port and built infrastructure solutions, has made great strides within the industry throughout 2020, despite the pandemic unfolding around the world. Trelleborg was able to seize new opportunities and thrive, successfully navigating all challenges as a strong global team. The business has explored new and innovative ways to engage with its audience, all while ensuring customer and staff safety was at the forefront of all projects and operations. Trelleborg has demonstrated its innovative problem-solving skills by continuing to source creative solutions through continuous team collaboration, enabling them to remotely support its customer base across the globe. In the face of adversity, Trelleborg has shown the strength, passion and ingenuity of its integral team and heads into 2021 with energy and ardour.

5.1 Delivering Support to Our Customers in the Face of New Challenges

Throughout 2020, Trelleborg provided continued support to its customers and partners remotely, helping to minimise distribution and maintain consistent business operations in the face of adversity. Factory Acceptance Tests were introduced and performed via video for the first time ever in 2020, allowing for greater accessibility. It was immensely successful in generating live support to as many as 14 remote attendees.

Additionally, Trelleborg completed many remote commissioning projects throughout the year. One of which was for Long Son Petrochemicals Co., Ltd. in order to inspect the quality and installation of its Super Cone fender systems in August 2020. Long Son Petrochemicals Co., Ltd. was greatly satisfied with the remote commissioning, which saw Trelleborg and agent, Active Solution Co., Ltd. assess the installation remotely and provide a comprehensive installation report. Trelleborg also provided remote commissioning to China Harbour Engineering and Pan Mediterranean Engineering Co. for the performance testing of its MV900 Fenders, which consequently saw independent third party SGS produce a performance report.
Remote assistance was also provided to reduce shutdown time at equipment upgrade project located at the world’s largest iron ore export port in region of Western Australia. Prior to installation, Trelleborg ensured that site Acceptance Documentation was extensively rewritten, pressure points were identified and mitigated with visual how-to guides and a detailed pre -works briefing took place. The overall installation was a great success and showcased that in the face of adversity, Trelleborg was still able to deliver reliable, safe and efficient site services even if done so remotely.

Despite the impact of the pandemic, throughout 2020, Trelleborg continued to provide its customers with its industry leading on-site service and maintenance offering, in-line with the required restrictions and safety measures to guarantee both employees and customer safety and well-being. The importance of ensuring frequent and thorough servicing and maintenance checks of docking and mooring equipment to industry standards in particular is of paramount importance.

Neglecting these key considerations can result in serious consequences including increased un-planned downtime that can have a knock-on effect on vessel through-put and revenue, long and short-term impacts on operational costs, impact on the design life of berthing products, potential injury, which can be fatal in some instances.

5.2 Best Practice and Knowledge Sharing Through Webinars

A new adaption of virtual connection has allowed Trelleborg to connect with customers and prospects by bringing our technical seminar online via informative Smarter Approach technical webinars; a two-part Smarter Approach Webinar series in Sydney, and a three-part Smarter Approach Webinar series in the United States.

The Sydney series was designed to equip delegates with the knowledge they need to adopt a Smarter Approach to marine fenders as well as docking and mooring equipment to facilitate efficiencies across the port environment.

Part one of the series, presented by General Manager of Marine Fenders – Australia, James Curl, provided technical design insight on fender berthing energy and testing performance factors, fender composition and potential causes for failure in performance. While part two saw James discuss fender specification, quality control and testing. In addition, the webinar saw Regional Sales Manager of Docking & Mooring – Australia, Paul Weston, discuss Trelleborg’s Smarter Approach to docking and mooring and the benefits of utilising smart technologies to reduce maintenance costs and improve safety.

The three-part online seminar in the United States was hosted for close to 60 Moffatt & Nichol engineers and consultants. It was designed to arm attendees with experience-based knowledge and the session highlighted the key considerations when it comes to fender specification, selection and design, as well as the importance of testing and how Trelleborg’s interactive online tools can support port owners in their fender selection. This allows them to create a ready-to-use specification for the entire fender system.
Trelleborg’s second webinar in the United States series, which was presented by the Regional Sales Manager for Docking & Mooring – America, Paulo Carmesini, covered everything from the key fundamentals of mooring system design, through to conventional mooring systems such as quick release hooks and central monitoring systems. The webinar further discussed how ports are using automation to extend their window of operationality with automated mooring systems such as Trelleborg’s AutoMoor and DynaMoor.

The final webinar in the three-part series saw Senior Technical Sales Manager of Oil & Gas Transfer, Steve Ward join Paulo Carmesini to provide attendees with an in-depth overview that covered a number of Trelleborg’s Marine Technology solutions. This included the Docking Aid System which assists in vessel approach and docking management; the Environmental Monitoring System which allows multi-user access to environmental and MetOcean data on the vessel during approach and whilst moored at the berth; and SafePilot which utilises state-of-the-art software and smart technology to help pilots and ports optimise safety and efficiency in their day-to-day operations. Additionally, this also covered Trelleborg’s Ship-Shore Links which help to ensure safe and efficient oil and gas transfer operations.

5.3 **Enhanced Fender Online Tools with On-The-Go and Multilingual Functionality**

Trelleborg continues to take a customer centric approach and in 2020 introduced new features to its fender online tools to significantly ease and improve operability and widen usability across the globe.

To ensure best-in-class, compliant solutions, the tools were developed in accordance with PIANC guidelines, British Standards, as well as American (ASTM) standard. The online tools, which help to simplify the fender selection process, can be used on handheld devices including smartphones, iPads and tablets. In addition to English, they now have Spanish and Russian language functionality and are available in iOS and Android app stores. Users can save projects and edit at a later date, a significant addition, which will support mobile and tablet users in engaging with the application remotely. Trelleborg’s online fender tools are extremely valuable for port owners and specifiers as they enable consultation with its dedicated team of experts and also showcases the fender solutions that are available to meet their required berthing energy specifications when in situ, significantly reducing hours of manual fender selection calculations to just a few clicks.

5.3.1 **Notable Contracts**

5.3.1.1 **Marine Fenders**

Trelleborg completed the supply of its twin parallel motion fenders to Ferry Berth 4 at the Port of Hirtshals, Denmark, helping the port to enhance berthing operations. The project required a fender solution that would produce a low line load on the vessel’s belting and avoid contact with the vessel’s hull. A challenging range of vessel types coming into the berth all required a fender with an optimum amount of energy to be absorbed.
Trelleborg’s twin parallel motion fender system ensures that the panel remains parallel at berth to avoid contact with the vessel’s hull and ensure contact with the belting only. The panel was designed to be 3.7 metres wide in order to evenly distribute the load from the fender and – using a combination of back-to-back cone fenders – the fender system is able to use its soft rubber panel to reduce reaction force as much as possible.

