DREDGING AND MARINE WORKS

Jan De Nul Group
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Architect: Dr. Ir. Philippe Samyn - Lierman & Lierman

Office Jan De Nul NV - Aalst (Belgium)
Jan De Nul Group is a world player for Civil Engineering, Dredging and Marine-related and Environmental Projects. Both in the design and execution phase the key activities are executed by the company’s in-house engineers using our own equipment. By combining such diverse activities Jan De Nul Group can offer an overall package and execute large-scale projects from start to finish.

Next to our technical expertise, the financial strength of Jan De Nul Group is also a major asset.

Jan De Nul, as a company, was established in 1938 as a Civil Engineering Construction Company and thanks to the pioneering entrepreneurial spirit of the De Nul family the first dredging project on its own account was executed in 1951. Since then, the Company started to focus on this market segment and was soon awarded its first international dredging project. Today, Jan De Nul Group ranks at the top of the international dredging industry and with its forward rolling expansion policy with respect to its new dredging fleet capacity, is unequalled.

Jan De Nul Group executes dredging, reclamation and marine-related works, of any kind, size or nature, including:

- Capital dredging and maintenance works in ports, harbours, rivers, etc;
- Reclamation of ports and industrial areas;
- Rock dredging in open sea conditions;
- Dredging of shore approaches and trenches for offshore pipelines and outfalls;
- Sand wave dredging in open sea (pre-sweeping);
- Pipeline stabilization and protection by rock dumping;
- Coastal defence by means of beach replenishment;
- Oil recovery and cleansing operations;
- Dredging, treatment and disposal of contaminated soils;
- Specialized alternative dredging methods to reduce or avoid the environmental impact of marine-related works.
- Salvage and heavy lifting.

More information is to be found on www.jandenul.com
2 DREDGING AND MARINE WORKS

A comprehensive updated list of reference projects, classified per activity will be found on www.jandenul.com

2.1 CAPITAL DREDGING AND PORT EXTENSION WORKS

Capital Dredging and Port Extension Works entail the creation of new or the deepening, widening or enlarging of existing access channels, swinging basins and harbour docks.

Capital dredging and port extension works are of great economic significance as a result of the expansion of world trade which requires and/or forces all ports to increase their capacity. Either existing harbour basins and access channels are deepened or completely new harbours are created to receive larger commercial vessels. Most new harbours are developed in order to meet the ever increasing demand for raw materials and the expanding world trade. For primary raw materials such as coal, iron ore and other basic metals and for the oil and gas trade new specialised harbours are now built all over the world.

- In Australia, Jan De Nul Group is expanding what is now already the country’s largest iron ore exporting harbour in Port Hedland. The export capacity has to be doubled in 2 years time requiring a huge deepening of the existing harbour area.

- In New Caledonia the construction was started of a completely new harbour for specifically one product, namely nickel. This harbour will accommodate 8% of the world’s demand for nickel.

- In Belgium, the Western Scheldt was deepened to improve the access to the Port of Antwerp for the ever increasing size of container ships.
Pilbara Iron Ore Infrastructure Project - Port Hedland (Australia)
Dredging works and land reclamation - Cutter Suction Dredger Leonardo da Vinci
CAPITAL DREDGING AND PORT EXTENSION WORKS
2.2 MAINTENANCE DREDGING

Maintenance Dredging consists of the removal of sedimentation to maintain the required depth of waterways, channels and ports.

Maintenance dredging works are the most traditional dredging projects and because of that are no doubt also the least conspicuous branch of Jan De Nul’s dredging activities. However, this type of works did eventually lead to the development of the trailing suction hopper dredger and is of vital importance to harbours. Not only in Belgium, but also worldwide, large-scale maintenance contracts are put out to tender. Jan De Nul Group has a very diverse fleet of modern trailing suction hopper dredgers, enabling it to execute maintenance dredging projects even in fairly shallow waters. The largest project so far undertaken is undoubtedly the maintenance of the Río Paraná in Argentina, where Jan De Nul Group is maintaining the river over a length of 800 km.

