Offshore platforms and facilities

Your field development provider, delivering all types of offshore fixed and floating facilities through an integrated network of regional locations
Infrastructure for the offshore energy business

TechnipFMC is uniquely equipped to lead throughout all phases of offshore field development.

Starting with site coordinates and a reservoir fluid assay, we help determine the most economical way to bring clients’ hydrocarbons to market. We combine broad knowledge of development options with local know-how to build an extensive record of results.

Genesis, TechnipFMC’s wholly owned sister company, creates matrices of potential development architectures and screens them to achieve the optimum architecture. Its ADEPT field development program rapidly compares multiple platform, pipeline, and onshore receipt facility options in terms of CAPEX, OPEX, and risk profile during field development planning. Genesis takes large developments through FEED and executes smaller projects through production.

While we specialize in project delivery, TechnipFMC regularly conducts field development planning studies for very large projects. Genesis and TechnipFMC also offer brownfield services during the production and life-extension phases, and both organizations advise clients on abandonment options.
Our differentiating strength

A complete range of floating and fixed platforms

**Health and safety**

The health and safety of our people is a foundational belief and an absolute commitment at TechnipFMC. Safety is central to everything we do in all project phases, from design to construction to offshore operations. Our award-winning PULSE health, safety, and environmental program emphasizes safety by design through training, R&D, lessons learned, and knowledge management. Many of our construction partners and clients have implemented the program as well.

**Quality**

As the scale and complexity of offshore projects increase, so does the importance of maintaining the highest levels of quality. We maintain rigorous quality procedures on all projects and apply additional quality verification systems to ensure compliance with specific regulatory regimes such as the NORSOK standards.

**Project delivery**

TechnipFMC’s unmatched project management capability delivers all types of offshore fixed and floating infrastructure, deploying common systems and procedures through an integrated network of regional locations. Where national content is a strong driver, our regional offices often perform major projects autonomously or by transferring specialized knowledge and technologies from other centers. All of our execution centers have access to TechnipFMC’s global procurement network.

**Floating platform design**

Floating platforms require specialized engineering tools for design optimization and validation. We invest heavily in design tools and have developed and validated our own software for calculating global motions and performing the basic design of Spar platforms. Our FIDE (Floater Integrated Design Environment) software has been extended to cover all floating platform types and can be used to perform floater design at any of our regional offices with minimal training. This approach has been used on several projects to efficiently transfer knowledge and increase national content.

TechnipFMC has emerged as a leader in computational fluid dynamics (CFD) simulation of floating platforms, using the technology to develop a virtual wave tank. CFD’s power to simulate at full scale enables our engineers to better understand complex wave and current behavior such as run-up/green-water effects and vortex-induced motion. The technology also enables us to develop our own low-motion, semi-platform design capable of supporting dry trees.
Adaptation of onshore processes for offshore
We have a strong track record of applying complex onshore processes to offshore platforms. Examples include LPG extraction on the Nkossa floating production platform and a full gas treatment plant on the Elgin TPG 500 jack-up platform. TechnipFMC can harness synergies between its onshore and offshore disciplines, such as between onshore LNG and offshore FPSO design, to support the new generation of FLNG projects.

Subsea processing
As offshore production moves into deeper water, there is growing need for subsea systems to process the fluids to reach the shore or a host platform. We can evaluate all the relevant options and recommend the optimum subsea architecture and platform configuration. We are investing in R&D to evaluate promising new technologies.

Services offering at a glance:

Floating platforms
- FLNG
- FPSO
- Spar
- TLP
- Semi

Fixed platforms
- Conventional jackets (with lift or floatover-installed topsides)
- Gravity-based substructures (with lift or floatover-installed topsides)
- Self-installing platforms
- Artificial islands
Monohulls

Floating liquefied natural gas

FLNG is a groundbreaking combination of onshore and offshore technologies that enables cost-effective development of large, remote gas reserves where pipeline export of gas to an onshore LNG plant is uneconomical or too risky. These mega-projects require collaboration between the technical skills of onshore LNG plant design and marinization of facilities required for offshore platforms. FLNG facilities are among the largest offshore floating structures and thus require experienced design and fabrication partners.

TechnipFMC is leading several JIP and internal R&D initiatives to model LNG spillages and protect FLNG vessels from damage caused by cold spills, fire, and explosion.

For benign environments, the cryogenic product can be offloaded onto an LNG carrier that moors alongside the FLNG vessel using a series of offloading arms composed of hard pipe and swivel joints. For harsh environments, it is unsafe for the LNG carrier to moor alongside the FLNG, so tandem offloading (e.g., stern to bow) is required to maintain significant separation between the vessels. TechnipFMC has a qualified aerial hose solution for tandem offloading of LNG that uses a cryogenic flexible flowline design.

