

Expansion of Port of Frederikshavn, phases 1 & 2

New quays, increased water depths and expanded hinterland



AARSLEFF

Port of Frederikshavn has been extended. New quay facilities with increased water depths and more hinterland were required to accommodate large ships and to allow new industrial development such as servicing the demands of the offshore industry. Per Aarsleff A/S and its sister company, VG Entreprenør A/S, constructed the first and second phases of the large port expansion in Frederikshavn.

Specialist preliminary work

We undertook major preparatory work to deliver the best solutions before starting the construction work in March 2016. Prior to that, our inhouse teams delivered geotechnical site investigations and preliminary design.

Throughout the development of solution methods, Aarsleff worked closely together with Sweco A/S. In addition, we also worked closely together with the relevant authorities prior to the execution phase.

1,000 running metres of quay and 4 kilometres of breakwater

A 600-metre-long section of the new quay was constructed as combi walls with tubular steel piles and sheet piles whereas conventional sheet piles were used for the remaining 400 metres of new quay. The two breakwater heads were also constructed as combi walls with tubular steel piles and sheet piles. The tubular steel piles have a diameter of 1.3 metres. The longest piles are 24 metres long and weigh almost 13 tons. We used a total of 3,430 tons of piles and 3,730 tons of sheet piles. As the weather condi-

tions were challenging, we installed the pipes for the breakwater heads first, and then the anchors between the pipes. Next, we installed the intermediate sheet piles, and as soon as this was done, we filled two thirds of the structure with coarse sand to secure it.

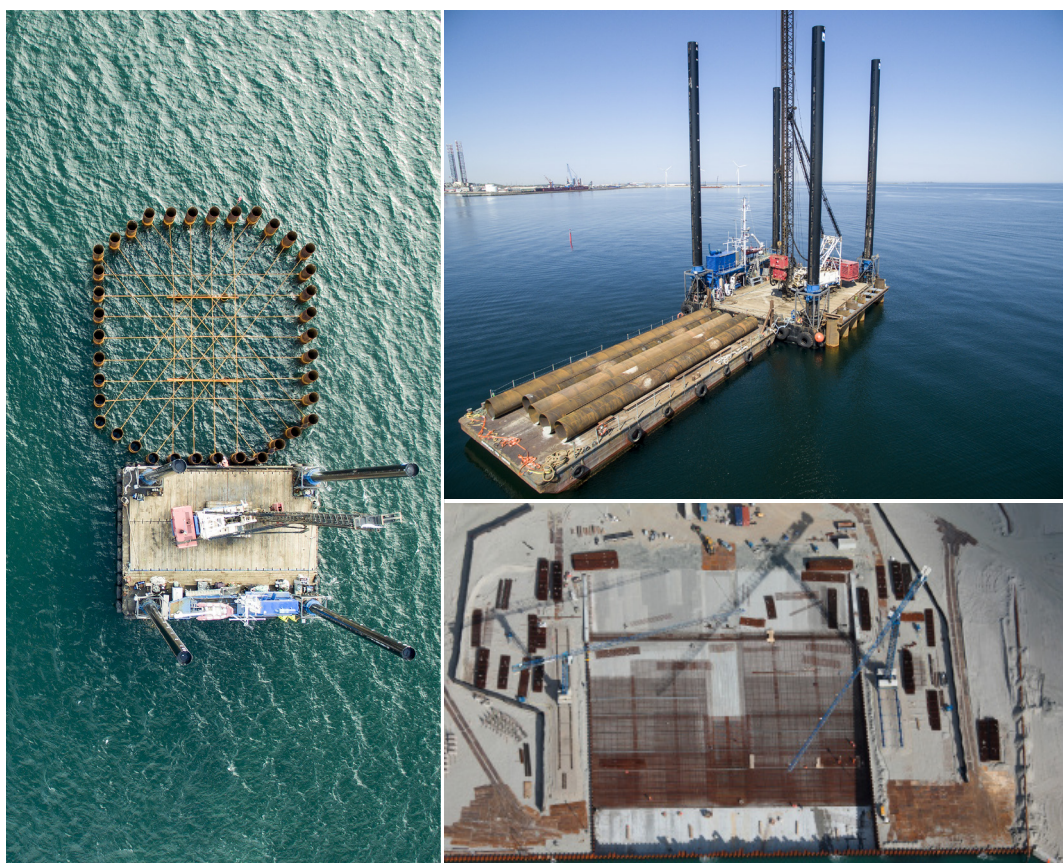
Moreover, on both breakwater heads we delivered reinforcement work for a relief beam, securing the breakwater heads against ship collision.

In just five months, 1,900 metres of the northern pier was constructed and connected to the 730-square metre-large breakwater head. In total, we constructed - including the southern breakwater - around four kilometres of breakwaters.

In addition, we delivered all technical installations, comprising illumination, power and water supply, dewatering plus a facility to handle wastewater discharged from ships.

Major expansions offshore and onshore

The new quays have a water depth of 14 metres. Onshore, we constructed 22,000 square metres of quay road with paving stone and 65,700 square metres of load-off area with crushed stone as part of the 490,000-square metre-large hinterland area. Part of the area will be used for demolition of oil rigs and other offshore structure. So large sections of the paving were installed with a dense membrane with separate drainage to comply with environmental regulations.



Data

- 490,000 m² of new hinterland
- 4 km of new breakwaters
- 900,000 tons of stone (core, filter and cover stone)
- 1.000 rm of quay
- 3.8 million m³ of dredging and backfilling of dredged materials
- 22,000 m² of paved quay road with concrete blocks
- 65,700 m² of load-off area with crushed stone
- 2,300 steel and concrete piles
- 7,160 tons of sheet piles and tubular steel piles

- 2 vertical breakwater heads
- 70,000 m² of dense membrane
- 10,000 m² of concrete ramp (90×107 metres, from level -5 to +2.5)

Client

Port of Frederikshavn

Contractor

Per Aarsleff A/S

Cooperation partners

VG Entreprenør A/S
Rohde Nielsen A/S

Type of contract

Design & Build contract

Consultant

Sweco A/S

Construction period

September 2015 to September 2019

Contract value

DKK 921 million

Contact

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