- The ongoing 18-year capital and maintenance dredging contract for the ‘Río Paraná’ and ‘Río de la Plata’ in Argentina, increases the navigability of the river so as to provide improved communications and trade opportunities for Argentina’s inland river conurbations. This project extends over approximately 800 kilometres from the entrance of the Port of Santa Fe on the ‘Río Paraná’ up to ‘Punta Indio’, km 240 on the ‘Río de la Plata’.

- In the Port of Hamburg, maintenance dredging works has to be executed at regular intervals as sedimentation from the river Elbe would otherwise silt up the port. Part of the dredged material is dumped in the North Sea as the storage capacity for dredged spoil in the port of Hamburg is limited. Such maintenance works are executed using large trailing suction hopper dredgers.

- To ensure good access to the Port of Antwerp, two to three trailing suction hopper dredgers are continuously dredging the Scheldt. The current contract with a concession period of 7 years also provides for the deepening of the Western Scheldt and the Sea Scheldt. The Scheldt is an extremely busy river, which together with the alternating currents makes this dredging project an extremely challenging one. Every year, about 10 million m³ of sand and sludge is dredged and re-dumped in places where the river is eroding. Occasionally, dredge spoil is also reclaimed onshore.

- Also in the North Sea navigation channels are maintained at their proper depth by Jan De Nul Group. These dredging works maintain the depth of both the navigation channel in open sea to the Scheldt and that to the ports of Zeebrugge and Ostend. Also dredging in the Zeebrugge and Ostend ports is carried out. The dredge spoil mainly consists of sludge and is dumped into dumping sites in the North Sea.
Coastal Ports Zeebrugge and Ostend - Belgium

Western Scheldt - Belgium
2.3 LAND RECLAMATION

Land Reclamation involves the creation of land over water by utilising sand dredged from the sea for coastal protection and/or to create areas for residential, recreational or industrial purposes. A subcategory of land reclamation is beach replenishment, where sand is placed on existing beaches to prevent or fight erosion.

Land reclamation projects are no doubt Jan De Nul’s most striking activity. Located at the coast of Dubai, for instance, huge amounts of sand have been reclaimed since 2002 for the construction of Palm Island II (Jebel Ali) and the Waterfront Project. To realise the Palm Jebel Ali Island and Waterfront projects, in all about 500 million m³ of sand has been reclaimed. This equates to a row of trucks encircling the earth about 22 times. Elsewhere in the world Jan De Nul Group has executed land reclamation projects, for example in Ras Laffan (Qatar), Soyo LNG (Angola), Pulau Ubin and Pulau Tekong (Singapore), Sfax (Tunisia), Saadiyat Island (Abu Dhabi) and Manifa (Saudi Arabia).

- Palm Jebel Ali Island and the Waterfront Project in Dubai. Palm Jebel Ali Island is an island in the form of a palm tree with a diameter of 4 km protected by a 17 km long breakwater. For the Waterfront Project 7 islands are reclaimed around Palm Jebel Ali. In an area of 2,300 hectare more than 300 million m³ of sand will have been reclaimed. This project, mainly executed by trailer suction hopper dredgers, will take approximately six years to complete. The first island will take 18 months to construct.

- The aptly named ‘dredging contract of the 20th century’, the reclamation works for the new international airport of Chek Lap Kok in Hong Kong. Jan De Nul Group, as a member of an international Consortium of dredging and civil engineering construction companies, successfully executed and managed this project within the agreed time limits. This Project (dredging and reclaiming of 237 million m³) was at the time the biggest reclamation project ever executed. Most of the world’s largest dredging vessels were deployed on it.