Keypoints

- TechnipFMC is a leader in FLNG
- Combination of onshore and offshore technologies
- Suitable for remote gas field developments

Main references

- Shell master agreement for design, construction, and installation of multiple FLNG facilities over up to 15 years
- Shell generic FLNG FEED
- Shell Prelude FLNG FEED and EPC
- Shell agreement to strengthen FLNG collaboration
- Petronas Satu FLNG FEED and EPC
- Petrobras FLNG FEED and winner of the design competition
- A number of conceptual and FEED studies completed or underway
- ENi Coral South FLNG integrated EPCi

As leader of three of the world’s first major projects, TechnipFMC is the reference company in FLNG.
Floating production storage and offloading

FPSOs enable offshore production and storage of oil with export by shuttle tanker where pipeline export is uneconomical or too technically challenging, such as in ultra-deep water. These facilities use onshore processes adapted to the floating marine environment.

These facilities can support large topsides and large production capacities. FPSOs can be spread-moored in benign environments, but in moderate to harsh sea states they require external and internal turret mooring, respectively. Where an FPSO is turret-moored and weathered, a flow transfer system is required to allow fluids from the subsea wells to pass onto the deck of the FPSO for processing.

Keypoints

- TechnipFMC and its construction partners have delivered some of the world’s largest FPSOs
- Well-suited to oilfield developments where subsea trees drilled by MODU are appropriate
- Wide range of water depths
- Offshore storage and export of oil by shuttle tanker – no need for oil export pipeline

Main references

- Total Girassol FPSO
- Total Dalia FPSO
- Total Akpo FPSO
- Inpex Ichthys FPSO
- Petrobras P58/P62/P70/P76

TechnipFMC, working with its construction partners, has delivered some of the world’s largest FPSO facilities.
Spars

Platform leadership

TechnipFMC is a global leader in Spar platforms, having built and delivered 15 out of 18 constructed to date.

Different solutions

The Spar has been developed from the original cylindrical classic Spar through the truss Spar, the cell Spar, the Arctic Spar, and Spar with storage. The Spar is a low-motion floater that can support full drilling with dry trees or with tender assist and flexible or steel catenary risers. The truss Spar can be configured with condensate storage appropriate for the development of remote gas fields. The classic Spar can be configured with larger storage volumes more appropriate to oilfield developments where a low-motion floater is required (such as in drilling and production). The Spar topside is installed offshore either by heavy lift or floatover.

Arctic Spar

TechnipFMC has also developed two Spar designs for the Arctic: one where sheet-ice conditions predominate and one where icebergs represent the only ice threat. In both cases, they have detachable risers and moorings.
Excellence in delivery
TechnipFMC’s on-time execution has become the gold standard in Spar delivery, reflecting our Spar platform history and project management expertise.

Main references
- Murphy Kikeh, the first Spar ever built in Malaysia at MMHE and the world’s first Spar with catamaran floatover topsides is a prime example of national content
- Shell Perdido, the world’s deepest production Spar (2,382 meters water depth)
- Anadarko Lucius
- Anadarko Heidelberg
- Statoil Aasta Hansteen, the first production Spar with product storage and the first Spar within the Arctic Circle

Keypoints
- TechnipFMC is the leader in Spar design and delivery
- The Spar has low motions and can support dry trees and SCRs
- Wide range of water depths
- The Spar can operate as an FPSO with storage and with full drilling facilities, or with tender assist
Multi-column floaters

Tension leg platform

Strategic partnership
TechnipFMC has delivered the Malikai TLP to Shell offshore Malaysia through its hull design affiliate TMH and fabrication partner Malaysia Marine and Heavy Engineering. TMH is a joint venture between TechnipFMC and MHB, This strategic partnership is an example of how TechnipFMC can facilitate local objectives for operators and host countries.

TechnipFMC's TLP design
The tension leg platform, with its vertical tendon moorings that eliminate heave, is an appropriate platform for deepwater drilling and production in water depths up to 1,500 meters. The TLP can be configured with full drilling or with tender assist and is generally a dry-tree unit. The TLP has a shallow draft, and its topside can be integrated onto the substructure at quayside. Thus, it can cost-effectively accommodate large topsides.

Keypoints
- TechnipFMC delivered its first TLP in Malaysia
- Low-motion platform for supporting dry trees
- Suitable for water depth of up to 1,500 meters
- Full drilling and large topside capability

Main references
- Shell Malikai – first TechnipFMC TLP, built in Malaysia
Semi

It has HVS properties – heave- and vortex-induced-motion suppression – and there are two variants: wet-tree or dry-tree compatible. The wet-tree semi has reduced motions compatible with steel catenary risers. The dry-tree version has greater draft, additional heave plates, and is capable of supporting dry trees.

The TechnipFMC semi development is made possible through extensive use of computational fluid dynamics to optimize the hull form for reduced motions prior to verification in a model basin. Our semi has all the attributes of a conventional semi, such as simplicity of construction, moorings, and low cost, but with the benefits of low motion that enable it to perform in an equivalent manner to a Spar or TLP.

