



Scheduled for completion at the end of 2015, the Sapinhoá-Lula NE project is a Subsea Umbilical, Riser and Flowline (SURF) contract awarded by Petrobras, offshore Brazil.

The project saw the deployment of four decoupled riser systems, featuring large submerged buoys supporting 27 steel catenary risers. It is the largest EPIC SURF contract awarded in Brazil to date.

To meet performance and installation requirements various innovative technologies were required. These included the deployment of Buoy Supported Risers (BSRs), a world-first, the installation of corrosion resistant alloy (CRA) mechanically lined BuBi® pipe by reel-lay and the development of a novel tethered tensioned mooring system for the BSRs.

Petrobras was awarded the Offshore Technology Conference (OTC) *2015 Distinguished Achievement Award* for successfully supporting the development of new technologies such as the Angular Connection Module (ACM), which connects flexible jumpers to pre-installed buoys.

# Petrobras Sapinhoá-Lula NE

## Project

Sapinhoá-Lula NE

## Client

Petrobras (Petroleo Brasileiro S.A.)

## Location

Santos Basin, offshore Brazil

## Water depth

Beyond 2,100m

## Project Type

SURF

## Date Awarded

March 31<sup>st</sup>, 2011

## Date Completed

End of 2015

## Vessels/Spoolbases /Facilities Utilised

*Seven Oceans, Seven Polaris, Skandi Neptune, Ubu Spoolbase*

## Industry Firsts

- Reel-lay of CRA lined SCRs
- BSR design, fabrication and installation
- ACM technology

## Overview

Sapinhoá-Lula NE is a significant discovery made by Petrobras in the Santos Basin, Brazil, in ultradeep water depths beyond 2,100m, 300km from shore.

The project scope included the engineering, procurement, installation and pre-commissioning of four decoupled riser systems featuring:

- Four submerged buoys each weighing about 2,800 tonnes were installed at 250 metres below the sea level
- 27 x associated steel catenary risers (SCRs) of 3.9km each
- 21 x associated pipeline end terminations
- 18 x 7.5-inch production lines
- 3 x 9.5-inch water injection lines
- 6 x 8-inch gas injection lines
- 27 x anchor suction piles
- 4 x monitoring systems for buoys and SCRs.

Petrobras and its partners selected this Buoy Supported Risers (BSR) system as the most effective solution for the project. In order to meet the system's performance and installation requirements, various innovative technologies were required.

These were:

- An efficient method to install corrosion resistant alloy (CRA) mechanically lined BuBi® pipe by the reel-lay installation method;
- The development of the Angular Connection Module (ACM). This unique engineering capability greatly simplified buoy hardware by minimising the number of connections and potential leak paths;
- A 400Te tension capable Riser Installation Tool (RIT), allowing for the reliable deployment of 27 SCRs;
- A state-of-the-art fracture mechanics engineering assessment for plastically strained pipe joints made of alloy 625 welds;
- A novel tethered mooring system, similar to that for Tension Leg Platforms (TLPs), but using spiral strand cables for installation simplicity and to achieve the necessary dynamic performance;
- A tether chain based tensioning system capable of withstanding top angle variations associated with the buoys natural offsets and the potential length variations of the almost two kilometres long tethers;
- A bottom connector device used to simplify connections to foundations.

The combination result of all these innovations, some incremental and resulting from existing technologies, and others entirely new and breakthrough, gave rise to the complete BSR system.

Engineering and project management work took place at Subsea 7's offices in Rio de Janeiro, Brazil. Fabrication of the rigid pipelines took place over 15 months at Ubu Pipeline Spoolbase, ES in Brazil.

SCRs were reel-laid by the *Seven Oceans* and hooked-up to the subsea buoys.

Offshore installation commenced in early 2013, using *Seven Oceans, Seven Polaris* and *Skandi Neptune* and was completed by the beginning of 2015.



Buoy being loaded in São Sebastião, São Paulo



Vessels during buoy installation



3D illustration model showing one of the buoys used on this project