- An important beach replenishment reference is the project in Cancún, Mexico, where beaches had been fully eroded because of the damage caused by the tropical storm Wilma. For the coastal area featuring Cancún’s hotels, about 2.8 million m³ of sand was reclaimed for restoring the beach.
Palm Jebel Ali Island - Dubai (U.A.E.)
Dredging works, land reclamation and rock revetment - Trailing Suction Hopper Dredger Alexander von Humboldt
LAND RECLAMATION

Pulau Tekong - Singapore
LAND RECLAMATION

Cancún - Mexico
2.4 ROCK REVETMENT

Rock Revetment is applied to protect shores against tidal and wave actions. In land reclamation projects, first a breakwater is formed with the supplied rocks marking out the circumference of the island. Subsequently, the island itself is reclaimed with sand using various techniques. Within the scope of port infrastructure works it concerns mainly the construction of breakwaters or shore protection.

Jan De Nul Group first engaged in this activity in Singapore (construction of the islands Pulau Ubin and Pulau Tekong) and subsequently perfected its skills in Dubai (Palm Jebel Ali Island and Jebel Ali New Container Terminal). This activity has become an indispensable link in many large-scale projects. Rock revetment is also being applied in Dubai (Waterfront and New Island Development), Abu Dhabi (Saadiyat) and Saudi Arabia (Manifa). The significance of this activity is also highlighted by the investment in dry equipment and split hopper barges over the last few years.

- Palm Jebel Ali Island and the Waterfront Project in Dubai. The 17 branches of Palm Jebel Ali are each 2.5 kilometres long and are protected against the rough sea by a breakwater of 17 km long and 350 metres wide. For the 7 islands of the Waterfront Project 12 million m³ of rock will be required to protect the coastline against erosion. For both projects a total of 40 million tonnes of rock are needed. This quantity represents 2 million truckloads.

- In Singapore, a total area of 1,400 hectare will be created using sand and dumped clay for expanding the island of Tekong in order to meet the growing demand for building land. The newly formed land will increase the coastline by some 13.3 kilometres, which, in comparison, is about one fifth of the Belgian coast. To protect these new shores, 1.6 million tonnes of rock were dumped over a surface of 100 hectare, equivalent to 125 football pitches. This shore protection was applied in water depths of up to 25 m.
New Container Terminal - Dubai (U.A.E.)
Dredging works, land reclamation and rock revetment
2.5 OFFSHORE SERVICES

Specialised Services for the offshore oil and gas industries include, among others, the dredging of shore approaches for offshore pipelines including the installation of cofferdams, rock dumping and seabed levelling for the installation of pipelines, lowering of oil and gas pipelines in seabed trenches, backfilling of pipelines with stone and rock, stabilising of oilrigs through rock dumping and ballasts and the excavation of so-named ‘Glory Holes’.

The specific requirements of the offshore industry require specialised equipment and Jan De Nul Group has, but not limited to, trailing suction hopper dredgers equipped with deep dredging facilities for water depths of up to 155 m, rock cutter suction dredgers, dynamically positioned (side) stone-dumping vessels and backhoe dredgers in its fleet, for such work.

- The construction of the ‘Manifa Field Causeway and Islands’ in Saudi Arabia. This 1 billion dollar contract is one of the largest dredging contracts awarded in recent years. The project includes the design and construction of a 41 km long main causeway in open sea and associated secondary causeways that will provide vehicle and service access to 25 drilling/production islands and 2 water injection islands. The project also covers the design and construction of bridges, berths, roll-on/roll-off facilities and the removal of existing under-water pipelines. In all, more than 10 million tonnes of rock is excavated from the desert to protect the reclaimed islands against storms – protection which will last for 100 years. Jan De Nul is responsible for both the design and the construction (EPC) of this project.

- Jan De Nul Group also brought an extremely complex dredging project to a successful close: the so-named ‘Glory Holes’ in Canada. These works were executed in the Atlantic Ocean, about 350 km east of Newfoundland, at a dredging depth of over 130 m in stiff clay with boulders. The project’s purpose was to protect the underwater drilling installations against the scouring of icebergs over the seabed.

