



Free Standing Hybrid Riser (FSHR)

Deepwater riser technology



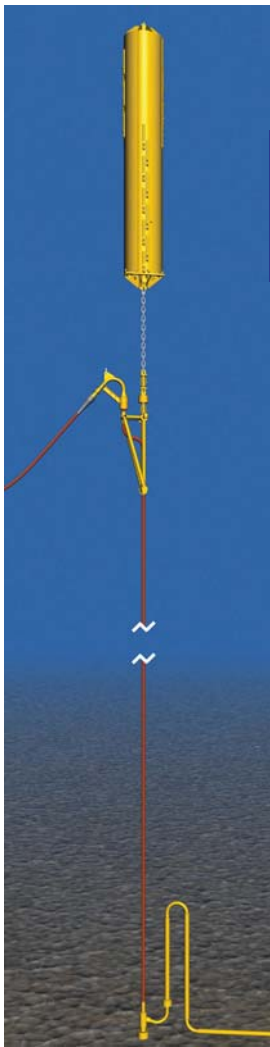
Technip

take it further.

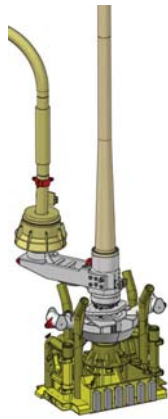
The Free Standing Hybrid Riser

A deepwater riser solution

The Free Standing Hybrid Riser (FSHR) solution effectively complements Technip's riser portfolio



FSHR concept



Foundation and lower riser assembly



Top riser assembly



Tether chain and load monitoring spool



Buoyancy can

The installation of the world's five deepest FSHR for Petrobras' deepwater field development offshore GoM, is a new achievement for Technip. It is a clear demonstration of the Group's capability to implement complex technical solutions and a successful benchmark from which to further develop deepwater riser solutions.

Following the PDET single FSHR that was designed to address the specific requirements of the P-52 platform offshore Brazil and the harsh environmental conditions of the Roncador Field, the Cascade & Chinook FSHR design was the only demonstrably feasible solution within the constraint of the project.

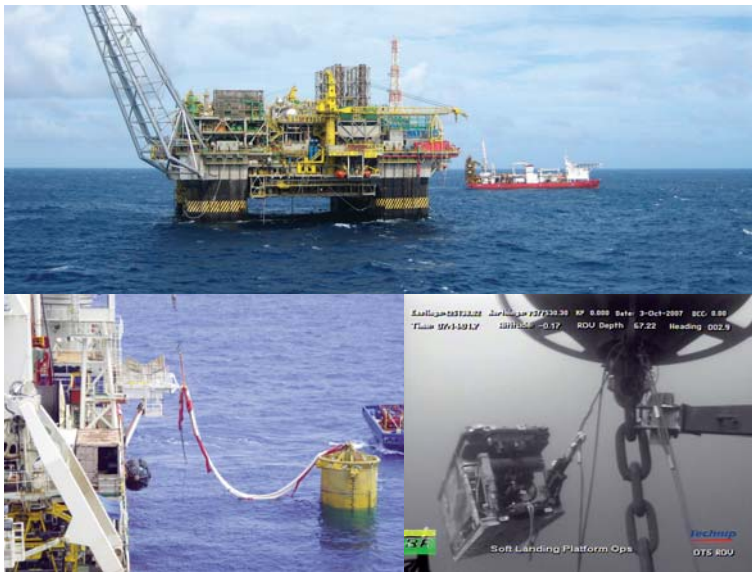
The installation of the world's 5 deepest FSHR's in winter in the GoM in an offshore duration of less than 38 days using 3 vessels working with overlapping and parallel specialised tasks has demonstrated the robustness of the solution and Technip's capability to adapt itself when addressing specific challenges.

The Free Standing Hybrid Riser concept

The FSHR consists of a vertical steel pipe tensioned by a near-surface buoyancy can. A flexible jumper connects the top of the riser to the production platform. The riser is attached to the sea bed via a foundation and a rigid base jumper connects the FSHR to the pipeline end termination.

Main benefits of the FSHR

- The FSHR can be installed before or after the platform (Floating Production Unit) is anchored on site.
- Tensioned by the buoyancy can, the riser supports its own weight, therefore reducing the total weight supported by the production platform.
- The riser is connected to the platform by a flexible jumper. This allows the platform motion to be substantially decoupled from the riser which makes the riser almost insensitive to fatigue due to wave motions.
- The flowline is isolated from the riser loads which are almost fully transferred to the foundation.



PDET Profundo project

2007: the first of its kind FSHR installed offshore Brazil

Client: Petrobras

Location: Campos Basin, Roncador field (Brazil)

Water depth: 1,800 meters

Project features:

- Application of a large diameter (18") Free Standing Hybrid Riser (FSHR) solution for Brazilian offshore deepwater fields
- Engineering, Procurement, Installation and Commissioning of a 56 km-long thermally insulated 18" rigid subsea pipeline, connecting the riser base to a shallow water platform

Characteristics of the FSHR:

- 16" ID flexible jumper: 425 m long
- Buoyancy can:
 - 36 m long x 5.5 m diameter
 - Top depth of 164 m
 - Uplift of 560 Te
- 18" rigid riser 1,600 m long (J-Lay)
- FSHR installed before arrival of the P-52 platform, one of the world's largest semi-submersible units. Technip carried out the detailed engineering, transport and offshore mating of the P-52 platform. First oil less than 7 weeks after P-52 arrival on site
- Fast track development: 26 months from contract award to completion

Cascade & Chinook project

End 2009: five FSHRs in the Gulf of Mexico

Client: Petrobras America

Location: Walker Ridge area - Gulf of Mexico

Water depth: 2,500 - 2,640 meters

Project features:

- Engineering, Procurement, Construction and Installation of 5 FSHR systems for both the Cascade and Chinook fields
- Deepest FSHR
- Deepest risers combined with a disconnectable turret-moored FPSO
- First FSHR connected to a disconnectable turret-moored FPSO
- First reeled FSHR
- First offset FSHR installed in the GoM

Characteristics of the FSHR's:

- 4 x 7" ID flexible jumpers, 630 m long each
- 1 x 6" ID flexible jumper, 630 m long
- Buoyancy can:
 - 39 m long x 6.4 m diameter
 - Top depth of 200 m
 - Net uplift of 700 te
- 9 5/8" OD production risers and 7.5" OD gas export riser, approximately 2,250 m long in 2,500 mwd
- FSHR's installed before the arrival of the FPSO on site
- First oil in 2010
- Fast track development: approximately 28 months from contract award to completion

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