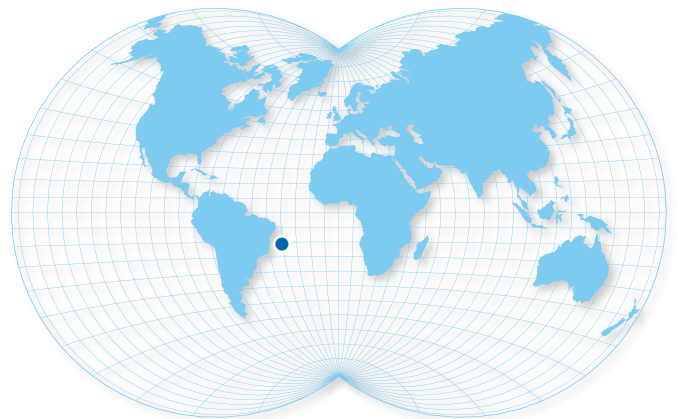


BIJUPIRÁ & SALEMA FIELDS, BRAZIL:

FPSO Fluminense External Turret



Scope of Work

SOFEC designed, constructed and supplied an external cantilevered bow turret mooring system for a 357,000 dwt FPSO vessel to produce the Bijupirá & Salema fields in the Campos Basin, Brazil. The taut leg mooring in water depths ranging from 470m to 800m set an external turret water depth record and was installed on the largest FPSO in Brazil. The MODEC-converted FPSO is moored between the Bijupirá & Salema fields and produces oil from the field, supplies injection water to the wells and exports gas to an existing pipeline in the field. The turret is designed for a combination of 18 risers and umbilicals.

General Description

Client Name:	Shell Brasil Ltda.
Contract Award:	May 2001
Installation Date:	July 2003
First Oil:	August 2003
Vessel Size:	357,000 dwt
Storage Capacity:	1,200,000 bbls
Water Depth:	800m [2,642ft]
Fabrication:	Turret – Malaysia Vessel – Singapore Topsides – Houston

Design Environmental Criteria [100-year storm]

Significant Wave Height:	7.8m [26ft]
Wind Velocity:	29m/s [56.4 knots]
Current:	2m/s [3.9 knots]

Mooring System

- 9-leg 3x3 synthetic rope taut mooring:
- 95mm ORQ +20% chain
- 154mm polyester rope
- VLA Anchors

Turret

This SOFEC external turret mooring system is record-breaking in size and provides safe and reliable means of mooring the FPSO on station in the Bijupirá and Salema fields for the entire service life of the FPSO, in all sea state conditions. The riser system must remain undamaged in the 100-year storm.

The SPM system is an external, bow-mounted cantilevered turret designed to allow free weathervaning of the FPSO about the mooring system. In the offloading condition, the mooring system shall, in

FSO Fluminense

(Continued)

Turret

addition to withstanding loads from the 357,000 dwt FPSO, be capable of withstanding loads imparted by a Suezmax shuttle tanker moored in tandem off the stern of the FPSO.

Fluid Swivel Assembly

Production:	2 x 10-in. toroids (740 psi design)
Production / Test:	1 x 10-in. toroid (740 psi design)
Water Injection:	1 x 8-in. toroid (3,700 psi design)
Gas Export/Import:	1 x 6-in. toroid (2,220 psi design)
Gas Lift:	1 x 6-in. toroid (3,700 psi design)
Hydraulic & Chemical Injection Swivel:	13 paths (5,000 psi design)
Electrical Swivel:	70 paths
Optical Swivel:	11 paths

Riser System

- 1 x 9.5-in. Flexible riser (Gas Import/Export)
- 4 x 8-in. Flexible riser (Production & Test)
- 1 x 7-in. Flexible riser (Water Injection)
- 2 x 6-in. Flexible riser (Production)
- 2 x 5-in. Flexible riser (Gas Lift)
- 1 x 4.5-in. Flexible riser (Water Injection)
- 3 Umbilicals (power, signal, high and low pressure hydraulic, injection & annulus bleed) and have future capacity for five additional risers.

Comments

The Bijupirá & Salema field development in the Campos Basin Offshore Brazil for Shell Brasil Ltda. is an example of the full field, turnkey capabilities available through MODEC and FMC Technologies.

The SOFEC external turret has the capacity for 15 risers and three umbilicals, allowing for future field expansion and tie-ins. MODEC has a separate 13-year agreement to operate the entire system under a production incentive formula.

This SOFEC external turret mooring system is ABS classed.