- One of Jan De Nul Group’s more striking offshore projects were the activities around the distant island of Sakhalin adjacent to the East-Siberian coast, in very heavy sea conditions. At locations about 1000 km away from the inhabited world trenches were dredged in the seabed and backfilled to protect pipelines against the scouring of ice floes over the seabed. For the landfalls at the shore cofferdams were built at temperatures down to 30° below zero in hard-frozen soil. At the end of the working season, rock revetment was constructed around the oilrigs before the sea was frozen over.
Manifa Field Causeway and Island Construction Project - Manifa (Saudi-Arabia)
Design and construction of 27 reclaimed islands, connecting roads and bridges
OFFSHORE SERVICES
Offshore Pipeline - Taiwan

Adriatic LNG - Italy

Glory Holes - Canada
2.6 PORT INFRASTRUCTURE WORKS

More and more, Port Infrastructure Works are put out to tender and awarded through all-in contracts, including design and engineering. The customer entrusts everything to the contractor. This trend was boosted in 2005 by the awarding of some of the largest dredging contracts ever to Jan De Nul Group, including the Jebel Ali New Container Terminal in Dubai and the Ras Laffan Port Expansion Project in Qatar. Thanks to its multidisciplinary approach Jan De Nul is able to combine all of its activities for this kind of large-scale project, which the company can deliver to the customer within the preset and required time frames.

- The extension of the existing LNG-port at Ras Laffan in Qatar. This 2 billion dollar contract entails the dredging of 20 million m³ of limestone, the reclamation of 25 million m³ of sand, the delivery and dumping of 18 million tonnes of rock and the production and installation of 1 million m³ of concrete blocks for the construction of breakwaters to protect the new harbour. On completion, Ras Laffan will become the world’s biggest LNG-port.

- The development of the Jebel Ali Container Terminal in Dubai. This Project consists of the deepening of the port basin (dredging of 23 million m³ of material), the dredging of a trench for the construction of a future quay wall, the construction of a breakwater using quarry stones and shore protection over a distance of 9 km (total amount of rock: 2.5 million m³), 8 million m³ of earthmoving and the construction of a 1.7 km long dynamic breakwater for the safe mooring of vessels.
2.7 SALVAGE WORKS

Early in 1995, an existing joint venture between four leading Belgian marine contractors, including Jan De Nul NV and T.V. Bergingswerken (TVB), was restructured as Scaldis Salvage & Marine Contractors NV. Scaldis provides salvage, wreck removal and marine contracting services throughout Northwest Europe and elsewhere in the world.

The Scaldis fleet includes the ocean-going heavy lift catamaran ‘Rambiz’ with a lifting capacity of 4,000 tonnes and the ‘Norma’, a floating shearlegs with a lifting capacity of 440 tonnes.

The Company’s history includes amongst others the removal of the ‘Mont Louis’, lost off Ostend in 1984, and the re-floating of the ferry ‘Herald of Free Enterprise’, which capsized off Zeebrugge in 1987. Scaldis has also been involved with major heavy lift and marine contracting works, including the new Tagus Bridge ‘Vasco da Gama’ in Portugal, which was opened for EXPO ‘98.

Scaldis brings its technical expertise to each task undertaken, thus ensuring a safe working environment and the protection of the marine environment at all times.
PORT INFRASTRUCTURE WORKS

Callao Terminal - Peru

Durban - South Africa

Port of Duqm - Oman

Callao Terminal - Peru
OTHER ACTIVITIES OF JAN DE NUL GROUP

3.1 CIVIL WORKS

Civil Engineering Works, that’s where it all started for the company of Jan De Nul and it remains an important part of its activities, which can focus on difficult and complex projects. To this end, Jan De Nul Group has set up an internal structured system offering customers an overall, tailor-made package. From design to completion, all key activities are executed by qualified engineers and by using equipment of the group, whether the project concerns buildings, water treatment plants, sewage systems and pipelines, quay walls, tunnels, bridges, roads or locks. This approach, combined with its vast technical expertise and many years of experience, ensures that Jan De Nul Group is, in Belgium, among the market leaders for civil engineering works. Thanks to its financial strength, the group also features strongly in the market of large-scale PPC-projects. This results in the construction of, amongst other large contracts, the water treatment plant Brussels North (Europe’s largest), the airport terminal in Zaventem and the concert hall in Bruges.

