

PROJECT SHEET

SUBSEA WELL PROTECTION STRUCTURES REMOVAL

BOSKALIS ENERGY SOLUTIONS

Boskalis is a leading global dredging and marine expert. With safety as our core value we provide innovative, sustainable and all-round solutions for our clients in the energy market. Realizing projects in remote locations with a heightened environmental focus is one of our specialties. Under brands such as Boskalis, Dockwise, SMIT, Fairmount, VBMS and Smit Lamnalco we offer more services than any other company in our industry, making us your next one-stop solution provider.

We support the development, construction, maintenance and decommissioning of oil and gas import and export facilities, fixed and floating exploration and drilling facilities, pipelines and cables, and offshore wind farms.

SUBSEA WELL PROTECTION STRUCTURES REMOVAL

The production platform and subsea wells were installed in the 90's last century. Since these wells were in shallow water and close by a busy North Sea shipping route, Well Protection Structures (WPS's) were installed to secure the wellheads. After cessation of production, decommissioning activities commenced.

FEATURES

| | |
|------------|--------------------------------------|
| Location | Southern North Sea |
| Period | 2014 - 2016 |
| Contractor | Boskalis Offshore Marine Contracting |

With the abandonment of the wells completed, the remaining WPS's needed to be removed, for which Boskalis was awarded the contract.

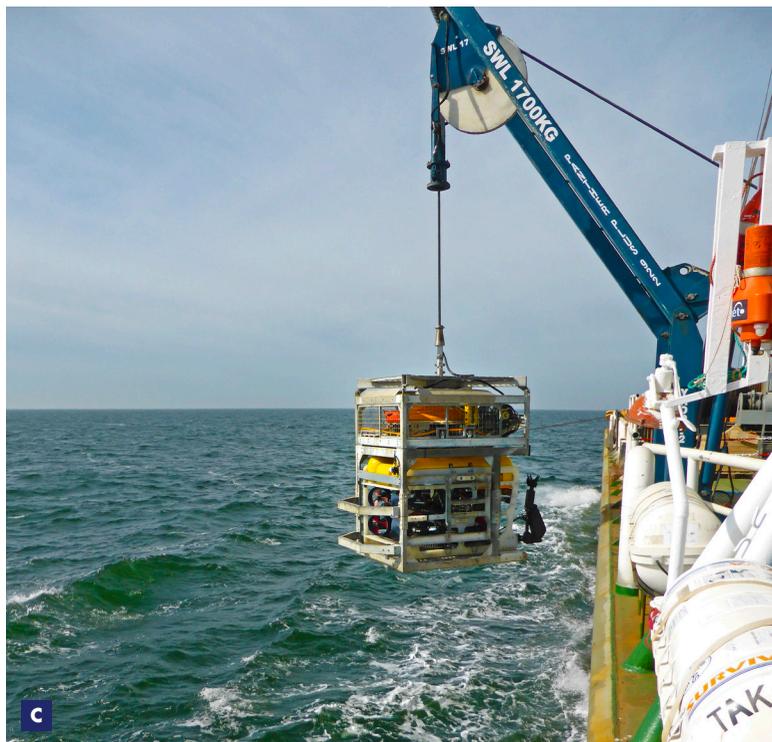
The WPS's were nearly identical in dimensions and weights, i.e. length approximately 14 m, width 14 m, height 6 m and an estimated weight of 145 t (including remaining grout, marine growth and pile friction). Each WPS was secured to the seabed with four 30-inch piles, installed through the pile sleeves that formed part of the WPS. The piles were driven into the seabed to a depth of approximately 18 m and the space between the pile sleeves and the piles (annulus) was filled with grout. During the installation process the excess grout was overflowing into the piles and it appeared that the piles were entirely filled up with grout.

The scope of work included:

- Gain access to the cutting location of the piles at 3 m below seabed
- Sever the piles internal or external
- Lift the WPS to the surface
- Transport the WPS to the dismantling yard
- Conduct various surveys to establish the as-found and as-left situation of the structure and seabed



A Taklift 4 with WPS in the hook



Boskalis decided to cut the piles internally to avoid the excessive amount of dredging (and consequent seabed disturbance) required for external cutting. Together with DECO Subsea Services Boskalis developed, built and tested a grout dredging tool to remove the grout from the piles. The tool used a combination of mechanical cutting wheels, high-pressure water jets and an airlift to disintegrate and remove the grout and soil plug inside the piles to the required depth.

Boskalis performed the works in two phases:

1. As-found survey, grout and soil plug removal
2. Cutting, lifting, transportation and as-left survey

The first phase was performed with the diving support vessel EDT Protea equipped with two light work class remotely operated vehicles (LWROV) and the purpose-built grout dredging tool. After extensive testing of the tool, which included solving some teething problems, the dredging process of the 12 piles was completed to the required level and the structures were ready for the next phase. An average of 5 m of grout and 4 m of clay was dredged in each pile to reach the cutting level.

The second phase was executed by heavy lift vessel Taklift 4 equipped with an LWROV, internal cutting spread, specific rigging and survey equipment for subsea operations. The first step in this phase was to lower the internal cutting tool from

the vessel into each pile and make the 360° cut using a mixture of very high-pressure water and an abrasive material. Once the four piles of the structure were cut the pile stubs were secured to the pile sleeves.

The next step was to connect lift rigging, all subsea activities using the LWROV, and lift the WPS to the surface. After an inspection of the WPS and the as-left survey of the seabed, the WPS was transported in the hook of the Taklift 4 to the dismantling yard and loaded onto the quayside.

PROJECT CHALLENGES

The main challenges effectively dealt with during project preparation and execution were:

- The development of a dedicated grout dredging tool.
- The workability at the site, i.e. waves and tidal currents influencing the LWROV operations.
- The location of the WPS's at a busy shipping route introducing an additional risk of collision with passing traffic when working at the site. Mitigation measures were taken.

Despite these challenges Boskalis successfully completed the WPS removal and transportation works, observing the strictest safety and environmental standards.

- B** Purpose-built grout dredging tool
- C** LWROV launched from Taklift 4

Royal Boskalis Westminster N.V.
PO Box 43
3350 AA Papendrecht
The Netherlands
T +31 78 69 69 000
F +31 78 69 69 555
royal@boskalis.com
www.boskalis.com