5.3.1.2 Docking & Mooring

Following last year’s announcement that Trelleborg will supply its automated mooring system, AutoMoor, to the Port of Langnas in Finland, the company has now successfully completed the first factory acceptance tests of the T40 Twin Arm AutoMoor units, with the installation and commissioning program at the port’s Domestic Berth well underway.

Installation of AutoMoor is part of a modernisation program at the port, which includes a new passenger terminal and automation of some of the port’s operations. Like other ports and terminals, the Port of Langnas is looking towards automated technologies to cope with increased demand and compete effectively in today’s complex, global landscape. The second phase of the project will see the installation of six AutoMoor units at the port’s International Berth, which is its busiest berth.
In 2020, Trelleborg installed six units of its AutoMoor T40 Twin Arm at the Old City Harbour’s Berth 13 at the Port of Tallinn in Estonia to facilitate faster berthing processes and improve safety levels within the port environment. Berth 13 services large cruise ferries from Finnish shipping companies including Viking Line and Eckero Line, on the Tallinn to Helsinki route across the Gulf of Finland.

Another product that is making its debut to market is DynaMoor, a constant tension mooring line system, where Trelleborg has been awarded a contract with one of the top five energy majors for an offshore LNG project application.

A further area that Trelleborg has been developing mooring solutions is for cold climate applications such as in Canada and Russia, where there has been significant LNG project activity of late in some of the harshest environments. Some energy majors are turning towards floating rather than land-based utilities which have substantially less impact on the environment they are operating in. Trelleborg was recently awarded contracts for the supply of its Quick Release Hooks and its Mooring Load Monitoring System to two floating storage units (FSUs) that will be built in Korea and operated in the Siberian region of Russia.

5.3.1.3 Navigation & Piloting

Trelleborg recently completed the successful, remote installation of its latest technology in navigation and piloting; SafePilot Offshore. Works were part of an upgrade of the navigation and positioning systems and buoy monitoring systems for Total E&P’s floating production storage and offloading unit (FPSO), DALIA in Angola. As part of its plans to create more remote operations for its offshore assets, Total E&P required a strategic partner capable of supporting the installation, data integration, software uploading and commissioning of the equipment.

By adopting our remote operational support and digital technology, Total E&P was able to save on operational costs and lower health and safety risk due to reduced offshore personnel. The successful installation of Trelleborg’s SafePilot Offshore solution has resulted in new standardisation of equipment on board of multiple FPSO’s in the Angola area and Trelleborg has since been awarded contracts for the upgrade of additional Total E&P assets.

5.3.1.4 Water Management

Trelleborg has completed the installation of its high-performance Gina gasket sealing system at the flood barrier on an underpass on the A15 in Verlengde Zuiderparkweg, which connects the Portland district in Barendrecht with Charlois in Rotterdam, the Netherlands.

With multiple road levels and heights, the Gina gasket was purpose designed and engineered with 18 corners to fit the complex profile of the flood barrier and accommodate its exact specifications. The barrier’s vertical lifting gate closes in just 15 minutes, and the bespoke Gina gasket was installed onto
this to provide a watertight barrier to prevent flooding. The Gina gasket and Omega seal are used between the sectional elements of immersed tunnels to prevent water ingress due to external water pressure. This combination of high-water pressure seals not only allows for sealing but also for the transfer of the hydrostatic loads and movements between the tunnel ends due to soil settlement, creep of concrete, temperature effects and if required earthquakes.

5.3.2 Committing to a Sustainable Future

With the shifting global and ecological landscape, it is more important now than ever for the industry to take steps to become more conscious and sustainable in its decision making. As a result, Trelleborg has embarked on a commitment to align with and deliver on a number of the United Nations’ (UN) Sustainable Development Goals. These include building responsible supply chains, decarbonising the industry through advancing the development of ‘cleantech’, and engineering sustainability through premium product design.

This commitment has seen Trelleborg Group launch a new climate target, ‘50 by 25’, meaning that each of Trelleborg’s various business units, will reduce its CO₂ emissions by 50 percent relative to sales by 2025. This is in conjunction with a vision statement to achieve complete climate neutrality, or net zero emissions, in its own operations by the end of 2035.

In line with the UN’s goal of advancing the development of ‘cleantech’, Trelleborg’s exploration of ways to further strengthen its portfolio to provide solutions with a lower environmental impact has led to the development of SmartPort. SmartPort is a technological platform that powers the critical interface between ship and port, on land and at sea. It connects port operations, allowing operators to analyse performance and use data to improve decision making. The system integrates assets like fenders, mooring equipment, ship performance monitoring, and navigation systems, all underpinned by cloud technologies.

Trelleborg’s SmartFenders are designed to assess fender status and facilitate preventative maintenance, in order to optimise fender utilisation and extend asset life. SmartFenders allow for improved berth allocation and management as well the ability to detect and highlight unnatural events,
prevent berthing incidents and possible fender damage. These functions allow for increased fender lifespan, reducing wastage from frequent replacements, as well as lowering vessel idling time, helping to reduce carbon emissions.

Another asset in the SmartPort Portfolio is Trelleborg’s ISO19030 compliant Ship Performance Monitoring Systems (SPM) which improve operational efficiencies onboard vessels, all contributing to reduce environmental impact. Propeller Shaft Power Monitors measure the true developed power being transmitted into the water, this measurement along with fuel consumption and vessel speed monitoring can be combined within the Trelleborg Ship Performance Monitor to provide sailing efficiency outputs from multiple vessels. By actively monitoring and taking action to correct inefficiencies, the vessel can be sailed under more optimum conditions, which reduces fuel consumption and excessive exhaust emissions. The systems are capable of automatically generating the statutory reports required in multiple jurisdictions to confirm vessel emission profiles. Trelleborg’s SPM technology can create cost savings of up to 3% for vessel operators.

Met-ocean conditions such as infragravity waves can have an impact on moored vessels and the sustainability and efficiency of operations. There are significant risks associated with these waves, not only from an environmental perspective but operational, including lines snapping and vessels drifting from berth. These risks can increase rates of unplanned downtime, excessive ship movements and high mooring loads, all of which leading to lower sustainability practices and higher carbon emissions.

Trelleborg’s automated mooring solutions, AutoMoor and DynaMoor, enable the industry to better manage the challenges faced when maximising berth utilisation. One of the ways in which port owners and operators can maximise berth utilisation to allow product or passenger transfers to occur seamlessly and reduce downtime, minimizing the effects of adverse environmental and met-ocean conditions, as well as the effects on passing vessels. For a mooring system to be effective, it must take all of this into account to restrain vessel motions sufficiently, allowing a big enough window for efficient product transfer.