More information on our civil engineering activities is to be found in the Civil Works brochure
3.2 ENVIRONMENTAL WORKS

Soil and groundwater remediation, sludge treatment, environmental dredging and the processing of other specific waste substances: Envisan has experience in environmental works of all kinds. The multidisciplinary team has a wide scope of remediation methods at its disposal. Here also, Jan De Nul Group ensures an integrated approach, from design to completion, using its own equipment and even its own processing centres. Innovation and research and development are crucial to Envisan so as to offer its customers creative and competitive solutions to their individual problems. Envisan has developed into the ideal partner for complex remediation projects and for the remediation of old landfills and this is both on national and international levels.

More information on Envisan is to be found in the Environmental Works brochure.
Ever more clients are seeking an overall solution for their building plans with an integrated approach of design and execution. Jan De Nul Group recognised this trend some time ago and started setting up a fully fledged, professional engineering department. The integration of its specific expertise in both the design and execution phases creates considerable “added value” resulting in more economic and safer building projects, increase of quality and a meticulous control of any risks involved.

The engineering department of Jan De Nul Group consists of a sizable team of specialised experts, qualified engineers, designers and draftsmen and has state-of-the-art soft- and hardware at its disposal.

The expertise of the engineering department include:

- Study and the integrated design of all kinds of constructions in concrete, steel and wood;
- Geotechnical design in all its aspects;
- Drainage and dewatering of sub-structure foundation soil;
- Integrated design of marine infrastructure including wave action calculations;
- Design of large-scale earthworks, optimising and follow-up;
- Comparative study of the execution methods for all types of project.

Complex projects require thorough preparations and intensive communication. Within the engineering department a team works with the programme MX to calculate all soil quantities in 3D, this way optimising major contracts (earth moving, dredging works, roads, railroads, etc.). Both from the CAD- and MX-teams information is passed on to the 3D visualisation team, where the various phases of a project or process can be visualised.
Ras Laffan Port Expansion Project - Ras Laffan (Qatar)
Dredging, land reclamation and rock revetment works - Design of breakwaters
4.2 SURVEY

In order to be able to chart its dredging projects and large infrastructure works in an accurate manner and to follow them up promptly and efficiently, Jan De Nul Group has set up its own survey division, which include the following tasks:

- The accurate indication of the location and level (height/depth) of the work area based on topographical and hydrographical measuring methods (before, during and after the works);
- Presentation of the measuring results and calculation of dredged quantities;
- Setting up and maintaining positioning and visualisation systems on dredging vessels so that the operator can work very precisely using a digital topographical model or soil profile.

The survey division of Jan De Nul consists of a sizable team of experts and engineers deployed on various projects worldwide. In order to meet the ever stricter demands of customers, the division has state-of-the art, high-tech measuring equipment for hydrographical and topographical measurements at its disposal. The team also monitors closely all recent technological developments and tests them out in preparation for future challenges in the dredging and offshore industry.

**Executing marine-related building projects in an ecological and sustainable manner**

As worldwide environmental concerns are becoming increasingly important, Jan De Nul are constantly asked to decrease the impact of dredging works on the water column and the surrounding marine environment. Jan De Nul Group recognises both the necessity of the current strict limitations imposed on dredging and land reclamation projects and the impact of some dredging activities on the marine environment.