With their column step design, TechnipFMC semis are exceptionally stable at shallow draft (quayside) and in the transition zone during ballasting to operating draft. The topside can be integrated onto the substructure at quayside. Therefore, as with the TLP, large topsides can be accommodated cost-effectively. Alternatively, the semi topsides can be installed by floatover, such as with the Petrobras series of platforms: P52, P51, and P56.

Keypoints

- Well-suited to oilfield developments where subsea trees drilled by MODU are appropriate
- Wide range of water depths
- Full drilling and large topside capability
- TechnipFMC has its own novel low-motion semi design that can accommodate dry trees

Main references

- Petrobras P52/P51/P56

TechnipFMC has designed its own semi-submersible platform.
Platforms

TechnipFMC has a long track record of delivering fixed platforms.

Fixed

There are several types of fixed platforms:

- Large, conventional platforms with pile steel jackets whose topsides are installed by a heavy-lift vessel or floatover (e.g., CTOC Cakerawala and ExxonMobil East Area have 18,000-ton topsides)
- Small, conventional platforms installed by small crane vessel (e.g., RWE Cavendish)
- Steel gravity-based structure platforms, generally with floatover topsides (e.g., Petronas Turkmenistan Block 1 and Chevron Wheatstone)
- Large, self-installing platforms (e.g., TPG 500 production jack-ups on Harding, Elgin, and Shah Deniz, with up to 30,000-ton topsides)
- Small, self-installing platforms (e.g., Burlington Calder)

Main references

- Chevron Wheatstone EP
- Statoil Valemon topsides EP
- Total Martin Linge topsides EPC
**Arctic platforms**

For shallow water, such as in the North Caspian, TechnipFMC has developed a conical steel foundation to support large topsides and provide good performance in drifting sheet-ice conditions as an alternative to conventional artificial islands.

Working with Cervval and BV, we developed an ice-modeling simulation program that is unique in the Arctic industry. It uses a multi-program simulator to cope with the complexity of calculating the properties of the ice sheet and for each ice fragment that results from contact with the structure or from collision with other ice rubble particles. The program allows optimization of platform structures to minimize ice loading and ice rubble build-up prior to final design verification in an ice test basin.

**Main references**
- Cairn Energy Offshore Southern Greenland field development option screening
- SDAG Shtokman FPU-FEED
- Total Kalamkas Sea Project concept study
- Yamal LNG – large onshore modules using offshore concepts
- Statoil Aasta Hansteen Spar, the first Spar in the Arctic Circle and the first production Spar with storage

TechnipFMC has a range of platform types suitable for offshore developments in the ice-prone Arctic and sub-Arctic.

**Keypoints**
- Arctic platforms require winterized topsides and a specialized approach to safety design
- Through its fleet of vessels, TechnipFMC has extensive experience in operating in remote sub-Arctic locations
- TechnipFMC can evaluate various platform designs in ice-prone areas and advise on optimum selection from technical, commercial, and HSE perspectives
Enabling technologies

A leader in floatover operations, TechnipFMC has performed several world firsts.

**Floatover**

TechnipFMC developed the jack-assisted set-down (Unideck) method to enable installation of topsides onto fixed jackets in West Africa’s challenging long period swell environment. TechnipFMC has extensive experience in topside mating onto floating structures such as semi hulls (e.g., Petrobras P52, P51, and P56) and a Spar hull using catamaran barges (e.g., Murphy Kikeh).

**Keypoints**

- Enables installation in one piece of topsides over current heavy-lift barge capacities

**Main references**

- ExxonMobil East Area
- Total Amenam AMP2
- Petrobras P52, P51, and P56 (onto semi hull)
- Murphy Kikeh (onto Spar hull)
- Adma-Opco GPF
- Petronas Turkmenistan Block 1 (onto a GBS)
- Total Ofon 2
Subsea processing and field extension

Subsea processing
As field developments move into deeper water, subsea processing becomes essential for lifting the reservoir fluids to surface or shore for further treatment. Subsea processing, which started with booster pumping and basic separation of gas and liquid phases, is becoming increasingly complex. Subsea gas compression systems are in the execution phase, and subsea factories are predicted for the future.

TechnipFMC has the expertise to evaluate the options for subsea processing, assessing their risks and the benefits in terms of riser configuration, reduced platform topsides, smaller export pipelines, and reduced onshore infrastructure.

Post-delivery opportunities
During a field’s production phase, opportunities may arise to improve the development’s economic value. This may involve debottlenecking if the reservoir deliverability exceeds original expectations, tying back other wells or fields to take advantage of excess processing capacity post-plateau, or using enhanced oil recovery techniques to improve the recovery of fluids from an existing reservoir. TechnipFMC is building a strong capability in brownfield works, drawing on its expertise in designing, planning, and executing large, complex offshore construction, hookup, and commissioning projects.

Main references
- Shell global engineering frame agreement
- BP Engineering Services Program
- Marine Well Containment System
- International subsea field designs in the United States, India, Venezuela, Mexico, United Kingdom, and elsewhere