

# PROJECT SHEET

## BACH HO

NEARSHORE PIPELINE SURVEY AND FREESPAN CORRECTION PROJECT

### BOSKALIS OFFSHORE: SKILLS, RESOURCES, EXPERIENCE

Boskalis Offshore brings together the offshore skills, resources and experience of Royal Boskalis Westminster. The group's offshore capabilities include seabed rectification works for pipeline/cable and platform installation, construction of pipeline shore approaches and landfalls, offshore mineral mining, offshore supply and support services and decommissioning services. Boskalis provides clients with tailored, project-specific solutions for above dredge related offshore services, as illustrated by the following project summary.

### PROJECT DESCRIPTION

The Bach Ho Gas Pipeline is located at the South Coast of Vietnam in the province of Vung Tau and comprises a 16" pipeline installed in 1994.

The 16" pipeline is one of the main production lines of Petrovietnam Gas Company (PVGAS) and important for the supply of natural gas to electrical power plants, production and export of LPG and other domestic users.

Boskalis Offshore was awarded a contract for rectification works on the 5 km shore approach section of this pipeline.

The scope of work for this project consisted of two main activities. In the first place a hydrographical multibeam survey had to be executed to determine the exact location and extent of exposed/freespanning pipeline. Secondly these locations would have to be protected by means of rock installation.

### ROCK INSTALLATION WORKS

The hydrographical multi-beam survey showed that 7 locations with a total length of 431 m exposed pipeline were found unacceptable and subsequently had to be protected. In accordance

### FEATURES

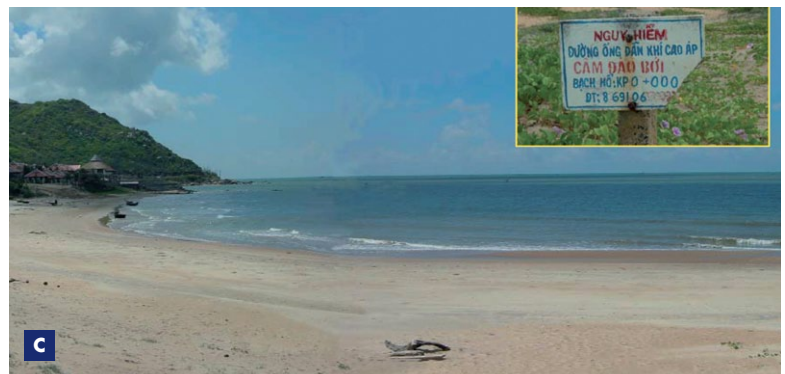
Client	Petrovietnam Gas Company (PVGAS)
Location	Vung Tau, Vietnam
Period	May - July 2004
Contractor	Boskalis Offshore
Contractor	Tideway - Boskalis JV



- A** Location map
- B** Quarry
- C** Landfall point Bach Ho Pipeline

with Client's design of the protection berm, consisting of a layer of filter rock (1 - 5") covered with armour rock (60 - 300 kg.), a total amount of 4,000 m<sup>3</sup> filter rock and 4,500 m<sup>3</sup> armour rock was required.

Prior to the installation works, this quantity and quality of rock had to be produced at the quarry and then transported to a stockpile at the nearest loading facility "Cat Lo Port". Production of 1 - 5" filter rock was relatively simple and in line with the quarry's usual production of aggregates for road and construction work. Producing the armour rock required more attention.



The rock was transported from the quarry to the stockpile at Cat Lo Port by normal size road trucks (11 m<sup>3</sup>). After stockpiling of sufficient rock at Cat Lo Port the loading of the vessel commenced. The loading was done by wheel loaders, flatbed trucks, skip and crane. There was sufficient time for loading the correct amount of rock for a specific location as the rock installation operation was tidal dependent.

The installation of the rock layers was executed with the self-propelled split hopper barge "WD Itchen". The required rock profile for the rock layers was according design specified by the Client. Firstly the layer of 1 - 5" filter rock was installed on top of the pipeline for stabilisation of the seabed and protection of the pipeline against the impact of the larger armour rock. The rock installation continued until the actual profile was conform the design requirements. After loading sufficient rock for a specific location the vessel sailed to the pipeline shore approach area. Upon arrival at location the vessel manoeuvred above the exact dump area and a cross-check was made for verification of the co-ordinates and the location. The rock was subsequently placed by opening of the split hopper while maintaining position.

### POSITIONING AND SURVEY

The outcome and success of the project depended on accurate navigation and positioning; the slightest offset in relation to the pipeline had to be avoided in order to minimise placement of rock outside the profile. A Long Range Kinematic (LKR) Thales Aquarius 5002SK reference station with LKR Aquarius 02 and CNAV receivers were used for positioning within a horizontal accuracy of 10 centimetres.

Next an interim survey was executed to verify the result of the installation. The survey data was processed on the way back to the loading facilities. At the time of arrival at Cat Lo Port the new data was compared with the previous data and calculations were made to determine the amount and type of rock for the next load. This sequence was repeated until all rock was successfully installed according to the design and accepted by the Client.

After completion of the rock installation a post-survey was executed. By processing the difference between the pre- and post-survey the exact position and profile of the installed rock could be demonstrated and made visible by plotted cross sections, bathymetric charts and longitudinal drawings.

### QUALITY ASSURANCE, HEALTH, SAFETY AND ENVIRONMENT

The works were executed at the highest levels of quality standards according to Petrovietnam Gas Company (PVGAS) requirements and monitored by Lloyds Register. The commitment to health, safety and environment resulted in completion of the works with a total of 10,000 man hours without incident or lost time accident.

The project was completed by the end of July 2004, in good time and to the Client's satisfaction.



**D** Loading of "WD Itchen"  
**E** Loading of skips  
**F** "WD Itchen" splitting