5.4 Partnering With and Supporting PIANC

As a longstanding advocate of PIANC’s tireless efforts in driving up standards for port and terminal infrastructure best practice, Trelleborg has sponsored and participated in various PIANC events. In 2020, Trelleborg was the Platinum sponsor of the PIANC Asia Pacific Conference 2020 held in Freemantle, Australia (1-3 December 2020), delivering the welcoming address at the plenary session.

Over the years, Trelleborg has actively participated in various PIANC Working Groups. Recently, Trelleborg stepped up its commitment with its involvement in WG 211 which aims to update PIANC’s 2002 ‘Guidelines for the Design of Fender Systems’ – marking a significant step towards industry-wide fender best practice. Trelleborg is also part of WG 210 – ‘Smart Shipping on Inland Waterways’, which is designed to facilitate the deployment of smart shipping to improve efficiency, safety and sustainability.
Additionally, Trelleborg is proud to be part of WG 231, responsible for developing clear guidelines for the selection, maintenance and testing of mooring bollards and hooks.

5.5 Moving Forward With Purpose

Though 2020 came with the challenges posed by the pandemic, Trelleborg’s global team showcased its unwavering commitment to supporting and strengthening the business offering, in addition to providing continued support to its customers to overcome the many obstacles they faced. Thus, showing a true willingness to adapt in real-time with the ever-changing pace of the world. 2020 has also seen greater ties with PIANC, forging an instrumental connection and driving up standards for port and terminal infrastructure best practice. Trelleborg looks forward to continuing its support of this important organisation throughout 2021 and beyond.

https://www.trelleborg.com/marine-and-infrastructure


@TrelleborgMI
6 SHIBATAFENDERTEAM: Keeping Close Despite the Distance in 2020

The year 2020 unquestionably affected our lives in many different aspects. With countries facing serious restrictions and in the aftermath of the global lockdown starting in March, COVID-19 disrupted many industries around the world, including the maritime industry. It was a year that challenged us to shift our approach, deal with the many uncertainties, change the way we communicate and adapt to the new normal within a very short period of time.

Amid all the uncharted territories and negative impacts of the pandemic, we at the ShibataFenderTeam Group have found new ways to keep our focus on our pioneering work and to extend our holistic and unconditional commitment to the fender industry – whether it comes to sharing our knowledge or putting it to good use in fender design and production. We have focused on the opportunities in the cooperation with our clients and agents and on innovations in application engineering, unique and customised solutions, developing new tools, and an even more targeted market approach.

We are proud of the team spirit of all our international team members at the SFT Group who kept up their hard work, commitment and flexibility throughout such a difficult year. Our company structure gave us the flexibility to quickly react to the new circumstances and we are well prepared for the future, coming out of this crisis stronger than before.

6.1 Supporting the Industry in Challenging Times

Our unconditional commitment to engineering excellence, value engineering and dedication to high-quality fender solutions remained our core values in 2020. We stood close to our clients as a reliable partner despite the travel restrictions which is why we launched our personalised online seminars as early as mid-April, being the first company to offer live and exclusive fender design content. Our teams of fender experts are customising the SFT Online Technical Seminars to the individual client’s needs and topics of interest. We cover a range of topics in 60-90-minute sessions with subsequent Q&As that provide the participants with the opportunity to discuss specific project-related questions. At the SFT Group, we consider it an important contribution to the maritime industry to share our key knowledge for an even safer environment through sustainable and high-quality fender design which is not a self-evidence in a competitive business.

Reaching out to engineers to support them with the ideal technical design for their needs is one of the key intentions of the SFT online seminar initiative. More than 100 seminars have already taken place to date – with more than 650 participants from all over the world having benefitted from this opportunity to enhance their knowledge in fender design and manufacturing. The seminars are offered in English, German, Spanish, French, Portuguese, and Dutch and are free of charge.

The seminar topics to date include: SFT Product Range | Design Energy | Panel System Design | Rubber Fender Manufacturing | Rubber Fender Testing | Installation, Operation and Maintenance.

If you are interested to arrange your customised inhouse seminar, please contact us.

6.2 Manufacturing and Curing – Advanced Perfection

In a time and age where digital transformation and innovative technologies are becoming increasingly important, certain things simply cannot be automated or replaced: the practical know-how and experience of more than five decades of accumulated knowledge in a complex industry like fender manufacturing. With our SFT White Paper Series that we launched with the first part in 2018, we continuously advocate more transparency in fender production in order to ensure quality standards that are driven by a commitment to high-performance products and a clear sense of responsibility.
In 2020, we released part three of the four-part series focusing on the different methods for manufacturing and curing, providing an unbiased view on state-of-the-art manufacturing standards. Building on the results of White Paper #1 on Compounding and #2 on Mixing, #3 on Manufacturing and Curing constitutes the third cornerstone in high-quality fender production. With a spotlight on the quality-critical parameters pressure, temperature, and time, the publication takes a close look at the optimal methods for each fender type and size and how these parameters play a decisive role in the advanced stage of fender production. Since each fender project has very unique requirements, we at SFT always look at the complete picture and are dedicated to the entire process. The series will be concluded with the final part about fender testing in 2021.

6.3 Cooperation for Innovation – SFT Meets PIANC

At the SFT Group, we take our role as a PIANC Platinum Partner very seriously to support the maritime industry with our know-how and expertise. We have been involved in several National Sections and Technical Working Groups since many years and moreover, SFT is represented in the PIANC Commissions by Anna-Lena Pahl as Chair of the Promotion Commission. The Promotion Commission has been very active in 2020, developing new approaches and material to further promote the association, its members and its core business. You can find more information in the ProCom report from Mrs Pahl.

6.3.1 PIANC Conferences 2020

PIANC APAC 2020

SFT looks back at the successful hybrid exhibition PIANC APAC 2020 that we were able to support as a silver sponsor and virtual exhibitor. In December, the maritime industry met in Fremantle, Australia, to discuss the latest developments and best practices of environmental and social sustainability in port infrastructure projects. Our representative Chris Millwood chaired the Session 11 – ‘Ports and Marine Facilities – Design – Fenders’ and Session 13 – ‘Ports and Marine Facilities – Construction’. He professionally guided the audience through these sessions of educational speeches and insights into current projects, especially the progress report of WG 211.

Despite many cancellations of important events for the maritime industry in 2020, we were very excited and relieved that PIANC ANZ decided for a hybrid event. The APAC 2020 Conference is a promising newcomer for the maritime industry since it aims to create a shared knowledge base by bringing together the major stakeholders of infrastructure projects from the Asia Pacific region. You can find more information about the APAC conference here.

