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## GIRASSOL, LUANDA, ANGOLA

Girassol is located about 210km NNW of Luanda, Angola. It lies in 1350m of water. It will be developed using a subsea facility tied back to an FPSO.

Girassol base-case reserves are estimated at around 700 millions of barrels (bbls). Production is expected to start by the end of 2000.

### SUBSEA

The subsea production system will initially provide for 40 wells: 23 production wells, 14 water-injection wells and three gas-injection wells.

### FPSO - HULL

The bare hull was built in Hyundai Heavy Industries (HHI) shipyard in Korea and moved out of dry dock in July 1999. It will be able to store two million barrels of crude oil and support processes with a capacity of 200,000b/d. It has an overall length of 300m, a moulded breadth of 59.5m, a moulded depth of 30.5m and a design draught of 22.77m. The design life of the hull is 20 years without dry docking.

Current deadweight is 343,000t which includes 98% of cargo capacity and 50% of slop tanks.

The hull features a double-sided construction with 12 ballast wing tanks measuring 7m wide, as well as two fore-peak and two aft-peak ballast tanks. In total, it has 12 cargo tanks.

### TOPSIDES

The main contractor, MAR Profundo Girassol - a joint venture between ETPM and Buoygues - originally subcontracted to build the integrated deck at Fos-sur-Mer in France. It has since re-awarded the contract to Hyundai. This deck is 180m long by 60m wide. It weighs approximately 20,000t.

It contains living quarters, oil treatment, storage, metering and offloading, gas treatment and reinjection facilities.

The process deck is located 7m above the deck of the hull. It contains facilities for produced water treatment at a flow rate of 180,000BPD as well as facilities for 3 million m³/day gas lift, 8 million m³/d gas compression at 285 bars, and gas dehydration.

### ACCOMODATION

The living quarters unit is located at the aft end of the hull and is designed to accommodate 140 people in 80 cabins.

### HOOK-UP

The integrated deck will be transferred to the hull, and the hook-up of the hull/topsides as well as the pre-commissioning will be complete.

**MOORING**

The FPSO will be towed from Korea to the Girassol Field, offshore Angola, where the risers and umbilicals will be installed and connected ready for commissioning and for first oil.

The FPSO will be spread-moored with 16 lines, four at each corner. The anchor lines will be a composite assembly of chains and cables connected to 16 suction anchors.

**RISERS AND UMBILICALS**

The east side of the FPSO will be designed to receive the umbilicals and risers from three riser towers. Each of the riser towers will be connected to the FPSO by a riser. In addition, ten umbilicals will be connected to the base of the riser towers. The west side of the FPSO is designed to receive further risers and umbilicals if needed.

**OFFLOADING**

The FPSO is designed for two offloading systems, one for normal operation with a buoy, one as back-up offloading, in tandem.

Both systems are located at the bow of the FPSO.

The main offloading system includes a loading buoy, located approximately one mile away from the bow of the FPSO. This can accommodate tankers from 80,000 to 400,000DWT, with a nominal offloading rate of 6,000m³/h through two rigid steel catenary 16in lines.

The tandem offloading is a conventional system with a mooring hawser assembly and handling system, and an offloading hose and its handling system. It is designed to accommodate tankers up to 200,000DWT at a nominal offloading rate of 8000m³/hour.
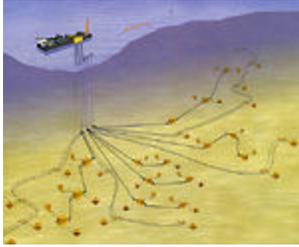
The field came on-stream in 2001.



**The Girassol FPSO hull being completed at the Hyundai yard.**



**The Seaway Eagle will carry out most of the installation work on the Girassol field.**

**The Girasoll field layout diagram.**

**The riser towers and flowline bundles as they will be installed.**



**A CAD detail of the top of the riser towers.**



**A CAD detail of the top of the riser tower (left) and the riser tower on the seabed (right).**



**The deepwater HOST 2500 system manufactured by Kongsberg.**

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