As an international company committed to the environment Jan De Nul Group is involved in marine-related building projects all over the world, applying strict standards concerning the disposal and diffusion of polluted substances. For these projects extensive survey techniques are applied to monitor the dredging and installation processes. This know how is used in our permanent efforts to develop operating techniques that can be even more efficient and environmentally friendlier.
Our commitment to the environment is demonstrated at 3 levels:

- Our very modern fleet of sea-going vessels and land equipment meets the strictest international environmental standards;
- Our marine environment team closely monitors environment-related issues during the various phases of a project (tender phase, mobilisation phase and implementation of the environmental policy plan);
- Envisan, a subsidiary company of Jan De Nul Group, specialises in remediation works for the treatment of historical pollution.

Environmental criteria are project-related. If required, a specific environmental management report is produced for a project. By implementing this specific environmental management and policy plan on every project, Jan De Nul aims to execute marine-related building projects in an ecological and sustainable manner.
4.3 FLEET

**Trailing suction hopper dredgers** are mostly used for dredging loose material such as sand, clay or gravel. To this end, one or two suction tubes equipped with a drag head that is trailed over the ground are lowered. Through a pump system the sand and water mixture is sucked in and stored in the ‘hopper’ or well of the vessel. Once fully loaded, the vessel sails to the unloading site where the material can be dumped through its bottom doors or be reclaimed using the ‘rainbowing’ technique. The on-site pumping of the sand using a floating pipeline is another frequently used unloading technique.

**Cutter suction dredgers** are equipped with a rotating cutter head cutting hard soil into fragments. The cut soil is then sucked in by dredge pumps. Cutter suction dredgers are mostly stationary suction dredgers that cut the soil according to a pre-set profile. The material is then pumped ashore using pumps and a floating pipeline or loaded into a split hopper barge moored alongside, which in turn can then dump the dredge spoil at the set location.

**Backhoe dredgers** are a very common type of dredging machine which is usually not self-propelled. The most important part of the machine is the hydraulic excavator dredging from a pontoon. The ‘Backacter’ is the world’s largest dredging excavator with a totally new, strongly improved excavation concept.
Jan De Nul’s dredging fleet is the most modern and most diverse in the world. The Company policy focuses on investing in new vessels and equipment and on the use of innovative and modern technology.

To be able to meet the growing demand, Jan De Nul Group continues to invest in the expansion of its fleet. The Group’s own Design and Engineering division designs new vessels in house, which are then built in various shipyards all over the world. Jan De Nul Group also delivers the required specific dredging equipment to the shipyard, which is a unique feature in the dredging industry. This dredging equipment is designed and engineered within the Company and then fabricated and assembled in the Company’s workshops in Aalst. Thanks to an investment programme of 1.8 billion Euro (covering a period up to 2011) the fleet now consisting of 42 vessels which will be expanded with another 20 new vessels.
4.4 DRY EQUIPMENT

Jan De Nul Group adheres to a policy of investment in its own equipment and, as a result, it has at its disposal a comprehensive range of modern equipment covering the whole spectrum of specialised equipment needed for realising projects in the industries it is active in.

At this moment, Jan De Nul owns more than 450 heavy machines and this number will increase year by year. At present this includes:

- Floating equipment for executing hydraulic engineering works;
- Ramming equipment: cranes, monkeys, pneumatic picks;
- Equipment for dry earthmoving works: cranes, dumpers, bulldozers;
- Building cranes: pillar cranes, cable cranes, telescopic cranes;
- Equipment for road construction: graders, road rollers;
- Topographical equipment: site positioning systems GPS, total station.

Jan De Nul Group also invests in specific equipment needed for executing one particular contract, examples of which are a bucket-wheel excavator for earth-moving works or the Starfish, an amphibious excavator that, thanks to the raised location of engine and cabin, can work in waters that are only a few metres deep. Finally, Jan De Nul Group has its own maintenance and repair workshop as well as a state-of-the-art metal processing division that can execute the most complicated turning, milling and welding works.