YP Argentina – AADIP

We strongly support the PIANC Young Professionals, and it is always a great pleasure for us to share our experience in fender design with the young generation. Sharing knowledge within the industry and giving others the chance to benefit from one’s experience is an extremely important matter for the whole team at the ShibataFenderTeam Group.

The Asociación Argentina de Ingenieros Portuarios developed a remarkable programme for their digital congress together with PIANC Argentina. Our colleague Daniel Lacueva Oyarzabal gladly shared a part
of SFT’s expertise and insights into important processes for the material selection and production of high-quality marine fender systems during the four-day online conference.

6.3.2 Working Group 211

The PIANC Working Group report ‘Guidelines for the Design of Fender Systems’ is a well-established reference for the entire maritime industry. The Working Group consists of industry members including leading fender manufacturers and puts its focus on updating the guidelines from 2002 to meet the latest requirements – hereby ensuring an approach to fender design and testing that leaves no room for interpretation. Our colleagues Dominique Polte and Eduardo Rodero are the Working Group’s interface to SFT’s holistic approach to fender design, which is coming more and more into focus as the discourse on the upcoming guideline update proceeds.

The members of WG 211 made good progress despite only one physical meeting which took place in January 2020 in Melbourne, Australia. All other meetings were held online. Last year brought on a fruitful discussion about what is really important in judging the quality of a fender and how to get a better understanding of the fact that mere quantitative analyses might give a wrong impression. WG 211 participants finally agreed that fenders should be judged by their performance and durability and not by the ingredients used and their respective ratios. Furthermore, the group is planning to invite independent rubber experts to include further unbiased information and facts in the new guidelines.

SFT is keeping a close eye to the comprehensibility and usability of the guidelines for designers, especially if they are no fender experts. Overall, we are glad to accompany this future-oriented project that will have a significant impact on the fender industry and to be working in an international team where everyone puts in a lot of effort into documenting their concentrated expertise.

6.3.3 PIANC National Sections

SFT Spain has been a Corporate Member of ATPyC (Asociación Técnica de Puertos y Costas), the Spanish PIANC National Section since the beginning of 2019. Our local SFT representative is Alvaro Rodero, who is also a member of the Spanish Young Professionals. A new YP Committee was selected in 2020 and we congratulate everyone who is now part of the Spanish YP-Com.

Unfortunately, all face-to-face events had to be cancelled in 2020 due to the pandemic. However, ATPyC has been successfully working on three different manuals via digital meetings of the Spanish Working

As a Platinum Partner, SFT is also represented in the German National Section by Anna-Lena Pahl and Young Professional member Lukas Kaste. PIANC Germany is currently in the process of innovative developments and will launch events for the German community in the near future.

6.4 SFT in the Media

Last year, we compiled the most important SFT Group media appearances of the past years and are happy to share them with our clients. The media clippings released in August 2020 contain articles and interviews published by World Port Development, Port Strategy Magazine, and Pile Buck. The pieces feature in-depth and cutting-edge insights into fender market developments, the SFT fender design concept, information on the SFT Group’s market approach as well as our opinion on a broad spectrum of fender-related topics.

6.5 Our Projects

Fortunately, we were able to maintain a full plant utilisation of our SFT production facilities in 2020 despite the economic and logistical difficulties caused through COVID-19. Our new facility in Malaysia has been working up to its maximum capacity in compliance with local rules and governmental guidelines with the order for TUAS Singapore – the largest order for SFT this year and a kickstart for the new production facility. At our German plant, we were busy manufacturing 80nos. of large Donut Fenders for the Hail & Ghasha Project in the UAE which is the world’s largest offshore sour gas project.

We have followed our commitment and dedication to providing specialised solutions for individual projects, ports, and ships all the way through an exceptional year. Our mission is to provide our clients with fender solutions that go beyond regular customised fender systems. We are there to assist our clients with the design of a suitable solution whether the projects call for standard fender systems or require a specific made-to-order design. In 2020, our focus included expanding our application engineering and developing very specific and unique solutions including barriers, spacers, or ship separators that we put a lot of new design spirit into. We have listed some of last year’s projects below to present examples of our work in 2020:

6.5.1 SFT Ocean Cushion Fenders in Antarctica

Rothera Station, the largest British Antarctic facility, operated by the British Antarctic Survey (BAS) is located on Adelaide Island, west of the Antarctic Peninsula. The modernisation program of its wharf of around 100 million GBP was carried out in two seasons, as works could only be done between November and April.

The new wharf is now ready for the berthing of the new UK research vessel RRS Sir David Attenborough. ShibataFenderTeam supplied four Ocean Cushion Fenders (diameter 2,500 mm and length 5,000 mm) and five T Head Bollards with a capacity of 100t. Ocean Cushion Fenders are floating foam fenders supplied with a heavy-duty chain & tire net. The chain & tire net provides additional protection to the fender and makes it extremely robust for heavy-duty operation – perfect for the sheet pile walls of Rothera wharf and the harsh environments in Antarctica.

The Ocean Cushion Fenders have proven to be successful in this environment as SFT also delivered five of them for the new berth at King Edward Point Research Station on the remote Sub-Antarctic Island of South Georgia.
6.5.2 LNG Terminal Extension in Kitimat, BC, Canada

The project at the LNG Terminal Extension in Kitimat, BC, Canada included 35 nos. Double SPC 800 Systems for the MOF, 4 nos. Double SPC 1000 Systems for the RoRo berth, 4 nos. SPC 1600 Fender Systems for the LNG Terminal, and 8 nos. of Donut Fenders. The venture is a Greenfield project North of Vancouver, Canada that will be built on 400 hectares of land in the Kitimat industrial area in British Columbia, Canada. When completed, the new Canada LNG plant will consist of a natural gas receiving and LNG production facility, as well as a marine terminal with the capacity to accommodate two LNG carriers, a tugboat dock, and LNG loading lines.

The berths at the Kitimat LNG terminal will be equipped with breasting and mooring dolphins that absorb the kinetic energy of the berthing vessel and secure the bow and stern lines to shore.

6.5.3 Cone Fenders and Guidewall for Kattwykbrücke in Hamburg, Germany

SFT has successfully delivered a unique fender guidewall system to the joint venture Max Bögl/HC Hagemann/Heijmans for the Hamburg Port Authority (HPA). The system protects the newly built ‘Kattwykbrücke’ in the Port of Hamburg, being one of the largest lifting bridges in the world with 2,000 t and 287 m length. It is one of the most important infrastructure projects for the Port of Hamburg.

The entrance area of the bridge is protected by six sets of our Cone 1800 Fenders Systems on mono steel piles – each offering a notable capacity of 3,000 kNm. The heart of the system is formed by two 7-metre high and 17-metre long guidewall panels, one on each side of the bridge. Each of the guidewall systems, acting as a crash barrier, is equipped with four nos. of our Cone 2000 Fenders and offers a remarkable energy absorption capacity of over 12,000 kNm – certainly, one of the most complex fender
system designs to date. The guidewalls have been successfully installed with all efforts above and below water by the team of Taucher Knoth in the Elbe river with 4 metres of tidal range.

