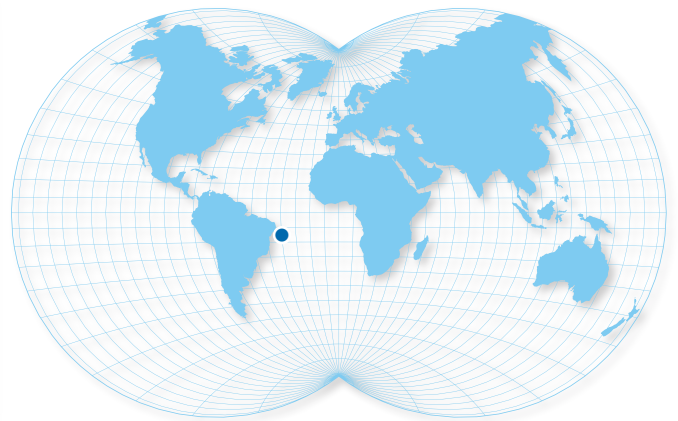


ALBACORA FIELD, BRAZIL:

FPSO Petrobras P31 Internal Permanent Turret



Scope of Work

SOFEC designed and constructed an internal permanent turret mooring system for a 283,000 dwt deepwater FPSO located in the Albacora field of the Campos Basin offshore Brazil. The FPSO is located in 330m water depth. The internal turret system is designed to accommodate 25 flexible risers arranged in a radial pattern around the turret chain table. The ten-path swivel stack includes fluid paths for production, oil import and export, gas lift, and water injection. Multi-line swivels provide hydraulic and pneumatic controls. The turret uses an eight leg symmetric catenary wire/chain mooring system.

This SOFEC internal permanent turret mooring system is ABS classed.

General Description

Client Name:	Petrobras
Contract Award:	February 1996
Installation Date:	September 1998
First Oil:	October 1998
Vessel Size:	283,000 dwt
Storage Capacity:	1,000,000 bbls

Water Depth:	330m (1,082ft)
Fabrication:	Turret - Abu Dhabi, UAE Vessel - Rio de Janeiro, Brazil Topsides - Angra Dos Reis, Brazil

Design Environmental Criteria (100-year storm)

Significant Wave Height:	7.6m (24.9 feet)
Wind Velocity:	37m/s (72 knots)
Current:	1.5m/s (2.9 knots)

Mooring System

- Anchor Legs: 8 catenary composite legs (chain/six strand wire rope/chain) lengths vary from 810m to 990m
- 3.75-in. ORQ +20% chain
- 4.125-in. 6-Strand wire rope
- 3.75-in. ORQ chain
- 18mt High holding capacity anchors

Turret

Internal Permanent Bow

FPSO Petrobras P31

(Continued)

Turret Structure

The turret structure proper is 9m in diameter and 31m tall and spans from below the vessel keel to the main turret bearing, located at approximately the main deck of the vessel. It includes the riser connection deck and chain table.

The interior of the turret structure is equipped with access platforms and ladders for inspection and maintenance.

Above this structure and located on the turret is the upper turret structure. The upper turret structure, which is 34m in diameter at the manifold deck and 35m tall is composed of the pull-in deck, manifold deck and swivel stack foundation with associated swivels.

The relative size of the turret shaft and the congestion of the riser system required the chain support assemblies to be mounted on a traditional below keel chain table. The chain table is equipped with eight chain support assembly foundations for the pivoting chain support assemblies which lock the anchor legs to the turret. Each chain support assembly is equipped with a flapper style chain latch to facilitate diverless installation of the anchor legs.

Turret Bearing System

Utilizes a 10.2m diameter Rothe Erde™ segmented three row roller bearing. Lower bearing assembly composed of 30 self-aligning bushings.

Fluid Swivel Assembly

Produced Oil:	1 x 16-in. toroid (450 psi design)
Imported Oil:	1 x 16-in. toroid (450 psi design)
Exported Oil:	1 x 16-in. toroid (450 psi design)
Oil (spare):	1 x 16-in. toroid (450 psi design)

Test A:	1 x 4-in. toroid (300 psi design)
Test B:	1 x 4-in. toroid (300 psi design)
Gas (export and gas lift):	1 x 10-in. toroid (2500 psi design)
Gas (spare):	1 x 10-in. toroid (2500 psi design)
Water Injection:	1 x 6-in. toroid (2000 psi design)
Depressurization (PSV's):	1 x 2.5-in. toroid (150 psi design)
Vent Line:	1 x 2.5-in. toroid (150 psi design)
Hydraulic Control Swivel:	6 x 1-in. passes (5,000 psi design)
Pneumatic Supply Swivel:	2 x 1-in. passes (5,000 psi design)
Electrical Power Swivel:	440 volt ac, 110 volt ac, 24 volt dc, 1 kw
Electrical Control Swivel:	ESD signals, communication network control signals
Fiber Optic Swivel:	Process/ESD control signals

Riser System

- 8 x 7.625-in. Flexible riser (production and auxiliary)
- 8 x 4-in. Flexible riser (gas lift and production test umbilicals)
- 1 x 6-in. Flexible riser (water injection)
- 1 x 11.0625-in. Flexible riser (gas export)
- 2 x 14.5-in. Flexible riser (oil export and import)
- 4 Electro hydraulic control umbilicals
- 1 Fiber optic telemetry riser