

PROJECT SHEET

BALEARIC SUBMARINE PIPELINE PROJECT
A GAS PIPELINE INTEGRATING THE BALEARIC ISLANDS INTO THE SPANISH GAS SYSTEM

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 Offshore, Dockwise, SMIT 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.

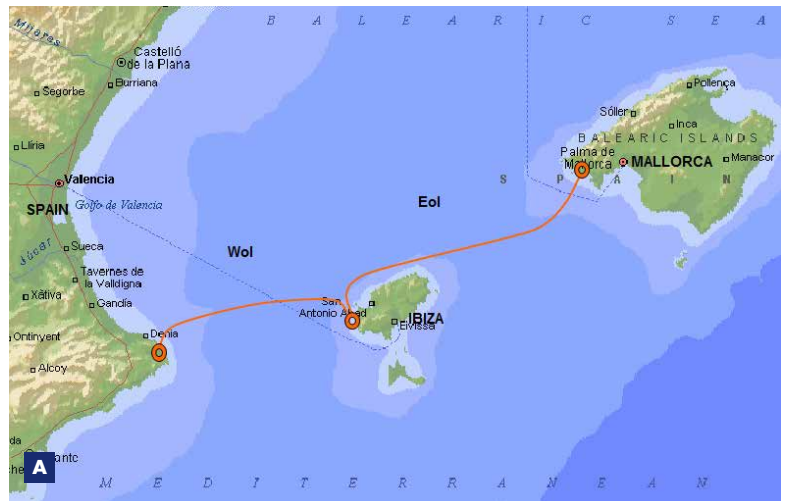
BALEARIC SUBMARINE PIPELINE PROJECT

As part of its network expansion program, Enagas undertook the installation of a submarine pipeline providing natural gas from the Spanish mainland to the Balearic Islands of Ibiza and Mallorca, integrating them into the Spanish gas system. This 20" nominal diameter pipeline was constructed in two distinct sections, one of 123 km between the mainland and Ibiza and another of 146 km between Ibiza and Mallorca.

Boskalis constructed the four landfalls of these pipeline sections at the three shore approach locations. Each shore approach posed highly different conditions: a sandy beach at Dénia, a rocky cliff at Ibiza and a shallow gravel and sandstone approach at Mallorca, the latter further complicated by space restrictions onshore.

FEATURES

Client	Enagas
Location	Playa Les Deveses, near Dénia – mainland Spain Punta de Cala Gració – island of Ibiza (dual landfall) San Juan de Dios – island of Mallorca
Period	October 2008 – March 2009
Contractor	Boskalis Sucursal en España / Boskalis Offshore
Main contractor	UTE Saipem – FCC Baleares DOS



- A** Location map
- B** Deflection sheave at Mallorca
- C** Pipe pull at Ibiza



BALEARIC SUBMARINE PIPELINE PROJECT

A GAS PIPELINE INTEGRATING THE BALEARIC ISLANDS INTO THE SPANISH GAS SYSTEM

DÉNIA LANDFALL

The landfall at Playa Les Deveses was characterized by a sandy seabed and beach and small dunes. A trench would provide protection for the pipeline along the shore approach.

A 140 m cofferdam prevented siltation of the trench in the surf zone and provided stability through the dunes. The construction methodology allowed the piling crane to stand on and work forward over the completed part of the cofferdam, which was filled with sand to allow supply of the sheetpiles from the inside. After strutting, the cofferdam was excavated and the material stored alongside the cofferdam, at the same time creating a logistical causeway.

The offshore trench was dredged by backhoe dredger (BHD) Nordic Giant. The pipeline was pulled ashore from Saipem's pipelay vessel over 1,700 m using a 500 t capacity linear winch system. Two tubular piles and a purpose designed pipe-clamp provided the winch anchoring.

The trench was backfilled by trailing suction hopper dredger (TSHD) Barent Zanen using material previously excavated from the trench and stored at a reserved storage ground. The cofferdam was backfilled and dismantled and the beach and dunes were reinstated.

IBIZA LANDFALL

At Punta de Cala Gració the shoreline consisted of a rocky cliff. To cover the height difference between the seabed and the cliff two micro tunnels had been drilled previously, into which 48" casing pipes of 150 m each had been installed.

Boskalis pulled each pipeline from the pipelay vessel through its respective tunnel onshore using a 300 t capacity linear winch system. The winch anchors were built with micro-piles drilled into the rocky substrate.

MALLORCA LANDFALL

The Mallorca landfall at San Juan de Dios featured a gravelly / rocky seabed and sandstone coastline with space onshore limited by an existing water plant and fish farm.

These restrictions prevented the linear winch to be placed in line with the pipe. Instead, a horizontal deflection sheave was used to allow the winch to be placed farther away at an angle with the pipeline. Due to an existing concrete well, even limited space was available for the sheave anchor and piling was not allowed. A sheetpile box was designed that was buried rather than piled halfway into the ground to provide the reaction force for the deflection sheave.

The offshore trench was dredged by BHD Nordic Giant and was extended onshore through the sandstone by a drum cutter attached to an excavator. The pipeline was pulled ashore from the pipelay vessel over 1,200 m using a 500 t capacity linear winch system. The winch anchor consisted of two Boskalis-developed anchor moles with a 300 t holding capacity each.

The shoreline was reinstated with geotextile, a cover of rocks and a second layer armor rock, while the trench was backfilled by TSHD Barent Zanen using material that was temporarily stored offshore.

THE ENVIRONMENT

Throughout the execution of the project, the pristine and attractive coastlines needed to be maintained. The environmental protection constraints were rigidly enforced and adhered to protecting not only the inherent beauty of the area but also the marine life. Ensuring that the tourist season was not hampered in any way as well as performing environmentally sensitive work during periods which can at best be described as not optimal for precise control proved to be challenging and demanding. Nevertheless the project was completed on time and to specification.



D



E

D TSHD Barent Zanen backfilling at Denia
E Pipe pull at Mallorca

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