_SFT Cone Fender Systems and Guidewalls for the Kattwykbrücke in Hamburg, Germany_

6.5.4 **LNG Terminal Extension in Kitimat, BC, Canada**

The project at the LNG Terminal Extension in Kitimat, BC, Canada included 35nos. Double SPC 800 Systems for the MOF, 4nos. Double SPC 1000 Systems for the RoRo berth, 4nos. SPC 1600 Fender Systems for the LNG Terminal, and 8nos. of Donut Fenders. The venture is a Greenfield project North of Vancouver, Canada that will be built on 400 hectares of land in the Kitimat industrial area in British Columbia, Canada. When completed, the new Canada LNG plant will consist of a natural gas receiving and LNG production facility, as well as a marine terminal with the capacity to accommodate two LNG carriers, a tugboat dock, and LNG loading lines.

The berths at the Kitimat LNG terminal will be equipped with breasting and mooring dolphins that absorb the kinetic energy of the berthing vessel and secure the bow and stern lines to shore.

**Visit Us:**

[www.sft.group](http://www.sft.group)  [LinkedIn](http://www.linkedin.com)  [YouTube](http://www.youtube.com)
7 BOSKALIS in 2020

CREATING NEW HORIZONS

Boskalis is a leading dredging and marine expert, providing a wide range of services comprising of:

- the design, construction and maintenance of (sustainable) ports and waterways, land reclamation, coastal defence and riverbank protection
- the execution of projects and marine services for the offshore energy sector including subsea, heavy marine transport, lift and installation services
- marine geophysical and geotechnical surveys
- towage and terminal services
- marine salvage services and projects

With safety as our core value we provide all-round, tailor-made innovative and sustainable solutions for infrastructural challenges in the maritime, coastal and delta regions of the world. Realising projects in remote locations – with a heightened environmental focus – is one of our specialties.

7.1 Boskalis as Partner of PIANC

As partner of PIANC, we recognise the importance of developing new and updating existing guidelines for navigation infrastructure based on state-of-the-art knowledge and data. As such, we actively contribute in a variety of Commissions and Working Groups to share our knowledge around the design, preparation and construction processes based on port infrastructure projects executed globally.

Where possible we introduce case studies in WG's to provide tangible examples of design and construction projects that support developed guidelines. An example of such a case study is the Duqm Port Development described on the following pages showing an innovative solution to the complex construction challenges.

More information and contact details can be found on the website www.boskalis.com.

7.2 Duqm – Innovative Port Design and Construction

In 2020, Boskalis finalised the Duqm Liquid Bulk Berth project, a large-scale port development which highlighted a variety of Boskalis’ specialist activities, executed in a multidisciplinary team and using Boskalis’ full potential of applying innovative solutions.

Colossal job

The creation of a huge port complex in Oman by means of a unique polder solution

Last year, Boskalis completed the Duqm project in Oman. As far as size is concerned, this huge project is reminiscent of major port construction projects such as Maasvlakte 2 in the Netherlands, Gorgon in Australia, Khalifa Port in the UAE and Porto do Açu in Brazil. “On the Duqm Liquid Bulk Berth Project, Boskalis has set new standards in terms of both productivity and safety”, says project director Bart Pröpper. “Meeting all deadlines in a highly complex environment required maximum output from our equipment and effort from our staff. Breaking safety records at the same time made this project a huge achievement.”
In recent years, Boskalis has been involved in projects in Oman, including The Wave and Salam Yiti in the port city of Muscat. The Engineering, Procurement & Construct contract for the port construction in Duqm is part of the master plan of the Special Economic Zone Authority Duqm. This plan is aimed at port development in Oman, with the port of Muscat being adapted to accommodate cruise vessels and the port of Salalah focusing on container handling. The Duqm Liquid Bulk Berth Project involves the creation of an enormous port area that will house, among other things, a liquid bulk terminal and a refinery. “Our assignment included the construction of a large port basin and an entrance channel with a depth of 18 metres, as well as the construction of a kilometre-long quay wall and two 400-metre long jetties”, Pröpper says. “What made this work unique is that we decided, at an early stage, to start by building a temporary heavy ring dike of sand, a so-called bund. By pumping and keeping out all water we created a large, eighteen-meter-deep polder. In this construction pit we were able to build the quay wall and the two jetties”, he explains.

7.3 Construction of Ring Dyke

Operations began after an intensive design phase and extensive soil surveys. The trailing suction hopper dredgers Queen of the Netherlands and Prins der Nederlanden pumped in millions of cubic metres of sand through a floating pipeline for the construction of the ring dyke. The sand was brought in from a borrow area about twenty nautical miles offshore. The hoppers sailed three times a day from the borrow area to the connection point, where they pumped tens of thousands of cubic metres of sand through a floating pipe to the location. At the same time the hopper dredger Crestway was carrying out maintenance dredging work in the existing access channel and port basin. “We took the prevailing environmental requirements relating to turbidity into account during this operation”, says Pröpper. “We considered the needs of local fishermen in our operations and we put procedures in place to ensure that we didn’t disturb the colony of whales living in the area by having our mammal observers on the hopper dredgers.”
7.4 New Cutter Suction Dredger Helios

The new mega-cutter Helios played a major role on the project. With a total installed power of almost 24,000 kW, a pumping capacity of 15,600 kW and a maximum cutter power of 7,000 kW, the Helios is one of the most powerful cutter suction dredgers in the industry. The 152-metre long vessel was developed to operate in extremely hard ground. “The Helios started the first phase of dredging for the entrance channel to the new port area and began excavating the outer section of the port basin”, explains Pröpper. “During this first phase, we also came across a layer consisting of a tough mixture of rock and clay-like material that was difficult to dredge with the existing cutterheads. To tackle it better, our team of specialists designed new cutter heads that were built specifically for the Duqm project in a record time of five months.” Using those cutter heads, the Helios removed the majority of the 20 million cubic metres of rock and clay-like soil in the second phase of the project.

7.5 Large-Scale Excavation and Earthmoving

The dry excavation of the pit and the large-scale earthmoving were carried out under the supervision of colleagues from Boskalis Nederland involving over 80 units of dry earthmoving equipment. “The excavated soil was beneficially reused and taken to a location in the vicinity of the project site to build new port areas in the future”, says Pröpper. “For the maintenance work on cranes, excavators, bulldozers and trucks, a large workshop was set up by colleagues who know all that equipment like the back of their hand. By the time the excavation work was finished, 9.3 million cubic metres of soil was removed. It was a colossal project in every respect.”
Boskalis Nederland was also involved in the construction of a rock slope, which was covered with geotextile and rock. Some of the rock came from an existing breakwater, which forms one edge of the port area. The rock was removed from the inside of the breakwater before the sand was put in.

7.6 Compaction of Reclaimed Land

The colleagues from Boskalis subsidiary Cofra also had an important job to do. “To comply with the stringent demands for the compaction of reclaimed land, Cofra set up a special testing area to study the best possible approach to compaction”, says Pröpper. “They brought in heavy plant, including large dynamic compaction machines, to compact the land in the reclaimed areas. In the deeper sections of the landfill area we had to use the vibro flotation instead of the dynamic compaction method. Here too, Cofra played an important role by bringing in expertise on site to manage our subcontractors that executed the vibro compaction activities.”

7.7 Training

As the work progressed about 1,500 people from 25 different countries were working on the project every day, including the staff from partner Six Construct. “In addition to our colleagues from numerous disciplines at Boskalis there were a lot of local employees as well,” says Pröpper. “More than 10 % of the workforce was from Oman, and there were many operators from Pakistan and India.” In order to train the inexperienced local drivers and operators to the required standard, a simulator was installed and local trainers and interpreters were called in. Besides a large number of dry earthmoving equipment, 25 new trucks were brought from the Netherlands to Duqm. The drivers were first tested on the simulator and, with the help of the SHE-Q colleagues, trained by the superintendents to work efficiently and safely.

7.8 Safe Working Environment

“We have really gone the extra mile on this project to ensure a safe working environment for all our project staff and vessel crews. It was a major challenge for our designers, engineers and supervisors to make sure that the bund complied with the strict requirements for strength and dewatering”, explains Pröpper. “Working in such a huge building pit surrounded by water created potential risks for our staff and project and involved all sorts of safety considerations. We had a range of monitoring systems in place for the bund to ensure that it wouldn’t slip, leak or break unnoticed. You always have to keep in mind that something can go wrong and as we know from other dyke failures this can take place quite quickly. We have spent a lot of time on good rescue equipment, including ladders and rafts to get out of the pit safely in just a few minutes. In addition, the development of evacuation plans and regular drills measuring the time to get all staff out of the pit contributed to ensuring this safe working environment. Our safety awareness program NINA played a crucial role here. NINA courses and toolbox meetings were organised from the outset, and the use of Safety Hazard Observation Cards was taken very
seriously. And I am proud to say that our strong focus on safety has paid off. At the end of the project we celebrated the fantastic landmark achievement of more than six and a half million man-hours without a single lost-time incident. That is a direct result of the efforts and dedication of all project members and of our joint commitment to create a safe working environment."

7.9 Quay Wall and Jetties

In the polder, partner Six Construct constructed the enormous quay wall. The more than 5,000 large concrete blocks that were required for this operation were produced in the specifically prepared casting and laydown area on site. At the same time, impressive steel structures for the two 400-metre long jetties were built in the middle of the polder. This involved installing 330 large steel piles that were then connected to each other with steel beams and in situ poured concrete platforms and abutments.

7.10 Flooding the Polder

Many contractors and architects of monumental buildings can proudly show their work to their friends, children or grandchildren. With Boskalis' hydraulic engineering projects, the situation is usually different: dredging work and maritime infrastructure are often hidden from view below the water. The project in Duqm is no exception. Following the completion of the construction works, the polder was flooded using large siphons. As the water in the polder rose, most of the quay wall and the giant steel structures of the jetties slowly disappeared from view. The bund was removed by dry earthmoving equipment and by the small cutter suction dredger Ceres. The mega cutter Helios removed the remaining rocky material underneath the constructed sand bunds.
7.11 Extension

As an extension of the contract an area of 1,800 by 350 meters was reclaimed along the breakwater. Again the sand was brought in from sand borrow areas, this time by the mega trailing suction hopper dredger Fairway. The area was compacted and the banks were covered by rock for protection. These activities were carried out in parallel with the last section of maintenance dredging and in combination with the water injection dredger Terra Plana for the final delivery of the project. “From a technical and logistical point of view, we have achieved something very special here”, Pröpper concludes. “Perfect coordination between all different Boskalis and subcontractor disciplines was required to execute all the different tasks, without literally tripping over one another. Making sure all the different work disciplines were able to excel and at the same time stayed in tune with each other was the main challenge on this job. Thanks to our fantastic teamwork we can all be very proud that we produced a first class symphony in time and to the full satisfaction of the client.”

This article previously appeared in the Horizons magazine published by Boskalis in print and online. In the online version of the magazine a video is included about the construction of this new port complex in Duqm. Go to www.boskalis.com/magazine to watch the video and find more information.

https://www.boskalis.com/

https://www.linkedin.com/company/boskalis/

@beleefboskalis
8 PENTA-OCEAN CONSTRUCTION IN 2020

Penta-Ocean Construction Co., Ltd. will celebrate its 125th anniversary in April 2021 since its founding as Mizuno Gumi in Kure City, Hiroshima Prefecture in 1896. Our initial business in marine civil engineering works has significantly expanded to land civil engineering and building construction works. Starting with the Suez Canal Dredging Project in 1961, Penta-Ocean Construction has made a foray into overseas business, and have involved in a number of large-scale civil engineering and building construction projects based in Singapore.

The social and economic situation in Japan and overseas remains uncertain due to the prolonged infection spread of the COVID-19. We places the highest priority on thoroughly implementing measures to prevent infection, such as avoiding Three Cs (Closed spaces, Crowded places, and Close-contact settings), as well as ensuring construction safety.

Penta-Ocean practices CSR management with an emphasis on ESG as “an advanced company in work style reform and productivity improvement”, “an advanced company in D&I (Diversity & Inclusion)”, and “a company that challenges new frontiers with pioneering spirit”. As a result, we aim to be a company that can provide customers and the society with high-quality infrastructures and buildings with reliable safety and quality.

8.1 Tokyo Umi no Mori Tunnel

The Tokyo Port North-South Connecting Road, named ‘the Tokyo Umi no Mori Tunnel’ (hereinafter, the Namboku Route) is a 5.7-km four-lane road, connecting the Central Breakwater area to the Ariake area, which are areas that will serve as venues for the Tokyo Olympic and Paralympic Games. With the opening of the Namboku Route, the trunk road connecting the Central Breakwater area to the Ariake area has been double-tracked. This is expected to improve the logistics functions as well as to enable the road to serve as an access route between the athletes’ village constructed in the Harumi area and the sporting venues.
In the Namboku Route, there is an undersea tunnel (around 930 m long), composed of seven immersed tubes linked together. Three of these immersed tubes (segments 4, 5, and 6; around 400 m of the route) were fabricated and installed through a joint venture between Penta-Ocean Construction, Toyo Construction, and Nippon Steel & Sumikin Engineering. Amid the need to open the route quickly, the tunnel was completed within about four years instead of the typical eight to ten years. The speedy completion owed to extending the length of each immersed tube, filling the steel shell immersed tubes with concrete while floating them on the sea, the application of Penta-Ocean Construction’s own Key Element Method, and collaborating with the Building Construction Business Unit for the construction of the tunnel's facilities across the entire tunnel and the electrical building.

![Sinking of the element 6](image1.png) ![Concrete filling while floating](image2.png)

The self-owned patented technologies for the immersed tunnel adopted in the project are as follows.

8.1.1 **Key Element Method**

Element 6, the final element of the immersed tubes to be installed under our joint venture project, was installed using the Key Element Method, which was developed by our company. The procedure utilises the final element itself, which is a trapezoid structure, as the jointing element, eliminating the need for conventional final joint construction work and greatly shortening construction time.

The use of the Key Element Method in this project marks the fourth application of this highly reliable method, which has also been applied for the former projects such as the Yumesaki Tunnel in Osaka.

![Diagram of Key Element Method](image3.png)

8.1.2 **Expandable Rubber Gasket**

The expandable rubber gasket is a hollow structured water seal made of rubber. It can be expanded by filling it with air or mortar. Combining this with the Key Element Method can deal with measurement errors made during sinking tunnel and deformation of the outer edge due to water pressure, while providing a failsafe system for sealing water.
In this project, it was adopted for Elements 5 and 7, which were connected to Element 6.

8.1.3 Crown Seal Method

The joint part of the Namboku Route immersed tunnel was installed using the Crown Seal Method in order to ensure high earthquake resistance.

Unlike conventional ridge connection structure, the Crown Seal Joint provides a free space (gap) between joints to absorb large deformations on the joint section caused by earthquakes, greatly reducing any stress the immersed tube body is subjected to.

To prevent water leaking from the gap into the tunnel, the Crown Seal Joint not only has a multi-layered water sealing function, but it is also coupled with a secondary rubber gasket to achieve high level water seal.

8.2 Port and Site Construction Project for the Matarbari Ultra Super Critical Coal-Fired Power Plant in Bangladesh

As part of the export of high-quality infrastructure promoted by the Japanese government, Bangladesh is building its largest and the highly efficient ultra-supercritical coal-fired power plant, located in the southeastern part of the country in order to meet their increasing power demand in recent years. As a part of this project, we are dredging an access channel for navigation of the coal carriers spanning to the total length of 14 km, constructing the sediment control groins to mitigate sedimentation in the access channel and the harbour basin after dredging, as well as reclamation and site construction for the power plant including soil improvement works.

The project was started in 2017 and will be ended in 2024. Dredging has been carried out using the self-owned Cassiopeia V, one of the most modern self-propelled cutter suction dredger owned by Penta-Ocean Construction, which was completed in 2014. The sediment control groins for measures against sedimentation was completed in May of 2020.
8.3 **Challenging Offshore Wind Farm Business**

### 8.3.1 CP-8001, the First Japanese SEP, Equipped with a Large Crane

In December 2018, Penta-Ocean Construction completed the construction of CP-8001, the first Japanese multipurpose SEP vessel, an offshore installation vessel, equipped with a large fully-revolving crane, having a lifting capacity of 800t. The vessel is able to achieve high operation rate, accurate and safe crane operation even under severe meteorological and oceanographic conditions. After undergoing various trials in Japanese coastal waters and used in a marine civil engineering work, the vessel was used for the removal of a bottom-fixed offshore experimental wind power facility and a wind observation tower off the coast of Kitakyushu in October 2019. It is now playing an active role in various areas across Japan, such as surveys of undersea ground.

- Designed to install large-scale marine structures, such as 10 MW class wind turbines
Operational in deep waters (up to 50 metres)
Equipped with a latest continuous hydraulic jacking system developed by GustoMSC
Designed to automatically control the hull position via Dynamic Positioning System (DPS)
Equipped with adequate accommodation space and a helicopter deck for emergency human transport

8.3.2 Construction of the Second New SEP Vessel, Responding to the Demand for Upsizing Wind Turbines

Penta-Ocean Construction is currently constructing the second multi-purpose SEP vessel equipped with a 1,600-t lifting capacity crane, to respond to the trend toward larger offshore wind turbines and their foundations.

This is being constructed by Singapore-based PaxOcean Engineering. It is slated for completion and delivery in September 2022. This vessel will be owned by PKY Marine (in which our company has a 65 % stake), jointly established by Penta-Ocean Construction, Kajima Corporation, and Yorigami Maritime Construction in February 2020.

Equipped with a fully revolving crane with a 1,600-t lifting capacity
Designed to install 10-14MW turbines and various foundations, including monopiles, jackets, etc.
Capable of transporting multiple 10-14MW class wind turbines for efficient installation
Operational in deep waters (up to 50 metres)
Designed to maintain the hull position by Dynamic Positioning System (DPS)

8.3.3 Started the R&D on Practical Application of Floating Offshore Wind Power

In collaboration with TEPCO Holdings and the University of Tokyo, we were successfully awarded by NEDO to participate in ‘Research and Development on Technologies to Lower the Cost of Floating Offshore Wind Power Generation’. The development of floating offshore wind farms is crucial in expanding offshore wind power generation in Japan. In order to achieve this, power generation costs need to be lowered. In our research, we will conduct the study on a rational and efficient construction method for spar-type floating structures capable of mounting a 10MW class wind turbine under the severe meteorological and oceanographic conditions in Japan.

https://www.penta-ocean.co.jp/english
BEKAERT IN 2020

Bekaert is a world market and technology leader in steel wire transformation and coating technologies. We are a global company with 28,000 employees worldwide, headquarters in Belgium and € 5.1 billion in combined revenue (2019).

Bekaert offers the construction industry a wide range of steel wire reinforcement solutions, strands, meshes, fences and customised products. Its Building Products division serves customers all over the world with its concrete, plaster, masonry and road reinforcement solutions. Our Dramix® steel fibres for concrete reinforcement are used in a wide range of heavy-duty pavements including industrial floors, logistics and distribution centres, container terminals and carparks since 1970.

Dramix® reinforced concrete pavements achieve the required performance with thinner concrete sections while replacing traditional reinforcement, thus saving time and reducing labour during project execution.

The Dramix® product range includes three main product lines – 3-D, 4-D, 5-D – designed to achieve the reinforcement needs of many different applications. The fibres’ bends and hooks are crucial to the fibre’s anchoring performance and subsequent concrete slab durability. These fibre design features combined with Dramix® fibres’ tensile capacity are the main differentiators of our Dramix® steel fibre concrete reinforcement portfolio.

9.1 Jobsite Highlights 2020 – Harbour Projects

Year 2020 has been very challenging all over the world. Concerns over public health have had a major impact on the way we live and work and the contact we can have with each other. Still, the strong collaboration between Bekaert and its customers has made it possible to execute many jobsites according to their original schedule.

9.1.1 Quay Walls Rotterdam, The Netherlands

Dramix® reinforced concrete has been used to fill up the space between the precast elements in the original walls and the sheet piles to increase the structure’s resistance against impacts thus reducing maintenance needs and extending its durability.
To define the optimal design for the project, Delta Concrete Consult b.v. (www.deltaconcreteconsult.nl) carried out a first simulation followed by ‘mock up tests’ conducted by Vitruvius Building Solutions (www.materiaalkunde.com) to simulate the design’s performance under real conditions. Bekaert took part in the casting process of over 45 beams used for EN 14651 and DAfStb tests.

The results achieved in this first project have later led the operating entity in the port of Rotterdam to choose Dramix® for a similar project to reinforce the precast elements as well as the concrete filling the gap between such elements and the existing wall using a combination of Bekaert steel fibres with two different lengths.

After seeing the results of using Dramix® steel fibres to increase impact resistance and noticing their advantages relative to alternative reinforcement methods, the port of Rotterdam has decided to use the same solution in all similar future projects.
9.1.2 Katoen Natie Antwerp, Belgium

Katoen Natie is an international logistics service provider and port operator. The company has recently built a new distribution centre in Antwerp, Belgium.

Bekaert has been deeply involved in the design of the floor solution and has provided the steel fibres to reinforce the floor of the new distribution centre. More than 200,000 m$^2$ of concrete have been reinforced with Dramix® steel fibres between 2019 and 2020.

The solution consists of a floor-on-piles combining a 26-cm thick concrete slab with a 3 m x 3 m pile grid. The slab combines two reinforcement technologies: 34 kg/m$^3$ of Dramix® 4D 65/60BG and a top mesh 100-8.

This configuration makes it possible to cast a seamless floor that meets the highest serviceability and durability requirements thus lengthening its service life and reducing total costs of ownership for Katoen Natie.
The seamless configuration eliminates saw-cut and expansion joints, no matter how large the surface. The client has chosen this solution to avoid the risk of interference between the wire guiding system for the forklifts and the steel joints present in other configurations.

9.1.3 All Weather Terminal Ghent, Belgium

This terminal is ArcelorMittal’s first-ever roofed loading bay and warehouse; these facilities will be mainly used to store and ship finished steel coils.

The ‘AWT’ warehouse is 240 x 60 metres and has the capacity to store up to 60,000 tonnes of products. The warehouse will be equipped with three fully automated travelling cranes for unloading, sorting and loading goods.

The roofed quay wall is 200 metres long and the dock is 25 metres wide. The roof rises 27 metres above the water level and it allows ships with a tonnage up to 10,000 tonnes to dock at the new quay protected from weather conditions.

The solution for the floor consists of a 29-cm thick slab-on-piles reinforced with a combined solution including 30 kg/m³ Dramix® 4D 65/60BG, a top mesh 100-8 and a bottom mesh 150-8.

This configuration creates a joint-free floor that minimizes the risk of joint-related cracks even under intensive usage thus reducing maintenance and repair costs and boosting the terminal’s productivity.
9.2 Upcoming Harbour Projects

Bekaert is actually involved in several container terminal projects around the world.

The usage of steel fibers, as indicated in Pianc report 165, makes it possible to increase the spacing between joints and reduce floor thicknesses.

Dramix® 4-D range with increased tensile strength and improved end hooks is the ideal solution to reinforce heavy-duty pavements in harbours. Engineered to prevent small cracks, Dramix® 4-D fibres significantly contribute to long-lasting surfaces that can withstand continuous exposure to weather, seawater and chemical products.

High impact resistance results in a surface free of spalling effects. It improves the safety and efficiency of operations and prevents damage to rolling machinery and containers. Dramix® steel fibres are easy to work with and require less time and labour to be installed relative to traditional reinforcement solutions.

9.3 Online Activities 2020

9.3.1 Webinars

Every year Bekaert organises dozens of seminars and participates at several events around the world promoting the modernisation of the construction market and offering its support to engineers.

In 2020, health considerations and mobility restrictions have led us to conduct a higher number of webinars and online meetings to continue communicating and sharing our expertise with our customers and prospects. Some of the most relevant webinars are still freely available online:

- Design of Industrial Concrete Floors – International Guidelines, Their Application and Relevance in the Middle East (June 2020)
- Steel Fibre Reinforced Concrete in the UK – Session 1: Basic Principles and Best Practices (September 2020)
- Steel fibre reinforced concrete in the UK – Session 2: Design principles (September 2020)
- Steel Fibre Reinforced Concrete in the USA – Session 1: An Introduction (November 2020)
- Steel Fibre Reinforced Concrete in the USA – Session 2: Technical Aspects of Designing & Specifying with Dramix® SFRC (December 2020)
- Steel Fibre Reinforced Concrete in the USA – Session 3: Jointless Floors (January 2021)
- Steel Fibre Reinforced Concrete in the USA – Session 4: Dramix® Steel Fibres vs. Other reinforcement options (February 2021)

The USA webinars can be found on the following link to Bekaert Construction’s LinkedIn page: https://www.linkedin.com/feed/update/urn:li:activity:6767458105191079937/

For links to other webinars, please go to: https://www.linkedin.com/showcase/bekaert-construction/posts/?feedView=all

9.4 Social Media

In 2020, we have been very active in social media with more than 100 posts generating over 7,000,000 impressions and more than 1,000,000 views on our videos. Bekaert Construction videos include an ‘FAQ series’ addressing the most frequently asked questions about steel fibre reinforcement and Dramix® as well as the popular ‘Expert Talk’ series of interviews where our experts explain several topics of interest.

In one of the most recent videos, for example, we present the advantages of steel fibre reinforcement vs. traditional reinforcement. As clearly explained on the video, there are very significant differences in terms of load capacity and maintenance requirements, which are crucial elements when designing heavy-duty port pavements.

https://www.linkedin.com/posts/bekaert-construction_dramix-steelfiber-concrete-activity-6757552934591967233-qbcD

To learn more about how Dramix® can help you in your next project, please visit our website (www.bekaert.com) and Bekaert Construction’s page on LinkedIn: Bekaert Construction: Overview | LinkedIn.

https://www.bekaert.com/

https://www.linkedin.com/showcase/bekaert-construction/